



Zero Beat

December 2021

General Meeting
Wednesday December 8
At 7:30 pm at the
Hazel Park Library
and on Zoom
With Socializing
At 7:00 pm

Solar Panel Buffet.

Chris Warren November 26, 2021

They're all (mostly) the same...on the outside.

Solar panel technology has gotten so inexpensive that even the tightest budgets can do it. The solar panels on my roof cost about \$2.50/watt ten years ago. Today I could replace every one of them for less than half that. In some cases they come in at less than \$1.00/watt! It got that good that fast! Solar panels are also a lot easier to find. They used to be a niche product sold only by a few distributors. Today...they're ubiquitous on Amazon and eBay and even local hardware stores.

So when a radio amateur decides to jump off the grid, it's easy to choose any panel in the desired power and price range. Click, click, click...it shows up at the door in a day or two, for not a whole lot of money. Before indulging in the buffet of solar panel options, it's helpful to have some working knowledge of the different types.

1: Thin film Solar

Thin film solar panels are the most common and least expensive. They are made by applying a silicon film to a flexible substrate such as plastic. This allows the panel to be folded or shaped to uneven surfaces. However, not all thin film panels are bendable. Some versions are on a hardened backing.

The tradeoffs: First, less efficiency. Amorphous silicon, which accounts for the vast majority of thin film panels, will not produce as much power as other panels of the same physical size. Don't read too much into this, though. The difference is not so great as to make a big difference to off grid radio applications. Second, thin film panels do not have as long a service life as the rest. While conventional solar panels can last twenty years or more, thin panels will need to be replaced sooner. Again, for the average ham, this is

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not a major consideration.

Variations on thin film solar panels.

Thin film solar comes in three basic varieties:

- amorphous silicon
- cadmium telluride
- copper indium gallium selenide

Thin film panels more or less all look the same, so there is no way to tell which flavor you have from outward appearances. If chemical makeup information is available, steer away from cadmium telluride. The panels work just fine but cadmium is a highly toxic heavy metal and difficult to dispose of ethically at the end of the panel service life. Cadmium telluride accounts for only about 5% of thin film production and nearly all of that is for commercial installations, so you're not likely to run into it.

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Copper indium gallium selenide panels are also marketed as "CIGS" or "CIS" panels. It's a really great technology with an efficiency & price point as good or better than mono crystalline panels. The infamous [Solyndra corporation](#) was a major producer of CIS panels before they were tangled in a Federal fraud investigation and went out of business. Other manufacturers produce them but you'll have to dig around as they are not very common.

2. Mono crystalline solar panels.

Mono crystal panels are at the top of the solar panel pyramid. They are the most efficient, and as you might guess, the most expensive. They are made from slicing silicon from larger bricks or ingots and can be identified by their uniform color. This process produces some waste, so of course that gets factored into the cost. The uninterrupted repeating crystal structures within

the slices is why these panels are more efficient.

The [latest data I could find](#) indicates that mono crystalline panels are the second-best selling type of panel globally. However, the data is several years old and since then the cost of mono crystalline solar panels has come down. Monos are only slightly more expensive and sometimes equal to other technologies.

There are not a whole lot of disadvantages to mono crystalline solar panels, other than the cost. Another consideration is the sizes available. Getting a mono in lower wattages that many hams use (less than 50 watts) is certainly possible, but the dollars-per-watt goes up as the size of the panel goes down, and flexibility may be an issue. By flexibility I mean the transport and use of the panel.

Monos are usually built into an aluminum frame. While there are a few exceptions, they typically cannot be rolled up or folded, so the size and shape you get is what you'll have to physically fit into your system.

3. Poly crystalline solar panels.

Poly crystal panels are a great balance of power and price, making them an excellent "bang for the buck". I use them myself for my large home installation.

Polys are manufactured by pouring melted silicon into molds. The resulting silicon crystal structure is uneven and random, giving the finished solar panel a characteristic metal flake or "broken glass" appearance of varying blue shades.

The main disadvantage to poly crystal solar panels is the lowered efficiency compared to monos. Because of this, a poly will be slightly larger than a mono of the same power output. The inefficiency does come with a lower cost, so you are getting something in the tradeoff. The difference in size is not significant and should not be an issue unless you are so tight for space that even a inch or two matters. Polys are also typically made with an aluminum frame. Like monos, in most cases they are a fixed size and shape.

