The Amateur in You, Part 2

What have you been pondering?

Full-time at 100 watts

Several years ago we published an article that addressed working remotely, which is great to know for an emergency situation, or even making a distant contact off-grid. Later we published yet another article that detailed everything one should prepare for the ultimate disaster preparedness station. It's now time to research the solar power and storage required to support a remote station operating SSB (single sideband) at 100 watts around the clock for many days.

First, a few agreements to outline the expectations:

- an SSB duty cycle of 40% (compromise between a 20% average overall minimum and a 50% average contest maximum)
- the operating location provides adequate sunlight (cloudy is ok) to allow the solar panels to sufficiently recharge the batteries
- *remote station* means no standby power source (commercial, generator, etc.) is available
- for *effective daily solar panel sunlight*, the Wasatch Front averages 3.7 hours during winter months and 6.1 hours during summer months
- *around the clock* means 24 hours a day, every day, non-stop
- "many days" potentially means *forever*, assuming all the equipment remains operational the entire time

That's a tall order. Next, let's calculate the total power that'll be required by the radio equipment alone:

100 watts x 40% duty cycle = 40 watts

The daily energy requirement by the radio equipment will be

40 watts x 24 hours = 960 watt-hours

and taking inefficiencies amounting between 20% and 30% (batteries, charge controller, wiring, etc.) into account, the energy is closer to

960 watt-hours x 1.3 ≈ 1250 watt-hours

This means the solar panels must generate

1250 watt-hours ÷ 3.7 hours ≈ 340 watts

during winter and

1250 watt-hours ÷ 6.1 hours ≈ 205 watts

during summer Just to keep up with the demand. Not many 350-watt panels available, so you can easily get hold of **two 200-watt solar panels**. Accompanying the panels you should acquire a solar charge controller capable of handling

400 watts ÷ 24 volts ≈ 16.7 A

Assuming each battery will present 13.6 volts, the required battery capacity should be at least

1250 watt-hours ÷ 13.6 volts ≈ 92 Ah.

Therefore, a **12.8 V 100 Ah battery** should work well, but because we're anticipating a maximum DoD (depth of discharge) of

100 Ah – 92 Ah = 8 Ah (8%)

the battery should be a **$LiFePO_4$** type, which offers very deep-cycle performance.

You can see that when you casually switch modes to FT8, which uses a 100% duty cycle, you can easily exceed your capacity if you operate for very long. Also, be sure to increase these capacities if you plan to use many accessories, such as lights, a fan, or a heater.

Summary

- two 200 W solar panels
- one 16.7 A solar charge controller
- one 12.8 V 100 Ah $LiFePO_4$ battery