

Heat pump technology overview

Phil Hurley, Chair,
Heat Pump Association

18 March 2022

Recent Announcements



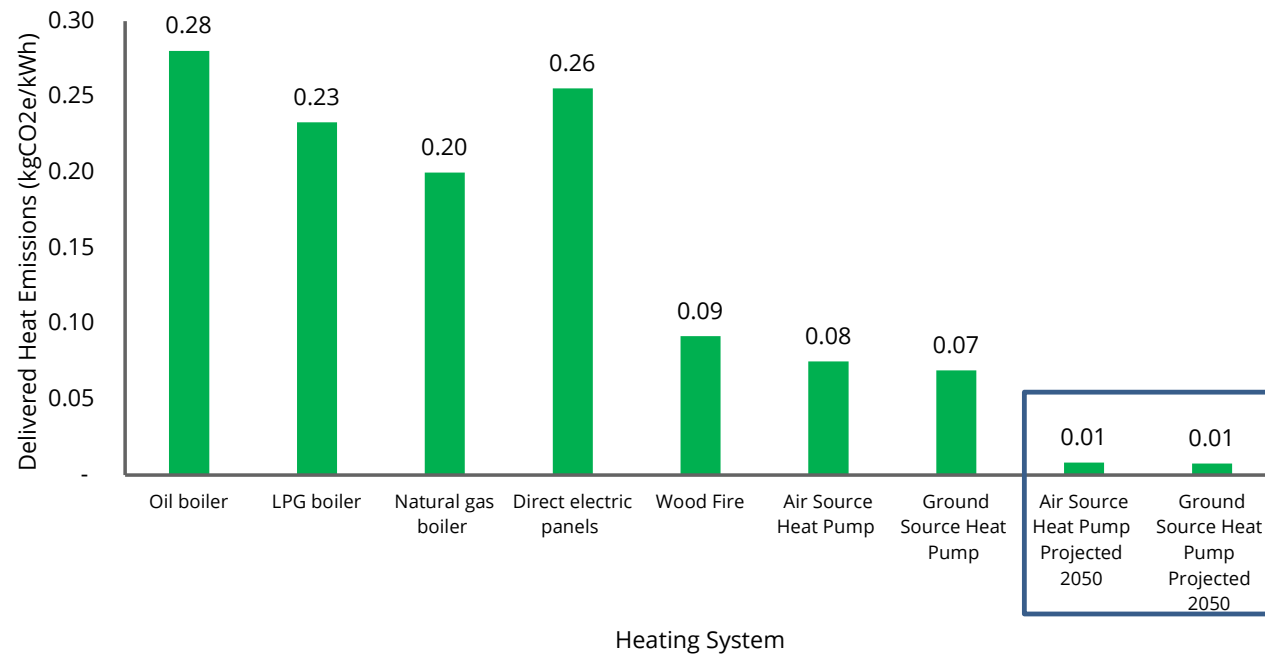
- 600,000 heat pumps per year by 2028 as part of [Ten Point Plan for Green Industrial Revolution](#)
- Heat and Buildings Strategy published – firm commitment to the use of HPs
- Building Regulation changes, coming into force in June – “We anticipate that heat pumps will become the primary heating technology for new homes”. Future Homes Standard to follow – no fossil fuels permitted.
- Oil and LPG heating to be phased out in homes from 2026. Ambition for gas boilers to be phased out from 2035.



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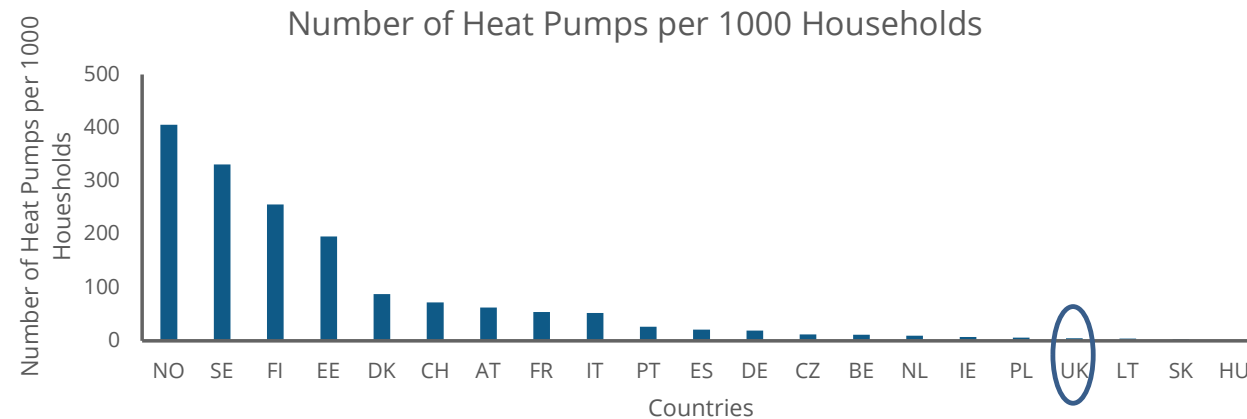
Why heat pumps?

The Carbon Savings from Heat Pumps



- Heat pumps offer huge carbon savings now around 65% versus a gas boiler.
- They also have the huge potential for further reductions as the grid continues to decarbonise. Projected savings vs. a gas boiler would be ~95% by 2050.

