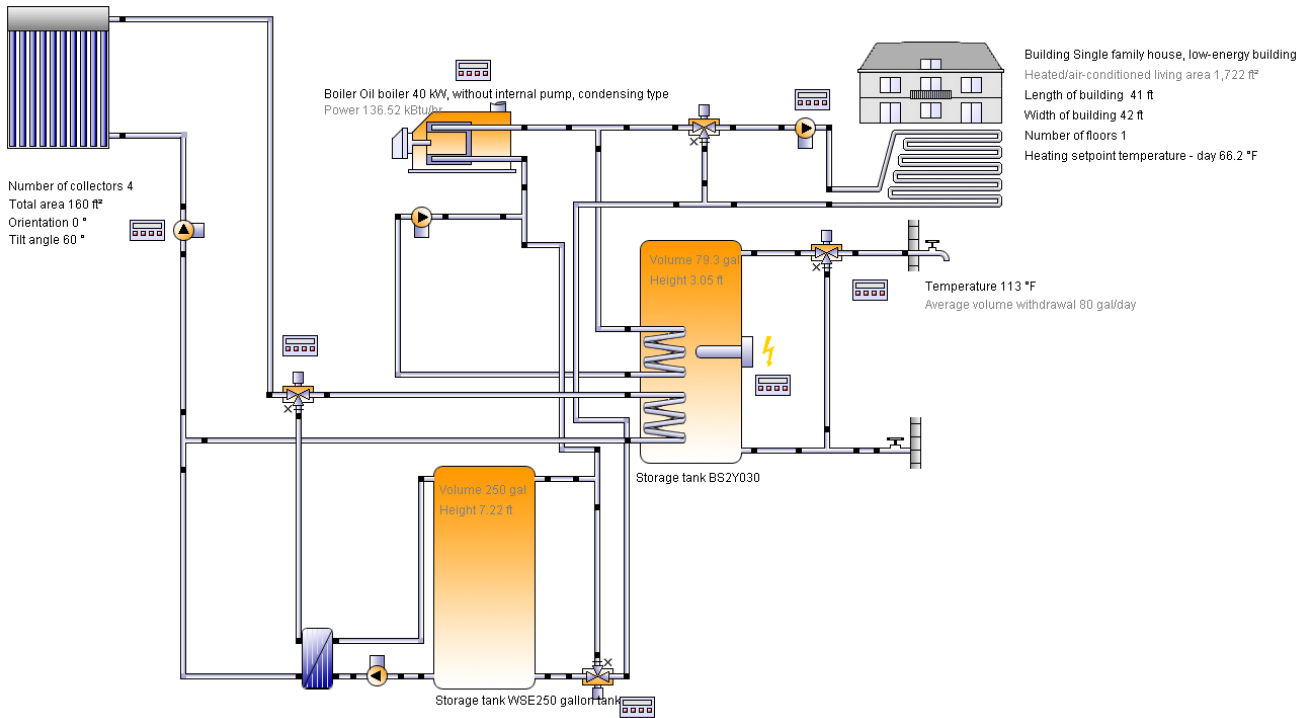


## Project

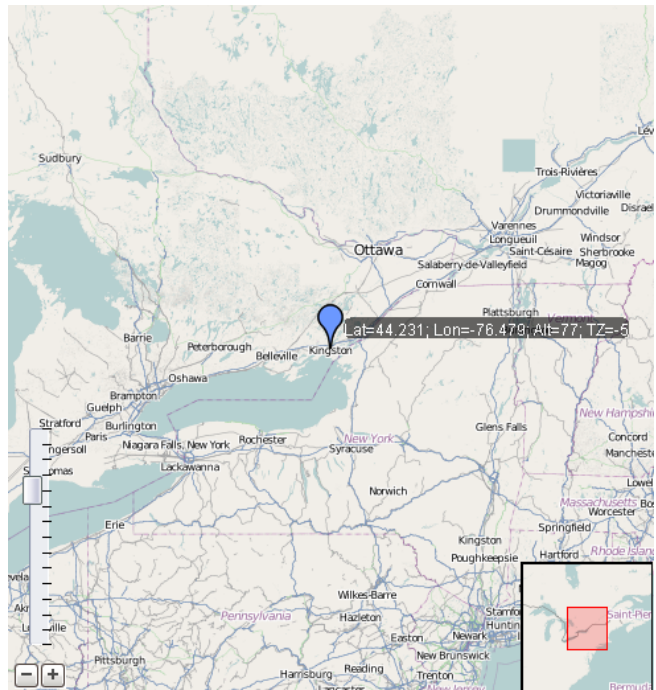
## WSE58ST Solar System DHW and Infloor heating



