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[Dachzeile]

Fugitive Emissions in Shale Gas Production Negate Climate Benefits

It is often claimed that a higher ratio of natural gas to coal in our energy mix can mitigate current carbon dioxide emissions and serve as a ‘bridge’ to future renewable-based scenarios. This is because the carbon footprint of energy produced through the combustion of methane is about half that of energy produced from coal. Given the significant rise in shale gas production – natural gas exploited using the hydraulic fracturing (fracking) technique – in the USA and possibly in other countries, it is likely that the share of gas in the global energy mix will grow.

Losses through drilling and transmission of shale gas are often underestimated

Despite the unquestionable benefits of natural gas in terms of CO₂ emissions at the combustion stage, on closer inspection we see that its advantages might have been overstated. According to several recent studies conducted in the USA ([Brandt et al., 2014](#); [Caulton et al., 2014](#); [Schneising et al., 2014](#); [Allen et al., 2013](#)), the amount of methane lost during the entire shale gas production chain is actually far greater than has often been alleged. Methane is a greenhouse gas that is several times more powerful than CO₂; even a minor leak is a concrete threat for the atmosphere. Interestingly enough, the lively international debate on shale gas tends to focus on groundwater contamination, water requirements, and land utilisation, largely neglecting the subject of methane leaks and their significant impact on climate change. In the process of defining guidelines and regulations on shale gas exploitation across the member states, the European Commission is aware of this risk and has appealed for proper practices. In fact, [in a communication released last March](#), the Commission reports that “greenhouse gas emissions from shale gas could be 41% to 49% lower than emissions from coal-based electricity generation”, yet “to realise this benefit [...], greenhouse gas emissions associated with the extraction process, notably methane, need to be properly mitigated.”

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Shale oil and conventional gas are also under observation

Methane and small quantities of other gases are also released during shale oil extraction, and significant amounts could be emitted if not carefully handled. New satellite measurements carried out in the USA and released in September ([Schneising et al., 2014](#)) show, in fact, that oil production from shales could release greenhouse gases into the atmosphere at a far higher rate than previously thought. Growing concerns about the fugitive gas emissions associated with shale gas and oil have recently spread to conventional gas activities, given the fact that exploitation in the two cases is almost identical if we consider the whole production chain (from drilling to distribution). Until recently, it was believed that methane losses were only localised during the water-gas separation stage (when the fracking fluids come back to the surface mixed with methane). Surprisingly, drilling and transmission also contribute to significant losses, ranging from 4 to 10 per cent of total gas production (for a review, see [Howarth, 2014](#)). For instance, if minor gas pools are buried between the well pad and deep reservoirs, they could be perforated during drilling operations with a resulting release of gas into the atmosphere unless it is processed, i.e. captured instead of simply flared/vented. Furthermore, some transmission pipelines used for gas transport and delivery have already been operating for long time (in the USA, some of them are a century old), and the integrity of the cases and seals may be compromised. It is likely that these aspects are significant factors in the latest observations of fugitive GHG emissions in the extraction of both shale and conventional gas.

In accordance with this trend, official EPA inventories of methane lost during gas production were revised upwards in 2011, but are still considered rather optimistic by a large part of the scientific community. The Obama administration has proposed a strategy to tackle this matter: a 17 per cent cut in methane emissions by the year 2020, to be achieved by way of new regulations for the exploitation of fossil fuels (fugitive carbon capture, reduction of flaring and venting, etc.) and measures to increase energy saving.

The need for joint efforts by policy-makers, industry and the general public

Thus uncontrolled gas leaks – in conventional gas exploitation, too – could negate the advantages of natural gas over coal under certain circumstances. The key question at this point is: are there cost-effective prevention technologies that would allow us to control and mitigate methane leaks from both conventional and unconventional hydrocarbon exploitation? The answer is probably ‘yes’. Ultimately, the advantages of gas over coal in terms of reducing CO₂ emissions depend on the implementation of effective regulations. The adoption of simple technical measures on a large scale (e.g. installing new valves, monitoring equipment, etc.) does not place a high financial burden on operators and could substantially mitigate major gas losses (the National Physical Laboratory estimates that 0.1 per cent of leaks are responsible for 99 per cent of emissions).

Policy-makers and industry representatives should cooperate to come up with effective energy solutions to ensure minimal release of greenhouse gases in the atmosphere and assuage widespread fears with regard to operators and fracking itself. At the same time, it should be acknowledged that broad public participation in future decision-making processes is vitally



important. Implementing these measures would help us to address issues like energy justice, environmental protection and social legitimacy, as well as develop an innovative, equitable, (and hopefully lasting) methodological approach. This path might be the most appropriate to dealing with the upcoming transformations in the energy system.

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