Gas for Europe

A supply crunch is looming

Claims that Europe will face a natural gas supply crunch over the coming two decades have proved controversial. But the facts show that the situation is going to be very, very tight. Certainly an LNG supply crunch around 2012/13 looks inevitable.

by Alex Forbes

Last year, Paulo Scaroni, chief executive of the Italian oil and gas major Eni, called for urgent action to avert a gas supply shortage in Europe. In a hard-hitting speech at the World Energy Congress (WEC) in Rome, Scaroni said that incremental consumption growth and the need to replace ageing power stations were likely to lead to demand being 40% higher by 2020. Meanwhile, he added, indigenous production in the European Union was expected to halve. The net result, he said, would be that Europe would need to import double the amount of gas that it does now. So imports would need to rise from 300 bcm (billion cubic metres) per year to 600 bcm/year. That, he concluded, would be 'a tall order to fill'.

It is no wonder that some EU officials are becoming concerned

Assuming that Scaroni's analysis was correct, since he made that speech the order has become taller still, because of factors affecting both demand and supply. These factors include geopolitical developments such as the war in Georgia, the ongoing nuclear stand-off between Iran and the United Nations Security Council, and climate change. However, also significant are changing energy demand patterns in some of the main gas-producing nations, notably those of the Middle East, which are likely to affect the availability of supply for Europe. Consequently, there is a growing likelihood that Europe could indeed face some kind of gas supply crunch, perhaps as soon as the middle of the next decade.

There is widespread consensus that global demand for natural gas is set to rise significantly over the coming two decades. The International Energy Agency (IEA) projected in its 2007 World Energy Outlook that, in a business as usual scenario, demand for gas would grow from 2,850 bcm in 2005 to 4,780 bcm in 2030, a rise of 60%, equivalent to average annual growth of 2.1%.

There is also widespread consensus that sufficient proved reserves of natural gas exists to meet demand growth on this scale. Statistics recently published by BP indicate that total proved reserves of natural gas at the end of 2007 were 177 Tcm. Dividing this figure by marketed production in 2007 gives a reserves/production (R/P) ratio of 60.3 years. In other words, existing reserves are sufficient to meet current demand levels for more than 60 years. So, in theory, a rise of about 50% in global gas demand by 2030 should still leave enough gas to take us to around the middle of the century. Unfortunately, this picture ignores some fundamental realities, two of which are particularly important. The first is that the average distance from reserves to markets is on the increase. The second, related to the first, is that the mere existence of reserves does not mean that they will be accessible to all – for reasons of politics, physics or price.

Demand outlook

According to a forecast published by Eurogas, an industry association, European demand for natural gas is set to rise from 505 bcm in 2007 to 642 bcm by 2020, a difference of 137 bcm, or 27% – not quite as high as Scaroni's 40% but still substantial.

Meanwhile, Eurogas expects the contribution of indigenous production (including imports from Norway) to fall from 59% of consumption in 2007 (298 bcm) to around 33% (212 bcm) of consumption by 2020, a difference of 86

Export status of top ten holders of proved gas reserves at end-2007

Ranking		Tcm	% of total	R/P ratio	Status as gas exporter
1	Russian Federation	44,65	25,2%	73,5	Largest producer and exporter of natural gas, with plenty of reserves to allow expansion. However, there are concerns that it is not investing enough upstream to meet future supply commitments. Europe is concerned about becoming overdependent on Russian supply.
2	Iran	27,80	15,7%	*	Major gas producer but current exports are more than offset by imports, making Iran a net importer. Winter shortages have led to opposition to growing exports. Meanwhile, increasing political isolation is making new export deals difficult.
3	Qatar	25,60	14,4%	*	Rapidly ramping up production to meet export commitments, mostly in the form of LNG. However, moratorium on new gas production projects unlikely to be reviewed before 2010.
4	Saudi Arabia	7,17	4,0%	94,4	Major gas producer but has no plans to export because all production is needed at home.
5	United Arab Emirates	6,09	3,4%	*	Long-time LNG exporter but now a net gas importer and facing shortages
6	US	5,98	3,4%	10,9	Structurally short of gas despite being a major producer. Exports of LNG to Japan and pipeline gas to Canada and Mexico are vastly outweighed by imports of pipeline gas from Canada and LNG. Anticipation of rising demand for LNG was a prime factor behind projections for rapid growth of the industry, however imports are currently low because of higher prices available elsewhere.
7	Nigeria	5,30	3,0%	*	Major exporter of LNG and also exporting pipeline gas. Proposed new projects struggling to reach final investment decision.
8	Venezuela	5,15	2,9%	*	Long-held ambitions to become a gas exporter have yet to reach fruition but Venezuela now hopes to start exporting LNG from 2014. Gas imports from Colombia began in 2007.
9	Algeria	4,52	2,5%	54,4	World's third-largest exporter of gas after Russia and Canada. Already heavily committed to LNG and pipeline exports and has several projects under way to expand these to more than 85 Bcm/year by 2012.
10	Iraq	3,17	1,8%	*	Potential to become a major gas exporter. Political and security situation making development difficult but the outlook is starting to look a little brighter. A long-term option.

