Hybrid Heating Systems: Accelerating Decarbonisation of Britain's Homes

REPORT

Hybrid Heating Great Britain (HHGB) is a consortium comprising electricity and gas distribution networks, heat pump manufacturers, and software solution providers, united by a shared recognition of the potential benefits hybrid heating systems can bring to Great Britain (GB).

Hybrid heating systems are a pragmatic, consumer-first solution, combining a heat pump with a traditional boiler to deliver immediate carbon savings, improve resilience and lower energy bills without disruptive renovations. However, hybrid heating systems are not currently recognised or supported by GB policy and regulation as part of the solution to address the significant heating decarbonisation challenge, resulting in a lack of impetus to invest and scale the technology.

In this report, HHGB members come together to explore the benefits of hybrids from a whole-systems perspective, to quantify the opportunity at a national level, and to design an actionable roadmap to accelerate heating decarbonisation.

This report's recommendations are grounded in the findings of that analysis, they are informed by a review of international jurisdictions, and by engagement with stakeholders across the GB heating sector. The recommendations aim to include hybrid heating systems as part of GB's solution to heat decarbonisation, to empower consumers, and to give the market confidence to invest, innovate and scale hybrid heating solutions.

WITH SUPPORT FROM

What are hybrid heating systems?

Hybrid heating systems, or hybrids, are a low-carbon heating option that combine a traditional gas boiler, whether new or existing, with an electric heat pump.

Hybrids are managed by a central controller that adjusts the operating mode to optimise the heat pump's contribution, either by minimising running costs or maximising carbon savings. Typically, the heat pump meets most of the heating demand during the year, while the boiler kicks in during peak periods to provide additional support, such as during cold winter months.

Hybrids are offered in **three main models:**

01.

REGULAR HYBRID

Pairs a heat pump with a gas boiler and hot water cylinder to provide flexible low-carbon heat

02.

COMBINATION HYBRID

Integrates the heat pump with a combi boiler to deliver both hot water and heat from a single system

03.

COMPACT HYBRID

Fully integrates boiler and heat pump technologies into a single, space-efficient appliance

The decarbonisation of heat is arguably the most significant challenge facing GB's energy sector over the coming decades.

- **85%** of the UK's residential building stock, approximately **23 million homes**, currently rely on **gas** for heating and hot water.
- With home heating and comfort fundamental to both physical and mental wellbeing, it is essential to consider **how the energy transition will be experienced by consumers.**
- With **~1.7 million gas boilers** sold in 2024 compared to **~90,000 heat pumps**, this report explores hybrid heating systems as a low-carbon alternative, supporting heat pumps in bridging this substantial gap.

Hybrids are a critical piece of the puzzle towards complete and achievable net zero heating. Hybrids can:

- ✓ **Reduce energy bills** for homeowners compared to heat pumps
- ✓ Install easily with **minimal disruption**
- ✓ **Reduce carbon emissions** by up to 70%
- ✓ **Provide choice** to consumers
- ✓ Run on green gas, or have the boiler easily removed, to achieve **100% emissions reduction** in the future

Yet despite these benefits, **hybrids are not currently supported under most British heating policy.**
In comparison, hybrids currently comprise **~50%** of the Dutch and Italian heat pump markets.

Hybrids are the cost-effective solution for ~40% of British homes

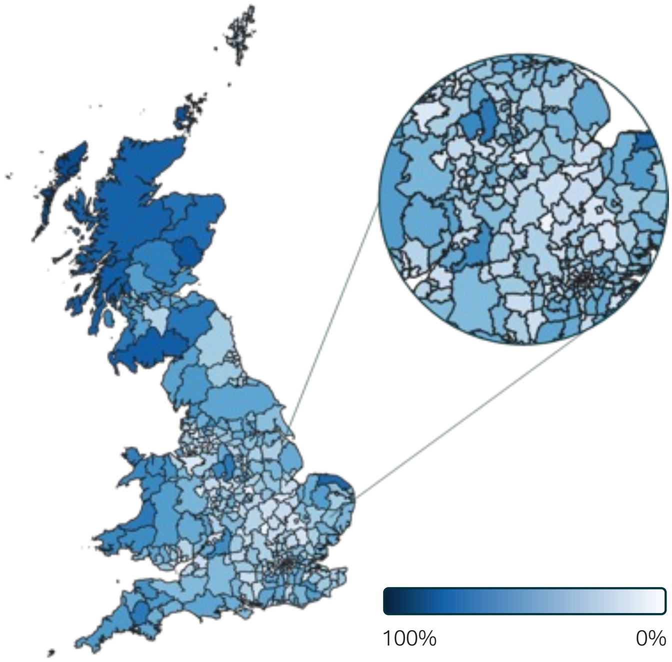
Hybrids operate at the intersection of the electricity and gas systems, offering a unique combination of whole energy system benefits, for consumers, networks and country. To develop a comprehensive understanding of the value of hybrids, this report adopted a whole energy systems perspective.

Whole System Analysis Findings

- Hybrids are **more cost-effective than heat pumps** across all housing types with low efficiency Energy Performance Certificate (EPC) ratings of **D, E, and F.**
- **Electric heat pumps** are more cost-effective in highly efficient homes with EPC ratings of **A and B.** However, housing retrofit rates remain relatively low, for example with costs estimated at **£4,000 to £13,000** to upgrade from EPC D to C and even higher to upgrade from EPC E and F.
- At **EPC C**, results are less conclusive, as the economics of hybrids and heat pumps are **relatively comparable**.
- Hybrids using natural gas **reduce emissions by 65–70%** through the use of smart controls to optimise performance, and up to **90%** when using biomethane.
- Hybrids are **more cost-effective per tonne of CO_2 saved** than electric heat pumps across most housing types, allowing greater decarbonisation per pound of public spending.
- Hybrids **do not increase peak electricity demand** by relying on the boiler to meet peak demand, whereas electric heat pumps can increase peak demand by **up to 10 kW per household**, roughly a 3-fold increase in household peak electricity demand.
- While modelling conducted for this report does not cover off-grid properties, engagement with GDNS, DNOS and other independent studies indicates there is strong potential for oil and LPG hybrids.

Hybrid Heating Attractiveness Map 2025

Share of homes (%) in each **Local Authority** where hybrids are cost-effective versus electric heat pumps



The Role of Hybrids at a National Level

Extrapolating the results of the cost-effectiveness analysis to all **317 local authorities** across GB offers a view of where hybrids are more cost-effective than heat pumps.

- **Local authorities (LAs)** with a high proportion of low efficiency stock (e.g., EPC D–F), are ideal candidates for the adoption of hybrids, where they are the **most cost-effective** low-carbon option.
- Across GB, there are **160 LAs with more than 40%** of their housing stock ideal for the adoption of hybrids. These LAs are primarily located across Scotland and Wales, and some areas of England, where older housing stock is concentrated.

Now is the ideal time for the Government to stimulate the hybrids market with four decisive actions

To realise the benefits of hybrid heating systems and heat pumps, decisive policy action must be taken now to accelerate deployment. Without early and coordinated intervention, Great Britain risks missing an opportunity to offer consumers a cost-effective pathway to decarbonise their homes, and an achievable trajectory towards a net zero 2050.

This report recommends **four policy actions** to give the market impetus to invest, incentivise consumers to transition, and to facilitate the deployment of a net zero compliant technology.

01.

Include hybrid heating systems explicitly in the national strategy for domestic heat decarbonisation and annual heat pump targets.

02.

Make hybrid heating systems eligible for grant subsidy support under the Boiler Upgrade Scheme and Home Energy Scotland.

03.

Introduce dynamic supplier credits for hybrid heating systems above the 0.5 baseline in the Clean Heat Market Mechanism to award credits proportionally to emissions saved.

04.

Formalise a biomethane production target to stimulate investment in biomethane production.

Hybrids can reduce energy bills today

National & international trials have consistently found that hybrids reduce consumers' energy costs.

This report found ~40% of British homes can benefit from a hybrid, and hybrids can achieve greater decarbonisation per pound of public spending.

Hybrids offer choice and comfort to consumers

Hybrids break the cycle of consumers replacing failed boilers with new ones through retrofitting.

They offer a minimally disruptive choice and prepare consumers for a heat pump with no additional steps (i.e. boiler removal) or for a green gas hybrid.

Hybrids minimise electricity grid impact

Unlike heat pumps, which increase electricity peaks by 3–10 kW per home, hybrids minimise peaks by relying on the boiler to meet peak demand. Huge investment would be required in the electricity grid to deliver 100% of Britain's heat.

Hybrids cut emissions today and in the future

The counterfactual to a hybrid installation is not a heat pump, but rather, a new gas boiler.

Hybrids can reduce emissions by 70%, vs. boilers today, while offering a pathway to a future net zero compliant heating technology.

"Hybrid heating systems have the ability to lower bills for consumers, even those on gas, while reducing the disruption and behavioural changes associated with heat pump only solutions. As such, they cannot be ignored and should be part of our armoury in the fight against climate change."

Mike Foster, CEO

Energy Utilities Alliance & Heating and Hotwater Industry Council

01. Decarbonising Heat

1.1 The Heat Decarbonisation Challenge

In 2019, the UK became the first major economy in the world to legislate a binding commitment to achieve net zero greenhouse gas (GHG) emissions by 2050. A key cornerstone of the UK's net zero ambitions is the decarbonisation of its power sector, for which the UK Government's Clean Power by 2030 (CP2030) plan defined decisive targets. CP2030 targets that 'clean' energy sources will produce at least 95% of the nation's power generation by 2030.

Alongside the power sector, decarbonising heat presents one of the greatest challenges for tackling the UK's GHG emissions. Residential buildings account for approximately 18% of the UK's total carbon emissions, primarily due to the use of natural gas for heating and cooking.[1] In 2023, homes burned more natural gas than any other sector, including industry and electricity generation, and accounted for over one third of total gas consumption.[2] Currently, 85% of UK homes, or 23 million, are connected to the gas grid and rely on gas for heating purposes. However, over the next decades, most of these heating systems will need to transition to low-carbon alternatives in order to meet the legally-binding net zero goal.[3]

Thus far, emissions reductions have mostly been delivered through the power sector with coal generation reduced to zero and renewable energy sources such as offshore wind and solar rapidly scaling up. As the UK enters the next phase of its energy transition journey, the decarbonisation of more difficult sectors such as buildings will become crucial. According to the Climate Change Committee (CCC)'s 7th Carbon Budget, the emissions from residential buildings alone must fall by 66% by 2040 from 2023 levels, as illustrated in *Figure 1*.[4]

Total building emissions reductions required in the CCC's Balanced Net Zero pathway

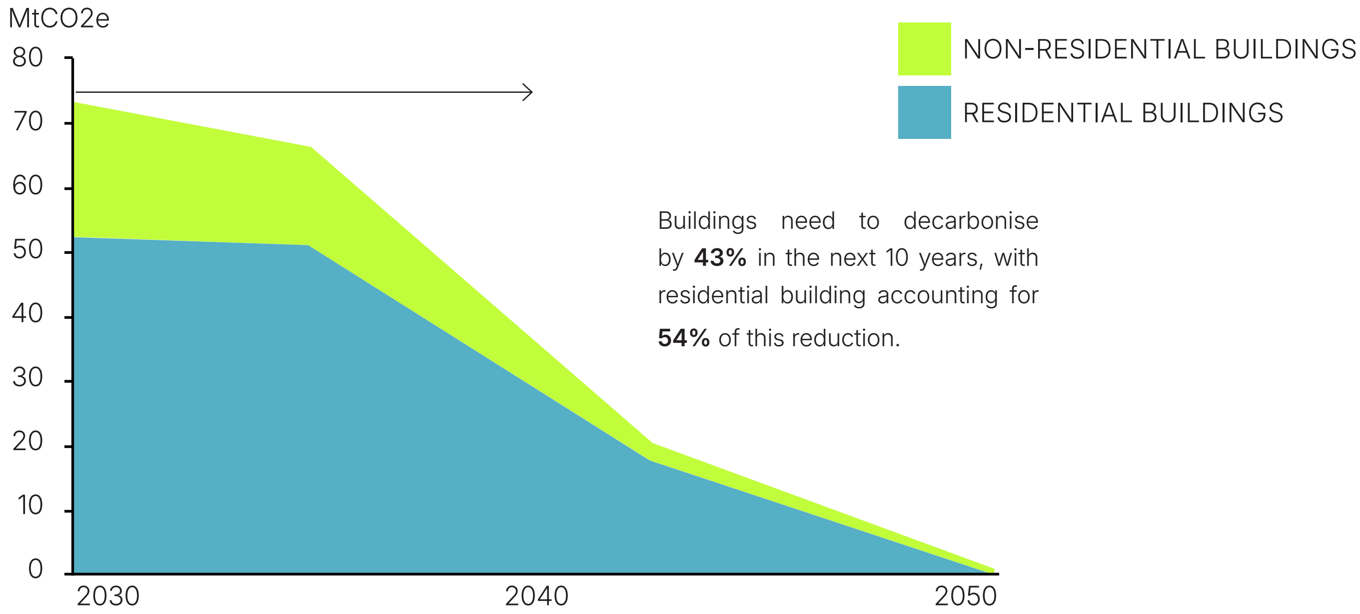


Figure 1: CCC's 7th Carbon Budget Balanced Pathway (Building Emissions Reduction)

1. NAO, Decarbonising Home Heating, 2024
2. DESNZ, DUKES: Natural Gas, 2025
3. DESNZ, Hydrogen Heating Overview, 2024
4. CCC, 7th Carbon Budget, 2025

Consequently, the majority of the 23 million homes connected to the gas grid will be affected by this transition. Unlike the decarbonisation of the power sector, where emissions were reduced without directly affecting consumers, the decarbonisation of heat may require more involved changes to homes. Heat and comfort are fundamental to both physical and emotional wellbeing. Therefore, it is essential to consider how the transition to low-carbon heating will be experienced by consumers, and how this may influence their preferences and decisions.

1.2 Options for Decarbonising Heat

Consumers' ability to choose how they heat their homes is critical, so it is important that policy support maintains optionality throughout the energy transition. Without it, the path to net zero risks becoming restrictive, potentially undermining public engagement and slowing adoption of low-carbon technologies.

There are a range of low-carbon heating solutions available to meet the UK's ambitious targets. However, different heating technologies influence customer experiences in distinct ways, both through the enduring interaction with the technology and the nature of the installation process itself. In addition to consumer preference for specific technologies, considerations such as the thermal properties of different building types and spatial requirements are also important to consider.

This section explores five potential options for decarbonising heat.

HEAT PUMPS

Heat pumps are well established and widely regarded as the cornerstone technology for decarbonising heat in homes and buildings. As a fully net zero compliant heating technology, they have been recognised by governments across Europe as a critical solution to decarbonising heat. They operate by extracting ambient heat from the air, ground, or a water source and compressing it with electricity to deliver usable thermal energy for space heating and hot water. For each unit of electricity consumed, heat pumps have the potential to deliver up to four units of heat, depending on which technology type is used (e.g. air source heat pump).[5]

HYBRID HEATING SYSTEMS

Hybrids combine a boiler with a heat pump in a single integrated system. Such a configuration allows for operation in two distinct modes. In 'switch' mode, the boiler meets all the heat demand in instances where the heat pump cannot operate and in 'parallel' mode, demand is satisfied by the boiler and heat pump in combination.

5. Energy and Utilities Alliance, Engagement, 2025

With advancing technology, HHS have evolved to include covalent systems. Here, the boiler accelerates initial heating before passing to the heat pump to maintain the temperature at the desired level. A central controller manages the operation of a HHS, dynamically adjusting its mode to either minimise running costs or maximise carbon savings by optimising the share of heat provided by the heat pump.

DIRECT BIOMETHANE HEATING

Biomethane is a renewable gas that is chemically identical to natural gas. Thus, biomethane can be injected directly into the existing gas grid and used in existing gas boilers, delivering immediate carbon savings without requiring consumers to modify their appliances. Biomethane is usually produced through the anaerobic digestion of organic waste, a process in which micro-organisms break down material in the absence of oxygen to generate biogas. This biogas is then refined to produce biomethane. Naturally, as more biomethane is injected into the gas grid, gas boilers become a more tangible and long-term heating decarbonisation alternative.

The 2025 Clean Flexibility Roadmap – published by Department of Energy Security and Net Zero (DESNZ), Ofgem, and the National Energy System Operator (NESO) – highlights the potential role for biomethane and its accelerated deployment in supporting the decarbonisation of heat.[6]

The future role and potential of biomethane is also emphasised by the Green Gas Taskforce's recent study estimating a biomethane potential of up to 120 TWh by 2050[7], and NESO's 2050 Future Energy Scenario (FES) forecasting up to 64 TWh of biomethane by 2050 in its 'Holistic transition' pathway.[8]

DIRECT HYDROGEN HEATING

Similar in form and function to typical natural gas boilers, hydrogen boilers are often regarded as a 'drop-in' replacement and eliminate carbon emissions completely. Hydrogen-ready boilers are in development in the UK,

with the Government's Hy4Heat programme concluding that 100% hydrogen can be used for heating in certain buildings, demonstrated and supported by technical, performance, usability, and safety evidence.[9]

Hydrogen-ready boilers can leverage the use of a full spectrum of the so-called 'hydrogen rainbow.' Notably, this includes green hydrogen, produced using renewably sourced electricity, and blue hydrogen, produced by steam reformation with carbon capture technology curtailing emissions.

Although hydrogen boilers offer a fully net-zero compliant solution to heating, there has been some public pushback in the UK to the local use of hydrogen in communities. It is anticipated that DESNZ will define its position on the use of hydrogen for heating in 2026, with the latest Hydrogen Update to Market highlighting ongoing consultations.[10]

DISTRICT HEATING

District heating systems, or heat networks, deliver heat via insulated underground pipework from a centralised energy centre to multiple buildings. These systems, as depicted below, can leverage a wide variety of heat generation sources, including combined heat and power (CHP) plants, waste heat, heat pumps, biomass, and geothermal energy.[11] Although district heating offers flexible and efficient decarbonisation, such heating networks are typically only suitable for dense urban communities.

