

## **Can cheap alternative sources of gas (from fracking) reduce energy prices dramatically in countries where reserves are found – such as the UK?**

### *Gas is a relatively clean and widespread fuel*

Worldwide resources of gas are estimated to be sufficient for 250 years<sup>1</sup>. The fuel produces electricity with less than half the carbon emission of coal<sup>2</sup>. In addition it costs about half as much as oil per equivalent unit of energy<sup>3</sup>. It also provides flexible power stations that can respond quickly and efficiently to rises and falls in demand and supply from other generators. More recently, natural gas has become a commodity that can be transported without pipelines, by cooling and pressuring it sufficiently to liquefy it. This Liquid Natural Gas (LNG) is then transported by large vessels, making the fuel able to be delivered to suitable ports around the world where it is re-gasified at specialist facilities. Today LNG only accounts for some 10% of gas supplied, but it provides a flexible means of turning gas into a transportable global commodity.

*“Natural gas is poised to enter a golden age, but this future hinges critically on the successful development of the world’s vast unconventional gas resources. North American experience shows*

*unconventional gas – notably shale gas – can be exploited economically.*<sup>4</sup>

In short, the fuel is extremely attractive as the world seeks to reduce carbon emissions whilst keeping costs under control. In recent years the rapid rise in the use of shale gas in America through the process known as fracking has caught the imagination of business leaders and politicians. Electricity costs in America have come down, along with emissions. Perhaps that experience can be replicated elsewhere if national shale gas reserves can be tapped?

The International Energy Agency (IEA) summed up the potential in its 2012 publication “Golden rules for a golden age of gas” – “Natural gas is poised to enter a golden age, but this future hinges critically on the successful development of the world’s vast unconventional gas resources. North American experience shows unconventional gas – notably shale gas – can be exploited economically. Many countries are lining up to emulate this success. But some governments are hesitant, or even actively opposed. They are responding to public concerns that production might involve unacceptable environmental and social damage”.

### Strong political support in the UK

In August 2013, Mr Cameron told the Daily Telegraph newspaper that fracking had “real potential” to drive energy bills down at a time when many families were struggling with rising prices. “Where we can relieve the pressure we must” he said. “It’s simple – gas and electric bills can go down when our home grown energy supply goes up”.<sup>5</sup>

In October 2013, Mr Cameron said at his European Council press conference: “Right, on fracking : we do need to take action across the board to help enable this technology to go ahead. It’s not the whole answer to our energy problems, but if you look at America it’s providing a large amount of low -cost gas that’s helping keep America competitive and helping to keep bills down.”<sup>6</sup>

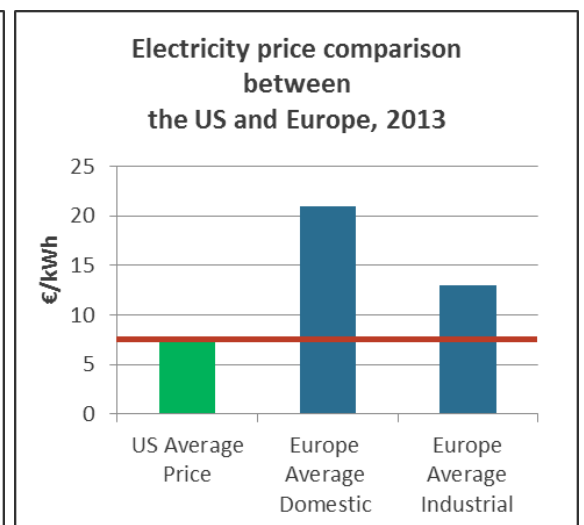
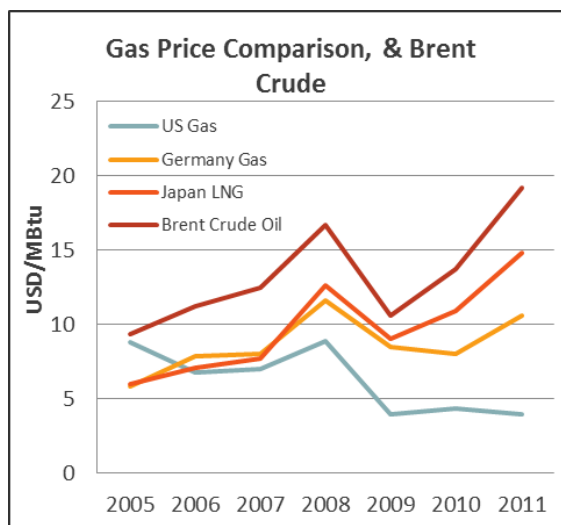
October 2013, Chancellor George Osborne said “I would love fracking to get going in the UK and I am doing absolutely everything I can to encourage it”.<sup>7</sup>

