THE NEW SECURITY ENVIRONMENT FOR EUROPEAN GAS: WORSENING GEOPOLITICS AND INCREASING GLOBAL COMPETITION FOR LNG

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1. INTRODUCTION: a new security environment

In 2006, security of European gas supply became a very topical subject following the cuts in Russian supplies to Ukraine in the first days of the year which had the consequence of restricting the availability of supplies to some European countries. Much of the subsequent discourse has been concerned with 'the arithmetic of gas security' expressed as current and projected national or collective dependence of European countries on non-OECD suppliers (or groups of suppliers) over the next 15–25 years. Increasing dependence is directly correlated with growing insecurity, defined as the likelihood that gas exporting countries will cut off, or threaten to cut off, supplies to importing countries in support of their commercial and political (foreign policy) demands. The European Union (EU) has responded to the prospect of growing import dependence with the publication, since 2000, of two Green Papers and a security of supply Directive.[1]

Even if these projections of future dependence are believed to be correct, concerns about the resulting commercial and political leverage form only a small part of a security environment. It also includes a cluster of short term and long term issues among which are resource availability, technical breakdown and accident, terrorist attack, political instability, and lack of timely investment, as well as disagreements in relation to existing and future supplies and prices, transit and facilities.

The central proposition of this paper is that, in both the short and the longer term, a 'new security environment' for European gas supplies is evolving. So degraded has the term 'security' become, in relation both to gas and to energy in general, that it is essential to define the geographical focus, the precise problems and the time frames which are being considered. While the paper focuses on Europe, it also takes into account progress towards a globalising LNG market in the Atlantic and Pacific Basins, including the potential requirements of China and India. The principal issues discussed in the paper are:

- the worsening political and geopolitical relationships between key gas exporting and importing governments – particularly between Russia and EU countries;
- the increasingly competitive market for LNG supplies.

These problems are viewed in two time frames – the next 1–2 years and the period up to 2020.

Some of the developments which shape this environment have been evolving since 2000; others have occurred only in 2006. The issue of whether they can all be termed 'new' is therefore questionable. However, the conclusion of the analysis is that collectively these trends suggest both a short and a longer term supply outlook for the European gas market which is significantly different from the one which has generally been assumed and projected.

[1] EU Green Paper 2000, EU Green paper 2006, EU Security of Gas Supply Directive 2004.

Most traditional gas projections are based on some combination of reserve availability and of economic and commercial incentives to bring the reserves to markets. This paper makes two broad and bold assumptions:

- that sufficient reserves have been established within an economic radius of European markets to meet any conceivable level of gas demand over at least the next three (and probably more) decades.
- that, at 2006 prices, all of these reserves would be commercially viable when delivered to European gas markets.[2]

In the late 1990s and early 2000s, the liberalisation of EU gas markets was considered to be a major potential security of supply problem.[3] This issue remains important, particularly in relation to incentives for the timely provision of peak supplies and storage facilities. But the new – less favourable – security outlook is fundamentally due to something else – a worsening geopolitical environment in both the short and longer term.

2. DECLINING PRODUCTION AND RISING IMPORT DEPENDENCE

An important factor in the longer term natural gas supply is the clear trend towards declining European gas production and resource discovery. While this trend is not 'new', and indeed has been foreseen for many years, the 2000s have produced increasing evidence that it is really occurring. UK gas production is projected to decline steeply to the point where the country may be 40 percent dependent on imports in the early 2010s, rising to as much as 80 percent by 2020.[4] Dutch production may be maintained at current levels until 2010–15 with output from the long-established Groningen field compensating for declines in the smaller fields. An overall production cap of 425 Bcm, imposed by the government for the 10 years from 2006 to 2015, places limits on annual Dutch production increases. Thereafter, both Groningen and the small fields will experience accelerating decline.[5] Elsewhere in Continental Europe, most countries will experience a gradual decline in production. The only exception to the trend of declining gas production in OECD Europe is Norway, whose production and exports will increase strongly up to 2010; thereafter they are projected to level off.[6]

On present knowledge of European gas resources, indigenous gas production will not increase beyond 2010. How fast it will decline is a matter of debate, but in the absence of substantial additional discoveries increasing import dependence – identified by both the EU and the International Energy Agency (IEA) – is incontrovertible, but again not new. The European Union projects that gas imports will increase to 80 percent of EU demand by 2030 while the IEA predicts that OECD European dependence on gas imports will increase to 65 percent by the same date.[7] Both these sources project relatively high levels of demand compared with work published by the OIES; this is principally because the latter assumes that power

[2] The technical and financial definition of 'reserves' is that they are commercially viable at current prices but this is not always how that term is used in general literature.
[3] Stern 2002.
[4] The 40% figure is from Dti 2005: para 4.3.4.
[5] CPB 2006, Figure 2.6, p.40.
[6] At around 120 Bcm/year. Norwegian Petroleum Directorate 2005, Figure 6.1, p.49.
[7] EU Green Paper 2006, Para 1; IEA 2004, Table 4.2, p.140.

generation will account for only 54% of incremental demand, compared with 63 percent in the IEA study.[8]

As already noted, sufficient reserves exist in a range of countries within economic reach of European gas markets – Russia, North Africa, Middle East, Caspian, and a number of intercontinental LNG suppliers – to bring sufficient gas supplies to Europe to meet the projected levels of demand. But such imports, far from being seen as the solution to European gas security, are almost universally seen as 'the problem'. A question addressed later in this paper is whether the historical record supports the contention that increasingly import dependence should be automatically considered to be equivalent to decreasing supply security.

The main argument advanced in this paper is that, despite the political and public fixation on economic and political vulnerability arising from import dependence, this is not the principal security threat to European gas supplies in either the short or the longer term. Nevertheless, the debate on the security of European gas supply has focussed overwhelmingly on supplies from external countries, particularly Russia.

3. RUSSIAN GAS SUPPLIES AFTER THE 2006 UKRAINE CRISIS

Despite the large number of commentators who discovered the subject of security of Russian gas supplies on January 1, 2006, it is not 'new'.[9] What has changed in the 2000s is that Russian gas supplies are delivered to increasingly pan-European destinations and in much larger volumes. In 2005, Gazprom exported more than 156 Bcm gas to 22 European countries.[10] All of this gas was exported by the dominant Russian gas company Gazprom, via its export subsidiaries, principally Gazexport. Russia is the largest single supplier of gas to Europe, providing around 25 percent of European gas demand. However, dependence on Russian gas is not uniform throughout Europe: some central and east European countries are totally dependent on Russian gas and there is significant dependence in north-west Europe. But the Iberian Peninsula imports no Russian gas, and the UK (Europe's largest gas market) has so far only imported relatively small quantities.[11]

Irrespective of national positions, the crisis on January 1–4 2006 when Russia cut gas supplies to Ukraine, with the consequence that Ukrainian consumers diverted substantial quantities of gas in transit through their country to Europe, produced a huge negative reaction from governments and commentators on both sides of the Atlantic.[12] Gazprom's imposition of steep increases in gas prices on CIS importing countries since 2005 has been interpreted both within and outside those countries as politically motivated, despite the continuing gap in 2006 between those prices and the corresponding EU import price. CIS governments (as well as some in central and eastern Europe) appear to believe that, if they could only obtain access to non-Russian

[8] Honore 2006.
[9] A very brief overview of the past 25 years of this debate can be found in Stern 2005, pp. 140–144.
[10] Gazprom 2006, pp. 54–5. These figures do not include the three Baltic countries to which Gazprom exported 5.5 Bcm in 2005 but which may also have received small additional quantities of Russian gas from others.
[11] Gazprom exports to the UK in 2005 were 3.8 Bcm. Gazprom 2006, p. 54.
[12] For details of this crisis and the subsequent reaction see Stern 2006a and 2006b.

supplies of pipeline gas and LNG, they would be able to import such supplies on more favourable terms.[13]

During February and March 2006, there was a period of exceptionally cold weather in both Russia and many parts of Europe. Moscow experienced its coldest winter for more than 60 years; temperatures well below minus 30 degrees Celsius for more than a week raised gas demand in Russia and much of central/eastern Europe to extremely high levels. This placed a huge strain on Russian gas and power networks which coped extremely well. During this period, there were again diversions of Russian gas in transit to European countries through Ukraine. These diversions – mostly not disputed by the Ukrainian government – prevented Gazprom from being able to meet the very high demand requirements of some European customers. Buyers in Poland, Hungary, Italy and Austria reported that deliveries were between 10 and 35 percent below requested volumes on a substantial number of days in January and February.[14]

The overwhelming conclusion of the political and public commentary throughout Europe during this period was that, by this action, the Russian government was exerting political pressure on the Ukrainian government and president in order to reassert its influence on a country attempting to make a decisive move towards the EU and NATO and away from Russian political influence.[15] The lack of any public official European censure of Ukraine for taking gas supplies to which it was not entitled clearly demonstrated where European politicians believed the blame lay for this episode.[16]

Irrespective of contractual obligations and rights (prices, payments, obligations to supply and entitlements to take gas) these early 2006 episodes, and ongoing problems and uncertainties in the Russian–Ukrainian relationship, have raised serious doubts in the minds of European politicians as to whether Russian gas can be considered reliable.[17] There were suggestions that the Russian government was by this action 'sending a signal' to Europe that it had the power to cut off gas supplies should it choose to do so and that, should European countries act in ways which it did not like, it might choose to do so. This is based on an increasingly popular view of Russian foreign policy which holds that the Putin Administration sees energy trade as an important means – perhaps the principal means at Russia's disposal – of projecting its political power and influence internationally.[18]

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[13] See for example the comments by the Moldovan president in July 2006 when the price of gas to Moldova increased to $160/mcm compared with a European border price of around $240/mcm in the same month (BBC Monitoring Service 2006a).

