David and Donna Sweetman (kicker)

Fish Lake Valley Couple Harness Nature to Produce Power;
And Get A VEA Power Bill Credit For Doing So (headline)

By Joe McCauley

Most people like to spend whatever money they might have leftover after paying their bills on vacations, entertainment, or other types of diversions. David and Donna Sweetman of Fish Lake Valley like to do the same, but with an added switch.

David is a technical type—one who loves to spend his money on building things—and for the past eight years he and Donna have been at work on a project that transforms the wind and sun's rays into useable electric energy for their home, yard and outbuildings.

And when they generate more juice than they can use, they get a credit on their bill for the excess "green power" they provide to Valley Electric Association (VEA).

The Sweetmans have been VEA members since 1994 in Dyer, Nevada, located 200 miles north of Pahrump, in the northern-most of the nonprofit cooperative's four districts, and they get a charge from harnessing nature's bounty to generate much of their own electrical energy.

David operates their power plant, which includes a single-propeller windmill, solar heating, and photovoltaic panels, all of which supplement the electrical energy the couple get from VEA. The system provides electricity for their expansive three-level home that includes a basement, therapy pool, and elevator, along with a single-story guest house, a huge garage, various storage buildings, workshops, water pumps and an extensive drip and irrigation systems with 4,000 feet of piping.

On an annual basis, operating their homemade green power plant has yielded a smaller VEA monthly bill for the Sweetmans than they would otherwise pay if they received all of their electricity from VEA. They get a credit some months for providing their excess energy to VEA, but their investment in alternative energy has also come with a substantial up front cost.

"Between the wind, the solar heating and the photovoltaic apparatus, I have probably got $200,000 invested in all of this," says David.

"Payback? Which is the amount of time it will take before the monetary savings realized eventually equal my investment in the system? Normal solar hot water heating will pay back in three years, but the way I did mine, it will pay back in 10 years, maybe a little less, seven years. The windmill will probably pay for itself in 12 to 15 years, and the photovoltaic panels will probably pay for themselves in 20 to 25 years.

"Does it make economic sense to do all of this? Absolutely not!" says David. "But on the other hand, I think that everybody in the VEA service area should be using solar heating for their hot water. And some fraction of people, depending on where they live, should be using a windmill to generate some of their own electricity, because a windmill makes economic sense. It has a longer payback period, but it makes economic sense to put a windmill in place.

"Photovoltaic panels? It has to be the right circumstances to justify doing it, because the economic payback takes a long time. They are getting close to where photovoltaic panels make economic sense, but it has to be the right circumstances."

For David, part of the whole allure of producing green power is to be a little more self-sufficient, especially in an isolated area such as Fish Lake Valley, but it also means realizing a financial benefit from providing the excess power that he produces to VEA, something that federal law mandates.

Currently, the co-op credits him approximately 5.2 cents a kilowatt-hour (kwh) for his excess electricity—for the power David generates over and above his and Donna's own needs. This is lower than the 8.362 cents a kwh that VEA residential power users pay VEA, and is a rate that is known in the power industry as the "avoided cost"—which in accounting terms is the "weighted average" cost of the power that VEA avoids paying its conventional suppliers. And to keep track of the energy that flows back and forth between the Sweetmans' system and the co-op, they paid VEA $1,300 for a special electric meter.

By federal law, VEA must take David's relatively small amount of excess power in lieu of that from its regular suppliers, but for VEA, the big difference between the two resources is that conventionally produced power, also called "firm" power, is always available to VEA as VEA's member demand dictates. The excess power David produces is available only when he produces excess energy, which is dependent on nature, of course—and whether the sun shines and the wind blows. That makes David's power a "nonfirm" power resource, which is not a stable power resource to the co-op, because VEA cannot count on receiving it 100 percent of the time.

Although his "renewable" energy may not always be a reliable power resource for VEA, that doesn't mean David is any less a booster for green power production. In fact, he believes green power will be a permanent, if not a growing component of America's energy portfolio out of necessity, as oil and natural gas (fossil fuels), along with nuclear and hydroelectric, the "nonrenewable" energy resources used to produce most of the country's electricity, dwindle and become less and less available because of increased energy demand from both established and emerging nations.

