15 March 2013

Cefic Position Paper

Les implications de l'exploitation du gaz de schiste pour les industries chimiques européennes

Recommandations et conclusions

- L'industrie chimique européenne considère que le gaz de schiste est une opportunité pour l'Europe. Le développer d'une manière sûre et responsable offre un potentiel pour le renforcement de la compétitivité de l'industrie et la création d'emplois. Nous encourageons les responsables politiques européens à explorer cette opportunité et sommes prêts à contribuer au débat avec l'aide de l'expertise de nos industries.

- La révolution du gaz de schiste aux Etats-Unis a des répercussions sur les industries manufacturières et chimiques européennes, de par la disponibilité pour l'industrie américaine du gaz de schiste très concurrentiel comme énergie ou matière première.

- À l'exception du Moyen-Orient, où les ressources énergétiques et en matières premières sont abondantes, les régions n'ayant ne pas accès au gaz de schiste souffrent d'un désavantage concurrentiel. Le gaz de schiste est en cours d'exploration à l'échelle mondiale, ce seront d'autres régions du monde qui pourront tirer parti d'avantages similaires à l'avenir.

- Le gaz naturel (y compris le gaz de schiste) peut aider l'Europe de répondre à ses objectifs de réduction des émissions de gaz à effet de serre de façon rentable, franchissant ainsi un pas important vers une économie sobre en carbone.

- Le gaz de schiste peut contribuer à la sécurité d'approvisionnement énergétique de l'Europe et a un rôle clé à jouer dans l'équilibrage des sources d'énergie renouvelables intermittentes.

- Le gaz de schiste peut également fournir une source concurrentielle de matières premières pour l'industrie chimique.

- L'Europe dispose d'importantes ressources potentielles de gaz de schiste. Retarder le développement du gaz schiste en Europe va augmenter la dépendance vis-à-vis des importations, réduire la compétitivité de l'industrie européenne, réduire les investissements dans notre industrie et – au fil du temps – conduire à une réduction de l'emploi et de la production dans nos régions par rapport au reste de la monde.

Pour toutes ces raisons, le Cefic considère que le développement de gaz de schiste, importés ou autochtones, pourrait apporter une contribution importante à notre industrie et sa chaîne de valeur. Nous demandons donc aux autorités européennes et des États membres de prendre des mesures qui suivent:

- D'accélérer l'exploration et la production responsable de gaz de schiste autochtones en évitant la création de barrières réglementaires inutiles, en prêtant une attention appropriée à la santé humaine et à l'environnement, en informant correctement le public sur les avantages économiques du gaz de schiste, ceci afin que l'Europe ne perde pas cette occasion de renforcer sa compétitivité industrielle et de maintenir et générer la croissance et l'emploi.

- De plus, il serait positif d'avoir une importation plus importante de gaz naturel liquéfié (GNL) ainsi que de liquides issus du gaz naturel (LGN) en Europe, à la fois comme sources énergétiques supplémentaire et de matières premières pétrochimiques. L'attention devrait être portée sur ce sujet dans le cadre des discussions commerciales UE-États-Unis, afin de surmonter les barrières existantes, éviter la création de nouveaux obstacles et ainsi renforcer la compétitivité de la chimie et des industries manufacturières européennes.