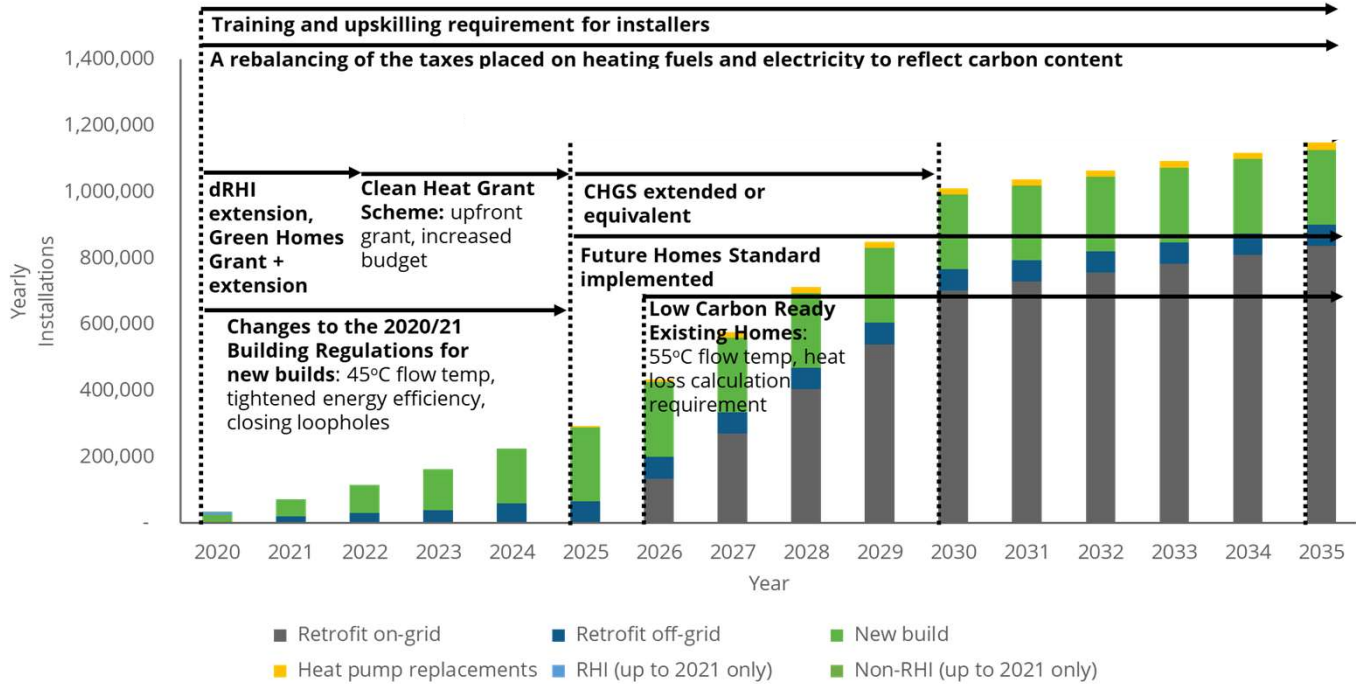
How does the UK compare to other countries?



- Heat pump deployment is widespread across many European countries with the UK lagging behind.
- Key lessons can be learned from these countries about increasing the deployment of heat pumps. Including tight carbon emission standards in new build homes.



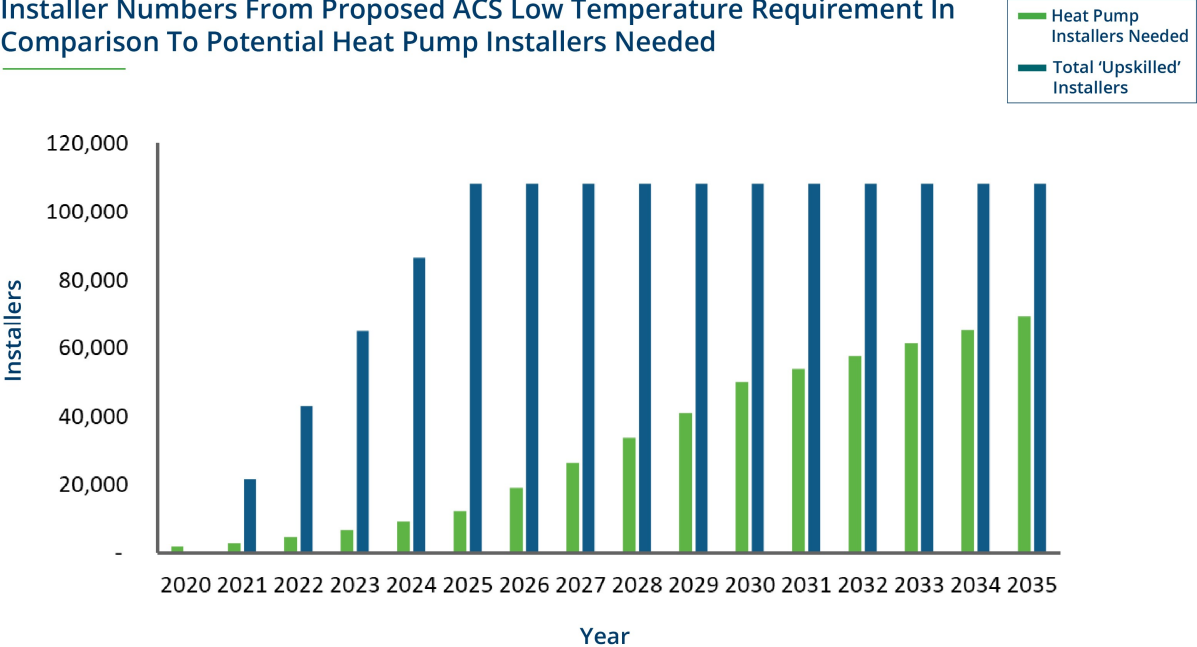
Heat Pump Installations per Year



- New build is essential for the growth of the heat pump market over the next few years, which looks like it will be driven by the Building Regulation changes.
- Following this, to meet the 600,000 units per year target deployment increase will need to come through retrofit of existing homes also.



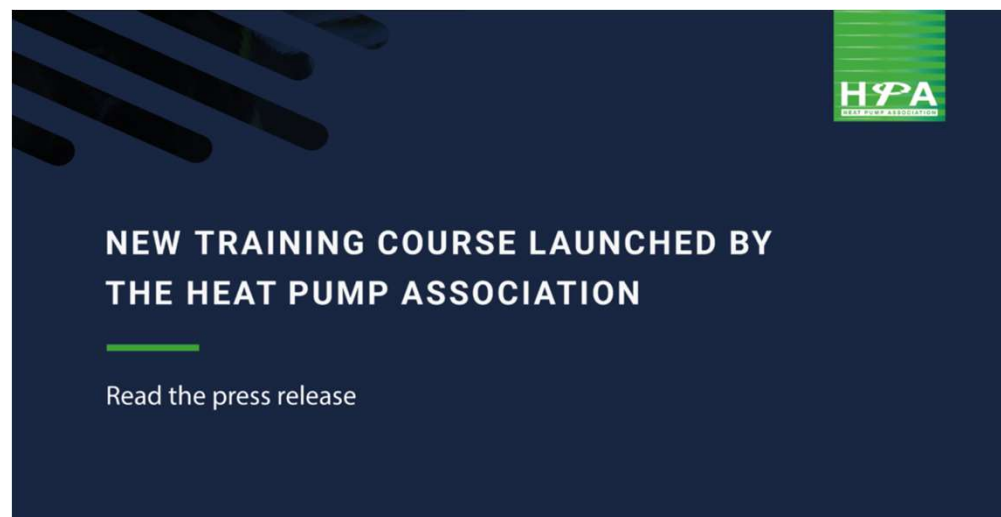
Installer Numbers From Proposed ACS Low Temperature Requirement In Comparison To Potential Heat Pump Installers Needed



