



CWC Dynamic Insights

REPORT

World LNG Series:
Americas Summit
CDI Report
Written by Pat Roberts

Global
Gas
Series

Executive SUMMARY

The CWC Group's **World LNG Series: Americas Summit** took place in San Antonio, Texas on 23-26 May 2011. It attracted over 170 delegates from a variety of disciplines connected to the gas value chain. Representation from the Americas, Asia, the Middle East and Europe validated the strong links of the Americas to the global LNG industry today.

The broad consensus was that the US has become a much more complex market than five years ago and the road forward for LNG is linked to price, which in turn is linked to the long run marginal cost of producing shale gas and transporting it to market. Elsewhere in the Americas, the road forward for LNG appears positive and growth will be linked to competitive pricing for markets intending to switch from oil products to gas. Generally due to their smaller and variable demand, small-scale regasification will frequently be a solution.

The key themes for the conference which are addressed in this report are centred around¹:

- The projections for US gas supply/demand and costs
- Growing LNG demand in Latin America and the Caribbean
- The potential for LNG exports from the US
- The integration of the Americas with the global LNG industry
- Developments in technology and storage which will drive the business forward

The collective outlook is summarised in Section 8 below. But first, to set the scene, three broad challenges have arisen from changed market fundamentals. These are:

i) The co-existence of export and import markets: The cost of shale gas production has made the US market much more complex and opened up the prospect of LNG exports. The same applies to Canada. Elsewhere, in South America, a new LNG plant in Peru has come on stream and there is further potential for plants in Venezuela and Brazil. Elsewhere, there are various import markets under development in South and Central America and the Caribbean, several are small-scale, and their characteristics will be quite different from the traditional major markets for LNG. To supply them effectively will require both technical and commercial innovation.

ii) If the price of energy from gas remains at less than a third of that from oil in the US for the long-term, how long will it be before gas is used as a baseload fuel in power generation and before the refuelling infrastructure is developed across the US to support natural gas taking a sizeable chunk of the market for transportation fuels?

iii) If shale gas production goes global, what impact will that have on LNG and its trade flows?

In short, "the future ain't what it used to be!"

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¹ Please note the charts shown herein contain forward-looking statements from the presenters and they give no assurance that they will prove to be correct.

SECTION 1

The Projections for US Gas Supply/Demand & Costs

More confidence in domestic shale gas supply

Only five years ago, analysts were predicting that by 2020, the US would be the world's largest importer of LNG at around 80Mtpa as a consequence of Canadian imports and falling conventional gas sources to meet the demand. There was a dash to develop LNG regasification terminals to meet the demand driven by the expectation of rising domestic gas prices. Current capacity stands at approximately 20 Bcf/d with utilization of 1 Bcf/d, or 5%. Now there are projects under development to install liquefaction capacity at some of the regasification terminals, which some predict could see the US as a net exporter of gas by 2020. In parallel, there are projects developing in Western Canada based on exports of LNG from Greenfield sites. What has happened is that the long-term decline in US production of gas has reversed with a rapid rise in the production of unconventional gas - notably shale gas driven by technological innovation of horizontal drilling and hydraulic fracturing. Over the past few years, its economic productive capability has taken many people in the LNG industry by surprise. The forecasts from the EIA have tended to lag the changes evidenced in the markets - although the upcoming forecasts are expected to reflect more fully the increases in the US's indigenous gas supply capability long-term. Accordingly, the US is being discussed

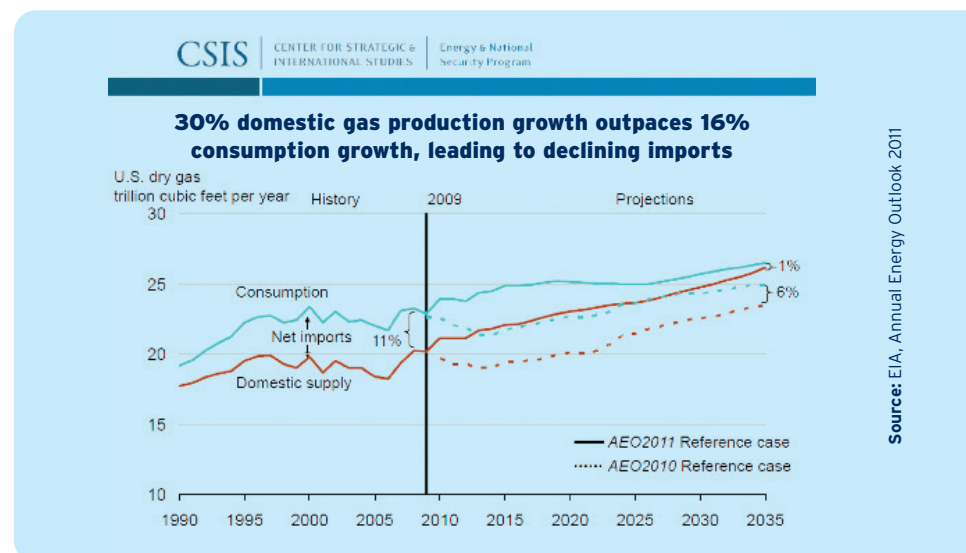
more widely as having around 75 to 100 years of economically recoverable shale gas reserves. If the US experience can be repeated around the world, then global gas reserves will be multiplied several times over.

