MASTER FILE

Form 34731 (R8-94)

Duke Power Company
PROCEDURE PROCESS RECORD

(1) ID No. PT/2/A/0610/01J
Change(s) 12 to 12 Incorporated

INFORMATION ONLY

PREPARATION

(2) Station OCONEE NUCLEAR

(3) Procedure Title EMERGENCY POWER SWITCHING LOGIC FUNCTIONAL TEST

(4) Prepared By Reginald Chapman Date 10-26-94

(5) Requires 10CFR50.59 evaluation?
[X] Yes (New procedure or reissue with major changes)
[ ] No (Reissue with minor changes OR to incorporate previously approved changes)

(6) Reviewed By Jeff W. Revell Date 10-27-94
Cross-Disciplinary Review By Tony R. Lee N/R _____ Date 10-26-94

(7) Additional Reviews
Reviewed By QA Larry C. Mansfield Date 10-26-94
Reviewed By _____ Date _____

(8) Temporary Approval (if necessary)
By _____ (SRO) Date _____
By _____ Date _____

(9) Approved By Walter Davenport FOR SITE MANAGER Date 10/27/94

PERFORMANCE (Compare with Control Copy every 14 calendar days)

(10) Compared with Control Copy _____ Date _____
Compared with Control Copy _____ Date _____
Compared with Control Copy _____ Date _____

(11) Date(s) Performed _____
Work Order Number (WO#) _____

COMPLETION

(12) Procedure Completion Verification

[] Yes [] N/A Check lists and/or blanks properly initialed, signed, dated or filled in N/A or N/R, as appropriate?

[] Yes [] N/A Listed enclosures attached?

[] Yes [] N/A Data sheets attached, completed, dated and signed?

[] Yes [] N/A Charts, graphs, etc. attached and properly dated, identified and marked?

[] Yes [] N/A Procedure requirements met?

Verified By _____ Date _____

(13) Procedure Completion Approved _____ Date _____

(14) Remarks (*attach additional pages, if necessary*)

2.14 OP/0/A/1600/05 SSF Normal Power

2.15 AP/2/A/1700/07 Loss of LPI

2.16 AP/2/A/1700/11 Loss of Power

2.17 NRC Generic Letter 88-17 - Loss of Decay Heat Removal

2.18 IIR-88-25-03 - Loss of Decay Heat Removal

3.0 TIME REQUIRED

3.1 8 hours - Refueling (Four Technicians, Two Operators and One Keowee operator)

3.2 Test complexity and potential for loss of decay heat removal from power failure implies the Unit Shift Supervisor and at least one Reactor Operator should have no other duties during test. Additionally, personnel responsibilities are as follows:

- Four Test Technicians - take data, verify relay actuation, time 2X4, 2X5 and 2X6 time-delay relays, and other duties required by procedure.
- One Designated Engineering person - available to resolve any technical questions during test and provide support as required to Operations Shift Manager and Management Designee.
- One Management Designee - Designated by the Operations Superintendent to monitor test and provide support to the Operations Shift Manager during critical portions of test. This designee has authority to abort test and, if necessary, provide recommendations to the Operations Shift Manager on actions to place the plant in a stable condition. Before the first source transfer, this designee will give or oversee a pre-job briefing with the affected personnel.
- One Keowee Operator - perform actions per procedure and monitor Keowee Units while operating during this test.

4.0 PREREQUISITE TESTS

_____4.1 PT/2/A/0610/01A (EPSL Normal Source Voltage Sensing Circuit)

_____4.2 PT/2/A/0610/01B (EPSL Startup Source Voltage Sensing Circuit)

_____4.3 PT/2/A/0610/01C (EPSL Standby Bus 1 & 2 Voltage Sensing Circuits)

5.0 TEST EQUIPMENT REQUIRED

5.1 Three Stopwatches

5.2 5/16" Nut Driver

5.3 Jumper

5.4 Flashlights

5.5 ES Cabinet Keys

6.0 LIMITS & PRECAUTIONS

6.1 With CT-2 de-energized, loss or degraded voltage on any other CT AND any Channel 1 or 2 ES signal will cause Switchyard Isolation.

6.2 After transfer to Standby Bus and Standby Breakers close, all non-loadshed equipment previously energized will be re-energized.

6.3 "C" Instrument Air Compressor will loadshed.

6.4 "B" and "C" LPSW pumps will lose power during MFB transfers. "A" LPSW pump must be "ON".

6.5 The time Keowee Units are operated in Emergency Start must be limited to < 24 hours.

6.6 72-Hour LCOs will be entered on Units 1 and 3 if RCS is $\geq$ 200°F when both SK Breakers are in Manual. This removes Keowee Underground from service.

6.7 7-Day LCOs will be entered on Units 1 and 3 if RCS is $\geq$ 250°F when power source for SSF loadcenter XSF is transfered from OXSF to 2X11A.

6.8 The possibility of a water surge out of the CCW Stand Pipes exist when restarting CCW Pumps. Manual venting of CCW Inlet High Point Piping will reduce the possibility.

7.0 REQUIRED UNIT STATUS

_____ Cold shutdown

8.0 PREREQUISITE SYSTEM CONDITIONS

_____8.1 Verify CT-2 (Startup Source) energized with 6900V energized to TA and TB Startup Breakers.

_____8.2 Verify Main Transformer backcharged with 2T supplying MFBs and the 6.9 KV side energized up to 2TA/TB Feeder Breakers.

_____8.3 Verify Unit 2 Operator Aid Computer operable.

_____8.4 Notify Operations to have Standby Bus energized by Lee Gas Turbines per OP/0/A/1107/03, before Step 12.5.

8.5 Verify "AUTO-MAN" transfer switches in "AUTO":

_____ MFB1 "AUTO" _____ MFB2 "AUTO"

_____ 2TA "AUTO" _____ 2TB "AUTO"

_____8.6 Verify "OFF" OR stop all Reactor Building Cooling Unit fans.

_____8.7 Verify SSF power supplied through OTS1-1.

_____8.8 Verify Equipment Hatch closed.

_____8.9 List names below of personnel assigned per step 3.2 which are required to be available from steps 12.1 through 12.63:

Engineering Representative: _____

Management Designee: _____

_____8.10 Verify Red Tags cleared on equipment listed on Enclosures 13.1, 13.2 and 13.3, with exception of tags required by LTOP.

_____8.11 Notify Operations to perform OP/2/A/1107/02 (Normal Power). All breakers to be left out of position must be evaluated to ensure necessary equipment is energized after loadshed.

_____8.12 Record stopwatch ID numbers and calibration due dates:

OCPRF - _____ Date _____

OCPRF - _____ Date _____

OCPRF - _____ Date _____

_____8.13 Verify or place "A" Chiller in service.

8.14 Verify the following:

_____ 2A AND 2B LPI Pumps providing decay heat removal.

_____ RCS level $\geq$ 80 inches Pressurizer level.

_____8.15 Verify "B" LPSW Pump powered from 2TD.

_____8.16 Verify SPB Load Center energized from STA transformer per OP/0/A/1103/24 (Switchyard Transformers and Load Centers) since Switchyard Feeder "B" on 2TE loadsheds.

8.17 Verify Red Tags cleared and valves open:

RED TAGS	OPEN	
_____	_____	2C-1 (2C Hotwell Pump Suction)
_____	_____	2C-3 (2C Hotwell Pump Discharge)
_____	_____	2C-4 (2B Hotwell Pump Suction)
_____	_____	2C-6 (2B Hotwell Pump Discharge)
_____	_____	2C-7 (2A Hotwell Pump Suction)
_____	_____	2C-9 (2A Hotwell Pump Discharge)
_____	_____	2C-77 (2A CBP Suction)
_____	_____	2C-80 (2A CBP Discharge)
_____	_____	2C-81 (2B CBP Suction)
_____	_____	2C-84 (2B CBP Discharge)
_____	_____	2C-85 (2C CBP Suction)
_____	_____	2C-88 (2C CBP Discharge)

_____8.18 Verify "ON" or start "A" and "D" RCW Pumps.

_____8.19 Verify I&E has verified normal power source available for Unit 1 & 3 Control Rod Drive per IP/0/B/0330/09 (CRD Checks before Tripping RPS Channel Breakers) since back-up source will loadshed.

NOTE: Step 8.20 will cause the desired slow transfer from Normal to Startup breakers.

8.20 Install jumper in Unit 2 Keowee Emergency Start Channel A cabinet, terminal strip Oconee "A", across terminals 11 (E12021) and 13 (E12023) and Blue Tag: (Unit 2 Cable Room)

_____/_____ Jumper _____ Blue Tag

_____8.21 (I&E) Have I&E remove jumper in 2EB-5 between 62GY and 86HY left side terminal strips.

_____8.22 Verify CT-1 and CT-3 Transformers energized.

_____8.23 Verify Unit 1 and 3 ES Channels 1 or 2 NOT tripped OR in TEST.

NOTE: The next step will remove the SSF from service per OP/0/A/1600/05.

8.24 Perform the following:

_____8.24.1 Notify Security to take compensatory actions at least 1 hour prior to transferring power source for SSF loadcenter XSF from OXSF to 2X11A.

_____8.24.2 Declare 7-day LCO for SSF 4160V per Technical Specifications 3.18.5:

_____ If Unit 1 RCS > 250°F, declare 7-day LCO:
(SRO)
Date/Time _____

_____ If Unit 3 RCS ≥ 250°F, declare 7-day LCO:
(SRO)
Date/Time _____

_____8.24.3 Transfer power source for SSF loadcenter XSF from OXSF to 2X11A per OP/0/A/1600/05 (SSF Normal Power).

8.25 To defeat system interlocks to allow Condensate and Feedwater component breaker closure:

_____/_____8.25.1 Open Breaker #20 in Panel 2DIA and Blue Tag:

_____ Blue Tag

8.25.2 Open link and Blue Tag: (TB/3 K-40 TB1130)

_____/_____ Link 2LS13X _____ Blue Tag

_____/_____ Link 2LS16X _____ Blue Tag

_____/_____ Link 2LS17X _____ Blue Tag

_____/_____ Link 2LS18X _____ Blue Tag

_____8.26 Perform pre-test breaker positioning:

_____ Enclosure 13.1 _____ Enclosure 13.2

_____8.27 Using OP/0/A/1102/06, position 6900V breakers per Enclosure 13.3.

_____8.28 Verify set-point data from Transmissions acceptable on all RLS, SBC, STD, 94/TA and 94/TB timers.

_____8.29 Verify calibration current on Undervoltage relays for Start-up, Normal, and Standby sources.

8.30 To prevent siphon flow initiation, perform the following:

_____8.30.1 Record 2CCW-7 "As-Found" switch position: _____

_____/_____8.30.2 Place 2CCW-7 switch in "PULL TO LOCK".

_____8.30.3 White Tag 2CCW-7 switch.

8.31 In 2TE-13 ("B" Chiller Motor Breaker), terminal block AJ, open the following links and Blue Tag: (Blocks "B" Chiller trip to verify 27 Undervoltage Relay operation)

_____/_____ Link "T" _____ Blue Tag

_____/_____ Link "03" _____ Blue Tag

_____8.32 Verify both Keowee units operable.

_____8.33 Verify test has Plant Operational Review Committee approval.

8.34 Notify the following of test:

_____ Unit Operations Manager

_____ Operations Shift Manager

_____ Unit 1 Shift Supervisor

_____ Unit 2 Shift Supervisor

_____ Unit 3 Shift Supervisor

_____ Keowee Personnel

_____ Toddville Transmission Control Center

_____ Systems Operating Center

_____ Security (SSF Normal Power System will be inoperable)

_____ I&E Shift Supervisor (possible OAC initialization)

_____ Radiation Protection Shift Supervisor

_____ Unit 2 Outage Manager

_____ Shift Work Manager

_____ RP Count Room

_____ Radwaste (Radwaste Transformer #1 will lose power)

9.0 TEST METHOD

9.1 Overcurrent relay 51TN/2T is used to provide a generator lock-out via 86GA & 86GB, which will:

- Open PCBs 23 and 24.
- Slow transfer of 4160V.
- Open 4160V and 6900V Normal breakers.
- Satisfy close permissive of 4160V and 6900V Startup breakers to allow an automatic transfer of busses.
- Undervoltage relay should trip all Loadshed Breakers.

9.2 Opening PCBs 26 and 27 will cause:

- Loss of 4160V and 6900V busses.
- Trip of all RCP breakers.
- Actuation of MFB Monitor Undervoltage timer (20 seconds).

