Shale Gas in North America
Emerging Supply Opportunities

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What is shale gas?

- Shale gas is natural gas within predominantly fine grained, organic rich rocks
- Both the source of the natural gas as well as the host reservoir in the subsurface
- Reservoirs are tight (low permeability) and require special drilling and completion technologies
- Laterally pervasive, but highly variable in terms of reservoir properties

Understanding the rock properties is the first critical step in reservoir evaluation and ultimately development of the resources

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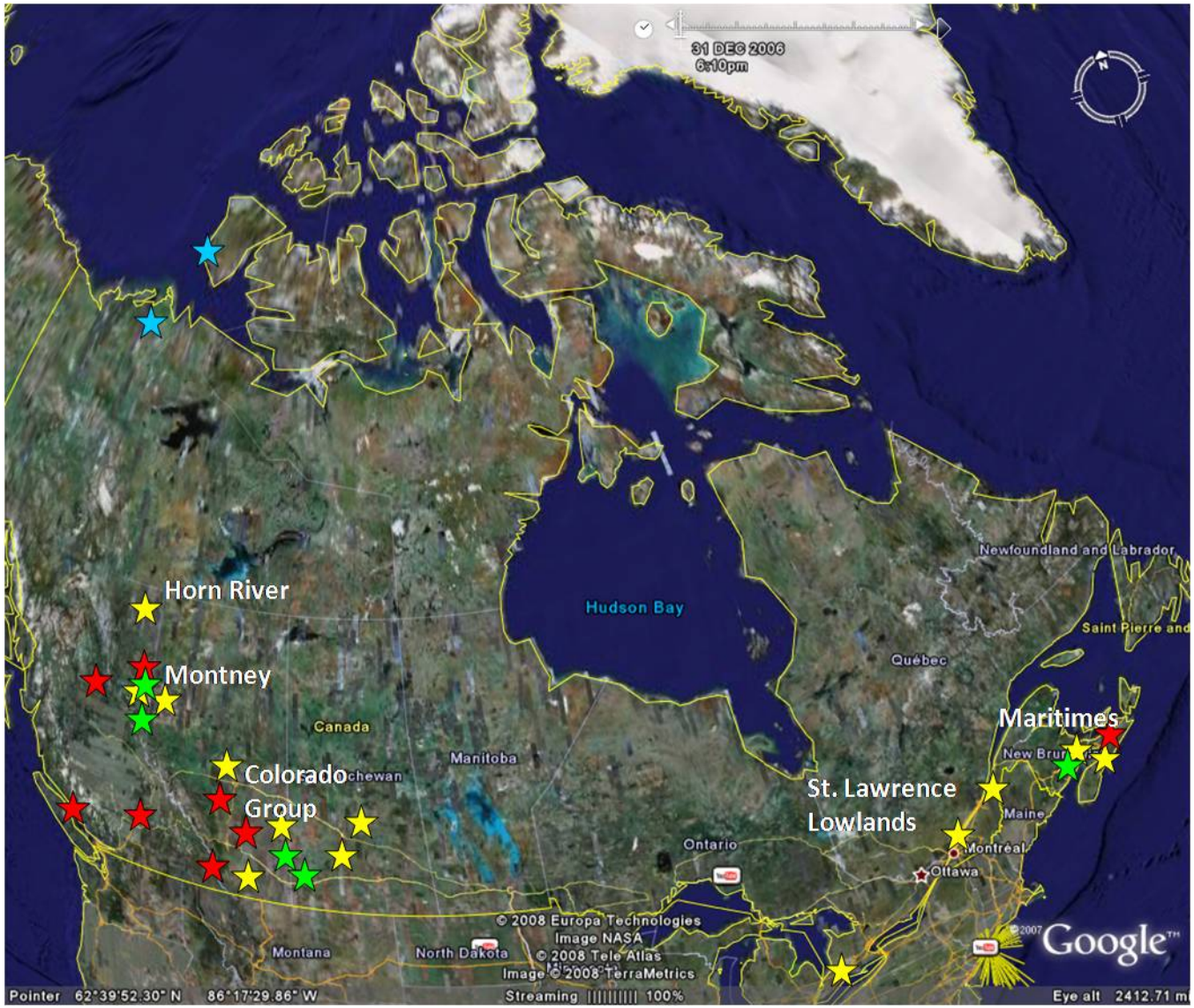

Areas of Unconventional Gas Exploration and Development in Canada

- Tight Gas Sands and Carbonates
- Natural Gas from Coal
- Shale Gas
- Gas Hydrates

September 24, 2008

What's All the Buzz About? The Size of the Prize

British Columbia

- Horn River Basin > 500 TCF OGIP
- Cordova Embayment > 200 TCF OGIP
- Montney Formation up to 250 TCF OGIP
- Doig Phosphate up to 164 TCF OGIP
- Nordegg Formation 1-24 Bcf/section
- Exshaw Formation 25 – 180 Bcf/section

From BCMEMPR

Total > 1000 Tcf OGIP

Alberta and Saskatchewan

- Colorado Group > 300 TCF OGIP

Southern Ontario

- Michigan Basin > 225 Bcf OGIP

Quebec Lowlands

- Utica and Marcellus Shale 2-15 TCF OGIP

Maritimes

- Windsor Basin (Nova Scotia) 89 – 109 Bcf/section

Total US shale gas opportunity believed to be similar in scale

Shale Gas in the Horn River Basin and Cordova Embayment

- Hottest new shale play in North America
- EOG reports OGIP number up to 318 Bcf/section
- Deep horizontals with large fracture stimulations leads to high well costs (currently)
- Initial wells tested by EOG show IP's > 5 mmcf/d
- Infrastructure in core area of current play is a concern

