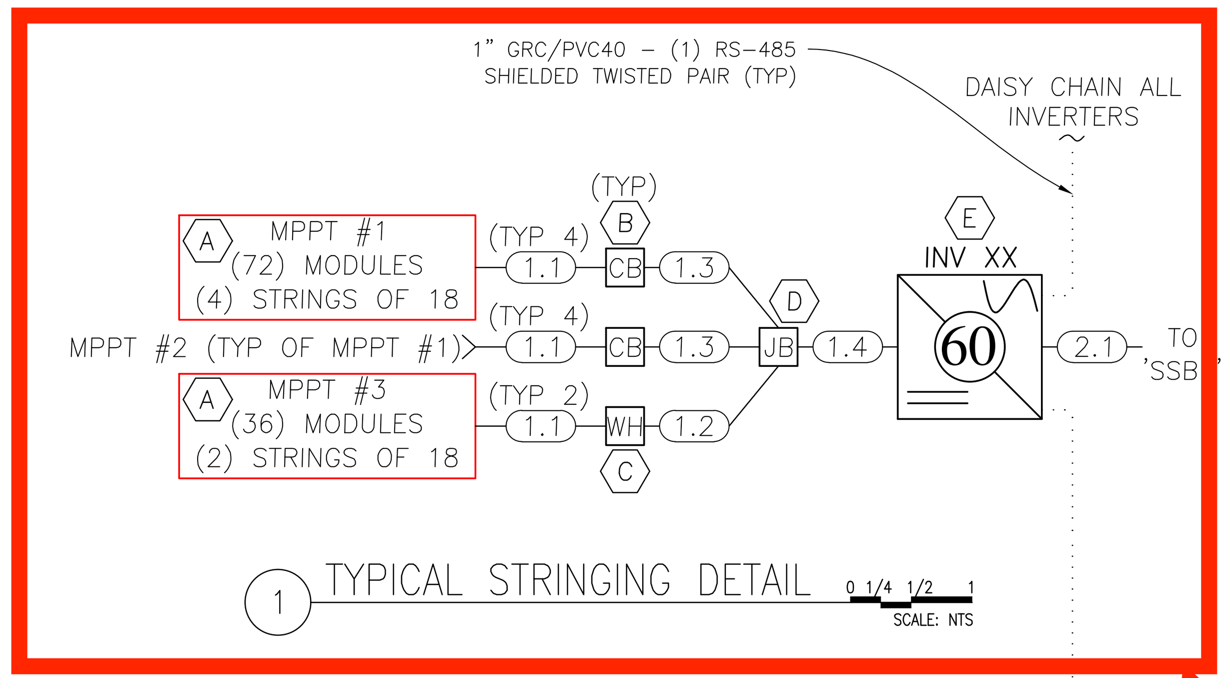
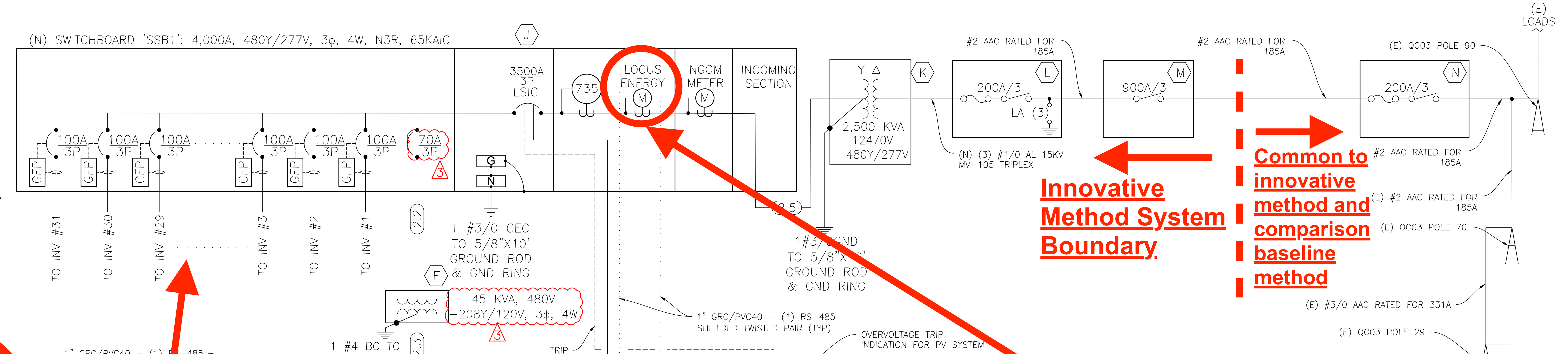
Innovative method Power Production