- Scaling up installer numbers is going to be fundamental to delivering on the growth rate needed in the heat pump market
- All HPA members have agreed to deliver new training course being developed, with current capacity for over 15,000 installers to be trained per year
- For current fossil fuel installers, by making a technology neutral low temperature heating course mandatory as part of ACS a vast chunk of the skills needed for heat pump installations can be in place by 2026

How to get trained on heat pumps and opportunities for engineers

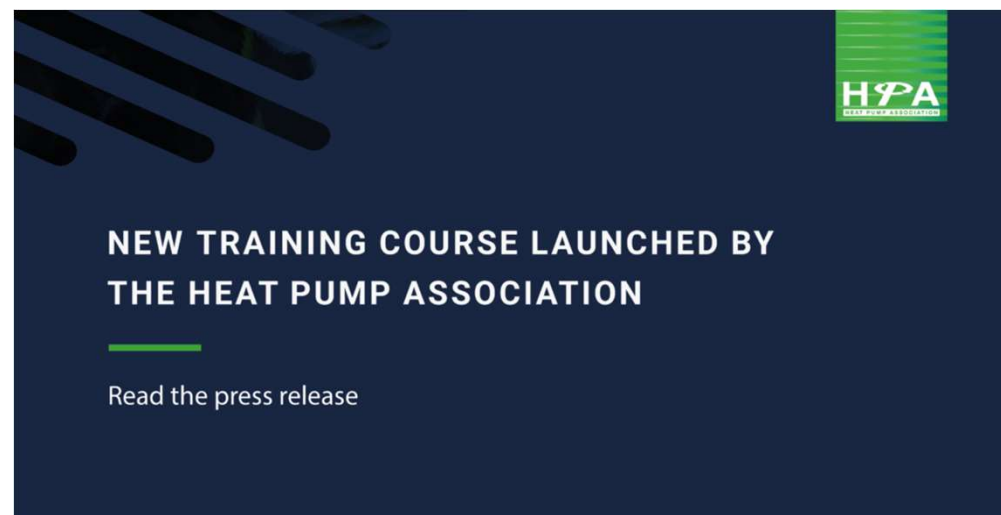
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Business and Energy Secretary Kwasi Kwarteng said:

“While heat pumps are fast becoming a natural option for households, we need to ensure we have enough skilled tradespeople to hit our target of 600,000 installations each year by 2028 – so the Heat Pump Association setting up this training scheme is absolutely critical in this endeavour.”

- New HPA course criteria is directly targeting the upskilling for existing installers
- Course is being delivered through HPA members, in their own training facilities across the country inc. main boiler manufacturers



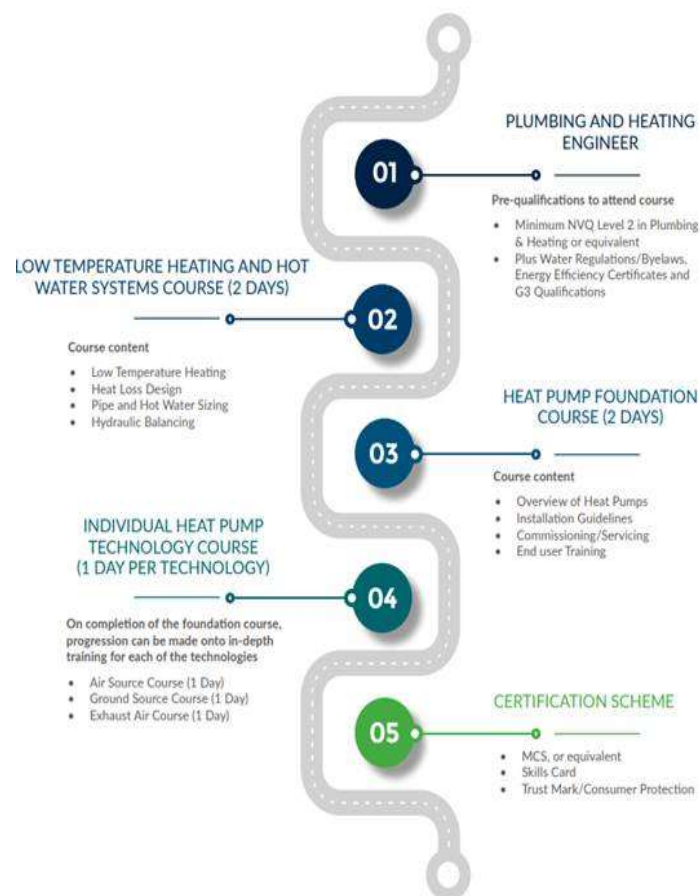
- No need to make the full shift immediately, can do proportion of both → gradually ramp up proportion of heat pumps as market grows
- Lots of similar transferable skills → new course is targeted just for this → higher skills increase ability to charge higher prices → early adopters stand to gain an edge in the long-run
- Greater sensitivity to some things that are not necessarily common place at the moment in the boiler industry, such as heat loss calculations and accurate sizing
- Being delivered in training centres across the UK



