WIND SYSTEMS MAGAZINE

Giving Wind Direction

WIND SYSTEMS

Education & Workforce

- **Company Profile: Kalamazoo Valley Community College**
- **Retooling America's Workforce for the Wind Energy Industry**

APRIL 2016

APRIL 2016

14

Company Profile:
Kalamazoo Valley Community College

Founded in Kalamazoo, Michigan, more than 40 years ago, Kalamazoo Valley Community College has made a name for itself in the wind energy industry with its Wind Turbine Technician Academy and the skilled workforce it produces.

By Anna Claire Howard

ALSO IN inFOCUS

E-RAD BLU

SETTING THE STANDARDS... HIGHER

visit TORKWORX

simplifying TORK

SOLUTIONS AVAILABLE

- DIGITAL TORQUE CONTROL
  The leading electronic torque control system in the Wind Industry assembled for your WTG.
- ONSITE BOLTING SERVICES
  Expertly trained controlled bolting technicians available for all your maintenance needs.
- WTG SPECIFIC TOOLING PACKAGES
  Our experience with all the major WTG OEM's delivers cost effective & efficient bolting systems.
- CALIBRATION AND REPAIR SERVICES
  Complete in-house facilities to handle all your tooling repair services no matter the make or model and calibration services to ISO17025 standards.

THE FUTURE OF ELECTRONIC DIGITAL TORQUE CONTROL THAT WORX FOR YOU TODAY

The New ERAD BLU electronic torque control systems are engineered and manufactured for maximum durability and performance. The world's most advanced electronic pistol grip stall type torque tool ever produced. Designed to provide continued accuracy and repeatability using the RAD legendary gear box design and the precision of electronic motor. Capable of collecting torque data, measuring torque / angle in a single consistent cycle and accurate to +/- 3%.

Using advanced technology only available from the RAD torque system insures maintenances are done accurately and efficiently in the most cost effective method. Includes a touch screen interface for simplified usability along with pre-set torque and angle capability.

- 2" X 3" Touchscreen Interface
- Multiple Torque Guns per Controller
- Torque and Angle Feature Standard
- Bluetooth Calibration
- Advanced Data Collection
- Password Protection
- Preloaded WTG Specific Presets

Contact TORKWORX today for a complete detailed WTG specific bolting package for your maintenances.

Extreme Bolting Working Solutions can be found at torkworx.com or at 888-502-WORX.

Visit TORKWORX at PowerGen 2015 in Las Vegas at Booth 1537!

AWEA WINDPOWER Conference & Exhibition 2016
BOOTH # 3023

TORKWORX.com
an ISO9001:2008 & ISO17025:2005 company

8319 THORA LANE, HANGAR E2, SPRING, TX 77379 | 888-502-WORX | INFO@TORKWORX.COM | WWW.TORKWORX.COM

SECTIONS

Volume 08 Issue 04

DIRECTION

Wind Systems (ISSN 2327-2422) is published monthly by Media Solutions, Inc., 266D Yeager Parkway Pelham, AL 35124. Phone (205) 380-1573 Fax (205) 380-1580 International subscription rates: $72.00 per year. Periodicals Postage Paid at Pelham AL and at additional mailing offices. Printed in the USA. POSTMASTER: Send address changes to *Wind Systems* magazine, P.O. Box 1210 Pelham AL 35124. Publications mail agreement No. 41395015 return undeliverable Canadian addresses to P.O. Box 503 RPO West Beaver Creek Richmond Hill, ON L4B4R6.

Cover Photo: Courtesy of iStock

SOUTHWIRE MANUFACTURES HIGH-PERFORMANCE CABLES TO MEET YOUR ELECTRICAL POWER AND ENVIRONMENTAL NEEDS IN A VARIETY OF WIND POWER ENERGY APPLICATIONS.

Our customizable solutions help improve costs, reliability and compliance across the renewable energy supply chain. So whether your focus is on powering the turbine motor, transmitting power back to the grid or any wire and cable accessories or support in between, we've got you covered.

A leading manufacturer of wire and cable for over 65 years, Southwire is a single-source solutions provider dedicated to supplying innovative, quality products and world-class service to our customers.

Visit us at www.southwire.com/oem

Southwire®

EDITOR'S DESK

The wind energy industry is constantly evolving and adapting to meet market demands. Like the innovative industry we serve, we also embrace change here at *Wind Systems*.

You may have noticed that our print and digital magazine have undergone a makeover recently. We've enhanced the visual aesthetics of the magazine with a lot of small adjustments that have had a big impact on the magazine's overall look, including mini tables of content within each of our five recurring sections — Direction, Construction, Innovation, Maintenance, and Manufacturing — to give you an idea of what you can expect to read in the remaining pages of that department. We are also in the process of updating our website, www.windsystemsmag.com, to be more captivating and reader-friendly. You can expect that project to be finished by the time most of us are at the AWEA Windpower show in New Orleans from May 23 to May 26. If you'll be attending this year's leading industry event, stop by Booth #3013 and let us know what you'd like to see more of in the magazine. Also, feel free to call or email me if you'd like to schedule a meeting to discuss editorial opportunities.

This month's issue focuses on education and workforce development in the wind energy industry. Like most industries in this economic climate, the United States wind market is facing a shortage of skilled and qualified workers needed to install new wind farms and maintain existing ones. An educated, well-trained workforce is necessary to keep the lights on and drive this industry forward. In the inFOCUS section, we've cultivated the perspectives of several industry leaders to present their opinions on the subject and ways this issue can be addressed. Shawn Lamb from the Danish Wind Power Academy Americas discusses ways America's workforce can be retooled and repurposed to meet the needs of the wind industry. Gordon Moran from the European Energy Centre (EEC) returns this month to propose how the U.S. can benefit from the United Kingdom's example in advancing educational and training opportunities. We also feature a column by Walter Christmas, a wind energy instructor at Ecotech Institute in Aurora, Colorado, on how wind school graduates have an edge when it comes to job opportunities, as well as an article by Kristen Graf, the executive director of Women of Wind Energy, on the importance of women in this industry.

Additionally, you'll find a company profile on Kalamazoo Valley Community College, a leading educational institution in the wind industry, as well as a Q&A with Jared Bezet, the Quality Enhancement Plan director and interim director of Institutional Effectiveness at Everglades University in Boca Raton, Florida. We have also included a list of U.S. educational institutions that offer programs in wind energy. If you would like a school added to this list, email the school's name and information to editor@windsystemsmag.com.

As always, thanks for reading!

Anna Claire Howard

Anna Claire Howard, managing editor
***Wind Systems* magazine**
annaclaire@windsystemsmag.com
(800) 366-2185, ext. 204

CONTRIBUTORS

Gordon Moran is a European Energy Centre (EEC) researcher who writes regular articles for renewable energy magazines internationally. His columns cover a wide variety of topics including government policy, industry trends, opportunities in the sector, and analysis of the latest technologies. For more information on the EEC, go to www.euenergycentre.org.

Walter Christmas, M.Ed., left public education to work in wind energy. Since then, he has installed and decommissioned met towers, rebuilt hundreds of megawatt-scale generators, and consulted in wind resource assessment. He is now a part of an experienced and diverse team at Ecotech Institute where he has come full circle back to teaching. For more information, go to www.ecotechinstitute.com.

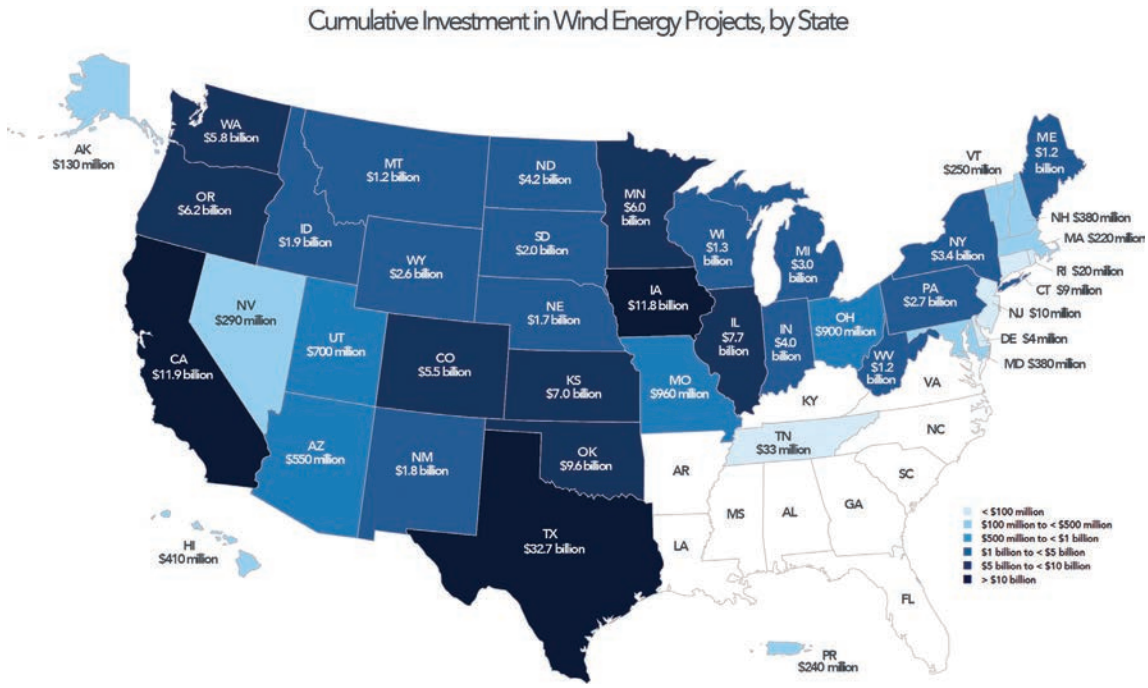
Kristen Graf is the executive director of Women of Wind Energy (WoWE), a national nonprofit advancing women in the renewable energy economy. Before joining to WoWE, she spent five years with the clean energy team of the Union of Concerned Scientists (UCS). She has a B.S. in Engineering from Cornell University. Graf can be reached at kristen@womenofwindenergy.org for comments or questions. For more information about WoWE, go to www.womenofwindenergy.org.

Shawn Lamb is the CEO of U.S. Operations for the Danish Wind Power Academy Americas in Denver, Colorado. Previously, he started the Wind Energy Technology program for Ecotech Institute and has been a wind turbine trainer for Nordex and GE. For more information, go to www.danishwpa.com.

DIRECTION

Policy • Advocacy • Business • Finance • Legal • Environment • International

MORE THAN $128 BILLION DOLLARS INVESTED IN U.S. ECONOMY BY NEW WIND POWER PROJECTS

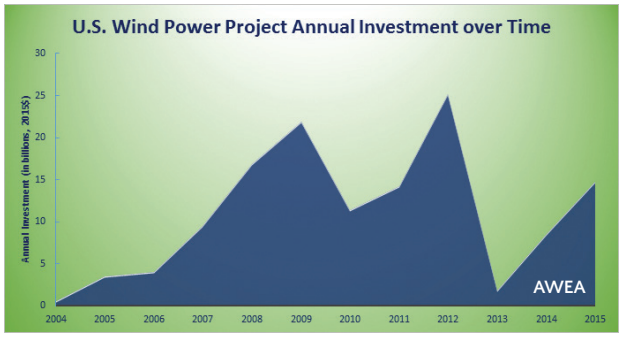


AWEA

Building new wind farms in the U.S. added $13 billion per year on average to the American economy over the past five years, according to information recently released by the American Wind Energy Association (AWEA).

"By building new wind farms across the country throughout the past decade, wind companies have invested $128 billion into the U.S. economy," said Tom Kiernan, CEO of AWEA. "Over this time, wind has rapidly

ALSO IN THIS SECTION



The recent boom-bust cycle of investment that was caused by repeated expirations of the Production Tax Credit (PTC) and alternative Investment Tax Credit will now be smoothed out by the tax credits' long-term extension through the end of the decade, as Congress approved in the budget package last December.

scaled-up. Now, there is enough wind power installed to reliably produce electricity for more than 19 million American homes. Continuing to invest in world-class wind resources here at home will help keep our lights on, grow state economies, and keep more money in the pockets of homeowners and businesses."

Wind energy was the number-one source for new electric capacity additions in 2015 with 8,598 MW installed. That number translates to $14.7 billion dollars in wind project investments in one year — a 73-percent increase over the $8.5 billion invested in new projects in 2014 and a more than seven-fold increase over investments by wind in 2013.

"The rapid rise of wind energy in the U.S. is clearly benefiting state economies," said John Hensley, manager of industry data and analysis for AWEA. "This American success story will continue in 2016 and beyond as there's an additional 9.4 GW of wind currently under construction on top of 4.9 GW that are in the advanced stages of development."

New analysis on wind project investments are featured in AWEA's 2015 U.S. Wind Industry Annual Market Report. The annual report provides a comprehensive update on the state of the U.S. wind market, including the latest wind industry job numbers, investment figures, state-by-state comparisons, market rankings, and more.

