

**PERFORM SHUTDOWN MARGIN CALCULATION FOR  
AN OPERATING REACTOR**

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K/A REFERENCE: 004 K5.19 (2.8/3.3)  
(NUREG-1122) 003 AK1.07 (3.1/3.9)  
003 AK3.04 (3.8/4.1)

ALTERNATE PATH JPM \_\_\_\_\_ YES  X  NO

**PERFORMANCE CHECKLIST:**

**SATISFACTORY** - Properly performed critical step(s) and/or in sequence (if applicable)

**UNSATISFACTORY** - Improperly performed critical step(s) and/or out of sequence (if applicable)

X  Procedure adequately addresses task elements.  
Enter identifier here:  PBF-2513, "Shutdown Margin for an Operating Reactor", Rev. 0

\_\_\_\_\_ Other document adequately describes necessary task elements.  
Enter identifier here: \_\_\_\_\_

X  Task elements described as attached.

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**DESIRED MODE OF EVALUATION:**

**APPLICABLE EVALUATION SETTING:**

SIMULATE/WALKTHROUGH  X  DISCUSSION \_\_\_\_\_ PERFORM  X  IN-PLANT \_\_\_\_\_ CONTROL ROOM  X

VALIDATED TIME FOR COMPLETION:  15  MINUTES

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EXAMINEE \_\_\_\_\_ EVALUATOR \_\_\_\_\_

START TIME \_\_\_\_\_ FINISH TIME \_\_\_\_\_

PERFORMANCE  SAT  UNSAT

JOB TITLE:  AOT  COT  SRO  STA

**TOOLS/EQUIPMENT/REFERENCES:**

Blank copy of PBF-2513, "Shutdown Margin for an Operating Reactor"  
Unit 2 ROD book  
Calculator with negative function & Ruler  
TS Figure 15.3.10-2

**TASK STANDARDS:**

Required Shutdown Margin calculated within the specified tolerance (1100-1160 pcm) and time (<30 minutes).

**SIMULATOR INFORMATION:**

Not Applicable to this JPM

**NOTE:** *If this JPM is performed on the simulator, the JPM administrator should only give cues that are not indicated on the simulator. If simulator indication is sufficient to indicate the completion of a step, the JPM administrator should not have to give a cue to the trainee to continue the evolution.*

**NOTE:** *Only this page needs to be retained in examinee's record if completed satisfactorily. If unsatisfactory performance is demonstrated, the entire JPM should be retained.*

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**READ AND PROVIDE TO THE EXAMINEE**

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**THIS SECTION IS READ ONCE FOR THE ENTIRE PACKAGE OF JPMS. IT IS NOT REQUIRED TO REVIEW THIS SECTION FOR EVERY JPM BEING PERFORMED IN THE PACKAGE. THE INITIAL CONDITIONS AND INITIATING CUE(S)/TASKS TO BE PERFORMED SHOULD BE READ AND THEN PROVIDED TO THE EXAMINEE.**

After I read you the initial conditions and initiating cue(s)/task to be performed for this JPM and provide you a copy of the same, you may review and begin. Once you have completed the task, indicate completion by handing back this form to the evaluator unless otherwise told.

You may use any approved reference materials normally available including logs. Make all written reports, oral reports, and log entries as if the evolution is actually being performed.

EOP Immediate Actions are required to be performed from memory. After completing immediate action steps without using the procedure, you may then use any approved reference materials.

For all two and three-way communications, make your report to me, the JPM evaluator. I will reply to your reports with the statement, "acknowledge." All actions in the plant are to be simulated and all actions in the simulator will be performed. Ensure you make it clear to me, the evaluator, of all actions you are taking so that credit may be given for completing each step of the task.

**DURING THE JPM, ENSURE PROPER SAFETY PRECAUTIONS, FME, AND/OR RADIOLOGICAL CONCERNS AS APPLICABLE ARE FOLLOWED.**

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**INITIAL CONDITIONS:**

Unit 2 has been operating at 100% power for the last 30 days.

