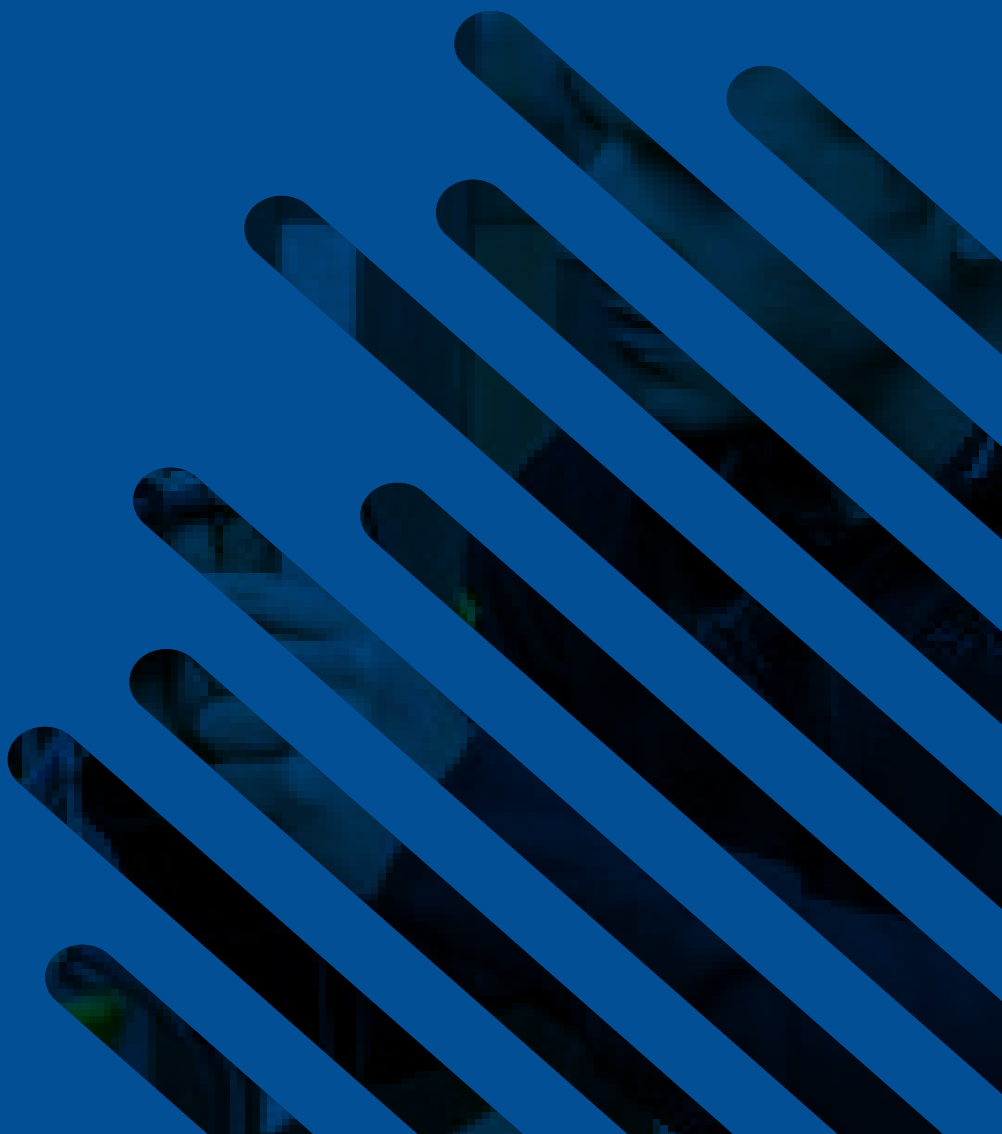
heatpumps.org.uk

RETROFITTING HOMES FOR NET ZERO HEATING

REGULATORY CHANGE

November 2020



ABOUT

The Heat Pump Association (HPA) is the UK's leading authority on the use and benefits of heat pump technology and includes the country's leading manufacturers of heat pumps, components, and associated equipment. Proposals put forward by the HPA are developed closely with a membership base that represents around 95% of the heat pump market manufacturing share, including all of the large multinational companies providing product to the UK market, ensuring that the proposals are workable and credible.

The Association works to support policymakers in the development of effective heat decarbonisation policy and other matters that affect the interests of end users, wider stakeholders, and the industry. In addition, the HPA co-ordinates technical and market research into areas of mutual interest identified by members, the aim of which is to improve market opportunities at home and abroad and helping markets to transform to low carbon solutions and technologies.

The HPA recognises that heat pumps will only fulfil their promise in the market if suppliers, installers, and users fully appreciate their function and capabilities. A major objective of the association, therefore, is to raise awareness of heat pumps by informing prospective specifiers of their long-term benefits, reassuring end users and providing up-to-the-minute advice on the various systems available. The HPA conveys this message by generating publicity using exhibitions, literature, promotions, and public relations in addition to helping customers deploy the technology through managed sales and services structures.

