ROMANIA SG BRIEF

Background: Gas market

Romania has the largest gas market in Central Europe and was the first country to use natural gas for industrial purposes [the first natural gas deposit was discovered in 1909]. Natural gas market reached record size in the early '80s, following the implementation of government policies oriented to eliminate dependence on imports. These policies led to intensive exploitation of internal resources, resulting in declining domestic production.
After 1989 energy market in Romania was gradually opened to competition, as part of the concept of liberalization of the national economy and the free movement of goods and services, and unbundling in autonomous sectors the production, storage, transport and distribution.
ANRGN (National Gas Regulating Administration) was established in 2000 as natural gas regulator as autonomous public institution, with main tasks regulating and monitoring the functioning of the gas market, merged into **ANRE** (National Energy Regulating Administration) since 2007.
Legal framework for specific activities in gas sector is **Gas Law no. 351/2004** for: natural gas policy, organization, function, role and powers of the regulatory authority, permits, licenses and certification in natural gas, access to natural gas, public service obligations and consumer protection, market prices and rates in natural gas. Gas Law was changed in order to adapt to new forms of cooperation within EU, strengthening the consultative and NGOs to increase their role in developing national strategies and programs on consumer protection and market surveillance activities, diversification of gas supply by creating technical-economic conditions of their transport, and amended by Law no.160/2012. The new Energy and Gas Law requires that all gas consumers receive in a "basket", a certain proportion of gas from domestic production and imports.
Current structure of the Romanian market of natural gas[1] includes:

· a National Transmission System Operator - **Transgaz SNTGN**
· 6 manufacturers: **OMW Petrom, Romgaz**, Amromco, Toreador, Wintershall Medias, Aurelian Oil & Gas
· 3 underground storage operators: Romgaz Amgaz, Depomures
· 34 distribution companies and natural gas supply to captive consumers - the biggest being Distrigaz Sud and EON Gaz Romania
· 76 providers wholesale market

In 2010, the EU's dependence from natural gas import came to 63%, while comparing to this, in 2010 Romania imported 18% of its consumption.
In 2011 Romanian internal production of conventional gas insured 74.84% from the total consume of 14 billion cubic meters, with two main producers Romgaz and OMW Petrom covering 97.14 of this source.

---

1 Autoritatea Națională de Reglementare in domeniul Energiei, 2011 Annual Report, 2012
at: http://www.anre.ro/informatii.php?id=474

The annual ANRE Report for 2011[2], shows a consume share of 20.69% for population + heat producers, and 79.31% for industrial and other purposes use (pg.59). According to same report, gas was used to produce 12.79% of the electricity in the country (pg.22).
According to Transgaz SNTGN website[3] for the first trimester 2012:
The percentage of imports ranged:

- For domestic use (population + heat producers): 8.0% 7.8% 9.0%
- For the rest of the market 29.0% 24.0% 33.5%

1. **GAS RESERVES**

Conventional

Romania has proved natural gas reserves[4] of 630 billion cubic meters (1 January 2011 est.) and is ranked 30th among countries with proved reserves of natural gas. With the local natural gas production dominated by two very large companies Romgaz with a market share of 51.25% and OMV Petrom with a market share of 46.33%.
According to US Energy Information Administration (December 2011), between 2000 and 2010, the average domestic production in Romania was 12.12.Bcm, after slightly decreasing from 13.45Bcm in 2000 to 10.47Bcm in 2010.
Hungary and Romania are interconnected by pipeline Arad - Szeged, which yet is done only imports of natural gas. Two pipes with Bulgaria (Giurgiu - Ruse) and Moldova (Iaşi - Ungheni) are under construction. Secretary of State in the Ministry of Economy, Rodin Traicu announced this month that technical evidence to export gas will be completed by the end of 2012.
In early this year, OMV Petrom and Exxon Mobil announced they had made a significant discovery in the Black Sea, preliminary estimates placing the deposit of natural gas at 42-84 billion cubic meters, which equates to 3-6 times annual consumption Romania. Estimated exploitation of the deposit, for a period of 10 years could provide energy independence with regard to Romanian natural gas.

Unconventionals

The term is confined due to porosity, permeability fluid trapping mechanisms and other characteristics of the reservoir rock formation, from which the gas is extracted, that differ greatly from the conventional sandstones and carbonate reservoirs.
Regarding unconventional gas, no clear evidence for proved reserves is in place in Romania yet. Oil companies generally evaluate deposits in three steps. First, they try to identify shale basins which contain gas. Second, they determine if a sufficient amount of gas exists and how the shale reacts when fractured. Finally, they estimate whether production would be profitable or competitive. Particularly there have been only prospection and some exploratory drillings. Stopping drillings was due to strong public

---

2 Autoritatea Națională de Reglementare in domeniul Energiei, 2011 Annual Report, 2012
http://www.anre.ro/informatii.php?id=1114

3 http://transgaz.ro/structura_amestec_2010.php

4 Proved reserves are those quantities of natural gas, which, by analysis of geological and engineering data, can be estimated with a high degree of confidence to be commercially recoverable from a given date forward, from known reservoirs and under current economic conditions.

criticism; the current Govern claimed a moratorium through the end of 2012. In fact no act is in place for that, except the political platform of Prime Minister Victor Ponta presented in Parliament through their investment in May.
Like other EU countries, Romania is reflecting on shale gas, although it is generally agreed, shale gas extraction is controversial due to high-volume hydraulic fracturing extraction technology.

- **Shale Gas**

Three prospective shale gas basins **reviewed, but for which estimates are not provided, mainly due to the lack of data necessary to conduct an assessment.** They include the Pannonian-Transylvanian Basin in Hungary and Romania, and the Carpathian-Balkanian Basin in Southern Romania and Bulgaria, and Moesian Platform.

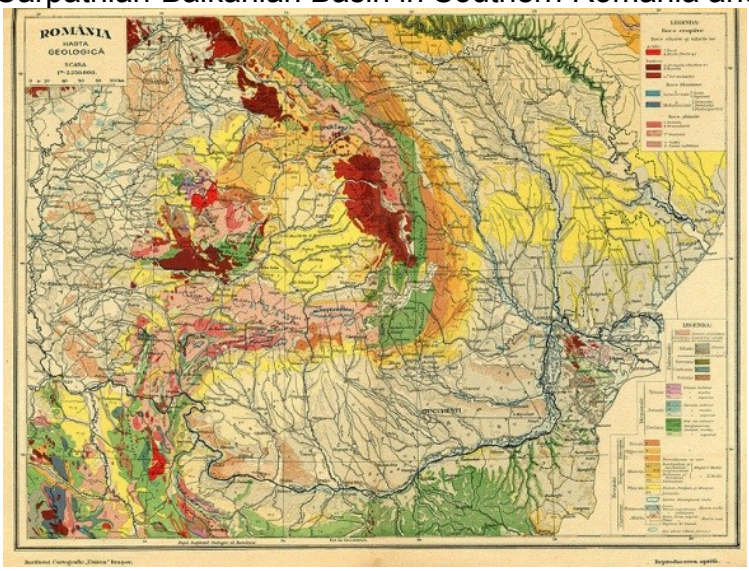

Fig.1: Geological map, Romania

Although these basins are not yet assessed though**,** EIA[5] mentioned in a last year report that **Romania, Hungary and Bulgaria have a joint recoverable shale gas reserve of 539 Bcm of shale gas** (19 trillion cubic feet).

