SolarCity

Ann Arbor's energy initiatives are getting national attention. So why aren't more home owners tapping the sun?

by Corry Berkooz

MARK BIALEK

City energy coordinator Dave Konkle helped put a solar water heater on the downtown fire station, a national first. He recently won a $200,000 "Solar America Cities" grant to encourage local home owners to go solar, too.

"I'm the only one in my family who likes to go to the cabin in the winter," admits Ann Arbor mayor John Hieftje. His wife's family has a second home near Sault Ste. Marie, and this time of year, the climate is dominated by the frigid air blowing off Lake Superior and the overcast "lake effect" sky.

So it's even more impressive that the UP getaway is powered largely by solar energy. "Recently we expanded the cabin [by adding] a larger building with all the things to run a normal house, including refrigerator, washer, dryer, and stove," Hieftje says. "This year is the first year the solar system is running everything. No generator turned on at all." Hieftje pauses and says, "If we can do it on Lake Superior, you can do it anywhere."

Even before Hieftje's election in 2000, Ann Arbor led Michigan localities in promoting conservation and renewable energy. Since then the trend has accelerated. The downtown fire station was the first in the nation with a solar-powered hot water system, and solar systems heat three municipal swimming pools. The AATA has sixteen hybrid electric-biodiesel buses on the road, with five more starting up in the spring. The city and Washtenaw County are researching "locally grown" wind development. And solar collectors will soon appear on the roof of the Ann Arbor Farmers' Market. "I've never had a negative comment about our renewable energy programs from any of our citizens," Hieftje says.

Now the city hopes to encourage private citizens to follow its lead. Its 2005 Energy Challenge envisions 5,000 solar rooftops by 2015, and the city recently won a $200,000 "Solar America Cities" award from the U.S. Department of Energy to encourage solar citywide. Ann Arbor is among thirteen cities, including New York, Boston, and New Orleans, to receive the award. Bundled with other grants, the city has approximately $632,000 available for local solar projects. As Dave Konkle, the city's energy coordinator, says, "That's enough to really do something."

Ann Arbor has funding, an environmentally motivated public, and political wherewithal. The question is, Why aren't more home owners tapping the sun?

MARK BIALEK

Home owner Jim Svensson with solar installer John Wakeman. Svennson's rooftop water heater cost $6,000 but cut his gas bill by about $180 a year.

Ann Arbor's renewable-energy headquarters is on the fourth floor of City Hall. In the energy coordinator's small cubicle, the walls are covered with Dave Konkle's name tags from speaking engagements in San Francisco, Boston, and many other locales. Cities seek him out to learn how to replicate Ann Arbor's achievements, as well as how to create their own municipal energy coordinator positions. Konkle estimates that over the past nineteen years, his department has saved the city a total of $8 million in energy costs with measures ranging from the simple (better insulation) to the exotic (sensors at City Hall desks that turn lights on and off as needed). He's also won $2 million in grants. His efforts have been so successful that Ann Arbor recently was featured alongside cities like Amsterdam and Beijing in a *Wall Street Journal* story on innovative energy programs.

Konkle has ridden along with the ups and downs in the United States solar industry since his days as a solar installer in the 1970s. Much to his chagrin, national leadership in the industry ended in 1985 when substantial federal tax credits were cut. Now global warming has put the industry in the spotlight again.

Home owners and small businesses are eligible for federal tax credits for solar projects at least through 2008, and possibly longer, according to U.S. Department of Energy spokeswoman Diana Glassman. The credits are capped at 20 percent of the cost of residential projects, but they aren't capped for small businesses—so Konkle says the city's new push will encourage businesses as well as home owners to look at solar alternatives.

The new efforts will supplement the city's current Go Solar seminars. Offered semiannually, these consistently sell out. Yet only a few participants end up installing solar in their homes. A look at those who've gone ahead illuminates both the potential and limitations of solar technology.

Jim Svensson, a southeast-side resident, had a solar hot water collector in-

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stalled on his roof three years ago. He spent around $6,000, and he says it cut his natural gas bills substantially—by a third in the spring and fall, and by two-thirds in the summer. And since water flows from the solar system into a conventional water heater, no cold showers are required—the conventional heater kicks in whenever it's needed. The system "definitely works," Svensson says. "You can see the thermostats in the basement and the temperature inside the collectors climbing to a hundred and fifty degrees."

Other local residents generate their own electricity with photovoltaic (PV) arrays. Michèle Hannoosh and Richard Janko knew they wanted to install a solar system, but since they "didn't have teenagers who might waste hot water in long showers," Hannoosh says, they opted instead for a PV array on their Ann Arbor Hills home.

