gas naturally
making a clean future real

MAKING A CLEAN FUTURE REAL

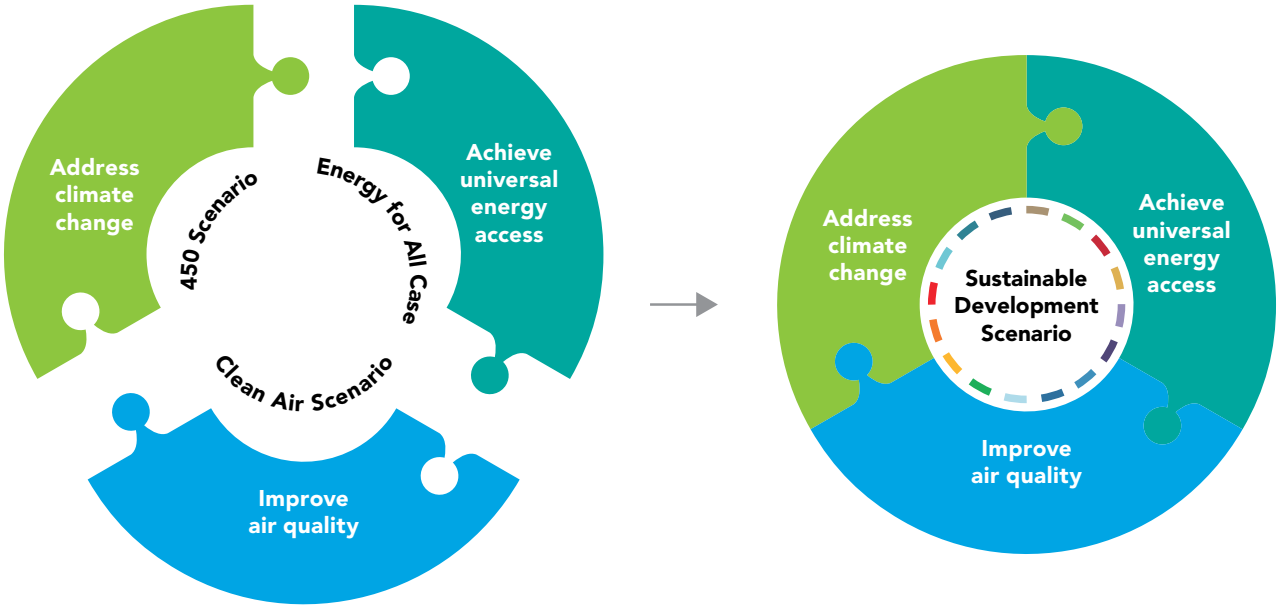
Long-Term Vision of the European Gas Industry

Table of Contents

Introduction

The gas industry is working to help the EU reach its commitment under the Paris Agreement and its 2030 climate and energy objectives. **Gas is a part of the solution** to rapidly address the risks of climate change and other pressing global challenges. This is recognised in the Sustainable Development Scenario published by the International Energy Agency (IEA), in which **natural gas becomes the largest single fuel in the global energy mix,** helping to deliver the EU and global goals of climate stabilisation, better air quality and affordable access to energy.[1]

Figure 1: Sustainable Development Scenario, IEA



The gas industry's contribution to a low-emission economy

The gas industry works every day on new, innovative solutions to further reduce emissions associated with gas production and consumption. Proven and emerging technologies could allow the use of gas to become carbon-neutral, while preserving its cleaner burning properties and affordability. The European gas industry will contribute to a low-emission economy in ten important ways.

1. Reducing EU emissions from power generation

Wherever possible, gas should be used to replace coal in power generation. This will reduce CO_2 emissions and improve air quality. In parallel, as the share of biomethane and hydrogen from different sources in the gas mix increases, flexible gas-fired power generation that supports the integration of variable renewables could become increasingly low-carbon. This would further reduce emissions from the power sector.

Figure 2: Comparison of CO_2, NO_X and PM 2.5 emissions

Natural gas power generation emits up to...

