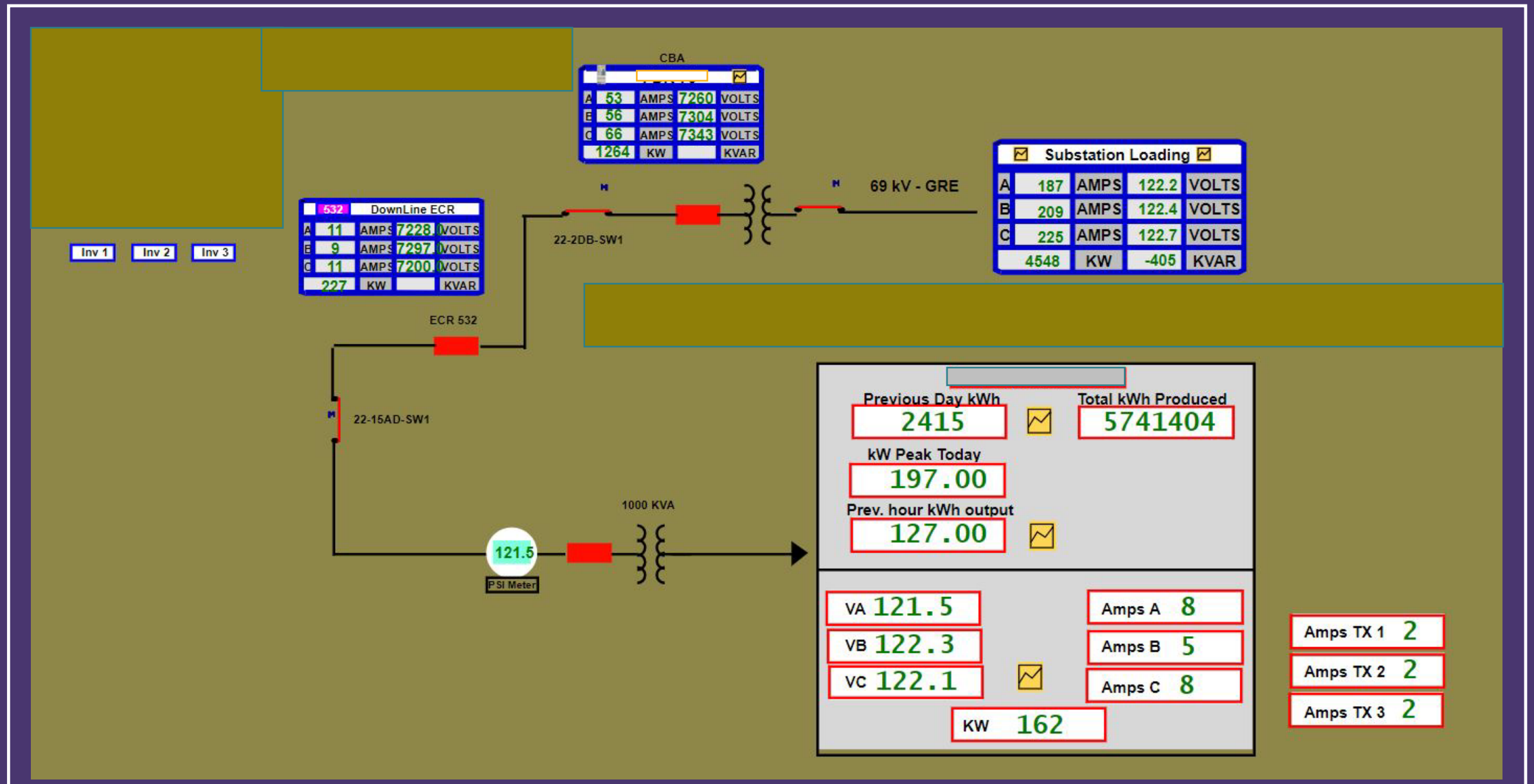
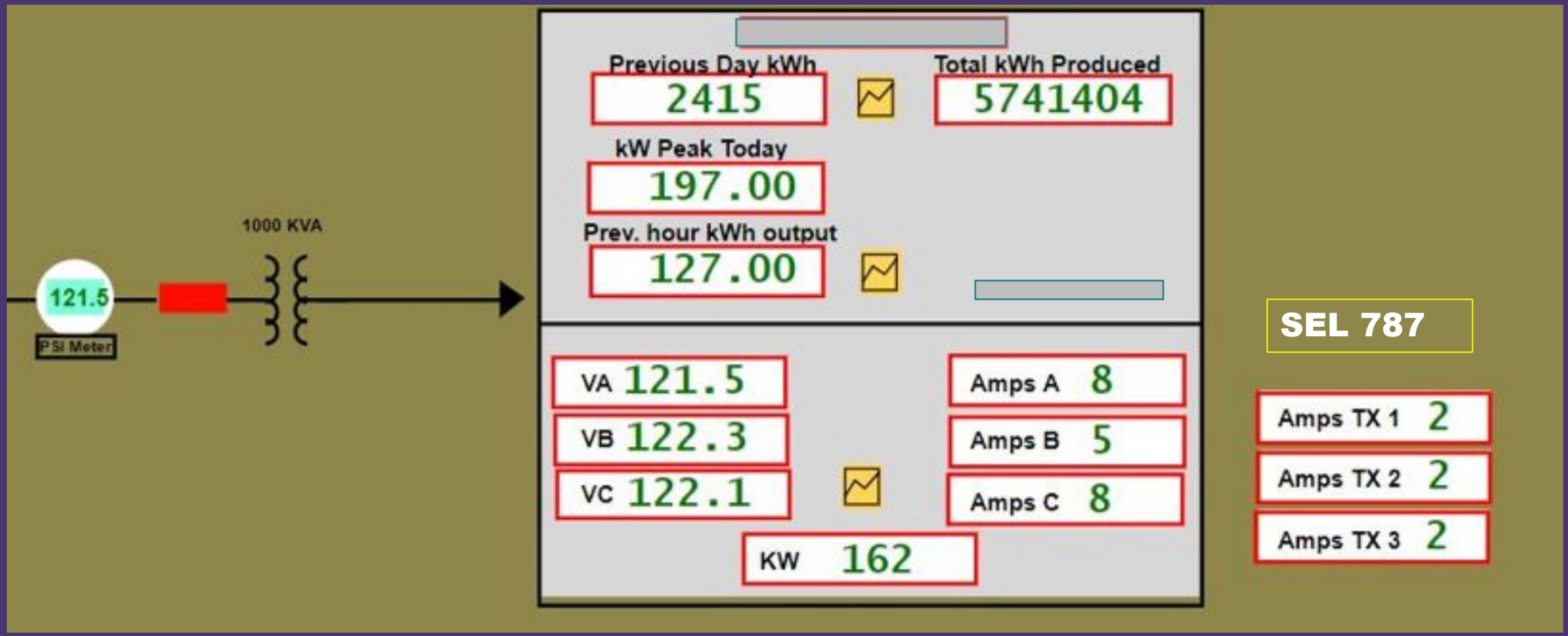
- DER- Distributed Energy Resources
- System Information

