

BY VIRGINIA HEFFERNAN

As we move through the echoing gloom underneath the Direct Energy Centre on Toronto's waterfront, I hear Noel Mationg, coordinator of energy systems for Exhibition Place, request a favour on his cell phone. Suddenly, the massive underground parking garage lights up like a movie set.

But the brightness is shortlived. Gradually and in sequence, the overhead lights dim. We continue walking the length of the near-empty garage and, as we do, lights illuminate to guide our way and then fade to black behind us.

This "intelligent" lighting system in the Direct Energy Centre's parking garage is just one of the ways Exhibition Place is striving for energy self-sufficiency.

"We found that being able to turn the lights off when

Caribana parade. The Direct Energy Centre (originally the National Trade Centre) is a new addition, built on the east end of the site in the late 1990s. The many other exhibit halls include historic buildings such as the Coliseum, the Horse Palace, the beaux-arts Music Building, and the Horticulture Building. There are also modernist buildings from the 1950s such as the Better Living Centre.

"We get five million people coming through here every year," says Goss. "What we want to do is present [green] technologies so that people can see them and to spur outside interest to help develop green industries in Canada." With this goal in mind, visitors can tour a permanent education exhibit on sources of energy and methods of conservation within the Direct Energy Centre.

SHOWING OFF AT EXHIBITION PLACE

they weren't needed led to big savings," says Mark Goss, P.Eng., general manager of operations for Exhibition Place, though he declined to elaborate on specific numbers.

When the Board of Governors for Exhibition Place decided to make the grounds a showcase for energy efficiency in 2004, the board wanted the complex of buildings on Toronto's waterfront to be a leader in the financing and use of energy-efficient technologies. The buildings – including the Direct Energy Centre – were then using 25 gigawatt hours of energy per year. The board committed \$7.4 million to make the grounds energy self-sufficient by 2010. By February 2009, energy consumption has been reduced by about one-third.

Entered off Lakeshore Boulevard West through the neo-classic Princes Gates, the Exhibition Place grounds have a long history. Since 1904 they have been best known as home of the Canadian National Exhibition ("the Ex"), but the city-owned parkland also hosts a myriad other events, including the CHIN Picnic, Molson Indy, and annual

The environmental plan for Exhibition Place has several components, including a wind turbine, a trigeneration plant, a green roof and photovoltaic plant on the Horse Palace roof, a geothermal heating and cooling system for the Press Building, and a number of building retrofits. The idea is to reduce energy consumption in three ways: one third through on-site power generation; one third by installing new technologies and equipment such as absorption chillers; and a final third by optimizing and controlling the energy used in operating the facilities.

One of the most significant investments in the plan is a \$4.4 million trigeneration plant, one of the largest in Canada when it opened in early 2007. The system – a cogeneration plant with an added absorption chiller – provides heating, cooling and power. It consists of one 1.6 MW natural gas-fired generator with a heat recovery package. In winter the plant, which is located on the roof of the Direct Energy Centre, takes the waste heat from the engine and runs it through a heat exchanger to augment the centre's boilers.

Left: aerial view of the showgrounds and its many venue buildings. The Direct Energy Centre is the largest exposition hall with the white roof. Below: Princes Gates entry.



Courtesy Canadian National Exhibition

THE FAMOUS EXHIBITION GROUNDS NEAR THE TORONTO WATERFRONT ARE BECOMING A SHOWPLACE FOR ENVIRONMENTAL DESIGN. THE GOAL IS TO MAKE THE SITE SELF-SUFFICIENT IN ENERGY.

In the summer, the waste heat drives the absorption chiller to provide cooling. Consultants on the project were Toronto Hydro Energy Services and Sandwell Consulting Engineers in Burlington.

The trigeneration plant is the first phase of a district energy system that will be expanded across the 192-acre site. Currently, the plant satisfies about 30% of Exhibition Place's electricity, heating and cooling requirements. It provides about 12 million kWh of energy per year and reduces annual energy consumption by the equivalent of 7,400 tonnes of CO₂. By recovering waste heat, the plant improves overall efficiency from the 40% typical of a standard engine to more like 80%.

Green technologies have also been installed on the roof of the Horse Palace. First, it has a 2,500-sq.ft. green roof planted in 2004. Complementing the green roof is a 100 kW photovoltaic power generation system designed by Carmanah Technologies with consulting services provided by Energy Profiles. Phase 1 of this component involved

monitoring four different subsystems, each using a different combination of solar, inverter and mounting technologies. Comparing the systems will allow Exhibition Place to find the best fit for its unique environmental challenges. These include snow, smog, fog and extra air pollution from the Gardiner Expressway.

A second phase was installed last summer that uses four 20-ft. arrays to produce a peak performance of 7.7 kW electrical and 7.2 kW thermal (23,400 BTU/h). The installation uses a germanium photo cell (rather than silica) that tracks the sun throughout the day.

Together, the two solar installations on the Horse Palace are reducing carbon dioxide emissions by approximately 115 tonnes per year. They generate roughly 120 kW hours of electricity, enough to cut hydro costs by \$10,000 annually. Exhibition Place will use information gathered during the two phases to design a 1.5–2 million kW generation system for the grounds.

Another important component of the environmental
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plan are building retrofits. In the Queen Elizabeth Building, for example, the “old clunker” of a boiler has been replaced by a smart chiller and two high-efficiency boilers. Boilers have also been replaced in other buildings, such as the Ricoh Coliseum, a project by M & E Engineering and Project Services Group.

By far the most public display of Exhibition Place’s green initiatives is the wind turbine built and operated by WindShare near the west entrance of the grounds. This three-bladed 750-kW gearless generator is capable of producing 1.2 million kWh of energy each year. After improving the ventilation to prevent the generator from overheating, the turbine is now operating at full capacity compared to about 80% of capacity during the first year of operation in 2003 (see CCE January/February 2004).

Outside the buildings, Exhibition Place has installed LED streetlights that use 50% less electricity and last five times longer than conventional streetlights. The technology for this type of lighting has evolved tremendously since the lights were first installed two and a half years ago, says Goss,



Left: photovoltaic system on the Horse Palace roof. Right: trigeneration plant at the Direct Energy Centre provides heating, cooling and 1.6 MW of electricity.

so Exhibition Place is adapting the lighting to include, for instance, the ability to pan the ground surface.

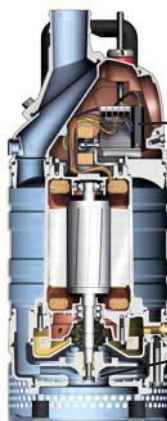
To put the contribution of LED lights in perspective, Exhibition Place says that if Toronto converted its 160,000 streetlights to LED, the city could save \$6 million a year in electricity costs and reduce greenhouse gas emissions by over 18,000 tonnes – equivalent to removing 3,608 cars from the streets.

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