

## Appendix: Case Study

### Distributed Energy Charging and Communications Station (DECCS)

#### Background

The DECCS project was created as a student-led collaboration. The goal of the project was to provide the Humber Arboretum and Centre for Urban Ecology with an outdoor wireless network and electronics charging station that could be used by members of the public and the student body alike. Unlike the school-supported networks at Humber College, this free, public Wi-Fi network was intended to allow all visitors to the Arboretum to easily and safely surf the web while enjoying the Arboretum's beautiful outdoor setting. The project also included a 120V electric socket that would allow visitors to charge their electronic devices from an off-grid solar power system.



The DECCS project presented three significant challenges to overcome:

1. The creation of a wireless network that would be broad enough to cover a large area of the Arboretum, while also being strong enough to penetrate through the significant amount of tree cover in the chosen area.
2. The design and development of an off-grid solar photovoltaic system that would provide enough energy to run the wireless network components 7 days a week, while also providing energy to charge electronic devices and, potentially, loudspeaker or projection equipment.
3. All electronic equipment had to be housed in a durable, vandalism-resistant casing that would be tough enough to withstand environmental and other abuse, while also allowing the electronic devices to be displayed to students and used as a learning tool for different programs at Humber.

## Solutions

The challenge of designing and developing a wireless network was addressed by three students from Humber's Wireless Communications program, Simranjeet Saharan, Tariq Kantroo, and Sukesh Dogra. They used an omni-directional antenna and a relay-like system to spread the wireless signal throughout the target area of the Arboretum.

Graeme McKenzie and Rachel Lieberman, students in the Sustainable Energy and Building Technology program, with help from Jeff Craig in the Electronic Engineering program, addressed the second challenge. They developed a small-scale photovoltaic energy system that was oversized to allow for the constant drain on the system from the wireless equipment and incorporated a timer circuit to control the frequency of electronic charging.

Graeme McKenzie and Talete Gallo, an employee at the Humber Arboretum, addressed the third challenge. They designed a shed-sized structure to house the equipment safely and allow the solar panels to be placed high enough to avoid obstructions to their use. The structure could also be opened to allow students to stand inside and inspect and learn from the circuitry and photovoltaic components.

## Partners

The following businesses and organizations made significant contributions to the success of this project:

**Humber Arboretum and Centre for Urban Ecology** The DECCS project couldn't have been completed without the guidance and solid workmanship of Talete Gallo and the staff at the Humber Arboretum. In addition to being the client, the Arboretum also provided tools, materials and man-hours to develop the project.

**Toronto and Region Conservation Authority** Glenn MacMillan provided invaluable guidance designing an off-grid solar photovoltaic system and a structure to withstand Ontario's diverse climate.

**Ontario Centres of Excellence** This public co-investment organization provided the majority of funding for the student project. Without its support, DECCS would have remained a design and would not have been developed into the useful device that it is today.

**Humber College Research Department** Laura Keating and the team at Humber Research played a vital role in bringing the DECCS project to fruition. They provided invaluable partnerships with public investment organizations and support to the students throughout the term of the project.

**Systems Plus Inc.** This electronic contractor provided innovative ideas in the design and installation of the electronic circuitry in the DECCS project.

**Solsmart Energy Solutions Inc.** These solar photovoltaic contractors provided extremely valuable knowledge in designing a small-scale off-grid photovoltaic system. They also provided materials for the photovoltaic system, which allowed the project to be built on time and on budget.



**Project Team in Front of the DECCS**

L-R: Talete Gallo, Humber Arboretum Employee  
 Khalid Grant, Solsmart Employee  
 Graeme McKenzie, Humber SEBT Student  
 Rachel Lieberman, Former Humber Student  
 Melanie Sifton, Humber Arboretum Director



**DECCS in an Outdoor Setting**

### **Benefits and Future Applications**

The DECCS project was a complete success in providing the Humber Arboretum with a robust, outdoor wireless network. Starting in September 2012, the DECCS will be used by Humber students on a large scale, providing online learning in a healthy, diverse, outdoor environment. It will also be used as a teaching tool in future classes to demonstrate off-grid photovoltaic design and use.

The DECCS has the potential to be expanded to bring wireless Internet networks to any outdoor environment. For example, it can be used in rural areas to allow a community-based network or it can be installed in developing communities to provide power for electronic necessities and access to the extensive knowledge base provided by the Internet.