Resulting in:

- Tripping ACB for generating Keowee unit to establish Keowee emergency power paths.
- Loadshed of non-essential loads.
- Transfer of MFBs to the Standby busses which are powered by Lee Gas Turbines on a dedicated feeder.
- Loadcenters 2X4, 2X5 and 2X6 trip and reclose.

9.3 After loadshed, all 4160V loads are verified for proper loadshed or non-loadshed status.

9.4 OCB-101 is opened to cause SL1 & SL2 to open, resulting in automatic closure (~1 second) of both SK breakers.

9.5 SK1 and SK2 breakers are opened to cause retransfer of both MFBs to Startup source (10 second). Underground LCO is initiated on operating units.

10.0 DATA REQUIRED

2X4, 2X5 and 2X6 reclosure time (seconds)

11.0 Acceptance Criteria

11.1 Circuitry function properly per Section 12.0.

11.2 After loadshed:

- Non-Loadshed equipment breakers remain closed.
- Loadshed equipment breakers open.

11.3 Reclosure time for 2TC-3 (2X4): ≥ 57 and ≤ 63 seconds.

11.4 Reclosure time for 2TD-3 (2X5): ≥ 32 and ≤ 36 seconds.

11.5 Reclosure time for 2TE-3 (2X6): ≥ 30 and ≤ 34 seconds.

11.6 Main Feeder Busses transfer to the Standby Busses powered by a dedicated Lee Gas Turbine.

12.0 PROCEDURE

_____12.1 Conduct pre-job briefing with Shift Operating crew:

- Describe test method in Section 9.0.
- Declaration of LCOs for Units 1 and 3.
- Stress importance of review by Control Room crew of transfer related Compensatory Actions listed in Enclosures 13.7 through 13.10.

12.2 Verify the following:

- Computer Points:

  _____ D2256 "4KV SWGR 2TC LOAD SHED PWR NORMAL"

  _____ D2257 "4KV SWGR 2TD LOAD SHED PWR NORMAL"

  _____ D2258 "4KV SWGR 2TE LOAD SHED PWR NOR"

- Lights ON:

  _____ 2TC LOAD SHED #1 PWR FAILURE (2TC-2)

  _____ 2TC LOAD SHED #2 PWR FAILURE (2TC-12)

  _____ 2TD LOAD SHED #1 PWR FAILURE (2TD-2)

  _____ 2TD LOAD SHED #2 PWR FAILURE (2TD-13)

  _____ 2TE LOAD SHED #1 PWR FAILURE (2TE-2)

  _____ 2TE LOAD SHED #2 PWR FAILURE (2TE-13)

12.3 To prevent OTS1-1 from tripping by ES or EPSL:

_____12.3.1 Verify SSF Breaker OTS1-1 closed.

_____/_____12.3.2 Open and Blue Tag Breaker #4 in panel 2DIA:

_____ Blue Tag

12.4 Perform the following:

_____ Verify Unit Shift Supervisor satisfied with status of OP/2/A/1107/02 (Normal Power), for MFB transfer.

_____ Verify Standby Bus energized by Lee Gas Turbines.

_____ Verify "A" LPSW pump operating and minimum flow requirement met for 3 LPSW pumps operating.

_____ Station a operator at SSF to monitor SSF during MFB transfers.

NOTE: Step 12.6.3 cause slow transfer of MFBs from Normal to Startup source by rotating 4.16 KV overcurrent relay disk. This provides generator lockouts 86GA and 86GB which trip both output PCBs, trip Normal breakers and provide permissive for Startups to close. If MFB transfer not complete within 5 seconds, Enclosure 13.7, Compensatory Actions for Transfer to Startup Source, should be followed. Enclosure 13.7 should be read before continuing.

_____12.5 Announce over inner-office page that Unit 2 will lose power.

12.6 To cause MFB transfer to CT-2:

_____12.6.1 Verify Unit 2 Shift Supervisor prepared for loss of power.

_____/_____12.6.2 On 2EB4, remove front cover from relay 51TN/2T "TRANSFORMER 2T 4.16 KV NEUTRAL OC".

_____/_____12.6.3 Slowly rotate disk clockwise until transfer occurs.

_____/_____12.6.4 Replace front cover on relay 51TN/2T.

12.7 Verify the following breakers:

- Open:

_____ $N1_2$ _____ 2TA NORMAL 6.9 KV FDR

_____ $N2_2$ _____ 2TB NORMAL 6.9 KV FDR

- Closed:

_____ 2A1 RCP BKR _____ $E1_2$

_____ 2A2 RCP BKR _____ $E2_2$

_____ 2B1 RCP BKR _____ 2TA SU 6.9 KV FDR

_____ 2B2 RCP BKR _____ 2TB SU 6.9 KV FDR

12.8 Remove Blue Tag and remove jumper in Unit 2 Keowee Emergency Start Channel A cabinet, terminal strip Oconee "A", across terminals 11 (E12021) and 13 (E12023): (Unit 2 Cable Room)

_____ Blue Tag _____/_____ Jumper

_____12.9 Perform loadshed breaker positioning per Enclosure 13.4.

NOTE: The next step prevents low seal flow start signal from being sent to the standby HPI pump.

12.10 Open link in 2MTC3 and Blue Tag:

_____/_____ Row 6, Block 3, Link 9 - HP53XR

_____ Blue Tag

12.11 Place or verify Control Room switches in "AUTO":

_____ 2A HPI Pump _____ 2B HPI Pump

NOTE: Test module switch must remain in each position ≥ 3 seconds. Step 12.12 will cause Control Room alarms.

12.12 Perform the following:

_____/_____12.12.1 Rotate logic test module switch in ES Cabinet 4, Channel #1, counterclockwise to Test Position #9.

_____/_____12.12.2 Rotate logic test module switch in ES Cabinet 6, Channel #2, counterclockwise to Test Position #9.

_____12.13 Verify communication between Control Room and Keowee personnel.

_____12.14 Notify Keowee Hydro Operations to perform Normal Start of both Keowee Units and place the Overhead Unit on the Grid at ~ 5 MWe load.

_____12.15 Notify Security SSF will be in degraded condition while OTS1-1 tripped.

12.16 Perform the following:

_____ Announce over inner-office page that Unit 2 will loadshed.

_____ Verify Unit 2 Shift Supervisor prepared for loadshed.

NOTE: Steps 12.17 through 12.22 should be read before continuing. Timing of 2TC-3 (2X4), 2TD-3 (2X5) and 2TE-3 (2X6) are performed locally. Opening PCB-26 and 27 de-energizes both MFBs to start MFB Monitor Panel 20 second timers. The Overhead Keowee unit will separate from the grid after 20 seconds, loadshed occurs at 21 seconds and both Standby Breakers should close at ~ 31 seconds to power MFBs from Lee turbines. If transfer is not complete after 1 minute, Enclosure 13.8, Compensatory Actions for Transfer to Standby, should be followed. Enclosure 13.8 should be read before continuing.

12.17 To cause transfer to Standby:

_____ 12.17.1 Notify Keowee Unit 2 will loadshed and the Overhead Keowee unit will separate from the grid.

_____/_____ 12.17.2 Open PCB-26.

_____/_____ 12.17.3 Open PCB-27.

12.18 Verify the following:

- Alarm:

  _____ 2SA14-B3 _____ 2SA15-C2

  _____ 2SA14-C3 _____ 2SA15-C6

  _____ 2SA14-D4 _____ 2SA15-D4

  _____ 2SA15-B6

- Tripped:

  _____ ALL RCP Breakers

12.19 Start associated stopwatch when the following trips:

_____ 2TC-3 (2X4) _____ 2TD-3 (2X5) _____ 2TE-3 (2X6)

12.20 Stop associated stopwatch when breaker reclose and record time:

_____ 2TC-3 _____ seconds (57 - 63)

_____ 2TD-3 _____ seconds (32 - 36)

_____ 2TE-3 _____ seconds (30 - 34)

12.21 When $S1_2$ and $S2_2$ close, verify:

- Alarm:

  _____ 2SA14-D6 _____ 2SA15-D6 Alarm

- Reset:

  _____ 2SA15-A5 _____ 2SA15-B5

  _____ 2SA15-A6

12.22 At Keowee, verify:

_____ BOTH units at rated speed and voltage.

_____ ACB-1 OPEN

_____ ACB-2 OPEN

_____ CT-4 Energized

NOTE: Steps 12.23 through 12.29 may be performed concurrently.

_____12.23 Record times from Utility Typer:

D2569 "EL 4KV SWGR SU SOURCE VOLT LO" _____

D2606 "EL 4KV B1 LOADSHED INIT." _____

D2607 "EL 4KV B2 LOADSHED INIT." _____

D2608 "EL 4KV B1 SB BRKR. CLOSED INIT." _____

D2609 "EL 4KV B2 SB BRKR. CLOSED INIT." _____

D1644 "EL 4KV SWGR. B1 TIE BRKR. CLOSED" _____

D1647 "EL 4KV SWGR. B2 TIE BRKR. CLOSED" _____

D1658 "EL 600V LDCTR 4 FDR CLOSED" _____

D1659 "EL 600V LDCTR 5 FDR CLOSED" _____

D1659 "EL 600V LDCTR 5 FDR OPEN" _____

D1660 "EL 600V LDCTR 6 FDR CLOSED" _____

D1660 "EL 600V LDCTR 6 FDR OPEN" _____

12.24 To verify CC Pump start indication, verify relays energized by red tip on plunger showing:

_____ RE1 (2UB2) _____ RE2 (2UB1)

12.25 Verify the following:

_____ D2513 "4KV RX1 COIL MON BAD"

_____ D2514 "4KV RX2 COIL MON BAD"

12.26 Verify relays energized:

_____ CLS1 in 2TC-2 _____ CLS2 in 2TC-12

_____ DLS1 in 2TD-2 _____ DLS2 in 2TD-13

_____ ELS1 in 2TE-2 _____ ELS2 in 2TE-13

12.27 Verify breakers closed:

_____ 2TC-1	_____ 2TD-1	_____ 2TE-1
_____ 2TC-3	_____ 2TD-3	_____ 2TE-3
_____ 2TC-8	_____ 2TD-9	_____ 2TE-9
_____ 2TC-9	_____ 2TD-10	_____ 2TE-12
_____ 2TC-10	_____ 2TD-11	_____ 2TE-14
_____ 2TC-11	_____ 2TD-12	_____ 2TE-15
_____ 2TC-12	_____ 2TD-13	
_____ 2TC-13	_____ 2TD-14	
_____ 2TC-14	_____ 2TD-15	

12.28 Verify breakers tripped:

_____ 2TC-2	_____ 2TD-2	_____ 2TE-2	_____ 2TE-10
_____ 2TC-4	_____ 2TD-4	_____ 2TE-4	_____ 2TE-11
_____ 2TC-5	_____ 2TD-5	_____ 2TE-5	_____ 2TE-13
_____ 2TC-6	_____ 2TD-6	_____ 2TE-6	_____ 2TE-16
_____ 2TC-7	_____ 2TD-7	_____ 2TE-7	
	_____ 2TD-8	_____ 2TE-8	

12.29 Verify the following:

_____ B2T-4 Breaker tripped.

_____ OTS1-1 tripped.

_____ SSF battery chargers operating to maintain batteries.

12.30 To verify 2C LPI Pump operation, perform the following:

_____12.30.1 Stop 2A LPI Pump.

_____12.30.2 Start 2C LPI Pump.

_____12.30.3 Start 2A LPI Pump.

_____12.30.4 Stop 2C LPI Pump.

_____12.30.5 Stop 2B LPI Pump.

_____12.30.6 Start 2C LPI Pump.

_____12.30.7 Start 2B LPI Pump.

_____12.30.8 Stop 2C LPI Pump.

12.31 Reset Main Feeder Bus Monitor Relay Panel from Control Room by simultaneously depressing "RESET" on the following:

_____/_____ MFB Undervoltage Channel 1 Reset

_____/_____ MFB Undervoltage Channel 2 Reset

12.32 Verify the following:

- Reset:

_____ 2SA14-B3	_____ 2SA15-B6
_____ 2SA14-C3	_____ 2SA15-C6
_____ 2SA14-D4	_____ 2SA15-D4
_____ 2SA14-D6	_____ 2SA15-D6

- Computer Points:

_____ D2513 4KV RX1 Coil Mon Good

_____ D2514 4KV RX2 Coil Mon Good

_____/_____12.33 Close B2T-4 (4 kV FDR BRK to SSF 4 kV SWGR OTS1-1) breaker.

_____/_____12.34 Pull both sets of Control Power fuses in B2T-4 and White Tag:

_____ White Tag

12.35 Depress "MANUAL" pushbuttons on RZ module:

_____/_____ "STBY BUS FDR BKR 1"

_____/_____ "KEOWEE START CH A"

_____/_____ "STBY BUS FDR BKR 2"

_____/_____ "KEOWEE START CH B"

12.36 Verify the following:

_____ D2513 4KV RX1 Coil Mon Bad

_____ D2514 4KV RX2 Coil Mon Bad

_____12.37 Verify <u>BOTH</u> Keowee units operating.

12.38 Depress Unit 2 Keowee Reset pushbuttons:

_____ "Keowee Logic Reset Channel 1"

_____ "Keowee Logic Reset Channel 2"

12.39 Verify the following alarm:

_____ 2SA14-E4 _____ 2SA15-E4

12.40 To energize Startup source, perform the following:

_____/_____12.40.1 Close PCB-26

_____/_____12.40.2 Close PCB-27

_____12.40.3 Verify 2SA15-C2 reset.

12.41 Verify reset or reset red flags on EPSL cabinets for relays:

_____ 2SBC1A _____ 2SBC2A

_____ 2SBC1B _____ 2SBC2B

12.42 Perform the following:

_____/_____12.42.1 Open knife switch #2, counted right to left, (next to red knife switch) in $27B1_2$ relay on Loadshedding Circuit A cabinet and verify:

_____ 2SA15-A5 Alarm

_____/_____12.42.2 Open knife switch #2, counted right to left, (next to red knife switch) in $27B2_2$ relay on Loadshedding Circuit B cabinet and verify:

_____ 2SA15-B5 Alarm

_____ D2625 "E BRK FAIL TRANS SB A" Enabled

_____ D2626 "E BRK FAIL TRANS SB B" Enabled

NOTE: Approximately 1 second delay between channels will cause the opposite channel loadcenter to trip. Channel 1 - 2X5, Channel 2 - 2X6)

12.43 Simultaneously, depress "MANUAL" pushbuttons on RZ module:

_____/_____ "LOAD SHED & STBY BKR 1"

_____/_____ "LOAD SHED & STBY BKR 2"

12.44 Verify the following:

_____ 2SA14-D4 Alarm _____ 2SA15-D4 Alarm

_____ 2SA14-D6 Alarm _____ 2SA15-D6 Alarm

12.45 Perform the following:

_____/_____12.45.1 Close knife switch #2, counted right to left, in $27B1_2$ relay on Loadshedding Circuit A cabinet and verify:

_____ 2SA15-A5 Reset

_____/_____12.45.2 Close knife switch #2, counted right to left, in $27B2_2$ relay on Loadshedding Circuit B cabinet and verify:

_____ 2SA15-B5 Reset

_____ D2625 "E BRK FAIL TRANS SB A" Disabled

_____ D2626 "E BRK FAIL TRANS SB B" Disabled

12.45.3 Verify red flags on EPSL cabinets for relays:

_____ 2SBC1A _____ 2SBC2A

_____ 2SBC1B _____ 2SBC2B

12.46 Place Control Room switches in "OFF":

_____ 2A HPI Pump _____ 2B HPI Pump

NOTE: Step 12.47.1 will cause rapid transfer of power to Standby Bus from Lee to the Keowee Underground. Opening the OCB creates an undervoltage condition to trip both SL Breakers, which allows both SK Breakers to close. If the transfer fails, Enclosure 13.9, Compensatory Actions for Transfer from Lee to Keowee, should be followed. Enclosure 13.9 should be read before continuing.

12.47 Performed the following:

_____/_____12.47.1 Open OCB-101 and verify:

_____ SL1 OPEN _____ SK1 CLOSED

_____ SL2 OPEN _____ SK2 CLOSED

_____/_____12.47.2 Close OCB-101.

12.48 Reset Generator Lockouts:

_____/_____ 86GA _____/_____ 86GB

NOTE: Step 12.49 will cause MFB retransfer to Startup source 10 seconds after opening SK2. Both Standby breakers open and both Startup Breakers close. If transfer fails, Enclosure 13.10, Compensatory Actions for Retransfer to Startup, should be followed. Enclosure 13.10 should be read before continuing.

12.49 Perform the following:

12.49.1 Declare 72-hour LCO due to both SK breakers in MANUAL which removes Keowee Underground from service per Technical Specifications 3.7:

_____ If Unit 1 RCS $\geq$ 200°F, declare 72-hour LCO:
(SRO)
Date/Time _____

_____ If Unit 3 RCS $\geq$ 200°F, declare 72-hour LCO:
(SRO)
Date/Time _____

_____12.49.2 Place CT4 Bus 1 "AUTO-MAN" transfer switch in "MANUAL".

_____12.49.3 Open SK1.

_____12.49.4 Place CT4 Bus 2 "AUTO-MAN" transfer switch in "MANUAL".

_____12.49.5 Open SK2.

12.50 When $S1_2$ and $S2_2$ open, verify:

_____ $E1_2$ CLOSED

_____ $E2_2$ CLOSED

_____ 2SA14-E2 Alarm

_____ 2SA15-E2 Alarm

_____ 2STD/1AX "Channel A Retransfer to SU Source Initiate by Channel A Circ." Red light "ON"

_____ 2STD/2AX "Channel A Retransfer to SU Source Initiate by Channel B Circ." Red light "ON"

_____ 2STD/1BX "Channel B Retransfer to SU Source Initiate by Channel A Circ." Red light "ON"

_____ 2STD/2BX "Channel B Retransfer to SU Source Initiate by Channel B Circ." Red light "ON"

NOTE: Battery chargers will lose power when 600 MCC XSF-8A (Alternate Incoming) trips.

12.51 Perform the following:

_____12.51.1 Locally reset OTS1-1 relay targets.

_____12.51.2 Close SSF Breaker OTS1-1 from the SSF Control Room.

_____12.51.3 Notify Security battery chargers will lose power.

_____/_____12.51.4 Remove Blue Tag and close Breaker #4 in panel 2DIA.

_____ Blue Tag

_____12.51.5 Verify SSF Breaker OTS1-1 trips.

_____12.51.6 Verify 600 MCC XSF-8A (Alternate Incoming) trips.

12.52 Depress "AUTO" pushbuttons on RZ Module.

_____/_____ "STBY BUS FDR BKR 1"

_____/_____ "LOAD SHED & STBY BKR 1"

_____/_____ "KEOWEE START CH A"

_____/_____ "STBY BUS FDR BKR 2"

_____/_____ "LOAD SHED & STBY BKR 2"

_____/_____ "KEOWEE START CH B"

12.53 Reset Main Feeder Bus Monitor Relay Panel from Conrol Room by simultaneously depressing "Reset" on the following:

_____/_____ MFB Undervoltage Channel 1 Reset

_____/_____ MFB Undervoltage Channel 2 Reset

12.54 Verify the following:

_____ D2513 4KV RX1 Coil Mon Good

_____ D2514 4KV RX2 Coil Mon Good

_____ 2SA14-D4 Reset (2SA14-D6 also reset)

_____ 2SA15-D4 Reset (2SA15-A6, 2SA15-D6 also reset)

_____/_____12.55 Close 600 MCC XSF-8A (Alternate Incoming) breaker.

_____12.56 Verify SSF battery chargers operating to maintain batteries.

12.57 Place "AUTO-MAN" transfer switches in "AUTO":

_____/_____ CT4 Bus 1

_____/_____ CT4 Bus 2

12.58 Secure from Keowee Underground LCOs:

_____ Unit 1 secure from 72-hour LCO:
(SRO)

Date/Time _____

_____ Unit 3 secure from 72-hour LCO:
(SRO)

Date/Time _____

12.59 Perform the following:

_____/_____12.59.1 Close SSF Breaker OTS1-1.

_____12.59.2 Verify Breaker OTS1-3 closed.

_____12.59.3 Verify Breaker OXSF-4B closed.

_____12.59.4 Reset SSF-CO Panel Trouble Alarm.

_____12.59.5 Verify SSF battery chargers operating to maintain batteries.

_____12.59.6 Verify SSF HVAC system operating properly.

12.59.7 Verify NO abnormal alarms:

_____ SSF Control Room

_____ Diesel Generator Room

_____ SSF Equipment Room

_____ Central Alarm Station (CAS)

_____12.59.8 Verify SSF Inverters operating properly.

_____/_____12.59.9 In B2T-4 remove White Tag ang install BOTH set of Contol Power.

_____ White Tag

NOTE: Test module switch must remain in each position ≥ 3 seconds.

12.60 Perform the following:

_____/_____12.60.1 Rotate logic test module switch in ES cabinet 6, Channel #2 to "Operate" (Push in).

_____/_____12.60.1 Rotate logic test module switch in ES cabinet 4, Channel #1 to "Operate" (Push in).

_____12.61 Notify Keowee that Overhead Keowee Unit will trip when Emergency Start is reset due to load rejection protection circuitry.

12.62 Depress Unit 2 Keowee Reset pushbuttons and record time of Keowee Emergency Start reset: (2UB1)

_____ "Keowee Logic Reset Channel 1"

_____ "Keowee Logic Reset Channel 2"

Keowee Emergency Start Reset time _____

12.63 Perform the following:

_____ Verify acceptance met.

_____ If acceptance NOT met, notify Test Supervisor or Shift Work Manager.

NOTE: Steps 12.64 through 12.76 may be performed concurrently.

12.64 Notify Keowee personnel:

_____ Test complete.

_____ To secure both Keowee units.

12.65 Remove Blue Tag and close link in 2MTC3 at Row 6, Block 3, Link 9 - HP53XR:

_____ Blue Tag _____/_____ Close link

12.66 Remove Blue Tag and close Breaker #20 in Panel 2DIA:

_____ Blue Tag _____/_____ Close breaker

12.67 Remove Blue Tags and close links: (TB/3 K-40 TB1130)

_____ Blue Tag _____/_____ Link 2LS13X

_____ Blue Tag _____/_____ Link 2LS16X

_____ Blue Tag _____/_____ Link 2LS17X

_____ Blue Tag _____/_____ Link 2LS18X

12.68 In 2TE-13 ("B" Chiller Motor Breaker), terminal block AJ, remove Blue Tag and close the following links:

_____ Blue Tag _____/_____ Link "T"

_____ Blue Tag _____/_____ Link "03"

NOTE: OP/2/A/1107/02, Normal Power procedure may be used in restoring loadcenters.

12.69 Return equipment per:

_____ Enclosure 13.5

_____ Enclosure 13.6

12.70 Reset red flags on EPSL cabinets for relays:

_____ 2SBC1A _____ 2SBC2A _____ 2RLS1-1

_____ 2SBC1B _____ 2SBC2B _____ 2RLS2-1

CAUTION: If restoring 2CCW-7 to Normal position, ≥ 1 CCW pump must be operating to prevent CCW Gravity Flow initiation.

12.71 Remove White Tag from 2CCW-7 switch and return to Step 8.30.1 "As-Found" position:

_____ White Tag

_____/_____ 2CCW-7 returned to "As-Found"

12.72 Verify "AUTO-MAN" transfer switches in MANUAL:

_____/_____ MFB1

_____/_____ MFB2

_____/_____ 2TA

_____/_____ 2TB

12.73 Verify power available:

_____ SFP Cooling Pumps _____ RCW Pumps

12.74 Re-energize Standby Busses as follows:

12.74.1 Place "AUTO/MAN" transfer switches in "MANUAL":

_____/_____ CT5 Bus 1

_____/_____ CT5 Bus 2

12.74.2 Close the following:

_____/_____ SL1

_____/_____ SL2

12.74.3 Position "AUTO/MAN" transfer switches in "AUTO":

_____/_____ CT5 Bus 1

_____/_____ CT5 Bus 2

_____12.74.4 Notify Operations Gas Turbines backup power is no longer needed and may be secured per OP/0/A/1107/03.

_____12.75 Energize SPB Load Center from STB transformer per OP/0/A/1103/24.

12.76 Perform the following:

_____12.76.1 Return power sources for SSF loadcenter XSF from 2X11A to OXSF per OP/0/A/1600/05.

12.76.2 Secure from SSF LCOs:

_____ Unit 1 secure from 7-day LCO:
(SRO)
Date/Time _____

_____ Unit 3 secure from 7-day LCO:
(SRO)
Date/Time _____

_____12.76.3 Notify Security SSF normal power returned.

12.77 If desired by Operations, re-energize MFBs to Normal Source as follows:

12.77.1 Reset relays in Control Room on 2EB4:

_____a. 86GA Generator Lockout

_____b. 86GB Generator Lockout

_____c. 86H Generator Backup Lockout

_____d. 86HY Generator Backup Shutdown

NOTE: Steps 12.77.2 through 12.77.10 closes PCB-23 and PCB-24 into a dead transformer.

