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AWEA Wind Energy Fall Symposium
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Wind Systems magazine, published by Media Solutions, Inc. Publications mail agreement no. 40624074 Return undeliverable Canadian addresses to: PO Box 503 | RPO West Beaver Creek | Richmond Hill, ON L4B 4R6

Cover Photo: Dow Electrical & Telecommunications

EDLETTER

The U.S. wind energy market will survive regardless of whether Congress extends the Production Tax Credit (PTC), but don't expect weak suppliers to remain in business.

Vic Abate, vice president of General Electric (GE), told reporters at Windpower 2012 that uncompetitive vendors who provide gearboxes, towers and blades for the wind industry will be culled from GE's supplier list. As the largest market shareholder with 29.4 percent in wind energy, GE's belt tightening will help shape the future of the industry.

GE is not alone in thinking that the shakedown will result in fat trimming. The American Wind Energy Association (AWEA) says an estimated 10,000 workers will lose their jobs in anticipation of fewer orders from manufacturers if the PTC is not extended, and an additional 37,000 employees will be axed next year if the incentives are not available to wind farm owners.

Among the other major industry players in Atlanta, executives with Gamesa, Mitsubishi, Siemens, Suzlon, Vestas, Nordex and Goldwind said beyond this year the U.S. wind energy market would decline 80 percent, but the U.S. will still install nine to 12 GW of wind installations in the rush to finish projects before the credit incentives expire.

Goldwind CEO Tim Rosenzweig said his company will expand in the U.S. in the coming years, and Suzlon's interim CEO, Duncan Koerbel, says Suzlon is "in this for the longest of long hauls."

The executives agree that a one-year extension will probably happen following the November presidential elections, but one-year extensions are not helpful for wind energy growth because developers do not have confidence in long-term stability.

With wind projects taking 18 months to two years to complete, a better solution would be a two-year PTC extension and a policy that allows for long range planning by developers and manufacturers. A three to five year buffer would be enough to create a stable platform for the U.S. wind industry, according to these industry experts.

Harm Toren, vice president and chief service officer for Mitsubishi Power Systems said 90 percent of his company's wind turbines are installed in the U.S., but uncertainty with U.S. policy and regulations is a concern in terms of research and sales goals. Toren suggests manufacturers maintain the turbines they have and wait for the market to stabilize.

Regardless of whether tax credits will be available at the end of this year, it appears that the top manufacturers are committed to remaining in wind power and the U.S. even if Congress abandons us.

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PUBLISHED BY MEDIA SOLUTIONS, INC.
P. O. BOX 1987 • PELHAM, AL 35124
(800) 366-2185 • (205) 380-1580 FAX

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SIX ATTENDEES AT WINDPOWER 2012 WIN SAFETY HARNESSES AND TOOLBOXES

Wind Systems partnered with Capital Safety and Snap-On Tools to raffle Snap-On toolboxes and ExoFit NEX Global Wind Energy Harnesses at the AWEA Windpower 2012 show in Atlanta, GA.

Raffle tickets were provided each day of the event to those visiting the Wind Systems booth where they received free subscriptions to the magazine and information about other exhibitors at the show held at the Georgia World Congress Center.

"We had a great time at Windpower 2012 and we'd like to congratulate AWEA for all their hard work," said David C. Cooper, president and CEO of MSI, and publisher of *Wind Systems* and *Gear Solutions* magazines. "We had a great turnout each day of the show and we were extremely pleased with the turnout each day at our booth generated by these prizes donated for the giveaway."

Winner of the first day's drawing for the harness was Michael Burns of Burns Brothers Performance.

Patrick Laird of Laramie County Community College won the harness the second day, while Telicia Craft of MH&W International took home the toolbox.

Third day winners included Nick Bach, a student who won the harness, and Dan Hadfield with Gard Specialists winning the toolbox.

Winners of the ExoFit Global Energy Safety Harnesses provided their measurements to Capital Safety so that their harnesses were custom-fit for their use.

The toolboxes and harnesses were shipped to the winners following the show.

AWEA Windpower 2012 was the first major wind

Companies wishing to submit materials for inclusion in this section should contact Sherri Mabry at sherri@windsystemsmag.com. Releases accompanied by color images will be given first consideration.

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energy conference and exhibition to take place in the Southeast, attracting thousands of corporate leaders and wind power professionals with concurrent educational sessions, committee meetings, and more than 900 exhibitors representing 60 countries.

"With more than 90 wind-related manufacturing facilities located in the Southeast – 20 of which are in Georgia – and the proximity to Hartsfield-Jackson International, the world's busiest airport, Atlanta was a natural fit to host Windpower, and we are excited that AWEA chose Atlanta as the host city this year," said Metro Atlanta Chamber Vice President, Supply Chain & Advanced Manufacturing Development Bob Pertierra. "Wind energy, renewable energy and clean technology represent one of the fastest-growing segments for economic growth in the world."

To sign up for a free subscription to *Wind Systems* visit www.windsystemsmag.com. For a free subscription to *Gear Solutions*, go to www.gearsolutions.com.

DETECT COMPLETES MERLIN AVIAN RADAR SYSTEM INSTALLATION AT THE C-POWER OFFSHORE WIND FARM IN BELGIUM

The MERLIN Avian Radar System was purchased by the Management Unit of North Sea Mathematical Models (MUMM), a division of the Royal Belgian Institute of Natural Sciences (RBINS), and was delivered to Belgium in January 2011 to collect data on bird activity along the coast at Zebrugge. MUMM studies

the effects of offshore wind parks on all forms of sea life but of particular concern here were Terns nesting on the mainland and flying out to the shoals to feed. In March 2012 DeTect radar technicians transferred the MERLIN radar system from its mobile trailer to the C-Power platform.

"This is a very important and exciting project for DeTect" said Edward Zakrajsek, Manager of DeTect EU in London. "DeTect technicians, headed by our Project Manager Andreas Smith, had to work quickly and accurately to reassemble the system onto the platform hours before it was transferred to a barge and towed out to sea." The wind park comprises 56 5-6 megawatt (MW) turbines that stand at 158 meters above sea level with rotor swept diameters of 63 to 64 meters. "These are some of the largest wind turbines in the world," continued Mr. Zakrajsek, "and DeTect's MERLIN avian radar technology is a key component for ensuring generation of environmentally-sound, clean, renewable energy."

For more information, visit www.detect-inc.com or call 850-763-7200.

BAKER RENEWABLE ENERGY INSTALLS WIND ENERGY SYSTEM AT JAMES MADISON UNIVERSITY

Baker Renewable Energy announced today it has installed a wind energy system at James Madison University featuring a 7.5-kilowatt Bergey wind turbine. Baker Renewable Energy installed the turbine as part of the Small Wind Training and Testing Facility, an educational initiative launched by the Virginia Center for Wind Energy (VCWE). The wind system is capable of producing 10,000-12,000 kWh of energy a year when operating at average annual wind speeds of 5 m/s, which is enough to power an average-sized house for a year.

Baker Renewable Energy installed the turbine on JMU's East Campus, adjacent to the CISAT library. It, along with a small solar array, will provide clean power to the new building, while wind instruments on the tower will measure wind flow to provide VCWE with data on area wind patterns. The turbine has a total rotor diameter of 23 feet, which when added to the 120-foot-tall, Rohn self-supporting lattice tower, places the total height of the system at 131.5 feet.

"We are excited to have been involved in this project, especially since it benefits the greater community in so many ways," said Jason Epstein, executive vice president of Baker Renewable Energy. "In addition to providing continuous, clean energy and reducing utility costs, the turbine will also offer a hands-on educational opportunity for students who are interested in the renewable energy field, further supporting the industry in Virginia."

This initiative will allow VCWE to provide educational outreach to JMU students, area entrepreneurs and local K-12 schools. JMU professors will be able to use the facility as a teaching tool geared toward student entrepreneurs who may be interested in wind power-oriented business. Such a curriculum, and the advancement of the wind industry, will help diversify the state's energy resources.

"Our goal is to cultivate a community that is educated in wind energy; therefore, we need to inform decision-makers, members of the public and local students about wind power development initiatives in Virginia," said Dr. Jonathan Miles, professor in the College of Integrated Science and Technology, coordinator of the International Masters Program and director of the Virginia Center for Wind Energy at JMU. "We are grateful to Baker Renewable Energy for supporting our efforts to bring economic development, high environmental quality and reliable and affordable energy to the Commonwealth." "The wind industry continues to gain visibility and traction across the Southeast and we are glad to support its development," added John Matthews, president of Baker Renewable Energy. "The turbine provides a valuable training tool that will help to develop the Virginia workforce."

Baker Renewable Energy has completed a number of other wind projects in Virginia, North Carolina and South Carolina. The company installed a wind turbine for the North Carolina Solar Center, for the utility Santee Cooper in South Carolina and for the Wind for Schools program in Virginia, which assists in providing wind turbines and curricula to schools across the country through a Department of Energy and National Renewable Energy Labs (NREL) platform. BRE has also worked with other schools such as New River Community College to install smaller wind systems.

For more information, visit www.windpowerVA.org or www.bakerrenewable.com.

CONSERT INC., AND NOVATEL WIRELESS WIN 2012 CTIA E-TECH AWARDS

Consert Inc., and Novatel Wireless, Inc., are the winners in the Green Telecom and Smart Energy Solutions category of the 2012 International CTIA Wireless Emerging Technology (E-Tech) awards program.

The CTIA E-Tech Awards honors the most innovative new products in 15 categories spanning the areas of mobile apps, consumer electronics, enterprise and infrastructure. Hundreds of entries were judged by a panel of recognized industry experts, media and analysts and were scored on innovation, functionality, technological importance, implementation and overall "wow" factor.

"This is a tremendous honor for Consort and only further highlights our successful partnership with Novatel Wireless," said Jeff Ebihara, Consert vice president of sales and marketing. "To be nationally recognized by the wireless industry for our leadership in the smart energy solution space speaks volumes about our impact on the industry."

The Consert Virtual Peak Plant™ (VPP) Solution, utilizing the Novatel Wireless Expedite® E396 PCI Express Mini Card for 3G, unites the best interest of utilities with those of consumers, empowering them to monitor and reduce energy consumption, and save money and the environment at the same time. The partnership enables the Consert Solution to operate over the Verizon Wireless 3G network. By using Novatel Wireless' 3G Expedite E396 PCI Express Mini Card for home energy management, the network can offer services in real-time, as opposed to once every 15 minutes or once an hour or once every 24 hours, which is common for other utility smart grid networks.

With consumers setting, monitoring and reducing energy consumption from any Internet-enabled device, utility companies have the opportunity to gain operational savings, address peak load with measurable and verifiable certainty, and realize new revenue streams.

"Having our industry leading embedded modules recognized in our partners' solutions in the 2012 International CTIA Wireless E-Tech awards program shows the importance of delivering modules that can be integrated with extreme flexibility and superior performance for mobile data applications," said Rob Hadley, CMO, Novatel Wireless. "We had multiple award recognitions this year that highlight the ongoing commitment of Novatel Wireless to deliver the most innovative mobile broadband solutions and are very pleased to be recognized with Concert for this solution for the Smart Energy segment.

For more information, visit www.consert.com or www.novatelwireless.com and www.CTIA.org.

AMSC RECEIVES 100 MW WIND TURBINE ELECTRICAL CONTROL SYSTEM ORDER FROM INOX WIND

AMSC, a global solutions provider serving wind and grid leaders, announces that Inox Wind Limited, part of India's Inox Group

of Companies, placed a follow-on order for 50 of AMSC's electrical control systems (ECS) for Inox's 2 megawatt (MW) wind turbines. AMSC expects to ship all of these systems to Inox in 2012. This is the fourth volume order that AMSC has received from Inox in the past two years.

"Inox is producing some of the best performing and most attractive wind turbines for the Indian market, which have been designed with consideration for Indian site conditions and low cost of operation and maintenance," said Devansh Jain, director of Inox Wind Limited. "We were among the first manufacturers to begin producing 2 MW turbines locally in volumes and have quickly established a leadership position in the market. This position is strengthened by our vertical approach, which includes best-in-class manufacturing as well as project development. We look forward to continuing our growth with AMSC at our side."

AMSC's ECS are an integrated, high-performance suite of power electronics systems that include the wind turbine power converter cabinet, internal power supply and various controls. Together, these systems serve as the "brains" of the wind turbine and enable reliable, high-performance operation by controlling power flows, regulating voltage, monitoring system performance, controlling the pitch of wind turbine blades and the yaw of the turbines to maximize efficiency.

The ECS are being utilized in Inox's 2 MW doubly-fed induction turbines, which were designed by and licensed from AMSC in 2009.

"Already the third largest wind power market in the world, India is supporting renewables in a significant way. In fact, the country recently introduced generation-based incentives for wind power, which incentivize project developers to select turbines that lower their leveled cost of energy and maximize their power output," said Daniel P. McGahn, President and CEO, AMSC. "This policy is sure to benefit a fully integrated player like Inox, who is committed to providing high-quality, competitively priced wind turbines with exceptional performance and reliability."

For more information, visit www.amsc.com.

STREAMLINING WIND PERMITTING IN MAINE

New legislation creates further streamlining for wind project permitting in Maine. Governor Paul LePage signed legislation LD 1798 to revamp the Land Use Regulation Commission (LURC). The reforms within the legislation include moving all permitting review for grid scale wind projects in the Unorganized Territories to the jurisdiction of the Maine Department of Environmental Protection (MeDEP).

Previously, LURC or MeDEP depending on the location of the project would conduct review of wind permitting. Occasionally this could cause difficulties when projects overlapped jurisdiction boundaries. With the recent improvements wind project permitting will have a standard procedure and review process throughout the state. The improvements signal the Legislature's ongoing support for wind development, and their desire to continue to provide all applicants with certainty and predictability for the entire state.

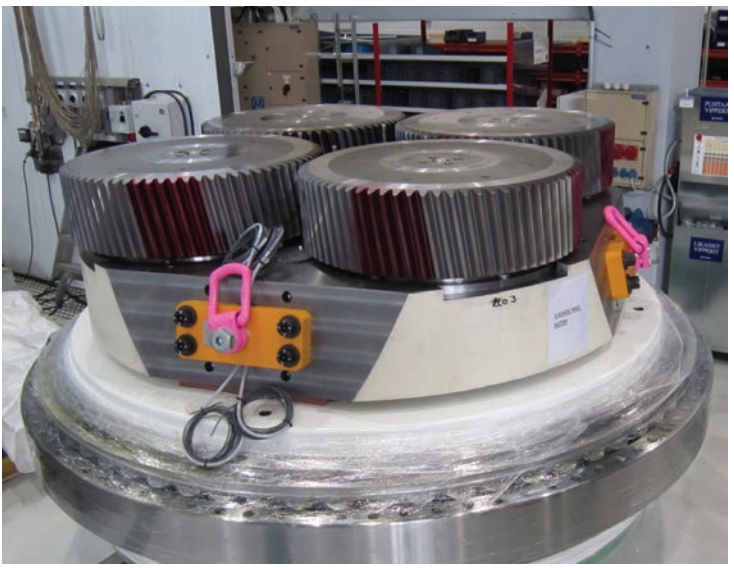
The wind permitting streamline process began in 2008 with LD 2283, passed by the 123rd Legislature and signed by former-Governor John Baldacci.

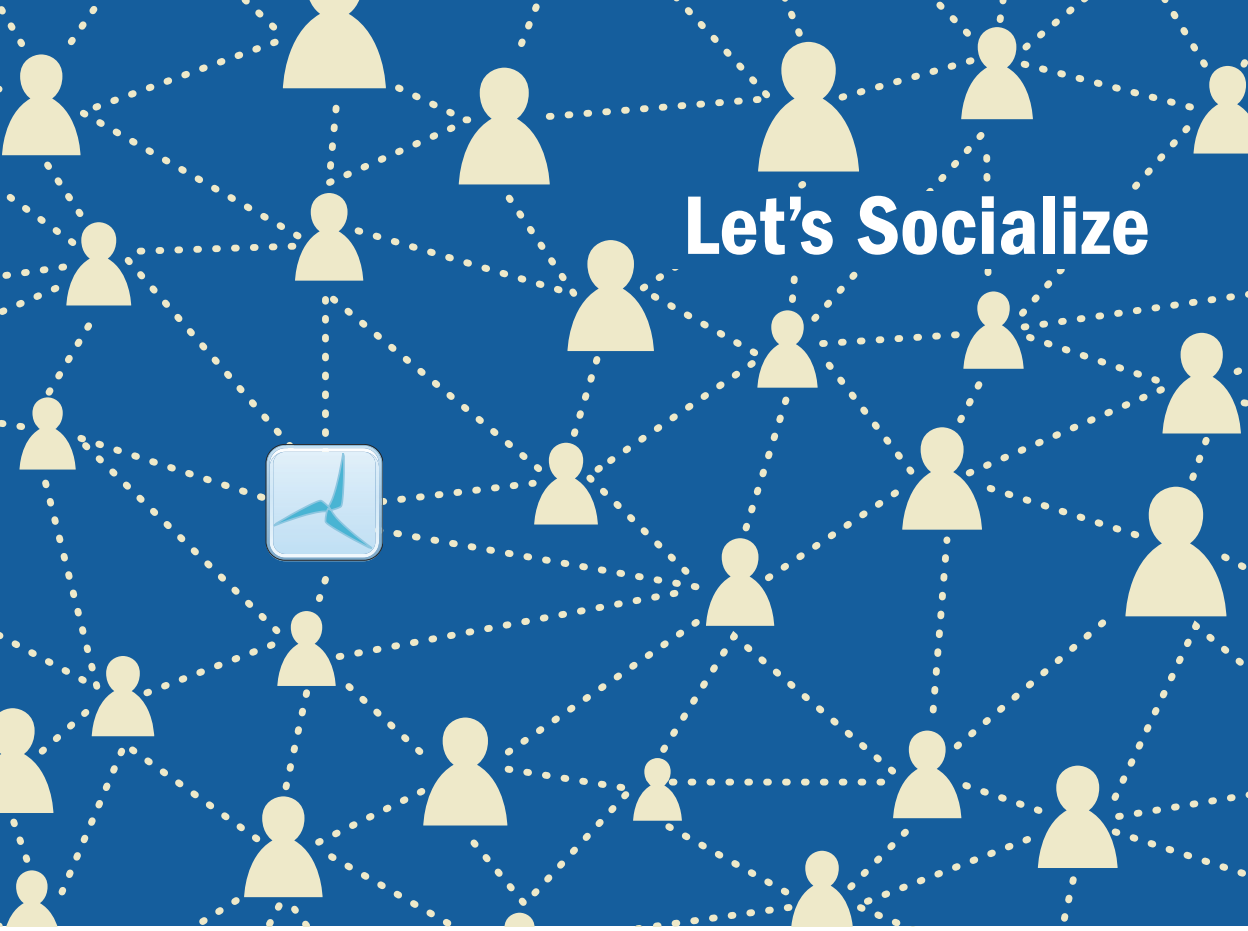
For more information, visit www.mainewindindustry.com.

