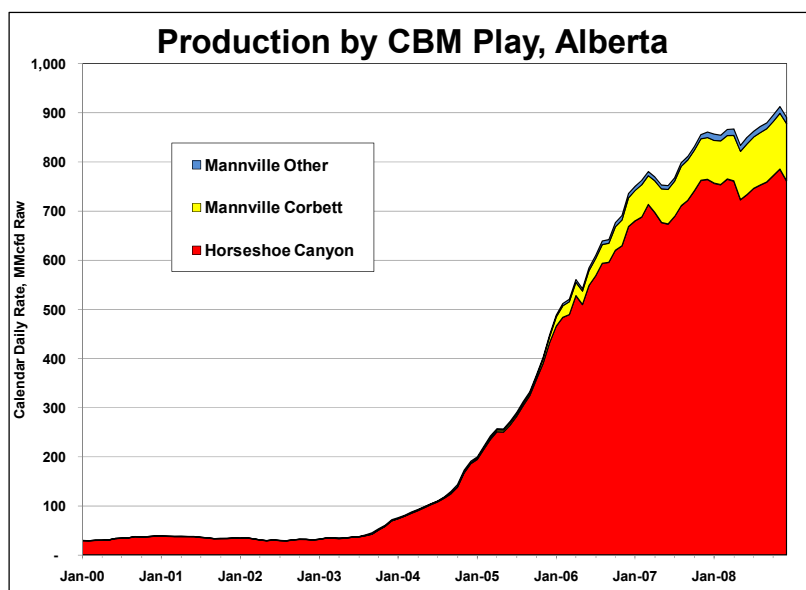


# Coalbed Methane Play Characterization

## Coalbed Methane

With supply declining from conventional sources, coalbed methane (CBM) has become an important source of natural gas supply, both in Canada and the United States. Coalbed methane production accounted for 900 MMcfd (about 5%) of total raw gas output from the Western Canadian Sedimentary Basin (WCSB) in 2008. Over 40 potential CBM plays have been identified in Canada in basins and coal zones from coast to coast to coast. Coalbed methane is also referred to as natural gas from coal (NGC) or coal seam gas (CSG).

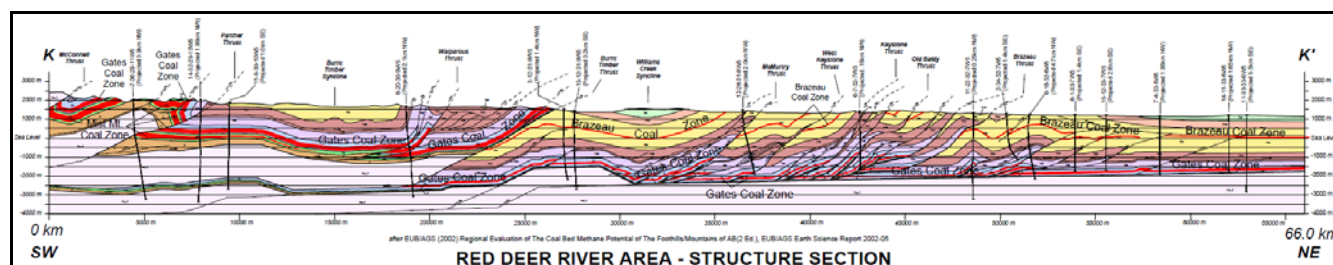


Forward Energy provides two kinds of analysis regarding Canadian CBM plays:

1. Play Resource Characterization - in-situ resource for CBM plays nationwide
2. Production Characterization of producing plays

