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Reexamining the United States' shale gas success

Is Europe letting the fox in the henhouse?

by Olga Buto

About the Author

Olga Buto is an Energy and Ecology Policy trainee at the Heinrich Böll Foundation North America in Washington, DC. She holds a Master of Science in Ecological Economics from the University of Edinburgh.

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Author: Olga Buto
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Heinrich Böll Stiftung

Washington, D.C. Office
1432 K Street, NW
Suite 500
Washington, D.C. 20005
United States
T +1 202 462 7512
F +1 202 462 5230
E info@us.boell.org
www.us.boell.org

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Shale gas development continues to cause a heated debate on both sides of the Atlantic with the industry touting the increasing number of jobs within the sector, as well as lower CO2 emissions in comparison to coal and oil. Although both seem to be good news for US and EU policy makers and civil society, such arguments are often exaggerated and do not reflect less promising economic and environmental realities.

By the end of 2013, shale gas in the United States rapidly grew to account for 40% of total natural gas production. It generated great enthusiasm among politicians and industry leaders alike, who lauded the shale gas boom as a part of a domestic energy renaissance that promises to raise the Unites States to prominence among the world's foremost fossil fuel producers. New developments in hydraulic fracturing (fracking) technology that make it possible to extract the resources of shale gas from rock formations have significantly driven down the domestic natural gas prices, as well as reduced US dependence on natural gas imports. According to the International Energy Agency (IEA), this increased US domestic natural gas supply also enhances the United States' chances of becoming a net exporter of natural gas by 2020.[1] Recently, the US Department of Energy approved a liquefied natural gas (LNG) export facility to be built by 2017, located on the Chesapeake Bay in Maryland, which is expected to export up to 2.2 billion cubic meters/day.[2] While increasing supply currently keeps the price of natural gas in the United States far lower than in other regions across the globe, the domestic price might increase once the exports of LNG are launched. Electricity prices in Europe are about twice as high as in the United States, while the gas prices are around three times as high. This energy price-gap puts greater pressure on European industry, and makes fracking a controversial issue on both sides of the Atlantic.

Oil and gas industry's main arguments in favor of shale gas development are strongly overestimated.

Oil and gas industry's main arguments in favor of shale gas development are the rapidly increasing number of jobs within the unconventional gas sector, as well as natural gas' role as a bridge fuel towards a low carbon economy. Although these claims seem to be favorable for the United States and the global climate, as well as the European countries willing to embrace fracking technologies, such positive arguments touted by natural gas proponents are highly overestimated.

Employment Impact: US experience

In the United States, the development of shale gas varies from state to state, with Pennsylvania among those most active in the shale gas bonanza: between 2002 and 2012 more than 6,245 new wells were drilled.[3] This is the largest number

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of wells drilled within the Utica and Marcellus Shale - northeastern geological formations, which have a particularly high potential for shale gas extraction. Shale gas extraction has undoubtedly increased the employment levels within the region. However, the employment impacts outlined by the Pennsylvania Chamber of Business and Industry, Pennsylvania Department of Community and Economic Development, the US Chamber of Commerce, as well as industry-subsidized academic studies, are vastly overestimated. According to the US Chamber of Commerce, the number of ancillary jobs in Pennsylvania - in other words, jobs necessary to support the primary activities of an industry - reached 238,000 through 2011. This estimate was reached by identifying 30 industries that are linked to the shale gas supply chain, and then attributing the jobs in these industries to the shale gas sector. Those 30 industries included such broad sectors as highway, street and bridge construction, administration & conservation programs, as well as industrial machinery & equipment wholesale. Yet, in many cases the listed sectors are only to a small degree driven by the shale gas industry. Consequently, it is unreasonable to assume that all 30 industries are actually shale ancillary. More critical estimates suggest that the oil and gas support activities across the six states covering the Marcellus and Utica formations generated 33,000 jobs.[4] Put into perspective, this is a minor number, in comparison to other sectors. For instance, health and education sectors account for 4.5 million jobs within the region.

Table: Shale-related employment estimates for the state of Pennsylvania

	Shale-related employment	Total employment[5]	Percentage (%) shale-related employment/ total employment
Multi-State Shale Research Collaborative (2012)[6]	22,441	6,016,258	0.37%
U.S. Chamber of Commerce Institute for 21st Century Energy (2011)[7]	238,000	5,931,033	4.01%
Pennsylvania Department of Community and Economic Development (2010)[8]	240,000	5,883,330	4.08%

Shale Gas: a low carbon fuel?

