

CBM REVIEW

Managing the uncertainty

Karl Schultz and Linus Adler, Climate Mitigation Works Ltd, discuss the future of coal mine methane use for greenhouse gas reduction.

A well-worn but fundamentally sound view is that coal mine methane (CMM) projects have an important role in reducing greenhouse gas (GHG) emissions, improving mine safety and providing clean energy to mining communities. While attention to these projects has grown over the past two decades, much more work has to be done before most CMM is harnessed.

Much of the attention to CMM and the challenge of encouraging resource development is found in the context of international policymaking. While overall understanding of the need to limit anthropogenic GHG emissions is growing, significant social and political obstacles remain in place – exemplified by the failure at Copenhagen in 2009 to arrive at a binding treaty to limit these emissions. Nevertheless, carbon markets continue to be a viable destination for investment: in 2009 the aggregate capitalisation of listed companies focused on trading credits was more than US\$ 530 billion.¹ There is a considerable framework in place for developing a growing volume of projects to reduce emissions. The need is to consolidate the gains that have been made, to correct where mechanisms have been shown to be less than effective and to ensure that needed growth continues.

CMM projects have benefited from both the carbon markets and other enabling incentives at the national or sub-national level. A review of many of these will help developers understand what has worked and not worked in stimulating projects, where this has been and what could happen in the future through exploring alternative political-economic scenarios.

FINANCING MECHANISMS FOR CMM

When the flexible mechanisms of the Kyoto Protocol, including the Clean Development Mechanism (CDM) and

Joint Implementation (JI) were introduced, there was an expectation that coalbed methane (CBM) and CMM projects would deliver high volumes of credits. Methane is 23 times more potent as a greenhouse gas than CO₂; the technology for the use of mine emissions is mature; and emissions levels in some of the gassiest mines are considerable. CMM projects are attractive candidates, as a single large mine could generate more than 2 million carbon credits/year.

The situation that actually developed proved to be a bit more disappointing. Of more than 80 CBM/CMM projects that entered into the CDM registration process to date, only twelve have generated certified emissions reductions (CERs), and these have done so only at an average of 44% of their expected rates (for a total of 3.3 million t of CO₂ equivalent [tCO₂e]).² This is owing to problems with technology and operations, policy uncertainties threatening project registrations, and higher risk perceptions from potential investors.

The development of CMM projects under JI has been even slower to take off, as only within the past few years have the first projects at Ukrainian and Russian mines been given approval for registration.

In contrast, financing incentives outside of Kyoto have provided considerable success in some cases in reliably generating emissions reductions and cash flows. Particularly in the US, Germany and the Czech Republic, CMM use has taken off for a number of projects that are largely subsidised and financed outside of the credit markets. Since the enactment of a feed-in tariff in Germany in 2000, for example, the country has become the leading consumer of CMM by percentage of its mine-based emissions, while at the same time overall methane emissions from German mines have dwindled from about 250 million m³/year to less than 50 million m³/year.

Changes in CMM Use After German Feed In Tariff Started

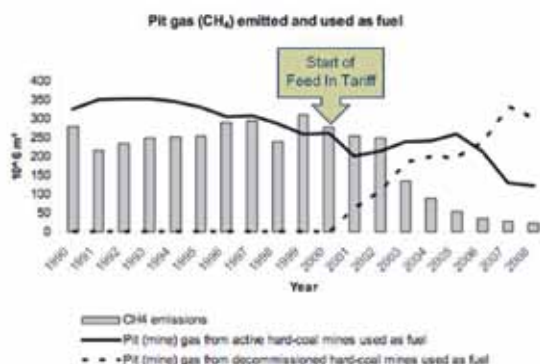


Figure 1. CMM use in Germany (Source: German Federal Environment Agency).

factoring in “unknown unknowns”, standard price forecasts have a less than sterling track record in terms of generating a robust medium to long-term outlook, as can be seen in the comparison of EIA forecasts to actual oil price history (Figure 2).

Carbon credit pricing based on forward curves is another useful instrument for assessment, but because of the risk and uncertainty following the end of the first Kyoto commitment period, the forward price signal falls dramatically (Figure 3).

Because of this forward discount, post-2012 certainty for investment becomes much lower – a factor that has inhibited longer-term investment in carbon markets in general and Kyoto-type projects in particular. After 2012 there are too many supply and demand uncertainties to perform standard forecasts. On the supply side, there is the prospect that many carbon reduction asset classes could be prohibited by whatever framework is developed to succeed Kyoto. Conversely, the continuing uncertainty as to commitments from national actors, such as the US, Australia and China, introduce significant doubt as to how demand will evolve.

