

Giving Wind Direction

WIND SYSTEMS

Electrical, Safety & Training

- » **Profile: ABB Inc.**
page 14
- » **Antifreeze and Cooling System Maintenance Play a Critical Role for Electronics**
page 18
- » **Simulation: A Shift and Advancement in Wind Energy Training Methods**
page 22



Maximizing Uptime Across North America

AMSOIL is protecting more than 10,000 MW-class turbines in North America alone. We have been delivering excellent protection and maximum uptime for more than seven years without reformulating our



product, preventing additional fluid changes and keeping turbines spinning. Find out why so many of the leading operators in the wind industry are switching to AMSOIL and why you should, too.

DEVOTED TO PROTECTION.®

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



AMSOIL Wind Group | 715.399.6305 | amsoilwind.com

CASTROL[®] OPTIGEAR[®] SYNTHETIC CT 320

Introduced over 10 years ago and **protecting 20,000 Megawatts** globally...and growing every day

- Lowest water ppm in the market as reported by a major wind turbine OEM*
- Higher Viscosity index and long-term viscosity stability to provide increased protection over a wider temperature range
- Superior micropitting protection and foam control which outperforms other competitive oils
- Ease of changeover from other competitive oils

* 6 year field average 76 ppm

Contact our expert engineers to discuss how Castrol can extend oil change out intervals and reduce O&M costs.

Castrol.com/windenergy

1-877-641-1600

IT'S MORE THAN JUST OIL. IT'S LIQUID ENGINEERING.®





Company Profile: ABB Inc.

For more than 130 years, ABB and its predecessor companies have set the pace for innovation in power grid technologies to harvest energy, improve productivity, safeguard the environment, increase profits, promote safe practices and, more recently, integrate renewable energies onto the transmission grid.

By Anna Claire Howard

ALSO IN inFOCUS

- 18** Antifreeze and Cooling System Maintenance Play a Critical Role for Electronics
- 20** Trained Personnel Are Key to Safe Wind Farm Operations
- 24** Conversation: Louis Dorworth - Abaris Training Resources Inc.

E-RAD BLU

SETTING THE STANDARDS... **HIGHER** 



visit TORKWORX



simplifying TORK

SOLUTIONS AVAILABLE

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

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

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

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

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

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

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

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



SECTIONS

Volume 08 Issue 07

DIRECTION



Global Wind Industry Celebrates 1 Million Jobs

9 DTE Energy Brings 25 Energy Jobs to Huron County, Michigan

10 Climate Resilience Is Central to Stabilizing U.S. Wind Cash Flows

MAINTENANCE

Siemens Signs First Balance of Plant Wind Service Agreement in the U.S.



INNOVATION

HUVRdata and EdgeData Announce Collaboration To Optimize Aerial Wind Inspections



MANUFACTURING

Siemens and Gamesa Merge Wind Businesses To Create Leading Wind Power Player



CROSSWINDS

Thank You for Making Windpower 2016 a Success!



Wind Systems (ISSN 2327-2422) is published monthly by Media Solutions, Inc., 266D Yeager Parkway Pelham, AL 35124. Phone (205) 380-1573 Fax (205) 380-1580 International subscription rates: \$72.00 per year. Periodicals Postage Paid at Pelham AL and at additional mailing offices. Printed in the USA. POSTMASTER: Send address changes to *Wind Systems* magazine, P.O. Box 1210 Pelham AL 35124. Publications mail agreement No. 41395015 return undeliverable Canadian addresses to P.O. Box 503 RPO West Beaver Creek Richmond Hill, ON L4B4R6. Copyright 2006 by Media Solutions, Inc. All rights reserved.

EXPERT KNOWLEDGE.

SUSTAINABLE FOCUS.

Staying on the forefront of the new energy economy requires cutting-edge information from authoritative voices. Each month, *Wind Systems* keeps its readers attuned to the latest innovations in the wind energy industry. Let us be your partner in driving sustainability—and your business—to new heights.

For your **FREE** subscription to *Wind Systems*,
log on to windsystemsmag.com.



Giving Wind Direction

WIND
SYSTEMS

EDITOR'S DESK

JULY 2016

Safety and training are two key aspects in wind energy generation, especially when working with the dangerous electrical components inside of the nacelle.

Welcome to the July issue of *Wind Systems* magazine! This month we're exploring the electrical side of the industry in terms of wind turbine components and getting wind-generated electricity to the grid. We're also focusing on the importance of safe workplace practices and thorough, high-quality training for existing wind energy professionals and those breaking into the industry.

For this issue's focus on electrical operations within the turbine, we spoke with Bill Rose and Dennis McKinley at ABB Inc., a key enabler in the wind energy industry as one of the largest independent suppliers of electrical components and as a technology leader in connecting wind farms to the grid, for the company profile. You'll also find that this issue features a conversation with Louis Dorworth from Abaris Training Resources Inc. where we discuss the role Abaris plays in producing the highly trained and qualified workforce the wind energy needs and what can be expected from the company moving forward as the industry continues to grow following the five-year production tax credit (PTC) extension.

In this month's inFOCUS section, you'll find a column by Jack Wallace at Frontier Pro Services on the key role well-trained personnel play when it comes to safety on a wind farm, as well as an article by Matt Erickson, a mechanical engineer and product manager at Amsoil Inc., on the critical role antifreeze and cooling system maintenance practices play when it comes to the life of wind turbine electrical components. This issue also features an article by Tiffany Sanders from JHT Incorporated, the creator of proxSIMity simulation training software, on how the wind energy industry can benefit from this out-of-the-box training method, as well as a column by Travis Dees from World Wind & Solar on ways wind industry professionals can benefit from erosion control on their wind sites.

I also invite you to flip to the Crosswinds section of this issue to check out the winners of our Snap-on toolbox giveaway from Windpower 2016 New Orleans. This year's winners include Jim Mason, the director of economic development for the City of Elk City, Oklahoma; Jeremy Greene, the lead software developer for JHT Incorporated based out of Orlando, Florida; and Steve Black, the senior business development manager for Moog Components Group based out of Blacksburg, Virginia. Make sure to stop by the *Wind Systems* booth at Windpower 2017 in Anaheim, California, to enter next year's raffle.

As always, thanks for reading!

Anna Claire Howard



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

CONTRIBUTORS

Jack Wallace is a veteran of wind farm operations and maintenance with more than 30 years of industry experience, and he is the director of composites and innovation at Frontier Pro Services. Wallace has taught wind turbine theory of operation and related subjects for various institutions in the U.S. and South Korea, and he is listed as an inventor on more than nine patents, all related to technology in the wind energy industry. He can be reached at jwallace@frontierpro.com for questions or comments.



Matt Erickson graduated from North Dakota State University in 2006 with a master's degree in mechanical engineering. He has been a mechanical engineer and product manager at Amsoil Inc. since 2011. He specializes in developing synthetic

lubricants, fuel additives, antifreeze/coolant, and other products that help maximize the life and performance of their vehicles and equipment. For more information, contact Rigoberto Murillo, the business development manager for Amsoil Inc. at windsalesgroup@amsoil.com.

Tiffany Sanders is the chief marketing officer for JHT Incorporated, a training and simulation firm based in the Central Florida Research Park. She oversees all strategic campaigns focused on the company's four core lines of business — interactive training, technical documentation, environmental science, and professional support solutions. For more information on JHT's simulation solution, go to www.jht.com/proxSIMity.



Travis Dees is the wind division director at World Wind & Solar (WWS), an energy service provider in the renewable energy sector. Providing complete services from met towers, to electrical construction through operations and

maintenance, the company also provides staffing and QA/QC services for both the wind and solar industries. WWS successfully services all major turbine and panel manufacturers at scores of renewable energy facilities throughout the United States. For more information, go to www.worldwindsolar.com.



DLRO100 Low Resistance Ohmmeter

Megger's new DLRO100 is the only battery operated continuous 100 A low resistance tester on the market.

No more looking for line power in remote locations. The fast charging, internal Li-ion battery has you covered so you can power on.

It's never been so easy to cut the cord.

us.megger.com/dlro100

Megger[®]
Power on

DIRECTION

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

GLOBAL WIND INDUSTRY CELEBRATES 1 MILLION JOBS



Record wind industry growth was reflected in a 5-percent increase in employment in the sector, which now employs 1.1 million people, according to the International Renewable Energy Agency's (IRENA) Renewable Energy and Jobs Annual Review 2016. On Global Wind Day last month, the Global Wind Energy Council (GWEC) highlighted the socio-economic benefits generated by the global wind industry. Global Wind Day is a worldwide event that occurs annually on June 15. It is a day for discovering wind energy, its power, and the possibilities it holds to reshape energy systems, decarbonize economies, build new industries, and create new jobs.

The increase in employment figures is mainly due to strong installation rates in China, the United States, and Germany. New job creation is being driven by declining renewable energy technology costs and en-

abling policy frameworks. As governments continue to struggle with high unemployment rates in many parts of the world, both the current reality and future potential for employment in the wind industry has become increasingly significant.

"We are getting bigger, better, and cheaper," said Steve Sawyer, GWEC secretary general. "The wind industry has witnessed record growth in recent years, which not only helps the world to meet the climate goals agreed in Paris but also generates much-needed new jobs and boosts local economies, to the tune of about \$110 billion last year."

In the meantime, corporations are increasingly investing in wind energy. Clean energy procurement is standard practice for some of the largest and most profitable companies in the world, including Apple, Facebook, Microsoft, Google, Lego, AT&T, Du-

Pont, General Motors, HP, Sprint, and Walmart.

“We are thrilled to see the rapidly growing number of companies opting to source their power from wind,” Sawyer said. “These globally leading companies show that wind makes economic sense, protects the environment, and is what their customers want to see. While

government action is needed, the real change happens when investors make economic decisions, which lead us in the right direction.”

Wind power was the largest source of new power generation in 2015. Led by wind, renewables are transforming the power sector bringing along a host of other

environmental, social, and economic benefits across the globe. The macroeconomic effects are increasingly a factor in political decision-making about future energy choices. ↴

Source: Global Wind Energy Council

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

DTE ENERGY BRINGS 25 ENERGY JOBS TO HURON COUNTY, MICHIGAN

DTE Energy recently celebrated the grand opening of the new Huron Renewable Energy Center in Bad Axe, Michigan, bringing 25 renewable energy operations and maintenance jobs to Huron County. The facility, which has been vacant since 2013, has a long-standing history in Huron County as the former Normans Warehouse and the site of the M-53 drive-in theater that opened in 1952. DTE’s renovations of the building transformed the space into a fully functioning renewable energy operations headquarters.

“We are excited to breathe new life into a building located on a site

that has been a landmark in Bad Axe for years and to provide yet another example of how renewable energy provides economic benefits to the local community,” said David Harwood, director of renewable energy for DTE Energy.

The newly renovated Huron Renewable Energy Center includes new offices, garage facilities, warehousing, and a maintenance shop area. The facility also has an unfinished 3,000-square-foot space that DTE plans to develop into a community space to serve as an area for renewable energy education and hosting wind park tours, meetings,

and other community activities. Plans are expected to be finalized this year with completion of the space in 2017.

The center’s proximity to DTE’s wind parks and solar arrays in the Thumb region of the state enables the operations team to respond more quickly to maintenance needs. The new location also increases accessibility of the operations team to the community and landowners, especially during the construction of the Pinnebog Wind Project, an expansion of DTE’s Echo Wind Park that is underway and expected to be complete by the end of the year.



“DTE has served Huron County residents as its energy provider since 1936 and as a renewable energy developer in the county since 2011,” Harwood said. “The opening of the Huron Renewable Energy Center deepens our commitment of service to this region as both an energy provider and corporate citizen for many years to come.”

DTE is Michigan’s largest investor in clean energy, including

wind and solar, having driven investments of more than \$2 billion since 2008. DTE currently owns and operates four wind parks and three solar arrays in Huron County and owns two wind parks and 23 solar arrays in other areas of the state.

DTE’s entire renewable energy portfolio is capable of providing enough clean energy to power more than 400,000 homes. The

portfolio includes facilities owned and operated by DTE, along with contracts to purchase power from third-party developers in Michigan. All of the power generated by these facilities is fed into the energy grid and distributed to those who need it. ↵

Source: DTE Energy

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

CLIMATE RESILIENCE IS CENTRAL TO STABILIZING U.S. WIND CASH FLOWS

Vaisala, a global leader in environmental and industrial measurement, recently announced that it has outlined findings that underscore the increasing importance of intelligent project selection for U.S. wind investors and ways to more realistically set future revenue expectations. Building a genuinely diverse, climate resilient portfolio could reduce the variability and financial impact created by short and long-term weather anomalies.

The findings, which were shared with delegates at the 2016 AWEA Windpower Conference and Exhibition in New Orleans, reflect a continued desire among investors and owner-operators to develop balanced project portfolios that yield stable returns. Vaisala’s research also serves as an important reminder of the ever-present risk associated with investing in regional power portfolios, following recent extreme low wind speed events and their subsequent impact on local power output.

While operators of wind energy projects throughout North America have demonstrated an awareness of the significance of geographical portfolio diversification by deploying assets in a range of different regions in order to mitigate the financial impact of below average wind resource in any single area, wide-

spread underperformance in the U.S. throughout much of 2015 has brought the strategy into question.

In particular, project owners with assets in both Texas and California felt the performance impact of unprecedented low wind speeds across their entire portfolios, creating cash flow problems and questions about the viability of further investment decisions. With the majority of U.S. operational wind capacity concentrated in a handful of regions, building a portfolio resilient enough to manage the impact of another extreme weather event on this scale poses a considerable challenge.

“Climate resilience continues to be a talking point for the U.S. energy sector, particularly given the impact of recent low wind conditions on investors,” said Matthew Hendrickson, global manager of energy assessment at Vaisala. “However, there are still questions about how the concept can be implemented and applied to operational and planned asset portfolios. Looking in-depth at the performance of a number of high-profile YieldCos along with a hypothetical portfolio optimized for climate resilience, we’ve been able to start answering some of the key questions for U.S. project owners. Namely, how much portfolio diversification is possible, given the

number of regions usually targeted for wind development, and what is the range of variability achieved by these existing portfolios?”

Vaisala’s climate resilience analysis and approaches to portfolio diversification and revenue forecasting was discussed during presentations held at the Windpower 2016 event. The company’s research forms part of an ongoing drive to help the U.S. wind industry meet the challenge of maintaining shareholder confidence with steady returns.

