

FORTRESS
POWER

Secure your energy

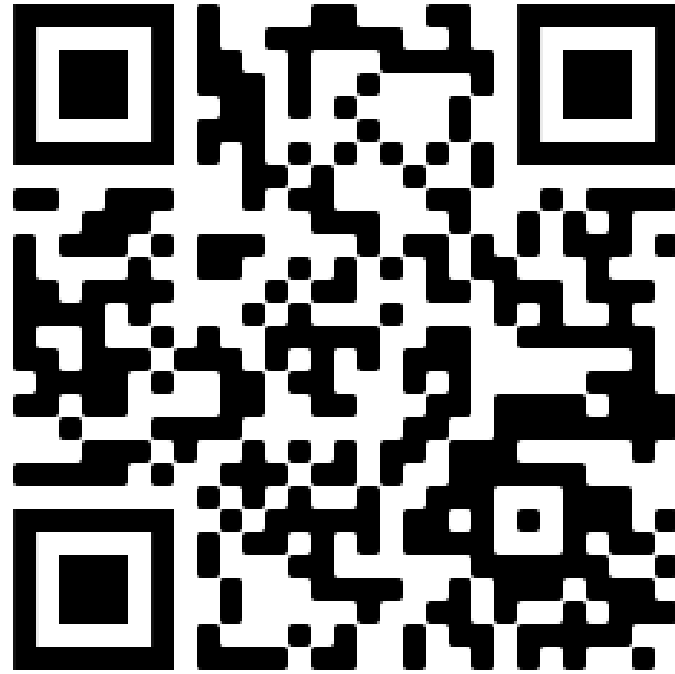
NABCEP Round Table Residential Battery Sizing

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Please take our survey:



<https://forms.gle/UUtSAYvDUfvS8T2i8>

Fortress Power

U.S. Headquarters - Southampton, PA (north of Philadelphia)

Lithium iron phosphate manufacturer for residential and commercial

- Test Lab with SMA/SolArk/Outback/Victron/Magnum/More...
- Distribution Centers in Florida, Texas, and California
- Robust presence in Latin America + South America
- As far as Indian Ocean
- utility provider for SEPTA + Hydro Quebec





Minimum Battery Sizing

Main Products

Contactor-based BMS w/ prismatic cells

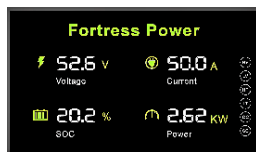


eVault MAX 18.5 kwh

- 9.2kW output
- “C/2”
- “2 Hour Battery”

eFlex 5.4kwh

- 5kW output
- “1C”
- “1 Hour Battery”



Battery + Inverter Minimum Sizing



- Capacitors are faster than batteries
- Proper sizing is not JUST about energy and power at 1C or C/2
- 1s / 100 ms / 10 ms “burst modes” + short circuit ratings
- “pre-charge” circuits may need to engage multiple times
- “pre-charge” circuits can fail due to improper sizing / quality selection



1 eVault MAX (9kW) per inverter (up to 9kW)