[14] In the Italian case, deliveries were still up to 15% below nominations at the beginning of March 2006.

[15] The IEA refers to '..the political cut-offs of gas supplies aimed at transit countries during negotiations over assets or tariff levels', despite the fact that these would seen to be economic and commercial issues (IEA 2006, p.35).

[16] There are indications that confidential letters were sent from both the EU and the Energy Charter Secretariat to the Ukrainian government pointing out shortcomings in the latter's behaviour; but, even if these existed, they stood in sharp contrast to the harsh and very public condemnation of Russia.

[17] The details of how much gas was delivered and taken by which parties and on which days, in comparison to their rights and obligations, has never been agreed.

[18] Those who hold this view of Russian foreign policy cite Section IV.3 of the Russian Energy Strategy 2003 where one of the stated strategic aims of gas industry development is to 'secure the political interests of Russia in Europe and surrounding states, and also in the Asia-Pacific region'. They also cite president Putin's PhD Dissertation (see Balzer 2006).

This growing perception of the undesirability of importing increasing quantities of Russian gas was not addressed by the March 2006 EU Green Paper on energy security, which envisaged a deepening of the existing energy partnership with Russia and argued that the G8 should intensify efforts to secure Russian ratification of the Energy Charter Treaty and its Transit Protocol.[19] But these suggestions were not new and the failure of European Commission to play any significant role during or after the events of January 1–4, 2006, using the institutions of the EU–Russia Energy Dialogue and the EU–Ukraine Summits, did not inspire confidence in its role in any future crisis management.[20]

These events were followed by strongly adverse reaction to the following two sentences in a Gazprom press release of April 18 2006[21]:

> '..one cannot forget that we are actively developing new markets such as North America and China…'
> 'It is necessary to note that attempts to limit Gazprom's activity in European markets and to politicize gas supply issues, which are in fact solely economic, will not lead to good results'.

These produced front page banner headlines in the Financial Times[22]: 'Gazprom in threat to supplies: EU told not to thwart international ambitions; Group says it may divert sales to other markets'. This reaction ignored the fact that Gazprom has no current capability to divert European supplies to North America or Asia and – in the most optimistic of all possible scenarios – will not have such capability for a decade.

This commentary also almost completely ignored other passages in the press release which read:

> 'Alexey Miller noted at the meeting that Gazprom was and is the main supplier of natural gas to Europe. We understand our responsibility and henceforth will remain the guarantor of energy security for the European consumers. All the contracts signed to supply gas will be implemented. There are no doubts at all…
> …Gazprom is interested in developing mutually beneficial energy cooperation with partners in Europe. A good example is the North European pipeline project. We have signed new contracts to supply gas and, for the first time, have started working jointly with German companies along the entire chain from production, transmission and up to gas sales to the consumer. This enhances cooperation reliability for all project participants and even broader – for all consumers of the Russian gas in Europe.'

[19] EU Green Paper 2006, para 2.6.
[20] For the history of the EU–Russia Dialogue and the Energy Charter Treaty in relation to Russian gas trade with the EU, see: Stern 2005, pp. 134–139.
[21] Gazprom 2006a.
[22] *Financial Times*, April 20 2006.

The reaction to the April 18 press release was followed, in early May, by US Vice President Cheney's speech to a conference of east European leaders in Lithuania. He noted in relation to Russia:[23]

> 'No legitimate interest is served when oil and gas become tools of intimidation or blackmail, either by supply manipulation or attempts to monopolize transportation'.

The IEA then made a direct connection between Gazprom's export monopoly and security:

> '..the IEA is worried about the increasingly monopolistic status of state-controlled Gazprom. Europeans cannot import gas from Russia unless Gazprom agrees. This restriction undermines European energy security'.[24]

None of this commentary remotely got to grips with the key short term security issue facing Russian gas supplies, namely, security of transit across Ukraine during the winter of 2006–07. In early September 2006, as this paper was being completed, it was reported that:

- nearly 20 Bcm had been pumped into Ukrainian storages and that the target of 24.5 Bcm would be met by mid-October (the start of the winter)[25];
- Gazprom had signed a three-year contract with Turkmenistan for 50 Bcm per year at a price fixed at $100/mcm throughout the period.[26] It is assumed that a significant portion of those volumes will be supplied to Ukraine at a price, including transportation, of $135–140/mcm.
- the Ukrainian government had given assurances that gas in transit to Europe would not be taken for domestic consumers.[27]

All of this was immensely positive in comparison to the first part of the year when it was unclear whether a government could be established in Ukraine with sufficient stability and legitimacy to take and enforce decisions on domestic and international pricing of gas supplies. However, there is continuing nervousness in Europe about the prospects for interruptions of Russian gas supplies flowing to Europe via Ukraine (and other transit countries) during future winters.

Security uncertainties in Ukraine seem likely to accelerate the development of the North European Gas Pipeline (NEGP) from North West Russia through the Baltic Sea to northern Germany. The first string of this pipeline, in which the German companies E.ON and Wintershall, and the Dutch company Gasunie have agreed to take a 49

[23] http://www.whitehouse.gov/news/releases/2006/05/20060504-1.html
[24] http://www.iea.org/journalists/topstories.asp (visited May 23 2006)
[25] *Na 1 Sentabry Ukraina zakachala v khranilishcha 20 mlrd kubometrov gaza*, Gazexport press release, September 5 2006; http://www.gazexport.ru/default.asp?pkey1=0000200017&id=109338
[26] Gazprom 2006h.
[27] 'Ukraine faces a deficit of 8 Gm3/yr but pledges no siphoning' (*European Gas Markets*, 23 August 2006, p.9).

percent equity share, is due to be completed in 2010 with the second string to be built soon thereafter, adding a further 55 Bcm to Russian gas export capacity to Europe.[28] This would increase nameplate Russian export capacity from around 230 Bcm in 2006 to 285 Bcm by the early 2010s.[29] But because of the deterioration of the Ukrainian network, total Russian export capacity to Europe in 2006 probably does not exceed 185 Bcm. Should the lack of adequate investment in the Ukrainian network continue, by the early 2010s – even with the construction of two NEGPs – this figure will probably not exceed 215 Bcm/year.

From the European side the two new NEGPs are already proving controversial in relation to the increased dependence on Russian gas that they will create for North West Europe. These two pipelines will reduce dependence on Ukrainian transit routes, at least until such time as total Russian exports require all available transport capacity to be utilised. However, if Russian–Ukrainian gas relations fail to show sustained improvement, the NEGP may simply be a partial replacement of Russian export capacity via Ukraine, rather than additional export capacity. The same reasoning may be applied to the South European Gas Pipeline (SEGP) which is envisaged as a westward extension to Blue Stream providing a route to south eastern Europe, possibly as far north as Hungary, avoiding Ukraine.[30]

Indeed, it is a major contention of this paper, that following the events of early 2006, a political limit to Russian gas supplies to Europe is in sight and will be reached following the completion of the NEGPs. The judgement that a limit may be imposed on Russian gas supplies follows from the European political reaction to the events of early 2006 (which would be reinforced by any repetition of these events). This type of political reaction would not be based on any analytical appraisal of European dependence on Russian gas, or the likely consequences of a supply disruption. It is rather, as Skinner has noted, related to a psychological notion of security which, despite being purely subjective, is just as important – arguably more important – for policy formation than analysis of likely scenarios.[31]

Perhaps surprisingly, the possibility of a limit being placed on Russian gas imports by European governments is not inconsistent with Russian export aspirations. There is little sign that either Gazprom or the Russian government has ambitions to increase exports significantly above 200 Bcm/year. The Russian Energy Strategy sees total exports, including those to CIS and Europe, rising from 194 Bcm in 2000 to 250–265 Bcm in 2010, and 273–281 Bcm in 2020, suggesting very moderate increases in the second decade of the century.[32]

There are several reasons for limited Russian export aspirations of which the most important are the limits to Gazprom's production horizons post-2010, due to the need to

[28] The dates for the commissioning of the second line are unconfirmed. The 2010 commissioning date for the first line may be complicated by concern over chemical weapons and other environmental hazards on the floor of the Baltic Sea which could be disturbed by pipeline construction.
[29] Ukrainian nameplate (i.e. design) transit capacity is 175 Bcm but usable capacity is probably less than 130 Bcm in 2006. Much of the nameplate capacity could be restored with a comparatively small investment – much less than that required for building a new export pipeline.
[30] This pipeline may have a number of branches including a southern connection to Israel (Gazprom 2006b).
[31] Skinner 2006.
[32] Russian Energy Strategy 2003, Chart 8, p.51.

invest in a new generation of fields on the Yamal Peninsula. Lead times for the development of these fields mean that they cannot now be producing large volumes (i.e. 100 Bcm/year) prior to 2015.[33] For a number of commentators, the IEA most prominent amongst them, this carries the following implication:[34]

> 'Current IEA projections suggest that Gazprom could face a gradually increasing supply shortfall against its existing [European] contracts beginning in the next few years if timely investment in new fields is not made'.