_____12.77.2 Station operators at the following locations:

- PCB-23 and PCB-24 control switches.
- PCB-23 and PCB-24 sync check relays located on 2EB3.

_____12.77.3 Remove covers from PCB-23 and PCB-24 sync check relays.

_____12.77.4 Turn PCB-23 SYNCHRONIZING switch "ON".

12.77.5 To energize output of sync check relay 25/23:

_____a. Using a pen, push in slot labled sync (bottom left) and hold.

_____b. Close breaker PCB-23 at control switch.

_____c. Remove pen from slot.

_____12.77.6 Turn PCB-23 SYNCHRONIZING switch "OFF".

_____12.77.7 Turn PCB-24 SYNCHRONIZING switch to "SYNC" position.

12.77.8 To energize output of sync check relay 25/24:

_____a. Using a pen, push in slot labled sync (bottom left) and hold.

_____b. Close breaker PCB-24 at control switch.

_____c. Remove pen from slot.

_____12.77.9 Turn PCB-24 SYNCHRONIZING switch "OFF".

_____12.77.10 Replace covers on PCB-23 and PCB-24 sync check relays.

NOTE: While jumper installed, if for any reason PCB-23 and PCB-24 open, a Generator Backup Shutdown 86HY lockout will occur.

_____/_____12.77.11 Have I&E replace jumper in 2EB-5 between 62GY and 86HY left side terminal strips.
(I&E)

_____12.77.12 If PCB-23 and PCB-24 opened, perform the following:

_____/_____a. Have I&E remove jumper in 2EB-5 between 62GY and 86HY left side terminal strips.
(I&E)

_____b. Reset 86HY Generator Backup Shutdown relay in the Control Room on 2EB4:

_____c. Close PCB-23 and PCB-24 per Steps 12.78.2 through 12.78.10.

_____/_____d. Have I&E replace jumper in 2EB-5 between 62GY and 86HY left side terminal strips.
(I&E)

_____12.77.13 Transfer auxiliaries from CT-2 to 2T per OP/2/A/1107/02, Normal Power.

_____/_____12.78 If Step 12.77 NOT performed, have I&E replace jumper in 2EB-5 between 62GY and 86HY left side terminal strips.
(I&E)

12.79 Notify test complete:

_____ Unit 1 Shift Supervisor

_____ Unit 2 Shift Supervisor

_____ Unit 3 Shift Supervisor

_____ Operations Shift Manager

_____ Keowee Personnel

_____ Systems Operating Center

_____ Toddville Transmission Control Center

_____ Unit Operations Manager

_____ Unit 2 Outage Manager

_____ Shift Work Manager

_____ Radwaste

_____ Security

_____ RP Count Room

_____ I&E Shift Supervisor

13.0 ENCLOSURES

13.1 Pre-test Non-Loadshed Breakers Checklist

13.2 Pre-test Loadshed Breakers Checklist

13.3 Alignment of 6900V Switchgear

13.4 Loadshed Breakers Checklist

13.5 Restoration of 4160V Switchgear

13.6 Restoration of 6900V Switchgear

13.7 Compensatory Actions for Transfer to Startup Source

13.8 Compensatory Actions for Transfer to Standby

13.9 Compensatory Actions for Transfer from Lee to Keowee

13.10 Compensatory Actions for Retransfer to Startup

ENCLOSURE 13.1
PRE-TEST NON-LOADSHED BREAKERS CHECKLIST

13.1.1 Record "As-Found" status of each breaker:

- Disconnected/Open
- Connected/Closed
- Connected/Open
- Test/Closed
- Test/Open

13.1.2 (Designated position)

13.1.3 Verify breaker in designated position OR remove DC fuses and rack out each breaker to designated position.

13.1.4 Verify or install 2 sets DC fuses, "ON" position up, and close breaker.

	13.1.1	13.1.2	13.1.3			13.1.4	
	As-Found	Design. Position	DC Fuses Removed	Performed By	Verified By	DC Fuses Installed	Bkr Closed
2TC-1 BUS 1 INCOMING FDR		CONNECT					
2TC-3 2X4		CONNECT					
2TC-8 2A HPI PUMP		TEST					N/A
2TC-9 2A LPI PUMP		CONNECT					
2TC-10 2A RBS PUMP		TEST					
2TC-11 C LPSW PUMP		CONNECT					
2TC-12 2X11		CONNECT					
2TC-13 2X8		CONNECT					
2TC-14 BUS 2 INCOMING FDR		CONNECT					

ENCLOSURE 13.1
PRE-TEST NON-LOADSHED BREAKERS CHECKLIST

13.1.1 Record "As-Found" status of each breaker:

- Disconnected/Open
- Connected/Closed
- Connected/Open
- Test/Closed
- Test/Open

13.1.2 (Designated position)

13.1.3 Verify breaker in designated position OR remove DC fuses and rack out each breaker to designated position.

13.1.4 Verify or install 2 sets DC fuses, "ON" position up, and close breaker.

NOTE: MDEFDWP Control Switch must be in "RUN" or "AUTO" to be closed locally.

	13.1.1	13.1.2	13.1.3			13.1.4	
	As-Found	Design. Position	DC Fuses Removed	Performed By	Verified By	DC Fuses Installed	Bkr Closed
2TD-1 BUS 1 INCOMING FDR		CONNECT					
2TD-3 2X5		CONNECT					
2TD-9 2C HPI PUMP		TEST					
2TD-10 2B LPI PUMP		CONNECT					
2TD-11 2B RBS PUMP		TEST					
2TD-12 B LPSW PUMP		CONNECT					
2TD-13 2X9		CONNECT					
2TD-14 BUS 2 INCOMING FDR		CONNECT					
2TD-15 2A EFDW PUMP		TEST					

ENCLOSURE 13.1
PRE-TEST NON-LOADSHED BREAKERS CHECKLIST

13.1.1 Record "As-Found" status of each breaker:

- Disconnected/Open
- Connected/Closed
- Connected/Open
- Test/Closed
- Test/Open

13.1.2 (Designated position)

13.1.3 Verify breaker in designated position OR remove DC fuses and rack out each breaker to designated position.

13.1.4 Verify or install 2 sets DC fuses, "ON" position up, and close breaker.

NOTE: MDEFDWP Control Switch must be in "RUN" or "AUTO" to be closed locally.

	13.1.1	13.1.2	13.1.3			13.1.4	
	As-Found	Design. Position	DC Fuses Removed	Performed By	Verified By	DC Fuses Installed	Bkr Closed
2TE-1 BUS 1 INCOMING FDR		CONNECT					
2TE-3 2X6		CONNECT					
2TE-9 2B HPI PUMP		TEST					N/A
2TE-12 2X10		CONNECT					
2TE-14 BUS 2 INCOMING FDR		CONNECT					
2TE-15 2B EFDW PUMP		TEST					

ENCLOSURE 13.2
PRE-TEST LOADSHED BREAKERS CHECKLIST

13.2.1 Record "As-Found" status of each breaker:

- Disconnected/Open
- Connected/Closed
- Connected/Open
- Test/Closed
- Test/Open

13.2.2 Designate "TEST" or "CONNECT" for 2A and 2D CCW pumps:

Unit 2 Shift Supervisor _____

13.2.3 Verify breaker in designated position OR remove DC fuses and rack out each breaker to designated position.

13.2.4 Verify or install 2 sets DC fuses, "ON" position up, and close breaker.

NOTE: HWP or CBP Control Switch must be in "RUN" or "AUTO" to be closed locally.

	13.2.1	13.2.2	13.2.3			13.2.4	
	As-Found	Design. Pos.	Fuses Removed	Perf. By	Verif. By	Fuses Installed	Bkr. Closed
2TC-2 2X1		CONNECT					
2TC-4 2A CCWP							
2TC-5 2D CCWP							
2TC-6 2A CBP		TEST					
2TC-7 2A HWP		TEST					

ENCLOSURE 13.2
PRE-TEST LOADSHED BREAKERS CHECKLIST

13.2.1 Record "As-Found" status of each breaker:

- Disconnected/Open
- Connected/Closed
- Connected/Open
- Test/Closed
- Test/Open

13.2.2 Designate "TEST" or "CONNECT" for 2B CCW pump:

Unit 2 Shift Supervisor _____

13.2.3 Verify breaker in designated position OR remove DC fuses and rack out each breaker to designated position.

13.2.4 Verify or install 2 sets DC fuses, "ON" position up, and close breaker.

NOTE: HWP or CBP Control Switch must be in "RUN" or "AUTO" to be closed locally.

	13.2.1	13.2.2	13.2.3			13.2.4	
	As-Found	Design. Pos.	Fuses Removed	Perf. By	Verif. By	Fuses Installed	Bkr. Closed
2TD-2 2X2		CONNECT					
2TD-4 2B CCWP							
2TD-5 2B CBP		TEST					
2TD-6 2B HWP		TEST					
2TD-7 2D2 HDP		TEST					
2TD-8 2E2 HDP		TEST					

ENCLOSURE 13.2
PRE-TEST LOADSHED BREAKERS CHECKLIST

13.2.1 Record "As-Found" status of each breaker:

- Disconnected/Open
- Connected/Closed
- Connected/Open
- Test/Closed
- Test/Open

13.2.2 Designate "TEST" or "CONNECT" for 2C CCW pump:

Unit 2 Shift Supervisor _____

13.2.3 Verify breaker in designated position OR remove DC fuses and rack out each breaker to designated position.

13.2.4 Verify or install 2 sets DC fuses, "ON" position up, and close breaker.

NOTE: HWP or CBP Control Switch must be in "RUN" or "AUTO" to be closed locally.

	13.2.1	13.2.2	13.2.3			13.2.4	
	As-Found	Design. Pos.	Fuses Removed	Perf. By	Verif. By	Fuses Installed	Bkr. Closed
2TE-2 2X3		CONNECT					
2TE-4 2C CCWP							
2TE-5 2C CBP		TEST					
2TE-6 2C HWP		TEST					
2TE-7 2D1 HDP		TEST					
2TE-8 2E1 HDP		TEST					
2TE-10 2C LPI		TEST					
2TE-11 SWYD FDR		CONNECT					
2TE-13 B CHILLER		TEST					
2TE-16 RADWASTE		CONNECT					

ENCLOSURE 13.3
ALIGNMENT OF 6900V SWITCHGEAR

13.3.1 Rack breakers to "TEST" and close per OP/0/A/1102/06:

	TEST	CLOSED
2TA Normal 6.9KV FDR	_____/_____	_____/_____
2TB Normal 6.9KV FDR	_____/_____	_____/_____
2A1 RC PUMP	_____/_____	_____/_____
2A2 RC PUMP	_____/_____	_____/_____
2B1 RC PUMP	_____/_____	_____/_____
2B2 RC PUMP	_____/_____	_____/_____

13.3.2 Rack breakers to "TEST" and open per OP/0/A/1102/06:

	TEST	OPEN
2TA S/U 6.9KV FDR	_____/_____	_____/_____
2TB S/U 6.9KV FDR	_____/_____	_____/_____

13.3.3 Perform the following:

a. If the following Potential Transformer Drawers are open, install or verify fuses installed in:

_____/_____ CT-2 6.9 KV Potential Transformer (2TB-1, front bottom)

_____/_____ 2T 6.9 KV Potential Transformer (2TA-1, front bottom)

b. Close or verify closed the following drawers:

_____/_____ CT-2 6.9 KV Potential Transformer (2TB-1, front bottom)

_____/_____ 2T 6.9 KV Potential Transformer (2TA-1, front bottom)

c. Close or verify closed:

_____/_____ CT-2 Disconnect to 6.9 KV Buss

ENCLOSURE 13.4
LOADSHED BREAKERS CHECKLIST

13.4.1 Record "As-Found" status of each breaker:

- Disconnected/Open
- Connected/Closed
- Connected/Open
- Test/Closed
- Test/Open

13.4.2 Close or verify closed each breaker.

13.4.3 Remove 27 undervoltage relay cover cabinet front, open red tip knife switch and Blue Tag.

NOTE: HWP or CBP Control Switch must be in "RUN" or "AUTO" to be closed locally.

