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**COMMUNICATION FROM THE COMMISSION TO THE COUNCIL AND THE
EUROPEAN PARLIAMENT**

**on unconventional hydrocarbon (especially shale gas) exploration and production in the
EU**

[...]

(Text with EEA relevance)

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1. INTRODUCTION

Ensuring a reliable and steady flow of energy is a fundamental requirement for European economies and the quality of life of the populations. Energy needs to be sustainable, affordable and its supply has to be secure. These goals are the drivers of the EU energy policy.

In 2010 EU leaders agreed on a long-term strategy for a smart, sustainable and inclusive growth. As part of it, they also agreed on the need to have a more "resource efficient Europe"¹ and to reduce the carbon-dependency of our economies. This has called for alternatives to the most polluting energy forms, gradually moving away from our dependency on fossil fuels, and for EU companies to maintain their competitive advantage drawn from a strong position on energy efficiency.

These goals were translated into three headline targets for energy and climate policies to be achieved by 2020: (i) a 20% reduction of greenhouse gas emissions compared to 1990 levels; (ii) a 20% share for renewable energy sources in the energy consumed in the EU; and (iii) a 20% improvement in EU energy efficiency.

[para introducing 2030 targets and link to 2050 objectives]

The effect of this policy is already showing. It will in the longer term radically reduce EU's energy import dependency. However, today and in the near future, the EU is still facing serious energy challenges with an increasing import dependency and related risks to security of supply, with impacts on energy prices, competitiveness and on the effective completion of the internal energy market.

All this is happening against the back-drop of a fast-evolving energy landscape. Conventional gas, which currently accounts for one quarter of the EU's primary energy consumption and can contribute to the reduction of greenhouse gas emissions in the medium term - should it replace more carbon intensive fossil fuels - is becoming scarcer in the EU. The EU's import dependency for natural gas - 67% in 2011 - is projected to continue to increase. Some Member States rely on a single supplier and often on a single supply route for 80-100% of their gas consumption. This has contributed to increasing energy prices in the EU with EU natural gas prices, whilst lower than Asian prices, three to four times higher than in the US. This puts pressure on the EU's energy-intensive industries such as chemicals and aluminium.

¹ A resource-efficient Europe – Flagship initiative under the Europe 2020 Strategy, COM(2011)21

Technological progress has made unconventional hydrocarbon extraction possible, enabling the production of fossil fuels that were previously technically too complex or too costly to extract. In the US, unconventional gas currently accounts for 60% of the domestic gas production with shale gas featuring the highest growth rates. This US ‘shale gas boom’ has resulted in lower gas prices and made available cheaper US coal supplies for export, notably into the EU.

Potentially significant reserves of shale gas have triggered high expectations also in some parts of the EU. Shale gas is seen as a possible substitute for more polluting fossil fuels, better security of supply at regional level with less dependency on dominant energy suppliers from abroad, as well as a possible source of public revenues. That is why some Member States have decided to consider including domestic shale gas in their energy mix.

At the same time, the risks associated with the high volume hydraulic fracturing technique, hereafter referred to as "fracking", trigger public concerns about their health and environmental impacts. An important part of the population in most EU Member States also critically perceives the overall level of precaution, transparency and public consultation applied to these activities. Very limited experience with “fracking” in Europe has not helped alleviate these concerns. Some Member States have decided to ban fracking or to set moratoria.

This divergent situation has led to requests for EU action. The European Parliament and the Committee of the Regions called for an EU regulatory framework to ensure the safe and sustainable extraction of unconventional fuels². Most respondents to a public consultation launched by the Commission from December 2012 to March 2013 asked for additional EU action related to unconventional hydrocarbons (e.g shale gas) developments in the EU³. In May 2013 the European Council called for the development of indigenous energy sources to reduce the EU’s external energy dependency and stimulate economic growth while stressing the need to ensure their safe, sustainable and cost-effective extraction and respecting Member States choices of energy mix.⁴

In this context, the Commission agreed to develop an EU framework for safe and secure unconventional hydrocarbon extraction following the objectives:

- to ensure that opportunities to diversify energy supplies and improve competitiveness can be safely and effectively taken up in those Member states that choose to do so,
- to provide clarity and predictability for both market operators and citizens, including for exploration projects,
- to fully consider greenhouse gas emissions and management of climate and environmental risks, including to health, in line with public expectations.

