

Altherma Selection Report

Produced on 07.02.2008 with Altherma Simulator V1.6.1 - database Central 5.8

Project name Otoplenie
Reference teteven
Client name Vassil Nikolov

Only the data published in the data book are correct. This program uses close approximations of these data.

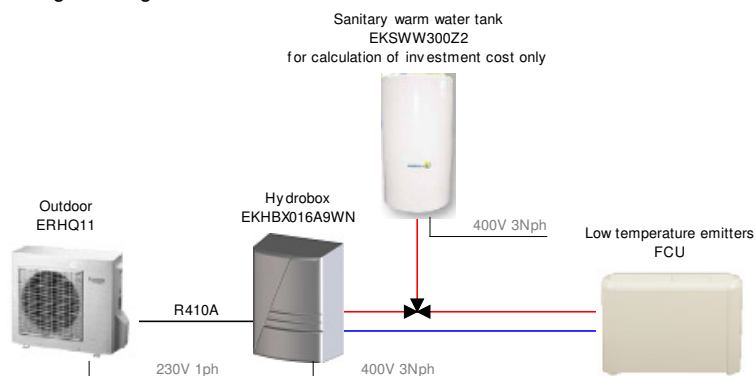
1. Material List

	Model
Outdoor	ERHQ11
Hydrobox	EKHBX016A9WN
Sanitary warm water tank	EKSWW300Z2

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2. Technical Details

Heating + Cooling



Hydrobox	EKHBX016A9WN
Function	Reversible
Dimensions	502x922x361 mm
Capacity electric heater	9,0 kW
Capacity steps	2
Power supply	400V 3Nph
Fuse size	16A
Leaving water range heating	25,0 - 50,0 °C
Leaving water range cooling	7,0 - 20,0 °C
Drain connection	18mm
Material	Epoxy polyester painted galvanized steel

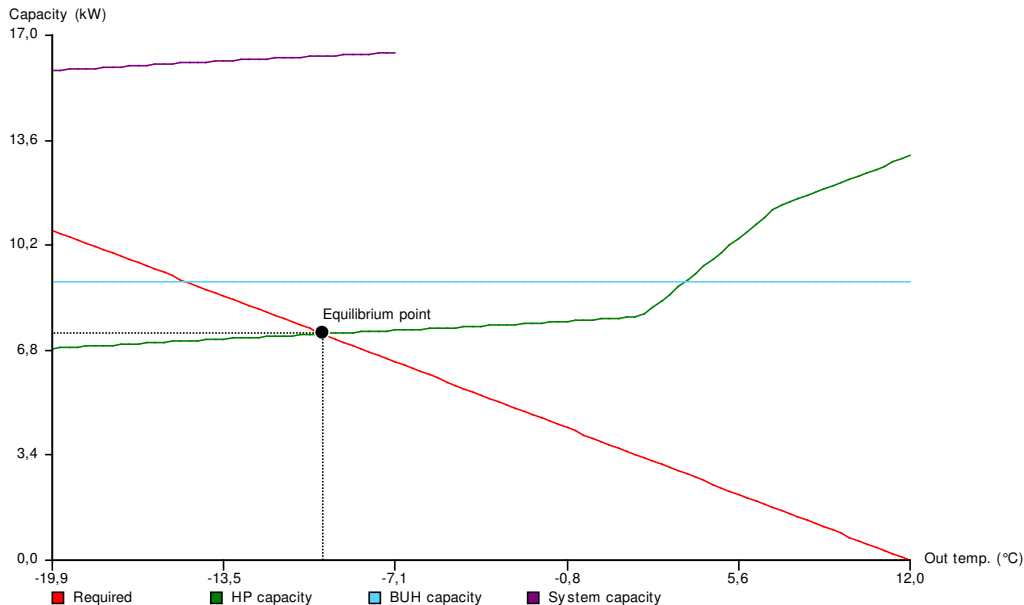
Sanitary warm water tank	EKSWW300Z2
Water volume	300 l
Max. water temperature	85,0 °C
Dimensions	580x1600 mm
Electric heater	3,0 kW
Power supply	400V 3Nph
Fuse size	20
Material inside tank	Stainless steel
Material outside tank	Epoxy-coated mild steel
Weight	59kg

