

# DUANE ARNOLD ENERGY CENTER

## NRC REQUALIFICATION EXAM

### SIMULATOR EVALUATION

#### SCENARIO GUIDE

#### NUMBER 2a

**TITLE: Loss of FW/W HPCI INOP**

**Reference Leg Leak - 1A3 Lockout**

DEVELOPED BY:

*[Signature]*  
Name

8/13/90  
Date

OPERATIONS SUPERVISOR  
APPROVAL:

*OK Mich.*  
Name

8/13/90  
Date

TRAINING SUPERVISOR  
APPROVAL:

*[Signature]*  
Name

8-13-90  
Date

9011050028 901024  
PDR ADOCK 05000331  
V PDC

## OBJECTIVES

### A. TERMINAL OBJECTIVE:

The operator, acting as a member of a shift operating crew, must demonstrate competence in performance of license duties required to protect the public health and safety while operating the plant in accordance with approved instructions and procedures.

### B. ENABLING OBJECTIVES:

1. Following a pre-shift brief, each crew member will be able to provide a detailed plant status report to include:
  - a. Status of safety-related systems, running equipment, and inoperable equipment.
  - b. STPs in progress and any existing LCOs.
  - c. Pertinent night orders and planned evolutions.
2. Using plant installed instrumentation and plant procedures, as well as information obtained by operating personnel outside the Control Room, the operating crew will correctly diagnose plant problems.
3. The OSS will be able to use appropriate plant procedures to ensure completion of immediate actions and direct subsequent actions as required.
4. When using plant procedures, the NSOE/ANSOE will be able to:
  - a. Locate the proper section of the procedure.
  - b. Follow the procedure correctly.
  - c. Locate and observe installed instrumentation.
  - d. Analyze system response.
  - e. Direct plant operators (Second ANSOE and Auxiliary Operators).
  - f. Inform the OSS when complete.
5. While operating in accordance with the Emergency Operating Procedures, the OSS will:
  - a. Identify all EOP entry conditions.
  - b. Direct the NSOE/ANSOE to perform required actions for control of reactor power, level, pressure, or containment parameters.
  - c. Specify the plant systems to be used to control plant parameters.
  - d. Evaluate changes in plant conditions against current actions being taken and make corrections as necessary.
6. When directed by the OSS to perform actions in accordance with the Emergency Operating Procedures, the NSOE/ANSOE will:
  - a. Utilize the systems designated by the OSS.

- b. Monitor system performance; i.e., pressure flow, etc.
- c. Inform the OSS immediately when a system becomes unavailable for further use.
- d. Inform the OSS of plant trends in response to actions taken.
7. Given a set of plant conditions, the OSS will be able to comply with the requirements of Technical Specifications and the Administrative Procedures.
8. The OSS will be able to utilize the Emergency Plan to properly:
  - a. Evaluate plant conditions and determine the emergency classification.
  - b. Ensure requisite notifications are made.
9. The STA will assist the operating crew as required to:
  - a. Ascertain that plant response is as predicted in the UFSAR during transients, accidents, and plant emergencies and report abnormalities to the OSS.
  - b. Provide technical assistance and perform whatever activities are deemed necessary by the OSS because of specific plant conditions.
  - c. Review the status of inoperable equipment to determine whether the loss of the equipment is a situation addressed by Technical Specifications requiring specific action by the plant staff.
10. The crew members will demonstrate effective communications, exchanging complete and relevant information in order to make team decisions in a timely manner.
11. The NSOE/ANSOE will be able to perform the following operator actions, in response to plant events:
  - a. IPOI-5 Immediate Actions for Scram.
  - b. Initiate Torus Cooling with a LPCI initiation signal present.
  - c. Operate ECCS Systems to restore RPV level.
  - d. Emergency depressurize when directed.