Such suggestions have been strongly contested by the CEO of Gazprom, not just in the press release noted above, but also in an international press conference at the June 2006 Annual General Meeting.[35]

Other reasons for not increasing exports to Europe include Gazprom's desire to diversify gas exports to North American and Asian markets, both of which will involve large scale investments in pipelines to east Asia and LNG projects in the Russian Far East (Sakhalin) and the Barents Sea. The gas which will be sold to these markets will remain largely undeveloped unless export projects go ahead.[36] With no Russian gas currently being sold in either market, there is less political sensitivity in relation to gas import dependence. There is also increasing evidence that Russian commentators believe that it would be desirable to reduce Gazprom's (and Russia's) financial dependence on European gas exports.[37]

But probably the key long term uncertainty for Russian gas exports to Europe is the development of domestic demand which is subject to major uncertainties, though analysis of this is not helped by the lack of any consistent and convincing historical data. Most recent data from Gazprom show that the company's supplies to Russian customers increased just over 2 percent during the period 2001–2005 to 307 Bcm in 2005.[38] However, total gas delivered to Russian customers increased by 7 percent during the same period and by more than 2 percent per year since 2002.[39] There is considerable uncertainty about how much gas from independent producers is sold to customers and how much either directly or indirectly to Gazprom. With such a level of uncertainty about current data, projections are fraught with difficulty but are likely to be crucial to future export availability particularly during the 2010s.

Elsewhere, I have set out scenarios which show how price developments in the domestic and European markets will impact on both investment in new supply and the attractiveness of sales to the different markets.[40] Broadly speaking, the higher the domestic price in relation to European prices, the less the incentive to increase exports to Europe. However, substantially higher domestic prices would create downward pressure

[33] For details see Stern 2005, pp. 11–16.
[34] IEA 2006, p.33.
[35] See Gazprom 2006a and 2006e.
[36] The Shtokmanovskoye field in the Barents Sea which will supply North America, and fields in Eastern Siberia and the Far East which will supply Asia. In relation to West Siberian gas supply to Asia see the section on China below.
[37] 'China gas supplies to end Russia's European dependence – experts' (RIA/Novosti, March 21, 2006).
[38] Gazprom 2006g. This data is not temperature-corrected and therefore it is difficult to see the underlying trend. The data are also not compatible with the same Gazprom publication for the previous year (*Gazprom in Figures 2000–2004*, p.27) where data for the same year is up to 19 Bcm lower.
[39] Gazprom 2006, p.41.
[40] Stern 2005, pp. 206–10.

on domestic gas demand which would allow Gazprom either to increase exports or reduce production. But in the power sector, rapidly increasing demand, and the long lead times necessarily for building either coal or nuclear plants – even if that was deemed to be the correct policy – may create short term gas demand which is relatively insensitive to price.[41]

A key conclusion of this paper is therefore that even by 2020, Europe should not count on having at its disposal more than 200 Bcm per year of Russian gas, and should not count on any increase in Russian supplies thereafter. Any suggestion that Gazprom might be concerned about meeting its long term export commitments would probably be signalled by curtailing short term gas supplies – in countries such as the UK – and reluctance to renew long term contracts when they expire. No such signals are currently visible; indeed the company seems to be aggressively expanding its European sales.[42]

4. MIDDLE EAST, NORTH AFRICAN AND WEST AFRICAN GAS TRADE: HUGE POTENTIAL, DIFFICULT POLITICS

In any discussion of global natural gas reserves, the Middle East and North Africa (MENA) are among the leading countries.[43] Although Russian reserves are larger than any single MENA country, many of the latter countries have reserve to production ratios exceeding 100 years, suggesting ample potential for exports.[44] For these reasons as well as the geographical proximity of particularly North African countries to Europe, MENA countries have always been seen as a huge potential import resource for European gas markets.

This potential was highlighted in the International Energy Agency's 2005 World Energy Outlook on this region. Table 1 shows the Agency's projections of MENA gas exports to 2030 both to Europe and in total. This is an extremely positive outlook for European gas supplies but may be over-optimistic in a number of respects.

The first of these is that MENA exports are projected to increase roughly four-fold within a period of less than 30 years. In absolute terms, this would require an increase of nearly 350 Bcm/year, of which the majority (over 250 Bcm) would need to come from the Middle East. But the Table shows that in 2003, Middle East gas exports had reached only 34 Bcm, a figure reached 25 years after the start of LNG exports.[45] Likewise North African projections foresee exports from that region increasing more than threefold to 200 Bcm/year over the next 25 years, when around 40 years were required for exports to reach the 2003 level of 63 Bcm.[46]

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[41] Price elasticity of Russian gas and electricity demand is a largely unknown and unaddressed issue.
[42] Shown by its desire to increase its share of the UK gas market to 10% by the early 2010s, and the contact extensions and new long term contract signed with E.ON/Ruhrgas in August 2006 (Gazprom 2006i).
[43] For a list of MENA countries see Table 1.
[44] This is particularly the case for Middle East countries. In North Africa only Libyan reserves exceed 100 years, reserves of the other major producers range from 52 to 65 years (IEA 2005, Table 5.2, p. 173).
[45] Abu Dhabi started to export LNG in 1977 and was joined by Qatar in 1997; all other Middle East exports started more recently. Having taken a long time to get off the ground, Qatari exports will increase extremely rapidly during 2006–2010.
[46] Algerian LNG exports commenced in 1964 and pipeline exports in 1987; Libyan exports only became significant with the start of pipeline trade in 2004.

Table 1: Middle East and North African* Gas Export Projections 2003–2030 (Bcm)

	TO EUROPE			TOTAL EXPORTS			
	2003	2010	2030	2003	2010	2020	2030
Middle East	2	35	117	34	102	185	244
North Africa	61	83	170	63	86	143	200
TOTAL	63	118	287	97	188	327	444
Major Exporters**:				2003	2010	2020	2030
Qatar				19	78	126	152
Algeria				64	76	114	144
Iran				-	5	31	57
Egypt				-	10	19	28
Libya				1	2	13	34
Iraq				-	1	7	17
TOTAL				84	172	310	432

*in addition to the countries listed, MENA includes: UAE, Kuwait and Saudi Arabia.
** figures are for 'net trade'.
Source: International Energy Agency, *World Energy Outlook 2005*, Paris: OECD, 2005, pp. 178–9, 560, 564, 568, 580, 592, 596, 600, 604.

These levels of gas exports could certainly be sustained by known proven reserves (let alone what may be discovered in these countries over the next two decades), although a significant number of new fields will need to be developed.[47] New LNG and pipeline projects, both under construction and in advanced stages of planning, would support the projections to 2010. Cost reductions in LNG (and to a lesser extent pipeline) projects during the 20 years up to 2004 meant that the economics of any project under discussion were positive. Since 2004, cost increases of up to 50 percent, due to the rise in raw material prices and competition for engineering, construction and contractors' services, were more than offset by price increases. For these reasons, the availability of investment funds has so far not proved to be a significant constraint; but cost overruns, particularly for large projects, and lack of available services have led to delays in implementing projects.

[47] For example, by 2030, less than 40 Bcm out of an anticipated total of 200 Bcm of Algerian gas production will come from fields currently in production (IEA 2005, Figure 9.7, p.301).

A more serious doubt is whether such a huge rate of increase in exports, sustained over a 25 year period, is realistic from the institutional, political and geopolitical point of view. In a number of countries, particularly Iran but also perhaps Algeria and Libya, increases in domestic consumption of gas (either directly or for reinjection in oil fields) may curtail availability for export.[48] This may account for the rather conservative projections for Libya in Table 1 given that the country already has up to 1 Bcm of LNG export capacity and 8 Bcm of export capacity via the Green Stream pipeline to Italy.

