Wilmar Court
37 kW_t Solar Thermal Installation

Final Report
January 2013

PROJECT SNAPSHOT

Address:	967 Pharmacy Ave., Toronto, ON
Building type and use:	Seniors' non-profit housing
Owner:	Wilmar Heights United Church Non-Profit Homes Inc.
Contact:	Jamie Ramesbottom, Executive Director, Wilmar Heights United Church Non-Profit Homes Inc.
Phone #:	(416) 759-7269
Email:	james.ramesbottom@sympatico.ca
System type:	Solar domestic hot water (evacuated tube collectors)
Array angle:	45 degrees from horizontal
Azimuth:	13 degrees East of South
System configuration:	24 collectors in parallel
Collector manufacturer:	Globe Solar Energy, Inc.
Collector model:	GSE IP-195
Number of collectors:	24
Solar storage volume:	150 L per collector (3,600 L total)
Collector fluid:	Water
System size (kW thermal):	37
System aperture area (m^2):	53.52
Installation date:	November 2009

PERFORMANCE

Pre-retrofit actual energy delivered:	54,821 kWh/yr (1,463 kWh/kW_t/yr)
Pre-retrofit modified RETScreen:	30,300 kWh/yr (809 kWh/kW_t/yr)
Post-retrofit actual* energy delivered:	33,406 kWh/yr (892 kWh/kW_t/yr)
Post-retrofit modified RETScreen:	29,200 kWh/yr (779 kWh/kW_t/yr)

*Energy delivered from September to November 2011 was extrapolated based on the typical amount of solar radiation received in Toronto during this period.

FINANCIAL

Installed cost (taxes included):	$141,147
External funding:	$73,200
2011-2012 Annual savings:	$1,583
Simple payback (excluding external funding):	89.2 years
Cost per kW_t (excluding external funding):	$3,768

MONITORING

Monitoring equipment installed:	Yes
Overview of the monitoring plan:	A BTU meter tracks energy production, and a web-based monitoring system enables in-depth performance monitoring.
Cost of M&V (% of total project):	Undetermined
Who is analyzing the data?	SolarCity Partnership
Is there a dedicated staff person responsible for system operation management?	No, but the building manager is very involved and checks the system's operation frequently.

Wilmar Court evacuated tube solar water heating system, Toronto, ON

SUMMARY

The Wilmar Court 37 kW_t solar water heating system located at 967 Pharmacy Avenue in Toronto, ON was installed for a cost of $141,147 in November 2009. The system was monitored over a period of approximately 2.5 years, from April 2010 to September 2012. During this time, a retrofit occurred which involved the replacement of a number of system components.

Pre-retrofit, actual system performance was 54,821 kWh/yr (1,463 kWh/kW_t/yr), which was 80.9% greater than a RETScreen simulation based on actual hot water loads and system temperatures. Post-retrofit, system yield decreased to 33,406 kWh/yr (892 kWh/kW_t/yr). This was likely due to a decrease in water flow through the system caused by an increase in the storage temperature of the boilers. However, system yield was 14.4% greater than a RETScreen model which incorporated post-retrofit system characteristics.

Based on post-retrofit system performance, the system will achieve a simple payback of 89.2 years before grants and 42.9 years after. Payback would have been considerably more favourable had the system continued to perform at pre-retrofit levels. These results highlight the importance of ensuring that all key operational parameters are thoroughly investigated during the feasibility assessment phase of the project.

BACKGROUND

Wilmar Court is a non-profit seniors' residence located in Toronto and owned by Wilmar Heights United Church Non-Profit Homes Inc. In order to take an active role in reducing the greenhouse gas emissions of its facilities, the organization, in partnership with the Canada China Environmental Cooperation Council (CCECC), has implemented a series of conservation measures over the past 25 years. These include waste reduction, water and energy conservation, air quality initiatives, and a cessation of pesticide and chemical fertilizer use.[1]

In November 2009, a 37 kW_t solar domestic hot water (SDHW) system was installed on site at a cost of $141,147. The system preheats the building's domestic hot water using energy from the sun, reducing the need for conventional natural gas water heating. The goals of this project were to assess the technical and financial viability of SDHW systems and educate Wilmar Court residents and employees about the benefits of renewable energy technologies. The project also serves as a model for other community organizations looking to implement similar initiatives.

1 Canada-China Environmental Cooperation Council (CCECC). 2008. A Solar Thermal Domestic Hot Water (DHW) Project at a Non-profit Seniors' Residence with Measurable Results in Energy Savings and GHG Reduction.

SYSTEM OPERATION

The GSE IP-195 evacuated tube system is a passive system in which the collected heat is transferred from the solar collectors directly to the storage tanks through heat pipes inserted into the solar storage tanks (Figure A1, Appendix A). When there is a hot water draw from the domestic hot water tanks inside the mechanical room, cold ("city") water flows into the solar storage tanks, while pre-heated water flows from the solar tanks into the domestic hot water tanks (Figure A2, Appendix A). In the case of Wilmar Court, there are 24 units functioning as a pre-heating system for the domestic hot water supply. To prevent water inside the connecting pipes (the pipes connecting the mechanical room to the solar storage tanks) from freezing, heat tracing is installed. Detailed system specifications are presented in Table A1, Appendix A.

