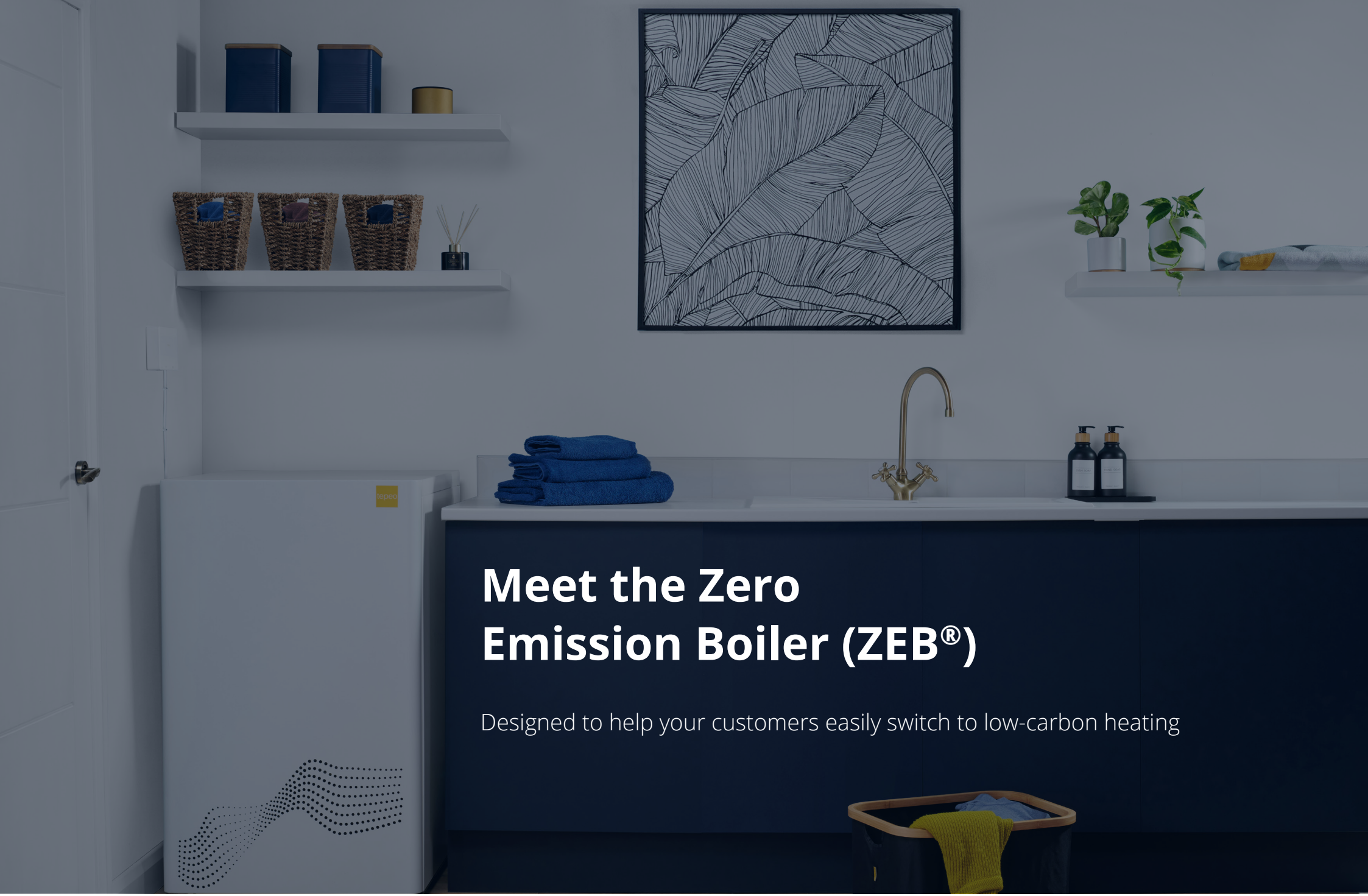


# Meet the Zero Emission Boiler (ZEB®)

Designed to help your customers easily switch to low-carbon heating

# Contents


| | |
|---|---|
| An introduction to tepeo | 3 |
| What is a low-carbon heating solution? | 4 |
| Why make the switch to a low-carbon boiler? | 5 |
| Meet the Zero Emission Boiler (ZEB®) | 6 |
| ZEB specifications | 7 |
| How does the ZEB compare to other heating solutions? | 8 |
| What are the ZEB's running costs & carbon emissions? | 9 |
| How the ZEB addresses the problem | 10 |
| Intelligent heating through Smart Charging | 11 |
| Home suitability check | 12 |
| The ideal home | 13 |
| Change the boiler, not the home | 14 |
| Installing the ZEB | 15 |
| Hot water solutions for the ZEB | 16 |
| Aftercare | 18 |
| Guarantee | 19 |
| Customer support | 20 |


