



# 2017 Symposium

## September 26 - 29, 2017

### Scheman Building - Ames, IA

#### Tuesday, September 26, 2017 – Pre-Meeting Activities

7:00 - 8:00 am	Registration	2 <sup>nd</sup> Floor Lobby
8:00 - 10:00 am	Training session: NREL FAST Solver	Room 220
10:00 - 12:00 pm	Training session: NREL SOWFA Solver	Room 220
12:00 - 1:00 pm	Lunch (on your own)	
1:00 - 3:00 pm	NAWEA Board Meeting	Room 080
3:00 - 6:00 pm	Registration	2 <sup>nd</sup> Floor Lobby
3:00 - 6:00 pm	Graduate Student Poster Competition	2 <sup>nd</sup> Floor Lobby
4:00 - 6:00 pm	Welcome Reception & Registration	2 <sup>nd</sup> Floor Lobby
	<b>Dinner on your own</b>	

#### Wednesday, September 27, 2017

7:30 - 8:30 am	Registration and Continental Breakfast	2 <sup>nd</sup> Floor Lobby
8:30 - 9:00 am	Welcome by Surya Mallapragada <i>Iowa State University Associate Vice President for Research</i>	Room 220-230
9:00 - 10:00 am	Modeling Wind Farms Actuator Line Theory Turbulence, and Wind Power Fluctuations <i>Professor Charles Meneveau</i>	Room 220-230
10:00 - 10:15 am	Mid-Morning Refreshments	2 <sup>nd</sup> Floor Lobby
10:15 - 11:00 am	Integration of High-Penetration Renewable Energy Into Future Power Systems <i>Professor Nadaona Chokani</i>	Room 220-230
11:00 - 11:45 am	Opportunities and Challenges – Road to High Share of Wind Power in China <i>Professor Xiaodong Wang</i>	Room 220-230
11:45 - 1:00 pm	Lunch	2 <sup>nd</sup> Floor Lobby
<b>12:00 - 1:00 pm</b>	<b>NAWEA Education Committee Meeting</b>	<b>Room 080</b>

## Wednesday, September 27, 2017 - Continued

### **Aerodynamics – I**

**Room 220**

**1:00 – 2:30 pm**

Chair: Mingming Zhang

[mmzhang@iet.cn](mailto:mmzhang@iet.cn)

#### ***Comparison of LES Research Codes for Wind Energy Applications***

Luis Martinez

#### ***The Role of Vortex Structures in the Stability of a Floating Offshore Wind Turbine Rotor Near-Wake***

Steven Rodriguez

#### ***Reducing Wind Turbine Simulation Time***

Matthew Fischels

#### ***Experimental Investigations of Reynolds Number Effects on Performance of Thick CAS-W2 Airfoils for Wind Turbines***

Xingxing Li

#### ***Numerical Flow Analysis of Azimuth Dependent Smart Rotor Control***

Mingming Zhang

#### ***A Comparative Experimental Study of Upwind and Downwind Turbines***

Pavithra Premaratne

### **Structural Health Monitoring & Reliability - I**

**Room 240**

**1:00 – 2:30pm**

Chair: Norbert Myendorf

[norbertm@iastate.edu](mailto:norbertm@iastate.edu)

#### ***Experimental Wind-Tunnel Study of a Sensing Skin for Damage Detection on a wind Turbine Blade***

Austin Downey

#### ***Proactive Monitoring of an Onshore Wind Farm through LiDAR Measurements, SCADA Data and a Data-Driven RANS Solver***

Giacomo Valerio Iungo

#### ***Automatic Crack Recognition and Classification of Wind Turbine Blade***

Huiyi Zhang

#### ***Condition Monitoring of Rotor Blades and Foundations of Wind Turbines***

Norbert Myendorf

2:30 - 3:00 pm

Mid-Afternoon Refreshments

2<sup>nd</sup> Floor Lobby

### **Guest internet access privileges for Iowa State University lasts for seven days**

1. Open a web browser and enter [netreg.iastate.edu](http://netreg.iastate.edu) if the ISU NetReg page does not appear automatically.
2. If you are attending a specific event, select it from the list and click "Register Here", otherwise click "Guest Registration Here".
3. Enter your local contact information and click "Next".
4. Read the terms and check "I Agree".
5. When instructed, close your browser and reboot your computer to complete the registration process.
6. When you re-open your browser you will be connected to the ISU network.
7. If you have problems or questions, contact the Solution Center, 515-294-4000.

