UK Government

Exploring the role of alternative clean heating solutions

Closing date: 10 February 2026

November 2025

Any enquiries regarding this publication should be sent to us at:
alternativecleanheatsolutions@energysecurity.gov.uk

Contents

General information

Why we are consulting

To seek views on the most appropriate low carbon heating technologies that could be used to decarbonise heat in the small number of properties that may not be suitable for heat pumps and heat networks.

Consultation details

Issued: 18 November 2025

Respond by: 10 February 2026

Enquiries to: Net Zero Buildings Clean Heat Team

Please do not send responses by post to the department.

Email: alternativecleanheatsolutions@energysecurity.gov.uk

Consultation reference:

Exploring the role of alternative clean heating solutions in complex to decarbonise properties.

Audiences:

This consultation will be of interest to stakeholders operating in the heat sector, business representative bodies, households, non-domestic buildings, and those with a wider interest in the UK's net zero ambition.

Territorial extent:

While this consultation is for the UK, elements of heat policy are devolved, and it may be for the Devolved Governments to consider steps that would enable the decarbonisation of properties that are not suitable for heat pumps and heat networks in Scotland, Wales and Northern Ireland respectively. We are sharing this consultation with the Devolved Governments and welcome their views. They will decide whether to take forward similar approaches in their own nations.

How to respond

Outline whether responses should be provided in a particular preferred format, where electronic responses should be emailed to, which address to send hardcopy responses to, whether to use different addresses for responses for the devolved administrations, etc.

Respond online at: https://energygovuk.citizenspace.com/energy-security/alternative-clean-heating-solutions

or

Email to: alternativecleanheatsolutions@energysecurity.gov.uk

Exploring the role of alternative clean heating solutions to heat pumps and heat networks.

Please do not send responses by post to the department.

When responding, please state whether you are responding as an individual or representing the views of an organisation.

Your response will be most useful if it is framed in direct response to the questions posed, though further comments and evidence are also welcome.

Confidentiality and data protection

Information you provide in response to this consultation, including personal information, may be disclosed in accordance with UK legislation (the Freedom of Information Act 2000, the Data Protection Act 2018 and the Environmental Information Regulations 2004).

If you want the information that you provide to be treated as confidential please tell us, but be aware that we cannot guarantee confidentiality in all circumstances. An automatic confidentiality disclaimer generated by your IT system will not be regarded by us as a confidentiality request.

We will process your personal data in accordance with all applicable data protection laws. See our privacy policy.

We will summarise all responses and publish this summary on GOV.UK. The summary will include a list of names or organisations that responded, but not people's personal names, addresses or other contact details.

Quality assurance

This consultation has been carried out in accordance with the government's consultation principles.

If you have any complaints about the way this consultation has been conducted, please email: bru@energysecurity.gov.uk.

Executive summary

Decarbonising the way we heat our buildings is essential for protecting consumers against high energy bills due to volatile global fossil fuel prices, reducing the UK's dependence on foreign sources of energy and combatting climate change. Heat in buildings is responsible for 22% of greenhouse gas emissions in the United Kingdom.[1] In the UK, there are approximately 26.5 million homes using fossil fuel heating systems (24.8 million using mains gas and around 1.7 million homes not connected to the gas grid still using high carbon fossil fuels, like coal and heating oil).[2]

We are investing £13.2bn in the Warm Homes Plan, which will upgrade up to 5 million homes over this Parliament, cut bills and strengthen our energy security by cutting our reliance on volatile international fossil fuel markets that we do not control.

The Warm Homes Plan will outline the government's strategy towards reducing energy bills and decarbonising buildings, and we will be publishing more details soon. It will help people find ways to save money on energy bills and transform our ageing building stock into comfortable, low carbon homes that are fit for the future. We will achieve this by accelerating the installation of efficient new technologies, upgrading millions of homes across the country.

In all heat decarbonisation scenarios, heat pumps, along with heat networks, will be the primary low carbon technologies for decarbonising home and non-domestic (commercial, public sector and voluntary buildings) heating over the next 10 years. Heat networks supply heat from a central source via a network of pipes carrying hot water and are deployed in urban areas. Heat pumps are highly efficient electric appliances that transfer and intensify heat from the outside air or ground into a building. Both are existing, technically mature low carbon technologies, deployable at scale and as such are expected to play a significant role in decarbonising heat in every pathway to net zero.

Whilst heat pumps and heat networks will work well for the majority of homes, the government recognises that they may not be suitable for all buildings and is committed to ensuring there is a good solution for every building and that consumers have access to a range of suitable low carbon heat technologies.

The government intends to use this consultation to expand our understanding of alternative low carbon heating technologies other than individual standalone heat pumps and heat networks, exploring the role they could play in heat decarbonisation, their benefits to consumers, and the circumstances in which they could provide the biggest impact.

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[1] DESNZ analysis, Final UK greenhouse gas emissions statistics: 1990 to 2023, by end user and Energy Consumption in the UK 2024.
https://www.gov.uk/government/collections/uk-greenhouse-gas-emissions-statisticshttps://www.gov.uk/government/collections/energy-consumption-in-the-uk

[2] Housing estimates are based on collective housing stock data from national housing surveys for England, Scotland, Wales and Northern Ireland

Exploring the role of alternative clean heating solutions to heat pumps and heat networks.

The government has previously issued a call for evidence on VAT relief on energy-saving materials, and more recently consulted on expanding eligible technologies under the Boiler Upgrade Scheme (BUS), and we have published the government response alongside this consultation. This consultation is not seeking further views on these specific government support mechanisms. However, stakeholders are welcome to provide evidence or views on the costs and the barriers to adoption of various alternative technologies set out in this consultation.

Note that hydrogen and biomethane for heat are outside of the scope of this consultation. We will consult in due course on our assessment of whether hydrogen should have a role in heating our homes. We expect to also publish a consultation on a holistic future policy framework biomethane by the end of FY 2025/2026.

Chapter 1 sets out the context of the consultation and the criteria used to identify alternative technologies. This chapter also explains how the government will use the information gathered through this consultation.

Chapter 2 focuses on alternative electric heating systems to individual hydronic heat pumps. This includes direct electric heaters (electric boilers, infrared heaters, panel heaters and electric radiators), alternative heat pumps (air-to-air heat pumps, networked heat pumps and exhaust air heat pumps) and thermal energy storage systems (heat batteries and storage heaters). In this chapter, we are also asking for information about other new electric heating technologies.

Chapter 3 seeks information on biomass heating systems and their role in the decarbonisation of heat. In this section, we are seeking views on the use of solid biomass boilers and exploring the potential of renewable liquid fuels for heat, including in hybrid heat pump systems. We are also asking for evidence to inform future decisions on a potential renewable liquid heating fuel obligation, which the government could introduce using powers in the Energy Act 2023.

Chapter 4 asks for views around other low carbon heating systems and technologies which may not be commercially available today but may play a role in decarbonising buildings in the future.

Chapter 1: Introduction

Context

The government is committed to decarbonising the way we heat our buildings to protect consumers against high energy bills due to volatile global fossil fuel prices, reduce the UK's dependence on foreign sources of energy and combat climate change. In that process, the government is committed to ensuring there is a good solution for every building and that consumers have access to a range of suitable low carbon heat technologies.

As set out in the Chancellor's Spending Review, we are investing £13.2bn in the Warm Homes Plan, which will upgrade up to 5 million homes over this Parliament and cut energy bills for good. Through our plan, we will help households take up measures like solar panels, heat pumps, home batteries and insulation, helping them save money on their bills and benefit from cleaner, cheaper heating. This spending review announcement builds on last year's initial settlement of £3.4bn. Further detail on our Warm Homes Plan will be set out soon.

Heat pumps, along with heat networks, will be the primary low carbon technologies for decarbonising home and non-domestic heating. These are existing, technically mature low carbon technologies, deployable at scale and as such are expected to play a significant role in decarbonising heat in every pathway to net zero.

In high density urban areas, mainly on the gas grid, heat networks can offer a low cost, low carbon heating option. Heat networks supply heat from a central source via a network of pipes carrying hot water and are an established technology in urban areas. Historically they have used heat sourced from burning fossil fuels but increasingly heat networks are using low carbon sources such as large air-source heat pumps, heat pumps taking heat from large rivers, geothermal and waste heat from industry. Making use of multiple heat sources also enables flexibility of generation, particularly when combined with large thermal stores, that enable heat networks to reduce their demand on the electricity grid compared to individual heat pumps. However, as heat networks are typically only economic for areas where there is a concentrated heat demand, the government does not expect these systems to provide a viable choice for all buildings and especially not in rural off-gas grid locations.

Heat pumps are highly efficient electric appliances that transfer and intensify heat from the outside air or ground into a building. They are three times more efficient than traditional boilers, with most heat pumps installed running at 45°C, compared to fossil fuel boilers that run at 60-80°C. The installation of heat pumps reduces household carbon emissions by around 70%.[3] As heat pumps run on electricity, emissions will reduce further as our electricity grid continues to decarbonise, in line with our Clean Power 2030 Action Plan.[4] Given their high efficiency and

[3] https://www.gov.uk/check-heat-pump

[4] https://www.gov.uk/government/publications/clean-power-2030-action-plan

low carbon emissions, installing individual heat pumps represents a cost-effective way to decarbonise buildings. Consumers using heat pumps will be less exposed to volatile fossil fuel markets, able to lower their bills in certain circumstances by making use of smart tariffs and in a position to benefit from new homegrown energy under our plans to make Britain a clean energy superpower.

The government already supports the deployment of heat pumps and heat networks. It currently offers grants, through the BUS, of £7,500 to properties installing a heat pump below 45kW in England and Wales, making the initiative one of the most generous of its kind in Europe. The Warm Homes: Local Grant (WH:LG) provides low-income households, living in privately owned EPC band D-G homes funded upgrades such as solar panels, insulation and heat pumps. In addition, the Green Heat Network Fund provides up-front capital grants for funding low carbon heat networks across England. The government is also working with industry to significantly reduce the cost of installing individual property heat pumps as we take forward measures that will grow the heat pump market through the 2020s.

Based on existing levels of insulation and electricity connection standards, heat pumps can work well in most homes. However, the government recognises that other factors including space constraints and heritage status mean that heat pumps and heat networks may not be suitable for all buildings.

Whilst heat pumps and heat networks will work well for the majority of buildings, the government is interested in understanding what alternative technologies are available across different types of domestic and non-domestic buildings to ensure consumers have a choice of suitable low carbon heating technology options. In exploring these solutions, the government wishes to make clear that we do not propose that any household or business installs a low carbon option which is not suitable for their property.

We anticipate the majority of these alternative technologies may not be deployable at scale – for example, because of the cumulative impact on the electricity grid – but we are keen to understand the settings and circumstances where they will be most useful, can have the largest impact in decarbonising heat and provide attractive and cost-effective solutions for consumers.

Both hydrogen and biomethane are outside of the scope of this consultation. We will consult in due course on our assessment of whether hydrogen should have a role in heating our homes. By the end of FY 2025/26, we expect to also publish a consultation on a holistic future policy approach to biomethane. This consultation will cover biomethane’s role across the energy system.

Exploring alternative low carbon heating solutions

The government believes that alternative low carbon heating solutions to heat pumps and heat networks available to consumers should:

- be capable of running on fully renewable energy as the grid decarbonises, and be net zero compatible;
- support more stable energy bills for consumers;
- use fuels produced from sustainable feedstock sources, where relevant;
- be consistent with air quality standards and objectives; and
- offer a positive experience for the consumer – with resilient supply chains able to meet ongoing demand at a competitive, affordable price for the consumer.

The government is aware of a range of existing and new technologies that could present viable, low carbon choices for consumers, and play a role in decarbonising homes and businesses which are not suitable for heat pumps, consistent with the above principles. In urban areas options might include alternative electric systems. In rural areas, in addition to alternative electric systems, systems fuelled by solid biomass and potentially liquid biofuels, as well as hybrid heat pump systems incorporating these, may also play a role. In future, there may be other innovative low carbon options or combinations of technologies that could play a role where heat pumps and heat networks are not suitable.

We plan to use this consultation process to develop further the evidence base and seek views on the most appropriate low carbon heating choices that could be used to stabilise and reduce energy bills for consumers and decarbonise heat in properties that are not suitable for more established low carbon technologies, like heat pumps and heat networks. We have set out estimates on the cost of installing and operating each of these alternative heating systems across a range of housing archetypes commonly found in Great Britain (see Annex A). We are also keen to hear about the possibilities of future heating technologies that we are not currently monitoring, but which could soon become commercially available.

Chapter 2: Electric Heating Systems

An electric heating system uses electricity as the only energy source (besides freely available heat from the air/water/ground) to heat the property. Appliances that rely on electricity can reduce their carbon emissions as more renewable sources – like wind and solar power – are connected to the electricity grid, replacing existing power stations using fossil fuels – like gas and coal – in line with our Clean Power 2030 Action Plan.[5] Alternatively, consumers can rely on supply from their own solar panels.

