

***Tight Gas in Western Canada:
An Important and Continuing Component of
Overall Supply***

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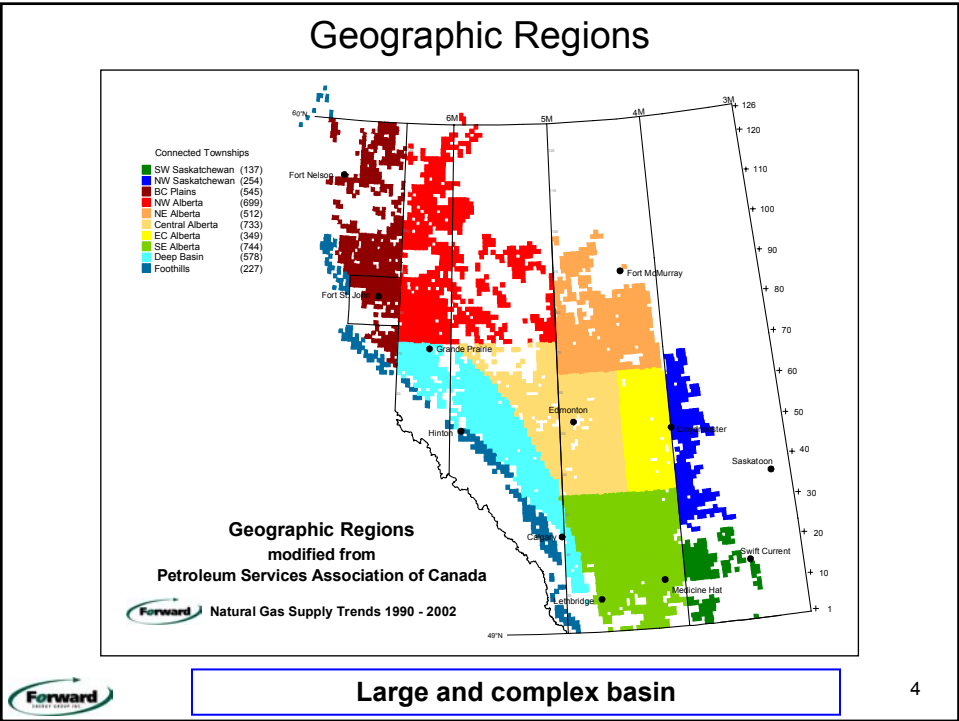
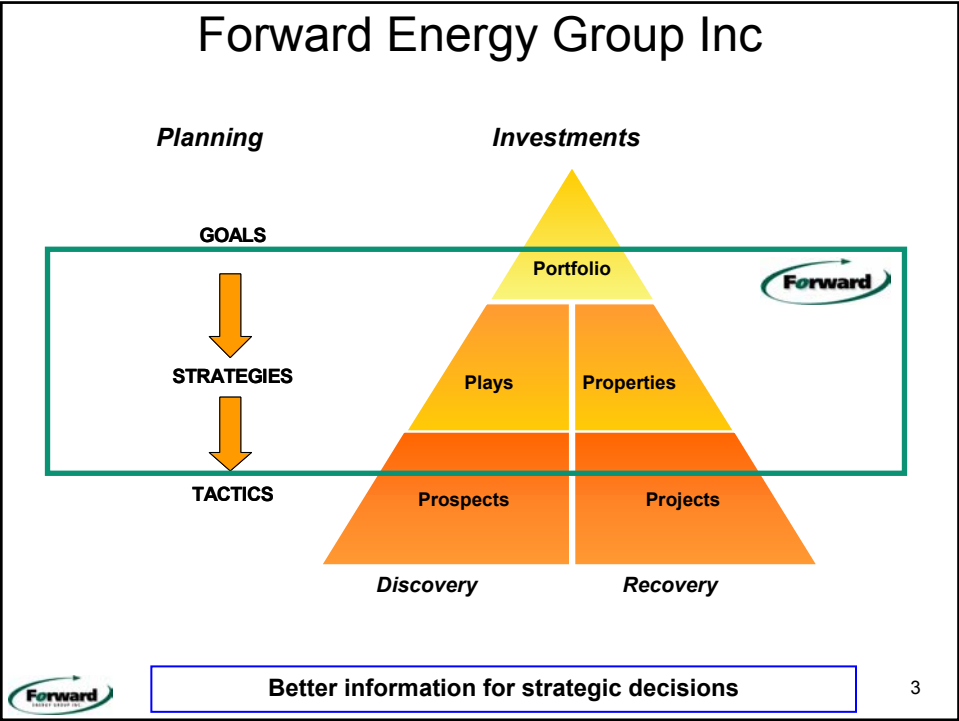
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Agenda

