Liquid Gas

Making the **'Just Transition'** more sustainable for rural Ireland

January 2023

Liquid Gas Ireland

Contents

About Liquid Gas Ireland

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

Our 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-gas grid energy users in the residential, commercial, industrial, agriculture, leisure, and transport sectors in Ireland.

LGI 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. The association also takes a leading role in safety, setting high standards for the safe, progressive development and use of LPG and BioLPG.

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

Foreword

No one can argue that the world's climate is in crisis. We must all play our part in addressing what is perhaps the greatest existential threat facing humanity.

In Ireland, the Climate Action Plan (CAP) is the Government's blueprint to net zero carbon emissions by 2050. The updated CAP, recently published, contains many positive pathways to lowering emissions across society and our economy.

However, when it comes to energy supply, there is huge scope to expand the focus beyond the narrow set of options currently being put forward to help homes and businesses decarbonise. This is particularly impacting owners of rural dwellings, most of which aren't on the national gas grid and traditionally rely on high carbon fossil fuels like oil for energy.

A 'Just Transition' away from high carbon fossil-based fuels is one which provides accessible, affordable, and fair options to all homes and businesses. A 'Just Transition' would mean that rural dwellings have the same variety of choices to decarbonise as those in urban settings.

Both LPG and BioLPG offer significant potential to assist rural Ireland on its decarbonisation journey. Both fuels can and are playing a key role in helping rural Ireland meet its energy needs while lowering carbon emissions. This must be embraced as part of Ireland's policy approach to achieving emissions targets.

The current 'one size fits all' approach, which prioritises the installation of heat pumps, is straightjacketing the options open to rural dwellers as they move to decarbonise. While the environmental impact of heat pumps is obvious, a sole focus on this alone is too blunt an instrument and is not a good fit for rural Ireland.

For many homeowners, the installation of a heat pump is simply too expensive an option, potentially costing more than €60,000 where a deep retrofit is required. By comparison, in this document we show how a transition from oil to a renewable ready gas boiler, with moderate fabric upgrades to a home, is achievable for just over €11,000 and can deliver a BER uplift from D1 to B1.

LGI strongly argues that a mixed technology approach, using LPG and BioLPG along with improved building energy efficiency measures, is a more effective and fairer way to move rural homes and businesses away from oil and solid fuels to lower carbon emitting options. Not only is this a cheaper option to install, but it will also improve energy efficiency and air quality.

As well as illustrating the benefits of LPG, BioLPG and in time rDME (renewable dimethyl ether) to the energy needs of homes and businesses in rural areas, this policy document strongly advocates how, in switching to a renewable ready gas boiler, consumers can enjoy a progressive and step by step 'Just Transition' to decarbonisation.

We are urging Government to widen its focus from the 'one size fits all' model and support an alternative approach of renewable ready gas boilers. Combined with solar PV and other moderate upgrades, this can see energy rating improvements up to BER B1, like heat pumps, but at a significantly lower upfront cost.

Paul O'Connell
Liquid Gas Ireland, Chair

What is LPG & BioLPG?

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.

LOWER CARBON
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 oil[1]. 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.

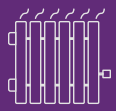
RENEWABLE CERTIFIED
BioLPG is a chemically indistinct but renewable version of LPG. It is made from a mix of sustainably sourced renewable vegetable oils, residues, and waste materials.

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[2] and is certified under the International Sustainable Carbon Certification (ISCC) scheme. Exempt from carbon tax, BioLPG is currently used in Ireland providing the same heating and fuel properties as LPG.

DROP-IN FUEL
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.

Uses for LPG & BioLPG

LPG and BioLPG can be used in several different sectors, such as domestic, commercial, industrial, agricultural and for transportation. Wherever heat or power is required, LPG can offer its benefits to both end-users and society as a whole.


Space Heating


Water Heating


Cooking


Automotive Fuelling


Power Generation


Industrial Processing

Where LPG & BioLPG is used


Homes


Farms


Industry


Leisure


Hospitality


Transport

1 - SEAI Conversion Factors
2 - 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.

The role of renewable ready gas boilers in a 'Just Transition' to drive greater energy efficiency & decarbonisation

Liquid Gas Ireland advocates for a mixed technology approach to decarbonising homes and businesses in rural areas.

