

STATION LOSS OF OFF-SITE POWER

This instruction covers the following:

- A. Loss of Auxiliary Transformer C
- B. Complete Loss of Off-Site Power

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A. LOSS OF AUXILIARY TRANSFORMER "C"
(138KV)

1.0 SYMPTOMS

1.1 Electrical Annunciator Alarms

- 1.1.1 Auxiliary Transformer "C" Trouble
- 1.1.2 4160 Volt 1C or 2C Low Voltage

1.2 Turbine Generator First Out Annunciator Alarms

- 1.2.1 Transformer "C" Differential Trip
- 1.2.2 Transformer "C" Sudden Pressure Trip
- 1.2.3 Transformer "C" Overcurrent Trip
- 1.2.4 138KV PCB Failure Backup Trip

1.3 Other Indications

- 1.3.1 No voltage on 4KV buses 1A, 1B, 1C and 2C
- 1.3.2 No voltage on 480 Volts buses 1, 2 and 3

2.0 AUTOMATIC ACTION

2.1 Reactor and turbine trip.

2.2 Unit 1 PCB 412 and PCB 612 open immediately.

2.3 Following components are tripped:

- 2.3.1 Heater drain pumps A and B
- 2.3.2 Turbine cooling water pumps A and B
- 2.3.3 Circulating water pumps A and B
- 2.3.4 Feedwater pumps A and B
- 2.3.5 Condensate pumps A, B, C and D
- 2.3.6 Charging pumps A and B
- 2.3.7 Reactor coolant pumps A, B and C (no generator inertia coastdown).

A. LOSS OF AUXILIARY TRANSFORMER "C" (Con't)
(138KV)

2.0 AUTOMATIC ACTION (Con't)

- 2.3.8 Auxiliary transformer "A" feeder ACB 11A04 open.
- 2.3.9 Auxiliary transformer "B" feeder ACB 11B04 open.
- 2.3.10 Auxiliary transformer "C" feeder ACB 11C02 open.
- 2.3.11 Auxiliary transformer "C" feeder ACB 12C02 open.
- 2.4 No. 1 and No. 2 diesel generators started on standby.
- 2.5 Steam dump is initiated when trip from above 30% of full power.
- 2.6 Following DC pumps will automatically start:
 - 2.6.1 Turbine and generator Lube oil pumps.
 - 2.6.2 Reactor coolant pump thermal barrier pump.
- 2.7 Station loss voltage automatic transfer (elapsed time from initial malfunction is ~two (2) minutes):
 - 2.7.1 Buses 1A-1C tie ACB 11C01 close.
 - 2.7.2 Buses 1B-2C tie ACB 12C01 close.
 - 2.7.3 Auxiliary transformer "A" feeder ACB 11A04 close.
 - 2.7.4 Auxiliary transformer "B" feeder ACB 11B04 close.
- 2.8 When power is restored to the 4KV buses the following will start if in automatic:
 - 2.8.1 Component cooling pump.
 - 2.8.2 Air compressor.

A. LOSS OF AUXILIARY TRANSFORMER "C" (Con't)
(138KV)

3.0 IMMEDIATE OPERATOR ACTION

3.1 Verify the following:

- 3.1.1 Reactor and turbine trip.
- 3.1.2 Control rods fully inserted into the core.
- 3.1.3 Turbine stop and control valves closed.
- 3.1.4 Unit 1 PCB 412 and PCB 612 open.
- 3.1.5 Exciter field breaker open.

3.2 Verify that the following DC pumps are operating:

- 3.2.1 Turbine and generator lube oil pumps.
- 3.2.2 Reactor coolant pump thermal barrier pump.