1 Background: What is shale gas?

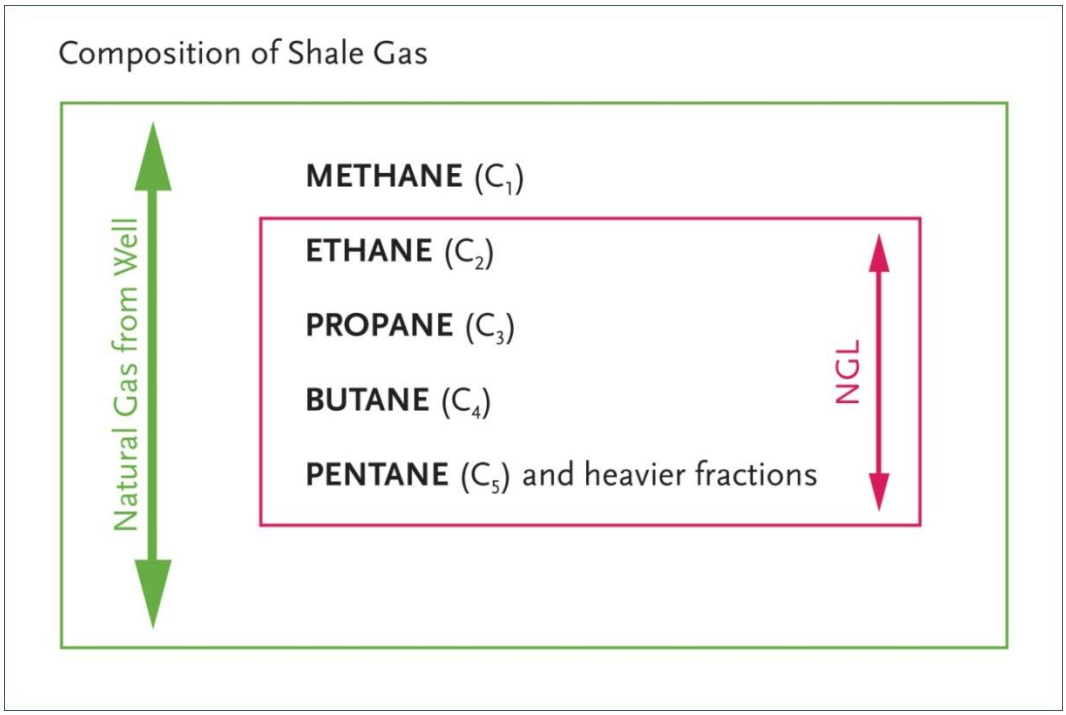
Shale gas is a naturally occurring hydrocarbon gas mixture that is trapped in shale rock formations. The combination of two existing techniques, hydraulic fracturing and horizontal drilling, has opened opportunities to economically recover these resources, which were not recoverable before. One of the techniques used is called “hydraulic fracturing”, which creates fissures, or fractures, in these underground formations to allow the release of the trapped gas. In the process, a solution consisting of water and additives is injected into the formation under high pressure. Shale gas, along with tight gas and coalbed methane, is also referred to as “unconventional gas”.

Shale gas reserves are being explored in many parts of the world, but so far only the United States has been able to commercialise production on a large scale. However, there is great potential in other regions, including Europe, Canada, Africa, Australia, Latin America and China.

According to recent studies [1], technically recoverable shale gas resources (TRR) globally are approximately 200 tcm (trillion cubic metres). Comparison with the global TRR of conventional gas, estimated at 425 tcm, shows the considerable global potential of shale gas.

Besides energy, shale gas can also be used as petrochemical feedstock. Depending on the formation, shale gas can either be “dry” (mainly only methane) or wet, (methane is accompanied with a high percentage of “natural gas liquids” (NGLs), which are a valuable feedstock for the petrochemical industry (see Figure 1).

Figure1



To allow shale gas to be transported over long distances, the gas is compressed at very low temperatures to become “liquefied natural gas” (LNG), which can then be transported by ship around the world.

2 How is shale gas impacting the chemical industry?

2.1 Shale gas revolution in the US

Shale gas has proven to be an abundant resource in North America. The total recoverable shale gas resources in the US are estimated at 20 tcm (trillion cubic metres)[1]. Access to shale gas has created a local, low cost source of energy for the manufacturing industry, in what has come to be called the "US shale gas revolution".

In addition, several of the shale gas formations in the United States are extracting significant amounts of petrochemical feedstock. This, in turn, is contributing to investments in refurbished or new capacity in the chemical industry.

Shale gas exploration, extraction and production started in the United States more than 20 years ago. Shale gas surged from 1% of the US gas supply in 2000, to 8% in 2008 to 30% today and is projected to account for 45% by 2025. The present revolution was enabled by significant innovation, public and private investments, and the establishment of a full service industry (rigs, water, hydraulic fracturing operations).

This improved competitiveness is resulting in new investments and job creation in the US. Over the past 18 months, US industry has announced roughly 100 new manufacturing projects representing over $80 billion dollars in investments and millions of new jobs, all predicated on competitive natural gas and chemical feedstocks. These projects are in energy-intensive industries such as steel, aluminum, glass, fertilizers and petrochemicals. Since January 2010, stable and competitive natural gas prices have created more than 500,000 manufacturing jobs [2].

