Gas from sealed areas – a hazard or resource?

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Global mine gas resource

- CMM: 9%
- VAM: 51%
- Mined coal: 2%
- SAM/AMM: 38%
## Mine gas in the life cycle of coal mining

<table>
<thead>
<tr>
<th>Mining cycle</th>
<th>Gas exploitation</th>
<th>Gas composition</th>
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</thead>
<tbody>
<tr>
<td>Exploration</td>
<td>CBM from surface wells</td>
<td>Mainly CH$_4$</td>
</tr>
<tr>
<td>Development</td>
<td>Pre drained CMM</td>
<td>CH$_4$ + air</td>
</tr>
<tr>
<td>Production</td>
<td>Post drained CMM</td>
<td></td>
</tr>
<tr>
<td>Sealing</td>
<td>SAM</td>
<td>CH$_4$ + air + N$_2$ + CO$_2$</td>
</tr>
<tr>
<td>Mine closure</td>
<td>AMM</td>
<td>CH$_4$ + N$_2$ + CO$_2$</td>
</tr>
</tbody>
</table>
Basic concepts – gas release from longwall mining
What is Sealed Area Methane (SAM)?

From Lunarzewski
What is Sealed Area Methane (SAM)?

Methane flows during coal production

Panel sealed

SAM flows

From Lunarzewski and Creedy, 2006
SAM resources and reserves

- SAM resource = residual volume of gas available in un-mined coal and void spaces

- SAM reserves = gas recoverable at commercial flow rates at a suction pressure that can be applied without inducing significant increase in CO and O2 concentrations. Flooded areas are excluded.
Why seal off mined-out areas?
Atmospheric pressure rising

Airway

Seal

Sealed area

Leakage flow
Atmospheric pressure falling

Airway  Seal  Sealed area

Leakage flow
Seal control

Gas sampling

Gas drainage

Nitrogen injection

Water drainage

Packing injection
Control of sealed areas creates best conditions for methane recovery

- Good standard of sealing – high quality gas
- Gas and water monitoring – good data for planning
- Underground gas drainage or surface venting arrangements – gas production facility
Feasibility of SAM extraction and use

SAM resources & reserves

• Residual gas content of coal seams
• Quantity of unworked coal comprising the gas reservoir
• Dimensions of the sealed area
• Water inflows
• Gas quality
Feasibility of SAM extraction and use

Gas extraction

• Access to sealed areas – underground, surface borehole, shaft
• Methane drainage capacity
• Expertise and skills in gas extraction and use
Feasibility of SAM extraction and use

Commercial and legal factors

- Gas and power price
- Accessibility of market – pipeline, customer, grid connection
- Carbon revenues
- Ownership of the gas and land access rights
Revenue from SAM
Where are the opportunities?

Extensive sealed areas in working, gassy, longwall mines represent potential mine gas production opportunities.

Where mining depths are relatively shallow, SAM can be accessed easily from surface boreholes drilled into abandoned mine roadways.
Conclusions

Sealed Area Methane (SAM) is similar in origin to Abandoned Mine Methane (AMM).

The difference is in the accessibility and controllability of the gas for SAM compared with AMM.
Conclusions

SAM is a potential asset that can provide:

– Additional value from mining using proven technology
– Clean energy
– Carbon revenues from emissions mitigation
Attention to SAM production detail will reduce sealed area explosion risk and vice versa.
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Thank you for listening