

OUTBACK POWER PRESENTATION BY GORD PETROSKI

VP ENERGY & INDUSTRIAL MARKET DEVELOPMENT

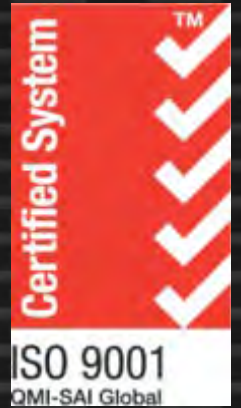
Alpha Technologies

1. Quality of Install
2. Install considerations
3. Understand the Power
4. Energy Storage
5. Monitoring and Field Serviceability



OutBack Power Technologies

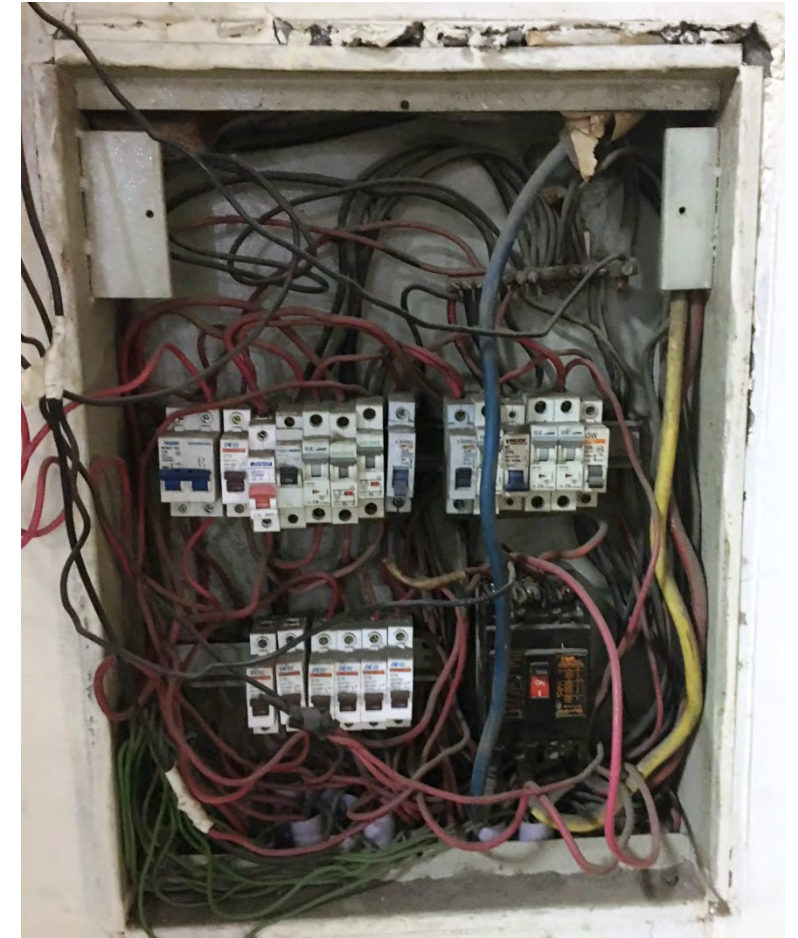
- ▶ Premier developer of off-grid and grid hybrid power conversion systems for renewable & energy systems
- ▶ Based in Arlington, Washington USA since founding in 2001
- ▶ International brand & product quality recognition



