



HEATING WITH LIQUID FUELS:

a pathway for a sustainable future

The potential for liquid fuels to contribute to the EU's energy and climate policy objectives in 2030, 2040, 2050 and beyond.

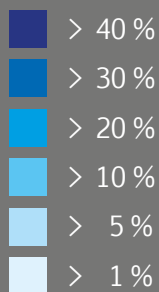
OIL HEATING IN EUROPE TODAY

A life without heating oil is unthinkable for around 20 million households in the EU. Today they are using oil to heat their homes and water, while new renewable liquid fuel replacements are being developed with a much lower carbon intensity. There are many advantages of handling energy in a liquid state. It is safe and easy to transport, can be stored on site and is an economical solution for heating – especially well-suited for rural areas. Such locations are usually not connected to the gas grid and have a limited electricity network. Off-grid people need energy

20 million homes

heated with liquid fuels in the EU, mainly in rural and residential areas

17% of households



Share of oil heating

At least
200,000 European jobs
related to oil heating

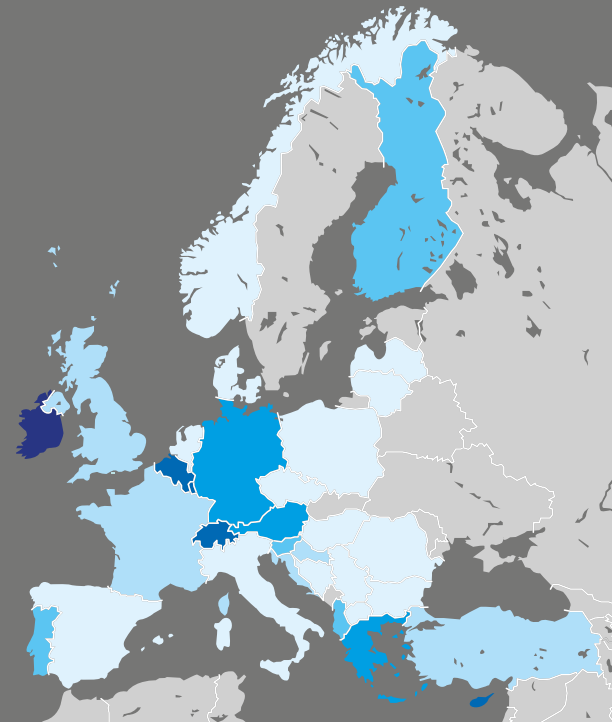
12,500 Companies
active in the industry:
installers, fuel distributors,
equipment manufacturers, etc.

Proven technologies for
more than 80 years



Source: EUROSTAT; Graphics: Eurofuel

supply and heating oil stored in tanks is one of the very few ways they can have it. New low-carbon liquid fuels are being deployed to replace fossil fuels. This is an important step towards achieving Europe's long-term climate targets. Home owners can also contribute to this effort by modernising their heating systems without having to replace them completely. This way, houses currently using oil heating systems can afford to future-proof their buildings and contribute to a diversified energy mix and energy security on our continent.



ADVANTAGES OF LIQUID FUELS HEATING FOR OFF-GRID AREAS

In rural and remote areas, liquid fuels (heating oil, Kerosene or LPG) are often the only viable options. The dispersed nature of energy demand in these regions makes other energy sources less practical. The greenhouse-gas emissions and capital costs associated with expanding infrastructure rise significantly as systems grow to serve these areas. In contrast, the supply chain for liquid heating oil remains more cost-effective and resilient.

AFFORDABILITY

Thanks to the lower capital investment and running costs, heating oil systems are affordable solutions to all households and, in particular, to those most exposed to energy poverty. Their costs and greenhouse-gas emissions grow in a linear fashion with the installed capacity.

EASY TO HYBRID WITH RENEWABLE ENERGIES

Low-Carbon-Liquid-Fuel-based heating systems are flexible and can be combined with locally produced renewable energy such as solar thermal, photovoltaic or

biomass to mitigate their intermittency. The combination with a small heat pump could also be a suitable solution for some households. The homeowner is free to choose the energy source and can switch to the liquid energy source stored on site in the event the supply of renewable electricity becomes insufficient.

