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Stanford Ovshinsky

Power Surge
After Decades, A Solar Pioneer Sees Spark in Sales

Mr. Ovshinsky's Roofing Can Generate Electricity; Other Ideas Lose Money
A Timely Boost From Germany

By JOHN J. FIALKA
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AUBURN HILLS, Mich. -- Stanford R. Ovshinsky has spent 40 years -- and millions of dollars in backing from various partners -- pursuing his dream. He wanted to build a huge machine that would make giant sheets of material that can generate solar power.

"I said we are going to make it by the mile," he recalls. "Nobody believed me, not even in my own company."

Today, Mr. Ovshinsky, 84 years old, finds himself running his factory at full capacity and overwhelmed with orders. His company, Energy Conversion Devices

Inc., is the largest U.S.-owned maker of photovoltaic materials, which convert sunlight to electricity. The company is a pioneer in an exploding global industry selling $15 billion a year of what's called "PV."

The company's mammoth machine extends the length of a football field. It runs much like a printing press, spooling out thin sheets of the PV material, which can be used on roofs of homes or businesses. As energy costs rise, along with concerns about global warming, PV is in demand.

For decades, solar power -- invented in the U.S. in the 1950s and improved on in the space program in the 1960s -- was a made-in-America product with a tiny market. U.S. companies dominated until the late 1990s, when Japanese and German companies took the lead. Today, the U.S. holds third place in solar-power production, but China is closing fast.

Mr. Ovshinsky, a thin, nattily dressed inventor who never progressed beyond high school, is a big reason why the U.S. remains in this high-tech race. He has a six-month backlog of PV orders, selling about half his production to Germany, and is building three new plants. His PV is thinner, cheaper and more flexible than that of many competitors, and can be used directly as a roofing material.

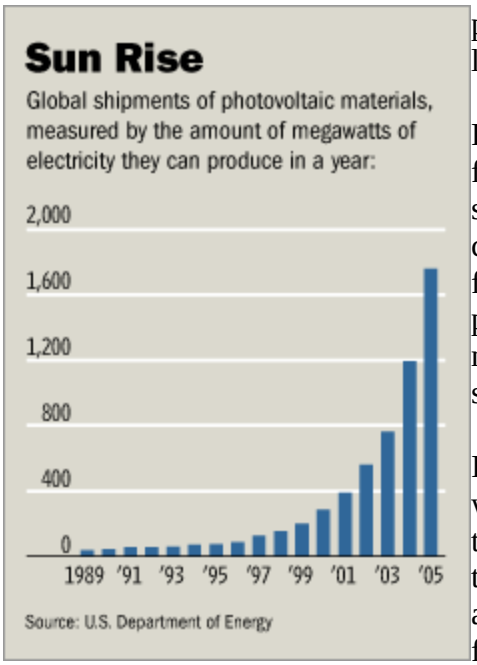
"Stan Ovshinsky has shown the world that there is a robust market for thin film panels," says Rhone Resch, president of the Solar Energy Industries Association, based in Washington, D.C., which represents U.S. manufacturers.

Along the way, critics have seen Mr. Ovshinsky's ideas as marginal or far-fetched. His plans have cost a succession of business partners millions of dollars. And even today, while sales of his solar products are booming, his company is still losing money because of his other unconventional projects, such as a system that can store hydrogen fuel in cars.

"His thinking is different than most of us," says Robert Stempel, who was chairman of **General Motors** Corp. when he first became intrigued with Mr. Ovshinsky's approach. In 1995, after being forced out at GM, Mr. Stempel took his current job as chairman and chief executive of Energy Conversion Devices.

Mr. Ovshinsky's PV product has caught the attention of President Bush, who earlier this year decried the U.S.'s "addiction" to oil and vowed to expand domestic energy resources.

In February -- after calling for a doubling of the government's current solar-research budget of $83 million a year in his State of the Union speech -- Mr. Bush visited Mr. Ovshinsky's factory. After meeting privately with the inventor, the president spoke glowingly about how a consumer with a PV system on his roof could produce his own power and even sell it to the local utility in times of peak demand. For many U.S. consumers, however, the idea is more theoretical than



practical, given a welter of conflicting state laws and utility practices.

Photovoltaic materials come in a variety of forms. What they have in common is that sunlight excites their atomic structures, creating electricity. Most producers make PV from expensive silicon crystals and cover their panels with protective sheets of glass. These materials depend on a uniform crystalline structure.

In the 1960s, Mr. Ovshinsky began working with cheaper materials that require a relatively tiny amount of silicon. In 1977, his work with these materials prompted him to begin thinking about a machine that would make a paper-thin film of PV. By this time, challenges weren't new to him.

Growing up in Akron, Ohio, Mr. Ovshinsky did odd jobs to help support his family during the Depression. He attended trade school at night, where he learned to run a machine shop. Building and fixing big machines became his passion. He soon wanted to know about the physics and chemistry that made machines run and the electronics needed to automate them. On weekends, he spent much of his time in Akron's libraries. "To me, school wasn't the place where I did most of my learning," he says.

He came to Detroit in the 1940s to sell his first invention, an automated lathe. In 1960, he and his wife, Iris, who had a doctorate in biochemistry from Boston University, set up Energy Conversion Devices. The purpose: to exploit the potential of amorphous materials, which include combinations of cesium, tellurium, germanium and other elements. "We wanted to start new industries and solve serious societal problems," says Mr. Ovshinsky.

