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Revision of the Renewable Energy Directive

Deploying renewable liquid gases for decarbonisation through the introduction of an EU wide renewable heat blending mandate

Executive Summary

Decarbonising heating remains one of the most complex challenges of the European energy transition. While electrification will play a major role in reducing emissions in the building sector, it is not always technically feasible, cost-effective, or rapidly deployable in all regions. This is particularly the case in rural and off-grid communities, where buildings often have higher heat demand, infrastructure is more limited, and households face greater affordability constraints.

Liquid gases already play a critical role in providing reliable and flexible energy to these communities. Across Europe, millions of households and hundreds of thousands of businesses rely on liquid gas for heating, cooking, and industrial processes. As the EU advances towards its 2040 climate targets, it is essential that these consumers are not left behind in the energy transition.

Renewable liquid gases (rLG), including bioLPG and renewable dimethyl ether (rDME), offer a practical and scalable pathway to decarbonise these applications. As 'drop-in' fuels, rLG can progressively replace fossil LPG through blending while continuing to use existing storage, distribution infrastructure, and end-use appliances. This enables emissions reductions without requiring costly infrastructure upgrades or disruptive changes for consumers.

However, the scale-up of renewable liquid gas production requires a strong and predictable policy framework. Without a clear long-term demand signal, investment in production capacity and supply chains will remain limited, slowing the deployment of these fuels across Europe.

Liquid Gas Europe therefore calls for the introduction of an EU-wide renewable blending mandate for liquid gas heating fuels in the next revision of the Renewable Energy Directive (RED IV). Similar to the blending obligations already established for transport fuels under RED III, such a mandate would require suppliers of liquid gas heating fuels to progressively increase the share of renewable fuels in the heating fuels they place on the market.

A renewable heat blending mandate would deliver several key benefits including:

- Accelerating decarbonisation of heating, particularly in rural and off-grid communities where electrification alone cannot deliver cost-effective emissions reductions.
- Providing a predictable demand signal that stimulates investment in renewable liquid gas production and supply chains.
- Supporting a cost-effective and gradual transition by enabling the continued use of existing heating systems and infrastructure.
- Strengthening energy security and resilience by diversifying renewable energy supply options.
- Ensuring a fair energy transition by avoiding disproportionate costs for rural households and businesses.



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Recent analysis suggests that, with supportive policy frameworks, renewable liquid gas production in Europe could reach almost 8 million tonnes by 2040 and more than 25 million tonnes by 2050¹, potentially enabling the full replacement of today's fossil LPG consumption. This could deliver around 20 million tonnes of CO₂ emissions reductions annually by 2040 compared with continued use of fossil LPG.

To unlock this potential, RED IV should establish a harmonised EU framework for renewable liquid gas blending obligations for heating applications. Such a mandate should be accompanied by enabling measures, including robust certification systems, financial support mechanisms to accelerate production capacity, and policy frameworks that ensure fair treatment of renewable liquid gases alongside electrification.

By recognising the role of renewable liquid gases as part of a diversified decarbonisation strategy, the EU can ensure that the transition to a climate-neutral energy system remains practical, affordable, and inclusive for all regions and consumers.

Policy Recommendations

To enable the deployment of renewable liquid gases (rLG) and support the decarbonisation of rural and off-grid heating, Liquid Gas Europe calls for the following measures in the revision of the Renewable Energy Directive (RED IV):

- 1. Introduce an EU-wide renewable blending mandate for liquid gas heating fuels**
Establish a binding blending obligation for suppliers of liquid gas heating fuels, aligned with the approach applied to transport fuels under RED III.
- 2. Or base the mandate on greenhouse gas (GHG) reduction**
A GHG-intensity approach should be preferred to ensure fuels are rewarded based on their real emissions performance.
- 3. Ensure EU-wide certification and mass-balance systems**
Harmonised sustainability certification and mass-balance accounting should enable efficient cross-border trade of renewable fuels.
- 4. Support investment in renewable liquid gas production**
Complement the mandate with targeted support mechanisms to accelerate rLG production and supply chain development.
- 5. Ensure technology neutrality and a fair transition.**
EU policies should recognise renewable fuels alongside electrification and protect rural consumers from disproportionate transition costs.

Current situation and why an EU blending mandate is needed

What are liquid gases?

Liquid gas (LPG - propane and butane) and renewable liquid gases (rLG - BioLPG and rDME) are stored as a liquid under moderate pressure and vaporises when pressure is released, making it easier to store and transport.

¹ Liquid Gas Europe, Outlook for Renewable Liquid Gas in Europe - Supply scenarios for 2040 and 2050



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Typically stored in bulk tanks or cylinders, liquid gas provides a flexible energy supply for homes and businesses not connected to natural gas grids or district heating networks. Its portability and onsite storage also enhance energy resilience during electricity outages. Liquid gas is transported by road in pressurised tankers that maintain it in liquid form and, for smaller-scale distribution, in steel cylinders (“bottled gas”), enabling safe storage, handling, and delivery.

Why liquid gases are an essential solution to the decarbonisation of rural heating?