	13.4.1	13.4.2	13.4.3	13.4.3
	As-Found	Breaker Closed	Knife Sw Open	Blue Tag
2TC-2 2X1				
2TC-4 2A CCWP				
2TC-5 2D CCWP				
2TC-6 2A CBP				
2TC-7 2A HWP				

ENCLOSURE 13.4
LOADSHED BREAKERS CHECKLIST

13.4.1 Record "As-Found" status of each breaker:

- Disconnected/Open
- Connected/Closed
- Connected/Open
- Test/Closed
- Test/Open

13.4.2 Close or verify closed each breaker.

13.4.3 Remove 27 undervoltage relay cover cabinet front, open red tip knife switch and Blue Tag.

NOTE: HWP or CBP Control Switch must be in "RUN" or "AUTO" to be closed locally.

	13.4.1	13.4.2	13.4.3	13.4.3
	As-Found	Breaker Closed	Knife Sw Open	Blue Tag
2TD-2 2X2				
2TD-4 2B CCWP				
2TD-5 2B CBP				
2TD-6 2B HWP				
2TD-7 2D2 HDP				
2TD-8 2E2 HDP				

ENCLOSURE 13.4
LOADSHED BREAKERS CHECKLIST

13.4.1 Record "As-Found" status of each breaker:

- Disconnected/Open
- Connected/Closed
- Connected/Open
- Test/Closed
- Test/Open

13.4.2 Close or verify closed each breaker.

13.4.3 Remove 27 undervoltage relay cover cabinet front, open red tip knife switch and Blue Tag.

NOTE: HWP or CBP Control Switch must be in "RUN" or "AUTO" to be closed locally.

	13.4.1	13.4.2	13.4.3	13.4.3
	As-Found	Breaker Closed	Knife Sw Open	Blue Tag
2TE-2 2X3				
2TE-4 2C CCWP				
2TE-5 2C CBP				
2TE-6 2C HWP				
2TE-7 2D1 HDP				
2TE-8 2E1 HDP				
2TE-10 2C LPI				
2TE-11 SWYD FDR				
2TE-13 CHILLER			N/A	N/A
2TE-16 RADWASTE				

ENCLOSURE 13.5
RESTORATION OF 4160V SWITCHGEAR

13.4.1 Have Unit 2 Shift Supervisor designate "As-Left" position for ALL breakers:

- Disconnected/Open
- Connected/Closed
- Connected/Open
- Test/Closed
- Test/Open

Unit Shift Supervisor _____

13.4.2 Remove Blue Tag and close red tip knife switch on 27 undervoltage relay.

13.4.3 Replace cover on 27 undervoltage relay.

13.4.4 If changing breaker position, remove 2 sets DC Fuses.

13.4.5 Verify or return each breaker to designated "As-Left" position.

13.4.6 Verify or install 2 sets DC Fuses, "ON" position up.

	13.4.1	13.4.2	13.4.3	13.4.4	13.4.5	13.4.6
	As-Left Position	Blue Tag/ Knife Sw Closed	27 UV Cover Replaced	DC Fuses Removed	Breaker Positioned By	DC Fuses Installed
2TC-1 BUS 1 INCOMING FDR		N/A	N/A			
2TC-2 2X1		/				
2TC-3 2X4		N/A	N/A			
2TC-4 2A CCWP		/				
2TC-5 2D CCWP		/				
2TC-6 2A CBP		/				
2TC-7 2A HWP		/				
2TC-8 2A HPI		N/A	N/A			

ENCLOSURE 13.5
RESTORATION OF 4160V SWITCHGEAR

13.4.1 (Designated "As-Left" position by Unit 2 Supervisor).

13.4.2 Remove Blue Tag and close red tip knife switch on 27 undervoltage relay.

13.4.3 Replace cover on 27 undervoltage relay.

13.4.4 If changing breaker position, remove 2 sets DC Fuses.

13.4.5 Verify or return each breaker to designated "As-Left" position.

13.4.6 Verify or install 2 sets DC Fuses, "ON" position up.

	13.4.1	13.4.2	13.4.3	13.4.4	13.4.5	13.4.6
	As-Left Position	Blue Tag/ Knife Sw Closed	27 UV Cover Replaced	DC Fuses Removed	Breaker Positioned By	DC Fuses Installed
2TC-9 2A LPI PUMP		N/A	N/A			
2TC-10 2A RBS PUMP		N/A	N/A			
2TC-11 C LPSW PUMP		N/A	N/A			
2TC-12 2X11		N/A	N/A			
2TC-13 2X8		N/A	N/A			
2TC-14 BUS 2 INCOMING FDR		N/A	N/A			

ENCLOSURE 13.5
RESTORATION OF 4160V SWITCHGEAR

13.4.1 (Designated "As-Left" position by Unit 2 Supervisor).

13.4.2 Remove Blue Tag and close red tip knife switch on 27 undervoltage relay.

13.4.3 Replace cover on 27 undervoltage relay.

13.4.4 If changing breaker position, remove 2 sets DC Fuses.

13.4.5 Verify or return each breaker to designated "As-Left" position.

13.4.6 Verify or install 2 sets DC Fuses, "ON" position up.

	13.4.1	13.4.2	13.4.3	13.4.4	13.4.5	13.4.6
	As-Left Position	Blue Tag/ Knife Sw Closed	27 UV Cover Replaced	DC Fuses Removed	Breaker Positioned By	DC Fuses Installed
2TD-1 BUS 1 INCOMING FDR		N/A	N/A			
2TD-2 2X2		/				
2TD-3 2X5		N/A	N/A			
2TD-4 2B CCW PUMP		/				
2TD-5 2B CBP PUMP		/				
2TD-6 2B HW PUMP		/				
2TD-7 2D2 HD PUMP		/				
2TD-8 2E2 HD PUMP		/				

ENCLOSURE 13.5
RESTORATION OF 4160V SWITCHGEAR

13.4.1 (Designated "As-Left" position by Unit 2 Supervisor).

13.4.2 Remove Blue Tag and close red tip knife switch on 27 undervoltage relay.

13.4.3 Replace cover on 27 undervoltage relay.

13.4.4 If changing breaker position, remove 2 sets DC Fuses.

13.4.5 Verify or return each breaker to designated "As-Left" position.

13.4.6 Verify or install 2 sets DC Fuses, "ON" position up.

	13.4.1	13.4.2	13.4.3	13.4.4	13.4.5	13.4.6
	As-Left Position	Blue Tag/ Knife Sw Closed	27 UV Cover Replaced	DC Fuses Removed	Breaker Positioned By	DC Fuses Installed
2TD-9 2C HPI PUMP		N/A	N/A			
2TD-10 2B LPI PUMP		N/A	N/A			
2TD-11 2B RBS PUMP		N/A	N/A			
2TD-12 B LPSW PUMP		N/A	N/A			
2TD-13 2X9		N/A	N/A			
2TD-14 BUS 2 INCOMING FDR		N/A	N/A			
2TD-15 2A EFDW PUMP		N/A	N/A			

ENCLOSURE 13.5
RESTORATION OF 4160V SWITCHGEAR

13.4.1 (Designated "As-Left" position by Unit 2 Supervisor).

13.4.2 Remove Blue Tag and close red tip knife switch on 27 undervoltage relay.

13.4.3 Replace cover on 27 undervoltage relay.

13.4.4 If changing breaker position, remove 2 sets DC Fuses.

13.4.5 Verify or return each breaker to designated "As-Left" position.

13.4.6 Verify or install 2 sets DC Fuses, "ON" position up.

	13.4.1	13.4.2	13.4.3	13.4.4	13.4.5	13.4.6
	As-Left Position	Blue Tag/ Knife Sw Closed	27 UV Cover Replaced	DC Fuses Removed	Breaker Positioned By	DC Fuses Installed
2TE-1 BUS 1 INCOMING FDR		N/A	N/A			
2TE-2 2X3		/				
2TE-3 2X6		N/A	N/A			
2TE-4 2C CCW PUMP		/				
2TE-5 2C CB PUMP		/				
2TE-6 2C HW PUMP		/				
2TE-7 2D1 HD PUMP		/				

ENCLOSURE 13.5
RESTORATION OF 4160V SWITCHGEAR

13.4.1 (Designated "As-Left" position by Unit 2 Supervisor).

13.4.2 Remove Blue Tag and close red tip knife switch on 27 undervoltage relay.

13.4.3 Replace cover on 27 undervoltage relay.

13.4.4 If changing breaker position, remove 2 sets DC Fuses.

13.4.5 Verify or return each breaker to designated "As-Left" position.

13.4.6 Verify or install 2 sets DC Fuses, "ON" position up.

	13.4.1	13.4.2	13.4.3	13.4.4	13.4.5	13.4.6
	As-Left Position	Blue Tag/ Knife Sw Closed	27 UV Cover Replaced	DC Fuses Removed	Breaker Positioned By	DC Fuses Installed
2TE-8 2E1 HD PUMP		/				
2TE-9 2B HPI PUMP		N/A	N/A			
2TE-10 2C LPI PUMP		/				
2TE-11 B SWYD FDR		/				
2TE-12 2X10		N/A	N/A			
2TE-13 B CHILLER		N/A	N/A			
2TE-14 BUS 2 INCOMING BKR		N/A	N/A			
2TE-15 2B EFDW PUMP		N/A	N/A			
2TE-16 RADWASTE		/				

ENCLOSURE 13.6
RESTORATION OF 6900V SWITCHGEAR

Position breakers to OPEN/DISCONNECTED per OP/0/A/1102/06:

	OPEN	DISCONNECTED
2TA Normal 6.9KV FDR	_____/_____	_____/_____
2TB Normal 6.9KV FDR	_____/_____	_____/_____
2TA S/U 6.9KV FDR	_____/_____	_____/_____
2TB S/U 6.9KV FDR	_____/_____	_____/_____
2A1 RC PUMP	_____/_____	_____/_____
2A2 RC PUMP	_____/_____	_____/_____
2B1 RC PUMP	_____/_____	_____/_____
2B2 RC PUMP	_____/_____	_____/_____

ENCLOSURE 13.7
COMPENSATORY ACTIONS FOR TRANSFER
TO STARTUP SOURCE

13.7.1 If transfer fails, immediately perform the following:

- Verify Startup Source energized.
- Attempt manual transfer to Startup Source by:

  a. Place "AUTO/MAN" transfer switches in MANUAL:

  - MFB1 AUTO/MAN
  - MFB2 AUTO/MAN

  b. Open the following Breakers:

  - $N1_2$ MFB1 NORMAL FDR
  - $N2_2$ MFB2 NORMAL FDR

  c. Close the following Breakers:

  - $E1_2$ STARTUP FDR
  - $E2_2$ STARTUP FDR

13.7.2 If unsuccessful, allow automatic loadshed and transfer to STBY Busses.

13.7.3 After 1 minute, if power NOT regained to MFBs and STBY Busses energized, perform the following:

a. Place "AUTO/MAN" transfer switches in MANUAL:

- STANDBY 1 AUTO/MAN
- STANDBY 2 AUTO/MAN

b. Close the following Breakers:

- $S1_2$ STBY BUS TO MFB1
- $S2_2$ STBY BUS TO MFB2

ENCLOSURE 13.7
COMPENSATORY ACTIONS FOR TRANSFER
TO STARTUP SOURCE

13.7.4 If MFBs still de-energized, perform the following:

a. Open the following Breakers:

- $S1_2$ STBY BUS TO MFB1
- $S2_2$ STBY BUS TO MFB2

b. Reset generator lockout relays 86GA and 86GB.

c. Manually close PCBs 23 and 24.

d. Close the following Breakers:

- $N1_2$ MFB1 NORMAL FDR
- $N2_2$ MFB2 NORMAL FDR

13.7.5 If MFBs still de-energized:

- Refer to AP/2/A/1700/07 (Loss of LPI)
- Refer to AP/2/A/1700/11 (Loss of Power)
- Refer to the Emergency Plan

ENCLOSURE 13.8
COMPENSATORY ACTIONS FOR TRANSFER
TO STANDBY

13.8.1 If MFBs not energized, determine STBY BUS status.

13.8.2 If STBY BUS energized, perform the following:

a. Place "AUTO/MAN" transfer switches in MANUAL:

- STANDBY 1 AUTO/MAN
- STANDBY 2 AUTO/MAN

b. Close Breakers:

- $S1_2$ STBY BUS TO MFB1
- $S2_2$ STBY BUS TO MFB2

c. If $S1_2$ and $S2_2$ BKRs fail to close, perform the following:

1. Place "AUTO/MAN" transfer switches in MANUAL:

- CT-4 BUS 1 AUTO/MAN
- CT-4 BUS 2 AUTO/MAN
- CT-5 BUS 1 AUTO/MAN
- CT-5 BUS 2 AUTO/MAN

2. Open or verify open:

- SL1 (CT-5 STBY BUS 1 FDR)
- SL2 (CT-5 STBY BUS 2 FDR)
- SK1 CT-4 STBY BUS 1 FDR
- SK2 CT-4 STBY BUS 2 FDR
- $S1_2$ STBY BUS TO MFB1
- $S2_2$ STBY BUS TO MFB2

3. Energize CT-2 by closing PCB-26 and PCB-27.

ENCLOSURE 13.8
COMPENSATORY ACTIONS FOR TRANSFER
TO STANDBY

NOTE: BOTH statalarms 2SA15-D6 and 2SA15-D4 must be clear before either "E" BKR will close automatically or manually.

