Above: Sue, Steve and Ditto in front of their solar-powered and earth-bermed home and business. Photo by Dan White

Some talked, we moved…

Sue Robishaw

It's been fifteen years since we quit our jobs and the city to move to the backwoods of Michigan's Upper Peninsula. We were part of the much talked of homesteading movement of the seventies. Most of our friends talked, we moved. Many who moved went back, physically or philosophically. We couldn't imagine "going back". Why would we? We weren't trying to make a statement. It was just our way of life — a comfortable, happy, satisfying and fun one.

OK, I admit, there are hard times. But they're easier when you have shelter, food, heat and electricity — all with little money needed for maintenance. It's a great sense of freedom for us to know that when things get bad we can make do quite well with very little money. To be honest, that's the way we live most of the time! And it's not bad at all.

Shelter

A person's home is all relative — hovel to one, castle to another. We started out in a four foot by eight foot plywood based, truck camper-cap-top home. It was great. It was paid for. We had an old car battery to run our car radio/tape player, and oil lamps for light. However, when the temperatures dropped into the low digits our half-built cabin/shop next door became our new castle. It didn't matter that it was barely up, let alone anywhere near being "done". It had a wood stove that could blast you out with the heat, and it kept a fire all night — heaven.

We had little building experience but we poured over the available books, especially Eccli's *Low Cost Energy-Efficient Shelter*, and drew plans. The wood and nails for our shop/temporary home were bought with $1500. The wood was green, but that was what we could afford. We built a comfortable, simple, 14 foot by 22 foot shed-roof home with south facing windows. It was a great way to learn to build. Steve wired in a simple 12 Volt system, replaced the old car battery with a new marine deep cycle unit and added some 12 Volt lighting. It was home and workplace for seven years, and has been a workshop for eight. Shelter doesn't have to cost a lot. We ended up with about $2600 total in the place, including a six foot by fourteen foot addition and a small porch. We made our own windows and latches, furniture and doors. After eight years we still miss living there, so much of ourselves went into it. But ever onward...

The Big House

We spent hours upon hours reading and drawing, building models, changing plans. Our energy efficient,

passive solar house was going to be great — slipform stone walls from the Nearings, underground design ideas from Malcolm Wells, windows and doors by Eccli, basics via Architectural Graphic Standards, and acres of south facing glass like the best of them. We were ready. We figured it'd take us two years, maybe three since we had to start a garden, cut firewood, fix roads, and build sheds and barns. Ah well. Thank goodness and any gods watching over us that we were always running out of time or money. It was many years before we finally got to the bulk of building. By then we had mellowed some, had a much closer feeling for the place and had come across Mike Oehler's *$50 and Up Underground House* book.

Two of the biggest changes were to build out of wood instead of stone, and to reduce our planned south facing glass to a size that made sense in our climate. The result was a place that fits in well with the surroundings, the local weather and us. We had no natural stone to work with and the price of cement was going up much faster than the house. We live in the woods, there are sawmills nearby. Wood just made sense for us. Oehler gave us the inspiration (if you're out there Mike, Thanks!). So our home is a timber-frame structure with 12 inch by 12 inch posts and beams, four inch by six inch intermediate posts and four inch by twelve inch rafters. The ceiling/roof and walls are two layers of one inch rough-sawn green pine. Yes, planed on the interior side would have been nicer but the budget didn't allow. The six-sided shape of our place had already been set in concrete, in the form of footings already dug and poured for the slip-form house. So we adapted our wood design to the shape which made for interesting joints and creative saw work!

We used scrap lumber to rough out a model actual size, on site, to reach our final south window and roof design. The original 12 foot high front window area came down, and down, and down farther to end up three feet high. It felt better and turned out to be a good decision. A large south window expanse would heat up the house well on sunny days, true — the status quo solar home design. But if you actually work and live in your home during winter days it's not practical or comfortable. The glare and heat from all that glass exposure on sunny days would make for very uncomfortable conditions in the south rooms. Also the large area would allow a lot of heat to escape during cold winter days. Insulating curtains are a good solution for night, but you usually don't want to block out the light and view during the day. Since we both work and live in our home year round, the three and four foot high by thirty-six foot wide south facing window design was a good compromise. Each window has its own insulating curtain so on really cold, not sunny, winter days we open only those windows needed for light. An attached greenhouse now covers a third of the window area and provides a place in the shop to work which is glare free.