Across the country, wind power's rapid growth continues to attract new investment into state economies. Texas currently leads all states in terms of cumulative project investment with more than $32 billion being injected into its economy. Rounding out the top five states are California at $11.9 billion, Iowa at $11.8 billion, Oklahoma at $9.6 billion, and Illinois at $7.7 billion.

The new investment figures made by wind come shortly after a new accord that was announced by a bipartisan group of 17 governors who made the pledge to accelerate clean energy growth, including wind power, as a way to build "a new energy future." The accord said that creating this new energy path will result in a "more durable and resilient infrastructure and [will] enable economic growth while protecting the health of our communities and natural resources."

Wind power costs two-thirds less than it did six years ago because of American innovation and improved domestic manufacturing, with more than 500 factories across 43 states building wind turbine parts and materials, and those savings are being passed on to U.S. consumers. Wind power saved consumers $1 billion over just two days across the Great Lakes and Mid-Atlantic states during the 2014 Polar Vortex event.

Wind energy in the U.S. produces enough electricity for more than 19 million American homes, and American wind power supports 73,000 well-paying jobs across every state, including nearly 20,000 manufacturing jobs.

By staying on track to supply 20 percent of U.S. electricity by 2030, wind energy could support 380,000 well-paying jobs, according to the U.S. Department of Energy. That number could grow to 600,000 by supplying 35 percent by 2050.

— Source: AWEA

For more information, go to www.awea.org.

IRON MOUNTAIN AGREES TO EXCHANGE 30 PERCENT OF U.S. ELECTRICITY USE WITH RENEWABLE ENERGY

Iron Mountain Incorporated, a storage and information management company, recently announced that it has signed a 15-year wind power purchase agreement (PPA) that will exchange 30 percent of its North American electricity footprint with renewable energy. Additionally, the purchase of two-thirds of the power produced by a new wind farm currently under construction in Ringer Hill, Pennsylvania, will provide Iron Mountain with long-term rate stability and an expected annual savings of up to $500,000 in utility costs.

The power generated by the Ringer Hill turbines will directly provide for the energy needs of Iron Mountain's entire Mid-Atlantic operations comprising all or part of 13 states and Washington, D.C. that currently use more than 80,000 MWh of electricity annually. This wind pow-

er purchase will support the energy requirements for Iron Mountain's emergent data center business, projected to account for as much as 20 percent of the company's electricity use in North America as the business grows.

"As the largest operational cost and environmental concern, power has an incredible impact on our data center business," said Mark Kidd, senior vice president and general manager of Iron Mountain Data Centers. "Locking in a long-term, reliable and renewable energy supply ensures price stability, predictability, and superior cost control. The wind power agreement, along with our recent Better Buildings Initiative pledge to reduce energy intensity of 8.75 MW, demonstrates a serious commitment to environmental responsibility. This new agreement better positions Iron Mountain and our customers to meet the growing demand for clean, sustainable power."

The agreement was signed in December 2015 with New Jersey Resources, a company that provides natural gas and clean energy services that include transportation, distribution, and asset management. When the wind farm goes online at the end of 2016, Iron Mountain will become one of the top 25 buyers of renewable energy among the Fortune 1000 and a top-70 energy buyer in the Environmental Protection Agency (EPA) Green Power Partnership, a voluntary program that encourages the organizational procurement of sustainable power.

"This agreement represents an exciting opportunity for us as we continue to advance our sustainability efforts," said Ty Ondatje, the chief diversity officer and senior vice president of corporate responsibility at Iron Mountain. "Our corporate responsibility journey has seen us evolve from our initial focus on corporate citizenship to a deeper, more strategic agenda that uses environmental and social metrics to help us identify blind spots in our business where we can innovate. In doing so, we are finding new ways of doing things that drive significant business value and deliver better results for our customers, our communities, and the environment. This agreement will deliver bottom-line impacts for our business through both operational efficiencies and significant cost savings. In turn, we can help our customers to do the same when they choose us for their storage and information management needs."

— Source: Iron Mountain Incorporated

For more information, go to www.ironmountain.com.

APPROXIMATELY 140 WIND PROJECTS AWARDED TURBINE CONTRACTS IN THE SECOND HALF OF 2015

A new report from Navigant Research titled "Wind Turbine Order Tracker 1Q16" tracks all publicly announced wind turbine orders with data segmented by region, country, and vendor between July and December 2015.

In the second half of 2015, more than 12 GW of capacity was awarded to wind turbine contracts for global wind projects. Europe led all regions with just more than 5 GW of capacity in orders, while North America had just under 2.8 GW and the Asia-Pacific region had just over 2 GW.

"Wind turbine orders tracked in the second half of 2015 show substantial business activity across all top- and mid-tier turbine vendors," said Adam Wilson, a research associate with Navigant Research. "The top countries for order volume are in the key markets such as the United States, the United Kingdom, and Germany, but activity is also strong in Brazil and India where turbine vendors are competing for geographic diversification. Notably, one vendor that was barely on the radar a couple years ago in India is now showing significant activity in that market."

Siemens and Vestas led turbine order vendors in total capacity awarded in the second half of 2015, according to the report. Meanwhile, General Electric (GE), Gamesa, and MHI Vestas, the offshore wind joint venture between Vestas and Mitsubishi Heavy Industries, rounded out the top five.

The study provides an analysis of orders placed by region, country, and vendor in addition to a breakdown of the vendor markets of the top countries by capacity. A detailed examination of turbine components including rotor diameter, turbine rating, and specific power is also provided. The report also offers a comparison of the onshore and offshore wind markets. Note that this tracker excludes orders for the Chinese market due to the opaque state of order reporting in that market. An executive summary of the report is available to be downloaded for free on Navigant Research's website.

— Source: Navigant Research

For more information,
go to www.navigantresearch.com.

EDF RENEWABLE ENERGY AND BLACKROCK CLOSE ON THE SALE OF TWO WIND PROJECTS IN NEW MEXICO

EDF Renewable Energy recently closed on a transaction to sell a 50-percent interest in the 250-MW Roosevelt Wind Project and the 49.65-MW Milo Wind Project to a fund managed by BlackRock Infrastructure. The closing of this transaction seals the partnership on the final two of five projects for which BlackRock and EDF Renewable Energy have signed agreements for over the past year.

The two wind projects are adjacently located in Roosevelt County, New Mexico. The combined 150 Vestas wind turbines produce enough clean, renewable energy to power approximately 170,000 New Mexico households. Both projects are operational with Roosevelt delivering electricity to Southwestern Public Service Company (SPS), a subsidiary of Xcel Energy. Milo electricity is committed into the real-time market in the Southwest Power Pool (SPP) Regional Transmission Organization (RTO).

"In total, EDF Renewable Energy has committed 50-percent stakes in 894 MW of U.S. wind energy projects to BlackRock since the start of 2015 along with a 40-percent stake in an earlier transaction," said Raphael Declercq, vice president of portfolio strategy at EDF Renewable Energy. "Those partial sell-downs are an integral part of our business, and this particular portfolio transaction is a testament to our strong partnership with BlackRock Infrastructure. It illustrates our philosophy of building long-term relationships with leading industry counterparties."

BlackRock Infrastructure has invested in the following EDF Renewable Energy projects:

- 2016: 50 percent in Roosevelt Wind at 250 MW and Milo Wind at 49.65 MW, both in New Mexico
- 2015: 50 percent in Spinning Spur 3 Wind at 194 MW, Texas Longhorn Wind at 200 MW, and Texas Hereford Wind at 200 MW, all in Texas
- 2013: 40 percent in Spearville 3 Wind at 100.8 MW in Kansas

"The North American renewable infrastructure market presents tremendous opportunity for our clients, and we are pleased to grow our successful relationship with EDF Renewable Energy," said David Giordano, head of the North American Renewable Infrastructure team at BlackRock Infrastructure. "Repeat business with a trusted partner creates reciprocal efficiencies in our transactions."

EDF Renewable Energy remains closely involved in the Roosevelt and Milo wind projects maintaining a 50-percent ownership stake. EDF Renewable Services, a leading provider of renewable operations and maintenance services in North America, will provide balance-of-plant operations and maintenance for the facility, including 24/7 remote monitoring from its NERC-compliant operations control center.

BlackRock operates one of the largest renewable power investment platforms in the world with over $1.5 billion of equity assets under management. To date, BlackRock Infrastructure has a total invested portfolio of approximately 1.9 GW of wind and solar projects and $2 billion AUM located across the U.S., Canada, Ireland, Sweden, France, and the U.K.

EDF Renewable Energy is one of the largest renewable energy developers in North America with 7.8 GW of wind, solar, biomass, and biogas projects developed throughout the U.S., Canada, and Mexico.

— Source: EDF Renewable Energy

For more information, go to www.edf-re.com.

The 250-MW Roosevelt Wind Project in Roosevelt County, New Mexico

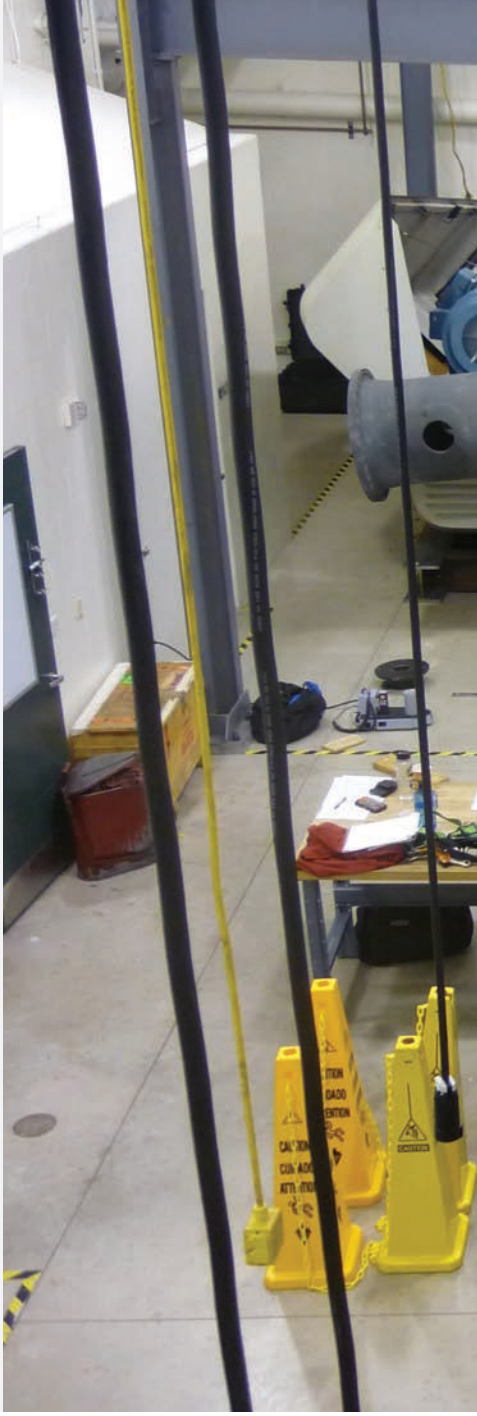
BlackRock Infrastructure

inFOCUS

Profile: Kalamazoo Valley Community College

Founded in Kalamazoo, Michigan, more than 40 years ago, Kalamazoo Valley Community College has made a name for itself in the wind energy industry with its Wind Turbine Technician Academy and the skilled workforce it produces.

By Anna Claire Howard



Established in 1966, Kalamazoo Valley Community College (KVCC) is a comprehensive, fully accredited public two-year college with approximately 13,000 students currently enrolled. It offers certificate programs in more than 20 areas of study and associate degrees in 25 others. In addition to associate degrees and certificate programs in business, health care, human and public service, technical occupations, and industry-specific fields, the college also provides a quality experience for students preparing to transfer to four-year institutions following graduation.

Creating an educated workforce skilled to meet the demands of a changing economy is the focus at the Groves Center on KVCC's Groves Campus, one of the college's four campuses that was originally opened in 2001 as one of 18 Michigan technical education centers (M-TEC) facilities across the state of Michigan. The Groves Center was financed by a $5 million grant from the Michigan Economic Development Corporation in addition to $6 million in matching funds provided by area companies and foundations. It offers a variety of training programs for those looking to embark on a new career path, including fast-track training academies that are designed with input from local employers. One of its most outstanding career programs is the Wind Turbine Technician Academy, which was initially launched in 2009 and has quickly earned a reputation as one of the premier training sources for wind industry professionals. Other career academies offered at the Groves Center include Mechatronic Technician Academy and the CNC Operator Academy, as well as customized workforce development training for area employers.

The Wind Turbine Technician Academy at KVCC is a comprehensive 24-week training program designed to teach students the skills necessary to work as wind turbine technicians. Upon successful completion of the program, students typically enjoy a high placement rate within the wind energy industry. The program meets from 8:00 a.m. to 4:30 p.m. Monday through Friday. During scheduled service trips, students can expect to work 10-12 hours per day to complete the scheduled tasks. Due to the rigorous nature of the program, it is recommended that students not work while they are enrolled in the academy.