MOVENTAS WINS CONTRACT TO SUPPLY NEW 5MW OFFSHORE WIND GEARS TO AREVA

Moventas continues to strengthen its offshore capability with its 5MW medium speed wind gear. In the beginning of May, Moventas delivered two 5MW offshore wind gears to AREVA Wind. The two companies have signed an 80 million euro agreement on future deliveries.

After approximately one year of testing, Moventas and AREVA Wind, subsidiary of the multi-





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View featured articles from the magazine chosen especially by the staff, and support the community of wind professionals.

Follow Media Solutions, Inc.—publisher of *Wind Systems* and *Gear Solutions* magazines—and network with members of the staff.

national energy industry group AREVA, will be ready for series deliveries. Moventas and AREVA Wind have signed an agreement worth 80 million euros concerning 5MW gear unit deliveries for the coming years.

"We are very pleased to find that AREVA Wind trusts our leading expertise and over 30-year history in creating technically superior gear solutions for medium-speed and multi-megawatt class drive trains", comments Senior Vice President of Wind Gears with Moventas, Arto Lahtela.

The new offshore gear will strengthen the Moventas product range, especially for the European markets, where the demand for offshore wind turbines is showing promising signs of growth. Challenging offshore conditions set extremely high requirements for both product design and manufacturing technologies. Moventas provides AREVA Wind's international offshore wind expansion with a reliable medium speed offshore wind gear.

With a rated power of 5 MW, AREVA's M5000 wind turbine with its innovative medium-speed concept has now three years operational experience in the German North Sea, and the group is now moving into serial production with its confirmed backlog of 120 machines. Beyond this AREVA is aiming at strong international expansion, with a focus on the European markets, and in particular United Kingdom and France.

Mikael Laine President & CEO Moventas companies. For more information, visit www.moventas.com.

MOOG PITCH CONTROL AND BLADE SENSING SYSTEMS HIGHLIGHT RELIABILITY

Moog Industrial Group introduces its electric pitch control systems for controlling the angle of inclination of a wind turbine's blades. Moog's array of hardware, software and services also includes blade-sensing systems, rotor monitoring systems, slip rings and global training and services.

Moog has supplied more than 27,000 systems and products to many of the world's top-ten wind turbine manufacturers. The company's wind industry products and expertise span both electric and hydraulic technologies. Moog's wind industry experts will explain how using the company's systems on today's wind turbines can reduce maintenance, improve safety and boost efficiency. For example, by precisely monitoring wind loads on blades, the rotor monitoring system improves the turbine's life span and maintenance costs. Predictive maintenance is vital to wind park operators because the cost of a shutdown and subsequent turbine repairs is high.

Moog Pitch Systems also improve safety when the wind turbine loses electrical power. The pitch system puts the turbine blades off-wind into a safe operating mode that protects the wind turbine from damage. When the wind blows at 25 meters per second (50 mph) or higher, a wind turbine needs a failsafe to put its blades at an angle where the load is reduced and the wind turbine stops.

Found in the hub of the wind turbine, the Moog Pitch System consists of: control boxes containing Moog Pitch Servo Drives; Wind Pitch Servo Motors; and, a control system including software for remote diagnostics and back-up power.

Moog also offers slip ring solutions, which are critical to operation. Found inside the wind turbine's nacelle, Moog's slip rings provide electrical signals and energy for blade pitch power and control. Moog's fiber brush slip rings offer wind turbine owners a minimum of 100 million revolutions of operational life with no maintenance.

Moog signed a contract to supply a test system to NAREC (National Renewable Energy Centre) to evaluate and test wind turbine blades at NAREC's new 100-m (328-ft.) blade testing facility in Blyth, Northumberland, United Kingdom.

Opening this summer, turbine blade manufacturers will use NAREC to test prototype blade designs and manufacturing processes. The new facility will accommodate blades being designed for larger offshore wind turbines up to 100 m (328 ft.) in length and will complement NAREC's existing capability testing blades in the 50-m (164 ft.) range.

The new 100-m (328 ft.) blade test facility will provide an independent and confidential environment to accelerate the development of new blade designs before they are taken offshore. It will be the largest facility of its type in the world and expands on NAREC's existing blade-testing capability developed over the last five years, serving the global supply chain and industrial research communities.

Stuart Bibb, Market Manager, Moog Test Systems said, "Our division within Moog specializes in structural testing for the aerospace industry. Using computer-controlled hydraulic technology, we are able to simulate service loads to ascertain structural strength prior to initial flight-testing. We were able to apply the same experience, technology and skills to NAREC's requirements to deliver the right solution."

Dean Goodwin, Mechanical Lead Engineer, at NAREC said, "NAREC undertakes fatigue testing of wind turbine blades using a hydraulic system to resonate the blade at its natural frequency. Moog's track record in the aerospace industry provided us with the confidence in their solution for our new world-leading facility."

Moog will supply and commission a Test Controller and monitoring system to control the NAREC Control Resonance Mass (CRM), which excites natural frequencies in the blade structure to evaluate the blades' resistance to fatigue under representative dynamic loading conditions. The scope of supply will also include a very high flow PLC controlled Hydraulic Power Unit designed to interface with the NAREC primary control system.

The power unit, comprising six Moog RKP Radial Piston Pumps, has an installed power of 675 kW, delivering a flow of 1,200 lpm (317 gpm US) at a pressure of 280 bar (4061 psi). A dedicated PLC controls and monitors the performance and health of the unit and a water-cooling system maintains the temperature of the hydraulic fluid. High pressure hydraulic fluid is circulated around the facility by a custom designed distribution network. For more information, visit www.moog.com.

MEDIACO MAXLIFT RAISES TOWER AT FRENCH PORT

Crane service provider Mediaco Maxilift recently lifted the tower of a dockside crane from its base at a French port to make it possible to perform necessary maintenance work. In order to safely lift the 414-tonne (456 US tons) load and then place it back on its base, the company relied on the powerful performance of a Terex™ CC 2800 lattice boom crawler crane.

The two lifts brought several challenges for the Mediaco team from the start: On the one hand, the wharf's structure was not designed to bear the joint weight of the CC 2800 and its load. "In order not to damage the structure, we placed steel beams under the CC 2800's crawler tracks in order to better distribute the weight," explains Mediaco Maxilift project manager Robert Titart. On the other hand, the load's center of gravity proved to be an obstacle in performing the lift safely. In order to solve this problem, a custom-made spreader was used to balance the load with the required precision. However, the spreader added 11.5 tons (12.6 US tons) to the load being lifted, increasing the total weight to 433 tons (477 US tons) together with the 4.5-tonne (4.9 US tons) hook block and the 3-tonne (3.3 US tons) rigging cables and chains.

The Mediaco team set up the CC 2800 with an SSL configuration, a 54-meter main boom, a superstructure counterweight of 160 tons (176 US tons), and a Superlift counterweight of 300 tons (330 US tons), and decided to use a Superlift radius of 15 meters (49 ft.). With this configuration, the CC 2800 was perfectly prepared to safely lift the load and put it back down later within the required working radius of 16 meters (52 ft).

The Terex® CC 2800 is a lattice boom crawler crane with a remarkable level of versatility. For instance, it can be converted from a standard crane to a special-purpose crane for wind turbine projects — and back. This includes a rigid luffing fly jib (LF2) with a length of 12, 24, or 36 meters that was developed specifically with wind power-related applications in mind. The crane's rated lifting capacity is 600 tons with a reach of seven meters, while its maximum load moment is 7,056 mt.

The undercarriage is available in two different models: the standard version and with a chassis designed for road travel. The basic machine, including all winches and the A-frame, can be transported within a 12-ton axle load limit.

The high level of flexibility provided by these options and features saves time and money during transportation, setup, and disassembly, providing for a high level of cost-effectiveness in the process. Moreover, the time-tested control system, featuring remote radio control capabilities, makes it possible to operate the Terex™ CC2800 easily, safely, and comfortably no matter what the operating conditions.

For more information, please visit www.mediaco-group.com or www.terex.com.

REDSTONE COLLEGE PREPARES ITS WIND ENERGY TECHNOLOGY GRADUATES FOR WORKFORCE

Redstone College, a Denver-based institution of higher learning, celebrated the commencement of its fourth graduating class from its Wind Energy Technology Program on May 21, bringing the total number of graduates since the program launched in August 2010 to 106. According to the American Wind Energy Association (AWEA), Colorado is one of the top 10 states for wind energy jobs, and receives 9.2% of its electricity from wind power.

"Wind energy is a relatively new

industry for America, and yet, it has had significant growth both in the U.S. and Colorado, especially in the last five years," said Tim Guerrero, campus academic dean of Redstone College. "When we launched our program, we made a commitment to provide our students with a curriculum that focused on hands-on learning to ensure they were workforce ready. We went to Denmark to find a used Vestas V27 to place in our wind lab, which teaches everything from testing equipment, such as a lab volt industrial trainer and a hydraulic station, to troubleshooting for the processes of installation, testing and repair of wind turbines. When our graduates complete the program, they are immediately ready to productively manage wind turbine electronic components."

Redstone's 15-month associate program teaches both mechanical and electrical applications for the wind energy industry, including the fundamentals of mechanics, math and physics. Safety training is also a critical component of the program; students receive training in first aid, fire suppression, and climb safety and current OSHA safety standards. The program has grown substantially since it launched and currently has eight faculty and two lab technicians. Four classes have graduated since October 2011, and program enrollments are accepted every two months.

"When you work with high voltage and high power, students must learn they can't rush it and that troubleshooting systems requires critical thinking," said Warren Schmelzer, wind energy technology instructor of Redstone College. "Our faculty doesn't teach the technology of a specific turbine, but rather we teach our students to 'read' and to understand the fundamentals of concepts such as wind mechanics and math, among others."

Wind Energy Technology graduates have received jobs at leading organizations including RES America, SOS Staffing/Vestas, Ethos Distributed Energy, enXco, Siemens and SkyClimber. For all programs offered at Redstone College, 80 percent of its eligible graduates have been placed in jobs in their fields of study.

For more information, visit www.redstone.edu.

LATEST TESTS CONFIRM INCREASED ENERGY GENERATION OF EVANCE SMALL WIND TURBINE

During the last few months the Evance R9000 small wind turbine has undergone further tests which have confirmed its energy generation has increased by over 4% to 9,167kWh at a wind speed of 5 meters per second.

The R9000 small wind turbine was one of the first small wind turbines to achieve SWCC conditional certification last year, and has received further improvements since.

Many Evance customers have

already benefitted from higher than expected energy generation as the R9000 system improvements were implemented several months ago. For example, Clive Breeze was pleasantly surprised with the energy generated from his recent installation: "In the first three weeks alone, the R9000 turbines exceeded the predicted energy generation targets by 10 percent." This reduced the customer's first quarterly electricity bill by the equivalent of nearly $500.

"We're delighted that our R9000 turbine is proving so efficient in energy production as this translates directly into a faster return on investment for our customers," said Kevin Parslow, CEO of Evance Wind Turbines.

"Our R9000 machine accounted for a third of all small wind turbines sold in the UK last year – making it the UK's small wind turbine of choice. We look forward to accelerating our drive into the North American market though our network of installers in a bid to establish a similar market leadership position," concludes Kevin.For more information, visit www.evancewind.com.

76 TEREX TOWER CRANES DELIVERED TO VENEZUELA

Terex™ Cranes announces that it has received an order for 76 flat top tower cranes for PDVSA – Petroleos de Venezuela S.A. The State owned company will utilize most of the cranes for a housing project that involves building 50,000 residencies per year. Of the 76 cranes, 38 are CTT 161A-6TS and 38 are CTT 91-5 TS12, all of them manufactured in the city of Fontanafredda, Italy. The cranes will be delivered through 2012.

This is among the biggest order of cranes for Latin America. "This order proves our brand strength and our commitment with Latin America", says Ivens Encarnação, General Manager, Terex™ Cranes Latin America.

Terex™ has a complete product offering for the construction and infrastructure industry, and superior after sales services and support for its customers. "The order with PDVSA positions us at a new league in Latin America, and increases significantly the presence of Terex™ Cranes in the local crane Market", adds Ivens. For more information, visit www.terex.com.

PSI REPAIR SERVICES INTRODUCES OFF-WARRANTY REPAIR SUPPORT

PSI Repair Services, Inc., introduces its off-warranty repair support for wind energy operations and maintenance (O&M) professionals.

PSI Repair Services offers fast, affordable repairs, including upgraded/longer-life products, for out-of-warranty electronic, hydraulic and precision mechanical components that drive your turbines' pitch and yaw systems and down tower electronics. Components repaired include printed circuit boards, PLCs, control cards, VRCC components, IGBTs, thyristors, converters, pitch motors, hydraulic pumps, servo motors, transducers and much more. All repairs come with a free evaluation and one-year warranty.

PSI uses the latest diagnostic tools to detect failures down to the

microchip level. Solutions range from minor component changes to full replacement printed circuit boards, with enhanced designs to improve performance and reliability. These options allow you to significantly increase mean time between failures (MTBF) and prevent costly downtime and/or repeat repairs.

In addition, PSI provides comprehensive remanufacturing services for unsalvageable, obsolete components. Plus, PSI's stocking programs provide fast turnaround to help reduce inventories.

"PSI Repair Services is a one-stop resource for wind farm O& M professionals," said Mike Fitzpatrick, General Manager of PSI Repair Services. "No other repair service provider in the wind industry can match PSI's breadth and depth of cost- saving services, or has a dynamic Engineering Services Department quite like PSI. The difference is clear for our customers."

For more information, visit www.psi-repair.com.

ISRAEL BARAJAS AND KEN MCGRAW JOIN WIND ENERGY SERVICES

Wind Energy Services Company (WES) announced that two new teammates have joined the company.

Israel Barajas has been appointed HSE Manager with primary responsibility for programs and practices to maintain and enhance the company's industry-leading safety record. He brings more than 20 years of experience in the composites industry. The last 14 years he has been employed by various entities of the Molded Fiber Glass Companies, including operations in Mexico, Alabama and South Dakota. In addition to experience in the Safety and Environmental areas, his background includes quality, engineering, production, materials, and scheduling and specific expertise in LEAN manufacturing.

Israel holds a Bachelor of Science in chemical engineering and an MBA, as well as a Health and Safety Management certificate from The University of Alabama.

In a newly created position of Account Manager/Sales, Ken McGraw will be responsible for supporting the company's business growth in North America. His prior experience includes ten years in industrial sales and customer service, including his most recent post as District Sales Manager for Dallas and East Texas at Klein Tools. He has a BS in Business Management from LeTourneau University.

Ken will be based at WES headquarters in Gainesville, TX, and can be contacted at kmcgraw@windenergyserviceusa.com.

OMEGA MORGAN PROVIDES MOVING INSTALLATION SERVICES FOR PROTOTYPE TURBINES

Omega Morgan, one of the West Coast's leading heavy equipment transport companies, offered free moving and installation services today for a prototype smaller, lighter, gearless wind turbine and four towers from the Portland area to the Port of Arlington, Oregon.

Harry Lee, developer of the new product and Genesis Wind Inc.'s CEO, said his turbine is a prototype for linear, reciprocating direct-drive technology, a brand new development in the world of wind power. The gearless turbine is valuable to future customers because turbine gears typically wear out quickly, causing great expense and downtime problems, Lee noted. It also is 100 feet shorter than the average 300-foot-tall tower and will weigh 35,000 pounds versus 85,000 pounds for the typical wind turbine and tower.