Building an underground home has peculiarities of its own to take into consideration, some obvious some not. One is that it does need to be insulated — from the ground. The earth insulates you from the hotter or colder air temperatures (how well depends on the type of soil, how wet or dry it is, and how deep). In the cold areas, the ambient temperature of the earth can be 45–50 degrees — rather cool for living spaces. We used an inch of foam board on the bottom half of the walls, two inches on the top half and three inches on the roof. We have about six inches of soil on our roof. If we were to do it again, we would put another inch or two of foam on the roof and walls. But that was what we could afford then.

Never underestimate the power of the earth. It's amazing we have learned. Design well for the particular stresses of underground buildings. Then add in lots of fudge factors and overbuild from there. It's unnerving to see a six inch by twelve inch beam bow in an inch or two and it takes a lot of digging to correct. But we wanted a window there anyway....

We enjoy living this close to the earth. It fits us and the land. With clerestories and windows, it is not at all like "living in a cave" as many imagine. The buffering effect of the earth is much appreciated in temperature extremes and storms. It is also very quiet which could be a great advantage if one lived in a noisy area. For us we put in a vinyl window to let in some of the surrounding noises. Then there are the deer and rabbits stomping across the roof at night — comforting for us, a bit of unnerving for guests.

Power

"As the old story goes," we started with a car battery and car radio in our four foot by eight foot camper home, with candles and oil lamps for light. As we settled into our cabin/shop we progressed to some 12 Volt, 8 Watt RV fluorescent lights and an old marine deep cycle battery. Then in December 1982 we installed our two ARCO 16-2000 photovoltaic (PV) panels, 4.4 Amps of power, on a handmade manual tracking pole mount rack. We added another marine deep cycle battery, a blocking diode, some wiring and two inexpensive meters. Our $1500 system was complete. Heaven on earth!

There wasn't much real info about alternative energy back then. We had what had been written in the old *Mother Earth News*, and the small catalogue from the Earth Store. But Steve knew about cars, understood

the basics, and trialed and errored it from there. We added tail light bulb lamps, and took the old TrippLite 250 watt inverter out of the van to run Steve's computer. We used power when we had it, and didn't when we didn't. We had a gasoline engine mechanically coupled to our power tools and the old Maytag washer (via a line shaft arrangement), but no generator to charge the batteries. December usually found us back with oil lamps and candles for a time.

The system moved with us into the new house in '85 with few changes. It would be two years before that first exciting *Home Power* issue arrived. Those first issues showed us how much better golf cart batteries would be, and that we weren't the only ones living this way. We personally knew of no one else living on alternative energy.

Over the years a few things were added, such as a 100 watt Statpower Inverter to run the printers and small tools, a 2200 watt generator to run the larger power tools, vacuum and washer, and a home-built generator to help charge the batteries in cloudy, low sun winters. Compact fluorescents with their great light color happily replaced the old regular fluorescents as our main lighting. The old lights were moved to the shop area, and small 0.2 Amp bulbs were placed here and there where candles used to burn. Steve also finally corralled the various wires and parts of our system into a neat power center. A few hours project turned into a few days and made Ananda's Power Center look *real* nice.

Last summer at the Midwest Renewable Energy Fair we splurged and bought two used Arco 16-2000s. We were now a four panel family! As is the case for those of us who build our systems piece by piece, we were happy with the added solar power but frustrated too. We were now short of battery and inverter power! All that "extra" power coming in and often no way to utilize it — but one step at a time! A larger inverter, more batteries and some efficient Wattevr Works DC motors for the washer and power tools will be added as we can. A few more panels will be next and then the generator gets torn apart for parts. We can't wait. See the chart for an estimate of how we use the power we have. Our use reflects our livelihoods which include woodworking, computer training and programming, writing, and an alternative energy business.

Sue & Steve's Energy Use

12 Volt DC Loads	*Watts*	*Hrs/day*	*W-hrs/day*
Fluorescent lighting	11	6.4	70.7
Incandescent lighting	3	5.7	17.1
Power tools	24	0.7	17.1
Greenhouse fans	3	5.7	17.1
Laptop computer	6	2.1	12.9
TV (2 inch)	5	0.7	3.6
Radio/tape player	2	1.4	2.9
		12 Volt DC Subtotal	141.4

120 vac Loads	*Watts*	*Hrs/day*	*W-hrs/day*
PC computer	35	2.9	100.0
Power tools	150	0.1	21.4
		120 vac Subtotal	121.4
		Total in Watt-hours per day	262.9