Outdoor	ERHQ11
Dimensions	980x1349x420 mm
Nominal heating capacity	11,2 kW
COP	4,5
Operation range heating	-20,0 - 25,0 °C
Nominal cooling capacity	13,9 kW
EER	3,7
Operation range cooling	10,0 - 46,0 °C
Power supply	230V 1ph
Fuse size	32A
Sound pressure	64dBA
Weight	103kg

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3. Graphs

Required and available capacities



Equilibrium point -9,9°C / 7,3 kW Seasonal COP 2,7
 Total thermal energy 20707 kWh

HP capacity (Heatpump capacity):

The integrated heat generation capacity of the heatpump. This value takes into account the energy used for the defrost cycle.

Heat pump capacity depends on the outside temperature and the leaving water temperature. The simulator calculates the heatpump capacity at the minimum night temperature in the winter as described in the meteorological data, and at the selected maximum leaving water temperature (Default values 35°C for floor heating, 45°C for fan coil units and 50°C for low temperature radiators).

The simulator can not calculate accurate capacity values for outside temperatures below -15°C.

BUH capacity (Backup heater capacity):

The nominal heat generation capacity of the electrical backup heater.

System capacity:

Total heat generation capacity of the system, i.e. the sum of heat pump capacity and backup heater capacity.

Spare capacity:

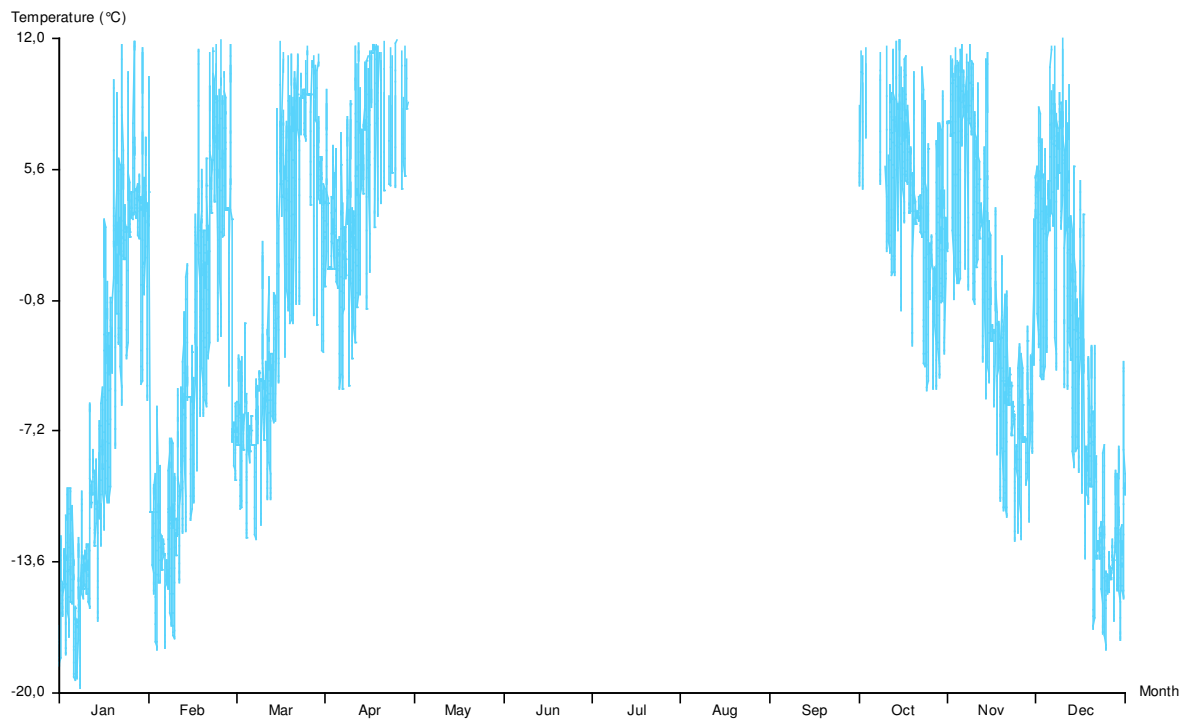
The surplus in heat generation capacity when compared to the required heating capacity, i.e. the difference between system capacity and required capacity.

