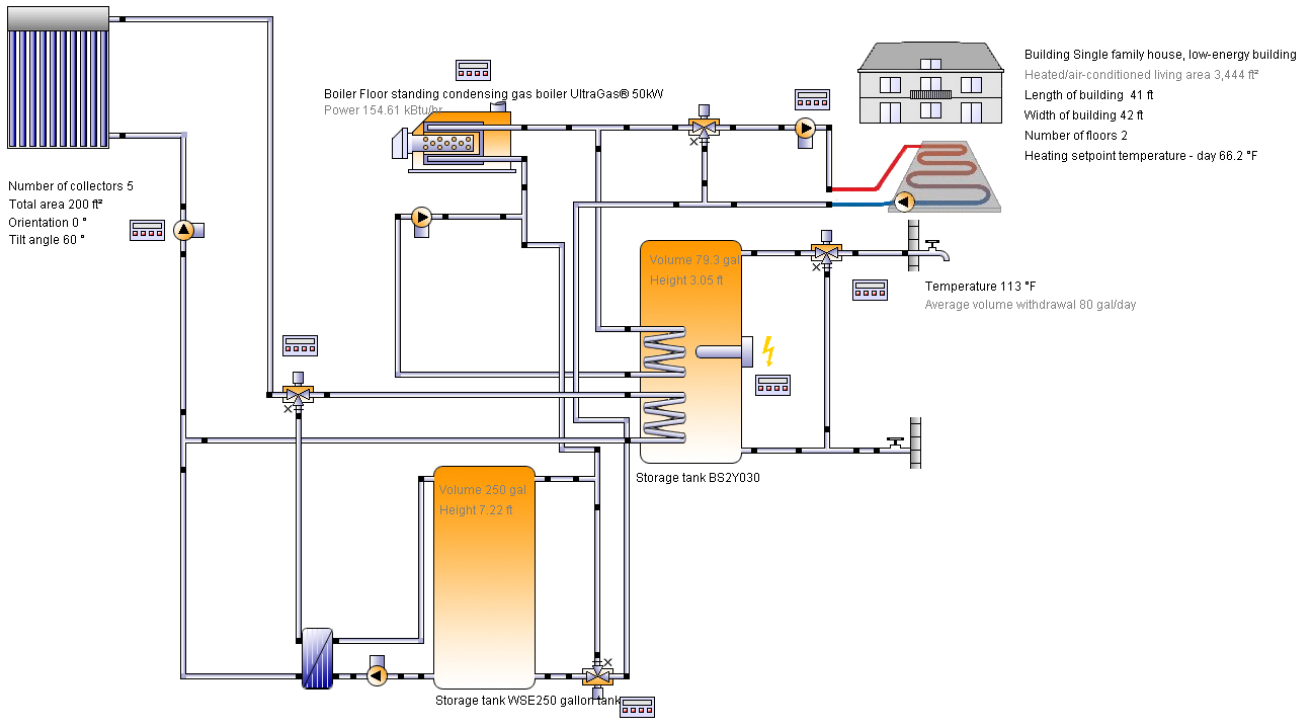


Project

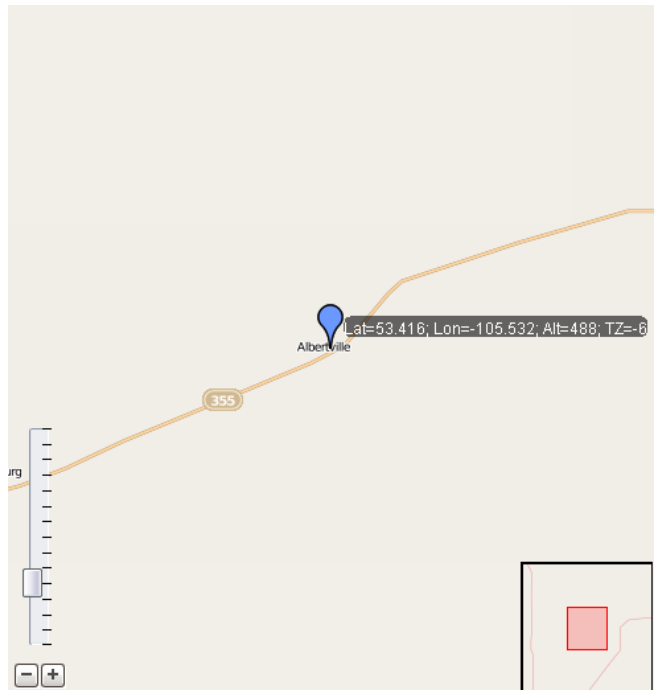
WSE58ST Solar System DHW and Infloor heating