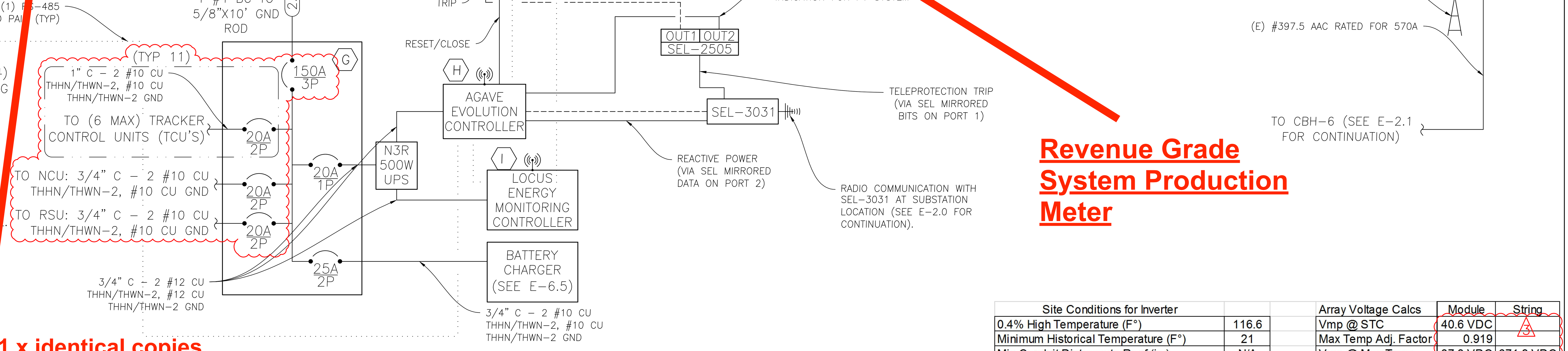


Exhibit C
Single Line Diagram

EQUIPMENT SCHEDULE:

- (A) PV MODULE: VIETNAM SUNERGY VSUN390-72BMH-DG.
- (B) DC COMBINER BOX: NEMA 3R, UL LISTED, MIDNITE SOLAR CAT #MNPV10-1000 (OR EQUAL), (8) 20A FUSES, (4) FOR DC+ & (4) FOR DC–. (1) 1000V OUTPUT STRING. FLOATING ARRAY CIRCUIT. SEE CUTSHEET FOR "WIRING FOR USE WITH TRANSFORMERLESS INVERTERS" FOR WIRING INSTRUCTIONS.
- (C) WIRING HARNESS: (2) STRING TO (1) STRING WIRING HARNESS, UL LISTED FOR 1,000V, COMPLETE WITH MC4 CONNECTORS.
- (D) J-BOX: UL LISTED FOR 1,000V DC, NEMA 3R.
- (E) INVERTER: SOLECTRIA PVI 60TL-480 [480] [SI1], 480V, 3ϕ, 4W, WITH INTEGRAL DC & AC DISCONNECTS. CONTRACTOR SHALL USE 3MPPT-INDEPENDENT MODE BYPASS FUSE OPTION PER INVERTER INSTALLATION MANUAL. PROVIDE (1) NETWORK CARD ON FIRST INVERTER IN THE COMMUNICATION CHAIN IN ORDER TO ALLOW FOR FIRMWARE UPGRADES OF ALL INVERTERS.
- (F) TRANSFORMER 'T-PV1': 45KVA, 480V-208Y/120V, 3ϕ, 4W, NEMA 3R, DRY-TYPE, 115° TEMPERATURE RISE, UL LISTED.
- (G) PANEL 'PV1': 200A, 208Y/120V, 3ϕ, 4W, NEMA 3R, UL LISTED, 14KAIC.
- (H) AGAVE EVOLUTION CONTROLLER.
- (I) LOCUS ENERGY MONITORING CONTROLLER.
- (J) NEW SOLAR SWITCHBOARD 'SSB1': 4,000A, 480Y/277V, 3ϕ, 4W, 65KAIC, NEMA 3R, UL LISTED. PROVIDE 4,000AF/3500AT L.S.I.G LOCKABLE MAIN BREAKER WITH SHUNT TRIP & RE-CLOSER. NOT ALL INVERTER BREAKERS ARE SHOWN, CONTRACTOR SHALL PROVIDE QTY (31) 100A/3P BREAKERS FOR THE INVERTERS.
- (K) MEDIUM VOLTAGE TRANSFORMER: 2,500KVA, 12470V, 3ϕ, 3W – 480Y/277V, 3ϕ, 4W, NEMA 3R, UL LISTED. ONAN IEEE TRANSFORMER COOLING CLASS.
- (L) POLE MOUNTED COMBINATION LOAD BREAK FUSE CUTOUTS/LIGHTNING ARRESTERS. LOCATED NEARBY SOLAR SYSTEM. MAINTAINED AND OPERATED BY SELLER. CONTRACTOR TO PROVIDE AS MUCH FIRE MITIGATION AS POSSIBLE SUCH AS CLEARING VEGETATION WITHIN 10 FEET OF POLES.
- (M) UTILITY LOCKABLE DISCONNECT: POLE MOUNTED LOAD BREAK SWITCH: 900A, 25.8KV, LOCKABLE & VISIBLE AS MANNUFACTURED BY INERTIA CAT #L19SLSUG1414E8E90. PROVIDE WITH 10 FT ROD EXTENSION. OPERATED BY BUYER & SELLER, MAINTAINED BY SELLER.
- (N) POLE MOUNTED LOAD BREAK FUSE CUTOUT. LOCATED NEARBY QC03 P-90. MAINTAINED AND OPERATED BY BUYER.

GENERAL NOTES:

1. CONTRACTOR SHALL FURNISH AND INSTALL A NEW 125VDC FLOODED LEAD ACID BATTERY SYSTEM RATED FOR OUTDOOR USE FOR POWERING OF SSB1 SHUNT TRIP/RE-CLOSER, SEL-3031, SEL-2505, SEL-735, REGATTA EVOLLUTION CONTROLLER.
2. INSTALL PV-WIRE FOR MPPT #3 IN 1" PVC40/GRC WHEN TRANSITIONING FROM ARRAY TO ARRAY.
3. CONTRACTOR SHALL GROUND MODULES & RACKING USING UL2703 LISTED INTEGRATED GROUNDING SYSTEM.
4. ALL MODULES SHALL BE GROUNDED IN ACCORDANCE WITH CODE AND THE MANUFACTURER'S INSTALLATION INSTRUCTIONS.
5. ALL PV EQUIPMENT SHALL BE LISTED BY A RECOGNIZED TESTED LAB.
6. NOTIFY SERVING UTILITY BEFORE ACTIVATION OF PV SYSTEM.
7. WHEN A BACKFED BREAKER IS THE METHOD OF UTILITY INTERCONNECTION, BREAKER SHALL NOT READ LINE AND LOAD AND SHALL BE INSTALLED AT THE OPPOSITE END OF THE BUSSING AS THE MAIN SERVICE BREAKER.
8. WORK CLEARANCES AROUND ELECTRICAL EQUIPMENT SHALL BE MAINTAINED PER NEC 110.26(A)(1), 110.26(A)(2) & 110.26(A)(3).
9. ALL EXTERIOR CONDUITS, FITTINGS AND BOXES SHALL BE RAIN-TIGHT AND APPROVED FOR USE IN WET LOCATIONS PER NEC 314.15.
10. ALL METALLIC RACEWAYS AND EQUIPMENT SHALL BE BONDED AND ELECTRICALLY CONTINUOUS.
11. COMBINED DC GEC/AC EGC REQUIRED PER 690.47(C)(3) SHALL BE INSTALLED IN ACCORDANCE WITH NEC 250.64(E) IN COMPLIANCE WITH 250.92(B) AND ENSURED BY ONE OF THE METHODS IN 250.92(B)(2) THROUGH (B)(4). FOR FERROUS METAL RACEWAYS & ENCLOSURES, CONTRACTOR SHALL INSTALL BONDING-TYPE LOCKNUTS OR BUSHINGS ON EACH END OF THE RACEWAY OR ENCLOSURE TO THE GROUNDING ELECTRODE CONDUCTOR.
12. PV SOURCE CIRCUIT WIRING NOT INSTALLED IN RACEWAYS SHALL BE SECURED AND SUPPORTED BY LISTED AND APPROVED CABLE TIES, CLIPS, HANGERS OR SIMILAR DEVICES/MEANS TO MEET THE REQUIREMENTS OF CEC 334.30 AND 334.15(A). WIRING SHALL BE INSTALLED AND SECURED IN A WORKMANLIKE MANNER CONSISTENT WITH THE INTENT OF CEC 110.12.
13. I_{SC} & I_{MP} VALUES USED FOR THE BIFACIAL MODULE ARE 115% OF THE VALUE LISTED ON THE MODULE CUTSHEET IN ACCORDANCE WITH THE MODULE MANUFACTURER'S RECOMMENDATION LETTER SHOWN ON E-4.1.

