



Natural Gas

The energy for a sustainable future

Key objectives and membership of Eurogas

The European Union of the Natural Gas Industry – Eurogas – is a non-profit making association based in Brussels. It promotes:

- The interests and views of its members in the supply, trading and distribution of natural gas and related activities such as storage and Liquefied Natural Gas (LNG);
- The development of the natural gas industry in Europe and understanding of its activities including in the statistical and economic fields;
- The smooth functioning of the European internal gas market;
- The contribution of natural gas to sustainable development;
- The co-operation and dialogue with European and international organisations and in general with all stakeholders public and private, who have interest in energy and natural gas.

Our membership as in June 2004

- Asociación Española del Gas – SEDIGAS (E)
- Association Française du Gaz – AFG (F)
- Bord Gáis Éireann – BGE (IRE)
- BOTAS (TK)
- BP plc (UK)
- Bulgargaz (BUL)
- Bundesverband der deutschen Gas- und Wasserwirtschaft – BGW (D)
- Centrica plc (UK)
- Czech Gas Union – CPU (CZ)
- DEPA (GR)
- DONG A/S (DK)
- Electrabel – Distrigas (B)
- EnergieNed (NL)
- ENI S.p.A. (I)
- E.ON Ruhrgas AG (D)
- Fachverband der Gas- und Wärmeversorgungsunternehmen – FGW (A)
- FIGAZ (B)
- Gas Natural SDG (E)
- Gasum Oy (FIN)
- Gaz de France (F)
- G-E Association of Gas Distribution Companies (HU)
- HNG (DK)
- N.V. Nederlandse Gasunie (NL)
- Polish Oil and Gas Company – POGC (PL)
- Slovak Gas Industry – SPP (SK)
- Swedish Gas Association (S)
- Swiss Association of Gas Industry (CH)
- Swissgas (CH)
- Transgás s.a. (P)

Mission and tasks of Marcogaz

Chief mission

- To serve the members as the European window on technical legislation and standardisation and to promote technical conditions required for the market success of natural gas.

Main tasks

- To promote **safety, reliability, cost effectiveness** and **environmental advantages** of natural gas systems and appliances.
- To identify, monitor and take action on **technical legislation** at EU level.
- To promote with the EU institutions **fair European legislation** reflecting the industry's high safety record and respecting subsidiary.
- To actively monitor **standardisation activities** related to natural gas conducted by CEN, ISO, OIML and others.
- To identify **appropriate levels of competence** for a safe and effective operation of gas systems.
- To study any **technical subject of interest** for its members.
- To promote **cooperation with other associations** representing the gas industry and the manufacturers.

Marcogaz co-ordinates with Eurogas (European Union of the Natural Gas Industry) and GERG (European Gas Research Group) on selected issues. Marcogaz also co-operates with other major gas industry or consumer organisations. It consults and co-operates with other industry and business organisations involved in the issues at hand.

Membership in Marcogaz

Membership is open to natural gas supply and related technical organisations in European countries interested in co-operation towards shared safety and quality objectives and standards, on any technical issue regarding the gas infrastructure systems, utilisation and protection of the environment.

- Österreichische Vereinigung für das Gas- und Wasserfach – ÖVGW (A)
- Association Royale des Gaziers Belges – ARGB/KVGB (B)
- GAS s.r.o. (CZ)
- Danish Gas Technology Centre – DGC (DK)
- Deutsche Vereinigung des Gas- und Wasserfaches e.V. – DVGW (D)
- Association Française du Gaz – AFG (F)
- Public Gas Corporation of Greece S.A. – DEPA (GR)
- Association of Gas Distribution Companies – GE (H)
- Bord Gais Eireann - BGE Technical Centre (IRE)
- Associazione Tecnica Italiana del Gas – ATIG (I)
- N.V. Nederlandse Gasunie (NL)
- Statoil A/S (N)
- Slovak Gas and Oil Association SGOA (SLO)
- Asociacion Española del Gas – SEDIGAS (E)
- Schweizerischer Verein des Gas- und Wasserfaches – SVGW (CH)
- National Grid Transco (UK)

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Introduction from Eurogas and Marcogaz Presidents

In the context of the establishment and functioning of the internal market and with regard for the need to preserve and improve the environment, the European Union policy on energy aims to:

- a) ensure the functioning of the energy market,***
- b) ensure security of energy supply in the Union, and***
- c) promote energy efficiency and saving and the development of new and renewable forms of energy.***

Eurogas, the European Union of the Gas Industry representing the interests of gas suppliers and Marcogaz, the technical association of the European gas industry support the European Union's drive towards a sustainable energy policy. It is necessary to set a strategy for growth which respects the environment at global, regional and local levels, that safeguards at the same time the ability of future generations to meet their own needs.