It wasn't easy to get started. Even for two articulate and determined U-M professors, the solar project was tough to research. "We had been trying to get information for ages. We had asked many contractors and nobody knew anything, which was intensely frustrating for us," says Hannoosh. Then she heard a public radio announcement about a Go Solar seminar last April, and she and Janko went to it. "It was wonderful," Hannoosh says. "Everyone knew exactly what we needed—prices, tax rebates, and contractors."

By August she and Janko had a "modest-sized" PV system installed on the south side of their roof. "Immediately you see the effect," Hannoosh says. "It's amazing! You don't have to have brilliant sunshine to make it work." When the sun is out they "easily" get 1,200 watts from the panels, she reports. Janko adds that the system has a "tiny box in the cellar with nice features. You can program it to tell you how much you are saving, and it tells you how much you are saving based on the cost of fossil fuel."

"We feel so good about doing it," Hannoosh says. Neighbors don't mind the visual aspect of the glassy panels, according to Janko. Rather, colleagues and others ask for details on how to get the same system on their roofs.

If solar systems work so well, why aren't there more of them? The city has never surveyed Go Solar participants to find out why they don't go ahead, but part of the problem may just be the ingrained skepticism of Ann Arborites, who know how rare it is to glimpse the sun in February.

"It's a common misconception that there is not enough sun in Michigan to successfully operate solar systems," says Jenny Malinowski, program manager at the Great Lakes Renewable Energy Association (GLREA). Indeed, data show Ann Arbor's solar capacity isn't as low as it appears on a typically cloudy day. The city energy coordinator's website states that Ann Arbor has 97 percent as much available solar energy as Madison, Wisconsin (no big surprise)—but also that we aren't too far behind a distant land where pomegranate and pistachio trees grow (we get 78 percent as much available energy as Austin, Texas). On the other hand, both Ann Arbor and Austin pale in comparison with the sunny parts farther southwest. "A Solar Grand Plan," an article in January's *Scientific American*, includes a U.S. map of average daily total radiation. Southeast Michigan receives about three kilowatt-hours per square meter per day, whereas the southwestern states average about seven or eight. That puts Ann Arbor in the middle-to-low range of U.S. solar availability.

This does not mean that harnessing solar energy is not worth trying—but it does mean that costs are higher here. It's no cheaper to install a solar system in Ann Arbor than it is in Albuquerque, but the Michigan version puts out only about half as much energy—and therefore takes twice as long to pay for itself.

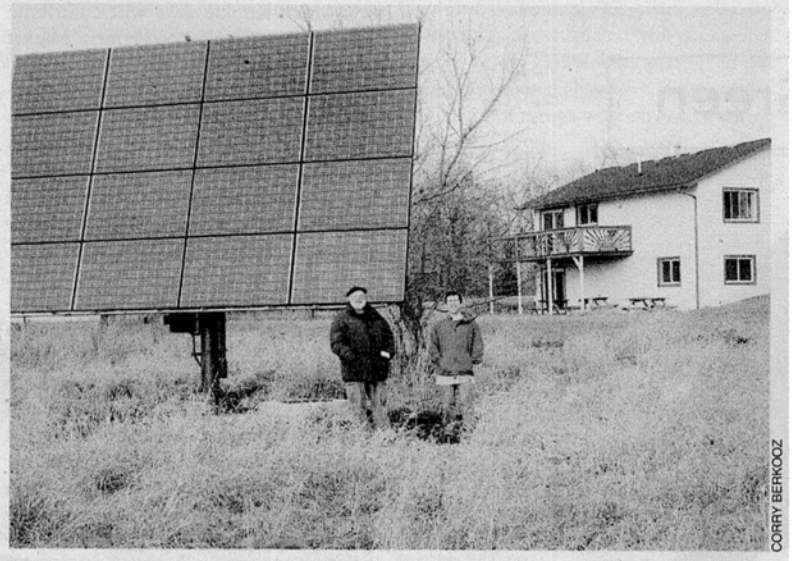
The local nonprofit Environmental House (EnHouse) studied aerial photos to track the solar potential of Ann Arbor's 27,000 single-family homes. It concluded that 7,000 of them are in a "good location for solar hot water installations." Yet Konkle guesses that only twenty or thirty systems have been installed so far. What's holding people back?

Most likely it's money. Svensson was able to claim a state tax credit that reimbursed 40 percent of the cost of his system. He says that in its first year of operation, he saved an average of $15 a month on his gas bill. At that rate, it will take twenty years to recover his investment. The state credit has since expired, but similar installation today would qualify for a 20 percent federal credit worth a maximum of $2,000. With that credit, though, Svensson's system wouldn't break even for more than twenty-six years.

