Tactical Solar Power Systems

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Tactical
Solar Power Systems

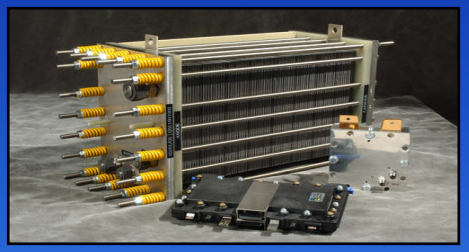
- Types of electrical power sources
- What's wrong with what we have now?
- If we had our druthers
- What's deliverable TODAY

TACTICAL ENERGY SOURCES

Generators

Batteries

Fuel Cells



Solar

Why bother with renewable energy?

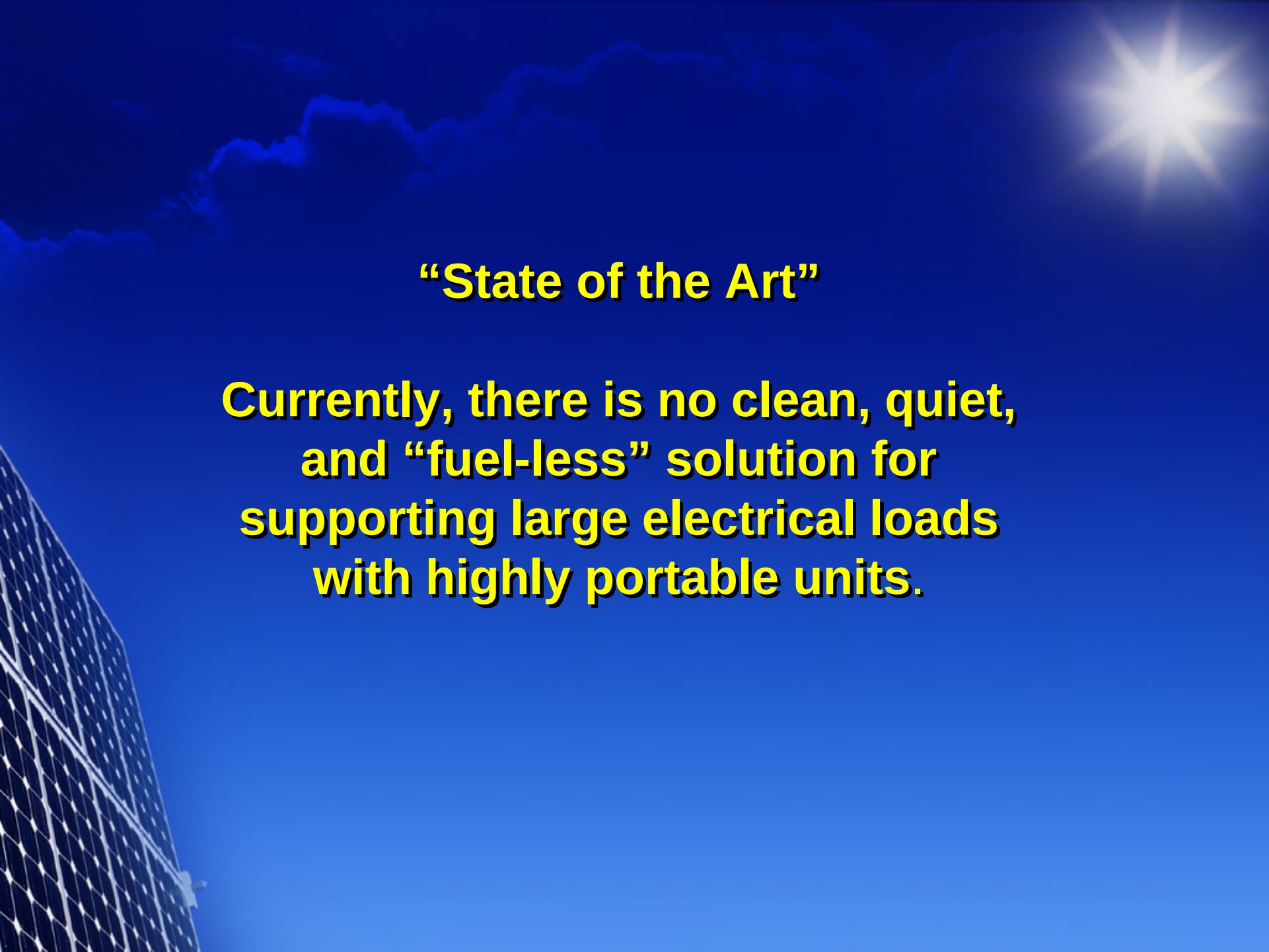
COST OF FUEL IN FORWARD AREAS

Depreciation	$1.5M	8%
Maintenance	$1.5M	8%
Fuel	$7.9M	43%
Support personnel	$6.3M	35%
Transport on battlefield	$0.1M	
Transport to battlefield	$0.8M	
TOTAL COST	$18.1M	

78%

Total KWH capacity 6,031,200 KWH (5600 hrs x 1077KW)

Cost delivered in forward areas → $3.00/KWH


“State of the Art”
Currently, there is no clean, quiet, and “fuel-less” solution for supporting large electrical loads with highly portable units.

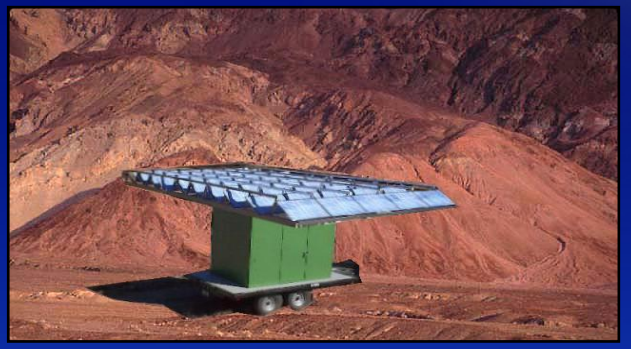
DRUTHERS MEET REALITY

A reasonable compromise

- Sustain 3kw load continuously for 12 hours without harvesting or generation
- Support a 3kw load continuously for 15 days without intervention or refueling
- Towable on an LTTHC trailer behind a HMMWV over any terrain