“There has been much debate amongst climate scientists about what caused some of the lowest wind speeds on record in California and Texas last year,” said Pascal Storck, global manager of energy services at Vaisala. “Experts have looked to signals from indices like El Niño and the North Pacific Mode for answers. While useful, these patterns only explain some of the variability. A trusted expert is really necessary to understand climate impacts across a portfolio.”

Critically, based on detailed performance analysis of existing U.S. wind portfolios, Vaisala’s research team has estimated that more effective modeling of weather impacts on production could reduce associated cash flow volatility. A more sophisticated view of portfolio management, considering climate

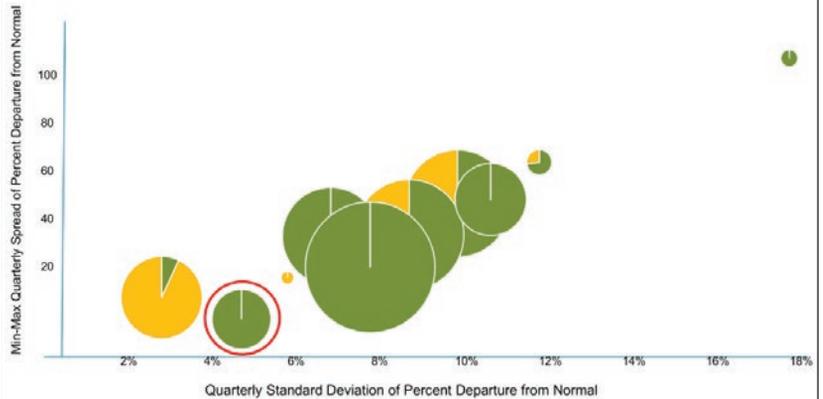
variability as well as other sources of risk, such as turbine technology and measurement campaign design, will ultimately help U.S. investors address the commercial challenge of stabilizing revenues, even in light of highly anomalous weather conditions.

“By looking at historical production variability at all existing and potential sites within an investment portfolio, asset managers can correlate the data and assess proposed investment scenarios against internal benchmarks,” Hendrickson said. “With this approach it is possible to set a diversification strategy both at a regional and national level in order to balance risk appetites and drive future financial returns.”

Source: Vaisala

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

YieldCo Departure from Normal Performance Compared to Climate Resilient Portfolio



Vaisala

Each YieldCo is scaled to the size of its portfolio with the mix of solar capacity (yellow) and wind capacity (green) depicted. The “climate resilient” portfolio optimized by Vaisala is encircled in red.

Take Control.



Henkels & McCoy - New Mexico

Remote control padding operation made easy with our SPD-150.

- Remote control operation
- Ideal for smaller padding operations
- Adjustable escalator for steep gradients
- Reversible foldable conveyor
- Screen sizes from 3/8" to 2"
- CAT C4.4 Acert 140hp Engine



U.S. toll free 800 383 2666 | Intl. toll free 800 9675 3948
pipeline@wvmach.com | www.superiormftg.com



WORLDWIDE GROUP

Worldwide Group family of companies

BEOTHUK ENERGY INC. ANNOUNCES OFFSHORE WIND PROJECT ENGINEERING CONTRACTS

Beothuk Energy Inc. (BEI) recently announced that it has awarded contracts for its St. George's Bay offshore wind energy project off the coast of western Newfoundland and Labrador, or NL, in Canada through its engineering firm, Madera Engineering, to DNV GL and Fugro GeoSurveys. The St. George's Bay project is planned to have a capacity of 180 MW.

The work program includes geological and bathymetric compilation, constraints analysis, wind resource and energy assessment, and levelized cost of energy (LCOE) cost modeling. The consultants and BEI have access to established data sets and 67 years of wind data for analysis and will be assessing an extensive collection of seismic, hydrographic, and bathymetric data.

DNV GL has been awarded a contract to provide the constraints analysis, wind resource and energy assessment, LCOE modeling, and a preliminary wind farm layout. DNV GL's long history and extensive experience in the offshore sector lead to an incomparable quality of its offered services. For more than 25 years, DNV GL has provided a range of services to the offshore wind industry including feasibility, development, engineering, construction, and operations services. By integrating 150 years of experience in shipping, 85 years of the power sector, 45 years of offshore oil and gas, and 30 years in wind power technology, DNV GL strives to be the leading service provider for all offshore wind-related services. Having participated in the majority of the worldwide commercial scale offshore wind farms currently operating, DNV GL brings an unparalleled level of experience and expertise across the offshore wind project life cycle.

Fugro GeoSurveys has been contracted to provide bathymetric/geologic compilation, hydrographic data reprocessing, assessment of stability and seismicity, GIS analyses of seabed morphology, and routing options. Fugro GeoSurveys is a division of Fugro Canada Corp. with offices in St. John's, NL, Canada. Fugro GeoSurveys is a professional service company that specializes in seafloor mapping, geotechnical, geological/seismic surveys, integrated navigation/positioning, and industrial surveys on land, in the air, or in the oceans.

Madera Engineering will provide owner's engineering services including planning, technical documentation review and integration, and interface management. Located in St. John's, NL, Madera Engineering Inc. focuses on the delivery of engineering, project management, and personnel services to the energy, industrial, and commercial sectors. Madera is acknowledged for providing a wealth of expertise, a diverse range of services from



a highly talented team, a commitment to quality, and a safe working culture. Madera's home office team offers multi-discipline engineering and design, project management, construction management, commissioning, quality assurance, and project services.

"This work program will provide key information for moving forward with the project's design, providing a foundation for engineering, planning, and development of Canada's first offshore wind farm," said Kirby Mercer, chairman and CEO of BEI.

BEI is currently working on other sites in the Atlantic region of Canada and is looking forward to advancing these projects concurrently. BEI is working to answer the call for clean renewable energy in Canada and in the United States. BEI has projects in NL, Nova Scotia, Prince Edward Island, and New Brunswick.

"Offshore Wind in Atlantic Canada is of national significance in the energy mix creating a new sector, reducing the nation's carbon footprint, building on synergies with Atlantic Canada's offshore oil and gas industry, and putting many highly skilled displaced workers to work in the fast-growing clean energy sector," Mercer said.

BEI is an international green energy company, based in Atlantic Canada and headquartered in St. John's, NL, with a strategic focus on offshore wind power. *↵*

Source: DNV GL

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

BOEM INITIATES PLANNING FOR CALIFORNIA OFFSHORE RENEWABLE ENERGY TASK FORCE

The Bureau of Ocean Energy Management (BOEM) announced that it will initiate planning with the State of California to establish an intergovernmental renewable energy task force to examine opportunities for offshore renewable energy development off the coast of the Golden State.

California Governor Jerry Brown requested formation of the task force in a letter to Interior Secretary Sally Jewell. The announcement was made during a BOEM-sponsored offshore wind roundtable that brought together representatives from foreign governments, state policymakers, experts in offshore wind, and members of the industry to share information on offshore wind development. The roundtable was convened in advance of the 7th Clean Energy Ministerial meeting held in San Francisco, California.

“In response to Governor Brown’s request, Interior Secretary Jewell has directed the BOEM to work with the State of California to establish a task force to coordinate and consult on potential renewable energy activities on the OCS offshore California,” said Janice Schneider, interior assistant secretary for land and minerals management.

The task force, a non-decisional entity, will facilitate coordination and communication in a partnership between BOEM and state, local, and tribal governments and federal agencies concerning potential renewable energy leasing for research activities and commercial development on federal submerged lands on the outer continental shelf (OCS) offshore of California.

“While offshore renewable energy resources have not yet played a significant role in California’s energy system, they present important potential future opportunities,” Governor

Brown said in his letter to Secretary Jewell. “There are significant offshore resources along most of California’s coast that complement the profile of onshore solar resources and new developments in offshore wind technology — such as larger facilities that are not visible from land and present little to no adverse avian impacts — that will likely make projects more viable.”

According to BOEM Director Abigail Ross Hopper, working closely with stakeholders will allow the BOEM to identify and address issues relating to future offshore renewable energy leasing and development in a way that supports California’s clean energy goals.

In April 2009, the Obama Administration announced the final framework for renewable energy development on the OCS. This framework establishes the process the BOEM uses for granting leases, easements and rights-of-way for offshore renewable energy development activities, such as the siting and construction of facilities on the OCS. The framework also allows for BOEM to use task forces in carrying out its responsibilities

for authorizing OCS renewable energy activities.

The BOEM has established intergovernmental renewable energy task forces for 13 other coastal states, which will provide critical information for the decision-making process, including how to resolve potential conflicts between development and environmental concerns and other uses. The offshore wind roundtable also offered participants an unique opportunity for multilateral engagement and sharing experiences in marine-based wind research and development.

According to the National Renewable Energy Laboratory (NREL), areas of the west coast of the United States (including Hawaii) hold great renewable energy potential. In particular, these areas have the potential to generate over 1.5 TW of offshore wind energy. This potential presents a compelling market opportunity that would assist states in meeting many of their ambitious and critically important renewable energy goals. ↵

Source: BOEM

For more information, go to www.boem.gov.



BOEM

inFOCUS

Profile: ABB Inc.

For more than 130 years, ABB and its predecessor companies have set the pace for innovation in power grid technologies to harvest energy, improve productivity, safeguard the environment, increase profits, promote safe practices, and, more recently, integrate renewable energies onto the transmission grid.

By Anna Claire Howard

As one of the power industry's leading technology solutions provider, ABB Inc. has made its mark as a key enabler and pacesetter in wind energy by helping its customers generate, connect, monitor, and control power generated from wind farms.

With global headquarters in Zurich, Switzerland, ABB — formerly known as Asea Brown Boveri — was the result of a merger between Asea AB of Sweden and BBC Brown Boveri Ltd. of Baden, Switzerland in 1988. The merged entity became the world's leading supplier in the \$50 billion electricity industry. At that time, ABB controlled as much as one-third of Europe's electric power business and more than 20 percent of the world market. It successfully integrated 850 subsidiary companies and 180,000 employees operating in 140 countries.

In 1989, ABB acquired the transmission and distribution business of Westinghouse Electric Corporation, the founder of which developed the transformer as a means to transmit massive amounts of power from his hydroelectric plant in Niagara Falls to Buffalo, New York, 20 miles away.

This acquisition gave ABB a foot in the door to the North American utilities market, leading it to support 20,000 employees and approximately 80 manufacturing facilities. Its U.S. corporate headquarters are based in Cary, North Carolina, while its Power Grids headquarters are located in nearby Raleigh on the Centennial Campus of North Carolina State University and its world-class school of engineering. While ABB focuses on a wide range of industries, including oil and gas, pulp and paper, food and beverage, microgrids, utilities, and solar power, it has made a name for itself as a worldwide leader in wind energy technology and connecting wind farms to the grid.

“From the time that the wind comes into a turbine to the time that it hits the grid, ABB can offer all of the major electrical components that you need for that electrical drivetrain to transform that power from wind energy into electrical energy on the grid,” said Dennis McKinley, the director of wind power solutions in North America for ABB.

ABB began working with wind turbine OEMs more than 20 years ago

by delivering generators and various electrical components for the turbine. With its utility industry expertise, ABB provides front-end studies on wind projects from a technical and technology-feasibility standpoint, including where the best place is to tie into the grid, what kind of infrastructure is required to make that tie into the grid, and the supply of all of the major electrical infrastructure needed in the turbine and on the ground level.





ABB Inc

“We had all of the electrical components required, and we had already established a partnership with the major utilities, so it just made sense to start working in the wind industry and supply it with total turnkey-type solutions as well as individual products,” McKinley said. “We supply all of the major electrical components required, including generators, converters, transformers, low-voltage products for protection and controls,

motors for pitch and yaw systems, and medium-voltage switchgears. In terms of the electrical balance of plant (eBoP), we can supply everything from the transformers at the base of the towers all the way to the collection systems, substation, and grid tie-ins.”

Utility-scale wind turbines have two main electrical drivetrain concepts — doubly fed and full converter. According to McKinley, the main

ALSO IN THIS SECTION

- 18** Antifreeze and Cooling System Maintenance Play a Critical Role for Electronics
- 24** Conversation: Louis Dorworth – Abaris Training Resources Inc.

differences between the two are the type and size of generator used and the function of the converter.

“Even though the market has been dominated by the doubly-fed concept, there are several factors pushing for a shift toward full-converter, including grid code compliance and optimized power generation at slower wind speeds,” McKinley said. “Each of the electrical drivetrain concepts affects the turbine’s weight, size, and maintenance requirements. Selecting an electrical drivetrain concept needs to be done carefully, weighing the requirements of the turbine with the needed certifications and grid code specifications that apply once the turbine is installed.”

That’s where ABB comes in.

“We’re like the Intel inside of your computer when it comes to the wind power industry because we’ve got all of the electrical components covered,” McKinley said. “We are engineering-focused with an eye toward long-term quality and energy efficiency. Once the customer selects the electrical drivetrain concept, our expert engineers can work with the manufacturer to discuss and integrate ABB products into the turbine engineering drawings, specifications, and plans. Turbine manufacturers benefit from ABB’s experience, resulting in design cost savings and increased efficiencies. When you look at the breadth of ABB, from the consulting team to the service capabilities we have after the project has been installed and commissioned, we have a soup to nuts approach to supporting the industry. It’s all an electrical drivetrain from the time the wind comes in to the time it hits the grid.”

According to Bill Rose, the manager of media and public relations for ABB’s Power Grids division in North America, ABB is one of the few suppliers that has been involved



in the commercialization of wind power since the industry’s early days.

“As the largest supplier of electrical components, grid connection systems, and consulting services to the wind power industry, we have decades of experience and have installed more equipment in wind farms than any other supplier,” Rose said. “ABB’s wind industry expertise ensures our products are designed for long life cycles and changing industry regulations.”

As an example, ABB has been a supplier of transformers for more than 100 years. And, according to Rose, the company sold one transformer 80 years ago that is still in operation today in New York.

“When that unit was purchased, it wasn’t expected to last for 80 years, but it has,” Rose said. “We have a very active Power Service organization within ABB, and we do a lot of work with the utilities and follow-up with these products. Most transformers have a life span of 25 to 35 years, and many of the transformers on the U.S. grid today are at least 40 to 50 years old. In other words, they’re living on borrowed time. The utility companies and the operators know that they need to replace them,



but there isn’t always capex room in the budget to do so.

“At ABB, we understand that,” Rose said. “So we have an active service organization that is available to provide the on-site consultations and maintenance services required to keep those components working properly. In fact, 70 percent of all transformers on the U.S. grid were made by ABB or by our legacy companies.”

ABB also offers a wide variety of safety-oriented products, and according to McKinley, it’s a leader in

industries like wind where arc flash is a potential safety issue.

