



Natural gas, contributing to Europe's energy and climate goals

In shaping its long-term energy policy, the European Union (EU) has set out three core priorities: maintaining economic competitiveness, transitioning to a low-carbon economy and ensuring security of supply.

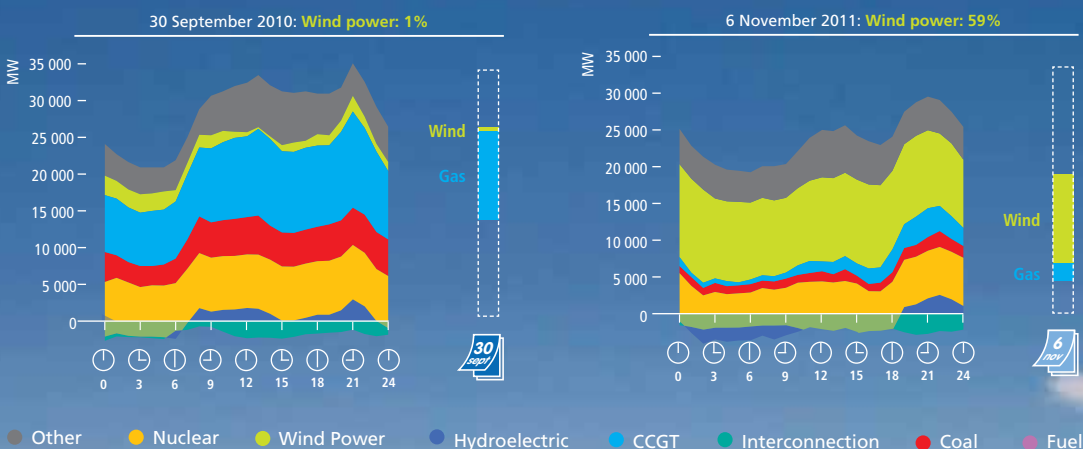
Gas is the cheapest and quickest way to bring immediate reductions in carbon emissions when replacing higher-carbon fuel for power generation.

The versatility of natural gas makes it ideally placed to contribute towards reducing CO₂ emissions, while providing the secure and reliable energy that Europe requires now and in the future.

Gas is the ideal partner for variable renewables: when the sun does not shine, at night, and when the wind does not blow, gas-fired plants can be turned on quickly to meet energy demand.

To make low-carbon Europe a reality, energy policies need to acknowledge and confirm the key role of gas now and in the long-term.

THE GAS AND WIND PARTNERSHIP



Source: REE and Enagás

Gas is secure, versatile, competitive and makes a clean future real

When used for power generation, natural gas has a lower carbon footprint and fewer particulate matter emissions, resulting in **cleaner air** for European citizens.

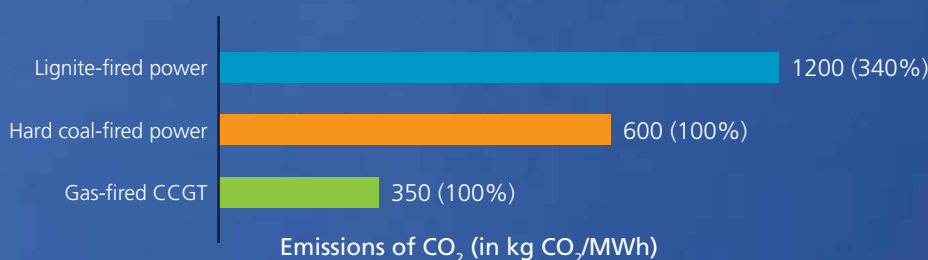
Gas is a secure option because there are significant gas reserves and untapped resources in Europe and elsewhere. Europe is strongly committed to widening its array of suppliers, both through pipelines and liquefied natural gas (LNG) transported by sea.

On the demand side, gas is by nature **versatile**: not only is it the ideal fuel for power generation and heating but it can also be an efficient fuel for transport.

The price of gas is **competitive**, requiring no subsidies for future supplies. In the long-term, natural gas-fired power generation allows policy makers to **keep all options open**. It is the no regret option.

After 2030, the use of existing, largely amortized plants for backup would be more economical than building dedicated backup for renewable capacity. When carbon capture and storage (CCS) matures, baseload gas-fired power generation **could provide even further emissions reductions**.