This Communication outlines the potential new opportunities and challenges stemming from shale gas extraction in Europe. It accompanies a Recommendation providing common minimum principles for the exploration and production of hydrocarbons by means of high

² European Parliament resolution on environmental impacts of shale gas and shale oil, November 2012; Opinion of the Committee of the Regions on shale/tight gas and oil adopted in October 2013

³ http://ec.europa.eu/environment/integration/energy/pdf/Shale%20gas%20consultation_report.pdf

⁴ <http://register.consilium.europa.eu/doc/srv?l=EN&t=PDF&gc=true&sc=false&f=ST%2075%202013%20REV%201&r=http%3A%2F%2Fregister.consilium.europa.eu%2Fpd%2Fen%2F13%2Fst00%2Fst00075-re01.en13.pdf>

volume hydraulic fracturing⁵. This Recommendation is to enable safe and secure development of these resources, and to foster a level playing field for this emerging industry in all EU Member States that choose to develop them.

2. SHALE GAS POTENTIAL IN THE EU: FACTS AND FIGURES

There is still considerable uncertainty as to the precise volume of unconventional hydrocarbon reserves in the EU. However these are deemed to be significant. Based on currently available information, natural gas production from shale formations seems to have the highest potential in Europe compared to other unconventional hydrocarbons: shale gas technically recoverable resources are estimated to amount to 16 tcm, much higher than for tight gas (3 tcm) or coal bed methane (2 tcm)⁶. However, there is still significant uncertainty on the economically recoverable portion of these resources.

There has been no commercial production of shale gas in the EU yet, although a few pilot production tests have already been conducted. Commercial production could start in 2015 in most advanced Member States.

While the EU will not become self-sufficient in natural gas, unconventional gas production from shale gas formations could compensate the decline in the EU's conventional gas production. Indeed it would be, in a best case scenario, able to meet about around 10 % of the EU gas demand by 2035. It could offer Member States with a high import dependency the possibility to diversify their energy sources and enhance their security of supply. Overall experts estimate that, still in a best case scenario, it could maintain the EU's gas import dependency (currently approaching 70%) at a stable level.

The direct price effect on European regional gas markets is likely to remain moderate, especially if compared to the evolution in the US. This is due to expected relatively low volumes and higher production costs than in the US and the fact that prices are still largely set through long term oil-indexed contracts. But even a moderate decrease or avoided increase in gas prices – for instance through increased negotiation power towards non-EU gas providers - would be beneficial for Member States, in particular for those with high import dependency, and for the most energy intensive industries.

Shale gas activities could also bring economic benefits, for instance through regional investments in infrastructure, employment opportunities, and public income via taxes, fees and royalties.

Under certain conditions, shale gas also has the potential to bring climate benefits if it substitutes more carbon intensive fossil fuels. Greenhouse gas emissions from shale gas production in Europe could be 41% to 49% lower than emissions from coal-based electricity generation, 2% to 10% lower than emissions from electricity generated from conventional pipeline gas produced outside Europe, and 7% to 10% lower than electricity generated from LNG imported into Europe⁷. However, to realise this benefit, greenhouse gas emissions

⁵ p.m to add reference when available

⁶IEA Golden Rules report 2012. See also "Unconventional gas: potential energy market impacts in the European Union", JRC 2012.

⁷ AEA 2012 study "Climate impact of potential shale gas production in the EU" commissioned by the Directorate-General for Climate Action of the European Commission, based on a hypothetical case study using US primary data and a 100 year global warming potential of methane. The study stresses the need to collect further data.

associated with the extraction process, notably methane, need to be properly mitigated by using best available techniques. In such a best case scenario, shale gas extraction could generate around 1 to 5% more greenhouse gas emissions per unit of electricity generated compared to conventional natural gas extracted in the EU. This needs to be seen in the context of a potential overall share of unconventional gas of less than 3% of the overall EU energy mix by 2030⁸.