1. The **Pannonian-Transylvanian Basin** is a large, Neogene-age, extensional basin covering a 200,000 square kilometers area largely inside of Hungary, Romania and Slovakia. For this basin, shale gas potential is being investigated by one firm in northern Romania, but the geologic data on their lease concessions is not publically available.
2. The **Carpathian-Balkanian Basin** is a geologically complex basin composed of a series of mountain napes, foredeeps and plains. The Romania Flysch Zone Unit in the Dysodile Schist–Tertiary Petroleum System encompasses three structural and paleogeographic subunits within the Pre-Carpathian Mountains region: the **Getic depression**, a segment of the Carpathian foredeep; the **flysch zone of the eastern Carpathian Mountains** and the **Miocene zone** - also called the Sub-Carpathian nappe. Source rocks are interpreted to be Oligocene dysodile schist and black claystone, along with Miocene black claystone and

5 An Initial Assessment of 14 Regions Outside the United States APRIL 2011, U.S. Energy Information Administration, World Shale Gas Resources: http://www.eia.gov/analysis/studies/worldshalegas/

marls. Also part of the Dysodile Schist–Tertiary Total Petroleum System is the Romania Ploiesti Zone, which includes a zone of diapir folds. This zone lies between the Rimnicu Sarat and Dinmbovita valleys and between the folds of the inner Carpathian Mountains and the external flanks of the Carpathian foredeep. The Oligocene Dysodile Schist is considered the main hydrocarbon source rock and Neogene black marls and claystones are likely secondary sources.

3. **Moesian Platform**[6] (borders the Carpathian-Balkanian Basin), is composed of Mesozoic and Cenozoic rocks within the Moesian platform region of southern Romania and northern Bulgaria and also within the Birlad depression in the northeastern platform area. In Romania, hydrocarbon sources are identified as carbonate rocks and bituminous claystones within the Middle Devonian, Middle Jurassic, Lower Cretaceous, and Neogene stratigraphic sequences. In the Birlad depression, Neogene pelitic strata have the best potential for generating hydrocarbons. (In Bulgaria, Middle and Upper Jurassic shales are the most probable hydrocarbon sources).

- **Coalbed Methane**[7]

Galaxy Energy Corp had been planning to evaluate a concession held in the Jiu Valley by exploratory wells. Almost half of the concession might have coalbed thicknesses greater than 5 m and are currently considered to be prospective for coalbed methane (CBM) production, at depths between 300–1,000 m. However, in 2008, Galaxy Energy filed for bankruptcy protection; the status of its exploration activities is unknown.

2. UPDATE ON SG ACTIVITIES:

2.1. Legal Background

- **Romania currently has no specific legislation in place on shale gas** (industry is still at an early stage), and instead uses the same laws that apply to its conventional oil& gas sector - **Oil Law no. 238/2004**
- **All oil accords and exploration licenses in Romania are classified information - Oil Law no. 238/2004 (Art.4)**
- As a general rule, any company holding an oil accord in Romania may operate exploration works for these unconventional resources
- Most companies holding oil accords, including MOL, Sterling, East-West, Petrom, Romgaz have shown their intention on SG as well
- A moratorium is in place since May, but a decision is expected after December elections
- *Licensing Regime*

The Ministry of Industry and Resources has responsibility for petroleum policy and strategy. The National Agency for Mineral Resources ("NAMR") was set up in 1993

---

6 Total Petroleum Systems of the Carpathian–Balkanian Basin Province of Romania and Bulgaria
By Mark Pawlewicz, U.S. Geological Survey Bulletin 2204–F, 17 p http://pubs.usgs.gov/bul/2204/f/

7 http://www.energydelta.org/mainmenu/energy-knowledge/country-gas-profiles/romania

to administer and regulate petroleum operations. When licenses are made available, NAMR publishes a list of available blocks for concession in the Official Gazette. Foreign and Romanian companies must register their interest by a specified date and must submit applications by an application deadline. Applicants are required to prove their financial capacity, technical expertise, and other stipulated requirements. The licensing rounds are competitive and the winning bid is based on a scoring system. NAMR negotiates the terms of ***agreements granting the licenses*** *with the winning licensee and the license agreement is then submitted to the government for its approval. The date of government approval is the effective date of the license. Blocks which fail to attract a prescribed level of bids are re-offered in a subsequent licensing round. NAMR may issue a prospecting permit or a petroleum concession. A prospecting permit is for the conduct of geological mapping, magnetometry, gravimetry, seismology, geochemistry, remote sensing, and drilling of wildcat wells in order to determine the general geological conditions favoring petroleum accumulations. A petroleum concession provides exclusive rights to conduct petroleum exploration and production under a petroleum agreement.*

- Romania should introduce specific regulations for shale gas exploration to settle related **environmental and property** issues and **ensure access to the gas pipelines**, consider Romanian officials from the NAMR (the president of Romania's Mineral Resources Agency NAMR, Alexandru Patruti). Exploration for shale gas has a much bigger environmental impact than conventional gas exploration because it requires the use of large amounts of chemicals and water to extract the gas from layers deep beneath the surface. As these chemicals and water have to be transported and stored, some environmental legal issues could occur because of this…
- To enhance the development of its shale gas industry, Romania also has to deal with the issue of **land ownership rights**. Unlike the U.S. where shale gas exploration was aided by its land ownership laws giving private owners the **commercial rights** to mineral resources found on their territory, in Europe and Romania, these commercial rights are generally held by the state.
- Regulations granting **access to gas pipelines** currently owned and operated by large integrated energy companies that control production, transport and sales are also needed because without this access shale gas companies wanting to enter the market will be unable to ship their gas to customers.
- According to the current Romanian legislation, the royalty level is the same with conventional (between 3-13%)
- All activities going on as part of an **oil accord** are regulated by current environmental legislation that does not impose during prospection phase to any impact study. The company executing these works submits documents to the environment agency and a decision is then issued saying an impact study is not needed (!).
- For deep drilling, the Romanian and European environment laws say explicitly than according to the characteristics of the drilling the relevant authority decides **whether or not** an environmental impact study is needed before the environmental approval is issued. And at that moment, if the authority considers an impact study is needed, the procedure to evaluate the impact on the

environment **and the whole public consultation procedure** that follows such a decision are launched.

- For certain **exploitation operations** where an environmental approval is needed, an environmental **authorization** is needed. It is only the case for those wells above 500.000 cubic meters/day productions.

2.2. In practice

In present estimated resources of shale gas are un-known for public, the process of geological evaluation being at the beginning, but also due to a clause of confidentiality of the **Oil Law no. 238/2004 (Art. 4)** which stipulates that the data and information included in the national geological found, as well as the database containing the national deposits of oil (gas included) are confidential. Thus, the public opinion and the academic can only assume data referring to this resource in Romania.

On 1 July 2010, the National Agency for Mineral Resources (NAMR) announced the results of their 10th Bidding Round, with blocks being awarded to MOL, Chevron, Lukoil and Melrose Resources amongst others.

Within the 10th Bidding Round, 20 out of the 30 exploration blocks offered were awarded to 13 different companies. The companies will now be in negotiation with the NAMR who estimate that the contracts will be signed in up to six months. The licenses are for a period of 30 years with the option to extend by 15 years if hydrocarbons are discovered. Royalties ranging from 7-13.5% of production will be paid, depending on the concession.