Key Industry Players:

- Encana, Apache } 350,000 gross acres
- Nexen 123,000 net acres
- EOG 140,000 net acres
- Exxon Mobil/Imperial Oil
- Devon
- Quicksilver
- Stone Mountain

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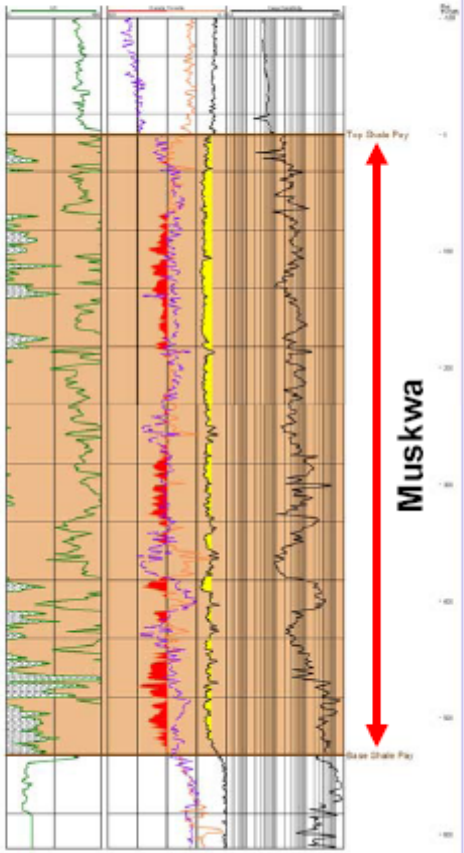
Comparison between EOG's Muskwa Discovery and Barnett Shale Gas

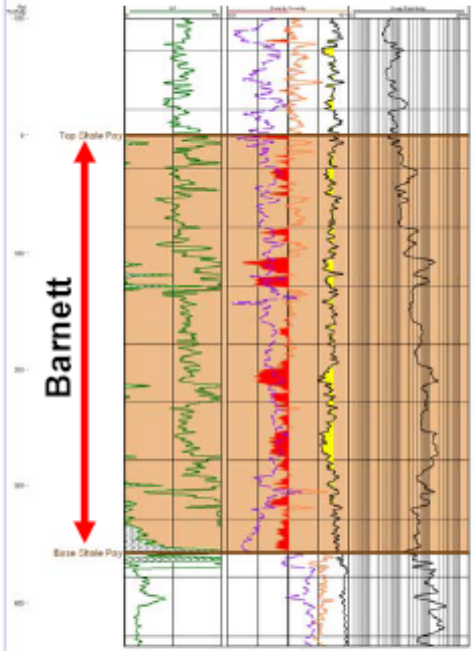
Muskwa		Barnett
530	Thickness (Ft)	355
230	Permeability (nd)	250
4.0	Gas-Filled Porosity (%)	4.5
2.8	Maturity (Ro)	2.2
65	Silica Content (%)	55
265	GIP (Bcf/Mi²)	193



from EOG Feb 08

Average GIP (Bcf/Mi²)

EOG Horn River Leases	Johnson Cty Barnett
318	131



Fowler Development

- 5 Hz Wells on 190 Acres
- 34 MMcfd IP
- 31.6 Bcf EUR, Gross
- 54% Recovery Factor

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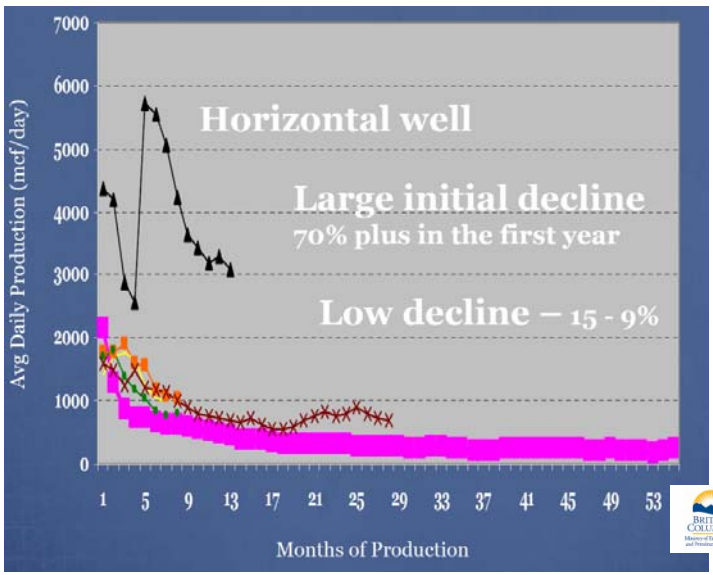
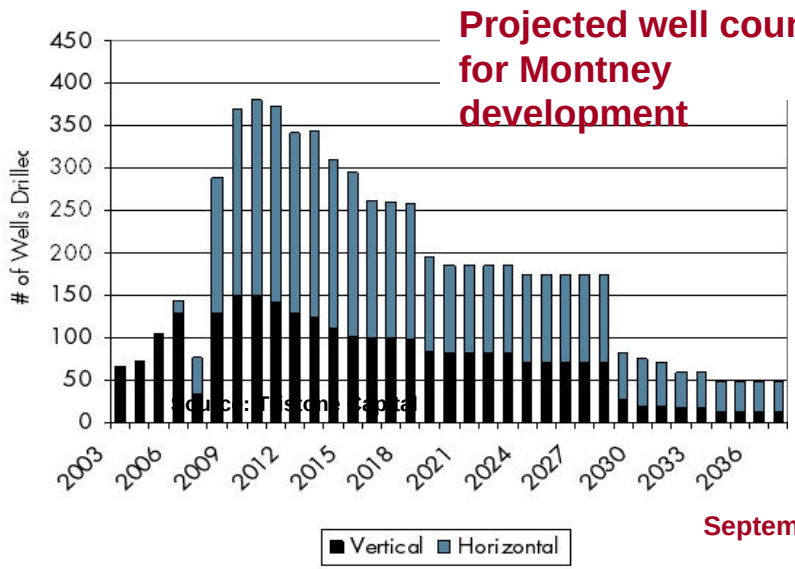
Montney and Doig Play in NE B.C.

