



TEXAS TECH UNIVERSITY

Wind Science & Engineering  
Research Center™

Wednesday, February 29, 2012

3:30 p.m. to 4:30 p.m.

EE Room 217

Reception to follow

## The McDonald-Mehta Lecture Series Presents:

### Research Directions and Design Practice in Modeling Loads on Wind Turbines

Lance Manuel, Ph.D., P.E.

Professor and Fluor Centennial Teaching Fellow in Engineering

The University of Texas at Austin

Wind turbines are being installed in increasingly complex environments on land as well as offshore. The quality of the wind resource—with stronger winds and, often, reduced turbulence—favors the selection of such sites, but complex inflow wind fields are not explicitly designed against.

This presentation will provide an overview of the practice in the design of wind turbines per available standards, and will discuss attempts made in research to simulate off-standard wind flow fields that occur during anomalous or extreme atmospheric events. Wind turbines are commodities of serial production—they are type certified in much the same way as most machines, and yet they have to also perform a structural function no different from that of civil structures.

Ultimately, the prediction of extreme loads for design—which guides the site-specific selection of the rotor type, tower, support structure, and foundation—needs to reflect uncertainty in the inflow, turbine dynamics, control systems, and modeling to assure reliability over the long term. Example studies of turbine response simulation focused on the effects of thunderstorm microbursts and other external influences will highlight design challenges and areas of ongoing research related to loads on and reliability of both land-based and offshore utility-scale wind turbines.

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Lance Manuel is Professor and the Fluor Centennial Teaching Fellow in Engineering at the University of Texas at Austin. He has been on the faculty since 1999. He has a Bachelor of Technology degree in civil engineering from the Indian Institute of Technology, Bombay, and a Ph.D. degree in civil engineering from Stanford University. Since 2001, his research group at UT-Austin has focused on research related to wind energy including studying the statistical analysis of inflow and turbine loads, the characterization of various spatio-temporal characteristics of inflow wind fields, and on the long-term reliability of turbines. Dr. Manuel has also completed research related to offshore wind turbines.

Dr. Manuel's wind turbine related research has been supported by Sandia National Laboratories, the U. S. Department of Energy, the Texas Higher Education Coordinating Board, and the National Science Foundation (including a CAREER award). He has provided expert guidance and review for several international wind agencies, and he has served on two National Academy committees, as well as on the International Electrotechnical Commission committee for the IEC 61400-1 standard for design requirements for wind turbines. His work in the field has been recognized two times with an ASME Best Journal Paper award.