



Liquid Gas
Ireland



The role of liquid gas in providing
accessible lower carbon heating
for Irish homes

Introduction

In 2021, the Irish Government launched its National Residential Retrofit Plan setting out an ambitious target to retrofit 500,000 homes to a building energy rating of B2 by 2030¹. Announced as a core pillar of Ireland's wider Climate Action Plan deliverables, the Government also aims to install 400,000 heat pumps in existing premises to replace older, less energy efficient heating systems over the same period. This policy is the cornerstone of the Government's approach to decarbonising energy use across Ireland's housing stock, but is it the right approach for everyone?

Examining Central Statistics Office (CSO) Census data from 2011 – 2022, this report by Liquid Gas Ireland (LGI) analyses the national trends of energy sources used for home heating. According to Census 2022, Ireland has a total housing stock of some 2,125,000 permanent dwellings², of which over 1.8 million are classified as permanent private households. Based on these figures, the National Residential Retrofit Plan aims to retrofit over a quarter of permanently occupied homes in a decade.

LGI's review of Census data reveals a slow move away from high carbon fuels nationally, particularly in more rural parts of the country. This is further emphasised when progress of the National Residential Retrofit Plan is considered, with 15,246 property upgrades completed in 2021, 27,199 in 2022 and a target of 37,000 for 2023³. If these figures are maintained, there will be fewer than 80,000 total retrofits completed in the first three years of the plan, representing just 16% of the 500,000 target.

1. National Residential Retrofit Plan

2. CSO Census 2022 – Housing

3. Sustainable Energy Authority of Ireland (SEAI) – Quarterly National Retrofit Plan Progress Report

LGI's review of Census 2022 data reveals a slow move away from high carbon fuels nationally, and an increase in the number of homes using oil for heating

How a mixed technology approach can accelerate the decarbonisation of Ireland's housing stock

Heat pump technology will play an important role in decarbonising Ireland's housing stock, however, it's clear that a wider suite of options is urgently required to accelerate the decarbonisation of homes by 2030. LGI strongly argues that a 'mixed technology' approach that supports the use of lower carbon liquid petroleum gas (LPG) and renewable liquid gas (BioLPG / rDME) through the installation of renewable ready gas boilers, as well as heat pump technology, would help achieve this.

The Government has committed to reducing carbon emissions in home heating, but this policy should not prevent the switch to renewable ready gas boilers, which should be supported as a more sustainable option for consumers in rural areas off the natural gas grid.

Percentage of carbon savings available compared to higher carbon fossil fuels*

Kerosene Oil:



LPG 11%
BioLPG 73%

Coal:



LPG 33%
BioLPG 80%

Peat Briquettes:

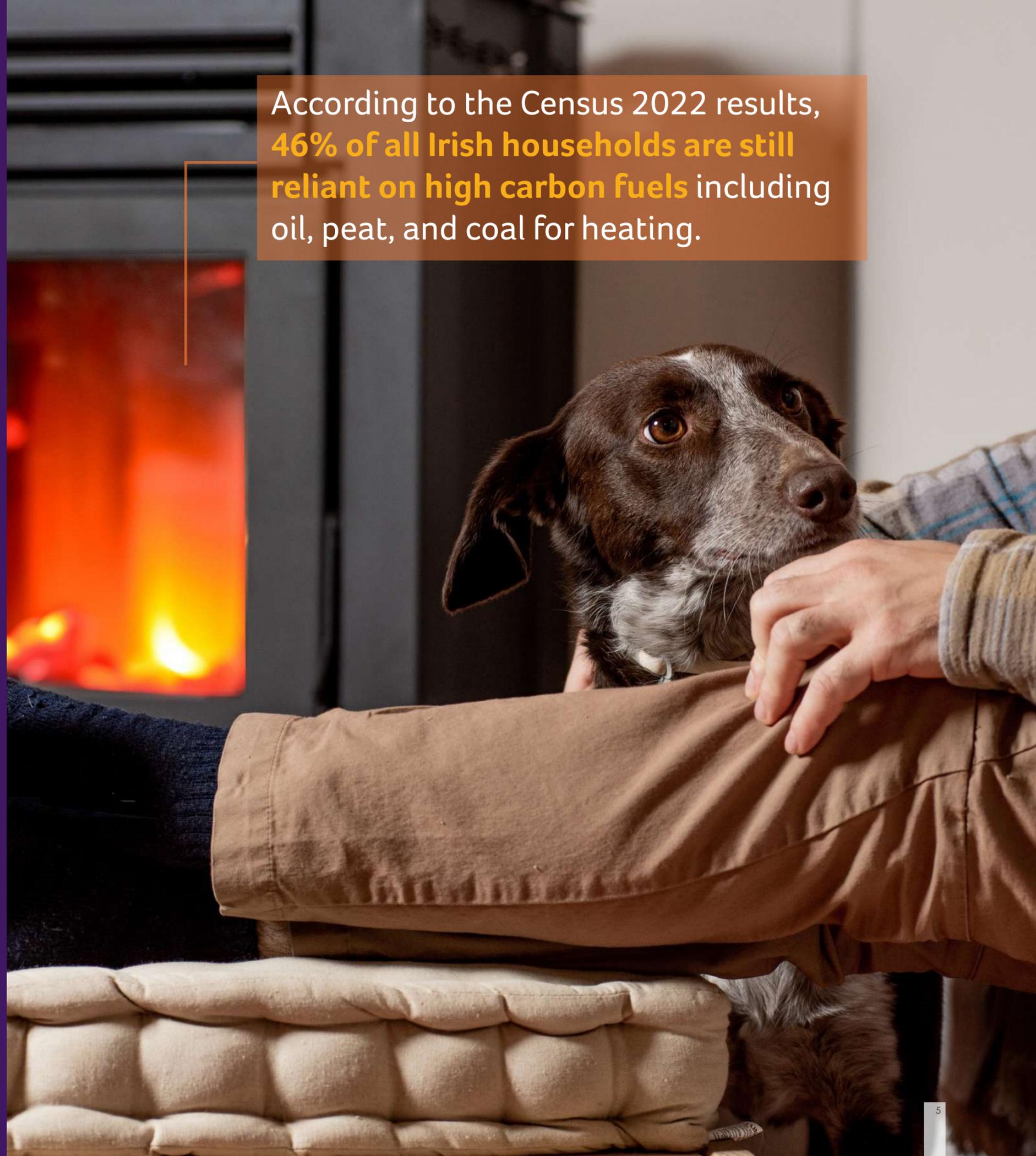


LPG 36%
BioLPG 81%

*An average BioLPG carbon value of 68.8 gCO₂eq/kWh is based on a 70% saving against conventional LPG (229.3 gCO₂eq/kWh SEAI). Actual figure is dependent upon input feedstocks.

