

## BACKGROUND INFORMATION

November 2011

### 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, 1999-2009

(Eurostat, 2010, numbers may not add up to 100 percent due to rounding)

	Oil	Natural gas	Coal	Nuclear	Renewables
1999	39%	22%	18%	14%	6%
2009	37%	25%	16%	13%	9%

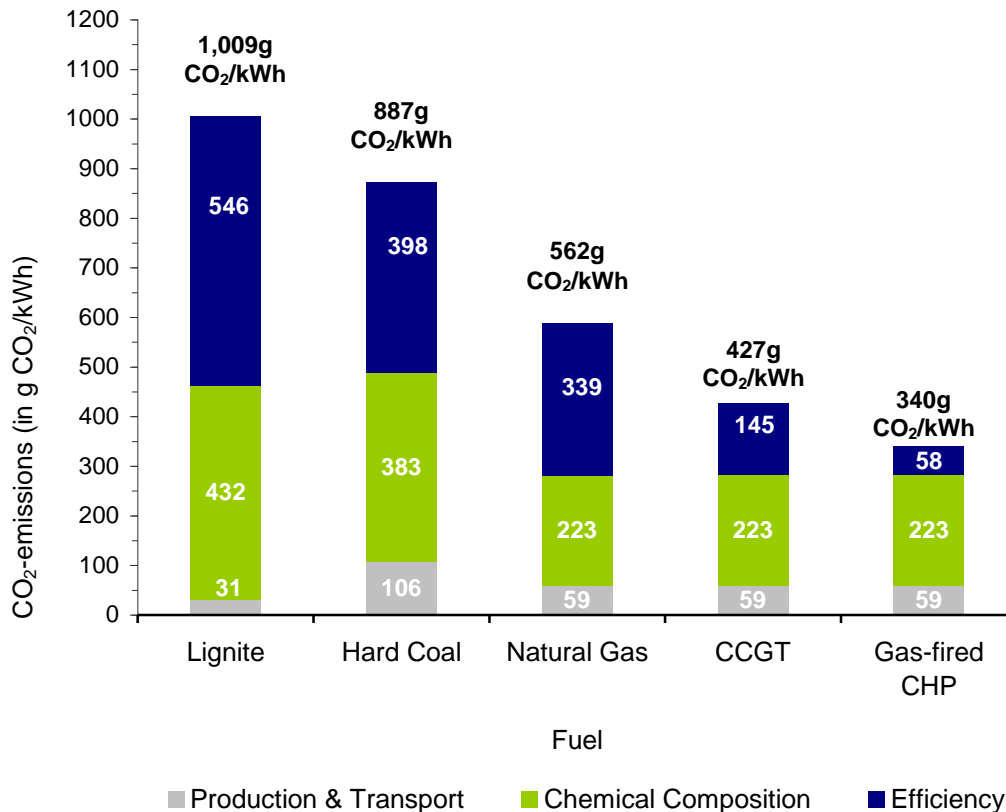
Although renewables will undoubtedly be used more prominently in the coming decades, Europe will not be able to do without fossil fuels altogether. As of 2009, the share of renewables in the EU energy mix was just over 9 percent. According to the EU's climate protection goals, this share is to rise to 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 CO<sub>2</sub>-emissions compared with all other fossil fuels. At the same time it is versatile and convenient in its uses."<sup>1</sup> Because of a beneficial combination of hydrogen and carbon molecules, natural gas produces roughly 38 percent less CO<sub>2</sub> 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 CO<sub>2</sub> 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 CO<sub>2</sub> than a coal-fired plant equipped with CCS. CO<sub>2</sub> 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

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

thermal energy that, in a CHP solution, can be recovered in a heat exchanger to 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.



### 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 6,300 gigawatt hours (GWh) in January 2008, but fell to below 2,000 GWh in June and July of the same year – a drop of almost 70 percent. 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.

