

# TAKING THE NANOPULSE

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*Nanotechnology can make a world of difference in virtually every facet of wind and solar energy generation.*

## Put some energy into it.

**For alternative energy, there's no alternative to nanotechnology.**

BY SCOTT E. RICKERT

How many years have we listened to naysayer' whine about alternative energy? We can't get there in time. We don't have the technology. It's not cost-effective. It's not reliable. It's not scalable.

Excuse me? Let's try that again. Suddenly, with the full-force support of the U.S. government backing alternative energy – not to mention the pressure of rising oil prices, instability in oil-producing nations, and increasing global demand on resources – opinions seem to be shifting at the speed of wind and sunlight. People are looking in new directions and at new technologies for solutions. At the top of the list: nanotechnology.

And here's the good news. Nanotechnology can make a world of difference in virtually every facet of wind and solar energy generation. Let's take a look.

In solar energy, you're likely to have heard about the importance of nanomaterials for light absorption. Depending on who you ask, you'll hear that the old-style solar panels captured as little as 12-40% of available wavelengths sunlight. Ouch. By using quantum dots, nanoparticles, nanodots and nanocrystals, the achievable efficiency could climb to 60%. One research team is touting over 95% efficiency. How? Many nanocoatings can increase the density of the energy-absorbing material. There are other sources working on thin films that broaden the spectrum of light that can be captured, including ultraviolet and infrared. Others are working on nanofilms that help reflect and channel incoming light toward the underlying photovoltaic cell or use nanorods that align with the sun's angle as it arcs across the sky. There are even insulating nanofilms that aim to increase heat retention and efficiency in panels.

That's just the start. Let's literally get to the nitty-gritty and consider the environment for solar generation. When you plant your solar panels in a desert, you can expect dirt, dust and crud build-up – daily, hourly. New self-cleaning and dirt-repelling nano-coatings keep the sun shining through. Others increase the life expectancy of a system with a layer of protection that prevents the micro-scratches and gouges that come from windblown dirt pounding the surface glass day after day.

Now let's switch to nanotechnology in wind energy generation. Turbines are, like solar panels, exposed to the elements, too. Yes, there are protective coatings in the works to boost blade durability. But wind turbines face an additional hazard: ice. It clings to blades, reducing the efficiency and life of a turbine. It's a sticky problem – figuratively and literally. Ice crystals have a dendrite structure. That is, they have long branching fingers

that grab hold of a surface. It's the same principal at work on a gecko's feet making them sticky enough to climb up a wall. Research on ice-phobic nanocoatings is enabling a surface that impedes ice formation and actually helps shed ice. It's an especially interesting topic in light of a patent I recently saw concerning mounting small wind turbines on wheels or runners to be transported across ice. To spin an old adage: where there's a wind, there's a way.

And while there's not yet a call for nano-coatings to prevent geckos from sticking to wind turbine blades, there are innovations in non-stick and non-fouling coatings that keep dirt, debris and insect remains (yes, bug guts) from collecting on the blade surface. It's well worth the effort because some studies suggest fouled blades can reduce turbine efficiency by as much as 50%.

Want to increase efficiency further? New nanocomposites make for stronger, lighter weight blades. And nano-enabled lubricants act as nano ball bearings to reduce friction in the spinning turbine, turning more of the action to energy.

What's it all mean to you? It's time to put your company and yourself in full support of alternative energy policy and initiatives. The technology is here or near to achieve more efficient alternative power generation before the energy clock – and our natural resources – run out. Keep talking to legislators. Keep asking for the technology in your plants, offices and home.

And in the meantime, look for ways to put some of these nano-science developments to work in your products. Is there a place for a self-cleaning surface? A more efficient lubricant? A more durable exterior? A stronger, lighter material? Put some energy into it.

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