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Shale Gas Exploitation– Economic Effects and Risks

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Abstract

The paper approaches the possible economic impact of the exploitation and turning to account shale gas resources, regarded from the perspective of other countries' accomplished results. Also, the team studies social acceptability issues for the shale gas exploitation on international and national levels. Next, the environmental risks associated to high volume hydraulic fracturing and horizontal drilling for shale gas exploitation are reviewed.

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1. Introduction

The US vast experience in commercial exploitation of unconventional hydrocarbons (including shale gas) allowed them to focus on improving the specific tax and royalties legal framework. This is happening while according total freedom to member states in finding the equilibrium between exhaustible resources preservation objectives and the ones aimed to economic development and competitiveness. On the other hand, the EU states struggle towards the establishment of a unitary framework under the circumstances of a very heterogeneous mix of

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opinions regarding the opportunity of applying the high volume hydraulic fracturing in shale gas exploitation.

1. The US experience in shale gas fracking and its economic impact evaluation. Comparisons with Romania's situation

Between 2005 and 2012, the shale gas revolution increased by 30% the US gas production, from 511 to 677 bln.cm. Consequently, the natural gas prices reduced to almost half, from 8 to 4 dollars/Mbtu, between 2008 and 2013 years. The reference scenarios for 2014-2020, published by the US Energy Information Administration in January 2014, forecast a sustainable growth (2.6% annually until 2040) of the shale gas production in the next 27 years.

Spencer, Sartor and Mathieu analyze the extent to which different consumers benefited from the lower gas prices, concluding that the main beneficiaries were the industrial ones and, to a considerably lesser extent, the households (Spencer, Sartor and Mathieu, 2014). The explanation results from the fact that, in US, the natural gas expenditures have a relatively reduced weight in the households' income, i.e. 0.57% in 2012. Additionally, the natural gas price decrease was rapidly blurred by the increase in the electricity and fuel gas prices. The impact on electricity prices was, also, much lower than the one felt on the wholesale gas market, due to the marginal costs of the energy supplying units. In 2010, in Romania, the natural gas expenditures share in the total population income was 2.22% (The National Statistic Institute' Tempo online program, 2012). Manufacturing sectors are classified by their sensitivity to the gas prices into three categories: a) sectors that use natural gas as a feedstock; b) sectors that consume gas as a fuel; c) energy intensive sectors using other energy sources. Four sub-sectors compose the first category: petrochemicals; nitrogenous fertilizers; plastic materials and resins; other basic organic chemicals. The American petrochemical industry benefited the most from the lower gas prices, while European producers remain dependent on oil global prices. Thus, the European chemical industry has to face more expensive gas, but member countries register very low unit energy costs relative to value added, reflecting their focus on energy efficiency and high value added products. In energy intensive sub-sectors using gas as a fuel (e.g. alumina and aluminium; iron and steel and ferroalloy; petroleum refineries), the gas bill is about only 6% of their value added, thus resulting a weaker sensitivity to the gas prices than the previous category. The main sub-sector entering the third category is the cement production with its 40% energy expenditure in value added; yet, gas represents only 5% from the total energy consumption. The sensitive manufacturing sub-sectors account for 0.5% of the US GDP and less than 5% from the manufacturing value added in 2010. The authors' conclusion is that the lower gas prices impact on manufacturing is going to be limited. This outcome is supported also by the fact that energy cost expenditure decrease is not transmitted on the whole product value chain. Anyways, the true dimension of the lower prices impact on industrial competitiveness needs time to be revealed, because recession is blurring an important part of the positive effects on costs. At a macroeconomic level, the increased gas production may influence the economic growth in two ways: a) cheaper energy could increase competitiveness through lower consumer prices and fewer imports; b) short term occupation and GDP growth through the mobilization of investment resources, otherwise inactive during recession. Thus, according to the above mentioned authors, the economic impact of the shale gas revolution was rather modest, with more local and sectoral influences, than macroeconomic ones. They emphasize that this revolution is not to be replicated at the same scale anywhere else.

