Nova Scotia Energy Research and Development Forum 2012

Lukas G. Swan

Biography

Dr. Lukas G. Swan is an assistant professor of Mechanical Engineering at Dalhousie University where he conducts research, supervises the Renewable Energy Storage Laboratory, and lectures. Lukas is a professional engineer involved with both R&D and commercial aspects of a broad array of renewable and alternative energy technologies. His passion is sustainable and efficient energy generation, storage, and conversion mechanisms, with the intent of displacing conventional fossil-fuel use. Drawing on his experience as a commercial wind developer (MW class turbines) and several years consulting for manufacturers of battery electric vehicles (EV), he has set his research objectives on developing energy storage technologies and management methods to allow for the increased integration of renewable energy with the electricity grid. As an associate of the NSERC Smart Net-zero Energy Buildings Research Network, Lukas is involved in residential and community energy modeling to evaluate unique technologies and their impact upon energy consumption and GHG emissions. He received his BSc at California Polytechnic (Cal Poly SLO) and both his MASc and PhD from Dalhousie University in Nova Scotia. He lives in Lawrencetown Beach with his wife and young son.

Presentation Abstract: Smart Net-Zero Energy Buildings Research

The NSERC Smart Net-zero Energy Buildings strategic Research Network (SNEBRN) is a **collaborative research network** linking researchers from academia, industry and government in a united effort to develop the technologically advanced smart net-zero energy buildings (NZEBs) of the future. *A net-zero energy building is defined as one that, in an average year, produces as much energy (electrical plus thermal) from renewable energy sources as it consumes.* The network totals 29 researchers from 15 Canadian universities taking part in the effort along with partners including CanmetENERGY, Hydro-Québec, Canada Mortgage and Housing Corporation, Philips, Alouette Homes and Kott Group, Régulvar, Unicel and Canadian Solar.

The **main network goal** is to develop optimal pathways for achieving zero average annual energy consumption at both the building and neighborhood levels. This will be achieved through combinations of dynamic building methods that integrate a number of technologies: building-integrated solar systems, high performance windows with active control of solar gains, short-term and seasonal thermal energy storage, heat pumps, combined heat and power technologies, and smart controls. We will aim for simultaneous reduction of energy demands and shifting of peak loads through techniques such as predictive control at the building and neighborhood scales. The Network is organized into the following five **Themes**:

1. Integrated solar and HVAC systems for buildings
2. Active building envelope systems and passive solar concepts
3. Mid-to long-term thermal storage for buildings and communities
4. Smart building operating strategies
5. Technology transfer, design tools and input to national policy

Concordia U. Solar Simulator

Concordia U. Solar Wall