"We are committed to enriching the lives of our students and communities through quality educational programs and services," said Benjamin Ash, program coordinator for career academics at KVCC. "For those in the Wind Turbine Technician Academy, we create an environment where students learn by

KVCC

doing. Many times, students' questions are met with questions from the instructor to help them develop their own thought process to solve a particular problem. As a wind turbine technician, the student will face new challenges every day. More than likely, there won't be a 'cookie-cutter' solution to all of the issues they'll encounter in the field, so our instructors try to guide the students to their own solution."

Additionally, the college has educational service contracts with two Michigan-based utility companies giving its Wind Turbine Technician Academy sole responsibility for five utility-grade turbines in the state of Michigan. Students can expect to spend at least two weeks working in the field on these turbines.

KVCC's wind training program differs from many others like it in the U.S. in that it is competency-based

ALSO IN THIS SECTION


KVCC


KVCC

rather than credit-based, meaning that students must demonstrate with 100-percent proficiency that they can complete the tasks necessary to be a wind turbine technician. These competencies are proven by hands-on demonstrations completed in the presence of one of the instructors.

"Not only do students have to complete the hands-on demonstration, they also have to be able to describe what they are doing and why they are doing it," Ash said. "They must also be able to answer any questions from the instructor. Many of the competencies build on one another, and if an instructor feels that a student is no longer competent in a particular task, they may strip the student of that competency until they are able to demonstrate it correctly."

Learning the skills necessary to be successful as a wind turbine technician requires hours of hands-on practice. So, as a general rule, KVCC aims to keep the class time to a minimum, spending approximately 85 percent of their time in the laboratory or in the field.

However, in order for this type of training to be successful, class sizes must remain small. According to Ash, KVCC only accepts a maximum of 12 students into the academy each session, allowing it to maintain an ideal student-to-instructor ratio.

"We currently have two full-time instructors and one part-time instructor, all of whom have been through our program and have worked in the wind industry and worked their way into leadership roles within their respective companies before deciding to come back and teach for KVCC," Ash said.

Beyond the traditional classroom setting, students in the Wind Turbine Technician Academy have the opportunity to work in the college's electronics lab and its training lab, which contains two 300-kW turbine nacelles. In addition to the lab work completed on campus, students can also spend time on utility-grade turbines by completing regularly scheduled maintenance and service requests.

According to Ash, graduates of KVCC's Wind Turbine Technician Academy typically take positions as wind turbine technicians either on a wind farm or as a traveling technician for virtually every major OEM and service and maintenance provider in the U.S. wind industry. The majority of the academy's graduates have moved to the Washington and Oregon areas and to North and South Dakota, while a handful of others have taken positions in Oklahoma, Nebraska, and Illinois.

KVCC's Wind Turbine Technician Academy costs a total of $14,000, which includes all safety gear, tools, books, and laptop computers to use while they are enrolled in the academy. The academy also covers the lodging costs of the students while on the off-campus service trips. Students enrolled in the

program may be eligible for Federal Financial Aid, Veteran Education Benefits, Kalamazoo Promise, Michigan Works, and private grants or scholarships.

According to Ash, there are several key factors that set KVCC's graduates apart from the pool of wind technicians entering the workforce, the first of which being that the college expects its students to treat the academy like a job from the start of the application process through graduation.

"We require students to apply with an application similar to a job application, provide contact references, and conduct an interview," Ash said. "Once the student is accepted into the program, they are accountable for tardiness and missing class. If a student does not call and does not show up for class, they may be asked to leave the program. Attendance is recorded throughout the course and will be reported to potential employers if requested. The class schedule also falls in line with a full-time work schedule."

Additionally, students enrolled in the academy must complete ENSA GWO BST training series, which includes working at heights, First Aid, fire prevention, and manual handling. All work-at-heights training is completed on the college's 100-foot climbing tower.

KVCC's wind program has earned both the American Wind Energy Association (AWEA) seal of approval and certification by the Bildungszentrum für Erneuerbare Energien (BZEE) Renewable Energy Education Center. Upon successful completion of a series of written and practical tests, as well as completion of the field service, students receive certification as a service technician for wind turbine engineering through the BZEE.

"Employers appreciate the fact that the students from KVCC's Wind Turbine Technician Academy complete the ENSA GWO training," Ash said. "They also like the fact that students are gaining experience on real components and actual field experience all within the 24-week training period.

KVCC runs two academies per year; one typically starts during the first week in January, and the other typically starts the first week in July. Applications are accepted year-round. Anyone who is interested in learning more about KVCC's Wind Turbine Technician Academy should contact Ash directly at bash@kvcc.edu or (269) 353-1560.

For more information, go to www.kvcc.edu/wind.

RETOOLING AMERICA'S WORKFORCE FOR THE WIND ENERGY INDUSTRY

By Shawn Lamb

According to the United States Bureau of Labor Statistics, the wind turbine technician profession — and opportunities for employment therein — is expected to increase by 108 percent over the next 10 years. This projection is much higher than the other occupations classified under the category of installation, maintenance, and repair, which is expected to grow by only 6 percent throughout the same time frame. This statistic indicates that U.S. wind energy generation is a growing industry with approximately 8.6 GW of newly installed capacity over the past year, as well as the tens of thousands of previously installed turbines that will need to be operated and maintained well into the next couple decades. However, the question remains — where will these workers come from?

As I have discussed in previous articles, there is a coming shortfall of wind workers in this industry, as well as a requirement for these workers to be properly trained and qualified in order to perform maintenance work on the wind turbines. Additionally, there is potential for workers from industries that are similar to the wind energy industry to transition into being wind technicians. There are two U.S. industries that have seen a recent downturn and may have trained workers who are currently seeking other employment options. The first is the mining industry. With the low prices of mining commodities, many mining companies are downsizing their workforce to stay in business. Mining involves many skills that can be transferable to the wind industry, including instrumentation, data analytics, heavy machinery maintenance, and troubleshooting hydraulics and electronic systems.

The other pool of potential workers could come from the oil and gas industry. The price manipulation of oil overseas coupled with the boom in fracking technology in the U.S. has created a glut on oil and gas worldwide. As a consequence, many experienced professionals in that industry find themselves without work. Before joining Ecotech Institute as the director of career development, Natasha Maier spent a decade in the oil and gas industry as a human resources consultant. Now, she finds jobs and placement for graduates of the school's Wind Turbine Technology program.

"Having previously worked in the oil and gas industry, I have seen a lot of the technical and safety skills transfer into the wind industry," Maier said. "With some additional training, these oil and gas technicians can become proficient wind technicians."

I met with one such technician while I was training wind techs at the Panther Creek Wind Farm in Big Spring, Texas. I asked John Sherrod, an employee of E.ON Climate and Renewables North America, how he felt the skills from his career in oil and gas carried over to wind.

"The skills I learned while troubleshooting the pumping units, PLCs [programmable logic controllers], and SCADA systems in oil and gas were very close to what I do while troubleshooting wind turbines," Sherrod said.

Sherrod spent 14 years in the oil and gas industry, first as a pumper, and then as a well technician who worked with controllers and PLCs.

"I made the transition from oil and gas to wind energy because I saw the layoffs coming, and I wanted to further my career in control systems and PLCs," Sherrod said.

As an educator in this industry, Sherrod was one of the students I trained through the Danish Wind Power Academy Americas when he started working at E.ON. When asked how difficult it was to transition from the theory and schematics found in a classroom to troubleshooting in the field, Sherrod said, "When I first started with E.ON, I didn't know anything about wind. The class helped me understand how the turbine works, and once I started working on the turbines with more experienced technicians, I could understand the terminology and what they were saying."

The retooling and repurposing of technicians from industries outside of wind energy can take many forms. Some may only need to be shown the schematics, while others may require a long-term training plan to fully understand how wind power plants operate. From my 20-plus years of teaching and training adult students, I can honestly say that there is no specific one path that's best for transitioning these technicians. However, finding workers with the right attitude and some heavy-industry experience is a great start for addressing the labor shortage and having qualified technicians working on the towers.

HOW THE U.S. WIND INDUSTRY CAN BENEFIT FROM THE ADVANCEMENT OF EDUCATIONAL AND TRAINING OPPORTUNITIES

By Gordon Moran

There is a broad range of professions that make up the workforce needed to drive the wind energy industry forward, including jobs in the manufacturing of wind turbines, engineering, and a range of support roles relating to daily operations, including marketing and community liaison work. A wide variety of training is required for all of these different roles, from initial background qualifications that may include a specific college degree or certification to conversion courses for someone coming into the sector from another discipline, as well as ongoing training for staff throughout their careers.

The wind industries in the United States and Europe both require a highly skilled workforce for their continuing development and expansion. Some European countries have wind turbine manufacturing industries that they have built up and developed over several decades, and many are installing large numbers of turbines and providing training programs and degrees at educational institutions that equip the workforce with the skills necessary to meet the current and future needs of the industry. A similar trend has developed in the U.S. where there are several manufacturing bases and states with a large number of turbines being installed. Educational support has also developed quickly in wind-rich states like Texas, where there is a growing need for a trained workforce to meet the needs of the industry.

According to the American Wind Energy Association (AWEA), more than 80,000 Americans are employed in the wind industry and related fields. While the development of the wind energy industry is on the rise in the U.S., the skills gap risks putting that growth in jeopardy if there is a shortage of skilled

> The wind industries in the United States and Europe both require a highly skilled workforce for their continuing development and expansion.

workers who are readily available to meet the industry's needs. This, combined with an aging workforce, means that an enhanced education pipeline will be crucial to ensure that there are well-trained, qualified workers to sustain the industry.

One way these needs could be addressed is by looking at how European countries have developed educational opportunities to support the wind sector and applying similar principles to the U.S. wind market. The United Kingdom can provide relevant insights that may prove helpful to the American wind industry.

The U.K. is currently facing a decrease in the number of available, qualified engineers and technicians that are required to sustain and advance the industry. The government addressed this shortage with an increased investment in apprenticeships and a flexible range of training options available for new applicants who are entering the industry. Companies are also investing heavily in on-the-job training for their existing staff to build on and increase their skillsets. For example, wind turbine technicians are one of the primary groups in the wind industry and are responsible for ensuring turbine equipment operates efficiently. Organizations such as the European Energy Centre (EEC) offer a variety of curricula for those looking to pursue careers as wind technicians. The EEC is an accredited center and offers qualification courses, such as the Wind Power course, where individuals learn how to install, maintain, and repair wind turbines. Additionally, courses like Modern Apprenticeships in Wind Turbine Operation and Maintenance as well as Wind Turbine Installation and Commissioning are also available in the U.K. This range of courses combined with relevant hands-on experience yields a workforce that is equipped with a broad range of qualifications and can ensure a large enough workforce is available.

More highly technical, specialized roles are also required for a range of engineering fields across the industry, including aerospace, civil, electrical, electronics, environmental, industrial, materials, and mechanical. An undergraduate engineering degree is typically a prerequisite for this type of employment, along with relevant work experience. These qualifications are available at a range of universities across the U.K., and students often participate in an internship or cooperative program as part of their undergraduate studies.

This flexible and broad range of avenues for applicants to become suitably trained is helping ensure that sufficient numbers of qualified personnel are available to work in the global wind energy industry. It has also resulted in a virtuous circle of initial educational investment by the public sector, which has led to companies investing in the educational development of their workforce. Siemens, for example, built a wind power training center in Newcastle Upon Tyne — a university city on the River Tyne in northeast England — and a global center for offshore grid connections in Manchester. The company is also sponsoring research in renewables at various U.K. universities and is currently constructing a manufacturing plant in Hull to support the offshore wind industry.

Some countries in Europe have established wind turbine manufacturing industries that require skilled technicians and a great deal of careful planning to develop the supply chains, infrastructure, and training facilities necessary to sustain the industry. While the U.K. does not have a history of technological advancements that are required to develop an indigenous manufacturing base, collaborations with private companies may result in the development of such a system. An established policy regime, commitments from government, and known projections for construction have led to the development of a training infrastructure and the facilities that can ensure the long-term viability of the industry. For example, the U.K. offers training facilities that were developed by private companies in addition to apprenticeship schemes, university degrees, and extensive in-employment training to provide the workforce that the industry requires.

Further investment in more comprehensive training facilities in the U.S. will lead to positive mutual reinforcement with initial public sector-led educational investments, which will lead to further internal investment by companies in the development of their wind workforce.

To learn more about renewable energy and energy efficiency through training courses, visit www.EUenergycentre.org

WIND SCHOOL GRADUATES HAVE A COMPETITIVE EDGE IN THE APPLICANT POOL

By Walter Christmas

As a wind energy instructor at Ecotech Institute, I'm envious of my students. They are at an exciting place in their careers, and the wind energy industry is exploding with opportunity worldwide right before their eyes. The technology uptower is changing so rapidly that employers are coming straight to schools like Ecotech Institute in Aurora, Colorado, to hire as many of our students as they can.

