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HEAT PUMPS in homes

Fitting heat pump technology in UK homes is a government-backed strategy to decarbonise housing, improve energy efficiency and reduce household bills.

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The concept of heat pumps to heat homes is not new. The first heat pump (HP) fitted in a domestic setting was in 1930[1] and HP technology has been developed for all types of properties since then. Heat pumps have become increasingly important and relevant in the 21st century due to their efficiency and low carbon emission status, providing an alternative to fossil fuel powered heating.

The heat pump has been agreed by all UK governments as the main replacement for natural gas heating, which is being phased out of the energy mix. Currently there are no other credible alternatives offering the same combination of economy, energy efficiency, and low carbon emitting technology that fit with our existing infrastructure.

If correctly installed, HPs supply three times more energy than they use, and produce 73% fewer emissions than gas boilers [2]. It is worth remembering that 80% of heat energy in commercial and domestic properties in the UK is produced by gas boilers[3]. With 18% of the UK's greenhouse gas emissions caused by the combustion of gas, the adoption of low emitting heat pump technology remains an essential enabler to achieve Net Zero by 2050[4].

In November 2023 the *Energy Act 2023* was given royal assent, detailing the UK Government's installation plan of 600,000 HPs a year in domestic homes by 2028 as part of the *Clean Heat Grant*. During consultation on HP adoption the Independent Climate Change Committee voiced disappointment at the government target, recommending 900,000 installations a year by 2028 should be aimed for[5]. However, even at the outset, modelling suggested the government target would not be met[6].

In October 2023, the UK Government scrapped requirements for landlords to upgrade properties to at least Energy Performance Certificate (EPC) C rating by 2025 for newly rented properties, and 2028 for existing tenancies. Despite this, housing associations are still aiming to achieve this timeline[7]. Of course the new government may move the goalposts again.

Domestic heat pump schemes

Various UK Government schemes have incentivised the transition to heat pump technology.

The Boiler Upgrade Scheme (BUS) was introduced in May 2022 for England and Wales, providing £450 million funding for those transitioning to low carbon heating, with a £5000 grant for each applicant. This

was increased in October 2023 to £7,500 to better reflect the real outlay of heat pump conversion. The average cost of an air source heat pump installation in a three-bedroom property in the UK is £10,000[9]. A similar *Home Energy Scotland Grant and Loan* is available for heat pump installations in Scotland.

The *Home Upgrade Grant: Phase 2 (HUG2)* scheme was provided for householders in England on low incomes who are off the gas grid and have an EPC between D & G. Funding was made available in April 2023, stopping in March 2025. £650 million was given to fund the retrofit of 30,000 homes through local authorities. Given that it was only a two-year programme and applications closed in 2024, it presented a finite opportunity. In fact, only 250-300 houses are reported to have been retrofitted[10].

Overall, outcomes have been unimpressive. Since the funding uplift to £7,500 per household, there has been a 39% rise in applications for BUS in 2024[11]. However, BUS has struggled since its inception to achieve its targets. In addition, the HUG2 scheme seems an abject failure due to its complex and restrictive application process and low take up. Despite £6bn being allocated to cut energy bills in the UK by upgrading housing stock, funding pales into insignificance compared with European countries. For example, Germany is allocating £47bn to achieve the same goal[12].

There is discreet funding that housing associations and public sector organisations can access. £6bn has been allocated to support low income, cold, and social homes to cut energy bills in approximately one million homes between 2025 and 2028. This funding is a split allocation among different funding pots. There is a £1.25bn allocation to housing associations who can apply for funding through the *Social Housing Decarbonisation Fund*, the *Green Heat Network Fund*, and the *Heat Network Efficiency Scheme*[13].

Heat Pumps for schools can be funded through the *Public Sector Decarbonisation Scheme* (PSDS), *Condition Improvement Fund*, *School Condition Allowance*, or any other funding avenue available, including *Devolved Formula Capital* or *Section 106* grants.

The perils of securing funding for renewable technology must be acknowledged. Historically, the chance of securing PSDS funding without applying to the *Low Carbon Skills Fund* (LCSF) first has been low. The LCSF provides funding for professionals (usually chartered surveyors) to conduct the complex and time-consuming process of applying for PSDS funding.

73%

If installed correctly, heat pumps supply three times more energy than they use and produce 73% fewer emissions than gas boilers.

