Pre-mine Drainage – Overview of CBM Projects in Poland

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Agenda

1. Coal resources in Poland
2. Methane emission from coal
3. GEO-METHANE experimental project
4. Gilowice pilot project results
5. International Centre of Excellence on Coal Mine Methane in Poland
Coalbed Methane Resources in the Polish Coal Basins

Map showing the distribution of coalbed methane resources in the Polish Coal Basins. The map highlights the Lower Silesian Coal Basin (LSCB), Upper Silesian Coal Basin (USCB), and Lublin Coal Basin. The map includes data on methane resources in specific years, such as 1989 and 2015, and indicates the number of mines and coal output in million t. The data is presented in a table format with columns for years, methane resources, and number of mines. The map also shows the number of mines and coal output. The website www.igg.pl/ICE-CMM is provided for further information.

Workshop on Best Practices in Coal Mine Methane Capture and Utilization

Bogota, 24-25 July 2018
Methane Emission from Coal Mines in the USCB

**Emissions, Recovery and Utilization of Methane in 2016 [MMm³]**

<table>
<thead>
<tr>
<th>Methane volume</th>
<th>Emission to atmosphere</th>
</tr>
</thead>
<tbody>
<tr>
<td>total</td>
<td>captured</td>
</tr>
<tr>
<td>933.8</td>
<td>342.1</td>
</tr>
</tbody>
</table>

**Measured volume of methane**
(methane released and recorded by mines – methane contained in ventilation air + methane captured)

933.8 MMm³

**Unmeasured methane sources**
(“non-methane” and “low methane” mines + extracted coal and barren rock consisting of 5–10% of measured methane)

ca. 45–90 MMm³

**Total volume of methane emission per year**: ca. 780–825 MMm³

(1 CH₄ = 25 CO₂, → 20 Bm³ CO₂)

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It is critical to initiate systematic efforts leading to a comprehensive solution, or, at least, considerable reduction of coal mine methane problem.

In the light of current and future energy policy of Poland, coal, recovered from domestic resources, will continue to be, for many years, the dominant fuel for energy industry.

It is also important to change the perception of methane, especially in the coal industry sector:

from a hazardous waste to be disposed of, to a valuable energy commodity

The long-term solution to the problem of gassy mines in USCB

PRE-MINE DRAINAGE OF COAL SEAMS

Methane recovery from coal seams for a few or several years before mining:

- early recovery of valuable energy source (1.0–1.5 Bm$^3$, increasing domestic gas production)
- extraction of coal in more favorable mining and economic conditions (reduction of methane hazard, improved work safety, significant reduction of coal extraction costs)
- reduction of methane emissions to the atmosphere (mitigation of the greenhouse effect, reducing the cost of emission fees, especially in case of EU ETS)
Overview of the GEO-METHANE Experimental Program: Pre-mine Drainage of Methane from Coal Seams using Surface Wells

Polish Oil & Gas Company + Polish Geological Institute – National Research Institute (PGNiG S.A. + PIG-PIB)
Objectives of Work and Studies

1. To support development of CBM production technologies in the Polish coal basins, as well as methane drainage of coal mines:
   - increasing gas production potential in Poland
   - supporting the domestic coal mining industry with a comprehensive solution to the problem of methane emissions in coal mines.

2. Determining, on an experimental basis, the screening criteria for pre-mine drainage of coal seam gas depending on geological-mining conditions.

3. Development of directional drilling technologies and methods of coalbed gas production enhancement suitable for the Upper Silesian Coal Basin conditions.

4. In case of positive results, find a trial application in order to demonstrate the feasibility of the pre-mine drainage technology, and subsequently its implementation in the selected area.

Phases of work:

- Phase I – Experimental Project (Gilowice)
- Phase II – Pilot
- Phase III – Implementation (Production)

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**Gilowice-1**
- final depth – 1080 m (TVD 1039.2 m)
- thickness of 510 coal seam – 5.28 m
- gas contents of 510 coal seam – 13.7 m³/t

**Gilowice-2H**
- final depth – 2300 m (TVD 850 m)
- length of the lateral well in 510 coal seam – 1505 m

**Primary objectives:**
1. Hydraulic fracturing of the Gilowice-2H well
2. Methane production tests
Gilowice-1 and 2H testing

- Downhole pressure [bar]
- Water production [m³/day]
- Gas flow rate [m³/day]
- Dewatering: 7000 m³/day
- Stabilization: 5200–5400 m³/day
- Dart Energy: max. 170 m³/day

CH₄: 98.04–99.25%
Geo-Methane Phase II – Pilot

Scope of work:

1. **Drilling of experimental wells** in 3 areas with different geological and mining conditions, with variable patterns of laterals relative to coal seams and type of intersections.

2. **Comprehensive evaluation** of the CBM production parameters (field and lab tests).

3. **Methane production enhancement** – fracture stimulation using different techniques, with a possibility of refracturing.

4. **CBM gas production tests** with determination of gas flow rates in a long period (2-3 years) and the analysis of gas flow variations.

5. **Verification of technical parameters** of gas recovery and transmission and the feasibility of the CBM development project (on a stand alone basis).

6. **Evaluation of the methane recovery effects** for coalbed gas content reduction of the planned longwall panels.

7. **Detailed feasibility study of pre-mine drainage** of coal seams in the mining industry including underground demethanisation cost analysis.

**Completion time of Phase II: 4–5 years**
Geo-Methane Phase III – Implementation

**Scope of work:**

1. **Drilling a number of directional wells**, on a selected location, with special production stimulation treatments and installations for gas recovery and transmission (or local use); 12 multilateral clusters of directional wells in the area of 18-20 km² are assumed.

2. **Carrying out gas production** until the flow rates drop to the level predetermined in the previous phases, as justified by geological, mining, and economic conditions.

3. **Report** on the implementation phase and business evaluation of the work performed.

**Completion time of Phase III: 5–7 years**
ICE-CMM
International Centre of Excellence on Coal Mine Methane in Poland
Founders of ICE-CMM Poland

Central Mining Institute
Polish Geological Institute – National Research Institute
Oil and Gas Institute – National Research Institute
Polish Oil and Gas Company

The Center in Poland operates within
The Chamber of the Natural Gas Industry

and under UNECE patronage

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Thank you for your attention