We believe that natural gas and the natural gas industry will make an important contribution to the European Union's policy of sustainable development. Natural gas as the cleanest fossil fuel is well placed to preserve and improve the quality of the environment at the same time enhancing the health and welfare of Europe's citizens. Natural gas companies attach high priority to objectives of environmental protection and good governance in the interests of sustainability.

This brochure explains how in all areas of our lives, from the wider economy to our homes, natural gas can bring a range of benefits. Natural gas is in plentiful supply, is the fuel of choice in solutions to contribute to climate change policy and to improve air quality; new and exciting applications will increase its use potential.

Natural gas is the fuel of the 21st Century.

Mr. Enrique Locutura
*Chief Executive Officer
Gas Natural SDG s.a.
President of Eurogas*

Prof. Dr. Klaus Homann
*Chief Executive Officer
RWE Transportnetz Gas GmbH
President of Marcogaz*

In the energy market Secure, competitive supplies

Abundant world reserves

Proven world gas reserves are now equal to about 60 years of gas production at current rates; in past years they have increased faster than gas consumption and estimated reserves could last for another 200 years.

“Gas resources easily meet the projected increase in global demand”

IEA World Energy Outlook 2004.

Europe's proximity to major suppliers

European countries including Norway still provide about 70% of the gas used in Europe; indigenous supplies will decline and by 2020 will be around 40%. Europe, however, is surrounded by many commercial gas suppliers. As the market increases, supply diversity will increase and also inter-

connected delivery routes to Europe. Imports into Europe will rise from traditional producers, in Russia, Algeria, and Libya and also new volumes can be contracted from further sources, like the Gulf States, Nigeria, Egypt and South America.

Appropriate climate for investment

Gas already arrives in Europe in liquid form by sea aboard LNG tankers. This trade will increase, encouraged by a growing spot market, one of the consequences of Europe's newly opened single market in gas. Other supplies travel to Europe by long-distance pipeline. Huge investments will be needed to construct the special terminals for receiving LNG and to build the long distance pipelines. Sustainable supplies will require long-term investment. The market framework should incentivise this.

Supply capacities for Europe 2010-2020



Source : IEA, OME.

A shared responsibility between industry and authorities

The natural gas industry is mainly responsible for security of supply, divided between the network operators who must provide the capacity in the pipeline to carry the gas and the suppliers who trade in and sell gas to consumers. National Governments and the EU have a role to play, in facilitating politically stable relations with producing countries so that companies can invest in and do business with confidence.

In Europe's economy Energy of the 21st century

A growing market in gas

Natural gas is currently the second most important source of energy for Europe, meeting around 25% of primary energy needs, forecast to rise towards 30% by 2020. Gas is playing an increasing role in the European economy, as its natural environmental advantages are recognized by energy and environmental policy makers and by consumers.

The fuel of choice for consumers

At the end of 2002 more than 95 million customers were connected to the Western European natural gas grid, which represents more than 240 million people using natural gas.

Growing use of gas for power generation

Although gas demand is growing in all sectors of the economy, it is particularly strong in power generation because, when it is used instead of other fossil fuels, CO₂ emissions are lowered significantly and other pollutants are much less. Natural gas use for power generation is expected to almost double by 2020 from today's share.

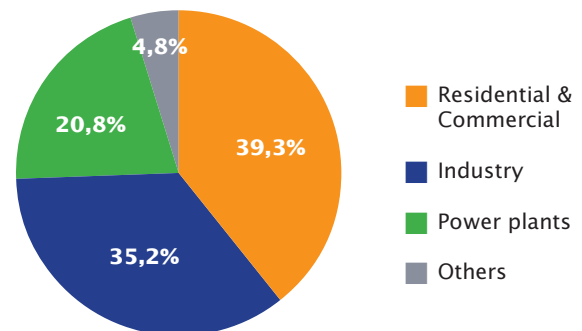
Competitively priced

Although market prices increasingly reflect the global upward trend in gas prices, gas remains competitively priced and its qualities will ensure it will continue to play a key role in Europe's economy.

