



EnerSys®

Power/Full Solutions

2011 Joint Service Power Expo

Regenerative Solar Power Solutions for Extended Mission Endurance

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EnerSys Proprietary and Confidential

An  Company

ABSL Power Solutions

People

142 employees
20 USA
122 UK

Capabilities

Thurso
Cell Design and Manufacture
Charging Design and Manufacturing
Battery Design and Manufacturing
Cell, Battery and Charger testing

Capabilities

Culham
Space Battery Design and Manufacturing
Space Battery Sales
Power Battery & Charger design
Power Sales

Capabilities

Longmont, Colorado
Space Battery Design and Assembly
Space Battery Sales
Military Power Sales

Capabilities

Herndon, Virginia
US Military Power Sales

Facilities

Manufacturing of Cells, Batteries & Chargers
Design and Engineering centres of Excellence
In house Qual & Test
Central location Sales team



HCS Technologies

Founded in 1994, HCS Technologies is a Veteran-owned Service Disabled small business that designs, manufactures and sells intelligent controls and small-scale hybrid energy platforms for military, government, agricultural, and other uses.

Our products are well suited to remote and hazardous environments where conventional power generation, distribution, and management systems are impractical or costly.

We manufacture and sell the first built-in controller designed to monitor the inputs and outputs of a hybrid energy platform, a device we call “the Brain Box.”



Renewable Energy Systems

- **SPACES - Solar Portable Alternative Communications Energy System** consists of several foldable solar panels, a multitude of output and input cables and adapters, and a small box no bigger than the average game console.
 - power everything from AN/PRC-119F SINCGARS radios and combat operations centers
- **GREENS - Ground Renewable Expeditionary Energy System** harvests energy from many different sources, distributes the energy using an intelligent management system, and stores excess harvested energy



Soldier Portable Power

Alternative Energy Objectives

- **Extending the power spectrum**
 - High efficiency /flexible / modular power conversion
 - PV /Wind /Geothermal Systems
- **Lightweight, Flexible, Cost Effective Solar Energy Photovoltaics**
 - Battery Recharging
 - Unattended Sensors
 - Surveillance Systems
 - Reduced Logistics
 - Modular integrated hardware systems to include solar source, energy storage and controls



Man-Portable Solar Harvesting Kit



Warner Energy Solar Recharger

Formerly Energy Masters

- Next generation 110W will weigh 5LB
- 22.5% efficient MILSPEC certified
- Currently in use for UAV / back-packable satellite / sensors



Deployed STAR-220 (Double STAR)



STAR-110 (Single STAR)



Double STAR: (pictured left)
 175Wp and 220Wp Models
 72" x 36" Fully Deployed
 18.5" x 12" Folded
 16lbs

Single STAR: (pictured right)
 88Wp and 110Wp Models
 72" x 18" Fully Deployed
 12" x 18" Folded
 8lbs

Wp = Watts Peak
 5" Monocrystalline Cells
 Anti-Glare Coating
 Camouflage Available



Available Camouflage Patterns

Electrical Specifications:

STAR-110 Wp	STAR-220 Wp
Voc = 24.12 volts DC	Voc = 24.12 volts DC
Isc = 5.9 amps DC	Isc = 11.8 amps DC



Smart Portable Charger (SPC)

- SPC Level 3 DC input multi-chemistry charger will charge any SMART battery (1-8 cell series)
 - SPC charges any non-SMART battery (with appropriate SMART cable)
 - Starts automatically when battery is connected
 - Dual LED indicators for charger and battery status
 - CAN bus interface via input connector – automated test and evaluation
 - Information continuously transmitted over serial interface
 - Future proof – ready for new batteries as developed
 - Under evaluation by UK MoD as power supply to laptops and other small electronic equipment
-
- Input voltage 10.5V to 40V (shut off at 9.5V)
 - Max. output 33.6V 180W (5.3A @ 33.6V / 6.0A @ 30.0V)
 - Max. input current 9A
 - Charge terminated by battery or SMART cable.