Several states, including Nevada, have passed laws that call for power utilities to include renewable energy in their portfolios for consumers. In Nevada, the two investor-owned utilities, (VEA and the state's other two co-ops are exempt) Nevada Power (NP) and Sierra Pacific Power Co. (SPPC), have to include a percentage of renewable energy resources in their portfolios—a percentage that neither utility has met because of its availability and also the cost to produce renewable power and, says David, "but mostly the unwillingness of the utilities to work with renewable energy suppliers."

David comes to the renewable power game, and to Fish Lake Valley, from the integrated-circuit (IC) industry. He worked for three start-up IC companies in Silicon Valley, and so successful was his career that he was able to retire at age 51. His last position was vice president of quality for SST, which made the memory chip that enabled Windows 95 to be plug-and-play.

Early in his career, David worked for a large power company, an investor-owned utility, or IOU, in South Carolina, and before that, for two years during a stint in the U.S. Navy, he was a nuclear reactor operator on a submarine, the USS Kamehameha.

It was the latter two posts, David says, that first sensitized him to energy issues, and the dangers of finite nonrenewable power resources.

"I was working at Carolina Power & Light during the first oil crisis, and people can say it was artificial this or that, but we were really in deep trouble," says David. "We were running out of coal, and the coal that could be dug up was not being transported. It really enforced to me how dependent we were on nonrenewable energy, and how fragile our energy structure was.

"In the second energy crisis I was living in California and was in school studying physics. In a class in the 1970s, we looked at alternative energy sources and asked the question: How much coal was available, as well as oil, uranium, and sun?

“Uranium? Independent of people’s views toward nuclear power, there is still several hundred years’ worth and, of course, if we do some recycling with breeder reactors and stuff like that, essentially it is longer than that—but the sun, the wind—it is not a problem.

“As a retired, fixed income person, I want stability and predictability in as many of my bills as I can. When you look at it, what is going to be your most unpredictable bill? Your energy cost. Which way is it going to go? It is going to do nothing but go up. I know it is going to go up by a lot starting in the next 10 years or so, when natural gas and oil really get cut back.

“So when you look at it, the energy situation, you begin to think,” says David, “that we are personally foolish for depending on nonrenewable energy sources.

“So I decided, if I can do something about it, then I will do it. I have been preaching doom and gloom since the 1970s, but I think people are beginning to recognize our dependency on nonrenewable energy resources, whether hydro (Hoover Dam is eventually going to silt up). Or coal, we’ve got another 100 years of coal, independent of the pollution problem. And oil, you’re talking 10, maybe 20 years, before we are going to be running out of oil. Natural gas, 20, maybe 30 years, and we are going to be running out of natural gas.”

David claims that solar-powered heating has actually been a developed methodology for a little over 3,000 years. The Greeks were good at it, he says, and the Romans were absolutely superb. Modern solar heating for hot water has been around for more than 100 years, and in the U.S. it was first developed in California in the 1880s and 1890s. Its modern advent was during the 1970s, during the first oil crisis.

“Back in those days,” says David, “there were two bad types of people doing it—those who were just incompetent, but what was even worse, there was a significant fraction of people who were outright fraudulent. Even a small fraction will give an entire industry a bad name.”

A lot of the legitimate work in solar energy was subsequently overlooked, says David, and now, because of it, good how-to books on the subject are “very rare.”

“The excuse for that,” says David, “is that every system is different. But I disagree. You can standardize solar systems. You should be able to go to Home Depot or Lowe’s and buy a kit, and if you are a halfway decent DIYer (Do It Yourself), install it in a weekend or two. But right now, you cannot do that. Most solar information is not available in a simple format. And for heating domestic hot water, no solar system has to be absolutely perfect.”