6. DESNZ, Ofgem, NESO, Clean Flexibility Roadmap, 2025
7. Green Gas Taskforce, Future of Biomethane, 2025
8. NESO, FES, 2025
9. Hy4Heat, Final Report, 2022
10. DESNZ, Hydrogen Update to Market, 2025
11. District Heating Cardenden, Image, 2019

DECARBONISING HEAT

TECHNOLOGY	UPFRONT COST	MAIN PROS AND CONS	MATURITY	KEY POLICY SUPPORT
Heat Pumps	Air source: £7,000 - £13,000 Ground source: £14,000 - £27,000[12]	✓ High energy efficiency ✓ Zero GHG emissions ✓ Extensive UK policy support ✗ High installation costs ✗ Not suitable for all building and income types ✗ May require additional home upgrades and modifications	Moderate – Over 250,000 installed in the UK, with 11,735 government-supported heat pumps installed in Q1 2025[13]	• Boiler Upgrade Scheme provides capital grants of up to £7,500 • Zero VAT rating period of 5 years offers tax relief • Social Housing Decarbonisation Fund supports installation • Heat and Buildings Strategy 2024 positions air source heat pumps as leading technology
Hybrid Heating Systems	£4,000 - £7,000[14] (dependent on need for a new boiler vs. a retrofit)	✓ Less disruption and unfamiliarity for consumers ✓ Flexible for easing grid constraints ✓ Could serve as a transitional technology ✗ Lack of direct support ✗ Lack of consumer awareness of the technology ✗ Require green gas support to present a fully decarbonised solution	Emerging – Low relative installation compared to other technologies in the UK, established in the European Union markets (e.g. The Netherlands)	• Not eligible for support under the Boiler Upgrade Scheme at present • Lacking policy drive and support • Rewarded in the Clean Heat Market Mechanism through credits to suppliers, but not recognised in the Boiler Upgrade Scheme
Direct Biomethane Heating	£0 retrofit costs	✓ No change or modifications required to gas boiler ✓ Drop-in solution that occurs on a network level with no impact or cost to the consumer ✗ Limited feedstock availability for scale-up ✗ Competes for biomethane use with other sectors (e.g. transport, power)	Moderate – Well over 80 biomethane plants connected to the grid, with ~5.5 TWh injected[8]	• Green Gas Support Scheme offers tariff support to producers injecting into the grid • NESO's FES 2025 pathways all require scale-up of biomethane to meet UK targets • Central to a flexible and secure future energy system in the Clean Flexibility Roadmap 2025
Direct Hydrogen Heating	~£3,000 (assuming cost comparable to gas boilers)	✓ Less disruption and unfamiliarity for consumers ✓ Zero GHG emissions ✗ Low energy efficiency ✗ Hydrogen safety concerns ✗ Large uncertainty around future of hydrogen	Nascent – Established working technology but rollout paused as policy pivots away	• CCC highlighted a very limited role for hydrogen in residential heating • DESNZ will consult by the end of 2025 on the role of hydrogen in heating
District Heating	£4,600 - £11,000[15]	✓ Leverages waste heat and large-scale low carbon ✓ Effective in urban areas, with no boilers needed ✗ Long lead time for projects ✗ Major disruption to consumers and communities ✗ Only suitable in select locations	Moderate – ~3% of UK buildings connected with new schemes emerging[16]	• Heat Network Zoning identifies areas where district heating offers the most cost efficiencies • Heat Networks Investment Project provided £320m of capital funding

12. DELTA, Cost of Installing Heating Measures
13. DESNZ, Heat Pump Deployment Statistics 2025
14. Heat Pump Installers, Engagement, 2025
15. Burohappold Technical Report
16. Heat Trust, Heat Networks About

02. The Case for Hybrid Heating Systems

HHS are increasingly recognised as a potentially strategic solution in the UK's heat decarbonisation challenge, particularly in properties that face difficulties with full electrification.

The design of HHS enables their automatic and intelligent operation across electricity and gas, optimising its efficiency based on factors like weather conditions and energy prices. For both households and policymakers, hybrids present a viable, cost-effective, and adaptable solution to drive decarbonisation.

This section describes HHS technology, explores their key benefits and challenges, and reviews relevant consumer trials conducted in the UK.

2.1 The Fundamentals of Hybrids

All HHS are heating systems which combine different heating technologies to provide reliable heating throughout the year, most typically a heat pump and a gas boiler. HHS are managed by a central controller that can switch between two modes to either minimise running costs or maximise carbon savings, depending on consumer preferences. The heat pump component often meets most of the heating demand, usually supplying upwards of 70% of heat needs, while the boiler provides additional support during peak, cold winter periods.[4]

HHS can be offered to consumers through a variety of set-ups depending on both the property and homeowner preferences. The three primary typologies are outlined below.

1. REGULAR HHS

A regular HHS, depicted in *Figure 2*, combines a regular heat pump system, most often an air-source heat pump, with a traditional gas boiler. The heat pump can either be retrofitted to an existing natural gas boiler or be installed with a new natural gas boiler. These HHS require installation of a hot water cylinder for storage. There is a single control unit that manages fuel source selection, operating temperatures, and prioritisation of heating demand between heat emitters and the hot water store.

Regular HHS:

- Are commonly retrofitted into homes with existing system boilers and radiators.
- Often deliver superior and future-proofed performance relative to other typologies.
- Require increased space and time for installation.

It is important to note that figures 2-4 are not accurately scaled, with the indoor heat pump unit often much smaller than the boiler.

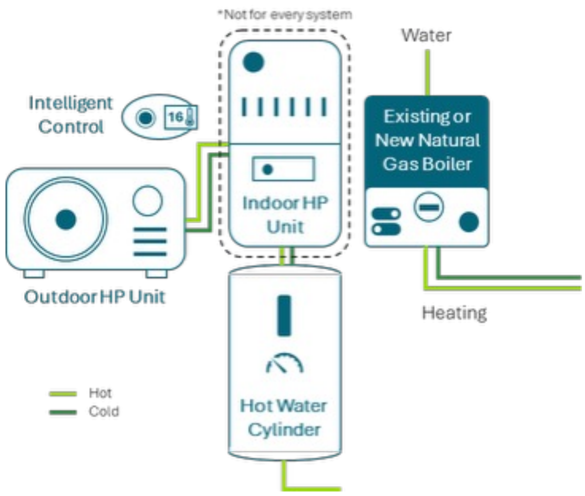


Figure 2: Regular HHS Set-Up (Not to Scale)

2. COMBINATION HHS

Combination HHS, depicted in *Figure 3*, integrate heat pump functionality into gas combi boiler systems. Here, the hot water demand is met by heating the water directly from the mains when the hot water tap is turned on. This means the heat pump is only used to optimise space heating with the control unit, with the boiler providing instantaneous hot water on demand. Thus, the expenses and space needed to install a hot water cylinder are eliminated.

Combination HHS:

- Simplify installation and increase comfort and familiarity for consumers.
- Are favourable for homes with space limitations inside the building.
- May trade-off some carbon savings for cost and disruption savings owing to increased reliance on gas.

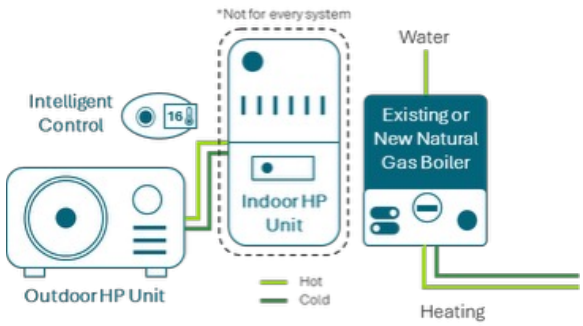


Figure 3: Combination HHS Set-Up (Not to Scale)

3. COMPACT HHS

Compact, or integrated, HHS comprise of a singular unit that houses a condensing boiler and all, or part of, the heat pump, as depicted in *Figure 4*. The existing heat generator is replaced by one compact unit. They often include unified interfaces, smart controllers and single-brand warranties. Given the level of compactness, such HHS are well suited for smaller households with significant spatial constraints. As HHS are often installed as an additional retrofit alongside an existing gas boiler, homes typically have a non-integrated HHS.

Compact HHS:

- May also be leveraged to supply stored hot water with the use of a cylinder.
- Offer the most favourable option for homes with spatial limitations.
- Present a cost-competitive option.
- Typically have a smaller electricity supply amperage relative to other HHS typologies.

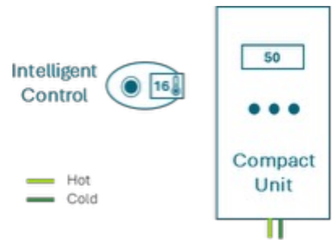


Figure 4: Compact HHS Set-Up (Not to Scale)

2.2 Hybrid Heating System Configuration and Controls

To drive optimal performance, HHS must be properly designed and installed with the correct output and control configuration. The proper configuration enables the system to deliver the efficiency and optimisation benefits of a hybrid.

There are two main system types:

01.

Parallel systems, where both the heat pump and boiler work together to meet demand. These must be carefully designed to keep flow and return temperatures within the heat pump's operating limits.

02.

Switch systems, where the controller selects the most suitable heat source at any given time. These can operate with different flow and return temperatures depending on the active source.

Consumers may choose to install HHS with either a bivalent or a tariff-controlled set-up.

01.

Bivalent HHS manually switch between the heat pump and the boiler based on a pre-defined external temperature.

02.

Tariff-controlled HHS automatically switch between the heat pump and the boiler to select the most cost-effective heating source – gas or electricity – whilst meeting the needs of the home.

The success of a HHS depends heavily on the control strategy utilised, both for facilitating consumer comfort and optimising energy use.

HHS can operate either continuously or on a timed schedule. The control selects the most appropriate mode and fuel source based on comfort (e.g., temperature set points) and a decision between cost savings versus carbon reduction.

To achieve optimal performance, the control system uses a range of parameters to determine switching points, including:

- Fuel tariffs
- Outdoor temperature
- Carbon intensity of fuels at a given point in time
- Calculated efficiency of each heat source

This intelligent fuel-switching capability makes HHS highly efficient. When external temperatures exceed approximately 5°C, the heat pump typically meets most demand, with the boiler only supporting during the coldest periods.

Such smart controls are important to help realise optimal performance and associated benefits of HHS, and their mandating in a potential Hybrid-Ready Boiler Scheme are discussed in the Heating Acceleration Roadmap in Section 5.

2.3 Innovations in the Market

In recent years, the HHS market has seen significant developments across control systems, HHS system design, consumer interaction, and solutions enabling participation in flexibility markets.

Notable innovations coming to market and shaping the HHS future are highlighted below.

DIGITALISATION AND FLEXIBILITY

Digitalisation, AI, and machine learning can be leveraged to enhance HHS control systems. 'Smart control systems' enable real-time optimisation of heat source selection based on carbon intensity, weather forecasts, tariffs, and household-specific patterns. This maximises the use of low carbon electricity, reduces running costs, and supports consumer ease and comfort with their HHS.

Conveniently, smart systems often connect to a user-friendly mobile phone application. This provides real-time updates, information about the consumer's HHS, carbon and cost savings, and remote control functionality.

Digitalisation and smart controls enable hybrids to participate in Demand Side Response (DSR). To help balance the GB electricity system, DSR involves consumers shifting their electricity usage in response to a signal. Many HHS and heat pump apps include financial incentives for consumers who are active in domestic DSR.

Passiv's Smart Thermostat, connected to the PassivApp, builds a thermal model of each home and leverages local weather forecasts and temperature data to maximise heat pump efficiency and lower overall energy bills.[17] This automatically switches between the heat pump and the boiler to select the most cost-effective heating mode 24/7. The PassivApp includes the first automated DSR incentive service, Greener Grid Payments, for heat pump and HHS owners in the UK. Its 2024 trial saw an average household demand reduction of 0.75kW, 90% higher than achieved with manual intervention.[18]

SMART HYBRID INTERFACE KITS

Manufacturers are developing specifically designed kits to connect heat pumps with existing boiler ranges, simplifying installation and enabling efficient switching between heat sources.

This year, **Alpha Innovation** launched a new customisable HHS, combining a range of heat pump outputs with both combi and system boilers and managed by a built-in smart control.[19] The kit has been designed to fit quickly beneath a range of boilers, making installation easier and more accessible to a range of consumers.

COMBI COMPACT HYBRID UNITS

To expand HHS' suitability further and reach spatially constrained building stock, developers are bringing fully integrated combi compact units for hybrid operation to market.

BDR Thermea, Intergas and **many manufacturers** across both Europe and the UK have or are developing compact combi systems to reduce spatial requirements even further.

ZONED AND MODULAR THERMAL STORAGE

HHS can be integrated with thermal storage such as small-format or modular buffer tanks to increase the efficiency of heating and reduce the proportion of natural gas used within the HHS.

Vital Energi partnered with SGN to conduct a Strategic Innovation Fund (SIF) Discovery project exploring coupling HHS with thermal stores through an innovative heat exchanger design, phase change material thermal store, and smart control system.[20] However, although this provided substantial benefits to the networks, the investment return for consumers was deemed 'unattractive'.

HYDROGEN-READY HYBRIDS

In line with the UK Government's plans to establish a hydrogen economy, as reiterated in the July 2025 Hydrogen Update to Market, developers are focusing on boilers certified for future hydrogen blends or conversion. With National Gas Transmission's plan to rollout a ~2000km UK hydrogen backbone, hydrogen-ready boilers futureproof heating technologies and also facilitate a net zero hybrid solution.[21]

In support of the energy transition, **Rinnai** have developed hydrogen-compatible HHS that can be easily retrofitted to existing gaseous fuel-based systems to create a renewable energy baseload in the future.[22] Last year, the Netherlands conducted three small-scale domestic hydrogen for heating trials, two of which explored hydrogen HHS.[23]

17. Passiv, Smart Thermostat, 2025
18. Passiv, Greener Grid Payments Trial, 2024
19. Alpha Innovation, Custom Hybrid Solution, 2025
20. ENA, Calfacto Latent Energy, 2023
21. NGT, Project Union, 2025
22. Rinnai, Hybrid Solutions, 2025

Nine key benefits of HHS

01
REDUCE GREENHOUSE GAS EMISSIONS
Real-world trials show HHS can reduce carbon emissions by up to 75% through reduced consumption of natural gas by relying on the heat pump to meet heat demand most of the year.

02
REDUCE ENERGY BILLS
National and international trials have consistently proven HHS reduce consumers' energy bills, delivering savings of 16% compared to traditional gas boilers and 20% compared to electric heat pumps.

03
REDUCE DISRUPTION FOR CONSUMERS
HHS minimise home disruption and enhance comfort relative to other low-carbon options. In a survey of over 1,000 UK homes, eight in ten indicated the low disruption of HHS was appealing.

04
A SOLUTION FOR 'DIFFICULT TO ELECTRIFY' HOMES
With up to 11 million UK homes considered difficult to electrify, HHS offer a solution suitable to households where full electrification is not feasible.

05
OPTIMISE ENERGY INFRASTRUCTURE
HHS help ease pressure on the electricity grid by intelligently shifting peak demand to the gas network, optimising existing electricity and gas network infrastructure and supporting energy security.

06
A FAMILIAR HEATING TECHNOLOGY
With 23 million homes using gas boilers and with boiler sales still a high proportion of home heating system sales, HHS offer a familiar alternative that delivers strong consumer satisfaction, with HHS users reporting "little difference" to gas heating.

07
ENABLE GREEN GAS DEPLOYMENT
HHS reduce gas demand substantially to a level where biomethane, or other emerging green gases, can fully scale and meet future heat demand.

08
PROVIDE A TRANSITIONAL AND FULLY NET ZERO SOLUTION
HHS deliver both immediate and long-term carbon savings by enabling easy and familiar adoption today and offering a future fully decarbonised technology with the use of green gases and renewable electricity.

09
ACCELERATE HEAT PUMP DEPLOYMENT
HHS installations are likely to represent additional uptake, complementing rather than replacing electric heat pumps, helping to bridge the gap in the decarbonisation of heating in the UK.

2.4 The Qualitative Benefits of Hybrid Adoption

This section presents a qualitative analysis of HHS, exploring nine drivers and benefits supporting the consideration of HHS as a heating decarbonisation technology.

1. REDUCED EMISSIONS AND FOSSIL FUEL CONSUMPTION

In a HHS setup, the heat pump typically meets the majority of the annual energy demand, while the boiler is used during peak demand periods and colder weather when the heat pump may not provide sufficient thermal comfort.

HHS customer trials in the UK and internationally have demonstrated that the use of HHS can reduce gas consumption and carbon emissions by 75%, enabled by the operation of heat pumps to meet baseline heat demand up to 85% of the time.[23] This reduced fossil fuel usage through decreased consumption of natural gas subsequently also results in significant reduction in carbon emissions.

2. COST SAVINGS TO CONSUMERS

Analysis commissioned by DESNZ concluded that HHS installations can result in cost savings of over 30% compared to electric air source heat pumps.[24] Not only have HHS been found to offer cost savings in comparison to electric heat pumps, but they can also reduce costs in the long-term for consumers compared to their existing gas boilers. This also includes those of more vulnerable customers, to overcome these challenges while delivering immediate carbon savings.

With an estimated six million UK households having been unable to keep warm last winter, HHS offer an affordable heating technology that can support decarbonisation while simultaneously providing incremental building efficiency upgrades.[25] Upgrading properties with HHS will enable more energy-efficient homes with lower bills and reduced emissions.

In the Netherlands, where the housing stock is comparable to that of the UK, a recent study conducted by the Association for Sustainable Heat explored the impact of HHS on 200 homes. The study found that, on average, the energy cost to households decreased by the equivalent of £653 annually, indicating that HHS adoption may be the most financially viable heating option in the long term.[26]

These results were recently reiterated in Northern Ireland's 2024 hybrid heating trial, albeit at a smaller scale, where heating costs for a trial participant were found to be 16% cheaper than using a traditional gas boiler and 20% cheaper than with a electric heat pump.[27]

"In the Netherlands we have learned the hard way that a tunnel-visioned all-electric approach will cause severe problems with the electricity grids. If it's not to hit the UK climate goals or to prevent grid congestion on the low voltage electricity grids, then the UK Government should at least embrace hybrid heat pumps to help people save money. In the Netherlands, over 200,000 households have already cut their energy bills significantly thanks to hybrid systems"

Josja Roest
Executive Board Member, Dutch Association of Sustainable Heating

23. Vereniging Duurzame Warmte, 2025
24. Eunomia, Cost of Heating Appliances, 2024
25. Propertymark, Fuel Poor Study Findings, 2024
26. Intergas, Hybrid Heat Pumps: A Practical Solution for Lower Energy Bills, 2025
27. Phoenix Energy, Hybrid heating trial, 2024

Additionally, HHS offer significant cost savings for vulnerable households by enabling efficient heat pump operation without the need for expensive retrofitting. By combining technologies such as boilers and heat pumps, HHS can deliver efficient heating even in poorly insulated homes, eliminating the upfront investment typically required to upgrade building fabric for electric heat pump systems. This makes low-carbon heating more accessible and financially viable for a broader range of consumers, facilitating a just energy transition.

3. REDUCED HOME DISRUPTION AND INCREASED CONSUMER COMFORT

According to the Heating and Hotwater Industry Council (HHIC), easier retrofit installation and minimal disruption are the main reason HHS have experienced considerable growth in recent years.[28] Unlike heat pumps, HHS avoid the need for thermal insulation retrofit, meaning they can be fitted in a single day. Furthermore, HHS also avoid the need for replacements of pipes, radiators, and existing boilers so installation is more akin to a familiar gas boiler. In a high percentage of situations in the Autumn and Winter months, a boiler replacement is a distress purchase, and the customer wants heat and water restored instantly. This is not possible with a heat pump, but possible with an HHS. The boiler could be installed within hours, and the heat pump added over the following days. The following results in a reduced disruption of day-to-day activities for consumers.

Replacing a gas boiler with a fully electric heating solution necessitates the installation of a new heating system. It also requires upgrades to the local electricity distribution network and the development of secure, resilient electricity generation capacity. These enhancements must be supported by grid infrastructure improvements from the point of generation through to end-user demand. Ideally, all these components should be in place before the new electric heating system is activated. In contrast, HHS can be deployed much more quickly and efficiently, making them a more timely solution for decarbonising home heating.

"By pairing air source heat pumps with tried-and-tested heating methods, hybrid systems deliver immediate carbon and energy savings while providing households with a practical and affordable transition towards fully renewable solutions."

Alpha
HEATING INNOVATION

Alpha Innovation UK

Boiler, Heat Pump, and Hybrid Solutions

In the 2022 HyCompact study, which surveyed over 1,000 British homes, eight out of ten households indicated the low disruption of HHS was appealing.[29] The analysis also found that the main reasons consumers would opt for a low carbon heating system in their homes are comfort, ease, reliability, and low cost.