This review does not set out to analyse the environmental or social costs. Instead it addresses the simple question of whether or not the economic success of the shale gas revolution in America is likely to be replicated in other countries. This is particularly relevant in the UK, where political support for shale gas has been profound in recent months.

### It has worked in America

The US has a very low cost of gas in comparison with most of the world, and it has disconnected its pricing in recent years from both international gas prices, and oil.

There is also no doubt that America is enjoying low cost electricity, relative to Europe.



### What is unique about America?

America has taken advantage of its large land mass, and areas of low population. The aerial photo graphically illustrates how this has allowed fracking wells to be developed in some parts of the country.

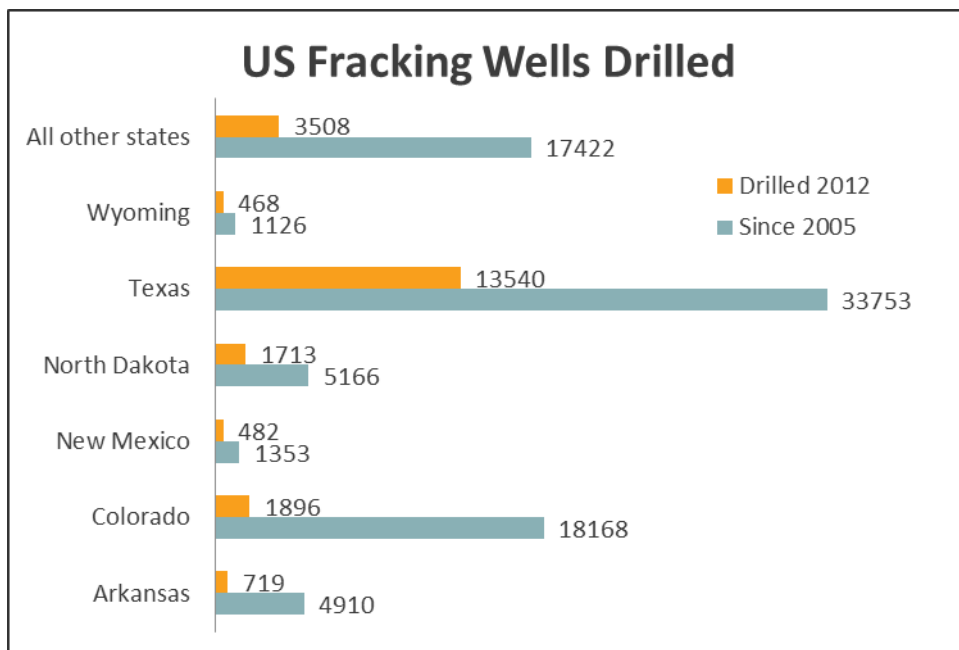


In addition, the US has a well-developed oil and gas industry onshore, which has been able to gear up quickly for this new opportunity.

In a report published in late 2013 the organisation Environment America estimated that over 80,000 fracking wells had been drilled since 2005, with over 20,000 in 2012 alone.<sup>10</sup> America has an unusual combination of accommodating property & mineral law, large areas of low population, and extremely advanced oil and gas industries and infrastructure.

