

LOSS OF POWER SCENARIOS

SIMULATOR GUIDE

APB

Program: Licensed Operator Requalification	Title: SG0012, Loss of Power Scenarios
Author: Pat Murphy	Revision Date: 7/16/98
References: 1. AOP 18A & AOP 18B, Train A (B) Equipment Operation 2. AOP 19A (B), Train A (B) Safeguards Bus Restoration 3. ECA 0.0, Loss of All Power	Duration: 4 hours
Commitments:	

1.0 **PURPOSE:**

The purpose of this is to give the Licensed Operators and the DTAs an opportunity to practice performing Abnormal and Emergency Operating procedures that deal with a loss of power to safeguards buses.

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2.0 OBJECTIVES

Objective	Description of Objectives
1	Stabilize the plant following a loss of power to a safeguards bus. (984.00.SG0012.001)
2	Establish charging and letdown. (984.00.SG0012.002)
3	Cross-tie 4160 V buses between units. (984.00.SG0012.003)
4	Reestablish containment ventilation to a normal lineup. (984.00.SG0012.004)
5	Identify and discuss the Technical Specifications associated with the Electrical Distribution components, parameters, and operation to include: a. Limiting Conditions for Operation (LCO) b. LCO Applicability c. LCO Action requirements (054.02.LP0007.007)(DTA)
6	Perform the immediate action steps of emergency procedures from memory. (984.00.SG0012.005)
7	Perform subsequent steps of emergency procedures as directed. (984.00.SG0012.006)
8	Monitor plant parameters and detect impending plant problems. (984.00.SG0012.007)(DTA)
9	Determine expected plant response to abnormal transients and identify deviations. Communicate this evaluation to the DSS. (984.00.SG0012.008)(DTA)
10	Classify the event and make page announcement of E-Plan classification, if appropriate. (984.00.SG0012.008) (DSS)

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3.0 TASKS:

CONTROL OPERATOR

P000.009COT	Respond to a loss of offsite AC power.
P000.010COT	Respond to a loss of all AC power.

SENIOR REACTOR OPERATOR

P004.004SRO	Direct personnel to mitigate emergency/abnormal events.
P003.014SRO	Perform required notifications.
P007.006SRO	Collect information and investigate the cause(s) of plant trips and/or other significant events.

DUTY TECHNICAL ADVISOR

C000.002DTA	Provide independent assessment of off-normal plant conditions.
C000.003DTA	Provide assessment of the crews response to abnormal plant conditions.
C000.004DTA	Advise the crew on actions needed to terminate or mitigate the consequences of an off-normal event.
P000.005DTA	Perform monitoring of Critical Safety Function Status Trees

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4.0 PRE-SCENARIO ACTIVITIES

- 4.1 Tell the crew that this is training. If any of the crew members want to discuss, explain or clarify any issue, they may ask the instructor to take the watch. As long as the crew has the watch, they have the normal responsibilities of monitoring and operating the control boards unless told otherwise. If the instructor has the watch, they have no operating responsibilities.

The intent of this session is to promote understanding of the event and to practice doing it right. We can back up if necessary to accomplish this.

The DSS's primary role is to observe and improve crew performance. The DSS will lead the post-event critique with assistance from the instructor. The DSS will conclude this session by updating the areas for improvement with the help of the crew liaison and develop an action plan to address them. Remind the DSS to assign activities to the DTA as appropriate during the scenario. The instructor's role is to support the DSS in the training of his crew.

- 4.2 Present session objectives as appropriate.
- 4.3 DSS assign roles based on individual needs ensuring crew rotation occurs so all operators have an opportunity to practice.
- 4.4 Discuss the differences between the plant and the simulator, if necessary.

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5.0 SESSION OUTLINE

This will start when the normal supply breaker to 1A04 opens. The problem will be an internal breaker failure. This will be compounded by the fact that the normally aligned EDG for that bus throws a piston through the casing. As part of their turnover the alternate EDG (G04) is tagged out. So 1A04 is deenergized which deenergizes 1A06 and 1B04. This will cause a plant perturbation in Unit 1 which will be stabilized by the crew using A Train equipment as directed by AOP 18A. They will also restore power to 1A04 using AOP 19B by cross-tying from 2A04 then restore their equipment to a normal lineup using AOP 18B. After the crew has had an opportunity to discuss the event, including the Technical Specifications that apply as a result of the failures, an AO will report that there is an oil leak which is spraying oil in the vital switchgear room. This will lead to a bus lockout of 1A05. Shortly after that the normal supply breaker to 2A04 will trip open deenergizing 1A04 and 2A04. This puts Unit 1 in a loss of all AC condition even though the reactor is still critical. Unit 2 will trip shortly after this because Instrument Air is lost to both units which will cause the MSIVs in Unit 2 to fail closed. The diesel air compressor can be started and aligned to instrument air but not quickly enough to avoid a reactor trip in Unit 2. It will make recovery easier, however. The crew will work through ECA 0.0 in Unit 1 and EOP 0 in Unit 2. Power will be restored to a 480V bus by backfeeding from 1B01 to 1B03. The scenario will end when the crew reaches a transition point and go to ECA 0.2, Loss of All AC Power Recovery With SI Required.

