SOLARGE

Enlarging Solar Thermal Systems in Multi-Family-Houses, Hotels, Public and Social Buildings in Europe

Project summary

Coatsworth Crescent
Toronto
Canada

Description

The building is a non-governmental organisational home for senior citizens. It is in sound mechanical condition. But the existing equipment for hot water heating is of poor efficiency level.

The solar thermal system is used for domestic hot water pre-heating only. The system is a drainback type. Energy generated is measured through a *Metrima* heat metre and broadcasted onto the internet through a cell phone modem via *Fat Spaniel Technologies*. The system is the largest solar thermal project in the City of Toronto.

Mondial Energy paid for and owns this CSTC – they are investor, owner and operator.

Building

Type of building	Senior citizens' home
Number of users / dwellings, floors	±200 users 174 dwellings 6 floors
Year of construction	1990
Total effective area (heated)	16,600 m^2
Hot tap water consumption (source)	n. a. m^3/a,
Whole energy consumption for heating purpose after CSTS implementation	485,000 kWh/a

System engineering

Year of construction of CSTS	2006
Type of collectors	Flat plate collectors
Thermal power	113 kW_{therm}
Aperture area of collectors*)	162 m^2
Buffer storage	5.88 m^3
Hot tap water storage	./. m^3
Total capacity of boilers (natural gas)	n. a. kW
Type of hot tap water heating	Centralised
Type of heating system	Centralised

Costs

Total cost solar system	90,970 Euro
Cost of CSTS / gross area of collectors	516 Euro/m^2
Subsidies	25 %

Output

Output of solar heat**)	131,000 kWh/a
Reduction of final energy***)	223,000 kWh/a
CO_2-emissions avoided	44 t CO_2/a
Solar performance guarantee	No

*) Aperture area = light transmitting area of the front glass
**) measured, between storage and piping to taps (solar system output)
***) related to the measured output mentioned before

Alex Winch, Mondial Energy President:
"*Mondial* funded and owns a 60-panel CSTS for a 172-unit residential building in Toronto, Canada. *Mondial* sells the metred delivered heat for less than the price of the displaced natural gas on a long-term fixed price contract. *Mondial* has thereby resolved the issues of high upfront capital cost for CSTS and perceived technology risk for building owners."

Owner

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Operator

See owner

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Technical description

Coatsworth Crescent
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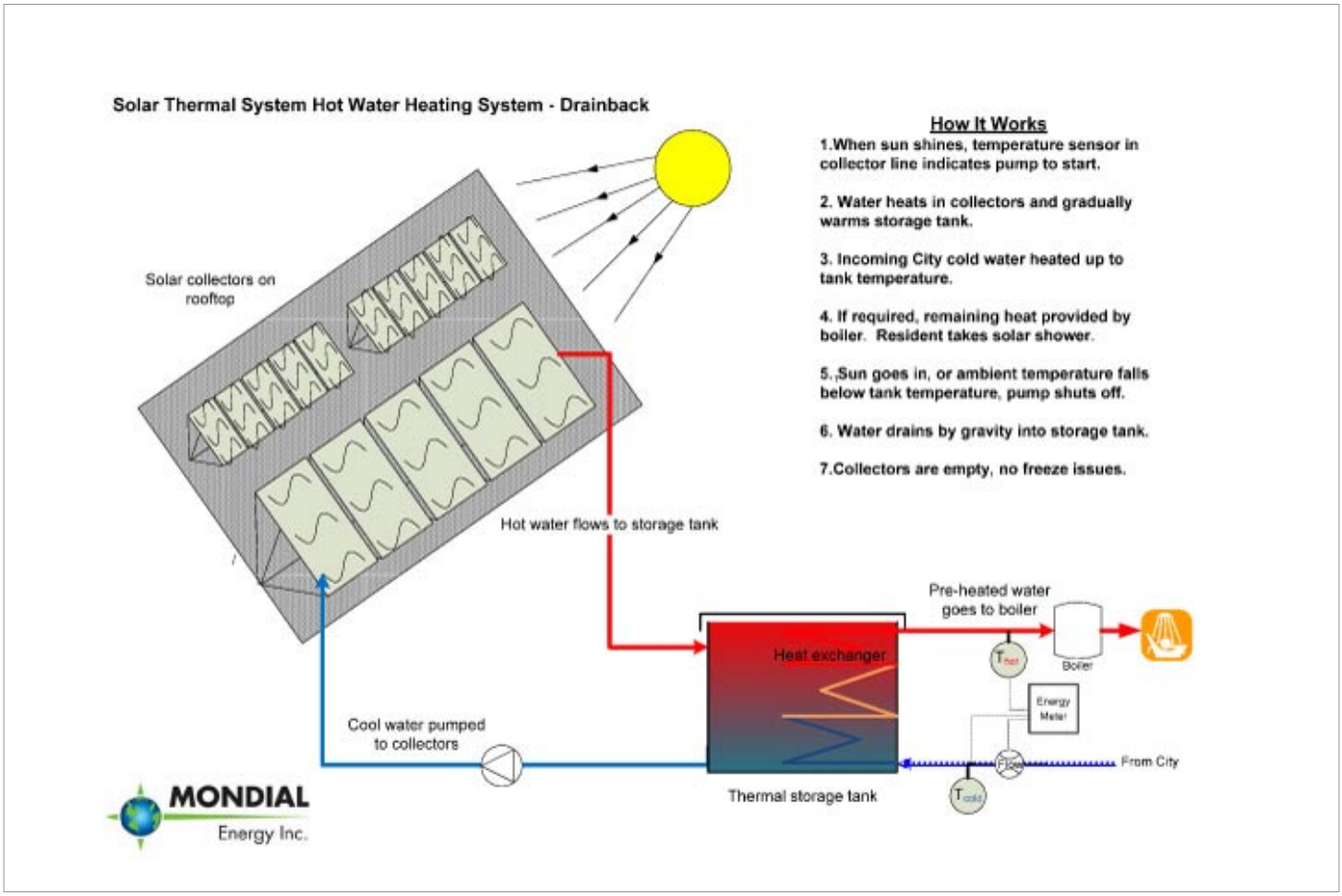