As detailed in Section 2.1, HHS can be retrofitted to existing gas boilers or installed as integrated packages, thus making them adaptable to a wide range of property types. As such, HHS represent a pragmatic and inclusive solution, empowering consumers to decarbonise at their own pace without facing high costs and complex home renovations.

4. PRACTICAL SOLUTION FOR 'DIFFICULT TO ELECTRIFY' HOMES

Several recent studies have sought to estimate the number of UK properties where heat pumps may not be a suitable heating solution. These studies estimate that up to 11 million UK homes may be 'difficult to electrify' and are unable to accommodate heat pumps due to space constraints, impractical fabric refurbishment, or affordability challenges.[30] For such homes, HHS offer a practical alternative that supports a cost-effective transition by helping all households.

28. HHIC, Hybrid Heat Pumps, 2022
29. UKPN and WWU, HyCompact Study Findings, 2021
30. CCC, 6th Climate Budget, 2020

"Hybrid heating systems can deliver significant flexibility benefits to electricity networks and its customers, and can accelerate adoption of heat pumps across GB. Decarbonising heating requires taking an 'all-of-the-above' approach, and hybrids are another tool in the toolkit. They provide a good stepping stone, especially in properties where the deep retrofit of insultation and the heat pump equipment will be significantly disruptive and costly to the customer."

SP Electricity North West

Electricity Distribution Network Operator

5. OPTIMISING EXISTING ENERGY INFRASTRUCTURE

The UK's electricity and gas networks are key national assets, playing a critical role enabling the continued economic growth across the country. The push for a decarbonised economy across heat, transport and industry has led to significant recent pressure, particularly on electricity networks, which are facing 'alarming' capacity constraints, with grid connection dates being offered as far away as 2037.[31]

HHS offer an opportunity to optimise existing electricity infrastructure by reducing peak pressure on electricity networks. HHS can intelligently shift peak demand to the gas system, offering much-needed additional time for continued reinforcement of electricity, or potentially avoiding the need for costly grid reinforcements. This flexibility is especially important during winter months when heating demand can surge rapidly and renewable generation may be limited.

In addition, HHS support continued use of legacy gas infrastructure, optimising decades of network investment and ensuring peak heating needs leverage the resiliency of the gas system.[32] In a future without the need for the gas infrastructure that is often regarded as a national asset, large volumes of pipeline decommissioning will be required and will need to be paid for through consumer energy bills.

6. FAMILIARISE CONSUMERS WITH LOW-CARBON HEATING AND HEAT PUMP TECHNOLOGIES

Natural gas boilers remain the most familiar and widely used heating system in the UK, serving approximately 23 million households. Engagement with installers of boilers, heat pumps, and HHS highlighted that despite government support for heat pump uptake, sales of traditional gas boilers remain high, with almost 2 million boilers installed in the UK over the last year.[33]

HHS enable customers to continue relying on their trusted gas boiler and not sacrifice comfort. This dual approach not only reduces emissions but also plays a vital role in consumer acceptance and adoption. Installers reported very positive feedback from HHS users, who noticed little difference in heating or hot water delivery compared to traditional fossil systems.

"What we need, as an industry, is for some form of incentive for the homeowner on hybrids to kick start this market. We should be installing a lot more heat pumps but the installers are wary of them and homeowners are kicking back against the cost of the upgrade, we can at least have a large percentage of the domestic heating load taken up by a heat pump, rather than the homeowner just going with a stand-alone gas boiler. This has to be the way forward for our industry!"

Sime

Boiler, Heat Pump, and Hybrid Solutions

31. Latitude Media, Grid Capacity Constraints, 2024
32. Cadent, Scope for HHS in Home Heating, 2025
33. Ofgem, Boiler Upgrade Scheme (BUS), Annual report, 2025

7. FACILITATES ACCELERATION OF BIOMETHANE

Biomethane supply is projected to scale up rapidly to support the UK's decarbonisation targets. However, one of the major challenges facing the long-term scalability of biomethane in the UK is feedstock availability. The majority of biomethane produced in the UK is sourced from agricultural residues and energy crops, which are inherently finite.[34] Furthermore, biomethane producers face cost challenges, grid capacity constraints, and are subject to involved processes to connect to the gas grid.

HHS offer a tangible pathway to fully decarbonising heating through the use of biomethane. With HHS primarily relying on electricity to meet heating needs, the gas heating demand significantly reduces. This makes it feasible for biomethane to partiallly, or fully, meet future heat gas demand.

Whilst biomethane has already seen successful UK deployment, with approximately 10 TWh injected into the gas grid every year, other green gases may also be leveraged by HHS to create a fully net zero compliant technology.[35] DESNZ is currently consulting on hydrogen blending into the existing gas transmission network, and novel green gases such as synthetic natural gas and chemical e-methane are in early stages of exploration.[36] Like with biomethane, these alternative green gases also offer a pathways for the gas component of HHS to evolve into a clean and sustainable vector.

8. SERVE AS BOTH A TRANSITIONAL AND A FULLY NET ZERO FUTURE HEATING TECHNOLOGY

HHS offer a practical decarbonisation pathway for homes, enabling rapid emissions reductions by using electricity for the majority of heating while retaining a gas boiler for backup. Over time, as the gas grid decarbonises, HHS will become increasingly low carbon. Once green gases such as biomethane and hydrogen dominate the gas supply, HHS can operate as a fully net zero solution. This allows HHS to not only serve as a stepping stone to enable decreased natural gas consumption in homes, but also as a long-term solution for decarbonised, flexible home heating.

With gas boilers typically lasting 15 years and the fear that continued boiler sales will delay decarbonisation efforts, HHS offer consumers full optionality of future decarbonisation pathways. HHS offer both a transitional decarbonisation pathway – through the immediate or near-term upgrade from a gas boiler to a HHS – and a full decarbonisation pathway – with the use of biomethane, or as a stepping stone towards a future adoption of a heat pump.

34. SIA Partners, Biomethane Benchmark, 2022
35. Energy UK, The Role of Gas in Heating Homes, 2025
36. DESNZ, Hydrogen Blending Consultation, 2025

9. ACCELERATES DEPLOYMENT OF ELECTRIC HEAT PUMPS

DESNZ currently promotes electric heat pumps as the primary solution for heat decarbonisation, with a target of 600,000 annual installations by 2028, increasing to over 1 million annually from 2030.[37] However, with approximately 62,900 installations completed in 2023 and 98,500 in 2024, the 2028 target appears increasingly unlikely to be achieved, as illustrated in *Figure 5*.[38] Further, based on installation statistics reported by the Boiler Upgrade Scheme (BUS), only 55% of BUS-supported heat pump installations displaced natural gas, while the other 45% displaced oil, electric heating, LPG, coal, or were new installations.[39]

Crucially, the counterfactual scenario to a hybrid installation is not a heat pump installation, but rather a new natural gas boiler. Each year, around 1.7 million new natural gas boilers continue to be installed nationally, locking in carbon-intensive heating for decades to come.[40] This slow rollout of heat pumps can be mitigated by including HHS in national targets, supporting decarbonisation now and providing more consumer choice in the future of domestic heating.

HHS offer a practical way to bridge the gap in decarbonisation progress by accelerating the adoption of heat pumps. It is likely that HHS installations would represent additional uptake, complementing rather than replacing primary heat pump systems. As such, HHS create a symbiotic relationship with heat pumps, working together rather than competing to support a more holistic and scalable energy transition.

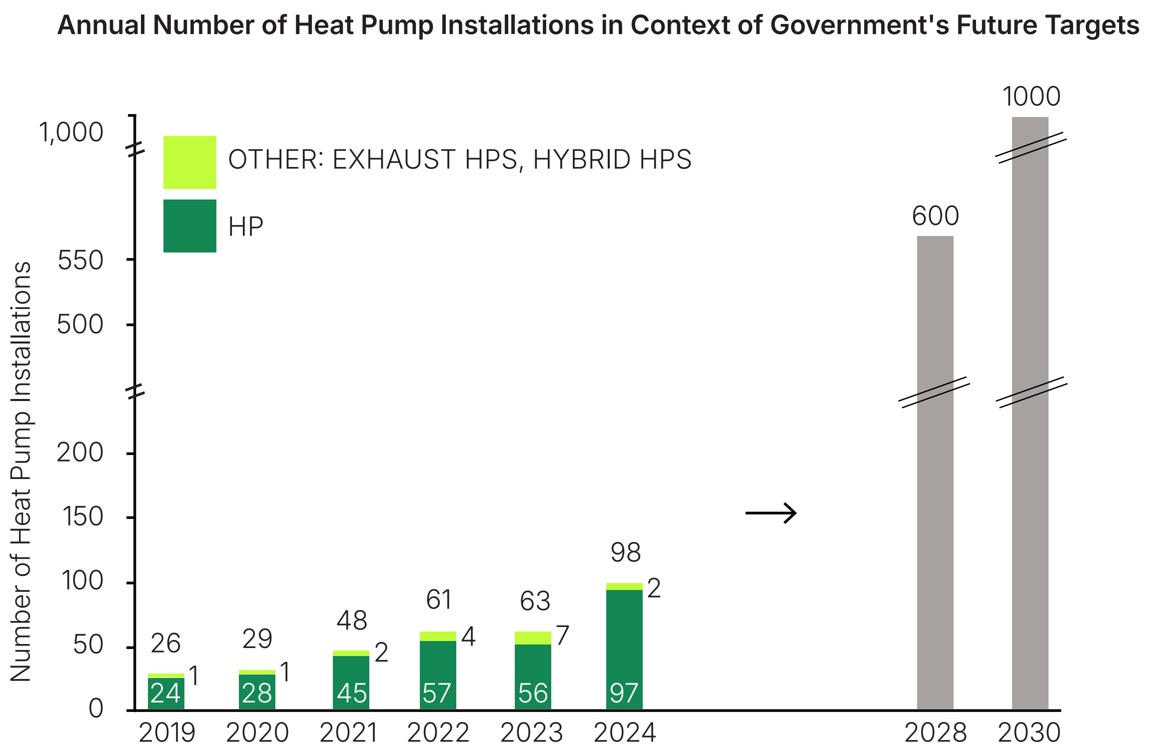


Figure 5: Annual Number of UK Heat Pump Sales

37. DESNZ, Energy Security Bill, 2023
38. Heat Pump Association, 2025
39. DESNZ, Boiler Upgrade Scheme Statistics, 2025
40. DESNZ, Boiler Standards Consultation, 2023

2.5 Trials are Providing the Evidence Base in the UK

To transition from innovation to implementation and bring a new technology to market, real-world trials and controlled pilots are crucial in providing the evidence base and consumer feedback. Over the last decade, several UK initiatives have piloted HHS in various configurations and locations. These projects are paving the way for wider HHS deployment by informing policy development, supporting innovation and design improvement, and increasing confidence among all key stakeholders

"Hybrid heating systems have the ability to lower bills for consumers, even those on gas, while reducing the disruption and behavioural changes associated with heat pump only solutions. As such, they cannot be ignored and should be part of our armoury in the fight against climate change."

Mike Foster

CEO, Energy & Utilities Alliance and the Heating and Hotwater Industry Council

In 2016, National Grid, alongside project partners Wales & West Utilities (WWU), Passiv, Delta-EE, Imperial College London, and City University commenced a three-year, large-scale HHS trial. The trial was named Flexible Residential Energy Efficiency Demand Optimisation and Management, or FREEDOM, and took place in the Bridgend region of South Wales.[41] Awarded £5.2m in innovation funding via Ofgem's Network Innovation Allowance (NIA), FREEDOM demonstrated the benefits of HHS through trialling the low-carbon technology across 75 domestic homes.

FREEDOM

KEY LEARNINGS FROM FREEDOM INCLUDED:

- HHS can deliver a no-regrets transition to low-carbon heat **at a lower cost than the equivalent full electrification scenario**
- HHS are viable across **all homes on and off the gas grid**
- **Consumer comfort can be maintained** with HHS without making extant heating or insulation changes
- HHS can provide fully flexible demand that is able to respond dynamically

41. National Grid, FREEDOM HHS Trial, 2019

Between 2020 and 2022, WWU and UK Power Networks collaborated with Passiv, Delta-EE, and Imperial College London to conduct a compact HHS trial across seven domestic homes. The geographical footprint of the trial covered homes in Wales, London, and South-West England. With £460k in funding via the NIA mechanism, the trial explored the cost and carbon savings associated with HHS.

HyCompact

KEY LEARNINGS FROM HYCOMPACT INCLUDED:

- HHS provided an annual reduction of over **1 tCO_2 per home.**
- Compact HHS could deliver **£100 in annual energy system cost savings per installation.**
- Up to **14 million homes** could be suitable for compact HHS.
- Smart-controlled HHS can flexibly switch between fuel sources in response to external signals (e.g., grid stress or future hydrogen availability).
- **79% of participants were attracted to the HHS design** yet only 16% were initially aware of heating technologies beyond gas boilers.

In 2024, Phoenix Energy funded a small-scale HHS trial in South Belfast with Refresh Northern Ireland and Alpha Innovation. The trial marked an initial exploration of the potential of HHS in Northern Ireland, with larger trials likely to follow.

Phoenix Energy

KEY LEARNINGS FROM HYBRID TRIAL INCLUDED:

- The heating cost for the consumer was **16% cheaper than a traditional gas boiler and 20% cheaper than a electric heat pump.**
- **Carbon emissions were reduced by 51%** compared to the previous gas boiler.
- **84% of the heating load was provided by the heat pump,** with the gas boiler covering the remaining 16%.
- Due to the gas boiler managing peak demand, the **heat pump operated at an average efficiency of 354%.**
- Consumers reported feeling warm and comfortable across the year.

2.6 The Challenges to Adoption

The qualitative analysis in the previous section shows significant benefits associated with HHS adoption. However, as with all innovative technologies, HHS also present a series of potential challenges to widespread adoption in the UK.

This section highlights the five significant barriers to unlocking the benefits of HHS.

01.

POLICY UNCERTAINTY

HHS face significant policy uncertainty. Despite being recognised and rewarded through supplier credits under the Clean Heat Market Mechanism, they are currently excluded from the Boiler Upgrade Scheme, which offers grants for electric heat pump installations. The exclusion of HHS reflects a policy preference for full electrification, despite mounting evidence that HHS offer a pragmatic interim solution, especially for complex, smaller, and fuel poor housing stock.

While the Government acknowledges the role HHS could play in decarbonisation, retrofit support remains limited and fragmented. Consultations have explored minimum efficiency standards and hydrogen-readiness for boilers, yet no clear roadmap has been established for HHS.[42] This lack of clarity creates confusion among manufacturers, installers, and consumers, stalling investment and deployment, resulting in a potential risk for the UK to miss out on near-term and cumulative carbon savings.

In contrast, countries like the Netherlands and Italy have embraced HHS, with HHS accounting for ~50% of total heat pump sales. The UK risks missing out on near-term carbon savings by delaying decisive support for HHS.

02.

OPERATIONAL COMPLEXITIES

HHS can potentially introduce operational complexity for installers and consumers. Unlike electric heat pumps, HHS require intelligent coordination between the heat pump and boiler components, demanding advanced control strategies to optimise performance. In the 2017 HHS Report, DESNZ highlighted that factors such as heat pump sizing, emitter type, heating schedules, and control algorithms can significantly influence efficiency and cost.[43]

Operational complexity also extends to installation and maintenance. Retrofitting a heat pump with an existing natural gas boiler requires careful configuration, especially in older homes with varied insulation and radiator types.

Moreover, customer engagement is critical, as homeowners must understand and trust the system's automated decisions. The FREEDOM HHS trial led by National Grid found that while consumers appreciated the comfort and cost benefits, initial unfamiliarity with smart controls posed a barrier. Installers of HHS highlighted a similar finding, noting that the main recurring question and challenge from consumers was a lack of understanding of the smart controls, its operation and its implications on the operation of the boiler and the heat pump.

42. DESNZ, Improving Boiler Standards and Efficiency, 2022
43. DESNZ, Hybrid Heat Pumps Final Report, 2017

03.

HOUSING SPATIAL CONSTRAINTS

Spatial constraints are a key consideration in the deployment of HHS. While HHS offer a less disruptive alternative to low-carbon heating technologies, they still require space for both an external heat pump unit and an internal boiler, along with associated pipework, controls, and potentially a hot water cylinder. This can be particularly challenging in older or compact homes, like flats, where space is limited and retrofitting options are constrained.[44]

Many UK homes, especially those with combi boilers, have repurposed airing cupboards or loft spaces, leaving little room for additional heating infrastructure. In dense urban areas and terraced housing, external space may be restricted, with limited access to gardens or suitable wall-mounting surfaces.

However, recent innovations, such as the compact HHS outlined in Section 2.1, have demonstrated that these typologies can be viable in up to 14 million UK homes.[45] These systems integrate components efficiently and are designed to fit within existing boiler footprints, reducing the need for structural changes. The Electrification of Heat Demonstration Project found that, with careful planning, HHS can be installed in a wide range of property types, including flats and small terraced houses.[46]

04.

LACK OF CONSUMER WILLINGNESS TO CHANGE TECHNOLOGY

A common challenge for emerging technologies that require consumer involvement is the willingness to embrace change. Installers have observed, through conversations during the installation of both traditional gas boilers and HHS, that many consumers fear change and lack awareness of low-carbon heating technologies.

To overcome this, clear justification and support must be provided to help consumers understand the value of transitioning. While HHS installations are less disruptive, resembling traditional boiler setups more closely than electric heat pumps, there remains a significant knowledge gap around how the technology works and its benefits.

05.

SUPPLY CHAIN LIMITATIONS

The rollout of HHS may face similar supply chain challenges that affect the current heat pump market across GB. Notably, around two-thirds of all heat pumps installed at present are manufactured in other countries, resulting in deployment delays and bottlenecks and a missed opportunity for British jobs and businesses.[47] Installers have reiterated this challenge, highlighting a strong need for increased training and upskilling across the supply chain for both HHS and electric heat pumps.

However, for the supply chain to have the confidence to invest in overcoming these limitations, industry players have emphasised a need for more consumer uptake and greater clarity from policy regarding the future of HHS.

44. University College Dublin, Residential HHS Technologies Assessment, 2016
45. BRE, Decarbonising Heat in Britain's Buildings, 2022
46. Energy Systems Catapult, Electrification of Hea Demonstration Project, 2025
47. Watt-Logic, The Need for HHS, 2024

03. The Policy Landscape

Exploration of the challenges associated with HHS adoption highlighted a lack of concrete policy support as the most significant barrier to unlocking the benefits of HHS.

This section provides a synthesis of the policy and regulatory landscape in GB, alongside an overview of best practices from international jurisdictions.

3.1 The UK's Heating Policy Landscape

The UK's heat decarbonising landscape has evolved significantly in recent years, with a growing mix of subsidies, regulations, and targets aimed at scaling low-carbon heating technologies. However, to-date, UK heating policy has focused largely on fully electrified solutions like electric heat pumps landscape and lacks support for adoption of HHS.

To understand the broader policy landscape in which HHS must operate, the following synthesis maps out the current state of heating-related subsidies, obligations, grants, tax reliefs, strategies and targets, and the degree of support of each of these for HHS. The policy landscape has been fractioned into three distinct mechanism types, with a brief synopsis of each provided below.

01.

POLICY TARGETS, COMMITMENTS AND STRATEGIES

No current policy target, government commitment or strategy in the UK provides an enabling environment for HHS. The policy landscape is heavily focused on accelerating the uptake of electric heat pumps, with the Heat and Buildings Strategy setting installation targets exclusively for air and ground source heat pumps. Whilst strategies include a role for green gases such as hydrogen and biomethane, this recognition has yet to translate into meaningful support or integration for HHS within the broader decarbonisation agenda.