will adjust firmware to meet Sol-Ark 15kW in closed loop

ex. 12kW - 30 minute surge

exceeding minimum size is still a good idea

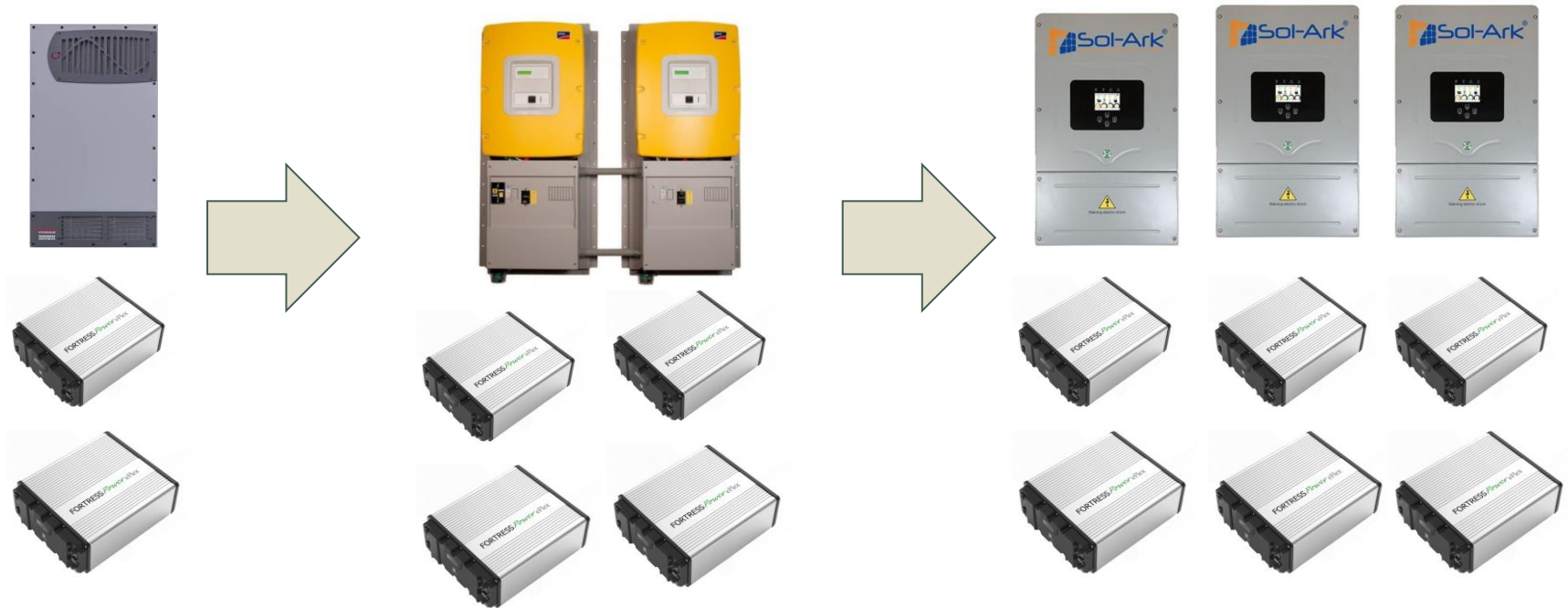


2 eFlex (5kW) per inverter (up to 9kW)

