2018 SANDIA BLADE WORKSHOP

Tour of Reese Technology Center

Sandia National Laboratories

WELCOME

Today you will tour the Reese Technology Center, a former Air Force base that has been repurposed into an incubator for research, education, manufacturing, and other activities conducted by local and national organizations. Specifically you will be visiting the research facilities and hearing from the staff of multiple organizations conducting energy related research. You will learn about many of the exciting activities taking place around the Center and possibly find new partnership opportunities.

The following pages provide a reference for the speakers and the sites you will visit. Enjoy your tour and thank you for visiting.

TOUR AGENDA

START TIME	END TIME	DURATION	BUS A (NAUGHTON)	BUS B (KLISE)	BUS C (MANIACI)	BUS D (PAQUETTE)
14:30	15:30	01:00	Assemble, board, and travel from Overton Hotel & Conference Center to Reese Technology Center			
15:30	15:40	00:10	Bus / GE Prototypes	Station 5	Station 4	Station 3
15:40	15:50	00:10	Station 1	Station 5	Station 4	Station 3
15:50	16:00	00:10	Station 1	Bus	Bus / Walk	Walk
16:00	16:10	00:10	Bus	Bus / GE Prototypes	Station 5	Station 4
16:10	16:20	00:10	Station 2a	Station 1	Station 5	Station 4
16:20	16:30	00:10	Station 2b	Station 1	Bus	Bus / Walk
16:30	16:40	00:10	Bus	Bus	Bus / GE Prototypes	Station 5
16:40	16:50	00:10	Station 3	Station 2a	Station 1	Station 5
16:50	17:00	00:10	Station 3	Station 2b	Station 1	Bus
17:00	17:10	00:10	Walk	Bus	Bus	Bus / GE Prototypes
17:10	17:20	00:10	Station 4	Station 3	Station 2a	Station 1
17:20	17:30	00:10	Station 4	Station 3	Station 2b	Station 1
17:30	17:40	00:10	Bus / Walk	Walk	Bus	Bus
17:40	17:50	00:10	Station 5	Station 4	Station 3	Station 2a
17:50	18:00	00:10	Station 5	Station 4	Station 3	Station 2b
18:00	18:20	00:20	Travel to Cagle Steaks - Rafters Room, 8732 4th St, Lubbock, TX 79416			
18:20	21:00	02:40	Dinner / Bus shuttles back to Overton Hotel & Conference Center			

TOUR STOP SUMMARY

STATION	LOCATION
Station 1	Sandia Scaled Wind Farm Technology (SWiFT) Facility
Station 2a	TTU GLEAMM and DOE X-Band Prototype
Station 2b	Group NIRE LiDAR Test Site
Station 3	TTU West Texas Mesonet and Ka-band Mobile Doppler Radar
Station 4	SWiFT Test Prep Lab and National Rotor Testbed Blades
Station 5	Group NIRE Energy Systems Testing Facility

STATION 1 SCALED WIND FARM TECHNOLOGY (SWIFT) FACILITY

Sandia National Laboratories' Scaled Wind Farm Technology (SWiFT) facility is located at Texas Tech University's National Wind Institute Research Center in Lubbock, Texas. SWiFT is the principal facility for investigating wind turbine wakes as part of the U.S. Department of Energy Atmosphere to Electrons research initiative (DOE-A2e). The SWiFT facility supports A2e's goal of ensuring that future wind farms are sited, built, and operated to produce the most cost-effective and usable electric power possible, given technological advances.

Sandia partners with OEM suppliers to enhance the research capabilities of the SWiFT site. For example, Sandia researchers have developed three modified Vestas wind turbines to enable wind plant technology research. Working with Vestas Wind Systems and National Instruments, SWiFT facility researchers have developed an integrated turbine data acquisition and control system that is open source, fully re-configurable, and capable of ongoing research in wind plant control methodology. With ABB Power Systems, Sandia installs variable-frequency drive technology in the modified wind turbines to provide modern power conversion and a flexible platform for electric power systems research. With Windar Photonics, Sandia investigates nacelle-mounted LIDAR instrumentation for wind plant performance optimization and controls.

SPEAKERS

JON BERG
SWiFT Program Lead
Sandia National Laboratories Wind Energy Technologies Dept.
Email: jcberg@sandia.gov

Jon has been with Sandia for over 10 years working on wind energy technologies. He currently leads the SWiFT facility program to maintain, operate, and enhance the capabilities of the site to support a variety of research programs for DOE and research partners.

TOMMY HERGES
Experimental Aerodynamics
Sandia National Laboratories Wind Energy Technologies Dept.
Email: therges@sandia.gov

Tommy has been with Sandia for nearly five years working on experimental aerodynamics. Tommy has worked on a variety of laser-based flow diagnostic systems including the Sandia Wake Imaging system, The DTU SpinnerLidar and the Windar WindVISION systems.

