Facility: Callaway		Date of Examination:	9/11/2017
Examination Level:	SRO	Operating Test Number:	2017 - 1

Administrative Topic (see Note)	Type Code*	Describe activity to be performed	
Conduct of Operations A1.a (SRO)	R,M	2.1.5 (3.9)	Ability to use procedures related to shift staffing, such as minimum crew complement, overtime limitations, etc.
		JPM:	Determine Shift Staffing (Fatigue Rule)
Conduct of Operations A1.b (SRO)	R,M,P*	2.1.37 (4.6)	Knowledge of procedures, guidelines, or limitations associated with reactivity management.
		JPM:	Review ECP Calculation
Equipment Control A2	R,N	2.2.17 (3.8)	Knowledge of the process for managing maintenance activities during power operations, such as risk assessments, work prioritization, and coordination with the transmission system operator.
		JPM:	Prioritize Job and Assess Risk
Radiation Control A3	R,M	2.3.4 (3.7)	Knowledge of radiation exposure limits under normal or emergency conditions
		JPM:	Determine Reportability Requirements for Overexposure
Emergency Procedures/Plan A4	R,N	2.4.44 (4.4)	Knowledge of emergency plan protective action recommendations.
		JPM:	Determine the Protective Action Recomendation

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

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

*A JPM from the 2014 exam was randomly selected by placing 5 slips of paper labeled "A1.a" through "A4" in a hardhat. "A1.b" was drawn from the hardhat.

A1.a	This is a MODIFIED, BANK JPM. The parent JPM (Set 2 G2 A.1.b) was last used on an ILT NRC Exam administered at Callaway in 2011. The applicant is provided a schedule for 5 Senior Reactor Operators and is directed to determine SRO eligibility for an overtime shift.
A1.b	This is a MODIFIED JPM. The parent JPM (RSA-1 rev 1) was last used on the 2014 ILT NRC Exam. The applicant is directed to review the ECP performed by Reactor Engineering per OSP-SF-00005, Estimated Critical Position Calculation. The applicant will find errors in the Critical Rod Position and Maximum Rod Height.
A2	This is a NEW JPM. The applicant is given a list of current plant status and provided a new Job against 'B' Train ESW UHS Bypass Valve EFHV0066. The applicant is directed to screen and assess the risk of the condition on plant status.
A3	This is a MODIFIED JPM. The parent JPM was last used on the 2011 ILT NRC Exam. Upon completion of the task, the candidate will have determined projected dose for a job with and without shielding installed and determined reporting requirements for an employee overexposure event.
A4	This is a NEW JPM. Upon completion of this JPM, the candidate will have recommended Sheltering within a 2 mile radius and 5 miles downwind (sectors B,C,D,E) and marked the PAR Flowchart accordingly.

CALLAWAY ENERGY CENTER
JOB PERFORMANCE MEASURE

A1.a (SRO)

JPM No:	Admin1-SRO-O-001	KSA No:	GEN 2.1.5
Revision Date:	06/24/2017	KSA Rating:	3.9
Job Title:	SRO		
Duty:	Administrative		
Task Title:	Determine Shift Staffing (Fatigue Rule)		
Completion Time:	15 minutes		

The performance of this task was evaluated against the standards contained in this JPM and determined to be:

☐ SATISFACTORY ☐ UNSATISFACTORY

Reason, if UNSATISFACTORY:

____

____

Evaluator Signature: ______________________ Date: ______________

Task Performer: ______________________

Location of Performance:
☐ Control Room ☐ Simulator/Lab ☐ Plant ☒ Classroom

Method of Performance: ☐ Simulated ☒ Performed

☐ Alternate Path ☐ Time Critical ☐ RCA

References: APA-ZZ-00905, Limitiations of Callaway Plant Staff Working Hours, Rev 020

Tools / Equipment: None

Initial Conditions: The Plant has been operating at 100% power for over a month.

Due to illnesses on the crew you are required to call in an additional Senior Reactor Operator (SRO) to maintain minimum crew staffing on DAY shift.

You have been given a package of 5 potential candidate's schedules to fill the SRO position for the 23rd.

Initiating Cues: Determine ALL **Senior Reactor Operators** that are eligible to work a 12 hour DAY shift on the 23rd based on their NOT exceeding Callaway Work hour limitations.

The shift cycle for determining days off is 4 weeks, starting the 24th of the month provided and DOES NOT REPEAT.

Individuals complete NIGHT shift on the day "NIGHTS" is listed.

(No waivers or exceptions are allowed, per a recent Management directive.)

Assume all hours on sheets provided are the hours that were or will actually be worked.

Complete the table below and return to the Shift Manager (Examiner) of SRO eligibility status and reason(s) WHY any individual is not eligible.

Simulator Set up and/or Note(s): None.

Task Standard: The candidate determined that only two Senior Reactor Operators are eligible:

- Davis and Johnson are eligible.
- Smith and Green ineligible due to not having off 10 days in the 4 week period.
- Williams is ineligible since already worked 72 hours in past 6 days. (72 hours in 7 day limit)

Start Time: ________________

Stop Time: ________________

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
1.	Obtain a verified working copy of APA-ZZ-00905, Limitations of Callaway Plant Staff Working Hours		Candidate obtained a copy of APA-ZZ-00905 and reviewed the working hour limitations	S U Comments:
2.	Review the hours of the SROs given as potential candidates to fill the 12 hour shift.		After reviewing the shift schedules, the candidate compared the time worked to the time allowed under working hour limitiations	S U Comments:
*3.	Determine which SROs are eligible to fill 12 hour watch without exceeding overtime limitations		Candidate determined that Davis and Johnson are eligible to take the 12 hour watch without exceeding overtime limitations.	S U Comments
*4.	Determine which SROs are not eligible to fill 12 hour watch without exceeding overtime limitations		Candidate determined that Smith and Green are not eligible due to not having off 10 days in the 4 week period.	S U Comments
*5.	Determine which SROs are not eligible to fill 12 hour watch without exceeding overtime limitations		Candidate determined that Williams is not eligible since already worked 72 hours in the past 6 days.	S U Comments
6.	**JPM IS COMPLETE**	RECORD STOP TIME ON PAGE 2.		S U Comments

*Critical Step

KEY:

SRO:	Circle One:	Reason(s) if Not Eligible
T. Davis	Eligible / Not Eligible	
G. Green	Eligible / Not Eligible	*Would violate minimum days off requirement 10 days off in the 4 week period (2.5 days/week)*
D. Johnson	Eligible / Not Eligible	
M. Smith	Eligible / Not Eligible	*Would violate minimum days off requirement 10 days off in the 4 week period (2.5 days/week)*
R. Williams	Eligible / Not Eligible	*Not eligible since already worked 72 hours in the past 6 days. (72 hours in 7 day limit)*

*Critical Step

A1.a (SRO)

Initial Conditions: The Plant has been operating at 100% power for over a month.

Due to illnesses on the crew you are required to call in an additional Senior Reactor Operator (SRO) to maintain minimum crew staffing on DAY shift.

You have been given a package of 5 potential candidate's schedules to fill the SRO position for the 23rd.

Initiating Cues: Determine ALL **Senior Reactor Operators** that are eligible to work a 12 hour DAY shift on the 23rd based on their NOT exceeding the Callaway Work hour limitations.

The shift cycle for determining days off is 4 weeks, starting the 24th of the month provided and DOES NOT REPEAT.

Individuals complete NIGHT shift on the day "NIGHTS" is listed.

(No waivers or exceptions are allowed, per a recent Management directive.)

Assume all hours on sheets provided are the hours that were or will actually be worked.

Complete the table below and return to the Shift Manager (Examiner) of SRO eligibility status and reason(s) WHY any individual is not eligible.

SRO:	**Circle One:**	**Reason(s) if Not Eligible**
T. Davis	Eligible / Not Eligible	
G. Green	Eligible / Not Eligible	
D. Johnson	Eligible / Not Eligible	
M. Smith	Eligible / Not Eligible	
R. Williams	Eligible / Not Eligible	

<u>SENIOR REACTOR OPERATOR</u> WORK SCHEDULE
M. Smith

24 **OFF**	**25** NIGHTS 12 hrs	**26** NIGHTS 12 hrs	**27** NIGHTS 12 hrs	**28** NIGHTS 12 hrs	**1** **OFF**	**2** **OFF**
3 NIGHTS 12 hrs	**4** NIGHTS 12 hrs	**5** NIGHTS 12 hrs	**6** NIGHTS 12 hrs	**7** **OFF**	**8** DAYS 12 hrs	**9** DAYS 12 hrs
10 DAYS 12 hrs	**11** DAYS 12 hrs	**12** **OFF**	**13** **OFF**	**14** NIGHTS 12 hrs	**15** NIGHTS 12 hrs	**16** NIGHTS 12 hrs
17 NIGHTS 12 hrs	**18** **OFF**	**19** **OFF**	**20** **OFF**	**21** DAYS 12 hrs	**22** DAYS 12 hrs	**23** **OFF**

Nights = 1900 – 0700
Days = 0700 - 1900

<u>SENIOR REACTOR OPERATOR</u> WORK SCHEDULE
D. Johnson

24 DAYS 12 hrs	**25** DAYS 12 hrs	**26** DAYS 12 hrs	**27** DAYS 12 hrs	**28** **OFF**	**1** **OFF**	**2** NIGHTS 12 hrs
3 DAYS 12 hrs	**4** DAYS 12 hrs	**5** DAYS 12 hrs	**6** DAYS 12 hrs	**7** **OFF**	**8** **OFF**	**9** DAYS 12 hrs
10 **VAC**	**11** **VAC**	**12** **OFF**	**13** **OFF**	**14** **OFF**	**15** DAYS 12 hrs	**16** DAYS 12 hrs
17 DAYS 12 hrs	**18** **OFF**	**19** **OFF**	**20** NIGHTS 12 hrs	**21** NIGHTS 12 hrs	**22** NIGHTS 12 hrs	**23** **OFF**

Nights = 1900 – 0700
Days = 0700 - 1900

SENIOR REACTOR OPERATOR WORK SCHEDULE
R. Williams

24 **OFF**	**25** **OFF**	**26** DAYS 12 hrs	**27** DAYS 12 hrs	**28** DAYS 12 hrs	**1** **OFF**	**2** **OFF**
3 NIGHTS 12 hrs	**4** NIGHTS 12 hrs	**5** NIGHTS 12 hrs	**6** NIGHTS 12 hrs	**7** **OFF**	**8** **OFF**	**9** DAYS 12 hrs
10 DAYS 12 hrs	**11** DAYS 12 hrs	**12** DAYS 12 hrs	**13** **OFF**	**14** **OFF**	**15** **OFF**	**16** **OFF**
17 DAYS 12 hrs	**18** DAYS 12 hrs	**19** DAYS 12 hrs	**20** DAYS 12 hrs	**21** DAYS 12 hrs	**22** DAYS 12 hrs	**23** **OFF**

Nights = 1900 – 0700
Days = 0700 - 1900

<u>SENIOR REACTOR OPERATOR</u> WORK SCHEDULE
T. Davis

24 **OFF**	**25** DAYS 12 hrs	**26** DAYS 12 hrs	**27** DAYS 12 hrs	**28** DAYS 12 hrs	**1** **OFF**	**2** **OFF**
3 NIGHTS 12 hrs	**4** NIGHTS 12 hrs	**5** NIGHTS 12 hrs	**6** **OFF**	**7** **OFF**	**8** **OFF**	**9** **OFF**
10 DAYS 12 hrs	**11** DAYS 12 hrs	**12** DAYS 12 hrs	**13** **OFF**	**14** **OFF**	**15** NIGHTS 12 hrs	**16** NIGHTS 12 hrs
17 **OFF**	**18** DAYS 12 hrs	**19** DAYS 12 hrs	**20** DAYS 12 hrs	**21** DAYS 12 hrs	**22** DAYS 12 hrs	**23** **OFF**

Nights = 1900 – 0700
Days = 0700 - 1900

<u>SENIOR REACTOR OPERATOR</u> WORK SCHEDULE
G. Green

24 **OFF**	**25** NIGHTS 12 hrs	**26** NIGHTS 12 hrs	**27** NIGHTS 12 hrs	**28** NIGHTS 12 hrs	**1** **OFF**	**2** DAYS 12 hrs
3 **OFF**	**4** DAYS 12 hrs	**5** DAYS 12 hrs	**6** DAYS 12 hrs	**7** **OFF**	**8** DAYS 12 hrs	**9** DAYS 12 hrs
10 DAYS 12 hrs	**11** DAYS 12 hrs	**12** **OFF**	**13** **OFF**	**14** **OFF**	**15** NIGHTS 12 hrs	**16** NIGHTS 12 hrs
17 NIGHTS 12 hrs	**18** **OFF**	**19** **OFF**	**20** DAYS 12 hrs	**21** DAYS 12 hrs	**22** DAYS 12 hrs	**23** **OFF**

Nights = 1900 – 0700
Days = 0700 - 1900

APA-ZZ-00905

LIMITATIONS OF CALLAWAY PLANT STAFF WORKING HOURS

MINOR Revision 020

LIMITATIONS OF CALLAWAY PLANT STAFF WORKING HOURS

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LIMITATIONS OF CALLAWAY PLANT STAFF WORKING HOURS

1.0 PURPOSE

1.1. This procedure establishes and implements controls prescribed by 10CFR26.205, Work Hours, to assure compliance of individuals subject to work hour limitations.

2.0 SCOPE

2.1. This procedure is limited to implementation of work hour limitations for covered individuals. Employees and supplemental personnel subject to this procedure are also subject to all other aspects of fatigue management specified by 10CFR26, Subpart I, Managing Fatigue, and promulgated by APA-ZZ-00911, Fatigue Management Program.

2.2. Work hour limitations established by this procedure apply to the following:

2.2.1. Plant staff (craft and supervisor positions) in the following work groups who are NOT specifically restricted from performing covered work:

- Operations
- Electrical Maintenance
- Mechanical Maintenance
- Instrument & Control
- Security

2.2.2. Technicians and Assistant Technicians in Chemistry and Radiation Protection who may fill On-Shift Emergency Response Organization positions.

2.2.3. Plant staff and supplemental personnel who have unescorted access to the protected area AND are assigned to perform covered work. Review APA-ZZ-00905 Appendix 2, Supplemental Personnel Performing Covered Work, to ensure supplemental personnel are in compliance with 10CFR26, Subpart I, Managing Fatigue.

NOTE

Removal of unescorted access privileges and providing an escort for the sole purpose of avoiding work hour limitations is prohibited.

2.2.4. Plant staff and supplemental personnel who direct personnel in the performance of covered work activities.

3.0 RESPONSIBILITIES

3.1. Supervisor Access Authorization FFD

- Ensuring a review is performed at least once per year, such that the entire year is reviewed, to evaluate the effectiveness of the control of work hours and ensuring issues identified in the annual review are addressed in the corrective action program.
- Reviewing the performance of the station in adherence to work schedules for covered workers.
- Evaluating the number of deviations and reasons for the deviations from work hour limitations.
- Reviewing the performance of the station in adhering to work schedules for covered work groups, including evaluation of the number of schedule changes and reasons for the changes.
- Maintaining a record of the shift schedules and shift cycles used for at least the past 3 years for those individuals who are subject to work hour limitations in accordance with APA-ZZ-00911, Fatigue Management Program.

3.2. Duty Manager

Authorizing on-site restorative rest periods (naps) on a case-by-case basis when necessary to assure availability of personnel who might otherwise exceed work hour limitations or experience a state of fatigue that would render them unfit for duty when needed to perform required work activities.

3.3. Managers and Department Heads

- Managing staffing levels, work load, and use of overtime within their departments to ensure adequate availability of personnel to perform covered work within established work hour limits.
- Communicating the requirements established by this procedure to appropriate personnel within their departments.
- Limiting and distributing overtime to ensure individual covered workers DO NOT routinely exceed an average of 54 hours worked per week over the term of each shift cycle.

3.4. Operations Shift Manager

- Performing responsibilities (as necessary) of Supervisors of Covered Workers as described in Step 3.6 when an individual's normal supervisor is not available.
- Determining that a waiver of work hour limitations for a covered worker is necessary to mitigate or prevent a condition adverse to safety.

3.5. Security Shift Supervisor

Determining that a waiver of work hour limitations for a covered worker is necessary to maintain site security.

3.6. Supervisors of Covered Workers

- Reporting time worked and time excluded from work hour limitations for themselves and their subordinates through the Time Reporting Information System (TRIS).
- Evaluating proposed changes in scheduled work hours for themselves and their subordinates to ensure continued compliance with work hour limitations.
- Maintaining hours worked for themselves and their subordinates within the limitations authorized by this procedure.
- Initiating requests to waive work hour limitations when necessary to provide adequate support to maintain site security or for mitigation or prevention of conditions adverse to safety.
- Obtaining qualification as a Qualified Fatigue Assessor and assessing fitness for duty by performing fatigue assessments of any employee being considered for a waiver of work hour limitations prior to processing the waiver.
- Ensuring a waiver is authorized prior to allowing an individual to exceed work hour limitations.
- Evaluating performance and continued fitness for duty of employees while working under a waiver of work hour limitations.

3.7. Covered Workers

- Maintaining hours worked within the authorized limits of this procedure.
- Checking hours worked are accurately documented in TRIS.
- Being aware of the total hours worked in the previous 14 days and notifying management if work hour limits will be exceeded when asked to work additional hours.

-END OF SECTION-

4.0 PROCEDURE

4.1. Work Hour Limits During Normal Operations (Unit Output Breaker Closed)

4.1.1. *Personnel Subject To Work Hour Limits* - except as permitted by waivers OR exceptions, LIMIT hours worked so as NOT to exceed:

- 16 work hours in any 24-hour period
- 26 work hours in any 48-hour period
- 72 work hours in any 7-day period.

4.1.2. *Personnel Subject To Work Hour Limits* - except as permitted by waivers OR exceptions, OBSERVE break periods of at least:

- 10 continuous hours between successive work periods, OR 8 continuous hours between successive work periods when a break of less than 10 hours is necessary to accommodate a crew's schedule transition between work schedules or shifts.
- 34 continuous hours in any 9 day period.

4.1.3. *Personnel Subject To Work Hour Limits* - except as permitted by waivers OR exceptions, OBSERVE the minimum day off (MDO) requirements established according to Work Group/Job Duties and Shift Schedules as specified in the table that follows.

- The MDO requirements specified for normal operations reflect number of days off per week averaged over the term of the shift cycle.
- Shift cycles used for determining average days off must NOT exceed six weeks in duration.

Step 4.1.3 Cont'd

- Refer to Step 4.5 for Calculation of Minimum Day Off (MDO), to determine which shift schedule applies.

Work Group/Job Duties	**8-hour Schedule**	**10-hour Schedule**	**12-hour Schedule**
Maintenance	1 day/wk (average)	2 days/wk (average)	2 days/wk (average)
Operations, Chemistry, Radiation Protection	1 day/wk (average)	2 days/wk (average)	2.5 days/wk (average)
Security	1 day/wk (average)	2 days/wk (average)	3 days/wk (average)

4.1.4. *Supervisors* - ENSURE work hours of their employees subject to work hour limits are maintained within the limits prescribed in this section UNLESS pre-approved to exceed limits as follows:

a. If necessary, INITIATE a CA-0161-Waiver of Work Hour Limits, in accordance with step 4.8 and OBTAIN approval PRIOR to allowing work hours to exceed the limits specified in Steps 4.1.1 through 4.1.3.

4.2. Work Hour Limits During Outages, (Unit Output Breaker Open)

NOTE

Application of the less restrictive work hour limits for outage periods is limited to 60 days. If an outage extends beyond 60 days, the limits for normal operations must be applied 60 days after the start of the outage. The 60 day limit may be extended on an individual case basis in 7-day increments for each non-overlapping 7-day period during the outage in which an individual has worked 48 hours or less.

4.2.1. *Personnel Subject To Work Hour Limits* - except as permitted by waivers OR exceptions, LIMIT hours worked so as NOT to exceed:

- 16 work hours in any 24-hour period
- 26 work hours in any 48-hour period
- 72 work hours in any 7-day period.

4.2.2. *Personnel Subject To Work Hour Limits* - except as permitted by waivers OR exceptions, OBSERVE break periods of at least:

- 10 continuous hours between successive work periods, OR 8 continuous hours between successive work periods when a break of less than 10 hours is necessary to accommodate a crew's schedule transition between work schedules or shifts.
- 34 continuous hours in any 9 -day period.

4.2.3. *Personnel Subject To Work Hour Limits* - except as permitted by waivers OR exceptions, OBSERVE the minimum day off (MDO) requirements established according to Work Group/Job Duties and Shift Schedules as specified in the table that follows.

Work Group/Job Duties	**8-hour Schedule**	**10-hour Schedule**	**12-hour Schedule**
Maintenance	1 day off per week	1 day off per week	1 day off per week
Operations, Radiation Protection Chemistry	3 days off in each successive (i.e. non-rolling) 15-day period	3 days off in each successive (i.e. non-rolling) 15-day period	3 days off in each successive (i.e. non-rolling) 15-day period
Security	4 days off in each successive (i.e. non-rolling) 15-day period	4 days off in each successive (i.e. non-rolling) 15-day period	4 days off in each successive (i.e. non-rolling) 15-day period

4.2.4. *Supervisors* - ENSURE work hours of their employees subject to work hour limits are maintained within the limits prescribed in this section UNLESS pre-approved to exceed limits as follows:

a. If necessary, INITIATE a CA-0161-Waiver of Work Hour Limits, in accordance with Step 4.8 and OBTAIN approval PRIOR to allowing work hours to exceed the limits specified in Steps 4.2.1 through 4.2.3.

4.3. Calculation of Work Hours

4.3.1. In calculating work hours for purposes of determining compliance with work hour limitations, INCLUDE:

- All hours on site that are NOT specifically allowed for exclusion by Step 4.3.2.
- Time expended performing work off site (e.g., technical assistance provided by telephone from an individual's home) WHEN the total time expended during any single break period exceeds 30 minutes.
- All intervening hours from the end of the last work period WHEN an individual is required to resume work activities before observing the minimum required break between successive work periods.
- All travel time required by the company other than daily commute time to and from the normal reporting location.

4.3.2. In calculating work hours for purposes of determining compliance with work hour limitations, EXCLUDE:

- Time spent actually performing shift turnover activities at the beginning AND end of the work period, INCLUDING time required to arm and disarm security officers.

NOTE

Shift turnover at the start of the work period must be conducted as the first activity in order to be excluded from work hour limitations. Likewise, shift turnover at the end of the work period must be conducted as the last activity in order to be excluded. Any work activity (such as signing in or out of the RCA, signing on or off of WPA, participating in pre-job briefs, checking tools in or out, etc.) that is conducted at the beginning or end of the work period will negate the exclusion of turnover time at that end of the shift.

- Time on site during which the individual is relieved of all duties AND provided with reasonable opportunity AND accommodation for restorative sleep (e.g., a nap of at least 30 minutes). Nap periods are permitted on a case-by-case basis and must be pre-approved by the Duty Manager.
- Time periods during which the employee is NOT on duty, but remains on site for personal reasons (i.e. using the fitness center, using the cafeteria, after hours study time, etc.).
- Unscheduled hours during which the individual is responding to declared plant emergencies as defined by the Radiological Emergency Response Plan.
- Unscheduled hours during which the individual is responding to unannounced emergency preparedness exercises and drills.
- Off site work activities initiated by the individual during break periods that are NOT required by the licensee. (e.g. studying, reading work related material, reading e-mail, etc.).
- On site voluntary study time not specifically required as part of a documented remediation or performance improvement plan.
- One hour during the shift on which clocks are set back to transition from Daylight Saving Time to Standard time.

4.4. Calculation of Break Periods

4.4.1. In calculating time off to determine compliance with the requirement for a continuous break period of 10 hours between successive work periods (or 8 hours during shift transitions) or 34 hours in any 9 day period, INCLUDE:

- All time between successive work periods during which the individual is NOT required to perform any duties for the licensee.
- Time spent actually conducting turnover activities at the beginning of the shift OR at the end of the shift, but NOT both.
- Time expended performing work off site (e.g., technical assistance provided by telephone from an individual's home) PROVIDED the total cumulative time expended during the break period does NOT exceed 30 minutes.

4.4.2. To determine compliance with the requirement for a 34 hour continuous break in any 9 day period, CHECK for a 34 hour continuous break during each period of time that begins with the start of each work period and ends 216 hours later.

4.5. Calculation of Minimum Day Off (MDO) Requirements

NOTE

Overtime worked during the course of the shift cycle will alter the average number of hours per work period. For example, individuals on an 8 hour shift schedule who work overtime continuous with shift will increase their average number of hours per work period, which may require a change in the MDO requirements during the course of the shift cycle. If, for example, the individual was required have an average of 1 day off per week and overtime moves the average such that an average of two days off per week is required, the two day off per week average applies to the entire shift cycle.

4.5.1. In determining individual MDO requirements during normal operations, DIVIDE the total number of hours worked AND scheduled during the entire shift cycle by the total number of continuous work periods worked AND scheduled during the same shift cycle to arrive at the average number of hours per work period.

4.5.2. REFER to the table in Step 4.1.3 to determine individual MDO requirements.

a. IF the average number of hours per work period is 9 OR LESS, APPLY the 8-hour schedule MDO requirements applicable to the individual's duties.

b. IF the average number of hours per work period is MORE than 9 but, NOT MORE than 11, APPLY the 10-hour schedule MDO requirements applicable to the individual's duties.

c. IF the average number of hours per work period is MORE than 11, APPLY the 12-hour schedule MDO requirements applicable to the individual's duties.

4.5.3. In determining the number of days off scheduled AND observed, INCLUDE as a day off:

- Each calendar day during which NO work period begins.
- Scheduled days off during which time worked consists SOLELY of responding to an unannounced emergency preparedness drill OR exercise.
- Shifts worked by security personnel during the actual conduct of force-on-force tactical exercises evaluated by the NRC.

4.6. Schedule Transitions

NOTE

The station or individual work groups may elect to observe outage MDO limits in lieu of the more restrictive on line limits whenever the output breaker is open. However, use of outage limits is not required. Work groups may elect to continue observing the more restrictive on-line limits during outage periods. When outage limits will be applied during scheduled outages, it may be beneficial to shorten earlier shift cycles such that the shift cycles leading up to the outage are a full six weeks in length in order to maximize availability of personnel during the period immediately preceding the outage.

4.6.1. Transition from normal operations to a planned outage:

a. APPLY outage work hour limits beginning with the start of the next calendar day AFTER the unit output breaker opens.

b. Prior to a planned outage, ADJUST the length of one OR MORE preceding shift cycles to LESS than six weeks as necessary to cause the end of a shift cycle to coincide with the beginning of the outage.

4.6.2. Transition from normal operations to an unplanned outage:

NOTE

The licensee will be considered to be in compliance with the MDO requirements of the normal operating shift cycle that was interrupted if the individuals on the schedule would have met the average MDO requirements by working the hours remaining in the unfinished shift cycle as they were scheduled prior to the interruption.

a. When a normal operations shift cycle is interrupted by an unplanned outage, APPLY the outage work hour limits beginning with the start of the next calendar day AFTER unit output breaker opens.

4.6.3. Transition from outage to normal operations:

a. WHEN restoring from outage conditions, APPLY the work hour limits for normal operations beginning with the start of the next calendar day AFTER the unit output breaker closes.

b. In addition to the on-line MDO requirements, CONTINUE TO OBSERVE outage MDO requirements through the end of the current week or the current 15 day period (as applicable) during which the output breaker closes.

c. For purposes of applying on-line MDO requirements, ESTABLISH the on-line shift cycle as follows:

1. BEGIN the shift cycle at the start of the first calendar day AFTER the unit output breaker closes.

2. END the shift cycle after full week increments of not less than one week nor more than six weeks after the start of the shift cycle.

3. ESTABLISH subsequent shift cycles of NOT MORE than six weeks per cycle.

NOTE

Outage MDO requirements are established on weekly basis for Maintenance and on successive 15 day periods for others. The end of the outage will not typically coincide with the end of a week or the end of a successive 15 day period. This raises the question as to how compliance with the outage MDO is determined for the shortened week or 15 day period at the end of the outage. Pro-rating the MDO is not workable and transitioning to on-line limits before breaker closure will result in compliance problems later in the cycle if employees are still on outage schedules when the transition to on-line rules is made. Therefore, NRCFM software is programmed to measure compliance with both rules simultaneously during the portion of the week or 15 day period already in progress at the time the breaker closes.

4.7. Transition to Covered Worker Status

4.7.1. *Supervisor* – NOTIFY TRIS group (Callaway Time via Outlook) of effective date of transition for employee being placed in covered worker status. Also confirm if the employee will remain on current schedule, or provide new schedule.

4.7.2. *TRIS Group* –

a. ASSIGN affected employee to covered work group in TRIS

b. UPDATE schedule in TRIS if necessary

c. UPDATE covered worker qualification code in Qualmaster.

4.7.3. *Employee transitioning to covered worker status* – COMPLETE Fatigue Management CBT, T68.0FFD.6, if not already completed

4.7.4. *Supervisor* – VERIFY qualification requirements are met by checking PATCVRW code in QualMaster.

4.7.5. *Supervisor* - BEFORE assigning an individual to perform covered work, EVALUATE hours worked and scheduled, INCLUDING hours worked performing duties that are not covered work, to assure the individual's work hours meet the following requirements:

a. Except as permitted by waivers OR exceptions, ENSURE the individual's work hours have NOT exceeded:

- 16 work hours in the past 24-hour period
- 26 work hours in the past 48-hour period
- 72 work hours in the past 7-day period

b. Except as permitted by waivers OR exceptions, ENSURE the individual has observed the following breaks and minimum days off:

1. A 10-hour break prior to the work period on which the transition to covered worker status will begin, OR an 8-hour break when a break of less than 10 hours is necessary to accommodate a scheduled transition between work schedules or shifts.

2. A 34-hour break in the past 9 day period.

3. Except as permitted by waivers OR exceptions, ENSURE the individual has received at least one day off in the preceding 7-day period IF the individual has been working an 8-hour shift schedule; OR at least two days off in the preceding 7-day period IF the individual has been working a 10 or 12-hour shift schedule.

4.8. <u>Waivers</u>

NOTE

Waiver of work hour limitations is permitted ONLY when necessary to mitigate or prevent a condition adverse to safety OR to maintain Site Security as defined in Step 6.2.

4.8.1. *Supervisor* - REQUEST a waiver by completing Section 1 of form CA-0161-Waiver of Work Hour Limits.

4.8.2. *Supervisor* - ARRANGE for a fatigue assessment in accordance with APA-ZZ-00911, Fatigue Management Program, to be conducted WITHIN four hours before the start of the proposed waiver period.

4.8.3. *Shift Manager or Security Shift Supervisor (as appropriate)* - CERTIFY that a waiver is necessary to mitigate OR prevent a condition adverse to safety OR to maintain site security prior to approving the waiver.

4.8.4. *All covered workers* - CHECK a waiver has been approved by reviewing completed CA-0161-Waiver of Work Hour Limits PRIOR to exceeding any of the following work hour limitations:

- 16 work hours in any 24-hour period
- 26 work hours in ay 48-hour period
- 72 work hours in any 7-day period
- Less than 34 hour break in any 9-day period
- Less than <minimum day off requirements required for normal operations or outage periods as applicable.

4.8.5. *Supervisor* - INTIATE Adverse Condition CAR IF covered work is actually performed while employee is working under waiver of work hour limits.

4.9. <u>Exceptions</u>

4.9.1. Work hour limitations need NOT be met by security personnel WHEN informed in writing by the NRC that these requirements, OR any subset thereof, are waived in order to assure the common defense and security. The duration of the exception will be defined by the NRC.

4.9.2. Work hour limitations need NOT be met during declared emergencies, as defined by the Radiological Emergency Response Plan.

4.10. <u>Time Reporting and Evaluation</u>

4.10.1. *Supervisor* - ENSURE their own and direct reports' compliance with work hour limitations for covered workers as follows:

a. RECORD all changes in hours worked AND scheduled through the Time Reporting Information System (TRIS) PRIOR to the end of the shift on which the change is reported OR approved except as follows:

- Recording changes that reduce the number of hours worked for an employee (i.e. sick leave, vacation, personal business, etc.) may be delayed until the next regular business day.
- When the TRIS application is unavailable, changes may be reported to to "Callaway Time" for system update on the next regular business day following system restoration.

NOTE

If the TRIS Application or the NRCFM evaluation tool is unavailable and additional schedule changes or overtime canvassing of covered workers is anticipated before the next regular business day, the Help desk should be contacted to restore the system immediately or call out technical support as necessary to restore the applications to service.

b. EVALUATE proposed changes in scheduled work hours using the TRIS Evaluation Application (NRCFM) PRIOR to assigning additional work hours OR approving any of the following changes in scheduled work hours:

- Shift trades
- Schedule changes
- Vacation changes that move scheduled vacation days out of the current shift cycle.
- Changes that advance the start time OR delay the end time of work hours currently scheduled in TRIS.
- Changes that reduce the total number of actual AND scheduled days off recorded in TRIS for the current shift cycle.

c. ENSURE hours for travel are recorded in TRIS and considered when company business or training requires travel for covered workers. Hours spent traveling, other than normal time spent commuting to the work location, are considered hours worked and must be included in work hour limit calculations. Consult with the TRIS Group on travel plans prior to traveling, if necessary.

d. REJECT proposed changes in work hours that result in non-compliance with work hour limitations EXCEPT when permitted by waivers OR exceptions.

e. CONSULT with Human Resources for special circumstances, IF NECESSARY, to authorize paid time off OR restrict employees from covered work to maintain compliance with work hour limitations.

-END OF SECTION-

5.0 REFERENCES

5.1. Implementing

5.1.1. APA-ZZ-00911, Fatigue Management Program

5.1.2. CA-0161-Waiver of Work Hour Limits

5.2. Developmental

5.2.1. 10CFR26.205, Work Hours

5.2.2. 10CFR26, Subpart I, Managing Fatigue

5.2.3. NEI 06-11, Managing Personnel Fatigue at Nuclear Power Reactor Sites

5.2.4. Regulatory Guide 5.73, Fatigue Management for Nuclear Power Plant Personnel Records

5.2.5. EDP-ZZ-01128 Appendix 1, SSCS in the Scope of the Maintenance Rule at Callaway

5.2.6. Independent Spent Fuel Storage Installation (ISFSI) Certificate of Compliance (CoC), Appendix A, Technical Specifications for the HI-STORM UMAX Canister Storage System

-END OF SECTION-

6.0 DEFINITIONS

6.1. **Break Period –** An interval of time that falls between successive work periods, during which the individual does not perform any duties for the licensee other than one period of shift turnover at the beginning or end of the shift, but not both.

6.2. **Condition Adverse to Safety / Site Security -** Unforeseen conditions which, in the informed opinion of the duty Shift Manager / Security Shift Supervisor, could jeopardize the safety / security of the public, station, personnel, or environment. Waivers are considered appropriate if required to mitigate conditions adverse to safety / site security. If rule compliance could result in the following, but not limited to, type conditions, it would be appropriate to consider using the waiver process:

- Violate other NRC requirements such as minimum on-site staffing.
- Jeopardize the industrial or radiological safety of the public or plant personnel.
- Delay recovery from a challenge to a safety system function.
- Delay in recovering from actual or potential loss of reactor core cooling capability during outages.
- Cause a forced reactor shutdown, power reduction, or similar action as a result of exceeding a time limit for a Technical Specification Limiting Condition for Operation.
- Cause an action as a result of exceeding a time limit for an ISFSI Certificate of Compliance Limiting Condition for Operation.
- Result in an Un-planned increase in core Damage Frequency that causes an entry into an Orange or Red condition on the Safety Monitor.
- Cause or prevent mitigation of an environmental permit violation.
- Compromise the ability to maintain the site secure from the actions of malicious groups or persons.
- Force undue risk to on-site or off-site station personnel as a consequence of an external event (e.g., security, fire, severe weather)

6.3. **Supplemental Personnel –** Any individual not employed by the licensee who is providing work or services to the licensee, either by contract, purchase order, oral agreement or other arrangement.

6.4. **Covered Individuals –** Any individual granted unescorted access to the protected area that performs covered work.

NOTE

Removal of unescorted access privileges and providing an escort for the sole purpose of avoiding work hour limitations is prohibited.

6.5. **Covered Work –** work involving any of the following activities:

- Operating or on-site directing of the operation of systems and components identified as High Risk Significant by EDP-ZZ-01128 Appendix 1, SSCS in the Scope of the Maintenance Rule at Callaway. This excludes operation of Chemistry sampling components of SSCS Systems and Components used for sample collection and analysis.
- Performing maintenance or on-site directing of the maintenance of structures, systems, and components identified as High Risk Significant by EDP-ZZ-01128 Appendix 1, SSCS in the Scope of the Maintenance Rule at Callaway, and ISFSI dry cask storage components.
- On the job training (OJT), Task Performance Evaluation (TPE), Job Performance Measures (JPM), or any other type of training activity that is performed in the plant and involves hands on operation or maintenance work on structures, systems, and components identified as High Risk Significant by EDP-ZZ-01128 Appendix 1, SSCS in the Scope of the Maintenance Rule at Callaway.
- Performing Radiation Protection or Chemistry duties required as a member of the on-site emergency response organization minimum shift complement.
- Performing duties of a fire brigade member who is responsible for understanding the effects of fire and fire suppressants on safe shutdown capability.
- Performing security duties as an armed security force officer, alarm station operator, response team leader, or watchperson.
- Trenching, boring, or excavating in the immediate vicinity of buried systems and components identified as High Risk Significant by EDP-ZZ-01128 Appendix 1, SSCS in the Scope of the Maintenance Rule at Callaway.
- Dry Cask Storage activities including Multi-Purpose Canister (MPC) loading, MPC sealing, MPC transfer and MPC unloading.

6.6. **Day Off –** A calendar day in which an individual does not start a work period.

6.7. **Directing –** The exercise of control over a work activity by an individual who is directly involved in the execution of the work activity, and either makes technical decisions for that activity without subsequent technical review, or is ultimately responsible for the correct performance of that work activity. The following tasks are examples generally considered NOT directing:

- Engineering tasks
- Supervision, in the plant, of the maintenance of a non-covered SSC.
- Supervision, at the second level of supervision or higher.
- Performance of work control center documentation activities.
- Development of a work procedure.
- Preparation of a work or modification package.
- Review by senior management of work plans.
- Training of personnel during which time the trainee is not operating or performing maintenance activities.
- Provision of recommendations from vendors and engineers on test performance, component and system operation, and other similar technical input.
- Any work that does not involve operations or maintenance on risk significant SSCs.
- Provision of recommendations only, by technical staff to control room staff.

6.8. **On-site –** Within the owner controlled area of the plant.

6.9. **Outage –** The period of time during which the reactor unit is disconnected from the electrical grid.

6.10. **Shift cycle –** A series of consecutive work shifts and days off that is planned to repeat regularly, thereby constituting a continuous shift schedule. A shift cycle cannot exceed 6 weeks for purposes of calculating days off.

6.11. **Shift turnover –** Only those activities that are necessary to safely transfer information and responsibilities between two or more individuals between shifts. Shift turnover activities may include, but are not limited to, discussions on the status of plant equipment, and the status of on-going activities, such as extended tests of safety systems and components.

Shift turnover at the start of the work period must be conducted as the first activity in order to be excluded from work hour limitations. Likewise, shift turnover at the end of the work period must be conducted as the last activity in order to be excluded. Any work activity (such as signing in or out of the RCA, signing on or off of WPA, participating in pre-job briefs, checking tools in or out, etc.) that is conducted at the beginning or end of the work period will negate the exclusion of turnover time at that end of the shift.

6.12. **Travel Time –** When company business or training requires travel for covered workers, hours spent traveling, other than normal time spent commuting to the work location, are considered hours worked and must be recorded in TRIS and included in work hour calculations. Whether the time is paid or unpaid is determined by company policy or collective bargaining agreements as appropriate.

6.13. **Work Hours –** Time during which the individual performs duties for the licensee excluding the following exceptions:

- Time spent actually performing shift turnover activities at the beginning and end of the work period.
- Time on site during which the individual is relieved of all duties and provided with reasonable opportunity and accommodation for restorative sleep (e.g., a nap of at least 30 minutes).
- Time periods during which the employee is not on duty, but remains on site for personal reasons (i.e. using the fitness center, using the cafeteria, after hours study time, etc.).
- Unscheduled hours during which the individual is responding to declared plant emergencies as defined by the Radiological Emergency Response Plan.
- Unscheduled hours during which the individual is responding to unannounced emergency preparedness exercises and drills.
- Off site work activities initiated by the individual during break periods that are not required by the licensee. (e.g. studying, reading work related material, reading e-mail, etc.).
- One hour during the shift on which clocks are set back to transition from Daylight Saving Time to Standard time.

6.14. **Work Period –** One continuous period of time during which an individual is assigned to perform duties for the licensee. Intervals of work separated by less than the required minimum break of 10 continuous hours (or 8 hours continuous hours when a break of less than 10 hours is necessary to accommodate a crew's schedule transition between work schedules or shifts) are considered one work period and the intervening hours between intervals is counted as hours worked.

-END OF SECTION-

7.0 SUMMARY OF CHANGES

Page(s)	Section or Step Number	Description
18	5.2.6	Added developmental reference to ISFSI Certificate of Compliance, Appendix A, Technical Specifications.
19	6.2	Added bullet to the definitions of Conditions Adverse to Safety/Site Security to reference ISFSI Certificate of Compliance, Appendix A, Technical Specifications Limiting Conditions for Operation.
20	6.5	Added ISFSI and dry cask storage components to the second bullet so that covered work involves both risk significant structures, systems, and components identified in EDP-ZZ-01128, Appendix 1, SSCS in the Scope of the Maintenance Rule, and ISFSI dry cask storage components. Added bullet to Covered Work activities list to include dry cask storage activities including multi-purpose canister (MPC) loading, MPC sealing, MPC transfer and MPC unloading.
20	6.5	Added "High" to Risk Significant by EDP-ZZ-01128 Appendix 1, SSCS in the Scope of the Maintenance Rule at Callaway each time it is referenced to clarify the definition of covered work.
4	3.1	Changed Superintendent, Labor Relation to Supervisor Access Authorization FFD
4	3.4	Removed Supervisor, Admin Support and moved responsibilities to section 3.1
14	4.7	Updated instructions when transitioning to covered work
1-22		Changed TRIS Administrator to TRIS Group

CALLAWAY ENERGY CENTER
JOB PERFORMANCE MEASURE

A1.b (SRO)

JPM Bank No:	Admin1-SRO-O-002	KSA No:	GEN 2.1.37
Revision Date:	04/13/2017	KSA Rating:	4.6
Job Title:	SRO		
Duty:	ADMINISTRATIVE		
Task Title:	Review ECP Calculation		
Completion Time:	35 minutes		

The performance of this task was evaluated against the standards contained in this JPM and determined to be:

☐ SATISFACTORY ☐ UNSATISFACTORY

Reason, if UNSATISFACTORY:

____

____

Evaluator Signature: ______________________________ Date: ____________________

Task Performer: ____

Location of Performance:

☐ Control Room ☐ Simulator/Lab ☐ Plant ☒ Classroom

Method of Performance: ☐ Simulated ☒ Performed

☐ Alternate Path ☐ Time Critical ☐ RCA

References: OSP-SF-00005, Estimated Critical Position Calculation, Rev. 21
Plant Curve Book
Student Handout of WinPCNDR & Xenon Prediction

Tools / Equipment: Calculator

CALLAWAY ENERGY CENTER
JOB PERFORMANCE MEASURE

Initial Conditions: The Plant experienced a reactor trip from 100% power on 9/6/17 at 0322.
The outage is complete.
The Start-up is scheduled for 9/12/17 at 1200.
Reactor Engineering department has reported that the ECP program is not available and that the ECP will be calculated using Attachment 1 of OSP-SF-00005.
RCS Boron Concentration at the time of trip was 163 ppm. Current concentration is 621 ppm by sample.
Burnup is 406.5 EFPD.

Initiating Cues: The Shift Manager has directed you to review and approve the completed Attachment 1 of OSP-SF-00005, Estimated Critical Position Calculation, using the printouts and information provided by the Reactor engineer. Inform the Shift Manager of any issues with the calculation.

Task Standard: Upon completion of this JPM, the candidate will have not approved the ECP due to the following errors on Attachment 1:

- Incorrect Critical Rod Height was recorded in step 6.13.2 as control bank D at 72 steps. Correct position is control bank D at 92 steps.
- Incorrect Maximum Rod Height was recorded in step 6.14.3.c.2 as control bank D at 199 steps. Correct position is control bank D at 170 steps.

Start Time: ________________

Stop Time: ________________

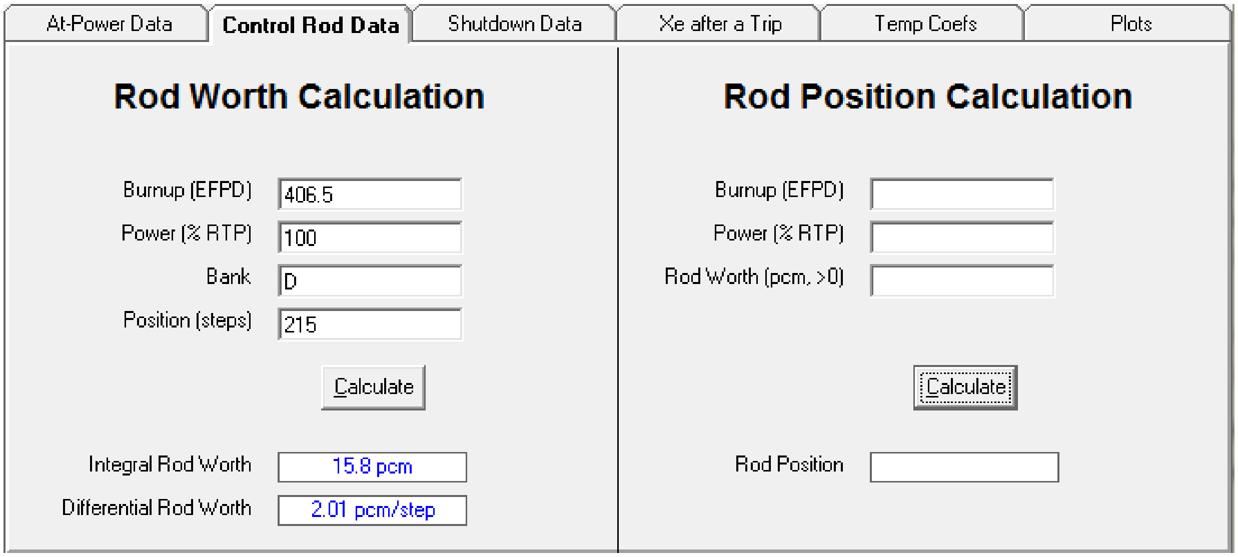
JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
1.		Provide the candidate with a copy of OSP-SF-00005 “Estimated Critical Position Calculation” and the print outs from WinPCNDR		**S** **U** Comments:
*2	Candidate reviews Attachment 1 of OSP-SF-00005 “Estimated Critical Position Calculation” Wrong rod position in step 6.13.2		Candidate identified the error and informs the Shift Manager. See KEY for correct data. Critical steps of the Attachment are marked on the KEY. Error 1 wrong rod position in step 6.13.2	**S** **U** Comments:
*3.	Candidate reviews Attachment 1 of OSP-SF-00005 “Estimated Critical Position Calculation” Wrong rod position in step 16.14.3.c.2		Candidate identified the error and informs the Shift Manager. See KEY for correct data. Critical steps of the Attachment are marked on the KEY. Wrong rod position in step 16.14.3.c.2	**S** **U** Comments:
4.	**JPM IS COMPLETE**	Record Stop time on page 2.		

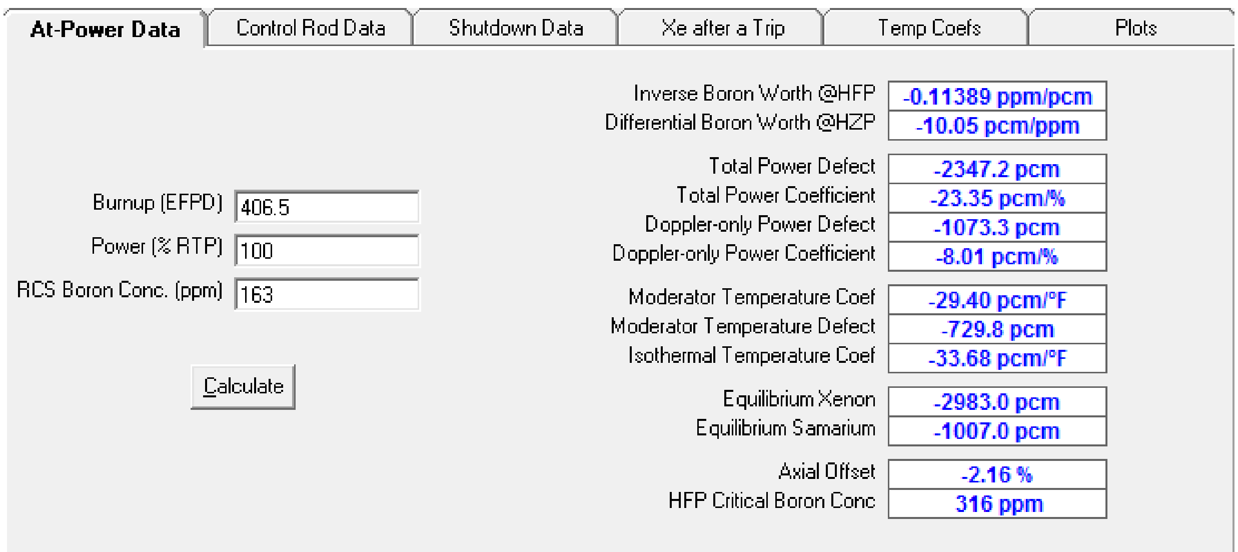
*Critical Step

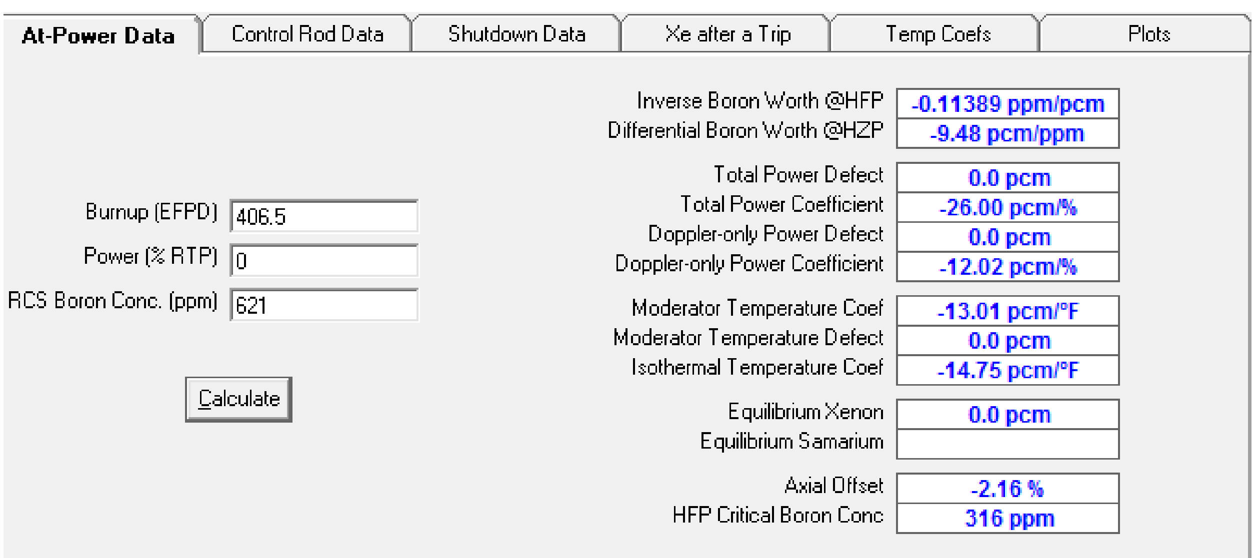
A1.b (SRO)

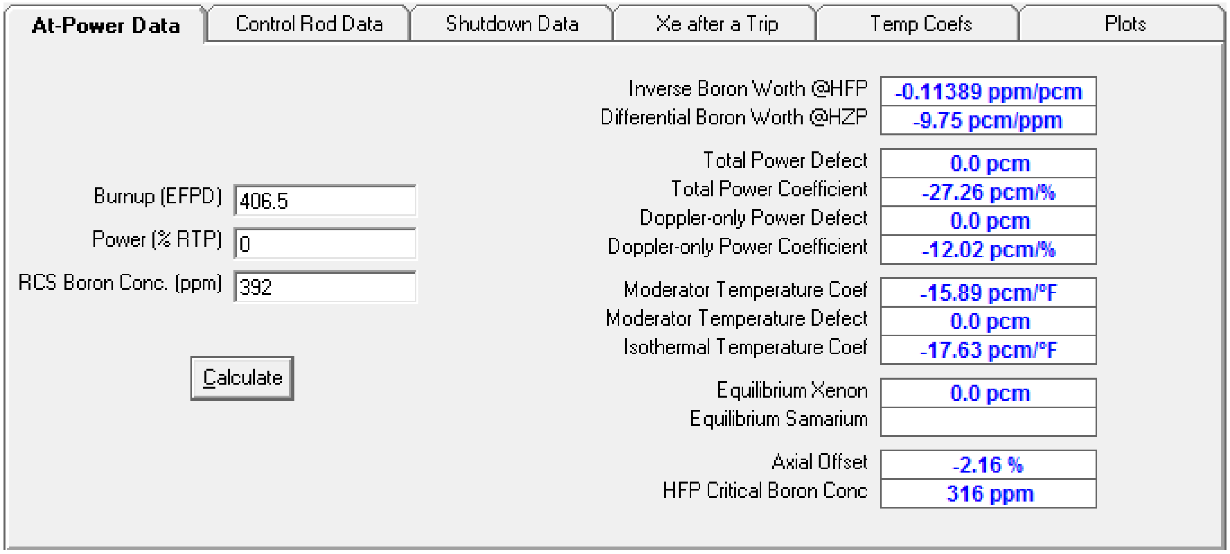
Initial Conditions: The Plant experienced a reactor trip from 100% power on 9/6/17 at 0322.
The outage is complete.
The Start-up is scheduled for 9/12/17 at 1200.
Reactor Engineering department has reported that the ECP program is not available and that the ECP will be calculated using Attachment 1 of OSP-SF-00005.
RCS Boron Concentration at the time of trip was 163 ppm. Current concentration is 621 ppm by sample.
Burnup is 406.5 EFPD.

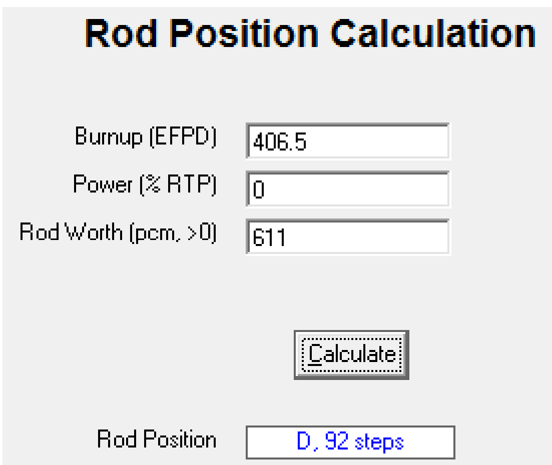
Initiating Cues: The Shift Manager has directed you to review and approve the completed Attachment 1 of OSP-SF-00005, Estimated Critical Position Calculation, using the printouts and information provided by the Reactor engineer. Inform the Shift Manager of any issues with the calculation.

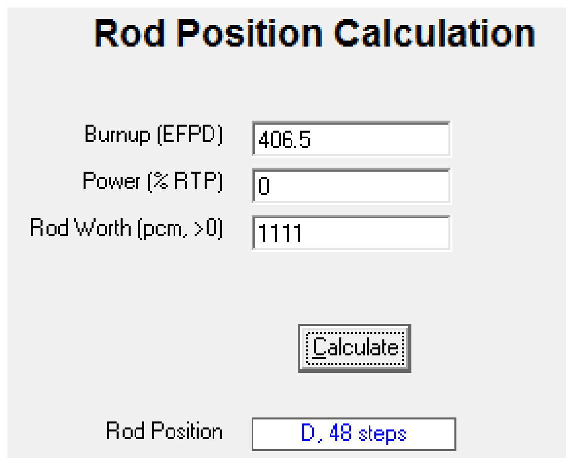

At-Power Data
Control Rod Data
Shutdown Data
Xe after a Trip
Temp Coefs
Plots
Rod Worth Calculation
Burnup (EFPD) 406.5
Power (% RTP) 100
Bank D
Position (steps) 215
Calculate
Integral Rod Worth 15.8 pcm
Differential Rod Worth 2.01 pcm/step
Rod Position Calculation
Burnup (EFPD)
Power (% RTP)
Rod Worth (pcm, >0)
Calculate
Rod Position

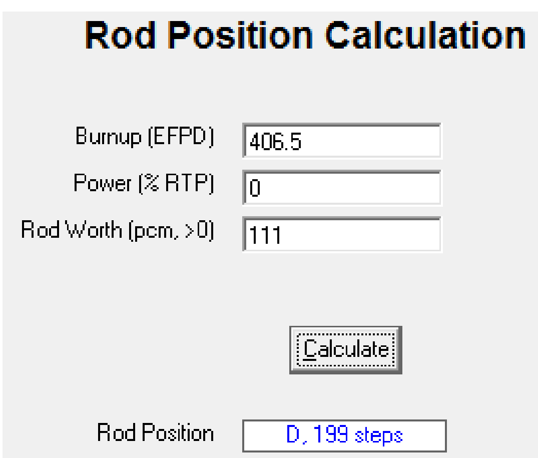

At-Power Data
Control Rod Data
Shutdown Data
Xe after a Trip
Temp Coefs
Plots
Burnup (EFPD) 406.5
Power (% RTP) 100
RCS Boron Conc. (ppm) 163
Calculate
Inverse Boron Worth @HFP -0.11389 ppm/pcm
Differential Boron Worth @HZP -10.05 pcm/ppm
Total Power Defect -2347.2 pcm
Total Power Coefficient -23.35 pcm/%
Doppler-only Power Defect -1073.3 pcm
Doppler-only Power Coefficient -8.01 pcm/%
Moderator Temperature Coef -29.40 pcm/°F
Moderator Temperature Defect -729.8 pcm
Isothermal Temperature Coef -33.68 pcm/°F
Equilibrium Xenon -2983.0 pcm
Equilibrium Samarium -1007.0 pcm
Axial Offset -2.16 %
HFP Critical Boron Conc 316 ppm


At-Power Data
Control Rod Data
Shutdown Data
Xe after a Trip
Temp Coefs
Plots
Burnup (EFPD) 406.5
Power (% RTP) 0
RCS Boron Conc. (ppm) 621
Calculate
Inverse Boron Worth @HFP -0.11389 ppm/pcm
Differential Boron Worth @HZP -9.48 pcm/ppm
Total Power Defect 0.0 pcm
Total Power Coefficient -26.00 pcm/%
Doppler-only Power Defect 0.0 pcm
Doppler-only Power Coefficient -12.02 pcm/%
Moderator Temperature Coef -13.01 pcm/°F
Moderator Temperature Defect 0.0 pcm
Isothermal Temperature Coef -14.75 pcm/°F
Equilibrium Xenon 0.0 pcm
Equilibrium Samarium
Axial Offset -2.16 %
HFP Critical Boron Conc 316 ppm


At-Power Data
Control Rod Data
Shutdown Data
Xe after a Trip
Temp Coefs
Plots
Burnup (EFPD) 406.5
Power (% RTP) 0
RCS Boron Conc. (ppm) 392
Calculate
Inverse Boron Worth @HFP -0.11389 ppm/pcm
Differential Boron Worth @HZP -9.75 pcm/ppm
Total Power Defect 0.0 pcm
Total Power Coefficient -27.26 pcm/%
Doppler-only Power Defect 0.0 pcm
Doppler-only Power Coefficient -12.02 pcm/%
Moderator Temperature Coef -15.89 pcm/°F
Moderator Temperature Defect 0.0 pcm
Isothermal Temperature Coef -17.63 pcm/°F
Equilibrium Xenon 0.0 pcm
Equilibrium Samarium
Axial Offset -2.16 %
HFP Critical Boron Conc 316 ppm


Rod Position Calculation
Burnup (EFPD) 406.5
Power (% RTP) 0
Rod Worth (pcm, >0) 611
Calculate
Rod Position D, 92 steps


Rod Position Calculation
Burnup (EFPD) 406.5
Power (% RTP) 0
Rod Worth (pcm, >0) 1111
Calculate
Rod Position D, 48 steps


Rod Position Calculation
Burnup (EFPD) 406.5
Power (% RTP) 0
Rod Worth (pcm, >0) 111
Calculate
Rod Position D, 199 steps

Date	Time	Power (%)	% I	% Xe	Xe Worth (pcm)	Delta Xe Worth (pcm)
09/06/2017	3:22	100.0	100.0	100.0	-2982.9	
09/06/2017	13:22	0.0	37.0	173.8	-5191.2	-2208.7
09/06/2017	23:22	0.0	12.9	127.8	-3817.0	1374.2
09/07/2017	9:22	0.0	4.5	75.9	-2267.6	1549.4
09/07/2017	19:27	0.0	1.6	40.8	-1219.9	1047.7
09/08/2017	5:27	0.0	0.5	21.0	-627.8	592.1
09/08/2017	15:27	0.0	0.2	10.5	-313.3	314.4
09/09/2017	1:27	0.0	0.1	5.1	-153.3	160.0
09/09/2017	11:27	0.0	0.0	2.5	-74.0	79.3
09/09/2017	21:27	0.0	0.0	1.2	-35.4	38.6
09/10/2017	7:27	0.0	0.0	0.6	-16.8	18.6
09/10/2017	17:27	0.0	0.0	0.3	-8.0	8.9
09/11/2017	3:27	0.0	0.0	0.1	-3.7	4.2
09/11/2017	13:27	0.0	0.0	0.1	-1.8	2.0
09/11/2017	23:27	0.0	0.0	0.0	-0.8	0.9
09/12/2017	9:27	0.0	0.0	0.0	-0.4	0.4

Date	Time	Power (%)	% Pm	% Sm	Sm Worth (pcm)
09/06/2017	3:22	100.0	100.0	100.0	-1007.1
09/06/2017	13:22	0.0	88.4	103.7	-1038.8
09/06/2017	23:22	0.0	77.6	107.1	-1073.5
09/07/2017	9:22	0.0	68.1	110.1	-1103.8
09/07/2017	19:27	0.0	59.7	112.8	-1130.7
09/08/2017	5:27	0.0	52.4	115.1	-1154.1
09/08/2017	15:27	0.0	46.0	117.1	-1174.6
09/09/2017	1:27	0.0	40.3	118.9	-1192.6
09/09/2017	11:27	0.0	35.4	120.4	-1208.4
09/09/2017	21:27	0.0	31.1	121.8	-1222.2
09/10/2017	7:27	0.0	27.3	123.0	-1234.4
09/10/2017	17:27	0.0	23.9	124.1	-1245.1
09/11/2017	3:27	0.0	21.0	125.0	-1254.4
09/11/2017	13:27	0.0	18.4	125.8	-1262.7
09/11/2017	23:27	0.0	16.2	126.5	-1269.9
09/12/2017	9:27	0.0	14.2	127.2	-1276.2

Key

Attachment 1

Estimated Critical Position Calculation

Sheet 1 of 4

Person Completing	Initials/PIN	Date & Time
W. White	WW 13579	9/12/17 1030
R. Swanson	RS 24680	9/12/17 1045

STEP				
6.1.1	Shutdown Date	9/6/17	Time	0322
6.1.2	Startup Date	9/12/17	Time	1200
6.1.3	Burnup	EFPD	406.5	

NOTE

Recalculate the ECP if the reactor has been shutdown less than 80 hours, and the estimated time of criticality will differ from the actual time of criticality by greater than one hour.

6.2	**Pre-Shutdown Reactivity From Rods**		
6.2.1	Controlling Bank D		
6.2.1	Step Counter 215		
6.2.2	Controlling Bank Rod Reactivity		(–) 16 pcm
6.3	**Critical Boron Concentrations**		
6.3.1	Critical Boron Concentration	163 ppm	
6.3.2	______PCNDR Section 7		
	X Boron sample		
6.4	**Power Defect**		
6.4.1	Power level before shutdown	100 %	
6.4.2	Total Power Defect		(–) 2347 pcm
6.5	**Fission Products At Shutdown**		
6.5.1	Xenon reactivity		(–) 2983 pcm
6.5.2	Samarium reactivity		(–) 1007 pcm
6.6	**Total Reactivity At Time Of Shutdown**		
6.6.1	Algebraic sum of Steps: 6.2.2, 6.4.2, 6.5.1, and 6.5.2		(–) 6353 pcm

Attachment 1 (Cont'd.)

Sheet 2 of 4

6.7	**Fission Products At Startup**		
6.7.1	Xenon reactivity		(–) 0 pcm
6.7.2	Samarium reactivity		(–) 1276 pcm
6.8	**Temperature At Startup**		
6.8.1	Anticipated RCS avg temp at startup	557 °F	
6.8.2	Anticipated boron concentration at startup	621 ppm	
6.8.3	Temp difference from 557°F	( ) 0 °F	
6.8.4	Isothermal Temp Coefficient	(–) 14.75 pcm/°F	
6.8.5	Temperature reactivity (Step 6.8.3 X 6.8.4)		( ) 0 pcm
6.9	**Desired Critical Rod Height** N A		
6.9.2	IRW with bank D at 170 steps	(–) ______pcm	
6.9.3	Step 6.9.2 + (–)200 pcm or more (IRW at desired Rod height)		(–) ______pcm
6.9.4	Critical rod height	______steps	
6.10	**Desired Critical Boron Concentration**		
6.10.2	Desired startup boron concentration	621 ppm	
6.10.3	Boron change from last critical (Step 6.10.2 – 6.3.1)	(+) 458 ppm	
6.10.4	Average boron concentration (Step 6.10.2 + 6.3.1) / 2	392 ppm	
6.10.5	Differential Boron Worth	(–) 9.75 pcm/ppm	
6.10.6	Reactivity change due to boron (Step 6.10.3 X 6.10.5)		(–) 4466 pcm
6.11	**Total Reactivity**		
6.11.1	ECP correction factor from Table 1-8		( ) 0 pcm
6.11.2	Reactivity at startup (6.7.1 + 6.7.2 + 6.8.5 + 6.11.1 + 6.9.3 or 6.10.6)		(–) 5742 pcm
6.11.3	Reactivity difference (6.6.1 – 6.11.2)	(–) 611 pcm	

Attachment 1 (Cont'd.)

Sheet 3 of 4

N A

6.12	**Critical Boron Concentration**	
6.12.2.a	Average boron concentration (Step 6.8.2 + 6.3.1) / 2	______ppm
6.12.2.b	Differential boron worth	(–) ______pcm/ppm
6.12.3	Boron change (6.11.3 / 6.12.2.b)	( ) ______ppm
6.12.4	Required critical boron concentration (6.12.3 + 6.3.1)	______ppm
6.13	**Critical Rod Height** *92	
6.13.2	Control bank D at 72 Steps	
	Minimum Rod Height	
6.14.1	Remaining control bank reactivity from 6.9.3 or 6.11.3	(–) 611 pcm
		– 500 pcm
6.14.2.a	Step 6.14.1 – 500 pcm	(–) 1111 pcm
6.14.2.c/d	Minimum Rod Height — Control Bank D at 48 Steps	
	Maximum Rod Height	
6.14.3	Remaining control bank reactivity from 6.9.3 or 6.11.3	(–) 611 pcm
		+ 500 pcm
6.14.3.a	Step 6.14.1 + 500 pcm	(–) 111 pcm
6.14.3.b/6.14.3.c.2/6.14.4	Maximum Rod Height — Control bank D at 199 Steps *170	

* Critical Step

 CONTINUOUS USE

Attachment 1 (Cont'd.)

Sheet 4 of 4

Remarks: ____

____

____

____

____

W. White 13579	R. Swanson 24680	
Performed by (Reactor Engineer/SRO/RO/STA)	IV Performed By (Reactor Engineer/SRO/RO/STA)	Approved By (Senior Reactor Operator)

Ameren MISSOURI | Callaway Energy Center

OSP-SF-00005

ESTIMATED CRITICAL POSITION CALCULATION

MINOR Revision 021

CONTINUOUS USE

ESTIMATED CRITICAL POSITION CALCULATION

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ESTIMATED CRITICAL POSITION CALCULATION

1.0 PURPOSE

1.1. To determine critical rod height.

1.2. To determine critical boron concentration.

2.0 SCOPE

Used for reactor startup calculations.

3.0 ACCEPTANCE/FUNCTIONAL CRITERIA

Within 4 hours prior to achieving reactor criticality; verify that the predicted critical control bank position is within the limits of T/S LCO 3.1.6 per the requirements of T/S SR 3.1.6.1.

4.0 PRECAUTIONS AND LIMITATIONS

4.1. The average moderator temperature for criticality shall be greater than or equal to 551°F.

4.2. When the reactor has been shutdown for less than 80 hours, the Estimated Critical Position/Boron Concentration shall be recalculated whenever the estimated number of hours from actual criticality to predicted criticality differ by more than one hour.

4.3. Curve Book Figures referenced in this procedure are controlled per ETP-ZZ-00015, Preparation, Review, Approval and Control of the Curve Book.

4.4. Data may be obtained as applicable from the following approved software programs for the current cycle:

- ECP
- PC Nuclear Design Report (PCNDR)
- WinPCNDR
- XENON_PREDICTION
- XEPRED
- Applicable Plant Computer Points

4.5. Design end of life may be obtained from plant computer point REK1531, or Curve Book Table 12-1CC.

4.6. In some cases, the pre-shutdown reference reactivity data may be more accurate if the data is obtained at equilibrium conditions rather than at conditions just prior to the shutdown. For example, if a rapid downpower is commenced prior to the reactor shutdown, then more accurate reference reactivity data may be obtained from equilibrium conditions just prior to the downpower rather than from transient conditions just prior to the reactor shutdown.

4.6.1. Based on the discussion in Step 4.6, the pre-shutdown reference reactivity data may be obtained from equilibrium conditions at some time prior to the shutdown rather than from conditions immediately prior to the time of shutdown. Guidance for selecting reference reactivity data may be found in Attachment 2.

4.6.2. Caution should be taken to ensure that all pre-shutdown reference reactivity data is selected for a consistent reference time (i.e., data for bank height, boron concentration, power level, xenon reactivity, and samarium reactivity should be selected for the same reference time.)

-END OF SECTION-

5.0 PREREQUISITES

5.1 CHECK the plant is in MODE 3 or 4.

5.2 DETERMINE the desired time for criticality.

-END OF SECTION-

6.0 PROCEDURE INSTRUCTIONS

> **NOTE**
>
> The ECP software should be used to determine the ECP and ECB. Section 6.0 should be used for guidance in obtaining the necessary input for the ECP software. The computer printout should be filed as a record of the ECP.
>
> The approved program should be located in folder I:\NUCENG\SYSTEMS\REACTOR\SOFTWARE\APPROVED\ECP. If the ECP program in this folder is not available, Reactor Engineering should be contacted for the approved software.
>
> If the software program is NOT being used, data in the following steps will be recorded on Attachment 1.

6.1 Critical Condition Prior To Last Shutdown

6.1.1 RECORD the shutdown date and time, referring to Attachment 2 for additional guidance.

6.1.2 RECORD the predicted startup date and time.

6.1.3. RECORD the burnup in EFPD using one of the following:

- REU1523, BURN UP
- XEPRED

-END OF SECTION-

6.2. <u>Pre-Shutdown Reactivity From Rods</u>

6.2.1. OBTAIN the pre-shutdown controlling bank information as follows:

a. IF at the beginning of a cycle AND power has not yet exceeded 5%, RECORD the following information for pre-shutdown conditions:

NA

- Bank D
- 228 steps

b. IF power in the current cycle has exceeded 5%, RECORD the following information from pre-shutdown conditions, referring to Attachment 2 for additional guidance:

- The controlling control rod bank.
- The step counters readings for the controlling control rod bank height.

> **NOTE**
>
> Other sources of rod worth data may be used during physics testing as determined by Reactor Engineering.

6.2.2. Using the rod information from Step 6.2.1, DETERMINE and RECORD the amount of pre-shutdown negative reactivity using one of the following:

- WinPCNDR
- PCNDR, Section 5

-END OF SECTION-

6.3. <u>Critical Boron Concentrations</u>

6.3.1. OBTAIN the critical boron concentration as follows:

a. IF at the beginning of a cycle AND power has not yet exceeded 5%, RECORD the critical boron concentration from the BOL critical boron concentration to control at HZP, ARO, (k=1.0) from PCNDR, Section 7.

NA

b. IF power in the current cycle has exceeded 5%, RECORD the most recent sample under stable RCS conditions, referring to Attachment 2 for additional guidance.

6.3.2. CHECK which source was used to obtain critical boron.

-END OF SECTION-

 CONTINUOUS USE

6.4 Power Defect

6.4.1. OBTAIN the power level before shutdown as follows:

a. IF at the beginning of a cycle AND power has not yet exceeded 5%, RECORD zero for power level before shutdown.

NA

b. IF power in the current cycle has exceeded 5%, RECORD the highest indicated power level the last time Keff was equal to one using one of the following and referring to Attachment 2 for additional guidance:

- Power range meters N41A, N42A, N43A, or N44A
- SE NR-45 Recorder after a Rx trip
- REU1150, 1 MIN AVG NIS POWER
- REU1117, RX THERMAL POWER
- REU0485M, 1 MIN AVG OF RCL AVG DT

6.4.2. OBTAIN the total power defect as follows:

a. IF power level was less than 0% the last time Keff was equal to one, RECORD zero for the total power defect.

NA

b. RECORD the total power defect for the power level recorded in Step 6.4.1 using one of the following:

- WinPCNDR
- PCNDR, Section 5

-END OF SECTION-

6.5. Fission Products At Shutdown

6.5.1. OBTAIN the negative reactivity from xenon at shutdown as follows:

a. IF at the beginning of a cycle AND power has not yet exceeded 5%, RECORD zero.

N/A

b. IF power in the current cycle has exceeded 5%, RECORD xenon reactivity prior to the time of shutdown using one of the following and referring to Attachment 2 for additional guidance:

- REU1504, XE WORTH (PCM)
- XENON_PREDICTION
- XEPRED

6.5.2. OBTAIN the negative reactivity from samarium at shutdown as follows:

a. IF at the beginning of a cycle AND power has not yet exceeded 5%, RECORD zero.

N/A

b. IF power in the current cycle has exceeded 5%, RECORD samarium reactivity prior to the time of shutdown using one of the following and referring to Attachment 2 for additional guidance:

- REU1505, SM WORTH (PCM)
- XENON_PREDICTION
- XEPRED

-END OF SECTION-

6.6. Total Reactivity At Time Of Shutdown

> **NOTE**
>
> This is the total negative reactivity due to rods, power defect, xenon, and samarium at the time of the last shutdown.

6.6.1. RECORD the algebraic sum the reactivities from Steps 6.2.2, 6.4.2, 6.5.1, and 6.5.2.

-END OF SECTION-

6.7. Fission Products At Startup

6.7.1. OBTAIN the negative reactivity from xenon at startup using one of the following:

a. IF at the beginning of a cycle AND power has not yet exceeded 5%, RECORD zero.
NA

b. IF power in the current cycle has exceeded 5%, RECORD xenon reactivity at time of startup using one of the following:

- XENON_PREDICTION
- XEPRED

6.7.2. OBTAIN the negative reactivity from samarium at startup using one of the following:

a. IF at the beginning of a cycle AND power has not yet exceeded 5%, RECORD zero.
NA

b. IF power in the current cycle has exceeded 5%, RECORD samarium reactivity at time of startup using one of the following:

- XENON_PREDICTION
- XEPRED

-END OF SECTION-

6.8. Temperature At Startup

> **NOTE**
>
> The lowest loop RCS Tavg shall be greater than 551°F. [Ref: 8.1.4]

6.8.1. RECORD the anticipated average RCS Tavg at startup.

6.8.2. RECORD the anticipated RCS boron concentration at startup.

6.8.3. RECORD the temperature difference between the anticipated temperature at startup and the no-load programmed average temperature of 557 °F.

6.8.4. CALCULATE the isothermal temperature coefficient for the anticipated average temperature and boron concentration at startup using one of the following:

- WinPCNDR
- PCNDR, Section 5

CONTINUOUS USE

6.8.5. CALCULATE the reactivity associated with a temperature other than that of the no-load value by multiplying the temperature difference in Step 6.8.3 by the isothermal temperature coefficient Step 6.8.4.

-END OF SECTION-

6.9. Desired Critical Rod Height

CAUTION

The Rod Insertion Limits of Curve Book Figure 13-1 and the Rod Withdrawal Limits of Curve Book Figure 2-13 shall be observed at all times.

6.9.1. IF it is desired to specify critical boron concentration and calculate rod height, PERFORM Section 6.10 and MARK Section 6.9 N/A.

NA

6.9.2. DETERMINE Integral Rod Worth with D Control Bank at 170 steps using one of the following: [Ref: 8.2.7]

- WinPCNDR
- PCNDR, Section 5

6.9.3. ADD 200 pcm or more of negative reactivity to IRW at 170 steps to determine the IRW for a desired rod height at least 200 pcm below Control Bank D at 170 steps.

6.9.4. Using one of the following, DETERMINE the desired critical rod height for the IRW determined in step 6.9.3: [Ref: 8.2.7, 8.2.8]

- WinPCNDR
- PCNDR, Section 5

-END OF SECTION-

6.10. Desired Critical Boron Concentration

> **NOTE**
>
> After RCS boron adjustments and sampling are complete, it may be necessary to recalculate the ECP by entering the actual RCS boron concentration in Step 6.10.2.

6.10.1. IF it is desired to specify rod height and calculate critical boron concentration, PERFORM Section 6.9 and MARK Section 6.10 N/A.

NA

6.10.2. RECORD the desired boron concentration for the startup.

6.10.3. CALCULATE and RECORD the change in boron concentration by subtracting the last critical boron concentration in Step 6.3.1 from the desired boron concentration in Step 6.10.2.

> **NOTE**
>
> Using the average boron concentration provides a more accurate value of the differential boron worth in the reactivity change calculation.

6.10.4. CALCULATE and RECORD the average boron concentration by adding the last critical boron concentration in Step 6.3.1 to the desired boron concentration in Step 6.10.2 and dividing by 2.

6.10.5. RECORD the differential boron worth of the average boron concentration from Step 6.10.4, using one of the following:

- WinPCNDR
- PCNCR, Section 6

6.10.6. CALCULATE and RECORD the change in reactivity due to boron by multiplying the change in boron concentration in Step 6.10.3 by the differential boron worth in Step 6.10.5.

-END OF SECTION-

6.11. Total Reactivity

NOTE

The correction factor accounts for a bias observed in other startups.

6.11.1. RECORD the ECP Correction Factor from the Curve Book: Table 1-8.

6.11.2. ALGEBRAICALLY SUM the reactivities for the following to obtain the reactivity that will be present in the core at startup relative to the last time Keff was equal to one:

- Xenon from Step 6.7.1
- Samarium from Step 6.7.2
- Temperature from Step 6.8.5
- ECP correction factor from Step 6.11.1
- One of the following:
  - Rods from Step 6.9.3
  - Boron from Step 6.10.6

6.11.3. ALGEBRAICALLY SUBTRACT Step 6.11.2 from Step 6.6.1 on the ECP calculation.

-END OF SECTION-

6.12. Critical Boron Concentration

6.12.1. IF rod height is being calculated, MARK Section 6.12 N/A and PERFORM Section 6.13.

N A

6.12.2. DETERMINE the differential boron worth as follows:

a. CALCULATE and RECORD the average boron concentration by adding the last critical boron concentration in Step 6.3.1 to the anticipated boron concentration at the predicted temperature at startup in Step 6.8.2 and dividing by 2.

b. RECORD the differential boron worth for the average boron concentration using one of the following:

- WinPCNDR
- PCNDR, Section 6

6.12.3. CALCULATE the required boron change by dividing the reactivity difference in Step 6.11.3 by the differential boron worth in Step 6.12.2.b.

NOTE

If the anticipated boron concentration at startup used in step 6.12.2.a differs significantly from the calculated required boron concentration for startup from step 6.12.4, it may be necessary to iterate several times by adjusting the anticipated boron concentration to match the calculated required boron concentration. This iteration may be necessary because the differential boron worth is dependent on the average boron concentration from last critical to startup.

6.12.4. CALCULATE the required boron concentration for startup by algebraically adding the required boron concentration change in Step 6.12.3 to the last critical boron concentration in Section 6.3.

-END OF SECTION-

6.13. Critical Rod Height

6.13.1 IF critical boron concentration is being calculated, MARK Section 6.13 N/A and PERFORM Section 6.12.

NA

CAUTION

The Rod Insertion Limits of Curve Book Figure 13-1 and the Rod Limits of Curve Book Figure 2-13 shall be observed at all times.

6.13.2. Using the reactivity difference in Step 6.11.3, DETERMINE the rod height from one of the following:

- WinPCNDR
- PCNDR, Section 5

-END OF SECTION-

6.14 Rod Limits

6.14.1. RECORD the remaining control bank reactivity worth from Step 6.9.3 IF calculating critical boron worth or 6.11.3 IF calculating critical rod height.

> **NOTE**
>
> If the calculated Minimum Rod Height is lower than the RIL, the RIL will be used as the Minimum Rod Height. [Ref: 8.2.7]

6.14.2. DETERMINE Minimum Rod Height for ECP as follows:

a. Subtract 500 pcm from the value in Step 6.14.1.

b. Using one of the following, DETERMINE the rod position of the IRW calculated in Step 6.14.2.a:

- WinPCNDR
- PCNDR, Section 5

c. IF the position calculated in Step 6.14.2.b is higher than the RIL, ENTER the position.

> **NOTE**
>
> Establishing the minimum rod height as the RIL satisfies the Acceptance Criteria of Section 3.0.

d. IF the position calculated in Step 6.14.2.b is lower than the RIL, ENTER the RIL.

NA

NOTE

If the maximum position reactivity is zero or positive, or the calculated Maximum Rod Height is higher than Control Bank D at 170 steps, Control Bank D at 170 steps will be used as the Maximum Rod Height.

If the calculated Maximum Rod Height is higher than the control rod withdrawal limit at 0% power from Curve Book Figure 2-13, the withdrawal limit will be used as the Maximum Rod Height.

6.14.3. DETERMINE Maximum Rod Height for ECP as follows:

a. ADD 500 pcm to the value in Step 6.14.1.

NA b. IF the result of Step 6.14.3.a is zero or positive, ENTER 170 steps on Bank D.

c. IF the result of Step 6.14.3.a is negative, PERFORM the following:

1. Using one of the following, DETERMINE the rod position for the IRW calculated in Step 6.14.3.a:

- WinPCNDR
- PCNDR, Section 5

2. ENTER the lower of the two following positions: [Ref: 8.2.7]

- Position calculated in Step 6.14.3.c.1
- 170 steps on Control Bank D

6.14.4. IF the position determined in Step 6.14.3 is higher than the control rod withdrawal limit at 0% power from Curve Book Figure 2-13, ENTER the withdrawal limit from Figure 2-13 as the Max Rod Height instead of the position determined in Step 6.14.3.

NA

-END OF SECTION-

7.0 RESTORATION

None

8.0 REFERENCES

8.1. Implementing

8.1.1. ODP-ZZ-00016, Reactor Operator Watchstation Practices And Logs

8.1.2. T/S LCO 3.1.6

8.1.3. T/S SR 3.1.6.1

8.1.4. T/S LCO 3.4.2

8.2. Developmental

8.2.1. Curve Book: Table 1-8, Figure 2-13, Figure 13-1

8.2.2. ETP-ZZ-00015, Preparation, Review, Approval and Control of the Curve Book

8.2.3. ETP-ZZ-00012, Inverse Count Rate Ratio

8.2.4. Nuclear Design Report

8.2.5. CAR 200303622

8.2.6. CAR 200303929

8.2.7. CAR 200207983

8.2.8. CAR 200509793

9.0 RECORDS

Records generated by this procedure are filed with the appropriate work authorizing document.

9.1. Attachment 1, Estimated Critical Position Calculation

10.0 SUMMARY OF CHANGES

Page(s)	Section or Step Number	Description
10	6.8.2	Added recording of boron concentration at startup. CAR 201505659
12	6.10.4	Added note to clarify why the average boron concentration is used and provided a step to calculate average. CAR 201505659
12	6.10.5	Enhanced step direction to specify average boron concentration. CAR 201505659
14	6.12.2.a	Enhanced step direction to specify average boron concentration. CAR 201505659
14	6.12.4	Added Note at step to allow for adjusting the anticipated boron concentration value. CAR 201505659
21, 22	Att. 1	Added a place to record average boron concentration for step 6.10.4 and 6.12.2.a. Added a place to record anticipated boron concentration for step 6.8.2. CAR 2015659

Attachment 1

Estimated Critical Position Calculation

Sheet 1 of 4

Person Completing	Initials/PIN	Date & Time
W. White	WW 13579	9/12/17 1030
R. Swanson	~~RS~~ 24680	9/12/17 1045

STEP

6.1.1	Shutdown Date	9/6/17	Time	0322
6.1.2	Startup Date	9/12/17	Time	1200
6.1.3	Burnup	EFPD	406.5	

> **NOTE**
>
> Recalculate the ECP if the reactor has been shutdown less than 80 hours, and the estimated time of criticality will differ from the actual time of criticality by greater than one hour.

6.2	**Pre-Shutdown Reactivity From Rods**		
6.2.1	Controlling Bank D		
6.2.1	Step Counter 215		
6.2.2	Controlling Bank Rod Reactivity		(–) 16 pcm
6.3	**Critical Boron Concentrations**		
6.3.1	Critical Boron Concentration	163 ppm	
6.3.2	______PCNDR Section 7		
	X Boron sample		
6.4	**Power Defect**		
6.4.1	Power level before shutdown	100 %	
6.4.2	Total Power Defect		(–) 2347 pcm
6.5	**Fission Products At Shutdown**		
6.5.1	Xenon reactivity		(–) 2983 pcm
6.5.2	Samarium reactivity		(–) 1007 pcm
6.6	**Total Reactivity At Time Of Shutdown**		
6.6.1	Algebraic sum of Steps: 6.2.2, 6.4.2, 6.5.1, and 6.5.2		(–) 6353 pcm

Attachment 1 (Cont'd.)

Sheet 2 of 4

6.7	**Fission Products At Startup**		
6.7.1	Xenon reactivity		(–) 0 pcm
6.7.2	Samarium reactivity		(–) 1276 pcm
6.8	**Temperature At Startup**		
6.8.1	Anticipated RCS avg temp at startup	557 °F	
6.8.2	Anticipated boron concentration at startup	621 ppm	
6.8.3	Temp difference from 557°F	( ) 0 °F	
6.8.4	Isothermal Temp Coefficient	(–) 14.75 pcm/°F	
6.8.5	Temperature reactivity (Step 6.8.3 X 6.8.4)		( ) 0 pcm
6.9	**Desired Critical Rod Height** N/A		
6.9.2	IRW with bank D at 170 steps	(–) ______ pcm	
6.9.3	Step 6.9.2 + (–)200 pcm or more (IRW at desired Rod height)		(–) ______ pcm
6.9.4	Critical rod height	______ steps	
6.10	**Desired Critical Boron Concentration**		
6.10.2	Desired startup boron concentration	621 ppm	
6.10.3	Boron change from last critical (Step 6.10.2 – 6.3.1)	(+) 458 ppm	
6.10.4	Average boron concentration (Step 6.10.2 + 6.3.1) / 2	392 ppm	
6.10.5	Differential Boron Worth	(–) 9.75 pcm/ppm	
6.10.6	Reactivity change due to boron (Step 6.10.3 X 6.10.5)		(–) 4466 pcm
6.11	**Total Reactivity**		
6.11.1	ECP correction factor from Table 1-8		( ) 0 pcm
6.11.2	Reactivity at startup (6.7.1 + 6.7.2 + 6.8.5 + 6.11.1 + 6.9.3 or 6.10.6)		(–) 5742 pcm
6.11.3	Reactivity difference (6.6.1 – 6.11.2)	(–) 611 pcm	

Attachment 1 (Cont'd.)

Sheet 3 of 4

NA

6.12	**Critical Boron Concentration**	
6.12.2.a	Average boron concentration (Step 6.8.2 + 6.3.1) / 2	______ppm
6.12.2.b	Differential boron worth	(–) ______pcm/ppm
6.12.3	Boron change (6.11.3 / 6.12.2.b)	( ) ______ppm
6.12.4	Required critical boron concentration (6.12.3 + 6.3.1)	______ppm
6.13	**Critical Rod Height**	
6.13.2	Control bank D at 72 Steps	
	Minimum Rod Height	
6.14.1	Remaining control bank reactivity from 6.9.3 or 6.11.3	(–) 611 pcm
		– 500 pcm
6.14.2.a	Step 6.14.1 – 500 pcm	(–) 1111 pcm
6.14.2.c/d	Minimum Rod Height	Control Bank D at 48 Steps
	Maximum Rod Height	
6.14.3	Remaining control bank reactivity from 6.9.3 or 6.11.3	(–) 611 pcm
		+ 500 pcm
6.14.3.a	Step 6.14.1 + 500 pcm	(–) 111 pcm
6.14.3.b/6.14.3.c.2/6.14.4	Maximum Rod Height	Control bank D at 199 Steps

Attachment 1 (Cont'd.)

Sheet 4 of 4

Remarks: ____

____

____

____

____

W. White 13579	R. Swanson 24680	
Performed by (Reactor Engineer/SRO/RO/STA)	IV Performed By (Reactor Engineer/SRO/RO/STA)	Approved By (Senior Reactor Operator)

Attachment 2

Input Guidelines For Estimated Critical Position Calculation

Sheet 1 of 1

DATA POINT	TYPE OF REACTOR SHUTDOWN	
	Controlled Shutdown	Reactor Trip/Rapid Shutdown
Time of Shutdown	Time when 10^{-8} data was taken. Note 1	Time of trip or commencement of shutdown.
Critical Boron Conc. Critical Rod Height Controlling Bank	From 10^{-8} data. Note 1	From most recent RO turnover entry or midnight entry, whichever is most recent.
Power Level Prior to Shutdown	Use 0%. Note 1	Enter power at time of trip or commencement of shutdown.
Xenon Iodine Samarium Promethium	Use poison concentrations at "Time of Shutdown" from XEPRED run or from curve book. Will need to account for power descension causing xenon and samarium buildup.	Use poison concentrations from midnight ODP-ZZ-00016 Control Room Computer Log printout if power was constant from midnight until trip. Otherwise do XEPRED run.

Note 1: If available, reference reactivity data should be taken from equilibrium conditions prior to 10^{-8} data. In this case, input data will be from the equilibrium conditions.

CALLAWAY ENERGY CENTER
JOB PERFORMANCE MEASURE

A2 (SRO)

JPM No:	Admin2-SRO-O-001	KSA No:	GEN 2.2.17
Revision Date:	05/08/2017	KSA Rating:	3.8
Job Title:	SRO		
Duty:	Managing maintenance activities		
Task Title:	Prioritize Job and Assess Risk		
Completion Time:	15 minutes		

The performance of this task was evaluated against the standards contained in this JPM and determined to be:

☐ SATISFACTORY ☐ UNSATISFACTORY

Reason, if UNSATISFACTORY:

____

____

Evaluator Signature: ______________________ Date: ______________

Task Performer: ______________________________________

Location of Performance:

☐ Control Room ☐ Simulator/Lab ☐ Plant ☒ Classroom

Method of Performance: ☐ Simulated ☒ Performed

☐ Alternate Path ☐ Time Critical ☐ RCA

References: PDP-ZZ-00023, Appendix A Priority Screening Matrix, Rev 4
EDP-ZZ-01129, Callaway Energy Center Risk Assessment, Rev 46

Tools / Equipment: None

CALLAWAY ENERGY CENTER
JOB PERFORMANCE MEASURE

Initial Conditions: The Plant is operating at 100% power with the following equipment out of service:

- 'A' Intake Pump
- 'B' Train Safety Injection Pump
- Intake Free Discharge Valve 'A'
- 'C' Service Water Pump
- Reactor Makeup Water Transfer Pump B

Job Number 17001973 (attached) has just been written on EFHV0066, ESW UHS Cool TWR TRN B BYP HV.

Initiating Cues: The Shift Manager has requested you to review and screen Job 17001973 per PDP-ZZ-00023, Appendix A Priority Screening Matrix.

The Shift Manager has also requested you assess risk for the given condition using the Equipment OOS PRA Matrix located in EDP-ZZ-01129, Callaway Energy Center Risk Assessment.

Job 17001973 should be screened as Priority _________ for Reason:

____

The risk for Callaway Energy Center is _____________ for Reason:

____

Simulator Set up and/or Note(s): None.

Task Standard: Upon completion of this JPM, the candidate will determine the Job is a Priority 1 due to failure of a high critical component (classification) which makes Train B ESW inoperable (significance). Candidate will determine risk profile is Yellow with Train B SI Pump and Train B of ESW out of service.

Start Time: ________________

Stop Time: ________________

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
*1.	Determine Priority Job Status per PDP-ZZ-00023 Appendix A Attachment 1		Candidate determined EFHV0066 is a **Priority 1 Job since EFHV0066 is a Row 1 High Critical Component and Column A significance since failure makes ESW train B inoperable.**	**S U** Comments:
*2.	Determine current risk level/color. EDP-ZZ-01129 Attachment 1		Candidate determined the risk profile is **YELLOW since Train B SI Pump and Train B of ESW OOS. (EM-B & EF-B)** Service Water (EA) is functional per Note 1.	**S U** Comments
3.	**JPM IS COMPLETE**	RECORD STOP TIME ON PAGE 2.		**S U** Comments

*Critical Step

KEY:

Job 17001973 should be screened as Priority __1__ for Reason:
Failure of a high critical component which makes Train B ESW inoperable

The risk for Callaway Energy Center is __Yellow__ for Reason:
Train B SI pump and Train B of ESW are out of service (EM-B & EF-B)

A2 (SRO)

Initial Conditions: The Plant is operating at 100% power with the following equipment out of service:

- 'A' Intake Pump
- 'B' Train Safety Injection Pump
- Intake Free Discharge Valve 'A'
- 'C' Service Water Pump
- Reactor Makeup Water Transfer Pump B

Job Number 17001973 (attached) has just been written on EFHV0066, ESW UHS Cool TWR TRN B BYP HV.

Initiating Cues: The Shift Manager has requested you to review and screen Job 17001973 per PDP-ZZ-00023, Appendix A Priority Screening Matrix.

The Shift Manager has also requested you assess risk for the given condition using the Equipment OOS PRA Matrix located in EDP-ZZ-01129, Callaway Energy Center Risk Assessment.

Job 17001973 should be screened as Priority _________ for Reason:

____

The risk for Callaway Energy Center is _____________ for Reason:

____

0010 - Detail of Job/Task - 17001973 - Sys EF - B Trn - Created on 05/04/2017 - Orig - BLAND,LD

Job Nbr 17001973 | 0 | INVESTIGATE loss of control voltage for EFHV0066 | Rev

Safety | (0/8/0/0) Notes | (1/388/0) Docs | Routing | Association | QC Insp Pts | Loop Locations

Detail | Insp Rpt | (10) Free Flds | (4/12/0/0/3) Hist | (3) Scheduling | Prod Loss | (1/0/0/0/0) Permits/WPAs/EOSL/FPIP/PERF CL | Stds/PM/Pckg

Job Nbr: 17001973 | Duration in Hrs: 0.0 | Rem Dur: 0 | Rank:

Location: EFHV0066 | ESW UHS COOL-TWR TRN B BYP HV | Parts List | 5/132 Jobs

Equipment: | Parts List | Jobs

/here Located: HS-2000-RM-U305 UHS COOL-TWR B VLV RM | Maint Rule ☑ | Criticality: 1

Category: PLE | Cfg ☑ | SPV | Q/Spcl. Scp.: Q QUALIFIED:Y; QLIST FLAG:Y; QLIST | FEG: EFS1B

Work Reason: OTHER - SEE JOB DESCRIPTIOI | Priority: | Matl Status: .

Job Type: CC | Job Sub Type: | How Discovered:

Scheduler: | Planner: BAXTER JR,JH | Engineer:

Requester: BLAND,LD | Supervisor: BIANCO,FJ | Approved By: WEST,ML

Lead Craft: EFIN | Planning Grp: PE | Supplier:

TBI Equipment: | Parts List | Jobs

RE Location: | Parts List | Jobs

Required? ☐ | Fire Risk? ☐ | PM/SURV 1st Time Perf? ☐ | Tool Pouch ☐ | Minor Maintenance ☐

+ Craft	Rad	Worke	Hrs/Wrkr	Total Hr	Labor Cost	Team
				0	$0.00	

Job Description Zoom

INVESTIGATE loss of control voltage for EFHV0066

EFHV0066 did not close as expected during ISF-EG-00T68.
Indicating lights went out, ESFAS panel alarms 3J and 13G
were recieved indicating
a loss of control voltage.
Locally, breaker NG08FAF2 was still closed and EFHV0066
remained open.
CR 201702418.

Report Zoom

***TROUBLESHOOTING REQUIRED - Document your best determination of the cause of the Equipment problem on the Report screen (05/04/2017 00:47:32 , WEST,ML)

EDP-ZZ-01129

CALLAWAY ENERGY CENTER RISK ASSESSMENT

MINOR Revision 046

INFORMATION USE

CALLAWAY ENERGY CENTER RISK ASSESSMENT

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EDP-ZZ-01129 Appendix 1, Listing of Components That Have Multiple Functions

EDP-ZZ-01129 Appendix 2, DELETED

EDP-ZZ-01129 Appendix 3, Performing Risk Assessments Required by Technical Specifications LCO 3.0.4.B and LCO 3.0.8

CALLAWAY ENERGY CENTER RISK ASSESSMENT

1.0 PURPOSE

1.1. This procedure defines expectations for managing and assessing the risk impact of equipment out-of-service during all modes of operations, including NO MODE (core off loaded to Spent Fuel Pool), to ensure the plant is always being operated within acceptable risk per 10 CFR 50.65 (a)(4). [Ref: 5.2.20]

1.2. This procedure defines expectations for enhancing shutdown nuclear safety and describes requirements necessary to ensure outages are planned and conducted safely.

1.2.1. Shutdown safety matrices are provided to ensure schedule logic includes the availability of equipment/systems necessary for safe and legal operation.

1.2.2. The Shutdown Safety Assessment process, used to evaluate the safety condition of the plant, is described for use during outage schedule development and implementation.

2.0 SCOPE

2.1. Risk assessment is required to assess risk impact for planned and unplanned outages, which are modeled in the Callaway Energy Center Probabilistic Risk Assessment (PRA) or have been determined to be risk-significant.

2.2. This procedure outlines planning, scheduling and maintenance strategies to maximize equipment performance, reliability, and availability by ensuring required maintenance activities are accomplished while holding out-of-service time to a minimum.

3.0 RESPONSIBILITIES

3.1. Responsibilities are outlined in APA-ZZ-00315, Configuration Risk Management Program.

3.2. The Safety Monitor Administrator is designated as the approval authority for EDP-ZZ-01129 Appendix 1, Listing of Components That Have Multiple Functions.

-END OF SECTION-

4.0 PROCEDURE INSTRUCTIONS

NOTE

APA-ZZ-00150, Outage Preparation and Execution, APA-ZZ-00322, Integrated Work Management Process Description, and PDP-ZZ-00017, Fix It Now (FIN) Team Process, provide additional scheduling information for outage and daily schedule activities.

Reviews and the resolution of schedule conflicts are considered a part of the schedule development process. Enhancements, changes to activity sequencing and/or duration, and exclusion/inclusion of work activities are expected.

IF Safety Monitor is unavailable, the Equipment OOS PRA Matrix (Attachment 1) is used for risk assessments in MODES 1, 2 and 3.

4.1. Guidelines for Schedule Development

4.1.1. The primary objective of scheduling and coordinating maintenance activities is to maximize safety and equipment reliability while minimizing the time equipment is unavailable.

4.1.2. Scheduling maintenance on Maintenance Rule equipment is determined by the need to perform one or a combination of the following:

- Surveillance testing and preventive maintenance (PM) tasks.
- Corrective maintenance.
- Maintenance required to correct a category (a)(1) Maintenance Rule failure problem Structures, Systems, Components (SSCs) that require additional monitoring because they do NOT meet established performance criteria).
- Design changes.
- System health other than a Green category per EDP-ZZ-01131, Plant Health and Performance Monitoring Program.

4.1.3. Corrective maintenance that requires a risk-significant component or system to be removed from service, but would NOT otherwise affect its operability, should be:

a. Scheduled with the next PM or surveillance task, or next Technical Specification Outage (TSO) per APA-ZZ-00322, Integrated Work Management Process Description, or

b. Moved to the next refueling outage, depending on the impact on plant operations.

4.1.4. The following issues are considered regarding WHEN corrective maintenance will be scheduled:

- Impact on associated safety function, fire risk and the potential need for Risk Management Actions.
- Condition of redundant in-service equipment, necessary to maintain key safety functions while work is performed (see Callaway Energy Center System Health Index, (a)(1) status report, Work Around list, etc.). Equipment that is marginally reliable should have alternate backup equipment considered WHEN the more reliable train or SSC is out-of-service.
- Impact of performance at power (i.e., TSO outage) vs. reduced power or shutdown.
- Impact of transition IF performance requires a shutdown that would NOT otherwise be necessary.
- Whether the out-of-service SSC could be restored to service IF need arose due to emergent conditions.
- Impact of temporary modifications and workarounds on maintenance activity.

4.1.5. Risk Management Actions are considered to ensure increased risk awareness and provide more rigorous planning and control of task performance. The following actions should be considered:

a. Actions to minimize potential for increased risk during performance, such as:

- Minimizing work on other SSCs in same location of subject work.
- Minimizing work that could affect redundant systems (includes work in areas of redundant systems).
- Working only on equipment of the designated train. Work on equipment of the opposite train is NOT permitted unless deemed necessary by the Shift Manager, and allowed by Technical Specifications (Tech. Specs.).

b. Actions to reduce duration of task such as:

- Pre-planning walk down of work area (may include craft and Engineering).
- Pre-staging parts, materials, and tools.
- Pre-job training with mockups to familiarize craft with task, IF available.
- Scheduling/performing maintenance around the clock.

Step 4.1.5 Cont'd

c. Actions to increase risk awareness such as:

- Pre-job briefs.
- Schedule/fragnet reviews and assignment of Project Coordinators.
- Using communication media (i.e., POD and Leadership meetings, Callaway Connection, etc.).

4.1.6. Risk Management Actions are addressed for all preplanned or emergent tasks deemed to be risk-significant (Safety Monitor in Yellow, Orange, or Red [Core Damaging Frequency (CDF), Large Early Release Frequency (LERF), Boiling] or Shutdown Safety Assessment in Yellow, Orange, or Red for defense-in-depth). [Ref: 5.2.7] Risk Management Actions may also be performed for any preplanned or emergent tasks deemed to be low risk significant (Safety Monitor or Shutdown Safety Assessment in Green condition) IF deemed appropriate by the Operations Shift Management. Refer To ODP-ZZ-00002 Appendix 2, Risk Management Actions for Planned Risk Significant Activities, for planned risk-significant activities. These actions may include, but are NOT limited to:

- Procedure controls.
- Temporary modifications (APA-ZZ-00605, Temporary System Modifications).
- Alternate monitoring equipment.
- Removal of work from the schedule.
- Re-sequencing work.
- Around the clock support (Craft, Engineering, Stores, Planning and Materials, etc.).
- Heightened awareness.
- Use of protected equipment signs per ODP-ZZ-00002, Appendix 1, Protected Equipment Program.

4.1.7. Risk Management Actions should address risk-significant concerns associated with the following:

- Work near equipment with a likelihood of a Rx trip, loss of mitigation or function(s) that will NOT be available.
- Emergent work when high-risk configurations already exist due to planned, on-line maintenance.
- Emergent work on support system that may affect multiple SSCs.
- Impact on flooding based on a qualitative risk assessment.

4.1.8. Fire Risk Management Actions which are implemented for the Fire Risk Systems and Components are discussed in Attachment 13.

4.1.9. Fire impairments or maintenance on a fire protection system do NOT make other SSCs inoperable or non-functional unless specifically addressed in APA-ZZ-00703, Fire Protection Operability Criteria and Surveillance Requirements, or APA-ZZ-00750, Hazard Barrier Program. Compensatory measures that are established to support Fire Protection Impairment Permit (FPIP) factor in qualitative risk assessment (SSC remains functional during the performance of maintenance).

4.1.10. Heavy load lifting does NOT make other SSCs, under or in the vicinity of the lift, inoperable or non-functional unless specifically addressed in APA-ZZ-00365, Callaway Lifting and Rigging Program. Compensatory measures or risk management actions, which are established to support heavy load lifting, factor in qualitative risk assessment (SSCs remain functional during the performance of the heavy load lifting). These risk management actions include heavy load lift exclusion zones for given plant modes and conditions, plus other controls, as delineated in APA-ZZ-00365, Callaway Lifting and Rigging Program.

4.1.11. The Work Week Manager uses the Safety Monitor (or Attachment 1 IF in MODES 1, 2 or 3 and the Safety Monitor unavailable) during schedule development to perform risk assessments on proposed work schedules. Work activities included in the risk assessment scope are:

- All maintenance activities (Jobs, PMs, retests, and surveillances).
- Equipment alignments.
- Plant operational states.
- Equipment removal and restoration.
- Plant modification activities.
- Environmental conditions.

4.1.12. A Red condition on the Safety Monitor or Shutdown Safety Assessment places the plant's ability to perform a safety function in jeopardy. The plant shall NOT be intentionally placed in this condition.

4.1.13. WHEN emergent work or SSC degradation impacts the safe and efficient operations of the plant, unplanned entry into an Orange or Red condition (Safety Monitor or Shutdown Safety Assessment) requires a Risk Management Action Plan consisting of the following:

- Actions to provide increased risk awareness and control.
- Actions to reduce duration of maintenance activities.
- Actions to minimize magnitude of risk increases.
- Notification of Senior Director, Nuclear Operations/Duty Manager (DM).
- Defense-in-Depth (DID) Contingency Plan

4.1.14. WHEN risk significant Functional Equipment Groups (FEGs)/SSCs are made non-functional, actions are taken to protect redundant/diverse FEGs/SSCs. FEGs/SSCs needing protection are those which IF lost, concurrent with other FEGs/SSCs being non-functional for planned maintenance, would cause an unplanned entry into an Orange or Red risk configuration. WHEN in MODES 1, 2, or 3, utilize Safety Monitor "Important Operable Component" function to identify FEGs/SSCs that need protection.

4.1.15. WHEN SSC degradation impacts the safe and efficient operations of the plant, planned entry into an Orange condition (Safety Monitor or Shutdown Safety Assessment) requires the following:

a. A Risk Management Action Plan.

b. Approval obtained in accordance with APA-ZZ-00322, Integrated Work Management Process Description.

c. DID Contingency Plan.

-END OF SECTION-

4.2. Daily/Weekly Schedule Development

4.2.1. The daily/weekly schedule is prepared, reviewed, and approved per this procedure and the following:

- Technical Specifications.
- APA-ZZ-00322, Integrated Work Management Process Description.

4.2.2. Prior to implementation, the Work Week Manager performs an assessment of the daily/weekly schedule to ensure plant safety during scheduled plant configurations (Section 4.1 and APA-ZZ-00322, Integrated Work Management Process Description) and other remedial actions to address plant risk, are factored into this assessment (Refer To Attachment 10).

a. The Work Week Manager sets the appropriate Safety Monitor Environmental factor into effect and calculates the appropriate plant risk upon notification from:

- Site personnel (maintenance on 100/200 Series and security emergency diesel generator out of service (OOS)).
- Power Supervisor (maintenance on off-site power lines or substations).
- Relay Services (relay maintenance affecting any switchyard component).

b. The Safety Monitor database may NOT contain all component locations that may impact plant risk. WHEN components associated with support systems (i.e., NK, NN, SB, etc.) that may impact the function of other components in the Safety Monitor are scheduled for work, the component affected should be deemed non-functional to calculate the correct risk impact of the configuration.

c. Numerous components have multiple functions (Refer To EDP-ZZ-01129 Appendix 1, Listing of Components That Have Multiple Functions). During maintenance on these components, the Work Week Manager ensures the correct plant configuration is entered into the Safety Monitor for risk assessment.

d. An accurate quantified assessment of plant risk is NOT always possible due to the limitations of Safety Monitor PRA modeling and software. In such cases, use of Technical Specifications in addition to the experience and judgment of the plant staff should be conservatively applied in assessing plant risk. These qualitative assessments should consider the impact due to flooding.

Step 4.2.2 Cont'd

e. WHEN a risk assessment represents elevated risk to the safe and efficient operation of the plant, (Safety Monitor risk profile in Yellow, Orange, or Red for CDF, LERF or Boiling) [Ref: 5.2.7], Work Management should give further consideration to reduce risk within acceptable levels. Scheduling options available for reducing risk, in order of preference, include:

1. Challenging whether the task is necessary to assure adequate equipment performance (i.e., balancing system reliability with unavailability); eliminating the task IF the maintenance is determined to be ineffective.
2. Performing the task in conjunction with other work that has a common effect on the function of the system.
3. Rescheduling the task.
4. Moving the task to the outage as a last resort.

4.2.3. Other options that are available to manage plant risk include:

- Minimizing work duration using training, mockups, walk thru, etc.
- Minimizing potential for risk during performance.
- Reviewing/developing Risk Management Actions.
- Awareness.

4.2.4. The Work Week Manager provides a completed weekly risk assessment to the Control Room in week T-1. This risk assessment may be considered valid provided that activities added do NOT violate the assumptions made during the initial risk analysis.

a. Any of the following require a new risk assessment:

- Activities whose start and/or completion are delayed by one or more calendar days.
- New or modified activities that could result in multiple FEGs/SSCs being OOS at the same time.
- Troubleshooting that could affect SSC functionality.
- Testing activities added to the current weekly schedule.

Step 4.2.4 Cont'd

b. Activities meeting any of the following conditions require NO further evaluation:

- Activity is the result of scope growth to the previously evaluated job in progress. Further loss of system function will NOT result from establishing conditions to perform the work.
- Activity is associated with Functions or SSCs that are NOT included in the power block and are NOT designated as risk significant per EDP-ZZ-01128 Appendix 1, SSCS in the Scope of the Maintenance Rule at Callaway.
- Activity will NOT significantly alter the pre-existing WPA boundaries.
- Activity is of an investigative nature and will NOT further degrade system or component operation.

c. IF any unplanned events or schedule changes occur after the risk assessment has been provided to the Control Room, the schedule will be re-evaluated for risk by the Shift Manager (SM)/Control Room Supervisor (CRS) or designee per Section 4.3. [Ref: 5.2.8]

4.2.5. IF the Safety Monitor risk assessment is in question, the Safety Monitor Administrator and/or Probabilistic Risk Assessment Group will be contacted for quantitative analysis.

-END OF SECTION-

4.3. Daily Schedule Implementation

4.3.1. The SM/CRS ENSURES a daily Safety Monitor schedule look ahead is run for the next three days.

IF the CDF or LERF value for an out-of-service component is anticipated to continue beyond 7 days, CONTACT the PRA group to perform a risk evaluation to evaluate accumulated risk and determine IF Risk Management Actions may be warranted.

4.3.2. The SM/CRS or designee performs a risk assessment of the current plant configuration (including FIN Team and emergent work) to determine the overall effect of scheduled work on performance of safety functions and ensure that the plant is NOT placed in a high risk configuration (Safety Monitor in Orange or Red band for CDF or LERF). [Ref: 5.2.7] WHEN emergent work or SSC degradation causes entry into an Orange or Red condition, efforts should be initiated to meet the requirements of Step 4.1.13, 4.1.14, 4.1.15 (Refer To Attachments 8, 9 and 11.).

a. SM/CRS sets the appropriate Safety Monitor Environmental factor into effect and calculates the appropriate plant risk upon notification from:

- Site personnel (maintenance on 100/200 Series and security emergency diesel generator OOS).
- Power Supervisor (maintenance on off-site power lines or substations).
- Relay Services (relay maintenance affecting any switchyard component).

b. All FIN Team and emergent conditions (activities or conditions that have NOT been included in the Work Week Manager's risk assessment) including temporary activities, severe weather, other external and internal conditions are incorporated into the risk assessment. IF an unacceptable risk level results (Safety Monitor in the Orange or Red), the SM/CRS and/or Work Week Manager re-schedules work activities as necessary to minimize the overall plant risk. [Ref: 5.2.8]

4.3.3. IF risk level requires Risk Management Actions, the SM/CRS and/or Work Week Manager is responsible for initiating the development of this plan.

4.3.4. IF Safety Monitor risk assessment is in question, or Safety Monitor is in the Orange or Red band for CDF or LERF, the Safety Monitor Administrator and/or the Probabilistic Risk Assessment Group is contacted for quantitative analysis.

4.3.5. SM/CRS ensures the following:

a. Safety Monitor is updated with actual out-of-service times for components, configuration changes, environmental/testing and mode changes modeled in the Safety Monitor PRA model.

b. Senior Director, Nuclear Operations and Duty Manager (DM) are notified IF ECCS equipment outage is extended to more than one half of the allowable outage time (AOT) as specified in Technical Specifications and WHEN plant CDF and/or LERF risk threshold for unplanned events is in the Orange or Red band on the Safety Monitor risk profile.

c. Risk assessment is performed at least once per 12-hour shift.

d. WHEN components associated with support systems (i.e., NK, NN, SB, etc.,) that may impact the function of other components in the Safety Monitor are scheduled for work, the component affected is deemed non-functional in order to calculate the correct risk impact of the configuration (Safety Monitor database may NOT contain all component locations that may impact plant risk.).

e. During maintenance on components that have multiple functions, the correct plant configuration is entered into the Safety Monitor for risk assessment (Refer To EDP-ZZ-01129 Appendix 1, Listing of Components That Have Multiple Functions).

4.3.6. Risk assessment for unplanned maintenance should be performed per this procedure, but should NOT delay operator and/or maintenance from taking timely actions to mitigate plant risk.

a. Emergent work may require troubleshooting. Since these activities can result in equipment being removed from service or subjected to transient conditions, all troubleshooting on equipment within the 10 CFR 50.65 (a)(4) scope is performed using appropriate administrative controls and a risk assessment is performed prior to the troubleshooting being performed.

b. IF the plant is in a risk informed allowed outage time (AOT), and an additional risk-significant SSC becomes inoperable/non-functional, a risk assessment is performed and appropriate actions taken to reduce plant risk.

Step 4.3.6 Cont'd

c. IF the plant is placed in a risk significant configuration (Yellow condition), the SM/CRS ensures implementation of the following requirements:

- More detailed communication by pre-job briefing, structured turnover meeting, and post-job briefing.
- Development of a Risk Management Action Plan to address or mitigate the identified risk.
- Increased technical oversight and field involvement by supervision.
- Increased emphasis on coordination and synchronization of involved groups.

d. IF the plant is placed in a risk significant configuration (Orange, or Red condition), the SM/CRS ensures implementation of the following actions:

- Determine cause of unacceptable risk.
- Evaluate Technical Specification Action requirements.
- Notify Senior Director, Nuclear Operations and DM.
- Develop a Risk Management Action Plan to return risk to acceptable level.

e. IF the plant is in a low risk significant configuration (Green condition) and the Operations Shift Management chooses to implement Risk Management Actions for equipment out of service, the SM/CRS ensures implementation of the following actions:

- Development of a Risk Management Action Plan to address or mitigate the identified risk.
- More detailed communication by pre-job brief, structured turnover meeting, and post-job briefing.
- Increased technical oversight and field involvement by supervision.
- Increased emphasis on coordination and synchronization of involved groups.

-END OF SECTION-

4.4. Outage Schedule Development

4.4.1. Outage activities are scheduled and reviewed per requirements of this procedure and the following:

- Technical Specifications.
- APA-ZZ-00150, Outage Preparation and Execution.
- APA-ZZ-00151, Unit Threat - Forced Outage Response Plan.

4.4.2. During schedule development, schedulers ensure that SSCs are OPERABLE/Available per the requirements of Shutdown Safety Matrices (Attachment 2).

a. The potential introduction of hazards (e.g., heavy lifts, flooding, etc.) posed by the level and/or scope of activities in a given area of the plant should also be considered.

4.4.3. Outage risk assessment is determined by Shutdown Safety Assessment (Qualitative assessment of the degree of risk based on redundancy of key safety functions). Risk is based on level of defense-in-depth for each key safety function and scheduled activities that may affect this defense-in-depth.

4.4.4. Shutdown Safety Assessments may be used to verify Safety Functions during an outage. Hammock activities that involve enhanced awareness evolutions may be used in conjunction with this assessment.

a. Cautions for enhanced awareness evolutions are added to the schedule as necessary to raise plant personnel awareness of identified evolutions, such as:

- CAUTION: High Risk Evolution (HRE)
- CAUTION: Potential Loss of RCS Inventory/Decay Heat Removal
- CAUTION: CTMT Heavy Lift Activity
- CAUTION: CTMT Integrity Concern
- CAUTION: Nuclear Safety Activity
- CAUTION: Equipment Availability Concern

b. WHEN the Shutdown Safety Assessment condition is Yellow, a Risk Management Action Plan will be developed to ensure safety functions are available.

c. WHEN the Shutdown Safety Assessment condition is Orange, a Risk Management Action Plan and DID Contingency Plan will be developed to ensure safety functions are available.

4.4.5. The Safety Monitor (or Attachment 1 IF in MODES 1, 2 or 3 and the Safety Monitor unavailable) is used to identify risk relationships between work activities and the status of systems that support key safety functions.

4.4.6. Throughout outage schedule development, the Outage Scheduler routinely performs outage risk assessments (Refer To Attachment 10). Section 4.1, APA-ZZ-00150, Outage Preparation and Execution, and other remedial actions that appropriately address shutdown risk concerns should be factored into the assessment. The assessments are reviewed by the Outage Schedule Review Team.

4.4.7. IF Safety Monitor risk assessment is in question, or Safety Monitor is in the Orange or Red band, the Safety Monitor Administrator and/or Probabilistic Risk Assessment Group is contacted for quantitative analysis.

4.4.8. A Red condition on the Shutdown Safety Assessment places the plant's ability to perform a safety function in jeopardy. The plant shall NOT be intentionally placed in this condition.

4.4.9. Prior to start of a planned outage, an outage risk assessment is performed by the Outage Schedule Review Team to ensure the schedule is built on a defense-in-depth philosophy.

a. The Outage Schedule Review Team should include a representative from each of the following work groups:

- Operations (Senior Reactor Operator (SRO) licensed)
- Engineering
- Maintenance (including craft personnel)
- PRA personnel
- Outage Scheduling
- Special Test Directors or similar outage-specific personnel

b. The scope of the schedule review should be the outage schedule from the time the breakers on the main generator are OPENED until the outage ends and one main generator output breaker is CLOSED.

Step 4.4.9 Cont'd

c. Objectives of the outage risk assessment are:

- To minimize the duration of periods of elevated risk, including time spent at Lowered or Reduced Inventory conditions.
- To assess the schedule for assurance that primary and backup capabilities exist for satisfying shutdown safety functions.
- To maximize system availability needed for normal and emergency conditions.
- To minimize maintenance work that is performed while at Lowered or Reduced Inventory conditions.
- To determine IF a potential problem area exists wherein the maintenance of shutdown safety functions could be unacceptably reduced by a single failure.
- To determine IF Risk Management Actions and DID Contingency Plans, IF required, exist to cover situations where shutdown safety functions availability is reduced.
- To make recommendations that could preserve or improve maintenance of shutdown safety functions.
- Qualitative risk assessments (heavy lifts, flooding etc.)
- Validation of OTO procedures and EOP procedures.
- To assess the schedule for compliance with Technical Specifications and FSAR Chapter 16.

d. A review of contingency plans that support defense-in-depth is performed to ensure the plans will be:

1. Validated and verified by a combination of the following methods, commensurate with the complexity and time-criticality of the actions:
    - Testing
    - Drills
    - Walkthroughs
    - Training
2. IF temporary equipment or systems are to be used as part of a plan, the following is required:
    - Equipment or systems are installed and tested prior to use.
    - Approved written procedures exist to operate the equipment.
    - Operators of the equipment are trained.

Step 4.4.9 Cont'd

e. A validation of Off-Normal (OTO) and Emergency (EOP) procedures is performed to ensure the equipment and systems used are available WHEN needed.

1. IF an OTO or EOP can NOT be performed as written due to equipment unavailability, PERFORM one of the following:

   a) REVISE the outage schedule such that the necessary equipment is available,

   OR

   b) REVISE the OTO or EOP such that it can be performed with the equipment available.

2. OTOs or EOPs used to support defense-in-depth should be listed in the Shutdown Safety Management Plan.

f. All team comments and recommendations shall be documented in the Corrective Action Program.

1. Items that may require schedule changes are resolved prior to issuing Revision 0 of the outage schedule.

2. Enhancements are resolved commensurate with their ability to improve the outage schedule.

g. The proposed Shutdown Safety Management Plan is submitted to the Senior Director, Nuclear Operations and Director, Nuclear Operations, or designees, for approval. The plan includes:

1. A description of the logic or plant conditions that result in any key safety function being any color other than Green.

2. A summary of the Risk Management Action Plan for each of these periods.

3. A description of the Contingency Plans developed to support Defense-in-Depth.

4. A list of the OTOs or EOPs used to support Defense-in-Depth.

5. Applicable internal and external Operating Experience (OE).

4.4.10. Senior management is provided awareness of the approved Shutdown Safety Management Plan through Outage Challenge Meetings and the Final Outage Readiness Review.

4.4.11. An independent technical review of the outage schedule and Shutdown Safety Management Plan will be performed per APA-ZZ-00150, Outage Preparation and Execution. The team should consist of the personnel outlined below and that were NOT directly involved in outage schedule development or preparation of the Shutdown Safety Management Plan:

a. At least one currently licensed SRO and at least two of the following:

1. SRO (currently licensed)

2. SRO (previously licensed) or SRO certified

3. Engineer knowledgeable on shutdown risk assessment

4. Off Site Peer

a) Meeting any of the above criteria at their station

b) Trained in Outage Scheduling

b. IF an Off Site Peer is unavailable, an individual that does NOT report to the Vice President, Nuclear Operations may participate in this review.

4.4.12. The independent technical review team will submit a report of their findings to the Senior Director, Nuclear Operations; Director, Nuclear Operations; and Manager, Outage. The report should include:

a. List of team members

b. List of documents reviewed

c. Conclusions on the management of plant risk

d. Identification of any gaps that require resolution (these gaps should also be recorded in the Corrective Action Program)

e. Recommendations for enhancements to improve risk management or its processes

4.4.13. IF outage work scope growth or unusual occurrences create a significant change to the outage schedule that would invalidate the current outage schedule review, an additional Outage Schedule Review Team review and independent risk assessment review shall be performed.

a. IF a revision to the approved Shutdown Safety Management Plan is required, the Senior Director, Nuclear Operations and Director, Nuclear Operations, or designees, must approve the revised plan.

b. Senior management will be provided a summary of the changes to the approved Shutdown Safety Management Plan.

4.4.14. For forced outages, the Manager, Outage determines the need for a formal outage risk assessment and documented Shutdown Safety Management Plan per APA-ZZ-00315, Configuration Risk Management Program.

4.4.15. During MODE 4 (Hot Shutdown) from the point at which the MCC breakers for the Shutdown Cooling Suction Valves, BBPV8702A, BBPV8702B, EJHV8701A, and EJHV8701B, are unlocked and closed, MODE 5 (Cold Shutdown) and MODE 6 (Refueling), consideration should be given to potential system unavailability as a result of a fire when developing Risk Management Actions for a plant configuration change. The goal is to ensure that contingency plans are established when the plant is in an NFPA 805 High Risk Evolution, and there is the possibility of losing a Key Safety Function due to fire. Additional control/measures should be evaluated during a mode where the risk is intrinsically high. Typically, these consist of a combination of administrative controls, fixed fire protection features and pre-fire actions that when taken, prevent Key Safety Function failures should a fire occur. [Ref: 5.2.21, 5.2.22]

-END OF SECTION-

4.5. Outage Schedule Implementation

NOTE

In MODES 4, 5, 6, and NO MODE, Risk Assessment philosophy requires a Shutdown Safety Assessment to be performed a minimum of every 24 hours. As a station, we perform a Shutdown Safety Assessment every 12 hours to ensure compliance.

4.5.1. A Safety Monitor risk analysis should be performed each 12 hour shift in MODES 1, 2, and 3. A Shutdown Safety Assessment should be performed each 12 hour shift in MODES 4, 5, 6, and NO MODE (core offloaded to Spent Fuel Pool) by the Control Room crew, using Attachment 3 and applicable Attachments 4 thorough 7.

a. The Shift Outage Manager should discuss the completed Shutdown Safety Assessment at daily POD meetings.

4.5.2. The Shutdown Safety Assessment is performed prior to major plant configuration changes to ensure Callaway Energy Center is being operated within acceptable risk.

a. The Shift Manager approves the major plant configuration changes by their approval of the Shutdown Safety Assessment.

4.5.3. The Outage Risk Assessment Coordinator performs:

a. An assessment of emergent work to the outage schedule to ensure plant safety throughout the outage.

b. A Shutdown Safety Assessment 12-hour look ahead prior to the next outage schedule being issued to verify the Shutdown Safety Management Plan.