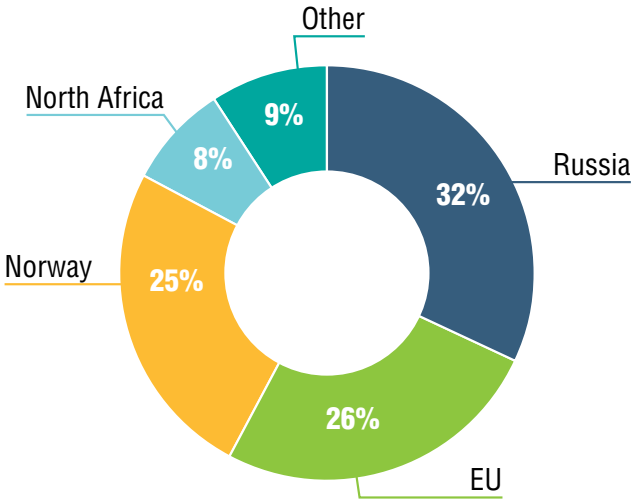
...less than coal.

2. Producing natural gas across Europe according to the high environmental standards

Responsible exploration and development of Europe's gas resources will secure energy supply, provide skilled jobs and generate government revenues for decades to come. Europe currently has around 5100 billion cubic meters (bcm) of commercial and technically recoverable natural gas resources (i.e. more than 10 years of current total annual demand).

Additionally, resources classified as 'yet-to-find' have risen, driven by supportive policies and the identification of encouraging prospects in Croatia, Cyprus, Greenland, Ireland, Norway and Romania.[2]

Figure 3: EU gas mix by share (%) of total supply, 2017



~50% of estimated European gas demand is currently supplied by European (EU28+Norway) production.[3]

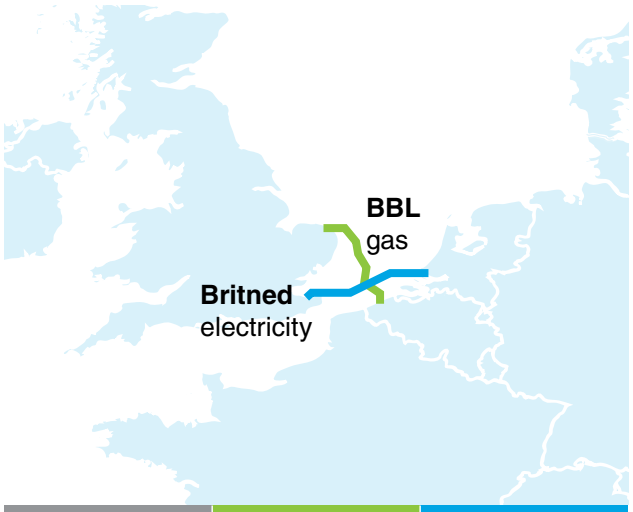
Under a 2°C scenario, **1/3** of EU gas demand in 2040 could still be supplied by European resources, some of which are yet to be discovered.[4]

In 2015, gas generated around **80 billion** in net government revenues in the EU28 + Norway.[5]

3. Optimising the use of existing infrastructure in a low-emission economy

Europe has an extensive gas grid comprising around 2.2 million kilometers of gas pipelines as well as storage and LNG facilities. Adding a few missing links would complete the European gas market, allowing all countries to benefit from various gas supply sources. The gas grid is able to provide the flexibility needed to meet seasonal variations and peaks in energy demand. Gas is routinely and economically stored in large volumes, making it very suitable for seasonal storage that cannot be covered with batteries and other storage techniques, with demand being three times higher in winter than in summer in a normal year.[6] At current costs per unit of storage capacity, storing energy as gas is also much cheaper than electricity.[7] Transporting electricity can be more than twenty times more costly than transporting gas.[8] Unnecessary costs and unwanted landscape disturbance are also avoided with the use of the existing gas pipeline infrastructure.

