

### Location of the system

### Map section

Elderton  
Longitude: -81.244°  
Latitude: 43.053°  
Elevation: 879 ft

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### This report has been created by:

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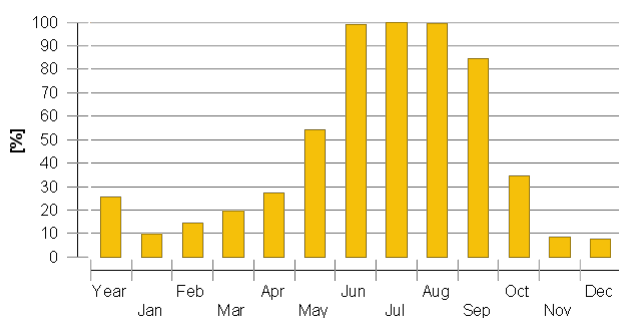
## System overview (annual values)

Total fuel and/or electrical energy consumption of the system [Etot]	125,223.8 kBtu
Total energy consumption [Quse]	169,139.2 kBtu
System performance (Quse / Etot)	1.35
Comfort demand	Energy demand of the building and domestic hot water demand not met

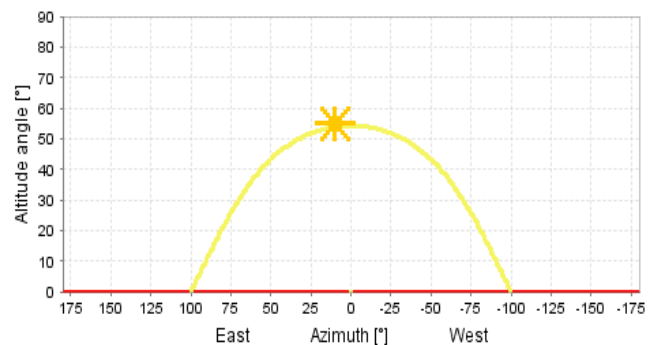
## Overview solar thermal energy (annual values)

Collector area	228 ft <sup>2</sup>
Solar fraction total	25.6%
Solar fraction hot water [SFnHw]	48.6 %
Solar fraction building [SFnBd]	14.9 %
Total annual field yield	44,686 kBtu
Collector field yield relating to gross area	196 kBtu/ft <sup>2</sup> /Year
Collector field yield relating to aperture area	219 kBtu/ft <sup>2</sup> /Year
Max. energy savings	44,686.4 kBtu
Max. reduction in CO2 emissions	15,487.2 pound

### Solar fraction: fraction of solar energy to system [SFn]



### Horizon line



## Meteorological data-Overview

Outdoor temperature 24h	47.1 °F
Annual global irradiance	438.6 kBtu/ft <sup>2</sup>
Annual diffuse irradiance	195.8 kBtu/ft <sup>2</sup>

## Financial analysis - Solar thermal

Purchase costs	6,500 CAD
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## Financial analysis - Solar thermal

Life span	40 years
Proportional incentives	0 %
Incentives per area	0 CAD
Fixed incentives	0 CAD
Inflation	3 %
Interest	5 %
Increase of energy prices	6 %
Electricity	0.15 CAD/kWh
Effective purchase cost after grants	6,500 CAD
Annual fuel cost savings	1,964.452 CAD
Solar energy cost per kWh	0.02 CAD
Payback period	4 years
Present value of the system	181,673.812 CAD
Net present value	175,173.812 CAD

## Component overview (annual values)

Boiler	ESU 9	
Power	kBtu/hr	30.72
Total efficiency	%	108.9
Energy from/to the system [Qaux]	kBtu	130,206.2
Fuel and electrical energy consumption [Eaux]	kBtu	119,587.6
Energy savings solar thermal	kBtu	44,686.4
CO savings solar thermal	pound	15,487.2
Fuel savings solar thermal	kBtu	44,697.8

Collector North America	WSE58Super Tube	
Data Source		u138368
Number of collectors		6
Number of arrays		6
Total area	ft <sup>2</sup>	228
Total aperture area	ft <sup>2</sup>	204
Tilt angle	°	45
Orientation	°	0
Collector field yield [Qsol]	kBtu	44,686.4
Irradiation onto collector area [Esol]	kBtu	115,442.2
Collector efficiency [Qsol / Esol]	%	38.7
Direct irradiation after IAM	kBtu	76,160.3
Diffuse irradiation after IAM	kBtu	51,654.9