After two years of hard work and personal sacrifice, more than 90 percent of Ecotech Institute graduates will go into high-paying jobs in the wind energy industry. Most of them will start off in challenging and exciting positions as wind turbine technicians — the first step in building a career in an industry that has seen phenomenal growth and a diverse range of career paths that continue to grow and evolve.

As an instructor, my charge is to take them from the slightly naive yet motivated renewable energy enthusiasts that they are coming into the program and turn them into highly professional technicians with a deep scientific understanding of turbine systems and the wide range of applicable skills that employers need.

Since July 2010, we have learned what kind of knowledge and skills our industry needs, and we enjoy evolving as a response to the wealth of input provided by site managers, safety managers, graduates working in the turbines, and other industry partners who take a personal level of responsibility in molding our program to reach new heights.

So what is it, specifically, that separates wind school graduates from job applicants who are trying to move into wind energy from other technical fields? In a word — trust.

A wind energy student must be able to trust his or her instructors to guide them to the point of not only being attractive to employers, but also being successful throughout their career. For example, as an instructor, I aim to train my students to smoothly see and follow a path to their second promotion. If I have only helped them get their foot in the door, then I have failed them.

A wind energy instructor must be able to trust that his or her students will go out and make a positive impact on our industry. The instructor must also trust them to take safety seriously, to continuously learn more about turbine reliability, and to respect the need for our employers' profitability.

At Ecotech Institute, we trust that our relationships with industry experts will net fruitful advice to us as technology advances. We cultivate these relationships to make sure they see the benefit in helping us stay on the cutting edge of wind turbine training.

Wind industry partners trust wind energy instructors to effectively train and mold their future employees to

Ecotech Institute

be the technicians that are needed on their wind farms. As students approach graduation, they transition into being an asset offered to the job market. At Ecotech Institute, we often get positive feedback in this regard as our students have multiple job offers from which to choose.

We as instructors trust industry partners to take on the responsibility of continuously training the students that they hire. We provide our industry partners with technicians who have succeeded in learning the physics, mechanics, electrical, hydraulics, schematics, and control logic of a wind turbine. Graduates are also proficient with Microsoft Office applications and can learn proprietary SCADA software quickly and efficiently as they have used SCADA simulators in the classroom. After the graduates have completed their training program and they have been hired, it is the employer's responsibility to train them on the site's specific turbine platforms. Most importantly, employers are trusted to provide the equipment and continued training needed to keep graduates safe.

There have been quite a few training programs popping up around the nation that train entry-level technicians to get their foot in the door with their first job. However, preparing students for successful careers in the wind energy industry with a wide range of options is not about stocking an impressive inventory of large components. It is crucial to have a faculty that is diverse in their wind energy experience so they can offer students the chance to a wide spectrum of career opportunities.

When prospective students are researching colleges for wind energy careers, they should inquire on the background of the instructors. While the majority of these educators' experiences are from uptower maintenance and troubleshooting, experience outside of the typical turbine technician realm is crucial. Otherwise, graduates risk suffering from tunnel vision and a general lack of how our industry works outside of those two key areas.

Wind technicians with tunnel vision often experience early burn out. Without a larger understanding of our industry, climbing turbines can seem like just a job rather than the right step in a promising career. If college program directors wish to serve the long-term needs of their students and the industry, they must hire faculty who bring this level of diversity and provide opportunities for instructors to gain additional industry training that they can then pass on to their students.

Again, I am envious of my students. The opportunities laid out before our future wind energy technicians are unlike any the industry has seen before. We trust that this growth will continue simply because market pressures support this belief. As long as wind energy remains cheaper than the fluctuating costs of coal and natural gas, as long as there is a possibility of a carbon tax looming on America's energy future, and as long as data continue to support the ever-strengthening understanding of the link between carbon dioxide and global climate change, the landscape will continue to remain wide open for wind energy to gain more of the diversified energy portfolio of our nation and world. This is not a trust based on assumptions. This is a trust based on fact and careful analysis. It is this trust that keeps wind energy technology instructors motivated to train ambitious people who are committed to a better world and can build rewarding careers in our industry.

THE IMPORTANCE OF ENCOURAGING WOMEN TO PURSUE CAREERS IN WIND ENERGY AT AN EARLY AGE

By Kristen Graf

The United States Department of Energy's Wind Vision Report suggests that we as a nation can achieve 20-percent wind-generated energy by 2030 and 35 percent by 2050. This estimated economic growth has the potential to create 600,000 additional jobs by 2050, which will require a trained and qualified workforce. Children who are currently in elementary school will be in their 40s by 2050, bringing those projected numbers to reality as they become members of the U.S. workforce. Now is the time to look toward the pipeline of potential wind workers that will be necessary to meet that coming need.

THE K-12 PIPELINE

Generation STEM, a 2012 report from the research arm of the Girl Scouts of the United States of America, suggests that there are a variety of factors that can encourage young women to pursue an education and a future career in science, technology, engineering, and math (STEM). Some of these factors include meeting role models who are involved in renewable energy and a STEM career, going to science and technology museums, and doing hands-on science activities at home at a young age.

Programs such as KidWind offer teacher trainings, curricula, and student design challenges to kids at a young age. Also, Wind for Schools is a program that helps schools get their own wind turbines on-site, creating pathways that bring wind energy to the classroom.

THE HIGHER EDUCATION AND TRAINING PIPELINE

I recently had the opportunity to speak on the Women in Sustainability panel at the annual Society of Women Engineers conference. The room was packed — standing room only — and students made up the majority of those in attendance. After the panel concluded, the lines to ask questions stretched across the room, and I heard the same story over and over again. These students were studying engineering and wanted to work in renewables and sustainability, but they weren't sure where or how to get connected to career opportunities. Regardless of the field of choice in college or vocational training programs, it is critical to begin making the connections to potential career paths, and part of that responsibility falls on the industry.

Programs like the Collegiate Wind Competition allow students to work in cross-disciplinary teams and work together on challenging problems, often with the help of experienced mentors who can help prepare them for careers in the renewable energy workforce.

Women of Wind Energy (WoWE) was founded around the Rudd Mayer Fellowship, a program that brings female students and recent graduates to the American Wind Energy Association's (AWEA) annual Windpower conference where they can gain the knowledge and contacts to successfully break into the field and thrive.

This year, in collaboration with the Wind Energy Foundation and the American Wind Energy Association, WoWE has added a new effort called the Wind at Our Backs Scholarship that also brings young women to

Women of Wind Energy

WHAT YOU CAN DO AS INDUSTRY LEADERS:

- Mentor or volunteer with a local school program or with collegiate teams where women and minority mentors serve as role models.
- Offer to have a student shadow you for a day to learn more about potential career paths.
- Donate to or sponsor fellowship and scholarship programs for women and minorities.
- Support and connect with affinity networks and groups like WoWE and the Society of Women Engineers that create community-oriented and educational opportunities to help retain and encourage women working toward careers in STEM and renewables.

the Windpower show and includes an additional $2,500 to be used toward tuition specifically for women in wind technician training programs.

THE LEADERSHIP PIPELINE

The final stage of the pipeline is one of ongoing retention, growth, and professional development. Whether transitioning from another field, changing areas within the sector, or steadily growing into new roles and capabilities, formal (i.e., graduate programs, certifications, etc.) and informal (i.e., WoWE Webinars and mentoring program) opportunities for continuing education are an important part of retaining women who have made it through from the earlier pipeline stages. While some of these efforts are for the individual member of the workforce, others can be focused on creating a culture across the wind energy industry that is standing ready and excited for all the new ideas that a diverse workforce will bring.

WIND EDUCATIONAL INSTITUTIONS IN THE U.S.

Alphabetized by State

ARIZONA

Coconino Community College
Arizona
Community College
Associate
www.coconino.edu
(800) 350-7122

Northern Arizona University
University
Arizona
Bachelor's
www.nau.edu
(928) 523-9011

CALIFORNIA

Airstreams Renewables Inc.
California
Career
Certificate
www.air-streams.com
(661) 822-3963

Santa Clara University
California
University
Master's
www.scu.edu
(408) 554-4000

College of the Desert
California
Community College
Certificate
www.collegeofthedesert.edu
(760) 346-8041

COLORADO

Colorado State University
Colorado
University
Master's; Doctorate
www.colostate.edu
(970) 491-6444

Northeastern Junior College
Colorado
Community College
Associate
www.njc.edu
(800) 626-4637

Ecotech Institute
Colorado
Career
Associate
www.ecotechinstitute.com
(877) 326-5576

Redstone College
Colorado
Career
Associate
www.redstone.edu
(877) 801-1025

Lamar Community College
Colorado
Community College
Associate
www.lamarcc.edu
(719) 336-2248

DELAWARE

University of Delaware
Delaware
Graduate
www.del.edu
(302) 831-2841

FLORIDA

Everglades University
Florida
University
Bachelor's; Master's
www.evergladesuniversity.edu
(888) 854-8308

University of Miami
Florida
University
Master's
www.miami.edu
(305) 284-2211

IDAHO

College of Southern Idaho
Idaho
Community College
Certificate; Associate
www.agriculture.csi.edu/wind
(208) 732-6403

ILLINOIS

Danville Area Community College
Illinois
Community College
Associate
www.dacc.edu
(217) 443-3222

Heartland Community College
Illinois
Community College
Associate
www.heartland.edu
(309) 268-8860

Highland Community College
Illinois
Community College
Certificate; Associate
www.highland.edu
(815) 235-6121

Illinois Valley Community College
Illinois
Community College
Certificate (Basic, Advanced)
www.ivcc.edu
(815) 224-2720

Lake Land College
Illinois
Community College
Certificate; Associate
www.lakeland.cc.il.us
(217) 234-5253

Northern Illinois University
Illinois
University
Certificate; Graduate
www.niu.edu
(815) 753-1000

Sauk Valley Community College
Illinois
Community College
Certificate
www.svcc.edu
(815) 288-5511

Eastern Illinois University
Illinois
University
Undergraduate coursework and minor
www.eiu.edu
(217) 581-5000

DeVry College
Illinois (main campus)
Bachelor's
www.devry.edu
(866) 338-7934

Elgin Community College
Illinois
Community College
Certificate
www.elgin.edu
(847) 697-1000

INDIANA

Ivy Tech Community College
Indiana
Community College
Certificate; Associate
www.ivytech.edu
(888) 489-5463

Purdue University
Indiana
University
Bachelor's
www.purdue.edu
(765) 494-4600

Indiana University
Indiana
University
Bachelor's
www.engr.iupui.edu
(317) 274-2533

University of Notre Dame
Indiana
University
Graduate; Minor
www.nd.edu
(574) 631-5000

IOWA

Des Moines Area Community College
Iowa
Community College
Associate
www.windenergy.dmacc.edu
(877) 863-6222

Iowa Lakes Community College
Iowa
Community College
Diploma; Associate
www.iowalakes.edu
(800) 521-5054

Kirkwood Community College
Iowa
Community College
Associate
www.kirkwood.edu
(319) 887-3658

Northeast Iowa Community College
Iowa
Community College
Diploma; Associate
www.nicc.edu
(800) 728-2256

Vatterott College
Iowa
Community College
Certificate
www.vatterott.edu
(888) 202-2636

Western Iowa Tech Community College
Iowa
Community College
Associate
www.witcc.edu
(800) 352-4649

Iowa State University
Iowa
University
Doctorate; Undergraduate minor; Research
www.engineering.iastate.edu
(515) 294-5933

Iowa Western Community College
Iowa
Community College
Associate; Certificate
www.iwcc.edu
(800) 432-5852

KANSAS

Cloud County Community College
Kansas
Community College
Certificate; Associate
www.cloud.edu
(800) 729-5101

MAINE

Northern Maine
Community College
Maine
Community College
Certificate; Associate
www.nmcc.edu
(207) 768-2700

MASSACHUSETTS

University of Massachusetts-Amherst/Wind Energy Center
Massachusetts
University
MS; Research
www.umass.edu/windenergy
(413) 545-4359

Western New England University
Massachussettes
University
Undergraduate (Concentration)
www.wne.edu
(800) 325-1122

MICHIGAN

Delta College
Michigan
Community College
Associate
www.delta.edu
(989) 686-9000

Kalamazoo Valley Community College
Michigan
Community College
Certificate
www.grovescenter.kvcc.edu
(269) 353-1253

Saginaw Valley State University
Michigan
University
Undergraduate minor
www.svsu.edu
(989) 964-4000

Grand Rapids Community College
Michigan
Community College
Certificate
www.cmsold.grcc.edu
(616) 234-4722

Lansing Community College
Michigan
Community College
Associate
www.lcc.edu
(800) 644-4522

MINNESOTA

Minnesota West Community and Technical College
Minnesota
Community College
Associate
www.mnwest.edu
(800) 658-2330

