



FUNCTION	DESCRIPTION	TRIP VALUE	TRIP TIME	OPERATING MODE
27-1	UNDERVOLTAGE (LV2)	<50%	2.00 SECONDS (120 CYCLES)	MC
27-2	UNDERVOLTAGE (LV1)	50% - 88%	1.10 SECONDS (66 CYCLES)	MO
59-1	OVERVOLTAGE (OV-1)	>110%	2.00 SECONDS (120 CYCLES)	MC
59-2	OVERVOLTAGE (OV-2)	>120%	0.16 SECONDS (10 CYCLES)	NA
81U-1	UNDERFREQUENCY 1 (UF-1)	<56.5%	300 SECONDS (18,000 CYCLES)	MO
81U-2	UNDERFREQUENCY 2 (UF-2)	56.5 - 58.5 HZ	0.16 SECONDS (10 CYCLES)	NA
81O-1	OVERFREQUENCY 1 (OF-1)	61.2 - 62 HZ	300 SECONDS (18,000 CYCLES)	MO
81O-2	OVERFREQUENCY 2 (OF-2)	≥ 62.0 HZ	0.16 SECONDS (10 CYCLES)	NA
79	RECONNECT TIMER	N/A	300 SECONDS (18,000 CYCLES)	NA

VOLTAGE RANGE (p.u.)	OPERATING MODE / RESPONSE	MIN. RIDE THROUGH TIME(S) (DESIGN CRITERIA)	MIN. RESPONSE TIME(S) (DESIGN CRITERIA)
V > 1.20	CEASE TO ENERGIZE	N/A	0.16
1.175 < V ≤ 1.20	PERMISSIVE OPERATION	0.2	N/A
1.15 < V ≤ 1.175	PERMISSIVE OPERATION	0.5	N/A
1.10 < V ≤ 1.15	PERMISSIVE OPERATION	1	N/A
0.88 < V ≤ 1.10	PERMISSIVE OPERATION	INFINITE	N/A
0.65 ≤ V < 0.88	MANDATORY OPERATION	LINEAR SLOPE OF 8.7 S/1 P.U. VOLTAGE STARTING AT 3 S @ 0.65 P.U.; T _{VER} = 3 S + $\frac{8.7}{V - 0.65} \times 1.1$	N/A
0.45 ≤ V < 0.65	PERMISSIVE OPERATION	0.32	N/A
0.30 ≤ V < 0.45	PERMISSIVE OPERATION	0.16	N/A
V ≤ 0.30	CEASE TO ENERGIZE	N/A	0.16

- ### GENERAL NOTES
- FEEDER SHALL NOT BE ROUTED THROUGH THE UTILITY PULL OR UTILITY METER SECTIONS. FEEDER SHALL NOT BE ROUTED THROUGH ANY OTHER SECTION THAN THAT IN WHICH IT TERMINATES UNLESS BARRIERS ARE PROVIDED PER NEC 408.3.
 - THE ENERGY SERVER INVERTER OUTPUT CHARACTERISTICS SHALL BE IN ACCORDANCE WITH NEC 705.14.
 - INTERCONNECTIONS SHALL BE IN ACCORDANCE WITH NEC 705.10.
 - THE ENERGY SERVER OUTPUT IS EQUIPPED WITH UTILITY-INTERACTIVE INVERTERS RECOGNIZED BY UL TO UL1741 AND IEEE 1547 AND COMPLIES WITH NEC 692.62. INVERTER SETTINGS PER THE PROVIDED TABLE BELOW.
 - THE ENERGY SERVER IS NOT A SEPARATELY DERIVED SYSTEM PER NEC 250.30 [ART. 100]
 - CONTRACTOR SHALL GROUND AND BOND ALL METALLIC EQUIPMENT, BOXES, AND CONDUIT BETWEEN EACH BLOOM ENERGY SERVER AND FACILITY POINT OF CONNECTION IN COMPLIANCE WITH LOCAL AHJ AND NEC REQUIREMENTS.
 - CONTRACTOR SHALL TEST ALL CIRCUIT BREAKERS GREATER THAN 100A
 - INSTALLATION PHASE ROTATION SHALL MATCH THE EXISTING PHASE ROTATION FOR 3-PHASE WIRES.
 - CONDUIT SIZES ARE BASED ON SCHEDULE 40 PVC AND RMC. UPSIZE CONDUIT AS NEEDED IF SCHEDULE 80, HDPE, OR OTHER APPROVED CONDUIT TYPE ARE USED. HDPE REQUIRES PRE-APPROVAL FROM THE AHJ AND ENGINEER OF RECORD.
 - CONDUCTOR SIZES ARE BASED ON NEC TABLE 310.15(B)(16) COPPER (CU) WITH THHN/THWN-2 INSULATION.
 - PROVIDE RIGID STEEL FOR ALL EXTERIOR EXPOSED RUNS SUBJECT TO DAMAGE.
 - PROVIDE PVC SCHEDULE 40 FOR ALL UNDERGROUND RUNS. UPSIZE CONDUIT AS NEEDED IF PVC SCHEDULE 80 IS USED.
 - ALL MEDIUM VOLTAGE FEEDERS SHALL BE 15kV, 1/C, CU, 133% EPR, MV-105, WITH TAPE SHIELD, SCUTHWIRE SPEC 48392 OR APPROVED EQUAL. ALL EQUIPMENT GROUNDING CONDUCTORS SHALL BE 600V RATED.

