



A rush for blue gold

No country better epitomises the growing importance of natural gas – or “blue gold” – than Qatar, a tiny peninsula in the Arabian Gulf. Already the world's biggest producer of LNG, a fast-growing part of Europe's energy mix, Qatar is also the epicentre of gas-to-liquids, or GTL. This too has a key role to play in Europe as the continent's vehicle fleet continues to dieselise and as fuel specifications get ever tighter. Qatar has taken on immense challenges on both counts. Will it be able to meet the expectations it has created?



| by Alex Forbes

Two decades ago, Ras Laffan resembled much of the rest of Qatar – an expanse of sand and gravel, with the occasional scrubby bush. In the words of the nation's finance minister, Yousef Kamal, it was ‘a desert yielding only truffles’.

Today, what is now called Ras Laffan Industrial City (RLIC) has become the world's largest concentration of natural-gas-based industry – a seemingly endless succession of huge steel structures, vast pressure vessels, massive storage tanks, and complex interweavings of piping, towered over by innumerable cranes.

The vital statistics of the industrial development at RLIC are staggering. Qatar did not export its first cargo of LNG until 1997, yet less than a decade later it had become the world's largest exporter of liquefied natural gas (LNG) – overtaking Indonesia, Malaysia and Algeria. By 2007, Qatar's LNG production capacity had grown to 30.7 million tonnes per annum (mtpa). Development has accelerated to the extent that Qatar hopes to be exporting 77 mtpa of LNG by the turn of the decade. That will give it between a quarter and a third of projected global LNG production – and considerable influence in the natural gas business.

With the LNG market getting tighter and tighter (demand is growing while new supply projects struggle in today's overheated energy construction environment) existing and potential buyers from around the world have been queuing up to negotiate with the Qataris for new LNG supply.

Improved technology |

A major factor in Qatar's rise to LNG primacy has been its willingness to make bold technological leaps: upstream, with the use of large-bore production wells; in liquefaction, by building ever-larger production “trains”; in shipping, with vessels almost double the size of the biggest used by other producers; and in offshore regasification, with the Isola di Porto Levante project now under construction offshore from Venice in the Adriatic.

These have extended Qatar's marketing reach to the extent that its target markets include all three of the main gas-consuming regions: Asia, North America, and, of course, Europe.

Not content with dominating the global LNG business, Qatar has ambitions to become the world's largest producer of gas-

to-liquids (GTL) – an emergent technology that involves converting natural gas into ultra-pure synthetic oil products, such as gasoil, naphtha and kerosene.

2006 saw the inauguration of Oryx GTL, a joint venture between South Africa's Sasol and national oil company Qatar Petroleum, which, when ramped up to full production, will be the world's largest such plant, with capacity of 34,000 barrels per day.

But that is just the beginning. Currently ramping up its construction phase is Pearl GTL, a Shell project that will produce 140,000 barrels per day of GTL products (as well as the equivalent of 120,000 barrels per day upstream products such as condensate, LPG and ethane) when it comes on stream around the turn of the decade. At peak, construction of Pearl will require some 35,000-40,000 workers. When finished it will cover an area the size of London's Hyde Park.

The main target markets for GTL products (particularly the synthetic gasoil or diesel that make up the bulk of the output) are Asia, where the purity of such products can significantly improve local air quality, and Europe, where a new car is now more likely to run on diesel than on gasoline. Shell also

plans to produce significant quantities of synthetic base oils for the manufacture of high-specification lubricants.

In yet another development at RLIC, Qatar is exporting natural gas by pipeline to its fellow members of the Gulf Co-operation Council (GCC), the United Arab Emirates and Oman, via the Dolphin Energy project. Bahrain and Kuwait, also GCC members, would like to import Qatari gas but are still waiting in the queue of potential buyers.

