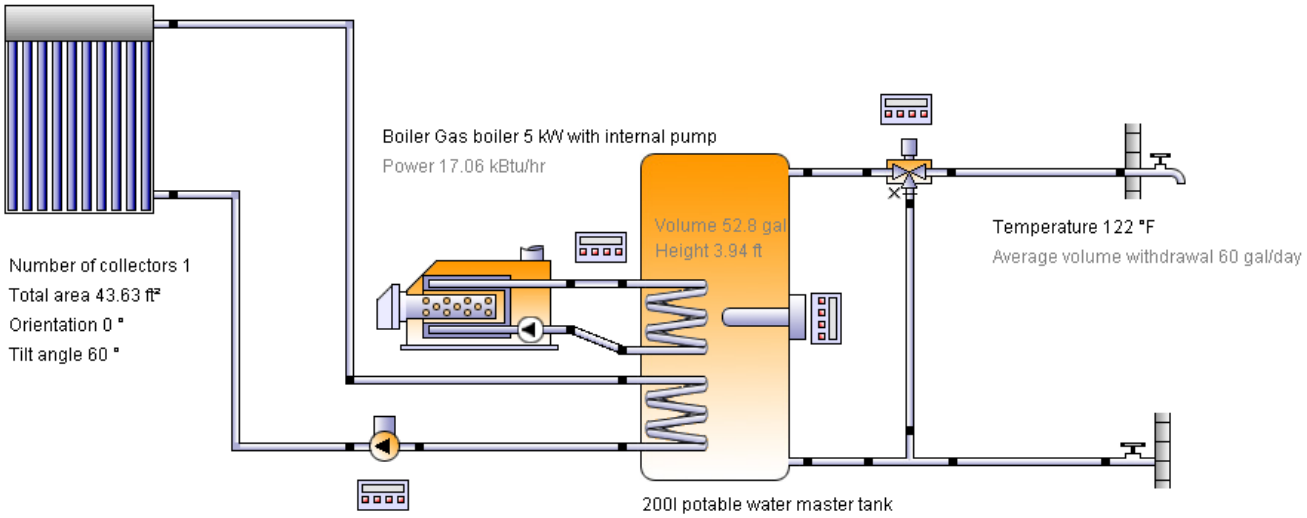
Financial Report

Project **8a: Hot water (solar thermal, high-flow)**



Location of the system

Canada

Saskatoon

Longitude: -106.67°

Latitude: 52.17°

Elevation: 1,657 ft

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System overview (annual values)

Total fuel and/or electrical energy consumption of the system [Etot]	6,053.1 kBtu
Total energy consumption [Quse]	10,966.3 kBtu
System performance (Quse / Etot)	1.81
Comfort demand	Energy demand covered

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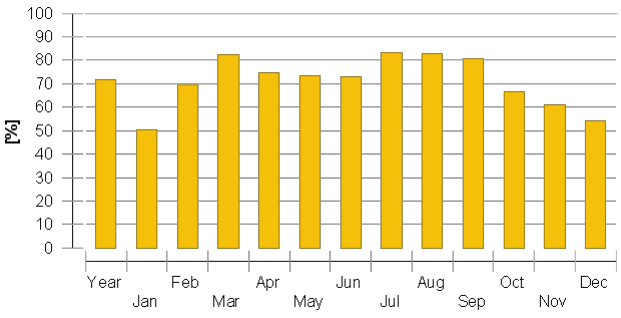
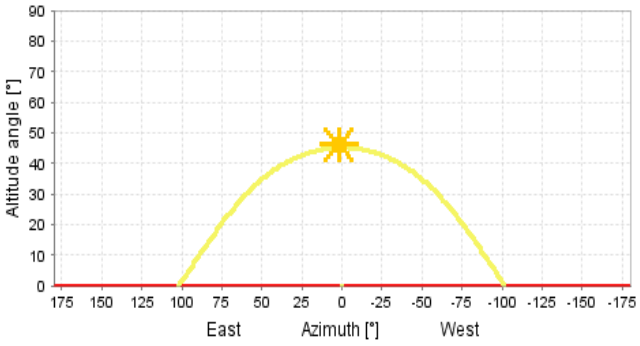
Overview solar thermal energy (annual values)

