Your heat pump proposal

Thanks for choosing Smart Energie Limited for your heat pump installation!

A heat pump will give you reliable, even and comfortable heating, will use much less energy than a boiler, and will greatly reduce your carbon footprint.

Please read the enclosed quote carefully. It covers in detail the components we will be installing, describes how the system works, shows how the system will meet the heating requirements of your property, and lists the costs for the work.

We're always happy to help answer questions, so please get in touch if there is anything you aren't sure about.

Hiral Raval
Smart Energie Limited

This proposal is for:

Ian

Broad Oak High Street
Glyn Ceiriog
Llangollen
LL20 7EH

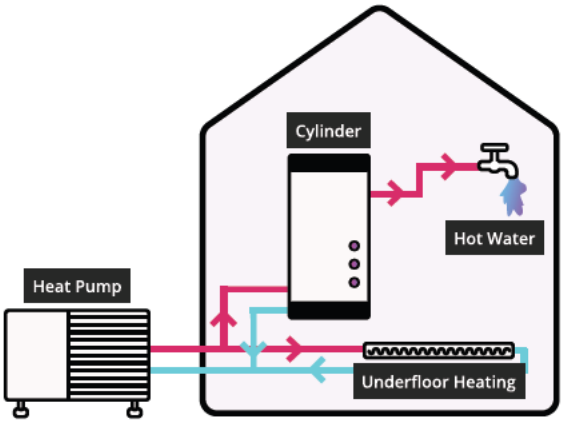
Prepared	11 May 2026
Valid for	30 days

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Your system

The system we propose includes a heat pump (Grant Aerona 290 9kW), a new hot water storage unit (UK Cylinders 300L FlowCyl Standard Cylinder), and all the other components necessary to plumb the heat pump and hot water storage components into your heating system. We have also specified underfloor heating which will help your new system run more efficiently.





Grant Aerona 290 9kW

The Grant Aerona Heat Pumps are designed for very high energy efficiency, using the sustainable R290 refrigerant they provide homeowners with a reliable, low-carbon solution for heating their homes and hot water.

ENA Registration Number: GRANT/10203/V1/A1
Heating SCOP at 45°C: 4.12
Sound Power Level: 53.6 dB
Nominal Output: 9.00 kW
Proposed flow temperature: 45°C
Actual Output at 45°C*: 10.06 kW
*at outside design temperature of -3.6°C



