

VRB-ESS BATTERY REPLACEMENT SYSTEM

The 5-kW VRB Energy Storage System (VRB-ESS™) is an environmentally friendly, long-life, virtually maintenance-free storage system designed to replace conventional lead acid battery systems. The VRB-ESS addresses the problems of traditional lead acid battery systems such as short lifetimes, maintenance requirements, and recycling costs.

The standard 5-kW system can be extended to provide longer storage durations at very low incremental costs through the addition of electrolyte, meeting utility backup requirements of 24 hours or longer.

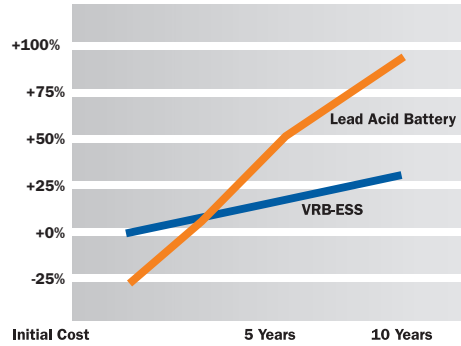
The VRB-ESS provides multiple simultaneous DC outputs without electronic conversion for telecommunication applications and can also be integrated with AC systems with the addition of an inverter.

Applications:

Remote Area Power Systems/wind/diesel/solar combinations, cellular radio towers, utility systems

VRB-ESS vs. Traditional Lead Acid Batteries

Cost/Benefit Comparison



	VRB-ESS	Lead Acid
Current Output	5kW (112A) x 4 hours	112A x 4 hours
Output Voltage Range (VDC)	42-56	42-60
Approx. Dimensions (W x D x H, in.)	34 x 86 x 80	32 x 30 x 90
Approx. Weight (Full, lbs.)	7,000	2600
Thermal (Stg/Opg, °F)	32-100/32-100	32-100/32-100
Approx. DC-DC Efficiency, round trip	75%	45%*
Performance vs. Temp.	Flat response over temp. range	IEEE/ANSI and manufacturers derating
Containment	Double containment of electrolyte storage	Cabinet drip tray
Lifetime (discharge cycles)	10,000+	1500
Depth of Discharge	From full to 20% state of charge	From full to 80% state of charge**
Recharge Time	4 hours (optional 1:1 charge/discharge ratio)	20 hours (5:1 charge/discharge ratio)
Speed of response	1 ms	1 ms
Overload capability	2x nominal rating	1.25x nominal rating
Maintenance	Annual inspection if desired	At least 4 times per year

* "A Study of Lead-Acid Battery Efficiency Near Top-of-Charge and the Impact on PV System Design," John W. Stevens and Garth P. Corey, Sandia National Laboratories, 1996 IEEE Photovoltaic Specialists Conference

** deeper discharges reduce life exponentially



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5-kW-VRB-ESS