A second reason why the IEA may be over-optimistic arises from the projection in the table that exports to Europe as a percentage of total MENA gas exports remain at 60–65 percent throughout the period. The share of Middle East exports delivered to European markets is projected to increase to more than one third by 2010, and to nearly one half by 2030. The table also suggests that Europe will retain the overwhelming majority of North African exports – 85 percent in 2030. Somewhat surprisingly, the US market is projected to take less than 20 percent of MENA exports by 2030, of which more than half will be from North Africa. Out of a total of 270 Bcm of MENA LNG exports in 2030, the IEA believes that Europe will capture a minimum of 113 Bcm or 42 percent, and perhaps up to 50 percent.[49] This suggests that Europe largely 'wins the battle' for global LNG supplies with the US and the Pacific Basin for both Middle East and North African LNG. This is a very optimistic projection for Europe and, given developments in the North American and Pacific markets (see below); there must be a question about whether it is realistic.

The third reason to question the IEA projections arises from the fact that the six countries shown in the bottom half of Table 1 account for more than 90 percent of projected MENA gas exports in the period 2010–2030; two countries – Algeria and Qatar – account for 70–90 percent of total exports.[50] Should any political or geopolitical problems prevent these two countries from developing exports as anticipated in Table 1, the consequences for European gas supplies and the Atlantic Basin (and global) LNG market will be significant. Saudi Arabia, the other major country with significant gas reserves, has shown no interest in exports preferring to use gas domestically and export oil.[51]

4.1 West African Suppliers

In the 2000s, West Africa has emerged as an important LNG exporting region, with Nigeria as the major supplier and Equatorial Guinea and Angola likely to start deliveries over the next few years. After more than 30 years of discussion and disappointment, the Nigeria LNG (NLNG) project began exporting in 1999. Within a decade of starting, these exports NLNG will have six trains in operation delivering more nearly 30 Bcm/year of supplies to the Atlantic Basin. Two more Nigeria LNG trains are planned which would add a further 22 Bcm of export capacity. In addition, three more projects

[48] Hallouche 2007.
[49] Calculated from the statement that the share of LNG in total MENA exports will not exceed 60% (p.178) and the figures in Figure 5.6, p.180.
[50] If the figures for Qatar include regional exports via the Dolphin pipeline system then these percentages will be somewhat lower.
[51] The Saudi oil minister has been quoted as saying that the Kingdom will not consider gas exports until production reaches 120 Bcm/year which may happen around 2020–25 (Gas Matters 2006a).

are in various stages of planning which, if realised, would see up to 47 Bcm of additional LNG export capacity, bringing total export capacity to nearly 100 Bcm/year. This is in the same range as Qatar and Algeria and would make the country one of the world's leading gas and LNG exporters. In addition, Equatorial Guinea and Angola may add up to another 12 Bcm of exports per year. West African gas export potential currently appears somewhat less than either North Africa or the Middle East, but additional discoveries could significantly expand current expectations.

5. A WORSENING GEOPOLITICAL ENVIRONMENT FOR EUROPEAN GAS SUPPLIES

Just as there is a common assumption that the principal threats to European gas security are externally focussed, so there is a common assumption that, within that external focus, the policies of exporting countries and/or probable political events within exporting countries will be the principal threats to European gas security. Thus, in respect of both Russia and the Middle East, much European commentary is focussed on the general political and economic policies of governments – as well as narrower oil and gas policy frameworks, which are believed to "threaten" European (and possibly wider OECD) gas security.

Part of this stronger recent sensitivity towards exporting countries is the product of a new assertiveness of oil and gas producing and exporting countries in the wake of the post-2003 increase in prices, and of a widespread perception that such price levels will be at least a medium term phenomenon.[52] This new assertiveness – often termed 'resource nationalism' – has created significant commercial challenges to both international oil and gas companies and OECD government policies in countries as geographically diverse as Venezuela, Bolivia, Russia and Iran, combined with a desire to challenge the political and geopolitical status quo which they see as imposed by US and EU governments.

Increasing producer/exporter assertiveness is resulting in reduced access to resources for international oil and gas companies (IOGCs), and demands by host governments and national energy companies for increasing shares of the rent from joint activities with IOGCs. In addition, OECD companies are facing increased competition for energy exploration and development opportunities particularly with Chinese and Indian companies. Overlaying these general commercial developments are trends which have specific and potentially serious consequences for European gas supplies:

- increasing bilateral and geopolitical tensions between Russia and both the US and European governments;
- continued deterioration of political stability in the Middle East region as well as increasing tensions between potential gas exporting countries, particularly Iran, and US and European governments;
- uncertainty about political stability in African LNG exporting countries, especially Nigeria.

[52] Mitchell 2006.

Geopolitical scenarios, such as the Clingendael Institute's 'Regions and Empires', and Shell International's 'Low Trust Globalisation', have produced comprehensive storylines that are strongly negative for oil and gas trade.[53] Correlje and Van der Linde have observed that under 'Regions and Empires' there is likely to be '..a slowly emerging [gas] supply gap, as a result of lagging investments as a consequence of ideological and religious contrasts, particularly with regard to the North African suppliers, the potential supplies in the Persian gulf and the Caspian Sea region'.[54]

5.1 Russia and CIS Countries

Much has been said already about the geopolitics of Russian gas supplies but in important respects, European and US reactions to the 2006 Ukrainian crisis reflected a significant deterioration of Russian political relationships with those governments. The disillusion of OECD governments with what they perceive as the Putin Administration's weak commitment to democracy and economic reform has been exacerbated by the new confidence and assertiveness of the Russian government and companies in projecting their oil and gas interests internationally. OECD objections have been met by Russian accusations of hysteria and double standards (in relation to judging democratic and economic reform credentials of different states) combined with a growing feeling in Moscow that the fundamental concern of most OECD governments is related to Russia's growing economic and political strength, following a protracted period of weakness during the post-Soviet period.

This is a specific problem in relation to CIS countries where the past two years have seen governments elected in Ukraine, Moldova and Georgia which have sought to distance themselves from Russian influence and developed aspirations (however distant and unrealistic) of becoming members of NATO and the EU. Meanwhile in Central Asia and the Caspian, US policy is aimed at removing oil and gas export flows from Russian influence by creating a new export corridor via Turkey. Needless to say, such aspirations run directly counter to Russian interests which are continued control over Central Asian resources. None of these tensions seems likely to be quickly resolved.

5.2 Middle East and Caspian Region

Over the next 2–3 decades, problems may arise within the important gas exporting countries, or between these countries and OECD importers. Qatar is a small state both in terms of population and geographical area. In a relatively short time it will become the world's second largest gas exporter (after Russia) and the world's largest LNG exporter. The scale of the industrial facilities needed to develop such a large LNG export capacity (plus some of the world's largest gas to liquids facilities) has the potential to create internal political strains. At present there is an (unofficial) moratorium on new LNG projects as the country comes to terms with the scale of development to which it is already committed.

In the mid 2000s, the Iranian political relationship with the international community (and especially the United States) has become increasingly difficult. The

[53] Clingendael 2004; Shell International 2005.
[54] Correlje and Van der Linde 2006.

Ahmedinejad regime has had regular verbal confrontations with OECD countries on issues ranging from nuclear power development to the existence of Israel. Should a reference to the UN Security Council, in relation to nuclear materials, lead to international sanctions being imposed on Iran, then most (if not all) substantial international investments in Iranian gas projects would become impossible.

Reinforcing current events is a pattern of political and economic development in Iran during the past 25 years which has consistently prevented the country from fulfilling what seemed likely to be a leading role in international pipeline gas and LNG trade. In 2005, Iran exported less gas than it had prior to the Iranian revolution of 1980. Moreover, with imports from Turkmenistan (due to substantially increase in 2007) more than offsetting exports to Turkey, Iran became a net importer of gas in the 2000s – an unthinkable position for a country with the second largest gas reserves in the world (after Russia and just ahead of Qatar).

Iran has a 30 year history of LNG and pipeline export project failure with a range of buyers. There was a reminder of this history in 2006 with the apparent repudiation of the price clause in the Iran–India LNG project – signed before the most recent increase in oil and therefore gas prices – for which deliveries have not yet started.[55] While such action may be understandable, it will not encourage potential investors in, or customers of, Iran to have confidence that the country can be relied upon to honour long term gas export contracts. Because the economic value of Iranian gas,reinjected into oil fields to promote increased oil production and exports is currently several times greater than that of gas exports, the incentive to conclude gas export contracts has been significantly reduced.[56]

There are therefore good reasons to question whether Iran will become a substantial gas exporter to Europe over the next 25 years.[57] Export volumes projected in Table 1 are relatively modest in relation to total MENA exports, and would be very unlikely to include pipeline gas exports dedicated to European markets, as opposed to LNG exports from Iran for which Europe would be in competition with Pacific and (assuming a resolution of current political problems) North American markets.