# An introduction to tepeo

tepeo was founded in 2018 to give customers a cleaner, smarter, and more cost-effective heating solution that would help them transition away from their existing boiler.

Since then we've designed, built, tested, and tried many ways to create an efficient heat battery solution that uses electricity to supply heating - all culminating in the Zero Emission Boiler (ZEB®).

The ZEB was launched in 2021 and, by growing our network of tepeoPRO installers, we're hoping to bring this British made product to more environmentally-focused customers across the UK, increasing the options available for low-carbon heating solutions.

tepeo is here to help millions of homeowners transition away from their existing boilers towards a cleaner alternative so they can heat their home, not the planet.

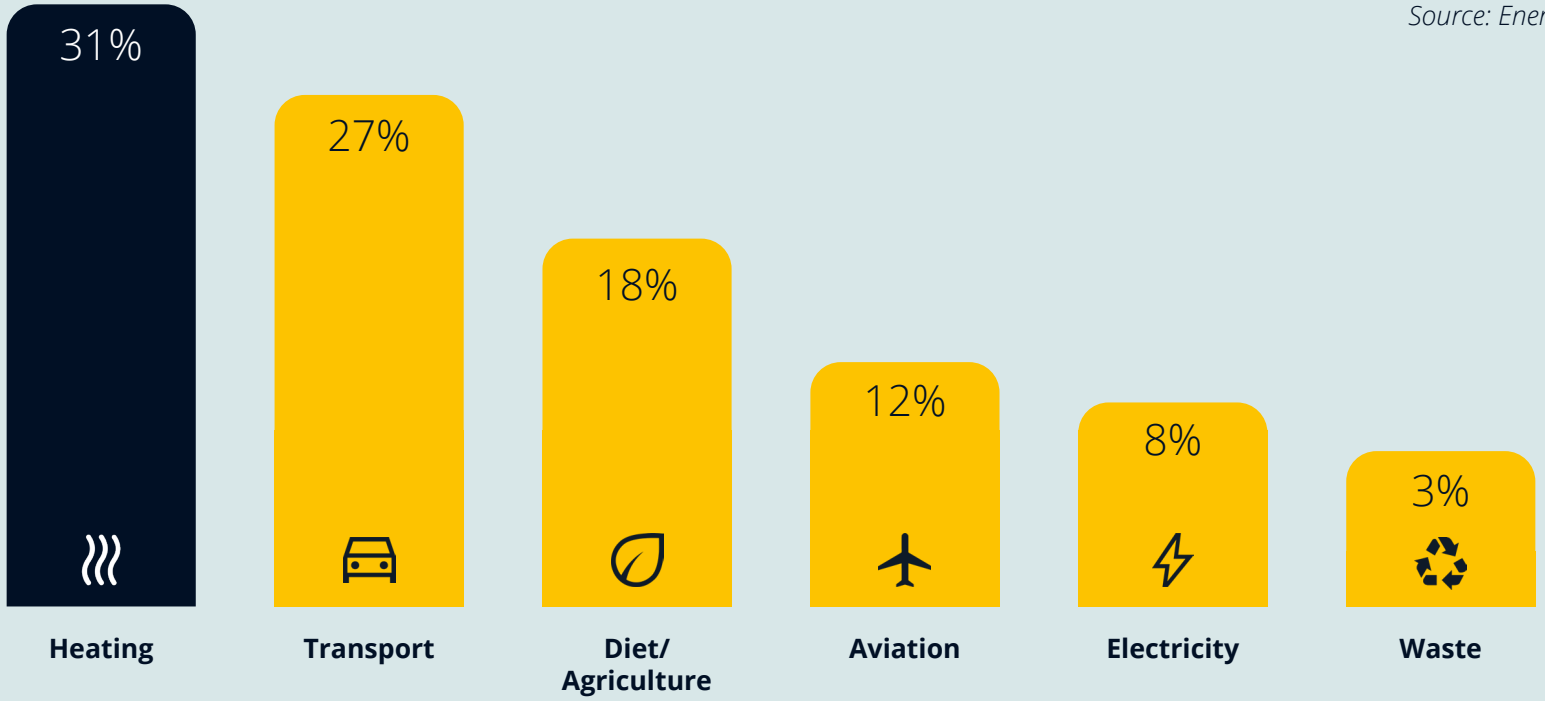
# What is a low-carbon heating solution?