02.

SUBSIDIES AND GRANTS

Subsidy support, capital grants, and tax relief schemes across the UK are slightly more supportive of HHS than policies, with many of these mechanisms including HHS as eligible technologies, alongside electric heat pumps. However, this is often caveated by strict requirements for HHS. For example, the Warm Homes Local Grant requires (1) that the heat pump component supply at least 55% of the home's heating, (2) requires the gas boiler to meet a minimum A rating, and (3) excludes integrated or packaged hybrid systems from eligibility.

03.

SUPPLIER OBLIGATIONS

Three out of the four supplier obligations reviewed do include HHS, although in some cases only partial credit is awarded compared to electric heat pumps.

For example, under the Clean Heat Market Mechanism, HHS installations receive half credits, whereas the Future Homes Standard – to be published later this year – has already explicitly stated that "fossil fuel heating, such as gas, hybrid heat pumps and hydrogen-ready boilers, will not meet these standards".

KEY TAKEAWAYS:

- **UK heating policy is heavily focused on driving electrification through electric heat pumps.** The policy landscape favours electric heat pumps across the UK as the primary route to address the heating decarbonisation challenge. The Government are actively promoting their rapid uptake through several incentive schemes and obligations. Leveraging learnings from the European markets revealed that whilst HHS offer a compelling solution, their real-world deployment depends heavily on the enabling policy and regulatory environment.
- **Only 2 out of the 21 key UK heating mechanisms actively create an enabling environment for HHS.** Despite the many benefits of HHS and the lack of suitability and preference for electric heat pumps by some consumers, only 9% of the mechanisms analysed provide meaningful support for their deployment. The absence of targeted subsidies and regulatory recognition keeps HHS marginalised, preventing their potential to accelerate decarbonisation and ease grid constraints.
- **HHS are overlooked by long-term strategies and scenarios owing to primarily being considered a transitional technology.** Policy narratives often indicate HHS as having only a short-term and transitional role in decarbonisation. As such, longer term mechanisms such as CCC's Carbon Budget and the CP2030 Action Plan, do not include hybrids or acknowledge them as only having a minimal role to play in heat decarbonisation. This overlooks their enduring value in supporting consumer choice, optimising flexibility, reducing peak electricity demand, and having the potential to be completely carbon neutral.
- **There is a level of contradiction in the current UK policy surrounding HHS for heating decarbonisation.** Whilst the Clean Heat Market Mechanism recognises and rewards HHS, the Boiler Upgrade Scheme specifically excludes them. This indicates a lack of alignment and clear messaging from the Government on HHS that could create confusion for stakeholders, discourage investment, and ultimately slow down the deployment of HHS.

The full range of relevant policies, subsidies and grants and supplier obligations are summarised in the following pages.

A **Red, Amber, Green (RAG) system** has been adopted to show the degree of support of each mechanism for HHS.

GREEN
Mechanism is **directly supportive** of HHS; for example, including HHS as eligible for subsidy support.

AMBER
Mechanism is **somewhat supportive and relevant** for HHS adoption.

RED
Mechanism is **not supportive** of HHS adoption; for example, excluding HHS from eligibility to subsidies.

POLICY NAME	FACTOR	OVERVIEW	DATES	DEPARTMENT	GEOGRAPHY	PROGRESS	SUPPORTIVE OF HHS
Heat and Buildings Strategy	Target	Targeting 600,000 annual heat pump installations by 2028[48]	2021 – 2028	DESNZ	UK-wide	60,244 installed in 2023, increasing to 98,468 in 2024[48]	Excludes HHS
Heat in Buildings Strategy	Target	Emissions in buildings reduced by 68%, 1m homes decarbonised by 2030, and at least 124,000 low carbon heating systems installed annually by 2026[49]	2021	Scottish Government	Scotland	1m homes target deemed not possible; 23,000 heat pumps installed in 2024	Excludes HHS, with the technology 'under review'
Green Gas Support Scheme	Subsidy	Provides tariff support for anaerobic digestion producers of biomethane that inject into the gas network[50]	2021 – 2028	DESNZ	UK-wide	Government making a decision on new policy framework following scheme closeout	Increased biomethane uptake supports a fully decarbonised HHS
Green Homes Grant Phase 3	Local Authority Grant	£287m available for installation of energy saving measures in low-income households with EPC rating of D or lower[51]	2022 – 2025	DESNZ	England	126 air-source heat pumps and 181 HHS installed	HHS included
Energy Company Obligation 4	Supplier obligation	Suppliers must deliver improvements that achieve £224.3m cost reduction[52]	2022 – 2026	Ofgem	UK-wide	66.4% reduction approved to 'achieved' status	HHS eligible, dependent on Standard Assessment Procedures
Boiler Upgrade Scheme (BUS)	Subsidy	£7,500 grant for homeowners installing electric heat pumps[53]	2022 – 2028	DESNZ	England and Wales	22,700 installations in 2024 under the BUS	Excludes HHS
Zero-Rated VAT on Heat Pumps	Tax relief	VAT reduction on heat pumps from 5% to 0%[54]	2022 – 2027	HMRC	UK-wide		Excludes HHS

48. DESNZ, Heat and Buildings Strategy
49. Scot Gov, Heat in Buildings Strategy
50. DESNZ, GGSS
51. DESNZ, Green Homes Grant Summary
52. Ofgem, Energy Company Obligations
53. DESNZ, BUS Overview
54. DESNZ, VAT Guidance

POLICY NAME	FACTOR	OVERVIEW	DATES	DEPARTMENT	GEOGRAPHY	PROGRESS	SUPPORTIVE OF HHS
Standard Assessment Procedure 10	Standard	Sets out a methodology to calculate a home's energy performance[55]	2022 – present	DESNZ	UK-wide		Methodology includes HHS however, the consultation for its replacement (Home Energy Model) did not mention HHS
Home Energy Scotland Grant and Loan Scheme	Grant/loan	£7500 grant or £7500 interest free loan to improve efficiency and clean heating, targeting 170,000 heat pumps installed by 2030[56]	2022 – present	Scottish Government	Scotland	1813 heat pumps and 344 HHS installed in 2024	Only provides grant funding for HHS if the heat pump component provides 100% of heat load
Social Housing De-carbonisation Fund Wave 2.2	Grant	£75m funding for local authorities and social housing landlords to improve energy performance of homes[57]	2023 – 2024	DESNZ	England	1600 households upgraded so far under Wave 2.2; Wave 2.1 saw 10,009 households upgraded with 779 electric heat pumps and 0 HHS	May be used for HHS but not to replace the gas boiler component
Home Upgrade Grant Phase 2	Local Authority Grant	£630m available for energy efficiency and low carbon heating upgrades for households that are low income and non-gas grid connected[58]	2023 – 2025	DESNZ	England	1546 air-source heat pumps installed by November 2024, replaced with Warm Homes Local Grant	Excludes HHS (non-gas grid connected)
Heat Training Grant	Supplier obligation	Up to £500 per person for training and upskilling regarding heat pump installation, with 41,000 installers by 2028[59]	2023 – 2025	DESNZ	England	8000 heat pump installers in 2024	Focuses on electric heat pumps but results in trained staff for HHS
Heat Strategy for Wales	Target	Targets heat decarbonisation and 580,000 heat pumps installed by 2035 (~47,000 annually)[60]	2024	Welsh Government	Wales	5853 heat pumps installed in 2023	Excludes HHS

55. DESNZ, Standard Assessment Procedure
56. ScotGov, Home Energy Scotland
57. DESNZ, SHDF Wave 2.2
58. DESNZ, HUG2
59. DESNZ, Heat Training Grant
60. Welsh Gov, Heat Strategy Wales

POLICY NAME	FACTOR	OVERVIEW	DATES	DEPARTMENT	GEOGRAPHY	PROGRESS	SUPPORTIVE OF HHS
Warm Homes Plan	Commit-ment	Sets out £3.2b of investment by 2026 with 300,000 homes to be upgraded this year[61]	2025 – 2028	DESNZ	UK-wide	Live this year, monitoring underway	Delivery focuses on electric heat pumps
Warm Homes: Social Housing Fund (Wave 3)	Grant	£1.29b funding for local authorities and social housing landlords to retrofit social homes, with 10% of gas-grid homes receiving £20,000 to install low carbon heating measures[62]	2025 – 2028	DESNZ	England	Funding awardees announced June 2025	HHS only considered that are gas-grid connected, and HHS excluded from £20,000 grants
Warm Homes: Local Grant	Grant	£500m funding to improve fuel-poor households to EPC rating C or higher and to install low carbon heat-ing in homes[63]	2025 – 2028	DESNZ	England	Live this year, monitoring underway	Excludes integrated and packaged HHS; the heat pump must provide at least 55% of heat and the gas boiler must have an A rating
Clean Heat Market Mechanism	Supplier obligation	Suppliers need to have at least 6% of total boiler sales be heat pumps or HHS, with consultations indicating sub-sequent rises to 10%[64]	2025 – 2029	DESNZ, Environment Agency	UK-wide	Live this year, monitoring underway	Half credits for HHS
Clean Power 2030 Action Plan	Target	Target to reach only 5% unabated gas by 2030, emphasising the need for heat pumps to decarbonise[65]	2025 – 2030	DESNZ	UK-wide		Minimal role for HHS
Hydrogen Update to the Market	Strategy	Consulting this year on the role of hydrogen in government's heating decarbonisation strategy.[66]	2025	DESNZ	UK-wide		Hydrogen for use in heating supports a fully decarbonised HHS

61. DESNZ, Warm Homes Plan
62. DESNZ, Social Housing Fund Wave 3
63. DESNZ, Warm Homes Local Grant
64. DESNZ and EA, Clean Heat Market Mechanism
65. DESNZ, CP2030 Action Plan
66. DESNZ, Hydrogen Update to Market

POLICY NAME	FACTOR	OVERVIEW	DATES	DEPARTMENT	GEOGRAPHY	PROGRESS	SUPPORTIVE OF HHS
7th Carbon Budget	Strategy	Models UK economy-wide decarbonisation and advises the Government with emphasis on electric heat pump deployment and electrification as the dominating decarbonisation route[4]	2038 – 2042	CCC	UK-wide		HHS not modelled; assumes limited role for biomethane post-2035
Future Home Standard	Obligation	Will futureproof new homes through improving energy efficiency and installing low carbon heating technologies where possible[67]	In develop-ment	DESNZ	UK-wide		"Fossil fuel heating will not meet this standard (including...hybrid boilers)"

67. Future Home Standard

3.2 European Policy is Leading the Way for Hybrid Heating Acceleration

The extensive benefits of HHS are becoming increasingly recognised across Europe where policy support is gaining momentum, particularly in response to some public concern about heat pump-only strategies. As such, HHS are gaining traction across Europe, with support schemes and regulations providing an enabling environment to set the pace. Notably, the EU's model of shared ownership of gas and electricity networks at the municipal level has enabled more collaborative and integrated approaches to planning and policy development.

NETHERLANDS

The Netherlands have made the commitment to phase out natural gas for heating by 2050. This is significant for residential homes, where 90% currently rely on natural gas.[68] Historically dependent on traditional gas boilers, the Netherlands market experienced a 23.5% drop in gas boiler sales in 2023, driven by high natural gas prices and growing financial incentives for renewable heating technologies.[69]

In 2022, the Dutch Government mandated that HHS will be required as the new standard when replacing an existing gas boiler from 2026 for the majority of homes.[70] The three-party coalition loosened this mandate in 2024 to avoid forcing any single technology on homeowners. Instead, it empowers Dutch homeowners to choose the best heating solution for them that delivers tangible cost savings over their current system alongside carbon savings.

HHS TOTAL SALES 2022 – 2024: 115,600 [68]

SUPPORT MEASURE(S):

- **ISDE Subsidy for Sustainable Energy**: Supports the purchase of hybrid heat pumps for owner-occupied homes, covering approximately 30% of the purchase price.[71]
- **Dutch National Heat Fund Loan:** Offers financing with a 0% interest rate for low- and middle-income households. Major Dutch banks have pledged a further £175m to the loan this year.[72]

ITALY

In Italy, heating and cooling account for 44% of the country's total energy consumption.[73] Similar to the Netherlands, Italy is another leading market for HHS uptake with hybrids constituting 40% of the heat pump market.[74] This is primarily due to HHS' versatility in adapting to varying regional weather conditions and strong financial incentives encouraging their deployment.

HHS TOTAL SALES 2022 – 2024: 164,100 [68]

SUPPORT MEASURE(S):

- **Superbonus**: Tax incentive measure that enables homeowners to recover up to 110% of the expenditure incurred from HHS installation. This was reduced this year to 65% due to concerns over potential fraudulent claims. The change underscores that financial incentives alone are not sufficient to achieve the intended outcomes.
- **Ecobonus**: Energy efficiency focused tax incentive measure that enables a 50% recovery on the expenditure incurred from installing energy efficient retrofits, including high-efficiency HHS.

68. OECD, 2023
69. ehi, Heating Market Report 2024
70. New Rules for Heat Pumps in the Netherlands, 2025
71. NEA, Sustainable Energy Investment Subsidy Scheme
72. NL Times, 2025
73. European Parliament, Italy's Climate Action Strategy
74. HHIC, Hybrid Heat Pumps

FRANCE

France is a global leader in heat pump deployment, installing over 850,000 electric heat pumps in the last 3 years.[68] Its buildings sector is responsible for a significant portion of its energy use and subsequent emissions, with residential and commercial buildings accounting for 46% of total energy consumption.[75]

HHS TOTAL SALES 2022 – 2024: 11,600 [68]

SUPPORT MEASURE(S):

- **White Certificate Programme, Coup de pouce chauffage:** Offers up to £7,800 as grant funding to households who replace a fossil fuel burner with a HHS or an air-to-water heat pump.[76]

BELGIUM

In line with its net zero strategy, the major regions of Belgium – Brussels and Flanders – are banning the use of natural gas boilers in new buildings and major renovations from 2025.[77] The country is therefore moving towards increased policy and financial support for the uptake of low carbon heating technologies. Therefore, it is likely the country will begin to see an increased uptake in heat pumps and HHS from 2025.

HHS TOTAL SALES 2022 – 2024: Data unavailable

SUPPORT MEASURE(S):

- **Mijn VerbouwPremie:** Subsidy grants of up to £2,700 per household for HHS installation in replacement of a fossil fuel boiler.[78]

GERMANY

Germany's heating market in recent years has been heavily influenced by geopolitical instability, energy price volatility, and policy uncertainty. In 2022, a proposed heating mandate that would require newly installed systems to use 65% renewable energy from 2024 led consumers to, often prematurely, upgrade their heating in 2023 to avoid future restrictions. Consequently, heat pump adoption saw an increase of 50%.[68] However, this perceived 'boiler ban' received a lot of political and public backlash in Germany, highlighting the importance of maintaining consumer choice and trust when it comes to heating. More recently, HHS are seeing an increase in popularity largely due to supportive financial policies.

HHS TOTAL SALES 2022 – 2024: 29,500 [68]

SUPPORT MEASURE(S):

- **KfW Grant 458**: Subsidy support of up to 70% of the installation cost offered as part of the Federal Funding for Efficient Buildings for homeowners who want to replace an old heating system with a new, climate-friendly heating system.[79]

SPAIN

Recent years have seen some technological diversification in the Spanish heating sector gaining momentum, with increased interest in HHS, heat pumps, and renewable fuels to support national decarbonisation goals. Whilst the current energy policy is fragmented, there is clear support for increased uptake of low carbon heating and cooling technologies.

HHS TOTAL SALES 2022 – 2024: 6,800 [68]

SUPPORT MEASURE(S):

- **Recovery Transformation and Resilience Plan:** Financed by NextGenerationEU funds, up to 40% of the installation costs are offered to homeowners, with a maximum threshold of £2,600.[80] People with lower income households may be eligible for 100% subsidy support.

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75. RAP, France as a Heat Pump Leader
76. French Gov, Coup de Pouce Chauffage
77. OEKO, Country Report Belgium
78. Vlaanderen, Mijn VerbouwPremie for the Heat Pump
79. Autarc, KfW Funding 458
80. Gobierno de Espana, RTRP

3.3 Assessment of Consumer Incentive Models

The review of policies and mechanisms in these six European countries shows how innovative consumer incentive models have been central to the success of their HHS markets.

Incentive models can overcome some of the major adoption barriers of HHS, including upfront costs, disruption and unfamiliarity, particularly for less flexible or fuel-poor households. For example, incentive and subsidy schemes are a tried and tested method to accelerate and motivate new and existing customers to make specific technology adoption decisions – with the value of the incentive or subsidy reflecting the full value of the technology – e.g., to the energy system. Consumer incentives can be an effective and rapid method to accelerate HHS adoption by addressing capital expenditure challenges, smoothing cashflow, and monetising benefits to electricity and gas networks.

This section explores six potential consumer incentive models that could be introduced to accelerate HHS uptake, leveraging learnings and experience from international jurisdictions. This includes an exploration of the benefits and drawbacks of each incentive model, the international jurisdictions that have applied these incentive models, and key considerations for effective GB deployment.

To assess and compare the potential of each incentive model in accelerating the uptake of HHS, this report used the following six evaluation criteria, across two categories.

CONSUMER-FOCUSED CRITERIA

01.

Consumer Preference – The level of effort required by the consumer and how compelling the model would be to a typical household from a familiarity, ease of use, received reward, and accessibility perspective.

02.

Just Transition – The ability of the model to support low-income and fuel-poor homes and avoid regressive outcomes.

GOVERNANCE AND MARKET-FOCUSED CRITERIA

03.

Implementation Complexity – The level of administrative burden and changes required, and the practical realities of rolling out the model.

04.

Market Alignment – The degree to which the model fits within existing UK market and policy and regulatory frameworks.

05.

International Precedence – The degree of international precedence and success in implementing each model.

06.

Stakeholder Support – The extent to which key industry stakeholders may support the model, based on stakeholder engagement.

KEY TAKEAWAYS:

- **Subsidy grants and loans – providing upfront CAPEX coverage – may be the most effective tools for driving HHS adoption in the UK.** Both subsidy grants and loans directly address the primary barrier in changing from a legacy gas boiler to a HHS; high installation costs, whilst also building consumer confidence in the technology.

  The existing Boiler Upgrade Scheme and Home Energy Scheme are excellent examples of these incentive models, and they demonstrate strong affinity from industry stakeholders. Additionally, there is a wide range of international jurisdictions that have successfully implemented similar subsidy grant and loan schemes to support the adoption of low carbon (heating) technologies.

- **Incentive models such as energy bill reductions and tax rebate schemes have seen notable success internationally.** However, compared to grants and loans, these approaches are more complex to implement within the GB market, making them relatively less favourable for deployment.

- **Several jurisdictions have demonstrated that stacking multiple incentive schemes can be an effective method** to accelerate the market by offering customers even stronger incentives and pricing signals. A common example of this is the stacking of subsidy grants and loans with operational incentives such as time-of-use (ToU) tariffs, reduced energy bills, and DSR/flexibility incentives.

  For example, in the UK, upfront cost subsidies through an HHS-specific subsidy grant, potentially part of the Boiler Upgrade Scheme, combined with preferential 5-year electricity tariffs (incl.ToU tariffs) could unlock significant consumer interest in HHS. Some of these incentive models, and combination of incentive models are explored further as part of the HHS Acceleration Roadmap.

