

3. TECHNOLOGY: Entrepreneurs make wind turbines that fly (11/30/2009)

Annie Jia, E&E reporter

It's a bird! It's a plane! No, it's a super wind turbine.

One day our electricity may come from the skies (and not in the form of lightning), if some entrepreneurs are right.

That day, floating wind turbines could drift by your airplane window.

The concept of capturing energy from powerful high-altitude winds has been around at least since the oil shock of the 1970s, but in the past few years, a number of new inventors have been joining older companies to turn the idea into startups. Some say floating wind turbines will be on the market in a few years.

Champions of the technology say high-altitude wind holds much higher potential as an energy source than ground-based wind, because it is on average faster and steadier, thus being able to generate more power for a given size turbine.



Magenn Power's floating wind turbine is a helium-filled balloon with wings. Wind blowing across it catches the wings, which are its rotors, making it spin, resulting in electricity generation. Tethers hold it in place and transmit the power to the ground. Photo courtesy of Magenn Power.

Cristina Archer, a professor at California State University, Chico, who co-authored a paper earlier this year on its potential, said that winds at 30,000 feet hold 20 times more energy than winds at ground level, on average.

"You can't find these energy concentrations near the ground in any form," Archer said. "It's kind of like finding rivers of petroleum."

Earlier this month, the first annual High Altitude Wind Power Conference convened in Chico, Calif., with companies from North America and Europe, as well as at least one attendee from a Chinese company, Archer said. About a dozen companies are now in the field, she said.

Sending wind farms aloft

Wind speeds pick up quickly as you go up, even below 30,000 feet, Archer said.

Although some companies are aiming to eventually make turbines that fly above 30,000 feet -- where commercial airplanes commonly fly and where they could tap into the jet stream -- many are starting at lower altitudes.

Joby Energy expects to launch its first turbines around 2012 at heights of 1,000 feet, according to JoeBen Bevirt, the company's founder, though he said it eventually wants to reach airplane height.

Magenn Power plans to come out with a 100-kilowatt commercial model in 2011, also at 1000 feet, and is not planning a higher-flying model, according to Anthony Pizarro, director of corporate development at the company.

The basic design of a high-altitude wind system is a turbine that sustains itself in the air and is connected to the ground by tethers. The super-strong tethers hold the turbine in place and transmit the electricity back to Earth. But specific designs vary.

Magenn Power has made what looks like a spinning, helium-filled blimp. Joby Energy's turbines fly by the same principle as kites. Lifted by the winds, they give the appearance of a flying framework for a roof. Helicopter-like rotors keep Sky WindPower's device afloat while also being the turbine's rotors.

Coexisting with aircraft?

"What about planes and aircraft? They would not coexist well," said Len Shepard, CEO of Sky WindPower. Flying wind farms would require designated air space, he and representatives of other companies said.

But Shepard does not expect that to be too much of a problem. Already, a field of "big blimps with radar detection equipment on them and photo detection" fly at 15,000 feet along the United States' southern border, and they have designated air space, he said.

Pizarro said it would be easier to meet aviation requirements at lower heights, such at 1,000 feet.

Bevirt said his company has talked with the Federal Aviation Administration, as well as with the offices of about 100 Congress members, "to bring the level of awareness up."

While turbines might be buyable in the next few years, Archer said the price of electricity from them likely will not be competitive for five to 10 years.

Magenn plans to stake out its first market in remote areas where the grid does not reach or where it is unreliable, and where electricity often is supplied with diesel and is thus very expensive, Pizarro said.

Can you fly above NIMBY?

Pioneers of high-altitude wind energy also say that an advantage is that it can be located in many more places than ground-based wind power. That's not only because it is viable in more areas because of the higher wind speeds, while also providing a steadier stream of power, but also because it may avoid the "not in my backyard" issues surrounding ground-based wind power development.

"It's difficult in many countries to build transmission lines and generating capacity," Pizarro said. "It makes more sense to have some autonomous source of power right there at that one spot."

Pizarro said people as far as a fish hatchery in Madagascar, as well as farmers from other places, have contacted the company. Inquiries have ranged from North America to India.

The company will likely focus its first efforts in North America and the Caribbean, Pizarro said.

Meanwhile, Google.org, the charitable arm of the Internet giant, has provided \$15 million in funding to the startup Makani Power. The funds are an investment, according to Niki Fenwick, a spokeswoman for Google.org.

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