Electric heating covers many different types of systems, ranging in heating style, efficiency and load shifting potential, including:

- direct electric heating technologies without storage capabilities (including electric boilers and infrared)
- thermal energy storage systems (including heat batteries and storage heaters)

These systems vary in capital and running costs to the consumer and this consultation explores the positive and negatives of the different systems. Some of these electric systems can create additional strain on the electricity grid, especially if replacing non-electric heating such as gas and oil boilers. However, grid constraints can sometimes be mitigated to some extent through energy storage solutions and charging during times where there is spare grid capacity.

This chapter will also explore the role of 'alternative' heat pump technologies, including air-to-air heat pumps, networked heat pumps and exhaust air heat pumps.

For all electric heating systems, the capital costs presented throughout this consultation document do not factor in the potential cost of upgrading a property from a single-phase connection to a 3-phase connection. This upgrade could be required if the combined demand of the property after the installation of the electric heating system exceeds the maximum that can be accommodated by a single-phase connection. This can happen for properties with particularly high heating demand or combined high demand from other appliances. If a property did require a 3-phase upgrade this could significantly increase the capital costs for electric heating systems. Costs for upgrading to 3-phase can be significant but will vary depending on the circumstance, typically sitting between £3,000-£15,000. However, regarding air source heat pumps (ASHP) specifically, only a small percentage of households are expected to require a 3-phase upgrade. For further information on 3-phase connections, please refer to the accompanying analytical note.

[5] Department for Energy Security and Net Zero (2025), Clean Power 2030 Action Plan, https://www.gov.uk/government/publications/clean-power-2030-action-plan

Exploring the role of alternative clean heating solutions to heat pumps and heat networks.

Earlier this year, the government consulted on proposed amendments to the BUS, including whether to support the installation of more types of electric heating technologies. The government response to the BUS consultation has been published alongside this consultation.

Direct electric heating

For the purposes of this consultation, direct electric heating refers to systems where electricity is directly converted to heat, which is used immediately (rather than stored for later use). This is usually by heating a resistive element. Direct electric heating systems do not draw on the ‘free’ energy available in the air/water/ground and therefore have a much lower efficiency than heat pumps. Greater energy use means greater running costs to consumers. Additionally, as they draw electricity to provide heat when needed, rather than decoupling charging and supply like storage systems, they are less able to benefit from drawing electricity when it is cheaper (off-peak times). Direct electric heating therefore creates additional strain on the electricity grid and increases running costs. However, they are often easier and cheaper to install than some other electric heating systems.

Homes may be limited in what electric heating technology they can install based on their fuse limit. This is far more restrictive for direct electric systems because heat pumps can generate much more heat per unit of electricity consumed. All homes have a maximum fuse rating for their household electricity supply. This is usually 60A, 80A or 100A depending on the age of the house and a range of other factors. Distribution Network Operators (DNO) are obliged to upgrade homes to a single-phase connection of 80A or 100A, depending on the DNO, for free.[6]

Electric boilers

For the most part, electric boilers look and work like gas or oil boilers, but instead of burning fossil fuels they use electricity to heat an element that provides space heating and hot water to the property. Like gas or oil boilers, electric boilers work with a wet central heating system involving radiators or underfloor heating, and they can output water at high temperatures.

Like combustion boilers, electric boilers are available in many types including wall mounted combination boilers, or boilers with inbuilt or separate hot water cylinders. This flexibility means they could therefore be installed in many properties as a simple replacement for their existing fossil fuel boiler without needing to upgrade building fabric or radiators – including in properties which are space constrained, or which are subject to heritage status. This could be helpful for some properties transitioning to clean heat in a potentially distressed purchase situation.

[6] Energy Networks Association, https://www.energynetworks.org/industry/connecting-to-the-networks/connecting-electric-vehicles-and-heat-pumps

	Smaller mid-terraced on-gas house	Semi-detached on-gas house	Larger detached on-gas house	Larger detached off-gas house
Capital cost[7]	£4,600	£5,000	£5,100	£7,200
Discounted average annual running cost[8]	£1,300	£1,850	£3,450	£4,250

Table 1. The capital and discounted average annual running costs of an electric combi boiler, for four housing archetypes in GB (2024 prices).[9]

Electric boilers tend to be more expensive than gas boilers for the unit, as they do not benefit from the same mature supply chain as gas boilers. Given there are fewer safety concerns compared to gas and oil, the installation (labour) costs tend to be lower. However, electric boilers are expensive to run compared to other more efficient systems such as a heat pump, even when a heat pump is running at a high temperature.

High running costs could be abated to some extent where electric boilers are installed in conjunction with thermal energy storage systems that can provide hot water and/or space heating. This would allow them to be used flexibly to utilise periods of cheap and clean electricity generation, by making use of time-of-use tariffs which offer a different price for certain times of the day, reducing running costs. However, this removes the internal space savings that consumers would gain from using a combination electric boiler.

More detail on thermal energy storage systems is provided later in this chapter. The strain on the grid could also be reduced if the electric boiler is installed in conjunction with electrical energy generation and storage (solar PV and electrical battery). This would, however, significantly increase total capital costs.

The role electric boilers could play in decarbonising heat

Based on available evidence, the government expects that electric boilers could play a role in decarbonising heat in some homes that may not be well suited for a heat pump or a low carbon heat network. Electric boilers could be used in homes with external space constraints, which are unable to accommodate an outdoor heat pump unit or connection unit to a heat network (typically a Heat Interface Unit), or in homes with internal space constraints, an electric combination boiler could be used because it does not require a hot water storage to operate.

[7] Capital cost (rounded to the nearest 100) includes the cost of the appliance, labour costs from installation, and ancillary costs (where applicable). For more information on cost analysis please refer to the accompanying analytical note

[8] Running cost (rounded to the nearest 50) includes the fuel cost (averaged and discounted over an 18-year period based on the assumed lifetime of an ASHP) and maintenance cost

[9] DESNZ analysis based on the National Buildings Model (NBM) and Eunomia Cost of Heating Database, https://eunomia.eco/reports/title-the-cost-of-heating-appliances-a-comprehensive-uk-database/

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To mitigate high running costs and potential issues with the electricity supply connection capacity and strain on the grid, they may be more suitable in homes that have very low space heating demand.

For some non-domestic buildings, electric boilers could be cost effective, as they can provide instant hot water and quick heating in buildings that are less frequently used (such as bases for sports clubs, which may only need heating and hot water two or three times a week). However other electric heating technologies may be more common in non-domestic buildings (e.g. panel heaters and electric radiators for space heating and point of use water heaters).

However, as electric boilers themselves do not have the ability to store heat and are much less efficient relative to heat pumps, their use at scale could place strain on the electricity network. This, in turn, could require higher network reinforcement and peak generation capacity. This could potentially lead to further increase energy bills, in addition to the high running costs for properties installing this technology. Other technologies may therefore be better suited to decarbonise some properties with low heat demand or those with space constraints. The government does not currently expect electric boilers to have a widespread role to play in heat decarbonisation.

The government would welcome evidence on the running costs (especially in conjunction with time-of-use tariffs and solar PV), supply chain development, user experience, and peak and diversity of demand of electric boilers. We would also welcome further evidence on the impact that further deployment of electric boilers would have on the electricity network.

Consultation question:

1 - Do you agree that electric boilers should play a limited role in decarbonising heat, given their comparatively low efficiency and limited ability to load shift, leading to high running costs for consumers? Yes/No/Don’t know. Please provide any evidence or views to explain your answer. We are particularly interested in details regarding:

- Installation and running costs
- In situ performance
- Impact on the electricity grid
- Supply chain maturity and potential for future development
- User experience
- Potential to be used in certain building types where other low carbon solutions may not be feasible or would be less cost-effective
- Use in combination with solar PV and electrical batteries; and
- Any other factors you consider may be relevant

2 - Do you agree that (a) thermal energy storage systems and (b) electrical energy generation and storage (solar PV and batteries) can enable electric boilers to become a more efficient and cost-effective option to decarbonise heat? Yes/No/Don’t know. Please provide any evidence or views to explain your answer. We are particularly interested in details regarding how combining with thermal or electrical storage impacts:

- Installation and running costs
- In-situ performance
- Strain on the electricity grid
- Supply chain maturity and potential for future development
- User experience
- Potential to be used in certain building types where other low carbon solutions may not be feasible or would be less cost-effective
- Any other factors you consider may be relevant.

Infrared heaters

Infrared heating heats objects within a room (including building fabric, occupants and furniture) via radiation which then indirectly heats the air via convection. Compared to some other low carbon heating systems, infrared heating panels are relatively cheap and easy to install. Typically, one unit would be required per room and installation costs will vary based on the model selected and what type of existing system is being replaced. Infrared heating panels are relatively space efficient, have long lifespans and limited maintenance requirements. They can also be fast to heat up room occupants and therefore are useful in spaces that are only used periodically. However, similar to panel heaters, they cannot store heat (and shift load away from peak electricity demand) and are not as efficient as heat pumps – leading to greater running costs.

	Smaller mid-terraced on-gas house	Semi-detached on-gas house	Larger detached on-gas house	Larger detached off-gas house
Capital cost	£6,500	£9,100	£9,400	£11,600
Discounted average annual running cost	£1,300	£1,850	£3,450	£4,250

Table 2. The capital and discounted average annual running costs of infrared panel heaters, for four housing archetypes in GB (2024 prices). Note capital cost includes the cost of installing a separate hot water heating appliance.[10]

Infrared heating panels can only provide space heating and do not support a wet central heating system. Therefore, the property would need to install an alternative hot water system, such as a hot water cylinder with immersion heater or point of use hot water systems, to meet the hot water demands of the property. The cost data shown in table 2 assumes either a hot

[10] DESNZ analysis based on the NBM and Eunomia Cost of Heating Database, https://eunomia.eco/reports/title-the-cost-of-heating-appliances-a-comprehensive-uk-database/

water cylinder for larger homes or a point of use system for space constrained homes for hot water provision.

The role infrared heaters could play in decarbonising heat

Based on evidence available, the government believes that infrared heaters could present a possible heating solution in certain building types – for instance in buildings (or rooms within buildings) that are not used frequently, or in properties that are very well insulated (i.e. to Passivhaus standards or equivalent) and therefore have very low space heating requirements.

The government is aware that some advocates have argued that infrared panels can provide thermal comfort at lower air temperatures than with other heating systems, creating the potential to reduce heating demand and running costs, and we would welcome evidence on this.

To overcome limitations in efficiency and flexibility, we welcome views on system combinations with other low carbon heating technologies, batteries and using time-of-use tariffs to reduce strain on the grid and reduce running costs for consumers.

In the non-domestic setting, infrared panels may offer a cost-effective solution for buildings which are only used for a couple of hours a day (village halls) or where only a small section of the building needs heat (small office area within a large warehouse).

The government would welcome evidence on the in-situ performance, user experience, and the development of the supply chain for infrared heating systems. We would also welcome further evidence on the impact that further deployment of infrared heating systems (in the scenarios set out above) would have on the electricity network and how they could work successfully in conjunction with storage or microgeneration systems.

Consultation question:

3 – Do you have any evidence or views on the role infrared heating could play in decarbonising heat? We would particularly welcome any evidence or views which take into account:

- Installation and running costs
- In-situ performance
- Impact on the electricity grid
- Supply chain maturity and potential for future technological development
- User experience
- Potential to be used in certain building types where other low carbon solutions may not be feasible or would be less cost-effective; and
- Any other factors you consider may be relevant

Panel heaters and electric radiators

Panel heaters use electrically heated elements to heat the air directly via passive convection currents (without using a heat transfer fluid), whereas electric radiators contain a heat transfer fluid, heated by the electric element. Typically, one unit is required per room.

	Smaller mid-terraced on-gas house	Semi-detached on-gas house	Larger detached on-gas house	Larger detached off-gas house
Capital cost	£5,600	£7,400	£7,800	£9,900
Discounted average annual running cost	£1,300	£1,850	£3,450	£4,250

Table 3. The capital and discounted average annual running costs of convective heaters, for four housing archetypes in GB (2024 prices). Note capital cost includes the cost of installing a separate hot water heating appliance.[11]

The key benefits and drawbacks of direct electric heaters are similar to infrared: easier and cheaper to install, but poor efficiency (in comparison to heat pumps) and little-to-no load shifting potential (given the absence of a hot water cylinder for any preheating), which leads to greater strain on the grid and higher running costs for consumers. In addition, they require a separate hot water system.

The role of other direct electric heating technologies in decarbonising heat

Based on the available evidence, the government expects that other types of direct electric heating (such as panel heaters and electric radiators) will play a more limited role in decarbonising building, as many properties could benefit from reduced running costs by upgrading to high heat retention storage heaters or air-to-air heat pumps, where suitable.