Collector area	44 ft²
Solar fraction total	71.5%
Total annual field yield	9,953 kBtu
Collector field yield relating to gross area	228 kBtu/ft²/Year
Collector field yield relating to aperture area	244 kBtu/ft²/Year
Max. fuel savings	10,900.2 ft³: [Natural gas H]
Max. energy savings	11,058.4 kBtu
Max. reduction in CO2 emissions	1,654.7 pound

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



Horizon line



Meteorological data-Overview

Outdoor temperature 24h	37 °F
Annual global irradiance	430 kBtu/ft²
Annual diffuse irradiance	153 kBtu/ft²

Financial analysis - Solar thermal

Purchase costs	2,500 CAD
Life span	50 years
Proportional incentives	0 %
Incentives per area	0 CAD
Fixed incentives	0 CAD
Inflation	2 %
Interest	4 %
Increase of energy prices	5 %
Electricity	0.2 CAD/kWh

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Financial analysis - Solar thermal

Natural gas H	0.031 CAD/ft³; 0.031 CAD/kBtu
Effective purchase cost after grants	2,500 CAD
Annual fuel cost savings	340.296 CAD
Solar energy cost per kWh	0.03 CAD
Payback period	7 years
Present value of the system	37,145.641 CAD
Net present value	34,645.641 CAD

Component overview (annual values)

Boiler	**Gas boiler 5 kW with internal pump**	
Power	kBtu/hr	17.06
Total efficiency	%	69.7
Energy from/to the system [Qaux]	kBtu	3,960
Fuel and electrical energy consumption [Eaux]	kBtu	5,685.4
Energy savings solar thermal	kBtu	11,058.4
CO_2 savings solar thermal	pound	1,654.7
Fuel savings solar thermal	ft³	10,900.2

Collector North America	**WSE58ST**	
Data Source		u138368
Number of collectors		1
Number of arrays		1
Total area	ft²	43.63
Total aperture area	ft²	40.849
Tilt angle	°	60
Orientation	°	0
Collector field yield [Qsol]	kBtu	9,952.6
Irradiance onto collector area [Esol]	kBtu	25,122
Collector efficiency [Qsol / Esol]	%	39.6
Direct irradiance after IAM	kBtu	18,890.7
Diffuse irradiance after IAM	kBtu	8,837.1

Hot water demand	**Constant**	
Withdraw volume	gal/d	60.4
Temperature setting	°F	122
Energy from/to the system [Quse]	kBtu	10,966.3