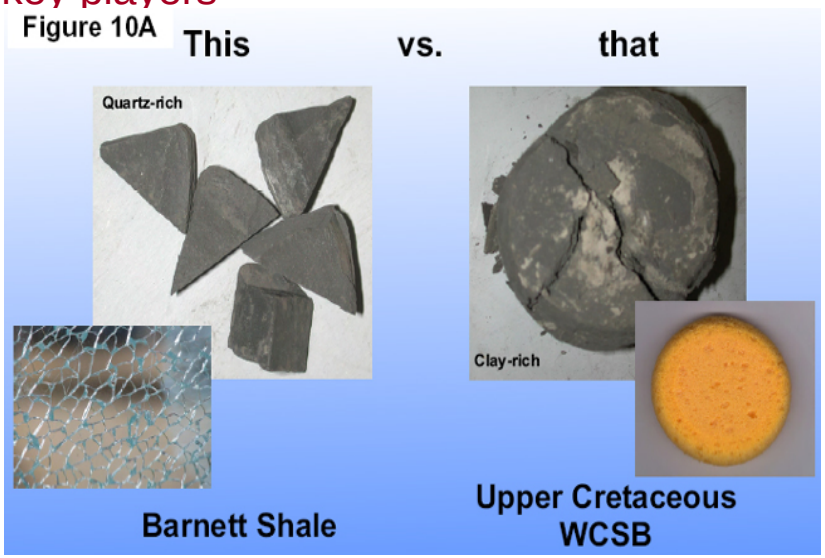
- Total thickness ranges from 50 – 200 m (thickens to the west)
  - Upper Montney 35-250 Tcf OGIP resource(8-60 Bcf/section)
  - Doig 27-164 Tcf OGIP resource (5-30 Bcf/section)
- High decline rates with stabilized long term production
- Dramatic increase in initial production and long term stabilized rate through application of horizontal drilling
- Current production ~200 MMcf/d of tight gas sands and shale
- Numerous players including Encana, ARC Resources, Murphy, Shell





Shale Gas in the Plains Region

- Colorado Group contains numerous shallow "hybrid" shale gas zones
  - Very different from Horn River, Barnett, etc.
  - Some have been exploited for years (First and Second White Specks/Base Fish Scales)
- Two major keys to economic success
  - Multiple zones - commingled gas production
  - Low cost drilling and operation costs
- Picking prospective geographical areas and vertical sections critical to success
- Average wells produce < 150 mcf/d, costs often < $250 k to drill/complete/stimulate
- Stealth, Panterra key players



From Ross and Bustin, 2007

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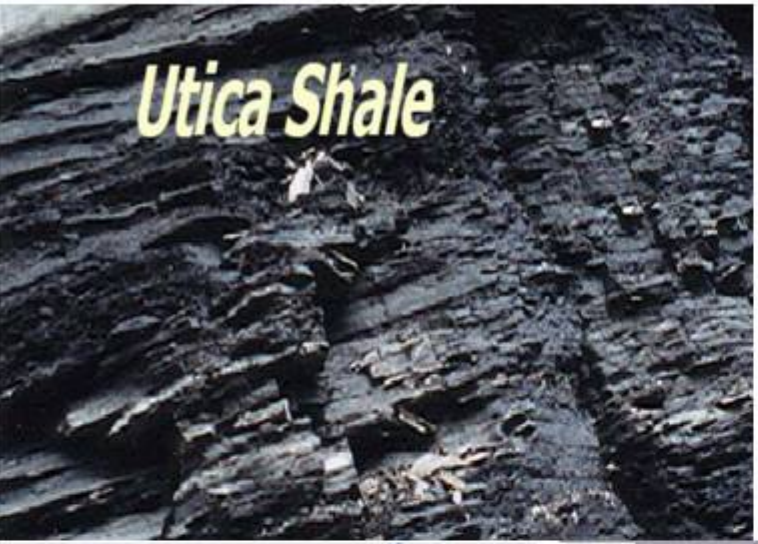
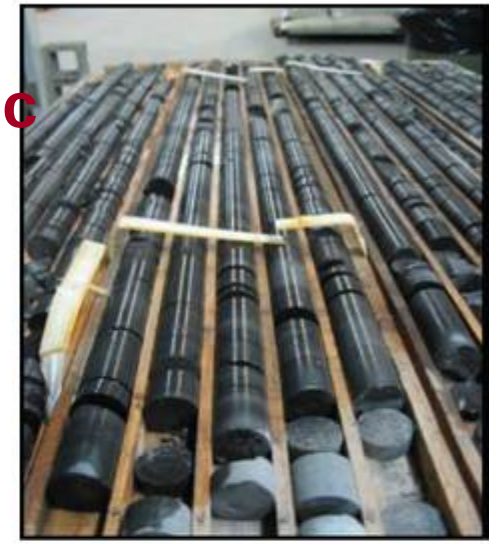
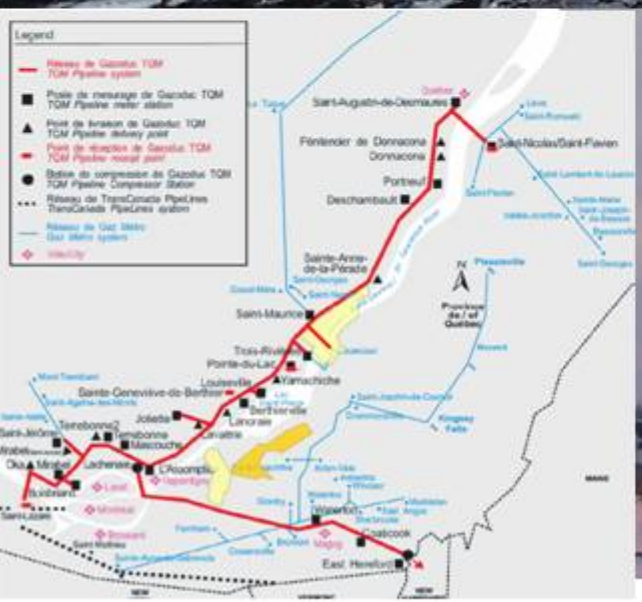