### Current events in America

However, even in America, concerns are being raised about the scale and scope of the industry. In Alaska for example, a large project to take gas 800 miles to a new liquefaction plant on the coast has recently met with public opposition. In California lawmakers introduced a bill in March 2014 that would stop fracking until a thorough review of its local impacts is completed. Because each well



can only reach a limited distance, production declines in a relatively small number of years, and so new wells have to be continuously drilled. It seems likely that replicating the rapid growth in shale gas in America will be difficult in the majority of countries.

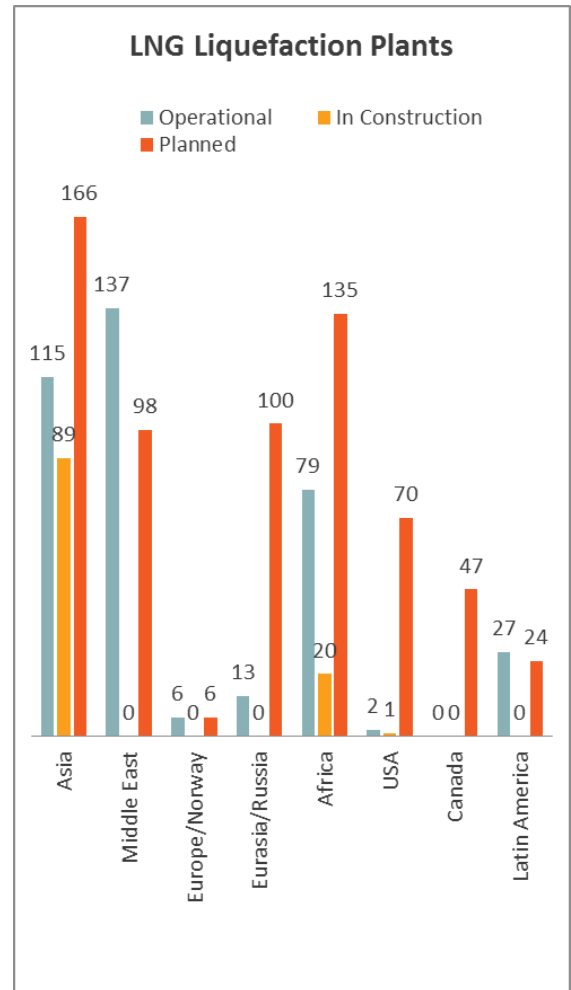
### Why not export from America?

The US installed one of the first LNG facilities in the world, in 1969, in Alaska. This was principally for domestic use. That currently remains one of the country's two operational liquefaction plants. Worldwide, over 350 operational LNG liquefaction plants have since been built.<sup>3</sup>

Until shale gas, the US was a heavy importer of LNG, and had no prospects of exports. That is why it has almost 200 import terminals for regasification. Now, however, America is responding to the business opportunity and has 70 liquefaction plants planned.<sup>3</sup>

### US government policy

US law prevents the export of crude oil or gas to countries with which there is no free trade agreement unless approval is provided by the federal government. This is a legacy from the energy crises of the 1970s. There is a big debate going on in America currently on whether exporting gas in the form of LNG is socially and economically desirable. One argument is



that US manufacturers and consumers should continue to benefit from gas prices that are significantly lower than those in the rest of the world. The counter-argument is that US gas companies should benefit from new markets and that lower cost energy would contribute to better international growth, thus helping the US as a result. A recent report for the US Department of Energy (NERA) concluded that *"...benefits from export expansion more than outweigh the losses from reduced capital and wage income to US consumers, and hence LNG exports have net economic*



*benefits in spite of higher domestic natural gas prices. This is exactly the outcome that economic theory describes when barriers to trade are removed.”<sup>11</sup>*

However the debate is a political hot potato, with strong views on both sides. The same report also states *“How increased LNG exports will affect different socioeconomic groups will depend on their income sources. Like other trade measures, LNG exports will cause shifts in industrial output and employment and in sources of income. Overall, both total labor compensation and income from investment are projected to decline, and income to owners of natural gas resources will increase”.*

So the overall US economy is set to benefit, with large energy corporations being winners, but with large energy intensive manufacturers and employment

potentially suffering - a difficult political conundrum.