Considerations for improved life of an OutBack System



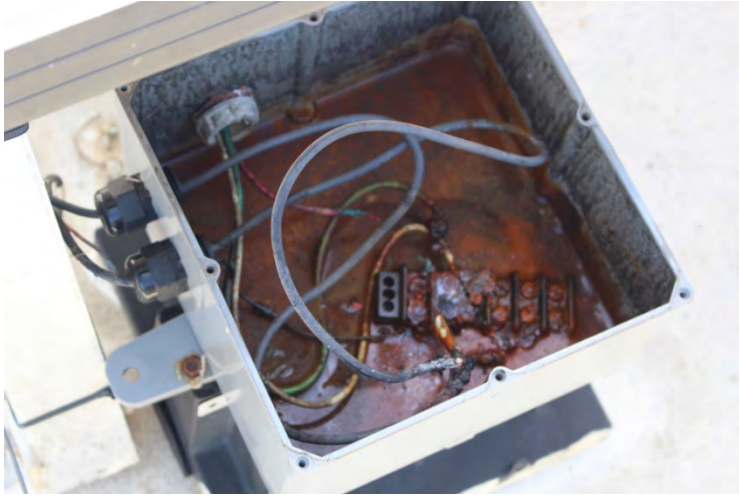
Proper wire management is so important



Take great care in your preparation or ...

Did you take it all into account: Proper materials

SOLAR CAN CREATE SOME AMAZING HEAT WHEN SHORTED

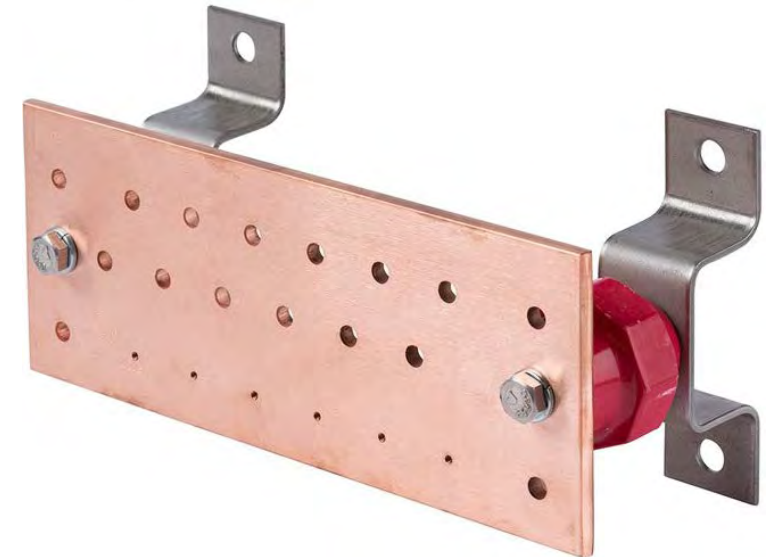
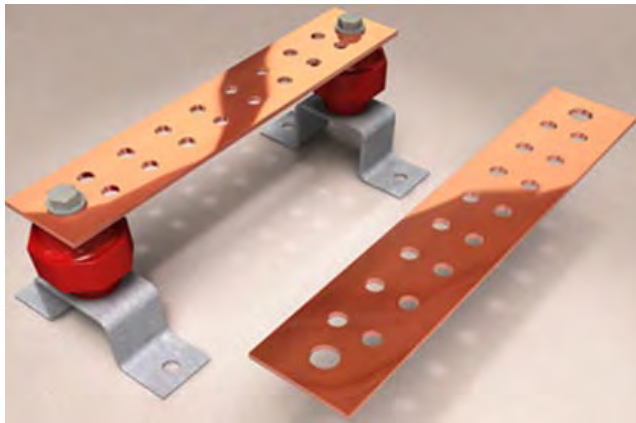


Water penetration into the box caused the combiner boxes to incinerate themselves

Proper bussing

- ▶ Use top quality products in every project
- ▶ Land one conductor per area
- ▶ Standoffs protect conductors
- ▶ Insolated and Isolated

Basbar Size	current capacity A	Weight kg/m CU
10x120	2400	10.68
10x100	2000	8.9
10x80	1600	7.12
10x60	1200	5.34
10x50	1000	4.45
10x40	800	3.56
5x40	400	1.78
5x30	300	1.335
5x25	250	1.1125
6x30	200	1.6



Wiring practices and 'Looming'

- ▶ Organized wiring practices
 - ▶ Trouble Shooting
 - ▶ Reduce Damage to wires
 - ▶ Labeling of conductors