### Location of the system

Kingston (Downtown)  
 Longitude: -76.479°  
 Latitude: 44.231°  
 Elevation: 253 ft

### Map section



### This report has been created by:

William Elliott  
 303 47 Str.E  
 S7K 5H2 Saskatoon

## Comments on the project

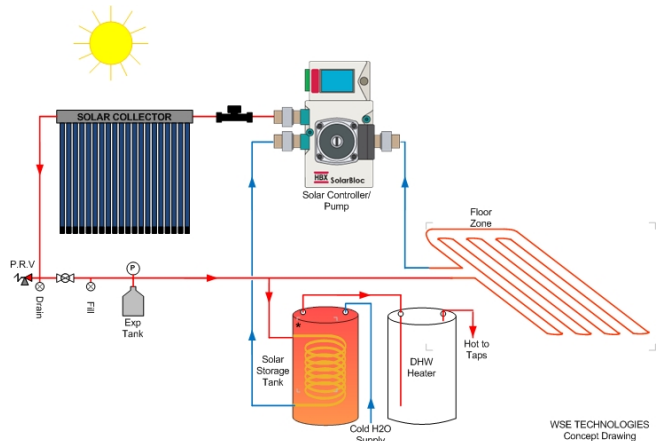
Note this design is to evaluate how effective our solar system will operate in your location and using the information you have supplied

Components used in quote

- 4 WSE58ST January Special \$750 \$3,000
- SOL 0100 Solar Controller with BTU meter \$995
- SOL 030D Double Wall Heat Exchanger \$304
- WSE Expansion Chamber \$52
- 2 Heat Dissipator \$500

Total \$4,851

## Photograph of property



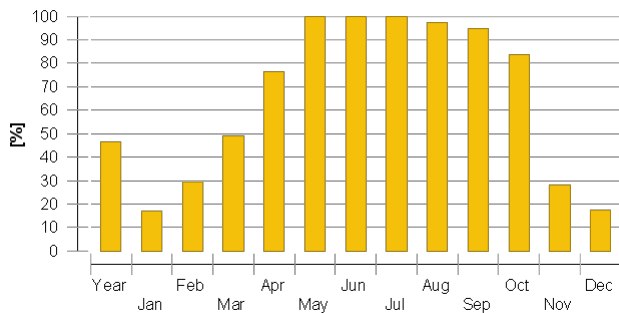
## System overview (annual values)

Total fuel and/or electrical energy consumption of the system [Etot]	37,123.7 kBtu
Total energy consumption [Quse]	45,035.9 kBtu
System performance (Quse / Etot)	1.21
Comfort demand	Energy demand covered

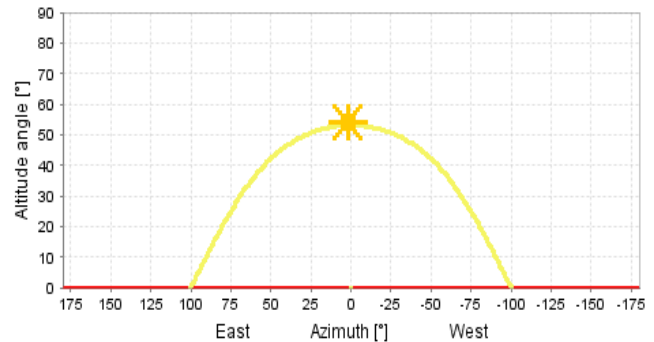
## Overview solar thermal energy (annual values)