4.5.4. A Shutdown Safety Assessment or Safety Monitor risk analysis will also be performed as directed by APA-ZZ-00150 Appendix N, Work Scope Control, whenever changes are made to the plant that affect any of the following key safety functions:

- Reactivity control.
- Core decay heat removal capability.
- Containment integrity.
- RCS inventory control.
- Electrical power availability.
- Spent fuel pool decay heat removal capability.

a. Changes may require convening the Outage Schedule Review Team and revising the Shutdown Safety Management Plan.

4.5.5. The Shift Manager reviews and approves the Shutdown Safety Assessment. Reviews are documented by signature, date, and time.

4.5.6. Shift Managers, as part of shift turnover, review the latest Shutdown Safety Assessment and forward a copy for review by the Operations Outage Manager and Outage Scheduling. Outage Scheduling retains a copy.

4.5.7. A Red condition on the Shutdown Safety Assessment places the plant's ability to perform a safety function in jeopardy. The plant shall NOT be intentionally placed in this condition.

4.5.8. IF, during a Shutdown Safety Assessment, a Red condition is discovered, immediate actions are taken to restore a Green condition or acceptable Yellow condition (the Yellow condition is allowable or NOT applicable to the associated present plant configuration).

4.5.9. IF any anticipated plant configurations result in a Yellow or Orange condition, and the on duty Operations Shift Manager can NOT determine that the condition is allowable or NOT applicable to the associated present or scheduled plant configuration, one of the following actions is taken:

a. Work is rescheduled to eliminate the Yellow or Orange condition, or

b. Risk Management Actions are developed prior to placing the plant in the configuration that would result in a Yellow condition.

c. An anticipated Orange condition requires prior approval of the Senior Director, Nuclear Operations or designee.

d. Prior to placing the plant in the configuration that would result in an Orange condition:

1. ENSURE a Risk Management Action Plan is developed.

2. ENSURE a DID Contingency Plan is implemented.

3. REVIEW scheduled activities that must be completed to exit the Orange condition, to ensure readiness to execute these activities.

4. NOTIFY the Manager, Outage of any issues that could challenge the timely completion of these required activities.

4.5.10. WHEN it is determined that a Yellow or Orange condition is allowable, or NOT applicable, the Shift Manager documents the decision by noting approval, signature and date in, or near, the 'CONDITION SCORE' box that indicates the Yellow or Orange condition.

4.5.11. An unplanned entry into a Yellow or Orange condition requires a Risk Management Action Plan to be developed and disseminated until the condition is exited. An unplanned Orange condition requires notification of Senior Director, Nuclear Operations and implementation of a DID Contingency Plan.

4.5.12. IF changes to the approved Shutdown Safety Management Plan (excluding editorial or typographical errors) are required, the following will be performed:

a. Outage Schedule Review Team evaluates the changes and revises the plan.

b. The Senior Director, Nuclear Operations and Director, Nuclear Operations, or designees must approve the revised plan.

c. Senior management will be provided a summary of the changes to the plan.

4.5.13. Scheduled activities should be annotated with a caution WHEN a Shutdown Safety Assessment indicates a Yellow or Orange condition that requires Risk Management Action or can NOT be considered NOT applicable, such as:

- CAUTION: High Risk Evolution (HRE)
- CAUTION: Potential Loss of RCS Inventory/Decay Heat Removal
- CAUTION: CTMT Heavy Lift Activity
- CAUTION: CTMT Integrity Concern
- CAUTION: Nuclear Safety Activity
- CAUTION: Equipment Availability Concern

4.5.14. Cautions may be added to other associated activities as deemed necessary by the Outage Scheduling Group.

NOTE

Although the next step gives approval authority for inclusion of jump up work to go to the field for work during the outage, it does NOT override the requirement for Operations SM/CRS to approve the start of work.

4.5.15. Outage scope changes (work added or cancelled) are reviewed and approved per the requirements of APA-ZZ-00150, Outage Preparation and Execution.

-END OF SECTION-

4.6. Proper Method for Using Jobs, WPA, or EOSL as Inputs to Safety Monitor to Support Accurate Risk Assessments for Scheduled Work

4.6.1. WHEN a Job is used as an input to Safety Monitor, the free field named 'FEG/COMP FUNC' must be populated with 'Y' or 'N' indicating the performance of the Job will cause the affected FEG to be Functional or NOT Functional. This free field must be populated for all tasks associated with the Job number. Additionally, IF the Job is a contingency Job, the free field named 'FEG/COMP CONT JOB' must also be populated with 'Y' to indicate the Job is planned as a contingency. To support the risk assessment of scheduled work, the free fields must be populated WHEN the Job status is advanced to PLNC.

4.6.2. WHEN a Workman's Protection Assurance (WPA) is used as an input to Safety Monitor, the field named 'FEG Functional ?' must be populated with 'YES' or 'NO' indicating the FEG(s) affected by the WPA will be Functional or NOT Functional. For Local Control WPA, the designated functionality applies WHEN the WPA status is changed to ISSUED. For all other types of WPA, the designated functionality applies WHEN the WPA status is changed to APPR TO PL. To support the risk assessment of scheduled work, the FEG Functional field of the WPA must be populated with an entry of 'YES' or 'NO' WHEN the WPA status is changed to PLANNED, within the time frame required by APA-ZZ-00322 Appendix B, Work Week Schedule and Execution.

4.6.3. WHEN using a WPA as an input to Safety Monitor, the WPA tagging must be reviewed to determine which FEGs, as currently defined in EMPRV, are made non-functional by the WPA. IF any FEGs are determined to be made non-functional, which are NOT listed on the WPA activities list, they must be processed in Safety Monitor **in addition to** the FEGs listed on the WPA. These Safety Monitor entries may be made using an Equipment Out of Service Log (EOSL) with the proper FEG(s) identified or a manual entry by the Safety Monitor operator.

4.6.4. WHEN using an EOSL which is being used to transfer and process WPA data as inputs to Safety Monitor, all FEGs on the WPA Activities tab must be listed on the Locations List window of the EOSL Detail tab. Any FEGs which are determined to be made non-functional by the WPA tagout and are NOT listed on the WPA activities tab must also be listed on the Locations List window of the EOSL Detail tab. To support the risk assessment of scheduled work, the checkbox on the EOSL Detail tab named 'COMP FUNC' must be unchecked to process the FEGs affected by a WPA as non-functional WHEN the EOSL status is changed to PLANNED, within the time frame required by APA-ZZ-00322 Appendix B, Work Week Schedule and Execution.

4.6.5. WHEN using an EOSL which is being used to transfer and process Job data as an input to Safety Monitor, the FEG assigned to the Job must be listed on the Locations List window of the EOSL Detail tab. To support the risk assessment of scheduled work, the checkbox on the EOSL Detail tab named ‘COMP FUNC’ must be unchecked to process the FEG affected by a Job as non-functional WHEN the EOSL status is changed to PLANNED.

-END OF SECTION-

5.0 REFERENCES

5.1. Implementing

5.1.1. APA-ZZ-00150, Outage Preparation and Execution

5.1.2. APA-ZZ-00150 Appendix M, Containment Closure

5.1.3. APA-ZZ-00150 Appendix N, Work Scope Control

5.1.4. APA-ZZ-00150 Appendix Q, Nuclear Contingency Management Guidelines

5.1.5. APA-ZZ-00151, Unit Threat - Forced Outage Response Plan

5.1.6. APA-ZZ-00315, Configuration Risk Management Program

5.1.7. APA-ZZ-00322, Integrated Work Management Process Description

5.1.8. APA-ZZ-00322 Appendix B, Work Week Schedule and Execution

5.1.9. APA-ZZ-00365, Callaway Lifting and Rigging Program

5.1.10. APA-ZZ-00605, Temporary System Modifications

5.1.11. APA-ZZ-00703, Fire Protection Operability Criteria and Surveillance Requirements

5.1.12. APA-ZZ-00750, Hazard Barrier Program

5.1.13. EDP-ZZ-01128, Maintenance Rule Program

5.1.14. EDP-ZZ-01128 Appendix 1, SSCS in the Scope of the Maintenance Rule at Callaway

5.1.15. EDP-ZZ-01129 Appendix 1, Listing of Components That Have Multiple Functions

5.1.16. EDP-ZZ-01129 Appendix 3, Performing Risk Assessments Required by Technical Specifications LCO 3.0.4.B and LCO 3.0.8

5.1.17. EDP-ZZ-01131, Plant Health and Performance Monitoring Program

5.1.18. EDP-ZZ-04044, Fire Protection Reviews

5.1.19. ETP-BB-03137, Assembly of the Core Exit Thermocouple Nozzle Assembly (CETNA)

5.1.20. ETP-BB-03138, Disassembly of the Core Exit Thermocouple Nozzle Assembly (CETNA)

5.1.21. ETP-BB-03147, Reactor Vessel Head Removal - IPTE

5.1.22. ETP-BB-03148, Reactor Vessel Upper Internals Removal - IPTE

5.1.23. ETP-BB-03151, Reactor Vessel Lower Internals Removal - IPTE

5.1.24. ETP-BB-03152, Reactor Vessel Lower Internals Installation - IPTE

5.1.25. ETP-BB-03153, Reactor Vessel Upper Internals Installation - IPTE

5.1.26. ETP-BB-03154, Reactor Vessel Head Installation - IPTE

5.1.27. FR-H.1, Response to Loss of Secondary Heat Sink

5.1.28. OOA-BB-00003, Refuel Level Indications

5.1.29. OOA-ZZ-SM001, Safety Monitor

5.1.30. ODP-ZZ-00002, Equipment Status Control

5.1.31. ODP-ZZ-00002, Appendix 1, Protected Equipment Program

5.1.32. ODP-ZZ-00002 Appendix 2, Risk Management Actions for Planned Risk Significant Activities

5.1.33. ODP-ZZ-00002 Appendix 3, Risk Management Actions for Fire Risk Systems and Components

5.1.34. ODP-ZZ-00027, Safety Function Determination Program

5.1.35. OSP-BG-0001A, Boron Injection Flow Paths MODE 4 Through 6

5.1.36. OSP-BG-00002, Verify One Centrifugal Charging Pump Incapable of Injection Into RCS

5.1.37. OSP-EM-00002, Rendering SI Pumps Incapable of Injection

5.1.38. OSP-GT-00003, Containment Closure

5.1.39. OSP-NB-00001, Class 1E Electrical Source Verification

5.1.40. OSP-SF-00001, Shutdown Margin Calculations

5.1.41. OTG-ZZ-00007, Refueling Preparation, Performance and Recovery

5.1.42. OTN-BB-00001, Reactor Coolant System - IPTE

5.1.43. OTN-BB-00002, Reactor Coolant System Draining

5.1.44. OTN-BB-00002 Addendum 5, Nozzle Dam Installation and Removal

5.1.45. OTN-BB-00002 Addendum 6, Draining the RCS to Limited Inventory or Reduced Inventory – IPTE

5.1.46. OTN-EC-00001 Addendum 4, Refuel Pool Cleanup Operations

5.1.47. OTO-EC-00001, Loss of SFP/Refuel Pool Level

5.1.48. OTO-EJ-00001, Loss of RHR Flow

5.1.49. OTO-EJ-00003, Loss of RHR While Operating at Reduced Inventory or Mid-Loop Conditions

5.1.50. OTO-KE-00001, Fuel Handling Accident

5.1.51. OTO-ZZ-00012, Severe Weather

5.1.52. OTS-MA-00001, Main Step-Up Transformer Backfeed - IPTE

5.1.53. PDP-ZZ-00017, Fix It Now (FIN) Team Process

5.1.54. Tech. Spec. 3.9.1

5.2. Developmental

5.2.1. APA-ZZ-00312, Probabilistic Risk Assessment (PRA)

5.2.2. APA-ZZ-00320, Work Execution

5.2.3. APA-ZZ-00322, Integrated Work Management Process Description

5.2.4. APA-ZZ-00330, Preventive Maintenance Program

5.2.5. APA-ZZ-00340, Surveillance Program Administration

5.2.6. PDP-ZZ-00025, Functional Equipment Groups

5.2.7. CARS 200201856

5.2.8. CARS 200203911

5.2.9. CARS 200206856

5.2.10. CARS 200507311

5.2.11. CARS 200302463

5.2.12. CARS 200506961

5.2.13. CARS 200507180

5.2.14. CARS 200600493

5.2.15. CARS 200704021

5.2.16. CARS 200909604

5.2.17. CARS 201110627

5.2.18. CARS 201203820, Fire Risk in MR (a)(4)

5.2.19. CARS 201101832, Track Implementation Items for NFPA 805 Project

5.2.20. COMN 43464

5.2.21. COMN 50171, Transition to NFPA 805 License Amendment Request

5.2.22. COMN 50182, Transition to NFPA 805 License Amendment Request

5.2.23. EPRI PSA Application Guide

5.2.24. INPO 06-008 Guidelines for the Conduct of Outages at Nuclear Power Plants

5.2.25. KC-26, Nuclear Safety Capability Assessment

5.2.26. NUMARC 91-06, Guidelines for Industry Actions to Assess Shutdown Management

5.2.27. Safety Monitor User Manual

5.2.28. 10 CFR 50.65, Requirements for monitoring the effectiveness of maintenance at nuclear power plants

5.2.29. NUMARC 93-01 Section 11, Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants, Rev 4a

5.2.30. Generic Letter 88-17, Loss of Decay Heat Removal

5.2.31. T/S BASA 3.8.2

5.2.32. T/S BASA 3.8.5

5.2.33. T/S BASA 3.8.8

5.2.34. T/S BASA 3.8.10

5.2.35. T/S LCO 3.5.2

5.2.36. WCAP 11916, Loss of RHRS Cooling While the RCS is Partially Filled

5.2.37. EJ-06, Loss of RHRS Cooling / RCS Partially Filled Generic Letter 88-17

5.2.38. EJ-51, Rev. 0, Add. 2, RWST Level Needed to Gravity Feed from RWST to RCS at Reduced Inventory Levels and Loss of RHR (RF17 and beyond).

5.2.39. BB-200, Rev. 0, Add. 2, RCS Venting Requirements for Operations from Mid-Loop to the Reactor Vessel Flange with Steam Generator Nozzle Dams in Place for (Refuel 17 and beyond).

5.2.40. Wolf Creek LER 2008-008-02 dated 08-25-2009, Potential for Residual Heat Removal Trains to be Inoperable During Mode Changes

5.2.41. WCAP 12476 Rev. 1 Evaluation of LOCA During Mode 3 and Mode 4 Operation for Westinghouse NSSS 11/2000

5.2.42. NRC Regulatory Guide 1.160 Rev 3, monitoring the Effectiveness of Maintenance at Nuclear Power Plants, dated May 2012.

5.2.43. PRAER 13-375

6.0 RECORDS

6.1. Shutdown Safety Assessments performed by the Control Room (B160.0004) to be forwarded to Records Management, to be filed in the Commercial File Room.

7.0 DEFINITIONS

For additional definitions Refer To APA-ZZ-00315, Configuration Risk Management Program.

7.1. **10 CFR 50.65 (a)(1)** - Category (a)(1) refers to plant structures, systems, or components, which do NOT meet established performance criteria outlined in EDP-ZZ-01128, Maintenance Rule Program, and require additional monitoring. Further definition can be found in 10 CFR 50.65.

7.2. **10 CFR 50.65 (a)(4) scope –** (a)(4) assessment scope may be limited to the following scope of Structures, Systems or Components (SSCs):

7.2.1. SSCs included in the scope of Callaway's IPE, internal events PRA (SSCs listed in Safety Monitor Component Status database).

7.2.2. SSCs in addition to the above that have been determined to be risk significant by the Expert Panel (Refer To EDP-ZZ-01128 Appendix 1, SSCS in the Scope of the Maintenance Rule at Callaway).

7.3. **Available** – An SSC is either performing, or is capable of performing its intended function.

7.3.1. Standby equipment can be placed in service by manual (simple operator actions) or automatic means.

a. Credit may be taken for reasonable actions both in the Control Room and in-plant.

1. A reasonable action would include an operator closing a breaker or opening a valve outside of the Control Room or operating a pump or valve from the Control Room.

2. A reasonable action also includes restoring a 4160-V breaker IF the breaker is only racked out to satisfy T/S LCO 3.4.12, Cold Overpressure Mitigation System (COMS) and an operator is designated and pre-job briefed to restore the breaker.

3. Actions required to place standby equipment in service should ensure success and be limited in number, NOT requiring analysis.

4. Simple actions for some outage conditions, such as low decay heat high inventory periods, may NOT constitute simple actions in other conditions, such as high decay heat lowered inventory conditions.

b. Equipment maintained Functional by a Maintenance Rule Dedicated Operator can be credited.

7.3.2. A system does NOT need to be OPERABLE as defined in Technical Specifications or the FSAR to be considered Available.

7.3.3. Credit may also be taken for temporary power and backup equipment provided:

a. Approved procedures or Work Instructions are available.

b. The temporary power or backup equipment have been installed and tested versus only staged.

c. Qualified personnel are assigned to operate the equipment and have performed a walkthrough or drill during the current outage.

7.3.4. Systems drained and/or out of service for maintenance are **NOT** credited as being Available.

7.3.5. Credit as being Available should NOT be given solely on the basis of a DID Contingency Plan being in place.

7.3.6. The Service Water (EA) System may be considered Available in MODES 4, 5, and 6, and in NO MODE with at least one Service Water Pump and either of the following [Ref: 5.2.17]

- Natural Draft Cooling Tower in service
- Cooling Tower Makeup and Blowdown in service to the forebay (Makeup requirement includes flow available from the Intake Structure)

7.3.7. An Essential Service Water (EF) System Train may be considered Available in MODES 5, 6, and in NO MODE with at least one Ultimate Heat Sink (UHS) Cooling Tower Fan Available to cool the train.

7.4. **Cold Core** – Condition in which the next fuel cycle core is within the Reactor (after Refueling).

7.5. **Defense-in-Depth (DID) Contingency Plan** – Developed to mitigate reductions in shutdown safety margins or losses of Key Safety Functions commensurate with the level of risk the activity poses. DID Contingency Plans are developed per APA-ZZ-00150 Appendix Q, Nuclear Contingency Management Guidelines. A DID Contingency Plan is NOT required WHEN the risk is adequately addressed by governing operating procedures and designated recovery procedures. A DID Contingency Plan provides compensatory actions to:

- Maintain defense-in-depth by alternate means WHEN pre-outage planning reveals that specified SSCs will be Unavailable.
- Restore defense-in-depth when system Availability drops below the required defense-in-depth during the outage.
- Minimize the likelihood of a loss of Key Safety Functions during High Risk Evolutions.
- Provide response actions for postulated events that would present a challenge to Key Safety Functions. Personnel required to implement the response actions will be identified and familiar with the plan.

7.6. **Fire Risk Management Actions (FRMAs)** – Risk Management Actions specified in ODP-ZZ-00002 Appendix 3, Risk Management Actions for Fire Risk Systems and Components, established based on Fire PRA insights which are implemented when Fire Risk Systems or Components are non-functional on the EOSL for greater than 60 hours.

7.7. **Fire Risk Systems and Components (FRSCs)** – The set of systems and components specified in ODP-ZZ-00002 Appendix 3, Risk Management Actions for Fire Risk Systems and Components, which are identified as having appreciable risk due to fire initiating events determined using a combination of the Fire PRA and Fire Protection Program Nuclear Safety Capability Assessment.

7.8. **Functional Equipment Group (FEG)** – Components and associated support components which can be logically grouped together and collectively removed from service. Establishing FEGs allows efficient bundling of work. For example, grouping a condensate pump and its associated breaker in the same FEG allows work to be done on both components simultaneously thereby minimizing unavailability time.

7.9. **High Risk Evolution (HRE)** – An activity which causes the plant to be in a configuration resulting in an increased vulnerability to an event, which may cause a loss of a key safety function. During the time period of the performance of a high risk evolution, the risk color for the affected safety function(s) may be administratively raised one color level at the Operations Shift Manager's discretion.

7.10. **Hot Core** -– Condition in which the present fuel cycle core is within the Reactor (before Refueling)

7.11. **Large Object Exclusion** – A scheduling condition (period) during which objects that would take longer than 60 minutes to move through the Containment Equipment Hatch (DSM52) are NOT allowed to enter or exit Containment. This condition is applied during either of the following periods:

- RCS Time-to-Boil (T_{boil}) is 120 minutes or less
- Fuel movement or Core Alterations in progress in Containment

7.12. **Mid Loop** – The condition where reactor vessel water level is lower than the top of the hot leg (at the reactor vessel) and fuel is loaded.

7.13. **"N"** – The designated letter in an algebraic expression representing defense-in-depth. The minimum amount of equipment, system, or trains that must be OPERABLE as defined by Tech. Spec. Limiting Conditions for Operations (LCO) or FSAR.

7.14. **"N+1"** – The algebraic expression representing defense-in-depth. The minimum amount of equipment, systems, or trains that must be OPERABLE as defined by Tech. Spec. LCO or FSAR plus one additional piece of equipment, system, train, or plant operating state that would provide an equivalent function.

7.15. **NFPA 805 High Risk Evolution** – A plant configuration where one or more of the following conditions is met:

- Fuel is in the reactor vessel and RCS inventory less than or equal to Reduced Inventory conditions

  OR
- Fuel is in the reactor vessel and T-Boil less than or equal to 40 minutes

7.16. **Qualitative Considerations** – An assessment based on operator knowledge that assesses the impact of maintenance activity and/or plant configuration change upon key safety functions, as follows:

7.16.1. Key safety functions affected by the SSC planned for removal from service and/or plant configuration change are identified.

7.16.2. The degree to which removing the SSC from service and/or plant configuration change will impact the key safety function is considered.

7.16.3. The degree of redundancy, duration of out-of-service condition, and appropriate Risk Management Actions or protective actions that could be taken IF appropriate for the activity under consideration is considered.

7.17. **Reduced Inventory** – The condition where reactor vessel water level is lower than 3 ft below the vessel flange and fuel is loaded.

7.18. **Reliability** – a measure of the expectation (assuming that the System, Structure, or Component (SSC) is available) that the SSC will perform its function upon demand at any time.

7.19. **Risk Thresholds** – pre-determined threshold of risk:

7.19.1. **Green** – key safety functions are at minimum risk. Plant and equipment availability conditions that exceed N+1 criteria result in a Green condition. Risk Management Actions may be implemented IF deemed appropriate by Operations Shift Management.

7.19.2. **Yellow** – key safety function is in a reduced capability. The plant's ability to perform the associated safety function is reduced but still acceptable. Only two key safety function success paths are Available. Risk Management Actions may be required prior to planned entry. For unplanned entry, a Risk Management Action Plan must be implemented as soon as possible. Plant and equipment availability conditions that meet the Technical Specification LCO without reliance on the action statements and the minimum equipment requirements.

7.19.3. **Orange** – key safety functions are degraded and steps should be taken to minimize the amount of time in this condition. Only one key safety function success path is available. A Risk Management Action plan, DID Contingency Plan, and specific approval are required prior to planned entry. For unplanned entry, initiation of a Risk Management Action Plan and Senior Director, Nuclear Operations notification are required.

7.19.4. **Red** – key safety functions are severely threatened. NO key safety function success path is Available. Immediate actions are required to restore acceptable plant risk. Planned entry is NOT allowed. For unplanned entry, Initiation of a Risk Management Action Plan and Callaway Senior Director, Nuclear Operations/DM notification are required.

7.20. **Troubleshooting** – A systematic approach to data collection, failure analysis, and development and execution of a test/measurement plan to identify the cause(s) of equipment deficiencies.

7.21. **Unplanned Event** – any condition NOT in the planned work schedule (i.e., jump-up activity that was NOT included in the weekly schedule risk assessment provided to the Control Room by the Work Week Manager), that renders station equipment non-functional or extends non-functional equipment scheduled outage time beyond its planned duration. [Ref: 5.2.8]

7.22. **Unplanned Shutdown Safety Color Change** – any color change to a higher risk level (e.g., Green to Yellow or Yellow to Orange) that was NOT included in the Shutdown Safety Management Plan at the start of the outage.

-END OF SECTION-

8.0 SUMMARY OF CHANGES

Page(s)	Section or Step Number	Description
		Changes listed below are per Engineering markup based upon the CAR indicated. Any additional minor changes are in accordance with Procedure Writers Manual.
		CAR 201602979
	Attachment 5B, 5C, & 6	For each Attachment, D-I-D Bases, *Containment* section, Step 2: Added “Credit can be given for individual Containment Coolers (1 point each).”
	Attachment 12 Sheet 2	Added Note preceding Example 1. In each Example changed “the Reactor Vessel Head removed alone” to “the Reactor Vessel Head detensioned with all required studs removed or the Reactor Vessel Head removed alone”.
		CAR 201603291
	Attachment 5A, 5B, & 5C	For each Attachment, D-I-D Bases, *Power Availability* section, Step 2: Added last bullet, “An offsite AC power source can be considered Available IF it has the capability to supply either NB01 OR NB02; it does NOT have to be connected to be considered Available.”
	Attachment 6	D-I-D Bases, *Power Availability* section: Added Step 2.c: “An offsite AC power source can be considered Available IF it has the capability to supply either NB01 OR NB02; it does NOT have to be connected to be considered Available.”
	Attachment 7	D-I-D Bases, *Power Availability* section, Step 1, 1st main bullet: changed “feeds” to “has the capability to feed”. In 3rd main bullet changed “powers” to “has the capability to feed”. D-I-D Bases, *Power Availability* section, Step 2.b: changed “core decay heat” to “spent fuel pool decay heat”.
		CAR 201604083
29	5.1.46	Added OTN-EC-00001 Addendum 4 to Implementing References.
	Attachment 6 Attachment 7	D-I-D Bases, *Spent Fuel Pool Decay Heat Removal* section, Step 1 and Step 2: Added: “Contingency actions must be established per OTN-EC-00001 Addendum 4, Refuel Pool Cleanup Operations, if the idle SFP cooling train is being credited” to each step.

Page(s)	Section or Step Number	Description
		CAR 201603942 (TCN 16-00009)
	Attachment 4 Attachment 7	D-I-D Bases, *Power Availability* section- Step 4.c.2: changed “the use” to “the movement or use”; added “energized” before Bus A; added “(excludes elevating a lift device that is stationary at a deenergized work location)”. Step 4.c.3: added “(includes WPA activities)”. Step 4.c.4: added ”Active” before “work”; added “(or similar)” after Relay/Test Added last sentence regarding what is included and excluded as active work.
	Attachment 5A, 5B and 5C Attachment 6	D-I-D Bases, *Power Availability* section- Step 6.c.2: changed “the use” to “the movement or use”; added “energized” before Bus A; added “(excludes elevating a lift device that is stationary at a deenergized work location)”. Step 6.c.3: added “(includes WPA activities)”. Step 6.c.4: added ”Active” before “work”; added “(or similar)” after Relay/Test Added last sentence regarding what is included and excluded as active work.

Attachment 1
Equipment OOS PRA Matrix

Sheet 1 of 3

Train Being Taken OOS

Train OOS

TRAIN OOS	PAL02	AL-A	AL-B	NSAFP	1 AEPS	2+ AEPS	BG-A	BG-B	EM-A	EM-B	EJ-A	EJ-B	EG-A	EG-PA	EG-PC	EG-B	EG-PB	EG-PD	EF-A	EF-B	EA	NE-A	NE-B	SWYD	PZR	GN-A	GN-B	EN-A	EN-B
PAL02	X			Yellow	Green	Green	Green	Green	Green	Green	Green	Green	Yellow	Green	Green	Yellow	Green	Green	Yellow	Yellow	Yellow	Green	Green	Yellow	Green	Green	Green	Green	Green
AL-A		X		Green	Green	Green	Green	Green	Green	Green	Green	Green	Yellow	Green	Green	Yellow	Green	Green	Yellow		Green	Green		Yellow	Green	Green	Green	Green	Green
AL-B			X	Green	Green	Green	Green	Green	Green	Green	Green	Green	Yellow	Green	Green	Yellow	Green	Green		Yellow	Green		Green	Yellow	Green	Green	Green	Green	Green
NSAFP	Yellow	Green	Green	X	Green	Green	Green	Green	Green	Green	Green	Green	Yellow	Green	Green	Yellow	Green	Green	Yellow	Yellow	Green	Green	Green	Yellow	Green	Green	Green	Green	Green
1 AEPS	Green	Green	Green	Green	X	N/A	Green	Green	Green	Green	Green	Green	Yellow	Green	Green	Yellow	Green	Green	Yellow	Yellow	Green	Green	Green	Yellow	Green	Green	Green	Green	Green
2+ AEPS	Green	Green	Green	Green	N/A	X	Green	Green	Green	Green	Green	Green	Yellow	Green	Green	Yellow	Green	Green	Yellow	Yellow	Green	Yellow	Yellow	Yellow	Green	Green	Green	Green	Green
BG-A	Green	Green	Green	Green	Green	Green	X		Green		Green		Yellow	Green	Green		Green	Green	Yellow		Green	Green		Yellow	Green	Green	Green	Green	Green
BG-B	Green	Green	Green	Green	Green	Green		X		Green		Green		Green	Green	Yellow	Green	Green		Yellow	Green		Green	Yellow	Green	Green	Green	Green	Green
EM-A	Green	Green	Green	Green	Green	Green	Green		X		Yellow		Yellow	Green	Green		Green	Green	Yellow		Green	Green		Yellow	Green	Green	Green	Green	Green
EM-B	Green	Green	Green	Green	Green	Green		Green		X		Green		Green	Green	Yellow	Green	Green		Yellow	Green		Green	Yellow	Green	Green	Green	Green	Green
EJ-A	Green	Green	Green	Green	Green	Green	Green		Yellow		X		Yellow	Yellow	Yellow		Yellow	Yellow	Yellow		Yellow	Green		Yellow	Green	Green	Green	Green	Green
EJ-B	Green	Green	Green	Green	Green	Green		Green		Green		X		Yellow	Yellow	Yellow	Yellow	Yellow		Yellow	Yellow		Green	Yellow	Green	Green	Green	Green	Green
EG-A	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow		Yellow		Yellow		X	N/A	N/A		Red	Red	Yellow		Orange	Yellow		Red	Yellow	Yellow	Yellow	Yellow	Yellow
EG-PA	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Yellow	Yellow	N/A	X	Yellow	Red	Green	Green	Yellow	Yellow	Green	Green	Green	Yellow	Green	Green	Green	Green	Green
EG-PC	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Yellow	Yellow	N/A	Yellow	X	Red	Green	Green	Yellow	Yellow	Green	Green	Green	Yellow	Green	Green	Green	Green	Green
EG-B	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow		Yellow		Yellow		Yellow		Red	Red	X	N/A	N/A		Yellow	Orange		Yellow	Red	Green	Green	Green	Green	Green
EG-PB	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Yellow	Yellow	Red	Green	Green	N/A	X	Yellow	Yellow	Yellow	Green	Green	Green	Yellow	Green	Green	Green	Green	Green
EG-PD	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Yellow	Yellow	Red	Green	Green	N/A	Yellow	X	Yellow	Yellow	Green	Green	Green	Yellow	Green	Green	Green	Green	Green
EF-A	Yellow	Yellow		Yellow	Yellow	Yellow	Yellow		Yellow		Yellow		Yellow	Yellow	Yellow		Yellow	Yellow	X		Orange	Yellow		Red	Yellow	***		Yellow	
EF-B	Yellow		Yellow	Yellow	Yellow	Yellow		Yellow		Yellow		Yellow		Yellow	Yellow	Yellow	Yellow	Yellow		X	Orange		Yellow	Red	Yellow		***		Yellow
EA	Yellow	Green	Green	Green	Green	Green	Green	Green	Green	Green	Yellow	Yellow	Orange	Green	Green	Orange	Yellow	Green	Orange	Orange	X	Green	Green	Yellow	Green	Green	Green	Green	Green
NE-A	Green	Green		Green	Green	Yellow	Green		Green		Green		Yellow	Green	Green		Green	Green	Yellow		Green	X		Yellow	Green	Green		Green	
NE-B	Green		Green	Green	Green	Yellow		Green		Green		Green		Green	Green	Yellow	Green	Green		Yellow	Green		X	Yellow	Green		Green		Green
SWYD	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Red	Yellow	Yellow	Red	Yellow	Yellow	Red	Red	Yellow	Yellow	Yellow	X	Yellow	Yellow	Yellow	Yellow	Yellow
PZR	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Yellow	Green	Green	Yellow	Green	Green	Yellow	Yellow	Green	Green	Green	Yellow	X	Green	Green	Green	Green
GN-A	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Yellow	Green	Green	Yellow	Green	Green	***		Green	Green		Yellow	Green	X		Green	Green
GN-B	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Yellow	Green	Green	Yellow	Green	Green		***	Green		Green	Yellow	Green		X	Green	Green
EN-A	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Yellow	Green	Green	Yellow	Green	Green	Yellow		Green	Green		Yellow	Green	Green	Green	X	
EN-B	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Yellow	Green	Green	Yellow	Green	Green		Yellow	Green		Green	Yellow	Green	Green	Green		X

KEY

	Not allowed by Tech Specs
X	Same Train
N/A	Not Applicable
***	Train is NOT functional. Can also be removed from service

Implement Risk Management Actions as described in EDP-ZZ-01129 for the corresponding color (risk)
Switchyard/EF-B result made RED to match the similar configuratiion on opposite train

See Notes and Cautions for Matrix usage on Sheets 2 and 3 of this attachment.
The Notes associated to this Matrix are system specific, the Cautions are generic.

INFORMATION USE

Attachment 1 (Cont'd.)

Sheet 2 of 3

NOTES:

1. At least two Service Water Pumps and their discharge valves are required to be functional for the 'EA' function. EF System valves are required to be OPERABLE or in their safeguards position.
2. The Switchyard Effect is modeled as 2 of 3 offsite lines OOS. Greater than this would be considered a loss of the entire switchyard (Loop).
3. Both PZR PORVs and their block valves are required to be Functional for the PZR function.
4. PAL02 function requirements from AB, AE, and BM systems:
   a. AB system
      1) B and C SG MSIVs are required to be OPERABLE or closed.
      2) ABHV0005 and ABHV0006 are required to be OPERABLE or open.
   b. AE system – FWIVs are required to be OPERABLE or closed.
   c. BM system – SG blowdown isolation valves are required to be OPERABLE or closed.
5. AL-A and AL-B SSC function requirements from AE, and BM systems:
   a. AE system – FWIVs are required to be OPERABLE or closed.
   b. BM system – SG blowdown isolation valves are required to be OPERABLE or closed.

INFORMATION USE

Attachment 1 (Cont'd.)

Sheet 3 of 3

CAUTIONS:

1. THE EQUIPMENT OOS PRA MATRIX IS APPLICABLE IN MODES 1, 2, & 3 ONLY.
2. This table is valid for only two risk significant SSCs OOS at a time and does NOT consider effects such as system draining.
   a. For planned activities which make more than two SSCs OOS at a time, an evaluation should be performed prior to taking the SSCs OOS by the PRA Analyst to ensure that the risk is acceptable.
   b. For unplanned events which make more than two SSCs OOS at a time, a conservative decision should be made to restore the SSCs which are OOS considering risk, return to service time, and available resources.
3. NOT all risk significant SSCs are listed on the matrix. The reason for the difference between the matrix and EDP-ZZ-01128 Appendix 1, SSCS in the Scope of the Maintenance Rule at Callaway, is that there are certain risk significant SSCs that are NOT intended to be removed from service on-line, except in case of failure. In these cases the LCO action time is so short that appropriate attention is placed on returning the SSC to service as soon as possible and/or preparations are being made to shutdown the unit.
4. This table does NOT include unit reliability concerns. These should be evaluated by Daily Scheduling and the SM/CRS prior to authorizing work.
5. LCO 3.5.2 requires the OPERABILITY of a number of independent subsystems (BG, EM, EJ). Due to the redundancy of the trains and the diversity of subsystems, the INOPERABILITY of one component in a train does NOT render the ECCS incapable of performing its function. Neither does the INOPERABILITY of two different components, each in a different train, necessarily result in a loss of function for the ECCS. The Callaway Technical Specifications allow a combination of equipment such that 100% of the ECCS flow (injection and recirculation phases) equivalent to a single OPERABLE ECCS train remains available. This allows increased flexibility in plant operations under circumstances WHEN components in opposite trains are INOPERABLE. The Callaway Technical Specifications require the INOPERABLE components to be returned to OPERABLE status within 72 hours. WHEN using the Equipment OOS PRA Matrix in these cases, the appropriate train of the independent subsystem(s) must be evaluated accordingly.

Attachment 2

Shutdown Safety Matrices

Sheet 1 of 3

Requirements for High Decay Heat Conditions (Before Core Reload)

RCS STATUS	**Emergency Diesel Generators**	**Off-Site Power Supplies**	**RHR Trains** *(Note 6)*	**CCPs**	**SI Pumps**	**Containment Closure/Integrity**
MODE 5 loops filled *(Note 1)*	1 OP	1 OP	1 OP	1 OP	N/A	N/A
Loops NOT filled, <23’ above Rx vessel flange in refueling pool, above Limited Inventory	1/2 OP *(Note 2)*	1/2 OP *(Note 2)*	2 OP	1 OP	1/2 A *(Note 5)*	*(Note 7)*
Limited Inventory Mid loop	1 OP 1 A *(Note 2)*	1 OP 1 A *(Note 2)*	2 OP	1 OP 1 A	1/2 A *(Note 5)*	*(Note 4)*
≥ 23’ above Rx vessel flange	1 OP	1 OP	1 OP	1 OP	N/A	*(Note 3)*

Note 1: At least two S/Gs filled to levels as specified in T.S. 3.4.7, and feedwater supply/steam vent path Available.
Note 2: Three of the four AC power supplies must be Available (i.e., one EDG and two offsite or vice versa) (Ref: Tech. Spec. 3.8.2).
Note 3: Containment closure requirements of Technical Specifications met for core alterations.
Note 4: Containment closure requirements per OTN-BB-00002, Reactor Coolant System Draining, are met.
Note 5: One or more SI pumps may be made capable of injecting in MODES 5 & 6 WHEN the RCS water level is below the top of the Rx vessel flange for the purpose of protecting the decay heat removal function (Ref: Tech. Spec. 3.4.12, Note 2). An SI pump can still be considered Available if INOPERABLE, IF the pump is rendered INOPERABLE only to satisfy COMS Tech. Spec. 3.4.12 (i.e., pump or breaker can NOT be tagged with WPA; Refer to DEFINITION of Available).
Note 6: Train of RHR containment recirculation sump Available to credit under “inventory”.
Note 7: Containment equipment hatch capable of closure per OTO-EJ-00001, Loss of RHR Flow, on a loss of RHR.

Legend:
OP - OPERABLE
A - Available

Attachment 2 (Cont'd.)

Sheet 2 of 3

Requirements for Low Decay Heat Conditions (After Core Reload)

<table>
<tr><th>RCS STATUS</th><th>Emergency Diesel Generators</th><th>Off-Site Power Supplies</th><th>RHR Trains
(Note 6)</th><th>CCPs</th><th>SI Pumps</th><th>Containment Closure</th></tr>
<tr><td>MODE 5 loops filled (Note 1)</td><td>1 OP</td><td>1 OP</td><td>1 OP</td><td>1 OP</td><td>N/A</td><td>N/A</td></tr>
<tr><td>Loops NOT filled, <23’ above Rx vessel flange in refueling pool, above Limited Inventory</td><td>1 OP</td><td>1 OP</td><td>2 OP</td><td>1 OP</td><td>1/2 A
(Note 5)</td><td>(Note 7)</td></tr>
<tr><td>Limited Inventory</td><td rowspan="2">1 OP
1 A
(Note 2)</td><td rowspan="2">1 OP
1 A
(Note 2)</td><td rowspan="2">2 OP</td><td rowspan="2">1 OP
1 A</td><td rowspan="2">1/2 A
(Note 5)</td><td rowspan="2">(Note 4)</td></tr>
<tr><td>Mid loop</td></tr>
<tr><td>≥ 23’ above Rx vessel flange in refueling pool</td><td>1 OP</td><td>1 OP</td><td>1 OP</td><td>1 OP</td><td>N/A</td><td>(Note 3)</td></tr>
<tr><td colspan="7">Note 1: At least two S/Gs filled to levels as specified in T.S. 3.4.7, and feedwater supply/steam vent path Available.
Note 2: Three of the four AC power supplies must be Available (i.e., one EDG and two offsite or vice versa).
Note 3: Containment closure requirements of Technical Specifications met for core alterations.
Note 4: Containment closure requirements per OTN-BB-00002, Reactor Coolant System Draining, are met.
Note 5: One or more SI pumps may be made capable of injecting in MODES 5 & 6 when the RCS water level is below the top of the Rx vessel flange for the purpose of protecting the decay heat removal function (Ref: Tech. Spec. 3.4.12, Note 2). An SI pump can still be considered Available if INOPERABLE, IF the pump is rendered INOPERABLE only to satisfy COMS Tech. Spec. 3.4.12 (i.e., pump or breaker can NOT be tagged with WPA; Refer to DEFINITION of Available).
Note 6: Train of RHR containment recirculation sump Available to credit under “inventory”.
Note 7: Containment equipment hatch capable of closure per OTO-EJ-00001, Loss of RHR Flow, on a loss of RHR.</td></tr>
</table>

Legend:
OP - OPERABLE
A - Available

Attachment 2 (Cont'd.)

Sheet 3 of 3

Core Offloaded To Spent Fuel Pool

RCS STATUS	**Emergency Diesel Generators** *(Note 3)*	**Off-Site Power Supplies**	**Spent Fuel Pool Cooling Trains**	**Emergency Makeup Sources to SFP Available** *(Note 2)*
NO MODE *(Note 1)*	1 A	1 A	1 A	1 A

Note 1: Reactor core off-loaded from reactor vessel and refueling pool (NO fuel in containment).
Note 2: Sources include ESW Train ‘A’, ESW Train ‘B’, and Fire Water.
Note 3: Spent fuel pool cooling train and one ESW makeup source should be same train as the Available emergency diesel generator.

Legend:
OP - OPERABLE
A - Available

INFORMATION USE

Attachment 3

Shutdown Safety Assessment Instructions

Sheet 1 of 2

The assessment performer evaluates listed criteria and completes by signing/dating a Shutdown Safety Assessment (SSA) as follows:

NOTE

When performing Shutdown Safety Assessment, the need to determine the plant risk for the 12 hour look ahead is based on current plant configuration and scheduled maintenance.

1. Assign a value for each entry in the SSA GROUP CRITERIA block.

NOTE

Degraded SSCs that support maintaining key safety function should NOT be credited in the Shutdown Safety Assessment. [Ref: 5.2.11]

For refueling outages only, Spent Fuel Pool Decay Heat Removal is only assessed from the start of core offload until MODE 3 entry ascending. For other outages, the function is always assessed.

   a. Refer To the defense-in-depth bases attached to each SSA for amplifying instructions.
   b. IF the criterion has a specified point value and the criterion is met, enter the specified point value in the value space.
   c. IF the criterion has a specified point value and the criterion is NOT met, place a 0 (zero) in the value space.
   d. IF the criterion has a number range (i.e., 0-4), place the appropriate number in the value space. For example; CCPs/SI pumps Available (0-4) one point is earned for each pump Available. IF pumps are OOS per OSP-BG-00002, Verify One Centrifugal Charging Pump Incapable of Injection Into RCS, and/or OSP-EM-00002, Rendering SI Pumps Incapable of Injection, requirements (NO maintenance), they are considered Available for injection into the RCS. IF pumps have WPA hung, they are considered Unavailable.

2. Add the value total for each SSA GROUP CRITERIA.
3. For each SSA GROUP, circle the CONDITION (RED, ORANGE, YELLOW, or GREEN) that corresponds to the total for the SSA group.
4. For each SSA GROUP, determine IF a High Risk Evolution applies to the Safety Function. IF so, document the High Risk Evolution and the applicable Safety Function(s) in the Assumptions section of the Shutdown Safety Assessment form.

Attachment 3 (Cont'd.)

Sheet 2 of 2

5. For Control Room Assessments only, route to the SM for approval.
   a. IF a Red, Orange, or previously unidentified Yellow condition exists, IMMEDIATELY notify the Shift Manager, Manager, Outage and Shift Outage Manager and prior to performance of the activity causing the condition.
   b. Refer To Steps 4.5.8 through 4.5.11 for actions required due to a Red, Orange, or Yellow condition.
6. Route completed Control Room Shutdown Safety Assessment forms to the Operations Outage Manager and Outage Scheduling after approval.
7. IF entry into Technical Specification LCO forces a Yellow or Orange Shutdown Safety Assessment, and an additional Defense in Depth SSC becomes Unavailable, re-evaluate Risk Management Actions.

Attachment 4
Shutdown Safety Assessment - MODE 4

Sheet 1 of 8

Performer: ________________________ Date: _____________ Time: _____________

Shift Manager *: ______________________ Date: ___________ Time:

SSA GROUP CRITERIA No/False=0 Use the corresponding number when specified			CONDITION/SCORE (Circle Condition/score)		12 hr look ahead
REACTIVITY			**CONDITION**		
1. Boration flow path OPERABLE ______________________	(1)	_____	0	RED	(1) ____
2. Source Range instrumentation/BDMS OPERABLE _______	(1)	_____	1	ORANGE	(1) ____
3. T/S LCO 3.1.1 MET _______________________________	(1)	_____	2	YELLOW	(1) ____
			3	GREEN	
REACTIVITY TOTAL		_________			_________
CORE DECAY HEAT REMOVAL			**CONDITION**		
1. ECCS train (CCP & RHR) OPERABLE ________________	(1)	_____	≤ 2	RED	(1) ____
2. RCS loop(s) and/or RHR Train(s) OPERABLE __________	(0-3)	_____	3	ORANGE	(0-3) ____
3. RCS feed and bleed path Available_____________________	(1)	_____	4	YELLOW	(1) ____
			5	GREEN	
CORE DECAY HEAT REMOVAL TOTAL		_________			_________
CONTAINMENT			**CONDITION**		
1. Containment OPERABLE per **T/S 3.6.1**________________	(1)	_____	0	RED	(1) ____
2. Containment isolation valves OPERABLE per **T/S 3.6.3**____	(1)	_____	1	ORANGE	(1) ____
3. Containment Spray & Cooling OPERABLE per **T/S 3.6.6**___	(0-2)	_____	2	YELLOW	(0-2) ____
			≥ 3	GREEN	
CONTAINMENT TOTAL		_________			_________
INVENTORY			**CONDITION**		
1. Primary ECCS injection flow path OPERABLE___________	(1)	_____	0	RED	(1) ____
2. Additional number of ECCS pumps Available____________	(0-3)	_____	1	ORANGE	(0-3) ____
3. Containment sump recirc capability OPERABLE _________	(1)	_____	2	YELLOW	(1) ____
			≥ 3	GREEN	
INVENTORY TOTAL		_________			_________
POWER AVAILABILITY			**CONDITION**		
1. Number of OPERABLE offsite AC power sources_________	(0-2)	_____	0	RED	(0-2) ____
2. Number of OPERABLE onsite AC power sources_________	(0-2)	_____	1	ORANGE	(0-2) ____
3. AEPS Diesel Generators Available_____________________	(1)	_____	2	YELLOW	(1) ____
4. Significant switchyard OR Significant grid work in progress_	[-1]	_____	≥ 3	GREEN	[-1] ____
POWER AVAILABILITY TOTAL		_________			_________
SPENT FUEL POOL DECAY HEAT REMOVAL			**CONDITION**		
1. Primary SFP cooling train Available____________________	(1)	_____	0	RED	(1) ____
2. Additional train SFP cooling Available_________________	(1)	_____	1	ORANGE	(1) ____
3. ESW make-up OR Fire Water make-up Available to support			2	YELLOW	
SFP cooling____	(1)	_____	3	GREEN	(1) ____
SFP DECAY HEAT REMOVAL TOTAL		_________			_________

Assumptions:____

* Review & filing requirement applies to Control Room Assessments only. B160.0004

Attachment 4 (Cont'd.)

Sheet 2 of 8

MODE 4 Defense-In-Depth Bases

Reactivity

Boration flow path OPERABLE (Ref: FSAR 16.1.2.1 and OSP-BG-0001A, Boron Injection Flow Paths MODE 4 Through 6).

- One Emergency boration flow path must be OPERABLE in MODES 4, 5, and 6. (Ref: FSAR 16.1.2.1, 16.1.2.3, and 16.1.2.6). An OPERABLE emergency boration flow path must be capable of being powered from an OPERABLE emergency power supply.
- RWST OPERABLE (Ref: Tech. Spec. 3.5.4).

1. Boration flow path OPERABLE (1 Point).
   Provides for the ability to insert negative reactivity into the reactor core (Ref: Applicable acceptance criteria section of OSP-BG-0001A, Boron Injection Flow Paths MODE 4 Through 6).
2. Source Range instrumentation/Boron Dilution Mitigation System (BDMS) OPERABLE (1 Point).
   Only one train required to support key safety function and must meet Technical Specification 3.3.1 and 3.3.9 requirements.
3. T/S LCO 3.1.1 MET [Ref: T/S LCO and BLCO 3.1.1 and OSP-SF-00001, Shutdown Margin Calculation] (1 Point)
   The reactor will be maintained sufficiently subcritical to preclude inadvertent criticality in the shutdown condition.

Attachment 4 (Cont'd.)

Core Decay Heat Removal

1. ECCS train OPERABLE (1 Point).
   - Reference Tech. Spec. 3.5.3.
   - An OPERABLE ECCS train consists of a centrifugal charging subsystem and an RHR subsystem. Each train includes the piping, instruments, and controls to ensure an OPERABLE flow path capable of taking suction from the RWST and transferring suction to the containment sump. The required RHR subsystem may be considered OPERABLE during alignment and operation for decay heat removal, IF the RHR subsystem is capable of being manually realigned (remote or manual) to the ECCS mode of operation and only IF RCS temperature is less than 240°F. The 240°F temperature restriction is used to address the potential loss of RHR when realigning as RHR train from its Core Decay Heat Removal alignment to its ECCS alignment (Reference Wolf Creek LER 2008-008-02 and WCAP 12476 Rev. 1 regarding temperature restriction).
   - In MODE 4 with any RCS cold leg temperature ≤ 275°F (Ref: Tech. Spec. 3.4.12), all Safety Injection (SI) pumps must be incapable of injecting into the RCS per OSP-EM-00002, Rendering SI Pumps Incapable of Injection.
2. RCS Loop(s) and/or RHR Train(s) OPERABLE (0-3 Points).
   - At least two loops consisting of any combination of RCS loops and RHR loops shall be OPERABLE and at least one of these shall be in operation (Ref: Tech. Spec. 3.4.6).
   - An OPERABLE RCS loop is comprised of an OPERABLE RCP and an OPERABLE Steam Generator, which has the minimum water level specified in SR 3.4.6.2. RCPs are OPERABLE IF they are capable of being powered and are able to provide forced flow IF required. To be credited here, a Steam Generator must have Auxiliary Feedwater or another makeup source Available AND Condenser Steam Dumps or Steam Generator Atmospheric Steam Dumps Available.
   - Reference Tech. Spec. 3.4.6.
   - An OPERABLE RHR loop consists of an OPERABLE RHR pump capable of providing forced flow to an OPERABLE RHR heat exchanger. RHR pumps are OPERABLE IF they are capable of being powered and are able to provide forced flow IF required. IF RHR was credited under “ECCS Train OPERABLE (Tech. Spec. 3.5.3)”, it can NOT be credited here.
   - Two points can be credited for the T/S LCO 3.4.6-required RCS and/or RHR loops. One point can be credited for any additional OPERABLE loops. It is preferred to maintain the maximum number of loops OPERABLE.

Attachment 4 (Cont'd.)

3. RCS feed and bleed path Available (1 Point).
   - Reference FR-H.1.
   - The ECCS feed and bleed decay heat removal capability shall only be considered a single alternate source of decay heat removal even though it has multiple flow courses that are divisionally separate. Due to COMS concerns, only one pump can be used for feed and bleed. IF CCP was credited under "ECCS Train OPERABLE (Tech. Spec. 3.5.3)", it can NOT be credited here.
   - RWST level must meet the requirements of T/S LCO 3.5.4.

Containment

1. Containment shall be OPERABLE per Tech. Spec. 3.6.1 (1 Point).
2. Containment isolation valves OPERABLE per Tech. Spec. 3.6.3 (1 Point).
   - Reference Tech. Spec. 3.6.3 bases. [Ref: 5.2.9]
   - Isolated pathways due to INOPERABLE containment isolation valves and those valves under administrative control satisfy the containment integrity requirement.
3. Containment Spray and Cooling System OPERABLE per Tech. Spec. LCO 3.6.6 (0-2 Points, 1 point per OPERABLE train). One train consists of one containment spray train and one containment cooling train. A Containment Spray Train typically includes a spray pump, spray headers, nozzles, valves, piping, instruments, and controls to ensure an OPERABLE flow path capable of taking suction from the RWST upon as ESF actuation and manually transferring to the containment sump. A Containment Cooling train typically includes cooling coils, dampers, two fans, instruments, and controls to ensure an OPERABLE flow path.

Inventory

1. Primary ECCS injection flow path OPERABLE (1 Point).
   - Reference Tech. Spec. 3.5.3.
   - Provides a high head (CCP) and low head (RHR) source of borated water for inventory makeup from RWST. Credit can be taken IF pumps are capable of being powered from an OPERABLE off-site or emergency power supply (Ref: ODP-ZZ-00027, Safety Function Determination Program).
2. Additional number of ECCS pumps Available (0-3 Points).
   - The ability to move water from the refueling water storage tank to the Reactor Coolant System. (Ref: OSP-BG-00002, Verify One Centrifugal Charging Pump Incapable of Injection Into RCS, and OSP-EM-00002, Rendering SI Pumps Incapable of Injection) Credit can be taken IF pumps are capable of being powered from an OPERABLE off-site or emergency power supply (Ref: ODP-ZZ-00027, Safety Function Determination Program).

Attachment 4 (Cont'd.)

Step 2 Cont'd

- A CCP or an SI pump can still be considered Available if INOPERABLE, IF the pump is rendered INOPERABLE only to satisfy COMS Tech. Spec. 3.4.12 (i.e., pump or breaker can NOT be tagged with WPA; Refer to DEFINITION of Available).

3. Containment sump recirc capability OPERABLE (1 Point).
To be OPERABLE requires at least one train capable of recirc. (Containment sump recirculation path shall be associated with the OPERABLE RHR train and an OPERABLE emergency diesel generator for long term Decay Heat Removal based on a Loss of Coolant Accident.)

Power Availability

1. Number of OPERABLE offsite AC power sources (0 - 2 Points).
These are the sources supplying the onsite class 1E AC Electrical Power Distribution Systems. One incoming switchyard power line is required to support each OPERABLE offsite AC power source.

   One offsite AC power source circuit at Callaway Energy Center includes:

   - One incoming switchyard line supplying power to Switchyard Bus (A or B) and one Safeguards Transformer (A or B), which feeds ESF Transformer XNB01, which in turn feeds either:
     - The NB01 ESF 4160 VAC bus through its normal feeder breaker OR
     - The NB02 ESF 4160 VAC bus through its alternate feeder breaker.
   - Associated supporting equipment

   Another offsite AC power source circuit at Callaway Energy Center includes:

   - One incoming switchyard line, (different line from the previous offsite source above), supplying power to Switchyard Bus (A or B) and the Startup Transformer, which feeds ESF Transformer XNB02, which in turn powers either:
     - The NB02 ESF bus through its normal feeder breaker OR
     - The NB01 ESF bus through its alternate feeder breaker.
   - Associated supporting equipment

Attachment 4 (Cont'd.)

2. Number of OPERABLE onsite AC power sources (0 - 2 Points).
   - Includes necessary OPERABLE DC and AC vital bus electrical power distribution subsystems to support the equipment needed to meet core decay heat removal and inventory control safety function guidelines (train includes EDG, two batteries, two chargers, two inverters, associated buses and LSELS. Ref: Tech. Spec. 3.8.1, 3.8.4, 3.8.7, and 3.8.9). An OPERABLE onsite AC source complies with OSP-NB-00001, Class 1E Electrical Source Verification, requirements.
   - Requires associated Essential Service Water System to be OPERABLE.

3. Alternate Emergency Power System Diesel Generators Available (1 Point).
   - Requires a minimum of 3 out of the 4 Alternate Emergency Power System Diesel Generators to be Available and capable of providing power to the NB01 ESF bus or NB02 ESF bus.

4. Significant Switchyard OR Significant Grid Work in Progress (-1 Point).
   a. Increases susceptibility to a loss of offsite power due to personnel errors or equipment failures.
   b. Severe weather also imposes a risk to the offsite power availability. IF severe weather conditions exist, PERFORM actions in accordance with OTO-ZZ-00012, Severe Weather, to protect Callaway Energy Center. The presence of inclement weather does NOT impact points applied. The Shift Manager may suspend or delay performance of activities due to the severe weather conditions.
   c. Risk-significant switchyard work (potential for loss of offsite power) consists of the following:
      1) Work on support structures and/or bus lines that have been evaluated by the responsible Engineer/Coordinator, Work Control Supervisor, or the On-shift Operations Shift Manager to be risk significant.
      2) Work that would require the movement or use of any cranes, lift devices, vehicles or other equipment, which has the capability to come in contact with the energized Bus A, Bus B or the interconnecting lines (excludes elevating a lift device that is stationary at a deenergized work location).
      3) Equipment operations performed in the switchyard switch house (includes WPA activities).
      4) Active work in the switch house or switchyard performed by the Relay/Test (or similar) work group. Active work includes trip checks, relay calibrations, relay replacements, etc., and excludes passive work such as scheme checks that do NOT operate any components.
      5) Any work performed in the switch house or switchyard which has been evaluated by the Work Control Supervisor, or the On-shift Operations Shift Manager to be risk significant.
   d. Significant grid work is work on substations, relaying or incoming power lines that has a high potential to affect the power availability to the switchyard at Callaway Energy Center. With significant switchyard or significant grid work in progress, one point is **deducted** due to the increased risk of losing power to the Callaway switchyard from the power grid. CONTACT Transmission Operations to determine the status of grid work.

Attachment 4 (Cont'd.)

Spent Fuel Pool Decay Heat Removal

NOTE

For refueling outages only, Spent Fuel Pool Decay Heat Removal is only assessed from the start of core offload until MODE 3 entry ascending. For other outages, the function is always assessed.

1. Primary SFP cooling train Available (1 Point).
   - An Available train of SFP Cooling that can be powered by an Available emergency diesel generator (requires the appropriate support system be Available, i.e., Component Cooling Water, Essential Service Water, train of AC buses and inverters, and DC chargers associated with Available emergency diesel generator).
   - IF either the Available train of SFP Cooling or the required emergency diesel generator fails, IMMEDIATELY initiate actions to restore a train of SFP Cooling to Available status with an Available emergency diesel generator. WHEN planned maintenance is to occur on the Available SFP Cooling train, the maintenance activities shall be performed continuously until the train of SFP Cooling is returned to Available status.
2. Additional train SFP cooling Available (1 Point).
   Requires Component Cooling Water aligned to support SFP cooling. Can be powered by a normal or emergency power supply and supported by either ESW or Service Water.
3. Essential Service Water make-up OR Fire Water make-up Available to support SFP cooling (1 Point).
   - Essential Service Water should be the same train as the Available emergency diesel generator.
   - Make-up from the Fire Water System Available with at least one diesel fire pump Available supplied from an Available Fire Water Storage Tank.
   - One point can be credited for these alternate methods of decay heat removal provided a SFP cooling train is Available. It is preferred to maintain the maximum number of flow paths Available.

Attachment 4 (Cont'd.)

Sheet 8 of 8

High Risk Evolution

A high-risk evolution is an activity that causes the plant to be in a configuration resulting in an increased vulnerability to an event that may cause a loss of a key safety function. The time spent in a plant configuration where a single active failure or personnel error can result in a rapid loss of RCS inventory including overlapping activities, should be minimized.

Any applicable High Risk Evolution(s) and the affected Safety Function(s) identified shall be documented in the Assumptions section of the Shutdown Safety Assessment form. Only one High Risk Evolution can be applied to a given safety function at a time. Additionally, more than one High Risk Evolution may be performed at the same time, IF the given HREs apply to different safety functions.

High risk evolutions that may be performed during the plant conditions of Attachment 4 and the safety functions affected include:

- Switching to remove/restore a switchyard bus from/to service
  Safety function – Power Availability

Attachment 5A
Shutdown Safety Assessment - MODE 5 - Loops Filled

Sheet 1 of 9

Performer: ______________________ Date: ____________ Time: ____________

Shift Manager:*______________________ Date: ____________ Time: ____________

SSA GROUP CRITERIA No/False=0 Use the corresponding number when specified			CONDITION/SCORE (Circle Condition/score)	12 hr look ahead
REACTIVITY			**CONDITION**	
1. Boration flow path OPERABLE____________	(1)	_____	0 RED	(1) ____
2. Source Range instrumentation/BDMS OPERABLE_______	(1)	_____	1 ORANGE	(1) ____
3. T/S LCO 3.1.1 MET ____________	(1)	_____	2 YELLOW	(1) ____
			3 GREEN	
REACTIVITY TOTAL		_________		_________
CORE DECAY HEAT REMOVAL			**CONDITION**	
1. Number of RHR trains OPERABLE____________	(0-2)	_____	0 RED	(0-2) ____
2. Secondary heat sink Available (2 S/Gs)____________	(1)	_____	1 ORANGE	(1) ____
3. RCS feed and bleed path Available____________	(1)	_____	2 YELLOW	(1) ____
			≥ 3 GREEN	
CORE DECAY HEAT REMOVAL TOTAL		_________		_________
CONTAINMENT			**CONDITION**	
Containment is capable of being closed within 4 hours.		Yes/No	No - YELLOW Yes - GREEN	Yes/No
INVENTORY			**CONDITION**	
1. Primary ECCS injection train flow path Available_________	(1)	_____	0 RED	(1) ____
2. Additional injection flow path Available____________	(0-3)	_____	1 ORANGE	(0-3) ____
3. Containment sump recirc capability Available____________	(1)	_____	2 YELLOW	(1) ____
INVENTORY TOTAL		_________	≥ 3 GREEN	_________
POWER AVAILABILITY			**CONDITION**	
1. Number of OPERABLE offsite AC power sources_________	(0-2)	_____	0 RED	(0-2) ____
2. Number of Available offsite AC power sources__________	(1)	_____	1 ORANGE	(1) ____
3. Number of OPERABLE onsite AC power sources_________	(0-2)	_____	2 YELLOW	(0-2) ____
4. Number of Available onsite AC power sources__________	(1)	_____	≥ 3 GREEN	(1) ____
5. AEPS Diesel Generators Available____________	(1)	_____		(1) ____
6. Significant switchyard OR Significant grid work in progress_	[-1]	_____		[-1] ____
POWER AVAILABILITY TOTAL		_________		_________
SPENT FUEL POOL DECAY HEAT REMOVAL			**CONDITION**	
1. Primary SFP cooling train Available____________	(1)	_____	0 RED	(1) ____
2. Additional train SFP cooling Available____________	(1)	_____	1 ORANGE	(1) ____
3. ESW make-up OR Fire Water make-up Available to support			2 YELLOW	
SFP cooling____________	(1)	_____	3 GREEN	(1) ____
SFP DECAY HEAT REMOVAL TOTAL		_________		_________
Assumptions:____________				

* Review & filing requirement applies to Control Room Assessments only. B160.0004

Attachment 5A (Cont'd.)

Sheet 2 of 9

MODE 5 - Loops Filled Defense-In-Depth Bases

(Ref: OTN-BB-00002, Reactor Coolant System Draining, definitions)

Reactivity

Boration flow path OPERABLE (Ref: FSAR 16.1.2.1 and OSP-BG-0001A, Boron Injection Flow Paths MODE 4 Through 6):

- One emergency boration flow path must be OPERABLE in MODES 4, 5, and 6 (Ref: FSAR 16.1.2.1 and 16.1.2.3). An OPERABLE emergency boration flow path must be capable of being powered from an OPERABLE emergency power supply.
- RWST or Boric Acid Storage System OPERABLE (Ref: FSAR 16.1.2.5).

1. Boration flowpath OPERABLE (1 Point).
   Provides for the ability to insert negative reactivity into the reactor core (Ref: Applicable acceptance criteria section of OSP-BG-0001A, Boron Injection Flow Paths MODE 4 Through 6).
2. Source Range instrumentation/BDMS OPERABLE (1 Point).
   Only one train required to support key safety function and must meet Technical Specification 3.3.1 and 3.3.9 requirements.
3. T/S LCO 3.1.1 MET [Ref: T/S LCO and BLCO 3.1.1 and OSP-SF-00001, Shutdown Margin Calculation] (1 Point)
   The reactor will be maintained sufficiently subcritical to preclude inadvertent criticality in the shutdown condition.

 INFORMATION USE

Attachment 5A (Cont'd.)

Sheet 3 of 9

Core Decay Heat Removal

1. Number of RHR trains OPERABLE (0-2 Points). (Ref: CAR 200600493)
   - Reference Tech. Spec. 3.4.7.
   - At least one train shall be OPERABLE in MODE 5 (loops filled). RHR pumps are OPERABLE IF they are capable of being powered and able to provide flow IF required. Electrical power source and distribution requirements for the RHR loops are as specified per LCO 3.8.2, LCO 3.8.5, LCO 3.8.8 and LCO 3.8.10, consistent with the Bases for those Technical Specifications for reduced requirements during shutdown conditions, subject to the provisions and limitations described in the Bases.
2. Secondary heat sink Available (2 S/Gs) (1 Point).
   - An acceptable substitute for one of the required OPERABLE trains of RHR is two S/Gs filled per T.S. 3.4.7 with an Available heat removal path (ability to feed and bleed S/Gs).
   - Credit should only be given to this heat sink IF it has NOT been credited under item 1 above as satisfying an RHR loop requirement. IF four steam generators are Available and two are satisfying the RHR loop requirement, the other two may be credited for secondary heat sink.
   - This heat removal method requires an intact Reactor Coolant System capable of being pressurized (Ref: OTN-BB-00002, Reactor Coolant System Draining) and an Available secondary system (i.e., S/G level is per T.S 3.4.7, Auxiliary Feed Water or make-up source Available within one hour and Condenser Steam Dumps or Steam Generator Atmospheric Steam Dumps Available).
3. RCS feed and bleed path Available (1 Point).
   - The ECCS feed and bleed decay heat removal capability shall only be considered a single alternate source of decay heat removal even though it has multiple flow courses that are divisionally separate. Due to COMS concerns, only one pump can be used and credited for feed and bleed, but more than one pump can be considered Available as a feed and bleed path.

     It is preferred that an Available SI pump be on the opposite train as an Available CCP pump based on loss of power to one safety train (Ref: OTN-BB-00002 Addendum 6, Draining the RCS to Limited Inventory or Reduced Inventory – IPTE).
   - RWST level must meet the requirements of FSAR 16.1.2.5.

Attachment 5A (Cont'd.)

Containment

Containment closure capability should be maintained such that the containment is capable of being closed per OTO-EJ-00001, Loss of RHR Flow, and OSP-GT-00003, Containment Closure, within 4 hours in the event of a loss of RHR and/or a loss of RCS inventory. The 4 hour closure time is to ensure defense-in depth. NO specific time is required by other procedures or commitments.

Containment equipment, emergency, and personnel hatches and containment penetrations must be capable of being closed commensurate with plant conditions (i.e., loss of RHR and/or a loss of RCS inventory). Containment penetrations (including temporary) are expected to remain intact following a severe accident. IF unable to close containment (Ref: OSP-GT-00003, Containment Closure) commensurate with plant conditions, a condition 'Yellow' is required for Shutdown Safety Assessment.

Inventory

NOTE

It is preferred that an Available SI pump be on the opposite train as an Available CCP pump based on loss of power to one safety train (Ref: OTN-BB-00002 Addendum 6, Draining the RCS to Limited Inventory or Reduced Inventory – IPTE).

1. Primary ECCS injection flow path Available (1 Point).
   - Provides a high head (CCP) source of borated water from the RWST to the RCS for inventory makeup. Credit can be taken IF pump is capable of being powered. Reference Technical Specification Basis for Electrical Power Source and Distribution requirements.
   - A CCP can still be considered Available if INOPERABLE, IF the pump is rendered INOPERABLE only to satisfy COMS Tech. Spec. 3.4.12 (i.e., pump or breaker can NOT be tagged with WPA; Refer to DEFINITION of Available). (Ref: Tech Spec 3.4.12, Note 2).
   - Requires RWST to be OPERABLE (Ref: FSAR 16.1.2.5)
2. Additional injection flow path Available (0-3 Points).
   - Requires pump with discharge path to be Available.
   - The ability to move water from the RWST to the RCS. Provides a redundant source of borated water for inventory makeup (Ref: OSP-BG-00002, Verify One Centrifugal Charging Pump Incapable of Injection Into RCS, OSP-EM-00002, Rendering SI Pumps Incapable of Injection, and applicable acceptance criteria section of OSP-BG-0001A, Boron Injection Flow Paths MODE 4 Through 6).
3. Containment sump recirc capability Available (1 Point).
   To be Available requires at least one train capable of recirc with the strainer intact. (Containment sump recirculation path shall be associated with an Available RHR train and emergency diesel generator for long term Decay Heat Removal based on a Loss of Coolant Accident.)

Attachment 5A (Cont'd.)

Sheet 5 of 9

NOTE

Transition to Attachment 5B is required when an RCS Loops NOT Filled condition exists.

4. ETP-BB-03138, Disassembly of the Core Exit Thermocouple Nozzle Assembly (CETNA), is performed to remove all CETNAs when preparing to offload the reactor core. Upon disassembly of the first CETNA, the reactor vessel is vented and the RCS loops are considered to be in a Loops NOT Filled condition. When the Loops NOT Filled condition is achieved, transition to Attachment 5B, Shutdown Safety Assessment - MODE 5 - Loops NOT Filled, is required for proper risk assessment.

Attachment 5A (Cont'd.)

Power Availability

1. Number of OPERABLE offsite AC power sources (0 - 2 Points).
   These are the sources supplying the onsite class 1E AC Electrical Power Distribution Systems. One incoming switchyard power line is required to support each OPERABLE offsite AC power source.

   One offsite AC power source circuit at Callaway Energy Center includes:

   - One incoming switchyard line supplying power to Switchyard Bus (A or B) and one Safeguards Transformer (A or B), which feeds ESF Transformer XNB01, which in turn feeds either:
     - The NB01 ESF 4160 VAC bus through its normal feeder breaker OR
     - The NB02 ESF 4160 VAC bus through its alternate feeder breaker.
   - Associated supporting equipment

   Another offsite AC power source circuit at Callaway Energy Center includes:

   - One incoming switchyard line, (different line from the previous offsite source above), supplying power to Switchyard Bus (A or B) and the Startup Transformer, which feeds ESF Transformer XNB02, which in turn powers either:
     - The NB02 ESF bus through its normal feeder breaker OR
     - The NB01 ESF bus through its alternate feeder breaker.
   - Associated supporting equipment

2. Number of Available offsite AC power sources (1 Point).
   - With NG busses cross-tied, offsite power is Available until an NG undervoltage alarm occurs.
   - Do NOT take credit for those OPERABLE offsite AC sources credited above.
   - An offsite AC power source can be considered Available IF it has the capability to supply either NB01 OR NB02; it does NOT have to be connected to be considered Available.

3. Number of OPERABLE onsite AC power sources (0 - 2 Points).
   - Includes necessary OPERABLE DC and AC vital bus electrical power distribution subsystems to support the equipment needed to meet core decay heat removal and inventory control safety function guidelines (train includes emergency diesel generator, two batteries, two chargers, two inverters, associated buses and LSELS. Ref: Tech. Spec. Section 3.8.2, 3.8.5, 3.8.8 and 3.8.10). An OPERABLE onsite AC source complies with OSP-NB-00001, Class 1E Electrical Source Verification, requirements.
   - Requires associated Essential Service Water System to be Available.

Attachment 5A (Cont'd.)

4. Number of Available on-site AC power sources (1 Point).
   - Requires associated ESW system to be Available.
   - Includes necessary DC and AC vital bus electrical power distribution subsystem to support the equipment needed to meet core decay heat removal and inventory control safety function guidelines.
   - Do NOT take credit for those OPERABLE onsite AC sources credited above.
5. Alternate Emergency Power System Diesel Generators Available (1 Point).
   - Requires a minimum of 3 out of the 4 Alternate Emergency Power System Diesel Generators to be Available and capable of providing power to the NB01 ESF bus or NB02 ESF bus.
6. Significant Switchyard OR Significant Grid Work in Progress (-1 Point).
   a. Increases susceptibility to a loss of off-site power due to personnel errors or equipment failures.
   b. Severe weather also imposes a risk to the offsite power availability. IF severe weather conditions exist, perform actions in accordance with OTO-ZZ-00012, Severe Weather, to protect Callaway Energy Center. The presence of inclement weather does NOT impact points applied. The Shift Manager may suspend or delay performance of activities due to the severe weather conditions.
   c. Risk-significant switchyard work (potential for loss of offsite power) consists of the following:
      1) Work on support structures and/or bus lines that have been evaluated by the responsible Engineer/Coordinator, Work Control Supervisor, or the On-shift Operations Shift Manager to be risk significant.
      2) Work that would require the movement or use of any cranes, lift devices, vehicles or other equipment, which has the capability to come in contact with the energized Bus A, Bus B or the interconnecting lines (excludes elevating a lift device that is stationary at a deenergized work location).
      3) Equipment operations performed in the switchyard switch house (includes WPA activities).
      4) Active work in the switch house or switchyard performed by the Relay/Test (or similar) work group. Active work includes trip checks, relay calibrations, relay replacements, etc., and excludes passive work such as scheme checks that do NOT operate any components.
      5) Any work performed in the switch house or switchyard which has been evaluated by the Work Control Supervisor, or the On-shift Operations Shift Manager to be risk significant.
   d. Significant grid work is work on substations, relaying, or incoming power lines that has a high potential to affect the power availability to the switchyard at Callaway Energy Center. With significant switchyard or significant grid work in progress, one point is **deducted** due to the increased risk of losing power to the Callaway switchyard from the power grid. CONTACT Transmission Operations to determine the status of grid work.

Attachment 5A (Cont'd.)

Spent Fuel Pool Decay Heat Removal

NOTE

For refueling outages only, Spent Fuel Pool Decay Heat Removal is only assessed from the start of core offload until MODE 3 entry ascending. For other outages, the function is always assessed.

1. Primary SFP cooling train Available (1 Point).
   An Available train of SFP Cooling that can be powered by an Available emergency diesel generator (requires the appropriate support system be Available, i.e., Component Cooling Water, Essential Service Water, train of AC buses and inverters, and DC chargers associated with the Available emergency diesel generator).
   - IF either the Available train of SFP Cooling or the required emergency diesel generator fails, IMMEDIATELY initiate actions to restore a train of SFP Cooling to Available status with an Available emergency diesel generator. WHEN planned maintenance is to occur on the Available SFP Cooling train, the maintenance activities will be performed continuously until the train of SFP Cooling is returned to Available status.
2. Additional train SFP cooling Available (1 Point).
   Requires Component Cooling Water aligned to support SFP cooling. Can be powered by a normal or emergency power supply and supported by either ESW or Service Water.
3. Essential Service Water make-up OR Fire Water make-up Available to support SFP cooling (1 Point).
   - Essential Service Water should be the same train as the Available emergency diesel generator.
   - Make-up from the Fire Water System Available with at least one diesel fire pump Available supplied from an Available Fire Water Storage Tank.
   - One point can be credited for these alternate methods of decay heat removal provided a SFP cooling train is Available. It is preferred to maintain the maximum number of flow paths Available.

Attachment 5A (Cont'd.)

High Risk Evolution

A high-risk evolution is an activity that causes the plant to be in a configuration resulting in an increased vulnerability to an event that may cause a loss of a key safety function. The time spent in a plant configuration where a single active failure or personnel error can result in a rapid loss of RCS inventory, including overlapping activities, should be minimized.

Any applicable High Risk Evolution(s) and the affected Safety Function(s) identified shall be documented in the Assumptions section of the Shutdown Safety Assessment form. Only one High Risk Evolution can be applied to a given safety function at a time. Additionally, more than one High Risk Evolution may be performed at the same time, IF the given HREs apply to different safety functions.

High risk evolutions normally performed during the plant conditions of Attachment 5A and the safety functions affected include:

- OTN-BB-00001, Reactor Coolant System - IPTE (draining RCS and RCS vacuum fill)
  Safety function – Inventory
- OTN-BB-00002 Addendum 6, Draining the RCS to Limited Inventory or Reduced Inventory – IPTE
  Safety function - Inventory
- Switching to remove/restore a switchyard bus from/to service
  Safety function – Power Availability

Attachment 5B
Shutdown Safety Assessment - MODE 5 - Loops NOT Filled or MODE 6 - RCS Inventory Between 3 ft. Below Vessel Flange (Indicated Level of 64.1") and 23 ft. Above Vessel Flange (Indicated Level of 376.0")

Performer: ________________________ Date: _____________ Time: _____________

Shift Manager*:______________________ Date: _____________ Time: _____________

SSA GROUP CRITERIA No/False=0 Use the corresponding number when specified			CONDITION/SCORE (Circle Condition/score)		12 hr look ahead
REACTIVITY				**CONDITION**	
1. Boration flow path OPERABLE______________________	(1)	_____	0	RED	(1) ____
2. Source Range instrumentation/BDMS OPERABLE_______	(1)	_____	1	ORANGE	(1) ____
3. T/S LCO 3.1.1 OR 3.9.1 MET (as applicable)___________	(1)	_____	2	YELLOW	(1) ____
			3	GREEN	
REACTIVITY TOTAL		_________			_________
CORE DECAY HEAT REMOVAL				**CONDITION**	
1. Number of RHR trains OPERABLE ____________________	(0-2)	_____	0	RED	(0-2) ____
2. RCS feed and bleed path Available ____________________	(1)	_____	1	ORANGE	
3. Gravity feed and large vent path Available ______________	(1)	_____	2	YELLOW	(1) ____
			3	GREEN	(1) ____
CORE DECAY HEAT REMOVAL TOTAL		_________			_________
CONTAINMENT				**CONDITION**	
1. Containment closure capability is maintained such that containment closure can be achieved prior to T-Boil, or 4 hours, whichever is less. IF a containment penetration cannot be closed within this time, it must remain closed (for containment hatchways, at least one hatch must remain capable of being closed) OR containment closure is established.	(2 OR 3)		0	RED	(2-3) ____
			1	ORANGE	
			2	YELLOW	
			≥ 3	GREEN	
2. Containment Coolers Available ______________________	(0-2)	_____			(0-2) ____
CONTAINMENT TOTAL		_________			_________
INVENTORY				**CONDITION**	
1. Primary ECCS injection flow path Available _____________	(1)	_____	0	RED	(1) ____
2. Additional injection flow paths Available _______________	(0-1)	_____	1	ORANGE	(0-1) ____
3. Containment sump recirc capability Available____________	(1)	_____	2	YELLOW	(1) ____
4. RCS < 110" _______________________________________	[-1]	_____	3	GREEN	[-1] ____
INVENTORY TOTAL		_________			_________
POWER AVAILABILITY				**CONDITION**	
1. Number of OPERABLE offsite AC power sources ________	(0-2)	_____	< 3	RED	(0-2) ____
2. Number of Available offsite AC power sources ___________	(1)	_____	3	ORANGE	(1) ____
3. Number of OPERABLE onsite AC power sources ________	(0-2)	_____	4	YELLOW	(0-2) ____
4. Number of Available onsite AC power sources ___________	(1)	_____	≥ 5	GREEN	(1) ____
5. AEPS Diesel Generators Available ___________________	(1)	_____			(1) ____
6. Significant switchyard OR Significant grid work in progress _	[-1]	_____			[-1] ____
POWER AVAILABILITY TOTAL		_________			_________
Assumptions:____					

* Review & filing requirement applies to Control Room Assessments only. B160.0004

Attachment 5B (Cont'd)
Shutdown Safety Assessment - MODE 5 - Loops NOT Filled or MODE 6 - RCS Inventory Between 3 ft. Below Vessel Flange (Indicated Level of 64.1")
and 23 ft. Above Vessel Flange (Indicated Level of 376.0")

SPENT FUEL POOL DECAY HEAT REMOVAL			CONDITION		
1. Primary SFP cooling train Available____________________	(1)	_____	0 RED	(1)	____
2. Additional train SFP cooling Available__________________	(1)	_____	1 ORANGE	(1)	____
3. ESW make-up OR Fire Water make-up Available to support SFP cooling____	(1)	_____	2 YELLOW		
			3 GREEN	(1)	____
SFP DECAY HEAT REMOVAL TOTAL		__________			_________

Assumptions:____
____
____
____

* Review & filing requirement applies to Control Room Assessments only. B160.0004

Attachment 5B (Cont'd.)

Sheet 3 of 10

MODE 5 - Loops NOT Filled or MODE 6 - RCS Inventory Between 3 ft. Below Vessel Flange (Indicated Level of 64.1”) and 23 ft. Above Vessel Flange (Indicated Level of 376.0”) Defense-In-Depth Bases

(RCS Indicated Levels – Reference OOA-BB-00003, Refuel Level Indications)

Reactivity

Boration flow path OPERABLE (Ref: FSAR 16.1.2.1 and OSP-BG-0001A, Boron Injection Flow Paths MODE 4 Through 6):

- One emergency boration flow path must be OPERABLE in MODES 4, 5, and 6 (Ref: FSAR 16.1.2.1 and 16.1.2.3). An OPERABLE emergency boration flow path must be capable of being powered from an OPERABLE emergency power supply.
- RWST or Boric Acid Storage System OPERABLE (Ref: FSAR 16.1.2.5)

1. Boration flowpath OPERABLE (1 Point).
   Provides for the ability to insert negative reactivity into the reactor core (Ref: applicable acceptance criteria section of OSP-BG-0001A, Boron Injection Flow Paths MODE 4 Through 6).
2. Source Range instrumentation/BDMS OPERABLE (1 Point).
   - Only one train required to support this key safety function and must meet Technical Specification 3.3.1, 3.9.3 (MODE 6) and 3.3.9 requirements. (BDMS NOT required in MODE 6).
   - In MODE 6, credit can be taken for SENI0060/61 per Tech. Spec. BLCO 3.9.3 IF coupled to the core.
3. T/S LCO 3.1.1 OR 3.9.1 MET (as applicable) [Ref: T/S LCO and BLCO 3.1.1 OR 3.9.1 and OSP-SF-00001, Shutdown Margin Calculation] (1 Point).
   - In MODE 5, the reactor will be maintained sufficiently subcritical to preclude inadvertent criticality in the shutdown condition.
   - In MODE 6, the limit on the boron concentration of filled portions of the RCS and the refueling pool that have direct access to the reactor vessel during refueling ensures that the reactor remains subcritical.

Attachment 5B (Cont'd.)

Sheet 4 of 10

Core Decay Heat Removal

1. Number of RHR trains OPERABLE (0-2 Points). (Ref: CAR 200600493)
   - Reference Tech. Spec. 3.4.8 and Tech. Spec. 3.9.6.
   - At least two trains shall be OPERABLE and one RHR train shall be in operation in MODE 5 (loops NOT filled) or in MODE 6 with water level less than 23 ft. above the top of the reactor vessel flange. An OPERABLE loop is one that has the capability of transferring heat from the reactor coolant at a controlled rate. An OPERABLE RHR loop is comprised of an OPERABLE RHR pump capable of providing forced flow to an OPERABLE RHR heat exchanger. RHR pumps are OPERABLE IF they are capable of being powered and are able to provide flow IF required. The RHR decay heat removal function can be satisfied or supported with either Service Water or ESW serving as the heat sink (with CCW as the intermediate heat transfer system). Service Water may be aligned to the OPERABLE diesel generator, however, ESW must be Available and available to supply the OPERABLE diesel generator. Additional Risk Management Actions described in ODP-ZZ-00002 Appendix 2, Risk Management Actions for Planned Risk Significant Activities, must be followed during this condition. [Ref: 5.2.15]
2. RCS feed and bleed path Available (1 Point).
   - Reference OTO-EJ-00001, Loss of RHR Flow
   - One or more SI pumps may be made capable of injecting in MODES 5 and 6 when RCS water level is below the top of the reactor vessel flange for the purpose of protecting the decay heat removal function (Ref: Tech. Spec. 3.4.12, Note 2).
   - The ECCS feed and bleed decay heat removal capability shall only be considered a single alternate source of decay heat removal even though it has multiple flow courses that are divisionally separate. Due to COMS concerns, only one pump can be used and credited for feed and bleed, but both CCPs and SI pumps should be maintained, and can be considered, Available as a feed and bleed path.
   - RWST level must meet the requirements of FSAR 16.1.2.5.
3. Gravity feed and large vent path Available (1 Point).
   a. Two Available gravity flow paths with sufficient RWST volume (Ref: Calculation BB-204, Rev. 000).
      1) Available flow paths include: (Ref. OTO-EJ-00001, Loss of RHR Flow)
         a) RWST to RCS Hot Leg 1 or 4 (backflow through RHR loop suction valves)
         b) RWST through BN8717 to RCS Cold Legs 1 & 2 or 3 & 4
      2) Attachment 12, RWST Gravity Feed to RCS, defines the required RWST level and combination of required vent paths for various times of interest
         a) RCS level must be at or below the reactor vessel flange
         b) Flow paths provide 150 gpm for at least 4 hours, maintaining the RCS at saturation conditions

Attachment 5B (Cont'd.)

Containment

1. Containment closure capability should be maintained such that the containment is capable of being closed per OTO-EJ-00001, Loss of RHR Flow, and OSP-GT-00003, Containment Closure, within 4 hours or Tboil, whichever is less. IF a containment penetration cannot be closed within this time, it must remain closed. For containment hatchways, as least one hatch of each hatchway must remain capable of being closed. (2 points)

   If containment closure is established, 3 points can be credited since the function is fully met.

   Personnel shall be standing by and made aware of their duties in implementing containment closure. This expectation is consistent with actions required for short T_{boil} conditions in Attachment 5C for RCS Reduced Inventory.

   Containment equipment, emergency, and personnel hatches and containment penetrations must be capable of being closed commensurate with plant conditions (i.e., loss of RHR and/or a loss of RCS inventory). Containment penetrations (including temporary) are expected to remain intact following a severe accident. IF unable to close containment (Ref: OSP-GT-00003, Containment Closure) commensurate with plant conditions, a minimum condition of 'Yellow' is required for Shutdown Safety Assessment.

2. Containment Coolers Available (0-2 points)

   - Credit can be given for individual Containment Coolers (1 point each). Requires the Containment Cooler Fan and cooling water supplied by an ESW Train supported by an Available Emergency Diesel Generator.

Inventory

NOTE

It is preferred that an Available SI pump be on the opposite train as an Available CCP pump based on loss of power to one safety train (Ref: OTN-BB-00002 Addendum 6, Draining the RCS to Limited Inventory or Reduced Inventory – IPTE).

1. Primary ECCS injection flow path Available (1 Point).
   - Requires pump with discharge path to be Available.
   - Provides a high head (CCP) source of borated water for inventory makeup. Credit can be taken IF pump is capable of being powered. Reference Technical Specification Basis for Electrical Power Source and Distribution requirements.
   - A CCP can still be considered Available IF INOPERABLE, IF the pump is rendered INOPERABLE only to satisfy COMS Tech. Spec. 3.4.12 (i.e., pump or breaker can NOT be tagged with WPA; Refer to DEFINITION of Available). (Ref: Tech Spec 3.4.12, Note 2).
   - Requires RWST to be OPERABLE (Ref. FSAR 16.1.2.5).

Attachment 5B (Cont'd.)

2. Additional injection flow path Available (0-1 Point).
   - Requires pump with discharge path to be Available.
   - The ability to move water from the RWST to the RCS. Provides a redundant source of borated water for inventory makeup (Ref: OSP-BG-00002, Verify One Centrifugal Charging Pump Incapable of Injection Into RCS OSP-EM-00002, Rendering SI Pumps Incapable of Injection.
   - Only one point can be credited, regardless of the number of pumps (CCP or SI) Available, to reflect the increased risk associated with this plant operating state. It is preferred to maintain the maximum number of pumps Available.
3. Containment sump recirc capability Available (1 Point).
   To be Available requires at least one train capable of recirc with the strainer intact. (Containment sump recirculation path shall be associated with an Available RHR train and emergency diesel generator for long term Decay Heat Removal based on a Loss of Coolant Accident.)
4. RCS level < 110" (-1 point).
5. In preparation for removing or installing the reactor vessel head, the RCS inventory level is lowered to < 94.1 inches (6 inches below the reactor vessel flange). When the RCS level is < 110 inches, one point is **deducted** to reflect the increased risk associated with this plant operating state.
6. After the Reactor Head is installed onto the reactor vessel, procedure ETP-BB-03137, Assembly of the Core Exit Thermocouple Nozzle Assembly (CETNA), is then performed to install all CETNAs. After assembly of all the CETNAs has been completed, OTN-BB-00001, Reactor Coolant System - IPTE, is used to perform an RCS Vacuum Fill. Refer To OTN-BB-00001, Reactor Coolant System - IPTE, to determine WHEN the RCS loops are considered to be in a Loops Filled condition. WHEN the Loops Filled condition is achieved, transition to Attachment 5A Shutdown Safety Assessment - MODE 5 - Loops Filled is required for proper risk assessment.

Attachment 5B (Cont'd.)

Power Availability

NOTE

The point total required for a Green risk condition is raised to reflect the increased risk of these plant operating states.

1. Number of OPERABLE offsite AC power sources (0 - 2 Points).
   These are the sources supplying the onsite class 1E AC Electrical Power Distribution Systems. One incoming switchyard power line is required to support each OPERABLE offsite AC power source.

   One offsite AC power source circuit at Callaway Energy Center includes:

   - One incoming switchyard line supplying power to Switchyard Bus (A or B) and one Safeguards Transformer (A or B), which feeds ESF Transformer XNB01, which in turn feeds either:
     - The NB01 ESF 4160 VAC bus through its normal feeder breaker OR
     - The NB02 ESF 4160 VAC bus through its alternate feeder breaker.
   - Associated supporting equipment

   Another offsite AC power source circuit at Callaway Energy Center includes:

   - One incoming switchyard line, (different line from the previous offsite source above), supplying power to Switchyard Bus (A or B) and the Startup Transformer, which feeds ESF Transformer XNB02, which in turn powers either:
     - The NB02 ESF bus through its normal feeder breaker OR
     - The NB01 ESF bus through its alternate feeder breaker.
   - Associated supporting equipment

2. Number of Available offsite AC power sources (1 Point).
   - With NG busses cross-tied, offsite power is Available until an NG undervoltage alarm occurs.
   - Do NOT take credit for those OPERABLE offsite AC sources credited above.
   - An offsite AC power source can be considered Available IF it has the capability to supply either NB01 OR NB02; it does NOT have to be connected to be considered Available.

INFORMATION USE

Attachment 5B (Cont'd.)

3. Number of OPERABLE onsite AC power sources (0 - 2 Points).
   - Includes necessary OPERABLE DC and AC vital bus electrical power distribution subsystems to support the equipment needed to meet core decay heat removal and inventory control safety function guidelines (train includes emergency diesel generator, two batteries, two chargers, two inverters, associated buses and LSELS. Ref: Tech. Spec. 3.8.2, 3.8.5, 3.8.8 and 3.8.10). An OPERABLE onsite AC source complies with OSP-NB-00001, Class 1E Electrical Source Verification, requirements.
   - Requires associated Essential Service Water System to be Available.
4. Number of Available on-site AC power sources (1 Point).
   - Requires associated ESW system to be Available.
   - Includes necessary DC and AC vital bus electrical power distribution subsystem to support the equipment needed to meet the core decay heat removal and inventory control safety function guidelines.
   - Do NOT take credit for those OPERABLE onsite AC sources credited above.
5. Alternate Emergency Power System Diesel Generators Available (1 Point).
   - Requires a minimum of 3 out of the 4 Alternate Emergency Power System Diesel Generators to be Available and capable of providing power to the NB01 ESF bus or NB02 ESF bus.
6. Significant Switchyard OR Significant Grid Work in Progress (-1 Point).
   a. Increases susceptibility to a loss of off-site power due to personnel errors or equipment failures.
   b. Severe weather also imposes a risk to the offsite power availability. IF severe weather conditions exist, perform actions in accordance with OTO-ZZ-00012, Severe Weather, to protect Callaway Energy Center. The presence of inclement weather does NOT impact points applied. The Shift Manager may suspend or delay performance of activities due to the severe weather conditions.
   c. Risk-significant switchyard work (potential for loss of offsite power) consists of the following:
      1) Work on support structures and/or bus lines that have been evaluated by the responsible Engineer/Coordinator, Work Control Supervisor, or the On-shift Operations Shift Manager to be risk significant.
      2) Work that would require the movement or use of any cranes, lift devices, vehicles or other equipment, which has the capability to come in contact with the energized Bus A, Bus B or the interconnecting lines (excludes elevating a lift device that is stationary at a deenergized work location).
      3) Equipment operations performed in the switchyard switch house (includes WPA activities).
      4) Active work in the switch house or switchyard performed by the Relay/Test (or similar) work group. Active work includes trip checks, relay calibrations, relay replacements, etc., and excludes passive work such as scheme checks that do NOT operate any components.
      5) Any work performed in the switch house or switchyard which has been evaluated by the Work Control Supervisor, or the On-shift Operations Shift Manager to be risk significant.

Attachment 5B (Cont'd.)

Step 6 Cont'd

d. Significant grid work is work on substations, relaying, or incoming power lines that has a high potential to affect the power availability to the switchyard at Callaway Energy Center. With significant switchyard or significant grid work in progress, one point is **deducted** due to the increased risk of losing power to the Callaway switchyard from the power grid. CONTACT Transmission Operations to determine the status of grid work.

Spent Fuel Pool Decay Heat Removal

NOTE

For refueling outages only, Spent Fuel Pool Decay Heat Removal is only assessed from the start of core offload until MODE 3 entry ascending. For other outages, the function is always assessed.

1. Primary SFP cooling train Available (1 Point).
   An Available train of SFP Cooling that can be powered by an Available emergency diesel generator (requires the appropriate support system be Available, i.e., Component Cooling Water, Essential Service Water, train of AC buses and inverters, and DC chargers associated with the Available emergency diesel generator).
   - IF either the Available train of SFP Cooling or the required emergency diesel generator fails, IMMEDIATELY initiate actions to restore a train of SFP Cooling to Available status with an Available emergency diesel generator. When planned maintenance is to occur on the Available SFP Cooling train, the maintenance activities will be performed continuously until the train of SFP Cooling is returned to Available status.
2. Additional train SFP cooling Available (1 Point).
   Requires Component Cooling Water aligned to support SFP cooling. Can be powered by a normal or emergency power supply and supported by either ESW or Service Water.
3. Essential Service Water make-up OR Fire Water make-up Available to support SFP cooling (1 Point).
   - Essential Service Water should be the same train as the Available emergency diesel generator.
   - Make-up from the Fire Water System Available with at least one diesel fire pump Available supplied from an Available Fire Water Storage Tank.
   - One point can be credited for these alternate methods of decay heat removal provided a SFP cooling train is Available. It is preferred to maintain the maximum number of flow paths Available.

 INFORMATION USE

Attachment 5B (Cont'd.)

Sheet 10 of 10

High Risk Evolution

A high-risk evolution is an activity that causes the plant to be in a configuration resulting in an increased vulnerability to an event that may cause a loss of a key safety function. The time spent in a plant configuration where a single active failure or personnel error can result in a rapid loss of RCS inventory including overlapping activities.

Any applicable High Risk Evolution(s) and the affected Safety Function(s) identified shall be documented in the Assumptions section of the Shutdown Safety Assessment form. Only one High Risk Evolution can be applied to a given safety function at a time. Additionally, more than one High Risk Evolution may be performed at the same time, IF the given HREs apply to different safety functions

High risk evolutions normally performed during the plant conditions of Attachment 5B and the safety functions affected include:

- ETP-BB-03147, Reactor Vessel Head Removal - IPTE
  Safety functions – Core Decay Heat Removal and Inventory
- ETP-BB-03154, Reactor Vessel Head Installation - IPTE
  Safety functions – Core Decay Heat Removal and Inventory
- ETP-BB-03137, Assembly of the Core Exit Thermocouple Nozzle Assembly (CETNA)
  Safety Function – Core Decay Heat Removal (time period when NO thermocouples are available)
- ETP-BB-03138, Disassembly of the Core Exit Thermocouple Nozzle Assembly (CETNA)
  Safety Function – Core Decay Heat Removal (time period when NO thermocouples are available)
- OTN-BB-00002 Addendum 6, Draining the RCS to Limited Inventory or Reduced Inventory – IPTE
  Safety Function – Inventory

Attachment 5C

Shutdown Safety Assessment - MODE 5 or 6 - RCS Reduced Inventory – Below 3ft Below Vessel Flange (Indicated Level ≤ 64 inches)

Sheet 1 of 9

Performer: ______________________ Date: ____________ Time: ____________ * **B160.0004**
Shift Manager:*______________________ Date: ____________ Time: ____________* (For CR only)

SSA GROUP CRITERIA No/False=0 Use the corresponding number when specified		CONDITION/SCORE (Circle Condition/score)	12 hr look ahead
REACTIVITY		**CONDITION**	
1. Boration flow path OPERABLE__________	(1) ______	0 RED	(1) ____
2. Source Range instrumentation/BDMS OPERABLE__________	(1) ______	1 ORANGE	(1) ____
3. T/S LCO 3.1.1 OR 3.9.1 MET (as applicable)__________	(1) ______	2 YELLOW	(1) ____
		3 GREEN	
REACTIVITY TOTAL	______		______
CORE DECAY HEAT REMOVAL		**CONDITION**	
1. Number of RHR trains OPERABLE__________	(0-2) ______	0 RED	(0-2) ____
2. RCS feed and bleed path OR Gravity feed and large vent path Available	(1) ______	1 ORANGE	
		2 YELLOW	(1) ____
		3 GREEN	
CORE DECAY HEAT REMOVAL TOTAL	______		______
CONTAINMENT		**CONDITION**	
1. Containment closure capability is maintained such that containment closure can be achieved prior to T-Boil, or 30 minutes, whichever is less. IF a containment penetration cannot be closed within this time, it must remain closed (for containment hatchways, at least one hatch must remain capable of being closed) OR containment closure is established.	(2 OR 3)	0 RED 1 ORANGE 2 YELLOW ≥ 3 GREEN	(2-3) ____
2. Containment Coolers Available __________	(0-2) ______		(0-2) ______
CONTAINMENT TOTAL	______		______
INVENTORY		**CONDITION**	
1. Primary ECCS injection flow path Available__________	(1) ______	< 2 RED	(1) ____
2. Additional injection flow paths Available__________	(0-1) ______	2 ORANGE	(0-1) ____
3. Containment sump recirc capability Available__________	(1) ______	3 YELLOW	(1) ____
4. HOT Core__________	[-1] ______		[-1] ____
INVENTORY TOTAL	______		______
POWER AVAILABILITY		**CONDITION**	
1. Number of OPERABLE offsite AC power sources__________	(0-2) ______	< 3 RED	(0-2) ____
2. Number of Available offsite AC power sources__________	(1) ______	3 ORANGE	(1) ____
3. Number of OPERABLE onsite AC power sources__________	(0-2) ______	4 YELLOW	(0-2) ____
4. Number of Available onsite AC power sources__________	(1) ______	≥ 5 GREEN	(1) ____
5. AEPS Diesel Generators Available__________	(1) ______		(1) ______
6. Significant switchyard OR Significant grid work in progress__________	[-1] ______		[-1] ____
POWER AVAILABILITY TOTAL	______		______
SPENT FUEL POOL DECAY HEAT REMOVAL		**CONDITION**	
1. Primary SFP cooling train Available__________	(1) ______	0 RED	(1) ____
2. Additional train SFP cooling Available__________	(1) ______	1 ORANGE	(1) ____
3. ESW make-up OR Fire Water make-up Available to support SFP cooling	(1) ______	2 YELLOW 3 GREEN	(1) ____
SFP DECAY HEAT REMOVAL TOTAL	______		______

Assumptions:____

Attachment 5C (Cont'd.)

Sheet 2 of 9

MODE 5 or 6 - RCS Reduced Inventory – Below 3ft Below Vessel Flange (Indicated Level ≤ 64 inches) Defense-In-Depth Bases

(RCS Indicated Levels – Reference OOA-BB-00003, Refuel Level Indications)

Reactivity

Boration flow path OPERABLE (Ref: FSAR 16.1.2.1 and OSP-BG-0001A, Boron Injection Flow Paths MODE 4 Through 6):

- One emergency boration flow path must be OPERABLE in MODES 4, 5, and 6 (Ref: FSAR 16.1.2.1 and 16.1.2.3). An OPERABLE emergency boration flow path must be capable of being powered from an OPERABLE emergency power supply.
- RWST or Boric Acid Storage System OPERABLE (Ref: FSAR 16.1.2.5).

1. Boration flowpath OPERABLE (1 Point).
   Provides for the ability to insert negative reactivity into the reactor core (Ref: applicable acceptance criteria section of OSP-BG-0001A, Boron Injection Flow Paths MODE 4 Through 6).
2. Source Range instrumentation/BDMS OPERABLE (1 Point).
   - Only one train required to support this key safety function and must meet Technical Specification 3.3.1, 3.9.3 (MODE 6), and 3.3.9 requirements. (BDMS NOT required in MODE 6).
   - In MODE 6, credit can be taken for SENI0060/61 per Tech. Spec. BLCO 3.9.3 IF coupled to the core.
3. T/S LCO 3.1.1 OR 3.9.1 MET [Ref: T/S LCO and BLCO 3.1.1 OR 3.9.1 and OSP-SF-00001, Shutdown Margin Calculation] (1 Point).
   - In MODE 5, the reactor will be maintained sufficiently subcritical to preclude inadvertent criticality in the shutdown condition.
   - In MODE 6, the limit on the boron concentration of filled portions of the RCS and the refueling pool that have direct access to the reactor vessel during refueling ensures that the reactor remains subcritical.

Attachment 5C (Cont'd.)

Core Decay Heat Removal

1. Number of RHR trains OPERABLE (0-2 Points). (Ref: CAR 200600493)
   - Reference Tech. Spec 3.4.8 and Tech Spec. 3.9.6.
   - At least two trains shall be OPERABLE and one RHR train shall be in operation in MODE 5 (loops NOT filled) or in MODE 6 (< 23 ft. above flange). An OPERABLE loop is one that has the capability of transferring heat from the reactor coolant at a controlled rate. An OPERABLE RHR loop is comprised of an OPERABLE RHR pump capable of providing forced flow to an OPERABLE RHR heat exchanger. RHR pumps are OPERABLE IF they are capable of being powered and are able to provide flow IF required. The RHR decay heat removal function can be satisfied or supported with either Service Water or ESW serving as the heat sink (with CCW as the intermediate heat transfer system). Service Water may be aligned to the OPERABLE diesel generator, however, ESW must be Available and available to supply the OPERABLE diesel generator. Additional Risk Management Actions described in ODP-ZZ-00002 Appendix 2, Risk Management Actions for Planned Risk Significant Activities, must be followed during this condition. [Ref: 5.2.15]
2. RCS feed and bleed path OR gravity feed and large vent path Available (1 Point). (Ref: OTO-EJ-00003, Loss of RHR While Operating at Reduced Inventory or Mid-Loop Conditions)
   - One of these alternate methods of decay heat removal is required to be Available for one point to be credited to reflect the increased risk of this plant operating state.
   - One or more SI pumps may be made capable of injecting in MODES 5 and 6 when RCS water level is below the top of the reactor vessel flange for the purpose of protecting the decay heat removal function (Ref: Tech. Spec. 3.4.12, Note 2).
   - The ECCS feed and bleed decay heat removal capability shall only be considered a single alternate source of decay heat removal even though it has multiple flow courses that are divisionally separate. Due to COMS concerns, only one pump can be used and credited for feed and bleed, but both CCPs and SI pumps should be maintained, and can be considered, Available as a feed and bleed path.
   - RWST level must meet the requirements of FSAR 16.1.2.5 for RCS feed and bleed.
   - Two Available gravity flow paths with sufficient RWST volume (Ref: Calculation BB-204, Rev. 000.
     - Available flow paths include: (Ref: OTO-EJ-00001, Loss of RHR Flow)
       - RWST to RCS Hot Leg 1 or 4 (backflow through RHR loop suction valves)
       - RWST through BN8717 to RCS Cold Legs 1 & 2 or 3 & 4
     - Attachment 12, RWST Gravity Feed to RCS, defines the required RWST level and combination of required vent paths for various times of interest.
       - RCS level must be at or below the reactor vessel flange
       - Flow paths provide 150 gpm for at least 4 hours, maintaining the RCS at saturation conditions

Attachment 5C (Cont'd.)

Containment

1. For plant conditions with the RCS level at reduced inventory with a hot core, containment closure capability must be maintained per OTN-BB-00002 Addendum 6, Draining the RCS to Limited Inventory or Reduced Inventory – IPTE, as follows:

   - The Equipment Hatch is installed with sufficient bolts to ensure NO gaps (normally 4 bolts).
   - The Personnel Hatch and Emergency Personnel Hatch are capable of having at least one door closed within 30 minutes.
   - All penetrations are closed or capable of being closed within 30 minutes by one valve or pressure rated flange.

   For plant conditions with the RCS level at reduced inventory with a cold core, containment closure capability must be maintained per OTO-EJ-00003, Loss of RHR While Operating at Reduced Inventory or Mid-Loop Conditions, OTN-BB-00002 Addendum 6, Draining the RCS to Limited Inventory or Reduced Inventory – IPTE, and OSP-GT-00003, Containment Closure, within 30 minutes or T_{boil} whichever is less, as follows:

   - The Equipment Hatch is installed with sufficient bolts to ensure NO gaps (normally 4 bolts) prior to predicted core damage time (T-Boil).
   - The Personnel Hatch and Emergency Personnel Hatch are capable of having at least one door closed prior to predicted core damage time (T-Boil).
   - All penetrations are closed or capable of being closed by one valve or pressure rated flange prior to predicted core damage time (T-Boil).

   IF a containment penetration CANNOT be closed within this time, it must remain closed. (2 points)

   IF containment closure is established, 3 points can be credited since the function is fully met.

   Personnel shall be standing by and made aware of their duties in implementing containment closure. This expectation is consistent with actions required for short T_{boil} conditions in Attachment 5C for RCS Reduced Inventory.

   Containment equipment, emergency, and personnel hatches and containment penetrations must be capable of being closed commensurate with plant conditions (i.e., loss of RHR and/or a loss of RCS inventory). Containment penetrations (including temporary) are expected to remain intact following a severe accident. IF unable to close containment (Ref: OSP-GT-00003, Containment Closure) commensurate with plant conditions, a minimum condition of 'Yellow' is required for Shutdown Safety Assessment.

2. Containment Coolers Available (0-2 points)

   - Credit can be given for individual Containment Coolers (1 point each). Requires the Containment Cooler Fan and cooling water supplied by an ESW Train supported by an Available Emergency Diesel Generator.

Attachment 5C (Cont'd.)

Inventory

1. Primary ECCS injection flow path Available (1 Point).
   - Requires pump with discharge path to be Available.
   - Provides a high head (CCP) source of borated water for inventory makeup. Credit can be taken IF pump is capable of being powered. Reference Technical Specification Basis for Electrical Power Source and Distribution requirements.
   - A CCP can still be considered Available IF INOPERABLE, IF the pump is rendered INOPERABLE only to satisfy COMS Tech. Spec. 3.4.12 (i.e., pump or breaker can NOT be tagged with WPA; Refer to DEFINITION of Available). (Ref: Tech Spec 3.4.12, Note 2).
   - Requires RWST to be OPERABLE (Ref: FSAR 16.1.2.5).
2. Additional injection flow paths Available (0-1 Point).
   - Requires pump with discharge path to be Available.
   - The ability to move water from the RWST to the RCS. Provides a redundant source of borated water for inventory makeup.
   - Only one point can be credited, regardless of the number of pumps (CCP or SI) Available to reflect the increased risk associated with this plant operating state. It is preferred to maintain the maximum number of pumps Available.
3. Containment sump recirc capability Available (1 Point).
   To be Available requires at least one train capable of recirc with the strainer intact. (Containment sump recirculation path shall be associated with an Available RHR train and emergency diesel generator for long term Decay Heat Removal based on a Loss of Coolant Accident.)
4. HOT core (-1 Point).
   - One point is **deducted** to reflect the increased risk of this plant operating state.

Attachment 5C (Cont'd.)

Power Availability

NOTE

The point total required for a Green risk condition is raised to reflect the increased risk of this plant operating state.

1. Number of OPERABLE offsite AC power sources (0 - 2 Points).
   These are the sources supplying the onsite class 1E AC Electrical Power Distribution Systems. One incoming switchyard power line is required to support each OPERABLE offsite AC power source.

   One offsite AC power source circuit at Callaway Energy Center includes:

   - One incoming switchyard line supplying power to Switchyard Bus (A or B) and one Safeguards Transformer (A or B), which feeds ESF Transformer XNB01, which in turn feeds either:
     - The NB01 ESF 4160 VAC bus through its normal feeder breaker OR
     - The NB02 ESF 4160 VAC bus through its alternate feeder breaker.
   - Associated supporting equipment

   Another offsite AC power source circuit at Callaway Energy Center includes:

   - One incoming switchyard line, (different line from the previous offsite source above), supplying power to Switchyard Bus (A or B) and the Startup Transformer, which feeds ESF Transformer XNB02, which in turn powers either:
     - The NB02 ESF bus through its normal feeder breaker OR
     - The NB01 ESF bus through its alternate feeder breaker.
   - Associated supporting equipment

2. Number of Available offsite AC power sources (1 Point).

   - With NG busses cross-tied, offsite power is Available until an NG undervoltage alarm occurs.
   - Do NOT take credit for those OPERABLE offsite AC sources credited above.
   - An offsite AC power source can be considered Available IF it has the capability to supply either NB01 OR NB02; it does NOT have to be connected to be considered Available.

 INFORMATION USE

Attachment 5C (Cont'd.)

3. Number of OPERABLE onsite AC power sources (0 - 2 Points).
   - Includes necessary OPERABLE DC and AC vital bus electrical power distribution subsystems to support the equipment needed to meet core decay heat removal and inventory control safety function guidelines (train includes emergency diesel generator, two batteries, two chargers, two inverters, associated buses and LSELS. Ref: Tech. Spec. 3.8.2, 3.8.5, 3.8.8 and 3.8.10). An OPERABLE onsite AC source complies with OSP-NB-00001, Class 1E Electrical Source Verification, requirements.
   - Requires associated Essential Service Water System to be Available.
4. Number of Available on-site AC power sources (1 Point).
   - Requires associated ESW system to be Available.
   - Includes necessary DC and AC vital bus electrical power distribution subsystem to support the equipment needed to meet core decay heat removal and inventory control safety function guidelines.
   - Do NOT take credit for those OPERABLE onsite AC sources credited above.
5. Alternate Emergency Power System Diesel Generators Available (1 Point).
   - Requires a minimum of 3 out of the 4 Alternate Emergency Power System Diesel Generators to be Available and capable of providing power to the NB01 ESF bus or NB02 ESF bus.
6. Significant Switchyard OR Significant Grid Work in Progress (-1 Point).
   a. Increases susceptibility to a loss of off-site power due to personnel errors or equipment failures.
   b. Severe weather also imposes a risk to the offsite power availability. IF severe weather conditions exist, perform actions in accordance with OTO-ZZ-00012, Severe Weather, to protect Callaway Energy Center. The presence of inclement weather does NOT impact points applied. The Shift Manager may suspend or delay performance of activities due to the severe weather conditions.
   c. Risk-significant switchyard work (potential for loss of offsite power) consist of the following:
      1) Work on support structures and/or bus lines that have been evaluated by the responsible Engineer/Coordinator, Work Control Supervisor, or the On-shift Operations Shift Manager to be risk significant.
      2) Work that would require the movement or use of any cranes, lift devices, vehicles or other equipment, which has the capability to come in contact with the energized Bus A, Bus B or the interconnecting lines (excludes elevating a lift device that is stationary at a deenergized work location).
      3) Equipment operations performed in the switchyard switch house (includes WPA activities).
      4) Active work in the switch house or switchyard performed by the Relay/Test (or similar) work group. Active work includes trip checks, relay calibrations, relay replacements, etc., and excludes passive work such as scheme checks that do NOT operate any components.
      5) Any work performed in the switch house or switchyard which has been evaluated by the Work Control Supervisor, or the On-shift Operations Shift Manager to be risk significant.

Attachment 5C (Cont'd.)

Step 6 Cont'd

d. Significant grid work is work on substations, relaying, or incoming power lines that has a high potential to affect the power availability to the switchyard at Callaway Energy Center. With significant switchyard or significant grid work in progress, one point is **deducted** due to the increased risk of losing power to the Callaway switchyard from the power grid. CONTACT Transmission Operations to determine the status of grid work.

Spent Fuel Pool Decay Heat Removal

NOTE

For refueling outages only, Spent Fuel Pool Decay Heat Removal is only assessed from the start of core offload until MODE 3 entry ascending. For other outages, the function is always assessed.

1. Primary SFP cooling train Available (1 Point).
An Available train of SFP Cooling that can be powered by an Available emergency diesel generator (requires the appropriate support system to be Available, i.e., Component Cooling Water, Essential Service Water, train of AC buses and inverters, and DC chargers associated with the Available emergency diesel generator).
   - IF either the Available train of SFP Cooling or the required emergency diesel generator fails, IMMEDIATELY initiate actions to restore a train of SFP Cooling to Available status with an Available emergency diesel generator. WHEN planned maintenance is to occur on the Available SFP Cooling train, the maintenance activities will be performed continuously until the train of SFP Cooling is returned to Available status.
2. Additional train SFP cooling Available (1 Point).
Requires Component Cooling Water aligned to SFP cooling. Can be powered by a normal or emergency power supply and supported by either ESW or Service Water.
3. Essential Service Water make-up OR Fire Water make-up Available to support SFP cooling (1 Point).
   - Essential Service Water should be the same train as the Available emergency diesel generator.
   - Make-up from the Fire Water System Available with at least one diesel fire pump Available supplied from an Available Fire Water Storage Tank.
   - One point can be credited for these alternate methods of decay heat removal provided a SFP cooling train is Available. It is preferred to maintain the maximum number of flow paths Available.

Attachment 5C (Cont'd.)

High Risk Evolution

A high-risk evolution is an activity that causes the plant to be in a configuration resulting in an increased vulnerability to an event that may cause a loss of a key safety function. The time spent in a plant configuration where a single active failure or personnel error can result in a rapid loss of RCS inventory including overlapping activities.

Any applicable High Risk Evolution(s) and the affected Safety Function(s) identified shall be documented in the Assumptions section of the Shutdown Safety Assessment form. Only one High Risk Evolution can be applied to a given safety function at a time. Additionally, more than one High Risk Evolution may be performed at the same time, IF the given HREs apply to different safety functions.

- OTN-BB-00002 Addendum 6, Draining the RCS to Limited Inventory or Reduced Inventory – IPTE
  Safety Function – Inventory

 INFORMATION USE

Attachment 6

Shutdown Safety Assessment - MODE 6 - Refueling Operations ≥ 23 ft. Above Vessel Flange (Indicated Level ≥ 376.0")

Sheet 1 of 8

Performer: ____________ Date: ________ Time: ________ * **B160.0004**
Shift Manager:*____________ Date: ________ Time: ________* (For CR only)

SSA GROUP CRITERIA No/False=0 Use the corresponding number when specified			CONDITION/SCORE (Circle Condition/score)	12 hr look ahead
REACTIVITY			**CONDITION**	
1. Boration flow path OPERABLE	(1)	______	0 RED	(1) ____
2. Source Range instrumentation OPERABLE	(1)	______	1 ORANGE	(1) ____
3. T/S LCO 3.9.1 MET	(1)	______	2 YELLOW	(1) ____
			3 GREEN	
REACTIVITY TOTAL		______		______
CORE DECAY HEAT REMOVAL			**CONDITION**	
1. Number of RHR trains OPERABLE	(0-2)	______	0 RED	(0-2) ____
2. RCS level ≥ 23 ft. above vessel flange	(1)	______	1 ORANGE	(1) ____
3. RCS feed and bleed path Available	(1)	______	2 YELLOW	(1) ____
			≥ 3 GREEN	
CORE DECAY HEAT REMOVAL TOTAL		______		______
CONTAINMENT			**CONDITION**	
1. Containment closure requirements are met:	(2 OR 3)		0 RED	(2-3) ____
• Containment is capable of being closed within 4 hours per Tech. Spec. 3.9.5 and			1 ORANGE	
• Containment is capable of being closed with Admin. Controls in place per Tech Spec. 3.9.4 during core alts or movement of irradiated fuel within containment OR			2 YELLOW	
• Containment closure is established			≥ 3 GREEN	
2. Containment Coolers Available	(0-2)	______		(0-2) ______
CONTAINMENT TOTAL		______		______
INVENTORY			**CONDITION**	
1. Primary ECCS injection flow path Available	(1)	______	< 2 RED	(1) ____
2. Additional injection flow path Available	(0-3)	______	2 ORANGE	(0-3) ____
3. Containment sump recirc capability Available	(1)	______	3 YELLOW	(1) ____
4. RCS level ≥ 23 ft. above vessel flange	(1)	______	≥ 4 GREEN	(1) ____
INVENTORY TOTAL		______		______
POWER AVAILABILITY			**CONDITION**	
1. Number of OPERABLE offsite AC power sources	(0-2)	______	0 RED	(0-2) ____
2. Number of Available offsite AC power sources	(1)	______	1 ORANGE	(1) ____
3. Number of OPERABLE onsite AC power sources	(0-2)	______	2 YELLOW	(0-2) ____
4. Number of Available onsite AC power sources	(1)	______	≥ 3 GREEN	(1) ____
5. AEPS Diesel Generators Available	(1)	______		(1) ____
6. Significant switchyard OR Significant grid work in progress	[-1]	______		[-1] ____
POWER AVAILABILITY TOTAL		______		______
SPENT FUEL POOL DECAY HEAT REMOVAL			**CONDITION**	
1. Primary SFP cooling train Available	(1)	______	0 RED	(1) ____
2. Additional train SFP cooling Available	(1)	______	1 ORANGE	(1) ____
3. ESW make-up OR Fire Water make-up Available to support SFP cooling	(1)	______	2 YELLOW	(1) ____
			3 GREEN	
SFP DECAY HEAT REMOVAL TOTAL		______		______

Assumptions:____

Attachment 6 (Cont'd.)

Sheet 2 of 8

MODE 6 - Refueling Operations ≥ 23 ft. Above Vessel Flange (Indicated Level ≥ 376.0”) Defense-In-Depth Bases

(RCS Indicated Levels – Reference OOA-BB-00003, Refuel Level Indications)

Reactivity

Boration flow path OPERABLE (Ref: FSAR 16.1.2.1 and OSP-BG-0001A, Boron Injection Flow Paths MODE 4 Through 6):

- One emergency boration flow path must be OPERABLE in MODES 4, 5, and 6 (Ref: FSAR 16.1.2.1 and 16.1.2.3). An OPERABLE emergency boration flow path must be capable of being powered from an OPERABLE emergency power supply.
- RWST or Boric Acid Storage System OPERABLE (Ref: FSAR 16.1.2.5).

1. Boration flowpath OPERABLE (1 Point).
   Provides for the ability to insert negative reactivity into the reactor core (Ref: applicable acceptance criteria section of OSP-BG-0001A, Boron Injection Flow Paths MODE 4 Through 6).
2. Source Range instrumentation OPERABLE (1 Point).
   - Only one train required to support key safety function and must meet Technical Specification 3.9.3 requirements.
   - Credit can be taken for SENI0060/61 per Tech. Spec. BLCO 3.9.3 IF coupled to the core.
3. T/S LCO 3.9.1 MET. [Ref: T/S LCO and BLCO 3.9.1 and OSP-SF-00001, Shutdown Margin Calculation] (1 Point)
   - The limit on the boron concentration of filled portions of the RCS and the refueling pool that have direct access to the reactor vessel during refueling ensures that the reactor remains subcritical.

 INFORMATION USE

Attachment 6 (Cont'd.)

Sheet 3 of 8

Core Decay Heat Removal

1. Number of RHR trains OPERABLE (0-2 Points). (Ref: CAR 200600493)
   a. Reference Tech. Spec. 3.9.5.
   b. At least one train shall be OPERABLE in MODE 6 (≥ 23 ft. above flange). An OPERABLE RHR loop includes an RHR pump, a heat exchanger, valves, piping, instruments, and controls to ensure an OPERABLE flow path and to determine the RCS temperature.
   c. The required RHR loop may be removed from operation under Tech. Spec. LCO 3.9.5 (≥ 23 ft. above the reactor vessel flange) only for ≤ 1 hour per 8-hour period, provided NO operations are permitted that would dilute the RCS boron concentration with coolant at boron concentrations less than required to meet the minimum concentration of LCO 3.9.1 (Ref: License Amendment 149).
2. RCS level ≥ 23 ft. above vessel flange. (1 Point).
   The amount of water over the core provides significant heat sink for core decay heat (Ref: Tech. Spec. 3.9.7).
3. RCS feed and bleed path Available (1 Point).
   - Uses high pressure injection (CCP or SIP) to support feed and bleed. (Ref: OTO-EJ-00001, Loss of RHR Flow)
   - The ECCS feed and bleed decay heat removal capability shall only be considered a single alternate source of decay heat removal even though it has multiple flow courses that are divisionally separate.
   - RWST level must meet the requirements of FSAR 16.1.2.5.

Attachment 6 (Cont'd.)

Sheet 4 of 8

Containment

1. Containment closure capability should be maintained such that the containment is capable of being closed within 4 hours to support Tech. Spec. 3.9.5 and capable of being closed with Administrative Controls in place during core alterations or movement of irradiated fuel in the reactor building. Administrative Controls are specified in APA-ZZ-00150 Appendix M, Containment Closure (2 points).

   IF containment closure is established, 3 points can be credited since the function is fully met.

2. Containment Coolers Available (0-2 points).

   - Credit can be given for individual Containment Coolers (1 point each). Requires the Containment Cooler Fan and cooling water supplied by an ESW Train supported by an Available Emergency Diesel Generator.

Inventory

1. Primary ECCS injection flow path Available (1 Point).
   a. Flow path is from RWST or BAST via boric acid transfer pump. (Ref: OTO-EC-00001, Loss of SFP/Refuel Pool Level)
   b. Provides a high head (CCP) or intermediate head (SIP) source of borated water for inventory makeup. Credit can be taken IF pump is capable of being powered. (Reference Technical Specification Basis for Electrical Power Source and Distribution requirements.)
   c. A CCP or an SI pump can still be considered Available IF INOPERABLE, IF the pump is rendered INOPERABLE only to satisfy COMS Tech. Spec. 3.4.12 (i.e., pump or breaker can NOT be tagged with WPA; Refer to DEFINITION of Available). (Ref: Tech Spec 3.4.12, Note 2).
2. Additional injection flow path Available (0-3 Points).
   a. Requires pump with discharge path to be Available.
   b. Provides a redundant source of borated water for inventory makeup.
   c. It is preferred that an Available SI pump be on the opposite train as an Available CCP pump based on loss of power to one safety train.
3. Containment sump recirc capability Available (1 Point).
   To be Available requires at least one train capable of recirc with the strainer intact. (Containment sump recirculation path shall be associated with an Available RHR train and emergency diesel generator for long term Decay Heat Removal based on a Loss of Coolant Accident.)

4. RCS level $\geq$ 23 ft. above vessel flange (1 Point).

Attachment 6 (Cont'd.)

Sheet 5 of 8

Power Availability

1. Number of OPERABLE offsite AC power sources (0 - 2 Points).
   These are the sources supplying the onsite class 1E AC Electrical Power Distribution Systems. One incoming switchyard power line is required to support each OPERABLE offsite AC power source.

   One offsite AC power source circuit at Callaway Energy Center includes:

   - One incoming switchyard line supplying power to Switchyard Bus (A or B) and one Safeguards Transformer (A or B), which feeds ESF Transformer XNB01, which in turn feeds either:
     - The NB01 ESF 4160 VAC bus through its normal feeder breaker OR
     - The NB02 ESF 4160 VAC bus through its alternate feeder breaker.
   - Associated supporting equipment

   Another offsite AC power source circuit at Callaway Energy Center includes:

   - One incoming switchyard line, (different line from the previous offsite source above), supplying power to Switchyard Bus (A or B) and the Startup Transformer, which feeds ESF Transformer XNB02, which in turn powers either:
     - The NB02 ESF bus through its normal feeder breaker OR
     - The NB01 ESF bus through its alternate feeder breaker.
   - Associated supporting equipment

2. Number of Available offsite AC power sources (1 Point).
   a. With NG busses cross-tied, offsite power is Available until an NG undervoltage alarm occurs.
   b. Do NOT take credit for those OPERABLE offsite AC sources credited above.
   c. An offsite AC power source can be considered Available IF it has the capability to supply either NB01 OR NB02; it does NOT have to be connected to be considered Available.

3. Number of OPERABLE onsite AC power sources (0 - 2 Points).
   a. Includes necessary OPERABLE DC and AC vital bus electrical power distribution subsystems to support the equipment needed to meet core decay heat removal and inventory control safety function guidelines (train includes emergency diesel generator, two batteries, two chargers, two inverters, associated buses and LSELS. Ref: Tech. Spec. 3.8.2, 3.8.5, 3.8.8 and 3.8.10). An OPERABLE onsite AC source complies with OSP-NB-00001, Class 1E Electrical Source Verification, requirements.
   b. Requires associated Essential Service Water System to be Available.

Attachment 6 (Cont'd.)

Sheet 6 of 8

4. Number of Available on-site AC power sources (1 Point).
   a. Requires associated ESW system to be Available.
   b. Includes necessary DC and AC vital bus electrical power distribution subsystem to support the equipment needed to meet core decay heat removal and inventory control safety function guidelines.
   c. Do NOT take credit for those OPERABLE onsite AC sources credited above.