Equilibrium point or equilibrium temperature:

The outside ambient temperature at which the heat pump capacity matches the heating demand. It is therefore the lowest outside temperature at which no additional heat source is needed. The heat pump can cover the entire heating demand down to this outside temperature. For outside temperatures below this equilibrium temperature, additional heat from the backup heater is required to fulfill the heating demand. During transient conditions at system heat-up, the equilibrium point can shift to a higher temperature than the one it would be at during normal operations.

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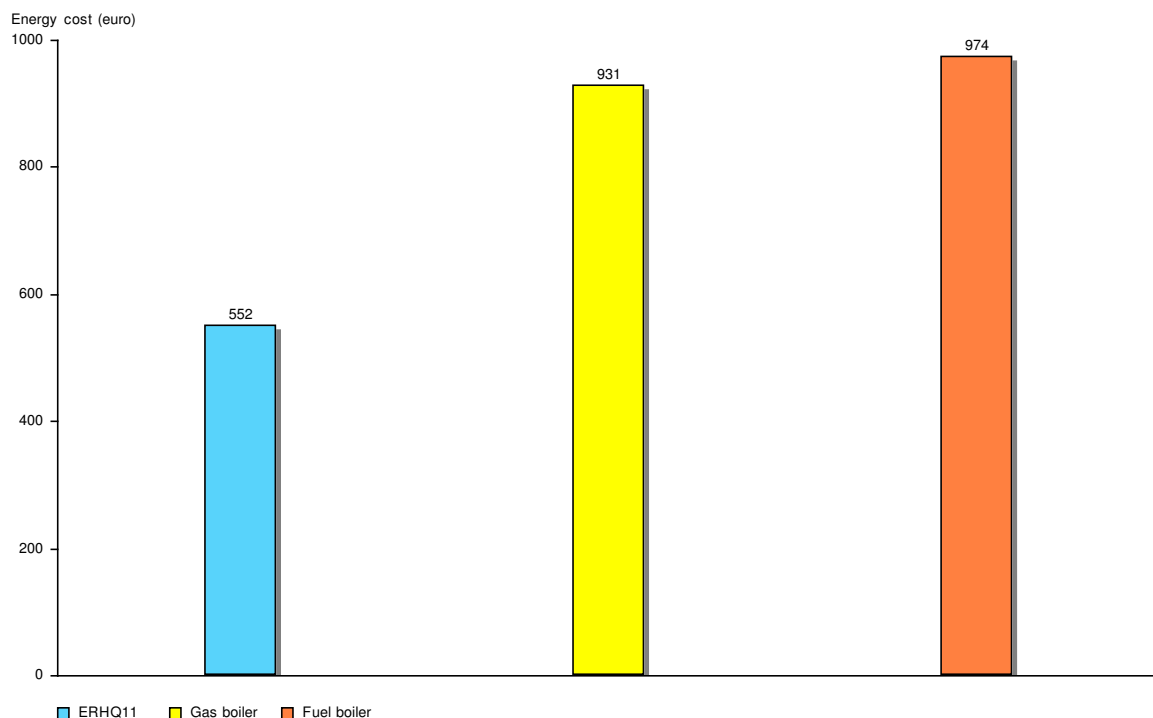
Heating period



Location	Country	Bulgaria
	City	Sofia *
Temperatures (min / max)	Summer Day	26,4 / 33,7°C
	Summer Night	9,5 / 14,8°C
	Winter Day	-13,1 / 12,6°C
	Winter Night	-19,9 / -3,8°C

The graph shows the simulated outdoor temperature variations within the defined heating months.