In 2012, Romania benefited from a 15.67 bln. cm of gas resources, consuming 13.6 bln.cm. In the same year, the imports accounted for 18.4% from the internal resources (production and stock). The energy balance provided by the National Statistics Institute allows us to identify the gas price sensitive sectors. This way, we are able to remark the 23.9% industry contribution to the internal consumption, and the 23.5% of the population. The most important natural gas consumers were, in 2012, the electricity and thermal energy generation units, with a 26.2 percentage in the internal consumption and the manufacturing sub-sectors "Substances, chemical and pharmaceutical products" with 9.2%, "Metallurgy" with 4.2%, "Manufacture of food, beverage, tobacco" with 2.9%, "Hydrocarbons extraction and ancillary services" with 2.7%, and "Manufacture of coke and refined petroleum products" with 2.8% from the internal consumption (INSSE, 2013). These sub-sectors provided 13% of Romania's gross value added (the most important natural gas consumers- the energy and the chemical industries providing 4%, respectively only 0.36%) (INSSE, 2012). Therefore it is to be assumed that the impact of an eventual gas price decrease would not trigger significant competitiveness growth.

If the across ocean literature is abundant in studies concerning the Severance Tax (ST), the European bibliography is very scarce in this field. Lepori defines the ST as "a tax imposed on the value of non-renewable natural resources that will be used outside the state from which they are extracted. Severance taxes are instated to cover costs associated with resource extraction and to compensate the state for the loss of a non-renewable resource" (Lepori, 2011). US apply this tax to all kinds of non-renewable resources (oil, gas, coal, wood, uranium, iron ores, fisheries etc). We consider this subject extremely sensitive to our country that subsists from log, timber, scrap and other raw materials or low value added product exports and that gave away through concessions an important share of its energy resources. Therefore, we will grant this subject the deserved attention in this paper and in our future researches.

Rabe and Hampton provide an extended and thorough analysis of the US legal framework evolution governing the ST in the "shale gas decade" (2004 – 2014). This framework was changed on numerous occasions, especially in 2013 and 2014, years. The authors emphasize the reluctance to any energy tax increases due to possible consumer reactions. On the other hand, they observe the ST implementation success because the additional costs are "exported", i.e. paid by companies using the resources outside the state boundaries. Consequently, one can speak about an emergent world of ST, states having almost full liberty in establishing their own regulations. With all precautions, income provided by ST doubled in last ten years, the total income amount reaching its maximum in the 2012 fiscal year: 18.2 bln dollars (for all non-renewable resources). In 2013, the percentage of ST income from the total tax budget varied among 78% in Alaska and 0.03% in California, with important differences among the other states. As mentioned before, US have different approaches in applying the ST. The tax level tends to be higher in states with lower degrees of their own energy resources turning to account. The best example is Alaska, the only state that imposed a gradual increase of the ST in the last decade through its "Alaska Clear and Equitable Act (ACES). ACES established a 25% tax followed by an additional growth for each dollar increase in the oil price over 30 dollars per barrel, a progressive scale designed after the Norwegian model. The tax level approaches 75% from the resource gross value when the oil price surpasses 90 dollars per barrel. The new incentive system for hydraulic fracking significantly reduced the tax level and brought Alaska back into the energy suppliers' competition. The new strategy didn't gain the whole population agreement, thus the 2014 year will decide the fate of the former strategy. The opposite is Pennsylvania, the third most important gas producer in US (after Texas and Louisiana), which decided to stimulate its shale gas production through a very low level of taxation. The temporary absence of the ST brought a series of debates that conducted, in 2010, to a 2% tax level from the resource gross value. The income provided by the ST is going either to the general budget, or to funds destined to counteract the negative externalities generated by the extension of the drilling activities or towards the long term protection of the non-renewable resources. For example, in Alaska, the Permanent Fund is an annual source to allocate dividends to each resident (Rabe, Hampton, 2014).

