#ACCELERATING ELECTRIFICATION

beama
The trade association for energy infrastructure & systems

"What should I do?"

ACCELERATING HEAT ELECTRIFICATION BY PROVIDING CUSTOMER CHOICE

Incorporating Domestic Space Heating and Hot water Options Matrix

August 2025

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CEO BEAMA

FOREWORD

As we now start to actively encourage consumers in a journey to electrify their homes, I can't help but feel this is THE defining moment for the electrification of heat and hot water and looking at the numbers from the Committee on Climate Change, I would argue it's make or break. With the heat pump consumer campaign now live and more households benefiting from the Boiler Upgrade Scheme, we have a responsibility to ensure ALL consumers have a pathway to accelerate their electrification journey. Current incentives, government and media messaging can create a confusing picture, leaving many to wonder *'what should I do'*?

Recent reports clearly outline the important role heat and hot water electrification will play in reaching Carbon Budget 7. We also recognise the vital role flexible thermal storage capacity will play in reducing distribution network investment. Energy UK's recent paper[1] on 'how to cut energy bills' states 'the biggest savings are likely to be found in more targeted approaches that make the most of maximising flexibility and moving quickly to implement an ambitious warm homes plan'. I couldn't agree more with this ambition.

In our paper we are aiming to create a clearer view of the suite of technologies that can provide flexible electric heat and hot water systems, and therefore the choice available in the market today#. We identify that the opportunity from flexible thermal storage is being underestimated and dramatically underutilised across current government policy and incentives. We have an opportunity now to shape a Warm Homes Plan with the level of ambition needed that will address the needs of all consumers and align to move the dial once and for all on fuel poverty. Fundamental to all of this is the rebalancing of energy costs during this parliament and I agree with Energy UK that this needs to be a national strategy led by Number 10 or Treasury. Crucially, any heating-specific electricity tariff must be uniformly applied to all low carbon heating technologies, not just heat pump driven solutions.

We don't have the benefit of time, and the scale of this program doesn't allow us to watch and wait. Action is needed in 2025. In harnessing action today, we will also see growth in these markets with direct UK benefit. Recently we saw the opening of a manufacturing plant in Derby for hot water cylinders, a £40million investment, that creates local green jobs. I want to ensure that this is the kind of news story I can report more on, in the months and years to come.

In the next 12 months, my hope is we can scope a more comprehensive and wide-ranging offering for consumers that addresses hard-to-treat homes, fuel poverty, and the 20% of households unable to benefit from a heat pump, giving customers choice and pathways to decarbonise their homes while investing rapidly in flexible storage capacity across the UK.

#see annex p 14

1 https://www.energy-uk.org.uk/publications/how-to-cut-bills-a-crisis-we-cant-afford-to-ignore/

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SUMMARY

The UK Government's Warm Homes Plan aims to address several key objectives to improve the living conditions and energy efficiency of homes across the country. The primary goal is for as many households to be taken out of fuel poverty as possible by 2030. It is designed to help households save money on their energy bills by providing energy saving upgrades.

Another key objective is to support the transition to cleaner heating systems, with particular emphasis on the promotion of heat pumps. This aligns with the Government's broader goal of reducing carbon emissions from domestic heating and enhancing energy security by reducing the stress on the grid. However, there are a number of impediments to the effectiveness of the current plan. Fuel poverty in the UK has increased over the last few years, despite various government interventions, and relying on heat pumps as the sole clean heat solution is short-sighted as around 20% of homes are not suitable for heat pumps. Meanwhile, there are a number of established, readily available, alternative clean heat solutions being under-utilised and neglected by government schemes#. These solutions could contribute significantly to reducing fuel poverty whilst simultaneously offering almost 10GW of flexibility on the grid by 2030, and a further 5GW by 2040[2] if only they were actively promoted as a solution for those households that are unable to accommodate a heat pump.

#see annex p 14

[2] Manufacturer estimates

THE CASE FOR CUSTOMER CHOICE

Recommendations

- Make it possible to identify the 'good' technologies that offer the highest energy efficiency credentials in class along with associated energy cost reduction through the flexibility incentive models essential for the energy transition. BEAMA has advocated for this and made it clear what 'good' looks like in its submission to the Thermal Energy Storage System MCS consultation (March 2025)
- Ensure 'the good' are normalised as accepted electric heating and hot water solutions that will benefit customers at point of use and play an integral part in the energy transition
- Create an inclusive fiscal and regulatory policy framework of domestic energy support schemes (e.g. reduced VAT rate or Warm Homes funding support either through grants or green finance) that recognises the unique pathways for different consumers and incentivises all low carbon efficient electric heating solutions relative to their capital cost and associated return on investment. Do not pick winners, pick criteria for capability
- Use Building Regulations to ensure we do not reduce our domestic thermal capacity through the ongoing removal of hot water storage technologies e.g. a minimum level of storage to occupant ratio to be present for all new homes
- Make it clear that all identified forms of viable flexible thermal stores are essential for meeting the 7th Carbon Budget
- Set targets against this framework for increased flexible thermal storage capacity – e.g. shifting from 4GW high heat retention storage in 2025 to 9.3GW by 2030
- Ensure that 'the good' technologies are consistently recognised as Energy Smart Appliances (ESA's) and provide clear signals for market development from within the Smart & Secure Electricity System framework (include hot water and storage heating as an absolute minimum)

