

# Centennial Recreation Centre 172 kW<sub>t</sub> Pool Solar Heating System

Final Report – January 2012



Technology

Monitoring

Best Practices

**SolarCity**  
Partnership

## PROJECT SNAPSHOT

Address:	1967 Ellesmere Road
Building Type and Use:	Indoor City Pool
Owner:	City of Toronto
Contact:	Joel Arthurs
Phone #:	416-392-5177
Email:	jarthur@toronto.ca
System type:	Solar Pool Heating
Collector Manufacturer:	Techno Solis
Collector Model:	T5-48-sm (4'x12') unglazed collectors
Collector Fluid:	Pool water
Number of Collectors:	56
System Size (kW thermal):	172.2
Total Gross Collector Area (sq. meters):	246
Installation Date:	November 2006

## PERFORMANCE

Estimated Annual Performance:	495 kWh/kW
2008 Actual Performance:	152 kWh/kW

## FINANCIAL

Installed Cost (taxes included):	\$101,798
External Funding:	\$39,768
Annual Savings:	\$2,781*
Simple Payback (excluding external funding):	36.6 years
Cost per kWt (excluding external funding):	\$413

\*based on estimated production and a natural gas price of 35 ¢/m<sup>3</sup>

## MONITORING

Monitoring equipment installed:	Yes
Overview of the monitoring plan:	No energy/BTU meter was installed with the system in 2006. Only total energy production is available through the BAS, but it is calculated using a flow rate estimate together with measured supply and return temperature to the collectors. A flow meter was installed to improve the energy collection measurements during summer 2011.
Cost of M&V (% of total project):	Unknown
Who is analyzing the data?	City of Toronto Energy & Waste Management Office
Is there a dedicated staff person responsible for system operation management?	No

Photos by  
Danielle Murray

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## BACKGROUND

The City of Toronto chose to install a 172 kWt solar pool heating system at the Centennial Recreation Centre to collect heat from the sun and deliver it to the indoor swimming pool. Designed to reduce the need for a conventional natural gas pool heating system, the system will function during the Spring, Summer and Fall when there is no risk of freezing. The system is controlled through a building automation system (BAS).

## PERFORMANCE ISSUES

The solar thermal system at Centennial Recreation Centre experienced a number of issues that contributed to lower than predicted energy production.

Much of the required pool heating was met by the boiler which heated the pool water in the morning before the sun had time to heat the water. The operator indicated that the boiler was kept off as much as possible during the 2010 and 2011 summers.

During sunny summer days, the pool reached the maximum set temperature between 2 and 3pm which caused the solar system to turn off.

No data was available for 2007, but in 2008 the system collected, according to calculated values of the BAS, 26,231 kWh, or only 31% of the initial estimates of 85,230 kWh. Data from 2009, 2010, and 2011 was either not recorded or found to be unreliable.

Centennial has a unique system that automatically controls the flow of fresh water to the pool.

Current code requires that for every bather per day, the pool must discharge 5 gallons of pool water. This resulted in a large amount of heated pool water being discharged, perhaps unnecessarily.

The City and Toronto Public Health piloted the implementation of the total dissolved solids measurement method whereby water is automatically discharged and made-up, based on the amount of dissolved solids in the pool, not the amount of bathers. Safe levels of dissolved solids are set out by Toronto Public Health. The pilot project was successful in eliminating unnecessary water discharge which in turn reduced the Centre's operating costs due to less water usage and less natural gas usage for water heating.

However, solar system performance is negatively affected by the total dissolved solids system because it reduces the amount of fresh water flow to the solar system.

The Total Dissolved Solids Report can be found on the [www.solarcitypartnership.ca](http://www.solarcitypartnership.ca) website associated with the Centennial Recreation Centre Final Report.



A number of solar collectors presented leakages on the welding between the collector plate and header. By the end of the 2011 season, all collectors had been replaced under warranty.

No energy or BTU meter was installed with the system in 2006. However, total energy production was available through the BAS system, but the BAS uses a flow rate estimate together with measured supply and return temperature to the collectors to calculate the energy production.

A flow meter was installed to improve the energy collection measurements during summer 2011.

## FINANCIAL

The City of Toronto, through the Energy Retrofit Program, funded 61% of the project.

Natural Resources Canada's ecoENERGY for Renewable Heat program contributed \$6,688 and Ontario's Solar Thermal Heating Incentive program contributed \$6,688.

