



Fortress Power

Energy Storage Systems

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Topic

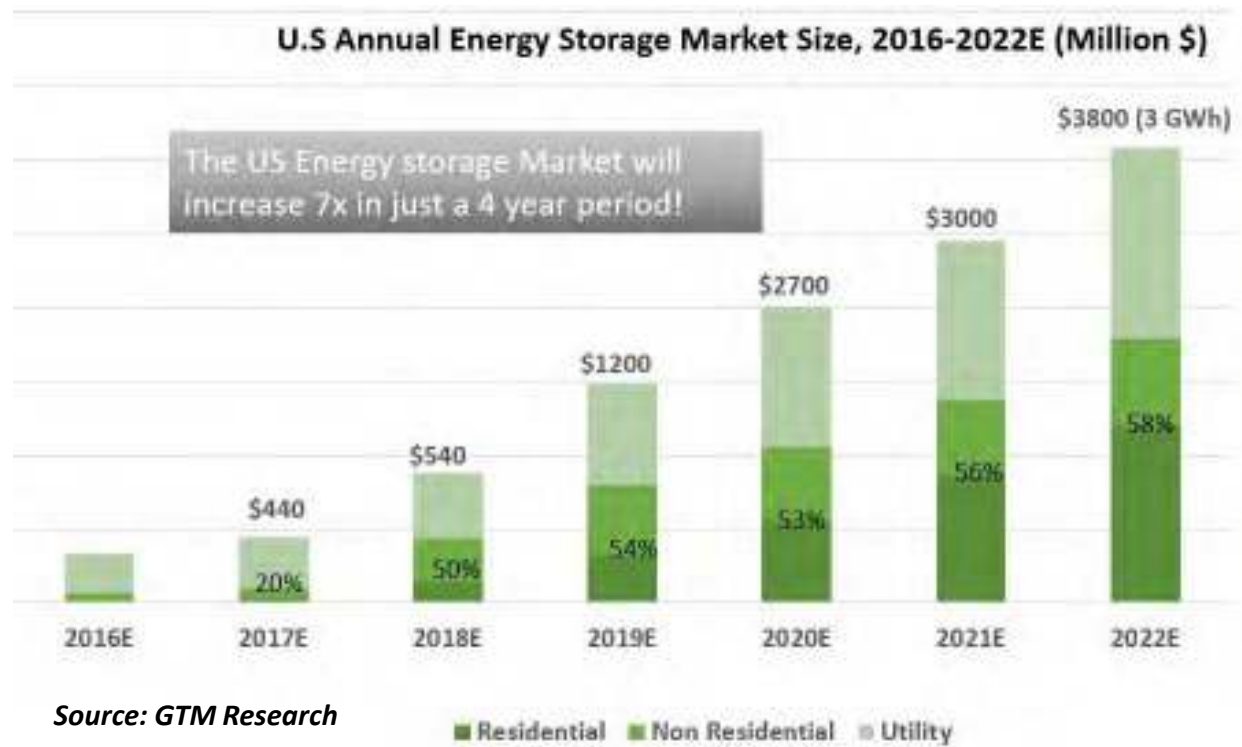
- Growth Opportunity
- Company Introduction
- Fortress Lithium Battery
- Battery Technology Comparison
- Sol-Ark 8 KW Hybrid Inverter
- Q&A