2.2 Implications for EU chemical industry

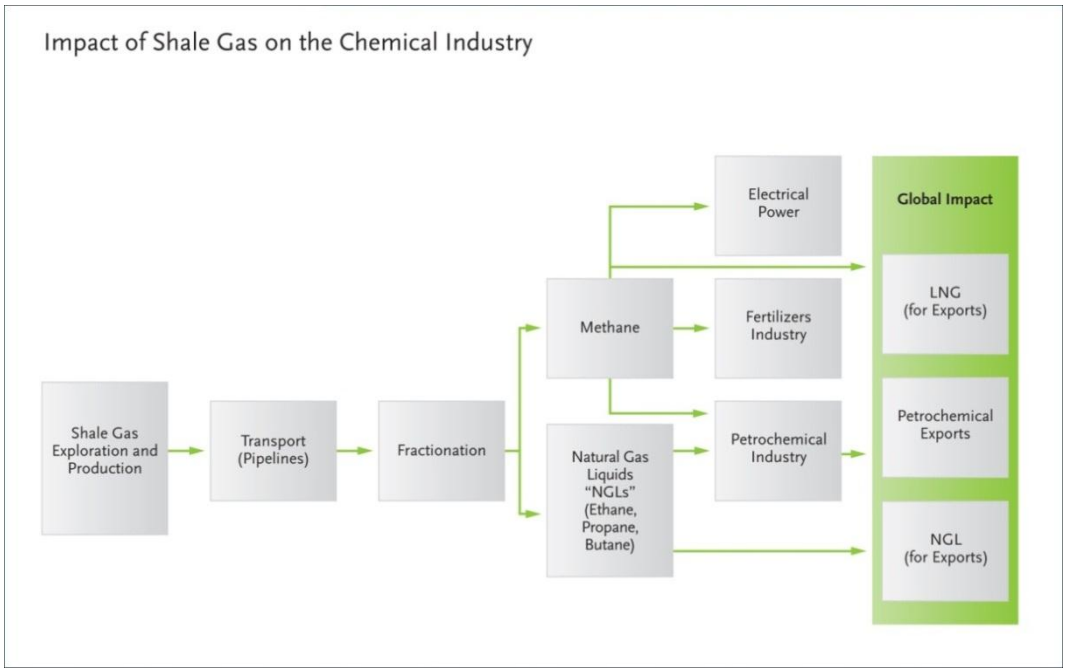
The EU chemical industry directly contributes to 1.1 per cent of the EU gross domestic product, or GDP. This may seem small at first, but one should take into consideration the indirect contribution of chemicals to the key sectors of the EU economy. The chemical industry underpins most sectors of the economy, and its strategies impact directly on downstream chemicals users. The large industrial customers are rubber and plastics, construction, and the automotive industry.

The chemical industry is also an important employer. Chemical companies in the EU employed in 2011 a total staff of about 1.2 million people. They also generate additional indirect jobs in the value chain – approximately two to three times the number of direct jobs. All in all, the chemicals sector provides jobs for approximately 3.6 to 4.8 million people in the EU.

In its activities, the chemical industry uses significant amounts of natural gas, both as fuel and as feedstock. In Europe, natural gas makes up about 35% of the energy used by the chemical industry. So the availability of affordable shale gas would reduce the energy and feedstock costs of European chemical and manufacturing industries.

The European chemical industry will be impacted by the shale gas bonanza taking place in the United States. The potential impacts will be greatest in the energy and feedstock-intensive chemicals sectors, namely the petrochemical and fertilizers industries and the value chains they support, as is illustrated below.

