

Here Comes the Sun

This is a condensed and edited article that Al Krulick did for the Orlando Sentinel. He worked on a much longer article that was not published. If you are interested in the longer article. Let me know (Paul) and I'll send it to you.

Here comes the Sun

It's a good time to go solar. And here in the Sunshine State, we have the advantage. By Al Krulick President Jimmy Carter warned us this would happen. Thirty years ago he cautioned us to turn down our thermostats, lessen our dependence on foreign oil and fight "the moral equivalent of war." Then he backed up his rhetoric by creating a cabinet-level Department of Energy, filing legislation for the creation of the Solar Energy Research Institute, installing solar panels on the White House roof and offering tax credits to anyone who purchased solar energy systems. For a while we listened. Entrepreneurs went to work creating solar hot water installations, while inventors ramped up research on the emerging technology of photovoltaics. Then came the Reagan "revolution" and the blossoming of a new American gilded age. The budget for the SERI was slashed by 50 percent, and by the end of 1985, Congress and the administration allowed the tax credits for solar systems to lapse, causing thousands of solar energy businesses to go bust. For two more decades we stopped listening. While Europe's and Japan's solar energy industries surged ahead, we slept. Had we followed through on Carter's proposals, solar, wind and other forms of clean, renewable energy could be powering 25 percent of our electrical use by now. Today in Florida, "green" energy (wind, geothermal, biomass and solar) accounts for only 1 percent of the state's electricity needs, with solar a tiny percentage of that. But it's a new day. The earth is heating up because of the continued burning of fossil fuels, which emit the greenhouse gases that trap the planet's heat. Moreover, our reliance on foreign oil risks our national and economic security; coal mining pollutes our air, land and waterways; and natural gas, while less dirty than oil and coal, is still a volatile and unclean alternative. We have finally awoken to the necessity of transitioning to low- and even zero-emission forms of power, and the time frame has narrowed. Yet with continued technological advances, and with the steady growth of pro-green policy initiatives from government, we are on the cusp of an energy revolution and a reinvigoration of the solar industry that, at long last, will take advantage of our state's location for the use of the sun's energy. Yes, Jimmy Carter, your moral equivalent of war has finally come home, and in Central Florida, here's how we're going to win it.

There are two fronts in this fight for Florida's solar future. The first is "distributive power generation," wherein home and business owners create their own clean energy production via the installation of individual solar systems. The second is the battle for the creation of renewable, wholesale electrical power generated by the state's private and publicly owned utility companies. In distributive generation, there are two types of solar systems in use. Solar thermal systems utilize the sun's radiant energy to heat water passing through a rooftop or similarly placed collector. For many years, the most prevalent use for thermal collectors was to heat swimming pools. As thermal formats matured and became better and cheaper, their use expanded to supply hot water for domestic use and space heating. Modern solar hot water systems are 80 to 90 percent efficient and can reduce an average home's electric bill (assuming an electric water heater) by almost one-third. Solar electric systems use the sun's light, rather than its heat, to produce energy. Solar cells, usually made of a silicon-based semiconductor material, absorb sunlight (photons), which knocks electrons loose from atoms (the photovoltaic effect), producing a direct electric current. An inverter changes the direct current to an alternating current for use in standard electrical configurations. Photovoltaics, or PV cells, are the basis of the common, recognizable rooftop arrays. More recently, thin film PV cells, only a few micrometers thick, have come into use, making it possible for solar cells to double as rooftop shingles, building facades or window and skylight glazing. For both systems there are rebate programs, financing schemes and tax incentives available from the local, state and federal governments, as well as from most utility companies. For example, in 2006 Florida instituted the Solar Energy Systems Incentives Program. It's a four-year plan offering rebates to homes and businesses for the tax-exempt purchase of solar photovoltaic, thermal and pool heating systems. PV systems are eligible for a \$4 per watt rebate, capped at \$20,000 for homes and \$100,000 for businesses. Solar thermal systems can receive a \$500 residential rebate, up to \$5,000 for businesses. Pool heater installation rebates are set at \$100. Another state-sponsored incentive program, sanctioned by the Public Service Commission in early 2008, is called net metering. Net metering allows the owner of a solar PV system to sell any excess produced electricity back to the grid at the same rate the utility charges its customers. While the net metering law only applies to investor-owned utilities, most publicly owned utilities offer some form of net metering as well, since it helps alleviate stress on their electric generation during peak time, when solar systems are more likely to be returning power to the grid. A third incentive is the Renewable Energy Feed-in Tariff, or FIT. The FIT assumes energy generated from renewable sources is still more expensive than retail electricity generated from oil, coal, nuclear or natural gas. For instance, in Florida the average cost of utility electricity is about 13 cents per kilowatt-hour, as opposed to around 25 cents per kilowatt-hour for electricity produced by current solar technology. To make renewable energy installation more appealing, a utility will enter into a long-term contract with a consumer, promising to buy at above-market rates any solar power generated from a home or business, and then spread the difference over all the utility's customers. If, say, \$1 million of "green" energy is bought during the year by a utility with two million customers, each rate-payer's yearly electric bill will be 50 cents higher. Recently, Gainesville Regional Utilities enacted a 32-cents-per-kilowatt-hour FIT for electricity generated with PV panels, a move which could make Alachua County a solar leader in the state, should many homeowners choose this type of financing help for their systems.

