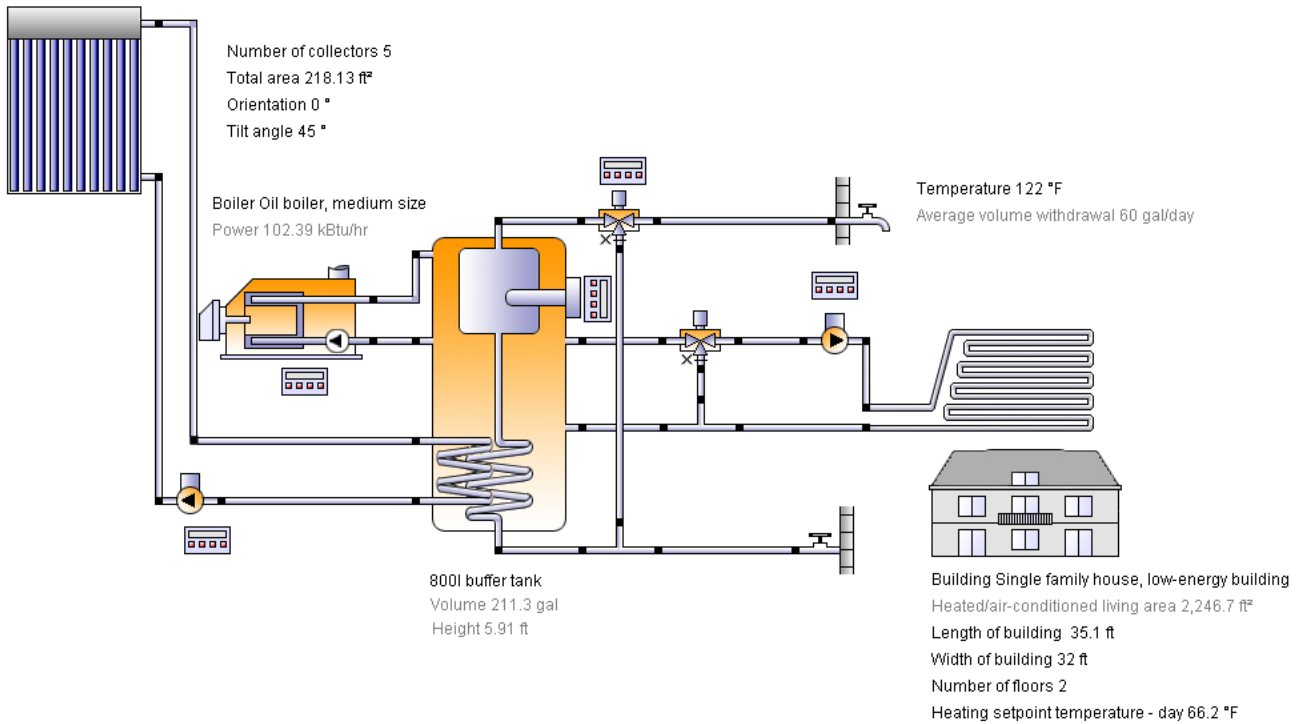


## Project

## 9a: Space heating (solar thermal, tank in tank)



### Location of the system

Nova Scotia  
Longitude: -63.896°  
Latitude: 45.027°  
Elevation: 249 ft

### Map section

"Current report item is not supported in this report format."

### This report has been created by:

Elliott William  
303 47 Str.E  
S7K 5H2 Saskatoon

## Comments on the project

Using 5 WSE58 ST Budgetary cost 5,000

## Photograph of property



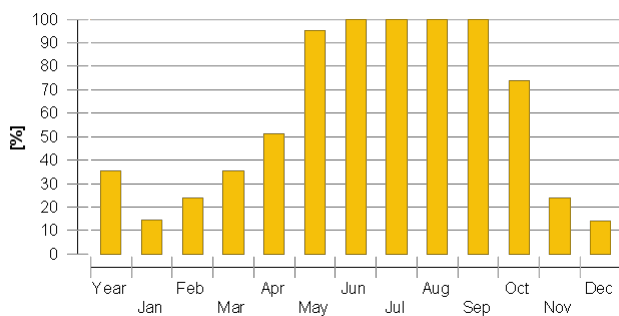
## System overview (annual values)