SCENARIO SOLUTIONS

Because extrapolation and forward pricing become much less useful post-2012, methods such as scenario analysis may need to be employed. Scenarios may be better described as sketches of indicators and values attached to a potential state of the world, as opposed to forecasts or predictions. Scenarios are useful because they can be used to identify which hedges and investment options need to be taken, given a specific state of the world.

For carbon market scenario outlooks, the drivers that determine scenario outcomes might include the following: global economic growth paths and general economic health; the degree of internationalisation of commerce and synchronisation of regulation; the shape of the overall energy mix and the size of the generation fleet; and the political and economic will to regulate carbon emissions. Given these inputs, the authors took part in a recent session where the following scenarios were developed:

- **Entrenchment:** a world with weak international climate frameworks, no domestic carbon markets, and lack of incentives to invest in efficiency or mitigation.
- **Muddling Through:** a loose international framework with loopholes is developed, participation is not universal, and domestic incentives such as feed-in tariffs become more important.
- **Magic Bullet:** technological breakthroughs, such as carbon capture and storage, cheap renewable energy, nuclear fusion, or even geo-engineering to abate climate change, are introduced. Economic and consumption growth remain high.
- **Socio-Economic Transformation:** The current model for economic growth is redefined, with much more emphasis on slow or no material growth, low energy intensity and greater emphasis on the production of non-physical goods (information, social networks)

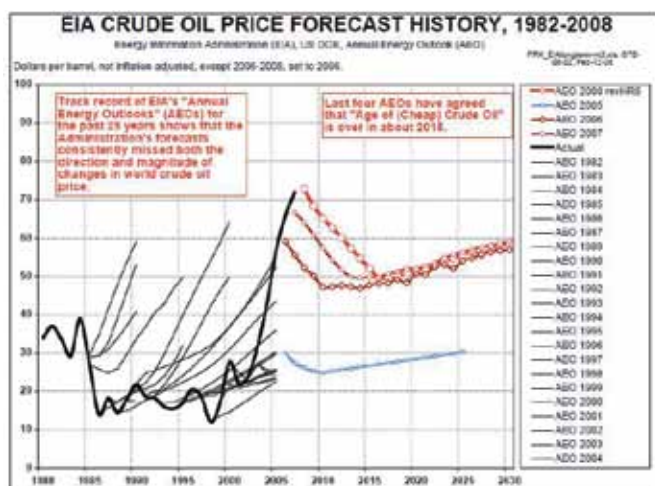


Figure 2. Oil price forecasts vs reality (Source: US Energy Information Agency).

Aside from feed-in-tariffs, other non-credit mechanisms for financing CMM projects include tax credits, clean energy targets, reverse auctions and R&D funding. One reason for the relative success of such measures lies in investment security. In contrast to the market uncertainties and speculation arising from carbon markets, such Government-backed mechanisms provide a lowered level of risk more acceptable to investors.

MANAGING POST-2012 UNCERTAINTIES

Over the short-term, many of the revenue (carbon and other) pricing estimates needed to manage investment risk can be made through the extrapolation of current trends or through forward price curve analysis. Trend extrapolation tends to increasingly diverge from reality the further one advances from the base time period. Furthermore, the divergence is sensitive to how well initial assumptions actually reflect the true drivers of the market. Given the difficulty of modelling all of the known factors and of

Incentives for CMM projects (among other outcomes) vary significantly between these four scenarios (Figure 4).

MARKETS AND SCENARIO INDICATORS

Based on existing national policies to encourage CMM projects, and the above scenario options, we can better outline where policies might head and what it would mean for coal mine methane in the four largest markets (China, the US, Ukraine and Russia) which together are responsible for about 70% of emissions and about 60% of current CMM use globally.³

US

Mines in the US pioneered the use of CMM resources in the 1980s, and since 1994 the capture of CMM emissions has nearly doubled, with the usage rate of drained gas increasing to over 80%. Most of the future growth thus lies in capturing and using ventilation air methane (VAM). However, prospects for further significant growth of this relatively saturated market faces barriers in the inability of the US Government to pass legislation restricting GHG emissions. Nevertheless, the push for regional and state efforts to institute cap-and-trade agreements remains ongoing, and following a recent Supreme Court ruling, the US Environmental Protection Agency is moving forward with regulating GHG emissions under the Clean Air Act.

In the near future, regional and voluntary action will dominate US abatement efforts. While much of this activity centres in the parts of the country without coal mines, such as California and the northeastern states, the offset provisions of these schemes and voluntary offsets are becoming a viable option. Recently deals to generate voluntary offset credits – such as the destruction of VAM emissions in a large West Virginia mine – have become increasingly common.⁴ Under the Entrenchment, Muddling Through and Magic Bullet scenarios above, developments in voluntary markets in the US would be more likely.