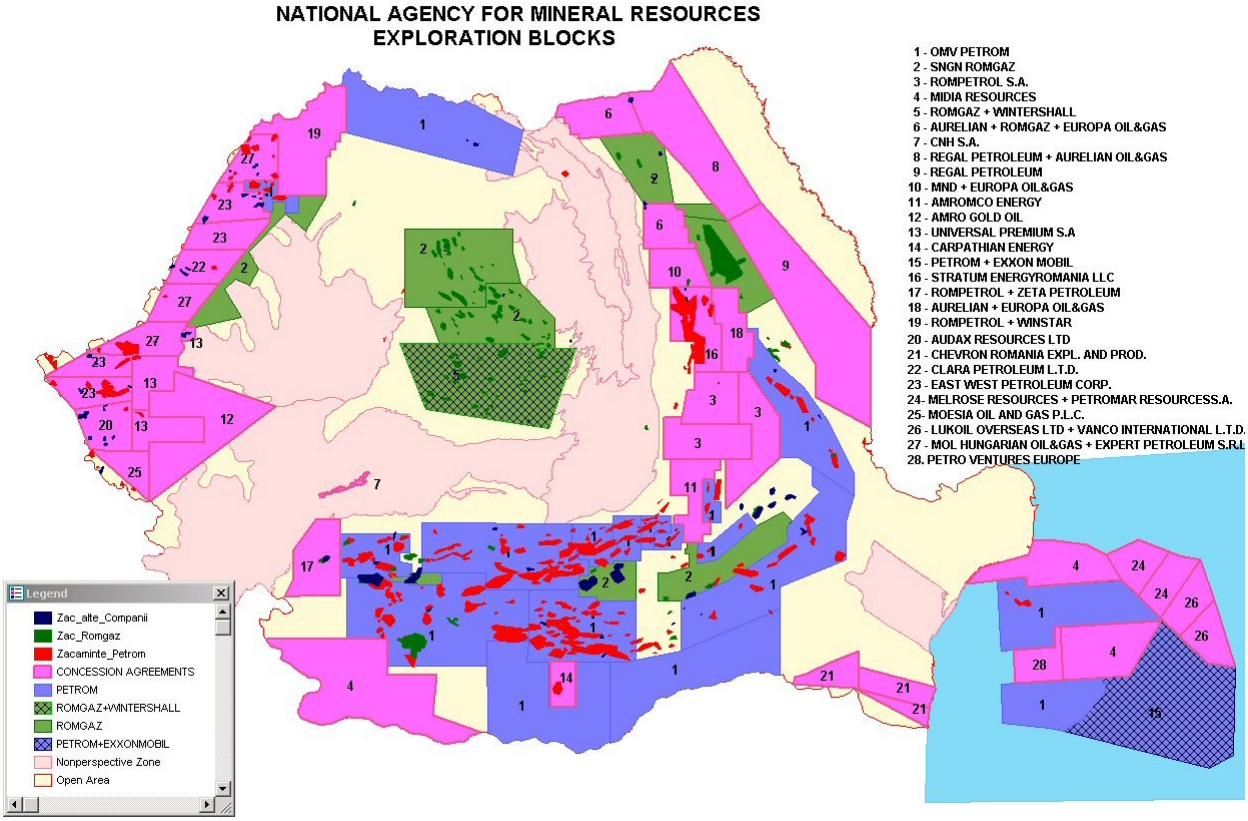

Fig 2. See map: http://www.namr.ro/map_petrol/map_petrol_er.htm

All the licenses up for bid in the Pannonian Depression were awarded, going to Avere Energy, Clara Petroleum, Universal Premium, Moesia Oil & Gas, Audax Resources and a consortium between MOL and Expert Petroleum. Only three of the licenses available in the Dobrogea region were awarded with Chevron Romania E&P successful having outbid Total.
Several companies do have previous agreements for oil and gas granted by NAMR (National Agency for Mineral Resources) based on the above procedure[8]. It is difficult to clear up their interest on SG, as long as the contracts are under the **Oil Law** (see the lack of reglementation on SG). Some of those agreements were adopted by Govern and after the public reacted, it was officially recognized they are going for SG.
Besides Chevron, Hungary's MOL and Canada's East West Petroleum also have struck drilling agreements with NAMR and are awaiting government approval. Canadian company Sterling Resources which has licenses to explore conventional gas reserves in Romania, has said it will use the same blocks to look for shale gas[9].

Chevron case

- Chevron owns 4 licenses as **main player yet**. One in Barlad, was bought from Regal Petroleum, and is not yet declassified, 3 were earned by Chevron in Dobrogea. They were approved by Govern this year, and are partly declassified after strong protests in April.
- Seismic studies have already been done in Barlad and two vertical exploration drills to depths of 2,500-3,500 m will be built in the next two years. Depending on the results of the two drills, a supplementary one will then be done.
- Investments amounts to over 80 million US dollars were announced in the three perimeters in southern Dobrogea region (Adamclisi, Vama Veche and Costinesti) in the next four years, involving prospects and exploration.
- These perimeters are not limited to the towns for which they are named. The Barlad perimeter for example has a surface of 4,000 square kilometers, while the perimeters in Dobrogea each have a surface of 1,000 square kilometers.
- Recently Chevron announced publicly intentions to continue prospecting operations (by seismics), and that they asked for an environment authorization from the local Agency

3. Update on socio-political aspects

Due to secrecy of above contracts and lack of referrals to shale gas/ unconventional, public opinion was informed only in January 2012, when activists requested public information from authorities. Even not complete, that info started to raise awareness, and public concern.

- Natural commons with neighboring countries: Bulgaria, Hungary, Moldova.

8 http://www.psg.deloitte.com/NewsLicensingRounds_RO_100712.asp

9 http://www.balkans.com/open-news.php?uniquenumber=128606

- There is a strong local civil society response: protests and large meetings in Bârlad (4,000 people were attending a meeting in March, and 7,000 in April), Constanța, Vama Veche, Bucharest (see picture below)
- There is an ongoing **process in Court**, intended by a coalition of organizations against NAMR and Chevron, aiming to terminate the granted licenses (started in July)
- Two petitions were addressed to European parliamentary committee Dedicated to complaints on shale gas exploitation in the European Union *Mangalia Civil Rights Association* addressed Petition 0444/2012. (October 9, 2012)
- A legislative bill to ban hydrofracking drilling was initiated in Parliament by a group of ten members. The Senate rejected it in June. It is not clear yet what the outcome should be in the decisional Chamber (final vote) and the issue is opened for the present. With elections in early December, the Parliamentarians might postpone it for the new legislative.
- The agency officials responsible with mineral resources, and those academics supporting industry, claims that being the early phase of the research, hydraulic fracturing will not be used in Romania in the case of unconventional gas in the next several years (!).
- The former governing party (PDL- Democrat Liberals) was much in favor of SG, and the President Traian Basescu is well-known as the biggest lobbyist for industry. (Doing the same with cyanides mining projects).
- We shall have Parliamentary elections on 9th December, and this hot issue seems to be avoided by most politicians, not to lose confidence & votes. Even the claimed moratorium is more about doing nothing until December. The Social Democrats that are in charge now with the Govern and have the Prime Minister, have a cautious approach at this time.


Foto: Barlad County protest, March 2012.

How advanced is our Govern in formulating a policy, which I presume will emerge from the Minister of Economy jointly with the Environment? Have our officials seen the newest reports and studies, or answered questions on fracking submitted by civil society?

I ask these questions to get some context in respect of this growing issue. It is extremely controversial in the eastern region of our country and in south-east Dobrogea as well. It is so controversial that in the absence of relevant and up-to-date

technological data, any attempt to grant a licence for the development of hydraulic fracturing in the area would be met with extremely stiff resistance.