Of course, if energy prices continue their recent rapid rise, the payoff will come faster. Moreover, Svensson says, he didn't "do it just to save money. I am an environmentalist, and I'm trying to save energy and reduce the use of fossil fuels." For him, the solar water heater is part of a larger conservation plan that also includes buying energy-saving appliances and spraying extra insulation in his attic.

John Wakeman of SUR Energy Systems installed Svensson's system. He says that home owners who want solar tend to be "people who are very concerned about global warming. I noticed an increase in my business after Al Gore's movie." He says that two solar water heaters at Leslie Science and Nature Center are twenty years old, salvaged from the Climax Molybdenum Company years ago, and should be good for another twenty to thirty years.

Another local solar installer, Chris Coon of Sustainable Systems, says the antifreeze-type product in a solar hot water system needs to be replaced every five to seven years. For solar electric with a battery, the owner needs to check the system every three months and add water, and must replace the battery bank every eight to ten years—a costly venture. "With that long a payback period, most people don't want to do it [install photovoltaics]," says Coon. "Until government provides incentives, this is a very expensive undertaking, and most people are not willing to lay out that much money." In the meantime, he says that while solar is "not a popular thing" with home owners, the work has been growing "steadily."



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Mel and Josh Barclay invested more than $30,000 in a sun-tracking photovoltaic array at Josh's "dream farm" north of town. Josh says his household now generates more power than it uses—but at the rate DTE is paying, it could take 200 years to recoup the cost.

Wakeman was also the installer for the Hannoosh-Janko project. That system cost around $12,000, or $10,000 after the federal tax credit. Janko says that their electricity costs were cut by 30 percent this past fall. Though he doesn't yet have the annual-savings figures needed to calculate a payback time, it's likely to be even longer than Svensson's. PV arrays in this area are estimated to pay back their costs in twenty-five to thirty years. "You pretty much need a crystal ball. Nobody knows what will happen with energy costs," says Wakeman.

Will water heater or PV systems actually last long enough to pay for themselves? It depends on how well they are built, of course. Konkle installed a solar hot water system on his house in 1975, "right after I got back from solar technician training school," he says. The tank has required very little maintenance for more than thirty years and started leaking for the first time last fall.

Wayne Appleyard, an architect and a member of the city's energy commission, says, "the first thing everyone should be thinking about is conservation. You can save thirty to fifty percent of energy costs by conservation. It is not as glamorous [as generating electricity], but the payback is two to three years."

Appleyard has another take on the purchase and payback of PV arrays. "If you do the calculations, you are buying twenty-five to thirty years of electricity. . . . The current cost is twenty-two to twenty-eight cents per kilowatt-hour, depending on the system. Considering we pay ten cents a kilowatt-hour now, it seems expensive. But if you call DTE for a fixed rate [for electricity in future years], they couldn't tell you. It's a hedge, but costs may be going up. There is a lot of value with a PV system that doesn't show up, with reducing your carbon footprint and avoiding use of dirty coal."

Ann Arbor will get a jump on encouraging solar with the two-year Solar America Cities grant. During 2008 local partners and focus groups will identify "barriers" to solar

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awareness and offer strategies to overcome them; the findings will be published as the Ann Arbor Solar Plan. The second year of the project will be spent implementing the plan.

Dave Konkle already knows the greatest obstacle to creating 5,000 solar rooftops. He rhetorically asks, "How do we reduce up-front cost?" and supplies his own answer: "The only way is low-interest loans or rebates." The mayor has an extensive brainstorming list for financing renewable energy projects: a lighting district; grants; an energy fund; and money from the Downtown Development Authority, which Konkle says will contribute $100,000 for the planned Farmers' Market PV installation.

The state may soon be pushing renewable energy too. In her January State of the State speech, governor Jennifer Granholm called for a "renewable portfolio standard" that would require utilities to generate 10 percent of their electricity from renewable energy by 2015—and 25 percent by 2025. Twenty-one states already have such rules. "We have to have this RPS. We desperately need it to drive investment," Granholm advisor Skip Pruss told a Great Lakes Renewable Energy Association membership meeting in December. "We've been contacted by five wind developers in the last month because they anticipate an RPS."

"Other states have seen a growth in [renewable energy] manufacturing after passing a portfolio," says GLREA's Jenny Malinowski. The hope is that an RPS would encourage growth of solar manufacturers such as United Solar Ovonics in Auburn Hills, one of two Michigan companies that recently won grants through a federal initiative to speed commercialization of photovoltaics. There may be hope for diversifying the state's manufacturing base after all.

Local solar installers would love to see this change. Tony D'Alecy of Renewable Energy Solutions works wherever he can find jobs—most recently, southern Illinois. He would rather work closer to his Chelsea home, but other states, he says, "are developing renewable industry. Hopefully, Michigan will legislatively help itself. We really need it."

