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Solar's future is so bright, you'll have to wear shades

By Roland Winston

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Solar is our most abundant and reliable form of renewable energy, and, when used effectively, has the potential to meet most, if not all, of our energy needs.

Each day we increase our fundamental ability to convert sunlight into electricity and thermal energy, while lowering the cost of doing so.

Has it taken significant effort and investment to get to this point? Yes.

Is there still progress to be made in the areas of solar energy conversion and storage? Yes.

Is the day upon us when solar energy systems are as ubiquitous as cell phones and automobiles? Not yet, but that day can be seen on the horizon.

I first became interested in solar energy conversion as a physics professor at the University of Chicago in the 1970s. Solving the problem of concentrating the sun's rays for more efficient energy conversion was one of the key accomplishments of a field I pioneered called non-imaging optics.

With early financial support from Crawford Greenewalt and the Department of Energy, I began seriously experimenting with concentrating photovoltaic and thermal systems.

Although initially people were quite interested, the United States cooled to solar energy in the 1980s. However, other countries, including China, Israel and Germany, embraced the technology.

Today, 250 million Chinese rely on solar energy for their domestic hot water; 90 percent of Israeli homes are equipped with solar hot water heaters; and Germany has more than 26 gigawatts of installed photovoltaic capacity.

By comparison, current industry figures place U.S. installed photovoltaic capacity near 7.2 gigawatts.

Then, beginning in the mid- to late 1990s a very important thing happened — the United States began to reawaken to the potential of solar energy.

This reawakening can be traced to number of factors including technological breakthroughs, the widespread availability of silicon solar cells, the rising cost of gasoline and other fossil fuels and the adverse environmental impact of conventional power plants.

300 dpi Gentry Mullen illustration of a solar-powered home. The Kansas City Star 2010<p> 06000000; ENV; krtcampus campus; krtenvironment environment; krtnational national; krtworld world; krt; mctillustration; 06001000; 06002000; 06003000; 06004000; conservation; energy saving; environmental issue; environmental policies; environmental policy; renewable energy; 10009000; FEA; krtfeatures features; krthome home house housing; krtlifestyle lifestyle; LEI; leisure; LIF; 04000000; 04004002; 04004003; FIN; house building; krtbusiness business; krtconstruction construction property; krtintlbusiness; krtnamer north america; krtrealestate real estate; krtusbusiness; REA; u.s. us united states; alternative energy; home; house; kc contributed mullen; solar energy; solar home; solar panel; 2010; krt2010 - MCT - Mullen

Solar was "hot" again and, thanks to an abundance of sunshine and entrepreneurs, much of this reawakening took place in California.

In 2003 I moved to California and accepted a faculty position at the newest campus in the University of California system, UC Merced. It was an opportunity to establish a dedicated solar lab at a start-up campus in a state that was rapidly embracing solar energy, and I couldn't pass it up.

Almost immediately, I began collaborating with a group of Silicon Valley entrepreneurs to develop concentrating photovoltaic and thermal systems, and my solar lab was up and running.

Shortly thereafter, we received very generous contributions from Sarah Kurtz and an anonymous donor. These funds enabled us to further push these technologies toward commercialization.

I knew I was in the right place, and the numbers support that perception.

According to a recent report by the Solar Energy Industries Association, in 2012 California became the first state to install more than 1 gigawatts of solar capacity in a single year, continuing a trend that has seen the total amount of installed capacity in the state virtually double each year since 2009.

California is leading the way, but other states are not far behind.

Arizona, for example, installed 710 megawatts in 2012, and New Jersey took third place with 415 megawatts installed.

This rapid growth in the U.S. solar market is driven by a combination of lower prices for solar systems, the desire to reduce carbon emissions, an overall acceptance of the technology by the finance sector and the desire for energy independence.

But the more we embrace solar energy as a nation, the more we come to realize there are still opportunities for innovation and the more we understand just where those opportunities lie.

System costs must continue their downward trajectory, the environmental impact of the manufacturing and disposal processes must be minimized, the effects of intermittency must be reduced, the impact of large solar resources on the energy grid must be better understood and the economic and societal benefits must be fully calculated.

While there are significant research opportunities inherent in an emerging global market characterized by rapidly evolving technologies and fluid market forces, there are also challenges.

But we are beginning to experience a future where these challenges are being overcome, and the full potential of solar energy is being realized — to everyone's benefit.

Winston, a professor of engineering and natural sciences at the University of California, Merced, is the director of the UC Solar Institute (UCSolar.org), which is made up of faculty and students from the University of California's Merced, Berkeley, Santa Barbara, Davis, San Diego, Riverside, Santa Cruz and Irvine campuses.
