CAES NEWS
October-November 2009
Center for Advanced Energy Studies • Monthly Newsletter

Center for Advanced Energy Studies tests new wind energy system

by Ryan Weeks, INL Communications and Public Affairs

Blackhawk helicopters accomplish our nation's missions every day. Now, the Center for Advanced Energy Studies (CAES) is supporting a new kind of Blackhawk to develop energy solutions.

Researchers from the Blackhawk Project LLC are testing and monitoring a new Blackhawk Tilt Rotor (TR-10) Vertical Axis Wind Turbine (VAWT) recently installed at CAES. This wind system, developed by Blackhawk, represents what could be a significant evolution in wind energy technology.

"One of the reasons we chose Blackhawk is that it invites involvement from students and faculty," said Raymond Grosshans, program coordinator at CAES. "And it supports economic development in Idaho."

Blackhawk's unique design distinguishes it from traditional wind energy systems. The most obvious distinction is that its helicopter-like wings, known as airfoils, rotate parallel to the ground, not horizontal like most commercial turbines.

The airfoils attach to a patent-pending tilt rotor in the center of the turbine. The slanted rotor allows the turbine to self-start without any external devices. This passive-control system offers power generation without the noise, clutching, electronics, tower heights or heavy blades often associated with horizontal-axis wind machines.

(The VAWT can produce electricity in winds as light as 7 mph. Propeller-type wind mills typically require speeds of 12 to 15 mph.)

The TR-10 is part of The Blackhawk Project's prototype series and produces around 1.5 kilowatts of power -- enough electricity to supplement a home, power a workshop or drive other small applications.

The power generated from the system will feed directly into CAES, but supplying the building with extra electricity is not why the center agreed to test the Blackhawk.

"CAES' main focus is to create opportunities for research collaborations between Idaho National Laboratory researchers, the Idaho research universities and the private sector," Grosshans said.

Students and researchers at CAES will be monitoring the turbine's performance, acoustic profile, strength, safety and durability.

A student crew chief will oversee maintenance of the turbine, which, Blackhawk says, is more durable than traditional windmills because it has fewer electronic gadgets and parts. Plus, the long arms of the turbine create such a high degree of torque that the unit is able to produce more power with fewer revolutions per minute (RPMs), which reduces wear and tear. When the turbine does need repairs or maintenance, locking magnets hold

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Did you know?

A high-resolution powerwall was recently installed in the CAES auditorium. This powerwall allows CAES partners to visualize large amounts of data in a setting that enables scientific discovery and encourages collaboration. Students, professors, researchers and others have used the powerwall for scientific visualization, presentations, training, classes, and seminars.

The powerwall, an important asset for CAES, averages 20-30 hours of use per week.

Idaho legislators tour CAES

Idaho legislators and their spouses ate lunch at CAES and toured the Idaho Falls facility during a recent visit to Idaho National Laboratory.

A Minute with David Solan

By Kortny Rolston, INL Communications

David Solan is the new director of Boise State University's Energy Policy Institute, which is affiliated with the Center for Advanced Energy Studies. Solan, who earned a master's degree and PhD in political science from the University of Delaware, has worked in several areas of the energy policy field.

Most recently, he was the energy policy faculty member at Boise State's Department of Public Poicy and Administration, and he conducted applied research for EPI, including writing a report on solar energy incentives for the state of Idaho.

Before moving to Idaho in 2008, he worked as a senior advisor at the Environmental Protection Agency and an energy analyst for the U.S. House of Representatives' Government Reform Committee. He also was a legislative director for a congressman.

So, why Idaho?

I was looking for a career change. I wanted to get back into teaching and especially doing applied research. Plus, the most exciting jobs in the energy field are out West. It's where everything is happening. I had been out West a few times with (the House committee) so when the faculty job came open at Boise State, I applied.

Why did you apply for the EPI position?

Some of the most exciting applied research out there is being done at centers and institutes like this one. That's what I want for EPI and I can still teach a class or two.

What are your goals for EPI?

In addition to making EPI self sustaining, I want it to become well known in the nation and region for its work and as a place people look to for certain information and research.

In which areas do you plan to focus?

One of the areas is infrastructure and siting. It's not an issue that has received much attention, but it's a critical area. As we update the power grid and bring more renewables online, where to put power lines and how we upgrade our infrastructure will become even more critical.

What attracted you to the energy policy field?

I was interested from a very young age. The energy crisis in the 1970s made a big impression on me; who can forget waiting hours in line for gas and the pumps running dry? Also, nuclear power was really interesting to me because the power plant in my hometown was the biggest employer and my neighbors were engineers at the plant. So I guess you can say that it was a natural progression as I entered graduate school and then went to work on policy.

What is the most critical energy policy issue facing Idaho, the country?

For Idaho as well as the country as a whole, it is, "How do we stay competitive in an economy that is becoming increasingly carbon-constrained?" This is a really difficult question because there are a lot of tough choices to be made, and a number of avenues we can go down. Increased investment in infrastructure as well as R&D will be really important to providing viable options going forward.

What do you like most about Idaho?

The natural beauty and the outdoors lifestyle, and the recreational opportunities. When I'm not working I tend to be outside, which is a big change from other places I've lived where people close themselves into their homes. The sun setting an hour later in Boise is a big plus too.

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the rotor in place and prevent accidental spinning, creating a built-in safety feature.

Students also will be responsible for developing operation and procedure manuals for the turbine and helping write grants for the company.

"Collaboration with our company is a natural fit," said Dawn Cardwell, Blackhawk's project manager. "The data-collection capabilities and access to universities and researchers is something we don't have."

