

## A Sea Change for Wind Farms

By Rachel Shafer

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THAR SHE BLOWS! Rendering of a WindFloat offshore wind farm. For a video of how the platforms are installed, go to [http://www.youtube.com/watch?v=vgGAgdJBNF4&feature=player\\_embedded](http://www.youtube.com/watch?v=vgGAgdJBNF4&feature=player_embedded)

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PHOTOS COURTESY THE RESEARCHERS

Twenty miles out to sea, far from seabirds and boat traffic, a 300-foot wind turbine spins in the breeze. It's not alone.

Thirty wind turbines are generating electricity in something called an offshore wind farm. Each turbine is integrated into a highly advanced floating platform and tethered by thick chains to the sea floor. Electricity flows into a giant undersea cable that extends toward shore. At 200 megawatts, this floating farm of clean energy powers more than 60,000 homes.

It's still a futuristic vision, but ocean engineers and entrepreneurs Dominique Roddier (Ph.D.'00 Naval Architecture) and Christian Cermelli (M.S.'90, Ph.D.'95 Naval Architecture) are one step closer to bringing their unique solution, WindFloat, to life. In conjunction with Seattle-based **Principle Power** [<http://www.principlepowerinc.com/index.html>], their company, **Marine Innovation and Technology** [<http://www.marineitech.com/>], is developing a prototype for Portuguese power company Energias de Portugal that will be installed in Portuguese waters in 2011.

"Portugal has very good wind resources and is trying to distinguish itself from the rest of Europe with renewable energies," Roddier says. "They were very interested in our project and wanted to be the first to do it."

Offshore wind farms are similar to land-based farms but have a few advantages. Wind is often stronger and steadier over sea than land and can produce more power. Offshore wind farms also don't suck up premium real estate and can be sited closer to power-hungry coastal populations. Recently, they got a publicity boost when President Obama mentioned them in his September 22 United Nations climate change speech.



**ENERGY ENTREPRENEURS:** Christian Cermelli (left) and Dominique Roddier developed a technology known as WindFloat that solves major problems facing current offshore wind farms.

While futuristic sounding, offshore wind farms do already exist. They've multiplied off the European coastline, and plans are under way to install farms off the shores of Massachusetts. All these, however, incorporate fixed-platform technologies using a steel structure sunk into the seafloor. That steadies the turbine and holds it in place against ocean waves, even during winter storms. But, to be cost effective, the columns can't extend down very far, limiting them to relatively shallow waters, which means they're visible from shore and invite controversy with coastal property owners (as in the case of the Massachusetts project). They also have the potential to harm seabirds.

Offshore wind farms needed sea legs. But no one knew how to float the platforms way out at sea and keep 300-foot wind turbines steady and upright in the roll of deep ocean water and storms. That is, until Roddier and Cermelli came along. Their **WindFloat design** [[http://www.youtube.com/watch?v=vGAgdJBNF4&feature=player\\_embedded](http://www.youtube.com/watch?v=vGAgdJBNF4&feature=player_embedded)] employs 80-foot-wide horizontal plates which, when submerged at the base of the structure, counteract the ocean's forces, minimizing the vertical and angular platform motion. WindFloat also features an active ballast system and triangular design to help the structure maintain stability. The platform can easily be assembled onshore and towed out to sea, the pair say, where it will be connected to its mooring system.

"The WindFloat platform was based on previous work for the oil and gas industry, and those results showed that, after scaling properly, it could be coupled with a wind turbine," says Pedro Valverde, project engineer for Energias de Portugal (EDP). "According to the previous work developed and the proven concept, EDP had no doubts about choosing this technology."

The seed for WindFloat was planted when Cermelli and Roddier were working at Shell and ExxonMobil, respectively, on offshore platforms. Realizing the economic potential of creating a scaled-down, weight-efficient, floating oil and gas platform, they left to start their own company in California and soon developed a concept called the MiniFloat. To finance their startup, the two took on consulting projects, one of which was a wind energy design. It didn't take long for the engineers to put two and two together: scaled-down, floating offshore platform meets wind turbine. WindFloat was born.

If the prototype proves successful, WindFloat bears enormous potential as a green energy business. "I'm very enthusiastic about it because the machines can be very large, and siting issues are solved," says NE and Energy and Resources Group professor Dan Kammen, a renewable energy expert.

Environmental issues are also addressed, since the platforms can be located away from fishing grounds, shipping channels and seabird gatherings. Technologies to frighten away birds may be implemented, the inventors say, and marine mammals won't become entangled in the anchor lines.

"It's a very difficult technical problem," says ME professor Ronald Yeung, who was their doctoral advisor. "They've come up with an ingenious idea."




Cermelli and Roddier met briefly during their Berkeley years and became friends. Both are French and discovered at Cal that their parents live just a few miles apart in southern France, yet they'd never met before arriving at Berkeley. Both enjoy boating, and Roddier, a sailing instructor, competes in regattas.

WindFloat is coming soon to the U.S. east coast. It is part of a University of Maine consortium that recently received a multimillion-dollar federal funding package to develop floating wind turbines in Maine and New Hampshire waters by 2013.

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