### *US export capacity*

As has been discussed, until recently America has never really considered itself to have opportunities to export gas. As a result export (liquefaction) facilities have been almost non-existent. In recent years this has begun to change, however, and in February 2014 the US Department of Energy (DoE) approved the sixth facility since 2011.<sup>12</sup> This will bring authorised US LNG export facilities up to a capacity of almost three quarters of that considered as a maximum by the DoE. This (soft) maximum represents an export capacity of approximately 112 billion cubic metres (bcm) per year.<sup>11</sup>

To put this in context, it is equivalent to around one third of the 327 bcm of LNG

traded globally in 2011.<sup>3</sup> This fresh volume has the capacity to be disruptive.

### **Global capacity**

The global liquefaction capacity stands at approximately 400 bcm, and can operate at around 90% of theoretical capacity, giving an annual volume of some 360 bcm. This has seen modest recent growth, but 2014 is expected to see up to a further 30 bcm of capacity come on line. Following that, very large capacities are expected to come on line, principally in Australia and America.



The current fleet of LNG ships is capable of transporting around 70bcm at any one time. Of course, the global capacity depends on the duration of the travel time from point of supply to point of demand. Shipping capacity has not yet proved to be a bottleneck for LNG.

Re-gasification facilities have grown rapidly and new countries have entered the market. Historically East Asia had around three quarters of the world's capacity, with Europe and America making up most of the rest. Recently South America has become active, along

with South and South East Asia. Japan, Korea and China are investing heavily as economic activity and nuclear constraints create ideal conditions for the use of LNG.<sup>13</sup>



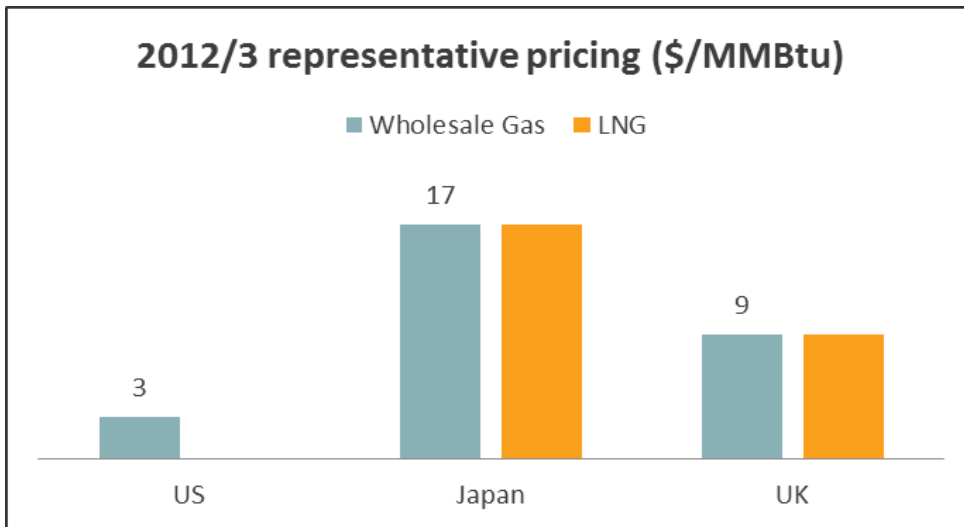
### *Global pricing –big differentials*

As has been seen there are very wide variances in gas wholesale prices around the world.

Two countries have been contrasted to the US to illustrate the impact of physical connection to markets by pipeline.

Japan is an island nation with no gas pipeline connections, and almost no indigenous gas, and high demand due to a general fuels shortage and curtailment of nuclear power. It imports around 120 bcm of LNG and only produces around 3 bcm of its own gas. It not only has very high gas prices, but it is clear that LNG sets the price.