GAS: CLEANEST FOSSIL FUEL



Source: Mott MacDonald

The role of policy makers

To make the transition to a low-carbon energy system happen in the **future**, policy makers have a strong role to play **today**. Especially in these times of economic and financial uncertainty, **investors need strong positive signals from policy makers**. The gas industry needs a predictable long-term framework to provide the legal and regulatory stability required for investment and the transition to a low-carbon future.

The first of these signals must be to **recognise the key role of gas in the long-term** in order to decarbonise society, in conjunction with other low-carbon technologies. The shift to a low-carbon power sector will require huge investments; from a recent level of €45bn per year to some €70bn over the next two decades, just for renewable and conventional generation.

The EU has also outlined that significant improvements are still needed to make our energy grids ready for a decarbonised energy system. The European Commission estimates the investments needed in the gas grid alone to be €70bn by 2020. Investments in gas infrastructure are crucial to complete the internal energy market. Moreover, **R&D in natural gas has to be supported** to achieve immediate emission reductions and to enable technologies, such as CCS.

Finally, the power market itself has to adapt and become more flexible in order to accommodate the massive projected increase in renewable power generation. Guaranteeing backup for variable renewable energy sources to ensure continuous and reliable electricity supply for European citizens will put pressure on gas networks. The internal energy market may need to evolve in order to acknowledge this increasing need for capacity and availability rather than output. **Capacity-based market mechanisms should be carefully examined.**

Natural **gas** already offers solutions for a sustainable future today and will **naturally** play a key role in the long term, provided the right policy signals are in place.

"Gas will be critical for the transformation of the energy system [...] with evolving technologies it might play an increasing role in the future"

December 2011,
European Commission Energy Roadmap 2050



Did you know that?

- Natural gas delivers up to 60% less CO₂ compared to coal when used for power generation
- 70% of the world's gas reserves are within economic reach of Europe (within a radius of 7,000km)
- 50-60% of European gas supplies come from local production (EU27 plus Norway), and the balance comes from a dozen other sources, including established routes from Russia, Africa, and the Middle East
- The European gas industry provides about 305,000 direct jobs in the European Union and many indirect jobs
- Gas is the ideal partner for renewables and will combine forces to reach EU 2050 goals

Gas Naturally brings together seven organisations within the gas industry



eurogas **EUROGAS** represents mainly the European gas wholesale and retail sector. Founded in 1990, its members are 50 companies and associations from 28 countries. Eurogas objectives include increasing the awareness of the important contribution that our industry can bring to the EU energy debate and to European citizens. Please visit www.eurogas.org and <http://blog.eurogas.org/>

gie **GAS INFRASTRUCTURE EUROPE (GIE)** is the European association representing the interests of natural gas infrastructure operators active in natural gas transmission, storage and LNG regasification. Its internal structure has three columns corresponding to the types of infrastructure activities represented, i.e. GTE (Gas Transmission Europe), GSE (Gas Storage Europe) and GLE (Gas LNG Europe). GIE currently represents 70 member companies from 25 countries. Please visit www.gie.eu.com

GERG **THE EUROPEAN GAS RESEARCH GROUP (GERG)**, is a research and development organisation with a unique role in Europe, in that it provides both support and stimulus for the technological innovations necessary to ensure that the European gas industry can rise to meet the technological challenges of the new century. Please visit www.gerg.eu

GIIGNL **INTERNATIONAL GROUP OF LIQUEFIED GAS NATURAL IMPORTERS (GIIGNL)** is a non-profit organisation whose objective is to promote the development of activities related to LNG: purchasing, importing, processing, transportation, handling, re-gasification and its various uses. The Group constitutes a forum for exchange of information and experience among its members to enhance safety, reliability and efficiency of LNG imports activities and the operation of LNG imports terminals in particular. Please visit www.giignl.org

IGU **THE INTERNATIONAL GAS UNION (IGU)**, established in 1931, is a worldwide non-profit organisation aimed at promoting the technical and economic progress of the gas industry emphasising environmental performance. IGU has more than 110 members globally and they represent over 95% of the world's gas market. IGU's working organisation covers all aspects of the gas industry in all market segments. Please visit www.igu.org

