

# green valley

by Martin Roscheisen

Many companies like mine are emerging from Silicon Valley with a business mission to contribute technologies to help solve the climate crisis. We believe government and business leaders around the world should be doing all they can to encourage and support such innovation. At Nanosolar — which this year completed a \$300 million strategic equity financing — we manufacture our products in California and in Germany, both of which provide substantial subsidies to businesses developing renewable energy solutions.

The direction in which these innovations and policies must go is very clear. First, while some countries have made good progress, others must expand their policies to support not just centralized, large-scale solar power generation facilities with a capacity of 50 megawatts or more, but smaller and less centralized facilities, allowing for 1 to 10 megawatt power generation. These smaller utility-scale facilities would allow for municipal solar energy plants that tie directly into existing local power grids — and so would not require specialized, expensive, new or enhanced transmission lines — greatly increasing the number of communities with access to affordable solar power. Such solar energy distribution would enable broad-scale residential and commercial use, and eliminate the current situation in the United States, for example, where most solar power use continues to be generated through cost-ineffective on-site solar panel installation. Towns and cities throughout Europe and Asia have already proven the concept, and many — increasingly entire counties — are now implementing plans to achieve 100 per cent renewable energy, based on a mix of solar and biofuels. This approach works, it offers significant economies of scale relative to other approaches, and it is possible now. So governments whose policies favour large-scale solar energy power generation facilities must re-orient themselves to support solar energy generation on all scales.

Second, we must move our transportation systems from fuel-based to all-electric, in order vastly to improve overall energy efficiency. Electric vehicles are about four times more energy efficient than fuel-based ones. This is because fuel engines mostly create heat and so most of the available energy units are consumed by the engine itself instead of powering the vehicle. If we succeeded in making the transition to all-electric vehicles for all transport, we would basically cut global energy consumption in half. For myself, I have vowed that the Toyota Prius I have driven for six years will be the last fuel-powered car that I own. It bakes in the sun all day while I work in our San Jose, California, headquarters. My next car will not sit idle during the daylight hours when I am not using it, but recharge under a solar carport at no cost whatsoever, and in a way that does not in any way diminish my mobility. This can, and should, be everyone's goal.

When we started Nanosolar Inc. in 2002, our goal was simple: to make solar power — the conversion of sunlight into electricity — broadly affordable and profitable to install. We believed then, and our work over the past six years has proven, that the limitations of the solar energy technology of the time — solar panels that are fragile, heavy and too expensive for most common applications — were surmountable.

Our team has developed technologies — including manufacturing processes and more than 200 patents — to produce thin, durable non-fragile solar cells at high speed and low cost. Our cells are produced by applying a patented type of 'ink' directly onto an inexpensive, highly conductive foil, in a process similar to a printing press operation. We have developed a machine that prints sheets of solar cells, several metres wide and several kilometres long that are rolled onto cylinders resembling large rolls of aluminium foil. This manufacturing process has a small footprint (so is itself environmentally minimalist) and does not require expensive vacuum chambers. Our solar cell rolls are small enough to allow for low-cost storage and shipping. We are currently 'printing' them at a rate of 100 feet per minute, equivalent to achieving production of one gigawatt of solar cells — enough to power half a million homes — annually.

Our solar panels are currently only being sold to utilities and large power producers, but we envision that it will not be long before our technology makes affordable solar energy available to residential and small commercial users. Indeed we believe that our solar cells will make possible the delivery of sustainable sunlit energy to all parts of the world in which there is a decent amount of sunshine available.

The twenty-first century requires a transition to broad-scale solar energy generation and distribution, and the elimination of fuel-based vehicles. Indeed these changes are already happening before our eyes in a sort of silent revolution, often without much media or political attention. Our government and business leaders already know the direction in which they must lead us through the climate and energy crises. Overdue though it is, we are starting to see significant strides in this direction, including recognition by both candidates in the U.S. presidential election, that the country must be weaned from its dependence on foreign fuel. At Nanosolar we look forward to a future in which solar and other renewable energy is available on a broad and affordable basis worldwide, and in which our vehicles collect and generate energy much more efficiently. 