STATION 2A GLEAMM

The Global Laboratory for Energy Asset Management and Manufacturing (GLEAMM) combines the research and commercialization expertise of Texas Tech University (TTU) with the field testing, certification, and development expertise of Group NIRE, a for-profit energy development company. GLEAMM was established thanks to a $13 million investment by the State of Texas. TTU will leverage this investment to test, certify, research, develop, and support the manufacturing of new electrical grid technologies and next-generation power electronic devices for public and private partners. Modernizing the outdated electric grid infrastructure is a key national and local priority for the industry and consumers. GLEAMM includes the world's only real-world field testing platform of its kind, drawing upon capabilities and research expertise in wind, solar, battery storage, weather & energy forecasting, cyber security, phasor measurement units, silicon carbide & manufacturing, distributed generation, microgrid, and other areas related to grid modernization.

TEXAS TECH UNIVERSITY DOE-X PROTOTYPE RADAR SYSTEM

The U.S. Department of Energy (DOE) funded the development of the DOE-X prototype radar to advance the use of radar technology for measuring wind plant complex flows. The prototype provides far more sensitivity in clear-air (i.e. non-precipitating) environments than the predecessor TTUKa radars without sacrificing spatial and/or emporal resolution. The DOE-X prototype was also designed and configured to operate in a far more autonomous manner, thereby enabling long term deployments without constant user interaction. The prototype is closely related to two early stage commercial radar systems deployed by SmartWind Technologies for Ørsted to monitor the Westermost Rough Wind Plant, which has successfully been used to examine small (wind turbine inflow and wakes) to large (wind plant blockage and wind plant wakes) scales of motion.

SPEAKERS

STEPHEN B. BAYNE
Ph.D. Electrical Engineering
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Dr. Stephen B. Bayne received his PhD, MS, and BS degrees in Electrical Engineering from TTU. After completing his doctoral studies, he joined the Naval Research Lab (NRL) where he was an electronics engineer designing advanced power electronics systems for space power applications. Dr. Bayne also worked for the Army Research Lab (ARL) where he developed a high temperature Silicon Carbide power electronic program. Dr. Bayne was promoted to Team Lead at ARL where he led the power components team. Dr. Bayne was then promoted to Branch Chief of the Directed Energy Branch. Dr. Bayne then transitioned over to academia where he is currently a Professor at TTU. Dr. Bayne has over 150 journal and conference publications. Dr. Bayne is also a veteran of the Military, where he served four years in the Air Force.

STATION 2B GROUP NIRE LIDAR TEST SITE

Group NIRE's LiDAR facility is a U.S.-based test location designed to accommodate the testing and calibration needs for the energy and wind industries. Group NIRE's mission is to provide a convenient service in an atmosphere that enables LiDAR owners and operators to spend less time shipping and testing LiDAR's overseas and more time utilizing their equipment on their sites.

The site includes access to a 130-meter met tower instrumented to International Electrotechnical Commission (IEC) standards. We have also formed a unique relationship with DNV GL, UL, and Intertek to provide the testing and calibration services at our facility. Working with these larger certification bodies allows for the testing to be conducted at our facility instead of having to ship valuable pieces of equipment overseas for an 8 to 10-week period.

This facility has been used not only for LiDAR but also SODAR testing. Group NIRE plans for this facility to be used to test and develop many remote sensing devices for our various partners across the energy industry.

SPEAKERS

DESTINY ROSALES
Director of Project Development
Group NIRE
Email: destiny.vasquez@groupnire.com

Destiny has served as the Director of Project Development at Group NIRE since 2014. In this capacity, she manages all deployments of prototype wind turbines, including the support of the construction and interconnection of solar and battery storage projects at the field site. Additionally, Mrs. Rosales is responsible for developing Group NIRE's LiDAR calibration and test site. She hopes to extend the use of this facility and branch into other industries to meet R&D goals.

STATION 3 WEST TEXAS MESONET

The West Texas Mesonet (WTM) serves the greater West Texas region by providing accurate and timely agricultural and meteorological data to a wide variety of users. The WTM currently consists of 117 automated, 10-meter, near-surface weather stations distributed across 74 counties in three states; seven boundary layer SODAR units; one atmospheric profiler; and one upper-air sounding system. The WTM plays an important role in various industries including agriculture, education, emergency management, energy, and transportation. Continued operation and even expansion of the WTM has the potential to save lives, enable more efficient water conservation, yield better agricultural practices, and aid in determining the potential output from renewable energy resources.

TEXAS TECH UNIVERSITY KA-BAND (TTUKA) MOBILE DOPPLER RADARS

The TTUKa radars were the first mobile research radar systems to operate in the Ka-band using a non-linear pulse compression frequency modulation technique. Resolution of an individual sample bin is 0.33° in the azimuthal/elevation dimension and 15 m in the along-beam range dimension. Both radar systems are capable of performing sector or full 360° horizontal plan-position indicator sweeps at 30° s-1 and vertical range–height indicator scans from 0° to 90° along a single azimuth at 6° s-1. A radome protects the antenna from wind loading and hail, while an automated hydraulic system levels the radar during deployment from within the truck. These radars were used to construct the first ever dual-Doppler synthesized wind fields to investigate wind plant complex flows such as turbine-to-turbine interaction.