Solar, wind and photovoltaic, the latter is another type of solar energy, has also taken a back seat to conventional resources, David says, because most people just naturally “do not want to make monetary investments in the future.” Because the initial cost for solar or wind energy can be high, and because people do not see the cost savings from it immediately, they are not willing or cannot afford to spend, for example, $3,000 or more up front.

And for consumers to want to buy one, David says a good solar system has to be reliable, and that maintenance on it has to be minimal, especially in rural areas. But he says that well-built photovoltaic panels are often warranteed for 25 years, and other components, such as piping and pumps, are sturdy, as well. Whole systems can keep running and saving money for owners on their utility bills for years with no problems. Insofar as cost savings, for example, the 1,800 sq. ft. building where David’s model trains and other hobby apparatus are located, is solar heated for only $36 a year, or $3 a month.

On bright, cloudless summer days, when the sun is high in the sky and stays aloft long, David and Donna typically produce more electrical energy than they can use. Their normal usage is between 2,000 and 3.000 kwh a month in the summer and up to 4,000 kwh in the winter. But their normal generation is anywhere from 3,000 to 3,500 kwh a month in the summer, with the extra, or “excess” energy going to VEA.

That’s when the Sweetmans start accumulating an energy credit with VEA. Their energy credit carries over and builds from month to month in the summer, and it keeps adding up until the fall when the weather starts to turn cooler, and the sun is lower the sky and also not shining as long during the day. So their winter generation is smaller. The combination of their normal power use, and lower power output from their solar system chips away at the accumulated credit they built up during the summer. And at some point during the winter, they start paying VEA again.

“If we get a few days in the winter when the sun does not shine, we turn on the electric geothermal heat pump,” says David. “But once our new heat exchangers were installed, we hardly used the heat pump.

“A couple of years ago, when we had to use the electric heater to heat the pool during parts of the winter, I think we had a greater than $100 bill one month. For us, that’s just an exorbitantly high, unacceptable amount,” David says. “Acceptable would be zero, of course, but from a planning and budgetary point of view, we would like $20, maybe a $40 bill in the wintertime. Normally in the winter, we keep it under $50 a month.”

Over the past eight years, David says that he and Donna have used about double the VEA energy than they have produced for the co-op, but they plan to use less VEA energy after they finish construction of an addition to their home, which will use solar panels for heating. When the addition is done, David predicts that it will enable him to generate about the same amount of energy over the course of a year as he and Donna will use, making them “energy neutral,” as David calls it.

“But being energy neutral does not mean being cost neutral,” he says. “Because we do not have net metering and we generate less than we use on an annual basis, I will always be paying more for VEA power than VEA pays me. Our credits will never equal our debits in that regard. So we will always have to pay something.”

Net metering is a different method from the “avoided cost” calculation that VEA uses to credit renewable energy providers, including the Sweetmans. They say the avoided cost method “benefits” the utility. Meanwhile, under net metering, NP and SPPC are mandated by state law to credit their renewable power providers for the full retail kilowatt-hour rate that they bill their consumers for renewable energy.

VEA is not subject to the state’s net metering law, and does not, as mentioned, employ it for renewable producers, opting instead for the avoided cost method. In fact, VEA and the National Rural Electric Cooperative Association (NRECA), which is the national association of electric co-ops, are both vehemently opposed to net metering. They claim that net metering proponents ignore the cost to co-ops, or to any utility, for having maintaining and having available their electric infrastructure systems to the renewable consumers. And David says he recognizes VEA and NRECA’s concerns.

“People have abused net metering,” says David. “Some people produce more than what they use, and then expect to be paid at the same rate they are paying the utility for power, selling it at the same rate they buy it at.

“Well, that is not fair to the utility, because there has to be a difference between what you sell at (to the utility), and what the utility sells it at (to their consumers) to cover the cost of their operation, not just the production.”

Actually, David says VEA initially credited him on a net metering basis for his renewable power, but that was before NRECA issued its statement on the matter. He has since talked to NRECA's legal counsel, hoping to find common ground between renewable energy producers and nonprofit co-ops. In fact, David has even authored language and recently sent it to NRECA and to VEA, language that would be fair to both the renewable producer and to the co-ops, he says, and that should be incorporated into any contracts between the two sides.