- Introduction
- WCSB Gas Supply Challenge
- Unconventional Gas
- CBM/Shale
- WCSB Tight Gas
 - Shallow
 - Jean Marie
 - Deep Basin
- Summary



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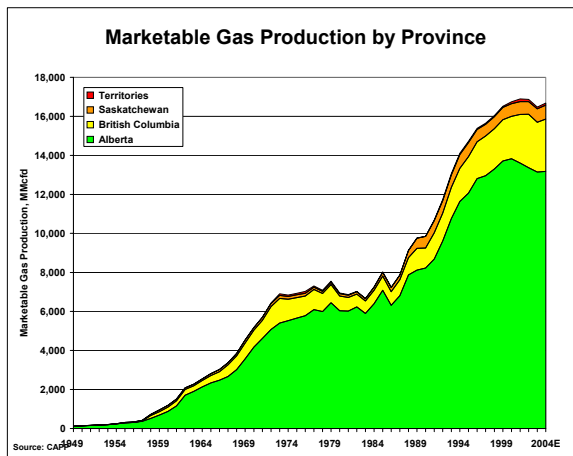
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WCSB Production



- WCSB production:
 - Recent peak at 16.9 Bcfd in 2001
 - Decreased to 16.5 Bcfd in 2003
 - Rebound to 16.7 Bcfd in 2004
- Alberta: dominant provincial source
- BC: only region with growth trend

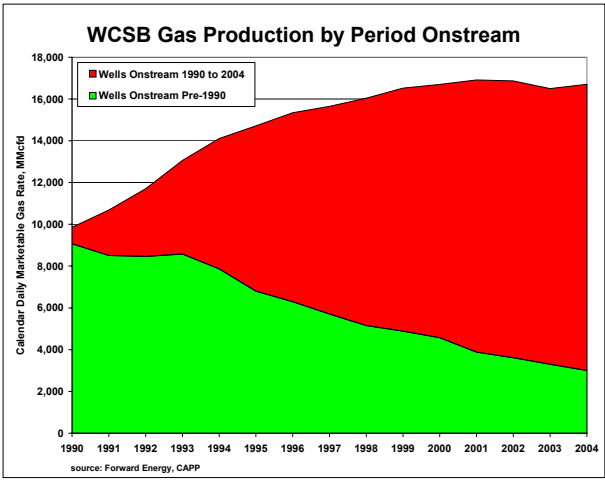
- WCSB ultimate potential for 'conventional' natural gas: 290 Tcf (NEB/EUB)
- Unconventional resource potential: 300 – 1000s Tcf



Will production grow again, sustain or decline?

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Supply Challenge: Sustain Production



- Total WCSB production flat at 16.7 Bcfd \pm 0.2 Bcfd
- Decline in production from connected wells
- Rate additions from new wells onstream provide growth
- Wells onstream since 1989 produce 80% of gas

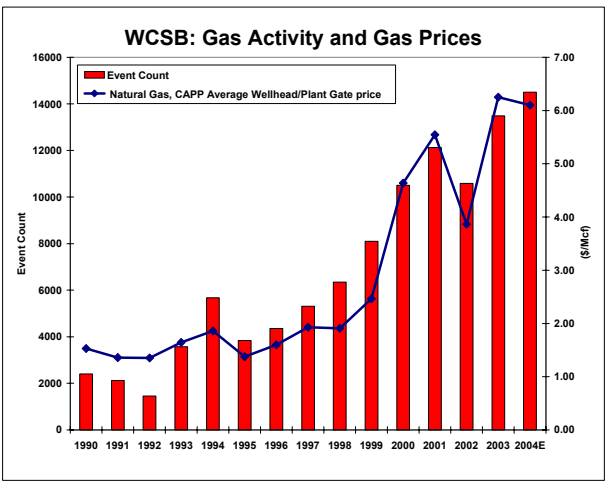
- WCSB supplies 25% of consumption in US and Canada



Competing processes of decline and rate additions

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How has industry responded?