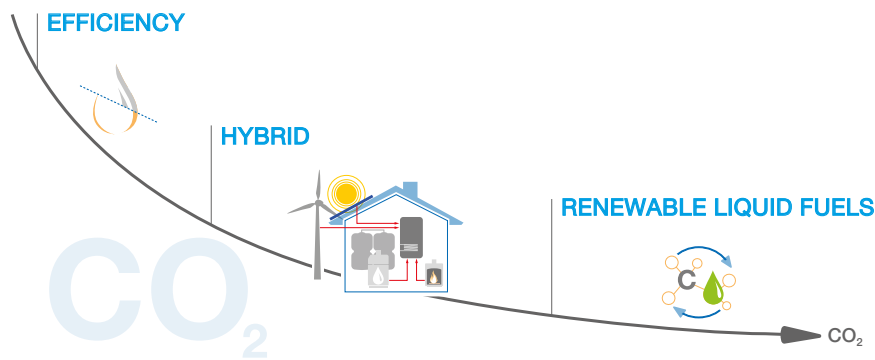
EASY TO TRANSPORT, STORE AND RELIABLE TO USE

Liquid fuels are a convenient source of energy, which can be transported easily. A single delivery of fuel to a storage tank can provide heat for a home throughout the entire heating season, and in some cases, even for several years. This ensures an independent and safe energy supply.

HIGHLY EFFICIENT AND DEPENDABLE HEATING

Modern condensing boilers offer efficiencies close to 100% and will get an A label in efficiency. Combined with renewable energy sources these packages will get an A+ label. Their installation and maintenance are simple and already performed by locally skilled personnel mastering a technology that withstood the test of time.

HEATING WITH LIQUID FUELS CAN CONTRIBUTE TO THE SUCCESS OF THE ENERGY TRANSITION



The three-step transition for oil-heated buildings

To transition European buildings to low-carbon energy, all technologies should be considered without restrictions on certain fuels. EU policy makers should focus on setting technology-neutral targets to achieve climate goals, whereas renewable and low-carbon liquid fuels can certainly be used to achieve these goals.

NEW FUELS FOR A GREEN FUTURE

The future of oil heating systems in Europe will be based on low-carbon liquid fuels. Their production scale-up from a vast and resilient array of renewable and circular resources is being researched intensively. These solutions will not compete with food production or question forestry and land-use or cause indirect land-use change. These fuels can be used in modern condensing boilers without the need for any alteration. Furthermore, the existing supply infrastructure can be used. Different types of renewable liquid fuels are already in production.

Plant photosynthesis is nature's pathway to a closed carbon cycle. In the bio-based liquid fuels processes, liquid fuels, with high greenhouse-gas reduction potential, can be generated from a variety of vegetable raw materials such as algae, waste, wood or straw. Waste from households or industries can also serve as a carbon source in the process. Two main types of bio-based liquid fuels are particularly suitable for heating:

- **FAME** (Fatty Acid Methyl Ester) is based on vegetable oil, which is processed with methanol to a liquid fuel, suitable for heating oil.
- **HVO** (Hydrotreated Vegetable Oil) is produced from used cooking oil, residues from the food industry and from vegetable oils that are not intended for food. HVO is an aromatics-free blend of paraffins and is the basis for clean and complete combustion. The hydro-treating of vegetable oils and suitable waste, as well as waste fats, for the production of HVO, is now a mature technology and the fuel is available on an industrial scale.

Step 1: MAXIMISE BOILER EFFICIENCY

Installing modern oil-fired condensing boilers in all buildings would have immediate benefits. They reduce both fuel oil consumption and greenhouse-gas emissions by up to 30% compared to outdated boilers.

