



# Energy Efficient Homes

## The Retrofit Toolkit

### Sheet no 11: Heating Systems

#### Alternatives to Fossil Fuels

##### Heat Pumps

The UK's legally binding commitment to Net Zero Carbon requires us to stop using coal, gas or oil to heat our homes and cook our food. Since the electricity grid is becoming greener through carbon-free nuclear and Renewable generation (mainly offshore wind farms and solar PV), the Government is offering grants to households to switch to electrical heating systems.

This policy (plus the increase in electric vehicle usage) has implications for the National Grid. Electricity consumption is forecast to rise by at least 50%, and local distribution networks will need upgrading. Hence the need for us to make our heating systems as economical as possible.

Traditional electric fires, radiators, blowers and convector heaters are heavy users of electricity and therefore expensive to run. Heat pumps work like a fridge in reverse: they use small amounts of electricity to compress a fluid and so raise it to a temperature where it can heat the house. Thus, one unit of electricity can produce three or more units of heat. See:

<https://energysavingtrust.org.uk/energy-at-home/heating-your-home/heat-pumps>

[www.cse.org.uk/advice/heat-pumps](http://www.cse.org.uk/advice/heat-pumps)

<https://cat.org.uk/info-resources/free-information-service/energy/heat-pumps>

##### Ground Source Heat Pumps (GSHP)

Ground Source Heat Pumps use buried pipes to bring a mixture of water and anti-freeze to ground temperature. This 'brine' is then heated by compression and the heat is transferred to the wet system round the house. GSHP's are relatively expensive to install: they require either a large horizontal area of ground, or vertical drilling. Their advantage is that the ground temperature at the relevant depth is relatively stable all year round, which allows one unit of electricity to produce up to 4 or 5 units of heat. GSHP's are an attractive option for heating blocks of houses or flats so that the installation costs can be shared. For more information see:

<https://energysavingtrust.org.uk/advice/ground-source-heat-pumps/#:~:text=Heat%20from%20the%20ground%20is,transfers%20that%20heat%20to%20water.>

##### Air Source Heat Pumps (ASHP)

Air Source Heat Pumps work on a similar principle, but use the heat of the air instead of the ground as their starting point. The system works well down to minus 15°C, but it takes more electricity to produce the same warmth than in better weather.

NB: The fluid heated and pumped round the house by GSHP's and ASHP's is at a lower temperature (typically 45-55°C) than traditional fossil-fuel heating systems.



They therefore require a larger area of piping to warm the rooms to the same level. This is most effective in an under-floor system, and may be combined with improving your floor insulation. Alternatively, the installers may recommend replacing your radiators with a larger size.

<https://energysavingtrust.org.uk/advice/air-source-heat-pumps>

**Air-to-Air Heat Pumps** may be a suitable way of heating small houses or flats – see:

<https://energysavingtrust.org.uk/advice/air-to-air-heat-pumps>

## Biomass

Biomass heating systems burn wood pellets, chips or logs to provide warmth in a single room or to power central heating and hot water boilers. They release carbon dioxide when burned, but considerably less than fossil fuels.

See <https://energysavingtrust.org.uk/advice/biomass>

## Net Zero Carbon Gases

### Bio Methane (Green Gas)

### Green Hydrogen

“Green gases” such as Bio Methane and Green Hydrogen are also being canvassed as Net Zero Carbon systems for heating and cooking. They count as Net Zero because:

Bio Methane emits CO<sub>2</sub> when burned, but as it is made from vegetation and food waste it returns only the carbon already removed from the atmosphere when the plants grew.

“Green Hydrogen”: spare renewable electricity is used to separate hydrogen from water, and when the hydrogen is burned it combines with oxygen to produce water vapour again.

Ecotricity advocates using grass to produce Green Gas which can be fed into the gas grid to use our existing heating and cooking systems without much disruption.

A pilot plant is planned in Reading: see

[www.ecotricity.co.uk/our-green-energy/green-gas-mills-fact-sheet](http://www.ecotricity.co.uk/our-green-energy/green-gas-mills-fact-sheet)

## Other sheets available in this series

1. Fabric First: Planning changes to your home?
2. Preparing for Retrofit: Resources on your doorstep
3. The Energy Hierarchy: The Principle behind the Whole Building Plan
4. Opportunities to Begin the Journey
5. First Retrofit Priorities
6. Insulation: Roof & Attic
7. Insulation: Walls
8. Insulation: Windows & Ventilation
9. Insulation: Floors
10. Water Efficiency
- 11. Heating systems**
12. Lighting
13. Renewables
14. Costs & Grants

NB: Ecotricity’s claims are controversial, and the following points must be borne in mind

- Green Gas is planned to work only for homes connected to the gas grid.
- These technologies are in their infancy and are not yet scaled up for delivery in bottled form to off-grid homes.

## Heating controls

We will get the best out of modern heating systems by using smart controls which find the cheapest as well as the most convenient times to operate them.

See: <https://energysavingtrust.org.uk/advice/thermostats-and-heating-controls>

<https://energysavingtrust.org.uk/advice/smart-charging-electric-vehicles>

Download the info sheets from our website at <https://southshropshireclimateaction.org>

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