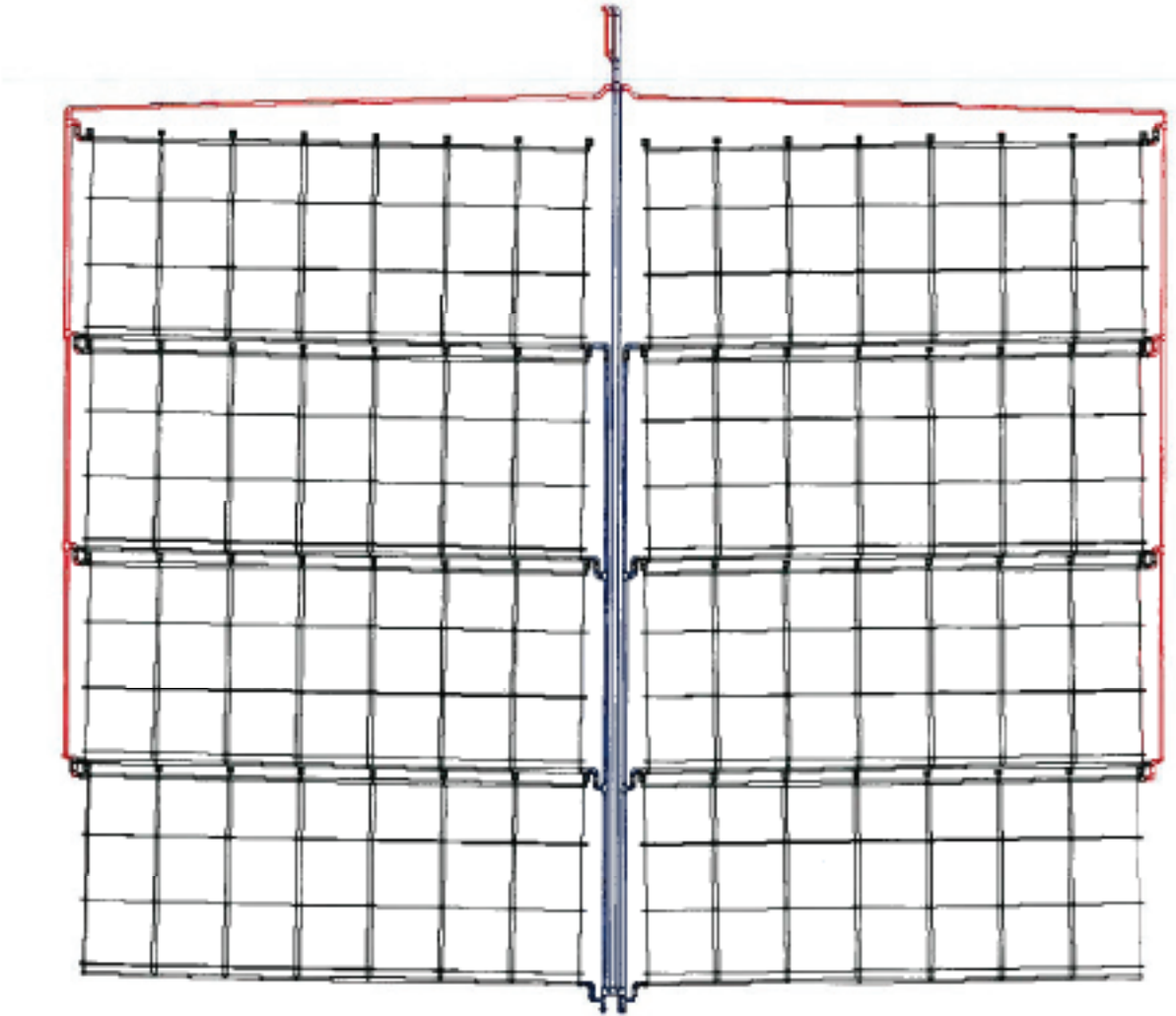
The Toronto Atmospheric Fund contributed \$26,393 towards monitoring and reporting.

Based on an estimated production of 85,239 kWh/yr the system will achieve a payback in approximately 37 years.

**Figure 1.** System view picture taken in Oct, 2010 showing collectors that had been replaced up to that time. The new collectors appear gray on the picture. The collectors have now all been replaced and the system should have normal operation in 2012.