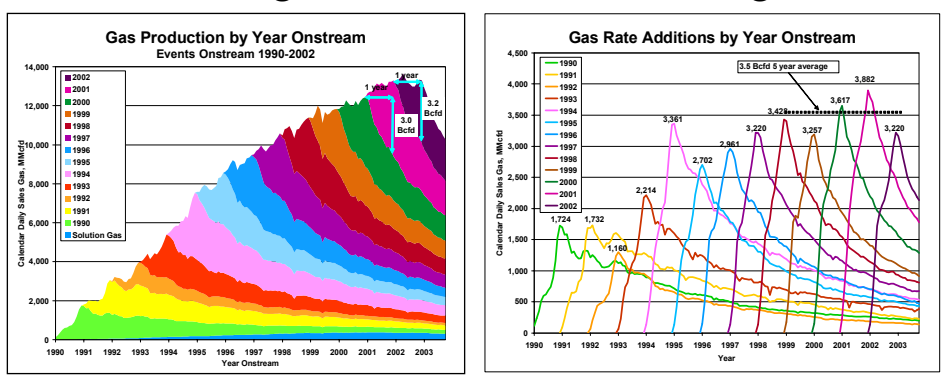
- Connection activity reached record levels, above 14,000 connections, by the end of 2004
- Activity, and rate additions, responded to prices, cash flow, acquisition and capital markets, export capacity, etc.



Gas price and gas connection activity correlated

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How big is the annual challenge?

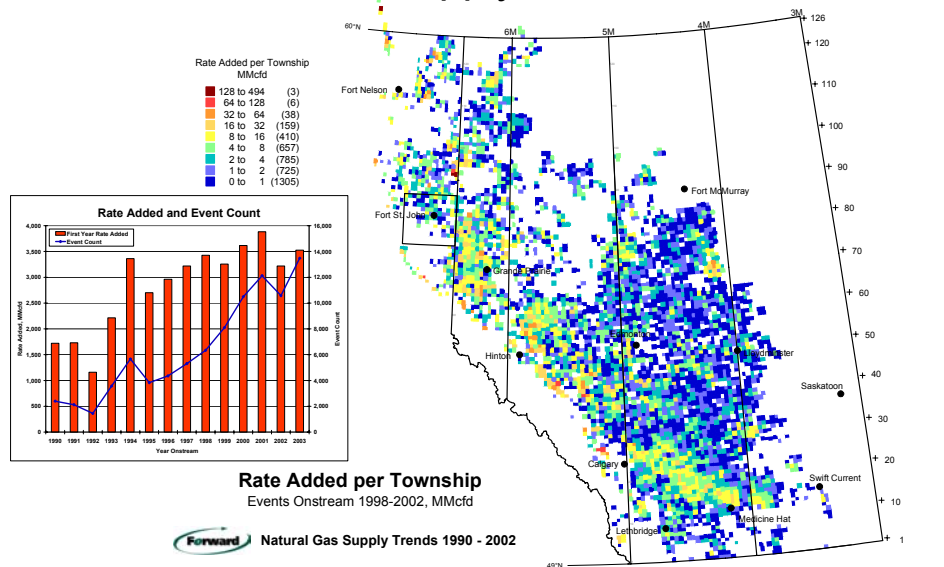


- Supply additions were 1.7 Bcfd in 1990, peaking at 3.9 Bcfd in 2001; 3.7 Bcfd in 2004
- Shallow declines in early years; first year decline has increased from less than 30% to 40%
- Rate additions for all wells onstream in year is the peak monthly rate