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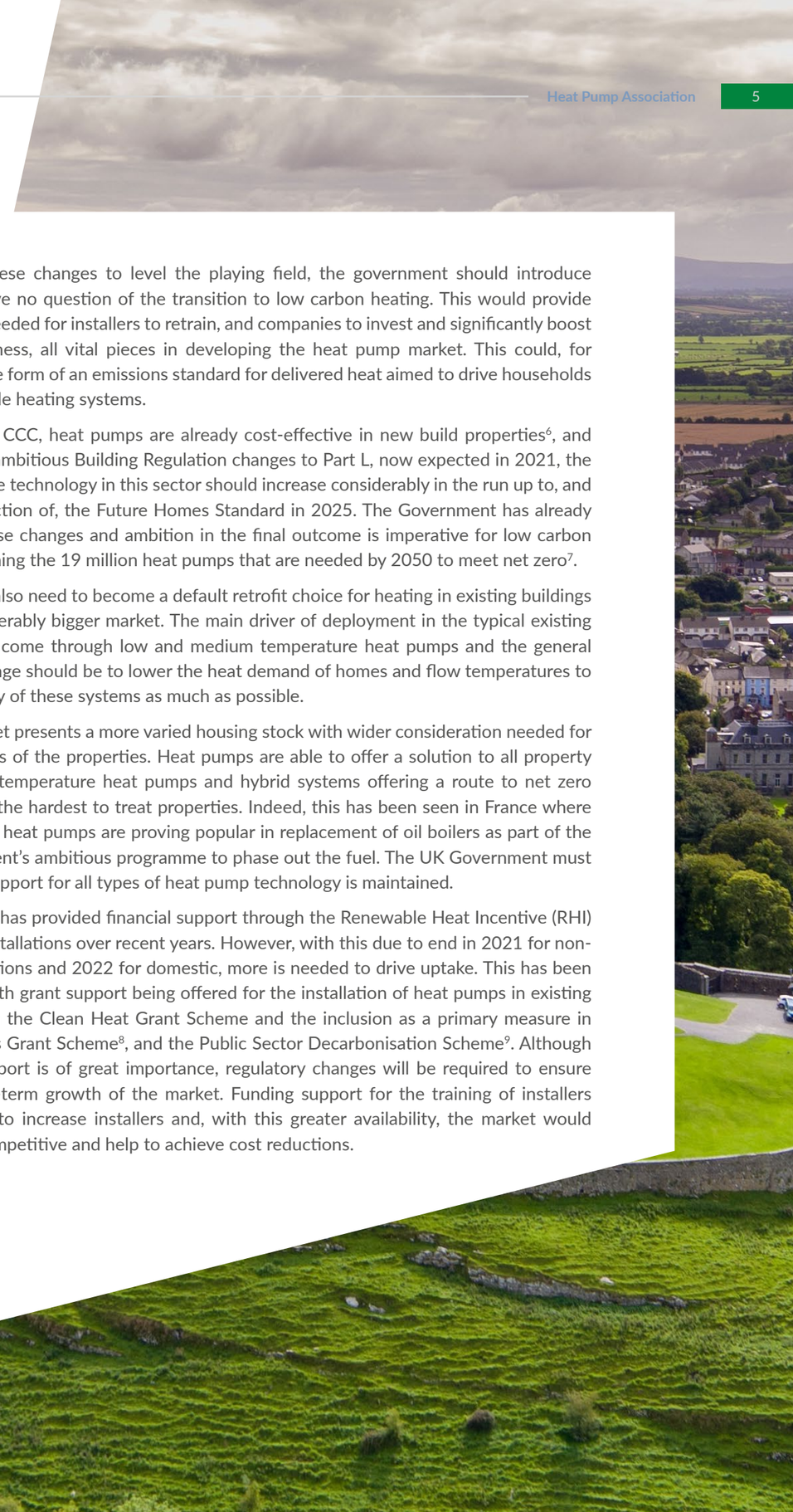
EXECUTIVE SUMMARY

The way we heat our homes is set to change, in order to reach the UK's net zero target by 2050, there must be an urgent and widespread shift to low carbon heating. For a number of years, the Committee on Climate Change (CCC) has recognised the important role that renewable heating, such as heat pumps, will play in meeting this target. They stress that heat pumps are an established technology and therefore provide one of the solutions for the decarbonisation of heat that must be supported immediately. While there is no 'silver bullet' solution to the decarbonisation of heat, the CCC state "heat pumps must scale up to be able to replace the majority of current gas boiler demand by the early 2030s"[1].

Outside of the usual proponents for the increased deployment of heat pumps, there has recently been wider support gathering for the technology and a growing appetite for regulatory change. This has included the Confederation of British Industry (CBI), who state that "heat pumps offer one of the most efficient solutions to low carbon heat"[2], and the Institute for Public Policy Research saying that "heat pumps are already available and give the UK the best chance of meeting its net zero targets in the housing sector" [3].

The HPA recommend that the following changes are introduced to transform the domestic heating market from fossil fuel to low carbon heat market over the next decade. This report sets out steps to 'level the playing field' across all heating types, encouraging best practice and low carbon heating for all installations, regardless of technology type, to ensure efficient installations that reduce both fuel bills and emissions from homes:

- **Mandate a maximum flow temperature of 55oC in Building Regulations to be applied to replacement heating systems from 2026.** This should be changed from 'supplementary information' in the Domestic Building Services Compliance Guide[4], or equivalent, to a 'minimum standard' and also introduced as a requirement of Boiler Plus or equivalent. It should be supported by immediate 'no regrets' steps to this date.
- **Mandate in Building Regulations for Heat Loss Calculations to be carried out for all replacement heating systems from 2026.** This should be introduced through a requirement to Boiler Plus, or equivalent, and an addition to the Domestic Building Services Compliance Guide, or wherever these current requirements end up being enforced.
- **Require all heating installers to have a Low Temperature Heating and Hot Water Qualification[5], or equivalent, as part of accreditation scheme refresher courses.** This would mean that, for example, the majority of installers who currently install gas that this course become part of their five-yearly Accreditation Certification Scheme refresher so that they all have the core skills needed to optimise heating system efficiencies and install low carbon heating systems within the next five years. It should apply to all energy vectors used for heating following this accreditation and renewal structure as part of a low carbon heating skills card.



In addition to these changes to level the playing field, the government should introduce regulation to leave no question of the transition to low carbon heating. This would provide the confidence needed for installers to retrain, and companies to invest and significantly boost consumer awareness, all vital pieces in developing the heat pump market. This could, for example, be in the form of an emissions standard for delivered heat aimed to drive households towards renewable heating systems.

According to the CCC, heat pumps are already cost-effective in new build properties[6], and with sufficiently ambitious Building Regulation changes to Part L, now expected in 2021, the deployment of the technology in this sector should increase considerably in the run up to, and after the introduction of, the Future Homes Standard in 2025. The Government has already consulted on these changes and ambition in the final outcome is imperative for low carbon heating and reaching the 19 million heat pumps that are needed by 2050 to meet net zero[7].