6.0 POTENTIAL OPERATOR PROBLEMS

- 6.1 Review the cycle reports for this crew's specific areas of concern.
- 6.2 Containment ventilation operation during AOP use may need to be discussed.
- 6.3 Technical Specification application when the loss of power occurs.
- 6.4 After the loss of 2A04 it may not be immediately apparent that the OS and CO2 need to use AOP-5 to restore instrument air without delay.
- 6.5 It will be difficult to prioritize with both units tripped.

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6.6 Communications will be difficult with both units tripped.

6.7 Coordination, including timing of crew briefs, will be difficult.

7.0 **IMPROVEMENT AREAS:**

Have the DSS tell the crew the areas that he expects them to work on during this session.

8.0 **BOOTH OPERATOR GUIDELINE:**

PREPARE and **START** the video equipment, if desired, using the Simulator Instructor Guide as a reference.

8.1 **VERIFY** the simulator is set up for training by using the Simulator Setup Checklist.

8.2 **INITIALIZE** the simulator:

LOAD IC-1

8.3 **ENTER** the Malfunctions, Flex Leaks, LOAs, Component Failures, and Overrides as follows:

Time	Unit	Failure	Component	Option	Value	Delay	Act	Conditional
Sim setup	1	MAL	DSG3	2		0	C	NOT.JBK1A56
Sim setup	2	MAL	DSG1B			0	D	
Sim setup	1	OVR ANN	MGA4		1	0	D	

Tag out G04 and align G03 to both B train buses. G03 trips as soon as it gets a start signal.
LO RES LEVEL HI-LO/TEMP HI alarm is due to low level in the Unit 1 LO reservoir and we are filling it per OI 48A.

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Time	Unit	Failure	Component	Option	Value	Act
After crew has shift	1	Comp Fail	BREAKERS	EPS11	1	D

Description: Opens the normal supply breaker to 1A04. 1A04 & 6 will be deenergized.

Communications: The AO will find that G03 has a huge hole in its side where a piston blew out. The normal supply to 1A04 is tripped open with an 86 lockout. It is unable to be closed or racked out.

Local actions: 5 minutes after being sent to stop the diesel driven fire pump LOA FPS157 1
If sent to fill the diesel fire pump tank LOA DSG19 1
If sent to reset the CR HVAC LOA HVA2 T

Tech Specs: 15.3.7.B.1.h for both units for the inoperable emergency supply to 1A04 & 2A04
15.3.7.B.1.1 for both units for the inoperable battery charger until power is restored to the battery charger
15.3.7.B.1.k for unit 1 due to 1A06 being deenergized which requires Unit 1 to be in 15.3.0.B because of
15.3.3.B.2 until power is restored to the bus from Unit 2
15.3.0.B for unit 1 due to the loss of normal power to 1A04 (15.3.7.A.1.c) with no relaxation in 15.3.7.B.1

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Time	Unit	Failure	Component	Option	Value	Delay	Act
After AO report	1	MAL	EPS3E		1	120	D
After AO report	2	Comp Fail	BREAKERS	EPS7	1	180	D

Description: Fault on 1A05, loss of normal supply to 2A04 which deenergizes both 1A04 and 2A04

Communications: The AO reports that there is a break in the pipe that is transferring the oil to the LO reservoir. It is spraying into the vital switchgear room. If sent to investigate, tell the CR that it is spraying on breaker 57 in 1A05 and on breaker 47 in 2A04. Bus 1A05 is faulted and breaker 47 appears to be damaged. If told to rack out breaker 47 after it fails, tell the CR that the breaker appears to be stuck and cannot be racked down.

