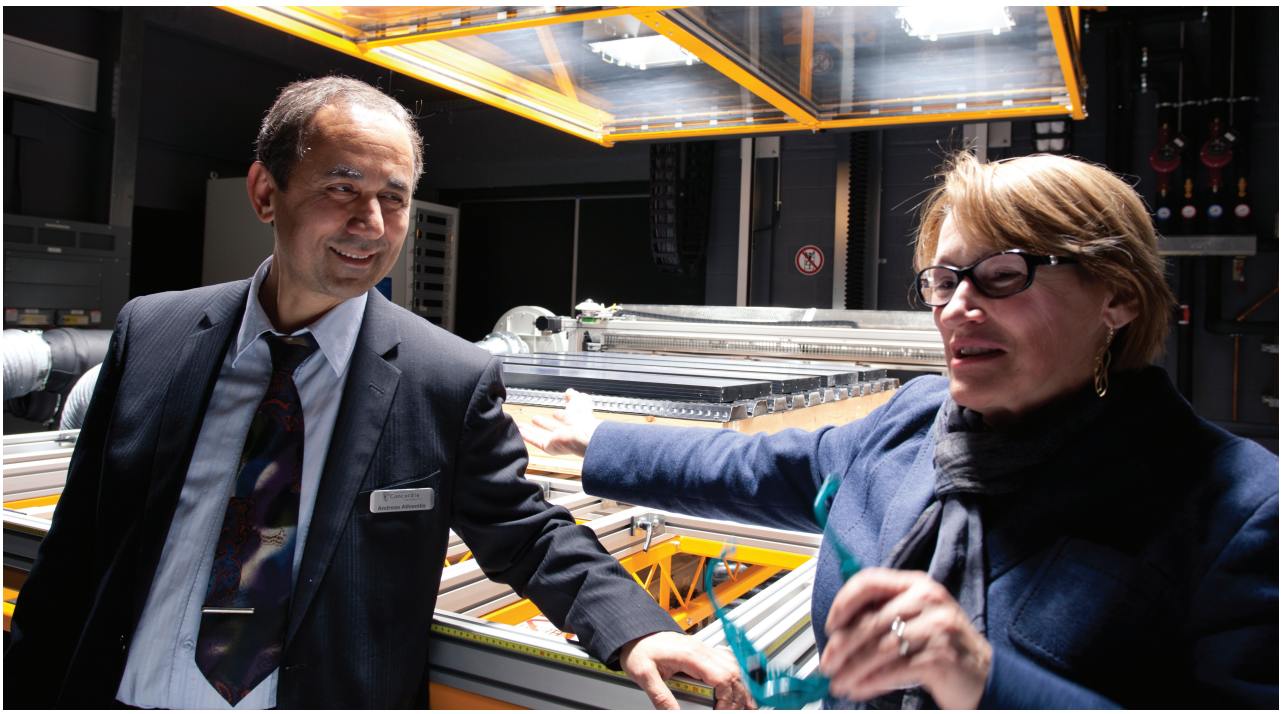
THE INEXHAUSTIBLE SUN

From Arctic cold to desert heat, Concordia University's new simulator puts solar energy to the test



Andreas Athienitis, a leader in solar energy development, based at Concordia University, and Suzanne Fortier, president of the Natural Sciences and Engineering Research Council of Canada, discuss energy efficiency in Concordia's Solar Simulator-Environmental Chamber.

Here comes the sun – to the basement of Concordia University's Henry F. Hall building in Montreal, where a new $4.6 million Solar Simulator-Environmental Chamber may hold answers to key environmental challenges facing Canada.

Inside the simulator, eight metal halide lamps replicate the effects of a full sun. Researchers test the effectiveness of photovoltaic (PV) systems – which use solar panels to convert sunlight into electricity – plus air and water collectors, windows with different coatings and other components.

Microclimates ranging from Arctic to desert are replicated in a two-storey environmental chamber, and test construction materials for how efficiently they respond to extremes of heat and cold while maintaining a steady, comfortable temperature inside. Specially designed windows admit solar light produced by a six-lamp, mobile solar simulator. Researchers can see how building components hold up under conditions ranging from -40°C to 50°C. Concordia calls the combined simulator and environmental chamber, which opened in December, the only facility of its kind in the world.

"The sun is inexhaustible," says Paul Fazio, a professor in Concordia's Department of Building, Civil and Environmental Engineering. "It's within our power to harness that energy and overcome some of the challenges we face as a planet."

The goal is to develop cost-effective, net-zero energy buildings. These are buildings that produce as much energy (electrical and thermal) as they use. Not only is energy harvested on site, but the buildings reduce their overall energy use through efficient technologies in heating, air conditioning and lighting. The result is no net consumption and zero carbon emissions.

Concordia has used its own campus to explore how buildings can achieve, on average, zero annual energy consumption. The John Molson School of Business building in downtown Montreal has served as the test subject. The building uses solar panels to convert as much as 55 per cent of sunlight to electricity and heat. The demonstration project is funded by the Department of Natural Resources Canada through the Technology Early Actions Measures demonstration program.

Teamwork is needed to transform the design, construction and operations of buildings, says Building Engineering Professor Andreas Athienitis. Architects, engineers, facade manufacturers, heating and air conditioning vendors and others in the industry tend to work separately, he says. "Nobody is responsible for the entire building energy system."

An example of teamwork on solar energy is the launch of the NSERC Smart Net-Zero Energy Buildings Strategic Network, with $5-million over five years, and with its headquarters at Concordia's Faculty of Engineering and Computer Science. It includes 29 researchers from 15 Canadian universities, and partners such as Natural Resources Canada, Hydro-Québec, Canada Mortgage and Housing Corporation, and the building industry. A key objective is to transfer the knowledge gained around net-zero buildings to designers, manufacturers, builders and utilities.

"This builds a critical mass in the country, and helps to create a culture of excellence," says Prof. Athienitis, the network's scientific director.