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"Fracking": A Solution to the Energy Problem for Emerging Countries?

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The production of unconventional natural gas such as shale gas, tight gas and coalbed methane from rock formations deep below the earth's surface up to 5,000 metres requires the combined use of horizontal drilling with hydraulic fracturing technologies ("fracking"). With its high-pressure injection of huge quantities of fracturing fluids, consisting of water, sand and toxic chemicals, horizontal fracking is extremely controversial from an ecological viewpoint. However, the shale gas boom in the USA is currently raising hopes in many emerging countries of energy supply security based on gas, plus sustainable low energy prices in the future.

The shale gas revolution in the USA

In the USA, over 220 billion cubic metres of shale gas were produced in 2011. In 2012, shale gas accounted for no less than 40% of US gas production. Large-scale commercial shale gas production has been made possible since 2007 due to technical innovations in the field of horizontal fracking together with favourable geological conditions, plus a framework with additional beneficial features. These include liberalization of the gas supply sector, with an extended gas infrastructure for domestic consumption, advantageous property relations (mineral resources belong to the landowner), a high level of acceptance for fracking and relatively high gas prices in investment boom times. Average prices in the period 2005-2009 stood at USD 7.2/mmBTU (dollars per million British Thermal Units) and thus were above the drilling costs for shale gas in the USA, which are estimated at USD 3-7/mmBTU. The additional influx of shale gas into the market combined with the lack of export opportunities has led to a rapid fall in US gas prices in the last three years, which fell by 9% in 2011 alone. At present, the price of gas is back at around USD 4/mmBTU; steady price rises are not expected until 2018 and onward. The results of the price fall are higher utilization of gas-fired power stations in the US electricity sector, reductions in electricity prices, competitive advantages for industries that are particularly energy intensive and reduced liquefied natural gas (LNG) imports.

Larger shale gas reserves in China and other newly industrialized countries

According to the most recent estimates by the US Energy Information Administration (EIA), China has the largest technically recoverable shale gas resources in the world, extending to around 32 trillion cubic metres. That said, the gas is mainly located in deeper rock strata (3,000 to 5,000 metres) than in the USA, and drilling costs are therefore higher (USD 4 to 8/mmBTU). China, whose energy supply is about 70% coal, is endeavouring to increase the share of gas in the energy mix, from 4% to 10% by 2020, and, to do this, is planning increasing its shale gas production to 60 billion cubic metres by that date. There are also significant shale gas reserves in the emerging economies of Algeria, Mexico, South Africa and Brazil. Argentina, which has the second-largest shale gas resources in the world and where gas contributes more than 50% to energy supply needs, is also placing its hopes in shale gas and promotes exploratory drilling. To what extent these gas sources can be developed under commercially and ecologically acceptable conditions is uncertain and dependent on geological conditions, the availability of technology, infrastructure and water, and gas prices.

Large gas importers could profit

From 2016 as a net exporter of LNG and from 2020 as a net exporter of natural gas, the USA will be (further) increasing liquidity on the global gas markets. Shale gas production beyond the USA and the increase and greater flexibility of the world's liquefied gas trade are also contributing to convergence in regional gas markets and to falling prices. This might not only be of benefit to the countries that are drilling the gas (e.g. through lower gas prices, higher tax revenues, more jobs and improvement of the balance of trade), but also to gas customers, especially the traditional large gas importers like Germany and Japan, plus emerging economies like India or Turkey.

The down side: high ecological risks

An important factor for the future of fracking technology is the handling of potential environmental risks, as well as their assessment and public acceptance. The greatest, hitherto barely calculable, environmental risks include high water and landscape consumption, the danger of water contamination and waste water leakage, gas leaks (methane) and the triggering of earth tremors. The International Energy Agency (IEA) estimates that using the best possible environmental and social standards ("Golden Rules") could raise the overall financial cost of development a typical shale gas well by up to 7%.

No solution for the climate problem

More gas, although it produces fewer emissions than coal when it is burned, does not mean more climate protection if account is taken of methane emissions as well as impacts on other energy sources. For instance, although the share of coal-fired power generation in the USA fell from 50% in 2005 to 40% in March 2013, thus also reducing CO_2 emissions, increased US coal exports exerted pressure on world market prices for coal, thus increasing coal-fired power generation in other countries, like Germany. In view of a steeply rising demand for energy worldwide, even an optimistically estimated triplication of global unconventional gas production in 2035 (according to the IEA's scenarios), would not considerably contribute towards slowing down global warming. Although the gas boom may put pressure on the profitability of investments in renewable energy and energy efficiency, the latter nevertheless offer a potential for long-term cost savings and thus continue to be indispensable and to form core components of a balanced future energy policy in both developed and developing/emerging countries. ■