“Safety is paramount inside of ABB,” McKinley said. “We start each one of our customer and staff meetings off with a safety moment, which is anything that happens from a safety standpoint, like if an employee is harmed or if there is potential for it. When a safety moment occurs, they immediately stop work, put a team around it, take actions, and come up with a solution for it. That solution is developed over time and spread out throughout the company to prevent it from happening again.

“For example, we developed technology that, in the event of an arc flash, pushes the arc, the power, and the damage away from the person and ducts it out through a safe position. At ABB, we work with some electrical equipment that if you don’t do things right, you could be seriously hurt or potentially face a fatal accident, so safety is a big concern.”

ABB is also a leader in the industry through its power consulting services. According to McKinley, wind farm developers depend on ABB to provide reliable, high-performance wind power generation solutions. Factors such as components needed to collect wind power, boundary conditions, and grid-connection strategy can significantly impact the success of a wind farm, and ABB’s wind and utility expertise helps improve efficiency and maximize generation capabilities.

“We try to get involved in a wind project as early as we can so that our consulting unit provides the critical system planning, technology feasibility studies, and other site-specific analyses early in the initial design of the farm,” McKinley said. “We also have teams that work on the design side with the customers. The turbine OEMs are always looking for more power output, more efficient power

coming out, smaller footprint, and less weight. The research and development inside ABB is very strong with that in mind. We offer some of the most energy-efficient products available.”

In addition to realizing the full power potential of a farm, ABB provides a comprehensive approach that ensures grid integration and grid code compliance.

“Our decades of experience with utilities and their specifications, including appropriate reactive power handling, system impact, and the maximum power injected into the grid, help us drive the approval, testing, and final implementation processes for the farm,” McKinley said.

ABB also leads the industry on an educational level, working closely with the federal and local governments to educate them on the state of the wind market, the potential it presents for job opportunities, and the benefits from offshore wind energy generation.

“We’ve done projects offshore where we can provide the substation platforms that collect the power,” McKinley said. “We’ve completed one project where we did three offshore collection systems totaling approximately 300 MW that fed into another substation that converts the AC power into high-voltage DC power. It’s about 125 kilometers offshore, so we also provided the subsea cabling. We ran the cabling to shore, and that fed into a substation onshore, which ran approximately 75 kilometers onshore and to another substation that converted it back to AC power. We’re a leader in the high-voltage DC (HVDC) market space as well, and that technology plays very well into the wind industry, especially when you have long lines to run the power.”

McKinley added that while the U.S. is moving in the right direc-

tion with the development of its first offshore wind farm on Block Island, there’s still a ways to go to catch up with other parts of the world where offshore wind farm development is on the rise.

“There’s a lot of work going on toward having offshore wind development in the U.S., but based on federal and state regional laws and regulations, it’s kind of low,” McKinley said. “It’s moving forward, but it’s not being adopted as fast as it is in Europe and elsewhere. One of the key things to remember is that in Europe, they had to resort to offshore because they didn’t have the space for it onshore for all of the power they were looking for. The U.S. is a different beast because we still have a lot of different regions that have yet to be filled out with onshore wind, which is less expensive than offshore wind. The only catch is that in the west market space where onshore development is booming, the grid infrastructure isn’t there to run the power across the country. That’s the challenge with the onshore wind, and that’s where offshore wind could step in.”

McKinley, who has served on numerous boards for the American Wind Energy Association (AWEA), said that he expects the wind energy industry to continue growing and thriving under the recent five-year production tax credit (PTC) extension, and he said that ABB will play a key role in moving the industry forward.

“We’re a technology leader, so we’re constantly looking for new, innovative technologies that can help make wind energy more effective and last longer, as well as ways to make the industry a more dominant leader in the energy sector,” McKinley said. ↵

For more information, go to www.abb.com/windpower.

ANTIFREEZE AND COOLING SYSTEM MAINTENANCE PLAY A CRITICAL ROLE FOR ELECTRONICS

By Matt Erickson

Cooling systems of all types are often poorly maintained, incorrectly serviced, or completely ignored. There is certainly room for improvement in this area in industrial applications, and the wind energy industry is no exception. These problems are likely due to issues within cooling systems that occur over a long period of time, enabling poor maintenance because the harm that's caused is not immediate. However, to help put it in perspective, up to 40 percent of engine failures have been attributed to cooling system problems. Cooling system issues contribute to frustrations within the wind industry, too. Wind farm owners and operators are looking deeper into the increased numbers of insulated gate bipolar transistor (IGBT) failures within their converter's electrical system. The good news is that there are ways to prevent cooling system-related problems.

Although the cooling systems in wind applications are unique, OEMs specify typical automotive antifreeze/coolants, and rightfully so. The materials and components used for cooling electronics are similar to automotive components, and the systems operate on the same principles. However, there are different needs for the wind energy industry that increase the importance of using a high-quality antifreeze product and implementing a proper maintenance program, particularly because of the costs associated with IGBT failures.

Antifreeze consists of three primary components:

- Water – This is a great heat-transfer fluid, but with it comes some inherent issues such as freezing and corrosion.
- Glycol – This is added to lower the water's freeze point.
- Additives – These protect against corrosion while providing a number

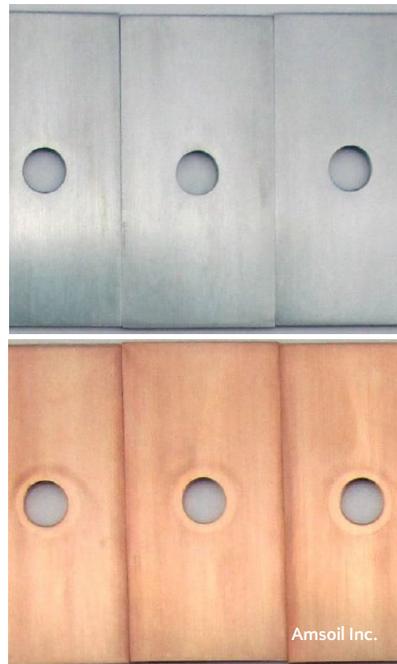
of other functions, including cavitation protection, pH control, lubrication, and anti-scale.

The glycol used in antifreeze is either ethylene glycol (EG) or propylene glycol (PG). The most common is EG, which has a slightly better freeze point and a small advantage in heat transfer when compared at a similar mix ratio. It is also less expensive, making it the popular choice. Because EG is hazardous, a bittering agent is added to antifreeze to help prevent ingestion. PG is the more environmentally friendly choice and is safer to use around children, pets, and wildlife because it is biodegradable and has low toxicity. Due to that benefit, some applications and locations require PG formulations.

ADDITIVES DIFFERENTIATE ANTIFREEZE PERFORMANCE

There are three categories of additives, and they can all be blended with the two glycols previously mentioned.

- Inorganic salts – The first additive type is found in the old “green” conventional antifreeze product. These products use inorganic salts such as nitrites, phosphates, and silicates to provide protection against corrosion and cavitation, among others. Inorganic salts work by forming a sacrificial layer over all components, and they are fast-acting. However, some of them are harmful to the environment and they deplete quickly, typically only lasting two years or less. Once they are depleted, they can start working against you by causing aluminum corrosion and deposit issues. Inorganic salts can also be incompatible with each other, leading to a dropout substance in the form of an abrasive or slime. For these



Steel and copper specimens after an ASTM D2570 simulated service corrosion testing of an OAT antifreeze where no signs of corrosion are shown, easily passing the test.

reasons, automotive OEMs have moved away from that type of antifreeze, and they have banned the use of certain inorganic salts.

- Organic acids – The next additive type is the high-performance choice called organic acids, often referred to as organic acid technology (OAT) or poly organic acid technology (POAT). Organic acids are only used when and where they are needed. This results in much longer-lasting protection. They also do not have the dropout, scale deposit, or compatibility issues that are inherent to inorganic salts. Therefore, this type of antifreeze can be used in a wide variety of applications, even for mixing with other types of antifreeze as top-off.
- Hybrids – The final option available is a combination of the previous

two, appropriately called hybrids or hybrid organic acid technology (HOAT). These are a mix of inorganic salts and organic acids, and the way they work is that once the inorganic salts deplete, the organic acids take over. The HOAT provides a blended performance result by alleviating some of the issues with inorganic salts by limiting the quantities and relying on the organic acids to boost the long-term performance. The inorganic salt(s) used in these products vary by application because automotive OEMs have banned various salts from their products due to performance issues. For example, Asian OEMs don't allow any silicates because they tend to drop out, forming hard particles that can cause seals to leak. They can also lead to scale deposits that insulate surfaces and lead to overheating.

METHODS FOR CHANGING ANTIFREEZE

There are two ways to accomplish conversion to a different antifreeze type. The ideal way is to use an acid-based flush to ensure any scale deposits that are already present are cleaned out. Otherwise, these can be incorrectly interpreted as a problem with the new antifreeze when routine maintenance is performed. This flush generally requires the following steps:

1. Drain the system's antifreeze
2. Fill with water and acid-based flush product
3. Run the pump
4. Drain and refill with water
5. Run the pump
6. Drain and fill with new antifreeze

This procedure adds cost and time to the changeover process, so it is not always a realistic option.

Antifreezes are generally compatible; therefore, in some cases, it is also acceptable to simply drain the current antifreeze and replace it with the new one. This can certainly be done when

the new antifreeze is a quality OAT product because it is fully compatible with all other antifreezes. If the new antifreeze is a hybrid, be cautious and check which inorganic salts are used to confirm compatibility. A simple drain and refill method does not remove deposits left behind by the previous product. However, quality OAT will ensure that no additional deposits form. This method is recommended for cooling systems that appear to be in good shape. Fully flushing, draining, and refilling the system are recommended for systems with issues such as increased operating temperatures or visible deposits and cloudiness.

PERFORM ROUTINE MAINTENANCE FOR BEST RESULTS

Antifreeze maintenance is an important consideration because avoidable issues can arise from incorrect practices. The maintenance requirements are slightly different depending on the type of antifreeze used. For hybrids, an extra step must be taken to monitor the inorganic salts so that the fluid can be changed once the salts are depleted. In the over-the-road truck industry, supplemental coolant additives (SCA) are sometimes used to replenish the inorganic salts and extend the drain interval.

OAT simplifies maintenance processes because they do not have the inorganic salts that deplete over time. Otherwise, both antifreeze types should have a maintenance program that includes a simple visual inspection and top-off as required, as well as a pH check. For open systems that may experience water evaporation, an additional glycol ratio check is recommended. If any contamination such as an odd color or cloudiness is noticed, change the antifreeze and inspect the system for the source of the contamination or leaks. If the system is low on fluid, top it off with a premixed product only. If the glycol ratio is off, make an

adjustment using only distilled water or a water source that has been tested and approved for cooling systems. Water quality is one of the biggest issues with cooling systems, often contributing to scale deposits and pH issues. An ideal antifreeze mixture will be between 40 and 60 percent glycol to ensure proper freeze protection, heat transfer capability, and that the additive concentration is properly balanced for corrosion protection. The target range for pH is between 7 and 11, depending on the antifreeze type.

Test strips are available to check pH, monitor inorganic salt content, and determine the freeze protection based on the glycol ratio. This can be done by dipping them in the antifreeze and matching the color to a scale. Test strips cost little and provide immediate results, but they are not exact. For more precise results, a full analysis is recommended by pulling a sample and sending it to a lab. A refractometer is the most accurate way to check the glycol ratio in the field.

Although automotive antifreeze/coolants sufficiently protect wind cooling systems, ensuring that equipment stays up and running properly requires routine maintenance. Using a premium OAT antifreeze/coolant is a great first step as it eliminates many of the costly problems associated with the inorganic salts found in both conventional "green" and hybrid antifreeze/coolants and simplifies maintenance processes by lasting longer and eliminating compatibility issues. Although there are many rising issues in the wind industry, we can take a deeper look into other industrial applications and learn from their mistakes to find solutions. Even the simplest products can have the greatest long-term effects. Investing in wind cooling systems now can decrease the issues a wind farm may face down the road. ↵

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

TRAINED PERSONNEL ARE KEY TO SAFE WIND FARM OPERATIONS

By Jack Wallace

Wind farm owners are doing their best to control spending, and, unfortunately, safety issues can be unintentionally overlooked, exposing contract workers and the wind farm itself to potential danger.

One such example is the practice of allowing the contractor to operate the turbine for “lock-out/tag-out” without spending the necessary time to train and document the training of the contractor on your sites and in your expected operating processes. The reason this is happening is due to manpower shortages and the industry overall not being as aware or vigilant as it should be of the potential risks. A shortcut like this is dangerous. Although the contractor technicians are more than willing to expand their knowledge to operate the turbines, their knowledge most likely is not at the same depth as that of the wind turbine technicians on-site. To ensure turbine safety, qualified and trained technicians should do the lock-out/tag-out procedure on these powerful electrical machines. To be qualified, one should be familiar with the equipment at hand. With that knowledge, they will most likely know what could go wrong and what to do if that happens. This is where the training needs to come in on each site. For example, I consider myself an electrically savvy member of the wind energy industry. However, I know that I am not qualified to go into most turbine controllers and manipulate them. I do not have the proper training. Therefore, I do not venture into areas on a wind farm or in the turbine itself that I feel are unsafe.

Some contractors do not understand the potential danger they are exposed to when it comes to the electrical side of wind turbine operations. They may underestimate the danger and overestimate their skills and

knowledge. Being unaware of the turbine-specific dangers is the problem, and that could be life-threatening. Unfortunately, the site personnel rarely go out and train their workers to ensure that the contractors are implementing the correct process. This should be the contractor’s priority because it is better to review something that everyone already knows than to let someone out on a wind

site who hasn’t been properly trained. I have found that the contractor is sometimes interviewed and that the working technicians’ safety certifications are looked at to make sure these items are current, but the contractor is rarely trained on the lock-out/tag-out protocols specific for each site.

A technician properly protected from arc flash while opening the cabinet on a Siemens 2.3 controller.