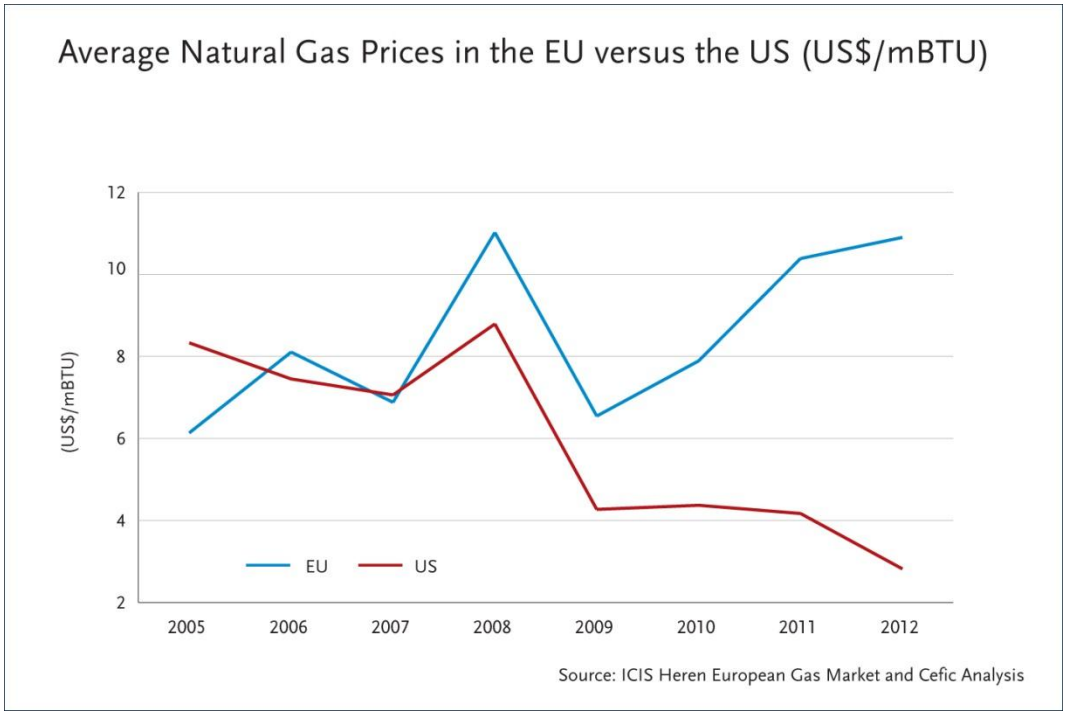
Figure 2



A key issue is the impact of shale gas on gas prices in the US versus the EU.

The arrival of shale gas in the US market has had an enormous impact on the gas price (from 8 USD per mBTU in 2005 to 3 USD/mBTU in 2012), giving the US a major boost in competitiveness. Within the same time frame, gas prices in the EU have increased by more than 80%.

Figure 3



The availability of advantaged shale gas is providing the US with the opportunity to become an export market, both for LNG (energy use), NGLs (feedstock use) and finished

petrochemicals (Figure 2). The US terminals that were mainly constructed to import LNG are being refurbished to become export terminals.

The export potential of US shale gas is expected to mitigate some of the impact on the European market, potentially leading to more competitive energy and feedstock prices.

2.3 Impact on petrochemicals and their value chain

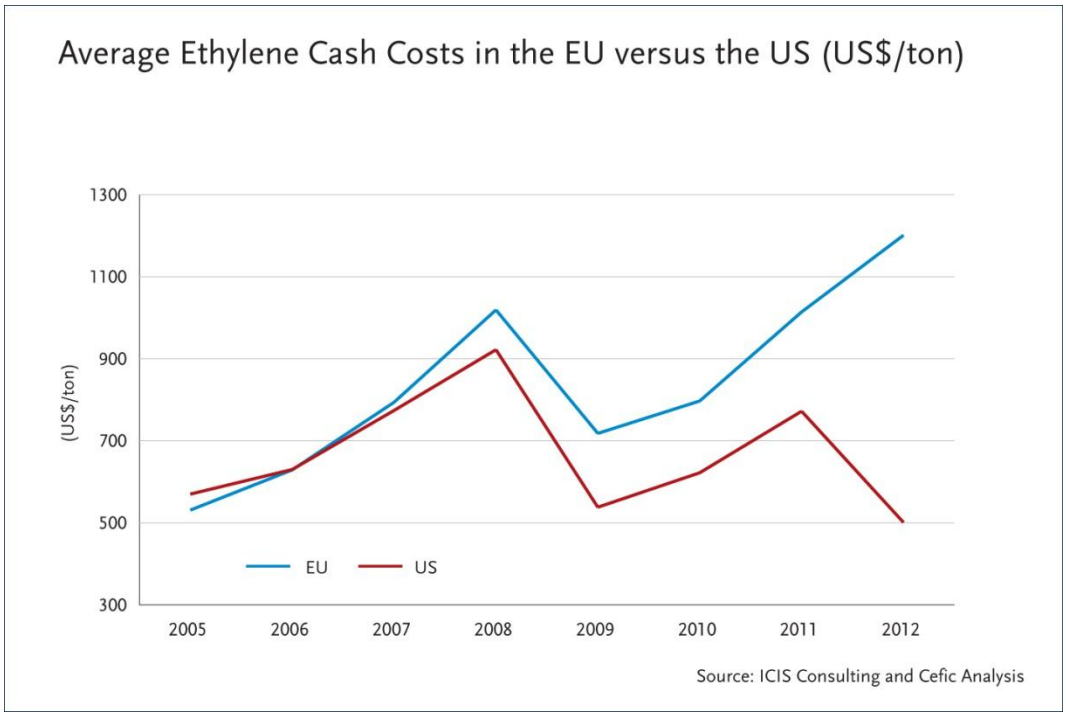
Petrochemicals constitute the building blocks of the entire chemical industry. They are produced in large volumes, and are sold within the petrochemicals industry itself or to other industries. They represent directly 25% of EU chemicals sales but support a value chain that amounts to more than 80% of European chemical industry sales.