As to the royalties paid to land owners, in US the usual level is 12.5% from the production gross value, but royalties can surpass this level according to the reserve's value. This way, some plays can provide the land owner few hundred thousands of dollars yearly. In Romania, through the concession permits, the royalties are established at the following levels, according to the gross extracted production (Table 1):

Table 1 Royalties in Romania for natural gas extraction (as percentage from the gross extracted production)

Royalty (%)	Gross extracted production (millions cm)/trimester
3,5	Less than 10
7,5	Between 10 and 50
9	Between 50 and 200
13	Over 200

Source: http://www.romaniacurata.ro/spaw2/uploads/files/document-2012-04-26-12095713-0-acord-chevron-pentru-explorare-exploatare-perimetrul-adamclisi.pdf

Important amounts of money were obtained in the US from the land properties' leasing. The leasing values increased rapidly with the demonstration of the viability of hydraulic fracturing and horizontal drilling technologies, from about 40 dollars per hectare in 2006, to over 800 dollars per hectare in 2008 (e.g. for the Marcellus site) (http://geology.com/articles/marcellus-shale.shtml). And it is known that the shale gas extraction is more land intensive than the natural gas one. Land use means also access roads, water treatment facilities etc., and Europe is more densely

populated and the agriculture farms are more fragmented than in the US. This means higher transaction costs. Also, we should emphasize the importance of the subsoil property regime, because in the US this was the main growth factor of the social acceptability.

2. Current situation in EU

The evidences point out the incertitude governing Europe's shale gas reserves. The Joint Research Centre estimates the shale gas technically recoverable reserves presenting three possible scenarios: low (2.3 tmc), average (8.9 tmc) and high (17.6 tmc) (JRC, 2012). In the same time, a study conducted by EIA/ARI estimate Europe's reserves to 25 tmc (EIA/ARI, 2013) and Romania's to about 1.4 tcm. Romania's subsoil is credited with favourable perspectives, although the researchers conducted are not sufficient to assess the shale gas reserves (Anastasiu, Pătruți, 2014). However, the CNR-CME report offers an extensive description of the Romanian plays with shale gas potential (CNR CME, 2013).

EU's natural gas import dependency is 67%, the main suppliers being Russia (25%), Norway (23%), Algeria (10%) and Qatar (9%). Certain countries are completely dependent on imports from Russia (Table 2).

Table 2 Natural gas import dependency for some EU countries, share of Russia in imports and share of gas in gross inland energy consumption

	Natural gas import dependency (%) (numbers above 100 indicate stock changes)	Share of Russia in gross imports of gas (%)	Share of gas in gross inland energy consumption (%)
Bulgaria	86	100	14
Czech Republic	111	97	16
Estonia	100	100	8
Latvia	109	100	30
Lithuania	100	100	38
Hungary	66	65	37
Austria	103	63	23
Romania	22	86	31
Slovakia	105	100	27
Finland	100	100	9
Poland	75	69	13

Source: Spencer, T., Sartor, O., Mathieu, M., (2014). *Unconventional wisdom: an economic analysis of US shale gas and implications for the EU*, Studies No. 02/14, IDDRI, Paris, France, p.32

The border prices for the gas delivered by Russia differ from one country to another (Figure 1).

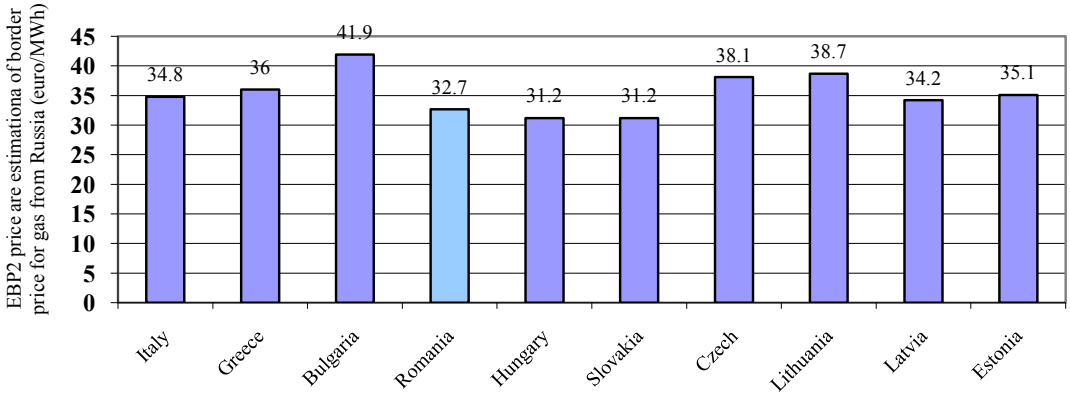

Fig. 1 Border gas prices delivered from Russia to some European countries

Source: Data from European Commission, Communication from the Commission to the European Parliament and the Council, European Energy Security Strategy, COM/2014/0330 final/p.21

