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LIQUID GAS IRELAND VISION FOR 2040

Liquid Gas Ireland

LPG and BioLPG:

a Greener Deal for Rural Ireland

Contents

Liquid Gas Ireland

Foreword

I am delighted to launch Liquid Gas Ireland's Vision 2040, which sets out how our industry can contribute to Ireland's 'Green New Deal', including the ambitious goal to reach net zero emissions by 2050, and to the Government's Clean Air Strategy.

LPG has been a key part of Ireland's energy mix for almost a century. Going forward, we believe LPG and BioLPG can support the Irish Government's commitment to transition to a low-carbon economy and fulfil its binding obligations under the 2015 Paris Agreement on climate change.

As natural gas network penetration in Ireland is relatively low (39% of households)[1], the full potential of lower-carbon gaseous fuels like LPG needs to be further exploited. Over 40% of households in Ireland rely on oil to heat their homes. This share varies significantly by region, with roughly 26% of households located in towns using oil for central heating compared to 65% in rural areas.[2]

While LPG already offers significant reductions in carbon and air pollutant emissions, BioLPG is the future, providing up to 90% certified carbon emission savings compared to conventional LPG. Already available on the market today,[3] BioLPG allows off-grid homes and businesses to significantly reduce their carbon footprint without expensive retrofitting or changes to heating systems.

Liquid Gas Ireland estimates that if 500,000 homes switched from using oil-fired central heating to BioLPG by 2040, it would save about 1.9 million tonnes of CO2 emissions per year. [4]

Liquid Gas Ireland members are committed to working with Ireland's policymakers to develop a long-term supportive policy framework to achieve 'net zero' and address barriers to decarbonisation in the off-grid heat and transport sectors.

A 'one-size-fits-all' approach will not work. It is crucial that the Government brings both urban and rural communities on the decarbonisation journey, providing them with technology choices that meet their unique needs through secure, clean, efficient, and reliable lower-carbon fuels. In this document, we outline three key actions that we believe the Government must take to achieve this, as well as the role that LPG and BioLPG can play in the decarbonisation process.

Our society demands an energy transition that is fair, affordable, and convenient; Liquid Gas Ireland's member companies have the experience and expertise to help deliver it. We look forward to engaging with Government and energy sector stakeholders in the coming weeks and months.

