

## Natural Gas in Europe – The Importance of Russia

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### Dynamic growth of natural gas in European energy balances

The modern history of natural gas in Europe began in 1959 with the discovery of the Groningen field in the Netherlands, followed a few years later by the first discoveries in the UK sector of the North Sea. This was followed by equally substantial discoveries of gas in the Norwegian sector starting in the 1970s. But while the UK had a huge domestic market, Norway did not and created a huge export business with a number of pipelines delivering gas to both Continental Europe and the UK (map 1).

→ see also map 1 on page 1 in annex

During the late 20<sup>th</sup> century, an industry was developed which today accounts for more than 20% of European energy demand with the potential to increase to around 30% over the next 30 years (table 1).

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While very small quantities of Soviet gas had been exported to Poland since the late 1940s, the idea of large-scale imports of Soviet gas into Western Europe seemed to some both unworkable and unwise. The focus of Soviet natural gas production was moving from the Volga/Urals, North Caucasus and Ukraine, to Siberia, which would require additional transportation amounting to several thousand kilometres.

→ see also map 2 on page 2 in annex

The transport problem was resolved by the Siberian gas development of the 1970s and 80s based on the super-giant fields discovered at Medvezhe, Urengoy and Yamburg. With multiple strings of large-diameter pipeline being built from Siberia to the Ukraine, it required only a relatively short extension for one or two pipelines to reach Europe (map 2). Between 1970 and 1980 deliveries of Soviet gas to Western Europe increased from 3.4 Bcm to 26 Bcm. By 1990 gas exports had risen to 109 Bcm and Western Europe, with 63 Bcm of imports, was the largest customer for Soviet gas.

→ see also map 3 on page 3 in annex

The Trans-Mediterranean pipeline from Algeria through Tunisia to Sicily started flowing gas to mainland Italy in 1983. The GME pipeline from Algeria through Morocco to Spain and Portugal was completed at the end of 1996 (map 3). The capacity of the Trans-Mediterranean line has since been increased substantially and GME capacity will be increased in the future. Algerian pipeline exports increased to nearly 35 Bcm in 2003.

### *Liquefied natural gas (LNG)*

Even before Dutch pipeline gas exports started to flow, the first LNG ships were arriving in the UK and France from Algeria. Over long distances or across water too deep for pipelines to be laid, LNG can be a very convenient alternative to pipeline gas. However, in the early 1960s the technology of liquefying gas to minus 161 degrees Celsius, loading it on to ships to be regasified on arrival, was both demanding and expensive.

LNG-receiving terminals were built in the UK, France, Italy, Spain and Belgium, and later in Turkey and Greece, but the rate of growth of LNG in Europe was modest until the early 1990s when new developments in technology made LNG more competitive. This resulted in rapid construction of new regasification terminals around Europe and plans to develop new terminals in both northern and southern Europe over the next decade.

→ see also map 4 on page 4 in annex

By 2003, nearly 40% of 525 Bcm of gas consumed in Europe was imported from countries outside the continent, of which LNG accounted for more than 37 Bcm. These imports have played a key role in the development of European gas markets and can be expected to play an even greater role in the future.

→ see also map 5 on page 5 in annex

## **The Future of Gas in Europe: increasing demand for power generation, declining supply**

### *Environmental issues*

Natural gas has inherent advantages over other fossil fuels with respect to harmful emissions. In support of the Kyoto Protocol's greenhouse gas reduction targets, the European has launched an emissions trading scheme which will come into effect in 2005. Taken together with the continual tightening of other environmental standards by the European Commission, the incentive to use gas over other fossil fuels will remain compelling over the coming decades.

### *Gas demand and power generation*

The power sector holds the key to substantially increased gas demand in Europe over the next three decades. All projections of European gas demand see the power sector accounting for 65-80% of the increase in gas demand over this period (chart 1).

