

**THE CONCORDIA INSTITUTE FOR INFORMATION SYSTEMS ENGINEERING
IS PLEASED TO PRESENT THE FOLLOWING GUEST LECTURE IN
OUR CIISE DISTINGUISHED SEMINAR SERIES**

Dr. Eric Bechhoefer
NRG Systems

System Engineering for a Low Cost/Light Weight HUMS

The reluctance of wind farm operators to adopt condition monitoring systems (CMS) is based in part on the expense of operating the CMS. After the initial purchase, there are additional costs for: installation, Information Technology (servers, database, and software maintenance/support), training, and knowledge creation. The term, knowledge creation, deals with the ability of the CMS to provide the operator of the wind turbines with actionable information and includes: threshold setting, fault detection, and prognostics. We discuss the system engineering challenges in the development of a low cost/light weight CMS. We looked at sensor selection, hardware, packaging and software design requirements to reduce cost. The resulting CMS is based on a high performance MEMS accelerometer. This decision allows signal conditioning, data acquisition and signal processing to be packaged with the MEMS accelerometer. Advanced packaging concepts, using conductive plastic, were then used to further reduce the bill of material (BOM) cost. The implementation required a solution to a number of engineering challenges, ranging for reducing electronic noise to improving the algorithms to run on an embedded system. This reduces the cost per acquisition channel and facilitates a scalable, bussed communication system between the sensors, reducing the wire runs and the associated cost of installation. From a software perspective, the proposed CMS has been designed as a cloud computing application. All vibration data is processed locally on the sensor: the sensor sends condition indicators to a cloud database, which handles security and the graphical user interface. Use of cloud services improves system test through better configuration management and reduces further cost to the operator: the operator does not pay setup or maintenance of application, but only for usage of the application.

Biography: Dr. Eric Bechhoefer is the chief engineer at NRG Systems, manufacturer of wind measurement equipment for the global wind energy industry. In this role he serves as program leader for the development of wind turbine condition monitoring systems. Prior to joining the company in 2010 Dr. Bechhoefer worked for the Goodrich Corporation, leading research and development initiatives within the aerospace division. As a former naval aviator and worldwide expert in rotor dynamics and wireless sensor technology, Dr. Bechhoefer holds 17 patents and has authored over 70 juried papers related to condition monitoring of rotating equipment. He holds a Ph.D. in general engineering from Kennedy Western University, a master's degree in operations research from the Naval Postgraduate School and a bachelor's degree in biology from the University of Michigan. In addition, Dr. Bechhoefer serves as a member of the University of Illinois at Chicago's Mechanical and Industrial Engineering Advisory Board.

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