Heat Batteries for Central Heating

November 2025

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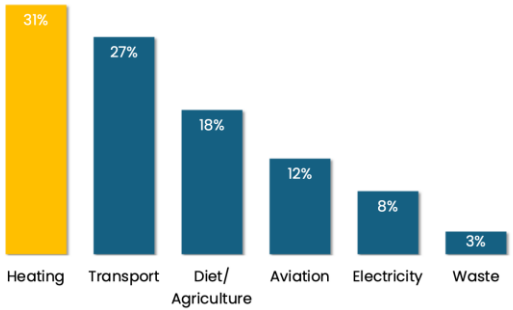
The Problem of Domestic Heat

Domestic heating is the single biggest challenge left in the UK's Net Zero transition

Heating is the largest component of UK household emissions…

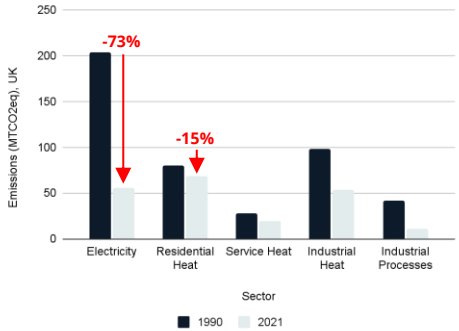
- Heating of domestic properties is responsible for ~18% of UK carbon emissions
- Heating accounts for 31% of the emissions



Breakdown of CO_2 emissions per household
UK Average
Source: Energy Savings Trust & DESNZ

…and has seen little change in over 30 years…

- Since 1990, emissions from residential heat have reduced only 15%!
- Emissions from electricity are dropping rapidly - we need to electrify heating



Emissions Reduction by Sector
UK
Source: FES Data Workbook 2023

…but has become the next big growth area.

- Government is committed to stimulating the market for clean heat
- *"Working families to get greater choice on upgrades to their home's heating including new products, such as air-to-air heat pumps and heat batteries, as well as offering new heat pump purchase options…" – DESNZ 2025*


2021 Heat and Buildings Strategy


2024 A Technology Agnostic Approach to Heat & Buildings Policy


2024 Clean Power 2030: Action Plan


Apr 2025 DESNZ Boiler Upgrade Scheme consultation


Jun 2025 Progress in Reducing Emissions, CCC

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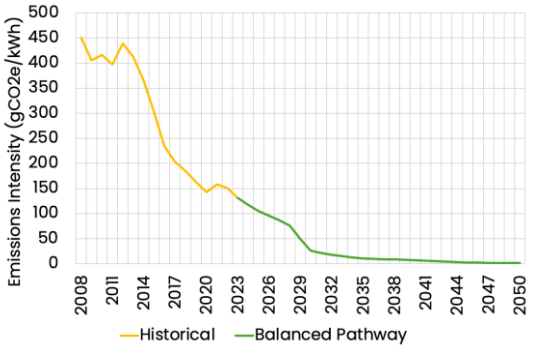
For millions of homes heat pumps aren't the right solution

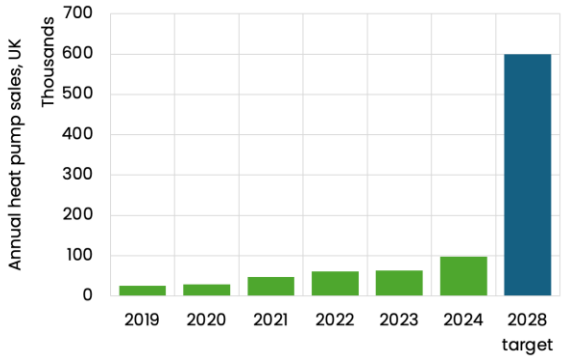
The electrification of heat is the way to decarbonise...

...but heat pumps are impractical or impossible for millions of homes...