The growth of US gas demand

At the same time as this new supply dynamic is emerging, there are several positive developments in the growth of US gas demand. The chart below²

remain, a fossil-fuelled economy in the long-term (78% in 2035). It was also noted that the current assumption is that there will **not** be an Alaskan Natural Gas Pipeline developed, due to the price modifying effect of abundant shale gas.

In 2009, 83% of the primary energy in the US came from fossil fuels. Gas made up a little over 23% of the 2009 energy supply, a figure that is set to rise to about 25% by 2030. Gas is clean,



shows the way that the supply/demand gap in the USA has narrowed over the past few years and that imports in 2035 are now predicted to be only 1% of total demand, down from an estimate of 6% only one year ago.

The consensus from a variety of presenters was that the US is and will

relatively cheap and there are around 2.8 million jobs currently tied to gas production³. In addition to the growth in production, the storage capacity for gas in the USA has risen by 10% in the past five years to a level of 4.4TCF which can support the flat production profile needed for gas, by putting gas into storage during the summer months

² Presented by Guy Caruso Senior Advisor CSIS (Center for Strategic and International Studies).

³ Presentation by John Somerhalder, Chairman, American Gas Association (AGA).

The 'Golden Age of Gas'

The International Energy Agency (IEA) describes the current global outlook as the 'Golden Age of Gas' as it moves to become the fuel of choice for new power plants; a position the recent events in Japan are likely to increase further. On the other hand, some analysts describe natural gas as a 'bridging fuel'; that is, a fuel that is not low-carbon in itself but with a lower carbon content than coal, its principal competitor. Over time, coal is likely to be substituted by gas to reduce carbon emissions but to give a truly low-carbon economy, gas will need to be substituted by nuclear or renewables (accepting gas may still remain as an effective back up fuel to renewables). The nature of gas as a bridging fuel was questioned and reconciled by accepting the bridge is a mighty long one!

The role of shale gas in the US

The role of shale gas in the US's future looks clearer than a year or so ago. The chart below shows the estimated source of gas supply over the period to 2035⁴.

Shale gas is forecast to increase from 14% of the total US supply today to 46% in 2035 and the total contribution from unconventional sources (which include coal bed methane and tight gas) rises from 50% today to 74% by 2035; the 'unconventional' becoming increasingly the new 'conventional'.

To fulfil this future, shale gas will have to meet the technical, environmental and regulatory challenges of hydraulic fracturing of shale rocks. There have been recent concerns over this process (the film 'Gasland' was critical of gas and its safety, it reached a wide audience and was nominated for an Oscar in 2011) and it is clear that any major incident could have repercussions across the industry. Concerns about high-pressure fracturing are causing legal/legislative uncertainty at both federal and state levels and there are claims of fugitive methane (Cornell), and methane migration (Duke) adding to an atmosphere of doubt, which several industry players regard as unnecessary. However, it is clear that in order to grow in an acceptable way for both regulators and consumers, the gas industry must address these concerns

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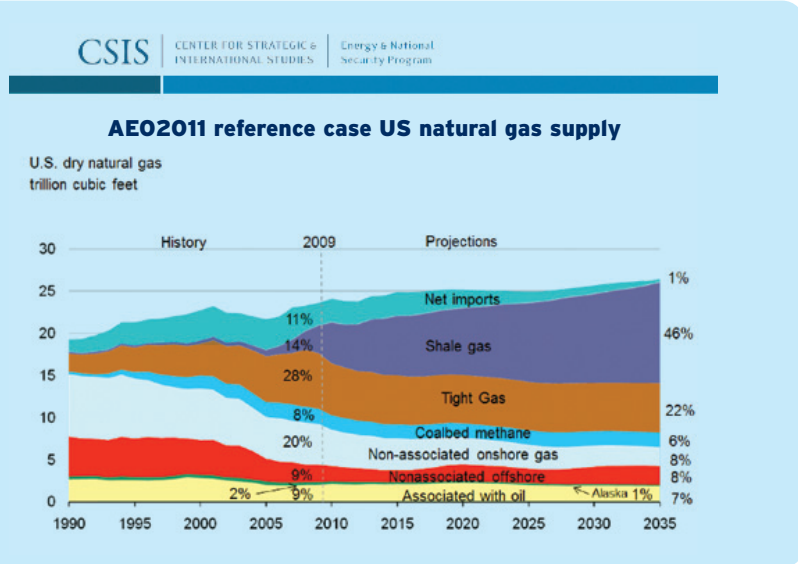
objectively, using the best practices and communicating effectively to the wider public.