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According to the International Energy Agency, this equates to an increase in OECD European gas demand for power from around 115 Bcm in 2000 to more than 400 Bcm in 2030. The reasons for this very high share of gas are straightforward:

- At most likely gas prices, electricity generated by gas will have a cost advantage over that generated by coal;
- In most European countries, nuclear power plants are either politically unacceptable or commercially too risky to be built by private companies;
- Renewable sources of electricity are currently more expensive than power generated from fossil fuels and are not expected to account for more than 20% of electricity demand in the majority of countries over the next 30 years.

This picture suggests that gas can be regarded as the fossil fuel bridge to a sustainable electricity future and – as long as the differential between gas and coal prices does not widen too greatly (chart 2) – will be the most commercially attractive fuel for power generation.

→ see also chart 2 on page 11 in annex

### *Declining European gas supply*

In contrast to the anticipated substantial increases in gas demand over the next 30 years, European gas production is forecast to decline substantially over the same period. The UK is projected to be importing around half of its gas supplies by 2010, and 50-80% by 2020.

By 2020, Dutch supplies are also likely to be in decline. While Norwegian gas exports are continuing to increase, they will reach a plateau of 95-100 Bcm in the late 2000s and additional exports beyond this level will require new discoveries.

## **The Importance of Russia and CIS countries as Gas and Energy Partners**

In the context of increasing demand and declining supply, the importance of Russia as a partner in European gas becomes abundantly clear. The opportunity for a much closer natural gas partnership between Russia and Europe is based on firm foundations:

### *Huge gas resources*

Russia has huge discovered resources of gas available for development. Russia has gas reserves of 48 trillion cubic metres (TCM) according to the Russian A+B+C1 classification. Gazprom estimates that it has 28 TCM of reserves in fields in production or being prepared for development, compared with an international estimate of 18.5 TCM of proven and probable reserves in those same fields. Whichever estimate is chosen, it is clear that Russian reserves overwhelm all other gas reserves available to Europe with the exception of Middle East countries, which are anticipated to deliver to Europe only in the form of LNG over the next two decades. Russian gas production of over 600 Bcm of gas in 2003 is projected to increase to 730 Bcm by 2020.

Very substantial gas reserves have also been established in the countries of Central Asia and the Caspian region. Turkmenistan and Uzbekistan each produced well over 50 Bcm of gas in 2003. Kazakhstan and Azerbaijan both have rapidly developing gas industries which will be based on gas production associated with oil, as well as non-associated gas.

→ see also map 6 on page 6 in annex

### *Established infrastructure*

Over the past 35 years, pipeline infrastructure has been established for delivery of very substantial volumes of gas from Central Asia to other CIS countries, and from Russia to Europe. Russia is already importing gas from Turkmenistan, Uzbekistan and Kazakhstan and total volumes, including those to be shipped to other CIS countries, could increase to as much as 100 Bcm/year over the next decade.

As far as Russian exports to Europe are concerned, compared with the position in 1973 when just four countries were supplied with less than 7 Bcm of gas, thirty years later nearly 140 Bcm was exported to nineteen countries (table 2). Of the 140 Bcm exported in 2003, 7.4 Bcm was Central Asian gas and this volume is likely to increase in future. Delivering these volumes requires a very large amount of transmission capacity. CIS countries play an important transit role in this trade with the majority of Russian gas exports to Europe passing through Ukraine from where a number of pipelines travel west, delivering gas to central and northern Europe (map 6). Some lines travel south through Moldova to south eastern Europe and Turkey; others pass through Hungary delivering to the Balkan countries. In 1999, the Yamal pipeline began transporting gas through Belarus and Poland to Germany, providing an alternative to the routes through Ukraine. There is also a pipeline which passes via St Petersburg taking gas into Finland. Another major pipeline takes Russian gas across the Black Sea to Turkey; the Blue Stream pipeline – which started transporting gas in 2002 – set a new record by laying pipeline in water depths exceeding 2000 metres.

→ see also table 2 on page 9 in annex

The next major pipeline bringing additional Russian gas to Europe is expected to be the North European Pipeline (NEP) running from Vyborg in north west Russia via the Baltic Sea to Germany and potentially on to the UK (Map 7). The possibility of the North European pipeline being able to deliver gas to Sweden and Denmark is also under consideration.

