

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



There is an urgent need to decarbonize industry globally. Without a shift in the types of fuels used, it is unlikely that greenhouse gas reduction targets will be met. In countries like the U.S. where nearly 50% of the industrial sector uses coal, a significant opportunity exists to switch to LPG for a lower carbon footprint.

LPG is used in both large industries as well as for smaller applications, in both developed and developing countries alike, as a key clean-burning fuel. It is used in the metallurgical industry and to fuel boilers, forklifts, ovens, and furnaces. It is used in pottery and ceramic tile manufacture, for the production of polymers, paint and varnish. It is also used in aerosols to replace ozone depleting propellants.

LPG's significance, versatility and flexibility as a fuel with many applications is important for consideration when developing sustainable industrialisation plans. In addition, the availability of bio-sourced LPG, or renewable LPG produced from organic wastes and residues, is growing year on year. Bio-LPG provides a promising



pathway towards decarbonisation of the LPG sector, of the many industries that LPG fuel supports, and of many industrial and transport processes that presently use other, higher-carbon-footprint fuels.

Adoption of LPG at scale in a national setting requires investment in infrastructure related to importation (if LPG is not domestically produced), bulk storage, transportation, and filling facilities and LPG cylinders. It also requires well-expanded distribution and retailing networks to ensure reliable and affordable supply and safe delivery to end-users.



LPG-fueled hot air balloons floating over Turkey



A POLISH ROAD CONSTRUCTION COMPANY SWITCHES FROM OIL TO LPG

Poland's extensive road infrastructure network is a clear sign of the country's economic development. During the last decade, the number of local and national roads – including motorways and expressways – has increased rapidly. Unfortunately, the manner in which the country produces bituminous masses and asphalt has not changed at all during this same period. Bituminous masses are used for road construction, and many facilities still use heavy burning oil, coal or coal dust in their production. This in turn emits large amounts of CO₂ and other harmful gases into the atmosphere.

In 2018, the Road Construction Company in Raciborz (in southwestern Poland) commenced the construction of an LPG installation and gas supply. The new approach was driven by complaints to the company and protests by

local inhabitants concerning environmental pollution, resulting in the company's decision to switch from oil to LPG.

The Road Construction Company will use 220 tons of LPG each year to produce 40,000 tons of bituminous masses in a much more environmentally-friendly way. The switch will translate into a significant reduction of CO₂ emissions compared to the old production method. The company itself will receive an additional benefit: the use of this convenient, maintenance-free energy source will provide significant savings of up to EUR 75,000.

Switching to LPG has a dual benefit for the environment and the company's bottom line. LPG enables the retrofitting of a longstanding integral industry for economic growth, facilitating the development of environmentally sustainable, resource efficient and resilient infrastructure for the future.



LPG FUELING A NEW SERIES OF VERY LARGE GAS CARRIERS (VLGC)

As an innovative solution to address increasingly stringent emissions restrictions, LPG as a main engine fuel will be installed on two VLGC New buildings – 86,000 m³ gas carriers. EXMAR has contracted these VLGCs to serve long-term commitments with Equinor ASA for worldwide LPG transportation. Both vessels are to be delivered by 2021.

This development is the result of Equinor ASA's commitment to improve the sustainability

performance in its activities. It also reflects the longstanding cooperation of EXMAR with Lloyds Register as Classification Society and MAN Energy Solutions as engine maker to develop an efficient LPG fuel system, which allows part of the cargo to be used for the vessels' propulsion. EXMAR has also signed a contract with Jiangnan Shipyard to deliver two newbuilt LPG-fueled vessels. This will be a pioneering project in the gas shipping industry. LPG as a marine fuel has superior environmental benefits; it does not contain sulfur, substantially reduces CO₂ and NO_x emissions, and almost halves the emissions of particulate matter compared to conventional marine fuel engines.



LPG-fueled gas carriers improve fuel efficiency and environmental sustainability

BIO-SOURCED LPG, A FULLY RENEWABLE FUEL FOR THE FUTURE

SHV Energy customers in seven European countries are now able to use a brand new, low carbon fuel: bio-LPG. Bio-LPG is a by-product from the Neste Renewable Diesel production facility in Rotterdam and represents the first large-scale distribution of bio-LPG in the world. Primagaz and Calor market and distribute this fuel, the newest innovation in the LPG sector.