John Paré knows about rebates, net metering and FITs, and he's taking advantage of all of them. After Hurricane Charley destroyed his Orlando home in 2004, he and his wife, Pam, rebuilt it with energy-efficient features that made it the first Leadership in Energy and Environmental Design silver-certified house in the state. In addition to insulating concrete forms, high-efficiency windows and doors, and energy-saving appliances, Paré has two solar systems: a solar hot water panel on one roof and 28 PV panels on another. Both systems are tied into the Orlando Utilities Commission grid; on days when the sun is bright and the house relatively empty, the electric meter will slow down and start to run backward. Because of net metering, Paré

can sell any surplus power he generates back to OUC at the same price he pays them for theirs. Because OUC also has decided to purchase "environmental attributes" as a way to meet its own renewable energy portfolio goals, this FIT-type system also pays Paré for every kilowatt his rooftop systems produce. Paré's electric bills on his 3,200-square-foot house generally run under \$100 a month. His lowest bill so far was \$49. Because Paré lives in Orange County (the only municipality in the state that offers such an incentive), he also received a \$200 rebate from the county when he installed his solar hot water system. The state still owes him \$500 for installing it and another \$20,000 as the rebate for the PV array. When he files his federal taxes, he can claim a 30 percent credit for the cost of his systems, up to \$2,000. So when all the rebates and credits accrue, Paré will have just under 50 percent of his \$45,000 in upfront costs reimbursed. With a payback time of under four years for the solar hot water and somewhere in the neighborhood of 15 years for the solar electric, by the time his two daughters graduate from high school Paré's system will be making money. With state and local governments, as well as local utilities, providing incentives (Progress Energy offers a \$450 rebate and additional credits for the installation of a solar thermal system under its energy management program, EnergyWise), it has become more cost-effective over the last few years to think solar in Central Florida, especially for hot water systems. But it's the national policy, and its recent renewal and expansion by Congress, that may be the single most important impetus driving the solar industry over the next decade. When Congress passed the Energy Policy Act of 2005, the first major piece of federal energy legislation since 1992, the massive bill included an important provision that made the green energy community beam: more than \$2 billion in tax incentives for "advanced energy-saving technologies and practices" beginning in 2006 and extending until the end of 2008. This huge bank of investment tax credits, as during the Carter years, quickly created unprecedented growth in the United States solar industry; annual installed solar capacity more than doubled. Billions of venture capital dollars poured into research and development, and PV production soared. In 2006, the annual market for domestic solar hot water systems grew 250 percent over its 2005 pre-tax credit numbers. On Oct. 3, President Bush signed HR 1424, the Emergency Economic Stabilization Act of 2008 (aka the "bailout bill"), designed to address the financial crisis. Tucked into this huge package was an extension of investment tax credits for residential and commercial solar installations for eight more years and an end to the \$2,000 cap for residential solar electric systems. (Had John Paré waited until 2009 to install his PV system, he could have saved thousands of dollars more.) In addition, President Obama's commitment to fund green energy programs via the recently passed \$787 billion stimulus bill should allow state and municipal programs to expand and flourish. So, for the Central Florida homeowner wanting to go solar, these programs can substantially reduce upfront, as well as continuing, costs. For instance, a solar thermal system to heat hot water can cost anywhere between \$4,000 and \$9,000, sales-tax exempt, depending on the type of system and how much electricity a buyer wishes to