Heat pumps will also need to become a default retrofit choice for heating in existing buildings which is a considerably bigger market. The main driver of deployment in the typical existing home is likely to come through low and medium temperature heat pumps and the general incentive for change should be to lower the heat demand of homes and flow temperatures to improve efficiency of these systems as much as possible.

The retrofit market presents a more varied housing stock with wider consideration needed for the characteristics of the properties. Heat pumps are able to offer a solution to all property types, with high temperature heat pumps and hybrid systems offering a route to net zero heating even for the hardest to treat properties. Indeed, this has been seen in France where high temperature heat pumps are proving popular in replacement of oil boilers as part of the French Government's ambitious programme to phase out the fuel. The UK Government must make sure that support for all types of heat pump technology is maintained.

The Government has provided financial support through the Renewable Heat Incentive (RHI) for heat pump installations over recent years. However, with this due to end in 2021 for non-domestic installations and 2022 for domestic, more is needed to drive uptake. This has been acknowledged with grant support being offered for the installation of heat pumps in existing buildings through the Clean Heat Grant Scheme and the inclusion as a primary measure in the Green Homes Grant Scheme[8], and the Public Sector Decarbonisation Scheme[9]. Although this financial support is of great importance, regulatory changes will be required to ensure sustainable, long-term growth of the market. Funding support for the training of installers would also help to increase installers and, with this greater availability, the market would become more competitive and help to achieve cost reductions.

The support for regulation to increase the deployment for heat pumps has never been stronger. Indeed, this was recognised in the Government's recent Future Support for Low Carbon Heat Consultation, where a commitment was made to consult on proposals for a regulatory framework to support the phase out of fossil fuel heating off the gas grid this year[10]. This report proposes specific regulatory changes that the Government should take immediately in the retrofit market, both on and off-grid, to level the requirements for all heating systems to support the increased deployment of heat pumps.

Regulation should be introduced to ensure minimum standards across all heating technologies. Due to the vast potential for higher efficiencies with heat pumps, many of the techniques needed for this minimum standard are already commonplace to ensure that the technology is working optimally. Traditional heating systems, such as gas boilers, on the other hand are less sensitive to these requirements and thus the same practices are not replicated across the whole industry. However, they are still relevant to optimise efficiency, lowering fuel bills and reducing carbon emissions, but are consistently overlooked. By regulating to bring the requirements for all heating systems up to the higher standard, not only will traditional heating systems operate more efficiently, but installer skills and heating system infrastructure will be future proofed for low carbon heating. This will provide a considerable boost to heat pump deployment in the retrofit market now and lay the foundations for further growth in years to come.

LEVELLING THE PLAYING FIELD FOR LOW CARBON HEATING

KEY RECOMMENDATIONS

Table 1: Regulatory Change Summary Timeline

2021

55°C flow temperature regulation where:

1. Whole heating system, pipework and heat emitters are already being replaced
2. Consequential improvements are already being made
3. Landlords are replacing the heating system

Requirement for low temperature heating and hot water course skills introduced.

2026

All installers trained in Low Temp. Heating and Hot Water course.

55°C flow temperature regulation for all heating system replacements.

Heat loss calculations required for all heating system replacements. Funding support to protect the most vulnerable consumers.

Recommendation 1: Mandate in Building Regulations for a maximum flow temperature of 55°C to be applied to replacement heating systems from 2026.

Heat pumps operate optimally at lower flow temperatures than are traditionally used in domestic heating systems. Heating systems in general operate more efficiently at lower flow temperatures and so this should be encouraged, where it is possible.

Figure 1 shows the efficiency for condensing boilers according to the return (inlet) temperature, following the SEDBUK efficiency calculation methodology. It can be seen that there are considerable efficiency improvements once condensing mode is reached, this is achieved when the return temperature is below 55°C, equivalent to a 75°C flow temperature for boilers.

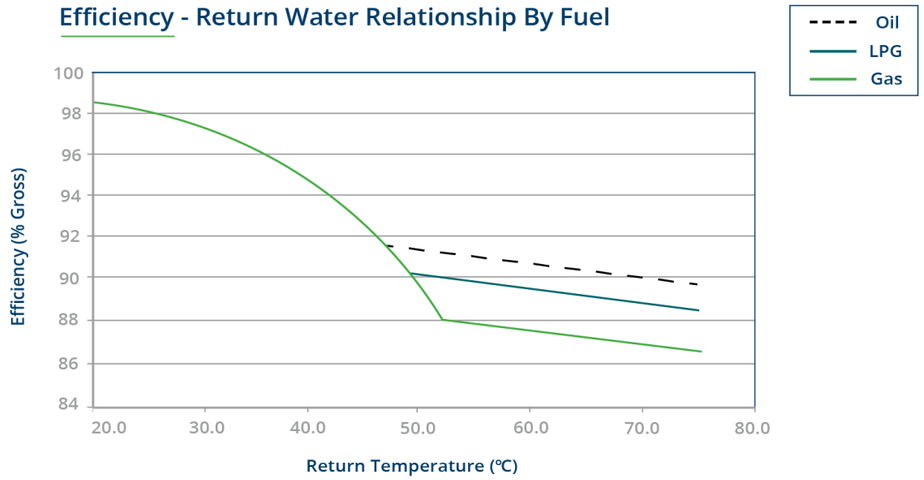


Figure 1: Condensing boiler efficiency by inlet water temperature[11]

Since 2005, it has been mandatory for condensing boilers to be installed[12]. Regulation should therefore ensure that all boilers are at the very least operating in condensing mode. However, this is currently not the case, with the Domestic Building Services Compliance Guide stating that "condensing boilers should be designed to have low primary return temperatures, preferably less than 55°C" as 'Supplementary Information' rather than the 'Minimum standard'[13]. As might be expected, this means that many boilers in reality do not operate in condensing mode. This was shown in a field trial conducted by the Energy Saving Trust that highlighted gas condensing boilers in-situ were not achieving the efficiencies that they would achieve if operating at a lower flow temperature[14].