Consultation question:

4 – Do you agree that panel heaters and electric radiators should play a smaller role in decarbonising heat, given their comparatively lower efficiency (than heat pumps) and limited ability to load shift, leading to high running costs for consumers? Yes/No/Don’t know. Please provide any evidence or views to explain your answer.

[11] DESNZ analysis based on the NBM and Eunomia Cost of Heating Database, https://eunomia.eco/reports/title-the-cost-of-heating-appliances-a-comprehensive-uk-database/

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5 – In what circumstances, if any, would panel heaters or electric radiators be more suitable than heat pumps, thermal energy storage systems, biomass heating systems or hybrid heat pumps? Please provide any evidence or views to explain your answers.

Heat pumps

Hydronic heat pumps distribute heat through hot water circuits in the property in the same way as fossil fuel boilers. Hydronic or ‘wet’ systems are the most common heating system currently used in UK homes, heating radiators or underfloor heating loops.

Whilst we expect individual low temperature hydronic air source and ground source heat pumps (that provide flow temperatures of up to 55˚C) to be the technologies of choice to decarbonise many UK buildings (alongside heat networks), there are other types of heat pumps that have unique advantages and disadvantages compared to individual hydronic heat pumps. In this section we want to explore the role they could play in complex to decarbonise properties.

High temperature heat pumps

Many of the heat pump systems already installed in homes across the UK will have been designed to run at a flow temperature of up to 55˚C (normally at around 45°C), compared to a fossil fuel boiler which would generally run at flow temperatures between 60 and 80°C. Heat pumps capable of running at higher output temperatures (i.e. above 55˚C) are also available and they potentially require fewer changes to be made in the home, such as fewer radiator upgrades. This can reduce the upfront heat pump installation cost and installation time. High temperature heat pumps (HTHP) are suitable for properties that cannot be upgraded (at all or at an acceptable cost) to use a low temperature system, such as being unable to suitably insulate the property or upgrade radiators. The availability of HTHPs is making heat pumps an effective decarbonisation option for a greater number of consumers.

The government acknowledges that high temperature ASHPs lose efficiency when operating at temperatures above 55˚C, meaning that the running cost is higher. Based on the Microgeneration Certification Scheme (MCS) database, ASHPs at above 55˚C show a 13-26% decrease in the manufacturers' quoted Seasonal Coefficient of Performance, increasing the average running costs by £120 to £290 per year compared with an ASHP operating at 45°C.[12] [13] HTHPs may be able to modulate their heating output according to demand, so they may only need to operate at higher temperatures for short periods where necessary, on very cold days, to ensure thermal comfort is maintained, resulting in a lower increase in running cost in these cases. During extreme cold days, heat pumps running at high output temperatures may place additional strain on the electricity network at peak demand. The government has consulted on

[12] MCS Product Directory https://mcscertified.com/product-directory/
[13] Based on Ofgem Energy Price Cap 1 July 2025 to 30 September 2025

new minimum efficiency requirements for HTHPs and will be publishing a response in due course.

The installation of HTHPs is permitted for retrofitting under Part L of the Building Regulations Approved Documents (unless a heating system is being fully replaced i.e. including radiators and pipework), and under MCS standard MIS 3005-D. This is permitted provided there is a reasonable justification for the high temperature system and that the cost of a low temperature system is also provided to the customer, so that they can assess the comparative costs.

	Smaller mid-terraced on-gas house	Semi-detached on-gas house	Larger detached on-gas house	Larger detached off-gas house
Capital cost	£9,300	£12,600	£15,200	£17,100
Discounted average annual running cost	£600	£800	£1,450	£1,750

Table 4: The capital and discounted average annual running costs of a HTHP, for four housing archetypes in GB (2024 prices). Note this assumes no radiator upgrades are required (so capital costs would be higher if some radiators did need replacing).

The role that high temperature heat pumps could play in decarbonising heat

HTHP are already playing a key role in decarbonising heat by increasing the number of buildings which can be practically decarbonised through heat pumps. Based on DESNZ analysis, the distribution of GB homes by peak heat loss indicates 86% of all fossil fuel-heated homes would have sufficient thermal insulation to have thermal comfort provided by a low temperature heat pump (LTHP). For the remaining 14% of homes, there is scope to improve thermal insulation beyond existing standards, which would increase the rate of homes that can have thermal comfort delivered by a LTHP.

Alternatively, homes not able to have thermal comfort provided by a LTHP could look to a HTHP, which DESNZ analysis indicates should be able to provide thermal comfort for the vast majority of homes. HTHPs can be installed through the BUS and WH:LG. They are also permitted under Warm Homes: Social Housing Fund (WH:SHF) and Energy Company Obligation (ECO) schemes provided bill savings can be achieved.

While there are advantages in HTHPs being potentially easier and less disruptive to install we are aware that the cost-effectiveness of installing and running a HTHP will vary according to, for example, the number of radiator upgrades needed (if any), the tariff used and the upfront cost of the HTHP unit itself – which may change as more become available on the market. Additionally, the impact of HTHPs on the grid in terms of demand and potential reinforcements will be a factor in how widely HTHPs should be deployed.

Consultation questions:

6 – Do you agree that high temperature heat pumps could play a key role in decarbonising heating of buildings? Yes/No/Don't know. Please provide any evidence or views to explain your answer. We are particularly interested in detail regarding their:

- Installation and running costs
- The number of energy efficiency and heat distribution system upgrades (e.g. radiator changes) that are required for a HTHP to work effectively
- In-situ performance
- Impact on the electricity grid
- Any other factors you consider may be relevant

7 – What are the key barriers that are preventing the installation of high temperature heat pumps in (a) domestic properties and (b) non-domestic buildings? How could these barriers be removed?

Air-to-air heat pumps

Air-to-air heat pumps (AAHPs), sometimes referred to as air conditioning units, are air source heat pumps that can deliver heated (or cooled) air via fan coil 'blower' units placed in rooms, rather than circulating warm water to radiators. Compared to other heating systems (especially hydronic heat pumps), AAHPs can be more space efficient, as indoor units can be mounted high on the wall to save space.

AAHPs usually only provide space heating, making them well-suited to non-domestic buildings which less commonly require hot water. In buildings installing an AAHP, where the previous hot water system is not retained, a replacement hot water system is likely to be needed. Options include a hot water cylinder with immersion heater, point of use systems and other innovative electric hot water solutions. The cost data shown in table 5 assumes a home uses either a point of use hot water system or immersion heater (depending on the size of the property) for domestic hot water. There are already 50,000 installers who are qualified to handle fluorinated gases (f-gases) and therefore install AAHPs, but they operate almost entirely in the commercial sector.[14]

Like a hydronic heat pump, an AAHP can be highly efficient,[15] meaning they would be less expensive to run than direct electric heating solutions. In addition to providing space heating, reversible AAHPs can also provide space cooling, dehumidification and air filtration. If AAHPs

[14] DESNZ, Air-to-air heat pumps: literature review, 2025, https://www.gov.uk/government/publications/air-to-air-heat-pumps-literature-review, p.6.
[15] We assume the space heating efficiency of an AAHP of 275%. This results in a combined efficiency of 204% when accounting for a hot water heater with an efficiency of 100% (assuming the proportion of space heating heat demand to hot water heat demand is 80/20).

are used to provide cooling, this will increase energy use across the year (compared to non-reversible systems).

	Smaller mid-terraced on-gas house	Semi-detached on-gas house	Larger detached on-gas house	Larger detached off-gas house
Capital cost	£6,800	£10,600	£19,000	£23,000
Discounted average annual running cost	£850	£1,100	£1,900	£2,300

Table 5. The capital and discounted average annual running costs (excluding cooling) of an AAHP, for four housing archetypes in GB (2024 prices).[16] Note capital cost includes the cost of installing a separate hot water heating appliance.

The role air-to-air heat pumps could play in adapting to a warmer climate

As global temperatures rise, managing overheating in buildings will be important to ensure negative impacts to health, wellbeing, the energy system and people's energy bills are minimised. In the Warm Homes Plan the government will set out our approach to make our buildings more resilient to extreme temperatures.

When used for cooling, there is an additional benefit in increased comfort and protection against overheating, which will become increasingly important over time as buildings will be required to adapt to the impacts of climate change. Those homes which may find AAHPs an appropriate technology due to space constraints, such as urban flats and terraced houses, are also likely to be more vulnerable to summer overheating in a future, warmer climate[17].

Combining AAHPs with passive cooling measures, such as external shutters, internal blinds or window film, can significantly reduce the amount of active cooling required or delay the point when active cooling is required. These measures can mitigate and minimise the increase in energy bills and energy demand, including peak demand in hotter months.[18] [19] For these reasons the government is prioritising a passive cooling first approach and recommends these low cost, high impact and low regret measures be installed when or before an active cooling technology is installed. We are interested in views and evidence on how to encourage the uptake of passive cooling measures to reduce the need for active cooling (e.g. from AAHPs).

[16] DESNZ analysis based on the NBM

[17] Assessing the future heating and cooling needs of the UK housing stock,https://www.gov.uk/government/publications/assessing-the-future-heating-and-cooling-needs-of-the-uk-housing-stock

[18] Assessing the future heating and cooling needs of the UK housing stock,https://www.gov.uk/government/publications/assessing-the-future-heating-and-cooling-needs-of-the-uk-housing-stock

[19] Cooling in the UK (2021) https://www.gov.uk/government/publications/cooling-in-the-uk

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Many heating, ventilation and cooling systems in non-domestic buildings already integrate an AAHP. Space cooling is becoming increasingly needed during the summer months to support the working environment during heatwaves.

Under the third National Adaptation Programme (NAP3)[20] DESNZ is responsible for progressing actions to manage adaptation risks relating to energy, buildings and health. The CCC recognises the importance of addressing overheating using passive cooling to avoid increased energy demand, pressure on the energy system and increased bills, however it also recognises there will be some need for active cooling (like AAHPs) in the most vulnerable buildings[21]. The permitted development right for ASHPs has been updated to allow the installation of ASHPs that provide cooling as well as heating, to enable more households to install AAHPs without needing to submit a planning application.

The role that air-to-air heat pumps could play in decarbonising heat

The government is currently carrying out research into the performance, suitability and system design combinations of AAHPs in the UK housing stock, which will help inform the evidence base and potential future policy. This research is due to produce initial findings later this year. We welcome further evidence on the performance and suitability of AAHPs from respondents.

Studies like the Cost Optimal Domestic Electrification project have shown that AAHPs could play a key role in decarbonising heat. They would be especially useful in; smaller properties with low heat demand, properties that are space constrained (including some flats and smaller houses), and in properties that do not have a wet central heating system (including some commercial properties) and are using less efficient electric heating systems.[22] They could also be useful as a form of top-up heating in areas of a property that are not used daily but need heating occasionally.

AAHPs may also be an attractive solution for many park homes – due to their typical small size and low heating demand. We understand that many of these properties would currently use direct electric systems, so replacing them with more efficient AAHPs would help reduce the burden on the network and help consumers save on energy bills.

Many large non-domestic buildings already make use of AAHPs in heating, ventilation and air conditioning (HVAC) systems, and we expect these systems to continue to be a good solution for non-domestic properties with lower hot water demand (e.g. commercial buildings and offices).

The government would welcome evidence on the current levels of deployment, and in-situ performance of AAHPs, including how effective they are at heating air. We would also

[20] Third National Adaptation Programme (NAP3) (2023) https://www.gov.uk/government/publications/third-national-adaptation-programme-nap3
[21] Climate Change Committee (2021), 'Independent Assessment of UK Climate Risk' https://www.theccc.org.uk/publication/independent-assessment-of-uk-climate-risk/.
[22] Cost Optimal Domestic Electrification (CODE) (2021) https://www.gov.uk/government/publications/cost-optimal-domestic-electrification-code

welcome detail on innovative hot water solutions which could work in conjunction with an AAHP. Our current evidence gap on this makes it more difficult to assess their running costs against other heating systems.

The government also wishes to better understand the cumulative impact on the network of deploying systems capable of providing heating and cooling. Though we anticipate that the overall summer peak demand for cooling would be lower than the winter peak demand for heating, we are interested in views and evidence regarding local scale impacts on the distribution network during extreme weather events.[23]

Finally, we welcome evidence on the compatibility of increased use of AAHPs with our ambition to accelerate the phase down of fluorinated gases, including what alternative refrigerants exist or are in development for AAHPs.

Many heat pumps are switching from using fluorinated gases (f-gases) as a refrigerant, which can contribute to climate change if they leak, to alternative refrigerants with a lower global warming potential. However, AAHPs commonly still use f-gases as a refrigerant and unlike hydronic heat pump systems, the options for moving to alternative refrigerants maybe more limited in air-to-air systems due to restrictions on how much refrigerant a device is allowed to contain when inside a property.

