KEY DETERMINANTS OF SHALE GAS IMPACT ON ENERGY PRICES

Valentina Ivan PhD Student
Bucharest University of Economic Studies

Abstract

Recent advances in drilling technology have led to profitable extraction of natural gas from shale gas formations. Shale gas has changed the economics of natural gas production in US as the sudden increase in supply has resulted in significantly lower gas prices. Starting 2008, the difference between gas prices in the United States and Europe has widened, with European gas prices even three times higher as compared to US ones. In North America, coal has been replaced by gas in the US electricity generating sector due to the sharp decrease of gas prices. Furthermore, coal reserves were partly exported to the EU, which has led to a decrease in prices in the EU and a replacement of gas by coal in the EU electricity sector. However, the effect cannot be entirely attributed to shale gas revolution, as other factors contributed such as minimum historical prices for carbon emission allowances in recent years and a decreasing consumption due to economic recession. The success of shale gas in the US has prompted companies and governments to assess the possibilities of replicating the shale gas production in Europe.

Keywords: Hydraulic fracturing, shale gas, gas prices, coal prices, electricity prices

JEL Classification Code: O13, Q30, Q38, Q40, Q43

Introduction

US benefited of some prerequisites for success in developing unconventional gas resources such as political will and policy coherence; little resistance from local communities mainly because they are entitled to receive royalties in exchange for their mineral rights, situation completely different from Europe where the state owns natural resources; technological advances in hydraulic fracking; thorough mapping of natural resources and an existing infrastructure (pipeline networks) as well as an adequate service industry, able to provide equipment and skilled workforce. Europe faces different hurdles in developing its shale gas resources such as different geology, higher density population, more stringent regulatory framework in terms of environmental compliance – water management and land-use particularities. The impact
of shale gas on energy markets in Europe will be different from country to country, given the local demand for gas, social acceptability and the size of recoverable resources in each country. First, the article will briefly point to the positive impact of developing shale gas resources in US and the indirect impact on energy prices at European level, highlighting predictions in terms of supply and demand. Second, it portrays the context in which unconventional gas resources can be developed in Romania. It does not intend to conduct a thorough cost-benefit analysis on the economic impact of unconventional resources in Romania and provide a tally of all the likely benefits, but it will make predications in terms of natural gas supply and demand. The article will point to the main variables which should be considered when evaluating the impact: domestic demand and supply of natural gas, the impact of switching from coal fired power plants to natural gas when producing electricity, the impact on the state budget (of fiscal regime, including royalties), the impact on energy-intensive industries such as the petrochemical sector. The article concludes that resource abundance is beneficial to overall European economy; nonetheless, the impact of shale gas developments on Europe is expected to be limited and gradual, and not similar to the shale gas boom in the United States.

**Methodology**

The article reviews literature of international and in particular European shale gas developments emphasizing the economics of shale gas and impacts on energy markets in Europe with a key focus on gas, coal and electricity prices. Due to the novelty of the topic (shale gas revolution kicked off in America in 2008), there is a scarcity peer-reviewed articles on the economic impact of shale gas topic, with most of them focusing on the environmental impact or on geological aspects or technology used. Kinnaman (2011) argues that several reports were sponsored by the gas industry and have estimated the economic effects of the shale gas extraction on incomes, employment, and tax revenues. Still, there are articles that have been published in reputed economics journal, and are likely to be influential to the formation of public policy. The scholar concludes his review of main articles assessing the economic impact of shale gas in US by emphasizing that due to questionable assumptions of most of the studies, the economic impacts estimated in these reports are very likely overstated. The data and information used for this article is qualitative and quantitative secondary data from peer-reviewed journals and reports from international organisations, think-tanks, academic research institutions, as well as newspaper articles. The literature
review was conducted using search engines of popular academic databases, Google Scholar, JStor, ScienceDirect and Web of Science. Snowball sampling techniques were also employed, especially for the reports published by international agencies (such as International Energy Association or studies commissioned by European Commission) which provided a comprehensive and trustworthy list of references. Due to the relatively nascent stage of the literature on shale gas in Europe, grey literature searches were also conducted, predominantly through Google. The research was supported by desk research, and participation in several unconventional gas conferences. The article has reviewed data sets provided by Energy Information Association, International Energy Association, Russian Academy Society which also provided forecasts and scenarios regarding production levels of shale gas in US and Europe. Those are the best available knowledge from an authoritative and un-biased source, with good, publicly available data sets. Data reviewed concerns gas prices, coal prices, and electricity prices.