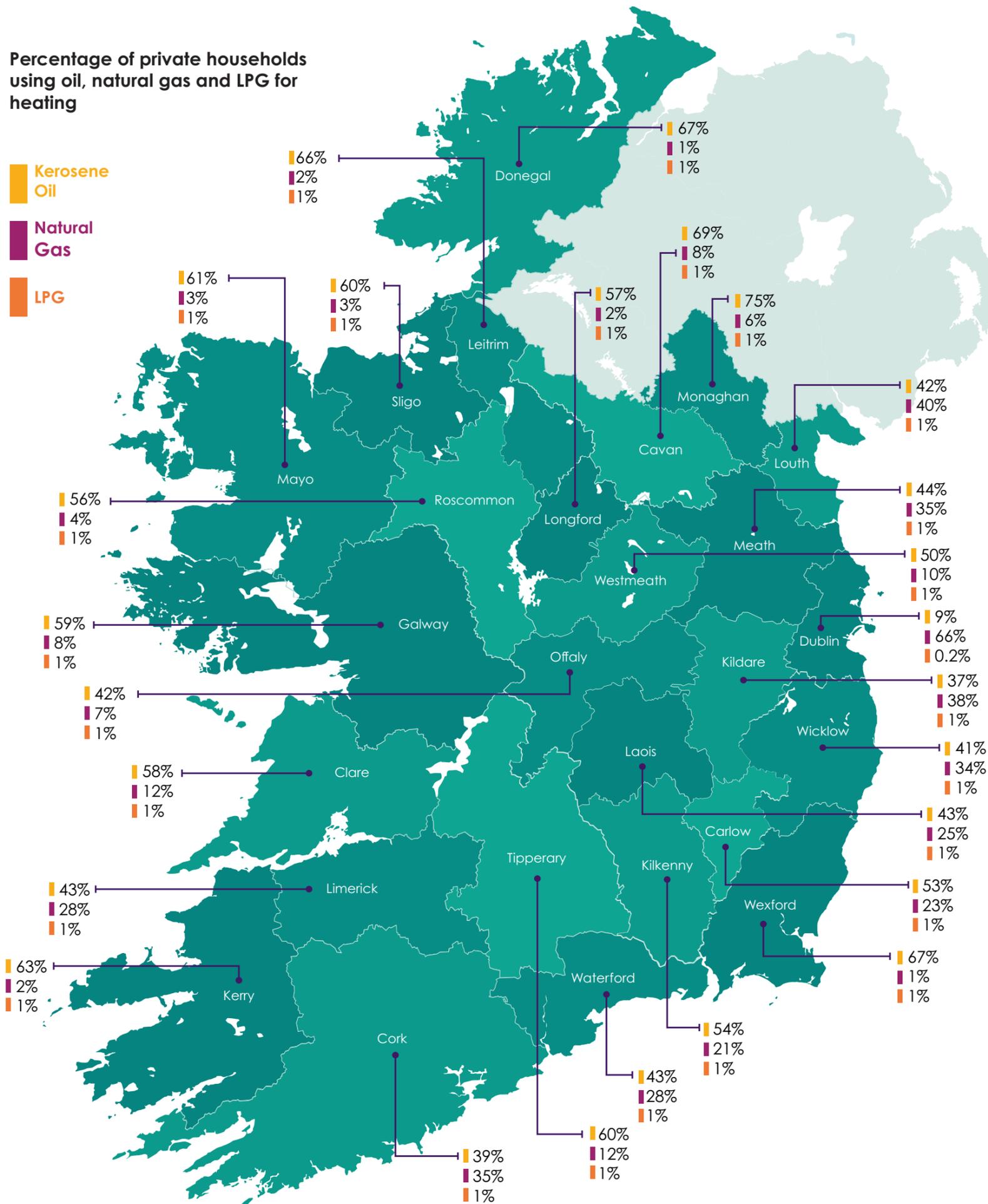
According to the Census 2022 results, 46% of all Irish households are still reliant on high carbon fuels including oil, peat, and coal for heating. A large majority of these households are located outside our major urban centres, in areas off the natural gas grid and in older building stock. In many circumstances, switching to a heat pump system is not logistically viable or is prohibitively expensive, leaving homeowners with limited alternative options to decarbonise their heating system.