More Favourable ↑

	EVALUATION CRITERIA						
INCENTIVE MODEL	CUSTOMER PREFERENCE	JUST TRANSITION	IMPLEMENT COMPLEXITY	UK MARKET ALIGNMENT	PRECEDENCE	STAKEHOLDER SUPPORT	OVERALL ASSESSMENT
Retrofit Subsidy Grant							**Accessible and favourable** for consumers; easily incorporated in the BUS
Zero- / Low-Interest Loans							**Favourable for consumers**; Scotland has implemented with support for HHS
Time of Use Tariffs							**Strong precedence**; may prove challenging for HHS-specific; potential for stacked use
Energy Bill Reductions							**Weaker precedence**; accessible; interesting to further explore/define
Tax Rebate Scheme							**Effective for middle-income households only**; strong precedence
Carbon Savings Rewards							**High complexity** to implement; not as valuable for consumers

INCENTIVE MODEL	OVERVIEW	INTERNATIONAL PRECEDENCE	PROS	CONS	CONSIDERATION FOR GB
1. Time-of-Use (ToU) Energy Tariffs	ToU tariffs vary the price of electricity depending on the time of day the consumer uses it, with electricity typically costing more during peak hours	The UK already offers heat pump TOU tariffs like Economy 7 and smart tariffs from suppliers.[81] Italy uses a mandatory TOU tariff for residential users, leveraging three bands for different hours. A significant number of countries across the EU and globally already leverage ToU tariffs for residential electricity use including France, Australia, and Slovakia.	✓ Contribute to a greener grid by using energy when there are greater volumes of renewable energy ✓ Reduces energy bills ✓ Encourage DSR through rewarding flexible operation ✓ Can be stacked with grants/loans	× Savings depend on user behaviour and flexibility × Requires smart meter installation and controls	• May require positioning as a special ToU tariff type • Include bill protection caps in Winter for low-income households using HHS • Pre-configure HHS to have smart controls for ToU optimisation
2. Tax Rebate Scheme	A portion of the HHS equipment costs are deducted from the consumer's income tax over several years	Italy's Superbonus and Ecobonus tax rebate schemes enable homeowners to recover up to 65% and 50% for HHS respectively. Under Section 35c of Germany's Income Tax Act, homeowners can claim a 20% tax reduction on energy-efficient renovations, including HHS.	✓ Offers long-term attractiveness to taxpayers ✓ Reduces admin at the point of sale	× May exclude no/low tax homes unless refundable × Policy changes can create stop-start markets	• Ensure HHS are explicitly eligible in tax codes alongside the electric heat pump • Allow installer transfers so rebates can be applied instantly
3. Zero- / Low-interest Loan	Public/regulated lenders offer loans with little to no interest, with repayments typically spanning 3 – 15 years	The Dutch National Head Fund Loan offers financing with 0% interest for low- and middle-income households. Scotland's Home Energy Scheme offers a £7500 interest free loan to improve efficiency and clean heating.[82]	✓ Tackles upfront cost challenge without non-repayable government grants ✓ Potential to offer variations on interest payback levels and timeframes depending on household income	× Creates debt to households × Requires credit checks and increased admin	• Offer zero-interest loans to lower EPC-band homes and households with increased fuel poverty • Set loan terms to fit within HHS lifespan

81. Octopus Energy, Economy 7 ToU Tariff
82. ScotGov, Home Energy Scotland

INCENTIVE MODEL	OVERVIEW	INTERNATIONAL PRECEDENCE	PROS	CONS	CONSIDERATION FOR GB
4. Retrofit Subsidy Grant	Upfront, non-repayable cash contribution, either fixed or a percentage of the total cost, for HHS retrofit	Belgian Govt. offer up to £2,700 per household for HHS. Coup de pouce chauffage offer £7,800 per household for HHS. The ISDE subsidy supports HHS, covering 30% of the costs. KfW Grant 458 covers up to 70% of HHS retrofit costs. Spain covers 40% of retrofit costs increasing to 100% for lower income households.	✓ Addresses the upfront CAPEX barrier for consumers ✓ Accessible for all household incomes ✓ Implements easily within the UK's established BUS ✓ Potential for coverage variation depending on household income	✗ May be limited by budget availability ✗ There is a risk of stop-go patterns related to HHS	• Include HHS within the BUS, potentially with a reduced grant relative to electric heat pumps • Maintain multi-year funding commitments
5. Carbon-Savings Rewards	Payments for households per verified carbon reduction through HHS use, often via tradable certificates	The French CEE scheme is a market-based mechanism obliging energy suppliers to fund energy-savings, including HHS retrofits, earning tradable certificates.[83] The CAES scheme provides tradable certificates with quantified energy and carbon savings.[84]	✓ Incentivises operation of the HHS to optimise carbon savings, supporting net zero ✓ Mobilises private capital ✓ Can be stacked with grants/loans	✗ Creates complexity and may be unfamiliar for consumers ✗ There is a high admin burden for suppliers and policymakers to implement and manage	• Integrate with supplier ECO4 obligations to allow HHS as a qualifying measure • Leverage smart meter data to verify carbon savings performance
6. Energy Bill Reductions	Utility distributes HHS retrofit costs through phased discounts on consumers' energy bills	Iberdrola, the Spanish electricity distributer, offer electricity bill reductions of up to £700 for the installation of carbon saving technologies.[85]	✓ Focuses on monthly budgeting which may be preferable for some consumers ✓ Reduces upfront friction with retrofit CAPEX	✗ There is a risk of process complexity through Ofgem providing the finances for utilities to leverage this incentive ✗ Consumer protection and visibility must be carefully managed	• Ensure clear switching rights and processing if consumer changes energy supplier • Allow HHS retrofit costs to be repaid with on-bill financing using regulated APR caps

83. Targray, French Energy Savings Certificates
84. ACT, Spanish Energy Savings Certificates
85. Iberdrola, Electricity Bil Savings

4. Quantifying the Whole Systems Value of HHS

This section sets out to explore and quantify the whole system value of HHS to GB's energy system, comparing them to other heating decarbonisation alternatives. To explore the whole system value of HHS, the analysis focuses on the total costs to consumers, the emissions reduction potential, and the impact on peak electricity demand.

This section also explores the economics of HHS deployment across different building types, identifying where HHS are best placed to deliver value on a national scale.

4.1 Adopting a Whole Systems Approach

The decarbonisation of energy demand and supply is creating stronger integration and interactions across electricity, gas, and heating. Increasingly, decisions related to one vector are having direct implications on other vectors. For example, the deployment of heat networks and the adoption of heat pumps have implications on the planning of future electricity and gas supply, network infrastructure, and system resiliency.

HHS operate at the intersection of the electricity and gas systems, and are in a unique position to deliver value across the entire energy system and to consumers. As such, to develop a comprehensive understanding of the value of HHS, this requires adopting a whole energy systems perspective, exploring the value and impacts of HHS across electricity, gas and heating.

Exploring these cross-vector interactions can ensure that future heating policy decisions and energy network investments support an efficient, cost-effective, reliable, and equitable transition.

NESO's FES emphasises the importance of adopting a whole systems perspective:

> *"A whole system view across electricity, gas, heat and transport underpins a sustainable energy transformation."* [86]

4.2 Analysis Scope and Methodology

The whole systems analysis assesses the deployment of eight heating decarbonisation technologies – including HHS – across four housing types, comparing their capital and operational costs to consumers, emissions reduction, and peak electricity impact.

The eight heating technologies include:
1. **Boiler** using biomethane
2. **Boiler** using natural gas
3. **HHS** with new boiler, using biomethane
4. **HHS** with existing boiler, using biomethane
5. **HHS** with new boiler, using natural gas
6. **HHS** with existing boiler, using natural gas
7. **Heat pump**, high temperature
8. **Heat pump**, standard

The four housing types are representative of average UK characteristics, and include:
1. **Flats**: 60 m², EPC rating C
2. **Terraced**: 90 m², EPC rating D
3. **Semi-detached**: 95 m², EPC rating D
4. **Detached:** 135 m², EPC rating D

86. NESO FES, Whole System Approach to Energy

Modelling the eight heating technology configurations across these four housing types results in 32 distinct heating scenarios, each representing a unique combination of technology and housing type. Each scenario is modelled over a 15-year time horizon, reflective of the typical lifetime of heating equipment.

The primary objective of the quantitative analysis is to establish a robust comparison framework that enables effective evaluation of HHS against other technologies. This includes both retrofit scenarios (using existing boilers) and new installations, allowing for a nuanced understanding of cost dynamics across different housing types and system configurations.

The methodology and assumptions underpinning this analysis are detailed in Appendix A and B, respectively.

4.3 Whole System Analysis Results

The results of the quantitative, whole system analysis are presented across four sub-sections:

1. Lifecycle Costs
2. Emissions Reductions
3. Cost of Emissions Reductions; and
4. Peak Electricity Impact

4.3.1 Lifecycle Cost

Lifecycle cost refers to the total upfront capital expenditure (CAPEX) and operational expenditure (OPEX) of the heating technology to consumers. The total lifecycle costs across all 32 configurations are presented in *Figure 6*.

Boilers, whether using natural gas or biomethane, are the lowest cost option across all housing types. For example, over their 15-year lifetime, natural gas boilers cost approximately £20,000 for flats, £30,000 for terraced houses, £32,000 for semi-detached, and £60,000 for detached homes. Biomethane boilers result in costs approximately 25% higher, ranging from £25,000 to £75,000. Nevertheless, they remain a lower cost alternative to most other heating equipment options.

HHS occupy a middle ground, varying slightly depending on whether using an existing vs. new boiler, and whether running on natural gas vs. biomethane. In most cases, however, **HHS offer a lower cost alternative to standard and high-temperature heat pumps**.

HHS using new boilers vary around £22,000-£28,000 for flats, £45,000-£50,000 for terraced, £50,000-£55,000 for semi-detached, and £70,000-£80,000 for detached homes. Meanwhile, HHS using existing boilers result in lower overall costs, by approximately 5-10%.

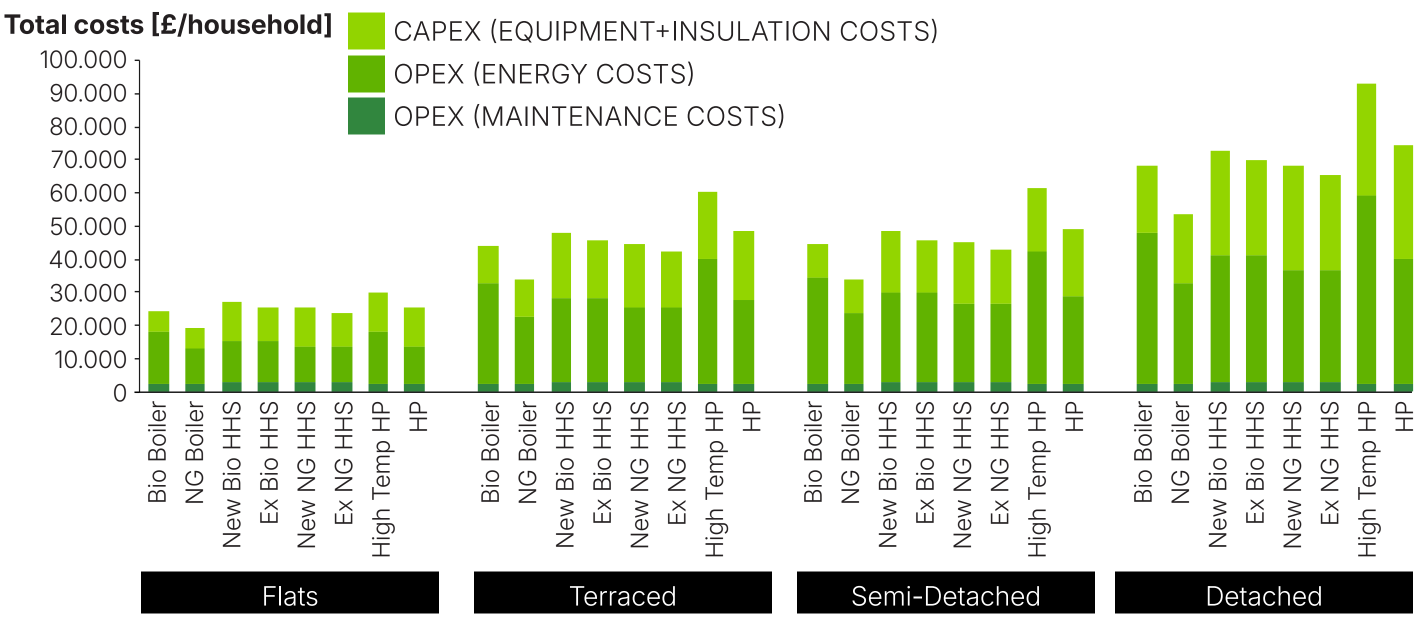


Figure 6: Total Lifecycle Costs

Standard heat pumps sit in the mid-to-high-cost range, with total costs starting at £23,000 for flats and reaching up to £80,000 for detached homes.

High-temperature heat pumps are the most expensive technology option, ranging from £30,000 to £90,000. These elevated costs are driven by substantial CAPEX requirements and high ongoing OPEX, making them less financially attractive despite their potential performance benefits.

Whilst interesting to compare all potential low carbon heating technologies, including those in early stages of development, options that are readily available today can lead to immediate decarbonisation impact. **Considering only the heating decarbonisation options available to mass market today** allows for a focused comparison against three technologies:

1. **HHS** with new boiler, using natural gas
2. **HHS** with existing boiler, using natural gas
3. **Heat pump**, standard

Figure 7 shows that HHS using natural gas boilers, whether new or existing, are cost-competitive with heat pumps across all four housing types.

While in flats, the costs of HHS vs. heat pumps are near-identical, in all other housing types, HHS are clear lower-cost alternatives to heat pumps. **For terraced, semi-detached, and detached homes, HHS using natural gas boilers consistently show lower costs relative to heat pumps.** This is primarily driven by lower CAPEX and moderate OPEX. This trend becomes more pronounced with larger floor areas, where the operational flexibility of HHS becomes more valuable.

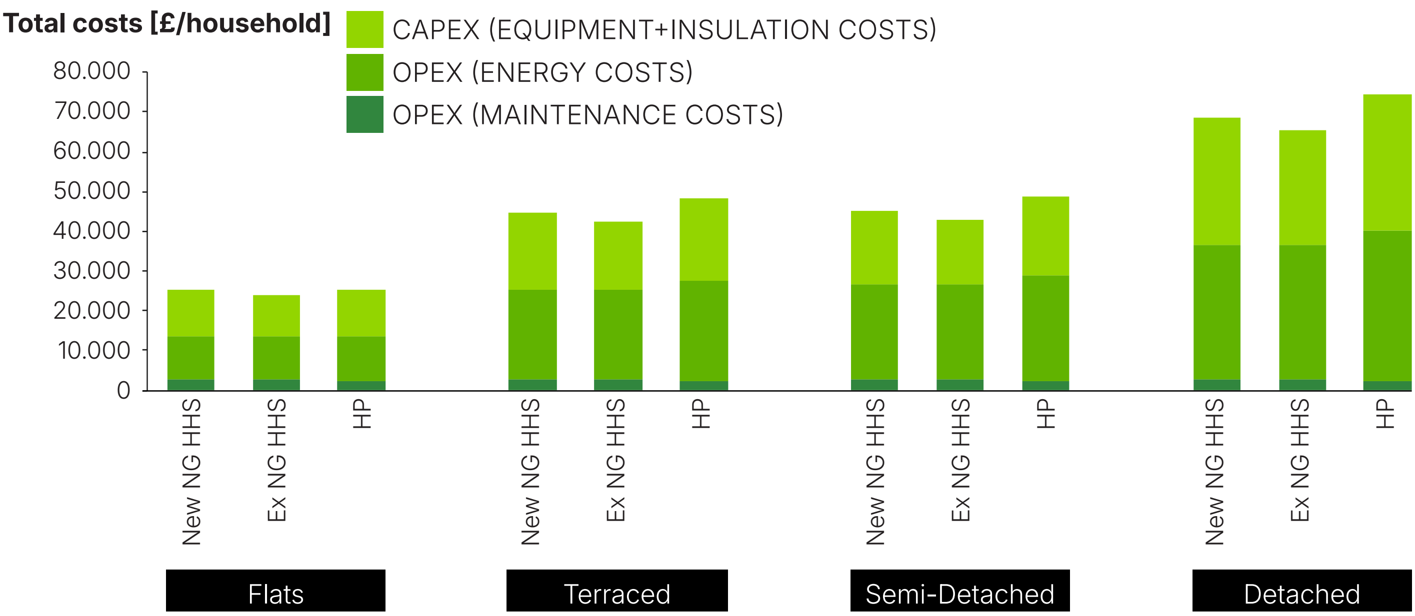


Figure 7: Total Lifecycle Costs for Select Technologies

4.3.2 Emissions Reductions

A significant benefit of switching from a natural gas boiler to a cleaner technology option is the associated reduction in emissions of the greenhouse gas, carbon dioxide. *Figure 8* shows the reduction in lifecycle emissions of carbon dioxide across all heating equipment configurations, relative to natural gas boilers.

HHS using natural gas – whether with an existing or new boiler – reduce lifecycle emissions by approximately 65-70%. Several HHS trials in the UK and internationally, as detailed in Section 2.4, however, have demonstrated emissions reductions of up to 75-80%.

HHS using biomethane decrease emissions even further with reductions of 90% when compared to natural gas boilers. This range is reflective of today's biomethane production, which averages emissions intensities of 20-25 gCO_2/MWh. However, in the future, HHS could become zero- or negative-emissions heating solutions by leveraging biomethane production using carbon capture and storage (CCS) technology.

Heat pumps result in the most significant emissions reduction, by up to 95%. Heat pumps, much like HHS, can also become zero-emissions options in the future, once the electricity system becomes fully decarbonised with increased wind and solar technologies in line with CP2030.

This analysis confirms that both HHS and heat pumps can deliver significant and immediate emissions reductions, with both technologies also offering pathways to fully decarbonising heat, through net zero biomethane production and renewable electricity generation.

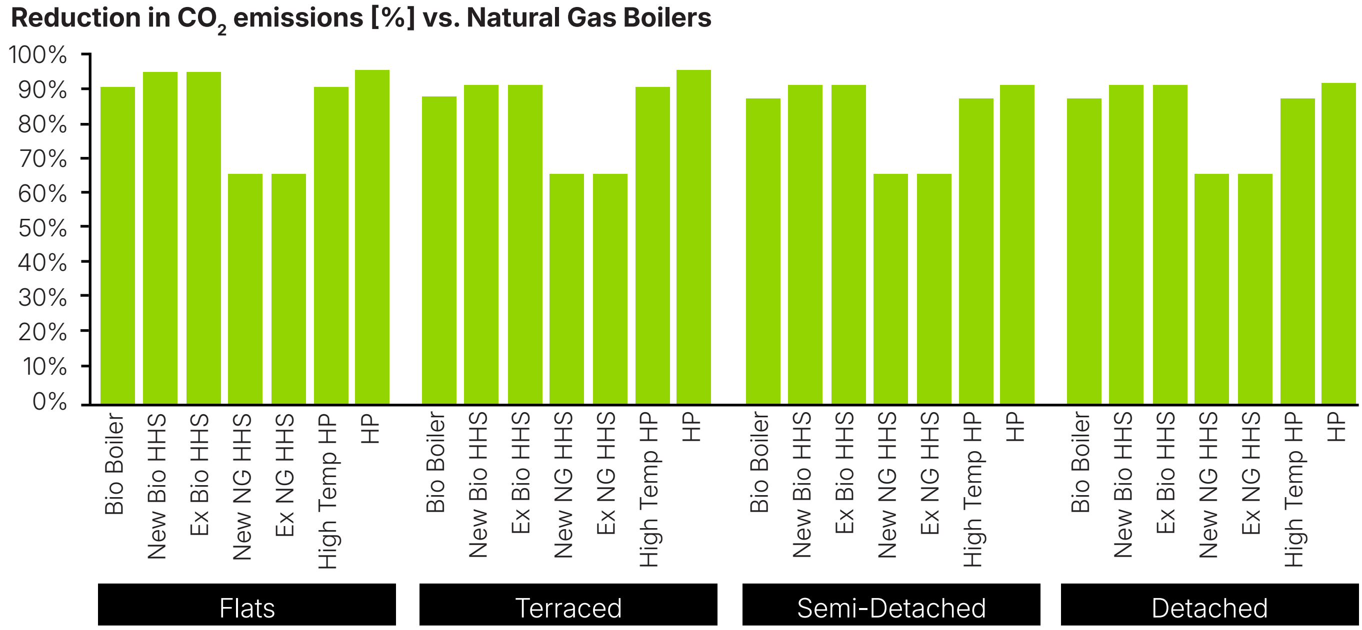


Figure 8: Emissions Reductions % (vs. Natural Gas Boiler)

4.3.3 Cost of Emissions Reductions

Building on the results of lifecycle costs and emissions reductions, this section calculates the cost of emissions reductions for all heating technologies.

