

Heinrich, Andreas

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The European natural gas market in the next decades – An overview

By Andreas Heinrich *

Summary

Despite of beginning liberalisation the West European natural gas market is still very heterogeneous and is likely to remain so in the foreseeable future. Natural gas demand on the West European market, one of the world's biggest, will rise considerably until the year 2020, a development which is due to increased use of gas for electric power generation. Prognoses assume that the share of natural gas in Western Europe's primary energy consumption will rise from the present 22% to 30% in 2020.

Western Europe's biggest single supplier is Russia's gas monopoly Gazprom with a market share of nearly 20%. Despite of increasing competition from the side of other suppliers it can be expected that Gazprom will maintain its share in the market.

Introduction

This paper deals with the West European natural gas market.¹ It analyses the main participants in the market and evaluates development prospects until the year 2020.

The first part of the paper describes the structure of the West European gas market, providing an overview of structural changes and the European Union's (EU) deregulation efforts as well as introducing the main participants in the market. The following part will then present and evaluate different projections of Western Europe's future demand for natural gas. On the basis of these projections the position, potential and strategies of present and possible future gas suppliers will be analysed and evaluated. The expansionist strategy of the biggest supplier — Russia's Gazprom — will be especially thoroughly examined in a separate part of the paper. Comparing projected demand with planned supplies will then allow to draw a conclusion on the future development of Western Europe's market for natural gas.

1. The structure of the West European natural gas market

The West European natural gas market is still very heterogeneous. It is marked by significant differences between structures and constellations in the energy sec-

tor as well as political orientations. There are self-reliant exporters like Great Britain, Norway and the Netherlands, countries which are relying partly on indigenous gas supplies like Germany and Italy, and countries that are largely or completely dependent on imports like France, Spain, Portugal and Belgium.

Since the 1970s, the share of natural gas in the EU's total consumption of primary energy sources has been rising steadily, increasing from 6% in 1970 to now more than 20%. In 1998, Western Europe's gas consumption totalled 368 billion cubic meters, accounting for 22% of the region's total energy demand. The gains were mainly due to strong demand for power generation as well as to expanded use in the industrial sector. As a result the countries in Western Europe now burn almost as much gas as coal, and gas consumption is approaching half that of oil.² However, the role of natural gas in primary energy

* Institute for East European Studies, Free University of Berlin, Garystr. 55, 14195 Berlin, Germany, ahein@zedat.fu-berlin.de. The author would like to thank Heiko Pleines for his support and his comments.

¹ In this paper the term Western Europe comprises all member states of the European Union (EU) and in addition Switzerland and Norway.

² In the following according to Avati, Helen (1999): Prospects still look rosy, in: Petroleum Economist, March, p. 14; Ruhrgas AG (1998): Branchenreport 1998. Erdgas im Energiemarkt, <http://www.ruhrgas.de/deutsch/daten/branch.pdf>, downloaded on July 20, 1999, S. 5–7; Quinlan (1997a), p. 65.

Table 1

**Share of Natural Gas in Primary Energy Consumption
in EU 1997**

in %

Country	Share	Country	Share
Netherlands	50.0	Denmark	18.5
UK	37.0	France	13.1
Italy	29.0	Spain	10.4
Austria	23.1	Finland	9.5
Germany	20.6	Switzerland	9.4
Belgium	20.3	Sweden	1.7
Ireland	19.4	EU	22.1

Source: Eurogas (1998): Consumption statistics, <http://eurogas.org/statis/statcons.htm>, downloaded on August 22, 1999; own calculations.

consumption in West European countries differs in a wide range (see tables 1 and 2).

Western Europe is also a region of natural gas production. At present it amounts to around 230 billion cubic meters per year. The United Kingdom (UK) with 84 billion cubic meters, the Netherlands with 64 billion and Norway with 44 billion cubic meters are the largest producers in Europe. Together, they account for nearly 80% of total natural gas production in Western Europe. In 1998, transnational gas trading in Western Europe reached a volume of around 190 billion cubic meters or 40% of all gas traded in the world. However, Western Europe's gas production is too small to cover the region's growing demand.

Additionally, gas production in Western Europe is much more expensive than in other parts of the world. As a result long-haul producers have won their shares of the European natural gas market by competing on price with Western Europe's own producers. Furthermore, their efforts were welcomed by customers interested in the diversification of their supply basis. In 1998, the resulting structure of gas suppliers to Western Europe looked as follows: Around 68.9% of the gas consumed came from Western Europe itself, 17.7% were supplied by Russia, 12.9% by Algeria and 0.5% came from other countries (see also table 3).

However, external suppliers to Western Europe's gas market have their problems. Transportation costs form a mayor part of the gas price. Moreover, natural gas production and marketing is both more complicated and less profitable than oil production. As a result natural gas exports require a prolonged period of negotiation, with intensive marketing, closer links with business partners and the authorities in the importing countries. Since small profit margins demand large volume projects, long-term agreements with substantial take-or-pay obligations on the part of importers are an important factor in exporters' planning.

1.1 Liberalisation of the EU natural gas market

Though the EU's deregulation efforts are about to harmonise the region's gas market, at present it is still characterised by different organisational structures on the national level. Some markets, as in France, are highly influenced by the government, some, as in Belgium or Spain, are monopolistic, others, as in Great Britain and Germany, are competitive.

Table 2

**Domestic Natural Gas Gross Consumption in Western
Europe 1990–1998**

in billion cubic meters

Country	1990	1994	1995	1996	1997	1998*
Austria	5.9	6.5	7.1	7.6	7.4	7.6
Belgium	9.2	10.8	11.9	13.2	12.7	13.4
Denmark	2.0	3.0	3.5	4.1 ^b	3.9	4.2
Finland ^a	2.5	3.2	3.2	3.3	3.3	3.8
France	27.6	30.5	32.5	36.6	35.2	37.5
Germany	61.6	68.6	74.4	82.4 ^c	78.0	78.3
Greece	0.2	0.1	0.1	0.1	0.2	0.8
Ireland	2.1	2.5	2.6	3.0	3.1	3.2
Italy	43.7	45.2	50.0	51.6	53.5	57.5
Luxembourg	0.5	0.5	0.6	0.7	0.7	0.7
Netherlands	34.5	37.4	38.2	42.0	39.5	39.2
Norway	n. a.	0.5	0.4	0.5	n. a.	n. a.
Portugal	0.0	0.0	0.0	0.0	0.1	0.8
Spain	5.6	7.1	8.7	9.7 ^d	12.4	13.3
Sweden	0.6	0.7	0.8	0.8	0.9	0.9
Switzerland ^f	1.7	n. a.	2.3	2.5	2.4	2.7
UK	52.9	67.5	72.8	85.0 ^e	80.5	83.4
Total	250.6	284.1	309.1	380.0	333.8	347.3

* preliminary data

^a lower figures by Statistics Finland (1997) and Statistics Finland (1998) for 1996 to 1998.

^b Eurogas (1998) gives the figure 3.8.

^c Eurogas (1998) gives the figure 80.6.

^d Eurogas (1998) gives the figure 9.4.

^e Eurogas (1998) gives the figure 80.5.

^f Eurogas (1998) gives higher figures (+0.2) for 1996 and 1997.

Sources: Statistical yearbook of Norway 1998 (1998), table 384, <http://www.ssb.no/www-open/english/yearbook/tab/t1008007/shtml>, downloaded on July 8, 1999; Statistics Finland (1997): Energy statistics 1997, http://www.stat.fi/tk/yr/ye607_en.html, downloaded on July 8, 1999; Statistics Finland (1998): Energy statistics 1998, http://www.stat.fi/tk/yr/ye608ennakko_en.html, downloaded on July 8, 1999; European Commission, Directorate General XVII (1998): Energy in Europe. 1998 – Annual energy review. Special issue, Brussels, S. 67-81; Bundesamt für Statistik (1998): Energieverbrauch nach Energieträgern, <http://adminsrv.admin.ch/bfs/ch150/dch58.htm>, downloaded on August 9, 1999; Eurogas (1998): Natural gas in Western Europe. 1998 publication of gas statistics and prospects, <http://www.eurogas.org/>, downloaded on August 15, 1999.

Table 3

Natural Gas Supplies to Western Europe 1998
in billion cubic meters

Country	Suppliers	Supply
Great Britain	Western Europe (WE)	89
Germany	WE, Russia	83
Italy	WE, Russia, Algeria, Abu Dhabi	58
Netherlands	WE	39
France	WE, Russia, Algeria	37
Belgium, Luxembourg	WE, Algeria	15
Spain	WE, Algeria, Libya, Abu Dhabi, Australia	14
Austria	WE, Russia	8
Denmark	WE	5
Norway	WE	4
Finland	Russia	4
Switzerland	WE, Russia	3
Ireland	WE	3
Sweden	WE	1
Greece	Russia	1
Portugal	Algeria	< 1
Total		365

Sources: Ruhrgas AG (1998): Branchenreport 1998. Erdgas im Energiemarkt, <http://www.ruhrgas.de/deutsch/daten/branch.pdf>, downloaded on July 20, 1999, S. 8. The figure for Portugal was taken from: Thomas, Victoria (1999): Supplies queue up for Europe. In: Petroleum Economist, March, p. 12.