Rod H-2 in Shutdown Bank "A" has dropped to the bottom of the core 30 minutes ago. The crew is responding in accordance with AOP-6A, "Dropped Rod".

**INITIATING CUE(S) / TASK TO BE PERFORMED (SIMULATED):**

The DSS has directed you to calculate the required shutdown margin in accordance with PBF-2513, "Shutdown Margin for an Operating Reactor", per Step 9 of AOP-6A within 30 minutes.

The following Unit 2 conditions currently exist:

- Boron Concentration – 1309 ppm
- Rx Power – 90%
- $T_{ave}$  - 567°
- $T_{ref}$  – 568°
- Control Bank D @ 220 steps.
- All other banks @ 228 steps.

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PERFORMANCE INFORMATION

**NOTE:** *CRITICAL STEPS ARE DENOTED WITH A "Y". FAILURE TO MEET THE STANDARDS FOR THIS ITEM CONSTITUTES FAILURE.*

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START TIME	STEP/SEQUENCE/CRITICAL			SAT
	1	1	N	UNSAT

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**ELEMENT:** Obtain PBF-2513 form.

**STANDARD:** As above.

**CUE:** Examiner provides a Blank copy of PBF-2513 when requested.

**COMMENTS:**

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	STEP/SEQUENCE/CRITICAL			SAT
	2	2	N	UNSAT

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**ELEMENT:** Verifies  $T_{AVG}$  within  $1.5^{\circ}F$  of  $T_{REF}$ .

**STANDARD:** Verifies  $T_{AVG}$  within  $1.5^{\circ}F$  of  $T_{REF}$  based on initial conditions given and circles YES on PBF-2513.

**CUE:**  $T_{AVG}$  is within  $T_{REF}$  by  $<1.5^{\circ}F$  (or as indicated on simulator).

**COMMENTS:**

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	STEP/SEQUENCE/CRITICAL			SAT
	3	3	Y	UNSAT

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**ELEMENT:** Obtains core burn-up from ROD 1.1.

**STANDARD:** As above and records on PBF-2513.

**CUE:** Provide examinee with copy of Unit 2 ROD book.

**NOTE:** *ROD 1.1 should be updated to read 1500 MWD/MTU.*

**COMMENTS:**

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PERFORMANCE INFORMATION

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STEP/SEQUENCE/CRITICAL  
4 4 Y

SAT \_\_\_\_\_  
UNSAT \_\_\_\_\_

**ELEMENT:** Obtains data and calculates % burn-up.

**STANDARD:** Obtains data, calculates % burn-up and records on PBF-2513.

**CUE:**

**COMMENTS:**

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STEP/SEQUENCE/CRITICAL  
5 5 N

SAT \_\_\_\_\_  
UNSAT \_\_\_\_\_

**ELEMENT:** Obtains reactor power level.

**STANDARD:** Obtains reactor power level from initial conditions given and records on PBF-2513.

**CUE:**

**COMMENTS:**

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STEP/SEQUENCE/CRITICAL  
6 6 N

SAT \_\_\_\_\_  
UNSAT \_\_\_\_\_

**ELEMENT:** Obtains control rod position for Bank C and D.

**STANDARD:** Obtains Bank C and D control rod position from initial conditions given and records on PBF-2513.

**CUE:**

**COMMENTS:**

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STEP/SEQUENCE/CRITICAL  
7 7 N

SAT \_\_\_\_\_  
UNSAT \_\_\_\_\_

**ELEMENT:** Obtains power defect from Rod 7.

**STANDARD:** As above and records on PBF-2513.

**CUE:**

**COMMENTS:**

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STEP/SEQUENCE/CRITICAL  
8 8 N