Figure 4: Comparison of transportation costs: electricity versus gas



	BBL gas	**Britned** electricity
Cost (€/GWh/d/km)	4.7	96.2

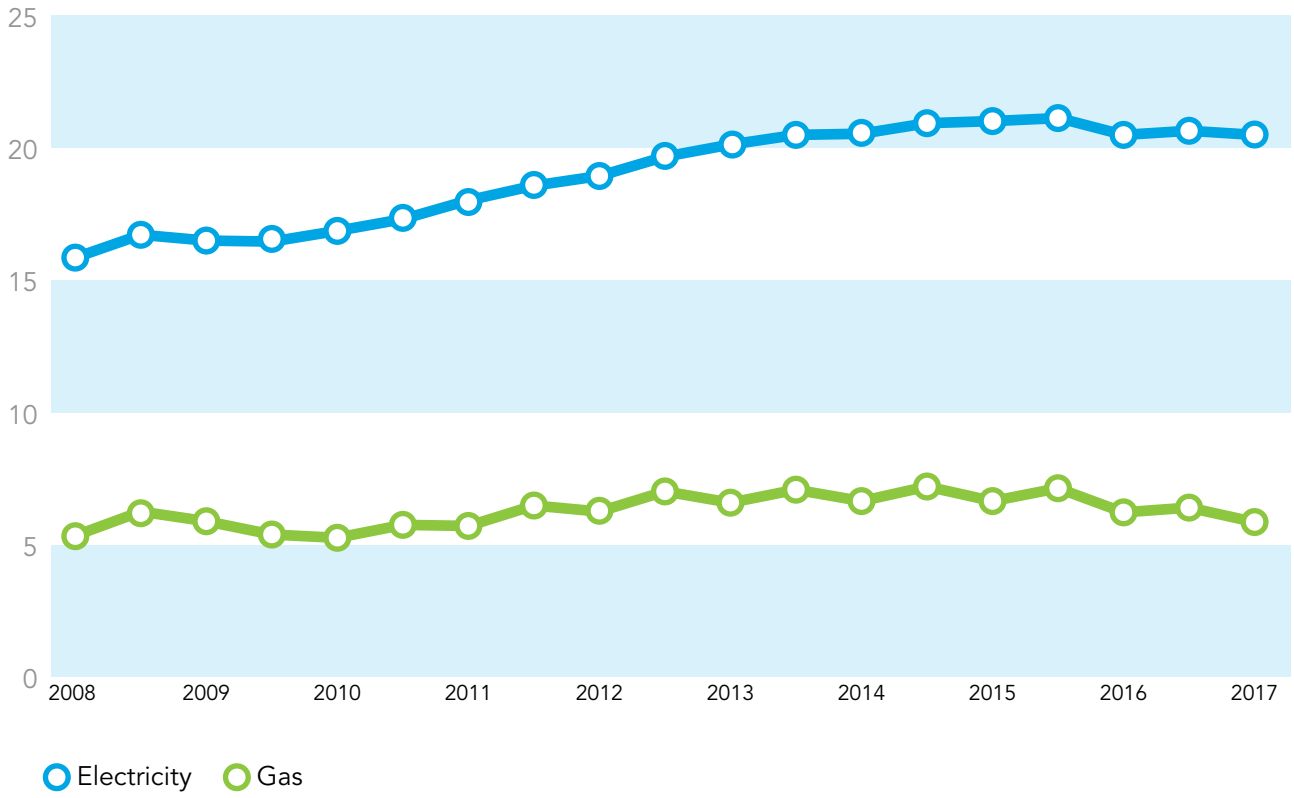
	Arc de Dierrey gas	**Suedlink** electricity
Cost (€/GWh/d/km)	4.7	130.2

4. Providing affordable energy to consumers

Natural gas has consistently been one of the most affordable fuels available to European consumers, and so is an ideal fuel to deliver a sustainable energy future. With 50 to 125 million people in the EU unable to heat their homes or pay household energy bills, energy poverty has been identified as a pressing challenge requiring social and financial policy measures.[9]

According to the European Commission's report on energy costs and prices, on average, EU citizens pay around 4 times more per kilowatt hour (kWh) for electricity than for gas.[10] A shift to full electrification of heating will require several decades and would lead to higher heating costs and the need for higher levels of insulation, with associated higher demand and costs of cooling.[11]

Figure 5: Evolution of household electricity and gas prices in the EU. Prices in € per 100kWh, all taxes and levies included.