The first consumer of bio-LPG in France is the L'Oréal site of La Roche-Posay, an industrial site in the French countryside which is not connected to the gas grid. La Roche-Posay consumes approximately 130 tonnes of standard LPG per year for its industrial processes. As of May 2018, it now uses 100% bio-sourced LPG, delivered by Primagaz France. Jean-Yves Larrauffie, the president of a L'Oréal subsidiary, explains:

"L'Oréal is committed to a carbon neutral approach for its manufactured products and



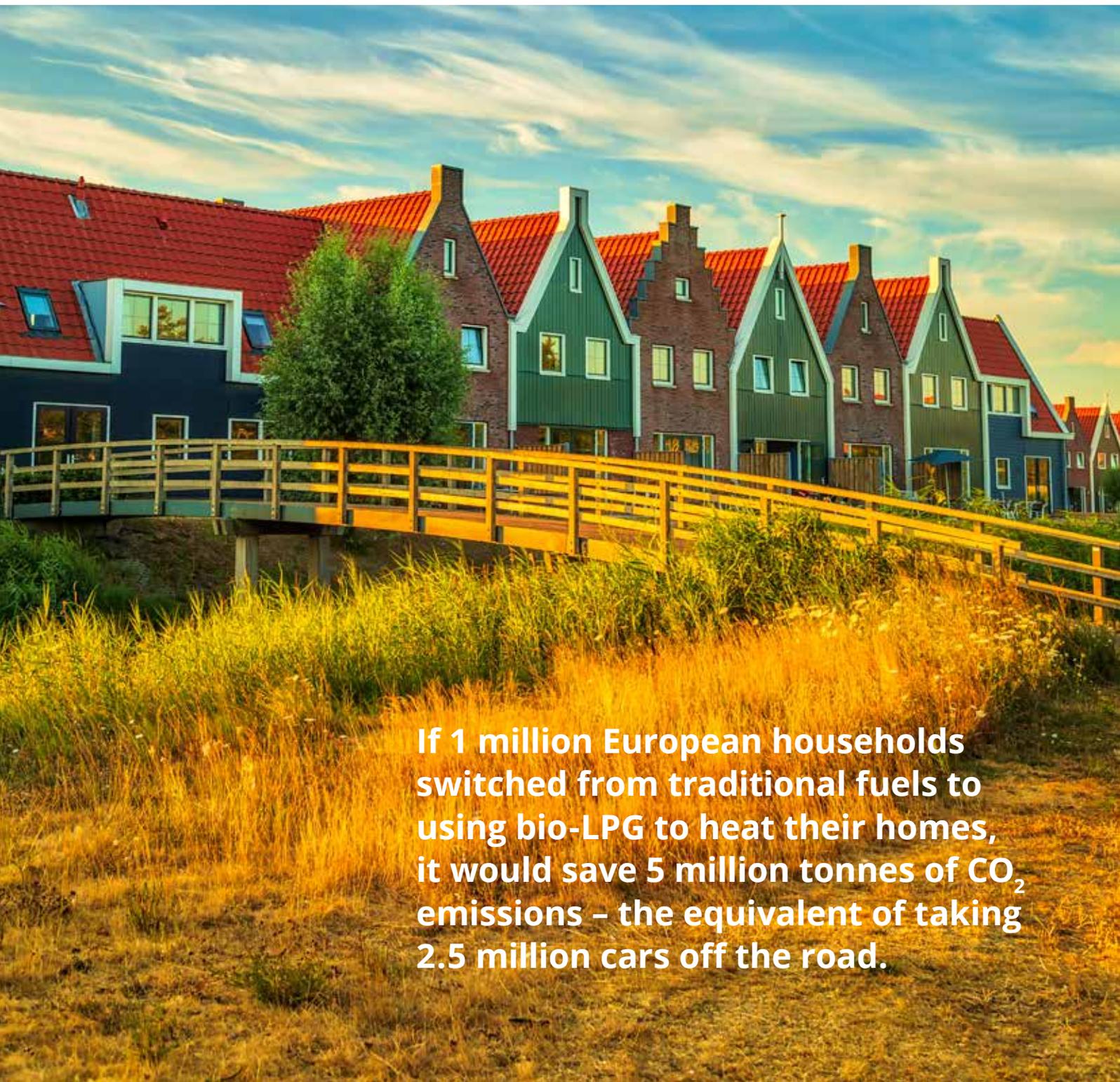
Bio-sourced LPG is now available in many European countries and the United States

plants and has set a target of reducing its CO₂ emissions by 60% between 2005 and 2020". Primagaz will deliver 150 tons per year over five years, saving 1,915 tonnes of CO₂ on an annual basis. As requested by L'Oréal, the delivered bio-LPG is produced exclusively from used cooking oil, improving resource-use efficiency.

Bio-LPG is a drop-in replacement for conventional LPG. Consumers can use exactly the same LPG appliances and vehicles while

dramatically improving their carbon footprint. For instance, if one million European households switched from traditional fuels to using bio-LPG to heat their homes, it would save five million tonnes of CO₂ emissions – the equivalent of taking 2.5 million cars off the road.

By 2040, SHV Energy aims to have 100% of its energy products be from renewable sources. Bio-LPG will have an integral role in achieving this goal.



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