MARCOGAZ **TECHNICAL ASSOCIATION OF THE EUROPEAN NATURAL GAS INDUSTRY** As the representative organisation of the European Natural Gas Industry, it aims at monitoring and influencing, when needed, on European technical regulation, standardisation and certification with respect to environment, health & safety and integrity of gas systems and equipment. MARCOGAZ is actively involved in the development of high efficiency gas technologies. Please visit www.marcogaz.org

OGP **THE INTERNATIONAL ASSOCIATION OF OIL & GAS PRODUCERS (OGP)** encompasses most of the world's leading publicly-traded, private and state-owned oil and gas companies, oil and gas associations and major upstream service companies. OGP members produce about one third of the world's gas. Please visit www.ogp.org.uk

A cleaner energy source



Better health and cleaner cities Natural gas produces two to three times less NO_x (nitrogen oxide) per unit of energy content than other fossil fuels. Natural gas also contributes to significantly decreasing particulate pollution in our cities.

Lower CO₂ emissions Natural gas has been a principal contributor of reduced CO₂ emissions since 1990 as it has substituted for other fuels in older, more polluting equipment. It has been estimated that the conversion of all power generation run by carbon-intensive fuels to best performance combined cycle gas turbine (CCGT) plants would cut emissions by 58% (relative to 1990 levels in the power sector).

Higher energy efficiency CCGT plants can achieve thermal efficiency rates of 55 to 60%, compared with thermal efficiencies of 35 to 42% for coal and for nuclear. When they can be used in combined heat and power (CHP) systems—where natural gas is the ideal fuel – they can achieve efficiencies of over 80%.

Biogas, green gas, and decarbonisation The carbon content of gas distributed to our homes, offices and factories can be further reduced by the injection of biogas (or ‘green gas’) into the high pressure transmission system of natural gas. R&D and technical progress in purifying biogas increases its potential and also opens opportunities for the direct blending of hydrogen (up to about 10% H₂) into gas distribution – providing more CO₂ savings.

Advancing technologies R&D is also focusing on new cutting-edge technologies such as the storage of renewable-derived hydrogen obtained by water electrolysis. This is yet another research avenue which advances the frontiers of energy efficiency by the deployment of micro-CHP systems and gas heat pumps suitable for homes, schools and offices. Advanced technologies such as micro-cogenerators and gas heat pumps will increase energy savings and enhance renewables.

CCS and gas The remaining emissions from gas-fired power generation can be captured and stored in depleted oil and gas fields or saline aquifers using CCS technology. This technology has yet to reach full-scale deployment, but we expect it to be used widely in the power and industrial sectors from around 2030 onwards.

Opening options Investing in high-efficiency gas-fired power plants today can bring immediate carbon reductions. Moreover it would open up future opportunities to partner these plants with variable renewables, or to explore retrofit as an option for CCS—depending on which is the better technical and economic option at the time. Natural gas in power generation is characterised by comparatively low capital expenditure (half as much as coal, one-tenth of nuclear per GW) and potentially leads to more rapid cost recovery.

A secure energy source

Abundant natural gas reserves The global natural gas resource base is vast and geographically dispersed. Conventional recoverable gas resources are equivalent to 120 years of current global consumption. Global proven gas reserves have more than doubled since 1980, reaching 190 trillion cubic metres at the beginning of 2010.

Liquefied natural gas LNG allows access to a global gas resource base, reducing the risk for importing countries to be dependent on one or a limited number of suppliers, and providing quick access to alternative sources in case of disruption. The LNG industry has a total of around 1,660 billion cubic metres (bcm) available for sale from existing production over the period 2009-2025. In 2010, Europe imported around 82 bcm of LNG from 13 different countries. The biggest LNG exporting country is Qatar, representing 41% of total LNG supplies to Europe; a useful point when considering the security of supply.

New suppliers The growth of pipeline trade has enabled the Commonwealth of Independent States (CIS), Caspian and North African countries to connect to Europe, thus reinforcing European security of gas supply by diversifying its import routes. New infrastructure enables the development of unexploited resources, adding to the global resource base.

Global gas The worldwide potential of natural gas from shales and other newly recoverable resources such as coal bed methane is expected to extend current production by a century or more and mitigate the decline of domestic production in Europe. It is yet to be determined whether the volumes at stake could be a game changer for domestic production in Europe. But already, the large scale development of these resources in North America and Australia has transformed global gas markets, freeing up more gas to go elsewhere, including Europe.