"The abuse comes when you are producing so much more than you are using that the co-op is paying you. And the co-op, or the utility, should not have to pay you at the retail sales rate for excess energy. That is one of the things I included when I wrote the proposal," says David.

David claims that renewable energy providers and their local utilities should always start by negotiating a contract, and it may be for something other than the avoided cost, based on various factors and costs, but it should still be a negotiated rate, just as all other power producers and buyers do to establish a price for power. Such contracts should also be good for a year, says David, "to even out the variations between production and use during a year."

To date, David says he has not heard back from NRECA or VEA about his proposed contract language.

If VEA was forced to employ net metering, such as NP and SPPC must do now by state law, David says it would be advantageous to him.

"Net metering would, during the summer, generate a higher credit for me," he says. "You (VEA) would be paying me the same as what I buy it for from VEA."

And the tradeoff for the co-op, he says, is VEA wouldn't have to do any special paper work, which VEA must do now, just for him. The co-op would also not have to use a special $1,300 meter to keep track of the kilowatt-hours going into and out of David's system, he says. A standard meter would be sufficient. David says his proposed contract would be a three-stage instrument, and a combination of net metering and avoided cost:

"If you produce up to what you use in a year, then it is net metering. For every kwh you produce, it costs the same as the kwh you use—as long as the number of kwh you use is greater than the number you produce. As soon as the number of kwh you produce on an annual basis is greater than the amount you use on an annual basis, you no longer get net metering for that excess.

"When you sell your excess, what you get for it is the avoided cost, up to such time as you pay for facility charges. Once you pay for facility charges, what you get goes down even more, to whatever the negotiated rate is, which would be something between the avoided cost and VEA's lowest cost wholesale producer.

"Then the limitation on the size of the power system you have will be a function of what equipment you have. If I said I wanted to put in a 100-kw generation facility, it would be my responsibility to pay for the transformer to put it on line."

After compiling eight years' worth of data about his wind and solar system, David says the most energy he's ever produced in any 15-minute period was eight kwh. His highest winter peak usage was 24 kwh, some of it offset by power he produced, a more than a 3:1 ratio.

"In other words, my peak use is three times my peak generation," he says. "In the middle of winter in Fish Lake Valley, that is a heavy power load."

VEA used a power quality meter to determine that a former transformer was inadequate for David's power load (not generation capability). VEA upgraded from a 15-kw to a 25-kw transformer and, he says, it also eliminated noise problems. David claims that transformer size, not power line size (which is for the standard 200 amp – 48 kw service), along with Nevada state law, actually limits the amount of green power he can transfer to VEA. But David also realizes that if he produces more green power, and therefore requires a larger transformer to handle his power load, that he should pay for the upgrade.

"As soon as my peak generation exceeds my peak use (both instantaneously and on an annual basis), then I would be in the business of commercial energy production," he says, "and I should pay for any associated incremental costs. As a commercial provider, I should be responsible for upgrading the equipment needed to transfer power greater than my peak use."

David also understands why NRECA opposes net metering—because it has been abused. It was intended, he says, for residential consumers to encourage them to install some form of renewable energy apparatus to reduce their power bills and dependence on conventional power resources. The backlash to net metering from co-ops came after some consumers turned it from a residential to a near-commercial-like venture, the intent of which then was to make money off their local utilities, for example, "where the utility is essentially buying excess power (that above the annual use) at the retail price; this generates a cost discrepancy between suppliers of power."

State legislators believe because they limit the size of net-metering producers, that larger power utilities can absorb this cost discrepancy, but at the much smaller co-op level, if net metering was allowed for many consumers, who were all producing more than they were using, net metering could seriously impact the financial viability of VEA, along with members' equity in VEA.