5. Providing flexibility to the electricity system

The EU is projected to generate 50% of all power from renewable sources by 2030, mostly from solar and wind; this means that thermal plants will be needed to dispatch extra power at short notice.[12] Gas-fired power plants are much more flexible than nuclear or coal-fired plants. Indeed, gas-fired plants are necessary for an integrated electricity system with an increasing share of variable renewables as the combination of electricity storage, demand-response and power interconnections alone cannot provide sufficient flexibility.

A recent report published by the International Renewable energy Agency (IRENA) and the European Commission confirms a key role for natural gas in the ambitious REmap Scenario, under which the share of renewables in the power sector increases to 50% by 2030. Compared with the reference scenario, the share of natural gas in the power generation mix decreases by only 6%, while the installed natural gas power generation capacity grows slightly compared with 2010 to accommodate for the increasing share of variable renewables.[13]

Figure 6: Power generation by technology (TWh)

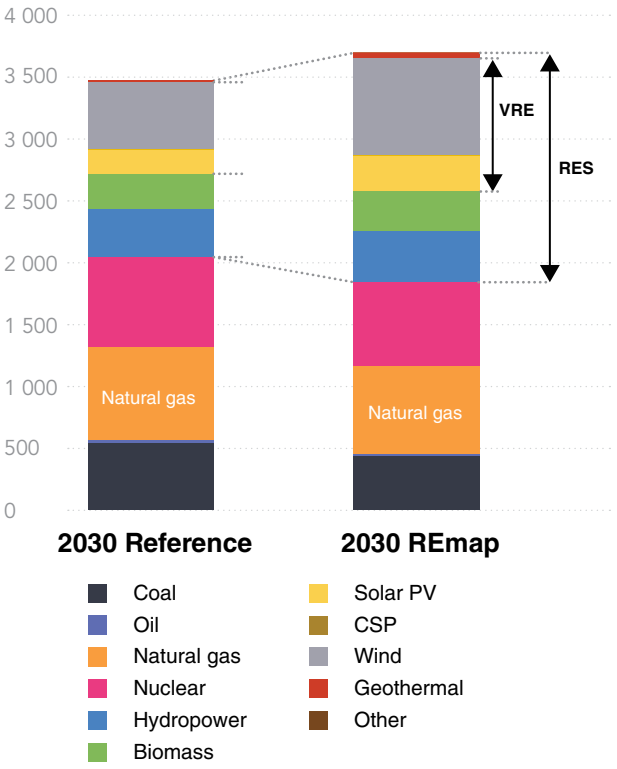
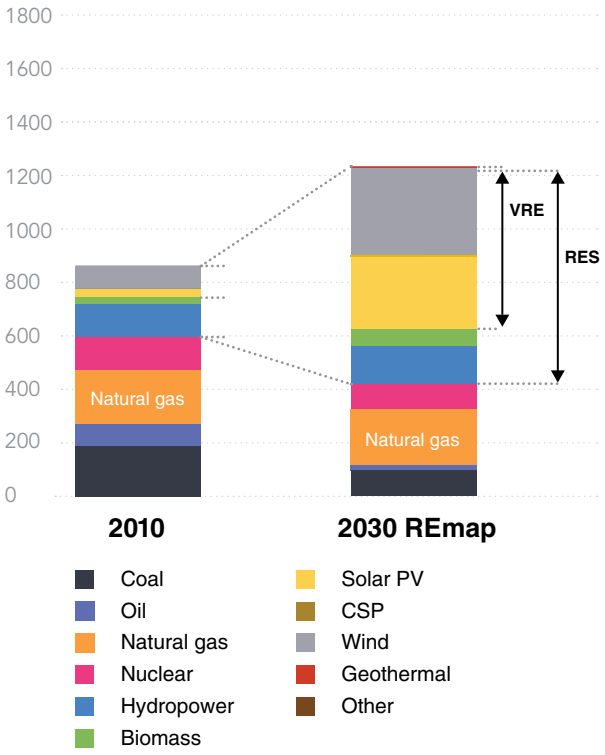