** More than 100 years.*

bcm. This would leave Europe needing to import an additional 223 bcm (with total import requirements at 430 bcm) – again, not quite as high as Scaroni's 300 bcm but still a very large amount of gas. To put this in context, it would require seven pipelines to be constructed with the capacity of the proposed 31 bcm/year Nabucco project. That said, some of the required gas is already contracted or could be by prolonging some existing contracts where the option exists. Nevertheless, according to Eurogas, that still leaves a supply-demand gap of 50 bcm in 2015, rising to 127 bcm by 2020.

There are, of course, many uncertainties associated with making long-term demand forecasts, one of the most significant being price. Eurogas warns that 'future demand increase may not be as strong as forecast above, because of higher and more volatile natural gas prices, the effect of environmental protection measures, the increased use of renewables in power generation and in the heat market, a possible revival of nuclear energy and the greater climate change awareness.'

So where might the necessary gas come from? Even a basic analysis shows that the range of supply options is surprisingly narrow – and getting narrower.

Supply options

The accompanying chart shows the top ten holders of proved gas reserves at the end of 2007, according to statistics published by BP. Together these ten countries hold more than three-quarters of the global total, yet several are net importers whilst a number of others would struggle to expand exports beyond existing commitments.

> *There is a growing likelihood that Europe could indeed face some kind of gas supply crunch*

One striking aspect of this chart is that the reserves in the top three countries – Russia, Iran and Qatar – are an order of magnitude larger than in the others. Together they hold 55% of global reserves, yet each faces challenges in growing exports beyond those already committed.

Russia is the world's largest producer and exporter of gas. Already the biggest source of supply for Europe, its importance is certain to increase as European demand grows. However, there are concerns that Russia has not been investing enough upstream to expand production sufficiently to meet its aspirations for future exports. Moreover, the European Union is concerned about becoming overdependent on supply from a single source.

Iran, which holds the world's second largest proved reserves, has huge potential – and ambitions – to become a major exporter of gas. It is one of the few countries in the Middle East with sufficient proven reserves to comfortably supply both a large domestic market and substantial exports. However, since Mahmoud Ahmadinejad became president in mid-2005, much-needed new initiatives in the oil and gas sectors have made scant progress. In 2007 Iran remained a net importer of gas. Exports to Turkey and Armenia of 5.6 bcm were more than offset by imports from Turkmenistan of 6.2 bcm. The outlook for growing exports is bleak, with plans for both pipeline and LNG exports facing considerable obstacles.

The war between Georgia and Russia has highlighted the vulnerability of the South Caucasus Pipeline

Qatar has made an astonishing success of developing the massive gas reserves in its offshore North Field, mostly for the export of LNG. It did not export its first cargo of LNG until 1997, yet less than a decade later had become the world's largest exporter. Qatar is also exporting gas by pipeline to the United Arab Emirates and Oman, and is developing a wide range of gas-based industries that includes petrochemicals and gas-to-liquids. Such has been the pace of gas development that in April 2005 Qatar Petroleum imposed a moratorium on new projects utilising North Field gas. It was imposed to give engineers time to study how production histories compare with the original reservoir models. It will not be reviewed until at least 2010, when the reservoir studies are due to be completed. It is, however, possible that even after this review, Qatar may feel that it has enough gas production capacity to be going on with, given the desire of the emir and the energy minister, Abdullah bin Hamad Al Attiyah, to preserve resources for future generations. Even if Qatar does launch a second wave of gas development, much of the new gas is likely to stay within the Middle East. Of the six nations of the Gulf Co-operation Council (GCC), Qatar is the only one not facing existing or looming shortages of natural gas. This helps to explain why the GCC nations are seriously considering launching a programme of nuclear power development – despite their oil and gas riches.

Nigeria has become a major exporter of LNG and also recently began exporting gas via the West Africa Gas Pipeline project. Its existing LNG complex, Nigeria LNG, has six operational production trains with total capacity of 22 million tonnes per annum (mtpa), which is 30 bcm. A seventh train is planned, which would take total capacity to 30 mtpa (41 bcm), but it is not clear when a final investment decision (FID) will be reached. An eighth train is being considered, which would add another 8 mtpa but the timescale for that is vague. Several green-field LNG projects, in various phases of development, are struggling to reach final investment decision. They include Brass LNG (10 mtpa or 14 bcm) and Olokola LNG (22 mtpa or 31 bcm). There is also a proposal to construct a gas pipeline across the Sahara to Algeria. That too has yet to reach FID.