Site Conditions for Inverter	
0.4% High Temperature (F°)	116.6
Minimum Historical Temperature (F°)	21
Min Conduit Distance to Roof (in.)	N/A
Temperature Adder (F°) 310.15(B)(2)c	N/A
Max Expected Module/Free-Air Temp (F°)	116.6
Max Expected Conduit/THWN-2 Temp (F°)	116.6

Array Voltage Calcs	Module	String
Vmp @ STC	40.6 VDC	
Max Temp Adj. Factor	0.919	
Vmp @ Max Temp	37.3 VDC	671.8 VDC
Voc @ STC	49.3 VDC	
Min Temp Adj. Factor	1.087	
Voc @ Min Temp	53.6 VDC	964.4 VDC

3-PHASE SHORT CIRCUIT CALCULATIONS
(FEEDER LENGTHS SHOWN IN THIS CALCULATION SHALL NOT BE USED FOR BID PURPOSES OF DETERMINING ACTUAL FEEDER LENGTHS)
THE FOLLOWING CALCULATIONS ARE BASED ON POINT TO POINT METHOD

$$f_{XFMR} = [I_{SC} \times V_{L\text{-}L,\ PRIMARY} \times \sqrt{3} \times \%Z] \div [100{,}000 \times KVA_{XFMR}]$$
$$f_{CONDUCTOR} = [\sqrt{3} \times L_{ft} \times I_{SC}] \div [C \times N \times V_{L\text{-}L}]$$
$$M = 1 \div [1 + f]$$
$$I_{SC} = I_{SC} \times M$$
$$\text{PV CONTRIBUTION} = [\#_{INVERTERS} \times 55_{AMPS}]$$
$$I_{SC,\ TOTAL} = [I_{SC} + \text{PV CONTRIBUTION}$$