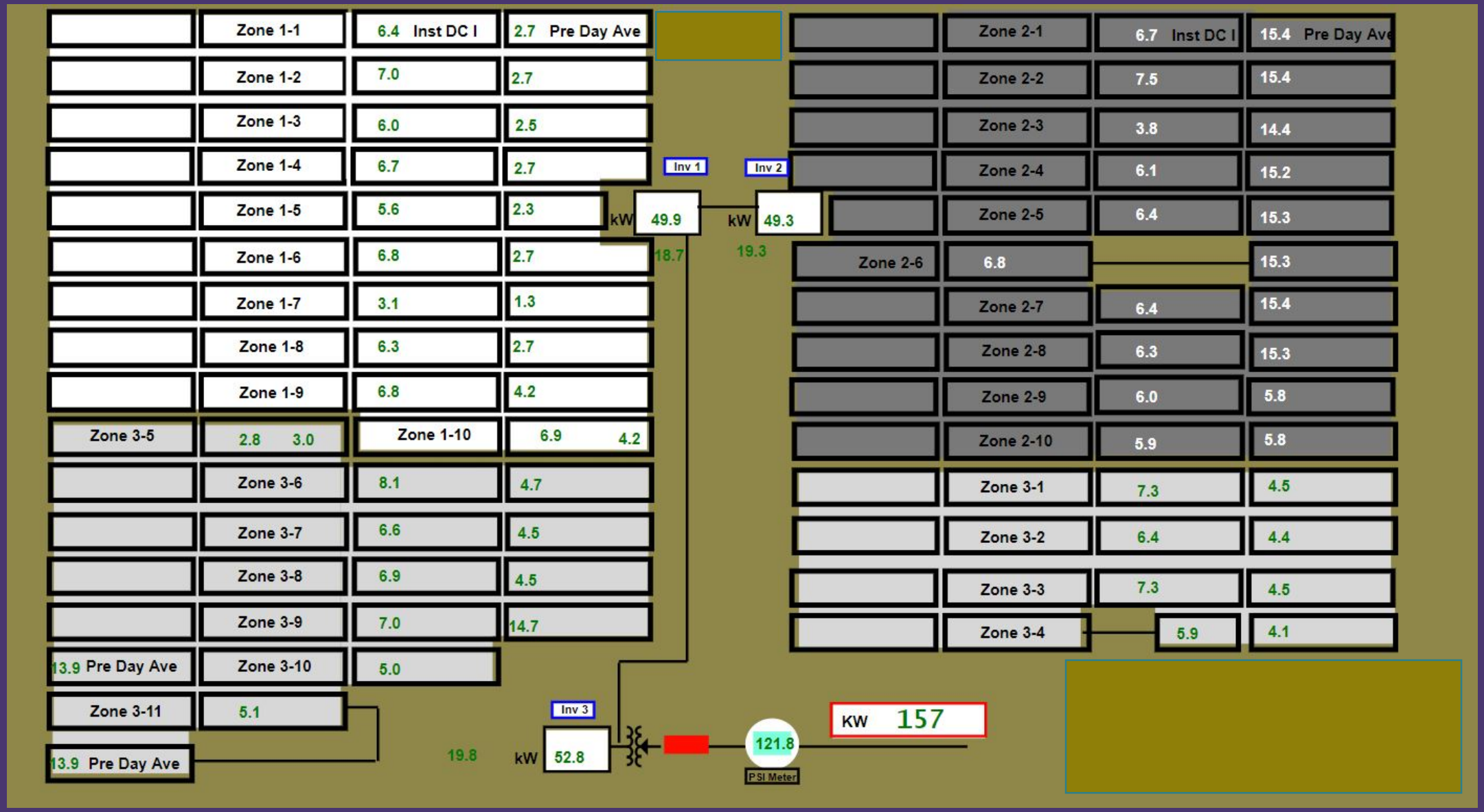
Knowing…..
What you need

Understanding…..
What you have

Normalizing DATA


CBA
A 53 AMPS 7260 VOLTS
B 56 AMPS 7304 VOLTS
C 66 AMPS 7343 VOLTS
1264 KW KVAR
Substation Loading
A 187 AMPS 122.2 VOLTS
B 209 AMPS 122.4 VOLTS
C 225 AMPS 122.7 VOLTS
4548 KW -405 KVAR
69 kV - GRE
532 DownLine ECR
A 11 AMPS 7228 VOLTS
B 9 AMPS 7297 VOLTS
C 11 AMPS 7200 VOLTS
227 KW KVAR
22-2DB-SW1
Inv 1
Inv 2
Inv 3
ECR 532
22-15AD-SW1
1000 KVA
121.5
PSI Meter
Previous Day kWh
2415
Total kWh Produced
5741404
kW Peak Today
197.00
Prev. hour kWh output
127.00
VA 121.5
VB 122.3
VC 122.1
Amps A 8
Amps B 5
Amps C 8
KW 162
Amps TX 1 2
Amps TX 2 2
Amps TX 3 2


1000 KVA
121.5
PSI Meter
Previous Day kWh
2415
Total kWh Produced
5741404
kW Peak Today
197.00
Prev. hour kWh output
127.00
VA 121.5
VB 122.3
VC 122.1
Amps A 8
Amps B 5
Amps C 8
KW 162
SEL 787
Amps TX 1 2
Amps TX 2 2
Amps TX 3 2


Zone 1-1
6.4 Inst DC I
2.7 Pre Day Ave
Zone 1-2
7.0
2.7
Zone 1-3
6.0
2.5
Zone 1-4
6.7
2.7
Zone 1-5
5.6
2.3
Zone 1-6
6.8
2.7
Zone 1-7
3.1
1.3
Zone 1-8
6.3
2.7
Zone 1-9
6.8
4.2
Zone 3-5
2.8 3.0
Zone 1-10
6.9 4.2
Zone 3-6
8.1
4.7
Zone 3-7
6.6
4.5
Zone 3-8
6.9
4.5
Zone 3-9
7.0
14.7
13.9 Pre Day Ave
Zone 3-10
5.0
Zone 3-11
5.1
13.9 Pre Day Ave
Inv 1
Inv 2
kW 49.9
kW 49.3
18.7
19.3
Inv 3
19.8
kW 52.8
121.8
PSI Meter
KW 157
Zone 2-1
6.7 Inst DC I
15.4 Pre Day Ave
Zone 2-2
7.5
15.4
Zone 2-3
3.8
14.4
Zone 2-4
6.1
15.2
Zone 2-5
6.4
15.3
Zone 2-6
6.8
15.3
Zone 2-7
6.4
15.4
Zone 2-8
6.3
15.3
Zone 2-9
6.0
5.8
Zone 2-10
5.9
5.8
Zone 3-1
7.3
4.5
Zone 3-2
6.4
4.4
Zone 3-3
7.3
4.5
Zone 3-4
5.9
4.1

Inverter 1

Inverter #1 Alarms
Shunt Trip
RCM Fault
Incorrect Phase
Open Phase Failure
VAC Sense Circuit Failure
Ground Fault Failure
MOV Failure
AC Current Sensor Failure
Contactor Failure
Power Desaturation
Power Stage Temperature Out Of Range
Unintentional Islanding
Waiting For Grid
AC Frequency High
AC Frequency Low
Fan Life Reached
Waiting for Restart
Power Stage Temperature Limit Exceeded
AC Voltage Critical High
AC Voltage High
AC Voltage Low
AC Voltage Critical Low
DC Voltage High
Slave Tempurature Sensor Error
Master Tempurature Sensor Error
Soft Shutdown
Remote Shutdown
RCM Error
DC Contactor Failure

Inverter #1 Analog Values	
383	L1-L2 Voltage
384	L2-L3 Voltage
381	L3-L1 Voltage
53	Inst KW
19186019	Total KWH
671	DC Voltage
66	DC Current All Zones
60	AC Grid Frequency
7	DC Current Zone 1
7	DC Current Zone 2
7	DC Current Zone 3
7	DC Current Zone 4
6	DC Current Zone 5
7	DC Current Zone 6
3	DC Current Zone 7
7	DC Current Zone 8
7	DC Current Zone 9
8	DC Current Zone 10
3023	Grid ON Hrs
5253	Fan ON Hrs
0	UL Wait Time Remaining
300	UL Faut Reconnect Time Waiting
418	AC Over Voltage Setting
334	AC Under Voltage Setting
60.50	AC Over Frequency Setting
118	Internal Temp 1
118	Internal Temp 2
108	Internal Temp 3