5. Alternate Emergency Power System Diesel Generators Available (1 Point).
   a. Requires a minimum of 3 out of the 4 Alternate Emergency Power System Diesel Generators to be Available and capable of providing power to the NB01 ESF bus or NB02 ESF bus.

NOTE

Significant Switchyard OR Grid Work should NOT be scheduled during offload or reload of fuel in the Reactor Vessel. Refer to INPO Event Report (IER) L3-15-15, Inadequate Risk Evaluation Results in Loss of Off-Site Power and Shutdown Cooling.

6. Significant Switchyard OR Significant Grid Work in progress (-1 Point).
   a. Increases susceptibility to a loss of off-site power due to personnel errors or equipment failures.
   b. Severe weather also imposes a risk to the offsite power availability. IF severe weather conditions exist, PERFORM actions in accordance with OTO-ZZ-00012, Severe Weather, to protect Callaway Energy Center. The presence of inclement weather does NOT impact points applied. The Shift Manager may suspend or delay performance of activities due to the severe weather conditions.
   c. Risk-significant switchyard work (potential for loss of offsite power) consists of the following:
      1) Work on support structures and/or bus lines that have been evaluated by the responsible Engineer/Coordinator, Work Control Supervisor, or the On-shift Operations Shift Manager to be risk significant.
      2) Work that would require the movement or use of any cranes, lift devices, vehicles or other equipment, which has the capability to come in contact with the energized Bus A, Bus B or the interconnecting lines (excludes elevating a lift device that is stationary at a deenergized work location).
      3) Equipment operations performed in the switchyard switch house (includes WPA activities).
      4) Active work in the switch house or switchyard performed by the Relay/Test (or similar) work group. Active work includes trip checks, relay calibrations, relay replacements, etc., and excludes passive work such as scheme checks that do NOT operate any components.
      5) Any work performed in the switch house or switchyard which has been evaluated by the Work Control Supervisor, or the On-shift Operations Shift Manager to be risk significant.

Attachment 6 (Cont'd.)

Step 6 Cont'd

d. Significant grid work is work on substations, relaying, or incoming power lines that has a high potential to affect the power availability to the switchyard at Callaway Energy Center. With significant switchyard or significant grid work in progress, one point is **deducted** due to the increased risk of losing power to the Callaway switchyard from the power grid. CONTACT Transmission Operations to determine the status of grid work.

Spent Fuel Pool Decay Heat Removal

NOTE

For refueling outages only, Spent Fuel Pool Decay Heat Removal is only assessed from the start of core offload until MODE 3 entry ascending. For other outages, the function is always assessed.

1. Primary SFP cooling train Available (1 Point).
   An Available train of SFP Cooling that can be powered by an Available emergency diesel generator (requires the appropriate support system be Available, i.e., Component Cooling Water, Essential Service Water, train of AC buses and inverters, and DC chargers associated with the Available emergency diesel generator).

   - IF either the Available train of SFP Cooling or the required emergency diesel generator fails, IMMEDIATELY initiate actions to restore a train of SFP Cooling to Available status with an Available emergency diesel generator. WHEN planned maintenance is to occur on the Available SFP Cooling train, the maintenance activities will be performed continuously until the train of SFP Cooling is returned to Available status.

   Contingency actions must be established per OTN-EC-00001 Addendum 4, Refuel Pool Cleanup Operations, if the idle SFP cooling train is being credited.

2. Additional train SFP cooling Available (1 Point).
   Requires Component Cooling Water aligned to support SFP cooling. Can be powered by a normal or emergency power supply and supported by either ESW or Service Water.

   Contingency actions must be established per OTN-EC-00001 Addendum 4, Refuel Pool Cleanup Operations, if the idle SFP cooling train is being credited.

3. Essential Service Water make-up OR Fire Water make-up Available to support SFP cooling (1 Point).

   - Essential Service Water should be the same train as the Available emergency diesel generator.
   - Make-up from the Fire Water System Available with at least one diesel fire pump Available supplied from an Available Fire Water Storage Tank.
   - One point can be credited for these alternate methods of decay heat removal provided a SFP cooling train is Available. It is preferred to maintain the maximum number of flow paths Available.

Attachment 6 (Cont'd.)

Sheet 8 of 8

High Risk Evolution

A high-risk evolution is an activity that causes the plant to be in a configuration resulting in an increased vulnerability to an event that may cause a loss of a key safety function. Time spent in a plant configuration where a single active failure or personnel error can result in a rapid loss of RCS inventory, including overlapping activities, should be minimized.

Any applicable High Risk Evolution(s) and the affected Safety Function(s) identified shall be documented in the Assumptions section of the Shutdown Safety Assessment form. Only one High Risk Evolution can be applied to a given safety function at a time. Additionally, more than one High Risk Evolution may be performed at the same time, IF the given HREs apply to different safety functions.

High risk evolutions normally performed during the plant conditions of Attachment 6 and the safety functions affected include:

- ETP-BB-03148, Reactor Vessel Upper Internals Removal - IPTE
  Safety functions – Inventory and Core Decay Heat Removal
- ETP-BB-03151, Reactor Vessel Lower Internals Removal - IPTE
  Safety functions – Inventory and Core Decay Heat Removal
- ETP-BB-03152, Reactor Vessel Lower Internals Installation - IPTE
  Safety functions – Inventory and Core Decay Heat Removal
- ETP-BB-03153, Reactor Vessel Upper Internals Installation - IPTE
  Safety functions – Inventory and Core Decay Heat Removal
- Switching to remove/restore a switchyard bus from/to service
  Safety function – Power Availability
- OTS-MA-00001, Main Step-Up Transformer Backfeed - IPTE
  Safety function – AC Power Availability

Attachment 7

Shutdown Safety Assessment – NO MODE

Sheet 1 of 5

Performer: ________________________ Date: _____________ Time: _____________

Shift Manager:*______________________ Date: _____________ Time: _____________

SSA GROUP CRITERIA No/False=0 Use the corresponding number when specified			CONDITION/SCORE (Circle Condition/score)		12 hr look ahead
POWER AVAILABILITY			**CONDITION**		
1. Number of Available offsite AC power sources ___________	(0-2)	_____	0	RED	(0-2) ____
2. Number of Available onsite AC power sources ___________	(0-2)	_____	1	ORANGE	(0-2) ____
3. AEPS Diesel Generators Available _____________________	(1)	_____	2	YELLOW	(1) ____
4. Significant switchyard OR Significant grid work in progress	[-1]	_____	≥ 3	GREEN	[-1] ____
POWER AVAILABILITY TOTAL		__________			_________
SPENT FUEL POOL DECAY HEAT REMOVAL			**CONDITION**		
1. Primary SFP cooling train Available____________________	(1)	_____	0	RED	(1) ____
2. Additional train SFP cooling Available__________________	(1)	_____	1	ORANGE	(1) ____
3. ESW make-up OR Fire Water make-up Available to support			2	YELLOW	
SFP cooling ___________________________________	(1)	_____	3	GREEN	(1) ____
SFP DECAY HEAT REMOVAL TOTAL		__________			_________

Assumptions:____

____

____

____

____

____

* Review & filing requirement applies to Control Room Assessments only. B160.0004

Attachment 7 (Cont'd.)

Sheet 2 of 5

NO MODE Defense-In-Depth Bases

Power Availability

1. Number of Available offsite AC power sources (0-2 Point). At least one incoming switchyard power line is required to support Available offsite AC power sources.
   With NG busses cross-tied, offsite power is Available until an NG undervoltage alarm occurs.

   One offsite AC power source circuit at Callaway Energy Center includes:

   - One incoming switchyard line supplying power to Switchyard Bus (A or B) and one Safeguards Transformer (A or B), which feeds ESF Transformer XNB01, which in turn has the capability to feed either:
     - The NB01 ESF 4160 VAC bus through its normal feeder breaker OR
     - The NB02 ESF 4160 VAC bus through its alternate feeder breaker.
   - Associated supporting equipment

   Another offsite AC power source circuit at Callaway Energy Center includes:

   - One incoming switchyard line, (different line from the previous offsite source above), supplying power to Switchyard Bus (A or B) and the Startup Transformer, which feeds ESF Transformer XNB02, which in turn has the capability to feed either:
     - The NB02 ESF bus through its normal feeder breaker OR
     - The NB01 ESF bus through its alternate feeder breaker.
   - Associated supporting equipment

2. Number of Available on-site AC power sources (0-2 Point).
   a. Requires associated ESW System to be Available.
   b. Includes necessary DC and AC vital bus electrical power distribution subsystem to support the equipment needed to meet spent fuel pool decay heat removal and inventory control safety function guidelines (train includes emergency diesel generator, two batteries, two chargers, two inverters, and associated buses. Ref: Tech. Spec. 3.8.2, 3.8.5, 3.8.8, and 3.8.10).

3. Alternate Emergency Power System Diesel Generators Available (1 Point).
   a. Requires a minimum of 3 out of the 4 Alternate Emergency Power System Diesel Generators to be Available and capable of providing power to the NB01 ESF bus or NB02 ESF bus.

Attachment 7 (Cont'd.)

Sheet 3 of 5

4. Significant Switchyard OR Significant Grid Work in Progress (-1 Point).
   a. Increases susceptibility to a loss of off-site power due to personnel errors or equipment failures.
   b. Severe weather also imposes a risk to the offsite power availability. IF severe weather conditions exist, perform actions in accordance with OTO-ZZ-00012, Severe Weather, to protect Callaway Energy Center. The presence of inclement weather does NOT impact points applied. The Shift Manager may suspend or delay performance of activities due to the severe weather conditions.
   c. Risk-significant switchyard work (potential for loss of offsite power) consists of the following:
      1) Work on support structures and/or bus lines that have been evaluated by the responsible Engineer/Coordinator, Work Control Supervisor, or the On-shift Operations Shift Manager to be risk significant.
      2) Work that would require the movement or use of any cranes, lift devices, vehicles or other equipment, which has the capability to come in contact with the energized Bus A, Bus B or the interconnecting lines (excludes elevating a lift device that is stationary at a deenergized work location).
      3) Equipment operations performed in the switchyard switch house (includes WPA activities).
      4) Active work in the switch house or switchyard performed by the Relay/Test (or similar) work group. Active work includes trip checks, relay calibrations, relay replacements, etc., and excludes passive work such as scheme checks that do NOT operate any components.
      5) Any work performed in the switch house or switchyard which has been evaluated by the Work Control Supervisor, or the On-shift Operations Shift Manager to be risk significant.
   d. Significant grid work is work on substations, relaying, or incoming power lines that has a high potential to affect the power availability to the switchyard at Callaway Energy Center. With significant switchyard or significant grid work in progress, one point is **deducted** due to the increased risk of losing power to the Callaway switchyard from the power grid. CONTACT Transmission Operations to determine the status of grid work.

Attachment 7 (Cont'd.)

Sheet 4 of 5

Spent Fuel Pool Decay Heat Removal

NOTE

Heat load for the Spent Fuel Pool (SFP) Cooling System is NOT challenged until core off load begins.

1. Primary SFP cooling train Available (1 Point).

   An Available train of SFP Cooling that can be powered by an Available emergency diesel generator (requires the appropriate support system be Available, i.e., Component Cooling Water, Essential Service Water, train of AC buses and inverters, and DC chargers associated with the Available emergency diesel generator).

   - IF either the Available train of SFP Cooling or the required emergency diesel generator fails, IMMEDIATELY initiate actions to restore a train of SFP Cooling to Available status with an Available emergency diesel generator. WHEN planned maintenance is to occur on the Available SFP Cooling train, the maintenance activities will be performed continuously until the train of SFP Cooling is returned to Available status.

   Contingency actions must be established per OTN-EC-00001 Addendum 4, Refuel Pool Cleanup Operations, if the idle SFP cooling train is being credited.

2. Additional train SFP cooling Available (1 Point).
   Requires Component Cooling Water aligned to support SFP cooling. Can be powered by a normal or emergency power supply and supported by either ESW or Service Water.

   Contingency actions must be established per OTN-EC-00001 Addendum 4, Refuel Pool Cleanup Operations, if the idle SFP cooling train is being credited.

3. Essential Service Water make-up OR Fire Water make-up Available to support SFP cooling (1 Point).
   - Essential Service Water should be the same train as the Available emergency diesel generator.
   - Make-up from the Fire Water System Available with at least one diesel fire pump Available supplied from an Available Fire Water Storage Tank.
   - One point can be credited for these alternate methods of decay heat removal provided a SFP cooling train is Available. It is preferred to maintain the maximum number of flow paths Available.

Attachment 7 (Cont'd.)

Sheet 5 of 5

High Risk Evolution

A high-risk evolution is an activity that causes the plant to be in a configuration resulting in an increased vulnerability to an event that may cause a loss of a key safety function. Time spent in a plant configuration where a single active failure or personnel error can result in a rapid loss of RCS inventory, including overlapping activities, should be minimized.

Any applicable High Risk Evolution(s) and the affected Safety Function(s) identified shall be documented in the Assumptions section of the Shutdown Safety Assessment form. Only one High Risk Evolution can be applied to a given safety function at a time. Additionally, more than one High Risk Evolution may be performed at the same time, IF the given HREs apply to different safety functions.

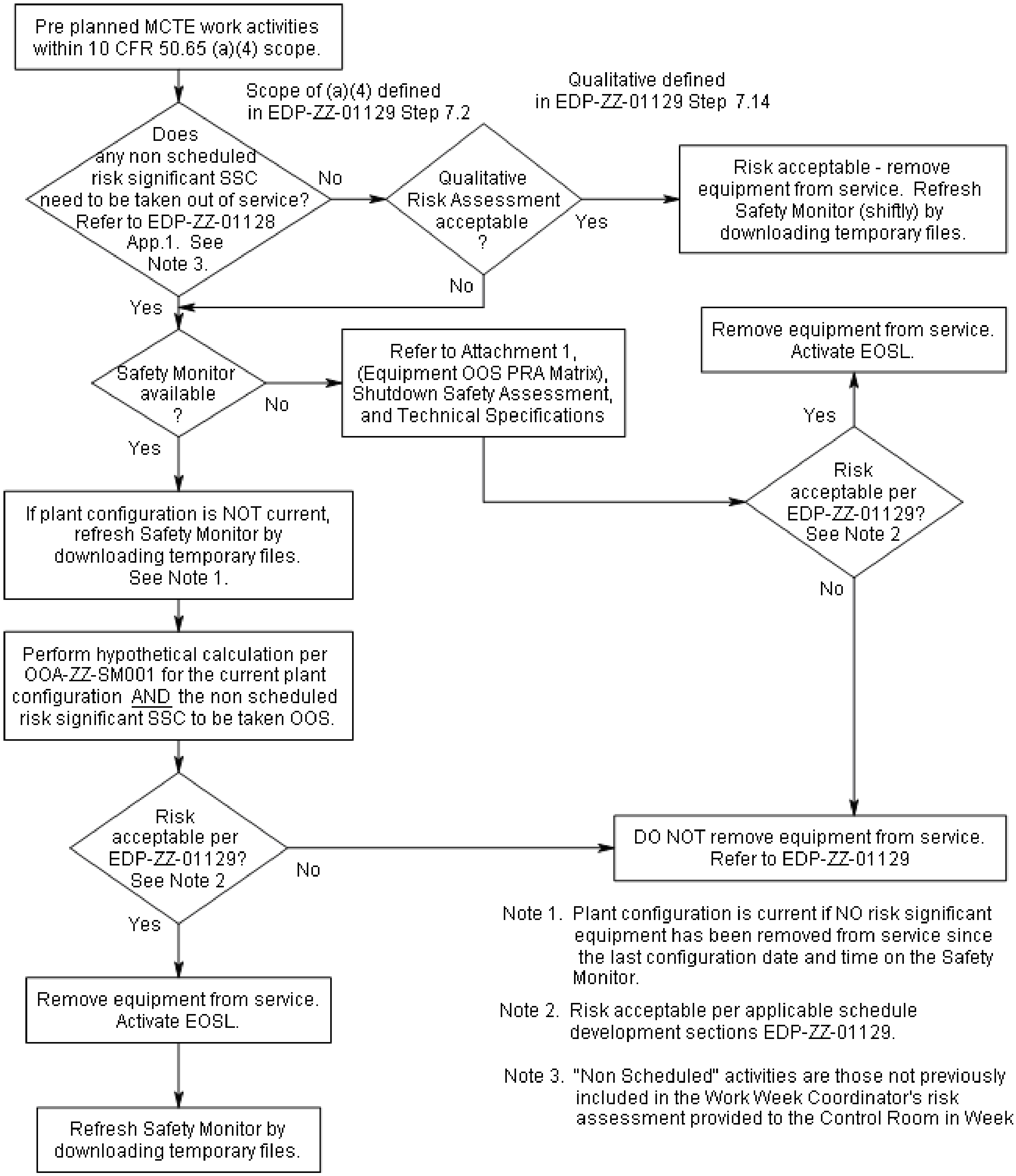
High risk evolutions normally performed during the plant conditions of Attachment 7 and the safety functions affected include:

- OTS-MA-00001, Main Step-Up Transformer Backfeed - IPTE
  Safety function – AC Power Availability
- Switchyard work in the following cases:
  Safety function – AC Power Availability
  1) WHEN two offsite power lines are already isolated and the scheduled switchyard work could cause a loss of one or more offsite power sources or the loss of power to XNB01 or XNB02.
  2) Significant switchyard work coincident with an NB bus outage.
  3) Switching to remove a switchyard bus from service.
  4) Switching to restore a switchyard bus to service.

Attachment 8

Control Room Risk Assessment for Daily Schedule Implementation

Sheet 1 of 1



Note 1. Plant configuration is current if NO risk significant equipment has been removed from service since the last configuration date and time on the Safety Monitor.

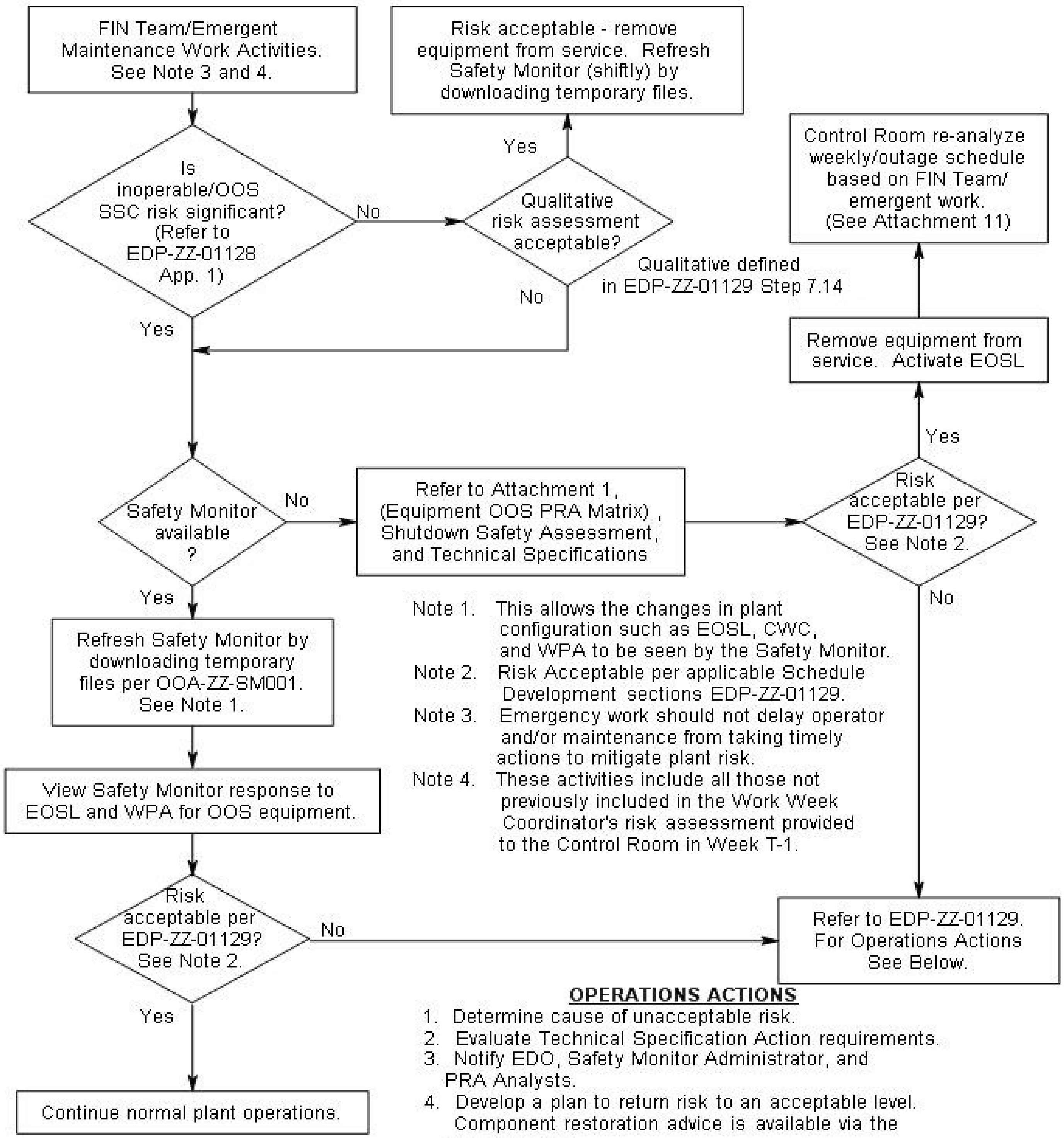
Note 2. Risk acceptable per applicable schedule development sections EDP-ZZ-01129.

Note 3. "Non Scheduled" activities are those not previously included in the Work Week Coordinator's risk assessment provided to the Control Room in Week T-1.

Attachment 9

Control Room Risk Assessment for FIN Team/Emergent Activities

Sheet 1 of 1



Note 1. This allows the changes in plant configuration such as EOSL, CWC, and WPA to be seen by the Safety Monitor.

Note 2. Risk Acceptable per applicable Schedule Development sections EDP-ZZ-01129.

Note 3. Emergency work should not delay operator and/or maintenance from taking timely actions to mitigate plant risk.

Note 4. These activities include all those not previously included in the Work Week Coordinator's risk assessment provided to the Control Room in Week T-1.

OPERATIONS ACTIONS

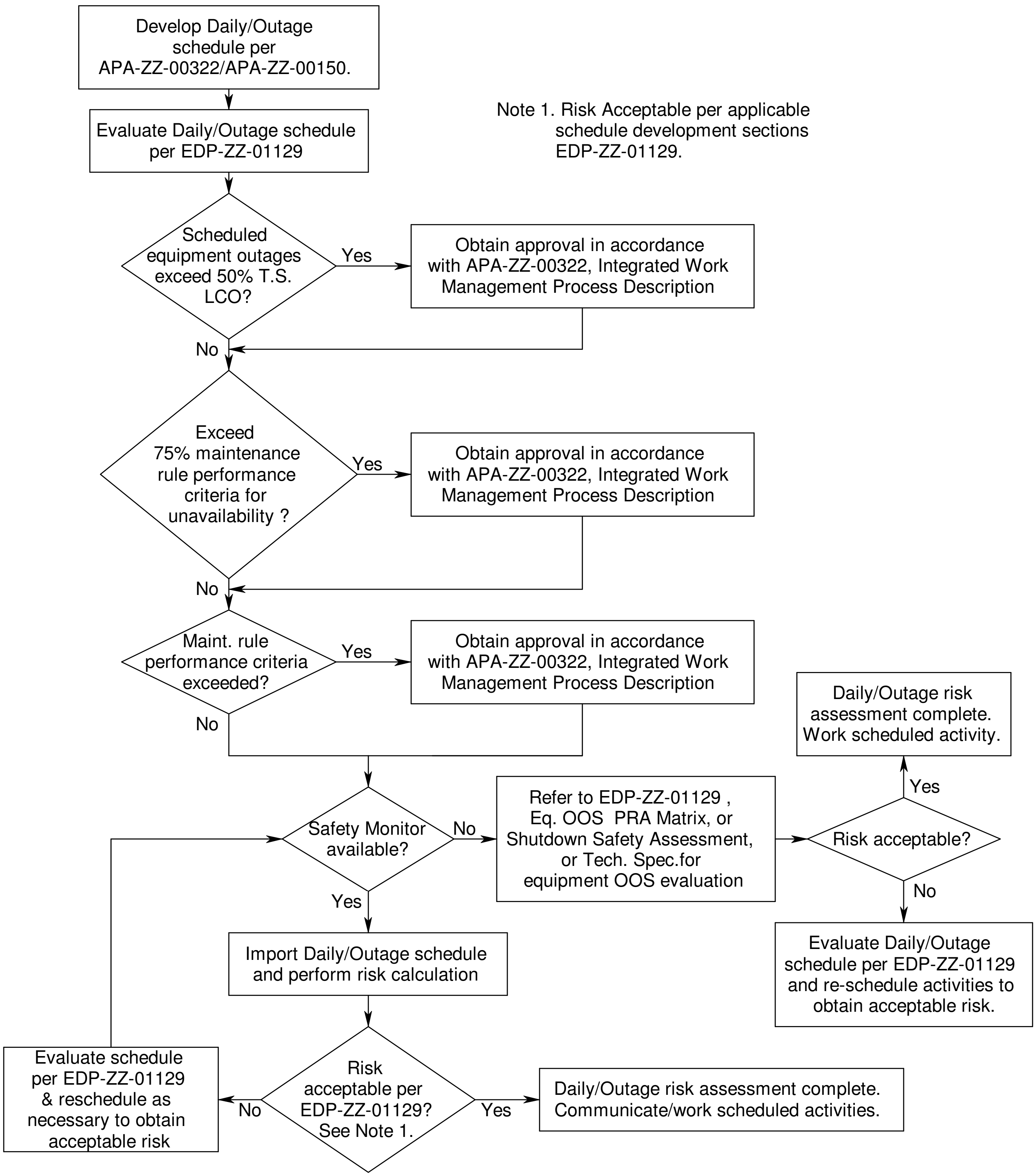
1. Determine cause of unacceptable risk.
2. Evaluate Technical Specification Action requirements.
3. Notify EDO, Safety Monitor Administrator, and PRA Analysts.
4. Develop a plan to return risk to an acceptable level. Component restoration advice is available via the Safety Monitor.
5. Review/Allocate resources.
   Work 24 hours a day
   Work weekends

 INFORMATION USE

Attachment 10

Work Week Manager Risk Assessment for Daily/Outage Schedule Development

Sheet 1 of 1

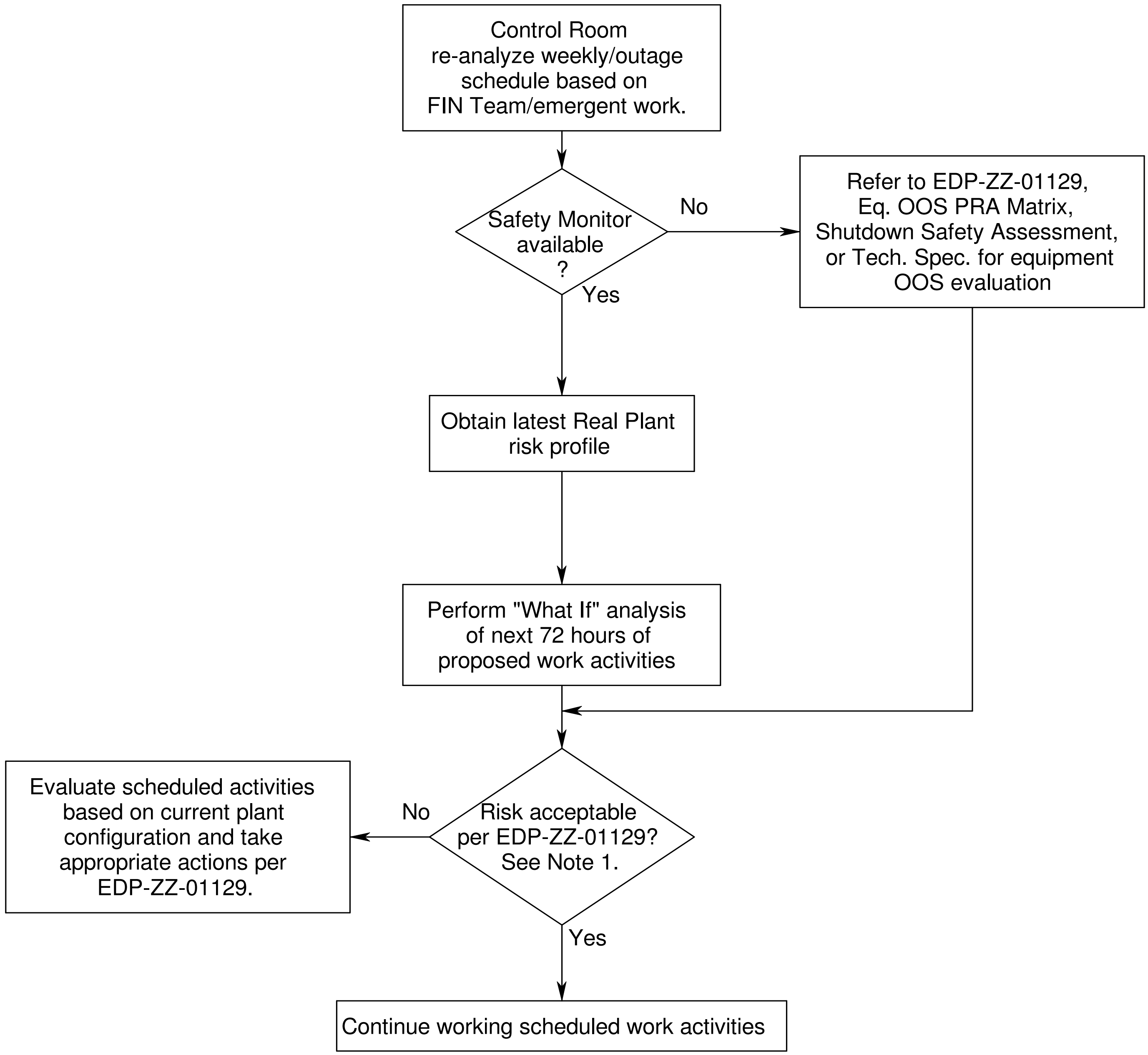


INFORMATION USE

Attachment 11

Control Room Risk Assessment for Re-Analysis of Weekly/Outage Schedule for FIN Team/Emergent Activities

Sheet 1 of 1



Note 1. Risk Acceptable per applicable EDP-ZZ-01129 schedule development sections.

 INFORMATION USE

Attachment 12

RWST Gravity Feed to RCS

Sheet 1 of 2

Days	Heat Load (MBTU/hr)	RWST Level (Percent)/RCS Pressure (PSI)						
		97%	92%	87%	82%	76%	71%	66%
0		7	6	5	4	3	2	1
0.5	100.02	195.43	215.51	241.29				
1.0	82.48	161.16	177.73	198.99	227.67			
1.5	73.21	143.05	157.76	176.63	202.08	239.10		
2.0	67.00	130.90	144.36	161.63	184.92	218.79		
2.5	62.37	121.86	134.38	150.46	172.14	203.67	255.98	
3.0	58.71	114.72	126.51	141.64	162.05	191.74	240.98	
3.5	55.69	108.81	119.99	134.35	153.71	181.86	228.57	
4.0	53.11	103.77	114.44	128.13	146.59	173.45	217.99	
4.5	50.87	99.39	109.60	122.72	140.40	166.12	208.78	
5.0	48.92	95.59	105.41	118.02	135.03	159.76	200.80	
5.5	47.20	92.22	101.70	113.86	130.27	154.14	193.72	
6.0	45.65	89.19	98.35	110.12	125.99	149.07	187.35	
6.5	44.24	86.43	95.32	106.72	122.10	144.47	181.57	
7.0	42.95	83.93	92.55	103.62	118.56	140.27	176.30	256.29
7.5	41.79	81.65	90.05	100.82	115.35	136.48	171.53	249.35
8.0	40.72	79.56	87.74	98.24	112.39	132.98	167.13	242.96
8.5	39.73	77.63	85.61	95.85	109.66	129.75	163.07	237.05
9.0	38.81	75.83	83.63	93.63	107.12	126.74	159.29	231.57
9.5	37.96	74.17	81.80	91.58	104.78	123.97	155.82	226.51
10.0	37.18	72.65	80.11	89.70	102.62	121.42	152.60	221.84
10.5	36.45	71.21	78.53	87.93	100.60	119.02	149.59	217.46
11.0	35.76	69.87	77.05	86.27	98.70	116.77	146.77	213.35
11.5	35.11	68.60	75.65	84.70	96.91	114.66	144.10	209.48
12.0	34.50	67.41	74.34	83.23	95.22	112.67	141.60	205.85
12.5	33.92	66.28	73.10	81.84	93.63	110.79	139.24	202.41
13.0	33.38	65.22	71.92	80.52	92.13	109.00	137.00	199.15
13.5	32.86	64.20	70.80	79.27	90.69	107.30	134.86	196.05
14.0	32.36	63.23	69.73	78.08	89.33	105.69	132.83	193.10
14.5	31.89	62.31	68.72	76.94	88.02	104.15	130.89	190.28
15.0	31.44	61.43	67.74	75.85	86.77	102.67	129.04	187.58
15.5	31.01	60.58	66.81	74.80	85.58	101.26	127.26	185.00
16.0	30.59	59.77	65.91	73.80	84.43	99.90	125.56	182.52
16.5	30.19	58.99	65.05	72.83	83.33	98.59	123.92	180.13
17.0	29.81	58.24	64.22	71.91	82.27	97.34	122.34	177.84
17.5	29.44	57.52	63.43	71.02	81.25	96.13	120.82	175.64
18.0	29.09	56.83	62.67	70.17	80.28	94.99	119.38	173.55
18.5	28.75	56.17	61.94	69.35	79.35	93.88	117.99	171.53
19.0	28.42	55.53	61.24	68.56	78.44	92.81	116.65	169.57
19.5	28.10	54.91	60.55	67.80	77.57	91.78	115.35	167.68
20.0	27.80	54.31	59.89	67.06	76.72	90.77	114.08	165.84

1 Safety	0	21.13
2 Safeties	21.13	42.26
3 Safeties	42.26	63.39
Head	63.39	196.74
Head and Safety	196.74	217.87
Head and 2 Safeties	217.87	239.00
Head and 3 Safeties	239.00	260.13

NOTE: This table lists the RWST level needed to provide the required amount of flow for different values of RCS pressure.

RWST Level Percent	RCS Pressure PSI	RWST Level inch
61%	0	329.4
66%	1	357.12
71%	2	384.84
76%	3	412.56
82%	4	440.28
87%	5	468
92%	6	495.72
97%	7	523.44
99%	7.4	

INSTRUCTIONS:

1. DETERMINE “Days” since reactor shutdown. This should be rounded downward (e.g., 9.3 days to 9 days).
2. SELECT the venting combination available from the top right table (e.g., “1 Safety” means one Pressurizer Safety Valve is removed).
3. DETERMINE the current “RWST Level”. This should be rounded downward (e.g., 95% to 92%).
4. DETERMINE whether RWST Gravity Feed is Available by comparing the cell color shading defined by the “Days” and “RWST Level” with the cell color shading from the top right table.

Attachment 12 (Cont'd.)

Sheet 2 of 2

NOTE: “Head” in the top right table (Sheet 1) includes when the Reactor Vessel Head is detensioned with all required studs removed (allowing for Engineering-evaluated stuck studs) or the Reactor Vessel Head removed.

- EXAMPLE 1: For 13.5 days after reactor shutdown with an RWST Level of 66%, 196.05 sq.in. of venting area is required. The top right table shows that the Reactor Vessel Head detensioned with all required studs removed or the Reactor Vessel Head removed alone can provide an adequate vent path for RWST Gravity Feed to be Available. IF the time since reactor shutdown was 13 days instead, 199.15 sq. in. of venting area would be required and both the Reactor Vessel Head and one Pressurizer Safety Valve would have to be removed to provide an adequate vent path.

- EXAMPLE 2: For 13 days after reactor shutdown with the Reactor Vessel Head detensioned with all required studs removed or the Reactor Vessel Head removed, RWST Level must be greater than 71% to provide an adequate driving head for RWST Gravity Feed to be Available. IF only 66% RWST Level was available, then both the Reactor Vessel Head and one Pressurizer Safety Valve would have to be removed to provide an adequate vent path.

Attachment 13
Fire Risk Assessment

1. Scope

10CFR50.65 (a)(4) requires licensees to monitor the plant risk due to on-line maintenance activities which includes fire risk. The NRC issued Reg. Guide 1.160, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants" Rev 3 [Ref: 5.2.42] which included the expectation that all licensees must include fire risk within the scope of the on-line risk monitoring program. Regulatory Guide 1.160 Rev. 3 endorsed NUMAR 93-01, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants" Rev 4A [Ref: 5.2.29]. The on-line fire risk assessment is performed outside of the Risk Monitor tool as described below and only applies in MODES 1 through 4. Fire risk associated with fire protection SSCs (e.g., fire doors, fire dampers, fire detection systems) are addressed by APA-ZZ-00703, Fire Protection Operability Criteria and Surveillance Requirements. The scope of the Fire Risk Assessment process described herein are systems and components credited within the Fire PRA (Probabilistic Risk Assessment) and Nuclear Safety Capability Assessment (NSCA) which represent an appreciable fire risk when removed from service.

2. Identification of Systems and Components with Appreciable Fire Risk

a. ESTABLISH Appreciable Fire Risk Systems and Components (FRSCs). FRSCs are established by an expert panel using a list of systems and components in the FPRA that are in the scope of Maintenance Rule (a)(4) and with a Risk Achievement Worth (RAW) of 2.0 or higher or a Risk Reduction Worth (RRW) of 1.005 or higher. PRAER 13-375 [Ref: 5.2.43] documents the FPRA model and the fire PRA systems and components selected for review by the expert panel. The expert panel review is described in Section 4.

b. EVALUATE NSCA systems and components for fire risk. NSCA components NOT contained in the FPRA are identified and evaluated on a case by case basis for inclusion as a FRSC by expert panel review.

c. DOCUMENT the FRCSs. The list of FRSCs is documented in ODP-ZZ-00002 Appendix 3, Risk Management Actions for Fire Risk Systems and Components.

3. Identification of Fire Risk Management Actions (FRMAs)

FRMAs are established by the expert panel for certain plant fire areas based on the fire scenarios where the FRSCs are risk significant.

a. Identification of Fire Areas

1) For FRSC contained in the FPRA generate cut sets for each FRSC with that FRSC failed and all other "test and maintenance" scenarios removed. The following screening criteria are established to focus RMA development on the most risk significant fire scenarios given the out of service FRSC:

a) Any cut set with a value > 1E-6.

b) All the cut sets necessary to identify the top 2 Fire Areas or 25% of the total conditional fire CDF (Core Damage Frequency) given the FRSC is out of service.

Attachment 13 (Cont'd.)

Step 3.a Cont'd

2) For FRSCs only in the NSCA, ESTABLISH fire areas based on the expert panel review and the FRSC function.

b. Identification of the FRMAs for Fire Areas

1) ESTABLISH FRMAs using the expert panel review, using a two tiered approach on either a fire area basis or IF the fire scenarios are limited to specific equipment or locations in a fire area they may be established at the fire zone level.

2) UTILIZE FRMAs suggested from NUMARC 93-01 which are 1) Communications (Daily crew brief on fire risk via the shift manager turnover), 2) verification of functioning detection and suppression features, 3) focused area inspections for transients, lube oil leaks, verification of fire barriers and fire precursors, 4) fire watches, 5) prohibition of hot work, 6) prohibition of transient combustibles, and 7) limitations on electrical equipment switching.

3) ESTABLISH Tier 1 FRMAs that should include 1) Communications (Daily crew brief on fire risk via the shift manager turnover), 2) verification of functioning detection and suppression features, 3) focused area inspections for transients, lube oil leaks, verification of fire barriers and fire precursors. Communication is always required with implementation of FRMAs. This includes a daily brief on the fact that fire risk is increased, to be included on the Shift Manager Operations Focus Index.

4) ESTABLISH Tier 2 FRMAs to be implemented when the Tier 1 FRMAs CANNOT be accomplished (e.g., detection is non-functional). Tier 2 should consider fire watches, prohibiting or limiting transient combustibles, prohibiting hot work, performing thermography on energized equipment, or limitations on electrical equipment switching. Signage/barriers are another option for increased fire risk communication with tier two FRMAs.

5) DOCUMENT the FRMAs in ODP-ZZ-00002 Appendix 3, Risk Management Actions for Fire Risk Systems and Components.

Attachment 13 (Cont'd.)

Sheet 3 of 4

4. Updates to FRCSs and FRMAs

a. EVALUATE changes to the FPRA and the NSCA for impact on the FRSCs and the FRMAs per EDP-ZZ-04044, Fire Protection Reviews and APA-ZZ-00315, Configuration Risk Management Program. When a change impacts the FRSCs or RMAs an expert panel should evaluate the changes following the guidance in Sections 2 and 3 above.

b. CONDUCT an expert panel review. Panel membership is comprised of the Maintenance Rule (a)(4) Program Owner/Safety Monitor Administrator, the FP Program engineer or the FP System engineer, the FPRA engineer, and an Operations person knowledgeable in EOPs. The Maintenance Rule (a)(4) Program Owner/Safety Monitor Administrator acts as the Chairman. The Operations position is suggested however a quorum is met by the remaining 3 members.

c. DOCUMENT discussions and changes to FRSCs and the FRMAs in a set of minutes keep by the Chairmen and maintained in document file E110.0151.

d. REVISE ODP-ZZ-00002 Appendix 3, Risk Management Actions for Fire Risk Systems and Components, as required.

5. Implementation of RMAs

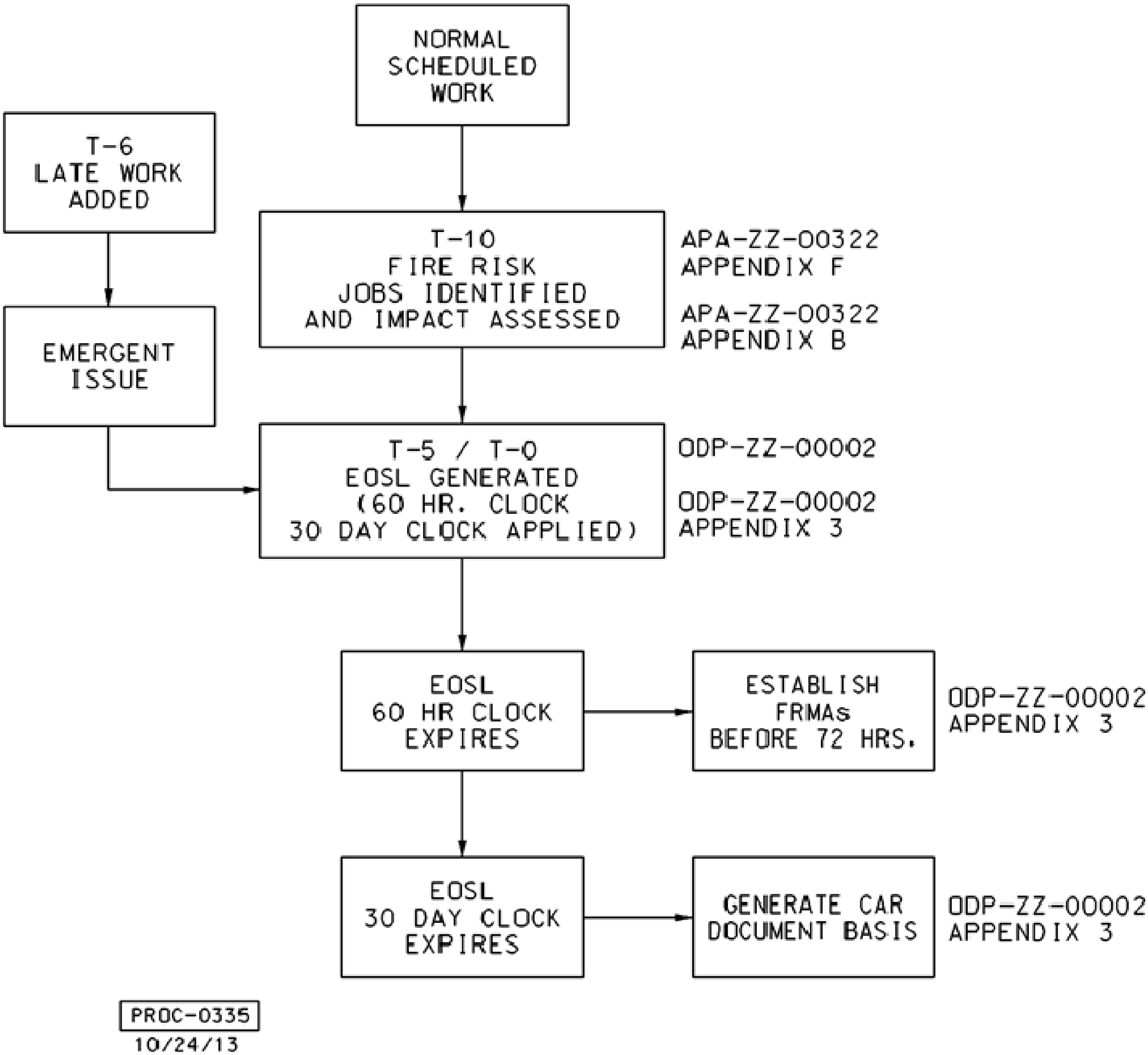
a. Figure 13-1 shows the process for implementation of FRMAs. During the work week planning process Jobs impacting FRSCs are identified as part of the routine risk assessment process. At week T-5, Operations generates the EOSL and identifies the specific FRSCs and the FRMAs associated with the work week. Should the active EOSL time exceed 60 hours, the RMAs are implemented and maintained until the FRSC is restored to service and removed from the active EOSL. IF the FRSC is on the active EOSL greater than 30 days a CAR is generated, the Shift Manager evaluates the FRMAs and documents the reason for the extended maintenance.

b. For late add work or emergent work that impacts FRSCs the active EOSL is generated in the same manner as planned work.

Attachment 13 (Cont'd.)

Sheet 4 of 4

Fire Risk Assessment - Figure 13-1



 INFORMATION USE

PDP-ZZ-00023, APPENDIX A

PRIORITY SCREENING MATRIX

MINOR Revision 003

PRIORITY SCREENING MATRIX

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ATTACHMENT 2, Examples Of Minor Maintenance And Toolpouch Work 13

PRIORITY SCREENING MATRIX

1.0 PURPOSE

To provide instructions for Job Screening and is to be used in conjunction with its mother procedure, PDP-ZZ-00023, Work Screening Processing.

2.0 SCOPE

As a sub-process of the Work Management process, Work Screening and Classification Process classifies work activities as Minor Maintenance, Facility Maintenance, Modifications, Corrective and Deficient Maintenance. The established criterion for each sub-process is based on ensuring safety, maximizing productivity, and minimizing cost.

3.0 RESPONSIBILITIES

As outlined in PDP-ZZ-00023, Work Screening Processing.

4.0 PROCEDURE INSTRUCTIONS

As outlined in PDP-ZZ-00023, Work Screening Processing.

5.0 REFERENCES

5.1. Implementing

5.1.1. PDP-ZZ-00023, Work Screening Processing

5.1.2. APA-ZZ-00500, Corrective Action Program

5.1.3. ODP-ZZ-00002, Appendix 3, Risk Management Actions for Fire Risk Systems and Components

5.2. Developmental

5.2.1. CAR 201104580

5.2.2. CAR 201505380

6.0 RECORDS

None

7.0 SUMMARY OF CHANGES

Page(s)	Section or Step Number	Description
		Incorporates CR 201604956, action 1.1
5-12	Attachment 1	Revise Attachment 1, sheets 4 thru 8
13-16	Attachment 2	Added new Attachment for Examples of Minor Maintenance and Toolpouch Work

Attachment 1

Priority Screening Matrix

Sheet 1 of 8

		A	B	C	D	E	F
	Work Significance / Component Classification	Failure or Significant Deficiency with System Inoperable or Unavailable	Failure or Significant Deficiency with System Operable and Available	Component Deficiency	Component Minor Deficiency	Enhancement Mods, Investigations, Refurbs	Grounds, Site Betterment
1	High Critical Component: MR(a)(4) yellow or red risk condition; Significant threat to station reliability; Regulatory Compliance issue that requires immediate compensatory action	1	2	3	4	5	6
2	Operational Workaround Significant Personnel Safety Concern	1	2	3	4	5	6
3	Fire Protection; Required Security Equipment; Chemistry/Environmental Sampling; Emergency Response Facilities; Equipment used for EALs and PARs; Control Room Deficiency	2	2	3	4	5	6
4	Critical Component; Regulatory Compliance issue with < 30 day response required or compensatory action required: Operator Burden; FLEX Portable Equipment	2	3	4	5	5	6
5	Minor Personnel Safety Concern or Security Issue; Simulator Fidelity; Non-critical component; Regulatory issue-deficient or non-conforming condition	4	4	5	5	6	6
6	Run to Failure Components	4	5	5	6	6	6

1	Red - Begin Immediately, Work 24/7
2	Yellow - Schedule Within T-5
3	Orange - Schedule > T-6 in next available system week or FEG Window
4	Blue - Schedule > T-13 in next available system week or FEG Window
5	Green - Schedule as resources allow in the normal process
6	White - When time allows (fill-in)

INFORMATION USE

Attachment 1 (Cont'd.)

Sheet 2 of 8

NOTE

Definitions and applicability of Operability and Functionality appear in APA-ZZ-00500, Corrective Action Program.

Priority of security equipment can change due to status of U.S. Homeland Security Advisory System.

Significant Management concerns that do NOT meet the Screening Matrix Criteria require Manager, Work Management approval and generation of a Corrective Action Document to allow priority upgrade.

COL A
A component whose failure or significant deficiency renders its system Train inoperable and/or non-functional.

COL B
A component which has failed or has a significant deficiency, but its system Train remains operable and functional.

COL C
The component has some deficiency but is still functional.

Active leaks (typically leakage Class 3-6) should be categorized in this column. [Ref: CARs 201104580 and 201505380]

COL D
The component has some minor deficiency but is still functional.

Inactive leaks (typically leakage Class 1 or 2) should be categorized in this column.
[Ref: CARs 201104580 and 201505380]

COL E
Any system enhancements.
Modifications that are not related to any components in one of the above categories.
Investigations
Refurbishments

COL F
Site Betterment
Grounds

Attachment 1 (Cont'd.)

Sheet 3 of 8

Component Classification:

ROW 1

- High Critical Components: FID 1, Criticality 1
- Any system that is Maintenance Rule (a)4
- Any Significant threat to Station Reliability
- Any regulatory compliance issues that require immediate attention ($\leq$ 7 days Allowed Outage Time (AOT))
- MR (a)(4) fire risk system/component or the Fire Protection systems credited for risk management actions (Reference ODP-ZZ-00002, Appendix 3, Risk Management Actions for Fire Risk Systems and Components)

ROW 2

- A SIGNIFICANT personnel safety concern
- Operational Workaround

ROW 3

- Fire Protection components that required compensatory actions (continuous fire watch or has an active FPIP)
- Required Security Equipment requiring compensatory actions (continuous Security watch)
- Chemistry/Environmental Sampling
- Emergency Response Facilities Habitability
- RERP Equipment used for EALs and PARs
- Control Room Deficiency

ROW 4

- Critical Components: FID 2, Criticality 2
- Any Regulatory Compliance Issue with a $\leq$ 30 Day response required or compensatory action required
- Operator Burden
- FLEX Portable Equipment (Emergency Preparedness Comp. free field marked “F”)

ROW 5

- MINOR Security issues
- MINOR Personnel Safety concerns
- Simulator Fidelity
- Non-Critical Components: FIN N, Criticality N
- Other Regulatory Issues
- Non-Conforming Conditions

ROW 6

- Any “Run-to-Failure” Components, FID R, X or blank or Criticality R, X or blank

Attachment 1 (Cont'd.)

Sheet 4 of 8

Examples of Corrective, Deficient, and Other Work Classifications

The examples of deficiencies identified below are general in nature and are used to show the interface between AP-913, component criticality code, and AP-928, definitions, to determine the correct classification. Regardless of the AP-928 classification, the urgency to resolve the deficiency is determined by the station prioritization system, not by the classification or criticality code.

Description of Deficiency Tag	AP-913 Classification	AP-928 Classification
Temperature switch 1N23-TS-006 on service building chiller broken (prevents start of chiller)	Run-to-maintenance (RTM)	CL – because of RTM or low consequence
Temperature switch 2X44-TS-009 on turbine building chiller failed (prevents start of chiller)	Noncritical	CN – because of Noncritical AP-913 classification
Temperature switch 1K74-TS-002 on reactor building chiller failed (prevents start of chiller)	Critical	CC – because of Critical AP-913 classification
Service door #221 (plant equipment) broken	No documented AP-913 classification	CL – because of no AP-913 classification; assumed to be RTM or low consequence
Casing vent/drain valve WT-DV-123 on spare water treatment transfer pump will not open because of corroded stem.	No documented AP-913 classification	CL – because of no AP-913 classification; assumed to be RTM or low consequence
Fire hydrant located by water treatment building did not pass any water during the recent test. Isolation valve did not open; possible separation internally.	No documented AP-913 classification	CL – because of no AP-913 classification; assumed to be RTM or low consequence
When the A reactor feed pump was tagged out-of-service and depressurized for repair, the low-pressure alarm did not actuate with the trip unit tripped on the back panel. Troubleshoot and repair the annunciator circuit and trip unit.	Critical	CC – because of Critical AP-913 classification
Reactor core isolation cooling (RCIC) system alarm did not annunciate when breaker was opened.	Noncritical	CN – because of Noncritical AP-913 classification
Offgas system air-operated valves are leaking by seat, causing high offgas system dew point resulting in increased drying operations.	Critical	CC – because of Critical AP-913 classification
Turbine building cooling water (TBCW) relief valve is leaking past its seat	Noncritical	CN – because of Noncritical AP-913 classification

Attachment 1 (Cont'd.)

Sheet 5 of 8

Description of Deficiency Tag	AP-913 Classification	AP-928 Classification
approximately 2 gallons per minute, causing excessive input to radwaste and makeup to system.		
CR 06-1135 identified that the vibration switches for the circulating water system cooling tower fans may have never been set to the vendor recommendation per drawing 0232-510-032-030.	RTM	CL – because of RTM or low consequence
Small hydrogen leak at the pipe-to-tubing fitting on the generator hydrogen panel; fitting will have to be removed, thread sealant applied, and fitting replaced.	Critical	CC – because of Critical AP-913 classification
Turbine building crane not operating. Troubleshoot and perform periodic inspection.	Noncritical	CN – because of Noncritical AP-913 classification
North Met tower struck by lightning and rendered nonfunctional. E-plan required equipment.	No documented AP-913 classification	CL – because of no AP-913 classification; assumed to be RTM or low consequence
Permanent space heater in the water treatment building does not work.	No documented AP-913 classification	CL – because of no AP-913 classification; assumed to be RTM or low consequence
Intake structure overhead crane will not operate and is needed to support intake structure work.	No documented AP-913 classification	CL – because of no AP-913 classification; assumed to be RTM or low consequence
Relay caused alarm during stator cooling water pump rotation. Alarm cleared after pump swap; pump operates satisfactorily. Relay reset; suspect relay is sticking. Replace relay.	No documented AP-913 classification	DL – because of no AP-913 classification; assumed to be RTM or low consequence
Heater drain pump controller is swinging approximately 1 inch around setpoint. Troubleshoot and repair the loop to correct this problem.	Critical	DC – because of Critical AP-913 classification
Intermediate range monitor (IRM) upscale alarmed repeatedly during plant startup; no observable IRM recorder response was noted. No alarm sealed in on IRM drawers.	Noncritical	DN – because of Noncritical AP-913 classification
Circulating water pump vibration levels are at .376 in/sec., and the "alert" level begins at .300 in/sec. The action level is .500 in/sec.	Critical	DC – because of Critical AP-913 classification
Bus ducts at switch gear are missing bolts on duct covers. Capture clips and nuts on the inside of the bus duct are also missing.	Noncritical	DN – because of Noncritical AP-913 classification

Attachment 1 (Cont'd.)

Sheet 6 of 8

Description of Deficiency Tag	AP-913 Classification	AP-928 Classification
A bus duct outage is required. No impact to system operations at this time.		
Diesel generator fuel oil pump has very slight inboard seal leak.	Critical	DC – because of Critical AP-913 classification
Chemical treatment building fan needs to be replaced. South blower is vibrating excessively. Fan currently runs and is probably all right for the next several months.	No documented AP-913 classification	DL – because of no AP-913 classification; assumed to be RTM or low consequence
Clean rust off outside of exposed well water piping, at well pump house, to allow painting.	No documented AP-913 classification	OF – other maintenance to be performed on facilities, which includes housekeeping, minor rust, painting, and general plant betterment or insulation
Warehouse building fan (which is not part of plant equipment) needs to be replaced. South blower is missing a blade, causing unit to shake excessively.	No documented AP-913 classification	OF – other maintenance to be performed on facilities, which includes housekeeping, minor rust, painting, and general plant betterment or insulation
Add temporary receptacles and lighting to the south end of the transformer yard and the turbine building to support the online bus outage the workweek 11-08.	No documented AP-913 classification	OP – other maintenance to be performed as pre-outage activities
Revise control circuit wiring for main transformer to energize a second bank of cooling when temperature reaches 90°F per design package 11-00112.	Noncritical	OD – other maintenance to be performed for design enhancements
Corrective action for CR 96-1135 requires an inspection of the vibration switch for the B circulating water system cooling tower fan to ensure that it was set to the vendor recommendation per drawing 0232-510-032-030.	RTM	OA – other maintenance to be performed as a result of corrective actions, inspections or generic issues
Spare transformer not connected to the plant has developed an oil leak. This component is labeled; however, it is not considered part of plant equipment because it is in storage.	No documented AP-913 classification	OF – other maintenance to be performed on facilities, which includes housekeeping, minor rust, painting, and general plant betterment or insulation
Perform work on or modify otherwise operable and nondeficient equipment to improve/enhance design or operating margins.	N/A – Equipment does not have a documented deficiency.	OD – if a design change, or OB – if not a design change

Attachment 1 (Cont'd.)

Sheet 7 of 8

Description of Deficiency Tag	AP-913 Classification	AP-928 Classification
Damaged Insulation	Critical	OF
Missing Insulation/potentially impacting process performance	Critical	DL
Damaged Insulation	Non-critical	OF
Missing Insulation/potentially impacting process performance	Noncritical	DL
Damaged Insulation	RTM	OF
Missing Insulation/potentially impacting process performance	RTM	OF
Missing or damaged door seals and is not resulting in the door being inoperable	Critical	DC
Missing or damaged door seals not resulting in the door being inoperable	Noncritical	DN
Missing or damaged door seals not resulting in the door being inoperable	RTM	DL
Missing or damaged door seals resulting in the door not meeting intended function	Critical	CC
Missing or damaged door seals resulting in the door not meeting intended function	Noncritical	CN
Missing or damaged door seals resulting in the door not meeting intended function	RTM	CL
Computer points on critical parameters or calculations (Heat Balance)	Critical	CC
Computer points on critical parameters or calculations (Heat Balance)	Noncritical	CN
Computer points on critical parameters or calculations (Heat Balance)	RTM	CL
All other computer points	Not evaluated	DL
ACU/heaters not required to support plant equipment (except containment)	All	OF
General Area plant lighting/illumination (Nonemergency)	All	OF
Mobile cranes and lifts	All	OF
Personnel elevators up to the breaker supply	All	OF
Maintenance communication	All	OF
Labels and Tags	All	OF
Painting/Surface rust on components	Critical	DL
Painting/Surface rust on components	Noncritical	OF
Manhole Covers	All	OF
Windows	All	OF
Receptacles	All	OF
Nonemergency Showers, drinking fountains, toilets, change rooms, laundry	All	OF

 INFORMATION USE

Attachment 1 (Cont'd.)

Sheet 8 of 8

Description of Deficiency Tag	AP-913 Classification	AP-928 Classification
Control Room Nonemergency Showers, drinking fountains, toilets, change rooms, laundry	All	DL
Non steam, security, flood doors	All	OF
Phones – Nonemergency/station PA	All	OF
Decontamination equipment	All	OF
Shop equipment	All	OF
Roofs over plant equipment (SOER 10-2 caution on priority)	All	OF

Attachment 2

Examples Of Minor Maintenance And Toolpouch Work

Sheet 1 of 4

Examples of Minor Maintenance and Toolpouch Work

Note: The Work Screening Committee should review minor maintenance. Minor maintenance should also be classified appropriately and considered part of the total backlog (CM, DM or OM), as applicable.

Examples of Potential Minor Maintenance Work

Equipment	Type of Maintenance
Manual valve	Adjust packing or repack.
Local indicators	Calibrate and repair instruments.
Fuses	Replace in accordance with plant fuse control program.
Insulation	Repair or replace, including bands and screws.
Pumps	Adjust packing.
Piping/valve caps	Repair or replace safety-related components as long as the integrity of the component is maintained, component disassembly is not required, operability is not affected, and the pipe/valve cap is consistent with approved plant configuration documents.

Minor Maintenance Criteria (See EPRI 3002007020, *Nuclear Maintenance Applications Center: Maintenance Work Package Planning Guidance.*)

Determining Factor or Criteria	Level 3 (Minor Maintenance – Detailed Work Instructions Not Required)
Complexity of the task Frequency with which work is performed (see Notes 1 and 2 below)	Simple task Performed frequently ≤ one fuel cycle
Availability of technical procedure(s) defining the work	Technical procedures are typically not needed
Risk of unit or generator trip or transient	Work presents no risk of single failure or errors causing unit or generator trip or transient
Risk of lost generation	No risk
Risk of entry into an LCO or work using > 50% of allowed LCO time	Work presents low risk of entry into an LCO and no risk of extending an LCO
Industrial safety and radiation exposure	Work presents low risk to industrial or radiological safety
Need for special controls*	No
Reliance on skill of the craft	Task and associated knowledge and skills are basic and known to be possessed by craft

1 February 2016

Attachment 2 (Cont'd.)

Sheet 2 of 4

***Special Controls** – Additional requirements required in order to complete a work activity successfully. These include: confined space permit, welding permit, diving, freeze seals, leak stop injection, special radiation work permits that provide coverage above standing permits, and changes in plant configuration.

Examples of Potential Toolpouch Maintenance Work

Note: The Work Screening Committee should review toolpouch maintenance. This maintenance should also be considered part of the total backlog (CM, DM or OM), as applicable, if not completed in a timely manner as intended with toolpouch maintenance and as the screening committee determines.

Equipment	Types of Maintenance
Air conditioners	Repair or replace (nonplant)
Air filters	Replace on noncontaminated air handlers outside of the radiologically controlled area
Air filters on motors	Repair or replace
Air systems	Tighten loose fittings
Building repairs and replacement	Repair/replace doorknobs, closures, panic bars, door hinges, general plumbing, commodes, water fountains, windows, floor drains, grating; patch holes in walls, stairs and handrails
Computer cables	Pull and terminate
Computer points	Check
Conduit	Replace covers, screws and brackets
Convenience outlets	Repair
Diaphragms	Seal against in-leakage on turbines by sealing with room-temperature-vulcanizing/equivalent
Door locks, latches	Repair or replace (except for safety-related, alarmed, control room habitability boundary, and so forth)
Equipment tags	Fabricate
Fittings	Replace
Flanges	Tighten (within maximum torque limits) to stop leakage
Handles	Repair or replace
Heaters	Repair or replace (baseboard or portable type only)
Hoses	Rig hoses to appropriate vents and drains
Indicators	Remove static charge
Instrument tubing	Repair or replace supports, screws, springs, shims
Junction boxes	Replace covers and screws
Kitchen equipment	Replace or repair
Lamps or bulbs	Replace or repair
Leak detection system	Change patches
Light fixtures	Repair or replace

Attachment 2 (Cont'd.)

Sheet 3 of 4

Equipment	Types of Maintenance
Local temperature indicators in wells	Repair or replace
Lube oil purifiers	Repair or replace
Manual valves	Repair or replace handwheels/handles and lubricate valve stems—Handwheels/handles may be repaired or replaced on safety-related valves as long as component integrity is maintained, disassembly is not required, and the handwheel/handle is an exact replacement.
Miscellaneous	Repair office and survey equipment
Paging equipment	Repair
Pressure gauges	Replace glass or gauge
Shop tool	Repair if in tool crib or machine shop
Signs	Install or repair
Telephone equipment	Repair or replace
Temporary sump pumps	Repair or replace motor or winding
Trash compactor	Replace broken bolts

Toolpouch Criteria (See EPRI 3002007020.)

Toolpouch Criteria:

Determining Factor or Criteria	Tool Pouch
Complexity of the task Frequency with which work is performed (see Notes 1 and 2 below)	Simple task No documentation required
Availability of technical procedure(s) defining the work	Procedure and work instructions not required
Risk of unit or generator trip or transient	Work does not present any risk to the station and little or no personnel safety concern
Risk of lost generation	No risk
Risk of entry into an LCO or work using > 50% of allowed LCO time	Work presents no risk of entry into or extending an LCO
Industrial safety and radiation exposure	Work presents minimal or no risk to industrial or radiological safety
Need for special controls*	No
Reliance on skill of the craft	Task and associated knowledge and skills are basic and known to be possessed by craft

3 February 2016

Attachment 2 (Cont'd.)

Sheet 4 of 4

***Special Controls** – Additional requirements required in order to complete a work activity successfully. These include: confined space permit, welding permit, diving, freeze seals, leak stop injection, special radiation work permits that provide coverage above standing permits, and changes in plant configuration.

Toolpouch work is performed within the skills of the worker. The worker or work group, using standing management guidance, will decide what documentation (if any) is required. Equipment history should be updated when applicable.

CALLAWAY ENERGY CENTER
JOB PERFORMANCE MEASURE

A3 (SRO)

JPM No:	Admin3-SRO-O-001	KSA No:	GEN 2.3.4
Revision Date:	06/30/2017	KSA Rating:	3.7
Job Title:	URO/SRO		
Duty:	Administrative		
Task Title:	DETERMINE REPORTABILITY REQUIREMENTS FOR OVEREXPOSURE		
Completion Time:	15 minutes		

The performance of this task was evaluated against the standards contained in this JPM and determined to be:

☐ SATISFACTORY ☐ UNSATISFACTORY

Reason, if UNSATISFACTORY:

____

____

Evaluator Signature: ____________________ Date: ______________

Task Performer: ______________________________

Location of Performance:

☐ Control Room ☐ Simulator/Lab ☐ Plant ☒ Classroom

Method of Performance: ☐ Simulated ☒ Performed

☐ Alternate Path ☐ Time Critical ☐ RCA

References: APA-ZZ-00520 Reporting Requirements and Responsibilities, Rev 48
HTP-ZZ-01101, Administrative Controls For Radiation Shielding, Rev 24

Tools / Equipment: None

Initial Conditions: The Plant is in MODE 6. Refueling activities are in progress. An Operations Technician (OT) will be sent inside the Incore Instrument Tunnel to place WPA.

The dose rate in the area is 400 mrem/hr.

If shielding is installed, the projected dose rate is 180 mrem/hr.

Installation of shielding is expected to take 15 minutes at the unshielded dose rate.

Placing WPA is expected to take 30 minutes.

No other work will be performed in the area.

Initiating Cues: You are the Control Room Supervisor. You are directed to determine the following items:

The projected dose to install shielding and place WPA is _________.

The projected dose to place WPA without shielding is __________.

Should shielding be installed? **YES / NO** (circle one)

Due to an Incore Instrument Thimble being retracted, the OT was exposed to a 300 REM/hr field for 6 minutes. Determine the following reporting items:

1. WHO do you send the original report to? __________________
2. WHAT is the time limit for the first report? _________________

RECORD your answers on your CUE sheet and return it to the examiner when complete.

Simulator Set up and/or Note(s): None

Task Standard: Upon completion of the task, the Candidate will have determined:

- Projected dose with shielding is **190 mrem**
- Projected dose without shielding is **200 mrem**
- **Shielding should be installed.**
- The primary recipient is the **NRC OPERATIONS CENTER**
- The time limit for the initial report is **ONE HOUR**

Start Time: ________________
Stop Time: ________________

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
*1.	Candidate determines projected dose to install shielding and place WPA.		Candidate calculates dose to install shielding and place WPA: Install Shielding: (400 mrem/hr) X (15 min) / (60 min/hr) = 100 mrem Place WPA: (180 mrem/hr) x (30 min) / (60 min/hr) = 90 mrem Total dose = 100 + 90 **Total dose = 190 mrem**	**S** **U** Comments:
*2.	Candidate determines projected dose to place WPA without shielding		Candidate calculates dose to place WPA without shielding: Place WPA: (400 mrem/hr) X (30 min) / (60 min/hr) = **200 mrem**	**S** **U** Comments:
*3.	Candidate determines if shielding should be installed.		Candidate circles **YES** for installing shielding.	**S** **U** Comments:
4.	Candidate determines that an overexposure occurred and refers to APA-ZZ-00520, Reporting requirements and Responsibilities.	Provide candidate a copy of APA-ZZ-00520 when candidate verbalizes that the event is reportable or candidate locates APA-ZZ-00520 to see if it is reportable	Candidate determined that an overexposure occurs (> 25 REM TEDE) and reviews APA-ZZ-00520 Exposure = (300 REM/hr) x (6 min) / (60 min/hr) = 30 REM	**S** **U** Comments: Note: APA-ZZ-00520, ATTACHMENT 1, STEP 3.f.1)a), AND ATTACHMENT 2, ITEM 42, contain reporting information for the overexposure per 10 CFR 20.2202(a).

*Critical Step

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
*5.	Candidate determines who original report is sent to		Candidate determined the **NRC OPERATIONS CENTER** is sent the original report: NRC ENS LINE (RED PHONE) IS ALSO AN ACCEPTABLE ANSWER "WHO" may also be used referring to the NRC Ops Center	**S U** Comments:
*6.	Candidate determines the time limit for the initial report		Candidate determined that the time limit for the initial report is **ONE Hour.**	**S U** Comments
7.	**JPM IS COMPLETE**	RECORD STOP TIME ON PAGE 2.		**S U** Comments

*Critical Step

KEY:

The projected dose to install shielding and place WPA is __**190 mrem**__.

The projected dose to place WPA without shielding is __**200 mrem**__.

Should shielding be installed? **YES / NO** (circle one)

1. WHO do you send the original report to? __**NRC Operations Center**__
2. WHAT is the time limit for the first report? __**ONE Hour**__

*Critical Step

A3 (SRO)

Initial Conditions: The Plant is in MODE 6. Refueling activities are in progress. An Operations Technician (OT) will be sent inside the Incore Instrument Tunnel to place WPA.

The dose rate in the area is 400 mrem/hr.

If shielding is installed, the projected dose rate is 180 mrem/hr.

Installation of shielding is expected to take 15 minutes at the unshielded dose rate.

Placing WPA is expected to take 30 minutes.

No other work will be performed in the area.

Initiating Cues: You are the Control Room Supervisor. You are directed to determine the following items:

The projected dose to install shielding and place WPA is _________.

The projected dose to place WPA without shielding is __________.

Should shielding be installed? **YES / NO** (circle one)

Due to an Incore Instrument Thimble being retracted, the OT was exposed to a 300 REM/hr field for 6 minutes. Determine the following reporting items:

1. WHO do you send the original report to? __________________
2. WHAT is the time limit for the first report? _________________

RECORD your answers on your CUE sheet and return it to the examiner when complete.

APA-ZZ-00520

REPORTING REQUIREMENTS AND RESPONSIBILITIES

MINOR Revision 048

INFORMATION USE

REPORTING REQUIREMENTS AND RESPONSIBILITIES

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REPORTING REQUIREMENTS AND RESPONSIBILITIES

1.0 PURPOSE

1.1. Identify reports to be prepared and submitted to various outside organizations having licensing or permitting authority for the Callaway Energy Center and Ameren Missouri Company Organizations. Refer to Attachment 3, Reporting Requirements by Reference for Callaway.

1.2. Identify and assign reporting responsibilities for organizations within the Nuclear Generation of Ameren Missouri Company. Refer to Attachment 3, Reporting Requirements by Reference for Callaway. [Ref: 5.2.10]

2.0 SCOPE

CAUTION

Except under emergency or extraordinary conditions, Safeguards Information shall be transmitted only by protected telecommunications circuits (including facsimile) approved by the NRC. Physical security events required to be reported pursuant to 10CFR73.71 are considered to be extraordinary conditions in accordance with 10CFR73.22 (f) (3).

Provide basic listing of organizational responsibilities for preparation, review, and issuance of reports for Callaway Energy Center and Ameren Missouri Company Organizations. Detailed instructions for filing applicable reports can be found in the referenced regulation requiring the report. Some reports (e.g., final decommissioning reports) are not listed in this procedure.

3.0 RESPONSIBILITIES

3.1. Senior Vice President/Chief Nuclear Officer (SVP/CNO)

Ensures reports required by regulatory agencies, applicable to the operation of Callaway, are filed by Callaway Energy Center and Ameren Missouri Company Organizations in a timely manner.

3.2. Site Vice President (VPN)

3.2.1. Reviews and approves reports that designate “VPN” in the “Reviewed” column of Attachment 2, Prompt Reporting Requirements for Callaway, and Attachment 3, Reporting Requirements by Reference for Callaway.

3.2.2. Issues reports where the “VPN” is listed in the “Issued” column of Attachment 2, Prompt Reporting Requirements for Callaway or Attachment 3, Reporting Requirements by Reference for Callaway.

3.3. On-Site Review Committee (ORC)

3.3.1. Review of reports generated by this procedure in accordance with APA-ZZ-00091, The On-Site Review Committee, that designate “ORC” in the “Reviewed” column of Attachment 2, Prompt Reporting Requirements for Callaway and Attachment 3, Reporting Requirements by Reference for Callaway.

3.3.2. Ensures reports required by this procedure and directed to the NRC are initiated and processed in accordance with APA-ZZ-00521, Attachment 3, Governmental Agency Correspondence Screening and Processing.

3.4. Manager, Regulatory Affairs

Ensures reports required by applicable regulatory agencies are filed by Callaway Energy Center Organizations in a timely manner.

3.5. Supervising Engineer, Regulatory Affairs and Licensing (RARL)

3.5.1. Maintains this procedure and APA-ZZ-00520, Appendix 1, Name/Organization Information, up to date to ensure responsible Callaway Energy Center and Ameren Missouri Company Organizations are cognizant of applicable regulatory reporting requirements and applicable regulatory points of contact.

3.5.2. Determines/confirms event reportability as requested by the Condition Report (CR) Screening Committee, and provides concurrence when Screening Committee determines that an event is NOT reportable.

3.5.3. Coordinates and issues reports where the Senior Director, Nuclear Operations or RARL is listed in the “Issued” column of Attachment 2, Prompt Reporting Requirements for Callaway or Attachment 3, Reporting Requirements by Reference for Callaway.

3.5.4. Filing Licensee Event Reports (LER) in accordance with guidance provided in APA-ZZ-00521, Attachment 3, Governmental Agency Correspondence Screening and Processing, and NUREG 1022.

3.5.5. Maintains and references the Callaway Reportability Notebook as appropriate.

3.6. Shift Manager (SM)

3.6.1. Determination of event reportability.

3.6.2. Initiating contact with regulatory agencies (NRC, FAA, U. S. Coast Guard, State and Local Governmental Agency) for reports that require notification “within 15 minutes”, “as soon as possible/promptly”, and/or designated “SM” in the “Issued” column of Attachment 2, Prompt Reporting Requirements for Callaway, or Attachment 3, Reporting Requirements by Reference for Callaway.

3.6.3. Ensures RARL notification no later than the first working day following discovery of a reportable event.

3.6.4. Ensures appropriate control room log entry is made to document regulatory report filed by SM in accordance with Attachment 2, Prompt Reporting Requirements for Callaway, or Attachment 3, Reporting Requirements by Reference for Callaway.

3.7. Condition Report (CR) Screening Committee

Performs reportability reviews for corrective action documents initiated in accordance with APA-ZZ-00500, Corrective Action Program.

-END OF SECTION-

4.0 PROCEDURE INSTRUCTIONS

> **NOTE**
>
> Point of contact information for reports filed in accordance with this procedure is contained in APA-ZZ-00520, Appendix 1, Name/Organization Information.
>
> EIP-ZZ-00201, Notifications, provides guidance for calls required during Emergency conditions.

4.1. Prompt Report Preparation/Filing (< 5 days)

4.1.1. If a prompt report is required to be filed by the SM, PERFORM the following:

a. Initiate a CR to document reportability determination, regulatory reporting requirement, SM concurrence, RARL notification, and Callaway Energy Center or Ameren Missouri Company Organization responsible for filing report per Attachment 1 through Attachment 4.

b. Final Reports filed with the NRC Operations Center by the SM for notifications required within one hour to and including twenty-four hours, should be filed after contacting the Duty Manager (DM).

c. Final Reports filed with the NRC Operations Center by the SM are filed via the Emergency Notification System (ENS), or any other method available if the ENS is unavailable.

d. NRC Form 361, Reactor Plant Event Notification Worksheet, is utilized for telephone reports to the NRC. [Ref: 5.1.6]

e. SM contacts and files Final Report with regulatory agencies listed in the "Primary" and "Secondary Recipient" columns of Attachment 2, Prompt Reporting Requirements for Callaway that require notification "within 15 minutes", "as soon as possible/promptly", or where "SM" is listed in the "Issued" column of Attachment 2, Prompt Reporting Requirements for Callaway, or Attachment 3, Reporting Requirements by Reference for Callaway.

f. SM ensures RARL is notified by the first working day following discovery of a reportable event.

g. Refer To Step 4.2 for follow-up reports filed by other Callaway Energy Center or Ameren Missouri Company Organizations.

4.1.2. If the reportability determination requires a prompt report to be filed WITHIN 5 days or less by other Callaway Energy Center or Ameren Missouri Company Organizations, perform the following:

a. Initiate a CR to document reportability determination, regulatory reporting requirement, RARL notification, and Callaway Energy Center or Ameren Missouri Company Organization responsible for filing report per Attachment 1 through Attachment 4.

b. Callaway Energy Center or Ameren Missouri Company Organization, listed in the “Initiated” column of Attachment 2, Prompt Reporting Requirements for Callaway or Attachment 3, Reporting Requirements by Reference for Callaway prepares preliminary report with data that addresses all the reporting requirements of the specific regulation.

c. Company Organizations listed in the “Reviewed” column of Attachment 2, Prompt Reporting Requirements for Callaway or Attachment 3, Reporting Requirements by Reference for Callaway reviews reportable event and returns preliminary report with comments to report “Initiator” in time to meet report filing requirement.

d. Reports filed with the NRC Operations Center for notifications required from within one hour to and including twenty-four hours, should be filed after contacting the Duty Manager (DM).

e. NRC Form 361, Reactor Plant Event Notification Worksheet, is utilized for telephone reports to the NRC. [Ref: 5.1.6]

f. Company Organization listed in the “Issued” column of Attachment 2, Prompt Reporting Requirements for Callaway or Attachment 3, Reporting Requirements by Reference for Callaway files Final Report with the regulatory agency listed in the “Primary” and “Secondary Recipient” columns of Attachment 2, Prompt Reporting Requirements for Callaway.

g. RARL files required report in accordance with APA-ZZ-00521, Attachment 3, Governmental Agency Correspondence Screening and Processing and NUREG 1022.

h. Refer to Step 4.2 for follow-up reports filed by other Callaway Energy Center or Ameren Missouri Company Organizations.

 INFORMATION USE

4.2. Written Follow-up Reports

4.2.1. Callaway Energy Center or Ameren Missouri Company Organization, listed in the "Initiated" column of Attachment 3, Reporting Requirements by Reference for Callaway ensures the following actions are completed:

a. Written Follow-up Report is prepared with data that addresses all the reporting requirements of the specific regulation, and forwards report to the Company Organizations listed in the "Reviewed" column of Attachment 3, Reporting Requirements by Reference for Callaway for their review and comments.

b. Company Organizations listed in the "Reviewed" column of Attachment 3, Reporting Requirements by Reference for Callaway review reportable event and return report with comments in time to meet final report filing requirement.

c. Completed follow-up report is forwarded to Company Organization listed in "Issued" column of Attachment 3, Reporting Requirements by Reference for Callaway for final review, approval, and issue to the regulatory agency listed in the "Primary" and "Secondary Recipient" columns of Attachment 3, Reporting Requirements by Reference for Callaway.

4.2.2. RARL files required report in accordance with APA-ZZ-00521, Attachment 3, Governmental Agency Correspondence Screening and Processing and NUREG 1022.

4.3. Report Preparation/Filing (> 5 Days)

4.3.1. Callaway Energy Center or Ameren Missouri Company Organization, listed in the "Initiated" column of Attachment 3, Reporting Requirements by Reference for Callaway, ensures the following actions are completed:

a. A CR has been initiated to document reportability determination, regulatory reporting requirement, RARL notification, and Callaway Energy Center or Ameren Missouri Company Organization responsible for filing report per Attachment 3, Reporting Requirements by Reference for Callaway.

b. Preliminary report is prepared with data that addresses all the reporting requirements of the specific regulation, and forwards report to the Company Organizations listed in the "Reviewed" column of Attachment 3, Reporting Requirements by Reference for Callaway for their review and comments. Preliminary report is forwarded to Reviewers, as soon as possible, but no later than ten (10) working days before report issue date.

Step 4.3.1 Cont'd

c. Company Organizations listed in the "Reviewed" column of Attachment 3, Reporting Requirements by Reference for Callaway reviews reportable event and returns preliminary report with comments to Company Organization listed in the "initiated" column of Attachment 3, Reporting Requirements by Reference for Callaway as soon as possible, but no later than five (5) working days before report issue date.

d. Comments are incorporated, and reviewed by ORC, if required, in accordance with APA-ZZ-00091, The On-Site Review Committee, this review is completed no later than five (5) working days before the report issue date.

e. Completed final report is forwarded to Company Organization listed in "Issued" column of Attachment 3, Reporting Requirements by Reference for Callaway for final review, approval, and issue to the regulatory agency listed in the "Primary" and "Secondary Recipient" columns of Attachment 3, Reporting Requirements by Reference for Callaway.

4.3.2. RARL files required report in accordance with APA-ZZ-00521, Attachment 3, Governmental Agency Correspondence Screening and Processing and NUREG 1022.

-END OF SECTION-

5.0 REFERENCES

5.1. Implementing

5.1.1. 10CFR73.22 (f) (3)

5.1.2. APA-ZZ-00091, The On-Site Review Committee

5.1.3. APA-ZZ-00521, Attachment 3, Governmental Agency Correspondence Screening and Processing

5.1.4. NUREG 1022

5.1.5. APA-ZZ-00500, Corrective Action Program

5.1.6. NUREG 1022, Revision 3, Sections 3 and 4

5.1.7. EIP-ZZ-00201, Notifications

5.1.8. APA-ZZ-00520, Appendix 1, Name/Organization Information

5.1.9. NRC Form 361, Reactor Plant Event Notification Worksheet

5.1.10. APA-ZZ-00811, Hazardous Chemical/Oil Spill Prevention Control And Countermeasure Plan

5.1.11. HDP-ZZ-07000, Radiological Environmental Monitoring Program and Groundwater Protection Initiative

5.1.12. AUE-ADM-2223, AMEREN Generation Disturbance Reporting – EOP-004

5.1.13. APA-ZZ-00810, NPDES Permit Compliance

5.1.14. APA-ZZ-00813, Part 70 Operating Permit Air Emission Monitoring

5.1.15. EIP-ZZ-03010, Hazardous Chemical/Oil Spill Response/Spill Cleanup Implementing Procedure

5.1.16. NEI 13-01 Revision 0

5.1.17. 10CFR72.11

5.1.18. 10CFR72.75

5.1.19. 10 CFR 72.212 (b)(2)

5.1.20. HI-STORM UMAX Certificate of Compliance (CoC)

5.2. Developmental

5.2.1. 10CFR73.71, Reporting of safeguards events

5.2.2. APA-ZZ-00520, Appendix 1, Name/Organization Information

5.2.3. NUREG 1022 Rev. 3, Section 3.2.6 (A190.0003)

5.2.4. HDP-ZZ-03000 Appendix E, Receipt Of Radioactive Material Surveys

5.2.5. SDP-SF-00022, Reporting Of Safeguards Events

5.2.6. OTO-RJ-00001, Loss of Plant Computer

5.2.7. EIP-ZZ-01211, Accident Dose Assessment

5.2.8. CARS 199601010

5.2.9. OQAM 15.7

5.2.10. Commitment 40768

5.2.11. Commitment 42364

5.2.12. Commitment 50005

5.2.13. Commitment 50110

5.2.14. CARS 201110935

5.2.15. Nuclear Electric Insurance Limited (NEIL) Loss Control Manual, January 2016 Edition

-END OF SECTION-

6.0 RECORDS

6.1. QA Records

UNLRC records are filed under File Code A160.0761, or are attached to the applicable CR.

6.2. Commercial Records

Reports filed with other regulatory agencies or organizations are filed under File Code E210.0001, or are attached to the applicable CR.

-END OF SECTION-

7.0 DEFINITIONS

7.1. Immediate/Immediately: Report submittal time limits (Within 1 hour to 8 hours) as described in Attachment 1, Detailed Description of Reports Requiring Submittal or Notification Within 5 Days or Less, and listed in the “Timing” column of Attachment 2, Prompt Reporting Requirements for Callaway, or Attachment 3, Reporting Requirements by Reference for Callaway.

7.2. As Soon As Possible: Report submittal time limit

7.3. As Soon As Practicable: Report submittal time limit

7.4. Prompt Report: Report filed with regulatory agency (federal, state, local) within 5 days or less as described in Attachment 1, Detailed Description of Reports Requiring Submittal or Notification Within 5 Days or Less, and listed in Attachment 2, Prompt Reporting Requirements for Callaway.

7.5. Preliminary Report: Report in finalized form submitted to the reviewing department for review prior to signature by the individual listed in the "Issued" column of Attachment 2, Prompt Reporting Requirements for Callaway, or Attachment 3, Reporting Requirements by Reference for Callaway.

7.6. Final Report: Report in finalized form after obtaining the signature of the individual listed in the "Issued" column of Attachment 2, Prompt Reporting Requirements for Callaway.

7.7. Safety Limit Violation: A condition in which a safety limit, as described in Section 2 of the Callaway Plant Technical Specifications, is exceeded.

7.8. Serious Injury:

7.8.1. An accident resulting from contact with energized electrical supply facilities (e.g., Callaway Energy Center switchyard) which results in a hospital admission or fatality. This differs from Step 7.8.3 in that this injury/accident does NOT require an overnight stay to qualify as an admission (Refer to Attachment 1, Detailed Description of Reports Requiring Submittal or Notification Within 5 Days or Less, Steps 7.a and 7.b).

7.8.2. Any other accident resulting from electrical contact and considered significant by the utility (Refer to Attachment 1, Detailed Description of Reports Requiring Submittal or Notification Within 5 Days or Less, Steps 7.a and 7.b).

7.8.3. A fatality or injury that results in an overnight hospitalization.

7.9. Electrical Supply Facility: Transmission and Distribution facilities, as well as, Callaway Energy Center switchyard. This includes Ameren Missouri power plants and Combustion Turbine Generator (CTG) sites.

7.10. ESF Systems: These systems include the Reactor Protection System (RPS), Emergency Core Cooling system (ECCS), Emergency Diesel Generators (EDG), Auxiliary Feedwater System (AFW), Emergency Service Water System (ESW), Containment heat removal and depressurization systems, and general Containment Isolation Signals affecting CIVs in more than one system.

7.11. Valid ESF Actuation: Actuations that result from "valid signals" or from intentional manual initiation, unless it is part of a preplanned test. Valid signals are those signals that are initiated in response to actual plant conditions or parameters satisfying the requirements for initiation of the safety function of the system. [Ref: 5.2.12]

7.12. Invalid ESF Actuations: Actuations that do NOT meet the criteria for being valid**.** Thus, invalid actuations include actuations that are NOT the result of valid signals or intentional manual actuations.

7.12.1. Invalid actuations include expected actuations as a result of pre-planned testing, instances where instrument drift, spurious signals, human error, or other invalid signals cause actuation of the ESF (e.g., jarring a cabinet, an error in use of jumpers or lifted leads, an error in actuation of switches or controls, equipment failure, or radio frequency interference).

7.12.2. Invalid actuations include those that are initiated from non-ESF circuitry. Refer to NUREG 1022 Rev. 3, Section 3.2.6.

7.13. Special Nuclear Material: Plutonium Pu-239, Uranium-233, Uranium enriched in the isotope 233 or in the isotope 235, or any material artificially enriched by any of the foregoing which is not source material.

7.14. Licensed Material: Source Material, Special Nuclear Material, or by-product material governed by a general or specific license issued by a regulatory agency.

7.15. Accelerated NRC Call: A call to the NRC Operations Center using the ENS phone to notify them within approximately 15 minutes following the discovery of an imminent threat or attack against the station.

7.16. Greater-Than-Class-C (GTCC) Waste: Radioactive waste for near surface disposal which exceeds the thresholds of Class C waste, as defined by 10CFR61.55.

-END OF SECTION-

8.0 SUMMARY OF CHANGES

Page(s)	Section or Step Number	Description
		Changes listed below are per Regulatory Affairs markup based upon CR 201608339-001 unless noted otherwise. Any minor additional changes are in accordance with Procedure Writers Manual.
	Throughout	Changed CAR to CR, as applicable.
3	3.2 and Attachment 2 Sheet 2	Changed title from "Vice President – Nuclear Operations (VPN)" to "Site Vice President (VPN)". (Ref. CAR 201601039, Action 2).
11	5.2.15	Added NEIL Loss Control Manual to Developmental References.
	Attachment 1 Sheet 20	In Step 7.o: deleted old sub-items 3, 5, and 6. Added NFPA 805 required systems impaired as item4.
	Attachment 1 Sheet 22-23	In Step 10.d through 10.h: changed NEIL 8-1.x to applicable NEIL LCM number.
	Attachment 1 Sheet 22	In Step 10.d: changed "the loss control representative" to "NEIL members". Changed "NEIL management" to "NEIL".
	Attachment 1 Sheet 23	Swapped order of 10.f and 10.g.
	Attachment 1 Sheet 23	In Step 10.h: deleted "or water induction possibilities". Rewrote remainder.
	Attachment 1 Sheet 23	Inserted new NEIL Step 10.i (Turbine operation with failed safety devices) and NEIL Step 10.j (Exceeding Turbine backpressure limits).
	Attachment 2 Sheet 10	Revised all NEIL Sections to LCM numbers. Swapped order of item 29 and 30. In item 31: changed 48 hours to 7 days. Revised remarks for each item number to show NEIL website.
	Attachment 3 Sheet 3	Revised all NEIL Sections to LCM numbers. Swapped order of item 20, 21, and 22. In item 23: changed 48 hours to 7 days. Revised remarks for each item number to show NEIL website.
	Attachment 3 Sheet 4	Revised NEIL Section to LCM numbers. Revised remarks to show NEIL website.
	Attachment 4 Sheet 5	In left-hand column, 5th box: changed 48 hours to 7 days.
	Attachment 4 Sheet 7	Changed "Immediately notify" to "Promptly notify". (throughout)

Attachment 1

Detailed Description of Reports Requiring Submittal or Notification Within 5 Days or Less

Sheet 1 of 27

TABLE OF CONTENTS

Section | Attachment Page Number

NOTE

For the 10 CFR Part 72 non-emergency events specified in this section (4-hr, 8-hr, and 24-hr reports), the NRC reporting requirements are applicable for those events that occurred **within 3 years** of the date of discovery.

1. 15 Minute Report 2
2. 30 Minute Report 3
3. 1 Hour Reports 4
4. 2 Hour Reports 7
5. 4 Hour Reports 7
6. 8 Hour Reports 10
7. 24 Hour Reports/1 Working Day 15
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 INFORMATION USE

Attachment 1 (Cont'd.)

Sheet 2 of 27

NOTE

For the 10 CFR Part 72 non-emergency events specified in this section (4-hr, 8-hr, and 24-hr reports), the NRC reporting requirements are applicable for those events that occurred **within 3 years** of the date of discovery.

1. 15 Minute Report

   a. Emergency classification declaration – 10CFR50, Appendix E, Section iv (D) (3).

      1) State/Local governmental agencies – Notification in accordance with Emergency Plan upon the declaration of any emergency classification.

      2) Notify the NRC as soon as possible and in all cases within 1 hour. Refer to Step 3.c for additional reporting requirements associated with Emergency Classifications. This step should be referenced, even if the conditions warranting declaration of an Emergency Classification are no longer present.

   b. Accelerated NRC Call

NOTE

These actions are required following discovery of an imminent threat or attack against the station.

The Accelerated Notification to the NRC is to allow the NRC to warn other licensees and initiate Federal response in accordance with the National Response Plan.

This Accelerated Notification is NOT to interfere with plant OR personnel safety OR physical security response.

This call is meant to be very brief and limited to the following information only.

CALL the NRC Operations Center within approximately 15 minutes of discovery of security event using the ENS phone and PROVIDE the following information:

1) Site Name (Callaway).

2) Emergency Classification (If it has been determined prior to the accelerated call.)

Attachment 1 (Cont'd.)

Sheet 3 of 27

Step 1 Cont'd

3) Nature of the threat. (Briefly describe, if known, including the type of attack and attack status.)
   - Armed assault by land
   - Armed assault by aircraft
   - Imminent attack
   - Attack in progress
   - Attack repelled

2. 30 Minute Report

   a. FAA - Cooling tower light failure, or CAL-Bland transmission line towers 25 and 26 tower light failure, or Microwave Tower – AC 70/7460 Section 23.

      1) Federal Aviation Administration – Notification required to Transmission Dispatcher for any failure or malfunction of a top steady burning light, or flashing obstruction light lasting more than 30 minutes. Provide estimated return to service date.

      2) The Transmission Dispatcher should be notified if the return to service date will not be met and when the lights are actually returned to service.

      3) Failures/malfunctions of steady burning side or intermediate lights are not reportable. This notification does NOT require NRC notification as specified in 10CFR50.72 (b)(2)(xi), or Step 5.e.

      4) Refer to NUREG 1022, Revision 3, Section 3.2.12, Example 7, for further clarification.

Attachment 1 (Cont'd.)

Sheet 4 of 27

3. 1 Hour Reports

a. NPDES – Release of any unplanned or uncontrolled liquid radioactive release that involves offsite release of liquid radioactive material. NPDES Permit MO-0098001 C. Special Conditions 5.e.

1) Notify State Emergency Response Commission (SERC)
2) Missouri DNR Notification required for any unplanned/uncontrolled liquid radioactive releases which are reported to the NRC pursuant to the reporting requirements of 10CFR50.72 and/or 10CFR20.2203.
3) Refer to Steps 5.e, 10.n, 10.o, 10.p, and 10.q

b. FFD –NRC employee unfit for duty – 10CFR26.77(c)

1) NRC Regional Administrator – Notification required when a reasonable belief exists that an NRC employee or NRC contractor may be under the influence of any substance, or otherwise unfit for duty. This notification should be followed up by written notification to document the oral notification.
2) If the NRC Regional Administrator cannot be reached, notification should be directed to the NRC Operations Center.

NOTE

The individual should not be denied access to the facility. Instead, ensure individual remains under escort.

c. Immediate Notification – Emergency classification declaration – 10CFR50.72(a)(1)(i), 10CFR72.75(a)

1) NRC Operations Center – Notification in accordance with Emergency Plan upon the declaration of any Emergency Classification.
2) If conditions warranting declaration of the Emergency Classification no longer exist, and a declaration/notification was not made to governmental agencies, then notify the NRC Operations Center of the undeclared event within 1 hour of discovery of the undeclared event.
3) If the event occurred within 3 years of the date of discovery, even if it no longer exists, a report to the NRC in accordance with 10CFR50.72(a)(1)(i) is still required.
4) For Part 50 notifications, refer to NUREG 1022, Revision 3, Section 3.1.1, for additional guidance.
5) For Part 72 notifications, refer to 10CFR72.75(e) and 10CFR72.75(f), for additional guidance.

Attachment 1 (Cont'd.)

Sheet 5 of 27

Step 3 Cont'd

d. Immediate Notification – Technical Specification deviation authorized pursuant to 10CFR50.54(x) – 10CFR50.72(b)(1)

1) NRC Operations Center – Notification required when 10CFR50.54(x) is invoked to allow departure from a license condition or a technical specification requirement in order to provide immediate protection for personnel/public health and safety.

2) If the event occurred within 3 years of the date of discovery, even if it no longer exists, a report to the NRC in accordance with 10CFR50.72(b)(1) is still required.

3) Refer to NUREG 1022, Revision 3, Section 3.2.3, for additional guidance.

e. Radiation levels exceeded on incoming packages of radioactive material – 10CFR20.1906(d)

1) Notification is required to the following, when incoming packages exhibit removable radioactive surface contamination/external radiation levels which exceed the limits of 10CFR71.87(i)/10CFR71.47, as described within HDP-ZZ-03000 Appendix E, Receipt Of Radioactive Material Surveys:

- NRC Operations Center
- Final delivery carrier

2) Refer to Step 10.a for possible additional reporting criteria.

f. Radiation over-exposure to individual or Excessive levels and concentrations of radioactivity (5 x limits) – 10CFR20.2202(a)

1) NRC Operations Center – Notification required of events involving by-product, source, or Special Nuclear Material possessed by the licensee that may have caused, or threatens to cause, either of the following conditions:

   a) An individual to receive:

      - A total effective dose equivalent of 25 REMs or more, or
      - A lens dose equivalent of 75 REMs or more, or
      - A shallow-dose equivalent to the skin/extremities of 250 Rads.

   b) The release of radioactive material, inside or outside of a restricted area, so that, had an individual been present for 24 hours, the individual could have received an intake five times the annual limit on intake (provisions of this requirement do not apply to locations where personnel are not normally stationed during routine operations).

2) Refer to Step 9.h for additional reporting criteria associated with lower individual exposure levels.

3) Refer to Step 3.a for additional reporting criteria associated with the release of liquid radioactive material.

4) Refer to Step 10.c for additional reporting criteria associated with hot particle over exposure.

Attachment 1 (Cont'd.)

Step 3 Cont'd

g. Safeguards events report– 10CFR73.71

1) NRC Operations Center – Notification required for any safeguards related events meeting the reporting criteria of 10CFR73.71, as described within 10CFR73, Appendix G. A written report is also required to be submitted within 60 days of the notification.

2) SDP-SF-00022, Reporting Of Safeguards Events, contains detailed criteria for events meeting this reporting criteria, and should be referenced when determining reportability per this regulation. Generally, events meeting this reporting criteria are those involving:

- An individual has committed, attempted, or credibly threatened a theft of Special Nuclear Material, significant physical damage to the facility, or interruption in normal operation through unauthorized use of plant equipment,
- Unauthorized entry of personnel into protected/vital areas,
- Failure, degradation, or vulnerability of safeguards systems which could allow unauthorized access to a protected area for which compensatory measures have not been employed, or
- Introduction of contraband into a protected area.

h. SNM – Loss, or theft/attempted theft of Special Nuclear Material – 10CFR70.52, 10CFR72.74 (a), 10CFR73.71, 10CFR74.11

1) NRC Operations Center – Notification required for any incident involving the loss, theft, or attempted theft of Special Nuclear Material.

2) Refer to Steps 3.g and 5.a for additional reporting criteria associated with the theft of Special Nuclear Material.

i. SNM – Accidental Criticality – 10CFR70.52(a)

NRC Operations Center – Notification required after discovery of any case of Accidental Criticality.

j. Cyber Security - Cyber Attack - 10 CFR 73.77(a)(1)

1) Within one hour after discovery of a cyber attack **that adversely impacted** safety-related or important-to-safety functions, security functions, or emergency preparedness functions (including offsite communications); or that compromised support systems and equipment resulting in adverse impacts to safety, security, or emergency preparedness functions within the scope of 10 CFR 73.54. A written report is also required to be submitted within 60 days of the notification.

2) Additional guidance provided in procedure EDP-ZZ-01108 Addendum 5 Attachment 1, Cyber Security Event Communication and Reporting Plan.

3) Potentially reportable as a 1-hour safeguards event (security report) - refer to Step 3.g

4) Refer to Step 3.c in the event that an emergency is declared.

Attachment 1 (Cont'd.)

4. 2 Hour Reports

   a. Deleted.

5. 4 Hour Reports

   a. Theft or loss of licensed material – 10CFR20.2201(a)(1)(i)

      1) NRC Operations Center – Notification required for any lost, stolen, or missing licensed material, in an aggregate quantity equal to/greater than 1,000 times the quantity specified in 10CFR20, Appendix C, which could result in exposures of personnel in unrestricted areas**.**

      2) Refer to Steps 3.g and 3.h for additional reporting criteria associated with the theft of Special Nuclear Material**.**

   b. Immediate Notification – Plant shutdown required by Technical Specification – 10CFR50.72(b)(2)(i)

      1) NRC Operations Center – Notification required for the initiation of a plant shutdown which is required by Technical Specifications.

      2) Initiation of a plant shutdown includes actions to start reducing reactor power (i.e., any addition of negative reactivity in response to achieving a plant shutdown required by Technical Specifications).

      3) Voluntary plant shutdowns are not reportable if the condition could have been corrected within the allowed outage time specified within the Technical Specifications.

      4) If the event occurred within 3 years of the date of discovery, even if it no longer exists, a report to the NRC in accordance with 10CFR50.72(b)(2)(i) is still required.

      5) Refer to NUREG 1022, Revision 3, Section 3.2.1, for additional guidance.

   c. Immediate Notification – RPS actuation while the reactor is critical – 10CFR50.72(b)(2)(iv)(B)

      1) NRC Operations Center – Notification required for any RPS actuation that occurs while the reactor is critical.

      2) Both valid and invalid actuations are reportable under these criteria. Actuations which occur as part of a pre-planned sequence during testing/operation are not reportable per this criteria.

      3) If the event occurred within 3 years of the date of discovery, even if it no longer exists, a report to the NRC in accordance with 10CFR50.72(b)(2)(iv)(B) is still required.

      4) Refer to NUREG 1022, Revision 3, Section 3.2.6, for additional guidance.

Attachment 1 (Cont'd.)

Step 5 Cont'd

d. Immediate Notification – ECCS actuation that results (should have resulted) in a discharge to the RCS – 10CFR50.72(b)(2)(iv)(A)

1) NRC Operations Center – Notification required for any ECCS actuation that occurs as a result of a valid signal which results, or should have resulted, in a discharge to the reactor coolant system.

2) Valid signals are those that have been initiated in response to actual plant conditions which satisfy the requirements for actuating the safety function of the system. Intentional manual actuations which are in response to actual plant conditions also meet this reporting criteria. Actuations that occur as part of a pre-planned sequence during testing/operation are not reportable per this criterion. [Ref: 5.2.12]

3) If the event occurred within 3 years of the date of discovery, even if it no longer exists, a report to the NRC in accordance with 10CFR50.72(b)(2)(iv)(A) is still required.

4) Refer to NUREG 1022, Revision 3, Section 3.2.6, for additional guidance.

e. Immediate Notification – News releases or notifications to other governmental agencies – 10CFR50.72(b)(2)(xi), 10CFR72.75(b)(2)

1) NRC Operations Center – Notification required for any news releases or other governmental notifications which will occur as a result of a situation related to the health and safety of the general public/onsite personnel, or the protection of the environment. Other governmental notifications include local, state, and other federal agencies.

2) The purpose of this criterion is to ensure the NRC is aware of issues that could cause heightened public or governmental concerns with respect to public/onsite personnel health and safety, or protection of the environment.

3) In general, abnormal radioactive effluent releases and onsite fatalities meet this reporting criterion. Minor, non-radioactive spills and minor deviations in sewage effluents do not meet this reporting criterion.

4) If the event occurred within 3 years of the date of discovery, even if it no longer exists, a report to the NRC in accordance with 10CFR50.72(b)(2)(xi) is still required.

5) For Part 50 notifications, refer to NUREG 1022, Revision 3, Section 3.2.12, which provides discussions and examples to assist in determining the threshold for reporting under this criterion.

6) For Part 72 notifications, refer to 10CFR72.75(e) and 10CFR72.75(f), for additional guidance.

Attachment 1 (Cont'd.)

Sheet 9 of 27

Step 5 Cont'd

f. Immediate Notification – HI-STORM UMAX Technical Specification or Certificate of Compliance departure – 10CFR72.75(b)(1)

1) NRC Operations Center – Notification required when 10CFR72.75(b)(1) is invoked to take action in an emergency that departs from a license condition or a technical specification contained in the HI-STORM UMAX Certificate of Compliance (CoC) in order to provide immediate protection for personnel/public health and safety.

2) Refer to 10CFR72.75(e) and 10CFR72.75(f), for additional guidance on initial reporting.

3) **Follow up notification** - Submission of a written report is required **within 60 days** of initial notification per 10CFR72.75(g).

   - The Commission may require supplemental information beyond that required by 10CFR72.75(g). If so, a report to the NRC is submitted in accordance with 10CFR72.75(h).

g. Cyber Security - Cyber Attack - 10 CFR 73.77(a)(2)

1) Within four hours after discovery of a cyber attack **that could have caused, but did not cause**, an adverse impact to safety-related or important- to-safety functions, security functions, or emergency preparedness functions (including offsite communications); or that could have compromised support systems and equipment, which IF compromised, could have adversely impacted safety, security, or emergency preparedness functions within the scope of 10 CFR 73.54. A written report is also required to be submitted within 60 days of the notification.

2) Within four hours after discovery of a **suspected or actual** cyber attack initiated by personnel with physical or electronic access to digital computer and communication systems and networks within the scope of 10 CFR 73.54. A written report is also required to be submitted within 60 days of the notification.

3) Within four hours after notification of a local, state, or other federal agency (e.g., law enforcement, Federal Bureau of Investigation) of an event related to the licensee's implementation of their cyber security program for digital computer and communication systems and networks within the scope of 10 CFR 73.54 that does NOT otherwise require a notification under 10 CFR 73.77(a).

4) Additional guidance provided in procedure EDP-ZZ-01108 Addendum 5 Attachment 1, Cyber Security Event Communication and Reporting Plan.

Attachment 1 (Cont'd.)

6. 8 Hour Reports

   a. Immediate Notification – Nuclear power plant in unanalyzed condition that significantly degrades plant safety – 10CFR50.72(b)(3)(ii)(B)

      1) NRC Operations Center – Notification required upon the discovery of an unanalyzed condition which could compromise plant safety, or could impact a system's ability to perform an intended design safety function. Examples of conditions that meet this reporting criterion include:

         - Discovery of the potential accumulation of voids under natural circulation conditions which could inhibit adequate heat removal capabilities,
         - Discovery of a system not meeting required single failure criteria, and
         - Discovery of a loss of separation between redundant safe shutdown trains due to a missing fire barrier.

      2) If the event occurred within 3 years of the date of discovery, even if it no longer exists, a report to the NRC in accordance with 10CFR50.72(b)(3)(ii)(B) is still required.

      3) Refer to NUREG 1022, Revision 3, Section 3.2.4, for additional guidance.

   b. Immediate Notification – Nuclear plant, including principal safety barriers, seriously degraded – 10CFR50.72(b)(3)(ii)(A)

      1) NRC Operations Center – Notification required for material problems causing abnormal degradation of a principal safety barrier (fuel cladding, RCS pressure boundary, containment). Abnormal stresses placed upon a principal safety barrier are also reportable under this criterion. Examples of conditions that meet this reporting criterion include:

         - Unique/widespread/unexpected fuel cladding failures,
         - Unacceptable welding defects within primary coolant system,
         - Serious steam generator tube degradation, T/S A/C 5.5.9
         - Violation of RCS pressure/temperature limitations, and
         - Loss of containment function integrity.

      2) If the event occurred within 3 years of the date of discovery, even if it no longer exists, a report to the NRC in accordance with 10CFR50.72(b)(3)(ii)(A) is still required.

      3) Refer to NUREG 1022, Revision 3, Section 3.2.4, for additional guidance.

Attachment 1 (Cont'd.)

Step 6 Cont'd

c. Immediate Notification – Valid system actuation – 10CFR50.72(b)(3)(iv)(A)

1) NRC Operations Center – Notification required upon a valid actuation of any of the below listed systems:
   - Reactor Protection System (valid actuations, while the reactor is critical, are reported as a 4 hour notification, reference Step 5.c),
   - General containment isolation signals affecting containment isolation valves in more than one system or multiple Main Steam Isolation Valves,
   - Emergency core cooling systems,
   - Auxiliary feedwater system,
   - Containment heat removal and depressurization systems, including containment spray and fan cooler systems, and
   - Emergency diesel generators
2) In general, anytime one of the above listed systems, or a major component within one of the above listed systems, is actuated/operated outside of a pre-planned evolution, this criteria should be evaluated.
3) Valid and invalid actuations of the above listed components are reportable, only valid actuations are reportable to the NRC Operations Center as an 8-hour notification under this reporting criterion.
4) Valid signals are those that are initiated in response to actual plant conditions that satisfy the requirement for actuating the safety function of the system. Valid actuations are those which result from valid signals, or from intentional manual initiation in response to actual plant conditions.
5) Valid ECCS actuations are reportable as a 4-hour notification as outlined within Step 5.d.
6) Invalid RPS actuations are reportable as a 4-hour notification as outlined within Step 5.c.
7) Single component actuations may be reportable under this criteria, if the component was capable of sufficiently mitigating the consequences of an event (i.e., emergency diesel generator, ECCS/auxiliary feedwater pump).
8) Actuation of a multi channel system is defined as the actuation of enough channels to complete the minimum actuation logic.
9) Actuations that occur as part of a pre-planned sequence during testing/operation are NOT reportable per this criterion.
10) If the event occurred within 3 years of the date of discovery, even if it no longer exists, a report to the NRC in accordance with 10CFR50.72(b)(3)(iv)(A) is still required.
11) Refer to NUREG 1022, Revision 3, Section 3.2.6, which provides detailed discussions and examples regarding the types of events reportable under this criterion.

Attachment 1 (Cont'd.)

Sheet 12 of 27

Step 6 Cont'd

d. Immediate Notification – Event or condition that could have prevented fulfillment of a safety function – 10CFR50.72(b)(3)(v)

1) NRC Operations Center – Notification required upon discovery of any event or condition that, at the time of discovery, could have prevented the fulfillment of the safety function of a system needed to:

- Shutdown the reactor and maintain it in a safe shutdown condition,
- Remove residual heat,
- Control the release of radioactive material, or
- Mitigate the consequences of an accident.

2) NUREG 1022, Revision 3, Section 3.2.7, provides detailed discussions and examples regarding the types of events reportable under these criteria. In general, if a reasonable expectation exists at the time of discovery that fulfillment of a safety function would be prevented, the event is reportable under this criteria.

3) These criteria are intended to cover events where a safety system (not an individual train within a system) could have failed to perform its intended function due to personnel errors, equipment failures, inadequate maintenance, design/analysis deficiencies, equipment qualification, procedural deficiencies, and/or unavailability of either all offsite power or all onsite emergency power. Reporting per these criteria is required regardless of whether an actual demand was present at the time of the failure. Some typical situations that would be reportable per these criteria include:

- Single failure/cause that disables multiple trains of a system,
- One system train disabled and (1) the underlying cause which disabled the train could have failed a redundant train, and (2) a reasonable expectation exists the redundant train would not have completed its safety function,
- Multiple system trains disabled simultaneously for dissimilar reasons.

4) The term "reasonable expectation" is utilized throughout the guidance contained within NUREG 1022, and should be taken into consideration when evaluating reporting criteria.

5) If the event occurred within 3 years of the date of discovery, even if it no longer exists, a report to the NRC in accordance with 10CFR50.72(b)(3)(v) is still required.

e. Immediate Notification – Transport of potentially contaminated personnel offsite – 10CFR50.72(b)(3)(xii)

1) NRC Operations Center – Notification required upon transporting a radioactively contaminated/potentially radioactively contaminated individual to an offsite medical facility.

2) Refer to Steps 7.a, 9.k, and 9.a for additional reporting criteria associated with personnel injury incidents.

Attachment 1 (Cont'd.)

Sheet 13 of 27

Step 6 Cont'd

3) If the event occurred within 3 years of the date of discovery, even if it no longer exists, a report to the NRC in accordance with 10CFR50.72(b)(3)(xii) is still required.

4) Refer to NUREG 1022, Revision 3, Section 3.2.11, for additional guidance.

f. Immediate Notification – Loss of emergency assessment capability, offsite response capability, or offsite communications capability – 10CFR50.72(b)(3)(xiii)

1) NRC Operations Center – Notification required for events resulting in a major loss of emergency assessment capability, offsite response capability, or offsite communications capability. Purpose of this criterion is to inform the NRC of events that could impair a licensee's ability to manage an accident or emergency. The following provides generalized guidance:

NOTE

Loss of the plant computer by itself is not a major loss of assessment capability due to the compensatory measures outlined in OTO-RJ-00001, Loss of Plant Computer, and EIP-ZZ-01211, Accident Dose Assessment.

a) Loss of emergency assessment capability – Situations in which a significant impairment exists for assessing plant conditions. This includes the loss of a significant portion of control room indications and/or annunciation, or the loss of all indications associated with assessing one aspect of an accident condition, i.e., Emergency Action Level.

NOTE

NUREG-1022 Revision 3 states that “major losses” of primary public alerting systems lasting longer than 1 hour should be reported.

b) Loss of offsite response capability – Situations which could significantly impair the fulfillment of the Emergency Plan for other than a short period of time. Such situations could include the loss of plant access, impairment of evacuation routes, the loss of emergency response facilities, or the loss of public notification systems.

Callaway Emergency Preparedness Department has determined that the “major loss” threshold for Callaway Energy Center’s 29 sirens is as follows (Ref. 5.1.16):

(1) A loss of any ten or more sirens or,

(2) A loss of any four or more of the following sirens (12 total): 1, 2, 3, 4, 5, 6, 13, 14, 15, 16, 22, 23.

Attachment 1 (Cont'd.)

Step 6 Cont'd

> **NOTE**
>
> Although the NRC Operations Center should always be notified of any failures of NRC communication systems (ENS/ERDS), a single failure of any of these systems may not warrant reporting pursuant to this criteria.

2) Loss of communication capability – Situations in which a significant impairment of communications capability exists. Such situations could include the loss of the Emergency Notification System (ENS) and/or other offsite communication systems (dedicated communication links to state/local agencies, communication links to emergency response facilities, and commercial telephone lines).
   a) The intent of this requirement is to report conditions in which the telecommunications systems can no longer fulfill the communication requirements of the emergency plan.
   b) Refer to NUREG 1022, Revision 3, Section 3.2.13, for additional guidance.
3) If the event occurred within 3 years of the date of discovery, even if it no longer exists, a report to the NRC in accordance with 10CFR50.72(b)(3)(xiii) is still required.

g. <u>OSHA – Fatality incidents –29CFR1904.39(a)(1)</u>

1) Occupational Safety and Health Administration – Notification required for any work-related incident which results in an employee fatality (including heart attack). This requirement applies to each such fatality that occurs within 30 days of the incident.
2) Refer to Steps 5.e, 7.e, 7.a, 9.j.2), 9.k, and 9.a for additional reporting criteria associated with the reporting of personnel injury incidents.

h. <u>Immediate Notification – Spent Fuel Condition – 10CFR72.75(c)</u>

1) NRC Operations Center – Notification required upon discovery of any of the following events or conditions involving spent fuel, or reactor-related Greater-Than-Class-C (GTCC) waste:
   a) A defect in any spent fuel, or reactor-related GTCC waste storage structure, system, or component that is important to safety
   b) A significant reduction in the effectiveness of any spent fuel, or reactor-related GTCC waste storage confinement system during use.
   c) Any event requiring the transport of a radioactively contaminated person to an offsite medical facility for treatment.
2) Refer to 10CFR72.75(e) and 10CFR72.75(f), for additional guidance on initial reporting.

 INFORMATION USE

Attachment 1 (Cont'd.)

Sheet 15 of 27

Step 6 Cont'd

1) **Follow-up notification** - Submission of a written report is required **within 60 days** of initial notification per 10CFR72.75(g).

   - The Commission may require supplemental information beyond that required by 10CFR72.75(g). If so, a report to the NRC is submitted in accordance with 10CFR72.75(h).

i. Cyber Security - Intelligence Gathering - 10 CFR 73.77(a)(3)

1) Within eight hours after receipt or collection of information regarding observed behavior, activities, or statements that may indicate intelligence gathering or pre-operational planning related to a cyber attack against digital computer, and communication systems and networks that fall within the scope of 10 CFR 73.54.

2) Additional guidance provided in procedure EDP-ZZ-01108 Addendum 5 Attachment 1, Cyber Security Event Communication and Reporting Plan.

7. 24 Hour Reports

a. Accident - Fatality, serious injury, or property damages greater than $200,000 – 4CSR240-3.190 (3) (A)

1) Missouri Public Service Commission – Notification required for any accident at the plant involving serious physical injury or fatality, or property damages greater than $200,000.

   - An unexpected equipment failure
   - Unexpected personnel failure (e.g., sudden illness, injury, fatality, etc)
   - Unintentional/improper use of equipment resulting in injury/property damage

2) Refer to Steps 5.e, 7.e, 8.f.2)b), and 9.a for additional reporting criteria associated with the reporting of personnel injury incidents.

b. Accident – Fatality, serious injury resulting from contact with energized electrical supply facilities – 4CSR240-3.190 (4)

1) Missouri Public Service Commission – Notification required for any accident at the plant, at a location where the plant supplies power, or at a location where the plant operates energized electrical supply facilities involving serious physical injury or fatality from contact with energized electrical supply facilities and which results in admission to a hospital even if source is on customer's side of the meter. Notification also required for contact with energized electrical supply that is considered significant by utility or rural electric cooperative.

2) Refer to Steps 5.d, 7.e, 8.f.2)b), 7.a, and 9.a for additional reporting criteria associated with the reporting of personnel injury accidents.

Attachment 1 (Cont'd.)

Step 7 Cont'd

c. <u>Environmental – Report of events of significant environmental impact– Environmental Protection Plan Section 4.1</u>

1) NRC Region IV Office – Notification required for events that result, or could result, in a significant environmental impact casually related to plant operation. Such events could include excessive bird impaction events, onsite plant or animal disease outbreaks, mortality or unusual occurrence of any species protected by the Endangered Species Act of 1973, fish kills, increase in nuisance organisms or conditions, or unanticipated/emergency discharge of waste water or chemical substances.

2) Refer to Steps 3.a, 8.c, 9.d, 10.o, 10.p, and 10.q for other potential reports.

3) Refer to Step 5.e for circumstances in which the NRC Operations Center may require notification of such events.

d. <u>FFD – Fitness for duty events – 10CFR26.719</u>

1) NRC Operations Center – Notification required following the occurrence of any significant fitness for duty event, including:

   a) The use, sale, distribution, possession, or presence of illegal drugs, or the consumption or presence of alcohol within the protected area, or

   b) Any acts by personnel licensed under 10CFR55 to operate a power reactor, as well as any acts by Strategic Special Nuclear Material (SSNM) transporters, FFD program personnel, or any supervisory personnel assigned to perform duties within the scope of this part,

      (1) Involving the use, sale, or possession of a controlled substance,

      (2) Resulting in a determination that the individual has violated the licensee’s or other entity’s FFD policy, or

      (3) Involving the consumption of alcohol within the protected area or while performing the duties that require the individual to be subject to the FFD program, or

   c) Any intentional act that casts doubt on the integrity of the FFD program, or

   d) Any programmatic failure, degradation, or discovered vulnerability of the FFD program that may permit undetected drug or alcohol use or abuse by individuals within the protected area, or by individuals who are assigned to perform duties that require them to be subject to the FFD program

2) NRC Document Control Desk – Notification required for any false positive error that occurs on a blind performance test sample submitted to an HHS-certified laboratory, or

3) NRC Document Control Desk – Notification required for any false negative error on a quality assurance check of validity screening tests

Attachment 1 (Cont'd.)

Step 7 Cont'd

e. Forced outages greater than 3 days duration – 4CSR240-3.190 (3) (B)

1) Missouri Public Service Commission – Notification required for any forced outages that could be reasonably anticipated to last longer than 3 days.
2) Refer to Step 5.e for additional reporting criteria associated with governmental notifications.

f. Loss of transmission system capability – 4CSR240-3.190 (3) (E)

1) Missouri Public Service Commission – Notification required in the event of the loss of transmission system capability which could limit the output of the plant.
2) Refer to Step 5.e for additional reporting criteria associated with governmental notifications.

g. NPDES Permit noncompliance's and violations – Standard Conditions for NPDES Permits, section B.2.B

> **NOTE**
> Bypasses that violate the permit by exceeding the Maximum Daily Effluent Limitations are reported via a 5-day written report

1) Missouri Department of Natural Resources – Notification required for any permit non-compliances that may endanger personal health or the environment.
2) Refer to Steps 3.a, 8.c, 9.d, 10.o, 10.p, and 10.q for other potential reports.
3) Refer to Step 5.e for additional reporting criteria associated with governmental notifications.

h. Radiation over-exposure to an individual; Excessive concentration of radioactivity – 10CFR20.2202(b)

1) NRC Operations Center– Notification required for events involving the loss of control of licensed material possessed by the licensee that may have caused, or threatens to cause, either of the following conditions:
   a) An individual to receive in a 24 hour period
      - A total effective dose equivalent exceeding 5 REMs, or
      - A lens dose equivalent exceeding 15 REMs, or
      - A shallow dose equivalent to the skin/extremities exceeding 50 REMs

Attachment 1 (Cont'd.)

Step 7 Cont'd

b) The release of radioactive material, inside or outside of a restricted area, so that, had an individual been present for 24 hours, the individual could have received an intake in excess of one occupational annual limit on intake (provisions of this requirement do NOT apply to locations where personnel are NOT normally stationed during routine operations).

2) Refer to Step 3.f for additional reporting criteria associated with higher individual exposure levels.

3) Refer to Step 10.p for additional reporting criteria associated with the release of liquid radioactive material.

4) Refer to Step 10.c if the exposure is the result of a hot particle.

i. <u>NERC – North American Reliability Council EOP-004 – AUE-ADM-2223</u>

1) Interface with AMEREN Energy and/or Generation Engineering to analyze Disturbance Reporting requirements (24 hour) as required by AUE-ADM-2223. [Ref: 5.1.12]

2) AUE-ADM-2223 Attachment A gives an example of a Disturbance Report.

j. <u>Spent Fuel Condition – 10CFR72.75(d)</u>

1) NRC Operations Center – Notification required upon discovery of any of the following events or conditions involving spent fuel, or reactor-related GTCC waste:

a) An event in which important to safety equipment is disabled or fails to function as designed when:

(1) The equipment is required by regulation, license condition, or certificate of compliance to be available and operable to prevent releases that could exceed regulatory limits, to prevent exposures to radiation or radioactive materials that could exceed regulatory limits, or to mitigate the consequences of an accident; and

(2) No redundant equipment was available and operable to perform the required safety function.

b) For notifications made under this paragraph, the licensee may delay the notification to the NRC if the end of the 24-hour period occurs outside the NRC's normal working day (i.e., 7:30 a.m. to 5:00 p.m. Eastern time), on a weekend, or a Federal holiday. In these cases, the licensee shall notify the NRC before 8:00 a.m. Eastern time on the next working day.

2) Refer to 10CFR72.75(e) and 10CFR72.75(f), for additional guidance on initial reporting.

3) <u>**Follow-up notification**</u> - Submission of a written report is required **within 60 days** of initial notification per 10CFR72.75(g).

- The Commission may require supplemental information beyond that required by 10CFR72.75(g). If so, a report to the NRC is submitted in accordance with 10CFR72.75(h).

Attachment 1 (Cont'd.)

Step 7 Cont'd

k. OSHA – Serious Personnel Injury – 29CFR1904.39(a)(2) and 29CFR1904.39(b)(6)

1) Occupational Safety and Health Administration – Notification required for any work-related incident which results in the in-patient hospitalization of one or more employee's or an employee's amputation or loss of an eye. This requirement applies to each such hospitalization that occurs within 24 hours of the incident.

2) Refer to Steps 5.e, 7.e, 8.g, 7.a, and 9.a for additional reporting criteria associated with the reporting of personnel injury incidents.

l. ISFSI Loading Conditions – HI-STORM UMAX CoC, Appendix B, Section 2.1

1) NRC Operations Center – Notification required if any of the Fuel Specifications or Loading Conditions in Section 2.1 of the HI-STORM UMAX CoC, Appendix B are violated.

2) **Follow-up notification** - Submission of a special report is required **within 30 days** of initial notification which describes the cause of the violation, and actions taken to restore compliance and prevent reoccurrence.

1 Working Day

m. NEI – Ground Water Protection Initiative

Informal communication required to the following for any onsite leak or spill into groundwater as required by HDP-ZZ-07000, Radiological Environmental Monitoring Program OR any onsite or offsite water sample results exceeding the limits of HDP-ZZ-07000, Radiological Environmental Monitoring Program:

1) Missouri Department of Natural Resources

2) Callaway County Presiding Commissioner

3) NRC Resident Inspector

4) NRC Region IV Office

n. National Source Tracking Transaction Report – 10CFR20.2207

A report must be filed after the manufacture, transfer, reception, disassembly, or disposal of a nationally tracked source. The report may be submitted online.

1) Refer to 10CFR20.2207 for additional guidance on information required in the report for specific actions taken.

Attachment 1 (Cont'd.)

Step 7 Cont'd

o. NEIL – Fire protection system impairments - NEIL LCM 5.1.7.2

Fire protection system impairments lasting more than 7 days and which will create any of the situations listed below require NEIL notification:

1) More than one Fire Water Pump impaired
2) Either Fire Water Tank impaired
3) Suppression system in Stores I or II impaired
4) NFPA 805 required systems impaired
5) Fire protection for major electronic equipment installations impaired (e.g., simulator, plant computers, etc.)

Refer to APA-ZZ-00701 for further guidance on Fire Protection Impairments.