The UK is an island nation but with gas pipeline connections to Europe and Norway. It imports around half its 80-100 bcm consumption but only around 10 bcm as LNG. The remainder is via pipelines.<sup>3</sup>



**LPG is costly to produce and ship**

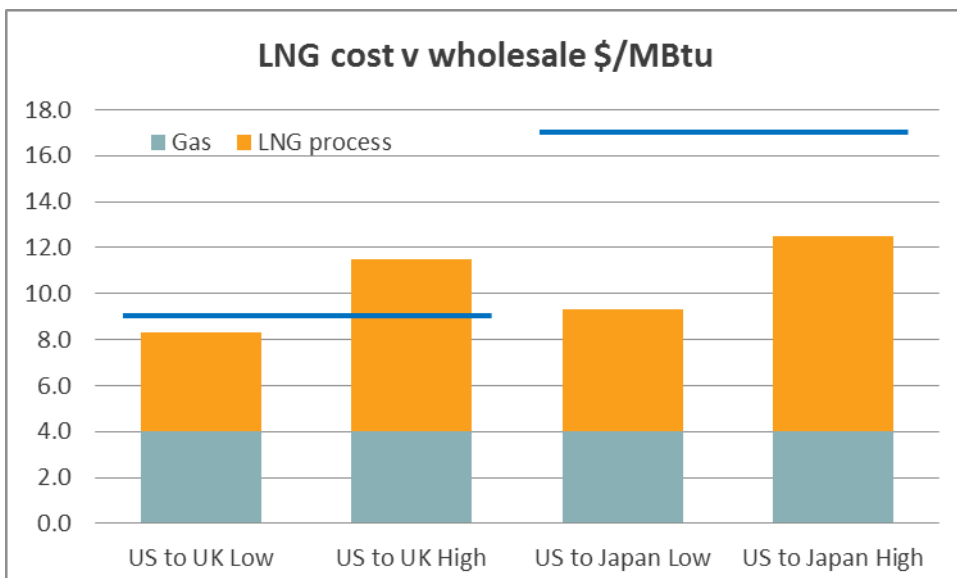
The differential between US gas at \$3 to \$4 per MMBtu and potential export markets appears very large. However the process of liquefaction, shipping, and regasification is complex and costly.

The IEA estimates for the range of costs are shown below:

With expectations of US gas prices stabilising around \$4 per MMBtu the Japanese margin still is significant. However the net effect is to narrow the UK margin dramatically and to bring into question the validity of the trade.

It is arguable that UK and US costs have already converged.

\$/MMBtu	US to Europe		US to Japan	
	Low	High	Low	High
Liquefaction	3.0	4.5	3.0	4.5
Shipping	1.0	2.5	2.0	3.5
Regasification	0.3	0.5	0.3	0.5
<b>Total</b>	<b>4.3</b>	<b>7.5</b>	<b>5.3</b>	<b>8.5</b>



*Europe and UK in comparison with America*



So if low cost unconventional gas can be produced in Europe, as is currently being proposed in the UK, is it likely to achieve sufficient volume quickly enough to make a material difference to domestic prices? Or will it simply be exported to better markets, either by pipeline or LNG? Some of the contrasts with the American experience should be considered.