Total fuel and/or electrical energy consumption of the system [Etot]	52,513 kBtu
Total energy consumption [Quse]	56,742.3 kBtu
System performance (Quse / Etot)	1.08
Comfort demand	Energy demand covered

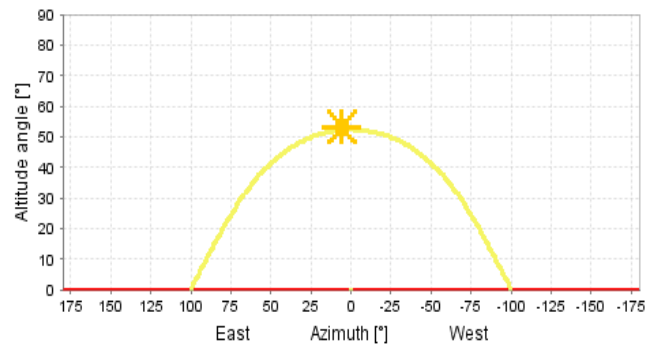
## Overview solar thermal energy (annual values)

Collector area	218 ft <sup>2</sup>
Solar fraction total	35.3%
Solar fraction hot water [SFnHw]	68 %
Solar fraction building [SFnBd]	20.6 %
Total annual field yield	22,814 kBtu
Collector field yield relating to gross area	105 kBtu/ft <sup>2</sup> /Year
Collector field yield relating to aperture area	112 kBtu/ft <sup>2</sup> /Year
Max. fuel savings	207.8 gal: [Heating oil]
Max. energy savings	26,840.1 kBtu
Max. reduction in CO2 emissions	5,214.2 pound

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



## Horizon line



## Meteorological data-Overview

Outdoor temperature 24h	44.8 °F
Annual global irradiance	403.5 kBtu/ft <sup>2</sup>
Annual diffuse irradiance	191 kBtu/ft <sup>2</sup>

## Financial analysis - Solar thermal

Purchase costs	5,000 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
Heating oil	3.785 CAD/gal; 0.029 CAD/kBtu
Effective purchase cost after grants	5,000 CAD
Annual fuel cost savings	786.61 CAD
Solar energy cost per kWh	0.02 CAD
Payback period	7 years
Present value of the system	85,953.344 CAD
Net present value	80,953.352 CAD

## Component overview (annual values)

<b>Boiler</b>	<b>Oil boiler, medium size</b>	
Power	kBtu/hr	102.39
Total efficiency	%	81.2
Energy from/to the system [Qaux]	kBtu	41,882.5
Fuel and electrical energy consumption [Eaux]	kBtu	51,562.2
Energy savings solar thermal	kBtu	26,840.1
CO savings solar thermal	pound	5,214.2
Fuel savings solar thermal	gal	207.8

<b>Collector North America</b>	<b>WSE58ST</b>	
Data Source		u138368
Number of collectors		5
Number of arrays		4
Total area	ft <sup>2</sup>	218.13
Total aperture area	ft <sup>2</sup>	204.245
Tilt angle	°	45
Orientation	°	0
Collector field yield [Qsol]	kBtu	22,814.1
Irradiance onto collector area [Esol]	kBtu	105,650.9
Collector efficiency [Qsol / Esol]	%	21.6
Direct irradiance after IAM	kBtu	68,759.8
Diffuse irradiance after IAM	kBtu	48,321.6

<b>Building</b>	<b>Single family house, low-energy building</b>	
Heated/air-conditioned living area	ft <sup>2</sup>	2,246.7
Heating setpoint temperature	°F	66.2
Heating energy demand excluding DHW [Qdem]	kBtu	44,349.5
Specific heating energy demand excluding DHW [Qdem]	kBtu/ft <sup>2</sup>	19.7
Solar gain through windows	kBtu	73,828.4
Total energy losses	kBtu	144,935.8

Convector Floor heating	Floor heating 1000W	
Number of heating/cooling modules	-	10
Power per heating module under standard conditions	kBtu/hr	3
Nominal inlet temperature	°F	104
Nominal return temperature	°F	95
Net energy from/to heating/cooling modules	kBtu	44,281.5

Hot water demand	Constant	
Withdraw volume	gal/d	60.3
Temperature setting	°F	122
Energy from/to the system [Quse]	kBtu	12,392.8