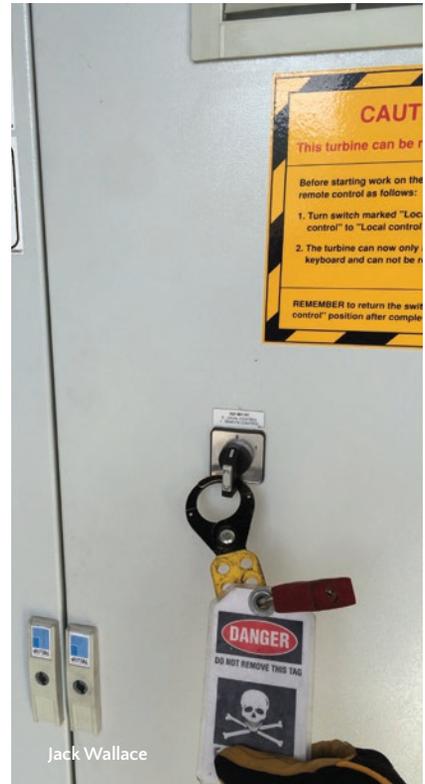
Some sites require that the contractor technicians take a NFPA 70E-qualified electrician course to make them eligible to perform electrical processes related to the turbine shutdown and lock-out. However, an online course on NFPA 70E electrical safety may not adequately train and qualify them to perform such potentially dangerous tasks as opening an electrical cabinet with exposed conductors behind it on a turbine. The technician needs turbine-specific and task-specific training to be safe while working on these turbines.

It is necessary to take the time to handle turbine operations with a qualified team and have the contractor lock out and tag out on top or in parallel, or you should build an adequate contractor training system that the contractor takes on the wind farm site. It may be as easy as having a savvy contractor work with you on a few turbines and follow your process, or it could be much more complicated. Either way, it's necessary. It may even be beneficial to always maintain operational control and lock out in parallel with the contractor. When it comes to the sub-contractors, I prefer that the site lock the turbine out and have my technicians lock and tag on top or in parallel. It is the safest option for all involved. For some turbines, lock-out/tag-out requires people to open control cabinets that have potentially dangerous electrical hazards. On these sites, extra personal protective equipment is required that includes fire-resistant clothing, a face shield, hearing protection, and electrically rated gloves. In my experience, many technicians do not use proper hearing protection with their arc flash protective gear, and it can be a challenge to have them wear the proper gloves and face shields unless they have experienced an arc flash event. As you can imagine, a sub-

The cabinet on a Siemens 2.3 controller with its controller locked and tags to prevent unauthorized operation.

contractor blade repair technician is not as proficient in the use of safety gear as the site technician should be. Safety professionals in wind have done an exemplary job of ensuring that they are properly geared and trained to perform the work they do at such great heights. Everyone understands the danger of heights intuitively, but the dangers of the turbine control system and its associated electrical components are not as readily visible until there is an accident. Those electrical dangers are growing as the turbines age, and the wind industry needs to be vigilant when it comes to electrical safety for everyone. ⚡

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



Jack Wallace

Powering the **future** through **education** and **sustainability**.

DEGREE OPTIONS IN:

- Water Quality & Sustainable Aquatic Resources
- Heating, Ventilation & Air Conditioning
- Construction Technology
- Wind Energy & Turbine Technology
- Environmental Studies
- Electrical Technology
- Engineering Technology

+ Industry Training



1-866-IA-LAKES • WWW.IOWALAKES.EDU
EMMETSBURG • ESTHERVILLE • SPENCER • SPIRIT LAKE • ALGONA

SIMULATION: A SHIFT AND ADVANCEMENT IN WIND ENERGY TRAINING METHODS

By Tiffany Sanders

Historically, the wind energy industry has been unreceptive to implementing simulation training as a viable alternative for standard training methods. Trade leaders have acknowledged that this primarily stems from a longstanding practice of using traditional, yet effective, on-the-job training (OJT) methods. The industry-wide lack of understanding on simulation benefits is another reason for their delayed adoption. The industry may not be aware of the operational savings and safety benefits aligned with a more technologically advanced training option. Wind energy trade members stand to benefit from learning how simulation modules can be integrated into their existing training program as a supplemental resource.

CURRENT STATE OF TRAINING WITHIN THE WIND ENERGY INDUSTRY

The "Occupational Outlook Handbook" projects that the need for wind turbine service technicians will increase to 108 percent by 2024 (<http://www.bls.gov>, 2016). The demand for

this skilled workforce greatly exceeds the availability of qualified workers, and entry-level training can often take six to eight months to complete. This fact highlights another challenge within the training realm — student throughput. An ongoing issue within the industry has been the absence of a successful method that alleviates the training backlog. Companies must also accommodate the travel costs associated with sending existing technicians to remote training locations stateside and internationally. The good news is that student throughput and travel funding concerns aren't novel or insurmountable in the global training arena. The steady adoption of virtual environments as a supplemental training tactic by government agencies and commercial companies has resulted in reduced operating expenses and improved student performance.

AN EXAMPLE OF SIMULATION TRAINING USED IN THE U.S. GOVERNMENT

The United States Navy, originating

in 1775 and touted as the largest employer in the world, accounts for more than 328,000 personnel, 272 combat vessels, and 3,700 aircraft currently in active service (www.navy.com, 2016). In the case of undersea initiatives prior to 2010, sailors were sent to multiple training sites to complete tasks using the actual tactical hardware. This resulted in hefty travel expenses, setup costs, and repair fees. Furthermore, this training method was limited to pre-established hardware configurations so it lacked flexibility in recreating troubleshoot and maintenance scenarios. In 2010, the Navy identified and implemented a solution to aid in reducing their training costs. The multipurpose reconfigurable training system (MRTS) was developed using affordable commercial off-the-shelf (COTS) hardware, such as monitors and computers that feature realistic 2-D and 3-D models, touch-based gestures, and touchscreen technology to simulate tasks that were originally only per-



formed on the tactical equipment. The format of the MRTS trainer was designed so that the configuration of the virtual components could be altered by the instructor to reflect a vessel-specific version of a radio room. The intent for this solution was to offer students an entry-level training tool for maintenance and operator tasks that can be easily shipped to and distributed in multiple naval bases and facilities worldwide. As a result, the U.S. Navy yielded a savings of over \$100 million with the use of this new virtual environment training technology.

A CASE FOR SIMULATION TRAINING IN THE WIND ENERGY INDUSTRY

While the majority of wind energy OEMs has opted to rely solely on the use of OJT, one global wind power firm recently engaged in a feasibility study to determine the efficacy and cost savings of developing a simulation training solution for service technicians. The company faced a multitude of training barriers that all pointed back to two principal issues — throughput and costs. In an effort to streamline their approach, they partnered with JHT Inc., a training and simulation firm based in Orlando, Florida, to develop a comprehensive business case for a tailored solution aligned with their technical requirements and training environment. The team at JHT Incorporated proposed the wind turbine simulation trainer (WTST). The construct of the WTST is a reconfigurable simulation system for performing authentic maintenance tasks and troubleshooting procedures on multiple wind turbine platforms. With implementation of the WTST, the wind energy firm aimed to realize an optimum balance of cost, reliability, adaptability, and effectiveness.

The primary objectives identified in developing the trainer included:

	FY2015	FY2016	FY2017	FY2018	FY2019
UNDISCOUNTED FLOWS:					
WTST Investment	(\$780,425)	(\$802,667)	(\$759,510)	(\$1,339,368)	(\$1,076,078)
WTST Benefits	\$567,544	\$3,443,199	\$5,216,230	\$5,006,563	\$3,978,263
Net Cash Flow	(\$212,881)	\$2,640,531	\$4,456,720	\$3,667,195	\$2,902,185
DISCOUNT FACTORS:					
Discount Rate - 10%					
Base Year - FY2015					
Year Index	-	1	2	3	4
Discount Factor	1.0000	0.9091	0.8264	0.7513	0.6830
DISCOUNTED FLOWS:					
Costs	(\$780,425)	(\$729,698)	(\$627,694)	(\$1,006,287)	(\$734,978)
Benefits	\$567,544	\$3,130,181	\$4,310,934	\$3,761,505	\$2,717,207
Net	(\$212,881)	\$2,400,483	\$3,683,240	\$2,755,218	\$1,982,232
Cumulative	(\$212,881)	\$2,187,602	\$5,870,842	\$8,626,059	\$10,608,291
RETURN ON INVESTMENT (5 YRS.)					
Return On Investment	4.8				
Net Present Value	\$10,608,291				
Internal Rate of Return	1299%				

- Reducing operational costs associated with technical training on turbine equipment
- Meeting the demand for qualified maintenance and troubleshooting technicians
- Achieving troubleshooting excellence and business impact while preserving the safety of technicians

COST BENEFIT ANALYSIS FOR WIND TURBINE SIMULATION TRAINER

The solution, comprised of a virtual 3-D environment and embedded with a realistic simulation of their turbine system, involved student interaction with the components of the wind turbine system through a multi-touch display. A predetermined number of simulated faults were designed for service technicians including: firmware upgrades, power, hydraulic, and lock-out/tag-out procedures using a library of realistic touch gestures from the ProxSIMity™ advanced touch system. The integration of ProxSIMity afforded students the ability to emulate over 100 pressure-sensitive actions within a 2-D or 3-D environment designed specifically for touch-screen-based applications.

THE LATEST IN TOUCH TECHNOLOGY

The use of gesture-based simulation training has found support across many industries including the med-

WTST cost-benefit analysis

ical equipment manufacturing sector. A current international conglomerate has integrated ProxSIMity into a customized training solution aimed at training maintenance technicians on several of their medical imaging modalities. Their tailored solution, using COTS 55" touchscreen monitors and computer towers, integrates student training stations (STS) and an instructor operating station (IOS), thereby allowing instructors to conduct classes, assign tasks and procedures, and monitor student performance in cities around the world. They now spend a fraction of previous years' costs on training expenditures.

CONCLUSION

The future for simulation training across all industries as a supplemental tool for OJT is expected to grow significantly as the case for cost savings, ease of throughput, and meeting customer demands becomes more substantiated. The availability of customized, cost-efficient 3-D simulation training solutions optimized for use on affordable COTS hardware presents a strong case that the wind energy industry will also benefit from reconsidering the advantages of their adoption and implementation. ↘

For more information, go to www.jht.com/proxSIMity.

CONVERSATION

Louis Dorworth

Manager of the Direct Services Division
Abaris Training Resources Inc.

(971) 261-2053
training@abaris.com
www.abaris.com
/AbarisTraining



Please give us some history on Abaris Training Resources Inc., including how it became involved in the wind energy industry.

Abaris started as a composite prototype and training company in 1983 with a group of former Lear Fan employees that had significant knowledge of advanced composite materials and processes. At the time, Abaris offered one composite repair course, serving mostly United States Department of Defense customers. In 1989, Abaris Training Resources Inc. was formed as a stand-alone company, and, over the years, it added many different composite courses that included engineering, manufacturing, and repair-related subjects to meet the demands of many different industries, including the wind energy sector. We currently offer 26 courses total.

How did you get involved in this market?

In the late 1990s, as wind turbine blades became larger and more efficient, the repairs needed on them became more critical, both from an aerodynamic and aeroelastic structural point of view. The OEMs had little expertise in the area of structural repairs, and Abaris began transferring knowledge from the aerospace industry to the wind energy marketplace.

Tell us about the various training and consulting services Abaris offers the wind energy industry.

Abaris currently has both engineering and technician level training for the wind energy industry. For up-tower repair technicians, Abaris offers a five-day course titled Composite Windblade Repair, wherein the students are actively introduced to structural repair methods and techniques that can be adapted to any composite turbine blade design. For engineers, Abaris offers a five-day course titled Structural Engineering for Composite Repair, in which engineers learn how to analyze the structure as well as the damage done to the structure and develop an appropriate repair design for the affected zones of the blade structure. In addition to these and many related courses, Abaris also offers both technical and engineering consultation to customers that may have specific re-

quirements within their organization that go beyond the scope of their current internal knowledge base.

Tell us about the importance of producing high-performance structural repairs and how that is critical to the durability and efficiency of the wind turbine blade.

As the size of turbine blades increase and the designs further optimize the use of both glass and carbon fiber reinforcements to carry more load, the demand for aerospace quality repairs become more commonplace. The old-school repairs that originally emerged from the marine industry are no longer efficient in meeting the demands of repairs to today's turbine blade designs. A thorough understanding of the aerodynamic and aeroelastic structural requirements of the composite repair are critical to the blades' performance and are designed to prolong the life of the blade.

What sets technicians who are trained through Abaris apart from other technicians in the field?

At Abaris, we use an active learning/training approach with our students so that they learn about how composite materials work within the structure and why each step in the repair process may be critical to the end result. We spend just enough time in

Abaris has the longest and most successful track record in the business of advanced composite training than any other company on the globe.

the classroom discussing the basics and the rest of the time in the workshop conducting actual repairs on different areas of blade sections to gain the knowledge and experience needed to competently perform high-quality field repairs. Oftentimes, a maintenance organization will send an entire group to our class, or a series of classes, to get everybody on the same page, thus providing consistency amongst their repair teams out in the field. This can only be accomplished in a formal training environment and not through on-the-job training efforts where many lessons and techniques are lost in the transfer of information from tech to tech.

What is laser shearography, and how can the wind power industry benefit from its application in blade inspections?

Laser shearography is a non-destructive inspection (NDI) technique that measures the material response to an applied stress, which can be either pressure, temperature, or load change. Using a high-power single frequency laser with powerful image capture and analysis tools, laser shearograms can produce a visual, micro-scale map of a surface that will show underlying disbonds, delaminations, and more in or around a defective or damaged area on the blade. It is very effective in finding a number of flaws in composite structures.

What are some of the challenges repair technicians face in the wind industry?

Up-tower technicians have a number of challenges, primarily the environmental conditions in which they work. Whether on a rope or a platform, just gaining the stability to perform dam-

age assessment and repairs can be a challenge on a windy day. It is assumed that technicians coming to our facility are gaining rope or tower training separately from the composite repair training that we offer. Having said that, we teach students to perform damage assessment and removal of structural damage in a timely manner so they can move forward to conducting the repair. In our facility, we spend a great deal of time teaching the technicians how to organize materials that will be needed for the repair. This involves the use of trace templates for each repair ply and core materials that, if applicable, can be sent to a ground crew to prepare the repair pieces and send back up-tower as needed. Much of the challenge is in handling and, eventually, curing the resin-impregnated fabric layers that are used to replace the axially oriented materials in the tapered scarf or otherwise prepared area so that the loads are regained in the laminate repair. This work is often done with a vacuum bag and, perhaps, a heater blanket and process controller. Abaris technicians learn to coordinate and prepare for each step, so as to minimize the time between resin impregnation, vacuum bagging, and curing the resin system.

What is a repair plan, and why is it such a critical step in the composites repair and inspection process on wind turbine blades?

