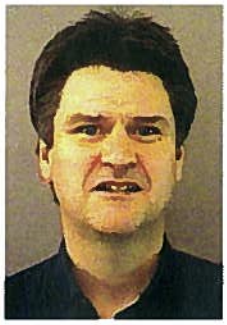
2008-2009

Graduate Seminar Series

The Department of Mechanical Engineering – Engineering Mechanics

Proudly Presents

David G. Wilson, PMTS
Sandia National Laboratory



David G. Wilson has three Degrees in Mechanical Engineering from Washington State University (BS – 1982, MS 1984) and The University of New Mexico (PhD – 2000). He has authored over 50 technical papers including two books. He is currently a Principal Member of Technical Staff at Sandia National Laboratories, Energy Systems Analysis Department. Dr. Wilson has over 24 years of R&D engineering experience in energy systems, robotics, automation, and space and defense projects. Recent areas of research include nonlinear/adaptive control design, analysis, and implementation for; flexible manipulators, robotic and automated systems, crane systems with flexible payloads, aerospace systems, multi-body dynamic systems, distributed decentralized control architectures for mobile vehicles; collective robotic/aerospace systems, and the development of dynamic programming optimized path planning and trajectory generation for dynamical systems. Currently he is developing exergy/entropy nonlinear power flow control for critical energy surety infrastructures, renewable energy systems, and active aerodynamic blade control for load alleviation for large wind turbines.

Thursday, Apr. 2, 2009 3:00 – 4:00 p.m. Room 112, ME-EM Bldg.

Sandia National Laboratories Wind Energy Research

SMART Rotor Programand Power Grid Control and Analysis R&D

Wind Energy is one of the fastest-growing sources of utility-scale power generation in the US today, providing nearly 35% of the total new capacity added in 2007 and 2008 (second only to natural gas). Through the end of 2008, wind power provided over 25 GW of the electricity generating capacity in the U.S, or just over 1.5% of the nation's electricity. The installed capacity makes the US the world leader in wind electricity generation, generating enough electricity to serve approximately 5.3 million American homes. In May of 2008, the DOE published a report discussing the possibility of 20% installed wind energy by 2030, which outlines the needs for technology innovation in order to accomplish the goal.

The Wind Energy Technology department at Sandia National Laboratories conducts applied wind energy research aimed to increase the viability of wind technology by improving wind turbine performance, reliability, and reducing cost of energy. SNL specializes in all aspects of wind turbine blade design, manufacturing, and system reliability, and has been supporting DOE's wind energy mission for over 30 years.

This presentation will outline the history of the technology; the trends and challenges faced by the Industry, and outline the potential future innovations that are being investigated at the laboratory targeted at increasing the efficiency and lowering the cost of wind energy. One of the components of the SMART Rotor Program utilizes active aerodynamic blade control design for load reduction on large wind turbines. Wind turbines are large complex dynamically flexible structures that must operate under very turbulent and unpredictable environmental conditions where efficiency and reliability are highly dependent upon a well designed control strategy. The possibility to quickly influence aerodynamic loads acting on the individual blades allows for a hybrid pitch control objective that includes a high frequency dynamic attenuation component with respect to fatigue load reduction. Active aerodynamic devices are potential candidates for this component. Several active aerodynamic load control strategies are investigated to help alleviate loads to prevent damage to the machinery. Numerical case studies for wind turbines ranging from 600KW to 5 MW rated power are reviewed.

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and the Department of Mechanical Engineering – Engineering Mechanics www.me.mtu.edu/seminar