



Shale gas: Potential in the EU and effects on the market

Shale gas is a type of unconventional natural gas that can now be extracted due to new technologies. Reserves are present in Europe and shale gas could have major effects on energy security and emission reduction. But it may not be economically viable and also poses threats to the environment.

Production has so far only started in North America, where - due to favourable conditions - it has significantly reduced energy dependency.

Energy dependency - reliance on imports - is also a major issue in the EU, but the situation is rather different. There are geological, administrative, technological and infrastructure issues which may hinder the development of shale gas production. Most of the concerns are environmental: effects of chemicals used in drilling on the water supply, and reducing investment in renewables.

The US shale gas boom has had diverse effects on the global political and economic situation. The price of natural gas has decreased, contracts have been renegotiated and capital flows changed. The positions of gas exporters have weakened. It has also brought uncertainty into the gas industry, especially regarding choice of technologies to invest in.

The EU sees the potential of shale gas to enhance energy security, but is highly concerned about the environmental effects. Production will probably wait until these issues are solved.

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Shale gas

Shale gas is an unconventional gas resource that is found within fine grained organic-rich rock formations. Thanks to the new technologies of *horizontal drilling* and *hydraulic fracturing* it can now be extracted. The former involves drilling downwards for up to 7 000 metres, then the drill is turned and continues horizontally for another 2 000 metres. The latter (also known as *hydrofracking* or *fracking*) involves pumping water, sand and chemicals into the rock, fracturing it to allow the trapped gas to escape.

The extraction of shale gas is only marginally more expensive than that of conventional natural gas. But its geographical distribution is different. Major shale *plays* (sources) are situated in North and South America, China and India, Australasia, the Middle East, North Africa and also in Europe. As extraction has only started in North America, the size of reserves elsewhere is as yet unproven.

Shale gas has the same properties as conventional natural gas: energy content and CO₂ emissions are similar. The production of shale gas is more flexible, though, with more, but smaller, wells.

These factors make shale gas very important for the EU from an energy security perspective. It has the potential to reduce

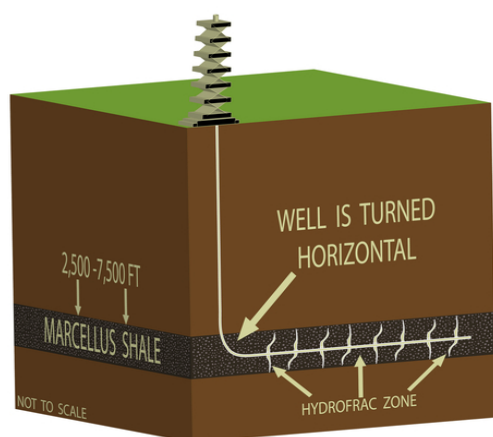


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Cross-section of a horizontal drill in Marcellus shale.

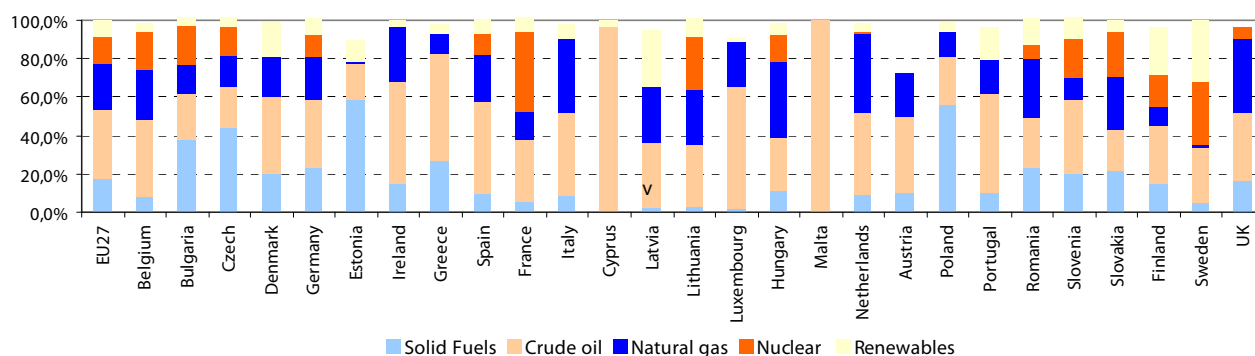
energy dependence. Shale gas may lower carbon emissions, if used to replace coal in power generation. In several countries it would improve the balance of payments and attract investment opportunities.