System Batteries

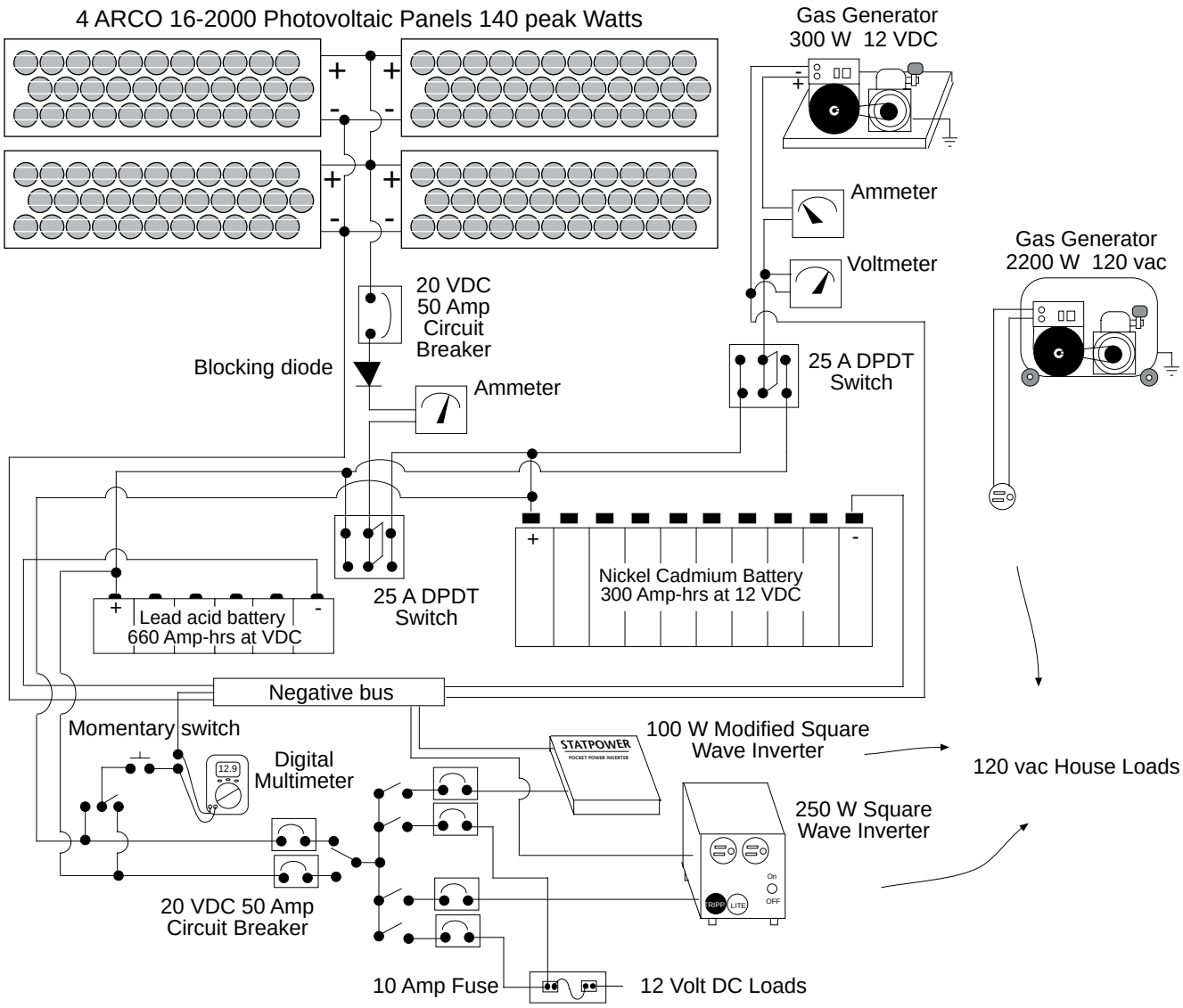
Once in a while things go OK for us simple living folks who've chosen to live with little money. We made do with one or two deep-cycle marine batteries for 10 years. They were old and way past retirement time but there just wasn't anything in the budget for new ones, even a set of golf cart batteries. Then one muddy spring day we were scrounging around the local salvage yard looking for something or other for our car when I spied a large pile of old auto batteries. We had to go look them over. There at the very bottom (of course) were some old steel case batteries in wooden crates. They turned out to be thirty-six 100 Amp-hr nicad cells made in 1963. We began learning about nicads.

In the end we replaced the electrolyte in only one set of 10 cells (the ole budget constraints again) but put the other 20 cells in service with only the addition of distilled water and oil. We tested them and found the reconditioned cells came in at 77% of rated power and the not reconditioned cells at 50%. A total of about 177 Amp-hrs of storage. Not the best, but compared to our old, tired marine batteries they are great — at a cost of only $70 for the batteries, new electrolyte and oil.

After we installed the old nicads, friends who went from generator to grid power gave us their five year old golf cart batteries, 660 Amp-hrs. We tested them out at

How much Sue & Steve spent ...