8. 48 Hour Reports

a. Completeness and accuracy of information – 10CFR50.9(b)

NRC Region IV Regional Administrator – Notification required when information is identified as having, for the regulated activity, a significant implication for public health and safety, or common defense and security. This requirement is not applicable to information that is already required to be provided to the Commission by other reporting requirements.

b. Defective components, failure to comply/existence of a defect – 10CFR21.21(d)(3)

1) NRC Operations Center – Notification required for any non-compliances or defects which are within the scope of 10CFR, Part 21. This regulation addresses non-compliances with regulations, or potential material/component defects, which could create a substantial safety hazard.
2) The reporting requirements associated with 10CFR50.72 should also be reviewed when reviewing potential Part 21 non-compliances/defects. [Ref: 5.2.9]
3) Per this regulation, facsimile is the preferred method of initial notification to the NRC Operations Center.

Attachment 1 (Cont'd.)

Step 8 Cont'd

> **NOTE**
>
> The purpose of the additional 10CFR Part 21 evaluation and notification requirements described below is to ensure all affected parties are notified as intended by 10CFR21.

4) Callaway Energy Center internal guidance mandates that any non-compliance or defect reported in accordance with 10CFR50.72 must also be evaluated for additional reporting in accordance with 10CFR Part 21 notification.

2 Working Days

c. Drinking water regulation noncompliance – 10CSR60-7.010(2)

Missouri Department of Natural Resources – Notification required for any failure to comply with any drinking water regulation, including the failure to comply with monitoring requirements.

d. Part 70 – Air emission permit non-compliances during emergency/abnormal conditions – Operating Permit OP2008-045, general permit section 2.d.ii, Plant ID 027-0026

1) Missouri Department of Natural Resources – Notification required for any air emission permit non-compliances that are the result of operating plant equipment under emergency/abnormal operating conditions.

2) Refer to Step 10.m for additional reporting criteria associated with air emission permit non-compliances.

9. 5 Day Reports

a. Accident – Fatality, serious injury, or property damages greater than $200,000 –4CSR240-3.190(3)(A)

1) Missouri Public Service Commission – Written notification required for any accident at the plant involving serious physical injury or fatality, or property damages greater than $200,000.

2) This is a written follow-up notification for the 24 hour telephone notification outlined within Step 7.a.

b. Forced outages greater than 3 days duration – 4CSR240-3.190 (3)(B)

1) Missouri Public Service Commission – Written notification required for any forced outages that could be reasonably anticipated to last longer than 3 days.

2) This is a written follow-up notification for the 24 hour telephone notification outlined within Step 9.e.

Attachment 1 (Cont'd.)

Sheet 22 of 27

Step 9 Cont'd

c. Loss of transmission system capability – 4CSR240-3.190 (3)(E)

1) Missouri Public Service Commission – Written notification required for any event involving the loss of transmission system capability which could limit the output of the plant.

2) This is a written follow-up notification for the 24 hour telephone notification outlined within Step 9.f.

d. Non-Compliance with Daily Maximum Effluent Limitation – Standard Conditions for NPDES Permits, Section B.2.A

1) Missouri Department of Natural Resources – Written notification required for any non-compliance with any daily maximum effluent limitations specified within the NPDES permit. By DNR interpretation, any pollutant discharge from an unauthorized outfall is reportable under this part of the permit.

10. As Soon As Possible/Promptly

a. Bodily injury or property damage from possession/use of radioactive material resulting in indemnity claim – 10CFR140.6(a)

1) Director of Nuclear Reactor Regulation, or Director, Office of Federal and State Materials and Environmental Management Programs – Notification required in the event of bodily injury or property damage arising out of, or in connection with, the possession or use of radioactive material at the location, or in the course of transportation, or in the event any claim is made thereof.

2) Refer to Steps 3.f, 9.g.3), 9.a, and 10.c for other possible reporting requirements.

b. Financial protection, change in proof of – 10CFR140.15(e)

NRC Document Control Desk – Notification required for any material change in proof of financial protection or in other financial information filed with the NRC under this regulation.

c. Hot Particle contamination – ANI/MAELU, 10CFR20.1201

1) Notify ANI/MAELU of any overexposures as soon as practical.

2) Refer to Steps 3.f, 9.g.3), and 10.p for other over-exposure requirements.

d. NEIL – Possible deductible loss – NEIL LCM 2.1.3

If in the judgment of NEIL members, a condition exists in which equipment is being operated in distress, equipment is operating with a known defect which significantly increases NEIL's exposure to loss, or conditions are observed that require immediate action, the loss control representative must immediately notify NEIL of the conditions observed.

Attachment 1 (Cont'd.)

Step 10 Cont'd

e. NEIL - Conditions which could cause excessive damage and/or outage duration – NEIL LCM 2.1.3.1

Notification required for any condition which, if allowed to continue uncorrected, could cause physical damage in excess of $500,000, or result in an outage duration longer than 10 weeks (excluding refueling and maintenance outages).

f. NEIL – Rotating equipment vibration levels which exceed guidelines – NEIL LCM 2.1.3.2

Notification required for any rotating equipment vibration levels that exceed NEIL vibration guidelines.

g. NEIL – Transformer oil analyses which exceed IEEE limitations – NEIL LCM 2.1.3.3

Notification required for any transformer oil test results which exceed IEEE limitations by greater than 10%.

h. NEIL – Turbine-Generator cracks – NEIL LCM 2.1.3.4

Discovery of crack indications in turbine blades, blade attachments, and associated hardware.

i. NEIL – Turbine Operation with failed safety devices – NEIL LCM 2.1.3.5

Continued operation with failed or defeated safety devices (except those undergoing routine maintenance or calibration), which could lead to a turbine water induction incident or turbine overspeed event.

j. NEIL – Exceeding Turbine Back Pressure limits – NEIL LCM 2.1.3.6

Exceeding the turbine manufacturer's limits for back pressure.

k. NEIL – Incident report damage or Activation of FP system – NEIL LCM 1.8.1
Any fire involving activation or malfunction of a fixed fire extinguishing or detection system or any physical damage loss in excess of $100,000.

l. Outage – Change in planned outage schedule – 4CSR240-3.190(1)(G)

1) Missouri Public Service Commission – Notification required when changes occur in a planned outage schedule which result in the planned outage schedule being different from that submitted in the most recent monthly report.

2) This notification is required prior to the initiation of any such outage.

m. Part 70 operating permit deviations –Operating Permit OP2008-045, general permit section 2.d.ii, Plant ID 027-0026

1) Missouri Department of Natural Resources – Notification required for any air emission permit non-compliances that may endanger public health and safety, or the environment.

2) Refer to Step 5.e and Step 8.d for additional reporting criteria associated with air emission permit non-compliances.

Attachment 1 (Cont'd.)

Sheet 24 of 27

Step 10 Cont'd

n. Waste – Revision notice of shipment of nuclear waste – 10CFR71.97(e)

> **NOTE**
>
> This regulation requires the name of the individual contacted to be maintained in record by the licensee for a period of 3 years.

1) Office of the Governor – Notification required for situations in which previously furnished schedule information regarding the shipment of nuclear waste will not be met.
2) Information included within this notification should include the extent of delay beyond the schedule originally reported.

o. UST – Release from an underground storage tank – 10CSR26-2.050 and 40 CFR 280.61

1) Missouri Department of Natural Resources – Notification required for any release from an underground storage tank.
2) Per 40 CFR 280.61, within 24 hours of a release from an underground storage tank containing petroleum or hazardous substances, report the release to the implementing agency (MO DNR).
3) Notify AMEREN SPILL LINE immediately, whose personnel will then determine further reportability requirements and make necessary notifications to all agencies except the NRC.
4) Refer to Steps 3.a, 5.e, 8.c, 9.g, and 9.d, for additional reporting criteria.

p. Toxic pollutant discharge – NPDES Permit No. MO-0098001

Discharge of any toxic pollutant which is not limited in the NPDES Permit

1) Including 5 times the maximum concentration value reported in the permit application
2) Any toxic pollutant that has begun to or is expected to begin being manufactured that was not reported in the permit application. (NPDES Permit C. Special Conditions 6(a)&(b))
   a) Notify Director of the Missouri Department of Natural Resources Water Protection Program
   b) Refer to steps 3.a, 5.e, 10.o, 10.p, and 10.q

Attachment 1 (Cont'd.)

Step 10 Cont'd

q. Release of oil – 40CFR112

1) Notify AMEREN SPILL LINE for the following conditions immediately, whose personnel will then determine further reportability requirements and make necessary notifications to all agencies except the NRC:

   a) Causing an oil sheen on surface water or navigable waters

   b) ≥50 gallons of oil released where a portion leaves Ameren property

   c) ≥300 cubic feet of natural gas where a portion leaves Ameren property

   d) Notification required to the following:

      (1) National Response Center (NaRC)

      (2) State Emergency Response Commission (SERC)

   e) Refer to APA-ZZ-00811, Hazardous Chemical/Oil Spill Prevention Control and Countermeasure Plan, for additional guidance on hazardous substance determination and event response actions.

2) Refer to steps 3.a, 5.e, 10.n, 10.p, and 10.q

r. HAZMAT – Hazardous Substances/Extremely Hazardous Substances

The release of any hazardous substance to the environment in a quantity greater than or equal to the reportable quantity in any 24 hour period (CERCLA 40CFR302 and 40CFR261)

1) Notify AMEREN SPILL LINE immediately, whose personnel will then determine further reportability requirements and make necessary notifications to all agencies except the NRC.

2) Notification required to the following:

   a) National Response Center (NaRC)

   b) State Emergency Response Commission (SERC)

3) Refer to steps 3.a, 5.e, 10.n, 10.o, and 10.q

s. HAZMAT – Fire, explosions and release of a hazardous waste to the environment - CERCLA 40CFR260-265

1) Notify AMEREN SPILL LINE immediately, whose personnel will then determine further reportability requirements and make necessary notifications to all agencies except the NRC.

Attachment 1 (Cont'd.)

Step 10 Cont'd

2) Notification required to the following agencies for release of extremely hazardous or comprehensive environmental response which exceed the reportable quantity:
    a) National Response Center (NaRC)
    b) State Emergency Response Commission (SERC)
    c) Local Fire Department – for fire or explosions
3) There is a 15 day follow-up for 40CFR265.56 and as soon as possible follow-up report for 40CFR355.40
4) Refer to steps 3.a, 5.e, 10.n, 10.o, and 10.p

t. <u>10 CFR 37 Category 1 and Category 2 Quantity Materials – 10CFR37.57</u>

1) Upon determining that an unauthorized entry resulted in an actual or attempted theft, sabotage, or diversion of a category 1 or category 2 quantity of radioactive material, make the following notifications:
    a) Immediately notify the Callaway Sheriff's Department (CSD).
    b) As soon as possible, but no later than 4 hours after notifying the CSD, notify the NRC's Operations Center.
    c) Refer to step 5.e and Security refer to procedure SDP-ZZ-00027.
    d) A 30-day written follow-up report is required. Refer to Attachment 3 for additional guidance.
2) After assessing any suspicious activity related to possible theft, sabotage, or diversion of category 1 or category 2 quantities of radioactive material, make the following notifications:
    a) Immediately notify the Callaway Sheriff's Department (CSD).
    b) As soon as possible, but no later than 4 hours after notifying the CSD, notify the NRC's Operations Center.
    c) Refer to step 5.e and Security refer to procedure SDP-ZZ-00027.

u. <u>Intake Navigation Light Failure – 33 CFR 62.65</u>

1) Notify the United States Coast Guard (USCG) upon discovering the failure of any of the four river navigation lights located on the intake structure.
2) A follow-up notification is required when the navigation light has been repaired and is operating as expected.

Attachment 1 (Cont'd.)

Sheet 27 of 27

Step 10 Cont'd

t. Loss or theft of any source or radiation - 19 CSR 20-10.060(5)

1) The loss or theft of any source of radiation not exempt from these rules shall be reported immediately to the MO Department of Health and Senior Services by telephone and a written report shall be submitted within twenty-four (24) hours.

2) Equipment exempted from the above is defined in 19 CSR 20-10.020 and includes radioactive sources licensed by the USNRC to an installation in Missouri.

3) Refer to step 5.e for additional reporting criteria associated with governmental notifications. If a notification is made to the MO Department of Health and Senior Services per the above requirement, the NRC must be notified of that notification.

Attachment 2
Prompt Reporting Requirements For Callaway

ACRONYMS

The following list of acronyms represents the departments/positions/groups responsible for initiating, reviewing, and issuing reports that may be required during operation of the Callaway Energy Center. These reports and regulations are listed in Attachment 2, Prompt Reporting Requirements for Callaway and Attachment 3, Reporting Requirements by Reference for Callaway:

A	Manager, Nuclear Administration
ACSTD	Ameren Corporate Safety and Training Department
B	Supervisor, Daily/Outage Scheduling
C	Supervisor, Chemistry
CBO	Callaway Business Operations
CC	Corporate Communications
CF	Controller's Function
CRW	Manager, Chemistry
DM	Duty Manager
EC	Environmental Services
ES	Energy Supply
GA	General Accounting
HMC	Hazardous Material Coordinator
I	Manager, Maintenance Instrumentation and Controls
ID	Insurance Division
LE	Corporate Legal
DPO	Senior Director, Nuclear Operations
MM	Marsh and McLennan, Nuclear Insurance Brokers
MNE	Director, Engineering Systems or Director, Engineering Design or Director, Engineering Projects or Director, Engineering Programs (as appropriate)
MNOS	Director, Nuclear Oversight
MPM	Director, Maintenance
MRO	Medical Review Officer
MT	Director, Training
NEE1	Director, Engineering Design
NEP1	Director, Engineering Systems
NEDR	Supervising Engineer, Reactor Engineering
NETE	Supervising Engineer, Performance Engineering
NESB	Supervising Engineer, Systems BOP
NOS	Nuclear Oversight
O	Director, Nuclear Operations
PRS	AA/FFD Supervisor or Manager, Emergency Preparedness (as appropriate)
R	Supervisor, Radwaste
RA	Manager, Regulatory Affairs
RP	Supervisor, Radiation Protection
RARL	Supervising Engineer, Regulatory Affairs and Licensing

Attachment 2 (Cont'd.)

Prompt Reporting Requirements For Callaway

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ACRONYMS

SRVPCNO	Senior Vice President/Chief Nuclear Officer
S	Supervisor, Security
SA	Safety Supervisor
SM	Shift Manager
SSS	Security Shift Supervisor
T	Manager, Operations Training
VPN	Site Vice President
W	Supervising Engineer, Configuration Management
WM	Manager, Work Management
XX	Any Ameren Missouri or Contract Personnel

The following list of acronyms is for the regulatory agencies/documents that require reports by Ameren Missouri during the operation of the Callaway Energy Center:

ADM	Director, Office of Administration, U.S. Nuclear Regulatory Commission
ANI/MAELU	America Nuclear Insurers / Mutual Atomic Energy Liability Underwriters
BTP	Branch Technical Position
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CSR	Code of State Regulations
DNR	Missouri Department of Natural Resources
DNR(APC)	Missouri Department of Natural Resources, Air Pollution Control Program
DNR(JCRO)	Missouri Department of Natural Resources, Jefferson City Regional Office
DNR(PDW)	Missouri Department of Natural Resources, Public Drinking Water Program
DNR(WM)	Missouri Department of Natural Resources, Waste Management Program
DNR (WPP)	Missouri Department of Natural Resources, Water Protection Program
DOE	U.S. Department of Energy
ENS	Emergency Notification System
EPA	Environmental Protection Agency
EPA(RA)	Environmental Protection Agency, Regional Administrator
FSAR	Final Safety Analysis Report
GC	General Counsel, U.S. Nuclear Regulatory Commission
INPO	Institute of Nuclear Power Operations
LEPC	Local Emergency Planning Committee
LER	Licensee Event Report
LLEA	Local Law Enforcement Agency (Callaway County Sheriff)
MPSC	Manager, Energy Department, PSC
MSDS	Material Safety Data Sheet
NaRC	National Response Center, USCG

Attachment 2 (Cont'd.)

Prompt Reporting Requirements For Callaway

ACRONYMS

NEI	Nuclear Energy Institute
NEIL	Nuclear Electric Insurance Limited
NERC/GADS	North American Electric Reliability Council/Generating Availability Data System
NMSS	Director, Office of Nuclear Material Safety and Safeguards, U.S. NRC
NPDES	National Pollution Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
NRC(ADM)	Director, Office of Administration, U.S. Nuclear Regulatory Commission
NRC(DCD)	Document Control Desk, U.S. Nuclear Regulatory Commission
NRC(EDO)	Executive Director for Operations, U.S. Nuclear Regulatory Commission
NRC(FSME)	Director, Office of Federal and State Materials and Environmental Management Programs, U.S. Nuclear Regulatory Commission
NRC(DWMEP)	Division of Waste Management and Environmental Protection, U.S. NRC
NRC(OC)	Operations Center, U.S. Nuclear Regulatory Commission
NRC(ONR)	Director, Office of New Reactors, U.S. Nuclear Regulatory Commission
NRC(RA)	Regional Administrator, U.S. Nuclear Regulatory Commission
NRC(RI)	Resident Inspector, U.S. Nuclear Regulatory Commission
NRC(RO)	Region IV Regional Office, U.S. Nuclear Regulatory Commission
NRC(DSFM)	Director, Division of Spent Fuel Management, U.S. Nuclear Regulatory Commission
NRR	Director, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission
NSRB	Nuclear Safety Review Board
NSTS	National Source Tracking System
OL	Operating License
ORC	On-Site Review Committee
ORR	Director, Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission
OSHA	Occupational Safety and Health Administration, U.S. Department of Labor
PSC	Missouri Public Service Commission
REIRS	Project Manager, Radiation Exposure Information Reporting System, Office of Nuclear Reactor Research, U.S. Nuclear Regulatory Commission
SARA	Superfund Amendment and Reauthorization Act
SEMA	State Emergency Management Agency
SERC	State Emergency Response Commission
SNM	Special Nuclear Material
TS	Callaway Plant Technical Specifications
USCG	United States Coast Guard
ULNRC	Ameren Missouri correspondence to NRC
UST	Underground Storage Tank

Attachment 2 (Cont'd.)

Prompt Reporting Requirements For Callaway

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The following is a listing of the report headings for reports submitted to outside organizations to satisfy Callaway Energy Center reporting requirements:

COLUMN HEADINGS

REPORT:	States the title or subject of the report.
REQUIRED BY:	Identifies the regulation requiring the report and the applicable section.
TIMING:	Specifies time period between occurrence of reportable event and receipt of report by the outside organization, or due date of a routine report.
INITIATED:	Designates responsible position required to initiate reports.
REVIEWED:	Designates responsible positions required to review reports.
ISSUED:	Designates responsible position required to issue reports.
PRIMARY RECIPIENT:	Indicates to whom the original report is sent.
SECONDARY RECIPIENT:	Indicates to whom copies of the report are sent.
REMARKS:	Any additional pertinent information related to the report is listed at the bottom of the page.

Attachment 2 (Cont'd.)
Prompt Reporting Requirements For Callaway
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	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
1.	Accident – Details of any accident at a power plant involving serious physical injury or death or property damages in excess of two hundred thousand dollars ($200,000).	4CSR240-3.190 (3)(A)	Telephone in 1 business day. Written follow-up within 5 business days of discovery.	Safety NESB WM	RARL DM DPO VPN NESB	RARL *	MPSC	ID NESB LE CC (SA, If injury/fatality)	NESB is triggered by a work order greater than or equal to $200,000 for a report to NEIL. * Preferred path is for RARL to submit the report to Ameren Legal to actually submit report to MO PSC. Also see Report 53
2.	Accident – Details of any accident at a power plant involving serious physical injury or death resulting from contact with energized electrical supply facilities and which results in admission to a hospital or fatality	4CSR240-3.190 (4)	Telephone in 1 business day. Written follow-up within 10 business days of discovery.	Safety NESB WM	RARL DM DPO VPN NESB	RARL *	MPSC	ID NESB LE CC (SA, If injury/fatality)	* Preferred path is for RARL to submit the report to Ameren Legal to actually submit report to MO PSC. Also see Report 53
3.	Accidental Criticality	10CFR70.52(a)	1 hour	SM/NEDR	SM	SM	NRC(OC)		
4.	Attack – Accelerated NRC call upon discovery of an imminent threat or attack to the station, to allow warning of other licensees and initiate Federal response.	NRC Bulletin 2005-02 ULNRC-05189	15 minutes	SM	SM	SM(ENS)	NRC(OC)		Also see Report 53
5.	Bodily Injury or Property Damage from Possession or Use of Radioactive Material Resulting in Indemnity Claim	10CFR140.6(a)	As soon as possible	SA/RP	DPO	DPO	NRR or NRC (FSME) NRC (ONR)		Also see Report 53
6.	Completeness and Accuracy of Information	10CFR50.9(b) 10CFR40.9(b) 10CFR30.9(b) 10CFR70.9(b)	2 working days	RARL/MNE	DPO	RARL	NRC(RO)		

Attachment 2 (Cont'd.)

Prompt Reporting Requirements For Callaway

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.	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
7.	Defective components, Failure to Comply or Existence of a Defect (Initial Notification)	10CFR21.21(d)(3)(i)	2 days following receipt of information by SRVPCNO which indicates item is reportable. 30 day written follow up	W	VPN RARL	SM (ENS)	NRC(OC)		The notification is not required if Ameren Missouri Company has actual knowledge that the defect has been reported to the NRC, i.e. Ameren Missouri has a copy of the report or a signed letter from the reporting organization confirming that the NRC has been notified of the defect.
8.	Drinking Water – Failure to comply with any drinking water regulation, including failure to comply with monitoring requirements.	10CSR60-7.010(2)	Within forty-eight (48) hours of discovery of noncompliance	C	EC	EC	DNR(PDW)		
9.	Emergency Classification as part of Emergency Plan	10CFR50 App. E, IV.D.3 RERP 6.3	15 minutes	SM	SM	SM (ENS)	State & Local Government Officials	NRC(RO) INPO, ANI at alert or higher emergency classifications.	Also see Report 53
10.	Environmental – Discharge of Any Toxic Pollutant Not Limited in the NPDES Permit	NPDES Permit C.6(a) NPDES Permit C.6(b)	Immediately (Within 1 hour)	SM	DPO/EC	EC/SM	DNR(WPP)	SARA Facility Coordinator	Also see Reports 25 & 53
11.	HAZMAT – Release of oil or natural gas	40CFR112	As soon as possible	C/SM	DPO/EC	EC	NaRC	SERC	Contact AMEREN SPILL LINE Also see Report 53
12.	Environmental – Report of any occurrence of an unusual or important event that indicates or could result in significant environmental impact casually related to plant operation	O.L. App. B. 4.1 O.L. App. B. 5.4.2	24 hours 30 day written follow-up report	SM RARL/C	DPO/DM DPO	SM RARL	NRC NRC		Other reporting may be required if a report has been made to another agency. See 5.4.2. Also see Report 53

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Prompt Reporting Requirements For Callaway
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.	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
13.a	FAA Advisory for Tower Top Light Failures on the following: - Cooling Tower, - CAL-Bland Transmission Line Towers 25 and 26 - Microwave Tower	AC 70/7460 Sect. 23	Within 30 minutes	SM		SM	FAA		Transmission Dispatcher is contacted with report. Also provide expected return to service date. Dispatcher contacts FAA.
	Follow-Up: FAA – Notification of Tower Top Light Outage Date Extension	AC 70/7460 Sect. 23	Prior to exceeding the return to service date previously provided	SM		SM	FAA		Transmission Dispatcher is contacted with report. Dispatcher contacts FAA
	FAA – Notification of Tower Top Light Return to Service Date	AC 70/7460 Sect. 23	As soon as light has returned to service	SM		SM	FAA		Transmission Dispatcher is contacted with report. Dispatcher contacts FAA
13.b	Combined with report 13.a								
14.	Financial Protection, Change in Proof of	10CFR140.15 (c)	As soon as possible	MM	ID	MM	NRC(DCD)		Reports are initiated and filed by Marsh and McLennan, Nuclear Insurance Brokers. Ameren Missouri Secretary's Department reviews after the report is initialed and files them in their Nuclear Reliability File.
15.	FFD – Fitness-For-Duty Events	10CFR26.719 (b)	Within 24 hours of discovery	PRS	RARL	RARL	NRC(OC)		APA-ZZ-00908 XDP-PD-00001
16.	FFD – NRC Employee Unfit for Duty	10CFR26.77 (c)	Immediately (Within 1 hour)	RARL	RARL	RARL	NRC(RA) NRC(OC) (other than normal working hours)		

Attachment 2 (Cont'd.)

Prompt Reporting Requirements For Callaway

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	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
17.	FFD Testing – False Positive Error on Blind Performance Test	10 CFR26.719 (c)	Within 24 hours of discovery Report within 30 days of completing investigation	MRO	PRS	RARL	NRC(DCD)	NRC(RO)	Report is routed to the appropriate Document Control File Code by RARL. XDP-PD-00001, XDP-PD-00003
18.	FFD Testing – False Negative Error on a Quality Assurance Check of Validity Screening Tests	10CFR26.719 (c)	Within 24 hours of discovery Report within 30 days of completing investigation	MRO	PRS	RARL	NRC(DCD)	NRC(RO)	Report is routed to the appropriate Document Control File Code by RARL. XDP-PD-00001, XDP-PD-00003
19.	Forced outages of any nuclear generating unit(s) that could reasonably be anticipated to last longer than three (3) days.	4CSR240-3.190 (3)(B)	Telephone in 1st business day. Written follow-up within 5 business days of discovery.	SM	RARL DM DPO VPN	RARL *	MPSC		* Preferred path is for RARL to submit the report to Ameren Legal to actually submit report to MO PSC.
20.	Ground Water – Onsite leak or spill into groundwater OR onsite or offsite water sample results exceed limits	NEI – Groundwater Protection Initiative	Informal communication within 1 working day.	RP	RARL	RA	DNR, Callaway County Presiding Commissioner	NRC(RI) NRC(RO) NRC (OC)	HTP-ZZ-07101 If event is serious or if a press release will be made, the NRC must be notified per 10CFR50.72 criterion.
21.	HAZMAT – Release of a Reportable Quantity of a Hazardous Substance	40CFR302 40CFR261	Immediately (Within 1 hour).	SM/C	DM/EC/C	SM/EC	NaRC, SERC		Contact AMEREN SPILL LINE Also see Report 53
22.	HAZMAT – Fire, Explosions, and Release of a Hazardous Waste to the Environment	40CFR260 40CFR265	Immediately (Within 1 hour)	SM/C	DM/EC/C	SM/EC	NaRC, SERC	Local Fire Dept for fire or explosions	Contact AMEREN SPILL LINE Also see Report 53
23.	NPDES – Release of any unplanned or uncontrolled liquid radioactive release that involves offsite release of liquid radioactive material	NPDES Permit C.5.e	Immediately (Within 1 hour)	RP/C	RP/EC/C	RP/EC/C	SERC DNR (WPP)	NRC(OC)	Also see Report 53

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Prompt Reporting Requirements For Callaway
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	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
24.	Hot Particle Overexposure	ANI/MAELU Bulletin 88-3A, V 10CFR20.1201	As soon as possible	RP	ORC	VPN	ANI	ID, NESB	
25.	Immediate Notifications Emergency Class Declared Use of 10CFR50.54.x 4 hour reports (Section 5, Att. 1) T/S initiated S/D ECCS or RPS actuation News release/Agency notification 8 hour reports (Section 6, Att. 1) Follow-up Notification	 10CFR50.72(a) 10CFR50.72 (b)(1) 10CFR50.72 (b)(2) 10CFR50.36 (c)(1) 10CFR50.72 (b)(3) 10CFR50.72 (c)	 1 Hour 1 Hour 4 Hours 8 Hours Immediately for changes (within 1 hour)	 SM SM SM SM SM	 SM SM SM SM SM	 SM SM SM SM SM	 NRC(OC) NRC(OC) NRC(OC) NRC(OC) NRC(OC)		Via Emergency Notification System, after notification of State and Local Governments and the recovery manager. In addition to telephone notification, Ameren Missouri shall also establish and maintain an open, continuous, communication channel with the NRC Operations Center, and shall close only when notified by the NRC. During normal working hours, NRC Resident Inspector shall be notified over ENS line at same time as the NRC Operations Center. Also see Report 53
26.	Loss of transmission capability that could limit the output of a generating plant.	4CSR240-3.190 (3)(c)	Telephone in 1st business day. Written follow-up within 5 business days of discovery.	ES		MPM	MPSC		
27.	National Source Tracking Transaction Report	10CFR20.2207	Before close of next business day after the transaction	RP	RARL	RA	NSTS		The NRC encourages submitting the report online at the NSTS website

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Prompt Reporting Requirements For Callaway

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	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
28.	NEIL Adverse Condition Report – a condition exists in which equipment is being operated in distress, with a known defect which significantly increases NEIL's exposure to loss, or conditions are observed that require immediate action, the loss control representative must immediately notify NEIL management of the conditions observed.	NEIL, LCM 2.1.3	As soon as possible.	NEE1/NEP1	MNE	MNE	NEIL	ID, NESB	Notification is by NEIL members website: http://www.nmlneil.com/members
29.	NEIL Adverse Condition Report – any condition which could result in property damage >$500,000 or an outage >10 weeks, transformer oil test results >10% IEEE limits, vibration levels exceed NEIL guidelines, or Turbine-Generator potential water induction or propagating cracks.	NEIL, LCM 2.1.3	As soon as possible.	NEE1/NEP1	MNE	MNE	NEIL	ID, NESB	Notification is by NEIL members website: http://www.nmlneil.com/members
30.	NEIL – Results of Fire Protection evaluations and audits	NEIL, LCM 1.4.1	As soon as possible.	NOS	NESB	NESB	NEIL		Notification is by NEIL members website: http://www.nmlneil.com/members
31.	NEIL Significant Impairments of Fire Protection Equipment (greater than 7 days)	NEIL, LCM 4.2.8.3.3	1 Working Day.	NEP1	NEP1	NEP1	NEIL	ID, NESB	Notification is by NEIL members website: http://www.nmlneil.com/members
32.	NEIL Incident Report Damage to Property >$100,000 or any fire involving activation or malfunction of a fixed fire extinguishing or detection system	NEIL, LCM 1.8.1	As soon as possible.	NEE1/NEP1	NEE1/NEP1	NEE1/NEP1	NEIL	ID, NESB	Notification is by NEIL members website: http://www.nmlneil.com/members Also see Report 53

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Prompt Reporting Requirements For Callaway

	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
33.	NPDES –Noncompliance which May Endanger Health or the Environment for Non-Radiological Events	Std. Conditions for NPDES Permits B.2.B	24 hours if health or environment is endangered. 5 day written followup	C/SM	DPO/EC	EC	DNR(JCRO)	NRC	A written report must be submitted to DNR within 5 days if not waived by DNR. The five-day report is a "permit event report" Refer to APA-ZZ-00810
34.	NPDES – Noncompliance with Daily Maximum Effluent Limitation	Std. Conditions for NPDES Permits B.2.A	Within 5 days of becoming aware of the condition	C	DPO/EC	EC	DNR(JCRO)		By DNR interpretation, any pollutant discharge from an unauthorized outfall is reportable within 5 days. Failure to monitor effluent, or exceeding monthly discharge limits are reportable with the next Discharge Monitoring report. The five-day report is a "permit event report" Refer to APA-ZZ-00810
35.	NPDES –Bypasses that Result in a Violation of the Permit	Std. Conditions for NPDES Permits B.2.A & B.5	5 days if Daily Maximum Effluent violated.	C/SM	DPO/EC	EC	DNR(JCRO)		A written report must be submitted to DNR within 5 days if not waived by DNR. The five-day report is a "permit event report" Refer to APA-ZZ-00810
36.	OSHA – Report of Loss of Life or Injury Accident	29CFR1904.39(a)(1) 29CFR1904.39(a)(2)	8 hours 24 hours	SM SM	DPO DPO	ACSTD ACSTD	OSHA OSHA	ACSTD	**See APA-ZZ-00835 for more detail on reporting** Also see Reports 25 & 53.
37.	Outage – Changes from the planned outage schedule, if the changes result in the planned outage schedule being different from the schedule in the most recently submitted monthly report.	4CSR240-3.190 (1)(G)	Prior to the initiation of the outage by telephone.	B	RARL	RARL	MPSC		

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Prompt Reporting Requirements For Callaway
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	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
38.	Part 70 Operating Permit deviations resulting from emergency conditions	Permit OP2008-045, General Reporting Requirement 2.d.ii 10CSR10-6.065 (6)(c)1.C	2 working days	C	DPO/EC	EC	DNR(APC)		APA-ZZ-00813
39.	Part 70 Operating Permit deviations which substantially endanger public/environment	Permit OP2008-045, General Reporting Requirement 2.d.ii 10CSR10-6.065 (6)(c).1	As soon as possible.	C/SM	DPO/EC	EC	DNR(APC)	NRC (4 hr report 50.72(b)(2)(xi)	APA-ZZ-00813 Also see Report 53
40.	Radiation levels exceeded on incoming package of radioactive material	10CFR20.1906 (d)	Immediate (Within 1 hour)	RP	SM	SM	NRC(OC)	Final Delivery Carrier	HDP-ZZ-03000 Appendix E
41.	Radiation Over-Exposure to Individual Excessive Concentrations of Radioactivity (annual limit)	10CFR20.2202 (b)	24 hours	RP	SM	SM (ENS)	NRC(OC)	NRC(RO)	Report of radiation overexposure to individual to be reviewed by Manager, Regulatory Affairs after initial notification.
42.	Radiation Over-Exposure to Individual or Excessive Levels and Concentrations of Radioactivity (5 x limits)	10CFR20.2202 (a)	Immediate (Within 1 hour)	RP	SM	SM (ENS)	NRC(OC)	NRC(RO)	Report of radiation overexposure to individual to be reviewed by Manager, Regulatory Affairs after initial notification.
43.	Radioactive Release – Unplanned or Uncontrolled Liquid Radioactive Release Where Emergency Class is declared	10CFR50.72 (a) NPDES Permit No. MO 0098001 D.4.f	1 hour A written report must be submitted to DNR within 5 days if not waived by DNR.	SM/RP	SM	SM	NRC(OC) DNR(JCRO)	EC/CRW/NRC	APA-ZZ-00810 Also see Report 53
44.	Safeguards Event Report	10CFR73.71 10CFR73.27 10CFR73.37 10CFR73.67	1 hour	S	SM	SM (ENS)	NRC(OC)		Duplicate reports not required for events reportable in accordance with 10CFR50.72/73. SDP-SF-00022

Attachment 2 (Cont'd.)
Prompt Reporting Requirements For Callaway

	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
45.	SNM – Accidental Criticality or Loss of SNM	10CFR70.52 (a) 10CFR72.74 (a) 10CFR73.71 (a)(1)	1 hour	SM/NEDR	SM	SM	NRC(OC)		
46.	SNM – Reports of Loss or Theft of SNM	10CFR70.52 (b) 10CFR73.71 10CFR74.11 10CFR20.2207	1 hour	SM/S	SM	SM	NRC(OC)		
47.	Spent Fuel – Schedule changes in excess of 6 hrs in Transportation of Spent Fuel	10CFR73.37 (f)(4)	Prior to transport by phone	R			Governor of State or the Governor's Designee		
48.	Theft or Loss of Licensed Material (1000 X App C quantity)	10CFR20.2201(a)(1)(i)	4 hour	RP	SM	SM (ENS)	NRC(OC)		HTP-ZZ-02004 Also see Report 53
49.	Category 1 or 2 quantity of radioactive materials – theft	10CFR37.57(a)	Immediately after determining an unauthorized entry resulted in the actual or attempted theft, sabotage, diversion of radioactive materials	S	SSS	S or SSS	LLEA		Security refer to procedure SDP-ZZ-00027
		10CFR37.57(a)	As soon as possible within 4 hours of making the immediate 10CFR37.57(a) report	S	SSS, SM	SM or SSS	NRC(OC)		Also report per 10CFR50.72(b)(2)(xi)
50.	Category 1 or 2 quantity of radioactive materials – suspicious activity	10CFR37.57(b)	Make notification as appropriate following assessment of suspicious activity	S	SSS	S or SSS	LLEA		Security refer to procedure SDP-ZZ-00027
		10CFR37.57(b)	As soon as possible within 4 hours of making the appropriate 10CFR37.57(b) report	S	SSS, SM	SM or SSS	NRC(OC)		Also report per 10CFR50.72(b)(2)(xi)

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Prompt Reporting Requirements For Callaway
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	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
51.	USCG – Intake Structure Navigation Light Failure	33CFR62.65	As Soon As Possible Follow-up call to notify when lights have been restored	SM SM	SM SM	SM SM	USCG USCG		
52.	UST – Underground Storage Tanks – Release from an UST	10CSR26-2.050 (1) 40 CFR 280.61	As Soon As Practical and within 24 hrs.	SM/C	DPO/EC	EC	DNR(JCRO) SERC	NRC	Also see Report 53 Contact AMEREN SPILL LINE for assistance in reporting
53.	NEI – Events of Public Interest Notification	January 30, 2013 NEI Memorandum	1 hour	CBO	CBO	DPO (Primary) CBO (Secondary)	NEI		NEI interface may be performed by either DPO or CBO (DPO is preferred)
54.	Spent Fuel Condition Defect in any spent fuel, or GTCC waste storage structure Reduction in effectiveness of any spent fuel, or GTCC waste storage structure Event requiring transport of a contaminated person offsite	10CFR72.75(c)	8 hours	SM/NEDR	SM	SM	NRC(OC)		

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Prompt Reporting Requirements For Callaway

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	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
55.	Spent Fuel Condition Event in which important to safety equipment is disabled or fails to function as designed; Equipment is required by regulation, license conditions, or certificate of compliance to be available and operable to prevent releases that could exceed regulatory limits, to prevent exposures to radiation or radioactive materials that could exceed regulatory limits, or to mitigate the consequences of an accident; and No redundant equipment was available and operable to perform the required safety functions.	10CFR72.75(d)	24 hours	SM/NEDR	SM	SM	NRC(OC)		
56.	Cyber Security - Attack that adversely affected …	10CFR73.77(a)(1) 10CFR73.71	1 hour	Cyber Security Incident Response Team Lead	SM DM or DPO	SM (ENS)	NRC(OC)		See EDP-ZZ-01108 Addendum 5 Attachments 1for detailed guidance. Note: Also report as a safeguards event per 10 CFR73.75. Reference report 44 in this attachment.

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	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
57.	Cyber Security - Attack that could have adversely affected … or people had physical or electronic access, or notification to other governmental agencies (see procedure referenced in remarks for guidance)	10CFR73.77(a)(2)(i) 10CFR73.77(a)(2)(ii) 10CFR73.77(a)(2)(iii)	4 hours	Cyber Security Incident Response Team Lead	SM DM or DPO	SM (ENS)	NRC(OC)		See EDP-ZZ-01108 Addendum 5 Attachments 1for detailed guidance.
58.	Cyber Security - Intelligence gathering or planning related to an attack against digital assets …	10CFR73.77(a)(3)	8 hours	Cyber Security Incident Response Team Lead	SM RARL DM or DPO	SM (ENS)	NRC(OC)		See EDP-ZZ-01108 Addendum 5 Attachments 1for detailed guidance.
59	Loss or theft of any radiation source	19 CSR 20-10.060(5)		Owner of the radioactive source			Mo Dept of Health and Senior Services	NRC (OC)	Notify NRC(OC) per report 25 - 10 CFR 50.72(b)(2)
	Phone call		Immediately		SM	SM			
	Follow up report		Within 24 hours	RARL	DPO	RARL	Mo Dept of Health and Senior Services		

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	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
1.a	FAA Advisory for Tower Top Light Failures on the following: - Cooling Tower, - CAL-Bland Transmission Line Towers 25 and 26 - Microwave Tower	AC 70/7460 Sect. 23	Within 30 minutes	SM		SM	FAA		Transmission Dispatcher is contacted with report. Also provide expected return to service date. Dispatcher contacts FAA.
	Follow-Up: FAA – Notification of Cooling Tower Top Light Outage Date Extension	AC 70/7460 Sect. 23	Prior to exceeding the return to service date previously provided	SM		SM	FAA		Transmission Dispatcher is contacted with report. Dispatcher contacts FAA
	FAA – Notification of Cooling Tower Top Light Return to Service Date	AC 70/7460 Sect. 23	As soon as light has returned to service	SM		SM	FAA		Transmission Dispatcher is contacted with report. Dispatcher contacts FAA
1.b	This report was combined into report 1.a.								. .
2.	Hot Particle Overexposure	ANI/MAELU Bulletin 88-3A, V 10CFR20.1201	As soon as possible	RP	ORC	VPN	ANI	ID, NESB	
3.	ISI – Inservice Inspection Summary Report	<u>ASME XI</u> CODE CASE N532	As soon as practical after each refueling outage	NETE	NETE	MNE	NRC(DCD)	NRC(SRI)	
4.	Seismic – Inoperable Seismic Monitoring Instrumentation	FSAR 16.3.3.2 (ACTION: a.)	10 days	RARL	ORC	DPO	NRC(DCD)	NRC(RO) NRC(RI)	

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Reporting Requirements By Reference For Callaway

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	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
5.	Seismic – Seismic Event Magnitude, Frequency Spectrum and Effect	FSAR 16.3.3.2.1 (16.3.3.2.1.b)	14 days	RARL/NEE1	ORC	DPO	NRC(DCD)	NRC(RO) NRC(RI)	
6.	Deleted								
7.	Loose-Parts – Inoperable Loose-Part Detection System	FSAR 16.3.3.5 (ACTION: a.)	10 days	RARL/NEP1	ORC	DPO	NRC(DCD)	NRC(RO) NRC(RI)	
8.	Containment – Abnormal Degradation of the Containment Structure	FSAR 16.6.1.2 (ACTION: a.)	15 days	NEE1	ORC	DPO	NRC(DCD)	NRC(RO) NRC(RI)	
9.	Containment – Indicated Abnormal Degradation of the Containment Structure	FSAR 16.6.1.2 (ACTION: b.)	30 days	RARL/NEE1	ORC	DPO	NRC(DCD)	NRC(RO) NRC(RI)	
10.	Contamination – Sealed Source Contamination	FSAR 16.7.3.1.1.c	Annually	RP	ORC	DPO	NRC(DCD)	NRC(RO) NRC(RI)	
11.	Temperature – Area Temperature Greater Than Allowable	FSAR 16.7.4.1 (ACTION: a.)	30 days	NEP1	ORC	DPO	NRC(DCD)	NRC(RO) NRC(RI)	
12.	Dose From Liquid Effluents LCO	FSAR 16.11.1.2 (ACTION: a.)	30 days	RP	ORC	DPO	NRC(DCD)	NRC(RO) NRC(RI)	
13.	Radwaste - Liquid Radwaste Treatment System LCO	FSAR 16.11.1.4 (ACTION: I)	30 days	RP	ORC	VPN	NRC(DCD)	NRC(RO) NRC(RI)	
14.	Dose – Noble Gases LCO	FSAR 16.11.2.2 (ACTION: a.)	30 days	RP	ORC	DPO	NRC(DCD)	NRC(RO) NRC(RI)	
15.	Dose – Iodine-131 and 133, Tritium and Radioactive Material in Particulate Form LCO	FSAR 16.11.2.3 (ACTION: a.)	30 days	RP	ORC	DPO	NRC(DCD)	NRC(RO) NRC(RI)	
16.	Radwaste – Gaseous Radwaste Treatment System LCO	FSAR 16.11.2.5 (ACTION: I)	30 days	RP	ORC	VPN	NRC(DCD)	NRC(RO) NRC(RI)	
17.	Dose – Total Dose LCO	FSAR 16.11.3.1 (ACTION: a.)	30 days	RP	ORC	DPO	NRC(DCD)	NRC(RO) NRC(RI)	

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	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
18.	Radiological Environmental Monitoring Program LCO	FSAR 16.11.4.1 (ACTION: b.)	30 days	RP	ORC	VPN	NRC(DCD)	NRC(RO) NRC(RI)	
19.	NEIL Adverse Condition Report – a condition exists in which equipment is being operated in distress, with a known defect which significantly increases NEIL's exposure to loss, or conditions are observed that require immediate action, the loss control representative must immediately notify NEIL management of the conditions observed.	NEIL, LCM 2.1.3	As soon as possible	NEE1/NEP1	MNE	MNE	NEIL	ID, NESB	Notification is by NEIL members website: http://www.nmlneil.com/members
20.	NEIL Adverse Condition Report – any condition which could result in property damage >$500,000 or an outage >10 weeks, transformer oil test results >10% IEEE limits, vibration levels exceed NEIL guidelines, or Turbine-Generator potential water induction or propagating cracks.	NEIL, LCM 2.1.3	As soon as possible	NEE1/NEP1	MNE	MNE	NEIL	ID, NESB	Notification is by NEIL members website: http://www.nmlneil.com/members
21.	NEIL – Results of Fire Protection evaluations and audits	NEIL, LCM 1.4.1	As soon as possible	NOS	NESB	NESB	NEIL		Notification is by NEIL members website: http://www.nmlneil.com/members
22.	NEIL Inspection Report Response	NEIL, LCM 5.1.3	60 days	NEE1	MNE	MNE	NEIL	ID, NESB	Notification is by NEIL members website: http://www.nmlneil.com/members
23.	NEIL Significant Impairments of Fire Protection Equipment (greater than 7 days)	NEIL, LCM 4.2.8.3.3	1 Working Day	NEP1	NEP1	NEP1	NEIL	ID, NESB	Notification is by NEIL members website: http://www.nmlneil.com/members

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	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
24.	NEIL Incident Report Damage to Property >$100,000 or any fire involving activation or malfunction of a fixed fire extinguishing or detection system.	NEIL, LCM 1.8.1	As soon as possible	NEE1/NEP1	NEE1/NEP1	NEE1/ NEP1	NEIL	ID, NESB	Notification is by NEIL members website: http://www.nmlneil.com/ members
25.	Radioactive Release – Unplanned or Uncontrolled Liquid Radioactive Release Where Emergency Class is declared	NPDES Permit No. MO 0098001 D.4.f 10CFR50.72 (a)	1 hour Written report must be submitted to DNR within 5 days if not waived by DNR.	RP	SM	SM	DNR(JCRO) NRC(OC)	EC/CRW/NRC	APA-ZZ-00810
26.	Environmental – Discharge of Any Toxic Pollutant Not Limited in the NPDES Permit	NPDES Permit C.6(a) NPDES Permit C.6(b) 10CFR50.72(b)(2)(xi)	Immediately (Within 1 hour) 4 hour	SM/C SM/C	DPO/EC/C DPO/EC/C	EC/SM SM	DNR(WPP) NRC(OC)	SARA Facility Coordinator	Also see Report 171
27.	NPDES Discharge Monitoring Report	Std. Conditions for NPDES Permits A.1.B NPDES Permit No. MO 0098001, Quarterly Reports	1/28, 4/28, 7/28, 10/28	C	DPO/EC	EC	DNR(JCRO)		
28.	NPDES – Noncompliance with any effluent limitations or standards	Std. Conditions for NPDES Permits B.1.A, NPDES Permit No. MO-0098001	1/28, 4/28, 7/28, 10/28 Any pollutant discharge from an unauthorized outfall is reportable within 5 days.	C	DPO/EC (Reported as part of Report in item 134)	EC	DNR(JCRO)		Failure to monitor effluent, or exceeding monthly discharge limits are reportable with next Discharge Monitoring report. Five-day report is a "permit event report" Refer to APA-ZZ-00810.
29.	NPDES – Change in Discharge	Std. Conditions for NPDES Permits B.1.B O.L. App. B, 3.2	60 days before such changes, or 30 days if effluent limitations not violated. Within 30 days	C C	DPO/EC DPO/EC	EC EC	DNR(JCRO) NRC(DCD)		NRC shall be notified of proposed change/renewal to NPDES Permit by providing a copy of the change/renewal at same time application is submitted to DNR.

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	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
30.	NPDES – Noncompliance with Daily Maximum Effluent Limitation	Std. Conditions for NPDES Permits B.2.A	Within 5 days of becoming aware of the condition Any pollutant discharge from an unauthorized outfall is reportable within 5 days	C	DPO/EC	EC	DNR(JCRO)		Failure to monitor effluent, or exceeding monthly discharge limits are reportable with next Discharge Monitoring report. Five-day report is a "permit event report" Refer to APA-ZZ-00810.
31.	NPDES –Noncompliance which May Endanger Health or the Environment for Non-Radiological Events	Std. Conditions for NPDES Permits B.2.B	24 hours if health or environment is endangered. 5 day written followup	C/SM C	DPO/EC EC	EC C	DNR(JCRO) DNR(JCRO)	NRC NRC	A written report must be submitted to DNR within 5 days if not waived by DNR. The five-day report is a "permit event report" Refer to APA-ZZ-00810.
32.	NPDES –Bypasses that Result in a Violation of the Permit	Std. Conditions for NPDES Permits B.2.A & B.5	5 days if Daily Maximum Effluent violated.	C/SM	DPO/EC	EC	DNR(JCRO)		A written report must be submitted to DNR within 5 days if not waived by DNR. The five-day report is a "permit event report" Refer to APA-ZZ-00810.
33.	Environmental – Annual Environmental Operating Report	O.L. App. B 3.1 O.L. App B 5.4.1	Annual, prior to May 1.	EC	RARL	RA	NRC(DCD)	DNR (WPP) NRC(RO) NRC(RI)	
34.	NPDES – Changes Renewals and/or appeal and stay to the NPDES Permits/Proposed NPDES changes	O.L. App. B, 3.2	Following approval date of change/renewal or grant of stay. Upon issuance of proposed NPDES changes.	DNR(JCRO)/C	C/EC	EC	NRC(DCD)		
35.	Environmental – Report of any occurrence of an unusual or important event that indicates or could result in significant environmental impact casually related to plant operation	O.L. App. B. 4.1; 5.4.2	24 hours 30 day written follow-up report	SM RARL/C	DPO/DM DPO	SM RARL	NRC NRC		Other reporting requirements may be required if a report has been made to another agency. See Steps 5.d, 6.c, 7.g, and 9.e

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Reporting Requirements By Reference For Callaway

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	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
36.	Part 70 Operating Permit deviations resulting from emergency conditions	Permit OP2008-045, General Permit Requirement (page 23) 10CSR10-6.065 (6)(c)1.C.III.c.I	2 working days	C	DPO/EC	EC	DNR(APC)		APA-ZZ-00813
37.	Part 70 Operating Permit – Opacity auxiliary boiler limit exceeded	Permit OP2008-045, Permit Condition EU0010-003 10CSR10-6.220	10 days	C	DPO/EC	EC	DNR(APC)		APA-ZZ-00813
38.	Deleted								
38. b.	Part 70 Operating Permit-Supplemental Reports	Permit OP2008-045, Permit General Requirement 2.d 10CSR10-6.065(6)(c)	10 days	C	DPO/EC	EC	DNR(APC)		
39.	Part 70 Operating Permit – Emission Inventory Questionnaire	Permit OP2008-045, General Permit Requirement (page 15) 10CSR10-6.110 (2)(c)	Annually, 4/1	C	DPO/EC	EC	DNR(APC)		
40.	Part 70 Operating Permit – excess emissions due to start-up, shutdown, or malfunction that exceed 1 hour – submit a written report	Permit OP2008-045, Core Permit Requirements (page 14) 10CSR10-6.050 (4)	2 days	C	DPO/EC	EC	DNR(APC)		APA-ZZ-00813
40. b	Part 70 Operating Permit – excess emissions due to start-up, shutdown, or malfunction that exceed 1 hour – submit a written report	Permit OP2008-045, Core Permit Requirements (page 14) 10CSR10-6.050 (3)	15 days	C	DPO/EC	EC	DNR(APC)		APA-ZZ-00813
41.	Part 70 Operating Permit Air Emission Monitoring Semiannual Report	Permit OP2008-045, General Permit Requirement (page 19) 10CSR10-6.065 (6)(c)1.C	4/1, 10/1	C	DPO/EC	EC	DNR(APC)		

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	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
42.	Part 70 Operating Permit Compliance Certification	Permit OP2008-045, General Permit Requirement (page 22) 10CSR10-6.065(6)(B)3.J	Annually, 4/1	C	DPO/EC	EC	DNR(APC)		
43.	Deleted								
44.	Part 70 Operating Permit deviations which substantially endanger public/environment	Permit OP2008-045, General Reporting Requirement I.B.4.b 10CSR10-6.065 (6) (c)1(c)	As soon as possible	C/SM	DPO/EC	EC	DNR (APC)	NRC (4 hr report 50.72 (b)(2)(xi)	APA-ZZ-00813
45.	Part 70 Operating Permit notification of change in signature authority	Permit OP2008-045, General Permit Requirement (page 24), 10CSR10-6.020(2)(c)12	30 days	C	DPO/EC	EC	DNR (APC)		
46.	Deleted								
47.	Deleted								
48.	Offsite Dose Calculation Manual	T/S AC 5.5.1	Annual, prior to May 1 See Remarks	RP		VPN	NRC(DCD)		Licensee initiated changes shall be submitted as part of or concurrent with Radioactive Effluent Release Report for the period of report in which any change in the ODCM was made.
49.	ANNUAL REPORTS Annual Personnel Exposure and Monitoring Report	10CFR20.2206(b) 10CFR20.2206 (c)	Annually, on or before April 30 of each year	RP	RP	RP	REIRS		HTP-ZZ-01433

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	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
50.	Radiological – Annual Radiological Environmental Operating Report	T/S AC 5.6.2 FSAR 16.11.5.1 NPDES Permit No. MO-0098001 HI-STORM UMAX CoC Section 5.1.c	Annual, prior to May 1	RP	RARL	RA	NRC(DCD)	DNR (WPP) NRC(RO) NRC(RI) NRC (DSFM)	
51.	Radiological – Radioactive Effluent Release Report	T/S AC 5.6.3 FSAR 16.11.5.2 NPDES Permit No. MO-0098001 HI-STORM UMAX CoC Section 5.1.c	Annual, prior to May 1	RP	RARL	RA	NRC(DCD)	DNR (WPP) NRC(RO) NRC(RI) NRC (DSFM)	
52.	Quarterly Operating Report	FSAR 16.12.4	Last day of the month following end of the quarter	RARL	RA	RARL	NRC(DCD)*	NRC(RO) NRC(RI)	Quarterly Operating Report is to be prepared in accordance with NRC Generic Letter 97-02. * Via INPO's Consolidated Data Entry (CDE) program.
53.	Core Operating Limits Report/Changes to Report	T/S AC 5.6.5.d	Upon issuance for each reload cycle	NEDR	NEDR	RA	NRC(DCD)	NRC(RO) NRC(RI)	
54.	Reactor Coolant System Pressure and Temperature Limits Report	T/S AC 5.6.6	Upon issuance for each reactor vessel fluence period	RARL	RARL	RA	NRC(DCD)	NRC(RO) NRC(RI)	
55.	PAM – Post Accident Monitoring (PAM) Instrumentation	T/S AC 5.6.8 FSAR 16.3.3.4 (ACTION: a.)	14 days	RARL/NESE	ORC	DPO	NRC(DCD)	NRC(RO) NRC(RI)	

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	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
56.	Steam Generator Tube Inspection Report	T/S AC 5.6.10	Within 180 days after initial entry into MODE 4 following completion of an inspection performed in accordance with TS 5.5.9, SG Program.	RARL/NETP	ORC	DPO	NRC(DCD)	NRC(RO) NRC(RI)	
57.	Deleted								
58.	Deleted								
59.	Responses to NRC Notices of Violation	10CFR2.201 (a)	Within 20 days after notice of violation, or other specified time.	RARL	Appropriate Dept. / ORC	RA	NRC(DCD)	NRC(RO) NRC(RI)	
60.	Radiation Exposure Data to Employees	10CFR19.13(b) 10CFR19.13(d) See Remarks	Annually	RP	RP	RP	Individual		Submit to individuals prior to or concurrent with the reports required pursuant to §§ 20.2202, 20.2203, 20.2204, or 20.2206. (See Item # 49)
61.	Radiation Exposure Data to Former Employees	10CFR19.13 (c)	Within 30 days of request or determination of exposure, whichever is later	RP	RP	RP	Individual		
62.	Radiation Exposure Data to Terminating Employees	10CFR19.13 (c)	At termination	RP	RP	RP	Individual		
63.	Radiation levels exceeded on incoming package of radioactive material	10CFR20.1906 (d)	Immediate	RP	SM	SM	NRC(OC)	Final delivery carrier	HDP-ZZ-03000 Appendix E
64.	Theft or Loss of Licensed Material (1000 X App C quantity)	10CFR20.2201(a)(1)(i)	4 hour	RP	SM	SM (ENS)	NRC(OC)		HTP-ZZ-02004

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	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
65.	Theft or Loss of Licensed Material (10 x App C quantity)	10CFR20.2201 (a)(ii)	Within 30 days after learning of the loss or theft.	RARL/RP	ORC	DPO	NRC(DCD)	NRC(RO) NRC(RI)	Incidents reported by LER in accordance with 10 CFR 50.73 need not be reported by a duplication report under 10 CFR20.2201. HTP ZZ 02004
66.	Theft or Loss, Additional Information on, Subsequent to 30 day Written Report	10CFR20.2201 (d)	Within 30 days after learning of such information.	RARL/RP	ORC	DPO	NRC(DCD)	NRC(RO) NRC(RI)	Incidents reported by LER in accordance with 10CFR50.73 need not be reported by a duplication report under 10CFR20.2201. HTP ZZ 02004
67.	Category 1 or 2 quantity of radioactive materials – theft	10CFR37.57(a)	Immediately after determining an unauthorized entry resulted in the actual or attempted theft, sabotage, or diversion of radioactive materials	S	SSS	S or SSS	LLEA		Security refer to procedure SDP-ZZ-00027
		10CFR37.57(a)	As soon as possible within 4 hours of making the immediate 10CFR37.57(a) report	S	SSS, SM	SM or SSS	NRC(OC)		Also report per 10CFR50.72(b)(2)(xi)
		10CFR37.57(c)	30 days after the LLEA notification	S	S, RARL	RARL	NRC(DCD)	NRC(NSIR)	
68.	Category 1 or 2 quantity of radioactive materials – suspicious activity	10CFR37.57(b)	Make notification as appropriate following assessment of suspicious activity	S	SSS	S or SSS	LLEA		Refer to procedure SDP-ZZ-00027
		10CFR37.57(b)	As soon as possible within 4 hours of making the appropriate 10CFR37.57(b) report	S	SSS, SM	SM or SSS	NRC(OC)		Also report per 10CFR50.72(b)(2)(xi)

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	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
69.	Radiation Over-Exposure to Individual or Excessive Levels and Concentrations of Radioactivity (5 x limits)	10CFR20.2202 (a)	Immediate	RP	SM	SM (ENS)	NRC(OC)	NRC(RO)	Report of overexposure to individual to be reviewed by Manager, Regulatory Affairs after initial notification.
70.	Radiation Over-Exposure to Individual Excessive Concentrations of Radioactivity (annual limit)	10CFR20.2202 (b)	24 hours	RP	SM	SM (ENS)	NRC(OC)	NRC(RO)	Report of radiation overexposure to individual to be reviewed by Manager, Regulatory Affairs after initial notification.
71.	Radiation Over-Exposure to Individuals and Excessive Levels and Concentrations of Radioactivity	10CFR20.2203 (a) 10CFR19.13 (d) 10CFR50.73 10CFR20.2205	30 days	RARL/RP	ORC	VPN	NRC(DCD)	NRC(RO) NRC(RI) Exposed Individual DNR	Incidents reported by LER in accordance with 10CFR50.73 need not be reported by a duplicate report under 10CFR20.2203 (a). A copy should be provided to RARL for forwarding to ANI. Report submitted to Manager, Regulatory Affairs for review at least 10 days prior to submittal date. Only events that involve offsite releases of liquid radioactive material are reportable to DNR.

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	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
72.	Radiation Levels or Releases of Radioactivity in Excess of 40CFR190 Limits	10CFR20.2203(a)(4) 40CFR190.10(a) 10CFR50.73 (a)(2)vii 10CFR20.2205	30 days	RARL/RP	ORC	VPN	NRC(DCD)	NRC(RO) NRC(RI) Exposed Individual	Incidents reported by LER in accordance with 10CFR50.73 need not be reported by a duplicate report under 10CFR20.2203 (a) or (c). Report submitted to Manager, Regulatory Affairs for review at least 10 days prior to submittal date
73.	Planned Special Exposure	10CFR20.2204 10CFR20.1206(f) 10CFR20.1206 (g) 10CFR20.2205	30 days	RARL/RP	ORC	DPO	NRC(RO)	Exposed Individual	
74.	National Source Tracking Transaction Report	10CFR20.2207	Before close of next business day after the transaction	RP	RARL	RA	NSTS		The NRC encourages submitting the report online at the NSTS website
75.	Trace Investigation when Shipper has not received notification of receipt	10CFR20 App G III.E	Within 2 weeks of completion of the investigation.	R	R	DPO	NRC(RO)		The investigation is required only if notification of receipt of the radioactive material shipment is not received within 20 days after transfer of the shipment. The investigation shall include tracing the shipments.
76.	Part 21 – Interim report of an identified deviation.	10CFR21.21 (a) (2) 10CFR21.5	Within 60 days of discovery.	W	VPN RARL	SM (ENS)	NRC(DCD)		APA-ZZ-00500 WDP-ZZ-00022

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	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
77.	Part 21 – Defective components never installed, Failure to Comply or Existence of a Defect (Initial Notification)	10CFR21.21 (d)(3)(i)	2 days following receipt of information by SRVPCNO which indicates item is reportable.	W	VPN RARL	SM (ENS)	NRC(OC)		The notification is not required if Ameren Missouri Company has actual knowledge that the defect has been reported to the NRC, i.e. Ameren Missouri has a copy of the report or a signed letter from the reporting organization confirming that the NRC has been notified of the defect. APA-ZZ-00500 WDP-ZZ-00022.
78.	Part 21 – Defective components never installed, Failure to Comply or Existence of a Defect, follow-up	10CFR21.21 (d)(3)(ii) 10CFR21.5	30 days following receipt of information by SRVPCNO which indicates item is reportable.	W	RARL	RARL	NRC(DCD)	NRR or NRC (FSME), as appropriate (3 copies) NRC(RO) NRC(RI) NRC(ONR)	The DPO will issue Part 21 reports if included on a Licensee Event Report. APA-ZZ-00500 WDP-ZZ-00022
79.	FFD – NRC Employee Unfit for Duty	10CFR26.77 (c)	Immediately (Within 1 hour)	RARL	RARL	RARL	NRC(RA) NRC(OC) (other than normal working hours)		APA-ZZ-00908
80.	FFD – Fitness-For-Duty Program Performance Data	10CFR26.717	Annually, submitted prior to March 1st	PRS	PRS	RARL	NRC(DCD)	NRC(RO)	
81.	FFD – Fitness-For-Duty Events	10CFR26.719 (b)	Within 24 hours of discovery	PRS	RARL	RARL	NRC(OC)		APA-ZZ-00908 XDP-PD-00001
82.	FFD Testing – Unsatisfactory performance of testing	10 CFR26.719 (c)	Report within 30 days of completing investigation	MRO	PRS	RARL	NRC(DCD)	NRC(RO)	Report is routed to the appropriate Document Control File Code by RARL. XDP-PD-00001, XDP-PD-00003

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Reporting Requirements By Reference For Callaway

	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
83.	FFD Testing – False Positive Error on Blind Performance Test	10CFR26.719 (c)	Within 24 hours of discovery Report within 30 days of completing investigation	MRO	PRS	RARL	NRC(DCD)	NRC(RO)	Report is routed to the appropriate Document Control File Code by RARL. XDP-PD-00001, XDP-PD-00003
84.	FFD Testing – False Negative Error on Quality Assurance Check of Validity Screening Tests	10CFR26.719 (c)	Within 24 hours of discovery Report within 30 days of completing investigation	MRO	PRS	RARL	NRC(DCD)	NRC(RO)	Report is routed to the appropriate Document Control File Code by RARL. XDP-PD-00001, XDP-PD-00003
85.	Completeness and Accuracy of Information	10CFR50.9(b) 10CFR40.9(b) 10CFR30.9(b) 10CFR70.9(b)	2 working days	RARL/MNE	DPO	RARL	NRC(RO)		
86.	ECCS Evaluation – Report of Change to or Error Discovered in an Acceptable ECCS Evaluation	10CFR50.46 (a)(3)(ii)	Annually or, if change is significant, within 30 days of discovering error or change.	RARL/NEE1	RA	VPN	NRC(DCD)	NRC(RO) NRC(RI)	
87.	OQAM Updating	10CFR50.54 (a)(3) 10CFR50.71 (c)(4)	Annually or within 6 months after refueling, not to exceed 24 months between updates	NOS	MNOS	VPN	NRC(DCD)		See 10CFR50.54 (a) for reports or changes to the NOS program that reduces commitments. GDP-ZZ-00600
88.	Security - Changes in Security Plan made without prior approval	10CFR50.54 (p)(2) 10CFR70.32 (g)	Two months after change.	S	ORC	VPN	NRC(DCD)	NRC(RO) (2 copies)	Changes to the Security Plan or to the Safeguards Contingency Plan can be made without prior approval if changes do not decrease the safeguards effectiveness of the plan. Records of changes made to the plan without prior Commission approval shall be maintained for two years from the date of change. SDP-ZZ-00030

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	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
89.	Emergency Plan - Changes in Emergency Plan made without Prior Approval	10CFR50.54 (q) 10CFR50 App. E, V 10CFR30.34(f)	30 days after change.	PRS	ORC	VPN	NRC(DCD)	NRC(RO) (2 copies) NRC(RI)	KDP-ZZ-00400 KDP-ZZ-00410
90.	Annual Insurance Levels or Financial Protection	10CFR50.54(w)(3)	April 1, annually.	RARL/ID	RA	VPN	NRC(DCD)	NRC(RO) NRC(RI)	
91.	Property Damage – On site Property Damage Insurance – Cleanup Plan	10CFR50.54.w(4)(ii)	Within 30 days after reactor is in safe, stable condition.	RARL/ID	RA	VPN	NRC(DCD)	NRC(RO) NRC(RI)	
92.	Spent Fuel – Plan for managing irradiated fuel after Operating License termination	10CFR50.54 (bb)	Not later than 5 years before OL termination.	RARL	RA	VPN	NRC(DCD)	NRC(RO) NRC(RI)	
93.	50.59 summary – Facility Changes, Tests, or Experiments Conducted without Prior Approval	10CFR50.59(d)(2)	≤ 24 months.	RARL	ORC RA/MNE	VPN	NRC(DCD)	NRC(RO) NRC(RI)	APA-ZZ-00140 [Ref: 5.2.10]
	72.48(d)(2) summary - Summary of changes, tests, and experiments per 10 CFR 72.48	10 CFR 72.48(d)(2)						NRC(DSFM)	ISFSI related changes
94.	Annual Financial Report to Stockholders	10CFR50.71(b)	When required, annually upon issuance of the Company's Financial Report.	RARL	RA	VPN	NRC(DCD)	NRC(RO) NRC(RI)	Not required when Ameren/Ameren Missouri submits a Form 10-Q with the Securities and Exchange Commission or a Form 1 with the Federal Energy Regulatory Commission.

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	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
95.	FSAR Updating	10CFR50.71 (c)(4)	Either annually or within 6 months after each refueling outage not to exceed 24 months between updates	RARL	RA/DPO	VPN	NRC(DCD) (10 copies)	INPO NRC(RO) NRC(RI)	FDP-ZZ-00100
96.	Immediate Notifications Emergency Class Declared	10CFR50.72(a)	1 Hour	SM	SM	SM	NRC(OC)		Via Emergency Notification System, after notification of State and Local Governments and the recovery manager. In addition to telephone notification, Ameren Missouri shall also establish and maintain an open, continuous, communication channel with the NRC Operations Center, and shall close only when notified by the NRC. During normal working hours, NRC Resident Inspector shall be notified over ENS line at same time as the NRC Operations Center.
	Use of 10CFR50.54.x	10CFR50.72 (b)(1)	1 Hour	SM	SM	SM	NRC(OC)		
	4 hour reports (Section 5, Att. 1) T/S initiated S/D ECCS or RPS actuation News release/Agency notification	10CFR50.72 (b)(2) 10CFR72.75(b)(1) 10CFR72.75(b)(2) 10CFR50.36 (c)(1)	4 Hours	SM	SM	SM	NRC(OC)		
	8 hour reports (Section 6, Att. 1)		8 Hours	SM	SM	SM	NRC(OC)		
	Follow-up Notification	10CFR50.72 (b)(3) 10CFR50.72 (c)	Immediately for changes (within 1 hour)	SM	SM	SM	NRC(OC)		
97.	Licensee Event Reports, Form NRC 366	10CFR50.73 OQAM 1.26.1.8 R.G.1.108.C.3.B	60 days after discovery.	RARL	ORC	DPO	NRC(DCD)	NRC(RO) NRC(RI) NSRB SRVPCNO	See NUREG 1022 [Ref: 5.2.11] LERs are required for events occurring within 3 years of the date of discovery, regardless of current plant conditions
98.	Operator – Notification of change in operator or senior operator status	10CFR50.74 10CFR50.4	Within 30 days of the reassignment, termination, or disability /illness.	T/O	ORC	DPO	NRC(DCD)		

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Reporting Requirements By Reference For Callaway

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	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
99	Preliminary decommissioning cost estimate report.	10CFR50.75(f)(2)	5 years prior to projected end of operations	RARL	RA	VPN	NRC(DCD)	NRC(RO) NRC(RI)	
100	ERDS – Hardware and software changes that affect transmitted data points identified in ERDS Data Point Library	10CFR50 App. E VI.3.a	Within 30 days of making hardware or software changes.	NESE	ORC	DPO	NRC(DCD)		
101	ERDS – Hardware and software changes (excepting data point modifications) that could affect transmission format and computer communication protocol to ERDS	10CFR50 App. E VI.3.b	As soon as practicable and at least 30 days prior to making modifications	NESE	ORC	DPO	NRC(DCD)		
102	Emergency Classification as part of Emergency Plan	10CFR50 App. E, IV.D.3 RERP 6.3	15 minutes	SM	SM	SM (ENS)	State & local government officials	NRC(RO) INPO, ANI at alert or higher emergency classifications.	
103	Surveillance Capsule Fracture Toughness Data	10CFR50 App.G, IV.A.1.c.	3 years prior to date when fracture toughness levels do not satisfy requirements.	MNE	RARL	VPN	NRC(DCD)	NRC(RO) NRC(RI)	
104	Surveillance Capsule – Proposed withdrawal schedule of reactor vessel material surveillance program	10CFR50 App. H, III.B.3	Prior to implementation of program.	MNE	RARL	RARL	NRC(DCD)		
105	Surveillance Capsule – Test results of Specimens Withdrawn from Capsules	10CFR50 App. H, IV.A	Within one year after capsule withdrawal.	MNE	RARL	RARL	NRC(DCD)	NRC(RO) NRC(RI)	The test results may be submitted in an extension of the one-year if granted by ORR.
106	Effluents – Report of Effluents Released in Excess of ½ of the Design Objectives	10CFR50 App. I IV.A	30 days from end of quarter when release occurred.	RP	RARL	VPN	NRC(DCD)	NRC(RO) NRC(RI)	

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	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
107	Leak Rate Test – Reactor Containment Building Integrated Leak Rate Test	10CFR50 App. J, V.B.	3 months after each test. (Company set time)	NETS	MNE/RARL	VPN	NRC(DCD)	NRC(RO) NRC(RI)	The report shall be titled "Reactor Containment Building Integrated Leak Rate Test."
108	Operator - Uncorrected Performance Test Failures on Simulation Facility	10CFR55.45(b)(4)(iii) 10CFR55.5	Every 4 years from anniversary of certification (Nov. 30, 1987)	T	MT	MT	NRC(RO)		
109	Operator - Licensed Operator Convicted of Felony	10CFR55.53(g) 10CFR55.5	30 days	O	MT	DPO	NRC(RO)	NRC(RI)	
110	Notification following Bankruptcy filing	10CFR70.32 (a)(9)(i) 10CFR50.54 (cc)(1) 10CFR30.34 (h)(1) 10CFR40.41(f)(i)	Immediately	MM	ID	MM	NRC(RO)	NRC(DCD)- (3 copies) NRC(RO) - (2 copies)	
111	SNM – Accidental Criticality or Loss of SNM	10CFR70.52 (a) 10CFR73.71 (a)(1)	1 hour	SM/NEDR	SM	SM	NRC(OC)		
112	SNM – Reports of Loss or Theft of SNM	10CFR70.52 (b) 10CFR73.71 10CFR74.11	1 hour	SM/S	SM	SM	NRC(OC)		
113	SNM – Material Status Report Form DOE/NRC 742 and 742C	10CFR74.13(a) & (b)	Within 60 calendar days of beginning of physical inventory	NEDR	NEP1	MNE	NMSS		APA-ZZ-00405
114	SNM – Nuclear Material Transaction Report Form DOE/NRC-741 Filed by Shipper	NUREG BR-0006, II.A 10CFR70.54(a) 10CFR74.15 10CFR74.6	Close of business next working day.	NEDR	NEP1	MNE	NMSS	Receiver	
115	SNM – Nuclear Material Transaction Report Form DOE/NRC-741 Filed by Receiver	NUREG BR-0006, II.25 10CFR70.54 (a) 10CFR74.15 10CFR74.6	10 days after receipt material.	NEDR	NEP1	MNE	NMSS	Shipper	

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	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
116	SNM – Notification of use of authorized package	10CFR71.12(c)(3)	Prior to first use of package.	R	DPO	DPO	NRC(DSFM)		
117	SNM – Significant Reduction in Effectiveness of any Authorized Package During Use	10CFR71.95 (a)	30 days	R	DPO	DPO	NRC(DSFM)		
118	SNM – Details of any Defects with Safety Significance in the Packaging After First Use	10CFR71.95(b)	30 days	R	DPO	DPO	NRC(DSFM)		
119	SNM – Instances in which the conditions of approval in the certificate of compliance were not observed in making a shipment	10CFR71.95 (c)	30 days	R	DPO	DPO	NRC(DSFM)		
120	Waste – Advance Notification of Shipment of Nuclear Waste	10CFR71.97(c)	7 days prior to shipment*	R	DPO	DPO	Governor of each State or the Governor's Designee (See 48 FR 30221, June 30, 1983)	NRC(RO)	The licensee shall maintain a record of the name of the individual contacted for one (1) year. Postmarked 7 days prior to the beginning 7-day period when shipment is estimated to occur, or 4 days by special messenger prior to the beginning 7-day period when shipment is estimated to occur.
121	Waste – Revision Notice of Shipment of Nuclear Waste	10CFR71.97 (c)	As promptly as practicable	R	R	R	Governor of each State or the Governor's Designee		The licensee shall maintain a record of the name of the individual contacted for three (3) years.
122	Waste – Cancellation Notice for Shipment of Nuclear Waste for which Advance Notification has been sent	10CFR71.97 (f)	As promptly as practicable	R	R	R	Governor of each State or the Governor's Designee	NRC(RO)	The licensee shall maintain a record of the name of the individual contacted for three (3) years.

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	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
123	Spent Fuel – Accidental Criticality or Loss of SNM	10CFR72.74(a)	1 hour	SM/NEDR	SM	SM	NRC(OC)		
124	Spent Fuel – Transportation of Spent Fuel	10CFR73.37 (f)(1)	7 days prior to shipment	R	DPO	DPO	Governor of each State or the Governor's Designee (See 48 FR 30221, June 30, 1983)		
125	Spent Fuel – Schedule changes in excess of 6 hrs in Transportation of Spent Fuel	10CFR73.37 (f)(4)	Prior to transport by phone	R	R	R	Governor of each State or the Governor's Designee		
126	Safeguards Event Report	10CFR73.71 10CFR73.27 10CFR73.37 10CFR73.67	1 hour	S	SM	SM (ENS)	NRC(OC)		Duplicate reports are not required for events that are also reportable in accordance with 10CFR50.72/73. SDP-SF-00022
127	Safeguards Event Report Follow-up Written Report	10CFR73.71	60 days	RARL/S	ORC	DPO	NRC(DCD)	NRC(RO)	SDP-SF-00022
128	Spent Fuel – Advanced Notice of Shipment of Irradiated Fuel	10CFR73.72(a)	10 days prior to transport of shipment commences	R	DPO	DPO	NRC(DSFM)		
129	Bodily Injury or Property Damage from Possession or Use of Radioactive Material Resulting in Indemnity Claim	10CFR140.6(a)	As soon as possible.	SA/RP	DPO	DPO	NRC (FSME) or NRC (ONR)		

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	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
130	Financial Protection, Proof of	10CFR140.15(a)	As required.	MM	ID	MM	NRC(DCD)		Reports are initiated and filed by Marsh and McLennan, Nuclear Insurance Brokers. Ameren Missouri Secretary's Department reviews report and files a copy in their Nuclear Reliability File.
131	Financial Protection, Change in Proof of	10CFR140.15 (c)	As soon as possible.	MM	ID	MM	NRC(DCD)		Reports are initiated and filed by Marsh and McLennan, Nuclear Insurance Brokers. Ameren Missouri Secretary's Department reviews report and files a copy in their Nuclear Reliability File.
132	Liability Insurance Policy Renewal	10CFR140.17(b)	30 days prior to policy expiration date.	MM	ID	MM	NRC(DCD)		Reports are initiated and filed by Marsh and McLennan, Nuclear Insurance Brokers. Ameren Missouri Secretary's Department reviews report and files a copy in their Nuclear Reliability File.
133	Guarantee of Payment of Deferred Premiums	10CFR140.21	At issuance of license and annually on anniversary date of indemnity agreement.	RARL/CF	RARL	RA	NRC(DCD)		A copy of this report is routed to the appropriate Document Control File Code by Safety Supervisor.
134	OSHA – Report of Loss of Life or Injury Accident	29CFR1904.39(a)	8 hours for fatality or 24 hours for serious injury	SM	DPO	ACSTD	OSHA	ACSTD	**See APA-ZZ-00835 for more detail on reporting.**
		10CFR50.72 (b)(2)(xi)	4 hours	SM	DPO	DPO	NRC(OC)		

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	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
135	USCG – Intake Structure Navigation Light Failure	33CFR62.65	As Soon As Possible Follow-up call to notify when lights have been restored	SM SM	SM SM	SM SM	USCG USCG		
136	Environmental – Discharges in violation of NPDES Permits into navigable waters	33CFR153.203 40CFR112.4 33U.S.C.1321	Immediately (within 1 hour)	SM	DPO/EC	EC/SM	NaRC notifies EPA	NRC(OC) DNR SARA Facility Coordinator	APA-ZZ-00810
137	HAZMAT – Release of a Reportable Quantity of a Hazardous Substance	40CFR302 40CFR261	Immediately (Within 1 hour).	SM/C	DM/EC/C	SM/EC	NaRC, SERC		Contact AMEREN SPILL LINE Also see Report 171
138	Waste Minimization Report	40CFR262.41(a)	Biennial	EC	CRW	EC	EPA(RA)		
139	HAZMAT – Fire, Explosions, and Release of a Hazardous Waste to the Environment	40CFR260 40CFR265	Immediately (Within 1 hour)	SM/C	DM/EC/C	SM/EC	NaRC, SERC	Local Fire Dept for fire or explosions	Contact AMEREN SPILL LINE Also see Report 171
140	NPDES – Release of any unplanned or uncontrolled liquid radioactive release that involves offsite release of liquid radioactive material	NPDES Permit C.5.e	Immediately (Within 1 hour)	RP/C	RP/EC/C	RP/EC/C	SERC DNR (WPP)	NRC(OC)	Also see Report 171
141	MSDS – Index for Callaway Energy Center	40CFR370.20 (d) 29CFR1910.1200	Annually	C	C	HMC	State Dept. of Health	SARA Facility Coordinator SA	A copy of this report is routed to the appropriate Document Control File Code by SA. Refer to APA-ZZ-00830
142	MSDS – Updated MSDS Index for Callaway Energy Center	40CFR370.21 (c) 29CFR1910.1200 (g)	Within 3 months of receipt of MSDS	W	W	HMC	LEPC, SERC Fire Depts	SARA Facility Coordinator	A copy of this report is routed to the appropriate Document Control File by HMC. Refer to APA-ZZ-00830

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	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
143	MSDS – for any Hazardous Chemical Present Above threshold Planning Quantities	40CFR370.21(c)(2)	Within 3 months of receipt of chemicals which raise the quantity onsite above the threshold level.	EC	EC	EC	LEPC, SERC Fire Depts	SARA Facility Coordinator	A copy of this report is routed to the appropriate Document Control File Code by the SARA Facility Coordinator.
144	HAZMAT – SARA Tier I, Tier II Reports	40CFR370.40 40CFR370.41	Annually	EC	SARA Facility Coordinator	EC	LEPC, SERC Fire Depts	SARA Facility Coordinator	A copy of this report is routed to the appropriate Document Control File Code by the SARA Facility Coordinator.
145	Outage – All generating unit outages and derates, excluding hydroelectric generating units.	4CSR240-3.190 (1)(A) 4CSR240-3.190 (1)(G)	30 days	MPM		MPM	MPSC		*Note: RARL supplies the data for this report.
146	Fuel Purchases – All fuel purchases for power production purposes, including the terms of those purchases. A copy of the Monthly Report of Cost and Quality of Fuels for Electric Plants on FERC Form No. 423, as submitted to the Federal Energy Regulatory Commission, will satisfy the requirements of this subsection.	4CSR240-3.190 (1)(B)	30 days	GA/MPM		MPM	MPSC		
147	Net hourly generation for each generating unit.	4CSR240-3.190 (1)(D)	30 days	ES		MPM	MPSC		
148	Purchases – Hourly purchases and sales of electricity from or to other independent power producers or co-generators, including the parties to purchases and sales, and the terms of purchases and sales.	4CSR240-3.190 (1)(c)	30 days	ES		MPM	MPSC		
149	Capacity purchases of longer than seven (7) days duration.	4CSR240-3.190 (1)(F)	30 days	ES		MPM	MPSC		

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	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
150	Planned outages of power production facilities as they are scheduled or rescheduled.	4CSR240-3.190 (1)(G)	30 days	B/MPM	WCO	MPM	MPSC		
151	Planned fuel test burns, unit heat-rate tests, and accreditation runs as they are scheduled or rescheduled.	4CSR240-3.190 (1)(H)	30 days	NESB	RARL	Power Operations	MPSC		
	Copies of all written reports on test burns of fuel, heat rate tests, and accreditation runs.	4CSR240-3.190 (1)(K)	30 days	NESB RARL	RARL	Power Operations	MPSC		
152	Outage – Changes from the planned outage schedule, if the changes result in the planned outage schedule being different from the schedule in the most recently submitted monthly report.	4CSR240-3.190 (1)(G)	Prior to the initiation of the outage by telephone.	MPM B	WCO	MPM B	MPSC		
153	Violation – Citations or notices of violations related to power production facilities received from any state or federal utility regulatory agency or environmental agency including, but not limited to, the Federal Energy Regulatory Commission, the Nuclear Regulatory Commission, the Environmental Protection Agency, the Department of Natural Resources and the Department of Energy.	4CSR240-3.190 (1)(I)	30 days	RARL, Safety, and Chemistry	RARL	Power Operations	MPSC		RA compiles and submits a list of violations to Power Operations for inclusion in the corporation's report to the MPSC.

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	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
154	Contracts – The terms of new contracts or existing contracts which will be booked to Accounts 310-346 or Accounts 502-546 of the Federal Energy Regulatory Commission's Uniform System of Accounts requiring the expenditure by the electrical corporation of more than one hundred thousand dollars ($100,000) including, but not limited to, contracts for engineering, consulting, repairs and modifications or additions to an electric plant.	4CSR240-3.190 (1)(J)	30 days	LE		MPM	MPSC		
155	Violation – Copies of all responses to state or federal utility regulatory agencies or environmental agencies concerning any alleged infractions, deviations or non-compliance with those agencies' rules or standards.	4CSR240-3.190 (1)(K)	30 days	Various for ULNRCs	Various	Power Operations	MPSC		RA compiles and submits the responses to violations to Power Operations for inclusion in the corporation report to the MPSC.
156	Outage – Copies of all written reports on forced outages of longer than three (3) days.	4CSR240-3.190 (1)(K)	30 days	RARL B	RARL	RARL	MPSC		The NERC/GADS definition will be used for forced outage. The completed CRs will be included in the monthly report to the PSC.
157	Accident – Details of any accident at a power plant involving serious physical injury or death or property damages in excess of one hundred thousand dollars ($200,000).	4CSR240-3.190 (3)(A)	Telephone in 1st business day. Written follow-up within 5 business days of discovery. 90 day investigative report.	Safety, NS, WCO	RARL DM DPO VPN NS	RARL*	MPSC	ID NESB LE CC NS (SA, if injury/fatality)	NESB is triggered by a work order greater than or equal to $200,000 for a report to NEIL. *Preferred path is for RARL to submit the report to Ameren Legal to actually submit report to MO PSC.

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	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
158	Forced outages of any nuclear generating unit(s) that could reasonably be anticipated to last longer than three (3) days.	4CSR240-3.190 (3)(B)	Telephone in 1st business day. Written follow-up within 5 business days of discovery.	RARL	RARL SM DM DPO	RARL	MPSC		* Preferred path is for RARL to submit the report to Ameren Legal to actually submit report to MO PSC.
159	Loss of transmission capability that could limit the output of a generating plant.	4CSR240-3.190 (3)(c)	Telephone in 1st business day. Written follow-up within 5 business days of discovery.	ES		MPM	MPSC		
160	Accident – Details of any accident at a power plant involving serious physical injury or death resulting from contact with energized electrical supply facilities and which results in admission to a hospital or fatality	4CSR240-3.190 (4)(A)	Telephone in 1st business day.	Safety WCO	Reviewed by at least 1 of: SM, DM DPO, VPN	RARL	MPSC	ID NESB LE, CC NS, SA	* Preferred path is for RARL to submit the report to Ameren Legal to actually submit report to MO PSC.
			Written follow-up within 10 business days.	Safety WCO	Reviewed by: RARL, SM DM, DPO VPN	RARL	MPSC	ID NESB LE, CC NS, SA	
161	Accident – Human contact with electric current of significant voltage at locations where it supplies power or operates energized electrical supply facilities resulting in admission to hospital or fatality of employee or other person, even if source originated on customer's side of meter	4CSR240-3.190 (4)(B)	Telephone in 1st business day.	Safety WCO	Reviewed by at least 1 of: SM, DM DPO, VPN	RARL	MPSC	ID NESB LE, CC NS, SA	* Preferred path is for RARL to submit the report to Ameren Legal to actually submit report to MO PSC.
			Written follow-up within 10 business days.	Safety WCO	Reviewed by: RARL, SM DM, DPO VPN	RARL	MPSC	ID NESB LE, CC NS, SA	
162	Accident – Details of any other electrical contact, arc, or flash considered significant by the utility or rural electric cooperative	4CSR240-3.190 (4)(c)	Telephone in 1st business day.	Safety WCO	Reviewed by at least 1 of: SM, DM DPO, VPN	RARL	MPSC	ID NESB LE, CC NS, SA	* Preferred path is for RARL to submit the report to Ameren Legal to actually submit report to MO PSC.
			Written follow-up within 10 business days.	Safety WCO	Reviewed by: RARL, SM DM, DPO VPN	RARL	MPSC	ID NESB LE, CC NS, SA	

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Reporting Requirements By Reference For Callaway

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	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
163	UST – Underground Storage Tanks – Release from an UST	10CSR26-2.050 (1) 40 CFR 280.61	As Soon As Practical and within 24 hrs.	SM/C	DPO/EC	EC AMEREN SPILL LINE	DNR(JCRO) SERC	NRC	Also see Report 171 Contact AMEREN SPILL LINE for assistance in reporting
164	UST – Underground Storage Tanks – Summary of initial abatement steps as a result of release from UST.	10CSR26-2.072 (2) 40 CFR 280.62(b)	20 days	C/EC	DPO/EC	EC	DNR(JCRO)		
165	HAZMAT – Quarterly Hazardous Waste Report Summary	10CSR25-5 (2)(D)(1)	Quarterly; 5/15, 8/25, 11/15, 2/15	EC	C	EC	DNR(WM)	C	Report is routed to the appropriate Document Control File Code by SRE.
166	HAZMAT – Hazardous Waste Manifests Exception Report	10CSR25-5.262(2)(D)2	45 days from date of shipment if the manifest is not received from designated facility within 35 days.	EC	C	EC	DNR(WM)	C	Final Copy to DNR.
167	Drinking Water – Failure to comply with any drinking water regulation, including failure to comply with monitoring requirements.	10CSR60-7.010(2)	Within forty-eight (48) hours of discovery of noncompliance	C	EC	EC	DNR(PDW)		
168	Attack – Accelerated NRC call upon discovery of an imminent threat or attack to the station, to allow warning of other licensees and initiate Federal response.	NRC Bulletin 2005-02 ULNRC-05189	15 minutes	SM	SM	SM(ENS)	NRC(OC)		

Attachment 3 (Cont'd.)

Reporting Requirements By Reference For Callaway

Sheet 28 of 30

	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
169	Ground Water – Onsite leak or spill into groundwater OR onsite or offsite water sample results exceed limits	NEI – Groundwater Protection Initiative NEI 07-07	Informal communication within 1 working day.	RP	RARL	RA	DNR, Callaway County Presiding Commissioner	NRC(RI) NRC(RO) NRC(OC)	HDP-ZZ-07000 The NRC must be notified if any of the 10CRF50.72 criterion are met
170	Onsite Ground Water Sample – Sample result for water that is or may be used as drinking water exceeds limits	NEI – Groundwater Protection Initiative NEI 07-07	Written report within 30 days.	RP	ORC	DPO	NRC(OC) NRC(RI) NRC(RO)	DNR, Callaway County Presiding Commissioner, ANI NEI	HDP-ZZ-07000 Notify NEI by email at GW_Notice@nei.org
171	NEI – Events of Public Interest Notification	January 30, 2013 NEI Memorandum	1 hour	CBO	CBO	DPO (Primary) CBO (Secondary)	NEI		NEI interface may be performed by either DPO or CBO (DPO is preferred)
172	DNR Permit Violation – Any exceedance of limits on AEPS diesel generators runtime, emissions data, or fuel sulfur content as stated in construction permit.	DNR – Permit to Construct: 102010-005	Within 10 days after end of month of record of violation	C	DPO/EC	EC	DNR(APC)	RARL	Report to Air Pollution Control Programs Enforcement Section P.O. Box 176, Jefferson City, MO 65102
173	Commitment Tracking System Summary Report	10CFR50.71(c)(4)	Within 6 months after each refueling outage	RARL	RARL	RA	NRC		APA-ZZ-00540 NEI 99-04

Attachment 3 (Cont'd.)
Reporting Requirements By Reference For Callaway

	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
174	Spent Fuel Condition Event in which important to safety equipment is disabled or fails to function as designed; Equipment is required by regulation, license conditions, or certificate of compliance to be available and operable to prevent releases that could exceed regulatory limits, to prevent exposures to radiation or radioactive materials that could exceed regulatory limits, or to mitigate the consequences of an accident. No redundant equipment was available and operable to perform the required safety functions.	10CFR72.75(d)	24 hours	SM/NEDR	SM	SM	NRC(OC)		
175	Spent Fuel Condition Defect in any spent fuel, or GTCC waste storage structure Reduction in effectiveness of any spent fuel, or GTCC waste storage structure Event requiring transport of a contaminated person offsite	10CFR72.75(c)	8 hours	SM/NEDR	SM	SM	NRC(OC)		
176	Cask Registration for dry cask storage Register use of each cask with the Nuclear Regulatory Commission no later than 30 days after using that cask to store spent fuel/	10 CFR 72.212(b)(2)	30 days after using that cask to store spent fuel	RARL	RA	RA	NRC(RO)	NRC (DSFM)	Recipients of the letter are delineated in 10CFR72.212(b)(2) and 10CFR72.4

INFORMATION USE

Attachment 3 (Cont'd.)

Reporting Requirements By Reference For Callaway

Sheet 30 of 30

	REPORT	REQUIRED BY	TIMING	INITIATED BY	REVIEWED BY	ISSUED BY	PRIMARY RECIPIENT	SECONDARY RECIPIENT	REMARKS
177	Cyber Security - Attack that adversely affected …	10CFR73.77(a)(1) 10CFR73.71	1 hour	Cyber Security Incident Response Team Lead	SM DM or DPO	SM (ENS)	NRC(OC)		See EDP-ZZ-01108 Addendum 5 Attachments 1for detailed guidance. Note: Also report as a safeguards event per 10 CFR73.75. See report 126 in this attachment.
178	Cyber Security - Attack that could have adversely affected … , or, people had physical or electronic access, or, notification to other governmental agencies (see procedure referenced in remarks for guidance)	10CFR73.77(a)(2)(i) 10CFR73.77(a)(2)(ii) 10CFR73.77(a)(2)(iii)	4 hours	Cyber Security Incident Response Team Lead	SM DM or DPO	SM (ENS)	NRC(OC)		See EDP-ZZ-01108 Addendum 5 Attachments 1for detailed guidance.
179	Cyber Security - Intelligence gathering or planning related to an attack against digital assets …	10CFR73.77(a)(3)	8 hours	Cyber Security Incident Response Team Lead	SM DM or DPO	SM (ENS)	NRC(OC)		See EDP-ZZ-01108 Addendum 5 Attachment 1for detailed guidance.
180	Cyber Security Event Report Follow-up Written Report	10CFR73.77(d)	60 days	RARL/Cyber Security	ORC	DPO	NRC(DCD)	NRC (Director NSIR) NRC(RO)	See EDP-ZZ-01108 Addendum 5 for additional guidance.
181	Loss or theft of any radiation source	19 CSR 20-10.060(5)		Owner of the radioactive source			Mo Dept of Health and Senior Services	NRC (OC)	Notify NRC(OC) per report 25 - 10 CFR 50.72(b)(2)
	Phone call		Immediately		SM	SM			
	Follow up report		Within 24 hours	RARL	DPO	RARL	Mo Dept of Health and Senior Services		

INFORMATION USE

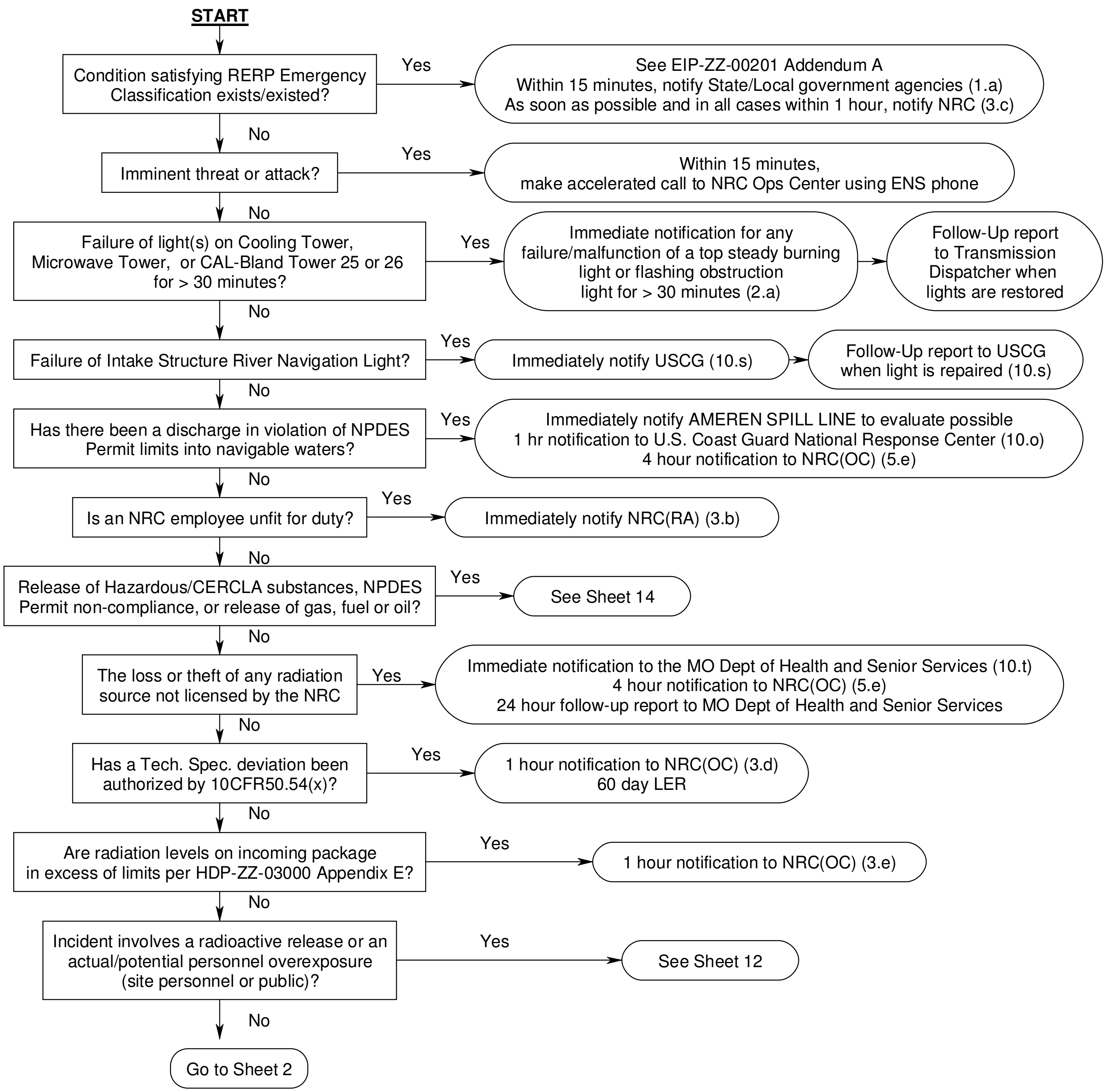
Attachment 4

Reportability Flowchart

Sheet 1 of 15

NOTE

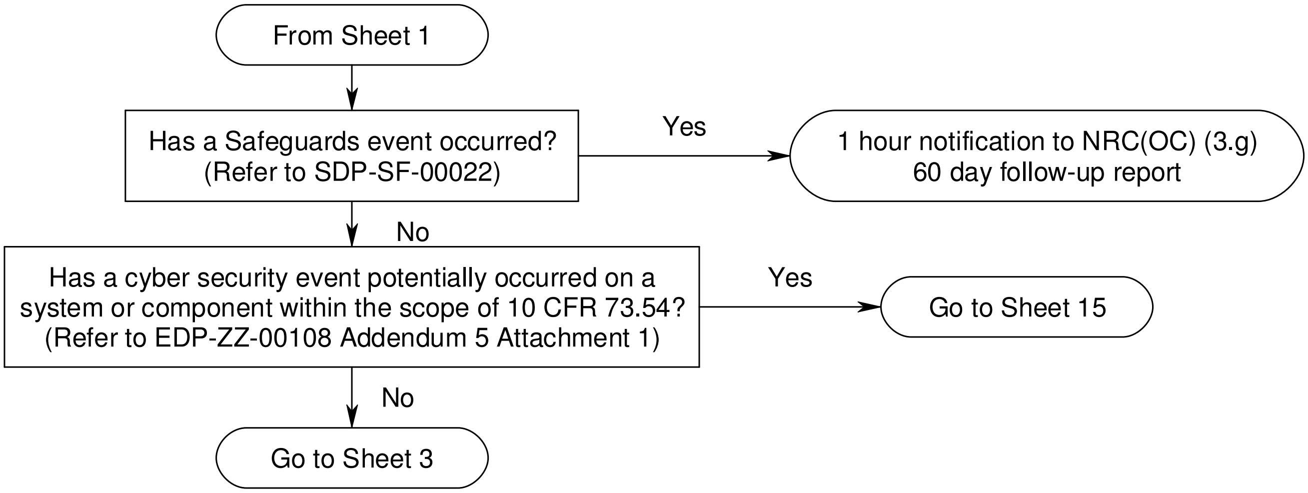
When using this flowchart, continue to the end of Sheet 6. Do NOT stop at the first notification. Steps in parenthesis ( ) refer to applicable steps in Attachment 1.



INFORMATION USE

Attachment 4 (Cont'd.)

Sheet 2 of 15



 INFORMATION USE

Attachment 4 (Cont'd.)

Sheet 3 of 15

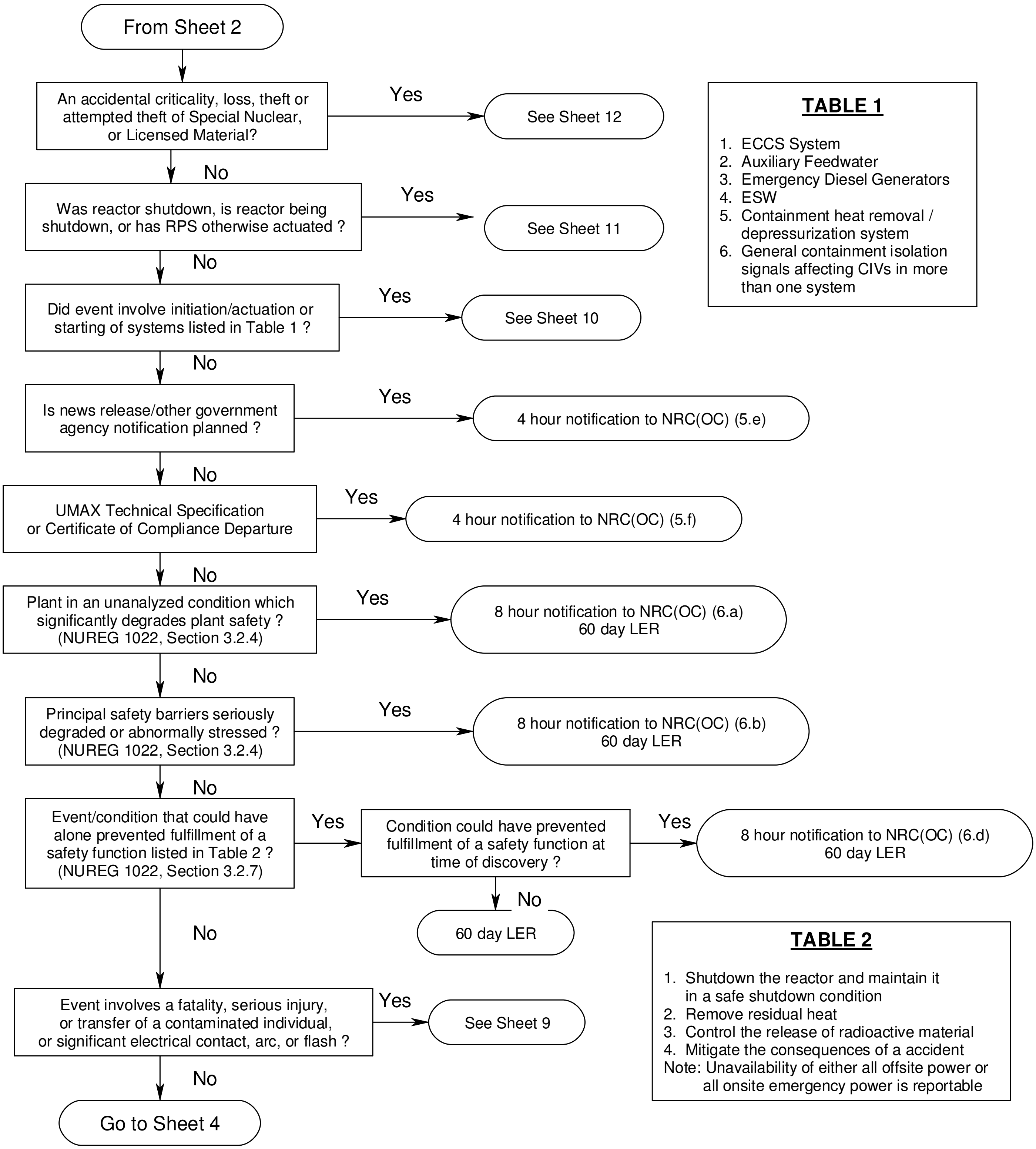


TABLE 1

1. ECCS System
2. Auxiliary Feedwater
3. Emergency Diesel Generators
4. ESW
5. Containment heat removal / depressurization system
6. General containment isolation signals affecting CIVs in more than one system

TABLE 2

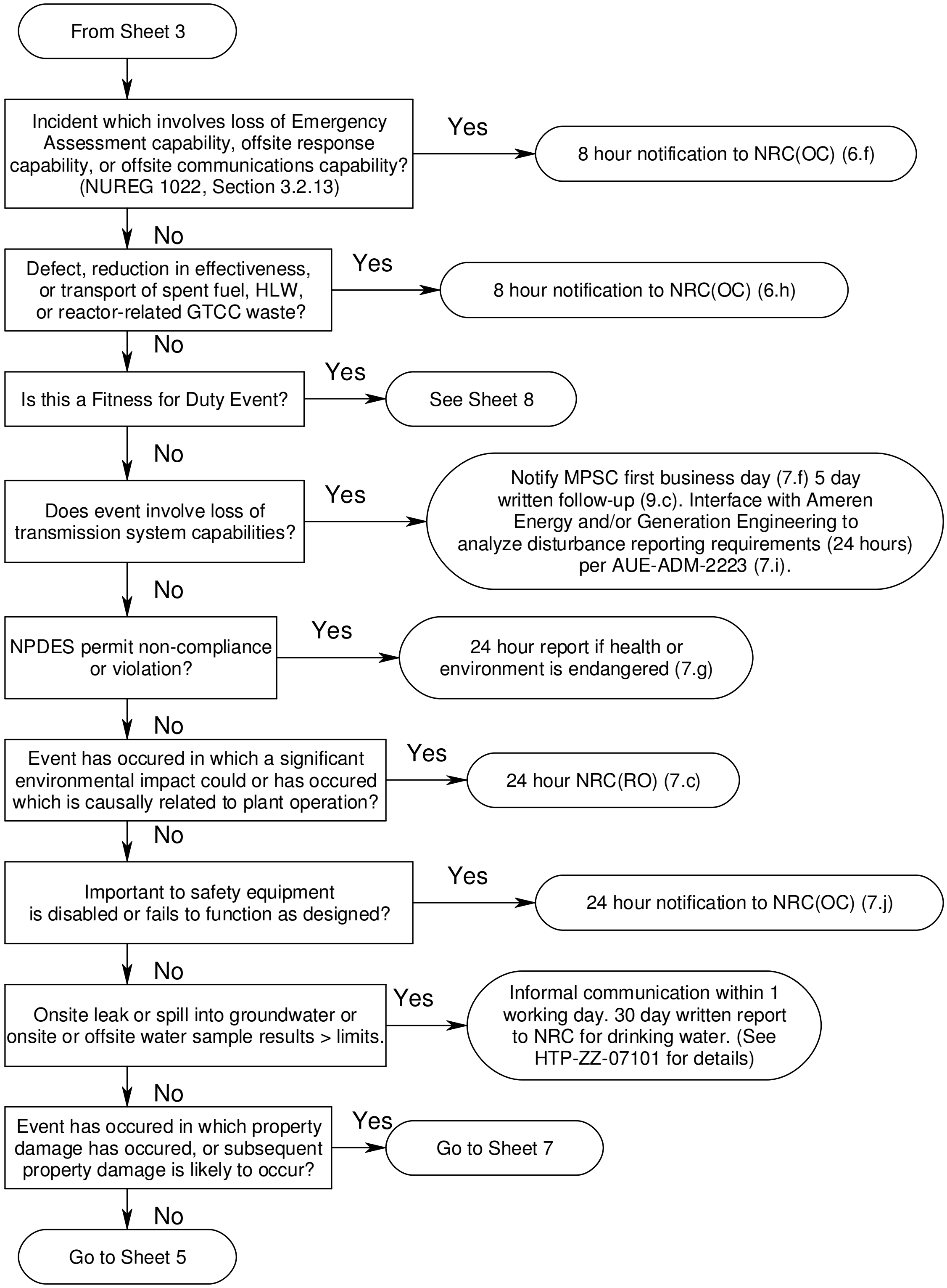
1. Shutdown the reactor and maintain it in a safe shutdown condition
2. Remove residual heat
3. Control the release of radioactive material
4. Mitigate the consequences of a accident

Note: Unavailability of either all offsite power or all onsite emergency power is reportable

INFORMATION USE

Attachment 4 (Cont'd.)

Sheet 4 of 15



INFORMATION USE

Attachment 4 (Cont'd.)

Sheet 5 of 15

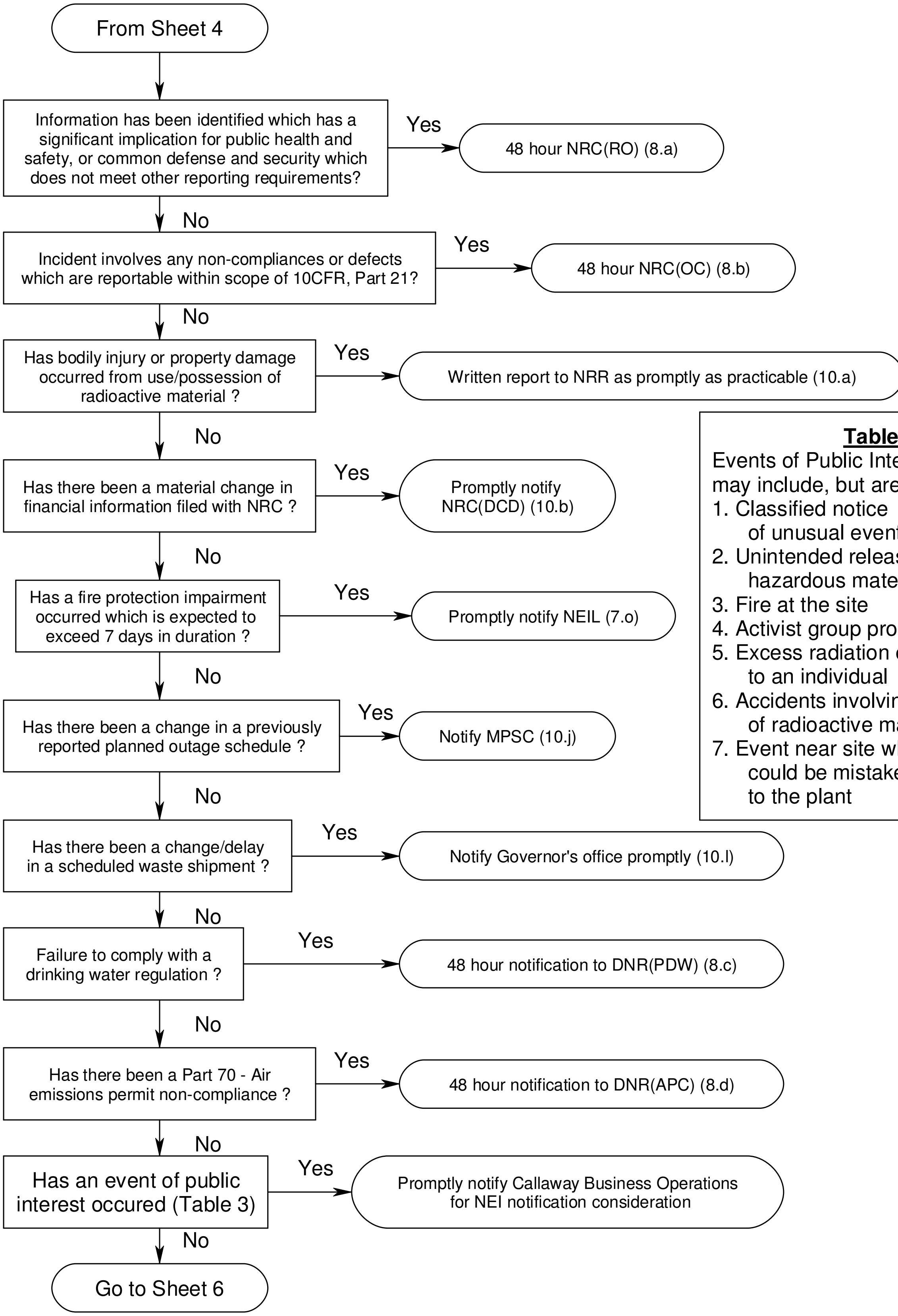


Table 3

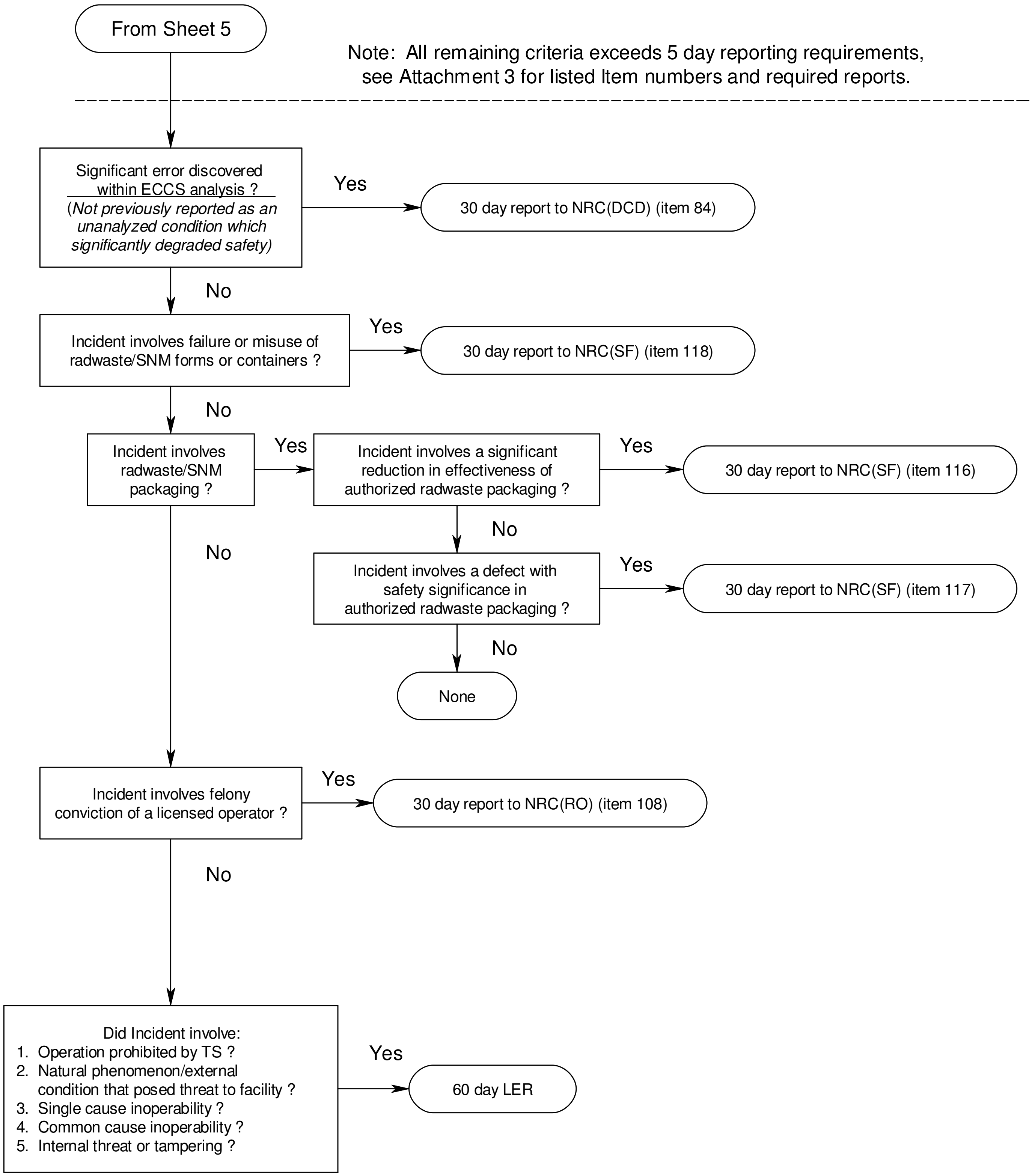
Events of Public Interest may include, but are not limited to:

1. Classified notice of unusual event
2. Unintended release of hazardous materials
3. Fire at the site
4. Activist group protest
5. Excess radiation exposure to an individual
6. Accidents involving transport of radioactive material
7. Event near site which could be mistakenly attributed to the plant

INFORMATION USE

Attachment 4 (Cont'd.)

Sheet 6 of 15

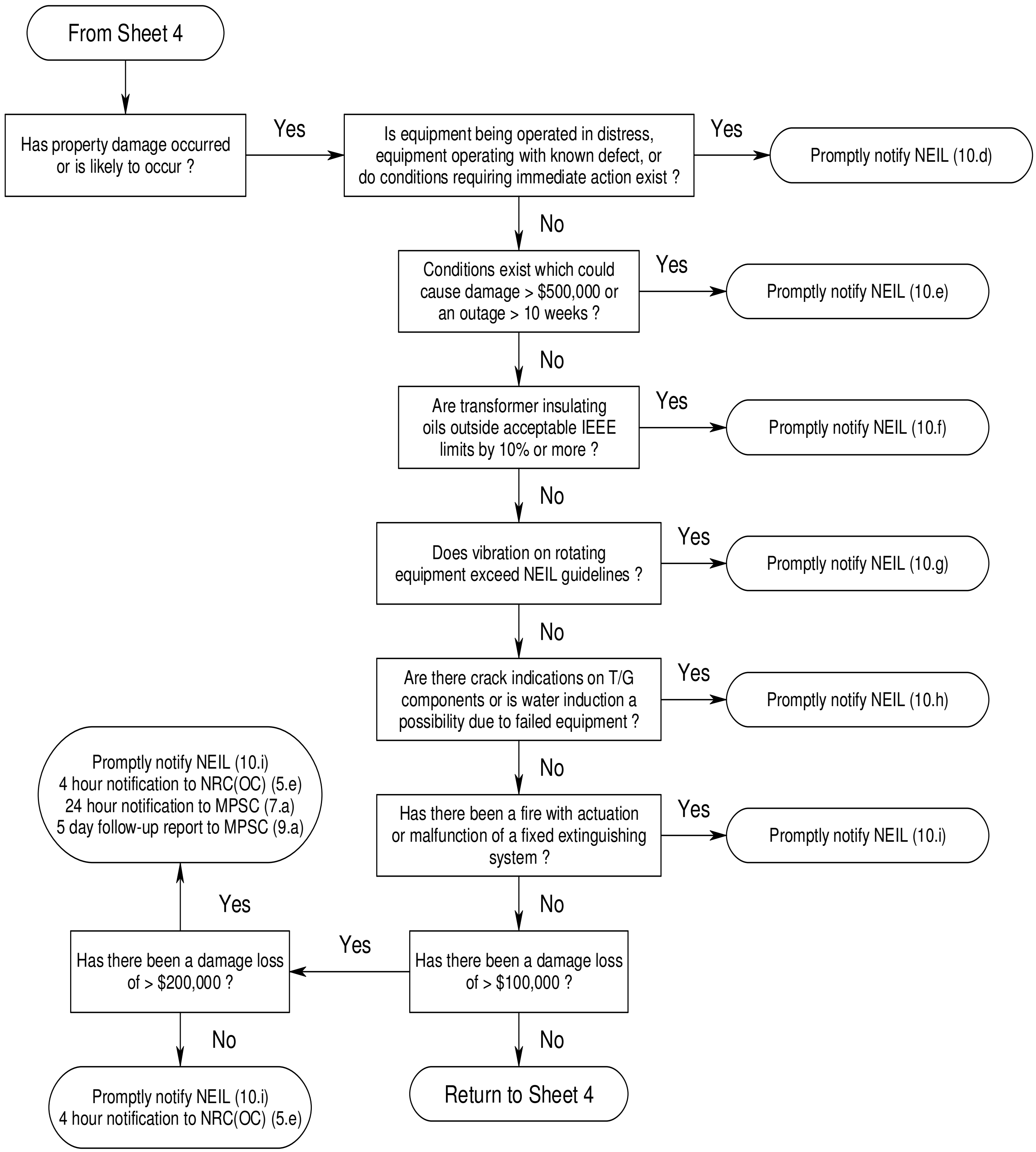


 INFORMATION USE

Attachment 4 (Cont'd.)

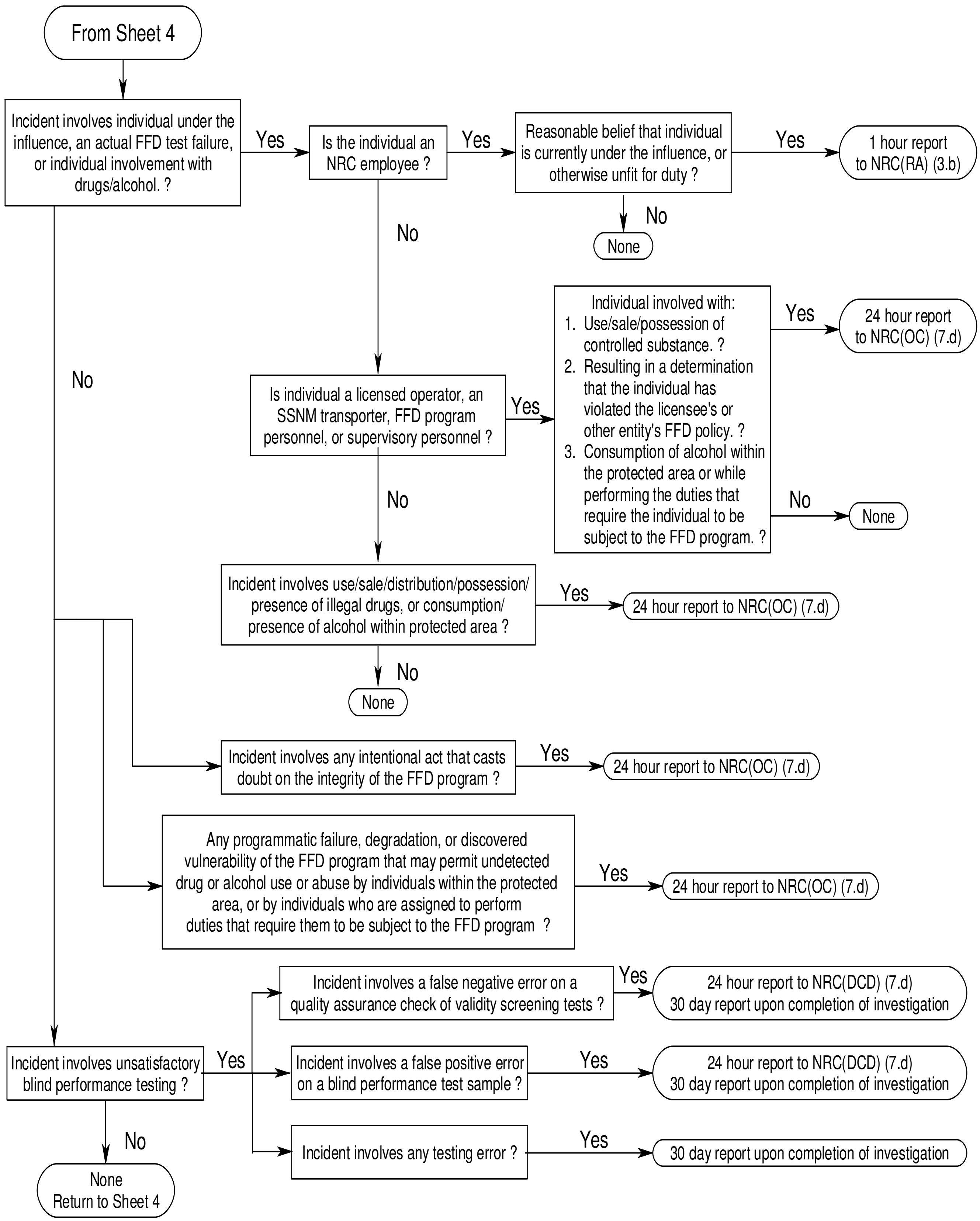
Sheet 7 of 15

Property Damage - Actual or Potential



Attachment 4 (Cont'd.)

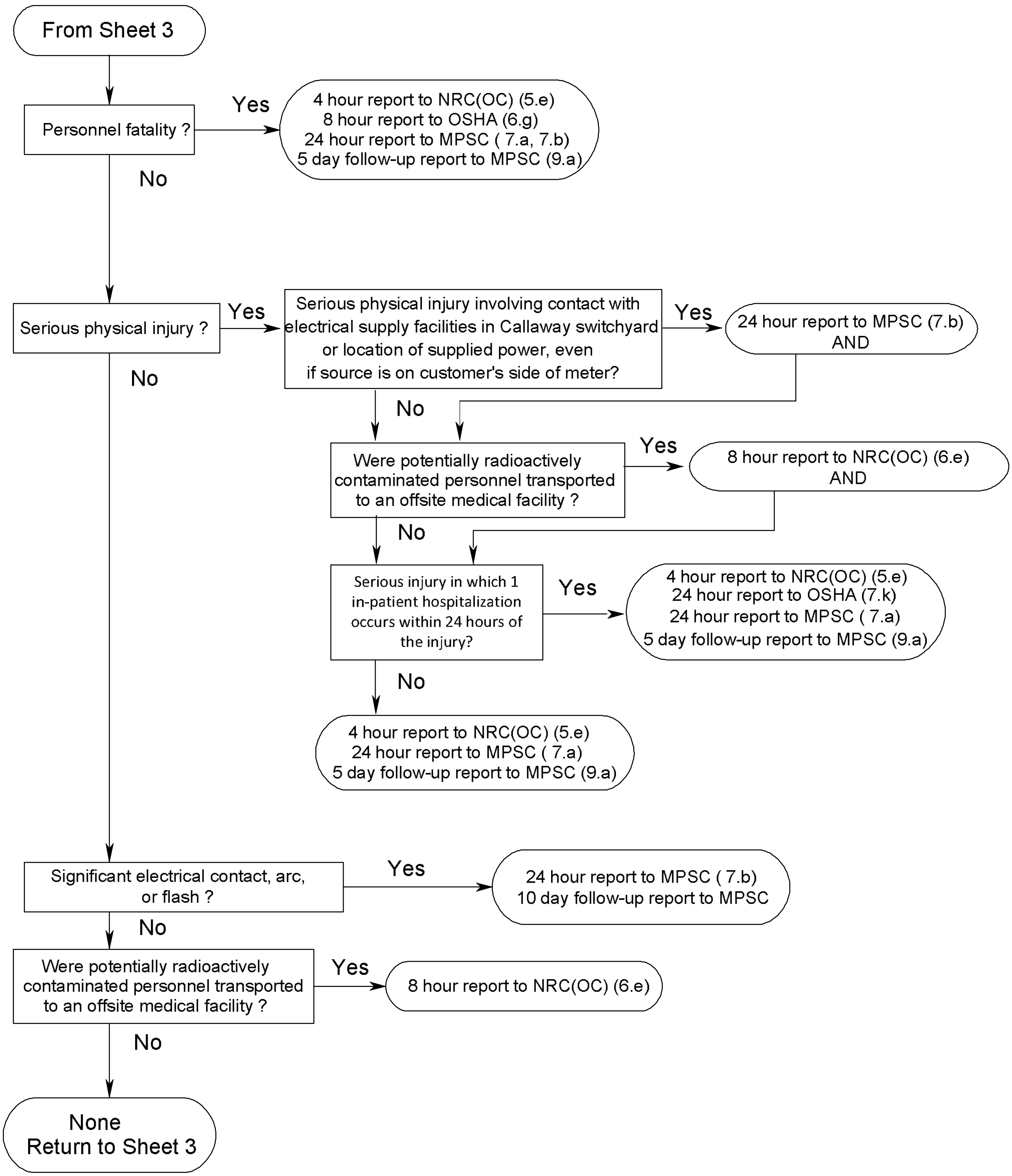
Sheet 8 of 15



INFORMATION USE

Attachment 4 (Cont'd.)