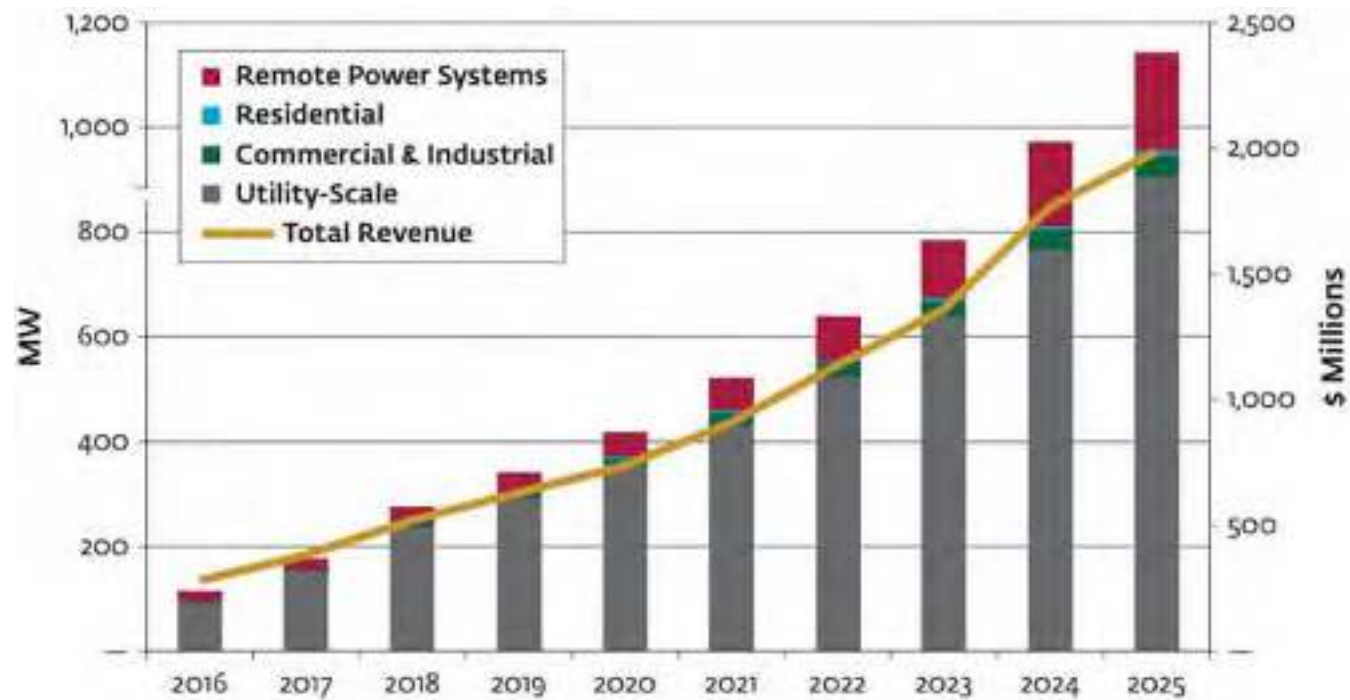
Growth Opportunity



US Energy Storage Market

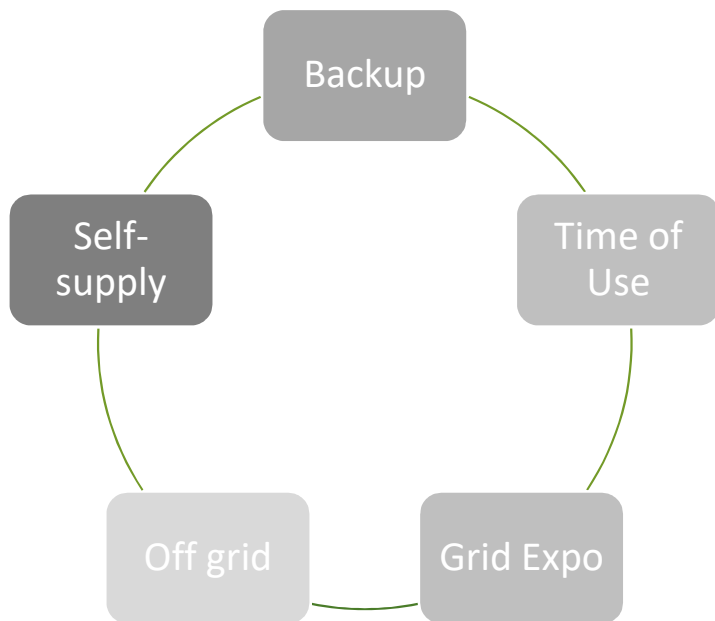


Central & Latin America Energy Storage Market



Annual stationary Energy Storage Deployments by Segments Central & Latin America, (2016-2025); Source IFC ES Report

Energy Storage Benefits



Back Up Your Facility

Power your facility when the grid is off; keep solar panels running during outages.