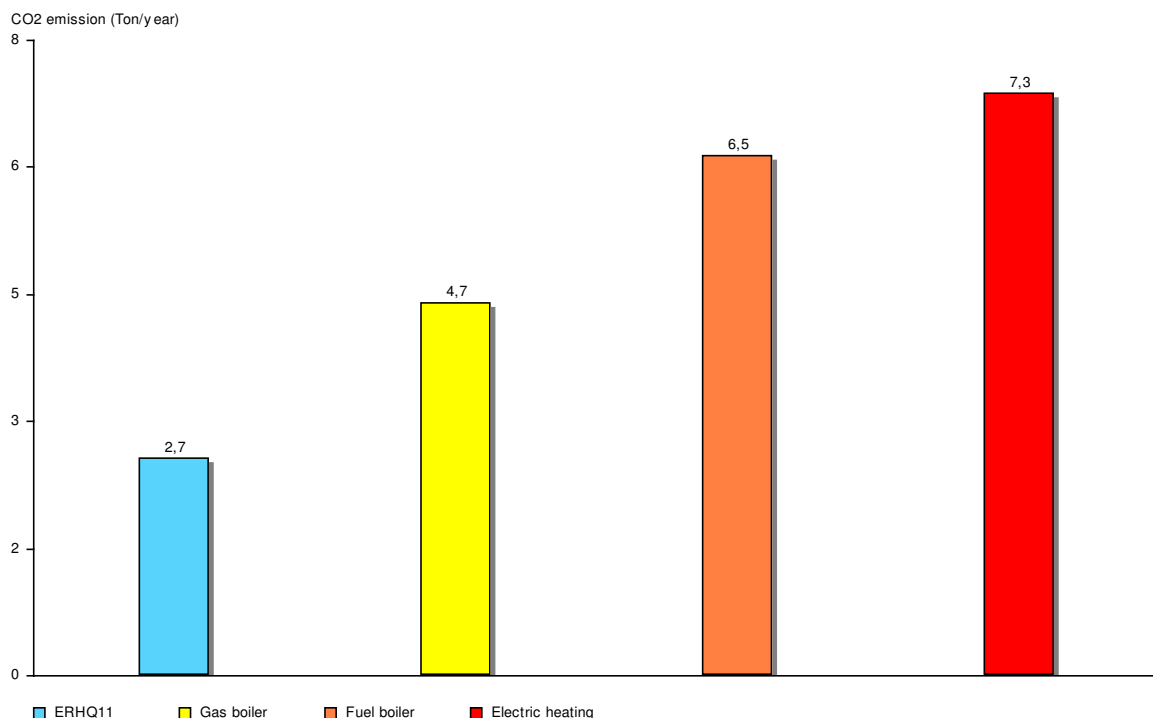
Energy cost



Electricity normal tariff	High	0,09 euro/kWh
	Low	0,05 euro/kWh
Electricity heat pump tariff	High	0,09 euro/kWh
	Low	0,05 euro/kWh
Electricity	Direct heater efficiency	100%
Gas	Tariff	0,04 euro/kWh
	Efficiency	89%
Fuel	Tariff	0,04 euro/kWh
	Efficiency	85%
Design conditions	Required capacity	10,7 kW
	Surface to be heated	150 m ²
	Zero capacity at outside temperature	12,0 °C

The graph shows a comparison of the simulated annual running costs for Altherma, a gas boiler and an oil boiler. The calculation is based upon the selected buildings yearly required thermal input, each systems coefficient of performance (without pump) and the inputted energy prices.