The impact of shale gas on petrochemicals production is illustrated below with the case of ethylene.

Ethylene is the largest basic building block for the chemical industry and largest volume organic chemical produced (~130 million tons/year).

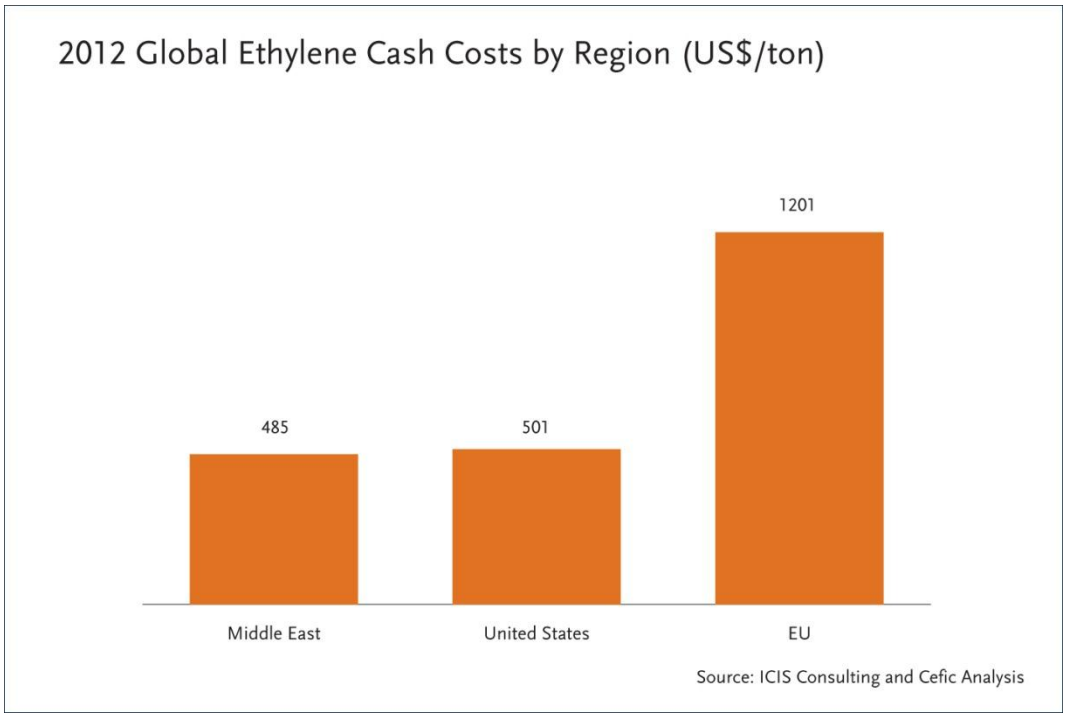
As can be seen in Figure 4 below, in 2005 naphtha-based ethylene in Europe had a cost basis which was similar to ethane- based ethylene in the US. In 2012, the cost difference between the two regions became 700 $/ton. On a European market of 20 million tons, this represents a cost advantage for the US of 14 billion USD per year. With a transportation cost between the two regions of 100-300 $/ton, this makes Europe very cost-defensive compared to the US (in addition to the Middle East, which was an already existing situation).

Figure 4



In summary, seven years ago Europe was in a comparable cost situation to the United States for the production of ethylene (the most advantageous was the Middle East, which has maintained its position). Now, with the emergence of shale gas in the United States, Europe today is essentially a “laggard” region from the cost competitiveness point of view (Figure 5).