Shale Gas in Quebec

- Multi-unit potential – Utica, Lorraine, Marcellus
- Rates tested up to 1,000 mmcf/d
- Talisman, Forest and several juniors





	Utica	Barnett
Depth (ft)	2,300 – 6,000	4,500 – 9,000
Thickness (ft)	500	150 – 700
Clay Content (%)	15 – 26	15 – 30
TOC (%)	1.0 – 3.1	3.5 – 5.0
Gas-Filled Porosity (%)	3.2 – 3.7	3.0 – 4.8
Pressure Gradient (psi/ft)	.45 – .60	.46 – .50
Maturity (Ro)	1.3 – 2.0	1.0 - 2.2
Gas Price ($)	NYMEX + 1.05	NYMEX - 0.53

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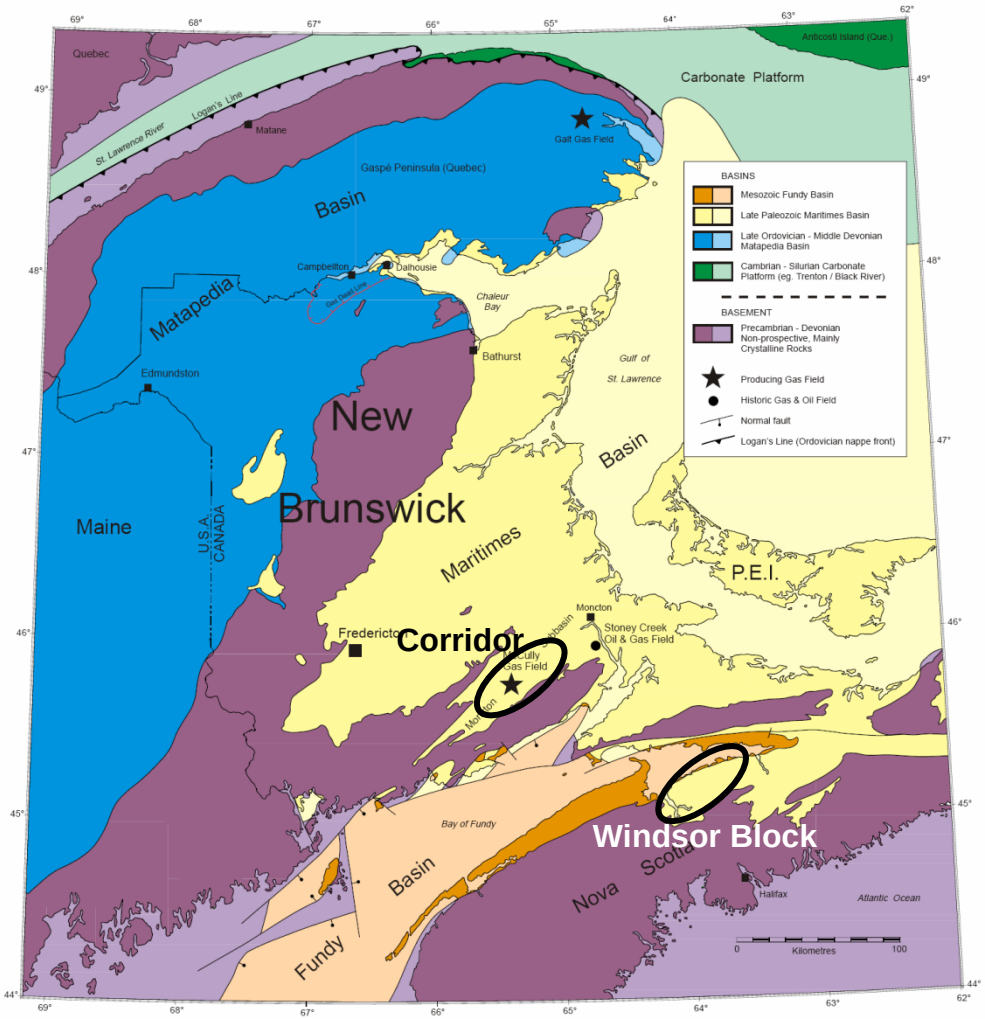
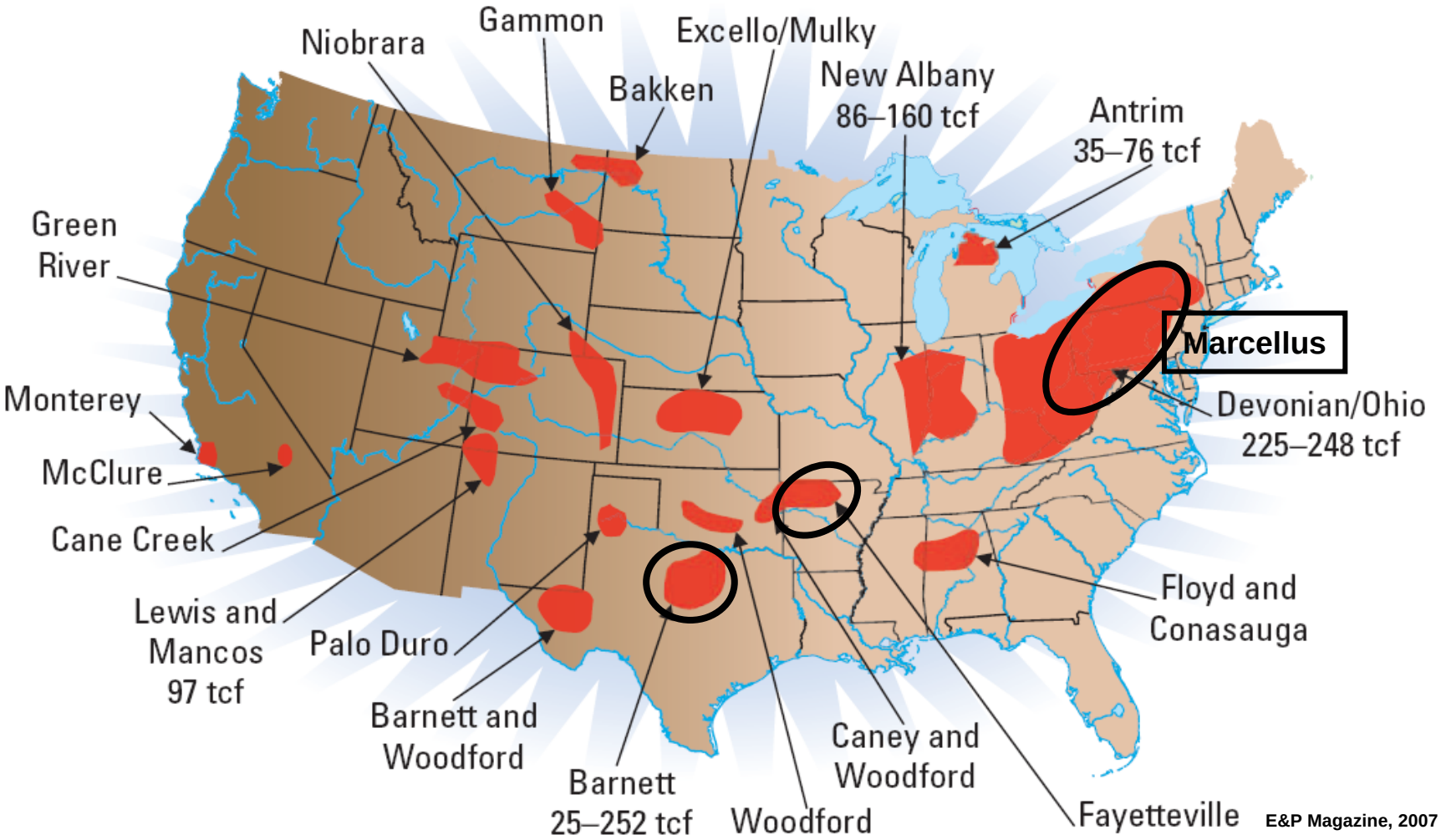
Shale Gas in the Maritimes