Besides the opportunities there are also threats: environmental ones. *Hydrofracking* might pollute water supplies, and a new source of energy could increase overall usage and hinder the development of zero-emission technologies.

gas extraction brought profits to landowners and local communities. Environmental concerns did not hinder these projects either, as they were not apparent from the beginning. The industry has also been backed by politicians, in the form of tax breaks.

The total resources in North America are estimated to be between 109 and 136 tcm (trillion cubic metres), 40% of which may be technically recoverable, given time. How much of this is economically recoverable

Figure 1 - Energy mix in the EU - Final energy consumption by type in % - 2008



source: Eurostat

The US "Shale gas revolution"

The first commercial shale gas well was drilled in New York in the 1820s, and there were already over 10 000 wells in the 1980s. However, the big leap took place in the 21st century, thanks to new technology and rising gas prices. Shale gas surged from 1% of US gas production in 2000 to 20% in 2009.

What made this revolution unique was that small, independent prospectors ran the explorations, because major energy companies were cautious. This added to the dynamism and flexibility of the sector, allowing for technological innovations and reducing costs.

The identification of shale *plays* and leasing the land advanced rapidly, partly due to the low population density in the areas concerned. There was no resistance from the population, since in the US landowners have the rights to the minerals under it. Therefore

depends on several factors: cost of technology, emission charges, gas market prices, etc.

Energy in the EU

The EU imports more than half (54.8% in 2008) of its energy consumption and over 60% of its natural gas (62.3% in 2008). All but two Member States (Denmark and the Netherlands) rely heavily on external sources.¹ Romania and the UK are less dependent on foreign gas than the EU average. EU gas production is expected to drop to less than 30% of its current level by 2030.²

One-quarter of total energy consumption in the EU is satisfied by natural gas. In some MS the reliance on gas is much greater. In gas-producing nations, like the Netherlands and the UK, the proportion is around 40%. Certain gas-importing MS, such as Hungary

(39.4%) and Italy (38.3%), also have a heavily gas-based energy mix.

Russia provides 40% of all gas imports³, which is 25% of total consumption of the EU. This brings up security of supply issues.⁴

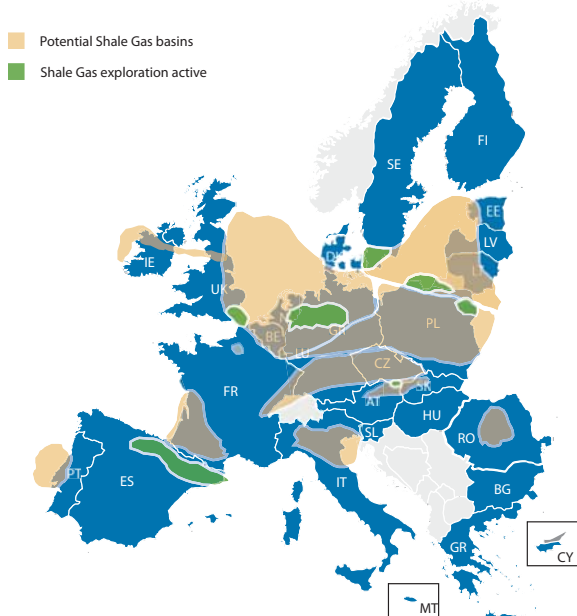
Shale gas in Europe

Resources

There are three major shale plays in Europe. One runs from eastern Denmark and southern Sweden to northern and eastern Poland; a second from north-west England, through the Netherlands and north-west Germany to south-west Poland. The third one includes the south of England, the Paris Basin, the Netherlands, northern Germany (Lower Saxony) and Switzerland. The richest site is probably the north-west German basin (stretching to the Netherlands).

