Nova Scotia Energy Research and Development Forum 2012

Dominic Groulx

Biography

Dominic Groulx received both his Bachelor's Degree in Physics in 1999 and his Ph.D. in Mechanical Engineering in 2005 from Sherbrooke University (Sherbrooke, Québec, Canada). His doctorate studies focused on the fundamentals study of close contact melting of phase change materials, particularly on the effect of convection and inertia forces on the process. In 2007, he accepted a position in the department of Mechanical Engineering at Dalhousie University. His research interests focus mostly on phase change and multiphase processes; this includes solid-liquid phase change, close contact melting, phase change material, two-phase flow and the application of the inverse heat transfer method, ranging from fundamental studies to applications as diverse as energy storage systems, cooling of electronic components and thermal systems for nuclear reactors.

Presentation Abstract: Thermal and Electrical Energy Storage for Renewable Energy Integration

Usage of renewable energy is on the rise, across Nova Scotia and around the world. However, nature controls the solar irradiation and cloud cover, the wind, the tides, the waves; which leads to energy production times that are mostly uncorrelated to energy usage times. This substantial problem can be solved by using various storage strategies, both thermal and electrical, therefore bridging the gap between the energy production and utilization times. When a system requires thermal energy to run, thermal storage is an effective way to go. Such systems are already used in conjunction with solar thermal collector and domestic hot water systems. Water is the storage medium used in those systems and research is currently underway on the use of phase change materials (PCMs) in hopes of increasing storage density and reducing required weight and space. Some of that research is performed in the Lab of Applied Multiphase Thermal Engineering at Dalhousie. Another popular thermal system used to store energy during electrical off-peak hours is cold storage using ice as the PCM. The end-use of the energy stored in those systems is for air conditioning. When a system requires electricity to run, it is more efficient to use a storage method that gives back electricity, as opposed to heat. Such systems includes pumped hydro, compressed air storage, supercapacitors, and of course, batteries which are studied at the Renewable Energy Storage Laboratory at Dalhousie.