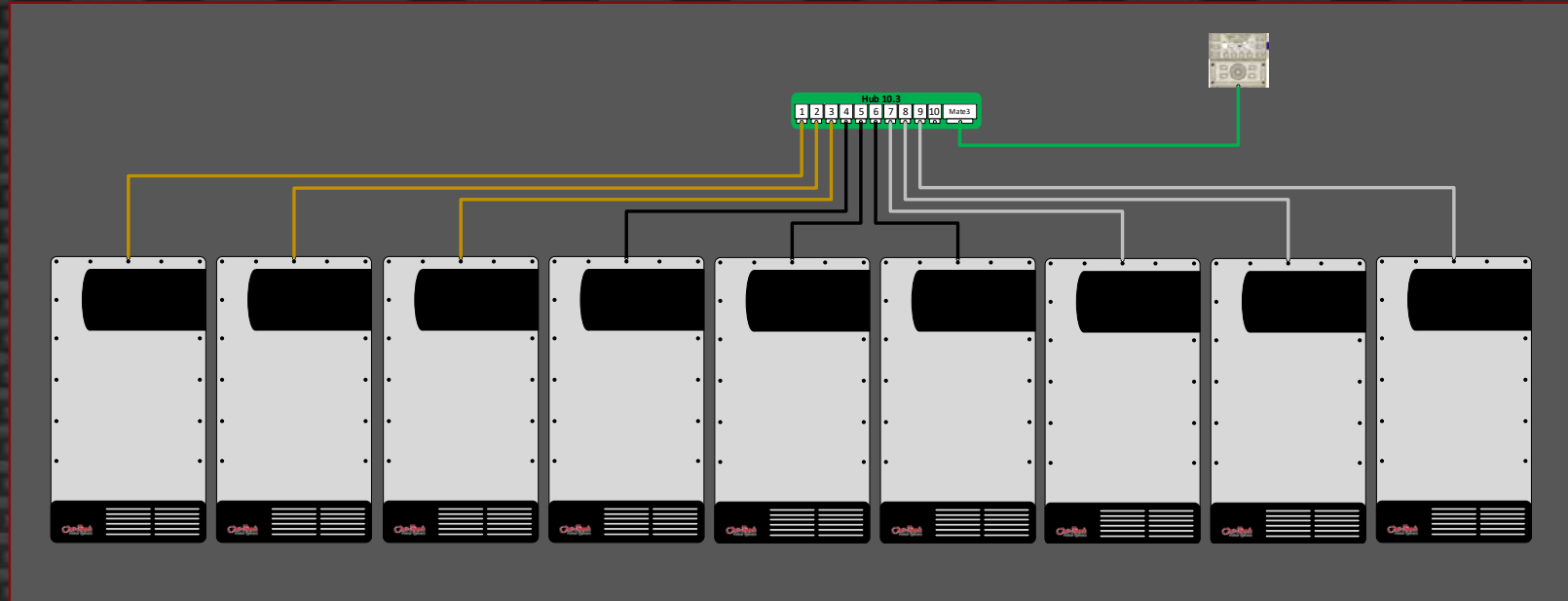


9 Radian System, 63kw

► Examination of a quality install

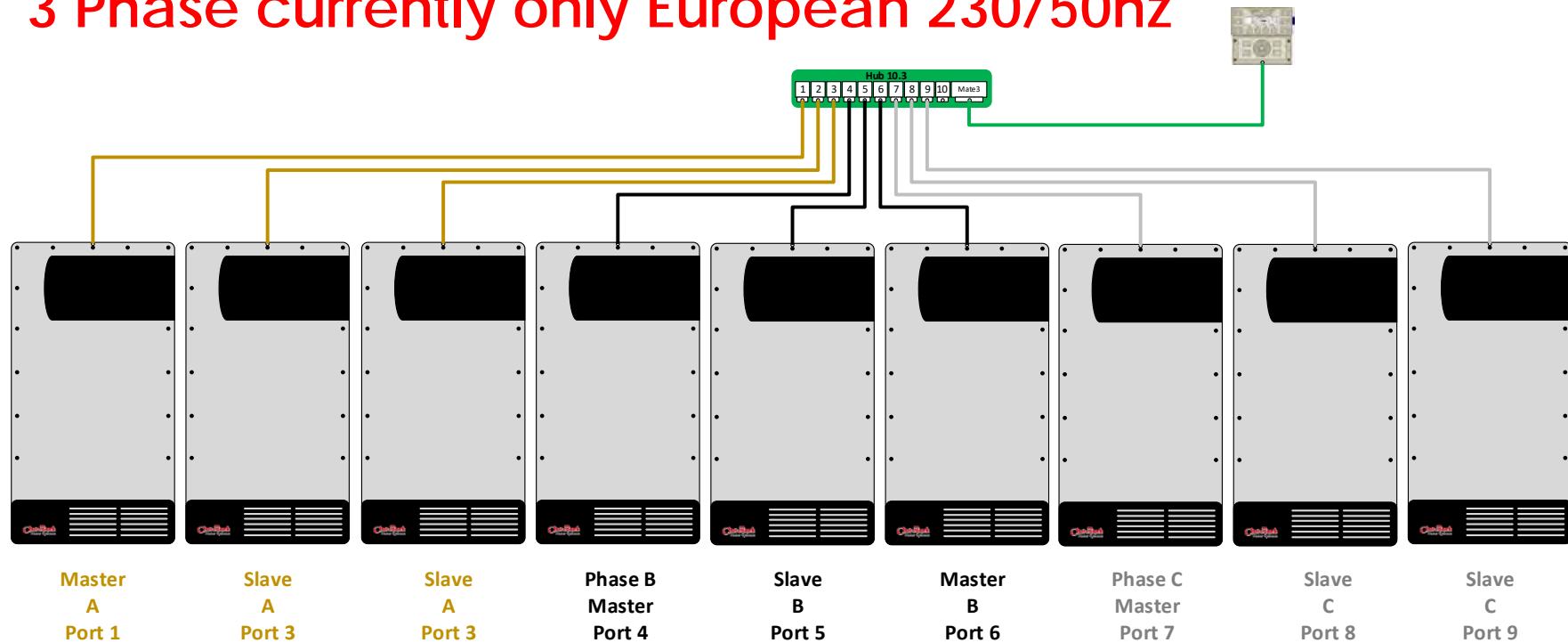
► What to look for:

- Proper Bussing
- Conductor lengths
- Circuit Protection
- Access to equipment



OutBack Power's 3 Phase 9 Stack

3 Phase currently only European 230/50hz



When System size increase, so too does the attention to detail.

35 KW 230 Vac Radian Installation





SimpliPhi battery systems at Jerry Brown's home microgrid. Cover image to this roundup is the carport installation onsite. Images: SimpliPhi / Outback Power.



Integrated Systems

SOME GOOD THINGS TO SAY



Protection against the elements



<https://youtu.be/VJa8SaINteg?t=254>

OutBack Product Overview

Charge Controllers

A device that limits the rate at which electric current is added to from batteries