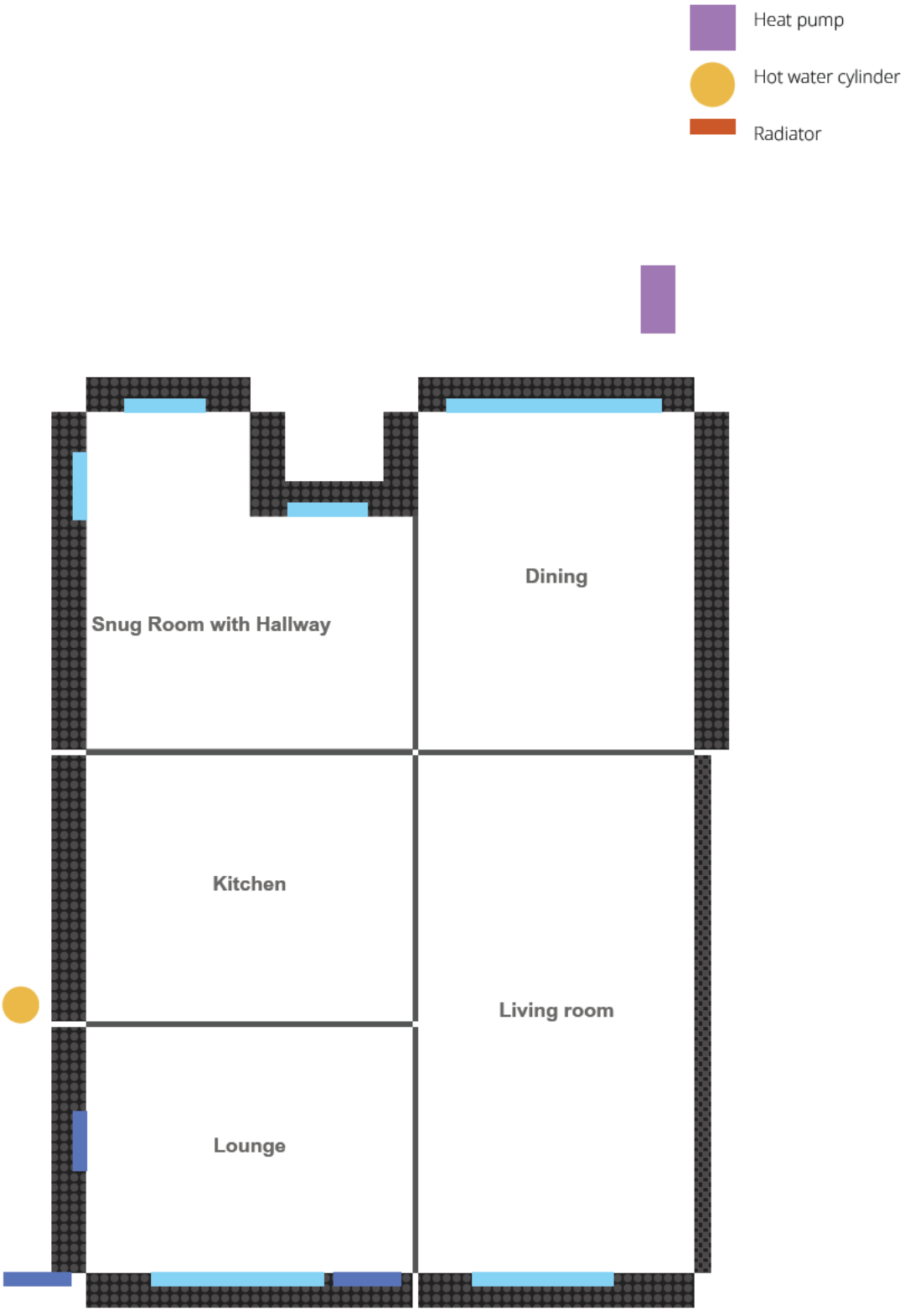
UK Cylinders 300L FlowCyl Standard Cylinder

High quality stainless steel cylinders manufactured in the UK. Designed to work with a heat pump to achieve maximum performance, with capacities ranging from 120L to 600L. Fully insulated with 50mm 100% CFC and HCFC free polyurethane and built with a 100% recyclable silver casing.

Nominal Capacity: 300ℓ
Dimensions: 545 × 545 × 1924 mm
Weight: 50 kg (empty), 330 kg (full)
Electric immersion heater size: 3 kW
Standing heat loss: 2.26 kWh/24h
ERP Band: C

System layout

The diagram below shows the proposed installation locations of the heat pump and hot water cylinder.

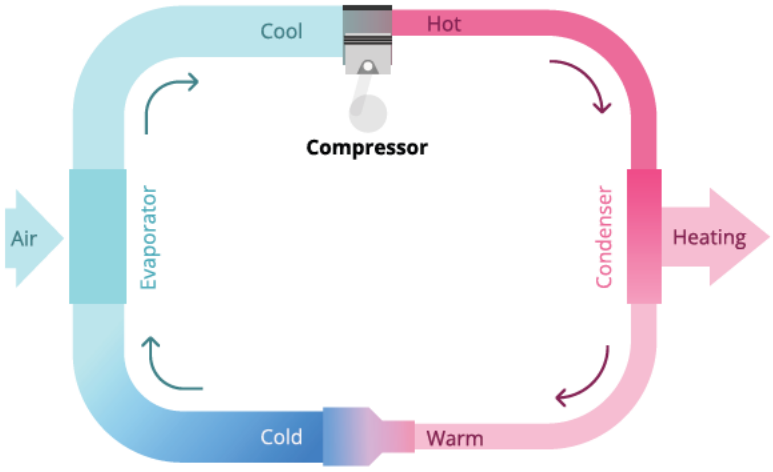


Heat Pumps Explained

A heat pump uses electricity to move heat from the outside of a building to the inside. It works on the same principle as a fridge.