The fast-rising demand for natural gas in the nations of the Middle East has implications for existing and potential customers further afield because buyers increasingly have

eventually lead to total gas production of 22 billion cubic feet per day, or 230 billion cubic metres per year. This is equivalent to almost half of Russia's gas production or a third of US consumption. As the nation's energy minister, Abdullah bin Hamad Al Attiyah, likes to remind people, when this is added to the 1 million barrels per day of oil that Qatar produces, total hydrocarbon production will then reach 5 million barrels per day of oil equivalent. This will put Qatar in the premier league of hydrocarbon producers, along with Russia, Saudi Arabia and Iran. And this in a country of less than a million people, of whom only around a quarter are Qataris.

young men – construction workers, mostly from south Asia, for whom Doha offers little affordable entertainment.

On the plus side, Qatar's influence in the Middle East and beyond is now diametric to its size.

It has successfully staged the West Asian Games and more recently the larger Asian Games. On the back of those successes, it is planning a bid to host the 2016 Olympics. Al Attiyah, who was recently promoted and now holds the titles both of energy minister and deputy prime minister, has become a familiar figure on the world's energy stage. Qatar is now home to world-class universities. And the Pearl Qatar real estate development – an artificial island in the Gulf of the kind made popular by Dubai – boasts of becoming the most prestigious address in the Middle East.

They will soon become the wealthiest people on the planet

to compete for available supplies – with obvious consequences for prices.

Completing the diversification of Qatar's natural gas development portfolio are the Al Khaleej and Barzan domestic gas supply projects, along with a range of natural gas-based industries. These include the production of petrochemicals, which require gas and its by-products as feedstocks, and aluminium, which depends on a cheap and plentiful supply of electricity (in Qatar's case, gas-fired electricity).

Again, faster-than-expected growth in Qatar's domestic gas demand is limiting the volumes available for export and putting pressure on prices.

Fuelling prosperity |

Taken together, these gas-based industries are propelling the Qataris towards wealth of which a decade ago they could not have dreamed. On the basis of Gross Domestic Product (GDP) per capita, they will soon become the wealthiest people on the planet. GDP per capita rose from \$28,125 in 2002 to \$57,350 in 2006 – and Qatar National Bank expects it to reach \$68,467 in 2008.

Again, the numbers tell much of the story. The gas projects currently under way will

Consequences |

There are, of course, consequences to Qatar's frenetic pace of gas development – some desirable, others less so.

Everywhere you go in Doha, the capital, you hear the sounds of construction. Workers in white helmets and black shades, with cloths draped around their faces to shield them from the desert sun, are either building something new, or knocking something down to make room for something bigger.

In the bars of the major hotels, much of the buzz of conversation among the ex-pats is of the economic boom that is underway and of the opportunities it presents for companies offering anything from air separation units to scaffolding.

In short, Doha shows all the signs of a gold rush – except that the gold is neither yellow nor black; it is the clear blue flame of natural gas.

Despite the construction boom, Qataris and ex-pats alike moan about the steep rise in the cost of accommodation and, of course, the traffic. Finding rooms in hotels can be difficult and expensive. Inflation has become a political issue. On weekends, the public spaces in central Doha are thronged with thousands of

Trebling production |

A member of Opec since 1961, Qatar has long depended on oil as its primary source of revenue. While oil remains the biggest contributor to the state budget – particularly at the current record level of prices – it is the nation's gas wealth that is now fast becoming the key driver of the economy.

In 2006, Qatar's average crude oil production was 810,000 barrels per day, according to figures published by the Middle East Economic Survey. Revenues from exports of oil and related products were QR63.9 billion (€13.4 billion), according to the Planning Council. Oil production is expected to rise to over 1 million barrels per day by the end of 2010.