60A / 150V

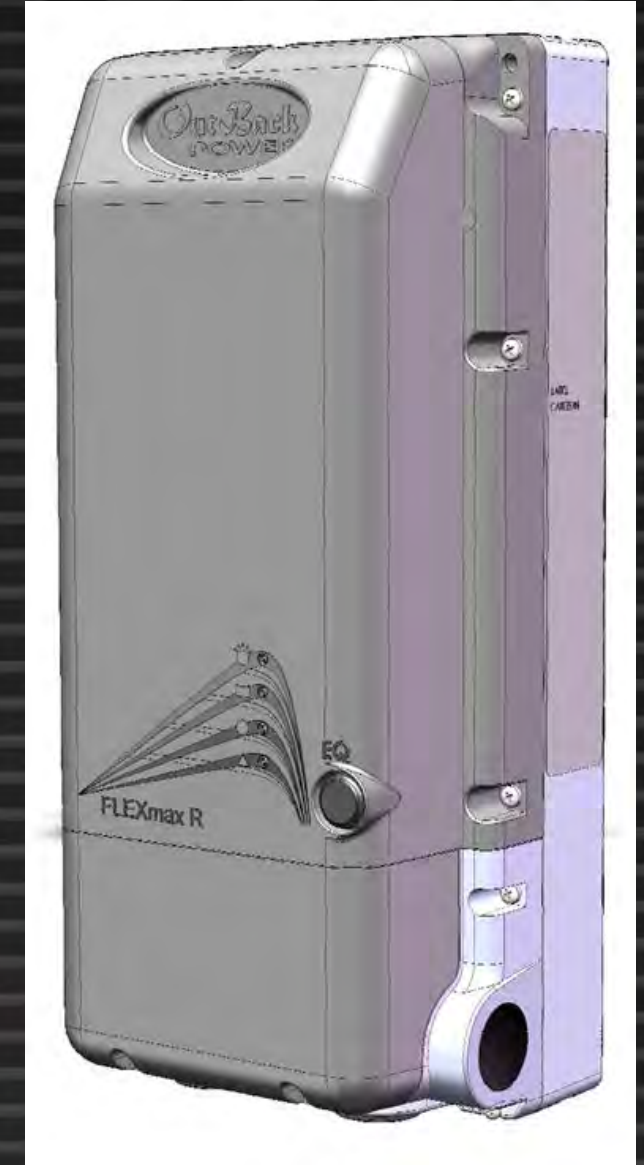
80A / 150V



100A / 300V

OutBack FLEXmax 100

- IP54 sealed design for NEMA 3R rating
- Advanced thermal management with passive cooling
 - Full 100A Avc output -20°C to 45°C
 - External Fan for 100A operation.
 - 300Vdc PV input
- Improved EMI signature
- Low tare loss of less than 1 Watt
- Advanced communications option using AXS Card Modbus interface
- Currently in Beta Testing – At my house
- Release in November-December 2017



Energy Storage

EnergyCell PLC

PRODUCT LINEUP



**12V Front Terminal AGM
Maintenance-Free**

EnergyCell RE EnergyCell PLC		EnergyCell NC EnergyCell PLC		EnergyCell GH EnergyCell PLC	
EnergyCell RE		EnergyCell NC			
EnergyCell RE & OPzV		EnergyCell NC			
EnergyCell FLA					
EnergyCell FLA					