The cost of emissions reductions is the ratio of total lifecycle costs to total lifecycle emissions reductions (relative to natural gas boilers), over the 15-year life of heating equipment. These results are presented in £ per tCO_2e as shown in *Figure 9*.

Benchmarking these results with HM Treasury's Green Book carbon value of £277/tCO_2 (2050 figure) allows for determination of which low-carbon heating technologies can be deemed 'cost-effective'.[87]

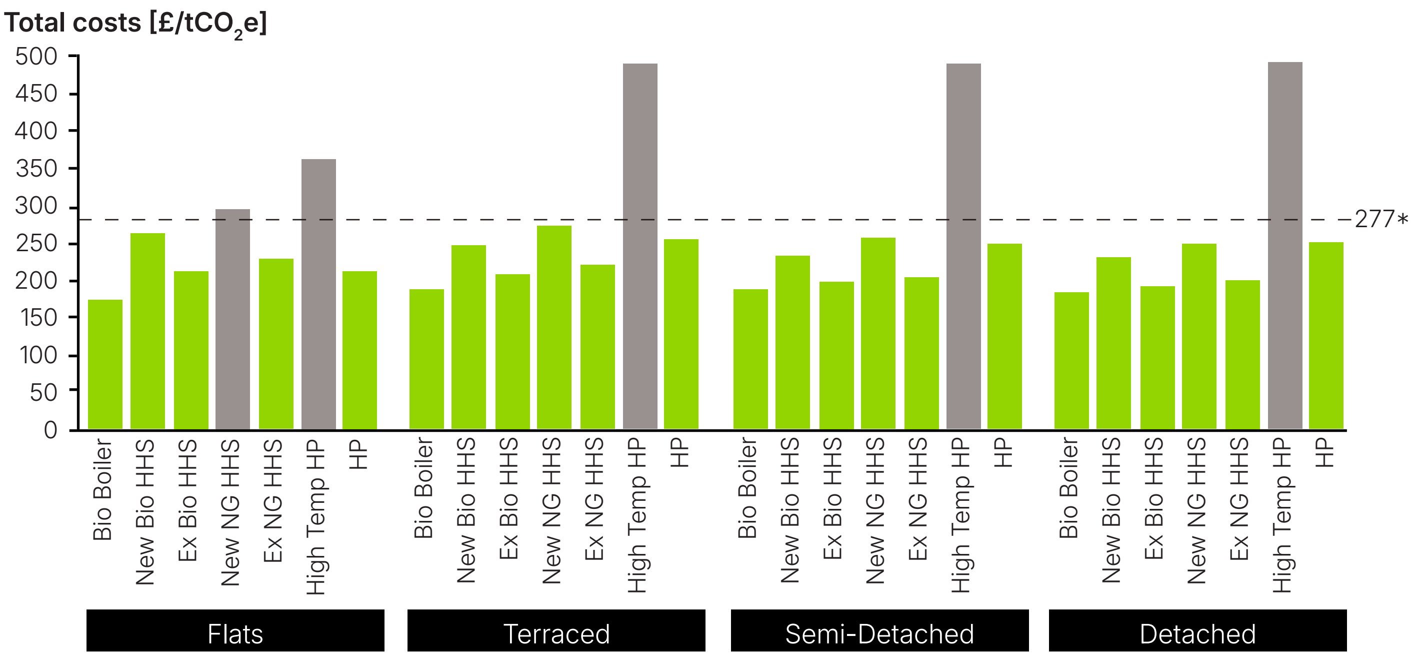
- **Not cost-effective:** Technologies with abatement costs above the threshold, shown in **grey.**
- **Cost-effective:** Technologies with abatement costs below the threshold, shown in **green.**

The analysis paints a nuanced picture across housing types and technologies. **Standard heat pumps are cost-effective across all housing types,** with abatement costs ranging from £200 to £250/tCO_2.

HHS, whether using natural gas or biomethane, are also cost-effective across all housing types, except for the scenario of flats requiring a new natural gas boiler.

Notably, HHS using an existing boiler are more or equally as cost-effective as heat pumps across all scenarios. HHS are approximately 20% more cost-effective than standard heat pumps across terraced, semi-detached and detached housing types, whereas in flats, they are equally as cost-effective.

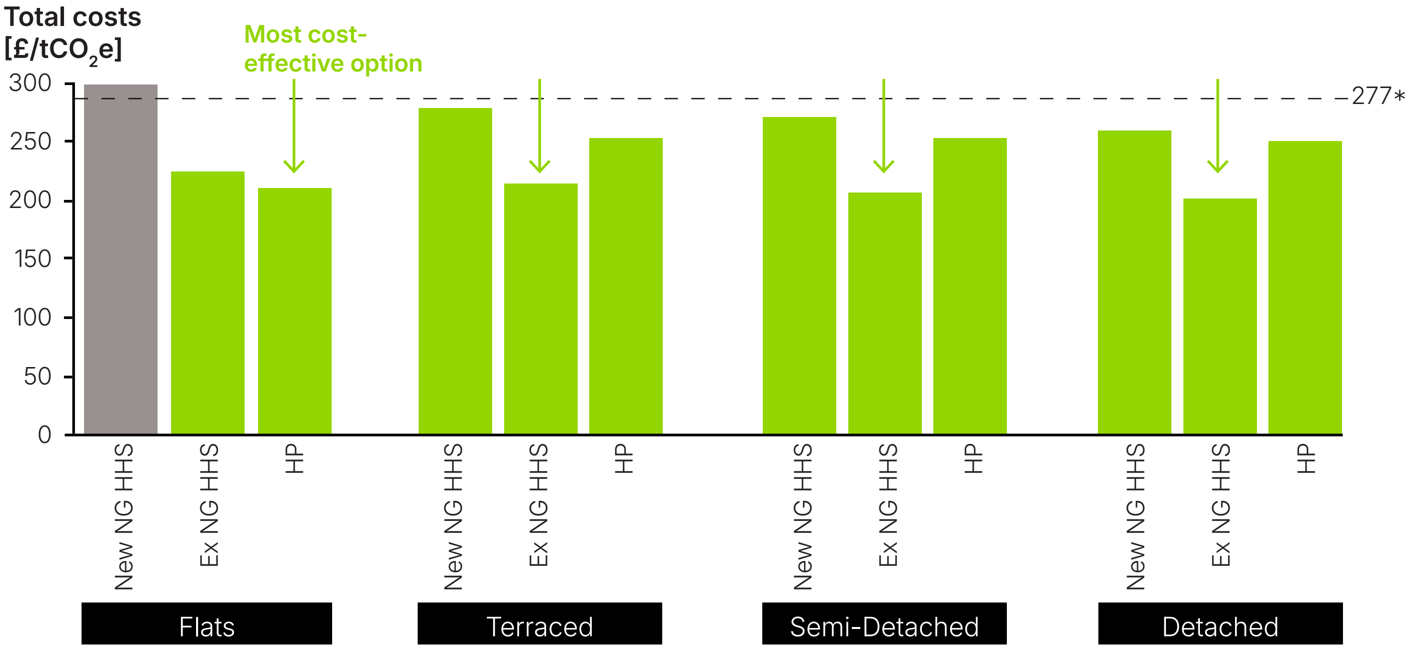
The least cost-effective option is high temperature heat pumps, with abatement costs ranging from £400 to £500/tCO_2, significantly higher than the Green Book's carbon value benchmark.



**£277/tCO_2e represents the carbon price in 2050 according to the HMT Green Book 2024*

Figure 9: Cost-Effectiveness of Emission Abatement

87. Carbon Valuation, 2024 – HM Treasury



*£277/tCO$_2$e represents the carbon price in 2050 according to the HMT Green Book 2024

Figure 10: Cost-Effectiveness of Emission Abatement for Select Technologies

As in prior sections, *Figure 10* **focuses on the three heating decarbonisation options available today.**

HHS are the most cost-effective option for terraced, semi-detached, and detached homes, typically around £200 to £215/tCO$_2$. HHS therefore offer greater emissions reductions for each pound spent for most housing types when compared to heat pumps, which average £250/tCO$_2$ for the same housing types.

This trend reverses in flats where heat pumps are the most cost-effective technology, at approximately £215/tCO$_2$, compared to HHS which are slightly higher at £225/tCO$_2$e. This is largely due to the typically smaller floor area and higher energy efficiency levels of EPC C in flats, allowing heat pumps to operate with lower energy demand and minimal insulation upgrades.

4.3.4 Peak Electricity Impact Results

Figure 11 shows the peak electricity impact of both standard and high-temperature heat pumps. Other technologies, such as biomethane boilers and HHS, are not shown since they do not result in an increased electricity peak as they rely entirely on gas during peak periods and therefore do not contribute to electricity demand spikes.

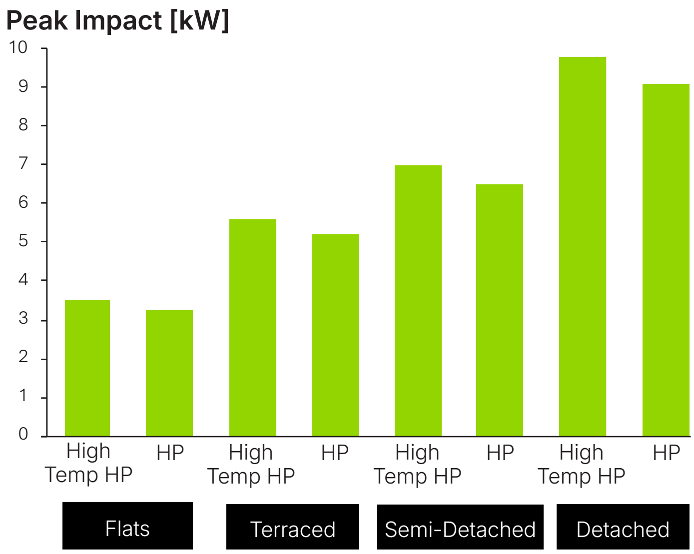


Figure 11: Peak Electricity Impact (kW per unit)

Both standard and high-temperature heat pumps lead to a substantial increase in electricity load during peak periods, usually winter evenings. The peak load impact is proportional to the size of the housing type, with approximately 3kW in flats compared to 10kW in detached homes, which is similar additional capacity of having an additional electric vehicle (EV) charger at home.

4.4 Detailed Cost Comparison of HHS vs. Heat Pumps

This section performs a more detailed cost comparison of HHS – using an existing boiler – and heat pumps, extending the previous analysis by evaluating the performance of HHS and heat pumps across the full spectrum of EPC bands – A to F – in all housing types. In comparison, the previous section focused on the average EPC band in each housing type.

This expanded view enables a more granular understanding of how HHS and heat pumps perform under varying energy efficiency levels. The objective of this analysis is to identify the lowest cost heating decarbonisation alternative between HHS and heat pumps, recognising the wide range of housing efficiency levels and housing types across GB. The basis for this analysis is also a recognition that since not every home is identical, a "one size fits all" approach to the heating sector is not adequate.

Figure 12 shows the lifecycle costs of HHS and heat pumps across housing types and EPC bands. The results show that HHS and heat pumps are more cost-effective than the other at different EPC ratings and in different housing types.

At the higher EPC bands of A and B, heat pumps are more cost-effective than HHS across all housing types. This is most evident in detached homes, benefitting from superior insulation, and leading to cost savings of 15% compared to HHS.

Conversely, in homes with lower efficiency ratings of EPC D to F, HHS are more cost-effective. Savings range from approximately 10% to as high as 40%, depending on EPC band and housing type. For example, in detached properties rated EPC F, HHS deliver savings of 40% compared to heat pumps, or approximately £50,000 over the equipment lifetime. In general, HHS represent a highly attractive option across all poorly insulated housing stock. This stock primarily consists of pre-1930s terraced and detached homes.

While heat pumps are more cost-effective for EPC A-B, and HHS for EPC D-F, results are less conclusive at EPC C. At EPC C, the economics of HHS and heat pumps are relatively comparable with only small differences in lifecycle costs of less than 5%. EPC C band is particularly key considering the UK Government's mandate for all privately rented homes to achieve a minimum rating of EPC C by 2030.[88]

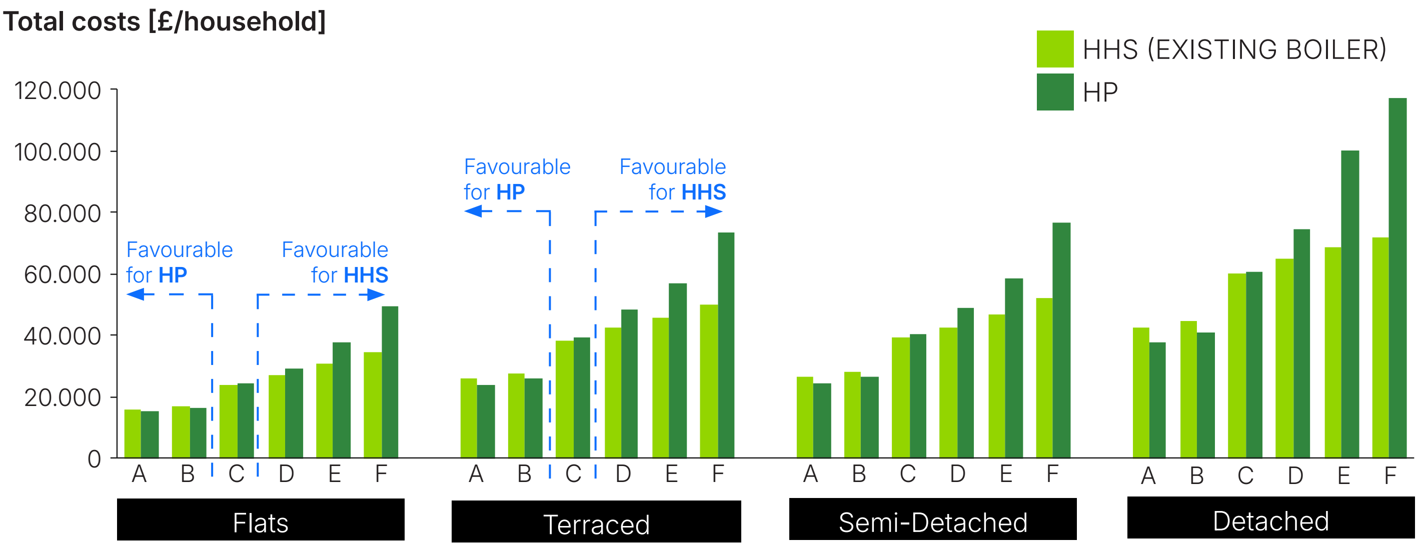


Figure 12: Total Lifecycle Costs of HHS vs Heat Pumps by Housing Type and EPC band

88. DESNZ, Improving Efficiency of Privately Rented Homes, 2025

To explore the cost comparison at EPC C further, a sensitivity analysis was conducted. This sensitivity explores a third heating equipment option for deployment in EPC C properties: **HHS with a new boiler.**

Figure 13 presents the results of this sensitivity and shows the lifecycle costs of three technology options.
1. **HHS** with new boiler, using natural gas
2. **HHS** with existing boiler, using natural gas
3. **Heat pump** (standard)

At EPC C, differences in lifecycle costs are only marginal, particularly between HHS using an existing boiler and heat pumps. HHS with an existing boiler appear to be only slightly more cost-effective than heat pumps and HHS with a new boiler. Heat pumps are higher cost by 2-3%, whereas HHS with a new boiler are higher costs by 3-5%.

The magnitude of these cost differences is within margin of error and emphasise not only the complexity and nuance of identifying the lowest cost heating decarbonisation option for each home, but also the importance of building efficiency levels in assessing the most suitable options.

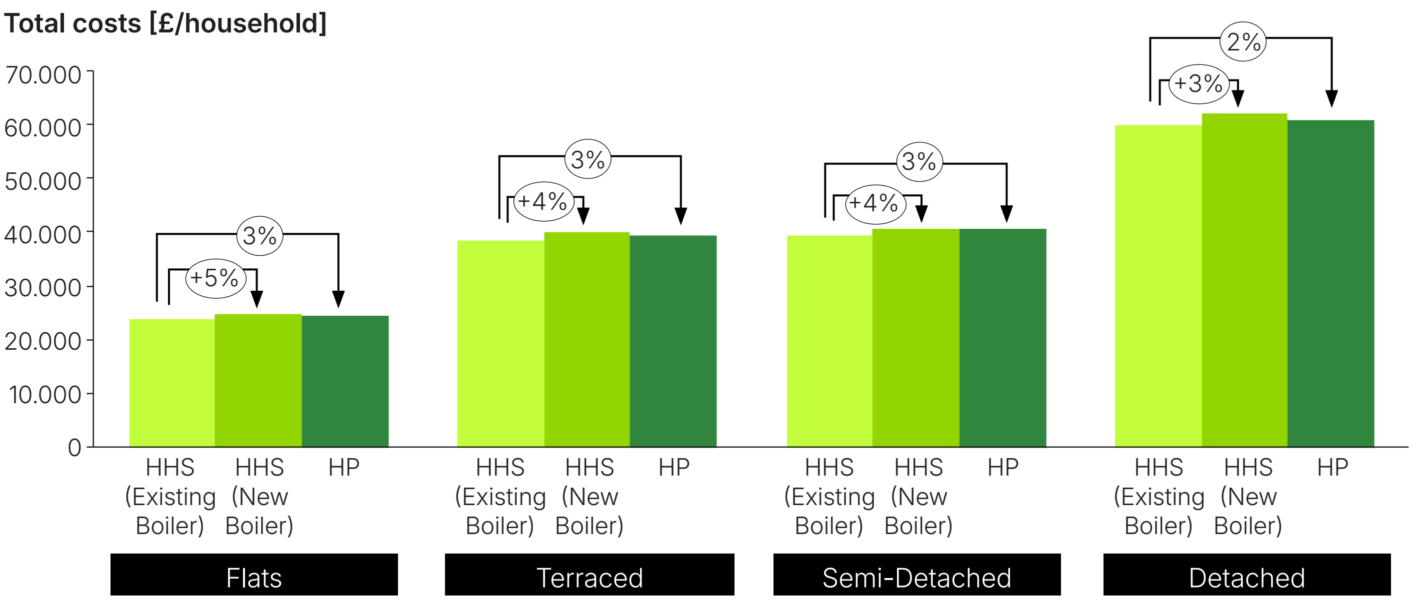


Figure 13: Sensitivity Analysis Total Lifecycle Costs at EPC C

THE ROLE OF BUILDING INSULATION UPGRADES

Our analysis has focused exclusively on the performance of heating equipment at a fixed EPC rating and has not explored the role of upgrading building envelops to higher EPC ratings.

