



Building Level Power System Configurations

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Agenda

- > Definition of Terms
- > Building Power Components by Layer
- > Designing for Resiliency
 - > Commercial
 - > Residential
- > Questions

Key Terms

Availability

- Ability of the user obtain access the system

Redundancy

- The inclusion of extra components in case of failure in other components

Reliability

- The quality of performing consistently well

Resiliency

- The capacity to recover quickly from difficulties

Nanogrid

- Power distribution system for a single building, with the ability to connect or disconnect from other power entities

Layer 1

Inside the Facility:

- UPS
- Power Distribution
- HVAC
- Control/Monitoring

- Loads
 - Critical
 - Non-Critical



Layer 2

Outside the Facility:

- Generator
- Renewable Energy
- Heat Rejection



Layer 3

Remote:

- Utility Power
- Distributed Energy Storage



Commercial Critical Loads



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Designing for Resiliency

Something will go wrong. How quickly can it be made right?



**Simplicity
of Design**



**Ease of
Repair**

Simplicity of Design Considerations

Availability Requirements

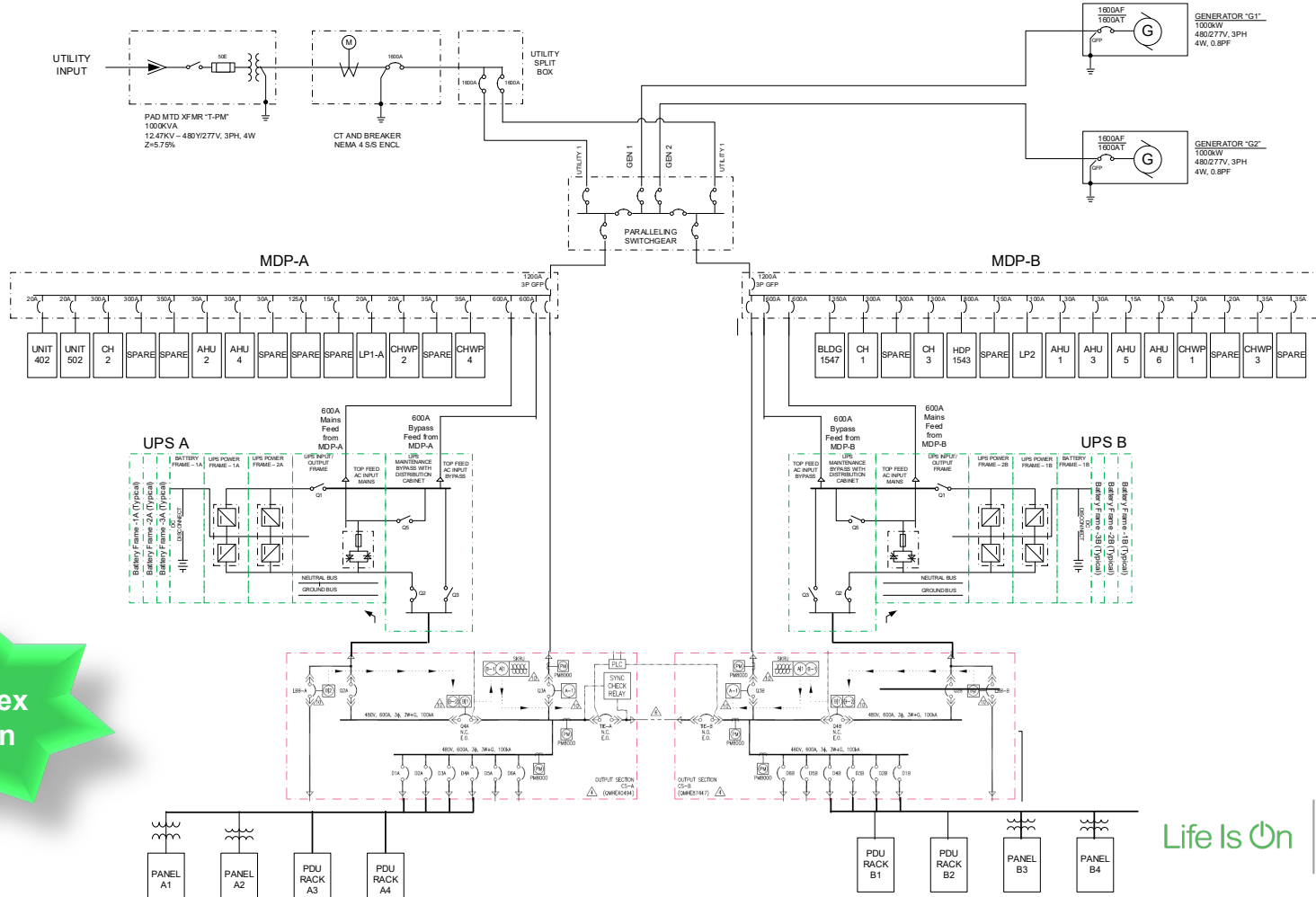
- Drives Complexity

Human Factors

- Qualifications
- Turn-Over

Simplicity of Design

Facility New One-Line Diagram

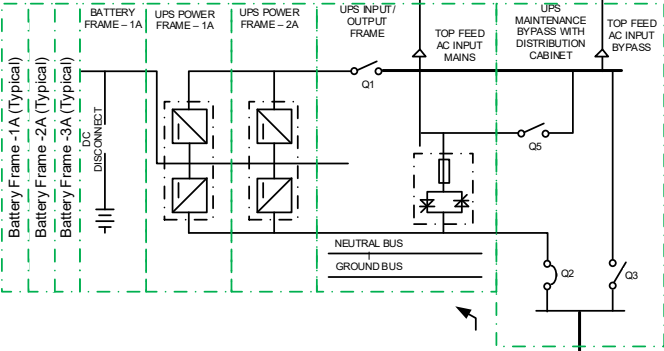


Complex Design

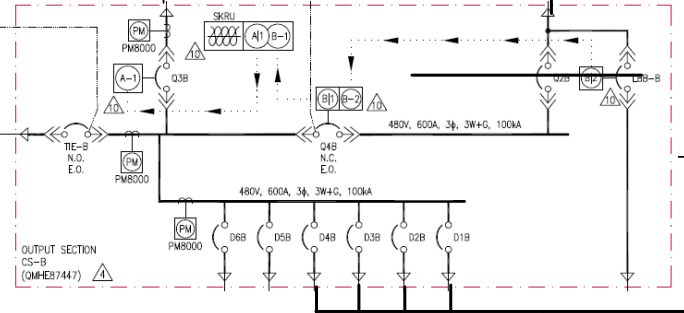
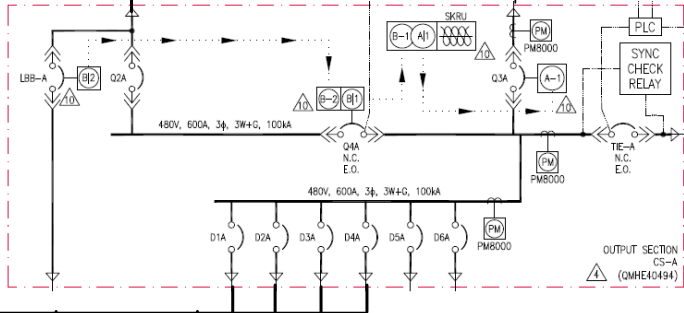
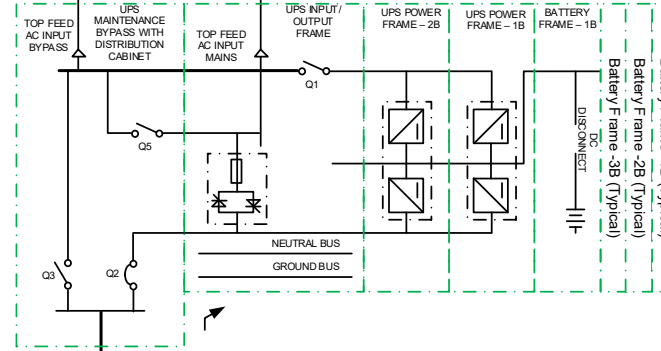
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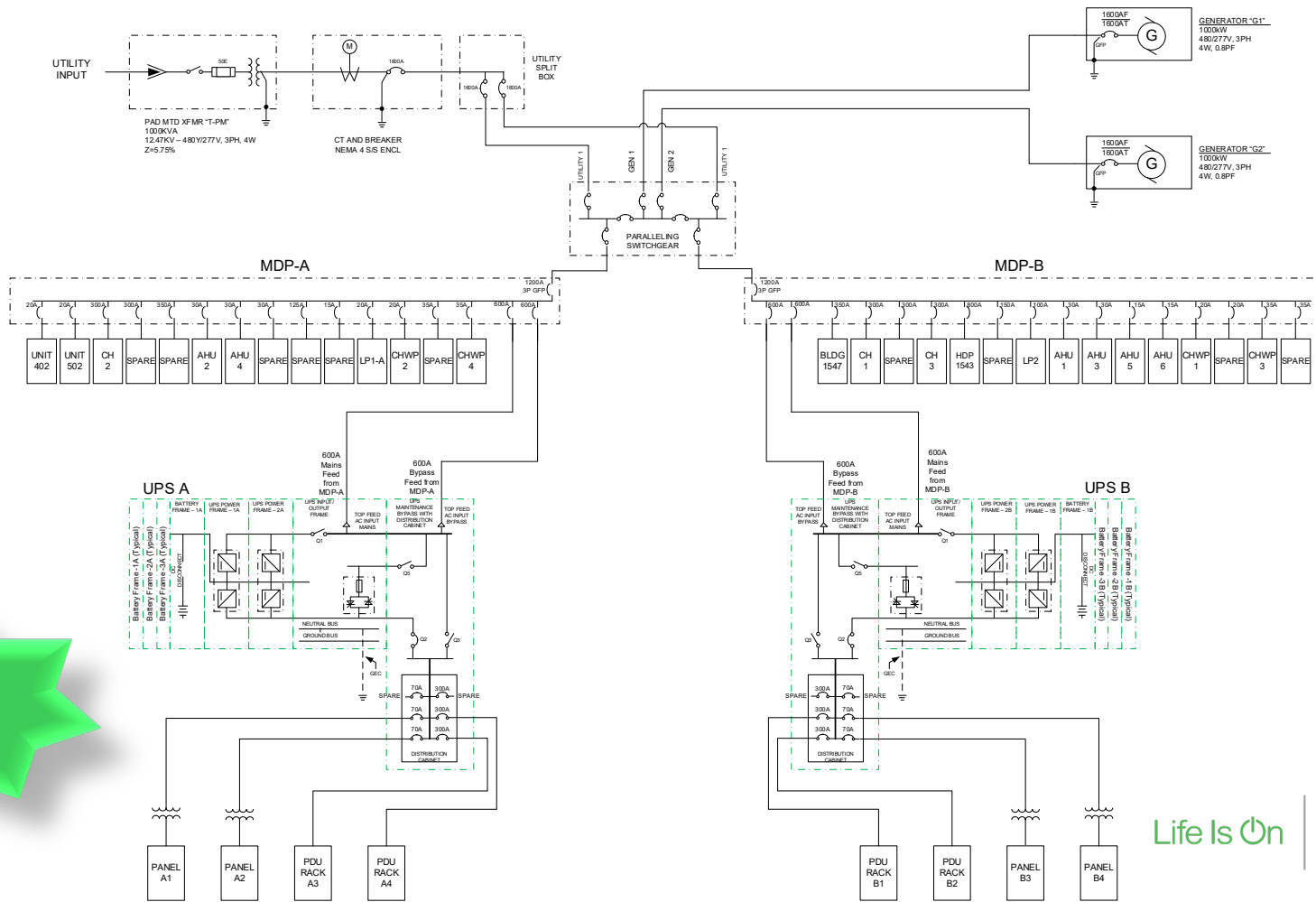
UPS A