The turbine, which is scalable to 1.5 megawatts of energy, is the first to be installed by Genesis at a pilot wind farm east of Portland.

Lee said. "I am so excited that this big idea is finally being launched." He has been working on development of the 25-kilowatt wind turbine since 2009. In the near future, the scaled-down turbines will be used for businesses, government buildings, schools, and countless other places to reduce costs and provide a cleaner form of energy.

"This company has a great future. We want to support local start-ups like Genesis because new local companies mean new jobs in Oregon. Our crews are well suited for this effort and can efficiently pick up the turbine and four towers, move them to the site, and install them precisely as specified," said John McCalla, CEO and president of Omega Morgan.

He said another Northwest company, Axis Crane, also volunteered its services to hoist the equipment onto two Omega Morgan trailers and to move them into place for the installation. United Rentals, Northwest Portland, donated free rental equipment for the project.

"This is the very first time in 10 years that I have received true, meaningful support for our project," Lee said. "It means so much to me that these two great companies have stepped forward to help and I am truly grateful."

Omega Morgan provides services to companies and organizations of all sizes by executing large equipment moves, often in complex environments; moving and installation of semiconductor equipment for the high-tech industry, commercial and export packing, crating and rigging.

For more information call Omega Morgan in Portland at 503-647-7474 or 800-442-8141; Seattle at 253-852-7500; Phoenix at 602-789-4143 or visit www.omegamorgan.com; or call Axis Crane at 800-585-2947 or visit www.axiscrane.com. For more information on Genesis Wind, call 503-546-0464.

WOODLAND WORKWEAR AWARDED UTILITY PATENT FOR KNEEDZ KNEEPAD

Woodland Workwear USA announces it has received a utility patent and trademarke for its KNEEDZ Gel kneepad technology.

"This has been a long process but definitely well worth the wait. We are very pleased with the outcome and now we can continue to focus on promoting our KNEEDZ® Gel Kneepad work pants knowing that we have patent protection for our intellectual property. Our founding partners invented a great product that continues to solve a serious safety problem in the workplace," states Dale Pelletier, President & CEO of Woodland Workwear. "In the spirit of innovation and creativity, we celebrate our patent knowing that it will change the lives of workers for many years to come. We will continue on our quest to solve safety problems in the workplace through innovation and technology."

The patent was issued under number 8,166,570 and protects Woodland's invention of gel kneepads that are permanently built-in to work pants for a term of more than 20 years.

Fore more information, call 719-630-5153 or visit www.kneedz.com.

SLIPRING HARNESS FAILURE MODES AND SOLUTIONS

Exposure to torsion, oil, abrasion, temperature extremes and human interference can cause downtime and loss of production.

Original equipment manufacturers are required to provide complete systems for industrial applications. Typically, the technical expertise lies in the most critical aspect of the project. Subsequently, many ancillary components are designed to the best of their abilility, but an fall short in the application due to a lack of knowledge and experience in all areas. One example of this is the slipring harness, which controls the three-blade pitch motors. This harness is subject to constant abuse in the form of torsion, oil exposure, abrasion and temperature extremes. When products like these fail, the wind farm experiences significant downtime, loss of revenue, and maintenance expense.

TPC Wire and Cable Corp consulted a major wind farm owner to design and develop a custom slipring harness that addresses the multiple failure modes encountered in the tower. The TPC harness was designed to be flexible at all temperatures, easy to install, and last for many years in the abusive wind tower environment. Previously, the slipring harnesses needed to be replaced every 12 months on average. The TPC slipring harnesses have been in continuous service for more than four years without a single failure.

Snaking the harness through 90 degree elbows, and terminating individual conductors to terminal blocks in very tight clearance areas had previously been very difficult, especially in cold weather. The highly flexible TPC harness was much easier to install at both the hub and the slipring end. Maintenance personnel were thrilled to have a robust, easy to install solution to one of their primary failure areas.

Material and labor cost savings alone totaled $8,575 per turbine, according to the manufacturer, but the increase in production hours of the tower ranged from eight hours to multiple days, depending on the availability of personnel to make the repair. When multiplied across an entire wind farm, the immediate savings and increase in production is important.

For more information, visit www.tpcwire.com or call 1-800-521-7935.

COLLIER'S HYPERSIZER V6.2 IMPROVES DESIGN AND MANUFACTURABILITY OF COMPOSITES AND METALS

Collier Research Corporation today announced the release of HyperSizer®v6.2 structural sizing and analysis software. The latest version of the product, which is used widely in the spacecraft and aviation industries, includes new modeling capabilities for airframe wing box designs, and laminate zone and ply-count optimization enhancements to improve manufacturing efficiency.

New features and enhancements in HyperSizer v6.2 include:

- Discrete Stiffener Modeling – For airframe wing box and fuselage structures, the software automatically identifies in the FEM, skin shell and stiffener beam elements and optimizes their spacings, heights, and laminates. This provides the flexibility for designing panel bays with non-uniformly spaced stiffeners of varying directions, dimensions, and materials, while also assigning margins to each unique stiffener panel segment.
- Laminate Optimization for Manufacturability –An improved, six-step process optimizes laminates (transition zones, ply-count compatibility, ply drops/adds, global ply tracking) while balancing strength, stability, and manufacturability. This leads to fabrication efficiencies and factory-floor cost-savings.
- Other enhancements – New puck composite failure analysis for both 2D and 3D fiber fracture; new curved (skin) local buckling analysis; upgraded compression and shear post buckling analyses; enhanced panel concepts (PRSEUS, reinforced core sandwich, and tapered tube beam); improved test data and other graphical displays and functions; and new methods documentation. For more information, visit www.hypersizer.com.

Chris Martin
Crane Service, Inc.

Going green doesn't necessarily mean that you must erect an 80, 90, or even a 100-meter tower. Micro wind nacelles have a major impact while being kind to the environment.

GOING GREEN DOESN'T JUST MEAN BUILDING

the highest and biggest mW hour nacelle. There are many other facets to the wind industry that in some circles go unnoticed. It is easy to give attention to the projects that involve the biggest economical impact, but sometimes the smaller projects tend to be more interesting. If we take a journey to El Paso there is a 73-unit apartment facility that will require no fossil fuels to operate. It will be the first to rely solely on Mother Nature to power the facility.

Harnessing the power of the earth is becoming more and more popular on a consumer level. We are now seeing cars that have solar panels covering their surfaces; an energy solution only available at a premium cost. This is true about the wind industry, too. A renewable energy source that was only available to large energy companies is now becoming an option for everyone.

After leaving AWEA we can see that there are many manufacturers of nacelles that cater to the consumer level now, which is exactly what we have here. El Paso was recently approved under Senate bill 1910 to allow for net metering to take place. Net metering is the arrangement to sell off any excess generated electricity to local power suppliers, in this case El Paso Electric, for the same price as they purchase the power. This will allow the apartment complex to potentially profit from this venture over time. The estimated cost for each unit expense-wise is around $8 per year.

The complex will be utilizing Xzeres wind nacelles and an unknown brand of solar panels to create electricity. The nacelles will feature 12-foot blades that are capable of producing 10kW hour at 12m/s and sit atop a 24-meter monopole tower. The lift was relatively straightforward from a rigging and hoisting standpoint, but due to site challenges the project took two days to set both nacelles. The site challenges consisted of wind [which is normal large or small] and heavy construction traffic. The site now is only a few weeks away from completion, but at the time of this writing, was bustling with many types of construction crews. Even with these challenges we were able to finish the project on time.

The 2,300 lb. nacelle did not require a mammoth 16,000 or even a 2250 to erect. What we used, was a pair of mid-20-ton boom trucks; one to hoist a man basket and the other to hoist the actual nacelle.

We were excited and proud to be a part of a project that is so small, but has such a large impact. What is interesting about this industry is that the technology can be scalable to power cities and states to something as small as your house. It all started in New Hampshire 30 years ago with a site of 20 – 30kW nacelles. Now when you go to West Texas it is hard to escape the fact that you are in turbine country. The land is covered with 1.5 mW nacelles spinning almost by magic. Now we are seeing nacelles being utilized on a consumer basis in our own back yards; something I find truly remarkable.

From a construction stand point we are at the forefront of technology, innovation, and hard work. We have been making our lifts look like miracles for over 52 years. This isn't something we fell into, though. We have been working 24/7 making this happen, and instead of collecting awards, we have been collecting hours. We have taken the time to learn the wind industry, not just from the construction or maintenance side, but from all aspects. We have assembled a team that is truly remarkable, and a majority them have double-digit experience. It is easy enough to say we know wind, but we really do know wind. Day in day out we are on the mesas erecting 2250, 8460's, and our new 16,000; a construction feat within itself. We know wind on a large scale and on a small scale. Weirdly enough sometimes it isn't about being awarded the big maintenance contract. Sometimes the smaller project is the one that is the most exciting.

Chris Martin is marketing coordinator at Crane Service, Inc. Learn more at www.craneserviceinc.com.

Merritt Brown
Rev1 Power Services, Inc.

Despite sophisticated control systems on modern wind turbines, some critical subsystems remain in the capable hands of the wind technician to monitor their integrity and safe operation.

IT WAS NOT SO LONG AGO THAT CONTROL systems utilized physical indicator lights and annunciators to provide a warning system of system faults on operating equipment. Despite the advancement in technology from these time-tested control panels to high-tech computer monitoring systems, somehow they still lack the capability to remotely monitor some critical subsystems that are just as vital to turbine operation as the generator itself. In these instances it's left to the wind technician to confirm the integrity of subcomponents, to test the lights as it were, and monitor the physical operating condition of the turbine. Examples of these subcomponents include the ladder safety system, the nacelle hoist, cable support systems, emergency lighting, and turbine weather protection. These all represent turbine subsystems that have no operational sensors, no functional alarm monitors, and can only be evaluated during an actual turbine visit.

Ladder safety is inarguably the most important aspect of working on a wind turbine. Despite what should be the most highly audited subsystem on the unit, ladder integrity issues can be commonplace. From loosened cable clips to damaged ladder rungs, all of these material issues can be resolved through a more comprehensive and active maintenance plan. Because aluminum is a malleable metal and is subject to dents and nicks, many small dents or nicks on the beams and rungs are not unusual and are not grounds to fail a ladder. However, each rung should be capable of supporting a single concentrated load of at least 250 pounds applied in the middle of the rung. When a rung has been compromised due to a large dent or severe cable rub (that will likely manifest itself in the middle section of a rung), this should be given proper consideration for replacement. With no other indicator than a visual inspection during a climb, the priority of this subsystem is obvious.

The chain or cable hoist is another installed system that is not externally monitored and can often be inadequately maintained. These systems serve to raise and lower loads from the ground to the nacelle at weights of up to a ton and at heights in excess of 325 feet. In what might be a lesser known ASME Standard B30.16 for overhead hoists, the operator should be conducting a pre-use assessment that includes inspection of the hoist components as well as a test of its safety devices, particularly the brake and overrun limit protection. The inspection should also include examination of the cable hook and of the cable or chain for gross damage, kinks, or broken strands. Missing or damaged chain stops will fail to act as a manual brake should the chain be inadvertently extended to its full length. Substantial force can be applied to the stop in the event that the chain is fully run out and can easily be twice the Safe Working Load. If the stop is not present or is severely damaged, the chain may run through with potentially disastrous consequences. In addition to pre-use inspections, the safety features of the hoist should be tested at the manufacturer's interval or at least annually and recorded in accordance with B30.16.

Descending a wind turbine in the dark can add a whole new challenge to what is already a demanding task. Emergency lighting is installed for that one most inconvenient time when grid power is lost to the turbine and a climb must be made safely back down to ground level. Again, being an unmonitored subsystem of the turbine controls, the only way to know if the emergency lighting functions properly and will be there for them when needed is for the technician to conduct a frequent functional test. In addition to the periodic functional test, an annual performance test should be conducted in accordance with NFPA standards.

We have yet to see moisture gauges installed inside a wind turbine tower but maybe one day this might be a standard feature. Given that most turbines are installed in areas where seasonal weather can be somewhat unforgiving, protection from the elements has been passively designed into the turbine structure, yet management of weather ingress is left to the wind technician to detect and mitigate. Opening the turbine door to standing water or a flooded basement should suggest a lack of proper sealing on the turbine, and it could be from an area not so desirable such as the skylight doors. While it may be marginal to describe weather proofing as a subsystem, the results of poor weatherproofing can have a significant impact on turbine operation, particularly on electrical components that are installed down tower. This is one turbine function that certainly needs to be working.

Today's wind turbine controls, though complex and increasing in monitoring capability, lack in an all-inclusive understanding of turbine health. The wind technician still has an important role to play in managing subsystem integrity issues that are not part of the turbine control scheme, particularly when it comes to monitoring safety systems and their proper operation.

Merritt Brown is vice president of Rev1 Renewables, an energy services company supporting wind, solar, and biomass clients worldwide. To learn more call (866) 738-1669 or go online to www.rev1renewables.com.

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Matthew A. Lackner, Ph.D.
UMASS Wind Energy Center

Graphical Processing Units offer a promising solution for parallelizing computations of N-body problems and drastically accelerating computations.

UNSTEADY AERODYNAMICS CAUSED by platform kinematics represents a significant increase in system complexity for offshore wind turbines. Offshore floating wind turbines (OFWTs) present significant advantages over conventional offshore fixed foundation wind turbines, and can harness the vast deep water wind resource while avoiding many of the public acceptance issues that have impeded near shore development. OFWTs also pose significant challenges that are not present for conventional offshore technology, most critically the additional dynamic behavior of the floating platform.

In a previous article in this space by Lackner and Sebastian (a former PhD student at UMass), the additional complexity of the aerodynamics for OFWTs was highlighted. In particular, a variety of analyses revealed that OFWTs have a greater fraction of unsteady flow energy due to platform kinematics than a comparable monopile system, momentum balance assumptions that underpin all blade-element momentum and generalized dynamic wake-based analysis break down more often for OFWTs than for monopoles, and transition states are more prevalent.

As a compromise between the computational complexity of computational fluid dynamics (CFD), and the limited applicability of Blade Element Momentum Theory (BEM) to complex flowfields, a potential flow method has been chosen by researchers at UMass Amherst to model the aerodynamics of OFWTs. Time-marching free vortex wake methods (FVMs), a subset of potential flow, numerically advect the wake lattice, which is composed of Lagrangian markers connected by vortex filaments. This approach has been used for a number of decades, in particular in rotorcraft aerodynamic analysis. Recognizing this, Sebastian and Lackner developed the Wake Induced Dynamics Simulator (WInDS) code, a lifting-line theory (LLT) based FVM developed for OFWTs and validated via comparison to analytical models and experimental data. The results of the wake development of this model compare favorably to both the MEXICO experiment by the Energy research Centre of the Netherlands (ECN) and a two bladed experiment by the Delft University of Technology (DUT). Comprehensive analyses of the aerodynamics of three floating platform models – a spar buoy, tension leg platform, and barge – were conducted and the complexity of the flow field was highlight.

However, one of the major challenges in this initial research was the computational cost of the FVM calculations using WInDS, which limited the feasible spatial and temporal discretization of the wake, and thus the accuracy of the solution and the ability to conduct a large number of simulations. The main computational cost of the model lies in the solution of the N-body Biot-Savart Law, which is used to calculate the induced velocity at all Lagrangian markers due to all the vortex filaments in the domain. The straightforward "brute-force" solution of the N-Body problem can be prohibitively slow for large numbers of vortex filaments, i.e. large values of N, as the solution time is proportional to N^2. A typical wind turbine simulation of 60 seconds can have values of N of nearly 100,000. To address this problem and accelerate the computational speed of WInDS, Lackner and deVelder (a PhD student at UMass) have explored a parallel computing approach to the Biot-Savart Law. Specifically they investigated parallelism using a low cost, off-the-shelf, Fermi based graphics processing unit (GPU) with both a "naive" and tiled shared-memory implementation of the Compute Unified Device Architecture (CUDA) kernel. The Biot-Savart Law was coded in CUDA and then compiled as a "mex" function, which can be called by Matlab, which is the language that WInDS is written in. In this way, the simplicity of developing the overall code in Matlab is maintained, while the main computational cost of the code is solved outside of Matlab on the GPU. The results have been promising. Identical 30-second simulations were conducted, solved either with the standard CPU approach or on the GPU. The GPU implementation decreased the total computation time by a factor of 25 times. These results open the door for more complex FVM calculations with WInDS with higher levels of discretization and the possibility to conduct design optimization. Future work will investigate even greater computational gains using the Barnes and Hut tree-code (BHTC) as a low-barrier-to-entry option for algorithmic improvement, taking the computational expense from $O(N^2)$ to $O(N\log N)$.

Matthew A. Lackner, Ph.D., is an assistant professor of mechanical and industrial engineering at the University of Massachusetts Amherst and a member of its Wind Energy Center. He can be reached at (413) 545-4713 or lackner@ecs.umass.edu. Also visit www.umass.edu/windenergy.

Michael Graska
Professional Logistics Group, Inc.

Logistics planning becomes more difficult with uncertainty about the future of wind energy tax credits.

UNLIKE PREVIOUS YEARS, AWEA Windpower 2012 held in Atlanta, had less than stellar attendance. Unfortunately, the attendance downturn will very likely parallel the downturn in wind turbine installations next year. The reasons are well known and include the uncertainty of tax credits, tight credit and general global economic forces. Everyone I talked to at the show could not begin to predict wind's immediate future in the United States. This got me thinking about how this will affect logistics in the near future.