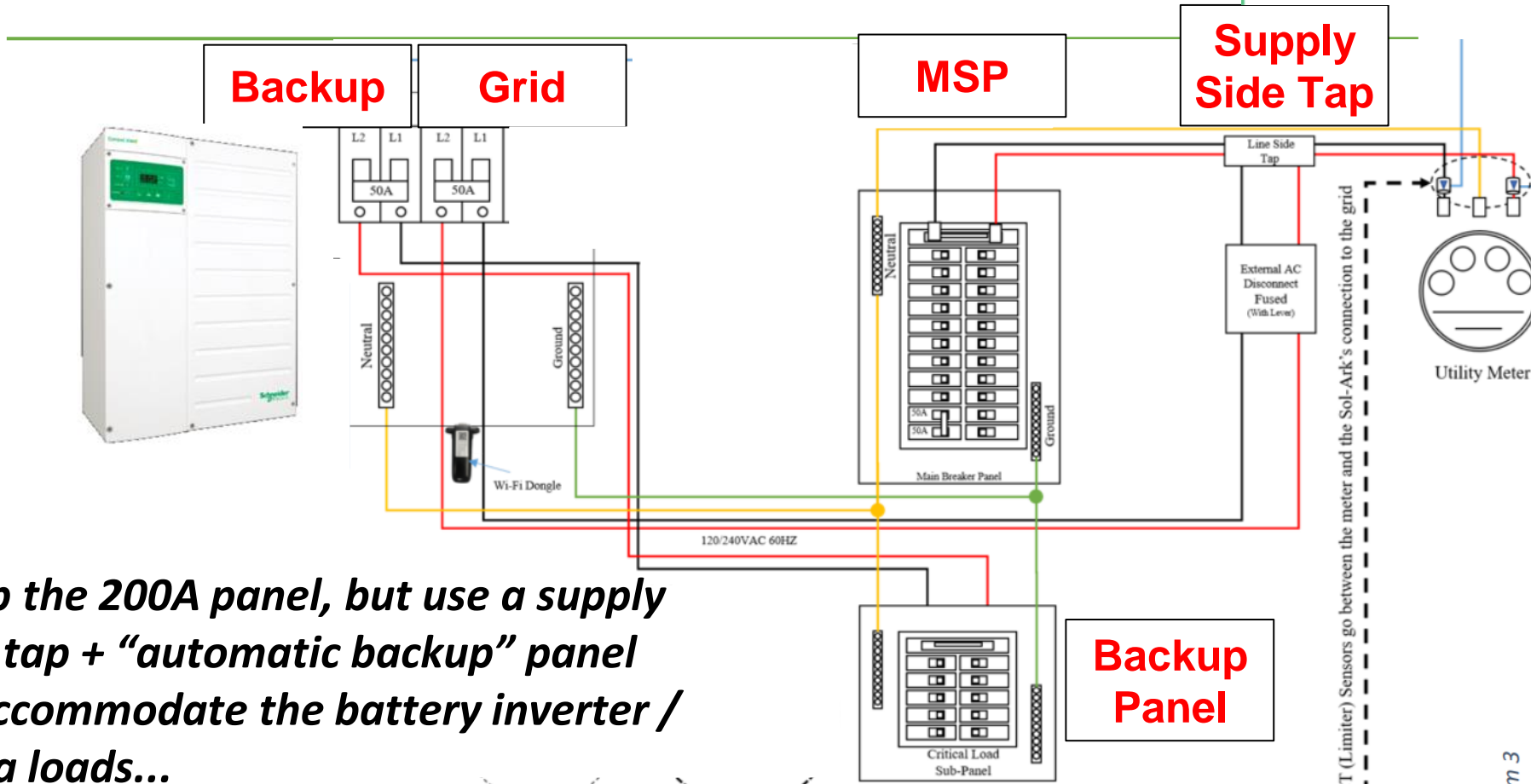
ex. 12kW = 3 eFlex minimum

4 makes full use of cabinet

exceeding minimum size is still a good idea



Traditional Battery Inverters



Keep the 200A panel, but use a supply side tap + “automatic backup” panel to accommodate the battery inverter / extra loads...

(Limiter) Sensors go between the meter and the Sol-Ark's connection to the grid

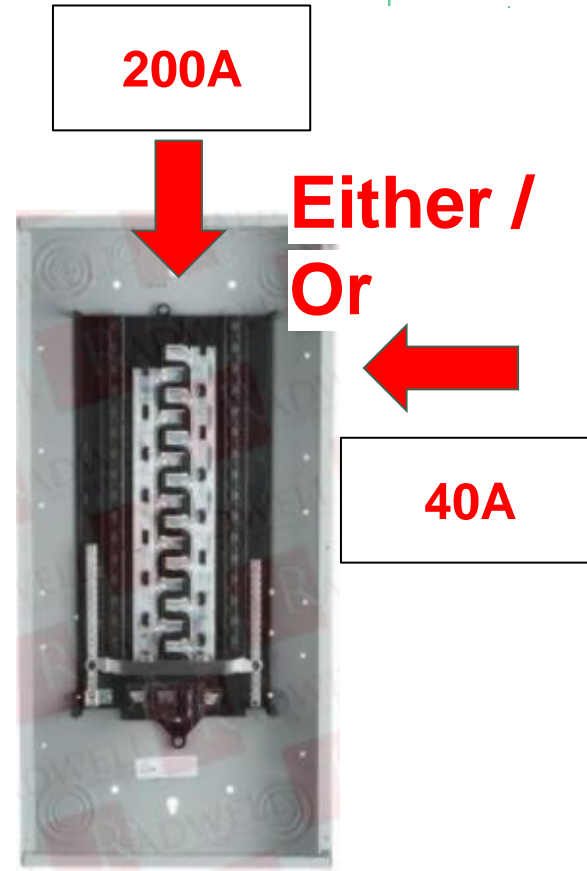
Generator Interlock Switch



NSD200A Square D
Generator Interlock
kit QO and Homeline -
Anodized

Brand: OPULARS
 ★★★★★ 143 ratings
 | 14 answered questions
 Amazon's Choice in Night-Lights b...