Figure 1 also demonstrates the considerable improvement in gas boiler efficiency from lowering the return temperature beyond the dew point at 55°C. The HPA therefore specifically recommends that the flow temperature is brought down to 55°C (35°C return temperature for a boiler). Doing so would create a system which can operate with a mean water temperature of 45°C, which can be categorised as 'heat pump ready'.

To get to this lower flow temperature, upgrades to the heat emitters may be needed, which could increase installation costs for consumers. Based on HPA membership experience, this typically requires changing several radiators to often larger more modern, efficient ones. Once installed, these radiators will be in place typically for 60 years[15], providing the future proofed heating system infrastructure which would allow heat pumps, or any alternative low carbon heating technology, to be installed at a later date. This will help to level the playing field for the installation of heat pumps compared to traditional heating systems and also yields considerable fuel bill and emission savings whatever the heating technology deployed.

The analysis below illustrates the scenario for a typical consumer (see Figure 2). This example considers the improvement of all radiators in a 1980s, 3-bed, detached home, using a condensing gas boiler operating at an 80°C flow temperature. Assuming improvements are made to ensure the system can operate at a 55°C flow temperature, the consumer will realise significant benefits. From a consumer perspective, the cost associated with radiator upgrades would deliver fuel bill savings of around £75 per year. This would provide a long, but positive, payback period for the heat emitter upgrades for the household. While this length of time exceeds normal moving patterns for a property, this could be complemented through novel financing methods to de-risk the additional upfront cost in case of shorter occupancy lengths, such as the Property Assessed Clean Energy 'PACE' model[16] or government subsidy support for these improvements.

CASE STUDY: PACE FINANCE MECHANISM

The PACE model is an innovative financing mechanism used to encourage financing for energy efficiency and renewable energy improvements, particularly in residential homes. The novel approach of the PACE assessments attaches the payback to the property, rather than the individual, for improvements paid back typically between 10 to 20 years. This ties the debt to the property rather than the current property's owner. The debt is then paid back as an addition to the owner's tax bills associated with the property and so can be passed on to subsequent owners.

This addresses a key disincentive for property owners investing in these improvements if they think that they might move away before the resulting savings from installation cover the upfront cost. The structure has proven popular in the USA, and is now being rolled out across the EU and beginning to be explored in the UK. It could provide a key enabler to building the heat infrastructure in the UK's owner-occupier market to make homes ready for low carbon heating.

As shown in Figure 2 below there is a clear case to be made for government intervention here, as the change would not only yield considerable fuel bill savings, but also would reduce carbon emissions and improve air quality to far outweigh the upfront costs and create a positive net present value (NPV), across the lifetime of the radiators. It is important to stress that without government intervention, this outcome would likely not be realised.

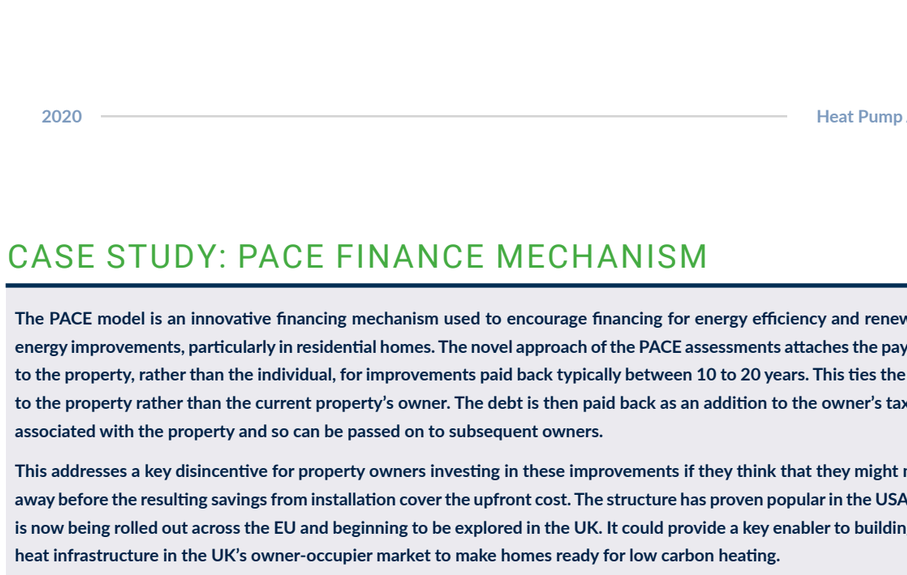


Figure 2: Net Present Value (NPV) of Upgrading All Radiators in a 1980s, 3-Bed, Detached Home to Allow a 55ºC Flow Temperature

The Domestic Building Services Compliance Guide should therefore be adjusted, to have a maximum of 55ºC flow temperature as a 'Minimum standard' for the installation of all heating systems from 2026. Figure 3 below shows a change-marked version of the Compliance Guide for gas boilers highlighting the amendments that need to be made to deliver the lower flow temperature. These should be applied to all heating systems with additional support provided for homes that might struggle to afford the upfront cost or to physically be able to upgrade emitters sufficiently to lower flow temperatures to this level. Introducing these changes will ensure the efficient operation of all heating systems installed as well as lowering some of the barriers to the deployment of low carbon heat.

It should be noted that earlier this year, the Ministry of Housing, Communities, and Local Government (MHCLG) proposed in the Future Homes Standard consultation[17] that the Compliance Guides were removed and placed in the Approved Documents instead. In this case or any other change, the specific changes suggested in this paper for the Compliance Guides should be translated into whatever final form or document that they end up in once a decision on this has been made.

