

Decarbonising a detached house in rural Wales.



Liquid Gas UK



**Detached house:
Pre 1945**

**Floor area:
198m²**

**No major
renovations**
solid walls &
uninsulated

**Energy needed for
heating:**

142.2 kWh/m²* per
year

This report looks at the most appropriate methods for heating rural, off-grid homes in Wales. 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 detached property located off gas grid in Wales representative of approx. 10,700 Welsh homes.

Oil boilers are the most widely used method for heating this type of home in rural Wales and replacing these boilers will have a significant impact on carbon emissions.

Many of the other low carbon alternatives available for heating homes 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 NO_x, SO_x 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 | 4,150 | 1,851 | 69 | 10,493 |
| Coal Boiler | 6,090 | 1,868 | 75 | 14,665 |
| LPG Boiler | 2,000 | 2,777 | 92 | 7,438 |
| BioLPg Boiler | <u>2,000</u> | <u>3,276</u> | <u>108</u> | <u>1,689</u> |
| ASHP | 18,270 | 3,039 | 139 | 2,433 |
| ASHP (+R) * | 31,690 | <u>1,217</u> | 167 | 974 |
| Hybrid | 14,960 | 2,886 | 131 | 2,284 |
| Hybrid (+R) * | 28,380 | 1,336 | 164 | 988 |
| Biomass Boiler | 16,574 | 2,325 | 109 | <u>686</u> |

Can rural households in Wales afford this?*

| Heating system (CapEx) | Percentage of households who can afford this capital cost? |
|------------------------|--|
| BioLPG Boiler (£2,000) | <u>64%</u> |
| Hybrid (£14,960) | 22% |
| Biomass (£16,574) | 20% |
| ASP (£18,270) | 17% |
| ASHP + R (£31,690) | 7% |

Analysis:

The lowest cost, low carbon, heating system is a bioLPG boiler at **£2,000**. All other recommended options carry a much higher up front cost making them an unviable option for many families.

The heating system with the lowest operational cost is the air source heat pump with renovations to improve fuel efficiency within the home. Unfortunately the up-front cost of purchasing a heat pump and subsequent renovations to install it makes it an unrealistic

option for many families. Just 7% of people living in this type of house can afford the costs of circa **£31,690** 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 64% of consumers saying they can afford the cost of **£2,000** for a bioLPG boiler.

Conclusion:

- BioLPG Boilers** have a much lower up-front cost 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 Wales. The full report can be found here: <https://www.liquidgasuk.org/uploads/DOC617931E48D387.pdf>

* Displays the approximate percentage of households that have an annual disposable income greater than the capital cost of each of the low carbon heating systems for a house of this archetype.