Collector area	160 ft <sup>2</sup>
Solar fraction total	46.6%
Solar fraction hot water [SF <sub>n</sub> Hw]	63.8 %
Solar fraction building [SF <sub>n</sub> Bd]	22.9 %
Total annual field yield	25,477 kBtu
Collector field yield relating to gross area	159 kBtu/ft <sup>2</sup> /Year
Collector field yield relating to aperture area	168 kBtu/ft <sup>2</sup> /Year
Max. fuel savings	201.3 gal: [Heating oil]
Max. energy savings	25,997.3 kBtu
Max. reduction in CO2 emissions	5,050.4 pound

## Solar fraction: fraction of solar energy to system [SF<sub>n</sub>]



## Horizon line



## Meteorological data-Overview

Outdoor temperature 24h	47.1 °F
Annual global irradiance	437.5 kBtu/ft <sup>2</sup>
Annual diffuse irradiance	187.6 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	761.908 CAD
Solar energy cost per kWh	0.02 CAD
Payback period	7 years
Present value of the system	83,236.07 CAD
Net present value	78,236.07 CAD

## Component overview (annual values)

<b>Boiler</b>	<b>Oil boiler 40 kW, without internal pump, condensing type</b>	
Power	kBtu/hr	136.52
Total efficiency	%	79.8
Energy from/to the system [Qaux]	kBtu	29,168.3
Fuel and electrical energy consumption [Eaux]	kBtu	36,545.7
Energy savings solar thermal	kBtu	25,997.3
CO <sub>2</sub> savings solar thermal	pound	5,050.4
Fuel savings solar thermal	gal	201.3

<b>Collector North America</b>	<b>WSE58ST</b>	
Data Source		u138368
Number of collectors		4
Number of arrays		2
Total area	ft <sup>2</sup>	160
Total aperture area	ft <sup>2</sup>	152
Tilt angle	°	60
Orientation	°	0
Collector field yield [Qsol]	kBtu	25,477.3
Irradiation onto collector area [Esol]	kBtu	77,780.2
Collector efficiency [Qsol / Esol]	%	32.8
Direct irradiation after IAM	kBtu	51,309.1
Diffuse irradiation after IAM	kBtu	34,296.6

<b>Building</b>	<b>Single family house, low-energy building</b>	
Heated/air-conditioned living area	ft <sup>2</sup>	1,722
Heating setpoint temperature	°F	66.2
Heating energy demand excluding DHW [Qdem]	kBtu	28,164.9
Specific heating energy demand excluding DHW [Qdem]	kBtu/ft <sup>2</sup>	16.4
Solar gain through windows	kBtu	44,618.3
Total energy losses	kBtu	89,452

<b>Convector</b>	<b>Floor heating 1000W</b>	
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	28,099.7
<b>Hot water demand</b>	<b>Constant</b>	
Withdraw volume	gal/d	80.3
Temperature setting	°F	113
Energy from/to the system [Quse]	kBtu	16,871
<b>External heat exchanger</b>	<b>Plate heat exchanger, small</b>	
Transfer capacity	W/K	5,000
<b>Pump 1</b>	<b>Giacomini R586S</b>	
Circuit pressure drop	psi	0.334
Flow rate	gpm	1.9
Fuel and electrical energy consumption [Epar]	kBtu	291.1
<b>Pump 3</b>	<b>Giacomini R586S</b>	
Circuit pressure drop	psi	0.106
Flow rate	gpm	3.1
Fuel and electrical energy consumption [Epar]	kBtu	44.6
<b>Pump 4</b>	<b>Giacomini R586S-1</b>	
Circuit pressure drop	psi	0.059
Flow rate	gpm	2.3
Fuel and electrical energy consumption [Epar]	kBtu	164.4
<b>Pump 2</b>	<b>Giacomini R586S</b>	
Circuit pressure drop	psi	0.091
Flow rate	gpm	2.6
Fuel and electrical energy consumption [Epar]	kBtu	78

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		1,796.5
Connection losses	kBtu		1,035.5