3.3 Observe the steam dump system operation, transfer to "Atmos - Condenser" when Tavg approaches 535°F.

3.4 Transfer NIS recorder to intermediate range channels.

4.0 SUBSEQUENT OPERATOR ACTION

4.1 When "Loss of 138KV Auto Transformer End of Sequence" indicating light illuminates two (2) minutes, verify the following:

- 4.1.1 Generator motor operated disconnect open.
- 4.1.2 Auxiliary transformer "A" ACB 11A04 closed.
- 4.1.3 Auxiliary transformer "B" ACB 11B04 closed.
- 4.1.4 Bus tie 1C-1A ACB 11C01 closed.
- 4.1.5 Bus tie 2C-1B ACB 12C01 closed.
- 4.1.6 Auxiliary transformer "C" ACB 11C02 open.
- 4.1.7 Auxiliary transformer "C" ACB 12C02 open.

4.2 Restore offsite power using 220/18KV System:

- 4.2.1 Reset the lockup bus.
- 4.2.2 Close Unit 1 PCB 412 and PCB 612. This will energize 4KV buses 1A, 1B, 1C and 2C.

A. LOSS OF AUXILIARY TRANSFORMER "C" (Con't)
(138KV)

4.0 SUBSEQUENT OPERATOR ACTION (Con't)

4.3 If station AC power cannot be immediately re-established:

4.3.1 Manually initiate auxiliary feedwater flow by placing the steam driven pump in service per S-2-13 "Auxiliary Feedwater System Operation."

4.3.2 Establish adequate flow to the steam generators to slowly increase level to approximately 50% by use of the redundant feedwater header and the attendant operator. The operator shall be in continuous communications with the Control Room during this operation.

4.4 Upon the restoration of the 4KV buses, start the electric auxiliary feedwater pump:

4.4.1 Slowly bring the steam generator level to ~50% using the auxiliary regulators (CV-142, CV-143, CV-144).

4.4.2 Close the feedwater block valves (MOV-20, MOV-21, MOV-22).

4.5 Upon restoration of the 4KV buses, start or verify the restart of the following equipment:

4.5.1 Start salt water cooling pump.

4.5.2 Component cooling water pump in automatic will start.

4.5.3 Air compressor in automatic will start. Verify that air pressure is rising.

4.5.4 Start charging pump, and establish charging and letdown.

4.5.5 Start reactor coolant pumps if station power is from 220KV/138KV system. Refer to Operating Instruction S-3-1.10, "Seal Water System and Reactor Coolant Pump Startup."

CAUTION: No reactor coolant pump may be restarted until thirty (30) minutes after coolant temperature has stabilized and all feedwater flow has been secured. Allow two (2) minutes between start of each pump.

4.5.6 Energize pressurizer heaters.

4.5.7 Start the inservice turbine plant cooling water pump. Align the salt water cooling pump discharge to the shell side of heat exchanger.

A. LOSS OF AUXILIARY TRANSFORMER "C" (Con't)
(138KV)

4.0 SUBSEQUENT OPERATOR ACTION (Con't)

- 4.5.8 Start fans A-8, A-8S and A-8SS. Verify that all other sphere fans are operating.
- 4.5.9 Start the primary make-up pump.
- 4.5.10 Start the service water pump.
- 4.5.11 Place boric acid blend system in automatic. Adjust the boron concentration to the hot shutdown value.
- 4.5.12 As soon as possible, restore power to the Security UPS and the Station lighting transformer.
- 4.5.13 Start the turbine auxiliary oil pump and generator air side and hydrogen side seal oil pumps. Stop the DC pumps.
- 4.5.14 Start a circulating water pump.
- 4.5.15 Open turbine drain valves.
- 4.5.16 Close reheater steam supply MOV's.
- 4.6 When offsite power is restored, shutdown the diesel generators.
- 4.7 Upon loss of station power, notify the "duty" station administrator and discuss the situation. If unable to contact any station administrator in the normal reporting chain within 15-20 minutes following the loss of power conditions make the report to the NRC via the red phone.
- 4.8 Verify proper operation of automatic turbine turning gear engagement.
- 4.9 Determine cause for loss of auxiliary transformer C, and initiate the necessary corrective actions.
- 4.10 Establish Hot Standby (S-3-1.4), Hot Shutdown (S-3-1.13) or Cold Shutdown (S-3-1.5) as conditions warrant.
- 4.11 Isotopic analysis for iodine in the reactor coolant must be made between two (2) and six (6) hours following a thermal power change exceeding 15% within a one (1) hour period.

