BBL REINFORCES THE EUROPEAN NETWORK

M. Bosman

The Netherlands
1. ABSTRACT

The European gas market is mature but is still developing. The main suppliers to Europe are Russia, Norway, The Netherlands and Algeria. New pipeline connections are planned and also an increase of the supply of LNG is expected.

Focussing on the east-west axe of Europe, we see huge supplies in Russia and huge demands in Western Europe. The UK is expecting shortages of natural gas supply in the near future. In this paper these developments are described and a description is given of the Balgzand-Bacton Line (BBL), which will connect the transmission grid in The Netherlands with that of the large UK gas market. After EU commitment to allow for an exemption from EU regulation, Gasunie, E.ON Ruhrgas and Fluxys have founded the joint venture BBL Company VOF in 2004. An overview will be given of this venture and the latest developments on this new interconnector are given.
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2. INTRODUCTION

The European gas network has expanded rapidly in the last 40 years. This expansion began in the late 1960s when the Groningen gasfield was connected to Germany, Belgium, France and Italy. Algeria also began the large-scale export of LNG, mainly to Italy, France and Spain. This was followed by the laying of gas pipelines to Sicily and Italy via the Mediterranean and Morocco and to Spain via the Strait of Gibraltar. Norway discovered major offshore reserves of its own and connected these via pipelines to the UK, Germany, Belgium and France.

Figure 1: European gas network

Russia was also found to have extensive gas reserves. These were connected to Italy, France, Germany and the former Eastern bloc countries. For a detailed account of the development of the gas industry in Russia, see the recent book by Professor J. Stern (1). The European gas market is therefore justifiably referred to as a mature market. However, it differs from the US natural gas market in that competition and liquidity on the latter are further developed than they are in Europe. Developing natural gas markets requires massive investments. A report by Patrick Cayrade of the Centre for European Policy Studies (2) concluded that over the next 20 years, the EU will need to invest between USD 150 and 200 billion in its pipeline connections and LNG receiving facilities if it is to satisfy future demand.
3. THE DEVELOPMENT OF GAS INFRASTRUCTURES

We can use three key factors and the way they interact to encourage the development of infrastructures as a theoretical model. The first of these three factors is the distance between natural gas sources and markets. This largely determines the investments that are required to supply the market with natural gas. The costs of developing gasfields can be very high; however, they are not included in this analysis of infrastructure developments.

The second key factor which determines the development of infrastructures for gas transport is the attractiveness of gas markets. In other words, how easily can natural gas be taken up by a market? Have initial investments already been made for distribution networks and industrial and domestic applications, or are there still major thresholds to overcome?

The third factor influencing the development of gas infrastructures are national and EU energy policies. To what extent is the consumption of natural gas being promoted and what regulations are in place to give investors the confidence to make decisions concerning new pipelines, etc?

Figure 2: The development of gas infrastructures

These three factors are illustrated in figure (2). Subsidiary factors are shown along each side of the triangle. I will give you two examples of how they interact. When we consider the factor of distance between gas sources and markets and the factor of market development, we tend to ask how attractive the market is and what investments it would be responsible to make. A second question concerns the best form of transport: is it a pipeline or is it LNG? There are obviously many dimensions to these fundamental questions. They include anticipated fluctuations in natural gas prices, uncertainties relating to the countries a pipeline would have to pass through, technological developments, financing options, and so on.

My second example is the combination of another two factors, namely the distance between sources and markets and energy policy. The questions which then arise concern the choice of the gas supply portfolio, security of gas supply, strategic and tactical gas supplies, and provisions to meet exceptionally high demand during cold spells (this mainly applies to north-western Europe).
If we apply this theoretical model to the EU gas market, this raises questions like: what were the circumstances under which these massive investments were made? We can then ask ourselves what we need to do in the future to guarantee that investments in the order of USD 150 to 200 billion continue to be made.
4. THE UK NATURAL GAS MARKET

The market for natural gas in the UK has evolved rapidly. The UK gas market has been given a substantial boost by the discovery of its own offshore gasfields (the UK Continental Shelf (UKCS)) and the supply of natural gas from Norway. The opening up of the gas market was followed by plans for a gas pipeline to link the UK with the Continent and this was followed in 1994 by the launch of Interconnector UK (3) and the export of natural gas to Belgium and the Netherlands. Demand for gas in the opposite direction quickly followed. The UK has recently become a net importer of natural gas due to the decline in production from UKCS.