Brian Derham / Chair, Liquid Gas Ireland

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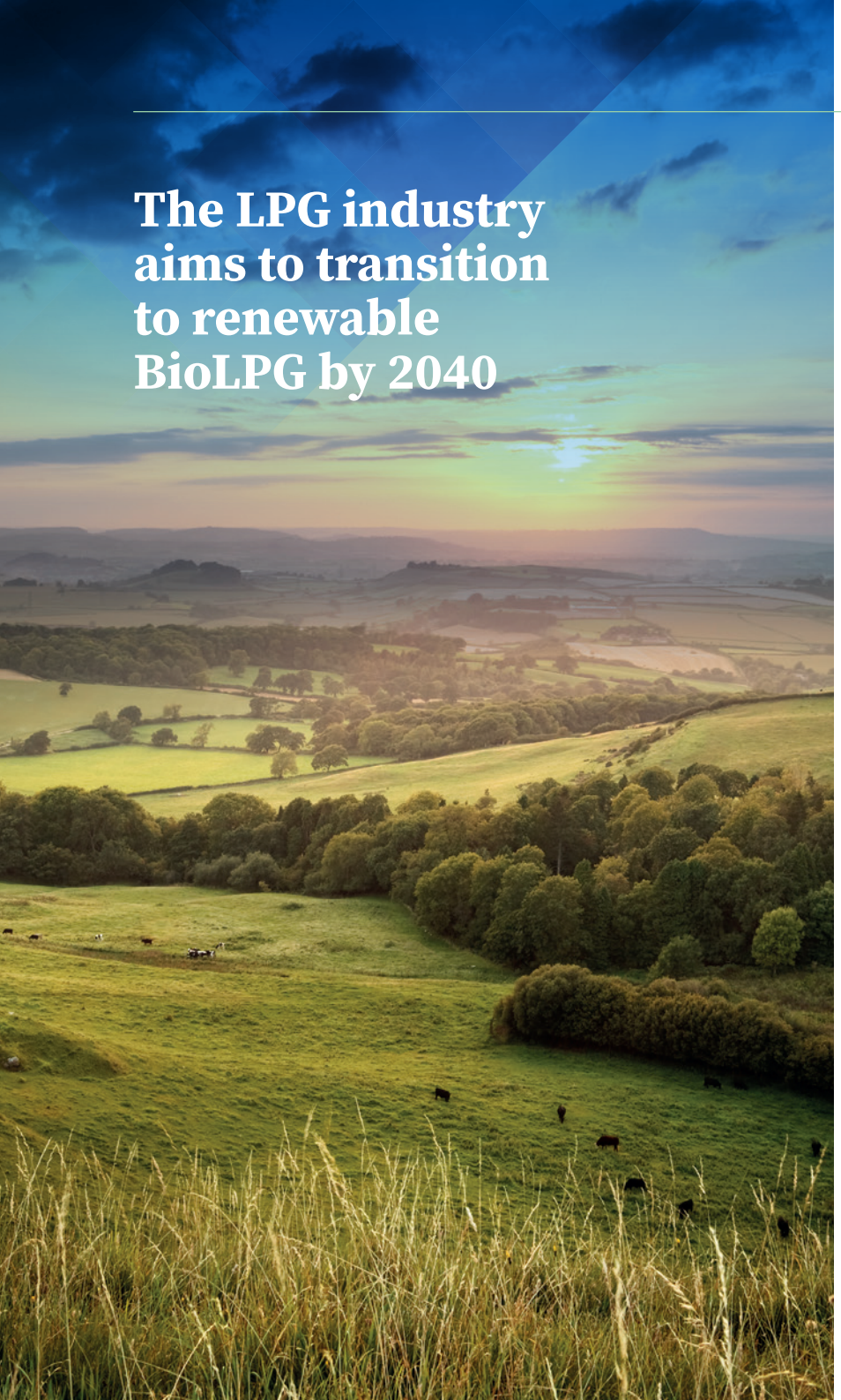
Vision and recommendations

Liquid Gas Ireland



The LPG industry aims to transition to renewable BioLPG by 2040

Our 2040 vision for rural energy provision

The Irish LPG and BioLPG industry is a key part of Ireland's energy mix, ensuring thousands of homes and business have access to lower-carbon fuels. Liquid Gas Ireland (LGI), as the representative body for the LPG and BioLPG industry, is determined to support the Irish Government in achieving its climate change and clean air targets in a timely, affordable, and non-intrusive way, taking into account the unique needs and economic and infrastructural challenges of rural Ireland.

Our objectives are therefore to:

- Transition up to 500,000 oil boilers to LPG by 2030, equivalent to 50,000 households and businesses per annum.
- As an industry, transition to 100% BioLPG by 2040.

The case for change:

- 1.8 million people live in rural areas across Ireland.[5] These communities matter and need to be understood. To deliver a just energy transition, policy should reflect conditions in rural areas.
- 75% of rural areas in Ireland are not connected to the natural gas grid.[6] Most rural homes (65%) are heated with oil and over 10% use peat for heating. Since 2017, rural fuel emissions have risen by 8% due to an increase in oil and coal consumption.[7]
- 42% of the rural building stock is relatively old, built before 1980. Older homes are also typically less energy efficient and have higher fuel bills than modern homes.
- Where other forms of low-carbon energy are not readily available, or require expensive infrastructural intervention, LPG and BioLPG are crucial alternatives.
- LPG, commonly butane or propane, is a clean-burning, smoke-free fuel. It contributes directly to climate and energy policy by reducing emissions by up to 33% compared to other fossil fuels such as oil and solid fuels.[8]
- BioLPG, also called biopropane, is a chemically indistinct but renewable version of LPG. BioLPG delivers up to 90% in certified carbon emissions reductions versus conventional LPG.[9]
- Affordability of energy solutions will be key for the economic recovery of rural households and businesses. LPG/BioLPG boilers are the most cost-effective low-carbon option for many households, especially older properties that are less energy efficient.
- For an average household, the upfront cost of an electric heat pump unit is €15,000 versus €4,000 for a new LPG or BioLPG boiler. Implementing the necessary energy efficiency upgrades to accommodate heat pump technology in an average older rural home would add an additional €15,000-€20,000 to the upfront cost.[10]
- As BioLPG is a 'drop-in' fuel, LPG infrastructure is already prepared for the future, so no deep retrofitting or new equipment is required.

Our recommendations to Government

Decarbonisation must be a priority for Ireland. However, the Government must also recognise that the energy transition will not work with a one-size-fits-all approach. To secure buy-in from the rural population, the transition must be 'just', considering the unique needs and economic and infrastructural challenges of rural Ireland.

Rural areas account for around two-fifths of Ireland's population.[11] These rural communities are often not connected to the natural gas grid. As a substitute, heating oil and solid fuels are widely consumed for heating purposes. Around 65% of the Irish rural housing stock is fuelled by heating oil.[12] Over half of these homes are detached houses, which have higher than average heating demand. Around 48% of detached homes using oil-heating have a Building Energy Rating (BER) of 'C' and below.[13] For these homes, switching to electric heat pumps is not a silver-bullet solution.

However, LPG and BioLPG are affordable, clean-burning, readily accessible, lower-carbon alternatives. Oil boilers can be replaced with an LPG or BioLPG boiler at minimal cost in a fraction of the time of electric heat pump installation. Government policy and legislation should recognise and support the role of LPG and BioLPG in a just transition to lower carbon energy and cleaner air in rural Ireland. We therefore recommend that the Government takes the following three key actions:

Legislate for a mixed technology approach to decarbonisation

Decarbonising heat will be necessary if Ireland is to meet its climate change targets. To do this in a just and effective way, policymakers need to balance emission reduction, air quality, and energy affordability challenges, all of which impact Ireland's rural communities.

The role of LPG and BioLPG in national climate and energy policy and plans must be considered in order to support rural households and business in the energy transition.

Commit to clean alternatives to improve regional air quality

Ireland needs a strong vision for a regional approach to delivering on air quality targets. This must include a clear commitment to cleaner, greener alternatives. Communities off the natural gas grid need support to make the change. LPG/BioLPG is a clean burning smoke-free fuel that supports cleaner air quality and can play a role in improving the health of rural communities across Ireland.

Prioritise a just transition

Take fully funded, sustainable, and achievable steps to bring rural ireland along the low-carbon journey.

The leap from old technology to new will leave many behind. Government policy should support cost-efficient solutions like fuel-switching and support to upgrade to modern, high-efficiency appliances, which are future-proofed and ready for 'drop-in' solutions.

LPG and BioLPG can help rural consumers and businesses achieve this transition with affordable, reliable, and sustainable options.