His wife, who died in August, helped drive the business. "She was a very strong technical person and very strong in organizing him," says Larry Kazmerski, who manages the solar-energy program for the Department of Energy's National Renewable Energy Laboratory. "When you bought Ovshinsky, you got two Ovshinskys." One of their skills, he notes, was the ability to attract a steady stream of financial backers.

The Ovshinskys planned a factory that would make thin-film solar PV. Mr. Ovshinsky envisioned a machine that would deposit layers of the electricity-producing film on flexible materials, such as stainless steel, plastic membranes and even shingles. "Other products you put on your roof," he says. "Mine *is* the roof."

Support for solar took a nosedive in 1982, when the Reagan Administration cut the government's solar research budget in half, sending entrepreneurs and scientists to other fields. Meanwhile, Wall Street investors, burned by over-hyped solar projects, were skeptical. The electricity produced by solar power was far more expensive than that generated by coal or natural-gas power plants.

None of this deterred Mr. Ovshinsky. His goal was to make PV so cheap that it would be competitive with fossil fuels. Some backers wound up disappointed because it took him decades to build the big PV-producing machine. Others learned from his ideas, while providing him with funds to pursue his project.

The first company to take the plunge was Atlantic Richfield Oil Corp., which gave him $25 million in 1980. But after a three-year contract expired, it wasn't renewed. Then came Sharp Electronics Corp. The Japanese company was interested in using solar-powered cells to run its calculators and other electronic devices. That pact ended in 1987, Mr. Ovshinsky says. Sharp later returned to solar energy and is now considered the world's leading manufacturer of silicon crystal panels.

Standard Oil of Ohio became a partner in 1981. Mr. Ovshinsky recalls the company wanted to build only small PV machines. "I said you have to have a big machine to bring down your costs," he says. That pact ended after **BP** PLC, the British oil company, took over the Ohio company in 1986.

Eric Daniels, vice president of technology for BP's solar division, says the company saw merit in Mr. Ovshinsky's thin-film approach, but decided to commercialize silicon crystal panels instead. BP is now one of the world's leading PV producers. Some customers prefer the heavier silicon product because they say it makes electricity more efficiently in areas where there is strong sunlight.

Mr. Daniels says BP is still doing research on thin-film PV, but in order to gear up to manufacture solar panels "there were some tough decisions taken" to focus on making and selling one initial product.

In 1999, Mr. Ovshinsky formed a joint venture with Canon USA, a subsidiary of the Japanese camera and copier maker. Canon later sold its interest to a Belgian company, Bekaert NV, which agreed to invest some $50 million to construct the big machine Mr. Ovshinsky had in mind.

Bekaert's engineers helped design and build the PV machine, which began running in 2002. But in May 2003, Mr. Stempel says, a new team of Bekaert managers concluded the machine was too big and expensive to make a profit.

"We didn't want a reluctant partner, so we bought them out," says Mr. Stempel. Energy Conversion Devices paid Bekaert about $6 million, he says. Francoise Vanthemsche, a spokesperson for the Belgian company said: "Bekaert considers this as a closed file and will not provide any additional comment."

About that time, demand for PV panels began to rise as the result of incentive programs in Germany and Japan. Both countries were preparing restrictions on carbon dioxide and other emissions believed to cause global warming. In 2000, Japan began offering incentives that paid 50% of the costs of buying and installing solar panels.

That same year Germany launched a program that allows solar users to pay for their systems by selling excess electricity back to utilities at a generous, fixed rate. Some homeowners even rented neighbors' rooftops to expand production of solar power and their income.

These days, the global market for PV has grown so much that silicon is in short supply. To counter demand from PV makers, the computer industry and other users of silicon chips are bidding the price up, hampering companies like BP and Sharp that need lots of silicon crystals. That's good for Mr. Ovshinsky. Because his process uses relatively little silicon, he is selling all the PV he can make.

Sales for the solar division of his company, called United Solar Ovonic, have quadrupled since 2003, now running at $90 million a year. About 50% of its products are headed to Germany, where sunlight is relatively thin. "Germany has the average solar exposure of Anchorage, Alaska," says Mr. Resch, of the U.S. solar-industry association. But Germans get fat incentives for installing Mr. Ovshinsky's product.

Last year, for example, Michael Schindler's apartment building in downtown Berlin invested its reserve fund in a local bank, which paid 2.5% interest. This year, it has invested part of the fund in a new solar membrane on the roof -- made by Mr. Ovshinsky's company -- which is making enough electricity to raise the rate of return to about 5% for the money invested in solar.

Mr. Schindler says he had questions about the project at first, but electricians installed a voltage meter that shows him and other unit owners when they are making juice. "Overall, I am optimistic that it is a good system," he says.

Biohaus PV Handels GmbH, one of Germany's biggest distributors of solar products, likes Mr. Ovshinsky's PV because it can produce energy on older buildings with flat roofs and sometimes on walls of large buildings. "Business with this material is picking up strongly and continues to grow," says Manuela Schafers, spokeswoman for the company.

Some states are trying to prime the solar pump. Earlier this year, California launched an 11-year, $2.85 billion incentive program that, among other things, provides rebates to consumers to reduce by as much as 30% the cost of solar rooftop installations. Other states are working on similar programs.

The rising cost of natural gas sometimes pushes peak electricity prices in California

and other areas above 20 cents a kilowatt hour -- a range where solar can compete without government incentives.

Thirty-four states have laws that permit homeowners to produce and sell solar energy, but many have limitations that discourage the practice, and utilities often make it difficult. "It's like having 50 different rules for plugging in your telephones," says Mr. Resch.

-- *Almut Schoenfeld in Berlin contributed to this story.*

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