Four major groups will have to deal with this downturn, each being affected differently. The principle groups are; OEM (original equipment manufacturers), Developers, General Contractors, and Transportation Companies.

OEMs are already cutting back on production resulting in layoffs and reduction of capacity. This is very apparent with second tier OEMs. So, even if all the underlying issues for the downturn are resolved, it will take quite a few months to ramp up and fill the pipeline with products. Because of this, OEMs may very well buy from unaffected foreign sources. One caveat however, to this foreign sourcing could be import tariffs imposed by the US. In any case, all this uncertainty adds complexity, which makes logistics planning all that more difficult.

OEM reaction to this uncertainly may go in a couple of directions. Cutbacks may affect their logistics departments, in which case they may have to rely more on third party logistics companies for planning and execution. On the other hand especially the tier 1 manufacturers, work that was normally delegated to outside sources may be pulled back because of excess capacity. This would be done to further gain control over costs and better manage execution.

For developers, logistics costs become an even larger cost consideration. With tight budgets, keeping logistics cost down becomes a major factor in choosing who controls this item. The decision a developer has to make is whether to assume logistics control or delegate it to either the OEM or general contractor. There are good arguments for all these approaches and it also depends on the proficiency of the developer to handle logistics. But an important consideration is as the OEM cuts into its logistics capacity and knowledge, just how well will they be able to preform in the future and how much is the developer willing to take this risk.

Execution of a logistics plan has always been a focus of the general contractor. Having the right part at the right place at the right time is critical to their construction schedule. They are dependent on the capability of the logistic sources chosen by the OEM or developer. For the general contractor, they are at the end of a bullwhip, where as a slight movement at the handle in this case either the OEM or developer, results in a big movement for them. Choices by the OEM or developer will be greatly amplified as felt by the general contactor.

> "The surviving companies will be stronger, more innovative and competitive. And this is good news for OEMs, developers and general contractors."

Finally the changes for transportation companies will be large. Excess asset capacity will be mothballed or sold. Experienced personnel will migrate to other industries. An example of this would be heavy-haul drivers driving other equipment in other industries. Transportation companies will also shift resources to other industries for diversification. There will certainly be winners and losers within the industry. With a continuing trend of less companies capable of moving wind components. This will happen through attrition and consolidation.

But all of the above is not necessarily bad for the transportation industry. The surviving companies will be stronger, more innovative and competitive. And this is good news for OEMs, developers and general contractors.

Although the show was less than well attended, I can attest to the strong belief in the wind industry by the participants and attendees. All were pragmatic about the near future, but all were optimistic about the overall wind industry, especially if and when the overall issues are resolved. Everyone I spoke with is looking forward to the show next year in Chicago, if for no other reason than to see if it is a wake or a rebirth. I am betting on the latter.

Michael Graska is project leader with Professional Logistics Group. For more information go online to www.prologisticsgroup.com.

GLOBAL ENERGY SERVICES

By Sherri Mabry

Strategically located in key renewable energy markets in the Americas, Europe, and North Africa, GES delivers service expertise to customers with complex needs.

IN OPERATION SINCE 1996, Since its creation in 1982 as a provider of specialized technical services to the petrochemical sector in Spain, Global Energy Services (GES) has become a world-class service group providing their service to wind, solar and conventional energy industries.

"By the early 1990s when renewable energy was emerging in Europe as a main source of energy, GES was perfectly positioned to provide operations, maintenance and construction services to the market," said John Plantier, business development director of GES.

In 1992, Gamesa acquired the Spanish company to fill its need for a dedicated service provider, and in 2006, the division was sold to 3i and renamed Global Energy Services, an independent entity specializing in engineering, construction, installation, commissioning and the operations and maintenance for wind and solar farms.

"Our first construction project was in Graham, Texas, which consisted of 60 wind turbines, totaling 120 MW's known as the Barton Chapel Project. That project helped establish our place in the US wind market and since then we have provided services for over 4,100 MW's in the U.S."

In 2008 when the wind construction market declined, GES-USA turned its focus to the operations and maintenance sector and solar industry allowing the company to retain its talented construction group until the market returned. "We are now at the top of the list for O&M service providers in the U.S. with over 1,500 MW's under contract. That is tremendous growth in such a short term in a new market. We've installed over 30 MW's since 2008 and our pipeline is extremely healthy." he said.

Plantier says GES' established reputation in Europe and U.S. coupled with a thriving customer base allows the company to enter into emerging renewable energy markets. This year GES will finalize construction of wind and solar projects Chile and Puerto Rico, and the Canadian market last year. In addition, GES was recently awarded the Istmeno Wind Project in Mexico consisting of 215 MW's, the largest wind project in Latin America. "We started work in Latin America, Puerto Rico, and Canada because we are a versatile and we have experience working in various countries," he said.

With 150 employees in the U.S., GES has expanded its territory to California, Washington, Texas, Arizona, Indiana, Iowa, South Dakota, New York, Ohio, Maine, Wyoming, Montana, Delaware, West Virginia, Massachusetts and Pennsylvania.

"Our key focus isn't necessarily to be the largest services provider, but we want to be the best."

In order to provide the best service, GES operates facilities in different regions of the country. In the United States the company operates a warehouse and training center in Abilene, Texas, where technicians are required to complete extensive in-house orientation courses on health and safety and basic turbine knowledge.

"Our training regiment involves electrical, mechanical, and hydraulic theory, along with technology specific questions. The class room and online training coupled with the OJT helps create an extremely talented group of technicians," Plantier said.

On a global scale, GES has more than 4,000 employees, performed Balance of Plant services on more than 9 GW's, installation services of over 16 GW's, and provides O&M services for over 12 GW's.

"I think it's often misunderstood as to how large we really are, but we operate in 20 different countries, providing services for the largest turbine manufacturers and utilities in the market place like Gamesa, Vestas, Gestamp, ENEL, EDP Renewables, Eon, Iberdrola, Siemens, Repower, Clipper and others."

As GES continues to expand its client base, it is currently building the Punta Lima Wind Farm for Gestamp Renewables. The wind project will be 23.4 MW at completion consisting of 13 Vestas 1.8 MW wind turbine generators. The project involves constructing roads, WTG foundations, crane pad and laydown areas adjacent to each turbine site and installation and testing of 34.5kV collection and grounding systems in addition to building the 34.5/115kV substations, the O&M building, and the 115kV transmission line. Work is expected to be complete in July.

However, wind is not the only activity that GES is involved in Puerto Rico. In addition to the Punta Lima Wind Farm, GES is constructing the Ilumina Project, the largest PV solar farm in Puerto Rico for AES-Solar consisting of 23 MW's.

For more information about Global Energy Services, visit www.ges-usa.com or call 1-610-940-6088.

MANAGING THE GRID IN MAUI

With the increased need for clean energy on the islands of Hawaii, ramp rate control, and curtailment and capture mitigation become more important than ever.

By Sherri Mabry

For more information on First Wind, visit www.firstwind.com. For more information on Xtreme Power, visit www.xtremepower.com.

OVERLOOKING THE SCENIC SHORES on a ridgeline in the West Maui Mountains, First Wind's Kaheawa Wind Project is helping Hawai'i Clean Energy Initiative realize its goal to provide at least 70 percent of the power from clean energy sources by 2030. "This is the second phase of a project on a very small island electric system where this wind project is quite large in proportion to the size of the electric system versus a similar site on mainland United States," said Tom Siegel, vice president of Transmission for First Wind. "The challenge for us was the variability of wind power. It can significantly impact the reliability of the power system. As the wind increases or decreases along the trade wind path, operational frequency is affected."

Initial studies for the project by the Maui Electric Company (MECO) asked how much energy could be taken by the utility without upsetting the balance of current electrical output, customer needs, and how a wind farm would impact the utility's status with regulatory boards. The amount of energy could be supplied through wind energy were relatively low, so it was determined that the island and MECO could work in harmony if a 30 megawatt wind farm was constructed and connected to the grid.

The first phase known as Kaheawa Wind Project I

Fig 1: The final turbine on the Kaheawa Wind Project II is topped off in preparation for commissioning.

(KWPI) was completed June 2006 and now KWPII, a 21 megawatt site is due for completion in the next few months.

"The first phase is the wind turbines, substation and operations support facilities, but has no energy storage system," Siegel said. "Phase II includes 14 wind turbines rated at 1.5 megawatts for a total of 21 megawatts of wind energy. Phase II also includes the substation, integrated energy storage, and offices and facilities to monitor and maintain our integrated power system."

KWPI provided First Wind the opportunity to learn how the island and wind energy would exist together, and because the systems are small, curtailing the resources was necessary to maintain the reliability of the MECO electric system.

"People often talk about wind generation in terms of the average capacity factor. The Kaheawa wind project has an average capacity of 40 to 45 percent," Siegel said. "The Kaheawa wind project provides about nine to 10 percent of all energy consumed on the island curtailing the energy was a concern for the Maui utility company who contracted us."

Since curtailment was paramount to the success of both the KWPI and KWPII projects, First Wind had to manage the system frequency, transmission rates and also store energy for later use.

"When you add up the amount of utility-owned generation that has to be online and compare that to customer demand, there is often not enough of a difference to allow the utility to take all of the wind energy generation that's available, so you curtail or back down and that's where storage comes into play," Siegel said. "Combining wind and energy storage give us the ability to store energy for use at a later time. We sought a way to smooth out moment-to-moment variability when the wind is gusting strongly or suddenly drops off. We needed a storage system and that's how Xtreme Power's system became involved," he said. "The advantage of the energy storage system is it allows us to smooth out the variable wind generation and gives the utility company more time to make the decision of whether or not to start a generator when the wind generation drops unexpectedly."

This situation in Kaheawa was a significant concern for the local island utility provider, but investigational studies showed that by the electrical provider with continuous status updates on turbines, and substation and the energy storage system, it would be possible to deliver more renewable energy to a community eager to remain eco-friendly.

"As a wind farm developer, we had to ask 'do we have the ability to control the energy we provide to Maui's grid?'" Siegel said. "We found the Xtreme Power energy storage system was the right solution for the situation we faced."

The solution for First Wind and Kaheawa was an alternative energy system that maximizes the winds on the island's grid with a technology that integrates power management and energy storage into an intelligent package.

"We found that DPR was the right solution in this instance," he said. "It helps us meet stringent performance requirements and supply more energy to the residents of Maui than would have been possible without the energy storage."

Fig 2: Xtreme Power's containerized Dynamic Power Resource® (DPR®) with 1.5 MVA rated capacity and 15 minutes of energy storage duration.

Providing integrated power management and energy storage for KPWII was a natural fit for both companies since they had already worked on the first Maui project in 2008.

"MPWI was our first renewable integrated site where they took wind turbines and one of our Dynamic Power Resource (DPR) systems and put them together in order to smooth the wind and match it to the grid," said Alan Gotcher, president and CEO of Xtreme Power.

In Maui, Xtreme Power provided a 10 MW/20 MWh DPR to manage the renewable energy penetration rate increases where the likelihood of curtailment is higher. By combining the Dynamic Power

Fig 3: Xtreme Power's 24/7 Operations Center allows Xtreme Power's engineers to monitor all field installations remotely and analyze the DPR®'s performance in Real-time.

Resource for the 10-megawatt / 20 megawatt hour facility, the DPR stores excess power during curtailment periods and delivers the power to the grid when MECO needs more energy.

"Our system works with First Wind's turbines to provide ramp control, frequency and voltage services, curtailment capture, and responsive reserves to help our customer, First Wind, make more money in its operation," Gotcher said.

With ramp rate control through the DPR, the wind farm and the utility provider are able to smooth the wind to accommodate for wind variability so that it becomes much less of an issue.

"As an example, MECO might say 'I need to count on you to control the rate of change or ramp and it can't vary by more than one megawatt per minute up or down," Gotcher said. "We do this through software controls or energy in the battery and we are able to add or subtract power relative to what the wind farm is capturing through our Dynamic Power Resource."

When the wind park generates too much energy, MECO and operators are able to 'feather' the blade props so they spin slower and capture less energy in the curtailment phase. Any excess energy is stored in batteries on site and used at a later date when usage is higher.

DPR also incorporates a semi-responsive reserve capacity that turns on the alternating current when demand is high. Because this 10 MVA system has a dynamic range of 20 megawatts, the DPR can push or pull 10 megawatts of energy as needed.

When the wind is highly intermittent, the intelligent controls command the DPR to charge or discharge to smooth the power to the utility. If the wind ceases, the utility can command the storage system via Automatic Generator Control (AGC) to discharge electricity to the grid while the generator is coming online.

"Our system has several building blocks," Gotcher said. "Sometimes it is mounted in shipping containers that are 40-feet-long and situated at the base of the turbine or solar park. Sometimes it's a smaller box. It depends on the numbers of turbines. It consists of a gray box of one IGBT's with a silicon base with switches for high power demands. The system handles the power to the grid from the batteries and manages real and re-

Fig 4: To reduce dependence on fossil fuel generators, Maui Electric Co. (MECO) maximizes the exploitation of the prevailing winds by taking advantage of the additional 21 megawatts of wind electricity production generated at KWPII.

active power for AC that connects to transformers which step up the voltage to as much as 35,000 volts where the utility service takes the power."

The purple box inside the main system is the master controller for the converter, which visually pushes data to the company's site in Texas where technicians working 24/7 can control and monitor data lines from the farm to the utility provider as needed.

The DPR is bi-directional and can function in increments of five minutes, 15 minutes, 30 minutes, one hour, four hours or six hours depending on the energy needs in a particular location.

"The battery size is dependent on the duration of the energy cycle and we use copper bussing bars in sizes from 1-2 inches thick; 2-3 inches thick; and up to 2 to 3 feet long," he said. "So the system acts like three components with energy storage, chemistry, power, an electronic system controller and software in one. Dynamic means we can do all of this quickly; Power is how the industry looks at the output; and Resources is to complement other things we manage. That's DPR or Dynamic Power Resource."

By managing the wind with the existing power grid using a system that offers curtailment capabilities, First Wind, MECO and Xtreme Power can provide a regulated amount of power at a given time, while still achieving a high return on the energy generated and sold to customers in an effective way.

"Our first project using DPR was in 2006 at the South Pole," Gotcher said. "Of course that was in a remote location and we installed a DPR to a diesel powered generator to operate a radio telescope that is 20 feet in diameter. The telescope must rotate every minute to capture a signal, so the challenge was how to use our Dynamic Power Resource

Fig 5: Xtreme Power's integrated power management and energy storage solution is housed at the KWPII site overlooking the Pacific Ocean.

Fig 6: A shot inside Xtreme Power's 15 MVA rated DPR® at Kahuku installation on the island of Oahu, HI, First Wind's second project with Xtreme Power.

to rotate the telescope to generate power at regular intervals and then store the power during breaks. We do an alternating break and regeneration with capture so the break generates less power and stores the energy for later use. It does three million cycles per year and it pushes and pulls power as needed based on the available energy."

Xtreme's DPR is installed in 12 sites around the world with eight customers and 26 more projects in the works, and Gotcher speculates on how his company might generate more business as the industry evolves.

Siegel adds that his role with First Wind is making sure each wind farm interconnects and integrates to the existing power grid where he and his employees coordinate with each utility company to solve individual needs. "We have projects in Maine, Vermont, New York, Utah, Washington, and Hawaii and no project is the same."

KITING FOR WIND POWER

To access wind at altitudes above 200 meters, the Kite Power Research Group at Delft University in The Netherlands is capturing wind energy with Airborne Wind Energy (AWE), or computer-controlled kites.

By Dr. Roland Schmehl

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THE MAJOR PART OF ATMOSPHERIC WIND energy is inaccessible to conventional wind turbines. Computer-controlled kites provide an attractive solution to efficiently harvest this resource.

Wind generally gets stronger and more persistent with increasing altitude. For this reason, tower height is an important factor in the design of wind turbines and greatly affects their power output and capacity factor. However, even the largest turbines in the megawatt-range cannot exceed altitudes much beyond 200 meters due to the structural limits of tower-based designs. For offshore and particularly for deep-water deployment of such large turbines, the additional investments in foundations or mooring platforms are decisive cost factors.

HIGH ALTITUDE WIND

Airborne Wind Energy (AWE) systems are designed to operate at higher altitudes. Common features of the many different concepts are flying devices such as wings, aerostats, or hybrid designs, which are tethered to ground stations and which can be controlled in altitude and flight path. Adjusting the operation to the prevailing wind conditions, significantly increased capacity factors can be expected.

Fig 1: A 25 m2 traction kite flying high on a single-line tether.

Several concepts are already tested as prototypes and indicate that the technology is particularly attractive for areas where conventional wind energy systems cannot be operated economically.

AWE systems have other distinct advantages. Replacing the rigid tower of a wind turbine by a lightweight tensile structure directly translates into lower investment costs and a lower environmental footprint. The reduced visual and acoustic impact is an advantage for installations in ecologically sensitive areas or tourist destinations, while the low weight and compact dimensions is particularly suitable for mobile deployment.

TURBINE OR TRACTION POWER?