Price: \$53.97
 Get \$50 off instantly: Pay \$3.97
 \$53.97 upon approval for the
 Amazon Rewards Visa Card. No
 annual fee.



Cheap “whole house” backup - 2021

Reliable

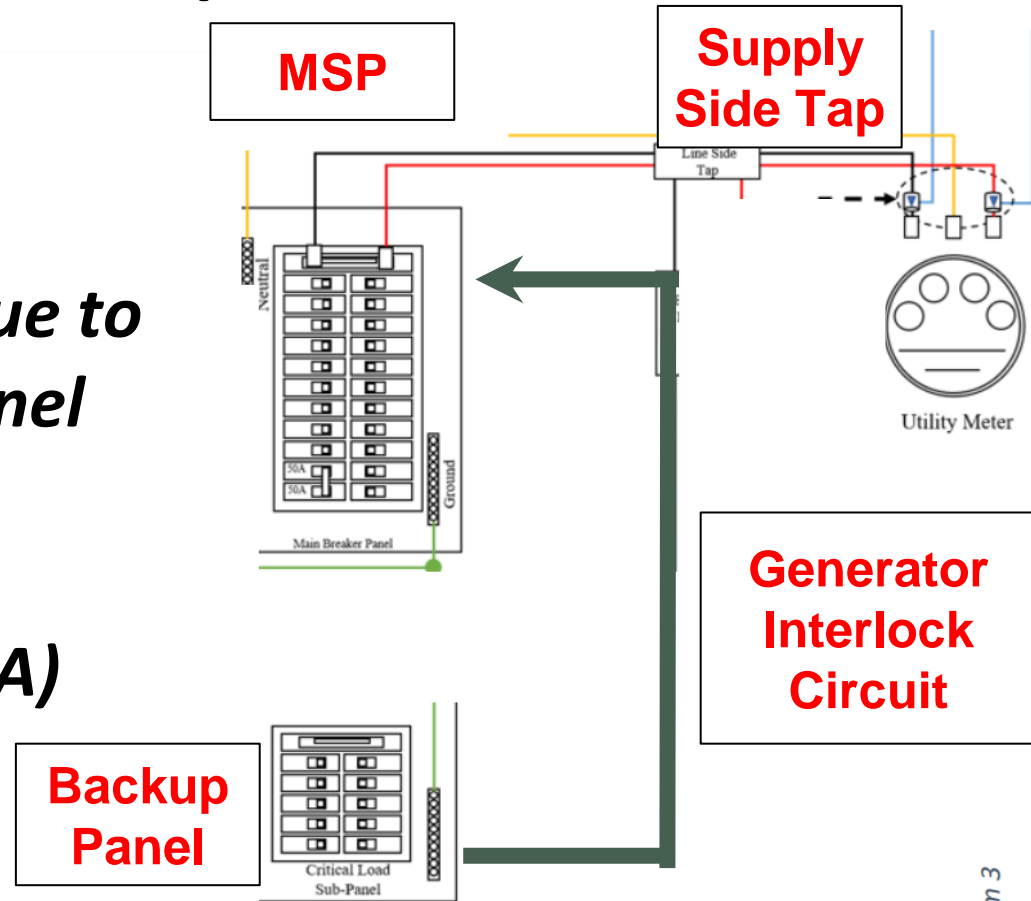
Affordable

Not allowed in all AHJ due to modification of main panel

\$60 generator interlock

\$150 cables/conduit (50A)

~30 minutes labor



Automatic Backup Needs

- Refrigerator / Freezer
- Internet
- Garage Door
- Entrance/Exit Lights
- Kitchen Appliance
- Master Bedroom/Bathroom
- Well pump
- Television

Other Wants

- Air Conditioning
 - 8kW startup
 - 4kW run
- Hot Water (8kW)
- the kitchen sink

Battery Inverters - 2022



200A grid pass-through allows “full use of panel” when grid tied

Still limited to size of inverter and battery when “off-grid”



