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Parliamentary Evidence

Shale Gas

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The Shale Gas Revolution – Key Questions

1. The ‘Shale Gas Revolution’ in the USA is part of significant recent developments in unconventional gas. In addition to shale gas this also includes tight gas, coal bed methane and also hydrates and biogenic gas. Unconventional gas refers to the fact that simply drilling is not sufficient to produce the gas as is the case for conventional gas. Further ‘activity’ is required and thus unconventional gas more resembles a manufacturing process. The developments in shale gas have been achieved by the application of horizontal drilling and hydraulic fracturing. Neither are particularly new technologies to oil and gas but they have been combined to good effect in recent years in the USA. The results have been spectacular. In 2000, less than 1% of domestic gas production in the USA came from shale; the latest figures suggest it is now getting close to 20%. However, even more important has been the impact on expectations. Up to 2005, the general view in the USA was that domestic gas production in the Lower 48 States would be in terminal decline. Given the continued strength in gas demand, this implied growing imports of gas both by pipeline but above all by the use of liquefied natural gas (LNG). To that end a great deal of money was invested in the USA in regasification capacity in the form of either taking regas capacity out of mothballs or new build. Since 2000, such capacity has increased ten-fold.

2. The ‘Shale Gas Revolution’ has had a huge impact in the USA. Gas prices have collapsed although this has also been driven by lower gas demand as a result of the economic recession. Thus based on data from the US Energy Information Agency the average well-head gas price in 2005 was $7.33 per thousand cubic feet (mcf) while the average for 2010 to October was $4.25 per mcf. Furthermore, LNG imports to the USA have collapsed and in 2009 capacity utilization on regasification plants was less than 10%. To put it crudely, a great many investors in LNG in the USA have lost their proverbial shirts.

3. There can be no doubt that shale gas has the potential to transform the global energy scene and is clearly a possible ‘game changer’. However, to determine whether this potential can be realized requires the answer to two key questions: - Can the ‘Shale Gas Revolution’ continue in the US? Can it be replicated elsewhere in the world?

Can the ‘Shale Gas Revolution’ Continue in the US?

4. For the US there are several concerns. The current low prices of domestic gas are threatening the economics of many existing shale gas projects and future investment may well be compromised. There are also the possible negative environmental consequences of hydraulic fracturing. This involves injecting water and chemicals at very high pressure into the gas plays. The 2005 Energy Act explicitly excluded hydraulic fracturing from the Environmental Protection Agency's Clean Water Regulations - the so-called ‘Halliburton Loophole’. As concerns grow, drilling moratoria have been called on some shale plays while environmental impact studies are completed. Interestingly when in 2009 ExxonMobil bought XTO, the third largest gas producer in the USA (mainly unconventional) for $41 billion, the deal had a special clause that would invalidate the purchase if the government (State or Federal) introduced legislation that was unfavourable to hydraulic fracturing.

5. On balance it seems unlikely that the ‘Shale Gas Revolution’ can be halted in the USA. In particular, in the last couple of years, the major international oil companies have become increasingly involved. Such companies have much deeper pockets and much greater influence with government than the smaller companies who originally pioneered the ‘Shale Gas Revolution’ before 2008.

6. The answer to the second question about replication elsewhere attracts much greater concerns, especially in the context of Western Europe.

Can the ‘Shale Gas Revolution’ Be Replicated Elsewhere?

7. Potentially global unconventional gas resources (coal bed methane, tight gas, and shale gas) are significant. A National Petroleum Council Report in 2007 estimated unconventional gas resources at five times conventional gas reserves. However, the ‘Shale Gas Revolution’ in the USA was triggered by a number of favourable factors. It is useful to list these and then consider in each case how likely replication might be generally in a European context and specifically in the UK.

1. Geology

8. The shale plays in the US are larger, shallower and more material than those in Europe. Furthermore there are very large core samples available from earlier conventional drilling in the USA. This creates much greater

knowledge of the immediate geology. There has been relatively little such drilling onshore in Europe and hence the data are not available. A related problem is that traditionally, exploration acreage being licensed in Europe has tended to involve relatively small areas with fairly rigid associated work programmes. Shale plays need larger areas and greater flexibility to tease out the best prospects.

2. Tax Breaks

9. In 1980, the Crude Oil Windfall Profit Tax Act in the USA introduced an alternative (non-conventional) fuel production tax credit of $3 per BTU oil barrel. This was equivalent to 53 cents per thousand cubic feet (tcf). It remained in force until 2002 and was a significant incentive to attempt to develop unconventional gas given that after 1980, the wellhead price rarely exceeded $2 tcf. In Europe, only Hungary has any form of tax advantage for unconventional gas.