Impact on European energy prices and supply and demand estimates

Overall, in terms of perception on the impact of shale gas, there are two sides: one that believes that it will create jobs, bring revenues to the state budget and have a positive impact on GDP, reduce CO₂ emissions and slowdown global warming, achieve energy independence and increased purchasing power for local communities; and another side which believes that shale gas pollutes groundwater, generates more CO₂ emissions than coal or gas from conventional sources and negatively impacts human health and leads to environmental disasters. The literature on the issue varies between these two extremes: some sources overstate economic benefits, while others exaggerate environmental impact. A decrease in energy prices in Europe will be beneficial as it has the potential to reduce oil and gas imports and thus lower EU’s import bill; second, low gas prices can help energy intensive industries (especially the steel and petrochemical plants) and improve their competitiveness; third, shale gas represents a cheaper opportunity to reduce carbon emissions, considering that natural gas has an increased efficiency as compared to coal. Pöyry and Cambridge Econometrics (2013) assess the macro-economic impact of shale gas production in Europe and conclude that shale gas could add a total of €1.7 trillion to 3.8 trillion to the European economy between 2020 and 2050. However, in spite of the some visible benefits portrayed by shale gas production in US on domestic energy security and the energy markets, there are still fears that shale gas could have negative impacts on the environment and human health. Although several countries in Europe are currently exploring potential
for commercially viable shale gas resources, the process of getting into the production phase has been much slower as compared to the North American region.

In 2010, the average gas spot price at the Henry Hub in the US was only $4 per Million British Thermal Units (MBtu), while in 2008 it was for about $8-9 per MBtu (see Figure 1 below). In 2010, compared to other regions which are not producing shale gas, the US gas price of $4 per MBtu was considerably lower than for example in Continental Europe ($8/MBtu) or in Japan ($11/MBtu). In only five years’ a shale gas boom has taken place in the United States that has reduced domestic gas prices to one third of the previous price. The spot natural gas price at Henry Hub averaged $4.32/MMBtu in 2014, 16% higher than in 2013.

Natural gas spot price at Henry Hub

Figure 1

Natural gas commodity prices have significantly declined since 2008 mainly due to the rising domestic production of shale gas, as well a moderate demand which had positive impact over consumers (from homeowners to businesses), the transportation sector, and power generation. Two forecasts for future gas prices provided by reputed organisations in this respect will be taken into consideration (see figure 2). The first one is based on the 2013 World Energy Outlook of the International Energy Agency (IEA). The second forecast is taken from the Global and Russian Energy Outlook of the Energy Search Institute of the Russian Academy of Sciences. This article assumes that that these two predictions can be considered as the minimum scenario (RAS forecast) and maximum (IEA forecast) for gas prices in Europe. The International Energy Agency expects gas demand to increase only slightly in the next 20 years, as it believes renewables will continue to gain importance in the power sector. However, gas demand will not fall as the agency believes gas will replace aging coal and nuclear power plants, in particular aging hard coal plants which will be put offline because of air pollution legislation and
higher CO2 prices. On the other hand, the IEA also expects more nuclear power plants to be retired than built. Both assumptions mean that gas will remain a key fuel in the European fuel mix and as a result its prices will rise, albeit slowly. On the other hand, the Russian Academy of Sciences believes that until 2030 Europe will experience a decline in gas prices, mainly caused by low demand and oversupply of gas. Only after 2030 will prices start to rise as increased demand in Asia will put pressure on European prices and will lead to increase.