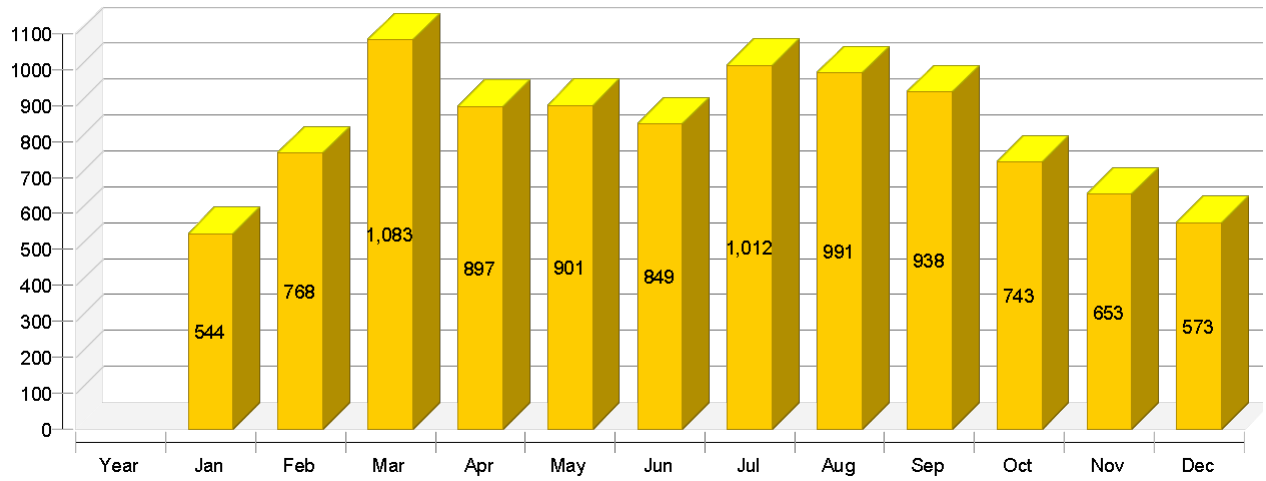
Pump Solar loop pump	Pump, small	
Circuit pressure drop	psi	0.083
Flow rate	gpm	0.7
Fuel and electrical energy consumption [Epar]	kBtu	367.7

Storage tank Potable water tank	200l potable water master tank	
Volume	gal	52.8
Height	ft	3.94
Material		Stainless steel
Insulation		Rigid PU foam
Thickness of insulation	in	3.1
Heat loss	kBtu	496.2
Connection losses	kBtu	602.2

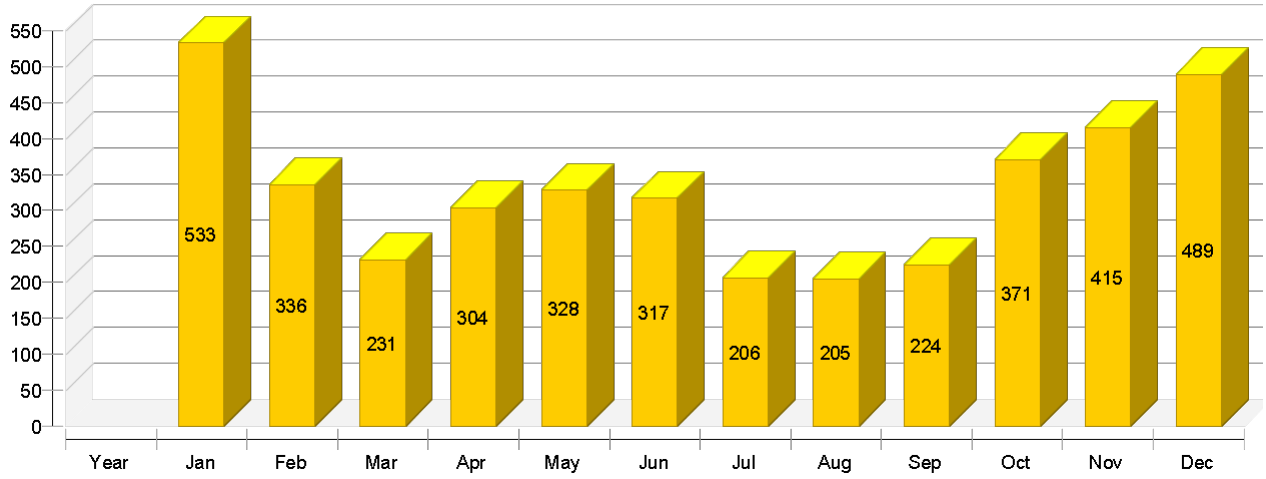
Loop

Solar loop		
Fluid mixture		Ethylene mixture
Fluid concentration	%	33.3
Fluid domains volume	gal	4.6
Pressure on top of the circuit	psi	58.016

