

## **DECC Gas Pricing Projections 2015**

### **Background**

The Department of Energy and Climate Change (DECC) publishes an annual 'Fossil Fuel Price Projections' series, widely used across the UK government for a range of purposes including modeling and appraisal. DECC is currently preparing its 2015 projections and is planning a short external peer review of its gas price projections. South-Court Ltd has been asked to carry out this peer review, and its comments are set out below.

### **Global Gas and LNG Market**<sup>1</sup>

During the period to 2035 the world's population is expected to increase by over 20% to 8.7 billion, while by 2035 GDP per capita is expected, on average, to be 75% higher than it is today. Non-OECD Asia, primarily China and India, is expected to be the major contributor to this growth such that by 2035 they will be the world's largest and 3<sup>rd</sup> largest economies respectively. The increase in productivity and income globally is expected to lead to a 37% rise in primary energy demand by 2035, virtually all in non-OECD countries (2.2% p.a. in non-OECD vs. 0.1% p.a. in OECD countries). It should be noted that this growth is lower than the period from 2000 to present, as a result of slower economic growth and also lower energy intensity (as economic growth becomes less dependent on heavy energy consuming industry).

Natural gas is still seen globally as the fastest growing fossil fuel (ahead of oil and coal that are in decline) with, in percentage terms, the use of renewables, nuclear and hydro-electric growing faster than total energy. Global natural gas demand is expected to grow by 1.9% p.a. to 2035. As with the global economy, growth is driven by non-OECD demand (est. at 2.5% p.a.) compared to a slower growth in OECD countries (est. at 1.1% p.a.). This is driven by increased usage in the power and industrial sectors. Gas in transport is the fastest growing sector, albeit from a very small base, with its share of total natural gas consumption rising to 3% by 2035.

To meet this higher gas demand growth, the movement of gas around the world is expected to double over the next 20 years as regional imbalances increase, with gas traded as LNG expected to grow at 8% annually up to 2020 and, over the period to 2035, grow twice as fast as pipeline gas<sup>2</sup>. The Asia Pacific region is expected to drive this growth. LNG is a flexible gas supply source, giving buyers, sellers and traders a greater ability to respond to varying movements in supply and demand globally. At any time the gas deficit markets of Asia are able to attract larger LNG supplies by paying a premium over other markets, such as the UK, and can, therefore, be defined as "Firm Markets". This means that, in order to attract LNG, the UK market must pay a price for LNG at least equal to Asian prices, less the freight differential. The UK, as with other North-West European countries, can be defined as a "Flexible Market", as it has an alternative gas supply available through pipelines, and this can, at times, be more economic than taking additional LNG.

There are still considerable uncertainties as to the level of future LNG demand. A major question is what will the role of nuclear power generation be in Japan and South Korea? Current indications are that the Japanese government supports the re-start-up of many of its nuclear power plants, within the rules set by the Japan Nuclear Regulatory Authority (NRA), but opposition to nuclear also remains high. In its LNG demand estimates, South-Court assumes that some nuclear power will start

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<sup>1</sup> BP Energy Outlook 2030, February 2015

<sup>2</sup> North America switches from a net importer of energy to exporter in 2015/16, Asia's import dependency rises and the Middle East remains the largest new exporter of energy and Russia the world's largest energy exporting country.