Local actions: If dispatched to operate the SG ARVs **LOA SGN12** for 1-MS-2015 and **LOA SGN13** for 1-MS-2016. When sent to start the Appendix R diesel air compressor **FILE DAIR**. Monitor point PT:3083 to ensure that air pressure does not reach zero. If it does get to zero then **FILE MOREAIR** before typing **FILE DAIR**. If air pressure gets too high **FILE NAIR**.

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Time	Unit	Failure	Component	Option	Value	Act
When sent to backfeed	1	Comp Fail	Bkr	EPS29	6	D
	1	LOA	EPS128		2	D

When sent to locally stop G02
From Unit 2
MAL DSG3 ACT,1

When sent to close seal injection throttle valves LOA CVC47 0 and LOA CVC48 0
When sent to close RCP CCW isolation valves LOA CCW23 0 and LOA CCW24 0
When sent to check CST isolated from hotwell LOA CFW68 0 and VLV CFW8 option 2
If sent to reduce SW loads LOA SWS94 0 and LOA SWS95 0
VLV SWS22 and SWS23 option 3

8.4 **TREND** the following points :

MONV PT:3083 Instrument Air Header pressure

9.0 **TRAINING:**

The Instructor will conduct a shift turnover using information on the Shift Turnover Information sheet.

If applicable, **PROVIDE** an overview of the scenario and Learning Objectives to the crew.

PLACE the simulator in **RUN**, if not already done.

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During the exercise **REINFORCE** the following:

- Attention to detail and self verification.
- Conservative decision-making.
- Communications to ensure they are done in accordance with the communications standard.
- Common operator errors or improvement areas.
- Pre-Action Feedback.
- Reactivity management considerations associated with OM 1.1.
- Complete discussion of Technical Specification issues addressed by the session.

OBSERVE the crew during the simulator session considering the following:

DID THE INDIVIDUALS:	DID THE CREW:
Recognize off-normal trends	Diagnose the event
Interpret alarms and annunciators	Understand plant response
Diagnose events	Comply with procedures/Tech Specs/E-Plan
Demonstrate understanding of plant response	Function as a team
Adhere to and use plant procedures	Perform briefs
Operate Control Room equipment properly	Set clear goals and resolve any conflicts
Direct shift operations	Maintain proper Control Room conduct
Perform EOP actions	Control the pace of the Control Room activities

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Event 1: Loss of power to 1A04

Brief Description: The normal supply breaker to 1A04 trips open and power is recovered by cross-tying from Unit 2A04.

Position	Expected response	Obj #	Instructor Notes
CO1, 3rd, DOS, DTA	1.1 Recognize the loss of power to 1A04	1	This will cause the 1P-2C charging pump to trip and letdown to isolate. Containment accident fans trip. Battery charger D08 trips.
CO1, 3rd, DOS, DTA	1.2 Enter AOP 18B and go to AOP 18A to stabilize the plant.	1,2,4	Establish lab seal ΔP . Start the idle containment accident fan. May establish excess letdown.
3rd, OS, DOS	1.3 Use AOP 19B to energize 1A04.	3	Cross-tie 2A04 to 1A04.
CO1, 3rd, DOS	1.4 Use AOP 18B to restore the plant to a normal lineup.	1	Start 2nd charging pump, establish normal letdown, restore battery charger, restore containment fans to normal, restore PAB ventilation.
OS, DOS, DTA, DSS	Determine applicable Tech Specs	5	15.3.7.B.1.h for both units for the inoperable emergency supply to 1A04 & 2A04 15.3.7.B.1.i for both units for the inoperable battery charger 15.3.7.B.1.k for unit 1 due to 1A06 being deenergized 15.3.0.B for unit 1 due to the loss of normal power to 1A04 (15.3.7.A.1.c) with no relaxation in 15.3.7.B.1

If the crew did AOP 19B in parallel with AOP 18A then, at DSS discretion and time permitting, have the OS and the DOS swap positions. Also have the COs swap positions.

This is a good point for a break. When the crew returns, the plant will be as they left it.

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Event 2: Loss of all AC Power

Brief Description: Bus 1A05 faults and the normal supply to 2A04 opens deenergizing all unit 1 safeguards buses.

