SOLAR Energy

For the Average Ham

Presented by

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Interest in “Alternative” Energy Goes Way Back

I hated to surrender hard-earned cash to energy moguls

- As a child, growing up among the Amish, I was fascinated with the waterwheel and windmill technology used to pump water for the livestock.
- In my late teens, I worked with an uncle designing “solar wall” passive heating for new and retrofit construction.
- In the mid-seventies I assembled the parts to convert a ’64 VW beatle to a hybrid vehicle, using a 12-hp Tecumseh engine.
- Converted a 2-story Indiana farm house to wood burning central heat furnace.
- Here in Fresno, heated my house with pelletized fuel stoves for 20 years.

Interest in solar energy began in 1973.

First Venture

- Closed loop, active domestic hot water.
- First residential solar system of its kind in Elkhart County Indiana.

Interest in solar energy began in 1973.

Second Venture **(1986)**

- Domestic hot water, active parabolic collectors which tracked the sun.
- Guaranteed 15 years; began having problems after about 6 years. I was able to keep it running 18 years.

Third Venture **(2004)**

- 2.7 KW Photo Voltaic Grid-Tied System
- 18 - 165 Watt Sharp panels
- 5 KW Sunny Boy Inverter
- Homebrew cut-off and transfer switches
- If grid goes down, can use 5 KW generator

Beginning the Solar / Ham Radio Connection

Solar Powered Emergency Supply

When the ARRL added 100 "Natural Power" Bonus Points to Field Day scoring, I began the planning process of integrating solar into my ham station.

I had a 7.5 Watt solar panel that I salvaged from an automatic compost tumbler.

Solar Powered Emergency Supply

I needed a storage battery to use with the solar panel. So my first purchase was a 1200 peak Amp jumpstart system. Harbor Freight # 40615, $80 on sale. Harbor Freight recently had a blowout sale on this item for $60.

Solar Powered Emergency Supply

Several other Harbor Freight items might fit your requirements.

38391 is similar to mine except only 900 peak Amps. ($60.00)

39954 adds a 260 psi air compressor. ($65.00)

38391

39954

96157 is a nifty package ($90.00) with a 1000 peak Amp battery, 260 psi compressor AND 400 Watt inverter. However, it might be difficult to add the additional connectors.

96157

Solar Powered Emergency Supply

I added a hi-current dual binding post DC output connector, plus a solar charging input, with a blocking diode that prevents discharge at night. For well under $100, I had a complete, portable natural power system that will hold a QRP transmitter for 20 hours.

DC Output →

← Solar Input

Converting the Ham Shack to Solar

The next step was to assemble a small, permanent solar system to supply the power for all the 12 V shack accessories. The plan was to gradually increase the size of the collectors and battery storage until I could take the shack completely off the grid (except for the 240 VAC linear amps).

(The little “yellow box” became the core of a portable emergency power system / Field Day back-up supply, and was not used in the shack.)

Converting the Ham Shack to Solar

After a ton of research about solar cells and current battery technology, the design process was directed to decision-making ... deciding whether it would be practical to homebrew a beginning system or whether it would be better to start with commercially available products.

It quickly became apparent that top quality components were very expensive when purchased in small quantities, so in the beginning it would be best to purchase commercially made components.

Thus the initial design goals were:

- Keep the outflow of cash to a manageable level;
- Purchase parts in small increments so that any mistake would not abort the project;
- Expandable;
- Homebrew as much as possible.

Converting the Ham Shack to Solar

After considerable price shopping, I decided to purchase a solar system from Harbor Freight.

This 45 Watt system includes a charge controller, a pair of DC florescent lamps, and is available on sale for under $200. (I have seen it on sale for $160.)

Converting the Ham Shack to Solar

The three collectors are mounted on the roof and aimed at the afternoon sun.

I built a weatherproof box with appropriate collector input and output connectors, and ran a heavy duty “zip” cord into the shack.

Converting the Ham Shack to Solar

For a storage battery, I decided on a 115 Ah (20 hour rating) deep cycle marine battery. The best deal by far is at Wal-Mart where the everyday price is under $70.

I also purchased an inexpensive battery box and added a handful of connectors which allowed me to use the battery in the shack, or to lug it into the field for Field Day operation.

BTW: This 45 Watt panel, charge controller and single 115 Ah battery system was the power source for a 2009 1A Battery Field Day operation. The station was a K2 running 5 Watts, with a small, low-current laptop computer, and numerous 12 V accessories. Everything worked flawlessly for the duration.

Converting the Ham Shack to Solar

The battery box is a neat way of efficiently organizing connections to and from the outside world.

1/4" studs with wing nuts

1/4" hardware forms the solar input terminals and all hi-current connections, like feeding the inverter.

Multiple output connectors offer universal connectivity... dual banana, Anderson Powerpole, and cigar lighter.

2nd, identical battery just visible to the rear.

Converting the Ham Shack to Solar

Converting the Ham Shack to Solar

If you plan to operate 120 VAC equipment from solar charged batteries, you'll need to purchase an inverter. Even though modified sine wave inverters are very inexpensive, you should look to a long range solution and purchase a pure sine wave inverter. The SunForce model shown here is a 1 kW, pure sine wave inverter and sells for ~$300.

Charge controller showing 13.2 VDC available at the battery terminals.

1kW inverter showing 120 VAC output under 400 Watt load.

Converting the Ham Shack to Solar

What's Next?

- Plans are in store to begin building my own 145 Watt panels. In bulk, they can be purchased for under $1 per Watt. (If anyone is interested in partnering in a bulk purchase of polycrystalline cells, please contact me. WS6X@comcast.net.)

- Continue to add batteries until I can switch the entire shack (not including the 240VAC amplifier supply) to 24-7 solar power with 50% additional headroom.

- After 3 - 4 batteries, the need to vent becomes a concern. I plan to relocate the "battery pack" to the garage and provide an enclosure with proper venting.

Converting the Ham Shack to Solar

For anyone interested in experimenting with solar energy:

- Take the time to become familiar with the technology. The Internet is a storehouse of information.
- Develop a flexible plan that suits your goals and budget.
- Remember... Solar cell and battery technology is changing rapidly.

That leads to ...

Converting the Ham Shack to Solar

Clymer's Law of Investing in Solar:

Every time you make a purchase in solar technology, the next day you will find it at half the price and twice the efficiency!

Guaranteed!

Converting the Ham Shack to Solar

Seriously:

If you are considering solar power for your station, I would be delighted to answer questions or to help find resources. You may contact me by email:

WS6X @ comcast . net

Any “?”

OK, I have some homework for YOU!

If you are serious about solar generation, you need to choose between :

- Amorphous Cells
- Mono-crystalline Cells
- Polycrystalline Cells

Let me know what you decide!

And WHY! ☻

Here's a great resource to get you started:

www.polarpowerinc.com/info/operation20/operation23.htm

THE END