Maximize Your PV Production

Store excess solar power for later use.



Save Money on your Electric Bill

Charge the batteries at off-peak times; discharge them during peak periods.



Tax and Incentives

30% ITC available if it's powered by solar; enjoy state and utilities rebates

Company Introduction



Company Introduction

A world-leading manufacturer who brings automotive Lithium Ferro Phosphate batteries to the energy sector



U.S Headquarters, Southampton, PA
(30,000 Sqf)



Manufacturing Facility, Shenzhen China
(since 2008)



Fortress Lithium Battery

Lithium Ferro Phosphate Technology

We incorporate the safest technology available into our batteries.

	Fortress Power	Tesla, LG Chem, Panasonic
Chemistry	Lithium Ferro Phosphate (LFP)	Lithium Ion or Nickel- Magnesium -Cobalt (NMC)
Safety	✓	X
Eco-friendly	✓	X
Life Cycles	6000	< 3000
Operating Temperature	32– 140 °F	32 – 113 °F
Degradation Rate		LFP < NMC
Energy density		LFP < NMC

Search LFP vs. NMC nail test videos on YouTube

Lithium Ion Safety Concerns

Terrifying moment 35 firefighters struggle to tackle an enormous blaze after a Tesla Model S crashes in Austria and turns into an INFERNO

- The fire started after the 19-year-old driver crashed into a motorway barrier
- 35 crew members battled the blaze while wearing special breathing equipment
- Electric car fires are especially hard to put out because they often relight
- The battery must be cooled enough to cut the power supply



Tesla Spontaneously Catches Fire, Burns Down During Test Drive In France



by Tyler Denton
Mon, 08/14/2018 - 08:08

0
SHARES



After Tesla's latest problem involving a Model S crash in Beijing while in autopilot mode (which has since prompted the carmaker drop remove "autopilot" from its Chinese website), Elon Musk may have to return to a more familiar problem plaguing his vehicles: spontaneous combustion.

Fortress Lithium Batteries

LFP-10 & 15



eVault 16.5



- ✓ ***Safe Lithium Chemistry***
- ✓ ***Large Capacity for Easy Installation***
- ✓ ***98% Round Trip Efficiency***
- ✓ ***Long Lasting***
- ✓ ***Competitively Priced***
- ✓ ***Lowest Cost Per Cycle***
- ✓ ***Maintenance-free***

Technical Specification

	LFP-10	LFP-15	eVault 16.5
Total Energy [KWH]	10.2	15.4	18.5
Usable Energy [KWH]	10.2	15.4	16.5
Capacity [AH]	200	300	360
Battery Voltage [V]	48V		
Max. Charge Current (Continuous) [A]	100	100	150
Max Discharge Power (Continuous) [KW]	5 (100A)	5 (100A)	8.2 (160A)
Peak Output [KW]	7.5 (150A)	7.5 (150A)	12 (240A)
Parallel Stacking	2	2	8
LCD Monitoring	No	No	Yes
Communication	N/A	N/A	CAN/RS485
Warranty	10 years; up-to 6,000 cycles		

Smart Battery Management System (BMS)

Multilevel Safety Concept for Highest Reliability

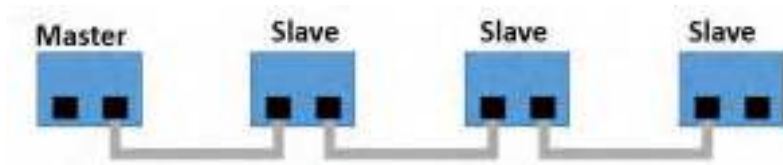
- ✓ Overcharge and Deep Discharge Protection
- ✓ Over-heat Protection
- ✓ Over Current Protection
- ✓ Cell Monitoring and Balancing
- ✓ Voltage and Temperature Monitoring



LCD Monitoring of eVault 16.5

Information on LCD Display:

- ✓ Voltage
- ✓ Current Output
- ✓ State of Charge
- ✓ State of Health
- ✓ Safety Warning: Over-charging & -discharging;
Over Current; Over-Heat
- ✓ Voltage of slave units