Equipment	*Cost*	*%*
4 Arco 16-2000 35W PV panels	$1,100	61%
Lighting	$170	9%
TrippLite 250 watt inverter	$160	9%
Wiring	$130	7%
Statpower 100 watt inverter	$120	7%
3 sets salvaged 100 Amp-hr nicads	$70	4%
Meters, control box	$50	3%
Total	$1,800	



Grass Valley Homestead System

65% capacity — not too good, but battery power is battery power. We weren't about to just throw them away. Since Steve was working on our new power center at that time, he built in a switch so that we can charge either battery pack, and we built a battery box for each bank. We don't have a regulator so we keep a close watch on the batteries and operate the switches manually. Then we tried the EDTA treatment to restore some of the capacity of the old golf cart batteries. We had previously used EDTA on our old sulfated marine batteries and it did appear to help. We had an interesting experience with the EDTA and the golf cart batteries though. After adding the EDTA we put the charger on the batteries and monitored the voltage. It went down instead of up — not quite what we had in mind. We dug through the old *HP*s. Nothing. We called Bob-O Schultze. The conclusion was that the EDTA was working, raising the capacity of the batteries even while we were charging, which meant the percentage of charge would go down. In the end the golf cart batteries came in at 70% capacity.

We never actually used the golf cart batteries in our system. They came in handy though as a loaner to a customer with a new system and a much delayed shipment of reconditioned nicads. Now that his nicads are installed, the golf cart batteries are in a new home with folks who live and work with a propane guzzling generator, and little cash. They have a small inverter, battery charger and hopes for a panel or two next summer. The process starts again.

Water and Waste

Our whole "alternative energy" system started when we moved here, had a well drilled and put up our 8 foot Baker "Runs in Oil" Windmill on a rebuilt power line tower. So few words but what an adventure! A 1200 gallon concrete septic tank, covered with sand, sits next to the tower to hold the water. A buried 1½ inch line down to the house (with side lines to the garden and the workshop) provide gravity fed running water. It's a great, simple system. Not without its problems, quirks and maintenance for sure but we love it. It doesn't take many winters of hauling water from town (the last half mile by sled), or pumping water by hand and hauling it from the pump, to make you really appreciate every drop coming into the house by just turning the faucet. We still use water as if we were hauling it, a habit I hope we never lose. The windmill is aesthetically pleasing, and fixable with hand tools and muscle. To us that is a big advantage over a solar pumping system.

We have an outdoor composting toilet which works great and was quite inexpensive. The view is much better than any indoor job too. It's very easy to maintain. One pit is used for a year, one pit composts for a year. At the end of the year, compost from the unused side can be spread on fruit trees. That side is then ready for use again. The generous use of wood ashes and sawdust, as well as a vent, keeps "smells" to a minimum. However, this facility was built near the workshop, not the new house. Winters being somewhat cold I admit we do use the archaic indoor toilet/septic tank arrangement on occasion. We hope to replace it with an indoor composting toilet someday. To help keep this system from being any more ridiculous than it is we use gray water to flush and a special alternative urine-commode (aka a bucket with a lid) which is carried to the compost pile. Not only does it not make any sense to use good fresh water to flush a toilet, our fresh water is often in limited supply in the winter. We can only pump water on a windy, above freezing days. We could enclose our pump in a small building so we could warm it and pump more often but this hasn't been necessary yet. Conserving water is easier.

Heat

The sun provides a lot of our heating, both space and water, as well as cooking. The south facing windows in the house (and the shop) do their job well when the sun shines. The rest of the time we heat with wood. Since we're becoming less and less happy with cutting trees to burn, we're going to install four used solar heating panels on our roof this spring. This should reduce our firewood demand, as well as be a very "interesting" retrofit to our house.

Our water heaters vary with the seasons. In the summer, we use our "¾ inch black pipe draped across the roof of the house" unit. It works great, though the grass and weeds do shade it some. It hooks into the water line at one side and has a faucet at the other, near the door. Our old standby "large dark enameled coffee pot set in the sun" system is used often since it can easily be moved to the sunniest spots. We also keep a jar and glass coffeepot full of water in our homemade solar oven for convenient hot water. During the cold months there are always kettles on the wood *heating* stove as well as a small hot water tank, fitted with a faucet at the bottom, right beside the stove. This provides warm water whenever the stove is used. Year-round whenever the wood *cook*stove is going, there are water kettles heating also. But with cooking on the heating stove in winter and the solar oven the rest of the year, the old cookstove gets very little use now. Our trees are happier.

