Shale gas extraction: issues of particular relevance to the European Union

European Academies Science Advisory Council

Executive Summary

Background

Shale gas (and oil) production has significantly reduced energy prices in the USA, which in turn has enhanced the competitiveness of US manufacturing. The US competitive advantage in gas is particularly relevant for the chemical industry, where natural gas is not only used to provide heat to its processes but also as a primary raw material. Moreover, and at the same time, production from shale has reduced both the US import dependence for its energy supplies and the country's carbon dioxide emissions.

The many benefits shale production is delivering to the US economy have raised the question of whether such a development could, or should, be repeated in Europe as well. Given substantial geological potential of shale gas in Europe, and an active interest by the exploration and production industry to develop this potential, the future of shale gas extraction in the EU is the subject of a highly important and ongoing debate. Within this debate, policy-makers have to reconcile economic objectives, concerns about the reliability of conventional gas and oil imports, greenhouse gas mitigation strategies and local environmental issues.

EASAC statement's contribution

In this statement, EASAC addresses three specific concerns that are being put forward in the public debate about the exploitation of Europe's shale gas potential: (1) the implications of a high population density throughout Europe (in combination with the problem of water usage); (2) the question of methane leakage; and (3) the challenge of (local) public acceptance. The statement finds that although these concerns are justified in general, all three of them can be mitigated by use of best practices and proper regulation. The statement thus concludes that the issues studied in the report need to be carefully reflected by policy-makers, but that they are not an unsurmountable obstacle for exploring and using Europe's shale gas potential. Currently the scale of the shale gas resources and the economic viability of its extraction in EU countries remain uncertain and, without exploratory drilling, this uncertainty will continue.

Issue 1. Implications of population density and water usage

- Some early hydraulic fracturing schemes used in the USA were only acceptable in remote locations because of potential impacts on more highly populated communities. However, the latest multi-well drilling pads and horizontal drilling techniques, such as those used in Pennsylvania (which has a population density that is similar to parts of Europe), offer a potential extraction area of 10 km^2 or more from one pad, reducing surface land use area accordingly. This reduces the impacts on local communities of noise and of transporting construction equipment and materials. Schemes using the latest technologies therefore cause less impact in areas with a high population density and are now a working practice in the USA, even in densely populated areas.

- Public concern about water quality and water usage has been raised from some negative experience in the USA, which resulted mainly from poor drilling and surface management practices. It is found that elaborate water management practices, including recycling of flow back water, are well established in Europe, and that the most recent technologies remedy earlier problems. Furthermore, it is also found that best practices are available and can be enforced through strict regulations and obligations when licensing hydraulic fracturing activities. Comprehensive baseline monitoring should include groundwater composition to allow early detection of any possible contamination source and provide time to respond.

Issue 2. Specific greenhouse gas emissions

- In principle, natural gas offers the potential to significantly reduce carbon dioxide emissions from electricity generation when it replaces coal. However, the relative merits in terms of specific

greenhouse gas emissions of using shale gas instead of coal are highly sensitive to the levels of methane leakage during shale gas extraction, transportation and distribution, as well as to any future leakage from abandoned shale gas wells.

- Best practices for ensuring 'well bore integrity' and thereby minimising methane emissions during construction and production are well known. Similarly, best practices for 'green completion' to capture and manage methane and other gases emitted from flow back water during the extraction process, and for long-term sealing of abandoned wells, are also available. The implementation and monitoring of such best practices should be made obligatory when licensing and regulating shale gas extraction activities.

Issue 3. Public acceptance of shale gas development

- Recent experience has highlighted the importance of companies working with stakeholders and ensuring that local communities are properly informed and fully engaged in the decision-making processes, in advance of the construction of energy related infrastructures.

- Transparency is important when putting in place regulations and independent monitoring for all steps in the development process. A comprehensive set of baseline measurements should be made before work begins, together with detailed monitoring throughout the exploration and exploitation phases, and continued after exploitation is terminated.

- Relationships need to be developed between the extraction companies and the local community; these can be helped by developer investments in the community as well as by community investments in the development.

The full statement is available from the EASAC website: www.easac.eu

EASAC

EASAC – the European Academies' Science Advisory Council – is formed by the national science academies of the EU Member States to enable them to collaborate with each other in providing advice to European policy-makers. It thus provides a means for the collective voice of European science to be heard. EASAC was founded in 2001 at the Royal Swedish Academy of Sciences.

Its mission reflects the view of academies that science is central to many aspects of modern life and that an appreciation of the scientific dimension is a pre-requisite to wise policy-making. This view already underpins the work of many academies at national level. With the growing importance of the European Union as an arena for policy, academies recognise that the scope of their advisory functions needs to extend beyond the national to cover also the European level. Here it is often the case that a trans-European grouping can be more effective than a body from a single country. The academies of Europe have therefore formed EASAC so that they can speak with a common voice with the goal of building science into policy at EU level.

Through EASAC, the academies work together to provide independent, expert, evidence-based advice about the scientific aspects of public policy to those who make or influence policy within the European institutions. Drawing on the memberships and networks of the academies, EASAC accesses the best of European science in carrying out its work. Its views are vigorously independent of commercial or political bias, and it is open and transparent in its processes. EASAC aims to deliver advice that is comprehensible, relevant and timely.

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