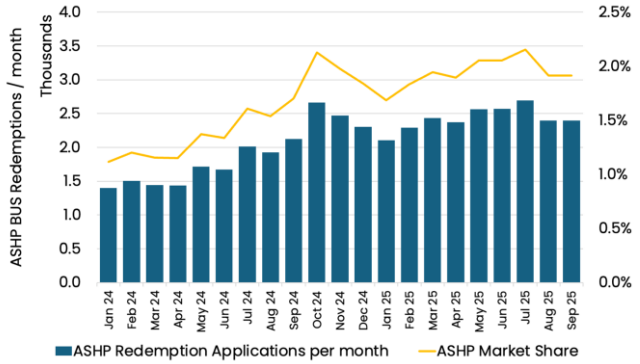
...and the government will need to support other technologies



Carbon Intensity of grid electricity
GB Electricity Grid
Source: Committee on Climate Change 7th Carbon Budget



Annual heat pump sales
UK
Source: Heat Pump Association

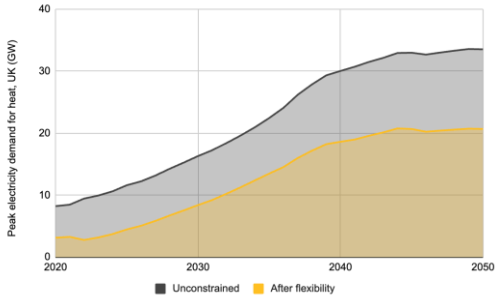


BUS Redemption Applications per Month
England & Wales
Source: Department for Energy Security & Net Zero

Flexibility is playing a critical role in reducing peak demand and supporting renewables

Flexibility will be the key to flattening peak demand...

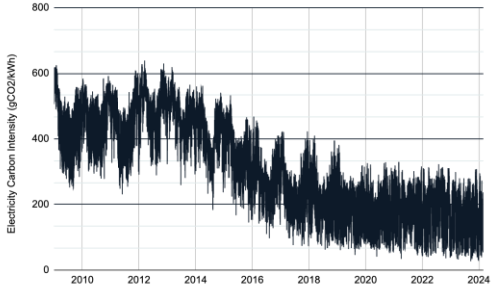
- Heat flexibility is expected to provide >10GW of flex by 2050
- Flexibility could save the UK over £16bn/year by 2050*



Peak Heating Demand Forecast
UK
Source: National Grid FES 2023 Data Workbook, Leading the way

...and smart products that provide flexibility...

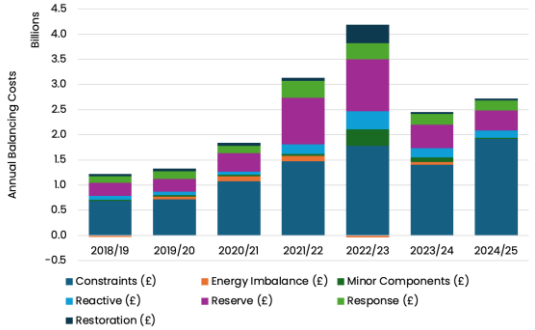
- Average carbon intensity of electricity was 124gCO_2/kWh in 2024
- Intraday volatility is now high throughout the year and increasing



Grid Carbon Intensity
GB
Source: National Grid 2023 Data Workbook, Carbon Intensity

...will increasingly be needed to balance the grid.

- Cost of GB system balancing continues to rise
- The trend will continue driven by electrification & growth in renewables



Annual Balancing Mechanism Cost (£bn)
GB
Source: NESO 2025 Report

What is a Heat Battery?

The ZEB is a smart heat battery: a plug-in replacement for a fossil fuel or electric boiler

The ZEB charges using off peak electricity, at up to 9kW power draw

It stores 40 kWh of energy as heat in our thermal core

The ZEB dispatches the stored energy at 30-80ºC flow temperatures

Installed by qualified heating engineer & electrician in 1-2 days

No changes to heating system (cylinder, radiators, pipework) or controls

ZEB-40R

Automatically charges when electricity is greenest & cheapest

Onboard controls & metering allow participation in flexibility markets

Customer control & insight via the tepeo App. Data processing & fleet management in AWS.