Information on the total resources is poor and outdated. The last assessment was done in 1997 for the EU15, estimating 15 tcm, but with Poland included the number may be 28 tcm. Recoverable reserves are estimated between 3 and 12 tcm. More up-to-date and accurate estimates are expected as a result of the [GASH](#) project in 2015.

Figure 2 - Shale gas basins in the EU



source: [Unconventional Gas: Unconventional Wisdom](#), Energy Policy Information Center, 19 July 2010

Europe is more densely populated than the US and some shale plays run under the most industrial and urbanised areas (the north-west of the continent). However, some of these areas have already been involved in conventional gas or coal production (e.g. the Netherlands, north-west Germany, Belgium), which might make them more open to new exploration.

Activities

The number of applications and concessions awarded has been rising. Companies are securing the rights to land and exploration opportunities. Test drillings have taken place around Poland, Germany, Sweden and the UK, while some are planned in the Netherlands.

However, environmental concerns are slowing down the progress: France has delayed the issue of exploration licences. And no production licences have been granted yet, as explorations have not reached that stage.

In terms of the commercial actors involved, major oil and utilities companies ([ExxonMobil](#), [Shell](#), [Total](#), [ConocoPhillips](#), [Chevron](#), [GdF Suez](#) and [RWE](#)) are providing the financing and the risk taking ability. Smaller, mostly North American ones provide the expertise, while national oil/gas firms are included for their local knowledge.

Potential

Some analysts have predicted a shale gas revolution in Europe similar to that in the US. The circumstances, though, are rather different on the two sides of the Atlantic.

Plays in Europe tend to be smaller and geologically more complex. Exploitation may be more challenging and the quality of the gas poorer. This means that the technology used in the US needs to be adapted. Also, costs of production and purification may be different.

The rights and royalties of landowners in EU MS are different from those in the US, therefore they are less motivated to allow



drilling on their land. Without political involvement to explain the energy security reasons, gaining their support can be difficult. The dense population and infrastructure might also pose problems.

Administrative procedures for licensing are more complicated, and differ from country to country.

There is a shortage of drilling equipment and personnel, due to the lack of onshore drilling history in Europe.

Production of shale gas - taking into account all these issues - could be significantly more expensive than in the US or conventional production in Russia, or liquefied natural gas (LNG) imports from North Africa.

Significant production at an EU level is not considered probable in this decade. Some Central European countries - dependent on Russian gas - may go ahead faster, though.

These reservations notwithstanding, shale gas may need to be taken into account when deciding on such strategic projects as pipelines and LNG terminals.

Situation in Poland

Poland considers shale gas an important opportunity. Factors other than costs, such as energy independence, investments and jobs might also come into play.⁵

Estimates of reserves vary from 1.5 to 3 tcm. Numerous (about 70) exploration licences have been awarded to major companies. Testing is at an early stage and about 7-10 years may be necessary before production starts.⁶

Poland may be the test case, and its success or failure will influence other countries' attitude towards shale gas.

Global effects

Geopolitics

If local shale gas replaces imported pipeline gas or LNG, geopolitical leverage may shift away from current exporters such as Russia, North African and Middle East countries.

Parallel to this, wealth transfer would also slow down, changing the investment capacity of exporters.

With this, some uncertainty would be removed from international economy and politics. Monopolistic pricing (mostly linked to oil price indices, not only the supply and demand of gas) can be broken. Still, to maintain the gas price, exporters might form a cartel similar to [OPEC](#).