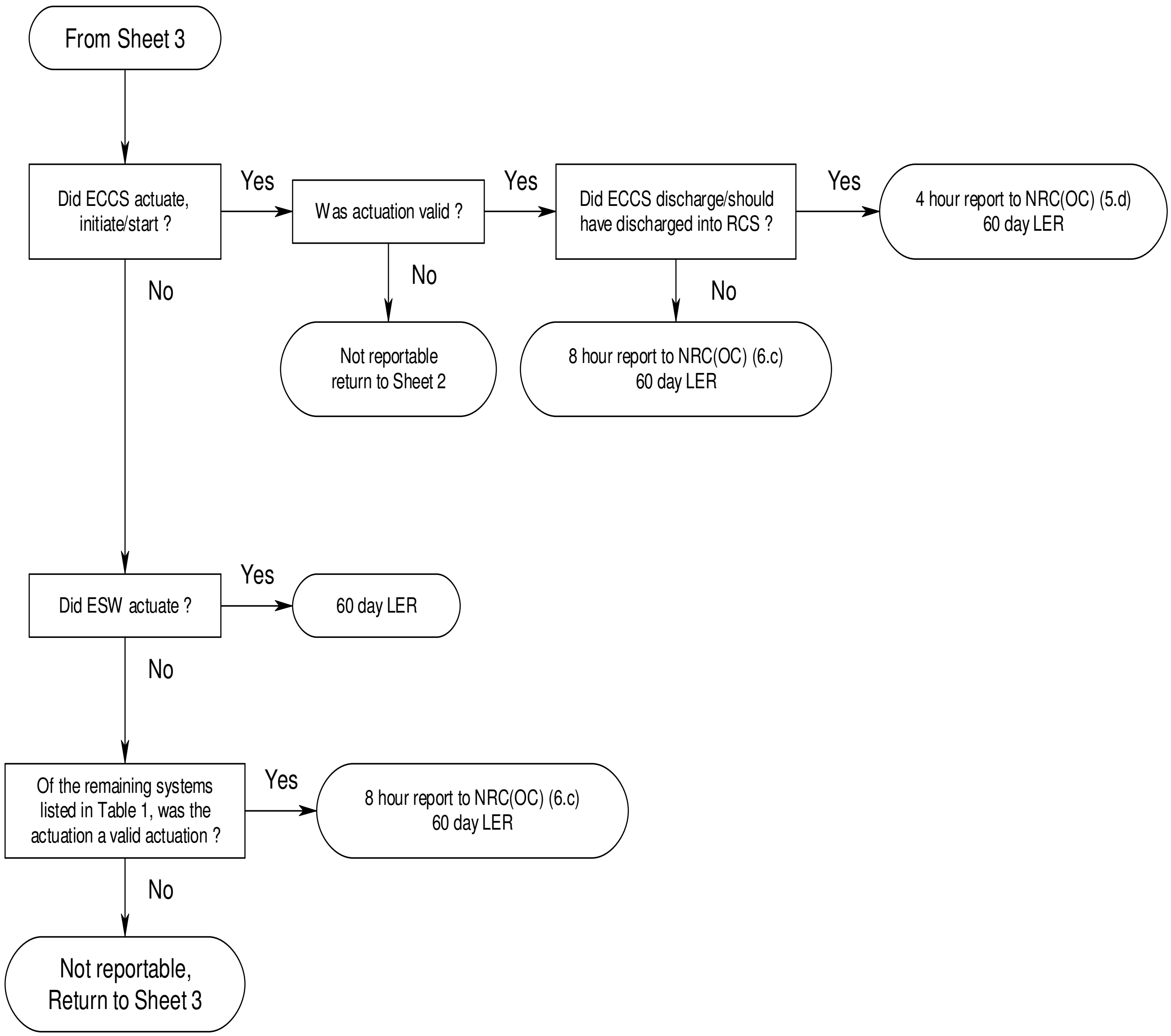
Sheet 9 of 15



INFORMATION USE

Attachment 4 (Cont'd.)

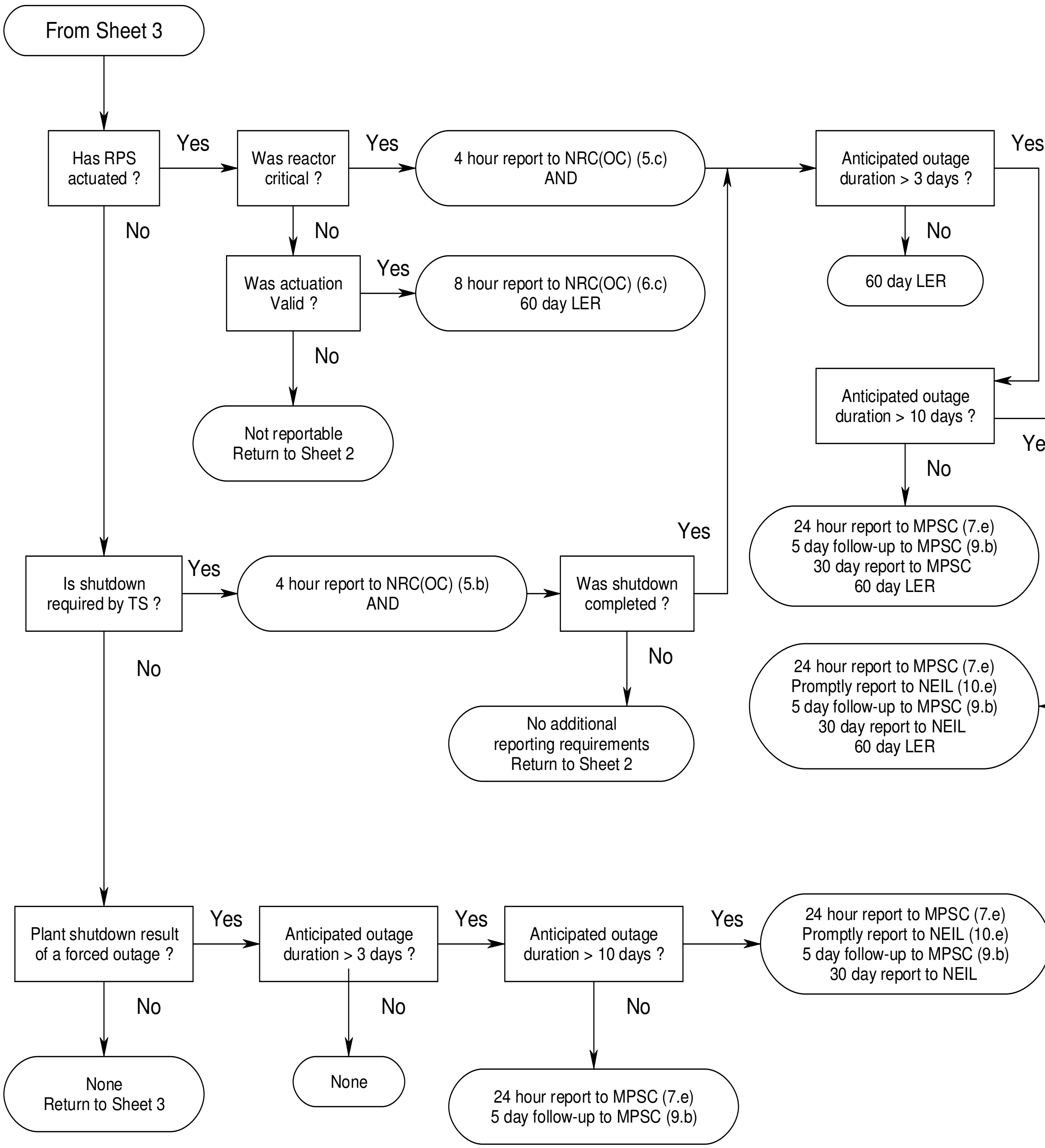
Sheet 10 of 15



INFORMATION USE

Attachment 4 (Cont'd.)

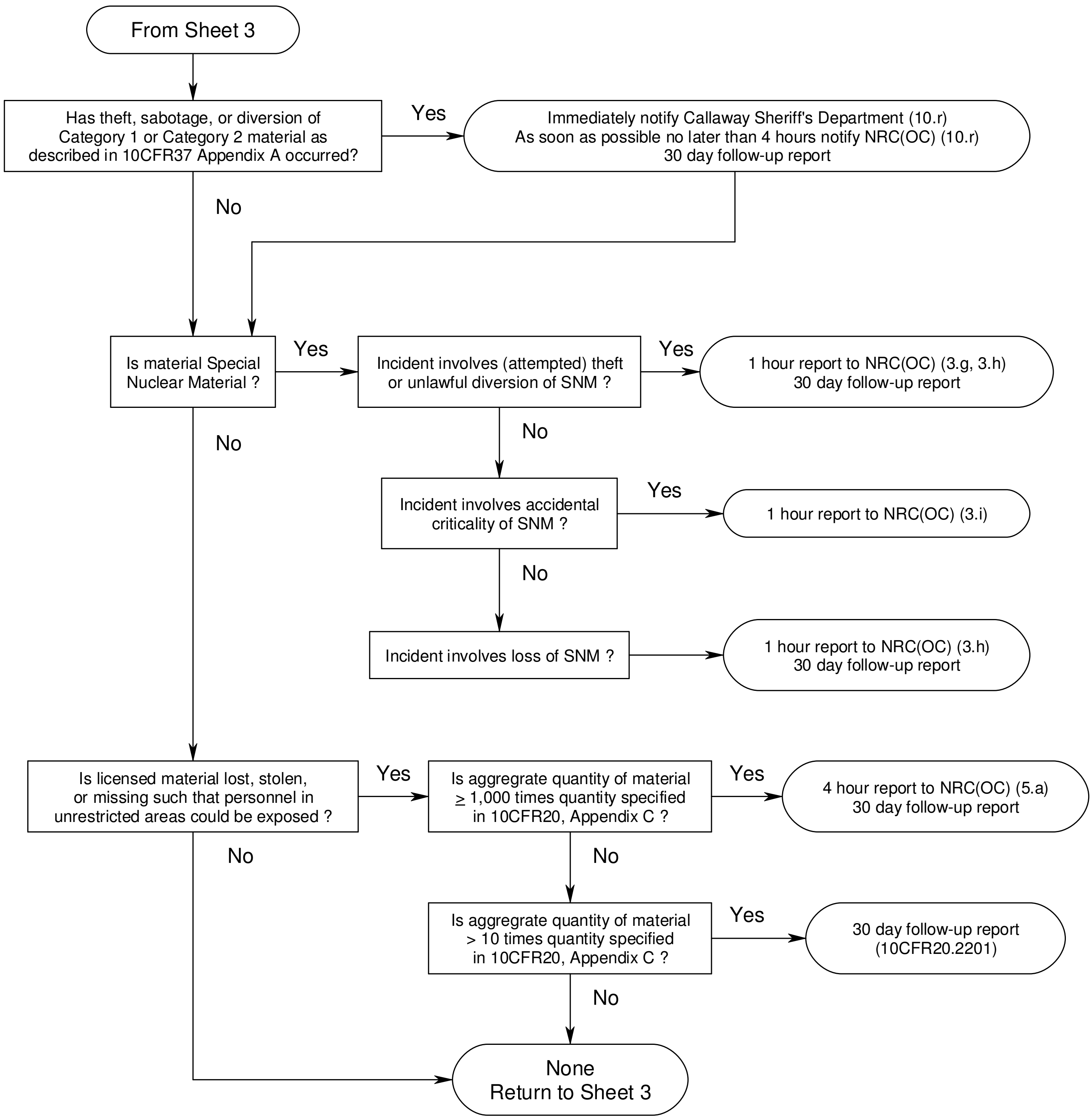
Sheet 11 of 15



INFORMATION USE

Attachment 4 (Cont'd.)

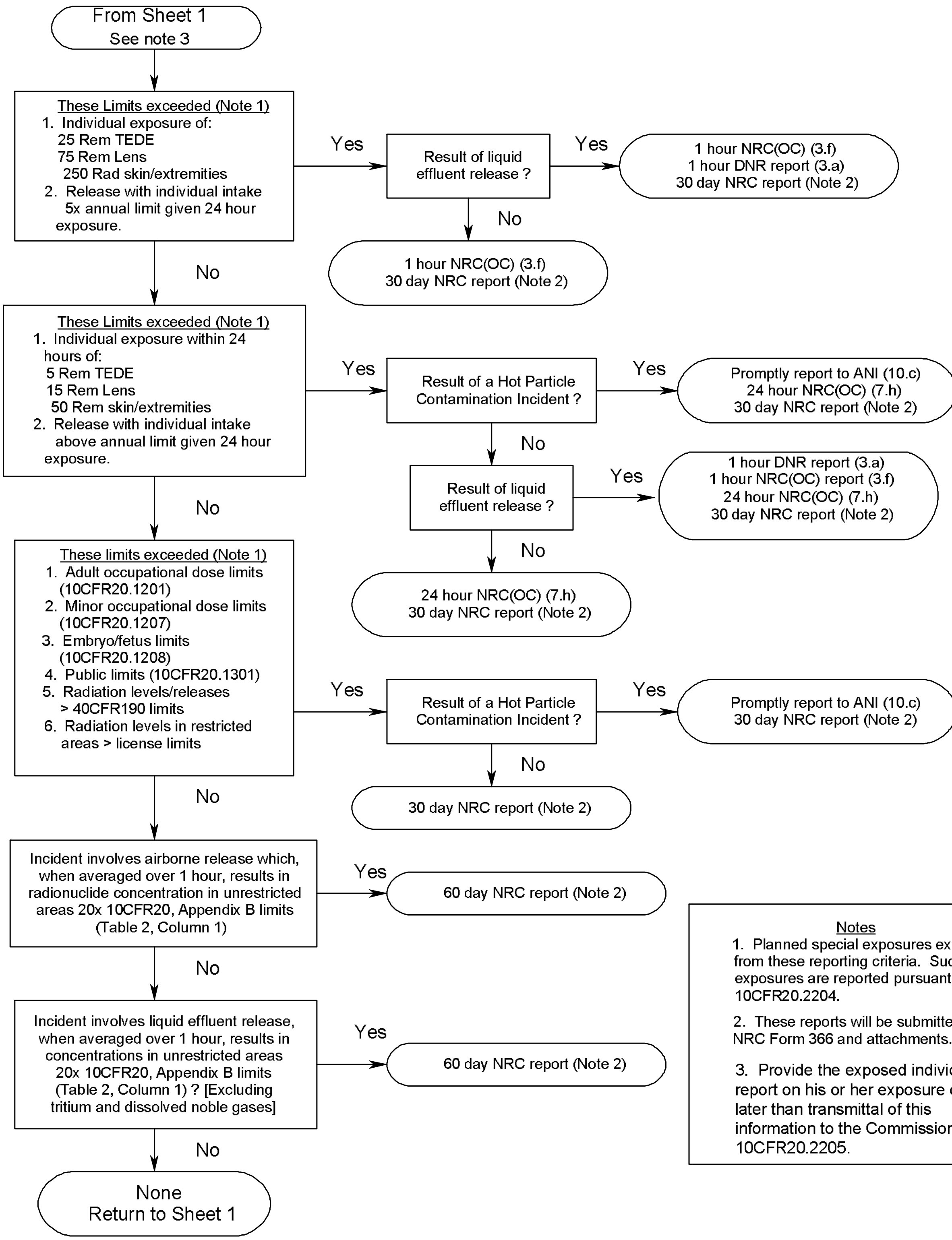
Sheet 12 of 15



 INFORMATION USE

Attachment 4 (Cont'd.)

Sheet 13 of 15



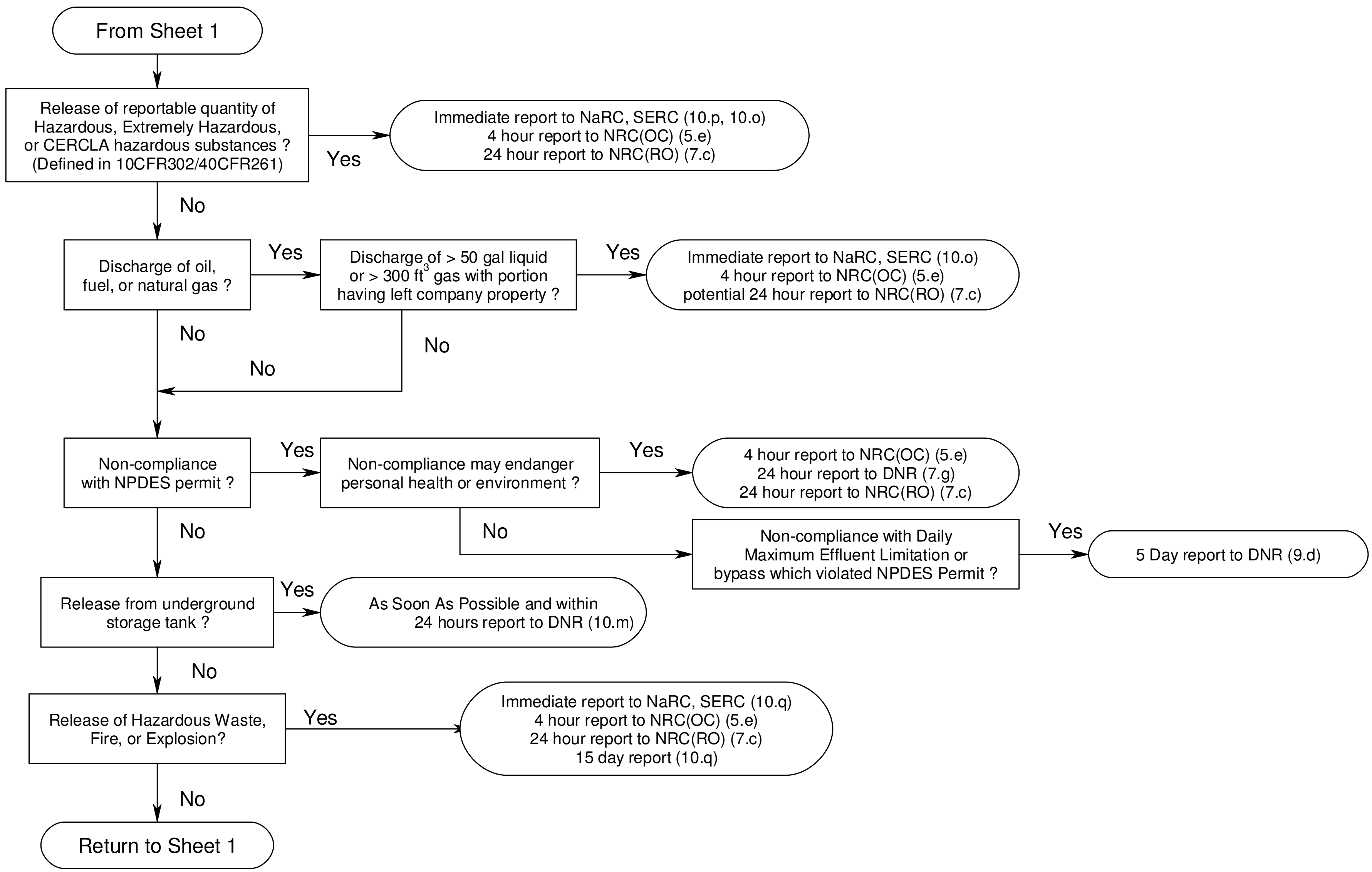
Notes

1. Planned special exposures excluded from these reporting criteria. Such exposures are reported pursuant to 10CFR20.2204.
2. These reports will be submitted on NRC Form 366 and attachments.
3. Provide the exposed individual a report on his or her exposure data, no later than transmittal of this information to the Commission, per 10CFR20.2205.

 INFORMATION USE

Attachment 4 (Cont'd.)

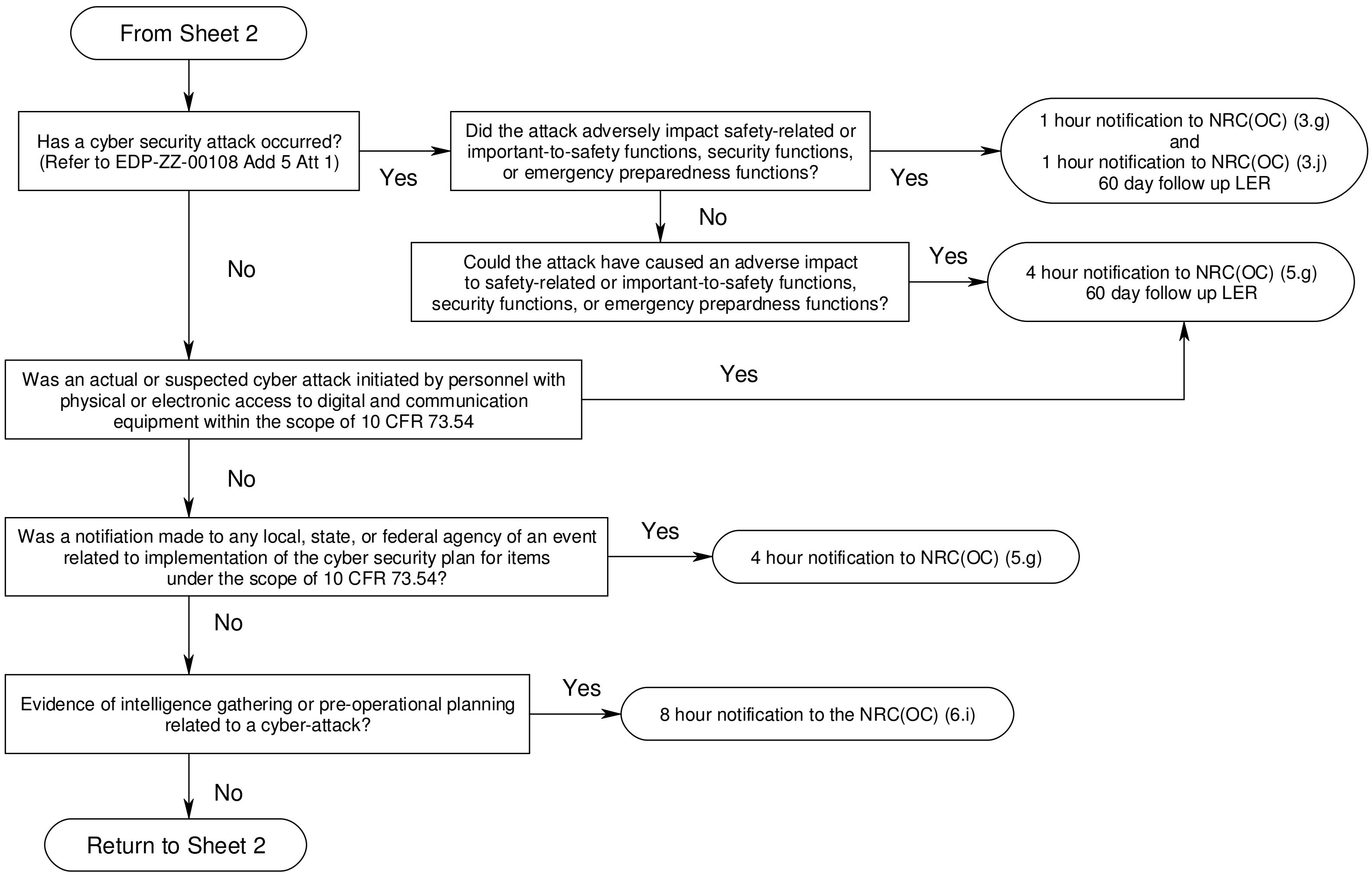
Sheet 14 of 15



INFORMATION USE

Attachment 4 (Cont'd.)

Sheet 15 of 15



CALLAWAY ENERGY CENTER
JOB PERFORMANCE MEASURE

A4 (SRO)

JPM No:	Admin4-SRO-O-006	KSA No:	GEN 2.4.44
Revision Date:	05/22/2017	KSA Rating:	4.4
Job Title:	URO/SRO		
Duty:	Emergency Plan		
Task Title:	Determine the Protective Action Recommendation		
Completion Time:	15 minutes		

The performance of this task was evaluated against the standards contained in this JPM and determined to be:

☐ SATISFACTORY ☐ UNSATISFACTORY

Reason, if UNSATISFACTORY:

____

____

Evaluator Signature: ____________________ Date: ____________

Task Performer: ______________________________

Location of Performance:
☐ Control Room ☒ Simulator/Lab ☐ Plant ☒ Classroom

Method of Performance: ☐ Simulated ☒ Performed

☐ Alternate Path ☒ Time Critical ☐ RCA

References: EIP-ZZ-00212, Protective Action Recommendations, rev 28
CA2843, PAR Flowchart

Tools / Equipment: None

CALLAWAY ENERGY CENTER
JOB PERFORMANCE MEASURE

Initial Conditions: A General Emergency has been declared per HG1.1 due to an on-going terrorist attack. The intruders have gained control of the fuel building and indications of damaged spent fuel exist from elevated radiation monitor readings.

Containment radiation as read on GT RE-59&60 indicate normal.

A reactor trip and plant cooldown is in progress.

Reports over the security radio channel indicate the fight is both inside and outside the protected area.

The Dose Assessment Technician location is unknown.

Wind speed is 8 mph heading from 234°

Initiating Cues: The Shift Manager has directed you to make the initial Protective Action Recommendation per EIP-ZZ-00212, Protective Action Recommendations, and complete CA2843, PAR Flowchart.

This JPM is Time Critical.

Simulator Set up and/or Note(s): None

Task Standard: Upon completion of this JPM, the candidate will have recommended Sheltering within a 2 mile radius and 5 miles downwind (sectors B,C,D,E) and marked the PAR Flowchart in accordance with the attached key.

Start Time: ________________

Stop Time: ________________

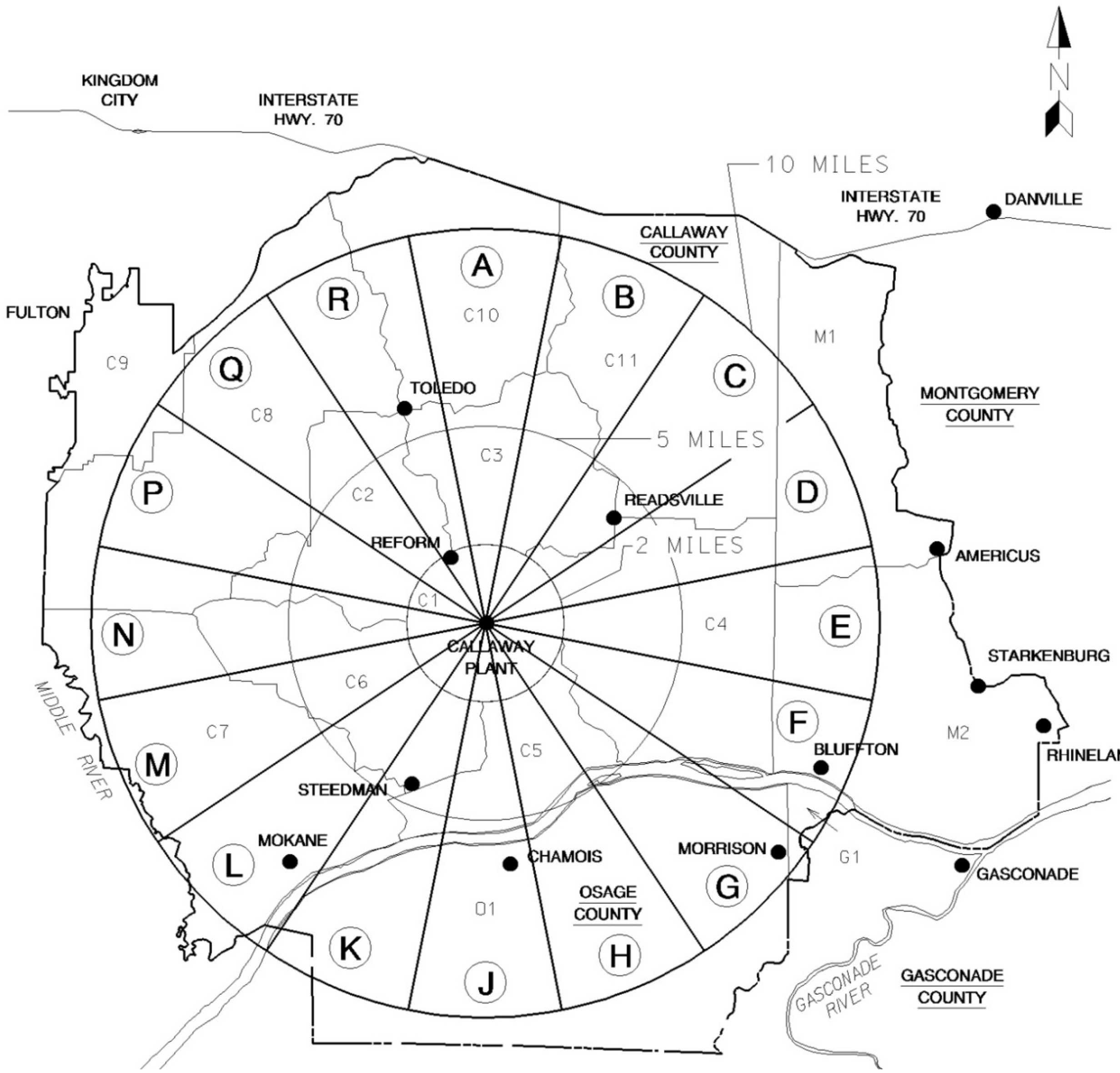
JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
*1.	Considering plant and radiological data, establish PARs as follows: a. Determine the appropriate PARs using CA2843, PAR Flowrate Step 5.2.3.a		The applicant determined to shelter in place 2 mile radius and 5 miles downwind	**S** **U** Comments:
*2.	Verify which sectors /sector segments are included in the PAR Step 5.2.3.b and 5.1.2		The applicant determined affected sectors are B,C,D,E (from 234°)	**S** **U** Comments: Note: all 4 sectors are required to complete for this step to be SAT
*3.	Document each PAR on a separate form CA2843, PAR Flowchart. Step 5.2.4		The applicant outlined affected sectors/segments on CA2843. (see key)	**S** **U** Comments
4.	**JPM IS COMPLETE**	RECORD STOP TIME ON PAGE 2.		**S** **U** Comments

*Critical Step

A4 (SRO)

Initial Conditions:	A General Emergency has been declared per HG1.1 due to an on-going terrorist attack. The intruders have gained control of the fuel building and indications of damaged spent fuel exist from elevated radiation monitor readings. Containment radiation as read on GT RE-59&60 indicate normal. A reactor trip and plant cooldown is in progress. Reports over the security radio channel indicate the fight is both inside and outside the protected area. The Dose Assessment Technician location is unknown. Wind speed is 8 mph heading from 234°
Initiating Cues:	The Shift Manager has directed you to make the initial Protective Action Recommendation per EIP-ZZ-00212, Protective Action Recommendations, and complete CA2843, PAR Flowchart. This JPM is Time Critical.

PAR FLOWCHART



Date: __________ Time:____________ Prepared By: ____________________________________ PIN:_______________

Outline Affected Sectors/Segments above indicating ....(**E**) Evacuate, ...(**S**) Shelter:

Method:............... ☐ Plant Conditions .... ☐ Dose Projections

Reason for type of Protective action: ____

____

Data considered:____

____

Questionable data and impact on PAR: ____

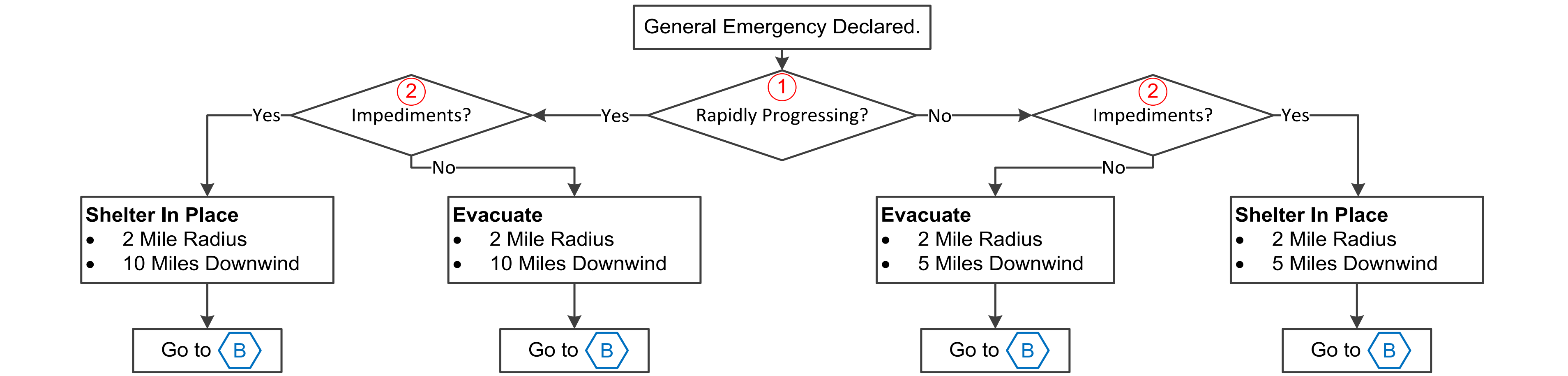
____

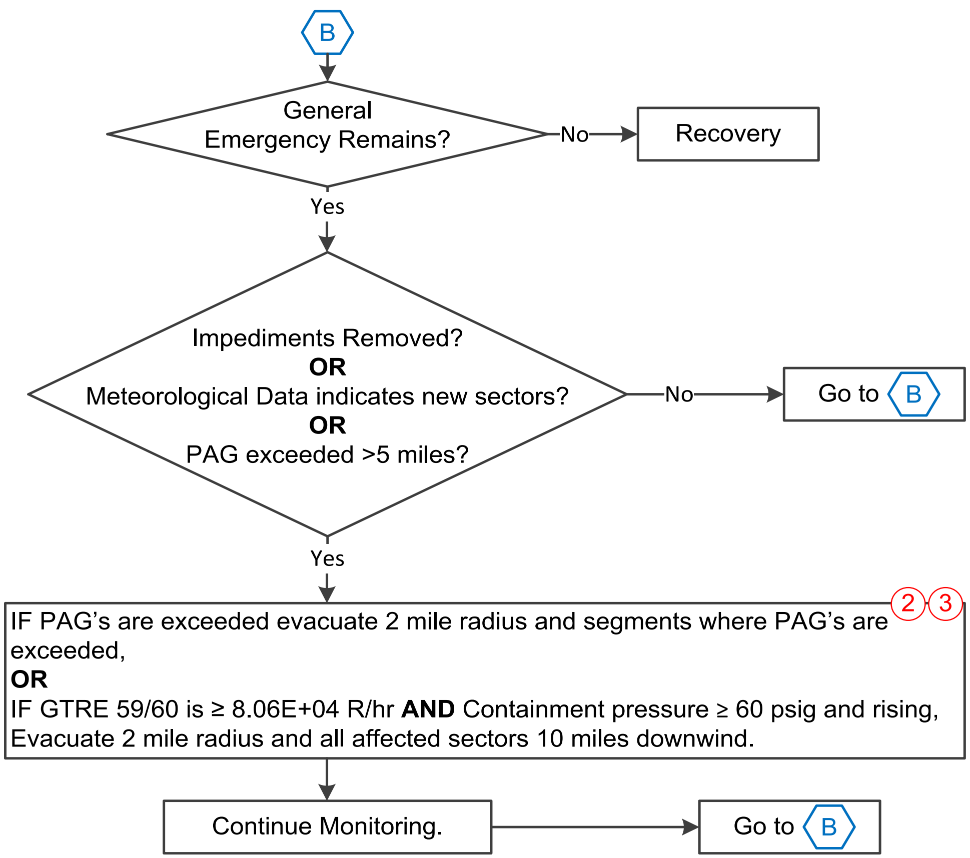
Impediments considered: ____

____

Correlations of effluent monitor projections with field measurements:____________________________________

____





Notes

1. Rapidly progressing severe accident is:
   The protective action recommendation is the first after the GE is declared.
   AND
   There is a loss of containment as defined in EAL Table F-1. *(Table F-1 applies during Hot or Cold plant conditions.)*
   AND
   EITHER of the following:
   ≥ 8.06E+04 R/hr on GT-RE-59 and/or GT-RE-60.
   ≥ 1 REM TEDE and/or ≥ 5 REM thyroid CDE at the EAB reached in 1 hour or less.

2.

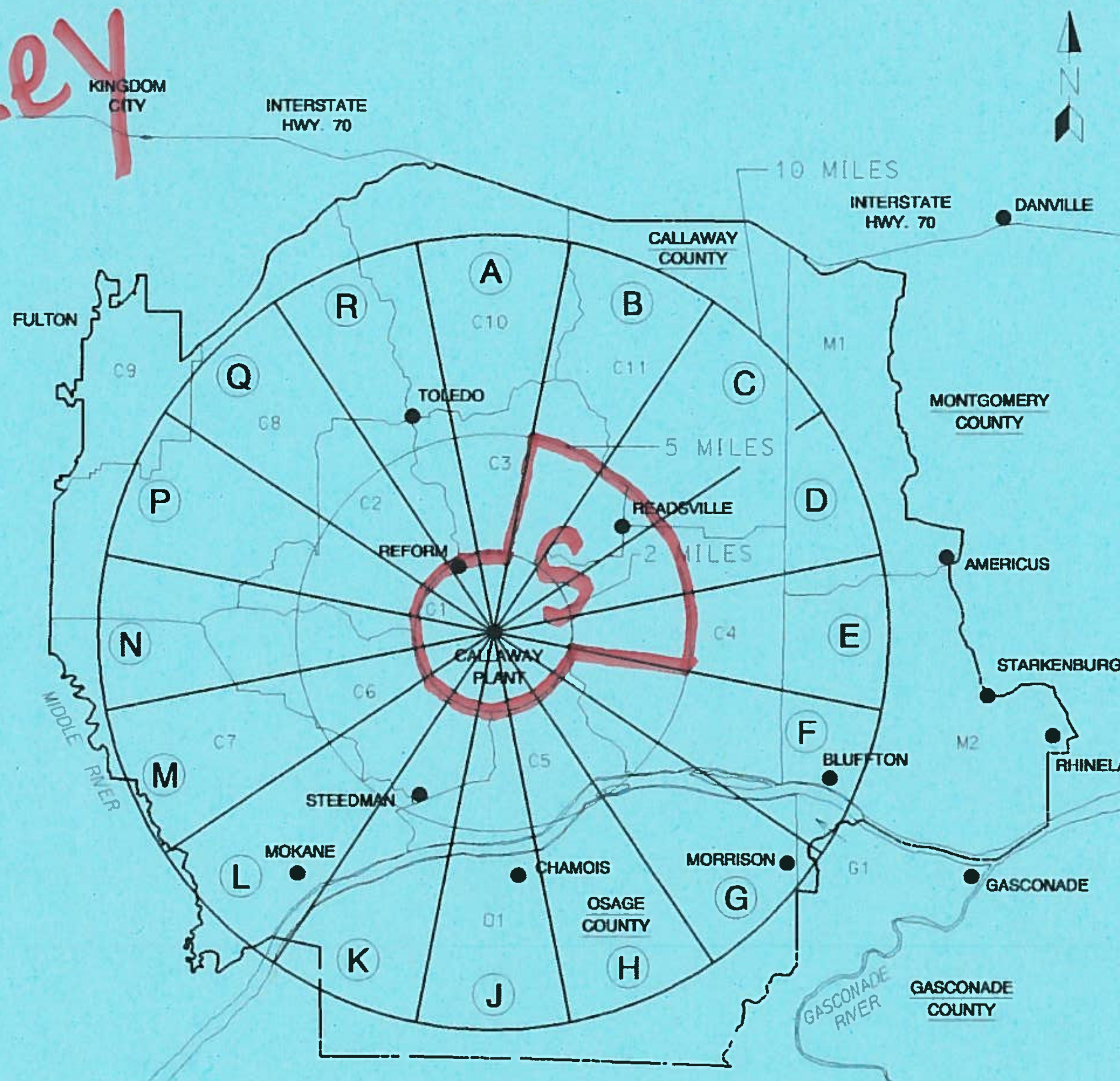
2. Recommend Shelter as a Protective Action only when:
   Controlled release <1 hour and the area cannot be evacuated before the release.
   OR
   Travel conditions present extreme hazard.
   OR
   A security threat exists.

3.

3. If Control Room has responsibility for PARs, *and dose assessment is* ***not available***, then expanded PARs may be called based on wind shift.

PAR FLOWCHART

Key



Date: __________ Time: __________ Prepared By: ______________________________ PIN: ______________

Outline Affected Sectors/Segments above indicating ....(**E**) Evacuate, ...(**S**) Shelter:

Method: .... ☐ Plant Conditions .... ☐ Dose Projections

Reason for type of Protective action: ____

____

Data considered: ____

____

Questionable data and impact on PAR: ____

____

Impediments considered: ____

____

Correlations of effluent monitor projections with field measurements: ________________

____

EIP-ZZ-00212

PROTECTIVE ACTION RECOMMENDATIONS

MINOR Revision 028

INFORMATION USE

PROTECTIVE ACTION RECOMMENDATIONS

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ATTACHMENT 1 ..... **16**
Example of Form CA2843 PAR Flowchart 16

PROTECTIVE ACTION RECOMMENDATIONS

1.0 PURPOSE

This procedure provides guidance in making protective action recommendations to the State of Missouri and 10-mile Emergency Planning Zone (EPZ) counties for protecting members of the general public using the Callaway Plant Radiological Emergency Response Plan (RERP).

2.0 SCOPE

2.1. This procedure outlines the Callaway Energy Center process for making Protective Action Recommendations (PARs) based on plant conditions and radiological dose projections to Federal, State and Local Officials for use in making protective action decisions for the general public.

2.2. This procedure only provides protective actions in the Early (Plume) phase of a nuclear incident.

3.0 RESPONSIBILITIES

3.1. Recovery Manager (RM)

3.1.1. Assumes responsibility from the Control Room for PARs to the State and local authorities.

3.1.2. Authorizes notifications to off-site agencies.

3.1.3. Ensures coordinated emergency response among Callaway Plant and off-site agencies.

3.2. Emergency Coordinator (EC)

3.2.1. Classifies and declares emergencies.

3.2.2. Prior to the arrival of the RM in the EOF, evaluates plant conditions and/or dose assessments and makes PARs to the State and local authorities.

3.2.3. Initiates the implementation of on-site protective actions.

3.3. Control Room Staff

Monitors plant conditions and assists in making PARs, until the Technical Assessment Coordinator or the Protective Measures Coordinator arrive at their respective facility.

3.4. Protective Measures Coordinator (PMC)

3.4.1. Formulates PARs based on plant and radiological information.

3.4.2. Assists the Recovery Manager, State officials, and Federal officials in the interpretation of plant-related data.

3.4.3. Coordinates PARs with Department of Health and Senior Services (DHSS) and the State Emergency Management Agency (SEMA), whenever possible.

3.5. Technical Assessment Coordinator (TAC)

3.5.1. Evaluates plant conditions to identify Emergency Action Levels (EALs) and emergency mitigating recommendations, using EIP-ZZ-00101, Classification of Emergencies.

3.5.2. Coordinates PARs consistent with plant conditions, with the Recovery Manager (or EC), and Dose Assessment Coordinator, prior to the arrival of the PMC or PAC.

3.6. Plant Assessment Coordinator (PAC)

3.6.1. Reviews and monitors plant conditions and EALs.

3.6.2. Verifies the adequacy of existing PARs.

3.6.3. Assists in the formulation of new PARs.

3.7. Dose Assessment Coordinator (DAC)

3.7.1. Performs dose assessment projections using EIP-ZZ-01211, Accident Dose Assessment.

3.7.2. Reviews effluent based EALs.

3.7.3. Assists in the formulation of PARs.

3.8. Dose Assessment Technician

Reports to the Control Room and performs initial dose assessment projections, until the Dose Assessment Coordinator arrives in the EOF.

4.0 PREREQUISITES

Plume Phase PARs are made to off-site agencies following declaration of a GENERAL EMERGENCY, and are NOT issued for less severe event classifications.

-END OF SECTION-

5.0 PROCEDURE INSTRUCTIONS

5.1. Considerations for PAR Development

5.1.1. UPON declaration of a GENERAL EMERGENCY, IMMEDIATELY ESTABLISH the initial PAR.

a. DEFAULT PAR is to evacuate the 2 mile radius around the plant and 5 miles downwind of the plant in affected sectors.

b. IF Shelter is the selected PAR due to impediments to Evacuation, the default area is still 2 mile radius around the plant and 5 miles downwind of the plant in affected sectors.

c. Determine if a Rapidly Progressing Event is occurring as follows:

The protective action recommendation is the first after the General Emergency is declared.
AND
There is loss of containment as defined in EAL Table F-1. (Table F-1 is also used to determine loss of containment in cold conditions)
AND
EITHER of the following:
≥ 8.06E+4 R/hr on GT-RE-59 and/or GT-RE-60
≥ 1 REM TEDE and/or ≥ 5 REM thyroid CDE at the EAB reached in 1 hour or less.

d. The PAR for a Rapidly Progressing Event is Shelter/Evacuate 2 mile radius around the plant and 10 miles downwind of the plant in affected sectors.

e. Radiological data, or a radioactive release above normal operating limits, is NOT required prior to issuance of the default PAR for a plant condition based declaration.

f. IF sufficient, timely information is available to warrant a different recommendation, MAKE the appropriate PAR.

g. IF there is uncertainty of information, Do NOT delay notification of off-site agencies with the default PAR. MAKE the default PAR notification, THEN MODIFY the recommendations (if necessary) when more/better data is available.

NOTE

- Callaway Energy Center makes PARs in terms of Sectors and Sector Segments, off-site agencies specify protective action decisions in terms of Subareas.
- If Subsequent PARs are required, dose assessment results must be used to modify PARs, adding new Sectors / Sector Segments to the PAR if Protective Action Guides (PAGs) are to be exceeded in the new area.

5.1.2. VERIFY current affected sectors as follows:

- IF available, USE affected sectors supplied by Notification and/or Dose Assessment software.
- Use the FROM Wind Directions on the table below to determine the affected sectors.

Wind Direction (From)	Sectors	Wind Direction (From)	Sectors
8 – 14	H, J, K, L	188 - 194	R, A, B, C
15 - 30	J, K ,L	195 - 210	A, B, C
31 - 37	J, K, L, M	211 - 217	A, B, C, D
38 - 52	K, L, M	218 – 232	B, C, D
53 - 59	K, L, M, N	233 – 239	B, C, D, E
60 - 75	L, M, N	240 – 255	C, D, E
76 - 82	L, M, N, P	256- 262	C, D, E, F
83 - 97	M, N, P	263 – 277	D, E, F
98 - 104	M, N, P, Q	278 – 284	D, E, F, G
105 - 120	N, P, Q	285 – 300	E, F, G
121 - 127	N, P, Q, R	301 – 307	E, F, G, H
128 - 142	P, Q, R	308 – 322	F, G, H
143 - 149	P, Q, R, A	323 – 329	F, G, H, J
150 - 165	Q, R, A	330 – 345	G, H, J
166 - 172	Q, R, A, B	346 – 352	G, H, J, K
173 - 187	R, A, B	353 - 7	H, J, K

5.1.3. CONTINUE to evaluate Sectors / Sector Segments that have been Sheltered for conditions that support Evacuation.

5.1.4. ONCE any Sector / Sector Segment has been included in a PAR, INCLUDE that Sector / Sector Segment in all future PARs.

5.1.5. ONCE an Evacuation PAR has been made for any Sector / Sector Segment, DO NOT REDUCE the recommendation to Shelter in that Sector / Sector Segment in any subsequent PAR.

5.1.6. RECOMMEND Shelter as a protective action ONLY for:

- Controlled releases from containment where there is assurance that the release is short term (<1 hour) AND the area near the plant cannot be evacuated before the plume arrives (evacuation may be considered later, after the plume passes)
- Travel conditions present an extreme hazard (until conditions improve)
- When there is a security threat.

5.1.7. Shelter conditions will remain in effect until impediments are removed and one or both of the following is met:

a. If Protective Action Guidelines (PAGs) are exceeded, evacuate 2 mile radius and segments where PAGs are exceeded.

b. If GTRE 59/60 is $\geq$ 8.06E+04 R/hr AND Containment pressure $\geq$ 60 psig and rising evacuate 2 mile radius and all effected sectors 10 miles downwind.

5.1.8. DOCUMENT each PAR on Attachment 1, PAR Flowchart and include detailed justification and basis for the PAR selected. The justification should include information such as:

- Reason for type of protective action
- Whether plant conditions or dose projections was the basis of the PAR
- Data that was considered in the decision
- Any data with questionable validity and how that impacted the PAR decision
- Evacuation impediments considered
- Correlation of effluent monitor projections with field measurements

NOTE

A PAR may be specified to Shelter or Evacuate any combination of Sectors / Sector Segments even if dose or plant data does not meet EPA PAG thresholds (1 REM TEDE, 5 REM CDE Thyroid), provided there is a reasonable justification to do so and that justification is communicated and documented. Examples where this may be warranted include:

- Uncertainties in radiological data or meteorological conditions indicate the possibility of exceeding a PAG.
- Plant condition uncertainties indicate there could be a near-term release exceeding a PAG.
- Any other situation where risk reduction to public health can be achieved at an acceptable cost.

5.2. Making Protective Action Recommendations

5.2.1. ASSESS plant data and compare to conditions and indications per EIP-ZZ-00101, Classification of Emergencies.

5.2.2. EVALUATE radiological data per EIP-ZZ-01211, Accident Dose Assessment.

NOTE

Determine PARs as soon as possible and within 15 minutes of data requiring a PAR is available.

5.2.3. CONSIDERING plant AND radiological data, ESTABLISH PARs as follows:

a. DETERMINE the appropriate PARs using CA2843, PAR Flowchart.

b. VERIFY which Sectors / Sector Segments are included in the PAR.

c. DISCUSS PAR with Department of Health and Senior Services (DHSS) and State Emergency Management Agency (SEMA), to the extent possible.

NOTE

Once the PAR has been developed and approved, actions to make Notifications to the State and Counties may be performed concurrently with completion of the PAR documentation on form CA2843, PAR Flowchart (throughout this procedure).

PAR Development Time for a **default** PAR should be the time of the GENERAL EMERGENCY declaration. Otherwise, PAR Development Time should reflect the time that the PAR was approved and announced.

5.2.4. DOCUMENT each PAR on a separate form CA2843, PAR Flowchart, and include detailed justification and basis for the PAR selected.

5.2.5. RETAIN completed form CA2843, PAR Flowchart as the official record of PAR formulation.

5.2.6. CONTINUE to evaluate plant and radiological conditions.

5.3. PAR Approval and Notification

NOTE

Notifications that initiate or change PARs are initial notifications and are required to be made and acknowledged within 15 minutes of PAR declaration or change.

5.3.1. MAKE Notifications to off-site agencies (SEMA and Counties) for declarations and PARs (or changes to them) using EIP-ZZ-00201, Notifications.

5.3.2. COORDINATE notifications and PARs with DHSS AND SEMA, to the extent possible.

5.3.3. IF necessary to determine a Plume Arrival Time manually (normally provided by SENTRY software):

a. DETERMINE desired location’s distance from the plant using Field Monitoring Team maps or Dose Assessment software.

b. To determine transit time, DIVIDE distance from the plant (in miles) by wind speed (in miles per hour).

c. ADD transit time to the Release Start Time (obtained from Dose Assessment personnel).

5.4. Modifications of PARs

5.4.1. AFTER performing the initial early protective actions near the plant, MODIFY the PARs as necessary based on:

- Field monitoring data which indicate PAGs (1 REM TEDE, 5 REM CDE Thyroid) may be exceeded in areas beyond those that have been evacuated.
- Dose projections which indicate that PAGs (1 REM TEDE, 5 REM CDE Thyroid) may be exceeded in areas beyond those that have been evacuated.
- Plant conditions.

5.4.2. MONITOR meteorological conditions frequently AND UPDATE forecasts periodically to anticipate and detect impact on PARs.

5.4.3. IF dose calculations indicate doses in excess of PAGs (1 REM TEDE, 5 REM CDE Thyroid) in Sectors or Sector Segments that are NOT currently included in PARs:

a. COMPLETE form CA2843, PAR Flowchart.

b. MODIFY PARs accordingly.

c. NOTIFY off-site authorities.

5.4.4. IF dose calculations indicate doses that exceed PAGs (1 REM TEDE, 5 REM CDE Thyroid) beyond 5 miles:

a. COMPLETE form CA2843, PAR Flowchart.

b. UPGRADE PARs to evacuate 10 miles downwind of the plant in affected sectors.

c. NOTIFY off-site authorities.

5.4.5. IF dose calculations indicate doses that exceed PAGs beyond 10 miles:

a. IF field team measurements are available, VERIFY the dose projection.

b. COMPLETE form Attachment 1, PAR Flowchart.

c. DISCUSS PAR with Department of Health and Senior Services (DHSS) and State Emergency Management Agency (SEMA), to the extent possible

d. Include affected areas beyond 10 miles in the modified PAR. This may require using geographical boundaries to define the affected area beyond the Emergency Planning Zone.

e. NOTIFY off-site authorities.

5.4.6. IF affected Sectors / Sector Segments change based on meteorological conditions or weather forecasts:

a. IF a radiological release is in progress, EXPAND the PAR into new area(s) where the PAGs (1 REM TEDE, 5 REM CDE Thyroid) are projected to be exceeded.

b. IF Control Room has responsibility for PARs and dose assessment is not available PARS may be EXPANDED into new area(s) based on wind shift.

c. IF the following plant conditions are met, EXPAND the PAR to 2 mile radius and all affected sectors 10 miles downwind.

≥8.06E+4 R/hr on GT-RE-59 and /or GT-RE-60

AND

Containment pressure ≥60 psig and rising

5.5. Event Termination

NOTE

Offsite authorities may decide to continue previously implemented offsite protective actions until more information becomes available.

5.5.1. WHEN the requirements for Plant Recovery have been met AND Plant Recovery has been declared using EIP-ZZ-00260, Event Closeout / Plant Recovery, EXIT this procedure.

-END OF SECTION-

6.0 REFERENCES

6.1. Implementing

6.1.1. EIP-ZZ-00101, Classification of Emergencies

6.1.2. EIP-ZZ-00201, Notifications

6.1.3. EIP-ZZ-00260, Event Closeout / Plant Recovery

6.1.4. EIP-ZZ-01211, Accident Dose Assessment

6.1.5. CA2843, PAR Flowchart

6.2. Developmental

6.2.1. Callaway Plant Radiological Emergency Response Plan (RERP)

6.2.2. NUREG 0654/FEMA REP 1, Criteria for Preparation of and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants

6.2.3. NRC Response Technical Manual

6.2.4. NRC Regulatory Issue Summary 2003-12, Clarification of NRC Guidance for Modifying Protective Actions

6.2.5. CARS 199900240, Guidance for PARS beyond the 10-mile EPZ

6.2.6. EDP-ZZ-00005, Assessing Core Damage

6.2.7. Protective Action Recommendation Determination, Nuclear Energy Institute, October 2010

6.2.8. EPA 400 R 92 001, Manual of Protective Action Guides and Protective Actions for Nuclear Incidents (including appendices)

7.0 RECORDS

7.1. QA Records

7.1.1. Attachment 1, PAR Flowchart.

7.1.2. All Facility Logs, computer screen prints, office memos, notes, etc. associated with drill, exercise or actual event should be turned in to the Logistics Support Coordinator and/or Emergency Preparedness Staff.

8.0 DEFINITIONS

8.1. **Plume Arrival Time** – The time that a radioactive release carried by the winds reaches a given area.

8.2. **Puff Release** – A controlled radioactive release from containment where there is assurance that the release is short term (less than 1 hour).

8.3. **Release Start Time** – The time that radioactive gases above normal operating limits were released from the plant, as described in EIP-ZZ-01211, Accident Dose Assessment.

8.4. **Sector** – One of 16 pie-shaped divisions of the Emergency Planning Zone.

8.5. **Sector Segment** – One of 3 portions of a Sector (0-2 miles, 2-5 miles, or 5-10 miles).

8.6. **Sentry** – A software program used to electronically send notifications to off-site agencies.

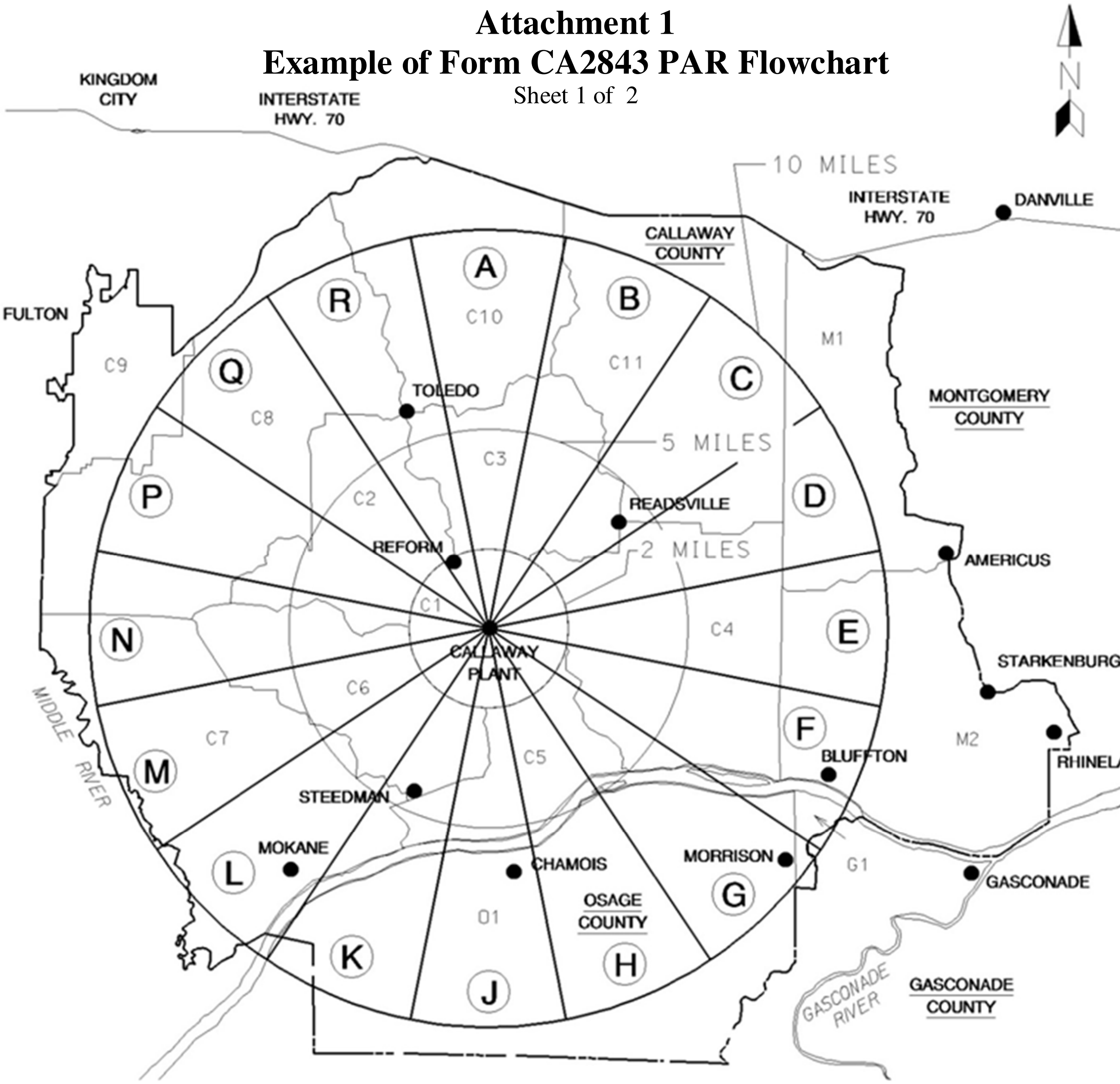
8.7. **Subarea** – An area separated on the map by geopolitical boundaries used by the State and Local government to delineate the scope of protective actions.

8.8. **Dose Assessment Software** – Software for dose calculations using EIP-ZZ-01211, Accident Dose Assessment.

9.0 SUMMARY OF CHANGES

Page(s)	Section or Step Number	Description
5	5.1.1.c	Clarified Table F-1 is also used to determine loss of containment when plant is in cold condition.
11	5.4.5	Revised to indicate Field Team Data should be used to verify Protective Action Recommendations beyond 10 miles if available. **CAR 201600391**
17	Attachment 1	Clarified Table F-1 is also used to determine loss of containment when plant is in cold condition.

Attachment 1
Example of Form CA2843 PAR Flowchart
Sheet 1 of 2



Date: __________ Time: __________ Prepared By: ______________________________ PIN: ____________

Outline Affected Sectors/Segments above indicating ....(**E**) Evacuate,............(**S**) Shelter:

Method:...............☐ Plant Conditions................☐ Dose Projections

Reason for type of Protective action: ____

____

Data considered: ____

____

Questionable data and impact on PAR: ____

____

Impediments considered:____

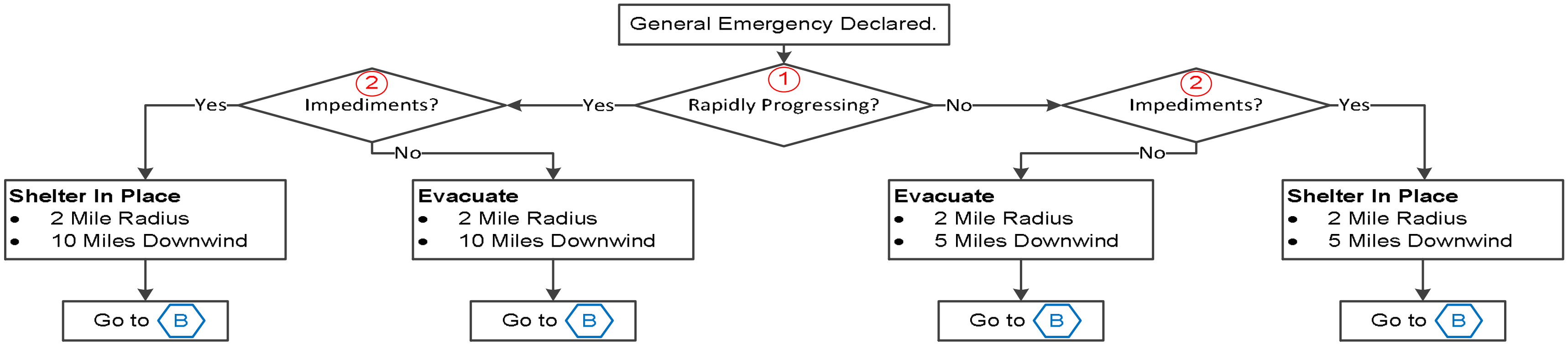
____

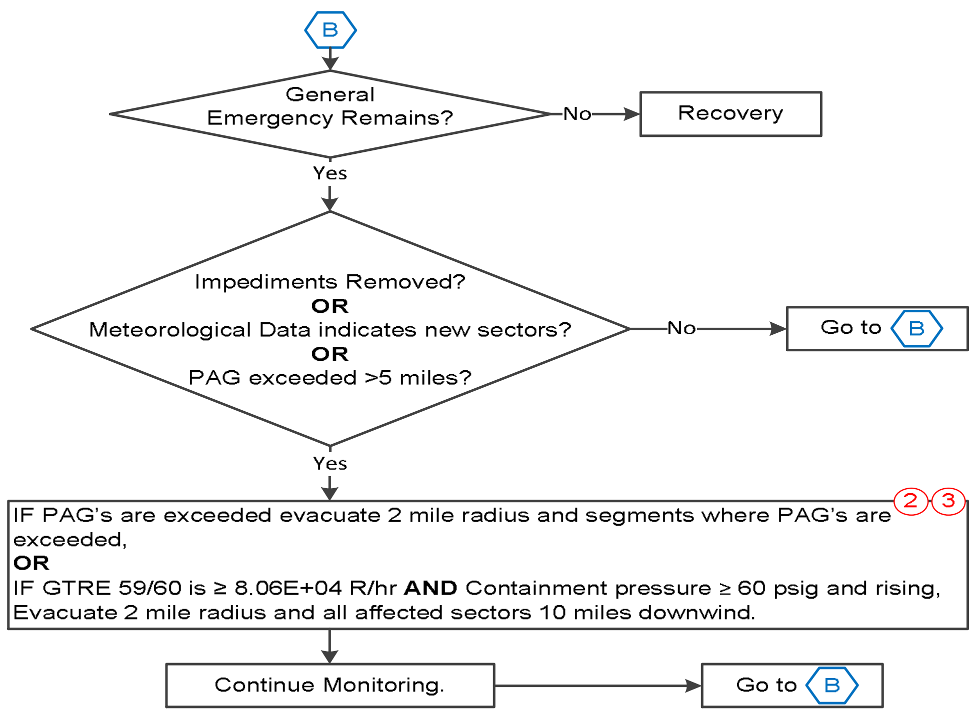
Correlations of effluent monitor projections with field measurements:____________________________

____

Attachment 1 (Cont'd.)

Sheet 2 of 2





Notes

1. Rapidly progressing severe accident is:
   The protective action recommendation is the first after the GE is declared.
   AND
   There is a loss of containment as defined in EAL Table F-1. *(Table F-1 applies during Hot or Cold plant conditions.)*
   AND
   EITHER of the following:
   - ≥ 8.06E+04 R/hr on GT-RE-59 and/or GT-RE-60.
   - ≥ 1 REM TEDE and/or ≥ 5 REM thyroid CDE at the EAB reached in 1 hour or less.

2. Recommend Shelter as a Protective Action only when:
   Controlled release <1 hour and the area cannot be evacuated before the release.
   OR
   Travel conditions present extreme hazard.
   OR
   A security threat exists.

3. If Control Room has responsibility for PARs, *and dose assessment is **not available***, then expanded PARs may be called based on wind shift.

Rev 1

Facility: Callaway Date of Examination: 9/11/2017

Exam Level: RO ☐ SRO-I ☒ SRO-U ☐ Operating Test No.: 2017-1

Control Room Systems:* 8 for RO; 7 for SRO-I; 2 or 3 for SRO-U

	System / JPM Title	Type Code*	Safety Function
S1	004 Chemical and Volume Control System / Manual VCT makeup	D,S	1
S2	013 Engineered Safety Features Actuation System / ESFAS – CSAS failure to auto actuate	A,D,EN,S	2
S3	010 Pressurizer Pressure Control System / Initiate Cold Overpressure Mitigation with PORV Malfunction	A,D,L,S	3
S4	003 Reactor Coolant Pump System / Start Reactor Coolant Pump during RCS Natural Circulation Cooldown	A,L,M,P[1],S	4P
S5	026 Containment Spray System / Stroke Time Test of BNHV0004	N,S	5
S6	062 AC Electrical Distribution System / Energize NB Bus from AEPS diesel generators	D,L,S	6
S8	029 Containment Purge System / Reinitiate Containment Purge following CPIS	D,L,S	8

In-Plant Systems* (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)

	System / JPM Title	Type Code*	Safety Function
P1	054 Loss of Main Feedwater / Local TDAFP Start Assuming Loss of AC and DC Power	D,P[1]	4S
P2	055 Loss of Offsite and Onsite Power / Manually load equipment on to an AC Bus	A,D,E	6
P3	008 Component Cooling Water System / Local Bypass and Isolation of CCW to the Seal Water HX	D,R	8

* 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 RO / SRO-I / SRO-U
(A)lternate path	4-6 / 4-6 / 2-3
(C)ontrol room	
(D)irect from bank	≤ 9 / ≤ 8 / ≤ 4
(E)mergency or abnormal in-plant	≥ 1 / ≥ 1 / ≥ 1
(EN)gineered safety feature	≥1 / ≥1 / ≥ 1 (control room system)
(L)ow-Power / Shutdown	≥ 1 / ≥ 1 / ≥ 1
(N)ew or (M)odified from bank including 1(A)	≥ 2 / ≥ 2 / ≥ 1
(P)revious 2 exams	≤ 3 / ≤ 3 / ≤ 2 (randomly selected)
(R)CA	≥ 1 / ≥ 1 / ≥ 1
(S)imulator	

Note 1. The JPMs from the 2014 exam were randomly selected by placing 11 slips of paper labeled “A” through “K” in a container. "D" and "J" were drawn from the hardhat.

S1 This is a BANK JPM. The JPM (BG-RO-S-002) has not been used on an NRC ILT Exam administered at Callaway between 2004 and 2016. At the completion of this JPM, the operator will have raised VCT level 10% with a blended flow makeup boron concentration of 962 ppm.

S2 This is an ALTERNATE PATH, BANK JPM. The JPM (EN-RO-S-002) has not been used on an NRC ILT Exam administered at Callaway between 2004 and 2016. Upon completion of this JPM , the Operator will have manually stopped all Reactor Coolant Pumps and initiated Containment Spray Actuation Signal (CSAS).

S3 This is an ALTERNATE PATH, BANK JPM. The JPM (BB-RO-S-002A) was used on the 2007 ILT NRC Exam. Upon completion of this JPM, the operator will have armed both Pressurizer PORVs for Cold Overpressure Mitigation and isolated or closed BB PV-455A after it fails open.

S4 This is an ALTERNATE PATH, MODIFIED JPM. The parent JPM (SIM D) was used on the 2014 ILT NRC Exam. The parent was modified into an alternate path JPM. Upon completion of this JPM, the operator will have started RCP A or B.

S5 This is a NEW JPM. The applicant is directed to perform a stroke time test of BNHV0004, RWST TO CTMT SPRAY PUMP A, using OSP-EN-V001A, Train A Containment Spray Valve Operability. Upon completion of this JPM, the operator will have stroked time tested BNHV0004 with times inside the normal stroke range (45.5 – 61.5 seconds).

Rev 1

S6 This is a BANK JPM. The JPM (NB-RO-S-001) has not been used on an NRC ILT Exam administered at Callaway between 2004 and 2016. Upon completion of this JPM, the operator will have established AEPS power to NB01.

S8 This is a BANK JPM. The JPM (GT-RO-S-001) was last used on the 2011 ILT NRC Exam. At the completion of this JPM, the operator will have established containment mini-purge intake and exhaust for both trains.

P1 This is a BANK JPM last used on the 2014 ILT NRC Exam. Upon completion of this JPM, the operator will have started the TDAFP and notified the EC that flow to the Steam Generators is available.

P2 This is an ALTERNATE PATH, BANK JPM. The JPM (EOP-NLO-P-002A) has not been used on an NRC ILT Exam administered at Callaway between 2004 and 2016. Upon completion of this JPM the following equipment will be loaded on NB01 bus:

- 480V buses NG01 and NG03
- Battery chargers NK21 and NK 23
- Instrument buses NN01 and NN03
- Control Room emergency lighting

P3 This is a BANK JPM. The JPM (EG-NLO-P-001) has not been used on an NRC ILT Exam administered at Callaway between 2004 and 2016. Upon completion of this JPM, The operator will successfully isolate Seal Water Heat Exchanger.

CALLAWAY ENERGY CENTER
JOB PERFORMANCE MEASURE

S1

JPM No:	BG-RO-S-002	KSA No:	004A4.12
Revision Date:	08/08/2017	KSA Rating:	3.8/3.2
Job Title:	URO/SRO		
Duty:	Chemical and Volume Control System		
Task Title:	Manual VCT makeup		
Completion Time:	15 minutes		

The performance of this task was evaluated against the standards contained in this JPM and determined to be:

☐ SATISFACTORY ☐ UNSATISFACTORY

Reason, if UNSATISFACTORY:

____

____

Evaluator Signature: ______________________ Date: ______________

Task Performer: ______________________________

Location of Performance:

☐ Control Room ☒ Simulator/Lab ☐ Plant ☐ Classroom

Method of Performance: ☐ Simulated ☒ Performed

☐ Alternate Path ☐ Time Critical ☐ RCA

References: OTN-BG-00002, Reactor Makeup Control and BTRS, Rev 48
Curve Book Figure 7-2: Reactor Makeup Control System Nomographs, Rev 4

Tools / Equipment: Calculator

S1

Initial Conditions: The Callaway Plant in Mode 1. RCS boron concentration is 962 ppm. The Reactor Makeup Control System has malfunctioned and automatic VCT makeup is disabled.

Initiating Cues: The Control Room Supervisor directs you to perform a normal frequently performed manual makeup to raise VCT level 10% per OTN-BG-00002, Reactor Makeup Control and Boron Thermal Regeneration System, **Attachment 9** with a makeup flow rate of 120 gpm.

Boric Acid Storage Tank boron concentration is 7215 ppm.

Simulator Set up and/or Note(s): IC-196 on training load 1603 and ensure counters set to 000 OR

- Load any full power IC
- Place BG HIS-112A in manual and close
- Open BG HIS-112A when level is 35-40%
- Plant Parameters/BG/TBG03ATAZTLIB set to 7215 ppm
- Plant Parameters/BG/TBG03BTAZTLIB set to 7215 ppm
- Ensure counters set to 000 and pots set to 0

Task Standard: At the completion of this JPM, the operator will have raised VCT level 10% with a blended flow makeup boron concentration of 962 ppm.

Start Time: ________________

Stop Time: ________________

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
1.	Obtain a verified working copy of OTN-BG-00002	Provide operator with procedure copy	Candidate obtains procedure copy	**S** **U** Comments:
2.	Review Precautions and Limitations Section 3.0	Cue: Precautions and Limitations are satisfied	Candidate reviews Precautions and Limitations	**S** **U** Comments:
3.	Review Prerequisites Section 4.0	Cue: Prerequisites are satisfied	Candidate reviews Prerequisites	**S** **U** Comments
4.	NOTE: This attachment provides direction for frequently performed blended flow VCT make-ups. Refer to Section 5.5 if performing a manual make-up at low RCS boron concentrations. Attachment 9 note prior to step 1		Candidate reads note.	**S** **U** Comments
*5.	PLACE BG HS-26, RCS M/U CTRL, in STOP Step 1		Candidate places BG HS-26 in STOP (handswitch is spring return to normal)	**S** **U** Comments
*6.	PLACE BG HS-25, RCS M/U CTRL SEL, in MAN. Step 2		Candidate places BG HS-25 in MAN	**S** **U** Comments

*Critical Step

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
*7.	SET BG FK-110, BA FLOW CTRL, at the desired boron flow rate and PLACE in AUTO Step 3		Candidate sets BG FK-110 potentiometer to 4.0 and ensures BG FK-110 is in AUTO. BG FK-110 setpoint = (desired flow rate X Desired Makeup Concentration) / (4 gpm/turn X BAST concentration) = (120 gpm X 962 ppm) / (4 gpm/turn X 7215 ppm) = 4.0 turns	**S** **U** Comments
*8.	SET BG FK-111, REACTOR M/U FLOW CTRL, at the desired flow rate and PLACE in AUTO Step 4		Candidate sets BG FK-111 potentiometer to 7.5 and ensures BG FK-111 is in AUTO BG FK-111 setting = desired flow rate / 16 gpm/turn = 120 gpm X 16 gpm/turn = 7.5 turns	**S** **U** Comments
9.	RESET BG FY-110B, BA COUNTER, to 000 Step 5		Candidate resets BG FY-110B to 000	**S** **U** Comments
*10.	ENSURE BG FY-110B is set to deliver the desired amount of boron Step 6		Candidate sets BG FY-110B counter to greater than or equal to 26.6 gals. NOTE: Makeup time = (20 gal/%) X (10%) / 120 gpm = 1.666 minutes BG FK-110 is set to deliver 16 gpm = (4gpm/turn) x 4 turns Minimum counter setting = 16 gpm x 1.666 minutes = 26.6 gallons	**S** **U** Comments NOTE: The setting should be sufficiently high enough to ensure boration addition during the entire makeup. The makeup will terminate when the combined counter reaches the desired value (BG FY-111B).

*Critical Step

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
11.	RESET BG FY-111B, COMBINED M/U AND BA BATCH COUNTER, to 000 Step 7		Candidate resets BG FY-111B to 000	S U Comments
*12.	ENSURE BG FY-111B is set to deliver the desired amount of combined makeup Step 8		Candidate sets BG FY-111B counter to 200 gallons. Setting = (desired change in VCT level) X (20 gal/%) = 10% X 20gal/% = 200 gallons	S U Comments
13.	PLACE BG HIS-111B, MAKEUP TO VCT INLET, in CLOSE Step 9		Candidate places BG HIS-111B in CLOSE.	S U Comments
*14.	OPEN BG HIS-110B, MAKEUP TO VCT OUTLET Step 10		Candidate opens BG HIS-110B	S U Comments
*15.	PLACE BG HS-26, RCS M/U CTRL, in RUN Step 11		Candidate places BG HS-26 in RUN	S U Comments
16.	WHEN the makeup addition is complete, PLACE BG HS-26, RCS M/U CTRL, in STOP Step 12		Candidate places BG HS-26 in STOP when makeup is complete.	S U Comments
17.	**JPM IS COMPLETE**	RECORD STOP TIME ON PAGE 2.		S U Comments

*Critical Step

S1

Initial Conditions: The Callaway Plant in Mode 1. RCS boron concentration is 962 ppm. The Reactor Makeup Control System has malfunctioned and automatic VCT makeup is disabled.

Initiating Cues: The Control Room Supervisor directs you to perform a normal frequently performed manual makeup to raise VCT level 10% per OTN-BG-00002, Reactor Makeup Control and Boron Thermal Regeneration System, **Attachment 9** with a makeup flow rate of 120 gpm.

Boric Acid Storage Tank boron concentration is 7215 ppm.

Figure 7-2: Reactor Makeup Control System Nomographs

Blended Flow for 120 GPM AUTO Makeup and Manual Reduced Flow Rates

Coolant Boron Concentration (PPM)	Auto Makeup (120 GPM) BGFK0111 AUTO set		Manual (90 GPM) Set BGFK0111 at 5.63		Manual (80 GPM) Set BGKF0111 at 5.00		Manual (70 GPM) Set BGFK0111 at 4.38	
	4% Boric Acid	BGFK0110 Setting	4% Boric Acid	BGFK0110 Setting	4% Boric Acid	BGFK0110 Setting	4% Boric Acid	BGFK0110 Setting
	GPM	# turns	GPM	# turns	GPM	# turns	GPM	# turns
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100	1.71	0.43	1.29	0.32	1.14	0.29	1.00	0.25
200	3.43	0.86	2.57	0.64	2.29	0.57	2.00	0.50
300	5.14	1.29	3.86	0.96	3.43	0.86	3.00	0.75
400	6.86	1.71	5.14	1.29	4.57	1.14	4.00	1.00
500	8.57	2.14	6.43	1.61	5.71	1.43	5.00	1.25
600	10.29	2.57	7.71	1.93	6.86	1.71	6.00	1.50
700	12.00	3.00	9.00	2.25	8.00	2.00	7.00	1.75
800	13.71	3.43	10.29	2.57	9.14	2.29	8.00	2.00
900	15.43	3.86	11.57	2.89	10.29	2.57	9.00	2.25
1000	17.14	4.29	12.86	3.21	11.43	2.86	10.00	2.50
1100	18.86	4.71	14.14	3.54	12.57	3.14	11.00	2.75
1200	20.57	5.14	15.43	3.86	13.71	3.43	12.00	3.00
1300	22.29	5.57	16.71	4.18	14.86	3.71	13.00	3.25
1400	24.00	6.00	18.00	4.50	16.00	4.00	14.00	3.50
1500	25.71	6.43	19.29	4.82	17.14	4.29	15.00	3.75
1600	27.43	6.86	20.57	5.14	18.29	4.57	16.00	4.00
1700	29.14	7.29	21.86	5.46	19.43	4.86	17.00	4.25
1800	30.86	7.71	23.14	5.79	20.57	5.14	18.00	4.50
1900	32.57	8.14	24.43	6.11	21.71	5.43	19.00	4.75
2000	34.29	8.57	25.71	6.43	22.86	5.71	20.00	5.00
2100	36.00	9.00	27.00	6.75	24.00	6.00	21.00	5.25
2200	37.71	9.43	28.29	7.07	25.14	6.29	22.00	5.50
2300	39.43	9.86	29.57	7.39	26.29	6.57	23.00	5.75
2400	N/A	N/A	30.86	7.71	27.43	6.86	24.00	6.00
2500	N/A	N/A	32.14	8.04	28.57	7.14	25.00	6.25

AUTO Makeup provides 120 GPM of blended flow and the Reactor Operator is not required to set BGFK0111. When MANUAL Makeup is selected on BG HS-25, the Reactor Operator must set BGFK0111 to the value given at the top of the table for the designated flow. These values are based upon 7000 PPM boron in the BAST. If it is desired to compute the setting for BGFK0110 for a different BAST concentration or for a flow rate other than specified above, utilize the following equations:

BGFK0111 SetPoint = Desired flow rate / 16 GPM/turn

BGFK0110 SetPoint = (Desired flow rate * Desired Makeup Concentration) / (4 GPM/turn * BAST concentration)

John A McShaw 9/26/94
Supt. Eng. / Date

OTN-BG-00002

REACTOR MAKEUP CONTROL AND BORON THERMAL REGENERATION SYSTEM

MINOR Revision 048

CONTINUOUS USE

REACTOR MAKEUP CONTROL AND BORON THERMAL REGENERATION SYSTEM

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REACTOR MAKEUP CONTROL AND BORON THERMAL REGENERATION SYSTEM

1.0 PURPOSE

To provide instructions for the operation of the Reactor Makeup Control System (RMCS) and the Boron Thermal Regeneration System (BTRS).

2.0 SCOPE

This procedure addresses all modes of RCS boration and dilution and also includes:

- Flushing BTRS Demineralizers
- Pressure testing BTRS Demineralizers
- Immediate Boration
- Establishing & Securing From Dry Layup in the CVCS Chiller Unit
- Removing BTRS from Service for Maintenance
- Restoring BTRS to Service

3.0 PRECAUTIONS AND LIMITATIONS

3.1. Precautions

3.1.1. When Operable, the Boric Acid Storage Tank (BAST) level should not be reduced below the minimum required by FSAR 16.1.2.6, if in MODES 1 through 4 or FSAR 16.1.2.5, if in MODES 5 and 6.

Plant MODE	**Contained Volume (gal)**	**% Level in One Tank**
1, 2, 3, or 4	17,658	70
5 or 6	2,968	10

3.1.2. Normally during Refueling Outages, one BAST is made inoperable and filled with 2400 ppm boron. In preparation to ascend to Mode 4, the inoperable BAST is transferred to the Refueling Water Storage Tank (RWST) and/or a Recycle Holdup Tank (RHT). The inoperable BAST must be transferred/drained to at least 0% level in order to allow single batches to attain BAST operability after refill.

3.1.3. Whenever a difference of 50 ppm exists, the pressurizer spray should be operated by placing the backup heaters on to equalize the boron concentration in the RCS and pressurizer.

3.1.4. Prior to make up being added to the refueling canal, RCS or Spent Fuel Pool, with all four RCPs secured, recirculation flow should be checked through the RCS (RHR flow greater than or equal to 1000 gpm) or the concentration of the make up should be greater than or equal to 2000 ppm.

3.1.5. At all times when boration/dilution via BTRS is initiated or in progress, the Reactor Coolant Filter must be in service with BGV8421, CVCS RX CLNT FLTR BYP ISO, CLOSED, to prevent possible resin leakage from entering the RCS.

3.1.6. When placing a BTRS bed into service after an extended period of time or when the bed boron concentration is suspect, letdown flow should be diverted to the RHUT until the desired trend in boron concentration is observed by the Boron Concentration Monitoring System, (BCMS), or chemistry sample.

3.1.7. The recirculation return line to the RWST is non-seismic. To ensure the RWST remains OPERABLE in MODES 1 through 4, no other systems, with the exception of the SI pumps in standby, are aligned to the RWST return header when performing Section 5.6 aligned to the RWST. [Ref: 6.2.13]

3.1.8. Prior to establishing M/U flow for flushing a BTRS Demineralizer bed, BG FY-111B, COMBINED M/U & BA COUNTER, must be reset and the counter set to the maximum amount of combined makeup that Radwaste can receive. It is important to stop letdown flow through the letdown reheat heat exchanger prior to stopping M/U flow. This will allow cooling of the letdown reheat heat exchanger.

3.1.9. During Reactor Makeup Control System operation, it is permissible to place one of the Boric Acid Transfer Pumps in Pull To Lock. This will allow for maintenance of level in one of the Boric Acid Storage Tanks to prevent Annunciator 37B, BA TKS LEV LO.

3.1.10. When setting BG FY-111B, COMBINED M/U & BA COUNTER, and BG FY-110B, BA COUNTER, allowances should be made in the setpoint to compensate for instrument inaccuracies and isolation valve closure times on total flow delivered. For instance, the accuracy of both the boric acid integrator BG FY-110B and the total makeup flow integrator BG FY-111B is +/- one count. This equates to +/- 0.1 gal for BG FY-110B and +/- 1.0 gal for BG FY-111B. Differences in setpoint and total flow delivered are also dependent on the amount of time it takes for valves to close and isolate flow once the integrator setpoint has been reached.

3.2. Limitations

Under normal conditions, the RMCS should operate in the AUTOMATIC mode. When used in modes other than AUTOMATIC, the system should be returned to AUTOMATIC upon completion of the evolution.

3.3. General Notes

3.3.1. BG HC-387, BTRS DEMIN BYPASS CTRL, should be adjusted to maintain a constant flow through the BTRS Demineralizer beds. This will allow more accurate results to be obtained for operator aid development.

3.3.2. Demineralizer flushing may be stopped or interrupted as required by plant conditions. However, to minimize the frequency of flushing operations, the Demineralizer should be flushed for the duration determined by the BG System Engineer.

3.3.3. A new BTRS Demineralizer bed should be flushed in accordance with OTN-BG-00001 ADD 5, Operation of the BTRS Demineralizer System, prior to placing the bed into service for the first time.

3.3.4. The BTRS Chiller Unit and Pumps are normally NOT in service.

a. The Service Water Inlet and Outlet Headers are in a dry lay-up condition until the Chiller Unit is required for service. This requires a fill and vent of service water headers prior to the Chiller Unit being placed in service. A dry lay-up condition requires the inlet and outlet service water isolation valves to be LOCKED CLOSED with various vents and drains OPENED.

b. The Chill Water side of the BTRS Chiller is also placed in dry lay-up condition until the Chiller Unit is required for service. Power is removed from the pumps and chiller unit. Some drains and vents are left OPEN with FME screens installed.

3.3.5. During Startup testing of the BTRS system, the following noted items were documented:

a. Operation of BTRS in the Borate mode following an extended period of time in the Dilute mode can initially produce BTRS effluent of approximately 200 ppm greater than the RCS boron concentration.

b. If the Demineralizers are saturated when boration begins, or if the Demineralizers have been recently flushed before starting a dilution, the maximum anticipated change in RCS boron concentration via BTRS is approximately 100 ppm. Under either condition, the maximum change will require 8-10 hours for the Demineralizers to become saturated.

c. Demineralizer inlet temperature as indicated on BG TI-381, LTDN RH HX TUBE SIDE OUTLET TEMP CTRL TEMP IND, should go to between 40°F to 60°F within approximately 1 hour after BTRS has been placed in the Dilute mode, when BTRS is originally at ambient conditions (80°F). This is due to the time required to cool down the associated heat exchangers and piping.

Step 3.3.5 Cont'd

d. Demineralizer inlet temperature, as indicated on BG TI-381, should go to between 135°F and 145°F within approximately 15 minutes after BTRS has been placed in the Borate mode, when BTRS is originally at ambient conditions (80°F).

e. When BTRS is in the Borate mode for more than 30 minutes at a time, Demineralizer inlet temperature, as indicated on BG TI-381, may begin to oscillate +8 to –10°F from the setpoint value.

f. During Borate mode of operation, to prevent the Demineralizer inlet temperature from reaching the BTRS TEMP HI DIVERT alarm setpoint of 156°F or the BTRS TEMP HI alarm setpoint of 150°F, it may be necessary to lower the setpoint on BG TK-381A, LTDN DIVERT FLOW CTRL, to prevent the oscillations.

3.3.6. Attachment 4, Volume Control Tank Level Control System, provides information on the setpoints and controls of the VCT level.

3.3.7. Attachments 6 through 9 are provided to assist in repeated batch additions or normal shiftly additions to the VCT. It is the intent that the current procedure revision is verified and precautions/limitations are reviewed prior to the first use of Attachments 6, 7, 8, or 9 for each shift.

4.0 PREREQUISITES

4.1. WHEN required, ENSURE the following:

- Reactor Makeup Water System is available to supply the RMCS.
- Sufficient boric acid of proper concentration is available to supply the RMCS.
- The Service Water System is available to supply the CVCS Chiller Unit during BTRS operation.
- The CVCS Chiller Surge Tank is within the normal operating range.

4.2. Prior to make up being added to the refueling canal, RCS or Spent Fuel Pool, with all four RCPs secured, MAKE a URO Log entry documenting that either recirculation flow through the RCS (RHR flow) is greater than or equal to 1000 gpm, or that the boron concentration of the make up is greater than or equal to 2000 ppm.

4.3. IF making up to the RWST per Section 5.6 in MODES 1 through 4, ENSURE no other systems, with the exception of the SI pumps in standby, are aligned to the RWST return header.

5.5. Manual Mode Of RMCS Operation To CCP Suction (VCT)

> **NOTE**
>
> A "Normal Frequently Performed Manual Makeup" should be performed per Attachment 9 instead of this section.

5.5.1. DETERMINE the desired boric acid and makeup water flow rates for blended flow using Curve Book, Figure 7-2, Reactor Makeup Control System Nomographs – Blended Flow for 120 gpm AUTO Makeup and Manual Reduced Flow Rates.

5.5.2. PLACE BG HS-26, RCS M/U CTRL, in STOP.

5.5.3. PLACE BG HS-25, RCS M/U CTRL SEL, in MAN.

5.5.4. SET BG FK-110, BA FLOW CTRL, at the desired boron flow rate and PLACE the controller in AUTO.

5.5.5. SET BG FK-111, REACTOR M/U WTR FLOW CTRL, at the desired flow rate and PLACE the controller in AUTO.

> **NOTE**
>
> When setting BG FY-111B, allowance should be made in the setpoint to compensate for instrument inaccuracies and isolation valve closure times on total flow delivered. (Step 3.1.10 contains more information if required.)

5.5.6. SET BG FY-111B, COMBINED M/U & BA COUNTER, to deliver the desired amount of combined makeup.

5.5.7. SET BG FY-110B, BA COUNTER, sufficiently high to ensure boric acid flow continues throughout manual makeup.

5.5.8. PLACE BG HIS-111B, MAKEUP TO VCT INLET, in CLOSE.

5.5.9. OPEN BG HIS-110B, MAKEUP TO VCT OUTLET.

CAUTION

BG FK-110, BA FLOW CTRL, is normally in AUTO in the Full Open position. During manual makeup to the VCT with low RCS boron concentrations, boric acid will inject at 40 gpm until BG FK-110 throttles back flow, resulting in adding more boron than required.

5.5.10. IF operating near end of cycle with low RCS boron concentration, PERFORM the following

a. PLACE BG FK-110, BA FLOW CTRL, in MANUAL

b. REDUCE output to the approximate boric acid addition rate in gpm. *(Late in the core cycle this may be close to zero demand.)*

NOTE

Steps 5.5.10.c and 5.5.11 should be performed concurrently.

c. PLACE BG-FK-110, BA FLOW CTRL, in AUTO.

5.5.11. PLACE BG HS-26, RCS M/U CTRL, in RUN.

5.5.12. WHEN the makeup addition is complete, PLACE BG HS-26, RCS M/U CTRL, in STOP.

5.5.13. PLACE the following in AUTO:

- BG HIS-110B, MAKEUP TO VCT OUTLET
- BG HIS-111B, MAKEUP TO VCT INLET

5.5.14. RESTORE the RMCS to AUTO per Section 5.1.

-END OF SECTION-

Attachment 9

Manual Mode Of RMCS Operation

Sheet 1 of 1

NOTE

- This attachment provides direction for frequently performed blended flow VCT make-ups.
- Refer to Section 5.5 if performing a manual make-up at low RCS boron concentrations.

1. PLACE BG HS-26, RCS M/U CTRL, in STOP.
2. PLACE BG HS-25, RCS M/U CTRL SEL, in MAN.
3. SET BG FK-110, BA FLOW CTRL, at the desired boron flow rate and PLACE in AUTO.
4. SET BG FK-111, REACTOR M/U FLOW CTRL, at the desired flow rate and PLACE in AUTO.
5. RESET BG FY-110B, BA COUNTER, to 000.
6. ENSURE BG FY-110B is set to deliver the desired amount of boron.
7. RESET BG FY-111B, COMBINED M/U AND BA BATCH COUNTER, to 000.
8. ENSURE BG FY-111B, COMBINED M/U AND BA BATCH COUNTER, is set to deliver the desired amount of combined makeup.
9. PLACE BG HIS-111B, MAKEUP TO VCT INLET, in CLOSE.
10. OPEN BG HIS-110B, MAKEUP TO VCT OUTLET.
11. PLACE BG HS-26, RCS M/U CTRL, in RUN.
12. WHEN the makeup addition is complete, PLACE BG HS-26, RCS M/U CTRL, in STOP.
13. PLACE the following in AUTO:
    - BG HIS-110B, MAKEUP TO VCT OUTLET
    - BG HIS-111B, MAKEUP TO VCT INLET
14. PLACE BG HS-25, RCS M/U CTRL SEL, in AUTO.
15. SET BG FK-110, BA FLOW CTRL, at the desired boron flow rate.
16. PLACE BG HS-26, RCS M/U CTRL, in RUN.

CALLAWAY ENERGY CENTER
JOB PERFORMANCE MEASURE

S2

JPM No:	EN-RO-S-002A	KSA No:	013 A4.01
Revision Date:	03/29/2017	KSA Rating:	4.5 / 4.8
Job Title:	URO		
Duty:	RESPOND TO LOSS OF REACTOR COOLANT		
Task Title:	ESFAS – CSAS failure to auto actuate		
Completion Time:	15 minutes		

The performance of this task was evaluated against the standards contained in this JPM and determined to be:

☐ SATISFACTORY ☐ UNSATISFACTORY

Reason, if UNSATISFACTORY:

____

____

Evaluator Signature: ____________________ Date: ________________

Task Performer: ________________________________

Location of Performance:

☐ Control Room ☒ Simulator/Lab ☐ Plant ☐ Classroom

Method of Performance: ☐ Simulated ☒ Performed

☒ Alternate Path ☐ Time Critical ☐ RCA

References: E-0, Reactor Trip or Safety Injection, Rev. 18

Tools / Equipment: None

Initial Conditions: The Plant has experienced a Reactor Trip and Safety Injection from full power.

The Crew is performing E-0, Reactor Trip of Safety Injection.

Initiating Cues: The Control Room Supervisor directs you to perform E-0, Attachment A, Automatic Action Verification.

Simulator Set up and/or Note(s): Use IC-116 on 1603. Go to RUN when the operator starts the JPM. OR follow the setup info below

- Using any Mode 1-3 IC
- Insert the following Malfunctions:
    - Malf (SB) SB029B_CSAS, Value = Block
    - Malf (SB) SB032B_CSAS, Value = Block
    - Malf (SB) SB029B_CSAS, Value = Normal, Cond = (X18I25A eq 1) AND (X18I31A eq 1)
    - Malf (SB) SA032B_CSAS, Value = Normal, Cond = X18I24Aeq1
- Insert Malfunction (BB) BB001_D, value = 100,000
- Once the Containment Pressure rises to > 27 psig, Freeze the Simulator and administer the initiating CUE.
- GO TO RUN when the Operator starts the JPM.

Task Standard: Upon completion of this JPM, the Operator will have manually stopped all Reactor Coolant Pumps, established CCW flow to the RHR HXs, secured the SFP Cooling System, and initiated Containment Spray Actuation Signal (CSAS).

Start Time: ________________

Stop Time: ________________

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
1.	Obtain a copy of E-0	Provide candidate with procedure copy.	Candidate obtained procedure copy	**S** **U** Comments: NOTE: Foldout page RCP trip criteria applies, Examinee may trip the RCPs prior to step A8.
2.	Check Charging Pumps: a. CCPs Both Running • BG HIS-1A • BG HIS-2A b. STOP NCP: • BG HIS-3 Step A1		Candidate verified the CCPs are BOTH RUNNING and the NCP is STOPPED by observing the CCP Green lights extinguished and the Red lights Lit. The NCP's Red light is extinguished, Amber light Lit and Green light is Lit.	**S** **U** Comments: Note: The NCP Amber light verification is due to a disagreement between HS position and breaker position due to it being load shed. The important item in this step is that Both CCPs are running.
3.	CHECK SI and RHR Pumps • SI Pumps BOTH RUNNING • EM HIS-4 • EM HIS-5 • RHR Pump BOTH RUNNING • EJ HIS-1 • EJ-HIS-2 Step A2		OPERATOR verified the SI and RHR pumps are RUNNING by observing each pumps Green light is extinguished and its Red light is Lit.	**S** **U** Comments:

*Critical Step

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
4.	CHECK ECCS Flow a. CCPs to Boron Inj Header Header – Flow INDICATED • EM FI-917A • EM FI-917B b. RCS press < 1700 psig c. SI Pump Discharge - Flow indicated • EM FI-918 • EM FI-918 d. RCS pressure – Less than 325 psig e. RHR Accumulator injection LOOP – Flow indicated • EJ FI-618 • EJ FI-619 Step A3		At RL017/018, candidate verified Flow to the RCS Loops via: CCPs - EM FI-917A and EM FI-917B SI Pumps - EM FI -918 and EM FI-922 RHR Accum Injection Loop – EJ FI-618 and EJ FI-619	S U Comments: Depending on current RCS pressure, flow may or may not be indicated on panel.
5.	CAUTION: If offsite power is lost after SI reset, manual action may be required to restart safeguards equipment.		Candidate place kept Caution.	S U Comments:
6.	CHECK ESW Pumps – RUNNING • EF HIS-55A • EF HIS-56A Step A4		At RL019/020, candidate checked BOTH ESW Pumps RUNNING by observing the each pumps Green light is extinguished and its Red light is Lit.	S U Comments:

*Critical Step

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
7.	CHECK CCW ALIGNMENT: a. CCW Pumps- ONE Running in Each Train RED Train: • EG HIS-21 or EG HIS-23 YELLOW Train: • EG HIS-22 or EG HIS-24 Step A5.a		At RL019/020, candidate Checks One CCW Pump running in each Loop CCW Pumps indicate running - RED LIGHT ON and GREEN LIGHT OFF	S U Comments:
8.	CHECK CCW ALIGNMENT: b. CCW Service Loop Supply and Return valves for one operating CCW pump – OPEN • EG ZL-15 AND EG ZL-53 OR • EG ZL-16 AND EG ZL-54 Step A5.b		At RL019/020, candidate checks Service Loop supplied by a running CCW Pump Either set of listed valves indicate OPEN for the CCW Train that is in service	S U Comments:
*9.	CHECK CCW ALIGNMENT: c. OPEN CCW to RHR HX Valves: • EG HIS-101 • EG HIS-102 Step A5.c		Candidate opened CCW to RHR HX Valves EG HIS-101 and 102 by depressing OPEN PB and observed Red Light LIT, Green Light off	S U Comments: Note: Both Valves should be opened for this STEP to be SAT
*10.	CHECK CCW ALIGNMENT: d. CLOSE Spent Fuel Pool HX CCW Outlet Valves: • EC HIS-11 • EC HIS-12 Step A5.d		At RL019/20, candidate closed Spent Fuel Pool HX OUTLET Valves EC HIS-11 and 12 by depressing Close PB and observing the Red Light off and Green light Lit.	S U Comments:

*Critical Step

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
*11.	CHECK CCW ALIGNMENT: e. STOP Spent Fuel Pool Cooling Pump(s): • EC HIS-27 (already stopped) • *EC HIS-28 Step A5.e		At RL019/20, candidate stopped the running Spent Fuel Pool Cooling Pumps(s) by rotating the pumps handswitch to the left and observing the Red light off and Green light Lit.	**S** **U** Comments: NOTE: Going to STOP on EC HIS-28 is the only critical portion of this step.
12.	CHECK CCW ALIGNMENT: f. Record the Time Spent Fuel Pool Cooling Pump Secured g. Monitor Time CCW Flow isolated to SFP HX – LESS THAN 4 HOURS Step A5. f & g		Candidate recorded Time SFP Cooling Pump Secured Monitors Time since CCW Flow isolated to SFP HX	**S** **U** Comments:
13.	CHECK Containment Cooler Fans - RUNNING in SLOW SPEED • GN HIS-9 • GN HIS-17 • GN HIS-5 • GN HIS-13 Step A6		Candidate checked ALL Containment Cooler Fans RUNNING – In Slow Speed by observing Slow speed Red light Lit and other lights off.	**S** **U** Comments:
14.	CHECK Containment Hydrogen Mixing Fans – Running in SLOW SPEED • GN HIS-2 • GN HIS-4 • GN HIS-1 • GN HIS-3 Step A7		Candidate checked ALL Containment Hydrogen Mixing Fans RUNNING - In Slow Speed by observing Slow speed Red light Lit and other lights off.	**S** **U** Comments:

*Critical Step

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
*15	CHECK if Containment Spray should be Actuated a. Check the following: • CHECK Containment Pressure > 27 PSIG OR • GN PR-934 indicates containment pressure HAS BEEN GREATER THAN 27 psig OR • Annunciator 59A CSAS-LIT OR • Annunciator 59B CSAS-LIT b. Containment Spray Pumps – BOTH RUNNING • EN HIS-3 • EN HIS-9 RNO b. Perform the following as necessary: 1) Manually actuate CSAS • SB HS-43 and 45 • SB HS-44 and 46 2) Ensure both Containment Spray pumps are running. Step A8.a and A8.b		Candidate determined Containment press has been > 27 psig. Candidate checks Containment Spray Pumps are both running and finds both pumps not running and proceeds to RNO column. Candidate manually actuates CSAS using SB HS-43 and SB HS-45, OR SB HS-44 and SB HS-46. (The set of switches must be actuated together using both hands) Candidate verified both Containment Spray Pumps are running by observing Red light LIT and Green light extinguished.	S U Comments: **Note: This is the start of the alternate path.**

*Critical Step

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
16.	ESFAS Status panels sections CSAS and CISB SA066X WHITE lights – ALL LIT SA066Y WHITE Lights – ALL LIT Step A8.c and A8.d		Candidate reviewed ESFAS Status panel lights SA066X and SA066Y Indicate normal after actuation (White lights ON)	**S** **U** Comments:
*17.	STOP ALL RCPs Step A8.e		Candidate STOPS ALL RCPs by rotating each pump's handswitch to the left and observing the Red light off and Green light Lit.	**S** **U** Comments: NOTE: Foldout page RCP trip criteria applies, Examinee may trip the RCPs prior to this step. If so this step is SAT.

*Critical Step

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
18.	CHECK if Main Steam Lines should be isolated a. Check the following: • Cntmt Press > 17 psig OR • GN PR-934 indicates containment pressure has been greater than 17 psig OR • Steam line press < 615 psig OR • AB PR-514 or AB PR-535 indicates steamline pressure – HAS BEEN LESS THAN 615 psig b. CHECK MSIVs and Bypass valves – CLOSED STEP A9		Candidate verified all Main Steam lines have been Isolated by observing each MSIV and MSIV bypass valve Green light is Lit and Red light is extinguished. Alternatively, the Candidate reviewed ESFAS Status panel lights SA066X and SA066Y Indicate normal after actuation (White lights ON) for the SLIS	S U Comments:
19.	CHECK ECCS Valves – Proper Emergency Alignment • SA066X WHITE Lights – ALL Lit • SA066Y WHITE Lights - ALL LIT Step A10		Candidate reviewed ESFAS Status panel lights SA066X and SA066Y Indicate normal after actuation (White lights ON)	S U Comments:
20.	CHECK Containment Isolation Phase A • SA066X WHITE Lights – ALL Lit • SA066Y WHITE Lights - ALL LIT Step A11		Candidate reviewed ESFAS Status panel lights SA066X and SA066Y Indicate normal after actuation (White lights ON)	S U Comments:

*Critical Step

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
21.	CHECK SG Blowdown Isolation: • SA066X WHITE Lights – ALL Lit • SA066Y WHITE Lights - ALL LIT Step A12		Candidate reviewed ESFAS Status panel lights SA066X and SA066Y Indicate normal after actuation (White lights ON)	S U Comments:
22.	CHECK Both Trains of Control Room Ventilation Isolation • SA066X WHITE Lights – ALL Lit • SA066Y WHITE Lights - ALL LIT Step A13		Candidate reviewed ESFAS Status panel lights SA066X and SA066Y Indicate normal after actuation (White lights ON)	S U Comments:
23.	CHECK Containment Purge Isolation • SA066X WHITE Lights – ALL Lit • SA066Y WHITE Lights - ALL LIT Step A14		Candidate reviewed ESFAS Status panel lights SA066X and SA066Y Indicate normal after actuation (White lights ON)	S U Comments:
23.	NOTIFY CRS of the Following: • Unanticipated Manual Actions Taken • Failed Equipment Status • Attachment A, Automatic Action Verification, completed Step A15	Acknowledge the CSAS had to be manually actuated and RCPs were STOPPED	Candidate informed the CRS of having to manually actuate CSAS and the need to STOP RCPs.	S U Comments:
24.	The JPM is complete	This JPM is Complete. **Record Stop Time on Page 2**		S U Comments:

*Critical Step

Initial Conditions: The Plant has experienced a Reactor Trip and Safety Injection from full power.

The Crew is performing E-0, Reactor Trip of Safety Injection.

Initiating Cues: The Control Room Supervisor directs you to perform E-0, Attachment A, Automatic Action Verification.

E-0

REACTOR TRIP OR SAFETY INJECTION

Revision 018

CONTINUOUS USE

A. PURPOSE

This procedure provides actions to verify the proper response of the automatic protection systems following the manual or automatic actuation of a reactor trip or safety injection, to assess plant conditions, and to identify the appropriate recovery procedure.

Major Action Categories:

- Verify Automatic Actions as Initiated by the Protection and Safeguards Systems.
- Identify Appropriate Optimal Recovery Procedure.
- Shut Down Unnecessary Equipment and Continue Trying to Identify Appropriate Optimal Recovery Procedure.

B. SYMPTOMS OR ENTRY CONDITIONS

1) The following are symptoms that require a reactor trip, if one has not occurred:

Reactor Trip	Logic, Interlock	Setpoint
SR high flux	(1/2, P-10 and P-6)	10^5 CPS
IR high flux	(1/2, P-10)	25% of RTP
PR high flux low level	(2/4, P-10)	25% of RTP
PR high flux high level	(2/4)	109%
PR positive rate trip	(2/4) (two seconds)	+4.25%
Overtemperature ΔT	(2/4)	122.6% $\pm$
Overpower ΔT	(2/4)	110.73% -
PZR pressure - Low	(2/4, P-7)	1885 PSIG
PZR pressure - High	(2/4)	2385 PSIG
PZR water level - High	(2/3, P-7)	92%
Rx coolant flow - Low	(2/3, 2/4 P-7, 1/4 P-8)	90% Design
RCP bus undervoltage	(1/2, 2/2 P-7)	10584 VAC
RCP bus underfrequency	(1/2, 2/2 P-7)	57.2 Hz
SG NR level - Low-Low	(2/4, 1/4) Normal {EAM}	17% {21%}
Turb trip - Low oil press	(2/3, P-9)	598.94 PSIG
Turb trip - Stop valves	(4/4, P-9)	1% OPEN
Safety Injection ESFAS	(1/4 signals)	SI
SSPS General warning	(2/2)	N/A

2) The following are symptoms of a reactor trip:

- Any reactor trip annunciator lit.
- Rapid lowering of neutron flux on nuclear instrumentation.
- All shutdown and control rods are fully inserted.
- Rod bottom lights are lit.

3) The following are symptoms that require a reactor trip and safety injection, if one has not occurred:

Reactor Trip & Safety Injection	Logic, Interlock	Setpoint
PZR pressure - Low	(2/4, P-11)	1849 PSIG
Steamline pressure - Low	(2/3 on 1/4, P-11)	615 PSIG
Containment pressure - High-1	(2/3)	3.5 PSIG

4) The following are symptoms of a reactor trip and SI:

- Any SI annunciator lit.
- ECCS pumps running.

5) This procedure should also be entered any time a manual reactor trip or safety injection is actuated.

C. CONDITIONS FOR [ADVERSE CONTAINMENT]

- Containment Radiation - HAS BEEN GREATER THAN 10^5 R/HR

  OR
- Containment Pressure - GREATER THAN 3.5 PSIG

FOLDOUT PAGE FOR E-0

1. **RCP TRIP CRITERIA**
   IF BOTH conditions listed below occur,
   THEN TRIP all RCPs:
   - CCPs or SI Pumps - AT LEAST ONE RUNNING
     AND
   - RCS pressure - LESS THAN 1425 PSIG

2. **FAULTED SG ISOLATION CRITERIA**
   IF any SG pressure is lowering in an uncontrolled manner OR is completely depressurized,
   THEN PERFORM the following as desired:
   - FAST CLOSE MSIVs.
   - Manually CLOSE or locally ISOLATE any failed open ASD(s).
   - ISOLATE feed flow to faulted SG(s).
   - MAINTAIN total feed flow greater than 285,000 lbm/Hr until narrow range level is greater than 7% [25%] in at least one SG.

3. **RUPTURED SG ISOLATION CRITERIA**
   IF BOTH conditions listed below occur,
   THEN ISOLATE feed flow to affected SG(s) as desired:
   - Level in any SG rises in an uncontrolled manner OR any SG has abnormal radiation.
     AND
   - Narrow range level in affected SG(s) - GREATER THAN 7% [25%].

4. **COLD LEG RECIRCULATION CRITERIA**
   IF RWST level lowers to less than 36%,
   THEN Go To ES-1.3, Transfer To Cold Leg Recirculation, Step 1.

5. **AFW SUPPLY SWITCHOVER CRITERIA**
   IF CST to AFP suction header pressure lowers to less than 11.5 PSIG,
   THEN PERFORM EOP Addendum 42, HCST Alignment.

   IF CST to AFP suction header pressure lowers to less than 2.75 PSIG,
   THEN PERFORM EOP Addendum 19, Aligning ESW To AFW Suction.

6. **SPENT FUEL POOL COOLING**
   IF SFP Cooling pumps have tripped,
   THEN monitor SFP level and temperature and implement the following as resources permit:
   - OTO-EC-00001, Loss of SFP/Refuel Pool Level
   - OTO-EC-00002, Spent Fuel Pool High Temperature

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

ATTACHMENT A
(Page 1 of 11)
Automatic Action Verification

A1. CHECK Charging Pumps:

a. CCPs - BOTH RUNNING

- BG HIS-1A
- BG HIS-2A

RESPONSE NOT OBTAINED:

a. START CCP(s) as necessary.

IF neither CCP can be started,
THEN PERFORM the following:

1) ENSURE NCP is running:

- BG HIS-3

2) Go To Step A2.

b. STOP NCP:

- BG HIS-3

A2. CHECK SI And RHR Pumps:

- SI Pumps - BOTH RUNNING
  - EM HIS-4
  - EM HIS-5
- RHR Pumps - BOTH RUNNING
  - EJ HIS-1
  - EJ HIS-2

RESPONSE NOT OBTAINED:

START ECCS pump(s) as necessary.

FOLDOUT PAGE FOR E-0

1. **RCP TRIP CRITERIA**
   IF BOTH conditions listed below occur,
   THEN TRIP all RCPs:
   - CCPs or SI Pumps - AT LEAST ONE RUNNING
     AND
   - RCS pressure - LESS THAN 1425 PSIG

2. **FAULTED SG ISOLATION CRITERIA**
   IF any SG pressure is lowering in an uncontrolled manner OR is completely depressurized,
   THEN PERFORM the following as desired:
   - FAST CLOSE MSIVs.
   - Manually CLOSE or locally ISOLATE any failed open ASD(s).
   - ISOLATE feed flow to faulted SG(s).
   - MAINTAIN total feed flow greater than 285,000 lbm/Hr until narrow range level is greater than 7% [25%] in at least one SG.

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   IF BOTH conditions listed below occur,
   THEN ISOLATE feed flow to affected SG(s) as desired:
   - Level in any SG rises in an uncontrolled manner OR any SG has abnormal radiation.
     AND
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4. **COLD LEG RECIRCULATION CRITERIA**
   IF RWST level lowers to less than 36%,
   THEN Go To ES-1.3, Transfer To Cold Leg Recirculation, Step 1.

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   IF CST to AFP suction header pressure lowers to less than 11.5 PSIG,
   THEN PERFORM EOP Addendum 42, HCST Alignment.

   IF CST to AFP suction header pressure lowers to less than 2.75 PSIG,
   THEN PERFORM EOP Addendum 19, Aligning ESW To AFW Suction.

6. **SPENT FUEL POOL COOLING**
   IF SFP Cooling pumps have tripped,
   THEN monitor SFP level and temperature and implement the following as resources permit:
   - OTO-EC-00001, Loss of SFP/Refuel Pool Level
   - OTO-EC-00002, Spent Fuel Pool High Temperature

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

ATTACHMENT A
(Page 2 of 11)
Automatic Action Verification

A3. CHECK ECCS Flow:

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
a. CCPs To Boron Inj Header - FLOW INDICATED • EM FI-917A • EM FI-917B	a. START CCP(s) and ALIGN valve(s) as necessary.
b. RCS pressure - LESS THAN 1700 PSIG	b. Go To Step A4.
c. SI Pump Discharge - FLOW INDICATED • EM FI-918 • EM FI-922	c. START SI Pump(s) and ALIGN valve(s) as necessary.
d. RCS pressure - LESS THAN 325 PSIG	d. Go To Step A4.
e. RHR To Accumulator Injection Loop - FLOW INDICATED • EJ FI-618 • EJ FI-619	e. START RHR Pump(s) and ALIGN valve(s) as necessary.

FOLDOUT PAGE FOR E-0

1. **RCP TRIP CRITERIA**
   IF BOTH conditions listed below occur,
   THEN TRIP all RCPs:
   - CCPs or SI Pumps - AT LEAST ONE RUNNING
     AND
   - RCS pressure - LESS THAN 1425 PSIG

2. **FAULTED SG ISOLATION CRITERIA**
   IF any SG pressure is lowering in an uncontrolled manner OR is completely depressurized,
   THEN PERFORM the following as desired:
   - FAST CLOSE MSIVs.
   - Manually CLOSE or locally ISOLATE any failed open ASD(s).
   - ISOLATE feed flow to faulted SG(s).
   - MAINTAIN total feed flow greater than 285,000 lbm/Hr until narrow range level is greater than 7% [25%] in at least one SG.

3. **RUPTURED SG ISOLATION CRITERIA**
   IF BOTH conditions listed below occur,
   THEN ISOLATE feed flow to affected SG(s) as desired:
   - Level in any SG rises in an uncontrolled manner OR any SG has abnormal radiation.
     AND
   - Narrow range level in affected SG(s) - GREATER THAN 7% [25%].

4. **COLD LEG RECIRCULATION CRITERIA**
   IF RWST level lowers to less than 36%,
   THEN Go To ES-1.3, Transfer To Cold Leg Recirculation, Step 1.

5. **AFW SUPPLY SWITCHOVER CRITERIA**
   IF CST to AFP suction header pressure lowers to less than 11.5 PSIG,
   THEN PERFORM EOP Addendum 42, HCST Alignment.

   IF CST to AFP suction header pressure lowers to less than 2.75 PSIG,
   THEN PERFORM EOP Addendum 19, Aligning ESW To AFW Suction.

6. **SPENT FUEL POOL COOLING**
   IF SFP Cooling pumps have tripped,
   THEN monitor SFP level and temperature and implement the following as resources permit:
   - OTO-EC-00001, Loss of SFP/Refuel Pool Level
   - OTO-EC-00002, Spent Fuel Pool High Temperature

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

ATTACHMENT A
(Page 3 of 11)
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CAUTION

If offsite power is lost after SI reset, manual action may be required to restart safeguards equipment.

A4. CHECK ESW Pumps - BOTH RUNNING

- EF HIS-55A
- EF HIS-56A

PERFORM the following:

a. ENSURE UHS Return valves are OPEN as necessary:

- EF HIS-37
- EF HIS-38

b. START ESW Pump(s) as necessary.

c. IF any DG is running with NO cooling water, THEN STOP affected DG(s):

1) RESET SI:

- SB HS-42A
- SB HS-43A

2) PUSH START/RESET button:

- KJ HS-8A
- KJ HS-108A

3) PUSH STOP button:

- KJ HS-8A
- KJ HS-108A

4) IF DG(s) can NOT be stopped, THEN locally TRIP affected DG(s).

FOLDOUT PAGE FOR E-0

1. **RCP TRIP CRITERIA**
   IF BOTH conditions listed below occur,
   THEN TRIP all RCPs:
   - CCPs or SI Pumps - AT LEAST ONE RUNNING

     AND
   - RCS pressure - LESS THAN 1425 PSIG

2. **FAULTED SG ISOLATION CRITERIA**
   IF any SG pressure is lowering in an uncontrolled manner OR is completely depressurized,
   THEN PERFORM the following as desired:
   - FAST CLOSE MSIVs.
   - Manually CLOSE or locally ISOLATE any failed open ASD(s).
   - ISOLATE feed flow to faulted SG(s).
   - MAINTAIN total feed flow greater than 285,000 lbm/Hr until narrow range level is greater than 7% [25%] in at least one SG.

3. **RUPTURED SG ISOLATION CRITERIA**
   IF BOTH conditions listed below occur,
   THEN ISOLATE feed flow to affected SG(s) as desired:
   - Level in any SG rises in an uncontrolled manner OR any SG has abnormal radiation.

     AND
   - Narrow range level in affected SG(s) - GREATER THAN 7% [25%].

4. **COLD LEG RECIRCULATION CRITERIA**
   IF RWST level lowers to less than 36%,
   THEN Go To ES-1.3, Transfer To Cold Leg Recirculation, Step 1.

5. **AFW SUPPLY SWITCHOVER CRITERIA**
   IF CST to AFP suction header pressure lowers to less than 11.5 PSIG,
   THEN PERFORM EOP Addendum 42, HCST Alignment.

   IF CST to AFP suction header pressure lowers to less than 2.75 PSIG,
   THEN PERFORM EOP Addendum 19, Aligning ESW To AFW Suction.

6. **SPENT FUEL POOL COOLING**
   IF SFP Cooling pumps have tripped,
   THEN monitor SFP level and temperature and implement the following as resources permit:
   - OTO-EC-00001, Loss of SFP/Refuel Pool Level
   - OTO-EC-00002, Spent Fuel Pool High Temperature

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

ATTACHMENT A
(Page 4 of 11)
Automatic Action Verification

A5. CHECK CCW Alignment:

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

a. CCW Pumps - ONE RUNNING IN EACH TRAIN
• Red Train:
  • EG HIS-21 or EG HIS-23
• Yellow Train:
  • EG HIS-22 or EG HIS-24
	a. START CCW Pump(s) as necessary.

b. CCW Service Loop Supply and Return valves for one operating CCW pump - OPEN • EG ZL-15 AND EG ZL-53 OR • EG ZL-16 AND EG ZL-54	b. ALIGN CCW valve(s) as necessary.
c. OPEN CCW To RHR HX valves: • EG HIS-101 • EG HIS-102	c. Locally OPEN valve(s) as necessary: • EGHV0101 • EGHV0102
d. CLOSE Spent Fuel Pool HX CCW Outlet Valves: • EC HIS-11 • EC HIS-12	d. Locally CLOSE valve(s) as necessary: • ECHV0011 • ECHV0012
e. STOP Spent Fuel Pool Cooling Pump(s): • EC HIS-27 • EC HIS-28	
f. RECORD The Time Spent Fuel Pool Cooling Pump Secured Time: _____________	
g. MONITOR Time Since CCW Flow Isolated To SFP HX - LESS THAN 4 HOURS	g. WHEN time since CCW flow isolated to SFP HX equals 4 Hours, THEN PLACE spent fuel pool cooling in service using OTN-EC-00001, Fuel Pool Cooling And Cleanup System.

FOLDOUT PAGE FOR E-0

1. **RCP TRIP CRITERIA**
   IF BOTH conditions listed below occur,
   THEN TRIP all RCPs:
   - CCPs or SI Pumps - AT LEAST ONE RUNNING
     AND
   - RCS pressure - LESS THAN 1425 PSIG

2. **FAULTED SG ISOLATION CRITERIA**
   IF any SG pressure is lowering in an uncontrolled manner OR is completely depressurized,
   THEN PERFORM the following as desired:
   - FAST CLOSE MSIVs.
   - Manually CLOSE or locally ISOLATE any failed open ASD(s).
   - ISOLATE feed flow to faulted SG(s).
   - MAINTAIN total feed flow greater than 285,000 lbm/Hr until narrow range level is greater than 7% [25%] in at least one SG.

3. **RUPTURED SG ISOLATION CRITERIA**
   IF BOTH conditions listed below occur,
   THEN ISOLATE feed flow to affected SG(s) as desired:
   - Level in any SG rises in an uncontrolled manner OR any SG has abnormal radiation.
     AND
   - Narrow range level in affected SG(s) - GREATER THAN 7% [25%].

4. **COLD LEG RECIRCULATION CRITERIA**
   IF RWST level lowers to less than 36%,
   THEN Go To ES-1.3, Transfer To Cold Leg Recirculation, Step 1.

5. **AFW SUPPLY SWITCHOVER CRITERIA**
   IF CST to AFP suction header pressure lowers to less than 11.5 PSIG,
   THEN PERFORM EOP Addendum 42, HCST Alignment.

   IF CST to AFP suction header pressure lowers to less than 2.75 PSIG,
   THEN PERFORM EOP Addendum 19, Aligning ESW To AFW Suction.

6. **SPENT FUEL POOL COOLING**
   IF SFP Cooling pumps have tripped,
   THEN monitor SFP level and temperature and implement the following as resources permit:
   - OTO-EC-00001, Loss of SFP/Refuel Pool Level
   - OTO-EC-00002, Spent Fuel Pool High Temperature

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
A6.	**CHECK Containment Cooler Fans - RUNNING IN SLOW SPEED** • GN HIS-9 • GN HIS-17 • GN HIS-5 • GN HIS-13	PERFORM the following: a. PLACE Containment Cooler Fan Speed Selector switch(es) in SLOW: • GN HS-9 • GN HS-17 • GN HS-5 • GN HS-13 b. START Containment Cooler Fan(s) as necessary.
A7.	**CHECK Containment Hydrogen Mixing Fans - RUNNING IN SLOW SPEED** • GN HIS-2 • GN HIS-4 • GN HIS-1 • GN HIS-3	START Containment Hydrogen Mixing Fan(s) in SLOW speed as necessary.

ATTACHMENT A
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FOLDOUT PAGE FOR E-0

1. **RCP TRIP CRITERIA**
   IF BOTH conditions listed below occur,
   THEN TRIP all RCPs:
   - CCPs or SI Pumps - AT LEAST ONE RUNNING
     AND
   - RCS pressure - LESS THAN 1425 PSIG

2. **FAULTED SG ISOLATION CRITERIA**
   IF any SG pressure is lowering in an uncontrolled manner OR is completely depressurized,
   THEN PERFORM the following as desired:
   - FAST CLOSE MSIVs.
   - Manually CLOSE or locally ISOLATE any failed open ASD(s).
   - ISOLATE feed flow to faulted SG(s).
   - MAINTAIN total feed flow greater than 285,000 lbm/Hr until narrow range level is greater than 7% [25%] in at least one SG.

3. **RUPTURED SG ISOLATION CRITERIA**
   IF BOTH conditions listed below occur,
   THEN ISOLATE feed flow to affected SG(s) as desired:
   - Level in any SG rises in an uncontrolled manner OR any SG has abnormal radiation.
     AND
   - Narrow range level in affected SG(s) - GREATER THAN 7% [25%].

4. **COLD LEG RECIRCULATION CRITERIA**
   IF RWST level lowers to less than 36%,
   THEN Go To ES-1.3, Transfer To Cold Leg Recirculation, Step 1.

5. **AFW SUPPLY SWITCHOVER CRITERIA**
   IF CST to AFP suction header pressure lowers to less than 11.5 PSIG,
   THEN PERFORM EOP Addendum 42, HCST Alignment.

   IF CST to AFP suction header pressure lowers to less than 2.75 PSIG,
   THEN PERFORM EOP Addendum 19, Aligning ESW To AFW Suction.