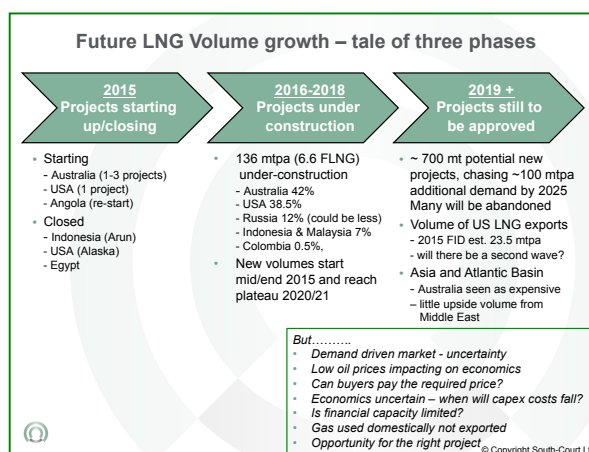
up and, as a result, oil demand for power generation will initially fall followed by some reduction in LNG demand. Chinese demand for gas and LNG is expected to rise as the Chinese government seeks to increase gas from 6.3% of its total energy consumption in 2014 to over 10% by 2020<sup>3</sup> as it seeks to improve air quality through reducing the use of coal in primary energy consumption. The volume of LNG imports will depend on the extent to which China develops its shale gas reserves, as the country will always favour gas supply from domestic sources, for security of supply reasons. China will also seek to source gas by pipeline for security of supply and economic reasons. India will continue to be a price sensitive market, importing marginal LNG when the price is lower than domestic energy alternatives.

Europe's gas imports currently account for approximately half of its total gas consumption. Over 80% of these imports are by pipeline, with the majority from Russia. European gas imports are expected to rise by 2035 to nearly 75% of total gas consumption<sup>4</sup>. Growth of LNG means these imports will become more diversified, with pipelines accounting for around two-thirds of imports and LNG the remainder<sup>1</sup>. The extent and length of the current recession in Europe makes for uncertainty, as have the politics of European gas supply following the Ukraine Crisis and the ceding of Crimea to Russia in March 2014.

On 25<sup>th</sup> February 2015, the European Commission published its policy proposal "A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy"<sup>5</sup>. In this document it clearly sees a role for LNG in European Gas supply stating that "We [EU] will explore the full potential of LNG, including as a back-up in crisis situations when insufficient gas is coming into Europe through the existing pipeline system" adding that "increases in LNG trade will help to bring world natural gas prices closer together" and "the Commission will also work to remove obstacles to LNG imports from the US and other LNG producers". In the document the Commission agrees an action point that it "will prepare a comprehensive strategy for liquid natural gas (LNG) and its storage". At present the volume of LNG arriving in European markets depends not only on internal demand, but also on supply availability, which is set by the demand for gas from Asian and South American LNG buyers. How this new EU policy will impact on this market structure is unclear.

LNG supply growth, over the period to 2030, can be clearly divided into three phases, as set out in the diagram below.

Phase 1 – immediate term (up to end 2015) – A period of uncertainty with gas and LNG demand weakness in Asia and Europe, together with the uncertain start-up timing of new LNG supply projects in Australia. If the Australian projects start-up as planned in mid 2015 and Sabine Pass, the first US Gulf LNG export project starts, and Angola LNG re-starts in 2015, then this additional supply could indicate a period of further market weakness. Some additional LNG demand is expected from South America, due to low rainfall and lower hydro-electric power production and short to medium term outages



<sup>3</sup> 2014 data from World Gas Intelligence 4/2/15. It is estimated that over 30% Chinese gas consumption in 2014 was imported

<sup>4</sup> BP Energy Outlook 2030, February 2015

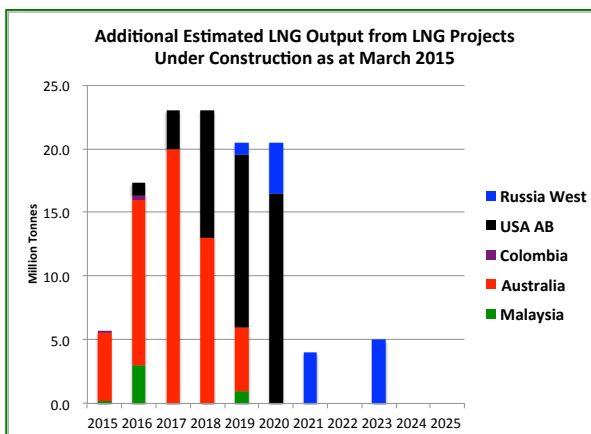
<sup>5</sup> European Commission Brussels, 25.2.2015 COM (2015) 80 final, Energy Union Package "A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy"



in Yemen could continue.