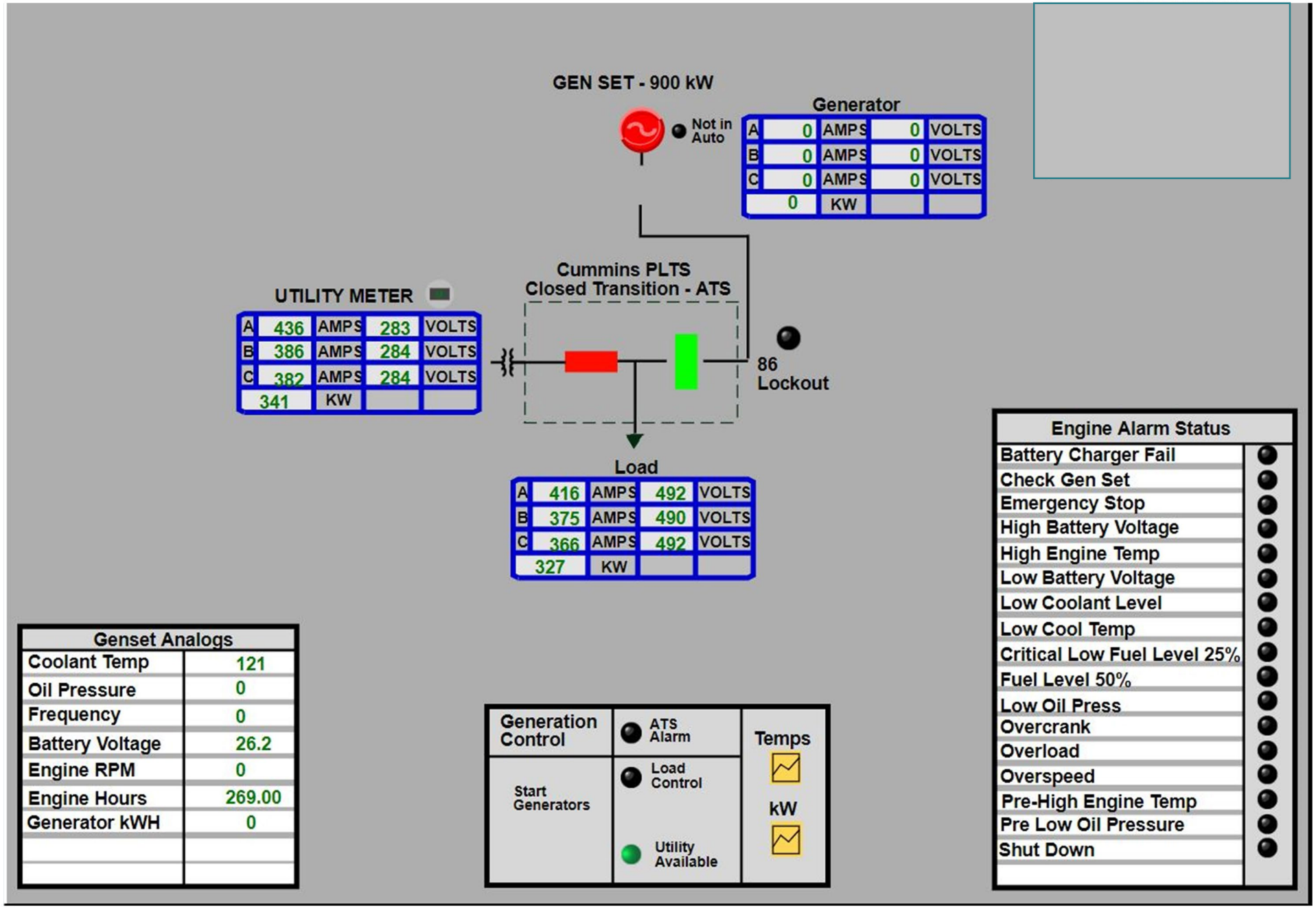
Curtailable Generation

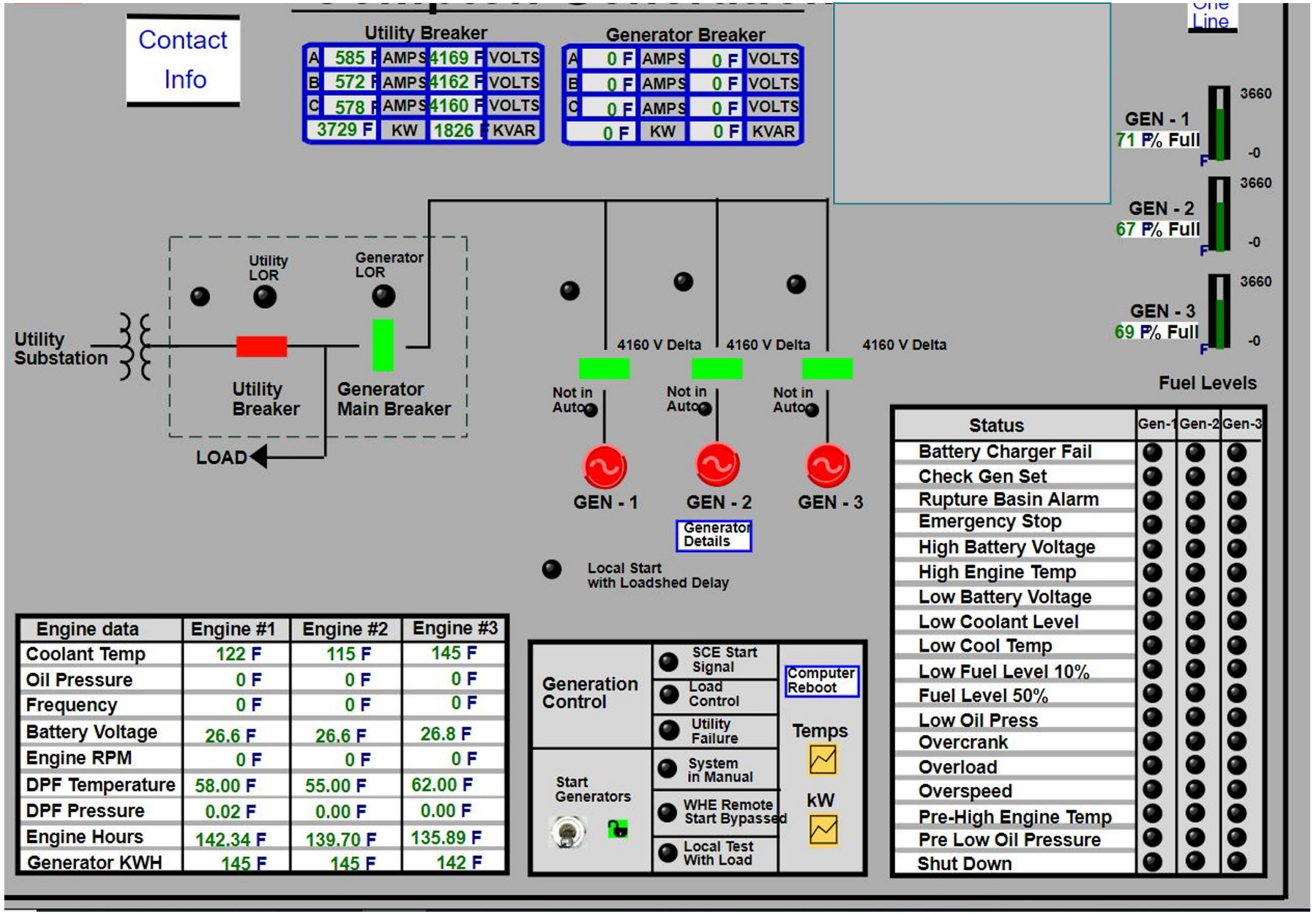
Knowing you Controlled – Verification

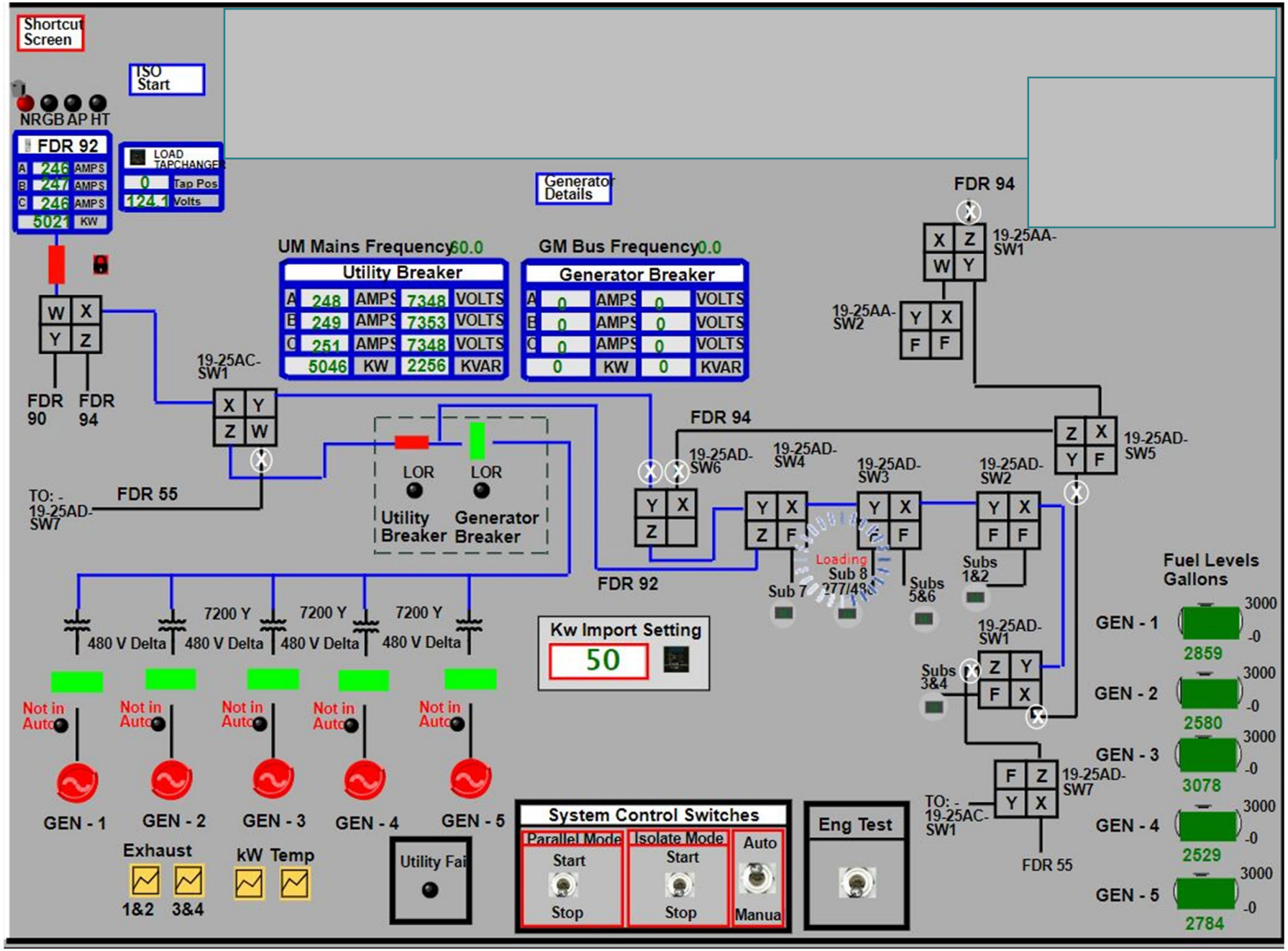
Seeing what is happening – Live

Different Engine Controllers

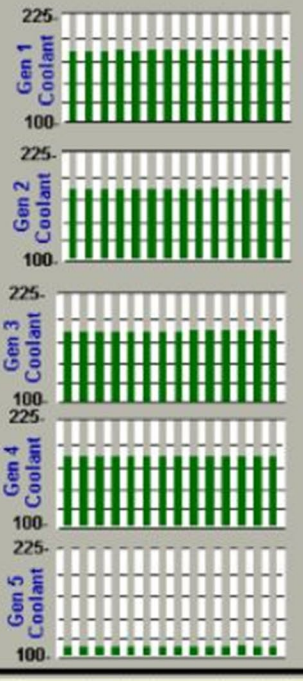
CAT
CAT


GEN SET - 900 kW
Not in Auto
Generator
A 0 AMPS 0 VOLTS
B 0 AMPS 0 VOLTS
C 0 AMPS 0 VOLTS
0 KW
UTILITY METER
A 436 AMPS 283 VOLTS
B 386 AMPS 284 VOLTS
C 382 AMPS 284 VOLTS
341 KW
Cummins PLTS
Closed Transition - ATS
86
Lockout
Load
A 416 AMPS 492 VOLTS
B 375 AMPS 490 VOLTS
C 366 AMPS 492 VOLTS
327 KW
Genset Analogs
Coolant Temp 121
Oil Pressure 0
Frequency 0
Battery Voltage 26.2
Engine RPM 0
Engine Hours 269.00
Generator kWH 0
Generation Control
Start Generators
ATS Alarm
Load Control
Utility Available
Temps
kW
Engine Alarm Status
Battery Charger Fail
Check Gen Set
Emergency Stop
High Battery Voltage
High Engine Temp
Low Battery Voltage
Low Coolant Level
Low Cool Temp
Critical Low Fuel Level 25%
Fuel Level 50%
Low Oil Press
Overcrank
Overload
Overspeed
Pre-High Engine Temp
Pre Low Oil Pressure
Shut Down

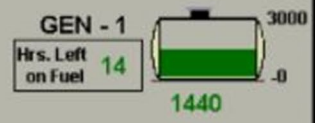

Contact Info
Utility Breaker
A 585 F AMPS 4169 F VOLTS
B 572 F AMPS 4162 F VOLTS
C 578 F AMPS 4160 F VOLTS
3729 F KW 1826 F KVAR
Generator Breaker
A 0 F AMPS 0 F VOLTS
B 0 F AMPS 0 F VOLTS
C 0 F AMPS 0 F VOLTS
0 F KW 0 F KVAR
One Line
GEN - 1
71 F% Full
3660
-0
GEN - 2
67 F% Full
3660
-0
GEN - 3
69 F% Full
3660
-0
Fuel Levels
Utility Substation
Utility LOR
Generator LOR
Utility Breaker
Generator Main Breaker
LOAD
4160 V Delta
4160 V Delta
4160 V Delta
Not in Auto
Not in Auto
Not in Auto
GEN - 1
GEN - 2
GEN - 3
Generator Details
Local Start with Loadshed Delay
Engine data | Engine #1 | Engine #2 | Engine #3
Coolant Temp | 122 F | 115 F | 145 F
Oil Pressure | 0 F | 0 F | 0 F
Frequency | 0 F | 0 F | 0 F
Battery Voltage | 26.6 F | 26.6 F | 26.8 F
Engine RPM | 0 F | 0 F | 0 F
DPF Temperature | 58.00 F | 55.00 F | 62.00 F
DPF Pressure | 0.02 F | 0.00 F | 0.00 F
Engine Hours | 142.34 F | 139.70 F | 135.89 F
Generator KWH | 145 F | 145 F | 142 F
Generation Control
SCE Start Signal
Load Control
Utility Failure
System in Manual