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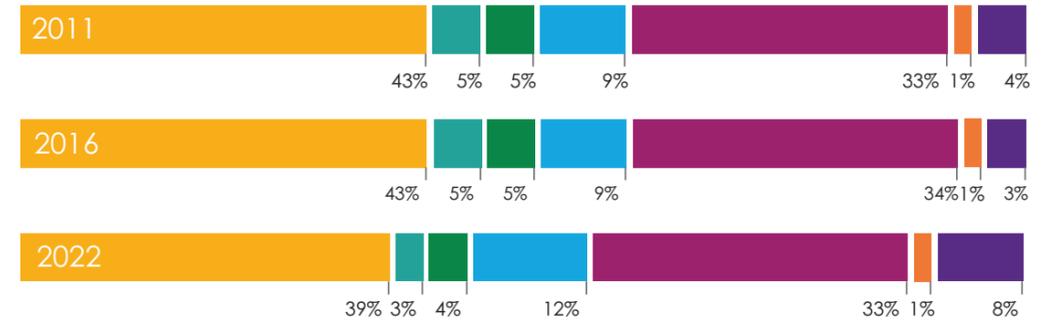
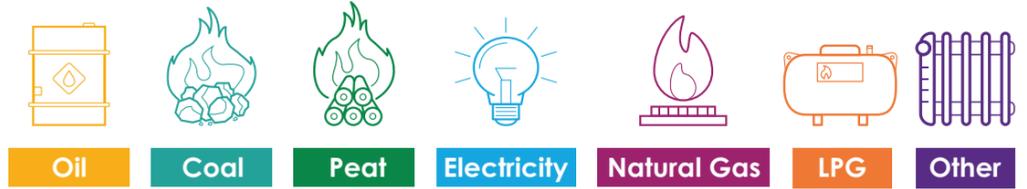


Percentage of private households using oil, natural gas and LPG for heating

- Kerosene Oil
- Natural Gas
- LPG



Types of heating used by private households



CSO Census 2011, 2016, 2022 – Housing

Both lower carbon LPG, renewable BioLPG and, in time, rDME, can and are playing a key role in helping rural Irish homes meet their energy needs while simultaneously lowering carbon emissions. By adopting a mixed technology approach that embraces lower carbon and renewable fuels, the Government can support the 46% of homes currently using high carbon fuels and deliver cleaner air and lower emissions in rural areas in line with our 2050 net zero targets.

A 'mixed technology' approach can plug the gap in the current 'one size fits all' policy and offer a Just Transition to lower carbon, cleaner burning heating for older, more rural homes.

This is where a 'mixed technology' approach can plug the gap in the current 'one size fits all' policy and offer a Just Transition to lower carbon, cleaner burning heating for older, more rural homes. A heat pump solution won't work for everyone, and significant carbon savings can be made if those who still rely on high carbon fuels can be transitioned to accessible, affordable and fair alternatives. This will be critical in convincing a broader number of households to consider implementing decarbonisation measures in their home, particularly those in more rural areas.

Setting the scene – Ireland's continued reliance on high carbon fuels

Many Irish households continue to heavily rely on high carbon fuels as their primary source of home heating. In total, 39% of households nationally rely on oil, with 4% using peat and 3% using coal. This demonstrates the significant cohort of dwellings that could be targeted to make real inroads in Ireland's climate targets.

Number of households using oil



2016: **686,004**

2022: **714,177**

total number of households using oil increased by 28,173

While the overall national proportion of households using these high carbon fuels has decreased slightly from 2016, the total number of housing units using oil has increased by 28,173, to 714,177. Consequently, there are now more houses in Ireland which rely on oil for central heating than there were in 2011. This trend towards higher total oil use puts the key objectives in both the National Residential Retrofit and Climate Action Plans at risk.

Unsurprisingly, the lowest reliance on oil for home heating is in Dublin at 10%, where there are greater options available for switching to lower carbon and renewable alternatives. Outside of Dublin and Cork City (16%), the reliance on oil across Ireland is much higher, fluctuating between 37% in Kildare and 75% in Monaghan.

Overall, the use of oil, peat and coal is greater in areas that don't enjoy the same access to lower carbon alternatives, or where a higher average age of housing stock is a prohibitive factor in switching to heat pump technology. The number of homes using peat and coal between 2016 and 2022 decreased by 45,312, likely impacted by the Government ban on the sale of turf, smoky coal, and wet wood introduced in October 2022. There is a possibility that a proportion of these homes switched over to oil, leading to the national increase in total housing units using oil referred to above.

