Why is more gas not the answer to EU concerns about its natural gas supply?

Executive summary

The political crisis in Ukraine augmented fears about the EU's reliance on imports of Russian gas, accounting for ~ 25-30% of the EU's annual consumption. It has also led to a renewed questioning of projects, such as the proposed South Stream pipeline, which would further increase the EU's dependence on Russian gas.

We argue that the crisis offers an opportunity to jumpstart a strategy aimed at reducing the EU's demand for natural gas, particularly for the heating of buildings (accounting for ~ 40% of the EU's annual gas consumption). By exploiting the synergies between energy efficiency in buildings and renewables for heating & cooling, the EU can significantly alleviate its reliance on foreign imports of gas.

An ambitious energy efficiency target of 40% for 2030 - as called for by the European Parliament - will result in a ~ 20% drop in annual gas consumption. Increased use of renewables, particularly in the heating & cooling sector, could further reduce the EU's reliance on gas imports by another ~ 10%. Another 8-15% in additional gas savings can be expected from electricity savings, if renewables continue to increase their share in the energy mix. In conclusion, investing in renewables and energy efficiency can generate gas savings of ~ 40%, exceeding all gas imports from Russia. Such a strategy will also have added benefits in terms of climate targets, developing cutting edge-technology and jobs.

Reducing the EU's gas consumption is a more realistic and cost-effective strategy than replacing gas supplies from Russia with alternative supplies of gas (Norway, new pipelines, more (US) LNG, domestic shale gas production). Developing these alternative supplies of gas will be extremely difficult, fail to address security of supply concerns and come at great expense. The reasons why are elaborated below.

The EU's domestic production has been declining for years, at a rate of ~ 5 to 10 Bcm per year. Norwegian gas is not in a position to compensate for declining domestic production in the EU and possible long supply interruptions from Russia.

New gas pipelines in the planning stage will further exacerbate the EU's reliance on Russian gas (South Stream) or gas from other volatile areas in the Central Asia and North Africa and support corrupt and authoritarian regimes (e.g. the 10 Bcm Trans Adriatic Pipeline linking the Caspian region to Italy).

The global LNG market is and will remain tight. Attracting LNG to the European gas market will be an expensive option, as LNG spot prices are about twice as expensive as Russian pipelines gas.

The US is unlikely to export significant amounts of gas. The US still imports 10% of its gas from Canada, about 80 Bcm per year. Gas production of major shale gas plays such as the Barnett and the Haynesville already peaked two years ago. At current gas prices at US hubs (~$4.5/MMBtu), drilling for shale gas is not commercially viable. Should the US ever realize gas exports, it will take years and billions of dollars to construct the liquefaction facilities. Rather than exports to the EU, American LNG is more likely to be exported to Asian markets where prices are higher.

Drilling for unconventional fossil fuels like shale gas in the EU will not reduce the EU's reliance on gas imports. Developing a large-scale shale gas industry in Europe will take at least a decade. Shale gas will not become available before 2025. Given the infancy of this industry in Europe, drilling 5000 wells between 2025-2035 will only result in 20 Bcm per year, making only a limited and short-term dent in the long-standing decline of EU's domestic production of conventional gas.

Natural gas in Europe: The current situation

Last year, the EU received 105 Bcm of natural gas from Russia at an average price of $10.50 per MMBtu. This corresponds to ~ 25% of EU gas consumption (in 2013 totaling 474 Bcm in 2012).[1]

Other sources of gas imports were pipeline gas from Norway (~ 105 Bcm) and LNG (~ 60 Bcm).[2&3] Gas production in EU Member States delivers around 35% of EU gas consumption, i.e. ~ 160 Bcm.[4]

The dependency rate on Russian gas among EU Member States varies greatly: From 0% in the case of Belgium to 100% in the cases of Finland, Bulgaria and the Czech Republic. All eastern European EU Member States (except Romania) import 60% or more of their gas from Russia.[5]

