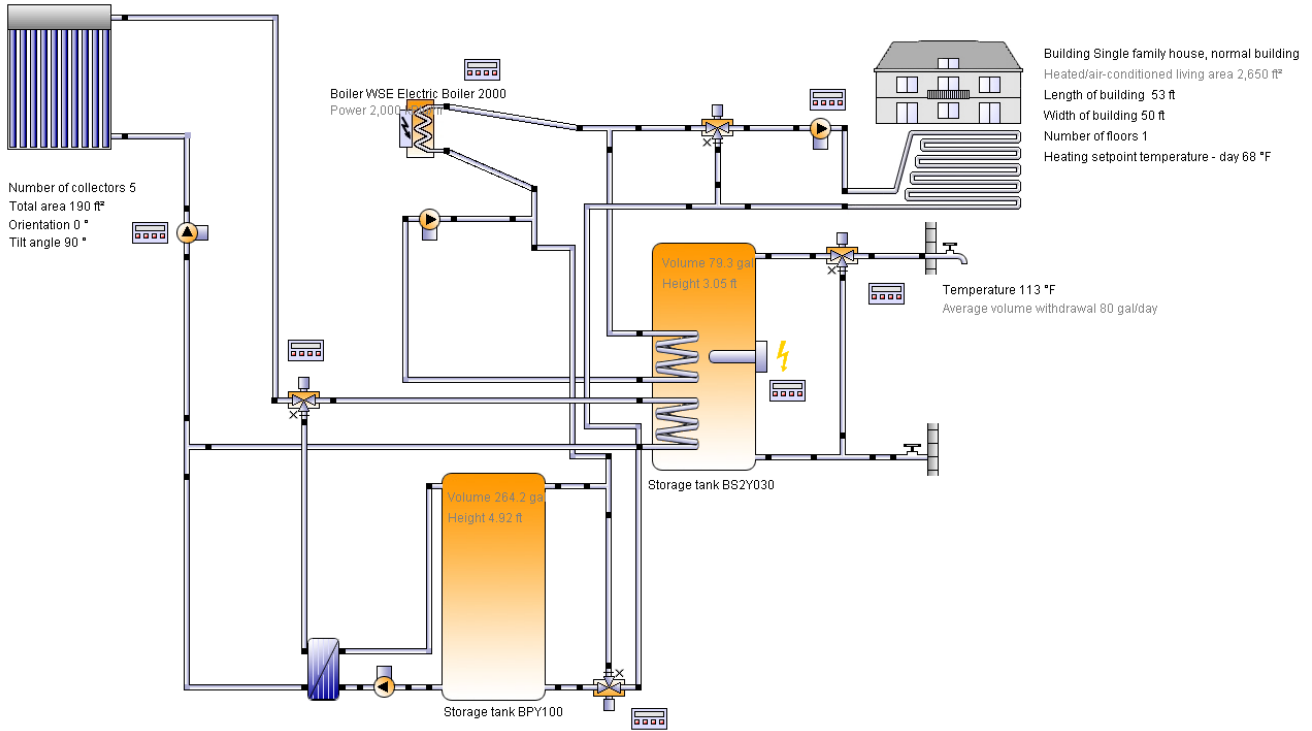


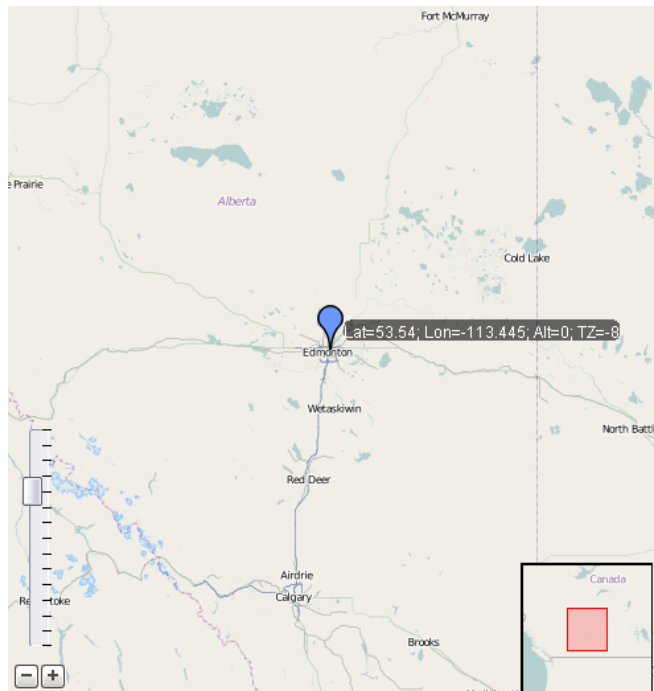
Project



Location of the system

Edmonton
Longitude: -113.445°
Latitude: 53.54°
Elevation: 0 ft

Map section



This report has been created by:

William Elliott
303 47 Str.E
S7K 5H2 Saskatoon

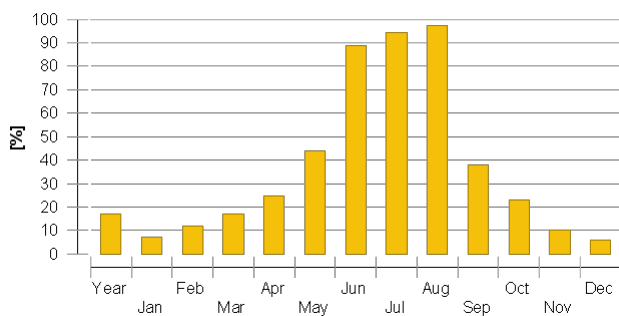
System overview (annual values)

Total fuel and/or electrical energy consumption of the system [Etot]	128,006.4 kBtu
Total energy consumption [Quse]	137,420 kBtu
System performance (Quse / Etot)	1.07
Comfort demand	Energy demand of the building not met

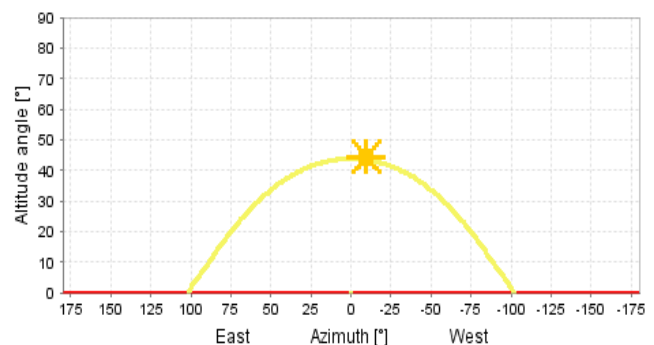
Overview solar thermal energy (annual values)

Collector area	190 ft ²
Solar fraction total	16.8%
Solar fraction hot water [SFnHw]	41 %
Solar fraction building [SFnBd]	12.2 %
Total annual field yield	24,090 kBtu
Collector field yield relating to gross area	127 kBtu/ft ² /Year
Collector field yield relating to aperture area	142 kBtu/ft ² /Year
Max. energy savings	25,357.6 kBtu
Max. reduction in CO2 emissions	8,788.3 pound

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



Horizon line



Meteorological data-Overview

Outdoor temperature 24h	39.7 °F
Annual global irradiance	409.3 kBtu/ft ²
Annual diffuse irradiance	159.4 kBtu/ft ²

Financial analysis - Solar thermal

Purchase costs	6,000 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	2 %
Interest	3 %
Increase of energy prices	6 %
Electricity	0.15 CAD/kWh
Effective purchase cost after grants	6,000 CAD
Annual fuel cost savings	1,114.74 CAD
Solar energy cost per kWh	0.03 CAD
Payback period	5 years
Present value of the system	131,809.453 CAD
Net present value	125,809.461 CAD

Component overview (annual values)

Boiler	WSE Electric Boiler 2000	
Power	kBtu/hr	2,000
Total efficiency	%	94.1
Energy from/to the system [Qaux]	kBtu	119,299.4
Fuel and electrical energy consumption [Eaux]	kBtu	126,796.4
Energy savings solar thermal	kBtu	25,357.6
CO savings solar thermal	pound	8,788.3
Fuel savings solar thermal	kBtu	25,364

Collector North America		WSE58Super Tube
Data Source		u138368
Number of collectors		5
Number of arrays		2
Total area	ft ²	190
Total aperture area	ft ²	170
Tilt angle	°	90
Orientation	°	0
Collector field yield [Qsol]	kBtu	24,089.7
Irradiation onto collector area [Esol]	kBtu	87,168.4
Collector efficiency [Qsol / Esol]	%	27.6
Direct irradiation after IAM	kBtu	47,368.3
Diffuse irradiation after IAM	kBtu	31,066.7

Building		Single family house, normal building
Heated/air-conditioned living area	ft ²	2,650
Heating setpoint temperature	°F	67.5
Heating energy demand excluding DHW [Qdem]	kBtu	131,300.5
Specific heating energy demand excluding DHW [Qdem]	kBtu/ft ²	49.5
Solar gain through windows	kBtu	76,808.8
Total energy losses	kBtu	217,751.9