Peace of mind with a 10 year guarantee and the option our tepeo Care Plan

Low environmental impact materials & storage capacity that doesn't degrade

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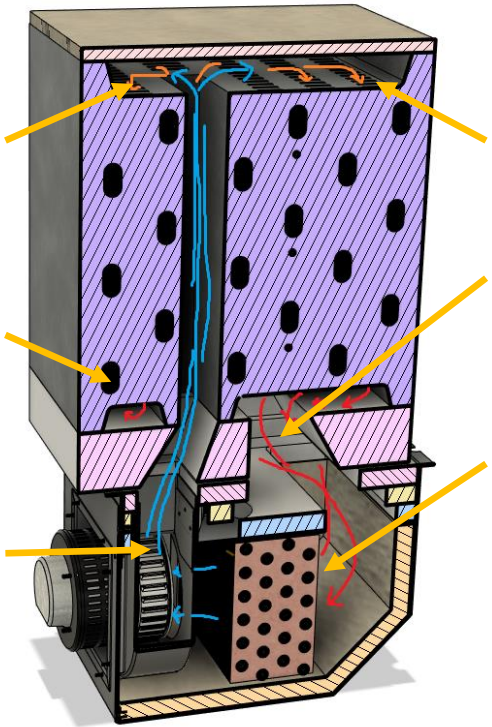
The ZEB stores off-peak energy as heat & releases it to the home just like a traditional boiler

3. The now ‘warm’ air spreads out in the top cavity of the core

2. Replaceable heating elements heat up the core to store off-peak electricity as heat

1. Fan blows cold air up the ‘chimney’ within the core



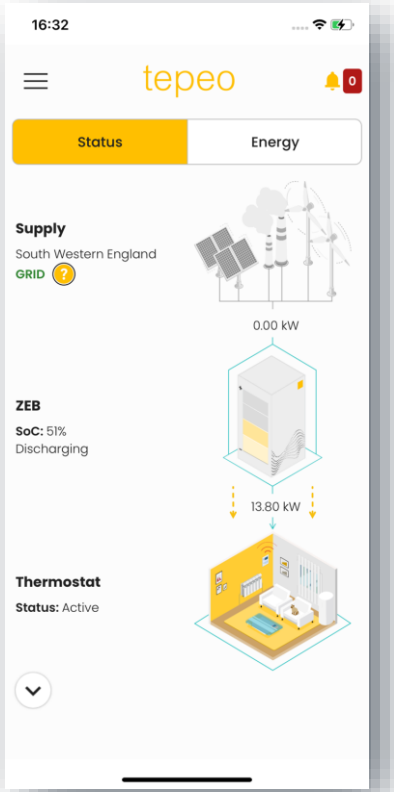
4. The ‘warm’ air distributes itself down through the ‘air tubes’ cast into the core

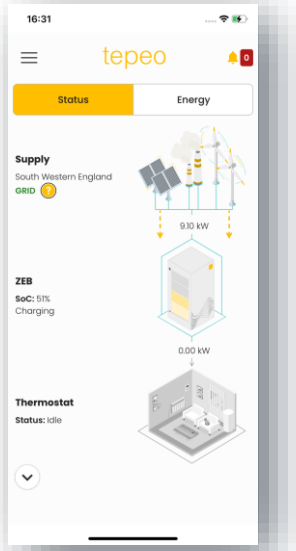
5. The now very hot air comes out and mixes again in the ‘hot cavity’ in the bottom of the core

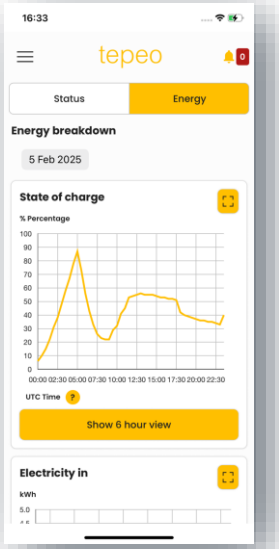
6. The hot air is forced through the heat exchanger, which has the plumbing pipes weaving back and forth through it, connected to the home heating system

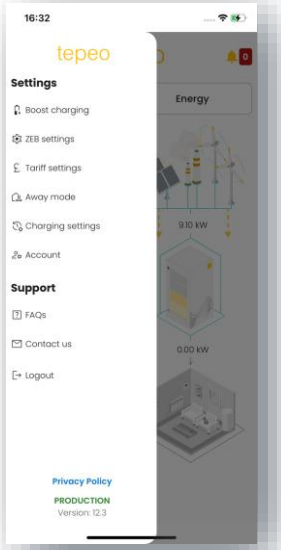
7. The air emerges cool again, for the cycle to repeat

The tepeo App









Our tepeo App and tepeoPRO installer apps give customers and installers control, insights & notifications about the ZEB.