Natural gas is used in mainly three sectors:

- ~ 40% for heating of buildings: 185 Bcm
- ~ 30% in industrial processes: 142 Bcm
- ~ 25% in power plants: 112 Bcm

Around 80% of all gas consumption for the heating of buildings is situated in just 6 EU Member States: UK, Germany, Italy, France, Netherlands and Belgium.[6]

1) Declining domestic gas production from conventional supplies has led to increasing gas import dependency for EU Member States

Domestic conventional gas production in EU Member States mainly comes from mature production basins and has been declining for years. Some examples[7]:

- German gas production peaked in 1999 (23 Bcm) and stood at 12 bcm in 2011, minus 50%.
- Denmark's production has been declining since 2005 (10 Bcm in 2005, 6 bcm in 2012), minus 40%.
- The drop in the UK's natural gas production has been particularly dramatic: 108 bcm in 2000 to 37 bcm in 2012, minus 65%.

One EU Member State – the Netherlands – has been able to keep its gas production stable around 80 Bcm per year. However, the Netherlands has capped gas production to address safety concerns about the growing number of earthquakes linked to gas production from the Groningen field. No short-term boost in gas output can be expected given these limitations.

Only Norway has been able to drastically increase its production from 28 Bcm in 1995 to 117 Bcm in 2012. That increased production is (almost) exclusively exported to EU Member States via pipelines. Norwegian authorities do not see a major jump in its natural gas production in the coming years (111 Bcm by 2017, compared to 106 in 2013).[8]

The result of dropping domestic conventional production has been a steadily increasing dependency rate for natural gas[9]:

- 2000: 48.9%
- 2005: 57,7%
- 2010: 62.4%

Assuming a constant level of natural gas consumption in the EU in the coming decades (~ 500 Bcm), the EU's gas import dependency will likely reach ~ 80% in 2030.

Key takeaways:

- *Boosting conventional gas production within the EU in the short or even long term is unlikely to happen.*
- *Limited growth of gas production in Norway will not compensate for declining conventional production elsewhere in Europe.*

2) Proposed new pipelines are unlikely to address the EU's energy security concerns about its gas supplies

Several new gas pipelines are on the drawing board or even at a more advanced planning stage. South Stream would bypass Ukraine as a transit country, but deepen the EU's reliance on Russian gas (max. capacity of 63 Bcm per year). Other pipeline plans on the drawing board may some day bring gas from Iraq, Iran or Egypt to Europe. The proposed Trans-Adriatic Pipeline could bring gas from the countries around the Caspian sea to Europe, tapping into the oil and gas reserves of authoritarian and corrupt regimes in Azerbaijan, Turkmenistan and Kazakhstan.

Key takeaway:

- *These proposed new gas pipelines will only exacerbate concerns about the security of the EU's gas supply.*

3) Reliance on global LNG markets will be difficult, expensive and fail to address concerns about security of supply.

The EU already accounts for ~ 20% of the global LNG market, importing ~ 60 Bcm per year.[10] Other major importers of LNG are Japan and South Korea, with China and India potentially importing more LNG in the future.[11]

The 2012 BP Statistical review is clear that the global LNG market remains very tight[12]:

> *Global LNG trade fell for the first time on record (-0.9%): a decline in net European LNG imports (-28.2%) was offset by net increases in Asia (+22.8%). Among exporters, an increase in Qatari (+4.7%) shipments was nearly offset by a decline in Indonesia (-14.7%). LNG's share of global gas trade declined slightly to 31.7%.*

A drive to buy more cargoes in the spot market would pit the EU against Asia, where prices were on average about 30 percent higher last year. Prices would need to rise as high as $19.93 per MMBtu to attract LNG in the spot market, almost double the price of Russian gas via pipelines.[13]

More than 95% of the EU's LNG imports comes from just 7 countries: Qatar (45%), Nigeria (17%), Algeria (17%), Norway (5%), Trinidad & Tobago (5%), Peru (4%) & Egypt (3%). Concerns about the security of supply of LNG exist for the majority of these countries.