4. Pros and cons

Hydraulic fracturing is a serious issue in the context of increased dependency on fossil fuels and a lower investment program in renewable energy production as a result of the economic downturn. Lot of references was made to shale gas production in the United States. In that context, there is an attraction for countries such Romania to consider shale gas extraction as a way out of the energy crisis that appears to be developing.
The discussion about the pros and cons of shale gas production has already reached the European Union, as well as Romania.
Proponents see the gas as a guarantor of energy security and as a cheap source of energy.

- **Expertise**

The massive increase in shale gas production in the US has been supported by an established industrial environment, necessary manpower and an experienced and well-equipped service industry. It will take time for the necessary service sector in Europe, to build-up adequate capacity and for companies to acquire the necessary equipment and experience to support a high level of shale gas production, which means higher costs in the short term.
Romania, on the other side, with its developed hydrocarbons exploration sector, could have an easier time pursuing shale gas, due to its existing infrastructure and trained manpower, as compared to others in the region that have little or no history of hydrocarbons production.

- **Energy security**

We have regional gas market and some opinions if shale gas takes off in Europe and other regions, it will affect competition and force Russian companies to rethink their own pricing strategies. But the argument that shale gas is the new wonder weapon against Europe's dependence on Russian gas seems to be based more on hope than on reality. A study by the European Commission shows that Europe itself with an ambitious opening up shale gas would continue to import 60% of its gas requirements.
Romanian domestic gas reserves have been boosted in 2012, by the discovery of up to 84Bcm off offshore natural gas in Black Sea.[10]

- **Energy transition**

We have the more environmentally conscious view that if we **continue to burn fossil fuels at the same rate**, then the EU will never achieve its goal for reducing greenhouse gas emissions by 80-95% by 2050.
First, in respect of renewables, we have a binding target of 10% in this regard. By 2020, 10% of the transport sector overall that is, railways, trucks, buses, airplanes and cars, should be powered by sustainable energy.

---

10 http://www.kpmg.com/CEE/en/IssuesAndInsights/ArticlesPublications/Pages/cee-shale-gas-outlook.aspx (Pg.44)

Based on the argument that shale gas produced less CO2 emissions than coal, some voices speak of "green gas". Even the Industry Committee of the European Parliament adopted a report in which this view is supported on 18 September.
The fugitive methane emissions and leaks (about 8%) is producing itself a lot of greenhouse effects than regular CO2 emissions. A study by the International Energy Agency (IEA) has concluded that an actual "shale gas revolution" would lead to a warming of 3.5 percent, making the target of 2 per cent would be significantly exceeded. Then energy transition shale gas is also not in favor.

The potential contribution of SG production to greenhouse gas (GHG) have been the subject of a number of studies since 2010, and was evaluated in the recent Study[11] commissioned by DG Climate Action of the European Commission, and delivered by AEA on 30 July this year. Despite that a number of uncertainties remain, including: the level of emissions associated with the well completion stage, about levels of water re-use and treatment of waste water, overall the emissions from shale gas are dominated by the combustion stage. Emissions from exploration were not been taken into account in previous studies, nor emissions from abandoned wells. The study takes a hypothetical analysis out of the potential life-cycle GHG emissions that might arise from SG exploitation within Europe, and estimates that GHG emissions per unit of electricity generated from SG to be around 4% to 8% higher than for electricity generated by conventional. These additional emissions arise in the pre-combustion stage, predominantly in the well completion phase, when fluid is brought to the surface together with released methane.
The comparison with coal is clear: SG emissions are lower with 41-49% than emissions from electricity generated from coal.

Second: researchers studies conclude that a **comprehensive promotion of shale gas would displace investment in the development of renewable energy is significant**.

- **The costs of hydraulic fracturing**

The great technological costs of this technology determined the exploitation of non-conventional gas to be unprofitable for many years.
The **associated environment costs are to be discussed only recently** and for the moment there are not available evaluations. The environmental costs aim many aspects: water pollution, grounds and atmospheric pollution.

The technological cost associated with the exploitation of shale gas in US is, on average, approx.4million USD/well. The drilling costs can be greater than those of fracture, thus the depth from which shale gas deposits lays counts in the economic equation. According to certain statements of the OMV representatives in 2010 for the Financial Times blog, the main difference regarding the production costs between USA and Europe would summarize to the following aspect: in USA, shale gas is generally

11 Climate Impact of potential shale gas production in the EU, AEA
http://ec.europa.eu/clima/policies/eccp/docs/120815_final_report_en.pdf

closer to the surface (3-4 km depth), comparing to that in Europe (5-6 km depth in Viena's basin, for example). In case of the formation in Austria, only this aspect would mean a difference of cost of up to 20-50 million USD/well. Although, even at the level of formations in Europe there can be noticed certain common trends[12] (smaller and more geotectonically complicated basins, than in USA), a generalization would be unproper.

Recent data may confirm the great costs associated to the exploitation of resources in Europe. At the end of last year, the expenses for one shale gas well in Poland were almost three times larger than to US. „The cost of one horizontal drilling investigation of 2.000 m in US is on average 3,9 million $, while in Poland it is raised to 11 million $", declared within a conference in Warsaw, Peter Richter – the manager for unconventional technology at Schlumberger[13] on the 29th of November, 2011.

5. ENVIRONMENTAL IMPACT

12 According to a study by Kuhn and Umbach in 2011, in Europe and SUA, also, shale gas is in different depths: „Fayetteville produces at 1.200 m and Haynesville at 4.000 m. In Europe, Shell is testing the Alum formation in Sweden at 900 m, while other companies aim shales in Baltic Basin placed between 2.500 m and 4.000 m."

13 Shale-gas drilling in Poland costs almost three times as much as in the US, according to a Schlumberger official. Energy Delta Institute.
http://www.energydelta.org/mainmenu/edi-intelligence-2/our-services/latest-energy-news/poland-shale-drilling-triple-us-costs

- **Land take**

An inevitable impact of gas extraction and shale gas from compact formations is the high degree of occupancy of land and substantial changes of the landscape.
These grounds are necessary to the placement of drilling installations, storing spaces for technical material, compressors, equipment, chemicals, water, parking and stationary spaces for trucks, infrastructures of processing and transporting gas, as well as for containers and pools for wastewaters and access ways for trucks (see fig.).

Fig. 2 An aerial view – extracting shale gas platform in Colorado

In Pennsylvania, an average platform with many drilling and fracture wells occupies aprox. 10.000 square meters. As comparison, a similar surface is occupied by a solar station which can generate 400.000 kWh of electricity per year [14]and which can produce for more than 20 years and it can be replaced further on.

EU has a higher population density than the USA and landowners in Europe do not own underground resources and so do not benefit directly from extraction, as in the USA.
Shale gas drilling could have negative consequences for the local population when land using is a direct source of living, such as agriculture in rural based population (see Barlad County), or tourism (see Dobrogea). In Europe the land currently used for houses, transport and industry is about 4%. Fracturing needs a high density of wells pads, roads, and pipelines, those overall impacts on agriculture, natural habits and cultural value of that region.
Another problem requiring attention is the network of transport pipes. In comparison with US, where there is a well-developed infrastructure even locally for a long time, in Europe, these networks are much lower and their development will determine the removal from circulation of additional lands.