PERFORMANCE ANALYSIS

Pre-install energy savings estimates

Two different studies have presented pre-install performance estimates. One is titled "A Solar Thermal Domestic Hot Water (DHW) Project at a Non-profit Seniors' Residence with Measurable Results in Energy Savings and GHG Reduction". It was in submitted in Feb. 2008 to the Toronto Atmospheric Fund (TAF) by the Canada-China Environmental Cooperation Council (CCECC) and Program Analytics Inc. This report lists estimated savings of natural gas from six potential suppliers. Although the suppliers are not identified, one of them matches the system description of the current installation, with 24 units and 3,600 liters of solar storage. This report does not present the collector area for each option analyzed or any other details on how the results were obtained.

For the 24 unit evacuated tube system, the CCECC study predicts gas savings of 10,150 m^3/year, based on a total of 26,000 m^3 of gas used annually for water heating. Since the boiler efficiency has a direct impact on overall system energy savings, it is necessary to know the assumed efficiency. Considering a Heating Value for natural gas of 10.55 kWh/m^3, the solar output would be 107,083 kWh/yr (2,858 kWh/kW_t/yr) for a 100% efficient boiler or 64,250 kWh/yr (1,715 kWh/kW_t/yr) for a 60% efficient boiler (Table 1).

The second study, the contractor proposal to Wilmar Court management, estimates the energy captured by the solar system at 108,037 kWh/yr (2,884 kWh/kW_t/yr). It also considers 20,985 m^3 of annual gas consumption used for domestic water heating and an average boiler efficiency of 72%. Assuming a cold water average temperature of 7.2°C and hot water temperature average of 50°C, this load would represent an average consumption of 8,775 litres/day.

2 Canada-China Environmental Cooperation Council (CCECC). 2008. A Solar Thermal Domestic Hot Water (DHW) Project at a Non-profit Seniors' Residence with Measurable Results in Energy Savings and GHG Reduction.

3 Ainsworth, Inc. 2009. A Renewable Energy Proposal for Solar Thermal Heating.

Table 1: Feasibility estimates of Wilmar Court system performance

Source of feasibility study	Estimated gas usage for DHW (m^3/yr)	Estimated load (L/day)	Estimated boiler efficiency (%)	Estimated system performance (kWh/yr)	Estimated system performance (kWh/kW_t/yr)
CCECC	26,000	Not specified	100	107,083	2,858
			60	64,250	1,715
Ainsworth, Inc.	20,985	8,775	72	108,037	2,884

Actual performance vs. RETScreen simulations

RETScreen model parameters

A total of four RETScreen simulations were performed. As discussed further below, the Wilmar Court System underwent a number of retrofits midway through the monitoring period. Therefore, different RETScreen models were created to characterize the system both before and after the retrofit occurred. RET1 was created by Globe Solar after the first year of system operation.[4] RET2 is a modified version of this model which incorporates the average hot water load measured during the pre-retrofit monitoring period (April 2010 to April 2011). RET3 and RET4 were created by the SolarCity Partnership. RET3 uses the same pre-retrofit hot water load and usage temperature as RET2, but also incorporates adjusted optical collector efficiency ($F_R(\tau\alpha)$) and thermal loss (F_RU_L) parameters, as discussed below. RET4 uses the same efficiency and thermal loss parameters as RET3, but includes the hot water load and temperature measured post-retrofit (September 2011 to September 2012). All models incorporate 20 year historic average solar irradiance and climate data from the Toronto International Airport. Key RETScreen model parameters are summarized in Table 2.

It should be noted that test data were not available for the compact (i.e. integrated storage) system configuration in place at Wilmar Court, so data from collectors tested separately was used as an approximation in the RETScreen simulations. However, it is likely that collectors tested separately would perform better than compact systems because the natural convection flow rate is greater in separate collectors.

The gross collector area can be defined as the total area occupied by the collector, including its frame. This is used by RETScreen in the calculation of predicted system output. $F_R(\tau\alpha)$ is a measure of the optical efficiency of the collectors. As $F_R(\tau\alpha)$ increases, so does the efficiency of the collectors in capturing solar energy. F_RU_L characterizes the thermal losses of the collectors, and has units of $(W/m^2)/^oC$. As F_RU_L increases, the energy lost by the collectors increases through conduction and convection to the ambient air. It is important that $F_R(\tau\alpha)$ and F_RU_L be coherent with the specified collector area. Refer to Appendix B for an explanation of how these model parameters were calculated.

4 It should be noted that in the RET1 model, the collector azimuth used was 0 degrees. This was corrected to 13 degrees East of South in the other models.

