

**InBrief**

# Fugitive methane emissions in coal mining

**Climate Change**  
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## Introduction

On 10 July 2011, the Australian government announced that it would introduce a carbon pricing scheme from 1 July 2012. It will commence with a fixed price period (carbon tax) of AUS\$23/per tonne of carbon dioxide (tCO<sub>2</sub>) increasing by 2.5% real terms per annum and transition to flexible price period (emissions trading scheme) from 2015.

The scheme will cover around 60% of Australia's national emissions from the power generation, stationary energy, parts of transport sector, industrial processes, new sources of waste emissions and fugitive emissions but will exclude the agriculture and land sectors. The Australian government has also proposed a number of taxation changes that include fuel tax credit arrangements.

While the government understands that many Australian industries compete in a global market and their competitiveness could be adversely impacted by a price on carbon, there remains an active public policy debate about the design of the scheme and the appropriate level of assistance to maintain competitiveness.

It is the first time that any major coal exporting country has introduced a price on fugitive emissions. Fugitive emissions arise during the extraction process whereby previously trapped methane (CH<sub>4</sub>) is released into the atmosphere. This topic is not well understood outside of the mining industry and has been viewed primarily as a safety issue for coal operations. This paper considers the key issues around fugitive emissions and the industry implications of applying a price or tax on them.

### Summary points:

- There are significant challenges in the estimation and measurement of fugitive emissions, particularly from open cut coal mines.
- There are technical and safety limits to what can be done to reduce fugitive emissions from coal mining operations. In underground operations, safety will continue to be the major driver for treatment of fugitive emissions irrespective of carbon pricing schemes.
- Placing a carbon price on fugitive emissions from coal mining when the abatement and mitigation options are not mature raises a number of financial, environmental and operational challenges for the coal industry.
- The Australian carbon scheme is moving beyond other major coal exporting and producing countries in terms of putting a price on fugitive emissions.
- Many companies are already investing in projects to utilize rich methane gas from their operations and R&D to improve treatment of low methane concentration air flows.

The ICMM Principles for climate change policy design can be found at [www.icmm.com](http://www.icmm.com).

## Our climate change program

In October 2010, ICMM's Council of CEOs committed its members towards establishing a comprehensive and rigorous climate change management program of policy principles, leading practice and company commitments.

The program is aimed at: (1) ensuring ICMM companies continue to contribute to sustainable development while participating positively in resolution of the climate change challenge; and (2) securing the continued competitiveness of the mining and metals industry in a future low carbon economy.

This initiative seeks a measured transition to a low-carbon future. The principles-based approach at its core is intended as a contribution to the evolution of climate change-related public policy when policies are being designed and implemented. This approach recognizes the reality of nation-specific solutions and is not intended as a means of driving a particular policy mechanism or package of approaches.

Importantly, it recognizes the need for respecting the different cultural, social, political, economic and physical environments around the world and a country's different priorities (for example, poverty reduction, development, adaptation).

The climate change issue has the potential to be a defining issue for ICMM and its members in the eyes of critical external audiences, including governments, industry, civil society and the media.

The core of ICMM's climate change program implementation is provided by:

- a) an integrated set of seven principles for climate change policy design that build on those contained in the 2009 policy.
- b) three focus areas which address the climate change issues which are important to mining and metals companies:
  - national climate policies and competitiveness
  - land use and adaption to the impacts of climate change
  - measurement, reporting and verification of net greenhouse gas activities.
- c) a set of ICMM member company commitments.

## Frequently asked questions

### Q1.

#### What are fugitive emissions?

Fugitive emissions are unintended emissions (including both carbon dioxide and methane) that arise during the production, processing, transport and storage, transmission and distribution of fossil fuels such as black coal, oil and natural gas or liquefied natural gas (LNG).

### Q2.

#### What other industries have fugitive emissions?

Other industries such as agriculture and manufacturing processes also have emissions often referred to as fugitive emissions.

### Q3.

#### Where do fugitive emissions come from in the coal mining process?

Fugitive emissions arise during the coal production/extraction process whereby previously trapped methane and carbon dioxide gas is released into the atmosphere as coal seams are mined.

The level of fugitive emissions from coal mines varies from mine to mine. Factors that influence the amount of fugitive emissions from a coal mine include geology, depth and type of mine, amount and type of gas contained in the coal and whether all gas is automatically released or a portion is retained in the coal.