In its National Residential Retrofit Plan[3] the Irish Government set a target to retrofit 500,000 homes to achieve a Building Energy Rating (BER) of B2 or higher by the end of 2030.

The Government is also aiming to install 400,000 heat pumps in existing premises to replace older, less efficient heating systems by 2030.

LGI aims to raise awareness amongst policy makers and political stakeholders of the specific needs of rural households and businesses in the energy transition. We are calling for a technology neutral approach to decarbonisation, which recognises that there are alternative, clean, lower carbon solutions available, including off-grid liquid gases – LPG, BioLPG and rDME.

3 - www.gov.ie – National Retrofit Plan

Why the ‘one size fits all’ approach to retrofitting homes is not working

Uptake of grants available for deep retrofitting and heat pump installation through the **National Home Energy Upgrade Scheme**[4] administered through the Sustainable Energy Authority of Ireland (SEAI), is lower than anticipated.

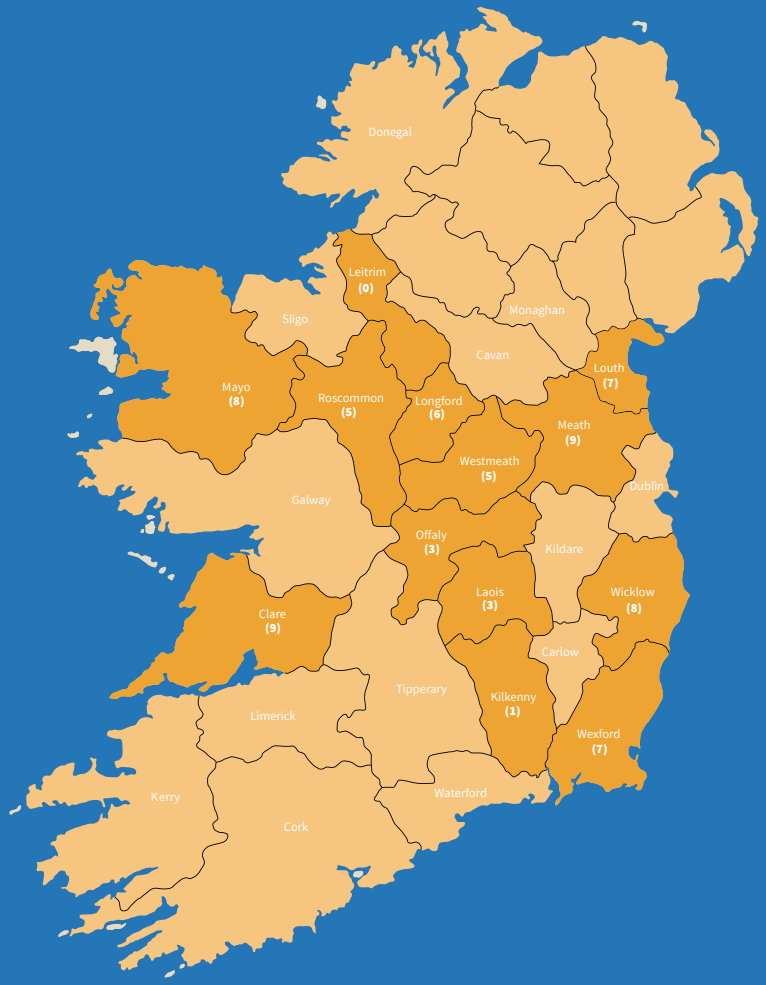
For the Irish Government to hit its target, 62,500 houses need to be retrofitted annually.

Since the scheme went live in February 2022, it’s been reported that just 681 homes were approved for deep retrofitting and heat pump installation grants up to the end of October 2022[5].
13 counties had fewer than 10 applications.

Of the applications received, the majority came from homes located in counties with the country’s main urban settings – Dublin (118), Cork (82), and Galway (72). The application rate for more rural counties is considerably lower, with Co. Leitrim failing to record a single application. Between February and October 2022, retrofitting of just 89 homes under the scheme was completed.

This is a first-hand indicator that **options need to be expanded beyond the Government’s ‘one size fits all’ approach to retrofitting,** as current options aren’t securing the national buy-in required, particularly from homeowners in rural Ireland.