Battery Technology Comparison



Comparison of different Battery Technologies

	Fortress LFP	Lithium Ion	Li-Polymer	Flooded LA**	AGM**	Carbon AGM**	Nickel Iron
Round trip efficiency	98%	95%	95%	80%	88%	94%	65%
Cost of 10 kWh Usable Power (MSRP)	6,900	6,999	4,500	2,800	3,600	5,000	18,000
Cycle Life	6,000	2,500	1,500	600	750	2,400	8,000
Off Grid Years	16.4	6.8	4	2.7	2	6.5	21.9
Cost per Cycle per kWh	0.11	0.28	0.30	0.46	0.48	0.21	0.23
Safety	Yes	No	No	No	No	No	Yes
Free Maintenance	Yes	Yes	Yes	No	Yes	Yes	No

* Additional \$ 1000 may apply to Flooded LA – Nickel Iron batteries

**Lead Acid and AGM can only be discharged to 50%

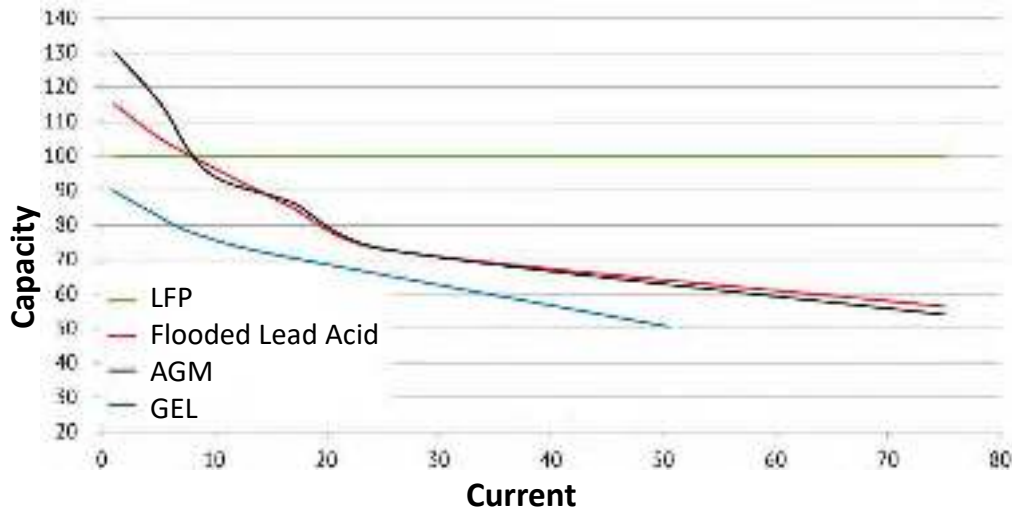
Comparison Chart of Various Lithium Batteries

	Fortress Power	Simpliphi	Discover	LG Chem	Panasonic
Battery Chemistry	LFP	LFP	LFP	NMC	NMC
Safety	Y	Y	Y	N	N
Usable Power	10/15/16.5 kWh	2.5/3.5 kWh	6.6 kWh	9.3 kWh	2 kWh
Roundtrip efficiency	98%	98%	98%	94.5%	96.5%
LCD Display	Yes	No	No	No	No
Guaranteed Battery Cycles	6,000	10,000	5,000	2,500	2,800
Off-Grid years	16	27 **	13.6	6.8	7.7
Price per kWh	Low	High	High	Low	Low
Installation time	Low	High	High	Low	High
Cost per Cycle	Lowest	Mid	Mid	High	High