11Ah X590 Battery



Typical 2590 battery with 18650 cells



Prototype X590 battery

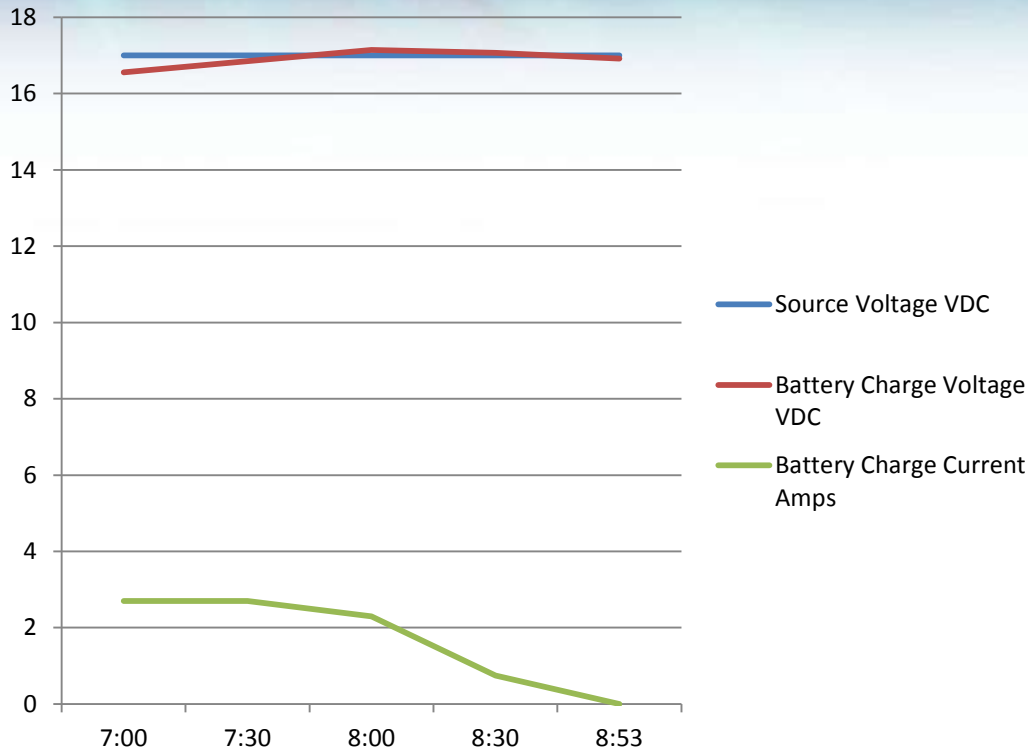
- Weight: 1.4 kg
- 28.8 V: 7.2 Ah, 207 Wh
- Cycle Life: 240+
- Operational at -20°C to +55°C

- Weight: 1.5 kg
- 28.8V: 11 Ah, 316 Wh
- Cycle Life: 500+
- Operational at -40C to +70C
- 1C discharge from -20C to +55C

Cell Specific Energy from 250Wh/kg to 275Wh/kg)



Test Data



Test Battery, BB2590 was taken to a full charge and then discharged with a .5 amp load for 8 hours. Then a controlled charge using the Soldier Portable Charger (SPC). Charge time was 1 hour and 53 minutes, the SPC output at the beginning of the charge was 16.56 VDC. The SPC voltage gradually adjusted higher to maintain a higher charge current, which allows for a faster charge.

Extending the Power Spectrum

DoD Statistics

- 300W continuous power replaces one small genset.
- One combat brigade uses 1/2 million gallons fuel per day
- One 60kW genset uses 4-5gal per hour - \$700,000/yr for fuel
- Solar could reduce by 30% to 50% current FOB fuel costs



Mobile Power Station



Summary of the HEDBS Performance Characteristics

The 5 modules plus the battery management unit would have the following estimated performance characteristics:

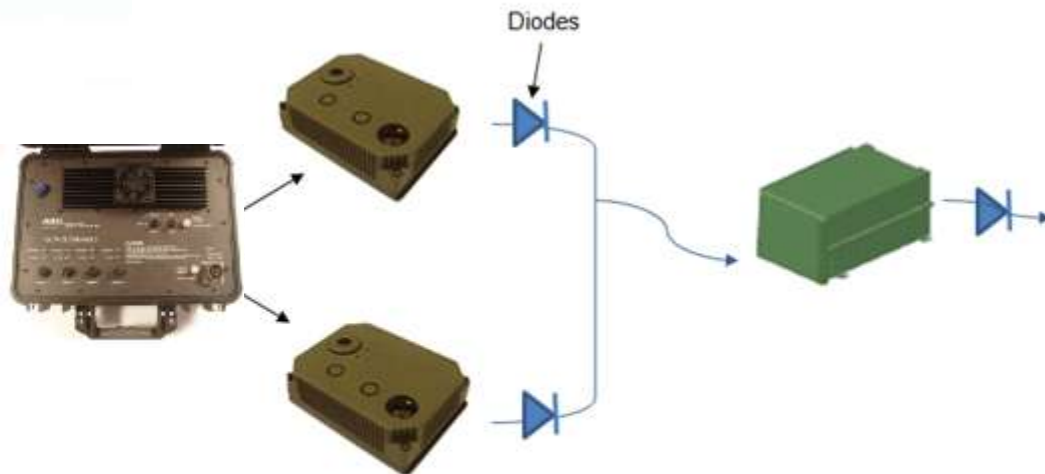
Length: 480mm
Width: 350mm
Thickness: 220mm
Weight: 90kg