Riverland Community College
Minnesota
Community College
Diploma
www.riverland.edu
(800) 247-5039

MISSOURI

Crowder College
Missouri
Community College
Certificate; Associate
www.crowder.edu
(417) 451-3223

Pinnacle Career Institute
Missouri
Career
Short course; Certificate; Associate (Online)
www.pcitraining.edu
(877) 241-3097

MONTANA

Montana State University
Montana
University
Certificate; Doctoral; Master's
www.montana.edu
(406) 994-0211

Montana Tech
Montana
University
Certificate; Associate
www.mtech.edu
(800) 445-8324

NEBRASKA

Northeast Community College
Nebraska
Community College
Diploma; Associate
www.northeast.edu
(800) 348-9033

Western Nebraska
Community College
Nebraska
Community College
Certificate
www.wncc.net
(308) 254-5450

Southeast Community College
Nebraska
Community College
Associate (AAS)
www.southeast.edu
(402) 761-2131

NEW MEXICO

Clovis Community College
New Mexico
Community College
Certificate; Associate
www.clovis.edu
(575) 769-4904

Mesalands Community College
New Mexico
Community College
Certificate; Associate
www.mesalands.edu
(575) 461-4413

NEW YORK

Clinton Community College
New York
Community College
Associate
www.clinton.edu
(518) 562-4200

Hudon Valley Community College
New York
Community College
Certificate
www.hvcc.edu
(877) 325-4822

Hudson Valley Community College
New York
Community College
Certificate
www.hvcc.edu
(518) 629-4822

Excelsior College
New York
University
Bachelor's
www.excelsior.edu
(888) 647-2388

NORTH CAROLINA

Appalachian State University
North Carolina
University
MS; Undergraduate minor
www.wind.appstate.edu
(828) 262-7333

Central Piedmont Community College
North Carolina
Community College
Associate; Certificate; Diploma
www.cpcc.edu
(704) 330-2722

NORTH DAKOTA

Bismarck State College
North Dakota
Community College
Certificate; Associate
www.energy.bismarckstate.edu
(800) 852-5685

Lake Region State College
North Dakota
Community College
Certificate; Associate
www.lrsc.edu
(701) 662-1519

OHIO

Lorain County Community College
Ohio
Community College
Certificate; Associate
www.loraincccc.edu
(800) 995-5222

Ohio State University
Ohio
University
Associate
www.osu.edu
(614) 292-6446

Stark State College
Ohio
Career
Certificate
www.starkstate.edu
(330) 494-6170

University of Dayton
Ohio
University
Master's
www.udayton.edu
(937) 229-1000

OKLAHOMA

Canadian Valley Technology Center
Oklahoma
Career
Certificate
www.cvtech.edu
(405) 262-2629

High Plains Technology Center
Oklahoma
Career
Certificate
www.hptc.edu
(580) 571-6167

Oklahoma State University – Oklahoma City
Oklahoma
University
Certificate; Associate
www.osuokc.edu/wind
(800) 560-4099

University of Oklahoma
Oklahoma
University
Associate; Certificate
www.osuokc.edu
(405) 947-4421

OREGON

Columbia Gorge
Community College
Oregon
Community College
Certificate; Associate
www.cgcc.cc.or.us
(541) 506-6011

Clackamas Community College
Oregon
Community College
Associate; Certificate
www.clackamas.edu
(503) 594-6000

PENNSYLVANIA

Penn State
Pennsylvania
University
MPS (Online)
www.wind.psu.edu
(814) 865-2569

SOUTH CAROLINA

Clemson University
South Carolina
University
Certificate
www.clemson.edu
(864) 656-3311

SOUTH DAKOTA

Mitchell Technical Institute
South Dakota
Community College
Associate
www.mitchelltech.edu
(800) 684-1969

TEXAS

Amarillo College
Texas
Community College
Certificate (Basic, Advanced); Associate
www.actx.edu/wind
(806) 371-5000

Clarendon College
Texas
Community College
Certificate (Level I, Level II); Associate
www.clarendoncollege.edu
(800) 687-9737

South Plains College
Texas
Community College
Associate
www.southplainscollege.edu
(806) 894-9611

Texas A&M University
Texas
University
Certificate; Master's
www.tamu.edu
(979) 458-1644

Texas Christian University
Texas
University
Bachelor's; Master's
www.tcu.edu
(817) 257-7000

Texas State Technical College (Harlingen)
Texas
Community College
Certificate (I, II); Associate
www.tstc.edu/harlingenwindtech
(800) 852-8784

Texas State Technical College (West Texas)
Texas
Community College
Certificate (I, II); Associate
www.tstc.edu/westtexaswet
(325) 235-7300

Texas Tech University/National Wind Institute
Texas
University
Certificate; Bachelor's; Doctorate
www.depts.ttu.edu/nwi
(806) 742-3476

West Texas A&M University
Texas
University
Certificate; Bachelor's
www.wtamu.edu
(806) 651-0000

MIAT College of Technology
Texas
Career
Certificate
www.miat.edu
(888) 547-7047

Houston Community College
Texas
Community College
Certificate
www.hccs.edu
(713) 718-2000

Howard College
Texas
Community College
Certificate
www.howardcollege.edu
(432) 264-5061

VIRGINIA

Dabney S. Lancaster Community College
Virginia
Community College
Certificate
www.dslcc.edu
(540) 863-2800

University of Virginia
Virginia
University
Graduate
www.virginia.edu
(434) 924-0311

Virginia Polytechnic Institute and State University
Virginia
Undergraduate
www.vt.edu
(540) 231-6000

WASHINGTON

Walla Walla Community College
Washington
Community College
Associate
www.wwcc.edu
(509) 522-2500

WASHINGTON, D.C.

The Catholic University of America
Washington, D.C.
University
Bachelor's
www.cua.edu
(202) 319-5000

WEST VIRGINIA

Eastern West Virginia Community and Technical College
West Virginia
Community College
Certificate; Associate
www.easternwv.edu
(877) 982-2322

WISCONSIN

Lakeshore Technical College
Wisconsin
Community College
Associate
www.gotoltc.edu
(888) 468-6582

Madison Area Technical College
Wisconsin
Community College
Certificate
www.madisoncollege.edu
(800) 322-6282

Northeast Wisconsin Technical College
Wisconsin
Community College
Associate
www.nwtc.edu
(800) 422-6982

Herzing University
Wisconsin
University
Certificate
www.herzing.edu
(800) 596-0724

WYOMING

Casper College
Wyoming
Community College
Certificate; Associate
www.caspercollege.edu
(800) 422-2963

Laramie County Community College
Wyoming
Community College
Associate
www.lccc.wy.edu
(800) 522-2993

If you would like an educational institution added to this list, email the school's name and information to editor@windsystemsmag.com.

CONVERSATION

Jared Bezet

Quality Enhancement Plan Director and
Interim Director of Institutional Effectiveness
Everglades University

(888) 854-8308
www.evergladesuniversity.edu
/EvergladesUniversity
Everglades University

Please give us some background on the university, including when it was founded and how it moved into the wind energy sector.

Everglades University was originally founded as American Flyers College in 1997. In 2000, the institution began offering bachelor's degrees with majors in business administration, information technology, applied management, aviation management, and professional aviation. In 2003, Everglades College began to offer master's degrees and changed its name to Everglades University. To better serve the community, Everglades University began offering the Bachelor of Science Degree with a major in Construction Management in 2005 and was regionally accredited by the Southern Association of Colleges and Schools Commission on Colleges in 2010. Continuing its commitment to offering innovative and forward-thinking programs, Everglades University responded to the growing need for alternative energies and capable graduates educated in managing those newly developing energy sources by building on the success of its construction management program and offering the Bachelor of Science Degree with a major in Alternative and Renewable Energy Management in 2011. This program contains many courses focused on a wide variety of alternative energy sources, including hydrogen, propane and natural gas, solar energy and photovoltaics, nuclear energy, hydroelectric, biomass, geothermal, and, of course, wind energy.

Tell us about the undergraduate curriculum in alternative and renewable energy management.

Everglades University's bachelor's degree with a major in alternative and renewable energy management focuses on the management skills and business knowledge required for the continually changing environment of the energy industry. The degree provides instruction in management skills and specific technical and occupational subjects, preparing graduates for a productive career in the alternative and renewable energy industry as managers. Emphasis is placed on alternative energy principles, regulations, and business and management operations with a broad-based knowledge of the sustainable energies industry built on a foundation of general education requirements as well as business and management applications.

What is the university's mission to its students who are pursuing degrees related to the wind energy industry?

Everglades University's mission is to provide quality education to adult learners of diverse backgrounds in a collaborative environment where each individual has the opportunity to achieve personal growth. The university seeks to accomplish this by combining small class sizes and innovative programs with traditional academic values. The university supports the academic endeavor and service to deliver graduate and undergraduate programs both on campus and online.

The Bachelor of Science in Alternative and Renewable Energy Management displays Everglades University's commitment to innovative programs by providing a foundation in general education as well as a solid background in business and management courses.

> Employment opportunities are endless for the graduate and include positions within a wide range of industries in both the private and public sectors.

What is the instructional philosophy behind Everglades University's focus in wind?

Everglades University aims to provide educational opportunities to the career-minded individual and offer an education that will produce an employable and skilled graduate. The university's philosophy is that learning takes place in a variety of ways, so it privileges flexibility, individualization, and previous knowledge and skills. Because of the growing market share of alternative energies, Everglades University's Bachelor of Science in Alternative and Renewable Energy Management program provides graduates the opportunities they need to become professionals in their chosen fields and play a critical role in the future economic growth and competitiveness of our society. By including wind energy as part of the curriculum of its alternative and renewable energy management program, the university leverages its view that instruction is a dynamic process that develops both the skill and the intellect of career-minded individuals interested in working in this burgeoning field.

What kinds of opportunities can students take advantage of beyond traditional classroom instruction at Everglades University?

Students in the Alternative and Renewable Energy degree program are welcome to network with the university's Program Advisory Committee, which comprises local industry professionals who actively work in the field.

Students are also welcome to visit Everglades University's Sarasota campus, which features a number of energy-saving devices, including a wind turbine and a variety of solar technologies, on and around the campus thanks in part to funding from Florida Power and Light (FPL). Students are encouraged to use these resources to research the efficiency and reliability of different technologies, exposing them to careers in renewable energy.

Everglades University recently entered a partnership with Pearson Learning and the U.S. Green Building Council (USGBC) to become a USGBC education partner, by which the university will include courses that provide students opportunities for pathways to LEED (Leadership in Energy and Environmental Design) certifications.

Tell us about the career opportunities available to students in the wind energy industry after graduation.

Graduates of Everglades University Bachelor of Science Degree in Alternative and Renewable Energy Management are prepared for an entry-level career in a wide range of renewable and sustainable industries including wind energy. Graduates may be interested in the role as project managers for the construction of wind energy projects from small-scale residential and commercial to large-scale industrial sites. Employment opportunities are endless for the graduate and include positions within a wide range of industries in both the private and public sectors.

What sets graduates from Everglades University apart from other wind energy professionals in the field?

Everglades University's Bachelor of Science Degree in Alternative and Renewable Energy Management provides more than just technical training on limited tasks in the wind energy sector. The degree delivers a broad survey of a variety of sustainable and renewable alternative energy models and focuses on providing the business acumen and managerial skills that graduates will need to advance in their careers and make a difference in the world. Everglades University not only prepares graduates to get jobs, but it also encourages them to become managers and leaders in their chosen fields.

Everglades University's commitment to a personalized education results in an innovative scheduling system designed to be more convenient for working professionals. Students take one course at a time so they can focus on fulfilling the learning objectives of each class before moving on to the next. Each class is personalized with comprehensive knowledge delivered throughout the four weeks, allowing students to complete the entire bachelor's degree program in less than four years. All of Everglades University's degree programs can be taken 100-percent online with no residency requirement. All Everglades University students have access to its extensive library resources and databases online at any hour of the day or night and any day of the year.

VAISALA SUPPLIES DATA TO ENDURANCE FOR WIND HEDGE TRANSACTION

Vaisala, a global leader in environmental and industrial measurement, is providing the long-term wind measurement data required by Endurance Specialty Holdings Ltd., a provider of property and casualty insurance and reinsurance, to complete a multi-year wind hedging transaction with Meridian Energy Australia, a leading Australian electricity supplier. The contract provides financial protection against the risk of low annual earnings from price and volume variability at Meridian's Mount Millar wind farm in South Australia.

ALSO IN THIS SECTION

Securing a power purchase agreement (PPA) at a reasonable price is becoming a greater challenge for wind projects around the world. In some markets, this is due to the rapid growth of wind power and fierce competition driving down PPA prices. In others, it is the result of reduced or disappearing subsidies creating extremely thin margins for wind projects. Regardless of the cause, more wind projects are now operating on a merchant basis and using wind hedging contracts to better weather the ups and downs of volatile spot markets.