Due to its lower CO2 emission levels in comparison to coal and oil, shale gas is frequently promoted as a bridge or transition fuel. However, shale gas is cleaner only at the point of combustion. When shale gas' full lifecycle assessment is taken into consideration, it is not better than other fossil fuels. In the words of David Hawkins, the director of climate programs at Natural Resource Defense Council (NRDC), "With natural gas, there's good news and bad news: the good news is it has half the carbon of coal; the bad news is it has half the carbon of coal. It's not carbon-free."[9]

Furthermore, methane is the main component of natural gas. Throughout the lifetime of a well, 3.6-7.9% of its methane content escapes into the atmosphere. Despite having a shorter time residence in the atmosphere, methane is a greenhouse gas (GHG) with a warming potential greater than that of carbon dioxide. Research done by a group of scientists from Cornell University concludes that the GHG footprint of shale gas, put into the 20-years time scale, is up to 20% greater than that of the direct emissions from conventional coal powered plants. Viewed in the timeline of 100-years, the GHG footprint of shale gas is similar to that of coal and is 14%-19% greater than of the conventional gas.[10]

Furthermore, the US example shows that high productivity shale wells are not omnipresent. Quite the opposite: many drilling locations suffer from the law of diminishing returns.[11] Put simply, wells already experience severe rates of depletion after the first year of operation. According to Dr. David Hughes from the Post Carbon Institute, more and more wells will need to be drilled in the United States in order to maintain high productivity rates. This undermines the industry claim that wells will be in operation for 30-40 years. The productivity decline rates of the shale wells vary from 65-85%, depending on the area. In order to keep the current production levels, about 7,200 wells will have to be drilled per year. This would require large investments to offset the declines.[12] Considering the fact that the average population density in Europe is three times as high as in the United States, it would hardly be possible to reach a high drilling intensity.

Viewed in the timeline of 20-years, the GHG footprint of shale gas is up to 20% greater than that of direct emissions from coal powered plants.

Lessons learned from the Unites States

In Europe, the shale gas boom is thus far supported by the United Kingdom, Eastern and Central European countries that are currently looking for opportunities to replicate the US shale gas bonanza.

In contrast to the United States, where private individuals own the rights to oil and gas exploration on their land, in Europe the national governments have exclusive mineral rights. Exploration works are already underway in Ukraine, Romania and Poland, while shale oil exploration is debated in Lithuania. The shale gas reserves in Poland are the largest in Europe, and by estimations of the US Energy Information Administration (EIA), reach 4.2 trillion cubic meters. France is estimated to have 3.8 trillion cubic meters of reserves and the UK with about 736 billion cubic meters.[13] Poland started explorational drilling in 2010, and so far none of the 51 wells have reached the commercial rate of gas extraction, which has generated public opinion that drilling needs to be intensified.

The recently published report by the International Association of Oil and Gas Producers states that in Europe, shale gas operations could create between 400,000 and 800,000 new jobs by 2035, and between 600,000 to 1.1 million by 2050.[14] Due to current high levels of unemployment, which have reached 14% in Poland and about 12% EU-wide, such promises are particularly appealing. Nevertheless, the

example from Pennsylvania suggests that the projected job numbers and impact on the region's economic development are strongly exaggerated in the industry-lead studies, and are therefore unreasonable as supportive arguments in the shale gas debate. Europe should reexamine the vastly overestimated employment impacts of shale gas, and should reassess its willingness to replicate the United States' questionable success.

Shale gas is not carbon free, and its role as a bridge fuel is minor in comparison to renewable energy sources. According to the European Renewable Energy Council, shale gas poses a threat to the development of renewables by driving private and public investments away from them.[15] As observed in the report by the Massachusetts Institute of Technology (MIT), investments in renewables have decreased in the US energy sector since the start of the shale boom. Even in the modeling scenario in which researchers impose a renewable mandate, the use of renewables never exceeds 25% mandate if the shale gas is on the market.[16]

Shale gas poses a threat to the development of renewables by driving private and public investments away.

European Union: triumph or failure of the Precautionary Principle?

In contrast to the United States, the European Union's policy making is governed by the precautionary principle, which in practice is the application of Environmental Impact Assessment, designed to predict possible ecological and social outcomes from certain development projects. A heated debate regarding the mandatory nature of the Environmental Impact Assessment for shale gas exploration projects has been taking place within the EU bodies. In February, 2014, members of the European Parliament's Environment Committee voted on amendments of the Environmental Impact Assessment Directive.[17] As a result, shale gas exploitation and other unconventional drilling activities have been included in Annex I of the Directive, making an Environmental Impact Assessment an obligatory procedure for shale gas projects of any size. However, due to strong opposition from United Kingdom, Poland and Lithuania, the Environmental Impact Assessment is still not mandatory during the early exploration period.[18] The revised Directive will be voted on by the full European Parliament in March 2014. If passed, it will include requirements for shale gas developers to consider the impacts on biodiversity and climate change, significantly strengthening the European Union's environmental policy tools necessary to cope with global environmental challenges.

The golden rule of policy making is that governments should enact policies that would maximize public benefits and minimize public costs. When enacting national policies on shale gas extraction, the public benefits and public costs should be estimated accurately and transparently: the projected jobs resulting from shale gas industry must be realistic and the high GHG footprint from shale gas industry should be taken into consideration. Last, but not least, a 2013 Eurobarometer survey found that 70% of Europeans see renewable energy development, and not fossil fuel development, as an energy priority for the next 30 years.[19] Even though fracking has already reached Europe, the scale of the North American shale bonanza

will be hard to replicate, due to its highly uncertain economic and environmental impacts – concerns that are likely to be given stronger weight in Europe than they were in the United States.

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