- New play recently tested by Triangle Petroleum in Nova Scotia (Windsor Block)
  - Kennetcook well analysis indicates up to 109 Bcf/section OGIP
  - 516,000 gross acre Windsor block
  - Targeting Horton Bluff Formation
- Corridor Resources currently drilling deep Elgin Formation shale well in New Brunswick

A flare during a testing at the Kennetcook #2 well in Nova Scotia signals success for Triangle's shale gas project on the east coast.

Shale Gas Opportunities in United States



E&P Magazine, 2007

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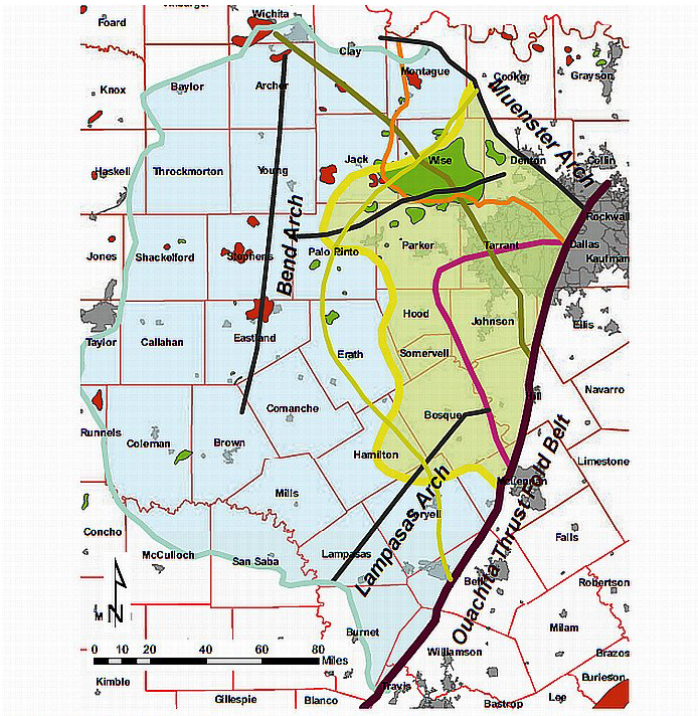
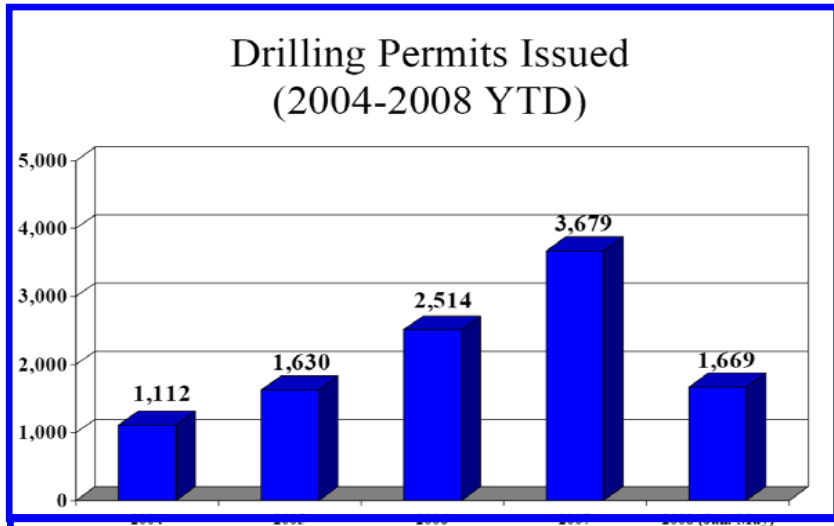
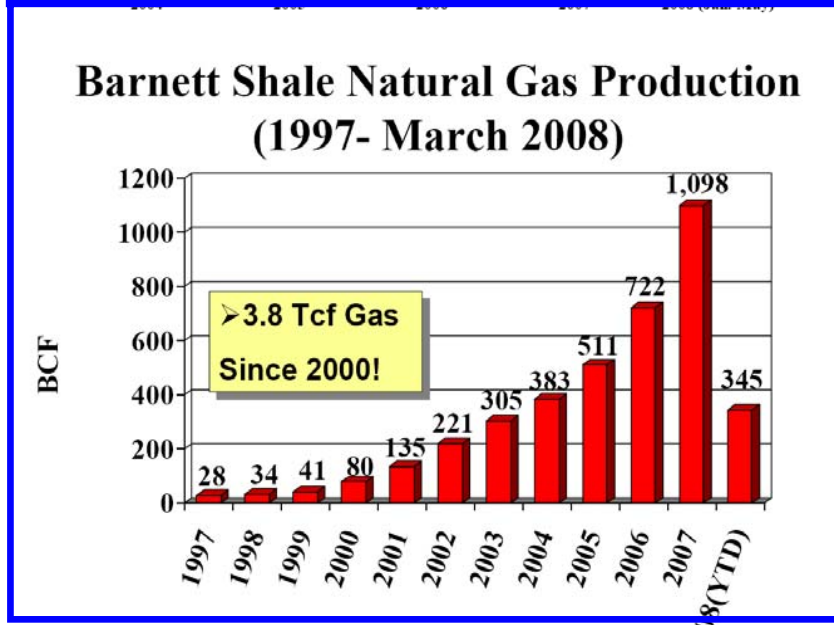
Barnett Shale – East Texas

- Production exceeds 3.7 Bcf/d and projected to increase to between 6.5 and 9.7 Bcf/d by 2014
- Currently over 7500 wells drilled with an additional 4500 permitted