- Ready for real-world deployment ASAP

Raven LTSU

Lightweight Towable Solar Unit



- Hybrid design uses onboard automatic genset
- Uses <u>much</u> less fuel than genset alone
- Easy to set up
- Immediate electrical power
- At Technology Readiness Level 6 ***<u>now</u>***

Reduces fuel usage by *<u>nearly half</u>*

Raven LTSU

Lightweight Towable Solar Unit

LTSU vs genset-only, 15 day mission

Solar Gain and Fuel Consumption					
	GENSET ONLY			4.8 kw	LTSU
Continuous load	3.0	kw		3.0	kw
Total kwh/day	72.0	kwh		72.0	kwh
Total kwh 15 days	1080.0	kwh		1080.0	kwh
Insolation factor				6.0	
Solar collection		kw		4.8	kw
Solar gain / day		kwh		28.8	kwh
Solar gain 15 days		kwh		432.0	kwh
% of load by solar	0%			40%	
Accumulated kwh deficit	1080.0	kwh		648.0	
Less stored energy				40.0	kwh
Genset size	3.0	kw		3.0	kw
Genset fuel usage	0.33	hr		0.33	hr
Genset run time	360.0	hrs		202.7	hrs
Fuel used 15 days	118.8	gal		66.9	gal
Weight of jp8 / lb	6.42			6.42	
Weight of fuel	762.7	lbs		429.4	lbs
Weight of genset	326.0	lbs		326.0	lbs

WEIGHT	
Container	700
Battery pack	890
Inverter, etc	100
Rack 3 x 24 foot truss	260
Panels 24 * 45# ea	1080
Genset (2kw diesel)	326
Fuel	429
TOTAL	**3785**