In contrast, gas production, already substantial at around 8 billion cubic feet per day, is set to treble between now and 2012. In 2006, Qatar exported 25.1 million tonnes of LNG, up from 22.2 million tonnes in 2005. These exports generated revenue of QR43.1 billion (€9.05 billion), more than a third of overall export earnings. The Planning Council estimates that LNG production in 2007 rose to 29 million tonnes, following the commissioning of new production capacity in the early part of the year. The year also saw Qatar begin pipeline gas exports to the UAE via the

Dolphin Energy project; exports to Oman are due to begin this year

If all goes to plan with the construction of a further six LNG “mega-trains” – each with capacity of 7.8 mtpa, 50% larger than the largest in operation today – Qatar’s LNG production will rise to the 77 million tonne plateau between 2010 and 2012. All of this will be exported, much of it to Europe,

‘The best way to reduce unit costs is grow in size’

holder of reserves after Russia and Iran. These reserves are enough to keep Qatar at the forefront of the natural gas business for over a century, even at the prodigious production rates that are envisaged.

That too presented obstacles. To make the most of the North Field reserves, Qatar needed to become ‘a world-scale supplier’, says Dr Ibrahim. But its location meant that, given the economics of the LNG



Construction at Qatargas 2, Doha, Qatar. Photo: Qatargas

where the list of countries planning new LNG receiving terminals gets ever longer. So how did this diminutive Gulf nation become such a force in global gas?

The North Field |

The story begins in the early 1970s with the discovery by Shell of a massive offshore gas resource called the North Field, part of the same geological structure that Iran calls South Pars. This structure, the world’s largest non-associated gas field, constitutes virtually all of Qatar’s proven reserves of more than 900 trillion cubic feet and makes Qatar the world’s third-largest

However, Qatar’s gas development took a long time to get going. To begin with, Qatar had ambitions to export gas within the region via a network of pipelines. However, the politics of the region at that time would have made constructing such a network difficult and there was also little demand for such projects – a stark contrast with today.

Qatar therefore turned towards LNG as an export option, says Dr. Ibrahim B. Ibrahim, economic advisor to the Emir and vice-Chairman of RasGas, one of Qatar’s two sister LNG companies.

business at that time, only Asian markets such as Japan and South Korea looked within its reach. Even these markets were sceptical when Qatar first approached them. At that time Qatar had gas but no port, no gas liquefaction technology and no commercial LNG expertise.

Undaunted, the Qatari government invested in constructing a port at Ras Laffan and set out to woo partners that could bring technology and experience of the LNG business. Won over by guarantees of return on investment, Total and Mobil (which later merged with Exxon to form ExxonMobil) became the major foreign investors in

Abdullah bin Hamad Al Attiyah, energy minister and deputy prime minister of Qatar, opening the GTLtec conference in Doha in February 2008. Photo: Alex Forbes



Qatar's nascent LNG industry, along with a number of Japanese companies.

By 2000, Qatar had become a significant supplier to Japan and South Korea. Japan's supplies came mainly from three Qatargas trains, each with a capacity of 2 mtpa. Gas to South Korea was supplied by two RasGas trains, each with a capacity of 3.3 mtpa. That gave Qatar a combined export capacity of 12.6 mtpa.

But this was nowhere near enough, says Dr. Ibrahim, given the scale of the North Field reserves, and so Qatar began working on a strategy that would enable it to reach markets outside Asia, namely in Europe and North America.

Its next endeavour, launched in 2001, was to expand RasGas by constructing another two trains, each with capacity of 4.7mtpa, 40% larger than the largest trains in operation at that time. The first was to supply India's Petronet LNG while the second mainly targeted markets in Europe. This RasGas Expansion programme (RGX) was eventually further expanded to include a third 4.7 mtpa train. It was the commissioning of that third train in early 2007 that took Qatar to the top of the world league of LNG production capacity.

But even the RGX programme was not enough to satisfy Qatar's LNG aspirations.

'We wanted to push technology to its limit,' says Faisal Al-Suwaidi, chief executive officer of Qatargas, sister company to RasGas. 'We said to ourselves: "If we are to make northern Europe a natural market for us then we really need to reduce our unit costs." And the best way to reduce unit costs is to grow in size.'

Thus it was in 2002 that Qatar Petroleum and ExxonMobil stunned the LNG industry with their announcement of the Qatargas 2 project: two 7.8 mtpa trains to primarily supply the UK market. (Qatar Petroleum has a share of around 70% in all the Qatari LNG project companies.)