Referring to lands, we must add that, in US, the lands owners have also the **commercial rights** on the underground resources, unlike Europe and Romania, where these rights are owned by the state. Although initially some U.S. farmers got profit from licensing their land where there was found shale gas, then they cannot later maintain the properties whose value decreases dramatically, especially if the land was contaminated.
For Romania, Barlad County is mainly farmland area, and the blocks in Dobrogea are near the seacoast a well-known recreational and touristic area. Moreover Dobrogea there are environmental protected NATURA 2000 such as Hagieni Forest, or Mangalia marine habitat, not to mention historical sites as antic Calatis fortress and Adamclisi.

- **The water footprint**

The water footprint for shale gas is defined in two main ways—water consumed and water polluted.

14 Study of DG IP/A/ ENVI: Impacts of shale gas and shale oil extraction on the environment and on human health, PE June 2011, page 20.

Water Consumed:
Fracking is a water intensive process. Hydraulic fracturing operations related to a single well require a volume of water that may vary between 9.000 cubic meters and 29.000 cubic meters, or according to other studies and estimates: 60 million liters of fluid in a drilling. The estimated average consumption shows values of 15.000 cubic meters per probe for the deposit in Barnett, according to the company Chesapeake Energy in 2011, 13.000 cubic meters for the deposit in Utica, according to Questerre Energy in 2010, between 15.000-45.000 cubic meters for the deposit in Marcellus, according to NYCDEP in 2009, etc. approx**. the equivalent of 10 olympic pools or 2.000 tankers, for one single extraction platform.**

20 to 30 % of the volume injected in wells, returns to the surface as flowback. That means up to 70-80 % of the fresh water injected in the fracking process is sequestered in deep geologic formations.
This **depletion is fundamentally different than evaporative losses** for agriculture, electricity generation, and recreational uses, which essentially **recycle the water used into the atmosphere** where it returns as precipitation. Water injected for fracking is locked away from the earth's natural hydrologic cycle, a total loss that doesn't return to its source.

These values are questioning the sustainability of water resource usage even in countries from temperate climate. Then water used for this purpose is practically restricted from other activities: consumption, agriculture and other local industries, tourism, etc., and affecting the functioning and development of local communities. Not at last, this water consumption restricts the necessary for development and existence of plants and animals in the area, with risks regarding the biodiversity.

Although the licenses granted in Romania to the involved companies do not refer to the source of these hundreds of thousands or (tens) millions of cubic meters, it is stipulated for the company, the right "*To use, respecting the local water management and environmental protection provisions in the field, for surface and underground water sources, necessary to the development of oil operations*"- see point 8.1.4. in the text[15]. It is thus possible that those companies can extract water from deep drillings, exhausting the regional aquifers – a matter **absolutely critical for the local communities in areas with relatively poor water resources, such as those in Dobrogea and Barlad block**. On short term, the effect could be destroying communities and biodiversity, and on long term, it could produce social effects, such as massive population resettlements.
Both Barlad area and Dobrogea have a shortage on water supply. Dobrogea has arid land, with low rain and almost lacked of surface waters. The water supply for small towns and the sea resorts is from underground aquifers.
The well-known aquifer in Dobrogea is a fossil water (over 20.000 years age), being placed from 100 m. to 700-800 m. depth, forming 2 large basinss of fossil water. The aquifer stocked in deposits of Upper Jurasic — Barremian age is flowing under

15 Oil agreement for concession for exploration-development-exploitation, in area EX-19 ADAMCLISI, issued by the National Agency of Mineral Resources and Chevron Romania Holding B.V., published on the ANRM site, on the 16th of April 2012.

Dobrogea with low speed (maximum 2 m. per day), from south-west to north-east, being shared by both Romania and Bulgaria. The aquifer discharges through two natural drains in Siutghiol Lake and in Mangalia Basin. This water is high importance declared the Chief of Hydrologic Department for Sea and Dobrogea Waters Department (DADL), Adrian Chera. He added that the groundwater is stocked on almost the whole county area, fact which allows “the supply with water for many towns and for all the sea resorts”. Karst underground waters that cross long routes have a good quality, as they fill along the suspensions and unnecessary salts and some bacteria die.

Water Polluted: The other way fresh water **is depleted is through deliberately pollution by the addition of fracking chemicals and inadvertently but inescapably contaminated by contact with naturally occurring toxic pollutants residing in shale gas bedrock**. Chemical additives make up to 0,5-2 % of the frack fluid injected in gas extraction. Up to 750 chemicals have been used in frack fluids; some of those chemicals are kept secret by drillers but have been documented in frack fluids used in the Marcellus Shale. Many of these chemical additives are toxic and are known carcinogens and endocrine disruptors; long term exposure can cause nervous system, respiratory and organ damage. Some, such as benzene, are so dangerous that even minuscule amounts can cause disease.
The fracturing fluid is introduced into the shale gas, by injection under pressures that reach over 1.000 at. The fracturing fluid breaks bedrock and liberate trapped gas. The produced cracks remain open due to the sand/or other propants in the fracturing fluid composition. This fluid, under high pressure and due to the chemical composition, has role both of training and solvent, dislocating and dissolving gas.
Chemicals, representing 0.5% of the fracturing fluid, catalyze, emulsify and react with the carbohydrated particles of the deposit in order to streamline the shale gas extraction and for the proper functioning of the extraction installation. The number of artificial fractures, the length and their disposing in layers, the distance between the wells, but also the fluid quantity used depend all on the geological formation characteristics.

From the amount of fracturing fluid injected in the probe, about **20-30% comes to the surface through the drilling hole, and recovered, the rest remaining in the gas bearing fractured formation.**
On the way back to the surface, the used fluid trains also contents of heavy metals or/and radioactive elements, from the rocks formations. The fluid arrived back to the surface (flow-back) is primarily stored in specially designed pools, or in containers.

What happens to the residual waters recovered from the deposit?
In U.S., the management of used fluids is different, from one company to another, and from one state to another (according to the existing regulations). Only a small quantity of the recovered fluid is recycled, being used to further fracking operations. There is not a clear, safe, ecologic solution, for the quantity that must be eliminated - which may involve thousands of cubic meters, equivalently to thousands of tankers, for each drilling. A frequently used method in US is to dispose those fluids on **injection wells**, where they are stored as toxic waste. The procedure of injecting fluids under pressure

in geological depth formations can induce, under certain conditions, a seismic risk[16], and studies of United States Geological Survey (see chapter seismic risks). The existing fissures may get lubricated and the geological formations in tension can move along those fissures, especially in the areas where there is already a seismic risk.

Another option for used fluids recovered from the well is to be transported to the **water treatment plants**. The costs of this process are extremely high.
The transport itself with special tankers, of large dimensions, is very expensive and polluting through carburants, energy and due to noxes and noise produced.
None of the licensed areas in Romania have **industrial water plants** to clean these used fluids. The **municipal** waste water plants where they exist, are by far too old and have limited capacity that hardly supplies local needs. We can reasonably ask ourselves what happens to the tens of thousands of cubic meters of wastewaters used in the wells within the village area of Romania, when or hundreds of km from the closest treatment plants.

According to licenses, the company is granted both free access and without any consideration to water resources (surface and/or underground), and possibility for stocking wastewaters -see point 8.2.18 which refers to "*injection of wastewaters in underground, through wells, other than those stipulated in the competent technical-economical study*". We appreciate that this is an additional risk that the environment and population are posed to as they ad even a seismic risk.
Barlad is closed to the seismic active Vrancea region, and in Dobrogea area, the Shabla-Snagov Fault seems to be recently re – juvenated.