Convector		Floor heating 1000W
Number of heating/cooling modules	-	12
Power per heating module under standard conditions	kBtu/hr	3
Nominal inlet temperature	°F	113
Nominal return temperature	°F	95
Net energy from/to heating/cooling modules	kBtu	118,926.3

Hot water demand		Constant
Withdraw volume	gal/d	80.3
Temperature setting	°F	113
Energy from/to the system [Quse]	kBtu	18,421.7

External heat exchanger		Plate heat exchanger, small
Transfer capacity	W/K	5,000

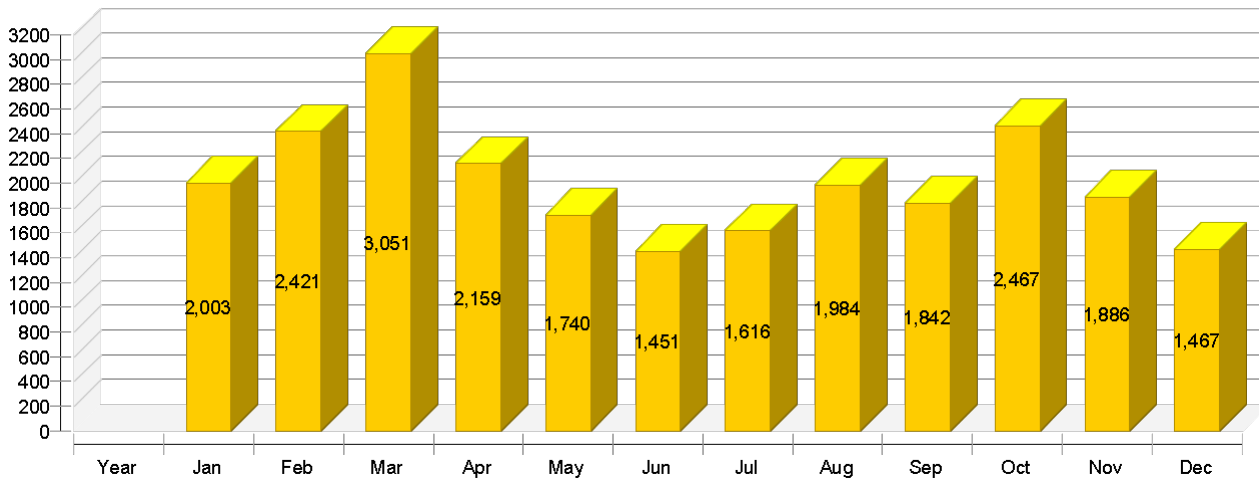
Pump 1		Giacomini R586S	
Circuit pressure drop	psi		0.244
Flow rate	gpm		1.4
Fuel and electrical energy consumption [Epar]	kBtu		326.3
Pump 3		Giacomini R586S	
Circuit pressure drop	psi		0.116
Flow rate	gpm		3.1
Fuel and electrical energy consumption [Epar]	kBtu		58.6
Pump 4		Giacomini R586S-1	
Circuit pressure drop	psi		0.165
Flow rate	gpm		4.2
Fuel and electrical energy consumption [Epar]	kBtu		759.1
Pump 2		Giacomini R586S	
Circuit pressure drop	psi		0.099
Flow rate	gpm		2.6
Fuel and electrical energy consumption [Epar]	kBtu		66.1
Storage tank 1		BS2Y030	
Volume	gal		79.3
Height	ft		3.05
Material			Enameled steel
Insulation			Rigid PU foam
Thickness of insulation	in		1.6
Heat loss	kBtu		1,320.5
Connection losses	kBtu		718.1
Storage tank 2		BPY100	
Volume	gal		264.2
Height	ft		4.92
Material			Enameled steel
Insulation			Rigid PU foam
Thickness of insulation	in		1.6
Heat loss	kBtu		1,345
Connection losses	kBtu		288.5

Loop

Solar loop		
Fluid mixture		Ethylene mixture
Fluid concentration	%	33.3
Fluid domains volume	gal	8.4
Pressure on top of the circuit	psi	58.016

