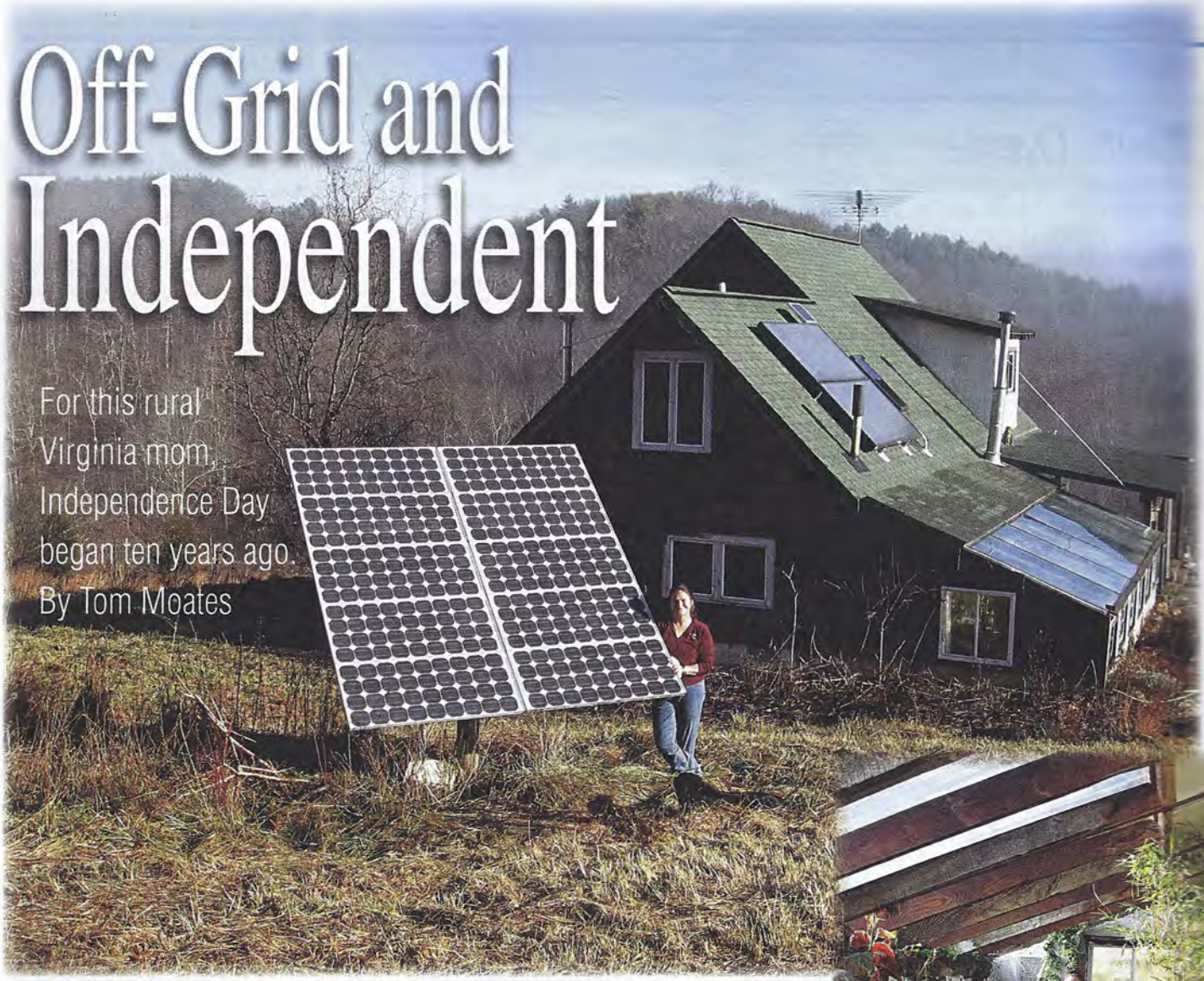
Off-Grid and Independent

For this rural Virginia mom, Independence Day began ten years ago.

By Tom Moates



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Laura Polant's off-grid home is completely self-sufficient, with wood cookstove and gravity-fed springwater. An attached greenhouse allows the family to be even more independent. The author built a livable home with a $50,000 construction loan and has since continued to add improvements.

"I want people to know that average folks can do it," Laura Polant explains, speaking about her experiences building a home from the ground up and living with solar electric power the entire time. Her enthusiasm is difficult to ignore, for at the beginning of her journey some ten years ago, few thought she could pull it off.