The energy we use to heat our homes comes from two sources: fossil fuels or electricity.

Traditionally, boilers are powered by fossil fuels such as gas, LPG or oil. The emissions, or pollution, from these types of boilers are a massive contributor to the climate crisis, with heating on average accounting for 31% of carbon emissions per household.

In contrast, a low-carbon heating solution uses energy from renewable and sustainable sources i.e. sun or wind to produce electricity. As such, these types of heating solutions produce little or no emissions, making them a much cleaner alternative to a traditional fossil fuel boiler.

*Source: Energy Savings Trust*




**UK average $CO_2$ emissions per household**

## Why make the switch to a low-carbon boiler?

The National Grid ESO is transforming its operation of the electricity system so that by 2025, when there is enough zero carbon generation available, it can be deliver electricity without fossil fuels. This is creating the path to Great Britain's electricity system being run purely on zero carbon electricity by 2035, which means no carbon will be released when creating electricity.

The reason for this shift is to support the move to a net zero future, where continuing to burn fossil fuels for home heating doesn't support this move, making electricity the only viable option. As a result, when it's time to replace an existing boiler, it makes sense to switch to one of the low-carbon alternatives now available. This aim from the National Grid ESO will also mean that heat batteries will become even cleaner and more cost-efficient in the future.

"Every year, air pollution causes between 28,000 and 36,000 deaths and costs the economy more than £20 billion. Children in highly polluted areas such as Tower Hamlets have a 10% reduced lung capacity due to poor air quality. Cars are not the only cause; gas boilers are projected to become the largest contributors to Nitrous Oxide (NOx) emissions by 2025. In fact, building heating is already the largest source of NOx in London's financial district."

# Meet the Zero Emission Boiler (ZEB®)

### Cut Emissions

Powered by electricity, the ZEB is a cleaner alternative to your customers boiler as it doesn't release any pollution directly and it stores heat at the greenest times.

### Cost-Effective

The ZEB stores most of the heat your customers home requires during off-peak times to be used on demand, keeping electricity costs low.

### Easy to Install

The ZEB is a direct replacement for your customers existing boiler, meaning installation typically takes only 1-2 days and requires minimal changes to the home.

### Smart & Flexible

The ZEB intelligently stores the right amount of heat based on your customers needs, the weather and tariff. It can also be controlled from anywhere with our tepeo App.

10 YEAR GUARANTEE

MADE IN BRITAIN

- **A quick and simple to install** heat only boiler
- **Minimal changes required** to heating system or control equipment
- **40 kWh** of heat battery storage
- **15 kW** peak heat output and any water temperature setpoint
- **9 kW** sustained charging and discharging rates
- **Self-consumption** of renewables
- **Low environment impact** materials
- **High flow temperature** capable with a range of 35-80°C