It clearly suggests that **the remaining cost of a deep retrofit and heat pump installation after available support grants, is beyond the financial reach for most households,** especially for those in older homes which require more extensive building fabric and insulation upgrades for heat pumps to work efficiently.



4 - www.seai.ie - National Home Energy Upgrade Scheme
5 - www.irishexaminer.com - Scheme branded a ‘failure’ with just 89 homes retrofitted out of target of 62,500

Urgent need to embrace a wider suite of options as part of a 'Just Transition' to decarbonise rural Ireland

The National Residential Retrofit Plan forms a core part of the Government's wider Climate Action Plan, supporting homeowners to undertake home energy upgrades, with a key focus placed on transitioning homes to heat pump systems.

Unless alternative, more accessible, versatile, and affordable options are encouraged by Government to help a broader national cohort of homeowners decarbonise, Ireland remains at serious risk of missing its 2050 net zero emissions target.

In areas off the national gas grid, 65% of households currently rely on oil for home heating[6] while thousands more are still using high carbon solid fuels.

For these homeowners, switching to a renewable ready gas boiler that caters for lower carbon LPG, BioLPG or a blend of both, would have an immediate and lasting impact on reducing carbon emissions.

6 - www.cso.ie - 2016 Census

Linking a switch to LPG or BioLPG with existing SEAI energy upgrade grants

A switch to a renewable ready gas boiler, can be combined with existing individual SEAI energy upgrade grants, to support additional energy efficiency work on homes as required.

This could include:

- Upgrading the home's heating controls, wall and attic insulation and windows.
- Installation of solar panels.

A combination of these measures can deliver an uplift on the BER rating of a home, at a much lower cost compared to a full deep retrofit for heat pump installation.

Furthermore, these upgrades can be carried out in stages, allowing households to manage the cost over time.

A transition from oil to LPG or BioLPG can also support installing an integrated hybrid heat pump with a renewable ready gas boiler.

This would provide a low carbon emitting backup in the event of a heat pump break down or in very low temperature weather conditions when the heating demand exceeds the heat pump capacity.

Increasing the BER of a rural home on oil from D1 to B1 by switching to LPG or BioLPG[7]

The BER of a home indicates how energy efficient it is on a scale of A-G, with 'A' being the most energy efficient. Homes with a higher BER enjoy lower energy bills, emit less carbon emissions and hold added market value.

BER RESEARCH STUDY

To temperature check alternative options to decarbonising rural Ireland, LGI commissioned Gemserv[8], to conduct research using SEAI DEAP4 software to analyse how a typical Irish property archetype using kerosene oil for heating has multiple pathways to transition from a BER of D1 to B1.

SUMMARY OVERVIEW

Gemserv found that LPG and BioLPG offer an alternative and cost- competitive pathway compared with heat pumps in achieving these efficient energy ratings, whilst also achieving low annual carbon emissions.

**Substituting BioLPG for conventional LPG in the above scenario will deliver the same energy rating and upfront cost results, but with a much lower carbon emission factor due to the renewable production process. BioLPG is more expensive at an assumed 30% premium to conventional LPG.*

HOUSE ARCHETYPE

Property type: One-story single-family house
Construction period: 1967-1977
Reference floor area: 115m2
Heating system: Oil operating at efficiency of 70%
Baseline renovations: Archetype begins with some renovation measures including roof insulation, floor insulation and double glazing
Annual space heating demand: 16,162 kWh/year
BER rating: D1 with a final demand of 255.2 kWh/m2

Switching to an LPG / BioLPG boiler combined with additional energy efficiency upgrades.

- **Building fabric upgrades:** In addition to the baseline renovations already considered above, additional fabric energy efficiency upgrades including cavity wall insulation and room thermostat temperature controls are added.
- **Annual space heating demand:** Reduces to 9,892 kWh/year.
- **Energy system upgrades:** The old oil boiler is replaced with a renewable ready gas boiler using LPG / BioLPG* operating at an efficiency of 83%. In addition, 2.7kW solar PV panels are installed, generating 3,000kWh of renewable electricity annually.