When it comes to peat specifically, nearly 68,000 homes are still using peat for home heating. While this represents a decrease of over 22,000 homes since the 2016 Census, there are several areas where the reliance on peat remains exceptionally high. The three areas most reliant on peat for home heating are Offaly (27%) Roscommon (20%) and Galway County (18%). An additional 63,000+ homes continue to use coal, with households in Donegal (11%) and Wexford (11%) the most prevalent users.



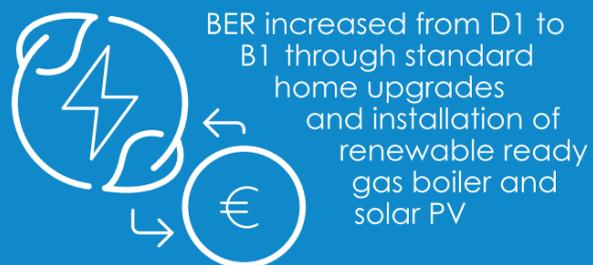
Lower carbon LPG, renewable BioLPG and rDME offer significant reductions in carbon emissions when compared to oil, peat, and coal. Renewable BioLPG has the capacity to reduce greenhouse

gas emissions up to 90% against the set values of fossil fuels, in accordance with the European Union Renewable Energy Directive⁴.

How LPG and BioLPG can support energy efficiency upgrades to older, off natural gas grid rural homes

The average age of Ireland's housing stock presents another challenge to achieving the Government's retrofitting targets, with 65% of all houses built before 2001. This equates to just over 1.2 million homes, which are typically less energy efficient and more costly to heat. For a heat pump system to work efficiently in these older properties, there is a high probability that a deep retrofit of the building will be required. This can potentially cost more than €60,000 for older properties⁵.

The age of Ireland's housing stock



Cost: €11,331

Furthermore, at the end of 2022, only 39% of the housing stock – 827,634 homes – had a valid energy efficiency (BER) rating and fewer than 20% had ratings of B2 or above. A study produced by Gemserv on behalf of LGI and published as part of LGI's policy document 'Liquid Gas – Making the 'Just Transition' more sustainable for rural Ireland' in January 2023, demonstrated that there are alternative scenarios in which an energy-inefficient older property can improve its BER⁶.

The study took a typical 1970's rural bungalow with a D1 BER rating using an old oil-fired boiler and explored what would be needed to improve its energy efficiency. It concluded that it is possible to meet and exceed a B2 BER rating by installing a renewable ready gas boiler, along with standard building and fabric upgrades to the home and the installation of solar PV. It also demonstrated that this work could be completed for just over €11,000; a

significantly lower cost than the installation of a heat pump and the associated deep retrofit.

The study concluded that renewable ready gas boilers should be considered as a key decarbonisation solution for home heating as part of a mixed technology approach, providing a realistic alternative option for older boiler replacement. This combined with the ability to make fabric upgrades to the house over time, would allow older homes in rural Ireland to enjoy an affordable, progressive, and step-by-step 'Just Transition' to decarbonisation.

4. BioLPG reduces GHG by at least 50% and up to 90% against set values of fossil fuels, in accordance with the European Union Renewable Energy Directive ('EU-RED'). Actual figure is dependent upon input feedstocks.

5. www.seai.ie

6. Gemserv heating system analysis report using SEAI DEAP4 software conducted on behalf of LGI.

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As clean burning fuels with low levels of air and particulate pollutant emissions, lower carbon LPG and renewable BioLPG offer a alternative heating options for households that want to switch from high carbon solid fuels.



Empowering older homeowners to play their role in a 'Just Transition' to decarbonisation

Older homeowners represent a large cross-section of society. A large majority of Ireland's lowest BER rated homes are occupied by older people, many of whom are on low incomes, rely on a single income stream and/or have limited savings. This presents a significant cost barrier when considering decarbonising their heating systems through retrofitting and heat pump installation.

Furthermore, many people are put off by the intrusive and time-consuming nature of a deep retrofit, with concerns that the process could prove to be very disruptive.

