

A Low Wind Blows Fair as Knight & Carver Shipyard Sails Into Wind Turbine Business

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By Bruce V. Bigelow

The Knight & Carver Yacht Center was founded in 1971 along the southeastern shore of San Diego Bay, where it continues to build and repair large boats, specializing in custom-built yachts and commercial passenger vessels. Because so many boat hulls are made of fiberglass, the National City, CA-based boatyard also has worked extensively with fiberglass composites.

So it was smart, really, when a wind turbine operator called the shipyard roughly 12 years ago to ask if Knight & Carver could repair a broken turbine blade. Figuratively speaking, the yard boss said, “Sure, we’ll give it a whirl.”

Today the Knight & Carver Wind Group operates as a separate company—a spinout, so to speak—with

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250 employees, about twice as many as the yacht center. The wind group develops prototype turbine blades at facilities near its headquarters in National City, manufactures 82-foot-long turbine blades in a new facility the company built in Southeastern South Dakota, and dispatches dozens of wind turbine repair and maintenance crews to wind farms throughout the United States.

The Knight & Carver Wind Group is moving now to commercialize its design for an innovative curved wind turbine blade, which was developed to operate more efficiently than conventional turbine blades—and at lower wind speeds. A key feature of the blade, known as the Sweep Twist Adaptive Rotor, or STAR blade, is that it automatically twists to adjust to wind speeds. Twisting enables the massive blade to optimize the wind turbine’s energy output in much the same way that trimming a sail optimizes the speed of a sailboat. As a result, the STAR blade can operate in low winds of 10 mph to 15 mph, and adjusts its pitch as winds increase to reduce excessive loads on the electricity-generating turbine.

Sam Brown, Knight & Carver's president, says the STAR blade was developed under a \$3 million research and development project initiated by the U.S. Department of Energy. The company, which shared a third of the development cost, collaborated in research and development of the blade with scientists at U.C. Davis and the Sandia National Laboratory in Albuquerque, NM. The project began in 2006, and culminated last year with the DOE's Wind and Hydropower Technologies division naming the STAR blade as one of the agency's "Top 10 Program Accomplishments."

A set of three prototype STAR blades, each more than 89 feet long and nearly 8 feet wide, were used to replace standard blades on an existing wind turbine in Tehachapi, CA. Brown says field tests show his company's blades are producing more electricity.

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The company's timing appears nearly perfect. Earlier this year, the Obama Administration proposed setting new federal renewable energy standards that would require 25 percent of the nation's electricity to come from wind turbines and other renewable energy sources by the year 2025. While Congress already has substantially lowered the President's goal in its own proposal, the administration also is rolling out millions of dollars in tax incentives for installing and producing renewable energy as part of the federal economic stimulus plan.

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With such federal incentives, the future of wind energy at Knight & Carver looks especially promising. But that wasn't always the case. Brown tells me that repairing fiberglass wind turbine blades was just "a little teeny piece of the yacht business" when he stepped in to head Knight & Carver 2001. "When I came into the business one of the things we saw was that the business of repairing wind turbine blades not only had potential growth, but it was a profitable," Brown says.

In 2006, Brown spun out the Knight & Carver Wind Group as a separate entity, and in 2007, the specialized wind energy company landed a \$12.5 million investment by the Global Environment Fund, a cleantech-focused private equity fund based in Chevy Chase, MD.

Brown declined to provide the wind group's annual revenue. But he says the company's sales increased 400 percent from 2006 to 2007, and doubled from 2007 to 2008. Even after the collapse of the capital

markets, which stalled financing for many windfarm projects, Brown says he still expects this year's sales to be about 20 percent higher than in 2008.

Brown finds the opportunity in offshore wind turbines especially attractive for the Knight & Carver Wind Group, in part because the capabilities and facilities available at the Knight & Carver Yacht Center. While the two private companies are separate entities, Brown is a part owner in both companies, along with the families of founders John Knight and Hugo Carver, and serves as the president and CEO of both businesses.

The nine-acre shipyard's facilities include a 330-ton crane capable of lifting 155-foot vessels, a 90,000-square-foot enclosed hangar, dock space, and railroad delivery capabilities.

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It almost seems as if an extraordinary confluence of circumstances enabled the shipyard to pursue an alternate path into the wind energy business. But Brown says Knight & Carver is hardly an isolated case. "LM Glasfiber in Denmark is the largest manufacturer of wind blades in the world, and they started out as a boat-builder," Brown says. "TPI Composites in Rhode Island started out as a yacht company, and then there's Abeking & Rasmussen," a German yacht-builder that has expanded into wind energy.

As Brown puts it, "Our core competency in blade design comes from the same core competencies that we have in designing and building boats. So our transition from yachts to wind has been done before."

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