3. Widely Dispersed Populations

10. Even ignoring environmental considerations, shale gas operations are potentially very disruptive to local communities. For example, on the Barnett Play in North Texas the average wellhead density is 12 per sq km. In the USA, population density is very much lower than is the case in Europe - 27 per sq km in the USA compared to 383 in England. Furthermore, the population in the USA has long experience (and acceptance of) oil and gas operations in their ‘back yard’. In large part this is because property rights in the USA mean that shale gas operations (and indeed any oil and gas operations) directly benefit the local landowners. In New York State for example, some residents are offered up to $5,500 per acre with 20% royalties on any gas produced. In Europe, where subsoil hydrocarbons are the property of the state, this is not the case. There is no reason for the local population to accept the disruptions. This is reinforced because given the capital intensive and specialist nature of shale gas operations, there are few local employment benefits.

4. Easy Access to the Gas Grid

11. In the USA, access to the gas grid is based upon ‘common carriage’. This means any gas supplier can gain access to the grid even if it is already operating at full capacity. Other users must reduce their throughput on a pro-

rata basis. In Europe, access is based upon 'third part access' which means if the system is operating a full capacity there is no access unless dedicated new pipelines are built.

5. Limited Environmental Control

12. In the USA, environmental controls in the context of hydraulic fracturing were (very surprisingly) lax. In Europe this is not the case and satisfying environmental impact assessment criteria is likely to prove difficult and controversial. Already local groups within the UK opposed to shale gas operations are beginning to form as my Email inbox can attest. There is another regulatory problem in Europe. European petroleum legislation has no mention of unconventional gas which means it is not at all clear how the industry will be regulated and on what basis. My understanding is that, for example in Germany, unconventional gas comes under coal mining legislation. A further difference concerns access to water. This is key to being able to mount hydraulic fracturing operations. In the USA access is generally very good in the shale play areas. However, in parts of Europe (notably in Central Europe where much of the European shale gas resources are located) water access is constrained.

6. Service Industry Capability

13. Small entrepreneurial companies with the help of an already vibrant and competitive service industry drove developments in shale gas in the USA. For example, at the peak of the recent boom in the Barnett Shale Play in 2008, 199 rigs were in action. However, as of July 2010, there appeared to be only around 34 land rigs in the whole of Western Europe, compared with some 2,515 active land rigs in the United States in 2008, of which 379 were in oil and 1,491 in gas. Putting it simply, the infrastructure in Europe does not currently exist to mount enough unconventional gas projects to make a difference. Of course this can change if the projects appear profitable, but it will take time. However, a further problem is that the service industry in Europe is an oligopoly dominated by a few (largely American) companies. This is not conducive to the rapid development of a service industry capability.

14. For all of these reasons, the replication of the 'Shale Gas Revolution' in Europe and indeed the UK faces a great many barriers. Of course, these are by no means insurmountable but it will take time to manage them. Outside of

Europe, the story may be different. In particular, there are parts of the world such as China were local opposition, which forms the major source of barriers to shale gas development in Western Europe, is likely to be ‘managed’ quite easily.

15. There are many uncertainties associated with the answers to the two key questions - can the ‘Shale Gas Revolution’ in the USA continue and can it be replicated elsewhere. This is extremely important for the future not just of gas markets but also the global energy scene. Uncertainties over the answers to the questions will inhibit future investment in gas supplies. There are already signs of the cancelation or postponement of gas export projects such as the giant Shtokman field in the Barents Sea north of the Kola Peninsula - a joint venture between Gazprom, Statoil and Total. There are also serious questions over the prospects of other gas projects such as Nabucco.

16. If the ‘revolution’ does continue and extend to the rest of the world, consumers can anticipate a future floating on large clouds of very cheap gas. However, if it falters, in the medium term, the world will face serious gas shortages given these current investment uncertainties. As the world recovers from global recession and as earlier constraints on gas use erode, gas demand will grow. The UK provides an excellent example of what happens to energy markets when previous constraints on gas use are removed. In 1990 when the constraints began to weaken, natural gas accounted for 20% of the UK's primary energy mix. Only ten years later in 2000, gas accounted for 40% of primary energy in the UK.

17. However, given the investor uncertainty described above, future gas supplies will be lower than required had the ‘Shale Gas Revolution’ and its current hype not happened. If unconventional gas fails to deliver on current expectations - and we will not be sure of this for some time into the future -in ten years or so, gas supplies will face serious constraints. Markets will eventually solve the problem as higher prices encourage a revival of investment. However, given the long lead times on gas projects, consumers could face high prices for some considerable time.