Location of the system

Albertville
Longitude: -105.532°
Latitude: 53.416°
Elevation: 1,601 ft

Map section



This report has been created by:

William Elliott
303 47 Str.E
S7K 5H2 Saskatoon

Comments on the project

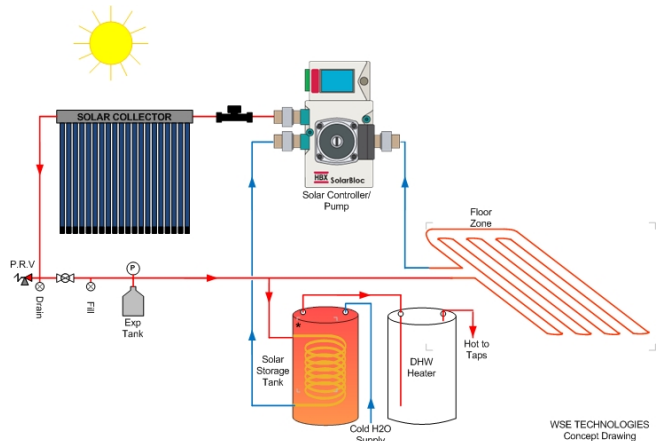
Note this design is to evaluate how effective our solar system will operate in your location and using the information you have supplied

Components used in quote

- 5 WSE58ST January Special \$750 \$3,750
- SOL 0100 Solar Controller with BTU meter \$995
- SOL 030D Double Wall Heat Exchanger \$304
- WSE Expansion Chamber \$52
- Need 250 gallon tank
- additional pump \$1,000

Total \$5351

Photograph of property



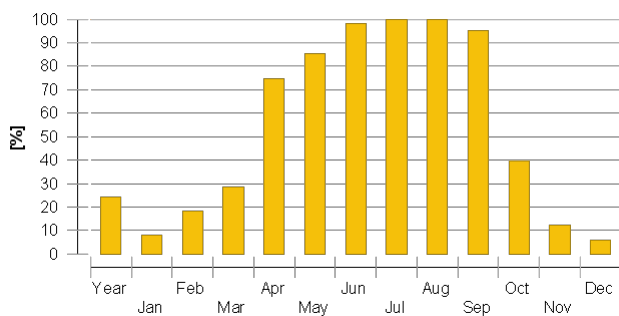
System overview (annual values)

Total fuel and/or electrical energy consumption of the system [Etot]	108,139.6 kBtu
Total energy consumption [Quse]	128,259.5 kBtu
System performance (Quse / Etot)	1.19
Comfort demand	Energy demand covered

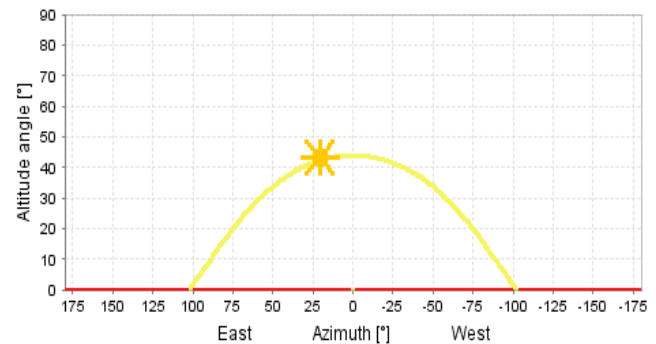
Overview solar thermal energy (annual values)

