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Do-It-Yourself Power

Plainfield Couple Find Joy In Solar, Wind Generation

Not everyone would see it the way Ed Hutchinson and Alexandra Thayer do. Ed is retired, since 2004, having spent a career in state government moving among the Finance Department, the Tax Department, and others besides – but he may never have worked harder in his life than he has over the past three years installing not one, but *four* renewable energy systems at the couple's hilltop home on East Hill Road in Plainfield. Erected along the south-facing wall of their old yellow clapboard house, and in the open field that sweeps up behind, where the grass is tended, inadequately, by Ed's sister's horse, are solar hot water, solar net-metered, and solar non-net-metered electricity systems (the last being home-produced power that is not tied into the grid), plus a 30-foot-high wind turbine that spins pleasingly in the breeze and which is Alexandra's favorite.

Ed has mounted and installed all of these systems – labor that includes not just complex wiring to various inverters, heat exchangers, gauges, and switches, but also the grunt work of excavating five-foot holes (through ledge) for the piers for the solar arrays, pouring concrete footings, and trenching the conduit to the inverters in the house and barn. To some, this might sound exhausting. But Ed, affable and bearded, says his blood pressure has dropped, without medication, since he replaced office work with this manual and mental labor, and he's never felt better.

For Alexandra – an attorney, formerly with the AG's office, with Woodbury College, and in private practice – the rewards of the couple's renewable-energy systems are quite spiritual. Alexandra is retired, too, and is one of the alternating hosts of The Quilting Hour on WGDR Radio at Goddard College. She credits Carl Etnier, a fellow radio host whose program, Relocalizing Vermont, awakened in her a sense of the community aspect of producing electricity and intermingling it with her neighbors' power through net metering and Washington Electric Co-op's electricity system.

"Listening to Carl," Thayer says, "you begin to think what you can do to make a contribution, to see the opportunities we have before us, and to know that it's not always, and only, about the money. It brightens my day, every day, to know that these things out in my field are making electricity, and that I can wash my clothes in water heated by the sun. If we generate more power than we can use or even get credit for [through net metering, which credits the couple's account at WEC for the kilowatt-hours they send into the Co-op's system], it goes to our neighbors. That's joyful for me. And I think that has value."

WEC member Ed Hutchinson stands proudly on a construction scaffold behind his 1.3- kW solar array. The power generated by this 12-panel array and the 1-kW wind turbine on the right goes to a battery bank in Ed and Alexandra Thayer's basement.

Domino effect

Ed and Alexandra didn't have solar energy in mind when they purchased their home in 1989. Both had

lived in places where they had felt closed in – even Ed, who is a Plainfield native – and they craved the views and open spaces of the East Hill Road property, which consisted of a house and barn, a ramshackle outbuilding or two, and some 25 acres. But various things – their interests and acquaintances, available time after retirement, and the state of the world's economy – nudged them toward the changes they've made in their home and lifestyle.

As ham radio enthusiasts they had gotten acquainted with fellow ham operator Virgil Hall of West Topsham, who is also known as Charlie, *and* as "The Barrel Man," *and* as one of the area's earliest and foremost proponents of home-produced renewable electricity. (Charlie Hall and his home-generation and conservation systems were featured in *Co-op Currents,* July 2010.) Ed had begun thinking about a solar hot-water system as he contemplated the silly notion of burning expensive fuel oil in the summertime just to heat water. "The price of oil was going crazy," he remembers (pretty much a constant state of affairs).

A "drain-back" system, in which water is pumped through the solar panels, has some advantages, but Ed settled on an antifreeze-based solar hot-water system that would be more compatible with winter.

Proud to do their part. Ed Hutchinson and Alexandra Thayer feel good about providing much of their own electric power and contributing surplus power to the grid. The couple also has a solar hot-water system (not pictured).

Still, there was this concern: If a power outage should occur in the summer and the pumps weren't able to circulate the antifreeze, the coolant could boil and corrode the panels. "Washington Electric has become increasingly reliable," Alex interjects, "but power outages can happen."

So that led to a broader vision – contemplation of a system for backup energy to power the pumps in case an outage occurred.

That's where Charlie Hall came in. Always with his nose in the air for renewable-energy components, he

Washington Electric Co-op has 78 members who have obtained Certificates of Public Good (CPGs) from the Vermont Public Service Board and have bought or constructed renewable-energy systems to participate in net metering.

had picked up several 106-watt solar photovoltaic panels somewhere and offered them to Ed and Alex for a song. Now the couple began thinking about other conveniences and necessities they'd rather not do without in the case of an outage. The list grew: the pump for their deep-water well, the refrigerator, the boiler, the computers, some lights and wall sockets…

"It was out of control," Ed laughs.

The writing was on the wall: They were headed toward some form of more comprehensive home-made energy system. And Alex interjects again, with girlish enthusiasm, "And I really wanted a little wind turbine!"

They reconciled themselves to the costs – "The dollar is tanking against the euro," says Ed, "so it's better to spend it on hardware" – and began researching options. Meanwhile they got started with a hot-water system and erected the 12-panel photovoltaic (PV) array in the back field that they'd gotten from Charlie Hall; combined with the 30-foot wind turbine (Alex got her wish), the PV array was connected to a battery backup system in their cellar.

But a larger, grid-tied and net-metered system was still missing, and they wanted it.

They contemplated going with a program offered by Williston-based All Earth Renewables wherein, for a $1,000 up-front investment by Thayer and Hutchinson, the company would install and maintain a net-metered solar electric system at their property which they could purchase after five years for its market value (estimated at a third of the original cost). Attorney Thayer parsed the financial particulars and wondered if it was the best way for them to go.