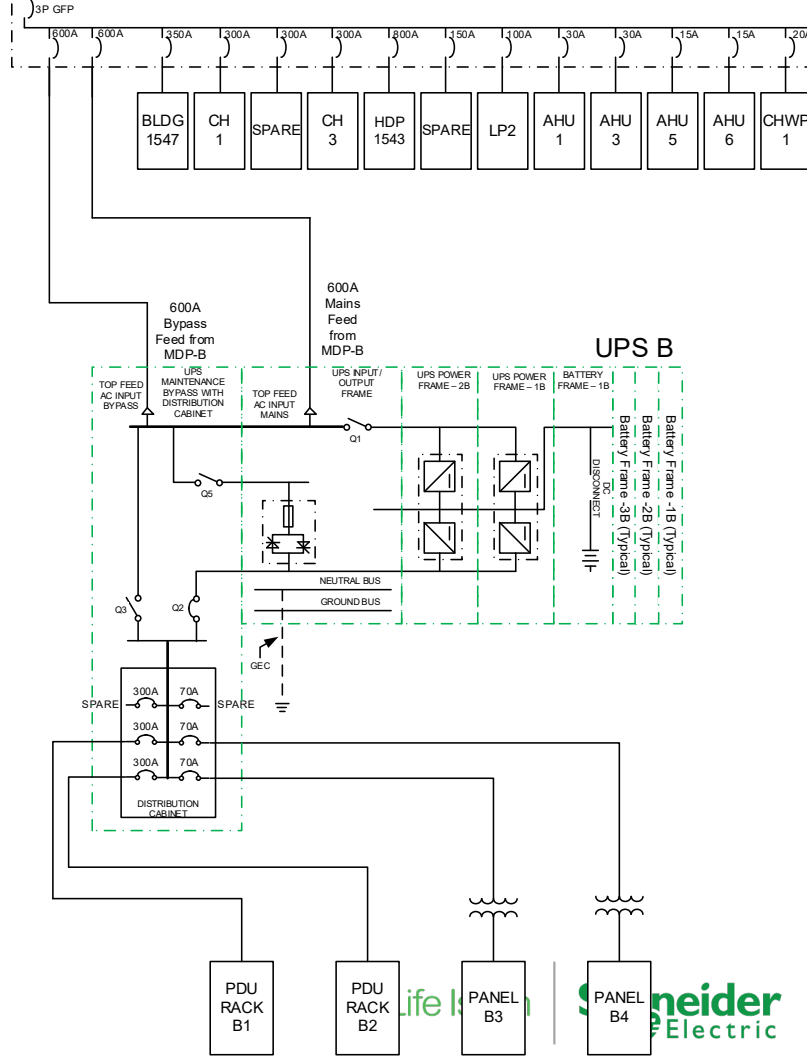
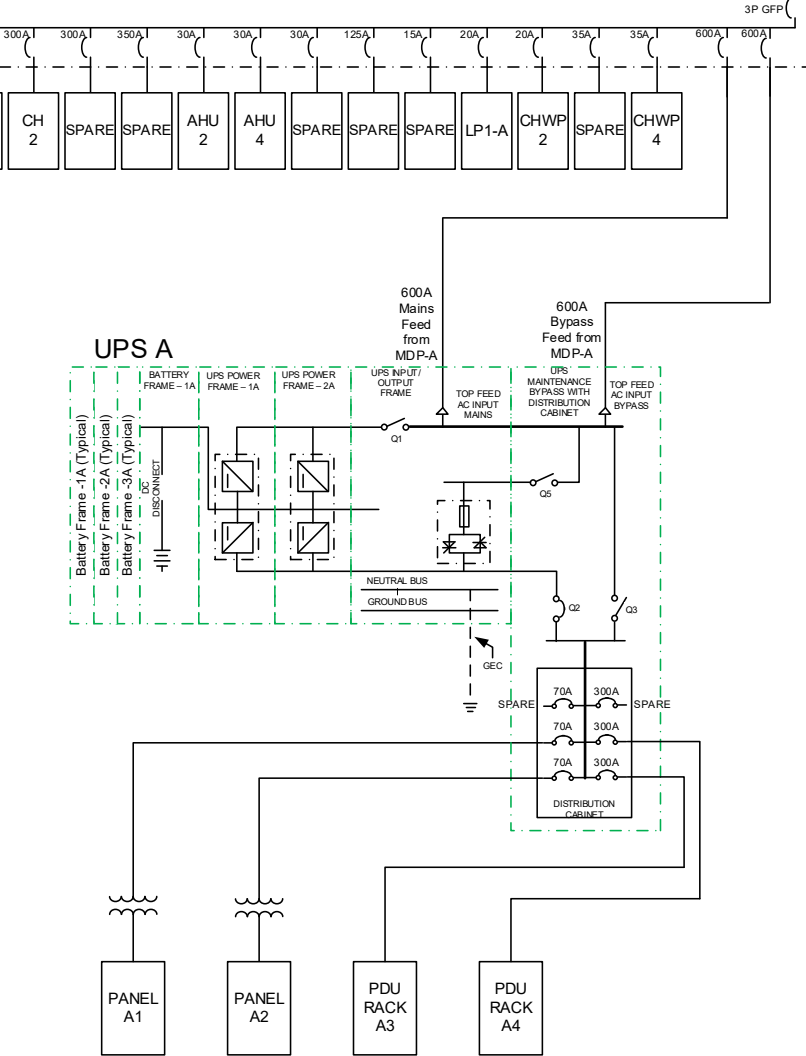


