Is There Methane Gas Potential in Colombia? Experience in Estimating CBM Resources in the Country

DIRECTION OF MINERALS RESOURCES
Research and Prospecting of Energy Mineral Resources Group

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Cracow, Poland, 27 February 2019
Themes

1. Background CBM in the SGC
2. Evaluated areas for CBM
3. Work methodology estimating CBM resources
4. Results
5. Projections
1. Background CBM in the SGC

- **Legal:** In the document Conpes 3517 of May 12/2008, whose objective is to set “Policy guidelines for the allocation of the rights of exploration and exploitation of methane gas in coal deposits and the development of technical standards for their exploitation”, it is recommended that the Ministry of Mines and Energy supported by the ANH and SGC issue technical standards for the exploration and production of this resource and coordinate the management and provision of technical information.

- **Mining Safety:** Accidents registered in coal mines caused by methane gas explosion, especially in the departments of Boyacá, Cundinamarca, Norte de Santander y Antioquia.

- **Environmental:** Methane gas is considered a Greenhouse gas, 21 times more powerful than CO\textsubscript{2} and at the same time a gas that influences the global warming of the planet.

- **Geoscientific Knowledge:** The SGC, since 2010, has been conducting exploration studies of Methane Gas Associated to Coal (GMAC), to obtain information on the origin, accumulation and potentiality of this resource, as another source of energy for the country, characterizing coal seam in terms of GMAC content.
**Carboniferous Potential of Colombia**

In the country 12 carboniferous zones has been defined.

Potential 16.678 MT (SGC, 2016)
2. Areas evaluated for CBM.

2012  Checua-Lenguazaque
2013  Tasco-Socotá
2014  Umbita-Rondón
2015  Carmen de Chucurí
2016  Landázuri-Vélez
2017  Guaduas Caparrapí
2018  Machetá – Jenesano
Geological structures of interest

Areas 1 y 2. Sinclinal Checua-Lenguazaque

Area 3. Sinclinal Rucú

Area 3. Anticlinal Socotá

Area 4. Sinclinal Úmbita
3. Work methodology estimating CBM resources

- **Stage 1**
  Information diagnosis

- **Stage 2**
  Project socialization
  Surface geology
  Mining activity review

- **Stage 3**
  Subsurface geology

- **Stage 4**
  Physical – chemical characterization of coal
  CBM potential calculation
  Final report
Stage 1  Diagnosis of geological information of carbons

Review of geological studies of coal exploration in the sectors of interest.

- Geological cartography
- Stratigraphy
- Coal seams
- Qualities
Stage 2  Project Socialization

• Civil authorities

• Military authorities

• Communities
Stage 2. Surface Geology and Mining

- Cartography review in the field. (continuity in the seams, inclination angles of the layers).


- Evaluation of the topographic characteristics of the sector (acces roads, water sources presnt, etc).

- Determination of perforation points.
Stage 3  Subsurface geology

- Perforation with core recovery
- Sampling for physicochemical measurements and analysis
Stage 4  Characterization and calculation of the CBM potential
Sampling and measurement of CBM contents

*Preparation of canister*

*Sampling and hermetic seal*
Measurement of lost and desorbed gas in the field

Measurement desorbed and residual gas in the laboratory
Sampling and measurement of CBM contents

Information processing - software Terragam

Introduction of basic data about the well and simples.

Filling of measurement data for each sample, gas lost and desorbed.

Obtaining graphs of desorption and value of gas lost more desorbed.
Physical - chemical characterization of coals

- Close analysis (residual moisture, volatile matter, ash and fixed carbon)
- Elemental Analysis (carbon, hydrogen, nitrogen and total sulfur)
- Ash chemistry (ten major elements)
- Minor elements
- Calorific power
- Mercury
- Swelling index
- Plastometry
- Petrography
- Chromatography

- Thermochronology – fission traces and stable isotopes
  (Research group and Nuclear and Geochronological applications)
Geochronology and Thermochronology Laboratory

**Campo**
- Muestreo
- Recepción de muestras
- Separación de minerales y montaje
- Pulido y ataque químico
- Revelado de huellas naturales
- Irradiación
- Revelado del detector externo
- Conteoh cruzado
- Determinación de la edad
- Interpretación

**Trabajo de laboratorio**
- Definición conjunta con el proyecto de conocimiento
- Interacción con el proyecto de conocimiento

**SGC**
- Modelo térmico como aporte al proyecto de conocimiento

**Nuclear Reactor**
Map of Structural Contours. Sector GMAC Carmen de Chucurí. 2015

Determinación de áreas de cálculo
4. Main Results

- Realization of 15 exploratory drilling in Cundinamarca, Boyacá y Santander, with depths between 300 a 600 m. In total 7235 m have been drilled with cores recovery.
- Coal characterization and GMAC potential evaluation.
- Obtaining coal samples with methane gas contents up to 730 ft3/ton. The highest values of GMAC were registered in the Departament of Santander in type coal Bituminous low to high volatile and Semi - anthracite.

<table>
<thead>
<tr>
<th>Año</th>
<th>Área</th>
<th>Pozos</th>
<th>Prof. Metros</th>
<th>Contenidos CBM (Pies3/ton)</th>
<th>Potencial (Bcf)</th>
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<td>Checua-Lenguazaque (Tausa-Cucunubá)</td>
<td>Sutatausa 1</td>
<td>400</td>
<td>11 - 73</td>
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<td>Cucunubá 3</td>
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<td></td>
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<td>Samacá 2</td>
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<td></td>
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<td>2014</td>
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<td>Chinavita 1</td>
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<td>2015</td>
<td>El Carmen de Chucurí</td>
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<td>Guaduas 1</td>
<td>500</td>
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Fuente: Datos del estudio
5. Projections

- Determine the incidence and prioritization of parameters in the CBM exploration.

- Add complementary analyzes (Isotherms, Pyrolysis, permeability, etc.).

- Review existing methodologies on calculation of CBM resources and reserves.

- Prepare map of CBM potential for the country.

- Gas measurements in the development in mining exploration activities.
Thank you

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