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DUANE ARNOLD ENERGY CENTER

NRC REQUALIFICATION EXAM

SIMULATOR EVALUATION

SCENARIO GUIDE

NUMBER 17

TITLE: MSL Rupture Outside Primary Containment

DEVELOPED BY:

Name Date

OPERATIONS SUPERVISOR
APPROVAL:

Name Date

TRAINING SUPERVISOR
APPROVAL:

Name Date

9011050029 901024
PDR ADDCK 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. Diagnoses failed Group 5 isolation.
 - b. Maintains RPV level above +15".

NARRATIVE SUMMARY

The plant is operating at 100% power. No LCO's currently exist. All major plant equipment is operable.

An inadvertent RCIC initiation occurs and causes a small Fuel cladding failure. Radiation levels will increase slightly and RWCU HX Room ARM will alarm, requiring entry into EOP-3.

A leak in the RWCU heat exchanger room occurs and MO 2700 fails to isolate. The RWCU leak causes ARM's to alarm in more than one area. The operators will enter EOP-I, reduce power and scram the reactor. The scram will fail and the ATWS EOP will be entered. Emergency depressurization caused by ARM's above max safe setpoints per EOP-3 will be required. Rods will insert when ED is directed.

SIMULATOR SETUP

1. GENERAL INSTRUCTIONS

- a. Reset to I.C. 14
- b. Verify rod pull sheet correct.

2. LIST OF MALFUNCTIONS

Verify E3 is RDPACC < I460 Type RMF ESGI7

Time	Malfunction No.	Malfunction Title	ET	Delay	F. Sev.	Ramp	I. Sev.
0	MS28A	MO 2700 Fails to isolate					
0	RM01 RE9156	ARM Upscale	E3		75%	8 min.	42
0	RM01 RE9157	ARM Upscale	E3		90%	8 min.	55
0	RM01 RE9167	ARM Upscale	E3		75%	12 min.	30
0	RM01 RE9169	ARM Upscale	E3		80%	12 min.	32
0	RM01 RE9176	ARM Upscale	E3		75%	12 min.	30
0	RP05A	RPS auto scram fail					
0	RP05B	RPS manual scram fail					
0	RP05C	ATWS ARI fail					
0	RP05D	RPS fuses fail					
0	RP05E	Scram switches fail					
2	RC08	Inadvertent RCIC initiation					
5	RX01	Fuel Cladding Failure			3%	2 min.	
10	CU10	Leak in RWCU HX Room			2%	10 min.	

3. LIST OF OVERRIDES

ROR ESG 17 for MO 2700 fail to isolate/RCIC Auto Initiation.

Time	Override	Value
t = 0	RWCU Inboard Isol. Valve MO 2700 Handswitch	OPEN
t = 0	MO 2700 Red light-1C04	ON
t = 0	MO 2700 Red light-PC Mimic	ON
t = 0	MO 2700 Green light-1C04	OFF
t = 0	MO 2700 Green light-PC Mimic	OFF
t = 0	AN: 1C05A[8] (Delete if level drops to Lo-Lo)	OFF

LIST OF CRITICAL TASKS

CRITICAL TASKS	RO/SRO
1. Declare 7 day LCO per TS 3.5.E.2	A OSS
2. Recognize MO 2700 fails to isolate and attempt to isolate.	NSOE
3. Directs manual scram when any area reaches its max. safe operating limit.	A OSS
4. Manually scrams Reactor when directed.	ANSOE
5. Recognize that all rods did not fully insert.	ANSOE
6. Perform Alternate Rod Insertion procedures per EOP-C section 5.0 as directed.	B OSS
7. Manually insert rods as directed.	ANSOE
8. Maintain RPV level above + 15".	ANSOE
9. Direct Emergency Depressurization when 2 like parameters in more than one area exceeds max safe operating limits.	A OSS
10. Initiate Emergency Depressurization when directed.	NSOE
11. Declare a SITE EMERGENCY.	A OSS
12. Notify State/County within 15 minutes, NRC within one hour.	B OSS

SHIFT TURNOVER

PLANT CONDITIONS: 100% reactor power, limiting control rod pattern.

EQUIPMENT STATUS: No inop equipment.