** Simpliphi uses low-cost MOSFET based BMS, which only lasts 10-15 years.

Performance Comparison

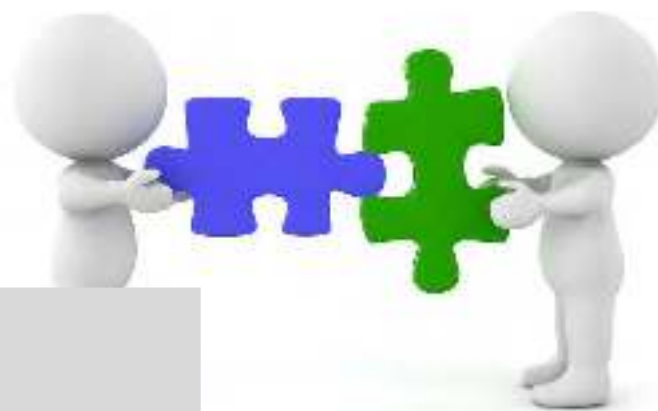
LFP vs Lead Acid at various discharge rate



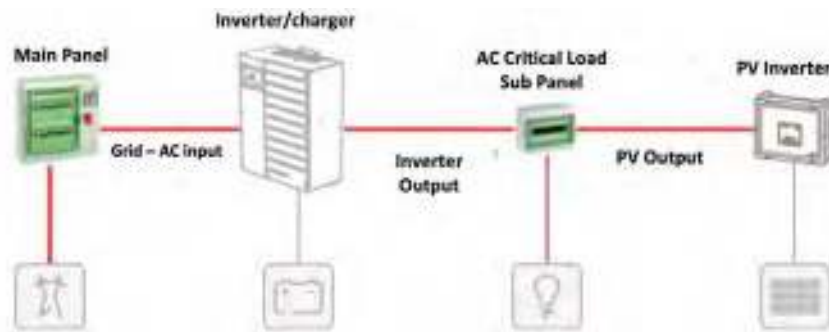
Disadvantages of Lead Acid:

- *Capacity drops significantly when output current increases*
- *6 times more space*
- *Higher cable cost and longer installation time*

Compatible Inverters



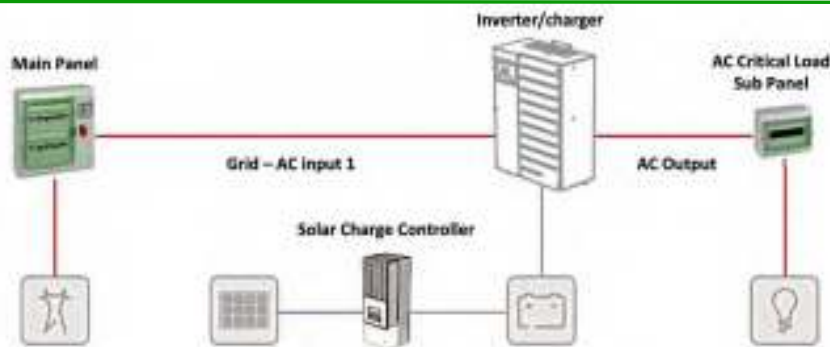
AC vs DC Coupled Solution



AC-Coupled System Diagram

Application for AC coupled solutions

- *When retrofitting to existing PV systems*
- *For new installations that require module level rapid shutdown*



DC-Coupled System Diagram

Application for DC coupled solutions

- *For new installation*
- *No additional PV inverter*
- *More efficient*

Compatible Inverters

COMPATIBLE WITH MOST 48V CHARGERS AND HYBRID INVERTERS!

Brand	Inverter/Charger Mode	Configuration
Sol-Ark	8 KW Inverter	AC or DC coupled
Schneider	Conext XW MPPT charge controller; Conext XW+ series; Conext SW;	AC or DC coupled
Outback	Skybox, FLEX max charge controller (48V), FLEXpower series (48V); Radian series (48V); FXR(A) and FXR (E) series (48V); GVFX and GVFX series (48V);	DC coupled
Magnum	MS 4448PAE; MS 4048-20B	AC or DC coupled
SMA	SUNNY ISLAND 4548-US/6048-US; SUNNY ISLAND 3.0M/4.4M/6.0H/8.0H	AC coupled
Victron	Phoenix VE.Direct Inverter; MultiPlus and Quattro Inverter/Charger; Skylla-TG Charger; General; Color Control or Venus GX	DC coupled
Morning Star	TriStar MPPT 600V; TriStar MPPT; Tristar PWM	DC coupled
Midnite Solar	Solar Classic 150, 200 & 250; Solar Classic 150, 200 & 250-SL	DC coupled