The slow progress of the EU's efforts to liberalise its gas market has hampered market access of smaller non-European producers. Moreover, even within Western Europe access to national markets has been fairly restricted. This situation is to change with the creation of a single EU market for natural gas. According to the general EU principles of competition policy companies of all member states must be able to compete on the same footing. An EU directive of December 8, 1997, which provides common rules for the internal market in natural gas, includes the dismantling of unilateral trade barriers and provides for fair competition among all market players. The EU also suggests that take-or-pay contracts are too anti-competitive, thus attacking a major instrument of gas suppliers. However, harmonisation does not imply imposing uniformity on the gas industries of all EU countries. Within a general framework, the member states have the right to take action according to their respective conditions.

The EU Gas Directive will come into force in August 2000. Under the Gas Directive consumers at once eligible to benefit from the initial liberalisation and to choose their suppliers freely, are gas-fired power generators, irrespective of their annual consumption level, and other final consumers with an annual demand of more than 25 million cubic meters per year. This should open at least 20% of

Western Europe's gas market to free competition. The threshold will be lowered to 15 million cubic meters in 2005 and further to 5 million cubic meters in 2010. By then about a third of the EU's gas market should have been liberalised.³

Not all EU member states are convinced that a common energy policy is necessary in the natural gas sector. In reaction first of all to French demands the market share to be opened to competition by 2000 was reduced from 30% to 20%. Moreover, as a result of opposition from several national governments, decisions about distribution will still be made nationally and take-or-pay contracts signed before the liberalisation directive takes effect, will be shielded from losses that result from increased competition.⁴

The big gas companies started their preparations for the partial market liberalisation already some time ago. One important point is, that from 2000 onwards, gas companies have to yield rights to competitors to use their transmission system. Therefore, they are all looking to acquire, or strengthen, positions in the ultimate markets by taking equity in distribution companies. Access to storage facilities is another key factor. The non-discriminatory availability of storage or storage-related services is an essential feature of fair and equal trading. New suppliers need access to storage facilities to guarantee supplies to meet winter peaks or to overcome emergency interruptions of supply.

Because of considerable differences in structure and organisation it is still necessary to analyse individual markets within Western Europe. The largest ones will be described briefly on the following pages.

1.1.1 Great Britain

In Great Britain the world's first fully-competitive natural gas market was created. With the Gas Act of March 1986 British Gas was privatised and demerged into two separate companies, British Gas plc and Centrica plc, with the latter being responsible for gas trading and transportation. The domestic supply market has been opened up in stages since 1986. Initially the largest gas users were allowed to buy from sources other than British Gas, and then progressively smaller consumers as well. At present

³ European Commission, Directorate General XVII (1998): Common rules for the internal market in natural gas, <http://www.europa.eu.int/en/comm/dg17/gasmemo.htm>, downloaded on June 16, 1999; Czernie (1997), pp. 10-11; Guizot, Jean-Luc (1998): The changing face of gas supply and distribution in Europe, in: Petroleum Economist, October, p. 32; on the liberalisation of the EU natural gas market see also Feigin (1998).

⁴ Avati, Helen (1998): Changing tack on energy policy, in: Petroleum Economist, August, p. 25; Avati, Helen (1998): Best tradition of compromise maintained, in: Petroleum Economist, January, p. 3.

there are around 70 gas supply companies in the UK, with Centrica retaining around 95% of the domestic market. Despite the market dominance of Centrica, competition pressure has caused gas prices to fall. The UK also has a short-term gas market with substantial trade in contracts of a year or less.⁵

1.1.2 Germany

Until 1993, the German domestic market for natural gas was divided between regional monopolies and dominated by the Ruhrgas AG, which accounts for 65% of direct sales and has an even higher share through participation in other gas-related companies. Ruhrgas is the largest European gas trading company. In 1996, Ruhrgas sold 55 billion cubic meters of natural gas, around two thirds of Germany's total gas consumption of 83 billion cubic meters. In 1993, competition emerged on the German market for natural gas, when the Russian natural gas exporter Gazprom and the German Wintershall AG, a subsidiary of BASF, established the joint Wingas AG venture.⁶

1.1.3 The Netherlands

At present the supply side of the Dutch domestic gas market has an oligopolistic structure. The Dutch government has opted for a careful liberalisation strategy, which is intended to secure the role of Gasunie as a major player, since this is seen as an important precondition for the long-term security of supplies. Gasunie controls the transmission grid. Accordingly, the government has opted for negotiated, instead of regulated, third party access to the transmission grid. It supports the organisational and legal unbundling of the transmission function from the trading function. In the Netherlands, deregulation of the gas business has resulted in a number of mergers in the distribution sector.

Liberalisation of the Dutch gas market will be completed by 1 January 2007. However, market liberalisation will for some time not pose a real threat to the national energy policy because most of the consumers are committed to long-term contracts with Gasunie. Nevertheless, falling gas prices and intensified competition from foreign suppliers in the Netherlands, as well as in the countries to which Gasunie exports, have already caused an 11%-fall in the company's turnover in 1998. Competition is first of all coming from gas piped to the Netherlands from Norway and the UK.⁷

1.1.4 France

Currently, the French gas industry is dominated by the government-owned company Gaz de France. Gaz de France has a legally guaranteed monopoly on imports and exports. The French government is convinced that a long-term, state-mandated and controlled energy policy

continues to be a vital necessity, which is of strategic importance for the French economy. Gaz de France accounts for some 80% of the gas sold to final consumers and operates most of the transport. Deregulation will deprive Gaz de France of its import monopoly and will erode its market. On the other hand, the company will gain access to gas markets in other EU countries.⁸

1.1.5 Mediterranean markets

Industrial development and growth in gas-fired power generation are the driving forces behind the rapid increase in the regional gas demand of the Mediterranean countries (Spain, Portugal and Italy), which is forecasted at least to double over the next ten years.

Italy's energy policy was driven by the country's relative deficiency of indigenous resources. The state company Eni was seen as the best guarantee for energy security. But liberalisation of the EU gas market will end the company's monopoly. Between November 1995 and summer 1998 Eni has been privatised. In Italy gas production should be revitalised by the entry of new operators. Downstream operations are seeing increased competition because the bureaucratic marketing controls, which drove out most of the major companies, are being chipped away. Edison is positioning itself to provide Eni with significant competition. Edison is the largest private-sector producer of hydrocarbons in Italy, with a market share of nearly 3%, which the company hopes to increase to around 10% in the next ten years.

Although Italy is by far the most important national gas market in the Mediterranean area, rapid growth and lack of established supply structures make the other markets interesting, too. Spain has become one of the fastest-growing markets for gas in Western Europe. Since 1996, the construction of the Spanish gas network has been under way and in the year 2000 it will cover all regions of the peninsula. Whereas the Spanish gas market has already grown considerably, the Portuguese one is just beginning to develop. After consuming little more than

⁵ Thomas, Victoria (1998): UK gas deregulation — there's more in the pipeline, in: *Petroleum Economist*, October, p. 20; Department of Trade and Industry (1998), p. 57; for the development of the British natural gas spot market see Roeber (1997).

⁶ Baum, Vladimir (1998): German deregulation: A political hot potato, in: *Petroleum Economist*, March, p. 26; Tultschinski, Dmitri (1997): Gazprom — Auf dem Weg nach Europa, in: *Wostok* Nr. 4, S. 64. For details on Wingas see below (chapter 3).

⁷ Bos, Jos AM (1998): Dutch gas policy: a balancing act, in: *Petroleum Economist*, October, pp. 28-30; "Competition cuts Gasunie sales", in: *Petroleum Economist*, May 1999, p. 36.

⁸ Avati, Helen (1998): Denial of competition benefits, in: *Petroleum Economist*, August, p. 26; Avati, Helen (1998): Changing tack on energy policy, in: *Petroleum Economist*, August, p. 25.

0.1 billion cubic meters during 1997, demand increased to nearly 1 billion cubic meters in 1998.⁹

1.1.6 Scandinavian markets

At present, the natural gas markets of the Scandinavian countries differ extremely. There is actually no demand for gas in Norway, though the country is one of Western Europe's main producers. Since Norway will in any case remain a high-cost producer, with new fields being situated in the deep northern waters, liberalisation in the EU, which is likely to lead to a decline in gas prices, might endanger the country's market position. However, until at least 2005 Norwegian exports are backed up by already existing supply contracts.¹⁰

Denmark, the other Scandinavian gas producer, can fully supply its more developed market with the help of domestic production. Sweden is still of no relevance neither as producer nor as consumer. And Finland, finally, has a developed gas market but relies on supplies from Russia, since it is not connected to the West European gas pipeline network. However, the realisation of plans by Norway or by Russia to build a Scandinavian pipeline network might create a common better developed Scandinavian gas market.

