

TurbSim & Design Codes Workshops

National Wind Technology Center (NWTC)
National Renewable Energy Laboratory (NREL)

Monday – Thursday, September 22 – 25, 2008

Agenda

September 22 —Turbulence and Its Impact on Wind Turbines: An Overview

9:00 Welcome / Introductions

- Introductions (All)
- Agenda and purpose of meeting (Neil Kelley)

9:30 Overview of the atmospheric boundary layer, its dynamics, and the turbulence characteristics associated with it that have the greatest impact on wind turbine operations (Neil Kelley)

10:30 Break

10:45 Atmospheric boundary layer structures that generate turbulence characteristics that can be detrimental to wind turbine component lifetimes and operations (Neil Kelley)

Specific turbulence characteristics that have been shown to influence the dynamic response of wind turbine structures and components (Neil Kelley)

12:00 Lunch

13:00 Environments that are modeled in TurbSim and why (Neil Kelley)

- IEC specifications
- Smooth, homogeneous terrain
- Wind farm models – Upwind and within a multi-row wind farm with 7- and 14-rotor diameter row-to-row spacing
- The NWTC test site (downwind of very complex, mountainous terrain)

A North American High Plains site

14:00 The TurbSim Site-Specific Models (Bonnie Jonkman)

- Overview and History of TurbSim
- Simulation Method
 - Frequency domain
 - Time domain

- Superimposed coherent structures
- Implementation of Site-Specific Models
 - Velocity spectra
 - Spatial coherence
 - Wind profiles
 - Coherent structures

15:00 Break

15:15

- Implementation of Site-Specific Models (continued)
 - Spatial coherence
 - Wind profiles
 - Coherent structures

17:00 Adjourn

September 23 — TurbSim's Input File

9:00 Using TurbSim: The Meteorological Input Parameters (Bonnie Jonkman)

- Input Parameters for Meteorological Boundary Conditions
 - Definitions
 - Default values
 - What they do

10:30 Break

10:45 Comparing Simulated Data with Measured Data (Bonnie Jonkman)

12:00 Lunch

13:00 Using TurbSim: The Non-Meteorological Input Parameters (Bonnie Jonkman)

- Runtime options
- Turbine/Model Specifications
- Coherent Turbulence Scaling parameters

14:00 Suggested methodologies for using TurbSim inflow simulations as part of the turbine design process, including IEC and site-specific turbulence models (Neil Kelley)

15:00 Break

15:15 Roundtable discussion of the general topic of the turbulent inflow, its simulation, and its impact on wind turbine design and operations (Neil Kelley)

17:00 Adjourn

September 24 — Using TurbSim

9:00 TurbSim Demonstration (Bonnie Jonkman)

- Downloading the archive – files contained in it
 - Coherent structure archive
- Running the code
- Interpreting the summary file
- Setting up AeroDyn to superimpose the coherent structures generated in TurbSim
- Tools for analyzing the data (auxiliary scripts/codes)

10:30 Break

10:45 Concluding remarks and discussion

12:00 Lunch

13:30 Tour of the NWTTC

September 25 — Design Codes Workshop

- 9:00 Welcome / Introductions
- Introductions (All)
 - Agenda and purpose of meeting (JJ)
- 9:15 Overview of Design Codes (JJ/MB)
- Design Process
 - List of Codes & Basic Features
 - Interaction Between Codes
 - NWTC Subroutine Library
 - Users
 - Applications
 - User-Support & Discussion Forum
- 10:00 NuMAD (DL)
- Overview
 - Planned Work & Future Opportunities
- 10:30 Break
- 10:45 PreComp (GB)
- Overview
 - Plans for Adding Stress Analysis
 - Future Opportunities
- 11:15 BModes (GB)
- Overview
 - New Feature: Offshore Support Structures
 - Recent Verification
 - Future Opportunities
- 11:45 WT_Perf (MB)
- Overview
 - Plans for Improved Solution Algorithm
 - Future Opportunities
- 12:00 Lunch
- 13:00 AeroDyn (JJ/MB)
- Overview
 - Review of Planned Overhaul Activities
 - Future Opportunities
- 13:30 FAST & HydroDyn (JJ)