Table 2: Key parameters in the different RETScreen scenarios

Model name	Model source	Reference collector area per unit (m^2)	Collector optical efficiency $F_R(\tau\alpha)$	Thermal loss of collectors F_RU_L	Usage volume (L/day)	Usage temperature (°C)
RET1	Globe Solar Energy, Inc.	3.51	0.6	0.7	3,300	50
RET2	Globe Solar Energy, Inc.	3.51	0.6	0.7	9,284*	50
RET3	SolarCity Partnership	2.23	0.48	1.31	9,284*	50
RET4	SolarCity Partnership	2.23	0.48	1.31	5,720**	60

*Measured pre-retrofit water usage

**Measured post-retrofit water usage

Pre-retrofit performance evaluation

As part of the initial installation, an energy meter was installed by the vendor to measure the thermal energy delivered by the solar system to the domestic hot water system. The results were collected and analyzed by Globe Solar, and presented in a short report in April 2011. According to the report, during the period between April 2010 and April 2011, the system delivered 187,057,000 BTU or 54,821 kWh/yr (1,463 $kWh/kW_t/yr$), and 3,388,576 litres or 9,284 litres/day. This is 49.3% less than the contractor's estimate, but only 8.5% below yield predicted by the RET2 model and 80.9% greater than the RET3 prediction (Table 3, Figure 1).

For this SDHW system, evaluating the specific performance ($kWh/m^2/yr$) is not straightforward due to conflicting information regarding the system's collector area. In the original contractor proposal, each unit is listed as having 3.514 m^2 of "solar collecting area". In Table A1, Appendix A, the same system is listed as having 2.74 m^2 of "solar collecting area". Each tube has a 47 mm external diameter and the length effectively exposed was measured at 1.425 m. If one assumes the collector rack dimensions as the gross collector area, that would be 2.76 m^2 for each unit, and the production reported would be 827.6 $kWh/m^2/yr$ based on gross area. This is a relatively high number and indicates a strong performance of the system. Considering hot water at 50°C and cold water at 7.2°C, the delivered energy would represent a solar fraction of 32.5% of a load of 168,639 kWh/yr.

Post-retrofit performance evaluation

Since the energy meter installed by the solar system contractor could not be easily retrofitted for real-time web-based monitoring, a new energy meter was installed in the summer of 2011. In the spring of 2011, new condensing boilers were also installed, together with new thermostatic mixing valves and plumbing in the mechanical room. The old energy meter was re-located to measure the energy output of the new domestic hot water boilers. A natural gas meter was also installed on the supply line to the boilers, allowing for basic efficiency calculations for the new boilers.

During the first months of operation of the new heating system in the summer and fall of 2011, there were many instances where hot water was dumped through the pressure and temperature safety valves on each solar water heating unit, which did not happen during the first year of operation under the original plumbing configuration. After an analysis of the plumbing design, a few mistakes were detected and corrected. However, the hot water loss is still occurring, which is discussed further below.

During the period between December 2011 and September 2012, the average hot water draw was 6,512 litres/day, which is 26% lower than during the first year of the solar system's operation and under the old plumbing design. Part of the reduction is due to an increase in storage temperature inside the boilers, which was raised from approximately 50°C to 57°C in order to reduce the risk of bacterial growth. With a higher temperature in the hot water storage tanks, more cold water by-passes the solar system to provide an adequate delivery temperature at the outlet of the thermostatic mixing valves.

With an average cold water temperature of 7.2°C and an increase in stored hot water temperature from 50°C to 57°C, a mixing set-point of 50°C reduces the volume of water flowing through the storage tanks by approximately 14%. A water meter installed upstream from the domestic hot water system measured, between October 2011 and September 2012, an average consumption of 9,647 litres/day. This includes the cold water fed to the mixing valve and to the solar heating system.

With the new plumbing configuration and energy meter in place, the system delivered an average of 99 kWh/day (2.6 kWh/kW_t/day) between December 2011 and September 2012, for a total of 27,200 kWh (726 kWh/kW_t) during this period, or 33,406 kWh/yr (892 kWh/kW_t/yr) when extrapolated based on the typical amount of solar radiation received in Toronto for the remainder of the year. This is 14.4% greater than RET4 simulated yield (Table 3, Figure 1).

Therefore, although absolute system performance decreased in the post-retrofit period due to the reduction in water flow through the system, output actually increased relative to RETScreen predictions based on a smaller hot water usage volume and higher storage temperature. System performance would likely have been even stronger had the energy lost through hot water dumping been accounted for.

Table 3: Actual vs. RETScreen simulated yield of the Wilmar Court SDHW system

Time period	Actual energy delivered (kWh/yr)	Actual water load (L/day)	RET1 energy delivered (kWh/yr)	RET2 energy delivered (kWh/yr)	RET3 energy delivered (kWh/yr)	RET4 energy delivered (kWh/yr)
Pre-retrofit						
Apr 2010 – Apr 2011	54,821	9,284 (Hot water only)	47,700	59,900	30,300	-
Post-retrofit						
Sep 2011 – Sep 2012	33,406*	9,647 (Hot water + mixing valve cold water)	-	-	-	29,200

*Energy delivered by the SDHW system from September to November 2011 was extrapolated based on the typical amount of solar radiation received in Toronto during this period.