FAST FACTS

Of the total population of 28 million homes 9.2% are heated electrically

There are currently 6.1 million households in fuel poverty in the UK up from 4.5 million in October 2021[3]

SSES has mandated heat pumps and storage heaters as energy smart appliances but not any other thermal energy storage system

The Government is promoting heat pumps with policy support and a range of incentives yet it is accepted that for up to 20% of properties a heat pump is not the most apt low carbon solution

The Clean Power 2030 pathway assumes demand flexibility of 4GW from storage heating currently

We have calculated that the combined flexibility potential of all thermal energy storage systems* available including storage heating by 2030 is 10GW

In order for the CCC 7th Carbon Budget to be met they are projecting that the flexibility requirement from all thermal energy storage systems* has to be 9.3GW by 2030[4]

Storage Heaters are recognised and incentivised as low carbon heating systems by some government support schemes but not all, and other thermal energy storage systems* are not recognised by any scheme

28 MILLION UK HOMES

GOVERNMENT PROMOTION AND INCENTIVISATION

ELECTRIFICATION OF HEAT TECHNOLOGY

FULLY PROMOTED AND INCENTIVISED

HEAT PUMPS

PARTIALLY PROMOTED AND INCENTIVISED

STORAGE HEATERS

LITTLE OR NO PROMOTION OR INCENTIVISATION

PHASE CHANGE HEAT BATTERIES

SMART HEAT BATTERIES

SMART HOT WATER CYLINDERS

DIRECT ELECTRIC HEATING

* A flexible thermal energy store is any device capable of mediating the availability of low-cost electricity with the provision of space heating and/or hot water

[3] Source NEA https://www.nea.org.uk/what-is-fuel-poverty/#:~:text=The%20average%20annual%20energy%20bill,on%20the%20UK%20energy%20crisis.

[4] https://www.theccc.org.uk/publication/the-seventh-carbon-budget/

UK DOMESTIC ELECTRIC HEATING MARKET OVERVIEW

Of the total of

28 MILLION

homes in the UK,

2.6 MILLION (9.2%)

have electric heating of which

2.3 MILLION

are heated with direct electric resistance heating such as storage heaters, panel heaters, electric underfloor heating or electric boilers, and the remaining

300,000

are heated with a heat pump. (See Figure 1)

Figure 1: UK domestic housing stock by existing heating system, with background colour coding to illustrate potential displacement/introduction by electric heating technology

	Existing: 28m (stock)			NEW BUILD 0.2M (/yr)
	MAINS GAS	ELECTRICITY*	OIL/LPG	
Large (detatched)	7.2M	0.4M	0.3M	
Medium (semi-detatched)	6.9M	0.3M	0.4M	0.15M
Small (terraced)	5.6M	0.2M	0.7M	
Flats	4.1M	1.4M	0.4M	0.05M

Hydronic heat pumps

Flexible thermal storage

Hydronic heat pumps/flexible thermal storage

Flexible thermal storage/Direct electric & DHW heat pump or instantaneous hot water/ Heat pump district heating

Flexible thermal storage/Direct electric & DHW heat pump or instantaneous hot water

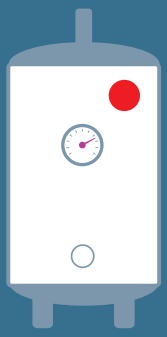
*Existing stock numbers do not include heat pumps

Source: LCP Delta/Glen Dimplex. Most recent independent statistics available at time of writing.

There are currently

9 MILLION

domestic hot water cylinders installed in residential properties



with

1.1 MILLION

of these heated electrically.

Electric instantaneous water heating is long established in commercial and industrial premises in the UK, but as the average newbuild residential flat has decreased in size over the years, while insulation levels have risen, space constraints and occupant lifestyle in these dwellings have made electric instantaneous hot water more attractive.

ELECTRIFICATION OF HEAT

The UK Government's Electrification of Heat program rightly aims to transition households to low-carbon heating solutions, reduce energy costs, and meet Net Zero targets, and it has made the promotion of heat pumps, alongside regulatory reforms and financial incentives to accelerate adoption, central to this strategy.

In this regard the UK Government's heat decarbonisation program mirrors that of many other European countries in recognising the fundamental advantage that a heat pump, with average efficiencies of over 300%, has over other electric heating technologies. However, the Government's intense focus on heat pumps almost exclusively as a solution has been criticised as short-sighted and overly reliant on a single technology. This attitude contrasts with the more diverse strategies adopted by the Scottish and German Governments, whose acceptance of alternative electric heating technologies displays a more flexible and diversified approach.

This restrictive policy is surprising, given that,

a) the previous Government acknowledged that up to 20% of UK households might not be suitable for a heat pump, for a variety of reasons,
b) the generally accepted concession that the carbon emissions of electric resistance heating is now less than 50% of that from a gas boiler,
c) if fitted today, a new electric heater would become a zero-emissions product within its useable lifetime.

FLEXIBILITY

The NESO Clean Power 2030 report presented advice to the Government and Ofgem as to how the UK might achieve clean power by 2030 but still maintain security of supply. In this document they highlight the importance of grid flexibility, and its vital role in managing the system and keeping costs down, while offering an opportunity for consumers to engage with the energy system and unlock lower costs for their energy.