**Forecasts of future gas prices in Europe**

![Figure 2](image)

**Source:** IEA, RAS

Shale gas developments in the United States have lead to a shift from coal to gas in the United States electricity sector and from gas to coal in the EU electricity sector. The significant drop in gas prices in US due to the shale gas boom made coal reserves in US redundant. Those were redirected towards other markets, and in particular European and Asian. Coal reserves were partly exported to the EU, which decreased coal prices in the EU and gas was replaced by coal in the electricity sector. Over the longer term however, coal import prices to the EU have not decreased, neither has overall coal import to the EU increased. Therefore, the exact contribution of US shale gas developments to the gas-coal fuel shift in EU electricity supply is not proven. The article argues that there are more relevant factors such as historically low prices for CO2 emission certificates which are more likely to have contributed to the gas-to-coal shift within Europe.

In Europe, natural gas could have a role in replacement of outdated (coal fired) production capacity. According to the EIA (2012), using natural gas to produce electricity generates only 20% of total emissions when burning coal. In 2008, for the first time since 1990, CO2 emissions have decreased
significantly in North America (Taskinsoy 2013) which can be largely attributed to the economic recession that reduced both industrial activity, but also to shale gas developments. According to a report by Tripe E Consulting (2014), coal prices in Europe have slightly decreased between 2010-2012, but over the longer term there has been an upward price trend. Production of natural gas electricity plants in Europe fell by about 25% between 2010 and 2012, while coal capacity increased by 10%. Nevertheless, shale gas is only one of the factors causing a recent fuel-shift from gas to coal in the European electricity sector. In Europe, coal consumption increased after 2010, driven by the falling price of North American coal (Eurostat, 2012, see figure 3 below). On top of this, other factors have contributed such as minimum historical prices for emission certificates after 2010, milder winters, and a decreasing (both industrial and households) consumption due to economic recession. The decline of gas can be partly attributed to the increase in the use of renewable energy sources in electricity supply in Europe over the same period. European gas prices have also increased substantially since the 1990s, which is another reason why a shift to coal has been attractive. Broderick et al (2011) highlights that the argument that shale gas should be exploited as a transitional fuel in the move to a low carbon economy seems tenuous at best.

Coal consumption in the EU, 1998-2013, million metric tons of oil equivalent

![Figure 3](image-url)

Source: EUROSTAT

Shale gas could have an indirect impact on European energy markets through increased LNG supply. However, there are some hurdles in making this possible. First, LNG terminal have to be built which require significant investments as export facilities are not in place. Second, there are higher incentives for shippers to make shipments to Asia than to Europe. Gas infrastructure Europe (2014) highlights that Europe has only 22 LNG terminals
(190 bcm) while other 6 are under construction (30 bcm). The gas consumption in Europe in 2012 was 511 bcm, out of which 161 bcm came from the Russian Federation (31.5%), while only 64 bcm came through the LNG terminals (12.5%) according to data from DG Energy (2013). As of January 2014, the U.S. Department of Energy (DOE) has approved five applications (94 bcm / annum) for permits to export liquefied natural gas (LNG) from the east coast to trade agreement nations. The cost of LNG may further increase if large LNG quantities from Middle East are shipped to Japan and South-East Asia. In particular Japan has become large LNG shipping destination following closure of nuclear power plants following the Fukushima accident. Gas trades at close to € 40/MWh in Japan, giving more incentives to shippers to make shipments to Japan rather than to Europe were it is traded at slightly over € 20/MWh. According to a GPPi Policy Paper (2012) supported by EC, European gas markets are in flux. In most of the OECD world, gas demand has faltered, a result of the financial and economic crisis. Furthermore, in Europe, shale gas will compete with abundant availability of piped gas from countries like Russia, Norway, Algeria and others, as well as mega infrastructure projects that are currently developed. In these circumstances, it is hard to predict that shale gas production could lead to a significant drop in the price of natural gas in the EU in the coming decades. Shale gas import as LNG to the EU will be limited until 2020, due to limited export capacities in the US. From 2020-2035 this will probably no longer be a limiting factor considering the current investments in infrastructure. Many additional LNG terminals are planned in the US, and these are expected to come online after 2020.