Higher production rates require higher production replacement

WCSB Supply Additions

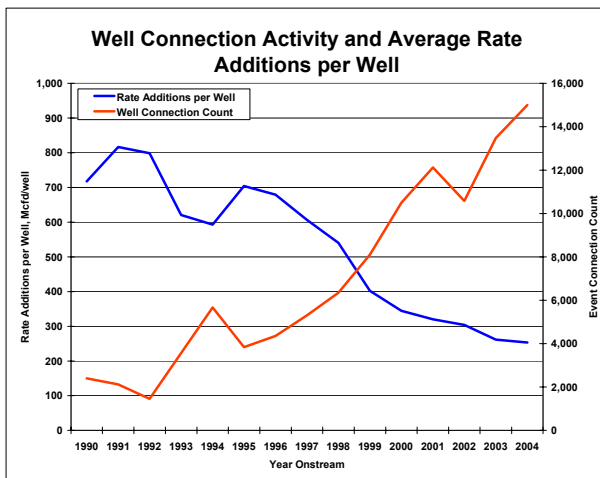


Natural Gas Supply Trends 1990 - 2002



WCSB: Very large area, many producing plays, very active

Rate Additions per Zone Connected



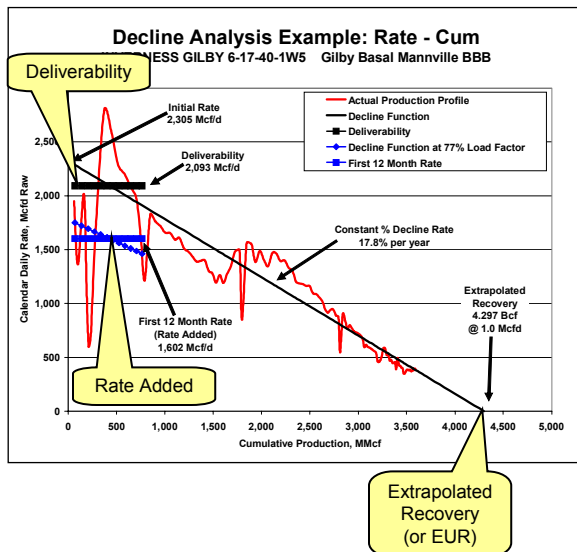
- Rate added by new connections declined to 250 Mcfd per zone (2004)
- Threshold size of an economic well decreased as gas price and netback increased
- Expanded opportunity set: smaller, higher cost, lower quality, higher risk or more remote prospects



More, but lower productivity, opportunities at the economic margin

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Supply Measures



Extrapolated recovery

Deliverability

Rate added

- the primary measure
- allocated by load factor-adjusted first 12 month rate

Discounted production
Plant gate marketable



Supply measures calculated from decline functions

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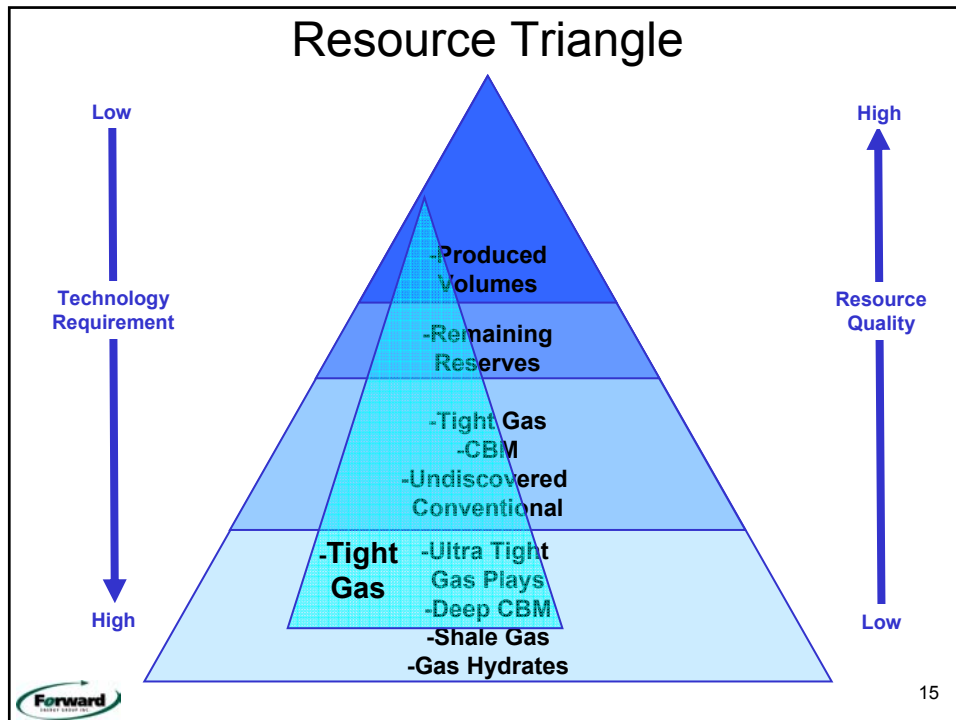
What is Unconventional Gas?

To provide a comparison to the US production, we have adopted the US Energy Information Administration (EIA) definition of unconventional gas:

“Natural gas extracted from **coalbeds** (coalbed methane) and from **low permeability sandstone** and **shale** formations (tight sands and gas shales) is commonly referred to as unconventional gas. Most of these resources must be subjected to a significant degree of stimulation (e.g., hydraulic fracturing) or other “unconventional” production techniques to attain sufficiently economic levels of production.”