Cooking and Refrigeration

In the winter we cook mainly on our wood heating stove. The wood cookstove is used more in the fall and spring when we want the heat it provides. We use our propane hot plate now and then for quick cooking jobs. As soon as the weather settles, we put out our homemade solar oven and use it whenever the sun cooperates. The oven is bulky and heavy so we don't move it in and out very much. The interior is an old stainless steel steamer pan we had around, painted black, with an added free swinging metal tray. We had some fiberglass duct board insulation to use, and a large cardboard mail box which was just the right size for the exterior. We painted it with some leftover epoxy resin then several coats of oil paint to try to make it weather resistant. The top is a piece of plywood cut to fit which holds the hinges for the glass door and brackets for the reflectors. The reflectors were made from aluminum which turned out to be too dull — we couldn't get the oven over 250 degrees. We still used it though! This year we glued on very reflective mylar film which we had (in the form of an emergency blanket). This is a great improvement even though we couldn't get the film on smooth. The oven easily gets up to 250 degrees on a hazy day, and into the 300s when it is sunny. The oven sits in a wooden base which is attached to a pipe in the ground so it can be tracked by hand east to west throughout the day.

Above Left: Sue and Steve at work together in their solar-powered office.

Above Right: Steve works wood on his homemade, pedal powered lathe.

Middle Left: Sue and Steve's bedroom with instruments on the wall. They make dulcimers by hand.

Bottom: Sue cuts wood with her homemade handsaw.

Photos by Dan White.

Our refrigeration is simpler. We have a root cellar and pantry in the back of our house which stays between 32–40 degrees for about seven of the colder months. This is our refrigeration, and we enjoy being able to keep leftovers for the next day. During the warmer months, the temperature climbs slowly to about 60 degrees in those rooms and we simply adjust our cooking and eating habits to reflect the lack of cold storage. We don't find artificial refrigeration to be a necessity at all. We appreciate the cold when nature provides it, and get along quite well when she doesn't.

Another kitchen appliance we use is a grinder. We have a hand operated steel bur mill for grinding oat flour, corn flour, homemade Postum and the like. For wheat, barley, millet rye and buckwheat flour, we have a hand stone mill which Steve fitted with an electric motor. This runs off the generator when we have it going for the washer and/or vacuum. Grinding our own flour works out well since whole seed stores much better and longer than ground flour.

Livelihood

We have a range of small, micro and nano businesses for our livelihood. They fit more or less smoothly with each other and blend into our lives. Steve does independent computer training and programming, usually working "out" one or two days a week throughout the year. He put together his computer to utilize the most energy efficient components at the time. This was important since his longer programming projects usually occur in the winter when our power is shortest. We are both artists, working in wood. We build stringed instruments, flutes, jewelry boxes, and do some sculpture. Most of this work is done in the winter. Since both of us work more with hand than power tools, this isn't too big of a draw on our power system. I also do some writing, usually in the winter months and usually in the evenings. We both use our computers in various ways for all of our businesses.

A few years ago we realized that more people were becoming interested in alternative energy. There are few, if any, dealers in the Upper Peninsula of Michigan to answer questions and assist those who would like some hands on help. So our business "Grass Valley Solar and Wind" began. We're in a small grassy valley so we had long ago named our place Grass Valley Homestead. Our woodworking business was Grass Valley Woodcraft. Grass Valley Solar & Wind followed without much thought. Frankly we now wish we had come up with a shorter name! We operate all our businesses out of our home with our own resources. The alternative energy business is growing slowly as education, knowledge and interest spreads. Since it is more active in the spring, summer and fall than in the winter, it fits in well with our other activities.

Costs

Our total water system cost us about $3670, the septic system $700 and the outdoor composting unit very little. We figure we have about $10,200 in the house and about $1800 in our solar electric system (not including the gasoline generator). In 1992 we spent $76 on gasoline (for chain saw, garden tiller and generators) and $8 on propane for a propane hot plate. A related cost/savings in our "alternative energy" lifestyle is gardening and food. We have a large organic raised bed garden which provides much of our food so we spend about $1000 a year on outside food, household supplies and sundries.

Of course dollar costs for any of this doesn't begin to compare to the enjoyment, satisfaction and just plain fun that we get from living and working the way we do. I hope the day will come when many others will have fun with a similar lifestyle, and it will no longer be "alternative". Not that we don't have a long way yet to go to living gently on earth. But it will be nice when most everyone around is going in the same direction. Meantime, we appreciate the support and sharing of other Home Powerers who are working toward that day.

Access

Author: Sue Robishaw & Steve Schmeck, Grass Valley Solar & Wind, Rt 1 Box 52, Cooks, Michigan 49817 • 906-644-2598