Step 2: MOVE TO HYBRID HEATING SYSTEMS

Hybrids build on the strengths of different technologies i.e. renewables which reduce greenhouse-gas emissions, and oil which is readily available independently of the wind and sun. This can provide an affordable and scalable solution to reduce greenhouse-gas emissions in the building sector.

Step 3: INTRODUCE RENEWABLE LIQUID FUELS

Introduce Renewable Liquid Fuels and deploy these new liquid fuels to abate CO₂ emissions, to comply with the long-term climate objectives.

The **PtL** ('Power-to-Liquid') process generates a synthetic liquid fuel by using renewable electricity, water, and circular carbon dioxide. Hydrogen is produced from renewable electricity by way of electrolysis of water. Circular carbon dioxide is captured from the atmosphere or other sources, including biogenic ones. The e-fuels are synthesized in a catalyst-driven "Fischer-Tropsch" process. These synthetic liquid fuels, are also called e-fuels. From production to combustion, they have 70% to 100% less greenhouse-gas emissions than of fossil fuels. They can also be blended with conventional fuels or bio-based liquid fuels alike.

The new world: renewable liquid fuels

The renewable heating fuels will be 'drop-in' replacements for oil. By using the suggested step-by-step approach, it is possible to reach the EU's decarbonisation goals for heating by 2050 starting from the poorer and most remote geographies.

Barriers are not technical but legislative

Both bio-based liquid fuels and PtL technologies are now available at maturity and deserve the financial support of the policy makers to enable the scale-up of their production capacities and the R&D to accommodate even more renewable and circular raw materials. Biomass wastes are available in ample supply in the European Union to produce bio-based liquid fuels. Together with the fully scalable production of PtL it is possible to decarbonise the existing manufacturing of liquid fuels and of their many co-products that permeate our modern way of life. It is only a matter of earmarking these resources and building a clear business case in the European legislation to invest in these new value chains. Failing to do so will put an end to research and development for low carbon heating and fail the energy security of the poorest and most fragile Europeans.

OUR MESSAGES TO POLICY MAKERS

Solutions for the 20 million oil heated homes in Europe to achieve zero-carbon emissions:

- Maintain a reliable and predictable policy framework that gives the right long-term signals to the market to invest in renewable fuel production and distribution.
- Follow a technology-open pragmatic approach that recognises the potential of renewable fuels. Policy objectives should include all heating technologies and all potential fuels that offer the opportunity to reach the emission targets.
- Follow a “full life cycle” approach to emissions’ calculations at the point of use that encompasses the emission to manufacture all the assets involved in the production of different energy pathways, and deduct the emissions of the circular carbon used as feedstock in the manufacturing of low-carbon liquid fuels for heating from their combustion emissions.
- Push forward innovation: specific fuel or technology bans will stop research and development by industry which could bring an essential contribution to a successful energy transition and could help sustain the resilience of the European energy system.
- Consider the social implications of the energy transition and its affordability for those on lower incomes. Also, consider the practicality of converting to zero-carbon liquid fuels in older and remote rural homes instead of enforcing a completely different system at the expense of higher capital cost to society.
- Improve efficiency standards of buildings, including heating, in a socially acceptable way. Energy poverty remains critical in the definition of the European Green Deal. Incentives for energy-efficient solutions should therefore be driven by such principles. Currently, there is a lack of affordable low or zero-carbon heating alternatives in rural areas due to the lack of infrastructure connections and the irrelevance of their extension.

Recommended political measures to reach the climate targets – 2030, 2040 and 2050

- **EFFICIENCY:**
Support and speed up the replacement of obsolete and inefficient heating systems through financial and policy incentives.
- **HYBRID:**
Promote and fund the installation of hybrid heating systems for most houses (e.g., solar linked to liquid fuel-condensing boilers or combinations with small heat pumps). This will provide substantial emission reductions while maintaining a secure supply of energy for citizens.
- **RENEWABLE FUELS:**
Call for a stable and enabling policy framework that includes grants for research and innovation on renewable liquid fuels as a substantial long-term contribution to the reduction of carbon emissions from heating.

CONTACT

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