The government response to the BUS consultation set out plans to expand the scheme to support the deployment of air-to-air heat pumps in domestic properties by providing a grant of £2,500. This will provide greater consumer choice and help homes without hydronic heating systems decarbonise.

Consultation question:

8 – Do you agree that air-to-air heat pumps could play a key role in decarbonising heating of buildings without wet central heating systems? Yes/No/Don’t know. Please provide any evidence or views to explain your answer. We are particularly interested in details regarding their:

- Installation and running costs
- In-situ performance (including whether they need to run for longer or at higher temperatures than other heating systems)
- Impact on the electricity grid (especially if systems are designed for heating and cooling)
- Ability to operate efficiently as part of a system including hot water provision; and
- Any other factors you consider may be relevant

9 – What are the key barriers that are preventing the installation of air-to-air heat pumps in (a) domestic properties and (b) non-domestic buildings? How could these barriers be removed?

[23] DESNZ (2021), ‘Cooling in the UK’, https://www.gov.uk/government/publications/cooling-in-the-uk.

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10 – Do you have any evidence on the potential for air-to-air heat pumps to use alternative refrigerants? Given the government's ambition to phase out the use of fluorinated refrigerant gases, we would particularly welcome evidence or views which take into account:

- What alternative refrigerants exist or are in development
- How the government can support the development of new refrigerant technologies
- Any other factors you consider may be relevant

11 – Please provide any evidence or views on a) the promotion of passive cooling measures to increase their uptake, so that active cooling is only used when and where needed, and b) local network impacts during extreme weather events.

Networked heat pumps

Networked clean heat solutions refer to heating systems designed to serve 2-100 dwellings, making use of communal elements, but on a smaller scale than the district heat networks we are promoting through policies like the Green Heat Network Fund and Heat Network Zoning. This can include properties with individual heat pumps connected to a communal heat source such as a shared ground loop (SGL) or shared outside unit. Where heat pumps with SGLs are used, these are typically installed as a series of boreholes near to the dwellings being served – whether they are a neighbourhood of houses or one building of multiple dwellings.

For existing properties, the cost of installing the communal infrastructure required for networked heat pumps can be much higher than for new builds. Even small projects can cost hundreds of thousands of pounds, and to decarbonise an entire row of terraces or an entire low-rise block of flats could easily run into the millions. Moreover, the upfront cost per dwelling of decarbonising a property with a networked heat pump could be around 20% higher than the cost of installing an individual dwelling level ASHP (if feasible).[24]

The government is aware that networked heat pumps have been installed in a small number of existing homes. For instance, Kensa Utilities' 'Heat the Streets' project fitted heat pumps in 98 homes (a mix of private housing, social housing and new builds) in Stithians, Cornwall, making use of shared ground loops.[25]

More generally, networked heat pumps have been proposed as a potential solution for properties with limited outside space for an external ASHP unit. Heat pumps connected to a shared ground loop would not require an external unit, and networked ASHPs could make use of a single external unit serving multiple properties.

Like individual ASHPs, networked heat pumps may still require internal space for the hot water tank and may require upgrades to radiators.

[24] DESNZ analysis of Eunomia database. This includes the cost of the ground collector which will have a lifetime several times longer than the heating appliance (e.g. 60 years) so would lead to lower long-term costs on replacement

[25] Available at: https://heatthestreets.co.uk/.

	Smaller mid-terraced on-gas house	Semi-detached on-gas house	Larger detached on-gas house	Larger detached off-gas house
Capital cost	£15,000	£17,300	N/A	N/A
Discounted average annual running cost	£600	£800	N/A	N/A

Table 6. The capital and discounted average annual running costs of a SGL, for four housing archetypes in GB (2024 prices). Note capital cost includes the cost of the unit and groundworks.[26]

Where networked heat pumps are used, some models involve the homeowner owning the heat pump installed within their home, but the shared infrastructure being funded, installed, maintained and owned by a third party, which could be the local authority, landlord, manufacturer, utility company or investor.

The role that networked heat pumps could play in decarbonising heat

The government believes that networked heat pumps could be an option for some groups of properties unable to install an individual ASHP per dwelling due to lack of space for an outside unit, but less suitable for properties that are spread apart (such as large rural properties), where the distance (and therefore infrastructure) involved could be large and where the properties are more likely to have sufficient outdoor space for individual solutions. We understand that this is more likely to be the case for flats and some small, terraced houses.

Networked heat pumps can be highly efficient, meaning they could be less expensive to run than direct electric heating and thermal energy storage systems, that could be deployed in properties without sufficient space for an external unit. However, networked heat pumps are likely to be more expensive to install.

The government intends to use this consultation to build the evidence base on heating solutions for buildings that are not suitable for individual ASHPs, e.g. due to lack of outside space. In particular, the government would welcome evidence on the current levels of deployment, and in-situ performance, of networked heat pumps.

While networked heat pumps are an established technology, we would like to build our evidence base on the most effective business models that could support their deployment in existing properties, where appropriate. Unlike individual dwelling level solutions, developers

[26] DESNZ analysis based on the NBM. SGL systems are likely to be more suitable where multiple, smaller properties with lower heat demands are located close together (e.g. blocks of flats) and struggle with space constraints. In the case of the larger detached housing archetypes, sharing a communal loop array would not be practicable and at a prohibitive cost given the potential distance between properties, especially in sparse rural settings. For this reason, SGL costs have not been determined for the larger housing archetypes.

would need to identify a suitable group of properties where a networked heat pump would be the most cost-effective solution, establish the technical, legal, and economic feasibility of any potential project before moving forward.

We would welcome evidence on which business models would be most effective at bringing forward networked heat pumps, where appropriate, addressing the key co-ordination and financial challenges affecting the deployment of networked heat pumps, and what steps would be necessary to support the development of these business models.

Finally, networked heating solutions are more cost-effective when a high number of consumers choose to participate. This means significant work would be required by the developer to engage the community and drive take up, ahead of moving forward with any project. We would welcome evidence from developers, and consumers, on the public appetite to make use of clean heat solutions relying on shared infrastructure, and what steps have been most effective at persuading households, and other non-domestic users to participate in projects.

Consultation question:

12 – Do you agree that networked heat pumps may have a key role to play for buildings with limited outdoor space for individual heat pumps per dwelling? Yes/No/Don't know. Please provide any evidence or views to explain your answer. We would particularly welcome any evidence or views which take into account their:

- Installation and running costs
- In-situ performance
- Impact on the electricity grid
- Supply chain maturity and potential for future development
- User experience

13 – Do you have any evidence or views on a) which business models would be most effective at bringing forward networked heat pumps, where appropriate, and b) what steps would be necessary to support the development of such business models?

14 – Do you have any evidence or views on a) the public appetite to make use of clean heat solutions relying on shared infrastructure, b) where clean heat solutions that rely on shared infrastructure have been implemented, and c) what steps have been most effective at persuading households to participate in projects?

Exhaust air heat pumps

Exhaust air heat pumps (EAHPs) are air-source heat pumps that use the thermal energy from air within the home as their air-source. They commonly utilise warmer areas such as bathrooms and kitchen as their heat sources. Rather than just recycling the indoor air, fresh air enters the property through ventilation shafts. Once the thermal energy from the indoor air is extracted, this air then exits the property via vents.

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There are far fewer sales of exhaust air-to-water heat pumps compared to other heat pump types.[27] Additionally, the government understands that they may more commonly have a lower capacity than some other heat pump systems. EAHPs use a higher temperature heat source than other types of air-source and ground-source heat pumps, as the warmest temperature air in the property is utilised rather than wasted. We are interested to increase our understanding of the capital and operating costs of these systems in comparison to hydronic ground-source heat pumps, ASHPs and AAHPs.

A key difference to other types of heat pumps are the space requirements. There are greater internal requirements (for the ventilation shafts) but no external requirements, as there is no external compressor unit or boreholes.

The role that exhaust air heat pumps could play in decarbonising heat

Based on evidence available, the government believes that EAHPs may be more suitable for properties with no outdoor space (e.g. flats) and lower heat demand, but less suitable for properties with limited internal space for ventilation or high heat demand (e.g. larger or poorly insulted properties).

Retrofit hydronic EAHPs are eligible for credits through the Clean Heat Market Mechanism. The government response to the BUS consultation sets out our intention to enable funding for EAHPs by removing the requirement that heat pumps cannot use heat in air expelled by an appliance or building. Further details on eligibility criteria are set out in the government response.[28]

Consultation question:

15 – Do you have any evidence or views on the role exhaust air heat pumps could play in decarbonising heat? Please provide any evidence or views to explain your answer. We would particularly welcome any evidence or views which take into account their:

- Installation and running costs
- In-situ performance
- Impact on the electricity grid
- Supply chain maturity and potential for future development
- User experience
- Any other factors you consider may be relevant

[27] DESNZ (2025), 'Air-to-air heat pumps: literature review', https://assets.publishing.service.gov.uk/media/67c7091916dc9038974dbe52/air-to-air-literature-review.pdf.
[28] Ofgem (2024), 'Boiler Upgrade Scheme: Installer guidance v2.6', https://www.ofgem.gov.uk/sites/default/files/2024-05/bus_guidance_for_installers_v2.6.pdf, page 30.
and
The Boiler Upgrade Scheme (England and Wales) Regulations 2022, https://www.legislation.gov.uk/ukdsi/2022/9780348232349/regulation/9.

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16 – Do you have any views on whether exhaust air heat pumps should be targeted primarily at buildings with a) limited outdoor space b) a higher risk of air-tightness c) lower heat demand d) new-builds? Please provide any evidence to explain your answer.

Thermal Energy Storage Systems

Thermal energy storage systems (TESS) shift peak demand by storing energy, as heat, for later use. The ability to shift demand can lower bills, when combined with a time-of-use tariff, and provide flexibility to the electricity system compared to direct electric.

MCS are developing a standard for TESS[29], focusing on those systems that provide space heating, with or without the provision of hot water (DHW). This is to ensure that any heat battery for central heating installed as part of government grant schemes provide optimal outcomes for consumers, including avoiding drawing from the grid at peak times.

This consultation will focus on TESS that are standalone heating systems that can be used in complex-to-decarbonise properties that are not suitable for a heat pump.

Heat batteries for central heating

Heat batteries for central heating are a type of TESS that use electricity to charge a thermal store and release this stored heat into a central heating system via a heat exchanger when it is needed, to provide space heating. The storage medium remains within the appliance, unlike an electric boiler combined with a hot water cylinder. Unlike combi boilers, they require a separate storage solution for hot water (such as a hot water tank or heat battery for hot water).

The government recognises the role that heat batteries for hot water can play in conjunction with a heat pump, to provide a solution for hot water storage in properties that do not have room for a hot water cylinder. However, for the purpose of this consultation we are focusing on heat batteries that can be used with a wet central heating system and as an alternative to a heat pump.

Many heat batteries are designed to charge up during off-peak times when certain electricity tariffs are much lower, or by using on site microgeneration, like solar power. This has potential to help consumers save on bills compared to more traditional electric boilers, especially when they can access attractive time-of-use electricity tariffs. This also has the potential to reduce strain on the electricity network, by shifting demand for electricity away from peak periods. However, it is essential to size a heat battery correctly, otherwise a user may deplete the battery and need to draw electricity directly from the grid at peak times in order to maintain

[29] MCS (2025), 'MCS announces pilot for new Thermal Energy Storage Systems Installation Standard', https://mcscertified.com/mcs-announces-pilot-for-new-thermal-energy-storage-systems-installation-standard/.

thermal comfort. This would lead to the heat battery operating like a direct electric system, with increased running costs and additional strain on the electricity distribution network.

To reduce the risk of a heat battery having to draw from the grid at peak times and to ensure good consumer outcomes for those who choose to install the technology, the government welcomes the development of the MCS TESS standard, which will include heat batteries. The government wants to better understand how we can protect consumers and maximise the benefits of TESS, including future changes to the forthcoming MCS TESS standard. We welcome the views of stakeholders on this.

	Smaller mid-terraced on-gas house	Semi-detached on-gas house	Larger detached on-gas house	Larger detached off-gas house
Capital cost	£10,200	£10,700	£10,700	£12,800
Discounted average annual running cost[30]	£1,000	£1,350	£2,550	£3,150

Table 7. The capital and discounted average annual running costs of a dry core storage boiler with hot water storage, for four housing archetypes in GB (2024 prices).[31]

The role heat batteries for central heating could play in decarbonising heat

The government notes that heat batteries are a promising technology which could play a role in certain housing types that are unsuitable either for heat pumps or connection to low carbon heat networks, such as those without outdoor space. In addition, their use has the potential to address some of the drawbacks of using technologies like electric boilers – especially in relation to higher running costs and grid impacts.

The government understands that heat battery technologies are still at an early stage of development, especially in the non-domestic sector, and the possibility to run these systems most efficiently (and at lower cost) is contingent on the ability to utilise favourable time-of-use tariffs on an ongoing basis.