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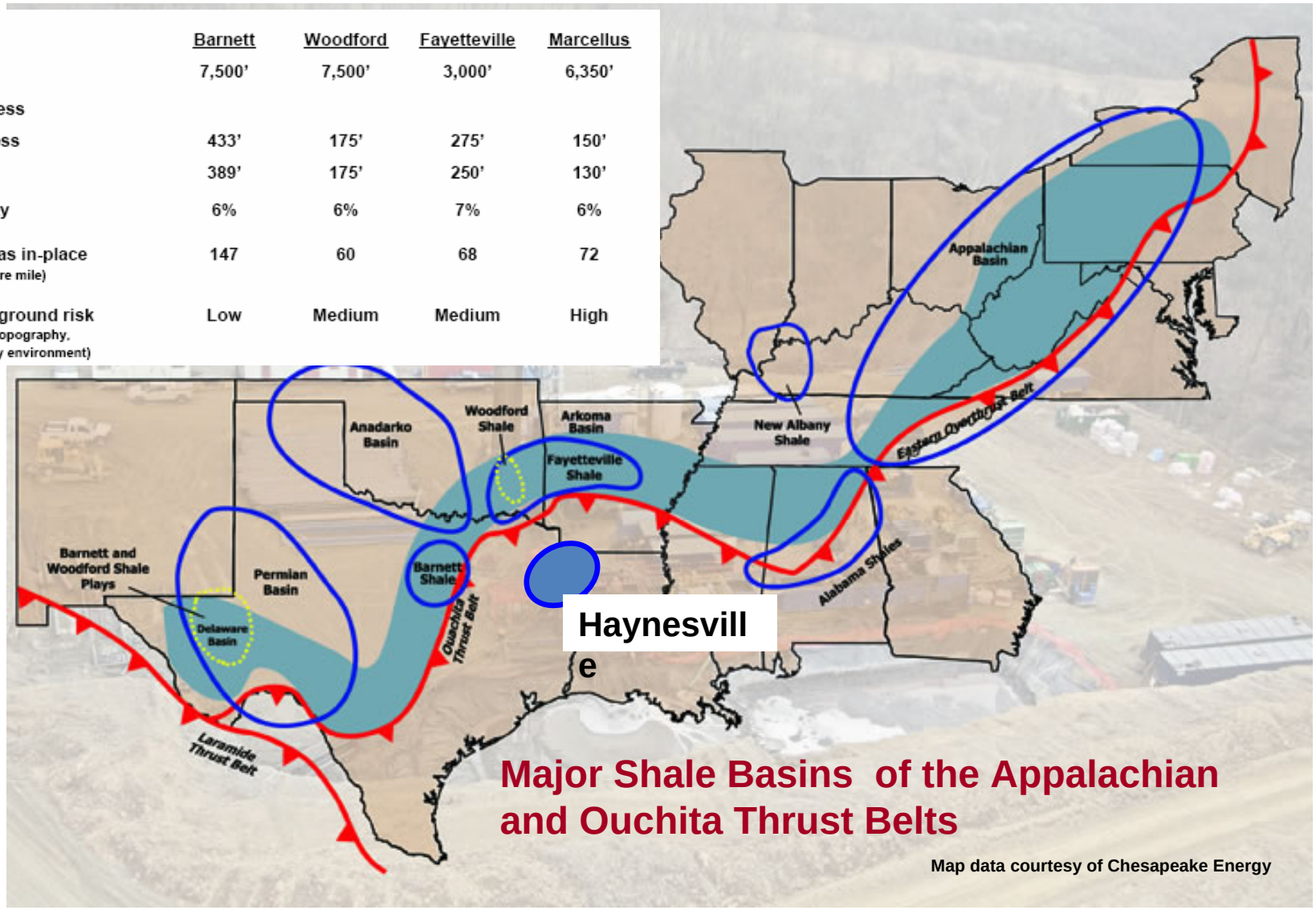
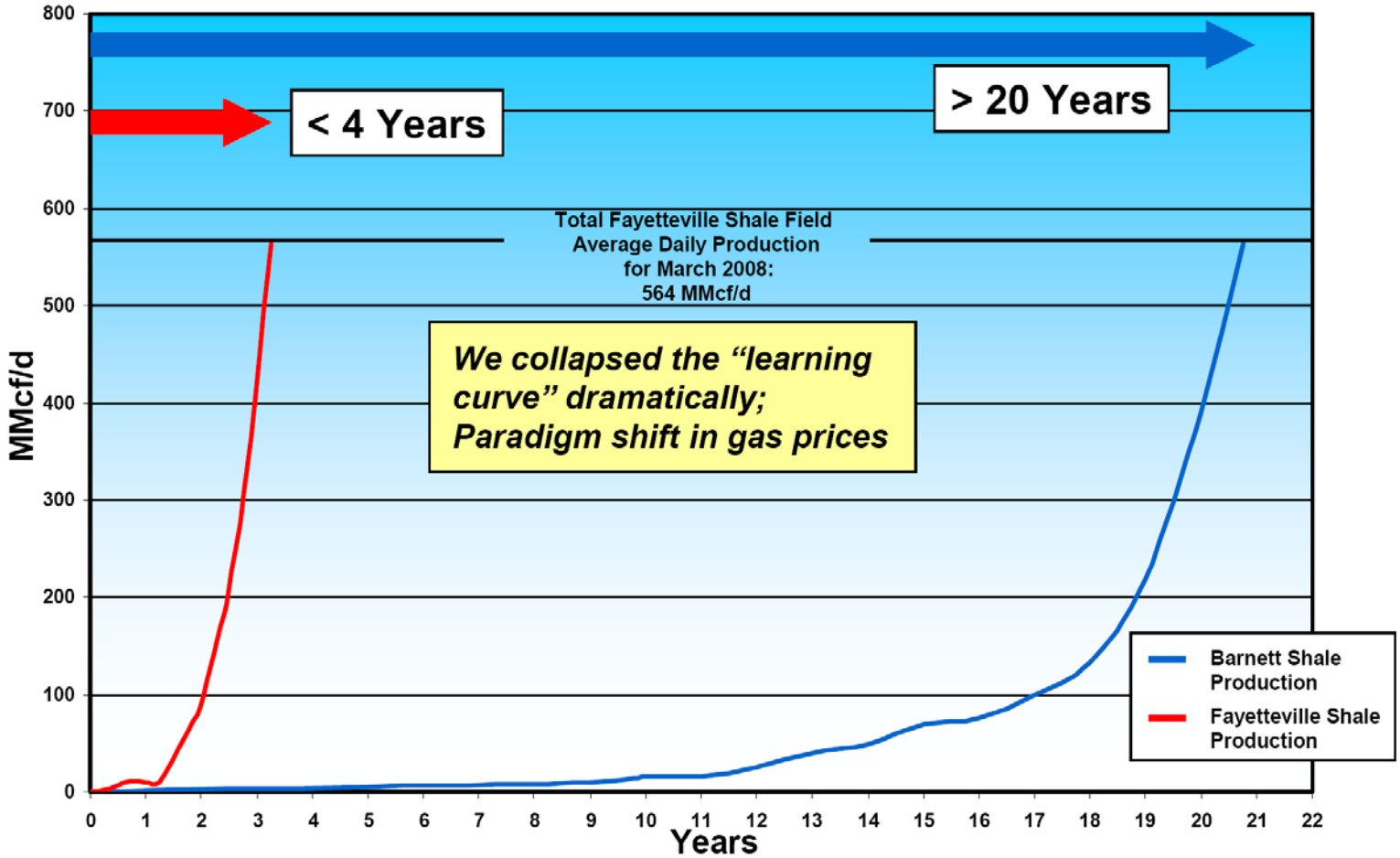
	Barnett	Woodford	Fayetteville	Marcellus
Depth	7,500'	7,500'	3,000'	6,350'
Thickness				
Gross	433'	175'	275'	150'
Net	389'	175'	250'	130'
Porosity	6%	6%	7%	6%
Total gas in-place (Bcf/square mile)	147	60	68	72
Above ground risk (market, topography, regulatory environment)	Low	Medium	Medium	High