Phase 2 – medium term (2016-2018) – During this period, 136 mtpa of new capacity will start operation (NOTE: Total LNG supply in 2014 was 242 mtpa). Approximately 50% of this new capacity is in Asia, and, as these projects start exporting LNG, it should reduce the volume of Atlantic Basin LNG that is being moved out of the region to Asia. Middle Eastern LNG that has been moving to Asia will also start to flow back into the Atlantic Basin.

A major uncertainty in this period is the speed of start-ups of new capacity and how quickly the new facilities increase their production towards full capacity. Assuming that these projects start-up as scheduled, as noted above, it can be expected that LNG from the new Australian LNG projects will supply Asian buyers and displace LNG currently being supplied by Middle Eastern and Atlantic Basin suppliers for part of this volume. The emergence of new markets will give a potential source of new demand in countries such as Pakistan, Bangladesh, Vietnam and Philippines, but the process of opening up these new markets has been slow. The “spare” LNG supply will, therefore, move into the Atlantic Basin and, initially target South America (where prices will be highest) and then target North West Europe (where spare LNG import terminal capacity exists and the markets can accept flexible gas).



US Gulf LNG exports start at the end of 2015, again targeting buyers in Asia (some of whom have secured long-term capacity in the export plants). The balance of US LNG will also move to North West Europe as LNG traders seek to optimize the costs of shipping LNG from the US by moving LNG to Europe rather than Asia due to the shorter shipping distances. The combination of these two waves of LNG could well put downward pressure on North West European hub prices.

Phase 3 – longer term (after 2019) – This period includes the greatest uncertainty. South-Court Ltd, in line with other commentators, estimates that, the market will require ~ 80-100 mtpa of new LNG supply by 2025. With five years to construct an LNG chain, this means that there must be project FIDs<sup>6</sup> over the next 5-6 years to ensure that there is sufficient LNG supply to meet future LNG demand estimates. At present, there are estimated to be over 700 mtpa of potential new LNG export projects under development. This means that there is considerable competition to meet the expected growth in demand for LNG, with potential new supplies from the US Gulf, East Africa, West Canada and Australia – all of which can be supplied into Asia at similar cost levels. Which projects move forward will depend on a variety of factors; volume of upstream reserves, project economics and development status, ability to sell a large percentage of LNG on a long-term basis, government & geopolitical factors, sponsors with LNG experience and ability to deliver, ability to finance the project.

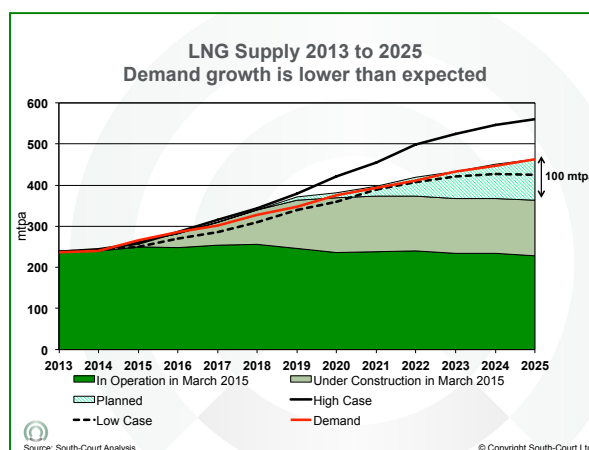
Low oil prices and weak global gas demand means that there are huge barriers to developing new LNG export projects. The major challenge is the price level; buyers can only secure additional LNG at levels where the gas will be competitive in its domestic market, and project developers can only commit to develop additional capacity where LNG sales revenues are sufficient to secure the necessary project returns. In an environment where there is considerable uncertainty over global

<sup>6</sup> Final Investment Decision - The date on which a project sponsors decide to make a binding financial decision to proceed with the project. Usually the key agreements related to the project are signed on this date (e.g. plant construction, gas purchase, LNG sales and financing agreements). Also known as FID date.