WHE Remote Start Bypassed
Local Test With Load
Computer Reboot
Temps
kW
Start Generators
Status | Gen-1 | Gen-2 | Gen-3
Battery Charger Fail
Check Gen Set
Rupture Basin Alarm
Emergency Stop
High Battery Voltage
High Engine Temp
Low Battery Voltage
Low Coolant Level
Low Cool Temp
Low Fuel Level 10%
Fuel Level 50%
Low Oil Press
Overcrank
Overload
Overspeed
Pre-High Engine Temp
Pre Low Oil Pressure
Shut Down

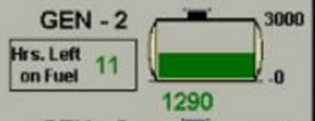

Shortcut Screen
TSO Start
NRGB AP HT
FDR 92
A 246 AMPS
B 247 AMPS
C 246 AMPS
5021 KW
LOAD TAPCHANGER
0 Tap Pos
124.1 Volts
Generator Details
UM Mains Frequency 60.0
Utility Breaker
A 248 AMPS 7348 VOLTS
B 249 AMPS 7353 VOLTS
C 251 AMPS 7348 VOLTS
5046 KW 2256 KVAR
GM Bus Frequency 0.0
Generator Breaker
A 0 AMPS 0 VOLTS
B 0 AMPS 0 VOLTS
C 0 AMPS 0 VOLTS
0 KW 0 KVAR
FDR 94
19-25AA-SW1
19-25AA-SW2
19-25AC-SW1
FDR 90
FDR 94
TO: - 19-25AD-SW7
FDR 55
LOR
LOR
Utility Breaker
Generator Breaker
FDR 94
19-25AD-SW6
19-25AD-SW4
19-25AD-SW3
19-25AD-SW2
19-25AD-SW5
FDR 92
Loading
Sub 7
Sub 8
Subs 5&6
Subs 1&2
Subs 3&4
19-25AD-SW1
19-25AD-SW7
TO: - 19-25AC-SW1
FDR 55
480 V Delta
480 V Delta
7200 Y
480 V Delta
7200 Y
480 V Delta
7200 Y
Kw Import Setting
50
Not in Auto
GEN - 1
GEN - 2
GEN - 3
GEN - 4
GEN - 5
Exhaust
1&2
3&4
kW Temp
Utility Fai
System Control Switches
Parallel Mode
Start
Stop
Isolate Mode
Start
Stop
Auto
Manua
Eng Test
Fuel Levels Gallons
GEN - 1 3000 -0 2859
GEN - 2 3000 -0 2580
GEN - 3 3000 -0 3078
GEN - 4 3000 -0 2529
GEN - 5 3000 -0 2784

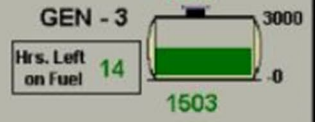
Engine data	Engine #1	Engine #2	Engine #3	Engine #4	Engine #5
Coolant Temp	182	182	182	182	111
Oil Pressure	71	65	65	63	1
Fuel Levels	1440	1290	1503	1368	2466
kW	1197	1186	1159	1196	0
kVA	1402	1392	1364	1448	0
kVAR	727	725	716	799	0
Power Factor	85	85	84	83	164
Frequency	60	60	60	60	0
Amps Phase - A	1541	1573	1529	1592	0
Amps Phase - B	1547	1573	1540	1597	0
Amps Phase - C	1526	1551	1527	1581	0
Volts Phase - A	505	505	505	505	0
Volts Phase - B	506	506	505	506	0
Volts Phase - C	506	505	506	506	0
Battery Voltage	28	27	27	27	26
Engine RPM	1800	1801	1800	1801	0
Engine Hours	934	908	918	915	383
Fuel Rate / Hour	82	86	83	81	0
Hours left of fuel	14	11	14	13	3