Position	Expected response	Obj #	Instructor Notes
ALL	1.1 Trip the reactor and close MSIVs when ECA 0.0 conditions exist.	6	The crew needs to recognize the fact that the reactor is critical while meeting ECA 0.0 entry conditions.
CO1, 3rd, DOS	1.2 Isolate RCS and establish aux feed.	7	TDAFP operation is the single most important factor in lengthening our time to core melt.
CO2, OS, DTA, DSS	1.3 Recognize the loss of instrument air. Send an AO to line up the diesel air compressor to supply the instrument air system.	8, 9	If the crew does not do this on their own, the instructor should suggest it.
CO2, OS	1.4 Respond to the unit 2 reactor trip.	6	It is unlikely that the backup to instrument air can avert a reactor trip.
CO1, DOS	1.5 Attempt to restore power to a safeguards bus from any available source.	7	None will be available.
CO1, DOS	1.6 Align the plant to mitigate a long term loss of power.	7	Place pumps in pull-out. Isolate RCP seals. Set up for cooldown.
3rd, OS	1.7 Restore power from any available source.	7	Only the backfeed from B01 to B03 will be available. It may be necessary to delay the local operator action to allow the crew to perform the SG depressurization. If necessary, the instructor should explain that the delay is merely to more fully exercise the procedure.

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Position	Expected response		Obj #	Instructor Notes
CO1, DOS, DTA	1.8	Depressurize the SGs to 250 psig	7	Remind the crew that this step adds two hours to the time assumption to avert core damage. It is also very important to stop the depressurization at 250 psig to avoid nitrogen injection into the RCS. This ensures that we keep natural circulation flow.
DSS	1.9	Classify the event.	10	According to the E-Plan it is an Unusual Event since we still have power to 1A03. But the DSS may determine that since he has lost power to all safeguards equipment for > 15 minutes, it should be a Site Emergency.

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10.0 TERMINATION:

- * **TERMINATE** the scenario at the direction of the instructor. The ideal stopping point is after the transition to ECA 0.2.
- * **STOP** the video equipment if in use.
- * **DISCUSS** the simulator session with the DSS to ensure he is aware of all significant observations.

11.0 POST SIMULATOR EXERCISE DEBRIEF:

- * **DISTRIBUTE** the Training Objectives to the crew members if they were not distributed previously.
- * **FACILITATE** the Crew Debrief with the DSS.
- * **DISCUSS** Technical Specifications that were impacted during the session.
- * **DOCUMENT** comments on the Instructor Comment sheet and forward to the LOR Program Administrator.
- * **REVIEW** video, as applicable.

12.0 EVALUATION AND MAKEUP:

- 12.1 Evaluation will be done during the scenario by the DSS and the instructor.
- 12.2 If feasible, makeups shall be completed by attending another simulator session. If not, the makeup should consist of an instructor-led, simulator walk-through of the applicable procedures and Technical Specifications for each event in the Simulator Guide.

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13.0 LOR SAMPLE PLAN INFORMATION

<u>Lesson plan setting</u>	<u>Hours</u>	<u>Topic areas</u>	<u>Hours</u>
Classroom	0.0	Systems	0.0
Simulator	<u>4.0</u>	AOPs	1.0
		TS/Admin/DCS	0.5
		EOPs/SEPs	0.0
		OPs/OIs/RPs	0.0
		Outage	0.0
		Industry Events	0.0
		ECA/CSP	2.5
		Fundamentals	<u>0.0</u>
Total hours	4.0		4.0

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SHIFT MANNING (Forward to LOR Program Administrator)

Scenario Title:

Crew:

Cycle:

Date:

DSS

DOS

OS

DTA

CO1

CO2

3rd LICENSE

INSTRUCTORS COMMENTS (Forward to LOR Program Administrator)

Include at a minimum the following items:

- Any simulator fidelity problems
- Any crew procedural problems
- Any equipment operation problems or systems knowledge weaknesses exhibited by the crew
- Any Cause and Effects manual changes

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SHIFT TURNOVER INFORMATION

1. **PLANT CONDITIONS:**

UNIT 1		UNIT 2	
Time in Core Life:	BOL	Time in Core Life:	MOL
Reactor Power:	100	Reactor Power:	100
Boron Concentration:	1210	Boron Concentration:	520
Rod height	218	Rod height	220
Day of week, support staff	Sunday, HP coverage only		

2. **LCO/TECHNICAL SPECIFICATIONS IN EFFECT:**

<u>TS #</u>	<u>Description</u>	<u>Reason</u>
None		

3. **EQUIPMENT OUT OF SERVICE:**

G04 is out of service and torn down. G03 is aligned to both 1A06 and 2A06 per OI 35A.

4. **PLANNED EVOLUTIONS:**

Fill the Unit 1 LO Reservoir (in progress).

5. **TURNOVER INFORMATION**

The Unit 1 LO reservoir level is low. We had been transferring oil to the LO Storage tank and pumped too much so we are transferring some back to the reservoir using OI 48A.