Building	Single family house, normal building	
Heated/air-conditioned living area	ft <sup>2</sup>	4,030
Heating setpoint temperature	°F	65.8
Heating energy demand excluding DHW [Qdem]	kBtu	162,890.2
Specific heating energy demand excluding DHW [Qdem]	kBtu/ft <sup>2</sup>	40.4
Solar gain through windows	kBtu	82,326.1
Total energy losses	kBtu	251,455.1

Convector 1	Floor heating 1000W	
Number of heating/cooling modules	-	10
Power per heating module under standard conditions	kBtu/hr	3
Nominal inlet temperature	°F	95
Nominal return temperature	°F	77
Net energy from/to heating/cooling modules	kBtu	120,657.6

Convector 2	Radiator 1000W	
Number of heating/cooling modules	-	5
Power per heating module under standard conditions	kBtu/hr	3
Nominal inlet temperature	°F	140
Nominal return temperature	°F	104
Net energy from/to heating/cooling modules	kBtu	18,823

<b>Hot water demand</b>	<b>Constant</b>	
Withdraw volume	gal/d	100.5
Temperature setting	°F	113
Energy from/to the system [Quse]	kBtu	19,114.1
<b>Pool</b>	<b>Indoor pool</b>	
Pool type		Indoor pool
Length	ft	38
Width	ft	30
Energy from/to the system [Quse]	kBtu	10,458.9
<b>External heat exchanger 1</b>	<b>Plate heat exchanger, small</b>	
Transfer capacity	W/K	5,000
<b>External heat exchanger 2</b>	<b>Plate heat exchanger, small</b>	
Transfer capacity	W/K	5,000
<b>Pump 1</b>	<b>Pump, small</b>	
Circuit pressure drop	psi	0.712
Flow rate	gpm	2.1
Fuel and electrical energy consumption [Epar]	kBtu	312
<b>Pump 2</b>	<b>Natural convection</b>	
Circuit pressure drop	psi	0.612
Flow rate	gpm	2.4
<b>Pump 3</b>	<b>Pump, medium</b>	
Circuit pressure drop	psi	7.624
Flow rate	gpm	15.9
Fuel and electrical energy consumption [Epar]	kBtu	1,594.5
<b>Pump 4</b>	<b>Pump, medium</b>	
Circuit pressure drop	psi	0.418
Flow rate	gpm	3.5
Fuel and electrical energy consumption [Epar]	kBtu	2,004.5
<b>Pump 5</b>	<b>Pump, medium</b>	
Circuit pressure drop	psi	0.089
Flow rate	gpm	0.9
Fuel and electrical energy consumption [Epar]	kBtu	1,035.7

Pump 6	Pump, small	
Circuit pressure drop	psi	0.113
Flow rate	gpm	4.4
Fuel and electrical energy consumption [Epar]	kBtu	689.5

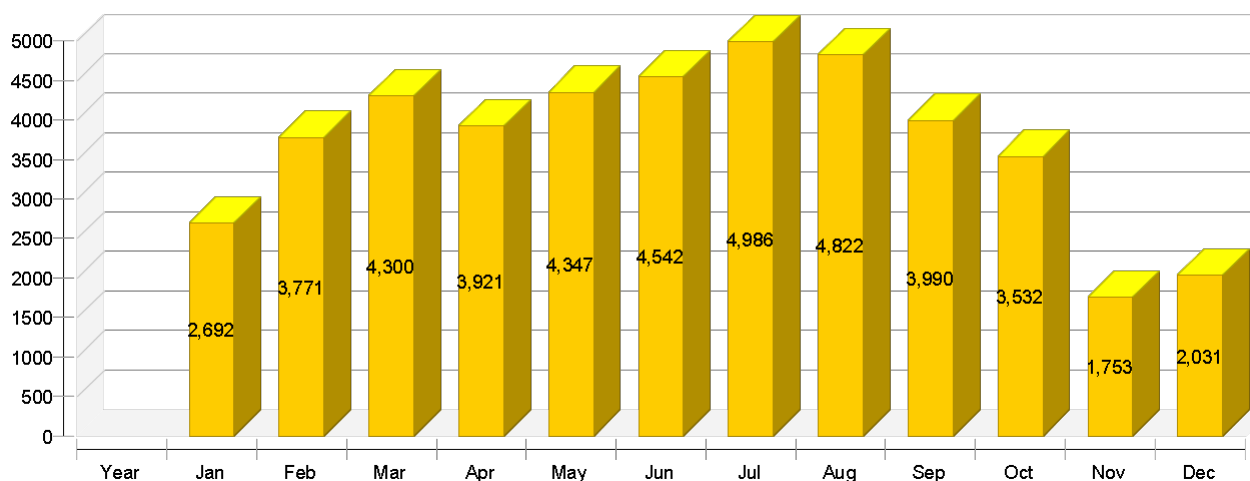
Storage tank 4	PC 1000	
Volume	gal	258.9
Height	ft	5.61
Material		Steel
Insulation		Fleece insulation
Thickness of insulation	in	3.9
Heat loss	kBtu	1,987.3
Connection losses	kBtu	1,275.4