Pump Space heating loop pump	Pump, medium	
Circuit pressure drop	psi	0.498
Flow rate	gpm	4.1
Fuel and electrical energy consumption [Epar]	kBtu	797.1

Pump Solar loop pump	Pump, small	
Circuit pressure drop	psi	0.919
Flow rate	gpm	3.3
Fuel and electrical energy consumption [Epar]	kBtu	153.7

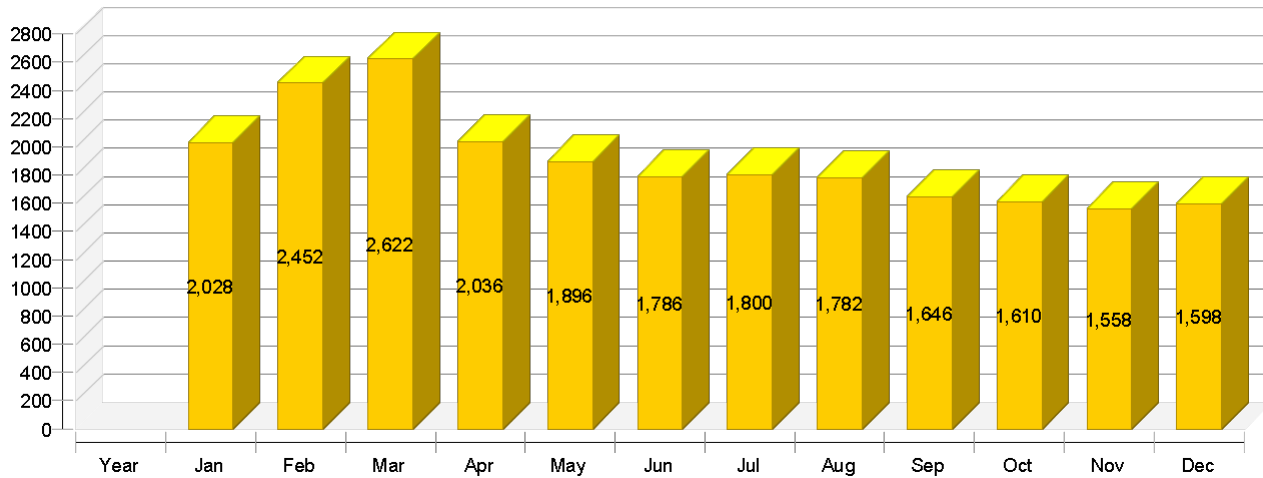
Storage tank Buffer tank	800l buffer tank	
Volume	gal	211.3
Height	ft	5.91
Material		Steel
Insulation		Rigid PU foam
Thickness of insulation	in	3.1
Heat loss	kBtu	3,192.8
Connection losses	kBtu	2,935.5

## Loop

Solar loop		
Fluid mixture		Ethylene mixture
Fluid concentration	%	33.3
Fluid domains volume	gal	7.3
Pressure on top of the circuit	psi	58.016

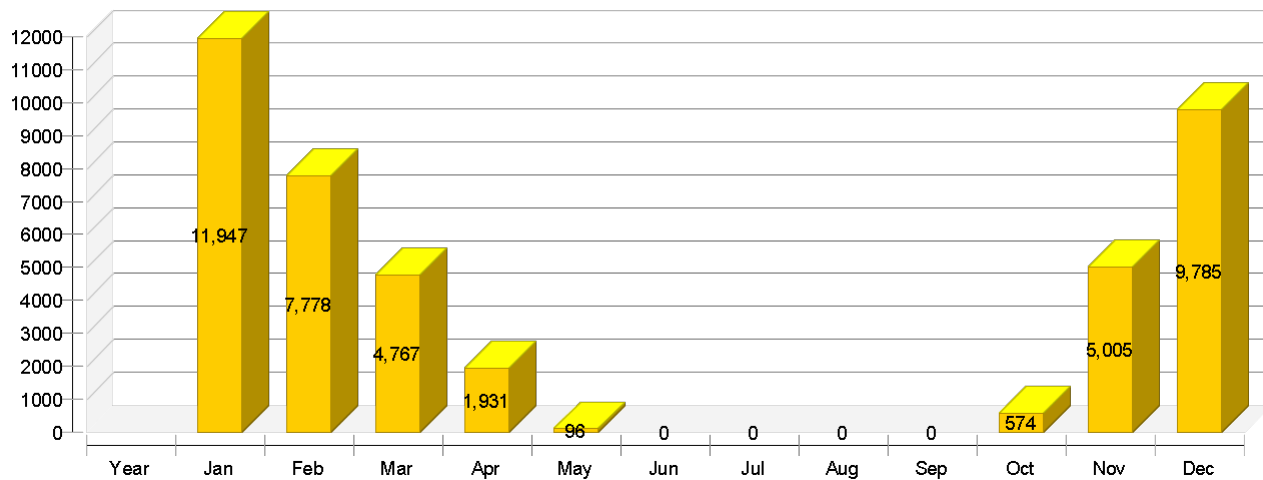
Solar thermal energy to the system [Qsol]