Raven LTSU

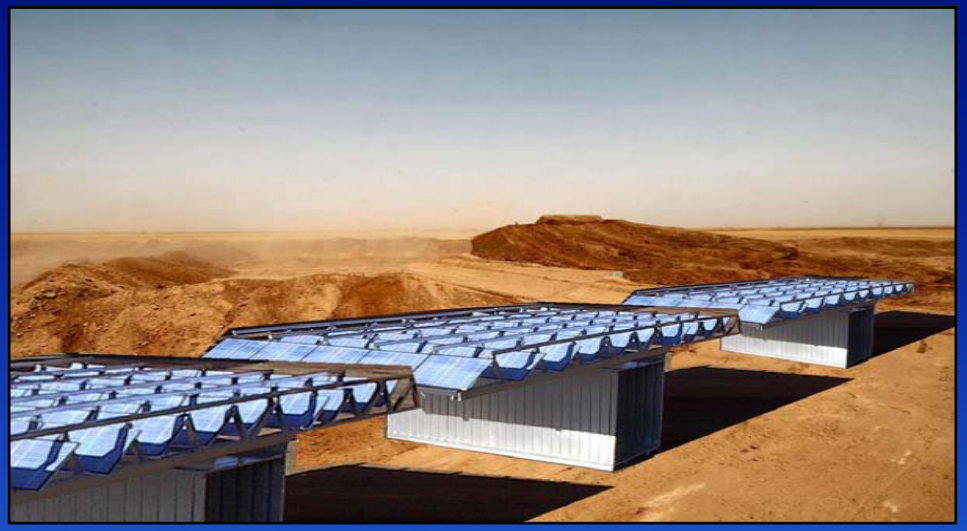
Lightweight Towable Solar Unit

- Total weight 3800#
- 3kw for 15 days without intervention
- 3kw for 12 hours without generation or harvesting
- Droppable, flyable, etc.
- Literally bulletproof

Large Scale Renewable Energy Production

LARGE SCALE RENEWABLE ENERGY PRODUCTION

NEST Transportable Solar Grid



- Arranged in “clusters” of 10-12 units (100kw+)
- For longer term requirements (6months+)
- All-up cost, less than $1 per KWH in forward area

LARGE SCALE RENEWABLE ENERGY PRODUCTION

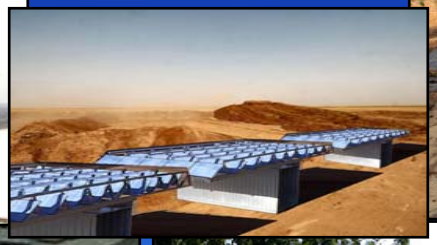
NEST Transportable Solar Grid

- Deliverable by air, land and sea
- Clean, quiet power - no fuel required
- Power for force support areas
- Can be combined with genset for HYBRID operation

LARGE SCALE RENEWABLE ENERGY PRODUCTION

NEST Transportable Solar Grid

- Supports reconstruction projects
- Disaster relief shelters/housing
- Military base housing
- Remote, off-grid areas