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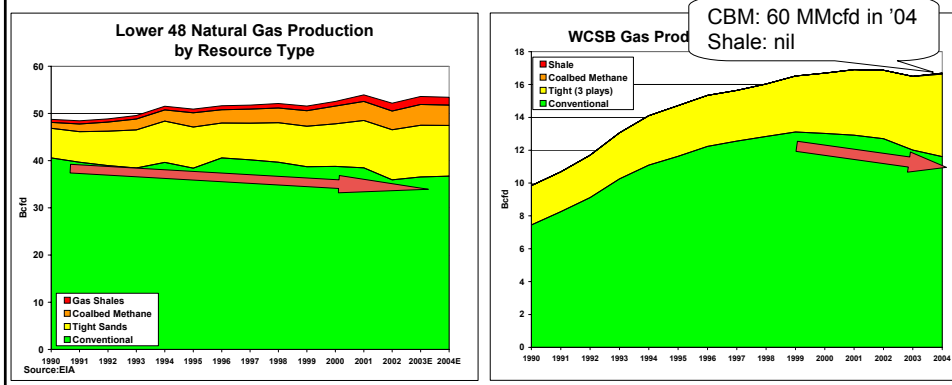
Identification Issues

- U.S. agencies currently report natural gas production in the Lower 48 states from conventional and “unconventional” sources
- Canadian agencies do not (yet) distinguish production from tight sand or shale reservoirs from conventional gas production
- The Alberta EUB only recently began to identify production from coalbed methane wells separately
- Confidentiality provisions delay some information release, thus potentially obscuring more recent trends



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US-Canada Gas Production Profiles

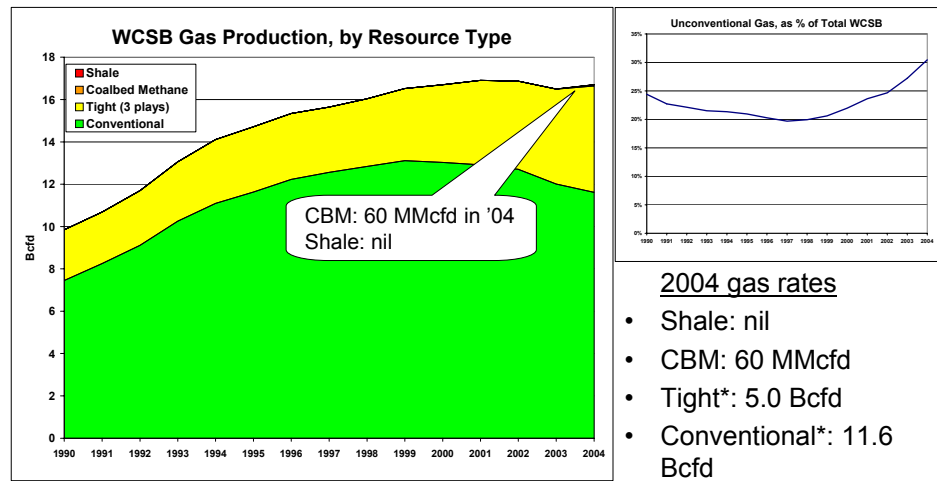


- Lower 48 gas production flat at 50-52 Bcfd; WCSB plateau at 16-17 Bcfd
- CBM and shale gas in WCSB not yet on radar
- 3 major plays for Tight* gas in WCSB
- Tight gas in lower 48 at 20% of total 2004 production vs 28% contribution in WCSB
- Conventional* gas in decline



Tight gas is significant for both USA and Canada

WCSB Unconventional Gas



- 2004 gas rates
- Shale: nil
 - CBM: 60 MMcfd
 - Tight*: 5.0 Bcfd
 - Conventional*: 11.6 Bcfd

- Tight* gas: Selected three plays as examples where tight gas dominates
- With decline in conventional, tight gas becoming greater share of the mix



Tight gas – currently 30% of WCSB output

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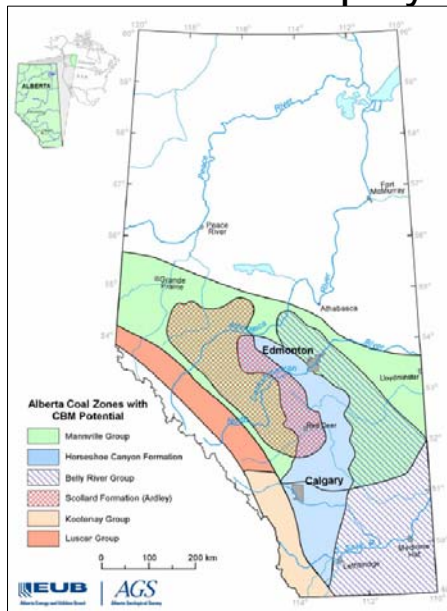
Coalbed Methane in WCSB