Now, with a decade of living proof to substantiate her claim, these naysayers should see her place. Overlooking a remote stretch of river in the mountains of Virginia, landscaped with flagstone and powered and mostly heated by the sun, it is a homesteader's dream come true. The home she now enjoys—complete with wood cookstove for preparing meals, gravity-fed springwater, and greenhouse connected to the great room—is a testament to her belief that average folks can choose to build a life of energy independence for themselves in an affordable way, all the while enjoying the comforts of home and remaining firmly footed in the 21st century.

Polant began her off-grid odyssey as a single mom with two daughters, Bailey and Katie Long, then ages five and seven. "They still, if you ask them to hold a piece of Sheetrock, will go screaming . . ." she confides, laughing at the memory. She worked for the Virginia Department of Forestry at the time and had a fierce independent streak. It soon translated into five acres of property, and a move with the girls into a rough cabin nearby, in preparation for breaking ground on her own place. Polant is the first to admit that homesteading started as a dream early in her life, and little by little became a reality.

"My motivation probably goes back to when I was about 12 years old, reading *Little House on the Prairie* and

saying, 'This is cool!'" Polant recalls. "And then I read all the *Foxfire* books in high school and thought, 'This is *really* cool, not being dependent on anybody else for whatever you need. You can make or do anything you have to.' When I was a teenager in the late 1970s, I lived in California and that's when everything jelled—I knew, from the examples I'd seen, that I could have a solar electric house and live off the grid. So, from then on it was 20 years of real jobs and life and marriage and all that, to get to the point where I had an opportunity to do this."

By 1998, Laura Polant had weathered a divorce, lived with a friend who shared the similar homesteading lifestyle she longed to achieve, and bought those five acres where she now lives, which she diligently paid off. Next, she began the task of designing a house. She borrowed $50,000 as a construction loan to get going, and set out into uncharted territory.

"We lived in a cabin with just cold running water the whole time while we built here. In March of 2001 we moved in. The house was nowhere near finished, but that's part of the beauty of doing it this way. It drives a lot of people crazy, because they want a turnkey deal, but we paid for it as we went."

Polant feels very fortunate to have hooked up with a knowledgeable solar energy contractor from the get-go, Bryan Walsh of Solar Connexion in Blacksburg, Virginia. She is fairly certain that the key to her long-term solar energy success was in the very first load evaluation. "Bryan had me sit down before I even built and said, 'What do you want down the road?'" she says. "So he sized the system. I have a generator backup, but I've never used it."

Today, the system accommodates Polant, her teenage daughters, and her partner, Matt Darrow. Other than an anticipated battery bank replacement (her first set, expected to last five years, made it to seven) and an upgrade to a maximum power point tracking (MPPT) charge controller, the original investment works perfectly and provides these four folks all their daily energy needs.

Initially, she did some of the work on the PV system herself, such as roughing in some of the wiring and setting the array-mounting pole. The equipment and additional installation costs originally ran around $12,500 in 2000. The solar thermal (hot water) system was purchased from Solar Connexion just a few years ago and came to $7,500 for materials and professional installation. The new battery bank and charge controller, installed in 2009, totaled $1,000.

"When I built the house there were no tax credits, so in the past three years I've tried to use those." Polant points out that if you figure the average electric bill for a family like hers over the nine years she's lived with the system, it's apparent that she is nearing payoff for her initial investment. Moreover, she's got an ace up her sleeve that a lot of people who've gone to renewable energy have not considered, at least not in the recent past:

"Almost everything is DC," she explains. "We have a DC refrigerator, the pumps for the radiant floor heating are on direct current, all the lights are DC, and the kids are running their laptop off DC. We flip on the inverter only to run the washing machine, vacuum, and to charge power tools. We have Verizon wireless broadband to run the laptops and be Internet savvy, so we're running all that off the solar panels. We've got two composting toilets; they're not for everybody, but we love 'em. I like being able to pull out the humanure and improve the soil. They work great."

Relegating the bulk of the home to DC circuits not only has the advantage of simplicity but also eliminates the slight, but still significant, loss of efficiency inherent in inverters, the devices used to convert battery-stored DC to user-friendly household AC. The more recent movement towards grid-tied PV systems has, in its own way, bypassed the battery and DC approach altogether, since it favors a direct tie to the utility grid through a special grid-tie inverter, without using batteries at all. The money saved on energy storage and DC wiring is usually put toward the purchase of additional PV panels, but at the sacrifice of independence—because when the grid goes down, the household system goes down with it, even if the sun is shining.