**12V Top Terminal AGM
Maintenance-Free**

**2V High Capacity AGM
Maintenance-Free**

**6V Flooded Lead Acid
Maintenance-Required**

**2V High Capacity Flooded Lead
Acid Maintenance-Required**

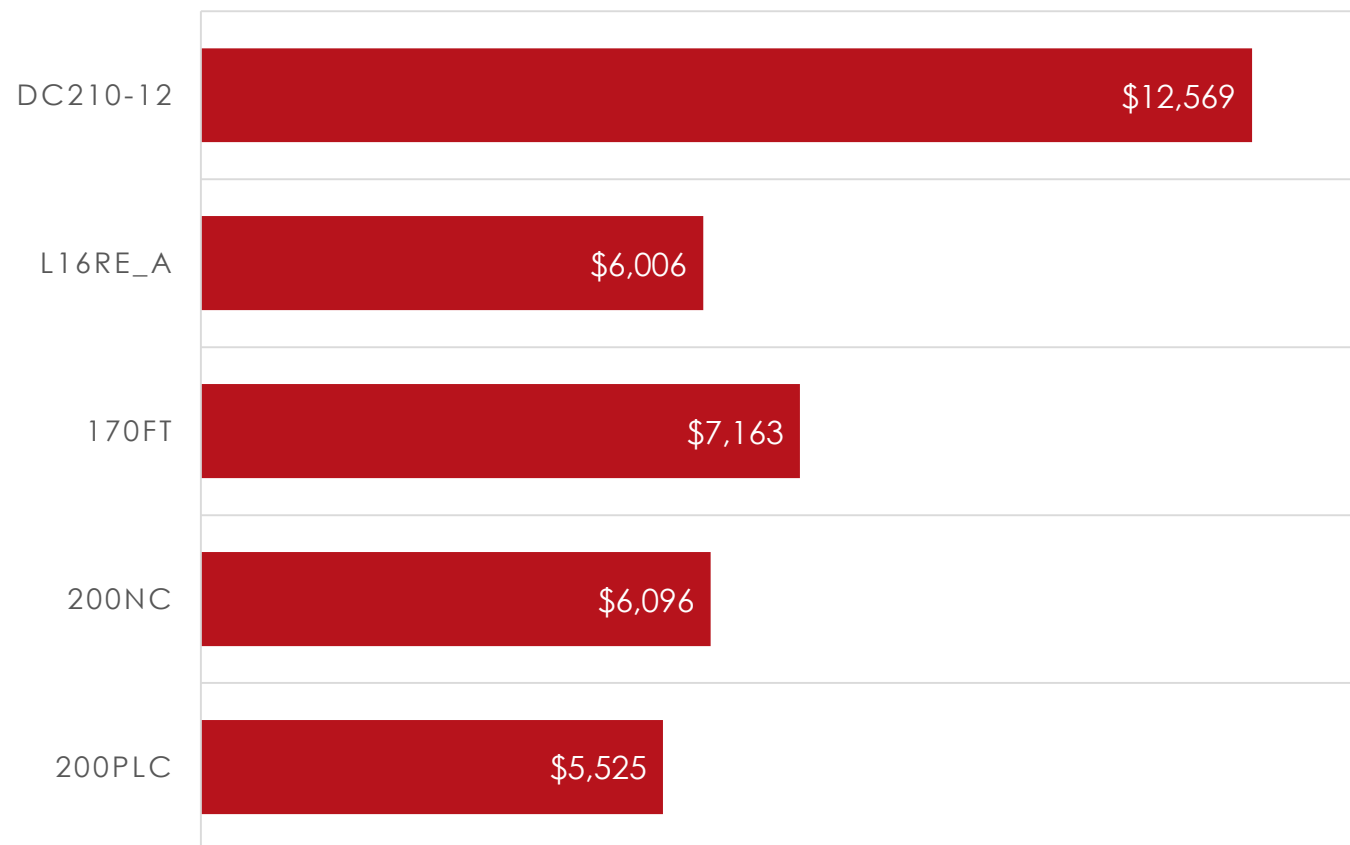
Competitive Analysis

SPEC COMPARISON/EFFECTIVE COST PER KWH

Brand	OutBack	OutBack	North Star	Trojan	Full River	Simpliphi	LG Chem
Model	200PLC	200NC	NSB 170FT Blue+	L16RE-A	DC210-12	PHI 3.4kWh	RESU10H
Technology	VRLA Pure Lead Carbon	VRLA AGM Carbon	VRLA Pure Lead Carbon	FLA Carbon	VRLA AGM	Li-phosphate	Li-ion NMC
Voltage	12V	12V	12V	6V	12V	48V	400V
20hr Rate	178	178	181	325	210	-	-
Cycles at 50% DoD	3,000	2,600	2,050	1,600	1,300	11,000	6,000
Operating Temp Range	-40° to 149°F	-10° to 140°F	-40° to 149°F	-4° to 113°F	-4° to 113°F	-4° to 140°F	14° to 113°F
Terminal Type	T11	Threaded copper alloy insert	M8	LT	LT	-	-
Dimensions LxWxH (in)	22 x 4.92 x 12.6	22.01 x 4.95 x 12.6	22 x 4.9 x 12.6	11.67 x 6.95 x 17.56	20.87 x 8.23 x 8.58	13.5 x 8 x 14	8.94 x 17.8 x 19.2
Weight (lbs/kg)	130/59	131/60	132/60	115/52	133.38/60.5	75.5	214
Warranty	6 year full replacement	2 year full replacement	2 year full replacement	2 year full replacement	2 year full replacement	10 year full replacement	10 year full replacement
Shelf Life @ 25°C	24 months	6 months	24 months	6 months	6 months	12 months	12 months
Qty batteries needed ~8-10 kWh 48V Bank	8	8	8	8	8	3	1
Avg Retail Price (excl. delivery/installation)	\$4,586.32	\$4,389.36	\$4,011.60	\$2,642.48	\$4,525.36	\$12,178.59	\$6,425.71
Effective kWh Size (20hr Rate)	8.54	8.54	8.69	7.8	10.08	10.2	9.3
Total Effective kWh Delivered	25,620	22,204	17,814.5	12,480	13,104	112,200	55,800
Effective Cost Per kWh Delivered	0.18	0.20	0.23	0.21	0.35	0.11	0.12