Figure 7: Installed power generation capacity (GW) by source



Note: VRE = variable renewable energy

6. Combining gas and power to provide heating

Most residential areas in Europe have old houses that are energy inefficient. Switching to an all-electric heating system would require time as well as substantial investments in house insulation and in the power grid to meet peak demand. The use of natural gas and renewable gases would provide more economic solutions for residential areas. The development of gas-based district heating will provide affordable heat for customers and support efforts to improve air quality in metropolitan areas. In many cases, infrastructure for gas distribution and transmission has been built already; using this infrastructure helps to reduce the need for challenging electricity infrastructure expansions. Moreover, gas infrastructure can play a key role in transporting renewable and decarbonised gases, thereby facilitating sector coupling and the integration of larger shares of renewable power generation.

All-electric systems are not, by definition, the smartest solutions – neither in financial, nor in environmental terms

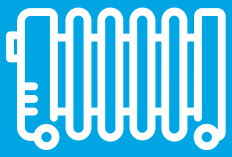
The results of a case study of the energy consumption on one of the coldest days of the year in Germany using a standard load profile for a household show a steep increase in energy use if the household had used electricity instead of gas:[14]

10x increase

if direct electric heating was used

4x increase

if state-of-the-art electric heat pumps were used



8x increase

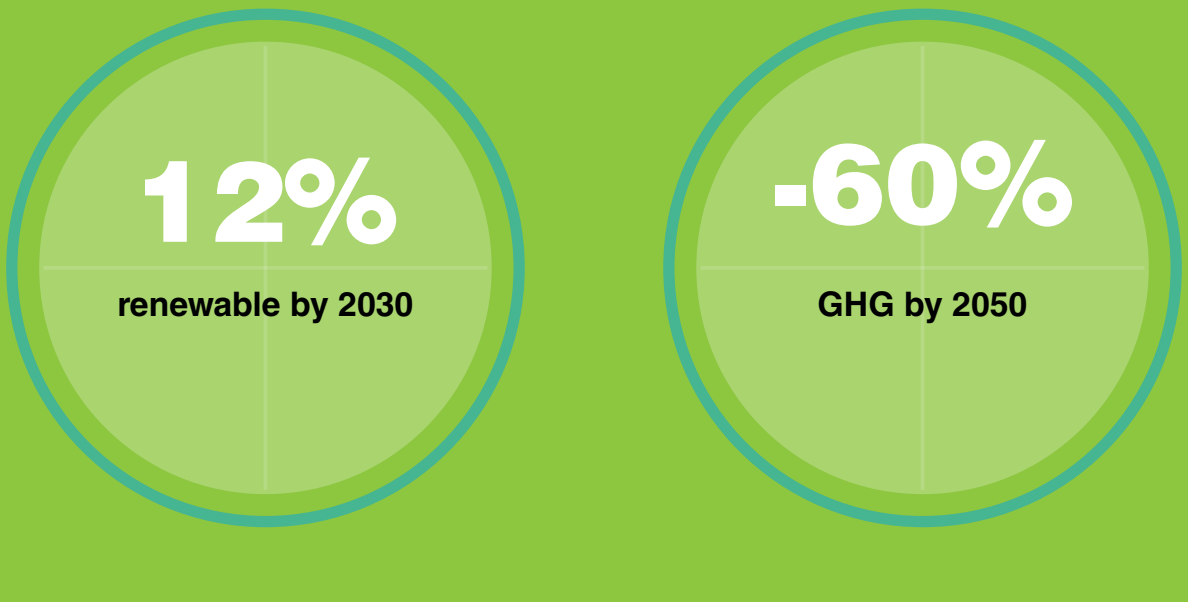
if direct electric storage heaters were used

7. Implementing g-mobility

Natural gas-fueled vehicles should be acknowledged as key solution to ower emissions from the transport sector and improve air quality in a cost-efficient way. To significantly decrease emissions from European road and maritime transport, the EU should make use of existing gas technologies, such as LNG for shipping and freight trucks and CNG for light, medium and heavy-duty vehicles.