![Figure 3: UK supply and demand (volume per year)](image)

The diagram above (figure 3) gives a forecast of supply and demand on the UK market. It shows that there will be a structural shortage of natural gas from 2008 onwards. Many market players have anticipated this and have responded with various plans for the transport of LNG. LNG has been supplied to the Isle of Grain since mid-2005 and there are also plans to supply LNG to Milford Haven in the near future. Another initiative is to build a pipeline connection from Balgzand in the Netherlands to Bacton in the UK and a new pipeline connection with the Norwegian fields via the Langeled pipeline to Easington.
The current expectation is that there will be fierce competition between buyers in the US and UK, thereby making it unclear whether the UK will be able to attract the volumes of LNG it needs. In volume terms, this does not appear to present a problem. However, if we look at the projected gas supply for a cold day in the UK in 2015, then shortages are likely to arise (see figure 5).

Figure 5: UK Capacity demand – coldest day (2015)
This explains the existing nervousness in the UK gas market and why record prices are being paid in winter for spot gas (e.g. £1.70 per therm on 21 November 2005).
An interesting report by ILEX Energy Consultancy (4) examines this problem and the need to expand underground storage facilities such as depleted gasfields. Problems, however, include the lengthy construction periods, the substantial investments required and uncertainty regarding price movements.
5. THE BALGZAND-BACTON LINE (BBL)

There have been plans to build a gas transport pipeline between the Netherlands and the UK for some considerable time. However, the investments required are high, which means there must be sufficient confidence that these investments will be recouped. In terms of the theoretical model for the development of gas infrastructures, the situation is as follows. The UK market is highly developed. In the longer term, however, the UK’s offshore fields and imports of Norwegian gas to St Fergus will not be enough to satisfy its energy requirements. There is however no explicit European energy policy as such. This became painfully obvious during the first week of 2006, when Russia briefly suspended gas exports to Ukraine and the EU realised it could offer no considered response. To date, the EU has mainly been concentrating on liberalisation and regulation. Investor confidence in the profitability of gas infrastructures has declined. Following years of general planning, preparations were finally tackled in 1998 and a basic design and a feasibility study were realised. EU regulations governing transport infrastructures gave rise to uncertainty about whether the BBL would be profitable enough. Intensive negotiations were therefore conducted with the European Commission and this generated sufficient confidence that BBL would be exempted from EU regulations. In 2003, an open season was organised. This eventually resulted in three long-term transport contracts. The BBL pipeline was designed on the basis of these contracts. It will consist of a 234-km offshore pipeline 36 inches in diameter, with a compressor station at Anna Paulowna (NL) and receiving facilities at Bacton.

In July 2004 a separate company was established. A joint venture BBL Company V.O.F. with the partners Gasunie BBL B.V. (60%), E.ON Ruhrgas B.V. (20%) and Fluxys BBL B.V. (20%). The first action of this company was to conclude contracts for engineering, procurement and construction of the BBL pipeline:

- Construction of a compressor, mixing and metering station near Anna Paulowna (NL).
- Construction of an onshore pipeline from Anna Paulowna crossing the dunes and a landfall at the Dutch coast.
- Offshore pipeline crossing the North Sea from the Netherlands to the UK.
- Landfall and shore approach at Bacton.
-Receiving facilities at the Shell Bacton Gas Plant: flow control, gas heating and metering and connection to the National Grid in the UK.
6. THE ROLE OF BBL IN EUROPE

The originator of the BBL, Gasunie Transport Services (now N.V. Nederlandse Gasunie), believed that on a European scale, a second physical link between the large markets of the UK and continental Europe increases the source of gas from a greater diversity of sources and thus increasing the scope for arbitrage. The BBL strengthens both delivery capacity and security of supply in the European single market, especially for the UK, which will gain a new supply route along which the expected supply-side deficits in the UK can be alleviated. The UK may also benefit from the increased possibilities for new entrants to the UK gas market that the BBL offers. For Continental Europe, having the ability to carry gas to the most liquid market will also have a beneficial effect on the operation of the internal market.

