

# Profiles

## Coalbed methane emissions – capture and utilisation

'Methane is a source of energy which is cheap, geologically accessible and relatively simple to use'

Methane emissions from coal contribute to increasing greenhouse gas concentrations. However, methane is a source of energy which is cheap, geologically accessible and relatively simple to use.

Methane can be obtained from coal seams in a concentrated form, for example from virgin coal beds (VCBM), from well-sealed abandoned mines (AMM) or from undisturbed

'Physical, economic and social barriers are hindering the development of new projects in many countries'

mines prior to mining (CMM). It may also arise in a more dilute form from working mines and mine ventilation air (VAM). The more concentrated the methane, the more valuable it is as a fuel and so mining activities are now being altered to enhance the recovery of methane before, during and after mining of the coal. Drilling and capture techniques are evolving to maximise methane capture. The possibility of

'Many projects are marginal and will require market mechanisms to promote investment'

replacing the methane in coal seams with CO<sub>2</sub> is also being evaluated as a capture and storage option with huge significance and future Kyoto protocol investment possibilities.

Methane produced from coal can be used in several ways, depending on its concentration. Pure and concentrated methane can replace natural gas in local and national pipeline systems, if the pipeline infrastructure is available.

**Relative achievements of profiled countries towards CBM/CMM**

	Market potential			Economic potential			Socio-economic potential			Technical potential			Physical potential		
	Use of sound technologies and practices	Utilise existing economic incentives	Bilateral or multilateral agreements	Define gas property rights; create and expand markets	Reduce risk and failure rates of projects	Unsubsidised free gas market	Educational and institutional reform	Changes in attitude	Industry involvement in policy making	Government initiatives, CMM/CBM energy plan	Development and demonstration of new technologies	Implementing new technologies; continued research	Increased use of new technologies	Widespread use of new technologies	New technologies commonplace
China	X	X		X			X	X					X		
USA	X	X	X	X	X	X	X			X			X		
Russia	X	X	X	X			X	X							
Ukraine	X	X													
Australia	X	X	X	X	X	X	X	X	X	X	X	X	X		
Poland	X	X	X				X	X	X				X		
Germany	X	X	X	X	X		X	X	X	X	X		X		
India	X	X	X												
South Africa	X	X													
Kazakhstan	X	X													
UK	X	X	X	X	X	X	X						X		
Czech Republic	X	X					X	X	X				X		

Concentrated methane can also be used as a high quality fuel in power generation and as a chemical feedstock. More dilute methane can be used in lean-burn engines or in conjunction with other fuels such as coal waste in fluidised bed systems and kilns. Very dilute methane (<1%) can even be used to replace intake air in small and large combustion systems including gas turbines and full-scale coal-fired power plants. Industrial oxidation systems can destroy methane and, in some situations, produce useful heat in the process. Even the simple flaring of methane oxidises it to CO<sub>2</sub> which is a less potent greenhouse gas.

Despite the obvious advantages to using methane from coal seams to produce energy, relatively few projects have been established. In some cases, the barrier to new projects is simply a lack of available knowledge and experience in CBM/CMM capture and utilisation. In other situations it is a problem with the legal ownership of the gas which halts new projects. Taxes and royalty fees can also be prohibitive in some situations. However, many countries are now waiving such fees, clarifying and even changing legal and ownership rights to promote CBM/CMM projects. The Kyoto Protocol and related emissions trading schemes will help promote further development, although the number of projects that will become viable through CO<sub>2</sub> trading will be highly dependent on the market price of credits. Other market mechanisms, such as the feed-in tariffs used in Germany to guarantee a minimum price for CBM as a fuel, could be vital to the success of many projects if copied elsewhere. Australia has the most innovative CBM/CMM market in the world due to significant government obligations and grants. Tax incentives and adjustments to fees and royalties were largely responsible for the huge CBM/CMM market in the USA and a similar approach is being attempted in Canada, China and India. The table shows the relative achievements in different countries towards promoting CBM/CMM activities.

The success of individual CBM/CMM projects is still highly variable, depending largely on the gas available within the seam and the ease of removing the gas. Although this can be estimated and modelled, there is still a significant amount of risk with many projects that the investment may not be

recovered. Coupled with the relative newness of the technologies involved and the potential legal and financial problems mentioned above, there is still a significant amount of hesitation to invest in these types of project. Several locations in Europe, such as the UK, Germany and Poland, have years of experience with CBM activities but technical and economic barriers are blocking further development. Most projects would still require some form of external funding or credit to make them viable. The greatest number of new projects are being established in China where a combination of large resources, a large potential marketplace and financing possibilities under initiatives such as the Kyoto Protocol have created a tempting situation. Although large CBM reserves and large energy marketplaces may co-exist in many regions of Asia, Africa and South America, nothing is likely to happen unless significant international investment and technology transfer is provided.

International projects such as the UNECE (United Nations Economic Commission for Europe) CMM working group and the US EPA (US Environmental Protection Agency) Methane to Markets partnership aim to disseminate information and match projects with developers and financial investors. Hopefully this will promote investment in CBM/CMM on a much larger scale in the future.

This new report from IEA CCC reviews the different CBM/CMM project types and their potential for use in different countries around the world. It also reviews the different market mechanisms which may help promote the use of the valuable and potentially significant energy source.

Each issue of *Profiles* is based on a detailed study undertaken by IEA Clean Coal Centre, the full report of which is available separately. This particular issue of *Profiles* is based on the report:

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