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'Nanoprinting' is hot solar item

Technology pits efficiency vs. cost in panel market

San Francisco Business Times - by [Amy Coombs](#)

The solar industry is competing in a Space Age-like rush to develop the next generation of solar panels. Thanks to a key summer finance deal and the achievement of critical technology milestones, the thinnest and perhaps most cost-effective new technology may soon hit the market.

In July, San Francisco's **ATEL Ventures** provided \$5 million in equipment financing to Innovalight — a thin-film solar panel company that has developed an ink made of silicon nanocrystals. The Sunnyvale startup hopes to make electricity from light by printing sun-absorbing ink on a variety of materials. "You can use your imagination — the solar panel can potentially be printed on any kind of substrate," said Ryan McCalley, an investment manager at ATEL.

Similar technologies are under development at the Austin, Texas-based **HelioVolt**, which uses a metal-based ink. The company prints nanostructured light absorbent layers onto metal and glass, potentially allowing the vertical sides of high-rise office buildings to be converted into solar panels. Awnings, curtains and potentially even windows can also be coated.

"Our panel is about the same thickness as a human hair," said John Langdon, vice president of marketing at HelioVolt. "This is 300 times thinner than 90 percent of the panels on the market now." The company announced in May that it made panels with 12 percent efficiency, which is equivalent to the lower-end models sold to consumers today. Efficiency is the percentage of energy hitting the solar panel that is converted to electricity.

HelioVolt says efficiency will continue to increase as its technology is perfected. The company is building a factory and says the first panels will hit the market during the first part of 2009. If it hits that goal, HelioVolt's product will be the first "nanoprint" solar panel available to consumers.

While Bay Area solar panel installers call the technology mind boggling, they advise consumers to keep shopping for traditional products. The first nanoprint panels to leave the factory will have to pass national certification tests before government subsidies can help pay for installation. Even then, they may face an uphill battle. While high-end solar panels now boast 20 percent efficiency, nanoprint technologies now top out at 12 percent.

According to Gary Gerber, president of the Berkeley-based **Sun Light and Power**, conventional solar panels will remain the best option for city dwellers.

"When rooftop space is limited, you need to maximize efficiency, and nanoprint panels don't cut it yet," said Gerber. Attaching panels to the sides of buildings remains one advantage of the technology,



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Conventional solar panels will remain the best bet for users who need to get the most electricity from limited space, says Gerber.

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but in latitudes like the Bay Area — about 38 degrees north of the equator — vertical panels are only likely to pick up 60 percent of the light rays caught by comparable rooftop systems. “There are also a lot of unanswered questions when it comes to wiring and installing vertical systems,” Gerber said.

On the flip side of the coin, nanoprint methods are touted as faster, cheaper and more environmentally friendly than standard solar panels. The ink can be made with no cadmium or other common toxic ingredients, and running a printing press takes much less energy than the costly heating stages used to crystallize traditional photon-absorbent silicon wafers. In fact, thin-film panels use virtually no silicon — a huge benefit given recent shortages of purified silicon wafers.

“These new methods aren’t even comparable to traditional methods,” Langdon said. In the case of HelioVolt, a 2- by 4-foot absorbent layer can be printed in six minutes, and an entire panel within two hours. HelioVolt plans to print on glass panels. Other thin-film companies print on rolls, much like newsprint, and the final product is flexible and easy to manipulate like plastic. “It’s the nanoprinting that allows us to process panels so quickly, and effectively” said Langdon, “it’s the rate-determining step.”

Like many nanoprint platforms, HelioVolt’s technology also allows for single-site production. In contrast, standard photovoltaic panels are often made overseas, where environmental regulations are less strict. After production, the silicon wafers are shipped across continents to be pieced into modules and framed.

“Even though they take more energy to produce, standard solar panels will pay back this energy debt in one to three years because they are more efficient,” Gerber said. But he also agrees that nanoprinting could be more ecologically sound across the board.

Even if nanoprint panels soon hit the market, analysts say the race is still open to a wide variety of alternative platforms. According to Steven Rea, the executive vice president at ATEL, nanoprinting is just one of many solar methods being developed. “Given how fast the market is expanding, it’s likely there will be many influential technologies in the end,” he said. “We predict nanoprinting will be disruptive, but so will a lot of developing technologies.” Other companies with nanoprinting platforms include the San Jose’s Nanosolar, which has raised more than \$100 million over the past two years. But Northern California is also home to companies like Sacramento-based Bloo Solar, which grows vertical nanocables on thin-film panels. The result resembles a brush, with each “bristle” capturing light. Palo Alto-based **Nanosys** is also trying out various nanostructures with the hope of making thin-film solar panels.

While some believe they are faster, nanoscale methods are not the only way to mass produce thin-film panels. **First Solar** in Tempe, Ariz., brought thin-film panels to the market in 2004, selling mainly to European consumers. First Solar doesn’t use nanoprinting.

Rea and McCalley believe there will be a lot of consolidation in the industry in the next few years. “We are in a race for grid parity, and the goal is to get off fossil fuels,” said McCalley. “It’s an exciting time to be involved in the market.”

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