BER uplift: D1 to B1
(With a final demand of 95.7 kWh/m2)

Upfront cost: €11,331

7 - Gemserv heating system analysis report using SEAI DEAP4 software conducted on behalf of LGI
8 - Gemserv heating system analysis report using SEAI DEAP4 software conducted on behalf of LGI

Key research learnings on home energy options that would support a 'Just Transition' to decarbonisation

The research conducted by Gemserv demonstrates that there are alternative scenarios in which an inefficient property using an old oil-fired boiler for home heating can be upgraded to increase its BER to B1[9]. It is possible to meet and exceed a B2 BER rating by installing a renewable ready gas boiler with standard building fabric and energy upgrades to the home

COST SAVINGS
While heat pumps can achieve this jump in energy rating largely due to their high system efficiencies, renewable ready gas boilers using LPG or BioLPG can also achieve similar improvements when combined with solar PV, but at a much lower upfront cost of €11,331 before individual SEAI energy upgrade grants are applied.

EMISSIONS SAVINGS
At the same time, the LPG boiler combined with fabric efficiency and the installation of solar PV delivers significantly lower carbon emissions with a 70% reduction when compared to the baseline scenario with an old oil boiler. If LPG is substituted with BioLPG the potential reduction in carbon emissions can be close to 100%, if combined with fabric efficiency and solar PV.

EASE OF TRANSITIONING TO LPG OR BIOLPG
Finally, Gemserv noted that the transition to LPG and BioLPG is overall less intrusive and time consuming to residents compared to the installation of a heat pump system, particularly in a case where a deep retrofit is required. This 'intrusive' time includes the time that is demanded directly by the resident facilitating the retrofit work, for example researching installation measures, installing new controls, and preparing for the retrofit in advance of the installer.

RESEARCH CONCLUSION
Renewable ready gas boilers should be considered as a key decarbonisation solution for home heating. They provide a realistic alternative option for old oil boiler replacement allowing homes in rural Ireland both on and off the national gas grid to enjoy an affordable, progressive, and step-by-step 'Just Transition' to decarbonisation.

9 - Gemserv heating system analysis report using SEAI DEAP4 software conducted on behalf of LGI

The benefits of LPG and BioLPG to rural Ireland

Over two million houses and apartments account for Ireland's total housing stock[10]. With just over 700,000 homes and businesses connected to the national gas grid[11], most properties across Ireland are dependent on other energy sources.

65% of properties located off the gas grid, **rely on oil as the energy source of choice for home heating** while others rely on high carbon traditional fuels like **coal** and **turf.**

40% of rural buildings in Ireland were **built before 1980,** meaning they are **typically less energy efficient** and **more costly to heat.**

Policy determining Ireland's energy transition must consider the **unique infrastructural challenges** of rural dwellings as well as the **economic circumstances** of rural homeowners.

CHEAPER AND MORE EQUITABLE ENERGY OPTION FOR RURAL OFF-GAS GRID AREAS

Retrofitting rural homes for heat pump installation to improve energy efficiency, is proving to be costly and impractical for older more traditional dwellings. Yet, the Irish Government continues to pursue this 'one-size fits all' approach to decarbonisation, with a real risk of rural Ireland being left behind on Ireland's decarbonisation journey.

For an average household, the upfront cost of an electric heat pump can be up to €12,000[12]. This compares to €5,000 for a new renewable ready gas boiler. The SEAI indicate that the average total capital cost to upgrade a home from an average BER rating of F to an average A3 rating is over €60,000[13] - beyond the financial reach of most rural households.

IMPORTANCE OF CHOICE AND AFFORDABILITY

A variety of cleaner, lower carbon energy options will be crucial in allowing rural Ireland to engage with a 'just' energy transition. As lower carbon, convenient and cost-effective energy solutions, LPG and BioLPG deliver significant benefits to homes and businesses looking to decarbonise by switching from oil, coal, and other solid fuels.

SWITCHING TO A RENEWABLE READY GAS BOILER

This allows homes and businesses to significantly reduce their emissions, without a deep retrofit of the property, removing the cost barriers to warmer and more energy-efficient properties.

Renewable ready gas boilers offer a long-term, cost-effective pathway to decarbonisation, through the gradual introduction of renewable LPG, including BioLPG and rDME, into the fuel mix over time. This will allow off-grid homes and businesses to significantly reduce carbon footprint, without expensive deep retrofitting or significant changes to the property's heating system.