3. ENVIRONMENTAL RISKS AND PUBLIC CONCERNS

Experts agree that shale gas extraction leads to higher cumulative environmental risks and impacts compared to conventional gas extraction. This is due to the fact that it requires a more intensive technique, it mainly takes place on-shore and it covers much wider areas. In addition, as productivity of shale gas wells is lower than conventional wells, more wells need to be drilled. Some of these risks and impacts have cross border implications, for example in case of water and air pollution.

In the current state of technological development, shale gas extraction requires the combined use of high volume hydraulic fracturing (hereafter referred as "fracking") and directional (especially horizontal) drilling at a scale and intensity for which there is very limited experience in Europe. Especially "fracking", a process by which fracturing fluid – a mixture consisting typically of water, sand and chemical additives - is injected under high pressure to break the rock, open and enlarge fractures to enable the hydrocarbons to flow into the well, has raised a wide range of environmental risks. Between 25-90 % of the initially injected fracturing fluids are expected to remain underground, depending on geological conditions.

One of the main environmental risks is the contamination of ground and surface waters. In some areas, deep groundwater is an important source of drinking water or other water uses. The contamination risk is notably linked to the chemicals used in the "fracking" process. Groundwater contamination can occur in case of leaks, through e.g. improper well casing, induced fractures or existing faults or abandoned wells. Surface water contamination can occur via improper handling of the high volume of wastewaters, typically contaminated by the injected fracturing chemical additives, highly saline water and through naturally occurring heavy metals and radioactive materials, which shale formations often contain. Instances of water contamination by gas have been reported in the US in cases where the well was improperly insulated from the geological formations.

Another water-related risk concerns the impact on water demand, especially in areas where water is scarce. "Fracking" requires large quantities of water⁹ part of which is not recovered. The extraction of water for drilling and "fracking" can lower the water table in areas where water is scarce and already competes with other uses (e.g. industry, agriculture, drinking water). It can harm the local ecosystem, thereby affecting biodiversity.

The quality of soil may also be negatively affected by leaks and spillage, if fracturing fluids and wastewater are not adequately handled.

⁸ IEA Golden Rules report, 2012 (best case scenario)

⁹ When assessed on a per unit of energy produced, this is 2000 to 10 000 times more than conventional gas, IEA Golden Rules report, 2012. Water consumption per shale gas well varies depending on geological specificities but typically amounts on average to about 15 000 m³ per well.

When shale gas is extracted, fugitive methane emissions can occur. If not captured and mitigated, they can be detrimental for local air quality and the climate. Air emissions can also result from increased transport¹⁰ and on-site equipment.

A large number of wells and related infrastructure (roads for example) are needed for shale gas extraction. This has impacts on land fragmentation and local road traffic, both of which have consequences for local communities and biodiversity. This risk needs to be addressed also in the context of competing uses of land in a given region e.g. for agriculture or tourism. Other risks that were identified relate to possible induced seismicity.

These environmental risks, also entailing health risks, have led to varying degrees of public concern, which not infrequently result in outright opposition to shale gas projects.

In addition, there is a public perception of insufficient level of precaution, transparency and consultation applied to shale gas activities. About 60% of individual respondents to the Commission consultation¹¹ stressed the lack of transparency and public information among the main challenges of the sector development. In particular, they identified the asymmetry of information between the operators and competent authorities or the general public as a problem, especially with respect to the composition of fracturing fluids and the geological conditions in which fracking is to take place.

Over the past few years, the Commission has received a large number of queries from the general public or its representatives. These queries express concerns and doubts about the effectiveness of the current EU legislative framework, notably as regards the EU legislation on mining waste, environmental impact assessment or air and water protection.