6. **SPENT FUEL POOL COOLING**
   IF SFP Cooling pumps have tripped,
   THEN monitor SFP level and temperature and implement the following as resources permit:
   - OTO-EC-00001, Loss of SFP/Refuel Pool Level
   - OTO-EC-00002, Spent Fuel Pool High Temperature

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

ATTACHMENT A
(Page 6 of 11)
Automatic Action Verification

A8. **CHECK If Containment Spray Should Be Actuated:**

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
a. CHECK the following: • Containment pressure - GREATER THAN 27 PSIG OR • GN PR-934 indicates containment pressure - HAS BEEN GREATER THAN 27 PSIG OR • Annunciator 59A CSAS - LIT OR • Annunciator 59B CISB - LIT	a. Go To Step A9.
b. Containment Spray Pumps - BOTH RUNNING • EN HIS-3 • EN HIS-9	b. PERFORM the following as necessary: 1) Manually ACTUATE CSAS: • SB HS-43 and SB HS-45 • SB HS-44 and SB HS-46 2) ENSURE both Containment Spray Pumps are running.
c. ESFAS status panels CSAS sections: • SA066X WHITE lights - ALL LIT • SA066Y WHITE lights - ALL LIT	c. ALIGN CSAS valve(s) as necessary.
d. ESFAS status panels CISB sections: • SA066X WHITE lights - ALL LIT • SA066Y WHITE lights - ALL LIT	d. CLOSE CISB valve(s) as necessary.
e. **STOP all RCPs**	

FOLDOUT PAGE FOR E-0

1. **RCP TRIP CRITERIA**
   IF BOTH conditions listed below occur,
   THEN TRIP all RCPs:
   - CCPs or SI Pumps - AT LEAST ONE RUNNING
     AND
   - RCS pressure - LESS THAN 1425 PSIG

2. **FAULTED SG ISOLATION CRITERIA**
   IF any SG pressure is lowering in an uncontrolled manner OR is completely depressurized,
   THEN PERFORM the following as desired:
   - FAST CLOSE MSIVs.
   - Manually CLOSE or locally ISOLATE any failed open ASD(s).
   - ISOLATE feed flow to faulted SG(s).
   - MAINTAIN total feed flow greater than 285,000 lbm/Hr until narrow range level is greater than 7% [25%] in at least one SG.

3. **RUPTURED SG ISOLATION CRITERIA**
   IF BOTH conditions listed below occur,
   THEN ISOLATE feed flow to affected SG(s) as desired:
   - Level in any SG rises in an uncontrolled manner OR any SG has abnormal radiation.
     AND
   - Narrow range level in affected SG(s) - GREATER THAN 7% [25%].

4. **COLD LEG RECIRCULATION CRITERIA**
   IF RWST level lowers to less than 36%,
   THEN Go To ES-1.3, Transfer To Cold Leg Recirculation, Step 1.

5. **AFW SUPPLY SWITCHOVER CRITERIA**
   IF CST to AFP suction header pressure lowers to less than 11.5 PSIG,
   THEN PERFORM EOP Addendum 42, HCST Alignment.

   IF CST to AFP suction header pressure lowers to less than 2.75 PSIG,
   THEN PERFORM EOP Addendum 19, Aligning ESW To AFW Suction.

6. **SPENT FUEL POOL COOLING**
   IF SFP Cooling pumps have tripped,
   THEN monitor SFP level and temperature and implement the following as resources permit:
   - OTO-EC-00001, Loss of SFP/Refuel Pool Level
   - OTO-EC-00002, Spent Fuel Pool High Temperature

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

ATTACHMENT A
(Page 7 of 11)
Automatic Action Verification

A9. CHECK If Main Steamlines Should Be Isolated:

a. CHECK for any of the following:

- Containment pressure - GREATER THAN 17 PSIG

  OR

- GN PR-934 indicates containment pressure - HAS BEEN GREATER THAN 17 PSIG

  OR

- Steamline pressure - LESS THAN 615 PSIG

  OR

- AB PR-514 or AB PR-535 indicates steamline pressure - HAS BEEN LESS THAN 615 PSIG

RESPONSE NOT OBTAINED: a. Go To Step A10.

b. CHECK MSIVs and Bypass valves - CLOSED

RESPONSE NOT OBTAINED: b. FAST CLOSE all MSIVs and Bypass valves:

- AB HS-79
- AB HS-80

IF valve(s) will NOT fast close,
THEN CLOSE MSIV(s) and bypass valves as necessary.

FOLDOUT PAGE FOR E-0

1. **RCP TRIP CRITERIA**
   IF BOTH conditions listed below occur,
   THEN TRIP all RCPs:
   - CCPs or SI Pumps - AT LEAST ONE RUNNING
     AND
   - RCS pressure - LESS THAN 1425 PSIG

2. **FAULTED SG ISOLATION CRITERIA**
   IF any SG pressure is lowering in an uncontrolled manner OR is completely depressurized,
   THEN PERFORM the following as desired:
   - FAST CLOSE MSIVs.
   - Manually CLOSE or locally ISOLATE any failed open ASD(s).
   - ISOLATE feed flow to faulted SG(s).
   - MAINTAIN total feed flow greater than 285,000 lbm/Hr until narrow range level is greater than 7% [25%] in at least one SG.

3. **RUPTURED SG ISOLATION CRITERIA**
   IF BOTH conditions listed below occur,
   THEN ISOLATE feed flow to affected SG(s) as desired:
   - Level in any SG rises in an uncontrolled manner OR any SG has abnormal radiation.
     AND
   - Narrow range level in affected SG(s) - GREATER THAN 7% [25%].

4. **COLD LEG RECIRCULATION CRITERIA**
   IF RWST level lowers to less than 36%,
   THEN Go To ES-1.3, Transfer To Cold Leg Recirculation, Step 1.

5. **AFW SUPPLY SWITCHOVER CRITERIA**
   IF CST to AFP suction header pressure lowers to less than 11.5 PSIG,
   THEN PERFORM EOP Addendum 42, HCST Alignment.

   IF CST to AFP suction header pressure lowers to less than 2.75 PSIG,
   THEN PERFORM EOP Addendum 19, Aligning ESW To AFW Suction.

6. **SPENT FUEL POOL COOLING**
   IF SFP Cooling pumps have tripped,
   THEN monitor SFP level and temperature and implement the following as resources permit:
   - OTO-EC-00001, Loss of SFP/Refuel Pool Level
   - OTO-EC-00002, Spent Fuel Pool High Temperature

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

ATTACHMENT A
(Page 8 of 11)
Automatic Action Verification

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
A10.	**CHECK ECCS Valves - PROPER EMERGENCY ALIGNMENT**	ALIGN SIS component(s) as necessary:
	a. ESFAS status panels SIS sections: • SA066X WHITE lights - ALL LIT • SA066Y WHITE lights - ALL LIT	• Refer To EOP Addendum 26, SIS Status Panel Alignment, as necessary.
A11.	**CHECK Containment Isolation Phase A:**	
	a. ESFAS status panels CISA sections: • SA066X WHITE lights - ALL LIT • SA066Y WHITE lights - ALL LIT	a. Manually ACTUATE Phase A: • SB HS-47 • SB HS-48 IF Phase A valve(s) are NOT closed, THEN CLOSE valve(s) as necessary: • Refer To EOP Addendum 25, Containment Isolation Phase A Valves, as necessary.
A12.	**CHECK SG Blowdown Isolation:**	
	a. ESFAS status panels SGBSIS sections: • SA066X WHITE lights - ALL LIT • SA066Y WHITE lights - ALL LIT	a. CLOSE SGBSIS valve(s) as necessary.

FOLDOUT PAGE FOR E-0

1. **RCP TRIP CRITERIA**
   IF BOTH conditions listed below occur,
   THEN TRIP all RCPs:
   - CCPs or SI Pumps - AT LEAST ONE RUNNING
     AND
   - RCS pressure - LESS THAN 1425 PSIG

2. **FAULTED SG ISOLATION CRITERIA**
   IF any SG pressure is lowering in an uncontrolled manner OR is completely depressurized,
   THEN PERFORM the following as desired:
   - FAST CLOSE MSIVs.
   - Manually CLOSE or locally ISOLATE any failed open ASD(s).
   - ISOLATE feed flow to faulted SG(s).
   - MAINTAIN total feed flow greater than 285,000 lbm/Hr until narrow range level is greater than 7% [25%] in at least one SG.

3. **RUPTURED SG ISOLATION CRITERIA**
   IF BOTH conditions listed below occur,
   THEN ISOLATE feed flow to affected SG(s) as desired:
   - Level in any SG rises in an uncontrolled manner OR any SG has abnormal radiation.
     AND
   - Narrow range level in affected SG(s) - GREATER THAN 7% [25%].

4. **COLD LEG RECIRCULATION CRITERIA**
   IF RWST level lowers to less than 36%,
   THEN Go To ES-1.3, Transfer To Cold Leg Recirculation, Step 1.

5. **AFW SUPPLY SWITCHOVER CRITERIA**
   IF CST to AFP suction header pressure lowers to less than 11.5 PSIG,
   THEN PERFORM EOP Addendum 42, HCST Alignment.

   IF CST to AFP suction header pressure lowers to less than 2.75 PSIG,
   THEN PERFORM EOP Addendum 19, Aligning ESW To AFW Suction.

6. **SPENT FUEL POOL COOLING**
   IF SFP Cooling pumps have tripped,
   THEN monitor SFP level and temperature and implement the following as resources permit:
   - OTO-EC-00001, Loss of SFP/Refuel Pool Level
   - OTO-EC-00002, Spent Fuel Pool High Temperature

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

ATTACHMENT A
(Page 9 of 11)
Automatic Action Verification

CAUTION

If offsite power is lost after SI reset, manual action may be required to restart safeguards equipment.

A13. CHECK Both Trains Of Control Room Ventilation Isolation:

a. ESFAS status panels CRVIS sections:

- SA066X WHITE lights - ALL LIT
- SA066Y WHITE lights - ALL LIT

Response Not Obtained:

a. IF CRVIS signal is NOT present,
THEN manually ACTUATE CRVIS:

- SA HS-9
- SA HS-13

IF CRVIS signal is present AND any CRVIS component(s) are NOT aligned,
THEN PERFORM the following:

1) IF the Control Room AC Unit or the Class 1E Electrical Equipment Room AC Unit did NOT start on the LOCA sequencer,
THEN RESET SI and CSAS:

   - SB HS-42A (SI Trn A)
   - SB HS-43A (SI Trn B)

   - SB HS-51 (CSAS Trn A)
   - SB HS-54 (CSAS Trn B)

2) IF component(s) are still NOT aligned,
THEN manually ALIGN component(s) as necessary:

   - Refer To EOP Addendum 27, CRVIS Status Panel Alignment, as necessary.

(Step A13. continued on next page)

FOLDOUT PAGE FOR E-0

1. **RCP TRIP CRITERIA**
   IF BOTH conditions listed below occur,
   THEN TRIP all RCPs:
   - CCPs or SI Pumps - AT LEAST ONE RUNNING
     AND
   - RCS pressure - LESS THAN 1425 PSIG

2. **FAULTED SG ISOLATION CRITERIA**
   IF any SG pressure is lowering in an uncontrolled manner OR is completely depressurized,
   THEN PERFORM the following as desired:
   - FAST CLOSE MSIVs.
   - Manually CLOSE or locally ISOLATE any failed open ASD(s).
   - ISOLATE feed flow to faulted SG(s).
   - MAINTAIN total feed flow greater than 285,000 lbm/Hr until narrow range level is greater than 7% [25%] in at least one SG.

3. **RUPTURED SG ISOLATION CRITERIA**
   IF BOTH conditions listed below occur,
   THEN ISOLATE feed flow to affected SG(s) as desired:
   - Level in any SG rises in an uncontrolled manner OR any SG has abnormal radiation.
     AND
   - Narrow range level in affected SG(s) - GREATER THAN 7% [25%].

4. **COLD LEG RECIRCULATION CRITERIA**
   IF RWST level lowers to less than 36%,
   THEN Go To ES-1.3, Transfer To Cold Leg Recirculation, Step 1.

5. **AFW SUPPLY SWITCHOVER CRITERIA**
   IF CST to AFP suction header pressure lowers to less than 11.5 PSIG,
   THEN PERFORM EOP Addendum 42, HCST Alignment.

   IF CST to AFP suction header pressure lowers to less than 2.75 PSIG,
   THEN PERFORM EOP Addendum 19, Aligning ESW To AFW Suction.

6. **SPENT FUEL POOL COOLING**
   IF SFP Cooling pumps have tripped,
   THEN monitor SFP level and temperature and implement the following as resources permit:
   - OTO-EC-00001, Loss of SFP/Refuel Pool Level
   - OTO-EC-00002, Spent Fuel Pool High Temperature

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

ATTACHMENT A
(Page 10 of 11)
Automatic Action Verification

Step A13. (continued from previous page)

3) IF any CRVIS Train can NOT be fully aligned, THEN PERFORM the following:

- IF CRVIS Train A can NOT be fully aligned, THEN PLACE the following equipment in PULL-TO-LOCK:

  a) Control Room Pressurization Fan A:

  - GK HIS-75

  b) Control Room Filtration Fan A:

  - GK HIS-19

  c) Control Room AC Unit A:

  - GK HIS-29

(Step A13. continued on next page)

FOLDOUT PAGE FOR E-0

1. **RCP TRIP CRITERIA**
   IF BOTH conditions listed below occur,
   THEN TRIP all RCPs:
   - CCPs or SI Pumps - AT LEAST ONE RUNNING
     AND
   - RCS pressure - LESS THAN 1425 PSIG

2. **FAULTED SG ISOLATION CRITERIA**
   IF any SG pressure is lowering in an uncontrolled manner OR is completely depressurized,
   THEN PERFORM the following as desired:
   - FAST CLOSE MSIVs.
   - Manually CLOSE or locally ISOLATE any failed open ASD(s).
   - ISOLATE feed flow to faulted SG(s).
   - MAINTAIN total feed flow greater than 285,000 lbm/Hr until narrow range level is greater than 7% [25%] in at least one SG.

3. **RUPTURED SG ISOLATION CRITERIA**
   IF BOTH conditions listed below occur,
   THEN ISOLATE feed flow to affected SG(s) as desired:
   - Level in any SG rises in an uncontrolled manner OR any SG has abnormal radiation.
     AND
   - Narrow range level in affected SG(s) - GREATER THAN 7% [25%].

4. **COLD LEG RECIRCULATION CRITERIA**
   IF RWST level lowers to less than 36%,
   THEN Go To ES-1.3, Transfer To Cold Leg Recirculation, Step 1.

5. **AFW SUPPLY SWITCHOVER CRITERIA**
   IF CST to AFP suction header pressure lowers to less than 11.5 PSIG,
   THEN PERFORM EOP Addendum 42, HCST Alignment.

   IF CST to AFP suction header pressure lowers to less than 2.75 PSIG,
   THEN PERFORM EOP Addendum 19, Aligning ESW To AFW Suction.

6. **SPENT FUEL POOL COOLING**
   IF SFP Cooling pumps have tripped,
   THEN monitor SFP level and temperature and implement the following as resources permit:
   - OTO-EC-00001, Loss of SFP/Refuel Pool Level
   - OTO-EC-00002, Spent Fuel Pool High Temperature

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

ATTACHMENT A
(Page 11 of 11)
Automatic Action Verification

Step A13. (continued from previous page)

RESPONSE NOT OBTAINED:

- IF CRVIS Train B can NOT be fully aligned, THEN PLACE the following equipment in PULL-TO-LOCK:

  a) Control Room Pressurization Fan B:
     - GK HIS-83

  b) Control Room Filtration Fan B:
     - GK HIS-30

  c) Control Room AC Unit B:
     - GK HIS-40

A14. CHECK Containment Purge Isolation:

a. ESFAS status panels CPIS sections:

- SA066X WHITE lights - ALL LIT
- SA066Y WHITE lights - ALL LIT

RESPONSE NOT OBTAINED:

a. Manually ACTUATE CPIS:

- SA HS-11
- SA HS-15

IF CPIS damper(s) are NOT closed,
THEN manually CLOSE damper(s) as necessary.

A15. NOTIFY CRS Of The Following:

- Unanticipated Manual actions taken
- Failed Equipment status
- Attachment A, Automatic Action Verification, completed

-END-

CALLAWAY ENERGY CENTER
JOB PERFORMANCE MEASURE

S3

JPM No:	BB-RO-S-002A	KSA No:	010 A4.03
Revision Date:	03/31/2017	KSA Rating:	4.0 / 3.8
Job Title:	URO/SRO		
Duty:	Operator the Reactor Coolant System		
Task Title:	Initiate Cold Overpressure Mitigation with PORV Malfunction		
Completion Time:	7 minutes		

The performance of this task was evaluated against the standards contained in this JPM and determined to be:

☐ SATISFACTORY ☐ UNSATISFACTORY

Reason, if UNSATISFACTORY:

____

____

Evaluator Signature: ______________________ Date: ______________

Task Performer: ______________________________________

Location of Performance:

☐ Control Room ☒ Simulator/Lab ☐ Plant ☐ Classroom

Method of Performance: ☐ Simulated ☒ Performed

☒ Alternate Path ☐ Time Critical ☐ RCA

References: OTN-BB-00005, Pressurizer and Pressurizer Pressure Control, Rev. 015
OOA-BB-0001B, COMS Lift Setpoint for Pressurizer PORVs, Rev. 008

Tools / Equipment: None

Initial Conditions: The Plant is in Mode 4, performing an RCS Cooldown.

Initiating Cues: The Control Room Supervisor directs you to ARM the Pressurizer Power Operated Relief Valves for Cold Overpressure Mitigation per OTN-BB-00005, Pressurizer and Pressurizer Pressure Control, Section 5.6.

Simulator Set up and/or Note(s): Use IC-115 OR use the setup info below:

- Use Mode 4 IC prior to cooling the RCS down below 275°F
- ME Schematic (BB) m22bb02_a, in engineering mode select bbpcv0455a valve
- Set RC06BBPCV0455AZMANTYP to value = 1, conditional = (X21I139A eq 1) AND (X21I140A eq 1)
- Set RC06BBPCV0455ATASTEM to value = 1, conditional = (X21I139A eq 1) AND (X21I140A eq 1)
- Set RC06BBPCV0455AZMANTYP to value = 0, conditional = X21I149C eq 1
- Set RC06BBPCV0455ATASTEM to value = 0, conditional = X21I149C eq 1
- Panel RL022 'A' PORV red light HWX210149R to value = 1, conditional = (X21I139A eq 1) AND (X21I140A eq 1)
- Panel RL022 'A' PORV green light HWX210149G to value = 0, conditional = (X21I139A eq 1) AND (X21I140A eq 1)
- Panel RL022 'A' PORV red light HWX210149R to value = 0, conditional = X21I149C eq 1
- Panel RL022 'A' PORV green light HWX210149G to value = 1, conditional = X21I149C eq 1

Task Standard: Upon completion of this JPM, the operator will have armed both Pressurizer PORVs for Cold Overpressure Mitigation and isolated or closed BB PV-455A after it fails open.

Start Time: ________________

Stop Time: ________________

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
1.	Obtain a verified working copy of OTN-BB-00005, Pressurizer and Pressurizer Pressure Control	Provide candidate with procedure copy.	Candidate obtained procedure copy	S U Comments:
2.	Review Precautions and Limitations Section 3.0		Candidate reviewed Precautions and Limitations	S U Comments:
3.	Review Prerequisites Section 4.0		Candidate reviewed prerequisites.	S U Comments:
4.	NOTE: Refer to OOA-BB-0001A, in the control room or OOA-BB-0001B, in the simulator. Note prior to Step 5.6.1		Candidate place kept note	S U Comments:
5.	ENSURE RCS pressure is less than the low PORV pressure setting. Step 5.6.1		Candidate ensured RCS pressure is less than the low PORV pressure setting.	S U Comments:
6.	Check BB HIS-8000A, PZR PORV BLOCK VLV, in OPEN Step 5.6.2		At RL019/20, candidate checked BB HIS-8000A is OPEN by observing Red light Lit and Green light off.	S U Comments:
7.	Check BB HIS-8000B, PZR PORV BLOCK VLV, in OPEN Step 5.6.3		At RL019/20, candidate checked BB HIS-8000B is OPEN by observing Red light Lit and Green light off.	S U Comments:

*Critical Step

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
8.	Check BB HIS-455A, PZR PORV, in AUTO Step 5.6.4		Candidate checked BB HIS-455A in AUTO	S U Comments:
9.	Check BB HIS-456A, PZR PORV, in AUTO Step 5.6.5		Candidate checked BB HIS-456A in AUTO	S U Comments:
*10.	Ensure the following Cold Overpressure Arming Switches in ARM: • BB HS-8000A • BB HS-8000B Step 5.6.6		Candidate placed BB HS-8000A and BB HS-8000B in ARM by depressed the ARM portion of the handswitch.	S U Comments: **This is the start of the alternate path.**
11.	NOTE: The PORVs are pilot operated valves and should open when the block valves open. Note prior to step 5.6.7		Candidate place kept note	S U Comments:
*12.	Check the following PORVs CLOSED: • BB HIS-455A • BB HIS-456A Step 5.6.7	If CRS is notified of manual action, provide cue "CRS concurs"	Candidate checked BB HIS-455A and finds it failed open. Candidate isolated or closed BB HIS-455A by either depressing CLS on BB HIS-455A OR depressing BLOCK on BB HS-8000A and CLOSE on BB HIS-8000A to close the 'A' block valve. Candidate checked BB HIS-456A closed.	S U Comments: **NOTE: When COMS is armed a signal is sent to the block valve to be open. In order to close the block valve, COMS must be blocked.**
13.	The JPM is complete	This JPM is Complete. **Record Stop Time on Page 2**		S U Comments:

*Critical Step

S3

Initial Conditions: The Plant is in Mode 4, performing an RCS Cooldown.

Initiating Cues: The Control Room Supervisor directs you to ARM the Pressurizer Power Operated Relief Valves for Cold Overpressure Mitigation per OTN-BB-00005, Pressurizer and Pressurizer Pressure Control, Section 5.6.

OTN-BB-00005

PRESSURIZER AND PRESSURIZER PRESSURE CONTROL

MINOR Revision 015

CONTINUOUS USE

PRESSURIZER AND PRESSURIZER PRESSURE CONTROL

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ATTACHMENT 1, Master Pressure Controller 16

PRESSURIZER AND PRESSURIZER PRESSURE CONTROL

1.0 PURPOSE

Provide instructions for the following:

- Operate the heaters in manual or automatic
- Operate the sprays in manual or automatic
- Transfer control between automatic and manual
- Transfer control between manual and automatic
- Initiating PORV Cold Overpressure Mitigation

2.0 SCOPE

Provide instructions to operate the pressurizer in manual or automatic.

3.0 PRECAUTIONS AND LIMITATIONS

3.1. Auxiliary spray actuation with a spray water temperature differential > 320°F is limited to 10 cycles. [Ref: 6.2.5]

3.2. Spray water temperature differential shall NOT exceed 583°F. [Ref: 6.2.6]

3.3. WHEN operating in MODE 5 with a PZR steam bubble, avoid activities that cause an insurge to the PZR to preclude exceeding surge line delta T limits. [Ref: 6.2.9]

3.4. Do NOT inadvertently collapse the steam bubble when manual spraying.

3.5. Cold overpressure mitigation shall be in service in MODE 4 with any RCS cold leg temperature less than or equal to 275°F or MODE 5 and MODE 6 when the reactor vessel head is on.

3.6. When Cold Overpressure Mitigation is in service, BBHV8000A, RCS PZR OUT PWR OPER RLF HV, can NOT be closed using BB HIS-8000A.

3.7. When Cold Overpressure Mitigation is in service, BBHV8000B, RCS PZR OUT PWR OPER RLF HV, can NOT be closed using BB HIS-8000B.

3.8. BB HS-8000A, TRN A COLD O/P BLOC/ARM, must be in BLOCK to allow BB HIS-8000A to operate.

3.9. BB HS-8000B, TRN B COLD O/P BLOC/ARM, must be in BLOCK to allow BB HIS-8000B to operate.

3.10. Operating experience has shown that placing Pressurizer Backup Heaters in service when RCS Boron Concentration is at or near peak value for the operating cycle can cause an RCS boration or dilution different from that predicted by chemistry sampling. [Ref: 6.2.10]

4.0 PREREQUISITES

ENSURE Pressurizer level is greater than 17%.

-END OF SECTION-

5.6. Initiating Cold Overpressure Mitigation

NOTE

Refer to OOA-BB-0001A, in the control room or OOA-BB-0001B, in the simulator.

Prior to any RCS cold leg temperature lowering to 275°F, INITIATE Cold Overpressure Mitigation as follows:

5.6.1. ENSURE RCS pressure is less than the low PORV pressure setting.

5.6.2. CHECK BB HIS-8000A, PZR PORV BLOCK VLV, in OPEN.

5.6.3. CHECK BB HIS-8000B, PZR PORV BLOCK VLV, in OPEN.

5.6.4. CHECK BB HIS-455A, PZR PORV, in AUTO.

5.6.5. CHECK BB HIS-456A, PZR PORV, in AUTO.

5.6.6. ENSURE the following Cold Overpressure Arming Switches in ARM:

- BB HS-8000A, TRN A COLD O/P BLOC/ARM
- BB HS-8000B, TRN B COLD O/P BLOC/ARM

NOTE

The PORVs are pilot operated valves and should open when the block valves open.

5.6.7. CHECK the following PORVs CLOSED:

- BB HIS-455A, PZR PORV
- BB HIS-456A, PZR PORV

-END OF SECTION-

CALLAWAY ENERGY CENTER
JOB PERFORMANCE MEASURE

S4

JPM Bank No:	BB-RO-S-001A	KSA No:	003 A4.06
Revision Date:	03/31/2017	KSA Rating:	2.9 / 2.9
Job Title:	URO/SRO		
Duty:	Abnormal / Emergency Operations		
Task Title:	Start Reactor Coolant Pump during RCS Natural Circulation Cooldown		
Completion Time:	20 minutes		

The performance of this task was evaluated against the standards contained in this JPM and determined to be:

☐ SATISFACTORY ☐ UNSATISFACTORY

Reason, if UNSATISFACTORY:

____

____

Evaluator Signature: ________________________ Date: ________________

Task Performer: ____

Location of Performance:

☐ Control Room ☒ Simulator/Lab ☐ Plant ☐ Classroom

Method of Performance: ☐ Simulated ☒ Performed

☒ Alternate Path ☐ Time Critical ☐ RCA

References: EOP Addendum 3, Starting an RCP, R002
ES-0.2, Natural Circulation Cooldown, R014

Tools / Equipment: None

Initial Conditions: The Plant experienced a Reactor Trip from full power.

A Switchyard fault resulted in the loss of the Startup Transformer.

The crew is performing the actions of ES-0.2, Natural Circulation Cooldown.

Initiating Cues: The Control Room Supervisor directs you to start a Reactor Coolant Pump per ES-0.2 step 1.

Simulator Set up and/or Note(s): Use IC-198 on load 1603 OR any Mode 1 IC and then trip the reactor, Secure the RCPs, and Insert a malfunction which prevents the RCP lift oil pump interlock from being satisfied.

Task Standard: Upon completion of this JPM, the candidate will have started either RCP 'A' or 'B' after RCP D lift pump pressure interlock fails to light following pump start.

Start Time: ________________

Stop Time: ________________

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
1.	Obtain a verified working copy of EOP Addendum 3, Starting An RCP	Provide operator with procedure copy	Candidate obtained procedure copy	**S** **U** Comments:
2.	CAUTIONS: If RCP seal cooling had previously been lost, the affected RCPs should NOT be started prior to a status evaluation		Candidate place kept caution	**S** **U** Comments:
3.	NOTES: RCPs should be run in order of priority to provide normal PZR spray: RCP D, RCP A or RCP B, RCP C.		Candidate place kept note	**S** **U** Comments:
4.	ESTABLISH conditions for starting an RCP in order of priority: 13.8 KV Buses – ENERGIZED • PA01 • PA02 Step 1.a		Candidate ensured 13.8 KV Buses PA01 and PA02 energized by either observing, at RL015/16, volt meter or white bus light is LIT.	**S** **U** Comments:
5.	RCS pressure – GREATER THAN 325 PSIG Step 1.b		Candidate ensured RCS pressure is greater than 325 psig	**S** **U** Comments:
6.	Number 1 seal differential pressure – GREATER THAN 200 PSID • BB PI-150A Step 1.c		Candidate ensured RCP D Number 1 seal differential pressure is greater than 200 psid by observing BB PI-150A	**S** **U** Comments:

*Critical Step

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
7.	VCT pressure - GREATER THAN 15 PSIG Step 1.d		Candidate ensured VCT pressure is greater than 15 psig	**S** **U** Comments:
8.	RCP seal injection flow – BETWEEN 6 GPM AND 13 GPM PER RCP • BG FR-157 • BG FR-156 • BG FR-155 • BG FR-154 Step 1.e		Candidate ensured RCP seal injection flow is between 6 gpm and 13 gpm per RCP • BG FR-157 • BG FR-156 • BG FR-155 • BG FR-154	**S** **U** Comments: Note: Normal RCP seal injection flow is between 6 gpm and 13 gpm per RCP
9.	Number 1 seal leakoff flow – GREATER THAN OR EQUAL TO 0.2 GPM • BG FR-157 • BG FR-156 • BG FR-155 • BG FR-154 Step 1.f		Candidate ensured Number 1 seal leakoff flow is greater than or equal to 0.2 gpm • BG FR-157 • BG FR-156 • BG FR-155 • BG FR-154	**S** **U** Comments:
10.	CCW To RCS Flow – INDICATED • EG FI-128 • EG FI-129 Step 1.g		Candidate ensured CCW To RCS Flow is indicated at RL019/20 on • EG FI-128 • EG FI-129	**S** **U** Comments:
11.	RCP CCW system annunciators – CLEAR • 52A, CCW Lo • 70C, RCP A Th Bar • 71C, RCP B Th Bar • 72C, RCP C Th Bar • 73C, RCP D Th Bar • 74C, RCP TB CCW Step 1.h		Candidate ensured RCP CCW system annunciators are clear • 52A, CCW Lo • 70C, RCP A Th Bar • 71C, RCP B Th Bar • 72C, RCP C Th Bar • 73C, RCP D Th Bar • 74C, RCP TB CCW	**S** **U** Comments:

*Critical Step

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
*12.	START Oil Lift Pump for RCP to be started: • BB HIS-44 Step 1.i		Candidate started Lift Pump for RCP D by rotating the handswitch to the right (RUN position) and observing the RED Light is Lit and Green light is extinguished • BB HIS-44	S U Comments:
13.	Oil Lift Pump oil pressure interlock WHITE light – LIT Step 1.j	Note: RCP D Oil Lift Pump oil pressure interlock white light is NOT LIT	Candidate identifies RCP D Oil Lift Pump oil pressure interlock white light is not lit.	S U Comments: **This is the start of the alternate path.**
14.	TRY to establish conditions for starting an RCP unless all seal cooling has been lost. IF conditions can NOT be established for any RCP, THEN PERFORM the following: 1. IF any RCP Oil Lift Pump(s) are running, THEN STOP Oil Lift Pump(s): • BB HIS-41 • BB-HIS-42 • BB-HIS-43 • BB-HIS-44 2. Return to procedure and step in effect. Step 1 RNO		Candidate tried to establish conditions to start another RCP by performing step 1 for next RCP in order of priority for normal PZR spray (A or B).	S U Comments:
15.	ESTABLISH conditions for starting an RCP in order of priority: 13.8 KV Buses – ENERGIZED • PA01 • PA02 Step 1.a		Candidate ensured 13.8 KV Buses PA01 and PA02 energized by either observing, at RL015/16, volt meter or white bus light is LIT.	S U Comments:

*Critical Step

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
16.	RCS pressure – GREATER THAN 325 PSIG Step 1.b		Candidate ensured RCS pressure is greater than 325 psig	**S** **U** Comments:
17.	Number 1 seal differential pressure – GREATER THAN 200 PSID • BB PI-153A OR • BB PI-152A Step 1.c		Candidate ensured RCP A or B Number 1 seal differential pressure is greater than 200 psid by observing BB PI-153A (RCP A) or BB PI-152A (RCP B)	**S** **U** Comments:
18.	VCT pressure - GREATER THAN 15 PSIG Step 1.d		Candidate ensured VCT pressure is greater than 15 psig	**S** **U** Comments:
19.	RCP seal injection flow – BETWEEN 6 GPM AND 13 GPM PER RCP • BG FR-157 • BG FR-156 • BG FR-155 • BG FR-154 Step 1.e		Candidate ensured RCP seal injection flow is between 6 gpm and 13 gpm per RCP • BG FR-157 • BG FR-156 • BG FR-155 • BG FR-154	**S** **U** Comments: Note: Normal RCP seal injection flow is between 6 gpm and 13 gpm per RCP
20.	Number 1 seal leakoff flow – GREATER THAN OR EQUAL TO 0.2 GPM • BG FR-157 • BG FR-156 • BG FR-155 • BG FR-154 Step 1.f		Candidate ensured Number 1 seal leakoff flow is greater than or equal to 0.2 gpm • BG FR-157 • BG FR-156 • BG FR-155 • BG FR-154	**S** **U** Comments:

*Critical Step

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
21.	CCW To RCS Flow – INDICATED • EG FI-128 • EG FI-129 Step 1.g		Candidate ensured CCW To RCS Flow is indicated at RL019/20 on • EG FI-128 • EG FI-129	S U Comments:
22.	RCP CCW system annunciators – CLEAR • 52A, CCW Lo • 70C, RCP A Th Bar • 71C, RCP B Th Bar • 72C, RCP C Th Bar • 73C, RCP D Th Bar • 74C, RCP TB CCW Step 1.h		Candidate ensured RCP CCW system annunciators are clear • 52A, CCW Lo • 70C, RCP A Th Bar • 71C, RCP B Th Bar • 72C, RCP C Th Bar • 73C, RCP D Th Bar • 74C, RCP TB CCW	S U Comments:
*23.	START Oil Lift Pump for RCP to be started: • BB HIS-41 (RCP A) OR • BB HIS-42 (RCP B) Step 1.i		Candidate started Lift Pump for RCP A or B by rotating the handswitch to the right (RUN position) and observing the RED Light is Lit and Green light is extinguished • BB HIS-41 (RCP A) OR • BB HIS-42 (RCP B)	S U Comments:
24.	Oil Lift Pump oil pressure interlock WHITE light – LIT Step 1.j		Candidate ensured RCP A or B Oil Lift Pump oil pressure interlock white light is lit	S U Comments: Note: This time the RCPA or B Oil Lift Pump oil pressure interlock white light will be Lit

*Critical Step

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
25.	NOTE: SI must be reset prior to starting RCP C or RCP D to prevent potential shutdown sequencer actuation on undervoltage of XNB02		Candidate place kept note	**S** **U** Comments:
26.	RESET SI If Necessary: • SB HS-42A • SB HS-43A Step 2		Candidate determined step is N/A	**S** **U** Comments:
*27.	START Desired RCP As Follows: CHECK associated oil lift pump – RUNNING GREATER THAN 2 MINUTES Step 3.a	If desired for time compression, 2 minutes has elapsed	Candidate ensured RCP A or B oil lift pump has been running greater than 2 minutes	**S** **U** Comments:
*28.	START desired RCP: BB HIS-37 (RCP A) OR BB HIS-38 (RCP B) Step 3.b		Candidate started RCP A using BB HIS-37 OR RCP B using BB HIS-38 by rotating the pumps handswitch to the right (START position) and observing red light lit and green light extinguished	**S** **U** Comments:
29.	CHECK RCP – RUNNING GREATER THAN 1 MINUTE: Step 3.c	If desired for time compression, 1 minute has elapsed	Candidate checked RCP A or B has been running greater than 1 minute	**S** **U** Comments:

*Critical Step

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
30.	STOP Oil Lift Pump: • BB HIS-41 (RCP A) • BB HIS-42 (RCP B) • BB HIS-44 (RCP D) Step 3.d		Candidate stopped RCP A or B Oil Lift Pump by rotating handswitch to the left position (STOP position) and observing the Green light Lit and Red light is extinguished. RCP A or B Oil Lift Pump has been stopped RCP D Oil Lift Pump may also be stopped.	**S** **U** Comments: Note: the candidate may stop the D RCP lift oil pump at any time in the JPM after it is determined the D RCP will not be started. Note: This step has been determined to be not critical as it does not support the task standard of starting a RCP.
31.	The JPM is complete	This JPM is Complete. **Record Stop Time on Page 2**		**S** **U** Comments:

*Critical Step

Initial Conditions: The Plant experienced a Reactor Trip from full power.

A Switchyard fault resulted in the loss of the Startup Transformer.

The crew is performing the actions of ES-0.2, Natural Circulation Cooldown.

Initiating Cues: The Control Room Supervisor directs you to start a Reactor Coolant Pump per ES-0.2 step 1.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

CAUTION

If RCP seal cooling had previously been lost, the affected RCPs should NOT be started prior to a status evaluation.

NOTE

RCPs should be run in order of priority to provide normal PZR spray: RCP D, RCP A or RCP B, RCP C.

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
1. ESTABLISH conditions for starting an RCP in order of priority: a. 13.8 KV Buses - ENERGIZED • PA01 • PA02 b. RCS pressure - GREATER THAN 325 PSIG c. Number 1 seal differential pressure - GREATER THAN 200 PSID • BB PI-153A (RCP A) • BB PI-152A (RCP B) • BB PI-151A (RCP C) • BB PI-150A (RCP D) d. VCT pressure - GREATER THAN 15 PSIG • BG PI-115 e. RCP seal injection flow - BETWEEN 6 GPM AND 13 GPM PER RCP • BG FR-157 (RCP A) • BG FR-156 (RCP B) • BG FR-155 (RCP C) • BG FR-154 (RCP D)	TRY to establish conditions for starting an RCP unless all seal cooling has been lost. IF conditions can NOT be established for any RCP, THEN PERFORM the following: 1. IF any RCP Oil Lift Pump(s) are running, THEN STOP Oil Lift Pump(s): • BB HIS-41 • BB HIS-42 • BB HIS-43 • BB HIS-44 2. Return To procedure and step in effect.

(Step 1. continued on next page)

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

Step 1. (continued from previous page)

f. Number 1 seal leakoff flow - GREATER THAN OR EQUAL TO 0.2 GPM

- BG FR-157 (RCP A)
- BG FR-156 (RCP B)
- BG FR-155 (RCP C)
- BG FR-154 (RCP D)

g. CCW To RCS Flow - INDICATED

- EG FI-128
- EG FI-129

h. RCP CCW system annunciators - CLEAR

- 52A, CCW To RCP Flow Lo
- 70C, RCP A Thrm Bar CCW Flow
- 71C, RCP B Thrm Bar CCW Flow
- 72C, RCP C Thrm Bar CCW Flow
- 73C, RCP D Thrm Bar CCW Flow
- 74C, RCP Thrm Bar CCW Flow

i. START Oil Lift Pump for RCP to be started:

- BB HIS-41 (RCP A)
- BB HIS-42 (RCP B)
- BB HIS-43 (RCP C)
- BB HIS-44 (RCP D)

j. Oil Lift Pump oil pressure interlock WHITE light - LIT

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

NOTE

SI must be reset prior to starting RCP C or RCP D to prevent potential shutdown sequencer actuation on undervoltage of XNB02.

2. RESET SI If Necessary:

- SB HS-42A
- SB HS-43A

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
3.	**START Desired RCP As Follows:**	
	a. CHECK associated oil lift pump - RUNNING GREATER THAN 2 MINUTES	a. WHEN oil lift pump has been running greater than 2 Minutes, THEN PERFORM Step 3.b.
	b. START desired RCP: • BB HIS-37 (RCP A) • BB HIS-38 (RCP B) • BB HIS-39 (RCP C) • BB HIS-40 (RCP D)	b. IF desired RCP can NOT be started, THEN PERFORM the following: 1) TRY to establish conditions and start another RCP in order of priority. 2) Return To Step 1. IF NO RCPs can be started, THEN PERFORM the following: 1) STOP Oil Lift Pump(s): • BB HIS-41 • BB HIS-42 • BB HIS-43 • BB HIS-44 2) Return To procedure and step in effect.
	c. CHECK RCP - RUNNING GREATER THAN 1 MINUTE	c. WHEN RCP has been running greater than 1 Minute, THEN PERFORM Step 3.d.
	d. STOP Oil Lift Pump: • BB HIS-41 (RCP A) • BB HIS-42 (RCP B) • BB HIS-43 (RCP C) • BB HIS-44 (RCP D)	

-END-

CALLAWAY ENERGY CENTER
JOB PERFORMANCE MEASURE

S5

JPM Bank No:	EN-RO-S-001A	KSA No:	026 A4.01
Revision Date:	03/28/2017	KSA Rating:	4.5 / 4.3
Job Title:	URO/SRO		
Duty:	Perform System Surveillance		
Task Title:	Stroke Time Test of BNHV0004		
Completion Time:	20 minutes		

The performance of this task was evaluated against the standards contained in this JPM and determined to be:

☐ SATISFACTORY ☐ UNSATISFACTORY

Reason, if UNSATISFACTORY:

____

____

Evaluator Signature: ______________________ Date: ______________

Task Performer: ______________________________________

Location of Performance:
☐ Control Room ☒ Simulator/Lab ☐ Plant ☐ Classroom

Method of Performance: ☐ Simulated ☒ Performed

☒ Alternate Path ☐ Time Critical ☐ RCA

References: OSP-EN-V001A, Train A Containment Spray Valve Operability, Rev 22
CA2716, Valve Retest Instructions, Rev 0

Tools / Equipment: Calibrated Stopwatch

CALLAWAY ENERGY CENTER
JOB PERFORMANCE MEASURE

Initial Conditions: The Plant is operating at 100%.

Initiating Cues: The CRS directs you to perform a stroke time test of BNHV0004 only in accordance with OSP-EN-V001A, Train A Containment Spray Valve Operability. Position indication testing will not be performed.

Simulator Set up and/or Note(s): Use IC-196 or Any IC in which BNHV0004 has power and is initially open.

In engineering mode on me schematic m22en01 select the motor for BNHV4. Set BNHV0004_MCTCLOSE to value of 63 seconds. When the open button is pressed, set BNHV0004_MCTCLOSE back to value of 50 seconds.

Task Standard: Upon completion of this JPM, the candidate will have stroke time tested BNHV0004 and determine initial stroke close time is outside normal range but within maximum allowable stroke time and stroke open time is within the normal range. The candidate will perform a retest and determine that both stroke close and open times are within the normal range. The candidate will determine step 1.b of the Valve Retest Instructions (CA2716) apply and notify the IST Engineer of the results.

Start Time: ________________

Stop Time: ________________

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
1.	Obtain a verified working copy of OSP-EN-V001A	Provide operator with procedure copy NOTE: Only hand out whole procedure copy. Keep retest instructions (CA2716) and marked up retest copy for later.	Candidate obtained procedure copy	**S** **U** Comments:
2.	Review Acceptance Criteria Section 3.1		Candidate reviewed Acceptance Criteria per Attachment 1	**S** **U** Comments:
3.	Review Precautions and Limitations Section 4.0	Cue: All precautions and limitations are satisfied.	Candidate reviewed Precautions and Limitations	**S** **U** Comments
4.	Review Prerequisites Section 5.0	Cue: All prerequisites are satisfied.	Candidate reviewed Prerequisites	**S** **U** Comments
5.	NOTE: All handswitches used in Sections 6.1 and 6.2 are on RL017 NOTE prior to step 6.1		Candidate place kept note	**S** **U** Comments:
6.	Using BN HIS-4, RWST TO CTMT SPRAY PUMP A, ENSURE BNHV0004 is open Step 6.1.1		Candidate checked BNHV0004 indicates open by observing Red light Lit and Green light extinguished.	**S** **U** Comments:
7.	If Position Indication Testing is required, perform the following... Step 6.1.2	Position indication testing will not be performed.	Candidate determined step is N/A. Position indication testing will not be performed (provided in initial cue).	**S** **U** Comments:

*Critical Step

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
8.	NOTE: Placing Containment Spray Pump in PTL makes Containment Spray Train A inoperable per T/S LCO 3.6.6 Note prior to step 6.1.3		Candidate place kept note	**S** **U** Comments:
9.	PLACE EN HIS-3, CTMT SPRAY PUMP A, in PULL TO LOCK Step 6.1.3		Candidate placed switch EN HIS-3 in PULL TO LOCK position by rotating handswitch to the left and pulling away from control panel.	**S** **U** Comments:
10.	Record Containment Spray Train A INOPERABLE time on Attachment 1 Step 6.1.4		Candidate recorded inoperable time on Attachment 1	**S** **U** Comments:
11.	If Position Indication Testing is required, inform local operator… Step 6.1.5		Candidate determined step 6.1.5 is N/A since position indicating testing is not required.	**S** **U** Comments:
*12.	Using BN HIS-4, CLOSE BNHV0004 and MEASURE the elapsed time between operating the handswitch and when the open light goes out Step 6.1.6		Candidate started timer when CLOSE is pressed and stopped timer when red open light goes out. Time should be approximately 63 seconds.	**S** **U** Comments:
13.	Record observed stroke time for BNHV0004 on Attachment 1. Step 6.1.7		Candidate recorded stroke time on Attachment 1.	**S** **U** Comments:

*Critical Step

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
14.	Record Full Stroke Remote Position of BNHV0004 on Attachment 1. Step 6.1.8		Candidate recorded Stroke Remote Position on Attachment 1 as "CLOSED".	**S** **U** Comments:
15.	If Position Indication Testing is required, perform the following… Step 6.1.9		Candidate determined step is N/A since position indicating testing is not required.	**S** **U** Comments:
*16.	Using BN HIS-4, OPEN BNHV0004 and MEASURE the elapsed time between operating the handswitch and when the closed light goes out. Step 6.1.10		Candidate started timer when OPEN is pressed and stops timer when green closed light goes out. Time should be approximately 50 seconds.	**S** **U** Comments:
17.	Record observed stroke time for BNHV0004 on Attachment 1 Step 6.1.11		Candidate recorded stroke time on Attachment 1	**S** **U** Comments:

*Critical Step

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
*18.	EVALUATE observed stroke time against the Normal Stroke Time Range and the Maximum Allowable Stroke Time and DETERMINE if valve retest is required for BNHV0004 a. IF observed stroke time for BNHV0004 does NOTE meet Acceptance Criteria, NOTIFY SM/CRS b. IF retest is required, PERFORM the retest per CA2716, Valve Retest Instructions. Step 6.1.12	Provide valve retest instructions when requested (CA2716)	Candidate determined the observed stroke time exceeds the Normal Range and is within the Maximum Allowable Stroke Time. Candidate determined a retest is required.	**S** **U** Comments: **NOTE: This is the start of the alternate path**
19.	NOTE: Any additional pages of this procedure repeated should be attached to this page and annotated as retest. Valves declared INOPERABLE may be repaired, replaced, or the data may be analyzed to determine the cause of the deviation and the valve shown to be operating acceptably. Note prior to Step 1 of CA2716		Candidate reads note.	**S** **U** Comments:

*Critical Step

20.	Normal Stroke Time Range exceeded without exceeding Maximum Allowable Stroke Time: CHECK validity of data by evaluating test instruments and conditions, conferring with test personnel, or other methods. PERFORM valve stroke test by repeating applicable steps of this procedure using newly obtained and annotated procedure pages. CA2716 step 1	Provide marked up procedure for retest. (OSP-EN-V001A)	Candidate obtains copy of new procedure pages and initiates applicable retest steps	**S** **U** Comments:
*21.	Using BN HIS-4, RWST TO CTMT SPRAY PUMP A, CLOSE BNHV0004 and MEASURE the elapsed time between operating the handswitch and when the open light goes out. Step 6.1.6		Candidate retests stroke test of BNHV0004. Candidate started timer when CLOSE is pressed and stopped timer when red open light goes out. Time should be approximately 50 seconds.	**S** **U** Comments:
22.	Record Observed Stroke Time for BNHV0004 on Attachment 1 Step 6.1.7		Candidate recorded stroke time on Attachment 1.	**S** **U** Comments:
23.	Record Full Stroke Remote Position of BNHV0004 on Attachment 1. Step 6.1.8		Candidate recorded Stroke Remote Position on Attachment 1 as "CLOSED".	**S** **U** Comments:
*25.	Using BN HIS-4, OPEN BNHV0004 and MEASURE the elapsed time between operating the handswitch and when the closed light goes out. Step 6.1.10		Candidate started timer when OPEN is pressed and stops timer when green closed light goes out. Time should be approximately 50 seconds.	**S** **U** Comments:

*Critical Step

26.	Record observed stroke time for BNHV0004 on Attachment 1 Step 6.1.11		Candidate recorded stroke time on Attachment 1	**S** **U** Comments:
27.	IF the Observed Stroke Time is again outside of the Normal Stroke Time Range, Perform the following: CA2716 step 1.a		Candidate determined the step is N/A.	**S** **U** Comments:
*28.	IF the valve retest does fall within the Normal Stroke Time Range, PERFORM the following: NOTIFY the IST Engineer INITIATE a CAR for tracking and trending. CA2716 step 1.b	When contacted as IST Engineer, Cue: IST Engineer will investigate cause. CAR 201700911 has been initiated for tracking and trending.	Candidate notifies the IST Engineer. Candidate records CAR number on CA2716.	**S** **U** Comments:

*Critical Step

29.	If Section 6.2 is NOT being performed, PERFORM the following: a. Record the Restored Position of BNHV0004 on Attachment 1. b. PLACE EN HIS-3 in Normal After Stop c. Record Containment Spray Train A OPERABLE time on Attachment 1 Step 6.1.13		Candidate recorded restored position of "OPEN" on Attachment 1. Candidate placed EN HIS-3 in Normal After Stop. Candidate recorded OPERABLE TIME on Attachment 1.	**S** **U** Comments:
30.	The JPM is complete	This JPM is Complete. **Record Stop Time on Page 2**		**S** **U** Comments:

*Critical Step

Initial Conditions: The Plant is operating at 100%.

Initiating Cues: The CRS directs you to perform a stroke time test of BNHV0004 only in accordance with OSP-EN-V001A, Train A Containment Spray Valve Operability. Position indication testing will not be performed.

Ameren MISSOURI

Callaway Plant

OSP-EN-V001A

TRAIN A CONTAINMENT SPRAY VALVE OPERABILITY

ADMINISTRATIVE CORRECTION Revision: 022

 CONTINUOUS USE

TRAIN A CONTAINMENT SPRAY VALVE OPERABILITY

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Checklist 1, Containment Spray System Restoration

 CONTINUOUS USE

TRAIN A CONTAINMENT SPRAY VALVE OPERABILITY

1.0 PURPOSE

This procedure demonstrates the operability of valves in the Containment Spray System Train A and RWST system per APA-ZZ-00340, Surveillance Program Administration, and APA-ZZ-00356, Pump And Valve Inservice Test Program.

2.0 SCOPE

NOTE

This procedure is normally run sequentially on the same day with two additional procedures in the following order:

OSP-EN-P001A, Train A Containment Spray Pump Inservice Test

OSP-EN-V001A, (this test)

OSP-SA-0006A, Train A CSAS Slave Relay Test

2.1. Stroke Time Testing is performed on the following valves:

- BNHV0004, RWST TO CTMT SPRY PMP A HV
- ENHV0006, CTMT SPRY PMP A DISCH HV

2.2. Position Indication Testing is performed on the above valves when scheduled.

3.0 ACCEPTANCE CRITERIA

3.1. Valve Stroke Time

3.1.1. Observed Stroke Time is less than the Maximum Allowable Stroke Time specified on Attachment 1.

3.1.2. Observed Stroke Time is within the Normal Stroke Time Range specified on Attachment 1.

3.2. Valve Position Indication Testing.

> **NOTE**
>
> The valves tested in this procedure have NO local position indicator.

3.2.1. The remote position indication agrees with the local position as determined by stem measurement.

3.2.2. The Valve Stroke Distance is greater than or equal to the Valve Stroke Acceptable Range specified in Attachment 2.

4.0 PRECAUTIONS AND LIMITATIONS

4.1. T/S LCO 3.6.6 should be referenced when performing this procedure in MODE 1, 2, 3, or 4.

4.2. If testing is terminated or temporarily postponed at some point prior to a locked valve being returned to its normal locked position, the altered valve must be logged on the Locked Component Deviation List.

4.3. If OSP-EN-P001A, Train A Containment Spray Pump Inservice Test, is also scheduled at this time this procedure must be performed after the pump run is complete and before OSP-SA-0006A, Train A CSAS Slave Relay Test, is complete. This is to prevent a pressure locking and thermal binding condition (locked rotor) from developing on ENHV0006, CTMT SPRY PMP A DISCH HV. [Ref: 8.2.4 and 8.2.2]

4.4. Valves in this procedure may be tested individually or in any order determined by the SM/CRS.

> **NOTE**
>
> APA-ZZ-00356, Pump And Valve Inservice Test Program, describes avoidable and unavoidable preconditioning. [Ref: 8.2.1]

4.5. Pretest operating, stroking, or manipulating of the valves is NOT permitted.

4.6. Observed Stroke Time is to be measured and recorded to the nearest tenth of a second.

4.7. Unless otherwise indicated, Stroke Time OPEN is the elapsed time between actuating the hand switch and loss of the CLOSED indicating light and Stroke Time CLOSED is the elapsed time between actuating the hand switch and loss of the OPEN indicating light.

4.8. Restoration steps may be completed after each valve test or after all valves have been tested.

5.0 PREREQUISITES

5.1. Initial Conditions

5.1.1. ENSURE the SM/CRS has reviewed Technical Specifications for any Limiting Condition for Operation Action Statements that may be entered should any component tested be declared INOPERABLE.

5.1.2. ENSURE the SM/CRS has reviewed the applicable activities and plant conditions which must exist prior to procedure performance.

5.1.3. The Containment Spray System is aligned for Emergency Standby Lineup per OTN-EN-00001, Containment Spray System.

5.2. Test Equipment

5.2.1. ENSURE a Calibrated Stopwatch is available.

5.2.2. ENSURE a drain rig is available for Section 6.2.

5.2.3. If position indication testing is scheduled, ENSURE a ruler or measuring tape to measure stem travel is available.

5.2.4. ENSURE all M&TE is within its calibration due date and RECORD ID number and calibration due date on Attachment 1.

-END OF SECTION-

6.0 PROCEDURE INSTRUCTIONS

> **NOTE**
>
> All hand switches used in Sections 6.1 and 6.2 are on RL017.

6.1. Stroke Time and Position Indication Test for BNHV0004

6.1.1. Using BN HIS-4, RWST TO CTMT SPRAY PUMP A, ENSURE BNHV0004 is open.

6.1.2. IF Position Indication Testing is required, PERFORM the following:

a. RECORD Initial Remote Position of BNHV0004, RWST TO CTMT SPRY PMP A HV, on Attachment 2.

b. REMOVE the valve dust cover from BNHV0004, RWST TO CTMT SPRY PMP A HV.

c. At BNHV0004, RWST TO CTMT SPRY PMP A HV, using a ruler (or measuring tape), MEASURE the distance from the actuator to the top of the valve stem or, if necessary, as directed by the SM/CRS.

d. RECORD the Initial Local Position of BNHV0004 on Attachment 2.

e. RECORD the measured distance as the Initial Position Distance of BNHV0004 in the space provided on Attachment 2.

> **NOTE**
>
> Placing Containment Spray Pump in PULL TO LOCK makes Containment Spray Train A inoperable per T/S LCO 3.6.6.

6.1.3. PLACE EN HIS-3, CTMT SPRAY PUMP A, in PULL TO LOCK.

6.1.4. RECORD Containment Spray Train A INOPERABLE time on Attachment 1.

6.1.5. IF Position Indication Testing is required, INFORM the local operator that BNHV0004, RWST TO CTMT SPRY PMP A HV, will be cycled.

6.1.6. Using BN HIS-4, RWST TO CTMT SPRAY PUMP A, CLOSE BNHV0004 and MEASURE the elapsed time between operating the handswitch and when the open light goes out.

6.1.7. RECORD Observed Stroke Time for BNHV0004 on Attachment 1.

6.1.8. RECORD Full Stroke Remote Position of BNHV0004 on Attachment 1.

6.1.9. IF Position Indication Testing is required, PERFORM the following:

a. RECORD Full Stroke Remote Position of BNHV0004, RWST TO CTMT SPRY PMP A HV, on Attachment 2.

b. At BNHV0004, RWST TO CTMT SPRY PMP A HV, using a ruler (or measuring tape), MEASURE the distance from the actuator to the top of the valve stem or, if necessary, as directed by the SM/CRS.

c. RECORD Full Stroke Local Position of BNHV0004 on Attachment 2.

d. RECORD measured distance as the Full Stroke Position Distance of BNHV0004 Attachment 2.

e. REINSTALL the valve dust cover on BNHV0004, RWST TO CTMT SPRY PMP A HV.

f. Using the two measurements recorded on Attachment 2, CALCULATE Valve Stroke Distance of BNHV0004.

g. RECORD Valve Stroke Distance of BNHV0004 in the table on Attachment 2.

h. Independently VERIFY the following:

1. Valve Stroke Distance calculation of Step 6.1.9.f for BNHV0004.

2. Valve Stroke Distance for BNHV0004 recorded correctly in Attachment 2 table.

i. COMPARE Valve Stroke Distance to the Valve Stroke Acceptable Range on Attachment 2.

j. IF Position Indication Test meets Acceptance Criteria, INITIAL Test SAT for BNHV0004 on Attachment 2.

k. IF Position Indication Test for BNHV0004 does NOT meet Acceptance Criteria, NOTIFY SM/CRS.

6.1.10. Using BN HIS-4, RWST TO CTMT SPRAY PUMP A, OPEN BNHV0004 and MEASURE the elapsed time between operating the handswitch and when the closed light goes out.

6.1.11. RECORD Observed Stroke Time for BNHV0004 on Attachment 1.

6.1.12. EVALUATE Observed Stroke Time against the Normal Stroke Time Range and the Maximum Allowable Stroke Time and DETERMINE if valve retest is required for BNHV0004.

a. IF Observed Stroke Time for BNHV0004 does NOT meet Acceptance Criteria, NOTIFY SM/CRS.

b. IF retest is required, PERFORM the retest per CA2716, Valve Retest Instructions.

6.1.13. IF Section 6.2 is NOT being performed, PERFORM the following:

a. RECORD the Restored Position of BNHV0004 on Attachment 1.

b. PLACE EN HIS-3, CTMT SPRAY PUMP A, in Normal After Stop.

c. RECORD Containment Spray Train A OPERABLE time on Attachment 1.

-END OF SECTION-

6.2. Stroke Time and Position Indication Test for ENHV0006

NOTE

Placing Containment Spray Pump A in PULL TO LOCK makes Containment Spray Train A INOPERABLE per T/S LCO 3.6.6.

6.2.1. IF Section 6.1 was NOT performed, PERFORM the following:

a. PLACE EN HIS-3, CTMT SPRAY PUMP A, in PULL TO LOCK.

b. RECORD Containment Spray Train A INOPERABLE time on Attachment 1.

6.2.2. Using BN HIS-4, RWST TO CTMT SPRAY PUMP A, CLOSE BNHV0004.

6.2.3. Using EN HIS-6, CTMT SPRAY PUMP A DISCH VLV, ENSURE ENHV0006 is closed.

6.2.4. IF Position Indication Testing is required, PERFORM the following:

a. RECORD Initial Remote Position of ENHV0006, CTMT SPRY PMP A DISCH HV, on Attachment 2.

b. REMOVE the valve dust cover from ENHV0006, CTMT SPRY PMP A DISCH HV.

c. At ENHV0006, CTMT SPRY PMP A DISCH HV, using a ruler (or measuring tape), MEASURE the distance from the actuator to the top of the valve stem or, if necessary, as directed by the SM/CRS.

d. RECORD the Initial Local Position of ENHV0006 on Attachment 2.

e. RECORD the measured distance as the Initial Position Distance of ENHV0006 in the space provided on Attachment 2.

6.2.5. Using EN HIS-6, CTMT SPRAY PUMP A DISCH VLV, OPEN ENHV0006 and MEASURE the elapsed time between operating the handswitch and when the closed light goes out.

6.2.6. RECORD Observed Stroke Time for ENHV0006 on Attachment 1.

6.2.7. EVALUATE Observed Stroke Time against the Normal Stroke Time Range and the Maximum Allowable Stroke Time and DETERMINE if valve retest is required for ENHV0006.

a. IF Observed Stroke Time for ENHV0006 does NOT meet Acceptance Criteria, NOTIFY SM/CRS.

b. IF retest is required, PERFORM the retest per CA2716, Valve Retest Instructions.

6.2.8. RECORD Full Stroke Remote Position of ENHV0006 on Attachment 1.

6.2.9. IF Position Indication Testing is required, PERFORM the following:

a. RECORD Full Stroke Remote Position of ENHV0006, CTMT SPRY PMP A DISCH HV, on Attachment 2.

b. At ENHV0006, CTMT SPRY PMP A DISCH HV, using a ruler (or measuring tape), MEASURE the distance from the actuator to the top of the valve stem or, if necessary, as directed by the SM/CRS.

c. RECORD Full Stroke Local Position of ENHV0006 on Attachment 2.

d. RECORD measured distance as the Full Stroke Position Distance of ENHV0006 on Attachment 2.

e. REINSTALL the valve dust cover on ENHV0006, CTMT SPRY PMP A DISCH HV.

f. Using the two measurements recorded on Attachment 2, CALCULATE Valve Stroke Distance of ENHV0006.

g. RECORD Valve Stroke Distance of ENHV0006 in the table on Attachment 2.

h. Independently VERIFY the following:

1. Valve Stroke Distance calculation of Step 6.2.9.f for ENHV0006.

2. Valve Stroke Distance for ENHV0006 recorded correctly in Attachment 2.

i. COMPARE Valve Stroke Distance to the Valve Stroke Acceptable Range on Attachment 2.

j. IF Position Indication Test meets Acceptance Criteria, INITIAL Test SAT for ENHV0006 on Attachment 2.

k. IF Position Indication Test for ENHV0006 does NOT meet Acceptance Criteria, NOTIFY SM/CRS.

6.2.10. Using EN HIS-6, CTMT SPRAY PUMP A DISCH VLV, CLOSE ENHV0006.

6.2.11. Using BN HIS-4, RWST TO CTMT SPRAY PUMP A, OPEN BNHV0004.

6.2.12. RECORD the Restored Position of the following valves on Attachment 1:

- BNHV0004, RWST TO CTMT SPRY PMP A HV
- ENHV0006, CTMT SPRY PMP A DISCH HV

NOTE

If OSP-SA-0006A, Train A CSAS Slave Relay Test, is to be performed after completion of OSP-EN-V001A, Step 6.2.13 may be skipped since draining is also performed in that procedure. [Ref: 8.2.3]

6.2.13. IF OSP-SA-0006A, Train A CSAS Slave Relay Test, is NOT to be performed after completion of this procedure, DRAIN the pipe downstream of ENHV0006, CTMT SPRY PMP A DISCH HV, as follows:

a. INFORM Radiation Protection that RWST water is going to be drained from the containment spray system.

b. CONNECT a hose downstream of ENV0076, CTMT SPRY PMP A DISCH DNSTRM ENHV0006 TEST CONN, and route to a floor drain.

NOTE

ENV0076 is a Containment Boundary Valve. A dedicated operator in continuous communication with the control room must be present at the valve the entire time the valve is unlocked and/or open to maintain containment operable.

c. STATION a dedicated operator in continuous communication with the control room at ENV0076, CTMT SPRY PMP A DISCH DNSTRM ENHV0006 TEST CONN.

d. UNLOCK and OPEN ENV0076, CTMT SPRY PMP A DISCH DNSTRM ENHV0006 TEST CONN.

e. DRAIN all water downstream of ENHV0006, CTMT SPRY PMP A DISCH HV.

f. CLOSE and LOCK ENV0076, CTMT SPRY PMP A DISCH DNSTRM ENHV0006 TEST CONN.

g. REMOVE the hose from ENV0076, CTMT SPRY PMP A DISCH DNSTRM ENHV0006 TEST CONN, and INSTALL cap.

h. RELEASE the dedicated operator at ENV0076, CTMT SPRY PMP A DISCH DNSTRM ENHV0006 TEST CONN.

6.2.14. PLACE EN HIS-3, CTMT SPRAY PUMP A, in Normal After Stop.

6.2.15. RECORD Containment Spray Train A OPERABLE time on Attachment 1.

6.2.16. PERFORM Checklist 1, Containment Spray System Restoration.

-END OF SECTION-

7.0 RESTORATION

NOTE

The following restoration steps may be performed in any order as long as the activity is performed prior to the independent verification.

7.1. ENSURE the valves that were tested are restored to their required position per Attachment 1.

7.2. INITIAL Restored Verification for all valves tested on Attachment 1.

7.3. ENSURE Checklist 1, Containment Spray System Restoration.

7.4. PERFORM an Independent Verification of Restored Positions per Attachment 1 for all valves tested.

7.5. ENSURE all M&TE calibrated equipment is listed on the appropriate attachment and on the Work Management Computer Application.

-END OF SECTION-

8.0 REFERENCES

8.1. Implementing

8.1.1. APA-ZZ-00340, Surveillance Program Administration

8.1.2. APA-ZZ-00356, Pump And Valve Inservice Test Program

8.1.3. OSP-EN-P001A, Train A Containment Spray Pump Inservice Test

8.1.4. OSP-SA-0006A, Train A CSAS Slave Relay Test

8.1.5. OTN-EN-00001, Containment Spray System.

8.1.6. CA2716, Valve Retest Instructions

8.1.7. T/S LCO 3.6.6

8.2. Developmental

8.2.1. CARS 199902065

8.2.2. NRC Generic letter 95-07

8.2.3. RFR 010633A

8.2.4. RFR 016843C

9.0 RECORDS

9.1. QA Records

9.1.1. Attachment 1, Valve Test Data Sheet

9.1.2. If used, Attachment 2, Position Indication Test Data Sheet

9.1.3. If used, CA2716, Valve Retest Instructions

9.1.4. Checklist 1, Containment Spray System Restoration

10.0 SUMMARY OF CHANGES

Page(s)	Section or Step Number	Description
11	6.2.13	Reworded step for clarity.

Attachment 1

Valve Test Data Sheet

Sheet 1 of 1

Person Performing	**Initial & PIN**		
______________________	____________	**Date Started**	____________
______________________	____________	**Date Completed**	____________

Stroke times to be recorded to the nearest 1/10th of a second.

Section	Valve	Normal Position	Initial Remote Position	Observed Stroke Time (sec)		Normal Stroke Time Range (sec)		Maximum Stroke Time (sec)		Full Stroke Remote Position	Restored Position	Restored Verification	Restored Independent Verification
				Open	Closed	Open	Closed	Open	Closed				
6.1	BNHV0004	Open	Open			45.5 to 61.5	45.5 to 61.5	65.0	65.0				
6.2	ENHV0006	Closed	Closed		N/A	11.8 to 15.0	N/A	15.0	N/A				

Time Containment Spray Train A INOPERABLE: ____________
(Step 6.1.4 or 6.2.1.b)

Time Containment Spray Train A OPERABLE: ____________
(Step 6.1.13.c or 6.2.15)

Comments: ____

M & TE ID Numbers: _________ ___________ _________ ___________

Cal Due Dates: _________ ___________ _________ ___________

Attachment 2

Position Indication Test Data Sheet

Sheet 1 of 1

Person Performing **Initial & PIN**

______________________ __________ **Date Started** ____________

______________________ __________ **Date Completed** ____________

Section	Valve	Initial Remote Position	Initial Local Position	Full Stroke Remote Position	Full Stroke Local Position	Valve Stroke Distance (In)	Valve Stroke Acceptable Range (In)	Test SAT (Initials)
6.1	BNHV0004						$\geq$ 10	
6.2	ENHV0006						$\geq$ 8 and 3/8	

BNHV0004

____________ - ____________ = ____________

Initial Position Distance (Step 6.1.2.e) | Full Stroke Position Distance (Step 6.1.9.d) | Valve Stroke Distance (Step 6.1.9.f)

ENHV0006

____________ - ____________ = ____________

Initial Position Distance (Step 6.2.4.e) | Full Stroke Position Distance (Step 6.2.9.d) | Valve Stroke Distance (Step 6.2.9.f)

Valve Retest Instructions

Sheet 1 of 1

Procedure Number Job Number:

NOTE

Any additional pages of this procedure repeated should be attached to this page and annotated as retest.

Valves declared INOPERABLE may be repaired, replaced, or the data may be analyzed to determine the cause of the deviation and the valve shown to be operating acceptably.

1. Normal Stroke Time Range exceeded without exceeding Maximum Allowable Stroke Time:

☐ CHECK validity of data by evaluating test instruments and conditions, conferring with test personnel, or other methods.

☐ PERFORM Valve stroke test by repeating applicable steps of this procedure using newly obtained and annotated procedure pages.

a. IF the Observed Stroke Time is again outside of the Normal Stroke Time Range, PERFORM the following:

☐ EITHER, immediately DECLARE the valve INOPERABLE, (EOSL number ______) OR:

☐ INITIATE an "Information only" EOSL entry to track the required operability evaluation.
EOSL number

☐ NOTIFY the IST Engineer. Time and Date notified _____ / _____
(The IST Engineer determines cause of deviation and provides documentation in surveillance package.)

☐ INITIATE a CAR to ensure the IST Engineer completes the Operability Evaluation within 96 hours
CAR number _____

b. IF the valve retest does fall within the Normal Stroke Time Range, PERFORM the following:

☐ NOTIFY the IST Engineer. Time and Date notified _____ / _____
(The IST Engineer determines cause of deviation and provides documentation in surveillance package.)

☐ INITIATE a CAR for tracking and trending. CAR number _____
(There is NO ASME Code required time limitation for completing this evaluation, however, it should be completed as soon as practical.)

2. Maximum Allowable Stroke Time exceeded:

☐ IF the Observed Stroke Time exceeds the Maximum Allowable Stroke Time, immediately DECLARE the valve INOPERABLE.

☐ INITIATE an EOSL to track the INOPERABLE valve. EOSL number _____

☐ CHECK validity of data by evaluating test instruments and conditions, conferring with test personnel, or other methods.

☐ PERFORM valve stroke test by repeating applicable steps of this procedure using newly obtained and annotated procedure pages.

☐ NOTIFY the IST Engineer. Time and Date notified_____/_____

☐ INITIATE a CAR to determine and track corrective actions to restore the valve OPERABLE.
CAR number_____

6.0 PROCEDURE INSTRUCTIONS

NOTE

All hand switches used in Sections 6.1 and 6.2 are on RL017.

6.1. Stroke Time and Position Indication Test for BNHV0004

6.1.1. Using BN HIS-4, RWST TO CTMT SPRAY PUMP A, ENSURE BNHV0004 is open.

6.1.2. IF Position Indication Testing is required, PERFORM the following:

N/A

a. RECORD Initial Remote Position of BNHV0004, RWST TO CTMT SPRY PMP A HV, on Attachment 2.

b. REMOVE the valve dust cover from BNHV0004, RWST TO CTMT SPRY PMP A HV.

c. At BNHV0004, RWST TO CTMT SPRY PMP A HV, using a ruler (or measuring tape), MEASURE the distance from the actuator to the top of the valve stem or, if necessary, as directed by the SM/CRS.

d. RECORD the Initial Local Position of BNHV0004 on Attachment 2.

e. RECORD the measured distance as the Initial Position Distance of BNHV0004 in the space provided on Attachment 2.

NOTE

Placing Containment Spray Pump in PULL TO LOCK makes Containment Spray Train A inoperable per T/S LCO 3.6.6.

6.1.3. PLACE EN HIS-3, CTMT SPRAY PUMP A, in PULL TO LOCK.

6.1.4. RECORD Containment Spray Train A INOPERABLE time on Attachment 1.

6.1.5. IF Position Indication Testing is required, INFORM the local operator that BNHV0004, RWST TO CTMT SPRY PMP A HV, will be cycled.

6.1.6. Using BN HIS-4, RWST TO CTMT SPRAY PUMP A, CLOSE BNHV0004 and MEASURE the elapsed time between operating the handswitch and when the open light goes out.

6.1.7. RECORD Observed Stroke Time for BNHV0004 on Attachment 1.

6.1.8. RECORD Full Stroke Remote Position of BNHV0004 on Attachment 1.

6.1.9. IF Position Indication Testing is required, PERFORM the following:

NA

a. RECORD Full Stroke Remote Position of BNHV0004, RWST TO CTMT SPRY PMP A HV, on Attachment 2.

b. At BNHV0004, RWST TO CTMT SPRY PMP A HV, using a ruler (or measuring tape), MEASURE the distance from the actuator to the top of the valve stem or, if necessary, as directed by the SM/CRS.

c. RECORD Full Stroke Local Position of BNHV0004 on Attachment 2.

d. RECORD measured distance as the Full Stroke Position Distance of BNHV0004 Attachment 2.

e. REINSTALL the valve dust cover on BNHV0004, RWST TO CTMT SPRY PMP A HV.

f. Using the two measurements recorded on Attachment 2, CALCULATE Valve Stroke Distance of BNHV0004.

g. RECORD Valve Stroke Distance of BNHV0004 in the table on Attachment 2.

h. Independently VERIFY the following:

1. Valve Stroke Distance calculation of Step 6.1.9.f for BNHV0004.

2. Valve Stroke Distance for BNHV0004 recorded correctly in Attachment 2 table.

i. COMPARE Valve Stroke Distance to the Valve Stroke Acceptable Range on Attachment 2.

j. IF Position Indication Test meets Acceptance Criteria, INITIAL Test SAT for BNHV0004 on Attachment 2.

k. IF Position Indication Test for BNHV0004 does NOT meet Acceptance Criteria, NOTIFY SM/CRS.

6.1.10. Using BN HIS-4, RWST TO CTMT SPRAY PUMP A, OPEN BNHV0004 and MEASURE the elapsed time between operating the handswitch and when the closed light goes out.

6.1.11. RECORD Observed Stroke Time for BNHV0004 on Attachment 1.

6.1.12. EVALUATE Observed Stroke Time against the Normal Stroke Time Range and the Maximum Allowable Stroke Time and DETERMINE if valve retest is required for BNHV0004.

NA

a. IF Observed Stroke Time for BNHV0004 does NOT meet Acceptance Criteria, NOTIFY SM/CRS.

b. IF retest is required, PERFORM the retest per CA2716, Valve Retest Instructions.

6.1.13. IF Section 6.2 is NOT being performed, PERFORM the following:

NA

a. RECORD the Restored Position of BNHV0004 on Attachment 1.

b. PLACE EN HIS-3, CTMT SPRAY PUMP A, in Normal After Stop.

c. RECORD Containment Spray Train A OPERABLE time on Attachment 1.

-END OF SECTION-

Attachment 1

Valve Test Data Sheet

Sheet 1 of 1

Person Performing	**Initial & PIN**		
____________________	__________	**Date Started**	__________
____________________	__________	**Date Completed**	__________

Stroke times to be recorded to the nearest 1/10th of a second.

Section	Valve	Normal Position	Initial Remote Position	Observed Stroke Time (sec)		Normal Stroke Time Range (sec)		Maximum Stroke Time (sec)		Full Stroke Remote Position	Restored Position	Restored Verification	Restored Independent Verification
				Open	Closed	Open	Closed	Open	Closed				
6.1	BNHV0004	Open	Open			45.5 to 61.5	45.5 to 61.5	65.0	65.0				
6.2	ENHV0006	Closed	Closed		N/A	11.8 to 15.0	N/A	15.0	N/A				

Time Containment Spray Train A INOPERABLE: __________
(Step 6.1.4 or 6.2.1.b)

Time Containment Spray Train A OPERABLE: __________
(Step 6.1.13.c or 6.2.15)

Comments: ____

M & TE ID Numbers: ________ ________ ________ ________

Cal Due Dates: ________ ________ ________ ________

CALLAWAY ENERGY CENTER
JOB PERFORMANCE MEASURE

S6

JPM No:	NB-RO-S-001	KSA No:	062 A4.01
Revision Date:	04/03/2017	KSA Rating:	3.3/3.1
Job Title:	URO/SRO		
Duty:	Station Blackout		
Task Title:	Energize NB Bus from AEPS diesel generators		
Completion Time:	15 minutes		

The performance of this task was evaluated against the standards contained in this JPM and determined to be:

☐ SATISFACTORY ☐ UNSATISFACTORY

Reason, if UNSATISFACTORY:

____

____

Evaluator Signature: ______________________ Date: ______________

Task Performer: ______________________

Location of Performance:

☐ Control Room ☒ Simulator/Lab ☐ Plant ☐ Classroom

Method of Performance: ☐ Simulated ☒ Performed

☐ Alternate Path ☐ Time Critical ☐ RCA

References: EOP Addendum 39, Alternate Emergency Power Supply, Rev 010

Tools / Equipment: None

CALLAWAY ENERGY CENTER
JOB PERFORMANCE MEASURE

Initial Conditions: A Loss of All AC Power is in progress. ECA-0.0 is being implemented to restore power. Transmission Dispatch has just notified the crew off-site power is NOT available.

Initiating Cues: The CRS has directed you to perform EOP Addendum 39, Alternate Emergency Power Supply, to energize NB01

.

Simulator Set up and/or Note(s): Use IC-117 on load 1603 OR perform the following below

- Load Any Mode 1-4 IC
- Place a WIP Tag on the B ESW Pump Handswitch and place the handswitch in PTL
- Insert a Loss of Offsite power
- Insert Remote Function to Trip the A EDG, NE01,
- Place A Train CCP, CCW, SI and RHR pumps in PTL
- Verify PB05 energized from AEPS diesels

Task Standard: Upon completion of this JPM, the operator will have established AEPS power to NB01.

Start Time: ________________

Stop Time: ________________

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
1.	Obtain a copy of EOP Addendum 39	Provide candidate with procedure copy.	Candidate obtained procedure copy	**S** **U** Comments:
2.	CAUTION: The Diesels from the AEPS are designed to support only one AC emergency Bus at a time. Central Electric Power Reform Substation may be able to supply apower to both AC Emergency Buses depending on power reserves. Caution prior to Step 1		Candidate place kept caution	**S** **U** Comments:
3.	NOTES: Figure A, AEPS One Line Diagram, is available for reference. Attachment F, AEPS Diesel Generator Alarms and Trips, is available for reference. Note prior to Step 1		Candidate place kept note	**S** **U** Comments:
4.	EVALUATE Plant Status to Determine Which AC Emergency Bus to Energize: Step 1	.	Candidate reviewed plant status and proceeded to step 2 as candidate was directed to energize NB01 from initial cue.	**S** **U** Comments:

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
*5.	IF Required, ALIGN Train A for Alternate Emergency Power Supply by placing in PTL: NB0111 via NE HIS-25 NB0109 via NB HIS-3 NB0112 via NB HIS-2 NB0114 via NB HIS-67 (originally in PTL) Step 2a-d		Candidate placed the 4 4160v breakers in PTL position by rotating each handswitch to the left position and pulling away from control board panel . These are the Normal, Alternate, Emergency, & AEPS supply breakers for NB01.	**S** **U** Comments: Note: For this step to be SAT, all 4 hand switches must be in PTL at the end of the step.
6.	If required, align Train B AC Emergency Bus for Alternate Emergency Power Supply Step 3		Candidate determined that step is N/A.	**S** **U** Comments:
7.	Perform Applicable Attachment as Necessary: NB01 – Attachment A NB02 – Attachment B Step 4		Candidate proceeded to Attachment A for NB01 .	**S** **U** Comments:
8.	CAUTION: Starting an ESW pump with less than three AEPS DGs OR less than 6 MW power from Central Electric Power Reform Substation may trip supply breakers. Caution prior to Step A1		Candidate place kept caution.	**S** **U** Comments:

*Critical Step

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
9.	NOTE: Each AEPS DG is rated for continuous 2000 KW The limiting component for power is breraker PA50101. The overcurrent device will trip PA50101 at 660 Amps (15 MW) Note prior to Step A1		Candidate place kept note.	S U Comments:
10.	Check Bus PB05 – Energized Step A1		Candidate determined PB05 is energized from the AEPS DGs and per the RNO proceeded to step A2.	S U Comments:
11.	Place ESW Pump A in Pull-To-Lock Step A2		Candidate placed ESW Pump A in PTL by rotating handswitch (EF HIS-55A) to the left position and pulling away from control board panel.	S U Comments:
*12.	Using PBXY0001 CLOSE AEPS FDR BKR PB0503 to NB0114 • PB0503 Step A3		At PBXY0001, candidate closed PB0503 by selecting PB0503 using the touch screen and selecting close and then confirming the action.	S U Comments:

*Critical Step

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
13.	NOTE: Handswitch NB HIS-67 must be held in the CLOSE position for a minimum of 3 seconds to allow the Undervoltage relay to reset. Ensure NB01 Auto-sequenced equipment has been placed in PTL position prior to re-energization Note prior to Step A4		Candidate place kept note.	S U Comments:
*14.	Close NB01 AEPS SPLY BKR NB0114 using: • NB HIS-67 Step A4		Candidate closed NB0114 by taking NB HIS-67 from PTL to the full right position (CLOSE) and held it in the CLOSE position for at least 3 seconds to ensure NB01 stayed energized.	S U Comments: **Note: the time the breaker is held in the close position is not critical**
15.	The JPM is complete	This JPM is Complete. **Record Stop Time on Page 2**		S U Comments:

*Critical Step

S6

Initial Conditions: A Loss of All AC Power is in progress. ECA-0.0 is being implemented to restore power. Transmission Dispatch has just notified the crew off-site power is NOT available.

Initiating Cues: The CRS has directed you to perform EOP Addendum 39, Alternate Emergency Power Supply, to energize NB01

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

CAUTION

The Diesels from the Alternate Emergency Power Supply (AEPS) are designed to support only one AC Emergency Bus at a time. Central Electric Power Reform Substation may be able to supply power to both AC Emergency Buses depending on power reserves.

NOTES

- Figure 1, Alternate Emergency Power Supply One Line Diagram, is available for reference.
- Attachment F, AEPS Diesel Generator Alarms and Trips, is available for reference.

1. **EVALUATE Plant Status To Determine Which AC Emergency Bus To Energize:**

   a. ASSESS the following:

      1) Availability of:

         o ESW Pumps

         o ECCS Pumps

         o CCW Pumps

         o AFW Pumps

         o AC Units

      2) Protected Train Status

      3) Inoperable Equipment

      4) Damaged/Degraded Equipment

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

2. IF Required, ALIGN Train A AC Emergency Bus For Alternate Emergency Power Supply:

a. PLACE NB01 Emergency Supply Breaker NB0111 in PULL-TO-LOCK

- NE HIS-25

b. PLACE NB01 Alternate Supply Breaker NB0109 in PULL-TO-LOCK

- NB HIS-3

c. PLACE NB01 Normal Supply Breaker NB0112 in PULL-TO-LOCK

- NB HIS-2

d. PLACE NB01 AEPS Supply Breaker NB0114 in PULL-TO-LOCK

- NB HIS-67

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

3. IF Required, ALIGN Train B AC Emergency Bus For Alternate Emergency Power Supply:

a. PLACE NB02 Emergency Supply Breaker NB0211 in PULL-TO-LOCK

- NE HIS-26

b. PLACE NB02 Alternate Supply Breaker NB0212 in PULL-TO-LOCK

- NB HIS-5

c. PLACE NB02 Normal Supply Breaker NB0209 in PULL-TO-LOCK

- NB HIS-4

d. PLACE NB02 AEPS Supply Breaker NB0214 in PULL-TO-LOCK

- NB HIS-68

4. PERFORM Applicable Attachment As Necessary:

a. NB01

- Attachment A, Energizing NB01 From Alternate Emergency Power Supply (AEPS), Step A1

b. NB02

- Attachment B, Energizing NB02 From Alternate Emergency Power Supply (AEPS), Step B1

-END-

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

ATTACHMENT A
(Page 1 of 4)
Energizing NB01 From Alternate Emergency Power Supply (AEPS)

CAUTION

Starting an ESW pump with less than three AEPS DGs OR less than 6 MW power from Central Electric Power Reform Substation may trip supply breakers.

NOTES

- Each AEPS DG is rated for continuous 2000 KW.
- The limiting component for power is breaker PA50101. The overcurrent device will trip PA50101 at 660 Amps (Approximately 15 MW).

A1. CHECK Bus PB05 - ENERGIZED

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
	a. CHECK PB05 Energized from Central Electric Power Reform Substation	a. IF PB05 is energized by AEPS DGs Continue with Step A2 If PB05 does not have power Go To Attachment C, Placing Alternate Emergency Power Supply DGs on PA501 Bus, Step C1
	b. NOTIFY Central Electric Power Transmission System Operator (TSO) of Callaway's required approximately 6 MW for emergency power from the Reform Substation • 573-761-2800 (Main number)	b. IF Central Electric Power cannot provide a minimum of 6 MW Go To Attachment C, Placing Alternate Emergency Power Supply DGs on PA501 Bus, Step C1

A2. PLACE ESW Pump A In PULL-TO-LOCK

- EF HIS-55A

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

ATTACHMENT A
(Page 2 of 4)
Energizing NB01 From Alternate Emergency Power Supply (AEPS)

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
A3.	**Using PBXY0001 CLOSE AEPS FDR BKR PB0503 TO NB0114** • PB0503	With a Safety Person present and wearing a 40 cal suit, locally CLOSE PB0503 using the Local Handswitch. IF Breaker PB0503 can NOT be CLOSED, THEN PERFORM one of the following: • Go To Attachment B, Energizing NB02 From Alternate Emergency Power Supply (AEPS), Step B1 OR • Return To Procedure and Step In Effect.

NOTES

- Handswitch NB HIS-67 must be held in the CLOSE position for a minimum of 3 seconds to allow the Undervoltage relay to reset.
- Ensure NB01 Auto-Sequenced equipment has been placed in PULL-TO-LOCK position prior to re-energization.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
A4.	**CLOSE NB01 AEPS SPLY BKR NB0114** • NB HIS-67	IF NB01 can NOT be energized, THEN PERFORM one of the following: • Go To Attachment B, Energizing NB02 From Alternate Emergency Power Supply (AEPS), Step B1 OR • Return To Procedure and Step In Effect.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

ATTACHMENT A
(Page 3 of 4)
Energizing NB01 From Alternate Emergency Power Supply (AEPS)

NOTE

An AEPS DG at full load uses 139 gal/hr fuel. At this rate, the low fuel level alarm will be received in approximately 19 hours and will be empty in 25 hours.

A5. MONITOR AEPS System Using PBXY0001:

- Watts
- Amps
- Volts
- Fuel (DG only)

RESPONSE NOT OBTAINED: IF PBXY0001 is NOT available, THEN MONITOR AEPS System using PBXY0002.

ENSURE the Local Control switch for PBXY0002 is ON.

A6. NOTIFY Jefferson City Oil To REFUEL AEPS DGs As Necessary:

- Contact information located in Call Out List

CAUTION

To avoid tripping other NB01 loads 'A' ESW pump must be started first.

NOTE

No loading restrictions apply if NB01 is energized by Central Electric Power Reform Substation.

\# **A7. CHECK NB01 Is Energized By Central Electric Power Reform Substation Or A Minimum Of 3 AEPS DGs**

RESPONSE NOT OBTAINED: CONSULT Plant Engineering Staff for loading equipment on NB01.

\# **A8. When Power Is Available To The Switchyard - Restore Power To NB01 Using Attachment D, Restore Normal Power To NB01, Step D1**

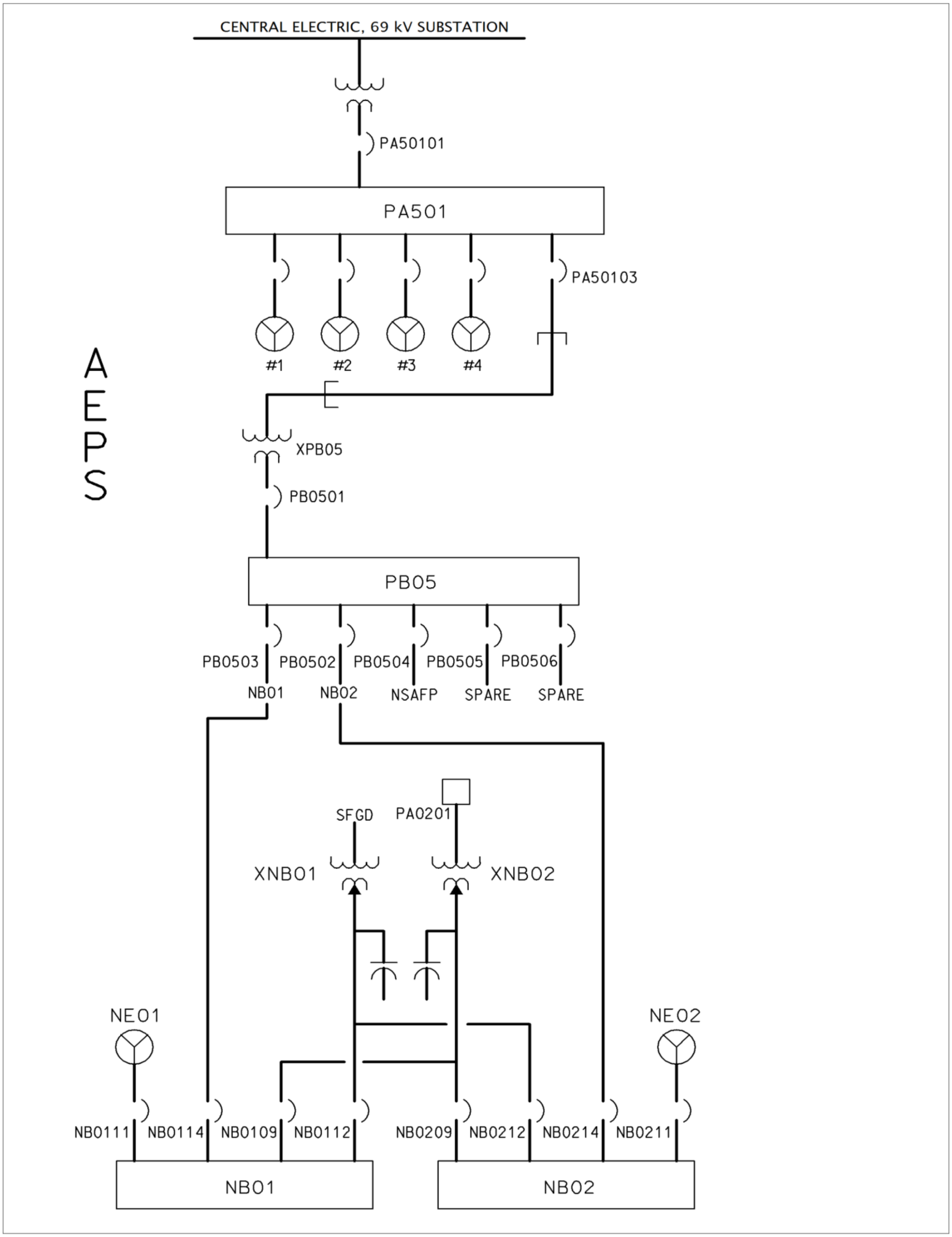
STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

ATTACHMENT A
(Page 4 of 4)
Energizing NB01 From Alternate Emergency Power Supply (AEPS)

A9. Return To Procedure and Step In Effect

-END-

Figure 1
Alternate Emergency Power Supply One Line Diagram



CALLAWAY ENERGY CENTER
JOB PERFORMANCE MEASURE

S8

JPM No:	GT-RO-S-001	KSA No:	029A2.03
Revision Date:	04/04/2017	KSA Rating:	2.7 / 3.1
Job Title:	URO/SRO		
Duty:	Containment Purge		
Task Title:	Reinitiate Containment Purge following CPIS		
Completion Time:	15 minutes		

The performance of this task was evaluated against the standards contained in this JPM and determined to be:

☐ SATISFACTORY ☐ UNSATISFACTORY

Reason, if UNSATISFACTORY:

____

____

Evaluator Signature: ______________________ Date: ______________

Task Performer: ______________________________

Location of Performance:
☐ Control Room ☒ Simulator/Lab ☐ Plant ☐ Classroom

Method of Performance: ☐ Simulated ☒ Performed

☐ Alternate Path ☐ Time Critical ☐ RCA

References: OTN-GT-00001, Containment Purge System, Rev 32

Tools / Equipment: None

CALLAWAY ENERGY CENTER
JOB PERFORMANCE MEASURE

Initial Conditions: The Plant is in Mode 3. A containment mini-purge was in progress to reduce noble gas concentrations prior to a containment entry.

Thirty minutes ago, a CPIS occurred due to an instrument spike on GT RE-22, CTMT PURGE EXH GAS DETECTOR.

The cause of the spike on GT RE-22 has been determined and corrected. **Control Building HVAC has been realigned.**

The Shift Manager has determined that Containment Purge may be reinitiated on the same Gaseous Radwaste Release Permit.

Initiating Cues: You have been directed to **REINTIATE** containment mini-purge per OTN-GT-00001, Section 5.6.

Inform the Control Room Supervisor when the containment mini-purge supply dampers are open and supply fan is running.

Simulator Set up and/or Note(s): Use IC-189 on load 1603 OR perform the below actions

- Use any Mode 3 IC
- Place Containment Mini-Purge in service
- Manually Actuate CPIS
- Hang Blue tags on GTRT22 and GTRT33 "Purge in progress, do not bypass."
- Ensure procedure copy provided to student has section 5.1 place kept as complete.

Task Standard: At the completion of this JPM, the operator will have established containment mini-purge intake and exhaust for both trains.

Start Time: ________________

Stop Time: ________________

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
1.	Obtain a verified working copy of OTN-GT-00001	After Candidate locates a working copy, provide procedure.	Candidate obtained a working copy of the procedure	**S** **U** Comments:
2.	Review precautions and limitations. Section 3	All precautions and limitations are satisfied If asked, indicate outside air Temp > 50°F	Candidate reviewed precautions and limitations	**S** **U** Comments:
3.	Review prerequisites Section 4	All prerequisites are satisfied	Candidate reviewed prerequisites	**S** **U** Comments:
4.	CAUTION: As a normal operational practice, a containment purge or vent should not be stopped and restarted without terminating the Gaseous Radwaste Release Permit. However, under special conditions and at SM discretion, a containment purge may be stopped and restarted without terminating the permit. Caution before step 5.6		Candidate place kept caution.	**S** **U** Comments:
5.	ENSURE time between stopping and restarting purge will NOT exceed two hours. Step 5.6.1	CPIS occurred 30 minutes ago.	Candidate verified less than 2 hours since purge was stopped.	**S** **U** Comments:

*Critical Step

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
6.	Request Count Room Technician ensure alarm/trip setpoints for the following are correct per Gaseous Radwaste Release Permit: • GTRE0021B • GTRE0022 • GTRE0033 STEP 5.6.2	The Count Room Technician has ensured setpoints correct per the release permit	Candidate contacted count room technician to ensure setpoints are correct.	**S** **U** Comments:
7.	If readings on any of the monitors in Step 5.6.2 are greater than Hi-Hi alarm setpoint, request Count Room Tech… Step 5.6.3		Candidate marked step N/A since readings are less than Hi-Hi alarm setpoint.	**S** **U** Comments:
8.	NOTE: Bistable identification number is located below bistable potentiometer Note prior to step 5.6.4		Candidate place kept note.	**S** **U** Comments:
9.	IF any bistable trip lights are lit on SA036D or SA036E, perform the following: a. RECORD which bistable trip lights are lit in Control Room Log. b. DEPRESS affected bistable trip lights to reset Step 5.6.4	**Cue: No Bistable Trip light is Lit.**	Candidate checked all bistable trip lights reset on SA036D and SA036E.	**S** **U** Comments:

*Critical Step

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
*10.	If Control Room Vent Isolation or Containment Purge Isolation are actuated on SA066X, Obtain SM/CRS permission and PRESS applicable RESET: • SA HS-9, CRVIS A • SA HS-11, CPIS A Step 5.6.5	If asked, SM/CRS grants permission to reset CPIS	Candidate determined containment purge isolation is actuated on SA066X Operator pressed RESET on SA HS-11	**S** **U** Comments:
*11.	If Control Room Vent Isolation or Containment Purge Isolation are actuated on SA066Y, Obtain SM/CRS permission and PRESS applicable RESET: • SA HS-13, CRVIS B • SA HS-15, CPIS B Step 5.6.6	If asked, SM/CRS grants permission to reset CPIS	Candidate determined containment purge isolation is actuated on SA066Y Operator pressed RESET on SA HS-15	**S** **U** Comments:
12.	IF CPIS or CRVIS lights are lit on ESFAS Status Panels, RESET using the following: • SA HS-23, SA066X • SA HS-24, SA066Y Step 5.6.7		Candidate determined CPIS lights are lit on ESFAS Status Operator reset ESFAS Status Panel Lights using SA HS-23 and SA HS-24: Candidate rotated SA-HS-23 to RESET and released. Candidate rotated SA-HS-24 to RESET and released.	**S** **U** Comments:
13.	ENSURE the following annunciators are CLEAR: • 59D, CPIS • 63A, CRVIS Step 5.6.8		Candidate ensured annunciators 59D and 63A are CLEAR	**S** **U** Comments:

*Critical Step

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
14.	REALIGN Control Building HVAC, as required, per OTN-GK-00001, Control Building HVAC System Step 5.6.9		Candidate determined Control Building HVAC has already been aligned. (Provided in cue)	**S** **U** Comments:
15.	Reinitiate activity, as applicable: • Mini-Purge per Section 5.2 Step 5.6.10		Candidate proceeded to section 5.2	**S** **U** Comments:
16.	NOTE: Containment Mini-Purge is normally used in MODES 1-4 to reduce noble gas concentrations and establish conditions for containment entry. Mini-Purge may be placed in operation in Mode 5, Mode 6 and No Mode when Shutdown Purge in not available. Operation of Mini-Purge to Raise or Lower Containment pressure is normally performed using OTN-GT-00001 ADD 1 Note prior to step 5.2		Candidate place kept note.	**S** **U** Comments:
17.	ENSURE Section 5.1 has been performed. Step 5.2.1	Cue: "SECTION 5.1 OF OTN-GT-00001 HAS BEEN PERFORMED."	Candidate ensured section 5.1 has been performed	**S** **U** Comments:

*Critical Step

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
18.	ENSURE Shutdown Purge System is NOT in service Step 5.2.2		Candidate ensured Shutdown Purge System is NOT in service. This could be performed by the Candidate observing GT HIS-34 green light LIT, red light EXTINGUISHED	S U Comments:
19.	IF in MODES 1-4 OR preparing to enter MODE 4 from MODE 5, Ensure one of the following: a. Ensure the following are in OPERATE with "CONTIANMENT PURGE IN PROGRESS DO NOT BYPASS" covers in place over the switches: • GTRT22 • GTRT33 b. IF T/S 3.3.6 Action B was entered for GTRE22 and/or GTRE33, PERFORM the following: Step 5.2.3	Cue: Covers are in place Cue: If asked, T/S 3.3.6.B is not applicable.	Candidate observed GTRT22 switch with cover in place Candidate observed GTRT33 switch with cover in place	S U Comments:
20.	IF in MODES 5 or 6 AND NOT preparing for entry into MODE 4, ENSURE the following are in BYPASS: Step 5.2.4		Candidate determined this step is N/A	S U Comments:
21.	NOTE: MINIVENT time trend may be used. Note prior to step 5.2.5		Candidate place kept note	S U Comments:

*Critical Step

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
22.	Monitor the following instrumentation: • GTRE0021B • GTRE0022 • GTRE0033 • Plant computer point GTD0040 Step 5.2.5		Candidate monitored instrumentation.	**S** **U** Comments:
23.	RECORD containment pressure as read on GT PDI-40 or plant computer point GTD0040 on Gaseous Radwaste Release Permit Step 5.2.6	CRS reports containment pressure has been recorded.	Candidate determined containment pressure and reported to CRS to record on release permit.	**S** **U** Comments:
*24.	Using GT HIS-20, CTMT MINI PURGE EXH FAN & DAMPER, START CGT02. Step 5.2.7		Candidate rotated GT HIS-20 to the right until the red light LIT and the green light EXTINGUISHED and released.	**S** **U** Comments:
*25.	Using GT HIS-11, CTMT MINI PURGE EXH INNER CTMT ISO, OPEN GTHZ0011. Step 5.2.8		Candidate depressed the OPEN pushbutton on GT HIS-11 until the red light LIT and released.	**S** **U** Comments: NOTE: It is acceptable to not hold the open button depressed until the green light extinguishes.
*26.	Using GT HIS-12, CTMT MINI PURGE EXH OUTER CTMT ISO, OPEN GTHZ0012. Step 5.2.9		Candidate depressed the OPEN pushbutton on GT HIS-12 until the red light LIT and released.	**S** **U** Comments:

*Critical Step

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
27.	Using GT HIS-28, CTMT PURGE EXH DAMPER, OPEN GTHZ0028. Step 5.2.10		Candidate depressed the OPEN pushbutton on GT HIS-28 until the red light LIT and released.	S U Comments:
28.	Using GT HIS-29, CTMT PURGE EXH DAMPER, OPEN GTHZ0029. Step 5.2.11		Candidate depressed the OPEN pushbutton on GT HIS-29 until the red light LIT and released.	S U Comments:
29.	Record date and time dampers were opened on Gaseous Radwaste Release Permit Step 5.2.12	CRS reports date and time have been recorded	Candidate reported to the CRS date and time dampers were opened on gaseous radwaste release permit.	S U Comments:
30.	NOTE: It is permissible to continue with the remainder of this section while Step 5.2.13 is in progress. Note prior to Step 5.2.13		Candidate place kept note.	S U Comments:
31.	NOTIFY Count Room Technician of time of purge initiation. Step 5.2.13	Count Room Technician acknowledges	Candidate reported time of purge initiation to Count Room Technician	S U Comments:

*Critical Step

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
32.	WHEN containment pressure is less than 10.0 in. H20, OPEN the following using GT HIS-41, CTMT MINI PURGE SPLY/EXH DAMPERS: • GTHZ0041, CTMT MINI PURGE EXH INNER CTMT UPSTRM DMPR OPER • GTHZ0042, CTMT MINI PURGE AIR SPLY INNER CTMT DNSTRM DMPR OPER Step 5.2.14		Candidate depressed and held GT HIS-41 OPEN pushbutton until red light LIT and green light EXTINGUISHED	**S** **U** Comments:
33.	WHEN containment pressure is less than 4.25 in. H20 as read on GT PDI-40, CTMT DP, or plant computer point GTD0040, CTMT-AUX BLD DIFF PRESS, PERFORM the following: • Using GT HIS-26, CTMT PURGE SYS AIR SPLY DAMPER, OPEN GTHZ0026. • Using GT HIS-27, CTMT PURGE SYS AIR SPLY DAMPER, OPEN GTHZ0027. Step 5.2.15		Candidate depressed and held GT HIS-26 OPEN pushbutton until red light LIT and green light EXTINGUISHED Candidate depressed and held GT HIS-27 OPEN pushbutton until red light LIT and green light EXTINGUISHED	**S** **U** Comments:

*Critical Step

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
34	SGT02, CTMT MINI PURGE AIR SPLY UNIT, should be running anytime CGT02, CTMT MINI PURGE EXH FAN, is running and Equipment Hatch is closed to prevent drawing excessive vacuum in Containment and creating a personnel hazard. CAUTION before Step 5.2.16		Candidate place kept.	S U Comments:
*35.	Using GT HIS-23, CTMT MINI PURGE AIR SPLY UNIT, START SGT02. STEP 5.2.16		Candidate rotated GT HIS-23 to RUN until red light LIT and released.	S U Comments:
*36.	Using GT HIS-5, CTMT MINI PURGE AIR SPLY CTMT ISO, OPEN GTHZ0005. Step 5.2.17		Candidate depressed and held GT HIS-5 OPEN pushbutton until red light LIT and green light EXTINGUISHED	S U Comments:
*37.	Using GT HIS-4, CTMT MINI PURGE AIR SPLY CTMT ISO, OPEN GTHZ0004. STEP 5.2.18		Candidate depressed and held GT HIS-4 OPEN pushbutton until red light LIT and green light EXTINGUISHED	S U Comments:
38.	MAINTAIN containment pressure +41.5 to -8.35 in. H20 as read on GT PDI-40 or plant computer point GTD0040 Step 5.2.19		Candidate place kept.	S U Comments:
39.	**JPM IS COMPLETE**	RECORD STOP TIME ON PAGE 2.	Candidate reports to CRS that mini-purge is in service.	S U Comments:

*Critical Step

S8

Initial Conditions:	The Plant is in Mode 3. A containment mini-purge was in progress to reduce noble gas concentrations prior to a containment entry. Thirty minutes ago, a CPIS occurred due to an instrument spike on GT RE-22, CTMT PURGE EXH GAS DETECTOR. The cause of the spike on GT RE-22 has been determined and corrected. **Control Building HVAC has been realigned.** The Shift Manager has determined that Containment Purge may be reinitiated on the same Gaseous Radwaste Release Permit.
Initiating Cues:	You have been directed to **REINTIATE** containment mini-purge per OTN-GT-00001, Section 5.6. Inform the Control Room Supervisor when the containment mini-purge supply dampers are open and supply fan is running.

OTN-GT-00001

CONTAINMENT PURGE SYSTEM

MINOR Revision 032

CONTINUOUS USE

CONTAINMENT PURGE SYSTEM

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OTN-GT-00001 ADD 1, Adjusting Containment Pressure

CHECKLIST 0001, Control Room Switch And Damper Alignment

CHECKLIST 0002, Local Valve And Switch Alignment

CHECKLIST 0003, Electrical Alignment

CHECKLIST 0004, Mini-Purge Restoration Lineup

CONTAINMENT PURGE SYSTEM

1.0 PURPOSE

1.1. Provide instructions for operation of the Containment Purge System.

2.0 SCOPE

2.1. This procedure can be used to:

- Place Mini-Purge in operation to purge containment at power or prior to entry.
- Place Mini-Purge in operation to purge containment in MODE 5, MODE 6 and No Mode when Shutdown Purge in not available.
- Place Shutdown Purge in operation to maintain a suitable containment environment for personnel access in MODE 5, MODE 6 and No Mode.

2.2. This is the parent procedure for OTN-GT-00001 ADD 1, Adjusting Containment Pressure.

2.3. OTN-GT-00001 ADD01 is normally used for the following:

- Periodic venting of Containment to a lower pressure
- Raising Containment Pressure when it becomes negative

3.0 PRECAUTIONS AND LIMITATIONS

3.1. Containment pressure shall be maintained at +1.5 to -0.3 psig (+41.5 to -8.35 in. H_20) in MODES 1 - 4 per T/S 3.6.4.

3.2. Primary Containment average air temperature shall be 120°F or less in MODES 1 - 4 per T/S 3.6.5.

3.3. Release rates set forth in Gaseous Radwaste Release Permit shall NOT be exceeded.

3.4. Mini-Purge operation in MODE 5, MODE 6 and No MODE is limited to periods when Shutdown Purge in not available.

3.5. During Core Alterations and movement of irradiated fuel assemblies within Containment, Operation of Containment Purge Exhaust is required to meet the Administrative Controls of T/S 3.9.4.

3.6. This procedure removes locking devices from valves. If procedure performance is terminated or postponed, any valves that remain unlocked shall be logged in the Locked Component Deviation list.

3.7. IF the Containment Equipment Hatch is open during Core Alterations and Purge Exhaust must be secured, then perform one of the following: [Ref: 6.2.2]

- CLOSE the Containment Equipment Hatch prior to securing CTMT Purge

  -OR-

- SUSPEND Core Alterations and Irradiated Fuel Movement in Containment

3.8. If Equipment Hatch is open, the following limitations apply:

- The exhaust fan (CGT01, CTMT S/D PURGE EXH FAN, OR CGT02, CTMT MINI PURGE EXH FAN) should be running to maintain negative pressure on Reactor Building or ensure air flow from outside into containment.
- The supply fan (SGT01, CTMT S/D PURGE AIR SPLY UNIT, OR SGT02, CTMT MINI PURGE AIR SPLY UNIT) may remain secured until Equipment Hatch is closed.
- The appropriate supply fan (SGT01, CTMT S/D PURGE AIR SPLY UNIT, OR SGT02, CT MT MINI PURGE AIR SPLY UNIT) should be running anytime an exhaust fan (CGT01, CTMT S/D PURGE EXH FAN, OR CGT02, CTMT MINI PURGE EXH FAN) is running and Equipment Hatch is closed to prevent drawing excessive vacuum in Containment and creating a personnel hazard.

3.9. To prevent backflow of containment atmosphere to other buildings, SGT01, CTMT S/D PURGE AIR SPLY UNIT, or SGT02, CTMT MINI PURGE AIR SPLY UNIT, must be running prior to establishing a flowpath between Containment and the Auxiliary Building via the air intake plenum.

3.10. The following apply when both Containment Personnel Hatch doors are open (interlocks defeated):

3.10.1. To control the spread of noble gas, CGL03A, AUX/FUEL BLDG NORM EXH FAN A, or CGL03B, AUX/FUEL BLDG NORM EXH FAN B, should be run in slow speed to ensure air flow is from the Auxiliary Building to Containment.

3.10.2. If the Equipment Hatch or Emergency Personnel Hatch is open and a positive air flow from Containment to the outside atmosphere is identified, CGL03A, AUX/FUEL BLDG NORM EXH FAN A, or CGL03B, AUX/FUEL BLDG NORM EXH FAN B, shall be shifted to FAST speed. If positive air flow out of Containment continues, the appropriate hatch shall be closed.

3.11. T/S 3.6.3 requires Shutdown Purge Containment Isolation valves to be Sealed Closed or Closed and Blind Flanged in MODES 1 - 4. In T/S SR 3.6.3.1 bases, "Sealed Closed" is defined as closed with motive power removed. Since the blind flanges are NOT normally installed, maintaining the air supply valves LOCKED CLOSED is required to comply with T/S 3.6.3.

4.0 PREREQUISITES

4.1. IF outside temperature is 50°F or less AND mini-purge or shutdown supply fans will be placed in service, ENSURE Plant Heating System is in service per OTN-GA-00001, Plant Heating System.

4.2. IF Section 5.4 or 5.5 will be performed, ENSURE ladder or scaffold is available to operate the following valves:

- GTHZ0006V1, AIR SPLY ISO FOR GTHZ0006
- GTHZ0007V1, AIR SPLY ISO FOR GT-HZ-0007
- GTHZ0008V1, AIR SPLY ISO FOR GT-HZ-0008
- GTHZ0009V1, AIR SPLY ISO FOR GTHZ0009

NOTE

The following would normally be performed post-maintenance, post-outage or for initial alignment (e.g., prior to containment purge).

4.3. IF necessary to ensure system alignment, PERFORM the following checklists:

- Checklist 0001, Control Room Switch And Damper Alignment
- Checklist 0002, Local Valve And Switch Alignment
- Checklist 0003, Electrical Alignment

NOTE

GTRE0022 and GTRE0033 automatic isolation is not required in MODE 5, MODE 6 or No Mode.

CAUTION

RM11 Console should be closely monitored during purging operations. Any change in system alignment or flow could result in radiation monitor failure.

4.4. ENSURE the following radiation monitors are in service OR monitoring requirements are in compliance with FSAR and Tech Specs:

4.4.1. Unit Vent Monitoring: [Ref: 6.2.3]

- GTRE0021A, CTMT BLD AIR EXH PLENUM/UNIT VENT PART/IOD DET
- GTRE0021B, CTMT BLD AIR EXH PLENUM/UNIT VENT GAS DET

4.4.2. Containment Purge Monitoring: [Ref: 6.2.1, 6.2.2 and 6.2.3]

- GTRE0022, CTMT PURGE EXH GTRE0022 GAS DETECTOR
- GTRE0033, CTMT PURGE EXH GTRE0033 GAS DETECTOR

-END OF SECTION-

5.0 PROCEDURE INSTRUCTIONS

> **NOTE**
>
> Unless otherwise noted, switches are on RL020.

5.1. Containment Purge Prestart

5.1.1. ENSURE a Gaseous Radwaste Release Permit is delivered to Control Room for the type of purge to be performed.

> **CAUTION**
>
> Closing GE HIS-103, COND AIR REMOVAL FAN DISCHARGE or GE HIS-104, COND AIR REMOVAL FAN DISCHARGE will cause an automatic trip of any running Condenser Vacuum Pumps.

5.1.2. At RP068, ENSURE the following to prevent inadvertent backflow of contamination to other buildings:

	At least one of the following - RUNNING: (√)	OR		At least one of the following - CLOSED: (√)
	GF HIS-17, MAIN STEAM ENCL EXHAUST FAN 3A			GF HIS-22, MAIN STM ENCL BLDG EXHAUST ISO DAMPER
	GF HIS-18, MAIN STEAM ENCL EXHAUST FAN 3B			GF HIS-23, MAIN STM ENCL BLDG EXHAUST ISO DAMPER
	At least one of the following - RUNNING: (√)	OR		At least one of the following - CLOSED: (√)
	GE HIS-83, CONDENSER AIR REMOVAL FAN 1A			GE HIS-103, COND AIR REMOVAL FAN DISCHARGE
	GE HIS-82, CONDENSER AIR REMOVAL FAN 1B			GE HIS-104, COND AIR REMOVAL FAN DISCHARGE
	At least one of the following - RUNNING: (√)	OR		At least one of the following - CLOSED: (√)
	GK HIS-47, ACCS CTRL EXHAUST FAN 2A			GK HIS-155, ACCS CTRL EXHAUST ISO DAMPER 2A
	GK HIS-49, ACCS CTRL EXHAUST FAN 2B			GK HIS-154, ACCS CTRL EXHAUST ISO DAMPER 2B

5.1.3. At RL020, ENSURE the following to prevent inadvertent backflow of contamination to other buildings:

At least one of the following - RUNNING: (√)		OR	At least one of the following - CLOSED: (√)	
	GL HIS-30, FUEL/AUX BLD NORM EXH FAN A			GL HIS-32, FUEL/AUX BLD NORM EXH DAMPER
	GL HIS-31, FUEL/AUX BLD NORM EXH FAN B			GL HIS-33, FUEL/AUX BLD NORM EXH DAMPER

5.1.4. IF GG HIS-15A, FUEL/AUX BLD EMERG EXH FAN A & DAMPER, is NOT running, ENSURE the following are CLOSED:

- GG HIS-40, FUEL BLD EMERG EXH DAMPER
- GG HIS-41, AUX BLD EMERG EXH DAMPER
- GG HIS-56, FUEL/AUX EMERG EXH CROSS CONNECT
- GG HIS-57, FUEL/AUX EMERG EXH CROSS CONNECT

5.1.5. IF GG HIS-21A, FUEL/AUX BLD EMERG EXH FAN B & DAMPER, is NOT running, ENSURE the following are CLOSED:

- GG HIS-43, FUEL BLD EMERG EXH DAMPER
- GG HIS-44, AUX BLD EMERG EXH DAMPER
- GG HIS-56, FUEL/AUX EMERG EXH CROSS CONNECT
- GG HIS-57, FUEL/AUX EMERG EXH CROSS CONNECT

5.1.6. WHEN Gaseous Radwaste Release Permit is delivered to Control Room, Go To applicable section:

- Mini-Purge - Section 5.2
- Shutdown Purge - Section 5.4

-END OF SECTION-

NOTE

Containment Mini-Purge is normally used in MODES 1 - 4 to reduce noble gas concentrations and establish conditions for containment entry. Mini-Purge may be placed in operation in MODE 5, MODE 6 and No Mode when Shutdown Purge in not available.

Operation of Mini-Purge to Raise or Lower Containment pressure is normally performed using OTN-GT-00001 ADD 1.

5.2. Placing Mini-Purge System In Service

5.2.1. ENSURE Section 5.1 has been performed.

5.2.2. ENSURE Shutdown Purge System is NOT in service.

5.2.3. IF in MODES 1 - 4 OR preparing to enter MODE 4 from MODE 5, ENSURE one of the following:

a. ENSURE the following are in OPERATE with “CONTAINMENT PURGE IN PROGRESS DO NOT BYPASS” covers in place over the switches:

- GTRT22 (located on Drawer 7N168-1 in SA036D)
- GTRT33 (located on Drawer 7N168-2 in SA036E)

b. IF T/S 3.3.6 Action B was entered for GTRE22 and/or GTRE33, PERFORM the following:

1. ENSURE the following INOPERABLE rad monitor(s) is/are in BYPASS:
   - GTRT22 (located on Drawer 7N168-1 in SA036D)
   - GTRT33 (located on Drawer 7N168-2 in SA036E)
2. ENSURE Administrative Controls are in place in compliance with T/S 3.3.6 Required Action B.1.

5.2.4. IF in MODES 5 or 6 AND NOT preparing for entry into MODE 4, ENSURE the following are in BYPASS:

- GTRT22 (located on Drawer 7N168-1 in SA036D)
- GTRT33 (located on Drawer 7N168-2 in SA036E)

NOTE

MINIVENT time trend may be used.

5.2.5. MONITOR the following instrumentation:

- GTRE0021B, CTMT BLD AIR EXH PLENUM/UNIT VENT GAS DET
- GTRE0022, CTMT PURGE EXH GTRE0022 GAS DETECTOR
- GTRE0033, CTMT PURGE EXH GTRE0033 GAS DETECTOR
- CTMT ΔP, or plant computer point GTD0040, CTMT-AUX BLD DIFF PRESS

5.2.6. RECORD containment pressure as read on GT PDI-40, CTMT ΔP, or plant computer point GTD0040, CTMT-AUX BLD DIFF PRESS, on Gaseous Radwaste Release Permit.

5.2.7. Using GT HIS-20, CTMT MINI PURGE EXH FAN & DAMPER, START CGT02.

5.2.8. Using GT HIS-11, CTMT MINI PURGE EXH INNER CTMT ISO, OPEN GTHZ0011.

5.2.9. Using GT HIS-12, CTMT MINI PURGE EXH OUTER CTMT ISO, OPEN GTHZ0012.

5.2.10. Using GT HIS-28, CTMT PURGE EXH DAMPER, OPEN GTHZ0028.

5.2.11. Using GT HIS-29, CTMT PURGE EXH DAMPER, OPEN GTHZ0029.

5.2.12. RECORD date and time dampers were opened on Gaseous Radwaste Release Permit.

NOTE

It is permissible to continue with the remainder of this section while Step 5.2.13 is in progress.

5.2.13. NOTIFY Count Room Technician of time of purge initiation.

5.2.14. WHEN containment pressure is less than 10.0 in. H_20, OPEN the following using GT HIS-41, CTMT MINI PURGE SPLY/EXH DAMPERS:

- GTHZ0041, CTMT MINI PURGE EXH INNER CTMT UPSTRM DMPR OPER
- GTHZ0042, CTMT MINI PURGE AIR SPLY INNER CTMT DNSTRM DMPR OPER

5.2.15. WHEN containment pressure is less than 4.25 in. H_20 as read on GT PDI-40, CTMT ΔP, or plant computer point GTD0040, CTMT-AUX BLD DIFF PRESS, PERFORM the following:

- Using GT HIS-26, CTMT PURGE SYS AIR SPLY DAMPER, OPEN GTHZ0026.
- Using GT HIS-27, CTMT PURGE SYS AIR SPLY DAMPER, OPEN GTHZ0027.

CAUTION

SGT02, CTMT MINI PURGE AIR SPLY UNIT, should be running anytime CGT02, CTMT MINI PURGE EXH FAN, is running and Equipment Hatch is closed to prevent drawing excessive vacuum in Containment and creating a personnel hazard.

5.2.16. Using GT HIS-23, CTMT MINI PURGE AIR SPLY UNIT, START SGT02.

5.2.17. Using GT HIS-5, CTMT MINI PURGE AIR SPLY CTMT ISO, OPEN GTHZ0005.

5.2.18. Using GT HIS-4, CTMT MINI PURGE AIR SPLY CTMT ISO, OPEN GTHZ0004.

5.2.19. MAINTAIN containment pressure +41.5 to -8.35 in. H_20 as read on GT PDI-40, CTMT ΔP, or plant computer point GTD0040, CTMT-AUX BLD DIFF PRESS.

-END OF SECTION-

5.3. Removing Mini-Purge System From Service

5.3.1. IF Containment Equipment Hatch is OPEN during Core Alterations and Mini-Purge Exhaust must be secured, PERFORM one of the following: [Ref: 6.2.2]

- CLOSE the Containment Equipment Hatch prior to securing CTMT Purge

-OR-

- SUSPEND Core Alterations and Irradiated Fuel Movement in Containment

5.3.2. Using GT HIS-5, CTMT MINI PURGE AIR SPLY CTMT ISO, CLOSE GTHZ0005.

5.3.3. Using GT HIS-4, CTMT MINI PURGE AIR SPLY CTMT ISO, CLOSE GTHZ0004.

5.3.4. Using GT HIS-23, CTMT MINI PURGE AIR SPLY UNIT, STOP SGT02.

5.3.5. Using GT HIS-26, CTMT PURGE SYS AIR SPLY DAMPER, CLOSE GTHZ0026.

5.3.6. Using GT HIS-27, CTMT PURGE SYS AIR SPLY DAMPER, CLOSE GTHZ0027.

5.3.7. Using GT HIS-20, CTMT MINI PURGE EXH FAN & DAMPER, STOP CGT02.

5.3.8. Using GT HIS-11, CTMT MINI PURGE EXH INNER CTMT ISO, CLOSE GTHZ0011.

5.3.9. Using GT HIS-12, CTMT MINI PURGE EXH OUTER CTMT ISO, CLOSE GTHZ0012.

5.3.10. Using GT HIS-41, CTMT MINI PURGE SPLY/EXH DAMPERS, CLOSE the following:

- GTHZ0041, CTMT MINI PURGE EXH INNER CTMT UPSTRM DMPR OPER
- GTHZ0042, CTMT MINI PURGE AIR SPLY INNER CTMT DNSTRM DMPR OPER

5.3.11. Using GT HIS-28, CTMT PURGE EXH DAMPER, CLOSE GTHZ0028.

5.3.12. Using GT HIS-29, CTMT PURGE EXH DAMPER, CLOSE GTHZ0029.

5.3.13. RECORD date and time dampers were closed on Gaseous Rad Release Permit.

5.3.14. RECORD containment pressure as read on GT PDI-40, CTMT ΔP, or plant computer point GTD0040, CTMT-AUX BLD DIFF PRESS, on Gaseous Rad Release Permit.

NOTE

It is permissible to continue with the remainder of this section while Step 5.3.15 is in progress.

5.3.15. NOTIFY Count Room Technician of time of purge completion.

5.3.16. IF in MODES 1 - 4 OR preparing to enter MODE 4 from MODE 5, PRFORM one of the following as applicable:

a. REMOVE "CONTAINMENT PURGE IN PROGRESS DO NOT BYPASS" covers from the following switches:

- GTRT22 (located on Drawer 7N168-1 in SA036D)
- GTRT33 (located on Drawer 7N168-2 in SA036E)

b. IF T/S 3.3.6 Action B was entered for GTRE22 and/or GTRE33, PERFORM the following:

1. ENSURE any OPERABLE rad monitor is in OPERATE:

   - GTRT22 (located on Drawer 7N168-1 in SA036D)
   - GTRT33 (located on Drawer 7N168-2 in SA036E)

2. RESTORE from use of Administrative Controls established by Step 5.2.3.b.2.

5.3.17. IF in MODES 5 or 6 AND NOT preparing for entry into MODE 4, ENSURE the following are in OPERATE:

- GTRT22 (located on Drawer 7N168-1 in SA036D)
- GTRT33 (located on Drawer 7N168-2 in SA036E)

NOTE

When post-release calculations are complete, Count Room Technician will adjust GTRE0021B, GTRE0022 and GTRE0033 to setpoints established by post-release calculations.

5.3.18. NOTIFY Count Room Technician of purge completion time and REQUEST disposition of Gaseous Radwaste Release Permit.

5.3.19. IF desired, REMOVE trends from plant computer:

- GTRE0021B, CTMT BLD AIR EXH PLENUM/UNIT VENT GAS DET
- GTRE0022, CTMT PURGE EXH GTRE0022 GAS DETECTOR
- GTRE0033, CTMT PURGE EXH GTRE0033 GAS DETECTOR
- GTD0040, CTMT-AUX BLD DIFF PRESS

-END OF SECTION-

NOTE

Containment Shutdown Purge is used in MODES 5 & 6 to maintain a suitable containment environment for personnel access.

5.4. Placing The Shutdown Purge System In Service

5.4.1. ENSURE Section 5.1 has been performed.

5.4.2. ENSURE the following:

- Mini-Purge System is NOT in service.
- Unit is in MODE 5, MODE 6 or No Mode. [Ref: 6.2.5]

NOTE

Steps 5.4.3 through 5.4.9 may be performed concurrently.

5.4.3. ENSURE the following are removed:

- Shutdown purge supply inner spectacle flange
- Shutdown purge supply outer spectacle flange
- Shutdown exhaust line inner spectacle flange
- Shutdown exhaust line outer spectacle flange

CAUTION

When Shutdown Purge is in operation, chill water to SGF01 has to be isolated to allow sufficient chill water supply to SGT01.

5.4.4. ISOLATE Chill Water to SGF01, MAIN STEAM ENCLOSURE BLD SUPPLY AIR UNIT, per OTN-GF-00001, Miscellaneous Building HVAC Systems.

5.4.5. OPEN GBV0049, CTMT PURGE SPLY AIR UNIT CHL WTR OUT DWNSTRM ISO.

NOTE

MINIVENT time trend may be used.

5.4.6. MONITOR the following instrumentation:

- GTRE0021B, CTMT BLD AIR EXH PLENUM/UNIT VENT GAS DET
- GTRE0022, CTMT PURGE EXH GTRE0022 GAS DETECTOR
- GTRE0033, CTMT PURGE EXH GTRE0033 GAS DETECTOR
- GT PDI-40, CTMT ΔP, or plant computer point GTD0040, CTMT-AUX BLD DIFF PRESS

5.4.7. RECORD containment pressure as read on GT PDI-40, CTMT ΔP, or plant computer point GTD0040, CTMT-AUX BLD DIFF PRESS, on Gaseous Radwaste Release Permit.