In EU "There is no experience with the permitting of production using high volume hydraulic fracturing ...", and only “limited experience with the permitting of exploration..” as it is stated in the Commission’s Recommendation of 22 January 2014 on minimum principles for the exploration and production of hydrocarbons (such as shale gas) using high volume hydraulic fracturing (art 10). Shale gas production is a very intense industrial activity. Few decades took US to prepare the non conventional hydrocarbons extraction technologies and between 2000 and 2010 years, 17268 wells have been drilled, with a monthly average of 130 (by comparison, Poland wishes to drill 345 wells by 2021) (European Commission, 2014). To produce 30 bln.cm of shale gas yearly (approximately 6% of the Europe’s demand in 2011) would imply drilling 700-1000 wells yearly for several decades. And all this under the circumstances of acute lack of skilled work force and industrial related services (Spencer, Sartor and Mathieu, 2014).

Nevertheless, the Recommendation leaves the liberty to the member states to determine "the conditions for exploiting their energy resources" as long as they protect the environment (art.1), yet not mentioning the need to enhance the quality of life. As a proof of the strict exigencies of the existing in EU legal framework, one can find here (art.7) a list of the 13 Directives, three Regulations and one Decision, all of them regulating the high volume hydraulic fracturing. There are emphasized the lacks in approaching specific issues regarding "strategic planning, underground risk assessment, well integrity, baseline and operational monitoring, capturing methane emissions and disclosure of information on chemicals used on a well by well basis" (art.8). Chapter 3 "Strategic planning and environmental impact assessment", makes recommendations regarding the minimal conditions to be respected before permitting the exploration or extraction activities, as follows: a strategic environmental assessment according to the Directive 2001/42/CE which provides clear rules on possible restrictions (e.g. minimum distances between authorized operations and residential areas); an environmental impact assessment respecting the Directive 2011/92/UE requirements. A special interest is provided by the article 3.4, which does not impose, but recommends to “provide the public concerned with early and effective opportunities to participate in developing the strategy…". The same importance have the recommendations regarding the selection of the exploration and production site (chapter 5), and the ones referring to the operational requirements (chapter 9), which presume the existence of a qualified and independent third party to insure the operational performances of the wells (art.9.2 e) and of a competent authority in the event of any incident or accident affecting public health or environment (art. 9.2 h). A financial guarantee covering the permit provisions and potential liabilities for environmental damage is recommended for the operator to provide (art. 12.2). Under question is our capacity to insure, at least in the present, that the “competent authorities have adequate human, technical and financial resources...". Anyways, member states that have chosen to explore or exploit hydrocarbons using high volume hydraulic fracturing “are invited to give effect to the minimum principles....by 28 July 2014 and to annually inform the Commission about the measures they put in place ..., and for the first time in December 2014".

In its work titled "Shale Gas in Europe: Much Ado About Little", Tania Zgajewski emphasizes the diversity of approaches existing in EU countries towards the shale gas exploitations, each country having distinct motivations: import dependency (Poland, Spain), the domestic resources decline and the important share of natural gas on the energy market (Great Britain), the existing energy alternatives (nuclear in France), nuclear units decommissioning, by 2022 (Germany). The withdrawal of important companies as ExxonMobil as a result of unsustainable commercial flows did not reduce the Polish enthusiasm regarding the shale gas exploitation. Poland considers that the beginning of the 2015 year will mark the shale gas production, although certain reports state that 2019 would be a more realistic term. The new tensions in Ukraine forced Poland to pass, in March 2013, a new legal project that eliminates any tax on shale gas exploitation until 2020 and after this year taxes will not surpass 40% from the obtained profits. Relevant for Romania is Poland’s example (different from the US one, taking into account the property regime and the density of population) regarding the way to manage the social acceptability issues. As to the benefits resulted from this activity, from the year’s 2015 gross profit, the Polish would gain maximum 40% from: royalties (5%), special cash flow tax (25%) which allows the investment deduction, profit tax (19%) (www.ecomagazin.ro). These sums are going to be shared between the central government, development regions and mayors. This was the way to begin shale gas exploration activities without social negative reactions gaining both national and local stimulation. The UK government considers that the risks of this activity deserve to be taken although, in the period May-December 2012, the drilling activities of Cuadrilla were stopped because of the seismic

