

INSIDE THIS ISSUE

- 2 Highlights – Recently funded projects

Approved projects

- 3 North House wins recognition in Washington

- 4 Solar canopy reduces electricity costs by 25 percent (cont'd)

Whalepower nominated for INDEX design award

The Innovator is published twice a year by the Ontario Power Authority with news and information about the Technology Development Fund. To subscribe or manage your subscription, enter your e-mail address on the lower left-hand side of the www.powerauthority.on.ca home page. Select Technology Development Fund from the list of available topics.

OPA Contacts:

Phil Bosco, 416-969-6095
Bryan Young, 416-969-6372
120 Adelaide St. W.
Ste. 1600
Toronto, ON M5H 1T1

INTRODUCTION AND WELCOME

2009 was a record year for the Technology Development Fund, with more than 47 submissions resulting in 11 new projects.

This year promises to be at least as busy, and we look forward to telling you about some exciting changes to the fund in the coming months. These changes are intended to reflect the ambitious objectives laid out in the Green Energy Act as Ontario assumes a leadership position worldwide in energy conservation and renewable energy.

To be a leader, we need innovations in how we generate, transmit and use electricity. In everything from highly efficient solid-state lighting and smart appliances, to the seamless dispatch of stored, renewably generated electricity – Ontario's inventors, entrepreneurs and universities have geared up to meet the challenge.

And the Ontario Power Authority's Technology Development Fund is here to accelerate the development of pre-commercial technologies that will help us get there – making our electricity system more reliable, greener and more efficient. We look forward to sharing with you changes to the Technology Development Fund, including our 2010 funding schedule, shortly.

Your Tech Fund team:

Bryan Young, Phil Bosco, Daniel Carr

We invite your comments and feedback on this e-newsletter. Tell us what you think.

As practitioners, we want to hear from you.

E-mail us at techfund@powerauthority.on.ca.

For more details on how the fund works, please visit www.powerauthority.on.ca/tdfund.

CASE STUDY

SOLAR CANOPY REDUCES ELECTRICITY COSTS BY 25 PERCENT

A section of the array used in the solar canopy-based system



In a typical multi-floor office building, the energy required for electric lighting during the day accounts for more than 30 percent of total electricity use. Adding that up across the many thousands of office buildings in Ontario results in vast requirements of electricity. This in turn results in substantial emissions of greenhouse gases, depending on the method of generation, as well as significant energy costs for businesses and institutions.

Dramatically reducing the amount of electricity needed to light multi-floor buildings during the day is the goal of a research-demonstration project being undertaken by the University of British Columbia (UBC) and the British Columbia Institute of Technology (BCIT), with \$80,000 from the Technology Development Fund. The project was to design and demonstrate a solar canopy-based illumination system for commercial office buildings. The aim was that the capital investment costs of the project can be justified purely by the resulting energy savings, once the canopy systems are manufactured in volume.

Highlights – Recently Funded Projects



Whirlpool's Smart Dryer

The Smart Dryer project entails both product and business model innovation. Whirlpool's intention is to transform its household appliances into online-enabled, "smart" appliances. Online capabilities will be enabled by a low-cost, plug-in communication module, the consumer's own home Internet infrastructure and the local distribution company's smart meter. The Smart Dryer will enable the homeowner, local distribution companies, Whirlpool or other third parties to remotely manage the power usage profile of the dryer. This innovation is especially compelling for electricity demand management, represents a new frontier for residential demand reduction and is consistent with the development of a smart grid in Ontario.

The project's key objectives are to provide benefits to both consumers and electricity utilities looking to conserve electricity. The project will consist of three phases. Phase 1 involves technology development and the integration of a prototype communications module into a demonstration dryer. Phase 2 involves the deployment of the prototype in a demonstration home. Phase 3 involves the deployment of the next generation of the smart dryer technology in several Ontario homes for a larger field pilot.



Dual Light Algae-growing BioSilo™

This innovative system will cultivate algae in an enclosed BioSilo™, which will consist of a modular construction designed to be used with a dual lighting system utilizing sunlight and LED lights. This design will facilitate algae cultivation continuously, 24 hours per day.