What happens to the fluid remaining in the deposit?
Of the dozens or even hundreds of thousands of cubic meters of fluid (water + sand + chemicals) injected underground during the well's life, up to 70-80% remains in the underground under high pressure. This fluid, will initially maintain the pressures at which it was injected, directly influenced by the lithostatic pressure of the above rocks column, whose gradient increases by depth. For example, at the level of 2.000 m. depth, we have a pressure over 1.200 at[17]given by the above rocks weight. It is hard to believe, the way that the supporters of this industry try to accredit, that the part of the fracking fluid, initially remained in the deposit (in very large quantities and high pressures) will strictly restrain in the area where it was injected. Regarding the under layer, we should not forget that the fracturing process itself implies the creation of new fractures in the rocks deposits, which get an increased permeability. Unlike the gas waters which are sometimes used for the stimulation of the deposits in conventional oil or gas extractions

16 Earth Magazine; http://www.earthmagazine.org/article/managing-seismic-risk-posed-wastewater-disposal?goback=.gde_1298547_member_108803627

17 Generally, it is accepted that the litostatic pressure constantly increase to depth and experience indicate that the maximum litostatic gradient (y max. letter) may reach up to 3,12 at/10 m (framework of a "barried" sedimentation basin). This value corresponds to a pressing force exercised by a formation with a specific average (global) rock + fluid of 2,31 g/cm3. According to data suplied by S.N.P. PETROM S.A, ICTP Campina, The follows of the geological research in operative wells.

(in quantities of approx. 1.000 times less than nonconventional), the fracking fluid remained underground is totally different due to these high pressures, but also due to specific composition, which makes it more active chemically and more corrosive. In other words, even where there are barriers in place for water, this fracking fluid may pass these barriers, because it was projected to pass through shale gas deposits, and hard permissive rocks. And in the end, it will reach inevitably in the successive layers of ground water of high, medium depth or even surface.
It is **only a matter of time and geological structure** (in terms of permeability meaning new man made or existing fissures and fractures), in order that those 70-80% of the total fracking fluid left behind in the deposit to reach close to the surface.
The process may be produced in years, under the permanent effect of a difference of ***deltaP*** pressure of few hundreds atm. and through successive infiltrations. Than conquering each and every layer and all the 2-3.000m, it may get up to the surface.

Contamination of ground waters
Firstly, it can be produced through the loss of the well's integrity, or due to a contamination regarding the circulation of fluids to surface, on different ways.
In US, unconventional extraction activities have benefited of a policy of exemptions, being excluded from the requirements of Environmental Protection of Safe Drinking Water Act [18](Law regarding the safety of drinking water). The way that the Act for politic energy established (energy policy Act) in 2005 prevented systematic monitoring, long-termed studies and deprived the population of the legal basis to address complaints about how this industry affects them.
Recent studies[19] show the concerning about the safety of water sources in Marcellus Shale deposit, concluding that chemicals injected underground by fracking could migrate to drinking water supply faster than experts previously predicted.
In Marcellus there were drilled over 5.000 wells between 2009 and middle of 2010, according to the study which was recently published in Groundwater's Magazine. Operators injected up to 4 million liters of liquid in each well.

North-American experience shows that there may be contaminations due to:
- Discharges from collection pools or waste tanks
- Leakage from pipes, accidents caused by surface activities, mishandling, old equipment
- Improper cementing of the wells
- Leakage through geological structures, facilitated by the existence of cracks, or natural or artificial passages

The study made by "Colorado Oil and Gas Conservation Commission" documented the appearance, between January 2003 and March 2008 of 1.549 of such discharges on the territory of Colorado. Among these, **20% produced contamination** of water and the

18 In conformity with the article 322 of EPA 2005

19 New Study Predicts Frack Fluids Can Migrate to Aquifers Within Years, by Abrahm Lustgarten ProPublica, May 1, 2012 ,http://www.propublica.org/article/new-study-predicts-frack-fluids-can-migrate-to-aquifers-within-years#ixzz1tl0V7IqM?kme=Email+hit&km_Email_Subject=

trend has been increasing from year to year. The researches made on Marcellus shale, by Osborne[20], in 2011, show an increasing of methane concentrations in the drinking water wells from the active areas of gas extraction, which reach values that present even explosion risk. The department of Environmental Protection of Pennsylvania recorded more than 1.000 complaints and reported 1.614 violations of the law in Marcellus shale deposit in a period of only two years. The city of Wichita pays millions of $ for trying to correct the aquifer layer Equus and to maintain the quantity of contaminated water from Burrton away from its municipal wells. This fact has produced recently, in south of Kansas. A huge explosion happened in Harper. Over 500 persons intend to sue the oil companies. In the arid areas of south Kansas, the inhabitants are concerned about the quantities of water these companies use: 3,5 millions of gallons of fresh water a drilling, which seems to further reach the Mississippian aquifer placed at 4.000 feet distance from the drilled areas.
According to reports, such accidents occur relatively frequently, the population being affected because the water in the area is not potable and in some cases it is inflammable.
In Romania, Chevron declared that “there is no danger of contamination of superior aquifer layer”. Although it depends on how many aquifer layers exist, the situation being different from one area to another (and from one country to another).
This risk of contamination of groundwaters, both of surface and depth, with chemicals and petrochemicals, used in the fracture fluid, is real and on long term. The only variables are: When? – How long and which way? – What impact?

The contamination of surface waters and soils

There is a risk of pollution rivers through contamination, due to accidents, related to storage and handling of fracturing fluids, chemicals, or waste recovered fluid. Among the possible risks related to the wrong handling of soil installations, there were accidents such as flowback with discharge of fracking fluid, leakages of wastewaters or from pools or pipes. The surface waters can be affected then as effect of contamination of groundwaters due to a wrong handling or nonprofessional cementing of the pipes column. For the first time, in December last year[21], US Environmental Protection Agency (EPA) admitted that hydraulic fracturing is responsible for the pollutions of groundwaters and drinking water supply in Wyoming state, as a result of the intimations made by the population of Pavillion city.
If there are more many wells, than bigger the efforts of surveillance and control required. New York Times reported accidental pollutions due to the contamination with wastewaters after the hydraulic fracture discharged in the rivers of Pennsylvania, drawing up also a map of these contaminations. In February 2012, the Court sentenced Chesapeake Appalachia company to pay penalties of 565.000 $ for the violation of Gas

20 Osborn, S G, Vengosh, A, Warner, N R, and Jackson, R B. 2011. Methane contamination of drinking water accompanying gas-well drilling and hydraulic fracturing. Proceedings of the National Academy of Sciences, Vol. 108.

21 Environment Protection Agency (EPA), Dec. 8, 2011
http://www.epa.gov/region8/superfund/wy/pavillion/EPA_ReportOnPavillion_Dec-8-2011.pdf

Law, Clean Waters Law and Dams' Safety Law. One year ago, the wastewaters storage lakes of the company nearby Harrisburg City, discharged, polluting the river and forests land than took out of use the local treatment station.
In Germany there took place accidents linked to the hydraulic fracture, in the gas field Solingen, due to leakage from the wastewaters pipes. The waters were contaminated with benzene and mercury. Although the Mining Agency of Lower Saxony was announced in time, people were informed about this incident only in 2011, when the company responsible had to replace the contaminated agricultural soils.