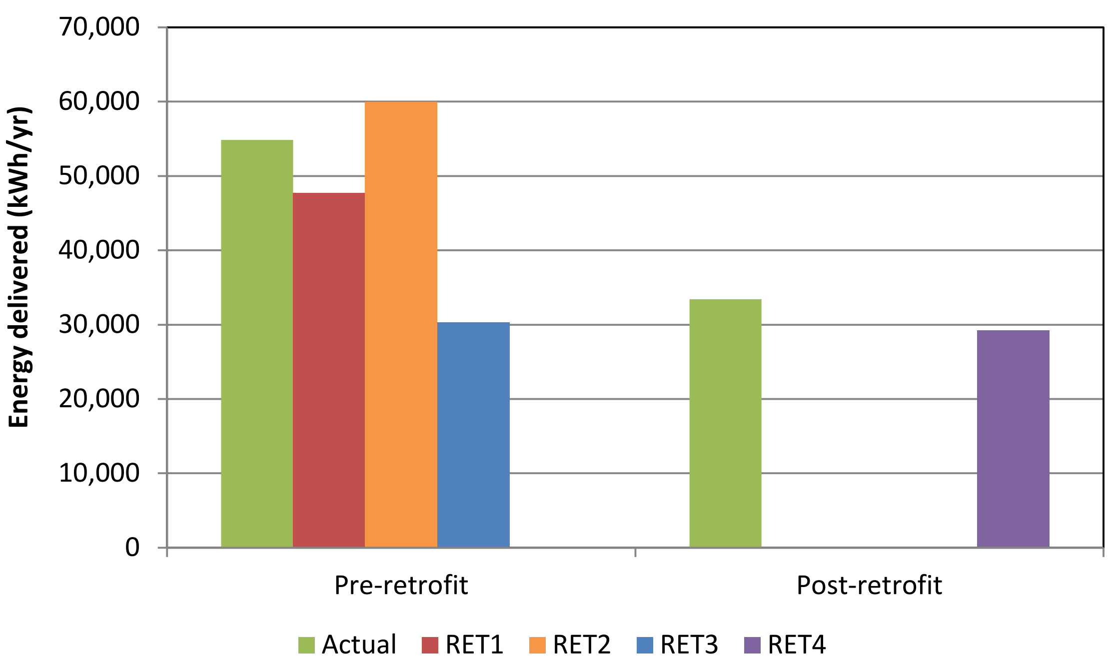

Figure 1: Actual vs. RETScreen simulated yield of the Wilmar Court SDHW system

System temperature

The reduction of water flow through the SDHW system may also be contributing to the problem of hot water loss through the pressure and temperature safety valves on each unit. With less water flowing through the SDHW system, the temperature of the circulating water would increase. If the water in a unit becomes too hot, this would trigger the safety valve. The supplier has informed management that the safety valves have an opening set-point of 65.5°C (150°F). It is not clear at this point why such a relatively low temperature was chosen, perhaps to protect the plastic piping that connects the solar tanks to the mechanical room. However, most plastic piping in North America is rated for 82.2°C (180°F).

To further investigate this issue, the hourly performance of the system was analyzed for one week in August 2012. Figure 2 presents the hot water draw, cold water inlet temperature and hot water outlet temperature from the solar system over this monitoring period. The hot water delivered did not rise above 60°C at any time and usage did not drop significantly over the weekend, as some had expected. If the temperature of the system did not exceed the set point of 65.5°C at all during a week in the summer, it is unlikely that it would exceed the set point at other times of the year. Therefore, further study is needed in order to determine what is causing the safety valves to open. During the one week monitoring period, the average draw was 5,720 litres/day and the average energy delivered was 130 kWh/day (3.5 kWh/kW_t/day).

It is recommended that future monitoring efforts assess potential net cooling effects of the solar thermal system during the winter. In the winter months, water which remains in the solar storage tanks overnight will likely undergo significant cooling. If the water temperature in the solar tanks drops below the temperature of the incoming municipal water, the solar system could be causing net cooling during early morning water draws when the water in the solar storage tanks has not been sufficiently heated. This effect may not be captured by the BTU meters.