SPEAKERS

JOHN SCHROEDER
Ph.D. Professor of Atmospheric Science
Texas Tech University Department of Geosciences
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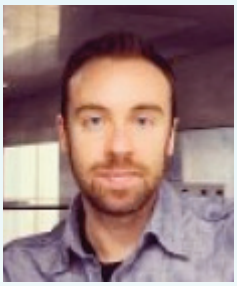
Dr. Schroeder has developed a nationally recognized research program focused on the measurement and characterization of low-level wind fields, created a unique suite of atmospheric observing technologies, pioneered the usage of radar to measure wind farm complex flows, and executed numerous atmospheric field campaigns. Dr. Schroeder has successfully published numerous peer-reviewed papers and spoken at conferences across the world on topics related to atmospheric measurements and boundary layer structure. Dr. Schroeder is also a founding partner of SmartWind Technologies, a technology development and service company specializing in providing hardware, software and knowledge to measure and analyze complex wind flows in the lower atmosphere.

STATION 4 NATIONAL ROTOR TESTBED

Sandia's Wind Energy Technologies Department designed a rotor research platform called the National Rotor Testbed (NRT) to support the U.S. Department of Energy (DOE) Atmosphere-to-electrons initiative (A2e). This new rotor platform serves as an open-source public research platform that will accelerate important rotor innovation and turbine-turbine interaction research so that DOE and the research community can realize new technologies to lower the cost of electricity and improve the operations of wind power plants. The NRT rotor design features similar design drivers and technology found on modern multi-megawatt utility scale rotors. Specifically, it is focused on replicating the rotor loads and wake characteristics of a megawatt-class turbine. This will be demonstrated using a combination of in-rotor sensors for structural and aerodynamic measurements and a variety of flow measurement systems available at SWiFT.

The current rotor on display in the SWiFT test preparation laboratory has nearly 100 data channels to measure strain, temperature and structural dynamics along the span of the blade. Iterations of the NRT in the design phase include added aerodynamic instrumentation and a jointed tip design to facilitate a variety of research paths in aerodynamics, aeroacoustics, flutter, active aerodynamic control, and lighting interaction.

SPEAKERS



CHRIS KELLEY
Experimental Aerodynamics
Sandia National Laboratories Wind Energy Technologies Dept.
Email: clkell@sandia.gov

Chris has been with Sandia for nearly five years working on blade design and aerodynamics. He is leading the field-test effort with the National Rotor Testbed blades to assess their performance against the design that he helped develop.

DAVID MITCHELL
SWiFT Site Supervisor
Sandia National Laboratories Wind Energy Technologies Dept.
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David has been the SWiFT Site Supervisor for the past three years. David leads the daily site operations and maintenance activities and helps ensure experiments are conducted safely and effectively.

STATION 5 GROUP NIRE ENERGY SYSTEMS TESTING FACILITY

At their testing facility in Lubbock, Texas, Group NIRE has developed a building-level microgrid. The facility supports the research and development of innovative technologies, tools, and techniques that reduce the risks posed by cyber and other emerging threats to critical infrastructure.

Group NIRE wants to help reliably manage, locally or globally, dynamic changes in the grid by leveraging Distributed Energy Resources (DERs) to provide ancillary services to the electric grid at different time scales. This will facilitate greater grid resiliency, security, and flexibility while having a minimal impact on customer quality of service (QoS). Real-time management of transmission and distribution networks, by system-wide control and coordination of flexible load and DERs, has the potential to improve the overall efficiency and reliability of the power grid.

Group NIRE also has implemented multiple energy storage assets at the Reese Field Site which promises to play a key role in the modernization of our electric grid. Several of these technologies are still at an early stage and require more data on their performance, reliability, and safety through extended use under realistic grid conditions. The facility provides a location for grid-tied field demonstrations of both residential and utility-scale storage systems. Benefits of energy storage include the balance of load, to shift energy consumption into the future, often by several hours, so that more existing generating capacity is used efficiently. Power Quality Management is also a benefit and allows the control of voltage and frequency to avoid damaging sensitive equipment.

Continuing to increase the security, reliability, and resiliency of our electricity delivery system will help ensure the success of grid modernization.

SPEAKERS

MARK HARRAL
CEO, Group NIRE
Email: mark.harral@groupnire.com

Mark Harral is a licensed attorney and CEO of Group NIRE with over 10 years of experience in constructing, operating, and managing energy system projects valued at over $40 million. His research expertise includes: developing a resilient control system for energy management (solar, battery, controllable load, etc.), managing and installing solar and battery systems for operations for electrical power distribution systems, significant project management experience, and identifying multidisciplinary solutions to complex problems.

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