10 - www.cso.ie - CSO 2016 Census
11 - www.gov.ie – Gas Policy Information
12 - www.seai.ie - National Heat Study 2022
13 - www.seai.ie

The benefits of LPG and BioLPG to modern Ireland *continued*

EMBRACING A MIXED TECHNOLOGY APPROACH
LPG and BioLPG can also be used seamlessly in cutting edge heating systems, such as hybrid heat pump installations. This 'mixed technology' approach can be operated in familiar ways for consumers and offers a more equitable option for rural consumers looking to meet climate targets while reducing the financial burden of a deep retrofit.

LOWER CARBON EMISSIONS WITH RENEWABLE OPTIONS
LPG already offers significant reductions in carbon and air pollutant emissions when compared to other high carbon fossil fuels being used in rural Ireland. However, BioLPG is the future, with the capacity to reduce greenhouse gas emission by at least 50% and up to 90% against set values of fossil fuels, in accordance with the European Union Renewable Energy Directive. The below infographic highlights the carbon savings available vs higher carbon fuels using SEAI Conversion Factors data[14].

PERCENTAGE OF CARBON SAVINGS AVAILABLE vs 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 68.8gCO2eq/kWh is based on a 70% saving against conventional LPG (229.3gCO2eq/kWh SEAI). Actual figure is dependent upon input feedstocks.

SUPPORTING CLEANER AIR QUALITY FOR IRELAND
LPG and BioLPG have an important role to play in helping tackle air pollution particularly in rural areas. Poor air quality is a significant challenge in rural towns where households traditionally use high carbon solid fuels like coal and turf for home heating.

There are an estimated 1,300 premature deaths in Ireland per year caused by fine particulate matter in our air[15]. The Environmental Protection Agency's (EPA) Air Quality in Ireland 2020 report noted that any movement towards cleaner home heating choices and less smoky solid fuel choices will result in a subsequent improvement in air quality.

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

A switch to LPG or BioLPG would have an immediate and lasting impact on regional air quality in Ireland, supporting the objectives of the Government's Clean Air Strategy, helping to deliver on Ireland's air quality targets.

14 - www.seai.ie - Conversion Factors
15 - www.epa.ie – Air Quality in Ireland 2020

The consumer experience of switching from oil to LPG

Study 1

THE CHALLENGE
Robert and Michelle recently purchased their first home, which is an older home in need of some renovations. Upon moving into their new home, they unfortunately found that the old oil system was starting to break down.

After conducting some research on other home heating options and seeing an advertisement on social media, they decided to find out more about LPG. Delighted to learn that LPG produces less carbon emissions than oil, Robert and Michelle soon decided to switch their old oil-fired heating system to clean burning LPG as one of the first upgrades they would make to their new home.

THE CHANGEOVER PROCESS
A call out was arranged with Robert and Michelle's local Registered Gas Installer (RGI) to complete the changeover from oil to LPG and after agreeing on the tank location, the RGI completed the gas boiler fitting and required pipework.

"Now that we've got the LPG system, our next plan is to retrofit the insulation and upgrade the windows to triple glazed. The LPG and retrofitting will improve the BER of our house"

THE BENEFITS
Delighted with the new, efficient LPG system, Robert and Michelle can now place their heating on a timer using their new thermostat controls. This allows for greater ease of management and means the heating can be switched on remotely at any time. They are delighted with the speed the new system can heat the house and how it retains heat throughout the day.

It is Robert and Michelle's intention to conduct additional home renovations down the line, such as insulating the walls and upgrading the doors and windows to triple glazed. They are confident once these upgrades are made, alongside their new LPG boiler, the BER of the house will improve considerably.

16 - www.seai.ie - Conversion Factors

CUSTOMER
Robert & Michelle Cannon

LOCATION
Loughrea, Co. Galway

SWITCHOVER STORY
Oil to LPG with eventual plans to make fabric energy upgrades to the house

RESULTS
- Low Carbon: emits 33% less CO2 than peat and 11% less than oil[16].
- Modern and efficient boiler.
- Heats the home instantly.
- Improved BER alongside planned retrofit.

The consumer experience of switching from oil to BioLPG

Study 2

CUSTOMER
Nick & Tricia Southwell

LOCATION
Tullamore, Co. Offaly

SWITCHOVER STORY
Oil to 100% BioLPG

RESULTS
- Spontaneity of instant hot water and heating on demand.
- Delivering a significant contribution to decarbonisation in an affordable manner.
- A secure, low carbon fuel source.