Collector area	200 ft ²
Solar fraction total	24.4%
Solar fraction hot water [SF _n Hw]	57.2 %
Solar fraction building [SF _n Bd]	15.4 %
Total annual field yield	33,016 kBtu
Collector field yield relating to gross area	165 kBtu/ft ² /Year
Collector field yield relating to aperture area	174 kBtu/ft ² /Year
Max. fuel savings	33,759.1 ft ³ : [Natural gas H]
Max. energy savings	34,249.2 kBtu
Max. reduction in CO2 emissions	5,124.8 pound

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



Horizon line



Meteorological data-Overview

Outdoor temperature 24h	35.4 °F
Annual global irradiance	399.1 kBtu/ft ²
Annual diffuse irradiance	159.2 kBtu/ft ²

Financial analysis - Solar thermal

Purchase costs	5,400 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
Natural gas H	0.031 CAD/ft ³ ; 0.031 CAD/kBtu
Effective purchase cost after grants	5,400 CAD
Annual fuel cost savings	1,053.937 CAD
Solar energy cost per kWh	0.02 CAD
Payback period	5 years
Present value of the system	115,313.703 CAD
Net present value	109,913.703 CAD

Component overview (annual values)

Boiler	Floor standing condensing gas boiler UltraGas® 50kW	
Power	kBtu/hr	154.61
Total efficiency	%	95.1
Energy from/to the system [Qaux]	kBtu	102,131.6
Fuel and electrical energy consumption [Eaux]	kBtu	107,340.7
Energy savings solar thermal	kBtu	34,249.2
CO savings solar thermal	pound	5,124.8
Fuel savings solar thermal	ft³	33,759.1

Collector North America	WSE58ST	
Data Source		u138368
Number of collectors		5
Number of arrays		2
Total area	ft²	200
Total aperture area	ft²	190
Tilt angle	°	60
Orientation	°	0
Collector field yield [Qsol]	kBtu	33,016.3
Irradiation onto collector area [Esol]	kBtu	107,621.8
Collector efficiency [Qsol / Esol]	%	30.7
Direct irradiation after IAM	kBtu	77,931.6
Diffuse irradiation after IAM	kBtu	40,910.8

Building	Single family house, low-energy building	
Heated/air-conditioned living area	ft²	3,444
Heating setpoint temperature	°F	66.2
Heating energy demand excluding DHW [Qdem]	kBtu	109,149.2
Specific heating energy demand excluding DHW [Qdem]	kBtu/ft²	31.7
Solar gain through windows	kBtu	106,713.8
Total energy losses	kBtu	248,164.8

Convector	Floor heating 2000 sq.ft.	
Number of heating/cooling modules	-	12
Power per heating module under standard conditions	kBtu/hr	51
Nominal inlet temperature	°F	113
Nominal return temperature	°F	95
Net energy from/to heating/cooling modules	kBtu	107,968.1
Hot water demand	Constant	
Withdraw volume	gal/d	80.3
Temperature setting	°F	113
Energy from/to the system [Quse]	kBtu	19,110.3
External heat exchanger	Plate heat exchanger, small	
Transfer capacity	W/K	5,000
Pump 1	Giacomini R586S	
Circuit pressure drop	psi	0.348
Flow rate	gpm	2
Fuel and electrical energy consumption [Epar]	kBtu	290.6
Pump 3	Giacomini R586S	
Circuit pressure drop	psi	0.158
Flow rate	gpm	3.1
Fuel and electrical energy consumption [Epar]	kBtu	65
Pump 4	Giacomini R586S-1	
Circuit pressure drop	psi	0.395
Flow rate	gpm	4
Fuel and electrical energy consumption [Epar]	kBtu	337.9
Pump 2	Giacomini R586S	
Circuit pressure drop	psi	0.091
Flow rate	gpm	2.6
Fuel and electrical energy consumption [Epar]	kBtu	105.5

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		1,584.8
Connection losses	kBtu		868.7

