Silicon Valley makes big push into solar and smart-grid technologies

February 12 2010, By Dana Hull

Cleantech's vast ecosystem includes a dizzying array of emerging technologies, from green building materials to electric vehicles, lighting and wind power. But as Silicon Valley reinvents itself as a global center of clean technology, two sectors -- solar power and "smart" upgrades to the electric grid -- already are reshaping the valley and changing the way energy is produced and used.

The Bay Area is thought to have the nation's largest concentration of cleantech jobs, and much of that job growth has been in solar and smart grid, technologies that leverage the valley's formidable strengths. Next 10, a nonpartisan think tank, estimates that the Bay Area now has about 7,000 jobs in renewable energy alone.

"The skills that have been put to such good use in the valley with chips -- engineering the processes to be more efficient, bringing costs down -- are now being applied to solar," said San Jose Mayor Chuck Reed, who wants to create 25,000 new cleantech jobs and cut the city's per capita energy use in half by 2022. "And in order to make a smart grid smart, you've got to collect an enormous amount of information and manage it and network it. It's a huge market opportunity for what companies here are already doing."

Solar technology is an extension of the semiconductor industry -- a solar cell is basically a simple, large and inexpensive chip, and some manufacturing processes are similar in both industries.

Smart grid, meanwhile, builds on the telecommunications and software industries to improve the electric grid by making it more reliable, secure and efficient all the way from the power plant to the home and office.

Nationwide, demand for electricity is expected to grow 30 percent by 2030, according to the Department of Energy, and the nation's aging grid is struggling to keep up. There's currently no way to store electricity, so utility companies often crank up capacity to meet peak demand during the evening hours, when consumers come home from work and turn on their appliances. If consumers were given incentives and the means to reduce energy use at critical times, that could offset the need to build additional power plants.

There's an environmental opportunity as well: A mere 5 percent improvement in the grid's efficiency would be equal to eliminating the fuel and greenhouse gas emissions from 53 million cars, according to the Department of Energy.

SMART GRID MARKET

Morgan Stanley predicts that the smart grid market will grow from $20 billion in revenue this year to $100 billion -- roughly three times Apple's current revenues -- by 2030. Networking giant Cisco, which is positioning itself to be a major player, believes the communications infrastructure alone for the smart grid could be worth $20 billion a year within the next five years.

A smart grid would also allow utilities to more nimbly manage renewable sources of power like wind and solar, which can be unpredictable and intermittent on cloudy days. And consumers would get real-time information about energy usage, so they could identify the electricity hogs among their appliances and adjust their behavior to reduce energy consumption and bills.

Creation of a smart grid is a top priority of the Department of Energy, which has funneled $4.5 billion in stimulus dollars to the effort, including $303 million to California utilities.

Spurred on by federal dollars, utility companies across the country are rolling out smart meters to better monitor energy consumption at homes and businesses. More than 250 million of them will be installed worldwide by 2015, up from 46 million in 2008, according to Pike Research.

In Northern California, PG&E is installing more than 12,000 smart meters every day toward a goal of having 10 million in place by 2012. Currently, they merely allow PG&E to collect data without meter readers but later will add useful energy-monitoring features.

The nationwide push for smart meters has been a boon to Silver Spring Networks, a Redwood City startup that makes software for several utilities, including Florida Power & Light, PG&E and the Sacramento Municipal Utility District. Silver Spring's software allows devices like meters, load management controllers and electric vehicle charging stations to communicate with each other and the utility.

"Anything we can do to make energy usage and distribution more efficient so we don't need to build more power plants is a pretty big benefit for all of us," said Eric Dresselhuys, Silver Spring's executive vice president. "A lot of people are talking about electric vehicles and rooftop solar. If we're going to adopt those technologies on a massive scale, we need a network in place to communicate with all of these devices."

At least 40 to 50 companies in Silicon Valley, including startups and tech giants, are focused on smart grid development, said Mayor Reed. Experts in the utility industry stress this is just the beginning.