The government would therefore welcome evidence on the running costs (especially in conjunction with time-of-use tariffs and solar PV), supply chain development, the amount of thermal storage a property requires, suitability, and user experience, of heat batteries. We would also welcome further evidence on the impact that further deployment of heat batteries would have on the electricity network.

[30] Heating appliances with thermal storage capabilities are assumed to make use of Economy 7 (E7) tariffs to charge their thermal stores during cheaper off-peak periods overnight. For these technologies, a 30% reduction has been applied to the fuel cost via the annual Green Book electricity retail price (more information can be found in the accompanying analytical note)

[31] DESNZ analysis based on the NBM.

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The government response to the BUS consultation set out plans to expand the scheme to support the deployment of heat batteries by providing a grant of £2,500. This will provide greater consumer choice and help support homes that are less suited to a heat pump to decarbonise.

Consultation question:

17 – Do you have any evidence or views on the role heat batteries could play in decarbonising heat? We would particularly welcome any evidence or views which take into account their:

- Installation and running costs (including in conjunction with time-of-use tariffs and solar PV)
- In-situ performance
- Impact on the electricity grid
- Supply chain maturity and potential for future development
- User experience
- What complex-to-decarbonise characteristics heat batteries are best suited to addressing
- What limits a property's suitability for a heat battery
- Any other factors you consider may be relevant

18 – Do you have any views on what further criteria, in addition to existing scheme criteria (e.g. MCS certification and SAP-eligibility), should be required for heat batteries that are supported through government grant schemes to prevent systems from drawing energy at peak times? We would particularly welcome any evidence on:

- Charging speed
- Storage capacity relative to building heat demand
- Maximum store size (e.g. how many hours of heating can the fully charged store provide)
- Heat loss and interaction with location (thermal envelope)
- Capabilities on a coldest day
- How to deliver both hot water and space heating when there is high heat demand
- Any other factors you consider may be relevant

19 – Do you have any evidence or views on how future developments in the thermal energy storage market might help reduce strain on the electricity grid and how this could work with other technologies (like heat pumps or electric boilers) to become more cost effective?

Exploring the role of alternative clean heating solutions to heat pumps and heat networks.

Storage heaters

Electric storage heaters are an established form of space heating technology, with 5% of dwellings in England using storage heaters.[32] They work by using electricity to heat a solid storage medium, such as ceramic bricks, which can then be discharged (sometimes assisted by a fan) to provide space heating, but not hot water.

Electric storage heaters can be used flexibly to utilise periods of cheap and clean electricity generation, making use of time-of-use tariffs, such as Economy 7 or Economy 10, to reduce running costs.

A high heat retention storage heater retains at least 45% heat, measured according to BS EN 60531, which is the British Standard for testing and measuring the performance of storage heaters. It also has a timer, electronic room thermostat and fan to control the heat output. In addition, it is able to estimate the next day's heating demand based on external temperature, room temperature settings and heat demand periods have smart controls.[33]

The government currently supports the installation of high heat retention storage heater systems in homes through schemes including ECO, WH:LG and the WH:SHF, mainly as replacements to existing inefficient electric heating, such as older storage heaters with simpler controls that would not support the use of time-of-use tariffs. These government schemes require compliance with "PAS 2035:2023 Retrofitting dwellings for improved energy efficiency specification and guidance" (PAS 2035:2023), which requires measures to be installed by an installer who is certified to PAS 2030 or by MCS for the relevant measure. Low carbon heat measures require MCS certification, except for high heat retention storage heaters, which are covered by PAS 2030.

	Smaller mid-terraced on-gas house	Semi-detached on-gas house	Larger detached on-gas house	Larger detached off-gas house
Capital cost	£6,900	£9,600	£10,000	£12,100
Discounted average annual running cost	£1,000	£1,350	£2,550	£3,150

Table 8. The capital and discounted average annual running costs of storage heaters, for four housing archetypes in GB (2024 prices). Note capital cost includes the cost of installing a separate hot water heating appliance [34]

[32] MHCLG (2024), 'English Housing Survey 2022 to 2023: energy report', https://www.gov.uk/government/statistics/english-housing-survey-2022-to-2023-energy/english-housing-survey-2022-to-2023-energy-report.
[33] BRE (2025), The Government's Standard Assessment Procedure for Energy Rating of Dwellings Version 10.2, https://bregroup.com/documents/d/bre-group/sap-10-2-14-03-2025.
[34] DESNZ analysis based on the NBM.

Storage heaters are relatively cheap and easy to install. Typically, one unit would be required per room and installation costs will vary based on the model selected and the type of existing system being replaced. However, the cost of heating a home with storage heaters is significantly higher than heating the same property with a heat pump, even operating at high temperatures, given the heat pump's ability to make use of 'free' energy in the air/ground/water.

Storage heaters can only provide space heating, so the property would also need to install an alternative hot water system, such as a hot water cylinder with immersion heater or point of use systems which would be required to meet hot water demands. The cost data shown in table 8 assumes a home uses a point of use system for domestic hot water.

Storage heaters are relatively space efficient, and as relatively simple technologies they benefit from long lifespans and have limited maintenance requirements.

The role storage heaters could play in decarbonising heat

Based on the evidence available, the government believes that storage heaters could present attractive heating solutions in certain housing types – for instance in buildings without a wet central heating system, or in properties that are very well insulated (i.e. to Passivhaus standards or equivalent) and therefore have very low space heating requirements. However, AAHPs may offer an alternative to storage heaters with lower running costs, given their greater efficiency.

Storage heaters rely on being able to shift electricity use away from periods of peak demand and utilise off peak electricity tariffs. However, storage heaters are less efficient than heat pumps – meaning they are generally more expensive to operate than a heat pump, and if undersized could draw electricity from the grid at peak times, placing strain on the electricity distribution network. Research, by organisations like National Energy Action, also shows that household experience of the thermal comfort provided by storage heaters can be mixed.

We welcome further evidence on the impact that further deployment of storage heaters would have on the electricity network and how they could work in properties that are unsuitable for a heat pump.

Consultation question:

20 – Do you have any evidence or views on the role storage heaters could play in decarbonising heat? We would particularly welcome any evidence or views which take into account their:

- Potential to be used in certain buildings where other low carbon solutions may not be feasible or would be less cost-effective
- Impact on the electricity grid
- Any other factors you consider may be relevant

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21 – Do you have any views on what further criteria, in addition to existing scheme criteria (e.g. SAP-eligibility), should be required for high heat retention storage heaters that are supported through government grant schemes, to prevent systems from drawing energy at peak times? We would particularly welcome any evidence on:

- Charging speed
- Storage capacity relative to building heat demand
- Maximum store size (e.g. how many hours of heating can the fully charged store provide)
- Heat loss and interaction with location (thermal envelope)
- Capabilities on the coldest winter’s day
- How to deliver both hot water and space heating when there is high heat demand
- Any other factors you consider may be relevant

Other electric heating technologies

The Department is often informed of new innovative technologies which offer alternatives to heat pumps. We welcome any evidence regarding other static electric heating technologies, in particular what makes them suitable in buildings less suited to heat pumps, how they compare to the electric heating systems discussed in this chapter, and how they can deliver low running costs and avoid putting strain on the electricity grid.

Consultation question:

22 – Do you have any evidence on any other types of electric heating that could play a significant role in decarbonising heat? We would particularly welcome any evidence or views regarding:

- Installation and running costs and how they compare to other electric heating technologies
- In-situ performance
- Impact on the electricity grid
- Supply chain maturity and potential for future technological development
- User experience
- Which building types they may be most suitable in
- Any other factors you consider may be relevant

Chapter 3: Biomass Heating Systems

The use of biomass for decarbonising heating, or other sectors of the economy, differs from other responses to climate change in that the production of the fuel provides a mechanism to absorb carbon from the atmosphere, compared to other responses which focus on the reduction of carbon emissions.[35] Where biomass is produced from genuinely sustainable feedstocks, its use in heat significantly reduces carbon emissions compared to the use of fossil fuels, like heating oil, LPG or coal.

However, the Biomass Strategy (2023) recognised that the availability of the sustainable feedstocks needed to produce biomass is limited and will need to be prioritised in sectors where it can be used alongside carbon capture and storage technologies to provide the greatest greenhouse gas (GHG) emissions savings.[36] Where carbon capture and storage are not feasible, the Biomass Strategy found that biomass should only be used in harder to decarbonise sectors with limited or no low carbon alternatives.

Lack of proper consideration of how these scarce sustainable feedstocks are to be used, risks shortages in sectors that need it most. Increased demand risks driving up the use of virgin feedstocks like palm oil, which can have much higher emissions, and which are associated with deforestation in other countries, to supply global demand that cannot be met from wastes.

However, the government does note that biomass could play an important role in decarbonising some off-gas grid properties that are not suitable for more established technologies, like heat pumps. We plan to publish a consultation shortly to develop a common sustainability framework to enable consistency between biomass sectors and strengthen criteria in line with latest evidence.

Solid biomass

Wood-fuelled heating systems, also called solid biomass systems, burn wood pellets, chips or logs to provide warmth in a single room or to power central heating and hot water cylinders to heat the whole property. Biomass can also be used as fuel for low carbon heat networks. Biomass boilers operate in a similar fashion to conventional gas and oil boilers, which involves burning the fuel source (e.g. wood pellets) to heat water, which is then circulated to provide the heating requirements for a building.

Solid biomass boilers provide heat and hot water at high temperatures, so they do not typically require energy efficiency upgrades to deliver thermal comfort. This means that solid biomass

[35] The Committee on Climate Change (2018) Biomass in a low carbon economy https://www.theccc.org.uk/publication/biomass-in-a-low-carbon-economy/
[36] DESNZ (2023) Biomass Strategy 2023: https://www.gov.uk/government/publications/biomass-strategy

systems could be installed across a range of properties considered complex to decarbonise due to factors such as poor building fabric, high heat loss or heritage status.

Solid biomass derived from sustainable sources is associated with low levels of carbon emissions and could drive a substantial reduction in emissions for a household transitioning from oil heating.[37] The government only supports the use of sustainable biomass as a low carbon resource, and generators only receive subsidies for biomass that meets our sustainability criteria. Sustainability criteria in place cover the greenhouse gas emissions of the supply chain and environmental protections (land criteria). For instance, on the Renewable Heat Incentive (RHI) scheme, there are three sustainability requirements which participants must comply with: greenhouse gas limits, land use criteria and using fuel that meets a high-quality standard.

Any future support for solid biomass use for decarbonising heat will need to include biomass sustainability criteria, ensuring alignment as far as possible with the common sustainability framework, once developed.

Without appropriate abatement, use of solid biomass can increase levels of air pollution – including particulate matter and oxides of nitrogen - unless it involves a switch away from a dirtier fuel such as coal. This is particularly problematic when the burning of the solid biomass takes place in or close to urban areas.

	Smaller mid-terraced on-gas house	Semi-detached off-gas house	Larger detached on-gas house	Larger detached off-gas house
Capital cost	[N/A]	£23,400	[N/A]	£26,200
Discounted average annual running cost	[N/A]	£950	[N/A]	£1,750

Table 9. The capital and discounted average annual running costs of solid biomass boilers, for four housing archetypes in GB (2024 prices).[38] [39]

The government is exploring the role that solid biomass could play in decarbonising some properties where conventional decarbonisation measures, such as heat pumps would be

[37] DESNZ analysis of Green Book data: https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal and Standard Assessment Procedure (SAP) 10.2: https://files.bregroup.com/SAP/SAP%2010.2%20-%2017-12-2021.pdf
[38] DESNZ analysis based on the NBM.
[39] Cost data has been omitted for mid-terraced and detached on-gas properties because a solid biomass boiler has been deemed unsuitable for properties already on the gas grid.

unsuitable or prohibitively expensive. While we have also provided illustrative estimates on the cost of installing and running a solid biomass system in on-gas housing archetypes, we do not believe that solid biomass would be a viable low carbon heating option for on-gas-grid properties given the need to manage air quality impacts in urban areas, space constraints, and the availability of more cost-effective low carbon heating options for this group.

The role solid biomass could play in decarbonising heat

The previous government sought views on the role solid biomass could play in heat in the 2021 consultation on phasing out the installation of fossil fuel heating in homes off the gas grid. Responses to that consultation reinforce our view that solid biomass has a role to play in decarbonising heat in a small number of properties and would be a viable choice of low carbon heating system in some off-gas-grid homes and non-domestic properties where heat pumps may not be the most suitable solution. For this reason, the government is currently offering grants of £5,000 to consumers installing solid biomass systems, through the BUS.