## NARRATIVE SUMMARY

During operation at rated power, the crew is scheduled to perform STP 45D002 HPCI INOP PACKAGE, because HPCI failed its operability test last shift due to a faulty EGM Controller and is inop. The 'A' CRD pump is inop for motor bearing replacement.

"A" Loop of Torus cooling is on with A and C RHR pumps running. "C" RHR pump trips which puts crew in a 24 hour Tech Spec. LCO with HPCI INOP.

A leak develops in the "A" GEMAC reference leg (CC-4561). This produces a small break LOCA inside containment, but more significantly the leak causes increasing level on LI-4561 and LI-4559. Feedwater level control is selected to "B" level LI-4560 so there is no initial impact on actual RPV level. When indicated level on LI-4561 and 4559 reaches 211" a trip of the turbine and both RFPs occurs. The turbine trip produces a reactor scram and EOC RPT. Turbine Bypass valves fail close so that LLS valves PSV 4401 and 4407 will open to control pressure. RCIC will be lost when it starts. When drywell pressure increased to 2 psig bus 1A3 will be lost due to a bus lockout. Drywell spray valve 1902 will not operate when required.

Other systems respond as expected, but high pressure makeup from RCIC and CRD is insufficient to maintain RPV level above +15". Emergency depressurization will be required due to high drywell temperature resulting from Drywell spray failure, and to allow restoration of level using RHR and Core Spray. Depressurizing will cause entry into the RPV saturation curve, requiring RPV Flooding.

## SIMULATOR SETUP

### 1. GENERAL INSTRUCTIONS

- a. Initialize the simulator to IC-20. CHECK MALFUNCTION FILE ESG 2 per (2).
- b. Place the simulator in Run.
- c. Place the A RHR loop in Torus cooling, place both ESW pumps in service.
- d. Ensure that all annunciators are acknowledged and the plant is stable.
- e. Advance the chart paper in the recorders.
- f. Tag out HPCI Aux Oil in P-T-L pump and Isolation Valves closed. Remove light bulbs to simulate breakers opened if overrides not working.
- g. Tag out 'A' CRD pump.

### 2. LIST OF MALFUNCTIONS

Verify E8 is RCVPM02404 > .1 and E11 is PCPDWG > 2 and Type RMF ESG2.

Time	Malfunction No.	Malfunction Title	ET	Delay	F. Sev.	Ramp	I. Sev.
0	HP02	HPCI Turbine Trip					
0	TC06A	BPV #1 F/C			0%		
0	TC06B	BPV #2 F/C			0%		
0	RD11A	A CRD pump trip.					
10-15	RR27A	"A" GEMAC Ref leak			100	4 min.	
	MS02		E11		1%	120 sec.	
≈2 psig DW	ED08C	1A3 Lockout	E11				
0	RC06	Steam leak RCIC	E8	30 sec	5	1 min	as is
5	RH01C	RHR pump trip					

3. LIST OF OVERRIDES

Type R0R ESG2

TAG	ET	DEL	OR VALUE
ZDIRHHS1902			close
ZLOPHS2238 [Red]			off
AN:1C03C[25]			off
ZLOPHS2238 [Green]			off
ZLOPHS2299			off
ZLOPHS2239 [Green]			off
ZLORDHS1807A [Red]			off
ZLOPHS2239 [Red]			off
ZLORDSH1807A [White]			off
ZLOPHS2256 [Green]			off
ZLORDHS1807A [Green]			off
ZLOPHS2256 [Red]			off
ZLOHPMO2238 [Green]			off
ZLOHPMO2238 [Red]			off
ZLOHPM02239 [Green]			off
ZLOHPMO2239 [Red]			off
ZAOHPPI2207 0			