The expected decrease in gas prices is mainly driven by weak European demand. This is caused by deployment of a large number of wind and solar plants (for example, 75GW in Germany as of 1Q 2014) on the wholesale electricity market, causing a reduction in electricity prices. This is because wind and solar power plants have 0 marginal cost of production and therefore move more expensive sources out of the market. Nonetheless, the demand for gas will stay low as Germany will continue adding wind and solar capacity eventually reaching 50% of German consumption in 2030 (see figure 4 below). This will keep power prices down and gas-fired plants out of merit order, while hard-coal prices are likely to fall given robust supply of cheap coal from Columbia and South Africa. The efforts undertaken by the European Commission to reform the CO₂ market will (if implemented) manage to revive the CO₂ market only from 2021 onwards. As a result, hard-coal will remain a viable substitute for gas, pushing demand down. Finally, energy efficiency measures will significantly hamper demand. In particular a requirement that all new public buildings be nearly zero-energy buildings.
(i.e. heat losses are close to zero) after 31.12. 2018 and ALL new buildings nearly zero-energy buildings after 31.12.2020 (Directive 2010/31/EU of 19 May 2010 on the energy performance of buildings) will have a material effect on gas demand for heating while the demand for gas will stay suppressed.

**Expected German Wind and Solar Production**

*Figure 4*

![Expected German Wind and Solar Production](image)

**Source:** German Federal Economy Ministry

The main factor affecting future electricity prices will be the CO₂ market, specifically whether the CO₂ market will revive in the future only if the current CO₂ oversupply problem on the market is solved. The EC has proposed several measures to tackle this problem: such as the back loading of current allowances; a target of 40% emission reduction target by 2030 compared to 1990 levels and a stability reserve system, which would start operation in 2021. The back loading of allowances will not help revive the CO₂ market as it does not solve the current oversupply problem, only moves the oversupply to the end of the trading period. As no strong increase in carbon emissions induced by strong economic growth is expected, this oversupply will not decrease. On the other hand, a new 40% emission reduction target in combination with the stability reserve mechanism is likely to help solve the oversupply problem. The stability reserve system seems to be an effective tool in reducing the accumulated oversupply, and if implemented starting 2021 - as envisaged, the system will adjust annual auction volumes.

Cedigaz (2014) foresees a very slow increasing electricity demand, with the share of natural gas in energy demand increases after 2020 to reach 27% by 2035 (24% in 2013), while coal share will decline. It is expected that gas’ role in the power sector will return to growth after 2020 (mainly on the back of nuclear phase out, coal plants decommissioning). Natural gas is the fuel to meet the economic, environmental and security challenges of the world energy system. However, its
competiveness is highly dependent on the energy policies and implementation of appropriate environmental regulations. It is unlikely that EU could reproduce US experience in terms of level of production. There are significant uncertainties regarding the amount of technical recoverable resources. A medium case scenario developed by Thomas et al (2014) put forward the argument that EU could cover about 3-10% of total demand from unconventional gas resources by 2035. Thus, the import dependency on fossil fuels is likely to grow, with prices determined by international markets. BP, in its World Energy Outlook 2035 published in 2014 argues that shale gas will have a modest contribution of only 6% in covering the demand, with import dependency rising from current 60-65% at present to 84% by 2035 mainly on the back of the decline in international supply. Europe is likely to kick of production of unconventional gas resources no earlier than 2017, but it does not have high chances of becoming an important player (Kavalov and Pelletier, 2012) due to geological, social, ecological, political, technical-economical and business environment limitations, and more recent due to a significant drop in international oil prices. Another study commissioned by EC (Pearson et al, 2012) emphasizes that European shale gas is likely to have a significant impact on international markets only under optimistic scenarios with regard to production costs and technically and economically recoverable resources and a more important role in setting up a more liquid European market, more integrated and competitive.

Romanian context: Supply and demand of natural gas and the impact of shale gas

According to BP Statistical Review of World Energy 2014, Romania’s natural gas reserves in 2012 were 100 Bcm, about 1/5 compared to 1992 level. The Romanian energy strategy estimates that Romanian gas reserves will gradually diminish by 2020, as presented in figure 5 below. The rate of decline of hydrocarbon reserves is 10% per year, which means that the dependence on gas imports will increase in the next 15 years from about up to10% today to 50% (as foreseen by Romanian Energy Strategy 2012-2035). Local gas production is expected to decline to 5.3 Bcm by 2021, requiring annual imports of 13.6 Bcm, unless new gas deposits are developed. A number of new, relatively small natural gas plays or rejuvenation of depleted oil fields could possibly slow down the rate of decline in domestic supply, as could the development of a major offshore field, which is currently being explored (resources have been estimated at up to 84 Bcm) and technically and commercially available unconventional resources (shale gas) could add to the country’s fuel mix starting with 2020.
Natural gas reserves: historical and projection (Bcm)