1.2 Summary: Future developments on West European natural gas markets

The deregulation initiated by the EU Gas Directive will only cause minor problems for Great Britain, Germany, the Netherlands and probably Italy. The natural gas markets in these countries have already been liberalised. Competition is in place and legal regulations for the implementation of the Gas Directive are being implemented. Most of the remaining EU countries, namely France, Denmark, Sweden, Spain, Austria, Belgium/Luxembourg, Spain and Ireland, have national gas markets dominated by monopolistic structures. In these countries the integration of the EU Gas Directive's provisions into national legislation is making very slow progress, if at all. Many governments are looking for gaps in the EU rules in order to reduce the consequences of liberalisation. Because of their specific situation, being not connected directly to the natural gas grid of any other EU member state and having only one main supplier, Finland, Greece and Portugal have the right to derogate the Gas Directive.¹¹ As a result the deregulation of national gas markets will differ considerably across the EU.

2. Perspectives of demand

Already since the 1970s is Western Europe's demand for natural gas growing at an enormous pace, establish-

ing gas as Europe's fastest growing energy source. The share of natural gas in the region's total energy demand has increased from 5% to now more than 20%. It is commonly expected, that the West European gas market will continue to grow in the following decade. Until 2010 the European Commission expects the share of gas in total energy consumption to rise to 26%. Projections for the region's gas demand in that year range between 420 to 460 billion cubic meters,¹² compared to a demand of about 370 billion cubic meters at present. This means a market growth of 8% to 24% over the next decade. The Energy Information Administration (EIA), however, has recently been much more optimistic, predicting a gas consumption of 591.9 billion cubic meters in 2010 and of 767.5 billion cubic meters in 2020.¹³

Though forecasts of the dimension of Western Europe's rise in gas demand differ considerably, actually all studies agree that the main reason for growth in the region's demand will be the increasing share of gas-fired power stations in electricity production, due among others to environmental concerns. Ruhrgas, for example, expects the share of electricity production in total gas demand to rise from its present level of 21% to 27% in 2010.

In a geographical perspective the main areas for growth in general are thought to be Italy (+24% in the period 1997–2010), Great Britain (+14%), Germany (+10%) and France (+7%). Moreover, countries which have turned to gas fairly recently, like Spain, Portugal and Greece, have a lot of catching up to do. But since they are starting from a low level and since the relevant infrastructure — mainly for gas distribution — is often lacking, only the better developed Spanish gas market is expected to be of some relevance before 2010, with demand growing by 6%. Scandinavian consumption is also increasing, but a regional pipeline system to supply Norwegian gas (or alternatively Russian gas) to southern Norway, Sweden,

⁹ EIA (1999): International energy outlook 1999. Natural gas, http://www.eia.doe.gov/oiaf/ieo99/nat_gas.html, last modified on April 6, downloaded on June 30, 1999; Thomas, Victoria (1999): Supplies queue up for Europe, in: *Petroleum Economist*, March, p. 12; Quinlan, Martin (1998): Finding life beyond the dominance of Eni, in: *Petroleum Economist*, November, p. 3.

¹⁰ Quinlan (1997a), p. 66; EIA (1998): Country analysis briefs: North Sea, November 1998, <http://www.eia.doe.gov/emeu/cabs/north-sea.html>, downloaded on June 30, 1999.

¹¹ European Commission, Directorate General XVII (1998): Common rules for the internal market in natural gas, <http://www.europa.eu.int/en/comm/dg17/gasmemo.htm>, downloaded on June 16, 1999.

¹² Ghanem (1997), p. 13 gives 456 billion cubic meters, Ruhrgas expects 415 to 435 billion cubic meters, see Gerstein, Dietrich (1998): Die Bedeutung des Gasexports für die Russische Föderation aus der Sicht der Ruhrgas AG. Präsentation auf dem Young-Leader-Seminar des Deutsch-Russischen Forums am 21.10.1998 in Magdeburg.).

¹³ EIA (1999), p. 40.

Denmark, and possibly Finland, has to be constructed, before dynamic growth can be expected.

To sum up, first of all three factors are responsible for the dynamic growth of natural gas consumption in Western Europe:

- access to abundant low-cost reserves at the North Sea, in North Africa and the Former Soviet Union (the most important factor),
- expansion of the infrastructure network,
- environmental aspects.

To estimate Western Europe's demand for natural gas more exactly three prognoses, provided by the European Commission, the Energy Information Administration and the International Energy Agency, will be presented. One prognosis is based on a scenario approach, the other two use mathematical approaches. The following passage will present the different prognoses as well as compare and evaluate their conclusions.

2.1 The European Commission's prognosis

The European Commission (1996) has developed four scenarios to estimate the natural gas demand in the EU until 2020.

The Conventional Wisdom (CW) scenario denotes the 'business as usual' world. After a strong rebound from recession economic growth gradually weakens in the long run as demographic changes mean slower growth in the labour force. In the Battlefield (BF) scenario the world reverts to isolationism, power blocks, and protectionism. Contradictions and instabilities in the global system make economic integration very difficult. In Forum (FO) the world moves more to consensus and co-operative international structures with a strong role for public administration and intervention. European and international institutions are gradually restructured so as to deal more effectively with broader, more complex shared problems and interests. Under Hypermarket (HM) the predominant themes are market forces, liberalism and free trade; there is a minimum of intervention from government and public administrators. Global economic integration is self-reinforcing and continues. The force driving this scenario is continued application of the market mechanism.

These four broad scenarios were subsequently translated into detailed macro-economic indicators which reflect the world described in the initial definitions. They provide contrasting industrial and macro-economic contexts for investigating future calls on energy. The initial development of the scenarios emphasises social and political dimensions. The economic analysis is an overlay of the economic consequences of such socio-political developments coupled with their quantification in terms of

relevant economic variables.¹⁴ Table 4 gives an overview of all the key macro-economic features of each of the scenarios:

For the natural gas market in Western Europe the scenarios resulted in the following predictions for the next two decades:

2.1.1 Scenario Conventional Wisdom (CW)

The increase in final energy demand is significantly higher in the first ten years (2000-2010), starting at 1.4% per year before moderating to 0.9% for 2010 to 2020. The penetration of natural gas in final energy demand seems to saturate at 23.9%, which means at high levels in industry and households. In total, in 2020 the energy system of the EU has to supply additional amounts of 62 billion cubic meters of natural gas compared to 1995 to cover the needs of end-users of energy.

The gas industry faces a relatively small increase in gas distribution to industrial and domestic consumers — 30% more in 25 years. The main change comes from the considerable increase in the use of natural gas in electricity production. This brings about substantial investment in gas pipelines and LNG gasification facilities (a near doubling of capacity will be required by 2020 compared to 1995). More than 25% of new power plants in the EU will be natural gas combined-cycle ones. The evolution in power capacities implies significant changes in the mix of fuels used for electricity production. In thermal power generation there is considerable substitution in favour of natural gas, which reaches a 52% share of total input by 2020 compared to only 25% in 1995.

The main change in energy imports comes from the substantial new requirements for natural gas. Indigenous production of natural gas in the EU will be stable, so it will be necessary to import large quantities in 2020: natural gas imports are forecasted to be 300 billion cubic meters above their 1995 level. This is higher than previous projections, but not necessarily unsustainable, given the recently revised information on gas reserves and production costs of suppliers to the European Union.

2.1.2 Scenario Battlefield (BF)

Because of low economic growth, Battlefield requires less energy compared to CW. The share of indigenous production and nuclear energy increases. Production of hydrocarbons is increased, while that of solids is just maintained. The fuel mix in Battlefield does not confirm the rapid penetration of electricity and heat, especially in the longer run (this explains in part the slowdown of inten-

¹⁴ In the following according to Europäische Kommission (1996), S. 8-9, 14-15, 48-82, 98, 128.