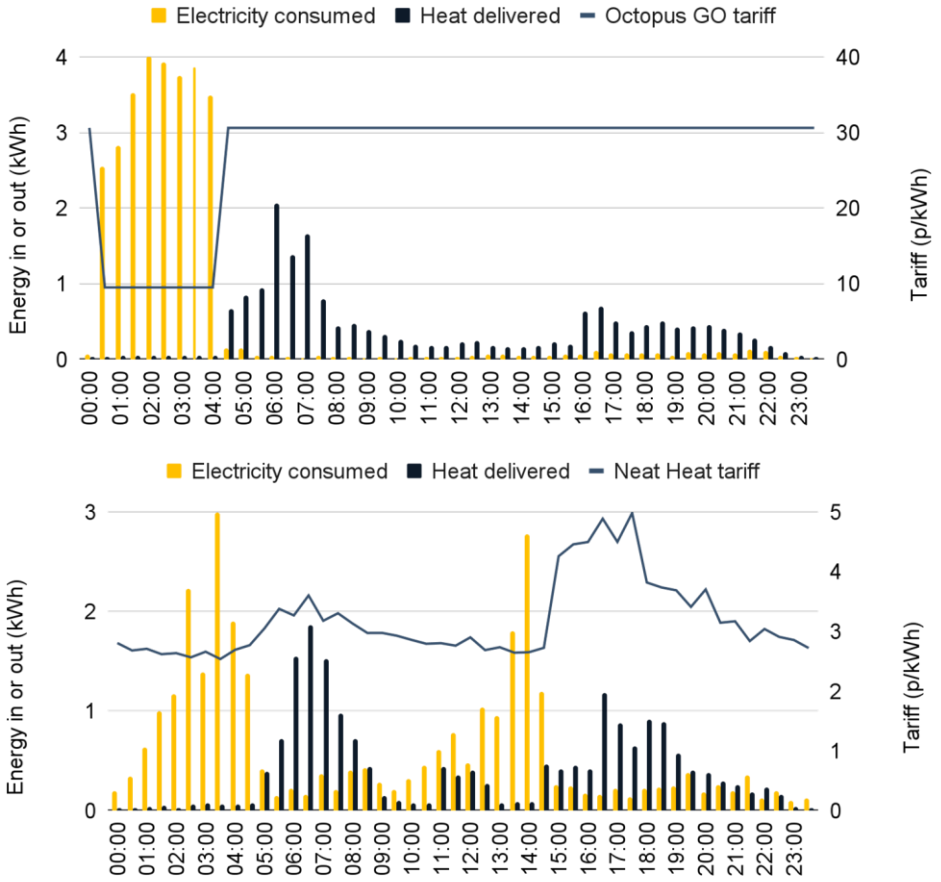
Our AWS system allows fleet-wide monitoring, DSR services and energy insights.

ZEBs use Machine Learning to maximise the value of storage

ZEBs use Machine Learning to create a bespoke view of half-hourly heating demand for each property based on local weather, historical heat demand data and other factors

Smart Charging then automatically charges the ZEB when cheapest & greenest. This uses tariff data and carbon intensity forecasts as price signals

>90% of ZEB electricity consumption is during off-peak hours for a typical 2-3 bed home



Data from more than 30 Customer ZEBs

Source: Management Analysis

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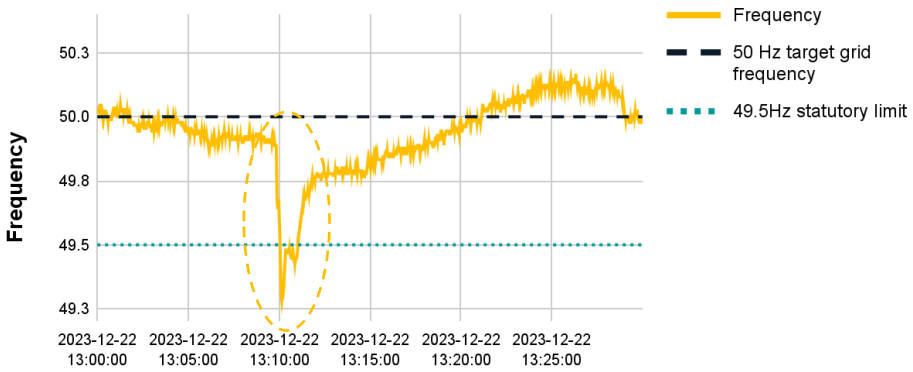
ZEBs monitor the grid and can help manage frequency and voltage for the network