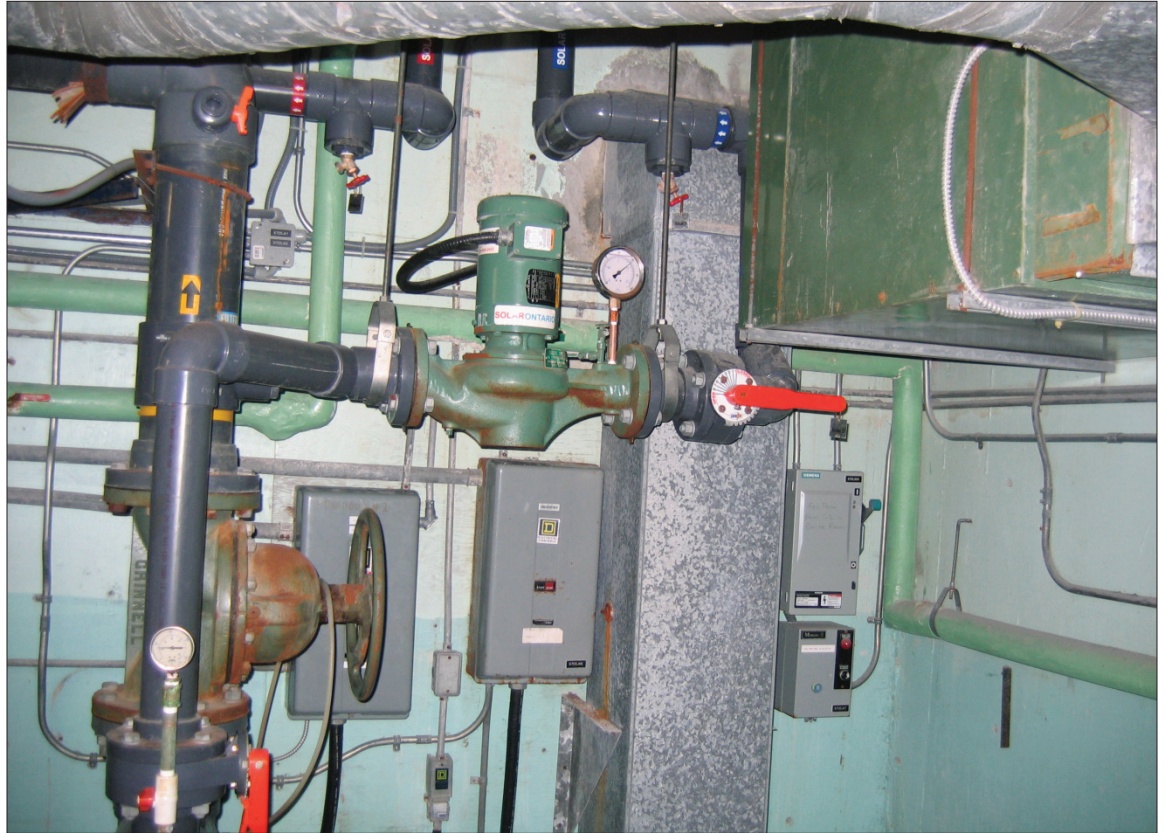


Figure 2. Solar collector array, source: Solar Ontario, system operation manual





**Figure 3. Solar heating system pump.**



**Figure 4. Solar collectors supply and return piping with temperature sensors.**





Figure 5. Two-way motorized valve installed on collector return piping.



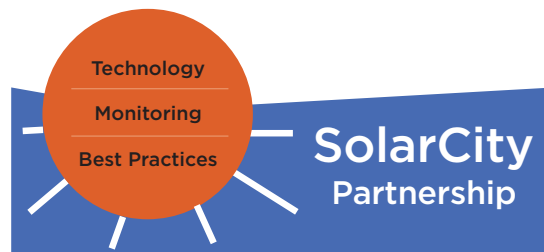
## About the SolarCity Partnership

The SolarCity Partnership is a joint initiative of the Toronto Atmospheric Fund, Toronto and Region Conservation Authority and the City of Toronto designed to promote best practices and careful monitoring of large solar installations. SolarCity Partnership is an information-sharing hub for both public and private organizations involved in deploying solar power. Our **SolarCityPartnership.ca** website provides case studies, research, and solar weather data to help with the effective use of zero emissions energy from the sun.



### We want to hear from you!

If you have further best practices recommendations, insights into system design, deployment or maintenance or a project to profile, please get involved with the SolarCity Partnership! Contact us at:



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**416-661-6600 ext. 5337**  
[www.solarcitypartnership.ca](http://www.solarcitypartnership.ca)

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