The existing approaches can be classified by the position of the electrical generator. "Flygen" concepts use either propeller turbines on the flying device or the flow-induced rotational motion of the complete device to drive on-board generators. The electrical energy is transmitted to the ground by a conducting tether. Essential advantages are the continuous generation and the comparatively simple launch and retrieval of the flying device, using the generators as motors to provide thrust and lift for hovering away from and back to the ground station. Technological challenges are the development of lightweight generators with high power density and of conducting flexible tethers capable of withstanding high mechanical loads.

Fundamentally different, "groundgen" concepts are based on the conversion of traction power using cable drums and connected generators on the ground. Essential advantages are the positioning of the heavy system components on the ground and the possible optimization for maximum traction performance and controllability. However, a single flying device requires operation in periodic cycles, alternating between reel-out and reel-in of the tether. As a consequence, electricity generation is intermittent requiring buffering across the cycles. Continuous generation can be achieved by using multiple, individually controlled flying devices to drive a loop configuration.

CONVERTING THE TRACTION POWER OF KITES

One of these designs is the "laddermill". Patented by former ESA astronaut Wubbo Ockels in 1996, it is based on a cable loop, which runs through a pulley at the ground station several kilometers into the sky. Kites are attached to the cable at equidistant intervals and by individually adjusting their aerodynamic properties for high lift in the upward moving section and low lift in the downward moving section of the loop, where a net traction force is established driving the generator connected to the pulley. The aim of the original concept is to access the kinetic energy of high altitude wind, however, it is obvious that a realization of such a large-scale system with many connected airborne components will be an outstanding technical challenge.

Avoiding the complexity of the airborne cable loop, the German company, NTS Nature Technology Systems, is developing a prototype system based on a cable loop, which is integrated into a horizontal rail track for kite buggies.

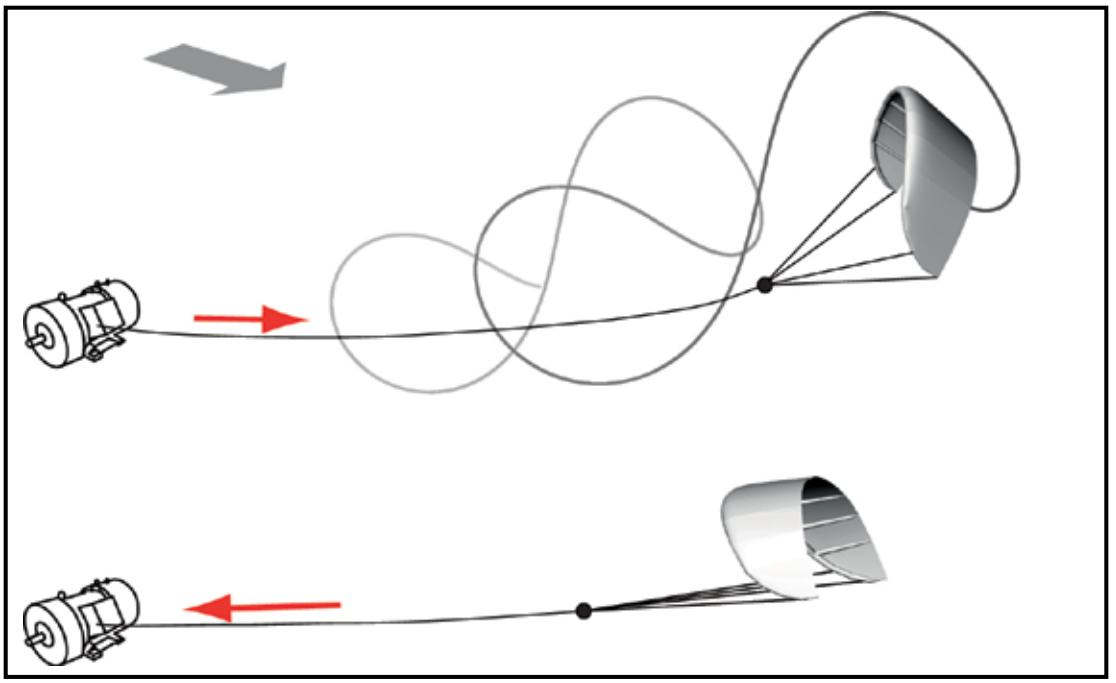

Fig 2: The system is operated in periodic pumping cycles, alternating between reel-out (top) and reel-in (bottom) of the tether.

Fig 3: 25 m2 Leading Edge Inflatable tube kite with suspended, tele-operated control unit.

Most of the current activities are focused on single-kite systems. A prominent example is the kite-based traction system for large cargo ships developed by the German company SkySails. The commercially available system can achieve fuel savings of up to 35% using kites of up to 320 square meters surface area with up to 160 kilonewtons (kN) of traction force. Single-kite systems for energy generation are based on the "groundgen" concept. To maximize the energy generated in the reel-out phase, the kite is flying fast crosswind maneuvers (see figure 2 top). This substantially increases the aerodynamic forces, lift and drag, which depend on the square of the relative wind velocity that the kite experiences. Typical flight patterns are figure-of-eights or circles, which are both used by kite surfers to achieve high speeds.

In the reel-in phase, the generator is operated as a motor and the kite is pulled back towards the ground station. The angle of

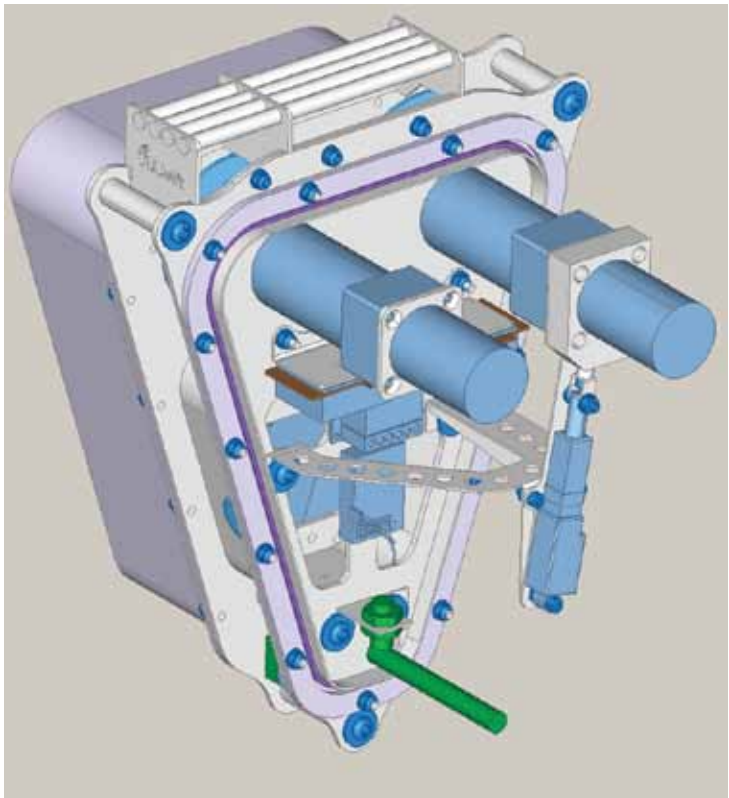

Fig 4: The Kite Control Unit incorporates two powerful micro-winches for steering and de-powering of the wing.

attack of the wing is decreased by rotating the kite into the relative wind to reduce the traction force (see figure 2 bottom). As a result of this de-power manuever, the reel-in of the tether requires only a small fraction of the energy generated during reel-out.

Balancing the energy across the periodic pumping cycles requires a storage mechanism, which can be an integrated battery module or a mechanical flywheel module. For a group of interconnected systems buffer capacity is less of an issue as the systems can be operated with phase-shifted pumping cycles. The Kite Power Research Group of Delft University of Technology initially tested a first experimental prototype of 3 kilowatts (kW) traction power in 2007 and since January 2010 a 20 kW prototype. The developments are co-financed with one million Euros by the Rotterdam Climate Initiative (RCI) and with 136,000 Euros by the Dutch province Friesland.

THE 20 KW KITE POWER SYSTEM

To minimize aerodynamic drag, a single cable is used to tether the Kite Control Unit (KCU), which is suspended some 10 meters below the kite wing (see figure 3), to the ground station. The cable is made of the high-strength plastic fiber, Dyneema. It has a diameter of 4 millimeters and a total length of 1 kilometer with the option to extend to 10 kilometers. A custom-made, Leading Edge Inflatable (LEI) tube kite with a surface area of 25 square meters generates the traction force. The main components of this inflatable membrane wing are the front tube, defining the curvature of the wing, the connected strut tubes, defining the

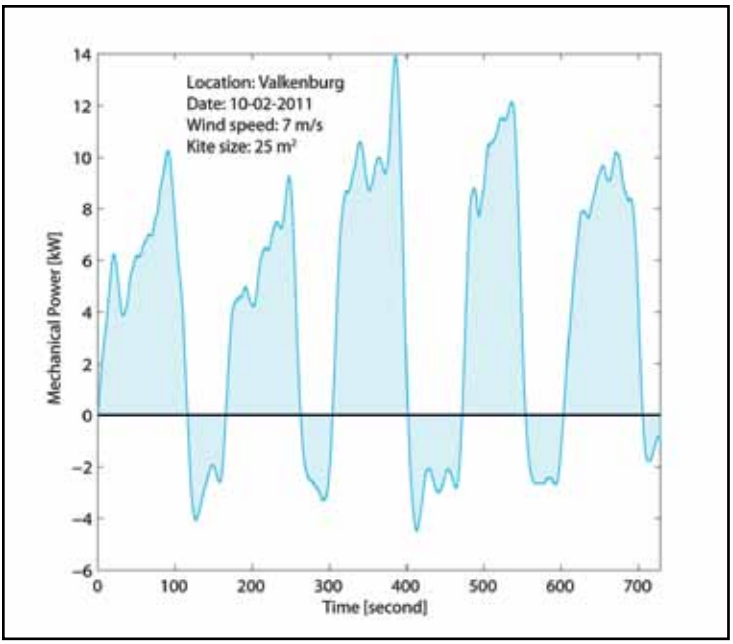

Fig 5: Traction power over five consecutive pumping cycles: reel-out phases (P > 0) and reel-in phases.

wing profile, and the canopy. The bridle line system connects the front tube to the structural frame of the KCU. The design of the bridle system incorporates pulleys to allow for deformation of the curved wing when rotating during a de-power manuever.

The KCU essentially is a cable robot incorporating two small but strong motor-winches for steering and de-powering of the wing using the two steering lines attached to the rear ends of the wing tips (see figure 3). It is connected to the ground station by two redundant wireless links. The autopilot software runs on the ground station computer and uses data transmitted from the KCU–the control positions and status of the different actuators–and from two sensor units mounted on the kite. The software alternates between two control modes corresponding to the two phases of the pumping cycle: a figure-of-eight trajectory control during reel-out, and symmetry plane stabilization during reel-in. The system tests in December 2011 have confirmed the reliability of the autopilot approach.

The ground station incorporates the generator with a rated power of 20 kW and a connected drum. Both are mounted on a sled, which is part of the feeding mechanism for the tether (see figure 4). A rechargeable battery module with a capacity of 18 kilowatt-hours allows for stand-alone operation and to cover periods of low wind by keeping the system employing reverse pumping cycles. The ground station controller uses measured velocity and force data to adapt the rotational speed of the drum such that the forces stay within the limitations of the system. An important feature of the development platform is the logging of all measurement data together with the video streams of various cameras at the ground station, the kite and the kite control unit. This data is used to analyse and improve the flight dynamics and structural dynamics of the kite as well as the performance of the complete kite power system.

OPERATION AND TEST RESULTS

More than 400 pumping cycles (equivalent to 13 hours continuous operation)" have been recorded and analysed in detail. The maximum operational altitude depends mainly on local airspace regulations. At the present test site, the former naval airbase of Valkenburg, which is located in the controlled airspace of the international airport Amsterdam, the operational altitude varies between 150 and 300 m, with the length of the cable varying between 180 and 400 m. At a more remote test site, a maximum height of 500 m with a maximum cable length of 700 m was possible. Depending on the wind velocity, the flight velocity of the kite during reel-out is between 70 and 90 kilometres per hour. To maximise the net energy per pumping cycle, the reel-in phase has to be as short as possible with the tension in the cable as low as possible. However, de-powering the kite by rotating it into the relative wind negatively affects the flight stability and steering behaviour and in practice, a compromise between achievable de-power and diminished flight authority is required. For operation at a wind speed of 7 m/s, the cable force can effectively be lowered from 3.1 kN during reel-out to 0.6 kN during reel-in at a speed of 5 m/s.

The figure 5 shows the instantaneous traction power at the drum over 5 consecutive pumping cycles, illustrating the alternating energy generation and consumption phases. The oscillations during reel-out are caused by the variation of the relative wind velocity during the figure-of-eight flight manoeuvres, between 4 and 5 per reel-out phase in this particular test. Considering the complete cycle, the traction power average is 4 kW. As a result of systematic optimizations on component- and system-level, affecting the kite

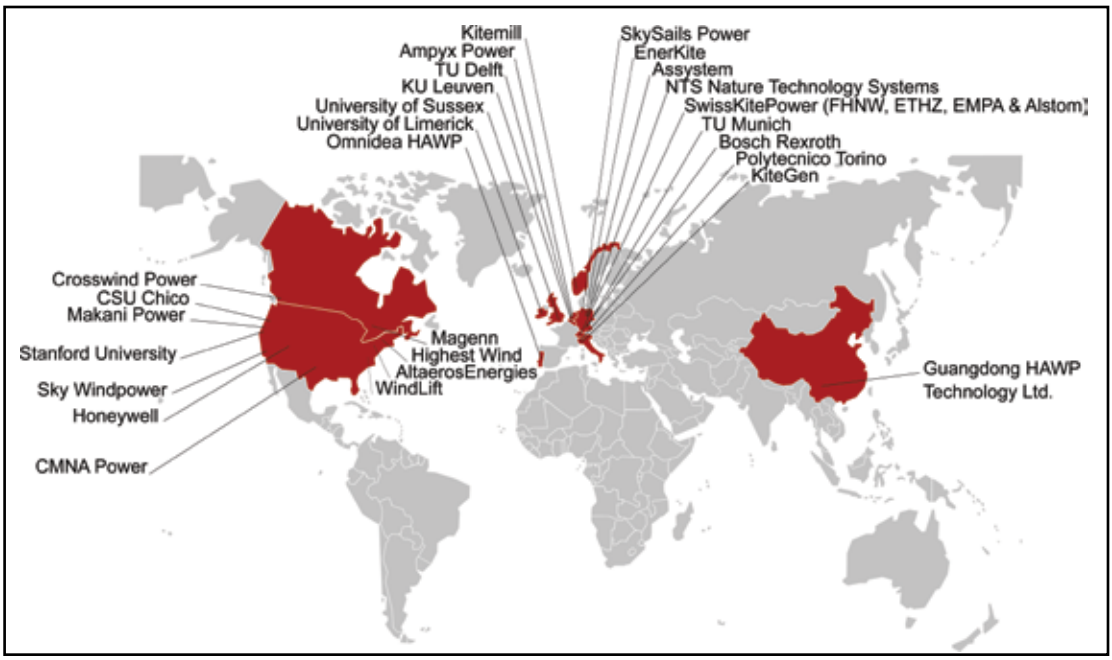

Fig 6: International research and development activities on Airborne Wind Energy in 2012.

and bridle system design, the responsiveness of the ground station winch and the flight trajectory, the traction power average has been increased to presently 6.5 kW, with the goal to achieve 9.6 kW in the near future. The tests have shown that the kite energy system can be operated even with very little wind on the ground. In this case, the kite is winch-launched, like a glider

Fig 7: Cable drum and 20 kW electrical generator.

plane, until it picks up the wind at higher altitudes. The current system can be operated at wind velocities up to 9 m/s, resulting in a projected aerodynamic wing loading up to 30 kg/m2. For stronger wind a smaller kite can be used up to the maximum wing loading of 40 to 50 kg/m2 for kite designs based on Nylon.

FUTURE APPLICATION AREAS

The specific design of kite power systems is attractive for a number of application areas. With a rated power between 10 and 30 kW, commercial derivatives of the technology demonstrator system are suited for distributed generation of renewable energy in remote areas or in disaster areas, especially when deployment and start-up times are crucial and fuel supply is cost-decisive. For stand-alone systems of this power range, full automation is not strictly required and, consequently, ground personnel can assist launch and retrieval of the kite. Once in the air, the kite control unit and ground station winch switch to automatic operation. The production cost of a small-scale power system will be determined mainly by the ground station and the kite control unit, both incorporating mechatronic components with various sensors and embedded control systems. The flexible airborne system components – kite, bridle system and tether – are optimized to capture and transfer the aerodynamic force to the ground. Compared to the costs for structure and foundation of equivalent wind turbines, these components are inexpensive. Due to material degradation, a replacement in periodic intervals will be required, which will affect the operational costs of the system.