These problems with Iran would be less significant for Middle East gas trade if the security situation in neighbouring Iraq was not so serious. Iraqi gas reserves are relatively modest by Middle East standards but the country's potential is believed to be significant and its proximity to Turkey – plus the existence of a previous gas trade contract between the countries – means that Iraq could become a significant source of European supplies. But the current security situation and outlook mean that secure and stable large scale gas exports from Iraq seem a very distant prospect.[58]

[55] The contract has a ceiling price based on Brent crude oil at $31/bbl. (LNG Focus 2006).
[56] IEA 2005, p. 365 shows that at a $28/bbl oil price – roughly equivalent to the price threshold in the Indian LNG contract – the value of gas is $75/mcm for the LNG project and nearly $350/mcm for reinjection.
[57] For Iran's alternative pipeline export options, see the section on China and India below.
[58] The exports shown in Table 1 up to 2020 are only for regional consumption (Iraq has a contract for export to Kuwait). The volumes shown for 2030 would only be large enough for exports to Europe if they were combined with an additional source of exports.

Thus with the exception of Qatar, the prospects for Middle East gas exports – and, in particular, pipeline exports to Europe – are relatively poor for at least the next decade and probably much longer. The best hope is for a dedicated pipeline via Turkey carrying supplies from a number of Middle East and Caspian countries – Azerbaijan, Turkmenistan, Kazakhstan, Iran and Iraq (and possibly also Egypt). None of these countries has up to now shown inclination to commit substantial volumes to the European market and, as already noted, it is uncertain whether some could be considered secure suppliers. But diverse sources of supply flowing through a single pipeline would decrease the importance of any individual supply source. This appears to be the concept underpinning the Nabucco pipeline currently being promoted by a number of central and south east European utilities and the European Commission.[59] Such pipelines from the Middle East/Caspian region are strongly endorsed by the US, EU and south eastern European governments to promote diversification away from Russian gas supplies and transport routes. However, two points should be recalled in relation to pipeline gas projects from the Middle East and Caspian region:

- they are not a new idea; there have been regular initiatives to create such projects for at least the past 30 years without success.
- it is not clear – given the number of borders which they will need to cross and the potential for problems within and between countries along the route – whether such pipeline routes can be considered more reliable than existing and new supplies from and through Russia which they are intended to displace.[60]

5.3 North and West Africa

During the mid-2000s, the Algerian political situation has been relatively calm in comparison to the decade of the 1990s. Confidence can be drawn from the fact that exports have increased substantially over the past 15 years, a period during which Algeria experienced internal upheavals and conflicts akin to a civil war. Libya has recently returned to acceptance within the international community after a long period of isolation due to international trade sanctions. The return of international energy companies to Libya is therefore a recent phenomenon and there is uncertainty about how soon gas can be developed, which partly accounts for the relatively cautious projections in Table 1.

The importance of North Africa for future European gas supply, however, goes beyond the purely numerical aspect of projected volumes. North Africa is likely to be the only supply source which will increase the volume of pipeline gas dedicated to Europe. There are not only possibilities of expanding the existing pipelines – the Enrico Mattei (Trans-Mediterranean), Pedro Duran Farrell (GME) and Green Stream lines – but also of building new ones such as the proposed Medgaz line to Spain and the Galsi line to Sardinia and Italy.

The political situation in West Africa is problematic. In Nigeria, the most important LNG exporting country, petroleum-related political unrest increased in 2006, when local communities protested against the lack of benefits conferred upon them by central government in return for what they see as the destruction of their environment

[59] EU 2006 mentions a scenario in which 10–15% of EU gas supplies would come from the Caspian region by 2025 suggesting 2–3 Nabucco-sized pipelines by that date.
[60] As illustrated by the brief disruption to the Iran–Turkey pipeline due to Kurdish terrorists in August 2006 (*Gas Matters Today*, August 23, 2006).

by energy companies. In Equatorial Guinea, where LNG exports will commence in 2007, the governance of the ruling regime has prompted serious transparency and human rights concerns, while Angola has only recently emerged from a 27 year civil war.

6. THE GAS EXPORTING COUNTRIES FORUM: AN OPEC FOR GAS?

It is still debateable whether the creation in 2001 of the Gas Exporting Countries Forum (GECF) was an event of no importance or the start of an 'OPEC for gas'.[61] In the five years since its creation, the GECF has been a rather chaotic organisation without stable membership, well-defined membership rules, mission or objectives. For external observers, this situation has not been helped by the lack of any website, official or press information about the Forum and its activities.

Many believe that the creation of the Forum can be attributed to the need felt by producers to respond to European liberalisation and the application of competition rules to the natural gas sector.[62] These EU initiatives, which were not arrived at in consultation with producers, provided a rationale for the latter to create their own organisation. Since its creation, by far the most active members of the Forum have been Iran, Algeria and Qatar, with Trinidad and Venezuela becoming more active since 2004. The intended Venezuelan presidency of the Forum in 2006 was always somewhat curious given that the country is not, and has no concrete timetable for becoming, a gas exporter. But plans for a Venezuelan presidency have collapsed and the Forum's annual meeting was scheduled for September 2006 in Qatar.

The Forum is notable for its relative lack of active pipeline gas exporters: Canada and Netherlands are completely absent; Norway is only an observer; Russia has attended all of the meetings but (as far as can be ascertained) has taken very little active part.[63] Algeria and Libya, which are pipeline as well as LNG exporters, as well as Iran, a pipeline exporter, are exceptions to this trend. No meetings of the Forum have been held in the Pacific, and Australia, an important LNG exporter to that region, has not been involved. The Forum therefore appears to be biased towards LNG exporters and, in terms of active members, heavily biased towards Atlantic rather than Pacific Basin LNG trade.

Key Forum members have strenuously denied any intention of becoming a 'gas OPEC' in the sense of a price-setting or volume-controlling organisation, and the only attempt to agree a common position on gas pricing ended in failure. Indeed there seem to be significant tensions among the members around issues of sharing commercially sensitive information and of collaboration on commercial gas sales policy. At present, the GECF shows little prospect of metamorphosing into anything akin to a gas OPEC; it would need to develop considerably greater institutional capacity and cohesion for this to become a reality. In a longer term perspective of one or two decades, the

[61] For background and detail see Hallouche 2006.
[62] In particular, the declaration by DG COMP that joint sales, destination clauses and profit sharing mechanisms in existing long term gas contracts involving EU companies were violations of competition rules.
[63] Neither has an organisation of Eurasian (CIS) gas exporters, suggested by the Russian president and prime minister in 2002–03, made any visible progress.

possibility of some type of price setting organisation should not be ruled out. The most likely characteristics of such an organisation would be the following:

- initially at least, it is more likely to be focussed on exports of LNG rather than pipeline gas, possibly because of the greater flexibility and arbitrage possibilities;
- it is more likely to develop with a regional focus – Europe or the Atlantic Basin – rather than as a global cartel;
- it is more likely to develop quickly in the context of a crisis for exporters (for instance, if prices sank to levels which threaten the profitability of new projects), rather than in the price environment of the post-2003 period.

The biggest threat could come from an agreement between the pre-eminent LNG exporters to the Atlantic Basin (Qatar, Algeria, Nigeria and Egypt) which, by acting together in a tight LNG market, could exert significant market power over importers. The sensitivity of importers to any such possibility was demonstrated by the Italian reaction to a press release following the visit of a Gazprom delegation to Algeria:[64]

> '.. the parties reviewed possibilities of jointly implementing "full cycle" projects encompassing hydrocarbon exploration, production, transmission, processing and marketing in Algeria, Russia and third countries'.