kBtu



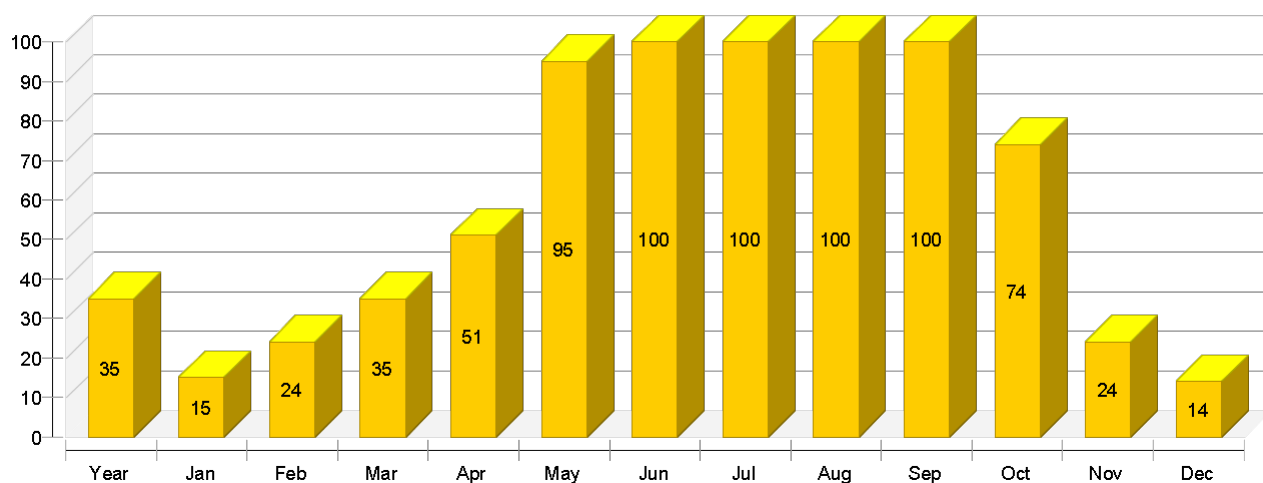
Heat generator energy to the system (solar thermal energy not included) [Qaux]

kBtu



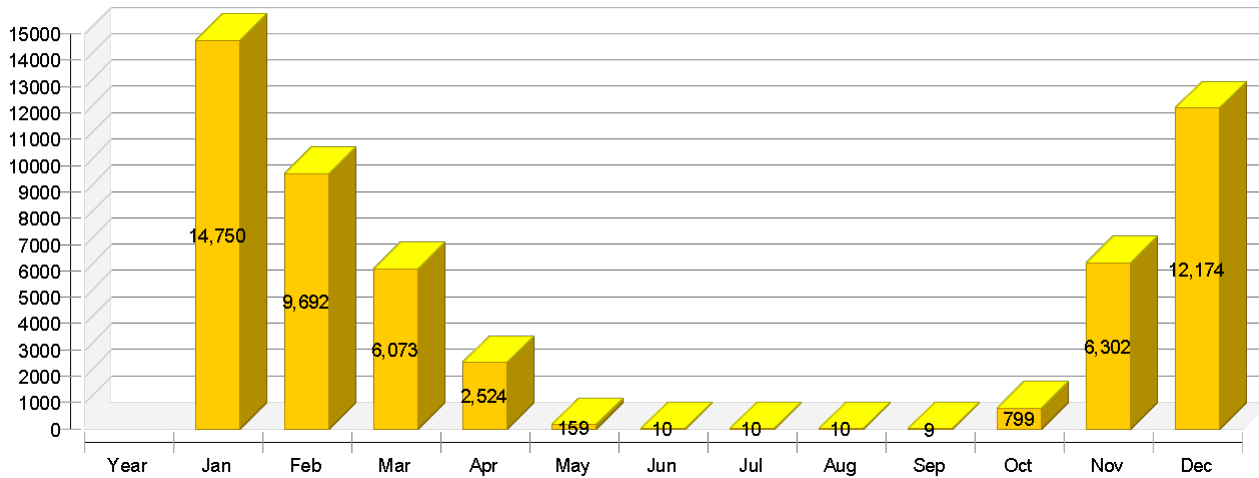
Solar fraction: fraction of solar energy to system [SFn]