Aside from the volatile political and security situation, the ability to meet growing gas demand of some of the world's more stable top LNG exporters has been questioned: Proved gas reserves in Trinidad & Tobago have been significantly reduced in the last decade. And the Indonesian government decided in 2006 to give priority to domestic customers over LNG exports.[14]

Key takeaways:

- *LNG is expensive (about double the price of Russia's pipeline gas).*
- *LNG mainly originates from regions with a volatile political and security situation.*
- *The global LNG market is already tight.*

4) LNG imports from US = a non-starter

Great hopes for a more liquid global LNG market that could meet growing global demand have been pinned on the American shale gas 'revolution' and the ability of US to share it abundance of natural gas. The arrival of 2 new technologies – fracking and horizontal drilling – and a long period of volatile and high gas prices in the US (averaging ~ $ 7.5/MMBtu in 2004-2008) helped to reverse the growing dependence of the US on gas imports.

Some reasons why the US is unlikely to export significant amounts of natural gas.

First of all, the US was, is and remains a net importer of natural gas, importing around 80 Bcm of natural gas from Canada, i.e. more than 10% of its annual gas consumption (737 Bcm).

Secondly, the cost of liquefaction, shipping and regasification of LNG adds ~ $ 6 to 7 /MMBtu.[15] Current hub gas prices in the US sit around $ 4.5/MMBtu. At these current prices, LNG exports from the US are already at least as expensive as pipeline gas from Russia.

A third point is that LNG export facilities are very expensive projects. For example, the total project cost of the Sabine Pass liquefaction facility in Louisiana – capable of exporting maximum 6 BCM per year – will be more than $10 billion.[16] As a result, LNG facilities take a long time to develop, are marked by cost overruns and involve complex joint venture structures, including a wide range of partners from different countries.[17] The Gorgon LNG in Western Australia project is expected to cost $ 54 billion.[18] In addition, LNG exports also require government approvals, which are likely to be controversial among consumers and industries that use natural gas as a feedstock. Asked if this facility could ease European import dependency for gas, Cheniere CEO Charif Souki stated: "It's flattering to be talked about like this, but it's all nonsense. It's so much nonsense that I can't believe anybody really believes it".[19]

Fourthly, while the rhetoric about a newfound abundance of natural gas in the US may give a different impression, the fact is that natural gas production from the major shale plays (Barnett and Haynesville) in the US already peaked in August 2012. Of all the major shale plays in the US, the Marcellus is the only shale play that shows rapid growth, which has been able to compensate for declines elsewhere. Even though prices have more than doubled since their low point in 2008, gas-directed drilling is at its lowest level in the last 20 years, as drilling rigs are now mainly targeting shale oil formations.[20&21] US gas prices will have to increase significantly to encourage more drilling for gas. A last point, if and when significant LNG exports would materialize, the destination of LNG from the US will be Asia, where prices are about 30% higher as in Europe.

Key takeaways:

- *The US is unlikely to ever export large volumes of gas.*
- *If and when the US would become a net exporter, the destination for American LNG will be Asia, not Europe, as Asian prices are higher.*

5) Fracking the EU: Unwanted, risky, too little and too late.

