

BACKGROUND INFORMATION

November 2013

The Benefits of Natural Gas

1. Natural gas – key to a cleaner future

Natural gas satisfies a significant amount of Europe's daily energy needs. Although consumption varies greatly from one country to another, natural gas makes up almost a quarter of the EU's total energy consumption, and its share is steadily increasing.

EU 27, Gross energy consumption by fuel, 2000-2011

(Eurostat, 2013, numbers may not add up to 100 percent due to rounding)

	Oil	Natural gas	Coal	Nuclear	Renewables
2000	38%	23%	18%	14%	6%
2011	35%	23%	17%	14%	10%

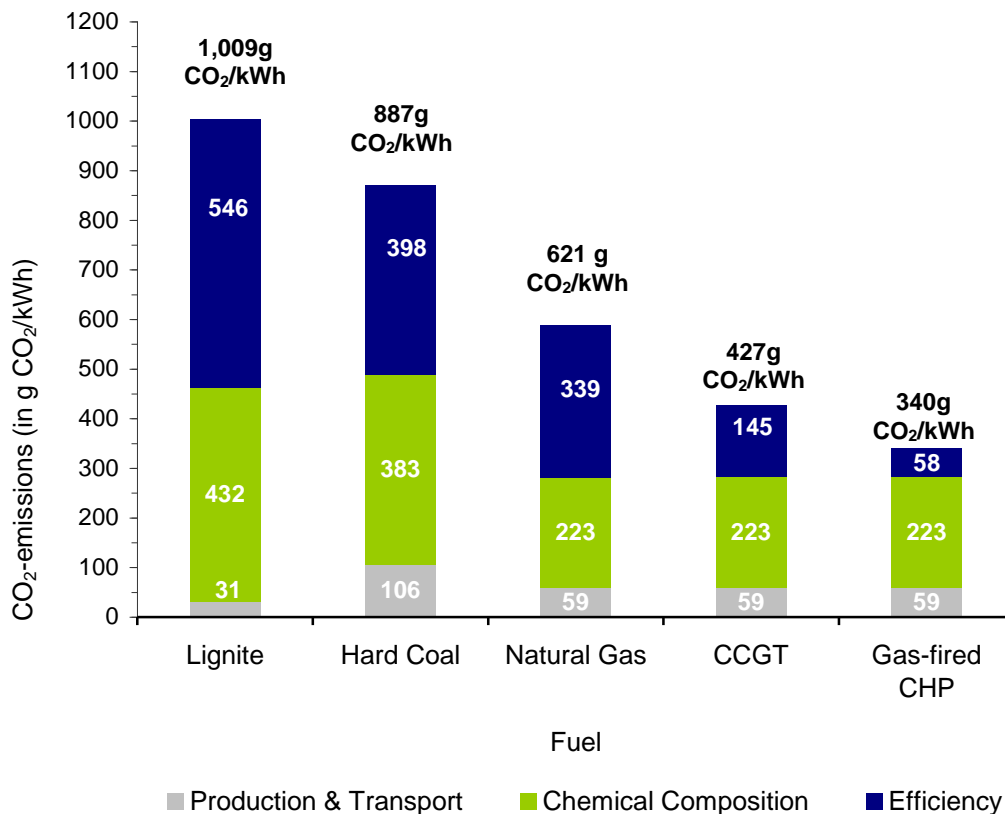
Although renewables will undoubtedly be used more prominently in the coming decades, Europe will not be able to do without fossil fuels altogether. As of 2011, the share of renewables in the EU energy mix was approximately 10 percent. According to the EU's climate protection goals, this share is to rise to 20 percent by 2020. For years to come, fossil fuels will remain an important source of energy. As will be explained below, natural gas has specific properties that make it suitable to provide energy security and bridge the gap to a future energy mix based on renewable sources.

Efficient combustion and low carbon emissions

As emphasised by Dr.-Ing. Manfred Fishedick, Vice President of the Wuppertal Institute for Climate, Environment and Energy, "Natural gas has the lowest CO₂-emissions compared with all other fossil fuels. At the same time it is versatile and convenient in its uses."¹ Because of a beneficial combination of hydrogen and carbon molecules, natural gas produces roughly 38 percent less CO₂ when burned. The difference is even bigger in electricity generation, as gas-fired power plants have a decisively higher energy efficiency of around 60 percent, compared to 45 percent for a typical coal-fired power plant. As a result, using gas in electricity production results in at least 50 percent less CO₂ per kilowatt hour than would be produced using coal. This holds true when using carbon capture and storage technology (CCS) as well, as a typical gas-fired CCS plant emits 30 percent less CO₂ than a coal-fired plant equipped with CCS. CO₂ output of gas turbines can be reduced even further by using Combined Heat and Power technology (CHP). In addition to electricity, a gas turbine exhaust produces thermal energy that, in a CHP solution, can be recovered in a heat exchanger to

¹ Wuppertal Institute for Climate, Environment and Energy, Erdgas: Die Brücke ins Regenerative Zeitalter, August 2010, p.45

generate either steam or hot water for further applications. Municipal utilities can use the steam for district heating, or industrial users can use it for heating or drying processes. A CHP system can reach efficiency rates of over 90 percent.