Economy

The first half of 2010 saw a reversal of the situation in 2009 when long-term contract prices had at times been twice as high as spot prices, leading European utility companies to try to change their traditional pricing structures in long-term contracts. This situation was connected indirectly to the US shale gas boom. Greater domestic gas production in the US reduced imports of LNG, thereby decreasing demand - and spot prices - on the global market.

Investors in LNG regasification terminals in the US have been seriously hurt, as only 20% of the installed capacity is used (and it may stay like this for the next 10-20 years). This leads to uncertainties (concerning what to invest in) in the gas industry and will probably reduce investments. That would result in insufficient capacity to satisfy growing demands in future, and thus, raise prices.

Concerns about shale gas

Several environmental aspects of shale gas production need to be addressed. Fracking requires millions of litres of water mixed with sand and chemicals. The water usage itself, as well as the chemicals used with it, raises environmental concerns. Also, green technology and energy intensity may be negatively affected.

The US Environmental Protection Agency (EPA) is currently conducting a study on the effects of hydrofracking on the environment. It is due to be finalised by 2012.



Groundwater contamination

There is no evidence clearly linking groundwater contamination to shale gas exploration. However, there are several cases of dead livestock and health complaints from residents. The industry argues that contamination is not possible as fracking takes place about 2 kilometres below groundwater reserves. Moreover, the chemical content of hydrofracking fluids is too low. Under the EU's [CLP Regulation](#) companies are obliged to classify and label chemicals used, and under [REACH](#) they are required to prove their safety.

Wastewater storage

Two-thirds of the liquid used for fracturing remains underground, but one-third flows back to the surface. The storage and disposal of this is unregulated and presents another possible risk of soil and water-supply contamination.

Delaying emission cuts and green technologies

Shale gas is argued to be a step forward in emission reduction by the industry. This is clearly the case if it replaces coal in power generation. Some argue, though, that an additional supply of reasonably priced energy would increase consumption and with it CO₂ emission.

There is also a danger that shale gas exploration and the development of the necessary technology will draw away financial and research resources from green technology. Also, with reduced political urgency, states would lose focus on their renewable energy agendas.

Positions

The European Parliament, in a November 2010 [Resolution](#), has asked the Commission to prepare by the end of 2011 an analysis of gas markets including, among others, shale gas. In its [conclusions](#) of 4 February 2011, the European Council urged an assessment of Europe's potential for sustainable extraction and use of unconventional fossil fuel resources.

Based on the [Tyndall Centre report](#), environmental groups have called for a moratorium on shale-gas exploration until the effects of the technology are proven to be safe. The UK House of Commons has launched an [inquiry](#).

The industry supports exploration and production of unconventional fossil fuel. It sees natural gas as the quickest and cheapest way to cut CO₂ emissions. [Shell](#), for instance, considers safety measures sufficient to avoid water pollution. [ExxonMobil](#) stresses the need to inform and assure locals about the industry, disclose the chemicals used in fracking, and set up industry guidelines.

Further reading/Main references

[Shale gas: a provisional assessment of climate change and environmental impacts](#), The Tyndall Centre for Climate Change Research, University of Manchester, January 2011.

[Can unconventional gas be a game changer in European gas markets?](#), Gény, Florence, The Oxford Institute for Energy Studies, December 2010.

[The 'shale gas revolution': hype and reality](#), Stevens, Paul, Chatham House, October 2010.

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Endnotes

¹ [Energy dependency](#), Eurostat.

² [Long Term Outlook for Gas Demand and Supply 2007-2030](#)/ Eurogas, May 2010.

³ [Europe's Energy Portal](#).

⁴ [Energy security: the EU and Russia](#)/ Library Briefing, Christopher Needham, European Parliament Library, 14 September 2010.

⁵ [EU shows caution over shale gas exploration](#)/ Rikki Stancich, ENDS Europe, 14 February 2011.

⁶ [Eastern Europe unconventional gas regulatory processes](#)/ James Slutz. Global Energy Strategies & CAPPA, 23 September 2010.