

Best Practice Guidance for Effective Methane Drainage and Use at Coal Mines

Activities of the Ad Hoc Group of Experts on
CMM with respect to mine safety

Item 6 of the Agenda

Geneva, 12-13 October 2009

Principal findings

Report outline

Finalisation

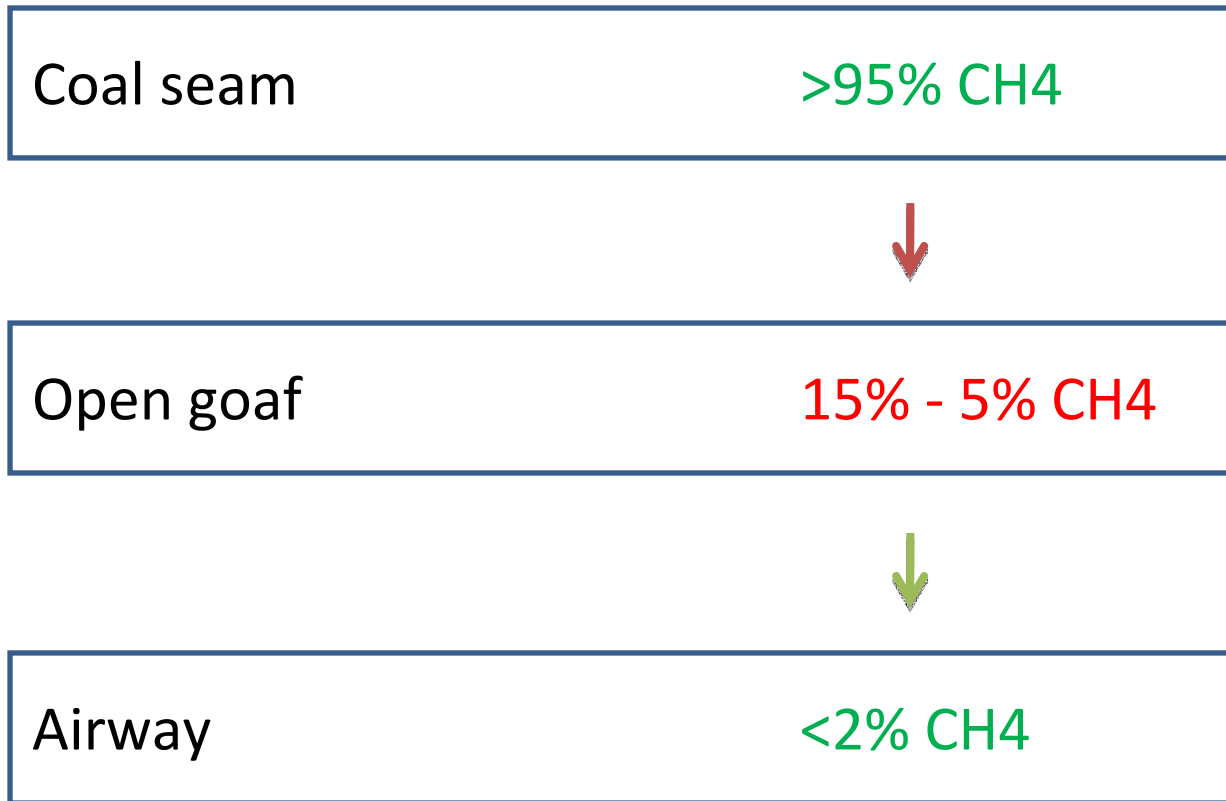
Reduce underground explosion risk



Explosions

- Devastating explosion events killing 100 – 200 miners and more have occurred in 21st Century
- All coal mining countries affected but scale and frequency differs
- Fatalities/Mt: 1.25 China, 0.037 USA, 0.0 NSW Australia
- Explosions are preventable – gas dilution, layer prevention, gas capture, gas transport, ignition sources