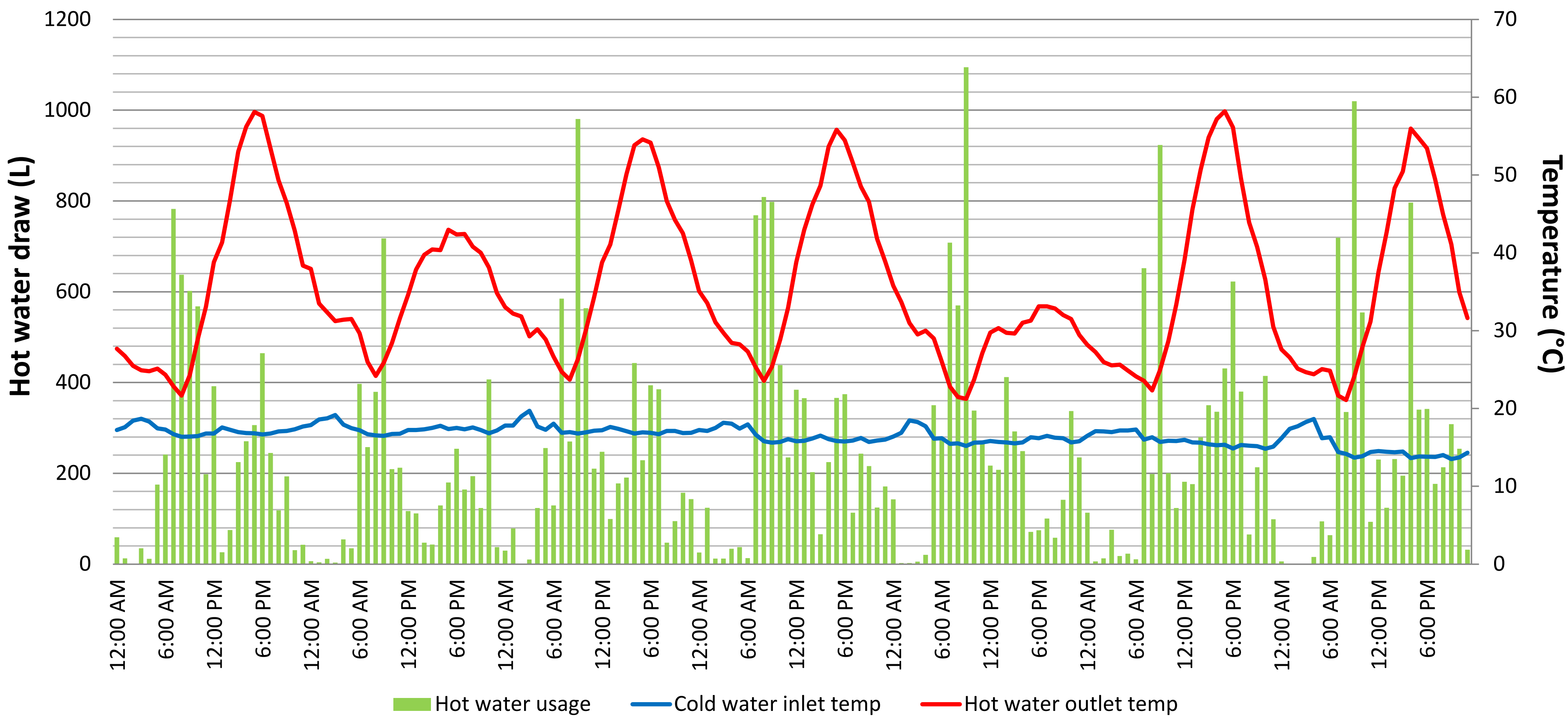

Figure 2: Hot water usage and system temperatures from August 1st to 7th, 2012

Heat tracing equipment

Another point of interest was the energy consumed by the heat tracing equipment attached to the connecting pipes. The circuits (there are 4 independent circuits) have a set-point of 8°C. During the winter of 2009/2010, each circuit used an average of 21.38 kWh, which was considered to be negligible.

Boiler efficiency

With dedicated natural gas and energy meters installed on the new boilers, it was possible to calculate the average boiler efficiency, which was evaluated over a 7 month period (Table 4). Assuming again a heating value of 10.55 kWh/m^3, the equivalent heating value for the period would have been 108,653 kWh (10,298.84 m^3 x 10.55 kWh/m^3), for a heating delivered by the boilers of 71,052 kWh. Therefore, the average efficiency was 65% for this period.

Table 4: Measured natural gas inputs and energy outputs of Wilmar Court's DHW boilers

Date	Natural gas input (x 100 ft^3)	Natural gas input (m^3)	Natural gas input (kWh)	Energy output (x 1000 BTU)	Energy output (kWh)
Feb 8, 2012	882	2,498	26,349	363,046	106,398
Sep 12, 2012	4,519	12,796	135,002	605,487	177,451
Difference	**3,637**	**10,299**	**108,653**	**242,441**	**71,052**

Since solar pre-heating can impact the boiler's capacity to condense, the same analysis was done for February 2012, a month when the solar contribution is typically low. For the period between February 8 and February 29 2012, the average boiler efficiency was 71%. In this case, it is likely that a combination of lower solar contribution and colder mains water temperature helped to increase the average efficiency. However, this is still significantly lower than the typical efficiencies of plate condensing boilers, which usually exceed 90%. The lower than expected boiler efficiency is likely due to high recirculation flow rates and the fact that the recirculation pipe return is connected to the supply pipe to the boiler. This maintains the temperature at the inlet of the boiler at relatively high levels, preventing condensation on the boiler heat exchanger. This analysis demonstrates the importance of performance verification for all major components of system retrofits.

It should be noted that even without the impact on condensation in the boiler, solar heated water is more difficult for the boiler to heat than cold water, and so the boiler's efficiency suffers. This is due simply to the fact that more energy is transferred between two systems with a higher differential temperature, and less energy is transferred between two systems that are closer in temperature.

BUSINESS CASE

Table 5 presents the business case for the Wilmar Court solar thermal project. This analysis uses the post-retrofit (2011-2012) delivered energy of 33,406 kWh/yr, which would save approximately $1,583/yr, assuming a natural gas price of 35¢/m^3. The simple payback for this scenario would be 89.2 years before grants and 42.9 years after. Payback would have been more favourable had the system continued to perform at pre-retrofit levels.

Table 5: Wilmar Court solar thermal project business case*

	Total cost installed	Grants	Array output (kWh/yr)	Dollars saved	Simple payback (yrs)	Simple payback after grants (yrs)
Adjusted feasibility study	$141,147	$73,200	33,406	$1,583	89.2	42.9

*This analysis assumes a 70% burner efficiency and a burner-tip natural gas price of $0.35/m^3.