An RPS might also get DTE Energy more involved—Konkle says Ann Arbor is the only 2007 Solar America City "without the partnership of local utility companies." In other places, he says, utilities are providing rebates or even making direct grants to fund projects.

"Personally, I hope solar will be a long-term winner," DTE rep Scott Simons says, "but costs are so high." DTE's Mike McNalley says the company is "not actively against [Solar America Cities]," but a utility would need a lot of land to build a cost-effective PV system. One utility-size array would require enough space "to fly a 747 through," he says.

Instead, McNalley says, DTE is looking at other renewable energy sources. "We do have very good wind in Michigan," he says. "For the next five to ten years, DTE is working on wind farm development. That's where we're spending more of our time and energy."

Some advocates say the company's antipathy to solar extends to home owners' systems as well. Utilities are supposed to use "net metering" to credit small generators for the power they produce. DTE's implementation, however, is unusually cumbersome and expensive. Home owners are required to install three separate meters: one to measure internal electrical use, one to measure electricity taken from the grid, and the last to measure what the home owner sends to the grid. This allows for "accurate accounting," according to McNalley. But many potential PV purchasers are put off by the cost.

Josh Barclay says he was quoted a price of $5,000 to install the three-meter system at his "Dream Farm" five miles north of Ann Arbor—and the work would have required putting "a large hole" through his wall. The West Bloomfield High School science teacher also was frustrated by the company's twenty-five-page application—as was his father, a retired med school professor. DTE ended up installing two meters in his existing socket; they measure energy drawn from the grid as well as energy sent to the grid.

Barclay is a serious environmentalist. He commutes to work in a retrofitted vegetable-oil-powered Volkswagen Jetta he calls his "frybrid." He's made what he calls a "regular old" 1,800-square-foot home extremely energy efficient with extra insulation, low-wattage bulbs, and energy-saving windows. Conservation, he says, is the "best way to save energy—it's even more important than solar." That is not to say he doesn't believe in capturing solar energy. In fact, Barclay owns the largest individual tracking PV array in Michigan.

His father, Mel, helped him purchase the setup, which cost more than $30,000. The sixteen panels, spanning eighteen by twelve feet, are mounted on a nine-foot pole in the marshy field behind the house. To maximize the energy captured, they swivel to track the sun across the sky. "Our reason was to show that it was possible, even in cloudy Michigan," Mel says. In that, they've succeeded: Josh says the panels generate enough electricity to run his household of two adults all year, with an extra 500 kilowatt-hours left over.

Like a good science teacher, Josh has compiled his energy data into graphs and charts that he posts on his website, dreamfarm.org. But he says that "the payoff time for the solar PV array is incredibly difficult to calculate." Because he didn't install a third meter, DTE won't let him join its net metering program. Even if it did, he says, DTE charges about 8¢ for a kilowatt-hour of electricity entering a customer's house but pays only about 4¢ for that same amount of power coming back (the company says the difference reflects its cost to transmit the energy). At that rate, Josh says, the payoff period on his setup "could be as high as two hundred years." He admits that even if the utility paid the same rate it charges, payback would take "about a hundred years at current electricity prices." On the other hand, if DTE paid him 50¢ per kilowatt-hour—as a bill introduced in the Michigan House of Representatives last fall would require—"we could pay it off in fifteen years."

John Wakeman and other solar installers also are frustrated with the net metering rules. "DTE asks people to put three meters on their houses for net metering, and that means very expensive wiring for that last meter," Wakeman says. "Other states don't require three meters at all." DTE's McNalley says that "new technologies are coming out that should cut the number of meters needed," but it isn't yet clear when the new systems will be available.

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Like Mayor Hieftje's cabin, Josh Barclay's Dream Farm demonstrates that solar energy really can power a household, even in cloudy Michigan. But it also shows why cost remains a barrier. *Scientific American*'s "Solar Grand Plan" is predicated on rapid improvements in solar electric technology, which the authors assume can be achieved through government subsidies. If they're right—and if that money comes through—future installations will no longer require financial sacrifice, and those solar roofs the city wants will proliferate.

In the meantime, the city will continue to encourage residents to move as fast as the bigger players—the state, utility companies, and the sun—will allow. "By Earth Day, the GIS [geographic information systems] folks have promised me that people can look up on the web and see if their house is good for solar using the EnHouse data," says Appleyard.

Solar-captivated residents may want to act fast to install that water heater or PV array: the federal solar energy tax credits currently are due to expire this year. But in the meantime, anyone can follow the advice of the pioneering solar home owners and installers: remodel for energy efficiency first. ■