The “Solar Shuttle” Solar Trailer

A photo essay showing some of the nearly 30 events from year 2010 where the Shuttle provided event power around Texas and the USA!

The Solar Shuttle…

A portable renewable energy resource providing 100% solar electricity for events, education, and reliable, fuel-free power for first responders in times of emergency.

100% solar power for Irving, Texas Earth Day Sound Stage, April 10, 2010. (3,500 attendees.)

Powering vendors at "Live Green Expo", Plano, Texas, April 17, 2010. (18,000 attendees.)

City of Dallas, Texas Earth Day sound stage, April 18, 2010. (10,000 attendees.)

City of Fort Worth, Texas "Prairie Fest", April 24, 2010. (4,800 attendees.)
The Solar Shuttle powered 10 bands at Prairie Fest 2010, including "Brave Combo", a multiple-Grammy Award winning group. There's no utility power anywhere in the Nature Reserve. The Solar Shuttle (and its predecessor) have been the ONLY source of power at this event since 2006!

Invited by Frito-Lay to Power Exhibitors at the Frito-Lay "Eco Fair", April 27, 2010.
Frito-Lay Corporate Headquarters, Frisco, Texas.

Mayfest, Fort Worth, Texas, April 29-May 2, 2010. (225,000 attendees.)
The Solar Shuttle powered several booths for the entire four-day event.

Midwest Renewable Energy Fair, Custer, Wisconsin, June 18-20, 2010. (22,000 attendees.)
Powering 42 vendors in the two main buildings and the Main Information Tent.

Solar Shuttle at a Simulated Emergency Communication Exercise, June 26 & 27, 2010.
The Solar Shuttle provided 100% of the electricity needed for the entire exercise.

Powering the Mother Earth News Fair Main Tent in Seven Springs, Pennsylvania, Sept 25-26, 2010. (16,000 attendees.) The Shuttle looks large here .. but look again! (See next photo.)

The Solar Shuttle (yellow circle) is dwarfed by the main tent. More than 160 exhibitors took part. 44 exhibitors were outside. 120+ were inside the resort main hall (background).

Solar Shuttle Interior View. Looking forward from the rear, equipment stowed, ready for transit.

All systems, including the solar panels, are fully redundant for the ultimate in reliability.

Equipment in the racks, starting from the top down:

- Two Exeltech 5,000 watt true sine-wave inverters (top units in each rack).
- Two Exeltech 1,100 watt sine-wave inverters (below main inverters).
- Two Blue Sky Energy maximum-power-point trackers/charge controllers (white boxes below main inverters).
- Circuit breaker bays: All circuit breakers are magnetic-trip (not thermal). This means they are unaffected by temperature, and will trip at their specified current regardless of the ambient conditions. All battery-side DC breakers are UL-rated for DC operation, with very high-current interrupt capability. AC output is protected by UL-certified circuit breakers and UL Listed overcurrent shutdown circuitry.

The blue bins (photo above) contain a variety of utility items such as emergency lights, tiedown straps, tape, tools, extension cords, power strips, tire compressor tire inflator attachment, and miscellaneous hardware. Almost anything one would need for an event .. or an emergency power situation.

AC power from the Solar Shuttle is available less than one minute after arriving on site. The solar panels do not need to be deployed for electricity to be generated, though they are usually set up and positioned toward the sun for optimal energy production.

When the Solar Shuttle is in operation, whether for event power or emergency purposes, only one inverter is typically used at a time. This provides an identical backup "just in case". For notes, there have been zero equipment failures in more than 12 years of providing solar power.

In this photo, the left-side 5,000 watt inverter is active. The other three inverters are available to provide more power if needed, or, in the unlikely failure of a main inverter, serve as immediate backup sources.

Solar Shuttle Interior – View from Inside Looking to the Rear
The Two Large White Battery Enclosures in the Foreground Hold More than 1/2 Ton of Battery.

Each battery box contains a set of four Rolls-Surrette lead-calcium batteries, wired for 24Vdc, and rated for 10 kilowatt-hours at a 20-hour discharge rate. Each main inverter (topmost unit in each rack) as well as the backup inverters (rectangular units below the main inverters) are also visible.

Large cables exiting the side of the battery box connect both battery systems in parallel when needed, doubling the total energy reserve to 20.16 kilowatt-hours. An additional 25% battery capacity was added in 2013 in the form of a third battery bank (not shown), increasing the total battery reserve to 26.4 kilowatt-hours. All three battery systems can be run independently, or in parallel in any combination as needs dictate.