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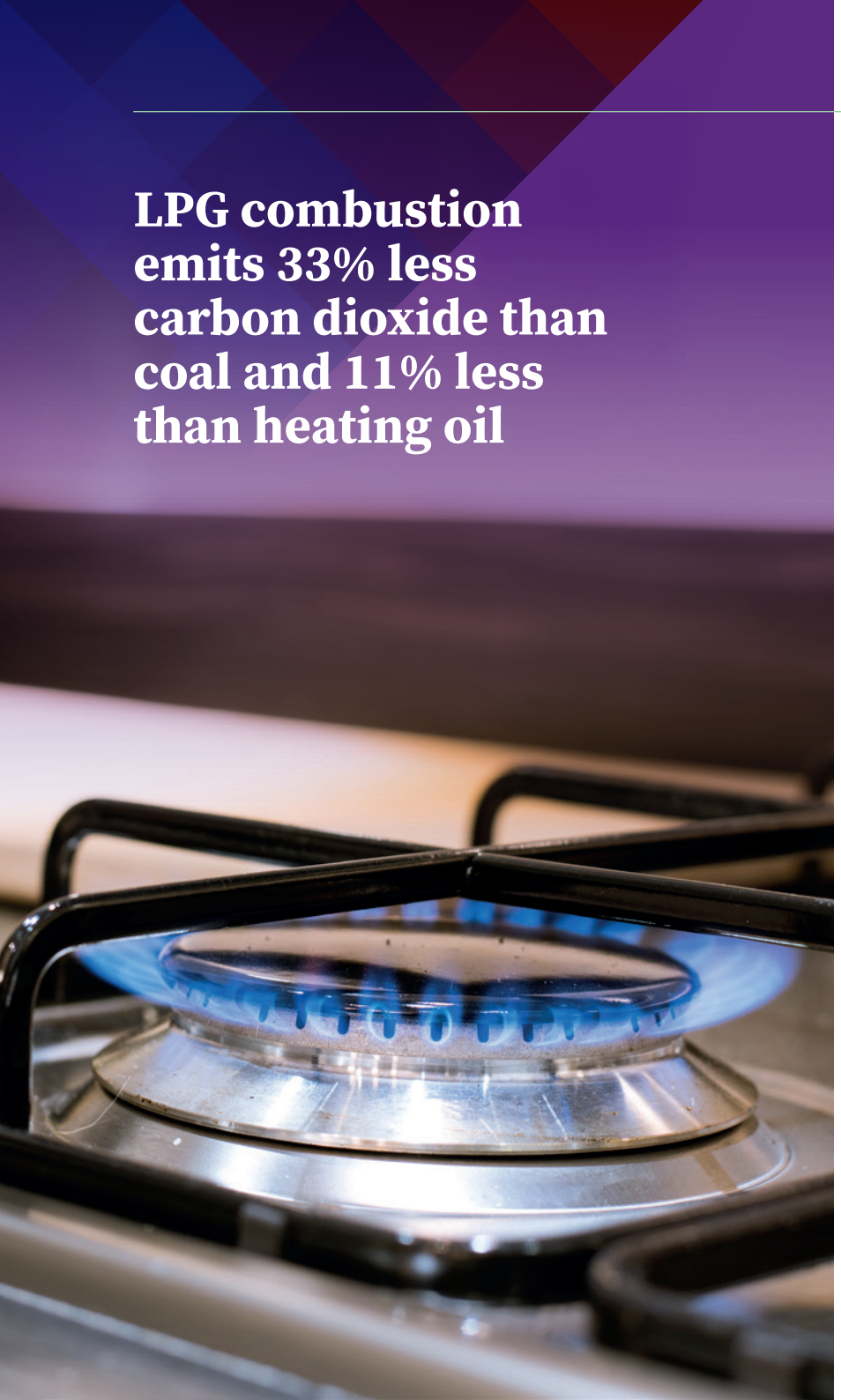
The LPG and BioLPG industry in Ireland

Liquid Gas Ireland

LPG combustion emits 33% less carbon dioxide than coal and 11% less than heating oil



LPG and the BioLPG future

Liquefied petroleum gas (LPG) is a hydrocarbon gas that exists in a liquefied form. It is supplied in two main forms, butane (C4H10) or propane (C3H8), and comes in a tank or cylinder. This flexibility and portability allow LPG to reach places that other energies cannot.

LPG combustion emits 33% less carbon dioxide than coal and 11% less than heating oil.[14] 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 (e.g. nitrogen oxides, sulphur oxides).