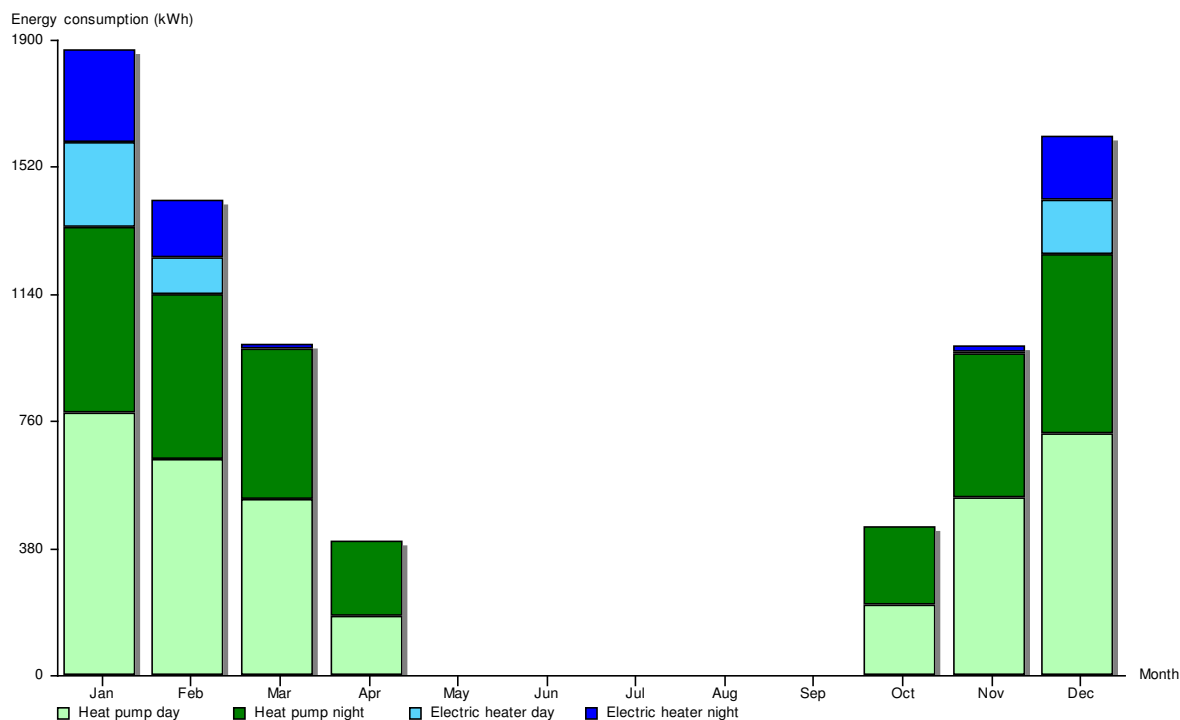
CO2 emission



Location	Country	Bulgaria
Electricity	CO2 emission	0,354 kg/kWh
	Direct heater efficiency	100%
Gas	CO2 emission	0,202 kg/kWh
	Efficiency	89%
Fuel	CO2 emission	0,2686 kg/kWh
	Efficiency	85%
Design conditions	Required capacity	10,7 kW
	Surface to be heated	150 m²
	Zero capacity at outside temperature	12,0 °C

The graph shows a comparison of the annual CO2 emissions for Altherma, an electric heating system, a gas boiler and an oil boiler sized to cover the yearly heat load for the simulated building. Neither Altherma nor the electric heater will have any direct emissions. The emission from these systems is based on calculations according to the average CO2 emission from the selected country's electricity production.

