

Winds of change

Five promising startups hope to infuse life into emerging cleantech

BY PAUL BONANOS

Before wind can catch up to other green forms of power—let alone traditional energy sources—innovators will have to overcome several intrinsic challenges. The biggest hurdle is that wind is intermittent. It doesn't always blow when and where it's needed.

To be effective, wind projects demand tall towers and large blades, which aren't always easy to erect and install in remote places. And they require sophisticated analytic tools to determine the optimal site for a wind farm.

For startups, the challenges add up to opportunities. Although today a few large companies, such as Houston's Horizon Wind Energy LLC—which EDP-Energias de Portugal SA bought last year—the GE Wind Energy division of General Electric Co. of Fairfield, Conn., and Renewable Energy Systems Ltd. of Kings Langley, U.K., control the worldwide wind market, specialized, smaller firms are introducing disruptive technologies that could soon change how wind power is harnessed and put to work.

Some make wind farms more efficient, while others provide new methods of energy capture and storage, lowering entry costs and distributing power more intelligently.

Here are five startups that have won the backing of venture investors in the

hopes that the winds of change yield windfalls as well.

Stored air

Due to its so-called intermittency, at best, wind power can be captured about 40% of the time, with no way to store capacity for use during downtimes. But General Compression in Newton, Mass., has an ambitious plan to marry wind turbines to compressed-air energy storage.

Backed with an initial \$14.6 million from unnamed Boston-area institutional investors, General Compression is developing turbines that drive underground compressors, filling unused mineral mines or other underground chambers with air at 100 times normal atmospheric pressure. The stored air can then be released at intraday demand peaks—often at two or more times the wattage than the turbines originally generated, over a longer time period—or spread out around the clock as base-load power, depending on the configuration of the power plant.

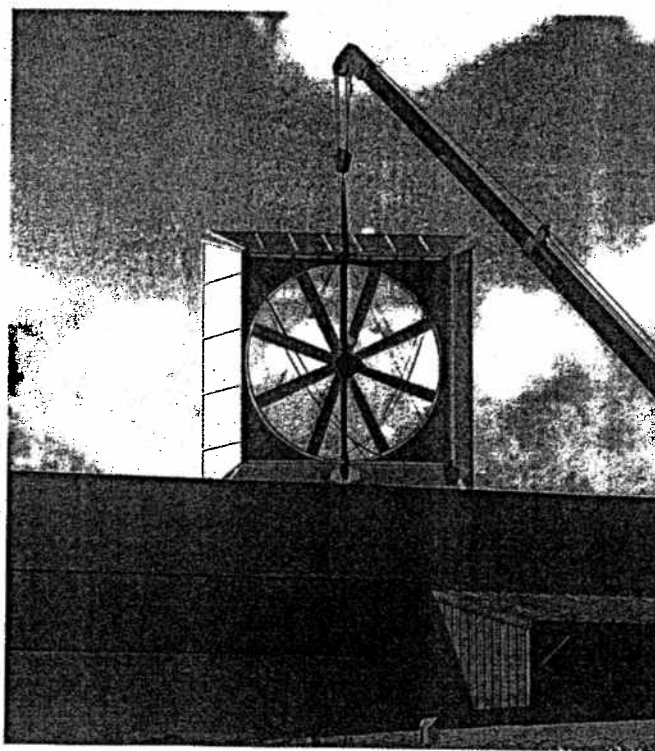
Chairman Eric Ingersoll reports that the company is in talks with investors to raise a round of \$40 million to \$60 million, intended to support technology prototyping and testing. The company plans to set up its own wind farms, with the first commercial installation arriving in 2012, rather than selling gear to third-party site developers.

Remote sensors

In an effort to capture more power, wind turbines have become larger and taller, which has made it tougher to construct and install them. Second Wind Inc., a decades-old company in Somerville, Mass., that logs wind speed and wind quality data for construction projects, has responded by introducing remote-sensing technology that assesses conditions at potential wind farm sites.

Second Wind's devices use sodar, a cousin of radar and sonar that bounces sound waves off moving air, to measure wind speeds and then logs the data for continuing analysis. Second Wind's machines can detect wind speed to a height of 200 meters, significantly higher than the tallest point that traditional wind turbines reach.

"Turbine towers can now be 80 meters tall, with blades 40 to 50 meters long," says Second Wind



general manager Susan Giordano. "Traditional measurement towers have maxed out in height, and they can miss 80% of the rotor sweep."

Second Wind also provides data for managers that operate wind farms, although Giordano says that line of business has expanded much more slowly than its site-assessment sales.