replace with solar thermal. Let's say Progress Energy services your account, you live in Orange County and you purchase a \$6,000 system. First, the state will reimburse you \$500. You can then apply for a 30 percent federal tax credit on the remaining \$5,500 for a savings of \$1,650. Your cost is now \$3,850. Progress Energy will grant a credit of \$450 over several months, and the county will rebate you \$200. Your final cost has been reduced to \$3,200. Now, if you save even \$70 per month on your electric bill, you will see \$840 per year not going to the utility company. In just under four years, you will have your system paid for and you will pocket that \$840 as long as you own your house. For PV systems, which can cost \$40,000 or more for a home and much more for a commercial application, the savings can be even more substantial. Not only will the state and utility incentives kick in, but the federal tax rebate of 30 percent is no longer limited, and, depending on one's electric use, net metering and/or an FIT will allow you to sell electricity back to the grid. In addition, many solar installers will finance home systems, and businesses will be allowed to depreciate costs over years as well, helping to amortize upfront expenses. So the battle for solar will be won on this first front by the individuals and businesses who, by taking advantage of the various programs and incentives, will cut their use of carbon-based fuels by becoming their own mini-power plants. It will be up to them to become knowledgeable consumers choosing among the dozens of solar contractors, distributors and installers in the Central Florida area. (The Florida Solar Energy Industries Association website, www.flaseia.org, lists many of those businesses.)

The second front will take on the large power companies themselves, because except for the tiny number of self-sufficient stalwarts who may be living entirely off grid, the utilities are ultimately responsible for our electricity, as well as most of our heating and cooling needs. How they approach the challenges of centralized power generation will also help determine how the solar war is won. Unlike 28 states, Florida has no mandated standards for the energy mix required for each of its utilities. (Currently, there are no national standards.) Florida does have, courtesy of a 2007 executive order signed by Gov. Charlie Crist, a set of goals: 20 percent of utility-generated power from renewable sources by 2020, "with a strong focus on solar and wind energy." Since 2007, the state's Public Service Commission has tried to decide what any Renewable Portfolio Standard should look like, and the state legislature has required the commission to make its RPS recommendations during this coming legislative session. A fierce battle is predicted this spring between those who want the state to adhere to Crist's proposal and those – many of the state's regulated, investor-owned utilities – expected to fight it. Should Florida politicians choose to mandate an RPS, the utilities will have a scant 10 years to create an infrastructure of solar, wind, geothermal, hydroelectric, biomass and other renewably sourced generating plants, something they are mostly reluctant to do. Most will push for nuclear power over renewables wherever they can, as they see nuclear as their most cost-effective alternative. The price for a one-gigawatt nuclear plant currently ranges between \$2 and \$6 billion, while a one-gigawatt solar plant would cost between \$5 and \$10 billion. A gigawatt is one billion watts, enough energy to power about 750,000 homes. The companies supplying electricity to greater Central Florida are Progress Energy, Florida Power and Light, the Kissimmee Utility Authority and the aforementioned Orlando Utilities Commission. Progress and OUC are the two main companies servicing the greater Orlando area. OUC is a nonprofit corporation owned by the citizens of Orlando; Progress is an investor-owned utility, subject to regulation by Florida's Public Service Commission. OUC generates 75 percent of the electricity it sells to its 200,000 owner-customers from coal and has programs that support distributive power generation. (Its Pilot Solar Program acts like an FIT, buying