## LIST OF CRITICAL TASKS

CRITICAL TASKS	RO/SRO
1. Declare 24 hour LCO IAW T.S. 3.5.D.	A OSS
2. Declare Unusual Event (Tech. Spec. - Shutdown)	A OSS
3. Notify State/County within 15 minutes. Notify NRC within 1 hour.	B OSS
4. Directs Emergency Depressurization when drywell temperature cannot be maintained < 280°F.	A OSS
5. Initiate Emergency depressurization when directed.	NSOE
6. Direct level restoration by establishing minimum flooding pressure.	A OSS
7. Restore level by injecting with systems as necessary to establish minimum flooding pressure when directed.	ANSOE
8. When manual control of Bypass valves is attempted, recognize failure of valves to open.	ANSOE
9. Declare Alert.	A OSS
10. Notify State and County within 15 minutes. (TC) Notify NRC within one hour.	B OSS
11. Evacuate the plant if an alert is declared.	B OSS
12. Direct Torus Spray before Drywell pressure reaches 9 psig.	A OSS
13. Initiate Torus spray when directed.	NSOE
<p><b>Note:</b> Specific critical tasks may be assigned to specific individuals; however, any crew member may perform the task without causing a failure of the assigned individual.</p>	

## SHIFT TURNOVER

**PLANT CONDITIONS:** The plant is operating at rated power.

**EQUIPMENT STATUS:** HPCI was just declared inop last shift due to a faulty EGM controller. HPCI turbine cannot be used because of overspeed potential. All other valves/components not tagged out by HPCI tagout can be used. 'A' CRD pump is inop due to a bad motor bearing.

All STPs for HPCI inop package (45D002) are complete except RCIC operability (45E001-LCO). "A" loop of RHR is in Torus cooling for RCIC operability.



TIME/NOTES	INSTRUCTOR ACTIVITY	EXPECTED ACTIONS/BEHAVIOR
T = 0	When the operators have familiarized themselves with the current plant conditions.	OSS directs RCIC operability STP per Tech Specs. OSS verifies prerequisite, authorizes STP.
		Conduct RCIC Valve Operability checks.
T = 5 minutes	<p>Activate Malfunction RH01C</p> <p>Auxiliary Operator: Report that the pump breaker lockout relay is tripped and the time overcurrent relay is tripped.</p> <p>Note: "A" pump may trip on Runout; it can be restarted if trip clear: ED05 clear, then reset.</p> <p>As SAN SOE report that the C RHR pump coupling is broken.</p>	<p>A OSS: Determines RHR pump inoperable.</p> <p>* A OSS: Declare 24 hour LCO IAW Tech. Spec. 3.5.D</p>
	Function as security and outside agencies as notifications are made.	<p>* A OSS: Declare unusual event.</p> <p>* B OSS: Notify state/county within 15 minutes, and NRC within 1 hour.</p>
When All calls are being made or 30 minutes after RHR pump C is tripped.	Activate malfunction RR27A at 100% on 4 minute ramp to initiate GEMAC "A" Reference Leg Leak.	
<b>Note:</b> * Critical task involved.		

TIME/NOTES	INSTRUCTOR ACTIVITY	EXPECTED ACTIONS/BEHAVIOR
		<p>Crew responds to Turbine Trip, Reactor Scram, Loss of Feedwater.</p> <p>A OSS: Enter EOP-1 on low reactor level and high reactor pressure.</p> <p>NSOE: Manually initiate RCIC when ordered.</p> <p>A OSS: Enter EOP-3 on RCIC Room or steam tunnel high temperatures</p>
	<p>If drywell vented prior to 2 psig then insert malfunction ED08C bus 1A3 lockout, and MS02 at 1% with 120 sec ramp. Act as Aux and report bus lockout is tripped and nothing else wrong, except "C" RHR pump. If electricians are present in 1A3, "will have the electricians check the bus".</p>	<p>Crew responds to increasing Drywell pressure.</p> <ul style="list-style-type: none"> <li>▪ May vent drywell per OI 573.</li> <li>▪ May depressurize at normal cooldown rates.</li> <li>▪ Recognize LLS is cycling.</li> </ul> <p>A OSS: Directs RCIC be used for level restoration and investigates level indication failure.</p> <p>NSOE: Places Torus Cooling in service.</p> <ul style="list-style-type: none"> <li>* A OSS: Direct Torus Spray before Drywell Pressure reaches 9 psig.</li> <li>* NSOE: Initiate Torus spray when directed.</li> <li>* ANSOE: When manual control of Bypass valves is attempted, recognize failure of valves to open.</li> </ul>
	<p>Instructor act as SAN SOE and close V-19-48 in Torus if required.</p>	<p>Crew monitors containment parameters.</p>
		<p>Crew recognizes loss of 1A3 bus and investigates bus lockout.</p>