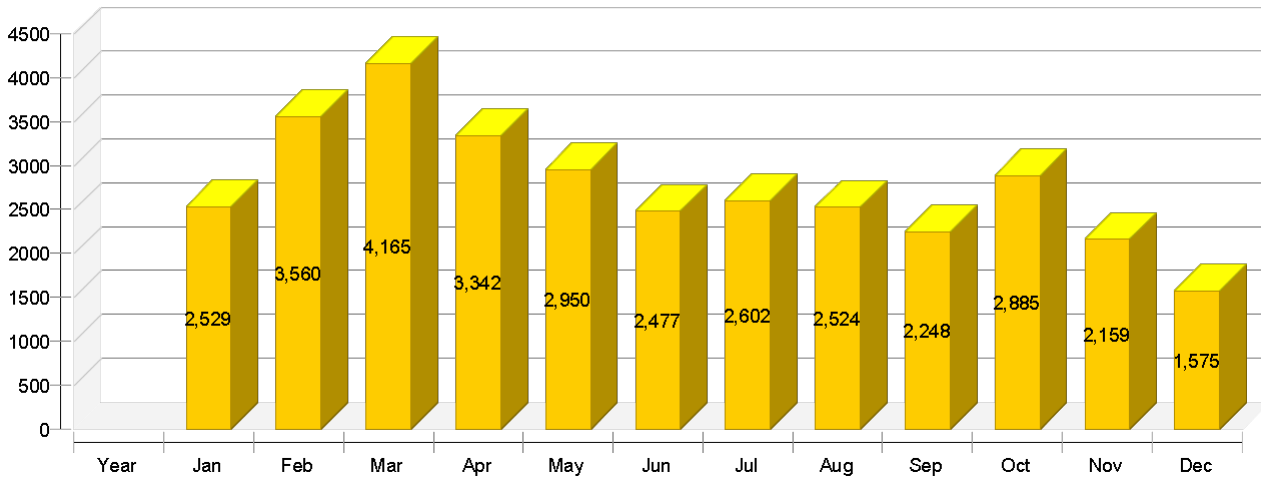
Storage tank 2		WSE250 gallon tank	
Volume	gal		250
Height	ft		7.22
Material			Enameled steel
Insulation			Flexible polyurethane foam
Thickness of insulation	in		4
Heat loss	kBtu		2,247.5
Connection losses	kBtu		1,010.5

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

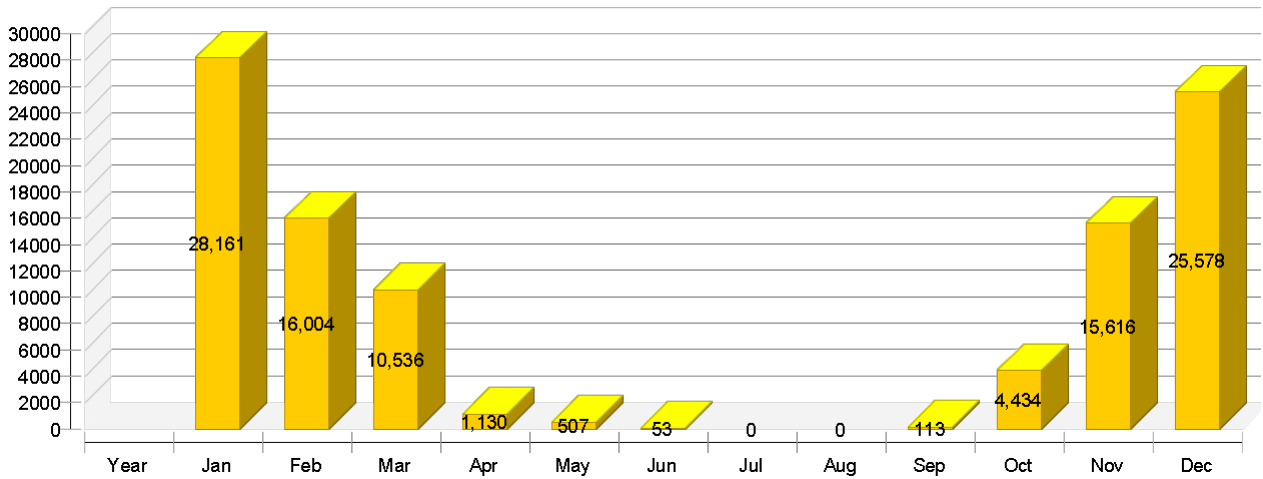
Solar thermal energy to the system [Qsol]