Infrastructure and storage Gas is stored to make sure that customers will be supplied even when there are big changes in the weather. Stored gas also helps to make up for changes in supply so that customers are protected. Pipes and storage infrastructure can move the gas around and make it available where it is needed in a highly efficient way. The European gas industry invests billions of euros per year to develop its infrastructure. As new import routes are being built in northern Europe, south eastern corridors are also being studied.

Energy transportation Gas transportation has a smaller footprint than, for example, electricity. Natural gas pipelines can transport much more energy than overland electricity transmission lines; and investing in them is particularly efficient due to the comparatively high energy content that can be transported through the underground pipelines.

A versatile energy source partnering with renewables

Power generation The technology for using natural gas in power generation is extremely efficient, rapidly deployable and affordable, making gas ideally versatile. Gas-fired plants provided 22% of annual power demand in Europe in 2010. Gas-fired plants are the most energy efficient of all power plants because of this technology.

Gas and renewables Gas-fired power plants are the most flexible for adapting to the changing energy needs of European citizens, in partnership with variable energy supply from wind and solar power. When the sun does not shine, at night, and when the wind does not blow, gas-fired plants can be turned on quickly to meet energy demand. Sufficient gas infrastructures, including storage and LNG terminals, need to be in place in order to provide the flexibility that renewables need.

Heating Natural gas offers a highly efficient solution for the heating needs of domestic, commercial and industrial customers. In terms of reducing our carbon emissions, condensing boilers can be up to twice as effective as converting gas into electricity for space heating, once electricity grid losses are taken into account.

Gas-fired applications Next generation gas technologies, such as micro-CHP, cogeneration, gas-fired fuel cells and gas heat pumps are being developed to heat and generate electricity for low-emission buildings. These will have a primary energy ration (PER) of up to 1.85 for heating and a PER of up to 2.75 for simultaneous heating and cooling.

Road transport Gas is well suited for use in fleet vehicles and, potentially for heavy goods vehicles (HGVs), for which second generation biofuels may be less readily available.

Maritime transport Ship-owners have been the forerunners in LNG-fuelled vessels and the interest in this new solution is growing globally. In the coming decades, LNG may become the fuel of choice for some segments of the shipping industry (inland ferries and offshore supply vessels). The shift towards LNG is driven by concerns about local air quality in harbours and along coastlines, as well as new rules from the International Maritime Organisation (IMO).

A competitive energy source



Cost comparison Natural gas is typically 1/3 of the price of electricity per kWh in Europe and it is for this reason the preferred source for heating and hot water.

Efficiency Compared to other fossil fuels, when producing electricity or heat, natural gas has a higher conversion efficiency rate resulting in less energy wastage, while being cost-efficient. Natural gas is easier to store than electricity and can be transported easily, silently and invisibly through underground pipelines without harming the environment. In fact, offshore gas pipelines can be up to 20 times cheaper for transporting energy than offshore electricity.

Carbon pricing In a carbon constrained business environment, natural gas, thanks to its low CO₂ emissions per unit of energy, is more competitive compared to other fossil fuels.

Pricing Competitive gas pricing is assured either by indexation to alternative energy products, which is still widely used, or by reference to hubs where gas-to-gas competition takes place. Prices set at hubs are becoming more common as price indices in contracts, which contributes to increased transparency.

Global commodity The development of the liquefied natural gas trade, in conjunction with the US's rapid exploitation of its abundant reserves of gas from shales, has meant that far more LNG cargoes are now available to global markets than was envisaged just a few years ago, thus freeing up supplies for Europe.



GasNaturally showcases the essential role of natural gas in the forthcoming energy debate. The mitigation of climate change has become one of the most important issues for the energy industry.

Nevertheless, the EU policy debate has failed to give sufficient attention to natural gas compared to the scale of its benefits in reducing carbon dioxide emissions.

This initiative intends to feed the debate with factual information and data about the benefits of natural gas in a long-term, sustainable energy mix. GasNaturally aims to provide a clear vision on how to face the challenges ahead, taking account of the fact that natural gas is a safe, secure and reliable energy source.