NESO's Clean Power pathways see levels of demand flexibility increasing by four to five times from today's levels to 2030 with significant benefits by moving energy demand away from peak periods. However, they also recognise that flexibility is not currently valued in full and faces multiple barriers to achieve that goal. The NESO report only assumes demand flexibility of 4GW from High Heat Retention (HHR) storage heaters in 2025, whereas the reality is that the combined flexibility potential of all flexible thermal energy storage systems, including storage heaters, could be 10GW. They also recognise that unlocking the benefits of flexibility for consumers will require engagement, and that however effortless participation in demand flexibility through digitalisation is, it must be affordable and accessible for all consumers to ensure a fair transition. Moreover, they acknowledge that for consumers to ultimately benefit from demand side flexibility they need to have the ability to respond to a price signal, the value of which must be attractive enough to encourage behaviour change. This latter point is key to the success of the demand flexibility initiative.

The Government's Smart Secure Electricity Systems Programme did give immediate recognition to the flexibility benefits of heat pumps and electric HHR storage heating, by ensuring they were in scope of the proposed ESA mandate. However, several of the remaining alternative electric heating technologies (which will ultimately meet the requirements of the bulk of the 20% of homes deemed unsuitable for heat pumps), were not immediately acknowledged in the same way, despite having greater flexibility potential than those heat pumps which are not used in conjunction with a buffer tank. If there is a delay in bringing these technologies into scope, there will be an inevitable delay to uptake of products while the necessary regulatory and technical frameworks are designed to support them.

FUEL POVERTY

Since the current fuel poverty strategy "Sustainable Warmth: protecting vulnerable households" was published in 2021, energy efficiency measures have been delivered through schemes including the energy Company Obligation (ECO), the Local Authority Delivery scheme (LAD) and the Social Housing Decarbonisation Fund (SHDF) and latterly the Home Upgrade Grant (HUG). Not all of these schemes promote alternative electric heating solutions.

It should be noted that in the almost 12-year period from January 2013 until October 2024, ECO, HUG, the Green Homes Grant Voucher scheme, (GHGV) SHDF and the Local Authority Delivery (LAD) scheme together only delivered 138,000 low carbon heating measures to households in England.

In 2023 the previous government estimated that there are nearly

3.2m

households in fuel poverty, which they expected to reduce to

2.9m

by 2030, and the NEA[4] estimates that, across the UK, there are currently

6.1 MILLION

households in fuel poverty, up from

4.5 MILLION

in 2021

WARM HOMES PLAN

The Government has announced a package of policies to reduce the number of households in fuel poverty, as part of the Warm Homes Plan, and although high heat retention storage heaters and heat pumps are deemed eligible measures under the Warm Homes: Local Grant for Local Authorities and Social Housing Fund Wave 3 policies, most other electric heating technologies are not included.

Figure 2: Domestic Energy Support Schemes & Policies – Eligible measures

Policy/Scheme	Heat Pump	Storage heater	Other flexible Thermal stores
Social Housing Fund	Yes	Yes	Heat batteries
Warm Homes local grant	Yes	Yes	No
Home Upgrade Grant	Yes	Yes	No
Local Authority delivery	Yes	Yes	No
Boiler Upgrade Scheme	Yes	No	No
VAT Relief	Yes	No	No

5 https://www.nea.org.uk/what-is-fuel-poverty/#:~:text=The%20average%20annual%20energy%20bill,on%20the%20UK%20energy%20crisis

MARKET POTENTIAL OF ELECTRIC HEATING TECHNOLOGIES

Heat Pumps

Air source heat pumps – to achieve its decarbonisation of domestic heat targets the Government is heavily reliant on air-source, and to a lesser extent ground-source heat pumps as the key technology. Progress in encouraging households to install heat pumps had been slower than planned due to a variety of factors, but sales have dramatically increased in the last year with a record number of 98,000 units installed. The take-up of heat pumps in the new build sector currently stands at 10.7%, and this is expected to grow to 50% by 2027 as the Future Homes Standard is phased in, and to 89% by 2029 (HPA)[6].

Domestic hot water heat pumps are the perfect complement to modern storage or panel heaters fitted in smaller flats but are eminently suitable for any property requiring a standalone low carbon domestic hot water solution, and can offer 10GW of flexible load if only 2.8m homes adopted this technology.

Direct Electric Heating

Electric panel heaters, electric radiators and electric underfloor heating are ideally placed to fill the requirement for the extremely low thermal demand flats and apartments built to the proposed Future Homes Standard, that cannot accommodate heat pumps for practical reasons, and are an ideal accompaniment to a domestic hot water heat pump or electric instantaneous water heating. The market potential for this technology is all small newbuild flats or apartments, which usually accounts for somewhere between 16-20% of properties per year.

