PILOT PROJECTS OF UNCONVENTIONAL GAS

Delivered at
A Regional Workshop on the Changing Global Gas Market and Unconventional Gas
INTRODUCTION

Lemigas has been conducting two major projects consisting of Coal Bed Methane (CBM) and Shale Gas.

These projects are aimed to explore CBM and Shale Gas potential in order to increase Indonesia’s Gas Reserve.

These projects are also intended to verify the potency of CBM and Shale Gas in Indonesia with the purpose of encouraging investment in CBM and Shale Gas exploitation.

These projects provide the opportunity to master the exploration and exploitation technologies of CBM and Shale Gas.
DEVELOPMENT OF CBM PILOT PROJECT
**CBM R&D TECHNOLOGY**

- Exploring the potential of Coal Bed Methane in order to increase National Gas Reserve.
- Verifying the potency of CBM in Indonesia with the purpose of encouraging investment in CBM exploitation.
- Mastery of exploration and exploitation technologies of CBM.

## MOTIVATIONS

<table>
<thead>
<tr>
<th>Basin</th>
<th>Target Formation</th>
<th>Coal Thickness (m)</th>
<th>Coal Rank (Ro %)</th>
<th>Avg. Depth (m)</th>
<th>Completable Resources (TCF)</th>
<th>Concentration (Bcf/mi²)</th>
<th>Ranking</th>
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<td>4.7</td>
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<td><strong>Total</strong></td>
<td></td>
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<td><strong>453.3</strong></td>
<td><strong>15.0</strong></td>
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**COAL BED METHANE RESOURCES IN INDONESIA (IN TCF)**

- **Total CBM Resources**: 453.3 TCF
- **Total of CBM Basins**: 11
CBM R&D TECHNOLOGY

LOCATION OF CBM PILOT PROJECT RAMBUTAN FIELD

CBM Wells with “Five Spot” Model

Rambutan Field

CBM-1 Well Drilled in 2004
INDONESIA CBM CONTRACT AREA MAP
@OCTOBER 2012
SHALE GAS PILOT PROJECT IN NORTH SUMATRA AND SOUTH KALIMANTAN
ROAD MAP OF SHALE GAS PILOT PROJECT IN NORTH SUMATRA AND SOUTH KALIMANTAN

Lemigas in cooperation with PT. Pertamina EP:

- **2011**: Regional Geology and Geophysics Study of Shale Gas Potential
- **2012**: Detail Geology and Geophysics Study of Shale Gas Potential
- **2013**: Geology, Geophysics and Reservoir (GGR) Study of Shale Gas Prospect, and propose well location
- **2014**: Drilling, Fracturing and Production Evaluation of Shale Gas Prospect
Unconventional natural gas reservoir contained in fine grained sedimentary rocks, dominated by shale containing clay and other minerals like quartz, calcite.

The shales typically serve as source, reservoir and seal of the hydrocarbons.

Total organic carbon, Thermal maturity, Mineralogy and Natural fractures are key.
SHALE GAS POTENTIAL STUDY IN NORTH SUMATRA
LOCATION OF NORTH SUMATRA BASIN
STRATIGRAPHY OF NORTH SUMATRA BASIN

(Kjellgren & Sugiarto, 1989)
Sample No : BK-25

No. samples : 10

- Lithology : Fossilliferous Shale
- Mineralogi : Quartz, Carbonate, and Clay
- Brittleness Index (average) : 0.64
- TOC (average) : 0.90
- Tmax (average) : 433°C
- VR (average) : 0.59

Summary : fair - good shale gas quality
BELUMAI FORMATION

Sample No : TKH-II 4

No. samples : 8

- Lithology : Fossilliferous Shale
- Mineralogi : Quartz, Carbonate, and Clay
- Brittleness Index (average) : 0.67
- TOC (average) : 0.94
- Tmax (average) : 429 °C

Summary : fair – good shale gas quality
BAMPO FORMATION

Sample No : TKH-11-5

No. samples : 5

- Lithology : Silty Shale
- Mineralogy : Quartz, Carbonate, and Clay
- Britteness Index (average) : 0.56
- TOC (average) : 0.59
- Tmax (average) : 439 °C
- VR (average) : 1.0

Summary : fair shale gas quality
SUMMARY:

- Prospecting formations are Baong, Belumai and Bampo Formations
- Bampo Formation indicates fair shale gas quality, whereas Belumai and Baong Formations show fair-good shale gas quality
- Shale gas resource calculation of these formations is 114.35 TCF
SHALE GAS POTENTIAL STUDY IN SOUTH KALIMANTAN
LOCATION OF BARITO BASIN
SOUTH KALIMANTAN

(Satyana et al., 1999)
STRATIGRAPHY OF BARITO BASIN
SOUTH KALIMANTAN

SHALE GAS PROSPECT

(Rotinsulu, 1993)
No. samples : 20

- Lithology : Silty Shale
- Mineralogy : Quartz, Carbonate, and Clay
- Brittleness Index (average) : 0.59
- TOC (average) : 0.53
- Tmax (average) : 450°C

Summary : poor - fair shale gas quality
NE – SW SEISMIC SECTION OF SOUTH KALIMANTAN AREA
SUMMARY:

- The most prospecting formation in South Kalimantan is Tanjung Formation
- Tanjung Formation indicates poor–fair shale gas quality
- Shale Gas resource calculation of the Tanjung Formation is 165.1 TCF
CONCLUSION

Lemigas has concluded the CBM pilot project in South Sumatra area. The exploration and exploitation activities proved CBM reserve discovery which was then produced to generate electricity (CBM to power).

Shale gas pilot project is currently in the exploration stage which is unable to define prospecting locations and calculate its gas resource within North Sumatra and South Kalimantan areas.

With support from PT. Pertamina EP, shale gas project will continue to perform drilling and fracturing activities next year to prove new gas discovery.

Both CBM and shale gas projects are hoped to encourage CBM and shale gas activities by investors which results in the increase of Indonesia’s gas reserve.
THANK YOU