In a heat pump, a compressor is used to pressurise a refrigerant, making it hotter - in the same way that a bicycle pump generates heat when it compresses air. The hot refrigerant is passed through a heat exchanger that draws off the heat for use in your house.

The refrigerant (now much cooler) is then passed though an evaporator nozzle, which allows it to expand. As the pressure decreases the refrigerant cools even further - in the same way that aerosols get cold when compressed air is released from a can.



The beauty of heat pumps is that a relatively small electrically-driven compressor can move large amounts of heat. The ratio between the electrical energy input and the heat output is the coefficient of performance (CoP). This will vary over the course of a year: the heat pump will be more efficient in the summer when the difference between the inside and outside temperatures is less.

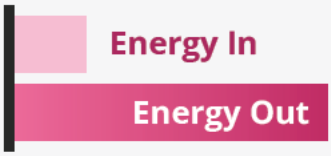
However, even in the winter the heat pump will use far less energy than a direct electrical heater or a gas boiler to produce a given amount of heat.

How efficient will my system be?

412%

From our model of your property, we expect your system to have a Seasonal Coefficient of Perfomance (SCoP) of 4.12.

That means for every kWh of electrical energy you put into the heat pump, you will on average get 4.12 kWh of heat.



Will I notice a difference?



Boilers typically run for short periods at very hot temperatures, and cycle rapidly on and off.

Heat pumps work more efficiently if they run at lower temperatures for longer periods, so your radiators will feel cooler than they used to but will be on for more of the time. We have based our calculations on a radiator temperature of 42.5 degrees.

You don't need to worry though - we've carefully sized your system so that you should always have enough heat to keep your house warm.

People who have heat pumps usually say they really like the more even heat that a heat pump system gives you compared with a gas boiler.

Sound check

Before your heat pump can be installed, we need to check that the noise it creates will not disturb your neighbours. Modern heat pumps are quiet, but are best not sited very close to doors or windows that may be open.

The sound check assesses how much sound from the heat pump will be transmitted to neighbouring properties. If the maximum sound level is less than 37dB then the installation can proceed without a planning application under the 'permitted development' rules.

Full details on the method used can be found in the MCS020 a) document on the MCS website.



Assessment point A
Backside

29db

No	10m between heat pump and assessment

MCS020 a) Sound Level Calculation
General data

Heat pump sound power level	**53.6dB**
Reflective surfaces	**2**
Sound pressure level	**Q4**

Consumption

We have run a detailed energy model over the course of a year to show how your energy use will change as a result of adding a heat pump.

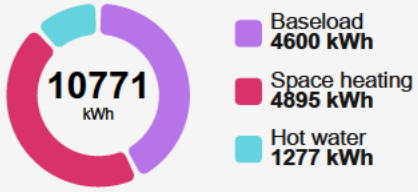
How your energy consumption might look in a typical year

The graph below shows your modelled electricity use over the course of a year. Your regular baseload consumption of **4600 kWh** per year is not expected to change. This covers lights, cooking, and appliance use. Typically regular baseload consumption is a little higher in the winter months.

The expected heat pump usage of 6172 kWh per year has been added on top of your regular baseload consumption. This is divided between electricity for space heating (**4895 kWh**) and electricity use for water heating (**1277 kWh**). Water heating has a fairly even profile throughout the year, while space heating is much higher in the winter months.