TIME/NOTES	INSTRUCTOR ACTIVITY	EXPECTED ACTIONS/BEHAVIOR
T = 0 min.	Verify required malfunctions are inserted per the Table for T = 0. (Event trigger E3 is the scram).	Crew familiarizes themselves with the plant conditions.
T = 2 min.	Insert malfunction RC08 (Inadvertent RCIC initiation). Act as SAN SOE if crew wants RCIC room investigated. After 2 min. report everything is normal.	Crew responds to RCIC initiation by: <ul style="list-style-type: none"> ▪ Tripping RCIC after verifying adequate core cooling. * "A" OSS declares RCIC inop and enters a 7 day LCO.
	After crew trips RCIC and system is shutdown: <ul style="list-style-type: none"> - Override ON: 1C05B E7 (RCIC Auto Initiated) - Override OFF: 1C04C D5 (RCIC Lo Suction Trip) - Insert malfunction RC02 (RCIC Turbine Trip) - Delete malfunction RC08 (Inadvertent initiation) - Delete override of 1C05A A8 (Reactor Lo Lo Level Trip) 	
T = 5 min.	Insert malfunction RX01 (Fuel Cladding Failure), 3% severity over a 2 minute ramp rate.	Crew responds to Rx Bldg. ARM Hi Rad Alarm (1C04B A-6): <ul style="list-style-type: none"> ▪ At Panel 1C11, monitor ARM's - note RWCU HX Room is alarming. ▪ Send an Operator to investigate locally. ▪ Enter EOP 3 and continue monitoring ARM's.
Note: * = Critical Task		

TIME/NOTES	INSTRUCTOR ACTIVITY	EXPECTED ACTIONS/BEHAVIOR
<p>T = 10 min.</p>	<p>Insert malfunction CU10 (Leak in RWCU Hx room, 2% severity, 10 minute Ramp rate)</p> <p>Act as SANSOE to investigate the RWCU Hx room. After Two minutes report:</p> <ul style="list-style-type: none"> ▪ Water and steam are coming out of the door. ▪ Can hear flow noise in the room. 	<p>Crew responds to Steam Leak Detection Alarms (1C04B B-4 and D-4)</p> <ul style="list-style-type: none"> ▪ At Panel 1C21, monitor temps - note RWCU temp. alarms * NSOE: Recognizes MO 2700 fails to isolate and attempts to isolate. * "A" OSS: Directs manual Scram when any area reaches its max. safe operating limit. * ANSOE: Manually Scrams Reactor when directed. * ANSOE: Recognizes that all rods did not fully insert. <p>Crew responds to failure to Scram.</p> <ul style="list-style-type: none"> ▪ OSS directs other actions be taken to scram the Reactor per ATWS EOP and/or EOP C's. ▪ OSS directs RPV level maintained above +15". ▪ OSS directs ADS be locked out. ▪ OSS directs EHC pressure set lowered to 880 psig and stabilizes pressure with the Main Turbine or other systems as required. * B OSS: Perform Alternate Rod Insertion procedures per EOP-C section 5.0 as directed. * ANSOE: Manually insert rods as directed. * NSOE: Maintains RPV level above +15". * "A" OSS: Declares a Site Emergency. * "B" OSS: Notifies state and county within 15 minutes, and NRC within 1 hour.

TIME/NOTES	INSTRUCTOR ACTIVITY	EXPECTED ACTIONS/BEHAVIOR
T = 20 min.	<p>Verify ARM malfunctions have inserted and are active (RM01RE 9156, 9157, 9167, 9169, 9176).</p> <p>When ED is directed, vent scram air header: IMF RD13 at 100%.</p>	<ul style="list-style-type: none"> * A OSS: Directs ED when 2 like parameters in more than one area exceed max. safe operating limits. ▪ A OSS: Directs injection into RPV secured except Boron, CRD, and RCIC. * NSOE: Initiates ED when directed. ▪ Crew recognizes rods inserting. ▪ A OSS exits ATWS EOP and re-enters EOP-I after all rods verified inserted. ▪ A OSS directs level restoration to 170-211 inches.
T = 40 min. (After ED)	<p>After ED complete, ramp malfunctions RM01RE 9156, 9157, 9167, 9169, 9176 from Asis to 50% over 15 minutes.</p>	
T = 50 min.	<p>When the reactor is shutdown with water level restored, <u>pressure being intentionally lowered</u>, or ED done, containment parameters under control, and the OSS has addressed the EPIP's, terminate the scenario by placing the simulator in Freeze.</p>	