## Wednesday, September 27, 2017 - Continued

### **Aerodynamics - II**

**Room 220**

**3pm – 4:15 pm**

Chairs: Leonardo Chamorro & James Baeder

[lpchamo@illinois.edu](mailto:lpchamo@illinois.edu)    [baeder@umd.edu](mailto:baeder@umd.edu)

#### ***On the Structure of Power Fluctuations of Wind Farms***

Leonardo Chamorro

#### ***Inverse Design of Single- and Dual Rotor Horizontal Axis Wind Turbine Blades***

Behnam Moghadassian

#### ***Wind Turbine Simulations Using CPU/GPU Heterogeneous Computing***

Yong Su Jung

#### ***Rotational Effects and Transport in Transient, Separated Flow***

Kevin Wabick

#### ***Doppler Radar Measurements of Wind Turbine Wake Structure and Evolution across Varying Atmospheric Stability Regimes***

James Duncan

### **Structural Health Monitoring & Reliability - II**

**Room 240**

**3:00 – 4:15pm**

Chair: D.Todd Griffith

[tgriffith@utdallas.edu](mailto:tgriffith@utdallas.edu)

#### ***Toward Smart Wind Turbines based on Wireless Sensor Networks***

Mathew Wymore

#### ***Motivating Small-Scale Wind Turbine Recurrence Failure Modeling as a Function of Dynamic Covariates***

Michael Czahor

#### ***Quantifying Uncertainty in Material Properties through High-Fidelity Structural Analysis of Wind Turbine Blades***

Emily Johnson

#### ***Frequency Domain Analysis for Offshore Wind Structures Subject to Multi-Hazard Loading***

Andrew Summerfield

**4:30 - 5:30 pm**

**Poster Committee Meeting**

**Room 220**

6:00 - 7:00 pm

View Reiman Gardens – On Your Own

This is free to symposium attendees

**7:00 - 9:00 pm**

**Banquet Dinner**

**Reiman Gardens**

*Best student poster award announced*

#### **Direction to Reiman Gardens from the Scheman Building**

Head east on Center Drive

Turn right onto S. University Blvd.

Turn right on S 16<sup>th</sup> Street; this is the second stop light.

Reiman Gardens will be on your left.

## Thursday, September 28, 2017

7:30 - 8:30 am	Continental Breakfast	2 <sup>nd</sup> Floor Lobby
8:30 - 9:30 am	The Research Challenge of Enabling Wind Energy to Supply a Major Portion of the US Electricity Needs <i>Dr. Paul Veers</i>	Room 220-230
9:30 - 10:00 am	Mid-Morning Refreshments	2 <sup>nd</sup> Floor Lobby

### **Aerodynamics – III**

#### **Room 220**

10:00 – 11:30 am

Chairs: Charles Meneveau & Artem Korobenko

[meneveau@jhu.edu](mailto:meneveau@jhu.edu)   [artem.korobenko@gmail.com](mailto:artem.korobenko@gmail.com)

#### ***CFD Simulation of Smooth and Rough NACA 0012 Airfoils at Low Reynolds Number***

Yunjian Li

#### ***Numerical Simulation of Wind Turbine Airfoil Flow Field Based on an IDDES Method***

Ming Zhao

#### ***Experimental Analysis of Wind Turbine Airfoils at Complete 360-Degree Incidences***

Nanyaporn Intaratep

#### ***Performance and Sizing Tool for Quadrotor-Biplane-Tailsitter UAS***

James Baeder

#### ***Simulation of Multiple Wind Turbines Operating in Atmospheric Boundary Layer Flow: from Aerodynamics to Fatigue Damage***

