

Harnessing the Winds of Change

Cal Poly Looks for a Cleaner Tomorrow

Story and photos By Scott Roark

You see them in the desert sometimes while driving down the interstate, clustered on the hills, sunlight glinting off white steel, spinning with an almost hypnotic grace.

Wind turbines represent the future of energy for many, an infeasible concept for others.

For Cal Poly Mechanical Engineering Professor Patrick Lemieux, studying how to harness wind energy effectively may not exactly be a breeze – but the research potential is endless and is preparing Cal Poly students to work on technology that could have far-reaching national and global effects.

Lemieux and colleagues John Ridgely and Joe Mello have spearheaded the developing Cal Poly Wind Power Research Center, a facility that includes an on-campus lab and a test site on Cal Poly's Escuela Ranch, which is managed by the College of Agriculture, Food and Environmental Sciences.

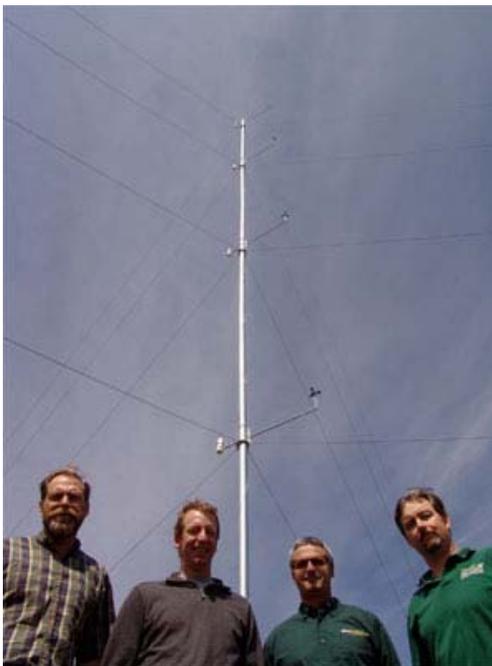
The group already has built an 80-foot tower on the ranch to measure wind speed and direction at 20-foot intervals. This is in preparation for a soon-to-be-deployed 70-foot tall wind turbine, completely designed by Cal Poly faculty and students. The lonely structure will overlook a vast swath of Central Coast mountains and valleys while churning on wind speeds up to 75 mph, the equivalent of a category 1 hurricane.

"We have measured pretty amazing wind speeds up on Escuela Ranch," Lemieux said. "It's proven to be an ideal test site."

The recently-completed turbine nacelle – the center component that holds the rotating blades – was developed entirely by Cal Poly undergraduates, based on a commercial wind turbine designed by mechanical engineering alum Dean Davis.

The turbine is versatile, efficient, light and strong. It includes a 3-kilowatt generator and a blade design in step with industry practice, with a high strength-to-weight ratio thanks to a fabrication process developed by graduate students Bryan Edwards and Devin Gosal. A gel coat and polyurethane coating provides UV and weather protection.

Why is this research so vital to alternative energy development? Lemieux, a native of Canada, becomes excited when talking about the possibilities.



Plowing the wind - Left to right, Mechanical Engineering Department Technician Jim Gerhardt and Mechanical Engineering professors Patrick Lemieux, Joseph Mello and John Ridgely in front of a measurement tower used to study wind power at Cal Poly's Escuela Ranch north of campus along Highway 1.



"The United States has been called the Saudi Arabia of wind power because of the abundance of wind. It's our version of oil," he said.

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"Harnessing this resource with a well laid-out plan is an important first step for an energy supply that is domestic, renewable and clean."

The U.S. already has started to move in this direction, he said. In the short term, the country is moving toward more aggressive renewable electricity standards and production tax credits, which he called "the lifeline of utility-scale wind energy developers."

In the long run, Lemieux would like to see the country embrace a vision like that of the Pickens Plan – a personal campaign by legendary oilman T. Boone Pickens for curbing dependence on foreign oil.

The plan calls for 40,000

wind turbines, each generating 5 megawatts, in the area from West Texas through North Dakota and the Canadian border.

According to the plan, more than 20 percent of U.S. energy could be generated by wind and solar energy. Combined with a long-awaited upgrade to the nation's electricity distribution system, the plan would generate and distribute 200 gigawatts of reliable electric power nationwide – the equivalent of 200 nuclear power plants, Lemieux said.

The cost would be about \$1 trillion. But before the sticker shock sets in, consider this: The U.S. has spent as much as \$700 billion annually on foreign oil imports.

A plan such as this is expensive, Lemieux said, but would eventually pay for itself. Best of all, he said, this solution is immediately feasible. "There is no need to invent any silver bullet technology or figure out how to deal with long term waste problems, carbon footprint issues or other environmental impact problems."

With all of that in mind, the proposed Cal Poly Wind Power Research Center aims to specifically train graduate and undergraduate engineering students for utility-scale wind energy jobs, preparing a new generation of engineers with direct, hands-on challenges related to wind turbine designs and subsystem technologies. The center is on target to achieve these goals, thanks to grant funding from the California Central Coast Research Partnership and the Chrones Chair of Mechanical Engineering.

"Along with our research projects, our students are already collaborating with industry leaders, using proven results to benchmark their own work," Lemieux said. "It's all in the best tradition of learn by doing with an eye on the long-term benefits for all of us."

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