The latest 2022 Census data informs us that in Ireland there are 188,981 households with an age group of 65 years and older living alone. Of this group, 86,057 (46%) rely on oil for central heating, 9,818 (5%) use peat, and 9,587 (5%) rely on coal. For much of this group currently using high carbon fuels, the heat pump solution simply isn't an affordable option.

Percentage of high carbon fuel use by age category

	Oil	Coal	Peat	Total
All ages	39%	3%	4%	1,836,728
65 years and over living alone	46%	5%	5%	188,981
65 years and over not living alone	51%	5%	6%	292,524
65 years and over	49%	5%	6%	481,505
60 - 64 years	44%	5%	5%	157,763
55 - 59 years	43%	4%	4%	173,201
50 - 54 years	40%	3%	3%	187,148
45 - 49 years	37%	3%	3%	196,813
40 - 44 years	34%	2%	2%	206,451
35 - 39 years	30%	2%	2%	178,314
30 - 34 years	26%	2%	1%	131,743
25 - 29 years	23%	2%	1%	77,813
Under 25 years	18%	2%	1%	45,977

There are also many technological barriers when it comes to retrofitting, as online applications through the SEAI can be onerous and time consuming. One-stop-shops, low interest loan schemes, and Nearly Zero-Emission Building (NZEB) standards can take time to research and be difficult to navigate, which can prove to be a substantial challenge for an elderly homeowner.

A further 292,524 households are classified as being occupied by persons over the age of 65 and not living alone. Again, we see a high reliance on high carbon fuels for heating among this group, with 51% using oil, 6% using peat and 5% using coal. Overall, the percentage of the population using high carbon home heating fuels increases with age. To make a convincing argument to older cohorts to decarbonise their central heating, there must be an obvious return of investment to them within their lifetime.

It's essential to carefully consider the specific circumstances and needs of each individual and each cohort of society when setting out pathways to decarbonising home heating systems. This is where embracing a mixed technology approach can provide a 'Just Transition' to a wider representation of society. Smaller, more targeted improvements may be a more suitable and practical option that allows older members of society engage in Ireland's decarbonisation journey. Lower carbon, cleaner LPG and renewable BioLPG have an important role to play here as part of a mix of lower carbon energy options.

LPG, BioLPG and rDME can support cleaner air quality across Ireland's regional urban settings

Poor air quality is a significant challenge in rural towns where households traditionally use high carbon solid fuels like coal and peat for home heating. The Environmental Protection Agency's (EPA) Air Quality in Ireland Report 2022, emphasises that we can improve air quality by using less solid fuel and instead use cleaner fuels to heat our homes⁷.

There are an estimated 1,300 premature deaths in Ireland per year caused by fine particulate matter in our air⁸. In 2022, 42 of the 58 air quality monitoring stations across the country used by the EPA exceeded the daily particulate matter limit at least once during the year⁹. Most stations that recorded particulate levels exceeding the limit are in regional urban and suburban areas.

The three worst performing areas were Ennis, Co. Clare, which exceeded the limit on 21 days, Tralee, Co. Kerry (14), and Edenderry, Co. Offaly (11). Other regional towns that exceeded the limit on five or more days in 2022 include Longford Town (9), Macroom, Co. Cork (7), Letterkenny, Co Donegal (6), Enniscorthy, Co Wexford (5), and Wexford Town (5).

Of these locations, only Ennis and Wexford Town are connected to the natural gas grid. The proportion of households who rely on high carbon fuels as their primary energy source for central heating is particularly high in each of these regional urban areas. The percentage of households using oil ranks highest in these areas, ranging from 53% in Edenderry and Longford Town to 69% in Letterkenny.

Furthermore, an additional 19% of households in Edenderry also use peat to heat their homes. When coal usage is factored in, it shows that 74% of all households in the County Offaly town use high carbon fuels. When it comes to the proportion of households using coal for home heating, Enniscorthy (17%) and Wexford Town (13%) rank highest.