kBtu



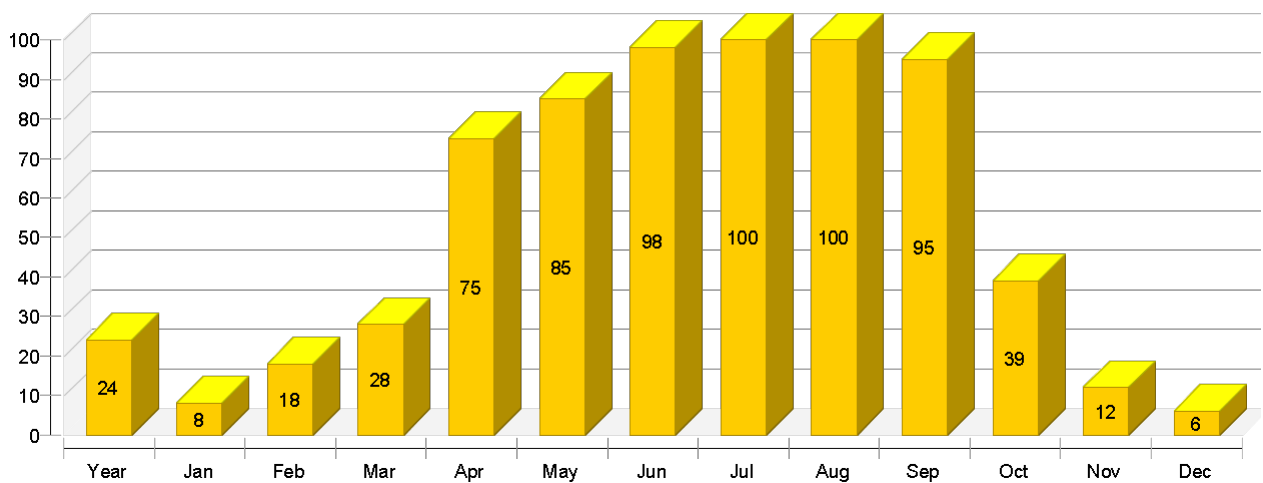
Heat generator energy to the system (solar thermal energy not included) [Qaux]

kBtu



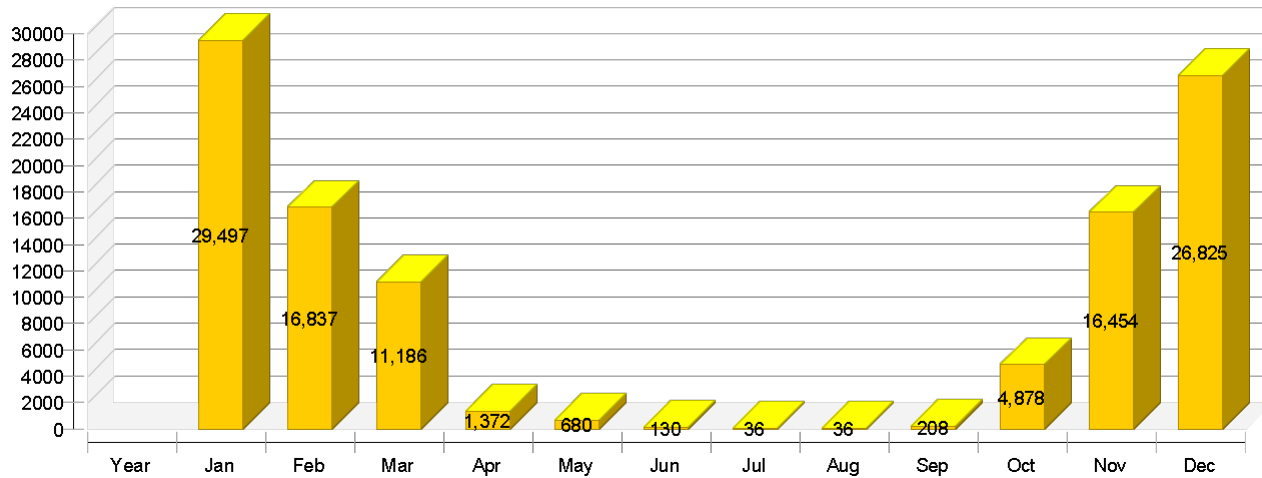
Solar fraction: fraction of solar energy to system [SFn]