"The only other option available to us was a full retrofit, which was economically and practically unviable for our home"

THE CHALLENGE
After moving from the UK, where they used natural gas from the grid, Nick and Tricia were looking for an option to replace the oil-fired heating system in their home. After researching viable options available to them online, they decided a switch to BioLPG would be a good fit, given their home is located off the national gas grid.

The only other alternative option available to Nick and Tricia was a deep retrofit for heat pump installation, which was economically and practically unviable for the age of their house and where they lived.

THE CHANGEOVER PROCESS
After making the decision to switch to BioLPG in July 2019, Nick and Tricia found the transition to be very efficient, taking a short amount of time, with the whole process complete in a couple of days.

THE BENEFITS
Since switching, Nick and Tricia have noticed a significant difference in the cleanliness of BioLPG compared to their old oil-fired system. They also enjoy the spontaneity of having hot water on demand as well as having instant controllable heating, making their lives a lot easier.

Supporting the national and global ambition to reduce carbon emissions was a key factor in Nick and Tricia's decision to move to 100% BioLPG. They saw BioLPG as a suitable, clean and renewable alternative to oil, which would allow them to make a significant contribution to decarbonisation in an affordable way.

The consumer experience of switching from oil to LPG & BioLPG

Study 3

THE CHALLENGE
Previously, Liam had an oil home heating system but wanted to change to a cleaner and more efficient fuel for his home and the environment.

Liam and his family also found that their house was taking too long to heat and provide hot water. They wanted an alternative home heating system that would heat their home on demand. Liam started to consider alternative home heating options and researched LPG.

After contacting an LPG provider, Liam assessed the benefits of switching from oil to LPG. Liam's Registered Gas Installer (RGI) visited his home to discuss the best tank location and the necessary siting guidelines for their home.

THE CHANGEOVER PROCESS
The installation was completed by a local RGI who agreed a layout for the pipework and where the tank would be placed. The RGI then fitted the gas boiler and completed the pipework. The LPG tank was then sited and filled, and Liam had his new heating system up and running in just one day.

It was a seamless switchover process with very little disruption to Liam and his family. Since the original switch from oil to LPG, Liam has recently taken his LPG installation one step further by switching to a 10% BioLPG blend and switched his two open fires to state-of-the-art gas fires.

"The switchover from oil to LPG and then to BioLPG, could not have been easier. It was a seamless transition and there was little disruption to our day-to-day lives"

THE BENEFITS
By switching from oil to LPG, Liam and his family found they could benefit from a cleaner fuel source. LPG is clean burning, meaning it is free from lead and sulphur and produces less carbon emissions than oil. An LPG powered central heating system also comes with a modern, quiet, and super-efficient boiler.

Living in a rural area, oil theft is also a constant worry for homeowners like Liam, but with LPG, your fuel supply is safe. Liam and his family were very impressed with the benefits of LPG and decided to make the switch.

CUSTOMER
Liam Sheedy

LOCATION
Nenagh, Co. Tipperary

SWITCHOVER STORY
Oil to LPG and onto a BioLPG blend

RESULTS
- Clean, efficient, and versatile fuel off the national gas grid.
- Heats the home instantly.
- Hot water on demand.

The consumer experience of switching from oil to LPG & BioLPG

Study 4

CUSTOMER
Ronan & Mary Berry

LOCATION
Tullamore, Co. Offaly

SWITCHOVER STORY
Oil to LPG with an option to switch to a BioLPG blend

RESULTS
- Extremely simple and quick switching process.
- Access to instant heat and hot water, managed through a digital app.
- Better control on stock management, through remote monitoring.
- Contributes to improved air quality.

"The option that's available to us to blend in BioLPG, which is fully renewable, or move to using BioLPG only, was very enticing for us"

THE CHALLENGE
Ronan and Mary's home originally ran on an old oil-fired boiler system when they moved in three years ago. Coming from their previous house which had piped gas, they decided to research cleaner and more efficient options to switch from oil.

As their new home was located off the national gas grid, they investigated switching to LPG after hearing an advertisement about it on the radio and took it from there.