Liquid gas is an important part of Europe’s energy mix, providing a reliable and transportable energy source for heating, cooking, and high-temperature processes. Across the EU, 137 million people live in rural areas, and around 700,000 businesses rely on liquid gas for heating and process heat.

Many rural and off-grid users face high heat demand but limited access to alternatives such as district heating, while electrification can be technically difficult or costly due to infrastructure and upfront investment requirements. Liquid gas therefore provides an immediate heating solution and supports a gradual transition to lower-carbon energy through the increasing use of renewable liquid gases (rLG).

Cost comparison between rLG deployment and electrification

Analysis by Frontier Economics finds that renewable liquid gas (rLG) heating systems can be broadly cost-competitive with heat pumps on a total cost of ownership basis, although costs may diverge from the late 2030s if very high rLG blending levels are required. However, lifetime cost comparisons do not fully reflect the significant upfront investment required for heat pump installation. For many households, particularly in rural or off-grid communities, rLG based systems may therefore provide a more accessible decarbonisation pathway.

The study also finds rLG can be economically attractive for certain industrial uses, including medium to high temperature processes and sites with limited electricity capacity. From a system perspective, greater use of rLG could reduce pressure on electricity infrastructure associated with large-scale heating electrification.

The constraints of full electrification for rural communities

Studies from France, Germany, and Italy show that full electrification is often constrained by four key factors:

1. Technical and economic feasibility in high heat loss homes and cold climates.
2. Market and workforce capacity.
3. Grid limitations and overall system adequacy.
4. Affordability and total cost of ownership.

As a result, cost optimal decarbonisation pathways for rural and off natural gas grid segments frequently include combustible low carbon fuel such as liquid gas or renewable liquid gases (rLG), either on their own or in hybrid systems with heat pumps, rather than relying solely on electrification in all cases.



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- **France:** Rural single-family homes account for roughly 25% of all dwellings (8.5 million homes)². Many of these are energy inefficient (Building Energy Rating (BER) F or G) and exhibit high peak heat losses, ranging from 12–17 kW to 21–31 kW depending on the climate zone. Even after building envelope renovations, air to water heat pumps with electric backup can be difficult to size effectively.
- **Germany:** There is a stable installed base of approximately 620,000 liquid gas fired appliances. Rural areas cover 68% of the country's land but only 32% of the population. Germany has around 4.6 million oil heated buildings with median boiler ages over 20 years. Even under optimistic electrification scenarios, about 830,000 buildings will still require decentralised solutions such as liquid gas³.
- **Italy:** Liquid gas is used in 5.6% of dwellings as a heating system. Residential thermal consumption totals 293 TWh, of which 84% is for heating. Electrification faces significant constraints given over 60% of dwellings are condominiums, and 60% of these lack outdoor space. Of the 10.3 million dwellings with F and G BER ratings, heat pumps are only technically feasible in 5.9 million, but when income limitations are considered, only 1.76 million dwellings are realistically able to adopt them⁴.

Why EU action is necessary to foster the deployment of renewable liquid gases

EU-level action is essential to unlock renewable liquid gases (rLG) for rural and off-grid communities. A renewable blending mandate would create a predictable EU market, attract investment, and drive cost reductions.

The success of transport blending mandates, such as RefuelEU Aviation, illustrates this approach. The blending requirement for sustainable aviation fuels (SAF) is projected to grow EU27 production from less than 0.1 Mt/year in 2021 to 4 Mt/year by 2030, reaching 12 Mt/year by 2040⁵.

Relying on national approaches risks fragmentation and slower progress. An EU framework can guide production to areas with optimal feedstock, logistics, and skilled labour, while enabling cross-border marketing to scale the most cost-efficient plants across the EU.

How a mandate compliments broader EU decarbonisation policy instruments

An EU mandate would support emissions reductions in hard-to-electrify sectors while complementing existing EU climate policies. It would extend the RED III mandate beyond transport into heating and other stationary uses, align with the EU Emissions Trading System's carbon pricing, and provide a practical low-carbon heating option for rural and off-grid buildings.

² COSTIC for Antargaz, Analyse de scenarios de rénovation de maisons individuelles, 2023

³ Deutscher Verband Flüssiggas (DVFG), 2026

⁴ BIP Group, Decarbonization of residential thermal consumption, 2025

⁵ S&P Global Commodity Insights, Biofuels Supply and Demand Outlook 2025



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The mandate would also advance the objectives of the EPBD, strengthen energy security, diversify decarbonisation pathways, and support a cost-effective, equitable transition across Member States in line with the European Green Deal and Fit for 55 targets.

Potential design of the mandate and preferred option

Several European countries are already using mandates to accelerate the uptake of renewable fuels. For example, the UK has long established renewable fuel mandates in transport and is now considering similar measures for off natural gas grid heating fuels.

Ireland is also in the final stages of introducing a renewable heat mandate for all heating fuels through its Renewable Heat Obligation (RHO) Scheme, while other Member States are exploring quota based approaches. These experiences provide a valuable blueprint for introducing an EU wide mandate for renewable liquid gases (rLG) under RED IV.