Energy consumption per month



Total for year

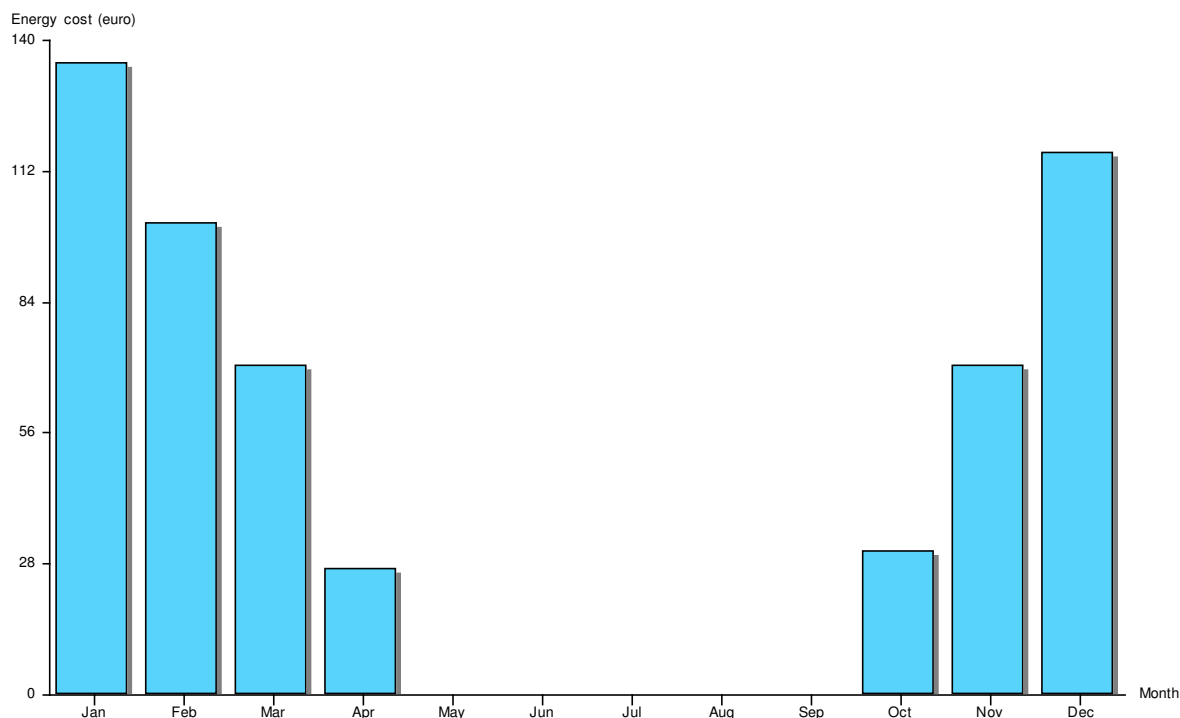
7732 kWh

Design conditions

Required capacity 10,7 kW
Surface to be heated 150 m²
Zero capacity at outside temperature 12,0 °C

The graph shows the energy consumption (input) per month for the heat pump and back up heater. There is made a separation between day and night operation to show the amount of energy consumption that falls under day and night tariff.

Energy cost per month



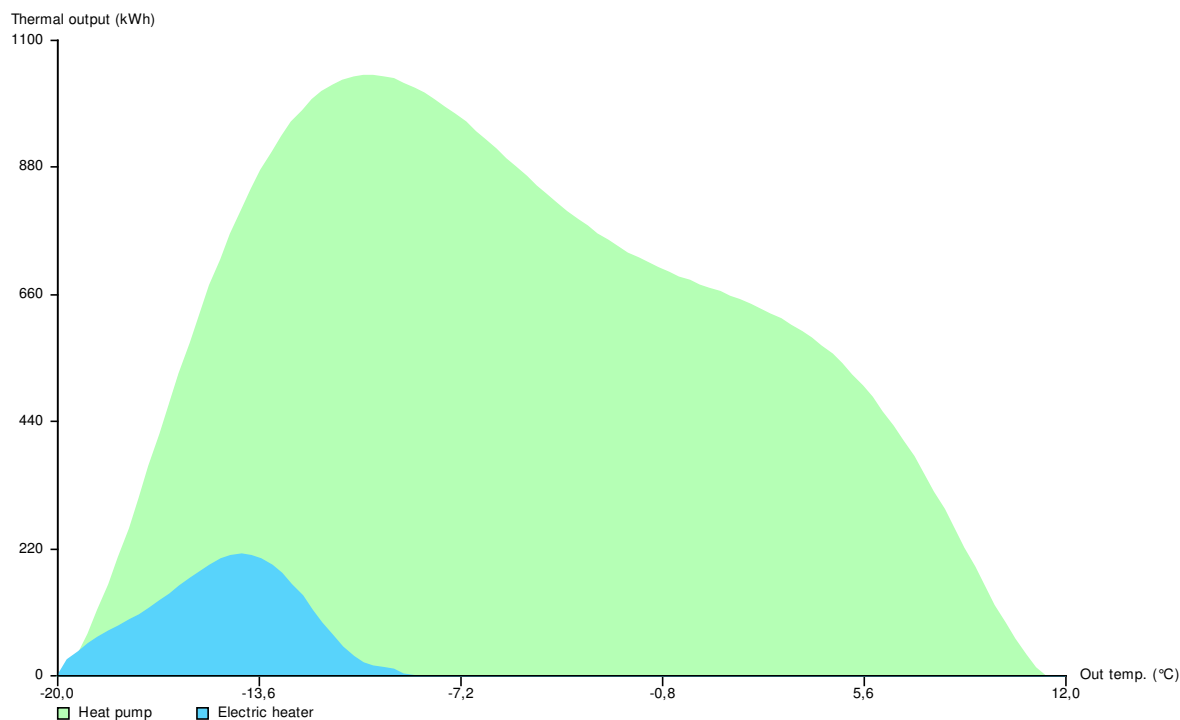
Total for year

552 euro

Electricity normal tariff	High	0,09 euro/kWh
	Low	0,05 euro/kWh
Electricity heat pump tariff	High	0,09 euro/kWh
	Low	0,05 euro/kWh
Design conditions	Required capacity	10,7 kW
	Surface to be heated	150 m ²
	Zero capacity at outside temperature	12,0 °C

The graph shows the running cost per month for Altherma according to the inputted electricity prices and the power input as given in the graph "energy consumption per month".