## Play Resource Characterization

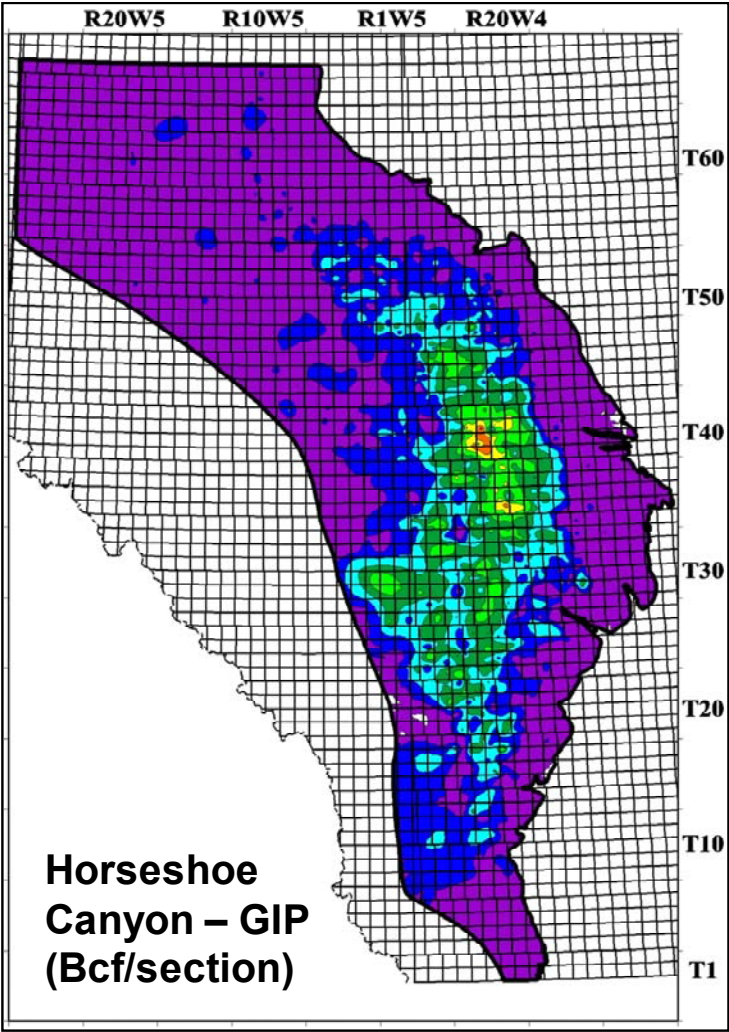
The in-situ gas resource of CBM in Canada is estimated to be very large – between 400 and 700 Tcf. However, this large resource is distributed in numerous basins and coal zones (plays). Forward Energy has characterized the resources for over 30 CBM plays, ranging from Carboniferous coal measures in Nova Scotia to Tertiary basins in British Columbia and including the major Jurassic through Cretaceous coal zones in the Plains, Foothills and Front Ranges of the WCSB. Each CBM play has different characteristics: age, depth, areal extent, thickness, gas content, pressure, permeability, water saturation, surface access, infrastructure, etc. What are the critical characteristics of each play? Which plays are the most attractive?



Forward Energy has created a summary **Play Comparison Table** of selected Canadian CBM plays. The plays are ranked based on parameters prioritized by our clients. Each play resource characterization is

based on the best and most current, publically-available information supplemented by data from federal government reports and provincial agency databases. Comments on uncertainty of interpretation, the availability of data for more detailed analysis, Forward Energy’s play ranking and references are also highlighted. The **Table** is delivered as an Excel file.

For each play, a **Play Descriptive Summary** provides a brief written description of the play and a compilation of key cross sections, maps, tables and graphs that illustrate the risk, complexity and the distribution of values. For the coal zones in the Alberta Plains and Nova Scotia basins, the Play Descriptive Summaries include maps of coal zone depth, coal thickness, gas content and in-situ resource density (Bcf/section). Cross sections through the significant coal measures in the Alberta Foothills and Front Ranges are included. CBM-targeted drilling and production pilot project activity has been summarized for those plays where commercial production has not been achieved or remains confidential. The CBM **Play Descriptive Summaries** are delivered in PDF format.



### Custom Resource Characterization

In addition to the regional play characterization described above, Forward Energy can also provide custom characterization of the CBM resource in place, both for regional plays and for focus areas. Additional local data on coal thickness, gas content and pressure, combinations of selected coal zones and resource density cutoff criteria can be incorporated into a custom analysis.