These fuels can play a vital role in achieving the EU's 2050 emissions reduction goals, particularly the target to reduce transport GHG emissions by 60%. Use of CNG in passenger vehicles, for example, could reduce CO_2 emissions by 7% compared with diesel and 23% compared with petrol. By blending just 20% of renewable gases with natural gas, GHG emissions in passenger cars could be reduced by a further 17%.[15]

Renewable gases can help Europe reach its targets for transport even faster

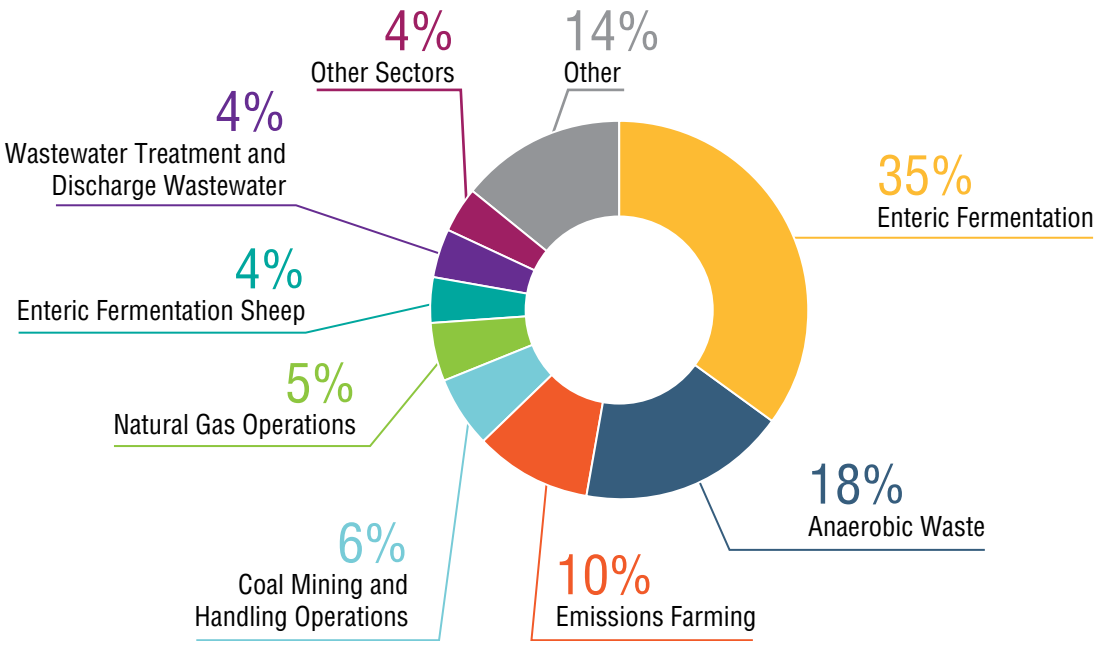


8. Addressing methane emissions across the value chain

Methane emissions from the gas industry represent a very small fraction of the overall anthropogenic methane emissions. Still, the industry is working to reduce them along the value chain by further decreasing venting as well as detecting and preventing fugitive emissions.