# ZEB specifications

| Zero Emission Boiler ZEB-40R_03 | | | |
|---|---|---|---|
| **Electrical** | Rated input power (@230V) | 9 | kW |
| | Rated current (@230V) | 41.5 | A |
| | Max current draw (exc FCU) | 46.3 | A |
| | Nominal voltage (*48 - 52Hz*) | 230 | VAC |
| | Onboard power & frequency monitoring | Class B | |
| **Heating** | Thermal storage capacity (usable) | 40 | kWh |
| | Time to full charge (from empty) | 4.5 | hour |
| | Heat output (at >50% Charge) | 15 | kW |
| | Modulation range | 0-100% | % |
| | Output temperature range | 35-80 | °C |
| | Recommended ΔT across boiler | 10 - 20 | °C |
| | Maximum operating pressure | 6 | bar |
| | Typical flow rate | 10 | l/min |
| | Minimum flow rate | 3.5 | l/min |
| | Standing heat loss (at 50% charge) | 280 | W |
| **Physical** | Dimensions (W x D x H) | 598 x 660 x 980* | mm |
| | Weight | 375 | kg |
| | Max sound power level | 58 | dB |
| **Environment** | Ambient temperature | 5 - 40 | °C |
| | Storage temperature | -20 - 55 | °C |
| | Operating humidity | 10 - 85 | % |
| | Storage humidity | 5 - 90 | % |
| **Smart features** | Tariff optimisation | Yes | - |
| | Charge optimisation and learning | Yes | - |
| | Frequency monitoring & response | Yes | - |
| **Other** | Compatible with home generation & storage | Yes** | - |
| | Min / max Solar PV consumption | 0 / 9 | kW |

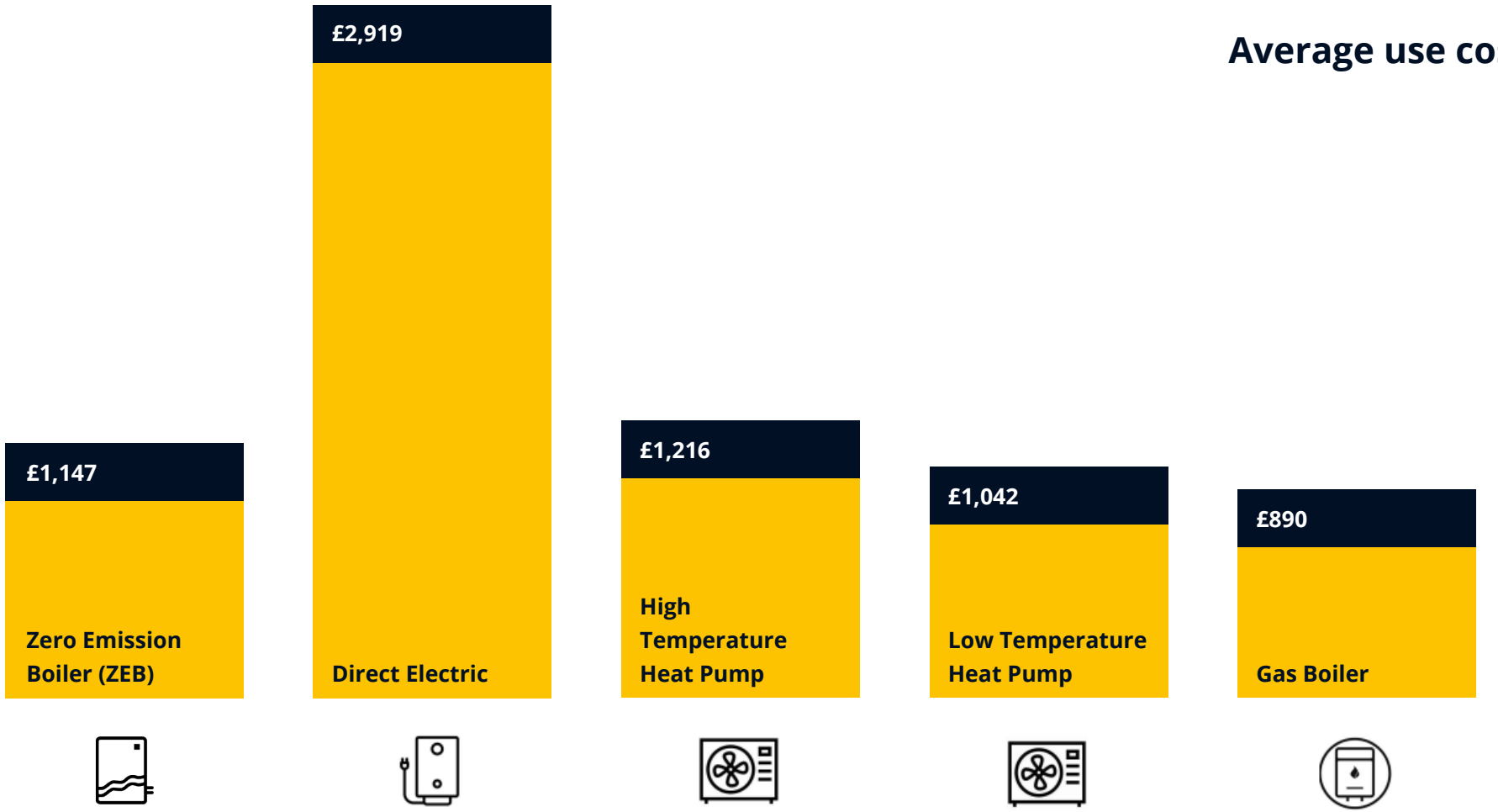
*Excludes necessary clearances. **Generation & storage dependent charging available from Spring 2024