Table 4

**Scenarios of the Economic Development in the European Union
until 2020 by the European Commission**

	CW	BF	FO	HY
Demographics	Population growth falls from 0.4% p.a. between 1995 and 2000 to zero after 2010. Labour force participation rate is slightly higher to 2010, but is static after that.	Population growth identical to Conventional Wisdom. Labour force participation is lower.	Population growth identical to Conventional Wisdom. Labour force participation is stronger.	Population growth identical to Conventional Wisdom. Labour force participation is weaker.
GDP	Growth rates of 2.4 per year from 2000 to 2005; 2.2% to 2010; 1.9% to 2015; and 1.8% to 2020.	Economic growth is slow compared to the other scenarios. After 2000 growth is only 1.0% to 2005; 1.8% to 2010 (there is recession in 2005/06); 1.4% to 2015; and 1.2% to 2020.	Growth is 2.6% p.a. for each 5 year increment between 2000 and 2015, falling back only slightly to 2.4% by 2020.	Economic growth falling to 2.9% by 2005; to 2.4% by 2010; to 2.2% by 2015; and to 2.0% by 2020.
Unemployment	Although unemployment is expected to fall, success is only partial. From 12% in 1994, the level is reduced to 7–7.5%.	Lower growth ultimately means fewer jobs. By 2020, unemployment is 17.5 million, or 11.0%.	Unemployment falls from 12% in 1994 to 5.6% by 2020, lowest rate under any scenarios.	Unemployment declines from 12% in 1994 to 6.5% by 2020, mainly the result of weak labour-force participation.
Inflation	Inflation becoming not a major issue. Nonetheless, inflation will be higher than in the recent past.	Inflation will have an annual rate of 5.4% between 1993 and 2020.	Inflation low, averaging 2.9% p.a. between 1993 and 2020.	Very low – only 2.6% p.a. between 1993 and 2020.
Industrial Outlook	The contribution of industry to European GDP declines. Industrial value added grows at 1.6% p.a. from 1995 to 2020, some 0.5% p.a. slower than GDP. From 2.5% p.a. between 1995 and 2000, industrial production slows to 1.4% p.a. after 2010. The energy intensive industries fare worst as a result of severe competition from developing countries.	Industry benefits from the short term boom, growing sharply. Post-2000 the cycle produces an equally sharp fall. By 2003, output has stagnated, falling into steep decline thereafter as a result of the oil price shock and recession. There is a brief recovery between 2007 and 2010 but from then on production increases at less than 1% each year.	Industry declines relative to services. Industrial production is hindered initially by stricter environmental rules and fiscal policies designed to promote sustainable investment. Heavy polluters and energy intensive industries face the most difficulties. Industrial production grows 2% p.a. between 1990 and 2020.	Strong competition results in the relocation of some manufacturing sectors to Eastern Europe or the FSU. Strong demand and liberal environment allow flourishing growth of competitive industries, or industries with relatively low international competition. Industrial production grows at 3% p.a. to 2000 slowing gradually to 2% p.a. after 2005.
Energy Policy	Energy policy remains fragmented, the result of unresolved conflicting objectives as well as differing national aims.	Energy policies are aimed at reducing import dependency; supply side measures such as protection of domestic energy production industries likely to be more successful than demand side measures.	Energy policies are most significantly affected by concern for the environment. Global unity of purpose allows positive action across the energy spectrum.	Strong belief in free market principles result in energy policy driven by desire to minimise government control and maximise efficient operation of free markets, nonetheless achieving desired standards.
Gas Prices	Deregulation and growing network bring lower prices relative to oil after 2000, reinforced by increasing gas-to-gas price competition.	Remains tied to oil, so reflecting the price shock but lagging in response.	Prices rising relative to oil as environmental pressures put premium on clean fuels.	Deregulation and growing network bring lower prices relative to oil, reinforced by increasing gas-to-gas price competition.

	CW	BF	FO	HY
Gas Demand	Fastest growing of all primary fuels with increasing share in all end-use sectors, particularly power generation. Gains could slow post-2000 as coal becomes more attractive in power sector.	Underlying strong demand growth but interruption by the price shock expected.	Environmental advantages likely to ensure significant increases in share although lower overall energy requirements could limit volume increases.	The dash for gas becomes a stampede, although there is increasing competition from low-cost coal imports post-2000.
Gas Supply	Not mentioned.	As with oil, policies such as benign upstream taxation aim to enhance and extend do	Domestic production will be strong, aided by technology. Well-head conversion to hydrogen for new energy technologies appears towards 2020.	Import dependency increases but mutual commercial interests of producers and consumers reduce security risks.
Source: Own summary based on Europäische Kommission (1996), S. 128–141.				

sity gains). Electricity attains a share of 20.5% in final energy in 2020 and heat 2.3%. These energy forms are mainly substituted by natural gas (24.6%), which increases its share within the use of fossil fuels in final energy consumption. According to Battlefield, the energy system of the EU has to supply additional 67 billion cubic meters of natural gas to end-users in 2020 compared to 1995. In 2020 incremental net import requirements from 1995 in Battlefield are 228 billion cubic meters of natural gas (13% less than in CW).

2.1.3 Scenario Forum (FO)

Energy taxation policy is the driving force of changes in energy demand patterns. The relative prices of energy products for the end-user are influenced by taxation: first electricity and then gas become more competitive than solids in particular but also oil products. Given that the economy grows more rapidly in Forum than in Conventional Wisdom, final energy demand is lower only by 3% in 2020 (9.6% less in industry, 1.8% less in households, but 1.8% more in transport). The fuel mix also changes considerably. Despite the introduction of heat and new fuels, the share of natural gas in final energy stabilises at 22.6% in 2020 (23.9% in CW).

Because of the intensity gains, end-user energy demand for fuel is generally lower than in Conventional Wisdom. In 2020, end-users in Forum demand 51 billion cubic meters of natural gas more than in 1995 (17.6% less than CW). Gas combined-cycle plants outrank all other candidates (except nuclear) and thus there is a massive swing to them. Taxation policy also affects the use of fuels: Natural gas is the main winner with a share that rises from 13.6% in 1992 to 55.8% in 2020 (51.8% in CW).

Forum is no more dependent on gas imports than Conventional Wisdom, as it requires an incremental 206 billion cubic meters of natural gas in 2020 (25% less than CW). This is explained by the low demand growth in Forum, the development of new fuels and the use of nuclear power generation.

2.1.4 Scenario Hypermarket (HY)

The results of HY can be explained by a combination of the following circumstances: low taxes, high import energy prices, high discount rates, absence of any technology promotion policy and high economic growth. Because of the higher economic growth, energy demand in Hypermarket is 5.4% higher than in CW. This increase represents an annual growth rate of 1.1% for the period 1995 to 2020.

In 2020 the European Union's energy system has to provide an additional supply of 72 billion cubic meters of natural gas to end-users (20% more than CW). The cost of energy decreases in Hypermarket compared to CW. These reductions are 6.3% in industry and 8.6% in domestic and are due mainly to lower taxation rates and secondarily to intensity gains. The most impressive development in power generation is the rise of natural gas as the dominant fuel for the sector. This results from the significant reduction of nuclear capacity and the steadily reducing importance of solid fuels, both due mainly to high discount rates.

The key issue in the Hypermarket scenario are the tremendous quantities of natural gas that the EU has to import, reaching 520 billion cubic meters by 2020. Gas imports grow at an annual rate of 5.9% from 1995 to 2020, with an incremental requirement of 395 billion cubic

meters over the period, 34.8% more than CW. Even with an optimistic view of long-term gas supply prospects, it is possible that such import requirements will be unsustainable at reasonable gas prices, at least if this trend continues beyond 2020.

2.1.5 General conclusions

The analysis predicts that the energy future of the EU will be determined by a number of key long-term trends. Energy growth in general will be modest. Import dependency rises in all scenarios. Despite improved technology and increased energy efficiency, energy demand growth remains a strong function of overall economic growth. There will be a steady if unspectacular growth in energy demand until 2020. Gross inland consumption increases in all scenarios within a relatively narrow range of 0.6 to 0.9% p. a.

Natural gas consumption shows the greatest volume increase. Demand will at least double, mainly for power generation. In the Hypermarket scenario, where free markets predominate, the increase would be even higher, with annual growth averaging almost 3%. In primary energy, gas is expected to grow considerably in all scenarios, notably in the power generation market. Gas increases its share in primary energy from 23% today to 31% by 2020 — in power generation, gas currently accounts for 25% of the fuel inputs for thermal generation but by 2020, this figure could rise above 50%.

Natural gas consumption is expected to be 75% to 125% higher by 2020 than it was in 1995. Nevertheless, the studies indicate that in a Conventional Wisdom world, natural gas could meet some 26% of total primary energy demand by 2010 and 30% by 2020 compared to 17% in 1990. Its ease of use and consumer acceptance as the alternative to electricity as a network fuel together with the rapid development of combined-cycle gas-turbine power generation plants are the two main reasons for such fast rising demand. In particular, the power generation sector is expected to account for around half of the growth in the period up to 2020 and according to Eurogas¹⁵ to more than treble its use of natural gas to 134.5 billion cubic meters in 2020 from its 1993 base of about 39.2 billion cubic meters. Western Europe's import dependency will rise from about 40% to nearer 80% in the same period. The gas business will be on a par with the oil industry. It is not unreasonable to consider that a spot market could be developed as more and more sources are used by more and more consumers.

2.2 The EIA prognosis

The Energy Information Administration (EIA) in Washington uses the World Energy Projection System Model

(WEPS) for projections of energy demand. The WEPS accounting framework incorporates projections from independently documented models and assumptions about the future energy intensity of economic activity and about the rate of incremental energy requirements met by natural gas, coal, and renewable energy sources. WEPS provides projections of total world primary energy consumption, as well as projections of energy consumption by primary energy type and projections of net electricity consumption.

Processing begins by computing a reference case total energy consumption projection for each country or region. All projections are computed in 5-year intervals up to the year 2020. Total energy projections are products of an assumed GDP growth rate, an assumed energy consumption per GDP growth elasticity, and total energy consumption for the prior year. In the first instance, the prior year consumption is based upon historical data. Subsequent calculations are based upon the projected prior year energy consumption amount. The model accommodates individualised GDP growth rate and elasticity assumptions for each year.¹⁶ Given total energy consumption, the next step is to calculate energy consumption by primary energy type. This calculation uses three subsystems: oil subsystem, nuclear subsystem, and the coal-natural gas-other subsystem.