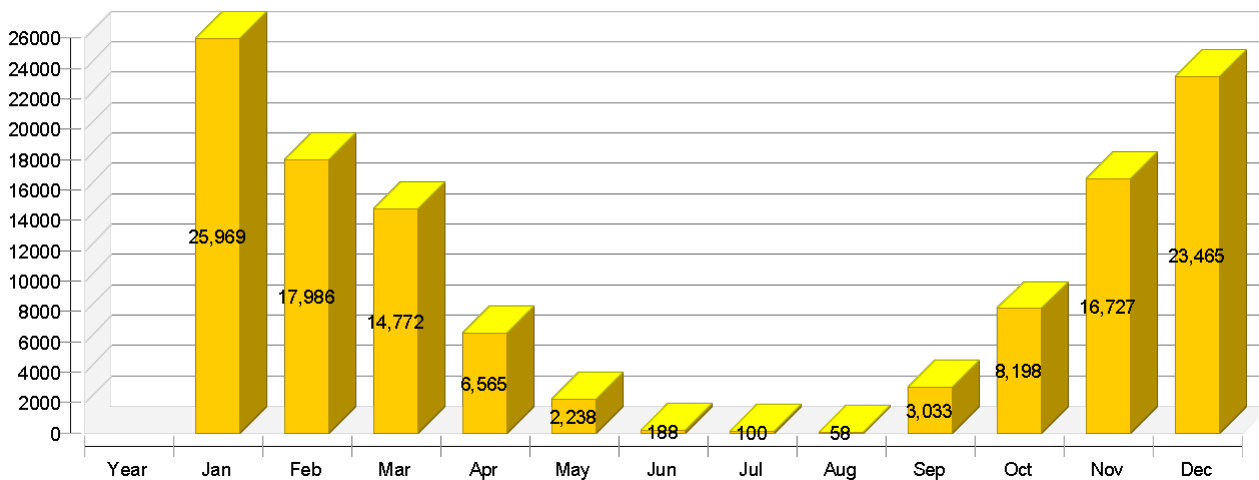
Solar thermal energy to the system [Qsol]

kBtu



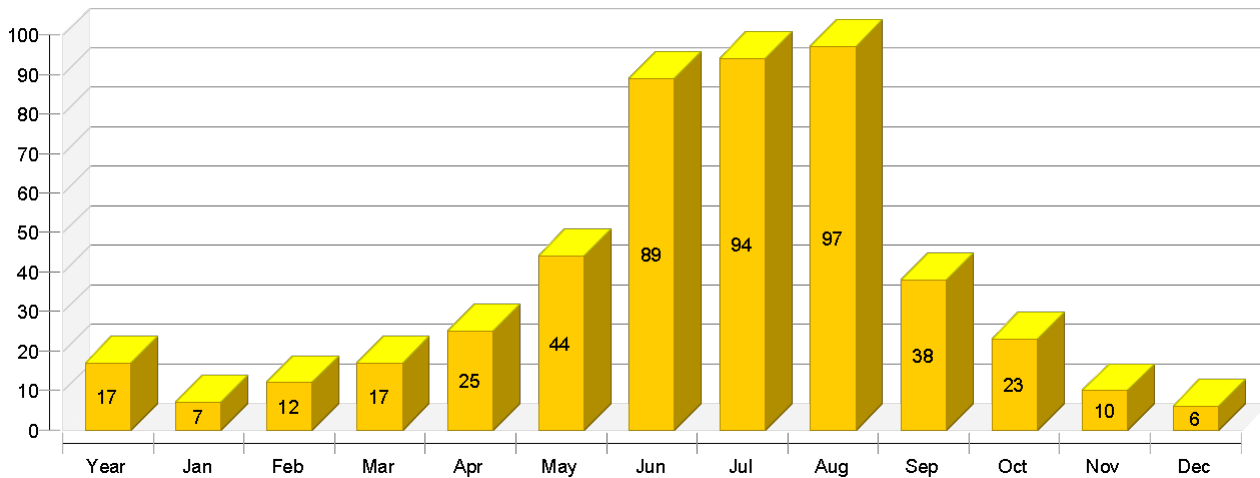
Heat generator energy to the system (solar thermal energy not included) [Qaux]