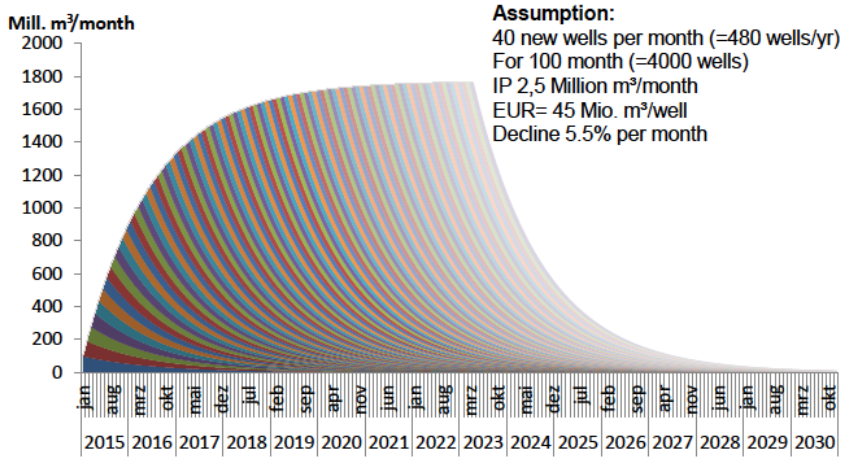
There is widespread consensus that an American-style shale boom, where more than 150.000 unconventional oil and gas wells have been drilled in the last decade, is not replicable in the EU.

Europe does not have the same level of geological knowledge about source rocks as in US states like Texas or Pennsylvania, who rely on decades of experience with oil and gas drilling.[22] Europe's higher population density and competition with e.g. farmers for access to land will present a major obstacle for developing the shale gas industry on a large scale. A number of industry bottlenecks have also been identified. For example, the US boasts about 2.500 rigs, whereas there were only 72 active rigs in Europe in 2012, with only 7 of them being able of targeting deep shale formations.[23]

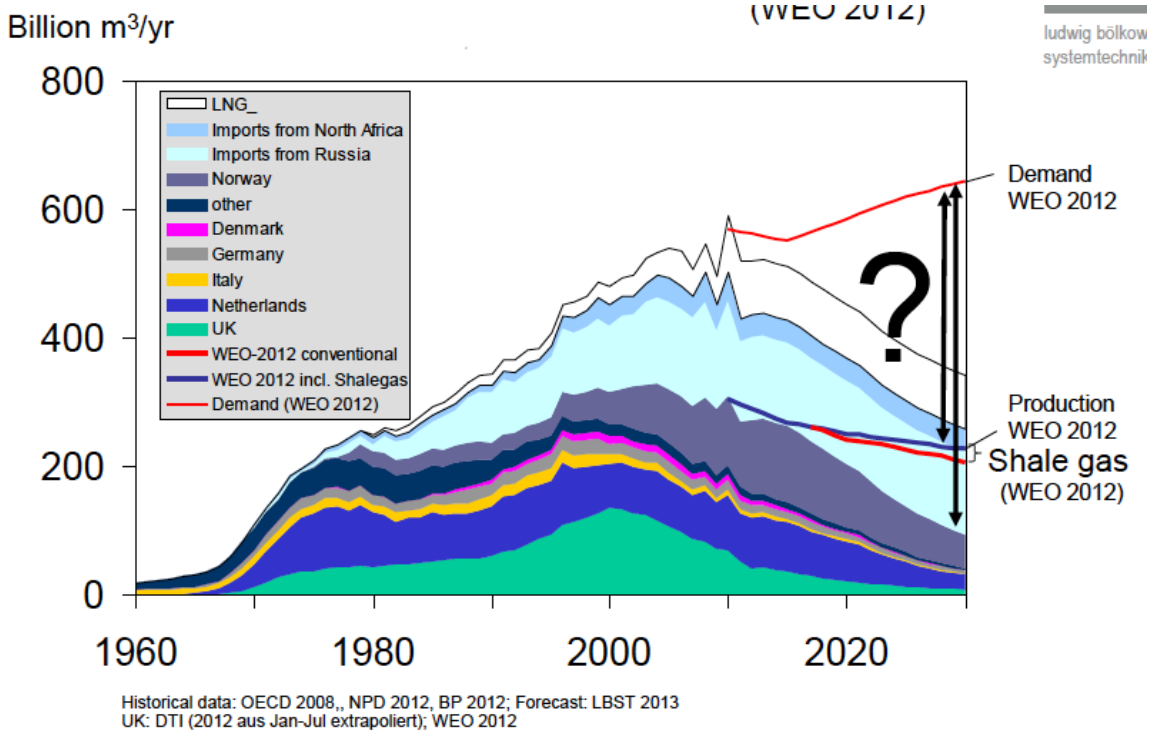
Under the assumptions that these obstacles can be overcome, what volumes of natural gas can fracking contribute? In January, the European Commission stated that unconventional fossil fuels like shale gas would be "able to contribute almost half of the EU's total gas production and meet about around 10 % of the EU gas demand by 2035" (or 77 Bcm per year), drawing on optimistic 'best case' scenarios by the IEA. This would imply drilling approximately 150 wells/month or 2000 wells/year. A stable contribution of shale gas to the EU's gas consumption would commit the EU to drilling some 20,000 wells over a decade or so. This can be considered a very optimistic figure. BP's 2035 Energy Outlook reduces the Commission's number by half, forecasting that Europe will be "expanding unconventional supplies reaching [38 Bcm per year] by 2035".