TIME/NOTES	INSTRUCTOR ACTIVITY	EXPECTED ACTIONS/BEHAVIOR
t ≈ 40 minutes	If "B" and "D" RHR pumps trip on runout, they can be reset: ED05 clear, then reset.	<ul style="list-style-type: none"> <li>* A OSS: Direct Drywell spray prior to 280° or after Torus pressure exceeds 9 psig if allowed by DSIL.</li> <li>■ Recirc secured</li> <li>■ DW Fans secured</li> <li>* NSOE: Recognizes MO-1902 cannot be opened.</li> <li>■ Informs OSS cannot spray drywell.</li> <li>* A OSS: Direct Emergency Depressurization when Drywell Temperature cannot be maintained &lt; 280°F.</li> <li>* NSOE: Initiate Emergency Depressurization when directed.</li> </ul>
		<ul style="list-style-type: none"> <li>* ANSOE: Restore level by injecting with systems as necessary to establish minimum flood pressure when directed</li> <li>* A OSS: Declare an Alert</li> <li>* B OSS: Notify State/County within 15 minutes. Notify NRC within 1 hour.</li> <li>* B OSS: Evacuate the plant if an alert is declared.</li> </ul>
	Terminate scenario when minimum flooding pressure has been established and stabilized.	

## REFERENCES

PROCEDURE	SECTION	PROCEDURE REVISION
Surveillance Test Procedures		
STP 45E001-Q RCIC Operability		4
Operating Instructions		
OI-149RHR	5.2	14
OI-416RHR-SW	4.0	5
OI-150 RCIC	6.0	9
OI-152 HPCI	5.1	14
Integrated Plant Operating Instructions	3.1, 3.2	
IPOI 5		4
Emergency Operating Procedures		
EOP-1	All	0
EOP-2	T/T	0
Emergency Inst.		
EPIP	I.1, I.2	57
Abnormal Operating Procedures		
AOP 301		
Possible EOP Contingencies		
Emergency Depressurization		
RPV Flood		
Alternate Level Control		

**DAEC TASKS**

<b>ENTRY CONDITION: LEAK IN GEMAC REFERENCE LEG CC-4561</b>		
<b>K/A System/Evolution</b>	<b>Ability No.</b>	<b>RO/SRO</b>
216000 Nuclear Boiler Instrumentation	A2.03	3.0/3.1
	A3.01	3.4/3.4
	A4.01	3.3/3.1

<b>ENTRY CONDITION: MAIN TURBINE GENERATOR TRIP (&gt; 30% POWER)</b>		
<b>K/A System/Evolution</b>	<b>Ability No.</b>	<b>RO/SRO</b>
295005 Abnormal Plant Evolution	AA1.01	3.1/3.3
	AA1.02	3.6/3.6
	AA1.04	2.7/2.8
	AA1.05	3.6/3.6
	AA1.07	3.3/3.3
	AA2.04	3.7/3.8
	AA2.07	3.5/3.6
	AA2.08	3.2/3.3

**DAEC TASKS**

<b>ENTRY CONDITION: MAIN TURBINE GENERATOR TRIP (&gt; 30% POWER)</b>		
<b>DAEC System</b>	<b>RO Task No.</b>	<b>SRO Task No.</b>
RECIRC (C)	C.0002	C.0002
ADS/LLS (D)	D.0002	D.0002
TURBINE (V)	V.0016	V.0016
RPS (KKK)	KKK.0030	KKK.0030
IPOIs (SSS)	SSS.0004	SSS.0004
EOPs (TTT)	TTT.0011	TTT.0011