- **Air pollution**
  +greenhouse effects

The higher number of drilling operations entails greater energy use, and this of course enlarges the greenhouse-gas footprint of natural gas production. As most hydrofracking drills are driven by diesel engines, the hydrofracking process generates carbon dioxide and other air pollutants, and shale gas wells yield less gas than their conventional counterparts.
The quality of air was affected in the Barnett shale area, where a study[22] was published in 2009.

Methane leakages have a huge impact on the balance of greenhouse effect gas.
According to reports from the US, methane has been detected in the ambient air around hydrofracking wells and can result from the following factors:

Methane is mobilized upward, even during the drilling process (there are estimated leakages of about 8%). Each drilling operates in a non-isolated area and everything it meets is to be circulated through the drilling fluid, through the non-isolated sections.
Emissions also occur in the operation of fluid discharged from shale gas wells, as it is shown by the measurements made (Cook et. al. 2010, Horwart et. al. 2011 quoted by the experts in the European Parliament). Leaky pipelines and leaks occur during the gas cleaning and drying process. Some of these fugitive gas (approx. 50%) are captured by the gas separation unit, on the drilling platform, but not completely.
Methane can also be released on the outside of the outermost casing, as well.
Well leaks are also induced by irregularities such as faulty joints between the cement and surrounding rock.
If there is a leak in the well piping resulting from a minor earthquake, corrosion, or a leak that has gone undetected due to faulty quality control, the hydrofracking fluid will escape and in the worst-case scenario can reach usable groundwater.

- **Noise and emissions**

Another risk is associated with the use of a large number of equipment and with the operation of generating units, which together release significant amounts of toxic emissions and produce high levels noise.
Emissions can come from sources as:

22 Armendariz, Al. : Emissions from Natural Gas Production in Barnett Shale Area, and Opportunities for Cost-Effective Improvements, 2009

- Trucks, drilling equipment;
- As an effect of processing and transport of natural gas;
- Emissions due to chemical substances from the pools of waste collecting;
- Emissions due to some accidental discharges and to wells explosions.

The intense transport and using heavy machinery has been reported by many people living near the perimeter of exploitation, because noise and vibrations take 24 hours, 7 days a week. Operation activities at each well can last between 500-1.500 days (and nights). The traffic estimated for a well needs 4.000-6.500 of courses with heavy duty trucks (which also affects the roads, not just pollutes the air).

- **Chemicals used**

We should mention that in U.S., in most states, the law allows to the companies to keep classified information regarding the composition of the mixture fracking fluid, for reasons of competition (as the "Coca Cola formula"). Due to this, unfortunately, in US there did not achieve complete studies, officially, regarding the impact they have on the environment and living organisms.
A study commissioned by the U.S. Committee for Energy and Commerce in April 2011[23], mentions about 750 chemical compounds that were used in hydraulical fracturing in between 2005-2009.
The study "*Impacts of shale gas and shale oil extraction on the environment and on human health"* of the DG IP/A - Environment and Public Health and Food Safety of the European Parliament, recognizes that due to commercial secrets, the composition of the additives used while drilling is not made public, but according to a list containing 260 chemicals provided by New York State, some are known for their toxicity or for their carcinogenic or mutagenic effects that they have on human organism (including benzene and ethylene).

- **Human health risks due to exposure**

A document recently released, Summary Report: Human Health Risks and Exposure Pathways of Proposed Horizontal Hydrofracking in New York State, identifies twenty concerns including:

- ✓ Handling and disposal of radioactive wastewater and sludge
- ✓ Accidents involving transportation of radioactive/chemical waste
- ✓ Unpredicted synergistic catalyzation and interactions with radioactive material
- ✓ Groundwater contamination from leaking storage containers, abandoned wells and failed casings
- ✓ High levels of radon in natural gas from Marcellus shale
- ✓ Respirable crystalline silica exposure of workers and nearby populations

---

23 Committee on Energy and Commerce, House of Representatives: Chemicals Used in Hydraulic fracturing, April 2011: http://democrats.energycommerce.house.gov/sites/default/files/documents/Hydraulic%20Fracturing%20Report%204.18.11.pdf

- ✓ Air contamination from diesel engines at drilling sites and in local communities
- ✓ Air contamination from flaring
- ✓ Impacts fall disproportionately on sensitive populations (children, elderly, pregnant women)
- ✓ Increased health care costs

- **Biodiversity**

According to the study by PhD Ronald E. Bishop[24], in Colorado, each drilling pad together with the access ways it needs generates approx. 8 tons sediments (solid waste) per year. If these reach fast the local waters, they can put into danger living species. By also, building the access ways, platforms and local pipes network, will fragment the fields and the forests, including the habitats, putting into danger species of plants and animals. The danger of contamination of any kind (water, soil or air) has effects also on biodiversity.

- **Seismic risks**

According to the USGS (US Geological Survey) site, under the undated title "Can we produce earthquakes? Are there not methods of preventing the earthquakes? the agency notes as follows: "*the earthquakes induced by human activity were documented in few locations of USA, Japan and Canada*". Most of them were small.

In Great Britain, Cuadrilla Resources announced that they discovered huge deposits up to 200 Tcm of gas, in Lancashire. Last year autumn, the company admitted that it is very probably that hydraulic fracturing was responsible for two earthquakes which hit Lancashire: 1,5 and 2,3 magnitude in April and May 2011, and possible other fifty small tremors. The report, Preese Hall Shale Gas Fracturing: Reviews and Recommendations for Induced Seismic Mitigation concluded that both earthquakes were connected to the drilling activity. Moreover, it revealed another concerning, by showing that the second earthquake in May caused the "*deformation*" of the well structure. British Geological Survey (BGS), also, confirmed that the series of small earthquakes in Blackpool area were related to the fracking.

Until two years ago, Oklahoma had usually approx. 50 earthquakes per year, but in 2012, 1.047 earthquakes shacked this state. In Lincoln County, where most seismic incidents occurred, there are 181 injection wells. A report of Austin Holland's, in august 2011[25] by Oklahoma Geological Survey OF1-2011, was released after the study of 43 earthquakes taking place on the 18th of January, varying in intensity 1.0-2.8 MD. While the report conclusions are cautious, it is mentioned that "Our analysis showed that in short time after the hydraulic drilling, small earthquakes began to appear; more than 50 were identified, of which 43 big enough to be located".

---

24 Ronald E. Bishop, PhD: Chemical and Biological Risk Assessment for Natural Gas Extraction in New York, martie 2011, Chemistry&Biochemistry Department, State University of New York

25 "Examination of Possibly Induced Seismicity from Hydraulic Fracturing in the Eola Field, Garvin County, Oklahoma" Oklahoma Geological Survey OF1-2011

Barlad area, is located near the famous Vrancea seismic area.

See Distribution of earthquake centers in the Carpathians

In Romania, according to the seismologists, we are in a period of maximum probability for producing a strong earthquake **as these seismic areas activate every 50 and 100 years.**
At a first sight, exploitation at three kilometers depth would not produce great effects. As the deep rocks are not compact “one piece”, the amplitude of each seismic wave passing through that area, is highly increased, and the fractures and fissures, located in depth, can accumulate tectonic energy themselves, with each earthquake produced, and generate, in their turn, new small earthquakes. At a critical point, this network is so much loaded, that the balance cannot be kept and thus, the energy dissipates. As a result, the exploitation area becomes totally a new fissure front, able to have its own earthquakes on periods of hundreds and thousands of years. The earthquakes produced are near surface, small to medium energy, but very energetic at the epicenter. They can cause severe damage by short and tough movements of the earth.
The microseisms and the extraction procedures by fracture practically detonate an energetically accumulation placed in the area that already have their own seismic potential, such as Vrancea and Dobrogea.
Dobrogea is placed on the Moesian micro plate of the Black Sea, which tectonically, is metastable. Professor Dr. Mircea Sandulescu, warning of seismic fault Vidraru-Snagov-Shabla, which reactivated, drew attention to the seismic risk that such technology involved in operating in Southern Dobrogea might have.