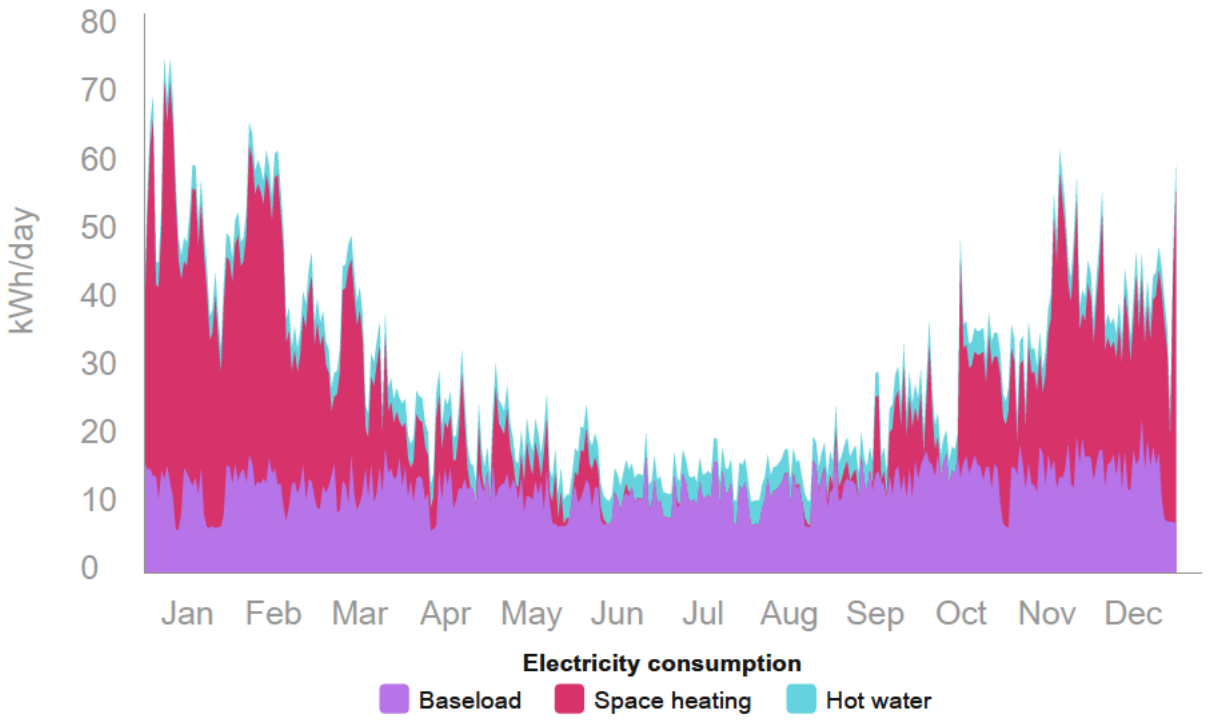
You will of course stop using gas for heating entirely, saving 31097 kWh of gas. Although your total electricity use is expected to increase from 4600 kWh per year to 10771 kWh, your overall energy use will drop from **35697 kWh** per year to **10771 kWh** per year.

New electricity breakdown



Total energy





Financial performance

Heat pumps use much less energy than boilers - but electricity is more expensive than gas, and running costs can vary depending on the source of electricity and how your system is controlled.

We have modelled how your running costs will change depending on whether some of your electricity comes from a solar array rather than directly from the grid.

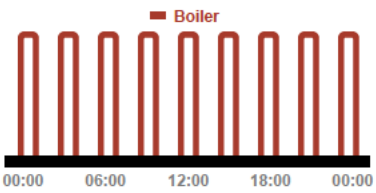
Estimated annual energy costs



Gas boiler

We estimate your boiler is around 80% efficient. To meet the expected demand of 24877 kWh for space and water heating you burn 31097 kWh of gas each year. At 6.00 p/kWh, this will cost [redacted]. The baseload electricity demand of 4600 kWh will cost [redacted] at 24.50 p/kWh, for a total energy bill of [redacted]