SAT \_\_\_\_\_  
UNSAT \_\_\_\_\_

**ELEMENT:** Obtains control rod worth (Bank D, C, B, A, S in , HZP) from Rod 5.

**STANDARD:** As above and records on PBF-2513.

**CUE:**

**COMMENTS:**

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STEP/SEQUENCE/CRITICAL  
9 9 N

SAT \_\_\_\_\_  
UNSAT \_\_\_\_\_

**ELEMENT:** Obtains stuck rod worth from Rod 5.

**STANDARD:** Above and records on PBF-2513.

**CUE:**

**COMMENTS:**

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PERFORMANCE INFORMATION

**NOTE:** *CRITICAL STEPS ARE DENOTED WITH A "Y". FAILURE TO MEET THE STANDARDS FOR THIS ITEM CONSTITUTES FAILURE.*

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STEP/SEQUENCE/CRITICAL  
10 10 N

SAT  
UNSAT

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**ELEMENT:** Obtain stuck rod worth minus control rod worth.

**STANDARD:** Subtracts values of Step 8 from Step 7 and records on PBF-2513.

**CUE:**

**COMMENTS:**

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STEP/SEQUENCE/CRITICAL  
11 11 N

SAT  
UNSAT

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**ELEMENT:** Obtains bank worth to ARO from Rod 3.1 using Step 2 and Step 5 data.

**STANDARD:** As above and records on PBF-2513.

**CUE:**

**COMMENTS:**

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STEP/SEQUENCE/CRITICAL  
12 12 N

SAT  
UNSAT

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**ELEMENT:** Obtains stuck rod worth found in Rod 5 (same as value in Step 8).

**STANDARD:** As above and records on PBF-2513.

**CUE:**

**COMMENTS:**

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PERFORMANCE INFORMATION

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STEP/SEQUENCE/CRITICAL  
13 13 N

SAT  
UNSAT \_\_\_\_\_  
\_\_\_\_\_

**ELEMENT:** Obtains total available control rod and negative reactivity by adding Step 9, 10, 11 and 250 pcm.

**STANDARD:** As above and records on PBF-2513.

**CUE:**

**COMMENTS:**

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STEP/SEQUENCE/CRITICAL  
14 14 Y

SAT  
UNSAT \_\_\_\_\_  
\_\_\_\_\_

**ELEMENT:** Calculates shutdown margin by adding Steps 12 and 6.

**STANDARD:** As above and records on PBF-2513.

**CUE:**

**NOTE:** *It is critical that this value falls within the range on the examiner key.*

**COMMENTS:**

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STEP/SEQUENCE/CRITICAL  
15 15 Y

SAT  
UNSAT \_\_\_\_\_  
\_\_\_\_\_

**ELEMENT:** Determine the required shutdown margin using T.S. Figure 15.3.10-2 using Step 3 data.

**STANDARD:** As above and records on PBF-2513.

**CUE:**

**COMMENTS:**

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PERFORMANCE INFORMATION

**NOTE:** *CRITICAL STEPS ARE DENOTED WITH A "Y". FAILURE TO MEET THE STANDARDS FOR THIS ITEM CONSTITUTES FAILURE.*

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STEP/SEQUENCE/CRITICAL  
16 16 Y

SAT \_\_\_\_\_  
UNSAT \_\_\_\_\_

**ELEMENT:** Determines if calculated shutdown margin is more negative than required shutdown margin.

**STANDARD:** As above and circles Yes on PBF-2513.

**CUE:**

**COMMENTS:**

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STEP/SEQUENCE/CRITICAL  
17 17 Y

SAT \_\_\_\_\_  
UNSAT \_\_\_\_\_

**ELEMENT:** Completes PBF-2513 within 30 minutes.

**STANDARD:** Not more than 30 minutes has elapsed since beginning JPM (start time).

**CUE:** This completes this JPM.

**COMMENTS:**

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**TERMINATION CUE:** THIS COMPLETES THIS JPM.

**COMPLETION TIME:** \_\_\_\_\_