4. If $E1_2$ and $E2_2$ BKRs DO NOT close automatically within 10 seconds, attempt to close them manually:

   A. Place "AUTO/MAN" transfer switches in MANUAL:

      - MFB1 AUTO/MAN
      - MFB2 AUTO/MAN

   B. Close the following Breakers:

      - $E1_2$ STARTUP FDR
      - $E2_2$ STARTUP FDR

   C. If neither STARTUP BKR close, GO TO 13.8.4.

13.8.3 If STBY BUSSES are NOT energized, perform the following:

a. Energize CT-2 by closing PCB-26 and PCB-27.

NOTE: BOTH statalarms 2SA15-D6 and 2SA15-D4 must be clear before either "E" BKR will close automatically or manually.

b. If $E1_2$ and $E2_2$ BKRs DO NOT close automatically within 10 seconds, attempt to close them manually:

   1. Place "AUTO/MAN" transfer switches in MANUAL:

      - MFB1 AUTO/MAN
      - MFB2 AUTO/MAN

   2. Close the following Breakers:

      - $E1_2$ STARTUP FDR
      - $E2_2$ STARTUP FDR

   3. If neither STARTUP BKR close, GO TO 13.8.4.

ENCLOSURE 13.8
COMPENSATORY ACTIONS FOR TRANSFER
TO STANDBY

13.8.4 If $E1_2$ and $E2_2$ BKRs fail to close, perform the following:

a. Open the following Breakers:

- $E1_2$ STARTUP FDR
- $E2_2$ STARTUP FDR

b. Reset generator lockout relays 86GA and 86GB.

c. Manually close PCB-23 and PCB-24.

d. Close the following Breakers:

- $N1_2$ MFB1 NORMAL FDR
- $N2_2$ MFB2 NORMAL FDR

13.8.5 If MFBs NOT energized:

- Refer to AP/2/A/1700/07 (Loss of LPI)
- Refer to AP/2/A/1700/11 (Loss of Power)
- Refer to the Emergency Plan

ENCLOSURE 13.9
COMPENSATORY ACTIONS FOR TRANSFER FROM LEE TO KEOWEE

13.9.1 After opening OCB-101, if SL BKRs DO NOT open immediately:

a. Place "AUTO/MAN" transfer switches in MANUAL:

- CT-5 BUS 1 AUTO/MAN
- CT-5 BUS 2 AUTO/MAN

b. Open Breakers:

- SL1 (CT-5 STBY BUS 1 FDR)
- SL2 (CT-5 STBY BUS 2 FDR)

13.9.2 If SK BKRs DO NOT automatically close AND the MFBs DO NOT retransfer to Startup within 10 seconds, perform the following:

a. Place "AUTO/MAN" transfer switches in MANUAL:

- CT-4 BUS 1 AUTO/MAN
- CT-4 BUS 2 AUTO/MAN

b. Close the following Breakers:

- SK1 (CT-4 STBY BUS 1 FDR)
- SK2 (CT-4 STBY BUS 2 FDR)

c. If STBY BUSES energize, verify Breakers closed:

- $S1_2$ STBY BUS TO MFB1
- $S2_2$ STBY BUS TO MFB2

13.9.3 If MFBs DO NOT energize from CT-4 and Retransfer fails, re-energize from CT-5:

a. Open or verify open Breakers:

- SK1 (CT-4 STBY BUS 1 FDR)
- SK2 (CT-4 STBY BUS 2 FDR)

b. Close OCB-101.

ENCLOSURE 13.9
COMPENSATORY ACTIONS FOR TRANSFER
FROM LEE TO KEOWEE

c. Place "AUTO/MAN" transfer switches in MANUAL:

- CT-5 BUS 1 AUTO/MAN
- CT-5 BUS 2 AUTO/MAN

d. Close the following Breakers:

- SL1 (CT-5 STBY BUS 1 FDR)
- SL2 (CT-5 STBY BUS 2 FDR)

e. If STBY BUSES energize, verify Breakers closed:

- $S1_2$ STBY BUS TO MFB1
- $S2_2$ STBY BUS TO MFB2

13.9.4 If Retransfer fails to energize MFB, perform the following:

a. Place or verify "AUTO/MAN" transfer switches in MANUAL:

- CT-5 BUS 1 AUTO/MAN
- CT-5 BUS 2 AUTO/MAN
- CT-4 BUS 1 AUTO/MAN
- CT-4 BUS 2 AUTO/MAN
- STANDBY 1 AUTO/MAN
- STANDBY 2 AUTO/MAN

b. Open or verify open Breakers:

- SL1 CT-5 STBY BUS 1 FDR
- SL2 CT-5 STBY BUS 2 FDR
- SK1 CT-4 STBY BUS 1 FDR
- SK2 CT-4 STBY BUS 2 FDR
- $S1_2$ STBY BUS 1 TO MFB
- $S2_2$ STBY BUS 2 TO MFB

ENCLOSURE 13.9
COMPENSATORY ACTIONS FOR TRANSFER
FROM LEE TO KEOWEE

c. Energize MFBs from CT-2 manually:

1. Place "AUTO/MAN" transfer switches in MANUAL:

- MFB1 AUTO/MAN
- MFB2 AUTO/MAN

NOTE: BOTH statalarms 2SA15-D6 and 2SA15-D4 must be clear before either "E" BKR will close automatically or manually.

2. Close the following Breakers:

- $E1_2$ STARTUP FDR
- $E2_2$ STARTUP FDR

13.9.5 If MFBs still not energized, perform the following:

a. Place "AUTO/MAN" transfer switches in MANUAL:

- MFB1 AUTO/MAN
- MFB2 AUTO/MAN

b. Open the following Breakers:

- $E1_2$ STARTUP FDR
- $E2_2$ STARTUP FDR

c. Reset generator lockout relays 86GA and 86GB.

d. Manually close PCB-23 and PCB-24.

e. Close the following Breakers:

- $N1_2$ MFB1 NORMAL FDR
- $N2_2$ MFB2 NORMAL FDR

13.9.6 If power is still unavailable to MFBs:

- Refer to AP/2/A/1700/07 (Loss of LPI)
- Refer to AP/2/A/1700/11 (Loss of Power)
- Refer to the Emergency Plan

ENCLOSURE 13.10
COMPENSATORY ACTIONS FOR
RETRANSFER TO STARTUP

13.10.1 If within one minute, "Retransfer to Startup" does NOT initiate (2SA14-E2 or 2SA15-E2 NOT in alarm), close Breakers:

- SK1 CT-4 STBY BUS 1 FDR
- SK2 CT-4 STBY BUS 2 FDR

13.10.2 If retransfer DOES initiate (2SA14-E2 or 2SA15-E2 in alarm) AND MFBs do NOT energize:

a. Close the following Breakers:

- SK1 CT-4 STBY BUS 1 FDR
- SK2 CT-4 STBY BUS 2 FDR

b. If "Transfer to Standby" does NOT occur within 15 seconds, manually energize MFBs:

1. Place "AUTO/MAN" transfer switches to MANUAL:

- STANDBY 1 AUTO/MAN
- STANDBY 2 AUTO/MAN

2. Close the following Breakers:

- $S1_2$ STBY BUS 1 TO MFB
- $S2_2$ STBY BUS 2 TO MFB

13.10.3 If MFBs are NOT energized, perform the following:

a. Place "AUTO/MAN" transfer switches in MANUAL:

- STANDBY 1 AUTO/MAN
- STANDBY 2 AUTO/MAN
- MFB1 AUTO/MAN
- MFB1 AUTO/MAN

ENCLOSURE 13.10
COMPENSATORY ACTIONS FOR
RETRANSFER TO STARTUP

b. Open the following Breakers:

- $S1_2$ STBY BUS 1 TO MFB
- $S2_2$ STBY BUS 2 TO MFB
- $E1_2$ MFB1 STARTUP FDR
- $E2_2$ MFB2 STARTUP FDR

c. Manually close PCB-23 and PCB-24.

d. Manually close the following Breakers:

- $N1_2$ MFB1 NORMAL FDR
- $N2_2$ MFB2 NORMAL FDR

13.10.4 If power is still unavailable to the MFBs:

- Refer to AP/2/A/1700/07 (Loss of LPI)
- Refer to AP/2/A/1700/11 (Loss of Power)
- Refer to the Emergency Plan

ATTACHMENT 4

KEOWEE DESIGN BASIS DOCUMENT
TEST MATRIX

40. TESTING/CALCULATION MATRIX

40.1 DESIGN BASIS REQUIREMENT

Both Keowee units shall start and accelerate from zero to rated speed and voltge within twenty-three seconds upon receiving an emergency start signal.

DBD Section: 20.2.1, 20.4.1

Technical Specification: 3.7 Bases. 4.6.2a

Do We Test? YES

Should We Test? YES

Relevant Procedure or Justification:

PT/0/A/0620/16 - Keowee Emergency Start Test

Relevant Calculation or Justification:

OSS-0254.00-00-2000 (4kV DBD Section 20.2.1.3.2)

Comments: N/A

40.2 DESIGN BASIS REQUIREMENT

If the Keowee units are already operating when an emergency start signal is received, the Keowee units shall separate from the network and continue to run on standby until needed.

If a Keowee unit is needed through the overhead path, a minimum of 3.64 seconds from the emergency start signal shall elapse prior to reconnecting to the overhead path.

DBD Section: 20.2.1

Technical Specification: N/A

Do We Test? YES

Should We Test? YES

Relevant Procedure or Justification:

PT/1,2,3/A/0610/01J - Oconee Unit EPSL Test
PT/0/A/0620/16 - Keowee Emergency Start Test
PT/0/A/0610/022 - Degraded Grid and Switchyard Isolation Functional Test

Relevant Calculation or Justification:

OSC-4077 (Design input calculation for NSM ON-52855 - Keowee Overload Scenario).

Comments: N/A

40.3 DESIGN BASIS REQUIREMENT

Each Keowee unit shall have adequate capacity to supply the emergency power needs for Oconee Nuclear Station (LOCA loads for one unit plus hot shutdown loads of the other two units).

DBD Section: 20.2.2, 20.4.1

Do We Test? YES

Should We Test? YES

Relevant Procedure or Justification:

PT/0/A/0620/16 - Keowee Emergency Start Test

Relevant Calculation or Justification:

FSAR Chapter 8, Table 8.1-1.
OSC-4077

Comments:

Emergency Start Test verifies ability to emergency start from each control room and supply ≥ the emergency required load.

40.4 DESIGN BASIS REQUIREMENT

The Keowee Emergency Power System shall provide adequate voltage to Oconee via two separate and independent paths (underground feeder and the overhead path).

DBD Section: 20.2.3, 20.2.3.1, 20.2.3.2, 20.2.7

Technical Specification: N/A

Do We Test? YES

Should We Test? YES

Relevant Procedure or Justification:

PT/1,2,3/A/0610/01J - Emergency Power Switching Logic Test. Verifies the unit aligned to the underground feeder supplies adequate power to the available Oconee shutdown loads during each Oconee unit's RFO.