Offshore wind energy could profit in a major way from the cost advantage of kite power systems. Since the generator is close to the sea level, the moment induced by the traction force of the kite is a tiny fraction of the moment induced by a wind turbine tower rising to more than 100 m above sea level. For this reason, kite power systems can be deployed from inexpensive floating platforms, which are moored to the seabed to avoid drifting. The technology of semi-automated launch and retrieval of kites with surface areas of several hundred square metres from ships has been successfully developed and commercialized by SkySails. This demonstrates that large-scale offshore deployment of kite power systems in the MW-range is technically feasible. The environmental impact of an offshore wind park of kite power systems will be lower than that of a conventional wind farm. The cables leading into the sky are hardly perceivable from a distance and the same holds for the large membrane wings sweeping back and forth at higher altitudes. As consequence, the new technology has the potential to significantly alter the public perception of wind power and thus accelerate the transition from fossil and nuclear energy to renewable energy.

CURRENT R&D LANDSCAPE OF AWE TECHNOLOGIES

A key challenge for current research and development activities is robust automatic operation of tethered flying devices, which is a central requirement for reliable base load power generation. Recent advances in flight control algorithms, modelling of structural dynamics, aerodynamics and flight dynamics of flexible membrane wings, and the availability of hardware prototypes with sensor equipment have led to several successful demonstrations of automated flight. Similarly important are technological advances on high-strength, lightweight and UV-resistant materials to significantly increase the durability and lifetime of the airborne system components and thus decrease the maintenance effort and operational costs of AWE systems.

The emergence of AWE as a new technology complementary

Fig 8: A 25 m2 tube kite flying cross wind maneuvers observed from the ground station.

to conventional wind energy is relatively recent, mainly motivated by the drastically increased demand for renewable energy. For example, the number of institutions actively involved in AWE has increased from three in 2000 to presently over 40 (see figure 6). The last 5 years have also seen some major investments. Since 2006, Google has invested $15 million in California-based start-up company Makani. In 2010, the company received an additional ARPA-E grant of $3 million from the U.S. government and it recently won the Popular Mechanic's 2011 Breakthrough Innovator Award in the Energy Category.

In 2011 the high altitude wind power group of the University of Leuven in Belgium received an ERC Starting Grant of one million Euros from the European Union.

The annual event for presentation of research and development achievements, exchange of ideas and development of new visions is the Airborne Wind Energy Conference (AWEC). After the successful launch in 2010 at Stanford University, in California, the event was held in May 2011 in Leuven, Belgium. Mid 2011, SkySails announced use of their technology base of kite-assisted ship traction as a starting point for venturing into power generation. Coincidentally, Garrad Hassan, a globally operating wind energy-consulting firm, has published a market status report on high altitude wind energy, critically analyzing more than 20 of the most advanced AWE projects.

Business research and consulting firm Frost & Sullivan, and the German Fraunhofer Institute are preparing technology assessment reports.

ALL WIRES AND CABLES ARE NOT CREATED EQUAL

When comparing life cycle costs for wires and cables in wind systems, consider the specific applications, cost per failure and dielectric losses to determine a cable's return on investment.

By Sherri Mabry

For more information, call 770-832-4403 or visit www.southwire.com. Also call 1-800-441-4369 or go to www.dow.com/electric.

CHOOSING THE RIGHT WIRES AND CABLES for wind farms may be one of the most important elements to consider in terms of longevity, reliability of service and cost of ownership for the system. At the AWEA Windpower 2012 show in Atlanta, GA, many industry leaders lamented the fact that employing best practices in selecting equipment and materials are not always the reality.

Wire and cable manufacturers in particular say they are disappointed to see customers sacrificing projects by choosing lesser quality materials.

"Reliability and cost of ownership of all wind farm components should be the top priority in wind energy assets because the lifecycle cost of such a major investment is an important consideration," said Jim Rosborough, North America Commercial Director, Dow Electrical &Telecommunications. "We see some developers choosing cheap and unreliable products that fail early and often when maintenance and replacement is not in the budget. This could have been avoided by using the right product from the beginning of the project."

In the rush to cash in on wind energy, some developers trade low first costs for higher total cost of ownership over the life of the system. The lowest cost wind project is when you do it right from the

beginning. Costly repairs to fix a project won't be sustainable in the long term," he said.

Potential failures and repairs can saddle owners, operators and ultimately the communities they serve with unexpected expenses, higher utility prices and premature equipment failure.

"Wire and cable components constitute a relatively small percentage of the total cost of the project – less than one percent. And the difference in cost between quality components and lower quality, lower price components can be less than 10 percent. Therefore it doesn't make sense to endanger the reliability of a $500 million wind project by using off-quality materials," said Ron Burchfield, director, Renewable Energy, Southwire Company. "The resulting cost of repairs from using off-quality materials is eventually passed to the owners and operators and ultimately the customers."

Wire and cable suppliers and manufacturers see this as a problem with some of the developers that have only a short-term interest in a project before selling to a permanent owner. The realization of quick profits by using lower quality components will come at the expense of owners and users of the system."

"Wind assets make money when they deliver energy to the grid. In other words, what comes out of the substation is what the wind farm gets paid for," Burchfield said. "So all materials going into the system – from turbines to cable – need to be of a high standard from the beginning."

Engineers say the rush to commission more wind farms has outstripped the usual development cycle of trial and error that results in mature technologies that define the equipment suited for the job. This may result in purchasing decisions based on lowest initial cost of ownership, not solutions that provide the best choice in terms of cost of ownership, network stability, higher maintenance costs and more downtime.

Carol Godfrey, vice president of marketing and product development for Southwire's Energy Division agrees. "If you deliver value with high performance assets and time, energy and engineering talent is considered and used properly, you'll find longevity because of the pride and quality of workmanship throughout the system. Wire and cable is a key component of those systems."

In a paper by the IEEE PES Wind Plant Collector System Design Working Group titled, Design and Application of Cables and Overhead Lines in Wind Power Plants, the authors provided a summary of the most important considerations for wind power plant collection systems. In their research, cable selection, cable properties, cable splicing and construction above or below ground were all considered. "Ease of installation and handling, as well as jacket material, insulation and rating, short circuit withstand ratings, and conductor material are all considered important in reliability and longevity of the wind power system.

"Making quality cable and using quality cable should be part of best practices for the wind industry. The industry currently lacks standards that are used in traditional power systems," Burchfield says. "We're confident in our reputation and our product because we've had cables, manufactured to meet or exceed power industry standards in the ground with major energy companies and our products are still doing the job."

Dow E&T also has a successful history with its

OTHER PRODUCTS SHOWCASED AT WINDPOWER 2012

Helukabel USA also discussed its cable product line, which includes the HELUWIND WK-Series ALU DLO cables are developed and tested to provide a service life of more than 20 years, according to the manufacturer. These products use specially stranded copper or finely stranded, flexible aluminum and unique conductor and jacket insulation compounds.

Alexander Kanouni, regional sales manager, said the WK-Series offers superior resistance to torsional stress with a wide operating temperature range and the line meets Global UL, CSA, VDE and CE global approvals for use in both on and off-shore projects.

The JZ 603 and JZ603-CY control cables, which recently received certification from CCC (China) and GOST-R (Russia) for use in wind turbines, and In addition to UL, CSA and HAR certification.

The Powerline ALU DLO is designed for use within the tower of the turbine to transfer electricity generated in the nacelle to the base of the tower for disbursement into the power grid. These low smoke, zero halogen power cables are extremely flexible and easy to install, according to the manufacturer.

The Powerline ALU offers turbine manufacturers and operators cost savings from lower metal surcharges and a 50 percent weight reduction and easier handling with increased flexibility for tight bending radii.

The manufacturer said these flexibly screened or unscreened wind turbine TC-rated cables are suited for transmitting data and power to the operating components within the turbine's nacelle and tower base.

The TRAYCONTROL cables are also oil resistant, flame retardant and compliant with NFPA 79 2007 standards and made to withstand hot and cold climates around the world.

These flexibly screened or unscreened, Wind Turbine TC-rated cables are best suited for transmitting data and power to the operating components within the turbine's nacelle and tower base. Protected by PVC, PUR or TPE outer jackets, the TRAYCONTROL-Series has been TC-ER, PLTC-ER, and ITC-ER approved for open installation. Additionally, TRAYCONTROL-Series cables are oil resistant having passed Oil Res I and II, flame retardant according to the FT4 flame test, compliant with NFPA 79 2007 standards and have been extensively tested for use up to 10,000 cycles.

For more information, visit www.helukabel.com.

products and Rosborough says Dow works with cable makers such as Southwire to deliver materials such as DOW ENDURANCE HFDC-4202 EC, an advanced performance tree-retardant cross-linked polyethylene (TR-XLPE) MV insulation to insure reliability.

"Dow E&T upgraded its medium voltage (MV) insulation to achieve a new level of performance for underground (UG) cable manufacturers, installers and utilities," Rosborough said. "The HFDC-4202 EC provides easier installation, lower operating costs for the wind farm, enhanced reliability, longer life and optimized asset management."

"Dow is excited to partner with Southwire because quality materials combined with quality cable manufacturing delivers the best outcome for customers," Rosborough said. "Wind power producers must ensure reliability of the power connection for the duration of the wind farm lifecycle."

Rosborough continued by saying that Dow has demonstrated that proper material selection is critical to the performance of cable in field applications by conducting rigid testing and surveys of utility cable engineers who identified several attributes they consider valuable for reliable performance.

Like Dow in the insulation of products, Southwire is the leading wire and cable manufacturer in North America, offering utility cable products, including overhead and underground transmission and distribution cable and other products for industrial applications. Southwire's complete renewable energy solutions include wire and cable for turbines, towers and collection, overhead and underground transmission and substation wiring.

"Wind is one of the fastest growing segments of our energy portfolio," Burchfield said. "As a full-line cable supplier for this market, we're excited to let our

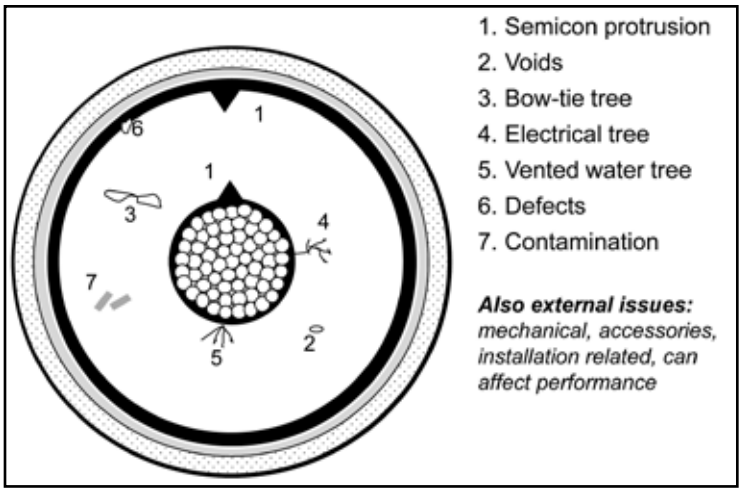

Figure 1: Examples of Cable Defects

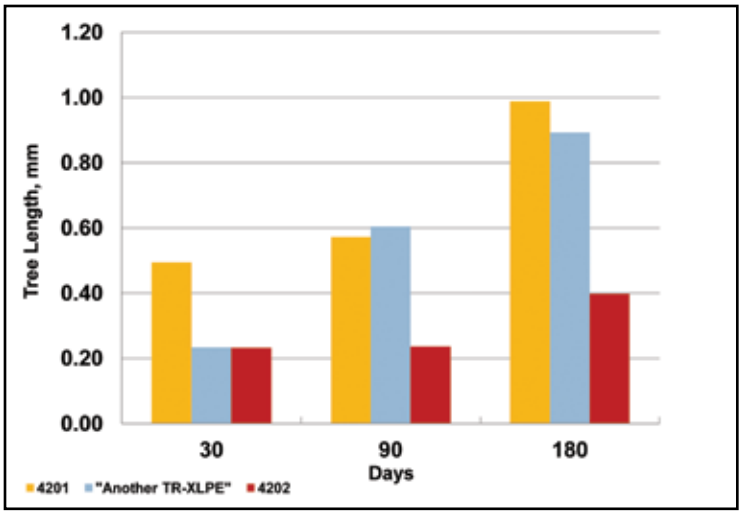

Figure 2: Water Tree Length @ 40°C (ASTM D6097) UCC Water Tree Growth Test at 5 kV, 1 kHz, 0.01 M NaCl, 3 mm needle tip

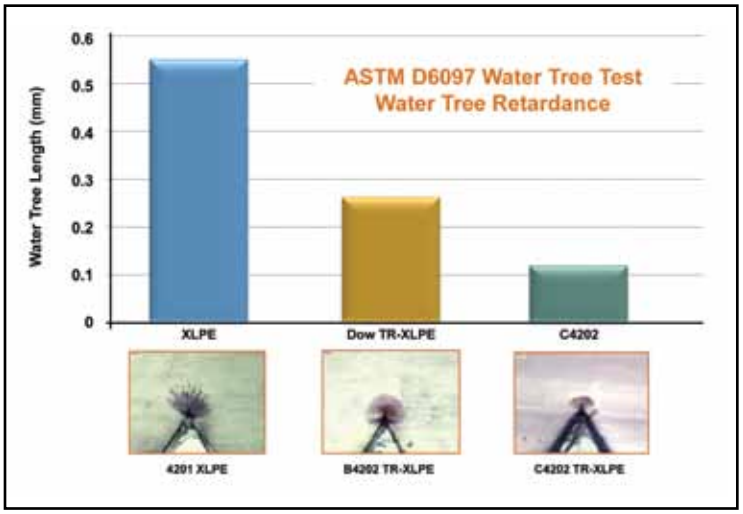

Figure 3: HFDC 4202 Water Tree Comparison, ASTM D6097; 30 day Aging

customers know how Southwire's cables ensure reliable, cost-effective power throughout the life of renewable energy systems."

Rosborough said unplanned cable repairs are costly in terms of maintenance and downtime is a profit killer that could be avoided by installing cables that exceed utility industry standards in UG cable for wind power applications.

"TR-XLPE insulated MV cables made with DOW ENDURANCE products have been operating in-ground for years," Rosborough said. "We know our products will last because they've already been tested in traditional utility applications. We have done studies with utilities to dig up cables to assess long-term performance. In one study, after 17 years in service, the insulation exceeded in providing electrical strength and long wear well above NA-ANSI / ICEA minimum requirements. These same cables, now 30 years in service, says a lot about the product; same thing with Southwire's cables and wires. They have been in business 60 years in traditional utility applications and since the beginning with wind turbines in the U.S., and their products are still performing as expected."

Rosborough said the insulation materials are produced at the company's plants in North America and reduce dielectric losses to increase the amount of energy delivered, while eliminating failure and repair costs. The insulation results in clean and consistent performance, retention and magnitude of electrical strength efficiency. The jacketing's physical characteristics resist moisture absorption, the conductor shield is fully bonded and the insulation shield is easy to strip.

COLEMAN'S WIND POWER CABLES AVAILABLE

Coleman Cable Inc, offers a variety of cable solutions to insure the requirements and demands of all wind generation systems will be met for the effective transfer of power onto the grid.

With several years experience in the wind industry and hundreds of installations in the U.S. and abroad with both standard and custom cable designs, CCI, says the success of cables depends on proper copper fabrication, torsion testing, and installation.

Coleman offers single conductor, control, grounding and multi-conductor cables among others.

The single conductor cables rated 600v, 1000v and 2000v feature flexible or extra flexible stranding in EP, XLP or TPE insulations with CPE, TPE and Polyolefin jackets that can withstand temperatures of 105°C, 90° C or 75° C in wet or dry applications with a -40° C cold impact option.

Rated WTTC, RHHW-2, PPE, AWM, FT-4 and UL, CSA, ETL or c(UL) certified. For more information, visit www.colemancable.com, or call 1-800-323-9355.

He attributes the success of his company's products to extensive testing and validation processes and a commitment to produce wire and cable products that exceed current power industry standards.

Burchfield agrees that being committed to developing the best products available is important to meet the unknown challenges of the renewable market, both on and offshore in a variety of demanding applications.

Southwire also offers a complete line of products for the wind market, including its TR-XLPE medium voltage cables, overhead CAMV cables, 2KV power cables, fiber-in-duct and grounding conductors, all used in the wind farm collection system.

Additionally, they produce the cables used within the wind turbine and tower, the cables used withstand the substation and a full line of both overhead and underground high voltage transmission cables.

As a single source providerwind turbine DLO, kV Cable, for transferring power in wind turbines in wet or dry areas. This cable resists oils, acids, alkalines, heat, flame and has abrasion resistance.

As a single-source provider for cables from generation to transmission, Burchfield says the company's customizable solutions may help to improve costs, reliability and compliance throughout the energy chain.

INDIVIDUAL PITCH CONTROL AND ITS IMPACT

Larger wind turbines with longer rotor blades and higher tower structures are creating technical challenges for turbine designers, but problems can be resolved with proper planning.

By Dr. Sherif El-Henaoui

Dr. Sherif El-Henaoui is the European Marketing Director, Moog Industrial in Böblingen Stuttgart, Germany, and Varese, Italy. He is responsible for developing and implementing the marketing strategies for Moog Industrial in Europe. For more information, visit www.moog.com/wind.

HOW CAN WE DEVELOP WIND TURBINES that reduce the overall cost of electrical power generation? When answering this question, investment costs as well as operating and maintenance

(O&M) costs have to be taken into consideration. One of the focal areas of this paper is load reduction as it can play a key role in increasing turbine efficiency and lifetime. When trying to reduce loads on turbine structures, designers focus on pitch control systems. We present recent technological developments and research results in this field, especially concerning Individual Pitch Control (IPC).