A repair plan may be a generic set of instructions applicable to a certain type and size of damage for various zones on the blade. If the damage is large and complex, the repair instruction may require an engineering analysis of the damage and a specific repair be developed to achieve the desired aerodynamic and/or aeroelastic structural properties. Post repair inspection

of the repair often will be required in the instruction as a review of photo documentation of step-by-step procedures, vacuum readings, process controller data, and some sort of NDI to verify the repair is sound. The bottom line is that having a repair instruction, plan, or checklist for any type of repair provides for consistency and reliability from one repair to another.

What are the advantages of working with Abaris?

The biggest advantage is learning from our many years of experience with advanced composite materials, processes, methods, techniques, and best practices that our staff has acquired over years of service to multiple industries. Abaris can pass on knowledge in a matter of days that might take years for others to acquire.

What sets Abaris apart from other training and consultation providers in the wind energy market?

Abaris has the longest and most successful track record in the business of advanced composite training than any other company on the globe. This experience spans multiple industries and has been uniquely applied to the wind energy market in establishing best methods and practices for wind blade engineering, manufacturing, and repairs.

What can the industry expect from Abaris moving forward?

Abaris will continuously improve our offerings based upon newly reported knowledge of new technologies, materials, processes, and designs affecting the wind energy industry. Our goal is to stay ahead of the status quo with our engineering and technical expertise. ↴

MAINTENANCE

Operations • Service & Repair • Inspection • Safety • Equipment • Condition Monitoring • Lubrication

SIEMENS SIGNS FIRST BALANCE OF PLANT WIND SERVICE AGREEMENT IN THE U.S.



Siemens recently signed a long-term contract extension for services and maintenance at the 152-MW Keenan II wind farm in Oklahoma that will also include balance of plant (BoP) to the scope and extend it for another 15 years. This marks Siemens' first long-term BoP wind service agreement in the United States. The customer is CPV Keenan II Renewable Energy Company (CPV

Siemens wind service technicians performing service and maintenance on an SWT-2.3-MW turbine

Keenan II), headquartered in Silver Spring, Maryland. Siemens will provide an additional 15 years of service and maintenance for the 66 SWT-2.3-101 turbines installed at the Keenan II wind farm located

ALSO IN THIS SECTION

28 Developers Turn to RNRG's 80m Tilt-Up Towers To Improve Power Performance Testing

29 DNV GL To Provide Project Certification for E.ON's Arkona Offshore Wind Farm

near Woodward, Oklahoma. The new agreements add BoP to the scope with Siemens performing or coordinating the performance by others of certain service and maintenance activities throughout the wind plant, including the collector system, substation, transformers, transmission lines, switchgear, equipment, machinery, fiber optic cables for the supervisory control and data acquisition (SCADA) system, control systems, communication systems, foundations, towers, and access roads.

“As the wind energy industry in the U.S. continues to mature, more and more of our customers are looking to Siemens for a fully integrated life cycle approach to support their long-term operational goals and to help reduce costs,” said Mark Albenze, CEO of Siemens Power Generation Services’ Wind Power and Renewables business unit. “This balance of plant agreement at Keenan II supports our goal to provide added value to customers such as CPV Keenan II through integrating our service offerings across the entire plant and tailoring them to meet their specific operational needs. As the original equipment manufacturer for select transmission and substation equipment, Siemens is in the unique position of being able to extend our service offerings beyond the wind turbines.”

The service and maintenance will be supported by Siemens Digital Services, including advanced remote monitoring and diagnostics services. Select data-driven services will utilize Sanalytics, the platform architecture and technology foundation for Siemens Digital Services, as well as tailored industry-specific applications. Siemens Digital Services for Energy incorporate advanced analytics based on market, operational, and contextual

know-how for a service and maintenance approach tailored specifically to a customer’s operating needs. This allows for a comprehensive plant-level asset optimization scenario enabling both predictive and prescriptive services.

“We are very pleased with this arrangement,” said Dave Magill, senior vice president of asset management at CPV. “The expansion of Siemens’ scope in a long-term contract will ensure the Keenan II wind farm continues to provide reliable low cost wind energy to Oklahomans for years to come.”

The Keenan II wind farm went into commercial operation in December 2010. Keenan II generates enough electricity to power approximately 45,000 average Oklahoma homes and avoid approximately 413,000 tons a year in greenhouse gas emissions — the equivalent of taking nearly 72,000 cars off the

road. The project has a 20-year power purchase agreement with Oklahoma Gas and Electric Company.

Siemens has been providing service and maintenance on the 66 SWT-2.3 wind turbines at the project since it began operations in 2010. In 2012, Siemens opened a 64,000-square-foot wind service distribution center in nearby Woodward, Oklahoma, citing the area’s proximity to wind projects throughout the wind belt.

Siemens currently provides service and maintenance for more than 4,000 installed wind turbines in the Americas region and more than 10,000 globally, with a combined generating capacity of approximately 24 GW. ↘

Source: Siemens

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

Everglades University

EUsolarenergy2.com





BACHELOR

- Alternative and Renewable Energy
- Environmental Policy
- Land and Energy
- Alternative Medicine

MASTER

- Public Health Administration
 - Concentration in Complementary and Alternative Medicine





Additional Degree Programs and Online Shifts are Available.

Boca | Sarasota | Tampa | Orlando | Online
888.854.8308

DEVELOPERS TURN TO RNRG'S 80M TILT-UP TOWERS TO IMPROVE POWER PERFORMANCE TESTING



Renewable NRG Systems (RNRG), a designer and manufacturer of decision support tools for the global renewable energy industry, recently announced the sale of 20 of its 80-meter tilt-up towers to high-profile developers and consultants to support their power performance testing (PTT) activities. This departure from the traditional use of higher lattice towers for PTT purposes represents a notable strategy change by key players in the wind sector.

“Companies are beginning to use our 80-meter XHD TallTower tilt-ups instead of the typical higher lattice towers for power curve verification purposes due to its advantageous price and functionality,” said Greg Erdmann, vice president of global sales at RNRG. “This was

unheard of in the wind industry only a year ago. Unlike higher lattice towers, they can be redeployed to other sites after the IEC test is completed. What’s more, site assessment costs and decommissioning costs are significantly lower. They are faster to set up and easier to decommission. Once developers grasped the extent of the opportunity offered by tilt-ups, opportunities naturally began to present themselves.”

Higher lattice towers are able to acquire hub measurements, and they can be climbed instead of tilted down, which reduces the cost for sensor maintenance. However, they are more expensive to purchase, install, transport, and decommission. They also present the added liability of requiring people to climb the

towers, and these towers come with longer delivery times and need significantly more time to be installed and to qualify the site.

“Consultants and developers have finally come to understand the true value of temporary tilt-up towers,” Erdmann said. “Our tilt-up towers fit the temporary requirement of a PPT and once the test has been completed, they can be moved to other sites, which allows more tests to be supported within constrained budgets. Thanks to our 80 XHD TallTowers, we are allowing more developers to perform PPT, which allows consultants to secure more service-related business.”

Source: Renewable NRG Systems
For more information, go to www.renewablenrgsystems.com.

DNV GL TO PROVIDE PROJECT CERTIFICATION FOR E.ON'S ARKONA OFFSHORE WIND FARM

E.ON recently awarded the project certification contract for the new Arkona offshore wind farm to DNV GL. The project covers the inspection phases from manufacturing, transport, installation, and commissioning to take the wind farm into operation.

The Arkona offshore wind farm is a 385-MW offshore wind farm that is currently being developed by E.ON. The wind farm will be located 35 kilometers northeast of Rügen Island in the Baltic Sea off the coast of Germany. The energy company Statoil has a 50 percent stake and has been involved in the project from the start. E.ON is responsible for building and operating the wind farm. Upon planned completion in 2019, the project will supply renewable energy for approximately 400,000 households and offset 1.2 million tons of carbon dioxide emissions a year.

Having worked on the project since 2014, DNV GL was initially appointed by E.ON for the full design assessment of the wind farm's turbines and the offshore substations. During the design assessment, DNV GL ensured timely delivery of the conformity statements for the basic design of the wind turbines and support structure.

DNV GL and E.ON are collaborating to finalize the detailed design of both the offshore transformer station and turbine as well as the support structures. Building on the successful partnership, DNV GL is continuing its work with E.ON into the operational phase of the wind farm.

Arkona marks the 14th offshore wind farm in Germany alone that DNV GL is supporting with its certification services, out of a total of 16 German wind farms currently in operation or under construction.

"As the pressure to produce clean energy at a cost-competitive price is growing, ensuring that the objectives of new wind energy projects are being met at each stage in the run-up to their operation is vital," said Steffen Haupt, global head of business development and sales at DNV GL energy and renewables certification. "Supporting this venture from start to finish enables us to contribute best to the success of this important offshore project, and we are excited to work side-by-side with E.ON to get Arkona implemented."

The stringent inspections of the project certification phase are designed to ensure that the assumptions made

WIND TURBINE TECHNICIAN ACADEMY

Competency-based, hands-on training
Industry-guided skill assessments
Industry tools and equipment
ENSA GWO Certified Safety Training

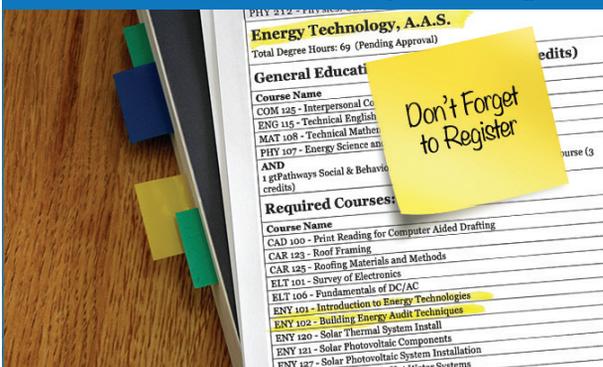
Change your life and your world.

Kalamazoo**VALLEY**[™]
community college
269.353.1253
www.kvcc.edu/wind






Lamar Community College



A small, rural college on the southeastern plains of Colorado, Lamar Community College (LCC) offers a variety of two-year degrees and certificates through on-site and online courses.

Renewable Energy Technology, A.A.S.

- ENY 101 - Introduction to Energy Technologies
- ENY 102 - Building Energy Audit Techniques
- OSH 126 - 30 Hour Construction Industry Standards
- WTG 100 - Introduction to Wind Industry
- WTG 110 - Wind Turbine Generator Power Distribution & Control Systems



www.lamarcc.edu



in the design assessment phase are validated and support the goal to provide optimal reliability for the entirety of the project lifetime.

Having type-certified both the Siemens SWT-6.0-154 turbine, which will be supplied to the project, as well as other manufacturers providing components to the Arkona wind farm, DNV GL's experts provide a unique knowledge of the wind farm assets.

Working with DNV GL, the world's largest certification body, enables E.ON to tap into a global workforce of highly technical experts, ensuring that the entire project certification process will be delivered by one supplier. ↪

Source: DNV GL

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

BASF'S LEADING-EDGE PROTECTION FOR ROTOR BLADES PASSES 50-HOUR RAIN TEST

BASF, which supports the wind energy sector with special systems and products, announced that it has launched Relest® Wind LEP S, an innovative coatings solution for rotor blades that has recently passed an external 50 hours rain erosion test by a renowned Danish institute, thus outperforming other well-known rain erosion resistant coatings.

The stress loads to which rotor blades are exposed during the operation are enormous. At top speeds of up to 300 kilometers per hour at the blade tips, gigantic forces act upon the blades. Moreover, weather influences such as rain, snow, hail, sand, heat, and ultraviolet (UV) radiation wear out the blades and lead to more frequent repair and maintenance intervals.

To prevent the material from damages caused by these influences, the coatings division of BASF has developed a solution for long-lasting protection. The system consists of a gel coat, a filler, an edge protection, and a topcoat. It is based entirely on solvent-free, two-component polyurethane compounds, thus complying with present VOC directives. Within BASF's coatings portfolio for the wind energy sector, Relest Wind LEP S stands for excellent sustainable and efficient leading-edge protection.

Relest Wind LEP S provides rotor blades with the optimum protection due to its excellent rain-erosion resistance. The recent test showed that with a speed of up to 160 meters per second (approximately 570 kilometers per hour), the rain did not cause any significant damage on

the coating. The material is virtually solvent-free as well as being exceptionally durable and UV-stable.

Ideally suited for OEMs, the material can be applied directly on the rotor blade. Relest Wind LEP S improves the efficiency of the wind turbine operation by providing an effective erosion protection, thus reducing potential maintenance costs. With its low film thickness and easy application, it is the ideal material matching the customers' requirements.

BASF supplies the matching coating system for all components under the trade name Relest, from the base of the wind power plant to the rotor blade edge, and provides innovative products for the energy of the future. ↙

Source: BASF

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



Giving Wind Direction
WIND SYSTEMS

SEEKING OPPORTUNITY?

Scan *Wind Systems* website to enjoy a host of features, including:

- Our new jobs listing, for employers and jobs seekers alike
- Events calendar to keep you informed
- A searchable articles archive, downloadable individually
- View the digital magazine, or download entire issues
- Vendor listings, along with our annual Buyer's Guide
- Company profiles and Q&As
- Connect to the wind industry through social media
- Wind industry news from around the world

Visit windsystemsmag.com today and get connected!

INNOVATION

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

HUVRDATA AND EDGEDATA ANNOUNCE COLLABORATION TO OPTIMIZE AERIAL WIND INSPECTIONS



Two leading companies in aerial wind inspection services — HUVRdata, based in Austin, Texas, and EdgeData based in Grand Forks, North Dakota — recently announced a collaboration to deliver a suite of wind industry data intelligence tools and credential processes to optimize the use of this technology within the wind industry. The collaboration will leverage multiple points of synergy between the two companies, including HUVRdata’s data capture ca-

pabilities and cloud-based services and EdgeData’s BladeEdge analytics software for automated blade condition assessment.

“With our shared commitments to accuracy, security, and continuous innovation, EdgeData and HUVRdata make natural partners,” said Lonnie Bloomquist, CEO of EdgeData.