FAULT LOCATION	FED FROM	KVA_{XFMR}	$E_{(volts)}$	%Z	FEEDER	CONDUIT TYPE	FEEDER SIZE	# OF PARALLEL RUNS (N)	INSULATION VOLTAGE	$L_{(ft)}$	C	f	M	I_{SC}	MOTOR CONT. (AMPS)	PV CONTRIBUTION (AMPS)	$I_{SC,\ TOTAL}$
(E) CBH-1	UTILITY		69000											2,674			2,674
(E) TX-1	(E) CBH-1		69000											2,674			2,674
(E) CBH-3	(E) TX-1	12000	12470	7.70								2.051	0.328	4,850		66	4,916
(E) CBH-6	(E) CBH-3		12470											4,850		66	4,916
(N) PV MV XFMR PRI	(E) CBH-6		12470											4,850		66	4,916
(N) PV MV XFMR SEC	(N) PV MV XFMR PRI	2500	480	5.75								2.409	0.293	36,958		1,705	38,663
(N) 'SSB1'	(N) PV MV XFMR SEC		480		CU	NM	500	10	600	15	26706	0.007	0.993	36,683		1,705	38,388
(N) 'SSB1'	(N) PV MV XFMR SEC		480		CU	NM	500	10	600	15	26706	0.007	0.993	36,683		1,705	38,388
(N) 'T-PV1' PRI	(N) 'SSB1'		480		CU	NM	4	1	600	20	3826	0.692	0.591	21,680.92		66	21,747
(N) 'T-PV1' SEC	(N) 'T-PV1' PRI	45	208	1.00								4.006	0.200	9,995		1,705	11,700
(N) PNL 'PV1'	(N) 'T-PV1' SEC		208		CU	NM	2/0	1	600	10	11424	0.073	0.932	9,316.60		1,705	11,022

DC CONDUCTOR SCHEDULE

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
PV SOURCE CIRCUIT	DESCRIPTION	AMPS (Imp)	AMPS (Isc)	MAX CURRENT [690.8(A)]	TERM AMPACITY [690.8(B)(1)]	OCPD	V_{NOM}	V_{MAX}	1-WAY DIST	Ω/kft	# COND'S	# PARA COND'S	# PARA CNDT'S	VOLTAGE DROP %	TEMP RANGE (F)	COND AMPS @86F	# CONDS DERATE	COND TEMP DERATE	COND DERATE AMPS	TERM TEMP RATING	TERM AMPS @86F
1.1	Module to Combiner/Harness	11.052	11.627	14.53	18.17	20	730.8	964.4	310.0	1.1858	2	1	1	1.11%	114-122	55.0	1.0	0.82	45.1	60C	30.0
		FREE-AIR - 2# 10 CU PV-WIRE-1000V; 1# 6 CU GND																			
1.2	Wiring Harness to DC J-Box	22.103	23.253	29.07	36.33		730.8	964.4	20.0	0.7437	2	1	1	0.09%	114-122	80.0	1.0	0.82	65.6	60C	40.0
		FREE-AIR - 2# 8 CU PV-WIRE-1000V; 1# 6 CU GND																			
1.3	Combiner to DC J-Box	44.206	46.506	58.13	72.67		730.8	964.4	25.0	0.1848	2	1	1	0.06%	114-122	130.0	1.0	0.82	106.6	60C	95.0
		1¼" PVC40 - 2# 2 CU PV-WIRE-1000V; 2# 10 CU PV-WIRE-1000V; 1# 8 CU GND																			
1.4	DC J-Box to Inverter	44.206	46.506	58.13	72.67		730.8	964.4	500.0	0.1848	4	1	1	1.12%	114-122	130.0	0.8	0.82	85.3	60C	95.0
		2" PVC40 - 4# 2 CU PV-WIRE-1000V; 2# 8 CU PV-WIRE-1000V; 1# 8 CU GND																			