Nominal Voltage: 25VDC
Nominal Capacity: 100Ah
Specific Energy: ~139Wh/kg
Energy Density: ~340Wh/l



High Energy Charging

Two SPCs Charging Each of Five Battery Modules



Two SPCs in parallel will provide a charge current of 20A at 29.4VDC

With a nominal 93% efficiency, each SPC will need a minimum of ~630W to charge at the C/5 rate (20A).

Over a 24 hour period, depending on the required average discharge power, each module would need a nominal input energy of:

- At 300W discharge (with 5 modules):
1.4kWh per module
- At 500W discharge (with 5 modules):
2.4kWh per module

Over a 10 hour charge period the two SPCs could deliver a nominal energy of ~5kWh. This is twice the energy required to fully charge a 'flat' module in a 10 hour period at a C/5 charge rate, which would allow for days when full output from the solar panels is not available.

Modular Storage Battery

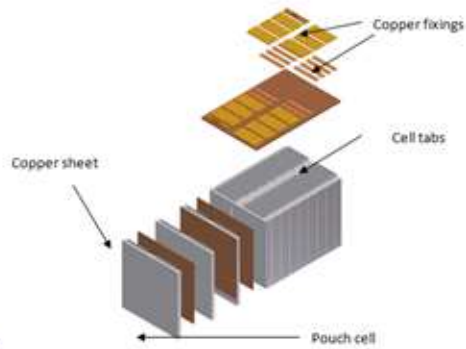


Figure 1: Representative Cell Stack Assembly

A 2.5kWh will stack will consist of 7 cells in series at 100Ah

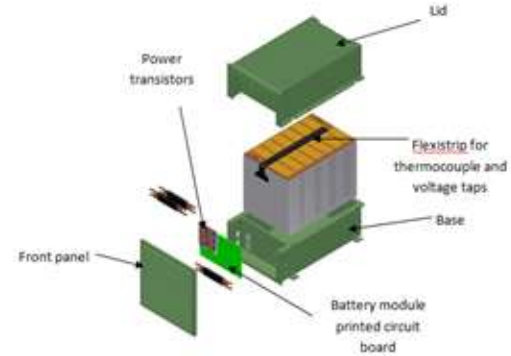
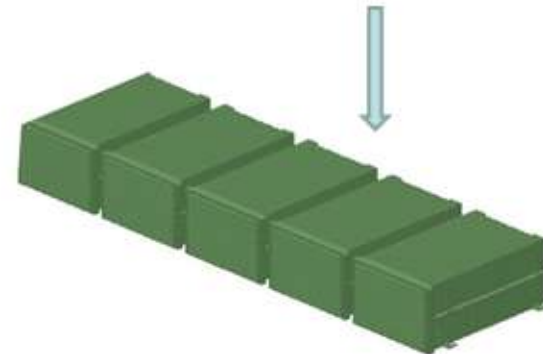
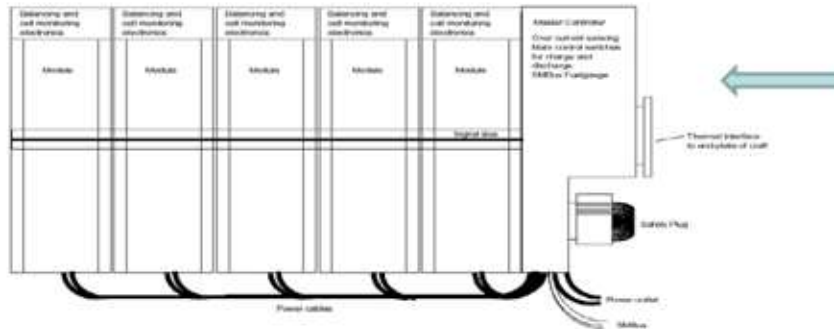


Figure 2: Representative Module Assembly



Summary

Smart Portable Charger – will harvest/scavenge energy from any DC source
wind; solar; vehicle power sources; primary or secondary batteries

11Ah X590 - 210Wh/kg
maximize energy storage per unit weight

Custom pouch cell technology
up to 275Wh/kg specific energy in cells
light weight modular design – 2.5kWh per LRU

Currently evaluation various solar collectors for use in portable kits