Description of the CSTS

Year of construction of CSTS	2006
Thermal power	113.4 $kW_{therm.}$
Gross area of collectors	176.4 m^2
Aperture area of collectors	162.0 m^2
Type of collectors	Flat plate collectors
Type of assembly	On flat roof
Orientation of collectors	South-East (-20°)
Inclination angle to horizon	45°
Freezing protection	Drain-back
Overheating protection	Drain-back
Operation mode	Variable
Use of CSTS for	Hot tap water heating
Buffer storage	5.88 m^3 (number of storages: 8, volume per storage: 735 l)
Hot tap water storage	./. m^3 (storage is buffer only)
Control of backup-system / CSTS	Separated control

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Technical description (2)

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Hot tap water system	
Type of hot water heating	Centralised
Recirculation system	Yes
For decentralised systems: The installation on the consumer site	./.
Size of storage for hot tap water	12 m³
Specification	Central
Space heating system	
Type of heating system	Centralised
Number of boilers	2
Total capacity (power output) of boilers	n. a. kW
Capacity of each boiler and the year of construction	n. a. kW (year)
Energy source	Natural gas
Type of boiler system	Standard
Type of operation	
Operator of the CSTS system	BOOT (*Mondial*)
CSTS monitoring	Yes: solar radiation, output of solar heat, total water consumption
Data accessible via internet	Yes
Scientific monitoring / follow up	Yes
Maintenance contract	Yes: twice a year
Visualisation of the solar heat output	Yes
Yield of CSTS plant	
Output of solar heat	131,000 kWh/a
Origin of data	Design (calculated)
Measuring point	Between storage and piping to taps (solar system output)
Reduction of final energy	223,000 kWh/a
Origin of data	*Heat Vision* modelling software
Solar performance guarantee	No
Heat consumption	
Whole energy consumption for heating purposes *after* CSTS implementation	485,000 kWh/a
Origin of data	Estimated (from calculated solar fraction)
Energy used for	Hot tap water heating
Whole energy consumption for heating purposes *before* CSTS implementation	485,000 kWh/a (assumed identical)
Total tap water consumption	8,218.7 m³/a
Hot tap water consumption	n. a. m³/a,
Hot tap water temperature	50 °C
Cold water temperature	5/10 °C

Summary

System is drain-back design with domestic cold water passing through heat exchanger coils located inside tanks. Flow is therefore variable depending on current building usage. Control of pumps is by temperature sensors located in the storage tanks and in the collectors.

Mondial monitors energy generation as it is taken into the building's hot water
< heating system. They also monitor ambient temperature, irradiation, collector-side hot water return temperature and energy input to building.
< http://www.mondial-energy.com/compare/coats-main.htm

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Financing & Investment

Coatsworth Crescent
Toronto
Canada

Financing of CSTS	
Form of financing	Purchase
Distribution in percentage	25 %
Costs of solar materials	
Total cost of solar system	90,970 Euro
Detailed costs for	
Collectors	n. a. Euro
Elevation / mounting structure	n. a. Euro
Storage / heat exchanger	n. a. Euro
Backup heater	n. a. Euro
Control	n. a. Euro
Installation	n. a. Euro
Planning / Engineering	n. a. Euro
Others	n. a. Euro
Operation costs of heating system (with CSTS)	
Power cost for pumping	100 Euro/a
Maintenance cost	500 Euro/a
Monitoring cost	300 Euro/a
Other operation cost	n. a. Euro/a
Total operation cost	800 Euro/a
Or: Increase of operation cost after CSTS implementation	./. Euro/a

Financed by investor capital from *Mondial Energy*.

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Development & Experiences

Coatsworth Crescent
Toronto
Canada

Qualitative aspects

The installation of the CSTS was initiated by the owner's desire to save money and be environmentally responsible.
Planning and installation was done within a turnkey contract given to supplier paid for by *Mondial*.

Experiences management

Experience problems or failures?	No
Find solutions to these problems or failures?	./.

Financial effects / project performance

Project economically efficient?	Yes: *Mondial*'s investment earns a rate of return for its shareholders.
Fiscal or other financial effects?	Yes: owner buys units of energy cheaper than that generated through natural gas boilers.
Effects on rental fees?	Yes: savings will flow through to the organisation which will allow then to control rent cost increases.

Experiences technical staff

Experience problems or failures?	Yes: some initial collector freezing due to plastic pipe with incorrect drainage slope
Find solutions to these problems or failures?	Yes: pipe replaced with copper

Summary of experiences / Notices to the project performance

The CRSTS runs very well now. *Mondial* have learned that all domestic hot water shut offs must be coordinated with on site building operators to avoid system over-heating. Mondial feel their belief confirmed that solar thermal is a profitable technology and serves as our template for the future.