AC CONDUCTOR SCHEDULE

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
AC FEEDER	DESCRIPTION	AMPS (Imp)		MAX CURRENT [690.8(A)]	TERM AMPACITY [690.8(B)(1)]	OCPD	V_{NOM}		1-WAY DIST	Ω/kft	# COND'S	# PARA COND'S	# PARA CNDT'S	VOLTAGE DROP	TEMP RANGE (F)	COND AMPS @86F	# CONDS DERATE	COND TEMP DERATE	COND DERATE APS	TERM TEMP RATING	TERM AMPS @86F
2.1	Inverter to 'SSB1'	79.4		79.40	99.25	100	480.0		50.0	0.1471	3	1	1	0.21%	114-122	145.0	1.0	0.82	118.9	60C	110.0
		1¼" PVC40 - 3# 1 CU THWN-2; 1# 8 NEU; 1# 8 CU GND																			
2.2	'SSB1' to XFMR 'T-PV1'	54.127		54.13	67.6582347	70	480.0		30.0	0.2951	3	1	1	0.20%	114-122	95.0	1.0	0.82	77.9	60C	70.0
		1" PVC40 - 3# 4 CU THWN-2; 1# 8 CU GND																			
2.3	XFMR 'T-PV1' to Panel 'PV1'	82.606		82.61	103.256875	150	208.0		15.0	0.0928	3	1	1	0.10%	114-122	195.0	1.0	0.82	159.9	75C	175.0
		2" LFMC - 3# 2/0 CU THWN-2; 1# 2/0 NEU; 1# 4 CU GND																			
2.5	'SSB1' to 'T-SSB1'	2461.4		2461.40	3076.75	3500	480.0		30.0	0.0231	3	10	10	0.06%	87-95	4300.0	1.0	0.96	4128.0	75C	3800.0
		(10) 3½" PVC40 - 3# 500 CU THWN-2; 1# 700 NEU																			

- A FEEDER NUMBER
- B FEEDER DESCRIPTION
- C DC = MODULE Imp; AC = CONTINUOUS RATED OUTPUT CURRENT
- D Isc; AC = NA
- E DC = D x 1.25; AC = C
- F E x 1.25
- G UPSTREAM FUSE OR OCPD INSTALLED. IF NO OCPD THEN = F
- H NOMINAL OPERATING VOLTAGE
- I MAXIMUM OPERATING VOLTAGE
- J 1-WAY DISTANCE OF CIRCUIT
- K TEMP. COMPENSATED CONDUCTOR RESISTANCE PER 1000' PER NEC 2014 TABLE 8 FPN 2.
- L # CONDUCTORS IN CIRCUIT (EXCLUDING NEUTRAL CONDUCTOR)
- M # PARALLEL FEEDERS IN CIRCUIT
- N # PARALLEL CONDUITS
- O VOLTAGE DROP % (DC) = ((D / N) * L * (K * 2 / 1000)) / H
- P MAXIMUM OPERATING TEMPERATURE OF CIRCUIT
- Q NOMINAL AMPACITY OF CONDUCTORS @ 30C PER NEC TABLE 310.16 OR 310.17
- R NUMBER OF CURRENT CARRYING CONDUCTORS IN CONDUIT DERATE
- S CONDUCTOR TEMPERATURE DERATE
- T DERATED AMPACITY OF CONDUCTOR(S) = S * T * U
- U TEMPERATURE RATING OF TERMINAL BLOCK
- V AMPACITY OF TERMINAL BLOCK

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REGISTERED PROFESSIONAL ENGINEER — NO. 21489, Exp: 6/30/20, ELECTRICAL, STATE OF CALIFORNIA

