ZIMBABWE’S COAL-BED METHANE POTENTIAL

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• Until the late 1980s, Southern Africa was one of the most overlooked areas for gas deposits.
• Geological investigations carried out over the Karoo basins during the first post independence decade revealed untapped coal-bed gas resources in these areas.
• The revelation triggered a CBM hive of activity on either side of the country’s geographic water-shed, but with more emphasis on Mid Zambezi Basin(Fig.1).
INTRODUCTION (cont)

• Results from the ongoing exploration activities continue to support the high level of potential for coal-bed methane gas production in Zimbabwe.
MAIN PLAYERS

• Among the initial pack were:
  Ÿ Shangani Energy Exploration (SEE)
  Ÿ Discovery Invesments(DI)
  Ÿ Hwange Colliery Company Limited(HCCL)
  Ÿ Apfen
  Ÿ Trotter
  Ÿ Zambezi Gas(ZG)
CO-ORDINATION OF ACTIVITIES

• Government formed Lupane Gas Development Company (Pvt) Limited as vehicle to handle all matters relating to CBM development in Zimbabwe.

• The Lupgas project was defined in terms of three platforms:
  Ŷ Policy and regulatory frame work in relation to gas extraction (relevant taskforce to meet regularly)
  Ŷ Research support mechanism (Geo. Surv., IMR, SIRDC)
  Ŷ Technical Committee.
ZIMBABWE’S CBM LOCATIONS TO DATE

Hwange Area
- Ŷ Entuba (Hwange Colliery & Zambezi Gas)
- Ŷ Luseche (Shangani Energy Exploration)
- Ŷ Hwange Concession (HCCL)

Lupane – Gwayi
- Ŷ Lupane (Shangani Energy Exploration)
- Ŷ Halfway House (Shangani Energy Exploration)
- Ŷ Lubimbi (Hwange Colliery & Shangani Energy Exp)
- Ŷ Sengwa (Rio Tinto)
HWANGE REDUCED CONCESSION (HRC)
ZIMBABWE’S CBM ATTRIBUTES

a) Depth of CBM Intersections

- Hwange Area
  - Entuba – 501m
  - Luseche – 835m
  - Hwange Reduced Concession – 250m

- Lupane Area
  - Special Grant 1729 – 1000m

- Lubimbi Area
  - Hwange 03/04 (LC91) – 453m
No Sample tromp A91 gas test
No Sample tromp B91 gas test
No Sample tromp C91 gas test
No Sample tromp D91 gas test
No Sample tromp F91 gas test
No Sample tromp G& H91 gas test
No Sample tromp H91 gas test
No Sample tromp K91 gas test
No Sample tromp L91 gas test

CARB MST-Carbonaceous Mudstone
LH SST –Lower Hwange Sandstone
<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>% Ash</th>
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<td>475.21</td>
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<td>17.5</td>
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**ENTUBA-BH007204**

- **OVERBURDEN**
- **CARBONACEOUS MUDSTONE**
- **HWANGE POWER STATION COAL (HPS)**
- **HWANGE COKING COAL (HCC)**

**Fig. 6**

Gas intersections
Depth vs Gas Content (cont)
b) Permeability

- Is a measure of how fast and how much CBM can move through the coal mass and is a major determining factor in CBM production success.
- The Zambezi Basin has been described as a half graben structure (Orpen et al. 1989).
- This has produced tensional forces that enhance creation of open fractures in subsurface strata. These fractures that have been observed directly in cores and underground workings enhance gas permeability in targeted areas.
c) Ash Levels vs Gas Content

Fig. 8
d) Coal Rank vs Gas Potential

![Diagram showing the relationship between coal rank and gas potential](image)

- **Ro (%)** column indicates the Ro% of coal.
- **Coal Rank** category includes Lignite, Sub-bituminous, Bituminous, and Anthracite.
- **Relative Abundance** shows the abundance of gases like biogenic methane, nitrogen, carbon dioxide in different basins.
- **Basins** include Powder River Basin, Botswana, Zimbabwe, Sydney Basin, and San Juan Basin.

*Modified from: Montgomery, 1999*
CBM AND SUBTERRANEAN WATER

• In all area the CBM has been intersected, there have been copious amounts of underground water associated with the gas.
• The water has attracted both domestic and wild animals as well as aquatic life (Entuba).
• Small linear green vegetation patches have developed in these areas, as a result of flows and surface seepage of the water ex-CBM drillholes.
INDICATED GAS RESOURCE TO DATE

CBM gas resource has been estimated at Gwayi, Luseche, Lupane and Hwange. The estimated figures are as follows in cubic metres of the gas:

- Hwange Concession (half of area) : 150 000 000
- Luseche (one third of SG 1806) : 175 000 000
- Gwayi (three quarters of SG 1312): 54 000 000
- Lupane (one third of SG 1731) : 436 000 000

- The gas resource quantity at Lubimbi is still classified as “proprietary information” and could not be disclosed by Discovery Investment at the time of preparation of this document.
POTENTIAL USES OF CBM IN ZIMBABWE

• Direct power generation – the country currently imports huge quantities of power from neighbouring states (Mozambique, South Africa, DRC)

• Co-firing – combining the gas with the high ash coals in thermal power generation (e.g. the “carbonaceous mudstones currently discarded at Hwange Colliery could be turned into a thermal coal reserve)
POTENTIAL USES OF CBM IN ZIMBABWE (cont)

• CBM is a form of natural gas can be a chemical feedstock for production of, explosives, polythene, fertilizer and many other petrochemical industries. The country’s fertilizer plant at Kwe Kwe, in particular, is threatened due to its requirement of large amount of electric power.

• In compressed natural gas (CNG) and liquid natural gas (LNG) which could replace imported diesel and petrol transport and the nation’s agricultural fleet.
POTENTIAL USES OF CBM (cont)

• The large volumes of water produced together with CBM could turn the otherwise arid regions of the western Zimbabwe into green belts and provide water for livestock.
CONCLUSION

• Zimbabwean Karoo basins have a good potential for CBM.
• Judging from gas estimated for a relatively small portion of the basin, the Zambezi Basin alone could be home to very huge deposits of the gas that will contribute significantly to nation’s energy needs.
• The CBM is intrinsically linked to the proven resources of quality coal at both mineable and sub-mineable depths.
CONCLUSION (cont)

• The wide array of CBM uses and savings on the foreign printed dollar makes the CBM “a resource lying like a flower bed in Zimbabwe’s Karoo basins, ready to blossom forth with a contribution of clean energy to brighten Africa’s future” (Tromp).

• CBM, being a pure natural gas that requires little processing, is the cleanest form of fossil fuel.

• Large volumes of produced water could create green belts, providing employment and water for livestock in dry areas of western Zimbabwe.
THE END
and
THANK YOU!