BioLPG, or biopropane, is chemically indistinct from LPG and provides the same heating and fuel properties. It is made from sustainably sourced renewable vegetable oils, wastes, and residues, and delivers up to 90% certified carbon emission savings compared to conventional LPG.[15]

BioLPG is certified as renewable by the EU and Irish Government and is exempt from carbon tax, meaning it is a great investment for the future.

As BioLPG is a 'drop-in' fuel, LPG infrastructure is already prepared for the future, so no new equipment is required. For customers in rural off-grid homes and businesses, this is an easy and affordable switch to make, and the environmental benefits are immediate.

LPG and BioLPG can also be used seamlessly in cutting edge heating systems, such as gas-driven heat pumps and hybrid heat pumps.

BioLPG is certified as renewable by the EU and Irish Government and is exempt from carbon tax, meaning it is a great investment for the future.

Innovative production pathways post 2030 are likely to be biological focused

Increasing BioLPG supply through innovation

BioLPG is not an innovation for the distant future: it is already available on the Irish and European markets in quantities that can service the energy needs of thousands of families and businesses.

Production is being increased and the market upscaled. LGI members are actively exploring a range of production methods, including both imported and localised production options in Ireland.

BioLPG currently used in Ireland is a by-product of a conventional hydrotreated vegetable oil (HVO) process that mainly produces renewable biodiesel. It is made from a mix of sustainably sourced renewable vegetable oils, residues, and waste materials.

An LGI member has also partnered with KLM and SkyNRG to develop BioLPG as a co-product of sustainable aviation fuel (SAF). They will develop Europe's first dedicated plant for the production of SAF, which is scheduled to open in 2022.

In the next decade, HVO and co-processing are likely to be the dominant sources of BioLPG, after which the focus will be on pathway development by using existing technologies re-engineered to produce BioLPG. One such development is 'Fisher Tropsch technology', which was invented in the 1920s to produce fossil liquid fuels. Adapting the process to use renewable and sustainable feedstocks, including lignocellulosic biomass and waste, instead of fossil inputs results in the production of renewable biofuels including BioLPG.

Innovative production pathways post 2030 are likely to be biological focused. An example is the fermentation of glucose by bacteria, yeasts, or other microorganisms.

LGI members recognise the importance of close collaboration with both EU and national industry stakeholders and policymakers to ensure the necessary policy support for the production or use of BioLPG in Ireland, and to provide investment confidence to producers, suppliers, and investors across the biopropane supply chain.

How is BioLPG made?

This graphic illustrates the potential feedstocks and production pathways identified alongside an ambitious timeline to commercialisation.

Feedstocks - Sustainably Sourced

Vegetable Oil
(short rotation crops)

Used Cooking Oils

Industrial & Domestic Solid Waste

Wood Waste

Industrial Waste Gases

Hydrogen

Carbon Dioxide CO2
(future feedstock)

Seaweed
(future feedstock)

Production Pathways

2018
CONVENTIONAL

Hydrotreatment
Conversion with hydrogen (biodiesel)

Co-processing
Co-feeding biocrude into conventional refineries

2025+
ADVANCED

Via Gasification
Conversion with high temperatures

Pyrolysis
Conversion via chemicals

Power2Gas
Carbon capture and utilisation

Fischer Tropsch
Synthetic fuels

2030+
BIOLOGICAL

Fermentation
Conversion by bacteria

Anaerobic Digestion
Conversion by bacteria

Renewable Gas - BioLPG

Oil accounted for 49% of energy-related CO2 emissions from heat in 2018[16]

The role of LPG and BioLPG in the future of rural heat and transport

Contributing to the decarbonisation of off-grid heating

More than 37% of the Irish population live in rural areas (higher than the EU average of 27.3%). 75% of rural areas in Ireland are without access to the natural gas distribution network.[17]

Many rural off-grid properties are considered both 'hard to heat' and 'difficult to treat'. Their age, design, and building materials make most energy efficiency improvements impractical and expensive.

