

## Metro Hall – Deep Lake Water Cooling



### Facility Profile

Metro Hall located at 55 John Street, is one of the main administrative centres for the City of Toronto. It also houses a Child Care centre and a Library. The 28 storey office tower is about 15 years old and has a total building area of 71,802 m<sup>2</sup> (772,870 ft<sup>2</sup>). The building received The Building Owners and Managers Association (BOMA) award in mid 1990's for energy efficiency.

The *pre-retrofit* conditions were as follows: Metro Hall had a centralized cooling plant consisting of two 1,050 ton chillers and thermo cool storage. The chillers used refrigerant CFC R11, which is being phased-out, resulting in a requirement that they either be replaced or upgraded in order to accept an environmentally-friendly replacement refrigerant (i.e., R 123). Although the Metro Hall chillers were in good shape, and about half-way through their useful life, it was prudent to address this issue as soon as possible, due to the current legislation,. Deep Lake Water Cooling (DLWC) was chosen as the best alternative solution to meet the cooling requirements for Metro Hall.

### Deep Lake Water Cooling Implementation

The implementation involved:

- Installation of two heat exchangers in mechanical room
- Connecting the new heat exchangers to DLWC pipe
- Decommissioning of existing chillers and cooling towers
- Removing thermo cool storage to increase space for other use
- Minor upgrades to existing cooling system

The DLWC system operates as follows:

- Three intake pipes draw icy cold water from 5 kilometres off the shore of Lake Ontario at a depth of 83 metres below the surface. Naturally cold water makes its way to the City's John Street Pumping Station. There, heat exchangers facilitate the energy transfer between the lake water and the closed chilled water supply loop, which takes the chilled water to Metro Hall
- The heat exchangers facilitate the energy transfer between DLWC chilled water and Metro Hall internal building closed loop, providing chilled water for building cooling system.

### Benefits of DLWC Implementation

- Use of innovative, green, renewable energy resource enables the City to reduce its demand for electricity by approximately 3 million kilowatt hours annually (reduction of up to 90 per cent compared to conventional chillers)
- The reduction in City demand for electricity relieves the pressure on the already over-burdened Provincial electricity grid, especially in the downtown core
- Implementing DLWC assists the City in meeting its green power targets
- Significant positive environmental and health benefits due to reduced electricity demand and consequently lower emissions of air pollutants and greenhouse gases
- Fixed pricing promotes operating cost predictability
- DLWC has a longer life expectancy than conventional cooling technology (50 years for DLWC vs. 25 years for a conventional cooling system), thus providing savings in maintenance and replacement costs

Project Summary	
Project completed:	June 2006
Total project cost:	\$2.9 mil
Actual electricity savings:	3,000 MWh/yr
Power saved is sufficient to supply	300 homes
Estimated water savings	4,400 m <sup>3</sup> /yr
CO <sub>2</sub> emission reduction:	732 tonnes/yr
No. cars with equivalent emissions	160
Project Funding: City of Toronto	

## Deep Lake Water Cooling cools down Metro Hall

Enwave Energy Corporation and the City of Toronto have created the Deep Lake Water Cooling system, an innovative cooling system that brings an alternative to conventional air conditioning to cool Toronto's downtown core.

### How the system works:

- Three intake pipes draw water (at 4 degrees Celsius) from 5 kilometres off the shore of Lake Ontario at a depth of 83 metres below the surface. Naturally cold water makes its way to the City's John Street Pumping Station.
- There heat exchangers facilitate the energy transfer between the icy cold lake water and the Enwave closed chilled water supply loop. Water enters the City side of the heat exchangers at 4.4° C and leaves at 12.5° C, with 8.1° C transferred from the water on Enwave's side of the heat exchanger. Physical separation between Enwave's system and the City's system is maintained via heat exchangers that are designed to facilitate the transfer of energy, not water. DLWC uses only the coldness from the lake water, not the actual water, to provide the alternative to conventional air-conditioning.
- The water drawn from the lake continues on its regular route through the John Street Pumping Station for normal distribution into the City water supply.

### Where Is Deep Lake Water Cooling Available?

- Enwave has enough capacity to air condition 100 office buildings or 3.2 million square meters of office space in Toronto's downtown financial district.
- Metro Hall is the first municipal facility added to the DLWC pipe. There are now 27 buildings connected and the owners of another 20 buildings have committed to the Enwave system.

### Main Benefits of Deep Lake Water Cooling:

- Compared to conventional chillers, Deep Lake Water Cooling reduces electricity usage by 90%. This frees more than 61 megawatts from the Ontario's electrical grid.
- Harmful ozone depleting refrigerants, CFC's and HCFC's are reduced.
- 79,000 tonnes of carbon dioxide are removed from the air, which is equivalent to taking 15,800 cars off the road.
- DLWC eliminates a buildings exposure to rate increases and volatile energy markets because it relies on a renewable energy.
- Customers will avoid increasingly restrictive CFC regulation because DLWC is a CFC-free chilling technology.
- Cleaner drinking water because the water used in the cooling process comes from a deeper part of Lake Ontario.
- Deep Lake Water Cooling reduces noise, pollution and humidity generated by chillers, fans and cooling towers.
- Reduces the strain on our electricity infrastructure, including transmission grids and local distribution networks.
- Enhances Toronto's world-class reputation as a place to live, provides cleaner air for breathing and makes Toronto a leader in sustainable energy.

For the latest information on Deep Lake Water Cooling visit: <http://www.enwave.com/enwave/dlwc/>

## Deep Lake Water Cooling System