2

Bridging the gap towards renewable energy

Natural gas offers a second benefit, which is vital if we are serious about increasing our renewable energy use – natural gas can compensate for fluctuations in renewable energy production. Although hydro power is popular in the Nordic countries, it is not an option for many EU member states that lack the needed geological properties and resources. This leaves solar and wind energy, which are characterised by highly volatile capacities due to varying winds and sunshine. For example, electricity production from wind turbines in Germany amounted to over 5,500 gigawatt hours (GWh) in December 2012, but fell to only slightly over 1,500 GWh in July 2013 – a drop of approx. 75 percent.³ These fluctuations will become even more significant as the share of wind power increases and will have to be compensated for by more stable forms of energy production.

² Oeko-Institut Darmstadt: Global Emission Model for Integrated Systems (GEMIS), Database

³ Fraunhofer Institute for Solar Energy Systems: www.ise.fraunhofer.de/en/downloads-englisch/pdf-files-englisch/news/electricity-production-from-solar-and-wind-in-germany-in-2012.pdf

Gas-fired turbines can be brought online in minutes rather than the hours it takes for coal-fired plants, or even days for nuclear reactors. Thus, they can adapt rapidly to changing capacities that occur when energy from intermittent renewable resources is fed into the electricity grid. According to the Energy Information Administration, natural-gas-fired combined-cycle capacity is an attractive choice for new power plants because of its fuel efficiency, operating flexibility and low capital costs. For similar reasons, Greenpeace recommends an increase in gas-fired power plants to counter fluctuations in production of solar and wind power, adding that “Natural gas as a bridge technology is one key to climate protection and a fast nuclear phase-out.”⁴

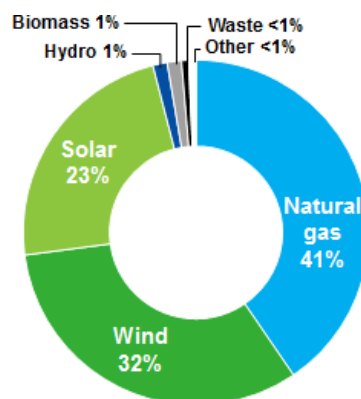
2. The growing importance of natural gas

Natural gas is not only the most environmentally friendly fossil fuel, but is also widely available and affordable. Global long-term recoverable gas reserves are estimated to be equal to 235⁵ years worth of production at current rates. The practical attributes of natural gas have led to its growing popularity in many sectors, including transport, domestic use and most notably, electricity production. Natural gas demand in the European Union grew by 33 percent between 1990 and 2011 and it is the only fossil fuel experiencing long-term demand growth in the region. On a global scale, the share of natural gas in the energy mix grew from 17 percent in 1980 to 21,3 percent in 2011, and is expected to increase to 23,7 percent by 2035. The International Energy Agency estimates that global annual gas demand will grow by almost 50 percent between 2011 and 2035, from 3,370 to 4,976 bcm.⁶ Growth is especially strong in the Middle East, India and China – in the latter, the share of gas in the overall energy mix is set to quadruple until 2035.

Electricity production

In the past twelve years, capacities for producing electricity with natural gas in the EU expanded considerably. With around 121 gigawatt, it makes up more than 40 percent of all newly created production capacity (see graph on the right side). Growth is also foreseen on a global scale: the Energy Information Administration expects the global capacities for gas-fired power generation to increase by over 40 percent in the coming three decades. Wind and photovoltaic power generation capacities will grow stronger than all

Net expansion of electricity producing capacity EU, 2000-2012



⁴ Greenpeace, [Der Atomausstieg bis 2015 ist machbar](#), 4 April 2011

⁵ IEA, World Energy Outlook 2013, p. 107

⁶ Ibid., p. 103

other forms of electricity production in the foreseeable future. This in turn calls for more flexible power generation based on gas to balance out load fluctuations.