The setup Polant chose has allowed her to run her own company, arranging

The wood cookstove provides a place to prepare meals and is an auxiliary source of heat as well. Solar thermal radiant floor heating and solar gain, along with wood, keep the house warm.

conservation easements out of a home office. "It's such a great feeling to be totally independent. No matter what's going on out there, we're just rocking along. Independence is a huge part of my life, and that comes from being a service brat—somebody who had to move every two years. That's totally the demon that I'm exorcizing here.

"The longer we're living here the more of it gets paid off. And what's hysterical is, people with regular power—their power is going down all the time. An ice storm came through last winter, and the kids are talking to their friends who haven't had a shower and haven't been able to watch TV or whatever, and we didn't even notice it. You turn on the radio and there'll be 70,000 people without power, and it's just a constant hum here."

As for what the future holds, Polant says, laughing, "Oh, the next thing that we want is a little wind turbine. Not because it's efficient, or even that effective, because Bryan would say, 'Well, if you're going to spend that kind of money just put it into more panels.' But I want the wind turbine because it's cool, and now that we have a TV—a direct-current TV so we can watch football—and it's a nasty winter Monday night and the wind's blowing, we won't have to worry about running down the batteries."

Polant's advice to others, based on her experience? "I'd say, don't let anybody tell you you can't do it, because the whole time I was building this house people were saying, 'You got what? You're doing what?' Trust your gut and you can do it. We probably built this house for $75,000, and now it's being valued at almost $200,000." That's a good conclusion to come to, independent or not.

PV System Profile

Laura Polant's electricity is generated by an array of ten Siemens SP-75 panels, totaling 750 watts. The 12-volt array is racked onto a pole mount and frame. The power travels to a combiner box, which provides breakers and lightning protection for the panels and sends the energy into a trunk line that runs into a utility room in the house.

In the utility room, power from the panels is regulated by a single Outback MX 60 power-point tracking charge controller, which tracks the output of the PV panels and compares it to the battery voltage. It then calculates optimum power for the panels to put out for the purpose of charging the battery, and converts it to the best voltage to get maximum amps into the battery bank.

The system has a single large metal-cased Solar One deep-cycle 12-volt battery with an amp-hour rating of 845 at a 20-hour rate. These batteries are designed to deliver 4,000 50-percent discharges in their lifetime, the equivalent of draining the battery to 50 percent every day for nearly 11 years. Current from the battery feeds a DC breaker panel that distributes 12-volt electricity to circuits throughout the house. A Trace DR 2412 inverter is also connected to the battery bank and can energize an AC breaker panel. The inverter is usually off in the Polant household, as most of their typical electrical loads are 12-volt DC, including lighting, water heating pumps, television, and computers.

Thermal System Profile

The thermal solar system has at its core the independent Thermo-Dynamics, Ltd., Solar Boiler System model SBM-9dc-T, made in Canada. The Thermo-Dynamics system components consist of two solar thermal collectors, a heat exchanger, a small 12-volt DC photovoltaic panel, and two 12-volt circulator pumps (one for circulating from the panels to the heat exchanger and another to circulate between the heat exchanger and the hot water storage tank). The thermal collectors and PV panel are roof mounted. A single unit about the size of a suitcase containing the heat exchanger and the pumps is set up in a utility room.

Propylene glycol (boiler antifreeze) is circulated by one pump through the thermal collection panels on the roof and one circuit of the heat exchanger, and is isolated from all other parts of the thermal system. This is a simple and dependable design that is freeze-protected and requires no batteries; if it is sunny enough to generate heat, it is sunny enough to generate the required electricity from the PV panel to run the circulator pump motors. The second pump circulates domestic hot water through a separate circuit in the heat exchanger to the hot water storage tank. In this way, the domestic water is isolated from the propylene glycol while still being able to capture the fluid's heat through conduction.

Laura Polant utilizes her domestic hot water for the other side of her heating system, which circulates in the house. The home's cold water is collected from a spring and is gravity-fed to the plumbing, that supplies the domestic hot water system. A third 12-volt DC circulator pump, energized by the house off-grid electrical system, engages to circulate domestic water between the 50-gallon hot-water storage tank and the input and return manifolds for five circuits of polybutylene piping coiled through the concrete floor, for the home's radiant floor heating system. In addition to the solar thermal collectors, the system has a Bosch on-demand tankless propane water heater to provide heat when the sun isn't shining and the stored hot water becomes depleted.