APPENDIX A: SYSTEM SCHEMATICS

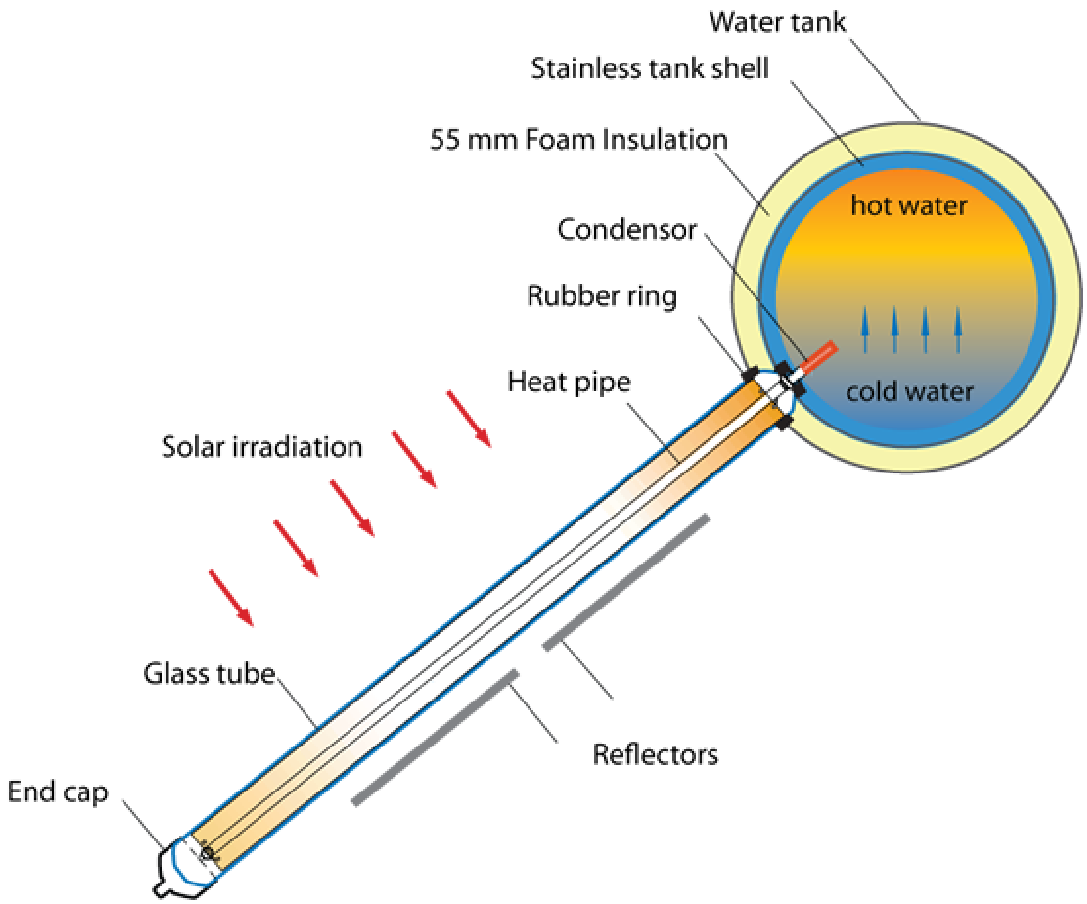

Figure A1: Compact solar heating system with evacuated tube and heat pipes[5]

5 Globe Solar Energy Inc. How GSE IP-195 Works. Available at: http://www.globesolarenergy.com/php_file/product/ip195/how_work.php