Figure 5

<table>
<thead>
<tr>
<th>Year</th>
<th>Natural Gas Reserves (Bcm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>170</td>
</tr>
<tr>
<td>2007</td>
<td>162</td>
</tr>
<tr>
<td>2008</td>
<td>155</td>
</tr>
<tr>
<td>2009</td>
<td>148</td>
</tr>
<tr>
<td>2010</td>
<td>141</td>
</tr>
<tr>
<td>2011</td>
<td>134</td>
</tr>
<tr>
<td>2012</td>
<td>127</td>
</tr>
<tr>
<td>2013</td>
<td>120</td>
</tr>
<tr>
<td>2014</td>
<td>114</td>
</tr>
<tr>
<td>2015</td>
<td>107</td>
</tr>
<tr>
<td>2016</td>
<td>101</td>
</tr>
<tr>
<td>2017</td>
<td>95</td>
</tr>
<tr>
<td>2018</td>
<td>89</td>
</tr>
<tr>
<td>2019</td>
<td>83</td>
</tr>
<tr>
<td>2020</td>
<td>77</td>
</tr>
</tbody>
</table>

Source: Romanian Energy Strategy 2012-2035 (March, 2012)

A study conducted by PwC (2014) shows that gas production in Romania incurs higher costs and lower efficiency as compared to other European countries: for example, the operating costs for a gas well in Romania are $17/barrel of oil equivalent (boe), compared to Croatia, Denmark and Poland ($12/boe), Norway ($7/boe) and Italy ($10/boe) while the average 21 boe/well/day recorded in Romania is the lowest production rate from the countries surveyed.

Most likely, fossil fuels will remain a dominant source of electricity production in Romania in the decades to come. Currently, natural gas accounts for 20% of the country’s energy mix, and is expected to grow insignificantly in the following years gradually picking up after 2020 mainly due to possible new gas fired power plants coming online and higher industrial consumption.

By 2020, gas consumption can slightly increase for the following reasons:

- **new installed capacities in gas fired power plants** are likely to go online by 2020 (this includes the retrofitting of old gas fired power plants and new plants), but this will not change the balance as other legacy plants will be decommissioned;
- **household consumption** is likely to go up due to an increasing number of households disconnected from the district heating system and switching to gas fired individual boilers (nonetheless, the impact will probably be cancelled by the fact that municipalities are becoming more efficient and significant investments are being made into insulating buildings and implementing energy efficiency measures);
- **however, industrial consumption will not be a driver** as some of the petrochemical plants (one of the largest consumers in Romania)
are to be closed while new ones (or reopening old ones such as Oltechim) are very unlikely.

Import prices paid for Russian gas by Romania in 2014 were about $370/1,000 cubic meters, 20% lower compared to the high levels recorded in winter 2008/2009 (approximately $500/1,000 cm). The price of locally extracted gas is set by the regulator ANRE and has been fairly stable since 2007, with a significant drop in 2013 (see table 1). The price of imported gas has been increasing since 2004, with a sharp increase in 2008 and 2011. Romania imports gas from Gazprom through several intermediaries. Starting in 2010 Romania also began importing from GDF Hungary. Gazprom prices are oil-indexed, but intermediaries are sometimes able to negotiate additional margins.

