The GEEKY Details of the DIY Portable Solar Generator:

The battery bank is two Battle Born Lithium Iron Phosphate (LiFePo4) 100 amp/hour batteries, wired in parallel for a combined capacity of 200 amp/hours. There is space in the chest I built for four batteries. Battle Born manufactures their batteries just outside Reno, NV. Thanks to Will Prowse and his DIY Solar Power YouTube channel. Here's a link to the Battle Born tear-down at https://www.youtube.com/watch?v=G5E30u-66VI&t=1s. I have found only rave reviews about their customer service and the quality of their products. Amazon has some negative reviews but I believe those problems were self-inflicted.

The chest has wheels and a retractable handle. I found the wheels, handle, and corner protectors at an outfit called DIY Road Cases. I added Red Oak strips to the back and rear corners for protection and to allow for sliding the case up and down stairs when needed.

The upper box/tray holds the electronics. The lower part of the tray holds a 3000 watt pure sine wave inverter. The upper tray holds the solar charge controller, bus bars, smart charger for when mains power is available, and a fused Blue Sea DC power distribution panel. The smart charger will be used mostly when the system is not in service. This will keep the battery bank in peak condition.

I used marine grade stranded wire throughout. 2 AWG wire is used to connect the batteries, including a 200 amp fuse on the main positive lead to the electronics. 175 amp Anderson PowerPole connectors are used to connect/disconnect the electronics tray from the battery bank for service.

50 amp Anderson PowerPoles are used for the solar input as connecting/disconnecting the solar MC4 connectors repeatedly is not advisable. I used 6 AWG wire for the connections to the charge controller as that was the largest wire it would accept. From the bus bars to the distribution panel, and to the inverter is 4 AWG wire.

The inverter, battery input, and solar inputs are all isolated from each other and each circuit has an appropriately sized DC circuit breaker. This allows for safe connection/disconnection and servicing. The downside is that currently I can't monitor the load on the battery bank. I think I'll install a shunt on the main positive lead of the battery and install a battery monitor (which I already have).

The charge controller came with a remote monitor which will be very handy when operating a field station. It doesn't show the load on the battery bank, however, because the load terminals of the charge controller are not used. They're not sized appropriately to support the potential loads.

The solar panels are mounted in two frames made of 2x4 lumber joined with half-lap joints, glue, and screws. The frames are double hinged to a central 2x4 between them to provide room for the support legs and to avoid mashing the wiring when the frames are folded up for transport. 3/8 plywood panels will attach to the outside faces of the folded frames to protect the solar panels in transport as the construction and wiring mandated that the panels face out when the frames are folded.

All up, the array weighs in at around 100 lbs. or so. The solar panels make up about 75 lbs of that, plus the weight of lumber, wiring, and hardware. It's not hard to manage in the shop but since I'm not getting younger and stronger I devised some removable wheels but I'm not happy with it yet. I'll fuss with that until it's right. I used a mover's dolly to get it in and out of the shop for testing today. That works well on concrete but it's not good enough for the field (or loading it in the trailer).

The completed chest is also heavy. The batteries are 35 lbs. each, plus the weight of the electronics, wiring, hardware, and the chest itself. I'm guessing a bit over 100 lbs easily. However, lead/acid batteries of the same capacity as the Battle Born batteries would weigh in around 400 lbs. all by themselves. You would need four 100 amp/hour lead/acid AGM batteries to get the same capacity and those weigh about 100 lbs. each.

Truth in advertising: An AGM lead/acid battery can only be discharged 50%. More than that and it will never hold a charge again. I know... I did it once. The Battle Born batteries can be discharged 100% because Battle Born overbuilds their capacity so that customers can get the full rated capacity. Also, these batteries are good for 3000 to 5000 charge cycles, after which they will still have 80% of their rated capacity. In that time one would have to replace the AGM batteries perhaps 5 or 6 times.

All in all, I'm very pleased. I've received some suggestions on materials to make the array frames lighter. I'll give that some thought. I always need to find new ways to make sawdust after all! (Or PVC dust, etc.).

Cheers!

Rich