Purpose and scope

An EU mandate for rLG would create a predictable demand signal to unlock investment and scale, while remaining technology-neutral and aligned with EU sustainability criteria. The mandate should also incentivise upstream producers to increase rLG supply, helping fuel suppliers meet obligations. Specific blending or GHG reduction targets should be set in consultation with industry and reflect realistic rLG availability.

Proposed application

The mandate should apply to suppliers of liquid gases for heating and other stationary uses, as they are best placed to manage volumes, compliance, and blending of rLG. Compliance could be based on either a rising minimum rLG share or, preferably, a portfolio-wide GHG reduction target.

A volume-based approach is simple and predictable but does not reflect differences in lifecycle emissions. A GHG-based system, while more complex, better captures the climate benefits of different rLG pathways and aligns with the EU renewable energy framework and broader climate policy.

Gradual trajectory

Implementing the mandate along a phased trajectory is crucial to balance ambition with practicality. Gradual ramp-up allows suppliers and producers to scale production capacity, ensures blending targets remain achievable, and prevents sudden cost spikes for households and businesses. It provides market certainty for investors, and supports the development of supply chains and infrastructure. A phased approach also allows for periodic review and recalibration of obligations based on evolving technology, fuel availability, and lessons learned from early deployment.

Potential impacts

An EU mandate would harmonise rLG deployment across Member States, support cross-border trade, and strengthen a single European energy market. By creating stable demand, it would accelerate



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economies of scale, reduce costs, and enable gradual decarbonisation for rural households using existing infrastructure.

The mandate should include flexibility mechanisms, certificate trading, limited banking and borrowing, or a price cap with recycled revenues, to manage cost and supply variability. Applying the obligation to fuel suppliers, aligned with EU ETS II, would increase administrative efficiency by covering the same entities across the value chain.

Necessary supporting policy measures at EU and Member State level

To ensure an EU mandate for renewable liquid gases (rLG) delivers tangible volumes without imposing undue costs, it should be supported by a targeted package of legal, financial, and fiscal incentives.

Legal and regulatory

Compliance must be practical, consistent, and enforceable across borders. The EU should recognise harmonised certification and sustainability verification systems, allowing rLG produced anywhere in the EU to count toward mandate obligations.

A mass balance approach should be accepted EU-wide to track renewable attributes without costly physical segregation. Product standards and building regulations should remain technology-neutral, ensuring efficient rLG boilers, hybrid systems, and emerging technologies are eligible.

By avoiding prescriptive technology requirements, the framework supports cost-effective decarbonisation, broader market adoption, and investment certainty for fuel suppliers, producers, and building owners.

Financial

Targeted financial incentives should complement the rLG mandate to reduce investment risk and accelerate production. Early-stage rLG plants face higher costs, so measures such as grants, innovation funding, or contracts for difference (CfDs) can ensure predictable returns and attract private capital.

Revenues from buy-out or alternative compliance payments should be reinvested to expand production and support storage, distribution, and end-use infrastructure, including hybrid heating systems and efficient appliances. These measures would create a stable, predictable financial environment, enabling rapid scale-up of rLG while keeping costs manageable for consumers.

Fiscal and consumer facing

Member States should implement tax, VAT, or excise differentiation based on verified GHG performance to allow rLG to compete fairly with electrification and other low-carbon options. Energy performance frameworks should recognise emissions reductions from switching fossil LPG to rLG, ensuring rural households are not penalised where electrification is costly or challenging.

Regular market reviews and flexibility mechanisms, such as certificate trading, limited banking/borrowing, and periodic recalibration, can manage supply variability, protect consumers, and maintain a credible, investable mandate.



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These measures provide a stable, predictable policy environment, supporting long-term investment while safeguarding affordability and accessibility.

ANNEXES

Scenarios at different levels of EU intervention

Liquid Gas Europe’s Outlook for renewable liquid gas in Europe report⁶ models how much renewable liquid gases (rLG = renewable LPG + renewable DME, reported in LPG equivalent values) Europe could produce in 2040 and 2050 under different policy and technology environments.

It uses a probabilistic Bayesian network model (outputs are ranges with a median, not single point forecasts) and focuses on domestic / regional production only (no feedstock or fuel imports/exports included in the modelling).

The report defines three market outlooks that can be read as increasing levels of EU intervention:

- Baseline (business as usual)
- Moderate (limited EU support and technology development)
- High (supportive EU policy framework and technology advancement).

<i>GHG savings (compared with fossil fuels) [Mt]</i>	Baseline	Moderate	High
2040	3,0	7,7	20,5
2050	9,3	26,9	74,0

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Liquid Gas Europe’s membership is composed by national LPG associations, the main European LPG suppliers, distributors and equipment manufacturers. With the support of its working groups of industry experts, Liquid Gas Europe is actively involved in concrete initiatives and programs to ensure the sustainable, safe and efficient development of LPG in Europe.

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⁶ NNFC + Frazer-Nash, commissioned by LGE, 2025