ZEB Frequency event detection
GB National Grid
Source: ZEB detection of IFA Interconnector Fault on 22 December 2023

- ZEBs automatically adapt their electrical consumption, heat output and monitor grid frequency. Being a fixed appliance, they have very high availability compared with EVs and very high flexibility compared with all other domestic electric products.
- We are already working with several DNOs to showcase the value of flexibility to their network
- ZEBs will integrate with a variety of aggregators to provide access to flexibility markets.

Two routes to low cost, electrified heat

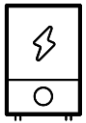
Huge efficiency

Take a flat rate for electricity: *25p/kWh*

Divide it by high efficiency: *3.0*

Achieve low cost per unit of heat: *~8p/kWh*

Huge flexibility



Use off-peak electricity (~90% pa): *~7p/kWh*

Top up at peak if needed (~10% pa): *~25p/kWh*

Achieve low cost per unit of heat: *~8p/kWh*

Heat Pumps and Heat Batteries deliver electrified heat with low running costs

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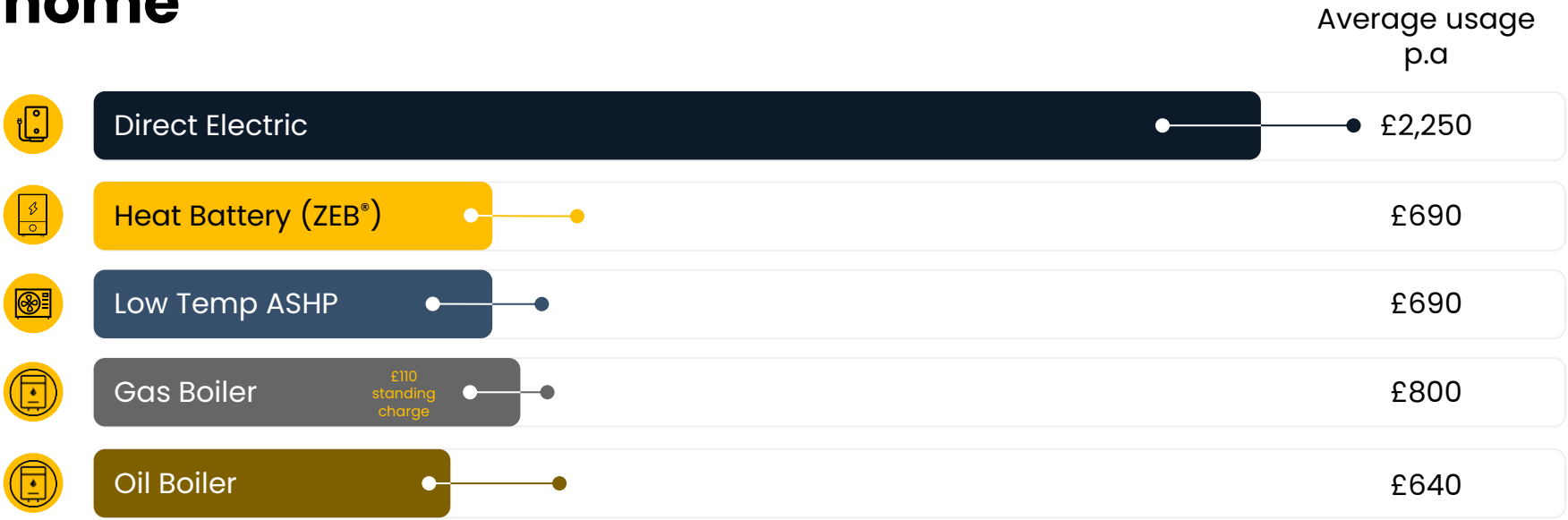
ZEB running costs & carbon emissions for a 2-3 bed home



The ZEB® is cost-comparable to both fossil fuel boilers and heat pumps

The ZEB would have saved 700 kgCO_2e vs a gas boiler in 2024

* Based on a property with 10,000 kWh annual fuel consumption. Gas boiler at 85% efficiency, with additional gas standing charge of £110/year. ASHP based on EoH CoP data based on external temperatures. ASHP optimised based on Octopus Cosy. ZEB based on Eon Next Drive.