Moreover, the BBL forms a potential part of the Baltic pipeline, enabling a connection with the enormous Russian gas reserves. Building the BBL could in fact have a positive effect on the establishment of a link to the Baltic pipeline in the Netherlands, thus increasing security of supply for both the UK and the Netherlands. The BBL pipeline will play an important role in bringing Russian gas to the UK in the future.

Figure 6: Pipeline system overview

The operation of the Dutch gas market may be improved as a result of the BBL interconnector, by reason of increased arbitrage possibilities. Furthermore the BBL will not lead to any crowding out of existing gas flows in the Netherlands, particularly to domestic gas customers.

GTS has decided to strengthen the connection between the German border and Anna Paulowna and is now constructing a 48” gas transmission pipeline and a related compressor station in the vicinity of the gas storage Grijpskerk.
7. BBL SYSTEM DESCRIPTION

The BBL system will comprise the following elements:

Compressor Station and onshore pipelines

The compressor station will be the inlet point for the BBL transportation system. Inlet facilities, electric driven compressors and auxiliary equipment will be installed in the Anna Paulowna polder south of Balgzand and next to the Noord-Hollands kanaal. To guarantee the gas landing pressure (80-100 bar) in Bacton, the compressor station will be built to the following specification:

- Maximum design pressure: 137 bar (e)
- Initial design capacity: 1.75 mln m³/hr (2 trains operational, 1 spare)
- Initial power: 3*23 MW (2 trains operational, 1 spare)
- Ultimate design capacity: 2.13 mln m³/hr (3 trains operational, 1 spare)

Furthermore, at the inlet of the station Gasunie facilities will be built for custody transfer metering and mixing/balancing of incoming gas in order to meet the Transco quality specifications.

A pipeline with an approximate length of 4 km will run between the compressor station and the designated pipeline landfall location near Julianadorp. It will also include the valve station Julianadorp near the landfall.

The project will also include the connection to two high-pressure transmission lines of the Gasunie grid and will involve a crossing of the Noord-Hollands kanaal.

Offshore Pipeline and shore approaches

For the landfall at the Dutch side of the offshore pipeline, the horizontal directional drilling technique will be applied.

Dependent on the exact locations of the landfalls the line crossing the North Sea from the Netherlands to the United Kingdom will have the following specifications:

- Size 36"
- Length approximate 235 km
- Carbon steel, material grade L450MB (equivalent to API 5L X65)
- Maximum design temperature of 50°C
- Design life of at least 50 years
- Maximum design pressure of 137 bar (e)

The line will cross five existing pipelines and nine telecom cables.

To negotiate the height differences at the British coast, the pipeline will come ashore through a tunnel and shaft. The line will surface close to Shell’s Bacton Gas Plant.

Bacton Reception Facilities and Transco Tie-in

Receiving, pressure reduction, flow control, heating and fiscal metering facilities will be installed at Shell’s terminal at Bacton as part of the assets of BBL Company.
For a large infrastructural work like the BBL, many licenses are necessary. Apart from a treaty between the UK and the Netherlands, licenses are required for the construction of buildings and facilities, the pipeline crossing the coasts and the North Sea. Two environmental impact statements were necessary. One onshore in the Netherlands and one for the UK territorial waters. Crossing the land of farmers needed agreements and compensation for damages. The crossing of the dunes, which protect the low land level in the Netherlands from damages of the North Sea, required much attention. Several limitations were present for protecting the beaches and the dunes and lowering impact of noise, light, emissions and risk for the public.

The available calendar time from the start of BBL Company V.O.F. (July 2004) and the aim to have first gas transmission at 1 December 2006 was 29 months. In a very short time contracts were concluded for the delivery of 20,000 pieces of 12-meter pipeline and electrically driven compressors. Moreover contracts were concluded for the Engineering, Procurement and Construction (EPC) of the compressor station Anna Paulowna. Other contracts were made for the laying of the offshore pipeline, the landfalls, the crossings of the coasts and the construction of the gas-receiving terminal at the Shell Bacton Gas Plant.

An exhaustive master planning was set up where more than 4,000 activities were distinguished. Risk analyses were carried out, Monte Carlo simulation and expert review in order to identify critical aspects and to take appropriate actions.

At the time of writing this paper, the project is half way and most of the commitments of the total investment of € 500 million are made.
8. REFERENCES