Through its customized WindLock product, Endurance Global Weather offers this type of risk protection for companies needing to manage the wind variability of operating assets as well as assets in development. However, pricing and structuring these transactions requires access to reliable long-term climate analysis. With an industry-leading approach using advanced weather models to predict wind power production over long-term climatological windows, Vaisala was selected by Endurance to report and quality-control data for the WindLock transaction with Meridian.

"This transaction is noteworthy given the site-specific settlement data provided by Vaisala and the relatively long contract duration," said Martin Malinow, Endurance Global Weather's president. "Endurance Global Weather has a successful track record of pioneering tailored solutions for its global client base and was delighted to work with Meridian to execute this WindLock transaction. We know from working with our wind clients that effective risk management can facilitate project finance by securing advantageous terms for debt and equity while potentially allowing developers to allocate their equity across a greater diversity of projects. There is also a benefit to the counterparties to power purchase agreements in passing the financial risk of volumetric uncertainty to weather-diverse third parties like Endurance Global Weather."

According to Pascal Storck, Vaisala's global manager of energy services, Vaisala is "excited to play such a key role in this ground-breaking transaction. By providing accurate wind measurements at Mount Millar, where there is no public weather station at the relevant hub height, [Vaisala is] able to reduce potential basis risk for Meridian."

— Source: Vaisala

For more information, go to www.vaisala.com.

WIND PROSPECT AND NABLA WIND POWER SERVICE LAUNCHED TO EXTEND WIND FARM PROJECT LIFE

In response to the changing renewable energy market in the U.K. and the move toward significantly reduced and zero subsidies for onshore wind projects, Wind Prospect, a leading independent consultancy, has developed a package of measures to extend the typical 20-year life expectancy for a wind project. Wind Prospect will work in collaboration with Nabla Wind Power, an independent wind engineering service provider that specializes in predicting site-specific component life, and a wind farm certification body to accredit the service.

"With more than 20 years' expertise in all aspects of wind, offshore wind, and solar farm design, permitting, construction, operation, and commercialization, Wind Prospect's multi-disciplinary teams have unsurpassed practical experience and are renowned for providing the detailed technical advice that helps clients to deliver projects," said Robert Speht, Wind Prospect's advisory services general manager. "We have harnessed these skills to introduce a series of measures to advise and support those in the market who are currently reviewing their assets and looking for ways in which to maximize their investment."

According to Speht, Wind Prospect believes that where wind projects have traditionally been based on a standard 20-year lifespan, existing and future projects now need to be engineered for a 40-year lifespan.

"This raises an interesting question about what owners and operators need to do to extend the lifespan of their project," Speht said. "We can answer this question and help our clients take the next step from a high level review of each project to the practical steps of implementing the engineering solutions. Furthermore, by extending the project design life cycle, we could see the levelized cost of electricity being brought down significantly. In the U.K., where the government has withdrawn subsidies, this is incredibly valuable."

As part of the launch of this new service, Wind Prospect and Nabla Wind Power have compiled a free guide that can be downloaded from Wind Prospect's website. The guide sets out the benefits of extending a wind farm design life and how to make it feasible. It provides invaluable advice on permitting, land rights, wind turbine OEM, components, balance of plant, O&M strategy, siting inspection strategies, grids, power purchase agreements, tariffs, and certifications.

"The combination of our skills will bring to owners and operators the best information to support decision-making by identifying the optimal financial life extension potential for our clients' assets, how to achieve it, and the plan for making it possible, leading to the protection and maximization of the asset value of your wind farm," said Ruben Ruiz de Gordejuela, CTO of Nabla Wind Power.

— Source: Wind Prospect

For more information, go to www.windprospect.com.

Snap-on® GIVEAWAY

Drawing
Every Day
at 11 a.m.

Attending WINDPOWER 2016 from May 23 to May 26 in New Orleans? Stop by the *Wind Systems* magazine booth (#3013) to register to win a Snap-On Toolbox. Drawings will be held at the booth on Tuesday, Wednesday, and Thursday at 11:00 a.m.

BE SURE TO REGISTER EARLY!

Giving Wind Direction
WIND SYSTEMS

INNOVATION

Research & Development • Design & Engineering • Forecasting & Analysis
Consultancy • Certification & Standards • Efficiency • Emerging Technologies

UMASS AMHERST ENGINEERS DEVELOPING MULTI-LINE ANCHOR SYSTEM FOR FLOATING OFFSHORE WIND TURBINES

A team of researchers that includes two engineers from the University of Massachusetts (UMass) Amherst is developing a new mooring system for floating offshore wind turbines that uses an integrated network of anchors and lines to hold dozens or even hundreds of turbines in place in the ocean in industrial-scale, offshore wind farms.

Civil and environmental engineers Sanjay R. Arwade and Don J. DeGroot from UMass Amherst, along with Charles P. Aubeny from Texas A&M University and Melissa Landon of the University of Maine, are conducting the research with a three-year, $497,341 grant from the National Science Foundation (NSF). The funding comes jointly from the NSF's Grant Opportunities for Academic Liaison with Industry (GOALI) and geotechnical engineering programs.

The research team is working with Vryhof Anchors, an international industrial partner that is a world leader in producing offshore anchoring systems, including the one used by the world's first floating offshore wind turbine in Norway.

The University of Maine-led New England Aqua Ventus I is one example of an operational offshore floating wind project.

This industrial collaboration is particularly important to the success of the project since Vryhof can assist Arwade and DeGroot with assessments of the complex installation, staging, and cost-estimating aspects of the project. Vryhof will also help guide the research in directions that will be directly applicable to the needs of the wind industry.

The principal goal of the research is to develop offshore floating wind farms where the individual floating wind turbines are moored using a networked series of anchors and cables that hold the entire wind farm in place. Currently, each floating wind turbine has its own individual anchoring system. The proposed networked system would save money and require fewer anchors and geotechnical site investigations, according to the researchers.

ALSO IN THIS SECTION

In order to accomplish this goal, the researchers will have to evaluate the feasibility and design implications of highly variable soil conditions on the ocean floor for securing the anchors, the layout of the wind farms, and the complicated dynamics that cause loads on the anchors. The scientists will also develop wind and wave models for the best placement and orientation of the wind farms.

"This project is an exciting opportunity to bring together structural dynamics and geotechnical engineering in new ways to support national renewable energy goals by potentially lowering capital costs associated with offshore wind development," Arwade said.

The team is also looking at the best designs for the mooring lines and the connections between the floating wind turbine and the anchors, according to Arwade. They will also develop three-dimensional models for measuring the behavior of the anchors on the seafloor and the best designs for the multiple cables attached to each anchor.

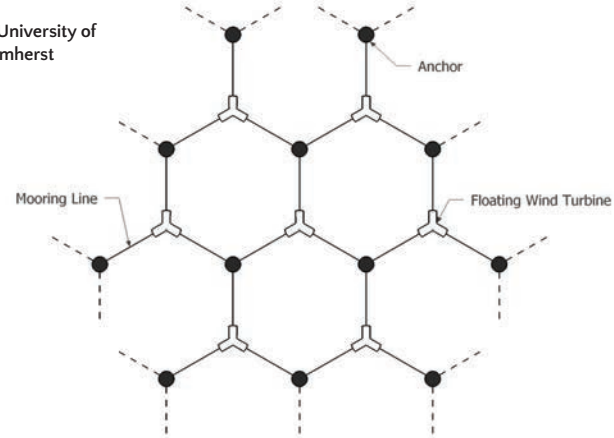
"At each level — at the floating structure and at the anchor — there are challenging, nonlinear, dynamic issues that force this research to work at the cutting edge of geotechnical engineering and offshore structural engineering," Arwade said. "For that reason, it also provides a perfect opportunity to educate the next generation of researchers in the area of offshore wind energy and supports a doctoral student toward that end."

It is expected that this project may hasten progress toward the goal of generating 20 percent of U.S. energy needs from wind power by potentially reducing the cost of building offshore wind farms by a significant margin.

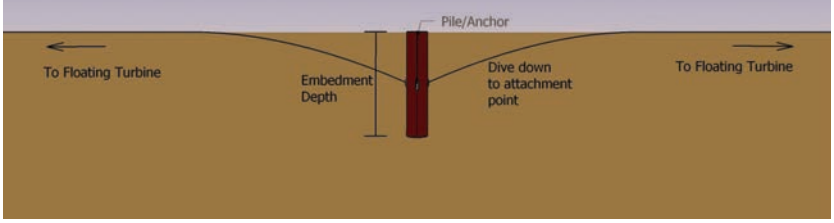
— Source: University of Massachusetts Amherst

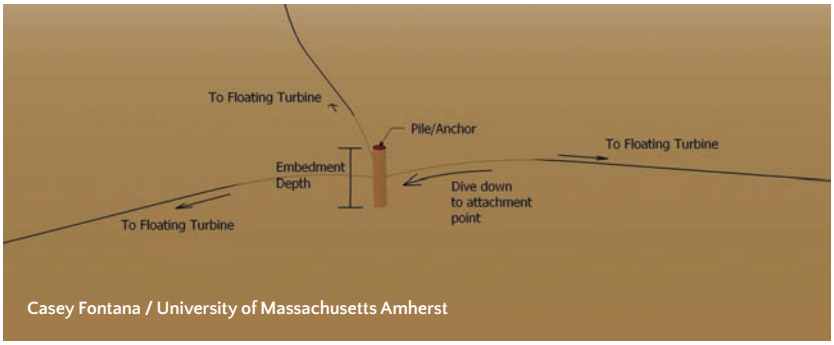
For more information, go to www.umass.edu.

Casey Fontana / University of Massachusetts Amherst



Casey Fontana / University of Massachusetts Amherst





Casey Fontana / University of Massachusetts Amherst

SENTIENT SCIENCE CHOSEN FOR COMPUTATIONAL GEARBOX TESTING OF 8-MW OFFSHORE WIND TURBINE

Sentient Science recently announced that it has signed an agreement with Adwen, a leading offshore wind turbine manufacturer, to validate the drivetrain for its next generation turbine of 8-MW-rated power, which has the largest annual energy production (AEP) on the market with the highest nominal torque drivetrain and largest rotor.

Under the terms of the agreement, Sentient Science's DigitalClone computational testing software will be used to further validate the Adwen 8-MW platform's drivetrain design and standards.

"Confidence in 20- to 30-year rotating equipment life is our crucial objective," said Ward Thomas, CEO and president of Sentient Science. "The world's largest equipment operators, gearbox and bearing manufacturers, and lubrication suppliers are turning to Sentient to confirm that their products will lower the cost of energy by 1 cent per kWh on land and 5 cents per kWh offshore. Sentient is proud to help confirm and validate the system under design and to make sure that Adwen has the world's most tested drivetrain before our friends at Fraunhofer begin their physical testing."

DigitalClone is designed to provide an exhaustive and comprehensive validation strategy in which thousands of gearbox validation test points are computationally created within weeks for a fraction of the cost of physical testing. This allows massive amounts of testing points and insights to be evaluated before physical testing begins.

"A front-end to our physical testing process with the newest computational test technology matches with our rigorous test and validation process, always with the final aim of increasing the reliability of the turbine," said Maite Basurto, CTO of Adwen. "Using Sentient's DigitalClone is a first step in our extensive validation program. It will contribute to having a faster certification process and, finally, a more reliable turbine available in serial production in 2018."

The United States National Renewable Energy Lab (NREL) and Department of Energy (DoE) has invested more than $25 million in DigitalClone to make it as accurate


Sentient Science

as physical testing. Today, one in every 10 land-based wind turbines are contracted to use DigitalClone for life prediction and life extension and 30-year risk and failure analysis.

— Source: Sentient Science

For more information,
go to www.sentientscience.com.

LEVENMOUTH TURBINE OFFERS UNRIVALLED OPPORTUNITY FOR RENEWABLE ENERGY R&D

Offshore Renewable Energy (ORE) Catapult recently unveiled its 7-MW demonstration offshore wind turbine in Levenmouth, Scotland, underlining the vital role that the United Kingdom plays in research, technology, and skills development at the heart of the global renewable energy industry.

The Levenmouth Demonstration Turbine was acquired by ORE Catapult from Samsung Heavy Industries in December 2015 and is the world's most advanced open-access offshore wind turbine dedicated to research. It offers complementary opportunities for economic growth, training, and the development of skills that


ORE Catapult / Matthew Kelly

are vital for the future of the offshore wind industry.

The turbine offers an unrivalled opportunity to develop a deeper understanding of a wide range of technologies as well as the operations and maintenance aspects of offshore wind turbines with the ultimate goal of reducing the cost of energy. ORE Catapult is working closely with key academic and industry stakeholders to align the research program of the Levenmouth Demonstration Turbine with industry priorities to drive down the costs associated with offshore wind energy development.

ORE Catapult is also working with local partners, including Fife Council, Fife College, Levenmouth Academy, Skills Development Scotland, and the Energy Skills Partnership, to develop and deliver educational and training programs that will both support local young adults to move on to higher education and develop a unique curriculum to ensure that training programs deliver employment-focused, in-demand skills to local people.