18. A related problem concerns investments in renewables. There is general agreement that the world must move to a low carbon economy if climate change is to be managed. Among other things, this requires much greater

investment in renewables. In a world where there is the serious possibility of cheap, relatively low carbon gas which could be seen as a 'transition fuel', who will commit large sums of money to expensive renewables to lower carbon emissions? Again, if shale gas fails to deliver, it condemns us to a higher carbon future than would otherwise have been the case.[12]

The Role of the UK Government in the Story

19. A key issue for the UK government is therefore what might be done to try and reduce the current uncertainties and thereby encourage greater investment in gas supplies generally and shale gas in particular? Before providing an answer it is necessary to argue why government should intervene at all? Why not simply leave it to the market? This has been the European Commission's position. On 19 July 2010, the European Commission's Michael Schuetz of the Directorate-General for Energy was asked how the European Union might assist in the development of shale gas in Europe. He replied that it was not the EU's job to nurture the technology, adding that 'the industry has to develop this business'. The conventional argument for government intervention is to manage market failure. Market failure arises from a number of causes. These are conventionally listed as: imperfect competition; inadequate information; the existence of externalities; and finally the presence of public goods. Gas markets in Europe are riddled with externalities most obviously in the context of security of supply and monopoly tendencies. However, for shale gas two specific issues stand out which justify government intervention - the nature of the learning curve and the issue of contestable markets.

The Nature of the Learning Curve

20. A major problem with shale gas is that the plays and indeed the wells on the same play are all very different in terms of geology, well behaviour and reservoir characteristics. Thus unlike many other activities, there is a very limited aggregate learning curve. Thus research and development (R & D) are essential ingredients to develop shale operations, as is the sharing of information between operators. In the USA this process has been going on over the last 10 years and has helped to reduce shale gas production costs by moving down the learning curve. However, because of the heterogeneity of shale operations this experience cannot necessarily be applied in Europe without adjustments. Traditionally, government should intervene to encourage

and promote R & D and the exchange of operating experiencing within the limits of what is feasible given competitive advantage and commercial confidentiality.

Contestable Markets

21. In the theory of contestable markets, market power such as monopoly can be controlled if there is threat of entry. Actual entry of competing suppliers is not necessary; simply the threat that the market might be contestable and new suppliers might enter is sufficient to enforce behaviour associated with competitive markets. Western Europe at the moment looks as though it will become increasingly dependent upon gas imports. If there are real prospects of significant gas supplies from domestic shale sources, this could have a very powerful influence on the behaviour of Europe's current external gas suppliers forcing them away from seeking higher prices. Thus even if the UK government and the EU only spout rhetoric about encouraging shale gas, this might be sufficient to create a contestable market to contain suppliers' behaviour over prices and contracts.

There are a number of actions that could be taken by the UK government to encourage the development of shale gas both here and in Western Europe more generally:

22. First would be to persuade/pressure the EU to take a more positive proactive role in encouraging shale gas developments. Western Europe is a regional gas market of which the UK is an integral part. Therefore anything that increases supply and reduces price will benefit the UK. The current EU position on shale gas of ‘leave it to the market’ is a serious mistake that ignores the externality dimensions involved. At the very least this pressure could involve looking at the myriad of European regulations which might inhibit shale gas developments.

23. The government could do much to encourage R & D into shale gas. This could range from the funding of research and a research centre to ensuring operating experiences are shared between companies to try and create an aggregate learning curve.

24. Something must be done to sort out the regulatory uncertainty with respect to shale gas. There needs to be explicit regulation to bring shale gas

operations into the general petroleum legislation. In particular, to allow for much more flexible terms for licensing acreage such that the work programme associated with shale plays can be better managed.

25. Given the positive externalities associated with shale gas in the context of security of supply - mainly the contestable market argument developed above- there may be a case for subsidy or at least some form of tax break/credit on shale gas operations.

26. Clarify the environmental position on hydraulic fracturing by ensuring the results of the current studies underway in the USA are disseminated. At the same time it will be necessary to carry out environmental impact assessments of shale gas developments in the UK to consider the relevance of the operating conditions to the experience in the USA.

27. Introduce financial mechanisms such that local communities can be compensated for disruption by some sort of fund drawn from the operators. This could be some form of compulsory corporate social responsibility fund. Something is required to provide incentives for landowners to allow access and communities to accept disruption.

28. Tax breaks for drillers building new rigs could also encourage the development of a European service industry that would make a shale gas revolution in Europe a more likely possibility. At the very least, there should be efforts to ensure that importing shale gas technology from the USA - software and hardware - is not constrained although the encouragement of a home grown service industry is preferred.