"But by now we had gotten excited about this," she recalls, "and Ed said, 'What do you think? Should we do it ourselves?' We called Washington Electric, and Bill Powell [director of products and services] said, 'Oh sure, as long as it has an inverter that's compliant with our system.'

"I knew that meant that I was going to be the cheerleader while Ed did all the work!"

And indeed, they have both excelled at their roles. Ed has tackled all the technicalities, and Alex can wax poetic at the drop of a hat on the cultural and aesthetic values of extracting electric power from nature – and of purchasing much of their intricate system from local businesses and entrepreneurs.

Ed Hutchinson installing and wiring one of the family's two 2,500-W, pole-mounted PV arrays (above and below). It's the two pole-mounted systems that are tied into the grid and, converted from DC to AC power, contribute to the Co-op's electricity network. Photos courtesy of Ed Hutchinson.

Between their ham radio apparatus and their wind and solar arrays, their house and property sport an impressive aerial matrix of wires, antennas, and contraptions. But it is elegant in its way,

and speaks to who they are and what they believe in.

Heading toward net zero

So what, exactly, have they come up with there on East Hill Road?

First, of course, are the three solar hot water panels on the south-facing side of their house. They actually purchased five of these, from Radiantec Inc. of Lyndonville. Ed is still contemplating where and how he will mount the remaining two, but he has big plans for them: They will supply radiant floor heating for the home. The solar hot water system sends antifreeze through pipes interlaced behind the dark screen that captures and intensifies the sun's heat. The heated fluid circulates into the basement, where two heat exchangers, roughly the size of paperback novels, transfer the heat to well water that is stored in a pair of white tanks. The system involves three small pumps – one to pump the heated antifreeze through the heat exchangers and the others to pump the water through the exchangers.

Out in the field behind the outbuildings are three large solar arrays. The 12-panel array that came from Charlie is mounted on a wooden frame that Ed constructed, and is positioned differently from the other two – "steep and a little east of south," as Ed puts it – to maximize production according to the sun's angle across the field in winter and early in the day.

This array, rated at 1.3 kilowatts (kW), and the 1-kW wind turbine nearby, are not net metered; the power goes to the battery bank in the basement. It powers the "protected loads" during the daytime and switches on automatically if the grid goes down. The wind turbine generates much less power than the solar array – 400-500 watts in a good breeze – but because it can generate at night Ed estimates that it provides 10 percent of the power for the battery system.

Some 120 feet away, higher in the field, are the other two solar arrays, each with 11 larger panels (rather than 12; panels are missing in an upper corner of both). They are Schott 230-W panels purchased from a company in Arizona, mounted on commercial

All This And Pellets, Too

WGDR radio's Carl Etnier ("Relocalizing Vermont") aired a program a few years ago with some enthusiastic Montpelier High School students, that made a compelling case for pellet stoves. Alexandria Thayer and Ed Hutchinson happened to be listening.

So, while the boxes of parts for the windmill, the solar hot water system, and the 1.3-kW PV battery-backup system were piling up in the living room in the summer of 2008, they took it upon themselves to install a pellet stove. The rewards were pretty immediate: The stove has cut their fuel oil consumption from 1,200 gallons per year (including their hot water, which is now heated primarily by their solar panels) to 300 gallons this past winter. True, they've also gone through two tons of pellets per year, which they've purchased in 40-pound bags; but that was at a total annual cost of only around $550, still a great savings. They are considering going to bulk storage to eliminate their use of plastic bags and get a better price on the pellets.

As retired folks, Thayer and Hutchinson have had the time to invest in these energy-conservation and renewable-energy projects, and Ed has had the skills to do the installation and maintenance. Not everyone has those advantages (though Alexandra is quick to offer her husband as a resource for others; Ed smiles and agrees to the idea, minus the digging, trenching, and pouring concrete). But they have also taken advantage of opportunities that exist for everyone: local alternative-energy entrepreneurs that provide leading-edge technologies; state and federal tax incentives, and net-metering regulations designed to encourage renewable generation. They take pride in the fact that most of the components of their systems were manufactured in the USA. They are also delighted to have provided business to local companies for many components of their systems.

Vermont doesn't have the nearly ceaseless solar opportunities of, say, Arizona or Texas. But it is generally considered to have more solar advantage than Germany, where PV plays a comparatively large role in the country's energy mix, and when the sun shines on Ed Hutchinson and Alexandra Thayer's open, grassy field, their solar panels can be quite productive. Plus, the wind usually stirs, and sometimes blusters, across the field, spinning the three blades of their small wind turbine.

The energy is there for the taking, and that's what Ed Hutchinson and Alexandra Thayer have done, bringing joy to them both.

racks and supported by vertical poles sunk into the ground. These are the net-metered installations. Their DC current travels through the trench Ed dug to the barn, where they attach to an inverter that changes it to AC power matching the Co-op's electricity.

Ed and Alex' house, therefore, is not off-grid. They purchase power from Washington Electric Co-op, but sometimes their systems are so productive (and/or their usage is so low) that they're producing more power than they need and the excess feeds into the Co-op's system. On a sunny morning in early July Ed peers at a meter that keeps track of how much electricity they've provided to Washington Electric and the grid.

"3,476 kilowatt-hours generated since we started on December 4," he reports. "The system returns about 20 kWh to the grid on a sunny day and has been more than net zero since March. We have used 997 kWh from WEC since December."

Given the summer weather, that will be net zero in a few weeks, with the excess power brewed there on East Hill Road being absorbed by the Co-op and, indirectly, the couple's friends and neighbors.

As Alex would say, that's keeping it local.