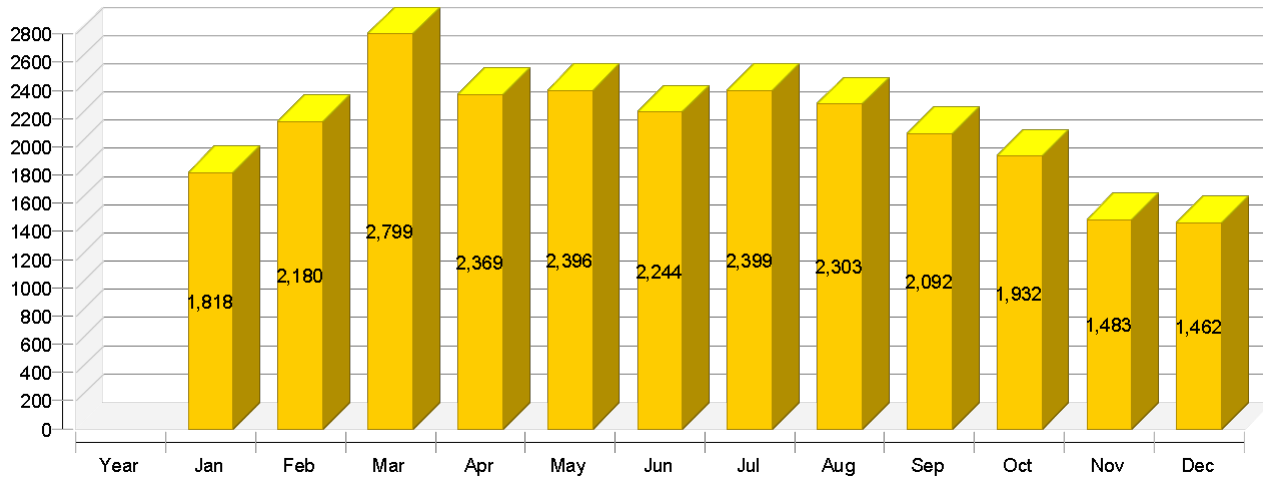
Storage tank 2		WSE250 gallon tank	
Volume	gal		250
Height	ft		7.22
Material			Enameled steel
Insulation			Flexible polyurethane foam
Thickness of insulation	in		4
Heat loss	kBtu		2,646.6
Connection losses	kBtu		1,210.3

## Loop

Solar loop			
Fluid mixture			Ethylene mixture
Fluid concentration	%		33.3
Fluid domains volume	gal		8.2
Pressure on top of the circuit	psi		58.016

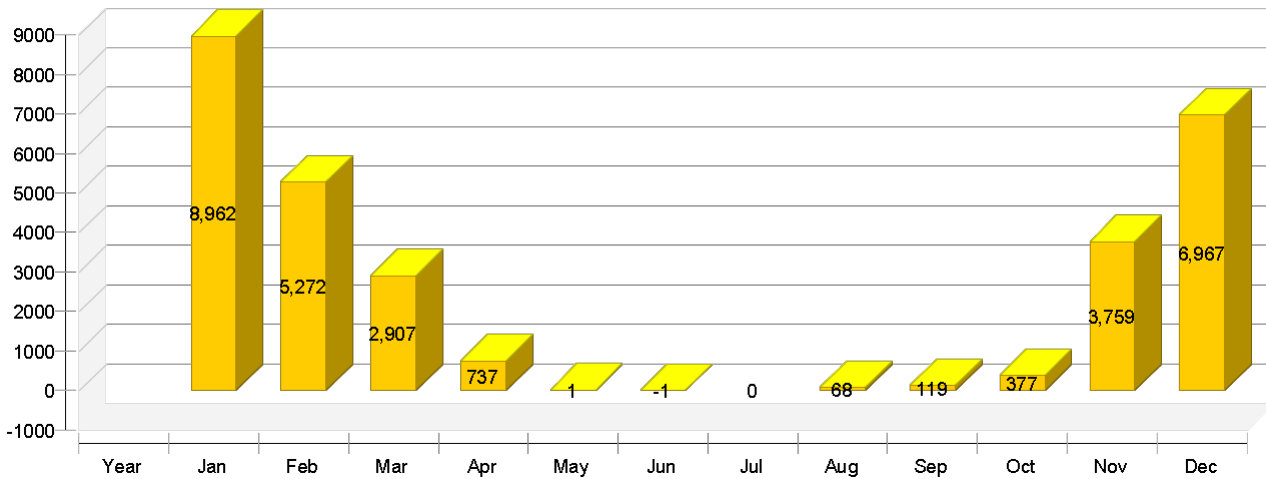
Solar thermal energy to the system [Qsol]