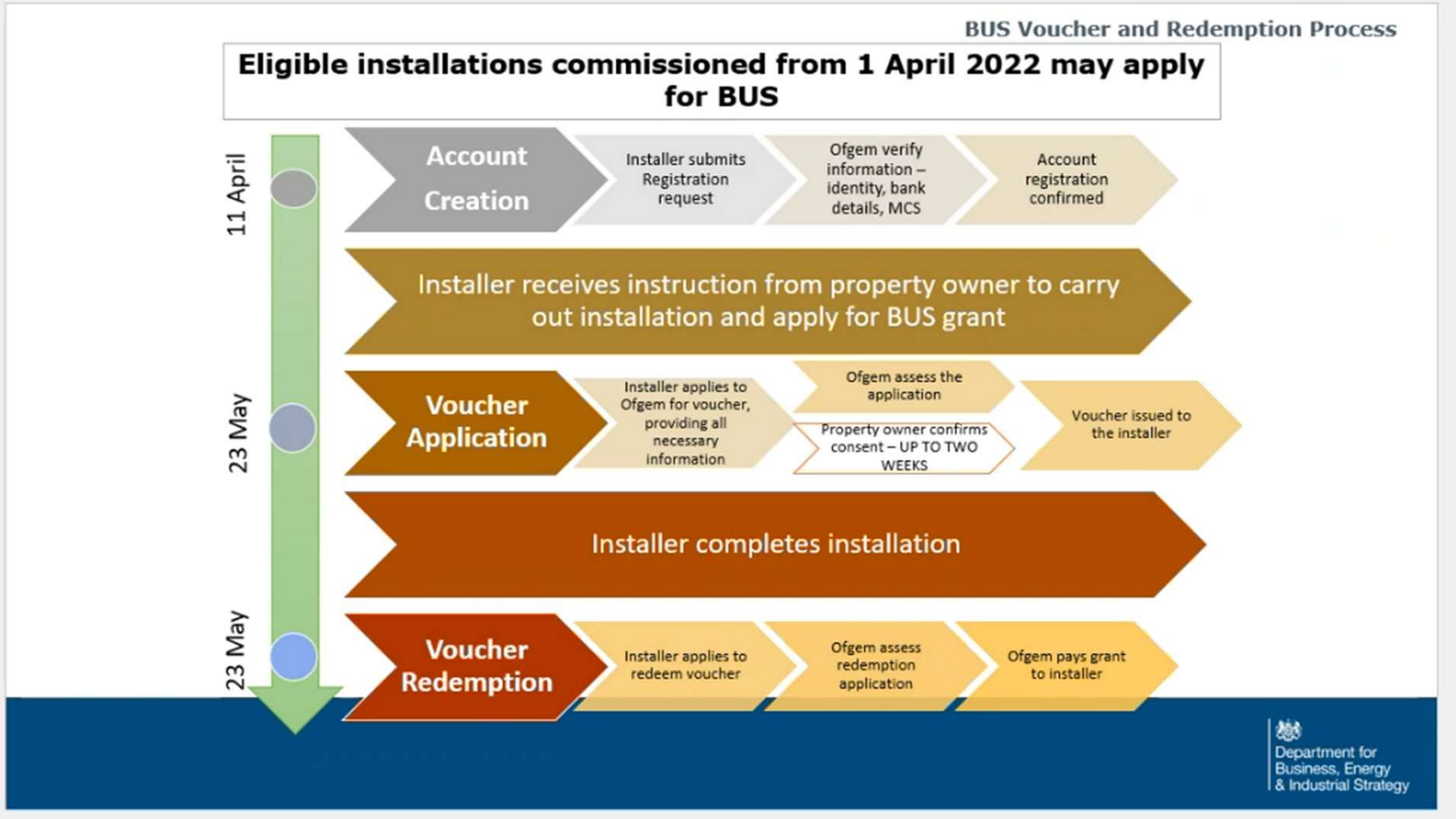
Installer Training



- Key area of current industry efforts, having enough installers is fundamental to the long-term growth of the heat pump market.
- HPA has been coordinating activity across the whole industry to lead on the development of a new training route for installers.
- Focus is on achieving scale through the upskilling of current boiler installers with course content modernised and the route to becoming an installer streamlined.



The Boiler Upgrade Scheme



Key Dates

The Boiler Upgrade Scheme Key Dates

- **1st April** – any heat pumps commissioned from this date are eligible for funding
- **11th April** – Installers are advised to set up an account on the BUS platform
 - **W/C 2nd May** – installer guidance will be published
- **W/C 16th May** – installer launch event focused on scheme application will take place
 - **23rd May** – Boiler Upgrade Scheme launches

From this date, installers can submit applications for installations commissioned from 1st April