THE CHANGEOVER PROCESS
Ronan and Mary found the process of switching from oil to LPG extremely simple. After logging a query about it online, they received a call a few days later and within a month their tank, boiler and pipework were installed, and they were operating on LPG.

THE BENEFITS
Running a busy household with three children, one of the main benefits Ronan and Mary enjoy since the switch, is access to instant heat and hot water. This has given them a lot of time back, as they aren't waiting around for water to heat, after mucky sports sessions.

They are also able to manage the system on a digital app, allowing them to turn the heating on and off while on the go, or when they are out of the house. Ronan and Mary also believe that they have much better control of stock management since switching to LPG, which is monitored remotely. If the stock drops below a certain level, a refill is coordinated by their supplier with minimal impact on their day-to-day lives.

Living in an urban rural town that traditionally was heavily dependent on solid fossil fuels over the years, Ronan and Mary wanted a solution that delivers positive environmental, sustainability and air quality impacts. As a lower carbon fuel, LPG was an excellent fit, particularly with the options available to blend in BioLPG or move to 100% BioLPG in the future.

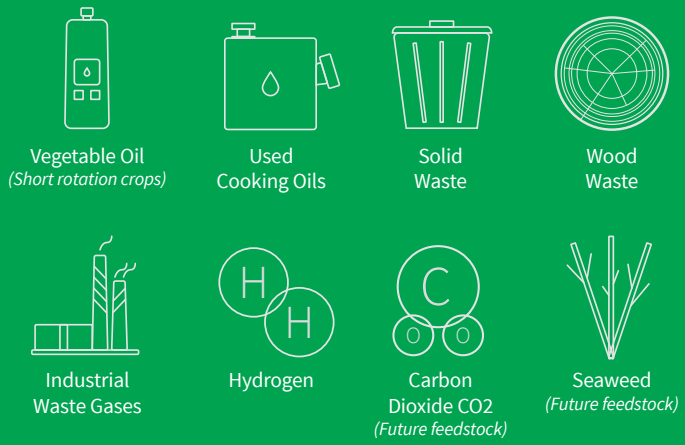
BioLPG and rDME - working towards a renewable future

As a 100% renewable alternative to lower carbon LPG, BioLPG is the future. Chemically identical to LPG, it reduces greenhouse gas emissions by at least 50% and up to 90% against set values of fossil fuels.

Made from sustainable feedstocks such as plant and animal waste materials, vegetable oils and biogas, it can be used on its own, or as a 'drop-in' fuel to be blended with LPG. This allows it to use existing equipment, making it a more affordable alternative.

BioLPG's role in moving the domestic, commercial, and industrial sectors in rural Ireland towards a more environmentally sustainable future, is well established. It will play a key role in achieving LGI's goal to achieve 100% renewable energy by 2040.[17]

FEEDSTOCKS – SUSTAINABLY SOURCED



PRODUCTION PATHWAYS

2018 CONVENTIONAL	2025+ ADVANCED		2030+ BIOLOGICAL
Hydrotreatment Conversion with hydrogen (biodiesel)	**Via Gasification** Conversion with high temperatures	**Power2Gas** Carbon capture and utilisation	**Fermentation** Conversion by bacteria
Co-processing Co-feeding biocrude into conventional refineries	**Pyrolysis** Conversion via chemicals	**Fischer Tropsch** Synthetic fuels	**Anaerobic Digestion** Conversion by bacteria

The development path for rDME

Continuing innovation in the liquid gas industry has led to the development of rDME, a low carbon, sustainable, liquid gas, which is complimenting the advances being made by BioLPG.