### Q4.

#### What is the connection between fugitive emissions and coal mine safety?

The problem of fugitive emissions is not new for coal mining firms. Methane is highly combustible when in the mine and therefore a safety risk. Most coal companies will drain as much methane gas from coal seams before mining commences to prevent the risk of outbursts and control gas concentrations as mining progresses. In underground mines, once mining commences the workspace is continually ventilated to dilute any methane present to safe levels. This is often referred to as ventilation air methane or VAM and is typically vented to the atmosphere.

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### Q5.

#### How can fugitive emissions from coal mines be accurately measured?

Fugitive emissions are inherently difficult to accurately calculate and estimates remain subject to large uncertainty. The estimation of fugitive emissions from open cut operations is particularly problematic. The Intergovernmental Panel on Climate Change (IPCC) recommends using mine-specific data as a first best option where possible. In the absence of this, then coal production is multiplied by an emissions factor (often established by the government dependent on the characteristics of the mine and the geography where it operates).

Australian coal miners currently report estimates of these emissions as part of their emissions accounting requirements under the *National Greenhouse and Energy Reporting Scheme* (NGERs) legislation, but there are significant concerns in the industry over the accuracy and ease of these measurements which may lead to high carbon cost uncertainty under carbon pricing schemes.

### Q6.

#### How can fugitive emissions from coal mining be reduced?

*Open cut coal mines:* there are a number of factors mentioned above that influence where it is technically or economically feasible to treat fugitive emissions from open cut coal mines. It should be noted that the gas content of a coal seam is a key determinant and is highly variable (any gas contained in shallow seams targeted for open cut operations has often already been liberated by the time mining commences, and cannot be reduced once released). Based on current available technologies, it is not feasible to abate these fugitive emissions once mining commences at an open cut operation.

*Underground coal mines:* there are a number of potential options for reducing fugitive emissions from underground operations. However the most appropriate approach will depend on a range of factors like concentration of methane in gas levels, composition of gas flows, volume and flow of gas over the life of mine, etc.

In some cases it is technically and economically feasible to progressively pre-drain coal seams prior to mining and this rich methane gas can be utilized for power generation on site. Where operations contain rich methane gas in areas from

The International Council on Mining and Metals (ICMM) was established in 2001 to improve sustainable development performance in the mining and metals industry. Today, it brings together 20 mining and metals companies as well as 31 national and regional mining associations and global commodity associations. Our vision is of member companies working together and with others to strengthen the contribution of mining, minerals and metals to sustainable development.

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which coal has already been removed, this gas may also be utilized for power generation. Typically however the majority of fugitive emissions from underground operations arise from VAM, which contain very low concentrations of methane and are technically very difficult to abate or harness for utilization.

**Q7.**  
**What technology is available to treat fugitive emissions?**

Technologies for utilizing rich methane gas for power generation are well established. Technologies for treating fugitive emissions, particularly VAM are at the early stages of the innovation chain and require significant investment in terms of time and research to demonstrate and deploy on a wide-scale.

Even with new technologies, there may be site-specific physical limitations on the amount of fugitive emissions that can be captured, such as low pressure and low permeability of the gas. Mitigation is therefore currently a costly option for the coal mining industry. This may be why other countries have chosen to exclude fugitive emissions from carbon pricing schemes, most notably in Phase III of the European Union Emission Trading Scheme (EU ETS); the most mature carbon trading scheme in operation worldwide.

**Q8.**  
**How are fugitive emissions treated under the Australian Carbon Scheme?**

Under the Australian scheme, coal companies will be required to pay for every tonne of fugitive emissions they emit from their operations. This is in addition to paying for their direct emissions, carbon costs passed on downstream from electricity generators and some transport emissions. It is unlikely that the coal sector will be granted a free allocation of permits for activities unlike other emissions intensive, trade exposed sectors. Instead the Australian government will provide AUS\$1.3bn in assistance over six years to a proportion of coal mines which are "gassy" (those with at least 0.1t/CO<sub>2</sub>e per tonne of saleable coal). Firms will only receive assistance for up to 80% of their emissions over this threshold.

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**Q9.**  
**What action are companies taking on fugitive emissions?**

The Australian government has also allocated AUS\$70m over six years in the form of grants on a co-contribution basis as part of the "Coal Mining Abatement Technology Support Package" for abatement technologies, including those from fugitive emissions in the coal sector.

A number of mining firms including Xstrata, Rio Tinto, Centennial, Anglo American, and BHP Billiton are already investing significant funds in the development of these new abatement technologies. The scale of the existing investment is already high and there is a risk that the funds in the government's support package will be insufficient to ensure the widespread deployment of these abatement technologies.