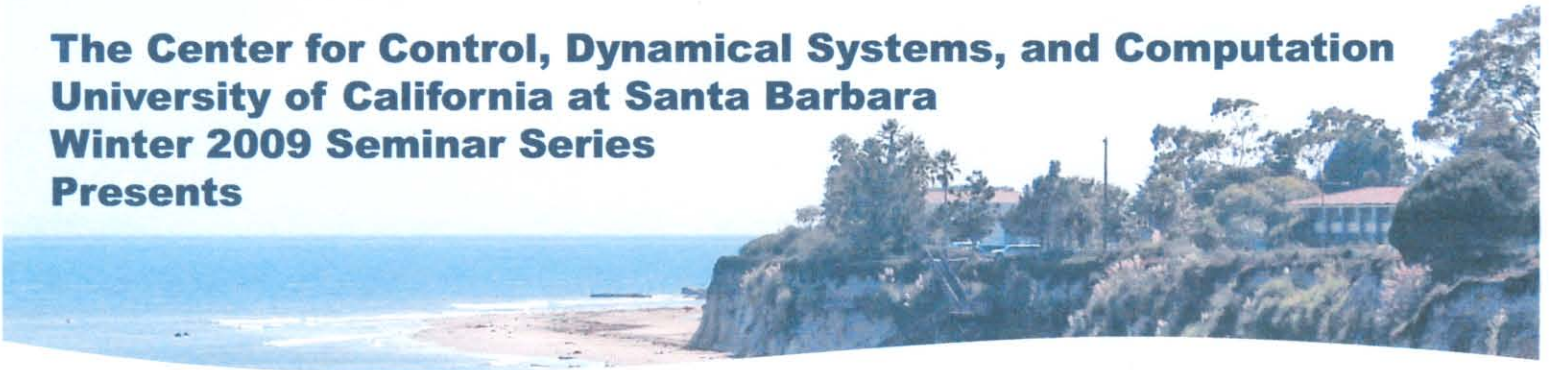


**The Center for Control, Dynamical Systems, and Computation  
University of California at Santa Barbara  
Winter 2009 Seminar Series  
Presents**



**Impact of Increased Penetration of DFIG based Wind Turbine Generators on Transient and Small Signal Stability of Power Systems**

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**Friday, January 23, 2009 3:00-4:00pm Chem 1171**

**Abstract:**

The targeted and current development of wind energy in various countries around the world reveals that wind power is the fastest growing power generation technology. Among the several wind generation technologies, variable speed wind turbines utilizing doubly fed induction generators (DFIGs) are gaining momentum in the power industry. With the increase in penetration of these wind turbines, the power system dominated by synchronous machines will experience a change in dynamics and operational characteristics. Given this assertion, the present paper develops an approach to analyze the impact of increased penetration of DFIG based wind turbines on transient and small signal stability of a large power system. The primary basis of the method is to convert the DFIG machines into equivalent conventional round rotor synchronous machines and then evaluate the sensitivity of the eigenvalues with respect to inertia. In this regard, modes that are both detrimentally and beneficially affected by the change in inertia are identified. These modes are then excited by appropriate disturbances and the impact of reduced inertia on transient stability performance is also examined. The proposed technique is tested on a large test system representing the Midwestern portion of the U.S. interconnection. The results obtained indicate that the proposed method effectively identifies both detrimental and beneficial impacts of increased DFIG penetration both for transient stability and small signal stability related performance.

**About the Speaker:**

Vijay Vittal is the Ira A. Fulton Chair Professor in the Electrical Engineering department at Arizona State University. From 1982 - 2004 he served as a faculty member at Iowa State University. His research interests are in the area of power system dynamics, dynamic security assessment of power systems, power system operation and control, and application of robust control techniques to power systems. He is the author and co-author of several papers in his field. In 1992 he co-authored the textbook entitled Power System Transient Stability Assessment Using the Transient Energy Function Method with A. A. Fouad, and in 1999 he co-authored the textbook entitled Power System Analysis with A. R. Bergen. He currently is the director of PSERC. He is a recipient of the 1985 Presidential Young Investigator Award. In 1997, he was elected as a Fellow of IEEE. He was also the recipient of the 2000 IEEE Power Engineering Society Outstanding Power Engineering Educator Award. From 1998-2000 he was the Chairman of the IEEE Power Engineering Society System Dynamic Performance Committee. He was elected to the U.S. National Academy of Engineering in 2004. He is the Editor in Chief of the IEEE Transactions on Power Systems.