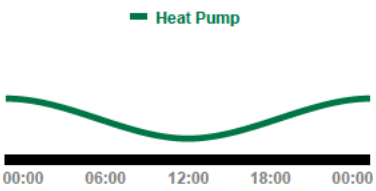
Daily energy use



Heat pump

Your heat pump will produce around 4.12 kWh of heat for every kWh of electricity consumed at a flow temperature of 45°C, so it will use around 4895 kWh to meet the space heating demand of 20166 kWh. For water heating the efficiency will be slightly lower: 3.69 kWh for every kWh consumed at a flow temperature of 55°C. Therefore, it will use another 1277 kWh to meet the water heating demand of 4711 kWh. Together with the existing baseload demand, at an electricity tariff of 9.00 p/kWh - 24.50 p/kWh, the total electricity usage of 10771 kWh each year will cost [redacted]

Daily energy use



Financial performance (continued)

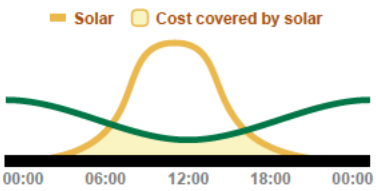
Heat pump with solar

If you have a solar array installed on your property then some of the energy used by the heat pump will be provided by the PV system.

We estimate that a 7.05 kW PV system will generate around 4216 kWh per year, of which 2028 kWh will be used by the heat pump as well as in the house.

With the heat pump, you will be exporting 2188 kWh, which (assuming you are paid 15.00 p/kWh) will generate income of [redacted] The net benefit of adding solar will be [redacted], leaving an annual cost of [redacted]

Daily energy use



Bills comparison

	Electricity cost	Electricity earnings	Gas cost	Total	Difference from gas
Boiler	[redacted]	[redacted]	[redacted]	[redacted]	0%
Heat pump	[redacted]	[redacted]	[redacted]	[redacted]	-16%
Heat pump with solar	[redacted]	[redacted]	[redacted]	[redacted]	-43%

The heat pump space heating total is based on the provided demand total of 20166 kWh, and the SCoP of the selected heat pump for space heating (4.12, at 45°C). The space heating profile uses real recent data from a house in a mild southern & eastern maritime region of the British Isles. The water heating profile and total are based on the assumption of reheats at 06:30, a daily hot water demand of 225L, a water supply temperature of 10°C and storage temperature of 50°C, a standing heat loss of 2.26 kWh per day, and pump power of 10.058 kW. The SCoP of the pump for water heating is 3.69, at 55°C. The baseline electricity consumption profile is drawn from a real UK household, adjusted to match the client's typical occupancy. The solar generation profile is derived from PVGIS insolation data for roofs at the location and angle specified in the project.

Quote

[redacted]

[redacted]

Description of goods and services	Price
Goods	
Grant Aerona 290 9kW with 300L Water Cylinder, Radiators & Pipework 1st Floor, Accessories	[redacted]
Goods total	[redacted]
Services	
BUS VOUCHER	[redacted]
Services total	[redacted]
Total before VAT	[redacted]
VAT at 0%	[redacted]
Total including VAT	[redacted]

Order form

To proceed with this order please sign below to acknowledge that you have read and accept the information contained within this quote document and our terms and conditions.

Customer signature _____

Customer name _____

Date _____

Appendix

Inputs

Property Details

Year built	Pre 2000

Design Data

Outside Design Temp – ODT	-3.6°C
Degree Days (DD)	2228
Mean air temp – MAT	10°C
Altitude	185m

Building Requirements

Space Heating load	6116W
Total area of building	185.94m²
Average Watts per metre square heat loss	33W/m²

Appendix

Heating check

We have checked that every room in your property will still be warm enough after the installation of the heat pump.

We've surveyed every room to work out the total expected heat loss through the ventilation, roof, walls, floors, windows and doors, at the specified room temperature. We've then compared this with the heat that the heat emitters will produce to ensure that every room will be warm enough. Radiators that will be removed are displayed with a lighter shade.