# How does the ZEB compare to other heating solutions?

| | Traditional gas boiler | Electrical boiler | Heat pump | ZEB® |
|---|---|---|---|---|
| **Eco credentials** | Burning fossil fuels, creates pollutants | High carbon electricity, No direct emissions | Low carbon electricity, No direct emissions | Low carbon electricity, No direct emissions |
| **Ease of installation** | Easy to install | Easy to install | Complex, invasive retrofit | Simple retrofit |
| **Space** | Like for like | Like for like | Large amount of outside space and space in home | Space in home |
| **Flexibility** | Heating on demand | Heating on demand | Limited flexibility, lack of heat storage | Stored heating |
| **Energy cost** | Reference cost, no smart energy purchasing | High, using electricity on demand usually at peak prices | Long-term cost savings, no smart energy purchasing | Saves by purchasing when electricity is cheap (tariff, grid fluctations) |

# What are the ZEB's running costs & carbon emissions?

The ZEB is cost-comparable to other low carbon heating solutions. Switching from a gas boiler to the ZEB would lead to a **carbon saving of 852 kg/CO2e in 2023 and more in subsequent years.**




*Based on a property with 12,000 kWh annual fuel consumption.

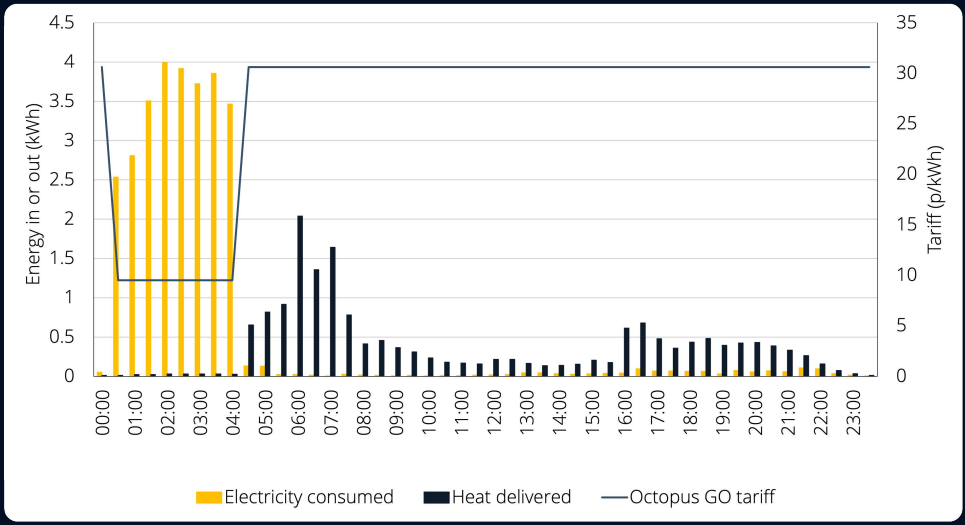
# How the ZEB addresses the problem

The ZEB is a heat battery and uses electricity to supply heating, charging up and storing most of the heat a home requires at off-peak times. This will help a customer make the most of time-of-use tariffs and minimise energy costs. Customers can also choose to charge their ZEB at the greenest times, which will mean when the carbon intensity for electricity production is at its lowest.