- Mission:
 - A Veteran owned engineering company dedicated to helping families be less dependent on our vulnerable Power Grid in an affordable way
- The most efficient & affordable Solar Storage inverter in the world
- No customer returns in 6 years of business



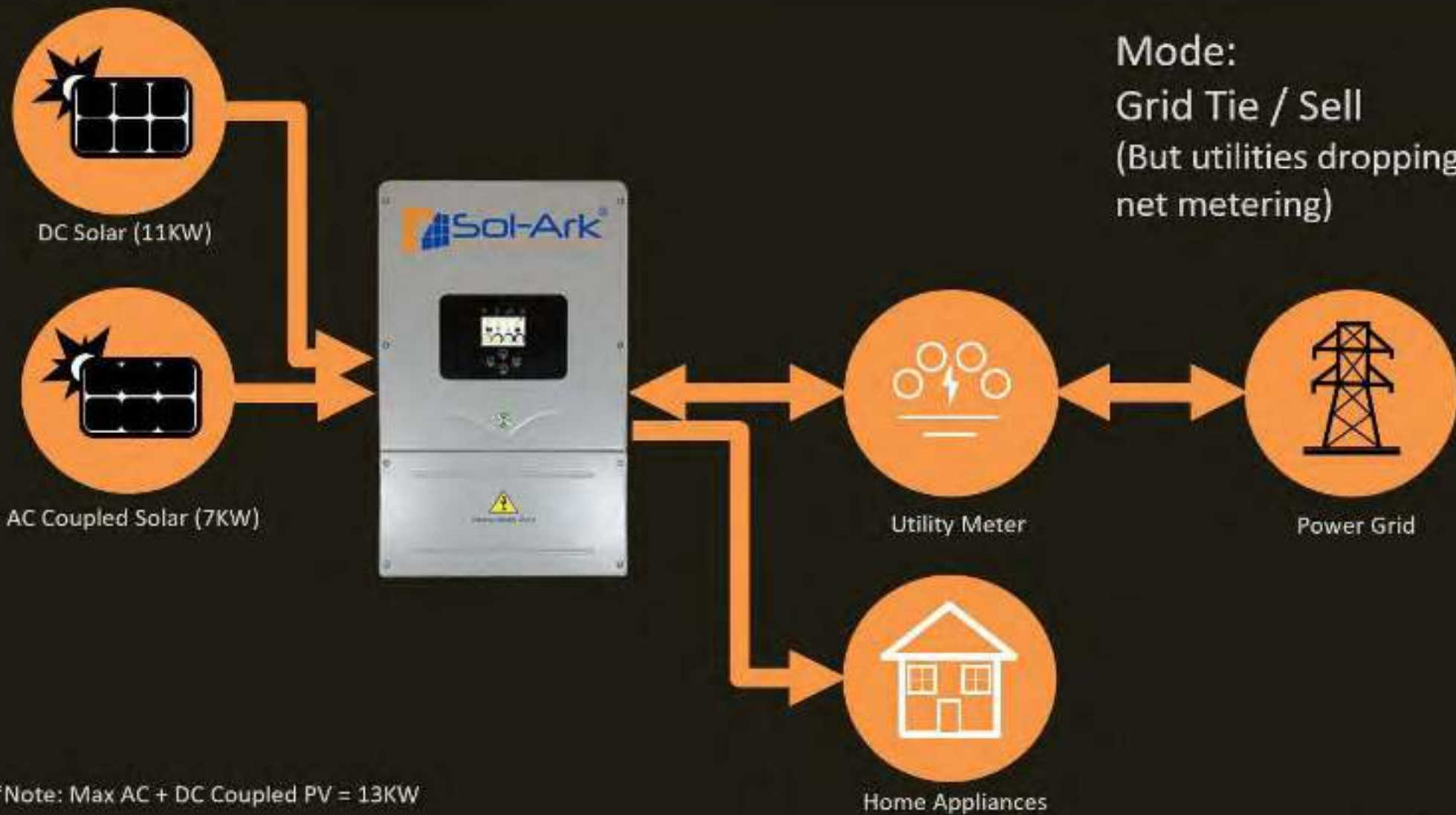
Sol-Ark 8K Features Overview

