



# BUILDING ING

## Building-integrated PV shingles can change the solar landscape

by Wendy Ventura

After decades of solar innovations, remarkable technological progress and growing global encouragement for a “greener” planet, residential photovoltaic (PV) systems are gaining broader acceptance. With new options available on the market and others on the way, homeowners have more choices and can receive answers to questions regarding aesthetics, longevity, savings, energy production and affordability.

The solar industry makes progress each year regarding solar cell efficiency and lowering manufacturing expenses, which in a free-market system will drive down end-user costs. This progress is aided further when government entities and utility companies offer meaningful incentives or tax breaks for pioneering homeowners and early adopters of solar technology.

As for concerns regarding whether PV systems can look good while also being highly functional, few in the industry have been able to surmount that critical barrier to offer what homeowners consider truly aesthetically pleasing building-integrated PV (BIPV) shingles.

### Aesthetics

Adam Gallegos, real estate principal for Arbour Realty, Arlington, Va., says currently about 20 percent of his clients have some interest in PV systems and want to learn more about them.

“There’s definitely a growing number of clients coming to us with an interest in PV systems and energy efficiency,” Gallegos says. “They are looking for superior-quality, high-efficiency homes. We’re currently at about 20 percent, but that’s a big jump from what was closer to 10 percent in 2010 and maybe 5 percent in 2009.”

According to Greentech Media, Boston, and the Solar Energy Industries Association,

more than 48,000 residential PV systems were installed in the U.S. in 2010, which represented about 264 megawatts (MW) of added capacity. This represents growth of more than 100 MW of capacity between 2009 and 2010. 2011 should demonstrate steady growth in the residential sector as incentive structures and third-party ownership offerings remain key growth factors. Residential PV installations could reach more than 350 MW, or target roughly 85,700 homes.

For the past 10 years, Paul Barnett of Bellevue, Wash., has worked with home improvement television show host Bob Vila and the Department of Energy (DOE) to create demonstration homes for display at locations such as the Consumer Electronics

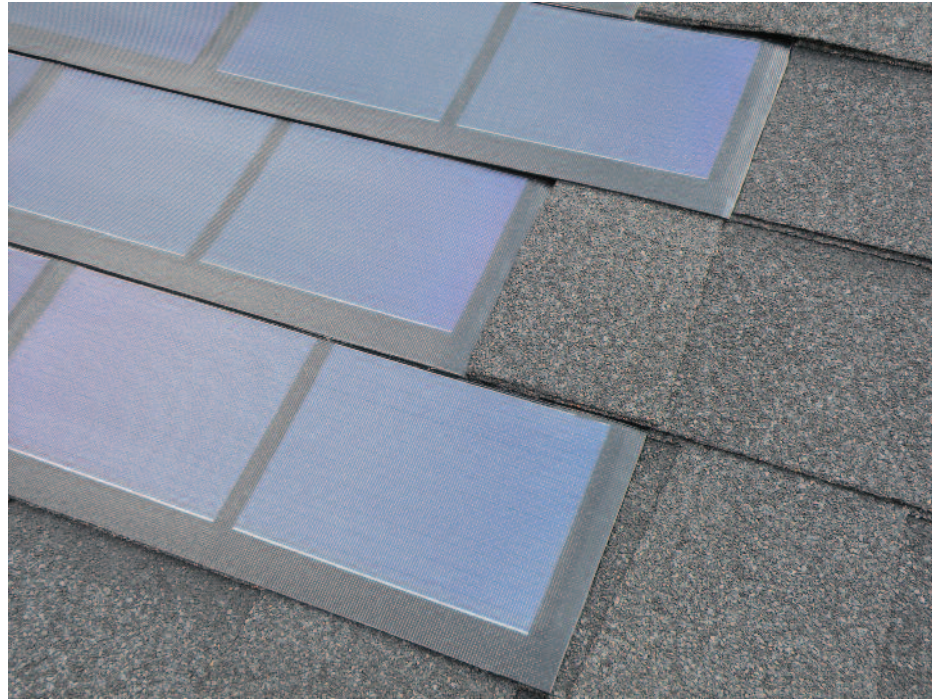
Show and builder shows throughout the U.S. Barnett heads an operation called NextGen Home Experience, showcasing the attributes of increased energy efficiency and renewable energy for the residential marketplace.