<b>ENTRY CONDITION: ANY AUTO REACTOR SCRAM SIGNAL - FULL SCRAM</b>		
<b>K/A System/Evolution</b>	<b>Ability No.</b>	<b>RO/SRO</b>
212000 RPS	AA1.01	4.2/4.2
	A1.06	3.4/3.4
	A1.07	3.4/3.4
	A1.08	3.4/3.3
	A1.11	4.1/4.2
	A2.20	4.4/4.4
	A3.01	4.2/4.2
	A3.03	3.9/3.8
	A3.04	3.9/3.9
	A3.05	3.6/3.6
	A3.07	4.1/4.1
	SG #13	4.3/4.4
	SG #14	
	295006 SCRAM Abnormal Plant Evolution	AA1.01
AA1.02		3.9/3.8
AA1.03		3.7/3.7
AA1.04		3.1/3.2
AA1.05		4.2/4.2
AA1.06		3.5/3.6
AA1.07		4.1/4.1
AA2.01		4.5/4.6
AA2.02		4.3/4.4
AA2.03		4.0/4.2
AA2.04		4.1/4.1
AA2.05		4.6/4.6
AA2.06		3.5/3.8
SG #6		4.1/4.2
SG #10		4.1/4.2
SG #11		4.3/4.5
SG #12	3.8/4.4	

**DAEC TASKS**

<b>ENTRY CONDITION: ANY AUTO REACTOR SCRAM SIGNAL - FULL SCRAM</b>		
<b>DAEC System</b>	<b>RO Task No.</b>	<b>SRO Task No.</b>
IPOIs (SSS)	SSS.0004	SSS.0004

<b>ENTRY CONDITION: LPCI LOOP SELECTION 2 PSIG/119.5" RPV LEVEL NO FAILURES</b>		
<b>K/A System/Evolution</b>	<b>Ability No.</b>	<b>RO/SRO</b>
203000 RHR/LPCI: Injection Mode	A1.01	4.2/4.3
	A2.16	4.4/4.5
	A3.01	3.8/3.7
	A3.05	4.4/4.4
	A3.06	3.7/3.6
	A3.07	4.2/4.6
	A3.08	4.1/4.1

**DAEC TASKS**

<b>ENTRY CONDITION: LPCI LOOP SELECTION 2 PSIG/119.5" RPV LEVEL NO FAILURES</b>		
<b>DAEC System</b>	<b>RO Task No.</b>	<b>SRO Task No.</b>
RHR System (L)	L.0002	L.0002

<b>ENTRY CONDITION: RCIC INITIATION AT 119.5" RPV LEVEL</b>		
<b>K/A System/Evolution</b>	<b>Ability No.</b>	<b>RO/SRO</b>
217000 RCIC	A3.01	3.5/3.5
	A3.02	3.6/3.5
	A3.03	3.7/3.6
	A3.04	3.6/3.5
	A3.05	3.9/3.9
	A3.06	3.5/3.4

**DAEC TASKS**

<b>ENTRY CONDITION: RCIC INITIATION AT 119.5" RPV LEVEL</b>		
<b>DAEC System</b>	<b>RO Task No.</b>	<b>SRO Task No.</b>
RCIC (H)	H.0003	H.0003
	H.0009	H.0009