Consumer barriers to adoption

For the consumer, cost is always a prime consideration. Currently it is cheaper to install a gas boiler system than an HP. In fact, the capital cost of an HP is higher in the UK than in many other countries[14]. There is also a lack of supply in the UK market which is driving up cost, and there are installation delays due to a lack of competent installers.

A major barrier to the adoption of HP technology is misinformation and disinformation[15]. Consumers of energy in the UK have been confused about HPs for decades. Various field trial studies suggest the lack of trustworthy data related to microgeneration as a reason for the slow adoption of HP technology[16]. Also, the lack of perspicuity and the complexity of the technology reduces uptake.

Residents' expectations have to be managed in advance of installation, with ongoing guidance for effective use of systems. Heat pump heating is different, and so is control of heat in the home. Like anything new, it takes time to accept and to adapt to the differences. Consumer knowledge and understanding of HP technology is crucial if installation is to be scaled up across the UK.

Adoption risks

For those commissioning HP technology, it is important to research the best solution for the

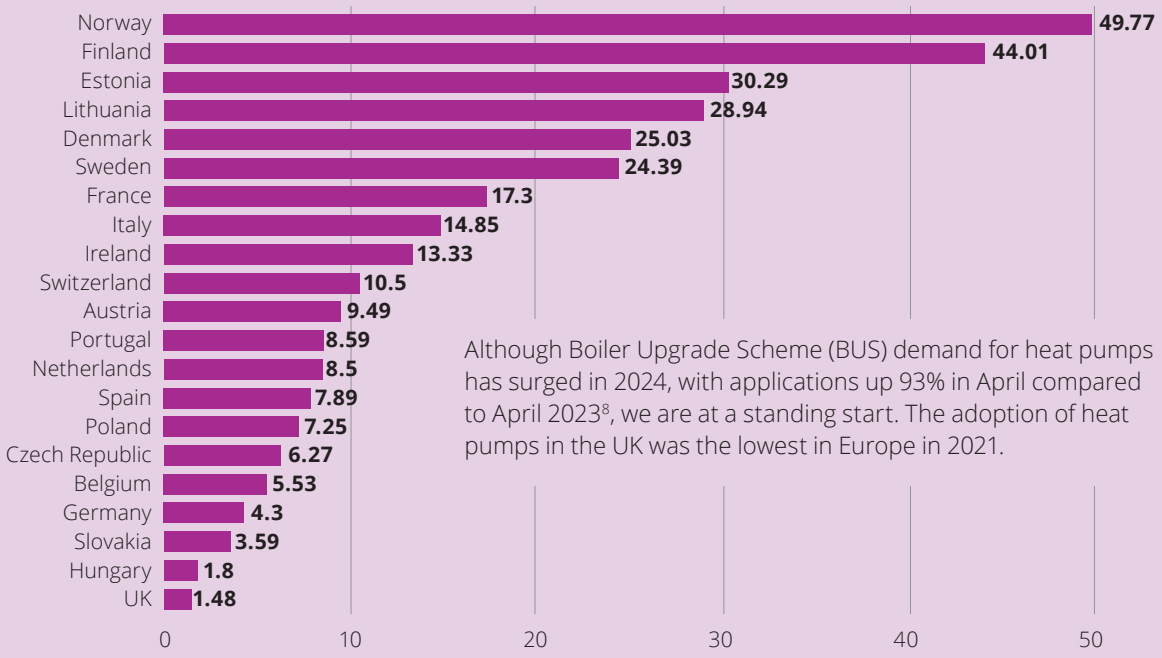
Heat pump technology

Heat pumps operate like a refrigeration unit in reverse. They perform as energy recovery units that use electricity to take higher temperature heat from air, ground or water to provide space and water heating. These different types of energy provision are regarded as sources of renewable energy as they do not require fossil fuel input.

The two most common types of HP fitted in the UK are air source heat pumps (ASHPs) and ground source heat pumps (GSHPs). ASHPs are the most popular type in the UK, making up 87% of the current market in HP installation[16]. Because of their relatively small size and lower installation costs, they have become the preferred choice in new builds and retrofits.