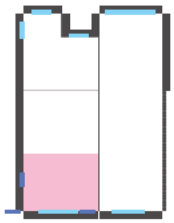
The output power of each radiator is calculated using:

The proposed flow temperature	**45°C**
The dT	**5°C**
The mean water temperature	**42.5°C**

Ground floor

Lounge

Area: 17.79 m² Heat loss: 55 W/m² Design Temp: 21°C Air changes: 0.5/hr



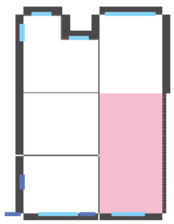
✓ Sufficient heating 1423 W / 972 W

Underfloor New

17.79m², Output at 80 W/m² 1423 W

Living room

Area: 31.54 m² Heat loss: 32 W/m² Design Temp: 21°C Air changes: 0.5/hr



✓ Sufficient heating 2523 W / 1021 W

Underfloor New

31.54m², Output at 80 W/m² 2523 W

Assumptions

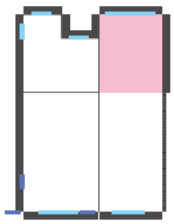
We have assumed an outside design temp of **-3.6**°C. This is based on tables of typical minimum winter temperatures in the UK.

We have used different design temperatures for different types of room. Bathrooms are typically kept warmer than living spaces such as lounges, kitchens and bedrooms for example, while utility spaces can be kept at a lower temperature. Kitchens and bathrooms also have more ventilation than other rooms, so we have allow for more heat loss through air exchange to these rooms.

Most heat loss from a property is through the building fabric however. We have provided a floorplan with a list of the materials we have used for the model along with a measure (U-value) of their insulating properties.