Figure 5



As a result of the shale gas revolution in the US, 7-10 million tons of extra ethylene capacity is being built, due to come on stream in the coming 3-5 years. This new volume, equal to 35-50% of the European demand, will exceed domestic demand in the US and will eventually participate also in export markets. It could also reach Europe, thus competing with local production.

This new competition would have material effects on the European chemical industry, itself also an export-oriented region. This shift in competitiveness impacts the entire ethylene value chain, making it globally uncompetitive.

This could lead to a gradual petrochemical industry delocalisation from Europe to regions like the US and the Middle East. In parallel, this rationalisation is also bound to affect investments that tend to accompany petrochemical integrated sites, namely R&D and corporate coordination centres.

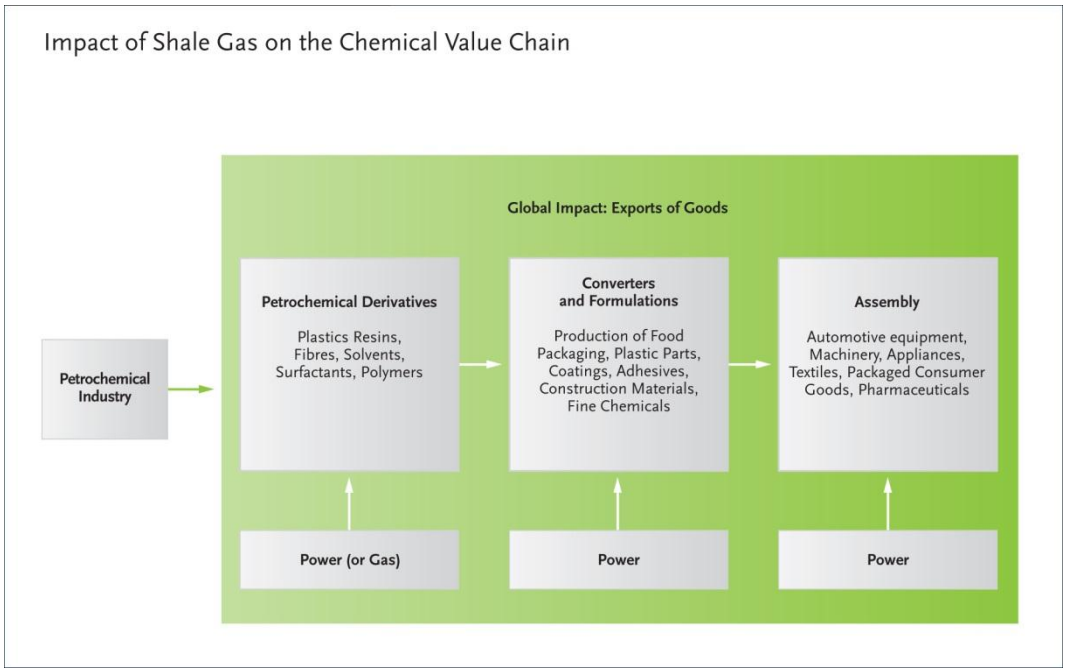
In addition to the impact on the petrochemical industry and its direct customers, there could potentially be an impact down the value chain, on the manufacturing industry in general (Figure 6).

The impact will be twofold:

- Firstly, downstream industries will be confronted with more costly petrochemical-based raw materials.
- Secondly, downstream industries will see an impact on gas (as already described) and also electricity markets.

These two factors will strongly affect the first column in Figure 6, but will do so gradually along the value chain, in a “domino effect’. The result can be a gradual move out of Europe of these value chains, with the resulting loss of wealth and employment.

Figure 6



2.4 Impact on fertilizer production

Fertilizers made from natural gas are an essential component of sustainable food production and European food security.

Fertilizers represent about 5% of the European chemical industry turnover. Natural gas is a key feedstock for fertilizers. The cost of fertilizers greatly depends on the cost of gas, and can represent up to between 60 to 80% of the total cost.

The shale gas revolution is already having a short-term impact, by boosting North American profits. In addition, this has triggered major investment in new plants that can amount to approximately 5 to 7 million tons of nitrogen fertilizers by 2016. This will, in turn, encourage exporters (from low cost gas producing regions like Russia and Ukraine, as well as Africa and the Middle East) currently supplying the US market to seek alternatives. Significant volumes will target Europe. When that happens, European industry will need to have improved its cost position on gas, hence the importance of developing shale gas (and other gas supplies, like LNG and pipeline sources).