The references to 'marketing' and 'third countries' were immediately interpreted in terms of gas price collusion to the detriment of Italy, causing an appeal by that government to the European Commission.[65]

7. SECURITY AND IMPORT DEPENDENCE: EMPIRICAL OBSERVATIONS FROM THE PAST 25 YEARS

The traditional inclination among politicians and the media in OECD countries is to regard energy supplies which are produced domestically as 'secure', and supplies which are imported as 'insecure'. This dates at least as far back as the 1973 Arab oil embargo, which was a formative experience for the current generation of senior politicians and decision-makers in terms of energy security. A survey of gas security incidents since 1980, carried out by this author, classified three types of incidents: source, transit and facility.[66] During the period 1980–2001, there were one or two source incidents and some transit incidents relating to Russian gas supplies through Ukraine, but no significant facility incidents.[67] There was one incident which could be labelled as 'terrorism' in 1997 when an explosion on the Trans-Mediterranean Pipeline cut the flow of Algerian gas to Italy.[68]

Since 2001, three serious facility incidents have affected European gas supplies: the liquids contamination of the Interconnector UK pipeline in 2002, the fire at the Algerian Skikda liquefaction plant in 2004 and the fire at the UK's Rough storage

[64] Gazprom 2006f.
[65] International Gas Report 2006; the same argument was made by the CEOs of Suez and Gaz de France to support their merger, 'GdF highlights Gazprom threat' (*Financial Times*, August 29, 2006).
[66] Stern 2002.
[67] At least in Europe. Arguably the most serious gas security incident seen worldwide occurred in Australia in 1998 when an explosion at a gas processing plant deprived the entire state of Victoria of gas for nearly two weeks.
[68] Little reliable public information is available about this incident. Some anecdotal accounts suggest that the flow was cut for 45 days and this was the trigger for the building of strategic storage in Italy. For another, more recent, example of a terrorist incident see note 54.

facility in 2006. During this period the only other significant European incidents which caused significant supply shortfalls were the 24-hour interruption of Russian gas supplies to Belarus in February 2004 and the January/February 2006 Ukraine crisis. The 2004 pipeline explosion in Belgium, which killed 16 and injured 120 people, is not included here since, having occurred in July, it appears to have caused no significant supply disruption.[69]

Summarising the security incidents which have occurred over the past 25 years in Europe: there have not been very many; and those that have occurred have been divided between the three main causes (source, transit and facility) but facility incidents appear to have increased over recent years. In particular, as far as the UK is concerned, the risk of facility incidents became increasingly problematic in the mid-2000s due to the tightness of the supply/demand balance and the lack of storage capacity.[70] Despite references by the EU to problems of importing gas from 'regions threatened by insecurity', it is difficult to think of any historical incident involving political instability which has prevented gas from being delivered to Europe.[71]

There is no evidence from Europe or anywhere else in the world that imported gas supplies have been – or are necessarily likely to be – less secure than supplies of domestically produced gas. Indeed history suggests that all serious security incidents – those in which customers have lost gas supplies for a considerable period of time – have stemmed from failure of indigenous supplies or facilities. While there is no guarantee that the future will be the same as the past, no empirical experience would lead to the conclusion that a country with substantial dependence on imported gas supplies is necessarily less secure, in other words, more prone to disruption, than one which is self-sufficient. Increased security, whether for domestically produced gas or imports, requires increased diversity of sources, of transportation and transit routes, and of facilities such as pipelines, LNG terminals, processing plants and storages. Clearly the higher the percentage of gas in a country's energy demand, the greater is the importance of diversity as protection against security incidents.

Exporting countries have a very strong incentive to maintain continuous and secure deliveries due to the revenues which they earn and the importance of those revenues to corporate and national budgets. For most non-OECD gas exporting companies and countries, earnings from gas export revenues are not only very significant in absolute terms, but also as a proportion of their total revenues. Even for a company as large as Gazprom, gas export revenues in 2005 were around 55 percent of the company's total receivables and around 17 percent of total Russian foreign trade earnings outside CIS countries.[72] This is a long term stream of earnings that would not be lightly put in jeopardy by an exporting company or government and which could not easily or

[69] 'Belgian king leads mourning for victims of Ghislenghien gas explosion' (*Gas Matters Today*, August 2, 2004).
[70] Stern 2004.
[71] Although this may depend on the exact definition of 'political instability'. Political instability has delayed or prevented a number of contracts from being concluded; but the only example of political instability – meaning the inability of a central government to maintain political control over a region – which this author can recall and which has caused any protracted disruption of supplies in an ongoing contract was Indonesian LNG deliveries from Aceh (Sumatra) to Japan and Korea in 2001.
[72] Gazprom's European earnings fell from around 63% of total receivables in the early 2000s. Given the huge increase in European gas prices and volumes post-2004 this is is significant and shows the importance of increased domestic and CIS gas prices during the same period.

quickly be replaced by any other commodity. LNG suppliers have greater range of export options than pipeline exporters and could choose to supply, or not to supply, certain markets for political as well as commercial reasons. But unless there is a significant global shortage of LNG, or a concerted boycott of a particular country by a group of exporters, it is not likely that an individual importing country will be completely unable to access LNG supplies. Equally likely, if not more so, is a refusal of importing countries to trade with certain LNG exporters for political reasons.[73]

8. SECURITY INVESTMENTS IN LIBERALISED MARKETS

Two dimensions of European gas security which are only just beginning to receive the attention which they deserve are the potential problems which can be caused by infrastructure breakdown, and the question of how to ensure the availability of adequate gas storage in liberalised markets. This paper is not the place to explore these issues in any detail, but it is important to note that the fire at the Rough storage site in February 2006 – arguably Europe's most important gas security incident of the past 12 months – deprived the UK of access to around 80 percent of its stored gas for several months. Had the incident happened any earlier or later in the winter, the consequences might have been substantially more serious than the price spikes which the market experienced in the few weeks before temperatures rose and demand declined.[74]

The huge investments in both new supplies and new storage which are under way in the UK certainly contradict the views expressed in the late 1990s and early 2000s that multibillion dollar investments would be impossible to finance in a highly liberalised market.[75] However, these projects will arrive several years after the market needed them and, even when all of the storage capacity which UK investors are currently seeking to build is complete, they will only amount to around 10 percent of annual demand, substantially less than other major markets in Europe. A useful comparison could be made with Italy where a combination of shortages of Russian gas (due to the problems with Ukraine mentioned above) and very cold weather in the winter of 2005–06 forced the use of strategic storage. The Italian government considered that the country had a narrow escape when only 3.9 Bcm of gas remained in strategic storage on March 22, 2006.[76] This volume, however, was roughly equal to total annual storage capacity in the UK – a much larger gas market than Italy – at the same date. The case of the UK raises important issues about the ability of liberalised gas markets to deliver market-based security investments when these are needed.[77]

[73] For example, the possibility that in the current political climate, the US government might refuse to allow future imports of Iranian LNG.
[74] If this accident had happened any earlier in the winter and there would have been even less supply to meet demand requirements; any later in the winter and the repairs could not have been made in time to pump gas back into the facility for the following winter heating season.
[75] For a discussion of such views see Stern 2002.
[76] Garriba 2006.
[77] Clingendael 2006. The UK market framework will provide adequate supplies, but 2–3 years later than the market needed them. Whether it is able to provide the storage which is needed – and whether this problem is more related to planning constraints than to market liberalisation – is a question for a separate paper.

9. INCREASING GLOBAL COMPETITION FOR LNG SUPPLIES

9.1 The Emerging LNG Market in the Atlantic Basin

Since 2000, the LNG market in the Atlantic Basin has been transformed from a relatively limited and rigid set of bilateral trades – Algerian exports to Continental European countries – into an increasingly liquid market with a much larger number of players. There are a number of reasons for this transformation:

- substantial cost reduction in all phases of the LNG chain up to 2004, although this trend has subsequently been decisively reversed;
- the transformation of the US and UK from surplus markets with low prices to shortage markets with high prices;
- the slow pace of liberalised access to pipeline networks in Continental Europe which makes LNG a more attractive transportation option;
- greater emphasis on diversification of gas supplies to promote security, particularly in southern Europe and the UK.

The key issue for the evolution of the Atlantic Basin LNG market has been the transformation of the North American gas market. This market (comprising the USA, Canada and Mexico) is roughly 30 percent larger than that of Europe and is experiencing a similar trend in relation to indigenous production.[78] The major difference is that while Europe developed a range of imported supplies over the past 30 years, North America has remained almost completely self-sufficient, aside from marginal quantities of imported LNG. Around 2000, the North American gas market changed as both US and Canadian production began to decline. Since 2001, natural gas prices – which had been around $2/mmBtu for 15 years prior to that date – have been in the range of $4–10/mmBtu with much greater volatility. Significant additional resources remain to be developed in the US and Canada; the largest known undeveloped fields are in the Canadian Arctic and Alaska. Mackenzie Valley production can make a contribution in Canada equivalent to a baseload LNG terminal but much of it may be devoted to developing Canadian tar sands. A pipeline from Alaska, for which costs have risen to $25bn (2006) could provide around 60 Bcm/year of additional gas supplies, but the scale of that project combined with corporate, regulatory and logistical complexities means that it cannot be fully operational until 2016 at the earliest.[79] For Mexico, the issues of gas development are less related to resources, and more to a constitution which prevents foreign investment for their development.

