game changer

new alternative energy source powers up

BY LESLIE MERTZ

A Michigan company is changing the face of alternative energy. Accio Energy, based in Ann Arbor, is developing a completely new power source that takes its cue from thunderstorms. The company expects to be doing commercial trials as early as next year.

"This is a green energy solution that not only cuts costs, but also has the potential in the long term to be cost-competitive with natural gas on an unsubsidized basis," says Jen Baird, Accio Energy CEO. A very scalable technology, the new system will be initially targeted to utility- or distributed-scale power generators.

DISTINCTLY DIFFERENT

The Accio Energy system is unique among alternative energy sources available today. It utilizes the wind, but that's where the similarity to a wind turbine ends. Wind turbines use the wind to push huge blades and generate energy, but Accio's technology has no blades at all. In the Accio system, wind moves through water-misting panels to generate power (see sidebar). "It's stationary, so it's wildlife-friendly and radar-friendly," says Baird.

It also has no negative effects on the water it uses. "We don't pollute the water, and we don't heat the water, so it can go right back into the ecosystem where it came from with no change," Baird says.

BUILDING ON AN IDEA

The Accio system is based on the science of electrohydrodynamics, which was first conceived as a potential energy source in the 1970s. The idea never really got off the ground until engineer Dawn White, Ph.D., co-

ResearchS cientist Vladimir Orlyanchik (left) and Master Electronics Technician Mike Bosserman continue to refine Accio's wind panels. To be marketed as early as next year, a single Accio Energy wind panel is the height and length of a standard shipping container and could produce 2.5–3 kilowatts (kW) of rated power when deployed in utility-scale arrays.

founded Accio in 2008. It took only two years for White and her team to jump the first major hurdle: creating a system that was net energy positive, or produced more energy than it was using. "Since then, it's been an accelerating process of increasing efficiency," says Baird.

The physicists, engineers and other members of Accio's nine-person team have continued to boost performance. "In the last two years, we've used advanced analytical modeling to multiply that efficiency eight times and are now at the point where we have commercially viable energy efficiency." In fact, Baird adds, "Most recent performance levels, if deployed in a full-scale system, would be similar in cost/watts to existing offshore wind turbines. And that's on an unsubsidized basis."

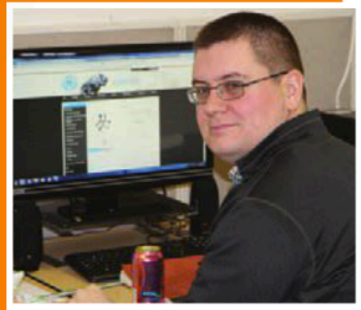
The company measured performance with controlled wind-tunnel experiments in its labs and then verified them with outdoor testing. The Accio team was thrilled to find that the outdoor tests showed the panels worked even more efficiently than the indoor experiments suggested, Baird says. "Natural wind was actually better than what we could produce in our wind tunnel."

Additional improvements are in the works. Accio hopes to double efficiency again in 2014 through refinements to the panel design. "We have multiple markets for this technology, but our favorite is offshore wind. It looks in the near term like we >>

HOW DOES IT WORK?

Accio Energy's system uses the power of electrohydrodynamics (EHD), the phenomenon that yields thunderstorms. In the latter, water droplets in clouds jostle against one another, causing the existing positive and negative charges in the droplets to separate. This results in an electrical field and, if conditions are right, can produce lightning.

The field in Accio's system carries far less power — nothing remotely near that of a thunderhead — but the physics is the same. Accio's EHD system is basically an array of panels, and each panel is composed of a collection of narrow, hollow tubes. The tubes are dotted with small holes, through which a mist of fine water droplets is released. When wind passes through the panel, it pushes around the water droplets and — as in a storm cloud — separates the charges. "That drives a voltage, and we are able in a controlled manner to harvest that energy off of our panels as a high-voltage direct current," says Accio CEO Jen Baird.



Senior Engineer Francis Mills helped develop the Accio technology and continues to improve its efficiency.

Accio's panel design became a game-changer. "Nobody else had ever been able to make hardware for this that was net-energy positive," Baird says, noting that the company received three patents for the technology in 2013.

"It's just so exciting that we are the world leader in developing this technology, and we're right here in Michigan."