Table 2 Recommended minimum standards for efficiency, system circulation, hot water storage, system preparation and commissioning for gas-fired wet central heating systems

	Minimum standard	Supplementary information
1.0 Efficiency	a. The boiler SEDBUK 2009 efficiency for boilers in new dwellings should not be less than 88%. b. The boiler ErP efficiency for boilers installed in existing dwellings should not be less than 92%. c. In existing dwellings, in the exceptional circumstances defined in the DCLG *Guide to the condensing boiler installation assessment procedure for dwellings*[16], the ErP efficiency standard would not apply and instead the boiler SEDBUK 2009 efficiency should not be less than 78% if natural gas-fired, or not less than 80% if LPG-fired. d. The boiler efficiency for heating boilers that are combined with range cookers should be as defined in Section 2.3. e. Systems should be designed to have low primary flow water temperatures, less than 55OC, to maximise efficiency in all homes.	The SAP Product Characteristics Database (PCDB) at www.ncm-pcdb.org.uk/sap displays separate SAP winter and summer seasonal efficiencies for boilers held within it. SAP 2012 (available at www.bre.co.uk/sap2012) uses these values to calculate the carbon dioxide emission rate for a dwelling. SAP winter and summer seasonal efficiencies are derived from SEDBUK 2009 values. SEDBUK 2009 and SEDBUK 2005 efficiency values are different to one another, and both are different to the ErP efficiency. If the SEDBUK efficiency in a boiler manufacturer's literature does not state whether it is SEDBUK 2009 or SEDBUK 2005, it should be assumed to be SEDBUK 2005. Minimum SEDBUK 2005 efficiency values for boilers are set out in Table 1 and in the 2010 edition of this guide All boiler manufacturers should be calculating and declaring the energy efficiency of boilers in line with the ERP methodology. For boilers installed in existing buildings, the ErP efficiency should be used and not the SEDBUK efficiency values. The DCLG *Guide to the condensing boiler installation assessment procedure for dwellings* sets out the approved procedure for establishing the exceptional circumstances in which boilers may be of the non-condensing type.
Add in Point E	Remove this section from the supplementary information, add to the minimum standard column and reword to the suggestion in Point E above.	Systems with condensing boilers should be designed to have low primary return water temperatures, preferably less than 55°C, to maximise condensing operation. Low return water temperatures can be obtained through techniques such as weather compensation and the use of low temperature heat emitters (for example correctly-sized radiators and underfloor heating elements). Low temperature heat emitters will also be compatible with low temperature heat generators, such as heat pumps, that might be installed as replacements in the future.

Figure 3: Suggested changes to the Domestic Building Services Compliance Guide (page 15)

A Phased Approach

This flow temperature requirement for any replacement heating system should be enforced from 2026. In the run up to this implementation date there are some changes that should be brought in immediately that can help to begin the journey. These immediate changes will offer demand to installers who have already taken the required training (see *Recommendation 3*).

Firstly, any *full* replacement of a heating system, including all heat emitters, should be required to be designed to operate at 55°C flow temperature or below. The additional upfront cost of this change, from slightly larger heat emitters, to the consumer would be fractional compared to the total already needed for works of this extent. Enforcing this change immediately will not only save these consumers money on fuel bills, but it will also considerably reduce carbon emissions for a far lower capital cost (see *Table 2*). There is therefore a strong case to be made for immediate change in this case.

Table 2: Net Present Value of Achieving Lower Flow Temperatures During a Full Radiator Upgrade

Flow Temperature	70°C (Baseline)	65°C	60°C	55°C
Installed Radiator replacement cost	£1143	£1247	£1506	£1650
Gas Boiler Efficiency (SEDBUK)	89.5%	92%	94%	95.5%
Net Present Value	N/A	£959	£1510	£1952

Secondly, there is also the opportunity to encourage this key change by including it in consequential improvements where they have already been triggered, such as through an extension. Such changes often require considerable investment from the owner and already create considerable disruption for them. At this point, it should be mandatory to also add the requirement to upgrade the heat emitters in a property to allow low temperature heating. Tying this requirement in will allow those able-to-pay to be accurately identified, to lead the development of this market, at the same time as avoiding disruption and hassle at a later date.

In addition, the heating infrastructure in a considerable number of homes may already have the potential to run at a lower, 55°C flow temperature. HPA membership experience has shown that many properties have oversized radiators already in place. With accurate heat loss calculations (see *Recommendation 2*) and an upskilled installer base (see *Recommendation 3*), in this circumstance, installers should be required to lower the flow temperature of the dwelling immediately to 55°C, or as low as possible whilst still meeting the heat demand, and explain to the consumer the benefits of doing so.

Finally, the Department for Business, Energy and Industrial Strategy (BEIS) are currently consulting on 'Improving the energy performance of privately rented homes'[18]. As part of the proposed changes outlined in the document, a requirement should be brought into place immediately for all landlords in the private sector to ensure that when replacing a heating system, the whole system is upgraded so that it should run at 55°C flow temperature or lower. To align with the preferred options for minimum Energy Performance Certificate (EPC) Band C requirements, this flow temperature change should also be mandatory for any new tenancy agreement from 2025 and for all tenancies from 2028. Doing so will considerably reduce tenants' fuel bills and save considerable amounts of carbon through the improved efficiencies created.

With these changes, there is an opportunity for the Government to cost-effectively reduce carbon emissions and reduce household fuel bills to yield a significant NPV gain from intervention. There is the chance for 'no regrets' steps to be taken in certain circumstances, where immediate change should be brought into place for some heating system replacements in the run up to the requirement for all heating systems to have a low flow temperature. Not only will carbon and fuel bill savings be realised immediately, but it will also establish the heating infrastructure needed for mass uptake of low carbon heat and make this deployment far easier as the switch is made.

Consumer Support

The analysis demonstrating the positive value of a flow temperature change here takes one specific example. The characteristics of the housing stock vary widely, as do the types of households that live in these homes. As demonstrated by the previous section, a nuanced approach that takes into consideration this variation is needed for the successful implementation of this policy change.

According to the CCC, additional costs will be a necessity to reaching net zero across the economy and this is very likely to also be the case in the decarbonisation of heat[19]. While there should be efforts to strive to minimise these costs, this should not come at the cost of inaction, as this may threaten the ability to meet these climate targets. In order to access the fuel bill savings down the line, there is still a burden of the additional upfront cost of this policy change that must be considered for this policy to be palatable and bring consumers on the journey to net zero heating, rather than to have them fighting against it; this will be crucial with the pace of change needed.