The project also provides learning opportunities for high school students. A Web cam streams video to high schools all over the country, and telemetry gives students of all levels easy access to real-time data from CAES' grid-type system.

"Students, faculty and researchers can use it for instrumentation, developing modeling tools and to support ongoing classroom activities," said Grosshans.

Blackhawk hopes the data tracked at CAES will narrow the commercialization gap for its system, which the company bills as a low-cost, low-maintenance alternative to horizontal-axis residential turbines currently on the market.

The entire turbine fits in the back of a pickup and takes about three hours to install. With a mere 10-foot diameter, the TR-10 is set to enter the small-turbine industry targeting farms, shops and homes in rural and semirural areas.

"We can be the market leader for bang-for-the buck," said Bruce Boatner, Blackhawk's lead engineer.

CAES research aims to add longevity to key national energy source

by: Kortny Rolston, CAES Communications

As demand for electricity continues to grow, U.S. companies are searching for new, reliable sources of energy and making the most of what they already have. A key part of that effort focuses on the source of 75 percent of the nation's emission-free electricity.

Scientists at the Center for Advanced Energy Studies are researching materials that could help extend the life of the nation's 104 nuclear power plants.

They are studying when and how different metallic alloys crack when subjected to the environment found in light water reactors. One of the first projects is being funded by the Electrical Power Research Institute, an industry cooperative that supports power-related research.

"Industry wants to know how these materials react in that environment because they are looking for ways to repair these reactors or extend their lives," said John Jackson, an INL scientist participating in this research at CAES.

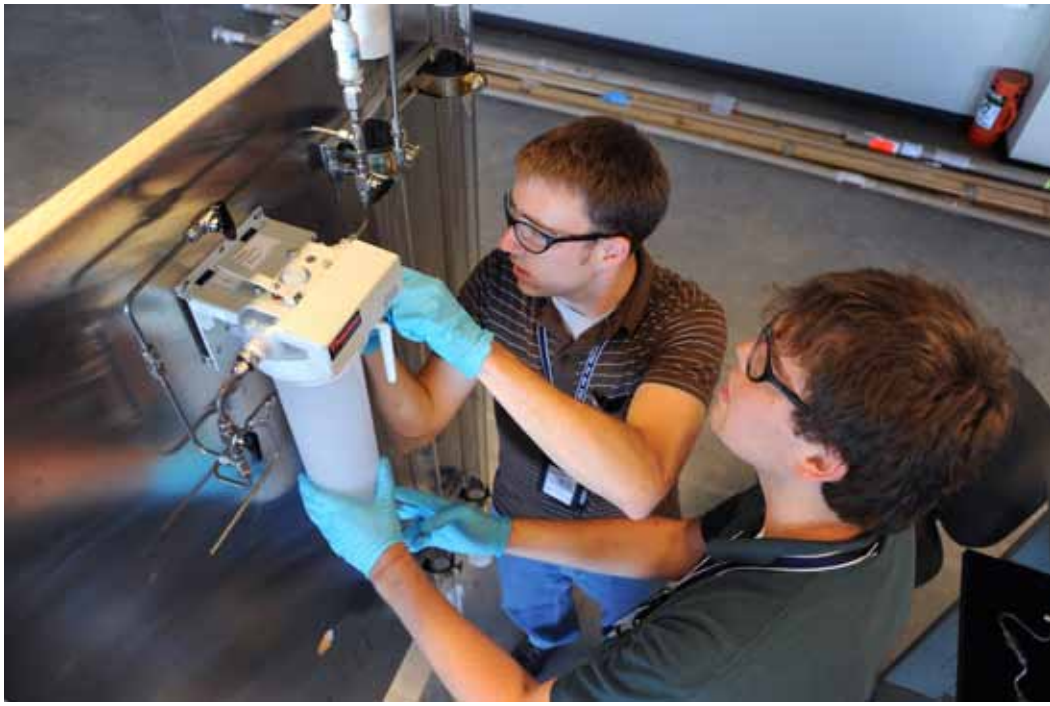
Keeping the current fleet of reactors operational is critical because they supply the country with nearly 20 percent of its power each year.

In addition, most were licensed in the 1970s and are nearing the end of their 40-year operating licenses. At the same time, few new reactors have come online to replace them, which means power companies will have to find other sources of power if they can't keep existing nuclear power plants running.

So far, the only other large-scale option is to burn fossil fuels like coal, a carbon-emitting process that has come under fire for contributing to climate change.

"They don't have a lot of other options," Jackson said.

The CAES research will progress in two phases.



The current first phase involves stress-testing the metallic alloys in a machine at CAES that simulates the high-temperature water in the nation's nuclear reactors. Jackson, INL's Sebastien Teysseyre and others on the team (including researchers from MIT and other universities and national laboratories) are conducting the tests to monitor when cracks develop and how fast they grow.

Eventually, the team will run those same alloys through INL's Advanced Test Reactor before testing them in conditions similar to those currently simulated at CAES. This second stage of tests will show scientists how the materials hold up in an irradiated environment.

This two-part testing is part of the reason CAES and INL were tapped for the project.

Only a handful of labs in the world are capable of conducting these stress corrosion cracking tests, and no other place has as ready access to a test reactor like ATR.

"We're one of only a few places in the world with this type of capability in one place," Jackson said.

CAES Deputy Director Oren Hester said the project showcases CAES' and ATR's capabilities.

"This project fits nicely into CAES' nuclear science and engineering focus and highlights the partnership being cultivated between CAES and the ATR National Scientific User Facility," he said.

To submit story ideas, calendar items or other information for upcoming CAES newsletters, please send an e-mail to Kortny.Rolston@inl.gov.