

Net Zero by Industry

## Ensuring energy security whilst decarbonising heat

Electrification is the only scalable option<sup>1</sup> for decarbonising heat in our 28 million UK homes<sup>2</sup>. This will mean an increase in total electricity consumption – The equivalent of 16% of 2020's total electricity consumption will be needed for heating alone by 2035<sup>3</sup>.

### How can we deliver this low carbon heat whilst ensuring energy security and protecting the developing capacity within our electricity grid?

**The answer: Build energy flexibility into low carbon heating choice.**

Flexible appliances and a flexible energy system can cut bills for householders and cut costs of grid upgrades. Increasing demand side response (DSR) capability while decarbonising home heating will enable peak avoidance and maximise the use of abundant renewable energy. This could help reduce expensive curtailment of generation and decouple energy consumption from heat demand. Flexibility from electric heat has the potential to save 10-14% of peak demand by 2050<sup>4</sup>.

We should now focus on offering consumers a broader range of technology choices to decarbonise optimally, whilst enabling the DSR that's necessary for a flexible secure grid.

Although there are still market barriers to overcome, we already have the most critical enabler in place – technology options for consumers to benefit from.

### So, what are these technology options\* and how can we enable this market...



\*All the below technologies lend themselves to whole house system integration for electrification, either working side by side or alongside onboard renewable energy and battery storage technology.



#### Net Zero by Industry Heat Pumps

A range of innovations utilising heat pump technology which is the most energy efficient way to heat a space or hot water, since it can draw heat from natural sources, rather than having to generate all of it through combustion or electricity.

**Suitable for 80-100%** of UK homes, with innovations available for all dwelling types, including those off the gas grid, apartment dwellings and older buildings.



Recent small-scale studies put peak energy consumptions savings at 18% during flexibility period<sup>5</sup>.

Soon be mandated as energy smart appliances due to the flexibility capability.

Can integrate with other low carbon technologies, including PV and associated battery store, and thermal hydro store.

Backwards compatible with a range of wet distribution systems including underfloor heating.

High deployment potential supported by air-to-air technology application in small and very well insulated dwellings.

The current circa **280k** heat pumps in the UK have a combined electrical load of **1.6 GW** – this is future flexibility potential.



Reducing peak power demand by 15 GW through demand side response by 2050<sup>6</sup> will only be achieved with time-of-use tariffs and enabling technologies – without a smart meter, and the accompanying in home display, homes will not be able to participate in the energy transition.



#### Net Zero by Industry Smart Thermal Store (Boiler)

The drop-in boiler replacement solution utilising smart algorithms and flexibility tariffs. Smart thermal stores efficiently retain low carbon heat in an incredibly dense ceramic core, until it is needed to heat the home.

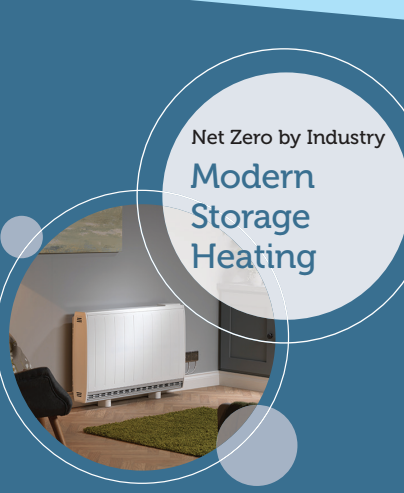


Offering **long operational lifespan** and **no degradation in performance or efficiency**.

Suitable for **20-30%** of homes, from smaller flats up to 2-3-bedroom semi-detached houses, which have up to 12,000 kWh gas demand in their current system and up to 5 kW heat loss.

Can store up to **40 kWh of thermal energy** – in some homes this is enough for a full day, in others a small top up is necessary around midday/early afternoon.

Soon to be mandated as **Energy Smart Appliances**, thermal batteries completely decouple energy consumption from heat demand. Backwards compatible with a range of wet distribution systems including underfloor heating.



#### Net Zero by Industry Modern Storage Heating

The innovative, intuitive evolution from the original storage solution with a long operational lifespan and no degradation in performance or efficiency.

Suitable for **5%** of current housing stock, currently heated with traditional, less efficient electric heating or with low heat demand.



Over **3-million-unit deployment potential**, enabling a potential 66 GWh of daily flexibility capacity, with a connected load of 9.4GW<sup>7</sup>.

Soon to be mandated as energy smart appliances.

Modern controls automate consumer-led heat generation in a similar way to electric vehicles.

Complementary solution to domestic hot water heat pumps and thermal battery store.

Can integrate with associated thermal battery solutions.



Multiple policy mechanisms must encourage and give tangible benefits to flexibility enabling technology, such as SAP and RdSAP, Approved Document L, the Boiler Upgrade Scheme and ECO.



#### Net Zero by Industry Domestic Hot Water Only Heat Pumps

A heat pump technology innovation consisting of a highly efficient package of an air source heat pump and hot water cylinder combined in a single unit to provide low carbon domestic hot water.