1-LINE PV

CLIENT APPROVAL
x CLIENT INITIALS

CALIFORNIA RESOURCES CORP.
12888 HOLLOWAY RD.
LOST HILLS, CA 93249

No.	DESCRIPTION	DATE
0	INITIAL	06/27/18
1	BACKCHECK #1	08/08/18
2	BACKCHECK #2	09/21/18
3	BACKCHECK #3	02/20/20

LINE SIDE SOLAR
CHECKED BY: LS

E-2.0

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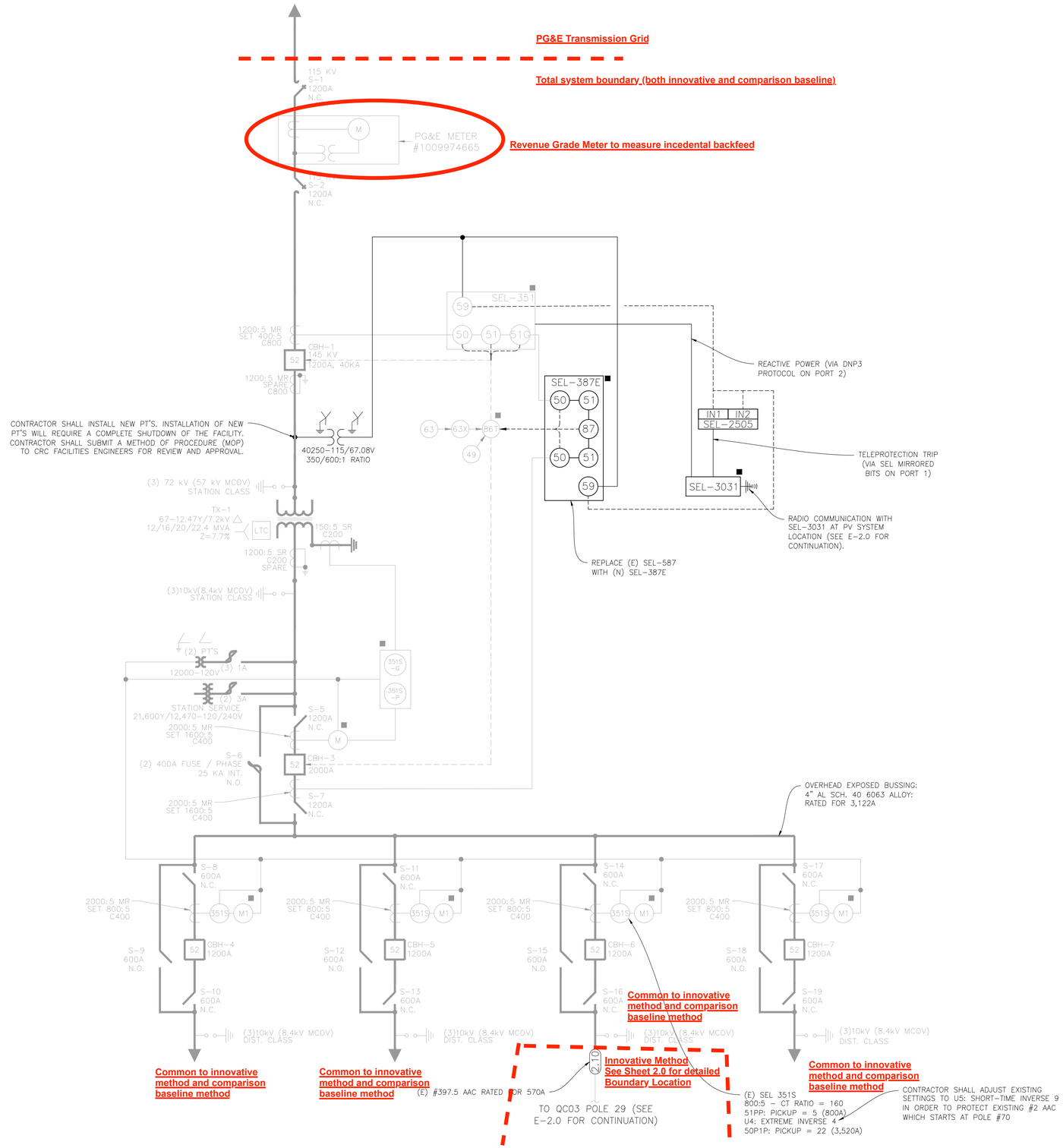

EQUIPMENT AND DEVICE LEGEND

- 52 — BREAKER
- GANG OPERATED ISOLATION SWITCH WITH ARCING HORNS
- GANG OPERATED ISOLATION SWITCH
- ISOLATION SWITCH (HOOKSTICK OPERATED)
- FUSED SINGLE POLE SWITCH (HOOKSTICK OPERATED)
- POWER TRANSFORMER, WITH GROUNDING RESISTOR
- POTENTIAL TRANSFORMER
- STATION SERVICE TRANSFORMER
- LIGHTNING ARRESTER
- CURRENT TRANSFORMER
- 50/51 — PROTECTIVE RELAY OR METER, DENOTED BY:
  - 351 MULTIFUNCTION RELAY, SEL-351
  - 351S MULTIFUNCTION RELAY INTEGRAL CONTROL P.B.'S, SEL-35
  - 49 WINDING THERMAL ALARM
  - 587 CURRENT DIFFERENTIAL, SEL-587
  - 63 FAULT PRESSURE
  - 86 LOCKOUT
  - G GROUND
  - M POWER/POWER QUALITY METER, C-H IQ ANALYZER
  - M1 MULTIFUNCTION POWER METER, C-H DP-4000
  - X AUXILIARY
- CLOSED DELTA WINDING CONNECTION
- WYE WINDING CONNECTION
- OPEN DELTA WINDING CONNECTION
- DEVICES LOCATED IN RELAY PANEL