Building insulation upgrades have a meaningful role to play increasing the energy efficiency of homes and can lead to a significant reduction in heating energy needs enabling heat pumps to operate at higher efficiencies. This is particularly important in housing stock with poor energy performance. While building insulation upgrades can offer long-term benefits in terms of energy efficiency and comfort, they represent a significant financial barrier to homeowners. For example, upgrading a property from EPC D to EPC C, a common threshold for effective heat pump use, can range between £4,000 to £13,000 depending on housing type.[89]

Housing retrofit rates have remained limited over the past decade across GB, at a pace far below other European countries and far below the rate required to meet heat pump adoption targets. Given this limited pace and the challenging realities of promoting a fabric-first approach, our analysis does not simulate the impact of upgrading from low-efficiency stock (e.g., EPC D to F) to medium or high-efficiency stock (C to A).

89. Habito, EPC Upgrading Costs, 2021

Extrapolating Results Nationally

This analysis shows **HHS** are more cost-effective at EPC D and below, whereas **heat pumps** are more cost-effective at **EPC A and B.**

At EPC C, however, it is **more challenging** to conclusively determine whether HHS or heat pumps are more economic.

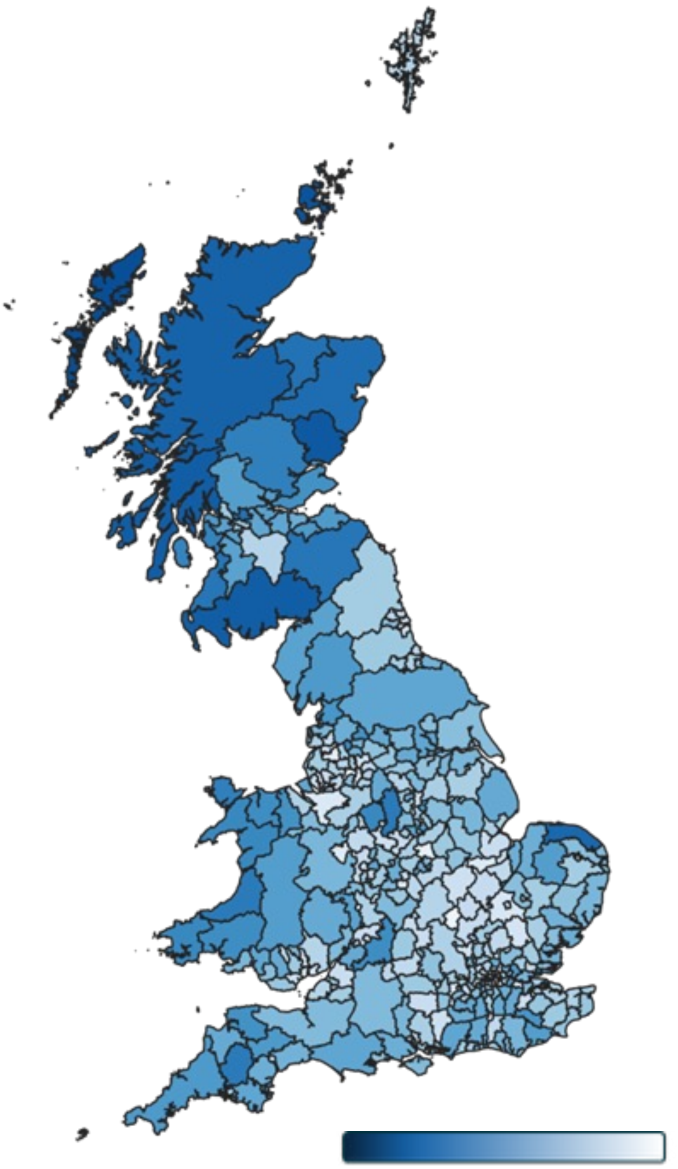
Projecting these results to the **317 local authorities** across GB offers an indicative view of the **share of homes** in each local authority – and at the national level – where HHS could be **cost-effective.**

HHS are cost-effective in approximately 40% of GB homes

The results of the cost comparison between **HHS and heat pumps** were extrapolated to all **317 local authorities** across GB to. This **HHS attractiveness map** identifies the **areas** of the country, and the **share of homes**, where HHS are more cost-effective heating option, compared to heat pumps.

HHS Attractiveness Map

Share of homes (%) in each Local Authority where HHS are cost-effective versus heat pumps*



*Calculated by applying the economic building stock analysis of which efficiency homes HHS are favourable for to the percentage of homes in each LA at those efficiency levels.

- HHS are the **most cost-effective** low-carbon heating solution for homes with lower EPC ratings, especially **D, E, and F**.
  → Local authorities (LAs) with high share of low efficiency EPCs are ideal candidates for HHS adoption from an economic perspective.

- **Low efficiency EPC ratings are typically found in aging housing stock**, most prevalent in urban unitary regions and older industrial districts where LAs face heightened political pressure to meet fuel poverty targets.
  → These LAs are primarily located in **Scotland, West Wales,** and **North England.**

- Across GB, **160 LAs (~45%) have more than 40% of their total domestic building stock where a HHS would be the optimal economic low-carbon heating technology.**
  → Some LAs where HHS may offer significant benefits include **Lancaster, Nottingham, Aberdeenshire, and Redcar** and **Cleveland.**

- Scotland presents the strongest opportunity for HHS deployment, with **~80% of LAs** showing it as the most economically favourable technology in over 40% of homes. Wales is close behind with **~65%,** followed by **~40%** across England.

Whilst some LAs have a significant share of homes **not connected to** the gas grid today, **HHS may still play a role****.

**Modelling does not reflect the nuances of off-gas grid properties however, engagement with GDNs, DNOs, and independent studies indicate there is strong potential for hybrids - i.e. those on oil or LPG.

05. Roadmap to Accelerate Hybrids Adoption to 2030

HHS have a critical role to play supporting GB's heating decarbonisation targets, not only as a transitional option that can immediately accelerate heat pump adoption, but also as a long-term, net-zero option, through the use of biomethane.

HHS offer a wide range of benefits to consumers, energy networks and GB, including significant emissions reduction potential, a cost-effective option for low-efficiency stock and vulnerable customers, increased system flexibility, and much-needed time for continued reinforcement of electricity networks.

To realise these benefits, action must be taken now to accelerate deployment. Without early and coordinated intervention, GB risks missing an opportunity to offer consumers a cost-effective pathway to decarbonise their homes, and an achievable trajectory towards the ambitious heat pump targets.

The journey to 2050 is well underway, and the decisions taken in the next five years, from 2026 to 2030, will shape the trajectory of the heating sector over the coming decades. Targeted action today can unlock the full potential of not only HHS, but also electric heat pumps as part of a balanced portfolio of low-carbon heating solutions.

The **Heating Acceleration Roadmap 2030**, presented in *Figure 14*, proposes a set of priority activities to be undertaken by the sector to accelerate adoption of HHS. The roadmap is made up of 18 activities, sequenced across near, medium and long-term activities, and divided into five acceleration categories:

01.

Policy, Regulation and Incentives – Activities with the aim of establishing supportive policy and regulatory changes that can more directly unlock HHS deployment at scale, for example, through customer incentives.

02.

Market-Based Mechanisms – Activities with the aim of modifying or creating mechanisms, targeted to manufacturers and consumers, to more effectively reflect and reward the whole system value of HHS.

03.

Consumer Awareness – Activities with the aim of building a more comprehensive consumer understanding and trust for HHS technology.

04.

Supply Chain Capabilities – Activities with the aim of supporting GB's manufacturing and installation capabilities, and distribution channels to support large scale rollout.

05.

R&D and Innovation – Activities with the aim of advancing HHS technology, consumer options, and software solutions to offer the consumer market more targeted and fit-for-purpose HHS solutions.

ROADMAP TO ACCELERATE HYBRIDS ADOPTION TO 2030

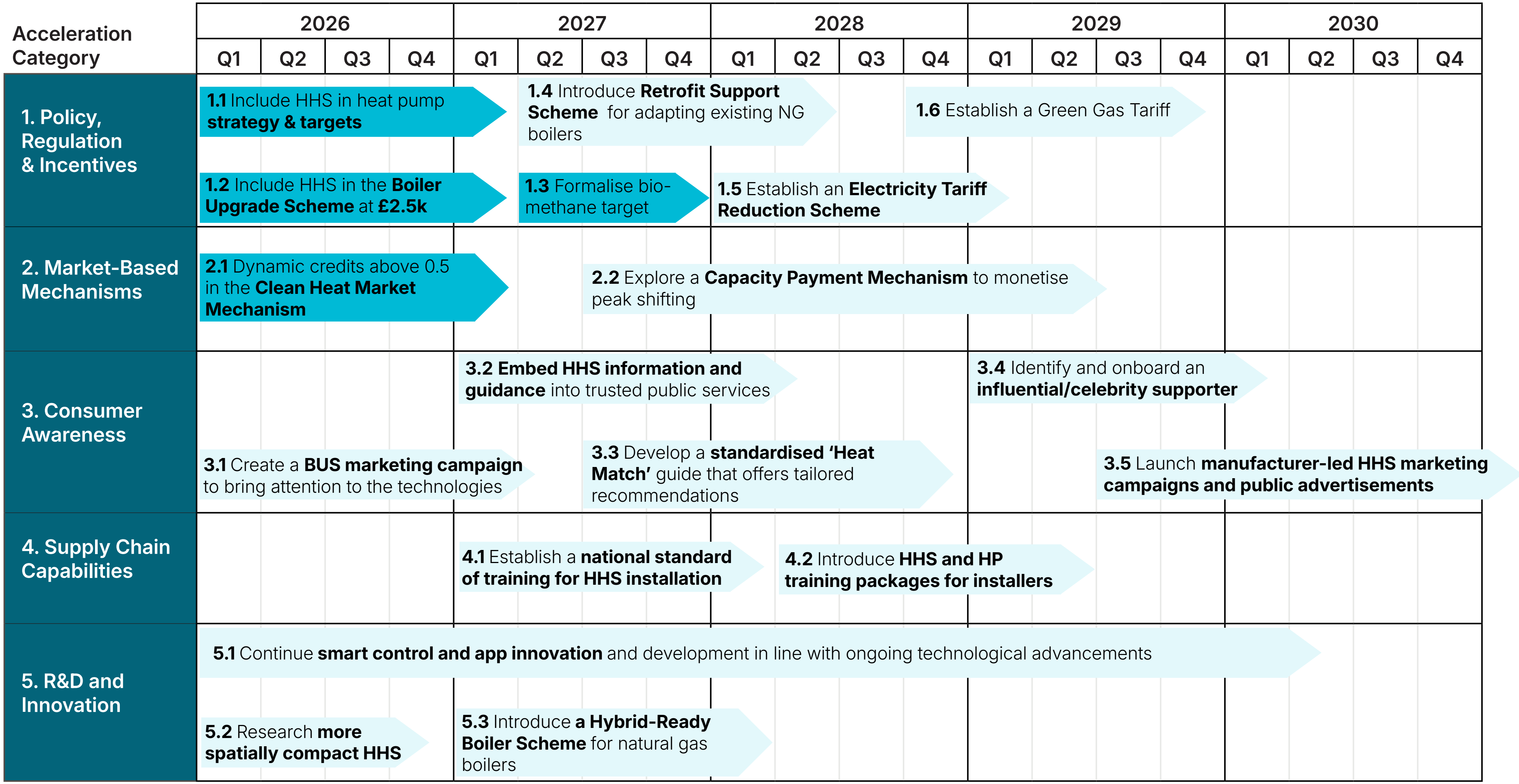


Figure 14: Heating Acceleration Roadmap 2030

Four of the 18 activities identified in the roadmap are critical to accelerating progress and are the basis for our recommendations to the Government. The success of all other activities hinges on the execution of these as they could immediately unlock adoption by directly addressing key barriers faced by the HHS market.

01.

Include hybrid heating systems explicitly in the national strategy for domestic heat decarbonisation and annual heat pump targets.

02.

Make hybrid heating systems eligible for grant subsidy support under the Boiler Upgrade Scheme and Home Energy Scotland.

03.

Introduce dynamic supplier credits for hybrid heating systems above the 0.5 baseline in the Clean Heat Market Mechanism to award credits proportionally to emissions saved.

04.

Formalise a biomethane production target to estimulate investment in biomethane production.

Detailed Recommendations & Actions

The policy recommendations outlined in this report are grounded **in independent analysis**, a comprehensive review of existing literature, **trial-based evidence, engagement with the heat pump industry, and insights drawn from international case studies** involving countries with comparable housing stock.

The four critical recommendations are detailed in the following pages, each with:

- A **summary** of the recommendation
- The key **underlying rationale**
- **Clear, actionable steps** to advance implementation and unlock both consumer and system-wide benefits.

These four recommendations act as the foundation of the 2030 roadmap and have an amplifying impact of the remaining 14 activities, category by category:

1. POLICY, REGULATION AND INCENTIVES

The roadmap envisions 2026 as a pivotal year, with HHS formalised into the national heating strategy, heat pump targets, and granted consumer incentives through the BUS.

In 2027, a Retrofit Support Scheme (Activity 1.4) could be introduced to offer support to consumers to retrofit existing natural gas boilers with a heat pump. This would not only assist those actively seeking to upgrade their heating systems but also help incentivise households that were not yet planning to replace their gas boiler, or had recently installed a new one, to consider an earlier transition toward low-carbon heating. This could intially form a targeted trial before becoming accessible to the wider public.

In Wales, the Welsh Government offers support to social landlords in accelerating decarbonisation through the Optimised Retrofit Programme. HHS could be championed within this framework to unlock benefits for Wales.

Beyond 2027, different mechanisms could continue to accelerate the adoption of low-carbon heating technologies without prescribing specific technologies. In 2028 and 2029, innovative energy tariffs designs could be explored to further accelerate decarbonisation efforts, for example, through an Electricity Tariff Reduction Scheme and a Green Gas Tariff (Activities 1.5 & 1.6). Such tariff schemes would work by adjusting the cost of energy to encourage the use of low-carbon heating.

The Electricity Tariff Reduction Scheme could offer lower electricity rates during periods of high renewable generation or high peak demand, reducing emissions and easing pressure on the grid. Meanwhile, a Green Gas Tariff could provide consumers with access to certified low-carbon gas at competitive prices, helping to reduce emissions from heating systems that still rely partially or fully on gas.

2. MARKET-BASED MECHANISMS

In parallel with policy and consumer incentive support, the roadmap identifies 2026 as a critical year for advancing market-based mechanisms. As HHS are formalised within the national heating strategy, suppliers should be actively encouraged to support their deployment. This could be achieved through evolving the existing supplier obligations embedded in the Clean Heat Market Mechanism. Activity 2.1 prescribes an approach to offer enhanced accreditation for HHS installations beyond the current 0.5 baseline, scaling dynamically based on verified reductions in natural gas consumption.

Beyond 2027, to further incentivise consumer behaviours that support grid flexibility, such as peak shifting, a Capacity Payment Mechanism (Activity 2.2) could be introduced. This mechanism would reward households that reduce demand during peak periods or shift usage of their heat pump to off-peak times, helping to stabilise the grid and return system-level benefits directly to consumers.

3. CONSUMER AWARENESS

To maintain consumer choice and maximise the benefits of low-carbon heating, it is essential to raise awareness of all available heating technologies. Today, public understanding of HHS remains limited. Once the Government takes initial steps, marketing campaigns can build momentum – starting with a BUS push to familiarise consumers with different types of heat pumps and the support available, followed by embedding HHS into trusted public advisory platforms such as Citizens' Advice and government portals.

By mid-2027, the roadmap proposes the launch of a standardised digital 'Heat Match' tool (Activity 3.3), designed to recommend the most suitable heating technology for each household. This tool could consider factors such as energy usage patterns, consumer preferences, property characteristics, and local infrastructure. By offering tailored, data-driven recommendations, the tool could empower consumers to make confident, informed choices, reducing decision-making complexity, increasing uptake of appropriate technologies, and helping to ensure that installations deliver both cost savings and carbon reductions.

By 2029, as demand for HHS grows and market competition intensifies, manufacturers can further amplify awareness through direct advertising, supported by influencer marketing, to reach a broader and more diverse consumer base.

4. SUPPLY CHAIN CAPABILITIES

Despite potential future policy support for HHS, their deployment could still be limited by the same supply chain challenges affecting the heat pump market today. Additional financial support and policy recognition could unlock investment in workforce and manufacturing development and training.

The roadmap suggests a national HHS installation standard could be established in 2027 (Activity 4.1). This would lay the foundation for the rollout of dedicated training programmes, delivered through colleges and installer certification schemes, from 2028 onwards (Activity 4.2). These programmes would equip the workforce with the necessary hybrid installation skills, enabling the rapid scaling of a GB-based HHS market and reducing reliance on overseas supply chains.

5. R&D AND INNOVATION

Research and innovation can also benefit from increased investment, particularly in the development of more compact HHS with advanced smart controls and user-friendly apps to enhance consumer appeal from 2026. As demand and awareness grow, the roadmap proposes the introduction of a Hybrid-Ready Boiler Scheme from 2027 (Activity 5.3).

Modelled on the concept of 'hydrogen-ready' boiler accreditation, this scheme would certify all new natural gas boilers that are designed for seamless integration with heat pumps and smart control systems. By mandating that all new gas boilers are 'hybrid ready', the scheme would streamline future retrofits ahead of the Retrofit Support Scheme (Activity 1.3) and reduce installation costs further. Crucially, this would also prevent new gas boiler installations from locking households into fossil fuel use for the next ~15 years, ensuring that today's decisions remain compatible with a decarbonised future.

DESNZ is consulting on its Smart Secure Electricity Systems (SSES) Programme, designed to create technical and regulatory frameworks to enable flexibility from consumer products, such as heat pumps. The Hybrid-Ready Boiler Scheme can work with the SSES to support consumers in making energy bill savings. To align with SSES timelines and provide the greatest consumer benefit, it is advised DESNZ mandate smart controls in the Hybrid-Ready Boiler Scheme.

Heating Acceleration Roadmap 2030: A Call to Action

Taken together, the roadmap illustrates a clear sequence; policy and market changes will drive consumer appeal, supply chain capabilities, and innovation in the market.

With the rollout of electric heat pumps progressing more slowly than anticipated, HHS present a valuable opportunity to help close the carbon budget gap. The compatibility and familiarity of HHS with existing heating systems, lower upfront costs compared to electric heat pumps, minimal disruption upon installation, cost-effectiveness, and reduced impact on peak electricity demand, make them well-suited for wide-scale deployment, provided that supportive policy and market mechanisms are in place.

Importantly, HHS can deliver immediate reductions in carbon emissions to support decarbonisation today. HHS can avoid – what may otherwise become – an unmanageable scale-up in low-carbon heating in the 2040s. At the same time, HHS also offer a pathway to full decarbonisation towards 2050, with the option for the remaining gas demand to be met by green gases such as biomethane.

This report's four core recommendations to the Government build on these irrefutable benefits and draw on international best practice and engagement with key players across the heating market. Collectively, these recommendations can provide consumers the awareness and financial incentive needed to retrofit or upgrade their gas boilers, whilst simultaneously giving the supply chain the confidence to invest and innovate.

