Integrated Energy and Harvesting Systems

60% of the energy produced is lost to thermal energy!

Monday, Nov. 21
138 DeBartolo
3:30-4:30 p.m.

Communities in Canada and around the world are supplied with energy via the outdated industrial era model of centralization. For example, Canada's electrical system relies on a one-way flow of electricity generated at large remote facilities and transported great distances to the end user. This approach results in large transmission losses, vulnerability to power loss due to weather events and, most important, the lost potential to utilize by-products of energy conversion such as waste heat.

The always-changing power demand in Ontario alone usually reaches a daily high that is as much as twice the base load power production. The current centrally-managed Ontario electric grid is able to meet these peaks, but because it is not integrated with other energy systems, it is estimated that 60 to 70% of the total fossil fuel energy used to meet changing loads is lost as waste heat. By combining technologies that generate electricity, harvest, and store wasted heat, much of this loss could be avoided.

The focus of the McMaster Thermal Management Research Laboratory is working to develop the knowledge and expertise necessary for a new energy systems approach, breaking traditional energy silos to unlock the transformative potential of distributed energy systems and create increased energy utilization, resiliency, and a low-carbon future.

During this seminar, the study of processes which capture normally "lost" thermal energy sources, accumulate them, and store them for later use will be presented. The potential of energy harvest and thermal energy storage will also be discussed, as will the team's recently patented TEG-POWER system.

JAMES COTTON
McMaster University
Hamilton, Ontario, Canada

A professor in the Department of Mechanical Engineering at McMaster University and associate director of the McMaster Institute for Energy Studies, Cotton is a leader in energy harvesting and in the emerging fields of thermal energy recovery, storage, and electrohydrodynamics. His research focuses on developing, modeling, and experimentally validating technologies to advance efficient thermal management solutions and tri-generation systems. Cotton's research and industry experience involves nearly all aspects of the energy network, ranging from improving the power conversion of automotive power trains, waste heat recovery from commercial and industrial processes, and enhancing energy efficiency in buildings. He has authored/co-authored more than 80 peer reviewed journal and conference papers and has three granted patents — one filed and two in-process invention disclosures. During the past six years he has trained more than 35 graduate students and researchers. He is the principal of a consulting company, *ThERM Solutions*, and is in the process of forming a spin-off company, *HARvEST Systems*. Cotton has worked with a wide variety of communities and commercial partners to establish community energy plans, identify the problems facing industry, and develop technology road maps to address these challenges. He is a member of the Stakeholder Advisory Committee for the award-winning Burlington Community Energy Plan and has advised Burlington Hydro and other Ontario power producers on emerging technologies and utilization strategies. He co-leads the Thermal Management Research Laboratory at McMaster and is working to establish an energy research cooperative with 30 partners focusing on integrated energy and harvesting systems as a pathway to low carbon communities.

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