Explosive mixtures are unavoidable



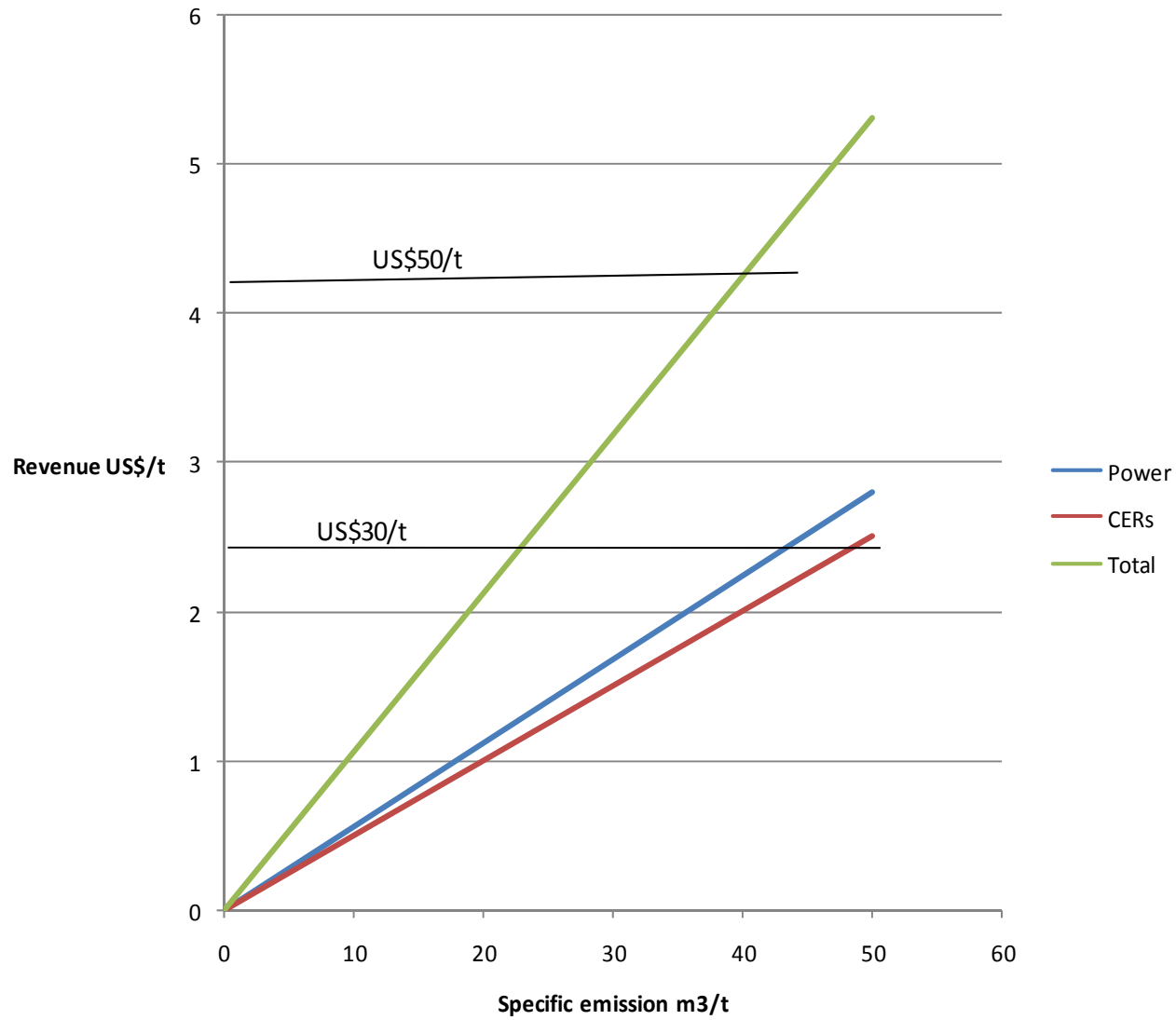
Regulatory and risk control

- Technology alone not enough
- Site specific treatment - risk assessment
- Involve stakeholder most at risk – workers
- Non prescriptive rules except where physical constraint eg explosive limits
- Strong enforcement essential

