Bill Kelsey

Hydro New England Style

Lights make the spirit happy, especially here in New England, but I did not want to put up with the noise of a generator. I had been living off grid using propane lights, which can be a fire hazard and are too hot in the summer. After talking with Gordon Ridgeway, a friend living off grid on solar electricity, I began investigating alternatives. My property is heavily wooded, so I only get a few hours of sunshine on an average summer day, and even less in the winter. What I do have is a brook with a good downhill run. It drains about 2,000 acres, all in a state park with no houses.

My 10-acre woodlot in Sharon, Connecticut, was once used by early settlers to grow fuelwood for their homes. Because of right-of-way restrictions, there is no access to the utility grid. With only a 30-foot (9 m) drop and the cold New England climate to work with, I have constructed an innovative, hydroelectric system that sustains me completely off grid.

Starting from Scratch

When I started twenty years ago, I had never seen another hydroelectric system. I built mine completely by trial and error. I ordered a Harris Hydro turbine from a retailer for 15 feet (4.6 m) of vertical drop. My first Rube Goldberg setup was a 275-gallon (1,040 l) flat tank with the side cut out of it, so that water coming off the top of my rock and timber dam passed through a homemade filter and into two, 2-inch pipelines laid side by side in the brook.

After many months building it, and lots of friends' ideas, it was disappointing when the turbine only produced 30 watts at best. I tried to get a refund, but the supplier refused, so I was stuck with all my toys and no electricity. Out of desperation, I called Don Harris—and thank goodness

The four-nozzle Harris turbine generates 3.6 KWH per day.

I did! Don helped me save face. You see, I had become the laughingstock of the town. I love tinkering, so after Don explained the requirements of a successful hydroelectric system, I knew my brook could produce a substantial amount of electricity with the right setup.

Don started by telling me I had too much pipe friction, so I changed over to 3-inch pipe. It worked a little better, but then I had problems with freezing in winter. Again, Don saved the day. He said I should measure the head (vertical drop) of the brook over the whole course on my property. That came to 30 feet (9 m), twice the head of my original system!

As luck would have it, my friend Bob was selling his 20-ton excavator for US$15,000, so I mortgaged my house to buy it. Next, I selectively cut oak trees on my property for cash to finance my project. We had a dry summer in '99, so I hired a friend to run the excavator and we dug a pond and a trench running along the brook for 275 feet (84 m). I worked feverishly for three months burying 4-inch PVC pipe, 15 feet (4.6 m) below the surface so it wouldn't freeze in winter. My welding skills came in handy when I fabricated the pipeline's intake, and I then built a concrete pad for the hydro turbine, complete with a 1/8-inch (3 mm) plate steel, bombproof cover.

In August, we sometimes have heavy rains. That August, we had 7 inches (18 cm) in 24 hours! I was scared to death, but my new earthen dam held, and I was off making 100 watts—not much, but you learn what you can live with.

One drawback in the early system was that Don's alternators loved to eat up brushes. I had a spare alternator around at all times so I could switch them out and replace the brushes, but it's a big job to change them. Thankfully, Don came out with the brushless, permanent magnet alternator, which I've upgraded to. Now my hydro setup runs day in and day out, making a continual 150 watts. That's 3.6 KWH per day, which I store in eight, 6-volt golf cart batteries.

The removable intake screens are easy to clean.

Steve Schulze of New England Solar Electric and Larry Riley, my electrician, helped me design my electric panel. This panel includes inverters that convert the DC energy stored in the batteries to AC electricity I can use to power standard, 120 VAC household appliances. It also has a remote start switch for a backup generator, which is located quite a ways from the house, since it creates a racket when it's running. A light at the house tells me if the generator is on. The Onan 5 KW propane generator is used a little bit in the summertime when the stream's flow is low, but not much in winter—maybe 75 hours total per year. I use it primarily to power big electrical loads for my shop, which includes a welder and an air compressor.

The intake pipe is secured to the bottom half of a new septic tank hidden beneath the dock.

