Exploring shale gas option

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Shale gas is easy to extract and transport, and will be viable if gas prices are above $7-8 per mmBtu. India should frame an exploration policy in this regard.

In recent weeks, there has been much comment about the possible use of shale gas on a large scale as an economic option to meet energy needs.

US companies have pioneered some advances in technology that could enable shale gas to become a major part of energy supplies. Other countries, including India, have been showing interest in this option. How far has shale gas advanced towards becoming a practical and feasible option?

Shale gas is natural gas trapped in shale, a sedimentary rock formed by the compaction of clay and other minerals. The gas is found throughout the shale layers, unlike oil or gas that are found trapped in reservoirs from which they can be easily extracted. In the case of shale gas, the rock itself is the reservoir and source of the gas.

The technical problem is, therefore, how to drive out the gas from the shale and extract it. A similar problem occurs in the case of shale oil, where the oil is diffused throughout the shale layer. Heating oil-bearing shale, a process known as pyrolysis, can yield both oil and gas, but this is a costly process and not commercially viable at current oil price levels.

US companies have pioneered methods of extracting gas from shale deposits. The process involves drilling down to the shale layer, and then drilling horizontally along the layer for distances up to 3000 metres.

In the horizontal shaft, spaced explosive charges are set off to create fissures in the shale layer. Then a mixture of water, sand, and chemicals is pumped under high pressure to expand the fissures and keep them open, a process called fracturing (frac).

Once this is done, the gas collects in the cracks and can be pumped out. One feature is that the production rate is relatively constant and takes place over a longer period of time. Once the gas supply drops, the drilling process can be repeated at another location in the shale layer and a new production site established.

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ENVIRONMENT COSTS

Obviously, this method involves greater costs, as the drilling requires more complex equipment and operation, while the pumping in and out of large amounts of water creates environmental problems.

There is also the risk that the pumping in of the mixture of water and chemicals could contaminate underground aquifers, rendering them useless for human use. The emerging water also contains dissolved methane gas, which can get released into the atmosphere, where it contributes to the overall greenhouse gas loading.

These issues are the subject of active discussion in the US, and the US Congress has attempted to frame some legislation to regulate shale oil exploitation keeping in view the environmental risks.

In the US, shale gas production has risen considerably, especially in Texas. It now accounts for 10 per cent of total dry gas production in the US. This has fuelled worldwide interest in shale gas. However, natural gas prices had shot up to an average of $9 per mmBtu (million metric British Thermal Units) during 2008, with a peak of $13 in June 2008, making shale gas profitable with a marginal cost of production of $7. Since then the price has dropped to around $4, and consequently, shale gas producers are feeling the pinch.

Elsewhere, in Canada, Europe, and China, this sector is in its initial stage of development. In Europe, Royal Dutch Shell, ExxonMobil and OMV (Austria) are evaluating shale deposits in Sweden, Hungary, Germany and the Netherlands.

China has set its companies a target of producing 30 billion cubic meters (BCM) a year from shale, especially in Southern China, and is exploring tie ups with the US for this purpose.

GAS PRICES

If gas prices remain high, above $7-8, shale gas will attract investment and grow. The technology is relatively simple, and ample deposits exist on land, making it easy to send the gas to consumption centres. In contrast, exploitation of coal-bed methane, and gas hydrates is till beset with problems, though the former has attracted commercial interest.

Gas supply via LNG is also a competitor. In the long term, shale gas seems certain to grow as a worldwide industry, given the rising trend in energy prices.

Activity in India has followed global trends. Reliance has invested some $1.6 billion in shale gas development in the US, and a further investment of $1.35 billion is likely. US shale industry has also attracted investors from China and Japan. ONGC has decided to invest Rs 100 crore for shale gas development in the Damodar valley region, and expects to assess commercial viability by the end of the year.

According to the company, the lack of a clear government policy on shale gas and oil exploration is a dampening factor.

Government exploration licences for hydrocarbons do not cover shale gas. India has large deposits of shale across the Gangetic plain, in Rajasthan and Gujarat, but no exploration has been done.

POLICY VACUUM

Given India's growing energy needs, it would be important to put in place a comprehensive policy that would enable interested companies to go in for shale gas exploration and development. Such a policy should include tax and other incentives, since this is a pioneer industry. It should also include measures to protect the environment from shale gas exploitation.

Investment in this sector should be promoted vigorously, including assurances on remunerative gas pricing. The experience with the case of coal bed methane is not inspiring — India has reserves of some 480 BCM, but despite the Government's promotional efforts for over 10 years, production is still only around 0.5 BCM per year. For robust shale gas sector development, India will need to do much better.

(The author is former Ambassador to Cuba and Greece.)