“A real pushback on PV systems has been lack of aesthetics,” Barnett says. “For the acceptance of solar in residential planned communities, there’s still resistance to installing first generation-looking PV panels on roof systems. To increase adoption of PV systems in the residential environment, it’s going to be necessary to offer PV systems integrated with roof systems. That, combined with the evolving state of solar manufacturing and design, is leading to solar film products that will be more cost-effective. I think the convergence of new technology, new approaches to PV systems, price point drops and improved aesthetics will help create market demand.”

United Solar, Auburn Hills, Mich., a wholly owned subsidiary of Energy Conversion Devices, is one company evolving its PV products to make them more aesthetically pleasing. The company will begin producing its residential *UNI-SOLAR*® product, *PowerShingle*™, during the fourth quarter of 2011.

*PowerShingle* is a PV product meant to emulate traditional asphalt shingles, the most common and popular roofing material in the U.S. *PowerShingle* has a smoother surface than traditional asphalt shingles but maintains many of their other characteristics, such as size, shape, weight, flexibility, thickness, weather resistance, and virtually identical installation materials and practices.

“Square pieces of glass perched on a roof that don’t blend architecturally with a home’s design still are common,” says Marcelino Susas, United Solar’s vice president of strategic marketing. “However,



United Solar’s *PowerShingle*™

Photo courtesy of United Solar, Auburn Hills, Mich.

with BIPV shingles, a homeowner now has more aesthetically pleasing options.”

Even with such options slowly emerging, Barnett is not certain how soon residential BIPV systems will be accepted; however, he is optimistic.

“Because PV systems will contribute to lower energy bills, I think the adoption rate is going to grow substantially during the next five years with lower costs and higher aesthetic appeal as electricity costs increase,” he says. “I think the industry is onto something. Roofing manufacturers are looking for ways to enhance the value of their roof systems with renewable energy. That’s a valid and growing aspect.”

## Challenges

Few would argue that price point is a determining factor in accepting PV systems—especially at the residential level. Add that to struggling U.S. and global economies, and it’s understandable why

the solar industry overall has been experiencing some difficulties.

John Kinch is the executive director of Michigan Energy Options, East Lansing, Mich., a 30-year-old nonprofit group that helps households, businesses and public institutions in Michigan conserve more energy, save money, reduce greenhouse gases, adopt renewable energy and lead more sustainable lives. He says the group has touched millions of people in Michigan with its work through affiliations, including state and local governments.

“Given these economic times, people are cutting back so much in their personal budgets that it just makes sense to cut energy costs,” Kinch says. “That’s money saved that can be repurposed and used for other necessities or discretionary purchases.

“PV systems are an investment up front, but if you can guarantee you’re going to be enjoying the benefits of that investment for the next 10, 20 or 30 years—or realize it’s going to enhance the resale value of your house—then you’re fixing those electricity costs,” he continues. “And the cost of electricity you’re getting from utilities



For more information about solar energy in the U.S., log on to [www.professionalroofing.net](http://www.professionalroofing.net).

is likely to increase during the next five, 10 and 20 years.”

Kinch believes incentives are key to garnering interest in residential PV systems.

“We need to think more about incentives that would take less out of people’s pocketbooks—incentives such as feed-in-tariffs, for example, which have experienced great success in Ontario, Canada,” he says. “We need some economic models that are friendlier toward solar residential roof system applications, and that could mean employing residential feed-in tariffs.”

From a roofing contractor’s perspective, Robert Baldwin, a 26-year veteran of family-owned Crown Roofing, Newton Square, Pa., agrees money-saving incentives would appeal to homeowners.

“If everything were established where we could guarantee homeowners would get a payback in a certain number of years, I think people would be more apt to spend the money,” Baldwin says. “If PV systems can be affordable and have a reasonable payback period, everyone’s going to want them on their houses.”

## Payment

For homeowners considering PV systems but concerned about prices, federal government tax policies can reduce costs. Local governments in certain states also are supporting expanded solar deployment in residential communities through tax policies, direct rebates and other programs.

A feed-in-tariff is a premium paid to homeowners when electricity generated by their residential PV systems is purchased by a local utility company at a price determined by the government. This process helps homeowners with project financing because it represents a guaranteed revenue stream. Some rebate programs also will pay upfront rebates on a per-watt basis. In many cases, these programs are initiated to meet state government mandates for renewable-energy production.

