The Urgent Need for Unconventional Gas to sustain Canada’s Natural Gas Production

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CSUG/PTAC Presentation, 18th November 2004
The Reality of 2004

- World fixation on oil price
  - Getting close to World oil peak?

- North America’s situation is more critical
  - Reached(?) natural gas peak production

- Canada: the ‘swing producer’ for North American gas for the past decade

- Peak of Alberta gas portends peak in Canadian and North American gas production

- Flat or Declining gas production
  - good news for Unconventional gas
  - bad news for consumer and economy of North America
Presentation Format

- Gas Resources and Reserves
- Gas Production and Drilling
- Canada’s Position in the World of Natural Gas
- Predicting the Future
  - A Comprehensive model for future production
  - NEB view
  - My assessment
- Questions and Feedback
Canada’s Natural Gas Resources and Reserves
Resource Triangle

Conventional Reservoirs

Obvious Traps

Small Resource
High Quality
Difficult to find
Easy to develop
Low cost
High margin

Unconventional Reservoirs

W.C.S.B.

Conventional Reservoirs

Obvious Traps

Gas Shale

Gas Hydrates

Unconventional Reservoirs

Basin Maturity
Better Technology
(Higher prices)

Large Resource
Low Quality
Easy to find
Difficult to develop
High cost
Low margin
Canada’s Resources and Reserves
Natural Gas (Conventional data adapted from CGPC 2001)

?1000’s Tcf

Ultimate Resources

Total
Conventional + Unconventional
592 Tcf

Discovered
340 Tcf

Raw Gas

Sales Gas

204 Tcf

Remaining Reserves

Unproduced

58 Tcf

Rate of Conversion:

Accessibility
Technology
Price
Motivation
Canada’s Remaining Accessible, Proven, Marketable Gas Reserves
(Estimated December 2003)

Total: 57.8 Tcf

- Alberta: 12 Tcf
- BC: 38.6 Tcf (Includes 0.027 Tcf CBM)
- Other WCSB: 2.2 Tcf
- E Coast: 5 Tcf
‘Orphaned’ Conventional Resources (Skipper, 2001)
## Understanding Remaining Gas Resources – Accessible and Economically Available

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*Russum, CSEG Recorder, June 2003*
Approximate distribution of Unproduced Natural Gas Resources

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Working with the CGPC to fill out the table for 2005

The ‘?’ will depend on Unconventional Resources
Canada’s Gas Production
Canada:

- 3rd Largest Natural Gas Producer
- 2nd Largest Natural Gas Exporter
- 1% of World Natural Gas Reserves
- ~20% of World Drilling Rig Count
Canada’s Natural Gas Production
(Bcf/d Adapted from CAPP Data)

Production Growth controlled by pipeline capacity
Alberta Remaining Reserves and R/P (Reserves to Production Ratio)

Peak Reserves (1982): 65 Tcf, R/P: 28

2003 Reserves: 38.6 Tcf, R/P: 7.5

Found more gas than produced only 3 years since 1982
Where did Alberta’s Gas Go in 2002? (AEUB ST-3)

Total: 6025 Bcf
Sales: 4657 Bcf

- USA: 2654 Bcf (57%)
- Rest of Canada: 1243 Bcf (27%)
- Alberta: 760 Bcf (16%)
- Flared + Fuel: 16%
Alberta New Gas Drilling and Daily Sales Gas (CAPP Data)

High activity, high price and declining production = Red Flag
Alberta Gas Trends 1992-2002

- Average IP down 61%
- Average Decline rate up 21%
- Average well <1/3rd as productive as 10 years ago

- Average well depth 1151m in 1992, 1100m in 2002
- An ever increasing number of wells required to sustain production
Canada’s Position in the world of Natural Gas
Currently a landlocked resource, LNG could make gas a world commodity

World Gas Reserves (BP, 2004)

Total 6206 Tcf

Canada: 1% of Reserves
North America:
4% of Reserves
29% of Production
29% of Consumption

Currently a landlocked resource, LNG could make gas a world commodity
North America Reserves
2003 vs 1981 (BP 2004 Data)

Total
258 vs 365 Tcf

-80%
-35.2%
-7.4%
North American Gas Production

Peak? 75Bcf/d
Reserves to Production R/P or RLI

- 1% of the proven Natural Gas reserves in the World (18th place)
- R/P:
  - Total World: 67.1 Years
  - Russia 81.2 Years
  - USA 9.5 Years
  - Canada 9.2 Years
  - UK 6.2 Years (Peaked in 2000)
- Alberta’s R/P is 7.5 (28 in 1982)
- Does not mean we will run out of gas in 7.5 years!!!
  - Cannot sustain production rate as reserves decline
Reserve Replacement Cost 2002

$US/BOE (Adapted from: John S. Herold / Harrison Lovegrove & Co.)