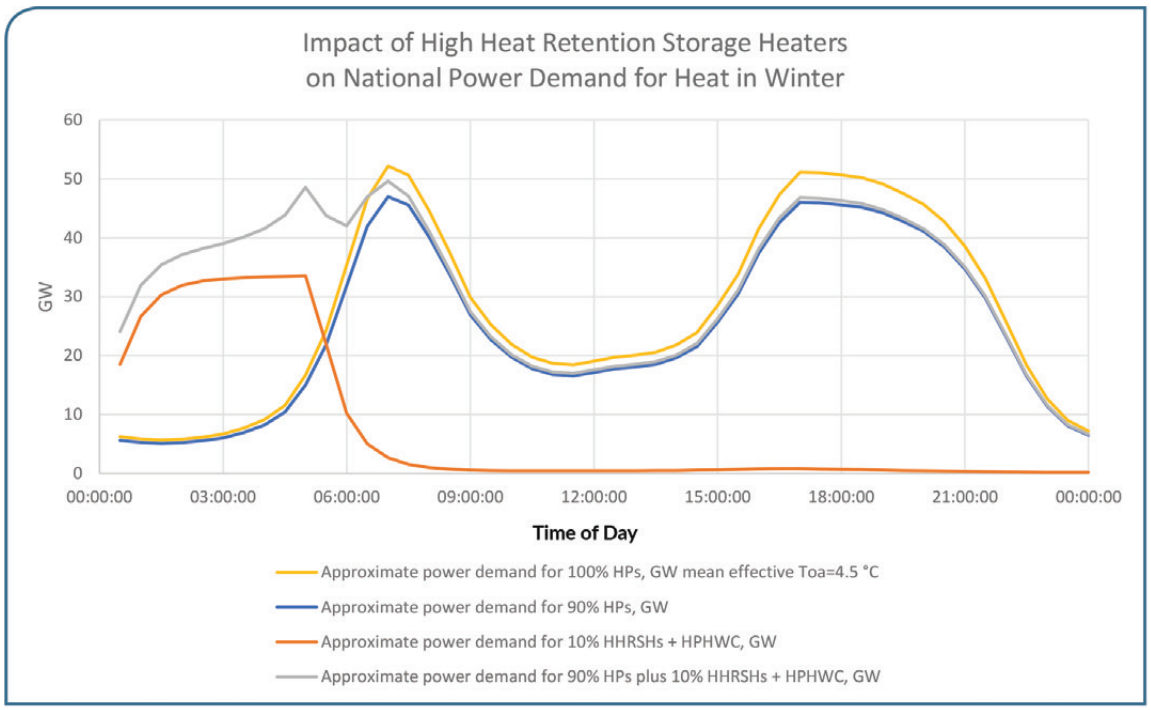
Thermal Energy Storage Systems

Modern High Heat Retention Storage Heating systems are significantly more advanced than the previous generation of products dating from the 1980s. These fully electronic, algorithm-driven intuitive appliances have a long operational life span and no degradation in performance or efficiency over time. They are suitable for around 5% of the current housing stock, giving them over 3-million-unit deployment potential with a flexibility contribution of 9.4GW.

Storage heaters have been used successfully for many years to reduce peak time energy consumption as demonstrated in (Figure 3).

6 https://www.heatpumps.org.uk/resources/industry-reports/

Figure 3: Impact of High Heat Retention Storage Heaters on National Power Demand for Heat in Winter



Source: Glen Dimplex

Note in Figure 3 that although the peak reduction seems relatively modest, the 10% of total evening peak demand aggregated across all installed storage heaters amounts to4-5 GW, nearly four times the generation capacity of the Sizewell B nuclear power station, and without which would require correspondingly larger transmission and distribution capacities and allowance for higher system losses. A significant impact is seen in the off-peak times when otherwise unused generation capacity could be used at very low cost.

Phase-Change Heat Batteries. These products use phase-change materials and best-in-class insulation to store energy in a box up to four times smaller than conventional hot water cylinders. Using phase change material in a space heating battery allows consumers to install enough storage capacity to cover more than 80% of the energy needed to heat their homes from the cheapest of the tariffs available on the market, thereby minimising annual running costs and the total cost of ownership.

Smart Heat Batteries. These heat batteries have a storage capacity of 40kWh and have been designed as a central heating boiler replacement. They are suitable for homes of up to 2/3 beds, either semi-detached or terraced, with limited or no outdoor space for a heat pump, or where a heat pump installation isn't possible for other reasons. Heat batteries can completely decouple electrical demand from heating demand, meaning they are incredibly flexible about when they consume electricity from the grid, taking advantage of the lowest cost of electricity when available.

Smart Hot Water Cylinders. These units turn each hot water cylinder into a connected heat battery, empowering the grid to connect more renewable energy, while lowering bills for tenants and homeowners. Optimised for social housing, new build developments, private homes and commercial properties, these products are ideal for either retrofit or new buildings. If 20% of all hot water cylinders installed today were smart, the UK grid would have approximately 5GW of flexible demand at its disposal, equivalent to four nuclear power plants. Every heat pump requires a hot water cylinder, and by ensuring that these are smart, huge amounts of additional flexibility will be brought online in the future. A version of this technology uses an indoor heat pump and supplementary direct electric heating as a hybrid system which can be a backup immersion/electric boiler or zonal panel/storage heaters. This is a practical solution for hard-to-treat dwellings such as flats where an external heat pump may not be viable.

MARKET APPLICATION

Heat pumps are fitted in a wide range of housing stock types whereas 60% of electric resistance heating of all types tends to be installed in flats/apartments and the remaining 40% is mostly found in older properties.