More broadly, the government believes that the overall use of solid biomass in heating should be limited in order to maximise its overall carbon abatement potential given limited supply of woody biomass from sustainable sources. In line with the government's Air Quality Strategy,[40] we continue to place increasing importance on managing the air quality impact of burning biomass. We therefore believe that solid biomass systems are most appropriate in rural properties to ensure air quality objectives are not compromised.

We would welcome evidence on the potential for innovation or other steps that could be taken, to reduce the negative impact on air quality that would arise from burning solid biomass for heat, as well as the potential to reduce the cost of installing a solid biomass system.

Consultation question:

23 – Do you have any evidence or views on the role solid biomass boilers could play in decarbonising heat? We would particularly welcome any evidence or views which take into account their:

- Innovation potential to reduce negative impacts on air quality
- Cost reduction potential

24 – Do you have any evidence on the types and/or characteristics of properties which would not be suitable for a heat pump or a heat network, but would be suitable for a biomass boiler?

[40] DEFRA (2023) The air quality strategy for England https://www.gov.uk/government/publications/the-air-quality-strategy-for-england

Renewable liquid heating fuels

Renewable liquid heating fuels are produced from renewable, biological sources such as vegetable oils, energy crops, or other lignocellulosic feedstocks including woody biomass. They provide a potential alternative to fossil fuels such as kerosene heating oil or liquefied petroleum gas (LPG).

The government recognises that renewable liquid heating fuels could, in future, prove a convenient route to decarbonising some off-gas grid properties where heat pumps, or other electric heating options may not be the best solution. Consumers could reduce emissions from their heating whilst keeping their existing boilers and avoiding the disruption of transitioning to an alternative heating system.

BioLPG is chemically identical to fossil LPG and so can be dropped into many applications, including central heating systems currently using fossil LPG, as a low carbon alternative. Renewable Dimethyl Ether (rDME) is a ‘cousin’ of bioLPG which can be used alongside LPG / bioLPG in blends of up to 10-20% in existing boilers. To use more than that percentage blend, the government currently understands the boiler must be upgraded or replaced as rDME can degrade the rubber seals currently used in LPG boilers.

Hydrotreated Vegetable Oil (HVO) is a form of biodiesel that has been proposed as an alternative to kerosene heating oil. The government understands that oil heated households may only need to make minor modifications to their existing oil boilers to use HVO (whether as 100% HVO, or as part of a blend with kerosene). According to industry research these modifications would cost around £500,[41] and involve:

- draining the existing kerosene oil tank to remove residue before replenishing with renewable liquid fuel;
- replacing the existing oil filter with a renewable fuel compatible one;
- replacing the burner (subject to existing renewable fuel compatibility) with a renewable fuel compatible pump;
- replacing the existing oil nozzle with one that is renewable fuel compatible;
- replacing the oil line with one that is compatible with renewable fuel.

When derived from waste feedstocks like used cooking oil (UCO) or municipal solid waste, HVO and bioLPG can have considerably lower carbon emissions than the traditional fossil fuels currently used for heating off the gas grid, with industry sources arguing that emissions could reduce by around 90% on a lifecycle basis.[42] The use of renewable liquid fuels as part of a blend involving fossil fuels would significantly reduce the level of carbon savings possible.

While there are renewable liquid fuels currently available on the market, few consumers are currently choosing to use these fuels for domestic heating and the volume of renewable liquid

[41] Future Ready Fuel (2023) Kehelland Village Project Report: https://futurereadyfuel.info/wp-content/uploads/2023/08/Kehelland_Report_Download-Version.pdf
[42] OFTEC (2023) HVO Handbook: https://www.oftec.org/campaigns

fuels used in heat applications in the UK is low. The government believes this is due to the broader technical and economic challenges associated with the supply and use of renewable liquid fuels for heat – particularly around cost and feedstock availability.

While the government is aware that some stakeholders have argued there will be sufficient sustainable feedstock available to fully accommodate all likely demands for renewable liquid fuels across sectors, it is important to differentiate between theoretical levels of potential future biomass availability and the sustainable implementation potential that will be practically available, based on technical, social, economic and sustainability factors.

Ultimately, the potential amount of biomass that might be available for heat (or indeed other applications), reflecting the sustainable implementation potential is expected to be considerably lower than the theoretical potential both on a global and a UK level.

The Biomass Strategy, published in 2023, sets out biomass supply scenarios intended to minimise negative impacts on land use, and food security. This means that the government's consideration of the potential role of renewable liquid fuels in heat will focus on those fuels which are derived from waste feedstocks, like UCO. BioLPG and HVO produced from waste feedstocks are considered sustainable and can have considerably lower carbon emissions than the traditional fossil fuels currently used for heating off the gas grid.

While oil heated households may only need to make minor modifications to their existing oil boilers to use HVO, oil customers will still need to replace their heating systems every 15 years, based on the average oil boiler lifespan. This system replacement would be associated with a capital cost to the consumer as set out in table 10, however this capital cost may not be incurred upfront at the point the customer switches to clean heat (unlike other low carbon systems like heat pumps).

The price of renewable liquid fuels is currently much higher than the cost of fuels like kerosene or LPG which are commonly used by off-gas grid customers. While limited cost data exists, analysis of fuel price indexes suggests that UCO derived HVO is on average 2.5 times more expensive than heating oil.[43] [44] The government is not currently aware of any evidence on the cost at which bioLPG or rDME could be made available to consumers.

	Smaller mid-terraced on-gas house	Semi-detached off-gas house	Larger detached on-gas house	Larger detached off-gas house
Capital cost	[N/A]	£7,900	[N/A]	£8,100

[43]More information on the price estimation of HVO derived from UCO can be found in the accompanying analytical note.
[44] Green Book supplementary guidance: https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal

Discounted average annual running cost	[N/A]	£1,450	[N/A]	£2,850

Table 10. The capital and discounted average annual running costs of HVO boilers running on 100% HVO fuel blend, for four housing archetypes in GB (2024 prices).[45] [46]

The government is exploring the role that renewable liquid heating fuels could play in decarbonising some off-gas grid properties that are already making use of a liquid fuel boiler and where a heat pump or other electric system would not be the best solution. We do not believe that renewable liquid fuels would be a viable low carbon heating option for the vast majority of on-grid properties given the need to prioritise scarce bioresources, space constraints for smaller properties, and the availability of more cost-effective low carbon heating options for this group.

The role renewable liquid heating fuels could play in decarbonising heat

The government welcomes steps being taken by the liquid heating fuel industry to decarbonise applications using LPG and kerosene heating oil respectively, and the readiness of industry to work with officials and share insights from industry-led research and analysis. These steps include the LPG industry's ambition to offer 100% renewable solutions by 2040 by transitioning to bioLPG and rDME produced from sustainable feedstocks, and the recent industry-led scheme to trial the use of HVO in around 150 oil heated properties across the UK.

Ahead of making decisions later this decade on the role renewable liquid fuels could play in the future heating mix, and the policy framework that would be needed to support such a role, the government wishes to better understand the supply outlook for renewable liquid heating fuels (in particular for the sustainable feedstocks needed to produce such fuels), and how these fuels could be made available to consumers at an affordable cost.

This would build on the evidence already gathered under the Biomass Strategy, which concluded that the sustainable feedstocks needed to produce renewable liquid fuels are in short supply and in high demand across sectors.

Although we welcome input on transitional options, the key aim of this consultation is to explore technologies and fuel types which will enable consumers to fully transition to clean heat. We are therefore particularly interested in input on how renewable liquid fuels could be used to fully decarbonise buildings. Input relating to blends would need to underpin a clearly evidenced (including on cost availability of sustainable feedstocks) pathway to 100% renewable liquid heating fuels or where a blend can support the transition to another low carbon heat technology, with minimal disruption to consumers.

[45] DESNZ analysis based on the NBM.
[46] A HVO boiler is deemed unsuitable for the mid-terraced or detached on-gas property archetypes due to being connected to the gas grid. In addition, the mid-terrace archetype would likely face space constraints from the installation of a HVO storage tank.

The government notes that most current HVO and bioLPG production relies on hydrotreating, which is an established route that could be scaled up quickly subject to demand and feedstock availability. However, the availability of genuinely sustainable feedstocks, like UCO, to produce these fuels is limited and in high demand across sectors. Equally, hydrotreating requires the use of hydrogen, the manufacture of which currently creates greenhouse gas emissions due to the use of fossil fuels in the production process, although this could in time be reduced through the use of blue or green hydrogen.

Other sectors, like transport, are seeing increased interest in the use of HVO for decarbonisation, which could place further pressure on supply chains and increase competition for the limited sustainable bioenergy resources. In 2023, HVO made up 14% (502m litres) of all regular renewable fuel types verified and supplied in the UK for compliance with the Renewable Transport Fuel Obligation (RTFO), with 70% of biodiesel supplied under the RTFO being produced from UCO.[47] [48]

The government also introduced a Sustainable Aviation Fuel (SAF) Mandate in January 2025, which obligates the supply of an increasing amount of SAF in the overall UK aviation fuel mix. For 2025, the overall SAF obligation is set at 2% of the total jet fuel, increasing annually to 10% in 2030 and 22% in 2040. Hydro-processed esters and fatty acids (HEFA) is the most commercialised SAF production pathway today. The amount of HEFA will be capped under the SAF Mandate, however, up to 1.1 billion litres of HEFA could be needed in 2030.[49]

HEFA, makes use of the same feedstocks, and most of the same processes, as HVO. Given the similarities between jet fuel and heating oil, the government expects that aviation and heat would represent competing demands for renewable liquid fuels. Across the United Kingdom in 2023, around 2 billion litres of kerosene was used domestically, the primary function of which to provide space and hot water heating.[50]

Going forward, scaling up the supply of renewable liquid fuels, for use in any sector, will rely on multiple production pathways. The government is keen to better understand the potential of novel production processes – which make use of chemical reactions to convert carbon monoxide and hydrogen to liquid hydrocarbons – for producing renewable liquid heating fuels.[51] This includes building stronger evidence on the availability of critical inputs to the production process which include appropriate sustainable low carbon feedstocks and investable demonstrated technologies.

[47] DfT Renewable Transport Fuel Obligation (RTFO) statistics (2023 final): https://www.gov.uk/government/statistics/renewable-fuel-statistics-2023-final-report
[48] Includes biodiesel, bioethanol, aviation turbine fuel, and HVO.
[49] DfT (2023) Pathway to net zero aviation: developing the UK sustainable aviation fuel mandate: https://www.gov.uk/government/consultations/pathway-to-net-zero-aviation-developing-the-uk-sustainable-aviation-fuel-mandate
[50] Digest of UK Energy Statistics (DUKES): https://www.gov.uk/government/statistics/petroleum-chapter-3-digest-of-united-kingdom-energy-statistics-dukes
[51] Relying on synthesis gas produced by either gasification, flash pyrolysis or power to X

Exploring the role of alternative clean heating solutions to heat pumps and heat networks.

We welcome evidence on how these production pathways would be underpinned by significant investment and innovation to reach technological maturity and deliver the required volumes – in addition to a sufficient ongoing supply of sustainable feedstock.[52]

The government would welcome views from renewable transport fuel suppliers on the potential to supply renewable liquid fuels, like HVO, to heating customers, noting competition for scarce sustainable feedstocks from other sectors, and the broader commitments the government has made that would involve using renewable liquid fuels to decarbonise aviation and road transport.

The government would also welcome views from SAF producers on the potential to co-produce bioLPG and HVO, and the possibility of supplying this to heating consumers, noting that SAF processes can be optimised to produce more or less bioLPG (depending on what is most economically attractive to the manufacturer). This co-produced bioLPG can also be used as an input to further SAF production (which tends to be energy intensive due to the need to heat the feedstocks).

The government is keen to gather evidence on the practical implications that may arise should some off-gas grid consumers transition to renewable liquid heating fuels, in future.

Consultation question:

25 – Do you have any further evidence or views on the sustainable implementation potential for renewable liquid heating fuel production in the UK? We would particularly welcome any evidence which takes into account:

- The availability of sustainable feedstocks that would be needed to produce renewable liquid heating fuels
- The commercial readiness of novel production processes for making renewable liquid heating fuels
- Any potential competing demands for feedstocks from other sectors – like transport.
- The potential to make certain renewable liquid heating fuels – such as bioLPG and HVO – as a co-product of SAF production
- Any other factors you consider may be relevant

26 – Do you have any further evidence or views on the cost at which renewable liquid heating fuels – produced from sustainable feedstocks - could be made available to UK consumers?

27 – Do you have any evidence or views on the potential of renewable liquid fuels to be used in buildings where other low carbon solutions may not be the best solution?