GasNaturally members contribute to transparency via studies and initiatives to overcome uncertainty about total methane emissions from the entire gas value chain. Recent findings suggest that 0.5% to 1.5% of the gas produced is emitted.[16]

Figure 8: Share of largest source categories of methane emissions for EU-28 and Iceland in 2015



9. Further developing renewable gases

Renewable gases have considerable potential for growth. Biomethane from waste or biomass, synthetic methane and hydrogen from power-to-gas facilities can be used in stand-alone equipment or blended with natural gas in the existing infrastructure.

Biomethane holds similar specifications as natural gas; existing **consumers can convert to low-emission fuel without further investment.**[17]

The number of **biomethane plants** in Europe has reached **over 500 units** and further development of the biomethane sector expected in the coming years.[18]

Synthetic methane can be **directly injected into natural gas grids**.

Production of synthetic methane and biomethane can be combined, by using renewable power to produce hydrogen in combination with CO_2 that becomes available from upgrading of biogas to biomethane. This **greatly improves the efficiency** of the conversion process.[19]

Power-to-gas processes convert surplus power from renewable sources into combustible gases that can be injected into the natural gas infrastructure. At present, **32 power-to-gas demonstration installations are operational in Europe,** and **16 additional installations are planned.**[20]

10. Working towards deploying at scale the technologies with CO_2 reduction potential

One example is production of decarbonised gas for use in the heating sector through the large-scale conversion of natural gas into hydrogen. This can be combined with carbon capture and storage (CCS), a technology that the gas industry is well-placed to further develop based on 100+ years of geological and engineering knowledge. Given the higher efficiency of gas-fired generation and its flexibility in responding to intermittent power production from renewables, CCS is more economically attractive when fitted to gas-fired plants than when used with coal-fired plants.

CCS has been successfully deployed in Europe for more than two decades

CCS hubs and cluster networks can reduce emissions and boost industry

The European Commission singles out hydrogen technologies as a promising mean to achieve integrated solutions in storage. Hydrogen can store significant quantities of energy in tanks or underground. It can also be delivered by pipelines, including via blending in natural gas networks, and converted into chemicals such as ammonia, synthetic natural gas or other liquid carriers. These energy carriers can be used locally or transported by train, ship or road to industries for energy and feedstock use.[21]

Recommendations

We call upon EU policy makers and stakeholders to:

1. Increase use of natural gas in power generation to displace, wherever possible, coal and to provide the flexibility necessary to integrate renewable energy sources.

2. Optimise Europe's gas resources by encouraging and supporting exploration and production, including via proven alternative technologies, thereby improving energy security.

3. Develop an Energy Union that allows gas and existing gas infrastructure to play a role in minimising the costs of the transition towards a lower-carbon energy system.

4. Fully implement the Third Energy Package so that a truly interconnected and well-functioning European gas market with competitive prices delivers an affordable, reliable energy source for all European customers. Design additional policies that effectively tackle energy poverty.

5. Support market-based policies, such as carbon pricing, to incentivise the most cost-efficient solutions to reduce GHG emissions and achieve a well-functioning energy market in which mature technologies are subject to the same conditions.

6. Implement policies to incentivise gas-based heating, thereby extracting maximum value from the existing gas infrastructure while also facilitating the introduction of renewables into the heating system.

7. Encourage public entities and consumers to capture the benefits of using LNG and CNG technologies in road and maritime transport.

8. Recognise the gas industry's efforts to lower methane emissions through reduction of venting and fugitive emissions by improving the detection and repair of leaks.

9. Introduce a policy framework that facilitates the growing use of decarbonised gas and renewable gases, allowing enough flexibility in regulation to give space for market participants to introduce innovative business concepts.

10. Expand R&D&I programmes for all promising technologies with long-term CO_2 reduction potential, such as natural gas-to-hydrogen, power-to-gas, biogas/biomethane, CCS and CCUS.

Sources

[1] IEA (International Energy Agency) (2017), World Energy Outlook 2017, OECD/IEA, Paris, www.iea.org/weo2017/#section-5-1

[2] IOGP (International Association of Oil & Gas Producers) (2017), fact sheet based on Wood MacKenzie European Gas Resources Report, 2017, IOGP, London, www.iogp.org/wp-content/uploads/2017/11/IOGP-Woodmac-Factsheet.pdf

[3] Idem

[4] Idem

[5] NERA Economic consulting (2018) Update on Energy Taxation and Subsidies in Europe: An Analysis of Government Revenues from and Support Measures for Fossil Fuels and Renewables in the EU and Norway.