energy prices and energy demand, this could mean that there may be no FIDs on new gas liquefaction capacity as LNG seller and buyer aspirations cannot be met. The industry knows that this will lead to a “boom and bust” scenario, which is not in the interests of either buyers or sellers. Buyers know that there will be a demand for new LNG post 2020-23, but the exact year is not known, and they will therefore need to secure additional gas supplies. Governments and project development companies are keen to commercialise gas reserves through developing new LNG export capacity and selling LNG on a steady/even basis to avoid peaks and troughs in project development cycles. The challenge is therefore – how can buyers and sellers develop a business model whereby new LNG capacity can be developed to meet the expected post 2020 demand for new LNG? The answer has to be that both buyers and sellers need to find common ground to ensure that new projects proceed.

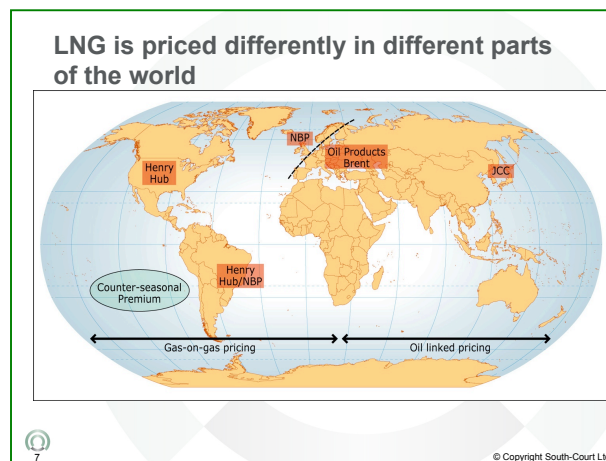
Global LNG demand is expected to rise to ~ 450 million tonnes by 2025 according to South-Court estimates (these are confirmed by other commentators). The graph sets out South-Court’s estimated global LNG supply/demand balance, from existing projects and those under construction (i.e. those that have taken FID) to 2025.



### LNG Pricing

Historically, LNG has been priced using different pricing structures depending on region. This has depended on whether the region has an operating liquid hub market pricing mechanism, or whether LNG prices are based on a formula linked to oil (crude oil based in Asia, primarily JCC<sup>7</sup> or crude oil/oil products in Europe). The diagram below sets out this regional pricing structure, which is undergoing a period of change.

1. The growth of spot and short-term LNG sales into Asia has resulted in Asian buyers having to pay prices high enough to “pull” cargoes away from North-West Europe, often on a fixed price with levels determined by the price that sellers can get in alternative markets, namely North-West Europe, so based on NBP or TTF hub related prices<sup>8</sup>. Post the March 2011 Tsunami, the Japanese government closed all its nuclear power generation capacity (22 Twh). This resulted in Japan having to import more fossil fuels, both oil and gas, resulting in the country experiencing its first trade deficit for over thirty years. This has led to the Japanese government putting pressure on LNG importers to reduce their LNG import costs by stating that the importers will not be able to automatically pass on the cost of LNG to the regulated market by increasing power tariffs. This will push LNG buying companies to secure lower contract prices and therefore lower energy costs in Japan.



<sup>7</sup> Japanese custom cleared crude price or Japan Crude Cocktail, the average price of crude oil imported into Japan in a given month

<sup>8</sup> NBP= National Balancing Point (UK virtual gas trading hub) and TTF = Title Transfer Facility (the Netherlands virtual gas trading hub)