Competitive Analysis

10 YEAR COST OF OWNERSHIP – 10 kWh 48V BATTERY BANK



Brand Model	OutBack	OutBack	North Star	Trojan	Full River
	200PLC	200NC	NSB 170FT Blue+	L16RE-A	DC210-12
Effective Cost Per kWh Delivered	0.18	0.20	0.23	0.21	0.35
life in years w/ daily cycle @ 50%	8.3	7.2	5.6	4.4	3.6
10 year cost of ownership	\$5,525	\$6,096	\$7,163	\$6,006	\$12,569

Commercial electrical power & historical preservation: Central Asia

- ▶ Historic building converted into the first net-zero office complex in that country



SOLAR COOL CUBE™

Cool Cube has chosen to partner with Alpha Technologies and OutBack power to provide refrigeration solutions directly for Africa.

- Fishing Villages
- Fresh Produce storage
- Milk Storage
- Animal and prepared Meats

What is the loss?

- Power interruptions
- Changing time to markets
- Unsold goods at the end of the day





One of Five Systems installed in 2008 in N'Kau Lesotho Africa
Three 3.0 kW Inverter/Chargers - 9.0 kW Total 230/400 VAC Three Phase

Monitoring and Serviceability

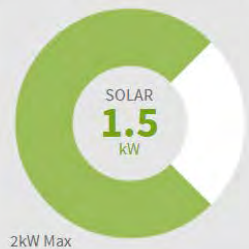
OutBack Product Overview

Optics



DASHBOARD DEVICE MAP EVENT HISTORY

CURRENT SYSTEM STATUS 10:51AM

