Decarbonising a modern detached family home in rural England.

Liquid Gas UK

Detached house 1981 - 1990

Floor area:
127m2

No major renovations
Cavity walls uninsulated & loft uninsulated

Energy needed for heating:

15,011 kWh/m_2* per year

There are approx 32,000 English properties of this type.

This report outlines the most appropriate methods for heating rural, off-grid homes in England. It takes into account the type of house and any renovations and improvements made over the years.

In this document we look at a typical modern detached property located off gas grid in a rural village location.

There are approximately 32,000 homes which fall into this archetype in England and approximately 14% of English homes aren't connected to the gas grid. Oil boilers are the most widely used method for heating this type of home and replacing these boilers will have a significant impact on carbon emissions.

Many of the low carbon alternatives available come at a high cost whether that comes from the up-front cost of purchase or installation, or the costs associated with retrofitting properties in order to make them more energy efficient.

LPG is a fossil fuel with a much lower carbon intensity than oil, it is clean burning and has low levels of NOx, SOx and particulate matter. It is currently used as a transitional fuel for BioLPG which is produced from sustainable fuel stocks making it an even lower carbon alternative

Cost Breakdown:

Heating system	CapEx (£)	OpEx (£/yr) (2020)	Levelized Cost (£/MWh) (2020)	Carbon Emissions (kgCO2e/yr) (2020)
Oil Boiler	3,950	1,144	85	5,728
Coal Boiler	4,754	1,020	77	8,005
LPG Boiler	1,500	1,541	96	4,060
BioLPg Boiler	**1,500**	**1,818**	**112**	**922**
ASHP	8,270	1,384	115	1,108
ASHP (+R) *	11,140	**987**	127177	790
Hybrid	9,430	1,389	119	1,071
Hybrid (+R) *	12,420	1,050	183	788
Biomass Boiler	11,544	1,269	116	**375**

Can rural households in England afford this?*

Heating system (CapEx)	Percentage of households who can afford this capital cost?
BioLPG Boiler (£1,500)	**74%**
ASHP (£8.270)	39%
Hybrid (£9,430)	36%
ASHP + R (£11,140)	33%
Biomass Boiler (11,544)	31%

Analysis:

Cost is always an important consideration when making decisions about which heating methods to recommend. Of the heating options which were analysed, the lowest cost, low carbon, heating system is a bioLPG boiler at **£1,500**. All other recommended options carry a much higher up front cost making them an unviable option for many families living in this type of property.

The heating system with the lowest operational cost is the air source heat pump with renovations to improve fuel efficiency within the home. The up-front cost of purchasing a heat pump and subsequent renovations required to install it makes it a costly option for many people. Only 33% of people can actually afford the costs of circa **£11,140** to purchase and install an air source heat pump.

The low capital cost of purchasing a bioLPG boiler, coupled with the levelized cost (ongoing costs throughout the duration of the boiler life span) makes the bioLPG the most financially accessible option for this type of home with 74% of consumers saying they can afford the cost of **£1,500** for a bioLPG boiler.

Conclusion:

- **BioLPG Boilers** have a much lower up-front cost when compared with heat pumps and biomass systems
- They offer a **low carbon solution** which meets Net Zero ambitions
- The **transition from oil to LPG is simple** - no renovations and large upfront sums of money required
- The **transition from LPG to bioLPG is seamless** as each product is chemically identical so can be mixed.

* This information has been taken from the Archetype Analysis work conducted by Ecuity Consulting comparing the suitability of heating methods between a variety of archetype properties in England. The full report can be found here: **https://www.liquidgasuk.org/uploads/DOC61793185F31C0.pdf**

***** It was assessed if rural households could afford the heating methods suggested after taking into account disposable income available