Dining

Area: 20.55 m² Heat loss: 58 W/m² Design Temp: 21°C Air changes: 0.5/hr



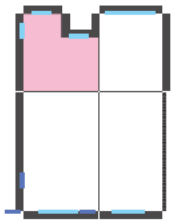
✓ Sufficient heating 1644 W / 1188 W

Underfloor New

20.55m², Output at 80 W/m² 1644 W

Snug Room with Hallway

Area: 20.65 m² Heat loss: 61 W/m² Design Temp: 21°C Air changes: 0.5/hr



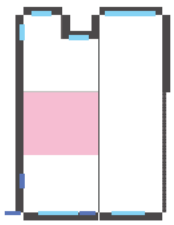
✓ Sufficient heating 1652 W / 1268 W

Underfloor New

20.65m², Output at 80 W/m² 1652 W

Kitchen

Area: 19.22 m² Heat loss: 7 W/m² Design Temp: 18°C Air changes: 0.5/hr



✓ Sufficient heating 1538 W / 127 W

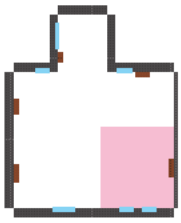
Underfloor New

19.22m², Output at 80 W/m² 1538 W

First floor

Bedroom

Area: 18.76 m² Heat loss: 28 W/m² Design Temp: 18°C Air changes: 0.5/hr



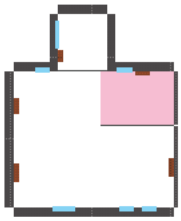
✓ Sufficient heating 671 W / 522 W

K2 New

W1000 x H600 mm 671 W

Bedroom

Area: 12.38 m² Heat loss: 31 W/m² Design Temp: 18°C Air changes: 0.5/hr



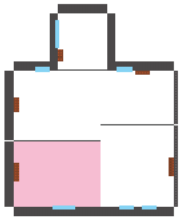
✓ Sufficient heating 536 W / 388 W

K2 New

W800 x H600 mm 536 W

Bedroom

Area: 17.78 m² Heat loss: 36 W/m² Design Temp: 18°C Air changes: 0.5/hr



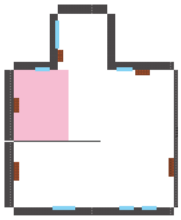
✓ Sufficient heating 671 W / 637 W

K2 New

W1000 x H600 mm 671 W

Bedroom

Area: 11.85 m² Heat loss: 37 W/m² Design Temp: 18°C Air changes: 0.5/hr



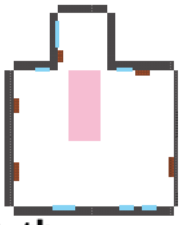
✓ Sufficient heating 536 W / 442 W

K2 New

W800 x H600 mm 536 W

Internal

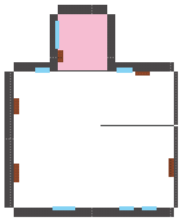
Area: 6.97 m² Heat loss: 5 W/m² Design Temp: 18°C Air changes: 0/hr



✓ Overridden: Internal Landing 0 W / 34 W

Bath

Area: 8.45 m² Heat loss: 89 W/m² Design Temp: 22°C Air changes: 0.5/hr



✓ Sufficient heating 795 W / 749 W

K2 New

W600 x H2000 mm 795 W

Why do I need new radiators?



Heat pumps work more efficiently at low flow temperatures - but at low temperatures small radiators may not have enough surface area to adequately heat a room.

With new, larger radiators you will use less energy to heat your property than if you used existing smaller radiators but had to run your heat pump at a higher temperature.

Appendix

Heat Pump Check

Your heat pump: Grant Aerona 290 9kW

Total heat loss	**6116 W**
Area of building	**185.94 m^2**
Average heat loss	**32.89 W/m^2**
Output power of **Grant Aerona 290 9kW** at the ODT and proposed flow temperature	**10058 W**



Heat pump meets demand

At the ODT -3.6 and proposed flow temperature 45°C, the total heat loss is less than the output power of the heat pump.

Appendix

Materials

The list of materials surveyed in the building. Radiators that will be removed are displayed with a lighter shade. Floors, intermediate floors, roofs, roof glazing and dormers are not shown in the drawings but are displayed in the material list.

Ground floor



First floor



Window

Building Regs 2022 - Limit New Dwellings
U-value: 1.6
Thickness: 200 mm

Door

Building Regs 2022 - Limit New Dwellings
U-value: 1.6
Thickness: 200 mm

External Wall

Party wall
U-value: 0.5
Thickness: 250 mm

Stone Walls
U-value: 0.63
Thickness: 517 mm

Internal Wall

Stone Wall
U-value: 2.81
Thickness: 400 mm

Floor

Suspended floor with 100mm of insulation

Intermediate Floor

Intermediate floors, boarding 19mm, airspace 100mm insulation between joists, 9.5mm plasterboard
U-value: (up) 0.32, (down) 0.31

Roof

Chippings, 3 layers of felt, boarding, air space, 100mm insulation, 9.5 mm plasterboard
U-value: 0.32

Pitched roof - Slates or tiles, sarking felt, ventilated air space, 100mm insulation between rafters, 9.5 mm plasterboard
U-value: 0.34

Appendix

Hot Water Calculations

Heat pumps are able to produce heat energy for both your heating system and your domestic hot water (DHW). However, they are not capable of producing instantaneous DHW for your taps, baths and showers and so a thermal store is required.

Guidance states that this thermal store should be a minimum of 45ℓ per occupant. Based on this, we have selected a 300ℓ DHW store for your property and the details of the storage temps, reheat times and energy consumption are given below.

DHW calculations are based on the parameters given below. Actual energy consumption will vary with usage habits, variation in system settings and outdoor conditions.