Given the opportunities and challenges in wind energy, we see the need for close cooperation between turbine designers and key system suppliers. This means companies combining their strengths and expertise by jointly engaging in research, as well as the development of prototypes and systems. Our partnership approach for developing future wind energy solutions is further explained at the end of this White Paper.

DEVELOPMENTS IN THE WIND ENERGY SECTOR

How are we going to meet our energy demands in the future? When governments and businesses

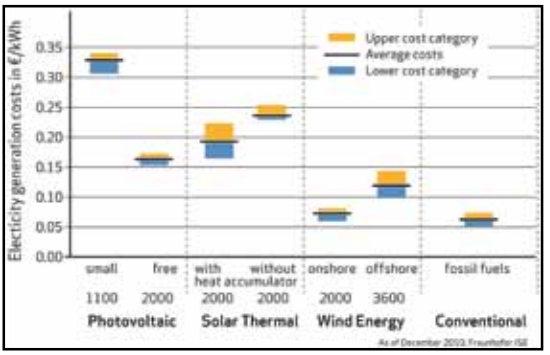

Figure 1: Comparison of electricity generation costs for selected renewable and conventional technologies.

worldwide draft strategies to answer this question, renewable energies play an increasingly important role. Among renewable energies, wind energy has gotten a head start in the race towards competitiveness. Electrical energy generated by wind power can already compete with energy generated by fossil or nuclear sources. [1]

According to a study of the Fraunhofer ISE from December 2010, wind energy plants in locations with favorable wind conditions can already compete with conventional power plants. The costs for electricity generated by onshore wind parks are currently 0.06 to 0.08 €/kWh, which is in the range of electricity generation costs of conventional power plants using coal, lignite or nuclear fuels. [1] Consequently, wind parks are emerging from the state of research or pilot projects to commercially attractive investments. Large energy companies are increasingly investing in wind power. Among these investors are companies specialized in wind power but also electrical power suppliers who are relying on a mix of fossil, nuclear and renewable energy sources. When planning new wind parks, especially in Europe, one of the main hurdles is getting approval from authorities. Due to regulations with respect to landscape protection and noise control, the sites available for new wind parks are increasingly located offshore or, in the case of onshore installations, in remote areas. These sites are often characterized by poor access, extreme climatic conditions or non-ideal wind conditions. For the manufacturers of wind turbines this means facing new challenges: their wind turbines need to withstand extreme temperatures and work efficiently for a wider range of wind speeds. The installation of turbines in areas with poor access also places increased emphasis on operating and maintenance (O&M) costs.

The growing importance of wind energy as a source for electrical power generation leads to stricter requirements concerning reliability and predictability of the power supply. Meeting grid code requirements with respect to frequency and voltage becomes more and more important for operators of wind parks. Large energy companies engaged in the wind power business are likely to focus their development efforts on meeting these requirements. [2]

The necessity to lower the overall cost of electrical power generated by wind turbines (cost per mega watt) has led to a trend towards larger turbine sizes. Especially for offshore installations the cost of the foundation represents a substantial part of the overall investment cost. It proved to be more cost efficient to build wind parks with fewer large

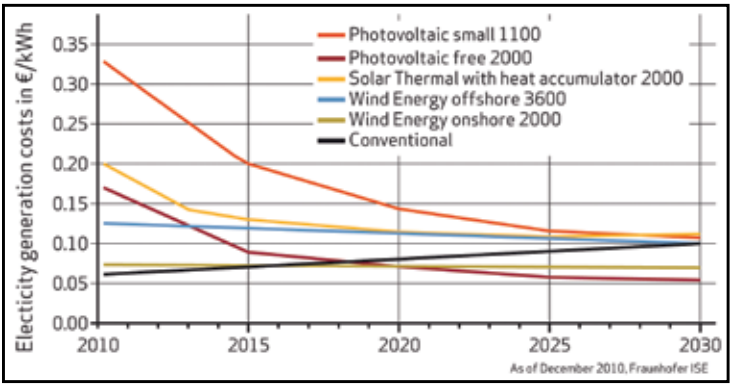

Figure 2: Learning curve based forecast for the development of electricity generation costs until 2030.

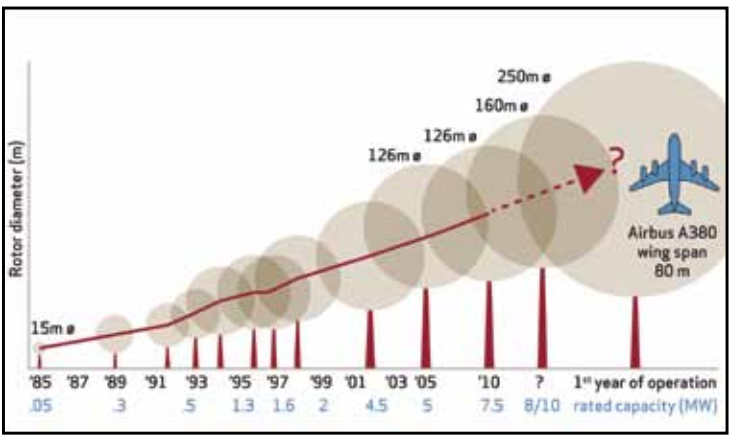

Figure 3: Evolution of standard rotor diameters.

size turbines than a large number of smaller turbines. [3]

EVOLUTION OF STANDARD ROTOR DIAMETERS

However, larger turbines with longer rotor blades and higher tower structures are creating technical challenges for turbine designers. The longer the rotor blades, the stronger the effect of any in homogeneities of the incoming wind field. Examples of such in homogeneities are lower wind speeds close to the ground and higher speeds with increasing distance from the ground (wind shear). Such a gradient of the wind speed translates into an asymmetric load on the rotor blades. The feasibility and technical challenges of large wind turbines has been the subject of recent studies and publications, notably the upwind project sponsored by the European Commission. While the power output of commercial wind turbines is usually in the range of 1 to 7 MW, the upwind project evaluates the feasibility of a 20 MW turbine. [4] [5]

INDIVIDUAL PITCH CONTROL

How can designers build wind turbines with longer lifetimes? Recent economic and technical developments such as the pressure to reduce the overall cost of electricity generated by wind turbines, the necessity to reduce O&M costs as well as increased emphasis on reliability and predictability of power production make it urgent to find a technical solution to that question. Load reduction is a key element of the solution. In addition, load reduction gains an increasing importance due to the trend towards larger wind turbines. Individual pitch control (IPC) plays a key role in compensating loads. So what is IPC? Any pitch control system allows control of the turbine speed and consequently the power output. It also acts as a brake, stopping the rotor by turning the blades. Moreover, pitch control, especially an IPC system, has a role in reducing fatigue loads on the turbine structures. Recently developed wind turbines are variable speed turbines capable of adapting to various wind conditions. This adaption is realized via new generator concepts on the one hand, and a pitch control system on the other hand. Pitch control means the turning of rotor blades between 0° and 90°. When wind speeds are below rated power, typically below 12 m/s, the rotor blades are turned fully towards the wind which means that the pitch is positioned at 0°.

At increasing wind speeds the pitch of the blades is controlled in order to limit the power output of the turbine to its nominal value. When wind speeds reach a predefined threshold, typically 28 m/s, the turbine stops power production by turning the blades to a 90° position.

Collective pitch control adjusts the pitch of all rotor blades to the same angle at the same time. In contrast, IPC dynamically and individually adjusts the pitch of each rotor blade. Based on current individual loads this pitch adjustment is carried out in real-time. The main benefit of IPC is the reduction of fatigue loads on the rotor blades, the hub, and mainframe and tower structures. In order to compensate these loads, especially symmetric loads caused by inhomogeneous wind fields, the pitch of each rotor blade has to be adjusted independently from the other blades. A reduction of fatigue loads has two considerable advantages: It allows lighter designs and translates into longer lifetimes of

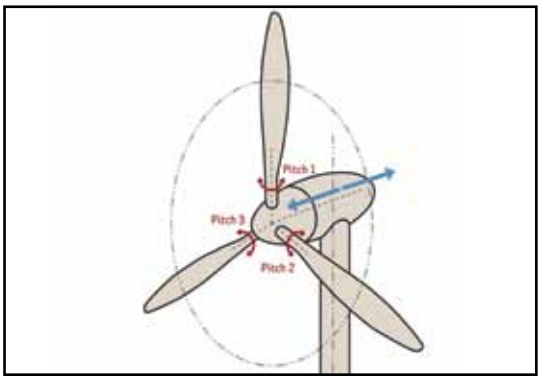

Figure 4: IPC individually adjusts the pitch of each rotor blade (pitch 1, 2 and 3).

wind turbines. What is meant by lighter designs? In cases where components are designed according to fatigue loads, a reduction of these loads allows savings in cost and material notably for the rotor blades and the tower structure, which are the most expensive elements of a wind turbine. Moreover, lighter rotor blades enable a more efficient turbine, especially in low wind conditions. Finally the load reduction through IPC gives designers the option to develop low wind turbines from existing designs, which means a reduction of time to market.

LOAD REDUCTION – A TECHNICAL OVERVIEW

During start-up, regular operation (power generation) and shutdown a wind turbine is subject to various forces causing peak loads and fatigue loads. In the context of this paper we shall focus on fatigue loads because they can be influenced by pitch control systems most effectively. Let us consider a wind turbine in operation at nominal wind speed and above, and have a look at the forces acting on the main elements of the turbine e.g., rotor blades, hub, mainframe, and tower. The rotor blades are subject to periodic bending forces. These bending forces are acting in two ways: First, edgewise bending in the direction of the rotor movement and second flap wise bending in the direction perpendicular to the plane of movement. There are also forces on the hub, mainframe and tower structures. These forces have two effects, in particular on the tower: The yaw moment (M_{yaw}) is twisting and the tilt moment (M_{tilt}) is bending it.

When designing strategies to counterbalance the forces discussed above, a first step is an analysis: The Fourier analysis gives what is usually called the 1p, 2p, 3p, components of the loads. Classic IPC, which is most often used, only compensates for the 1p component. Other components can also be addressed by IPC but their compensation requires increased pitch activity and more dynamic control systems. Highly dynamic control systems would

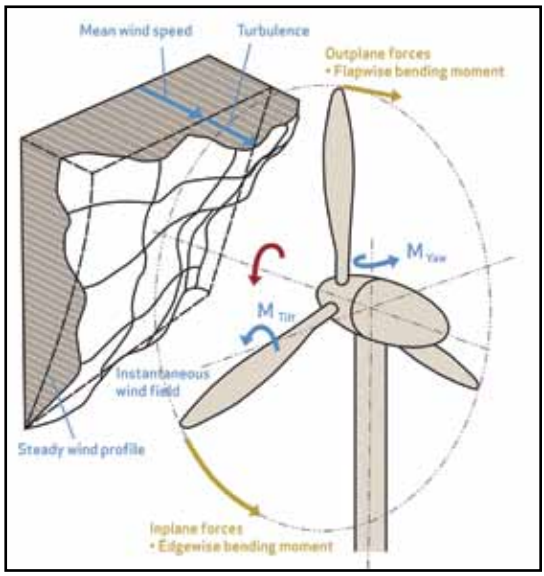

Figure 5: The main forces acting on a wind turbine.

also be necessary to fully benefit from recent developments in wind measurement. The newest measurement technologies such as LIDAR (Light Detection and Ranging) provide real-time information on wind conditions and forecasts for the next few seconds. Based on this information it becomes possible to prevent peak loads by using IPC to develop preventative load alleviation strategies. [4]

Advanced blade sensing systems provide information about the load condition of the rotor blades in real-time. These monitoring systems rely on sensor technology using e.g., optic fibers embedded in the rotor blade material. Using IPC and blade sensing systems to adjust pitch actions to the actual loads measured for each rotor blade individually becomes an obvious choice.

ECONOMIC CONSIDERATIONS AND TECHNICAL CHALLENGES

Compared to collective pitch systems, IPC systems require higher investment costs. These investments relate particularly to a more complex control strategy, higher requirements for the pitch motor and increased fatigue loads on the pitch bearings and pitch gears. However, as shown in the graphic below, the cost of any pitch system is low in comparison to the overall cost of a wind turbine. The savings in other components due to reduction of fatigue loads have the potential to compensate for the extra investment for an IPC system. When creating the business case, turbine designers would therefore need to consider the entire cost of a wind turbine. When not only investment costs, but also O&M costs are taken into account, IPC could be even more beneficial. This is due to load reductions, which translate into an increased lifetime of

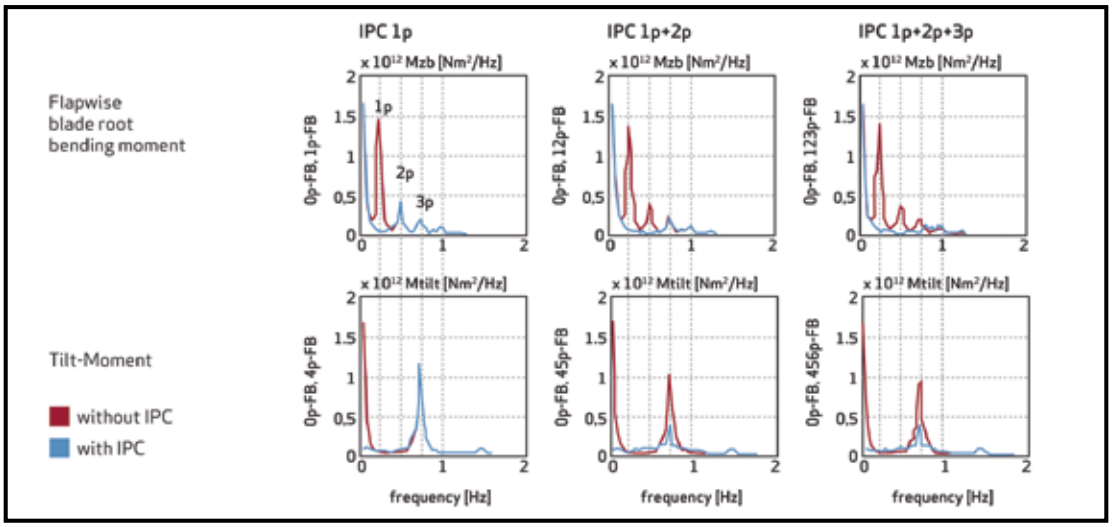

Figure 6: Simulated load reductions through IPC.

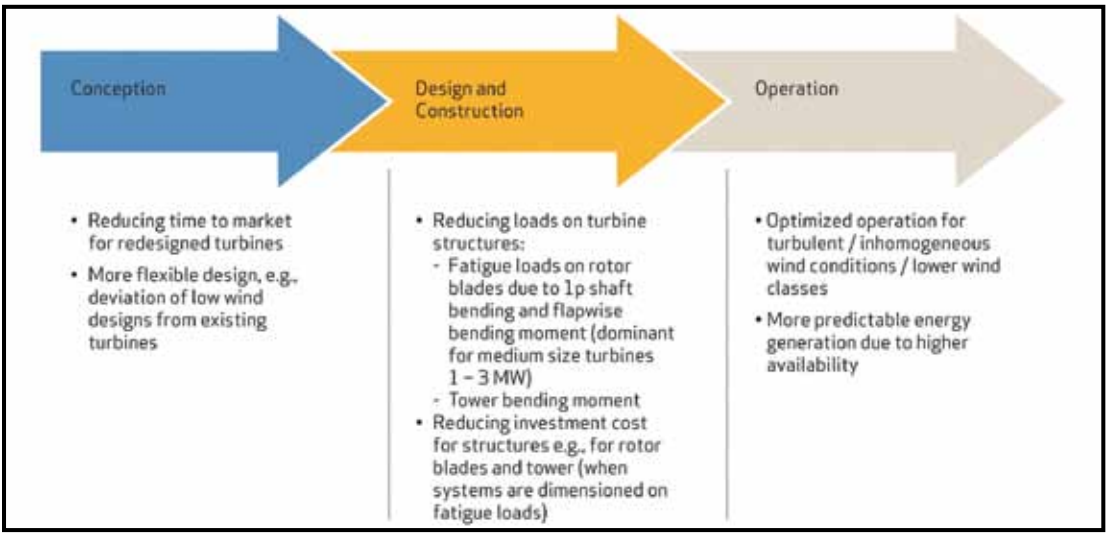

Figure 7: The main benefits of IPC during the life-cycle of a wind turbine (conception, design, construction and operation).

turbines. Experts predict increasing potential for reducing the total cost of ownership for turbines using IPC systems. To achieve this it would be necessary to optimize and adjust existing systems through careful evaluation of, not only the components of the IPC system, but of the entire turbine design. Focus should be on the evaluation of extreme loads during start-up and shut-down, fatigue loads on the main shaft and main bearing, the use of new types of pitch bearings and the optimized utilization of load sensors.

For these reasons, the best and fastest results are expected through close cooperation between manufacturers of turbines and IPC systems.