Relevant Calculation or Justification:

Underground Feeder:

OSC-2444 and OSC-3696
OSC-5952 dynamically models Keowee and the ONS loads and verifies voltage adequacy.

Overhead Path:

Calculation OSC-5701 dynamically models Keowee and the ONS auxiliaries and verifies voltage adequacy.

Comments: N/A

40.5 DESIGN BASIS REQUIREMENT

The Keowee Emergency Power auxiliaries shall receive adequate voltage from the following sources:

1. Keowee generator through Keowee transformers 1X and 2X
2. Oconee switchgear 1TC through Transformer CX
3. 230KV Switchyard through Keowee main step up transformer and transformers 1X and 2X

DBD Section: 20.2.3, 20.2.3.3, 20.2.3.4, 20.2.3.5

Technical Specifications: N/A

Do We Test? YES

Should We Test? YES

Relevant Procedure or Justification:

IP/0/A/4980/27G - Calibration Instruction for the undervoltage relays on Keowee LC.
OP/0/A/2000/049 - Auxiliary Power Transfer Test

Relevant Calculation or Justification:

KC-Unit 1 1-2-0095, Keowee Units 1 & 2 Auxiliary System Voltage and Load Study
KC-0073, Keowee Hydro Station Auxiliary Power System Voltage Level
KC-0096, Electrical Design Input Calculation for NSM ON-52930 (27/1X, 2X, CX1, CX2)

Comments: N/A

40.6 DESIGN BASIS REQUIREMENT

Each Keowee unit shall be capable of automatically starting and accelerating upon receipt of an Engineered Safeguards signal from any of the three Oconee units.

Each Keowee unit shall be capable of automatically starting and accelerating without AC power to either of its unit auxiliaries ("shall black start").

DBD Section: 20.2.4

Technical Specifications: N/A

Do We Test? YES

Should We Test? YES

Relevant Procedure or Justification:

PT 0 A 0620 16 - Keowee Emergency Start Test
PT 1.2.3 A 0610 01J - Oconee Units EPSL Test

Relevant Calculation or Justification: N/A

Comments:

The Keowee units ability to "black start" was an original design concept and was verified during preoperational testing. This test is not considered necessary to be performed periodically (i.e., one time test). However, this feature was reverified satisfactorily via TT/O/A/650/01 on December 16, 1992.

40.7 DESIGN BASIS REQUIREMENT

The auxiliaries for the Keowee unit aligned to the underground feeder shall not transfer from its normal source to its backup source within 23 seconds of its normal source breaker tripping.

The unit aligned to the underground feeder shall have its auxiliaries aligned to receive power from Transformer CX. The unit aligned to the overhead path shall have its auxiliaries aligned to receive power from its auxiliary transformer.

DBD Section: 20.2.6, 20.2.5

Technical Specifications: N/A

Do We Test? YES

Should We Test? YES

Relevant Procedure or Justification:

OP/0/A/2000/049 - Auxiliary Power Transfer Test

Relevant Calculationor Justification:

KC-0096
OSC-5096 Keowee Single Failure Analysis

Comments: N/A

40.8 DESIGN BASIS REQUIREMENT

The Keowee Emergency Power System shall meet the system functional design basis for design bases events while sustaining a worst case single failure.

DBD Section: 20.3.1

Technical Specifications: N/A

Do We Test? NO

Should We Test? NO

Relevant Procedure or Justification: N/A

Relevant Calculation or Justification:

FSAR Chapter 8, Tables 8.3-1 and 8.3-2 Single Failure Analysis for Keowee Hydro Station and the Emergency Power System respectively.

FSAR Chapter 7, Section 7.1.2.2 Single Failure Criteria

Calculation KC-0082, Keowee Hydro Station Units 1 and 2 Single Failure Analysis of the Auxiliary Power System with Regard to Transformer CX.

Calculation OSC-4077 Electrical Design Inputs for NSM ON-52855 (Keowee Overload Scenario)

OSC-5096 Keowee Single Failure Analysis

Comments: N/A

40.9 DESIGN BASIS REQUIREMENT

During an Appendix R event with the Oconee units in hot shutdown, the Keowee Emergency Power System shall provide power to the Appendix R switchgear via the underground feeder.

DBD Section: 20.3.2

Technical Specification or Justification: N/A

Do We Test? NO

Should We Test? NO

Relevant Procedure or Justification:

ONS Units 1,2, and 3 Hot Shutdown/SSS/Associated Circuits Review/Operation Plan for Fire Analysis

Relevant Calculation or Justification: N/A

Comments: N/A

40.10 DESIGN BASIS REQUIREMENT

The Keowee Emergency Power System and associated support systems which are required to function during DBEs shall be classified QA Condition 1.

DBD Section: 20.3.3

Technical Specification or Justification: N/A

Do We Test? NO

Should We Test? NO

Relevant Procedure or Justification: N/A

Relevant Calculation or Justification: N/A

Comments: Reference NSD-307.

40.11 DESIGN BASIS REQUIREMENT

Electrical equipment considered essential in providing emergency power shall be designed to assure that it will not lose its capability to perform intended safety function during and following maximum hypothetical earthquake (MHE).

DBD Section: 20.3.4

Technical Specification or Justification: N/A

Do We Test? NO

Should We Test? NO

Relevant Procedure or Justification: N/A

Relevant Calculation or Justification:

ONS FSAR Chapter 3, Subsection 3.7 and 3.10 (Seismic)
OSS-0254.00-00-4000 Design Basis Specification for Keowee Structures

Comments: N/A

40.12 DESIGN BASIS REQUIREMENT

QA Condition 1 cables which provide mutually-redundant functions shall be separated.

DBD Section: 20.3.11.2

Technical Specification or Justification: N/A

Do We Test? NO

Should We Test? NO

Relevant Procedure or Justification: N/A

Relevant Calculation or Justification:

FSAR Chapter 8, Section 8.3.1.4.6, Cable Installation and Separation
ONDS-0344 - Plant, Keowee, & 230 KV Switchyard Cable Separation Study

Comments: N/A

40.13 DESIGN BASIS REQUIREMENT

ACBs 1 and 2 (overhead path) shall be rated for 15KV and 4000A. ACBs 3 and 4 (underground path) shall be rated for 15KV and 2000A.

DBD Section: 20.4.2

Technical Specifications: N/A

Do We Test? NO

Should We Test? NO

Relevant Procedure or Justification: N/A

Relevant Calculation or Justification: N/A

Comments: See KM 303-26, (IB) for ACBs 3 & 4, KM 303-9 for ACBs 1 & 2

40.14 DESIGN BASIS REQUIREMENT

The Keowee Main Stepup Transformer No. 1 shall have a tap setting of five (5).

Auxiliary Transformer CX shall have the capacity to supply adequate power to both Keowee units auxiliaries and shall have a tap setting of five (5).

Auxiliary Transformer 1X and 2X shall have the capacity to supply adequate power to each of its respective units auxiliaries.

DBD Section: 20.4.3, 20.4.4, 20.4.5

Technical Specification: N/A

Do We Test? NO

Should We Test? NO

Relevant Procedure or Justification: N/A

Relevant Calculation or Justification:

OSC-5701
KC-UNIT-1-2-0095
KC-0073
TAP setting Calc OSC-5284

Comments: N/A

40.15 DESIGN BASIS REQUIREMENT

Each Keowee unit is required to have its own dedicated load center. Each load center shall have available a dedicated auxiliary transformer. The auxiliaries of the unit aligned to the underground feeder shall be fed from Transformer CX. Each load center shall feed a dedicated units motor control centers (XA and XS).

DBD Section: 20.4.6

Technical Specification: N/A

Do We Test? NO

Should We Test? NO

Relevant Procedure or Justification: N/A

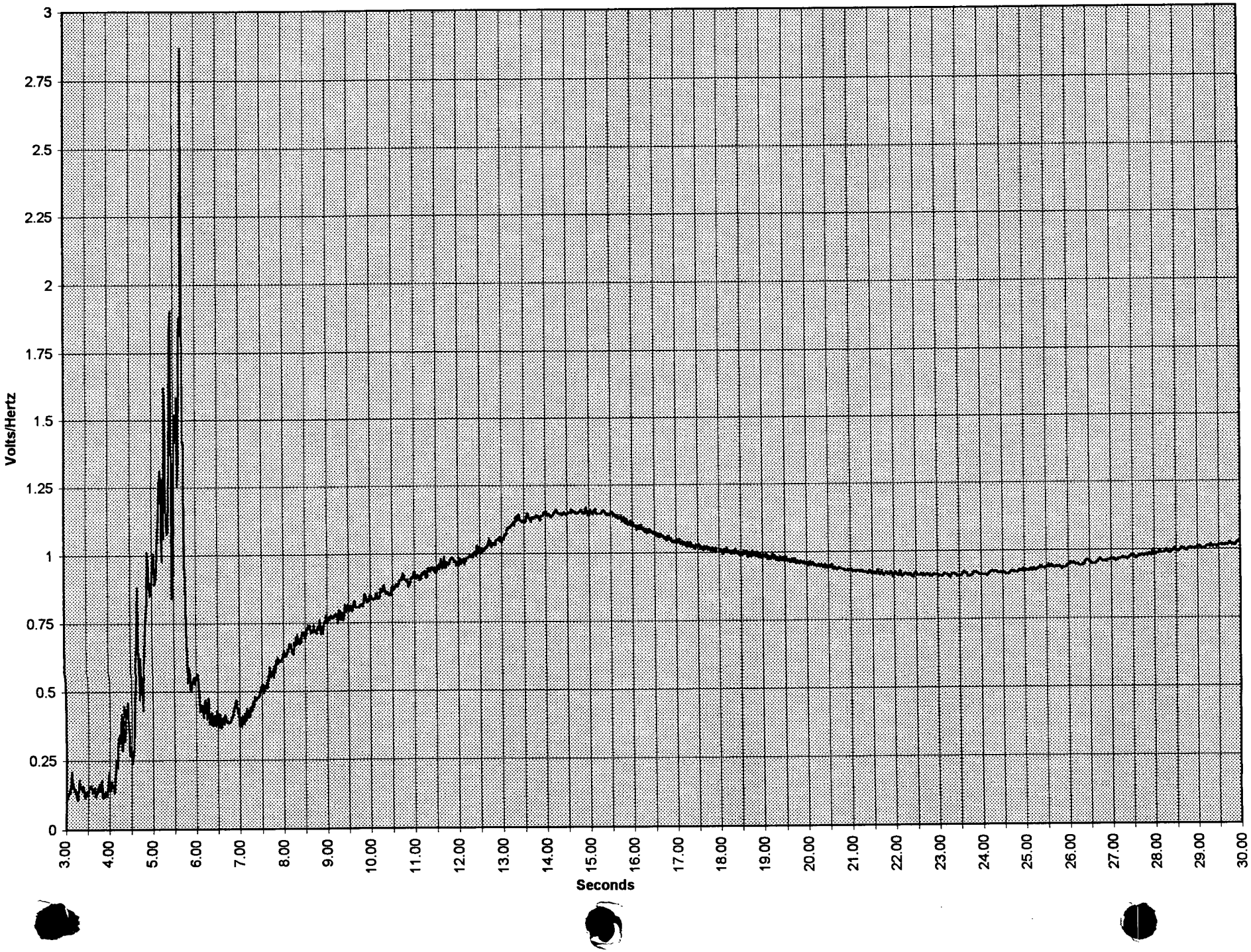
Relevant Calculation or Justification: N/A

Comments: The system is designed and normally operated with this configuration.