A 30 percent federal investment tax credit is available to homeowners who install PV systems by the end of 2016. The tax credit may be converted to a cash payment if used by Dec. 31, 2011. In addition, homeowners can benefit from depreciating the entire PV system cost

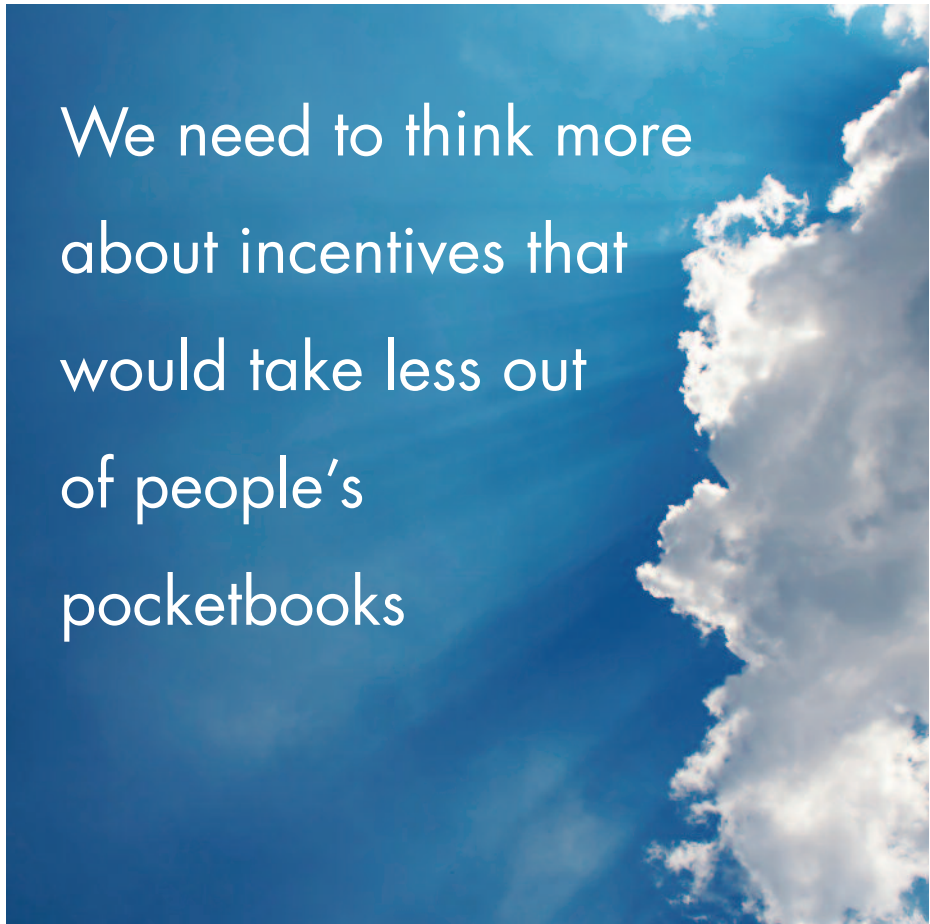
in 2011; this depreciation deduction can help reduce a homeowner’s taxable income in 2011.

About half the states in the U.S. offer programs—though limited in many cases—to help homeowners. California, Hawaii and New Jersey offer robust solar incentive and rebate programs. Hawaii recently approved a feed-in-tariff plus a solar energy credit of 35 percent—on top of the federal tax credit—and Honolulu recently approved a property tax exemption of 25 years for PV system installations. Colorado also has helpful rebate programs managed through several of the state’s utility companies. A list of federal and state incentives and rebates can be found at [www.dsireusa.org](http://www.dsireusa.org).

To help homeowners benefit from the myriad federal, state and local incentives, several solar leasing companies are serving the residential market. These companies offer contracts, known as Power Purchase Agreements (PPAs), which effectively allow homeowners to purchase the electricity from rooftop PV systems for a fixed price during a multiyear period of up to 20 years. Leasing companies—on the strength of PPAs—finance the cost of installing rooftop PV systems so homeowners can lock in electricity rates for a long period of time while not having to pay up front for the PV systems.

Another potential way to lower costs and accelerate homeowner payback would be to address municipal permitting requirements to make them more standardized.

According to the *New York Times*, solar installation companies partnered to create a report, *The Impact of Local Permitting on the Cost of Solar Power*, Jan. 20, 2011, showing more than \$2,500 per residential PV system installation is added to a homeowner’s project cost just for complying with individualized permit requirements that differ from one municipality to the next. If permit standardization were mandated at the federal level, or at least the state level, the report suggests solar



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# Steep-slope BIPV products are becoming available

NRCA is aware of a number of manufacturers who offer or soon will introduce steep-slope building-integrated photovoltaic products. The following list is included as a service to readers; it is neither meant to be all-inclusive nor imply NRCA endorsement or approval.