Artem Korobenko

### **Resources & Forecasting - I**

#### **Room 240**

10:00 – 11:30 am

Chair: Tom Acker

[Tom.Acker@nau.edu](mailto:Tom.Acker@nau.edu)

#### ***Distributed Wind Resource Assessment for a Residential-Scale Wind Turbine Using Meteodyn WT***

Tom Acker

#### ***Wind Speed Forecasting using Neural Network***

Biswanath Samanta

#### ***Scale Dependence of Analog Search Criteria for RTO-level Wind Generation Forecast Bias Correction***

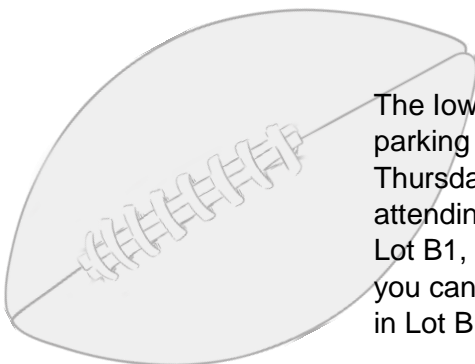
Daniel Kirk-Davidoff

#### ***Wind Turbine Blade Reference Model for the U.S. Low Wind Resource Regions***

Brandon Ennis

#### ***Preliminary Trends from Two Tall Meteorological Towers in Central Iowa***

Kristy Carter



### **Football & Parking**

The Iowa State Cyclones host the Texas Longhorns at 7pm on Thursday. All parking lots surrounding the Scheman Building will be controlled beginning early Thursday morning. Upon arrival, please let the parking attendant know you are attending the NAWEA Symposium in Scheman, which will allow you to park in Lot B1, north of Scheman. No parking permit is required for Lot B1; however, you cannot park in any other lot that day or your vehicle may be towed. Vehicles in Lot B1 need not move for the game.

## Thursday, September 28, 2017 – Continued

11:30 - 12:45 pm

Lunch

2<sup>nd</sup> Floor Lobby

**11:45 - 12:30 pm**

**Workshop: PSU-XTurb (webinar)**

**Room 230**

### **Aerodynamics – IV Room 220**

12:45 – 2:15 pm

Chairs: Robert Thresher & Pankaj Jha

[robert.thresher@nrel.gov](mailto:robert.thresher@nrel.gov)

[pankaj.jha@envision-energy.com](mailto:pankaj.jha@envision-energy.com)

#### ***Evaluation of Active Wake Steering Using Large-Eddy Simulations***

Umberto Ciri

#### ***Wind Turbine Blade Design Optimization using High-Fidelity Isogeometric Structural Analysis***

Austin Herrema

#### ***Development of a LIDAR Array to Study and Classify Wakes at the DOE/Sandia SWiFT Facility***

Tassia Penha Pereira

#### ***Wind Plant Power Optimization and Control Under Uncertainty***

Pankaj Jha

### **Resources & Forecasting – II Room 240**

12:45 – 2:15 pm

Chairs: Corey Markfort & Matt Churchfield

[corey-markfort@uiowa.edu](mailto:corey-markfort@uiowa.edu)

[matt.churchfield@nrel.gov](mailto:matt.churchfield@nrel.gov)

#### ***A Strategy for Performing Mesoscale-Driven Microscale Simulations in Complex Terrain***

Matthew Churchfield

#### ***On the Potential of Windbreaks for Wind Farm-Scale Power Production***

Leonard Chamorro

#### ***Environmental Boundary Layer Turbulence Measurement and Prediction for Wind Energy Development***

Corey Markfort

#### ***Coupling the Mesoscale to the Microscale using Momentum Budget Components***

Caroline Draxl

#### ***An Evaluation of Wind Energy Production in Iowa at Elevated Hub Heights***

Bin Cai

2:15 pm - 2:45 pm

Mid-Afternoon Refreshments

2<sup>nd</sup> Floor Lobby

## **Thank you to our Sponsors**

*The support provided is greatly acknowledged*



National Renewable Energy Laboratory

Iowa State University's Department of Aerospace Engineering

**Thursday, September 28, 2017 – Continued**

**Aeroacoustics  
Room 220**

**2:45 – 4:15 pm**

Chairs: Nathan Alexander & Seongkyu Lee  
[alexande@vt.edu](mailto:alexande@vt.edu)      [skulee@ucdavis.edu](mailto:skulee@ucdavis.edu)