In the CCC 7th Carbon Budget advice for the Government (Feb 2025), their pathway predicts a gradual increase in household penetration of non-heat pump electric heating systems including flexible thermal energy stores from the current 7% to 16 % by 2040 (see Figure 4). Converting these percentages into values (Figure 5) reveals that by 2040 they expect the flexibility contribution from all electric flexible thermal energy stores to reach 15.7GW, over 3.5 times the current load.

Figure 4: Key values in the Balanced Pathway for residential buildings

		2025	2030	2035	2040	2050
Emissions	Emissions in year ($MtCO_2e$)	58.5	51.4	35.2	17.7	0.4
	Change in emissions since 1990	-27%	-36%	-56%	-78%	-99%
	Change in emissions since 2023	+12%	-2%	-33%	-66%	-99%
	Share of total UK emissions	14%	17%	19%	16%	
Key drivers - quantity variables	Proportion of homes with a heat pump	2%	6%	26%	52%	80%
	Proportion of homes with a low-carbon electrified heating system	9%	16%	39%	68%	100%
	Deployment of 'big' energy efficiency measures (cumulative, millions)	0.2	4.6	5.5	5.5	5.5
	Deployment of 'small' energy efficiency measures (cumulative, millions)	0.6	14.0	32.2	34.7	34.7
Key drivers - price variables	Capital cost of first-time 12 kW air source heat pump installation (£ thousands)	10.9	10.3	9.6	8.9	7.5

Source: CCC 7th Carbon Budget

Figure 5: Current & Future Flexibility Contribution by all Thermal Energy Stores

Date	2025	2030	2035	2040	2050
Flexibility Contribution	**4.4GW**	**9.3GW**	**12.2GW**	**15.7GW**	**21.4GW**

Source: Based on CCC 7th Carbon Budget Balanced pathway (Assumptions – Housing stock increases by 200k p.a.)

The CCC concedes that direct electric heating and thermal energy storage systems will be typically deployed in homes with lower heat demand, particularly where heat pumps may not be an appropriate solution, and that these systems have significantly lower capital costs than heat pumps. They also concede that in some homes with lower heat demand, this can mean that total lifetime costs are lower for these electric systems than for a heat pump system. They also note that these products are readily available through long-established supply chains. A similar conclusion was reached in the Government sponsored CODE report from 2021 (Cost Optimal Domestic Electrification BEIS Research Report August 2021).

SPARK GAP

The current spark gap between electricity and gas pricing in the UK is significant. As of January 2025, electricity costs 24.86 pence per kWh, whereas gas costs 6.34 pence per kWh. This means that electricity is approximately 3.92 times more expensive than gas per unit of energy. The spark ratio, or electricity-to-gas price ratio, is 3.97, which is the highest in Europe, and nearly double the recommended ratio of 2 if the UK is to achieve its heating decarbonisation objectives.

This large price disparity creates a very significant barrier to the adoption of any electric heating system, including heat pumps, despite their higher efficiency compared to gas boilers.

It is clear that there are several challenges for Government in achieving its objective to deliver Clean Power by 2030 while tackling rising fuel poverty, but industry has the tools to help meet those challenges.

What is needed is that Government recognises that the campaigns supporting low carbon heating should be inclusive of all eligible technologies, which are required to provide the necessary choice for all housing types and applications. It must acknowledge that the forthcoming EPC revision will inevitably ensure that Energy Assessors will be promoting these alternative electric heating technologies as the next best alternatives to heat pumps for 20% of homes, particularly if the HEM/EPCs reward flexibility. It seems almost indefensible therefore not to offer a VAT exemption for these products. VAT relief on heat pump installations currently has an annual cost to the Government of £300m (based on heat pump sales of 100K p.a.). VAT exemption on the same volume of these alternative electric heat technologies would cost less than £70 million.

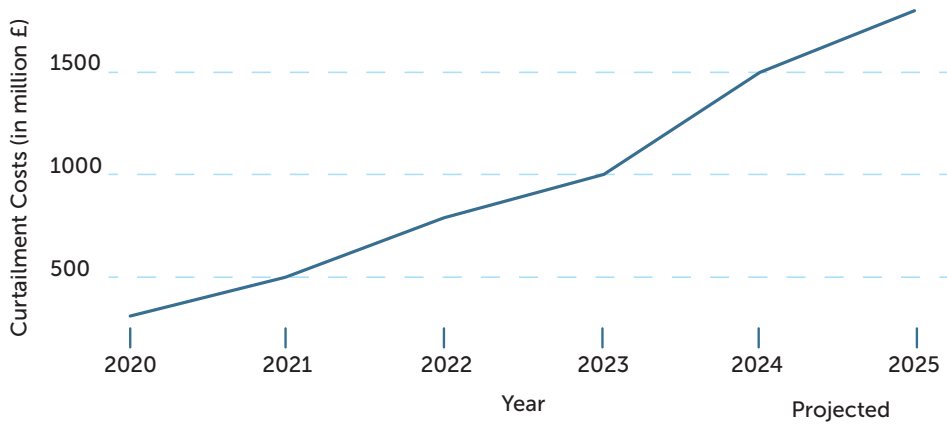
The Boiler Upgrade Scheme should incorporate a grant which subsidises the cost of installing these flexible energy stores in households. For example a typical installation cost of a storage heater system is around £4,500 per home, so a grant of £2,000 per property would significantly boost take-up, while costing substantially less than the £7,500 currently subsidising each heat pump.