Climate change

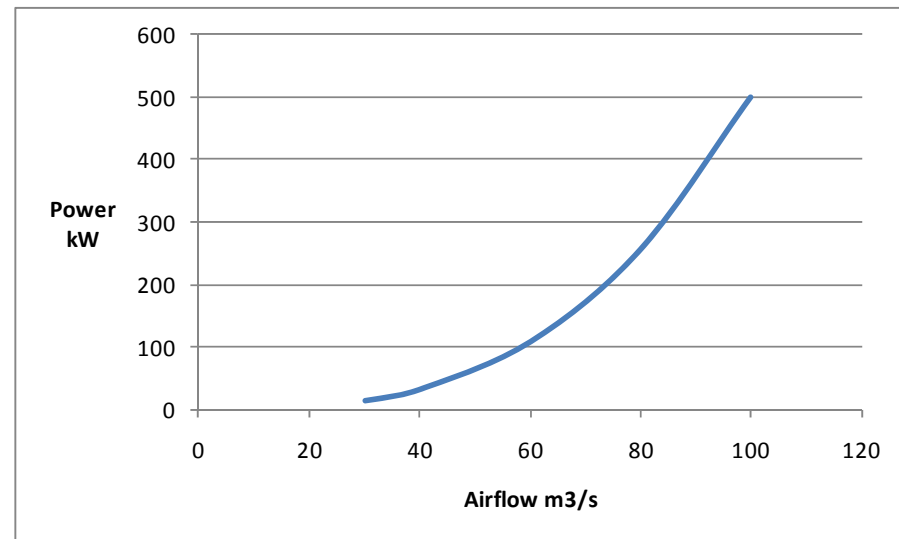
- 2020: 793Mt CO₂ released; 95% from underground
- 70-80% VAM; remainder drained gas and coal product emissions
- Cost to economy not yet borne by mining
- Technology exists which can virtually eliminate methane emissions
- High opportunity cost barrier: but utilisation attractive with high gas/power price plus high carbon price or high emission penalty

CMM projects are “additional”