The increase in gas use has already led to significant reductions in emissions. The United Kingdom (UK), for example, increased the share of gas in electricity production from 1 to 40 percent between 1990 and 2011, largely replacing coal as an energy source. Over the same period, annual carbon dioxide emissions dropped from 590.3 to 456.3⁷ million tonnes – a reduction of almost 100 million tonnes per year.

However, the UK will need additional gas imports to sustain this progress. North Sea reserves are being rapidly depleted, and domestic gas production is dwindling – from 120 bcm in 2000 to 47 bcm in 2011. The country was a net exporter in 2000 (11.5 bcm), but had to import almost 36 bcm in 2011 to meet demand.

Diverse applications of natural gas

Natural gas is used in many homes for the heating of space and water and gas is used for cooking as well. The main advantage of this application is its high efficiency rate, which leads to savings in energy and costs. Another area where natural gas brings benefits is transport. Natural gas vehicles (NGVs) use less fuel and are more environmentally friendly than gasoline cars. Finally, industries such as the chemical sector use gas for a range of applications, including the production of fertilizers, plastics and anti-freeze agents. Natural gas provides over 30 percent of all energy consumed by European industries.

Gas at home



- Energy-to-heat efficiency rate of **90%** – compared to 45% for using electricity from coal
- In the Netherlands, **98%** of all homes are connected to the gas distribution network
- New gas-fired “home power plants” can provide both heat and electricity with **efficiency rates of 94%**

Natural Gas Vehicles (NGVs)



- Save up 50% on fuel costs compared to gasoline
- Emit **25% less CO₂**
- Emit **95% less carbon monoxide**
- Worldwide, in over 80 countries, 17.8 million NGVs are used
- Iran has over 3.3 million NGVs, while Pakistan has almost 2.8 million NGVs and Argentina – almost 2.3 million NGVs
- Italy leads the way in Europe with over **820,000** NVGs
- The number of NVGs increased more than tenfold in Germany and Sweden over the last decade

⁷ DECC, 2012, [Emissions and Climate Change Statistics: 2011 provisional UK figures: Data Tables](#). Accessed: September 2012.



3. Conclusion

Gas offers real and practical benefits in a wide range of sectors, including as a supplement to renewables in electricity generation and transport. It is widely available on a global scale, and, alongside renewables, increased gas use will become a vital part of a diverse and more environmentally friendly energy mix. Replacing just 10 percent of the EU's total electricity generation using coal with gas-generated power would cut CO₂ emissions by 120 million tonnes per year. That is the equivalent of over two times Sweden's annual CO₂ output.

"...an increase of the gas share does not only constitute a responsible step towards the reduction of CO₂ emissions, but also an important contribution to the European energy and climate policy."

Jens Hobohm, German Institute for International and Security Affairs⁸

"Gas is the true bridging technology. Gas-fired power plants can be used in a flexible way which makes them a good combination for renewable energies."

Claudia Kemfert, German Institute for Economic Research, DIW⁹

"With respect to the construction of new power-plants, gas offers a number of advantages: gas-fired power plants can be built quickly, they constitute a flexible addition to renewable energies and they emit less CO₂."

German Chancellor Angela Merkel¹⁰

"Natural gas also plays a crucial role in transport. Vehicles that use gas as a fuel contribute positively to climate goals."

Jochen Homann, State Secretary at the Federal Ministry of Economics¹¹

"Natural gas is the fossil fuel that, due to its low CO₂-emissions is our favoured bridge technology."

Gisela Kallenbach, Bündnis 90/Die Grünen¹²

"Substitution of coal (and oil) with gas in the short to medium term could help to reduce emissions with existing technologies until at least 2030 or 2035. [...] Gas, as the least emitting fossil fuel, remains an important contributor to the EU energy mix in this period."

Günther Oettinger, European Commissioner for Energy¹³

⁸ Jens Hobohm, German Institute for International and Security Affairs (SWP), *More Natural Gas for Climate Protection?*, January 2009.

⁹ Claudia Kemfert, *Gas ist die wahre Brückentechnologie*, *Financial Times Deutschland*, 16 March 2011

¹⁰ *Die Zeit*, *„Ausbüxen gibt's nicht mehr"*, 12 May 2011

¹¹ Forum Erdgas, *Presseerklärung, Schallende Ohrfeige oder Vertrauen in die Regulierungskraft des Marktes – Erdgas und Energiekonzept in der Diskussion*, 15 November 2010

¹² Forum Erdgas, *Presseerklärung, Mit Erdgas Klimaschutzziele schneller erreichen*, 11 March 2011

¹³ *Günther Oettinger, Speech at Eurogas Conference*, 27 April 2012.



Sources:

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