The scope of the collaboration spans data capture, software analytics tools, data handling, and report-

ALSO IN THIS SECTION

36 GE Renewable Energy Introduces New Suite of Digital Wind Farm Apps

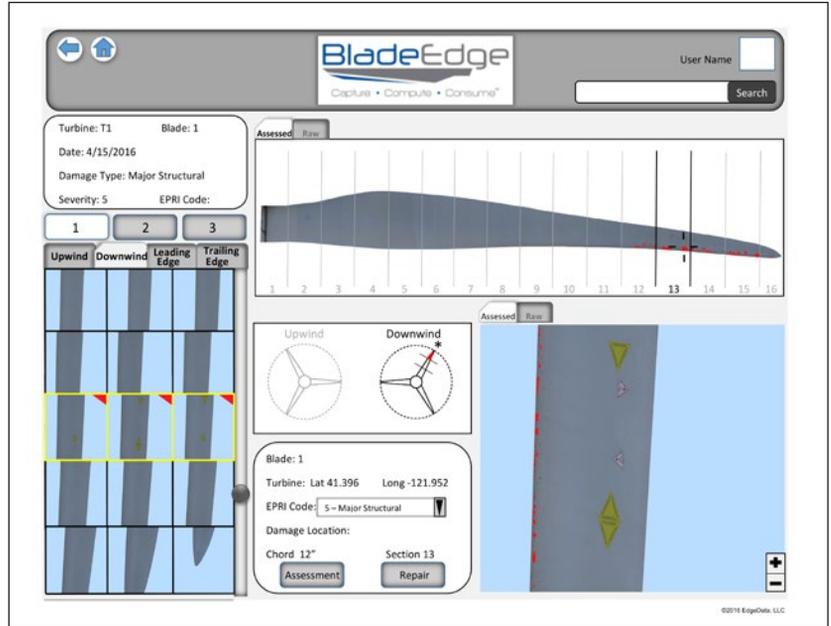
37 Campbell Scientific Releases CR300 Datalogger

ing. HUVRdata, which holds a 333 exemption for wind turbine inspections and is the first company to be credentialed by the National UAS Credentialing Program, will be added as an EdgeData unmanned service provider (USP) to provide safe, reliable turbine inspection data.

“Our collaboration will allow the industry to accelerate the adoption of unmanned aircraft systems [UAS] within O&M operations and provide the most robust analytics and cloud-based services to lower annual operating expenses,” said Bob Baughman, CEO of HUVRdata.

The companies will work together to accelerate software performance, deliver enterprise-grade cloud-based and on-site data storage, and optimize reporting tools to serve the needs of different organizational roles, from wind farm technician to vice president of operations.

“This partnership will give wind professionals more powerful tools for delivering rate of interest [ROI]



with an unprecedented range and depth of data collection, analytics, and reporting capabilities,” said Chris Shroyer, president of EdgeData. “It is about the data and the associated intelligence. This is the future of the wind industry.”

Source: HUVRdata

For more information, go to www.huvrdata.com and www.bladeedge.net.

TEXAS TECH RESEARCHER AIDING IN STUDY OF EAGLE INTERACTION WITH WIND TURBINES

In the avian world, the eagle is known as the apex predator, meaning no other bird considers an eagle its prey. The eagle is on the top of the avian food chain. But that doesn't mean they live without dangers, most of which are man-made. There's one man-made danger in particular that has led a Texas Tech University professor to work with several government agencies in an effort to discover ways to mitigate golden eagle deaths as much as possible.

With the push toward clean energy, West Texas and Eastern New Mexico have seen a tremendous growth in the popularity and construction of wind turbine farms. However, while they are essential to ending the United States' dependency on fossil fuels, these wind



farms have created a danger for the golden eagle in the same areas.

“Wind energy development throughout the western U.S. is ongoing and rampant, and it is an important renewable energy source,” said Dr. Clint Boal, a professor in the Department of Natural Resources Management in the College of Agricultural Sciences & Natural Resources and leader of this study. “But it doesn’t come without some ecological cost that can result in either displacement of wildlife or the direct mortality of wildlife. If the species is really abundant, it may not be a substantive issue, but when you have a species like the golden eagle that is not as abundant, has a long life span, and has low productivity, it does become an issue.”

That’s why the research that Boal and his colleagues are performing is so important. Boal, a member of the United States Geological Survey’s Cooperative Research Unit at Texas Tech, along with the U.S. Fish and Wildlife Service’s Region 2 office and its Western Golden Eagle Team, are in the process of studying golden eagle movements and potential interactions with wind turbines by capturing golden eagle chicks before they can fly and affixing lightweight GPS transmitters on their backs. The chicks are returned to the nest, and their movements can then be tracked over the next several years.

“Because these are alpha birds, their distribution is such that they have a large territory, and their primary cause of death that first year is starvation or accidents, just because they have to learn how to fly and hunt,” Boal said. “What happens when you start losing them through electrocution on power poles, flying into turbines, or getting hit by cars on the highway when they are scavenging car-

casses is that it may have a population-level effect, and that is what the Fish and Wildlife Service is concerned about. Wind turbines are the most recent and potentially most dramatic of these.”

PROTECTING THE EAGLE

Golden eagles are not on the endangered or threatened species lists, but the species is protected under the Bald and Golden Eagle Protection Act. According to Boal, from the 1940s to the early 1960s, hundreds of golden eagles were killed, leading to them being added to the act in 1962. A golden eagle reaches full maturity in about five years and produces only one to two chicks per year, if any, when it reaches breeding age.

The golden eagle can be found throughout the western third of North America, from the western edge of the Great Plains to the Pacific Coast and from Alaska south to Mexico. A small population also is present in northeastern Canada.

However, according to Boal, there has been no real assessment of the golden eagle population in Texas since the 1970s. Boal did some studies in the Texas Panhandle in 2005 and 2006, but the growth of wind turbines presented a new danger.

Boal said that during the last two winters, he and other researchers have studied eagle habitats off the plains of Oklahoma and Texas and into Eastern New Mexico, examining both the birds that stay in the area year-round and those that migrate to the area every year. They’ve also examined some of the sites where golden eagles have nested since the 1970s, in the Trans Pecos region of Texas and, more closely, along the Caprock Escarpment.

Capturing a golden eagle is quite a process. Once an appropriate

nest is located along the face of a cliff, a group of the researchers fan out across the bottom of the cliff. A climber descends from the top of the cliff above the nest and either captures it at the nest or it flees the climber by jumping from the nest. Though it can’t yet fly, the young eagle can glide very well — up to a kilometer, according to Boal — before reaching the ground.

There, the researchers capture the young eagle, put a hood over its head to keep it calm, affix the solar-powered GPS transmitter, tag the bird, and take blood samples for genetic analysis before the climber returns it to its nest.

Last year, Boal and the other researchers tagged and fitted six golden eagles in Eastern New Mexico, several of which migrated into the Texas Panhandle between Lubbock and Amarillo and into the Caprock. Another seven birds have been fitted and tagged this year so far.

“We’re able to track where they go to see if they interact with wind turbine farms, if they fly through to hunt in those areas, or if they avoid them altogether,” Boal said. “We hope to determine what the important features of the landscape they key in on, especially during that first year of life when they’re just learning how to be eagles and learning how to hunt.”

PROTECTION THROUGH MITIGATION

Boal said that regardless of what the GPS trackers say about a golden eagle’s movements, not much can be done to change an eagle’s habits. So, the task for Boal and other researchers becomes ensuring that eagle habitats and the landscape are as conducive as possible to ensure survival and reproduction while, at the same time, having mitigation policies in place

for landowners who erect wind turbine farms that could endanger eagles.

One mitigation strategy could be to put wind turbines in areas like a cotton field where the prey eagles hunt for is scarce. It's the native grasslands where prey like jackrabbits and cottontail rabbits are most abundant, and eagles may venture to hunt even if there are wind turbines present.

Because golden eagles are protected, the Fish and Wildlife Service has developed an incidental take permit system. That program allows energy companies to apply for an incidental take permit that protects these companies from liability if an eagle is struck by a wind turbine blade, which would be a violation of the Bald and Golden Eagle Protection Act.

This is where some of the data that Boal and his team are collecting can be used to determine how many eagles are expected to be in an area and the potential for being killed if a wind energy center is placed in a certain area. But those incidental take permits usually span only about five to 10 years, and a condition of those permits is that for every eagle killed by a wind turbine, the energy company has to offset the loss by ensuring birth of a new eagle somewhere else or prevent an eagle in another location from dying from other causes.

The methods to ensure eagle productivity could range from putting money into a mitigation bank fund to be used in some management action to a direct action by the energy company itself.

Ensuring the viability of the landscape for eagles to hunt and capture prey is an area of particular interest for Boal. One example of that, he said, is the encroachment of juniper all along the Caprock.

Juniper thickets not only reduce the number of jackrabbits and cottontails for eagles to capture, but it also makes it difficult to capture the ones that are there by allowing the rabbits to hide in the thickets.

Boal said landowners are interested in reducing juniper because it degrades the quality of land for cattle grazing and uses a large amount of water. Boal wants to find a way to estimate how many eagle chicks can be produced by restoring a certain amount of land to native grassland that eagles can hunt in.

"That's a way where energy companies can say that they want to put money into a mitigation bank to help the landowners do what they already want to do and that is controlling the juniper and mesquite encroachment," Boal said. "By doing that, the landowner wins because they receive financial assistance for improving the quality of range land for cattle. Eagles win because it provides a habitat for jackrabbits and cottontails, and it provides it in such a way that the landscape is more effective for foraging."

In the long term, Boal said he would like to also study eagles' food habits by putting remote cameras near eagle nests to see what kind of prey they bring back for their young. A better understanding of the diversity and proportions of different prey species used would help determine how to manage the landscape to ensure an adequate food supply for eagles to hunt.

"I think it's a win-win for everybody involved," Boal said. "You get clean energy through turbines and a good habitat for eagles, and it also benefits the cattle ranchers." ♪

Source: Texas Tech University

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



OBO
BETTERMANN

**Cable Management
for Wind Turbines**

www.obous.com

GE RENEWABLE ENERGY INTRODUCES NEW SUITE OF DIGITAL WIND FARM APPS



At the American Wind Energy Association’s Windpower 2016 event in New Orleans, GE Renewable Energy introduced a new software applications suite for its Digital Wind Farm ecosystem.

Offered as part of GE’s flexible service agreements, the apps are compatible with the company’s new 2- and 3-MW wind turbines and were developed to enhance annual energy production (AEP) and improve wind farm profitability. The programs are built on the Predix software platform, the foundation for all GE’s industrial internet applications, and include its specialized cyber security protection for operational technology.

“The Digital Wind Farm is changing the future of our industry,” said Anne McEntee, president and CEO of GE’s onshore wind business. “We are actively working with our customers to develop new software technology applications that gener-

ate more production, better availability, and ultimately higher profit across the life cycle of a wind farm.”

One such customer collaboration resulted in GE’s new energy forecasting application. Developed in cooperation with Exelon Power as a strategic way to improve wind farm profitability, the app utilizes weather forecasting data to generate more accurate financial modeling and better predict the next day’s grid supply and demand fluctuations. It also offers real-time forecasting for identifying production ramps throughout the day to improve profitability for dispatchers and traders in PPA or merchant energy markets.

Energy forecasting was recently deployed for testing at four new wind projects in the U.S., and Exelon expects the software will deliver 1 to 3 percent of additional revenue per site.

In addition to business optimization, GE also unveiled two new

apps that help streamline wind farm operations. Digital Plan of the Day is a scheduling application that improves operations and maintenance efficiency for field service teams. The app combines a variety of disparate data sets, including SCADA information, diagnostic readings, weather conditions, and even geolocation data, to organize and prioritize daily maintenance schedules across a site.

The second operations-focused app is the next generation of GE’s popular Wind PowerUp Services platform, which is now capable of increasing a wind farm’s annual energy production by up to 10 percent. The newest version of PowerUp Services builds on GE’s earlier capabilities in making small hardware and software adjustments based on performance and reliability data, but now it expands the concept by introducing an iterative tuning process to monitor a site’s specific wind environment and lock in the appropriate

settings based on the most current information available.

“When we initially launched PowerUp Services a few years ago, we were using historical data to make hardware and software adjustments that would yield up to 5 percent more AEP,” McEntee said. “We’ve now taken all that learning from the initial version and put it back into our software development to speed up the adjustment cycle and generate more value for our customers. Today, PowerUp Services is capable of delivering up to double the AEP improvements of just a few

years ago. That’s the benefit of the Digital Wind Farm — it’s always learning.”

The final two applications in GE’s new wind software suite are focused on asset performance management. The Diagnostics app uses operating data for advanced anomaly detection analysis and then incorporates that analysis into a detailed case management and recommendation system. The Prognostics app uses operating, maintenance, and inspection data to project future operating conditions and predict turbine component reliability.

By shifting from unplanned outages to predictive maintenance, the Diagnostics and Prognostics apps can help wind farm operators reduce maintenance costs by up to 10 percent.

Many of the new applications are already being deployed with pilot customers, and they will be broadly available as part of GE’s flexible service agreements beginning later this year. ↵

Source: GE Renewable Energy

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

CAMPBELL SCIENTIFIC RELEASES CR300 DATALOGGER

Campbell Scientific, a maker of research-grade measurement instruments for over 40 years, is releasing an innovative new data-acquisition product — the CR300 measurement and control datalogger. The CR300 has many of the best capabilities of full-size Campbell Scientific dataloggers with the smaller size and price of Campbell’s compact dataloggers.

“A nice part about the CR300 is that, from a user’s skill-level standpoint, it is not so different from our other dataloggers, so the learning curve is very small,” said Kevin Rhodes, Campbell Scientific’s product manager for the CR300. “Integrators can capitalize on their knowledge of CRBasic and our other popular dataloggers for use with this lower-cost datalogger.”

The CR300 datalogger was developed based on customer feedback, especially from customers who embed Campbell Scientific dataloggers in their own products. It is a step up from Campbell’s earlier low-cost, compact dataloggers because of its much richer CRBasic command set and serial communication capabilities, and its capacity for larger, more complex programs. The CR300 also

has its own onboard compiler that can handle large, complex programs.

The CR300 is the same size as the earlier compact Campbell Scientific dataloggers, and it can be a drop-in replacement. It is also the first Campbell datalogger that can measure 4 to 20 mA sensors natively.

The CR300 is the best-value datalogger Campbell Scientific has ever built. It has a 24-bit analog to digital converter, a high-speed processor, and a micro-USB port. For communication, the CR300 has full PakBus

capability, making it an important part of your network. There is plenty of non-volatile flash memory for storage.

The CR300 is programmed with Campbell Scientific’s LoggerNet software, which includes a point-and-click program generator, and a network planner for graphical layout of devices. ↵

Source: Campbell Scientific

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



Campbell Scientific

MANUFACTURING

Production • Fabrication • Components • Supply Chain • Materials • Tooling • Machinery

SIEMENS AND GAMESA MERGE WIND BUSINESSES TO CREATE LEADING WIND POWER PLAYER



Siemens and Gamesa recently signed binding agreements to merge Siemens' wind power and services business with Gamesa to create a leading global wind power player. Siemens will receive newly issued shares of the combined company and will hold 59 percent of the share capital

while Gamesa's existing shareholders will hold 41 percent. As a part of the merger, Siemens will fund a cash payment of €3.75 per share, which will be distributed to Gamesa's shareholders (excluding Siemens) immediately following the completion of the merger (net of any ordi-

ALSO IN THIS SECTION

40 Inox Wind Wins 100-MW Order from Leading Renewable Energy IPP

nary dividends paid until completion of the merger). The cash payment represents 26 percent of Gamesa's unaffected share price at market close on January 28, 2016.