RUSSIA

The degasification and methane use rates in Russian coal mines is low, with only 20% of the country's generally high methane emitting mines currently employing degasification. Furthermore, mines use only about 40 million of the estimated 250 million m³ of methane which is drained. The Government's strategy on national power and energy use to 2020, The Energy Policy of Russia, has set out a goal of increasing the percentage of domestic power production from coal to 39%. The International Energy Agency (IEA) has projected that doing so would increase methane emissions from operating mines by 4% / year; therefore, the Government's new energy strategy calls for the adoption of new degasification methods and technologies.⁵ In addition, under a 2003 decree, methane has been classified as a pollutant, with set regional emissions limits and fines payable for emissions into the air and water.⁶

Nevertheless, significant barriers to use still exist, due in part to low domestic gas and fuel prices but also the inability of emissions trading schemes (such as JI) to gain traction and to the lack of a significant Governmental subsidies, regulation or even

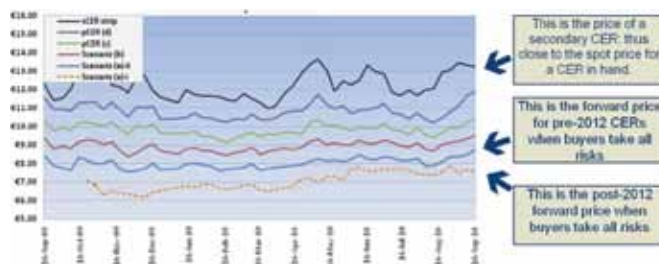


Figure 3. CER forward curve prices (Source: IDEACarbon).



Figure 4. Scenario outcomes.

policy making up to now. However, under the new energy policy, the Government is trying to introduce incentives and reforms, such as degassing rules and tax breaks for CMM sales. The generation of credits under JI is still in the incipient stage, with applications for several mine gas projects having obtained tentative approval for registration within the last few years, but doubts still remain over the viability of obtaining credits for these projects. If JI were not to be a significant driver of project investment in the future, then development of Russian CMM would require a focus on strong domestic incentives, reflecting a trend toward the Muddling Through scenario.

CHINA

With emissions totalling 40% of the global total, China is the world's leading source of CMM. Because of the number of small and unregistered mines and spotty reporting and record keeping, the exact nature and extent of China's CMM resource is hard to measure and monitor. However, Government regulation has recently been stepped up, with closure and consolidation of smaller mines accompanied by increasing regulation of emissions. Policies have been developed to induce sales of gas to the power industry and to provide subsidies for these sales. Although the legislation and policy framework development is probably going in the right direction, enforcement remains local and there is little indication that incentives are being applied.

China hosts the bulk of CDM projects registered worldwide to use CMM and CBM, with over 3 million tCO₂e/year in estimated reductions. But CDM registrations have slowed since new incentives (including a requirement that all coal mine gas over 40% methane concentration be used) have, although not

enforced, resulted in some concerns that the rule making qualification for CDM is less clear cut.⁷ Incentives for further growth of CMM in China would likely revolve around enhanced CDM activity, power market subsidies and the growth of a domestic carbon market. These developments, in turn, would be indicative of the scenarios Muddling Through and Socio-Economic Transformation.

UKRAINE

Although Ukraine's coal production decreased significantly following the collapse of the Soviet Union, in recent years there has been a major restructuring of the industry, including investment by steel firms in a number of well-run export coking coal mines with good gas drainage systems. Another important issue facing the country has been security of supply, as exemplified by Gazprom's tendency to work out contract disputes by means of threatened or actual disruptions of its European pipeline gas exports going through Ukraine. Such actions have stimulated the Government to seek to develop a larger indigenous gas supply, and Ukraine has been active in putting together legislation and a regulatory framework in order to speed up JI and Green Investment Scheme (GIS) project investment and to provide tax incentives for CMM use.

However, while the demand to produce alternative gas sources may be high, to date there has not been enough success in capturing emissions from the country's gassy mines, in part due to factors such as underinvestment and low concentrations of methane in ventilation streams.

CMM use in Ukraine might be helped if mechanisms such as JI or other, newer carbon market tools were to be enhanced, or if there were a more concerted effort toward domestic power subsidisation – both indicative of the Muddling Through and Socio-Economic Transformation scenarios.

CONCLUSION

While existing and potential policies will be important in helping

to shape the growth of CMM use, significant uncertainties make investment decisions difficult, particularly after the end of the first Kyoto crediting period in 2012. The growth of CMM use for climate mitigation will hinge not only on the carbon price, but on the continuation of existing mechanisms, as well as the creation of new mechanisms, for project financing.

When seeking to anticipate future change, the key is to identify those actions that are robust across multiple scenarios and those that are more scenario-specific. Comparing the requirements of the future with current strategy will allow those elements that need to be added, changed or deleted from current strategic plans to be identified. The art of developing a strategy entails making tradeoffs between continuing with current strengths and investing in the new capabilities that will be needed in the future. ●

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