The increased upfront cost to achieve the lower flow temperature may be unaffordable for some households and they should be supported to complement the regulatory requirement. Accordingly, the HPA would suggest that there should be financial support for these households. This could come through schemes, such as the Energy Company Obligation (ECO) or the Green Homes grant, to offer subsidy towards the costs of the heat emitter upgrades needed to achieve the lower flow temperature. By offering this support, regardless of the heat generation technology installed, a neutral approach can be provided to unlock the lower fuel bills and carbon emissions, as demonstrated in the previous section.

It is also expected that there will be exceptional properties that, given their heat loss and wall space, will make it impossible to deploy heat emitters with enough effective surface area to reach the heat loss of the property at the lower flow temperature. In these cases, following evidence from a heat loss calculation, the lowest achievable flow temperature should be implemented for the system that is installed. There is likely to be a role for hybrid heat pumps and high temperature heat pumps in such circumstances to offer a low carbon, efficient heating solution.

The replacement of a heating system is a vital intervention that should be used to as a trigger for this regulatory change, as suggested. The majority of current replacements are distress purchases where a consumer has to replace a system because it has broken down or is beyond repair. It is of course vital that the consumer is able to get access to hot water and heating as quickly as possible, but this should not be sacrificed for higher than necessary fuel bills and emissions in the long run. This is where readily accessible subsidies for the most in need and support for all will be needed to ensure that this regulation is a success. Ideally, there would be a drive to encourage heating system replacements outside of the heating season and before the system needs replacing as a distress purchase. This could be done through a government awareness campaign for low carbon heating, and would complement the financial assistance offering.

Recommendation 2: Mandate in Building Regulations for heat loss calculations to be carried out for all replacement heating systems.

Requiring a low flow temperature normally requires heat loss calculations for a property to ensure heat emitters are appropriately sized. In addition to the benefits already discussed for this, heat loss calculations also allow accurate sizing of heating engines to take place, reducing the likelihood of paying too much for an oversized system. This should be standard practice already across all heating systems, as it is for heat pump systems, to ensure that the heating system operates as efficiently as possible and is sized appropriately. Considerations such as system balancing and correctly setting Thermostatic Radiator Valves (TRVs) rely upon a heat loss calculations.

It has been shown that despite the average peak heat load of a UK house being around 6 kW, the sizes of new regular boilers typically range from 12 to 30 kW[20], likely costing the consumer more upfront as a result. According to BEIS, this oversizing occurs for several reasons[21]:

- **Heating systems remain in-situ without major changes, despite design practices evolving over time, installers usually replace like-for-like**
- **Installers may be following company guidance that does not reflect best practice**
- **Incorrect sizing when switching from standard to combi or combi to standard when calculating heating and hot water system designs**
- **Consumer pressure to upsize for comfort perceptions and installer attitude to avoid complaints related to under-sizing**

Through a requirement for heat loss calculations and an understanding of what they are for amongst installers, the majority of these problems can be overcome. This will ensure that consumers are able to get a more appropriately sized product. It also provides valuable data needed to make the home ready for low carbon heat. With heat loss calculations already carried out for a property, the ease of installing a heat pump is considerably increased.

In addition to appropriate sizing, heat loss calculations can provide valuable information for the potential of, or need for, fabric improvement measures. This helps to determine the cost and feasibility of any upgrades that are possible and the low carbon heating technologies suitable for each property. This information will be extremely beneficial in decarbonising our homes and providing solutions that are right for the consumer. It will also help to complement the recommendations given from Energy Performance Certificates (EPCs), which are often not up to date with improvement measures made since the assessment was carried out.

The basis for all heat loss calculations comes from EN 12831 as the standard to follow. Technological developments across the industry are now making it easier to carry out these calculations. These developments increase the ease for heating engineers to carry out heat loss calculations, making the service less hassle for the installer and more cost-effective for the consumer, and are available

from the majority of heat pump manufacturers. With heat loss calculations a necessary step for the deployment of heat pumps, these innovations will help with the cost-effective deployment of the technology. The earlier that these calculations can be carried out, the earlier that consumers can begin saving and the greater the likelihood of low carbon heat deployment.

Boiler Plus standards, which came into force from April 2018, were designed to increase the efficiency of boilers installed, bringing down overall costs for consumers and cutting carbon emissions[22]. This determined changes to the Domestic Building Services Compliance Guide, such as requiring the ErP of a gas boiler to be a minimum of 92% and to have an energy efficiency measure installed alongside combination boilers. Two years on, Boiler Plus is now under review and standards should be updated to drive further efficiency improvements with a focus on heat loss calculations to reinforce the low flow temperature change required. This could be done through a change to 'Heating System Plus' to ensure that high standards are driven for *all* heating systems, to help encourage the deployment of low carbon heat, and to align with the shift to a low carbon installer skills card.

Specifically, it is recommended that the update to Boiler Plus includes an amendment to the Domestic Building Services Compliance Guide Table 4, section 2.0 (and equivalent for other systems and fuels) to include a 'Minimum standard' that: "All heating appliances should be correctly sized for the peak heat load of the building based on a heat loss calculation, including domestic hot water requirements where applicable." As above, this should be caveated to wherever the standards from the Compliance Guide are placed.

Recommendation 3: Require all heating installers to have a Low Temperature Heating and Hot Water Qualification[23], or equivalent, as part of accreditation scheme refresher courses.

It is crucial that installers have the skills required to ensure that heating systems can operate correctly at a low flow temperature and for the benefits of any regulatory changes to be fully realised. This includes practices such as heat loss calculations, heat emitter sizing and hydraulic balancing. While some installers will already understand these practices, they are not currently commonplace as part of the installation of traditional boiler heating systems. Therefore, refresher courses may be needed for those that already have training in these areas or first-time training for those that have not had it before.