- Overview
- New Feature: Offshore Monopiles
- New Feature: Offshore Floating Platforms
- New Feature: CVF Versus IVF
- Plans for New DOFs & Coupled Modes
- Future Opportunities

14:15 MSC.ADAMS, FAST-to-ADAMS, & A2AD (JJ)

- Overview
- Planned Work to Improve Analysis of Blades with Built-In Sweep & Curvature
- Future Opportunities

14:30 NAFNoise & FAST Noise Module (PM)

- Overview
- Planned Work & Future Opportunities

15:00 Break

15:15 MBC (GB)

- Overview
- Planned Work & Future Opportunities

15:45 MCrunch (MB)

- Overview
- Planned Work & Future Opportunities

16:15 Loads-Analysis Scripts (MB/BJ)

- Overview
- Planned Work & Future Opportunities

16:30 Review and Wrap-Up (All)

- Feedback
- Scheduling of an Annual Users Meeting?

17:00 Adjourn

NWTC Attendees:

José Azcona, CENER, Spain
Matthew Barone, Sandia National Laboratories
Marshall Buhl, NREL
Sandy Butterfield, NREL
Jørgen Højstrup, Suzlon Energy A/S, Denmark
Bonnie Jonkman, NREL
Jason Jonkman, NREL
Neil Kelley, NREL
Daniel Laird, Sandia National Laboratories
Jason Laks, University of Colorado
Rodman Linn, Los Alamos National Laboratory
David Malcolm, Global Energy Concepts Inc
Timothy Olsen, Advanced Energy Systems, LLC
Laust Olsen, Siemens Wind Power, Denmark
Francisco Oyague, NREL
Ian Prowell, Sandia National Laboratories
Brian Resor, Sandia National Laboratories
Mike Robinson, NREL,
Rune Rubak, Siemens Wind Power, Denmark
Scott Schreck, NREL
Shuangwen (Shawn) Sheng, NREL
Jesper Stærdahl, Siemens Wind Power A/S, Denmark
Dirk Steudel, REpower Systems, Germany
Akihiro Suzuki, Wind Energy Institute of Tokyo Inc,
Japan
Henry Swales, Abundant Renewable Energy
Bob Thresher, NREL
Paul Veers, Sandia National Laboratories
Kyle Wetzal, Wetzal Engineering, Inc.
Alan Wright, NREL

Remote Attendees:

Puneet Agarwal, Stress Engineering Services
Corneliu Barbu, DeWind Inc
Sukanta Basu, Texas Tech University
Mark Capallaro, University of Stuttgart, Germany
Tim Fischer, University of Stuttgart, Germany
Gabriel Galvan, IMPSA WND, MZA, Argentina
Brandon Gerber, General Electric Wind
Emilio Guiñazu, IMPSA WND, MZA, Argentina
Stefan Hauptmann, University of Stuttgart, Germany
Gabriel Julian, IMPSA WND, MZA, Argentina
ajao Kajogbola R., University of Ilorin, Nigeria
Juan Mañanes, IMPSA WND, MZA, Argentina
Lance Manuel, University of Texas at Austin
Jason Mcneil, Texas Tech University
Elmar Mikkelson, IMPSA WND, MZA, Argentina
Emil Moroz, DeWind Inc
David Nagle, Hamilton Standard
Leandro Orsi, IMPSA WND, MZA, Argentina
Justin Sharp, Iberdrola Renewables
Shawn Shaw, Cadmus Group
Ursula Smolka, University of Stuttgart, Germany
Song Xiaowen, Wind Energy Institute of
Technology, Shenyang University, China
Nicolas Tripp, IMPSA WND, MZA, Argentina
Juan José Trujillo, University of Stuttgart, Germany
Mel Tyree, University of Alberta, Edmonton, Canada
Nilay Sezer Uzol, TOBB University of Economics
and Technology, Turkey
Oguz Uzol, Middle East Technical University,
Turkey
Yin Zhengbing, Shanghai Power Transmission &
Distribution Co.,Ltd, China
Zhou Hua, Tongji University, Shanghai, China
Ahmed Zobaa, University of Exeter, UK