



# The Adventures of “Private Power”

By Steven Moore



## On The Rack

A few years ago, our children’s electricity consumption was growing even faster than they were. It was clear that we would have to produce more juice. That meant more solar panels. We already had six on the roof and any more would block the view of our pond from the upstairs windows. That meant a new site for the new panels.

I had seen solar panel racks that could be swiveled horizontally and tilted vertically to directly face the sun and generate maximum power. I had also heard that such a rack would increase our power output by at least 20% over a fixed mount. Sounded good so far. I even looked at racks with a little DC motor on them that automatically swiveled and tilted the panels every few minutes.

I finally decided to go with another kind of solar-powered rack-turner – us. Just as we have resisted any kind of automatic device to turn on the generator at low battery levels, so we would resist an automatic rack turner and do it ourselves.

The design was fairly simple. First, a big lattice to hold six panels with a horizontal pipe through the middle that could tilt on the two upright forks of the rack. That took care of following the up and down motion of the sun from horizon to high overhead. Second, upright forks with a seven-inch pipe that slid over an eight-inch pipe in the ground so water would run off the outside. That would give us a 360° swivel when all we really needed was about

270° from a north-northeast sunrise to west-northwest sunset at the summer solstice. I visited a steel dealer in Belleville, opting for new one-inch angle iron for the lattice, five-inch channel with a one-inch flange for the upright forks and base, and used seven and eight-inch pipe.

My neighbor, Jeff, is a welding genius, thank goodness. He and I measured and cut and drilled angle iron for a day and fashioned the six-pocket lattice. Another hour and we built the upright forks and base in the shape of a large “C”.

I prefer working with wood, it’s more forgiving. Steel is cold, or hot, or sharp and heavy. It throws sparks, not sweet-smelling shavings. Working with it is also noisy – if it isn’t a chop saw, it’s a grinder because you can’t just plane an edge to make a good fit. I wore out a pair of leather gloves working with it.

You also can’t stick your marking pencil behind your ear because steel laughs at pencils. It takes a piece of soapstone to mark it and that soapstone just wouldn’t stay put.

But I learned how steel will shrink and expand and pull and push when it is heated and joined together. I even learned to weld a little. Now we had our lattice and our forks. Tilt was accomplished.

We cut and welded the larger pipe to the base of the forks. All we had to do now was figure out a way to swivel the whole rack on the smaller pipe that was to stick out of the ground.

## *The Adventures of Private Power* by Steven Moore

It had to have stops so I could slide bolts into the stops to discourage the rack from acting like a spinning top on windy days.

My neighbor looked at the ceiling a minute. “A flywheel is what we need.”

“A flywheel?” I asked, “I don’t think we have to worry about a constant speed for this rig,” I said.

“No, a flywheel is round and has holes all around the perimeter,” he said. “We weld a large round flange about three feet down from the top of the pipe that comes out of the ground. Then we weld a flywheel on the end of the pipe that fits over it. When we slide the base and lattice down over the ground pipe, the flywheel rests on the flange. If we drill enough holes in the flange, you can just drop a bolt or two in there to anchor the rack anywhere you want.”

It sounded like Junkyard Wars and it worked.

While Jeff was spray painting the whole rack a metallic blue (better than any of our vehicles), our family began to prepare the anchor to hold the pipe sticking up out of the ground. Wind could exert quite a force on our six-foot by five-foot lattice of panels, as anyone who has tried to move a sheet of plywood on a windy day can attest. So we decided on a concrete base. That meant digging a hole four feet by four feet by five feet deep.

Digging that hole in our stony ground took as much time as building the rack. We all toiled down there with picks and shovels for a full day, never taking a good scoop of dirt without clanking against a rock. It was slow and frustrating. I figured there were about thirty gazillion cupfuls of dirt in a whole that size.

We bought 50 bags of cement and borrowed Jeff’s cement mixer, then filled that hole back up with rocks and cement around the smaller flanged pipe with a star of steel bars welded to the bottom for extra support.

At one point, I turned around to see Charlotte struggling to carry a 50-pound bag of cement over to the mixer. At that moment, she realized every farmer’s fondest dream – a daughter who could lift her weight in cement.

We gave the concrete a week to set. Then Jeff brought the rack up and we slid the larger pipe, base and forks down over the pipe in the ground until the flywheel rested on the flange. Just the right height. Then we secured the lattice to the forks with the horizontal pipe. It fit. Once the modules were bolted to the rack and wired together, we doubled our power production to 900 watts peak power and turning the panels to follow the sun did, in fact, increase our production by another 20%. I highly recommend it.

All we needed was a precision instrument to tell if the panels were aimed directly at the sun. Sextant? Astralabe? No, a one-foot square piece of plywood with a dowel screwed into the middle did the trick. Place the plywood flat on the panels and they faced directly into the sun when the dowel threw no shadow.

Now “Did you turn the panels?” is heard in our house nearly as often as “Have you seen my hat...glasses...socks?”

I’ve been out there so often that I can pretty well amaze my friends anytime of the year by facing the sun and guessing true north and what time it is. An unexpected benefit of a solar panel rack for Private Power.

***Steven Moore and his family farm off-the-grid in Eastern Ontario***