The coal-natural gas-other subsystem, calculates the amount of the change in total energy consumption not assumed by oil and nuclear energy consumption. In this subsystem the model allocates any remaining change in total consumption from one period to the next to coal, natural gas, hydroelectricity and other renewables based upon assumed shares for each country or region and each forecast year. The allocation shares are based on examination of historical data in WEPS and consideration of exogenous information. The share of natural gas is reviewed for consistency with projections from other forecasting associations. Total coal, natural gas, and renewable consumption equals previous year consumption of each fuel, plus the change in consumption allocated to each.

Long-term projections of energy consumption are subject to substantial uncertainties. WEPS forecasts include a baseline set of assumptions for these variables to provide a reference case. To depict a range of uncertainty, two additional cases were developed, with higher and lower economic growth rates relative to those in the refer-

¹⁵ Eurogas is a organisation of European natural gas companies located in Brussels, Belgium.

¹⁶ GDP growth rates are based upon rates obtained from the WEFA Group's report, *World Economic Outlook: 20-Year Extension*. Energy consumption per GDP growth elasticity assumptions are developed by EIA analysts.

ence case. The more mature industrialised economies grow more slowly and show less variation. For industrialised countries, increments of +1.0 and -1.0 percentage points, respectively, are added to the reference case growth rates to generate the high and low growth cases.

Based on this model the EIA projects increases in natural gas demand of 2.9% per year in Western Europe¹⁷ until 2020. Total natural gas consumption in Western Europe is projected to reach 764.6 billion cubic meters by 2020. The fastest growth is expected in countries with less mature but rapidly expanding infrastructure, such as Greece, Spain and Portugal. Several factors favour increased reliance on natural gas in Europe, most importantly access to abundant low-cost reserves.¹⁸

2.3 The IEA prognosis

The projection of the International Energy Agency (IEA) in Paris¹⁹ follows a 'business as usual' (BAU) approach. From 1995 to 2020 the rate of economic growth for OECD Europe²⁰ is expected to reach 2.0%.

Economic growth is arguably the most important driver of energy demand. The IEA compares growth rates for the past 25 years with assumptions made for a 'business as usual' projection and for low and high economic growth variants. The BAU assumption broadly continues the past world rate of economic growth. The gross domestic products of different countries have been converted into the common currency of US-Dollars using purchasing power parities rather than market exchange rates. The main components of economic growth are

- future growth in the labour force and its skills,
- future investment and the rate of growth of capital stock,
- and improvements in productivity.

The IEA high and low economic cases capture the uncertainty over future world economic growth until 2020. The impact of this variation on world primary energy consumption is calculated around the BAU projection. In the case of low economic growth (GDP = -13%) the total primary energy consumption in 2020 is 10% lower than in the BAU projection. In the case of high economic growth (GDP = +17%) total primary energy consumption increases by 14%.

According to the BAU projection world-wide gas demand is expected to grow by 2.6% annually until 2020. With 3% annually, the strongest growth within the OECD is expected to be in OECD Europe. Total natural gas consumption is projected to reach 759 billion cubic meters in 2020. Again it is mainly demand for power generation, freed by the liberalisation of the electricity sector and to

some extent the gas markets, that is expected to fuel this increase. OECD Europe's yearly growth in gas demand for power generation is expected to be above 7%. Strongest gas demand increases in power generation are expected in Italy, Spain, Denmark, Belgium and the UK. On the other hand, France, Germany, the Netherlands and the rest of Scandinavia can expect relatively slower gas growths in power production. In 2020, natural gas is forecasted to reach a share of nearly 40% in fuel inputs for power generation. OECD Europe will need to import about 70% of its gas supplies in 2020.

Energy intensity will continue to fall through the introduction of new technologies, economic and industrial restructuring and the substitution of commercial for non-commercial fuels.

2.4 Comparison and evaluation

The prognoses are made for slightly differing areas (EU, Western Europe and OECD Europe respectively), which makes comparison more difficult. To the smallest area, the EU, Iceland, Norway, Switzerland and Turkey are added in the case of the EIA study and the IEA study even includes Hungary and the Czech Republic. However, apart from Turkey all other non-EU countries considered in the prognoses are small natural gas markets which do not have a considerable influence on overall figures. Turkey's gas demand is forecasted to rise to overoptimistic 82 billion cubic meters until 2020, a figure high above the present market volume. Total demand of all non-EU countries covered in the studies of the EIA and IEA should not amount to more than 100-120 billion cubic meters in the year 2020. However, the studies forecast a demand which is 185-195 billion cubic meters higher than the one given in the most optimistic scenario of the EU Commission. In sum, differences in the regions covered by the studies cannot explain the considerable differences in projected natural gas demand.

¹⁷ The term Western Europe includes for the EIA all EU member states plus Iceland, Norway, Switzerland and Turkey (in the following Western Europe).

¹⁸ EIA (1997): World Energy Projection System. Model Documentation. Washington D. C., DOE/EIA-M050(97), <ftp://ftp.eia.doe.gov/pub/pdf/model.docs/m05097.pdf>, downloaded on October 20, 1999, p. 3, 8-9; EIA (1999), p. 20.

¹⁹ The projection is based on their *World Energy Outlook* and on *World Energy Prospects to 2020*. Paper presented by the International Energy Agency for the G8 Energy Ministers' Meeting, Moscow, 31 March - 1 April 1998, <http://www.iea.org/g8/world/index.htm>.

²⁰ OECD Europe comprises 21 countries: All EU member states and in addition Czech Republic, Hungary, Iceland, Norway, Switzerland and Turkey. Although Poland joined the OECD in November 1996, Polish energy data had not yet been incorporated into the IEA's OECD Europe statistics.

The EIA publication does not provide sufficient information for a comparison to be made for gas production. With 3.8% the EIA projection gives a higher growth rate in gas demand than the IEA projection with only 3.0% for OECD Europe. This difference arises from the link in the IEA's gas supply model between gas production and gas reserves.

The IEA projection can also be compared with that of the European Union. The EU's Conventional Wisdom scenario has been used as it represents the closest match, in term of assumptions, to the IEA's BAU projection. Although, the EU predicts a relative low growth rate for natural gas consumption in EU Europe, the EU forecasts faster growth in total OECD gas consumption than does the IEA. The EU's assumption of a rapid growth rate in total OECD natural gas consumption suggests that either it does not have an explicit link between gas reserves and production in its gas supply model or that it is projecting larger gas imports into one of the single OECD regions than expected by the IEA. The EU projection does not mention an increase in gas prices which would encourage these imports.²¹

The eventually rising gas demand will necessitate some increase in gas prices. The IEA's model is therefore important, as it takes into account this increase.

IEA and EIA forecast a very high demand for natural gas, mainly because they apply the projected general economic growth rates too generally to all countries of Western Europe and do not consider differences in national gas markets. The dimension of the region's increase in natural gas demand in the next decades has to be considered carefully. Though liberalisation of the EU's gas market will be uneven across the member countries, it will promote an increase in consumption. The share of natural

gas in total primary energy consumption is projected to rise from its current level of 22% to nearly 30% in 2020.

However, two factors put a question mark behind the prognoses of dynamic growth in Western Europe's total natural gas consumption. First, in the main national markets the residential and commercial sectors are already integrated into a country-wide gas supply system. This leaves not much room for dynamic growth. In fact the forecasts for increased gas demand in the main national markets are first of all based on the assumption that gas-fired electricity production will expand drastically. This development is in many of the countries concerned dependent on the government's energy policy and, therefore, difficult to forecast over a longer period. The countries with a nationwide growth potential are those which, like Spain or Portugal, have just started or are about to start the creation of a nation-wide gas supply network. But their markets are rather small and cannot compensate for reduced growth rates in the developed markets.

Secondly, especially in Germany a tendency towards a general reduction of energy consumption can be observed, which also challenges the optimistic projections of dynamic future increases in gas demand. Structural changes in the German economy, namely reduced growth of energy intensive branches like metallurgy, as well as general measures to save energy are responsible for this tendency. This has led to a growing discrepancy between general economic development and energy demand in Western Europe's second biggest natural gas market.²² This discrepancy is likely to grow further not only in Ger-

²¹ IEA (1999), pp. I.24–I.25.

²² Wittke, Ziesing (1999).

Table 5

Synopsis of Projections of Natural Gas Demand in 2020

in billion cubic meters

	EIA	IEA Commission	European	Eurogas	Wood Mackenzie ¹⁾
Area covered	Western Europe	OECD Europe	EU	EU	EU
Total primary gas demand	767.5	758.9	430.6 – 585.3	487.5	560.0
Share in primary energy consumption	—	—	30–31%	27%	30%
Net imports of natural gas	—	470.1	311.9 – 508.4	347.4	—
Import dependency	—	70%	—	—	75%

¹ The study from the Wood Mackenzie consultancy is used by the Department of Trade and Industry, UK. For a summary of the report by Wood Mackenzie see Department of Trade and Industry (1998), pp. 141–144.
Sources: Department of Trade and Industry (1998), p. 63, 142–143; Eurogas (1998): Natural Gas Demand and Supply Outlook to 2020, <http://www.eurogas.org/statis/statout.htm>, downloaded on October 22, 1999.

many but in other West European countries as well. Accordingly, in the developed markets energy consumption will grow much slower than GDP.