The Home Upgrade Grant should also recognise the potential value of domestic hot water heat pumps and smart cylinders to the low-income, off-gas grid household customer, and the electricity grid.

The combined cost of these schemes is insignificant compared to the cost of wind turbine curtailment which in the last year reached £1 billion and is rising rapidly each year (Figure 5).

In line with the recommendations above, a range of purpose-designed dynamic tariffs supporting these technologies should be devised.

Figure 6: Year-by-year increase in Wind Turbine Curtailment Costs



Sources: NESO and FTI Consulting

CRITICAL TO CUSTOMER CHOICE

The energy transition as a pathway to heat electrification must be predicated on suitable customer choice. Low heat demand dwellings with low occupancy limits and no present central heating distribution system will require different solutions to those with high heat demand, existing multi-room heat distribution and higher occupancy. Localised heat solutions (room by room) coupled with smaller but smart thermal stores may be the preferred option for the customer. Therefore, the policy framework for heat electrification needs to recognise and respond to the following prompts:

- Does the heat system fit my personal or dwelling needs (how I use the service, simple to operate)
- Will the heat system offer me a relatively low cost 'no regret' solution to improve comfort and energy bills and be on an equal footing, for example with customers who can install heat pumps (for the latter we must factor in flexibility and the associated rewards)
- Will I be able to access a fast installation (if an emergency replacement) to ensure I have continuity of service (without an existing heat distribution system, choosing a central heat pump solution will take time, and may not be my preferred option anyway).

Some energy retailers are now offering heat pump service packages, but believe they need to expand their electrification offer because the solution is too narrow to satisfy the above 'test points'.

CRITICAL TO POLICY NEEDS

Central to the policy agenda should be:

- Driving customer action to reduce energy consumption
- Developing a range of options that can accelerate heat electrification
- Stimulating growth across existing UK innovator companies with the potential to offer thermal energy storage system technologies today
- Creating a framework that not only engages consumers but stimulates installers to offer alternatives for heat electrification – the 'low hanging fruit' principle
- Accurately and consistently identify technologies and systems that can – if appropriate for the application – provide flexibility in energy demand in line with the Smart & Secure Electricity Systems objectives
- Ensuring we offer choice within the Warm Homes Plan framework that does not leave any customers behind but stimulates positive change for comfort, energy demand and costs

Even without energy cost re-balancing there is every likelihood, when the flex market starts expanding, that the retail market will start offering competitive tariffs with a heat-as-a-service business model. But it will need to be regulated.

CONCLUSION

If the Government is serious in its aim to reduce fuel poverty and carbon emissions by upgrading inefficient homes with low carbon heating solutions, it needs to recognise that there are alternative electric heating technologies offering diverse, efficient, and scalable pathways for decarbonising homes. However, the current incentives are largely focussed on supporting heat pumps. Expanding support to include all electric heating systems would democratise access to clean heating, accelerate the transition to net zero by addressing diverse housing needs and income levels, improving cost accessibility, and leveraging flexibility in conjunction with dynamic tariffs. More fundamental perhaps is the urgent need to recognise that the principal hurdle to be cleared in order to accelerate the electric heat retrofit program, is the rebalancing of the relative cost of electricity versus gas. If then a specific electric heat tariff is devised, applying to all low carbon heating products in an equitable way, this would stimulate demand for both heat pumps and other electric heating technologies.

ANNEX

Domestic Space Heating and Hot Water Options Matrix

HEAT OPTION	APPLICATIONS AND COUNTERFACTUALS	TYPICAL CUSTOMER DEMOGRAPHIC	SSES	ECO	WARM HOMES LOCAL GRANT	BUS	VAT RELIEF	FLEX POTENTIAL	ENERGY EFFICIENCY	THE 'DO NOTHING' RISK	TYPICAL INSTALLED COST
SAMPLE	**Air to Water Heat Pumps – space and water heating** 	Suitable for most housing types, except for smaller apartments with extremely low heat load or applications with space or other constraints. Typically displacing all fossil-fuelled and some legacy direct electric heating systems. Limited flexibility potential but very high efficiency, particularly if mated to underfloor heating.	This product category has the widest socio- demographic profile of all heating systems from owner occupiers, private and social rented sector.	Yes	Yes	Yes	Yes	Yes	Yes	300-500%	The risk is that those who could be eligible for this technology do not take advantage of the BUS grant and other subsidies, would retain existing heating systems that are not as efficient and more expensive to operate, with higher carbon footprint.	Median installed cost of £12,975 for 8.5kW capacity

