

VENTURES IN THE SUN

Why financiers think film solar technology is the next Internet

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THE BIG NEWS ABOUT SOLAR POWER right now isn't the technology. It's the money. Specifically, it's the venture capitalists (VCs)—the same types whose investments jump-started companies like eBay and Google, and who are now investing in nascent solar companies. Make no mistake: venture firms have not turned into tree-hugging do-gooders in the post-dot-com years. "We don't invest against societal objectives," says Bill Green, a managing director at VantagePoint Venture Partners. "The only reason we invest money is to drive venture returns for our limited partners. We want to make money as quickly as possible." These days, many VCs believe that solar is where the dough is.

Green's San Francisco-based firm invests in high-tech industries as disparate as communications and health care. It first dipped its toe into the solar energy business in 2004, leading a group that invested \$4.5 million in Miasolé, a San Jose-based maker of one of the hottest new technologies, thin-film solar cells. Thin-film manufacturers print or vacuum-deposit a microscopic layer of photoreactive materials onto substrates that are slimmer and more flexible than aluminum foil, similar to the way chemicals are printed on celluloid to make camera film. The technology has the potential to make solar power ubiquitous and the materials needed for it almost invisible. Says Nancy Floyd, cofounder of San Francisco-based Nth Power, a venture firm that specializes in clean energy, "You could have solar thread woven into fabrics. Your imagination can run wild."

VantagePoint isn't the only firm to recognize the potential of thin-film technology. Last June the great-granddaddy of all venture firms, the Bay Area-based Kleiner, Perkins, Caulfield & Byers (joined, among others, by VantagePoint), gave Miasolé a \$16 million boost. In the same month, a group led by another prominent Bay Area firm, Mohr Davidow Ventures, put \$20 million into the locally based Nanosolar, a thin-film solar cell producer.

The VCs, though, aren't thinking about fashion. They like thin film because it's far cheaper to produce than conventional solar panels. For one thing, it requires less material; and manufacturers can also print it continuously instead of in small batches. Add to

CAUGHT ON FILM: Konarka's thin solar film is a big hit with venture capitalists, who see it as a power source of unique versatility.

printing the cells is simpler and less expensive than setting up the kind of sterile production facilities that silicon-based cells need. Add to that a demand that's growing by 35 percent a year—much faster than the supply—and you've got a recipe for profits. Thin-film and other innovative solar manufacturers haven't sent many products to market yet, but they're beginning to line up manufacturing contracts. "There is no indication that demand is cooling," says Green, "so we expect that alternatives to crystalline silicon, notably less expensive alternatives, will do well." There are lots of thin-film technologies available, and different investment firms are betting on different horses. One of the most renowned companies, in addition to Nanosolar and Miasolé, is the Massachusetts-based Konarka Technologies, which prints its solar film on carbon-based organic materials. Not only is carbon cheaper than silicon, it can also be structured to respond to many more types of light rays. Konarka's cells can be printed on almost anything—including a cell phone or BlackBerry.

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And its technology is sensitive to indoor as well as outdoor light, allowing gadgets made of solar-printed plastic to recharge almost anywhere. Konarka has contracts with a number of companies to manufacture products using its technology, including a partnership with the German manufacturer Leonhard Kurz GmbH & Company to develop light-activated plastic.

As Konarka's ability to fine-tune organic material improves, its chairman and CEO, Howard Berke, envisions much more adventurous products. Among the projects in Konarka's lab (or at least Berke's imagination) are greenhouses covered in solar film that absorbs the frequencies that make electricity and lets through those that feed plants, and film that creates electricity from infrared rays, capable of generating power even at night.

Nanosolar, meanwhile, is working on putting solar cells into conventional building materials. "You might have Spanish tiles with

this material in it, or shingles, or tarplike applications that you roll out like a blanket," says Eric Straser, a partner at Mohr Davidow. With these products, an ordinary-looking house or office building could generate all the electricity it needs and more.

None of these applications has yet made it to market. But next year, Pasadena, California-based Energy Innovations, which specializes in so-called solar aggregators, will start shipping its Sunflower 250, a box-like contraption with rows of mirrors that follow the sun and magnify its rays while reflecting them onto a receiver. The company—whose Web site disarmingly details its earlier, failed models—is marketing the Sunflower to companies with big rooftops that want environmental kudos. Down the road, says CEO Andrew Beebe, are smaller installations for houses as well as the huge portions of the globe that aren't yet wired. "There are places where the cost of electrifying is so high that using solar is a no-brainer."

In the solar business, cost is the magic word. So far, solar companies have been supported largely by government subsidies (38 U.S. states have allocated a total of \$3.8 billion to subsidize clean energy). Add the military—which sends soldiers into many unwired areas—environmentalists, and companies that are willing to spend a bit more to earn environmental bragging rights, and you've got today's market.

But as more money pours into solar, things are speeding up. "There are breakthroughs happening at every point of the value chain," says Ron Pernick, cofounder of clean-technology consulting firm Clean Edge—not only sexy new technologies but also innovative ways of financing solar projects, more efficient installation methods, and better techniques to get the current to a plug.

The goal of the VCs is to drive the solar market until getting power from the sun becomes cheaper—without subsidies—than getting it from local utilities. When a technology "beats the grid" in this way, fortunes are made. How far off is that moment for thin-film solar power? Beebe, for one, expects his Sunflower to beat the grid in the expensive California market in four years or so.

"It's like the early period of the Internet," says Pernick. "The whole rich universe that makes industries happen is moving to energy and clean technology." ■