activity intensification in the proximity of the drilling perimeter. The government announced important tax reductions for the gas industry and incentives most substantial for the local communities. In December 2012, the German parliament rejected the appeals to interdict the hydraulic fracturing. The approval of the legal project proposed in 2013 was delayed and the moratorium on hydraulic fracturing is maintained until the environmental issues are resolved. The Spanish Government supports the shale gas exploitation although there is opposition from the Cantabria province which banned in 2013 the hydraulic fracking. Netherlands and Luxemburg stopped the drilling activities; Bulgaria banned in 2012 the exploration through fracturing; Czech Republic also has a moratorium in this respect; Italy does not wish at this moment to perform such activities, focusing on gas storage facilities' growth. France was the first country to ban the hydraulic fracturing through the Jacob Law passed in July 2011. Nevertheless, there are voices supporting the shale gas activities, the subject being under debate. In France, there are opinions pointing out that shale gas may have an economic impact that cannot be neglected under the ongoing geo-strategic revolution. In their report to the "Office parlementaire d'evaluation des choix scientifiques et technologiques", Lenoir and Bataille emphasize the necessity to assess the national energy resource heritage in order to evaluate the economic impact of the shale gas industry with the following parameters: a) extracted gas prices (the substitution possibilities of oil and gas for economic activities, the electricity price decrease as a result of lower gas prices, the competitiveness of the natural gas production companies, the possible effects on energy intensive industrial sectors); b) the gas trade balance; c) employment; d) contribution to the state budget; e) the substitution degree between renewable energy resources and non-conventional hydrocarbons (Lenoir, Bataille, 2013).

The Romanian Government granted, through its Decision no. 189 from 20th of March 2012 the oil exploration-development-exploitation permit to Chevron Romania Holding B.V., in EX-19 Adamclisi area for a perimeter of 909.2 square km, in EX-18 Vama Veche (889.54 square km) and EX-17 Costinesti (901.75 square km) areas, all situated in Dobrogea. Also, the company received an exploration license in Barlad area, the permit to explore 600 thousand hectares being approved through the Government Decision no. 2283/2004. Other areas programmed for shale gas exploitation in Romania are: one in the South of Craiova granted to Midia Resources company; two in Voievozi and Adea situated in the western part of the country (Campia de Vest), with exploration-development-exploitation permits to MOL Hungarian Oil and Gaz Public Limited Company together with S.C. Expert Petroleum S.R.L., under approval; Bihor (Baile Felix), Timis (Periam, Biled, Paulis, Buzia, Crai) and Constanta (Cupida and Eforie) areas with permits obtained by Avere Energy. On 31st of January 2013, Romania granted to Chevron the shale gas exploration certificate. The first well was drilled at Pungesti, Vaslui County starting from May 2014. Thus, the shale gas reserves could be assessed in the next few years, after the completion of the exploration stage in already leased areas.

Under the pressure of Ukraine recent events, the European Commission released, on 28 May 2014, an EU Energy Security Strategy (COM/2014/0330 final) stating that the exploitation of conventional oil and gas resources in Europe should be developed only if issues of public acceptance and environmental impact are adequately addressed.