28 – Do you have any evidence or views on the practical implications that may arise if some off-grid consumers start using renewable liquid heating fuels? We would welcome any evidence which takes into account:

[52] Or green hydrogen in the case of Fischer Tropsch processes making use of power to X

- At what blend level (i.e. of renewable liquid heating fuel to fossil heating fuel) would existing boilers require certain modifications or upgrades (e.g. to their nozzles)?
- At what blend level would boiler manufacturers be happy to warrant existing boilers?
- Would there be any implications for fuel storage if some off-grid customers took a blend of renewable liquid heating fuels and fossil heating fuels?
- Are there any existing boiler makes or models – used off the gas grid - that could not take a blend of renewable liquid heating fuels and fossil heating fuels?

29 – Do you have any evidence or views – especially on cost and availability of sustainable feedstock - to demonstrate that a possible initial blend approach could be increased to a 100% renewable liquid fuel solution for consumers? We would particularly welcome any evidence which takes into account:

- The cost and availability of sustainable feedstock
- Any other factors you may consider to be relevant

Hybrid systems using liquid biofuels

A hybrid heating system could consist of any combination of heat generators (alongside a single master system control capable of determining which heat generators are to be utilised depending on one or more operating conditions) to create a single system for space heating (and often hot water). We use the term ‘hybrid heat pump’ to describe a hybrid heating system where one of the heat generators is an electricity-driven hydronic heat pump.

In our consultation “*Raising product standards for space heating”*, which closed in March 2025, the government proposed to introduce a definition of a hybrid heat pump into ecodesign and energy labelling regulations.[53] It proposed that only combinations of a heat pump and a fuel boiler would be classified as hybrids for the sake of those regulations, rather than heat pumps combined with other technologies. It also sought stakeholder feedback on the introduction of a minimum energy performance standard for hybrids, and an associated testing methodology.

The present market for hybrid heating systems is developing, but still relatively small in comparison to other heating technologies. There are a wide variety of heat pumps and the carbon-intensity of a hybrid heat pump depends on a range of factors including where and how it is installed, the system’s flow temperature, the fuel used by the non-heat pump component, the relative cost of the fuels used, the proportion of heating delivered by the heat pump, and the energy efficiency of each of the elements of the hybrid heating system.

There are currently hybrid products, packages of products, and installation configurations, which are suitable for buildings off the gas grid, for example combining an oil boiler with a heat pump. If the hybrid should need to remain in the long term, the fuel used by the boiler element of the hybrid system would need to be net zero-compliant, for instance burning an (unblended) liquid biofuel like HVO produced from sustainable and renewable feedstocks.

[53] DESNZ (2024), ‘Raising product standards for space heating’ consultation: https://www.gov.uk/government/consultations/raising-product-standards-for-space-heating

Therefore, with respect to technologies that could play a role in a future clean heating landscape that are the focus of this consultation, hybrid heat pump systems involving liquid biofuel boilers could potentially be a solution for buildings not suitable for a standalone heat pump. As well as offering higher energy efficiency and potentially lower running costs than non-hybrid biofuel boilers, hybrid appliances would also have lower demand for scarce biofuels – albeit not necessarily low enough demand to warrant widespread deployment of biofuel hybrids for heating where non-biofuel systems would be a viable alternative, given the competing strategic demands for sustainable feedstocks of these fuels discussed above.

	Smaller mid-terraced on-gas house	Semi-detached off-gas house	Larger detached on-gas house	Larger detached off-gas house
Capital cost	[N/A]	£16,200	[N/A]	£17,800
Discounted average annual running cost	[N/A]	£1,100	[N/A]	£2,100

Table 11. The capital and discounted average annual running costs of a hybrid ASHP running at low temperatures with an HVO boiler for four housing archetypes in GB (2024 prices).[54] [55]

As outlined earlier in this chapter, the government believes that hybrids involving renewable liquid fuels would only be a viable or appropriate low carbon heating option for properties which are presently off the gas grid, currently using liquid heating fuels and not suitable for a standalone heat pump.

Consultation question:

30 – Do you have any evidence or views on the role that hybrid heat pumps, comprising of a heat pump and an appliance using 100% renewable liquid fuels, could play in decarbonising heat? We would particularly welcome any evidence or views which take into account:

- Installation and running costs;
- In-situ performance;
- Impact on the electricity grid;
- User experience;

[54] DESNZ analysis based on the NBM. Cost data has been omitted for mid-terraced and detached on-gas properties because a hybrid ASHP working with a HVO boiler has been deemed unsuitable for properties already on the gas grid.

[55] For hybrid HP systems, departmental modelling assumes an 80/20 ratio of work for space heating (80% of heating by a heat pump and the remaining 20% by the second heating system) and 100% of the hot water heating provided by the secondary heating system. This results in a total heating ratio of 64/36. In practice this split can be defined by the user and so the efficiency may vary depending on this.

- Potential to be used with controls that can maintain up-to-date fuel pricing and cost-optimise the system (including how best they can update price data for fuels that are bought in bulk);
- Potential to be used in buildings where other low carbon solutions may not be feasible or would be less cost effective; and
- Any other factors you consider may be relevant

Other hybrid heat pump systems

The government would welcome views and evidence on other kinds of net zero-compatible hybrid heat pump systems – i.e. not involving fossil fuel combustion – that could play a role in heating properties that are not suitable for standalone heat pumps.

We would particularly welcome views on whether or not the use of solid biomass as part of a hybrid system could present a feasible, cost-effective option for some properties that would not be suitable for a standalone heat pump.

Consultation question:

31 – Are there any other alternative low carbon heat sources not discussed in this consultation which you consider could offer further benefits if installed as part of a hybrid heat pump system compatible with net zero? Please provide an explanation and evidence to support your answer.

Renewable liquid heating fuel obligation

While renewable liquid heating fuels may have a role to play in decarbonising some properties off the gas grid, we recognise that without steps taken by industry and/or government, supply and take-up are likely to remain low. This may impact the likelihood of these fuels to present a viable low carbon heating solution for consumers off the gas grid.

The previous government took a power in the Energy Act 2023 to bring in a Renewable Liquid Heating Fuel Obligation, should that be needed to support the decarbonisation of some properties off the gas grid. If implemented via secondary legislation, this obligation would require suppliers of liquid heating fuels like kerosene or LPG to supply a minimum proportion of renewable fuel. The power taken in the Energy Act places a duty on ministers to consult before making regulations that would implement a Renewable Liquid Heating Fuel Obligation.

Similar approaches have been used in other sectors to help bring forward decarbonisation and drive market growth of renewable solutions. For instance, the RTFO was introduced in 2008 to reduce the carbon emissions from fuels deployed in surface transport. The RTFO set an initial obligation on fuel suppliers, requiring 2.5% (volume) of all fuel supplied in surface transport to be renewable.[56] The obligation has increased to 13.55% in 2025.[57]

Obligated suppliers can meet their obligation by redeeming Renewable Transport Fuel Certificates (RTFCs) or by paying a fixed sum for each litre of fuel for which they wish to 'buy-out' of their obligation. An obligated supplier can obtain RTFCs either by supplying renewable fuels, or by buying them from renewable fuel suppliers. DfT sets the buy-out price, and the market determines certificate prices based on supply and demand. The RTFCs are issued to suppliers of renewable transport fuel and this certificate purchasing process by other suppliers is designed to enable obligated suppliers to meet their obligation in the most cost-effective way. The costs associated with the RTFO are borne by the obligated parties i.e. fuel suppliers, with those costs likely passed on to fuel users, such as motorists, via increased pump prices.

If implemented in future, the Renewable Liquid Heating Fuel Obligation would work in a similar way to the RTFO. However, the government wishes to make clear that any future decision to bring in a Renewable Liquid Heating Fuel Obligation would be subject to confidence in the likely available supply of the sustainable feedstocks used to produce renewable liquid heating fuels, and considerations around the best use of scarce feedstocks across other sectors.

Moreover, any future policy proposals would need to be fair and affordable to consumers. Given our current understanding of HVO prices, it is estimated that if the average off-gas grid home were to run on a 14% HVO blend this could drive up an oil consumers' heating costs by around 20%.[58]

The government wishes to test through this consultation, and other evidence pathways, the impacts on consumer bills and the supply outlook for sustainable feedstock. The government has so far not seen sufficient evidence on affordability to consumers and the availability at scale of truly sustainable feedstock however we will carefully consider any evidence provided as part of this consultation ahead of any future decision on implementing a Renewable Liquid Heating Fuel Obligation.

We will set out our final decision on whether to implement a Renewable Liquid Heating Fuel Obligation at this stage in the government response to this consultation, having considered the evidence provided in response to this consultation. Any decision, following this current consultation exercise, to implement a Renewable Liquid Heating Fuel Obligation would be subject to further consultation on the detailed changes to legislation, and other technical requirements, that would be needed to deliver this policy. This future consultation would also need to consider the latest evidence on the availability of feedstocks for renewable liquid fuel production, best use of scarce feedstocks across sectors, and consumer impacts.

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[56] The National Archives (2007) The Renewable Transport Fuel Obligations Order 2007: https://webarchive.nationalarchives.gov.uk/ukgwa/20110104205844/http://www.legislation.gov.uk/uksi/2007/3072/article/4/made

[57] DfT (2025) Renewable Transport Fuel Obligation: Compliance Guidance: RTFO compliance guidance 2025

[58] DESNZ analysis assumes the price of UCO derived HVO and kerosene are broadly indexed, albeit HVO on average 2.5 times more expensive than kerosene.

Exploring the role of alternative clean heating solutions to heat pumps and heat networks.

A Renewable Liquid Heating Fuel Obligation could play an important role in the future to support the decarbonisation of some properties off the gas grid. We wish to use the current consultation process to seek evidence and views on: the role that such an obligation could play in future, how such an obligation could be implemented, and at what stage of development in the market for renewable liquid fuels it would be appropriate to consider bringing in such an obligation. We also wish to seek views on how the government could work with industry to encourage voluntary initiatives that could unlock deployment.

Consultation question:

32 – Do you have any evidence or views that could help inform future decisions on whether to implement a Renewable Liquid Heating Fuel Obligation, and if so, how? We would particularly welcome any evidence or views which take into account:

- At what stage of development in the market for renewable liquid heating fuels would it be appropriate to consider bringing in such an obligation?
- What initial level of obligation would strike the right balance between ambition and deliverability?
- What forward trajectory for the level of obligation would strike the right balance between ambition and deliverability?
- How would the fossil fuel heat sector offer a viable, tradable, market for the renewable heating fuel certificates that would be generated under any future Renewable Liquid Heating Fuel Obligation?
- How the likely costs to consumers arising from any future Renewable Liquid Heating Fuel Obligation could be abated?

33 – Do you agree that evidence of affordability to consumers, and availability at scale of sustainable feedstock are key factors in determining if the government should pursue the implementation of a Renewable Liquid Heating Fuel Obligation? If not, what other factors do you think are significant and why? Please provide your views and evidence to support this answer.

34 – Do you have any views on what other steps government or industry could take to develop the market for renewable liquid heating fuels, ahead of making a decision on whether to implement a Renewable Liquid Heating Fuel Obligation?

35 – Do you have any views on whether the introduction of the Renewable Liquid Heating Fuel Obligation would be an effective tool in fully decarbonising oil heated homes or whether it is a transitional solution to decarbonisation (if either)? We would particularly welcome responses which take into account cost, renewable liquid heating fuel availability and sustainability considerations.

Chapter 4: Other low carbon heating systems

Throughout this consultation document, the government has set out our understanding of the key low carbon heating solutions which we have been monitoring as we believe they may play a role in the future heating mix in at least some properties that are not suitable for hydronic heat pump systems. Some of these solutions are already suitable for most homes, while others are expected to play a more niche role.

We recognise our understanding may not be exhaustive, and there may be other low carbon heating solutions, or combinations of systems potentially including smart technology and microgeneration, that could be suitable for commercial deployment before 2050 and which we should be considering as they may also allow us to decarbonise this group of properties.

The government believes there is strong potential for technological innovation in this area, which could be of great benefit to consumers in the future. The low carbon heating mix of 2050 may include attractive technologies that are not commercially available today. We want to understand what opportunities innovative new technologies may present and consider how best to promote their development through inclusive policy design.

Consultation question:

36 – Do you have any evidence or views on the role other low carbon heating systems, not discussed in this consultation, could play in decarbonising heat? We would particularly welcome any evidence or views which take into account their:

- Installation and running costs
- In-situ performance
- Impact on the electricity grid
- Supply chain maturity and potential for future development
- User experience
- Potential to be used in certain building types where other low carbon solutions may not be feasible or would be less cost-effective
- Any other factors you consider may be relevant

37 – Do you have any evidence or views on what steps the government could be taking to support the development of early-stage heating technologies that have legitimate potential in decarbonising properties? We would particularly welcome any evidence or views which take into account:

- What barriers exist to the development of early-stage low carbon heating technologies with potential to decarbonise?

Exploring the role of alternative clean heating solutions to heat pumps and heat networks.

- What steps could government take to support the commercialisation on new low carbon home heating technologies?