The application of the dual lighting system optimizes algae growth while minimizing energy requirements. The key objectives of Converted Carbon of Canada's project is the design of a highly controlled system capable of high-volume, economical algae production in any climate, resulting in the production of clean energy feedstock.

The first stage of the project involves the selection of optimal algae varieties that balance high yields of bio-oil relative to the speed of growth. The next stage of the project will be to install a modular silo at a pilot plant location. Algae will be cultivated in this controlled environment using a variety of organic nutrients and industrial carbon dioxide to optimize growth. Algae biomass can be used as a feedstock for bio-oil to fuel electrical generators and coal-fired power plant burners.

Approved Projects in 2009

The Technology Development Fund is pleased to announce that \$1.7 million in funding for nine new projects was approved by the OPA's Grant Award Committee in the first half of 2009. These projects have leveraged an additional \$12.2 million in funding from other sources. The projects are:

	Project Title	Proponent	Funding Awarded
1	Web-based Intelligent Dimming and Lighting Management System	Fifth Light Technologies	\$ 250,000
2	Applying Tubercle Technology to Small and Medium-sized Fans	Whalepower Corp.	\$ 59,000
3	The Ultra Fridge Project	Unified Corp.	\$ 249,555
4	North House Prototype Construction	University of Waterloo	\$ 125,000
5	Smart Dryer	Whirlpool Corporation	\$ 250,000
6	Dual Light Algae-growing BioSilo™	Converted Carbon of Canada	\$ 250,000
7	Biomass Energy from Field to Grid	Queen's University	\$ 185,000
8	Energy-efficient Primary Power Distribution Systems for Data Centres	Queen's University	\$ 250,000
9	High-percentage Biomass Utilization in Coal-fired Power Plants	The Centre for Energy Advancement through Technological Innovation (CEATI)	\$ 55,000

The results from our second round of funding in December will be announced soon. For more information on each of these projects, please visit our website at www.powerauthority.on.ca/tdfund.

The votes are in and it's official: the Ontario Power Authority-sponsored Team North has created one of the most liveable, energy-efficient, solar-powered homes in the world. After two weeks competing on the National Mall in Washington, D.C., and more than a year in development, the North House entry has placed fourth worldwide in the U.S. Department of Energy's 2009 Solar Decathlon. Team North finished four points behind third-place California, often regarded as the international energy-efficiency leader.



North House, shown above, produces twice as much energy as it consumes, using solar photovoltaic panels.

“We didn't have a building in July and now we're fourth in the world. It's fantastic!” said Maun Demchenko from Team North. “It shows that Canada is a force to be reckoned with when it comes to new technologies and the talents of our university students.” And Ontarians have a reason to be proud because Team North was on the National Mall, constructing and demonstrating what is one of the world's most liveable and energy-efficient houses.

Through the Technology Development Fund, the Ontario Power Authority provided Team North with \$125,000 in 2009 for the rigorous product testing, monitoring and research they have put into the development of North House.

Team North is made up of students and faculty from the University of Waterloo, Ryerson University in Toronto and Simon Fraser University in Burnaby, B.C. – together representing some of Canada's best and brightest minds in the fields of sustainable engineering, business and design.

“The real ambition of the project is to innovate and drive change within the design of new residential prototypes in North America,” said Geoffrey Thun, the faculty lead on the project. “The systems we're using on North House are all electrically run, and the house produces all of its required electricity with solar photovoltaic panels.”

North House is a perfect example of what can be accomplished when you give sustainable energy engineers the time, money and support they need to push the boundaries of what is currently possible.

Based on the average lighting conditions of southern Ontario, North House produces twice as much energy as it consumes. And it is designed to be modular. This means the key components of the house, like the electrical and plumbing systems, can be snapped together like a three-dimensional jigsaw puzzle.

The implications for the future of sustainable living are huge. Professor Thun and the North House team imagine a world where whole communities of energy-efficient North Houses can be custom-designed, built on demand and shipped to location on flatbed trucks.