The IEA prognosis has rightly pointed out that price effects of rising demand for natural gas have to be taken into consideration. Rising gas prices could weaken demand. However this effect should be limited, since the regions gas suppliers have already started to increase their production and transport capacities.²³ Moreover, suppliers will in the future continue to fight for market shares with the help of competitive prices. As a result of the EU's liberalisation policy this tendency should gain even more importance.

On the other hand new suppliers, which try to enter the West European gas market, are often delivering LNG, which is generally more expensive than piped gas. Moreover the new suppliers face higher transportation costs due to their geographical position. That means they will not be able to offer competitive prices. Russia's Gazprom, the most important supplier of natural gas to Western Europe, is faced with rising production costs.²⁴ Accordingly the company will not be able to continue its price war.

As a result of these conflicting factors — increased competition on the one hand and rising costs for important suppliers on the other hand — the increase in prices resulting from rising demand can be expected to be moderate.

At the same time where demand for natural gas is expected to continue its rather dynamic growth, the EU's gas production is likely to decrease. Accordingly, the dependence on gas-imports from non-EU countries will rise from nearly 40% at present to around 60% in 2010 and perhaps to 75% in 2020. This makes security of supplies the main target for the EU's gas policy, including as future aims diversification of supply and extension of storage capacities.²⁵ The present non-EU suppliers, Russia, Algeria and Norway, are the first to benefit from the EU's growing demand for gas imports. But to secure deliveries in the longer run the EU's gas companies are also looking for alternative suppliers.

3. Russia's Gazprom — the biggest supplier

Gazprom is the world's largest producer and exporter of natural gas. With 533.8 billion cubic meters in 1997, the company produced around 25% of the world's total natural gas production. Gazprom owns 70% of Russia's natural gas reserves, equalling 33.4 trillion cubic meters. Gazprom delivers nearly 20% of its gas production to Western Europe. With that the company is controlling about 30% of the European natural gas export market.²⁶

After the collapse of the Soviet Union, conditions for the transport of natural gas from Russia to Western Europe²⁷ changed radically. The newly independent states, namely Belarus and Ukraine, introduced transit fees, which made gas deliveries more expensive. Russian gas is being delivered to Western Europe through pipelines running from Siberia via Belarus, Ukraine and then on through Poland or Slovakia and the Czech Republic. Because of long-lasting quarrels with Ukraine about transit fees and because of accusations that gas was being siphoned off during transit, Gazprom developed plans for an alternative transit route. The Yamal pipeline from the Western Siberian gas fields on the Yamal peninsular bypasses Ukraine and goes through Belarus directly to Poland and further on to Germany.²⁸

Russia's gas monopolist Gazprom, which had taken over all Soviet supply contracts, has even more problems with supplies to the domestic market, characterised by low

²³ Thackery, Fred (1998): Supply surplus looms over Europe's gas market, in: *Petroleum Economist*, October, p. 16–19.

²⁴ See the analysis in the following part.

²⁵ Czernie (1997), p. 11.

²⁶ RAO Gazprom (1998): Annual Report 1997. Moscow, p. 4, 11; Avati, Helen (1999): Prospects still look rosy, in: *Petroleum Economist*, March, p. 15.

²⁷ For the history of Russian gas deliveries to Western Europe see Stern (1989), p. 31, 33, 59.

²⁸ Kossikova (1993), S. 54; on the quarrels with Ukraine see Heinrich (1999).

Table 6

Russia's Production and Export of Natural Gas 1991–1998

in billion cubic meters

	1991	1992	1993	1994	1995	1996	1997	1998
Russia	642.9	640.4	617.7	606.8	594.7	600.2	569.3	—
Of that: Gazprom	—	—	—	570.7	559.5	564.7	533.8	553.7
Total exports of Gazprom	211.7	204.2	179.4	184.3	190.6	195.8	188.9	188.8

Source: RAO Gazprom (1998): Annual Report 1997. Moscow, p. 15; RAO Gazprom (1999): Annual Report 1998, <http://www.gazprom.ru/>, downloaded on August 22; Sergeev (1998), S. 115; *Petroleum Economist* (1997): Gas in the CIS and Eastern Europe. Special issue, September, p. 72; FSU Oil and Gas Monitor, January 26, 1999; *Nefte Compass* (Energy Intelligence Group), February 25, 1999, <http://www.securities.co.uk>, ISI Emerging Markets, downloaded on February 26, 1999.

prices — which are subject to state approval — and an extensive non-payment crisis. Accordingly Gazprom developed plans to expand natural gas exports into all possible directions, with Western Europe being the first target. Moreover, the company initiated an attempt to gain direct access to large industrial and gas-fired power generation markets in Western and Central Europe.²⁹ Gazprom hopes to profit from the EU's liberalisation attempts by getting access to the downstream business in Western Europe. In order to realise its ambitious strategy, Gazprom has entered into strategic partnerships with leading natural gas companies. In Germany Gazprom is cooperating with Ruhrgas and Wintershall/BASF, in Italy with Eni.

The partnership with Ruhrgas can be traced back to 1970, when the first supply contract between the Soviet Union and Ruhrgas was signed. The Ruhrgas AG dominates the German gas industry. Its natural gas grid has the function of a turntable for gas in Europe. Accordingly the contract with Gazprom included gas transit deliveries to France and Switzerland. Soviet respectively Russian gas sales to Ruhrgas in the period 1973-97 amount to a total of 355 billion cubic meters, worth around 32.5 billion US-Dollars (at current prices). Until 2020 an additional 370 billion cubic meters, worth 35.5 billion US-Dollars, are to be delivered according to present contracts. Further transit agreements with Ruhrgas should offer Gazprom better access to markets in France and the Benelux countries. In December 1998, Ruhrgas and Gazprom signed an agreement according to which the Russian company will cover one third of its German partner's demand for natural gas until 2030 independent of quantities.³⁰

The cooperation with Ruhrgas helps Gazprom to increase its access to the West European gas market and to be prepared for the partial liberalisation of the EU gas market. Already since 1989 had Gazprom been looking for new business opportunities in the West European downstream sector, in which profits are higher than in the upstream sector. However, at that time Ruhrgas seemed to be unwilling to grant its Russian partner access to the downstream market. As a result, a heavy strain was put on the partnership between the two gas giants in the early 1990s, when Gazprom signed an cooperation agreement with Wingas — one of the main competitors of Ruhrgas in the German natural gas market — in order to participate in the German downstream market. The resulting tensions with Ruhrgas disappeared only very slowly. The cooperation agreement between Gazprom and the Wintershall AG, a subsidiary of BASF, was signed in 1990. The agreement includes the common marketing of Russian natural gas, the joint planning and construction of gas pipelines and storage facilities in Germany and in the neighbouring countries.³¹

Gazprom's cooperation with Italy's gas monopolist Eni follows similar patterns. Eni established first contacts with

the Soviet gas industry already in the late 1960s. Since then three delivery contracts have been signed. In 1995 Gazprom covered 25% of Italy's natural gas demand and it is expected, that this figure will rise to 33% in 2010. In 1998, Gazprom and Eni concluded a strategic alliance, which should offer Gazprom access to South European gas markets.³²

As a result of lasting contacts and successful strategic partnerships Gazprom is well positioned in the West European gas market. Nevertheless it remains questionable whether the company will be able to realise its ambitious goal to double exports until 2010. Firstly, prices for gas production in Russia will increase, forcing Gazprom to soften its aggressive price policy on the West European market. Secondly, new competitors are likely to enter the EU gas market once liberalisation has started.³³

The expected rise in production costs is due to the fact that Gazprom exploits outdated technology which is less efficient and less reliable. The company has problems to attract the financial means necessary for investments into modern technology. Moreover, Gazprom plans to increase gas production by developing fields in Russia's Far North, most notably the Yamal field, where production is complicated — and therefore made more expensive — by the extreme climate. After the Russian financial crisis of August 1998 Gazprom finds it still harder to cover its capital needs.³⁴

²⁹ Pryce, Twomey (1997), p. 63; for the development of the natural gas sector in Central and Eastern Europe see Berenyi, Ivan (1998): Process in restructuring, in: *Petroleum Economist*, March, pp. 22–24 and Shkuta (1999).

³⁰ Ruhrgas AG (1998): *Russisches Erdgas für Ruhrgas. Die ersten 25 Jahre. Energie, Know-how, Erfolg.* Essen, S. 1–2, 5, 7.

³¹ As joint ventures the trading company Wintershall Erdgas Handelshaus GmbH (WIEH) and other joint trading and construction companies were established. In 1993, all joint ventures, with exception of WIEH, were united into the Wingas AG. New pipelines and storage facilities were built, which are connected with the European gas pipeline grid. Wintershall AG (1995): *Geschäftsbericht 1994.* Kassel, S. 9–10; Müller-Elschner, E. (1997): *Die Partnerschaft Gazprom–Wintershall in der Gaswirtschaft: Ziele und Ergebnisse.* Manuskript, Kassel, January 31, S. 1–8.