REFERENCES

PROCEDURE	SECTION	PROCEDURE REVISION
Operating Instructions ▪ OI 150 (RCIC)		9
Integrated Plant Operating Inst IPOI 5	3.2	4
Annunciator Response Procedures IC04B IC05B	B-4, D-4, A-6 E-7	11 12
Emergency Operating Procedures EOP 1 EOP 3 ATWS EOP EOP C's	RC, RC/L, RC/P S/T All 5.0	0 0 0 11
Emergency Plant Implementing Procedures	I.1, I.2, I.3	60

ENTRY CONDITION: Any Auto Reactor Scram Signal - Full Scram			
K/A System/Evolution	Ability No.	RO/SRO	
212000 RPS	A1.06	4.2/4.2	
	A1.07	3.4/3.4	
	A1.08	3.4/3.4	
	A1.11	3.4/3.3	
	A2.20	4.1/4.2	
	A3.01	4.4/4.4	
	A3.03	4.2/4.2	
	A3.04	3.9/3.8	
	A3.05	3.9/3.9	
	A3.07	3.6/3.6	
	SG #13	4.1/4.1	
	SG #14	4.3/4.4	
	295006 Scram Abnormal Plant Evolution	AA1.01	4.2/4.2
		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

ENTRY CONDITION: Any Auto Reactor Scram Signal		
DAEC System	RO Task No.	SRO Task No.
IPOI (SSS)	**SSS.004	**SSS.004
Admin (UUU)		UUU.018 UUU.027

ENTRY CONDITION: RCIC Initiation		
K/A System/Evolution	Ability No.	RO/SRO
RCIC System	SG #1	3.7/4.0
	SG #5	3.3/4.3
	SG #6	2.7/3.8
	SG #8	3.8/3.6
	SG #14	4.0/3.6

ENTRY CONDITION: RWCU Unisolated Leak		
K/A System/Evolution	Ability No.	RO/SRO
High Secondary Containment Temperatures	EA 1.01	3.6/3.7
	EA 1.02	3.4/3.5
	EA 1.05	3.7/3.9
	EA 2.01	3.8/3.8
	EA 2.03	3.8/4.0
	SG #1	3.1/4.0
	SG #5	3.8/3.7
	SG #6	3.8/3.7
	SG #9	3.8/3.6
	SG #11	4.1/4.2
	SG #12	3.6/4.4

ENTRY CONDITION:		
K/A System/Evolution	Ability No.	RO/SRO
High Secondary Containment Area Radiation Levels	EA 1.01	3.9/4.0
	EA 1.05	3.9/4.0
	EA 2.01	3.8/3.9
	EA 2.03	3.7/4.2
	SG #1	3.4/4.2
	SG #2	3.1/4.5
	SG #11	4.0/4.5
	SG #12	3.8/4.4

ENTRY CONDITION: Emergency Depressurization		
K/A System/Evolution	Ability No.	RO/SRO
Automatic Depressurization System	A1.04	4.1/4.2
	A1.06	4.1/4.3
	A2.01	4.1/4.3
	A3.06	3.9/3.9
	A3.08	4.2/4.3
	A3.09	4.1/4.2
	A4.01	4.4/4.4
	A4.09	3.9/3.9
	A4.12	4.2/4.3
	SG #1	4.2/4.3
	SG #9	4.4/4.1
	SG #14	4.1/3.8
	SG #15	4.2/4.4

ENTRY CONDITION:		
K/A System/Evolution	Ability No.	RO/SRO
Low Reactor Water Level	AA1.01	3.9/3.9
	AA1.02	4.0/4.0
	AA2.01	4.2/4.2
	AA2.03	2.9/2.9
	SG #6	3.9/3.9
	SG #10	4.2/4.0
	SG #11	4.3/4.5
	SG #12	3.8/4.4

DAEC TASKS

ENTRY CONDITION:		
DAEC System	RO Task No.	SRO Task No.
ADS (D) RHR (L) EOP's (TTT)	D.0002	D.0002
	L.0009	L.0009
	TTT.0012	TTT.0012
	TTT.0020	TTT.0017
	TTT.0021	