CASE STUDY: ENERGY EFFICIENCY INSTALLER PROGRAMME

Changes to Part L of the Building Regulations in 2005 brought in the requirement for the installation of condensing boilers, propelling the technology into the mainstream. Alongside this change was a need to equip installers with the knowledge and skills to bring condensing boilers into homes across the country. This needed collaboration between installers and manufacturers through training schemes, such as the Energy Efficiency installer programme, as well as the manufacturers' own programmes. With the requirement for installers to complete the course, this meant that every installer in the country went through the programme soon after the change. There was also funding support to help with the additional costs of the requirement, as well as the ability for installers to self-certify, giving them a desire to retrain in many cases.

This radical shift in the condensing boiler market shows the potential for such a change towards low carbon heating and that a rapid upskilling can occur on an even greater scale when the right incentives are in place. The success of this example comes from the certainty provided with Government changes to regulation, support for upskilling alongside the efforts of manufacturers and installers to set up and go through the course. With the right framework in place such an upskilling can happen again to equip installers with the skills needed for net zero heating.

These skills are not only needed for the installation of heat pumps, but also for the efficient operation of all heating systems, as recognised as part of the HPA's recently published Training Strategy[24]. The new proposed route to becoming a heat pump installer, which is outlined briefly below and in more detail in the Training Strategy, intends to update the curriculum, remove unnecessary bureaucracy, and lower the cost to becoming a heat pump installer. This should be part of a 'low carbon installer' skills card that applies the same standards and requirements for all heating appliances, ensuring that the skills are regularly updated, following the current five year ACS refresher level, to maintain competence and recognition through the card. Whilst ensuring that standards are high, such an approach would also allow differentiation between installers and branding opportunities. There could also be the potential to show tangible benefits to installers for being part of a scheme, such as the ability to self-certify.

A pre-requisite to the proposed heat pump modules of this new route will be a Low Temperature Heating and Hot Water in Dwellings qualification (see graphic below). This course will ensure that installers have the competencies in place to maximise the performance of all heating systems and equip them with the skills necessary to install heating systems to operate at a low flow temperature. This qualification has been developed by an industry-wide collaboration spanning all heating technologies and led by the Chartered Institute of Plumbing and Heating Engineers (CIPHE)[25].

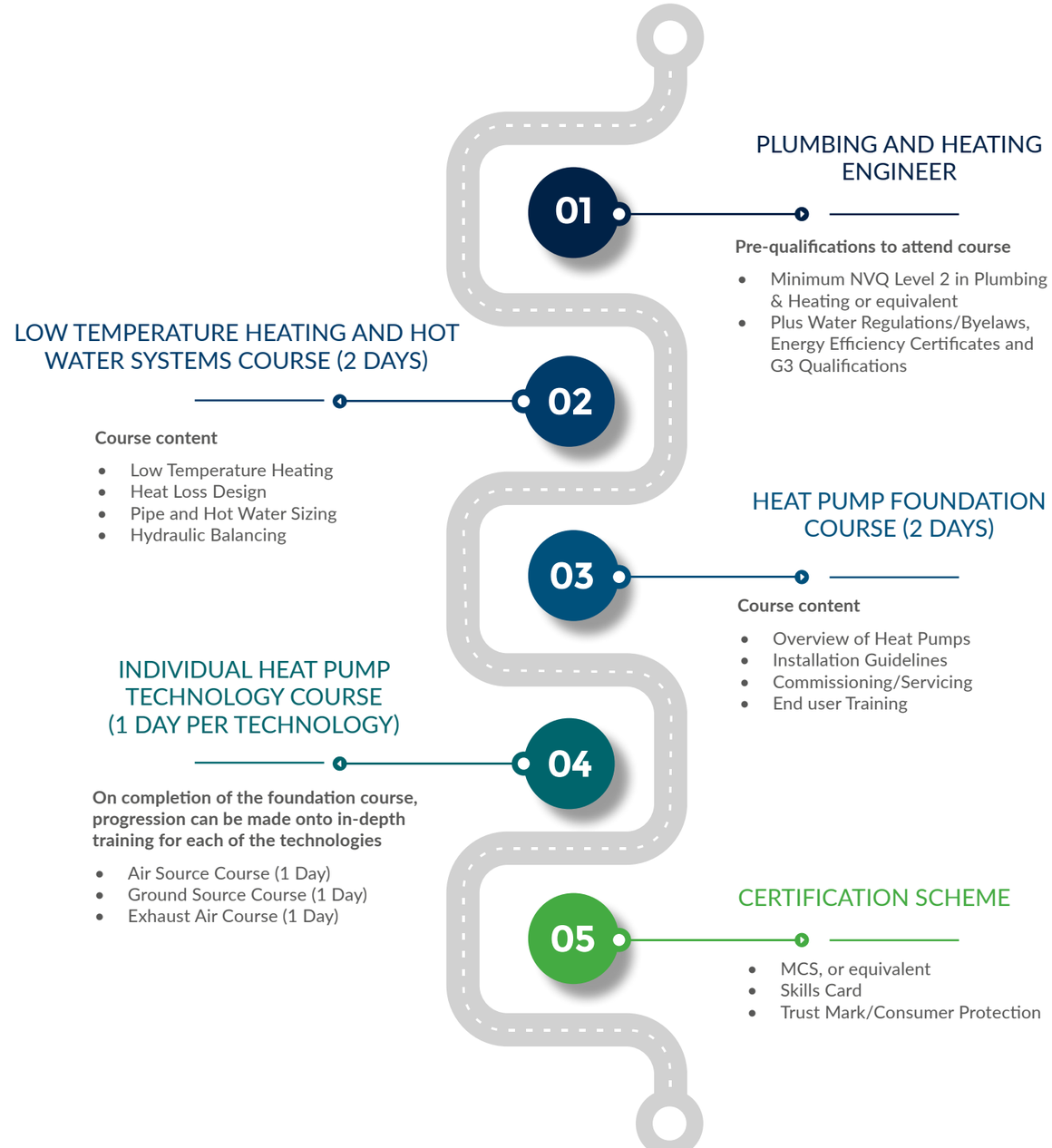


Figure 5: New Training Route Being Developed For Heat Pump Installers

The qualification includes practices such as the heat loss calculations, heat emitter sizing and system balancing. Having these skills in place will create a double-benefit, drastically improving the efficiency of heating systems being used now, but also upskilling the installer base. This core skillset will enable installers to then undertake a technology specific course on the installation of heat pumps greatly reducing the barriers, cost, and time to becoming a heat pump installer compared to the current state of play.