Include hybrid heating systems explicitly in the national strategy for domestic heat decarbonisation and annual heat pump targets.

The inclusion of hybrid heating systems in the national heat pump strategy and associated annual deployment targets is a crucial step that must come first to realise their potential. Hybrids represent a consumer-first approach to decarbonisation: they are easy and undisruptive to install, reduce energy bills, provide familiarity to consumers in the face of change, offer immediate emissions reductions, and make the transition away from fossil fuels more practical and affordable. Recognising hybrids at a national policy level is therefore essential to not only ensure fairness and choice to consumers, but to provide industry with the certainty to invest and innovate in the market.

The **actions** required from the Government include:

01.

Consult with heating technology manufacturers and installers, public representative bodies, and energy networks on the inclusion of hybrid heating systems in national heat pump policy.

02.

Publish a Government position recognising hybrid heating systems as a contributor to addressing the nation's heating decarbonisation challenge.

03.

Expand annual heat pump deployment targets to include hybrid heating systems within the overall ambition and define a **specific target** for hybrids.

With hybrids currently at <1% of heat pump sales but with potential estimated at 40% of homes, a moderate target could be set at 20% of the current heat pump target: **120,000/year by 2028.**

Despite progress, current deployment levels suggest the target of 600,000 annual heat pump installations by 2028 will not be achieved. **Each year, around 1.7 million new natural gas boilers are installed nationally**, locking in carbon-intensive heating for decades to come. Crucially, the counterfactual to hybrid installations is not a heat pump installation, but a natural gas boiler.

By positioning hybrids alongside heat pumps, DESNZ can accelerate progress towards targets, reduce emissions, and empower consumers to make the clean energy transition in a way that works for them.

Make hybrid heating systems eligible for grant subsidy support under the Boiler Upgrade Scheme and Home Energy Scotland.

Adapting the Boiler Upgrade Scheme to include hybrid heating systems is a straightforward but high impact intervention. Although UK trials have found hybrid heating systems to reduce heating bills by up to 16% compared to a traditional natural gas boiler, hybrids are currently more expensive upfront. Following extensive engagement with the market, it is recommended that DESNZ include hybrid heating systems in the scheme, potentially at £2,500, to cover the difference between purchasing a new natural gas boiler and installing a hybrid. **This means that for the same amount of public spending, the grant could support three hybrid heating systems for every one electric heat pump*, achieving greater net decarbonisation and faster displacement of natural gas boilers across the housing stock.**

Consumers typically only upgrade their heating when a gas boiler fails, usually with another boiler. Hybrid systems can break this cycle by retrofitting a heat pump to an existing boiler, leveraging grant support to deliver immediate carbon savings even if the boiler still has years of life left.

Supporting hybrid heating systems **does not introduce additional steps** if a household later switches to full electrification, as the boiler component can be easily removed.

The **actions** required from the Government include:

01.

Consult with heating technology manufacturers and installers on the optimal level of grant support to be made available for hybrid heating systems.

02.

Amend the Boiler Upgrade Scheme and Home Energy Scotland criteria to include hybrids as an eligible technology.

03.

Introduce a £2,500 subsidy grant for hybrid heating systems.

04.

Publish clear eligibility and installation guidance, highlighting the benefits of the technology.

Including hybrid heating systems opens up the subsidy support to **'difficult-to-electrify' households**. It also increases consumer awareness of hybrid heating systems, potentially appealing to those who may be against a full heat pump option and familiarising a larger proportion of the population with low-carbon heating technologies.

"Hybrid heating systems have the ability to lower bills for consumers, even those on gas, while reducing the disruption and behavioural changes associated with heat pump only solutions. As such, they cannot be ignored and should be part of our armoury in the fight against climate change."

Mike Foster, CEO

Energy and Utilities Alliance,
Heating and Hotwater Industry Council (HHIC)

*BUS supports heat pump installation with £7,500.

Introduce dynamic supplier credits for hybrid heating systems above the 0.5 baseline in the Clean Heat Market Mechanism.

The current policy landscape is conflicted, with the Clean Heat Market Mechanism recognising and rewarding hybrids but other key policy such as the Boiler Upgrade Scheme explicitly excluding them. The Clean Heat Market Mechanism is designed to drive the uptake of low-carbon heating technologies by obligating suppliers to meet annual installation quotas. Hybrid heating systems are already recognised in the mechanism, but only as **0.5 credits**, implying they are 'half as clean' as a electric heat pump, which are awarded full credits. This conflicts with field evidence; trials have demonstrated that hybrids can achieve up to 75% reduction in carbon emissions compared to natural gas boilers. Our analysis shows this can increase to 90% when the hybrid runs on biomethane, with the potential to reach 100% as green gases are injected into the grid.

By transitioning to a dynamic crediting system above the 0.5 baseline credit, DESNZ and Ofgem can ensure the mechanism rewards hybrid heating systems in proportion to their proven performance. For example, this would mean that a hybrid heating system with a demonstrated 75% reduction in carbon emissions is awarded 0.75 credits.

The **actions** required from the Government include:

01.

Consult with heating technology suppliers and hybrid manufacturers to gather input on the feasibility, design, and implementation of dynamic crediting within the Clean Heat Market Mechanism.

02.

Amend the Clean Heat Market Mechanism to introduce dynamic crediting for hybrid heating systems, with credits awarded proportionally to proven natural gas savings.

03.

Publish national guidance for how savings will be measured and verified.

Such a change will likely unlock wider system benefits by encouraging suppliers to invest in hybrid installation training and incentivising manufacturers to bring production capabilities to GB, creating opportunities for British workers and businesses. At present, **two-thirds of heat pumps** installed in the UK are manufactured abroad.

Formalise a biomethane production target to estimulate investment in biomethane production.

Creating a market for increased green gas injection to the grid can facilitate hybrid heating systems' transition to a net zero compliant heating option that brings cost savings, familiarity, and minimal disruption to consumers. Much like electric heat pumps, which will only be net zero compliant once power is fully decarbonised, hybrids also provide a pathway to full heating decarbonisation. However, to unlock this future solution for consumers, the Government must create a market for producers to support decarbonisation of the gas grid through the formalisation of a biomethane production target, similar to that created for hydrogen via the UK Hydrogen Strategy.

The **Green Gas Taskforce**, an industry-led coalition between ten of the UK's largest biomethane generators, shippers, and traders, all five British gas networks, and key industry groups, published a recent paper concluding that there is sufficient sustainable feedstock for Britain to produce up to **120TWh of biomethane by 2050**. This level of biomethane production can be achieved without impacting food production or availability on sectors such as aviation and is already being achieved in international markets like Denmark, where 40% of total gas supply was sourced from domestic biomethane in 2023.

By formalising a British biomethane production target, the Government would provide investors and green gas producers with the impetus to scale-up, enabling a decarbonised gas grid and simultaneously reducing reliance on imported gas.

The **actions** required from the Government include:

01.

Consult with industry experts and biomethane producers to align on achievable and sustainable targets for British biomethane production.

02.

Define a statutory biomethane production target, potentially for 2035 and for 2050.

03.

Align support mechanisms and regulatory frameworks (e.g. the Green Gas Support Scheme, guarantees of origin, a potential future Green Gas Tariff) to unlock investment and expedite green gas deployment.

JURISDICTION	PRODUCTION TARGET?
FRANCE	✓
ITALY	✓
DENMARK	✓
IRELAND	✓

The Green Gas Taskforce recently stated they "consider a production target of 20TWh by 2035 to be low-regrets" for Britain, aligning with biomethane production targets in comparable EU jurisdictions.

06. Appendix

APPENDIX A: DESCRIPTION OF ACTIVITIES IN ACCELERATION ROADMAP 2030

ACCELERATION CATEGORY	ACTIVITY	RECOMMENDATION	OWNER	START
Policy, Regulation and Incentives	**Heat Pump Strategy and Targets**	Include HHS in the national heat pump strategy, Heat Pump Investment Roadmap, and associated heat pump targets. This will enable HHS to contribute to the annual installation target of 1 million heat pumps by 2030.	DESNZ	Q1 2026
	Boiler Upgrade Scheme £2.5k Grant	Include HHS in the Boiler Upgrade Scheme by offering £2.5k in subsidy grant support for consumers installing HHS, opposed to the £7.5k offered for electric heat pumps.	DESNZ	Q1 2026
	Retrofit Support Loan Scheme	Introduce a Retrofit Support Scheme to offer targeted financial support for consumers retrofitting existing natural gas boilers. A loan will cover consumers in adapting their current heating technology to install the heat pump component. The loan may be paid back through energy bill savings over a set amount of time, with varying interest depending on household income.	DESNZ	Q3 2027
	Electricity Tariff Reduction Scheme	Introduce a Retrofit Support Scheme to offer targeted financial support for consumers retrofitting existing natural gas boilers. A loan will cover consumers in adapting their current heating technology to install the heat pump component. The loan may be paid back through energy bill savings over a set amount of time, with varying interest depending on household income.	DESNZ and Ofgem	Q1 2028
	Green Gas Tariff	Establish a scheme that offers reductions in electricity tariffs for consumers with installed heat pumps and HHS to bring the grid benefit of such flexibility technologies back to the consumer.	DESNZ and Ofgem	Q4 2028
Market-Based Mechanisms	**Dynamic Credits in the Clean Heat Market Mechanism**	Revise the Clean Heat Market Mecha-nism to award dynamic credits above the current 0.5 baseline for HHS. For example, systems demonstrating a 75% reduction in natural gas consumption would receive 0.75 credits, with proportional increases applied accordingly.	DESNZ	Q1 2026
	Capacity Payment Mechanism	Explore mechanisms to monetise the peak-shifting capability of heat pumps and HHS, recognising their ability to reduce grid demand at critical times. This would reward consumers for the system flexibility they provide in reducing peak demand and deferring costly grid reinforcements, in line with the 2025 Clean Flexibility Roadmap.	Ofgem	Q3 2027

ACCELERATION CATEGORY	ACTIVITY	RECOMMENDATION	OWNER	START
Consumer Awareness	**BUS Marketing Campaign**	Develop consumer-facing advertisement and marketing on the BUS to bring attention to the technologies offered under the scheme, highlighting the subsidy support offered and potential energy bill savings.	DESNZ	Q2 2026
	HHS Information and Guidance	Embed information and guidance on HHS and low-carbon heating technology options into trusted consumer-facing platforms such as Local Authority publications, Energy Saving Trust, Citizens Advice, and government portals. This will require proactive engagement from the NESO with the organising bodies and Local Authorities on the benefits of HHS and how to help households make informed decisions about their heating.	NESO	Q1 2027
	Standardised 'Heat Match' Guide	Develop a standardised Heat Match guide that provides consumers with tailored recommendations on the most suitable heating technology for their home, based on property characteristics, energy usage, and regional infrastructure.	Ofgem	Q3 2026
	Influencer Marketing	Identify and onboard an influencer or celebrity to be a public advocate and voice for HHS, preferably having the technology installed themselves.	Manufacturers	Q1 2029
	HHS Marketing Campaigns	Launch marketing campaigns for the HHS technology types created and developed by manufacturers. This will be a natural result of increased uptake from conducting previous acceleration activities.	Manufacturers	Q3 2029
Supply Chain Capabilities	**National Training Standard**	Establish a national standard of training for HHS installation to ensure consistent quality and consumer confidence. This should include a clear safety case outline, and specifics for both retrofit and new installation.	Energy & Utilities Skills; HHIC	Q1 2027
	Heat Pump Training Packages	Develop tailored training packages for heat pumps, including HHS, for installers to upskill the workforce in low-carbon heating technologies. These should be implemented during apprenticeships, college programs, and routine training.	Training providers; manufacturers	Q2 2028
R&D and Innovation	**Smart Control Innovation**	Drive continuous innovation in smart controls and consumer app development to optimise HHS performance and user experiences.	Technology Developers; Manufacturers	Ongoing
	Spatially Compact HHS	Innovate towards more spatially compact HHS with reduced noise to increase attractiveness to consumers.	Manufacturers	Q1 2026
	Hybrid-Ready Boiler Scheme	Introduce a Hybrid-Ready Boiler Scheme that certifies natural gas boilers capable of easy integration with heat pumps and smart controls. This effort should enforce all new natural gas boilers to be made 'hybrid ready.'	Manufacturers; DESNZ	Q1 2027

APPENDIX B: KEY MODELLING INPUTS AND SOURCES

Figure 11: Technology costs

TECHNOLOGY COSTS	AMOUNT	UNIT	SOURCE
System level (incl. installation)			
HHS (with natural gas boiler) (CAPEX) - 1-2 bed	7,500	£	Cost of Domestic and Commercial Appliances - Eunomia
HHS (with green gas boiler) (CAPEX) - same as NG		£	Cost of Domestic and Commercial Appliances - Eunomia
HHS (with natural gas boiler) (CAPEX) - 3-4 bed	10,600	£	Cost of Domestic and Commercial Appliances - Eunomia
HHS (with natural gas boiler) (CAPEX) - 5-6 bed	14,000	£	Cost of Domestic and Commercial Appliances - Eunomia
HHS (without natural gas boiler) (CAPEX) - 1-2 bed	6,000	£	Cost of Domestic and Commercial Appliances - Eunomia
HHS (without green gas boiler) (CAPEX) - same as NG		£	Cost of Domestic and Commercial Appliances - Eunomia
HHS (without natural gas boiler) (CAPEX) - 3-4 bed	8,300	£	Cost of Domestic and Commercial Appliances - Eunomia
HHS (without natural gas boiler) (CAPEX) - 5-6 bed	10,800	£	Cost of Domestic and Commercial Appliances - Eunomia
Heat Pump (CAPEX) 1-2 bed	8,000	£	Cost of Domestic and Commercial Appliances - Eunomia
Heat Pump (CAPEX) 3-4 bed	12,100	£	Cost of Domestic and Commercial Appliances - Eunomia
Heat Pump (CAPEX) 5-6 bed	16,700	£	Cost of Domestic and Commercial Appliances - Eunomia
High Temp Heat Pump (CAPEX) 1-2 bed	7,800	£	Cost of Domestic and Commercial Appliances - Eunomia
High Temp Heat Pump (CAPEX) 3-4 bed	11,600	£	Cost of Domestic and Commercial Appliances - Eunomia
High Temp Heat Pump (CAPEX) 5-6 bed	16,000	£	Cost of Domestic and Commercial Appliances - Eunomia
Green Gas Boiler (CAPEX) 1-2 bed	2,200	£	Cost of Domestic and Commercial Appliances - Eunomia
Green Gas Boiler (CAPEX) 3-4 bed	2,500	£	Cost of Domestic and Commercial Appliances - Eunomia
Green Gas Boiler (CAPEX) 5-6 bed	2,900	£	Cost of Domestic and Commercial Appliances - Eunomia
Natural Gas Boiler (CAPEX) 1-2 bed	2,200	£	Cost of Domestic and Commercial Appliances - Eunomia
Natural Gas Boiler (CAPEX) 3-4 bed	2,500	£	Cost of Domestic and Commercial Appliances - Eunomia
Natural Gas Boiler (CAPEX) 5-6 bed	2,900	£	Cost of Domestic and Commercial Appliances - Eunomia

Figure 12: Fuel costs

FUEL COSTS (FOR CONSUMERS)	AMOUNT	UNIT	SOURCE
Electricity from the grid	0.25	£/kWh	Changes to energy price cap between 1 July and 30 September 2025 | Ofgem
Natural Gas	0.06	£/kWh	Changes to energy price cap between 1 July and 30 September 2025 | Ofgem
Biomethane - estimated 3 pence premium (compared to NG)	0.09	£/kWh	Quarterly Energy Prices: June 2025 - GOV.UK

Figure 13: Emission factors

EMISSION FACTORS	AMOUNT	UNIT	SOURCE
Grid emission factor (2025)	171	gCO_2e per kWh	FES 2025 - NESO
Grid emission factor (2030) - FES 2025 Pathway to 2030	50	gCO_2e per kWh	FES 2025 - NESO
Natural Gas	183	gCO_2e per kWh	DESNZ
Biomethane	22	gCO_2e per kWh	FES 2025 - NESO

Figure 14: Equipment sizing

EQUIPMENT SIZING	AMOUNT	UNIT	SOURCE
Natural Gas Boiler – Semi Detached	24	kW	DESNZ
Biogas (Biomethane) Boiler – Semi Detached	24	kW	DESNZ
Heat Pump – Semi Detached	10	kW	DESNZ
HHS (Natural Gas) – Semi Detached	16	kW	DESNZ
HHS (Biomethane) – Semi Detached	16	kW	DESNZ
Natural Gas Boiler – Terraced	22	kW	DESNZ
Biogas (Biomethane) Boiler – Terraced	22	kW	DESNZ
Heat Pump – Terraced	8	kW	DESNZ
HHS (Natural Gas) – Terraced	13	kW	DESNZ
HHS (Biomethane) – Terraced	13	kW	DESNZ
Natural Gas Boiler – Detached	30	kW	DESNZ
Biogas (Biomethane) Boiler – Detached	30	kW	DESNZ
Heat Pump – Detached	14	kW	DESNZ

EQUIPMENT SIZING	AMOUNT	UNIT	SOURCE
HHS (Natural Gas) – Detached	20	kW	DESNZ
HHS (Biomethane) – Detached	20	kW	DESNZ
Natural Gas Boiler – Flats	18	kW	DESNZ
Biogas (Biomethane) Boiler – Flats	18	kW	DESNZ
Heat Pump – Flats	5	kW	DESNZ
HHS (Natural Gas) – Flats	8	kW	DESNZ
HHS (Biomethane) – Flats	8	kW	DESNZ

Figure 15: Coefficient of performance

COEFFICIENT OF PERFORMANCE FOR EACH HEATING SYSTEM FOR EACH BUILDING TYPE (I.E 1 KWH ELECTRICITY → X KWH HEAT) AT EPC D	AMOUNT	UNIT	SOURCE
High Temp Heat Pump	2.00	N/A	Heat Pump Ready | The Carbon Trust
HHS (with green gas boiler) - assume to be the same as for NG	2.43	N/A	Heat Pump Ready | The Carbon Trust
HHS (with natural gas boiler)	2.43	N/A	Heat Pump Ready | The Carbon Trust
Heat Pump	3.00	N/A	Heat Pump Ready | The Carbon Trust
Green Gas boiler - assume to be the same as for NG	0.90	N/A	Heat Pump Ready | The Carbon Trust
Narural Gas boiler	0.90	N/A	Heat Pump Ready | The Carbon Trust

Figure 16: Additional Assumptions

ADDITIONAL ASSUMPTIONS	AMOUNT	UNIT
Calculation Period	30	years
Discount rate	3.5	%
Energy price increase - moderate pricing according to FES 2025, assuming 0%	0	%
Lifetimes		
Floor	50	years
Wall	40	years
Roof	40	years
Windows	31	years
HHS	15	years
Heat Pump	15	years
Green Gas Boiler	15	years
Natural Gas Boiler	15	years
Coefficient of performance for each heating system for each building type (i.e 1 kWh electricity → x kWh heat) at EPC D		
High Temp Heat Pump	2.00	N/A
HHS (with green gas boiler) - assume to be the same as for NG	2.43	N/A
HHS (with natural gas boiler)	2.43	N/A
Heat Pump	3.00	N/A
Green Gas boiler - assume to be the same as for NG	0.90	N/A
Natural Gas boiler	0.90	N/A

Guidehouse

Thank You