'HUGE OPPORTUNITY'

"There's a huge opportunity," said Don Von Dollen, director of the IntelliGrid program at EPRI, the Electric Power Research Institute in Palo Alto. "Everyone is trying to figure out how to mine the data that comes out of the smart meters and turn it into usable information that can help consumers save energy and reduce their bills. There are going to be lots of opportunities to develop apps, and that's Silicon Valley's sweet spot. Someone is going to come up with the iPod for in-home energy management."

Cisco veteran Laura Ipsen, who was chosen last fall to lead a new Smart Grid Business Unit of more than 100 people, says Cisco's utility customers were "clamoring for us to explore this area." Cisco wants to provide the communications infrastructure to connect all points on the grid, from power plants to homes, as well as tools to manage energy use.

"If we can connect it," she added, "it can be more green."

Cisco has already rolled out its Building Mediator, a product that can automatically and remotely control a building's heating and air conditioning, lighting, security and other electricity use. NetApp, a maker of network storage equipment, uses Cisco's Building Mediator at its Sunnyvale headquarters and reduced energy costs for its 1.2 million square feet of office space by 25 percent -- and $2 million -- over an 18-month period.

Another valley company pioneering smart grid technologies is San Mateo's eMeter, which is piloting a product to alert consumers by text message that they are about to blow their preset electricity budget unless they modify their behavior.

Redwood City startup EcoFactor, meanwhile, creates software that can

continuously tweak the settings of a home thermostat -- including adjusting heating or air conditioning based on variations in outside temperatures and local weather. The company, which recently announced $2.4 million in first-round financing, has a contract with the Texas utility Oncor.

Even Google has gotten into the act. The search giant has introduced PowerMeter, which allows consumers with smart meters to monitor their energy consumption from their iGoogle home page.

"We can begin to see what a clean energy future will look like," President Obama said in an October speech announcing smart grid grants. "We can imagine the day when you'll be able to charge the battery on your plug-in hybrid car at night, because your smart meter reminded you that nighttime electricity is cheapest."

Many of those hybrid owners may be recharging their cars with solar power, another cleantech sector with enormous potential and deep roots in Silicon Valley.

The solar market -- including modules, system components and installation -- will grow from a $30 billion global industry in 2008 to $81 billion by 2018, according to Clean Edge, a cleantech research firm.

Currently, the dominant solar company in Silicon Valley is San Jose-based SunPower, which assembles its panels at the historic Ford assembly plant in the East Bay city of Richmond, where tanks were built for World War II.

POWERED BY SUNPOWER

Its recent projects include a solar power system at Agilent's Santa Clara headquarters capable of generating one megawatt of electricity, about

enough to power 750 to 1,000 homes. SunPower also completed a 1-megawatt system at the University of California-Merced campus expected to produce two-thirds of the campus' electricity on summer afternoons.

SunPower's panels, like most others, use sunlight to excite electrons in silicon to generate electricity. But several companies have created a lot of buzz by replacing silicon with other compounds to make so-called thin-film panels to drive down costs and improve efficiency.

The industry leader in thin film is First Solar, an Arizona company that makes cadmium telluride solar cells and has a deal with the Chinese government to build a 2-gigawatt solar plant in Mongolia, enough to power about 3 million Chinese households. But Silicon Valley has a cadre of thin film startups that manufacture solar panels using a compound known as CIGS -- shorthand for copper indium gallium selenide -- that they say will represent a great leap in solar technology.

Fremont-based Solyndra, a CIGS company founded by veterans of Applied Materials, has filed for a $300 million initial public offering. Several other local companies, including SoloPower, Nanosolar, and MiaSole, are also racing to bring thin-film CIGS into volume production.

Santa Clara-based MiaSole got a big boost last month when it received $101.7 million in federal cleantech manufacturing tax credits. The company doubled its workforce to 300 last year and is ramping up production at its Santa Clara factory.

"The first CIGS company to deliver will be an enormous hit," said Stephen O'Rourke, a solar industry analyst with Deutsche Bank. "A lot of people bought tickets, and now it's time to deliver."

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