SAMPLES

HEAT OPTION	APPLICATIONS AND COUNTERFACTUALS	TYPICAL CUSTOMER DEMOGRAPHIC	SSES	ECO	WARM HOMES LOCAL GRANT	BUS	VAT RELIEF	FLEX POTENTIAL	ENERGY EFFICIENCY	THE 'DO NOTHING' RISK	TYPICAL INSTALLED COST
Ground Source Heat Pumps – space and water heating 	Suitable for a variety of housing applications but particularly beneficial for larger older properties or can be networked to provide heat to multi-unit buildings with enough outdoor space available to accommodate the necessary pipework. Typically displacing fossil-fuelled systems, these heat pumps are generally the most efficient of all, and particularly if used with underfloor heating. Some versions also offer cooling.	Higher-income owner-occupiers of larger properties,or private renters of flats in multi-unit buildings.	Yes	Yes	Yes	Yes	Yes	Yes	400%	The risk is that those who could be eligible for this technology, which has the highest level of efficiency, do not take advantage of the BUS grant and other subsidies, would retain existing heating systems that are not as efficient and more expensive to operate, with higher carbon footprint and shorter lifespan.	Median installed cost of £25,000 for 13kW capacity
Air to Air Heat Pumps – mostly only space heating  	Smaller dwellings, particularly flats, low heat loss, cross tenure, cross affordability audiences. Typically replacing existing legacy storage heating which has more flex but lower efficiency or direct acting electric heating which has higher operating costs and no flex capability. High efficiency but generally can only be used for space heating, requiring an additional means of heating domestic hot water. There is a risk of excessive use for cooling.	Cross segment (i.e. fuel poverty, able to pay, private rented and social landlords).	No	No	No	In consultation	Yes	No	300-500%	The risk is that households retain their poor-performing legacy electric heating systems which are more expensive to operate, with higher carbon footprint, and forego the benefits of cooling.	Median installed cost of £3,000 for a 5kW capacity

SAMPLES

HEAT OPTION	APPLICATIONS AND COUNTERFACTUALS	TYPICAL CUSTOMER DEMOGRAPHIC	SSES	ECO	WARM HOMES LOCAL GRANT	BUS	VAT RELIEF	FLEX POTENTIAL	ENERGY EFFICIENCY	THE 'DO NOTHING' RISK	TYPICAL INSTALLED COST
Intelligent Phase Change Heat battery – space and water heating 	Phase change material (PCM) heat batteries for space heating and hot water allow customers to enjoy the cost-savings from providing flexibility and using off-peak or flexible tariffs without impacting their comfort by changing their heating set points to drive flexibility. Using hydronic distribution they allow users to keep their existing radiators and benefit from low-cost electricity tariffs.	Suitable for smaller properties up to 2/3 bed semi-detached or terraced houses and flats, they appeal to a wide demographic of owner-occupier, private and social rented sectors who have properties that are unable to have a conventional air-to-water or ground-source heat pump fitted.	Yes	No	No	In consultation	No	Yes	100% / 200+% (if charged by HPs)	The risk is that households retain or renew their fossil fuel heating systems, which have significantly higher carbon emissions, locking in to fossil fuels for another 12+ years, and forgo the opportunity to take advantage of the flex benefits and lower operating cost of a system that uses off-peak energy.	£8,650 for 26kWh of storage
Intelligent Heat Batteries – space and water heating 	These products are drop-in central heating boiler replacements storing electrical energy in a high energy density central core and transfering that energy into hot CH water when required. The 40kWh storage capacity allows for flexible charging. The product can heat an indirect hot water cylinder or PCM heat battery for hot water, or be paired with a direct electric DHW cylinder/ heat battery or DHWHP.	Suitable for 2/3 bed semi-detached or terraced houses, and flats, appealing to a wide demographic of owner occupier, private and social rented sectors,who have properties that are unable to have a conventional air- to-water or ground source heat pump.	Yes	No	No	In consultation	No	Yes	100%	The risk is that households retain or renew their fossil fuel heating systems, which have significantly higher carbon emissions, locking in to fossil fuels for another 12+ years, and forgo the opportunity to take advantage of the flex benefits and lower operating cost of a system that uses off-peak energy.	£9000-£12,000 for a home with up to 5kW peak load

SAMPLES

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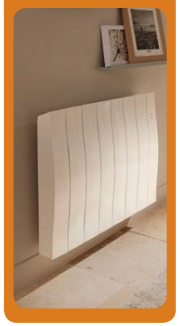
High Heat Retention Storage Heaters (HHRS) – space heating only 	Smaller dwellings, low heat loss, cross -tenure, cross- affordability audiences. Very controllable, high flexibility products typically replacing existing legacy storage which have less flexibility and less controlled efficiency, and direct acting technologies which have higher running costs and no flex capability.	Cross segment (i.e. fuel poverty, able to pay, private rented and social landlords).	Yes	Yes	Partially	In consultation	Reduced rate of 5% under certain schemes	Yes	100%	Switch out of storage (flex) capability for direct acting systems which undermines 12GW flex gap. Customers left with poor performing legacy products and higher bills. Excluded from MEES for private rented progress due to current EPC treatment.	£7,000 for a home up to 10kW peak heat load
Direct-acting Electric Heating – space heating only 	Most commonly used in small, extremely low thermal demand, flats and apartments which cannot accommodate or justify a heat pump or high heat retention storage heaters and represented by panel heaters, electric radiators and underfloor heating. Frequently specified by private landlords because of entry level pricing, but there is no flex benefit. New flats built to the FHS standard will make these technologies more viable, affordable alternative to other heating systems for the smallest properties, particularly if used with domestic hot water heat pumps or instantaneous electric water heating.	The demographic for this product type has historically been dominated by the private rented sector over social housing, and frequently represented by households without children or single person households and in fuel poverty. Properties built to the latest building regs are now able to adopt the technology to provide cost effective heating for a much wider demographic because of low thermal demand.	No	No (unless as part of a pack-age)	No	No	No	No	100%	The risk is that households retain their poor performing legacy direct electric heating systems with electro-mechanical controls, when they could upgrade to modern digital, app-controlled products with advanced control features, thereby losing the benefits of reduced costs and lower carbon footprint.	£9,000 for a home of up to 3kW peak load