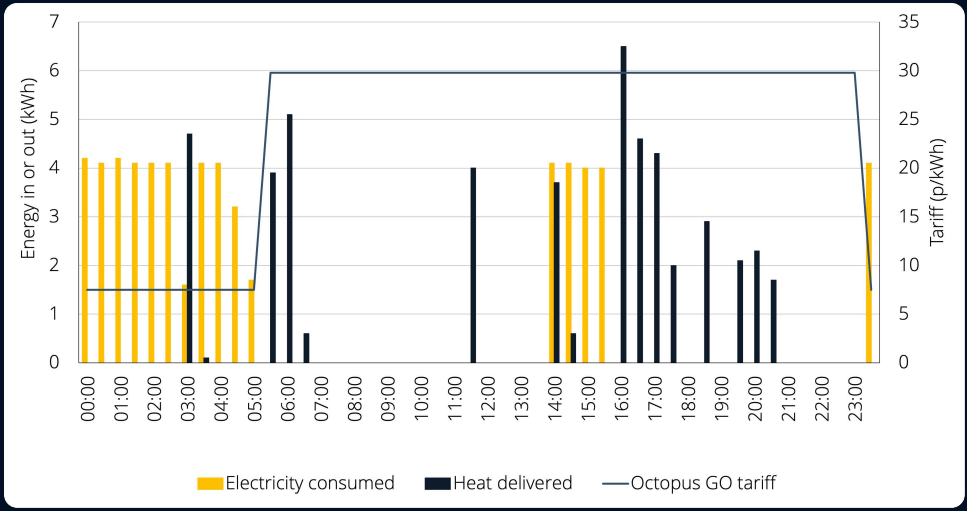
The ZEB intelligently stores the right amount of heat based on your customers needs, the weather and tariff, charging up at night and topping up during the day if needed.

Because the ZEB has no flue, it doesn't produce any pollution, meaning it's good for local air quality and health.

## Standard Charging Schedule




## Peak Winter Charging Schedule




## Intelligent heating through Smart Charging

The ZEB learns how much heating your customer needs and works out the best times to charge throughout the day.

First, the ZEB learns how much heat your customers home needs and uses local weather forecasts to make a prediction for the day ahead.

Next, the ZEB works out how much to charge and when to do it based on your customers tariff pricing, the grid carbon intensity and when your customer will need heat

As the day unfolds, the ZEB constantly checks its level of charge and re-calculates to make adjustments throughout the day if needed.

tepeo

Your customer is always in control - the tepeo app lets your customer adjust or set how the ZEB should charge and your customer can always boost the ZEB manually.

# Home suitability check

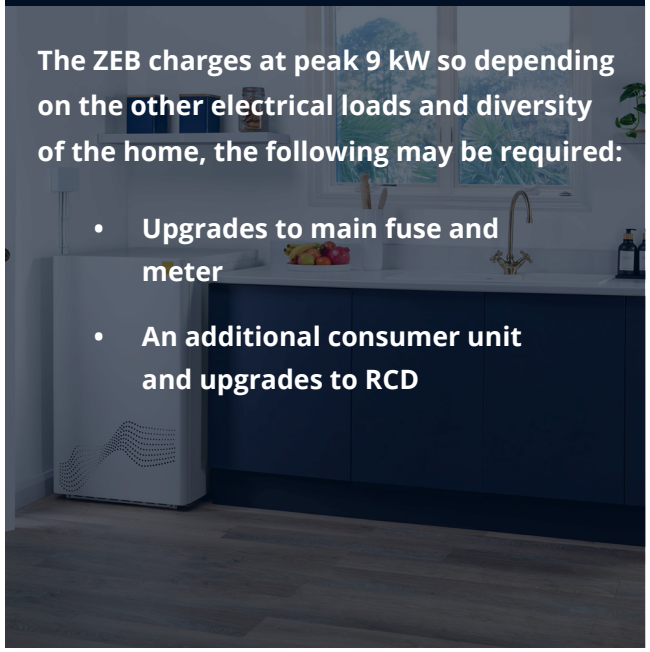
Key things to think about when identifying whether a home is suitable for the ZEB

## Site survey and access

The ZEB does not require a flue or condensate drain allowing for alternative installation locations compared to traditional fossil fuel boilers but the following needs to be considered;

- Size with packaging: 700mm (W) X 700m (D) x 1,130mm (H)
- Weight: 375kg
- Needs to be installed on a solid, stable floor