Algeria has a sizeable domestic market and major pipeline exports to service. It is one of the largest producers of LNG but capacity is expanding slowly. A 4 mtpa (5.5 bcm) plant to replace capacity destroyed in an explosion in 2004 is due on stream at Skikda in 2011 and the first 4.7 mtpa (6.5 bcm) train of the Gassi Touil project is due on stream before the end of 2012. The nation exports large volumes of gas to southern Europe via existing pipelines that are being expanded, and another two such pipelines are under development: the Medgaz line to Spain and the Galsi line to Italy. Algeria has a target of exporting 85 bcm/year by 2012.

Saudi Arabia, which has the fourth-largest reserves, has said it does not plan to export gas until at least 2025. The US, Venezuela and Iraq also look unlikely suppliers for Europe. So, of the top ten, only Russia, Qatar, Nigeria and Algeria are likely to be able export gas to Europe, beyond what they have already committed, in the foreseeable future. And all four face challenges and uncertainties.

What about other options lower down the list of reserves holders? Libya currently exports a small amount of LNG to Spain and has become a major pipeline supplier to southern Europe through the Green Stream project. This pipeline is to have its capacity expanded by 3 bcm and Eni intends to construct a 5 bcm/year LNG export plant at Mellitah. Otherwise, new discoveries will need to be made if Libya is to commit to further exports. Egypt has become a significant exporter of LNG and was at one time seen as a potential exporter of gas to Europe through the Arab Gas Pipeline. However, the exploration successes of the latter half of the 1990s have not been matched in recent years and the country is now struggling to source new supply to expand its LNG exports and to meet domestic demand. Azerbaijan already supplies Turkey and has potential to supply gas further into Europe from the Shah Deniz reserves in the Caspian Sea. However, the war between Russia and Georgia has highlighted the vulnerability of the South Causasus Pipeline that transports this gas to Turkey. Turkmenistan could supply Europe but only if a subsea

> *'Europe will need to double its import of gas'*

Final Investment decisions on LNG projects - 2006-2008

Project	Shareholders	LNG capacity (mtpa)	FID date	EPC contractor	EPC value (US$)	Specific capital cost ($/t/year)	Specific capital cost ($/t/year)	Notes
Peru LNG	Hunt Oil Company (50% - operator) SK Corp. (20%) Repsol YPF (20%) Marubeni (10%)	4,45	'December 2006	Chicago Bridge & Iron	$1.5 billion	$337	First half of 2010	Total project cost, including financing costs, is expected to be $3,800 million
Pluto	Woodside (90% - operator) Tokyo Gas (5%) Kansai Electric (5%)	4.8 (Woodside expects annual production of 4.3 mtpa)	July 2007	Foster Wheeler & WorleyParsons	$10 billion**	$2,080**	Early 2011	Specific capital cost for the onshore plant has been estimated by some observers at $1,200-1,400/t/y
Skikda re-build	Sonatrach	4,5	July 2007*	KBR	$2.8 billion	$622	2011	-
Angola LNG	Sonangol (22.8%) Chevron (36.4%) Eni (13.6%) Total (13.6%) BP (13.6%)	5,2	December 2007	Bechtel	Not disclosed	-	Early 2012	-
Gassi Touil	Sonatrach	4,7	July 2008*	Chiyoda/ Snamproggetti	$4.6 billion	$970	End-2012	-

** Date that EPC contract award was announced, ** includes investment for upstream production*

pipeline is laid across the Caspian Sea. This would require resolution of a long-running dispute over how the Caspian should be divided up amongst the littoral states.

LNG supply crunch

What about the prospects for more LNG? Expectations have been that the LNG industry would continue to grow at or above 7-8%/year, as it has over the past decade. However, it now looks inevitable that growth will start to be constrained early in the next decade by a shortage of supply. The rationale for this view is simply that there have been very few final investment decisions on new liquefaction plants since the start of 2006.

The accompanying table shows that there have been just five FIDs for new liquefaction plants over the past two-and-a-half years, representing capacity of just 23.7 mtpa (32.7 bcm), and the chances of another FID being reached before the end of the year are not high. It takes around four years for a liquefaction plant to go from FID to first production, so supply is likely to be constrained from around 2011/12.

Between now and then plants already under construction will be coming on stream to meet incremental demand growth, notably the six mega-trains that are under construction in Qatar, each with capacity of 7.8 mtpa (10.8 bcm).

If Eurogas is correct about a supply-demand gap of 50 bcm/year in the EU by 2015, it is clear that filling this gap will not be straightforward, particularly if it grows to over 120 bcm five years on – even without competition from other gas-hungry regions.

It is no wonder that some EU officials are becoming concerned, as indeed is the IEA. EER has learned that the issue of possible gas supply shortages will be one of the themes of the agency's next World Energy Outlook. It is due to be published on 12 November. ■