Example – 12kW Battery Inverter

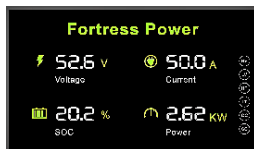
eVault MAX 18.5 kwh



- 9.2kW output
- Needs 2 batteries*
- ~\$22k
- 37 kwh

eFlex 5.4kwh

- 5kW output
- Needs three batteries
- ~\$11k
- ~16 kwh



Closed Loop Example – 12kW Battery Inverter



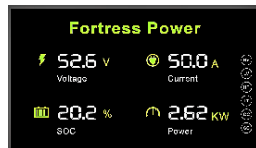
eVault MAX 18.5 kwh

3 x eFlex 5.4kwh



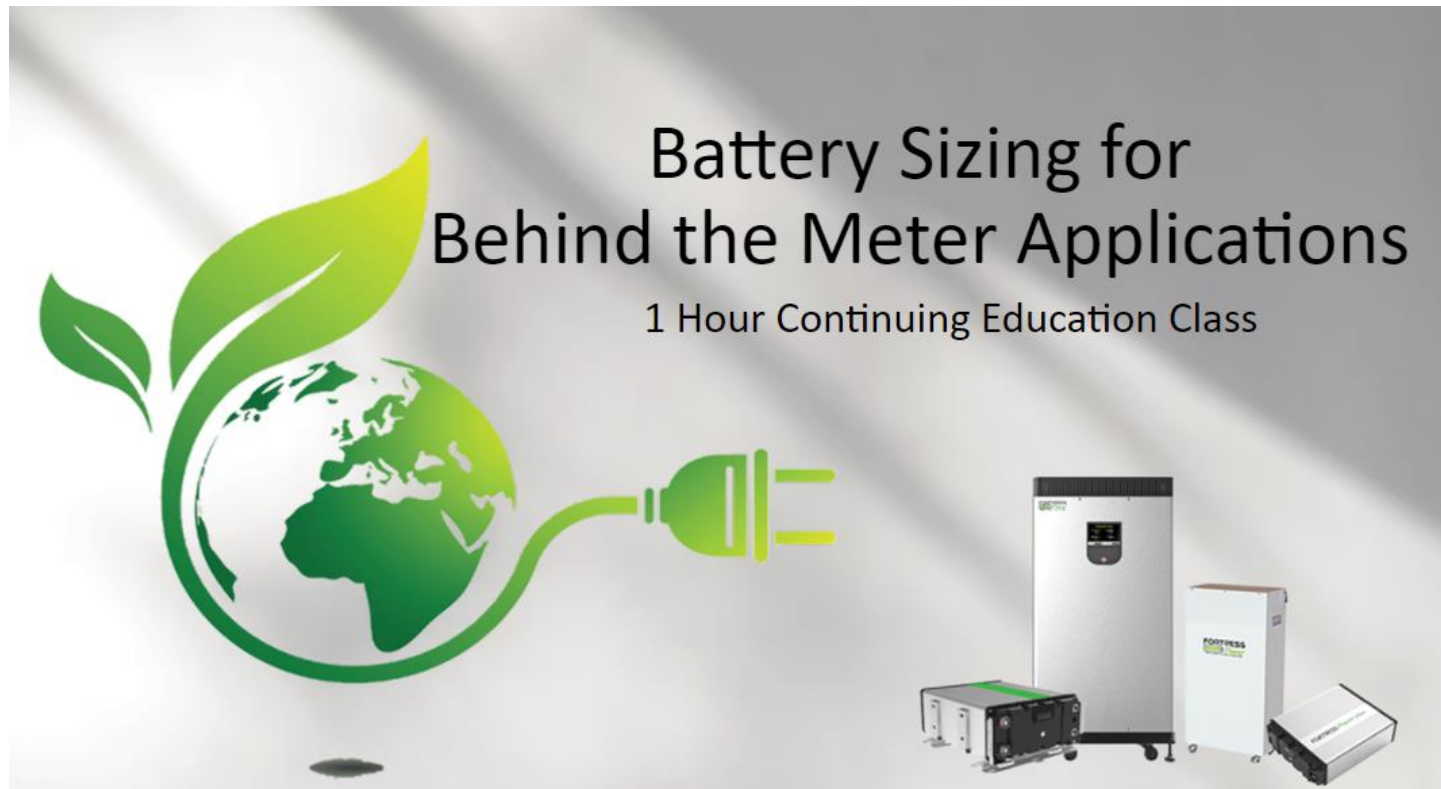
- ~~9.2kW~~ 12kW output
- Need 1 battery in closed loop
- 12kW capability is <60 minutes
- i.e. capable of discharge rates faster than C/2 but not ideal