UPS B



Facility New One-Line Diagram





Ease of Repair Considerations

User Maintainability

- Training
- Modularity

Access to Service Representatives

- Location
- Response Time

Ease of Repair



**Complex
Component**

Component Number	Component Quantity	Component Description
Relsd SKU		
0J-0M-4133	1	CIRCUIT BRKR BOX SYM MW PSU - SPARE PART
0J-0N-0011	2	ASSY FAN MODUL EMEA
0J-0N-0966	1	ASSY MAINCONTROLLER PARALLEL OPERATION
0J-0P0958	1	ASSY PCB MW CONN PLANE W/ CONTROL / EMO
0J-0P4501AF	2	ASSY PMC FOR SYMMETRA MW
0J-0P4506AA	3	ASSY PM INTERFACE FOR SYMM
0J-0P4510AB	1	ASSY FAN CAN I/O FOR BV
0J-0P4527AA	1	ASSY FAN SPEED CONTROL FOR BV
0J-0P4527AB	1	ASSY FAN SPEED CONTROL FOR BV
0J-0P4530AA	1	PCB ASSY BACKPLANE FOR PAR. OP. BV
0J-0P4595AB	1	INT MAIN/BYPASS SSW INTERF FOR BV (EMEA)
0J-0P4623AA	1	ASSY PCB FAN CONTROL FOR EMEA BV
0M-4132A	2	SUB ASSY FOR MAIN PSU SY M
0M-4133A	1	SUB ASSY CIRCUIT BREAKER BOX SYMMETRA MW PSU
0M-5373	1	SET OF AIR FILTER 1400KVA SYM MW
0N-0011	2	ASSY FAN MODUL EMEA
0N-0013	1	ASSY TOP MODUL FANS/PMC EMEA
0N-0017	1	ASSY PMC BOX BV
0N-0218A	1	ASSY MAINCONTROLLER PAR OP
0P0957	1	ASSY PCB SYMM MW CONN PLANE W/ CONTROL
0P4501	2	ASSY PMC FOR BV
0P4506C	3	ASSY PM INTERFACE FOR BV
0P4510B	1	PCB ASSY FAN CAN I/O FOR BV
0P4527	1	ASSY FAN SPEED CONTROL FOR BV
0P4530A	1	PCB ASSY BACKPLANE FOR PAR. OP. BIG VIKING
0P4595C	1	INT MAIN/BYPASS SSW INTERFACE FOR BV (EMEA)
0P4623	1	ASSY PCB FAN CONTROL FOR EMEA BV
0W2039C	5	WIRE ASSY SET TOP FAN SYMMETRA MW EMEA
0W2104A	1	WIRES SET INV SEC 800KVA EMEA
490-0041	1	FAN 225X225X80 230V AC 17.2m3/min 59dB
511-0050	10	FUS 20A 500V 0 CLIP/FUSE HOLDER 0.25"X1.