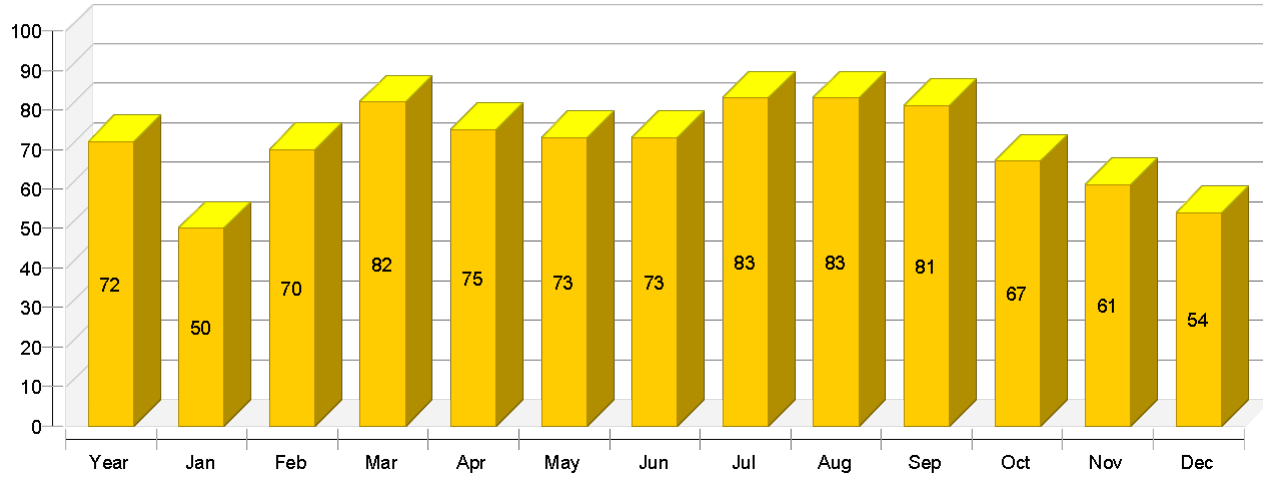
Solar thermal energy to the system [Qsol] kBtu



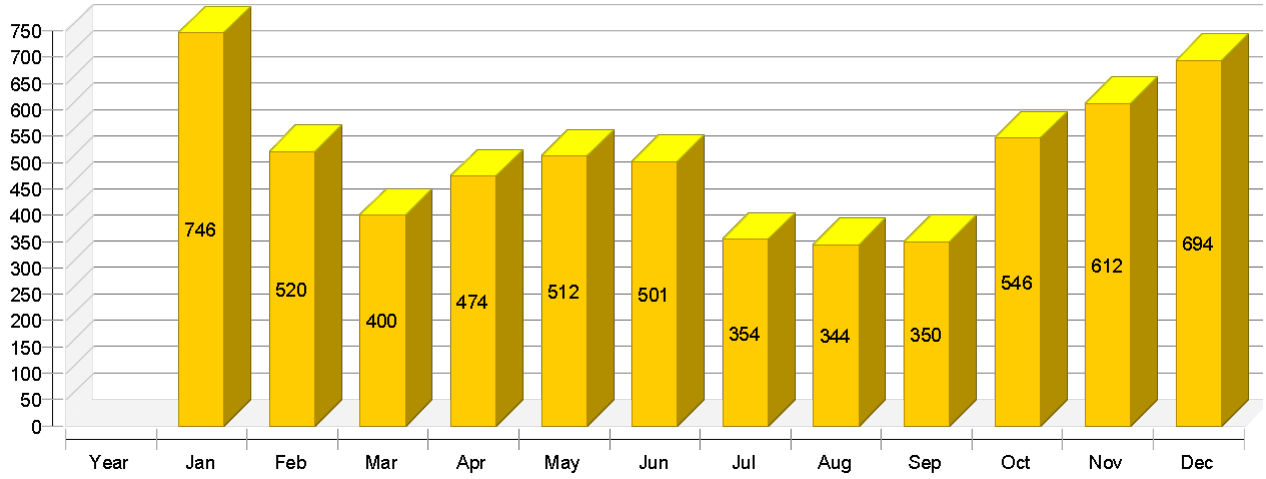
Heat generator energy to the system (solar thermal energy not included) [Qaux] kBtu