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Upfront costs - typical installation

The ZEB saves ~£3,000 per install vs a heat pump - reducing / removing the need to replace radiators & pipework. Average heat pump installations through the Boiler Upgrade Scheme are about £12,000.

Savings could be higher in social housing where the average heat pump installation cost is £16,500**. Even with VAT at 20%, the ZEB is cheaper & less disruptive to install than a heat pump.

	Electric Boiler	Gas Boiler	Heat Battery Boiler	Air Source Heat Pump
Heat Source	£1,000	£1,200	£5,000	£4,000
Heating System Upgrades & Parts	£500	£500	£500	£2,000
Hot Water Store	£0	£0	£0	£2,000
Labour (# person days)	£1,500 (2)	£1,200 (1)	£1,500 (2)	£3,600 (8)
VAT	£600	£580	£1,400	£0
TOTAL	**~£3,600**	**~£3,480**	**~£8,400**	**~£11,600**
Running cost pa	*~£2,250*	*~£690*	*~£690*	*~£690*

* These costs are for a typical home with a functioning heating system & hot water cylinder. If the existing system is a combi / the hot water store is non-functional, ~£2-3k would be added to ZEB and Electric Boiler costs. It is assumed above that heat pumps require a cylinder replacement in all cases to accommodate lower flow temperatures and typical installation specifications.

** Social housing HP costs based on SHDF Wave 2.2 data

Heat pumps won't fit all homes. With the ZEB AND ASHPs we have solutions for >90% of homes.

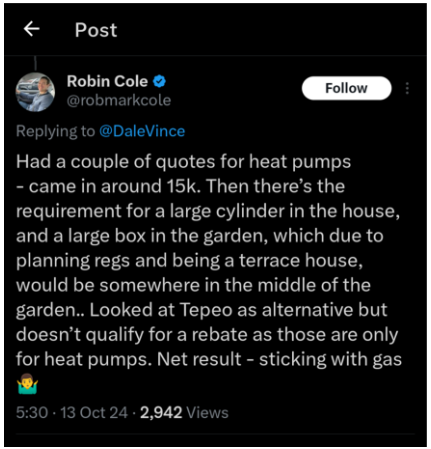
For 20-40% of homes, heat pumps may not be a viable or preferred route off fossil fuel heating. This is not because heat pumps "don't work in the UK" - it is simply an issue of space & hassle to customers. We need an alternative to decarbonise these homes.