Major Shale Basins of the Appalachian and Ouchita Thrust Belts

Map data courtesy of Chesapeake Energy

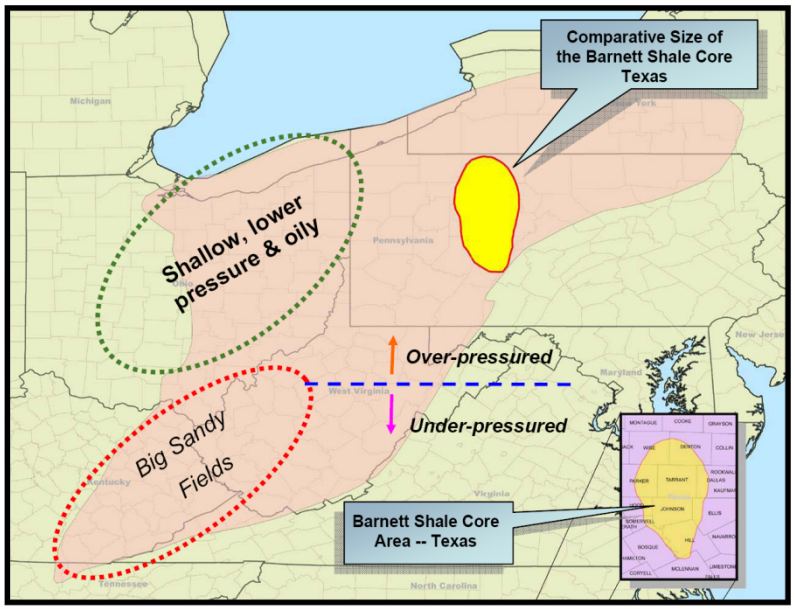
Fayetteville Shale Play



Source: Tudor, Pickering, Holt & Co. Securities, Inc., Arkansas Oil & Gas Commission

From: Southwest Energy Sept 2008

Marcellus Shale Play



- About 63 million acres, vs Barnett at 2.7 million acres
- Big Sandy area producing since 1920's (3 Tcf to date) from the Huron Shale
- Over-pressured Marcellus now being developed
- Presence of natural fractures will be key to regions of economic production

- Marcellus shale conservatively estimated to contain from 168 -516 Tcf GIP*
- Early results from some horizontal wells show IP > 3 mmcf/d
- Basin located in favorable gas market - $0.20 to $0.50 per mcf premium

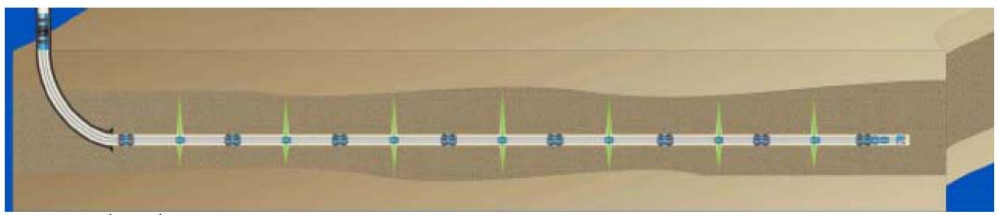
*** From Engelder and Lash, 2007**

Keys to Success

- Technology
  - Drilling and logging
  - Multiple well orientations from single surface wellpads
- Well spacing and orientation: Downspacing
  - Improves ultimate recovery
  - Sustains production levels – slows field declines
- Application of Multi-Stage Fracing Critical to Unlocking Resource Potential

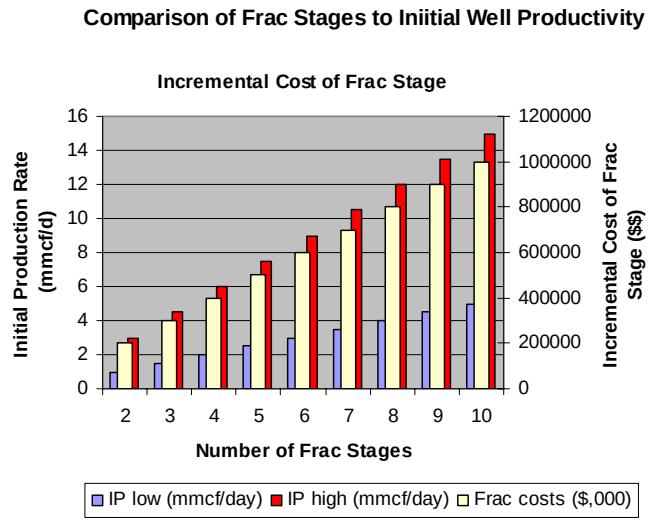
Each additional frac increases initial well productivity by 0.5 to 1.5 mmcf/d

Each additional frac potentially increases recoverable reserves by 0.5 to 1.5 Bcf



Source: Packers Plus Energy Services Inc.

from Halliburton



courtesy Halliburton

Challenges the Industry Faces

- Front end capital
  - Assembling a land position
  - "Experimentation"
  - Infrastructure
- High decline rate
- Footprint
  - Water use and disposal
  - Habitat fragmentation
  - Traffic and general intrusion

Summary

- Shale gas potential in North America is huge
  - Greater than 1000 Tcf in Canada
  - Possibility of equivalent in United States
- Recent success in numerous basins across continent
- Each basin is unique, but a common theme is high OGIP with potential for significant recoverable reserves
- Success comes with a price: land acquisition costs, “experimental” high cost early stages of evaluation, infrastructure deficits
- Significant capital requirements by all players to move shale plays forward
- Potential to sustain continental gas supply and meet the growth in demand, but lead times can be long

Thank you for your Attention

Questions???