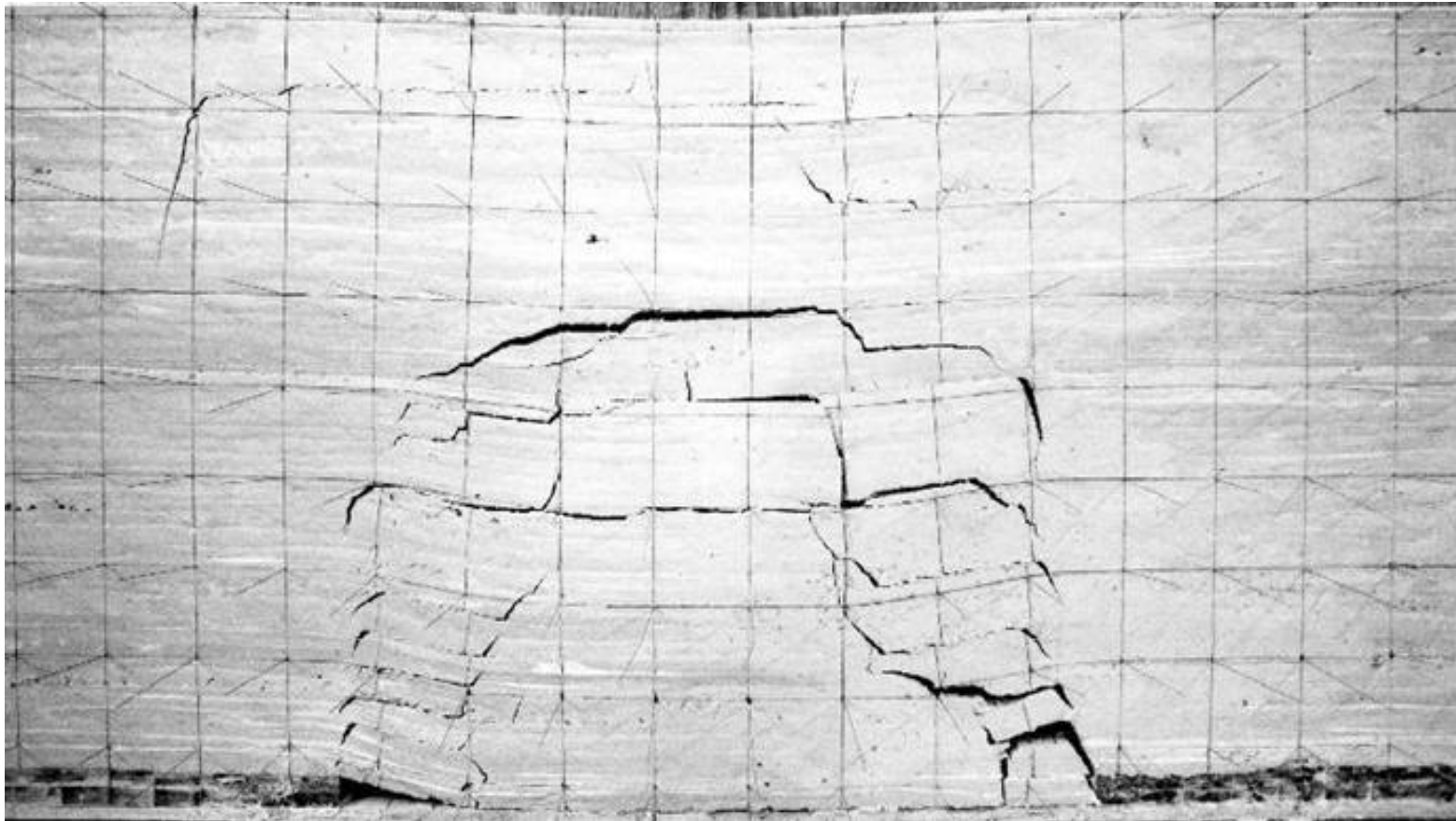


Gas drainage

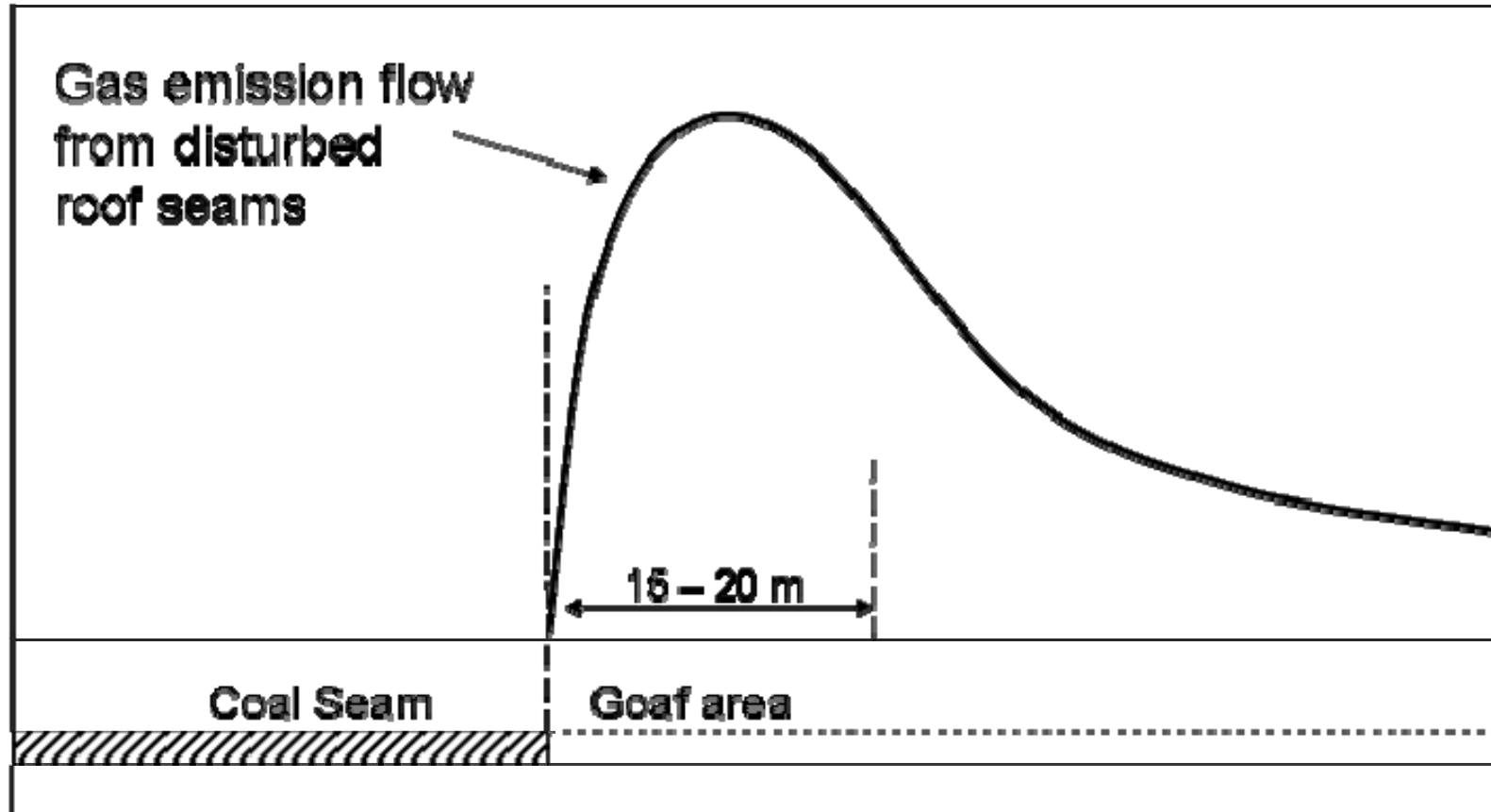
- Many technologies but principles common
- Drainage reduces accident risk and hence mining cost
- Reduces ventilation costs (double airflow, x8 more power)
- Allows increased coal production
- Post drainage – capture gas before excessive dilution so can use
- Captured gas can be used or flared to reduce emissions at low cost
- Drainage of gas at low concentration is dangerous, inefficient and can be avoided