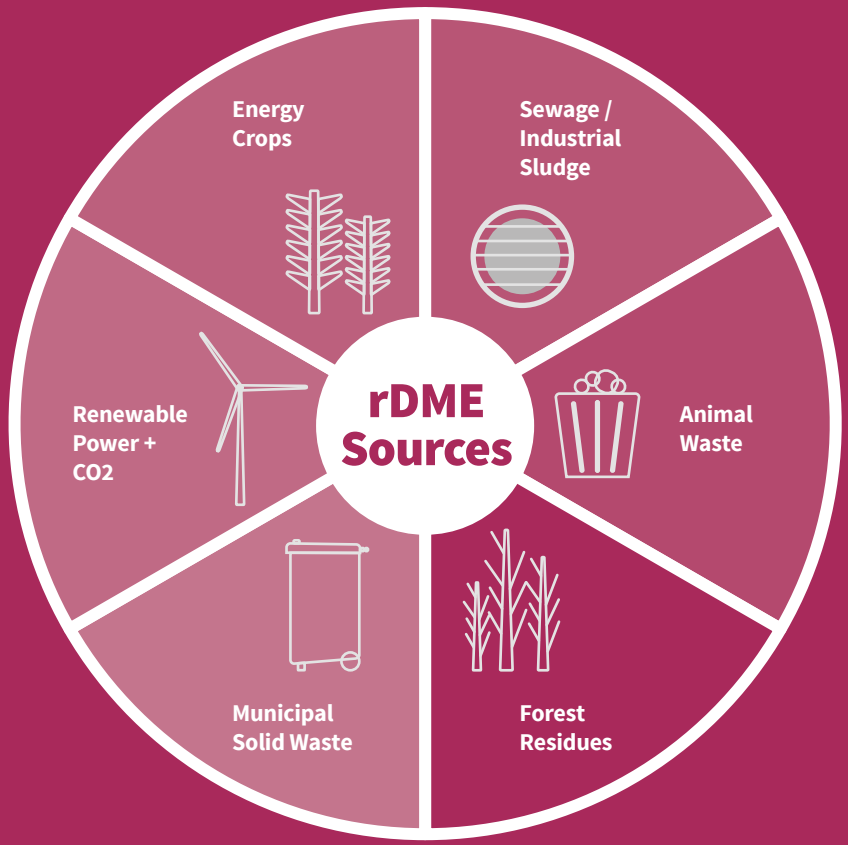
Made from a wide range of renewable and recycled carbon feedstock, including waste streams, it offers a versatile and flexible decarbonisation route for industrial and domestic heating, cooking applications, and the transport sector. It is a sustainable gaseous fuel that can reduce greenhouse gas (GHG) emissions by more than 80%. When used in the transport sector, it significantly improves local air quality, when substituting diesel.

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. Producing rDME from cow manure is especially attractive as it prevents its high methane content being directly released to the atmosphere.

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 clearly a sustainable fuel for the future and significant progress is being made, with a commercial plant under development in Teesside, UK. By 2024, this plant 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



Conclusion

Household behaviour change will be a key consideration for the Irish Government as it looks to steer Ireland to a net zero economy by 2050. Whilst some decarbonisation routes can be promoted without consumer disruption and behaviour change (such as the decarbonisation of power production), others will require active participation from consumers – such as decisions regarding home heating.

Indeed, the SEAI has a behavioural economics unit which has published reports highlighting consumer traits around heat use and many behavioural barriers which may slow the heat decarbonisation journey. For instance, the efficient operation of electric heat pumps requires a change to the heat use profile, moving away from instantaneous high temperature heat produced by traditional boilers, to low-temperature heating with a longer ramp-up period between turning the system on and reaching comfortable temperatures in the property. Alongside the use of new heating controls, these household behaviour changes should be considered by the Government.

LGI strongly recommends, that the Government should pursue a mixed technology approach which supports new heating solutions such as heat pumps. However, a mixed technology approach must also embrace alternative solutions such as renewable ready gas boilers, which are future proofed for renewable liquid gas solutions and can be operated in familiar ways for consumers. Some consumers will gravitate towards new technologies, based on their preferences and building types, whilst others will find the convenience of using drop-in renewable fuels, like BioLPG, in their existing heating system, to be more appealing.

A basket of solutions is required to deliver a 'Just Transition' to heat decarbonisation in the next 30 years – which is equivalent to two heating system replacement cycles.

OUR KEY RECOMMENDATIONS TO GOVERNMENT

1. **Support renewable ready gas boilers, which can be combined with moderate fabric upgrades to a home to deliver a BER uplift up to B1.**
2. **Integrate LPG, BioLPG and rDME into current and future Government policy, to ensure a mixed technology approach and wider choice of viable options for homes and businesses off the natural gas grid.**
3. **Develop a regulatory environment which supports the use and availability of renewable liquid gases to meet the energy needs of rural Ireland.**
4. **Invest in research and development for advanced feedstock options and hydrotreated vegetable oil (HVO) production in Ireland.**
5. **Create the conditions to attract the future production of rDME.**

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