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Project No.: _____
 Date: 03/04/22
 Scale: N.T.S.
 Drawing No.: **E1.0**

4 MW FUEL CELL POWER PLANT
 1225 CENTRAL AVENUE, BRIDGEPORT CT 06607

ELECTRICAL ONE-LINE DIAGRAM

Project No.: _____
 Date: 03/04/22
 Scale: N.T.S.
 Drawing No.: **E1.0**

SYMBOLS

	BREAKER CLOSE
	STATUS CONTACT
	OPEN BREAKER - SHUNT TRIP

- ### REFERENCE SHEET NOTES
- ALL CONNECTIONS FROM FUEL CELLS TO INVERTER ARE FACTORY WIRED AND ALL MAINTENANCE CABINETS ARE ACTIVELY PRESSURIZED, THEREFORE, NO CLASS 1, DIVISION 2 WIRING IS REQUIRED.
 - ALL COMPONENTS SHOWN IN THIS BOUNDARY SHALL BE UL LISTED TOGETHER AS A SINGLE, COMPLETE, ALL INCLUSIVE UNIT. ALL ELECTRICAL CONDUIT/CABLE CONNECTIONS WITHIN THIS BOUNDARY SHALL BE FACTORY INSTALLED WITH SOME FINAL CONNECTIONS TO BE COMPLETED BY THE CONTRACTOR IN THE FIELD. REFER TO BLOOM ENERGY INSTALLATION MANUAL FOR ALL FINAL TERMINATION POINTS.
 - CONTRACTOR SHALL FURNISH AND INSTALL CONDUITS AND CONDUCTORS AS SHOWN. REFER TO BLOOM ENERGY INSTALLATION MANUAL FOR ALL FINAL TERMINATION POINTS AT BLOOM ENERGY FURNISHED EQUIPMENT.
 - MANUFACTURER INSTALLED, PRE-WIRED EPO BUTTON LOCATED IN READILY ACCESSIBLE LOCATION AT ENERGY SERVER PLATFORM AND CONNECTED TO TELEMETRY CABINET TERMINAL STRIP.
 - CONTRACTOR SHALL FURNISH AND INSTALL GROUND CONDUCTOR FROM EQUIPMENT TO THE UFER GROUND ROD IN THE CONCRETE PAD.
 - GROUNDING DETAILS LATER.
 - VISIBLE OPEN LOAD BREAK 89L, LOCKABLE, UTILITY APPROVED AC SERVICE RATED DISCONNECT HEAVY DUTY FOR UTILITY USE.
 - BLOOM ENERGY SHALL FURNISH EQUIPMENT AND CONTRACTOR SHALL INSTALL EQUIPMENT. CONTRACTOR SHALL FURNISH AND INSTALL FUSES.
 - CONTRACTOR SHALL INSTALL CONDUCTORS ON CABLE TRAYS AS INDICATED. SELECTION OF CABLE TRAY SHALL BE PER NEC REQUIREMENTS. REFER TO BLOOM ENERGY INSTALLATION MANUAL FOR ALL FINAL TERMINATION POINTS AT BLOOM ENERGY FURNISHED EQUIPMENT.
 - 2" CONDUIT WITH 3 #2 AWG CU & #6G FOR DC LINK CONNECTIONS BETWEEN ENERGY SERVERS (ES).

TABLE - 2 SEL 751 RELAY SETTINGS

FUNCTION	TRIP VALUE	SET TIME DELAY IN RELAY	TOTAL CLEARING TIME
UNDERVOLTAGE (27-1)	<88%	1.93 SECONDS (115 CYCLES)	2.00 SECONDS (120 CYCLES)
UNDERVOLTAGE (27-2)	<50%	1.03 SECONDS (62 CYCLES)	1.10 SECONDS (66 CYCLES)
OVERVOLTAGE (59-1)	>110%	1.93 SECONDS (115 CYCLES)	2.00 SECONDS (120 CYCLES)
OVERVOLTAGE (59-2)	>120%	0.1 SECONDS (6 CYCLES)	0.16 SECONDS (10 CYCLES)
UNDERFREQUENCY 1 (81U-1)	58.5 HZ	299.93 SECONDS (17,996 CYCLES)	300 SECONDS (18,000 CYCLES)
UNDERFREQUENCY 2 (81U-2)	56.5 HZ	0.1 SECONDS (6 CYCLES)	0.16 SECONDS (10 CYCLES)
OVERFREQUENCY 1 (81O-1)	61.2 HZ	299.93 SECONDS (17,996 CYCLES)	300 SECONDS (18,000 CYCLES)
OVERFREQUENCY 2 (81O-2)	62.0 HZ	0.1 SECONDS (6 CYCLES)	0.16 SECONDS (10 CYCLES)
RECONNECT TIMER (79)	N/A	299.93 SECONDS (17,996 CYCLES)	300 SECONDS (18,000 CYCLES)

ESS-A1, ESS-A3, ESS-A5, ESS-A7 NAMEPLATE DATA

325 kW AC FUEL CELL INVERTER-INC: 391 MAX AMPS 480V, 3PH, 3W OUTPUT MAX ISC = 480A FC ANSI/CSA FC1
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ESS-A2, ESS-A4 NAMEPLATE DATA

275 kW AC FUEL CELL INVERTER-INC: 331 MAX AMPS 480V, 3PH, 3W OUTPUT MAX ISC = 480A FC ANSI/CSA FC1
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ESS-A6 NAMEPLATE DATA

300 kW AC FUEL CELL INVERTER-INC: 361 MAX AMPS 480V, 3PH, 3W OUTPUT MAX ISC = 480A FC ANSI/CSA FC1
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