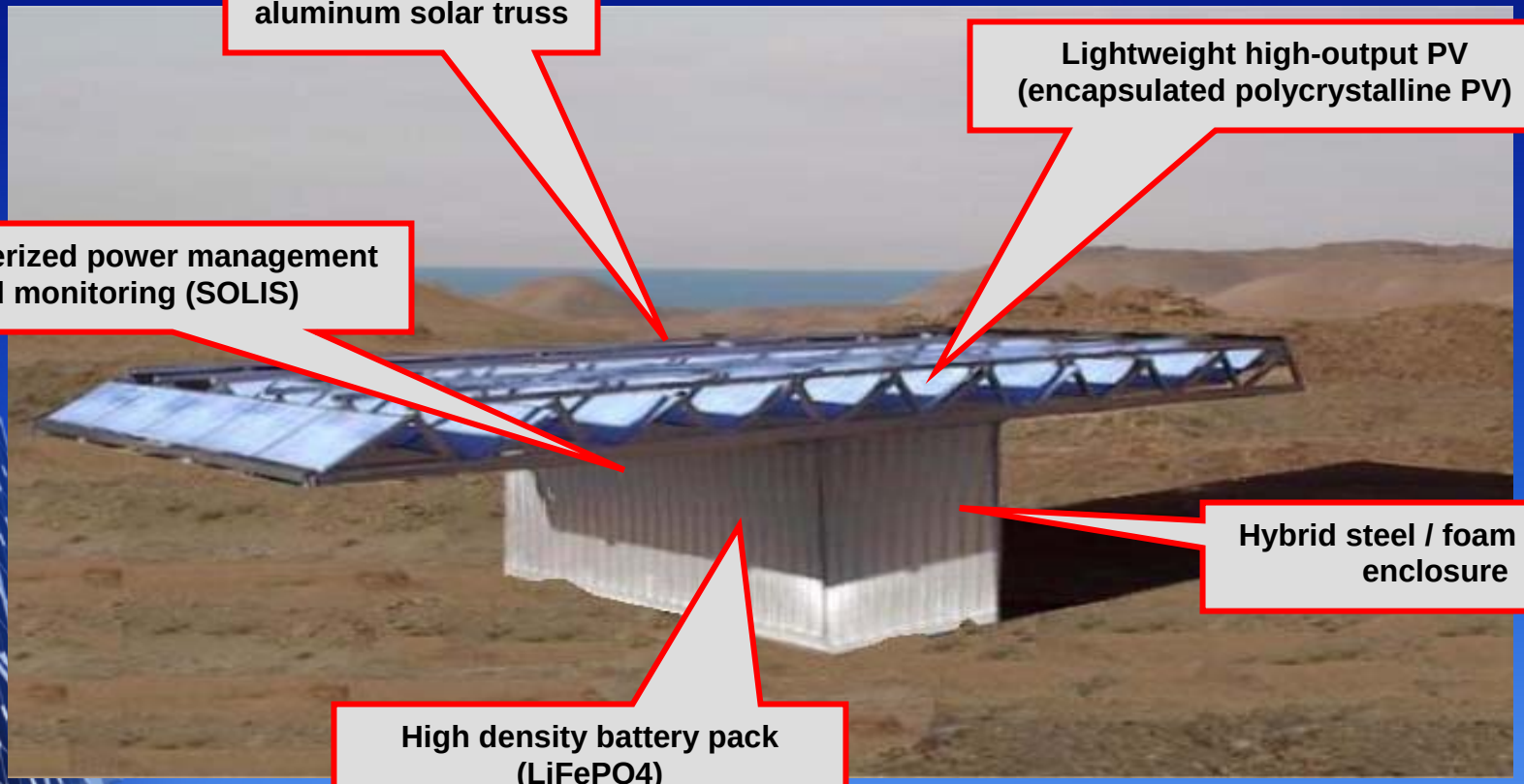


Technological Advancements

Today and Tomorrow

Portable Renewable Energy Solutions

Enabling Technological Advancements



Portable Renewable Energy Solutions
Near Future (3-5 year) Developments

What's on tap…

- **Solar panels with 40-50% efficiency (2 to 3 times current COTS)**
- **Solar panel will cost $1.50 per watt instead of $5.00 per watt**
- **Batteries ten times as weight-efficient as lead-acid**

Portable Renewable Energy Solutions

Near Future Developments

If technology that's in the laboratory today were available tomorrow…

- **We could provide a portable, towable solar unit that would supply 100% of the DREAM energy needs from solar alone. No noise, no fuel, no maintenance.**

- **We could manufacture large-scale solar systems that could be transported on two medium size trucks and would replace a 100kw generator that burns 200 gallons of fuel per day.**