Thus North American countries (and particularly the United States) have begun a major drive to import LNG supplies which has seen a profusion of proposals for new regasification terminals, and an expansion of existing terminals. In July 2006, there were 5 existing and 45 proposed receiving terminals in North America, all but six of which

[78] In 2005 North American (US, Canada and Mexico) gas demand was around 756–775 Bcm compared with a 'Europe of 35' (the EU plus Central/Eastern Europe and Turkey, not including Ukraine and Belarus) demand of 536 Bcm. Estimates from Cedigaz, *The Gas Year in Review 2005*, and *BP Statistical Review 2006*.
[79] Martin 2006.

were in the United States, and all but 8 on the east and Gulf coasts.[80] Of the proposed terminals, 23 had received federal regulatory approval and, of these, seven were either under construction or in the advanced stages of planning. The capacity of the existing terminals and those under construction would exceed 140 Bcm/year; terminals which have received federal regulatory approval would add a further 110 Bcm/year of capacity. The US Energy Information Administration expects US LNG imports to rise from less than 18 Bcm in 2005 to more than 80 Bcm in 2015 and to 125 Bcm by 2030. This suggests either that many terminals which are currently anticipated will not be built, or that a significant amount of excess import capacity will be created over the next two decades; others have made significantly higher import projections.[81]

In 2005, Trinidad was the major source of LNG for the US, with significant quantities from Algeria and Egypt and additional small deliveries from other African and Middle East Countries.[82] Projects under construction clearly show that Qatar, Egypt and Nigeria will become much more significant suppliers of LNG to the US. Although LNG projects to the USA from South American countries, such as Venezuela, Bolivia and Peru, have been promoted, current politics both within those countries, and between them and the United States, make many of these developments impossible.[83] Another major potential supplier of LNG to the US is Russia, with both the Shtokman and Baltic LNG projects currently targeted at North America. However, a combination of rising costs, lengthening lead times and worsening US–Russian political relations may create problems for these projects. In general, Trinidad aside, it seems most likely that incremental LNG to the US over the next 10 years is most likely to come from Middle East (Qatar) and African countries (Egypt, Nigeria and possibly Libya) which would suggest much greater competition with Europe than was indicated above.

The question of how North America gas supply and demand will unfold in a price environment of $5–10/mmbtu, which is projected to continue over the next few years, is highly uncertain. However, unless gas demand levels off and falls, North America seems set to remain a strong competitor for Atlantic Basin and global LNG supply in the 2010s. Yet so also do the major Pacific Basin importers in Japan and Korea. Given that the traditional major LNG supplier Indonesia is struggling to meet current contractual commitments and is not likely to renew most of the 16 Bcm/year of existing export contracts which expire around 2010–11, the Pacific Basin may be facing a short to medium term supply shortage, especially in the winter months.

The price that LNG can command in North America, Europe and the Pacific Basin at any point in time will be an extremely important determinant of where some of the available LNG supplies will be landed. As both the Atlantic and the Pacific Basins become increasingly liquid LNG marketplaces, this entails both positive and negative security consequences for European importers. On the positive side, a more liquid marketplace will mean that cargoes will always be available if an importer is willing to pay a sufficiently high price. On the negative side, cargoes which importers would

[80] FERC. Only terminals on the east and Gulf coasts would compete directly with Europe for LNG. Terminals on the west coast would compete with the Pacific Basin. In addition there were 21 potential terminals of which 10 were on the east and Gulf coasts, 4 were in Canada and 1 in Mexico.
[81] Martin 2006.
[82] Nigeria, Oman, Qatar and also Malaysia.
[83] Many were anyway of dubious commercial viability.

previously have been considered firmly 'contracted' to be landed at national terminals, may be drawn away by higher prices at a different location.[84]

Extreme temperatures and other weather events have become major determinants of short term trade flows and prices on both sides of the Atlantic – but especially in North America – and will affect short term production and demand unpredictably.[85] Gas prices on both sides of the Atlantic have appeared to fluctuate in a band where the floor is set in the summer by the heavy (residual) fuel oil price and the ceiling in the winter by the gasoil price. For Europe, this band is roughly determined by the indexation of long term gas contracts. In the US, it appears to be set by interfuel competition which dictates that if the summer price of gas (at the margin to meet the air conditioning load) falls below that of heavy fuel oil, gas demand, and therefore prices, will increase; by contrast in the winter if gas prices rise above those of gasoil for heating, large consumers with fuel flexibility switch to gasoil causing gas demand and prices to fall.[86] These processes mean that Atlantic Basin gas prices have very similar dynamics, albeit somewhat delayed in Europe due to the operation of contracts, which would suggest that no significant price differential is likely beyond that of short term supply and demand fluctuations caused by weather-related events.[87] The frequency and extent of those fluctuations, and whether they produce similar or opposite price movements, will determine the extent of LNG arbitrage opportunities and the future development of short term trade.

10. COMPETITION FOR GAS FROM CHINA AND INDIA

As the 2000s have unfolded, it has become clear that developing countries, particularly China and India, are having an increasingly significant impact on global energy demand. In neither country is gas yet an important fuel, providing less than 3 percent of Chinese, and 8 percent of Indian, primary energy demand. But with coal-dominated energy balances, serious urban pollution problems and limited indigenous gas resources, both countries have a significant need for imported energy, particularly gas. During the early 2000s, both countries developed plans for very substantial gas imports with LNG apparently the dominant import mode under consideration.

China has one operating LNG terminal, another under construction and up to a further 9 in various stages of planning. However, the significant increase in oil and therefore LNG prices since 2003 has undermined the Chinese programme. The majority of the regasified LNG will be used in power plants where the competing fuel is coal, but it is not possible for LNG to compete in the power sector at the prices seen in the Pacific market since 2004.[88] Since late 2005, aspiring Chinese LNG importers have lost out to their Japanese and Korean competitors and, under pressure from suppliers, were forced to agree to a significant upward revision of prices under current contracts.[89] While Chinese companies still appear to be pressing ahead with new terminals, the sources of

[84] This could be a different European location, but is most likely to be a location on the other side of the Atlantic.
[85] For example the impact of tropical cyclones Rita and Katrina on production in the Gulf of Mexico was still evident one year later (EIA 2006a).
[86] Foss 2006.
[87] It is not certain whether the fall of US gas prices below residual fuel oil in the early months of 2006 was a "blip" which finished in July, or whether it suggests some more complex price dynamics.
[88] For details of the competitive position of LNG in China see Miyamoto and Ishiguro 2006.
[89] Gas Matters 2006b

gas for these terminals is not clear, certainly not on the scale of 70 Bcm/year which some projections suggest by 2015.[90] These events may be among the major reasons why, in 2006, Chinese gas import policy appears, to some extent, to have reoriented away from LNG towards pipeline gas.

Indian LNG importers, although they are better located in respect of Middle East supplies, are in a similar position to their Chinese counterparts, that is, unable to compete on price with the richer Pacific competitors and therefore struggling to obtain either long term LNG supplies or spot cargoes. In this commercial environment, the two existing LNG receiving terminals may be underutilised, while the Dabhol power station, which was intended to be fired with gas from the Dabhol LNG terminal (due to open later in 2006), could be forced to operate using naphtha at least in the short term.[91]

The position of India and China is similar in another respect in that both countries have opportunities to import substantial volumes of pipeline gas: China from Eastern Siberia and the Russian Far East and to a lesser extent Central Asia; India from the Gulf and Central Asia. The location and magnitude of the Russian resources in Eastern Siberia and the Far East means that the natural market will be China and there will be only limited competition for these resources from other importers and also that for East Siberian gas the most efficient means of transport will be via pipeline rather than as LNG.

A protocol was signed in March 2006 between Gazprom and CNPC (in the presence of the presidents of both countries) for deliveries of pipeline gas from Russia to China.[92] The Protocol envisages two pipelines supplying China with gas from western and eastern Siberia. There has been discussion of a pipeline from western Siberia with commercial talks concluded by end-2006 and gas flowing by 2011.[93]

Not only does this timetable seem highly optimistic but the notion of selling gas to China from western Siberia seems very unattractive for both parties: for Gazprom, because taking gas from west Siberian fields to China means building a new 2,800km pipeline from the Yamburg field through the Khanti Mansi, Tomsk and Altai regions to the Chinese border from where it will need to be piped a further several thousand kilometres to centres of demand, as opposed to taking the gas through existing pipelines from western Siberia to supply European markets at oil-related prices; and for CNPC because it may be required to pay an oil-related price for supplies from western Siberia which it will then need to transport an additional several thousand kilometres further east for use mainly in power stations where the competing fuel will be domestic coal.

China is in advanced negotiations for pipeline gas imports from both Kazakhstan and Turkmenistan. Agreement was reached between the Turkmen and Chinese governments for a pipeline carrying 30 Bcm/year for 30 years starting in 2009.[94] But this will require a pipeline of around 2,000 km through Uzbekistan and Kazakhstan, just to reach the Chinese border; a gas pipeline from Kazakhstan parallel to the oil

[90] EIA 2006.
[91] The Dabhol power project has been renamed Ratnagiri Power and Gas.
[92] Gazprom 2006c.
[93] Gazprom 2006d.
[94] Aside from any other aspect of this project, the date of 2009 seems wildly optimistic (BBC Monitoring Service 2006b).

pipeline between the countries would be around 1,000km. It is possible that Chinese importers are trying to create price competition between Central Asian suppliers and Gazprom. Given the problematic commercial viability of all of these projects, their possibility of success remains to be seen.