³² Quinlan, Martin (1998): Finding life beyond the dominance of Eni, in: *Petroleum Economist*, November, p. 4; Bykov, Pavel, Petr Vlasov (1999): *Brosok na iug. Italija i Rossija formiruiut "energeticheskuiu os"*, in: *Ekspert* No. 6, February 15, S. 23.

³³ Quinlan (1997a), pp. 65–66; for the further plans of Gazprom see Baskaev, Konstantin, Sergei Gornov (1999): *Ambitsii Gazproma dostigli predelov Evropy*, in: *Delovye Liudi* No. 102, S. 114–115.

³⁴ Some of the company's more ambitious capital intensive projects, like the Yamal pipeline, will — among others — therefore be delayed further. Gazprom has already indicated that the development of the Yamal gas fields will not be started before the year 2010. Other projects, like "Blue Stream", a gas pipeline from Russia through the Black Sea to Turkey, will be financed with the help of strategic partners, in this case Eni. Gasunie (1999): *Long-term market analysis 1999.* Groningen, p. 10.

Tabelle 7

Russia's Gas Exports to Western Europe 1996–1999
in billion cubic meters

	1996	1997	1998	1999*
Germany	32.9	32.5	32.5	30.4
Italy	14.0	14.2	17.3	17.5
France	12.4	10.9	10.9	10.2
Austria	6.0	5.6	5.7	n. a.
Finland	3.7	3.6	4.2	n. a.
Switzerland	0.4	0.4	0.4	n. a.
Greece	—	0.2	n. a.	n. a.
Sum	69.4	67.4	71.0	58.1

* The forecast for 1999 is based on existing delivery contracts.
Sources: RAO Gazprom (1998): Annual Report 1997. Moscow, p. 25; Sergeev (1998), S. 115; FSU Oil and Gas Monitor (NewsBase), January 26, 1999; Bykov, Pavel, Petr Vlasov (1999): Brosok na iug. Italiia i Rossiia formiruiut "energeticheskuiu os", in: Ekspert No. 6, February 15, S. 23.

But rising costs endangering the continuation of aggressive price policy are not the only problem of Gazprom. It is also very likely that the envisaged doubling of exports will cause an oversupply in the West European market. To meet these problems Gazprom is actively trying to diversify its customer base and to increase activities in the downstream business. At present Gazprom is already delivering gas to customers in seven West European countries. (see table 7) Gazprom's expansionist strategy in Western Europe concentrates on increased supplies to the French market and on access to the Scandinavian market (beyond Finland) with the help of a new pipeline.³⁵

4. The non-European suppliers

The most important non-European supplier to the West European natural gas market is Algeria, which accounts for more than 12% of all gas deliveries. At present, Algerian gas is being sold directly to France, Belgium, Spain, Portugal and Italy (see table 3). About half of the country's gas exports are being made either through the Trans-Mediterranean pipeline via Tunisia to Italy or through the Maghreb-Europe pipeline via Morocco to Spain. The Trans-Mediterranean pipeline, brought on stream in 1983 with a capacity of 15 billion cubic meters per year, has been upgraded. The capacity of the pipeline is now 24 billion cubic meters per year and could be increased to 30 billion cubic meters by adding further compression facilities. The Maghreb-Europe pipeline with a capacity of 8 billion cubic meters began delivering natural gas in November 1996. Final capacity is planned at 19 billion cubic meters. The pipeline is seen as a future supply route to markets in France and Germany.

The other half of Algeria's gas exports is being shipped in the form of LNG. The country has finished renovation of its LNG plants in 1997, increasing capacity from 15 to 34 billion cubic meters per year. Because of the high share of LNG in gas exports, Algeria remains a high-cost producer. Since LNG is as a niche fuel rather than a direct competitor to piped gas, LNG markets are found around the Mediterranean, or in the pockets where pipeline supplies have yet to penetrate.³⁶

With the help of increased pipeline and LNG capacity Algeria hopes to increase natural gas exports drastically. The Algerian government has set itself an export target of 80 billion cubic meters in the medium-term. The ultimate aim is 90-100 billion cubic meters. In 1998 the country exported 46 billion cubic meters of natural gas to Western Europe.³⁷

If the present main suppliers of natural gas to Western Europe, Russia and Algeria, continue with their expansionist strategies they will be able to meet the region's rising demand. Accordingly, most analyses of the European gas market agree that Russia and Algeria could meet Europe's likely additional import requirements to 2010 and beyond. Contractually secured imports and expected prolongation of existing contracts alone can meet more than 90% of projected demand in 2010.³⁸

Nevertheless, new suppliers, first of all Trinidad, Nigeria, and Middle Eastern countries, try to enter the European gas market. They hope to profit from the EU's liberalisation efforts. This means that the West European natural gas market is heading towards increased competition. In order to forecast the nature of this competition it is necessary to have a brief look at the potential new suppliers.

Trinidad and Tobago is dynamically increasing gas production, aiming at an annual output of more than 16 billion cubic meters in 2000. The country began exporting LNG in April 1999, with the start-up of its first LNG plant. At present the plant allows an annual export of about 4 bil-

³⁵ To get access to the Scandinavian market beyond Finland, Gazprom has plans to build a 650 km long pipeline from Finland across the Baltic Sea to Gävle in Sweden. The projected pipeline would cost about 3.5 billion US-Dollars. The pipeline could then be continued to Denmark. This "Scandinavian ring" could start operation in 2005. But realisation of the project depends on finance from the Scandinavian countries involved. Ivanov, Andrei (1998): "Gazprom" khochet dotianut'sia do Shvetsii. I smozhet, esli ne pomeshat Norvegiia, in: Finansovye Izvestiia, November 17, S. 4.

³⁶ Quinlan (1997a), p. 66; Quinlan (1997b), pp. 69-70; EIA (1999): International energy outlook 1999. Natural gas, http://www.eia.doe.gov/oiaf/ieo99/nat_gas.html, last modified on April 6, downloaded on June 30, 1999.

³⁷ Gasunie (1999): Long-term market analysis 1999. Groningen, p. 10; Ruhrgas AG (1998): Branchenreport 1998. Erdgas im Energiemarkt, <http://www.ruhrgas.de/deutsch/daten/branch.pdf>, downloaded on July 20, 1999, S. 7.

³⁸ Quinlan (1997a), p. 66; Enseling (1997), pp. 22–23.

lion cubic meters. But it is planned to triple output to 22.2 billion cubic meters of LNG per year. The LNG has been sold under 'take-or-pay contracts'. Most notably Trinidad has concluded a 20-year delivery contract with Spain.³⁹

Nigeria possesses the tenth largest natural gas reserves in the world. But due to a lack of gas utilisation infrastructure, Nigeria flares 75% of the gas it produces and re-injects 12% to enhance oil recovery. Now there are plans to make better use of the natural gas produced. An LNG project is expected to come onstream in late 1999 and will sell its products to customers in Europe. At the end of the year annual capacity should amount to 7 billion cubic meters. Nigeria has signed 20-year supply contracts with customers in Spain (deliveries of 4.4 billion cubic meters per year), Italy (3.5 billion cubic meters), France and Portugal (0.4 billion cubic per year each).

A number of countries in the Middle East are also trying to get access to the West European gas market. Arab gas exports have more than tripled during the last decade — rising from 21.6 billion cubic meters in 1989 to 70.9 billion cubic meters in 1998. And they are expected to exceed 100 billion cubic meters by the year 2002-2003. But at present Algeria alone accounts for nearly 90% of Arab gas exports. Mainly through projects in Abu Dhabi, Qatar and Oman the remaining 10% are exported as LNG, first of all to Asian markets.

The export capacity of Abu Dhabi's LNG plant should be expanded to 5.7 billion cubic meters per year. But the Asian crisis has made it unlikely that the plans will go ahead in the short-term period. Qatar plays a significant role in the international LNG trade. The two LNG plants to be finished in 1999 will have an annual production capacity of 15.2 billion cubic meters of gas. A third project will have an output capacity of 6.9 billion cubic meters of gas per year and is projected to begin operation in 2001. Oman is concentrating on one major gas export project, a LNG plant with an annual output capacity of 9.1 billion cubic meters of gas. The first train of the plant is scheduled to be operational by the end of 1999. That means, LNG production in the Near East will increase considerably in the next few years. However, LNG demand in Asia has declined significantly due to the region-wide financial crisis and has forced Arab gas exporters to look for new export markets.

Although Iran's domestic consumption of natural gas is growing rapidly, the country continues to promote gas exports. Under current plans, Iran hopes to export 4.7 billion cubic meters in 2000, rising to 41.3 billion cubic meters in the longer term as larger, more ambitious projects come online. Iran is increasingly targeting emerging Asian markets like Pakistan and India for LNG supplies. Due to lack of gas pipelines to Europe and because of sanctions, advocated most actively by the USA, Iran's chances on the West European gas market seem to be very limited.⁴⁰

Egypt has set itself the ambitious goal to double gas production, which amounted to 16 billion cubic meters in 1998, in the next few years. The rapid increase in natural gas reserves and production in recent years has encouraged ambitious plans for gas exports either by pipeline or as LNG. Currently, Egypt consumes all the gas it produces, but it has already signed agreements for gas exports to neighbouring countries in the Middle East. The country's ambitious export plans include subsea links to Italy and Greece, and a land link across Libya to Algeria, allowing Egyptian and Libyan gas to flow through the existing Algerian pipelines to Italy and Spain.