5.4.8. At ESFAS Cabinets, BYPASS the following:

- GTRT22 (located on Drawer 7N168-1 in SA036D)
- GTRT33 (located on Drawer 7N168-2 in SA036E)

NOTE

If left open from previous operation of Shutdown Purge System, the following valves may be ensured OPEN by review of the Locked Component Deviation List.

5.4.9. ENSURE the following are OPEN:

- GTHZ0006V1, AIR SPLY ISO FOR GTHZ0006
- GTHZ0007V1, AIR SPLY ISO FOR GT-HZ-0007
- GTHZ0008V1, AIR SPLY ISO FOR GT-HZ-0008
- GTHZ0009V1, AIR SPLY ISO FOR GTHZ0009

5.4.10. ENSURE the following for valves in Step 5.4.9:

- Valves have been entered into Locked Component Deviation List.
- EOSL entry has been made to ensure valves are LOCKED CLOSED prior to MODE 4 entry.

5.4.11. Using GT HIS-34, CTMT S/D PURGE EXH FAN & DAMPER, START CGT01.

5.4.12. Using GT HIS-11, CTMT MINI PURGE EXH INNER CTMT ISO, OPEN GTHZ0011.

5.4.13. Using GT HIS-9, CTMT S/D PURGE EXH OUTER CTMT ISO, OPEN GTHZ0009.

5.4.14. Using GT HIS-28, CTMT PURGE EXH DAMPER, OPEN GTHZ0028.

5.4.15. Using GT HIS-29, CTMT PURGE EXH DAMPER, OPEN GTHZ0029.

5.4.16. RECORD date and time dampers were opened on the following:

- Gaseous Radwaste Release Permit
- Control Room Log

NOTE

It is permissible to continue with the remainder of this section while Step 5.4.17 is in progress.

5.4.17. NOTIFY Count Room Technician of time of purge initiation.

5.4.18. WHEN containment pressure is less than 10.0 in. H_20 as read on GT PDI-40, CTMT ΔP, or plant computer point GTD0040, CTMT-AUX BLD DIFF PRESS, PERFORM the following:

a. Using GT HIS-8, CTMT S/D PURGE EXH INNER CTMT ISO, OPEN GTHZ0008.

b. Using GT HIS-11, CTMT MINI PURGE EXH INNER CTMT ISO, CLOSE GTHZ0011.

5.4.19. IF Equipment Hatch is CLOSED, PERFORM the following:

a. WHEN containment pressure is less than 4.25 in H_20 as read on GT PDI-40, CTMT ΔP, or plant computer point GTD0040, CTMT-AUX BLD DIFF PRESS, PERFORM the following:

- Using GT HIS-26, CTMT PURGE SYS AIR SPLY DAMPER, OPEN GTHZ0026.
- Using GT HIS-27, CTMT PURGE SYS AIR SPLY DAMPER, OPEN GTHZ0027.

CAUTION

SGT01, CTMT S/D PURGE AIR SPLY UNIT, should be running anytime CGT01, CTMT S/D PURGE EXH FAN, is running and Equipment Hatch is closed to prevent drawing excessive vacuum in Containment and creating a personnel hazard.

b. Using GT HIS-1, CTMT S/D PURGE AIR SPLY UNIT, START SGT01.

c. Using GT HIS-7, CTMT S/D PURGE AIR SPLY CTMT ISO, OPEN GTHZ0007.

d. Using GT HIS-6, CTMT S/D PURGE AIR SPLY CTMT ISO, OPEN GTHZ0006.

-END OF SECTION-

5.5. Removing Shutdown Purge System From Service

5.5.1. IF Containment Equipment Hatch is OPEN during Core Alterations and Shutdown Purge Exhaust must be secured, PERFORM one of the following: [Ref: 6.2.2]

- CLOSE the Containment Equipment Hatch prior to securing CTMT Purge

-OR-

- SUSPEND Core Alterations and Irradiated Fuel Movement in Containment

5.5.2. IF Equipment Hatch is CLOSED, PERFORM the following:

a. Using GT HIS-7, CTMT S/D PURGE AIR SPLY CTMT ISO, CLOSE GTHZ0007.

b. Using GT HIS-6, CTMT S/D PURGE AIR SPLY CTMT ISO, CLOSE GTHZ0006.

c. Using GT HIS-1, CTMT S/D PURGE AIR SPLY UNIT, STOP SGT01.

d. Using GT HIS-26, CTMT PURGE SYS AIR SPLY DAMPER, CLOSE GTHZ0026.

e. Using GT HIS-27, CTMT PURGE SYS AIR SPLY DAMPER, CLOSE GTHZ0027.

5.5.3. Using GT HIS-34, CTMT S/D PURGE EXH FAN & DAMPER, STOP CGT01.

5.5.4. Using GT HIS-8, CTMT S/D PURGE EXH INNER CTMT ISO, CLOSE GTHZ0008.

5.5.5. Using GT HIS-9, CTMT S/D PURGE EXH OUTER CTMT ISO, CLOSE GTHZ0009.

5.5.6. Using GT HIS-28, CTMT PURGE EXH DAMPER, CLOSE GTHZ0028.

5.5.7. Using GT HIS-29, CTMT PURGE EXH DAMPER, CLOSE GTHZ0029.

5.5.8. RECORD date and time dampers were closed on the following:

- Gaseous Radwaste Release Permit
- Control Room Log

5.5.9. RECORD containment pressure as read on GT PDI-40, CTMT ΔP, or plant computer point GTD0040, CTMT-AUX BLD DIFF PRESS, on Gaseous Radwaste Release Permit.

NOTE

It is permissible to continue with the remainder of this section while Step 5.5.10 is in progress.

5.5.10. NOTIFY Count Room Technician of time of purge completion.

5.5.11. At ESFAS Cabinets, ENSURE the following are NOT in BYPASS:

- GTRT22 (located on Drawer 7N168-1 in SA036D)
- GTRT33 (located on Drawer 7N168-2 in SA036E)

NOTE

When post-release calculations are complete, the Count Room Technician will adjust GTRE0021B, GTRE0022 and GTRE0033 to setpoints established by post-release calculations.

It is permissible to continue with the remainder of this section while Step 5.5.12 is in progress.

5.5.12. NOTIFY Count Room Technician of purge completion time and REQUEST disposition of Gaseous Radwaste Release Permit.

5.5.13. ALIGN Chill Water to SGF01, MAIN STEAM ENCLOSURE BLD SUPPLY AIR UNIT, per OTN-GF-00001, Miscellaneous Building HVAC Systems.

5.5.14. CLOSE GBV0049, CTMT PURGE SPLY AIR UNIT CHL WTR OUT DWNSTRM ISO.

5.5.15. IF NOT anticipated that Shutdown Purge System will be placed back in operation prior to MODE 4 entry OR NOT desired to leave valves OPEN, PERFORM the following:

a. LOCK the following valves CLOSED:

- GTHZ0006V1, AIR SPLY ISO FOR GTHZ0006
- GTHZ0007V1, AIR SPLY ISO FOR GT-HZ-0007
- GTHZ0008V1, AIR SPLY ISO FOR GT-HZ-0008
- GTHZ0009V1, AIR SPLY ISO FOR GTHZ0009

b. ENTER restoration into Locked Component Deviation List.

c. ENTER restoration into EOSL.

5.5.16. IF desired, REMOVE trends from plant computer:

- GTRE0021B, CTMT BLD AIR EXH PLENUM/UNIT VENT GAS DET
- GTRE0022, CTMT PURGE EXH GTRE0022 GAS DETECTOR
- GTRE0033, CTMT PURGE EXH GTRE0033 GAS DETECTOR
- GTD0040, CTMT-AUX BLD DIFF PRESS

-END OF SECTION-

CAUTION

As a normal operational practice, a containment purge or vent should not be stopped and restarted without terminating the Gaseous Radwaste Release Permit. However, under special conditions and at SM discretion, a containment purge may be stopped and restarted without terminating the permit.

5.6. Containment Purge Reinitiation

5.6.1. ENSURE time between stopping and restarting purge will NOT exceed two hours.

5.6.2. REQUEST Count Room Technician ensure alarm/trip setpoints for the following are correct per Gaseous Radwaste Release Permit: [Ref: 6.2.6]

- GTRE0021B, CTMT BLD AIR EXH PLENUM/UNIT VENT GAS DET
- GTRE0022, CTMT PURGE EXH GTRE0022 GAS DETECTOR
- GTRE0033, CTMT PURGE EXH GTRE0033 GAS DETECTOR

5.6.3. IF readings on any of the monitors in Step 5.6.2 are greater than Hi-Hi alarm setpoint, REQUEST Count Room Technician perform the following: [Ref: 6.2.1]

a. CLOSE Gaseous Radwaste Release Permit.

b. RESAMPLE Containment atmosphere.

c. GENERATE new Gaseous Radwaste Release Permit.

NOTE

Bistable identification number is located below bistable potentiometer.

5.6.4. IF any bistable trip lights are lit on SA036D or SA036E, PERFORM the following:

a. RECORD which bistable trip lights are lit in Control Room Log.

b. DEPRESS affected bistable trip lights to reset.

5.6.5. IF Control Room Vent Isolation or Containment Purge Isolation are actuated on SA066X, OBTAIN SM/CRS permission and PRESS applicable RESET:

- SA HS-9, CTRL BLD VENT TRN A ISO
- SA HS-11, CTMT PURGE TRN A ISO

5.6.6. IF Control Room Vent Isolation or Containment Purge Isolation are actuated on SA066Y, OBTAIN SM/CRS permission and PRESS applicable RESET:

- SA HS-13, CTRL BLD VENT TRN B ISO
- SA HS-15, CTMT PURGE TRN B ISO

5.6.7. IF CPIS or CRVIS lights are lit on ESFAS Status Panels, RESET using the following:

- SA HS-23, ESF PANEL SA-066X MODE SEL
- SA HS-24, ESF PANEL SA-066Y MODE SEL

5.6.8. ENSURE the following annunciators are CLEAR:

- 59D, CPIS
- 63A, CRVIS

5.6.9. REALIGN Control Building HVAC, as required, per OTN-GK-00001, Control Building HVAC System.

5.6.10. REINITIATE activity, as applicable:

- Mini-Purge per Section 5.2
- Shutdown Purge per Section 5.4
- Containment vent per OTN-GT-00001 ADD 1

-END OF SECTION-

5.7. Opening Equipment Hatch With Mini-Purge And Shutdown Purge Unavailable

NOTE

This ventilation lineup could cause noble gas to migrate from Containment to Auxiliary Building.

5.7.1. ENSURE the following: [Ref: 6.2.9]

- NO core alterations or movement of irradiated fuel assemblies within containment are in progress.
- IF cavity is drained AND highly contaminated, cavity cover is installed.

5.7.2. ENSURE GLD0338, OUTAGE DMPR TO HELP XENON CONC NORMALLY CLOSED, has been opened.

5.7.3. ALIGN one train of Fuel Building HVAC System in Emergency Operation Manual Alignment per OTN-GG-00001, Fuel Building HVAC System.

5.7.4. ENSURE containment pressure is approximately 0.0 in. H_20 as read on GT PDI-40, CTMT ΔP, or plant computer point GTD0040, CTMT-AUX BLD DIFF PRESS.

5.7.5. REQUEST Maintenance perform the following:

a. DEFEAT interlocks on DSM50 per PM0818565.

b. Slowly OPEN inner and outer doors to Containment Personnel Hatch.

5.7.6. Using GL HIS-1, AUX BLD SPLY AIR UNIT FAN, STOP SGL01.

5.7.7. WHEN a minimum of five (5) minutes has elapsed, NOTIFY Containment Coordinator to clear personnel from outside of Equipment Hatch.

NOTE

Airflow into Containment can be checked with a strip of lightweight material (paper, cloth) attached to the hatch.

5.7.8. REQUEST Containment Coordinator to check air flows into Containment as Equipment Hatch is opened.

5.7.9. REQUEST Maintenance open Equipment Hatch.

Step 5.7 Cont'd

5.7.10. IF airflow is into Containment, EXIT this section.

5.7.11. IF air flow is from Containment to outside atmosphere, PERFORM the following:

a. SHIFT running fan to FAST speed:

- GL HIS-30, FUEL/AUX BLD NORM EXH FAN A
- GL HIS-31, FUEL/AUX BLD NORM EXH FAN B

b. IF air flow from Containment to outside atmosphere persists, PERFORM one of the following:

- REQUEST Maintenance close Equipment Hatch.
- REQUEST RP install Equipment Hatch curtain.

-END OF SECTION-

5.8. Restoration Of Ventilation Lineup When Mini-Purge Or Shutdown Purge Becomes Available

> **NOTE**
>
> If air flow changes such that flow is from Containment to outside atmosphere while changing ventilation lineup, preparations should be made to close Equipment Hatch.

5.8.1. ENSURE GLD0338, OUTAGE DMPR TO HELP XENON CONC NORMALLY CLOSED, has been CLOSED.

5.8.2. PLACE Purge System in operation as applicable:

- Mini-Purge per Section 5.2
- Shutdown Purge per Section 5.4

5.8.3. ENSURE one of the following is RUNNING in SLOW speed:

- GL HIS-30, FUEL/AUX BLD NORM EXH FAN A
- GL HIS-31, FUEL/AUX BLD NORM EXH FAN B

5.8.4. Using GL HIS-1, AUX BLD SPLY AIR UNIT FAN, START SGL01.

5.8.5. RESTORE Aux/Fuel Building Ventilation System as directed by SM.

-END OF SECTION-

5.9. Opening The Containment Equipment Hatch With Shutdown Purge System In Service

5.9.1. WHEN the Equipment Hatch is approximately half way open, PERFORM the following:

a. Using GT HIS-7, CTMT S/D PURGE AIR SPLY CTMT ISO, CLOSE GTHZ0007.

b. Using GT HIS-6, CTMT S/D PURGE AIR SPLY CTMT ISO, CLOSE GTHZ0006.

c. Using GT HIS-1, CTMT S/D PURGE AIR SPLY UNIT, STOP SGT01.

d. Using GT HIS-26, CTMT PURGE SYS AIR SPLY DAMPER, CLOSE GTHZ0026.

e. Using GT HIS-27, CTMT PURGE SYS AIR SPLY DAMPER, CLOSE GTHZ0027.

-END OF SECTION-

5.10. Closing The Containment Equipment Hatch With Shutdown Purge System In Service

5.10.1. WHEN the Equipment Hatch is approximately half way closed, PERFORM the following:

a. Using GT HIS-26, CTMT PURGE SYS AIR SPLY DAMPER, OPEN GTHZ0026.

b. Using GT HIS-27, CTMT PURGE SYS AIR SPLY DAMPER, OPEN GTHZ0027.

CAUTION

SGT01, CTMT S/D PURGE AIR SPLY UNIT, should be running anytime CGT01, CTMT S/D PURGE EXH FAN, is running and Equipment Hatch is closed to prevent drawing excessive vacuum in Containment and creating a personnel hazard.

c. Using GT HIS-1, CTMT S/D PURGE AIR SPLY UNIT, START SGT01.

d. Using GT HIS-7, CTMT S/D PURGE AIR SPLY CTMT ISO, OPEN GTHZ0007.

e. Using GT HIS-6, CTMT S/D PURGE AIR SPLY CTMT ISO, OPEN GTHZ0006.

-END OF SECTION-

5.11. Opening The Containment Equipment Hatch With Mini Purge System In Service

5.11.1. WHEN the Equipment Hatch is approximately half way open, PERFORM the following:

a. Using GT HIS-5, CTMT MINI PURGE AIR SPLY CTMT ISO, CLOSE GTHZ0005.

b. Using GT HIS-4, CTMT MINI PURGE AIR SPLY CTMT ISO, CLOSE GTHZ0004.

c. Using GT HIS-23, CTMT MINI PURGE AIR SPLY UNIT, STOP SGT02.

d. Using GT HIS-26, CTMT PURGE SYS AIR SPLY DAMPER, CLOSE GTHZ0026.

e. Using GT HIS-27, CTMT PURGE SYS AIR SPLY DAMPER, CLOSE GTHZ0027.

f. CLOSE the following using GT HIS-41, CTMT MINI PURGE SPLY/EXH DAMPERS:

- GTHZ0041, CTMT MINI PURGE EXH INNER CTMT UPSTRM DMPR OPER
- GTHZ0042, CTMT MINI PURGE AIR SPLY INNER CTMT DNSTRM DMPR OPER

-END OF SECTION-

5.12. Closing The Containment Equipment Hatch With Mini Purge System In Service

5.12.1. WHEN the Equipment Hatch is approximately half way closed, PERFORM the following:

a. OPEN the following using GT HIS-41, CTMT MINI PURGE SPLY/EXH DAMPERS:

- GTHZ0041, CTMT MINI PURGE EXH INNER CTMT UPSTRM DMPR OPER
- GTHZ0042, CTMT MINI PURGE AIR SPLY INNER CTMT DNSTRM DMPR OPER

b. Using GT HIS-26, CTMT PURGE SYS AIR SPLY DAMPER, OPEN GTHZ0026.

c. Using GT HIS-27, CTMT PURGE SYS AIR SPLY DAMPER, OPEN GTHZ0027.

CAUTION

SGT02, CTMT MINI PURGE AIR SPLY UNIT, should be running anytime CGT02, CTMT MINI PURGE EXH FAN, is running and Equipment Hatch is closed to prevent drawing excessive vacuum in Containment and creating a personnel hazard.

d. Using GT HIS-23, CTMT MINI PURGE AIR SPLY UNIT, START SGT02.

e. Using GT HIS-5, CTMT MINI PURGE AIR SPLY CTMT ISO, OPEN GTHZ0005.

f. Using GT HIS-4, CTMT MINI PURGE AIR SPLY CTMT ISO, OPEN GTHZ0004.

-END OF SECTION-

6.0 REFERENCES

6.1. Implementing

6.1.1. T/S 3.6.4

6.1.2. T/S 3.6.5

6.1.3. T/S 3.6.3

6.1.4. T/S SR 3.6.3.1 bases

6.1.5. OTN-GA-00001, Plant Heating System

6.1.6. Checklist 0001, Control Room Switch And Damper Alignment

6.1.7. Checklist 0002, Local Valve And Switch Alignment

6.1.8. Checklist 0003, Electrical Alignment

6.1.9. OTN-GF-00001, Miscellaneous Building HVAC Systems

6.1.10. OTN-GK-00001, Control Building HVAC System

6.1.11. OTN-GT-00001 ADD 1, Adjusting Containment Pressure

6.1.12. OTN-GG-00001, Fuel Building HVAC System

6.1.13. PM0818565

6.2. Developmental

6.2.1. T/S 3.3.6

6.2.2. T/S 3.9.4

6.2.3. FSAR 16.11.2.4

6.2.4. COMN 1770

6.2.5. COMN 1534

6.2.6. COMN 2901

6.2.7. CARS 199700736

6.2.8. CARS 199700739

6.2.9. CARS 199903146

6.2.10. FSARCN 08-026

7.0 RECORDS

7.1. Checklist 0001, Control Room Switch And Damper Alignment

7.2. Checklist 0002, Local Valve And Switch Alignment

7.3. Checklist 0003, Electrical Alignment

8.0 SUMMARY OF CHANGES

Page(s)	Section or Step Number	Description
9-11 14-17	Sections 5.2 and 5.4	Rearranged steps in Sections 5.2 and 5.4 of the procedure to enhance efficiency. Replaced Job title of Rad/Chem Technician (Count Room) with Count Room Technician where applicable. Used Containment Gas Monitors GTRE0022, CTMT PURGE EXH GTRE0022 GAS DETECTOR and GTRE0033, CTMT PURGE EXH GTRE0033 GAS DETECTOR as instruments to monitor where applicable. Removed instruments or plant computer points previously monitored where applicable: SDRE0041, MANIPULATOR CRANE RAD MONITOR, or plant computer point SDR0041H, MANIP CRANE RAD MON and SDRE0042, CTMT BLDG RAD MONITOR, or plant computer point SDR0042H, CARS 201602177
28, 29	Sections 5.11 and 5.12	Added sections 5.11 and 5.12 to open and close the Containment Equipment Hatch with Mini Purge in service. CARS 201603025

CALLAWAY ENERGY CENTER
JOB PERFORMANCE MEASURE

P1

JPM No:	EOP-NLO-P-001	KSA No:	054 AA1.02
Revision Date:	04/03/2017	KSA Rating:	4.4/4.4
Job Title:	OT/URO/SRO		
Duty:	Auxiliary Feedwater		
Task Title:	Local TDAFP Start Assuming Loss of AC and DC Power		
Completion Time:	25 minutes		

The performance of this task was evaluated against the standards contained in this JPM and determined to be:

☐ SATISFACTORY ☐ UNSATISFACTORY

Reason, if UNSATISFACTORY:

____

____

Evaluator Signature: ______________________ Date: ______________

Task Performer: ______________________________

Location of Performance:
☐ Control Room ☐ Simulator/Lab ☒ Plant ☐ Classroom

Method of Performance: ☒ Simulated ☐ Performed

☐ Alternate Path ☐ Time Critical ☐ RCA

References: EC SUPP GUIDE Attachment R, Rev 21

Tools / Equipment: DC Strobotach (Simulate) and PPE
Flashlight

Initial Conditions: The Plant has entered into OTO-SK-00003, Extensive Damage Mitigation Guidelines (EDMGS), which has removed controls from the Control Room. Command and Control of the Plant is currently out of the TSC.

An Operations Technician is standing by in Area 5 to assist.

Initiating Cues: You have been instructed by the EC to perform EC Supplemental Guideline, Attachment R, Starting TDAFP on Loss of AC and DC Power.

Once the TDAFP is running contact the EC in the TSC and let him know that feedwater flow to the Steam Generators is available.

Simulator Set up and/or Note(s): Note: This JPM is written assuming the TDAFP is in its normal Standby lineup with the mechanical overspeed reset which is applicable for the cue in step #5.

Task Standard: Upon completion of this JPM, the operator will have located the strobotach, started the TDAFP and raised speed to 3850 RPM.

Start Time: ________________

Stop Time: ________________

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
1.	Obtain verified copy of EC SUPP GUIDE ATT R, Starting TDAFP On Loss of AC and DC Power.	Provide Operator with Procedure Copy	Candidate obtained procedure copy	**S** **U** Comments:
2.	CAUTION: Actions to locally Start the TDAFP must be completed within 50 minutes of a full power reactor trip to prevent SG dryout. Prior to Step R1.		Candidate place kept caution	**S** **U** Comments:
3.	NOTE: The Strobotach is used to monitor TDAFP rpm Prior to Step R1.		Candidate place kept note	**S** **U** Comments:
*4.	Obtain the following equipment: • DC Powered Strobotach from the TSC B.5.b. Packet • Portable Battery-Powered Flow Meters (Contact System Engineering) Step R1.	Note: Strobotach is available in the TSC Packet (Once located by OT, simulate retrieval) EC has contacted Engineering to install and setup the flow meter.	Candidate obtained strobotach from the TSC B.5.b. Packet. (Operator needs to locate packet and Strobotach in TSC)	**S** **U** Comments:
5.	Check TDAFP Mechanical Overspeed - RESET Step R2.	Cue: "The Mechanical Overspeed is how you see it". Note: This JPM is written assuming the TDAFP is in its normal Standby lineup with the mechanical overspeed reset	Candidate checked TDAFP Mechanical Overspeed is RESET	**S** **U** Comments:

*Critical Step

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
6.	CAUTION: Operation of the TDAFP without room cooling can lead to adverse environmental conditions (e.g.temperature and humidity). Prior to Step R3.		Candidate place kept caution	**S** **U** Comments:
7.	NOTE: • Closing the trip and throttle valve allows the trip hook to engage the latch-up hook • The minimum SG pressure required to ensure proper performance of the TDAFP is 110 psig. Prior to Step R3.		Candidate place kept notes	**S** **U** Comments:
*8.	Close AFP Turb Mech Trip/Throt Hv Using the Manual Handwheel • FCHV0312 Step R3.	When FCHV0312 is declutched and the candidate is rotating the handwheel in the clockwise direction: Stem is lowering Pause Handwheel will no longer rotate	Candidate demonstrated how to close FCHV0312 by: pushing down on the declutch lever then rotating handwheel in the clockwise direction	**S** **U** Comments:
9.	Check at least one of the Following - Open • ABHV0005, TDAFP Stm Sply From MS Loop 2 OR • ABHV0006, TDAFP Stm Sply From MS Loop 3 Step R4.	Operations Technician in Area 5 communicates that ABHV0005 indicates Open Note: Initial cue states that there is an OT in Area 5 standing by to assist.	Candidate verified Open ABHV0005 OR ABHV0006	**S** **U** Comments:

*Critical Step

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
10.	NOTE: TDAFP speed should be maintained less than or equal to 3850 RPM to prevent an overspeed trip. Prior to Step R5.		Candidate place kept notes.	**S** **U** Comments:
*11.	Slowly crack open, AFP Turb Mech Trip/Throt Hv, to start spinning AFW Pump Turbine. • FCHV0312 Step R5	Steam flow is heard FCHV0312 stem is slightly higher.	Candidate demonstrated slowly cracking open FCHV0312 by rotating handwheel in the counterclockwise direction.	**S** **U** Comments:
*12	Monitor TDAFP Speed Using Portable Strobotach Step R6	Strobotach indicates 1560 RPM	Candidate demonstrated using the strobotach to determine TDAFP speed.	**S** **U** Comments:
*13.	Slowly RAISE TDAFP To 3850 RPM Step R7	FCHV0312 is throttled in the open direction (counterclockwise) to bring speed to 3850 RPM	Candidate demonstrated slowly adjusting FCHV0312 (counterclockwise) to acquire TDAFP speed of 3850 RPM.	**S** **U** Comments:
14.	STABILIZE TDAFP Speed - AT3850 RPM Step R8	TDAFP speed is stable at 3850 RPM.	Candidate demonstrated slowly adjusting FCHV0312 to acquire TDAFP speed of 3850 RPM.	**S** **U** Comments:
15.	Notify the EC that the TDAFP is running and stable at 3850 RPM	EC acknowledges the TDAFP is at 3850 RPM and Stable.	Candidate contacted the EC.	**S** **U** Comments:
16.	The JPM is complete	This JPM is Complete. **Record Stop Time on Page 2**		**S** **U** Comments:

*Critical Step

P1

Initial Conditions: The Plant has entered into OTO-SK-00003, Extensive Damage Mitigation Guidelines (EDMGS), which has removed controls from the Control Room. Command and Control of the Plant is currently out of the TSC.

An Operations Technician is standing by in Area 5 to assist.

Initiating Cues: You have been instructed by the EC to perform EC Supplemental Guideline, Attachment R, Starting TDAFP on Loss of AC and DC Power.

Once the TDAFP is running contact the EC in the TSC and let him know that feedwater flow to the Steam Generators is available.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

ATTACHMENT R
(Page 1 of 4)
Starting TDAFP On Loss of AC and DC Power

CAUTION

Actions to locally Start the TDAFP must be completed within 50 minutes of a full power reactor trip to prevent SG dryout.

NOTE

The strobotach is used to monitor TDAFP rpm.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
R1.	**OBTAIN The Following Equipment:** • DC Powered Strobotach From The TSC B.5.b Packet (located in top drawer of TSC cabinet) • Portable Battery-Powered Flow Meters (Contact System Engineering)	IF DC Strobotach is not available, THEN PERFORM The Following: a. OBTAIN Necessary Equipment: • AC Powered Strobotach • Portable Generator • Extension Cord(s) b. POSITION Generator in a well ventilated area to minimize the exhaust fumes to the operator. c. START Portable Generator.
R2.	**CHECK TDAFP Mechanical Overspeed - RESET**	RESET the TDAFP Mechanical Overspeed Trip Lever: • Refer To OTN-AL-00001, Addendum 01, Turbine-driven Auxiliary Feedwater Pump Trip/Throttle Valve Trip Check And Reset, as necessary. (Located in OOA holder outside TDAFP Room)

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

ATTACHMENT R
(Page 2 of 4)
Starting TDAFP On Loss of AC and DC Power

CAUTION

Operation of the TDAFP without room cooling can lead to adverse environmental conditions (e.g.temperature and humidity).

NOTES

- Closing the trip and throttle valve allows the trip hook to engage the latch-up hook.
- The minimum SG Pressure required to ensure proper performance of the TDAFP is 110 psig.

R3. CLOSE AFP Turb Mech Trip/Throt Hv Using The Manual Handwheel:

- FCHV0312

R4. CHECK At Least One Of The Following - OPEN

- ABHV0005, TDAFP Stm Sply From MS Loop 2

  OR

- ABHV0006, TDAFP Stm Sply From MS Loop 3

RESPONSE NOT OBTAINED: OPEN at least one TDAFP Stm Sply From MS Loop valves.

NOTE

TDAFP speed should be maintained less than or equal to 3850 rpm to prevent an overspeed trip.

R5. Slowly Crack OPEN, AFP Turb Mech Trip/Throt Hv, To Start Spinning AFW Pump Turbine:

- FCHV0312

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

ATTACHMENT R
(Page 3 of 4)
Starting TDAFP On Loss of AC and DC Power

R6. MONITOR TDAFP Speed Using Portable Strobotach

R7. Slowly RAISE TDAFP To 3850 RPM

R8. STABILIZE TDAFP Speed - AT 3850 RPM

CAUTION

Control of SG makeup rate is very important. SG overfill can damage steamline piping or trip the TDAFP. Underfilling the SGs can lead to RCS heatup and eventual core damage.

NOTE

Attachment RR, Insights For Operating Steam Generators to Minimize RCS Inventory Loss, provides additional guidance for feeding SGs with a loss of AC and DC power.

Step	Action/Expected Response	Response Not Obtained
R9.	**CHECK Steam Generator Level Indication - AVAILABLE**	INSTALL Local SG Level Monitoring using Attachment U, Local Monitoring Steam Generator Wide Range Levels.
R10.	**MAINTAIN Available Steam Generator Levels 45% to 55% NR (87.9% to 90.5% WR) Using The Following:** • AL HV-8 (SG A) • AL HV-10 (SG B) • AL HV-12 (SG C) • AL HV-6 (SG D)	Locally OPERATE valves as directed by the Control Room/TSC.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

ATTACHMENT R
(Page 4 of 4)
Starting TDAFP On Loss of AC and DC Power

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
R11.	**CHECK Auxiliary Feedwater Flowrate Indication - AVAILABLE**	PERFORM One of the Following: • INSTALL Local Flowrate Monitoring using Attachment UU, Local Monitoring Auxiliary Feedwater Flow Rates • INSTALL Portable Flow Meters on Selected SG Supply Line(s)
R12.	**DETERMINE SG Level Changes Using Information From:** • Local Auxiliary Feedwater flow rate monitoring reading(s) • Portable Flow Meter flow rates • Tank Data Book • Drawings M-1183-00005 and M-1183-00006	

NOTE

CST volume information can be used to determine the amount of water added to the SGs as well as to determine if CST makeup is necessary.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
R13.	**MONITOR CST Level:** a. INSTALL a pressure gauge on an APLT0004 Spare Tap (CST Valve Room, Lower Level) b. Determine CST level using the Tank Data Book	

-END-

CALLAWAY ENERGY CENTER
JOB PERFORMANCE MEASURE

P2

JPM No:	EOP-NLO-P-003(A)	KSA No:	055EA2.03
Revision Date:	05/22/2017	KSA Rating:	3.9/4.7
Job Title:	OT/URO/SRO		
Duty:	Respond to loss of all AC		
Task Title:	Manually load equipment on to an AC Bus		
Completion Time:	12 minutes		

The performance of this task was evaluated against the standards contained in this JPM and determined to be:

☐ SATISFACTORY ☐ UNSATISFACTORY

Reason, if UNSATISFACTORY:

____

____

Evaluator Signature: ______________________ Date: ______________

Task Performer: ______________________________

Location of Performance:

☐ Control Room ☐ Simulator/Lab ☒ Plant ☐ Classroom

Method of Performance: ☒ Simulated ☐ Performed

☒ Alternate Path ☐ Time Critical ☐ RCA

References: ECA-0.0, Loss of all AC Power, Rev 25
OTN-ZZ-00480, Racking Operation of 480 VAC Breakers, Rev 5

Tools / Equipment: PPE

CALLAWAY ENERGY CENTER
JOB PERFORMANCE MEASURE

Initial Conditions: The Plant has experienced a loss of all AC power.

Emergency diesel generator NE01 is restored and emergency bus NB01 is energized.

Initiating Cues: CRS directs you to perform Step 29 of ECA-0.0 for NB01.

Notify the CRS when complete.

Simulator Set up and/or Note(s): Step 29 is a bulleted list which may be performed in any order. JPM guide is written for listed order.

Task Standard: Upon completion of this JPM the following equipment will be loaded on NB01 bus:

- 480V bus NG03
- Battery charger NK 23

Start Time: ________________

Stop Time: ________________

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
1.	Obtain a copy of ECA-0.0, Loss of all AC Power	Cue: After Candidate locates a copy, provide procedure.	Candidate located a procedure copy	**S** **U** Comments:
2.	Loads placed on the energized AC emergency bus should not exceed the capacity of the power source. CAUTION before step 29		Candidate place kept Caution.	**S** **U** Comments:
3.	Check following equipment loaded on energized AC emergency buses: • NB01: • 480 Volt Buses: • NG01 breaker NB0113 Step 29 and first bullet	Using a pointer: Cue: NB0113 red light "LIT", green light "EXTINGUISHED"	Candidate observed breaker light indication on NB0113	**S** **U** Comments
4.	Check following equipment loaded on energized AC emergency buses: • NB01: • 480 Volt Buses: • NG01 breaker NG0101 Step 29 and first bullet	Using a pointer: Cue: NG0101 Breaker Flag in window "CLOSED"	Candidate observed breaker flag indication on NG0101	**S** **U** Comments
5.	Check following equipment loaded on energized AC emergency buses: • NB01: • 480 Volt Buses: • NG03 breaker NB0110 Step 29 and first bullet	Using a pointer: Cue: NB0110 red light "LIT", green light "EXTINGUISHED"	Candidate observed breaker light indication on NB0110	**S** **U** Comments

*Critical Step

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE

*6.	Check following equipment loaded on energized AC emergency buses:
	• NB01:
	  • 480 Volt Buses:
	  • NG03 breaker NG0301
	RNO: Manually or locally LOAD equipment as necessary
	Step 29 and first bullet
		Using a pointer:
		Cue: NG0301 Breaker Flag in window "OPEN"
		Cue: NG0301Breaker Flag in window "CHARGED OK"
		Cue: "Sound of spring discharge is heard, window flag displays CLOSED."
			Candidate observed breaker flag indication on NG0301
			*Candidate at upper door frame on NG0301 depressed red circle CLOSE pushbutton
			OR
			*Candidate removed retaining screw on plexiglass cover on NG0301 breaker face and then depressed CLOSE pushbutton
				S **U**
				Comments
				NOTE: Starts Alternate Path
				NOTE: There are two buttons to close a Square D 480 Volt Load Center breaker, using either switch is acceptable.

7.	Check following equipment loaded on energized AC emergency buses:
	• NB01:
	  • Battery Chargers:
	    • NK21 breaker NG0103
	Step 29 second bullet
		Using a pointer:
		Cue: NG0103 Breaker Flag in window is "CLOSED"
			Candidate observed breaker flag indication on NG0103	**S** **U**
				Comments

*8.	Check following equipment loaded on energized AC emergenc
	• NB01:
	  • Battery Chargers:
	    • NK23 breaker NG0303
	Step 29 second bullet
		Using a pointer:
		Cue: NG0303 Breaker Flag in window is "OPEN"
		Cue: NG0303 Breaker Flag in window is "CHARGED OK"
		Cue: "Sound of spring discharge is heard, window flag displays CLOSED."
			Candidate observed breaker flag indication on NG0303
			*Candidate depressed red circle CLOSE pushbutton at upper door frame on NG0303
			OR
			*Candidate removed retaining screw on plexiglass cover on breaker face and then depressed CLOSE pushbutton on NG0303
				S **U**
				Comments
				NOTE: There are two buttons to close a Square D 480 Volt Load Center breaker, using either switch is acceptable.

*Critical Step

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE

9.	Check following equipment loaded on energized AC emergency buses:
	• NB01:
	  • Instrumentation and controls
	    • NN01
	Step 29 third bullet
		If Candidate proceeds to NN11 to verify NN01 loaded;
		Using a pointer on P201 light on NN01:
		Cue: "amber light is LIT"
		Using pointer for meters:
		• 120 on AC OUTPUT meter:
		• 125 DC INPUT meter:
		• 60 Frequency meter:
		Cue: "Meter is here."
			Candidate observed load light P201 on NN01
			
			Candidate observed meter indication on NN01
				S **U**
				
				Comments

10.	Check following equipment loaded on energized AC emergency buses:
	• NB01:
	  • Instrumentation and controls
	    • NN03
	Step 29 third bullet
		If Candidate proceeds to NN13 to verify NN03 loaded;
		Using a pointer on P201 light on NN03:
		Cue: "amber light is LIT"
		Using pointer for meters:
		• 120 on AC OUTPUT meter:
		• 125 DC INPUT meter:
		• 60 Frequency meter:
		Cue: "Meter is here."
			Candidate observed load light P201 on NN03
			
			Candidate observed meter indication on NN03
				S **U**
				
				Comments

11.	Check following equipment loaded on energized AC emergency buses:
	  • Control room emergency lighting:
	    • Breaker NK51-20
	Step 29 fourth bullet
		Using a pointer to ON:
		Cue: "Handle is here"
			Candidate observed breaker position.	**S** **U**
				
				Comments

12.	The JPM is complete	This JPM is Complete. **Record Stop Time on Page 2**		**S** **U** Comments:

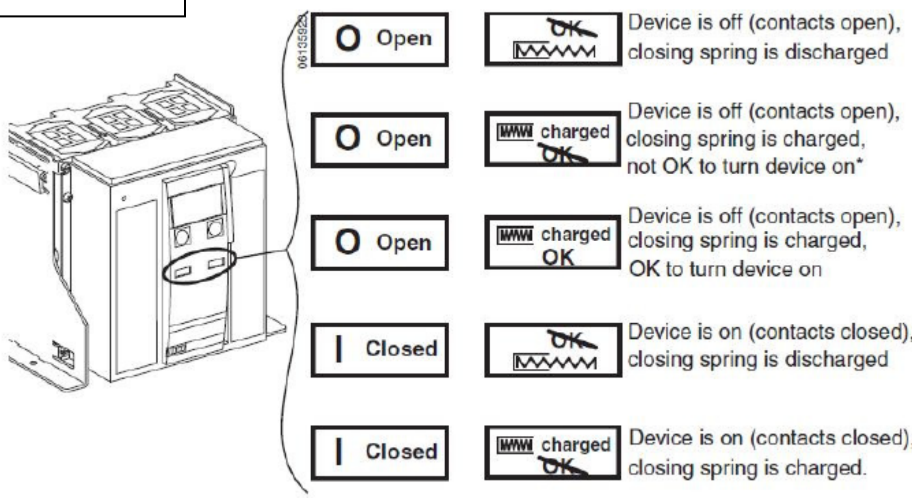
*Critical Step

Attachment 1

800 AMP Square D Breaker and Closing Spring Status

Sheet 1 of 1

NG0303



*not OK to turn on will be shown if:

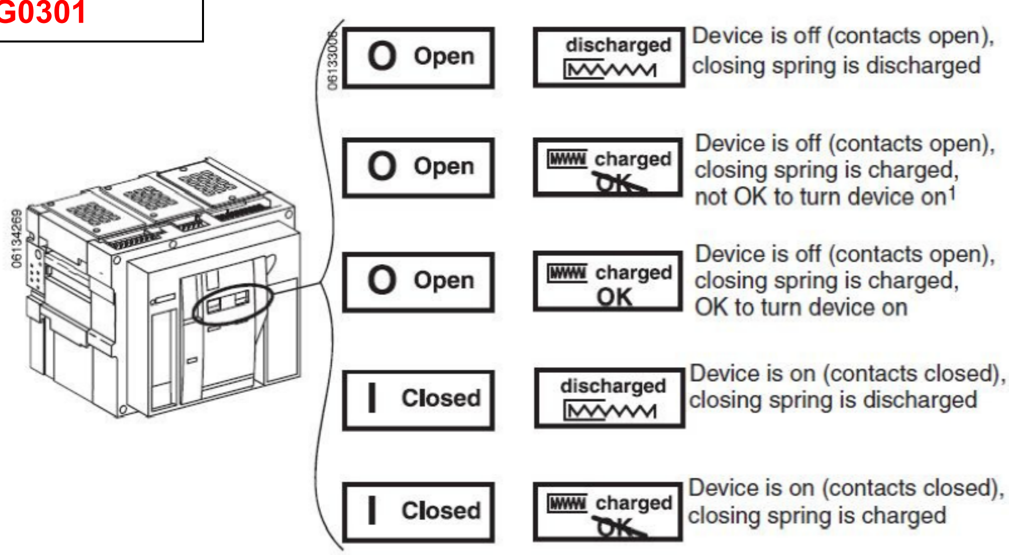
Shunt trip is energized
Circuit breaker is not in connected, test, disconnected or withdrawn position
Undervoltage trip is not energized
Mechanical interlock is locking mechanism in the open position

Attachment 2

1600 AMP Square D Breaker and Closing Spring Status

Sheet 1 of 1

NG0301



[1] not OK to turn on will be shown if:
Shunt trip is energized
Circuit breaker is not connected, test, disconnected or withdrawn position
Undervoltage trip is not energized
Mechanical interlock is locking mechanism in the open position

P2

Initial Conditions:	The Plant has experienced a loss of all AC power. Emergency diesel generator NE01 is restored and emergency bus NB01 is energized.
Initiating Cues:	CRS directs you to perform Step 29 of ECA-0.0 for NB01. Notify the CRS when complete.

ECA-0.0

LOSS OF ALL AC POWER

Revision 025

CONTINUOUS USE

A. PURPOSE

This procedure provides actions to respond to a loss of all AC power.

Major Action Categories:

- Check Plant Conditions.
- Restore AC Power.
- Maintain Plant Conditions for Optimal Recovery.
- Evaluate Energized AC Emergency Bus.
- Select Recovery Procedure After AC Power Restoration.

B. SYMPTOMS OR ENTRY CONDITIONS

1) The symptom of a loss of all AC power is the indication that all emergency AC buses are deenergized.

2) This procedure is entered from either E-0, Reactor Trip Or Safety Injection, Step 3, on the indication that all AC emergency buses are deenergized, OR directly when it is identified that all AC buses are deenergized.

C. CONDITIONS FOR [ADVERSE CONTAINMENT]

- Containment Radiation - HAS BEEN GREATER THAN 10^5 R/HR

  OR

- Containment Pressure - GREATER THAN 3.5 PSIG

FOLDOUT PAGE FOR ECA-0.0

1. **RCS TEMPERATURE CONTROL CRITERIA**
   IF a Loss of Off-Site Power has Occurred, THEN CLOSE MSIVs.
   IF no RCPs are Running AND Off-Site Power is Available, THEN Select STM PRESS Mode on the Steam Dumps

2. **ALTERNATE LOW PRESSURE FEEDWATER**
   IF TDAFW flow is lost and is NOT immediately recoverable after step 5 has been performed, THEN perform Attachment A of this procedure.

3. **ALTERNATE HCST MAKEUP**
   IF AFW Suction pressure is LESS THAN 3.25 PSIG, and the conditions listed below are met, THEN perform FSG-6, ALTERNATE HCST MAKEUP:
   a. ELAP is in progress
   AND
   b. HCST is available
   AND
   c. Step 4 has been performed

4. **LOSS OF VITAL INSTRUMENTATION OR CONTROL POWER**
   IF ELAP is in progress and EITHER condition below occurs, THEN perform FSG-7, LOSS OF VITAL INSTRUMENTATION OR CONTROL POWER:
   a. ALL DC bus voltages are LESS THAN 105 VDC
   OR
   b. Required vital instruments CAN NOT be maintained energized:

RCS Thot & Tcold	CETs
RCS Wide Range Pressure	RVLIS
PZR Level	
SG Pressures	SG Narrow Range Level
SG Wide Range Level	
AFW Flow	AFW Suction Pressure
Wide Range Containment Pressure	
DC Bus Voltage	
SFP Level	

5. **LOW DECAY HEAT TEMPERATURE CONTROL**
   IF SG pressure CAN NOT be maintained at or above the target pressure in EITHER condition below, THEN perform FSG-9, LOW DECAY HEAT TEMPERATURE CONTROL:
   a. SG pressure 290 PSIG, with accumulators NOT isolated/vented.
   OR
   b. SG pressure higher than 150 PSIG, with accumulators isolated/vented.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

CAUTION

The loads placed on the energized AC emergency bus should NOT exceed the capacity of the power source.

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
29.	**CHECK Following Equipment Loaded On Energized AC Emergency Bus(es):**	Manually or locally LOAD equipment as necessary.

- NB01:
  - 480 Volt Buses:
    - NG01 breakers NB0113 and NG0101
    - NG03 breakers NB0110 and NG0301
  - Battery Chargers:
    - NK21 breaker NG0103
    - NK23 breaker NG0303
  - Instrumentation and Control:
    - NN01
    - NN03
  - Control Room Emergency Lighting:
    - Breaker NK51-20
- NB02:
  - 480 Volt Buses:
    - NG02 breakers NB0213 and NG0201
    - NG04 breakers NB0210 and NG0401
  - Battery Chargers:
    - NK24 breaker NG0203
    - NK22 breaker NG0403
  - Instrumentation and Control:
    - NN02
    - NN04
  - Communications:
    - QF076 Emergency Supply Breaker PN0803

CALLAWAY ENERGY CENTER
JOB PERFORMANCE MEASURE

P3

JPM No:	EG-NLO-R-001	KSA No:	008A2.02
Revision Date:	04/04/2017	KSA Rating:	3.2 / 3.5
Job Title:	URO/SRO		
Duty:	Respond to Off-Normal Conditions		
Task Title:	Local Bypass and Isolation of CCW to the Seal Water HX		
Completion Time:	10 minutes		

The performance of this task was evaluated against the standards contained in this JPM and determined to be:

☐ SATISFACTORY ☐ UNSATISFACTORY

Reason, if UNSATISFACTORY:

____

____

Evaluator Signature: __________________________ Date: __________________

Task Performer: ____

Location of Performance:

☐ Control Room ☐ Simulator/Lab ☒ Plant ☐ Classroom

Method of Performance: ☒ Simulated ☐ Performed

☐ Alternate Path ☐ Time Critical ☒ RCA

References: OTO-EG-00001, CCW SYSTEM MALFUNCTION Rev 14

Tools / Equipment: PPE

CALLAWAY ENERGY CENTER
JOB PERFORMANCE MEASURE

Initial Conditions: The Plant is in Mode 1.

Operators are performing OTO-EG-00001, CCW System Malfunction, to isolate a CCW leak

The Control Room Supervisor has determined there is a leak in the Seal Water Heat Exchanger.

Initiating Cues: CRS directs you to locally isolate the Seal Water Heat Exchanger using Step B10 of Attachment B of OTO-EG-00001, CCW System Malfunction, inform the CRS when you are complete

Simulator Set up and/or Note(s): None

Task Standard: Upon completion of this JPM, The operator will successfully isolate Seal Water Heat Exchanger.

Start Time: ________________

Stop Time: ________________

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
1.	Obtain a verified working copy of Attachment B of OTO-EG-00001, CCW System Malfunction	Provide operator with procedure copy	Candidate obtained procedure copy	**S** **U** Comments:
*2.	OPEN BG8400, CVCS Seal Water HX Bypass Valve Step B10.a.1)	After candidate demonstrates how to open valve BG8400 handwheel stops turning.	Candidate removed the lock and manually opened valve BG8400 by rotating handwheel counterclockwise.	**S** **U** Comments:
*3.	CLOSE BG-8398A, CVCS Seal Water HX Inlet Isolation Step B10.a.2)	After candidate demonstrates how to close valve BG-8398A handwheel stops turning.	Candidate removed the lock and manually closed valve BG-8398A by rotating handwheel clockwise.	**S** **U** Comments:
*4.	CLOSE BG-8398B, CVCS Seal Water HX Outlet Isolation Step B10.a.3)	After candidate demonstrates how to close valve BG-8398B handwheel stops turning.	Candidate removed the lock and manually closed valve BG-8398B by rotating handwheel clockwise.	**S** **U** Comments:
*5.	CLOSE BGV0206, CVCS Seal Water HX Outlet CCW Return Isolation Step B10.a.4)	BGV0206 stem is up and threads showing After candidate demonstrates how to close valve BGV0206 stem is down and no threads showing	Candidate removed the lock and manually closed valve BGV0206 by rotating handwheel clockwise.	**S** **U** Comments:

*Critical Step

JPM STEP	TASK ELEMENT	EXAMINER CUE	PERFORMANCE STANDARD	SCORE
*6.	CLOSE EGV0085, Seal Water HX CCW Inlet Isolation Step B10.a.5)	EGV0085 stem is up and threads showing After candidate demonstrates how to close valve EGV0085 stem is down and no threads showing	Candidate removed the lock and manually closed valve EGV0085 by rotating handwheel clockwise.	**S** **U** Comments:
7.	Inform the CRS when complete	The JPM is Complete **Record Stop Time on Page 2**	Informed the CRS task is complete	**S** **U** Comments:

*Critical Step

Initial Conditions: The Plant is in Mode 1.

Operators are performing OTO-EG-00001, CCW System Malfunction, to isolate a CCW leak

The Control Room Supervisor has determined there is a leak in the Seal Water Heat Exchanger.

Initiating Cues: CRS directs you to locally isolate the Seal Water Heat Exchanger using Step B10 of Attachment B of OTO-EG-00001, CCW System Malfunction, inform the CRS when you are complete

Ameren MISSOURI | Callaway Energy Center

OTO-EG-00001

CCW SYSTEM MALFUNCTION

Revision 014

CONTINUOUS USE

A. PURPOSE

This procedure provides instructions for a leak or loss of flow in the Component Cooling Water (CCW) system.

B. SYMPTOMS OR ENTRY CONDITIONS

1) CCW Leak Symptoms:

   a. Lowering CCW Surge Tank Level.

   b. Lowering CCW flow.

   c. Rising temperatures on components supplied by CCW.

   d. Any of the following Control Room annunciators in alarm:

   - Annunciator 51D, CCW Srg Tk A Lev HiLo
   - Annunciator 52F, CCW To Aux Comp Flow Hi
   - Annunciator 53D, CCW Srg Tk B Lev HiLo

2) CCW Pump/Flowpath Problem Symptoms:

   a. Rising temperatures on components supplied by CCW.

   b. Any of the following Control Room annunciators in alarm:

   - Annunciator 51B, CCW Pmp A/C Trouble
   - Annunciator 51C(53C,52C,54C), CCW Pmp A(B,C,D) Flow Lo
   - Annunciator 52B, CCW Pmp A/C Press Lo
   - Annunciator 53B, CCW Pmp B/D Trouble
   - Annunciator 53F, CCW To Aux Comp Flow Lo
   - Annunciator 54B, CCW Pmp B/D Press Lo
   - Annunciator 54F, Seal Hx Flow HiLo

C. REFERENCES

1) Implementing:

   a. ODP-ZZ-00001 Addendum 13, Shift Manager Communications

   b. OTN-EG-00001, Component Cooling Water System

2) Developmental:

   a. M-22EG01, P&ID Component Cooling Water System

   b. M-22EG02, P&ID Component Cooling Water System

   c. M-22EG03, P&ID Component Cooling Water System

   d. CARS 200301950, EGHV0061 Failed OSP-EG-V002A

   e. RFR 016805D, Clarify Results Of Several EGHV0132 Evaluations

   f. RFR 016805E, Change To Administrative Controls For EGHV0132

   g. CAR 201007678, Technical Specification (T/S) Bases 3.6.3 are being met

   h. MP 10-0009 New RCP Seals

   i. Westinghouse DW 09-010 RCP Seals

STEP	ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED

ATTACHMENT B
(Page 5 of 7)
CCW Train B Leak

B10. BYPASS And ISOLATE CCW To The Seal Water Heat Exchanger:

a. DISPATCH EO to perform the following:

1) OPEN BG8400, CVCS Seal Water HX Bypass Valve

2) CLOSE BG-8398A, CVCS Seal Water HX Inlet Isolation

3) CLOSE BG-8398B, CVCS Seal Water HX Outlet Upstream Isolation

4) CLOSE BGV0206, CVCS Seal Water HX Outlet CCW Return Isolation

5) CLOSE EGV0085, Seal Water HX CCW Inlet Isolation

6) Do NOT Proceed Until Seal Water Heat Exchanger is isolated

b. CHECK For Indications That Leak - STILL PRESENT

RESPONSE NOT OBTAINED: b. Go To Step 13 of the procedure.

c. RESTORE Lineup For CCW To The Seal Water Heat Exchanger

B11. ISOLATE The CCW Service Loop By Closing The CCW Train Supply/Return Valves:

- EG HS-15
- EG HS-16

Facility: Callaway Scenario No.:1 , Rev 1 Op-Test No.: 2017-1

Examiners: ______________________ Operators: ______________________

Initial Conditions: 100%

Turnover: No equipment out of service.

Event No.	Malf. No.	Event Type*	Event Description
1	PBG04	SRO (C) RO (C)	Trip of the Normal Charging Pump. OTO-BG-00001, Pressurizer Level Control Malfunction
2	PAD01A	SRO (C) RO (C) BOP (C)	Condensate Pump 'A' Trips. OTO-AE-00001, Feedwater System Malfunction
3	SEN0043	SRO (I) RO (I) BOP (I)	Power Range Channel N43 fails high. OTO-SF-00001, Rod Control Malfunctions OTO-SE-00001, Nuclear Instrument Malfunction (Tech Spec 3.3.1)
4	EBB01D	SRO (R) RO (R) BOP (R)	Tube Leak in Steam Generator 'D' OTO-BB-00001, Steam Generator Tube Leak (Tech Spec 3.4.13 and 3.4.17)
5	EBB01D	SRO (M) RO (M) BOP (M)	Tube Rupture in Steam Generator 'D' E-3, Steam Generator Tube Rupture
6	PEM01A_2	RO (C)	Safety Injection Pump 'A' fails to start. E-0, Reactor Trip or Safety Injection, Attachment A, Automatic Action Verification

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

Target Quantitative Attributes (Per Scenario; See Section D.5.d)	Actual Attributes
1. Total malfunctions (5-8)	6
2. Malfunctions after EOP entry (1-2)	1
3. Abnormal events (2-4)	4
4. Major transients (1-2)	1
5. EOPs entered/requiring substantive actions (1-2)	1
6. EOP contingencies requiring substantive actions (0-2)	0
7. Critical tasks (2-3)	2

Scenario #1 Event Description
Callaway 2017-1 NRC ES-D-1, rev. 1

The plant is stable at 100% with no equipment out of service.

Event 1: After the reactivity brief is complete the Normal Charging Pump trips. The RO should perform the Immediate Actions of OTO-BG-00001, Pressurizer Level Control Malfunction, to start a CCP.

Event 2: After immediate action verification is complete, Condensate Pump 'A' Trips. The crew should respond per OTO-AE-00001, Feedwater System Malfunction, by reducing power to less than 97% per Attachment A, Load Reduction.

Event 3: Once power is stabilized, Power Range Nuclear Instrument Channel N43 fails high causing an automatic rod insertion. The crew should respond to the rod insertion by performing the immediate actions of OTO-SF-00001, Rod Control Malfunctions. Following verification of immediate actions the crew will enter OTO-SE-00001, Nuclear Instrument Malfunction, to bypass channel N43 and restore control rods to desired position. Tech Spec 3.3.1 applies.

Event 4: Once the crew has initiated restoration of control rod positions, a 20 gpm tube leak develops in Steam Generator 'D'. The crew should enter OTO-BB-00001, Steam Generator Tube Leak, and quantify the leak to be greater than 150 gpd. The crew should initiate a load reduction to below 50% within 1 hour using OTO-MA-00008, Rapid Load Reduction. Tech Spec 3.4.13 and 3.4.17 apply.

Events 5 & 6: Once the crew has reduced power below 90%, the tube leak becomes a rupture. The crew will trip the reactor and actuate safety injection and enter E-0, Reactor Trip or Safety Injection.

Safety Injection pump 'A' fails to start on the LOCA sequencer. The crew should start the pump per E-0 Attachment A, Automatic Action Verification. The crew should also monitor Steam Generator 'D' Level and isolate AFW flow to the ruptured Steam Generator when level rises above 7% NR per the Foldout Page Actions of E-0.

The crew should transition to E-3, Steam Generator Tube Rupture, and isolate the ruptured SG. Once SG 'D' is isolated, the crew should initiate a cooldown at maximum rate to below the target temperature for maintaining RCS subcooling following RCS depressurization and SI termination.

The scenario is complete when the crew has completed the RCS cooldown.

Scenario #1 Event Description
Callaway 2017-1 NRC ES-D-1, rev. 1

Critical Tasks:

Critical Tasks	CT #1 - Isolate feedwater flow into and steam flow from the ruptured SG before a transition to ECA-3.1 occurs.	CT #2 - Establish/maintain an RCS temperature so that transition from E-3 does not occur because the RCS temperature is in either of the following conditions: • Too high to maintain minimum required subcooling (30°F) OR • Below the RCS temperature that causes an extreme (RED path) or a severe (ORANGE path) challenge to the subcriticality and/or the integrity CSF
EVENT	5	5
Safety significance	Isolating the ruptured SG maintains a differential pressure between the ruptured SG and the intact SGs. The differential pressure (250 psi) ensures that minimum RCS subcooling remains after RCS depressurization.	Failure to establish and maintain the correct RCS temperature during a SGTR leads to a transition from E-3 to a contingency ERG. This failure constitutes an incorrect performance that "necessitates the crew taking compensating action that would complicate the event mitigation strategy...."
Cueing	All of the following: • Indication and/or annunciation of SGTR in one SG o Increasing SG water level o Radiation • Indication and/or annunciation of reactor trip • Indication and/or annunciation of SI	All of the following: • Indication and/or annunciation of SGTR in one SG o Increasing SG water level o Radiation • Indication and/or annunciation of reactor trip • Indication and/or annunciation of SI • Indication of ruptured SG pressure greater than minimum required pressure
Performance indicator	Manipulation of controls as required to isolate the ruptured SG • Close Steam line low point drain valve from ruptured SG o AB HIS-10 (SG D) • Close MSIV and MSIV bypass valve from ruptured SG o AB HIS-11 (SG D) • Stop feed flow to ruptured SG o CLOSE AL HK-5A and AL HK-6A	Manipulation of controls as required to establish and maintain RCS temperature • Steam dump valve position lamps and/or indicators indicate closed • SG PORV valve position lamps and/or indicators indicate closed
Performance feedback	Crew will observe the following: • Indication of stable or increasing pressure in the ruptured SG • Indication of decreasing or zero feedwater flow rate in the ruptured SG	Indication of steam flow rate greater than zero • Indication of RCS temperature decreasing OR • Indication of RCS temperature less than target value
Justification for the chosen performance limit	When the crew cannot maintain the 250 psi differential, the ERGs require a transition to contingency ERG ECA-3.1. This transition unnecessarily delays the sequence of actions leading to RCS depressurization and SI termination.	Terminating the RCS cooldown before reaching the target temperature prevents achieving the minimum RCS subcooling. Failure to achieve the required RCS subcooling results in a condition that forces the crew to transition to contingency ERG ECA-3.1, thereby delaying the RCS depressurization and SI termination. Such a delay allows the excessive inventory increase of the ruptured SG to continue until the SG overpressure components release water or until SG overfill occurs. Terminating the cooldown too late challenges either the subcriticality CSF or the integrity CSF. Because the crew is directed to cool down at the maximum rate, late termination of cooldown could force the RCS temperature low enough to challenge the integrity CSF. The crew must then transition to one of the integrity FRGs. The transition also delays RCS depressurization and SI termination.
PWR Owners Group Appendix	CT-18, Isolate the Ruptured SG	CT-19, Control initial RCS cooldown

Scenario Procedure References
Callaway 2017-1 NRC Scenario #1, rev. 1

References
OTO-BG-00001, Pressurizer Level Control Malfunction
OTO-AE-00001, Feedwater System Malfunction
OTO-SF-00001, Rod Control Malfunction
OTO-SE-00001, Nuclear Instrument Malfunction
OTO-BB-00001, Steam Generator Tube Leak
OTO-MA-00008, Rapid Load Reduction
E-0, Reactor Trip or Safety Injection
E-3, Steam Generator Tube Rupture
Tech Spec 3.3.1
Tech Spec 3.4.13
Tech Spec 3.4.17
ODP-ZZ-00025, EOP/OTO User's Guide

PRA Systems, Events or Operator Actions

1. SG Tube Rupture

Scenario Setup Guide
Callaway 2017-1 NRC Scenario #1, rev. 1

Scenario #1 Setup Guide:

Establish the initial conditions of IC-166 on load 1603, MOL 100% power:

- RCS boron concentration 962 ppm
- Rod Control Bank D 215 steps, Other banks 228 steps

=============SCENARIO PRELOADS / SETUP ITEMS================

Safety Injection Pump 'A' fails to start

- Insert Malfunction (EM) PEM01A_2, Value = 1

============= EVENT 1 ===================================

Trip of the Normal Charging Pump

- Insert Malfunction (BG) PBG04, Value = Trip

============= EVENT 2 ===================================

Condensate Pump 'A' Trips

- Insert Malfunction (AD) PAD01A, Value = Trip

=============EVENT 3 ===================================

Power Range Channel N43 fails high

- Insert Malfunction (SE) SEN0043, Value = 200

=============EVENT 4 ===================================

Tube Leak in Steam Generator 'D'

- Insert Malfunction (BB) EBB01D, Value = 20

=============EVENT 5 ===================================

Tube Rupture in Steam Generator 'D'

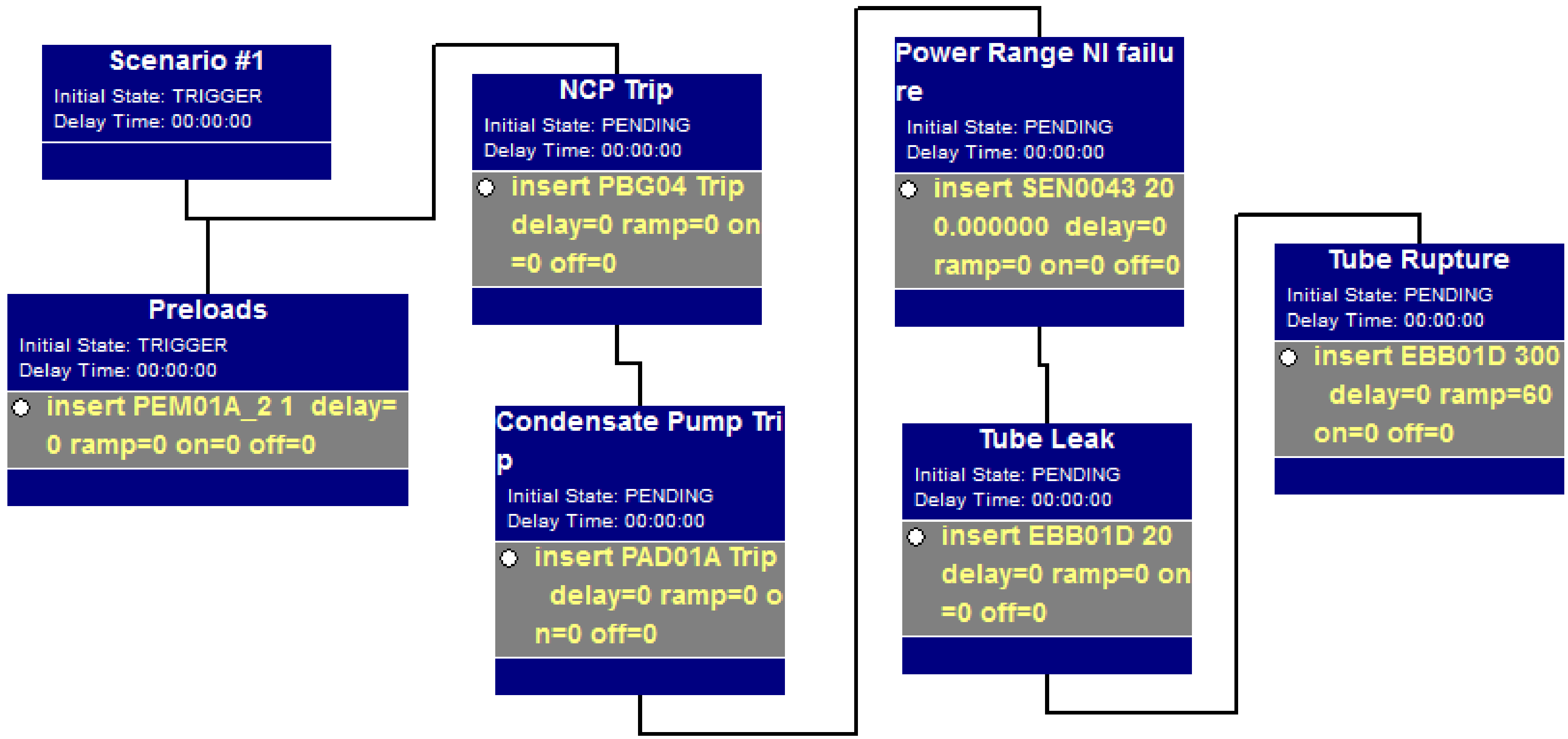
- Insert Malfunction (BB) EBB01D, Value = 300, Ramp = 60 sec

=============EVENT 6===================================

Safety Injection Pump 'A'' fails to start

- See PRELOADS

Scenario#1 Simulator Lesson Plan
Callaway 2017-1 NRC Scenario #1, rev. 1



Op Test No.: 2017-1	Scenario # 1 rev.1	Event # 1	Page 7 of 36
Event Description:	Trip of the Normal Charging Pump		

Proc /Time	Position	Applicant's Actions or Behavior

Booth Operator:

- Establish SBT Data Recording
- TRIGGER step NCP Trip
- Respond as Primary OT if contacted to investigate pump trip.
  - After 5 minutes, report nothing abnormal at the NCP and B CCP is running normal
- Respond as Secondary OT if contacted to investigate NCP breaker.
  - After 5 minutes, report the breaker shows an instantaneous overcurrent relay is dropped.

Indications Available

41A – SEAL INJ TO RCP FLOW LO

42A – CHG LINE FLOW HILO

42E – CHARGING PMP TROUBLE

OTO-BG-00001, Pressurizer Level Control Malfunction

Proc /Time	Position	Applicant's Actions or Behavior
	CRS	Implement OTO-BG-00001
	RO	(Step 1) CHECK Charging Pumps – At Lease One Running • NCP is tripped and CCPs are in standby
		Step 1 is an immediate action step
	RO	(Step 1 RNO) Perform the following: a. ENSURE CCP Recirc valves OPEN • BG HIS-8110 (CCP A) is open • BG HIS-8111 (CCP B) is open b. ENSURE CCP or NCP suction is aligned to VCT or RWST • BG HIS-112B and BG HIS-112C are open from VCT c. START one CCP: • BG HIS-1A • BG HIS-2A d. IF CCP can NOT be started (N/A) e. ENSURE CCW Pump is running in the same train as the CCP that was started • EG HIS- or EG HIS- (Train A) • EG HIS- or EG HIS- (Train B) f. IF a charging pump can not be started, then isolate letdown (N/A)
		Step 1 is an immediate action step ***NOTE: Per turnover B CCP likely to be started.***

Op Test No.: 2017-1	Scenario # 1 rev.1	Event # 1 Page 8 of 36
Event Description:	Trip of the Normal Charging Pump	
Proc /Time	Position	Applicant's Actions or Behavior

OTO-BG-00001	**RO**	(Step 2) VERIFY at least ONE method of RCP Seal Cooling to All RCPs in progress • Seal Injection • CCW to Thermal Barrier Heat Exchanger
	RO	(Step 3) CHECK for Failed PZR Level Indicator – Indicators are normal
	RO	(Step 3 RNO) PERFORM the following: a) IF PZR Level Master Controller is malfunctioning (N/A) b) Go to Step 23
	RO	(Step 23) CHECK Charging Header Flow for Proper Charging alignment • BG FI-121A
	RO	(Step 24) MAINTAIN RCP Seal Injection Flow between 8-13 gpm
	RO	(Step 25) CHECK Instrument Air – IN SERVICE
	RO	(Step 26) CHECK Letdown – IN SERVICE
	RO	(Step 27) CHECK Letdown Relief Valve (BG8117) Normal • Letdown Relief to PRT Outlet Temperature o BG TI-125 • Annunciator 39C, LTDN RLF TEMP HI - CLEAR
NOTE		**At Lead Examiner's discretion move to the next Event after one of the CCPs is started**

Op Test No.: 2017-1	Scenario # 1 rev.1	Event # 2	Page 9 of 36	
Event Description:	Condensate Pump 'A' Trips			

Proc /Time	Position	Applicant's Actions or Behavior

Booth Operator:

- TRIGGER step Condensate Pump Trip
- Respond as Secondary OT if contacted to investigate pump trip.
- Respond as transmission and other departments when notified of load reduction.

Indications Available

120B – MFP A SUCT PRESS LO

123B – MFP B SUCT PRESS LO

OTO-AE-00001, Feedwater System Malfunction

	CRS	Implement OTO-AE-00001
OTO-AE-00001	**BOP**	(Step 1) CHECK BOTH Main Feed Pumps Tripped
		Step 1 is an Immediate Action Step
	BOP	(Step 1 RNO) Go to Step 2
		Step 1 is an Immediate Action Step
	BOP	(Step 2) CHECK ONE Main Feed Pump Tripped
		Step 2 is an Immediate Action Step
	BOP	(Step 2 RNO) End of Immediate Actions. Go to step 10
		Step 2 is an Immediate Action Step
	BOP	(Step 10) MAINTAIN MFP Suction Pressure $\geq$ 240 psig
	BOP	(Step 11) CHECK DFWCS Operator Station on RL005 AVAILABLE
	BOP	(Step 12) CHECK MFP Speeds controlling in auto & stable
	BOP	(Step 13) CHECK If MFW REG Valves – IN SERVICE
	BOP	(Step 14) CHECK MFW Reg Valves Controlling in AUTO
	BOP	(Step 15) CHECK If MFW Reg Valve Bypass – In Service

Op Test No.:	2017-1	Scenario #	1 rev.1	Event #	2	Page	10	of	36
Event Description:		Condensate Pump 'A' Trips							

Proc /Time	Position	Applicant's Actions or Behavior
OTO-AE-00001	**BOP**	(Step 15 RNO) Go To Step 17
	BOP	(Step 17) CHECK Condensate Pump Tripped
	RO	(Step 18) CHECK Reactor Power $\geq$ 45%. a. If less than two condensate pumps are running, then perform the following (N/A)
	RO	(Step 19) CHECK Reactor Power $\leq$ 97%
	CRS	(Step 19 RNO) Using Attachment A, reduce reactor power to less than 97% Reactor Power.
	RO	(Step A1) PLACE Rod Control in Auto • SE HS-9
	RO	(Step A2) MANAGE Reactivity: a. PERFORM Reactivity Management Brief: • Discuss Amount and Rate of Turbine Load reduction • Determine amount of boric acid needed

Op Test No.: 2017-1	Scenario # 1 rev.1	Event # 2	Page 11 of 36
Event Description:	Condensate Pump 'A' Trips		

Proc /Time	Position	Applicant's Actions or Behavior
OTO-AE-00001	**BOP**	(Step A3) Reduce Turbine load at < 5% per minute using any of the following: • Using the Loading Rate: a. Slowly lower load using the DECREASE LOAD pushbutton until all of the following are met: • Load Limit Limiting Light – EXTINGUISHED • Decrease Loading Rate "OFF" Light – LIT • Loading Rate Limit &/MIN "1/2" Light – LIT b. ROTATE Load Limit Set potentiometer fully clockwise c. SELECT Decrease Loading Rate – ON d. SET Loading Rate Limit %/Min to desired value e. LOWER load set MW toward desired load using the DECREASE LOAD pushbutton OR • REDUCE Turbine Load using the Load Limit Potentiometer

Op Test No.: 2017-1	Scenario # 1 rev.1	Event # 2	Page 12 of 36
Event Description:	Condensate Pump 'A' Trips		

Proc /Time	Position	Applicant's Actions or Behavior
OTO-AE-00001	**RO**	(Step A4) BORATE from the BAST using: • BORATE using OTN-BG-00002 Attachment 8 1. If this is the first boration (N/A for OTO/EOP) 2. PLACE BG HS-26, RCS M/U CTRL, in STOP 3. PLACE BG HS-25, RCS M/U CTRL SEL, in BOR 4. RESET BG FY-110B, BA COUNTER, to 000 5. ENSURE BG FY-110B is set to deliver the desired amount of boron 6. PLACE BG HS-26, RCS M/U CTRL, in RUN. 7. WHEN the desired amount of borated water has been added, PLACE BG HS-26, RCS M/U CTRL, in STOP. 8. IF required, PERFORM the following: 9. PLACE BG HS-25, RCS M/U CTRL SEL, in AUTO 10. PLACE BG HS-26, RCS M/U CTRL, in RUN OR • BORATE to the VCT a. PLACE RCS Makeup Control in STOP (BG HS-26) b. PLACE RCS Makeup Control Selector to BORATE: • BG HS-25 c. Set Boric Acid Flow Controller to the desired flow rate • BG FK-110 d. PLACE BG FK-110 in AUTO e. RESET Boric Acid Counter to 000: • BG FY-110B) f. SET BG FY-110B for the desired gallons of boric acid to be added g. PLACE BG HS-26 in RUN h. WHEN desired boration is complete, THEN PLACE BG HS-26 in STOP i. REPEAT Boration as necessary OR • BORATE using Emergency Boration: (See next page)

Op Test No.: 2017-1	Scenario # 1 rev.1	Event # 2	Page 13 of 36				
Event Description:	Condensate Pump 'A' Trips						

Proc /Time	Position	Applicant's Actions or Behavior
OTO-AE-00001	**RO**	(Step A4 continued) BORATE from the BAST using: OR • BORATE using Emergency Boration a. START at least one Boric Acid Transfer Pump • BG HIS-5A • BG HIS-6A b. OPEN Emergency Borate To Charging Pump Suciton: • BG HIS-8104 c. CHECK Emergency Borate Flowrate $\geq$ 30 gpm • BG FI-183A d. WHEN desired boration is complete, THEN: • CLOSE BG HIS-8104 • STOP Boric Acid Transfer Pumps e. REPEAT Boration as necessary
	RO	(Step A5) INITIATE Boron Equalization: a. ENERGIZE at least one set of PZR backup heaters • BB HIS-51A • BB HIS-52A b. PLACE BB PK-455A in MAN c. LOWER BB PK-455A output to 38-42% d. PLACE BB PK-455A in AUTO
	CRS	(Step A6) NOTIFY Power Dispatcher • Load reduction is in progress • Rate of load reduction • Amount of load reduction
	CRS	(Step A7) NOTIFY Chemistry, RP, Radwaste, & Count Room of load reduction

Op Test No.: 2017-1	Scenario # 1 rev.1	Event # 2	Page 14 of 36
Event Description:	Condensate Pump 'A' Trips		

Proc /Time	Position	Applicant's Actions or Behavior
OTO-AE-00001		NOTE: The following Plant Parameters are considered Critical during the Load Reduction: • Annunciator 81C, Rod Bank LoLo Limit – EXTINGUISHED • Axial Flux Difference (AFD) maintained within Limits of Curve Book, Figure 1-1 • Main Generator MVARs maintained within limits of Curve Book, Figure 10-1 through 10-6
	RO	(Step A8) Check Rod Control maintaining T_{ave}/T_{ref} within 3°F
NOTE		**At Lead Examiner's discretion move to the next Event after the load reduction is initiated.**

Op Test No.:	2017-1	Scenario #	1 rev.1	Event #	3	Page	15 of	36
Event Description:		Power Range Channel N43 fails high						

Proc /Time	Position	Applicant's Actions or Behavior
Booth Operator: • TRIGGER step Power Range NI Failure • When contacted, respond as I&C. Acknowledge the request to investigate the instrument/channel failure. • When contacted, respond as DUTY MANAGER. Acknowledge entry into the OTO.		
Indications Available ANN 78A, PR CHANNEL DEV ANN 82A, PR OVER PWR ROD STOP ANN 83C, RX PARTIAL TRIP		
OTO-SF-00001, Rod Control Malfunctions		
		Crew may utilize OTO-SF-00001 due to inadvertent rod motion.
	CRS	Implement OTO-SF-00001
OTO-SF-00001	**RO**	(Step 1) Check both of the following are met for indication of multiple dropped rods: • Annunciator 81A, Two/More Rods At Bottom – LIT • Rod Bottom Lights for greater than one rod – LIT RNO: Go to Step 3
		Step 1 is an immediate action
	RO	(Step 3) Check Main Turbine Runback or Load Reject in progress RNO: Go to Step 5
		Step 3 is an immediate action
	RO	(Step 5) Place Rod Control in MANUAL using SE HS-9
		Step 5 is an immediate action
	RO	(Step 6) Check Control Rods Motion Stopped
		Step 6 is an immediate action
	RO	(Step 7) Check instruments indications NORMAL: a. RCS Tavg b. HP Turbine First Stage Pressure c. Power Range Nuclear Instruments. N43 is failed. (RNO c.) Go to OTO-SE-00001, NI Malfunction

Op Test No.: 2017-1	Scenario # 1 rev.1	Event # 3	Page 16 of 36
Event Description:	Power Range Channel N43 fails high		

Proc /Time	Position	Applicant's Actions or Behavior
OTO-SE-00001, Nuclear Instrument Malfunction		
	CRS	Implement OTO-SE-00001
OTO-SE-00001	**RO**	(Step 1) CHECK Power Range Nuclear Instruments - NORMAL
	RO	(Step 1 RNO) a. Ensure Rod Control in MANUAL • SE HS-9 b. IF any MFW Reg Valve Bypass Valves are in-service (N/A) c. Go to Attachment A, PR Instrument Malfunction
	RO	(Step A1) STOP Any Main Turbine Load Changes
	RO	(Step A2) MAINTAIN RCS Tavg within 1.5°F of Tref using manual control rods.
	BOP	(Step A3) CHECK the following permissives are in the correct state within one hour of the NI failure per Attachment H • P-7 (LIT) • P-8 (LIT) • P-9 (LIT) • P-10 (LIT)
	CRS	(Step A4) SELECT an operable channel on NIS Recorder: • SE NR-45

Op Test No.:	2017-1	Scenario #	1 rev.1	Event #	3	Page	17	of 36
Event Description:		Power Range Channel N43 fails high						

Proc /Time	Position	Applicant's Actions or Behavior
OTO-SE-00001	**BOP**	(Step A5) BYPASS the malfunctioning PR Channel by selecting the affected channel on the following switches (Cabinet SE054D): a. On the Detector Current Comparator drawer: • PLACE Upper Section switch to N43 • PLACE Lower Section switch to N43 • PLACE Rod Stop Bypass switch to N43 • PLACE Power Mismatch Bypass switch to N43 b. On the Comparator and Rate Drawer, PLACE Comparator Channel Defeat switch to N43 c. ENSURE the following annunciators are extinguished: • 78A, PR Channel Dev • 78B, PR Upper Detector Flux Dev • 78C, PR Lower Detector Flux Dev • 82A, PR Over Pwr Rod Stop d. DELETE computer point from processing for the Bypassed Channel in order to maintain the AFD Monitor OPERABLE: 1) At a PPC terminal with a security level 0-3, TYPE "DFP" – Select OK. 2) ENSURE the "Delete From Processing" dialog box is displayed. 3) ENTER the computer point ID for the bypassed channel in the "Point ID" field: • N43 – REN0051A 4) ENTER your initials in the "Modified by" field. 5) ENTER "OTO-SE-00001" in the "Reason" field. 6) CLICK the "Execute" button. 7) CLICK the CANCEL button to close the "Delete From Processing" dialog box. 8) At the PPC terminal, TYPE "SHOW REN0051A" and verify the value displayed is "DEL".
		NOTE: Step A5 must be completed before continuing
	CRS	(Step A6) CHECK Control Rod Insertion From Instrument Failure
	CRS	(Step A7) RESTORE Control Rods as determined by CRS

Op Test No.:	2017-1	Scenario #	1 rev.1	Event #	3	Page	18	of 36
Event Description:		Power Range Channel N43 fails high						

Proc /Time	Position	Applicant's Actions or Behavior
OTO-SE-00001	**RO**	(Step A8) CHECK Tavg to Tref within 0.3°F
	RO	(Step A9) RESTORE Rod Control to AUTO: SE HS-9
	BOP	(Step A10) CHECK any SG Level being controlled by MFRVBVs
	CRS	(Step A10 RNO) Go to step A11
	RO	(Step A11) CHECK Reactor Power > 10%
	CRS	(Step A12) TRIP the protective bistables for the failed channel per Attachment D, Tripping Power Range Protective Bistables, within the time limit specified in the applicable Tech Spec
		The CRS should enter T/S 3.3.1.A, D, E, S, T and FSAR 16.2.1 and 16.2.2
NOTE		**At Lead Examiner's discretion move to the next Event**

Op Test No.: 2017-1	Scenario # 1 rev.1	Event # 4	Page 19 of 36
Event Description:	Tube Leak in Steam Generator 'D'		

Proc /Time	Position	Applicant's Actions or Behavior
Booth Operator: • TRIGGER step Tube Leak • Respond as chemistry if directed to sample/determine leak rate • Respond as Field Supervisor/ OT if directed to start the aux boiler		
Indications Available ANN 61A, PROCESS RAD HIHI ANN 61B, PROCESS RAD HI		
		OTO-BB-00001, Steam Generator Tube Leak
	CRS	Implement OTO-BB-00001
OTO-BB-00001	**RO**	(Step 1) CHECK if PZR Level Can Be Maintianed a. Control charging flow as necessary to maintain PZR level b. CHECK PZR level – Stable or Rising
	RO	(Step 2) CHECK if VCT level can be maintained > 5% by normal makeup
	BOP	(Step 3) NOTIFY Chemistry to perform CTP-ZZ-02590, Primary to Secondary Leakrate Determination
	BOP	(Step 4) TRY to identify affected SG
	RO	(Step 5.a) Determine SG Tube Leak Rate • Use trends of VCT and/or PZR level • Compare charging and letdown flows • Plant computer trends group display "SGTL" • Plant computer trends group display "SG17"
	RO	(Step 5.b) Leak rate – less than 50 gpm

Op Test No.: 2017-1	Scenario # 1 rev.1	Event # 4	Page 20 of 36
Event Description:	Tube Leak in Steam Generator 'D'		

Proc /Time	Position	Applicant's Actions or Behavior
	CRS	CHECK if Plant Should be shutdown. With ≥ 75 gpd, perform actions of Attachment D
	CRS	(Step D1) EPRI Action Level 3 – leakage > 75 gpd in any one SG. Initiate Step 7 and Commence a controlled shutdown to Mode 3. Reduce power to < 50% within 1 hour, and be in Mode 3 within next 2 hours (total of 3 hours). • Perform applicable procedures: OTO-MA-00008
	BOP	(Step 7) Initiate action to minimize Secondary Contamination: a. Locally close TDAFP Manual isolation from affected SG (N/A) b. Start Auxiliary Boiler c. Ensure auxiliary steam is supplying main turbine seals per OTN-CA-00001 d. Close condensate reject AD LIC-79A, bypass condensate demins, and transfer auxiliary steam to the auxiliary boiler e. Refer to Tech Specs & EALs • LCO 3.4.13 RCS leakage • LCO 3.7.5 AFW System • LCO 3.7.18 Secondary activity • EIP-ZZ-00101 for EALs
		The CRS should enter T/S 3.4.13.B and 3.4.17.B
OTO-MA-00008, Rapid Load Reduction		
	RO	(Step 1) Place Rod Control in AUTO using SE HS-9
	RO	(Step 2) Manage Reactivity. Discuss amount and rate of load reduction and amount of boric acid needed.

Op Test No.: 2017-1	Scenario # 1 rev.1	Event # 4	Page 21 of 36
Event Description:	Tube Leak in Steam Generator 'D'		

Proc /Time	Position	Applicant's Actions or Behavior
OTO-MA-00008	**BOP**	(Step 3) Reduce turbine load at < 5%/min using pot or load set: • Reduce load using %/min loading rate: a. Slowly lower load using DECREASE LOAD pushbutton until all of the following are met: • Load limit limiting light – extinguished • Decrease loading rate "OFF" light – LIT • Loading Rate Limit %/min "1/2" light – LIT b. Rotate load limit set potentiometer fully clockwise c. SELECT decrease loading rate – ON d. Set loading rate limit %/min to desired value e. LOWER load set MW toward desired load using the DECREASE LOAD pushbutton OR • REDUCE turbine load using the Load Limit Potentiometer

Op Test No.: 2017-1	Scenario # 1 rev.1	Event # 4	Page 22 of 36
Event Description:	Tube Leak in Steam Generator 'D'		

Proc /Time	Position	Applicant's Actions or Behavior
OTO-MA-00008	**RO**	(Step 4) BORATE from the BAST using: • BORATE using OTN-BG-00002 Attachment 8 1. If this is the first boration (N/A for OTO/EOP) 2. PLACE BG HS-26, RCS M/U CTRL, in STOP 3. PLACE BG HS-25, RCS M/U CTRL SEL, in BOR 4. RESET BG FY-110B, BA COUNTER, to 000 5. ENSURE BG FY-110B is set to deliver the desired amount of boron 6. PLACE BG HS-26, RCS M/U CTRL, in RUN. 7. WHEN the desired amount of borated water has been added, PLACE BG HS-26, RCS M/U CTRL, in STOP. 8. IF required, PERFORM the following: 9. PLACE BG HS-25, RCS M/U CTRL SEL, in AUTO 10. PLACE BG HS-26, RCS M/U CTRL, in RUN OR • BORATE to the VCT a. PLACE RCS Makeup Control in STOP (BG HS-26) b. PLACE RCS Makeup Control Selector to BORATE: • BG HS-25 c. Set Boric Acid Flow Controller to the desired flow rate • BG FK-110 d. PLACE BG FK-110 in AUTO e. RESET Boric Acid Counter to 000: • BG FY-110B) f. SET BG FY-110B for the desired gallons of boric acid to be added g. PLACE BG HS-26 in RUN h. WHEN desired boration is complete, THEN PLACE BG HS-26 in STOP i. REPEAT Boration as necessary OR • BORATE using Emergency Boration: (see next page)

Op Test No.: 2017-1	Scenario # 1 rev.1	Event # 4	Page 23 of 36
Event Description:	Tube Leak in Steam Generator 'D'		

Proc /Time	Position	Applicant's Actions or Behavior
OTO-MA-00008	**RO**	(Step 4 continued) BORATE from the BAST using: OR • BORATE using Emergency Boration a. START at least one Boric Acid Transfer Pump • BG HIS-5A and/or BG HIS-6A b. OPEN Emergency Borate To Charging Pump Suciton: • BG HIS-8104 c. CHECK Emergency Borate Flowrate $\geq$ 30 gpm • BG FI-183A d. WHEN desired boration is complete, THEN: • CLOSE BG HIS-8104 • STOP Boric Acid Transfer Pumps e. REPEAT Boration as necessary
	RO	(Step 5) INITIATE Boron Equalization: a. ENERGIZE at least one set of PZR backup heaters • BB HIS-51A and/or BB HIS-52A b. PLACE BB PK-455A in MAN c. LOWER BB PK-455A output to 38-42% d. PLACE BB PK-455A in AUTO
	BOP	(Step 6) Check MFP Turbine Speed Control – IN AUTO • FC SK-509B and FC SK-509C
	CRS	(Step 7) Notify Power Dispatcher of load reduction
	CRS	(Step 8) Notify on-site departments of load reduction
	BOP	(Step 9) Check Rod Control system responding to RCS Tavg/Tref within 3°F
NOTE		**When the crew has reduced load below 90% or at the direction of the lead evaluator, input the next event.**

Op Test No.: 2017-1	Scenario # 1 rev.1	Event # 5 & 6 Page 24 of 36
Event Description:	Tube Rupture on Steam Generator 'D' / Safety Injection Pump 'A' fails to start.	
Proc /Time	Position	Applicant's Actions or Behavior

Booth Operator: o TRIGGER Tube Rupture		
Indications Available 32C – PZR LO LEV DEV		
OTO-BB-00001, Steam Generator Tube Leak		
OTO-BB-00001	**RO**	(Foldout Page) SI Acutation Criteria trip breakers open IF all the conditions listed occurs, then TRIP the reactor, VERIFY reactor trip, and ACTUATE SI, and go to E-0, Reactor Trip or Safety Injection: • Normal charging is maximized from one pump • Letdown is isolated • Pressurizer level is lowering
E-0, Reactor Trip or Safety Injection		
E-0	**RO**	(Step 1) CHECK Reactor Trip: • Rod Bottom Lights – ALL LIT • Reactor Trip and Bypass Breakers – OPEN • Neutron Flux - LOWERING
		Step 1 is an immediate action
	BOP	(Step 2) CHECK Turbine Trip: • All Turbine Stop valves - CLOSED
		Step 2 is an immediate action
	BOP	(Step 3) CHECK Power to AC Emergency Buses: a. AC emergency buses – AT LEAST ONE ENERGIZED b. NB01 & NB02 are both energized
		Step 3 is an immediate action

Op Test No.: 2017-1	Scenario # 1 rev.1	Event # 5 & 6 Page 25 of 36
Event Description:	Tube Rupture on Steam Generator 'D' / Safety Injection Pump 'A' fails to start.	
Proc /Time	Position	Applicant's Actions or Behavior

E-0	**RO**	(Step 4) Check SI Status: a. Check if SI is actuated • 88D Lit • SB069 SI Actuate Red light is lit • LOCA Sequencers alarms 30A & 31A b. CHECK both Trains of SI-Actuated • 30A lit • 31A lit • SB069 SI Actuate Red light lit solid
		Step 4 is an immediate action
	RO	(Step 5) PERFORM Attachment A
E-0 **Attachment A**	**RO**	(Step A1) Check Charging Pumps: d. CCPs – Both Running • BG HIS-1A • BG HIS-2A e. Stop NCP • BG HIS-3
	RO	(Step A2) CHECK SI and RHR Pumps: • SI Pumps – BOTH RUNNING • EM HIS-4 • EM HIS-5 • RHR Pumps – BOTH RUNNING • EJ HIS-1 • EJ HIS-2
	RO	(Step A2 RNO) START SI Pump A using EM HIS-4

Op Test No.: 2017-1	Scenario # 1 rev.1	Event # 5 & 6	Page 26 of 36
Event Description:	Tube Rupture on Steam Generator 'D' / Safety Injection Pump 'A' fails to start.		

Proc /Time	Position	Applicant's Actions or Behavior
E-0 **Attachment A**	**RO**	(Step A3) CHECK ECCS flow: a. CCPs to Boron Inj Header – FLOW INDICATED • EM FI-917A • EM FI-917B b. RCS pressure – Less than 1700 psig: RNO go to step A4
	RO	(Step A4) CHECK ESW Pumps – BOTH RUNNING • EF HIS-55A • EF HIS-56A
	RO	(Step A5) CHECK CCW Alignment: a. CCW Pumps – one running in each train • Red Train: EG HIS-21 or EG HIS-23 • Yellow Train: EG HIS-22 or EG HIS-24 b. CCW Service Loop Supply and Return valves for one operating CCW pump – OPEN • EG ZL-15 and EG ZL-53 • OR • EG ZL-16 and EG ZL-54 c. OPEN CCW to RHR HX valves: • EG HIS-101 • EG HIS-102 d. CLOSE Spent Fuel Pool HX CCW Outlet Valves: • EC HIS-11 • EC HIS-12 e. STOP Spent Fuel Pool Cooling Pump(s): • EC HIS-27 • EC HIS-28 f. RECORD the time spent fuel pool cooling pump secured g. MONITOR time CCW flow isolated to SFP HX < 4 hours

Op Test No.:	2017-1	Scenario #	1 rev.1	Event #	5 & 6	Page	27	of	36

Event Description: Tube Rupture on Steam Generator 'D' / Safety Injection Pump 'A' fails to start.

Proc /Time	Position	Applicant's Actions or Behavior
E-0 **Attachment A**	**RO**	(Step A6) CHECK Containment Cooler Fans running in slow • GN HIS-9 • GN HIS-17 • GN HIS-5 • GN HIS-13
	RO	(Step A7) CHECK Containment H2 Mixing Fans in slow • GN HIS-2 • GN HIS-4 • GN HIS-1 • GN HIS-3
	RO	(Step A8) CHECK if Containment Spray should be actuated • Containment Pressure > 27 psig • GN PR-934 indicates ctmt pressure has been > 27 psig • Annunciator 59A CSAS LIT • Annunciator 59B CISB LIT RNO: Go to step A9
	RO	(Step A9) CHECK if Main Steamlines should be Isolated • Containment pressure > 17 psig • GN PR-934 indicates ctmt pressure has been > 17 psig • Steamline pressure < 615 psig • AB PR-514 or 535 shows pressure has been < 615 psig RNO: Go to Step A10
	RO	(Step A10) CHECK ECCS Valves in proper alignment a. ESFAS Status Panels SIS sections: • SA066X WHITE lights – ALL LIT • SA066Y WHITE lights – ALL LIT

Op Test No.: 2017-1	Scenario # 1 rev.1	Event # 5 & 6	Page 28 of 36
Event Description:	Tube Rupture on Steam Generator 'D' / Safety Injection Pump 'A' fails to start.		

Proc /Time	Position	Applicant's Actions or Behavior
E-0 **Attachment A**	**RO**	(Step A11) CHECK Containment Isolation Phase A: a. ESFAS status panels CISA sections: • SA066X WHITE lights – ALL LIT • SA066Y WHITE lights – ALL LIT
	RO	(Step A12) CHECK SG Blowdown Isolation: a. ESFAS status panels SGBSIS sections: • SA066X WHITE lights – ALL LIT • SA066Y WHITE lights – ALL LIT
	RO	(Step A13) CHECK Both Trains of CRVIS a. ESFAS status panels CRVIS sections: • SA066X WHITE lights – ALL LIT • SA066Y WHITE lights – ALL LIT
	RO	(Step A14) CHECK Containment Purge Isolation: a. ESFAS status panels CPIS sections: • SA066X WHITE lights – ALL LIT • SA066Y WHITE lights – ALL LIT
	RO	(Step A15) NOTIFY CRS of the following: • Unanticipated manual actions taken: Started SI Pump A • Failed Equipment Status • Attachment A completion

Op Test No.: 2017-1	Scenario # 1 rev.1	Event # 5 & 6	Page 29 of 36
Event Description:	Tube Rupture on Steam Generator 'D' / Safety Injection Pump 'A' fails to start.		

Proc /Time	Position	Applicant's Actions or Behavior
Foldout page	**BOP**	RUPTURED SG ISOLATION CRITERIA: IF BOTH conditions listed below occur, THEN ISOLATE feed flow to affected SG(s) as desired: • Level in any SG rises in an uncontrolled manner OR any SG has abnormal radiation. AND • Narrow Range level in affected SG(S) greater than 7%
CRITICAL TASK #1	**BOP**	**Isolate feedwater flow into and steam flow from the ruptured SG before a transition to ECA-3.1 occurs.**
E-0	**BOP**	(Step 6) CHECK Generator Output Breakers – OPEN • MA ZL-3A (V55) • MA ZL-4A (V53)
	BOP	(Step 7) CHECK Feedwater Isolation: a. MFPs Tripped • ANN 120A, MFP A Trip – LIT • ANN 123A, MFP B Trip b. Main Feedwater Reg Valves – CLOSED • AE ZL-510 • AE ZL-520 • AE ZL-530 • AE ZL-540 c. Main Feedwater Reg Bypass Valves – CLOSED • AE ZL-550 • AE ZL-560 • AE ZL-570 • AE ZL-580 d. Feedwater Isolation Valves – CLOSED • AE HIS-39 • AE HIS-40 • AE HIS-41 • AE HIS-42

Op Test No.:	2017-1	Scenario #	1 rev.1	Event #	5 & 6	Page	30 of 36	
Event Description:	Tube Rupture on Steam Generator 'D' / Safety Injection Pump 'A' fails to start.							

Proc /Time	Position	Applicant's Actions or Behavior
E-0	**BOP**	(Step 8) CHECK AFW Pumps: a. MD AFW Pumps – BOTH RUNNING • AL HIS-23A • AL HIS-22A b. TDAFP -Running if Necessary
	BOP	(Step 9) CHECK AFW Valves – proper emergency alignment • MD AFP Flow Control Valves – THROTTLED • AL HK-7A • AL HK-9A • AL HK-11A • AL HK-5A • TD AFP Flow Control Valves – FULL OPEN • AL HK-8A • AL HK-10A • AL HK-12A • AL HK-6A • TD AFP Loop Steam Supply Valves – BOTH OPEN IF NECESSARY • AB HIS-5A • AB HIS-6A
	BOP	(Step 10) CHECK Total AFW Flow > 285,000 lbm/hr

Op Test No.: 2017-1	Scenario # 1 rev.1	Event # 5 & 6	Page 31 of 36	
Event Description:	Tube Rupture on Steam Generator 'D' / Safety Injection Pump 'A' fails to start.			

Proc /Time	Position	Applicant's Actions or Behavior
E-0	**BOP**	(Step 11) CHECK PZR PORVs and Spray Valves: a. PZR PORVs – CLOSED • BB HIS-455A • BB HIS-456A b. PZR PORVs – Both in AUTO • BB HIS-455A • BB HIS-456A c. PORV Block Valves – BOTH OPEN • BB HIS-8000A • BB HIS-8000B d. Normal PZR Spray valves – CLOSED • BB ZL-455B • BB ZL-455C
	BOP	(Step 12) CHECK if RCPs should be stopped: a. RCPs – ANY RUNNING b. ECCS Pumps – AT LEAST ONE RUNNING • CCP OR • SI Pump c. RCS Pressure < 1425 psig. RNO: Go to step 13
	BOP	(Step 13) CHECK RCS Temperatures: • Any RCP Running – RCS Tavg stable at 557°F or trending to 557°F
	BOP	(Step 14) CHECK if any SG is faulted: a. Check pressures in all SGs: • Any SG pressure lowering in an uncontrolled manner or completely depressurized. RNO: Go to step 15

Op Test No.:	2017-1	Scenario #	1 rev.1	Event #	5 & 6	Page	32	of 36
Event Description:	Tube Rupture on Steam Generator 'D' / Safety Injection Pump 'A' fails to start.							

Proc /Time	Position	Applicant's Actions or Behavior
	BOP	(Step 15) CHECK if SG Tubes are intact: The D SG is ruptured based on level rising in an uncontrolled manner and N16 alarms. RNO: Go to E-3
E-3, Steam Generator Tube Rupture		
E-3	**RO/BOP**	(Step 1) CHECK if RCPs should be stopped: a. RCPs – ANY RUNNING b. ECCS Pumps – AT LEAST ONE RUNNING • CCP OR • SI Pump c. RCS Pressure < 1425 psig. RNO: Go to step 2
	RO/BOP	(Step 2) IDENTIFY Ruptured SG(s): "D" d. Unexpected rise in any SG narrow range level OR e. High radiation from any SG sample OR f. High radiation from any SG steamline OR g. High radiation from any SG blowdown line sample

Op Test No.:	2017-1	Scenario #	1 rev.1	Event #	5 & 6	Page	33 of 36
Event Description:	Tube Rupture on Steam Generator 'D' / Safety Injection Pump 'A' fails to start.						

Proc /Time	Position	Applicant's Actions or Behavior
E-3	**RO/BOP**	(Step 3) ISOLATE flow from ruptured SG(s): a. ADJUST ruptured SG(s) ASD controller setpoint to 1160 psig: • AB PIC-4A b. CHECK ruptured SG(s) ASD – CLOSED • AB PIC-4A c. Local CLOSE TDAFP steam supply from ruptured SG: N/A d. Check Blowdown CIV from ruptured SG closed • BM HIS-4A e. CLOSE steamline low point drain valve from ruptured SG(s) • AB HIS-10 f. CHECK C-9A interlock lit: g. CLOSE MSIV and MSIV bypass valve from ruptured SG(s) • AB HIS-11 • AB HIK-15
CRITICAL TASK #1	**RO/BOP**	**Isolate feedwater flow into and steam flow from the ruptured SG before a transition to ECA-3.1 occurs.**

	RO/BOP	(Step 4) CHECK Ruptured SG Level:
		a. Narrow range level > 7%
		b. STOP feed flow to ruptured SG(s):
		• CLOSE Associated MD AFP Flow Control Valves(s):
		  • AL HK-5A
		• CLOSE Associated TD AFP Flow Control Valves(s):
		  • AL HK-6A

CRITICAL TASK #1	**RO/BOP**	**Isolate feedwater flow into and steam flow from the ruptured SG before a transition to ECA-3.1 occurs.**
	RO/BOP	(Step 5) CHECK Ruptured SG(s) Pressure > 340 psig

Op Test No.: 2017-1	Scenario # 1 rev.1	Event # 5 & 6			Page 34 of 36		
Event Description:	Tube Rupture on Steam Generator 'D' / Safety Injection Pump 'A' fails to start.						

Proc /Time	Position	Applicant's Actions or Behavior
E-3	**RO/BOP**	(Step 6) INITIATE RCS Cooldown: a. CHECK RCS pressure < 1970 psig • P-11 light – LIT RNO: When RCS pressure is < 1970 psig, perform step 6.b. Continue with Step 6.c b. BLOCK Steamline Pressure SI: • SB HS-9 • SB HS-10 c. Determine required core exit temperature from table • SG Pressure ________ • Core Exit temp ________ d. DUMP Steam to condenser from intact SG(s) at maximum rate: 1) CHECK Condenser available • C-9 interlock Lit • MSIVs – any open 2) PLACE Steam Dump Select switch in STM PRESS: • AB US-500Z 3) Rapidly OPEN the Steam Dumps in MANUAL in approximately 20% increments to 40-42% on AB UI-500 • AB PK-507 4) WHEN the P-12 Interlock has Actuated: a) Place Steam Dumps in Bypass/Interlock: • AB HS-63 • AB HS-64 b) ENSURE Group 1 steam dumps fully open to establish maximum cooldown rate e. Core exit TCs – less than required temperature: RNO: When core exit TCs are less than required temperature, then perform steps 6.f and 6.g

Op Test No.: 2017-1	Scenario # 1 rev.1	Event # 5 & 6	Page 35 of 36
Event Description:	Tube Rupture on Steam Generator 'D' / Safety Injection Pump 'A' fails to start.		

Proc /Time	Position	Applicant's Actions or Behavior
CRITICAL TASK #2	**RO/BOP**	**Establish/maintain an RCS temperature so that transition from E-3 does not occur because the RCS temperature is in either of the following conditions:** • **Too high to maintain minimum required subcooling** **OR** • **Below the RCS temperature that causes an extreme (RED path) or a severe (ORANGE path) challenge to the subcriticality and/or the integrity CSF**
E-3	**RO/BOP**	(Step 7) CHECK Intact SG Levels: a. Narrow range levels > 7% b. CONTROL feed flow to maintain narrow range levels between 22% and 52%
	RO/BOP	(Step 8) CHECK PZR PORVs and Block Valves: a. Power available to block valves: • BB HIS-8000A • BB HIS-8000B b. PZR PORVs – CLOSED • BB HIS-455A • BB HIS-456A c. Block Valves – BOTH OPEN • BB HIS-8000A • BB HIS-8000B
	RO/BOP	(Step 9) RESET SI: • SB HS-42A • SB HS-43A
	RO/BOP	(Step 10) RESET CIS-A and CIS-B • CIS-A using SB HS-53 & SB HS-56 • CIS-B using SB HS-52 & SB HS-55

Op Test No.:	2017-1	Scenario #	1 rev.1	Event #	5 & 6	Page	36	of 36

Event Description: Tube Rupture on Steam Generator 'D' / Safety Injection Pump 'A' fails to start.

Proc /Time	Position	Applicant's Actions or Behavior
E-3	**RO/BOP**	(Step 11) ESTABLISH Instrument Air to Containment a. CHECK if ESW to Air Compressor valves – OPEN • EF HIS-43 • EF HIS-44 b. START Air Compressor(s): • KA HIS-3C • KA HIS-2C c. OPEN Instrument Air Supply CIV • KA HIS-29
	RO/BOP	(Step 12) CHECK if RHR Pumps should be stopped: a. RHR Pumps running with suction aligned to RWST b. RCS pressure > 325 psig c. STOP RHR Pumps and PLACE in standby: • EJ HIS-1 • EJ HIS-2 d. MONITOR RCS pressure
	RO/BOP	(Step 13) CHECK if RCS Cooldown Should be stopped: a. Core exit TCs – Less than required temperature b. STOP RCS cooldown c. MAINTAIN core exit TCs less than required temperature
		The crew should not proceed until the target temperature is reached.
	RO/BOP	(Step 14) CHECK Ruptured SG(s) Pressure stable or rising
	RO/BOP	(Step 15) CHECK RCS Subcooling > 50°F
The scenario can be terminated at the discretion of the Lead Examiner		

Facility: Callaway Scenario No.: 2 , Rev 1 Op-Test No.: 2017-1

Examiners: ______________________ Operators: ______________________

Initial Conditions: 100%

Turnover: Service Water Pump 'A' is out of service for maintenance.

Event No.	Malf. No.	Event Type*	Event Description
1	NG0103	SRO (C) RO or BOP(C)	Battery Charger NK21 loss OTO-NK-00001, Failure of NK Battery Charger (Tech Spec 3.8.4)
2	BBLT0461	SRO (I) RO (I)	Pressurizer Level Channel BB LI-461 fails high OTO-BG-00001, Pressurizer Level Control Malfunction (Tech Spec 3.3.1)
3	PEA2101B	SRO (C) BOP (C)	Service Water Pump 'B' trips OTA-RK-00014 Addendum 12A, Service Water Pump Lockout
4	ACYE0017	SRO (R) RO (R) BOP (R)	Turbine Vibration requiring load reduction OTO-AC-00002, Turbine Vibration
5	AE002 SF006	SRO (M) RO (M) BOP (M)	Feedwater break in containment with auto reactor trip failure E-2, Faulted Steam Generator Isolation
6	AEFV40	BOP (C)	FWIV 'B' Failure to close E-0, Reactor Trip or Safety Injection

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

Target Quantitative Attributes (Per Scenario; See Section D.5.d)	Actual Attributes
1. Total malfunctions (5-8)	6
2. Malfunctions after EOP entry (1-2)	1
3. Abnormal events (2-4)	4
4. Major transients (1-2)	1
5. EOPs entered/requiring substantive actions (1-2)	1
6. EOP contingencies requiring substantive actions (0-2)	0
7. Critical tasks (2-3)	2

Scenario #2 Event Description
Callaway 2017-1 NRC ES-D-1, rev. 1

The plant is stable at 100% with Service Water Pump 'A' out of service.

Event 1: After the reactivity brief is complete, battery charger NK21 is lost. The crew should use OTO-NK-00001, Failure of NK Battery Charger, to select away from NN01 powered instrumentation and to direct placing the swing charger NK25 into service in the field. Tech Spec 3.8.4 applies.

Event 2: Once Tech Specs have been determined pressurizer level channel BB LI-461 fails high. The crew should enter OTO-BG-00001, Pressurizer Level Control Malfunction, to restore pressurizer level to program in manual, select away, and restore automatic control. Tech Spec 3.3.1 applies.

Event 3: Service Water Pump 'B' Trips leaving the crew with 1 pump supplying all plant loads. The crew should perform the OTA-RK-00014 Addendum 12, Service Water Pump Lockout, actions and start both trains of Essential Service Water using OTN-EF-00001, Essential Service Water System.

Event 4: Once both trains of ESW are in manual, a turbine vibration develops. The crew should enter OTO-AC-00002, Turbine Vibration, and perform a load reduction while monitoring vibration levels.

Events 5 & 6: Once the crew has reduced load 5-10% the 'B' Loop feedwater line breaks inside containment with no automatic reactor trip. The crew should manually trip the reactor and enter E-0, Reactor Trip or Safety Injection.

The crew should close the 'B' FWIV and perform foldout page criteria for Faulted SG Isolation Criteria to Fast Close MSIVs and stop auxiliary feedwater flow to the 'B' SG. The crew should transition to E-2, Faulted Steam Generator Isolation, and complete isolation of the 'B' SG.

The scenario is complete when the crew has transitioned out of E-2 to ES-1.1, SI Termination.

Critical Tasks:

Critical Tasks	CT #1: Manually trip the reactor before ALL intact SG levels lower to 10% WR (dryout).	CT #2: Isolate faulted SG 'B' before transition out of E-2
EVENT	5	5 & 6
Safety significance	Failure to manually trip the reactor causes a challenge to the subcriticality CSF beyond that irreparably introduced by the postulated conditions. Additionally, it constitutes an incorrect performance that “necessitates the crew taking compensating action that would complicate the event mitigation strategy” and demonstrates the inability of the crew to “recognize a failure or an incorrect automatic actuation of an ESF system or component.”	Failure to isolate a faulted SG that can be isolated causes challenges to CSFs (Integrity, Subcriticality, & Containment) beyond those irreparably introduced by the postulated conditions.
Cueing	Indication and/or annunciation that plant parameter(s) exist that should result in automatic reactor trip but reactor does not automatically trip • Annunciator 85A, SG LEV LOLO RX TRIP	Both of the following: Steam pressure and flow rate indications that make it possible to identify 'B' SG as faulted AND Valve position and flow rate indication that AFW continues to be delivered to the 'B' SG
Performance indicator	Manipulation of control room reactor trip switches (SB HS-1 or SB HS-42) as required to trip the reactor. • Reactor trip and bypass breakers indicate open	CLOSE AL HK-9A & AL HK-10A to isolate AFW flow to faulted SG Close SG B low point drain valve AB HIS-9 Fast Close all MSIVs and Bypass Valves using AB HS-79 or AB HS-80 Close FWIV AE-HS-40
Performance feedback	Indications of reactor trip • Control rods at bottom of core • Neutron flux decreasing	Indication of the following • Any depressurization of intact SGs stops • AFW flow rate indication to faulted SG of zero
Justification for the chosen performance limit	Not tripping the reactor prior to SG reaching dryout conditions when it is possible to do so forces an immediate extreme challenge to the subcriticality CSF, availability of the heat sink, and containment. Additionally, the incorrect performance of failing to trip the reactor necessitates the crew taking compensating action that seriously complicates the event mitigation strategy. This misoperation constitutes a “significant reduction of safety margin beyond that irreparably introduced by the scenario.”	“before transition out of E-2” is in accordance with the PWR Owners Group Emergency Response Guidelines. It allows enough time for the crew to take the correct action while at the same time preventing avoidable adverse consequences.
PWR Owners Group Appendix	CT-1, Manually Trip the Reactor	CT-17, Isolate Faulted SG

Scenario Procedure References
Callaway 2017-1 NRC Scenario #2, rev. 1

References
OTO-NK-00001, Failure of NK Battery Charger
OTO-BG-00001, Pressurizer Level Control Malfunction
OTA-RK-00014 Addendum 12A, Service Water Pump Lockout
OTN-EF-00001, Essential Service Water System
OTO-AC-00002, Turbine Vibration
E-0, Reactor Trip or Safety Injection
E-2, Faulted Steam Generator Isolation
ES-1.1, SI Termination

PRA Systems, Events or Operator Actions

1. ATWS (12% of contribution to Core Damage Frequency)

Steam Line Breaks (5% of contribution to Core Damage Frequency)

Scenario #2 Setup Guide:

Establish the initial conditions of IC-166 on load 1603, MOL 100% power:

- RCS boron concentration 962 ppm
- Rod Control Bank D 215 steps, Other banks 228 steps
- Service Water Pump 'A' handswitch in PTL with WIP tag hanging

=============SCENARIO PRELOADS / SETUP ITEMS================

Service Water Pump 'A' is out of service for maintenance

- Insert ME Schematics, System = EA, Schematic = x8600x88562_a, Breaker = 152PB12104, Malfunction = EA09PB12104TA_PKPOS, Value = 3

Automatic Reactor Trip Failure

- Insert Malfunction (SF) SF006, Value = Auto_Mode

FWIV 'B' Failure to close

- Insert Malfucntion AEFV40_A, Value = Fail_False
- Insert Malfunction AEFV40_B, Value = Fail_False
- Insert Malfunction AEFV40_C, Value = Fail_False
- Insert Malfucntion AEFV40_D, Value = Fail_False
- Insert Malfunction AEFV40_E, Value = Fail_False
- Insert Malfunction AEFV40_F, Value = Fail_False

============= EVENT 1 ===================================

NK21 charger loss

- Insert ME Schematics, System = NG, Schematic = e21ng01_a, Breaker = NG0103, Malfunction = NG0103_RMTTC_ELEC, Value = 0

============= EVENT 2 ===================================

Pressurizer Level Channel BB LI-461 fails high

- Insert Malfunction (BB) BBLT0461, Value = 209.1

=============EVENT 3 ===================================

Service Water Pump 'B' trips

- Insert Malfunction (EA) PEA2101B, Value = Trip

=============EVENT 4 ===================================

Turbine Vibration requiring load reduction

- Insert Malfunction (AC) ACYE0017, Value = 9

=============EVENT 5 ===================================

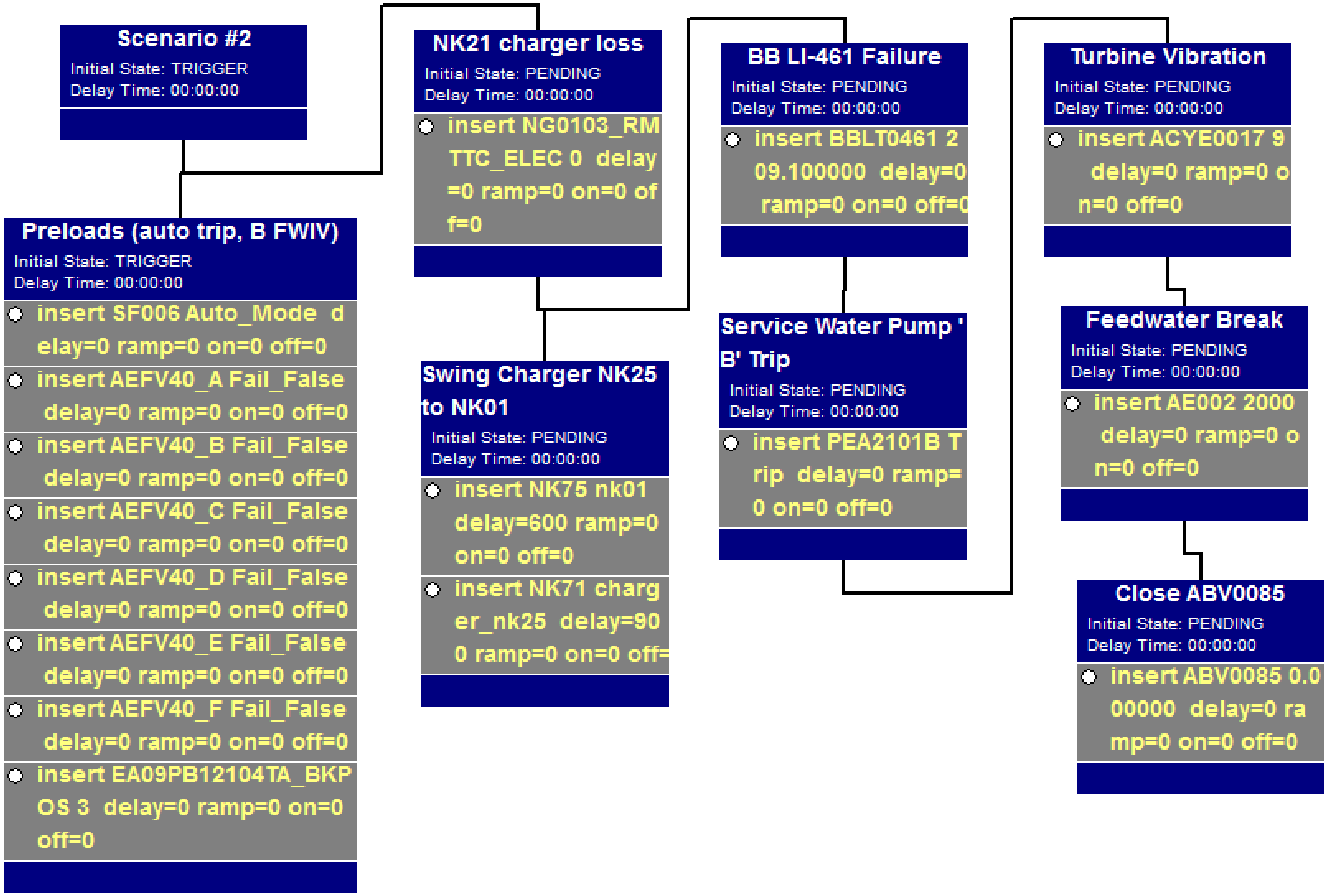
Feedwater break in containment with auto reactor trip failure

- Insert Malfunction (AE) AE002, Value = 2000
- Auto Trip Failure PRELOADED

=============EVENT 6===================================

FWIV 'B' Failure to close

- See PRELOADS


Scenario #2
Initial State: TRIGGER
Delay Time: 00:00:00
Preloads (auto trip, B FWIV)
Initial State: TRIGGER
Delay Time: 00:00:00
insert SF006 Auto_Mode delay=0 ramp=0 on=0 off=0
insert AEFV40_A Fail_False delay=0 ramp=0 on=0 off=0
insert AEFV40_B Fail_False delay=0 ramp=0 on=0 off=0
insert AEFV40_C Fail_False delay=0 ramp=0 on=0 off=0
insert AEFV40_D Fail_False delay=0 ramp=0 on=0 off=0
insert AEFV40_E Fail_False delay=0 ramp=0 on=0 off=0
insert AEFV40_F Fail_False delay=0 ramp=0 on=0 off=0
insert EA09PB12104TA_BKPOS 3 delay=0 ramp=0 on=0 off=0
NK21 charger loss
Initial State: PENDING
Delay Time: 00:00:00
insert NG0103_RMTTC_ELEC 0 delay=0 ramp=0 on=0 off=0
Swing Charger NK25 to NK01
Initial State: PENDING
Delay Time: 00:00:00
insert NK75 nk01 delay=600 ramp=0 on=0 off=0
insert NK71 charger_nk25 delay=900 ramp=0 on=0 off=
BB LI-461 Failure
Initial State: PENDING
Delay Time: 00:00:00
insert BBLT0461 209.100000 delay=0 ramp=0 on=0 off=0
Service Water Pump 'B' Trip
Initial State: PENDING
Delay Time: 00:00:00
insert PEA2101B Trip delay=0 ramp=0 on=0 off=0
Turbine Vibration
Initial State: PENDING
Delay Time: 00:00:00
insert ACYE0017 9 delay=0 ramp=0 on=0 off=0
Feedwater Break
Initial State: PENDING
Delay Time: 00:00:00
insert AE002 2000 delay=0 ramp=0 on=0 off=0
Close ABV0085
Initial State: PENDING
Delay Time: 00:00:00
insert ABV0085 0.000000 delay=0 ramp=0 on=0 off=0

Op Test No.: 2017-1	Scenario # 2 rev.2	Event # 1	Page 7 of 31				
Event Description:	Battery Charger NK21 loss						

Proc /Time	Position	Applicant's Actions or Behavior

Booth Operator:
- TRIGGER NK21 charger loss
- Respond as Secondary OT if contacted. Report after 5 minutes local alarms for NK21 charger failure and NK21 supply breaker NG0103 is tripped.
- When directed to place swing charger NK25 into service to NK01, TRIGGER Swing Charger NK25 to NK01. Report back when complete (15 minutes)
- Respond as Electrical Maintenance/Duty Manager when contacted.

Indications Available

ANN 25C – NK01 TROUBLE

		OTO-NK-00001, Failure of NK Battery Charger
	CRS	Implement OTO-NK-00001
OTO-NK-00001	**BOP**	(Step 1) CHECK Associated NN Bus – ENERGIZED • Annunciator 25A, NN01 INST BUS UV, is extinguished
	BOP	(Step 2) CHECK the Following Control Room Annunciators • Annunciator 25C, NK01 TROUBLE, is not extinguished RNO: Go to Attachment A, Actions for NK01
	BOP	(Step A1) Direct Operations Technician to perform actions of OTA-NK-00001

Op Test No.: 2017-1	Scenario # 2 rev.2	Event # 1 Page 8 of 31
Event Description:	Battery Charger NK21 loss	

Proc /Time	Position	Applicant's Actions or Behavior

OTO-NK-00001	**RO/ BOP**	(Step A2) ENSURE the following components are NOT Selected: (Select Away from Red Train Channels)
		• SG A:
		  • AB FT-512, SG Steam Flow Channel Selector
		  • AB LT-512, SG Level Channel Selector
		• SG B:
		  • AB FT-522, SG Steam Flow Channel Selector
		  • AE LT- 529, SG Level Channel Selector
		• SG C:
		  • AB FT-532, SG Steam Flow Channel Selector
		  • AE LT-539, SG Level Channel Selector
		• SG D:
		  • AB FT-542, SG Steam Flow Channel Selector
		  • AE LT-554, SG Level Channel Selector
		• Pressurizer:
		  • BB PT-455, PZR Pressure Control Selector
		  • BB LT-459, PZR Level Control Selector
		• Main Turbine
		  • AC PT-505, HP Turbine First Stage Pressure

	BOP	(Step A3) Press SELECT on STEAM FLOW and Level for ALL Steam Generators on AE SS-500, SG Level Control Input Selection
	RO	(Step A4) PLACE BB TS-411F, ΔT Defeat Switch in T411 Position.
	RO	(Step A5) PLACE BB TS-412T, Rod Control Tave Input Channel Defeat Switch in T412 Position.
	BOP	(Step A6) CHECK Battery Charger Lineup • CHECK breaker NG0103 closed RNO: Place NK25 Swing Charger in service per OTN-NK-00001
	BOP	(Step A7) CHECK NK01 Bus Voltage $\geq$ 105 VDC

Op Test No.: 2017-1	Scenario # 2 rev.2	Event # 1	Page 9 of 31
Event Description:	Battery Charger NK21 loss		

Proc /Time	Position	Applicant's Actions or Behavior
OTO-NK-00001	**BOP**	(Step A8) CHECK Charger Connected to the NK01 Bus RNO: CONSIDER transferring the associated NN inverter to an alternate power supply per OTN-NN-00001
	CRS	(Step A9) Contact Electrical Maintenance to inspect the affected charger per MTE-ZZ-QB0002, Battery Charger Troubleshooting
	CRS	(Step A10) REVIEW Applicable Technical Specifications
		The CRS should enter Tech Spec 3.8.4.A
NOTE		**At Lead Examiner's discretion move to the next Event**

Op Test No.: 2017-1	Scenario # 2 rev.2	Event # 2	Page 10 of 31	
Event Description:	Pressurizer Level Channel BB LI-461 fails high			

Proc /Time	Position	Applicant's Actions or Behavior

Booth Operator:

- TRIGGER BB LI-461 Failure
- Respond as Duty Manager or I&C if contacted.

Indications Available

ANN 32D – PZR HI LEV DEV HTRS ON

ANN 83C – RX PARTIAL TRIP

OTO-BG-00001, Pressurizer Level Control Malfunction

Proc /Time	Position	Applicant's Actions or Behavior
	CRS	Implement OTO-BG-00001
OTO-BG-00001	**RO**	(Step 1) CHECK Charging Pumps – At Least one running. • NCP is running
		Step 1 is an immediate action step.
	RO	(Step 2) VERIFY at least ONE method of RCP Seal Cooling to ALL RCPs in progress • Seal Injection OR • CCW to Thermal Barrier Heat Exchanger
	RO	(Step 3) CHECK Pressurizer Level Indicator failed: • BB LI-461 is failed high
	RO	(Step 4) CHECK Pressurizer Level • Trending to or at program level
	RO	(Step 4 RNO) Perform the following: a. Stabilize Pressurizer Level: • Place master level controller BB LK-459 in manual OR • Manually throttle NCP discharge FCV BG FK-124 b. RESTORE Pressurizer Level to Program Level

Op Test No.: 2017-1	Scenario # 2 rev.2	Event # 2	Page 11 of 31
Event Description:	Pressurizer Level Channel BB LI-461 fails high		

Proc /Time	Position	Applicant's Actions or Behavior
OTO-BG-00001	**RO**	(Step 5) TRANSFER Pressurizer Level Control Selector to remove failed channel from control (remove 461 from control) • BB LS-459D
	RO	(Step 6) CHECK Pressurizer Heater Control Group C ON • BB HIS-50
	RO	(Step 7) CHECK Letdown – In Service
	RO	(Step 8) CHECK Pressurizer Level Within One of the following: • Trending to Program Level OR • At Program Level

	RO	(Step 9) WHEN Pressurizer Level is at program level:
		• Place Pressurizer Level Master Controller in AUTO
		  • BB LK-459
		OR
		• PLACE NCP discharge FCV in AUTO
		  • BG FK-124

	RO	(Step 10) CHECK Operable Pressurizer Level Channel used for Recorder • BB LS-459E RNO: Select alternate channel as input to recorder
	CRS	(Step 11) Review Applicable Tech Specs
		The CRS should enter T/S 3.3.1.A & M
	RO	(Step 12) Review Attachment A for effects of failure
NOTE		**At Lead Examiner's discretion move to the next Event**

Op Test No.:	2017-1	Scenario #	2 rev.2	Event #	3	Page	12 of 31
Event Description:	Service Water Pump 'B' trips						

Proc /Time	Position	Applicant's Actions or Behavior

Booth Operator:

- TRIGGER Service Water Pump 'B' Trip
- Respond as Outside OT if contacted about Service Water Pump Trip. Service Water Pressure is 70 psig
- Respond as Inside OT if contacted. UHS level is > 71.7%. Motor bearing L-O levels are in range. Pre-Lube storage tank has continuous overflow

Indications Available

ANN 12A – SERV WTR PMP LOCKOUT

ANN 12E – SERV WTR VLV TROUBLE

OTA-RK-00014 Addendum 12A, Service Water Pump Lockout

	BOP	Implement OTA-RK-00014 Addendum 12A
OTA-RK-00014 Add 12A	**BOP**	(Step 3.1) IF Standby Service Water Pump did not auto start, start the standby service water pump. No pumps are available.
	BOP	(Step 3.2) IF the Service Water System can NOT be restored, START both ESW trains and isolate from Service Water in accordance with OTN-EF-00001, Essential Service Water System
	BOP	(Step 3.3) DISPATCH an Operator to the Circ & Service Water Pump House to determine cause of pump trip.
	BOP	(Step 3.4) ENSURE the discharge valve on the tripped pump is CLOSED: VEA2101B
	BOP	(Step 3.5) IF only one Service Water Pump is running, PERFORM the following: • Evaluate the need to run ESW in manual with Service Water isolated from ESW • IF required, START both ESW trains and isolate from Service Water in accordance with OTN-EF-00001

OTN-EF-00001, Essential Service Water System

		Section 5.1 aligns 'A' Train. Section 5.8 aligns 'B' Train.