2. The development of LNG export projects in North America, sourcing feedgas on a Henry Hub related price, has meant that LNG can be sold into global markets on a US hub priced basis. Asian buyers and aggregators (intermediary companies such as BG and BP), and some Asian end-users have signed 20 year capacity processing and offtake agreements with US Gulf LNG export plants. When these deals were signed long-term oil related LNG prices in Asia were considerably higher than the \$12-13/MMBtu cost that US Gulf LNG can be delivered into Asia. With the collapse of oil prices this position has reversed. Assuming an Henry Hub price of \$4/MMBtu, the oil price has to be over \$70-75/bbl before US Gulf LNG will be cheaper, to Asian buyers, once again.
3. Lower LNG demand in Asia, combined with new LNG supply starting up in Asia<sup>9</sup>, has meant that North-West Europe is the highest priced “Flexible Market” for LNG. As such, global spot cargoes of LNG are currently being priced on an NBP basis and, once LNG supply commences from the US Gulf at the end of 2015, the UK and Northern Europe will be able to attract LNG on US Henry Hub related pricing. This LNG will be priced based on the following formula: *Henry Hub price PLUS liquefaction fee PLUS freight*. The liquefaction fee has varied depending on the time at which the liquefaction contract was concluded. The earliest deals secured a fee that was as low as Henry Hub plus \$3.00-3.50/MMBtu<sup>10</sup>. Assuming a freight of \$1.00/MMBtu<sup>11</sup> from US Gulf facilities to the UK, this equates to an ex-ship LNG cost of Henry Hub plus \$4.60-5.10/MMBtu<sup>9</sup>. In a case of short-supply, sellers will seek a premium to their cost level, but where LNG supply is in surplus, which could be expected 2019-2021/22, then sellers may discount below cost in order to minimise their potential losses on their US liquefaction capacity position.
4. The availability of lower priced US LNG could push down the level of NBP. The extent to which this NBP falls in price will also depend on the strategy of Norway and Russia as major gas suppliers. In mid 2014, when NBP fell to nearly \$6/MMBtu, there was some evidence that Norwegian gas flows reduced, indicating that this could be a “floor” price for Norwegian gas exports. A similar floor level could also apply to Russian gas, but in the case that Russia needs foreign currency earnings, and if the Ruble continues to depreciate, this floor price level could go even lower. Also, as Russia’s domestic gas production cost, mainly Ruble based, has fallen in line with the depreciating currency, the cost of gas production in Euro/Sterling terms has fallen.

#### Comments on the DECC Gas Price Projections 2015

South-Court Ltd has reviewed the DECC Price Projections 2015 and makes the following observations.

The basis and factors behind the calculation of DECC’s 2015 Gas Price Projections are sound. In the Central Scenario the logic that, by 2025, the marginal LNG supply source for gas to the UK will be through LNG from the USA, is a reasonable assumption<sup>12</sup>. Indeed, it is possible that this assumption could apply earlier as US liquefaction comes into operation. Under this scenario the marginal gas price, through LNG, should be based on the Henry Hub gas price.

<sup>9</sup> PNG LNG’s first cargo was in May 2014 and Australia’s QC LNG in December 2014/January 2015

<sup>10</sup> The Sabine Pass trains 1 & 2 sales agreements are based on a formula (in US\$/MMBtu) Henry Hub x 1.15 plus 2.25-3.00. Assuming Henry Hub price level of 4.00 this equates to an FOB cost level of 6.85-7.60 FOB. Later deals are understood by South-Court to be equivalent to having a premium of 3.50, equivalent to 7.35-8.10 FOB, or Henry Hub plus 5.10 ex Ship North-West Europe.

<sup>11</sup> This round trip freight cost of \$0.95/MMBtu from the US Gulf (basis Sabine Pass) to the UK (basis Isle of Grain) assumes a 170,000m3 vessel, charter cost of \$75,000/day, 4975 nm, Bunker cost of \$350/MT and boiloff gas cost of \$6/MMBtu. The freight cost from Eastern USA (basis Elba Island) is \$0.20/MMBtu lower at \$0.75/MMBtu due to the shorter distance, 3840 nm.

<sup>12</sup> This was seen in the period 2006-2008, US Henry Hub and UK NBP prices were vying with each other as to which was the premium market and which market would pay the higher price for marginal LNG cargoes. The market that could pay more attracted the cargoes and, in the case of the UK market, the price of the LNG set the marginal cost of additional gas.