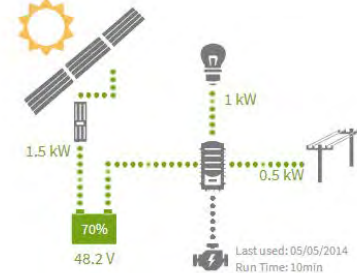


Right Now, You are

SELLING

Solar	1.5kW
Grid	0.5kW
Load	1kW
Generator	0kW

ENERGY FLOW

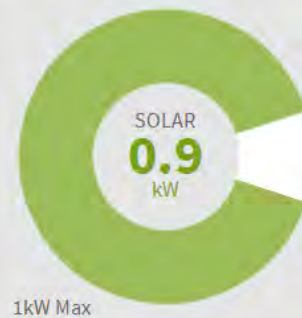


TOTAL ENERGY SINCE SYSTEM INCEPTION

7,619.45 kWh = 594.32 gallons of gas saved^a

DASHBOARD DEVICE MAP EVENT HISTORY

CURRENT SYSTEM STATUS 11:51AM

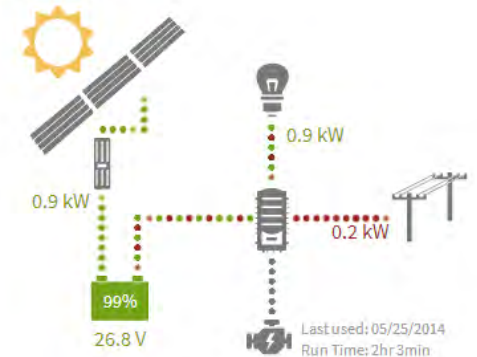


Right Now, You are

BUYING

Solar	0.9kW
Grid	0.2kW
Load	0.9kW
Generator	0kW

ENERGY FLOW



TOTAL ENERGY SINCE SYSTEM INCEPTION

213.3 kWh = 16.64 gallons of gas saved^a

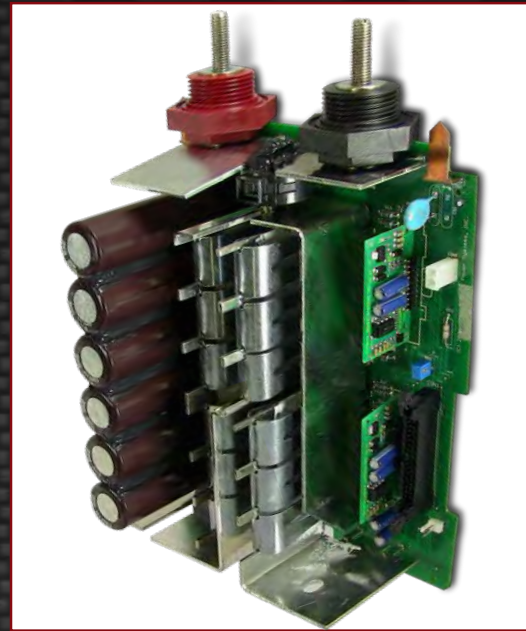
Service Ability

Keeping Spares for Projects

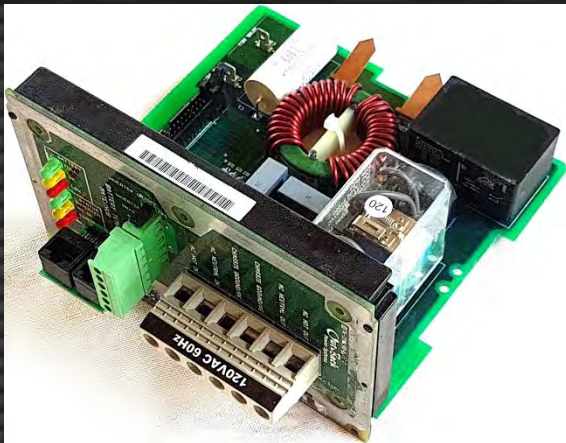
Improved Service

Turn around of less than an hour

Online video for board replacements



1. FET Board
2. Control Board
3. AC Board



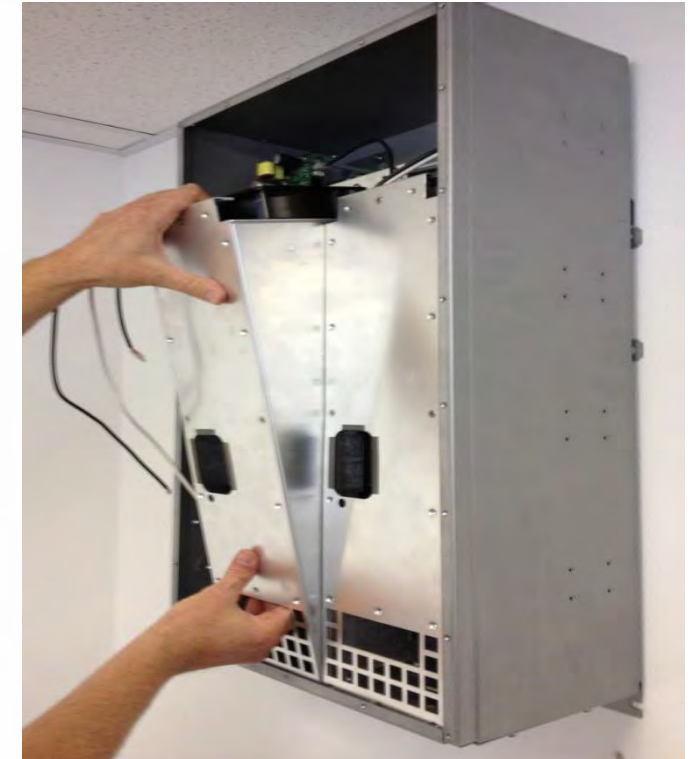
OutBack Product Overview

Radian Field Servicing

Two identical 3.5 kW power blocks
Separate control and AC board stack

Dual Power Module Benefits:

- Better efficiency in low power
- Low tare loss - 30 W
- Redundancy & Ease of Servicing
- Field Serviceable
- Field upgradeable firmware



Thank You!

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