Electrification of heat is less suitable and costlier than gas alternatives in larger, less-efficient homes.

There are approximately 800,000 rural off-grid homes in Ireland that are heated by conventional fossil fuels, such as heating oil, peat, and coal.[18] Oil accounted for 49% of energy-related CO2 emissions from heat in 2018.[19]

If 500,000 homes switched from using oil-fired central heating to BioLPG by 2040, it would save about 1.9 million tonnes of CO2 emissions per year.[20]

Switching to BioLPG also forgoes the expensive cost of grid reinforcement and the physical disruption it causes. Mass deployment of heat pumps requires expensive grid reinforcement, which would be subsidised by raising energy bills for homes and businesses. This is likely to increase the depth of fuel poverty of households in the most acute areas.

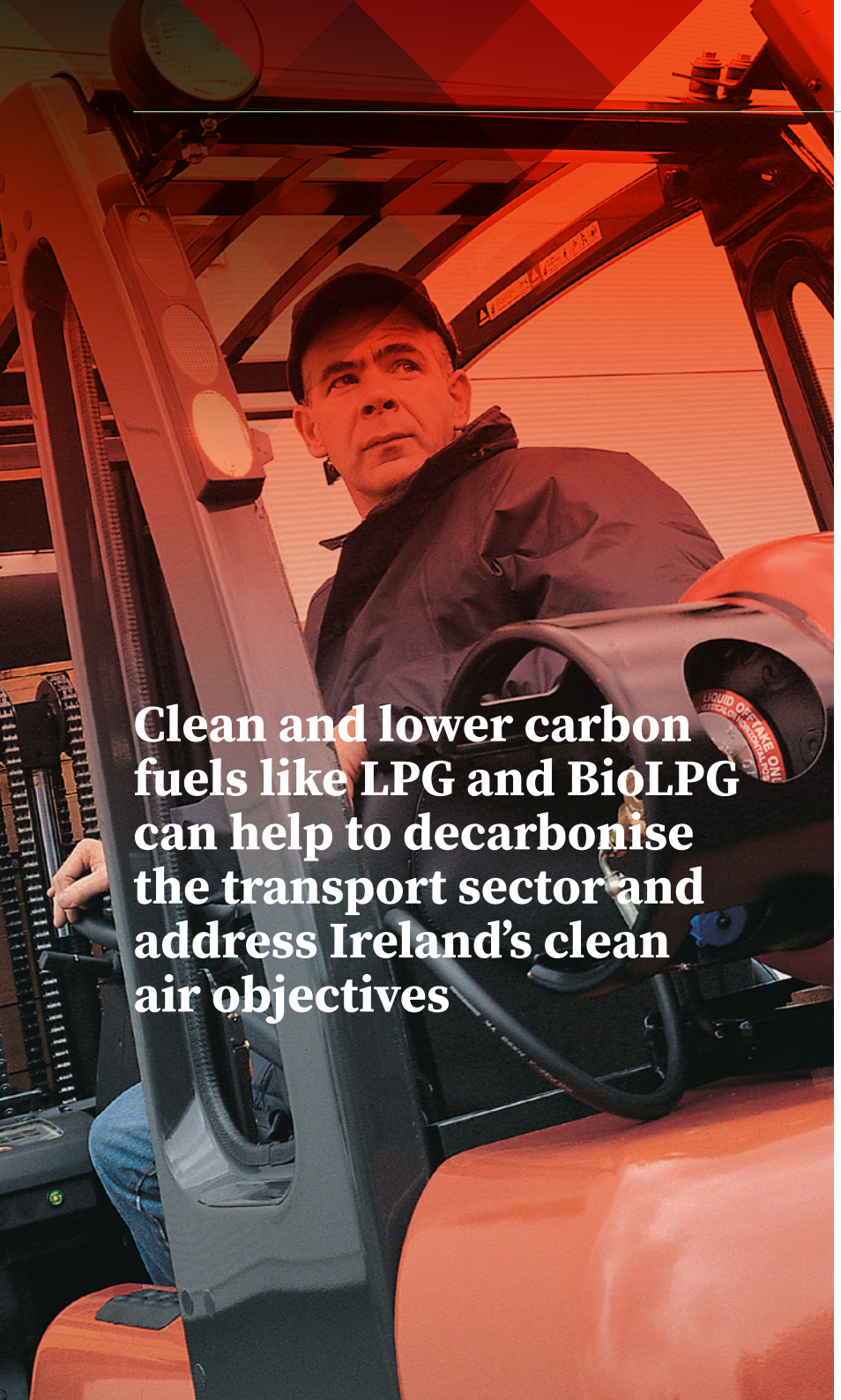
Contributing to cleaner air

Air pollution is a leading cause of premature deaths. It is considered by the World Health Organisation to be the single largest environmental health risk in Europe.

Heart disease and stroke are the most common reasons for premature deaths attributable to air pollution, followed by lung diseases and lung cancer. Around 391,000 premature deaths were attributed to exposure from particulate matter concentrations in the EU and UK in 2015.[21]

Environmental Protection Agency figures released in February 2019 indicate that poor air quality is now responsible for 3 premature deaths per week in Ireland, or 1,100 in a year.[22]

Due to the use of heating oil and solid fuels for heating, rural energy users can suffer from poor air quality. LPG and BioLPG are cleaner burning fuels. They produce virtually no black carbon and very low levels of air and particulate pollutant emissions. A switch to LPG and BioLPG therefore has a major impact on regional air quality in Ireland's rural areas.



Clean and lower carbon fuels like LPG and BioLPG can help to decarbonise the transport sector and address Ireland's clean air objectives

The role of LPG and BioLPG in the future of rural heat and transport

Contributing to the decarbonisation of transport