kBtu



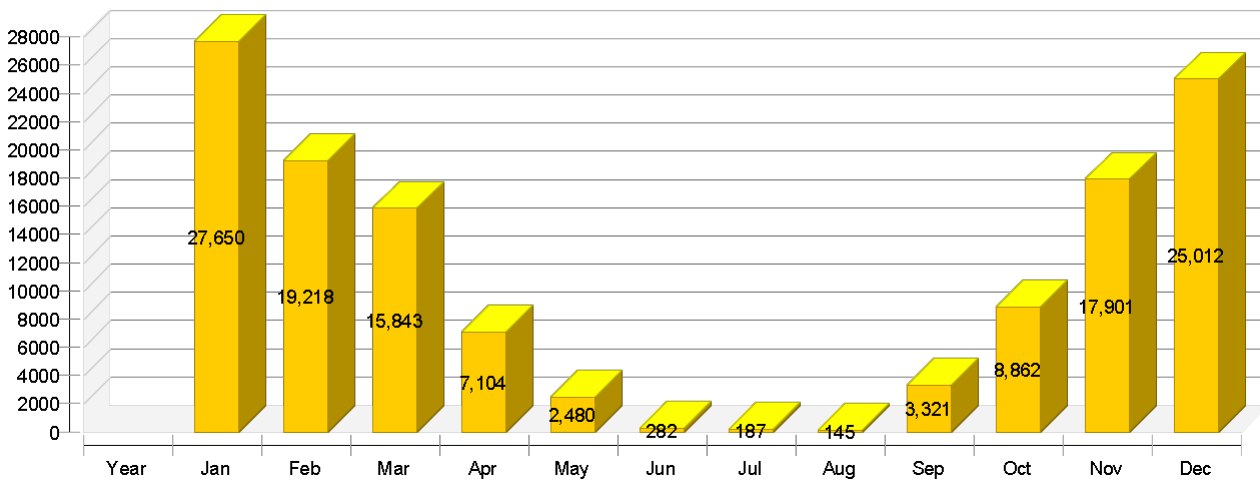
Solar fraction: fraction of solar energy to system [SFn]

%



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
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Solar thermal energy to the system [Qsol]

kBtu	24090	2003	2421	3051	2159	1740	1451	1616	1984	1842	2467	1886	1467
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Heat generator energy to the system (solar thermal energy not included) [Qaux]

kBtu	11929€	25969	17986	14772	6565	2238	188	100	58	3033	8198	16727	23465
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Heat generator fuel and electrical energy consumption [Eaux]

kBtu	12679€	27488	19068	15689	7009	2425	250	154	110	3257	8745	17749	24852
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Solar fraction: fraction of solar energy to system [SFn]

%	16.8	7.2	11.9	17.1	24.7	43.7	88.5	94.2	97.1	37.8	23.1	10.1	5.9
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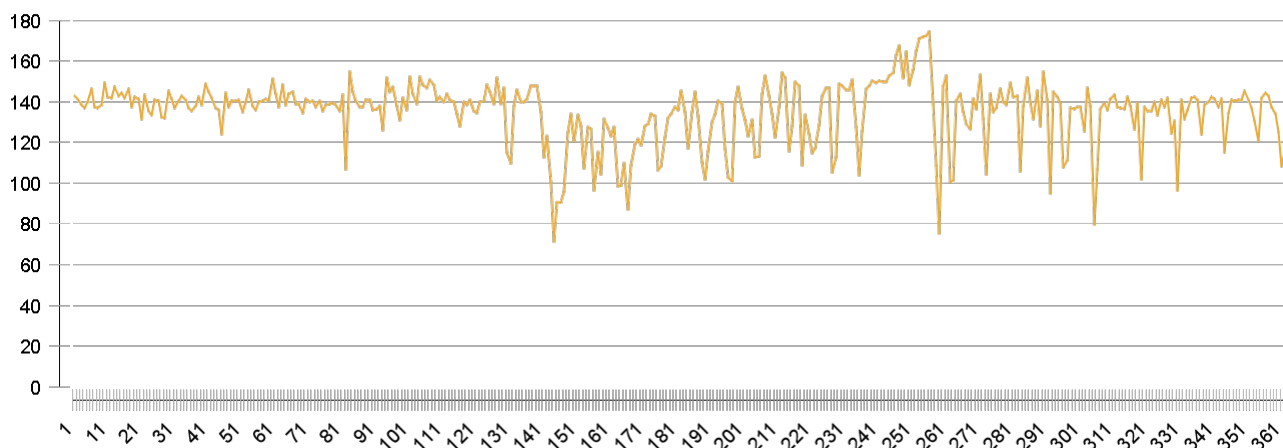
Total fuel and/or electrical energy consumption of the system [Etot]

kBtu	12800€	27650	19218	15843	7104	2480	282	187	145	3321	8862	17901	25012
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Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Irradiation onto collector area [Esol]													
kBtu	87168	7063	8090	10560	8321	6958	5840	6439	7277	6900	8046	6171	5502
Electrical energy consumption of pumps [Epar]													
kBtu	1210	161	150	154	95	55	32	33	35	65	118	151	160
Heat loss to indoor room (including heat generator losses) [Qint]													
kBtu	14337	2192	1718	1629	1076	651	295	325	533	991	1225	1669	2033
Heat loss to surroundings (without collector losses) [Qext]													
kBtu	398	42	38	44	38	28	22	25	27	33	33	30	37
Total energy consumption [Quse]													
kBtu	137420	27393	19888	17213	8180	3586	1459	1438	1400	4312	10046	18084	24422

Collector North America

Daily maximum temperature [°F]



Energy flow diagram