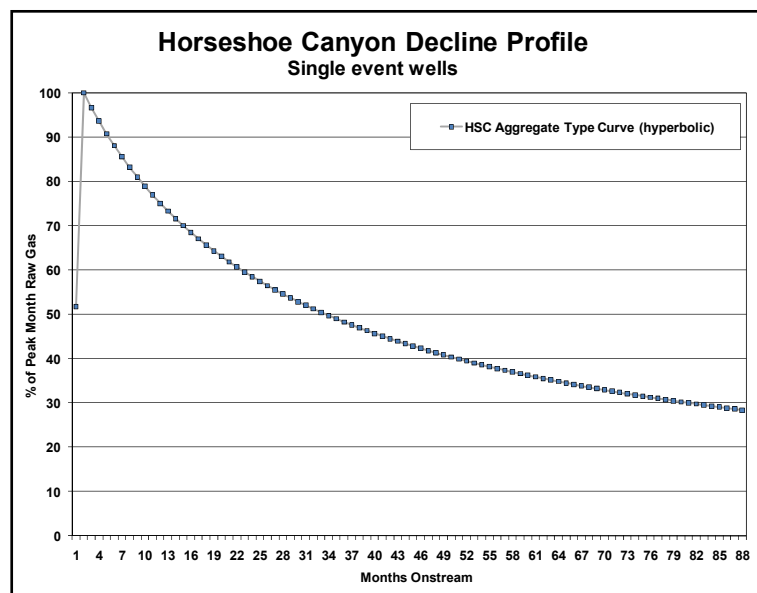
## Production Characterization

Commercial CBM production in Canada has been established in several plays in the Alberta Plains region. Commerciality is based on either of the operator's public announcements or in areas of significant ongoing development.

- The Horseshoe Canyon play in the Alberta Plains is the largest CBM producing play. Total output was over 780 MMcfd onstream at year end 2008, as commingled production from vertical wells in primarily “dry” coal measures.
- Over 120 MMcfd of production has been established from multi-lateral horizontal wells in “wet” coal seams of the Mannville play in the Corbett area.

Forward Energy has developed a database of the wells in Alberta that produce coalbed methane. The database includes the wells targeted to evaluate CBM plays. Although based on multiple public data sources, many value added features have been incorporated, including:

- CBM play definition: stratigraphic and geographic boundaries
- Play sub-areas: Mannville producing and pilot areas; Horseshoe Canyon sub-areas
- Target play and producing play assignment
- Producing status
- Year drilled and year onstream
- EUR / IP rate / decline rate estimation
- Well orientation and well completion type for technology analysis
- Township and section assignment for development density analysis
- Initial and current operator for performance benchmarking
- Monthly production data for type curve and production analysis

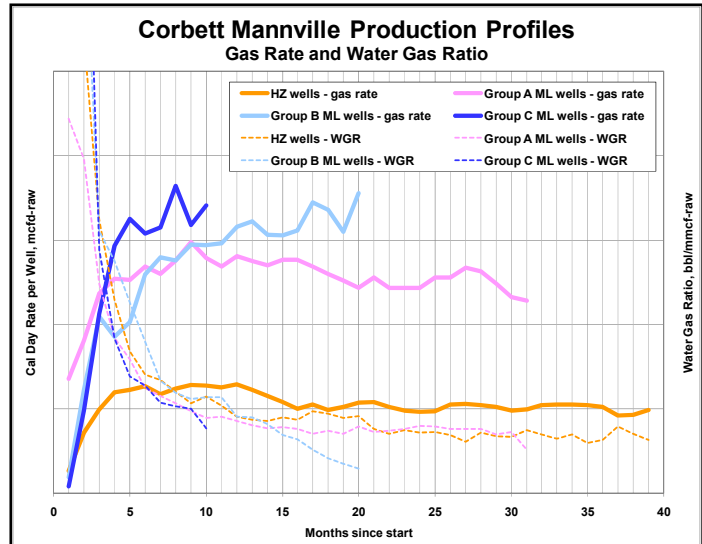


The Forward Energy CBM well database currently contains data on almost 14,900 wells drilled to year-end 2008. About 12,800 CBM wells had been connected and brought onto production to year-end 2008.

## Regional Play Overviews

From this proprietary database, Forward Energy has developed an overview analysis of the two major producing plays and play subareas. The overviews include:

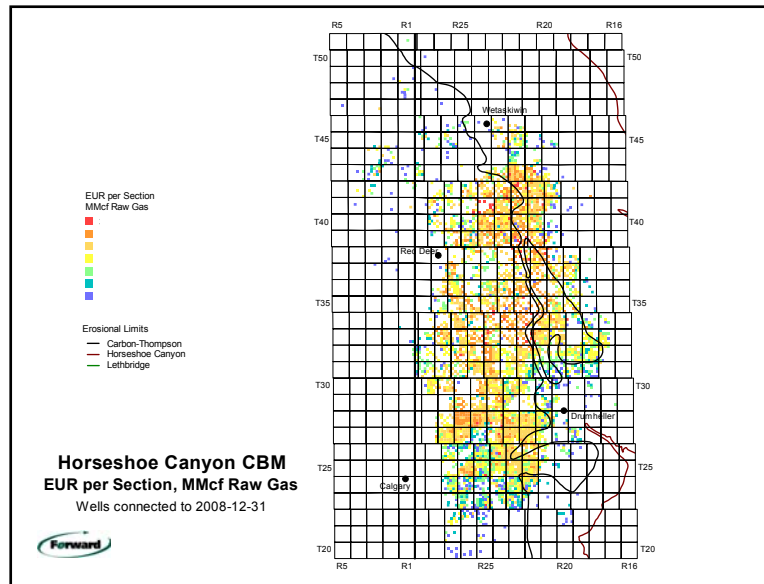
- Aggregate production profiles
- Normalized production profile by well
- Type curve development
- EUR estimation, by R/P method
- Trend charts (by play, by operator, by area, by technology, etc.)
- Maps of EUR per section, per well, etc.
- EUR distributions, with cutoff
- Well spacing analysis
- Pilot area summaries
- Scoping analysis of the major operators

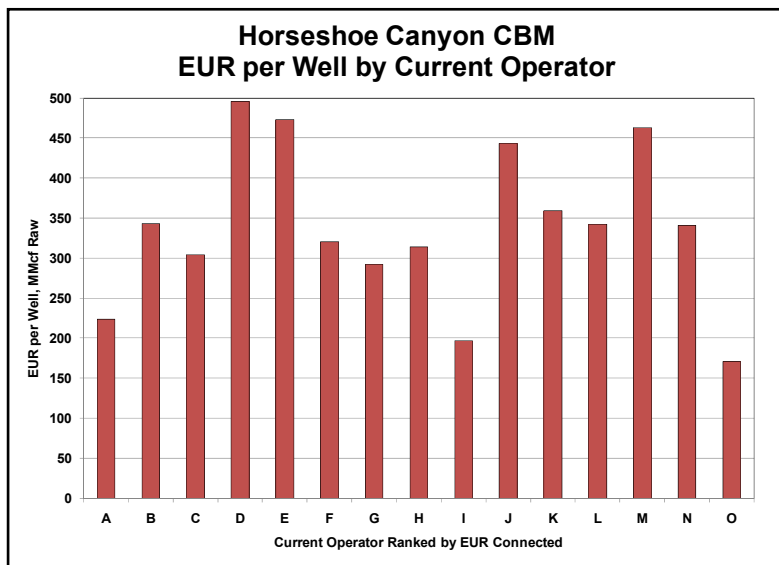


## Custom Production Characterization

Based on the Regional Play Overviews, clients can then use their access to the CBM database to answer questions with respect to focus areas, plays and benchmark operator performance. The following is a list of some custom analysis options.

- Focus area selection based on resource density, proprietary land, pilot subareas, etc.
- Play definitions incorporating alternate play boundaries and zones
- Local normalized gas production profiles, water/gas ratio performance
- Local EUR estimation: custom type curves and periods
- Apply cutoffs to EUR per well to assess commercial success
- Operator analysis and performance benchmarking
- Technology comparisons, particularly well type
- Spacing analysis by play – trends in downspacing
- Enhanced visualization and mapping down to section and quarter section
- other





The benchmarking process incorporates publicly available data for well operators. Selected peer operators are compared for their well activity, production, completion styles, entry timing, efficiency and many other physical metrics. Clients can supplement public data with client-specific data such as well working interest and non-operated wells.

**Value analysis** addresses questions such as: Which operators (or plays) are (how) profitable? In the Value phase, financial inputs (commodity prices, capital costs, operating expenses, inflation factors, etc.) are integrated with the physical models.

From these economic models, value performance indicators such as Rate of Return, Risked F&D cost, and NPV are determined.

Custom analysis is conducted on a confidential and exclusive basis. Clients can realize significant value added by integrating proprietary information on well results/forecasts, capital and operating cost estimates, facility and infrastructure positions, working interest positions, with Forward Energy's volumetric and physical data.

## Summary

Forward Energy's consistent and rigorous study process, combined with our experience and insights are a valuable resource for any client considering entry into, or evaluating an existing position within, CBM plays in Canada.

## Contacts

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