DHW Storage Details	
Make	**UK Cylinders**
Model	**FCHPD3300**
Nominal Capacity	**300ℓ**
Electric Immersion	**3 kW**
Dimension (L × W × H)	**545 × 545 × 1924 mm**
DHW System Details	
Hot water storage temperature	**50°C**
Supply water temperature	**10°C**
Flow temperature whilst providing hot water	**55°C**
Pipework efficiency	**80%**
Heat pump capacity output @ 55°C	**8.89 kW**
Number of occupants	**5**
Water consumption per person per day	**45ℓ**
DHW Calculations	
Hot water storage reheat time	**118 min**
DHW Energy demand excluding Legionella	**3833 kWh/yr**
DHW Energy demand including Legionella	**4015 kWh/yr**
Mixed water volume @40°C	**400 ℓ**
Legionella Details	
Legionella purge	**yes**
Legionella purge frequency	**weekly**
Legionella heat source	**immersion**
Legionella purge energy demand	**182 kWh/yr**

Legionella

Legionella is an aquatic pathogen that thrives in warm stagnant water, and can cause diseases such as Legionnaires' when inhaled. In order for Legionella to multiply and grow to dangerous levels, it requires stagnant water and a temperature of between 20°C and 40°C. Eliminating either of these conditions will prevent it from growing and using most of your DHW capacity each day will likely prevent growth to dangerous levels. If you do store water at optimum growth conditions, then an anti-Legionella cycle (Legionella purge) will kill off any bacteria that might have formed by sterilising the water at a high temperature (70°C = instantly kills, 65°C = 100% in 2 mins, 60°C =100% in 30 mins).

Appendix

Performance Estimate

We have since completed a BS EN 12831 calculation and have provided the below performance estimate based on its results.

Your Energy Requirements

Energy required for space heating	**16559 kWh**
Demand to be supplied by the heat pump	**16559 kWh**
Energy required for hot water	**3833 kWh**
Demand to be supplied by the heat pump	**3833 kWh**

Your Property

Your postcode prefix	**LL**
Total property floorspace (not property footprint)	**185.94 m²**
Average watts per square metre	**34 W / m²**

Note: W/m² is a measure of your property's thermal efficiency.
0-30W/m² is very low heat loss and 120-150W/m² is very high heat loss.

Proposed System

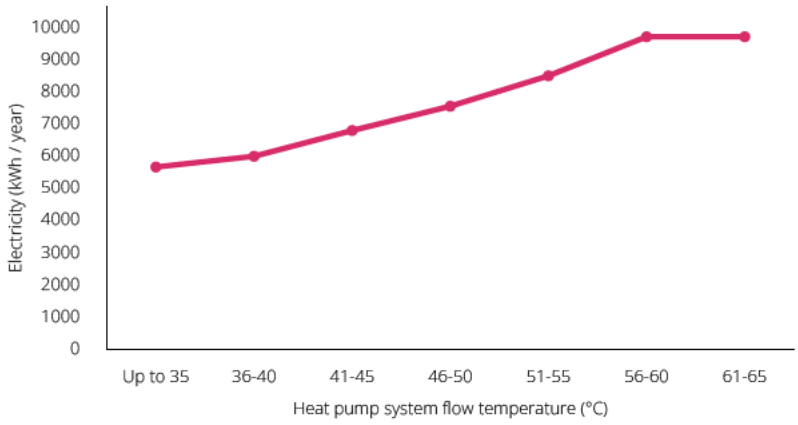
Heat pump capacity	**9.86 kW**
Heat pump type	**Air source heat pump**
System is proposed to provide	**Space heat and hot water**
Proposed heating system will be	**Approx. 50% radiators and 50% underfloor**
The proposed flow temperature will be	**45 °C**

Performance

The seasonal performance factor is calculated to be:		**3.4**
	High estimate	Low estimate
Estimate of energy consumption of the proposed heat pump	**8038 kWh**	**6576 kWh**

Note: you can convert these figures to approximate running costs.

Graph of system performance



Important note

This is not a detailed system design. It offers a reasonable estimate of likely performance and a description of the likely design.

Applicable warning notes

Note

Dry floor systems with UFH complies with BS1264 Type B aluminium plate construction laid with insulation underneath - default pipe spacing 200mm cc.

Info

Specialist UFH designers can provide more accurate information for heating performance with different systems.