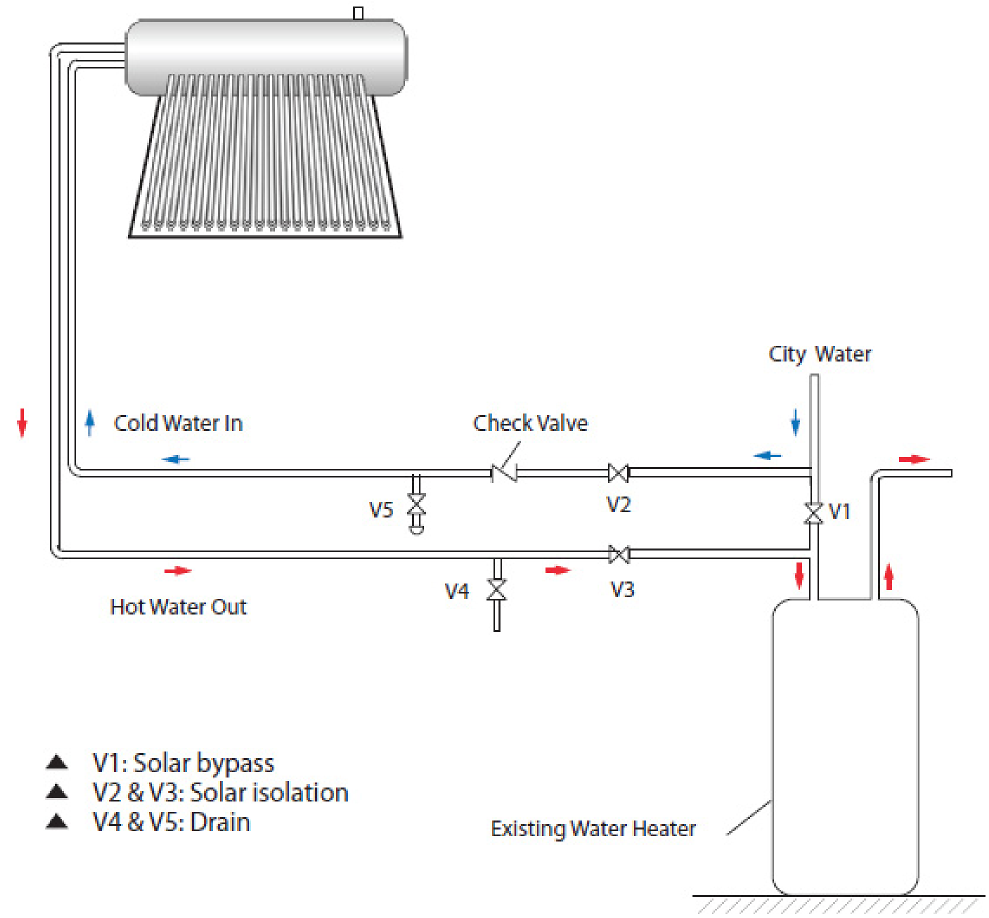

Figure A2: Typical compact passive SDHW system installation[6]

6 Globe Solar Energy Inc. GSE IP-195 User's Manual. Available at: http://www.globesolarenergy.com/images/manuals/user_manual_online.pdf

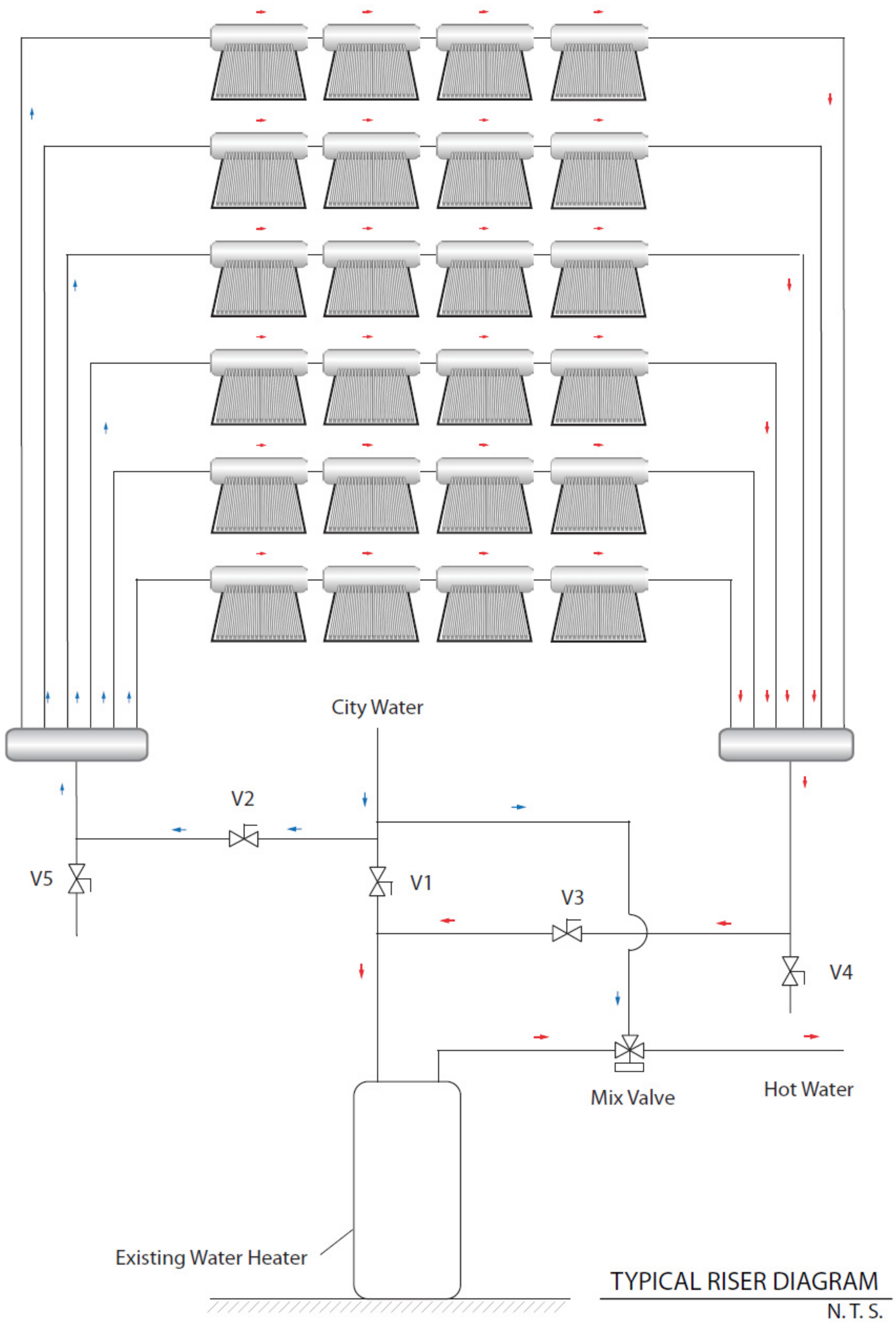

Figure A3: Wilmar Court SDHW system layout[7]