3 What is the opportunity for Europe?

Europe has significant potential shale gas resources that, if developed, could be an important boost for our economy, energy security, climate change targets and could provide advantaged feedstock for the chemical industry.

Studies point to significant reserves in the UK, Poland, Germany, France, Denmark, Sweden, Austria, Hungary, Romania and Ukraine. Recent EU Commission studies estimate a TRR for Europe of about 16 tcm (for the US, EU Commission studies show an estimated maximum of 47 tcm); however, uncertainty levels are still high. Projections are difficult to make, as the only way to know a region's real potential is by drilling exploration wells, of which there are only a few in Europe [1].

EU Commission studies [1] show that under a favourable scenario (full exploitation of indigenous shale gas reserves), European import dependence would remain flat at around 60% in the 2012-2040 period, since shale gas would be compensating for a decline in conventional gas production. Without shale gas development, however, import dependence could rise to 80% by 2040.

Additional studies [3] show clearly that shale gas (in a similar manner to conventional gas) has the potential to reduce carbon emissions by 50% compared to coal. Development of indigenous shale gas in Europe has several advantages. It could reduce energy dependence, provide an affordable source of clean energy, and play a key role in balancing intermittent renewable energy sources.

Shale gas can also provide advantaged feedstock for the chemical industry.

However, investments in shale gas exploration and development in Europe are taking place at a slow pace, and are hindered by public and political opposition.

Decisions on the energy mix are ultimately a Member State decision. In the Member States where this process is most advanced – the UK and Poland – experts agree that it will take several years before significant production takes place, because of the high cost of exploration, the expected lengthy approval process for obtaining the exploration licences and the need for a service industry (rigs, piping fractionation equipment and service industries) that needs to be established to exploit the wells.

The EU has shown great interest in the subject, due to the important economic implications and also due to the potential environmental concerns with the hydraulic fracturing process. The European Parliament issued two reports in 2012 [4] and [5] , concluding that shale gas is clearly a potential addition to the European energy mix, with the potential benefits it could bring, but calling for caution in its development – due to environmental concerns – and thus for a "robust regulatory framework" to regulate it.

The European Commission, under the lead of DG Environment, has started work to come up with a framework and recommendations to Member States for the exploration and production of shale gas.

The increasing abundance of unconventional gas in North America is having a positive effect in terms of dampening European gas and feedstock prices. LNG exports from Qatar, Nigeria and North Africa that were in the past partially destined for the US are now being exported to Asia and Europe, improving market liquidity.

Cefic considers it would be positive to have an increased flow of LNG and also NGLs into Europe from all regions (including the US), as they would help both as an additional source of gas into the energy market and of petrochemical feedstock. Cefic calls for attention to be given to this topic in the context of the EU-US trade discussions.

Figure 7: Potential shale gas reserves in the EU (Source: International Energy Agency)

4 Chemicals in hydraulic fracturing

Hydraulic fracturing is essential for the production of natural gas from shale formations. It must be done in such a way that risks to the environment as well as human health are controlled [6].

For the hydraulic fracturing process, water and chemicals are required. The chemical additives used in the process have a number of purposes including reducing friction, preventing bacterial growth, scale inhibition, corrosion inhibition, clay stabilization, gelling, and cleaning, as well as potentially reducing the overall consumption of water [7].

The use of chemicals has been raised as a concern, mainly due to their potential environmental impact. The chemicals typically used in hydraulic fracturing need to comply with the applicable EU legislation addressing chemical products and their uses, notably the REACH Regulation and the Biocidal Products Regulation, as well as meeting the objectives of the Water and Groundwater Framework Directives in their use. National, regional and local regulations must be observed.

Cefic supports the responsible use of chemicals and water in the hydraulic fracturing process, along with the recommendations set by the IEA [7]. Cefic supports the disclosure of the contents of fracturing fluids to the public in a similar manner to *Fracfocus* in the US [8].

The European chemical industry, as a solutions provider, supports continued research and innovation efforts aimed at improving the hydraulic fracturing process.

5 Conclusion

The European chemical industry considers that shale gas is an opportunity for Europe. Developing it in a safe and responsible way has the potential to strengthen industry's competitiveness and create jobs. We encourage European policymakers to explore these opportunities and are willing to contribute our industry expertise to the debate.

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