→ see also map 7 on page 7 in annex

### *An “energy partnership” with Europe*

The foundations of Russia’s gas export business were laid during the Cold War. The trade was able to develop despite political opposition partly because West European governments believed gas could be a force for peace and partnership and prosperity. The other main reason has been the excellent track record of first Soviet, and then Russian, gas deliveries to Europe over the past 35 years.

With the passing of the Cold War and the increasing need for Europe to develop strong relationships with its energy suppliers, the European Commission proposed an “energy dialogue” with Russia. In 2001:

- The EU imported 21% of its net oil imports (equal to 16% of consumption) and 41% of gas imports (equal to 19% of consumption);
- 53% of Russia’s oil exports and 36% of its gas exports were delivered to the EU, and 45% of Russia’s exports to the EU were energy products.

The establishment of the energy dialogue has allowed a high-level channel of communication between Russia and the EU on issues where the two sides have had some disagreements such as destination clauses in natural gas contracts. Within the framework of the dialogue, the EU has agreed to recognise certain Russian gas projects as “energy infrastructure projects of common interest”, specifically:

- the North European gas pipeline for which the EU has agreed to co-finance a feasibility study;
- the Yamal pipeline;
- the Shtokman gas field;
- the Druzhba-Adria oil pipeline link.

### **Oil in Europe: similarities to natural gas**

Despite the growing importance of gas, oil will retain the largest share in European energy balances, although its share is projected to decline from over 40% in 2000 to 37% in 2030. European oil production will decline in the future and will need to be replaced by increased imports (chart 2). By 2030, imports will account for more than 90% of European oil demand.

→ see also chart 2 on page 11 in annex

Much of the decline in the share of oil in European energy balances over the past 40 years is attributable to its displacement by natural gas for heating and power generation. However, there remains a very strong link between the two fuels via the price mechanism.

Large-scale Soviet oil exports to Europe predated those of gas by about a decade – by 1960, Western Europe was already receiving nearly 16 million tons (mt) of crude oil. By 2003, Russian crude and product deliveries to Europe exceeded 200 mt and new export routes for Russian oil were being actively explored. Azerbaijan and Kazakhstan are also set to become important oil exporters to Europe.

### **Natural Gas and Oil in Europe: the current and future importance of Russian supply**

Gas demand has grown rapidly across Europe over the past 30 years and power generation – shaped by environmental and commercial advantages enjoyed by gas – is the key to continued growth over the next several decades. Imports of gas will be needed increasingly as Europe’s indigenous supply declines and Russia is in a very good position to expand its market share due to its resource endowment, established infrastructure and markets, and track record as a secure supplier.

These advantages have been recognised and reinforced politically by an energy partnership between the EU and Russia which recognises Russia’s growing role as a source of energy and its contribution particularly in terms of gas and oil supplies. In summary, the Russian contribution to European energy balances – both oil and gas – is substantial and likely to grow significantly in the future to the benefit of both exporter and importers over the next several decades.