Most ASHPs in the UK are the air to water type, which take heat from the outside air, transferring it to water. This water then heats the home through radiators or underfloor heating and provides hot water. Heat from the air is absorbed into a refrigerant which has a very low boiling point. This is compressed into a superheated state by a compressor, and heat is transferred to the water. GSHPs are designed to extract heat via a buried network of fluid-filled pipes, known as a 'closed loop', with a compressor and pump unit. The basic principle is the same as the ASHP, just on a larger scale.

Fig 1: HP sales per 1000 households in 2021 (Albert, 2022)



Although Boiler Upgrade Scheme (BUS) demand for heat pumps has surged in 2024, with applications up 93% in April compared to April 2023[8], we are at a standing start. The adoption of heat pumps in the UK was the lowest in Europe in 2021.

premises concerned. Each building requires different considerations. For example, a Victorian property may require a deep retrofit, where the walls, windows and roof need extra insulation to make it HP ready. However, adequate ventilation is essential to prevent condensation issues in properties designed to breathe through the building fabric. There is a perception that period homes cannot be efficiently or sufficiently heated by heat pump technology, however this is proven to be inaccurate[17]. Many heritage buildings have been retrofitted effectively, including listed properties owned by the National Trust.

Once funding is in place it can be difficult to secure a competent contractor to install the heat pump. Some trades are trained to fit heat pumps, but specialists are in demand. Anecdotally, some registered providers have experienced issues with poor or improperly fitting heat pumps fitted by inexperienced or unqualified installers. Problematically, there hasn't been the market confidence to sustain a pipeline to upskill and train a workforce. Even though HP take up is growing, market certainty is not assured.

Once installation is complete, educating residents on how the system works, what to expect, and how to operate the HP efficiently, is crucial. Heat pumps provide ambient heat controlled by a thermostat to maintain a constant temperature day and night. In retrofitted properties the radiator capacity is usually increased to compensate for lower temperatures. Those used to gas or oil boilers may take time to adjust. Facilities managers should be educated in heat pump technology and its operation, and support residents in their use of new systems.

Many professionals in housing remain sceptical of heat pump technology, especially when retrofitted. The belief is that less thermally efficient properties are not suitable for heat pump installation. However, many social housing providers have taken the plunge, with success. For example, in Kennedy Drive, Swindon, 55 properties built in the late 1960's were fitted with air source heat pumps and insulated to a high standard in 2021. The residents have benefitted from improved, affordable and reliable heating systems, and in a cost of living crisis, have experienced lower energy bills[18].

£10,000

The average cost of an air source heat pump installation in a three-bedroom property in the UK is £10,000[9]

In the next two decades fossil fuel technology will be phased out and replaced by renewable heating alternatives. At present HPs are best placed to fill this void. HP technology will become more advanced and more affordable, with further opportunities for innovative schemes, including district heating projects funded by local authorities, like the mine water energy scheme at Gateshead[19]. Heat pump technology will continue to evolve, with improvements to heat extraction efficiency. Continuing development of two-way HPs that cool as well as heat buildings will become increasingly attractive in a possible 3°C heated world. Heat pumps can provide an effective solution to our dependency on oil and gas, and are a key element in the UK's climate change transition. Let's hope the *Planning and Infrastructure Bill* galvanises heat pump roll out.

Certain drivers and levers can secure the adoption of HPS across the UK:

1 HP adoption is written into Building Regulations - with fixed termination dates for new and existing oil and gas boilers.
2 The *Domestic Renewable Heat Incentive* (or similar) is re-introduced – this was a financial incentive to promote renewable energy use.
3 Industry is supported in training and upskilling trades.
4 The National Grid updates and expands sub-station capacity.
5 District heating projects are assured of government funding.
6 New and improved incentives make installation affordable for all householders.
7 A rolling UK wide HP education and awareness campaign across all media platforms explains and supports HP technology.

Pimp my pump!
Common consumer myths are that heat pumps are noisy and ugly. However, they are no noisier than a standard gas boiler, and can be wrapped in a colour, or camouflaged to blend in with their surroundings.

Full-Colour Printed Brickwork Effect Vinyl Wrap by Creative solutions on Private Client's Ecodan R32 Ultra Quiet Air Source Heat Pump
https://www.creative-solutions-direct.co.uk/

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Hookway Chartered Surveyors is a Bristol-based building surveyors specialising in condition surveys, construction and refurbishment project management, and government funding applications. Our expertise is in providing services to housing associations, education institutions and local authorities in England and Wales.
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