Additionally, Gamesa and Areva have entered into contractual agreements whereby Areva waives existing contractual restrictions in Gamesa's and Areva's offshore wind joint venture Adwen, simplifying the merger between Gamesa and Siemens. As a part of these agreements, Gamesa — in alignment with Siemens — grants Areva a put option for Areva's 50 percent stake and a call option for Gamesa's 50 percent stake in Adwen. Both options will expire three months after the deal is made. Alternatively, Areva can divest 100 percent of Adwen to a third party via a drag-along right for Gamesa's stake.

The new company, which will be consolidated in Siemens' financial statements, is expected to have a 69-GW installed base worldwide, an order backlog of around €20 billion, revenue of €9.3 billion, and an adjusted EBIT of €839 million. The combined company will have its global headquarters in Spain and will remain listed in Spain. The onshore headquarters will be located in Spain, while the offshore headquarters will reside in Hamburg, Germany, and Vejle, Denmark.

"The merger with Siemens constitutes recognition for the work performed by the company in recent years and evidences our commitment to generating value in the long term by creating significant synergies and extending the horizon of our profitable growth," said Ignacio Martín, executive chairman and CEO of Gamesa. "Today, we are embarking on a new era, creating, alongside Siemens, a world-leading wind player. We will continue to work as before, albeit as part of a stronger company and with an enhanced ability to offer all of our customers end-to-end solutions."

The two businesses are highly complementary in terms of their global footprints, existing product portfolios, and technologies. The combined business will have a global reach across all key regions and manufacturing footprints in all continents. Siemens' wind power business has a strong foothold in North America and Northern Europe, and Gamesa is well-positioned in fast-growing emerging markets, such as India and Latin America, and in

Southern Europe. Further, the transaction will result in a product offering covering all wind classes and addressing all key market segments to better serve customers' needs.

"The combination of our wind business with Gamesa follows a clear and compelling industrial logic in an attractive growth industry, in which scale is a key to making renewable energy more cost-effective," said Joe Kaeser, president and CEO of Siemens AG. "With this business combination, we can provide even greater opportunities to the customers and value to the shareholders of the new company. The combined business will fit right into our Siemens Vision 2020 and underlines our commitment to affordable, reliable, and sustainable energy supply."

Siemens and Gamesa expect significant synergy potentials in a combined setup. In total, annual EBIT synergies of €230 million are expected in year four post closing.

"As a leading wind power player especially in emerging markets, Gamesa is a perfect partner for us," said Lisa Davis, member of the managing board of Siemens AG. "Teaming up will enable Siemens and Gamesa to offer a much broader range of products, services, and solutions to meet customer requirements. The move will put Siemens and Gamesa in the best position to shape the industry for lower cost of renewable energy to the consumers."

The merger is unanimously supported by Gamesa's board of directors and Siemens' supervisory board. Iberdrola has entered into a shareholders agreement with Siemens and will hold approximately 8 percent in the combined company after closing of the transaction. The transaction is subject to the approval by Gamesa's shareholders and to other customary conditions such as merger control clearances and the confirmation by the Spanish stock market regulator (CNMV) that no mandatory takeover bid has to be launched by Siemens following completion of the merger. Supervision of the merger process has been entrusted by Gamesa to a merger committee created ad hoc, which will be made up exclusively of independent directors. Closing is expected in the first quarter of calendar year 2017. ↘

Source: Gamesa

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

GE EXPANDS ONSHORE WIND PORTFOLIO WITH NORTH AMERICAN VERSION OF NEW 3.4-MW WIND TURBINES

GE Renewable Energy recently introduced a North American version of its new 3-MW wind turbine platform in advance of the American Wind Energy Association's (AWEA) Windpower 2016 event in New Orleans. The turbine platform, which first debuted in Europe last

November, now includes a new 60-Hz version of the 3.4-MW machine with a rotor diameter of 130 meters or 137 meters.

This announcement follows the recent success of GE's 2-MW wind platform, which was introduced a year ago



GE Renewable Energy

at AWEA’s 2015 Windpower event. The new 2-MW machines began shipping late last year and recorded more than a gigawatt of orders in the United States throughout the first quarter of 2016.

“We were pleased to see strong orders when we launched our new 2-MW machines, and the addition of a 3-MW option gives our customers more flexibility for land-constrained areas and regions with complex geographies throughout North America,” said Anne Mentee, president and CEO of GE’s Onshore Wind business. “We now have a comprehensive technology portfolio capable of meeting a wide variety of wind conditions across the continent.”

The 3.4-130 model sits at a tower height of 85 meters, while the 3.4-137 reaches 110 meters. The machines represent GE’s most powerful onshore wind turbines offered to date, with the 3.4-137 capable of providing up to 24 percent higher output than existing technology.

For the North American version of GE Renewable Energy’s new 3-MW wind turbine platform, the 3.4-130 model sits at a tower height of 85 meters, while the 3.4-137 climbs to 110 meters.

In addition, the new 3-MW machines feature the software analytics capabilities of GE’s Digital Wind Farm, which uses a virtual modeling system to enhance individual turbine configuration and site layout, aiming to capture more energy production from each site’s unique wind conditions. It is powered by the Predix software platform, the foundation for all of GE’s Industrial Internet applications.

GE’s 3-MW turbines are configurable to meet IEC class IIIA, IIB, and IIIB wind conditions. ↪

Source: GE Renewables

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

INOX WIND WINS 100-MW ORDER FROM LEADING RENEWABLE ENERGY IPP

Inox Wind Limited recently announced that it has won two orders for a cumulative capacity of 100 MW from one of India’s leading renewable energy independent power producers (IPPS). The turnkey orders comprise of a 50-MW project to be set up in Gujarat and a 50-MW project to be set up in Madhya Pradesh. Once commissioned, the projects will provide power to approximately 50,000 households, curtail approximately 0.15 million tons of carbon dioxide emissions annually, and further consolidate Inox Wind’s leading position in the two states.

As a part of the turnkey projects, Inox Wind will provide end-to-end solutions from development and construction to commissioning and providing long-term operations and maintenance services. The orders involve the supply and installation of 25 units of Inox Wind’s 100-meter rotor diameter wind turbine generator (WTG) for the Gujarat project and 25 units of the company’s 113-meter rotor diameter WTG for the Madhya Pradesh project. The 113-meter rotor diameter WTG is the newest variant of the company’s market-leading

2-MW platform and has been tested to have one of the highest generation performance per kilowatt of all WTG variants available in India.

Inox Wind offers its clients total wind power solutions, including wind resource assessment, acquiring land, developing the entire site infrastructure, building the power evacuation system, supplying the WTGs, erection and commissioning services, long-term operations and maintenance services, and post-commissioning support.

“These orders have further boosted Inox’s strong order book with major IPPs in India,” said Kailash Tarachandani, CEO of Inox Wind Limited. “Orders from a leading renewable energy IPP prove the competitiveness of wind power in the states of Gujarat and Madhya Pradesh and ensure that Inox Wind continues to play a key role in further developing the wind energy industry in the two states.”

Source: Inox Wind Limited

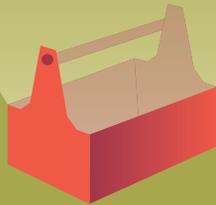
For more information, go to www.inoxwind.com.



women of wind of ENERGY



WOWE LEADERSHIP FORUM



EXPANDING YOUR TOOLKIT.
POWERING OUR FUTURE.

Connect | Gain | Accelerate | Leverage

This year’s Leadership Forum will focus on:

- Expanding the Conversation about the Maturing Renewables Industry
- Energy Markets Education
- Enhancing Your Skills to Continue Growing Your Career

Don’t miss out! Join us November 14-15, 2016

Co-located with the AWEA Fall Symposium
Hyatt Regency Hill Country Resort & Spa, San Antonio, TX

More information online at:
womenofwindenergy.org/leadership-forum

Leadership Forum Lead Sponsor



Thank you to our top sponsors!



GE Energy



CONSTRUCTION

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

THE WIND PROFESSIONAL'S GUIDE FOR FLOOD, DEBRIS, AND EROSION CONTROL

By Travis Dees



Challenges in providing adequate erosion control in the field require a diverse toolbox of solutions. As lands are disturbed, erosion and sediment control professionals are demanding best management practices that can be specified, installed, and inspected with confidence. Wind energy professionals, especially those on the operations and maintenance side of the wind energy industry, should take the time now to set up the proper procedures to prevent problems later.

PROTECT THE SITE FIRST

Water always behaves the same way; it seeks its own level. What does change is the topography and elevation in the settling points. As soil is deposited, it diminishes the volume of a drainage route or a retention basin. Therefore, drainage routes and basins must be cleared of obstructions, dirt, and debris that may have accumulated. Flow channels, swales, riprap beds, and culverts need to be cleaned out to allow unrestricted water passage. In addition to removing

ALSO IN THIS SECTION

- 45** SgurrEnergy Secures Beatrice Construction Monitoring Contract

debris, trash, and silt build-up, contractors in operations and maintenance should make any repairs necessary to drain grates, catch basins, inlets, channels, and roadways to ensure that storm water flows freely. Pay close attention to culverts under roadways using adequate lighting to inspect and ensure unobstructed water passage can occur. Maintain a channel cleaning and maintenance program that addresses vegetation trimming, debris, sediment, and trash in those flood channels.

On a smaller scale, blockage in culverts can lead to similar damage, causing water to flow over roadways and erode or destroy site access infrastructure. To help prevent this, swales or drainages leading into basins must be intact and capable of carrying storm water at a controlled rate. A breach in a drainage route or flow path negates the design capabilities to move water across the property or into an appropriate catch basin. A good rule of thumb is to inspect what you expect by looking at the “story marks” on the property from the last wet weather event.

HYDROSEEDING

Effective erosion control measures will go a long way when it comes to preventing or controlling erosion on wind energy projects. Hydroseeding is a quick, cost-efficient way to apply seeds, mulch, and fertilizer to recently disturbed soils found on any construction project. The value of hydroseed can be seen in both erosion control and dust mitigation. It’s also an effective revegetation strategy. Selecting the right contractor is always important, as is ensuring they have trained applicators who have sprayed on wind energy projects. Seed mix, mulch rate, fertilizer, application uniformity, overspray mitigation, and other factors need to be well-thought-out. Selecting the right seed mix for your projects’ climate and soil content and working with an unbiased consultant to help determine the appropriate seed is also important. The seed mix can change your price per acre by hundreds of dollars. With projects ranging from 20 acres to 2,000 acres, this can result in significant savings.

Here are a few more key points to consider when using hydroseeding:

- It’s a great option for disturbed soil.
- Hydroseeding is normally done after a project is built in accordance with a revegetation plan.
- Selecting a vendor with experience spraying in the wind energy array is critical. This is certainly an instance where choosing the best quality is more important than price alone.
- Selecting the right seed mix is also critical. It will impact the overall cost and success.
- You will need unbiased insight into the right seed. Some seed suppliers will recommend a seed that only

they carry, which may or may not be the best value or most effective option.

- Hydroseeding should be applied prior to the expected rainfall. Generally, this is from October through March.

Weed control is a big land management issue, especially after El Niño drenched most of the nation this year. Weeds are expected to be at an all-time high as fire season kicks in. It would be a good idea to budget your wind site more than usual for this year’s operations and maintenance needs. When it comes to mowing, we recommend a minimum of two times for most sites starting around May and going through October. World Wind & Solar provides services for a variety of wind projects that range from 200 to 3,000 acres, and the company utilizes a variety of custom-made equipment and chemical strategies in order to combat weeds.

One of the biggest weed challenges that wind industry members face is contending with tumbleweeds, also known as thistle. In the Antelope Valley alone last year, World Wind & Solar removed more than 2,000 tons of tumbleweeds, mostly from both solar and wind projects. Tumbleweeds can cause serious problems when they get caught up in racking systems, cable trays, pylons, and inverters. In order to prevent these problems, it’s better to be proactive than reactive. Each weed can produce up to 200,000 seeds if not removed from the site, and weeds contain oils that can be extremely flammable. They should be mowed while they’re still green and physically removed from the site. A chemical weed abatement program that requires careful planning and permitting can also be used.

NOW IS THE TIME FOR FIRE PREVENTION

Wind owners and operators may expect more visits from the fire departments this year due to El Niño, so make sure you’re in compliance.

Most fire requirements demand a defensible space of 500 feet for the site, but codes vary by region. It is also important to know that inspections are conducted throughout the dry season and that the property must be maintained in order to remain in compliance. Even if a property owner abates their property early in the season, there is potential for re-growth.

Clearing around power poles, transformer pads, and junction boxes is essential, along with the other obvious places on your sites such as roads and buildings. A 10-foot radius around power poles will help prevent a fire from starting if there is any arching due to a failed component. Trees and other large brush should be cleared at least 8 feet below a power line. Clearing a radius of 10 feet around transformers and junction boxes will help prevent

a fire from starting if the component has a major failure that causes sparks.

Maintaining your roads will also help as a fire break if a large brush fire breaks out. Most roads in high-risk fire areas are left at 20 feet wide after a project has been constructed, allowing for access and to serve as a fire break.

Mowing weeds can be a fire risk, so it is imperative that it be done safely. One small spark from a mower blade hitting a rock can result in a big fire. Given the high-dollar assets that are at stake on wind farms, it would be wise to hire licensed professionals with proven track records, especially given the chemical and mechanical weed abatement strategies used.

MORE TIPS

In addition to site-preparation steps such as hydroseeding and weed abatement, here are some additional preparation steps to include in your plan:

- Roadways that provide critical site access should be constructed above grade and of a road-base type material. To maintain or prepare non-paved roads for wet conditions, soil stabilizers can be added periodically to bind the base material, preventing wet weather deterioration, which also helps to minimize dust in the dryer months.
- Fencing can restrict water flow as floating debris builds up, creating a beaver dam effect. Look for areas where water flow passes under fencing and remove any accumulated debris.
- Develop a checklist to inspect all electrical equipment enclosures to ensure cabinets and doors are closed and secured with a proper weather seal.
- Inspect conduit openings to ensure they are weather-tight. In some applications, high-quality expanding foam or UV-resistant RTV can aid in filling gaps or addressing areas of concern.