"Scotland's research and development in renewables is unrivalled and the Levenmouth Demonstration Turbine adds to Scotland's extensive portfolio of test facilities," said Fergus Ewing, the Scottish government minister for business, energy, and tourism. "ORE Catapult will work with the offshore wind sector, Skills Development Scotland, and the Energy Skills Partnership to ensure the knowledge is transferred to the industry to help it develop our offshore wind resources."

Fergus Ewing MSP accessing an offshore wind turbine through next-generation virtual reality technology developed by Heriot Watt University in association with Energy Skills Partnership.

"The Levenmouth Demonstration Turbine will play a major part in the development of future technologies to lower the cost of offshore wind," said Andrew Jamieson, chief executive of ORE Catapult. "It offers opportunities for the U.K. supply chain and technology developments, and it is vital that the turbine also plays a role in locally developing and supporting the next generation of Scottish engineers, who will ensure that Fife enjoys a bright future thanks to renewable energy."

According to William Leithead, the chair of the EPSRC Supergen Wind Hub and director of the EPSRC Doctoral Training Centre for Wind and Marine Energy Systems, the Levenmouth turbine is a game-changer for the U.K. academic community.

"Until now, we've lagged behind other European nations in not having open access to a full-scale turbine that can be used to back up new research outputs and technologies," Leithead said. "Access to the Levenmouth Demonstration Turbine will make it possible to position the Scottish and a wider U.K. academic research community right at the heart of European wind research, funding opportunities, and technology development."

— Source: ORE Catapult

For more information, go to ore.catapult.org.uk.

ADWEN'S AD 5-135 FIRST TURBINE TO OBTAIN DNV GL TYPE CERTIFICATE

Adwen's AD 5-135 turbine has obtained the first type certificate based on the "Guideline for the Certification of Offshore Wind Turbines, Edition 2012" issued by DNV GL. This new guideline updates the previous version from 2005 to fully comply with the GL's "Guideline for Onshore Wind Turbines, Edition 2010" and to cover IEC 61400, parts 1 and 3.

The new guideline contains a type certification process specifically developed for offshore wind turbines. It takes into account the important increase on the average size

of turbines experienced from 2005 as well as the use of advanced, intelligent control systems to mitigate loads. Furthermore, the machinery and electrical design requirements are improved to be state-of-the-art.

The AD 5-135 is an evolution of the AD 5-116 that was first certified in March 2015 according to this guideline and has been updated to cope with the specific configuration required for Wikinger offshore wind farm, Iberdrola's 350-MW project in the Baltic Sea. Among the new features are the 25-year operating lifetime and the grid loss system — a new system that allows energy production for self-consumption in case of temporary loss of grid connection.

"We are pleased to issue the first type certificate according to GL 2012 to Adwen for their AD 5-135 turbine," said Mike Wöbbeking, head of the certification body at DNV GL-Energy. "As the development of modern offshore wind turbines is rapidly progressing, the guideline GL 2012 is taking all the latest safety and reliability requirements into account, including updated qualifications for load, mechanical engineering, and safety engineering."

— Source: Adwen

For more information, go to www.adwenoffshore.com.


Adwen

GE IS BUILDING AMERICA'S FIRST OFFSHORE WIND FARM

New wind farms added more than a quarter of total new power generation capacity in the United States between 2010 and 2014, reaching 75,000 MW at the end of last year. With the exception of China, no other country has more.

However, despite America's abundance of coastline, its wind farms spin exclusively on shore. But that's about the change. America's largest wind turbine manufacturer, General Electric (GE), just finished the installation of the platforms that will support the first offshore wind farm in the United States. The wind farm, built by Deepwater Wind and located 3 miles off the coast of Block Island, Rhode Island, is scheduled to come online at the end of 2016 and generate 125,000 MWh of electricity. That's enough to meet 90 percent of Block Island's power needs.

GE recently celebrated the milestone at a plant in the Port of Providence in Rhode Island where it will assemble the towers for the wind turbines. Rhode Island Governor Gina Raimondo, Deepwater CEO Jeffrey Grybowski, and Anders Soe-Jensen, CEO of GE Renewable Energy's Offshore Wind Activity, were present.

But a lot of the action is already taking place on the other side of the Atlantic. The wind farm will use five huge Haliade wind turbines, which GE acquired with Alstom last fall and manufactures inside a new plant at the mouth of the Loire River in Saint-Nazaire, France. Each Haliade can generate 6 MW, enough to power 5,000 American homes and save 21,000 tons of CO2 during the turbine's life cycle. The turbine has a 150-meter diameter rotor that sweeps over an area large enough to fit nearly two Airbus A380 double-decker passenger jets.

The Saint-Nazaire factory opened in 2014 and currently employs 170 people. Besides the Haliades, it also manufactures turbine nacelles — the casings that shelter the power generation equipment on top of the tower — and generators.

An offshore wind farm with a Haliade wind turbine in the North Sea.

Parts of a Haliade rotor are heading out to sea in Europe.

The first Haliade produced by GE recently left the factory for Denmark where it will be installed on the Osterild site operated by the utility EDF Énergies Nouvelles (EDF EN). The utility will use 238 GE offshore wind turbines for its three French wind fields in Saint-Nazaire, Courseulles-sur-Mer, and Fécamp.

Workers in Saint-Nazaire will also make the five Haliades for the Block Island wind farm in the U.S., as well as 66 Haliades for Merkur Offshore, a large offshore wind project in Germany.

GE is also offering wind farm operators access to the GE Store, which allows the company to quickly share knowledge, technology, and innovation across its businesses. Deepwater Wind, for example, is pursuing battery storage from Current, a startup powered by GE, for its proposed 90-MW, 15-turbine Deepwater ONE – South Fork project for Long Island, New York. The battery solution will stabilize the grid and maximize utilization of the energy provided by the offshore wind turbines.

Batteries solve one of the key challenges currently facing renewable energy producers. It allows them to store excess power generated when it's windy and release it during peak demand.

"This solution will help the South Fork meet its energy needs in an affordable and sustainable way," said Pratima Rangarajan, general manager of storage for Current.

Power transmission from the sea on shore presents another hurdle. That's where GE's Energy Connections business comes in. Connecting offshore wind farms to the grid requires the installation of an offshore electrical substation. The unit's high voltage direct current (HVDC) lines can efficiently transmit power over long distances of 50 km or more.

The 900-MW DolWin3 HVDC project in the German North Sea is a great example. As part of this project, GE recently installed a pair of advanced transformers manufactured in Mönchengladbach, Germany, for use in the onshore substation. Each transformer, equipped with a tap changer, allows the operators to level out voltage fluctuations and keep power flowing even if one transformer goes off-line.

The Haliade generator at GE's factory in Saint-Nazaire, France.

— *Source: GE Reports*

For more information, go to www.gereports.com.

CONSTRUCTION

BOP/EPC • Project Status • Siting • Equipment • Project Due Diligence • Services

XCEL ENERGY BOOSTS EASTERN PANHANDLE POWER GRID

Xcel Energy completed a major high-voltage transmission project in Gray and Wheeler counties in the eastern Texas Panhandle that will help sustain industrial development and will position the regional economy for continued growth as electricity demand increases.

The company energized a new 115-kilovolt, 38-mile transmission line between the Bowers Substation near Lefors in Gray County and the

ALSO IN THIS SECTION

Howard Substation in the city of Wheeler in Wheeler County. The $39 million project also includes significant upgrades at both the Bowers and Howard substations to accommodate the new line.

"The demands on the transmission network have grown over the past decade with increased oil and gas drilling and the ensuing growth in industries that add value to these raw materials," said Donnie TeBeest, Xcel Energy project manager. "Without the new line, it would have been a challenge to regulate the flow of power in that area while meeting the growing needs for electricity."

The new line was envisioned six years ago when the Southwest Power Pool identified possible bottlenecks and voltage issues in the eastern Panhandle, which had not seen significant upgrades in power infrastructure in decades. Xcel Energy took on the project as part of its Power for the Plains transmission enhancement initiative and started planning the project in 2012.

"The Bowers-to-Howard project is one of dozens of high-value improvements we have completed in recent years," said David Hudson, president of Southwestern Public Service Company, an Xcel Energy company. "We're pleased to be partners with regional industries as we make a lasting contribution to job opportunities and economic development for decades to come."

Since July 2014, Xcel Energy has invested $1 billion in new power lines, substations, and upgrading power-generating facilities across its Texas-New Mexico service area. Through 2020, that number is expected to exceed $3 billion in improvements.

According to Xcel Energy, the Power for the Plains initiative is not only improving the reliability and capacity of the region's high-voltage transmission network, but also is providing opportunities to tap cheaper sources of power. New transmission connections to the east are saving approximately $60 million annually in purchased power costs. Additionally, the improvements are providing pathways to move wind and solar power generated in this region to new markets. Xcel Energy has added 750 MW of additional wind energy capacity to its regional energy mix since 2015.

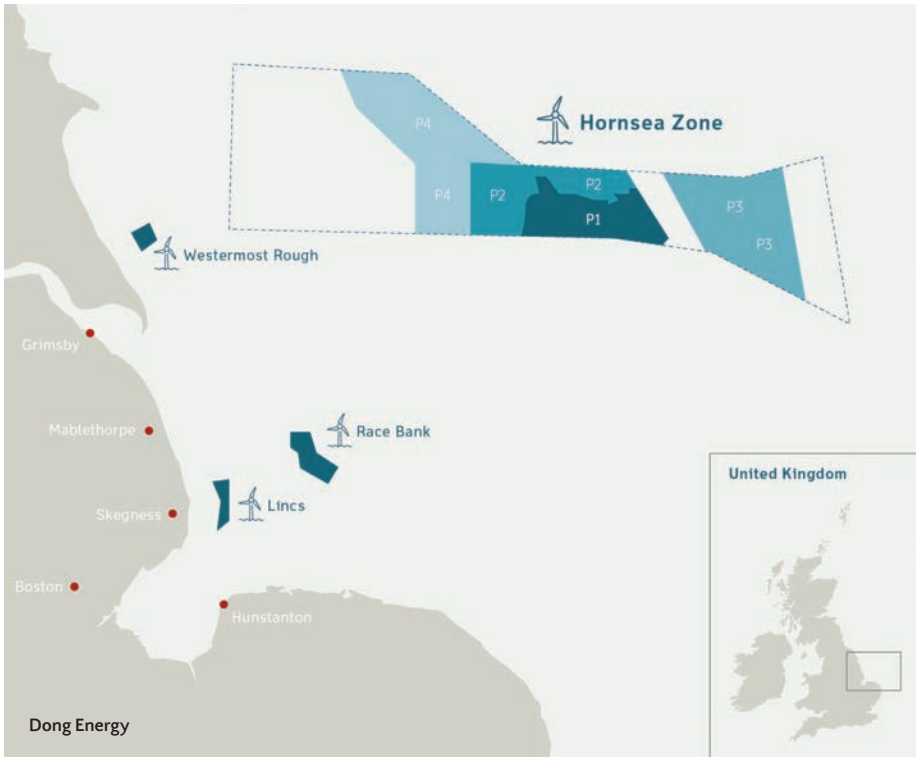
— Source: Xcel Energy

For more information,
go to www.powerfortheplains.com.

DONG ENERGY REACHES AGREEMENT WITH THE CROWN ESTATE FOR HORNSEA ZONE

Dong Energy has reached an agreement with the Crown Estate, an independent commercial business created by the an Act of Parliament in the United Kingdom, to reconfigure the Hornsea zone as part of the company's Round 3 offshore wind development zones.

Following Dong Energy's acquisition of the remainder of the Hornsea zone from Mainstream Renewable Power and Siemens Financial Services in 2015, Dong Energy has concluded its zone appraisal process, which resulted in project-specific agreements for lease being agreed on for three projects: Hornsea Project Two, Hornsea Project Three, and Hornsea Project Four.



The previously identified Hornsea Project Three has been split into two separate projects — Hornsea Project Three to the east of Hornsea Project Two and Hornsea Project Four to the west of Hornsea Project Two.

This follows Dong Energy's recent announcement that it will build the 1.2-GW Hornsea Project One, which is expected to be capable of powering well over 1 million U.K. homes.

"We are pleased to have reached this agreement with the Crown Estate for the Hornsea projects, which highlights once again our absolute commitment to the U.K. offshore wind market," said Brent Cheshire, Dong Energy's U.K. country chairman. "Having just confirmed that we are building Hornsea Project One — the world's biggest offshore wind farm — we see these projects as a vital part of our post-2020 pipeline."

Hornsea Project Two has been identified as having a capacity of up to 1.8 GW. A planning consent decision for Hornsea Project Two is expected to take place later this year.

Hornsea Project Three, which will shortly be taken forward to external consultation, is estimated to have the potential for 1-2 GW capacity. Hornsea Project Four could add around a further 1 GW.