kBtu



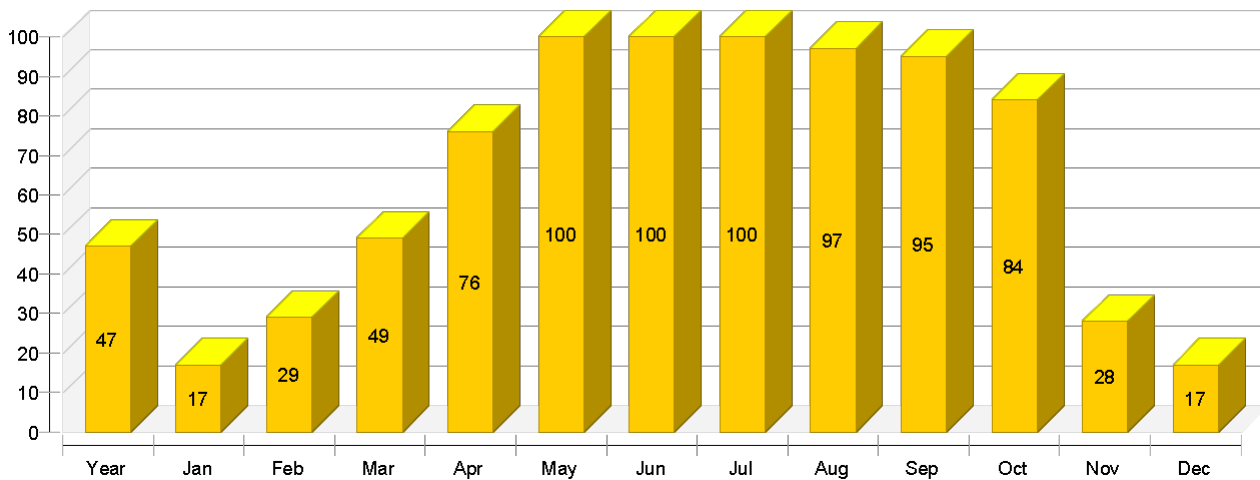
Heat generator energy to the system (solar thermal energy not included) [Qaux]

kBtu



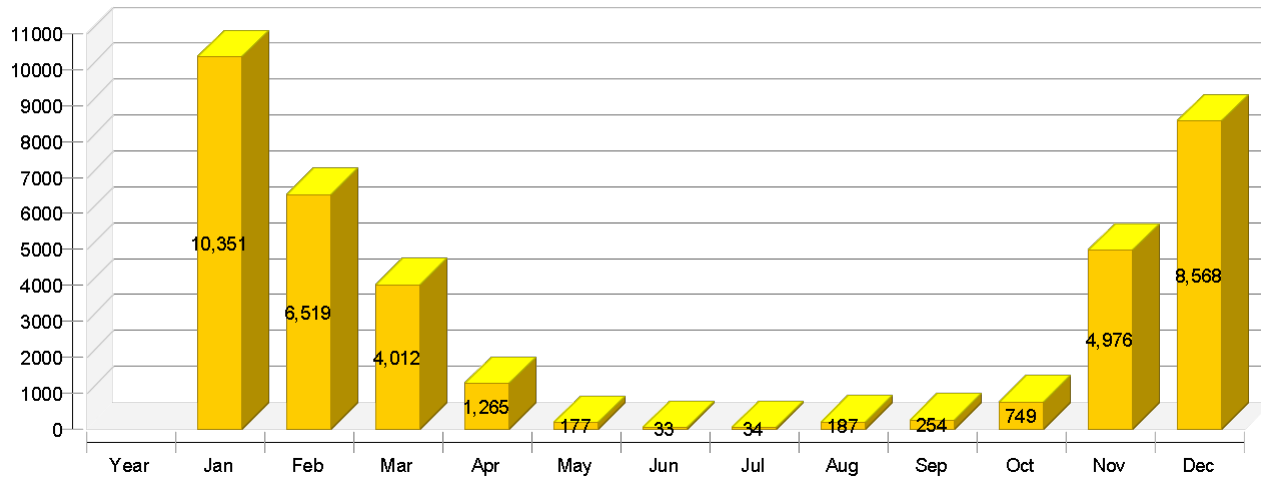
Solar fraction: fraction of solar energy to system [SFn]