## Loop

Solar loop		
Fluid mixture		Ethylene mixture
Fluid concentration	%	33.3
Fluid domains volume	gal	11.4
Pressure on top of the circuit	psi	58.016

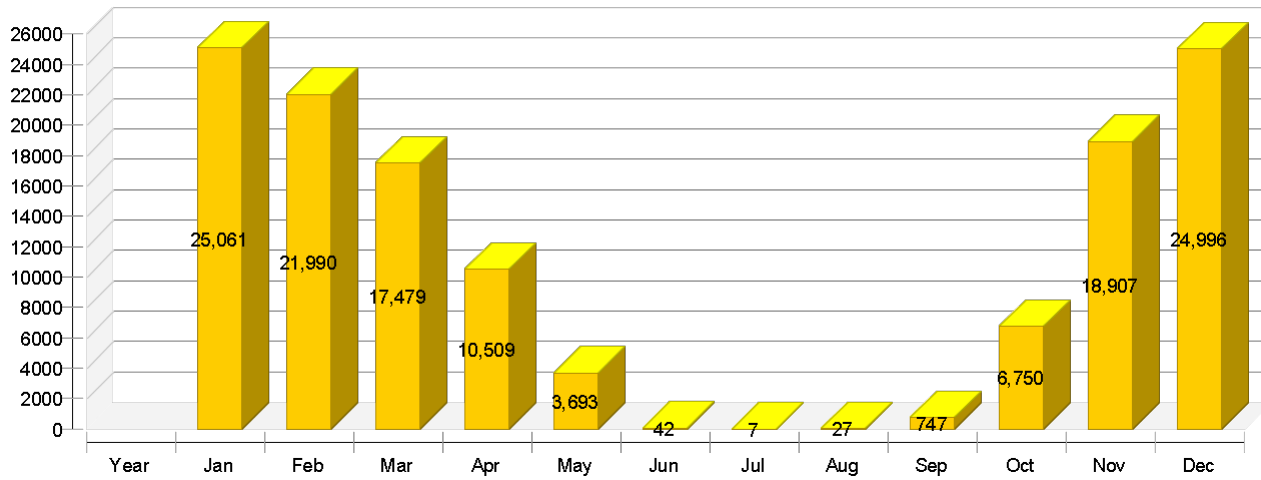
## Solar thermal energy to the system [Qsol]

kBtu



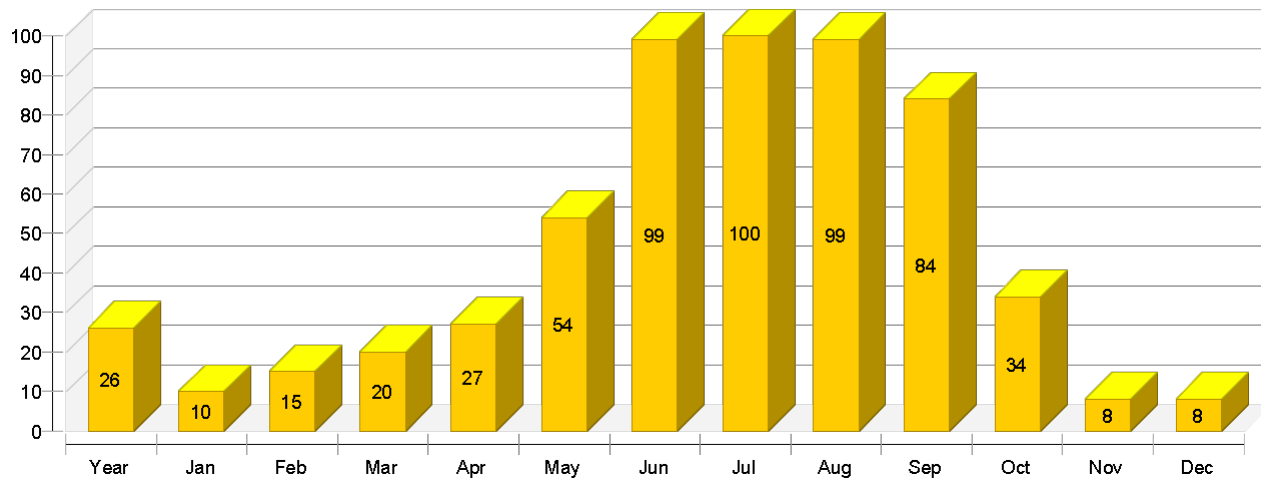
Heat generator energy to the system (solar thermal energy not included) [Qaux]