**Land law**

The US has built an economy from full utilisation of natural resources, from its

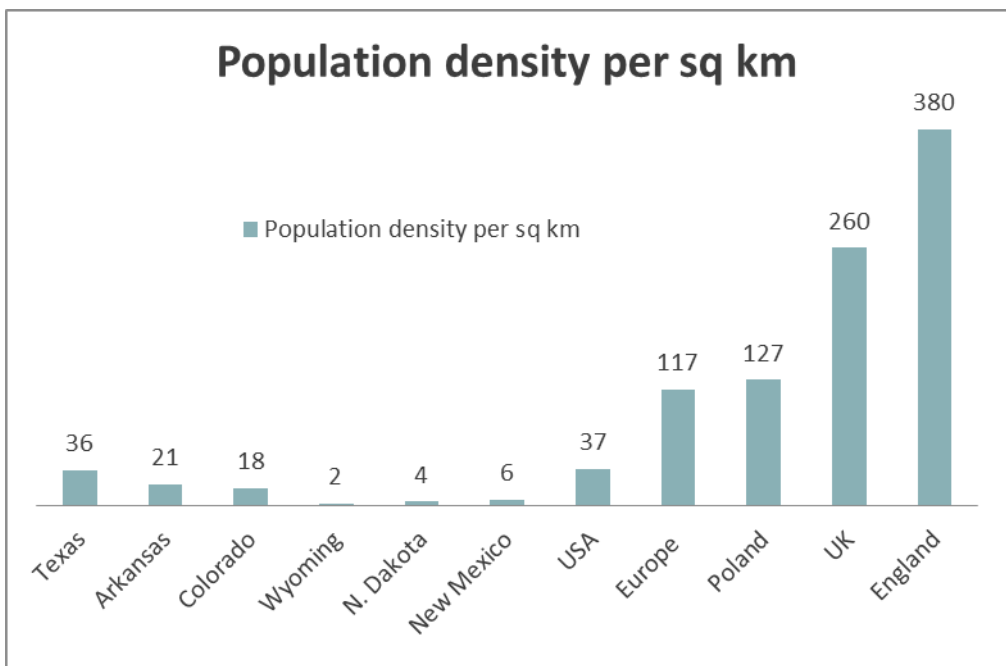
inception. The position in Europe is radically different. Napoleonic land law prevails across large parts, and complex mineral rights exist in the UK where legal challenges to fracking are already starting to appear.

**Population density**

Again, the relative positions are radically different as the graphic illustrates. Even Poland, one of Europe’s largest countries, has a population density over three times greater than America. It is worth noting that the US Central Intelligence Agency description of the UK’s geography is “slightly smaller than Oregon”.

**Open market**

The US has modest access via pipelines to the Canadian and Central American markets. Canada produces more gas than it consumes and the Mexican market is very small.<sup>3</sup> With lucrative export





markets such as South America and Asia, it is natural for the US to export LNG.

Europe, by contrast, has an open market serving over 500 million people. It has an annual gas demand of over 500 bcm<sup>3</sup>, with production of around half that figure, and declining. It is well integrated with extensive gas networks, ultimately linking to Russia which is mistrusted as a

