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Lowell, Massachusetts

**Chief Executive:** Bill Beckenbaugh

**What It Does:** Develops flexible, low-cost photovoltaic technologies.

Power has served as the basis for America's industrial and information transformation over the past century. Chart the availability of electricity against U.S. GDP and the growth curves are nearly identical. Over 50% of our power comes from burning coal. But at a price: coal accounts for more than 43% of global carbon emissions. And yet reliable and environmentally sound renewable energies (hydro, solar, wind) still constitute less than 10% of total electric power generation. Why? Renewable energies are not yet cost effective: rooftop solar panels, for example, can cost more than \$30,000 and require years to recoup the original investment.

Konarka Technologies CEO Bill Beckenbaugh thinks he has the solution to this dilemma. He plans to produce low cost, flexible, lightweight and portable photovoltaic (PV) products utilizing nanomaterials and conductive polymers. These PVs will be flexible enough to roll up like a sheet of paper, and can be integrated in products as diverse as building shingles, emergency roadside signs, Walkmans, mobile phones, children's toys and clothing.

Konarka grew out of U.S. Army-funded research at the UMass-Lowell to develop portable, lightweight solar energy generators that could be worn on future combat uniforms (see "Nanotech on the Front Lines," November 2002). Konarka acquired the exclusive rights to the technology, licensed key patents from the Swiss Ecole Polytechnique, and added more than 25 of its own patent applications.

The company has two main technology platforms. The nearest term technology uses titanium dioxide (TiO<sub>2</sub>) nanoparticles to increase its surface area. This allows it to absorb more light than would be possible with a single slab of TiO<sub>2</sub>. The second technology uses conductive polymers (plastics that conduct like metals) made with carbon fullerenes (also known as "buckyballs") to absorb the light and transfer electrons. Unlike other photovoltaic technologies, Konarka's technologies can convert both sunlight and indoor light into direct current electrical energy. It uses low temperature production methods to put the photovoltaic cells on inexpensive plastics, rather than on costly glass or silicon.

Seeded in August 2001, Konarka has now raised more than \$16 million in two financing rounds from Zero Stage Capital, Draper Fisher Jurvetson, Ardesta, NextGen Partners, and corporate investors **ChevronTexaco** [CVX] and **Eastman Chemical** [EMN]. Companies competing to address the PV market include Nanosys, which signed a multi-million dollar deal in December for photovoltaic technology with Matsushita for the Japanese building materials market (see "Asian Nanotech Fever Running Hot," January 2003). Like Nanosys, Konarka has not hesitated to use its financial strength to purchase intellectual property, acquiring Austria's Quantum Solar Energy Linz to bolster its position organic photovoltaics (see *Follow the Money*, March 2003).

Konarka is part of teams awarded several million dollars in grants and joint development deals from two U.S. Navy contacts, the California Energy Commission and DARPA. Konarka expects to have its first products on the market in 2004. □