De-stressing zone from which gas released above a longwall



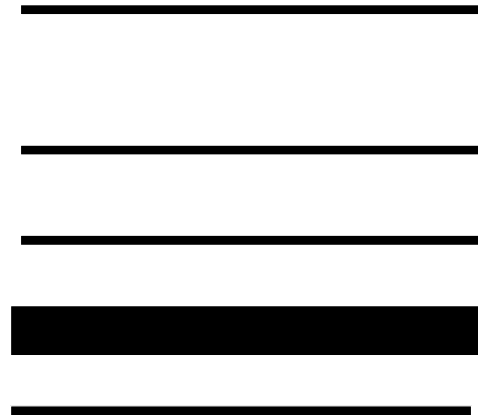
Effective post drainage captures gas where released



Gas drainage options – high permeability coal

Many coal seams in roof and floor (+150;-40m)

- Pre-drainage of worked seam effective
- Post-drainage also needed if gassy



No coal seams in roof and floor (+150;-40m)

- Pre-drainage of worked seam essential if gassy
- Post-drainage of no benefit



Gas drainage options – low permeability coal

Many coal seams in roof and floor (+150;-40m)

- Pre-drainage of worked seam ineffective alone
- Post-drainage essential if gassy – may include floor boreholes



No coal seams in roof and floor (+150;-40m)

- Pre-drainage of worked seam ineffective
- Post-drainage of no benefit
- Ventilation solutions only, coal production rate limited



Main conclusions

- Global application of the accumulated knowledge on methane occurrence, prediction, control and management could virtually eliminate explosion risks in coal mines.
- There is a strong business case for installing and operating high efficiency gas drainage systems
- Methane emissions from underground coal mines can virtually be eliminated using existing technology

Report outline

1. Executive Summary
2. Introduction
3. Fundamentals of gas control
4. Occurrence, release & prediction of gas emissions
5. Mine ventilation
6. Methane drainage
7. Methane utilisation and abatement
8. Cost & economic Issues
9. Conclusions
10. Case studies (5 studies)

Report conclusions

- The global economy, will continue to be dependent on energy from coal for the foreseeable future.
- Coal extraction will become increasingly challenging as shallow reserves are exhausted and deeper and more gassy seams are mined.
- Climate change impacts will lead to greater restrictions on coal mining activities and societies will increasingly demand and expect safer working conditions.
- This guidance is considered a starting point for devising strategy and evolving programs to support the necessary safety and practice improvements from which all mining countries can benefit.

Report conclusions continued

- Technologies now exist that will allow coal mines to maximize gas capture for utilization.
- There is a strong business case for installing and operating high efficiency gas drainage systems.
- Elimination of virtually all mine-mouth emissions through oxidation of the un-captured methane that escapes into the ventilation air is now feasible.
- This high level of emission control only becomes financially viable when supported by a market that assigns a value through carbon credits to environmental protection.