QUESTIONS / COMMENTS

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GSA Advantage!
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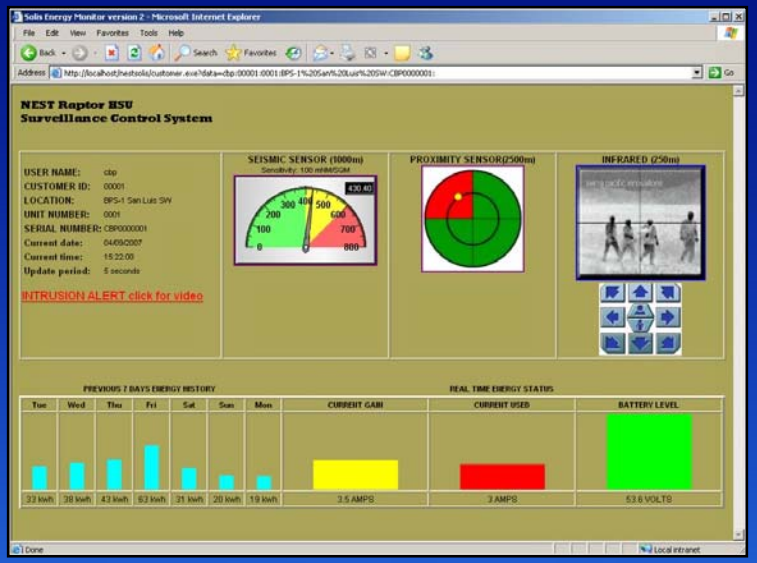
Portable Renewable Energy Solutions

Enabling Technological Advancements

SOLIS™ Energy Management and Security System

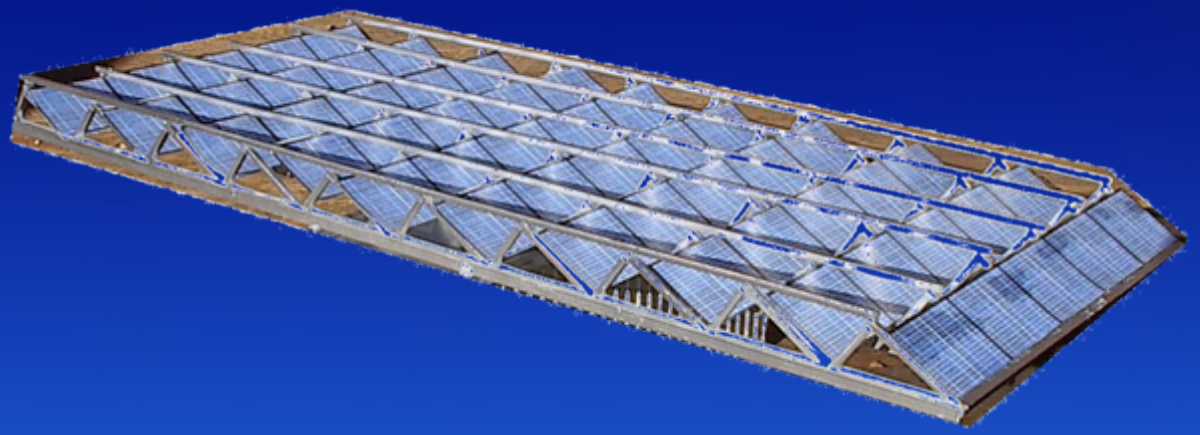


- Secure, web-based communications protocol
- Interactive communications between unit & HQ
- Alerts to power fluctuations / intruders
- Optional surveillance / security system

Portable Renewable Energy Solutions

Enabling Technological Advancements

Aluminum truss grid



- Patented “truss-rack” design
- Accelerates deployment of large-scale PV systems
- Support panels at correct angle
- Wind, torsion, shear, load tested
- 2 person set up, no special tools, expertise needed

Portable Renewable Energy Solutions

Enabling Technological Advancements

Hybrid steel / foam / Kevlar shell

- In production
- Strong as reinforced 14g steel shell
- Reduces enclosure weight from 1200# to 360#
- Insulated, bulletproof (Kevlar sandwich)
- EMP protection

Portable Renewable Energy Solutions

Enabling Technological Advancements

Encapsulated polycrystalline PV

- Encapsulation eliminates aluminum frame
- Simplifies assembly process
- U.S. -made
- Highest efficiency possible with COTS product

Portable Renewable Energy Solutions

Enabling Technological Advancements

Lithium Iron Phosphate Energy Storage (LiFePO4)

- Much lighter than lead-acid, NiCad
- Safer than Lithium-polymer
- Faster charge, no heat issues
- Integrated battery charging / power management