**Average Annual Gas Prices in Romania, $/thousand cubic meters**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>$ 60</td>
<td>$ 110</td>
<td>$ 110</td>
<td>$170</td>
<td>$ 160</td>
<td>$160</td>
<td>$165</td>
<td>$165</td>
<td>$170</td>
<td>$ 123</td>
<td>$ 116</td>
</tr>
<tr>
<td>Import</td>
<td>$200</td>
<td>$ 216</td>
<td>$ 289</td>
<td>$296</td>
<td>$ 454</td>
<td>$322</td>
<td>$352</td>
<td>$ 442</td>
<td>$ 440</td>
<td>$ 400</td>
<td>$ 368</td>
</tr>
</tbody>
</table>

Source: ANRE, Annual reports

Historically, there has been a significant divergence in prices of domestically produced and foreign gas in Romania (see figure 6); nevertheless, the Romanian prices are currently (1Q 2015) convergent with continental European gas hubs.
Wholesale Gas prices in Europe will continue to converge as infrastructure is developed and the European states are better interconnected. This will result in a stronger convergence of wholesale gas prices in European gas hubs. Most likely, CEGH gas hub (Baumgarten) would become an important price reference hub for Romania in case of market liberalisation as it is geographically the nearest hub and is already favoured by Romanian traders, aside from being already the leading gas hub in Central Europe. NCG is one of Germany’s major gas hubs, serving as a reference price for large volume of continental gas products. There is no reason to assume that Romanian gas hub prices would be an exception and would not converge with European gas prices over time. Therefore, it is assumed that the price at which gas from unconventional resources will be traded will be similar to the one on European gas hubs.

For an average Romanian, the most perceptible consequence of shale gas production in Romania will probably be the reduction of natural gas prices. The natural gas price for households, one of the lowest in Europe (Eurostat) is currently the outcome of a regulated (gas basket) price mechanism aimed to guarantee equal access to import and domestic gas to all participants, to ensure a lower depletion rate of domestic resources and to protect vulnerable consumers. Nevertheless, the mechanism has caused distortions on the competitive market, which had to be over-regulated. The market for households is due to be liberalised and this will mean abolishing the gas basket mechanism and thus gradually increasing the price for the end
consumers. The entry of new gas sources into the country’s fuel mix will not significantly decrease the gas prices for households which are projected to increase due to the gas market liberalisation calendar.

In Romania, at least until 2020, substitution between coal fired and gas fired capacities when producing electricity will be limited, and the country is unlikely to witness a hash for gas. Nevertheless, Romania is in the process of closing the last four hard coal mines (by 2018), with lignite mines to remain operational. Romania imports coal, but the share of imported coal has dropped to a quarter compared to 1990 (IEA). For social reasons, Romania imported insignificant coal quantities, although locally produced lignite has a relatively low calorific value compared with coal from Czech Republic and Germany, and production costs are even higher than production costs in other countries. About 30% of electricity in Romania is currently provided by coal fired plants, 80% of which went into operation in the ‘70–‘80s, thus requiring significant investment to comply with environmental standards. Coal sector (hard coal) will receive by 2018 state aid and will have to close by then the 4 mines currently considered economically viable, while about 1,200 MW in Mintia and Paroșeni (part of Hunedoara Energy Compound) to be taken offline. Moreover, even the Energy Strategy 2012-2035 states that about 13,540 MW will be decommissioned in the energy sector by 2035, of which probably more than 30% of coal powered units. Since the government is currently updating the energy strategy (1Q 2015), assessment of policy options between coal and gas energy is essential for future decisions in the electricity production sector. Investments may be directed to reshape the country’s fuel mix and the support (subsidies / state aid according to European legislation) to be granted to specific technologies or through public policy measures (for example, trading CO2 certificates schemes or full energy markets liberalization).