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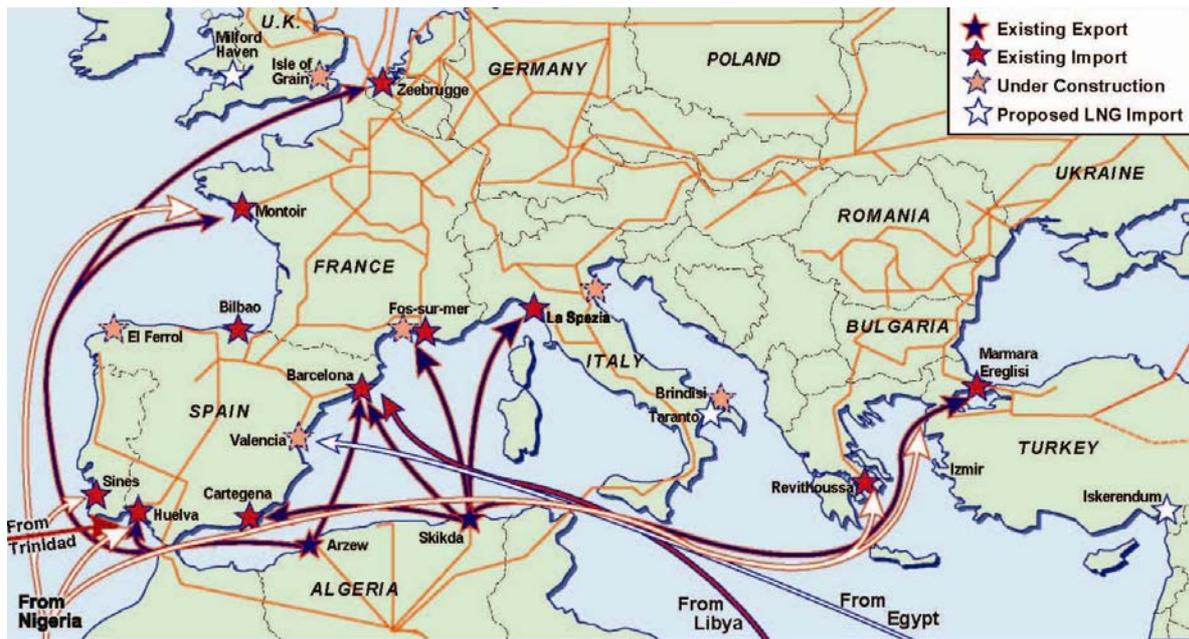
Map 2