The cost range of US\$5-\$7/MMBtu was brought up by several speakers although economists and planners are mindful that the forecast demand for shale may need to be tempered by increasingly stringent safety and environmental regulation along with the expectation that several majors have moved into the sector and their operational costs are relatively higher than smaller incumbents. There was no firm quantification of these factors - but it is clearly something to watch.

Gas prices to remain lower (calorifically) than oil prices

Given the profile of the various gas sources, the price of gas in the US will be set by the Long-Run Marginal Cost (LRMC) of shale gas.

Source: EIA, Annual Energy Outlook 2011



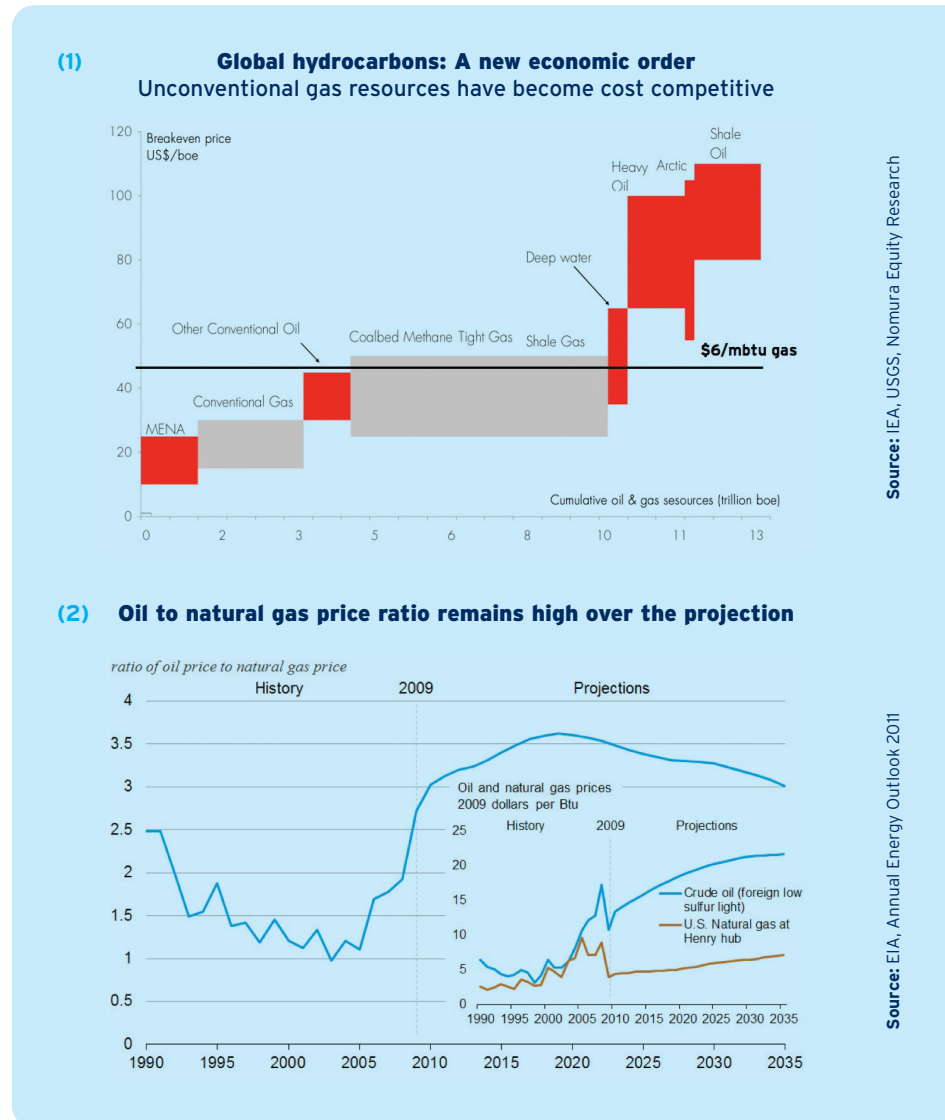
⁴ Presented by Guy Caruso, Center for Strategic & International Studies (CSIS).

This is often estimated at US\$5 to \$7/MMBtu in real terms in the medium term - see chart (1) opposite⁵. Furthermore, in the presentation at the Summit by Dr Michelle Michot Foss⁶, US\$6.25/MMBtu was quoted as the typical average value currently used for the long-term breakeven cost of shale gas production. At this price, gas is projected to remain consistently much cheaper than crude oil on a calorific basis over the medium and long-term.