Ireland's transport system is currently highly dependent on carbon intensive fuels, which results in significant carbon emissions and air pollutants that are contained in exhaust fumes. According to the Environmental Protection Agency, the transport sector accounted for 12% of all air pollutant emissions in 2015 and is one of the largest contributors to particulate matter pollution in cities.[23]

With LPG and BioLPG, there is the opportunity to switch commercial vehicles, and even smaller private vehicles, to a clean and lower carbon fuel.

Some of Ireland's largest businesses currently depend on LPG for their forklift operations. This sector currently uses diesel, electric and LPG engines, with fossil diesel being the prominent choice of fuel.

LPG and BioLPG powered forklifts offer Irish businesses unrivalled flexibility, offering the ability to work safely both indoors and outdoors and without a requirement for electric charging. LPG and BioLPG powered forklift trucks, offer reduced emissions benefits and importantly, air quality improvements.

BioLPG is recognised and eligible for the Biofuels Obligation Scheme (BOS) under the definition of 'road transport'. Supporting and actively contributing to Ireland's Biofuels Obligation Scheme with biofuels such as BioLPG, can play an important role in helping Ireland to meet its renewable energy targets.

By supporting the development and adoption of renewable fuels like BioLPG, the government can ensure a multi technology approach to addressing the transport decarbonisation challenge to 2030 and support the LPG industry's ability to supply BioLPG from advanced feedstocks in the future.

Some of Ireland's largest businesses currently depend on LPG and BioLPG for their forklift operations.

LPG and BioLPG in action

Gerard Hennessy, Homeowner

Co. Cork

Gerard was converting and upgrading his rural property, which contained a main house and a self-contained apartment. The home had an old oil heating system that was inefficient. He wanted a clean, easily controlled, and energy-efficient system. Taking into account the unique features of his rural home, an underground gas tank and high-efficiency condensing gas boiler were recommended, which were both readily suitable for the 'drop-in' recommended solution, BioLPG.