The company received a \$4 million commitment from venture firm Good Energies Inc. in New York in December. If the current U.S. wind farm construction boom doesn't last, Second Wind is hedging its bets by developing applications for environmental monitoring, offshore use and aviation.

Blade booster

TPI Composites Inc. was already profitable, with a 30-plus-year history of building lightweight materials for the boating industry, when it saw its future in wind. Beginning in 1999, the Warren, R.I., company began applying its vacuum-resin-infusion and precision-molding process toward new industries, and three years later it had left behind boats, focusing primarily on wind turbine blades.

"We make blades that are longer, lighter, stiffer and cheaper," says chief executive Steven Lockard of TPI's innovative blades. He asserts that the blades capture more wind while placing less load on the machines.

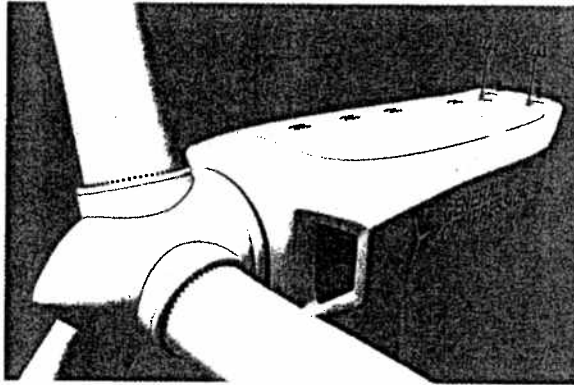
Customers include GE Wind and Mitsubishi Power Systems Inc., both of which have boosted their demand for blades, prompting TPI to increase its manufacturing capacity by building factories in Mexico, Iowa and China to serve their needs.

TPI's aggressive growth strategy coincided with an investment from private equity firm Landmark Growth Capital Partners of Simsbury, Conn., in 2004, but increased demand spurred it to take an additional \$22 million from NGP Energy Technology Partners of Washington and Angelino Group of Los Angeles in September. The company also builds military vehicles and other transportation gear but will have to scramble to keep up with turbine-blade demand. "We're tripling the size of our Mexico plant, which is producing five blades a day," Lockard boasts.

Island nation

"There are large portions of the world with no electricity, and we think wind power is suitable for a lot of them," says Wasatch Wind Inc. chief executive Tracy Livingston, noting that many islands and other relatively inaccessible locales are quite breezy.

By developing a mechanism that lifts rotor blades onto



Turbine rendering better capacity storage

towers without the use of a separate crane, Wasatch Wind claims it has reduced transportation costs and enabled tower installations in far-flung locations, where roads and bridges are often inadequate to handle the weight of heavy equipment.

The Heber City, Utah, company will deploy its novel craneless tower designs initially in large wind farms in the U.S. and anticipates creating wind farms in developing

countries and on remote island nations. Wasatch Wind's lighter composite materials can also be used to build taller towers, some of which will soon be found in a 3,000 megawatt wind farm in Wyoming intended to deliver power to California. The startup plans to develop its own wind farm projects while also selling towers through third-party turbine manufacturers.

The company took an initial investment of undisclosed size from Element Partners, an affiliate fund of Draper Fisher Jurvetson of Menlo Park, Calif., and expects to close a \$10 million second fund by June 2008.

Acceleration advantage

Career inventor Stanley Marquiss used to apply air-movement principles to audio speaker design. But in mid-2006 he joined with Velocity Venture Capital of Sacramento, Calif., in creating Marquiss Wind Power Inc., a developer of rooftop turbines that deliver energy to urban and suburban buildings. Velocity invested alongside Strategis Early Ventures of El Dorado Hills, Calif., in Marquiss' \$1.3 million first round of funding in January.

A second round, probably less than \$10 million, is expected in the coming months.

According to CEO Paul Misso, Marquiss' box-fan-shaped turbines take advantage of wind's natural acceleration as it rises and passes over a building. The turbines are ducted to capture wind coming from a variety of angles and to capitalize on Bernoulli forces, the increases in wind speed due to pressure differentials as air passes through the ducts.

In a locale with wind speeds averaging 12 miles per hour—a relatively calm environment that's common in the Midwest or South—the 19-foot turbines can deliver about 150 kilowatt-hours per day.

Misso says the company is still working out certain kinks—zoning ordinances and snow impact, for example—but reception to its prototypes has been strong. These days, he reports, businesses are proud to have a turbine on the roof, saying that it's a positive statement of environmental responsibility rather than an eyesore. ■