As for any other potentially polluting activities, local populations tend to oppose to projects developments that are too close to their homes (“Not in My Backyard effect”)¹². In several Member States, citizens' actions have prevented shale gas exploration projects from going forward.

As long as these environmental and health risks, lack of transparency and legal uncertainties remain unaddressed, public concerns will persist. A number of experts¹³ consider that the lack of public acceptance represents a barrier to further shale gas development¹⁴. The oil and gas industry itself has highlighted this as a key issue already encountered at the exploration stage¹⁵.

Therefore addressing these risks and reassuring the public about safety of the operations is of paramount importance if industry is to gain public acceptance and its 'social licence to operate'.

¹⁰ E.g. of water, chemicals, sand for fracking and wastewater resulting thereof.

¹¹ Unweighted rate, rising to about 80 % in the weighted case.

¹² According to the Flash Euro-barometer survey conducted in September 2012, three quarters of the respondents would be concerned if a shale gas project were to be located in their neighbourhood, with 40% being very concerned.

¹³ E.g. International Energy Agency Golden rules report 2012; US Department of Energy 90 days report

¹⁴ Public acceptance was among the three main challenges identified by respondents in the EC public consultation.

¹⁵ E.g. JRC IET workshop on shale gas, March 2013

4. UNCERTAINTIES AND GAPS WITH REGARD TO THE APPLICABLE LEGAL FRAMEWORK

Both general EU legislation and specific pieces of EU environmental legislation¹⁶ apply to shale gas activities from planning until cessation.

However, as shale gas exploration activities are progressing, Member States have started interpreting the EU environmental legislation in different ways and some are developing specific national rules, including bans and moratoria.

This has resulted in differing requirements from one Member State to another. For instance, some Member States conduct a strategic environmental assessment prior to licensing to take into account the cumulative effects of shale gas projects and require a systematic environmental impact assessment when "fracking" is intended to be used whereas others do not. Another area with apparent divergent interpretation is the water and mining waste legislation.

This is leading to a fragmented and increasingly complex operating framework within the EU which hinders the proper functioning of the internal market. The different approaches by public authorities to managing the complex set of administrative and technical decisions may lead to a lack of level playing field and give rise to recurrent concerns regarding the suitability of the environmental safeguards and precaution measures. A risk that national interpretations are legally challenged further affects the predictability for investors.

The EU environmental legislation was not developed to specifically address the risks associated with the "fracking" technique. Specific issues such as strategic planning, underground risk assessment, well integrity, the lack of integrated and consistent requirements in terms of baseline and operational monitoring, capture of methane emissions and disclosure of chemicals used are not addressed by the current EU regulatory framework.

4. TOWARDS AN EU FRAMEWORK

Experts from the International Energy Agency and other reputed organisations have confirmed the need for robust and clear rules to accompany shale gas developments to ensure that negative impacts can be reduced and risks can be managed.

In 2011, the Commission issued a note summarising the main pieces of applicable EU environmental legislation¹⁷ and a specific guidance note on the applicability of the Environmental Impact Assessment (EIA) Directive (2011/92/EU) to shale gas projects¹⁸. In addition, the Commission is reviewing the existing reference document (BREF) on extractive waste so as to cover notably the management of waste from shale gas activities and to ensure that waste is appropriately stored and treated, in order to minimise the risk of water, air and soil pollution.

However, a number of national authorities have called for additional EU action. The general public also asks for clear information on what is required for safe shale gas extraction. This is

¹⁶ e.g. EIA Directive, Mining Waste Directive, Water Framework Directive, REACH, Biocidal Products Directive, Seveso II and III (under certain conditions), Habitats and Birds Directives and Environmental Liability Directive (for activities listed under Annex III).

¹⁷ http://ec.europa.eu/environment/integration/energy/uff_news_en.htm

¹⁸ http://ec.europa.eu/environment/integration/energy/pdf/guidance_note.pdf

why the Commission adopted a Recommendation which includes a common set of key principles which, if fully applied, would contribute to enabling shale gas activities, while ensuring that climate and environmental safeguards are in place. This Recommendation does in no way imply that Member states are under any obligation to allow for shale gas activities if they choose not to.