A European success story, with product category sales doubling in the last three years and increasing five-fold in the last ten years<sup>8</sup>.

Suitable for up to **25% homes**, where there are existing domestic water cylinders or where hot water demand is your primary energy load.

If **2.8 million** hard-to-treat homes adopted a hot water only heat pump and smart storage heating it could offer **10 GW of flexible load**.

Can integrate with **PV and associated storage**, as well as waste water heat recovery for additional running cost benefits.

Can provide **100% pasteurised hot water** due to automatic cycle built in to the program.

In reality, **100% of homes** could be suitable for a hot water only heat pump dependent on cylinder capacity and space constraint.



#### Net Zero by Industry Domestic Hot Water Cylinders

Flexibility opportunity through domestic hot water, which can be either heated indirectly, pairing with a heat pump, boiler, or thermal battery store, or directly with an electric immersion element.

The circa seven million hot water cylinders in a variety of UK properties already provide a potential **17.5 GWh of flexibility**.

If connected to a **fossil fuel boiler** (estimated five to six million units), cylinders with back-up immersion heaters could be decoupled for the central system to take advantage of flexibility benefits.

Facilitates **whole house system integration** for electrification using low carbon heat sources, and PV and associated battery storage.

The **one million direct electrically heated cylinders currently in the market** are designed and specified to take advantage of existing and future time-of use tariffs. These can also be integrated with Solar PV and waste water heat recovery systems to maximise efficiency, and further future-proof the home.

Suitable for up to **100%** of homes, dependent on cylinder capacity and space constraint.



#### Net Zero by Industry Thermal Hydro Store (Phase-change thermal heat battery for hot water)

Heat battery technology in an effective and flexible phase-change cylinder, which can be directly or indirectly heated.

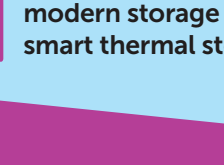
Suitable for up to **100% of homes**, dependent on cylinder capacity and space constraint.

Uses **less space** to deliver up to four-times equivalent thermal hot water, an important point as we try to tackle the issues of ripped out cylinders.

Offering up to **1,000 kWh of load shifting potential a year**, depending on the size of the solution.

Facilitates **whole house system integration for electrification** using low carbon heat sources, and PV and associated battery storage.

Can integrate with heat pumps, modern storage heating and a smart thermal store.



The cost of electricity is key to affordable electrification and the increasing demand for the deployment of responsive low carbon heat. Only Government can remove this regulatory barrier.



### It's time to unlock this market and ensure grid protection...

**We must take a holistic approach to deliver heat decarbonisation which considers both energy security and consumer choice. Business will not U-turn on Net Zero, but to unlock the full investment potential, and the onshoring of manufacturing sites and the green jobs they bring, Government must back simple interventions to enable the development of this market.**

- **Develop holistic policy and guidelines** that require consideration of how technology, fabric and controls work together to decarbonise homes whilst enabling demand side response.
- **Create and update direct and indirect subsidies** to recognise the broad range of electrification technologies required to decarbonise homes, offering homeowners choice.
- **A review of the barriers to flexibility through heat**, including reflection in EPCs and the Standard Assessment Procedure (SAP).
- **Expand the policy vision of what electrified heat solutions are available**, and ensuring these are treated equally alongside the heat pump story.
- **Utilisation of existing installer capacity** can be fast tracked through supporting technologies which are immediately complimentary to existing skills.

<sup>1</sup> Second National Infrastructure Assessment (NIC, 2023)

<sup>4</sup> Future Energy Scenarios (ES0, 2023)

<sup>7</sup> Based on product capacity of 22kWh.

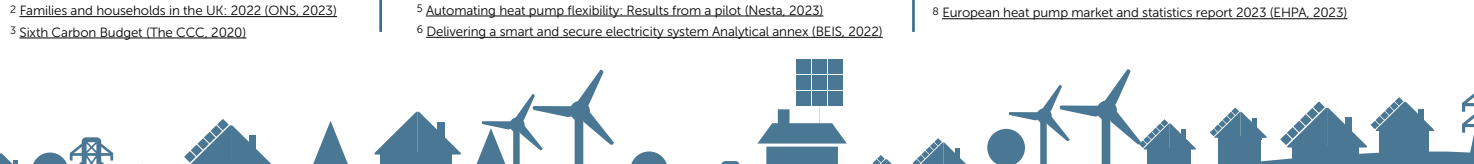
<sup>2</sup> Families and households in the UK: 2022 (ONS, 2023)

<sup>5</sup> Automating heat pump flexibility: Results from a pilot (Nesta, 2023)

<sup>8</sup> European heat pump market and statistics report 2023 (EHPA, 2023)

<sup>3</sup> Sixth Carbon Budget (The CCC, 2020)

<sup>6</sup> Delivering a smart and secure electricity system Analytical annex (BEIS, 2022)



LEARN MORE ABOUT WHAT IT WILL TAKE TO DELIVER NET ZERO HOMES AND INFRASTRUCTURE – VISIT OUR CENTRAL HUB