%



## 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	22814	2028	2452	2622	2036	1896	1786	1800	1782	1646	1610	1558	1598
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### Heat generator energy to the system (solar thermal energy not included) [Qaux]

kBtu	41882	11947	7778	4767	1931	96	0	0	0	0	574	5005	9785
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### Heat generator fuel and electrical energy consumption [Eaux]

kBtu	51562	14524	9526	5955	2466	145	0	0	0	0	780	6191	11974
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### Solar fraction: fraction of solar energy to system [SFn]

%	35.3	14.5	24	35.5	51.3	95.2	100	100	100	100	73.7	23.7	14
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### Total fuel and/or electrical energy consumption of the system [Etot]

kBtu	52513	14750	9692	6073	2524	159	10	10	10	9	799	6302	12174
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### Irradiance onto collector area [Esol]

kBtu	105651	6461	7750	10213	9515	10029	10345	10988	10891	9901	8685	5723	5152
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### Electrical energy consumption of pumps [Epar]

kBtu	951	226	165	119	57	14	10	10	10	9	20	111	200
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### Heat loss to indoor room (including heat generator losses) [Qint]

kBtu	18149	3359	2455	1942	1203	735	686	698	718	679	842	1883	2947
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### Heat loss to surroundings (without collector losses) [Qext]

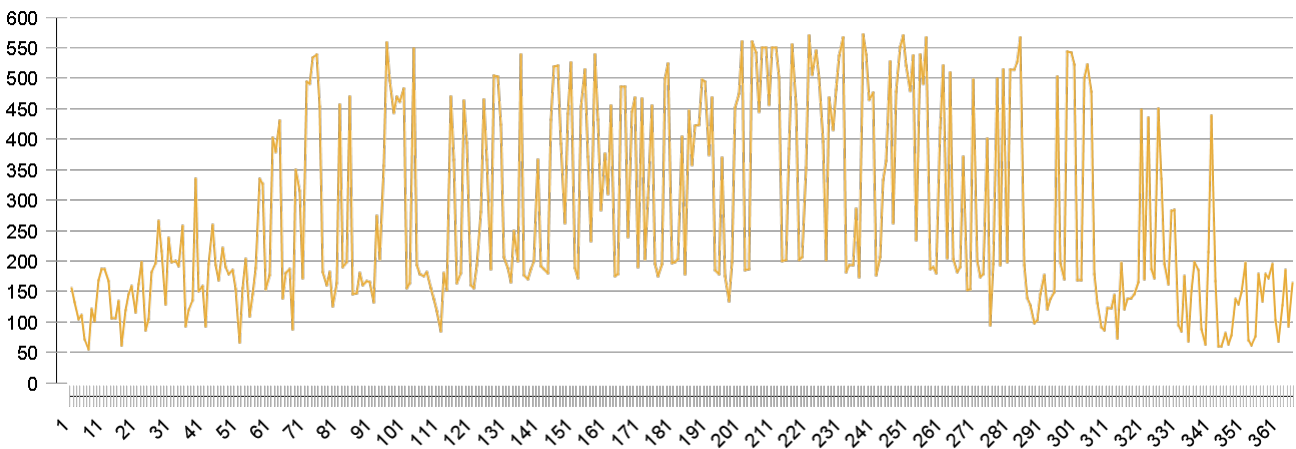
kBtu	507	42	49	50	47	49	45	42	42	40	37	34	30
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### Total energy consumption [Quse]

kBtu	56742	13367	9664	6674	3351	1256	1061	1064	1040	976	1507	5974	10808
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## Collector North America

Daily maximum temperature [ °F]



## Energy flow diagram