Libya has vast natural gas reserves and is looking to increase its gas exports, particularly to Europe. To expand its production, marketing and distribution Libya needs foreign participation and investment. Potential exists for a large increase in Libyan gas exports to Europe, although at present the only customer for Libyan gas is Spain's Enagas, which in 1995 received 1.5 billion cubic meters of Libyan gas as LNG. In 1996, Libya and the Italian Agip, a subsidiary of Eni, formalised a plan for the construction of a subsea pipeline to Sicily with a capacity of 8 billion cubic meters per year. The supply should start in 2000. Libya also plans to increase its LNG exports.

Up until now, for European consumers natural gas from north African has meant Algerian gas. But in 2000, or soon after, according to plans now being advanced, this will change. Implementation of all these plans, together with Algeria's ongoing expansions, will result in an increase of more than 60% in north African's natural gas production, and a doubling of its gas exports.⁴¹

A main problem of the new suppliers to the West European gas market is the fact that they all — at least at present — can make deliveries only in the form of LNG and only Egypt and Libya have more or less realistic plans to get pipeline capacity for supplies to Western Europe. The West European market for LNG is mainly restricted to the Mediterranean area and rather small, since deliveries of LNG cause considerable additional costs for suppliers and customers alike. Nevertheless, after the end of sanctions Libya has the potential to enter the Italian market successfully. The Middle Eastern countries, however, will have problems to compete with Algeria and Nigeria. Their reorientation from Asian markets to Western Europe might, therefore, be reverted soon, especially since Asian

³⁹ In the following according to the different Country Analysis Briefs of the EIA.

⁴⁰ Currently, Iran is trying to enter the Turkish gas market. In 1996, a supply agreement was signed over the delivery of 10 billion cubic meters of Iranian natural gas per year to Turkey for 22 years.

⁴¹ Quinlan (1997b), pp. 69-70; for Libya's potential as supplier of natural gas to Western Europe see also Townsend, David (1999): Caveat emptor, in: *Petroleum Economist*, June, pp. 11-12.

markets are at present recovering fast. Such a reversion can take place in the short term, since the Middle Eastern countries have not concluded long-term contracts with European customers.

In summary, the new competitors in Western Europe's natural gas market will not be able to challenge the market position of the main suppliers. They may, however, be able to get access to a market niche or to profit from drastically increasing demand in some regions and from some countries' desire to diversify supply sources. Thus they — or some of them — will participate in the growing West European gas market without causing a considerable change in the market's supply structure.

5. Conclusion

In the nearer future Russia and Algeria are in the position to supply some 220 billion cubic meters of natural gas to Western Europe. Assuming no drastic changes in Western Europe's domestic production levels (230 billion cubic meters) the present suppliers should be able to cover a demand of about 450 billion cubic meters. Additional supplies of 80 to 100 billion cubic meters could come from new suppliers.

The main challenge to the present supply structure of the West European natural gas market will come from Russia's Gazprom. The company's plan to double deliveries until 2010 would increase its market share considerably and thus endanger the position of the other main suppliers. However, Gazprom's problems in the sphere of production and transit as well as long-term delivery contracts

which bind its potential customers to its main competitors Norway and Algeria, make it highly unlikely that Gazprom will come even close to the realisation of its ambitious aims. That means at least until 2010 no important changes are to be expected in the structure of supply. In the long run, however, Gazprom may be able to overcome its internal problems and profit disproportionately from Western Europe's rising demand for natural gas.

However, as has been argued above, the dimension of the region's increase in natural gas demand has to be considered carefully. First, in the main national markets the residential and commercial sectors are already integrated into a country-wide gas supply system. This leaves not much room for dynamic growth. In fact the forecasts for increased gas demand in the main national markets are first of all based on the assumption of a considerably expansion in gas-fired electricity production. This development is in many of the countries concerned dependent on the government's energy policy and, therefore, difficult to forecast over a longer period. Secondly, especially in Germany structural changes in the economy have led to a growing discrepancy between general economic development and energy demand. This discrepancy is likely to grow further not only in Germany but in other West European countries as well. Accordingly, in the developed markets energy consumption will grow much slower than GDP.

But even if Western Europe's energy demand will be lower than projected, is the region's dependency on imports bound to increase. Especially when Western Europe's own production will start to decline in the second decade of the next century, will a rise in gas imports be unavoidable.

References

- Czernie, Wilfried (1997): A single European market for natural gas. In: Petroleum Economist, Ruhrgas AG (eds.): The fundamentals of the natural gas industry. London, second edition, 10–11.*
- Department of Trade and Industry (1998): Conclusions of the review of energy sources for power generation and government response to fourth and fifth reports of the Trade and Industry Committee. London (Cm 4071).*
- EIA (1999): International energy outlook 1999. Washington D. C. DEO/EIA – 0484 (99), <ftp://ftp.eia.doe.gov/pub/pdf/international/048499.pdf> [Stand June 1999].*
- Enseling, Gerhard (1997): Market with growth potential. In: Petroleum Economist, Ruhrgas AG (eds.): The fundamentals of the natural gas industry. London, second edition, 22–25.*
- Europäische Kommission, Generaldirektion XVII (1996): Energie in Europa. Die Energie in Europa bis zum Jahre 2020. Ein Szenarienansatz. Luxemburg.*
- Feigin, V. (1998): Gazovaya promyshlennost' Rossii: sostoyanie i perspektivy. In: Voprosy Ekonomiki No. 1, 133–147.*
- Ghanem, Shokri (1997): Future natural gas production and its determinants. In: Petroleum Economist, Ruhrgas AG (eds.): The fundamentals of the natural gas industry. London, second edition, 12–16.*
- Heinrich, Andreas (1999): Rußlands Gazprom. Teil II: Gazprom als Akteur auf internationaler Ebene. Bericht des Bundesinstituts für ostwissenschaftliche und internationale Studien (BIOst) Nr. 34.*

- IEA (1999): Natural Gas Information 1998. Paris.
- Kossikova, Lydia (1993): Die Handelsbeziehungen mit den ehemaligen Unionsrepubliken: Tendenzen und Probleme. Bericht des Bundesinstituts für ostwissenschaftliche und internationale Studien (BIOst) Nr. 23.
- Pryce, Vicky, Adrian Twomey (1997): Prospects for the UKCS in the new millennium. In: Petroleum Economist, Ruhrgas AG (eds.): The fundamentals of the natural gas industry. London, second edition, 62–64.
- Quinlan, Martin (1997a): Impressive performance, but here comes the tricky part. In: Petroleum Economist, Ruhrgas AG (eds.): The fundamentals of the natural gas industry. London, second edition, 65–66.
- Quinlan, Martin (1997b): Gas exports set for sharp increase. In: Petroleum Economist, Ruhrgas AG (eds.): The fundamentals of the natural gas industry. London, second edition, 69–70.
- Roeber, Joe (1997): Development of a UK natural gas spot market. In: Energy Journal, Vol. 17, issue 2, 1–16.
- Sergeev, Pavel A. (1998): Truboprovodnyi transport Rossii i Zapadnoi Evropy. In: Mirovaia Ekonomika i Mezhdunarodnye Otnosheniia No. 11, 112–119.
- Shkuta, A. A. (1999): Rossiiskii gaz v tsentral'noi i vostochnoi Evrope. Moscow.
- Stern, Jonathan P. (1989): Soviet oil and gas exports to the West: Commercial transaction or security threat? Aldershot (Energy Papers No. 21).
- Wittke, Franz, Hans-Joachim Ziesing (1999): Primärenergieverbrauch 1998 wiederum gesunken. In: DIW-Wochenbericht Nr. 5.

Zusammenfassung

Der europäische Erdgasmarkt in den nächsten Jahrzehnten – Ein Überblick

Der westeuropäische Erdgasmarkt ist trotz der begonnenen Liberalisierung sehr heterogen strukturiert und wird dies auch auf absehbare Zeit bleiben. Die Nachfrage nach Erdgas auf einem der größten Absatzmärkte der Welt wird bis zum Jahre 2020 spürbar ansteigen, was vor allem auf den verstärkten Einsatz von Erdgas bei der Elektrizitätserzeugung zurückzuführen sein wird. Die Prognosen gehen davon aus, daß sich der Anteil von Erdgas am Primärenergieverbrauch in Westeuropa von derzeit 22% auf 30% im Jahr 2020 erhöhen wird.

Der größte Einzellieferant für Westeuropa, mit einem Marktanteil von annähernd 20% an den Gesamtlieferungen, ist Rußland und damit der Erdgasmonopolist Gazprom. Trotz zunehmender Konkurrenz durch andere Anbieter ist davon auszugehen, daß Gazprom seinen Marktanteil wird behaupten können.