Asia-Pacific: $2.50
Africa & M.E.: $3.10
S&C America: $5.30
Europe: $6.50
United States: $7.10
Canada: $8.40

United States and Canada have the highest replacement costs, followed by Europe, S&C America, Africa & M.E., and Asia-Pacific with the lowest.
“Don’t worry - Canada is less explored than the US”

- Every Basin and geologic trend has different potential
- The WCSB has been more efficiently exploited than any other Basin in the World
- Some of early ‘Unconventional’ knowledge evolved in Canada (Deep Basin=BCG, Shallow biogenic gas)

Should not assume we will see the same trends in Canada as have occurred in the USA
Texas (on shore) vs. Alberta

Texas

Area: 269,000 Sq Miles.
Peak: 1971
Rem. Res: 43Tcf
Annual Prodn: 5.6Tcf
R/P: 7.7
Cum Prod: 319Tcf

(Tight gas Incentive)
(Decline 5% per year)

Texas is richer in natural gas than Alberta!

Alberta

Area: 255,000 Sq Miles
Peak: 2001
Rem. Res: 38.6Tcf
Annual Prodn: 4.8Tcf
R/P: 8.0
Cum Prod: 116Tcf
Comments

- As pass peak: gas price vulnerable to fluctuations in supply and demand

- Canada’s long term position as a natural gas producer is weakening – has significant political and economic implications

- Washington has a far clearer understanding of the implications than Ottawa

- Vital that we accurately predict future supply

- Want to show a model that improves prediction
Predicting the Future

Dave Russum
Geo-Help Inc
June 2003
Natural Gas In Canada – Where are we going?

GLOBAL FUTURE?
Kyoto?
El Nino?
NAFTA?
OPEC?
LNG?
Politics?
Terrorism?
N.Am Economy?
Energy alternatives?
Resource Development Model (RDM) – 8 Stages

1. Discovery
2. Evaluation
3. Development
4. Growth
5. Peak
6. Decline
7. Reality
8. Abandonment

Knowing current stage of project can better predict future
Stage 6: Decline

- “Denial” - Companies, workers, politicians, regulators and consumers expect continued growth in production
  - “Current decline is temporary”
  - “Hockey stick” predictions of future

- Future predictions disconnected from current reality (often based on old data)

- High Spending based on unrealistic expectations

- Costs to maintain production increase

Alberta’s Conventional Gas Production is at this stage
# Canada’s Hydrocarbon Stages

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<th>1 Disc</th>
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Predicting the future

Resource Development Model
+ Current Production*
+ Decline Analysis*
+ Investment/Exploration/Drilling/Technology trends
= Accurate prediction of future production

* Data from PetroCube a new product from AJM Petroleum Consultants
The Future According to the NEB
The importance of up-to-date information

- NEB recently published a resource estimate based on year end 2000 data.
- Since that time:
  - Over 55,000 wells have been drilled
  - Over 23Tcf of gas has been produced
  - Ladyfern had one well on Production!
Canadian Gas Supply
NEB Forecast 1999 (Bcf/Yr)

Production increase: 43%
Canadian Gas Supply
NEB Forecast 2003 (Bcf/Yr)

Note: includes some LNG imports by 2008
Canadian Gas Supply
NEB Forecast 2003 (Bcf/Yr)

Available for Export

Domestic Consumption
Increase: 47%

2001 Production Level

Note: includes some LNG imports by 2008
My View of Gas Supply
Future Marketable Gas: East Coast Conventional (Bcf/Yr)

- 500Mmcf/d increasing to 1Bcf/d
- Sable
- Deep Panuke
- White Rose

Dave Russum, 2003
Future Marketable Gas: Territories Conventional (Bcf/Yr)

- MacKenzie Pipeline: 1 to 1.8 Bcf/d

Dave Russum, 2003
Future Marketable Gas: Sask. Conventional (Bcf/Yr)

700Mmcf/d growing by 3%p.a.
Future Marketable Gas: BC Conventional (Bcf/Yr)

2.5Bcf/d growing to 3.2Bcf/d
Future Marketable Gas: Alberta Conventional (Bcf/Yr)

- 3% Decline to 2005
- 5% Decline after

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Future Conventional Marketable Gas Prediction (Bcf/Yr)

- E Coast
- Territories
- Sask
- BC
- Alberta Demand
- Rest of Canada
- Export to US

Dave Russum, 2003
What can you deliver?
Future Marketable Gas Prediction (Bcf/Yr)

Assume:
1 Bcf/d by 2009
(10,000 successful Wells)
2.2 Bcf/d 2016

NEB 2003 Expectation
+5.5 Bcf/d

Dave Russum, 2003
Gas Prediction 2003 - 2013

- Supply will be tight
- Decade of wildly fluctuating prices
- Average price will climb steadily
- Reality of situation will encourage:
  - LNG
  - Development of higher cost gas
  - Conservation
  - Energy alternatives
- Import of LNG and energy alternatives may be cheaper than Canadian gas in future

Dave Russum, June 2003
Our Challenges in Canada:

- ‘Just in time’ Industry focused on short-term results
- We have become risk averse
- Not investing in enough research for exploration and extraction
- Escalating COF&D
- Governments have taken a hands-off approach to energy (no overall energy management or plan)
- Obligations to NAFTA
- Increased demand for energy to extract oil
Summary

- Canada is not running out of gas **resources**

- Rapidly depleting our **accessible, low cost gas reserves**

- Alternatives exist – take research, time and money

- We need to be very conscious of costs and economic viability in relation to a North American and World market

- The need for Unconventional gas will be huge – at the right price!
Welcome your feedback

Contact Dave Russum
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More Information:
www.ajma.net
www.geohelp.net

Thank You