Disconnecting each battery creates completely three separate systems. This allows for total redundancy, and the ultimate in reliability. Should a failure occur in one system, an identical system is immediately available and can be online in seconds. It should be noted .. in more than 12 years of providing portable solar power, there has never been a failure of any kind in any of the equipment. If it's well designed, properly built, and responsibly treated and maintained .. it will last a very long time.

With only five hours of sunlight per day, the Solar Shuttle PV system can generate and store enough energy to power emergency communications equipment, portable cell-phone towers, medical refrigerators, battery chargers for first-responders' radios and cell-phones, and countless other loads. Best of all, the Shuttle can do so almost indefinitely, and unattended. Unlike noisy mechanical generators, no refueling or maintenance of any of the equipment is required when deployed.

Given the option of a generator .. or the Solar Shuttle .. which would YOU prefer for your event?

Solar Shuttle Electrical Specifications

♦ Power Source	Photovoltaic Modules (exclusively)
♦ Photovoltaic Module Manufacturer/Model	Sanyo HIT-215 premium PV, high-output, high-temperature.
♦ Total Number of Photovoltaic Modules	10
♦ Photovoltaic Panel Specifications	215 Watts. 5.13 amps at 42 volts (at maximum power point).
♦ Nominal Total PV Panel Output Power	2,150 watts rated (+10%/-0%). 2,500 watts measured output.
♦ PV Adjustment Range	0° (horizontal) to 90° (vertical). Manually positioned and locked.
♦ Charge Controllers (two)	Blue Sky Energy SB50 with optional Digital Data Display.
♦ Charge Controller Maximum Current	50 Amps each.
♦ Peak Charge Controller Output Power	3,000 watts
♦ Batteries	Rolls-Surette S420, 6Vdc, deep-cycle lead-calcium, flooded-cell.
♦ Total Number of Batteries	Eight – four each in two separate 24Vdc systems.
♦ Battery Amp-Hours (each battery)	420 amp-hours @ 20 hour discharge rate (20.16 kWh).
♦ Battery Configuration	Two independent banks, four series batteries each (24Vdc).
♦ Auxiliary Battery System (24Vdc)	Four US Battery 260 amp-hour (6.24 kWh) emergency backup.
♦ Total Battery Amp-Hours	1100 amp-hours @ 20 hour rate (all battery banks in parallel).
♦ Total Battery Reserve	26,400 watt-hours @ 20 hour rate (all battery banks on line)
♦ Main Inverters (two)	Exeltech MX, 5 kW, true sine-wave, continuous duty.
♦ Auxiliary Inverters (two)	Exeltech XP, 1.1 kW, true sine-wave, continuous duty.
♦ Total Continuous AC Output (all inverters)	12.2 kW AC_{rms} (no time limit except for battery reserve).
♦ Peak AC Output Power (all inverters combined)	25.2 kW AC_{rms} (surge).
♦ Inverter Safety Switches	Yes. Main inverters – DC input @ 300 Amps. UL certified.
♦ Over-current Protection	UL certified magnetic-trip breakers. Unaffected by temperature.
♦ AC Output Voltage	120 V, 60 Hz, 102 Amps AC_{rms} maximum continuous.
♦ AC Output Waveform (all inverters)	True sine-wave. Total harmonic distortion less than 1.5%.
♦ AC Output Receptacles (Main Inverters)	NEMA 5-20 (4 per system), accepts 15 and 20 amp NEMA plugs.
♦ AC Output Receptacles (Backup Inverters)	NEMA 5-15 (2 per system), accepts 15 amp NEMA plugs.
♦ Energy Metered	Yes, on main MX inverters.
♦ Data Output	Ethernet interface to 802.11g wireless router.
♦ Safety Certifications	
Underwriters Laboratories	UL Listed to UL1950, UL1703, UL1741, UL489, and others.
National Electric Code	Fully compliant with the National Electric Code, NEC Section 250 “Portable and Vehicle-Mounted Generators”, NEC 690, "Solar Photovoltaic (PV) Systems” and other Sections.

Special thanks and acknowledgement to the many Solar Shuttle sponsors:

♦ **Exeltech**	12,200 watts of sine-wave inverters	www.exeltech.com
♦ **Texas Instruments**	Ten Sanyo high-output photovoltaic modules	www.ti.com
♦ **Blue Sky Energy**	Max Power Point Tracking & Metering	www.blueskyenergy.com
♦ **APW Mayville**	Custom Inverter Racks	www.apwmayville.com
♦ **Radiant Solar Technology**	Custom Battery Enclosures	www.radiantsolartech.com
♦ **Licor Biosciences**	Solar Irradiance Sensors	www.licor.com
♦ **W & W Silkscreening**	Custom Vinyl Graphics	www.wwsilk.com

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