[6] TYNDP 2017 Presentation Regional Group meetings (February 2017) pg 4, https://circabc.europa.eu/webdav/CircaBC/Energy/13%20Regional%20Meetings/Library/Gas%20Regional%20Groups%20meetings%2015%20%26%2016%20February%202017/ENTSOG_TYNDP%202017%20Presentation%2015-16%20February%202017_v1.pdf

[7] Ecofys (2018), Gas for Climate Report, Ecofys, pg 6, www.gasforclimate2050.eu/files/files/Ecofys_Gas_for_Climate_Feb2018.pdf

[8] Sources: Britned, BBL, GTRGaz, Bloomberg

[9] European Parliamentary Research Service (2016), Energy Poverty: Protecting Vulnerable Consumers, http://www.europarl.europa.eu/RegData/etudes/BRIE/2016/583767/EPRS_BRI(2016)583767_EN.pdf

[10] Eurostat (2018), Energy Prices in 2017, http://ec.europa.eu/eurostat/documents/2995521/8489679/8-29112017-AP-EN.pdf/600c794f-c0d8-4b33-b6d9-69e0489409b7

[11] Ecofys (see 7)

[12] EC (2017), Fact Sheet, http://europa.eu/rapid/press-release_MEMO-17-163_en.htm

[13] IRENA (International Renewable Energy Agency) and EC (2018), Renewable Energy Prospects for the European Union, pg 54-55, www.irena.org/publications/2018/Feb/Renewable-energy-prospects-for-the-EU

[14] Based on load profiles provided by Thüga see: Eurogas (2014) Gas: The Right Choice for Heating in Europe, pg 13, http://www.eurogas.org/uploads/media/Gas__the_right_choice_for_heating_in_Europe_PART_II_Brochure_140814.pdf

[15] Thinkstep (2017) Greenhouse Gas Intensity of Natural Gas, http://gasnam.es/wp-content/uploads/2017/11/NGVA-thinkstep_GHG_Intensity_of_NG_Final_Report_v1.0.pdf

[16] EEA - Annual European Union GHG inventory 1990–2015 and inventory report 2017, https://www.eea.europa.eu/publications/european-union-greenhouse-gas-inventory-2017

[17] IRENA (2012), Renewable Energy Technologies: Cost Analysis Series, IRENA, Abu Dhabi, http://www.irena.org/DocumentDownloads/Publications/RE_Technologies_Cost_Analysis-BIOMASS.pdf; see also (translated from) ECOFYS/Thinkstep: "Ökoeffizienzanalyse von Heiz- und Speichersystemen für private Haushalte", www.ecofys.com/de/news/neue-studie-erstellt-okoeffizienzanalyse-von-verschiedenen-heiz-und-speiche/

[18] Gas Infrastructure Europe, European Biogas Association (2018), European Biomethane Map 2018, (press release), www.gie.eu/index.php/news/gie-news/13-news/gie/355-pr-biogasmap

[19] Ecofys (see 7)

[20] European Power-To-Gas Platform, www.europeanpowertogas.com/demonstrations

[21] EC (2017), Energy Storage: The Role of Electricity, Commission staff working document pg 19 https://ec.europa.eu/energy/sites/ener/files/documents/swd2017_61_document_travail_service_part1_v6.pdf

List of Figures

The gas industry has been delivering a reliable, affordable and cleaner fuel to EU consumers for decades. We understand that this alone does not guarantee future success and we need to continue innovating to address the societal challenges. We are ready to meet these challenges by providing low-emission solutions that will help the EU meet its climate goals.

www.gasnaturally.eu | @GasNaturally | info@gasnaturally.eu

gas naturally
making a clean future real