3. Environmental risks associated with shale gas exploitation by hydraulic fracturing

So far, there is no practical experience on shale gas exploration in Romania. Consequently, the environmental, health and biodiversity impact assessment of hydraulic fracturing (HF) technology can be estimated only based on data provided by countries where this technique was applied (USA, Australia, and Canada). These estimates show that HF exploitation of shale gas requires firstly a proper identification and selection of geological sites, taking into account that not all fields of this type can be exploited (Pearson et al., 2012). One of the important aspects that have to be taken into account in shale gas exploitation through HF is the risk of environmental pollution. This could occur in all phases related to identifying and preparing of exploitation: drilling, completion and cementing the well, hydraulic fracturing, completion of drilling, extraction itself, the abandonment of the well (Smith, 2012; Healy, 2012). Potential environmental effects of HF are directly influenced by geological conditions, applied technology, the experience in exploiting shale gas etc. These effects, that could manifest both locally and globally, may include climate change, air and water quality change, affecting local communities and with impact on human health too (Vengosh et al., 2013 Stuart, 2011; Moore, 2014).

The general risk factors associated with shale gas exploitation through HF are generated by: the large volumes of water and chemicals involved, difficulties related to ensure the integrity of equipment and wells (prospecting-

extraction itself - completion of works), the discharge of chemicals and wastewater during the lifetime of exploitation, potential uncertainties associated with the presence of underground long term fracturing fluid, the potential toxicity of chemical additives used in fracturing fluid composition, traffic problems providing access roads to transport equipment, materials and waste to and from the production wells, soil sealing and potential pollution of a large operational areas, generating emissions and noise pollution caused by specific facilities and equipment.

Potential effects on soil, water and air varies in duration and intensity. These are associated with rocks layer structure, the density of wells drilled, the correct application of exploitation technology during the entire operation (Williams, 2012). In addition to the risks mentioned above, it is pointed out that the occurrence of earthquakes of low intensity is also favoured (Junghans and Bryner, 2013). It is directly related to the process itself, which can lead, under certain circumstances to earthquakes with a magnitude of up to 3 degrees on the Richter scale, which are not felt by the population. Some earthquakes more and more extensive are possible when waste water is used in injection phase, in the case of layers with certain geological features. These significant underground movements can be felt on the ground and can cause landslides. Also in certain circumstances the HF of shale gas may be accompanied by emission of greenhouse gases (Lukey, 2014; UK-DE & CC, 2014).

All the environmental risks mentioned above are also present in the case of other techniques alternative to HF exploration. In fact, the development of these alternative techniques appeared as a necessity to reduce the environmental risks associated with operating in FH (Kargbo et al., 2010). The analysis of published data of these alternative techniques: electro mechanical methods, thermal fracturing, fracturing by injecting liquid carbon dioxide, helium, nitrogen, gas water foam techniques in various stages of research, indicated a decrease of environmental risks (Gandossi, 2013). Nevertheless, a realistic estimation of the potential effects of these techniques is possible only after the application of these technologies and the assessment of their effects (it is estimated that these techniques will be operational after 10 years). At present, an alternative method to HF that seems to be more developed is the fracturing with liquid propane or gel form. This technique requires fewer chemicals, reduces transportation needs and manipulates smaller volumes of materials.

As a conclusion, known technology to exploit shale gas involves potential risks of negative effects on the environment, public health and climate change, with intensities and duration difficult to predict. These are depending on factors such as the geological structure of the site, operation technique applied, the duration of operation etc. The assessment of the intensity of these environmental impacts and the costs of protecting the environment, human health, the preservation of species and of the reproductive capacity of the ecosystem are difficult to achieve in the exploration phase, new events being possible at any time during shale gas exploitation. As a consequence each **s**hale gas exploitation must comply with regulations on air quality, soil and water of the host country (Craven, 2014). Also, a permanent monitoring of exploration and exploitation of shale gas is necessary in order to determine the size and nature of the possible harm effect. This must be regarded as an obligation for both investors and public institutions, which have to involve groups of specialists with skills in this area (geologists and drilling engineers, chemists etc.). So the continuous monitoring of the activity of the companies applying for the exploration licenses or mining of shale gas appears as a necessity for a closer surveillance of the environmental impact (Philippe & Partners, 2011; Ionescu, 2012).