kBtu



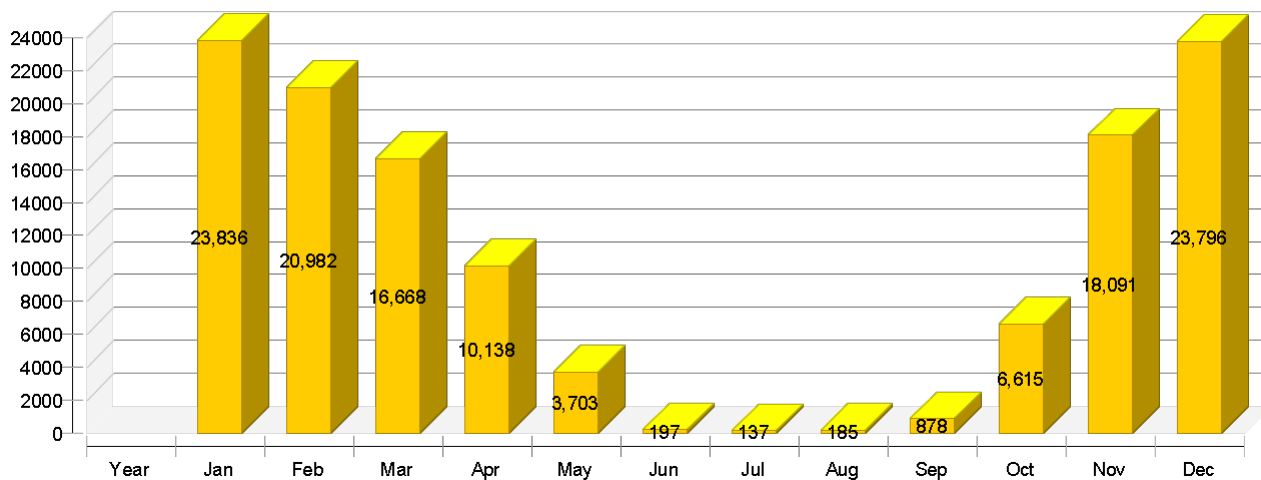
Solar fraction: fraction of solar energy to system [SFn]

%



Total fuel and/or electrical energy consumption of the system [Etot]