- Atlantis Energy Systems Inc.: [www.atlantisenergy.com](http://www.atlantisenergy.com)
- CertainTeed Corp: [www.certainteed.com](http://www.certainteed.com)
- The Dow Chemical Co.: [www.dowsolar.com](http://www.dowsolar.com)
- EcoTech: [ecotechshingles.com/shingles.html](http://ecotechshingles.com/shingles.html)
- LUMA Resources: [www.lumaresources.com](http://www.lumaresources.com)
- Lumeta Inc.: [www.lumetasolar.com](http://www.lumetasolar.com)
- SunPower: [us.sunpowercorp.com](http://us.sunpowercorp.com)
- United Solar: [www.uni-solar.com](http://www.uni-solar.com)

power would become financially “competitive for roughly half of the nation’s 128 million homes within just two years” and “could provide a \$1 billion investment to the residential and commercial solar power market during the next five years.”

## Installation process

The installation process is another important factor affecting PV system costs. If the PV system of choice is difficult to transport and install, project costs increase and homeowners are less likely to buy rooftop PV systems.

A majority of a residential PV system’s installation occurs on a roof with attachments and connections designed to be completed by a roofing contractor with standard tools. Importantly, the installation process separates trades. A roofing contractor can install and connect the product while it is not connected electrically to the

home. After PV module installation, an electrician makes the final connections between the rooftop BIPV shingles and balance of system components, which makes the system live.

“One series of solar modules, or electrically connected string, is a vertical column of shingles that will come in 5- and 10-foot versions,” says Troy Glatfelter, United Solar’s senior product development engineer.

## Local ordinances

Lorraine Bradshaw is a residential architect from Media, Pa., as well as a local councilwoman for Middletown Township, and serves on the Delaware County Planning Commission. She lives in a town-home community where she believes installing traditional PV panels would be challenged because of aesthetics. Through her role on the planning commission,

she has seen such topics gaining more attention.

“I have seen more ordinances come into other surrounding townships to address solar and wind power, determining where solar panels can be placed, whether they’re freestanding on the roof, etc.,” Bradshaw says. “There will be more ordinances addressing this topic—what’s allowed, deciding whether there are infringements on the neighbors—similar to when satellite dishes started becoming popular. For PV systems, I think ordinances are a non-issue if it’s part of a shingle.”

## Application

The first real-world application of United Solar’s PowerShingle will take place in New Jersey this summer as part of a pilot program with NJR Home Services (NJRHS), an unregulated subsidiary of utility company New Jersey Resources, Wall, N.J.

NJRHS will install United Solar's integrated PV modules on about 15 residential homes as part of its solar lease program that helps make clean, renewable energy more accessible to customers. Through the solar lease program, NJRHS covers the upfront installation and maintenance costs, which can be tens of thousands of dollars.

The average system for the pilot program is expected to be 3 kilowatts (kW) with a lease payment price of \$26 per month during a 20-year period. That monthly rate is fixed during the life of the lease. An average residential customer is expected to save about \$600 annually—more than \$10,000 in electrical costs during the life of the lease according to NJRHS calculations—while generating clean, reliable power for his or her home. These concepts are true for all BIPV shingle installations on homes.

"NJRHS launched its solar lease program

to provide customers with an opportunity to affordably access renewable energy for their homes," says Stan Kosierowski, president of NJRHS, NJR Plumbing Services and NJR Clean Energy Ventures. "We understand our customers' homes are their most important investments."

On a 2,000-square-foot home in New Jersey with an unobstructed, south-facing roof, a 4.5-kW PowerShingle system could be installed and would produce an average of 6,200 kilowatt-hours (kWh) of energy per year. According to DOE, in 2008, the average home energy use was 11,000 kWh; therefore, the PV system could provide more than half the home's energy needs at no cost.

There is enough sunshine across the U.S. for homeowners to justify PV shingle installation. For example, as mentioned, in New Jersey, which is not known for its abundance of sunshine, PV shingles could produce an average of 6,200 kWh

of energy per year. On the other end of the spectrum, the same 4.5-kW PV system installed in Arizona, which is recognized as a location with a lot of sunshine, will produce even more energy—8,700 kWh per year.

## Looking forward

Residential PV systems are becoming more popular in the U.S. as homeowners increase their awareness of energy benefits and incentives. As the solar industry continues to progress and more roofing-related technology emerges, BIPV shingles will be one of the available options.

"Shingles are a natural first step as we think of our homes as opportunities to be power-generation plants—not just places to live," Kinch says. ☺ ● ❄

Wendy Ventura is marketing communications manager for United Solar, Auburn Hills, Mich.

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