Market choice for customers

Now most customers throughout Europe can choose their gas supplier. Companies will increasingly compete on the basis of price and quality of service and products, tailored to customers' needs. Competition will enhance standards of customer services.

Natural gas sales by sector



In the home

Comfort and efficiency

A range of applications

Gas is the preferred choice of many residential customers for space heating, hot water and cooking. Modern appliances are compact, clean and easily maintained. Gas is also growing more popular as a direct fuel for washing machines, dishwashers, tumble dryers and refrigerators.

High efficiency

For space heating, gas systems developed in recent years offer efficient and economic solutions. Energy savings can be as high as 40% when an old conventional boiler is replaced by the latest condensing boiler, enabling the customer to cut his fuel bill and contribute to environmental improvement.

A clean fuel

On combustion, gas produces much less CO₂ than other fossil fuels, and also it contains practically no pollutant-forming components like sulphur. For the same use, NO_x emissions decrease if natural gas is used instead of other fossil fuels. With low NO_x combustion technologies, emissions are reduced assuring that best results are obtained. So the exhaust gas from appliances contains low emissions.

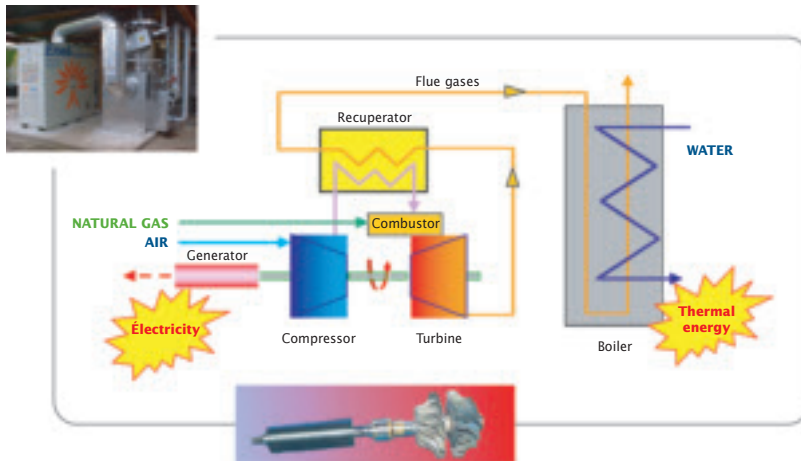


In commerce and industry

Economic tailored variable uses

Efficient base load production

Combined cycle gas turbine stations (CCGT) and large-scale Combined Heat and Power (CHP) plants offer higher efficiencies than conventional power stations, by as much as 40-45%. When the benefits of cleaner combustion properties of gas are factored in, it is clear that using gas as a fuel to generate electricity enables electricity companies to reduce CO₂ and local pollutants.



*Cogeneration with microturbine.
Photo provided by : ATIG, Italy.*

Tailored solutions

Furthermore CHP allows primary energy saving and can offer economic solutions based on some general advantages of decentralized production. A plant delivers on-site produced electricity – thereby avoiding distance related losses – to be used by commercial or industrial customers, and at the same time the exhaust gases can provide heating and/or eventually cooling possibilities, to be used in the offices, on the site, or in the manufacturing process itself. Moreover, which is not the case for all distributed generation systems, CHP can provide guaranteed power. Businesses can improve their efficiency, lower costs and save energy, realizing reduced environmental impact by using gas-fired tailored solutions.

Added-value in manufacturing processes

Natural gas offers large benefits in a variety of manufacturing processes, offering as well as high energy efficiencies and lower emissions, savings in operational and maintenance costs, with enhanced product quality. Its gaseous quality and its clean combustion make it ideal for use in direct firing, for example in the metal, glass, and ceramic industry. Also space heating of large areas like workshops or factories is achieved efficiently using gas-fired technology such as condensing air heaters.

In town and city Pleasanter, cleaner surroundings

Reducing local pollution

As gas has replaced other fossil fuels in our towns and cities, the air has become less polluted, contributing to the reduction of ground-level ozone and lower levels of sulphur and particles in local air quality. The air is cleaner and healthier to breathe. The increased use of natural gas vehicles, especially when replacing diesel fueled trucks or buses, can also contribute to a better environment.