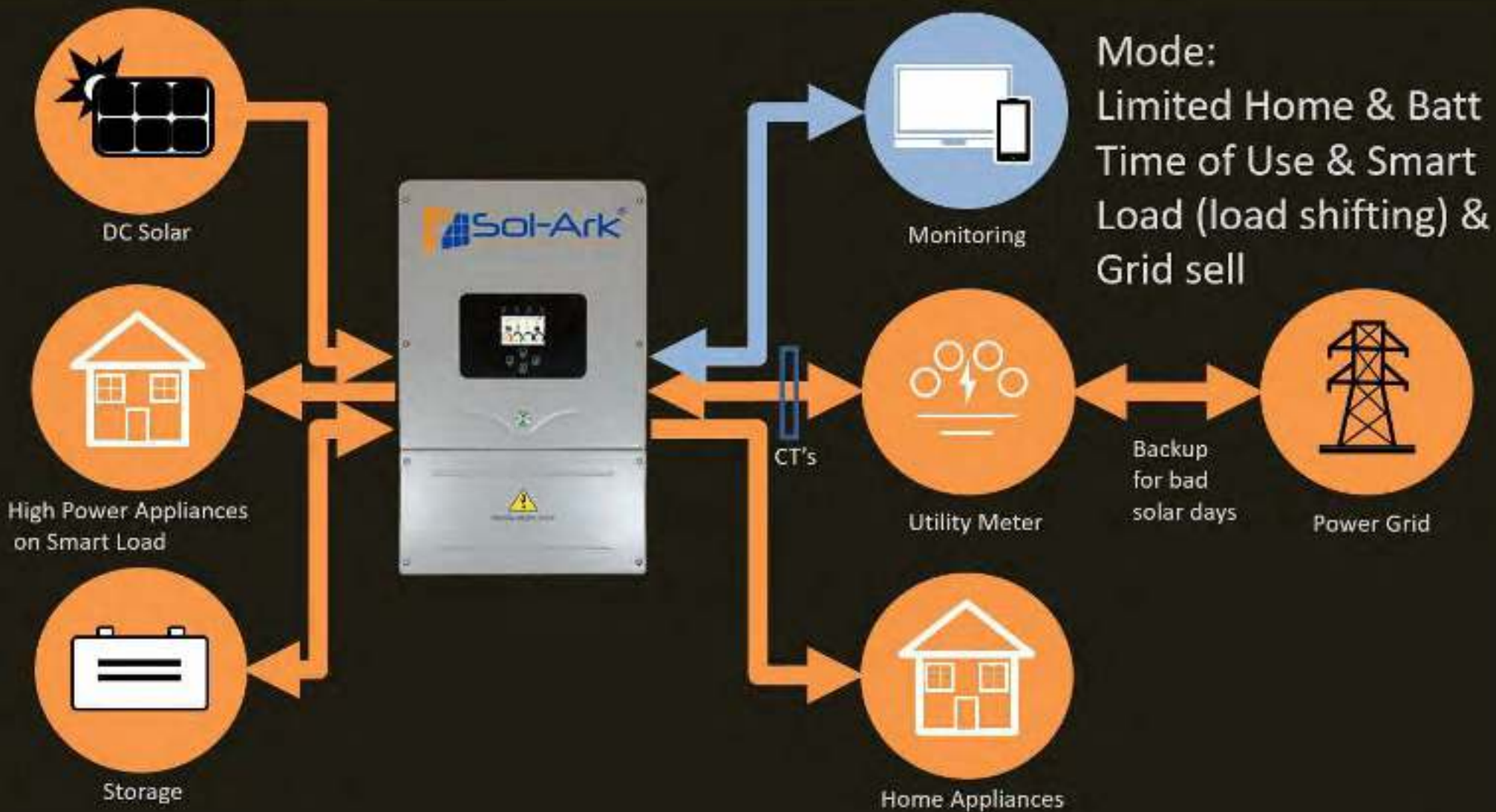


- Hybrid/On/Off Grid Inverter
 - 8KW & 20KWpk power
 - 2 x 18A 500V MPPT's
 - 50A/12KW passthrough
- Transformerless DC Design
 - Efficient DC & AC Coupling (AC+DC Max PV = 13KW)
- 48V Battery optional
 - Any battery types
- Grid support compliant
- 5yr warranty / 10yr optional

