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A Green Energy Industry Takes Root in California

By MATT RICHTEL and JOHN MARKOFF

SAN FRANCISCO — The sun is starting to grow jobs.

While interest in alternative energy is climbing across the United States, solar power especially is rising in California, the product of billions of dollars in investment and mountains of enthusiasm.

In recent months, the industry has added several thousand jobs in the production of solar energy cells and installation of solar panels on roofs. A spate of investment has also aimed at making solar power more efficient and less costly than natural gas and coal.

Entrepreneurs, academics and policy makers say this era's solar industry is different from what was tried in the 1970s, when Jerry Brown, then the governor of California, invited derision for envisioning a future fueled by alternative energy.

They point to companies like SolarCity, an installer of rooftop solar cells based in Foster City. Since its founding in 2006, it has grown to 215 workers and $29 million in annual sales. "It is hard to find installers," said Lyndon Rive, the chief executive. "We're at the stage where if we continue to grow at this pace, we won't be able to sustain the growth."

SunPower, which makes the silicon-based cells that turn sunlight into electricity, reported 2007 revenue of more than $775 million, more than triple its 2006 revenue. The company expects sales to top $1 billion this year. SunPower, based in San Jose, said its stock price grew 251 percent in 2007, faster than any other Silicon Valley company, including Apple and Google.

Not coincidentally, three-quarters of the nation's demand for solar comes from residents and companies in California. "There is a real economy — multiple companies, all of which have the chance to be billion-dollar operators," said Daniel M. Kammen, a professor in the energy and resources group at the University of California, Berkeley. California, he says, is poised to be both the world's next big solar market and its entrepreneurial center.

The question, Professor Kammen says, is: "How can we make sure it's not just green elite or green chic, and make it the basis for the economy?"

There also are huge challenges ahead, not the least of which is the continued dominance of fossil fuels. Solar represents less than one-tenth of 1 percent of the $3 trillion global energy market, leading some critics to suggest that the state is getting ahead of itself, as it did during the 1970s.

The optimists say a crucial difference this time is the participation of private-sector investors and innovators and emerging technologies. Eight of more than a dozen of the nation's companies developing photovoltaic cells are

based in California, and seven of those are in Silicon Valley.

Among the companies that academics and entrepreneurs believe could take the industry to a new level is Nanosolar, which recently started making photovoltaic cells in a 200,000-square-foot factory in San Jose. The company said the first 18 months of its capacity has already been booked for sales in Germany.

“They could absolutely transform the market if they make good on even a fraction of their goal for next year,” Professor Kammen said. “They’re not just a new entrant, but one of the biggest producers in the world.”

Many of the California companies are start-ups exploring exotic materials like copper indium gallium selenide, or CIGS, an alternative to the conventional crystalline silicon that is now the dominant technology.

The newcomers hope that CIGS, while less efficient than silicon, can be made far more cheaply than silicon-based cells. Indeed, the Nanosolar factory looks more like a newspaper plant than a chip-making factory. The CIGS material is sprayed onto giant rolls of aluminum foil and then cut into pieces the size of solar panels.

Another example is Integrated Solar, based in Los Angeles, which has developed a low-cost approach to integrating photovoltaic panels directly into the roofs of commercial buildings.

In 2007, 100 megawatts of solar generating capacity was installed in California, about a 50 percent increase over 2006, according to the Solar Energy Industries Association, a trade group.

That growth rate is likely to increase, in part because of ambitious new projects like the 177-megawatt solar thermal plant that Pacific Gas and Electric said last November it would build in San Luis Obispo.

The plant, which will generate power for more than 120,000 homes beginning in 2010, will be built by Ausra, a Palo Alto start-up backed by the investor Vinod Khosla and his former venture capital firm, Kleiner Perkins Caufield & Byers.

The industry in California is also helped by state and local governments’ substantial subsidies to stimulate demand. The state has earmarked $3.2 billion to subsidize solar installation, with the goal of putting solar cells on one million rooftops. The state Assembly passed a law to reduce greenhouse gas emissions by 25 percent by 2020, which could spur alternatives like solar.

Additional incentives have come from a small but growing number of municipalities. The city of Berkeley will pay the upfront costs for a resident’s solar installation and recoup the money over 20 years through additional property taxes on a resident’s home. San Francisco is preparing to adopt its own subsidy that would range from $3,000 for a home installation to as much as $10,000 for a business.

The subsidies have prompted a surge in private investment, led by venture capitalists. In 2007, these seed investors put $654 million in 33 solar-related deals in California, up from $253 million in 16 deals in 2006, according to the Cleantech Group, which tracks investments in alternative energy. California received roughly half of all solar power venture investments made in 2007 in the United States.

“We’re just starting to see successful companies come out through the other end of that process,” said Nancy C. Floyd, managing director at Nth Power, a venture capital firm that focuses on alternative energy. “And through

innovation and volume, prices are coming down."

Whether any of this investment pays off depends, as it did in previous eras, on reaching the point at which solar cells produce electricity as inexpensively as fossil fuels. The cost of solar energy is projected to fall steeply as cheaper new technology reaches economies of scale. Optimists believe that some regions in California could reach that point in half a decade.

At present, solar power is three to five times as expensive as coal, depending on the technology used, said Dan Reicher, director for climate change and energy initiatives at Google.org, the philanthropic division of the Internet company. Among its investments, Google says, is $10 million in financing for eSolar, a company in Pasadena that builds systems that concentrate sunlight from reflecting mirrors.

"We're at the dawn of a revolution that could be as powerful as the Internet revolution," Mr. Reicher said. The problem is, he said, "renewable energy simply costs too much."

At a conference of alternative energy companies in San Francisco last month, to discuss how to encourage the industry's growth, Mr. Brown, the former governor, joked that if the participants wanted to make real headway selling alternative energy, they should try not to come off as flaky. "Don't get too far ahead of yourselves," said Mr. Brown, now the state's attorney general. "You will be stigmatized. Don't use too many big words and make it all sound like yesterday."