Equality Act 2010

Under the Public Sector Equality Duty, government must take steps to understand how policies will affect different groups in society in different ways, with a particular focus on removing or minimising disadvantages suffered by people due to the following protected characteristics under the Equality Act 2010: age; disability; gender reassignment; marriage and civil partnership; pregnancy and maternity; race; religion or belief; sex; and sexual orientation.

Warm homes and thermal comfort play a crucial role in maintaining our health and wellbeing. Where this is not the case – for example, because households install an unsuitable heating system, or heating systems are undersized, or because there is a break in service when a boiler breaks down, various reports suggest that elderly, pregnant and disabled groups may be particularly affected and at an elevated risk of negative health outcomes.[59] [60] [61]

We are committed to ensuring that no consumer will need to install a low carbon heating system which is not suitable for their property. We have considered equality issues throughout the process of formulating this consultation and will continue to do so as the government considers the responses to inform the policy position.

We are using this consultation to gather evidence on the most appropriate low carbon heating technologies that could be used to decarbonise heat in properties that are not suitable for heat pumps or heat networks. This evidence will help inform how any future policy decisions on how to decarbonise heat in properties can address potential risks to groups with protected characteristics. The government does not propose that any household or business installs a low carbon option which is not suitable for their property.

Consultation question:

38 – Do you have any additional evidence on how people with protected characteristics under the Equality Act 2010 may be affected by the installation of any of the alternative heating technologies included in this consultation?

[59] Office for National Statistics. 'Excess winter mortality in England and Wales: 2018 to 2019' (2020) https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/bulletins/excesswintermortalityinenglandandwales/2019to2020provisionaland2018to2019final

[60] NHS (2022) Seasonal vaccines and winter health' https://www.nhs.uk/live-well/healthy-body/keep-warm-keep-well/

[61] NHS. 'Cold weather increases risk of heart attack and stroke' (2018): https://www.england.nhs.uk/north/cold-weather-increases-risk-of-heart-attack-and-stroke/

Annex

Annex A: Costs of Alternative Heating Technologies

Table 1. Capital costs and annual operating costs for different heating technologies across four housing archetypes in GB (2024 prices).[62]

	Smaller mid terraced on-gas house		**Semi-detached on-gas house[63]**		**Larger detached on-gas house**		**Larger detached off-gas house**	
	Capital cost[64]	**Average annual running cost[65]**	**Capital cost**	**Average annual running cost**	**Capital cost**	**Average annual running cost**	**Capital cost**	**Average annual running cost**
Low temperature air source heat pump (LTHP)	£9,300	£600	£13,200	£750	£15,100	£1,400	£16,900	£1,700
High temperature air source heat pump (HTHP)	£9,300	£600	£12,600	£800	£15,200	£1,450	£17,100	£1,750

[62] Capital and running costs are not applicable (N/A) for heating systems that have been deemed unsuitable for particular housing archetypes. This is because these archetypes are either on the gas grid and/or have external space constraints that may prohibit additional requirements such as groundworks or installing external fuel storage tanks.
[63] Where (*) is present for capital and running costs, this denotes the costs for select heating technologies in the off-gas variant of the semi-detached housing archetype (based on suitability).
[64] Capital costs include the cost of the heating unit, labour costs, and ancillary costs. Ancillary costs include things like hot water cylinders and pipework or radiator replacements. For the larger detached off gas housing archetype, an additional £1,500 oil storage tank decommissioning cost is included for all systems except for the HVO boiler and hybrid LTASHP + HVO boiler (as these will retain the need for HVO fuel storage). Assumes 20% VAT applies to all technologies except heat pump systems and biomass boilers. Rounded to the nearest £100.
[65] Average annual running costs consider fuel costs and maintenance costs, which have been discounted and averaged over an appraisal period of 18 years (the assumed lifetime of an air source heat pump). Fuel prices for all systems are derived from Green Book data where possible. Maintenance costs are derived from the Eunomia Study on the Cost of Heating Appliances: https://eunomia.eco/reports/title-the-cost-of-heating-appliances-a-comprehensive-uk-database/. Rounded to the nearest £50.

Low temperature ground source heat pump[66]	N/A	N/A	£23,500	£650	£36,300	£1,150	£39,400	£1,400
Low temperature shared ground loop (SGL) ground source heat pump[67]	£15,000	£600	£17,300	£800	N/A	N/A	N/A	N/A
Air to air heat pump (AAHP) [68]	£6,800	£850	£10,600	£1,100	£19,000	£1,900	£23,000	£2,300
Space heating[69]	*£4,600*	-	*£8,400*	-	*£16,900*	-	*£20,900*	-
Hot water heating[70]	*£2,200*	-	*£2,200*	-	*£2,200*	-	*£2,200*	-
Dry Core Storage Boiler[71]	£10,200	£1,000	£10,700*	£1,350*	£10,700	£2,550	£12,800	£3,150
HVO Boiler	N/A	N/A	£7,900*	£1,450*	N/A	N/A	£8,100	£2,850
Biomass Boiler	N/A	N/A	£23,400*	£950*	N/A	N/A	£26,200	£1,750
Electric Combi Boiler[72]	£4,600	£1,300	£5,000	£1,850	£5,100	£3,450	£7,200	£4,250
Storage Heater	£6,900	£1,000	£9,600	£1,350	£10,000	£2,550	£12,100	£3,150
Space heating	*£4,700*	-	*£7,500*	-	*£7,800*	-	*£10,000*	-
Hot water heating	*£2,200*	-	*£2,200*	-	*£2,200*	-	*£2,200*	-
Convective Heater	£5,600	£1,300	£7,400	£1,850	£7,800	£3,450	£9,900	£4,250
Space heating	*£3,400*	-	*£5,300*	-	*£5,600*	-	*£7,800*	-
Hot water heating	*£2,200*	-	*£2,200*	-	*£2,200*	-	*£2,200*	-
Infrared Panel Heater	£6,500	£1,300	£9,100	£1,850	£9,400	£3,450	£11,600	£4,250

[66] An 80/20 split has been assumed for ground source heat pump costs by those with a vertical borehole and those with a horizontal collector.
[67] SGL are not deemed suitable for the larger detached on- or off-gas home archetypes, as opposed to non-shared ground source heat pumps.
[68] AAHP, storage heater, and infrared panel heater capital costs do not include the cost to remove existing radiator system.
[69] Total capital cost for energy systems with separate space heating and hot water components may not equal the sum of the individual components due to rounding.
[70] Hot water heating assumes a home has either a hot water cylinder for larger homes or a point of use system for space constrained homes.
[71] Storage based heating systems which are on an Economy 7 tariff assume a 30% price reduction over Green Book electricity retail prices. It is acknowledged that in practice, electrical heating systems that can make use of off-peak electricity prices may need to be operated during peak hours, particularly during colder winter months. Doing so would increase the running costs over what is assumed in DESNZ modelling.
[72] Electric boilers are most suitable for properties with low heat demand or those with space constraints (smaller mid-terraced and semi-detached on-gas home archetypes).

Space heating	*£4,300*	-	*£6,900*	-	*£7,300*	-	*£9,400*	-
Hot water heating	*£2,200*	-	*£2,200*	-	*£2,200*	-	*£2,200*	-
Hybrid LTHP + HVO boiler	N/A	N/A	£16,200	£1,100	N/A	N/A	£17,800	£2,100

Consultation Questions

1 - Do you agree that electric boilers should play a limited role in decarbonising heat, given their comparatively low efficiency and limited ability to load shift, leading to high running costs for consumers?

2 - Do you agree that (a) thermal energy storage systems and (b) electrical energy generation and storage (solar PV and batteries) can enable electric boilers to become a more efficient and cost-effective option to decarbonise heat?

3 – Do you have any evidence or views on the role infrared heating could play in decarbonising heat?

4 – Do you agree that panel heaters and electric radiators should play a smaller role in decarbonising heat, given their comparatively lower efficiency (than heat pumps) and limited ability to load shift, leading to high running costs for consumers?

5 – In what circumstances, if any, would panel heaters or electric radiators be more suitable than heat pumps, thermal energy storage systems, biomass heating systems or hybrid heat pumps?

6 – Do you agree that high temperature heat pumps could play a key role in decarbonising heating of buildings?

7 – What are the key barriers that are preventing the installation of high temperature heat pumps in (a) domestic properties and (b) non-domestic buildings? How could these barriers be removed?

8 – Do you agree that air-to-air heat pumps could play a key role in decarbonising heating of buildings without wet central heating systems?

9 – What are the key barriers that are preventing the installation of air-to-air heat pumps in (a) domestic properties and (b) non-domestic buildings? How could these barriers be removed?

10 – Do you have any evidence on the potential for air-to-air heat pumps to use alternative refrigerants?

11 – Please provide any evidence or views on a) the promotion of passive cooling measures to increase their uptake, so that active cooling is only used when and where needed, and b) local network impacts during extreme weather events.

12 – Do you agree that networked heat pumps may have a key role to play for buildings with limited outdoor space for individual heat pumps per dwelling?

13 – Do you have any evidence or views on a) which business models would be most effective at bringing forward networked heat pumps, where appropriate, and b) what steps would be necessary to support the development of such business models?

14 – Do you have any evidence or views on a) the public appetite to make use of clean heat solutions relying on shared infrastructure, b) where clean heat solutions that rely on shared

infrastructure have been implemented, and c) what steps have been most effective at persuading households to participate in projects?

15 – Do you have any evidence or views on the role exhaust air heat pumps could play in decarbonising heat?

16 – Do you have any views on whether exhaust air heat pumps should be targeted primarily at buildings with a) limited outdoor space b) a higher risk of air-tightness c) lower heat demand d) new-builds?

17 – Do you have any evidence or views on the role heat batteries could play in decarbonising heat?

18 – Do you have any views on what further criteria, in addition to existing scheme criteria (e.g. MCS certification and SAP-eligibility), should be required for heat batteries that are supported through government grant schemes to prevent systems from drawing energy at peak times?

19 – Do you have any evidence or views on how future developments in the thermal energy storage market might help reduce strain on the electricity grid and how this could work with other technologies (like heat pumps or electric boilers) to become more cost effective?

20 – Do you have any evidence or views on the role storage heaters could play in decarbonising heat?

21 – Do you have any views on what further criteria, in addition to existing scheme criteria (e.g. SAP-eligibility), should be required for high heat retention storage heaters that are supported through government grant schemes, to prevent systems from drawing energy at peak times?

22 – Do you have any evidence on any other types of electric heating that could play a significant role in decarbonising heat?

23 – Do you have any evidence or views on the role solid biomass boilers could play in decarbonising heat?

24 – Do you have any evidence on the types and/or characteristics of properties which would not be suitable for a heat pump or a heat network, but would be suitable for a biomass boiler?

25 – Do you have any further evidence or views on the sustainable implementation potential for renewable liquid heating fuel production in the UK?

26 – Do you have any further evidence or views on the cost at which renewable liquid heating fuels – produced from sustainable feedstocks - could be made available to UK consumers?

27 – Do you have any evidence or views on the potential of renewable liquid fuels to be used in buildings where other low carbon solutions may not be the best solution?

28 – Do you have any evidence or views on the practical implications that may arise if some off-grid consumers start using renewable liquid heating fuels?

29 – Do you have any evidence or views – especially on cost and availability of sustainable feedstock - to demonstrate that a possible initial blend approach could be increased to a 100% renewable liquid fuel solution for consumers?

Exploring the role of alternative clean heating solutions to heat pumps and heat networks.

30 – Do you have any evidence or views on the role that hybrid heat pumps, comprising of a heat pump and an appliance using 100% renewable liquid fuels, could play in decarbonising heat?

31 – Are there any other alternative low carbon heat sources not discussed in this consultation which you consider could offer further benefits if installed as part of a hybrid heat pump system compatible with net zero?

32 – Do you have any evidence or views that could help inform future decisions on whether to implement a Renewable Liquid Heating Fuel Obligation, and if so, how?

33 – Do you agree that evidence of affordability to consumers, and availability at scale of sustainable feedstock are key factors in determining if the government should pursue the implementation of a Renewable Liquid Heating Fuel Obligation? If not, what other factors do you think are significant and why?

34 – Do you have any views on what other steps government or industry could take to develop the market for renewable liquid heating fuels, ahead of making a decision on whether to implement a Renewable Liquid Heating Fuel Obligation?

35 – Do you have any views on whether the introduction of the Renewable Liquid Heating Fuel Obligation would be an effective tool in fully decarbonising oil heated homes or whether it is a transitional solution to decarbonisation (if either)?

36 – Do you have any evidence or views on the role other low carbon heating systems, not discussed in this consultation, could play in decarbonising heat?

37 – Do you have any evidence or views on what steps the government could be taking to support the development of early-stage heating technologies that have legitimate potential in decarbonising properties?

38 – Do you have any additional evidence on how people with protected characteristics under the Equality Act 2010 may be affected by the installation of any of the alternative heating technologies included in this consultation?