India has the opportunity to import gas from the Gulf both by pipeline and as LNG. Plans for both types of projects from Iran are already well advanced, but the pipeline project requires transit across Pakistan. There is also the long-discussed TAP pipeline project from Turkmenistan to India via Pakistan and Afghanistan. India also has the possibility of importing gas from the east, with both Bangladesh and Myanmar as possible sources of supply.[95] But there are significant political problems in relation to all Indian pipeline gas imports: first, dependence on transit through Pakistan to the west or Bangladesh to the east, raises serious issues of security given the at best uneasy, and at worst hostile, bilateral relationships between India and its neighbours; second, there are problems with Iran as a supplier given US opposition to large scale energy projects involving that country.

Thus for India and China, a strong case can be made that their natural suppliers are Gulf and Central Asian countries and Eastern Siberia/Russian Far East respectively, and that the most advantageous mode of transportation is pipeline gas. It makes less economic sense for these relatively poor countries to attempt to compete with much richer OECD importers for LNG, when they could import pipeline gas supplies for which – certainly in the case of East Siberian gas and arguably for other sources – they have few competitors. Should they choose to compete for LNG supplies with Europe (and the US) then this will be for Middle East supplies, principally from Qatar. What this picture suggests is that neither China nor India is likely to become, or seek to become, a serious competitor to Europe for gas supplies up to 2020. The one area where this judgement may be in doubt is in respect of western Siberian gas where Gazprom and CNPC are discussing a pipeline project to China which cannot be ruled out, despite being by international commercial standards unattractive for both parties. However, to the extent that the political and geopolitical problems suggested in this paper create limits on Russian and Middle Eastern gas exports to Europe and North America, China and India may become more attractive markets for those exporters.

11. THE NEW SECURITY ENVIRONMENT: SHORT AND LONGER TERM CONSIDERATIONS

11.1 Short term

For the next few years, the European gas security discourse will be dominated by the problems between Russia and the countries which transit its gas to Europe, principally Ukraine but also Belarus. The current problems in the gas relationship, particularly between Russia and transit countries, are commercially and politically complicated and will take time to resolve. During this period there will be nervousness about maintaining Russian exports to Europe, especially during winter months. Established

[95] In early 2006, the Indian Company GAIL called for expressions of interest from companies to develop ships to bring compressed natural gas (CNG) from Myanmar. Richa Mishra, 'GAIL to call for Eols to transport CNG from Myanmar' (*The Hindu*, February 15, 2006).

institutions, such as the EU–Russia Energy Dialogue and the Energy Charter Treaty, should play a role in helping to resolve these problems.

Over the same time period at least as much, and probably more, attention should be devoted to dealing with the risk that end-users could be deprived of supply due to a combination of infrastructure failure and insufficient storage to meet extreme weather conditions. Ensuring adequate supplies to meet peak demand, and preventing domestic infrastructure failure, particularly in countries such as the UK which have limited storage capacity and deliverability relative to the size of their markets, will be of paramount importance.

11.2 Longer term

Over the next 10–15 years, European gas supply availability will be adversely affected by a combination of three factors: first, ongoing indigenous resource depletion, second, political and geopolitical problems between Russia and CIS countries, within the Middle East/Caspian region and between these regions and EU countries, and, third the globalising market for LNG in the Atlantic and Pacific Basins.

For the period up to 2020, this paper has advanced a series of propositions about the development of European gas supply:

- European gas production will not increase significantly after 2010 and is likely to fall; this decline is likely to accelerate after 2015.
- Russian gas exports to Europe will plateau at around 200 Bcm/year over the next decade and will not rise thereafter. This limit will result from a combination of two factors: first, European unwillingness to become more dependent in either volume or percentage terms on Russian gas, due to a deterioration of the political climate between Moscow and European capitals and between Moscow and Washington DC and second, Gazprom reluctance, and perhaps inability, to increase exports above this level due to a combination of shortage of available gas in the 2010s, a desire to diversify exports away from Europe towards Asia and North America, and decreasing commercial attractiveness of European sales compared with Russian domestic sales.
- Large scale (50–100 Bcm/year) exports of Middle East and Caspian gas to Europe *by pipeline* are extremely unlikely given the institutional/political/ geopolitical outlook. Several Middle East and Caspian exporters could combine supplies through one or more pipelines, but this will be a complex task with no guarantee of success.
- The best prospects for substantial additional pipeline gas dedicated to the European market will be from North African countries. But these producers have domestic gas requirements which may limit their ability to substantially expand exports and, even when they choose to do so, they may, like those in the Middle East, prefer the flexibility of LNG exports to the relative rigidity of destination which pipeline gas dictates.
- West African LNG supplies, specifically from Nigeria, are probably the best hope for a significant expansion beyond currently anticipated projects, but domestic politics may complicate a major expansion of exports.

- Increasing competition for LNG supplies with North American and Pacific importers may constrain European options regarding additional large scale gas deliveries dedicated to Europe.

If the assumptions which underlie these propositions are correct, this paints a picture in which, after 2020, the source of the next supply increment of 50–100 Bcm/year for European markets is not obvious. To repeat what was said in the introduction, this judgement is not related either to the existence of gas resources or the commercial profitability of bringing these resources to Europe at current gas prices. There is an abundance of known reserves in countries with the potential to deliver gas profitably to Europe at prices well below those of 2006. This situation is entirely different to a past in which the main constraints on natural gas development appeared to be whether the industry could develop the technology to deliver challenging projects, or whether prices would be sufficiently high to allow such projects to be commercially viable.

The resource, supply/demand and geopolitical picture which has been painted here is not predetermined. Prior to 2020, the long term time horizon of this paper, there is still time for the outlook to change:

- new resources could be discovered in European countries, and the infrastructure built to deliver them to markets;
- political and geopolitical changes could create a more favourable environment for gas development and transportation to European markets, although some of the problems in the current political and geopolitical environment for gas supplies – particularly from the Middle East – appear relatively intractable;
- gas demand (and therefore supply requirements) could be reduced by a combination of the adoption of non-gas fired power generation, and reduction of demand in the non-power sector through efficiency measures driven by high prices.

To the extent that these developments do not happen, political constraints and increasing global competition for LNG may limit the prospects for European gas supplies particularly after 2020. This should not give rise to any immediate panic about security of European gas supplies. Some European political and commercial reactions to perceived threats from exporters seem extreme. Despite the fact that there is no sign that an ‘OPEC for gas’ is on the horizon, any suggestion of collaboration between exporters, as in the 2006 discussions between Russia and Algeria, created an extreme reaction from some European importers including calls for EU intervention. It should not automatically be assumed that gas exporting companies and governments are intent on collective action to control volumes and prices to the detriment of EU importers.

Exporting countries have reason to believe that they have been subject to collective commercial decisions of importing countries. The introduction of EU gas liberalisation and competition policies has not only increased commercial complexity for exporting countries, but requires them to conform to rules with which they may not agree. These measures have the aim of introducing gas-to-gas competition which, from the perspective of exporters, can only reduce their financial returns. In such circumstances, and given the current oil price environment, it would not be surprising

for exporters, who have a growing share of the European gas market, to seek to retain oil-linked gas pricing.

In the mid-2000s, a combination of much higher export prices and growing internal demand is causing major gas suppliers to Europe to review their future plans. Much higher revenues than anticipated a few years ago have removed the pressure to increase export volumes, while countries with large populations are finding that the requirements of domestic energy markets are raising the issue of a limit on exports. Indonesia is the clearest example of a major gas exporter which, in the mid-2000s, is unable to service existing long term contracts to Asian customers due in part to increased domestic gas demand, and has made it clear that many contracts will not be renewed when they expire. Tension between rising domestic requirements and exports may become more common among suppliers to the European market, particularly if price liberalisation in exporting countries increases the commercial profitability of sales to domestic markets.

If not reversed, the combination of impending decline of indigenous production, political and institutional obstacles to gas export developments within gas supplying countries, and the worsening geopolitical environment between those countries and Europe, will place longer term supply constraints on European gas consumption. Specifically these constraints threaten the expansion of natural gas as a fuel for power generation in Europe after 2020. From a broader European energy perspective, this may present no significant problems as other energy sources are mobilised to fill any potential gap left by gas. However, from a carbon emissions perspective this has a serious consequence. If gas is unable to take a larger share of the power generation market then the gap is most likely to be filled by coal, unless a combination of demand reduction, new and renewable energies and nuclear power make much faster progress than currently anticipated. In those circumstances, the new security environment would mean that not only would gas fail to provide any part of a ‘bridge’ to a lower carbon electricity future, but also that after 2020, natural gas would become a ‘sunset industry’ in Europe.

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