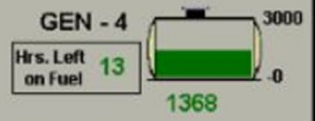


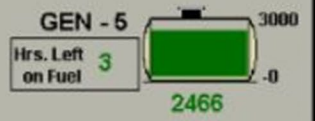
Fuel Levels
Gallons











CHP – Turbine Site

6.2 MW Parallel to the Distribution

Different Rate Structures

Knowing what is needed for Information

Al Corn - 17
Steele Waseca

SNMP - 161 kVolts

One Line

Substation Loading

A	154	AMPS	121.4	VOLTS
B	158	AMPS	121.2	VOLTS
C	160	AMPS	121.4	VOLTS
	2999	KW	3439	KVAR

FDR 172 Monthly Max and Time

1766

11/5/2018 1:05:22 PM.797

FDR 172 Prev Month Max and Time

0

1/1/1601 12:00:00 AM.000

FDR 172

A	72	AMPS
B	87	AMPS
C	84	AMPS
	1550	KW

NR GB AP HT

SW17S1

SW17CS2

FDR 171

A	81	AMPS
B	70	AMPS
C	75	AMPS
	1419	KW

NR GB AP HT

FDR 171 Monthly Max and Time

1619

11/5/2018 1:05:20 PM.790

FDR 171 Prev Month Max and Time

0

1/1/1601 12:00:00 AM.000

CAP Bank
3- 200 kVAR
Steps

VI-024 SW-023 SW-022 SW-021

PSI Meter

To Ckt 103
Feed from Claremont

To Al Corn UM
CKT-4

Al Corn Inst. kW Plant Load

8599

Monthly Max and Time

8850

11/5/2018 8:20:47 AM.637

Al Corn Plant Load Prev Month Max an

0

1/1/1601 12:00:00 AM.000

SW-012 SW-011

PSI Meter

To Al Corn UM
CKT-3

Turbine Meter

A	260	AMPS	7273	VOLTS
B	260	AMPS	7265	VOLTS
C	258	AMPS	7270	VOLTS
	5530	KW	1141	KVAR

Turbine Monthly Max kW

5666

PSI Meter

Schneider Electric

PowerLogic ION8650

Home

Monitoring | Control | Diagnostic | Maintenance | Setup

Operation
Consumption
Power Quality

Operation

Voltage	
Vln avg	7268.68 V
Vln a	7271.93 V
Vln b	7264.82 V
Vln c	7269.30 V
Vll avg	12589.71 V
Vll a-b	12587.60 V
Vll b-c	12585.92 V
Vll c-a	12595.61 V
V unbal	0.05 %
Frequency	
Freq	59.99 Hz

Current	
I avg	258.48 A
I a	259.02 A
I b	258.91 A
I c	257.52 A
I unbal	0.37 %
Power Factor	
PF sign total	-98.00 %
PF sign a	-97.97 %
PF sign b	-97.82 %
PF sign c	-97.91 %

Power	
kW total	5518.14 kW
kW a	1845.40 kW
kW b	1839.83 kW
kW c	1832.90 kW
kVA total	5630.98 kVA
kVA a	1883.59 kVA
kVA b	1880.91 kVA
kVA c	1871.99 kVA
kVAR total	1121.67 kVAR
kVAR a	368.37 kVAR
kVAR b	381.88 kVAR
kVAR c	371.42 kVAR

Schneider Electric

PowerLogic ION8650

Home

Monitoring | Control | Diagnostic | Maintenance | Setup

Operation
Consumption
Power Quality

Consumption

Energy	kWh	kVARh	kVAh
Del	7006.83	1153.74	5229.71
Rec	0.00	0.00	0.00
Del + Rec	5121.83	1053.74	5229.71
Del - Rec	5121.83	1053.74	5229.71

Demand	kW	kVAR	kVA
Del	1.27	0.26	1.30
Rec	0.00	0.00	0.00
Del + Rec	1.27	0.26	1.30
Del - Rec	1.27	0.26	1.30

Peak Demand		
kW sd mx del	1.57	2018-11-01 05:35
kW sd mx rec	0.00	2018-09-10 23:55
kW sd mx d+r	1.62	2018-10-21 03:35
kW sd mx d-r	1.62	2018-10-21 03:35
kVAR sd mx del	0.33	2018-10-21 03:35
kVAR sd mx rec	0.00	2018-09-11 00:20
kVAR sd mx d+r	0.33	2018-10-21 03:35
kVAR sd mx d-r	0.33	2018-10-21 03:35
kVA sd mx del	1.66	2018-10-21 03:35
kVA sd mx rec	0.00	2018-09-10 23:55
kVA sd mx d+r	1.66	2018-10-21 03:35

Schneider Electric

PowerLogic ION8650

Home

Monitoring | Control | Diagnostic | Maintenance | **Setup**

Setup

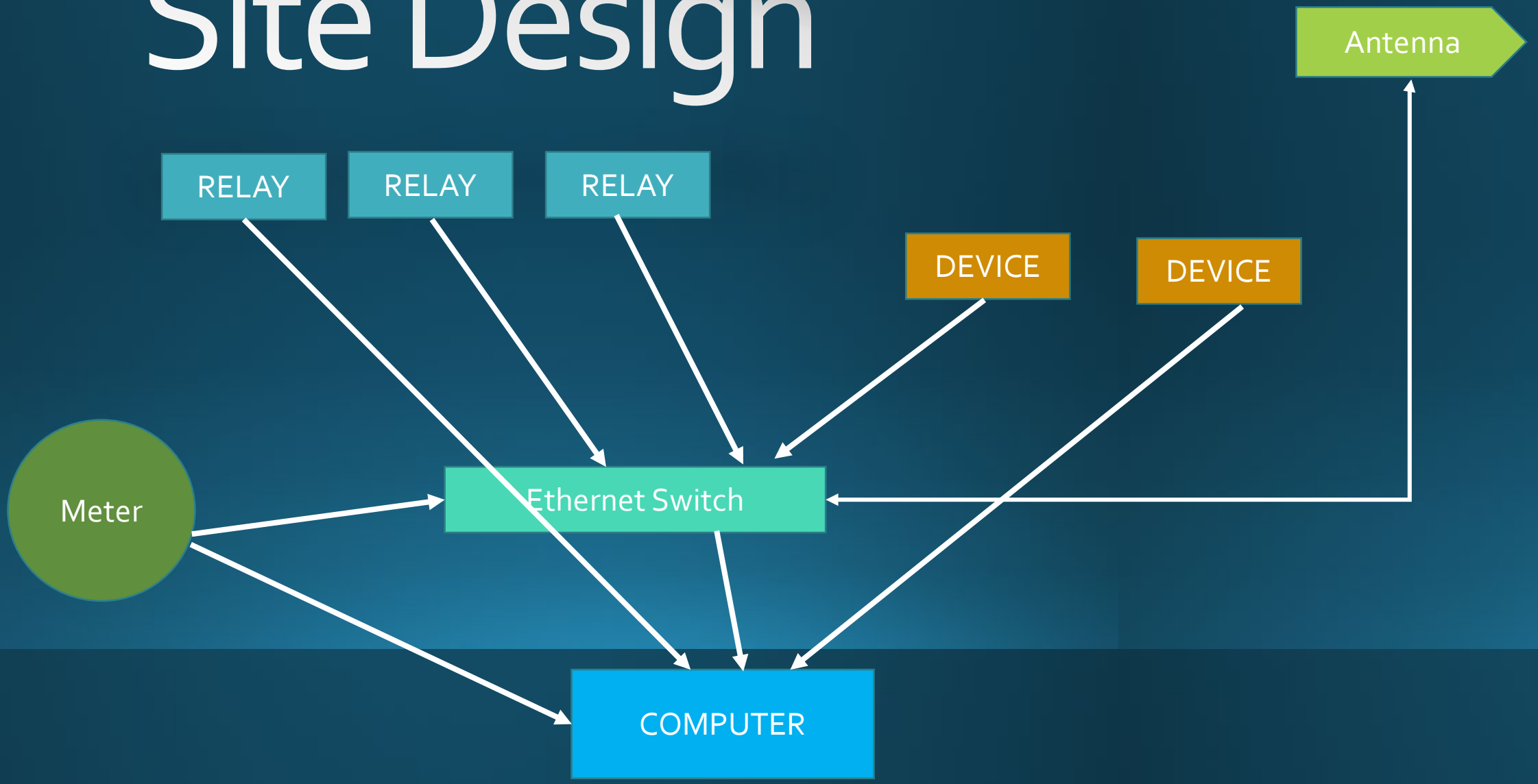
Setup

Power Meter			
Volts Mode	9S - 4 Wire Wye/Delta	Va Polarity	Normal
PT Primary	60.00	Vb Polarity	Normal
PT Secondary	1.00	Vc Polarity	Normal
CT Primary	300.00	V4 Polarity	N/A
CT Secondary	5.00	Ia Polarity	Normal
		Ib Polarity	Normal
		Ic Polarity	Normal
		Power Quality	
		Nominal Voltage	277.00
Nameplate Information		**Sliding Window Demand**	
Owner		Sub Interval	300.00
Tag1	SW Alcorn	# Sub Intervals	3.00
Tag2		Predicted Response	70.00