Lastly, facilities must review the regulatory requirements as dictated by their site-specific storm water pollution prevention plan (SWPPP) to gain a detailed understanding of expectations for water retention and pass-through by sampling frequencies and testing and recording retention. With this knowledge, the next step is to create a standard operating procedure (SOP) for wet weather events and develop personnel training so that adherence to the SOP becomes a procedure that is driven companywide. Implementing this allows contractors in operations and maintenance time to set up vendor support agreements to assist if the water intrusion is more evasive than the site and staff can effectively manage.

CONCLUSION

Given all of the potential devastating effects from erosion, wind professionals should take every necessary step to minimize damage and protect their projects. The past decade of droughts and catastrophic wildfires have left parched landscapes that are ill-pre-



An example of a tumbleweed on a construction site.

pared, so site assessments and maintenance practices are particularly critical. Many wind energy projects are built in mountain passes where mudslides are a looming danger, while others are built on or around dry lakebeds where land is inherently flat and soil pecculation is minimal. Either way, this typically means that even a minimal amount of rain can create maximum problems, and the preventative measures discussed in this article can save time and money. ↵

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

SGURRENERGY SECURES BEATRICE CONSTRUCTION MONITORING CONTRACT

SgurrEnergy, a leading renewable energy consultancy, was recently awarded a three-year construction monitoring contract for the 588-MW Beatrice offshore wind farm — the first commercial offshore wind farm from the Crown Estate Scottish Territorial Waters leasing round to reach this stage of development.

SgurrEnergy will also provide operational support for the first five years of the project's operation.

The scope of the company's responsibilities will include regular monitoring of construction and installation, checking progress and confirming consistency with the final design, reviewing permits and environmental requirements, and undertaking site visits, including factory and construction site visits.

SgurrEnergy will undertake risk management monitoring and continually review the project's risk profile in accordance with the construction budget.

The Beatrice offshore wind farm will consist of 84 Siemens SWT-7.0-154 wind turbines, which will be the largest turbine commercially deployed offshore. Additionally, the project will utilize a new and innovative offshore transformer module solution in place of a standard offshore substation leading to significant cost savings.

"Involvement in what will be the first commercially operating offshore wind farm in Scottish waters has been an extremely rewarding experience," said Fiona Shaw, senior renewable energy consultant at SgurrEnergy. "We are proud to have supported the project and look forward to our continuing involvement through the construction phase and into operations, ensuring that the lenders' interests continue to be met."

As part of SgurrEnergy's role as the lenders' technical advisor, the team undertook a review of key technical and commercial aspects

of the project that include permits, consents and environmental considerations, the construction and operations phase participants, and civil and electrical works.

A technology review was conducted along with a construction and operations-phase contract review, energy yield, review of the project's O&M strategy, PCQRA review, and financial model review.

Located in the Outer Moray Firth, approximately 14 km from the Scottish Caithness coastline, the project is expected to be commissioned in 2019. ↴

Source: SgurrEnergy

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

Stahlwille Tools is the ONLY tool company with dimensionally accurate hand tools!

STÄHLWILLE

TORQUE WRENCHES

- Super accurate scale designed for industrial applications
- Can be used as a breaker bar with no damage
- Designed to ISO 12 month calibration cycle
- Does not need to be "zero'd" after use
- Interchangeable insert heads

MOBILE TORQUE TESTERS

STÄHLWILLE TOOLS NA, SARASOTA FL, 800-695-2714
WWW.STÄHLWILLETOOLS.COM

Dealer Inquiries Invited

STÄHLWILLE

Professional Tools made in Germany
800-695-2714



7th Fastest Growing
Micropolitan in America!
**ELK CITY,
OKLAHOMA!**



- Strategically located on Interstate 40 in the U.S wind corridor and is the principal center of trade in western Oklahoma
- Elk City I wind farm was constructed in 2009 with 43 2.3 megawatt Siemens Turbines
- Elk City II wind farm was constructed in 2010 with 48 1.5 megawatt GE Turbines and 18 1.6 megawatt GE Turbines
- Together these 109 turbines generate approximately 200 megawatts which will power 59,000 homes.
- Oklahoma is a Right-To-Work state and is a profitable place to manufacture wind turbines and components



Contact:
Jim D. Mason, CEcD, EDFP • 580-225-3230
masonj@elkcity.com • www.elkcity.com

**BLADE REPAIR
TRAINING**



TRAINING IN:

- ENGINEERING • MANUFACTURING • REPAIR

DIRECT SERVICES:

- ENGINEERING • ONSITE TRAINING • CONSULTATION



**Remaining 2016 Courses:
August 1-5 & Dec 5-9**

+1 (775) 827-6568 • www.abaris.com

**WIND
SYSTEMS** *Giving Wind
Direction*

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

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

EDITORIAL DEPARTMENT

Molly Rogers
Editor
molly@msimktg.com
ext. 205

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

SALES DEPARTMENT

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

Tom McNulty
Regional Sales Manager
tom@windssystemsmag.com

CIRCULATION DEPARTMENT

Teresa Cooper
Manager
info@windssystemsmag.com
ext. 201

Jamie Willett
Assistant

DESIGN DEPARTMENT

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

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

No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopy, recording, or any information storage-and-retrieval system without permission in writing from the publisher. The views expressed by those not on the staff of *Wind Systems* magazine, or who are not specifically employed by Media Solutions, Inc., are purely their own. All "News" material has either been submitted by the subject company or pulled directly from their corporate web site, which is assumed to be cleared for release. Comments and submissions are welcome, and can be submitted to editor@windssystemsmag.com.



Media solutions

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

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

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

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

AD INDEX

Abaris Training Resources 46

Amsoil IFC

AWEA (American Wind Energy Assn) IBC

Castrol 1

City of Elk City Oklahoma EDC 46

Everglades University 27

Iowa Lakes Community College 21

Kalamazoo Valley Community College 29

Lamar Community College 29

Lighthouse Global Energy LLC 47

Megger 7

NTC Wind Energy 47

OBO Betterman 35

Snap-On Tools BC

Stahlwille Tools NA 45

TORKWORX LP 3

Wind Systems 5,31

Women of Wind Energy 41

Worldwide Machinery Pipeline Division 11

COMPONENT REPAIR SOLUTIONS



- Hydraulic Systems (Pitch Cylinders, Servo Valves, Accumulators)
- YAW Drives
- Motors
- Pumps
- High Quality
- Quick Turn Times
- Core Exchanges
- Engineering Services
- In house Testing
- Machining/Manufacturing

“An authorized Fritz Schur Energy Inc. Repair Station and Distributor”



3550 Maple Street, Abilene, TX 79602

(325) 692-7278

WWW.LGNRG.COM

INTRODUCING IRONCLAD GROUT SLEEVES



- Grout Sleeves are More Effective in Protecting Bolts from Grout
- Saves Labor – Enhances Safety – No More Cutting Foam
- Displace Almost No Grout, Resulting in a Considerably Stronger Foundation



800.359.0372
JWBRUCE@NTCWIND.COM
NTCWIND.COM

Call to inquire about our special limited time pricing!

CROSSWINDS

THANK YOU FOR MAKING WINDPOWER 2016 A SUCCESS!



Jeremy Greene from JHT Incorporated won a Snap-on toolbox from *Wind Systems* magazine. This was JHT's first time exhibiting at a Windpower event.



Steve Black from Moog Components Group was also a winner of a Snap-on toolbox.



Jim Mason from the City of Elk City was also a winner of a Snap-on toolbox from *Wind Systems* magazine at Windpower 2016.

Windpower 2016 attendees gather around the Wind Systems booth to await the results of the Snap-on toolbox raffle and giveaway.

Wind Systems would like to thank all Windpower 2016 attendees who stopped by our booth in New Orleans and helped make this year's conference and exhibition a success. Our staff was working diligently to answer your questions and share our vision of becoming your primary source for the latest, most insightful wind energy industry information available.

In what has become a longstanding tradition at the American Wind Energy Association's (AWEA) Windpower event, *Wind Systems* held daily giveaway drawings on May 24-26. Those who visited the booth and signed up for a free subscription to *Wind Systems* magazine were automatically entered to win a Snap-on toolbox.

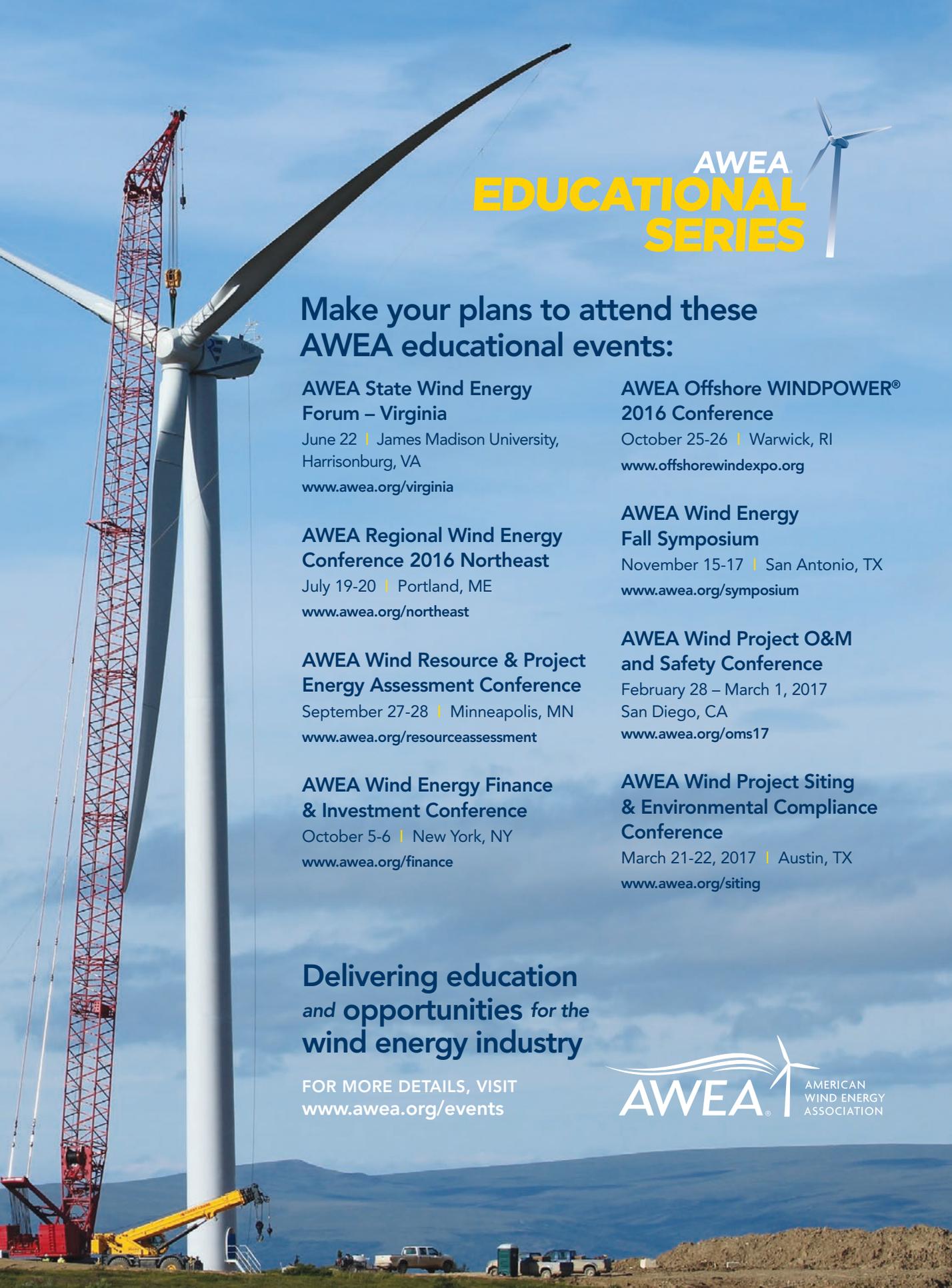
This year's toolbox winners were Jim Mason, the director of econom-

ic development for the City of Elk City, Oklahoma; Jeremy Greene, the lead software developer for JHT Incorporated based out of Orlando, Florida; and Steve Black, the senior business development manager for Moog Components Group based out of Blacksburg, Virginia.

Congratulations, winners! Thank you for coming by and participating in our drawing. If you came by our booth during the conference and didn't win, make sure to visit

the *Wind Systems* booth next year at Windpower 2017 in Anaheim, California. ✌

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



AWEA EDUCATIONAL SERIES

Make your plans to attend these AWEA educational events:

AWEA State Wind Energy Forum – Virginia

June 22 | James Madison University,
Harrisonburg, VA
www.awea.org/virginia

AWEA Regional Wind Energy Conference 2016 Northeast

July 19-20 | Portland, ME
www.awea.org/northeast

AWEA Wind Resource & Project Energy Assessment Conference

September 27-28 | Minneapolis, MN
www.awea.org/resourceassessment

AWEA Wind Energy Finance & Investment Conference

October 5-6 | New York, NY
www.awea.org/finance

AWEA Offshore WINDPOWER® 2016 Conference

October 25-26 | Warwick, RI
www.offshorewindexpo.org

AWEA Wind Energy Fall Symposium

November 15-17 | San Antonio, TX
www.awea.org/symposium

AWEA Wind Project O&M and Safety Conference

February 28 – March 1, 2017
San Diego, CA
www.awea.org/oms17

AWEA Wind Project Siting & Environmental Compliance Conference

March 21-22, 2017 | Austin, TX
www.awea.org/siting

Delivering education
and opportunities for the
wind energy industry

FOR MORE DETAILS, VISIT
www.awea.org/events



AWEA
AMERICAN
WIND ENERGY
ASSOCIATION

ENGINEERED DROP PREVENTION SOLUTIONS



Since inventing the socket and driver back in 1920, Snap-on has been driven by innovation. This GE 1.5 Hub Hatch Tool is an engineered solution that replaces the homemade version in many technician bags. It includes a floating, certified attachment point, ensuring functionality and drop prevention.

GE Hub Hatch Tool



Stainless Steel Safety Coil is designed to slide freely along the handle, so you can hold the wrench where you need to.

CUSTOM DESIGNED AND TESTED DROP PREVENTION TOOLKITS WITH INVENTORY MANAGEMENT SYSTEMS ARE ORDERED AS A SINGLE LINE ITEM.



Contact Power Generation Manager John Tremblay
413-519-3380 or john.r.tremblay@snapon.com
www.snapon.com/industrial

Snap-on
INDUSTRIAL