Op Test No.: 2017-1	Scenario # 2 rev.2	Event # 3	Page 13 of 31
Event Description:	Service Water Pump 'B' trips		

Proc /Time	Position	Applicant's Actions or Behavior
OTN-EF-00001 **'A' Train**	**BOP**	(Step 5.1.1) ENSURE EF HIS-51 is OPEN
	BOP	(Step 5.1.2) ENSURE EF HIS-59 is CLOSED.
	BOP	(Step 5.1.3) Using EF HIS-55A start PEF01A and check pump is running as indicated by the following: • EF PI-1, ESW PUMP A DISCH PRESS • EF FI-53, ESW PUMP A DISCH FLOW
	BOP	(Step 5.1.4) Close EF HIS-23 and EF HIS-25
	BOP	(Step 5.1.5) Open EF HIS-37
	BOP	(Step 5.1.6) Close EF HIS-39 and EF HIS-41
	BOP	(Step 5.1.7) OPEN EF HIS-49
	BOP	(Step 5.1.8) If this is the second pump started for manual operation AND two (2) SW pumps are supplying only TB Loads: N/A
	BOP	(Step 5.1.9) Check ESW train A is operating within the following parameters: • Pressure is approx. 145 psig as read on EF PI-1 • Flow is approx 7.6 x 10^6 lbm/hr as read on EF FI-53 • Temperature is less than 89°F as read on EF TI-61
B Train	**BOP**	(Step 5.8.1) Ensure EF HIS-52 is OPEN
	BOP	(Step 5.8.2) Ensure EF HIS-60 is CLOSED

Op Test No.: 2017-1	Scenario # 2 rev.2	Event # 3	Page 14 of 31				
Event Description:	Service Water Pump 'B' trips						

Proc /Time	Position	Applicant's Actions or Behavior
OTN-EF-00001	**BOP**	(Step 5.8.3) Using EF HIS-56A, start PEF01B and check pump is running as indicated by the following: • EF PI-2, ESW PUMP B DISCH PRESS • EF FI-54, ESW PUMP B DISCH FLOW
	BOP	(Step 5.8.4) CLOSE EF HIS-24 and EF HIS-26
	BOP	(Step 5.8.5) OPEN EF HIS-38
	BOP	(Step 5.8.6) CLOSE EF HIS-40 and EF HIS-42
	BOP	(Step 5.8.7) OPEN EF HIS-50
	BOP	(Step 5.8.8) IF this is second ESW pump started for manual operation and two (2) SW pumps are supplying TB loads: N/A
	BOP	(Step 5.8.9) Check ESW train B is operating within the following parameters: • Pressure is approx. 135 psig as read on EF PI-2 • Flow is approx. 7.6 x 10^6 lbm/hr as read on EF FI-54 • Temperature is less than 89°F as read on EF TI-62
	BOP	(Step 5.8.10) Dispatch OT to determine SW discharge pressure
NOTE		**At Lead Examiner's discretion move to the next Event after step 5.8.9 completed.**

Op Test No.:	2017-1	Scenario #	2 rev.2	Event #	4	Page	15 of	31
Event Description:		Turbine Vibration requiring load reduction						

Proc /Time	Position	Applicant's Actions or Behavior

Booth Operator:
- TRIGGER Turbine Vibration
- Respond as OT if contacted to investigate turbine vibration. After 2 minutes, report the #5 bearing sounds louder than normal.

Indications Available

ANN 119B – TURB VIB/SYS ALERT

OTO-AC-00002, Turbine Vibration

	CRS	Implement OTO-AC-00002
OTO-AC-00002	**BOP**	(Step 1) CHECK Main Turbine is online
	BOP	(Step 2) MONITOR Main Turbine Vibration less than 12 MILS
	BOP	(Step 3) MONITOR time main turbine vibration remains greater than 10 MILS less than 15 minutes.
	RO	(Step 4) PLACE rod control in Auto • SE HS-9
	RO	(Step 5) Manage reactivity. Discuss amount and rate of load reduction and amount of boric acid needed.

Op Test No.: 2017-1	Scenario # 2 rev.2	Event # 4	Page 16 of 31
Event Description:	Turbine Vibration requiring load reduction		

Proc /Time	Position	Applicant's Actions or Behavior
OTO-AC-00002	**BOP**	(Step 6) Reduce turbine load at < 5%/min using pot or load set: • Reduce load using %/min loading rate: a. Slowly lower load using DECREASE LOAD pushbutton until all of the following are met: • Load limit limiting light – extinguished • Decrease loading rate "OFF" light – LIT • Loading Rate Limit %/min "1/2" light – LIT b. Rotate load limit set potentiometer fully clockwise c. SELECT decrease loading rate – ON d. Set loading rate limit %/min to desired value e. LOWER load set MW toward desired load using the DECREASE LOAD pushbutton OR • REDUCE turbine load using the Load Limit Potentiometer

Op Test No.: 2017-1	Scenario # 2 rev.2	Event # 4	Page 17 of 31	
Event Description:	Turbine Vibration requiring load reduction			

Proc /Time	Position	Applicant's Actions or Behavior
OTO-AC-00002	**RO**	(Step 7) BORATE from the BAST using: • BORATE using OTN-BG-00002 Attachment 8 1. If this is the first boration (N/A for OTO/EOP) 2. PLACE BG HS-26, RCS M/U CTRL, in STOP 3. PLACE BG HS-25, RCS M/U CTRL SEL, in BOR 4. RESET BG FY-110B, BA COUNTER, to 000 5. ENSURE BG FY-110B is set to deliver the desired amount of boron 6. PLACE BG HS-26, RCS M/U CTRL, in RUN. 7. WHEN the desired amount of borated water has been added, PLACE BG HS-26, RCS M/U CTRL, in STOP. 8. IF required, PERFORM the following: 9. PLACE BG HS-25, RCS M/U CTRL SEL, in AUTO • PLACE BG HS-26, RCS M/U CTRL, in RUN OR • BORATE to the VCT a. PLACE RCS Makeup Control in STOP (BG HS-26) b. PLACE RCS Makeup Control Selector to BORATE: • BG HS-25 c. Set Boric Acid Flow Controller to the desired flow rate • BG FK-110 d. PLACE BG FK-110 in AUTO e. RESET Boric Acid Counter to 000: • BG FY-110B) f. SET BG FY-110B for the desired gallons of boric acid to be added g. PLACE BG HS-26 in RUN h. WHEN desired boration is complete, THEN PLACE BG HS-26 in STOP i. REPEAT Boration as necessary OR • BORATE using Emergency Boration (See next page)

Op Test No.: 2017-1	Scenario # 2 rev.2	Event # 4	Page 18 of 31				
Event Description:	Turbine Vibration requiring load reduction						

Proc /Time	Position	Applicant's Actions or Behavior
OTO-AC-00002	**RO**	(Step 7 continued) BORATE from the BAST using: OR • BORATE using Emergency Boration a. START at least one Boric Acid Transfer Pump • BG HIS-5A and/or BG HIS-6A b. OPEN Emergency Borate To Charging Pump Suciton: • BG HIS-8104 c. CHECK Emergency Borate Flowrate $\geq$ 30 gpm • BG FI-183A d. WHEN desired boration is complete, THEN: • CLOSE BG HIS-8104 • STOP Boric Acid Transfer Pumps REPEAT Boration as necessary
	RO	(Step 8) INITIATE Boron Equalization: a. ENERGIZE at least one set of PZR backup heaters • BB HIS-51A • BBHIS-52A b. PLACE BB PK-455A in MAN c. LOWER BB PK-455A output to 38-42% d. PLACE BB PK-455A in AUTO
	BOP	(Step 9) CHECK MFP Turbine Speed Control in auto • FC SK-509B • FC SK-509C
	BOP	(Step 10) CHECK Main Turbine Vibration stable or lowering
	BOP	(Step 11) CHECK Elapsed time from time recorded in step 3 less than 15 minutes
NOTE		**When the crew has reduced load 5-10% or at the direction of the lead evaluator, input the next event.**

Op Test No.:	2017-1	Scenario #	2 rev.2	Event #	5 & 6	Page	19	of 31
Event Description:		Feedwater break in containment with auto reactor trip failure / FWIV 'B' Failure to close						

Proc /Time	Position	Applicant's Actions or Behavior

Booth Operator:

- TRIGGER Feedwater Break
- Respond as primary operator when directed to close ABV0085. TRIGGER Close ABV0085 and notify control room when complete.
- Respond as chemistry when contacted to sample SGs
- Respond as Radiation Protection when contacted to survey steam lines.

Indications Available

ANN 60E – CTMT SUMP A/B LEV HI

ANN 60F – CTMT SUMP C/D LEV HI

ANN 109C – SG B LEV LO

ANN 109D – SG B FLOW MISMATCH

ANN 85A – SG LEV LOLO RX TRIP

E-0, Reactor Trip or Safety Injection

		NOTE: Adverse Containment Values [bracketed] used when containment pressure ≥ 3.5 psig or 10^5 Rad/hr
E-0	**RO**	(Step 1) CHECK Reactor Trip: • Rod Bottom Lights – ALL LIT • Reactor Trip and Bypass Breakers – OPEN • Neutron Flux - LOWERING RNO: Manually TRIP Reactor.
		Step 1 is an immediate action step.
CRITICAL TASK #1	**RO**	**Manually trip the reactor before ALL intact SG levels lower to 10% WR (dryout).**
	BOP	(Step 2) CHECK Turbine Trip: • All Turbine Stop valves - CLOSED
		Step 2 is an immediate action
	BOP	(Step 3) CHECK Power to AC Emergency Buses: a. AC emergency buses – AT LEAST ONE ENERGIZED b. NB01 & NB02 are both energized
		Step 3 is an immediate action

Op Test No.:	2017-1	Scenario #	2 rev.2	Event #	5 & 6	Page	20 of 31
Event Description:	Feedwater break in containment with auto reactor trip failure / FWIV 'B' Failure to close						

Proc /Time	Position	Applicant's Actions or Behavior
E-0	**RO**	(Step 4) Check SI Status: a. Check if SI is actuated • 88A thru 88D Lit • SB069 SI Actuate Red light is lit • LOCA Sequencers alarms 30A & 31A b. CHECK both Trains of SI-Actuated • 30A lit • 31A lit • SB069 SI Actuate Red light lit solid
		Step 4 is an immediate action
	RO	(Step 5) PERFORM Attachment A
Foldout Page	**BOP**	<u>Faulted SG Isolation Criteria:</u> IF any SG pressure is lowering in an uncontrolled manner or is completely depressurized, then perform the following as desired: • FAST CLOSE MSIVs • Manually CLOSE or locally isolate any failed open ASD(s) • ISOLATE feed flow to faulted SG(s) • MAINTAIN total feed flow > 285,000 lbm/hr until narrow range level is > 7% [25%] in at least one SG.
		Crew may secure AFW flow to 'B' SG & Fast Close MSIVs using foldout page.
E-0 Attachment A	**RO**	(Step A1) Check Charging Pumps: a. CCPs – Both Running • BG HIS-1A • BG HIS-2A b. Stop NCP using BG HIS-3

Op Test No.: 2017-1	Scenario # 2 rev.2	Event # 5 & 6	Page 21 of 31				

Event Description: Feedwater break in containment with auto reactor trip failure / FWIV 'B' Failure to close

Proc /Time	Position	Applicant's Actions or Behavior

	RO	(Step A2) CHECK SI and RHR Pumps:
		• SI Pumps – BOTH RUNNING
		  • EM HIS-4
		  • EM HIS-5
		• RHR Pumps – BOTH RUNNING
		  • EJ HIS-1
		  • EJ HIS-2

	RO	(Step A3) CHECK ECCS flow:
		a. CCPs to Boron Inj Header – FLOW INDICATED
		  • EM FI-917A
		  • EM FI-917B
		b. RCS pressure – Less than 1700 psig: RNO go to step A4

	RO	(Step A4) CHECK ESW Pumps – BOTH RUNNING • EF HIS-55A • EF HIS-56A

Op Test No.: 2017-1	Scenario # 2 rev.2	Event # 5 & 6	Page 22 of 31
Event Description:	Feedwater break in containment with auto reactor trip failure / FWIV 'B' Failure to close		

Proc /Time	Position	Applicant's Actions or Behavior
E-0 **Attachment A**	**RO**	(Step A5) CHECK CCW Alignment: a. CCW Pumps – one running in each train • Red Train: EG HIS-21 or EG HIS-23 • Yellow Train: EG HIS-22 or EG HIS-24 b. CCW Service Loop Supply and Return valves for one operating CCW pump – OPEN • EG ZL-15 and EG ZL-53 • OR • EG ZL-16 and EG ZL-54 c. OPEN CCW to RHR HX valves: • EG HIS-101 • EG HIS-102 d. CLOSE Spent Fuel Pool HX CCW Outlet Valves: • EC HIS-11 • EC HIS-12 e. STOP Spent Fuel Pool Cooling Pump(s): • EC HIS-27 • EC HIS-28 f. RECORD the time spent fuel pool cooling pump secured g. MONITOR time CCW flow isolated to SFP HX < 4 hours
	RO	(Step A6) CHECK Containment Cooler Fans running in slow • GN HIS-9 • GN HIS-17 • GN HIS-5 • GN HIS-13
	RO	(Step A7) CHECK Containment H2 Mixing Fans in slow • GN HIS-2 • GN HIS-4 • GN HIS-1 • GN HIS-3

Op Test No.: 2017-1	Scenario # 2 rev.2	Event # 5 & 6	Page 23 of 31				
Event Description:	Feedwater break in containment with auto reactor trip failure / FWIV 'B' Failure to close						

Proc /Time	Position	Applicant's Actions or Behavior
E-0 Attachment A	**RO**	(Step A8) CHECK if Containment Spray should be actuated • Containment Pressure > 27 psig • GN PR-934 indicates ctmt pressure has been > 27 psig • Annunciator 59A CSAS LIT • Annunciator 59B CISB LIT RNO: Go to step A9
	RO	(Step A9) CHECK if Main Steamlines should be Isolated a. Check the following: • Containment pressure > 17 psig • GN PR-934 indicates ctmt pressure has been > 17 psig • Steamline pressure < 615 psig • AB PR-514 or 535 shows pressure has been < 615 psig b. CHECK MSIVs and Bypass valves - CLOSED
	RO	(Step A10) CHECK ECCS Valves in proper alignment a. ESFAS Status Panels SIS sections: • SA066X WHITE lights – ALL LIT • SA066Y WHITE lights – ALL LIT
	RO	(Step A11) CHECK Containment Isolation Phase A: a. ESFAS status panels CISA sections: • SA066X WHITE lights – ALL LIT • SA066Y WHITE lights – ALL LIT
	RO	(Step A12) CHECK SG Blowdown Isolation: a. ESFAS status panels SGBSIS sections: • SA066X WHITE lights – ALL LIT • SA066Y WHITE lights – ALL LIT

Op Test No.: 2017-1	Scenario # 2 rev.2	Event # 5 & 6	Page 24 of 31				
Event Description:	Feedwater break in containment with auto reactor trip failure / FWIV 'B' Failure to close						

Proc /Time	Position	Applicant's Actions or Behavior
E-0 **Attachment A**	**RO**	(Step A13) CHECK Both Trains of CRVIS a. ESFAS status panels CRVIS sections: • SA066X WHITE lights – ALL LIT • SA066Y WHITE lights – ALL LIT
	RO	(Step A14) CHECK Containment Purge Isolation: a. ESFAS status panels CPIS sections: • SA066X WHITE lights – ALL LIT • SA066Y WHITE lights – ALL LIT
	RO	(Step A15) NOTIFY CRS of the following: • Unanticipated manual actions taken • Failed Equipment Status • Attachment A completion
E-0	**BOP**	(Step 6) CHECK Generator Output Breakers – OPEN • MA ZL-3A (V55) • MA ZL-4A (V53)

Op Test No.: 2017-1	Scenario # 2 rev.2	Event # 5 & 6	Page 25 of 31
Event Description:	Feedwater break in containment with auto reactor trip failure / FWIV 'B' Failure to close		

Proc /Time	Position	Applicant's Actions or Behavior
E-0	**BOP**	(Step 7) CHECK Feedwater Isolation: a. MFPs Tripped • ANN 120A, MFP A Trip – LIT • ANN 123A, MFP B Trip b. Main Feedwater Reg Valves – CLOSED • AE ZL-510 • AE ZL-520 • AE ZL-530 • AE ZL-540 c. Main Feedwater Reg Bypass Valves – CLOSED • AE ZL-550 • AE ZL-560 • AE ZL-570 • AE ZL-580 d. Feedwater Isolation Valves – CLOSED • AE HIS-39 • AE HIS-40: failed open • AE HIS-41 • AE HIS-42 (Step 7 RNO d) Fast Close FWIVs using AE HS-80 or AE HS-81. May also close using AE HIS-40.
	BOP	(Step 8) CHECK AFW Pumps: a. MD AFW Pumps – BOTH RUNNING • AL HIS-23A • AL HIS-22A b. TDAFP -Running if Necessary

Op Test No.:	2017-1	Scenario #	2 rev.2	Event #	5 & 6	Page	26	of	31
Event Description:	Feedwater break in containment with auto reactor trip failure / FWIV 'B' Failure to close								

Proc /Time	Position	Applicant's Actions or Behavior

	BOP	(Step 9) CHECK AFW Valves – proper emergency alignment
		• MD AFP Flow Control Valves – THROTTLED
		  • AL HK-7A
		  • AL HK-9A
		  • AL HK-11A
		  • AL HK-5A
		• TD AFP Flow Control Valves – FULL OPEN
		  • AL HK-8A
		  • AL HK-10A
		  • AL HK-12A
		  • AL HK-6A
		• TD AFP Loop Steam Supply Valves – BOTH OPEN IF NECESSARY
		  • AB HIS-5A
		  • AB HIS-6A

	BOP	(Step 10) CHECK Total AFW Flow > 285,000 lbm/hr

	BOP	(Step 11) CHECK PZR PORVs and Spray Valves:
		a. PZR PORVs – CLOSED
		  • BB HIS-455A
		  • BB HIS-456A
		b. PZR PORVs – Both in AUTO
		  • BB HIS-455A
		  • BB HIS-456A
		c. PORV Block Valves – BOTH OPEN
		  • BB HIS-8000A
		  • BB HIS-8000B
		d. Normal PZR Spray valves – CLOSED
		  • BB ZL-455B
		  • BB ZL-455C

Op Test No.:	2017-1	Scenario #	2 rev.2	Event #	5 & 6	Page	27	of 31
Event Description:		Feedwater break in containment with auto reactor trip failure / FWIV 'B' Failure to close						

Proc /Time	Position	Applicant's Actions or Behavior
	BOP	(Step 12) CHECK if RCPs should be stopped: a. RCPs – ANY RUNNING b. ECCS Pumps – AT LEAST ONE RUNNING • CCP OR • SI Pump c. RCS Pressure < 1425 psig. RNO: Go to step 13
	BOP	(Step 13) CHECK RCS Temperatures: • Any RCP Running – RCS Tavg stable at 557°F or trending to 557°F
	BOP	(Step 14) CHECK if any SG is faulted: a. Check pressures in all SGs: • Any SG pressure lowering in an uncontrolled manner or completely depressurized. b. Go to E-2, Faulted SG Isolation Step 1
		E-2, Faulted Steam Generator Isolation
E-2	**BOP**	(Step 1) CHECK MSIVs and Bypass Valves CLOSED
	BOP	(Step 2) CHECK if any SG Secondary Pressure Boundary is Intact c. Check pressures in all SGs – any stable or rising
	BOP	(Step 3) IDENTIFY Faulted SG(s): B SG is Faulted a. CHECK Pressures in all SGs: • Any SG Pressure lowering in an uncontrolled manner OR • Any SG completely depressurized

Op Test No.: 2017-1		Scenario # 2 rev.2		Event # 5 & 6		Page 28 of 31	
Event Description:		Feedwater break in containment with auto reactor trip failure / FWIV 'B' Failure to close					

Proc /Time	Position	Applicant's Actions or Behavior
E-2	**BOP**	(Step 4) ISOLATE Faulted SG(s): a. ISOLATE AFW flow to f aulted SG(s): • CLOSE associated MD AFP Flow Control Valve(s): • AL HK-9A • CLOSE associated TD AFP Flow Control Valve(s): • AL HK-10A b. CHECK ASD from faulted SG(s) – Closed • AB PIC-2A c. Locally close TDAFP steam supply manual isolation from faulted SG B: • ABV0085 d. CHECK Main Feedwater valves to faulted SG(s) – Closed • Main Feedwater Reg Valve: • AE ZL-520 • Main Feedwater Reg Bypass valve: • AE ZL-560 • Feedwater Isolation Valve • AE HIS-40 e. CHECK SG Blowdown Containment Isolation valve from faulted SG(s) – Closed • BM HIS-2A f. Close Steamline Low Point Drain valve from faulted SG: • AB HIS-8
CRITICAL TASK #2	**BOP**	**Isolate faulted SG 'B' before transition out of E-2**
	BOP	(Step 5) CHECK CST to AFP suction header pressure > 2.75 psig

Op Test No.:	2017-1	Scenario #	2 rev.2	Event #	5 & 6	Page	29 of 31
Event Description:	Feedwater break in containment with auto reactor trip failure / FWIV 'B' Failure to close						

Proc /Time	Position	Applicant's Actions or Behavior
E-2	**BOP**	(Step 6.a) CHECK Secondary Radiation: a. Perform the following: • Perform EOP Addendum 11 to restore SG sampling (below) • Direct Chemistry to periodically sample SGs for activity • Direct RP to survey steamlines in Area 5 as necessary (EOP Addendum 11 Steps:) 1. RESET SI if necessary using SB HS-42A and SB HS-43A 2. RESTORE Instrument Air if necessary: a. CHECK if ESW to Air Compressor valves – OPEN • EF HIS-43 • EF HIS-44 b. START Air Compressor (s): • KA HIS-3C • KA HIS-2C 3. OPEN CCW to Radwaste Supply/Return Valves: • EG HS-69 and EG HS-70 4. Sample SG(s) As Necessary: a. OPEN SG Upper or Lower Sample Inner Containment Isolation Valve(s): • SG A: BM HIS-19 (upper) or BM HIS-35 (lower) • SG B: BM HIS-20 (upper) or BM HIS-36 (lower) • SG C: BM HIS-21 (upper) or BM HIS-37 (lower) • SG D: BM HIS-22 (upper) or BM HIS-38 (lower) b. Direct Chemistry to obtain samples one SG at a time as necessary
	RO	(Step 6.b,c,d) CHECK Secondary Radiation: b. Check unisolated secondary radiation monitors • SG Sample radiation: SJL 026 • SG ASD radiation: • AB RIC-111 / 112 / 113 / 114 • TDAFP exhaust radiation • FC RIC-385 c. Secondary Radiation Normal d. Levels in all SGs – none rising in an uncontrolled manner

Op Test No.:	2017-1	Scenario #	2 rev.2	Event #	5 & 6	Page	30	of 31
Event Description:		Feedwater break in containment with auto reactor trip failure / FWIV 'B' Failure to close						

Proc /Time	Position	Applicant's Actions or Behavior

E-2	**RO**	(Step 7) CHECK if ECCS flow should be reduced:
		• RCS Subcooling – greater than 30°F [50°F]
		• Secondary heat sink:
		  • NR level in at least one intact SG > 7% [25%]
		  OR
		  • Total feed flow to intact SGs > 285,000 lbm/hr
		• RCS pressure stable or rising
		• PZR level > 9% [29%]

	RO	(Step 8) RESET SI using SB HS-42A and SB HS-43A
	RO	(Step 9) STOP all but one CCP • BG HIS-1A OR • BG HIS-2A
	CRS	(Step 10) Go to ES-1.1, SI Termination, Step 3
		ES-1.1, SI Termination

ES-1.1	**RO**	(Step 3) RESET Containment Isolation Phase A and Phase B
		• Phase A (CISA):
		  • SB HS-53
		  • SB HS-56
		• Phase B (CISB):
		  • SB HS-52
		  • SB HS-55

Op Test No.: 2017-1	Scenario # 2 rev.2	Event # 5 & 6	Page 31 of 31				
Event Description:	Feedwater break in containment with auto reactor trip failure / FWIV 'B' Failure to close						

Proc /Time	Position	Applicant's Actions or Behavior
ES-1.1	**RO**	(Step 4) Establish Instrument Air to Containment: a. CHECK if ESW to Air Compressor Valves – OPEN • EF HIS-43 • EF HIS-44 b. START Air Compressor(s): • KA HIS-3C • KA HIS-2C c. OPEN Instrument air supply to containment isolation valve: • KA HIS-29
	RO	(Step 5) CHECK RCS Pressure Stable or Rising
	RO	(Step 6) ISOLATE Boron Injection Header: a. CCP – Suction aligned to RWST b. RESET CCP Recirc Valves • BG HS-8110 • BG HS-8111 c. CHECK CCP Recirc valves – open • BG HIS-8110 • BG HIS-8111 d. CLOSE Boron Injection Header Inlet Valves: • EM HIS-8803A • EM HIS-8803B e. CLOSE Boron Injection Header Outlet Valves: • EM HIS-8801A • EM HIS-8801B
The scenario can be terminated at the discretion of the Lead Examiner		

Facility: Callaway Scenario No.: 3 , Rev 1 Op-Test No.: 2017-1

Examiners: ______________________ Operators: ______________________

Initial Conditions: Mode 3 with shutdown banks withdrawn

Turnover: No equipment out of service. The crew is directed to dilute the RCS to desired ECP boron concentration.

Event No.	Malf. No.	Event Type*	Event Description
1	NA	SRO (N) RO (N)	Dilute RCS to ECP boron concentration OTN-BG-00001, Reactor Makeup Control and Boron Thermal Regeneration system
2	SEN0031	SRO (I) RO (I)	Source Range Channel N31 fails high to 700 cps OTO-SE-00001, Nuclear Instrument Malfunction Tech Specs 3.3.1 and 3.3.9
3	PEC01B	SRO (C) BOP (C)	SFP Cooling Pump 'B' Trips OTA-RK-00022 Addendum 76E, Spent Fuel Pool Cooling Pump B Trip
4	ABPV0004	SRO (C) BOP (C)	Atmospheric Steam Dump 'D' fails open with manual control OTO-AB-00001, Steam Dump Malfunction Tech Spec 3.7.4
5	BB001_C	SRO (C) RO (C)	A 25 gpm RCS leak develops. OTO-BB-00003, RCS Excessive Leakage Tech Spec 3.4.13
6	BB001_C	SRO (M) RO (M) BOP (M)	Small break LOCA E-1, Loss of Reactor or Secondary Coolant
7	EFHV0037	RO (C)	EFHV0037 fails to open on Safety Injection E-0 Attachment A, Automatic Action Verification

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

Target Quantitative Attributes (Per Scenario; See Section D.5.d)	Actual Attributes
1. Total malfunctions (5-8)	6
2. Malfunctions after EOP entry (1-2)	1
3. Abnormal events (2-4)	4
4. Major transients (1-2)	1
5. EOPs entered/requiring substantive actions (1-2)	1
6. EOP contingencies requiring substantive actions (0-2)	0
7. Critical tasks (2-3)	2

The plant is stable in Mode 3 with shutdown banks withdrawn.

Event 1: The crew has been directed to dilute the RCS to the desired Estimated Critical Position boron concentration per step 5.3.10.a of OTG-ZZ-00001, Plant Heatup Cold Shutdown to Hot Standby, using OTN-BG-00002, Reactor Makeup Control and Boron Thermal Regeneration System. The crew will begin a RCS dilution that will last 25 minutes.

Event 2: Once the dilution has been initiated, a failure of Source Range Channel N31 high occurs. The failure will cause a charging pump suction swapover from the VCT to the RWST on flux doubling. The crew should respond per OTO-SE-00001, Nuclear Instrument Malfunction, to stop the RCS dilution evolution and restore the charging pump suction to the VCT. Tech Specs 3.3.1 and 3.3.9 apply.

Event 3: Once Tech Specs have been determined, SFP Cooling Pump 'B' trips. The crew should respond per OTA-RK-00022 Addendum 76E, Spent Fuel Pool Cooling Pump B Trip. The crew should start a Train 'A' CCW pump and start the Train 'A' SFP Cooling Pump using OTN-EC-00001, Fuel Pool Cooling and Cleanup System.

Event 4: Once Train 'A' SFP Cooling is in-service, the 'D' Atmospheric Steam Dump fails open. The BOP operator should close the dump valve using manual control. The crew should enter OTO-AB-00001, Steam Dump Malfunction. Tech Spec 3.7.4 applies.

Event 5: A 25 gpm RCS leak develops. The crew should enter OTO-BB-00003, RCS Excessive Leakage, to quantify the leakage.

Event 6 & 7: Once letdown is isolated, the leak becomes a Small Break LOCA. The crew should take action per foldout page to trip the reactor and safety inject when it is determined that pressurizer level can not be maintained. Tech Spec 3.4.13 applies.

When SI actuates, a NB02 bus fault occurs causing a loss of Train 'B' equipment. In addition, ESW return valve EF HV-37 fails to open on the LOCA sequencer causing a loss of containment cooling. The crew will enter E-0, Reactor Trip or Safety Injection, and should open EF HV-37 when performing Attachment A. Also, the crew will need to secure RCPs when RCP Trip Criteria is met.

The scenario is complete when the crew has transitioned out of E-1, Loss of Reactor or Secondary Coolant, and then to ES-1.2, Post LOCA Cooldown and Depressurization.

Critical Tasks:

Critical Tasks	CT #1: Manually actuate containment cooling by establishing 'A' Train ESW flow by opening EFHV0037 prior to completion of Attachment A of E-0.	CT #2: Trip all RCPs within 5 minutes of meeting RCP trip criteria.
EVENT	7	6
Safety significance	If one train of containment cooling is not actuated, the FSAR assumptions and results are invalid. Because compliance with the assumptions of the FSAR is part of the facility license condition, failure to manually actuate at least one train of containment cooling under the scenario conditions and when it is possible to do so constitutes a violation of the license condition.	Failure to trip the RCPs under the postulated plant conditions leads to core uncovery and to fuel cladding temperatures in excess of 2200°F, which is the limit specified in the ECCS acceptance criteria. Thus, failure to perform the task represents misoperation or incorrect crew performance in which the crew has failed to prevent “degradation of...{the fuel cladding} ...barrier to fission product release” and which leads to “violation of the facility license condition.”
Cueing	Indication and/or annunciation that containment cooling is required Indication and/or annunciation that the minimum required complement of containment cooling equipment is not entirely available.	Indications of all the following: • SBLOCA • Safety Injection • Only one train of safety injection pumps actuated RCP Trip Criteria are met RCP Trip Criteria IF BOTH conditions listed below occur, then TRIP all RCPs: • CCPs or SI Pumps – At Least One Running • RCS pressure less than 1425 psig
Performance indicator	Opening EFHV0037, ESW TRN A TO UHS	Manipulation of controls as required to trip all RCPs • RCP breaker position lights indicate breaker open
Performance feedback	EFHV0037, ESW TRN A TO UHS, open light and Flow established to UHS as indicated by EF FI-53	Indication that all RCPs are stopped • RCP breaker position lights • RCP flow decreasing • RCP motor amps decreasing
Justification for the chosen performance limit	“before completion of Attachment A of E-0” is in accordance with the PWR Owners Group Emergency Response Guidelines. It allows enough time for the crew to take the correct action while at the same time preventing avoidable adverse consequences.	In a letter to the NRC titled “Justification of the Manual RCP Trip for Small Break LOCA Events” (OG-117, March 1984) (also known as the Sheppard letter), the WOG provided the required assurance based on the results of the analyses performed in conjunction with WCAP-9584. The WOG showed that for all Westinghouse plants, more than two minutes were available between onset of the trip criteria and depletion of RCS inventory to the critical inventory. In fact, additional analyses sponsored by the WOG in connection with OG-117 conservatively showed that manual RCP trip could be delayed for five minutes beyond the onset of the RCP trip criteria without incurring any adverse consequence.
PWR Owners Group Appendix	CT-3, Manually actuate containment cooling	CT-16, Manually Trip RCPs

Scenario Procedure References
Callaway 2017-1 NRC Scenario #3, rev. 1

References
OTG-ZZ-00001, Plant Heatup Cold Shutdown to Hot Standby
OTN-BG-00002, Reactor Makeup Control and Boron Thermal Regeneration System
OTO-SE-00001, Nuclear Instrument Malfunction
OTA-RK-00022 Addendum 76E, Spent Fuel Pool Cooling Pump B Trip
OTN-EC-00001, Fuel Pool Cooling and Cleanup System
OTN-EG-00001, Component Cooling Water System
OTO-AB-00001, Steam Dump Malfunction
OTO-BB-00003, RCS Excessive Leakage
E-0, Reactor Trip or Safety Injection
E-1, Loss of Reactor or Secondary Coolant
ES-1.2, Post LOCA Cooldown and Depressurization
EOP Addendum 26, SIS Status Panel Alignment

PRA Systems, Events or Operator Actions

Small Break LOCA (36% of contribution to CDF)

Scenario #3 Setup Guide:

Establish the initial conditions of IC-190, MOL, Mode 3 (may set an exam specific IC)

- RCS boron concentration 1500 ppm
- Shutdown Banks Withdrawn

=============SCENARIO PRELOADS / SETUP ITEMS================

Establish desired Boron Concentration

- Insert Plant Parameters (BB) TAHIBO, Value = 1500

NB02 Bus lockout B CCP start

- Insert Malfunction (NB) NB02_F, Value = fault, conditional = "hwx01o147r eq 1"

EFHV0037 failure to open on sequencer

- Insert ME Schematics, (EF) e23ef06, 42 O relay, Malfunction EF15RL_42_OTVSP = 0
- Insert EF15RL_42_OTVSP, value = -1, conditional = "X19i261o eq 1"

============= EVENT 1 ===================================

Dilute RCS to ECP boron concentration

============= EVENT 2 ===================================

Source Range Channel N31 fails high to 700 cps.

- Insert Malfunction (SE) SEN0031_1, Value = 700

=============EVENT 3 ===================================

SFP Cooling Pump 'B' Trips

- Insert Malfunction (EC) PEC01B, Value = Trip

=============EVENT 4 ===================================

Atmospheric Steam Dump 'D' fails open with manual control

- Insert Malfunction (AB) ABPV0004A_1, Value = 1

=============EVENT 5 ===================================

A 25 gpm RCS leak develops

- Insert Malfunction (BB) BB001_C, Value = 25

=============EVENT 6===================================

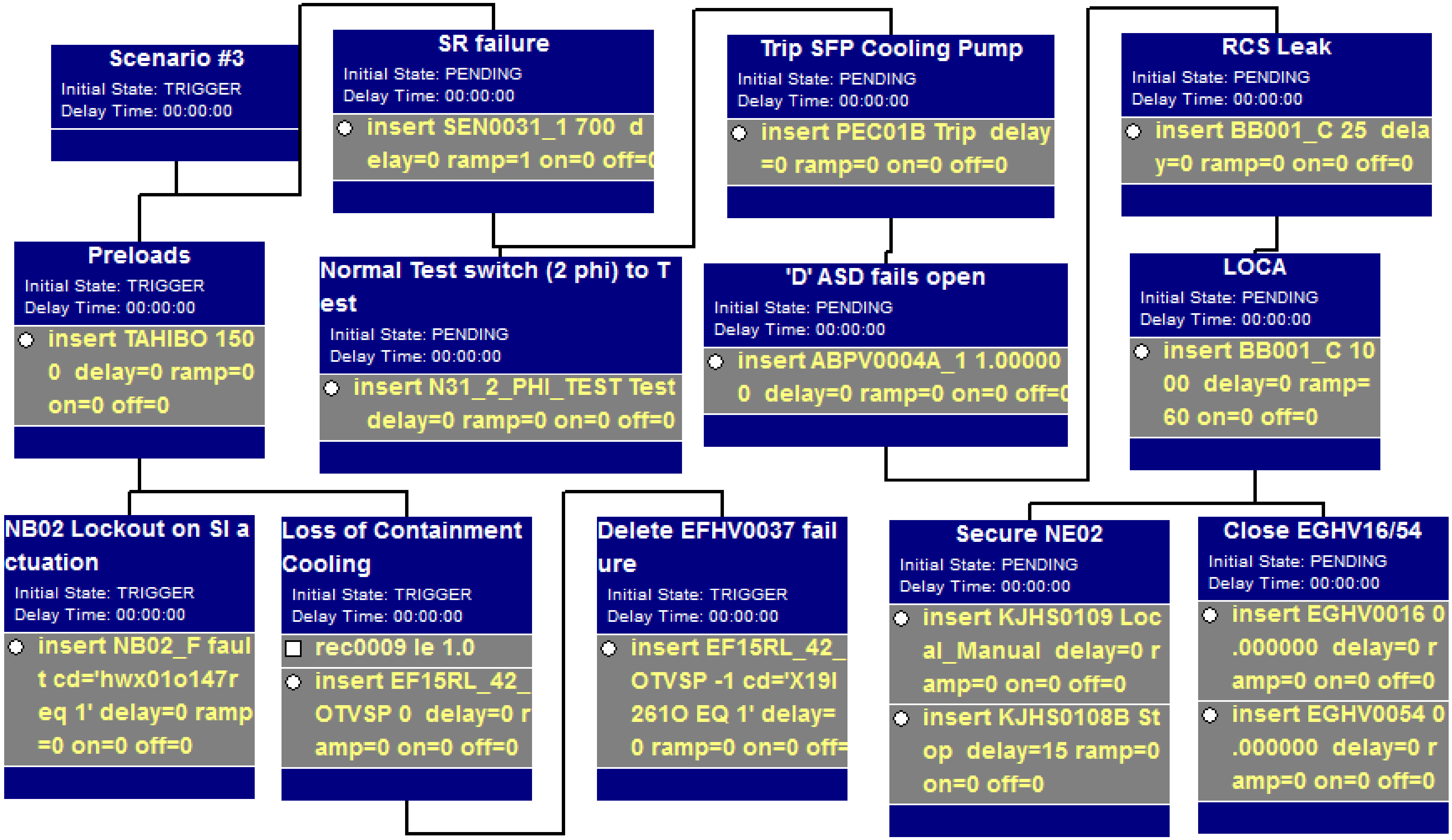
Small Break LOCA

- Insert Malfunction (BB) BB001_C, Value = 1000

=============EVENT 7===================================

EFHV0037 fails to open on Safety Injection

- See preloads


Scenario #3
Initial State: TRIGGER
Delay Time: 00:00:00
SR failure
Initial State: PENDING
Delay Time: 00:00:00
insert SEN0031_1 700 delay=0 ramp=1 on=0 off=0
Trip SFP Cooling Pump
Initial State: PENDING
Delay Time: 00:00:00
insert PEC01B Trip delay=0 ramp=0 on=0 off=0
RCS Leak
Initial State: PENDING
Delay Time: 00:00:00
insert BB001_C 25 delay=0 ramp=0 on=0 off=0
Preloads
Initial State: TRIGGER
Delay Time: 00:00:00
insert TAHIBO 1500 delay=0 ramp=0 on=0 off=0
Normal Test switch (2 phi) to Test
Initial State: PENDING
Delay Time: 00:00:00
insert N31_2_PHI_TEST Test delay=0 ramp=0 on=0 off=0
'D' ASD fails open
Initial State: PENDING
Delay Time: 00:00:00
insert ABPV0004A_1 1.000000 delay=0 ramp=0 on=0 off=0
LOCA
Initial State: PENDING
Delay Time: 00:00:00
insert BB001_C 1000 delay=0 ramp=60 on=0 off=0
NB02 Lockout on SI actuation
Initial State: TRIGGER
Delay Time: 00:00:00
insert NB02_F fault cd='hwx01o147r eq 1' delay=0 ramp=0 on=0 off=0
Loss of Containment Cooling
Initial State: TRIGGER
Delay Time: 00:00:00
rec0009 le 1.0
insert EF15RL_42_OTVSP 0 delay=0 ramp=0 on=0 off=0
Delete EFHV0037 failure
Initial State: TRIGGER
Delay Time: 00:00:00
insert EF15RL_42_OTVSP -1 cd='X19I261O EQ 1' delay=0 ramp=0 on=0 off=
Secure NE02
Initial State: PENDING
Delay Time: 00:00:00
insert KJHS0109 Local_Manual delay=0 ramp=0 on=0 off=0
insert KJHS0108B Stop delay=15 ramp=0 on=0 off=0
Close EGHV16/54
Initial State: PENDING
Delay Time: 00:00:00
insert EGHV0016 0.000000 delay=0 ramp=0 on=0 off=0
insert EGHV0054 0.000000 delay=0 ramp=0 on=0 off=0

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Event Description:		Dilute the RCS to ECP boron concentration						

Proc /Time	Position	Applicant's Actions or Behavior
Booth Operator: • none		
Indications Available		
OTN-BG-00002, Reactor Makeup Control and Boron Thermal Regeneration System		
	CRS	Implement OTN-BG-00002
OTN-BG-00002	**RO**	(Step 5.2.1) Determine the desired dilution volume and flow rate using the following (as applicable) • Curve book Figure 7-5 • 3171 gallons of dilution required to reach desired ECP concentration
		Attachment 6 is utilized for nominal 120 gpm dilutions
Attachment 6	**RO**	(Step 1) PLACE BG HS-26 in STOP
	RO	(Step 2) PLACE BG HS-25 in DIL
	RO	(Step 3) RESET BG FY-111B to 000
	RO	(Step 4) ENSURE BG FY-111B is set to deliver the desired amount of makeup water. Set to 3171 gallons.
	RO	(Step 5) PLACE BG HS-26 in RUN
	RO	(Step 6) WHEN the desired amount of water has been added, PLACE BG HS-26 in STOP
NOTE		**Once the dilution is initiated or at discretion of lead examiner, move on to the next event.**

Op Test No.: 2017-1	Scenario # 3 rev.1	Event # 2	Page 8 of 32
Event Description:	Source Range Channel N31 fails high to 700 cps		

Proc /Time	Position	Applicant's Actions or Behavior

Booth Operator:

- TRIGGER SR failure
- When contacted as I&C to put normal/test switch for N31, TRIGGER Normal Test switch (2 phi) to Test

Indications Available

ANN 57A – SR FLUX DOUBLED

OTO-SE-00001, Nuclear Instrument Malfunction

	CRS	Implement OTO-SE-00001
OTO-SE-00001	**RO**	(Step 1) CHECK Power Range NIs normal
	RO	(Step 2) CHECK Intermediate Range NIs normal
	RO	(Step 3) CHECK Source Range NIs normal: RNO: Go to Attachment C, Source Range Instrument Malfunction
	RO	(Step C1) CHECK Reactor Power greater than P-6: RNO: Go to Step C5
	RO	(Step C5) CHECK High Flux at Shutdown in alarm
	RO	(Step C6) CHECK Plant Personnel – Inside Containment RNO: Go to Step C9
	RO	(Step C9) CHECK plant status. The plant is in Mode 3.
	RO	(Step C10) Check one source range indication operable
	RO	(Step C11) Suspend Operations Involving Positive Reactivity Additions

Op Test No.: 2017-1	Scenario # 3 rev.1	Event # 2		Page 9 of 32			
Event Description:	Source Range Channel N31 fails high to 700 cps						

Proc /Time	Position	Applicant's Actions or Behavior
		The crew should stop the RCS dilution.
OTO-SE-00001	**RO**	(Step C12) CHECK Rod Control System – Capable of withdrawal
	RO	(Step C13) RESTORE Inoperable Source Range Channel within 48 hours
	CRS	(Step C14) CHECK plant in Mode 6 RNO: Go to Step C17
	RO	(Step C17) CHECK annunciator 57A, SR FLUX DOUBLED, LIT
	RO	(Step C18 & RNO) CHECK annunciator 57A extinguished RNO: RESTORE charging lineup a. On module NM107 of the affected SR Drawer, DIRECT I&C to place the Normal/Test switch, in TEST. b. PRESS BLOCK on the SR Doubled Block/Reset pushbuttons: • SE HS-11 • SE HS-12 c. PRESS RESET on the SR Doubled Block/Reset pushbottons: • SE HS-11 • SE HS-12 d. ENSURE SR FLUX DBL BLOC on SB069 is EXTINGUISHED e. OPEN VCT outlet valves: • BG HIS-112B • BG HIS-112C f. CLOSE CCP Suction From RWST Valves: • BN HIS-112D • BN HIS-112E g. UPDATE Status Board for current Boron Concentration in charging pumps.
	RO	(Step C19) SELECT an operable channel on NIS recorder • SE NR-45

Op Test No.:	2017-1	Scenario #	3 rev.1	Event #	2	Page	10	of	32
Event Description:		Source Range Channel N31 fails high to 700 cps							

Proc /Time	Position	Applicant's Actions or Behavior
OTO-SE-00001	**CRS**	(Step C20) Place Inoperable Source Range Channel in the EOSL
	CRS	(Step C21) REVIEW Applicable Technical Specifications
		The CRS should enter T/S 3.3.1.A & K for inoperable NI channel and T/S 3.3.9.A for one BDMS train inoperable due to I&C placing Normal/Test switch for N31 in TEST.
NOTE		**At Lead Examiner's discretion move to the next Event**

Op Test No.: 2017-1	Scenario # 3 rev.1	Event # 3	Page 11 of 32				
Event Description:	SFP Cooling Pump 'B' Trips						

Proc /Time	Position	Applicant's Actions or Behavior
Booth Operator: • TRIGGER Trip SFP Cooling Pump • Respond as primary OT to perform the following as directed: o Stop B Train Room Cooler using GGHS0079 o ECV0009 is 36 & ½ turns open o ECV0001 is open o ECV0009 is throttled and flow is 1.75 x 10^6 lbm/hr		
Indications Available ANN 76E – SFP COOL PMP B TRIP		
OTA-RK-00022 Addendum 76E, Spent Fuel Pool Cooling Pump B Trip		
	BOP	Implement OTA-RK-00022 Addendum 76E
OTA-RK-00022 Add 76E	**BOP**	(Step 3.1) Refer to OTN-EC-00001, Fuel Pool Cooling and Cleanup System, and PERFORM Fuel Pool Cooling System Shutdown for Train B
	BOP	(Step 3.2) IF SFP Cooling is required and Train A is not running, Refer to OTN-EC-00001, Fuel Pool Cooling and Cleanup System, and PERFORM Fuel Pool Cooling System Startup for Train A.
	BOP	(Step 3.3) NOTIFY appropriate Maintenance personnel to investigate and correct the problem.
	BOP	(Step 3.4) Refer to FSAR 9.1.3
OTN-EC-00001, Fuel Pool Cooling and Cleanup System		
		Section 5.2 performs system shutdown. Section 5.1 performs system startup. Section 5.3 is used for swapping trains.
OTN-EC-00001	**BOP**	(Step 5.2.1) Using the applicable switch, STOP running Fuel Pool Cooling pump(s): • EC HIS-28, SFP COOL PUMB B
		NOTE: Candidate may leave pump in tripped status for troubleshooting

Op Test No.:	2017-1	Scenario #	3 rev.1	Event #	3	Page	12	of 32
Event Description:		SFP Cooling Pump 'B' Trips						

Proc /Time	Position	Applicant's Actions or Behavior
	BOP	(Step 5.2.2) Using the applicable pushbutton, STOP both Spent Fuel Pool Cooling Pump Room Coolers: • GGHS0079 (Local at NG04CEF1)
OTN-EC-00001	**BOP**	(Step 5.1.1) ENSURE Fuel Pool Cooling Train to be started is filled and vented
	BOP	(Step 5.1.2) MONITOR current plant heat loads and CONSIDER starting idle train of Component Cooling Water/Spent Fuel Pool cooling in accordance with OTN-EG-00001, Component Cooling Water System if necessary.
OTN-EG-00001, Component Cooling Water System		
		Crew may use OTN-EG-00001 section 5.7 or OTN-EG-00001 Addendum 2 section 5.1 to start Train A CCW
OTN-EG-00001	**BOP**	(Step 5.7.1) ENSURE that SW/ESW cooling water is in service to the A CCW Heat Exchanger
	BOP	(Step 5.7.2) If either CCW pump A or C is running, PERFORM the following: a. ENSURE the A CCW Surge Tank level is > 50% b. Using the following, determine the pump with the least run time on the major equipment log c. Using EG HIS-21 or EG HIS-23, START a CCW pump
	BOP	(Step 5.7.3) If shifting service loop from train B to train A, perform the following:
		Shifting the service loop is not required, but may be performed.
OTN-EG-00001 Addendum 2, Supplying CCW to Idle Train Safety Loads		
OTN-EG-00001 Add 2	**BOP**	(Step 5.1.1) ENSURE that SW/ESW cooling water is in service to the A CCW Heat Exchanger with EF HIS-51 open.

Op Test No.: 2017-1	Scenario # 3 rev.1	Event # 3	Page 13 of 32				
Event Description:	SFP Cooling Pump 'B' Trips						

Proc /Time	Position	Applicant's Actions or Behavior
OTN-EG-00001 Add 2	**BOP**	(Step 5.1.2) ENSURE the A CCW Surge Tank level is greater than 50%.
	BOP	(Step 5.1.3) Using the following, DETERMINE the pump with the least run time on the major equipment log: EGQ0021 and EGQ0023 on the plant computer.
	BOP	(Step 5.1.4) Using the applicable switch below, START the CCW pump with the least run-time: • EG HIS-21, CCW PUMP A • EG HIS-23, CCW PUMP C
	BOP	(Step 5.1.5) Using EC HIS-11, THROTTLE ECHV0011 as needed to clear low flow alarms.
	BOP	(Step 5.1.6) As necessary for coarse adjustment, using EG HIS-101 THROTTLE EGHV0101 to maintain annunciator 75D clear.
OTN-EC-00001 continued	**BOP**	(Step 5.1.3) ENSURE the following valves are throttled approximately 36-1/2 turns OPEN: • ECV0009, FUEL POOL HX A TO SFP ISO
	BOP	(Step 5.1.4) ENSURE suction valve for oncoming pump is OPEN: • ECV0001, FUEL POOL COOL PMP A SUCT ISO
	BOP	(Step 5.1.5) Using applicable switch below, START oncoming Fuel Pool Cooling Pump: • EC HIS-27, SFP COOL PUMP A
	BOP	(Step 5.1.6) THROTTLE oncoming train's valve to obtain flow between 1.65 x 10^6 and 1.95 x 10^6 lbm/hr on listed indicator: • ECV0009, FUEL POOL HX A TO SFP ISO

Op Test No.: 2017-1	Scenario # 3 rev.1	Event # 3	Page 14 of 32				
Event Description:	SFP Cooling Pump 'B' Trips						

Proc /Time	Position	Applicant's Actions or Behavior
	BOP	(Step 5.1.7) THROTTLE oncoming train's valve below to control Fuel Pool Hx outlet temperature less than or equal to value listed in Curve Book, Table 8-8b or less than alarm limit (Annunciator 75D) during normal operations, while maintaining CCW flow between 100,0000 and 3.0 x 106 lbm/hr on indicator shown: • EC HIS-11, SFP HX A CCW OUTLET VLV, (observing flow locally on EGFI0079, CCW TO FUEL POOL COOLING HX A FLOW IND, or on Computer Point EGF0079, CCW FLO SFP COOL HX A)
OTN-EC-00001 **Section 5.3**	**BOP**	(Step 5.3.1) IF Refuel Pool Cleanup is in progress (N/A)
	BOP	(Step 5.3.2) RECORD currently running trains of Fuel Pool Cooling and, if it's in service, Fuel Pool Cleanup. Records B.
	BOP	(Step 5.3.3) ENSURE a Component Cooling Water pump is RUNNING to support oncoming train of SFP cooling.
	BOP	(Step 5.3.4) IF in service, STOP running Fuel Pool Cleanup Pump(s) (N/A)
	BOP	(Step 5.3.5) IF SFP Cleanup was in service (N/A)
	BOP	(Step 5.3.6) ENSURE suction valve ECV0001 is OPEN
	BOP	(Step 5.3.7) Using EC HIS-27, START Fuel Pool Cooling Pump A
	BOP	(Step 5.3.8) Using applicable switch, STOP off going cooling pump using EC HIS-28
		NOTE: Candidate may leave pump in tripped status for troubleshooting
	BOP	(Step 5.3.9) IF desired to place SFP Cleanup in service (N/A)

Op Test No.: 2017-1	Scenario # 3 rev.1	Event # 3	Page 15 of 32				
Event Description:	SFP Cooling Pump 'B' Trips						

Proc /Time	Position	Applicant's Actions or Behavior
OTN-EC-00001 **Section 5.3**	**BOP**	(Step 5.3.10) IF required, THROTTLE valve in oncoming train (ECV0009) to obtain flow between 1.65 x 10^6 and 1.95 x 10^6 lbm/hr on indicator ECFI0017B
	BOP	(Step 5.3.11) IF it is desired to place a Fuel Pool Cleanup pump in service (N/A)
	BOP	(Step 5.3.12) Using the applicable pushbutton, STOP off-going Spent Fuel Pool Pump Room Cooler using GGHS0079 locally
NOTE		**At Lead Examiner's discretion move to the next Event**

Op Test No.:	2017-1	Scenario #	3 rev.1	Event #	4	Page	16	of	32
Event Description:		Atmospheric Steam Dump 'D' fails open with manual control							

Proc /Time	Position	Applicant's Actions or Behavior
Booth Operator: • TRIGGER 'D' ASD fails open • Respond as Count Room when contacted about ASD opening		
Indications Available ANN 109F – SG PORV OPEN		
OTO-AB-00001, Steam Dump Malfunction		
		Crew may attempt closure prior to OTO entry
	CRS	Implement OTO-AB-00001
OTO-AB-00001	**RO**	(Step 1) CHECK Reactor Power < 100% by NIs and ΔTs
	BOP	(Step 2) CHECK at least one SG ASD failed open
	BOP	(Step 3) PLACE the affected SG ASD controller in manual and close the valve: • AB PIC-4A
	BOP	(Step 4) NOTIFY count room technician of opening and closing times of the SG ASD
	CRS	(Step 5) Go to Step 17
	CRS	(Step 17) Initiate actions to repair the failed component
	CRS	(Step 18) Review Technical Specification 3.7.4
		The CRS should enter T/S 3.7.4.A
NOTE		**At the direction of the lead evaluator, input the next event.**

Op Test No.: 2017-1	Scenario # 3 rev.1	Event # 5, 6, & 7	Page 17 of 32				
Event Description:	25 GPM RCS Leak / Small break LOCA / EFHV0037 fails to open on Safety Injection						
Proc /Time	Position	Applicant's Actions or Behavior					

Booth Operator:

- o TRIGGER RCS Leak when directed
- o TRIGGER LOCA once letdown is removed from service
- o Respond as Chemistry to perform sampling when directed
- o Respond as RP to survey steamlines when directed.
- o Secure B EDG Locally when directed. TRIGGER Secure NE02
- o Respond as OT when directed to close EOP Addendum 8 Breakers.
- o Respond as OT when directed to place diesels in standby.
- o TRIGGER Close EGHV16/54 when contacted to close EGHV0016/54

Indications Available

ANN 61B – PROCESS RAD HI

OTO-BB-00003, RCS Excessive Leakage

OTO-BB-00003	**RO**	(Step 1) CHECK if pressurizer level can be maintained: • Control charging flow as necessary to maintain PZR level • CHECK pressurizer level stable or rising
	RO	(Step 2) CHECK Pressuizer Level stable or rising
	BOP	(Step 3) EVACUATE NON-Essential Personnel in Containment
	RO	(Step 4) CHECK if VCT level can be maintained greater than 5% by normal makeup
	RO	(Step 5) Determine if plant trip is required: a. Determine leak size and rate of change using any of the following: • Use trends of VCT level and PZR level • Compare charging and letdown flows • Utilize "GD SG17" on plant computer b. Leak rate less than 50 gpm
	RO	(Step 6) Check Pressurizer Pressure at or trending to band of 2220 to 2250 psig.

Op Test No.: 2017-1	Scenario # 3 rev.1	Event # 5, 6, & 7	Page 18 of 32
Event Description:	25 GPM RCS Leak / Small break LOCA / EFHV0037 fails to open on Safety Injection		

Proc /Time	Position	Applicant's Actions or Behavior
OTO-BB-00003	**RO**	(Step 7) CHECK SG Tubes – Intact a. SG Steam Flow/Feed Flow trends b. Condenser Air Removal Radiation • GEG 925 c. SG Blowdown and Sample Radiation Monitors • BML 256 • SJL 026 d. SG Steamline N16 Radiation
	RO	(Step 8) CHECK Containment Conditions normal • Containment Radiation • GTG 313 • GTG 323 • GTA 591 • GTA 601 • Containment Pressure • GN PI-934 • GN PI-935 • GN PI-936 • GN PI-937 • GN PR-934 • Containment Normal Sump Level • LF LI-9 • LF LI-10 • Containment Area Radiation Monitors • SD RE-39 • SD RE-40 • SD RE-41 • SD RE-42 • Instrument Tunnel Sump Level • LF LI-79

Op Test No.: 2017-1	Scenario # 3 rev.1	Event # 5, 6, & 7	Page 19 of 32				
Event Description:	25 GPM RCS Leak / Small break LOCA / EFHV0037 fails to open on Safety Injection						

Proc /Time	Position	Applicant's Actions or Behavior
OTO-BB-00003	**RO**	(Step 8 RNO) If normal letdown is/was in service, then perform the following: 1) CLOSE Letdown Throttle Isolation Valves: • BG HIS-8149AA • BG HIS-8149BA • BG HIS-8149CA 2) CLOSE RCS Letdown to Regen HX isolation Valves: • BG HIS-459 • BG HIS-460 3) IF Leakage is stopped, then establish Excess letdown per Attachment G
		The CRS should enter T/S 3.4.13.A ***Once Tech Spec is determined or at discretion of lead evaluator, input the next event.***
Foldout Page	**RO**	<u>SI Actuation Criteria (Trip Breakers Closed):</u> IF ALL the conditions listed occur, then TRIP the reactor, VERIFY reactor trip, ACUATE SI, and go to E-0, Reactor Trip or Safety Injeciton step 1: • Normal Charging is maximized from one pump • Letdown is isolated • Pressurizer Level is lowering
		E-0, Reactor Trip or Safety Injection
E-0	**RO**	(Step 1) CHECK Reactor Trip: • Rod Bottom Lights – ALL LIT • Reactor Trip and Bypass Breakers – OPEN • Neutron Flux - LOWERING
		Step 1 is an immediate action
	BOP	(Step 2) CHECK Turbine Trip: • All Turbine Stop valves - CLOSED
		Step 2 is an immediate action

Op Test No.:	2017-1	Scenario #	3 rev.1	Event #	5, 6, & 7	Page	20	of 32
Event Description:	25 GPM RCS Leak / Small break LOCA / EFHV0037 fails to open on Safety Injection							

Proc /Time	Position	Applicant's Actions or Behavior
E-0	**BOP**	(Step 3) CHECK Power to AC Emergency Buses: a. AC emergency buses – AT LEAST ONE ENERGIZED b. NB01 is energized. NB02 has bus lockout. RNO: Try to restore power to deenergized AC bus as time permits. Bus is locked out.
		Step 3 is an immediate action
	BOP	(Step 4) Check SI Status: a. Check if SI is actuated • 88D Lit • SB069 SI Actuate Red light is lit • LOCA Sequencers alarms 30A & 31A b. CHECK both Trains of SI-Actuated • 30A lit • 31A lit • SB069 SI Actuate Red light lit solid
		Step 4 is an immediate action. NOTE: Both trains of SI will be actuated. Annunciator 31A will not be lit due to power loss.
FOLDOUT PAGE	**RO/ BOP**	<u>RCP Trip Criteria:</u> IF BOTH conditions listed below occur, then TRIP all RCPs: • CCPs or SI Pumps – At Least One Running • RCS pressure less than 1425 psig
		Time RCP Trip Criteria is met = ________ **Time Last RCP is tripped = _________**
CRITICAL TASK #2	**RO/ BOP**	**Trip all RCPs within 5 minutes of meeting RCP trip criteria.**
	RO	(Step 5) PERFORM Attachment A
		Only Train 'A' Equipment will be available. Applicable RNOs are listed.

Op Test No.: 2017-1	Scenario # 3 rev.1	Event # 5, 6, & 7	Page 21 of 32
Event Description:	25 GPM RCS Leak / Small break LOCA / EFHV0037 fails to open on Safety Injection		

Proc /Time	Position	Applicant's Actions or Behavior
E-0 **Attachment A**	**RO**	(Step A1) Check Charging Pumps: a. CCPs – Both Running • BG HIS-1A • BG HIS-2A (not running) b. Stop NCP • BG HIS-3
	RO	(Step A2) CHECK SI and RHR Pumps: • SI Pumps – BOTH RUNNING • EM HIS-4 • EM HIS-5 (not running) • RHR Pumps – BOTH RUNNING • EJ HIS-1 • EJ HIS-2 (not running)
	RO	(Step A3) CHECK ECCS flow: a. CCPs to Boron Inj Header – FLOW INDICATED • EM FI-917A • EM FI-917B b. RCS pressure – Less than 1700 psig c. SI Pump Discharge – Flow indicated • EM FI-918 • EM FI-922 d. RCS Pressure less than 325 psig RNO: Go to step A4
	RO	(Step A4) CHECK ESW Pumps – BOTH RUNNING • EF HIS-55A • EF HIS-56A (not running) RNO c: If any DG is running with no cooling water, then stop the affected DG(s): • IF DG(s) can NOT be stopped, then locally trip affected DG(s)
		Since the DG can not be stopped due to UV signal, direction should be given to locally secure the 'B' Train EDG.

Op Test No.: 2017-1	Scenario # 3 rev.1	Event # 5, 6, & 7	Page 22 of 32				
Event Description:	25 GPM RCS Leak / Small break LOCA / EFHV0037 fails to open on Safety Injection						

Proc /Time	Position	Applicant's Actions or Behavior
E-0 **Attachment A**	**RO**	(Step A5) CHECK CCW Alignment: a. CCW Pumps – one running in each train • Red Train: EG HIS-21 or EG HIS-23 • Yellow Train: EG HIS-22 or EG HIS-24 b. CCW Service Loop Supply and Return valves for one operating CCW pump – OPEN • EG ZL-15 and EG ZL-53 • OR • EG ZL-16 and EG ZL-54 RNO: Align CCW valve(s) as necessary. Open EG ZL-15 and EG ZL-53. c. OPEN CCW to RHR HX valves: • EG HIS-101 • EG HIS-102 d. CLOSE Spent Fuel Pool HX CCW Outlet Valves: • EC HIS-11 • EC HIS-12 e. STOP Spent Fuel Pool Cooling Pump(s): • EC HIS-27 • EC HIS-28 f. RECORD the time spent fuel pool cooling pump secured g. MONITOR time CCW flow isolated to SFP HX < 4 hours
	RO	(Step A6) CHECK Containment Cooler Fans running in slow • GN HIS-9 • GN HIS-17 • GN HIS-5 • GN HIS-13

Op Test No.: 2017-1	Scenario # 3 rev.1	Event # 5, 6, & 7	Page 23 of 32				
Event Description:	25 GPM RCS Leak / Small break LOCA / EFHV0037 fails to open on Safety Injection						

Proc /Time	Position	Applicant's Actions or Behavior
E-0 **Attachment A**	**RO**	(Step A7) CHECK Containment H2 Mixing Fans in slow • GN HIS-2 • GN HIS-4 • GN HIS-1 • GN HIS-3
	RO	(Step A8) CHECK if Containment Spray should be actuated • Containment Pressure > 27 psig • GN PR-934 indicates ctmt pressure has been > 27 psig • Annunciator 59A CSAS LIT • Annunciator 59B CISB LIT RNO: Go to step A9
	RO	(Step A9) CHECK if Main Steamlines should be Isolated a. Check the following: • Containment pressure > 17 psig • GN PR-934 indicates ctmt pressure has been > 17 psig • Steamline pressure < 615 psig • AB PR-514 or 535 shows pressure has been < 615 psig b. CHECK MSIVs and Bypass valves - CLOSED
	RO	(Step A10) CHECK ECCS Valves in proper alignment a. ESFAS Status Panels SIS sections: • SA066X WHITE lights – ALL LIT: H2, ESW A TO UHS ISO VLV EFHV37, is DARK • SA066Y WHITE lights – ALL LIT RNO: Align SIS component as necessary. Refer to EOP Addendum 26, SIS Status Panel Alignment, as necessary. Press OPEN on EF HIS-37.
CRITICAL TASK #1	**RO**	**Manually actuate containment cooling by establishing 'A' Train ESW flow by opening EFHV0037, ESW TRN A TO UHS, prior to completion of Attachment A of E-0.**

Op Test No.: 2017-1	Scenario # 3 rev.1	Event # 5, 6, & 7 Page 24 of 32
Event Description:	25 GPM RCS Leak / Small break LOCA / EFHV0037 fails to open on Safety Injection	
Proc /Time	Position	Applicant's Actions or Behavior

E-0 **Attachment A**	**RO**	(Step A11) CHECK Containment Isolation Phase A: a. ESFAS status panels CISA sections: • SA066X WHITE lights – ALL LIT • SA066Y WHITE lights – ALL LIT
	RO	(Step A12) CHECK SG Blowdown Isolation: a. ESFAS status panels SGBSIS sections: • SA066X WHITE lights – ALL LIT • SA066Y WHITE lights – ALL LIT
	RO	(Step A13) CHECK Both Trains of CRVIS a. ESFAS status panels CRVIS sections: • SA066X WHITE lights – ALL LIT • SA066Y WHITE lights – ALL LIT RNO: 3) IF any CRVIS Train can not be fully aligned • IF CRVIS Train B can NOT be fully aligned, then place the following equipment in Pull to Lock a) Control Room Pressurization Fan B: • GK HIS-83 b) Control Room Filtration Fan B: • GK HIS-30 c) Control Room AC Unit B: • GK HIS-40
	RO	(Step A14) CHECK Containment Purge Isolation: a. ESFAS status panels CPIS sections: • SA066X WHITE lights – ALL LIT • SA066Y WHITE lights – ALL LIT
	RO	(Step A15) NOTIFY CRS of the following: • Unanticipated manual actions taken • Failed Equipment Status • Attachment A completion

Op Test No.: 2017-1	Scenario # 3 rev.1	Event # 5, 6, & 7	Page 25 of 32				

Event Description: 25 GPM RCS Leak / Small break LOCA / EFHV0037 fails to open on Safety Injection

Proc /Time	Position	Applicant's Actions or Behavior
E-0	**BOP**	(Step 6) CHECK Generator Output Breakers – OPEN • MA ZL-3A (V55) • MA ZL-4A (V53)
	BOP	(Step 7) CHECK Feedwater Isolation: a. MFPs Tripped • ANN 120A, MFP A Trip – LIT • ANN 123A, MFP B Trip b. Main Feedwater Reg Valves – CLOSED • AE ZL-510 • AE ZL-520 • AE ZL-530 • AE ZL-540 c. Main Feedwater Reg Bypass Valves – CLOSED • AE ZL-550 • AE ZL-560 • AE ZL-570 • AE ZL-580 d. Feedwater Isolation Valves – CLOSED • AE HIS-39 • AE HIS-40 • AE HIS-41 • AE HIS-42
	BOP	(Step 8) CHECK AFW Pumps: a. MD AFW Pumps – BOTH RUNNING • AL HIS-23A • AL HIS-22A (not running) b. TDAFP -Running if Necessary

Op Test No.: 2017-1	Scenario # 3 rev.1	Event # 5, 6, & 7	Page 26 of 32	
Event Description:	25 GPM RCS Leak / Small break LOCA / EFHV0037 fails to open on Safety Injection			

Proc /Time	Position	Applicant's Actions or Behavior

E-0	**BOP**	(Step 9) CHECK AFW Valves – proper emergency alignment
		• MD AFP Flow Control Valves – THROTTLED
		  • AL HK-7A
		  • AL HK-9A
		  • AL HK-11A
		  • AL HK-5A
		• TD AFP Flow Control Valves – FULL OPEN
		  • AL HK-8A
		  • AL HK-10A
		  • AL HK-12A
		  • AL HK-6A
		• TD AFP Loop Steam Supply Valves – BOTH OPEN IF NECESSARY
		  • AB HIS-5A
		  • AB HIS-6A

	BOP	(Step 10) CHECK Total AFW Flow > 285,000 lbm/hr

	BOP	(Step 11) CHECK PZR PORVs and Spray Valves:
		a. PZR PORVs – CLOSED
		  • BB HIS-455A
		  • BB HIS-456A
		b. PZR PORVs – Both in AUTO
		  • BB HIS-455A
		  • BB HIS-456A
		c. PORV Block Valves – BOTH OPEN
		  • BB HIS-8000A
		  • BB HIS-8000B
		d. Normal PZR Spray valves – CLOSED
		  • BB ZL-455B
		  • BB ZL-455C

Op Test No.: 2017-1	Scenario # 3 rev.1	Event # 5, 6, & 7	Page 27 of 32				

Event Description: 25 GPM RCS Leak / Small break LOCA / EFHV0037 fails to open on Safety Injection

Proc /Time	Position	Applicant's Actions or Behavior
E-0	**BOP**	(Step 12) CHECK if RCPs should be stopped: a. RCPs – ANY RUNNING b. ECCS Pumps – AT LEAST ONE RUNNING • CCP OR • SI Pump c. RCS Pressure < 1425 psig d. STOP all RCPs
		Time RCP Trip Criteria is met = ________ **Time Last RCP is tripped = _________**
CRITICAL TASK #2	**RO/ BOP**	**Trip all RCPs within 5 minutes of meeting RCP trip criteria.**
	BOP	(Step 13) CHECK RCS Temperatures: • RCS Tcold stable at or trending to 557°F RNO: If temperature is less than 557°F and lowering, then perform the following: a. STOP dumping steam b. IF cooldown continues, THEN CONTROL total feed flow: maintain > 285,000 lbm/hr until NR level is > 7% in at least one SG c. If cooldown continues, then fast close MSIVs and bypass valves using AB HS-79 & AB HS-80
	BOP	(Step 14) CHECK if any SG is faulted: a. Check pressures in all SGs: • Any SG pressure lowering in an uncontrolled manner or completely depressurized. RNO: Go to Step 15
	BOP	(Step 15) CHECK if SG Tubes Are Intact: • Levels in all SGs: No NR level rising in uncontrolled manner and Radiation is Normal

Op Test No.: 2017-1	Scenario # 3 rev.1	Event # 5, 6, & 7	Page 28 of 32
Event Description:	25 GPM RCS Leak / Small break LOCA / EFHV0037 fails to open on Safety Injection		

Proc /Time	Position	Applicant's Actions or Behavior

E-0	**BOP**	(Step 16) CHECK If RCS Is Intact:
		• Containment Pressure – NORMAL
		  • GN PI-934
		  • GN PI-935
		  • GN PI-936
		  • GN PI-937
		  • GN PR-934
		• Containment Normal Sump Level – Normal
		  • LF LI-9
		  • LF LI-10
		• Containment Radiation – Normal before isolation
		  • GTG 313
		  • GTG 323
		  • GTA 591
		  • GTA 601
		RNO: Go to E-1 ,Loss of Reactor or Secondary Coolant, Step 1

		E-1, Loss of Reactor or Secondary Coolant
E-1	**RO**	(Step 1) CHECK if RCPs should be stopped: a. RCPs – Any Running: RNO a. Go to step 2. OBSERVE NOTE prior to Step 2

	BOP	(Step 2) CHECK if any SG is faulted:
		a. Check pressure in all SGs:
		  • Any SG depressurizing in an uncontrolled manner
		  • Any SG completely depressurized
		RNO: Go to Step 3

	BOP	(Step 3) CHECK Intact SG Levels: a. NR levels > 7% [25%] b. CONTROL feed flow to maintain level 7% [25%] and 52%

Op Test No.: 2017-1	Scenario # 3 rev.1	Event # 5, 6, & 7	Page 29 of 32				
Event Description:	25 GPM RCS Leak / Small break LOCA / EFHV0037 fails to open on Safety Injection						

Proc /Time	Position	Applicant's Actions or Behavior
E-1	**BOP**	(Step 4) CHECK Secondary Radiation – Normal a. PERFORM the following: • EOP Addendum 11, Restoring SG Sampling After SI Actuation • DIRECT Chemistry to sample SGs for activity • DIRECT RP to survey steamlines in Area 5 b. CHECK unisolated Secondary radiation monitors: • SG Sample Radiation • SJL 026 • SG ASD radiation: • AB RIC-111 • AB RIC-112 • AB RIC-113 • AB RIC-114 • TDAFP • FC RIC-385 c. Secondary Radiation – Normal
	RO	(Step 5) CHECK PZR PORVs and Block Valves: a. Power to Block Valves: • BB HIS-8000A • BB HIS-8000B b. PZR PORVs – Closed • BB HIS-455A • BB HIS-456A c. Block Valves – BOTH OPEN • BB HIS-8000A • BB HIS-8000B
	RO	(Step 6) CHECK If ECCS flow should be reduced: • RCS subcooling greater than 30°F [50°F] • Secondary Heat Sink: • NR level in at least one intact SG > 7% [25%] OR • Total feed flow to intact SGs > 285,000 lbm/hr • RCS pressure stable or rising RNO: Go to Step 7

Op Test No.: 2017-1	Scenario # 3 rev.1	Event # 5, 6, & 7	Page 30 of 32
Event Description:	25 GPM RCS Leak / Small break LOCA / EFHV0037 fails to open on Safety Injection		

Proc /Time	Position	Applicant's Actions or Behavior
E-1	**BOP**	(Step 7) CHECK if Containment Spray should be Stopped: • Spray Pumps – any running. None are running. RNO: Go to step 8
	RO	(Step 8) CHECK if RHR Pumps should be stopped: a. CHECK RCS pressure: 1) Pressure > 325 psig 2) Pressure – Stable or rising RNO: Go to step 9
		The crew may secure RHR pumps if pressure has stabilized
	RO	(Step 9) CHECK SG and RCS Pressures: • CHECK pressure in all SGs – stable or rising • CHECK RCS pressure – stable or lowering
		Note: SG pressures may be lowering slowly due to RCS Cooldown from injection flow.
	BOP	(Step10) CHECK if DGs Should be stopped: a. AC emergency buses – energized by offsite power • NB01 b. RESET SI if necessary: • SB HS-42A • SB HS-43A c. LOAD equipment on AC emergency bus(es) as necessary using EOP Addendum 8. (Perform for 'A' Train Equipment) d. STOP any unloaded DG(s) and place in standby 1) PUSH START/RESET button: • KJ-HS-8A 2) PUSH STOP button: • KJ HS-8A 3) Perform EOP Addendum 9 to place DGs in standby

Op Test No.: 2017-1	Scenario # 3 rev.1	Event # 5, 6, & 7	Page 31 of 32
Event Description:	25 GPM RCS Leak / Small break LOCA / EFHV0037 fails to open on Safety Injection		

Proc /Time	Position	Applicant's Actions or Behavior
E-1	**BOP**	(Step 11) CHECK UHS Normal: a. NG07 and NG08 Bus annunciators – CLEAR • 30E, NG07 Bus UV/OV • 31E, NG08 Bus UV/OV RNO: If alarm is due to undervoltage, secure the affected train using EOP Addendum 17 b. Determine ESW Return Temperature: • Computer Point EFT0067A, UHS Cool TWR in Temp A c. CHECK UHS Cooling Tower Bypass Valve 1) COMPARE UHS Cooling Tower Bypass Valve Position to ESW Return Temperature: • IF ESW Return temperature is $\geq$ 84°F the cooling tower bypass valve is closed • IF return temperature is < 78°F, the cooling tower bypass valve is open 2) UHS Cooling Tower Bypass Valves – NORMAL • EF HIS-65A d. CHECK UHS Cooling Tower Fans Speeds 1) Compare UHS Fan Speed to ESW Return Temperature • If ESW return temperature is $\geq$ 95°F both cooling tower fans are on in slow speed • If ESW Return temperature is $\geq$ 105°F both cooling tower fans on in fast speed • If ESW return temperature is restored to $\leq$ 102.5°F both cooling tower fans are on in slow speed • If ESW return temperature is restored to < 92.5°F both cooling tower fans are off. 2) UHS Cooling Tower Fan Status - Normal

Op Test No.: 2017-1	Scenario # 3 rev.1	Event # 5, 6, & 7	Page 32 of 32
Event Description:	25 GPM RCS Leak / Small break LOCA / EFHV0037 fails to open on Safety Injection		

Proc /Time	Position	Applicant's Actions or Behavior
E-1	**RO**	(Step 12) Initiate Evaluation of Plant Status: a. CHECK Cold leg recirculation capability: • Train A – Available • RHR Pump A • CCW Pump A or C • RWST to RHR Pump A Suction (BN HIS-8812A) • Containment Recirc Sump to RHR Pump A Suction (EJ HIS-8811A) • CCW To RHR HX A (EG HIS-101) b. CHECK Auxiliary Building radiation – NORMAL • Aux Building Process Radiation monitor • GLP 604 • Aux Building Area Radiation monitors c. OBTAIN Samples: 1) Direct chemistry to initiate post-accident sampling 2) Place hydrogen analyzers in service using EOP addendum 16 3) Consult Plant Engineering Staff for assessing additional sampling requirements for fuel damage d. Evaluate Plant Equipment for long term recovery as necessary e. Start additional plant equipment to assist in recovery as directed by SM/CRS
	RO	(Step 13) CHECK if RCS Cooldown and Depressurization is Required: a. RCS pressure > 325 psig b. Go to ES-1.2, Post LOCA Cooldown and Depressization, Step 1
The scenario can be terminated at the discretion of the Lead Examiner		

Facility: Callaway	Scenario No.: 4 , Rev 3	Op-Test No.: 2017-1
Examiners: ______	Operators: ______	

Initial Conditions: The plant is stable at 80%.

Turnover: No equipment out of service

Event No.	Malf. No.	Event Type*	Event Description
1	BNLT0931	SRO (T)	RWST Level Channel BN LI-931 fails low OTO-BN-00001, RWST Level Channel Malfunction Tech Spec 3.3.2
2	ACPT0505	SRO (I) RO (I) BOP (I)	Turbine impulse pressure channel AC PT-505 fails low OTO-SF-00001, Rod Control Malfunctions OTO-AC-00003, Turbine Impulse Pressure Channel Failure Tech Spec 3.3.1
3	BBPCV045 5B	SRO (C) RO (C)	Loop 1 spray valve fails 50% open OTO-BB-00006, Pressurizer Pressure Control Malfunction
4	EGHV0071	SRO (C) BOP (C)	CCW flow to containment isolated by EG HV-71 closure OTO-EG-00001, CCW System Malfunction OTO-BB-00002, RCP Off-Normal
5	LOOP	SRO (M) RO (M) BOP (M)	Loss of Off-Site Power and plant trip E-0, Reactor Trip or Safety Injection
6	PAL02_1	BOP (C)	TDAFP fails to auto-start. Total loss of AFW flow.

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

Target Quantitative Attributes (Per Scenario; See Section D.5.d)	Actual Attributes
1. Total malfunctions (5-8)	6
2. Malfunctions after EOP entry (1-2)	1
3. Abnormal events (2-4)	4
4. Major transients (1-2)	1
5. EOPs entered/requiring substantive actions (1-2)	2
6. EOP contingencies requiring substantive actions (0-2)	1
7. Critical tasks (2-3)	2

The plant is stable at 80% power with no equipment out of service.

Event 1: Following the reactivity brief RWST Level Channel BN LI-931 fails low. The crew should enter OTO-BN-00001, RWST Level Channel Malfunction. Tech Spec 3.3.2 applies.

Event 2: Once Tech Specs have been determined and level control is in automatic, a failure of turbine impulse pressure AC PT-505 occurs causing control rods to insert into the core. The crew should utilize the immediate actions of OTO-SF-00001, Rod Control Malfunctions, to place rods in manual , and then enter OTO-AC-00003, Turbine Impulse Pressure Channel Failure, to select away and restore rods at or near the original position and restore rod control to automatic. Tech Spec 3.3.1 applies.

Event 3: Once rod restoration is complete, the loop 1 pressurizer spray valve BB PCV-455B fails 50% open. The crew should take manual control of the loop 1 spray valve and close it using OTO-BB-00006, Pressurizer Pressure Control Malfunction.

Event 4: When pressurizer pressure has stabilized, CCW flow is lost to containment when EG HV-71 fails closed. The crew should enter OTO-EG-00001, CCW System Malfunction, and re-establish CCW flow to containment by energizing and opening bypass valve EG HV-126. This action must be accomplished within 10 minutes to prevent damage to RCPs. The crew may use OTO-BB-00002, RCP Off-Normal, instead of OTO-EG-00001 to re-establish flow.

Events 5 & 6: A reactor trip occurs from a combination of partial loss of off-site power and turbine trip. The crew will respond per E-0, Reactor Trip or Safety Injection, and transition to ES-0.1, Reactor Trip Response.

A complete loss of auxiliary feedwater flow occurs due to 'A' Train Motor Driven AFW pump discharge valve malfunctions, a loss of NB02, and the turbine driven AFW pump fails to auto-start. The crew should transition to FR-H.1, Response to Loss of Secondary Heat Sink, to start the turbine driven AFW pump.

The loss of NB02 is due to feeder breaker NB0209 failure to open preventing the B EDG from energizing the bus. NB01 remains energized for 10 minutes post trip, and then is lost when the final off-site line de-energizes. The crew should enter ECA-0.0, Loss of all AC Power, and start the 'A' EDG to re-energize NB01. The crew should then transition back to procedure and step in effect.

The scenario is complete when the crew has transitioned out of ECA-0.0 and established a minimum required feedwater flow rate (>285,000lbm/hr).

Critical Tasks:

Critical Tasks	CT #1: Restore one AC power source to NB01 within 15 minutes of NB01 power loss.	CT #2: Establish 285,000 lbm/hr to the SGs before all SG WR levels indicate less than 10%.
EVENT	5	6
Safety significance	In the scenario, failure to energize at least one ac emergency bus results in the needless continuation of a situation in which the pumped ECCS capacity and the emergency power capacity are both in a completely degraded status, as are all other active safeguards requiring electrical power. Although the completely degraded status is not due to the crew's action (was not initiated by operator error), continuation in the completely degraded status is a result of the crew's failure to energize at least one ac emergency bus.	Failure to establish the minimum required feedwater flow rate, under the postulated plant conditions, results in "adverse consequences or significant degradation in the mitigative capability of the plant." In this case, the minimum required feedwater flow rate can be established by performing the appropriate manual action.
Cueing	Indication and/or annunciation that all ac emergency buses are de-energized • Bus energized lamps extinguished • Circuit breaker position • Bus voltage • EDG status	Indication and/or annunciation of the following: Reactor trip without SI Secondary Heat Sink is required • Total feedwater flow rate indicates less than the minimum required • Total AFW flow rate indicates less than the minimum required • AFW valve position indication that a flow path is not established to at least one SG
Performance indicator	Manipulation of controls as required to energize at least one ac emergency bus from NE01: • Press START/RESET on KJ HS-8A	Manipulation of controls in the control room as required toestablish the minimum required feedwater flow rate to the SGs: • Press OPEN on FC HIS-312A
Performance feedback	Indication that NB02 is energized • NB02 bus energized light • NB02 bus voltage	• Indication that at least the minimum required feedwater flow rate is being delivered to the SGs • Indication of increasing SG levels
Justification for the chosen performance limit	Failure to perform the critical task would result in an unnecessary Emergency Action Level declaration of a Site Area Emergency. Failure to the perform the critical task also results in needless degradation of any barrier to fission product release, specifically of the RCS barrier at the point of the RCP seals.	Because the secondary heat sink is required but not satisfactorily provided, the RCS heats up. If feedwater flow rate commensurate with core decay heat is not established, the heat sink CSF is eventually challenged. With continued insufficient feedwater flow, the SGs dry out, causing an RCS pressure increase that opens the pressurizer PORVs. The open PORVs create a small-break LOCA that eventually challenges the core cooling CSF. Ultimately, the fuel matrix/clad (a fission-product barrier) is challenged.
PWR Owners Group Appendix	CT-24, Energize at least one ac emergency bus	CT-45, Establish minimum required feedwater flow rate to SGs before SG dryout

References
OTO-BN-00001, RWST Level Channel Malfunction
OTO-SF-00001, Rod Control Malfunctions
OTO-AC-00003, Turbine Impulse Pressure Channel Failure
OTO-EG-00001, CCW System Malfunction
OTO-BB-00006, Pressurizer Pressure Control Malfunction
E-0, Reactor Trip or Safety Injection
ES-0.1, Reactor Trip Response
ECA-0.0, Loss of all AC Power
FR-H.1, Response to Loss of Secondary Heat Sink
OTO-BB-00002, RCP Off-Normal

PRA Systems, Events or Operator Actions

Station Blackout (contribution to CDF is 9%).
Scenario addresses failures in 3 of the top 10 risk important s ystems: AFW (3), EDGs (5), CCW (8)

Scenario #4 Setup Guide:

Establish the initial conditions of IC-11, MOL 80% power: (may set an exam specific IC)

- RCS boron concentration 1047 ppm
- Rod Control Bank D 181 steps, Other banks 228 steps

=============SCENARIO PRELOADS / SETUP ITEMS================

TDAFP fails to auto-start

- Insert Malfunction (AL) PAL02_3, Value = 1

Train 'A' EDG failure to start in auto

- Insert Malfunction (KJ) DGBLOCK_1, Value = Block

Adjust stroke time of EGHV0126 to prevent thermal barrier isolatin

- Insert ME Schematic (EG) m22eg03, HV126 motor, EGHV0126_MCTOPEN, Value = 30

NB0209 failure to open

- Insert ME Schematic (NB) e23n14, 152/TC relay, NB08RL152_TCTTVSP, Value = 0
- Insert ME Schematic (NB) e23n14, 152/TC relay, NB08RL152_TCACTIVE, Value = 1

============= EVENT 1 ===================================

RWST Level Channel BN LI-931 fails low

- Insert Malfunction (BN) BNLT0931, Value = 0

============= EVENT 2 ===================================

Turbine Impulse pressure channel AC PT-505 fails low

- Insert Malfunction (AC) ACPT0505, Value = 0

=============EVENT 3 ===================================

Loop 1 spray valve fails 50% open

- Insert Malfunction (BB) BBPCV0455B_1, Value = 5, Ramp = 2 sec

=============EVENT 4 ===================================

CCW flow to containment isolated by EG HV-71 closure

- Insert ME Schematic (EG) HV71 valve, EGHV0071ZMANTYP, Value = 1
- Insert ME Schematic (EG) HV71 valve, EGHV0071TASTEM, Value = 0, Delay = 1 sec
- Insert from Panel, EG HIS-71 close pushbutton, X19I213C, Value = 1

=============EVENT 5 ===================================

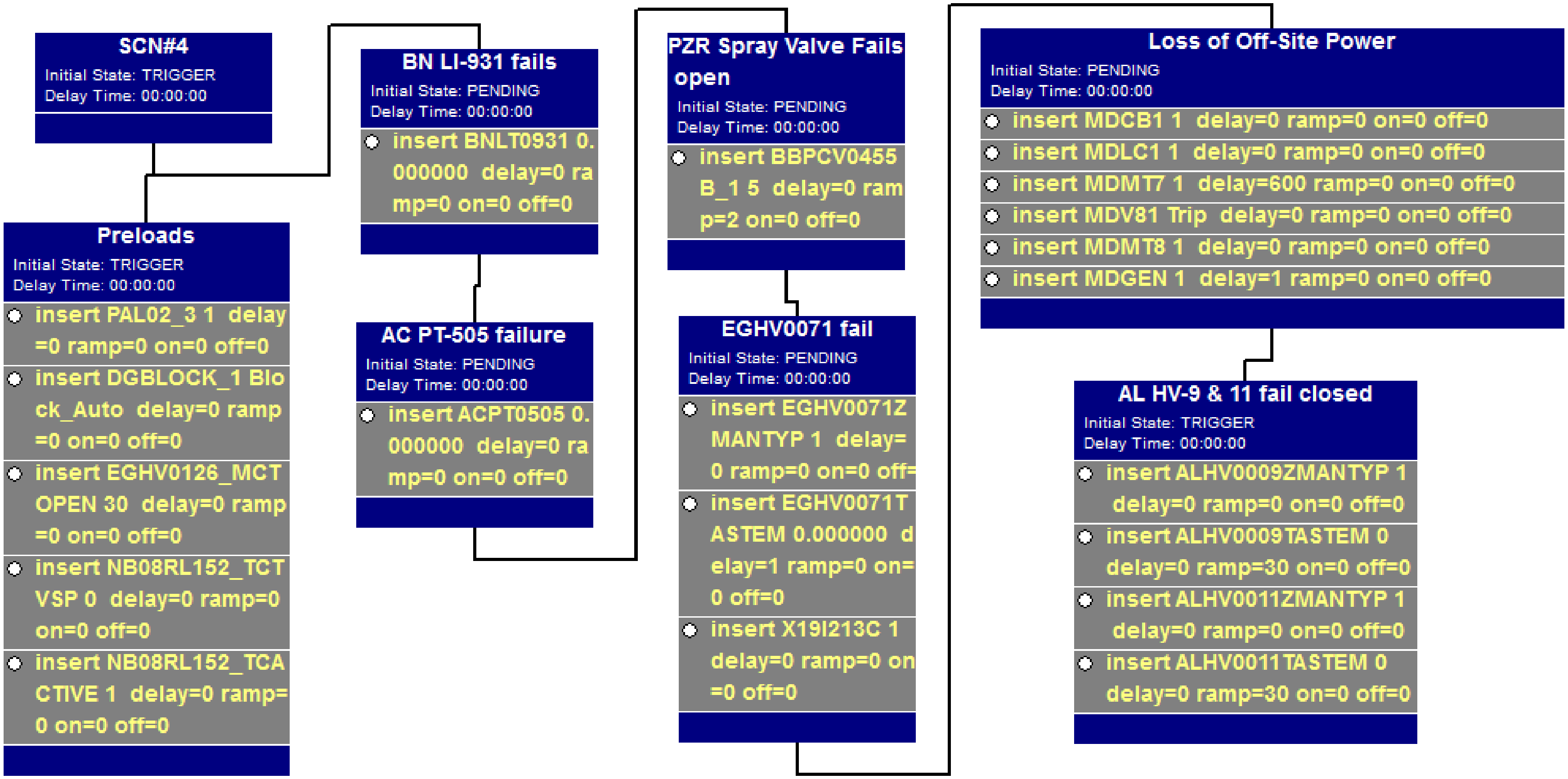
Loss of Off-Site Power and plant trip

- Insert Malfunction (MD) MDCB1, Value = 1
- Insert Malfunction (MD) MDLC1, Value = 1
- Insert Malfunction (MD) MDMT7, Value = 1, delay = 10 min
- Insert Malfunction (MD) MDMT8, Value = 1
- Insert Malfunction (MD) MDGEN, Value = 1
- Insert Remote (MD) MDV81, Value = trip

=============EVENT 6====================================

TDAFP fails to auto-start. Total loss of AFW flow.

- See PRELOADS for TDAFP malfunction
- AL HV-9 & 11 fail closed
  - Insert ME Schematic (AL) m22al01, HV9, ALHV0009ZMANTYP, Value = 1
  - Insert ME Schematic (AL) m22al01, HV9, ALHV0009TASTEM, Value = 0
  - Insert ME Schematic (AL) m22al01, HV11, ALHV0011ZMANTYP, Value = 1
  - Insert ME Schematic (AL) m22al01, HV11, ALHV0011TASTEM, Value = 0


SCN#4
Initial State: TRIGGER
Delay Time: 00:00:00
Preloads
Initial State: TRIGGER
Delay Time: 00:00:00
insert PAL02_3 1 delay=0 ramp=0 on=0 off=0
insert DGBLOCK_1 Block_Auto delay=0 ramp=0 on=0 off=0
insert EGHV0126_MCTOPEN 30 delay=0 ramp=0 on=0 off=0
insert NB08RL152_TCTVSP 0 delay=0 ramp=0 on=0 off=0
insert NB08RL152_TCACTIVE 1 delay=0 ramp=0 on=0 off=0
BN LI-931 fails
Initial State: PENDING
Delay Time: 00:00:00
insert BNLT0931 0.000000 delay=0 ramp=0 on=0 off=0
AC PT-505 failure
Initial State: PENDING
Delay Time: 00:00:00
insert ACPT0505 0.000000 delay=0 ramp=0 on=0 off=0
PZR Spray Valve Fails open
Initial State: PENDING
Delay Time: 00:00:00
insert BBPCV0455B_1 5 delay=0 ramp=2 on=0 off=0
EGHV0071 fail
Initial State: PENDING
Delay Time: 00:00:00
insert EGHV0071ZMANTYP 1 delay=0 ramp=0 on=0 off=
insert EGHV0071TASTEM 0.000000 delay=1 ramp=0 on=0 off=0
insert X19I213C 1 delay=0 ramp=0 on=0 off=0
Loss of Off-Site Power
Initial State: PENDING
Delay Time: 00:00:00
insert MDCB1 1 delay=0 ramp=0 on=0 off=0
insert MDLC1 1 delay=0 ramp=0 on=0 off=0
insert MDMT7 1 delay=600 ramp=0 on=0 off=0
insert MDV81 Trip delay=0 ramp=0 on=0 off=0
insert MDMT8 1 delay=0 ramp=0 on=0 off=0
insert MDGEN 1 delay=1 ramp=0 on=0 off=0
AL HV-9 & 11 fail closed
Initial State: TRIGGER
Delay Time: 00:00:00
insert ALHV0009ZMANTYP 1 delay=0 ramp=0 on=0 off=0
insert ALHV0009TASTEM 0 delay=0 ramp=30 on=0 off=0
insert ALHV0011ZMANTYP 1 delay=0 ramp=0 on=0 off=0
insert ALHV0011TASTEM 0 delay=0 ramp=30 on=0 off=0

Op Test No.:	2017-1	Scenario #	4 rev.2	Event #	1	Page	7	of	20
Event Description:		RWST Level Channel BN LI-931 fails low							

Proc /Time	Position	Applicant's Actions or Behavior
Booth Operator: • TRIGGER BN LI-931 fails • Respond as Inside OT if contacted to investigate RWST Level Instruments. No obvious failure locally.		
Indications Available ANN 47A – RWST EMPTY ANN 47B – RWST LEV LOLO 2 ANN 47D – RWST LEV HILO		
OTO-BN-00001, RWST Level Channel Malfunction		
	CRS	Implement OTO-BN-00001
OTO-BN-00001	**BOP**	(Step 1) CHECK RWST Level Instruments indications reading abnormal • BN LI-931 is abnormal
	BOP	(Step 2) DISPATCH Equipment Operator to the RWST Valve House to inspect RWST level instruments
	CRS	(Step 3) REVIEW applicable Technical Specifications. Refer to Attachment A
		The CRS should enter T/S 3.3.2.A & K
	CRS	(Step 4) PERFORM Notifications per ODP-ZZ-00001 Addendum 13 Shift Manager Communications
	CRS	(Step 5) Place inoperable channel in the EOSL
	CRS	(Step 6) Initiate action to repair the failed component
NOTE		**At Lead Examiner's discretion move to the next Event**

Op Test No.:	2017-1	Scenario #	4 rev.2	Event #	2	Page	8 of	20
Event Description:		Turbine Impulse pressure channel AC PT-505 fails low						

Proc /Time	Position	Applicant's Actions or Behavior
Booth Operator: • TRIGGER AC PT-505 failure		
Indications Available ANN 65E – T REF / T AUCT LO		
		OTO-SF-00001, Rod Control Malfunctions
		Crew may utilize OTO-SF-00001 due to inadvertent rod motion.
	CRS	Implement OTO-SF-00001
OTO-SF-00001	**RO**	(Step 1) Check both of the following are met for indication of multiple dropped rods: • Annunciator 81A, Two/More Rods At Bottom – LIT • Rod Bottom Lights for greater than one rod – LIT RNO: Go to Step 3
		Step 1 is an immediate action
	RO	(Step 3) Check Main Turbine Runback or Load Reject in progress RNO: Go to Step 5
		Step 3 is an immediate action
	RO	(Step 5) Place Rod Control in MANUAL using SE HS-9
		Step 5 is an immediate action
	RO	(Step 6) Check Control Rods Motion Stopped
		Step 6 is an immediate action
	RO	(Step 7) Check instruments indications NORMAL: a. RCS Tavg b. HP Turbine First Stage Pressure. AC PT-505 is failed (RNO b.) Go to OTO-AC-00003, Turbine Impulse Pressure Channel Failure
		OTO-AC-00003, Turbine Impulse Pressure Channel Failure
OTO-AC-00003	**CRS**	Implement OTO-AC-000003

Op Test No.: 2017-1	Scenario # 4 rev.2	Event # 2	Page 9 of 20
Event Description:	Turbine Impulse pressure channel AC PT-505 fails low		

Proc /Time	Position	Applicant's Actions or Behavior
OTO-AC-00003	**RO**	(Step 1) PLACE Rod Control in MANUAL using SE HS-9
	BOP	(Step 2) CHECK HP Turbine First Stage Pressure Indicator FAILED. AC PI-505 is failed.
	BOP	(Step 3) Select HP Turbine First Stage Pressure Selector to Operable Channel: AC PS-505Z to P506
	CRS	(Step 4) CHECK Control Rod Insertion from instrument failure
	RO	(Step 5) RESTORE Control Rods as determined by CRS
	CRS	(Step 6) CHECK RCS Tavg to Tref within 0.3°F
	RO	(Step 7) RESTORE Rod Control to AUTO using SE HS-9
	BOP	(Step 8) PLACE Steam Dump Bypass Interlock Switches to OFF/RESET • AB HS-63 • AB HS-64
	BOP	(Step 9) CHECK the following permissives are in the correct state within one hour of the channel failure per Attachment B, Permissives: • P-7 (LIT) • P-13 (LIT)
	CRS	(Step 10) REVIEW applicable Technical Specifications. Refer to Attachment C, Technical Specifications
		The CRS should enter T/S 3.3.1.A & T
NOTE		**At Lead Examiner's discretion move to the next Event**

Op Test No.: 2017-1	Scenario # 4 rev.2	Event # 3	Page 10 of 20				
Event Description:	Loop 1 spray valve fails 50% open. BB PK-455B						

Proc /Time	Position	Applicant's Actions or Behavior
Booth Operator: • TRIGGER PZR Spray Valve Fails open		
Indications Available BB PK-455B (Loop 1 spray controller) demand rises		
OTO-BB-00006, Pressurizer Pressure Control Malfunction		
	CRS	Implement OTO-BB-00006
OTO-BB-00006	**RO**	(Step 1) CHECK Pressurizer Pressure Indicator – FAILED RNO: Go to Step 19
	RO	(Step 19) CHECK Pressurizer Pressure less than 2235 psig
		Note: If pressure lowers to less than 2195 psig, T/S 3.4.1 applies.
	RO	(Step 20) CHECK Both Pressurizer Spray Valves closed • BB ZL-455B indicates open RNO: PERFORM the following: a. PLACE the affected Pressurizer Spray Loop Controller in MANUAL and CLOSE the valve: • BB PK-455B b. Energize PZR Backup Heaters as necessary to stabilize pressurizer pressure: • BB HIS-51A • BB HIS-52A c. IF pressurizer pressure continues to lower in an uncontrolled manner (N/A)
	RO	(Step 21) CHECK pressurizer pressure > 2250 psig RNO: Go to step 23
	RO	(Step 23) CHECK PZR Pressure 2220 – 2250 psig
NOTE		**When pressure has been restored within band or at the discretion of the Lead Examiner, move on to the next Event.**

Op Test No.: 2017-1	Scenario # 4 rev.2	Event # 4	Page 11 of 20
Event Description:	CCW flow to containment isolated by EG HV-71 closure		

Proc /Time	Position	Applicant's Actions or Behavior

Booth Operator:
- TRIGGER EGHV0071 fail
- Respond as OT when dispatched for administrative controls.

Indications Available

ANN 52A – CCW TO RCP FLOW LO
ANN 74A – RCP MTR CCW FLOW HILO
ANNs 70C, 71C, 72C, 73C – RCP THRM BAR CCW FLOW

		OTO-EG-00001, CCW System Malfunction
		The crew may use OTO-BB-00002 instead of OTO-EG-00001.
	BOP	Implement OTO-EG-00001
OTO-EG-00001	**BOP**	(Step 1) CHECK one CCW Pump Running for each operating train: • B CCW Pump is running in the operating train
	BOP	(Step 2) CHECK CCW Flow – Reduced or Lost • EG FI-128 and EG FI-129 indicate no flow to containment
	CRS	(Step 3) Record time CCW lost to the RCPs
	RO	(Step 4) VERIFY at least one method of RCP Seal Cooling to all RCPs in progress • Seal Injection is in service
	CRS	(Step 5) Check CCW Lost to RCPs greater than 10 minutes RNO: When time since CCW was lost to RCPs is greater than 10 minutes, then perform steps 5.a through 5.d. Continue with step 6

Op Test No.: 2017-1	Scenario # 4 rev.2	Event # 4 Page 12 of 20
Event Description:	CCW flow to containment isolated by EG HV-71 closure	

Proc /Time	Position	Applicant's Actions or Behavior
OTO-EG-00001	**BOP**	(Step 6) CHECK CCW Flow to Containment – NORMAL OR HIGH FOR PLANT CONDITIONS. RNO: Perform the following: a. ENSURE all CCW to Containment Inner and Outer Isolation valves are open: • EG HIS-71 is not open b. IF any valve(s) fail to open, THEN OPEN the associated bypass valve using Attachment E, CCW Containment Isolation Valves. c. Ensure CCW Flow to Containment is restored.
Attachment E	**CRS**	(Step E1) PLACE Administrative Controls for any OPEN Containment Isolation CCW Bypass Valve: • Station a local dedicated operator and designate a control room dedicated operator
	BOP	(Step E2) EGHV0071 actions: • Place EG HIS-126A in NON ISO • Press OPEN on EG HIS-126
OTO-EG-00001	**BOP**	(Step 7) CHECK CCW to RW & RCS Flow normal or high for plant conditions on EG FI-55A
	BOP	(Step 8) CHECK CCW Surge Tank Level(s) lowering • EG LI-1 (Tank A) • EG LI-2 (Tank B) RNO: Perform the following: a. IF level is stable, then go to step 13.
	CRS	(Step 13) REVIEW Technical Specifications 3.6.3 and 3.7.7
		No Tech Specs apply. EGHV0071 is not a containment isolation valve.
OTO-BB-00002	**BOP**	(Step 1) CHECK All RCPs - RUNNING
		Note: Steps of OTO-BB-00002 if utilized to restore CCW Flow

Op Test No.: 2017-1	Scenario # 4 rev.2	Event # 4	Page 13 of 20				
Event Description:	CCW flow to containment isolated by EG HV-71 closure						

Proc /Time	Position	Applicant's Actions or Behavior
OTO-BB-00002	**BOP**	(Step 2) Go to Attachment C, CCW to RCP Abnormal
Attachment C	**BOP**	(Step C1) CHECK RCP Motor Parameters meet all the following: • Motor Bearing Temps < 195°F on all RCPs • Motor Stator Winding Temps < 311°F on all RCPs • CCW lost to RCP motors < 10 minutes
	BOP	(Step C2) CHECK CCW flow to containment normal or high for plant conditions: EG FI-128 & EG FI-129 RNO: Perform the following: a. ENSURE all CCW to Containment Inner and Outer isolation valves are OPEN: all are open except EG HIS-71 b. If any valve(s) fail to open, then OPEN the associated bypass valve using Attachment F, CCW Containment Isolation Valves.
Attachment F	**BOP**	(Step F1) Place administrative controls for any OPEN containment isolation CCW bypass valve
	BOP	(Step F2) Use the tables below for additional containment isolation CCW valve information: EGHV0071: Press NON ISO on EG HIS-126A and then press OPEN on EG HIS-126
NOTE		**At Lead Examiner's discretion move to the next Event**

Op Test No.: 2017-1	Scenario # 4 rev.2	Event # 5 & 6	Page 14 of 20
Event Description:	Loss of Off-Site Power and plant trip / TDAFP fails to auto-start. Total loss of AFW Flow		
Proc /Time	Position	Applicant's Actions or Behavior	

Booth Operator:
- TRIGGER Loss of Off-Site Power
- Respond as OT if directed to investigate NB0209 breaker.
- Respond as OT if directed to investigate AL HV-9 & 11
- Respond as OT when dispatched to investigate TDAFP start failure.
  - If running, report back the pump looks normal
  - If not running, report back no obvious reason it shouldn't start.

Indications Available

ANN 86C – RCP UV RX TRIP

		E-0, Reactor Trip or Safety Injection
E-0	**RO**	(Step 1) CHECK Reactor Trip: • Rod Bottom Lights – ALL LIT • Reactor Trip and Bypass Breakers – OPEN • Neutron Flux - LOWERING
		Step 1 is an immediate action step.
	BOP	(Step 2) CHECK Turbine Trip: • All Turbine Stop valves - CLOSED
		Step 2 is an immediate action
	BOP	(Step 3) CHECK Power to AC Emergency Buses: a. AC emergency buses – AT LEAST ONE ENERGIZED b. NB01 & NB02 are both energized RNO b. TRY to restore power to deenergized AC emergency bus as time permits: 1) Depress START/RESET pushbutton for any stopped Diesel Generator. The 'B' EDG is running. 2) If DG started AND output breaker did NOT close, then close DG output breaker • NE HIS-26
		Step 3 is an immediate action. The B EDG diesel output breaker will not close since the normal feeder is still closed.

Op Test No.: 2017-1	Scenario # 4 rev.2	Event # 5 & 6	Page 15 of 20				

Event Description: Loss of Off-Site Power and plant trip / TDAFP fails to auto-start. Total loss of AFW Flow

Proc /Time	Position	Applicant's Actions or Behavior
E-0	**RO**	(Step 4) Check SI Status: a. Check if SI is actuated • 88A thru 88D Lit • SB069 SI Actuate Red light is lit • LOCA Sequencers alarms 30A & 31A RNO a. CHECK if SI is required: • PZR pressure less than or equal to 1849 psig OR • Any SG pressure less than or equal to 615 psig OR • Containment pressure greater than or equal to 3.5 psig IF SI is required, then manually ACTUATE SI. Not required IF SI is not required, then go to ES-0.1
		Step 4 is an immediate action
		ES-0.1, Reactor Trip Response
FOLDOUT PAGE	**BOP**	<u>RCS Temperature Control Criteria:</u> IF a Loss of Offsite Power has occurred, THEN CLOSE MSIVs
		Crew should fast close MSIVs using AB HS 79 & 80
ES-0.1	**BOP**	(Step 1) CHECK RCS Temperature Control: a. Check RCPs – ANY RUNNING RNO a. TRANSFER Condenser Steam Dump to Steam Pressure Mode. 1) Check Condenser Available: • C-9 interlocks LIT • MSIVs – any open. MSIVs should be closed. b. CHECK RCS temperature response – NORMAL • RCS Cold leg temperatures stable at or trending to 557°F if no RCP running
		FR-H.1, Response to Loss of Secondary Heat Sink
		The crew should transition to FR-H.1, Response to Loss of Secondary Heat Sink, when RED path is identified.

Op Test No.: 2017-1	Scenario # 4 rev.2	Event # 5 & 6	Page 16 of 20				
Event Description:	Loss of Off-Site Power and plant trip / TDAFP fails to auto-start. Total loss of AFW Flow						

Proc /Time	Position	Applicant's Actions or Behavior
FR-H.1	**RO**	(Step 1) CHECK if Secondary Heat Sink is Required: a. RCS Pressure greater than any non-faulted SG pressure b. Check the following: • RCS Temperature > 350°F OR • RCS Pressure > 360 PSIG
	BOP	(Step 2) CHECK if RCS Bleed and Feed – Required a. SG WIDE RANGE level in any 3 SGs less than 27% RNO a. Continue with Step 3. Observe CAUTION prior to Step 3.
	BOP	(Step 3) TRY to Establish AFW Flow to at Least One SG a. Check SG blowdown isolation: • SG Blowdown Containment Isolation Valves CLOSED • BM HIS-1A, 2A, 3A, and 4A • SG Sample Outer Containment Isolation Valves CLOSED • BM HIS-65, 66, 67, 68 b. CHECK Control Room indications for cause of Auxiliary Feedwater failure: • CST level • MD AFW pump power supply • TD AFW pump steam supply • AFW valve alignment: Refer to EOP Addendum 18 (See attached page at end of document) c. TRY to restore AFW flow d. CHECK total AFW flow to SGs < 285,000 lbm/hr e. Establish Non-Safety Auxiliary Feedwater Flow: f. Perform EOP Addendum 38, Non Safety Auxiliary Feedwater Pump while continuing with this procedure.
		NOTE: If operators utilize the Non Safety Auxiliary Feedwater Pump, flow is limited to 280,000 lbm/hr. `
CRITICAL TASK #2	**BOP**	**Establish 285,000 lbm/hr to the SGs before all SG WR levels indicate less than 10%.**

Op Test No.: 2017-1	Scenario # 4 rev.2	Event # 5 & 6	Page 17 of 20	
Event Description:	Loss of Off-Site Power and plant trip / TDAFP fails to auto-start. Total loss of AFW Flow			

Proc /Time	Position	Applicant's Actions or Behavior
		NOTE: When the crew loses AC power, a transition to ECA-0.0 should occur. Step 4 of ECA-0.0 starts the TDAFP.
		ECA-0.0, Loss of ALL AC Power
ECA-0.0	**RO**	(Step 1) CHECK Reactor Trip: • Reactor Trip and Bypass Breakers – OPEN • Neutron Flux – LOWERING
		Step 1 is an immediate action
	BOP	(Step 2) CHECK Turbine Trip: • All Turbine Stop valves - CLOSED
		Step 2 is an immediate action
	RO	(Step 3) CHECK if RCS is isolated: a. Letdown isolation valves CLOSED 1) Letdown Throttle Isolation valves: a) BG HIS-8149AA b) BG HIS-8149BA c) BG HIS-8149CA 2) RCS Letdown to Regen HX valves: d) BG HIS-459 e) BG HIS-460 RNO: CLOSE valve(s) as necessary b. PZR PORVs – CLOSED • BB HIS-455A • BB HIS-456A c. RCS to Excess Letdown HX valves – CLOSED • BG HIS-8153A • BG HIS-8154A • BG HIS-8153B • BG HIS-8154B d. Reactor Head Vent Valves – CLOSED • BB HIS-8001A • BB HIS-8002A • BB HIS-8001B • BB HIS-8002B

Op Test No.: 2017-1	Scenario # 4 rev.2	Event # 5 & 6	Page 18 of 20				

Event Description: Loss of Off-Site Power and plant trip / TDAFP fails to auto-start. Total loss of AFW Flow

Proc /Time	Position	Applicant's Actions or Behavior
ECA-0.0	**BOP**	(Step 4) CHECK AFW Flow greater than 285,000 lbm/hr RNO: PERFORM the following: 1. CHECK TDAFW Pump running IF TDAFW Pump is NOT running, THEN START TDAFW Pump: a) OPEN AFP Turbine Loop Steam Supply vavle(s): • AB HIS-5A • AB HIS-6A b) OPEN TDAFW Pump Mechanical Trip/Throttle valve: • FC HIS-312A c) IF TDAFW Pump trips or fails to start (N/A) 2. ENSURE TDAFW Pump Valves in proper emergency alignment: a) TDAFW pump Flow Control Valves are OPEN or THROTTLED • AL HK-8A • AL HK-10A • AL HK-12A • AL HK-6A b) ESFAS status panel SA066X AFAS section WHITE valve light is LIT: • AP-V015 (15C) c) IF AFW flow greater than 285,000 lbm/hr for the AFW normal source can NOT be established or maintained (N/A) d) IF AFW suction header pressure lowers to 11.5 psig (N/A)
CRITICAL TASK #2	**BOP**	**Establish 285,000 lbm/hr to the SGs before all SG WR levels indicate less than 10%.**

Op Test No.:	2017-1	Scenario #	4 rev.2	Event #	5 & 6	Page	19 of	20

Event Description: Loss of Off-Site Power and plant trip / TDAFP fails to auto-start. Total loss of AFW Flow

Proc /Time	Position	Applicant's Actions or Behavior
	RO	(Step 5) TRY to restore power to any Any AC Emergency Bus: a. ENERGIZE AC emergency bus with diesel generator: 1) Check both DGs – RUNNING • KJ HS-8A • KJ HS-108A RNO: Manually Start DG(s) 2) CHECK AC emergency buses – AT LEAST ONE ENERGIZED • NB01 OR • NB02 b. CHECK AC emergency buses – AT LEAST ONE ENERGIZED • NB01 OR • NB02 c. CHECK ESW Pump associated with energized AC emergency bus(es) – RUNNING • EF HIS-55A d. Return to procedure and step in effect and IMPLEMENT Functional Restoration Procedures as necessary.
CRITICAL TASK #1	**RO**	**Restore one AC power source to NB01 within 15 minutes of NB01 power loss.**
	CRS	Return to procedure and step in effect and IMPLEMENT Functional Restoration Procedures as necessary.
The scenario can be terminated at the discretion of the Lead Examiner		

NOTE

The following two steps may be performed in any order.

☐ **1. ALIGN MD AFW Pump Valve(s) As Necessary To Establish Proper AFW Emergency Alignment:**

Component	Description	Status	Check
AL HK-7A	SG A MD AFP AFW Reg Vlv Ctrl	THROTTLED	______
AL HK-9A	SG B MD AFP AFW Reg Vlv Ctrl	THROTTLED	______
AL HK-11A	SG C MD AFP AFW Reg Vlv Ctrl	THROTTLED	______
AL HK-5A	SG D MD AFP AFW Reg Vlv Ctrl	THROTTLED	______
AL HIS-31A	ESW To MD Aux FW Pump	CLOSED	______
AL HIS-35A	CST To MD Aux FW Pump	OPEN	______
AL HIS-30A	ESW To MD Aux FW Pump	CLOSED	______
AL HIS-34A	CST To MD Aux FW Pump	OPEN	______

☐ **2. ALIGN TD AFW Pump Valve(s) As Necessary To Establish Proper AFW Emergency Alignment:**

Component	Description	Status	Check
AL HK-8A	SG A TD AFP AFW Reg Vlv Ctrl	FULL OPEN	______
AL HK-10A	SG B TD AFP AFW Reg Vlv Ctrl	FULL OPEN	______
AL HK-12A	SG C TD AFP AFW Reg Vlv Ctrl	FULL OPEN	______
AL HK-6A	SG D TD AFP AFW Reg Vlv Ctrl	FULL OPEN	______
AL HIS-32A	ESW To TD Aux FW Pump	CLOSED	______
AL HIS-36A	CST To TD Aux FW Pump	OPEN	______
FC HIS-313A	AFP Turbine Speed Gov Control	3850 RPM Minimum	______
AL HIS-33A	ESW To TD Aux FW Pump	CLOSED	______
AB HIS-6A	Loop 3 Steam To Aux FW Pump Turbine	OPEN	______
AB HIS-5A	Loop 2 Steam To Aux FW Pump Turbine	OPEN	______
FC HIS-312A	AFP Turbine Mech Trip/Throttle Vlv	OPEN	______

-END-

Facility:	**Callaway**	Date of Exam:	**9/11/2017**	Operating Test No. :	**2017-1**

APPLICANT	EVENT TYPE	Scenarios: Team 1: S1, S2, S3												TOTAL	MINIMUM(*)		
		1			2			3			4						
		CREW POSITION			CREW POSITION			CREW POSITION			CREW POSITION						
		SRO	ATC	BOP	SRO S3	ATC S1	BOP S2	SRO S1	ATC S2	BOP S3	SRO S2	ATC S3	BOP S1		R	I	U
SRO-I S1	RX					4								1	1	1	0
	NOR							1						1	1	1	1
	I/C					1[#],2		2,3,4,5					2,3	7/8[#]	4	4	2
	MAJ					5		6					5	3	2	2	1
	TS							2,4,5						2	0	2	2
SRO-I S2	RX						4							1	1	1	0
	NOR								1					1	1	1	1
	I/C						1[#],3		2,5		2,3,4			6/7[#]	4	4	2
	MAJ						5		6		5			3	2	2	1
	TS										1,2			2	0	2	2
SRO-I S3	RX				4									1	1	1	0
	NOR													0*	1	1	1
	I/C				1,2,3					3,4		2,4		7	4	4	2
	MAJ				5					6		5		3	2	2	1
	TS				1,2									2	0	2	2

Instructions:

1. Check the applicant level and enter the operating test number and Form ES-D-1 event numbers for each event type; TS are not applicable for RO applicants. ROs must serve in both the "at-the-controls (ATC)" and "balance-of-plant (BOP)" positions; Instant SROs must serve in both the SRO and the ATC positions, including at least two instrument or component (I/C) malfunctions and one major transient, in the ATC position. If an Instant SRO *additionally* serves in the BOP position, one I/C malfunction can be credited toward the two I/C malfunctions required for the ATC position.

2. Reactivity manipulations may be conducted under normal or *controlled* abnormal conditions (refer to Section D.5.d) but must be significant per Section C.2.a of Appendix D. (*) Reactivity and normal evolutions may be replaced with additional instrument or component malfunctions on a 1-for-1 basis.

3. Whenever practical, both instrument and component malfunctions should be included; only those that require verifiable actions that provide insight to the applicant's competence count toward the minimum requirements specified for the applicant's license level in the right-hand columns.

- RO or BOP may receive credit for Scenario 2 event 1.

ES-301	**Transient and Event Checklist**	**Form ES-301-5**

Facility: **Callaway** Date of Exam: **9/11/2017** Operating Test No. : **2017-1**

APPLICANT	EVENT TYPE	Scenarios: Team 2: S4, S5, Surrogate BOP												TOTAL	MINIMUM(*)		
		1			2			3			4						
		CREW POSITION			CREW POSITION			CREW POSITION			CREW POSITION						
		SRO	ATC	BOP	SRO	ATC	BOP	SRO S4	ATC S5	BOP	SRO S5	ATC S4	BOP		R	I	U
SRO-I S4	RX													0*	1	1	0
	NOR							1						1	1	1	1
	I/C							2,3,4,5				2,4		6	4	4	2
	MAJ							6				5		2	2	2	1
	TS							2,4,5						3	0	2	2
SRO-I S5	RX													0*	1	1	0
	NOR								1					1	1	1	1
	I/C								2,5		2,3,4			5	4	4	2
	MAJ								6		5			2	2	2	1
	TS										1,2			2	0	2	2
	RX														1	1	0
	NOR														1	1	1
	I/C														4	4	2
	MAJ														2	2	1
	TS														0	2	2

Instructions:

1. Check the applicant level and enter the operating test number and Form ES-D-1 event numbers for each event type; TS are not applicable for RO applicants. ROs must serve in both the "at-the-controls (ATC)" and "balance-of-plant (BOP)" positions; Instant SROs must serve in both the SRO and the ATC positions, including at least two instrument or component (I/C) malfunctions and one major transient, in the ATC position. If an Instant SRO *additionally* serves in the BOP position, one I/C malfunction can be credited toward the two I/C malfunctions required for the ATC position.

2. Reactivity manipulations may be conducted under normal or *controlled* abnormal conditions (refer to Section D.5.d) but must be significant per Section C.2.a of Appendix D. (*) Reactivity and normal evolutions may be replaced with additional instrument or component malfunctions on a 1-for-1 basis.

3. Whenever practical, both instrument and component malfunctions should be included; only those that require verifiable actions that provide insight to the applicant's competence count toward the minimum requirements specified for the applicant's license level in the right-hand columns.

Facility:	**Callaway**	Date of Exam:	**9/11/2017**	Operating Test No. :	**2017-1**

Scenarios: Team 3: S6, U1, Surrogate BOP

APPLICANT	EVENT TYPE	1 CREW POSITION SRO			2 CREW POSITION SRO			3 CREW POSITION SRO			4 CREW POSITION SRO			TOTAL	MINIMUM(*)		
		SRO	ATC	BOP	SRO	ATC	BOP	SRO S6	ATC U1	BOP	SRO U1	ATC S6	BOP		R	I	U
SRO-I S6	RX													0*	1	1	0
	NOR							1						1	1	1	1
	I/C							2,3,4,5				2,4		6	4	4	2
	MAJ							6				5		2	2	2	1
	TS							2,4,5						3	0	2	2
SRO-U U1	RX													0*	1	1	0
	NOR								1					1	1	1	1
	I/C								2,5		2,3,4			5	4	4	2
	MAJ								6		5			2	2	2	1
	TS										1,2			2	0	2	2
	RX														1	1	0
	NOR														1	1	1
	I/C														4	4	2
	MAJ														2	2	1
	TS														0	2	2

Instructions:

1. Check the applicant level and enter the operating test number and Form ES-D-1 event numbers for each event type; TS are not applicable for RO applicants. ROs must serve in both the "at-the-controls (ATC)" and "balance-of-plant (BOP)" positions; Instant SROs must serve in both the SRO and the ATC positions, including at least two instrument or component (I/C) malfunctions and one major transient, in the ATC position. If an Instant SRO *additionally* serves in the BOP position, one I/C malfunction can be credited toward the two I/C malfunctions required for the ATC position.

2. Reactivity manipulations may be conducted under normal or *controlled* abnormal conditions (refer to Section D.5.d) but must be significant per Section C.2.a of Appendix D. (*) Reactivity and normal evolutions may be replaced with additional instrument or component malfunctions on a 1-for-1 basis.

3. Whenever practical, both instrument and component malfunctions should be included; only those that require verifiable actions that provide insight to the applicant's competence count toward the minimum requirements specified for the applicant's license level in the right-hand columns.

Facility:	Callaway	Date of Exam:	9/11/2017	Operating Test No. :	2017-1

APPLICANT	EVENT TYPE	Scenarios: Spare															
		1 CREW POSITION			2 CREW POSITION			3 CREW POSITION			4 CREW POSITION			TOTAL	MINIMUM(*)		
		SRO	ATC	BOP	SRO	ATC	BOP	SRO	ATC	BOP	SRO	ATC	BOP		R	I	U
	RX	4													1	1	0
	NOR														1	1	1
	I/C	1,2,3													4	4	2
	MAJ	5													2	2	1
	TS	3,4													0	2	2
	RX		4												1	1	0
	NOR														1	1	1
	I/C		1,2,3												4	4	2
	MAJ		5												2	2	1
	TS														0	2	2
	RX			4											1	1	0
	NOR														1	1	1
	I/C			2,3											4	4	2
	MAJ			5											2	2	1
	TS														0	2	2

Instructions:

1. Check the applicant level and enter the operating test number and Form ES-D-1 event numbers for each event type; TS are not applicable for RO applicants. ROs must serve in both the “at-the-controls (ATC)” and “balance-of-plant (BOP)” positions; Instant SROs must serve in both the SRO and the ATC positions, including at least two instrument or component (I/C) malfunctions and one major transient, in the ATC position. If an Instant SRO *additionally* serves in the BOP position, one I/C malfunction can be credited toward the two I/C malfunctions required for the ATC position.

2. Reactivity manipulations may be conducted under normal or *controlled* abnormal conditions (refer to Section D.5.d) but must be significant per Section C.2.a of Appendix D. (*) Reactivity and normal evolutions may be replaced with additional instrument or component malfunctions on a 1-for-1 basis.

3. Whenever practical, both instrument and component malfunctions should be included; only those that require verifiable actions that provide insight to the applicant’s competence count toward the minimum requirements specified for the applicant’s license level in the right-hand columns.

Facility: **Callaway** Date of Examination: **9/11/2017** Operating Test No.:**2017-1**

Competencies	APPLICANTS							
	RO				SRO-I & U			
	SCENARIO				SCENARIO			
	1	2	3	4	1	2	3	4
Interpret/Diagnose Events and Conditions					1,2,3,4,5, 6	1,2,3,4,5, 6	2,3,4,5,6, 7	1,2,3,4,5, 6
Comply With and Use Procedures (1)					1,2,3,4,5, 6	1,2,3,4,5, 6	1,2,3,4,5, 6,7	1,2,3,4,5, 6
Operate Control Boards (2)					1,2,3,4,5, 6	1,2,3,4,5, 6	1,2,3,4,5, ,6,7	2,3,4,5,6
Communicate and Interact					1,2,3,4,5, 6	1,2,3,4,5, 6	1,2,3,4,5, 6,7	1,2,3,4,5, 6
Demonstrate Supervisory Ability (3)					1,2,3,4,5, 6	1,2,3,4,5, 6	1,2,3,4,5, 6,7	1,2,3,4,5, 6
Comply With and Use Tech. Specs. (3)					3,4	1,2	2,4,5	1,2

Notes:
(1) Includes Technical Specification compliance for an RO.
(2) Optional for an SRO-U.
(3) Only applicable to SROs.

Instructions:

Check the applicants' license type and enter one or more event numbers that will allow the examiners to evaluate every applicable competency for every applicant.