Aside from those issues, however, David loves to show off his wind-and-solar-power system. And because he designed it, and because of his technical background and know-how, he also likes to discuss the details of his system at length, using terms such as "solar radiance," "active dual access tracker," "passive and fixed" solar systems, "generator and inverter modes," and "watts per square meter."

Given that Fish Lake Valley is such a small community, David says he was fortunate to find excellent local builders and crafts people to construct his and Donna's home and the current addition to it, along with his wind-and-solar-power systems. Fish Lake Valley resident and friend, Gary Fedor, and his crew for the jobs, Paul Cornforth and Ed Pratt along with Branden Cornforth and Sean Pringle, reconstructed all of David's home and most of his green power systems. Fish Lake Valley resident Art Johnson is an excellent cabinetmaker, and a Tonopah High School teacher. He made all of David and Donna's cabinetry.

They and Art's sons, Matt and Jeremiah, and the late Harry Livermore, along with Tom Hilligoss, constructed David's windmill, including the large concrete piers for it, with most of the piping for both it and his photovoltaic solar panels built in nearby Bishop, California.

As for David's windmill, it is 70 feet high and built to withstand winds of up to 120 mph. When the wind speed hits 7 to 8 mph, it starts generating power. Optimum wind speed at which the windmill produces energy is 27 mph, because governors on it limit the velocity of the propeller at higher wind speeds. The technical apparatus David installed on his windmill can measure such things as wind speed and direction, temperature, humidity, and the solar radiance for David's solar panels. Using special meters, David can even measure line losses, which is the natural loss of some energy as it moves through a power system.

"The generator on top of the windmill is rated, at sea level, for about 3.2 kilowatts max. For an hour, that is 3.2 kwh, but I can get only a fraction of that at our altitude (about 5,000 feet). Two point seven kwh is a lot, but we cannot get more out it because the air up here is a lot less dense than it is at sea level," says David.

“The photovoltaic solar panels provide most of my energy, about 75 percent of my renewable power,” David says. “The solar panels supply heat.”

David installed his first group of photovoltaic solar panels in 1997. They are stationary, or fixed, unlike the eight “tracker” panels he installed later and that automatically follow, or track, the sun as it moves through the sky, enabling them to collect the maximum amount of solar energy.

The tracker panels, with each one producing 1,000 watts of direct current (DC) power, generate some 42 percent more electricity than David’s fixed panels during the summer, but that drops to just an 8- to 10-percent improvement in the winter months.

An inverter system, located near batteries to provide some electrical storage, converts the direct current (DC) power that the solar and wind system generates into alternating current (AC). AC current can then be used in David and Donna’s home and on their property. David says his whole system is “parallel” with that of VEA’s, at 60 hertz, which the system has to constantly monitor and verify.

“I do not have a lot of batteries because, believe it or not, VEA does not lose power for long periods of time,” says David, “frequently for short periods of time, but not lengthy power outages, so we do not need a lot of backup capacity.”

To reduce cooling costs in the summer, David and Donna use their swamp coolers, instead of the geothermal heat pump. During the winter, they use solar energy for heating and, if needed, they use a wood-burning furnace that also heats water and that ties into their central geothermal heating system. The central geothermal system is similar to the heat pumps that many people use, but it is also the most expensive for David to operate, so it is used the least. He and Gary Fedor designed and built an option to the geothermal system so that the central fan can be used to circulate solar heat independently of the heat pump.

David and Donna say that if they should ever find themselves contending with a large, extended power outage, their wind-and-solar power system is built to deal with it.

Says David: “Most of our equipment is set up to be powered only by VEA. In the event of an extended power outage, critical equipment like the microwave, refrigerators, reezer, water pump, elevator, well pumps, and solar heating equipment, are all powered by a backup system. The windmill, the photovoltaic panels, or the batteries will provide enough power to operate that equipment, at least for a couple of days.”

David Sweetman says that if any readers would like to contact him with questions about his wind, solar and photovoltaic green power generation system, they may do so by e-mailing him at d-dsweetman@att.net. David has also published more detailed descriptions of his renewable energy electrical and heating systems in Home Power magazine.

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