Protecting the cultural heritage

Buildings are less ravaged by acid rain, the product of regional and local pollutants.

Minimising disruption

In the future, problems traditionally associated with pipelaying and maintenance activities will be reduced as new non-dig laying methods become widespread. New detection methods for grids will also improve network management, involving minimum disruption.



In the countryside

Unseen, silent, non-polluting pipelines

Minimal disturbance

In deciding on a transmission pipeline route, a company considers environmental impact, transmission safety and technical-economic criteria, in order to avoid or disturb as little as possible areas of natural or cultural importance, archeological sites, geologically unstable areas, built-up areas, or those where new housing is planned. In the construction phase, trenches are excavated for the pipelaying operations using technologies that interfere as little as possible with the surroundings. Once the pipes have been laid, the land is restored very carefully. Only the yellow company markers indicate the pipeline's location.

Virtually no local environmental impact

The supply of natural gas directly to the end-user in underground pipes eliminates the environmental impacts associated with transport of other energies. Although some noise is generated by compressors and other equipment installed on the pipelines these are generally sited far from residential areas, so no noise nuisance is associated with the transport of gas.



Underground natural gas pipeline crossing the river Mosel.

On the sea

Safe and flexible deliveries

Growing importance of LNG

LNG maritime transportation at a temperature of minus 160°C by means of special vessels represents an increasing percentage of total natural gas international trade movements. At the present time, more than 150 bcm/year are shipped by sea route, which represents about 35% of the interregional gas trade. This kind of transportation makes easier the supply from different sources and enhances security of supply.

Minimal environmental impact

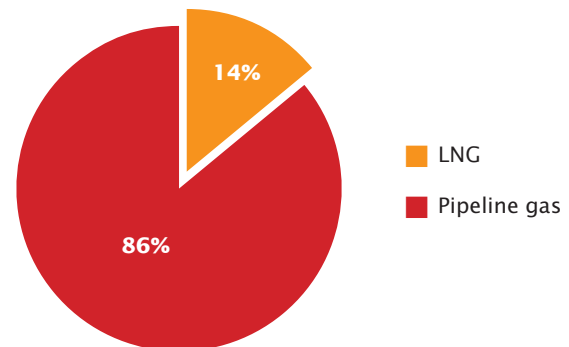
The environmental impact of natural gas transportation by sea is minimal because during the crossing the boil-off of the tanks is recovered and burned in the ship's engines. In this way emissions of methane and volatile organic components (VOC) into the atmosphere are avoided. Moreover, the ballast water is not contaminated, since independent tanks are used for this purpose, and no cleaning of tanks is carried out on the high seas.



Safe transport

LNG vessels are very safe as all of them are reinforced with a double hull structure, minimizing consequences if there were an accident. Even if any LNG were to spill, there would be no pollution since on contact with the LNG, the sea-water would freeze reducing any further spillage and resulting in slow evaporation.

Net import to the EU by transport



On the road

An alternative fuel

The road transport sector is a major contributor to emissions of CO₂, and also other climate change gases NO, N₂O and hydrocarbons. Using natural gas as a vehicle fuel can reduce the impact of the transport sector on global warming.

Aiming for a higher market share

Although traditional fuels and associated technologies have made significant progress towards emissions reductions in recent years, a report issued by the European Commission underlines the objective of finding alternative fuels, and states that natural gas is the only fuel which can easily replace part of the diesel/gasoline currently used with a possible market share of 10% in 2020.

Bringing environmental and health benefits

The lower emissions from natural gas engines also contribute to the reduction of toxic substances associated with other fuel powered vehicles, including particulates and nitrogen oxides. The substantially better environmental performance brings benefits for human health.



In the community

Caring for people

High standard of customer service

Caring for their customers is a central to gas company business. Companies aim to deliver high standards of customer services and products giving value for money.

Caring for vulnerable customers

In particular, within national legislative and social frameworks, companies seek to ensure that safeguards are in place to protect customers among whom are the weakest in the community, the elderly, the disabled or chronically sick, and disadvantaged families with very young children.