Gas price formulation in Europe is expected to continue to move from a relationship with oil to solely a hub price basis, where the price of gas is determined by supply-demand of natural gas. The issue is the pace of this change. In its 2014 report, The International Gas Union noted that, in 2013, regions of Europe had very different price formation mechanisms. In North-West Europe (approximately half of European gas demand) 80% of gas was priced on a hub basis (as a result of increased hub trading and gas supply contract renegotiations), while in the Mediterranean and South-East Europe, oil-linked and regulated pricing remained dominant<sup>13</sup>. It is viewed, therefore, that the trend is towards increased volumes of European gas being priced on a market related pricing basis, will continue until all gas is priced that way, probably by the end of the decade or early 2020s. This means that it can be assumed for these gas price forecasts that UK gas prices will be set by gas supply demand with the marginal gas supply source setting the level.

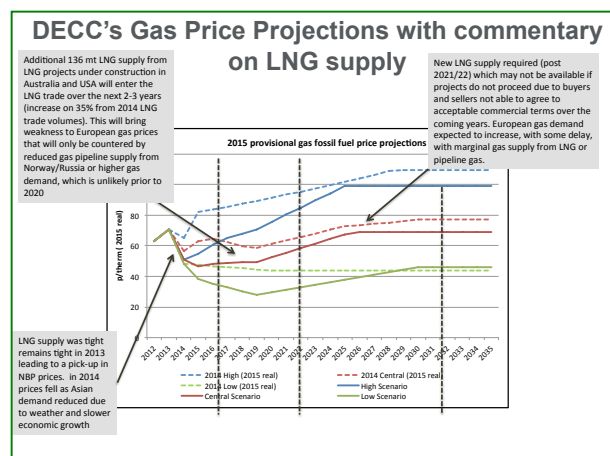
LNG is a global commodity with marginal cargoes moving to the highest priced market, which tends to be the Firm Markets of Asia or South America (especially during periods of low rainfall when hydroelectric power generation is reduced). Once these markets are satisfied, then the LNG will move to the next highest priced market, which could be Southern Europe, before supplying North-Western European Flexible Markets. Which specific North-West European market the LNG moves to, will depend on price in different European markets and the ability to access LNG regasification capacity.

As noted in South-Court's commentary above, new LNG sources that are currently under

construction will start production in Australia in the 2015-17 period and from North America 2016-18. At this time, the UK should see an increase in LNG supply. The graph shows DECC's gas price projections with commentary on LNG supply availability during the different phases of the price forecasts. South-Court's view is that, for the period 2015-2019, the level of NBP under the Central Scenario could be between DECC's Central and Low Scenarios, depending on whether

a) Norway and Russia counter increased LNG flows into Europe with reduced gas pipeline flows, or

b) Oil prices rise, pulling up North-West European pipeline contract gas prices (as 20% North-Western European gas is still priced based on oil), which would then support higher hub gas prices.



Post 2018/19, continuing over the rest of the forecast period, it is expected that the marginal LNG supply to the UK will switch to LNG from the US, which is sourced on the basis of Henry Hub prices. The \$5.00/MMBtu premium to Henry Hub that DECC uses in its gas price forecasts, seems reasonable. A linkage of NBP to Henry Hub during the 2020s also seems reasonable, with marginal LNG supply from the USA. The volume level of pipeline gas imports will determine the extent to which Northern European gas prices are linked to Henry Hub levels. The Asian LNG short-term price, which is a function of Asian and Middle Eastern LNG supply costs and short-term Asian LNG demand, will continue to determine the marginal price of LNG into the UK as the higher priced global firm market (reference the paragraph above the graph above).