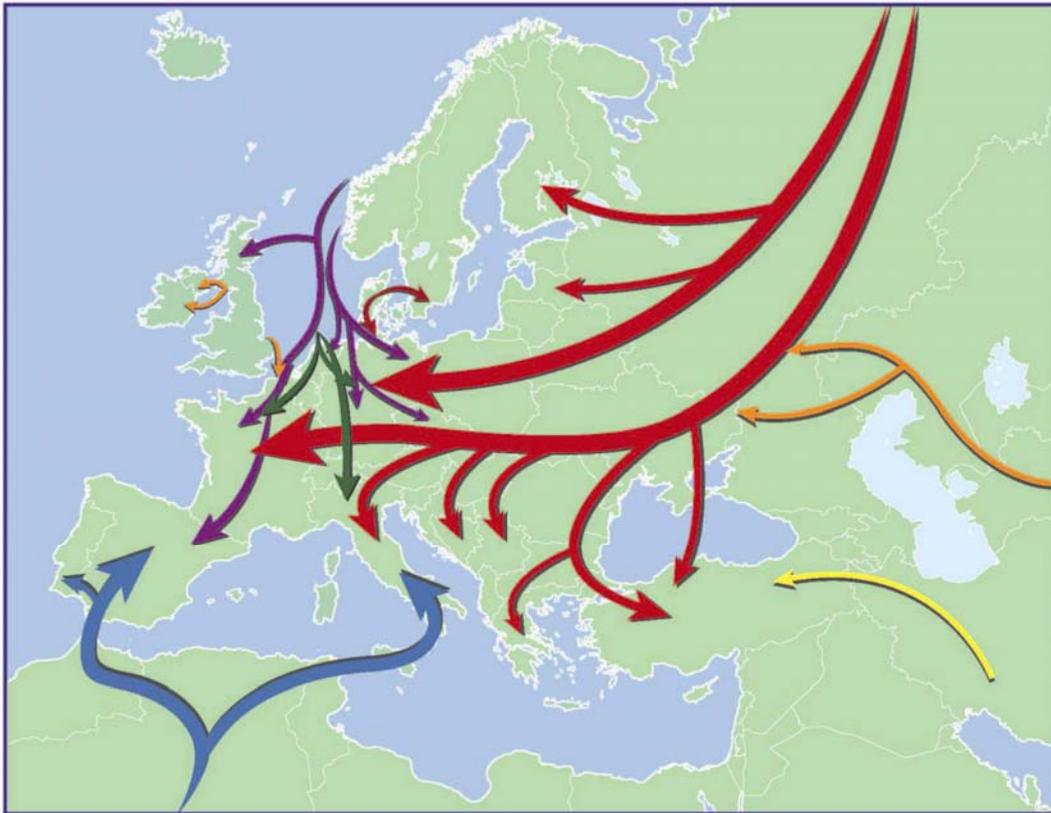
Map 3



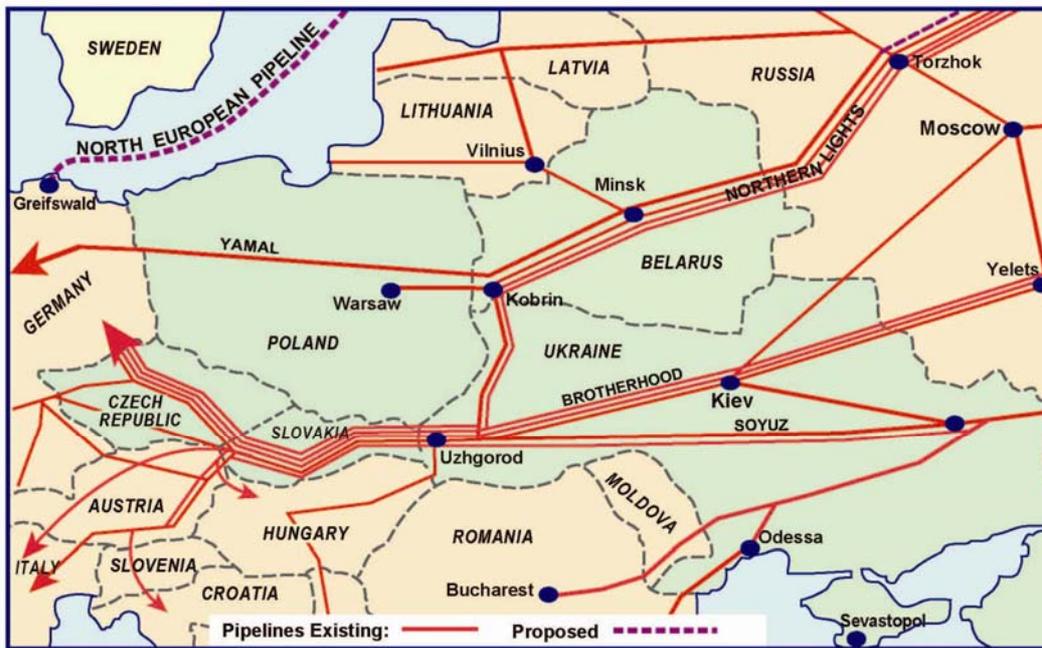
Map 4



Map 5



Map 6



Map 7



Table 1

### European Gas Balances 1960-2000

	1960	1970	1980	1990	2000
<b>RESERVES (Tcm)</b>					
OECD Europe*	~ 0.5	3.6	3.9	5.5	6.9
Central Europe**	~ 0.4	0.5	0.6	0.5	0.6
<b>PRODUCTION (Bcm)</b>					
OECD Europe	10.4	79.7	199.1	196.7	285.5
Central Europe	12.3	36.2	49.6	40.5	24.7
<b>DEMAND (Bcm)</b>					
OECD Europe	10.4	82.2	235.4	290.1	414.7
Central Europe	12.7	38.6	72.2	86.2	68.9
EU15 - % of primary energy demand	1.8	7.5	14.8	17.6	22.5
<b>IMPORT DEPENDENCE %</b>					
OECD Europe ***	0	41.7	46.1	52.6	55.0
% Imports from non-OECD countries		(1.0)	(15.3)	(31.7)	(32.6)

~ approximate; \* OECD Europe members in 1990; \*\* Former Socialist Countries;