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.”<sup>2</sup>

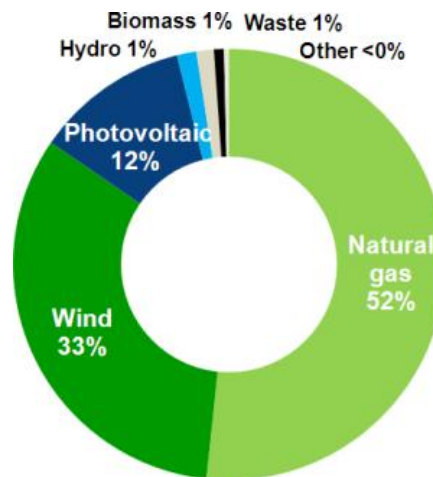
## 2. The growing importance of natural gas

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 250 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 OECD Europe grew by 70 percent between 1990 and 2009 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 percent in 2009, and is expected to increase to 23 percent by 2030. The International Energy Agency estimates that global annual gas demand will grow by 45 percent between 2009 and 2030, from 3,076 to 4,473 bcm. Growth is especially strong in the Middle East, India and China, with the share of gas in the overall energy mix set to triple or even quadruple until 2030.

### Electricity production

In the past ten years, capacities for producing electricity with natural gas in the EU expanded considerably. With around 118 gigawatt, it makes up more than half of all newly created production capacity (see graph below). In 2010 alone, new gas-fired power plants totalling 28 gigawatt in capacity went online in the EU. Growth is also foreseen on a global scale: the Energy Information Administration expects the global capacities for gas-fired power generation to increase by 40 percent in the coming three decades. Wind and photovoltaic power generation capacities will grow stronger than all 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.

**Net expansion of electricity producing capacity EU, 2000-2010**



<sup>2</sup> Greenpeace, [Der Atomausstieg bis 2015 ist machbar](#), 4 April 2011

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 2008, largely replacing coal as an energy source. Over the same period, annual carbon dioxide emissions dropped from 592.9 million 531.8 million tonnes – a reduction of more than 60 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 115 bcm in 2000 to 63 bcm in 2009. The country was a net exporter in 2000 (11.5 bcm), but had to import 30 bcm in 2009 to meet demand and by 2012, imports will be on par with indigenous production.

### 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 CO<sub>2</sub>**
- Emit **90% less carbon monoxide**
- Worldwide, 13.2 million NGVs are used
- Pakistan has over 2.8 million NGVs, another 3.5 million are used in Argentina and Brazil
- Italy leads the way in Europe with over **750,000** NVGs
- The number of NVGs increased more than tenfold in Germany and Sweden over the last decade



## 2. 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 from coal-generated with gas-generated power would cut CO<sub>2</sub> emissions by 120 million tonnes per year. That is the equivalent of over two times Sweden's annual CO<sub>2</sub> output.

*"...an increase of the gas share does not only constitute a responsible step towards the reduction of CO<sub>2</sub> emissions, but also an important contribution to the European energy and climate policy."*

Jens Hobohm, German Institute for International and Security Affairs<sup>4</sup>

*"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, DIW<sup>7</sup>

*"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 CO<sub>2</sub>."*

German Chancellor Angela Merkel<sup>8</sup>

*"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 Economics<sup>5</sup>

*"Natural gas is the fossil fuel that, due to its low CO<sub>2</sub>-emissions is our favoured bridge technology."*

Gisela Kallenbach, Bündnis 90/Die Grünen<sup>6</sup>

<sup>4</sup> Jens Hobohm, German Institute for International and Security Affairs (SWP), More Natural Gas for Climate Protection?, January 2009.

<sup>5</sup> Forum Erdgas, Presseerklärung, [Schallende Ohrfeige oder Vertrauen in die Regulierungskraft des Marktes – Erdgas und Energiekonzept in der Diskussion](#), 15 November 2010

<sup>6</sup> Forum Erdgas, Presseerklärung, [Mit Erdgas Klimaschutzziele schneller erreichen](#), 11 March 2011

<sup>7</sup> Claudia Kemfert, Gas ist die wahre Brückentechnologie, Financial Times Deutschland, 16 March 2011

<sup>8</sup> Die Zeit, „Ausbüxen gibt's nicht mehr“, 12 May 2011

Sources:

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- > NGV Communications Group, [Gas Vehicles Report](#) Gas Vehicles Report, 2011.
- > [UK Department of Energy and Climate Change](#) (DECC)
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- > Greenpeace, [Der Atomausstieg bis 2015 ist machbar](#), 2011

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