%



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	33016	2529	3560	4165	3342	2950	2477	2602	2524	2248	2885	2159	1575
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Heat generator energy to the system (solar thermal energy not included) [Qaux]

kBtu	102132	28161	16004	10536	1130	507	53	0	0	113	4434	15616	25578
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Heat generator fuel and electrical energy consumption [Eaux]

kBtu	107341	29369	16738	11096	1326	640	94	0	0	176	4824	16364	26713
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Solar fraction: fraction of solar energy to system [SFn]

%	24.4	8.2	18.2	28.3	74.7	85.3	97.9	100	100	95.2	39.4	12.1	5.8
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Total fuel and/or electrical energy consumption of the system [Etot]

kBtu	108140	29497	16837	11186	1372	680	130	36	36	208	4878	16454	26825
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Irradiation onto collector area [Esol]

kBtu	107622	7507	9557	11297	10640	10246	9383	10302	10216	9421	8058	6037	4958
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Electrical energy consumption of pumps [Epar]

kBtu	799	128	99	90	46	40	35	36	36	33	54	90	112
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Heat loss to indoor room (including heat generator losses) [Qint]

kBtu	13550	1566	1119	1029	1026	1093	1038	1066	1021	1029	1008	1101	1455
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Heat loss to surroundings (without collector losses) [Qext]

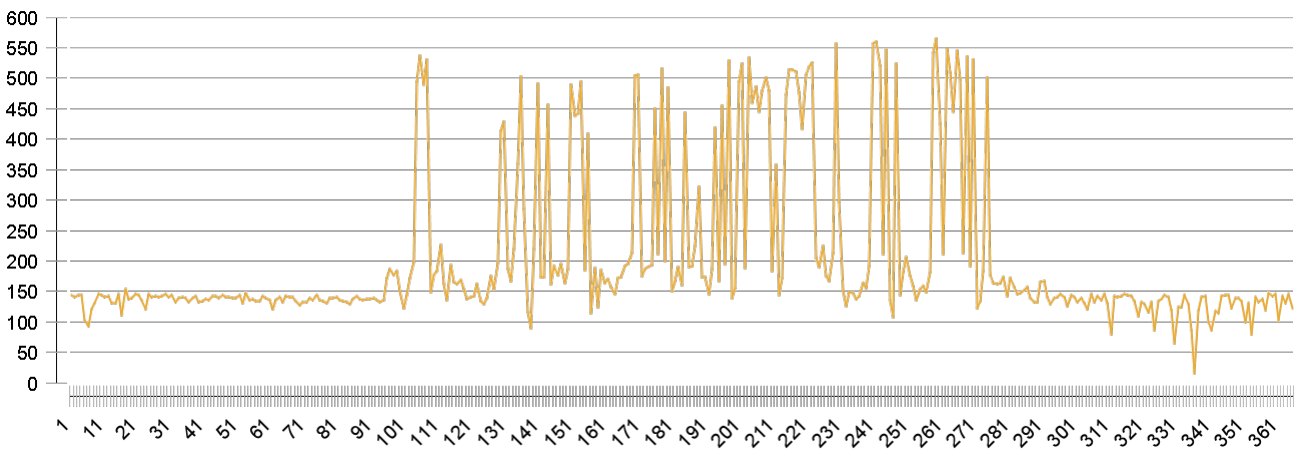
kBtu	520	44	43	47	51	51	50	48	43	43	38	30	31
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Total energy consumption [Quse]

kBtu	128250	30419	19291	14219	3816	2431	1698	1672	1630	1583	7093	17506	26902
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Collector North America

Daily maximum temperature [°F]



Energy flow diagram