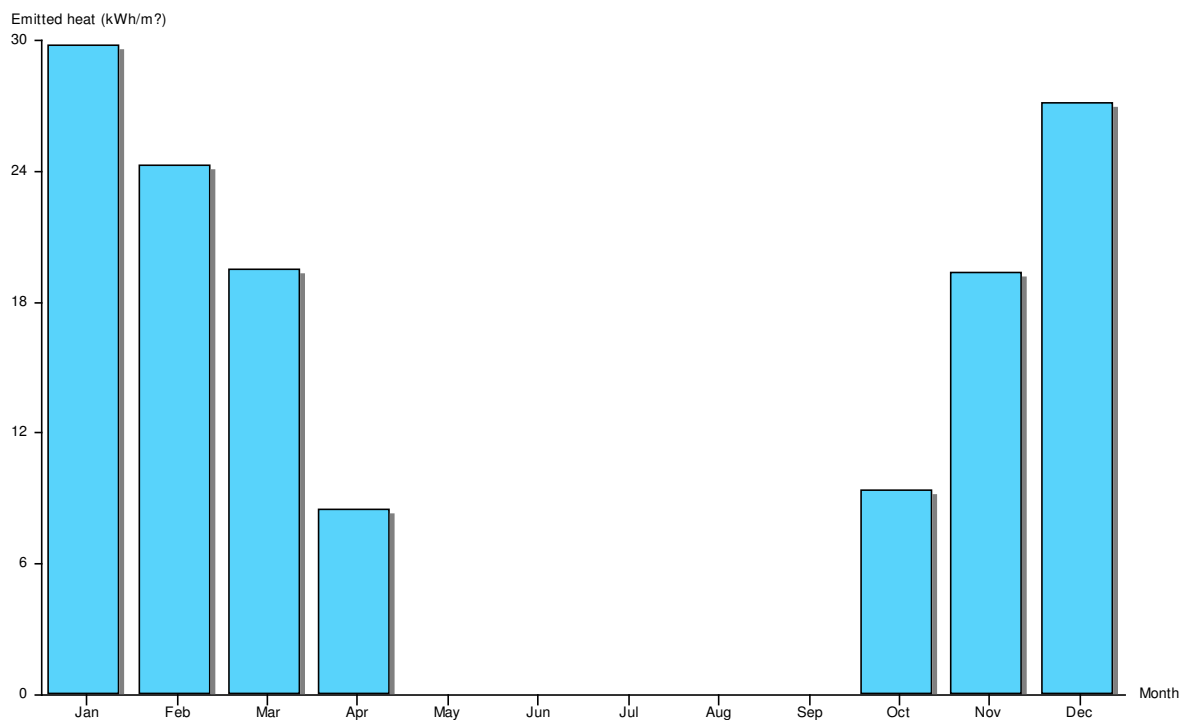
Thermal output by source



Temperature range	Heat pump	-19,9 / 12,0 °C
	Electric heater	-19,9 / -9,9 °C
Percentages for year	Heat pump	94,2%
	Electric heater	5,8%
Design conditions	Required capacity	10,7 kW
	Surface to be heated	150 m ²
	Zero capacity at outside temperature	12,0 °C

The graph shows the simulated thermal output in kWh for the heat pump and back up heater through one year. The back up heater is only operational at low temperatures. The main portion of the output is at moderate temperatures where the heat pump can cover the entire heating requirement.

Emitted heat per m²



Total for year	138 kWh/m²
Seasonal COP	2,7
Total thermal energy	20707 kWh
Design conditions	
Required capacity	10,7 kW
Surface to be heated	150 m²
Zero capacity at outside temperature	12,0°C

The graph shows the total emitted heat per m² living surface per month. The required heat emission varies with the buildings insulation standard and the weather conditions at the location.