Table 2

**Russian Gas Export to Europe 1973-2003 (Bcm)**

	1973	1975	1980	1985	1990	1995	2000	2003
Germany	1.1	6.4	16.2	18.7	26.6	32.1	34.1	34.9
Italy	-	2.3	6.6	6.3	13.6	14.3	21.8	19.8
Turkey	-	-	-	-	3.3	5.7	10.2	12.9
France	-	-	3.7	7.3	10.6	13	12.9	11.2
Hungary	-	0.6	3.8	4	6.5	6.3	6.5	10.4
Slovakia	-	-	-	-	-	6.5	7.9	7.3
Czech Rep*	2.4	3.7	8.3	10.5	14.2	8.4	7.5	7.4
Poland	1.7	2.5	5.3	5.98	8.4	7.2	6.8	7.4
Austria	1.6	1.9	2.4	4.2	5.1	6.1	5.1	6.0
Finland	-	0.7	0.97	1.02	2.7	3.6	4.3	5.1
Romania	-	-	1.6	1.95	7.3	6.1	3.2	5.1
Bulgaria	-	1.2	4	5.5	6.9	5.8	3.2	2.9
Yugoslavia	-	-	1.8	3.9	4.5	1.2	1.5	1.9
Greece	-	-	-	-	-	-	1.6	1.9
Netherlands	-	-	-	-	-	-	-	2.3
Croatia	-	-	-	-	-	0.3	1.2	1.2
Slovenia	-	-	-	-	-	0.5	0.7	0.7
Switzerland	-	-	-	-	0.3	0.4	0.4	0.3
Macedonia	-	-	-	-	-	-	1.08	0.08
<b>TOTAL</b>	<b>6.8</b>	<b>19.3</b>	<b>54.8</b>	<b>69.4</b>	<b>110</b>	<b>117.4</b>	<b>129.0</b>	<b>138.9</b>

\* 1970 – 1990 data for Czechoslovakia

Source: Gazexport

Chart 1

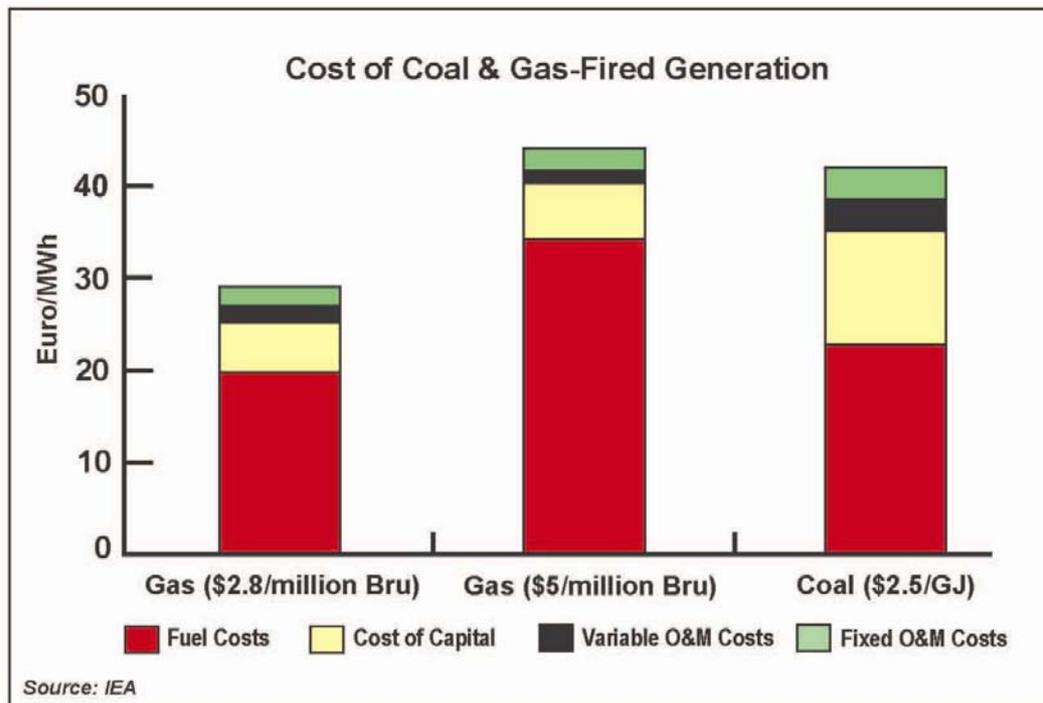


Chart 2