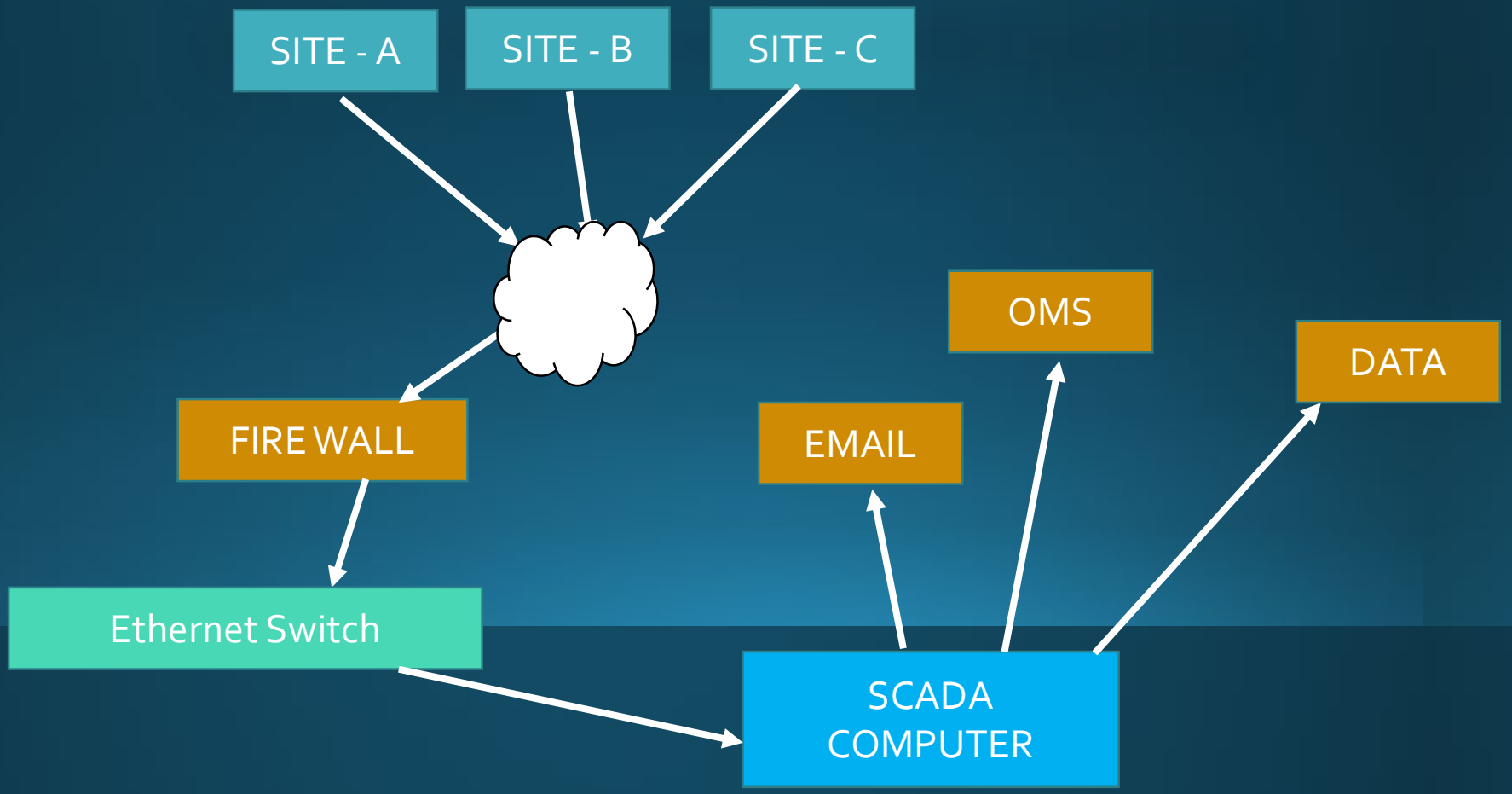
Save

Architecture To Devices

Site Design


Antenna
RELAY
RELAY
RELAY
DEVICE
DEVICE
Meter
Ethernet Switch
COMPUTER

SCADA HOST


SITE - A
SITE - B
SITE - C
FIRE WALL
Ethernet Switch
OMS
DATA
EMAIL
SCADA
COMPUTER

Communication – Line

Mesh Network
Cell Modem – VPN
Private Radio
Open Radio – 900 MHz
Fiber

Device Communication

Serial and Ethernet

ModBus

DNP 3

61850

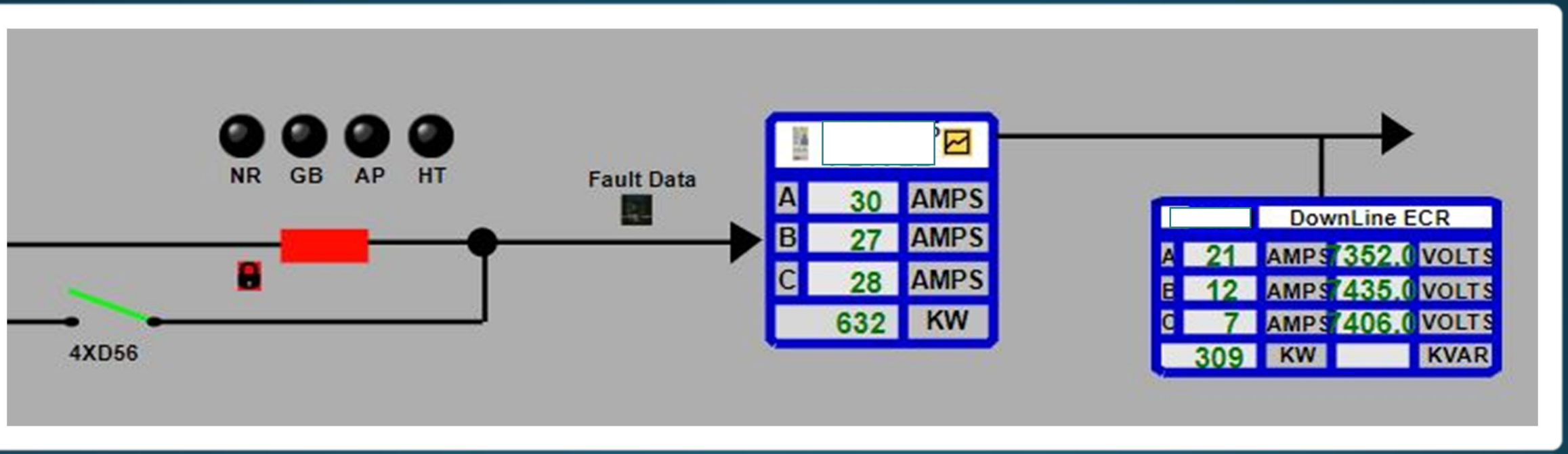
New DER Changes

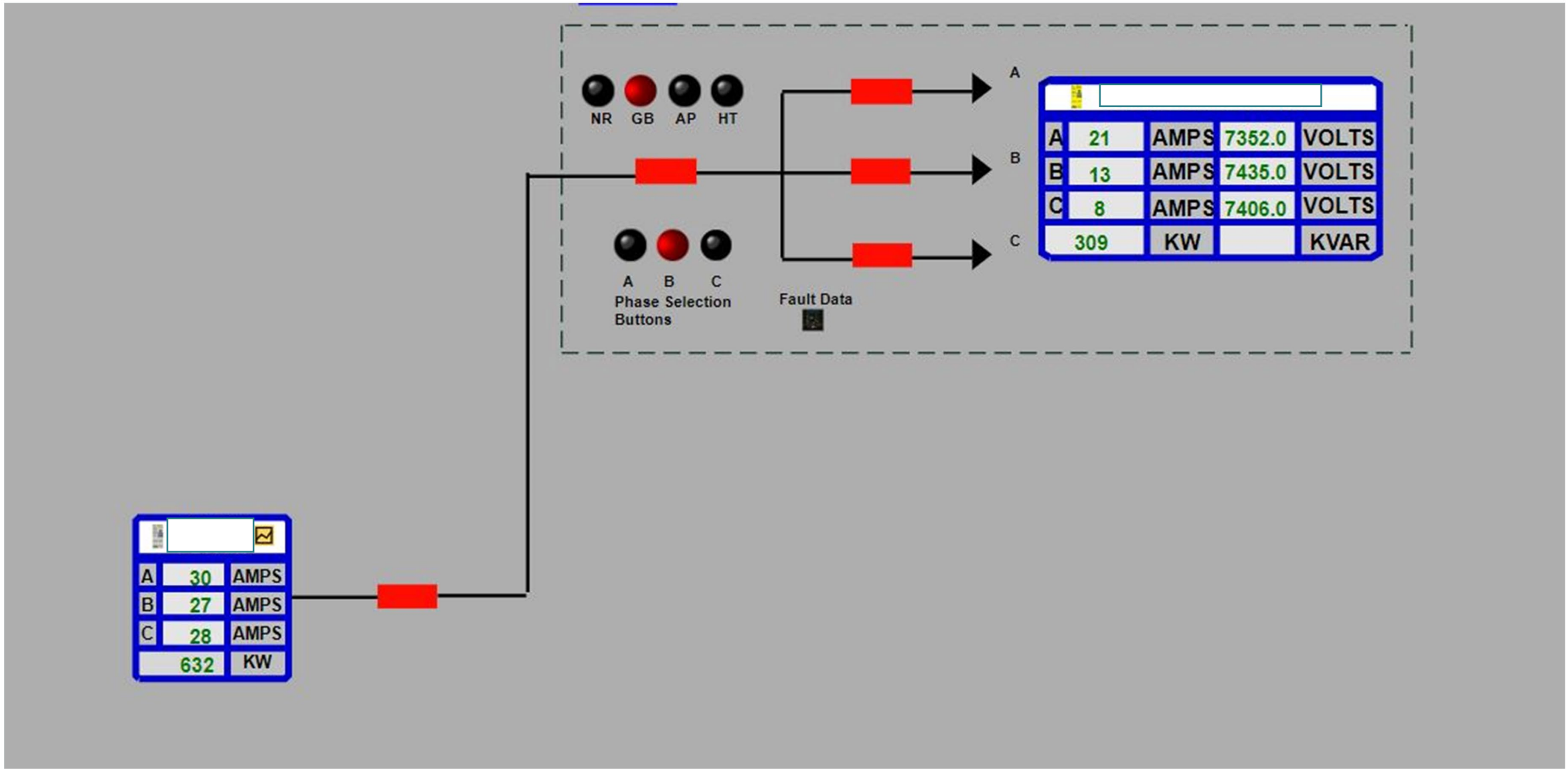
More and more solar installations

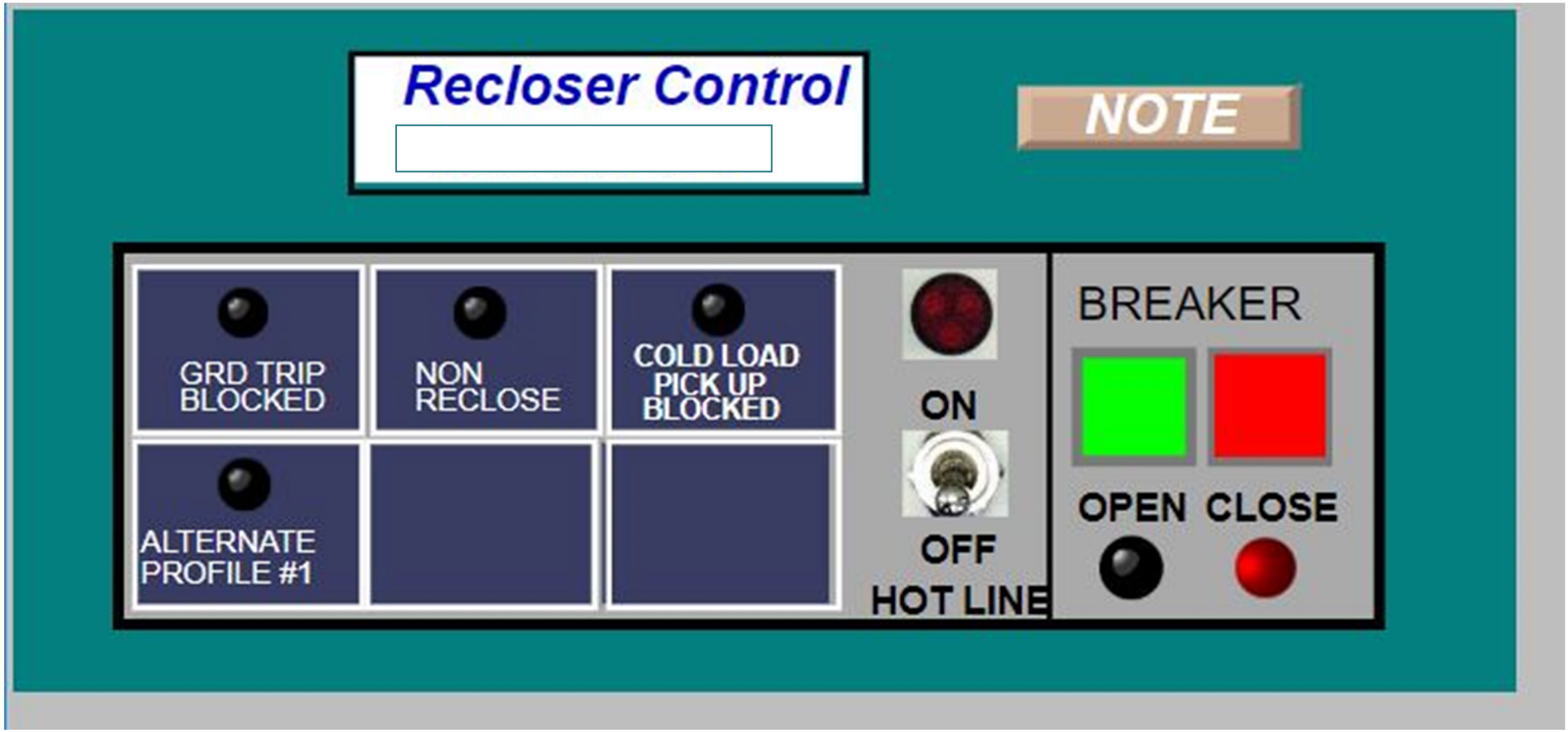
Newer Anti Islanding Inverters

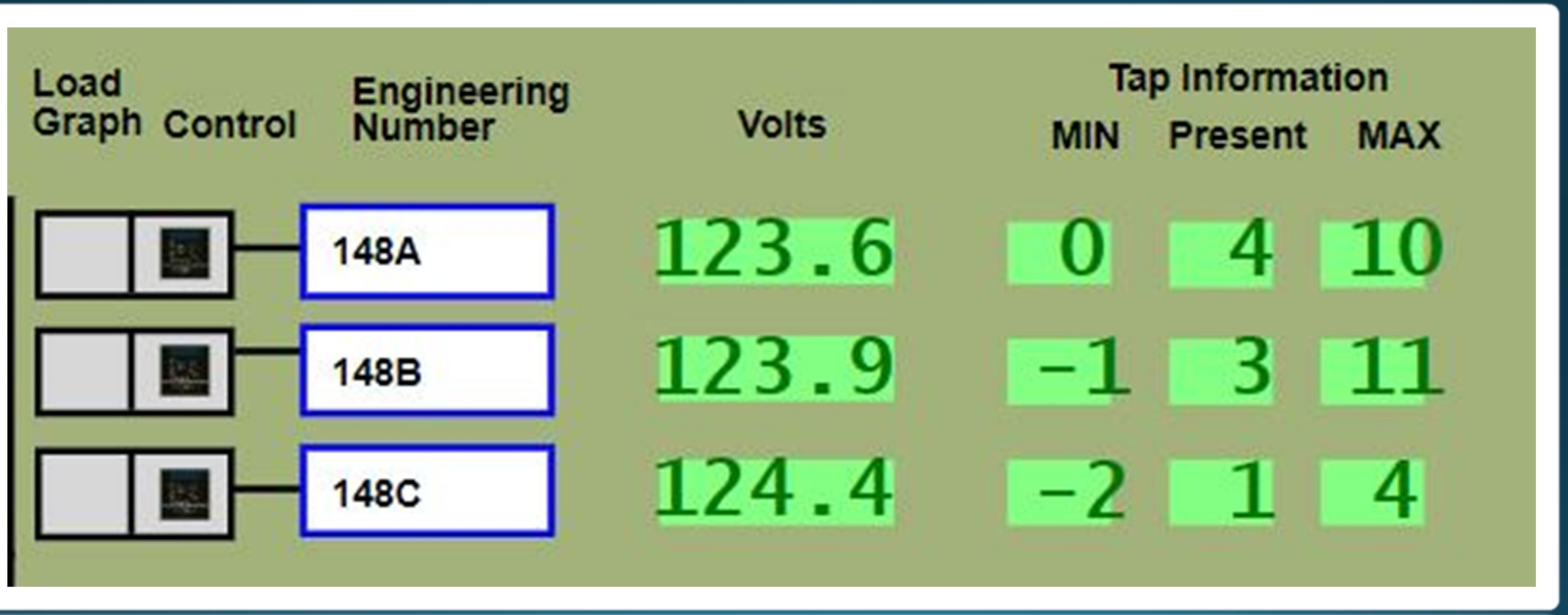
SEL has an Anti Islanding feature in the relay – SWCE will implement this next spring on a site

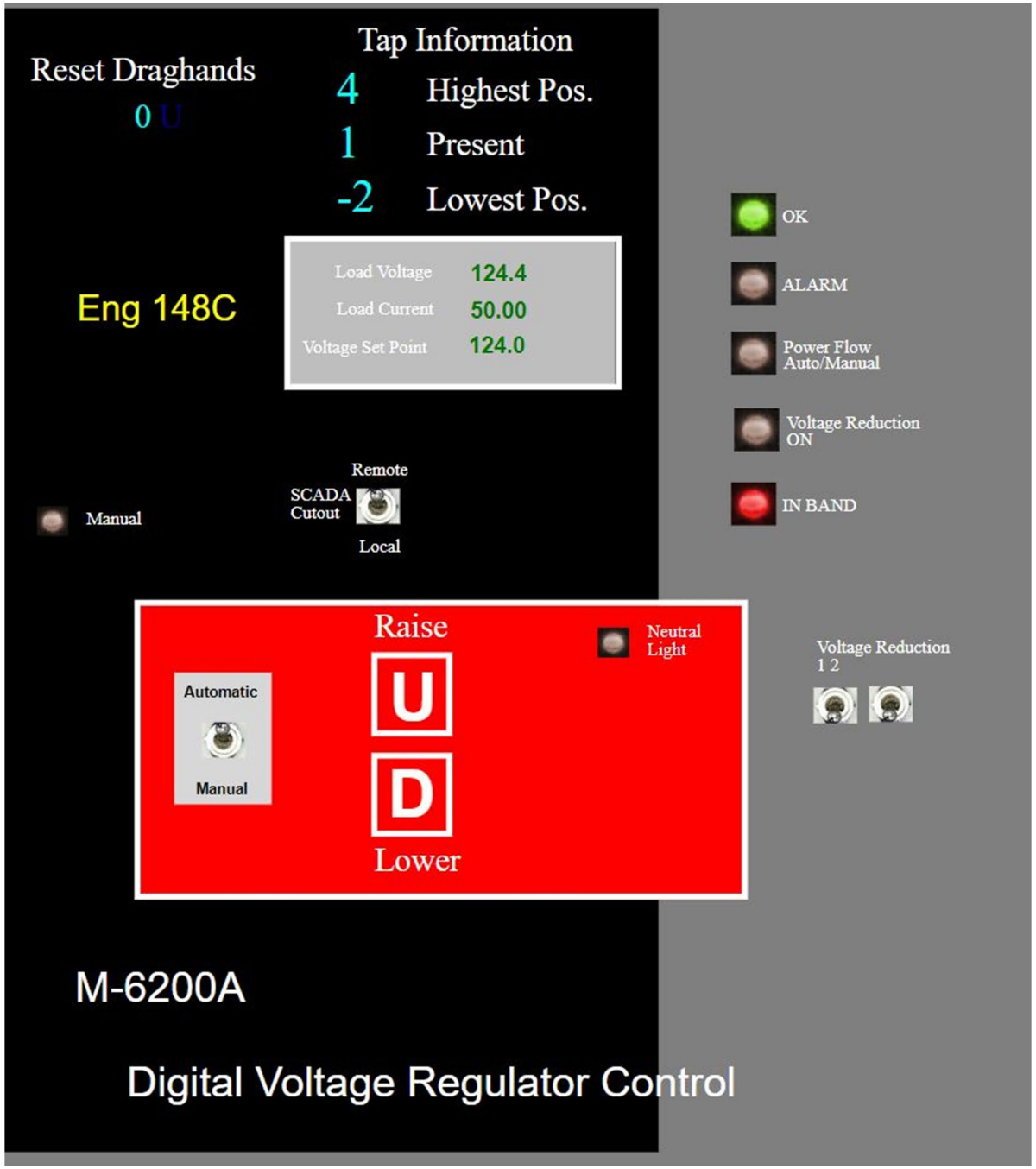
After accomplishing this…..


NR
GB
AP
HT
Fault Data
4XD56
A 30 AMPS
B 27 AMPS
C 28 AMPS
632 KW
DownLine ECR
A 21 AMPS 7352.0 VOLTS
B 12 AMPS 7435.0 VOLTS