3. The social acceptability of the shale gas exploitation

The shale gas exploitation through hydraulic fracking divided the Romanian society and the specialists in two opponent groups, each with its own arguments exposed in endless debates similar to those in other EU countries.

As every natural resources exploitation activity, the one discussed here, induces, on the one hand, risk-taking (environmental, social etc.) and, on the other hand, benefit gathering. To understand why this activity is so controversial and to identify the social acceptability influencing factors, essential is to analyze the means of risk prediction and management, the benefit sharing schemes and a profound understanding of the envisaged community specificity.

In Romania, in contrast to other sources (e.g. coal), the shale gas resources have at least two particular features that infringe on human environment, respectively on the social acceptability of this activity, as follows:

- the shale gas plays are situated on private properties, in rural areas with agricultural or tourism oriented

activities, close to inhabited perimeters;
- shale gas extraction needs more than one operation perimeter, in order to drill hundreds of wells connected to a common collecting network.

Lack of information, fear from the environmental and human health impact and the impression of missing regulations are fuelling a growing opposition towards the shale gas industry. Thus, the debate surpasses the strictly local interest, gaining national dimensions. The way this activity is perceived and the categorical opposition could be considered the result of a multitude of factors in action:
- economic benefits perceived as dominant or even as a unique mobile in decision making, while ignoring the other environmental or health aspects;
- lack of decision makers' ability to present the shale gas activity under its multiple aspects and to respond to citizens' concern in a proper manner;
- people's perception regarding the state's role in decision making as being a passive one or even subordinated to the interests of foreign shale gas operation investors;
- controversies regarding the scientific state of the art in this particular field;
- uncertainties linked to the short, medium and long run life environment state determined by the above mentioned factors.

Being aware of these factors, we consider that shale gas exploitation in Romania needs an extensive multidimensional portrait (geological, economic, environmental and social) allowing for a precise anticipation of the impact dimensions. Then, concrete measures could be implemented and the price to pay clearly estimated. Generally speaking, to take a decision, equilibrium should exist between:
- the national interest – the Communitary one;
- the foreign investors' interests– the Romanian contributor's one;
- the national interest – the local priorities;
- the need of simplifying the procedures – the urge of tighter regulations.

The increase of the social acceptability towards shale gas exploitation in Romania cannot be seen without the following actions:
- determination of the state's energy independence real imperatives;
- once the necessity of shale gas exploitation is clarified, a clear, predictable and stable regulation framework should be established. This should envisage: concession mechanisms for the shale gas plays (in order to insure the seriousness of operation companies), fiscal framework (taxes, royalties, fees etc.), establishment of the regulation authority, means of income distribution between the state budget and the local ones (the risks and costs being, above all, local) yet avoiding the overcompensation of the local community;
- creation of strong institutions, able to implement all these regulations and monitor the tax payments and the compliance degree to the regulations;
- growth of transparency in implementing these measures;
- identification of all risks, both the ones needing very strict regulations, and the ones that can be managed by the investor in its concern not to generate damage.

Consequently, the shale gas industry's related social acceptability depends, mainly, on how the risks are managed and the benefits shared.

Conclusions

We can highlight few conclusions, as follows:
- the assessment of the shale gas exploitation feasibility in Romania will be possible only after a determination of economically recoverable plays through proper exploration activities;
- generally, the European operation environment is less favourable than the US one because of the more difficult geological conditions, the issues connected to the access to the exploitation plays and the social accessibility, the more restrictive environmental framework and the less flexible, uncompetitive and inexperienced ancillary services industry;
- the shale gas production will hardly compensate the conventional production decline, keeping thus high rates of import dependence;
- the gas prices will further be determined by the international market;

- the shale gas prices will surpass the internal production conventional gas and the ones imported from Russia;
- in Romania, it is absolutely necessary to apply a severance tax following the US model, both in order to protect exhaustible natural resources, and to stimulate the development of industrial sectors with high value added products, the ones downstreaming the extractive sectors;
- important attention should be paid to creating of "qualified and independent" institutions that should monitor the whole shale gas exploitation activity and to ensuring the needed human, technical and financial resources.

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