B. COMPLETE LOSS OFF-SITE POWER

1.0 SYMPTOMS

1.1 Loss of 18/220KV System

1.2 Loss of 138KV System

2.0 AUTOMATIC ACTION

2.1 Reactor and turbine trip.

2.2 Unit 1 PCB 412 and PCB 612 open immediately.

2.3 Following components are tripped:

2.3.1 Heater drain pumps A and B

2.3.2 Turbine cooling water pumps A and B

2.3.3 Circulating water pumps A and B

2.3.4 Feedwater pumps A and B

2.3.5 Condensate pumps A, B, C and D

2.3.6 Charging pumps A and B

2.3.7 Reactor coolant pumps A, B and C (no generator inertia coastdown).

2.3.8 Auxiliary transformer "A" feeder ACB 11A04 open.

2.3.9 Auxiliary transformer "B" feeder ACB 11B04 open.

2.3.10 Auxiliary transformer "C" feeder ACB 11C02 open.

2.3.11 Auxiliary transformer "C" feeder ACB 12C02 open.

2.4 No. 1 and No. 2 diesel generators started on standby.

2.5 Steam dump is initiated when trip from above 30% of full power.

2.6 Following DC pumps will automatically start:

2.6.1 Turbine and generator Lube Seal oil pumps.

2.6.2 Reactor coolant pump thermal barrier pump.

B. COMPLETE LOSS OFF-SITE POWER (Con't)

3.0 IMMEDIATE OPERATOR ACTION

3.1 Verify the following:

- 3.1.1 Reactor and turbine trip.
- 3.1.2 Control rods fully inserted into the core.
- 3.1.3 Turbine stop and control valves closed.
- 3.1.4 Unit 1 PCB 412 and PCB 612 open.
- 3.1.5 Exciter field breaker open.

3.2 Verify that the following DC pumps are operating:

- 3.2.1 Turbine and generator lube seal oil pumps.
- 3.2.2 Reactor coolant pump thermal barrier pump.

3.3 Observe the steam dump system operation, transfer to "Atmos-Condenser" when Tavg approaches 535°F.

3.4 Transfer NIS recorder to intermediate range channels.

4.0 SUBSEQUENT OPERATOR ACTION

4.1 Open or verify open the following breakers:

- 4.1.1 Open bus tie 1C-1A ACB 11C01
- 4.1.2 Open Auxiliary transformer C ACB 11C02
- 4.1.3 Open bus tie 2C-1B ACB 12C01
- 4.1.4 Open Auxiliary Transformer C ACB 12C02
- 4.1.5 Open 4KV ACB RX1
- 4.1.6 Open 4KV ACB RY1

4.2 Reset LOP at remote surveillance panels 1 and 2.

4.3 Verify that diesel generators No. 1 and No. 2 are operating at normal frequency and voltage.

B. COMPLETE LOSS OFF-SITE POWER (Con't)

4.0 SUBSEQUENT OPERATOR ACTION (Con't)

4.4 Energize buses 1C and 2C:

- 4.4.1 Close No. 1 diesel output ACB 11C14, energizing bus 1C.
- 4.4.2 Close No. 2 diesel output ACB 12C15, energizing bus 2C.

CAUTION: Under no circumstances should you parallel the diesel generator to the SDG&E system. The governor is in the "Isochronous" position. To do so will cause the diesel generator to go to an overload or no-load condition.