Component Number	Component Quantity	Component Description
Relsd SKU		
511-1004	10	FUSE FAST4A 500V 0017079
515-1251	6	FUSE FAST 250A 660V
515-1501	9	FUSE FAST 500A 690V
515-3000	3	FUSE FAST 3000A 500V
516-0001	10	FUSE FAST 1A 6.3X32MM 415V
516-0065	10	FUSE FAST 0.5A 600V 10X38MM
516-0066	10	FUSE SLOW 1.4A 500V 10X38MM
516-0076	10	FUSE FAST 0.315A 6.3X32MM 380V
W0M-4132	2	Sub Assy For Main PSU SY M - Spare Part
W0M-5373	1	Set of Air Filter 1400KVA SYM MW
W0N-0011	2	Assy Fan Module EMEA - Spare Part
W0N-0013	1	Assy Top Module FANS/PMC EMEA - Spare Part
W0N-0017- OPT2	1	Power Module Controller Box For Symmetra Mega Watt - Spare Part
W0N-0966	1	Main Controller Parallel Operation - Spare Part w/ old FPGA
W0P0957	1	Assy PCB SYMM MW Conn Plane W/ Control - Spare Part
W0P4501-OPT2	2	Power Module Controller Board for Symmetra MW - Spare Part
W0P4506	3	Assy PM Interface For BV - Spare Part
W0P4510	1	PCB Assy Fan Can I/O For BV - Spare part
W0P4527	1	Assy Fan Speed Control For BV -Spare Part
W0P4530	1	PCB Assy Backplane For PAR. OP. Big Viking - Spare Part
W0P4595	1	INT Main/Bypass SSW Interface For BV (EMEA) - Spare part
W0P4599	1	Assy SSW Driver Stage BV EMEA - Spare Part
W0P4623	1	Assy PCB Fan Control for EMEA BV - Spare Part
W490-0041	1	Fan 200MM 230V 1000M3/H Hall - Spare Part
W511-0050	10	FUSE FAST 20A 500V 6.3X32 - SPARE PART Qty1
W511-1004	10	Fuse - Fast 4A 500V - Spare Part
W515-1251	6	FUSE FAST 250A 660V - SPARE PART Qty1
W516-0001	10	Fuse Fast 1A 6.3X32MM 415V - Spare Part
W516-0065	10	Fuse Fast 0.5A 600V 10X38MM - Spare Part
W516-0066	10	Fuse Slow 1.4A 500V 10X38MM - Spare Part
W516-0076	10	FUSE FAST 0.315A 6.3X32MM 380V SPARE PART Qty1
W516-1016	10	Fuse Fast 16A 660VAC 10X38MM - Spare Part

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Ease of Repair



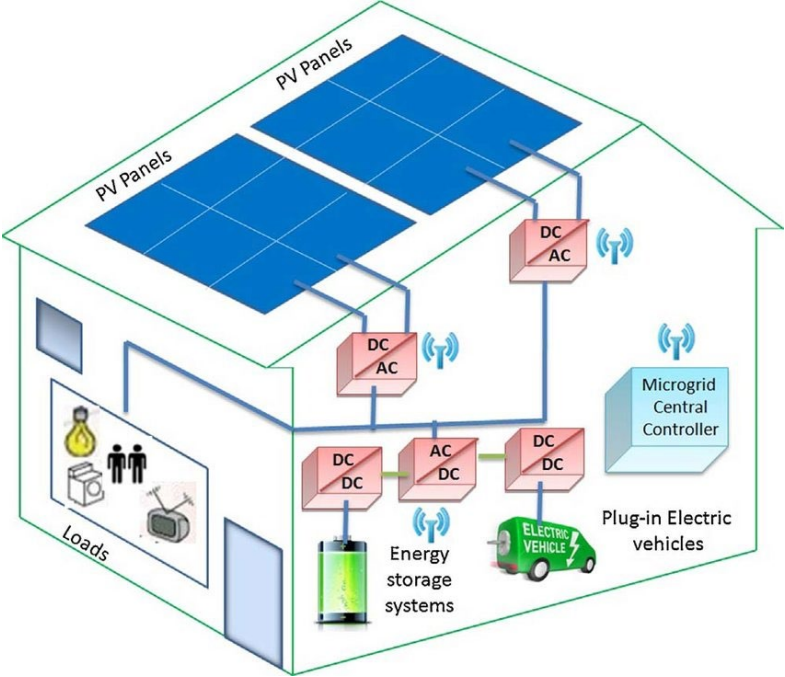
Component Number	Component Quantity	Component Description
Relsd SKU		
W515-1100	1	Semic Fuse 1100A 690V 200kA - Spare Part
WSYSW500KD	1	Stac Bypass Switch 500 KVA - Spare Part
WSYFAN	1	Fan For SYSW250KD And SYPM25KD - Spare Part
WSYPSU	1	System Power Supply Unit Board For SYIOF500KMBR & SYBFXR8 - Spare Part
SYPM25KD	2	APC Symmetra PX 25kW Power Module, 400/480V

Simple
Component

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Resilient Residential Nanogrids



Residential Layer 1

Inside the Facility:

- Power Distribution
 - Critical Bus
 - Non-Critical Bus
- Control/Monitoring
 - Transformer
 - Monitoring



Residential Layer 2

Outside the Facility:

- Renewable Energy Generation
- Energy Storage



Residential Layer 3

Remote:

- Utility Power

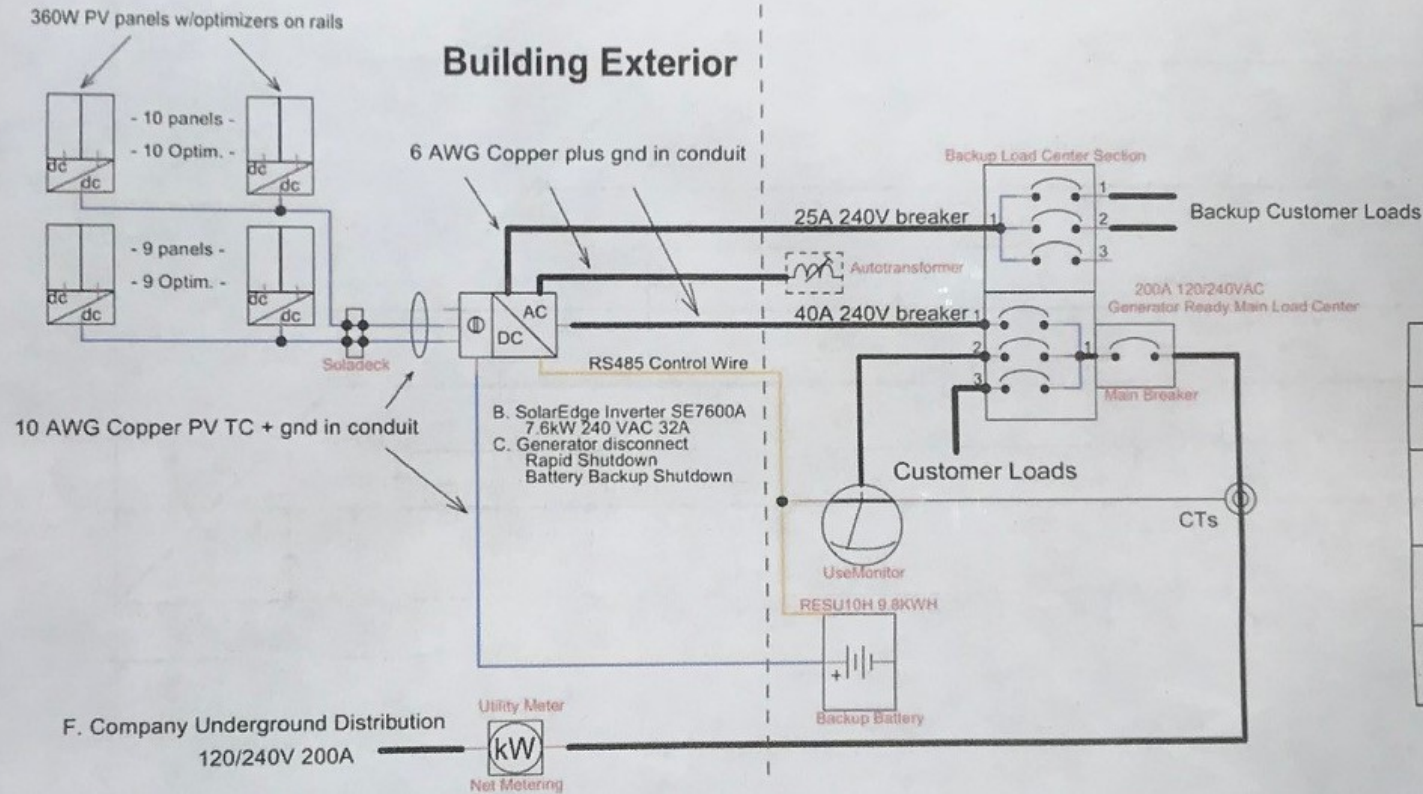


Residential Nanogrid One-Line

A. System Size: 6.84 kW DC, 7.6kW AC

19 Seraphim Solar 360W Panels, 19 SE-P400 Optimizers, 1 S

Building Roof mounted with IronRidge Flashings a



Residential Critical Loads



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Residential Disaster Recovery



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