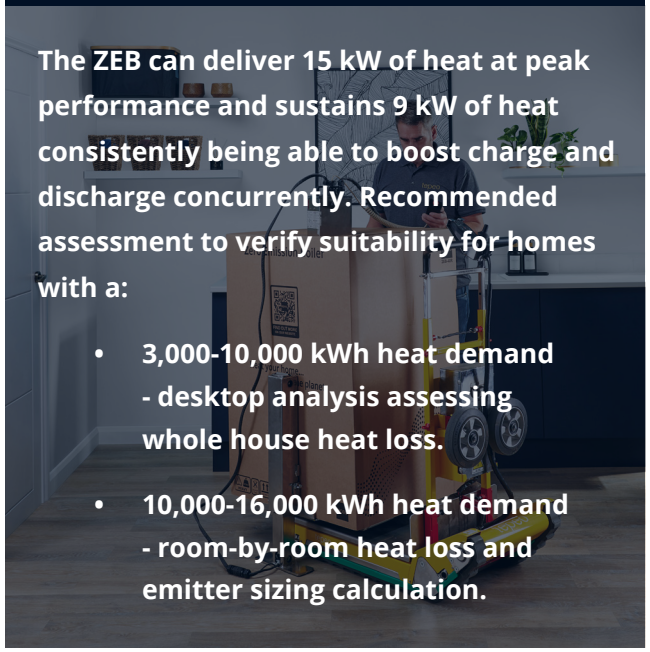
## Electrical supply



The ZEB charges at peak 9 kW so depending on the other electrical loads and diversity of the home, the following may be required:

- Upgrades to main fuse and meter
- An additional consumer unit and upgrades to RCD

## Heat loss and consumption



The ZEB can deliver 15 kW of heat at peak performance and sustains 9 kW of heat consistently being able to boost charge and discharge concurrently. Recommended assessment to verify suitability for homes with a:

- 3,000-10,000 kWh heat demand - desktop analysis assessing whole house heat loss.
- 10,000-16,000 kWh heat demand - room-by-room heat loss and emitter sizing calculation.

# The ideal home

Est. annual consumption **12,000 kWh** or less (heat demand of 10,000 kWh)

Whole home heat loss of **5 kW** or less

Flats and **2-4** bedroom houses

Heat loss calculation with emitter sizing **recommended**

Daily heat consumption of **60 kWh** or less

Installation within the heated envelope space heating efficiency **100%***

*Installation within the heated envelope of the home rates a ZEB® at 100% efficient at converting fuel into heat; installation in garages or unheated spaces is not optimal and may result in increased standing losses and reduced capacity.

## Change the boiler, not the home

Transitioning to greener heating with the ZEB is hassle-free. Unlike other low-carbon heating solutions, the ZEB can typically be installed in 1-2 days and requires minimal changes to a home or heating habits.

It's designed to directly replace a standard fossil fuel boiler, meaning a customer won't need planning permission, outside space, larger radiators, or substantial changes to their heating system.

# Installing the ZEB

**Fuel:** Because the ZEB runs on electricity, the fuel source is likely to be changed if replacing a gas or oil boiler. Therefore a new high current circuit will be needed, with the ZEB powered via an isolator directly from the consumer unit (50A breaker/RCD, 10mm2 min cable size).

**Controls:** Existing or new third party heating controls connect to the ZEB to provide a call for heat from either heating or hot water. The ZEB works with any type of time/temperature control including basic timeclocks and thermostats, through programmable thermostats and smart thermostats. There's no need to adjust any settings, your customer can use the ZEB as if they were using a fossil fuel boiler.

**Plumbing:** The ZEB is a regular boiler (heat only) and integrates into the existing heating system with 22mm copper flow and return connection using solder or compression/press fit fittings. Additional considerations include:

- Isolation valves - on both flow and return so the ZEB can quickly be isolated from the heating system for maintenance without draining the system.
- Automatic bypass valve - to ensure minimum flow through ZEB even when the heating system valves have closed.
- Pressure relief valve - to ensure the system pressure stays within limits.
- Magnetic System Filter - to help ensure the ZEB heat exchanger stays free from contamination (which would reduce performance).

**Hot water:** If replacing a combi boiler, there is a need to add a hot water store. This can be an indirect cylinder heated by ZEB, a direct cylinder heated with immersion or a compact heat battery, where space is limited.

# Hot water solutions for the ZEB

As the ZEB is a heat-only boiler, an additional solution needs to be added to provide hot water to the house. All of the solutions below are aimed at decarbonising both a customer's heating and hot water without compromising on performance.