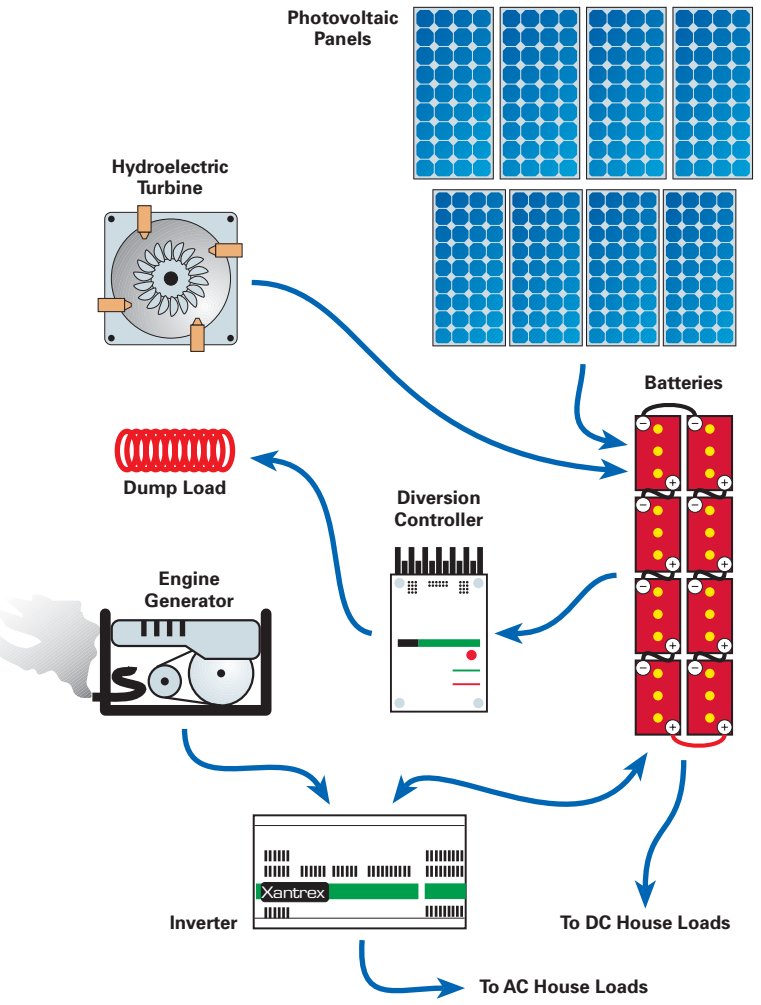
The AC distribution panel feeds 120 VAC circuits, powered by the Trace DR2424 modified square wave inverter. I have a spare inverter just in case I have problems. A DC panel energizes DC compact fluorescent lights in each room of the house.

My system is all up to code. We have severe storms in New England, so even with the best engineering, the possibility of a direct lightning hit is still a threat. We have done a lot to protect from lightning, but there are no easy answers.

Using the Energy

With a frequent surplus of electricity, I decided to see how else I could use it. I had heard how great radiant floor

Kelsey System Energy Flow



Note: Overcurrent protection and disconnects not shown.

heating is, but I wanted a DC circulating pump for the most efficient energy usage. As luck would have it, Ivan labs Inc. was just coming out with a 24 VDC circulating pump—the El-Sid. Using my existing Aqua-Therm outdoor wood furnace for heating and the electricity from my hydro to run the pump, my home is peaceful and warm.

One thing for sure, Don Harris has changed my life forever—thanks, Don! Lights do make your life happier, and now I have more than enough electricity to run lights and basic appliances whenever I want. My wife and I lived in a 600-square-foot (56 m^2) house for years. When the hydro system finally worked, I decided to double the size of our house, and added four BP 75-watt solar-electric panels and later, four more BP 50-watt panels. The setup complements the hydro turbine, producing at about 420 watts in full sun. I heat my domestic hot water and regulate the output of both my hydro and PV charging systems with a DC water-heating element controlled by a Trace C35 controller.

In the power room, hydro and solar power converge. When the batteries are full, excess hydro or solar electricity is used to heat domestic water.

Independent Life

My son who lives in the city once said to me, "If you hopped, skipped, and jumped all the way to town, you still wouldn't get back in step with the world." He and my daughter, who lives a simple life in the country, have been a big part of my inspiration to live up to one of my favorite slogans, "Dare to be different—you might impact the world." When they were young, we took trips to help people in Haiti, and seeing a poor country had a huge effect on all of us. It made us appreciate what we have here, and urged me on to be more self-reliant and less wasteful.

Bill and Patricia Kelsey in front of their energy supply—the pond.

I had a dream of an independent life, totally off grid, trying something that most people would say, "Oh that's impossible. You can't do that." This is what makes me push on. With direction and encouragement, I was driven to build my dream, one building block at a time.

I am working to get young people to view my home and systems, to let them know it's all right to be different, to follow a different path. Maybe it will make an impact and help make the world a better place to live. I might have given up if hadn't received such great advice from Don Harris, and I'd still be in the dark. Thanks also to *Home Power* for inspiration, to help people like me say, "Yeah! I can do that."

Access

Bill Kelsey, 5 Weber Rd., Sharon, CT 06069 • 860-364-0288

Don Harris, Harris Hydroelectric, 632 Swanton Rd., Davenport, CA 95017 • 831-425-7652

Larry Riley, Riley Electric, 116 Point-of-Rocks Rd., Falls Village, CT 06031 • 860-824-0859 • Electrician

BP Solar, 630 Solarex Ct., Frederick, MD 21703 • 800-521-7652 or 410-981-0240 • Fax: 410-981-0278 • info@bpsolar.com • www.bpsolar.com

New England Solar Electric Inc., 401 Huntington Rd., Worthington, MA 01098 • 800-914-4131 or 413-238-5974 • Fax: 413-238-0203 • nesolar@newenglandsolar.com • www.newenglandsolar.com

Xantrex Technology Inc., 5916 195th St. NE, Arlington, WA 98223 • 800-670-0707 or 360-435-8826 • Fax: 360-435-3547 • info@xantrex.com • www.xantrex.com