— Source: Dong Energy

For more information, go to www.dongenergy.com.

BLM ISSUES ENVIRONMENTAL ASSESSMENT FOR PHASE I WIND TURBINE DEVELOPMENT FOR CCSM PROJECT

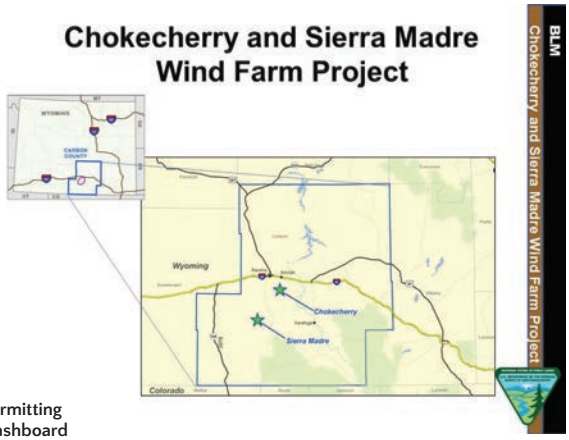
The Bureau of Land Management's (BLM) Rawlins Field Office has released the second of two environmental assessments, along with a draft "Finding of No New Significant Impact," for Phase I of the Chokecherry and Sierra Madre Wind Energy (CCSM) Project, a 1,000-turbine wind farm being developed by Power Company of Wyoming LLC (PCW).

This environmental assessment analyzes and evaluates PCW's site-specific plan of development for the initial 500 wind turbines, turbine access roads, and associated facilities. The environmental assessment is tiered to the 2012 project-wide Environmental Impact Statement and Record of Decision, which approved the CCSM Project site as suitable for wind energy development. The 500 wind turbines in Phase I are located within the western portion of the Chokecherry Wind Development Area and within the western portion of the Sierra Madre Wind Development Area.

The Phase I development area totals approximately 75,000 acres of private, federal, and state land. However, the long-term surface disturbance will only amount to approximately 849 acres, or 1.1 percent of the land.

Reflecting six major revisions and many more minor revisions, the Phase I layout is designed to avoid and minimize potential impacts to birds and other wildlife by using over five years' worth of scientific data gathered through methods approved by the BLM and U.S. Fish and Wildlife Service.

PCW has voluntarily set aside more than 105,000 acres, or approximately 33 percent, of the 320,000-acre Overland Trail Cattle Company ranch as specific turbine no-build areas — a significant proactive conservation measure. Additionally, PCW intends to place 27,500 acres of private land into a conservation easement for the benefit of greater sage grouse and other wildlife.



Permitting Dashboard

Phase I of the CCSM Project — which is at 1,500 MW of nameplate capacity — is estimated to produce nearly 6 million MWh of clean electricity per year, reducing greenhouse gas emissions by millions of tons annually.

Documents related to the CCSM Project environmental impact statement (EIS) and the two environmental assessments are available from the BLM Rawlins website or from the BLM ePlanning website.

— Source: The Power Company of Wyoming LLC

For more information, go to www.powercompanyofwyoming.com.

GOOGLE X REACHES NEW HEIGHTS WITH MAKANI ENERGY KITES

Makani doesn't make a typical steel wind turbine tower, such as GE's widely used 1.5-MW model that consists of 116-foot blades on top of a 212-foot tower for a total of 328 feet from the base to the nacelle. Founded in 2006, the Almeda, California-based company made a name for itself in the wind industry by developing a low-cost renewable energy solution using kite technology to generate electricity.

An energy kite is a plane-like device with rotors that flies around like a kite. Its system is made up of four parts: the kite, the tether, the ground station, and the computer station. The rotors lift the kite off the ground, but once it's in flight, the kite generates power by flying in large circles where the wind is strong and consistent. The wind allows the rotors to work as individual turbines, and the energy created powers an onboard generator that sends the generated energy down the tether to the grid.

In 2013, Makani was acquired by X, Google's research and development facility that's operated by Alphabet Inc. and develops advanced technologies. According to Fort Felker, the general manager for Makani at X, the company has made a lot of progress since joining X, including improving how the kites launch and land, how they fly in variable wind conditions, and how to generate power more efficiently.

"Our new energy kite will reach higher, fly longer, and generate 30 times more power than earlier versions," Felker said. "We're moving

Makani's 30-kW energy kite prototype perched on a ground station prototype at one of the company's test sites in California.

The Makani team hand-carries the 30-kW energy kite prototype back from the ground station after a successful day of field testing.

"Google X Reaches New Heights with Makani Energy Kites"

continued on pg.48 ...

WIND SYSTEMS

Giving Wind Direction

David C. Cooper
Publisher
david@msimktg.com
ext. 200

Chad Morrison
Associate Publisher
chad@msimktg.com
ext. 202

EDITORIAL DEPARTMENT

Molly Rogers
Editor
molly@msimktg.com
ext. 205

Anna Claire Howard
Managing Editor
annaclaire@windsystemsmag.com
ext. 204

SALES DEPARTMENT

Mike Barker
Regional Sales Manager
mike@windsystemsmag.com
ext. 203

Tom McNulty
Regional Sales Manager
tom@windsystemsmag.com

CIRCULATION DEPARTMENT

Teresa Cooper
Manager
info@windsystemsmag.com
ext. 201

Kassie Boggan
Coordinator
kassie@msimktg.com
ext. 209

Jamie Willett
Assistant

DESIGN DEPARTMENT

Shane Bell
Creative Director
design@windsystemsmag.com
ext. 206

Michele Hall
Graphic Designer
michele@windsystemsmag.com
ext. 210

Media **solutions**

Published by Media Solutions, Inc.
P. O. Box 1987 • Pelham, AL 35124
(800) 366-2185 • (205) 380-1580 fax

David C. Cooper
President
david@msimktg.com
ext. 200

Chad Morrison
Vice President
chad@msimktg.com
ext. 202

Teresa Cooper
Operations Director
info@msimktg.com
ext. 201

AD INDEX

from our proof-of-concept phase to a stage where we want to test ourselves against the real-world challenges we'll face if we want to bring electricity to people."

According to Felker, Makani was inspired by an idea conceived in 1979 that was only recently made possible because of technological advancements.

"Carbon fiber — the material we use for parts of our kite and tether — has become stronger, lighter, and cheaper, which has made it physically possible to fly a small kite in strong winds," Felker said. "Also, Moore's law has made computers smaller and more powerful, making it possible to direct the path of the kite for optimal energy generation using a flight computer that is now about the same size as a smartphone."

These breakthroughs have allowed Makani to replace tons of steel and concrete with smart software and advanced materials.

"Makani's kite actually operates on the same aerodynamic principles as a conventional wind turbine, but is able to replace tons of steel with lightweight electronics and smart software," Felker said. "By building just the tip of a wind turbine blade, which makes most of the energy, and replacing the rest of the structure with a computer system and more advanced materials, and without a tower holding them in place, energy kites eliminate 90 percent of the materials of conventional wind turbines. Because the kites are more aerodynamic and able to access stronger, more consistent wind at higher altitudes, we think they'll be able to generate 50 percent more energy. The lower cost and higher energy output more than quadruples the amount of land available in the U.S. for wind energy production."

Also, because the energy kite is lightweight, it can fly at high altitudes, allowing it to access stronger, steadier winds and generate more clean energy. Its tether is made up of conductive wires that connect the kite to the ground station where the kite is parked when it's not flying. The computer station combines GPS, sensors, and other advanced technologies to guide the kite in the flight path that will allow it to maximize the amount of energy it generates.

"Conventional wind turbines must be sited in locations where the wind is fast and consistent enough to generate enough power to offset costs, but less than 15 percent of all land around the world is suitable," Felker said. "Energy kites, on the other hand, can be economically sited in a wide array of locations, including sites that are too remote from roads, too hilly, or not windy enough for conventional turbines. In the continental United States alone, energy kites could generate wind power economically in over two-thirds of the landmass, more than four times the area available to conventional wind turbines."

As a part of X, Makani is focused on creating a "moonshot," which is Google's catchall description for innovations that could revolutionize the world. According to Felker, there are three factors that constitute a moonshot: one, if it is a big problem for the world, in this case, turning wind into a viable, clean source of renewable energy. Second, you need breakthrough technology, and Makani's technology certainly meets that criterion as it could dramatically change the calculus of wind power.

"Its technology reduces the cost and complexity of harvesting wind," Felker said. "It moves us from an industrial-era solution involving tons of steel and open space to a control systems problem involving sensors and smart software."

Lastly, there needs to be proof that the moonshot is viable. Makani has done so by logging more than 100 hours of flying time generating power.

Makani is one of many successful X endeavors, including Google Glass, high-altitude Wi-Fi balloons, and driverless cars. More recently, the company has been developing the latest version of the energy kite that can fly higher, last longer, and generate more energy than earlier versions — up to 30 times the power for kites that are three times the size of the current prototypes.

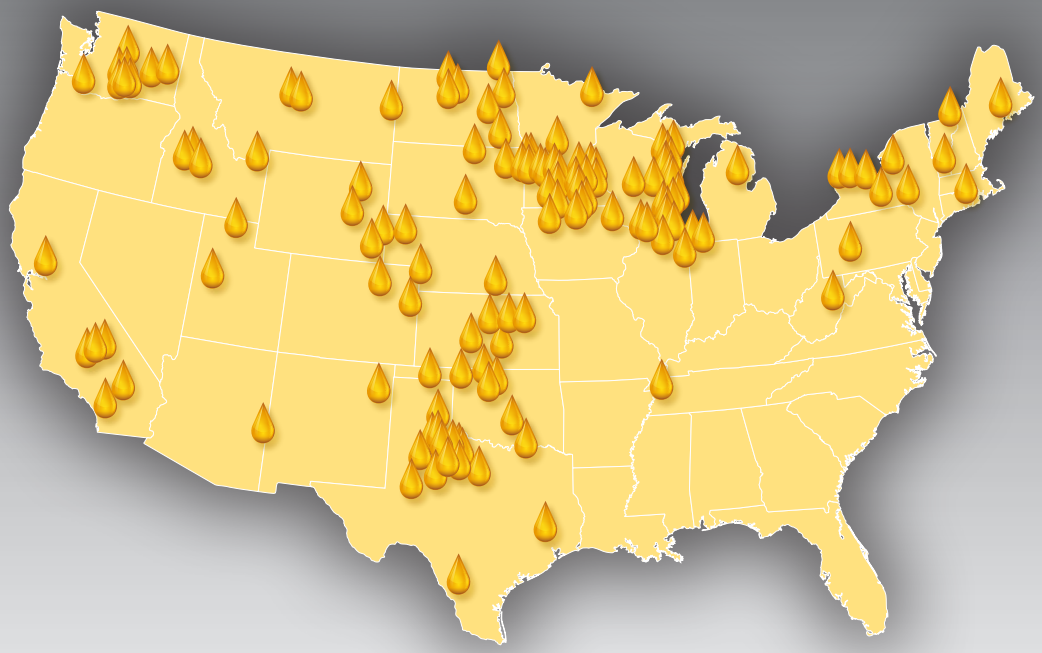
"We've incorporated redundancy for extra safety and reliability, including three flight computers instead of one, more rotors to keep the kite flying in case one breaks, and backup communications," Felker said. "We have also improved the durability of the system so that it can handle more variable weather conditions and last for years. We're ready to take the final steps toward providing electricity to people in the real world, which means moving from proof-of-concept to flying in real-world conditions. We've started working on a pilot project in Hawaii to test long-duration flights of the kite for the first time so we can learn as much as possible and feed it back to the design process, including what our power curve is and how to efficiently maintain the kite over long periods of time."

In May 2015, Makani began testing an 84-foot-long model that can generate up to 600 kW of energy. Prior to that, its kite models were only 28 feet in length.

Despite the company's progress, Makani is still in the early stages of developing its kite systems. However, Felker said they're on the right track to making their energy kites commercially available.

"It's still early days for Makani, and we have a lot to learn about the technology and what it would take to make renewable energy more accessible," Felker said. "We're in favor of measures like the PTC extension that make the market more stable and could help us as a society realize the benefits of many kinds of renewable energy sooner."

For more information, go to www.google.com/makani.



Maximizing Uptime Across North America

AMSOIL is protecting more than 10,000 MW-class turbines in North America alone. We have been delivering excellent protection and maximum uptime for more than seven years without reformulating our product, preventing additional fluid changes and keeping turbines spinning. Find out why so many of the leading operators in the wind industry are switching to AMSOIL and why you should, too.

DEVOTED TO PROTECTION.®

AWEA WINDPOWER Conference & Exhibition 2016
New Orleans, LA May 23-26

BOOTH # 4713

Exceptional protection • Superior foam control • Proven water resistance • Minimized maintenance and downtime

AMSOIL®
The First in Synthetics®

AMSOIL Wind Group | 715.399.6305 | amsoilwind.com