6. Perspectives

Some EU countries already responded. France had banned the drilling for the gas and under public pressure, the Bulgarian parliament banned promotion of shale gas in January 2012. The Netherlands imposed a moratorium until the end of this year to examine the impact of shale gas drilling. Czech Republic is also discussing a moratorium. In Germany, the resistance by environmental organizations has led to a moratorium in NRW. In Baden-Württemberg is already discussing stricter rules and thought in Thuringia and Bavaria to ban.

Over the ocean, IEA released a study and the so-called "golden rules" of the Golden Age. These calls, put the focus on sustainability, improved drilling technology to avoid methane emissions, water conservation and the review of chemicals used included. The U.S. Environmental Protection Agency has created even new rules that oblige companies to intercept the fugitive methane emissions.
It is high time that the EU Commission will draw up better framework legislation.
A site specific risk assessment of above and below ground risks for a given project should be conducted for each approval procedure.

An extensive monitoring program needed that centers around the following:

- Monitoring the concentrations of specific substances in groundwater
- Geomechanics (hydrofracking crack propagation)
- The physical, chemical and biological conversion and transport processes that occur underground
- Material flow analyses concerning the following: methane emission levels; wastewater composition and volume; chemical and radioactive substance concentrations in deep groundwater; hydrofracking fluid concentrations; hydrofracking chemical degradation products
- Ensuring well and pipeline integrity
- The nature of the drinking water risks entailed by hydrofracking should be studied in detail at existing production sites.

The European public need and deserve better public information and policy-makers must emphasize and stress the importance of a transparent and open dialogue with civil society, based on scientific evidence, and wherever shale gas development activities are taking place, it is imperative that companies apply the best available technologies, the best operational practices, in total transparent manner to local communities.
Meanwhile, European Parliament received petitions on shale gas in the PETI committee. There are 9 official petitions in addition to 2 already answered: 3 from Poland, 2 from Romania, 2 from Germany, 1 from France and 1 from Bulgaria. There was a PETI commission meeting on 09.10 focused on those petitions.
Even Niki Tzavela, Member of the European Parliament, and rapporteur of a controversial report issued by Industry Research and Energy Committee of the European Parliament, was clearly in stating that: *"the role of public opinion will undoubtedly play a defining role in whether shale gas is a hit or a miss in Europe. In some Member States for example, there is a lack of public consultation in the authorization phase for drilling licenses".*

7. From National to European and back: Legal frame

EU has no competency regarding the energy mix of member states, than public authorities in EU Member States should check, and if necessary, improve regulatory frameworks in order to ensure their adequacy for shale gas projects. Many questions arise when political weighing the interests of the industry against the interests of citizens concerning the protection of their health, the environment and the highest of all goods, water.
To minimize the risks of shale gas extraction, we need a secure legal framework that meets the concerns of every citizen in Romania and Europe.
Unfortunately, the Romanian framework for environmental protection in the promotion of shale gas has not yet been adapted despite the need for such enterprise.
According to the present Romanian laws, an evaluation on environment impact is required when only the well's production overcomes 500.000 cm per day.
This limit is too high and ignores the reality of the wells, their production being initially of few tens of thousands of cubic meters per day.

An evaluation on environment together with the citizens should be mandatory for each well. The regional authorities should have the right to forbid fracking activities in sensitive areas (areas of protection of drinking water, villages, organic agriculture land, protected areas, etc.).
More, the regional authorities should have a greater autonomy in deciding the forbidding or authorization of hydraulic fracture on their territory.
European Debate

While in June 2011, a reference study of the European Parliament experts "*The impact of shale gas and oil extraction on environment and human health*" was recommending the review of over 40 directives and regulations, another study commissioned by the European Commission[26], in regard with the legislation of concessions in 4 states, concluded, generalizing, that there are already proper regulations in Europe for shale gas activities. This position generated concerns and even violent debates in European forums.

Within the European Parliament Committees also there were recently submitted two **draft reports** on various aspects of shale gas. Both are non-legislative reports, and their goal is to enable the European Parliament to establish its political position before adopting any new regulations or policies proposed by the European Commission.
The draft report of **ITRE Commission** (Industry, Energy and Research) on "*Industrial, energetically aspects, as well as other aspects of shale gas and oil*" is generally favorable to industry. It mentions the crucial global role of shale gas production in energy security supply and diversity on long term, including in Europe, as well as its contribution to the EU objective of reducing emissions of greenhouse gases by 80-95% by 2050, compared to 1990.
The second draft report, focused on "*The impact on environment of shale gas and oil extraction from bituminuos deposits*" is made by **ENVI Commission** (Environment), whose members are less favorable to industry. The draft report confirms that risks are well understood and they could be eventually managed with the existent technology and using the best procedures. Especially, it is emphasized that the integrity of the drilling pipes cementing is essential for preventing the contamination of ground waters.
The disclosure of chemicals used in fracturing fluids, are considered to be key issue in both reports, the ITRE Commission requesting full information and ENVI Commission, on the other hand, requiring mandatory disclosure.

The plenary decisions are expected to be voted on 19-22 Nov.

Some arguments are found in the most recent studies by the European Commission:

- *Potential Risks for the Environment and Human Health Arising from Hydrocarbons Operations Involving Hydraulic Fracturing in Europe,*
- *Climate Impact of Potential Shale Gas Production in the EU,*
- *Unconventional Gas: Potential Energy Market Impacts in the European Union*.

26 Philippe & Partners Final report on Unconventional Gas in Europe - 8 November 2011 Page 102-103

The decision by the European Parliament could be a crossing point in the development of the fossil fuels and specially the unconventional ones.

- **The latest studies of the EU conclude the rules had to be adjusted for the development of shale gas.**

The reason is that technologies incorporated in the shale gas production are highly controversial for environment and chemicals can heavily contaminate the soil, air, groundwater and drinking water supply. There should be safety standards and inspections at safety-critical stages of well construction and hydraulic fracturing.
In addition, it is important that operators restore the land used and conduct post-operational monitoring on the completion of their activities.
Energy Commissioner Günther Oettinger commissioned in 2011 a study, which was to review the EU legislation for the promotion. The study came to the conclusion that the current framework needs to be adapted for shale gas in some places. The controversial shale gas report of the Industry Committee of the European Parliament, which was passed with no great majority, concludes the current regulatory framework is sufficient.
The recent report for Fracking technology of the European Commission, the Federal Environmental Agency and the Federal Ministry of Environment came to a different conclusion. They confirm that there are regulatory gaps and that the legal framework needs to be adapted. These include **mandatory environmental impact assessments prior to shale gas production, a transparent and competent handling of chemicals, and better citizen participation**.

What would be the best strategy which would allow us to build convergence between our struggles which are over the use of land, water resources, biodiversity and finally conclusions drawn from all of these contradictory studies? We do not know yet. But as long as the shale gas regulatory framework cannot face the problems and all the questions raised have not been sufficiently answered, the promotion should be excluded.

Georgeta Ionescu
Green Institute
Romania