Heat Pump Solutions



GROUND SOURCE HEAT PUMPS

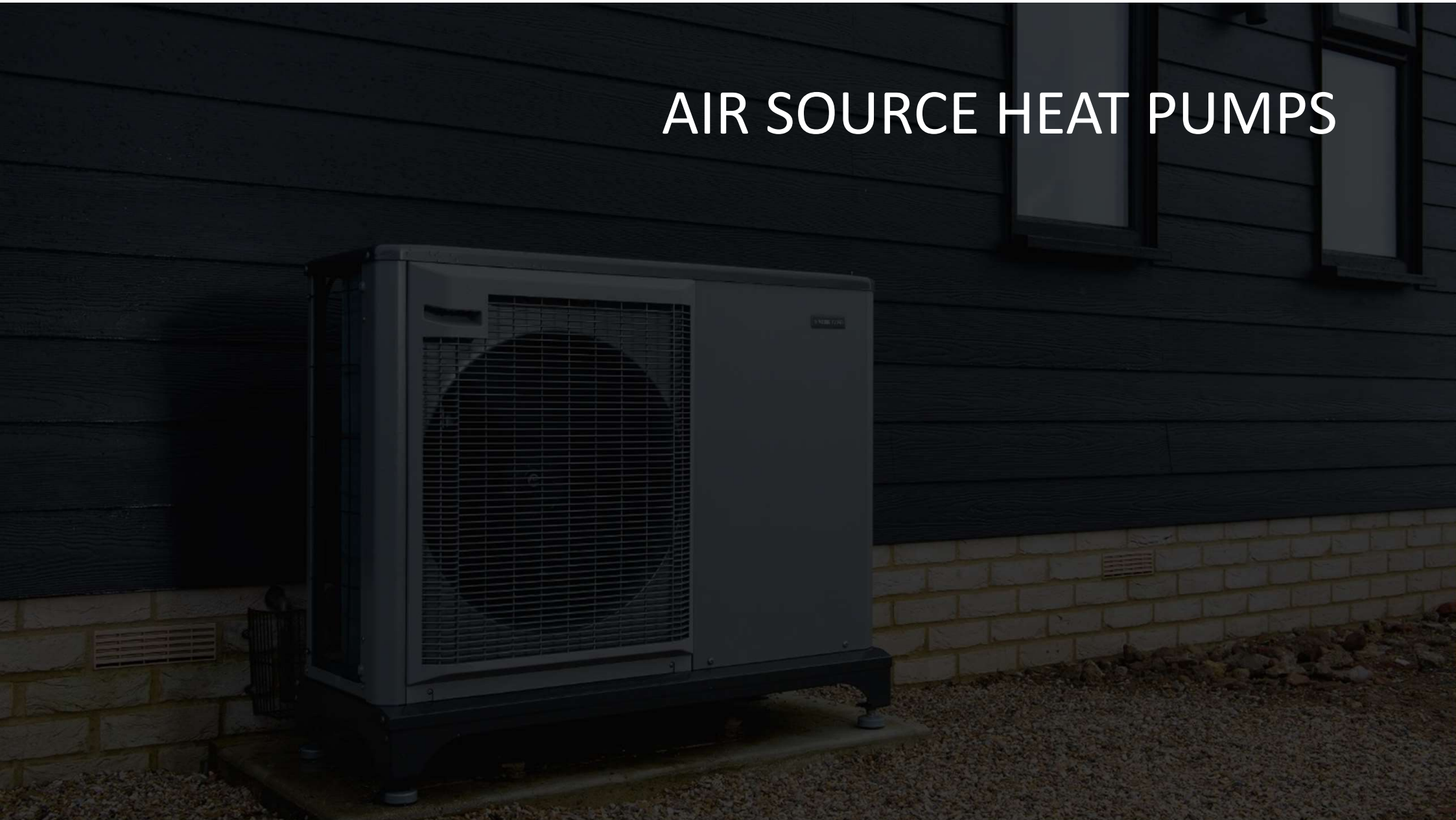


AIR SOURCE HEAT PUMPS



EXHAUST AIR HEAT PUMPS

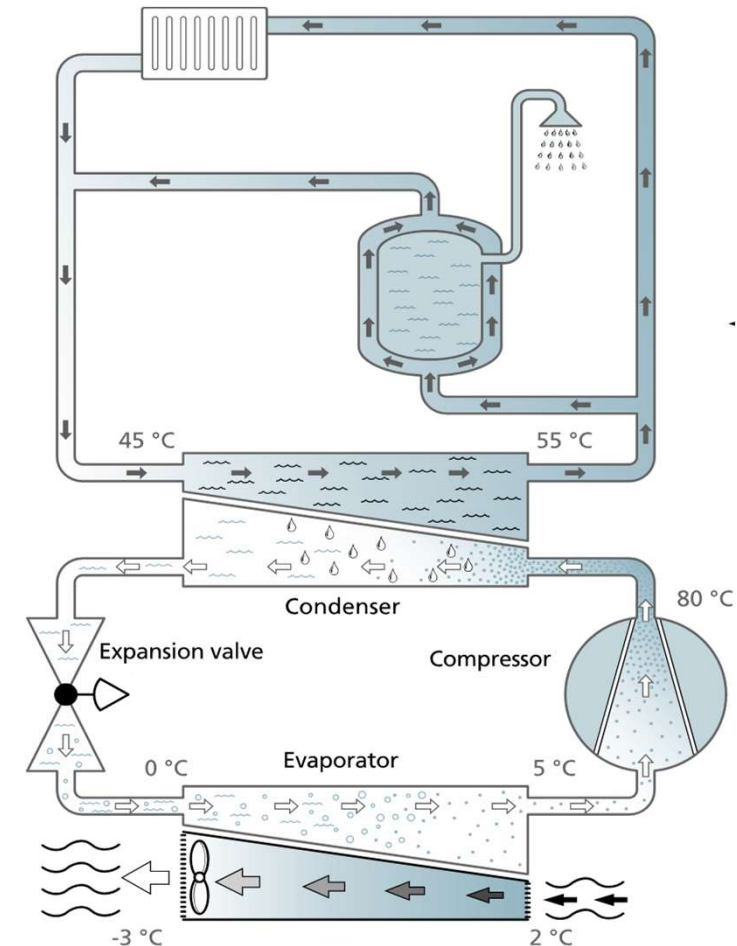
AIR SOURCE HEAT PUMPS



ASHP Principle of operation



- 1.) The ASHP fan creates a flow of ambient air through the heat exchanger.
- 2.) This heat exchanger extracts heat energy from the air down to -20°C .
- 3.) This heat energy evaporates the refrigerant liquid into its gas form.
- 4.) An electrical driven compressor rapidly compresses this gas, greatly increasing its pressure and temperature.
- 5.) The now high temperature gas is passed over a condenser where the heat energy is given of to the heating and hot water circuit to be used as useful energy



Permitted Development/Planning Permission



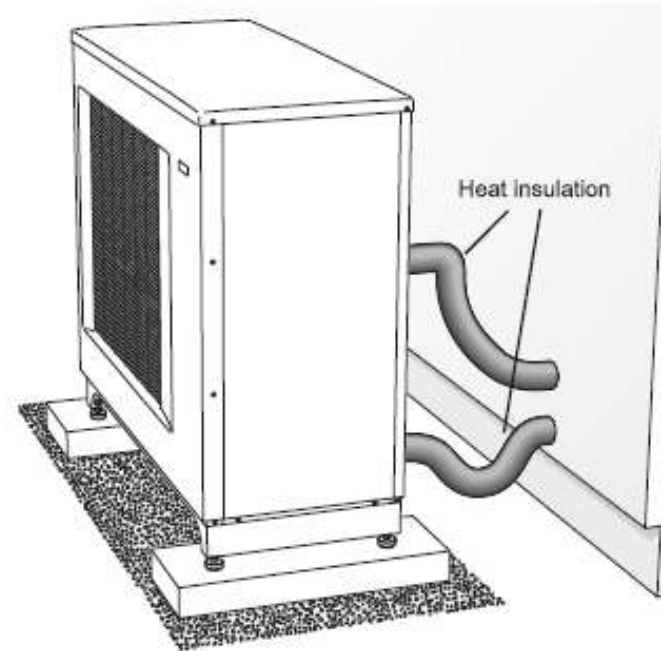
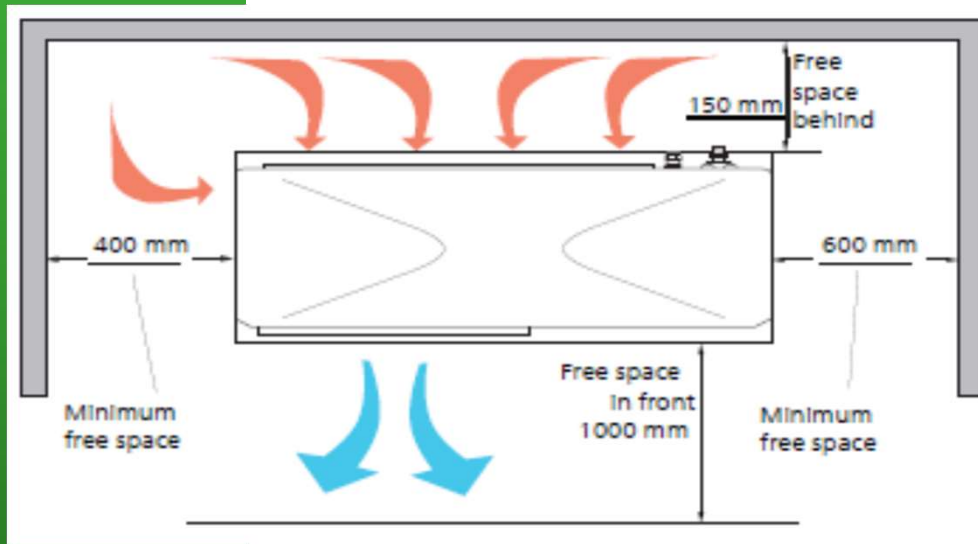
From 1 December 2011 the installation of an air source heat pump on domestic premises is considered to be permitted development, not needing an application for planning permission, provided ALL the limits and conditions listed below are met.

These permitted development rights apply to the installation, alteration or replacement of an air source heat pump on a house or block of flats, or within the curtilage (garden or grounds) of a house or block of flats, including on a building within that curtilage.