Sol-Ark 8K: Reduces Solar + Storage costs by 30-50% (\$13K+)

- Sol-Ark DC Transformerless efficient design
 - Boost PV energy **10-20%** without increasing PV (**\$4K**)
 - Reduces storage inverter costs up to **30%** (**\$2K**)
- Improve battery efficiency by **10-15%** (**\$4K**)
 - Choose batteries with round trip efficiency ~**95-98%** vs. wet cell 80%
- Improves install time & support by **2X** (**\$1-2K**)
 - All in One string 11KW MPPT's, 8KW Inverter, & wiring area w/breakers
 - Remote diagnostic & monitoring to avoid site visits
 - Or install your self because it is DIY friendly (**\$10K**)
- Up to 13KW combined DC + AC Coupling **utilizes existing PV** (**\$3K**)
- Improve battery capacity **10-20%** (**\$1K**)
 - Efficiency and Smart Load using PV instead of batteries
- No need for Server UPS's due to 2ms transfer time (**\$1K**)
- 120/208V 3P light commercial support with **1 inverter** vs. 2 or 3. (**\$6K**)





Mode:
 Limited Home & Batt
 Time of Use & Smart
 Load (load shifting) &
 Grid sell



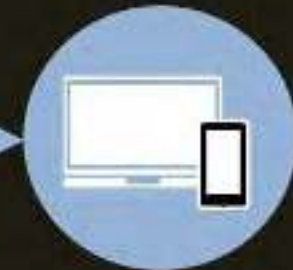
DC Solar (11KW)



Smart Load or
AC Coupled Solar (7KW)



Storage (15-48KWh)



Monitoring



Generator (4-30KW)

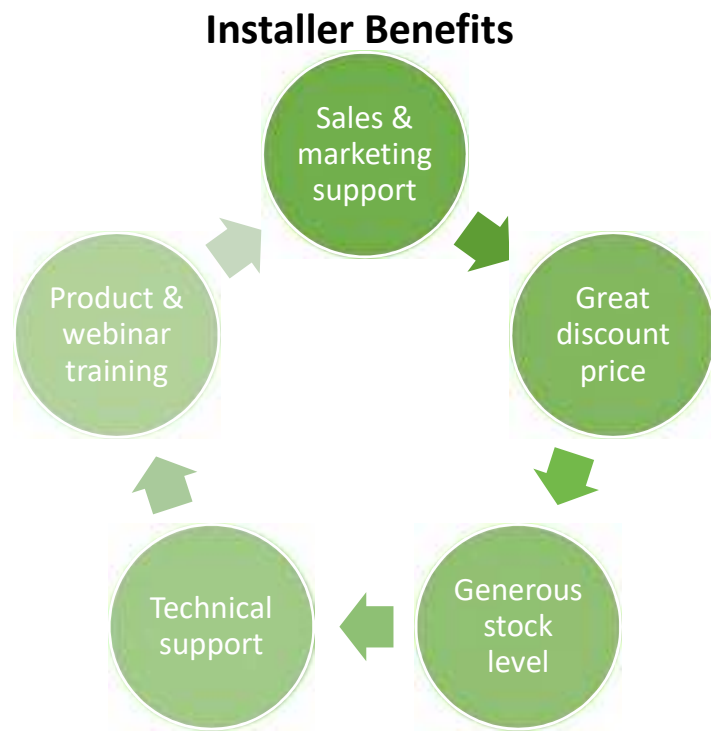


Home Appliances

Mode:
Off Grid

*Note: Auto-Gen Start Built In

Authorized Installer Benefits



Becoming

Fortress Power
Authorized Installer



Thank You & Contact Us



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