According to other, more realistic analyses, achieving 10 to 20 Bcm of production from shale gas wells for a decade would already constitute a major challenge. Producing 20 Bcm would require ~ 50 new wells per month. Or ~ 5000 wells over a decade.[24] The IEA estimate of shale gas production in the EU in 2035 is 20 Bcm, with 8 Bcm coming from Poland.[25] However, almost all major international investors in Polish shale gas (Exxon, Marathon Oil, Talisman, ENI and Total) have given up on their licences, as Polish shale was considered not to be economically viable. This relatively small volume of shale gas will not become available before 2025, given the abovementioned bottlenecks (as well as the lack of public acceptability of this industry). Moreover, shale gas wells are

characterized by a sharp production decline in the first year (typically ~65%), which requires constant drilling to maintain overall production levels.



This arrival of 20 bcm of new unconventional gas must be seen against the ongoing decline in the mature production basins of about ~ 5 to 10 Bcm *per year*.[26]



Key takeaways:

- *No significant volumes of shale should be expected before 2025.*
- *Volumes of shale gas, produced in the EU, are unlikely to exceed 20 Bcm by 2035.*
- *Shale gas will not be able to compensate for declining conventional supplies.*

6) Conclusion

From the above, it should be clear: Alternative supplies of gas for the EU will not be easy to find. If they can be tapped, they might expose the EU to a greater reliance on many of the world's more volatile regions. And regardless of the origin (LNG or domestic fracked gas), there will be a hefty price tag. And new supplies will in any case take years to develop.

If reliable gas supplies are the problem, reducing the EU's demand for gas should be first step. The European Council conclusions of March 2014 clearly acknowledge this:

> *Moderating energy demand through enhanced energy efficiency should be the first step which will also contribute to other energy and climate objectives.*

The current crisis in Ukraine and the resulting concerns about Russia as a dominant gas supplier to the EU is an opportunity to relaunch a real, long-term and sustainable energy strategy: Exploiting the synergies between energy efficiency in buildings and renewables for heating & cooling must be a cornerstone of this strategy to reduce the EU's gas demand in the most cost-effective way possible.

An ambitious energy efficiency target of 40% for 2030 - as called for by the European Parliament - will result in a ~ 20% drop in annual gas consumption.[27] Increased use of renewables, particularly in the heating & cooling sector, could further reduce the EU's reliance on gas imports by another ~ 10%.[28] Another 8-15% in additional gas savings can be expected from electricity savings, if renewables continue to increase their share in the energy mix.[29] In conclusion, investing in renewables and energy efficiency can generate gas savings of ~ 40%, exceeding all gas imports from Russia. Such a strategy will also have added benefits in terms of climate targets, developing cutting edge-technology and jobs.

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