%



## 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	25477	1818	2180	2799	2369	2396	2244	2399	2303	2092	1932	1483	1462
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### Heat generator energy to the system (solar thermal energy not included) [Qaux]

kBtu	29168	8962	5272	2907	737	1	-1	0	68	119	377	3759	6967
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### Heat generator fuel and electrical energy consumption [Eaux]

kBtu	36546	10268	6451	3949	1224	143	0	0	153	222	718	4924	8494
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### Solar fraction: fraction of solar energy to system [SFn]

%	46.6	16.9	29.3	49.1	76.3	100	100	100	97.1	94.6	83.7	28.3	17.3
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### Total fuel and/or electrical energy consumption of the system [Etot]

kBtu	37124	10351	6519	4012	1265	177	33	34	187	254	749	4976	8568
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### Irradiation onto collector area [Esol]

kBtu	77780	5295	6163	7937	7188	7420	7039	7574	7462	6932	6273	4222	4275
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### Electrical energy consumption of pumps [Epar]

kBtu	578	82	68	63	41	35	33	34	34	32	32	52	73
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### Heat loss to indoor room (including heat generator losses) [Qint]

kBtu	17137	1865	1778	1792	1310	1064	900	1065	1111	1086	1260	1748	2158
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### Heat loss to surroundings (without collector losses) [Qext]

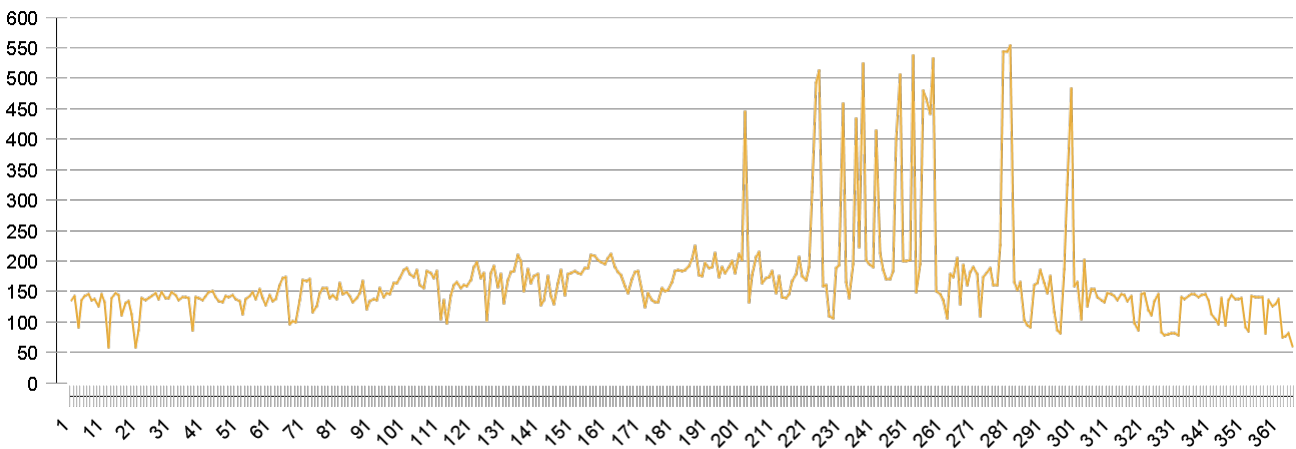
kBtu	496	35	38	47	49	50	46	50	44	43	40	26	28
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### Total energy consumption [Quse]

kBtu	45036	10170	7009	4884	2199	1473	1349	1329	1295	1257	1388	4719	7964
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## Collector North America

Daily maximum temperature [ °F]



## Energy flow diagram