Gerard was already realising the benefits of gas cooking and the convenience of a gas fire using LPG cylinders. Due to the versatility of BioLPG, these were also connected to his new BioLPG supply. This enabled Gerard to have a single and secure fuel source for his home, as well as a 100% renewable fuel source.

KEY BENEFITS

- Carbon savings: over 6 tonnes saved since switching to BioLPG from oil, 2 tonnes per year.
- A 70% reduction in carbon emissions.

MacNean House and Restaurant

Co. Cavan

As MacNean House and Restaurant's popularity increased, so too did the demand for accommodation. In late 2010, an opportunity to purchase the building next door arose, so chef Neven Maguire and his team set about remodelling the interior in order to create an additional nine guest bedrooms. Recognising that increased energy demands and costs would ensue, they looked to LPG for their energy needs.

LPG already fuelled the catering equipment in the kitchen and the gas fire in the lounge, although an oil-fired boiler generated the heating and hot water. Modern, high-efficiency gas boilers were recommended to replace the oil boiler in the original restaurant building and also for the new building.

Flogas LPG boilers were installed, and now the whole operation benefits from one-source efficiency for all its cooking, heating, and hot water requirements.

KEY BENEFITS

- One source efficiency for all the house and restaurant, cooking, heating and hot water.
- Significantly reduced running costs despite extra bedrooms.
- Reduced carbon footprint.

LPG and BioLPG in action

BrookLodge & Macreddin Village

Co. Wicklow

Home to The Strawberry Tree, the first restaurant in Ireland to have an organic licence, sustainability has always been a high priority for BrookLodge & Macreddin Village.

LPG already provided the energy solution for their spa, heating, hot water, and eight kitchens throughout, but they had the aim of meeting their sustainability goals of increasing their renewable energy usage across the property.

BrookLodge & Macreddin Village made the simple transition from LPG to BioLPG with no interruption to the day-to-day functioning of the business or need for new appliances and equipment.

KEY BENEFITS

- Carbon savings: over 260 tonnes saved since switching to BioLPG in the last year alone.
- A 70% reduction in carbon with zero capital expenditure investment needed.

The Dunne Dairy Farm

Co. Wexford

With a growing farm, in 2018 the Dunnes began a major transformation of their old dairy parlour into one suitable for housing the state-of-the-art Lely Astronaut robotic milking system.

Gerald and Henry pride themselves in supplying a top-quality dairy product, so they began a search for a hot water solution that would suit their needs and fulfil the requirements of the Lely Astronaut.

The Dunnes opted for an LPG hot water system. A smooth changeover process was arranged as part of the overall parlour upgrades and expansion.

An LPG bulk tank was delivered while the wall-mounted water heaters were installed and connected to the tank.

KEY BENEFITS

- On-demand hot water delivering temperatures from 37˚C to 85˚C.
- Reduced running costs.
- Reduced carbon footprint.

About Liquid Gas Ireland

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

Established in 1969 (as the Irish Liquified Petroleum Gas Association), Liquid Gas Ireland's mission is to ensure that policymakers 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, agriculture, leisure, and transport sectors in Ireland.

Liquid Gas Ireland represents its members in all relevant policy, regulatory, and stakeholder engagement to shape and contribute to policy goals related to the decarbonisation of heat, transport, and industry.

Liquid Gas Ireland also takes a leading role in safety, setting high standards for the safe, progressive development and use of LPG and BioLPG.

Liquid Gas Ireland is committed to working with consumers, industry stakeholders, and policymakers to support Ireland's goal to improve air quality, drive decarbonisation, and achieve net zero emissions by 2050.

Liquid Gas Ireland is a member of Liquid Gas Europe.

Contact Information

W lgi.ie
T 01 500 0810
E info@lgi.ie

liquid-gas-ireland
@LiquidGasIE

Liquid Gas Ireland

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