SAMPLES

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Domestic Hot Water Heat Pump (DHWHP) – domestic hot water heating only 	Suitable for small to medium houses and apartments with low heat demand,used with air-to-air HPs or direct electric space heating. Typically displacing electrically heated DHW cylinders, which have higher carbon footprint and operating cost. Particularly apt for Passive House applications.	Cross segment (i.e. fuel poverty, able to pay, private rented and social landlords) but also owner occupiers.	Yes	No	No	No	Yes	Yes	220-350%	That for many applications customers retain direct electric water cylinders or instantaneous electric HW instead of DHWHP with increased efficiency, lower operating costs and lower carbon footprint.	£2,700-£3,600 for 200ltr cylinder depending on siting and ducting
Intelligent Phase Change Heat battery – domestic hot water heating only 	The high energy density of these products means they are up to 4 times smaller than the hot water cylinders they are designed to replace, and their compact nature means they are applicable for all flats and apartments up to 3-4 bed houses, but can be connected in series for larger properties. Compatible with a range of energy sources incuding heat pumps they are fully flexible.	Arguably these heat batteries have the largest possible demographic appeal, as they not only have the exact same addressable market as cylinders, but can also target the market segments where cylinders are not suitable due to their size.	Yes	No	No	In consultation	No	Yes	100+%	The risk is that households retain their existing cylinders and/or forego the opportunity to take advantage of the compact nature of the phase change battery.	£2,035 for a 210 litre version

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Intelligent Hot Water Cylinders- domestic hot water only 	These units turn each hot water cylinder into a form of connected heat battery, optimising hot water production and stratification with machine learning, empowering the grid to connect more renewable energy while lowering operating costs. Applications include social housing, private homes and commercial properties, both new buildings and retrofit. Smart Hot water systems can deliver thermal load shifting and time-of-use optimisation by heating during periods of low grid demand or high renewable generation.This reduces strain on the grid, helps decouple hot water demand from peak electricity use,and enables participation in demand-side response services where supported by controls or aggregated platforms.	This product category has one of the widest socio-demographic profiles of all domestic hot water heating systems, from owner occupiers, private and social rented sector, effectively any property that has, or used to have, a conventional hot water cylinder.	Yes	Yes	No	In consultation	Reduced rate of 5% under certain schemes and zero rated for VAT if installed alongside an ASHP or GSHP.	Yes	100%	The risk is that households retain existing DHW cylinders and forgo the benefits which accrue from having a "Smart" product, such as greater controllability and operating cost savings, lower carbon footprint, and reduced load on the Grid. If only 20% of all hot water cylinders currently employed were " smart" the grid would have approximately 5GW of flexible demand available.	£1600 - £1800 up to 300 litre of hot water
Stored Domestic Hot water – domestic hot water only 	These hot water cylinders are a well established technology with approximately 9 million in domestic premises in the UK, offering benefits to householders and 23GWh per day of demand response to the Grid. These products have historically been displaced by combination boilers but should only be displaced by a low carbon electrically heated or smart cylinder. Ideal for integration with Solar PV and WWHR which increase system efficiency.	Domestic hot water cylinders, vented or unvented, have been used in domestic dwellings across all socio-demographic profiles and all sectors and tenures from owner occupiers, private and social rented sectors. Penetration of flats and apartments has been limited because of space restrictions.	Yes	Yes	Yes	No	Reduced rate of 5% under certain schemes and zero rated for VAT if installed alongside an ASHP or GSHP.	Yes	100%	If stored domestic hot water was not used, and the default was instantaneous hot water for very application, then the grid would lose 23GWh of flexibility, and most of the load would shift to peak times.	£1,500-£2,200 for a 200ltr cylinder

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Instantaneous Domestic Hot Water – domestic hot water only 	The market for instantaneous electric hot water has been well defined historically, as an apt choice for commercial and light industrial applications, and only penetrated the domestic arena to service retrofit or home extensions. New flats built to the FHS standard will now make this technology a more viable, low carbon, cost-effective means of providing domestic hot water, particularly for the smallest properties where heat and hot water demand is so low.	The typical user demographic for this technology was the average office or SME worker, but with the compact nature of new domestic buildings, instantaneous electric water heating has become more viable than the alternatives for small new-build flats and apartments where space is at a premium, hot water demand is low or sporadic, and minimizing installation and running costs is a priority. This will extend the user base to encompass typical flat users. ranging from students to executives to OAPs, and everyone in between.	No	No	No	No	No	No	100%	Instantaneous electric hot water has always been specified when stored hot water was not feasible or justifiable, and frequently there has not been an alternative choice available. Now however instantaneous hot water has become the default choice for the smallest well-insulated flats and apartments.	£660 for anything between 6kW (3l/m) & 12kW (6l/m)

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