The chart (2) opposite shows the projected ratio of the price of energy from crude oil and gas, with the inset chart showing the prices in 2009 in US\$ per MMBtu. During the years 2000 to 2005, the price of gas was close to that of crude oil but as oil prices rose in 2006/7 and gas production in the US rose rapidly, the ratio of the prices rose to 3:1 or even higher with energy from natural gas set to remain at less than one third of the price of crude oil for the period to 2035.

New market uses for gas

The foregoing is a very significant statement of itself. It suggests that gas is an extremely cost effective fuel on a calorific basis and that it is poised to increase its market share through fuel substitution - particularly coal - wherever possible and to look at new market uses for gas. Indeed, gas has already started to move into some areas traditionally served by liquids such as fuelling trucks, buses and taxi fleets. The lack of a widely distributed infrastructure for refuelling may slow the growth in this sector of the gas market in the US (although cars running on compressed natural gas are common in some countries such as Argentina, Germany and India) but the price signals are clear. The advantage of LNG over CNG is the additional range that the higher energy density of LNG can provide.



Source: IEA, USGS, Nomura Equity Research

Source: EIA, Annual Energy Outlook 2011

One change - only briefly discussed - that could add significant new demand would be if the US were to move to using gas-fired plants for base-load power generation. No figures were presented, but it reflects one of the possible variables that could add to sustained gas demand increases in the US.

A change in the production business model

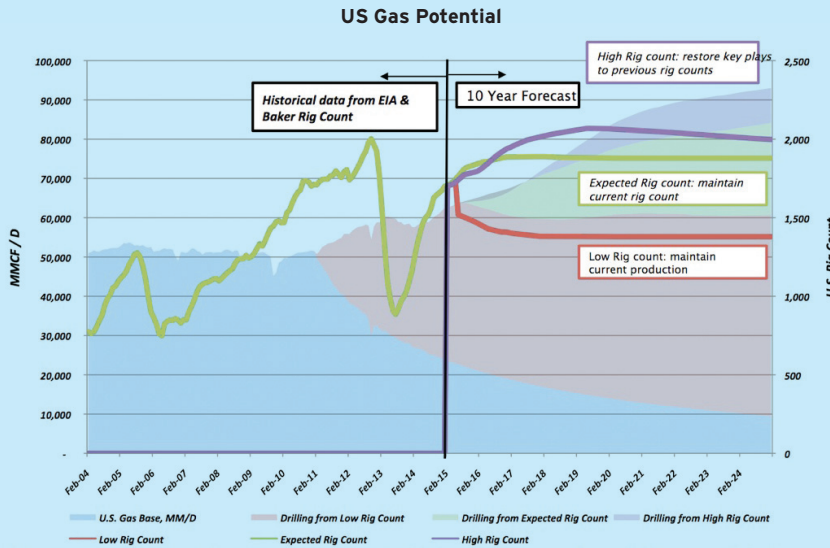
A side effect of the growth in shale gas production is the 'death' of the

conventional E&P business model⁷. With shale gas there are no dry holes, the gas is known to be in place before drilling starts, and the business model is moving to become more typical of a manufacturing business focussing on unit costs, than of an extraction business with high uncertainty over locating the resources. In addition, with the long run marginal cost predicted to be in a relatively flat zone, price volatility should decrease from historical levels and the US should be in a position to have a better-defined cost base.

⁵ Guy Caruso, Center for Strategic & International Studies (CSIS).

^{6/7} Dr Michelle Michot Foss, Chief Energy Economist & Head, Center for Energy Economics, Bureau of Economic Geology, The University of Texas at Austin.

US gas production: Historical & projected



Source: CHK estimates of total industry development, excluding potential transportation constraints. (Risk factors are CHK estimates of industry standards)

According to Chesapeake, if the current rig count is maintained to 2020, the productive capacity of the US could rise from 64 Bcf/d to 85 Bcf/d

US\$6.25/MMBtu was quoted as the typical average value currently used for the long-term breakeven cost of shale gas production

This has other consequences too. A manufacturing based business model requires a constant source of demand in order to keep the capital investment in shale gas. An interesting presentation from Bill Wince, Vice President - Transport & Business Development of Chesapeake Energy Marketing⁸, underlined this. It showed (based on rig count), the productive capacity of the US based on a continuing tension of demand. The view projected was one where if the current rig count is maintained to 2020, the productive capacity could rise from

64 Bcf/d to 85 Bcf/d. Additionally, if gas prices rose and producers were incentivised, production could increase further. The implications of this were that there would be enough gas supply to fulfil both domestic demand growth and exports. This is an important consideration when it comes to addressing the drivers for issuing export permits (see Section 3).

⁸ Bill Wince, Vice President - Transportation & Business Development, Chesapeake Energy Marketing Inc.