***Finlets: Application in a Rotating System and Field Testing***  
 Nathan Alexander

***Numerical Investigation of Bio-Inspired Blade Designs at High Reynolds Numbers for Ultra-Quiet Aircraft and Wind Turbines***  
 Andrew Bolding

***Predictions and Challenges of Airfoil Trailing Edge Noise with Semi-Empirical Models***  
 Seongkyu Lee

***Aerodynamic and Aeroacoustic Behaviors of Spanwise Wavy Trailing Edge Modified SNL 100-meter Blade***  
 SeungJoon Yang

***Prediction of Wind Turbine Noise Propagation***  
 Biswanath Samanta

**Electrical Power  
Room 240**

**2:45 – 4:15 pm**

Chair: James McCalley  
[jdm@iastate.edu](mailto:jdm@iastate.edu)

***Deformation Processed Al/Ca Nano-filamentary Composite Conductors for HVDC Applications***  
 Charles Czahor

***Modeling of Phosphorous Acid Fuel Cell in PSCAD***  
 Sundari Ramabhotla

***Wind Farms Control for Secondary Frequency Regulation: Actuation by Pitch and Generator Torque***  
 Carl Shapiro

***GeneratorSE: NREL's New Design Optimization Tool for Variable Speed Wind Generators***  
 Latha Sethuraman

***Wind Capacity Growth in the Northwest US: Co-optimized vs Sequential Generation and Transmission Planning***  
 Patrick Maloney

***Review on Fuel Cell Technologies***  
 Sundari Ramabhotla

4:30 pm

Load buses to travel to ISU Campus, Howe Hall  
*Buses will depart the west side of the Iowa State Center, near CY Stephens*

**5:00 pm - 7:00 pm**

**Tour of ISU AERE facilities**

**ISU Campus**

7:00 pm - 7:30 pm

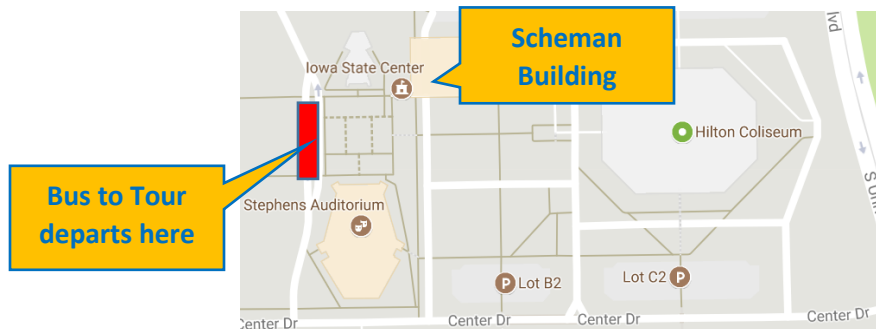
Travel to back the Scheman Building  
*Note: You will not be able to re-enter the Scheman Building*

**7:00 pm - 9:00 pm**

**ASME Wind Energy Technical Committee Meeting**

**Howe Hall 1235**

**Dinner on Your Own**



## Friday, September 29, 2017

7:30 - 8:30 am	Continental Breakfast	2 <sup>nd</sup> Floor Lobby
8:30 - 9:30 am	Creating a Renewable Energy Future <i>Michael C. Fehr</i>	Room 220-230
9:30 - 10:00 am	Mid-Morning Refreshments	2 <sup>nd</sup> Floor Lobby

### **Aeromechanics**

#### **Room 220**

**10:00 – 11:45 am**

Chairs: Xiaodong Wang & Paul Veers

[wangxd@ncepu.edu.cn](mailto:wangxd@ncepu.edu.cn)   [paul.veers@nrel.gov](mailto:paul.veers@nrel.gov)