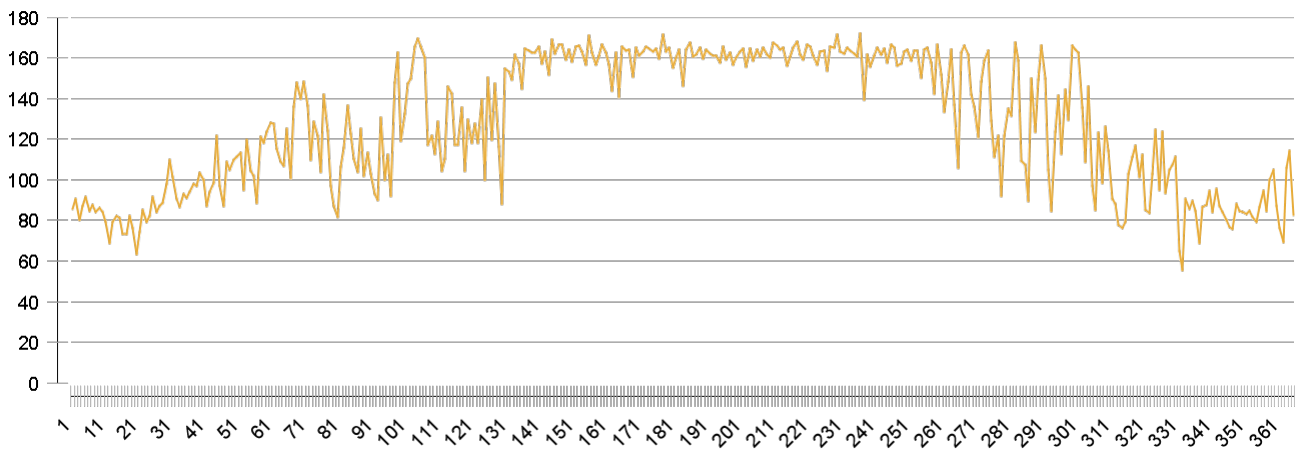
kBtu



	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>Solar thermal energy to the system [Qsol]</b>													
kBtu	44686	2692	3771	4300	3921	4347	4542	4986	4822	3990	3532	1753	2031
<b>Heat generator energy to the system (solar thermal energy not included) [Qaux]</b>													
kBtu	130206	25061	21990	17479	10509	3693	42	7	27	747	6750	18907	24996
<b>Heat generator fuel and electrical energy consumption [Eaux]</b>													
kBtu	119586	22842	20100	16071	9703	3468	103	39	88	760	6276	17334	22804
<b>Solar fraction: fraction of solar energy to system [SFn]</b>													
%	25.6	9.7	14.6	19.7	27.2	54.1	99.1	99.9	99.4	84.2	34.3	8.5	7.5
<b>Total fuel and/or electrical energy consumption of the system [Etot]</b>													
kBtu	125224	23836	20982	16668	10138	3703	197	137	185	878	6615	18091	23796
<b>Irradiation onto collector area [Esol]</b>													
kBtu	115442	6974	9491	11295	10414	11517	11720	12511	12041	10225	9103	4745	5406
<b>Electrical energy consumption of pumps [Epar]</b>													
kBtu	5636	995	882	597	435	235	93	98	96	118	339	757	992
<b>Heat loss to indoor room (including heat generator losses) [Qint]</b>													
kBtu	581	-1302	-870	-424	109	691	954	968	992	869	413	-607	-1210
<b>Heat loss to surroundings (without collector losses) [Qext]</b>													
kBtu	282	18	24	30	28	29	26	25	25	25	25	13	14
<b>Total energy consumption [Quse]</b>													
kBtu	169136	27817	25603	21365	13931	7265	3762	4169	3977	4004	9778	20544	27085

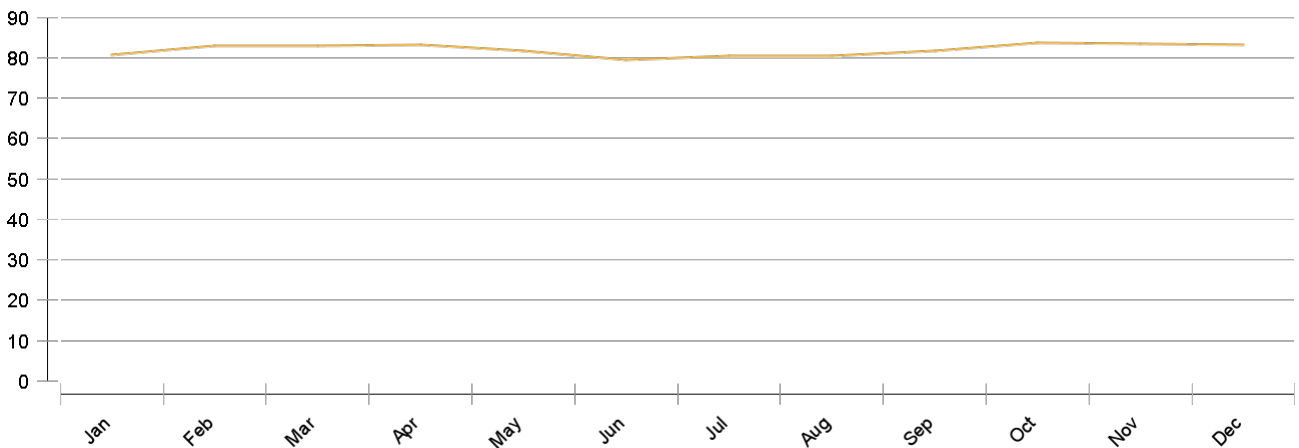
## Collector North America

Daily maximum temperature [ °F]



## Pool

Monthly average - Temperature [ °F]



## Energy flow diagram