EXPERTISE AND PARTNERSHIP APPROACH

In the field of pitch control systems for wind turbines, Moog has in-depth experience highlighted by an installed base of more than 25,000 systems. We are a supplier of all necessary products for pitch control systems, including software and hardware. This means that critical products such as Pitch Servo Drive, Pitch Motor, Slip Ring and Blade Sensing System are all designed and manufactured by Moog. A partnership approach in adapting to our clients' needs is especially important. This approach is characterized by the flexibility to adjust to the technology chosen. We can tailor our products for example to the needs of electric as well as hydraulic pitch systems.

DEMAND FOR RENEWABLE RESOURCES

Demand for electrical power generated by renewable sources

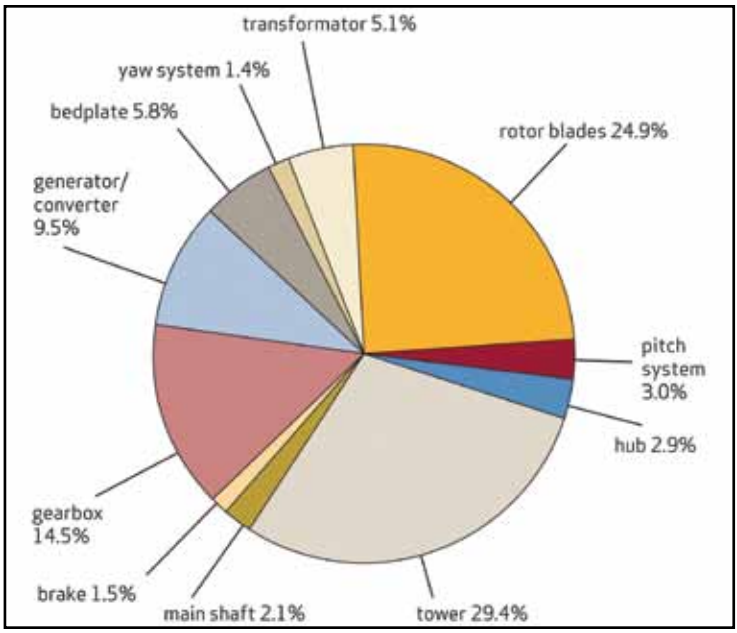

Figure 8: Relative component costs for a wind turbine with rated power in the 2MW range.

is increasing on a global scale. The prospects in the wind energy sector are especially promising. However, this development also brings new challenges including: Larger turbines, wind parks in remote areas with difficult climatic conditions and higher expectations on reliability, flexibility and predictability of electrical power generation. When turbines are getting larger, load reduction, especially for asymmetric loads caused by inhomogeneous wind fields, becomes more and more important. Consequently, the manufacturer anticipates that IPC will play an increasingly important role as the most common technology capable of compensating asymmetric loads. The ultimate aim of this cooperation is to reduce the overall cost of electrical power generated by wind turbines. To achieve this it is necessary to reduce the total cost related to the design, construction and operation of wind turbines to develop the wind energy solutions for the future.

Moog has supplied more than 27,000 systems and products to many of the world's top-ten wind turbine manufacturers. The company's wind industry products and expertise span both electric and hydraulic technologies. For example, by precisely monitoring wind loads on blades, the rotor monitoring system improves the turbine's life span and maintenance costs. Predictive maintenance is vital to wind park operators because the cost of a shutdown and subsequent turbine repairs is high.

The Pitch Systems also improve safety when the wind turbine loses electrical power. The pitch system puts the turbine blades off-wind into a safe operating mode that protects the wind turbine from damage. When the wind blows at 25 meters per second (50 mph) or higher, a wind turbine needs a failsafe to put its blades at an angle where the load is reduced and the wind turbine stops. Found in the hub of the wind turbine, the Moog Pitch System consists of: control boxes containing Moog Pitch Servo Drives; Wind Pitch Servo Motors; and, a control system including software for remote diagnostics and back-up power.

The company also offers slip ring solutions, which are critical to operation. Found inside the wind turbine's nacelle, slip rings provide electrical signals and energy for blade pitch power and control. The fiber brush slip rings offer wind turbine owners a minimum of 100 million revolutions of operational life with no maintenance.

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Virtual Power Stations Communicate With 'bluecom' From Bachmann Electronic

The requirement placed on state-of-the-art wind farms to respond to the power grid like a single conventional power station requires the use of a central wind farm controller: communication is required in very high speed. Bachmann electronic presents 'bluecom' – a communication solution specially developed for smart grids.

'bluecom' is based on conventional Ethernet technology and provides affordable and easy to implement communication for fast and reliable information exchange in real time. The transmission protocol was specifically optimized with regard to the particular requirements of future-proof energy systems. The prime objective of these measures is to maintain the stability of the grid by enabling energy parks and virtual power stations consisting of a large number of decentralized power generation plants to respond quickly.

The new communication protocol 'bluecom' Bachmann provides an important foundation for the transition to a smart grid and the use of regenerative energies for electricity generation. It is another contribution by Bachmann electronic to the active development of the power grid of the future.

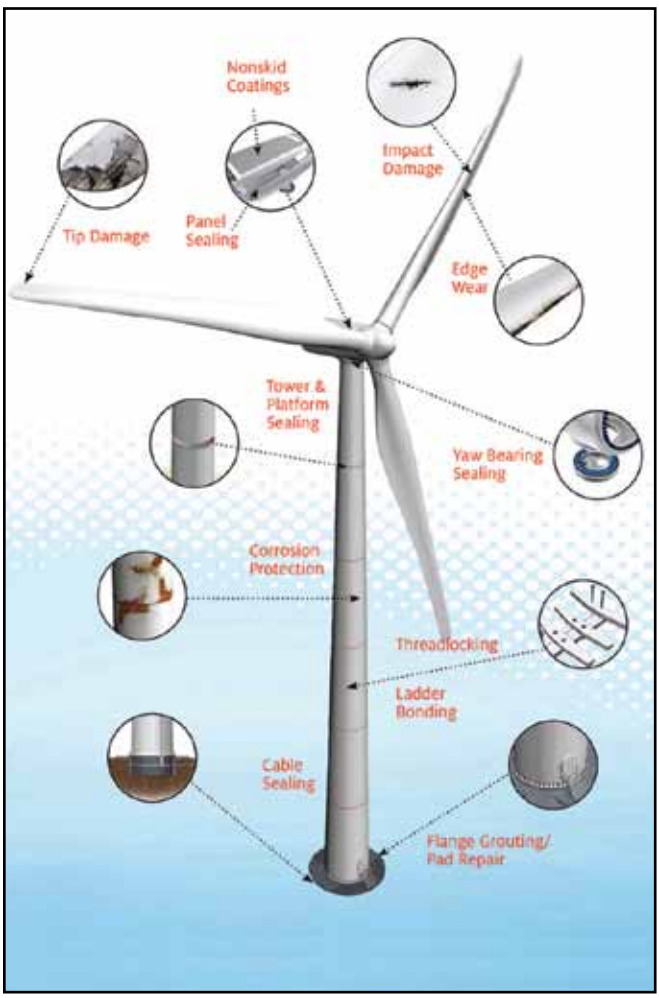
For more information, visit www.bachmann.info.

Companies wishing to submit materials for inclusion in this section should contact Sherri Mabry at sherri@windsystemsmag.com. Releases accompanied by color images will be given first consideration.

O&M Products Increase Equipment Reliability and Reduce Downtime and Failure

For O&M applications on wind turbines, Henkel Corporation has introduced a full line of Loctite® adhesives, sealants, lubricants and coatings for installation and maintenance of blades, nacelles, towers and bases.

For rotor blade repair, Loctite® high performance polyurethane resins cure rapidly at room temperature, significantly reducing downtime associated with blade maintenance. Developed using the same standards and technology as Loctite® GL-approved rotor blade assembly materials, polyurethane repair resins offer superior long-term dynamic fatigue strength, outstanding tensile shear strength, resistance to aging, and creep performance. Specifically formulated to restore composite blades, these resins are used to patch and repair structural cracks on blade tips and stress risers, impact damage caused by lightning and bird strikes, and leading edge wear and erosion.



On the nacelle, Loctite® O&M products provide excellent UV/moisture resistance to seal against harsh weather conditions. Cleaners and lubricants keep equipment running reliably. High-traction coatings prevent slipping on interior and exterior walkways. And anaerobic products maintain threaded fasteners, joints and flanges.

Loctite® O&M products seal out moisture and prevent corrosion on tower sections, load support plates, platforms, bolt heads, ladder frames and metal surfaces. Products are also used for ladder bonding and thread locking.

On the base, Loctite® fast curing grouts facilitate tower installation and ensure the structure is level and secure. Sealants prevent water ingress around electrical cables and concrete repair products correct damage and cracks.

To view the full line of Loctite® products for wind turbine installation and maintenance, visit www.henkelna.com/windpower.

Positioning Spray by 3M Integrates During Infusion Process

3M™ introduces the new 3M™ Adjustable Composite Positioning System (ACPS) 11095, a spray designed for pre-infusion resin bond dry reinforcements and composite matrices.

The unique properties of 3M™ ACPS 11095 enable it to integrate into the part during resin infusion, eliminating read-through and transition layers in the part post-cure. This patent-pending system offers manufacturers benefits in productivity, esthetics and flexibility.

3M™ ACPS 11095 is uniquely formulated to be compatible with most resin systems, including polyester, vinyl ester and epoxy resins. It goes down easily on both flat and curved mold designs, and after spraying, the product builds tack within seconds and is tack-free in two to three minutes. Designed with ease-of-use in mind, the product features a unique color change system that gives it a blue color when first sprayed, then fades to clear as it cures. With this feature, users can easily see the amount of coverage they've achieved, and also have a visual indication of the curing cycle. 3M™ ACPS 11095 is not affected by ambient temperature and/or humidity, allowing it to be used in a variety of manufacturing conditions.

Additional user-friendly features of 3M ACPS 11095 allow substrates to be easily repositioned without leaving fibers behind, simply by peeling back an individual layer and reapplying. If the coating dries before laying up of materials, an additional coating can be applied at a lower rate, which reactivates the previously applied coating. The product also enables manufacturers to use less than competitive brands.

3M™ ACPS 11095 has the ability to hold most types of reinforcement and to maintain the position of reinforcement for days without sagging. With typical usage, users will see little to no change in laminate shear properties. Available in aerosol cans as well as five-gallon and 55-gallon containers compatible with most traditional spray equipment, the product is also easy to clean up with most solvents. 3M™ ACPS 11095 is approved by Lloyd's Register and DNV.

For more information contact 3M Technical/Application Support at 772-343-7300, or Customer Service/Ordering at 1-855-380-6553 or visit www.3M.com.

Easily Erect and Disassemble Scaffolding with Scaffold Ratchet

When the job calls for erecting scaffolding to work at an elevated level, the new Williams® Scaffolding Ratchet from Snap-on Industrial Brands can be a true time saver.

The scaffolding ratchet is three tools in one. The ratchet includes tools that erectors need to easily and quickly engage the posts, fasteners and clamps on scaffolding. Since most scaffolding uses 7/8" hex nuts, the ratchet comes with a 1/2" drive pinned 7/8" six-point socket. Opposite of the socket is a bronze hammerhead, which comes in handy to pound out quick-release levers. Lastly, a pry bar is located at the other end of the ratchet to aid in scaffolding disassembly.

Other features and benefits of the scaffolding ratchet include:

- 36-tooth gear with 10-degree of engagement for working in tight areas
- Supertorque lobular opening for greater turning power without deforming the fastener
- Easy access reversing level to change working direction with only one hand
- Bronze hammerhead to reduce rebound
- Tethering device to prevent dropped tools

For more information about the Williams® Scaffolding Ratchet from Snap-on Industrial Brands, call 800-446-7407, or visit www.snaponindustrialbrands.com.

Sonoco Expands EcoReel Recycling Program

Sonoco is expanding its innovative EcoReel® recycling program to include scrap cable recovery at wind farm construction sites. Together with associate company American Cable Recyclers, Sonoco takes care of unwinding, securing and purchasing high-value #1 and #2 insulated or bare brite copper remnants. The company also unwinds, stores and buys scrap URD and other cable plus knock down and remove and recycle the wood reels.

"This new program is a convenient way for wind farm contractors to keep the site safer and more secure," said Wendy Williams, Recycling Operations Manager at Sonoco. "Our customers as well as the utilities, contractors and distributors they supply can quickly recognize the environmental and fiscal advantages of reusing wood reels."

A member of the Dow Jones Sustainability World Index (DJSI), Sonoco recovered over 44,000 wood reels in 2011 saving nearly 15,000 trees. All viable reels are put through a rigorous seven-step process to make sure every recycled and refurbished reel will deliver like-new performance. Reels can often be reused three or more times. Sonoco's EcoReel recycling program began in 1991.

For more information, call 828-330-0379 or visit www.sonoco.com.

Availon's New Positioning Controller Improves Availability

Availon, Inc., a premier independent provider of parts and engineering services to the wind power industry in North America, is pleased to introduce a thoroughly redesigned, robust, and cost-efficient pitch controller.

True to the company's "We Listen" stance, Availon has partnered with Lenord + Bauer, the world renowned manufacturer of innovative automation systems for industrial motion sequences. The premise for the extensive re-design of the pitch controller was the customers' feedback and the ability to do a root cause analysis by Availon's engineers who singled out several issues that needed to be addressed, such as: communication problems; damages, caused to the controller's circuit board by the constant vibration and environmental contaminates; damages to the controller and the controlled components from voltage spikes; and the disparity between specified temperature range and actual operating environment.

To minimize turbine's failures, the new innovative design features robust and reliable communications from the Pitch Controller to the axis cabinet components. Circuit boards are specially coated to prevent loosening due to vibration and to guard against corrosion. Improved RS communications now provides a higher tolerance for voltage spikes. Upgrades to the controller's components allow it to handle a wider temperature range, from -40oC to +70 oC.

John Boorman, Availon North America Director of Sales, notes: "Availon's mission has always been improvement of wind turbines availability. The new pitch controller is a perfect example of our engineering capabilities to design custom solutions that reduce or eliminate reoccurring fault problems and shortcomings."

For more information contact ServicesUSA@Availon.com or PartsUSA@Availon.com.

ADINDEX

Wayne Kilcollins
Wind Power Technical Institute /Northern Maine Community College

WHAT IS YOUR ROLE WITH NORTHERN MAINE COMMUNITY COLLEGE?

I have been the lead instructor for the Wind Power Technology program at Northern Maine Community College for the past three years. A portion of my role has been to develop curriculum for the associate level program that match current and anticipated skills for wind technicians through discussions with wind industry leaders both in the project development and operations and maintenance arenas. My other roles have been to deliver course material and identify equipment that may be used for students to practice skills. Our program has been successful in obtaining much of the necessary training equipment through private and corporate donations. Our efforts have enabled many of the program graduates to enter the workforce in wind related career opportunities.

WHAT IS YOUR BACKGROUND?

My educational background includes a bachelor's degree in mechanical engineering and a master's degree in engineering management. I have spent 25 plus years with organizations developing automated assembly equipment, implementing process improvements, and assisting with technical training. These organizations include Bell Laboratories, First Technology, and General Electric. This background has given me an appreciation for organizations that develop and service industrial equipment. After many years of field experience, I felt it was time to turn my attention to sharing what I have learned with the next generation of engineers and technicians.

To order the textbook scan QR code or enter the URL http://htl.li/byPcw

WHY DID YOU DECIDE TO WRITE *MAINTENANCE FUNDAMENTALS FOR WIND TECHNICIANS*?

My initial effort with the Northern Maine Community College Wind Power Technology program was to find textbooks that would be appropriate for each of our new courses. I spent time searching the Internet and speaking with publishers to find textbooks that would match the needs of our program. There were textbooks available for general wind energy information, bachelor and graduate level engineering courses, but none that focused on the certificate or associate level wind technology programs. After several discussions with publishers, one called back and said they were looking for someone to write a textbook that would match my needs and those of several other colleges looking for the same type of material. Writing a textbook was new territory for me, but I figured it was worth the time to pull my discussion materials into one textbook that would fill a need for our program and other wind energy technology programs.

WILL *MAINTENANCE FUNDAMENTALS FOR WIND TECHNICIANS* ONLY BE AVAILABLE FOR STUDENTS AT NMCC OR WILL IT HAVE A MASS AUDIENCE?

Maintenance Fundamentals for Wind Technicians will be available for anyone interested in wind energy technology. I developed the material to explain some of the basic skills necessary to work with wind turbines and then expanded on these skills to show how they are used with typical maintenance activities of community and utility size systems. The publisher coordinated peer reviews of the textbook material with instructors from several of the wind energy technology programs within the United States. Their feedback was invaluable in ensuring that the material would meet their needs as well as those of my students. I believe the textbook material will be valuable in explaining how skills learned in the classroom and lab setting will be used in the field.

EXPLAIN HOW THE TEXTBOOK WILL BENEFIT STUDENTS IN PRACTICAL APPLICATIONS?

Discussion materials within the textbook and instructor materials will assist instructors in facilitating classroom discussions of what basic skills are necessary for careers in the wind energy field. The expanded discussions of how these skills are used in the maintenance and operation aspects of wind energy technology will assist students in pulling these concepts together for work activities. Supplemental materials provided to instructors will aid in developing activities for students to use in practicing necessary skills before they enter the workforce. The textbook material not only focuses on hard technical skills to complete a task, but also on the soft skills necessary to do the task safely and communicate necessary information to others such as their supervisor, engineers, and customers.

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