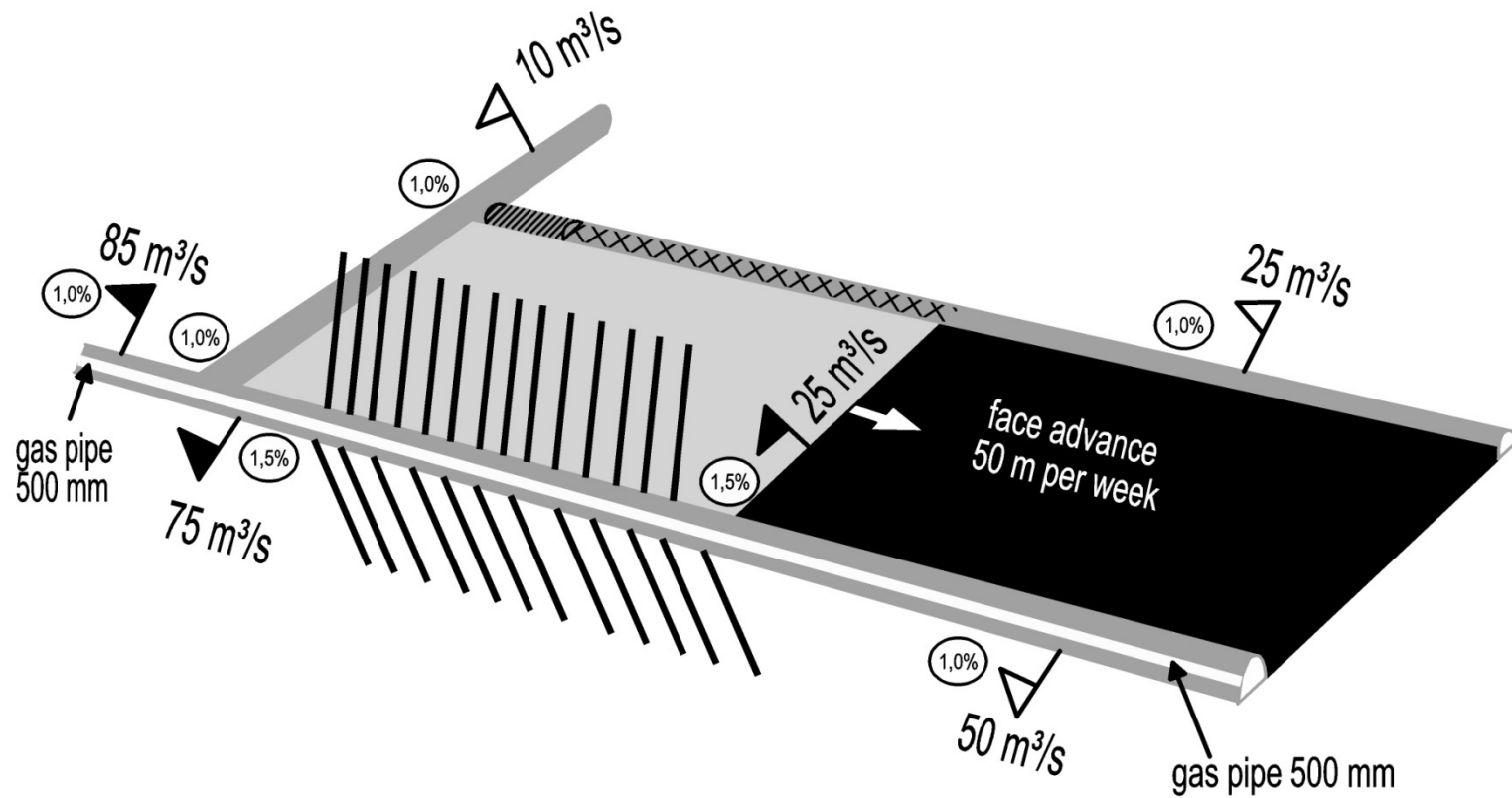
Case Studies

- VAM Case Studies (Megtec or Biothermica)
- Upgrading Technology (Molecular Gate)
- High performance longwall operations in areas with high gas emissions – Germany
- Achieving planned coal production from a gassy, retreat longwall with severe strata stress and a spontaneous combustion prone coal seam – UK
- High performance longwall operations in areas with high gas emissions – Australia
- Development of a CMM power co-generation and emission abatement scheme – China

Molecular Gate Unit for 2.5 MM SCFD



Case Studies: Longwall with Y-shaped, ventilation design and drainage boreholes in the roof and the floor behind the longwall



$1,0\%$ $1,5\%$ = permitted methane concentration

$50 \text{ m}^3/\text{s}$ = airflow

Finalising draft

- Omissions – contractor safety, use of gas storage tanks, environmental regulations on utilisation and destruction?
- Standardising terms – differences between Australian, US, UK and European usage
- Corrections – factual errors, differences of opinion
- Illustrations – simple, clear, relevant – illustrator needed
- Photos – invite submissions, fully attributed and no copyright issues