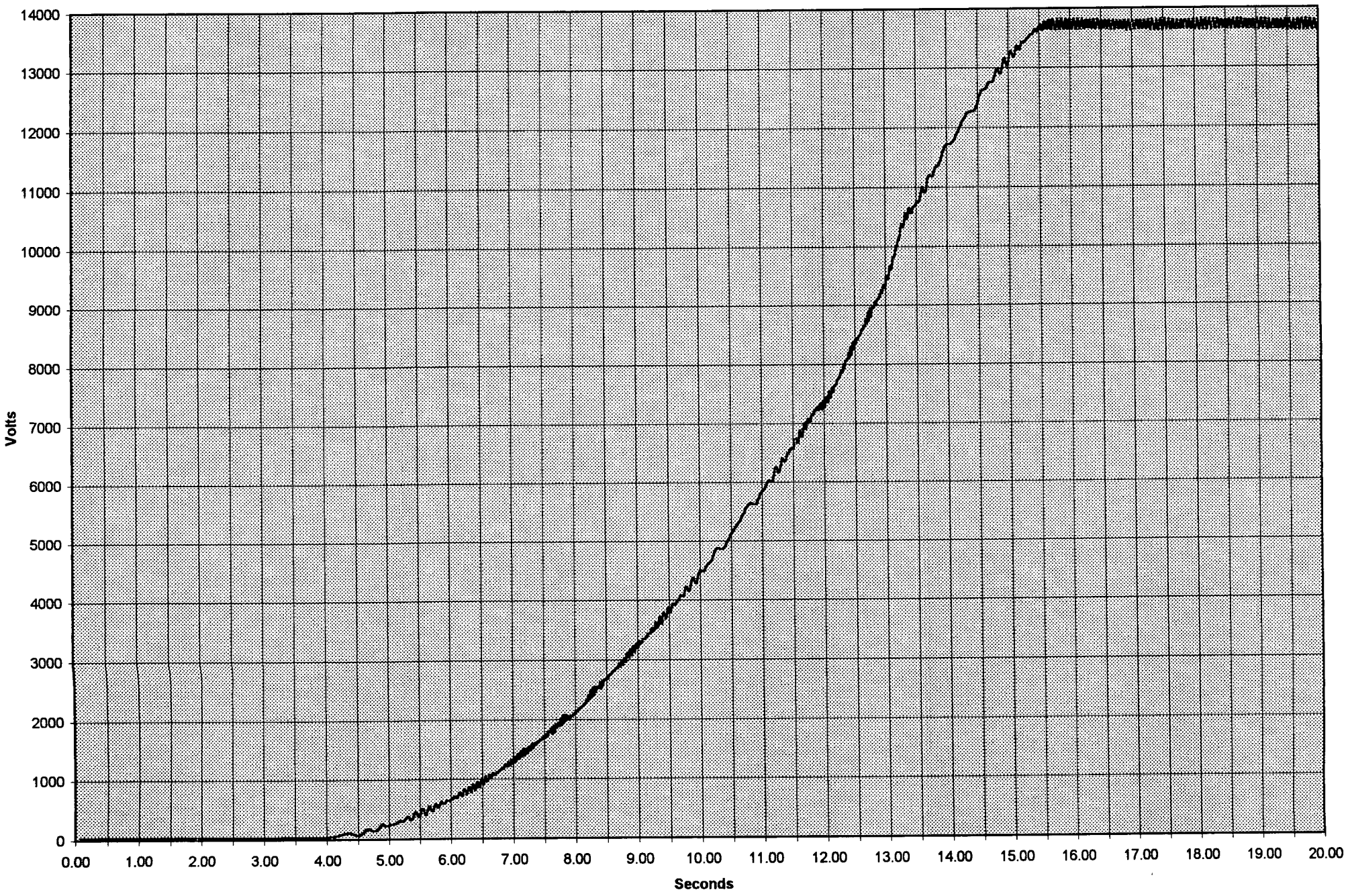
ATTACHMENT 5

GRAPHS OF THE OCONEE UNIT 1 EOC16
EPSL FUNCTIONAL TEST RESULTS

Keowee Emergency Start
Loading Test
Volts per Hertz

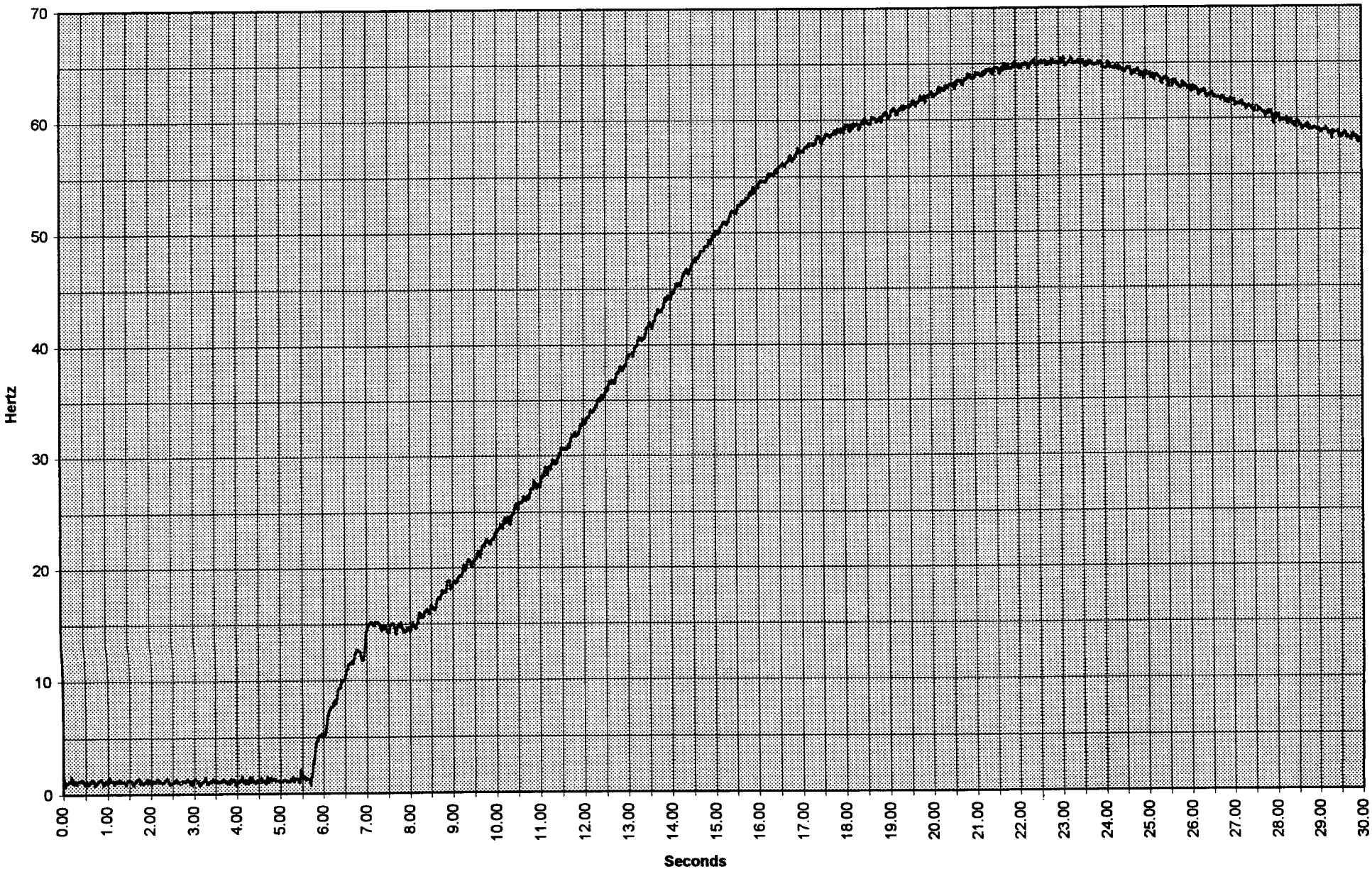


Keowee Emergency Start Loading Test



Keowee Emergency Start
Loading Test

Frequency



ATTACHMENT 6

VENDOR LETTERS

PHILADELPHIA GEAR CORPORATION

industrial gears · speed reducers · fluid mixers · limitorque valve controls · precision ground gearing

Main Office:
Schuylkill Expressway, Suburban Phila.
KING OF PRUSSIA, PA. 19406
TELEPHONE: 265-3000

July 19, 1971

C. J. Wylie
Principal Electrical Engineer
Duke Power Co.
430 S. Church St.
Charlotte, North Carolina
28201

Attention: Mr. J. E. Thomas

Subject: Limitorque Valve Operators on Engineered safeguard system

Gentlemen:

This confirms my telephone advice of July 16th, 1971.

Your question was when could a Limitorque Valve Operator be connected to the power lines if your generator started at 0 volts and 0 cycles and built up to rated voltage, 60 cycles in a period of 8 seconds. While the generator is coming up to speed the volts to cycles ratio would be constant.

Limitorque Valve Operators utilizing our lost-motion feature (hammer-blow) should not be connected to the power lines until the line frequency has reached 30 cycles per second.

Limitorque Valve operators utilizing the no-lost-motion feature may be connected to the power lines at any time, but in general, will not begin to accelerate the load until line frequency has reached 30 cycles per second.

In either type of operation there will be no damage to the motor while the generator is building up to rated voltage and frequency.

C. J. Wylie
July 19, 1971

We have also given this information to Mr. R. G. Burnley of Babcock & Wilcox, Nuclear Power Generation Dept., advising them that it applies to the valve operators supplied against Duke Power Co. contract 620-0003.

Very truly yours,

PHILADELPHIA GEAR CORPORATION

R. B. McFall

R. B. McFall,
Limitorque Div.

cc: Babcock & Wilcox, Nuclear Power Generating Dept., P.O. Box 1260, Lynchburg, Va. 24501
Attn: Mr. R. G. Burnley

cc: K. Neal, Jeff Evens, Don Foot, Barry Strauss, Edward Lawson
Frank Denham, Walter Denkowski

RBMcF/Ba 2

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TELEPHONE: 265-3000

July 20, 1971

Babcock & Wilcox
Nuclear Power Generation Dept.
P.O. Box 1260
Lynchburg, Virginia
24501

Attention: Mr. R. G. Burnley

Subject: Duke Power Co. Contract #620-0003

Gentlemen:

This confirms our telephone advice of July 16th, 1971. In your memorandum, you asked what could be expected with motors on engineered safeguard valves if the motors are energized at from 30% to 80% of 100% of rated voltage and frequency for a period of 4-6 seconds before voltage and frequency reach 80 to 100% of rated. In our telephone conversation I advised you that I had also been in telephone contact with Mr. J. E. Thomas of Duke Power Co. who had a similar requirement.

Most of the valves on your list were those requiring our lost-motion feature (Hammerblow). This feature requires that the motor rotor be at some minimum speed before the hammerblow occurs. Two of the operators on your list would have our no-lost-motion feature (motor is directly connected through operator gearing to the load). In this type of operator acceleration from rest will begin when sufficient motor locked rotor torque is developed.

Our calculations indicate that lost-motion type operators should not be connected to the power line until it has reached a frequency of 30 cycles per second. No-lost-motion type operators may be connected to the power lines at any time, however, we do not expect them to develop sufficient locked rotor torque to accelerate the load until line frequency reaches 30 cycles per second.

ATTACHMENT 1 (cc

Babcock & Wilcox
July 20, 1971

In either type operation, there will be no damage to the motor while the generator is building to rated voltage and frequency.

We have given the same information to Mr. J. E. Thomas of Duke Power Co. in Charlotte, North Carolina.

Very truly yours,

PHILADELPHIA GEAR CORPORATION

Robert B. McFall,
Limitorque Div.

cc: Mr. C. J. Wylie
Principal Electrical Engineer
Duke Power Co.
430 S. Church St.
Charlotte, North Carolina 28201
Attn: Mr. J. E. Thomas

cc: K. Neal, cc: J. Evens, D. Foot, B. Strauss, Ed Lawson, F. Denham, R. L. Carlson Inc., Attn: R. L. Carlson

RBMcF/Bc/9 & 10

inghouse Electric Corporation Power Systems

Box 1399
2001 W Morehead Street
Charlotte North Carolina 28201

August 2, 1971

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Mr. C. J. Wylie (Attention: Mr. Jim Thomas)
Principal Electrical Engineer
Duke Power Company
Post Office Box 2178
Charlotte, North Carolina 28201

Subject: Oconee Nuclear Plant
Our CH-43307-L7
Your Spec OS-314-7
High Pressure Injection Service Pump Motor
CH-43308-L7
Your Spec OS-314-8
Low Pressure Injection Service Pump Motor

Dear Sir:

The above motors can be operated on occasional system start-up as follows without long term damage to the motors.

1. Start at 1200 volts at 18 Hz.

2. Provided during the next 10 seconds following instant start the voltage and frequency will increase to rated 4000 volts and 60 Hz with maximum deviation from rated V/Hz ratio of minus 10 percent and plus 2 percent.

3. Thereafter motors operate at rated conditions.

4. Motors drive centrifugal pumps with load torque varying as square speed. I do not know normal accel time with rated 4000 volts at 60 Hz.

Should you have any additional questions, please let me know.

Very truly yours,

F. J. Wheeler
Special Sales Representative

FJW:mc