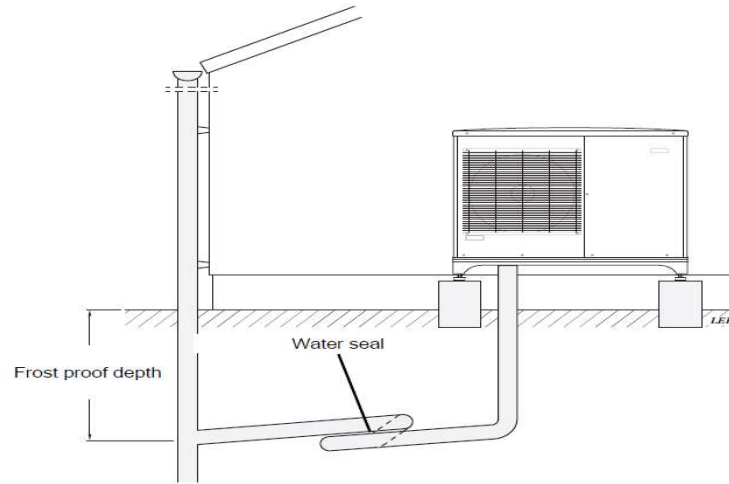
A block of flats must consist wholly of flats (e.g. should not also contain commercial premises).

STEP	INSTRUCTIONS	INSTALLER RESULTS/NOTES
1	From manufacturer's data, obtain the A-weighted sound power level of the heat pump. See 'Note 1: Sound power level'. The highest sound power level specified should be used (the power in "low noise mode" should not be used).	STEP 1 RESULT = 48 dB(A)
2	Use 'Note 2: Sound pressure level' and 'Note 3: Determination of directivity' to establish the directivity 'Q' of the heat pump noise.	
3	Measure the distance from the heat pump to the assessment position in metres.	STEP 3 RESULT = 5m
4	Use table in 'Note 4: dB distance reduction' to obtain a dB reduction.	STEP 4 RESULT =
5	Establish whether there is a solid barrier between the heat pump and the assessment position using 'Note 5: Barriers between the heat pump and the assessment position' and note any dB reduction.	STEP 5 RESULT = No solid barrier, only a low hedge Reduction = 0
6	Calculate the sound pressure level (see 'Note 2: Sound pressure level') from the heat pump at the assessment position using the following calculation: (STEP 1) + (STEP 4) + (STEP 5)	STEP 6 RESULT =
7	Background noise level. For the purposes of the MCS Planning Standard for air source heat pumps the background noise level is assumed to be 40 dB(A) Lp. For information see 'Note 6: MCS Planning Standard for air source heat pumps background noise level'.	STEP 7 RESULT = 40dB(A)
8	Determine the difference between STEP 7 background noise level and the heat pump noise level using the following calculation: (STEP 7) – (STEP 6)	STEP 8 RESULT =
9	Using the table in 'Note 7: Decibel correction' obtain an adjustment figure and then add this to whichever is the higher dB figure from STEP 6 and STEP 7. Round this number up to the nearest whole number.	STEP 9 RESULT =
10	Is the FINAL RESULT in STEP 9 equal to or lower than the permitted development noise limit of 42.0 dB(A)? If YES - the air source heat pump will comply with the permitted development noise limit for this assessment position and may be permitted development (subject to compliance with other permitted development limitations/conditions and parts of this standard). NOTE - Other assessment positions may also need to be tested. If NO - the air source heat pump will not be permitted development. This installation may still go ahead if planning permission is granted by the local planning authority.	STEP 10 RESULT =

Unit Installation

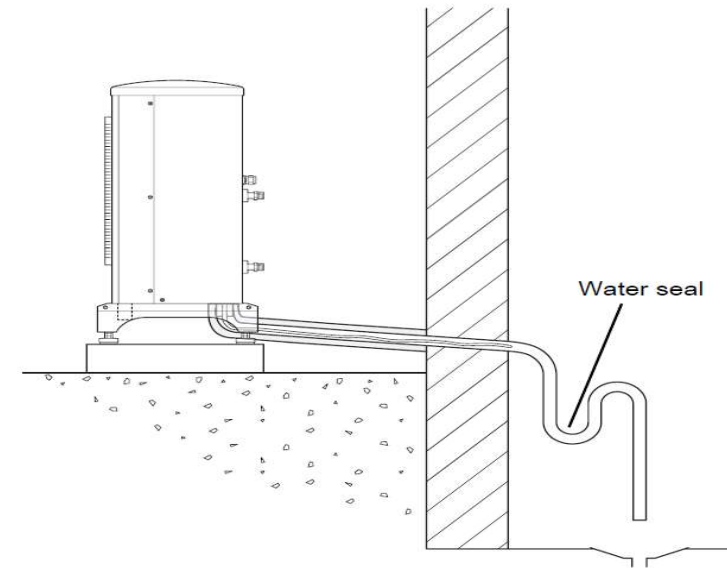


Gutter drainage

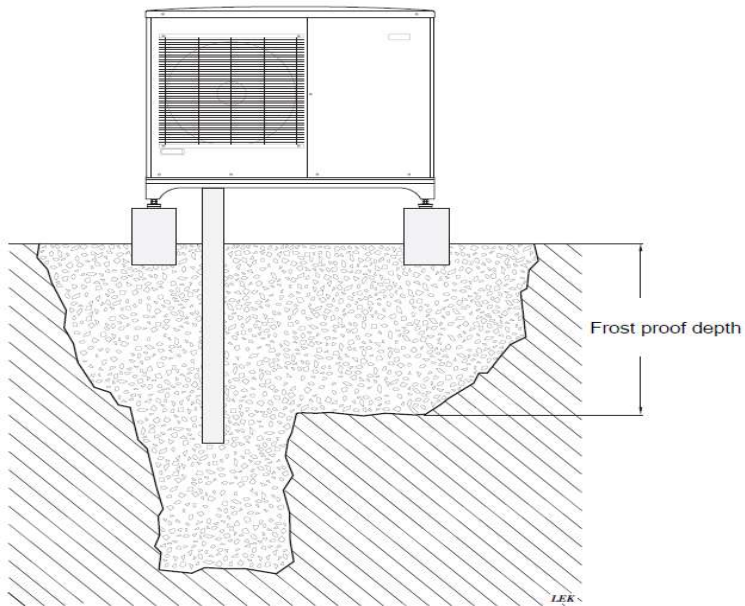


Drainage

Drain indoors



Stone caisson



- The condensation water (up to 100 litres/day) collected in the trough should be routed by pipe to an appropriate drain, it is recommended that the shortest outdoor stretch possible is used.