The development of shale gas in Romania in the next 10 years is unlikely to lead to a paradigm shift in the electricity sector (as it happened in the USA), but pressure coming from increasing CO2 prices can have a significant impact. There are also other variables to be taken into consideration when assessing the economic impact of shale gas in Romania: First, production costs are currently unknown as there is little current geological information, while perimeters differentiate a lot, with wells in the same area showing different results. Polish Geological Institute estimated in 2011 that the operations in Poland will imply costs up to three times higher when compared with levels in North America; while production costs were estimated to be up to 2-3 times higher. Breakeven exploitation of shale gas in the EU will be higher than in the United States. Second, Romania has a royalty tax system based on income that requires differentiated rates imposed on the value of oil production, depending on the production, quality and level of oil production.
per reservoir. Currently in Romania, conventional hydrocarbons are charged fees ranging from 3.5 to 13% and are one of the lowest in Europe. Royalties’ levels are to be reassessed end of 2014. Third, it is said that the industry can bring jobs. An industry study commissioned by the company exploring shale gas potential in the UK, Cuadrilla (2014) shows that the industry will create 74,000 jobs in the U.K., while government study shows that the new jobs created would amount between 16,000-32,000 (including indirect jobs). Following a conservative line, a study by Romanian member committee of World Energy Council (2013) reaches a total of 4,517 direct jobs and 13,552 indirect jobs nationally. Nevertheless, considering that this is a more capital intensive industry, the overall employment impact will be insignificant. Fourth, cheaper gas could, in principle improve the competitiveness of energy intensive industry and in particular petrochemical, steel and aluminium one. ExxonMobil (2014) believes that one of the main benefits of shale gas is to provide cheap fuel for petrochemical industry in the USA. Furthermore, the same study puts forward the arguments for which the demand for petrochemical products (fertilizers) will increase by 50% by 2020, while about 125 new projects with an estimated investment value of $ 84 billion are to be carried by 2020. It is possible that these new projects will lead to oversupply of petrochemicals in North America, and commodities’ export to Europe, leading to fierce competition. Nevertheless, to conclude with, the most important piece to the puzzle is the amount of economically viable shale gas resources that Romania holds.

Conclusion

Although unconventional resources are spread across the globe, production is likely to remain concentrated in North America while factors that have contributed to the dramatic growth of production are unlikely to be quickly replicated elsewhere. The impact of shale gas developments in Romania and Europe will not be similar to the recent shale gas boom in the United States and will most likely be limited and gradual. Overall, Europe is unlikely to score significant results in terms of impact of shale gas. However, depending on the level of resources and role of natural gas in the fuel mix, some countries are likely to witness important effects. Whether Romania decides to produce shale gas itself (if this is an economically viable resource) and how this plays out will have a considerable effect not only on its own energy market, but also on the regional energy markets. To conclude with, the overall socio economic impact of unconventional gas resources should be subject to a national cost-benefit analysis, which will take into consideration direct and indirect impact, all externalities, positive and negatives.
Acknowledgement

"This paper was co-financed from the European Social Fund, through the Sectorial Operational Programme Human Resources Development 2007-2013, project number POSDRU/159/1.5/S/138907 “Excellence in scientific interdisciplinary research, doctoral and postdoctoral, in the economic, social and medical fields -EXCELIS”, coordinator The Bucharest University of Economic Studies”.

References

- Cedicaz, 2015, Medium and Long Term Gas Outlook.
- Gas infrastructure Europe, Use and role of LNG in 2013 and expected contribution to SoS in 2014, presentation delivered by Wim Groenendijk, GLE President, Gas Coordination Group, Brussels, 14 February 2014.
- German Federal Economy Ministry.
- Kavalov, B., Nathan Pelletier, N., 2012, Shale Gas for Europe – Main Environmental
and Social Considerations A Literature Review, Joint Research Centre, European Commission.
- World Energy Council of Romania, 2013, Centgas, Gas resources from unconventional formation, Potential and development, November 2013, available at http://www.cn...
Condiții pentru prezentarea materialelor spre publicare

Lucrările științifice sau tehnice, originale, se pot prezenta redacției spre publicare fie sub formă de articole, fie sub formă de scurte comunicări în limba română și în limba engleză (traducere integrală).

Precizările privind condițiile tehnice pentru predarea materialelor se află pe site-ul www.revistadestatistica.ro, secțiunea „Procesul de recenzare”.

Conditions for the articles designated for the Romanian Statistical Review

The original scientific or technical works can be sent to be published either under article form or short communications in Romanian and English (complete translation).

The technical conditions for the articles to be presented can be found at www.revistadestatistica.ro in the “Peer review” section.

ISSN 1018-046X

Reproducerea conținutului articolelor fără acordul Institutului Național de Statistică este interzisă, iar utilizarea conținutului acestei publicații, cu titlul explicativ sau justificativ, în diferite lucrări este autorizată numai cu precizarea clară a sursei.

Se precizează că punctele de vedere, datele și informațiile cuprinse în articolele publicate aparțin autorilor și nu angajează răspunderea Institutului Național de Statistică