In order to build the installer base for net zero heating, the Low Temperature Heating and Hot Water Systems Course should become a mandatory requirement for the ACS refresher course taken every five years by gas engineers. Gas engineers are required to renew their ACS qualification modules every five years to ensure that they can continue working safely, legally and remain on the Gas Safe register[26]. Most installers will take these refresher modules at the same time due to taking them altogether when they first qualified.

This offers an established framework that should be used to upskill workers, the additional time and cost incurred for the new learning could be funded through a government voucher scheme to reduce the burden on installers from the transition. By making the Low Temperature Heating and Hot Water in Dwellings a module needed as part of this re-accreditation there is the chance to address a significant proportion of market and develop skills needed for net zero heating within the next five years.

There is the opportunity to copy this proven structure for all low carbon heating installers. As the transition to low carbon heat progresses, it will be crucial to ensure that skills and safety are kept up to date. This refresher structure should therefore also be part of the low carbon skills card development.

Figure 6 shows the impact of introducing the 'Low Temperature' course as a requirement of the ACS process and the number of upskilled installers that this could generate. As shown by the graph, this will deliver a significant proportion of the installer base required to meet net zero to allow easier specialisation in specific low carbon heating technologies, such as heat pumps.

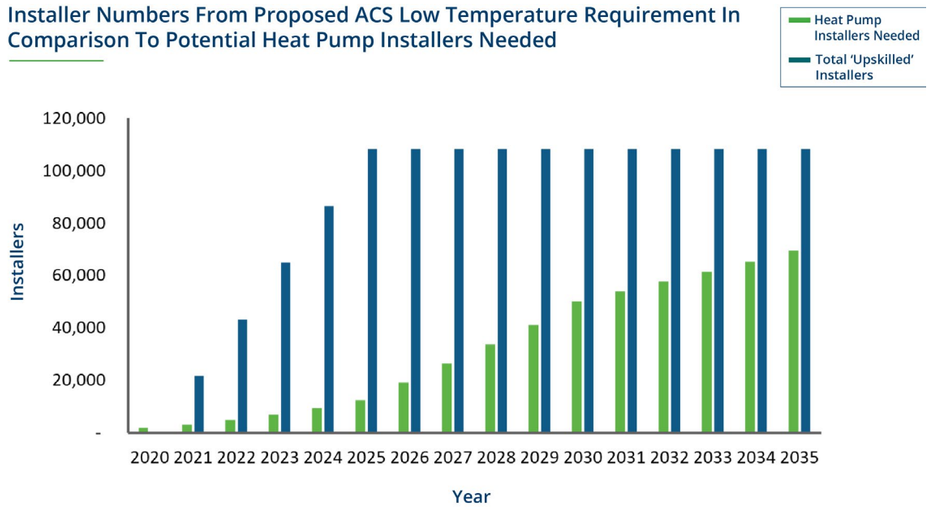


Figure 6: Installer Numbers from Proposed ACS Low Temperature Course Requirement in Comparison to Potential Heat Pump Installers Needed[27]

By utilising this existing structure of accreditation renewal alongside regulatory standards to ensure the use of this training, the heating market can be transformed over the next five years to provide a skills foundation for the transition to net zero heating. This can happen at minimal cost and time to installers if built into the existing refresher requirement framework and can yield significant benefits for efficient heating operation now in addition to this net zero foundation. By providing funding alongside this for early adopters, significant momentum can be built to grow the installer base.

It should be introduced alongside a skills card for low carbon heat installers. Through this card, a framework would be provided for the accreditation and acknowledgement of competent installers for all low carbon heating systems. This structure would provide the framework to level the playing field across all technologies, ensuring competence and safety requirements are met through bodies overseeing each low carbon technology.

CONCLUSION

It is an exciting time for the heat pump industry. Heat pumps are an established, existing solution that will form the backbone to the decarbonisation of heat. This has been recognised consistently by the CCC, with a recommendation of over 1 million installations needed per year by the mid-2030s, as well as considerable backing from an increasingly wider set of organisations.

The industry is gearing up for a mass market level of deployment. The HPA is overhauling the training route for heat pump installers, in coordination with CIPHE, to make it more accessible and up to date. Companies are continually innovating to offer a better product to consumers, with research and development being made into smart controls, dynamic pricing tariffs and heat-as-a-service. The installation of systems is being made easier for installers with advancements such as virtual assistance to help on-site.

The implementation of Recommendations 1, 2 and 3 would establish a lot of the heating infrastructure in homes, and skills amongst the installer base, needed for low carbon heating installations, by 'laying the groundwork' for wider heat pump adoption. This would provide the foundations for the Government to regulate the phase out of fossil fuel heating systems to align with the ambitions needed to reach net zero by 2050. With progress significantly behind where it needs to be, according to the CCC in their latest Progress Report to Parliament[28] , there must be a clear regulatory pathway to decarbonise heat.

Government backing would provide further incentive to push these developments and to grow the market to the levels advised by the CCC. This paper lays out some specific, technology neutral regulatory changes that can level the playing field between heating technologies, to promote high quality installations, cut costs for consumers and lay the foundations for substantial growth in low carbon, renewable heating. This will come through regulation to reduce the flow temperature in replacement heating systems to 55°C, mandating for heat loss calculations to be carried out for all replacement heating systems and to require installers to complete a Low Temperature Heating and Hot Water Systems course.

These changes should form part of a clear and long-term heat and buildings strategy that addresses policy, regulation, skills, and training. There should be no doubt of the transition to low carbon heating and confidence provided to the market to invest time and effort into the development of skills and products needed to reach net zero and end the UK's contribution to global warming.

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CONTACT

W: heatpumps.org.uk

T: 0118 940 3416

E: info@heatpumps.org.uk