The Solar Decathlon is just the beginning for North House. The house will be shipped to Vancouver to be displayed during the 2010 Winter Olympics. When that event ends, it will be moved back to Ontario where it will serve as a real-world sustainable design lab. North House was designed so that the systems can be exchanged for more advanced technologies as they are developed and become available.

Congratulations, Team North, for your winning design. You are helping to create a net-zero energy future for Ontario homes.

SOLAR CANOPY REDUCES ELECTRICITY COSTS BY 25 PERCENT

continued from page 1

Dr. Michelle Mossman, a research associate and laboratory manager at UBC, says the project was to demonstrate that the solar canopy-based system, designed and developed at UBC, can send daylight deep into the interior of an office building. This is done in a cost-effective way, using a system that can be mass-produced for early economic payback from energy-cost savings. "The system will reduce electricity consumption for lighting by at least 25 percent on average and, in particularly sunny areas, the reduction could be as high as 50 percent," Mossman says.

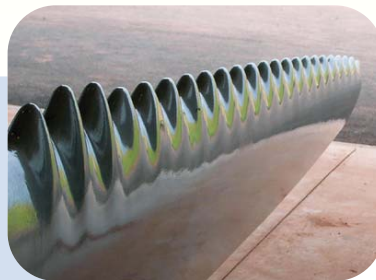
Specifically, the solar canopy-based core daylighting system will:

- reduce the energy required for standard commercial building lighting by 25 percent
- replace electric lighting 75 percent of the time for each day that the sun shines within six core daylight hours
- save 207,000 kilowatt-hours of electricity and 112 metric tonnes of carbon-dioxide emissions annually from a building of 20,000 square metres of floor space
- reduce peak electricity demand when it is most needed, on hot, sunny days

- continue to provide high-quality illumination within the building.

Results of this order could, of course, dramatically reduce overall electricity consumption in multi-floor office buildings, lower peak-period electricity demand, contribute to a healthier environment and save a great deal of money for owners or tenants of such buildings.

The first phase of the project was carried out during the summer of 2008, on one floor of a three-storey building on the BCIT campus in Burnaby, B.C. Transparent canopies were installed above existing windows, each including an array of slightly concave mirrors that moved in synch with the sun. The concentrated sunlight was then directed via parabolic concentrating mirrors through a small window into a specially designed, dual-function light guide system that distributed the light deep within the building. These light guides were integrated with dimmable fluorescent electric lamps programmed to supplement the daylight to maintain the desired illumination when direct sunlight was not available, such as on cloudy days.



WHALEPOWER NOMINATED FOR INDEX DESIGN AWARD

Whalepower Corporation, a two-time recipient of support from the Technology Development Fund, was nominated for the prestigious INDEX Design award – the largest such competition in the world. With Tech Fund support, Whalepower's innovative tubercle blade design has been successfully commercialized by Envira-North – an Ontario-based industrial fan manufacturer, whose new Altra-Air fans consume 20 percent less electricity than conventional equivalent fans. While Whalepower was not chosen as a winner at this year's competition, the entry was one of 60 selected by a jury from more than 700 international entries in a wide range of categories.



This schematic shows how the solar canopy array captures the sunlight and moves it into the interior of a building for use.

The demonstration showed that under sunny conditions, the system provided uniform illumination with high colour rendering over a distance of 12 metres within the building, eliminating the need for electric lighting. "The system worked as expected and was highly successful as a proof-of-principle test," says Dr. Mossman, who also noted that the components of the system can be manufactured in volume at relatively low cost and should have a very long, maintenance-free life. "The canopy enclosure can also be manufactured in bulk and can be modified for installation on different types of buildings, while the interior light guides should also be relatively easy to retrofit on existing office buildings," she adds.

Further testing will focus on finalizing a software control program for automated data collection on an hourly basis, which will allow for detailed assessment of the ongoing electricity savings, and on evaluating the visual experiences of people who work in the buildings. Later project phases will demonstrate integration of the solar canopy-based system with different building types and lighting designs.