<b>ENTRY CONDITION: REACTOR LOW WATER LEVEL (&lt; 170")</b>		
<b>K/A System/Evolution</b>	<b>Ability No.</b>	<b>RO/SRO</b>
295031 Emergency Plant Evolution	EA1.01	4.4/4.4
	EA1.02	4.5/4.5
	EA1.03	4.4/4.4
	EA1.05	4.3/4.3
	EA1.06	4.4/4.4
	EA1.07	3.7/3.7
	EA1.10	3.6/3.7
	EA1.12	3.9/4.1
	EA2.01	4.6/4.6
	EA2.03	4.2/4.2
	EA2.04	4.6/4.8
	SG #6	4.1/3.9
	SG #10	4.0/3.8
	SG #11	4.2/4.6
	SG #12	3.9/4.5

<b>ENTRY CONDITION: DW PRESSURE &gt; 2 PSIG - TORUS WATER TEMP &gt; 95°F</b>		
<b>K/A System/Evolution</b>	<b>Ability No.</b>	<b>RO/SRO</b>
T/T-1 219000 RHR/LPCI Torus/Suppression Pool Cooling Mode	A1.01	4.0/4.0
	A1.02	3.5/3.5
	A1.08	3.7/3.6
	A2.14	4.1/4.3
	A4.01	3.8/3.7
	A4.02	3.7/3.5
	A4.05	3.4/3.4
	A4.06	3.9/3.7
	A4.09	3.4/3.3
	A4.14	3.7/3.5
	SG #9	4.2/3.8
SG #13	3.9/3.7	
PC/P-4 230000 RHR/LPCI Torus/Suppression Pool Spray Mode	A1.01	3.8/3.9
	A2.15	4.0/4.1
	A4.01	3.7/3.5
	A4.02	3.8/3.6
	A4.05	3.2/3.1
	A4.06	4.0/3.9
	A.409	3.6/3.3
	A4.16	3.8/3.8

### DAEC TASKS

<b>ENTRY CONDITION: DW PRESSURE &gt; 2 PSIG - TORUS WATER TEMP &gt; 95°F</b>		
<b>DAEC System</b>	<b>RO Task No.</b>	<b>SRO Task No.</b>
RHR (L)	L.0009	L.0009
	L.0016	L.0016
ADMIN (UUU)		UUU.0050 UUU.051 UUU.0053

<b>ENTRY CONDITION: HIGH DW TEMPERATURE</b>		
<b>K/A System/Evolution</b>	<b>Ability No.</b>	<b>RO/SRO</b>
295028 HIGH DW TEMPERATURE	EA 1.01	3.8/3.9
	EA 1.03	3.9/3.9
	EA 1.04	3.9/4.0
	EA 2.01	4.0/4.1
	EA 2.02	3.8/3.9
	EA 2.03	3.7/3.9
	SG #6	3.9/3.8
	SG #11	4.2/4.4
	SG #12	3.8/4.3

**DAEC TASKS**

<b>ENTRY CONDITION: HIGH DW TEMPERATURE</b>		
<b>DAEC System</b>	<b>RO Task No.</b>	<b>SRO Task No.</b>
RHR (L)	L.0016	L.0016
EOP's (TTT)	TTT.0012	TTT.0012
	TTT.0016	TTT.0016
	TTT.0021	TTT.0021
	TTT.0020	TTT.0020

<b>ENTRY CONDITION: STEAM LEAK IN RCIC ROOM</b>		
<b>K/A System/Evolution</b>	<b>Ability No.</b>	<b>RO/SRO</b>
295032 High Secondary Containment Area Temperature	EA 1.01	3.6/3.7
	EA 1.02	3.4/3.5
	EA 1.03	3.7/3.7
	EA 1.05	3.7/3.9
	EA 2.01	3.8/3.8
	EA 2.02	3.3/3.5
	EA 2.03	3.8/4.0
	SG #6	3.8/3.7
	SG #11	4.1/4.2
	SG #12	3.6/4.4

**DAEC TASKS**

<b>ENTRY CONDITION: STEAM LEAK IN RCIC ROOM</b>		
<b>DAEC System</b>	<b>RO Task No.</b>	<b>SRO Task No.</b>
EOP's (TTT)	TTT.0013	TTT.0013
RCIC (H)	H.0027	H.0027