7 Globe Solar Energy, Inc. A Case Study on 24 Panel GSE IP-195 Solar Hot Water System for Wilmar Court.

Table A1: Detailed system specifications[8]

Model	GSE IP-195
Number of tubes	24
Length of tubes	1500 mm
Outer tube diameter	47 mm
Tube thickness	1.6 mm
Tube thermal expansion	3.3×10^{-6} °C
Absorptive coating	Graded Al-N / Al
Absorbency	> 92% (AM 1.5)
Volumetric capacity	150 L
Emittance	7% (100°C)
Insulation	Polyurethane, 55 mm
Solar collecting area	2.74 m^2
Vacuum	P < 0.005 Pa
Stagnation temperature	< 220°C
Heat loss	< 0.8 W/m^2
Tested pressure	150 PSI
Working pressure	79 PSI
Tilt angle	45°
Weight empty	75 kg
Max. pressure	11 kg or 150 PSI
Inlet and outlet	½ inches
T&P valve port	¾ inches
Reflector	Flat plate diffuse, aluminum
Frame	Aluminum alloy
Dimensions	78 ¾“ x 56 ¾“ x 60 ½” (W x D x H for flat roofs)

8 Globe Solar Energy Inc. GSE IP-195 Specifications. Available at: http://www.globesolarenergy.com/php_file/product/ip195/ip195_specification.php

APPENDIX B: MODIFIED RETSCREEN INPUTS

Modifications were made to the RET1 and RET2 models (since these were not created by the SolarCity Partnership) in order to more accurately simulate the Wilmar Court system. The calculation of the modified RETScreen inputs used in RET3 and RET4 is explained below.

In RET1 and RET2, $F_R(\tau\alpha)$ and F_RU_L were not appropriate for the type of collector and the chosen reference area (which appeared to be the absorber area partially based on the perimeter of the vacuum tubes). The gross area of each unit collector, measured as the area of the racking structure that supports the tubes, is 2.8 m^2. The $F_R(\tau\alpha)$ parameter based on gross area for double glass vacuum tubes would be in the range of 0.35 to 0.45.

The RET1 and RET2 models used a gross area of 3.51 m^2 which is larger than the calculated gross area, and so $F_R(\tau\alpha)$ would have been even smaller than the range stated above. Therefore, it was decided that the $F_R(\tau\alpha)$ of 0.6 used in these models was an unrealistic value.

The RET3 and RET4 models were based on system aperture area. This was calculated in accordance with the ISO 9488 for tubular collectors with reflectors, and incorporated collector dimensions measured on site. System aperture area was calculated to be 2.23 m^2 per unit.[9]

RET3 and RET4 also incorporated test data from the Solar Rating Certification Corporation (SRCC) and Solar Keymark. To determine the efficiency parameters used in RET3 and RET4, the values for the Sunrain U-tube collector model TZ47/1500-25U were used as a starting point, again based on absorber area values. This model was chosen because it has a similar geometry to the GSE IP-195 collectors used at Wilmar Court, with vacuum tubes 47 mm in diameter and 1500 mm long. However, U-tube vacuum tube collectors are more efficient than similar heat pipe collectors. Since data for similar U-tube and heat pipe collectors from SunRain was not available, data from similar Himin double-glass vacuum tube collectors was compared. When comparing a U-tube to a heat pipe collector, $F_R(\tau\alpha)$ was reduced by 18% and F_RU_L was reduced by 13%. Therefore, in RET3 and RET4, $F_R(\tau\alpha)$ was adjusted to 0.48 and F_RU_L to 1.31.

9 Collector aperture area = Reflector area + Tube projection area without reflector

= (1.044 m x 1.723 m) + (24 x 0.047 m x 0.38 m) = 2.23 m^2

Considering that the average annual solar irradiation on a plane tilted at 45^{o} and with an azimuth of 13^{o} SE in Toronto is 1.478 MWh/m^2 and the “aperture window” above each collector is approximately 2.46 m^2 (1.72 m x 1.43 m), the total available irradiation in one year would be 87.2 MWh. To produce 54.8 MWh, the system would have had to operate with an average efficiency of 62.8%. This is very unlikely, considering that the intercept point of the efficiency curve of the solar collector ($F_R(\tau\alpha)$) is below this value. The system would have had to operate significantly below ambient temperature to achieve this efficiency, and such conditions are unrealistic. Therefore, this indicates an error in the initial measurements taken by the vendor.

About the SolarCity Partnership

The SolarCity Partnership was developed to provide third party monitoring of large urban solar installations and develop best practice recommendations based on independent project evaluations. The 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 radiation data to help with the effective use of zero emissions energy from the sun.

Supporting Partners

The SolarCity Partnership was founded in 2008 by the Toronto Atmospheric Fund, the City of Toronto Energy and Waste Management Office, and Toronto and Region Conservation (TRCA), with support from the Federation of Canadian Municipalities Green Municipal Fund. Phase 2 of the Partnership, co-ordinated by TRCA, has expanded to include solar facility assessments across the Greater Toronto Area with funding support from the Region of Peel and York Region, and in-kind contributions from various site partners.

We want to hear from you!

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

info@solarcitypartnership.ca

289-268-3902

www.solarcitypartnership.ca