Hybrids – where to use them

Can lower disruption and transition behavioural change

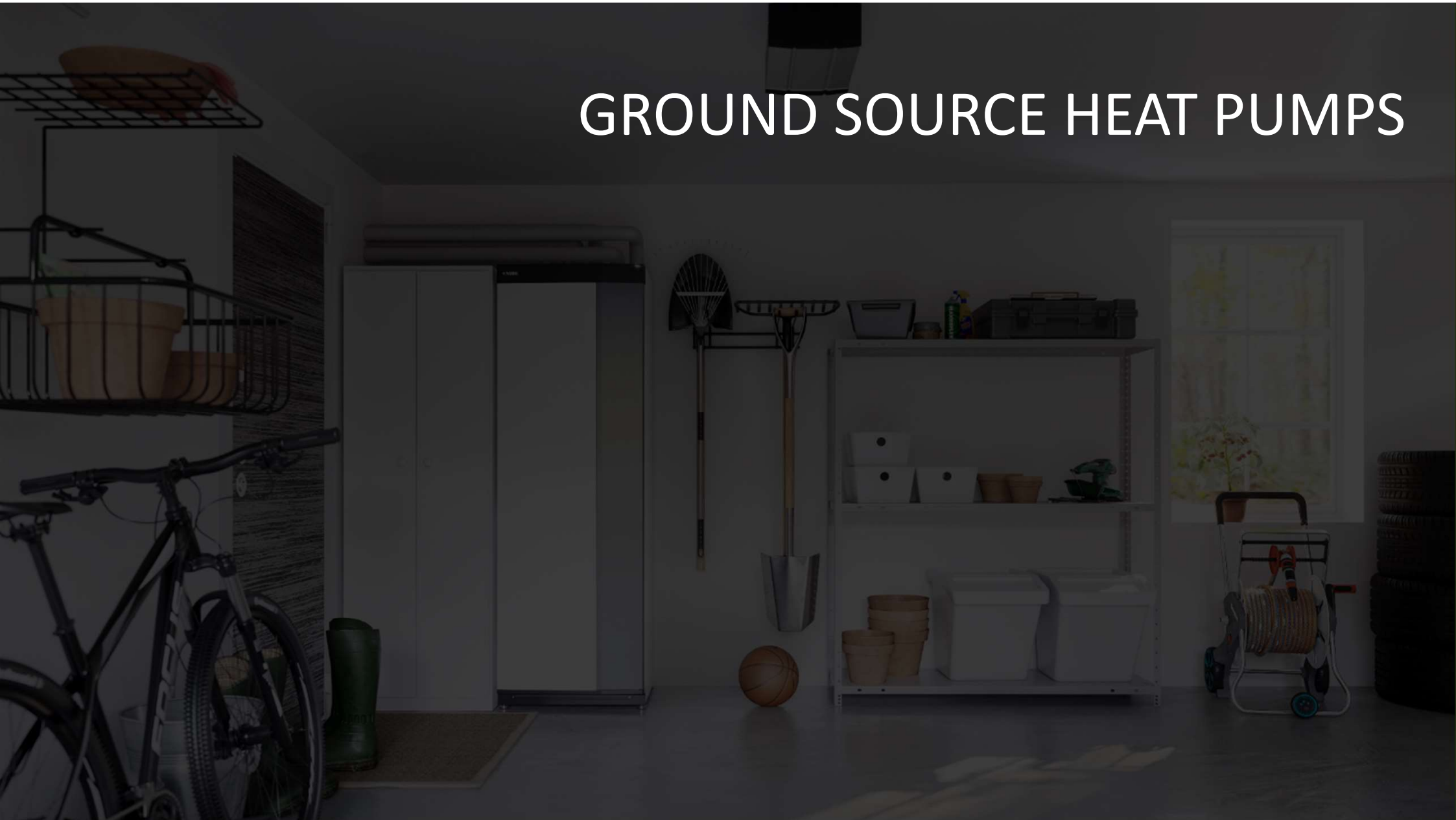
Traditional boiler operation combined with advanced heat pump technology. Many with water only connections, so no need for F-Gas connections, making for a fast and easy installation.



Intelligent heating & lower running costs

The system aims to select a balance between gas or oil & electricity, which is crucial to achieving a lower energy bill, by comparing energy costs and selecting the most cost efficient, whilst not impacting your comfort.

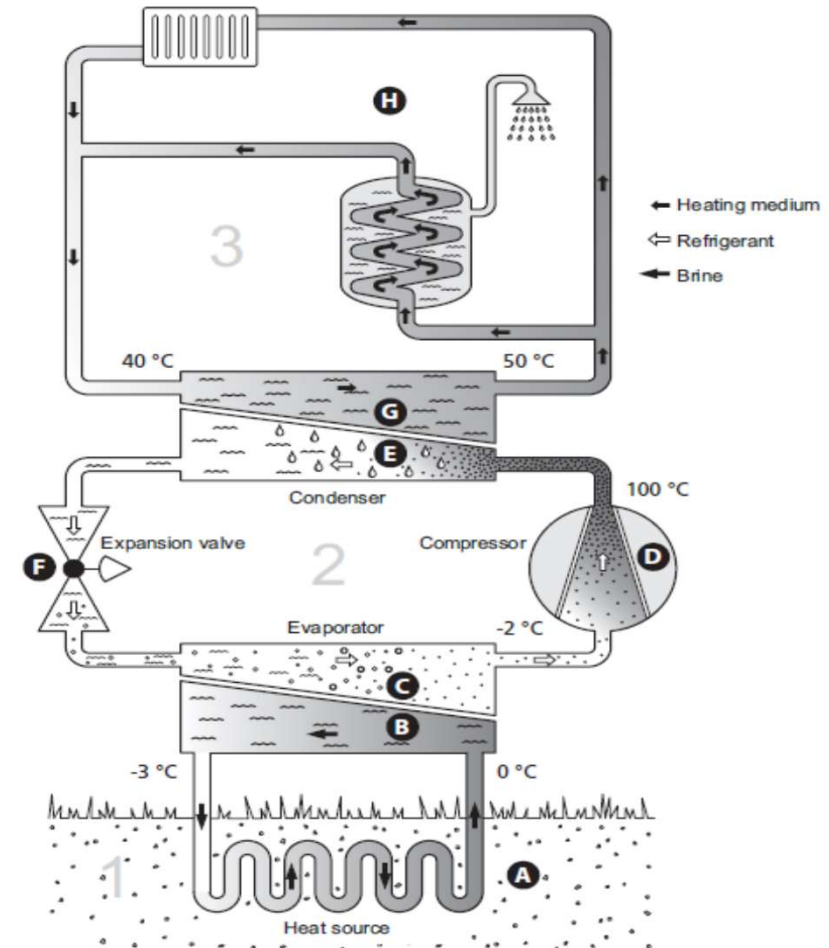
GROUND SOURCE HEAT PUMPS



GSHP Principle of operation



- 1.) An Anti-freeze solution is passed through a collector system, extracting stored solar energy. Turbulent flow through the collector allows for an efficient transfer process.
- 3.) The antifreeze solution passes through the GSHP evaporator where the heat energy is extracted and evaporates the refrigerant liquid into its gas form.
- 4.) An electrical driven compressor rapidly compresses this gas, greatly increasing its pressure and temperature.
- 5.) The now high temperature gas is passed over a condenser where the heat energy is given of to the heating and hot water circuit to be used as useful energy.