#### ***Impact of the Low-Level Jets Negative Wind Shear on the Wind Turbine's Low-Speed and High-Speed Shafts***

Walter Gutierrez

#### ***Large Scale Strength Testing of Hexcrete Segment Design for Tall Wind Towers***

Sri Sritharan

#### ***Improvement of Jensen Wake Model using CFD Simulations for Wind Farm on Complex Terrain***

Xiaodong Wang

#### ***Study on Wake-Induced Fatigue on Wind Turbine Blade based on Elastic Actuator Line Model and Two Dimensional Finite Element Model***

Hang Meng

#### ***Instrumentation Development for Surface Pressure Measurement on a Wind Tunnel-Scale Wind Turbine Blade***

Arash Hassanzadeh

#### ***Effects of Rotating Wind Turbine Blades on Aerodynamic Forces Acting on Tower***

Takaaki Kono

### **Offshore**

#### **Room 240**

**10:00 – 11:45 am**

Chairs: James Baeder & Jonathan Naughton

[baeder@umd.edu](mailto:baeder@umd.edu)   [naughton@uwyo.edu](mailto:naughton@uwyo.edu)

#### ***On the Interaction of Turbine Wake and Offshore Wind-Wave Field in Offshore Wind Farm: Large-Eddy Simulation with Actuator Models***

Pin Lyu

#### ***Assessment of Fresh-Water Wind Resources on Lake Erie***

Xiong Yu

#### ***Assessment of Offshore Wind Turbine with Friction Wheel Foundation under Lateral Load Using Centrifuge Tests***

Jerry Li

#### ***Integrated Design Optimization of a Floating Offshore Wind Turbine Rotor and Structural Controller***

Gaertner, Evan

#### ***Characterization of Offshore Wind Resources in the Contiguous United States***

Caroline Draxl

11:30 - 12:45 pm	Lunch	2 <sup>nd</sup> Floor Lobby
<b>11:45 - 12:45 pm</b>	<b>WISDEM Training</b>	<b>Room 230</b>

## Friday, September 29, 2017 - Continued

### **Educational & Environmental/Social Impacts Room 220**

12:45 – 1:30 pm

Chairs: Tom Acker & John Madsen

[Tom.Acker@nau.edu](mailto:Tom.Acker@nau.edu)      [jmadsen@udel.edu](mailto:jmadsen@udel.edu)

#### ***U.S. Wind Energy Education Programs at the University Level: A Path Forward***

Tom Acker

#### ***Preparing University Students for Professional Careers in the Wind Industry: An Innovative Convergence Model for Education***

John Madsen

#### ***Experimental Investigation of Aerodynamic and Impact Characteristics of Bats for Modeling Bat- Turbine Interaction***

Shivendra Prakash

### **New Concepts Session**

#### **Room 220**

1:30 – 2:15 pm

Chair: Xiong Yu

[xxy21@case.edu](mailto:xxy21@case.edu)

#### ***An Experimental Study of Wind Turbine Icing Process under Freezing Rain Conditions***

Linyue Gao

#### ***Analyses of the Performance of Bio-Inspired Wind Turbine Blade***

Xiong Yu

#### ***Conceptual Development of an Unmanned Aerial Vehicle Powered by Regenerative Soaring***

Pavithra Premaratne

### **Design & Optimization**

#### **Room 240**

12:45 – 2:15 pm

Chairs: Jason Jonkman

[Jason.Jonkman@nrel.gov](mailto:Jason.Jonkman@nrel.gov)

#### ***Development and Validation of FAST.Farm: A New Multiphysics Tool for Wind Farm Design and Analysis***

Jason Jonkman

#### ***Wind Plant Layout Optimization Considering Atmospheric Stability***

Ryan King

#### ***Mesh Generation Best Practices and Automation Strategies for Wind Turbine Farm Applications***

Claudio Pita

#### ***Operation and Maintenance Cost Optimization with Respect to the Availability of a Microgrid***

Sundari Ramabhotla

#### ***A Quasi-coupled Wind Wave Experimental Framework for Testing Offshore Wind Turbine Floating Systems***

Michele Guala

2:15 pm

Symposium Adjourns