1S06

GENERAL NOTES

1. EXISTING SEL-351 FOR CBH-1, NEW SEL-387E & NEW SEL-3031 SHALL BE POWERED BY EXISTING 125V DC FLOODED LEAD ACID BATTERY SYSTEM.

OVERVOLTAGE PROTECTION SCHEME:

1. PRIMARY OVERVOLTAGE PROTECTION: SHALL BE PROVIDED VIA CBH-1 EXISTING SEL-351 RELAY IN RELAY PANEL. CONTRACTOR SHALL INSTALL NEW PT'S ON PRIMARY SIDE OF CBH-1.
2. REDUNDANT OVERVOLTAGE PROTECTION: CONTRACTOR SHALL REPLACE CBH-1 EXISTING SEL-587 RELAY LOCATED IN THE EXISTING RELAY PANEL WITH NEW SEL-387E RELAY. CONTRACTOR SHALL INSTALL NEW PT'S ON PRIMARY SIDE OF CBH-1.
3. CONTRACTOR SHALL INSTALL A NEW SEL-3031 TRANSMITTER IN THE EXISTING RELAY PANEL AND A NEW SEL-3031 RECEIVER AND TWO SEL-2505 RELAYS AT SOLAR ARRAY TO COMMUNICATE TELEPROTECTION TRIP TO SWITCHBOARD SSB1 BASED ON 110% OVERVOLTAGE TO REMOVE PV SOLAR SYSTEM FROM GRID.
4. REFERENCE PG&E TRANSMISSION INTERCONNECTION HANDBOOK TABLE G2-6 THIS SHEET FOR OVERVOLTAGE RELAY SETTINGS.

POWER FACTOR CONTROL SCHEME:

1. NEW SEL-3031 RELAY SHALL TRANSMIT EXPORTED POWER FACTOR MEASUREMENTS FROM CBH-1 EXISTING SEL-351 RELAY TO NEW SEL-3031 RECEIVER AT SOLAR ARRAY.
2. NEW SEL-3031 RECEIVER SHALL RELAY EXPORTED POWER FACTOR MEASUREMENTS TO AGAVE EVOLUTION CONTROLLER.
3. AGAVE EVOLUTION CONTROLLER USES SIEMENS SIMATIC S7 1515-2PN TO CONTROL POWER FACTOR BETWEEN 0.95 LEADING AND 0.95 LAGGING DURING POWER EXPORT CONDITIONS AT CBH-1 EXISTING SEL-351.
   - 3.1. AGAVE EVOLUTION CONTROLLER SHALL COMMUNICATE WITH ALL (31) SOLECTRIA INVERTERS.
   - 3.2. AGAVE EVOLUTION CONTROLLER SHALL SET ALL (31) SOLECTRIA INVERTERS FROM 0.8 LEADING TO 0.8 LAGGING TO MAINTAIN CLIENTS EXISTING POWER FACTOR OF 0.74 OR GREATER AT THE POINT OF UTILITY INTERCONNECTION WHEN POWER IS BEING IMPORTED FROM PG&E.
   - 3.3. AGAVE EVOLUTION CONTROLLER SHALL SET ALL (31) SOLECTRIA INVERTERS FROM 0.8 LEADING TO 0.8 LAGGING TO MAINTAIN POWER FACTOR OF 0.95 LEADING TO 0.95 LAGGING AT THE POINT OF UTILITY INTERCONNECTION WHEN POWER IS BEING EXPORTED TO PG&E.

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1-LINE SUBSTATION

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