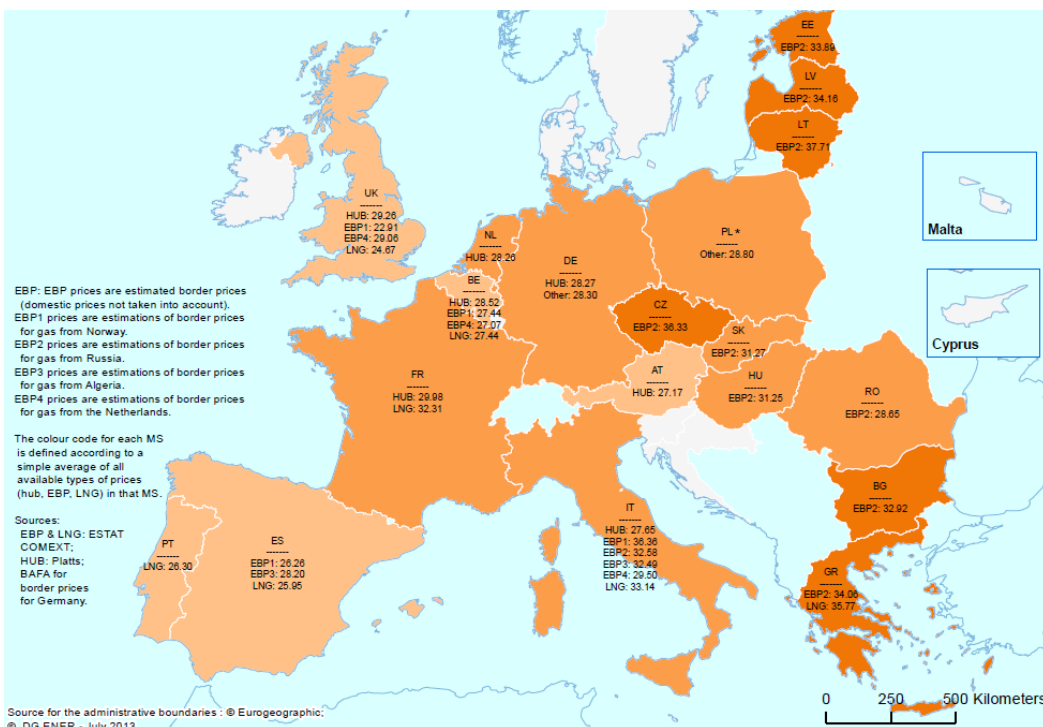


trading partner. If low cost unconventional gas was to be developed in the UK, it is most likely that it would first be used to support the current low

UK pricing, with any surplus being supplied to neighbouring countries where wholesale values are higher. The UK is directly connected to large markets with higher market prices. America is not.

**Political insularity strong in America, less so elsewhere**

America is a very large economy which historically passed laws prohibiting the export of crude oil and gas. The UK is a small economy directly connected to its trading partners in the European Union. The UK may be perceived within Europe as being insular. However the idea that it would – or could – pass laws prohibiting the export of gas to Europe in order to keep domestic prices artificially low is difficult to conceive.





### *Likely outcomes for the UK and Europe*

It is highly improbable that US shale gas will have any material effect on UK or European gas prices.

Unconventional gas from UK fracking is most likely to keep UK gas prices static relative to Europe its neighbours - slightly lower than much of Europe.

The commercial organisations developing the resource will behave rationally and sell gas where they can make the most profit. That may include exporting LNG if margins are sufficiently high although there are only 6 liquefaction facilities in Europe<sup>3</sup> – all in Norway – with no more under construction or planned.

The analysis of the facts suggests strongly that the limited scale of fracking in the UK is unlikely to have any material effect on domestic gas or electricity pricing.

Lord Brown, chairman of a leading UK shale gas company, former chief

executive of BP, and UK government energy adviser told an audience at the London school of Economics in November 2013 “We are part of a well-connected European gas market and, unless it is a gigantic amount of gas, it is not going to have a material impact on price”.<sup>19</sup>

George Osborne, Chancellor of the Exchequer in February 2014 said to the House of Lords economic affairs committee on fracking: “I think it will have an impact (on prices). I hope it will have a significant impact”. But he added “I think in the UK there are some differences with the US. We are not as closed an energy economy as the US is. So I think we more closely track the worldwide gas price than the US does and we have less ability to detach ourselves from the worldwide gas price”.

“I just don’t want to over-promise. I don’t want to go out there and say that this is the solution to all of this country’s economic problems.”<sup>20</sup>

## *References*

- 1 International Gas Union*
- 2 International Energy Agency (IEA) Statistics CO<sub>2</sub> Emissions from Fuel Combustion*
- 3 IEA Medium Term Gas Report*
- 4 IEA World Energy Outlook – Golden Rules for a Golden Age of Gas*
- 5 British Broadcasting Corporation (BBC) report*
- 6 UK Government announcement*
- 7 Thomson Reuters Newsmaker event, reported by Telegraph newspaper*
- 8 United States Energy Information Administration*
- 9 European Union Europa statistics*
- 10 “Fracking by Numbers” report, Environment America Research & Policy Center*
- 11 “Macroeconomic Impacts of LNG Exports” from the United States Office of Fossil Energy, US Department of Energy, NERA*
- 12 United States Department of Energy announcement February 11<sup>th</sup> 2014*
- 13 Various trade journals and reports*
- 14 European Union Market Observatory Volume 6*
- 15 IEA World Energy Outlook 2013*
- 16 United States Census Bureau, Statistical Abstract*
- 17 European Union Eurostat*
- 18 World Bank*
- 19 Address to London School of Economics reported by Guardian newspaper*
- 20 House of Lords Economic Affairs Committee reported by the BBC February 2014.*