C 7 AMPS 7406.0 VOLTS
309 KW KVAR


NR
GB
AP
HT
A
B
C
Phase Selection Buttons
Fault Data
A
B
C
A 21 AMPS 7352.0 VOLTS
B 13 AMPS 7435.0 VOLTS
C 8 AMPS 7406.0 VOLTS
309 KW KVAR
A 30 AMPS
B 27 AMPS
C 28 AMPS
632 KW


Recloser Control
NOTE
GRD TRIP BLOCKED
NON RECLOSE
COLD LOAD PICK UP BLOCKED
ALTERNATE PROFILE #1
ON
OFF
HOT LINE
BREAKER
OPEN
CLOSE


Load Graph
Control
Engineering Number
Volts
Tap Information
MIN
Present
MAX
148A
123.6
0
4
10
148B
123.9
-1
3
11
148C
124.4
-2
1
4


Reset Draghands
0 U
Tap Information
4 Highest Pos.
1 Present
-2 Lowest Pos.
Eng 148C
Load Voltage 124.4
Load Current 50.00
Voltage Set Point 124.0
OK
ALARM
Power Flow Auto/Manual
Voltage Reduction ON
IN BAND
Remote
SCADA Cutout
Manual
Local
Raise
U
D
Lower
Automatic
Manual
Neutral Light
Voltage Reduction 1 2
M-6200A
Digital Voltage Regulator Control

Digital Voltage Regulator Control

Analog Settings	
Fwd Voltage	0.0 U
Fwd Bandwidth (V)	0 U
Fwd Time Delay (S)	0 U
Block Raise	0 U
Block Lower	0 U
Rev. Voltage	0.0 U
Rev. Bandwidth (V)	0 U
Rev. Time Delay (S)	0 U

Analog Values	
Fwd Voltage	124.0
Fwd Bandwidth (V)	2
Fwd Time Delay (S)	60
Block Raise	127.0
Block Lower	117.0
Rev. Voltage	124.0
Rev. Bandwidth (V)	2
Rev. Time Delay (S)	60

Statuses	
Neutral Tap	
Not Regulating	
SCADA Block	

Present Values	
Load Voltage	123.6
Source Voltage	120.3
Load Current	56
kW	400
Power Factor	93.4
Operations Ctr.	36
Peak Motor Amps	4

Tap Position		
Low	Present	High
0	4	10

New DER Changes

More and more solar installations

Newer Anti Islanding Inverters

SEL has an Anti Islanding feature in the relay – SWCE will implement this next spring on a site

Knowing what we need….

Understanding what we have…..

Normalizing our DATA….

If this is what we do……

This could happen to you….

Thank you-

Wright-Hennepin Cooperative Electric

Steele- Waseca Cooperative Electric

MIPSYCON

- **Steve Nordahl**
- **snordahl@swce.coop**
- **800-526-3514**