back customers' generated electricity at the rate of 5 cents per kilowatt-hour for PV and 3 cents per kilowatt-hour for solar water heating systems.) But in terms of generating wholesale power from renewables, the utility is still waiting to see what will happen in Tallahassee. OUC recently raised its rates 14 percent because coal prices rose, and customers are simply using less power due to declining incomes. It is interested in buying a stake in Progress Energy's nuclear capacity as part of its long-term energy plan (see "Other people's money" in this issue, page 6). Progress Energy's local service territory covers 20,000 square miles of Central Florida. To ensure its customers a stable supply of electricity, it stresses a diverse production mix – 34 percent natural gas, 43 percent coal, 16 percent nuclear, 7 percent oil and about 1 percent hydroelectric – that can withstand abrupt changes in market conditions. For base-load generation plants that must operate 24/7, Progress believes its most practical and efficient alternatives are natural gas and nuclear. To that end, Progress has recently announced plans to build two new nuclear generating stations in Levy County, expected to go online by 2017-2018 (see "Nukes ahead," Jan. 15). The anticipated cost for these plants is \$14 billion for the units themselves and an additional \$3 billion for transmission facilities. The company touts nuclear power as a clean and environmentally safe way to generate electricity because it doesn't produce any greenhouse gas emissions. It also suggests that nuclear protects its customers from "price volatility associated with oil and natural gas." So although the state's power companies support distributive solar power, they will most likely try to hold onto the wholesale status quo as long as possible. (An exception, Florida Power & Light, servicing 4.5 million Florida customers, is planning to invest heavily in solar power generation via its 75-megawatt Next Generation Solar Energy Center in Martin County. The facility, set to become operational in 2010, will be the second-largest solar energy facility in the country.) It is expected, therefore, in order to keep an extensive retrenchment at bay, that the utilities will lobby the legislature to replace the term "renewable" with the word "clean," so that any RPS that comes out of the session will allow nuclear energy – because it creates no greenhouse gases – to be included. And since Progress already has a nuclear capacity of just under 20 percent, and because its new Levy County plants would surpass and add to what its Crystal River nuclear generating station already produces, the company will have no need to explore any other forms of renewable energy production in order to satisfy the mandate. So this battle will be fought in the capital with our legislators as our proxy soldiers. If we want Florida to move away from carbon-based and nuclear fuels, we will need to influence them to support the governor's RPS proposals, forcing the state's regulated utilities to invest in solar and other forms of clean, renewable power generation. They can do this by building their own renewable plants or by increasing the amount of clean power they can purchase from homes and businesses via net metering and FIT programs. But according to Bob Reedy of the Florida Solar Energy Center, the free market – not incentives, rebates or renewable portfolio standards – will ultimately cause the balance to shift to the solar side. Why? Because, according to Reedy, grid parity is only several years away. As electricity costs continue to rise (an average of 66 percent over the last three years in Florida) and the cost of PV-generated solar electricity continues to decline (as it has been doing for years), we are very close to the time where they will meet somewhere in the middle: grid parity. When that happens, there'll be pressure to repeal the state's third-party rule – which forbids any company, other than private or publicly owned utilities, to generate power – and an explosion of independent solar businesses will rush into the marketplace to generate and sell power that is as cheap or cheaper than that which can be purchased from the utilities. In addition, Reedy believes that new home construction will include solar thermal and PV arrays as a matter of course, just as central air conditioning became a standard feature in Florida construction just a few decades ago. Right now, solar hot water is half as cheap per kilowatt-hour as retail, and it's expected electrical costs will soon follow suit. We can win this moral equivalent of war, as we in Central Florida finally harness the sun's massive energy for the continued progress of our city, our state, our country and our world. To arms!