In particular, the Recommendation invites Member States to ensure that:

- a strategic environmental assessment is carried out prior to granting authorisations in order to analyse and plan how to prevent, manage and mitigate cumulative impacts, possible conflicts with other uses of natural resources or the underground;
- a site specific risk characterisation and assessment is carried out, related to both the underground and the surface. This is needed to determine whether an area is suitable for a safe and secure exploration or production of hydrocarbons involving "fracking". It would inter alia identify risks of underground exposure pathways such as induced fractures, existing faults or abandoned wells;
- baseline reporting (e.g. of water, air, seismicity) takes place, in order to provide a reference for subsequent monitoring or in case of an incident;
- the public is informed of chemicals used in fracking on a well by well basis, waste water composition, baseline data and monitoring results. This is needed to ensure that the authorities and the general public have factual information on potential risks and their sources. Improved transparency should also facilitate public acceptance;
- the well is properly insulated from the surrounding geological formations, in order to avoid underground contamination;
- venting (release of gases into the atmosphere) is avoided, flaring (controlled burning) of gases is minimised, and gas is captured for its subsequent use (on-site or through sales pipeline). This is needed to mitigate negative effects of emissions on the climate effort, as well as on local air quality..

Member States should ensure that companies apply best available techniques (BAT) and good industry practices to prevent, manage and reduce the impacts and risks associated with exploration and production projects and strive for maximum transparency in their operations, to constantly improve technologies and operating practices. In order to draw up and update BAT reference documents, the Commission will organise an exchange of information between Member States, the industries concerned and non-governmental organisations promoting environmental protection.

In order to ensure adequate risk management and to avoid administrative burden for operators, Member States should also ensure that permitting authorities have sufficient resources and knowledge of the process and that the permitting procedure is appropriately coordinated. They must consult citizens and stakeholders early on, before operations are starting. Member States and their competent authorities are also encouraged to exchange good regulatory practices and other knowledge. The Commission will facilitate such exchange through the Technical Working Group of Member States on environmental aspects of unconventional fossil fuels.

The Commission will closely monitor the implementation of the Recommendation through a publicly available comparison of the situation in Member States in the form of a scoreboard. This is designed to increase transparency and assess progress in each Member State on applying the principles set in the Recommendation.

Member States and national competent authorities should inform the public on key issues related to the operations in order to enhance transparency and restore public trust. Member States are invited to implement the minimum requirements set out in the Recommendation 6 months after its publication and to inform the Commission on measures they have taken in response to the Recommendation.

The Commission will review the extent to which this approach is effective in implementing the principles set out in the Recommendation and will report to the Parliament and the Council within 18 months after publication in the Official Journal. If necessary, it may decide to put forward legislative proposals.

5. CONCLUSIONS

Member States are responsible for deciding on their energy mix with due regard to the need to preserve and improve the quality of the environment¹⁹. Member States who will decide to explore or exploit their shale gas and other unconventional hydrocarbon resources, will have to make sure that proper conditions are in place for doing that. Among these conditions, they will need to reassure their population and prevent, manage and reduce the risks associated with such activities.

The Commission therefore calls upon Member States which are currently exploring or plan to extract their unconventional hydrocarbon resources such as shale gas to properly implement the existing EU legislation as well as to follow the accompanying Recommendation to make sure that proper conditions for their safe and secure extraction are in place, also taking into account effects on neighbouring countries.

Finally, it should be recalled that the EU's long-term objective is to become a resource-efficient carbon-free society. In the short term, natural gas and the availability of new sources of indigenous fossil fuels, such as shale gas, play a role in the transformation of the energy sector if it substitutes more carbon intensive fossil fuels. But the long term objectives of decarbonising our energy system will require continued improvement of energy efficiency, energy savings and uptake of low carbon technologies, in particular renewable energies. [reference to 2030 framework]

¹⁹ Art. 194 TFEU