4.5 If station AC power cannot be immediately re-established:

- 4.5.1 Manually initiate auxiliary feedwater flow by placing the steam driven pump in service per S-2-13 "Auxiliary Feedwater System Operation."
- 4.5.2 Establish adequate flow to the steam generators to slowly increase level to approximately 50% by use of the redundant feedwater header and the attendant operator. The operator shall be in continuous communications with the Control Room during this operation.

4.6 Upon the restoration of the 4KV buses, start the electric auxiliary feedwater pump:

- 4.6.1 Slowly bring the steam generator level to ~50% using the auxiliary regulators (CV-142, CV-143, CV-144).
- 4.6.2 Close the feedwater block valves (MOV-20, MOV-21, MOV-22).

4.7 When buses 1C and 2C are re-energized, start or verify re-start of the following equipment:

- 4.7.1 Start salt water cooling pump.
- 4.7.2 Component cooling water pump in automatic will start.
- 4.7.3 Air compressor in automatic will start. Verify that air pressure is rising.
- 4.7.4 Start charging pump and establish charging and letdown.
- 4.7.5 Energize pressurizer heaters.

B. COMPLETE LOSS OFF-SITE POWER (Con't)


4.0 SUBSEQUENT OPERATOR ACTION (Con't)

- 4.7.6 Start inservice turbine plant cooling water pump. Align the salt water cooling pump discharge to the shell side of the heat exchanger.
- 4.7.7 Start fans A-8, A-8S and A-8SS. Verify all other sphere fans are operating.
- 4.7.8 Start the primary make-up pump.
- 4.7.9 Start the service water pump.
- 4.7.10 Place boric acid blend system in automatic. Adjust the boron concentration to the hot shutdown value.
- 4.7.11 As soon as possible restore power to the Security UPS and the Station lighting transformer.
- 4.7.12 Start the turbine auxiliary oil pump and generator air side and hydrogen side seal oil pumps. Stop the DC pumps.
- 4.7.13 Start a circulating water pump.
- 4.7.14 Open turbine drain valves, and close reheater steam supply MOV's.
- 4.8 Notify the SCE Dispatcher, Mira Loma Switching Center and SDG&E Resource Coordinator that San Onofre does not have off-site power available.
- 4.9 Upon loss of station power, notify the "duty" station administrator and discuss the situation. If unable to contact any station administrator in the normal reporting chain within 15-20 minutes following the loss of power conditions make the report to the NRC via the red phone.
- 4.10 Verify proper operation of automatic turbine turning gear engagement.
- 4.11 Establish Hot Standby (S-3-1.4), Hot Shutdown (S-3-1.13) or Cold Shutdown (S-3-1.5) as conditions warrant.
- 4.12 If station power is on diesel generators, transfer loads when a stable source of power is restored to the unit from either the 220KV or 138KV system:
 - 4.12.1 Transfer all auxiliary load to DG#1.
 - 4.12.2 Open 4KV ACB 12C15 de-energizing 4KV bus 2C.

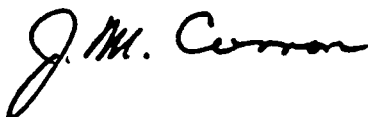
B. COMPLETE LOSS OFF-SITE POWER (Con't)

4.0 SUBSEQUENT OPERATOR ACTION (Con't)

- 4.12.3 Restore power to 4KV bus 2C from available offsite power.
- 4.12.4 Transfer all auxiliary load to 4KV bus 2C.
- 4.12.5 Open 4KV ACB 11C14 de-energizing 4KV bus 1C.
- 4.12.6 Restore power to 4KV bus 1C from available offsite power.
- 4.12.7 Stop diesel generators.
- 4.13 Determine cause for loss of offsite power, and initiate the necessary corrective actions.
- 4.14 Isotopic analysis for iodine in the reactor coolant must be made between two (2) and six (6) hours following a thermal power change exceeding 15% within a one (1) hour period.


R. R. BRUNET
SUPERINTENDENT, UNIT 1

APPROVED:



J. M. CURRAN

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