<sup>13</sup> International Gas Union, Wholesale Gas Price Survey - 2014 Edition - A global review of price formation mechanisms 2005 – 2013 ([http://www.igu.org/sites/default/files/node-document-field\\_file/IGU\\_GasPriceReport%20\\_2014\\_reduced.pdf](http://www.igu.org/sites/default/files/node-document-field_file/IGU_GasPriceReport%20_2014_reduced.pdf))



South-Court concurs with the International Energy Agency's (IEA) reference case that US LNG exports will reach 73 Bcm by 2025 and 95 Bcm by 2035, but is of the view that it is more likely that LNG exports from the US could reach this level between 2020 and 2025. As at mid May 2015, there is 68 Bcma of new US LNG export capacity under construction and it is expected that an additional 26 Bcma<sup>14</sup> capacity could take FID in 2015, making a total of 96 Bcma LNG capacity in operation by 2020. South-Court is also of the view that new LNG supply from East Africa could be delayed into the early 2020s and additional volumes from Russia and Australia delayed until a similar timeframe.

The global energy market is, however, increasingly uncertain and economic, political or natural events can change the outlook, these could include:

1. The Central Scenario case sees gas prices rising 2015-2017 above 2014 levels. With new LNG supply starting up in Australia and North America during this period, together with low gas demand in Europe, there is a case where the North West European gas price weakness of 2014 remains in place for the following years. This could encourage increased gas demand.
2. Russia and Norway could react to lower European gas prices, which have been influenced by greater supply of global LNG, by cutting back supply to encourage higher prices? If yes, then this could support prices.
3. Higher oil prices would provide support for higher LNG prices in Asia, both contractually, but also as spot LNG at the margin competes with oil and oil products.
4. In Japan, if nuclear does return to 50-60% pre-Fukushima levels, then this would release LNG back into the global LNG market, thus increasing global LNG supply.
5. The level of gas demand in China remains a major uncertainty for the LNG business. There are several variables: the pace of Chinese economic growth; environmental policies; the level of domestic gas production (major new production is expected from unconventional gas) and whether the planned Russian pipelines go ahead or not. These factors could all impact on the level of China's LNG imports, which directly impacts on the availability of LNG for the UK. Likewise the volume of Indian LNG imports is also uncertain as the Indian government seeks to use regulation to hold domestic gas prices low - at levels that do not attract LNG cargoes into the market in large volumes. Should this policy change, then India could become a major LNG importer which would also directly impact on the availability of LNG for the UK.
6. Continued weak economic growth in Europe, and lower energy demand, could reduce the volume of US LNG that is imported into the region and therefore the impact of Henry Hub gas prices on the UK gas market. This trend could be exacerbated if carbon prices do not rise to a level where gas and coal fired power stations are on a similar economic basis, then the demand for coal for power could increase at the expense of gas.
7. If the European Commission's plans to increase the role of LNG in European security of energy supply move forward, as Europe seeks to diversify gas supply sources away from its traditional suppliers, then it could increase demand for LNG into Europe (see comment above). Other potential political events also cause uncertainty.
8. It is expected that those North American LNG projects under construction (68 Bcma as at mid May 2015) should operate as planned, but there could be a change of US regulation that may prevent more projects taking the decision to proceed, or in the extreme, restrict the volume of US LNG exports in some way.
9. The 186 Bcma LNG projects under construction in Australia and USA could experience severe start-up delays, which could result in a period of LNG market tightness returning in 2016/17. Also, if new FID's do not happen over the next five years, then there could be a period of LNG supply tightness post 2020.

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<sup>14</sup> This figure assumes that Corpus Christi and Sabine Pass Train 5 take FID.



10. Shale gas developments, outside North America, could increase thus creating another gas supply source available to the global market. If this happens in Europe, this could displace some LNG imports.
11. Short-term disruptions in the market due to political and market restructuring events could impact on global gas and LNG supply/demand.

Historically, the energy market has proven to be robust against changing global events. That said, political uncertainty in Europe, oil price volatility and uncertain global economic and gas demand levels will test it further over the period of the DECC forecast. The impact of these factors on UK gas prices should be contained within the high and low gas price scenarios set out in the price forecasts.

David Ledesma  
12<sup>th</sup> May 2015