Opportunity for GSHPs



Significantly more cost-effective than many of the alternative heating fuels



Lower carbon and better SAP ratings when considering environmental performance.



Longer lifespan compared to alternative systems



A quiet, space-saving solution in large developments



Once the groundworks are completed no specialist technology or skills and training is needed for the installation of a GSHP



Challenges for deployment



Disruption in existing properties due to boreholes and groundworks



High upfront cost of drilling works



Consumer unfamiliarity



Space requirements if not considered from the outset



A modern laundry room with a grey cabinet, a window with plants, and a washing machine. The room is dimly lit, with a window in the background showing some greenery. The text "EXHAUST AIR HEAT PUMPS" is overlaid in white on the image.

EXHAUST AIR HEAT PUMPS



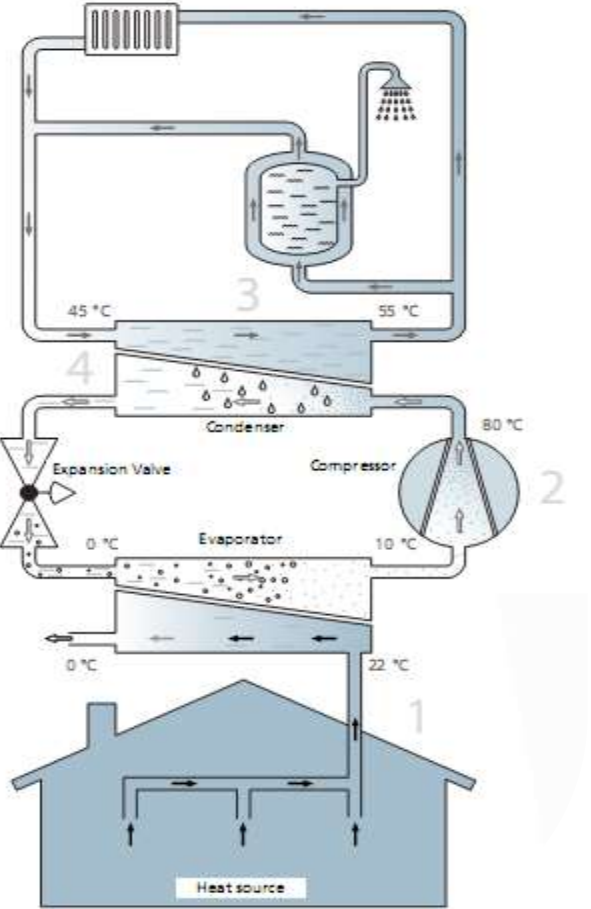
EAHP Principle of operation

Exhaust Air Heat Recovery

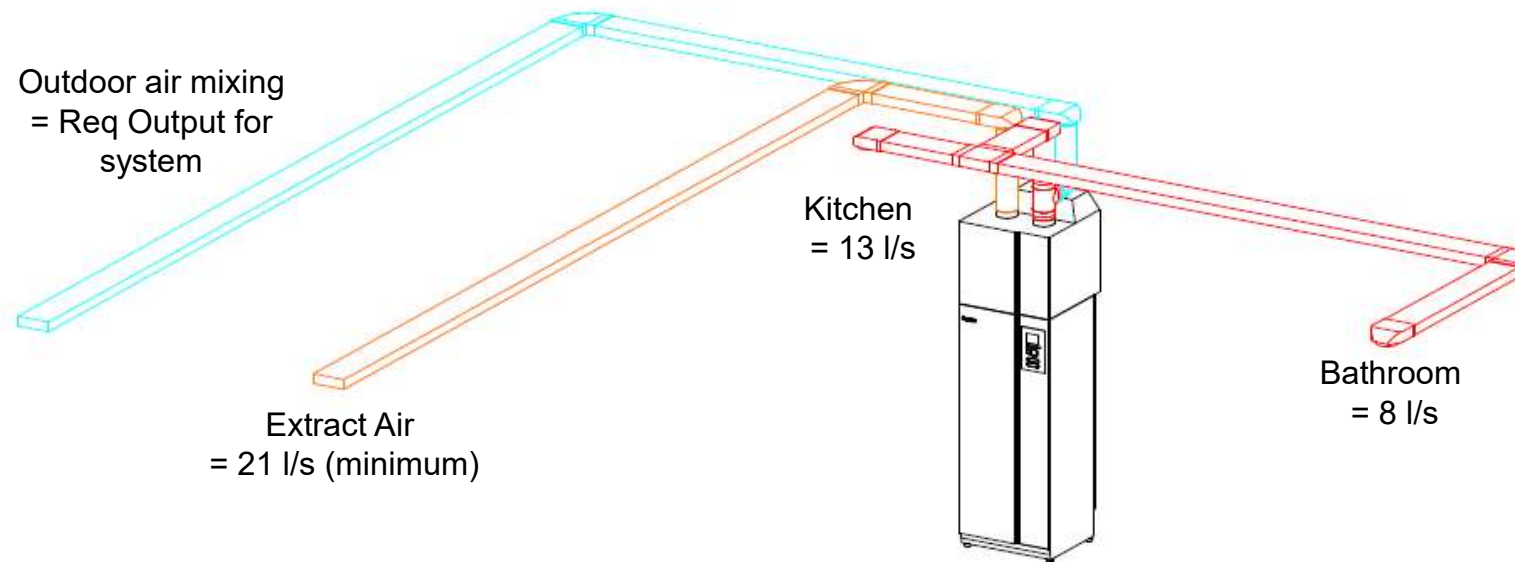
Exhaust Air Heat Pumps provide necessary ventilation to a property. Heat energy is recovered from the exhaust air during the ventilation process and provides heating and hot water production through a refrigeration cycle using the same principles as GSHP's and ASHP's

Purpose of Ventilation

- Remove stale air
- Supply fresh air
- Prevent moisture and mould growth



EAHP Schematic





Questions

- HPA: www.heatpumps.org.uk