What really took the industry by surprise was the size of the proposed trains – each over 50% larger than anything that had been proposed before.



Construction of Pearl GTL. Photo: Shell



Mega-train construction at Qatargas 2. Photo: Alex Forbes

The mega-trains at Qatargas 2, the first of which is now expected to come on stream in the third quarter of 2008, became the template for all future trains. Four other mega-trains are due to come on stream between now and the end of 2010, two at RasGas 3 (where ExxonMobil is the main foreign partner), a third at Qatargas 3 (a joint venture with ConocoPhillips) and another at Qatargas 4 (a joint venture with Shell).

When the going gets tough |

The RGX programme was notable because, despite some commissioning "upsets", all three trains came in on time and within budget.

In constructing the new mega-trains, Qatar has found the going much tougher. The overheating that has taken place in the energy construction industry is taking its toll, despite that the engineering,

procurement and construction contracts were mostly awarded before the overheating began. It has created shortages of labour, materials and skilled people, and has put upward pressure on costs.

It is no secret that the first mega-train is now several months behind schedule. So how concerned is the energy minister about the delays? And when does he expect Qatar to reach its 77 mtpa production target?

'I'm not concerned,' says Al Attiyah. 'So far, we are still talking about 2010. If there is a delay of a few months, we will cope with it. We are putting a lot of pressure on our contractors to meet their commitments. We are pushing them hard for recovery planning to tackle this few months' delay. I am confident we will see the gas there. I have met the management of the contractors and they have promised they will do their best to recover some of the delay.'

The sheer scale of the projects has introduced complications. For example, there are some 60,000 people working on construction of the mega-trains, and they all have to be fed, transported and housed. The workers come from 54 countries and speak more than 20 languages, which makes communication far from straightforward.

Another issue is coordination between the various project companies because the foreign partners in each company differ, as do their timelines. It is inevitable that at times they end up competing for available resources.

Qatar's GTL developments have also presented challenges, some predictable and some not. Oryx GTL, inaugurated in June 2006, is still a long way from reaching full production capacity because of unexpected problems in the Fischer-Tropsch reactors, which are the heart of the process, that engineers from Sasol and Qatar Petroleum are struggling to resolve. Meanwhile, with construction ramping up on Pearl GTL, it remains to be seen how the numerous contractors involved in the project will cope with the number of contractual interfaces that have to be



Qatargas ship under construction. Photo: Qatargas

managed. That said, the project's managing director Andy Brown remains confident that the project is on track to come on stream 'around the turn of the decade'.

In April 2005, Qatar Petroleum decided that, with so many projects being planned to utilise gas from the North Field, it was time to impose a moratorium on further development. The official justification for the moratorium was that it was necessary to conduct a study to compare production histories with reservoir models to ensure that the field was behaving as expected.

The deadline for completion of that study has been put back several times and the moratorium is now not expected to be reviewed until at least 2010 – to the disappointment of the existing and potential customers who have been queuing up to sign up new gas deals.

Between now and then, Qatar will have its hands pretty full with the projects that are already under way. So how likely is a new wave of Qatari gas development after the turn of the decade?

'Everybody needs gas, I understand that,'

says Al Attiyah, 'but we are waiting for the North Field study to show where we should go.'

It has been suggested in recent years that an internal political debate within Qatar might mean that the moratorium would remain in place, whatever the results of the study, because of a desire to conserve resources for future generations. Asked whether it was a political issue, the minister said: 'It's not a political issue at all; it's a professional issue. We are going to produce huge amounts of gas that, including our oil production, are equivalent to more than five million barrels per day of oil. We are committed to producing this gas so we also have to commit to managing our reserves very carefully.'

That said, one engineer to whom EER spoke confirmed that the plans he sees already show the locations of proposed future projects beyond those already under construction.

Impressive as the current developments at Ras Laffan undoubtedly are, it seems likely that Qatar's rush for blue gold is far from over. ■