Poly crystallines are easily the most popular type of solar panel on the market. With retail panels regularly dipping below \$1.00/watt (a target price

that would have been unheard of just a few years ago), they are a fantastic value for the money. Unless you can find monos on sale for comparable prices, polys should be the first choice for the off grid amateur.

4. Perovskite, the solar power version of “vaporware”?

Way back in 2017 I posted [an article about emerging perovskite solar technology](#). At the time it was still in the experimental stages and (we were told) it would be on the market soon. I’m not sure how others define “soon” but here we are nearly five years later and perovskite solar is nowhere in sight.

There are a lot of whispers and rumors, yet no actual product. “Click bait and switch” trickery is alive and well, though: I found one ad by an on line retailer proclaiming, *“Seriously, we have perovskite solar!”*. Then when I clicked on the ad, it sent me to a page of legacy technology solar panels that one can find anywhere.

I’m including perovskite on this list because I believe it will ultimately become available to us regular folks. Until then, keep it on your radar. If anyone knows of a retail source for perovskite solar, please tip me off because I’d love to get my hands on one and write an article about it.

Where to go from here.

Economies of scale and improved manufacturing processes have pushed solar energy to a place where almost any radio amateur can afford it. Even with all these good deals going on, it’s in your best interest to know the difference between the different types of panels and understand what you’re buying.

Choose thin film solar if:

You want a solar panel that can fold, roll, or bend.
 You have low power needs and do not expect to expand your system.
 Are willing to sacrifice efficiency for physical flexibility (fold/roll/bend).

Choose mono crystalline solar if:

Efficiency is a top priority.

You have the budget.

Physical space is restricted and you need to squeeze the most power out of every square inch.

You are ok with having rigid, fixed-size panels that cannot be rolled, folded, or bent.

Choose poly-crystalline solar if:

You are budget-conscious and are looking for the best “bang for the buck”.

Physical space is not critical.

You are ok with having rigid, fixed-size panels that cannot be folded, rolled, or bent.

The cost differences between mono and poly crystalline solar panels has tightened to the point that it is not too hard to find mono panels priced very close to or even lower lower than polys. Shop around...you may find some champagne for a beer price!



HAM RADIO SANTA WILL HELP YOU FIND THAT PERFECT GIFT FOR YOUR FAVORITE HAM OPERATOR



<https://www.etsy.com/shop/HamRadioSHIRTSnHATS>

Chairmen

Repeater	Joe WB8ADX
W8JXU Trustee	Bill N8QVS
Swap	John KD8NYF
Field Day	John AA8UU
Education	Jerry W9NPI
Sunday Net	Bob N8REL
Zero Beat Editor	Rick KB5OO
Public Information Officer (PIO)	Rick KB5OO
Webmaster	Mike K8WU
Banquet	John W8TOY
Club Picnic	Jay WB8SBI

HPARC Nets

HPARC Official Sunday Night 2-meter Phone Net

Every Sunday a 9:00 Pm local time on the DART repeater, 146.64 (PL 1 00), catch up on club news and information, and just to keep in touch. All amateurs are welcome to check in.

ARPSC Thursday Night 2-meter phone net

Every Thursday at 8:00 PM on the W8OAK repeater, 146.90 (PL 100). The Hospital radio check net takes place on the last Thursday each month at 7:30 PM on the W8OAK repeater. <http://www.arpdc.com>

Around Town

HPARC Buddy Breakfast every Saturday at 9:00 AM (or so)

Cozy Cabin Diner, 2129 E. 12 Mile Rd, Warren, MI
Come in early for the socializing. Park in the restaurant parking lot.

Volunteers

LoTW Manager	Murray KE8UM
Refreshments	Brenda N8AQ
Club Cook	Bill N8QVS
Holiday Meeting	Board of Directors
Equipment Inventory	Jim K8ABZ
Audio/Video Specialist	Ken KE8LIG
Lark in the Park	John AA8UU
Meeting Greeter	OPEN
Net Control Operators	Lee KD8TBC John W8TOY Mike K8WU Bob N8REL
HPARC Media Dream Team	Hugh KE8BED Rick KB5OO Al K8ALH John AA8UU Mike K8WU Jim K8ABZ John W8TOY

Oakland County ARPSC Siren Testing, 1st Saturday at 1:00 PM.

March through November. Contact Marsha, N8FE, at n8fe@arrl.net, to volunteer and be assigned a siren to test.

Amateur Radio Licensing Testing

Jerry has announced that license testing will begin again on The second Tuesday of every even month at 7:00 PM at the Oak Park community center.