Heavy reliance on high carbon fuels in each of these regions must be seen as a driving factor to continuous poor performance in the EPA's annual air quality reporting. Given that most don't have a connection to the natural gas grid, these towns don't have the same options available to them to help with decarbonisation efforts.

As clean burning fuels with extremely low levels of air and particulate pollutant emissions (NOx, SOx and PM), lower carbon LPG and renewable BioLPG give households in regional urban settings an alternative option to contribute to improving local air quality by switching away from high carbon solid fuels.

A switch to LPG, BioLPG or, in the future, rDME, would have an immediate and lasting impact on regional air quality, supporting the objectives of the Government's Clean Air Strategy and helping to deliver on Ireland's air quality targets. For this to happen, it is essential that consumers have the option and are supported to utilise renewable ready gas boiler technology.

7. www.epa.ie – Air Quality in Ireland 2022

8. www.epa.ie – Air Quality in Ireland 2020

9. www.epa.ie – Air Quality Bulletin – PM10 Dec 2022

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About Liquid Gas Ireland

Liquid Gas Ireland (LGI) is the association representing companies operating in the LPG and BioLPG industry in Ireland. Members include LPG and BioLPG distributors, equipment manufacturers, and service providers.

LGI's mission is to ensure that policy makers continue to recognise LPG and BioLPG as the clean, versatile, and alternative lower carbon energy of choice for off-grid energy users in the residential, commercial, industrial, agricultural, leisure, and transport sectors in Ireland. The Association also takes a leading role in safety, setting high standards for the safe, progressive development and use of LPG and BioLPG. LGI is committed to working with consumers, stakeholders, and policymakers to support Ireland's goal to tackle air quality, drive decarbonisation and achieve net zero emissions by 2050.



About LPG, BioLPG and rDME

Liquefied Petroleum Gas (LPG) is a liquified hydrocarbon gas that comes in two main forms, propane (C₃H₈) or butane (C₄H₁₀). As it is supplied in liquified form in a bulk tank or cylinder, it is a flexible fuel source that can reach areas not connected to the national gas grid or centralised district heating systems.

Both LPG and BioLPG offer significant emissions reductions from traditional fossil fuels. LPG combustion emits 33% less carbon dioxide than coal and 11% less than kerosene heating oil¹⁰. LPG also emits almost no black carbon, which scientists now believe is the second biggest contributor to climate change, and very low levels of air and particulate pollutant emissions.

BioLPG is a chemically indistinct but renewable version of LPG. It is made from a mix of sustainably sourced renewable vegetable oils, residues, and waste materials. BioLPG reduces greenhouse gas emissions by at least 50% and up to 90% against set values of fossil fuels, in accordance with the European Union Renewable Energy Directive and is certified under the International Sustainable Carbon Certification (ISCC) scheme.

Exempt from carbon tax, BioLPG is currently used in Ireland and provides the same heating and fuel properties as LPG. BioLPG is what's known as a 'drop-in' fuel, meaning no new equipment is required to switch from LPG. For consumers in rural off-grid homes, this is an easier and more affordable switch to make and the environmental benefits are immediate.

LPG and BioLPG can be used in several different sectors, such as domestic, commercial, industrial, agricultural and for transportation.

Continuing innovation in the liquid gas industry has led to the development of rDME, a low carbon, sustainable liquid gas, which is complementing the advances being made by BioLPG. It can be produced via gasification and catalytic synthesis, using feedstocks such as municipal solid waste, forest residues, animal waste, sewage/industrial sludge, and energy crops.

rDME can also be blended with LPG or BioLPG and used in existing infrastructure, making it a more flexible and affordable option for homeowners and businesses in off-gas grid areas. rDME is a sustainable fuel for the future and significant progress is being made, with a commercial plant under development in Teesside, UK, which is targeted to produce 50,000 tonnes of rDME per year. Should the necessary investment and regulatory framework be put in place, there may be opportunities for rDME production facilities in Ireland in the future.

10. SEAI Conversion Factors⁸. www.epa.ie – Air Quality in Ireland 2020





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