



BIG energy seminar series

Addressing the scale and complexity of the global energy challenge.



Rotational Kinetic Energy as Power System Service: Assessing The Role of Wind Farms

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Engineering Center - ECEE 1B55 Conference Room

Summary: The electric power system is currently composed of generators with large spinning masses whose speeds are tightly coupled together. These masses offer a store of rotational kinetic energy that naturally gives inertia to the average speed of the system. This inertia offers a first line of defense that is tapped during sudden power imbalances. Installing a large fleet of wind farms will result in hours of the year when many traditional generators are turned off. The result may be a power system with lower inertia that is more vulnerable to disturbances, and in some jurisdictions this prospect has resulted in restrictions on allowable instantaneous percentage of wind generation. Even though wind turbines have significant technical potential to offer a controlled and fast power response to imbalances by drawing on their own kinetic energy, most currently installed machines do not do so.

In the future, it may be required to optimize, forecast, and remunerate power control capability from wind turbines. In this talk we focus on short-term inertial response- there are many questions that arise about the necessity and value of such a requirement, and about how to integrate the contribution of wind turbines into power systems operation. We will consider the basic problem and potential, and outline some insights that can be obtained based on regional wind-speed data, and farm-level measurements. As an example, we will examine how the total inertia of Great Britain might vary over time for a future scenario of wind power, and how emulated inertia from wind farms could contribute. We will then open up the problem of how to estimate the availability over time of inertia contributions from wind farms, and examine several issues related to the problem of determining how the contributions of individual wind turbines really aggregate at the farm level and at the system level.

Dr. Barry Rawn

Dr. Barry Rawn is a postdoctoral researcher at the Delft University of Technology in the Netherlands. He studied Engineering Science and then Electrical Engineering, receiving all his degrees from the University of Toronto, and specializing in control theory and power systems. He is a member of the IEEE, acts as a reviewer for several power and energy journals, and has contributed to the IEA Task 25 on Operation of Power Systems with Large Amounts of Wind Power. He participates in the nationally funded research projects "North Sea Transnational Grids" and "Far and Large Offshore Wind". These projects address offshore wind power, its effects on the transmission system, and future grid codes.

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