- 15kW output for 1 hour
- Still only ~60 minutes at full power
- Requires closed loop for 5kW rating





Determining actual “backup” run time





“1 Hour” or “2 Hour” nomenclature doesn't match reality

	A	B	C	D	E
1		Consumption (kwh)	Days	Hours	Hourly Average kW
2	Jan	1500	31	744	2.0
3	Feb	1000	28	672	1.5
4	March	800	31	744	1.1
5	April	800	30	720	1.1
6	May	800	21	504	1.6
7	June	1000	30	720	1.4
8	July	1500	31	744	2.0
9	August	2000	31	744	2.7
10	September	2000	30	720	2.8
11	October	1500	31	744	2.0
12	November	1000	30	720	1.4
13	December	1500	31	744	2.0
14	Annual	15400	355	8520	1.8



We have a design tool for quantifying grid reliance

	With Battery	Without Battery
% Building Consumption from Site Energy System	49%	41%
% Building Consumption from Grid or Generator	51%	59%
Annual Consumption (kwh)	17616	17616
PV generation (kwh)	15050	15050
Total Grid/Generator Days	365	365
Total Grid/Generator Run Hours	1006	8760
Grid/Generator Hours Per Use	2.8	24
Grid/Generator Reliance	11.5%	100%
% PV Sold Back or Stranded	43%	52%
% PV Instant Consumption	48%	48%
% PV Stored	9%	0%

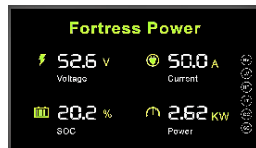
<https://fortresspower.trainercentral.com/>

Take Notes Here										
Simulations	A	B	C	D	E	F	G	H	I	J
Array Size	12.0	16.0	16.0	22.0	16.0	24.0	24.0	32.0	45.0	45.0
Battery Size	10.8	21.6	43.2	21.6	64.8	43.2	64.8	74.0	111.0	148.0
Grid Consumption	51%	33%	19%	28%	17%	11%	8%	4%	0%	0%
Grid/Gen Days	365	313.0	162.0	296.0	133.0	103.0	74.0	42.0	0.0	0.0
PV Sold-Back/Stranded	43%	42%	29%	54%	42%	48%	46%	58%	69%	69%
PV Offset	85%	114%	114%	157%	114%	171%	171%	228	320	320%
Grid Reliance	11.50%	7.40%	4.30%	6.40%	3.80%	2.50%	1.90%	0.90	0%	0%

Battery Sizing Conclusions



- For best results, 2x inverter kW output = battery size kwh
- At minimum, 1x inverter kW output = battery size kwh
- If smaller, quality is even more important
 - “1C” capable vs. intentional
- Some backup is better than no backup power
- Time-of-use metering may only need small batteries
- Additional batteries reduces grid reliance

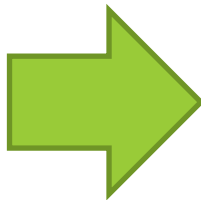


Support Portal

The screenshot shows the top navigation bar with the Fortress Power logo, 'Support Center' text, and a search box. Below the navigation bar are five content cards:

- Troubleshooting - General**: Basic troubleshooting that applies to all Fortress batteries.
- Inverter Guides**: Inverter related items.
- eFlex**: Knowledge base for eFlex.
- eVault MAX**: Technical Knowledge Base for the eVault MAX.

Login



This screenshot is identical to the one on the left, but with a red rectangular box highlighting the 'Login' button in the top right corner of the navigation bar. The rest of the page content is the same as the previous screenshot.



Thank You



For More Information:

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