### ZEB and Hot Water Cylinder

A hot water cylinder is a traditional cylinder that stores and heats water for use on demand. As the water is heated on a schedule, some planning is required to ensure customers aren't without hot water, but newer models come with smart features so offer better control. Depending on the property, hot water cylinders can either be connected to the mains water supply or require an additional cold water tank in the loft). Hot water cylinder can be heated indirectly by a ZEB (indirect hot water cylinder) or directly using an electric immersion.

### ZEB and Smart Cylinder

A smart cylinder is a hot water cylinder that heats from the top down, so you only heat the water that is needed. The heated water then stays hot as it's used from the tank. Smart features give better control of charging times, hot water volume as well as visibility, though they also mean upfront costs are more expensive than a traditional hot water cylinder. The extra smart technology and monitoring means upfront costs are more expensive than a traditional hot water cylinder. As with traditional hot water cylinders, smart cylinders are available in direct or indirect types.

### ZEB and PCM heat battery

A PCM store for hot water is a type of heat battery, like the ZEB. Internal materials store energy, which is then used to heat water on demand, rather than storing water like a cylinder would do. Although this is a relatively new technology, upfront costs don't differ significantly from traditional solutions. Customers can also use both cheap night electricity rates and energy generated from solar PV to keep running costs lower. In terms of size, they are significantly smaller than traditional solutions and don't require legionella cycles, so it saves energy compared to cylinders. There are a few different options of PCM similar to direct or indirect hot water cylinders, which mean they can be configured either separately or together with a ZEB.

### ZEB and Electric Water Heater

An electric water heater is a smaller, wall-mounted device that heats water on demand. Depending on the size of your customer's property, they might need more than one. They are typically low cost to install, but running costs will be high as they heat water on demand using peak electricity rates. It's worth noting that this solution does have a limited flow rate, which means it won't fill up a bath with hot water, but should be sufficient for taps and showers. The electric water heater and the hot water supply can only be wired and plumbed separately from the ZEB, which can be managed by tepeoPRO installers.

# Aftercare

## An annual Health Check, for the ZEB

The ZEB Health Check involves a trusted tepeoPRO installer checking the water quality in the heating system, clearing filters, visually inspecting parts for wear and tear, including cleaning where necessary, checking for leaks, carrying out an electrical safety test and generally ensuring the ZEB is running smoothly:

Unlike an annual service for a traditional heating system, a ZEB Health Check from tepeo includes all of the parts that may be needed - without any hidden costs.

Customers will automatically receive a yearly reminder of when their Health Check is due once the ZEB is installed.

## tepeo Care Plan, keeping the ZEB running smoothly

Our tepeo Care Plan can offer peace of mind, helping to maintain the 10-year guarantee by providing the routine checks the ZEB may need, including:

- The annual ZEB Health Check
- Remote monitoring of the ZEB through our cloud-based platform - if the ZEB has a fault, or we spot something unusual, we can let the customer know and get it sorted, fast.
- Discounts on fixed-price repairs to other essential parts of the heating system. If we identify a fault with core parts of the heating system, not covered under our guarantee, we can provide a fixed-price repair. Members of our Care Plan may be entitled to discounts on these fixed-price repairs.

Find out more about either the ZEB Health Check or tepeo Care Plan at www.tepeo.com/tepeo-care-plan.

## We want to be transparent with our guarantee

The ZEB comes with up to a 10 year guarantee as standard. Like all boilers, there are some parts which will wear faster than others, and like all boiler manufacturers, we provide a 5-year guarantee on these replaceable parts.

This includes the heating elements, heat exchanger and fan - all of which have been designed to be quick and easy to replace.

To maintain the guarantee, a customer needs to have an annual ZEB Health Check as a minimum, which includes all the parts that may be needed, without the hidden costs.

# Customer Support

We are here to help you with any queries you may have.

Support Operational Hours:

Monday - Friday : 8am - 6pm

Saturday: 9am - 2pm

Sunday: Closed

To speak to one of our Support Team
please call us on: 020 7072 5540

Or you can send us an email to: customer.service@tepeo.com

For any heating and hot water emergencies, please contact your installer directly.

Installer to enter contact details here:

We constantly update our product and product documentation and to find the latest copy of this document please visit www.tepeo.com/resources