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



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



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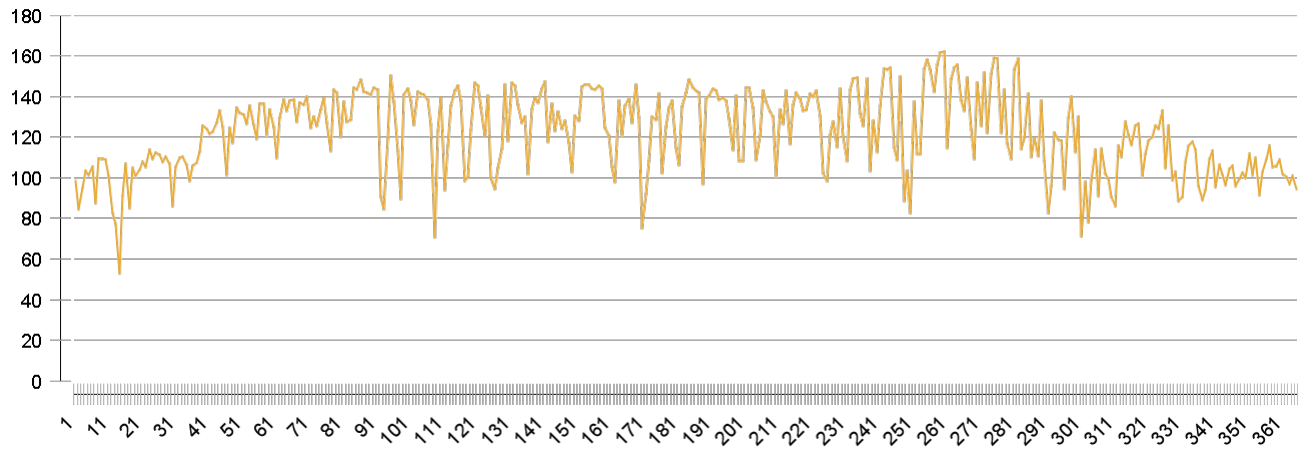
	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Solar thermal energy to the system [Qsol]													
kBtu	9953	544	768	1083	897	901	849	1012	991	938	743	653	573
Heat generator energy to the system (solar thermal energy not included) [Qaux]													
kBtu	3960	533	336	231	304	328	317	206	205	224	371	415	489
Heat generator fuel and electrical energy consumption [Eaux]													
kBtu	5685	723	491	365	441	478	468	317	307	319	518	586	671
Solar fraction: fraction of solar energy to system [SFn]													
%	71.5	50.5	69.6	82.4	74.7	73.3	72.8	83.1	82.8	80.7	66.7	61.2	54
Total fuel and/or electrical energy consumption of the system [Etot]													
kBtu	6053	746	520	400	474	512	501	354	344	350	546	612	694
Irradiance onto collector area [Esol]													
kBtu	25122	1500	2005	2790	2279	2262	2128	2463	2380	2272	1847	1658	1536
Electrical energy consumption of pumps [Epar]													
kBtu	368	23	28	35	33	34	33	37	36	31	28	26	23
Heat loss to indoor room (including heat generator losses) [Qint]													
kBtu	4215	345	338	364	339	363	364	353	349	333	357	360	349
Heat loss to surroundings (without collector losses) [Qext]													
kBtu	825	77	89	108	72	59	49	50	53	65	65	70	69
Total energy consumption [Quse]													
kBtu	10966	863	863	1014	960	986	941	959	933	892	869	832	853

Collector North America

Daily maximum temperature [°F]



Energy flow diagram