Improving quality of life at home and abroad

Companies often enter into partnership with local non-profit organizations and charities to promote community welfare :

- In Britain Centrica brings together private, public and voluntary sector partners to help combat household poverty and make a difference to the quality of life for many families and individuals.
- Gaz de France is contributing to the social bond and combating exclusion. Specific proposals have been implemented for disadvantaged cus-



tomers and social welfare organisations, access to heating under tailored economic terms (Gas Energy Solidarity Fund) and appropriate services with regards to safety and management of consumption. 17 centres were opened in selected areas. At the same time, Gaz de France is undertaking actions in favour of disabled people: making customer service centres accessible for the mobility-impaired, training customer service advisors to deal with the hearing-impaired, making available bills in Braille, etc.

- In Belgium, natural gas companies have set up a fund to develop nature reserves and improve green sites in urban areas and abroad.
- Snam Rete Gas supports the pro-environment initiative “Clean Up the World” organized in Italy by the Environmental Association Legambiente and promoted internationally by the United Nations Environment Programme.
- Spanish Gas Natural sponsors education and health programmes in South America.
- Dutch Gasunie sponsors sports for youth and social and medical welfare, as well as cultural organizations.

In the global environment

Contribution to the Kyoto targets

Benefits of fuel switching

From a global perspective, natural gas and natural gas companies make an important contribution to reducing or containing increases in worldwide greenhouse gas emissions. The CO₂ produced by natural gas combustion is 25-30% lower than petroleum products and 40-45% lower than coal for the same energy input. Therefore switching from coal or oil to gas brings significant benefits, especially if enhanced by high efficiency technology. Companies encourage fuel switching in a range of applications.

The natural choice for efficiency

Natural gas-fired applications in electricity generation, industrial and domestic utilization offer high efficiency results, based on the latest technology. Companies promote energy conservation, energy management and energy efficiency and educate and advise all customers on means to economize on energy use.

Technological development

Natural gas companies research businesses, cooperate with academic centres and manufacturers to achieve advances in technology that will build on the inherent advantages of natural gas and enhance its potential role in contributing to the Kyoto targets.

Reducing methane emissions

The main component of natural gas is methane, upwards of 80%. Methane emissions from natural gas industry activities are minimal and are below the level at which the benefits of switching to gas would be lost. Gas transmission and distribution operators continuously monitor and follow cost-effective methods of methane emission reduction from their activities.



CH4 Airborne Remote Monitoring CHARM.

In the future

Finding new ways

New generations of appliances

As a driver to future sustainability, it is important that as the existing generation of energy appliances come to the end of their lives, they are replaced by new, improved technologies, already on the market but not in sufficient numbers.

These include :

- **Micro-CHP:** In the home of the future, it will be possible to use gas to generate electricity, to produce heat, hot water and eventually cooling, and to be able to sell surplus production of electricity to the grid. Among the developed technologies, micro-CHP based on a Stirling engine seems to correspond best to the needs of the market.
- **Fuel-cells:** Or as an alternative to mechanical power generation, fuel cells will generate electricity and heat from natural gas. They can be used in transport applications as well as domestic, commercial and industrial settings.



*Installation of a fuel cell ONSI in Chelles, France.
Gaz de France.*

Photo by Xavier Renauld.

“Residential combined heat and power generation is a relatively new concept. Only a few technologies are presently developed to address this market, notably Stirling engines and fuel cells. Their success depends on actively achieving maturity in both regulatory and technical domains. Presented here are two tests of small fuel cells systems for residential application which are fuelled with natural gas.



Electrical room with connections for the combined heat and power plant installed at OPAC, Paris, France. Gaz de France.

Photo by Franck Dunouau.



A cogeneration boiler at Emmentalerstrasse, Berlin, Germany. Gaz de France.

Photo by Noël Hautemanière.

Hybrid fuel systems

Already natural gas is used in combination with solar and biomass systems. Biogas can also be injected into the grids for distribution provided it meets certain safety and technical standards. Natural gas companies are exploring the possibility of more extensive hybrid systems, that will expand in step with growing penetration of renewable energy sources on the market.

Towards a role for hydrogen

Much research and development is ongoing into the possibilities of developing a hydrogen based energy economy. Many technical problems remain to be resolved and the economics of such a transition present a huge challenge. Natural gas companies, however, are engaged in co-operating with scientists and researchers to assess if small amounts of renewable based hydrogen can be distributed through natural gas systems.

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