Flats: 6.1m

Terraces: 6.9m

Semi-detached: 6.3m

Detached: 4.2m



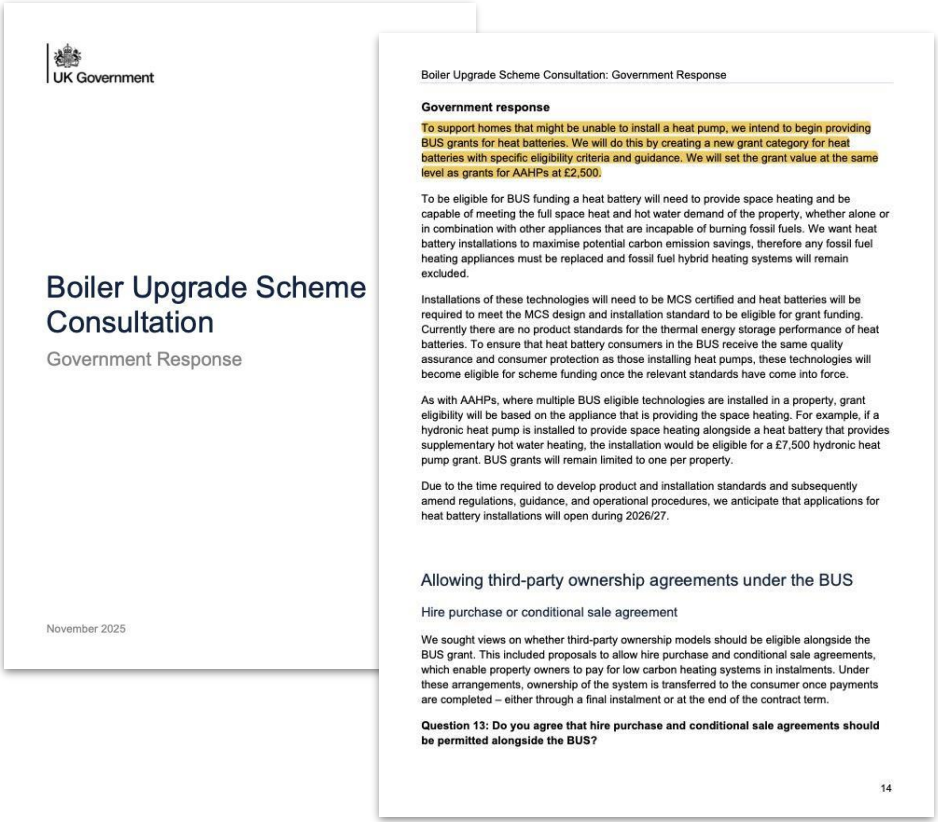
The ZEB is well-suited to smaller homes, or those with a modest heat loss (<5kW): flats, terraces, bungalows or hard-to-heat-pump homes… and customers are crying out for a solution now.

If they lack outside space, have significant heating system incompatibilities, require planning permission, or customers are simply put off by the 'difference' to a boiler, most providers are simply ending the customer journey.

Customers are being presented with a "heat pump or bust" binary and we are collectively failing to present alternatives.

Heat batteries will soon join the BUS subsidy scheme

- DESNZ has now acknowledged that heat pumps aren't suitable for every home
- On 18th November they announced they would be expanding the Boiler Upgrade Scheme to Heat Batteries for Central Heating applications with a £2,500 grant
- **Heat Batteries are now the only technology covered by MCS that still attracts VAT…**
- Electrification of domestic heating will be delivered by highly efficient heat pumps and highly flexible heat batteries



UK Government

Boiler Upgrade Scheme Consultation

Government Response

November 2025

Boiler Upgrade Scheme Consultation: Government Response

Government response

To support homes that might be unable to install a heat pump, we intend to begin providing BUS grants for heat batteries. We will do this by creating a new grant category for heat batteries with specific eligibility criteria and guidance. We will set the grant value at the same level as grants for AAHPs at £2,500.

To be eligible for BUS funding a heat battery will need to provide space heating and be capable of meeting the full space heat and hot water demand of the property, whether alone or in combination with other appliances that are incapable of burning fossil fuels. We want heat battery installations to maximise potential carbon emission savings, therefore any fossil fuel heating appliances must be replaced and fossil fuel hybrid heating systems will remain excluded.

Installations of these technologies will need to be MCS certified and heat batteries will be required to meet the MCS design and installation standard to be eligible for grant funding. Currently there are no product standards for the thermal energy storage performance of heat batteries. To ensure that heat battery consumers in the BUS receive the same quality assurance and consumer protection as those installing heat pumps, these technologies will become eligible for scheme funding once the relevant standards have come into force.

As with AAHPs, where multiple BUS eligible technologies are installed in a property, grant eligibility will be based on the appliance that is providing the space heating. For example, if a hydronic heat pump is installed to provide space heating alongside a heat battery that provides supplementary hot water heating, the installation would be eligible for a £7,500 hydronic heat pump grant. BUS grants will remain limited to one per property.

Due to the time required to develop product and installation standards and subsequently amend regulations, guidance, and operational procedures, we anticipate that applications for heat battery installations will open during 2026/27.

Allowing third-party ownership agreements under the BUS

Hire purchase or conditional sale agreement

We sought views on whether third-party ownership models should be eligible alongside the BUS grant. This included proposals to allow hire purchase and conditional sale agreements, which enable property owners to pay for low carbon heating systems in instalments. Under these arrangements, ownership of the system is transferred to the consumer once payments are completed – either through a final instalment or at the end of the contract term.

Question 13: Do you agree that hire purchase and conditional sale agreements should be permitted alongside the BUS?

14

Thank you

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