- Resource potential: 300-400 Tcf gas in place; 10-20 Tcf recoverable (various sources)
- Recent startup – WCSB production at 170 MMcfd
- Only commercial production to date from the Horseshoe Canyon coals, in Alberta
- Experimental pilots operating in BC and in Alberta – production levels not yet material



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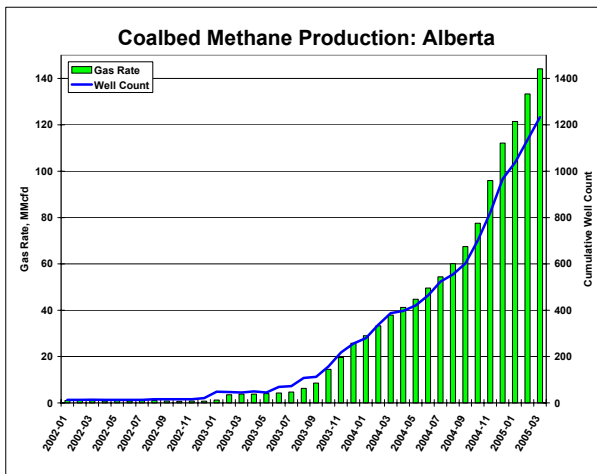
CBM plays in Alberta



- Horseshoe Canyon and Belly River coals
 - Upper Cretaceous
 - Typically dry gas production
 - Focus of most of current activity
- Ardley (Scollard)
 - Upper Cretaceous
 - Limited activity to date
- Mannville Group
 - Lower Cretaceous
 - Often with associated water
 - Experimental pilots, results often confidential

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Coalbed Methane Production



- Production rate increasing dramatically
 - 60 MMcfd annual average in 2004
 - 110 MMcfd exit rate – Dec04
 - 170 MMcfd est. rate – Jun05
- CBM now contributing 1% of total WCSB

- Recent start; high growth rates
- 3000+ wells drilled to date; 1000 wells onstream by end Dec04 (EUB designation)

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Coalbed Methane Opportunities and Challenges

- Significant resource potential
- Value drivers increasing with strengthening of commodity prices and technology improvements
- Due to their location, CBM properties often have the benefit of existing infrastructure and stakeholder familiarity
- Surface land and land user impacts
- Major challenges
 - sufficient resources of permeability-thickness
 - (the cost of) water handling



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Shale Gas in WCSB

- No current recognized gas production from shale zones
- Values for resource estimates → large numbers
- Experimental work being undertaken – results are confidential
- Some production occurring as commingled production with sand stringers, whether inadvertent or planned



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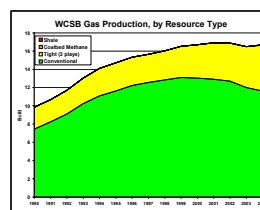
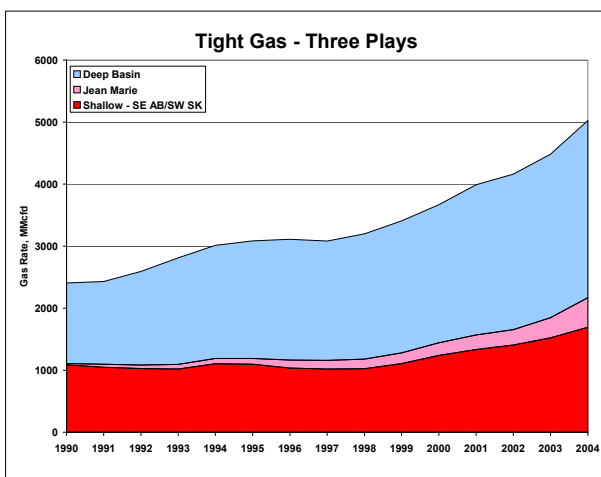
What is Tight Gas?

- In the US, “tight gas reservoirs generally are defined as gas-bearing rocks with an in-situ permeability to gas of less than 0.1 md” (Spencer, 1989)
- Since in-situ permeability data is not publicly reported for gas zones in the WCSB, we have estimated tight gas production on the basis of a number of criteria, including stratigraphic group, geographic region, the occurrence of fracture stimulation or horizontal drilling and depth



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Tight Gas Play Examples



- For the purpose of this analysis, we illustrate three types of tight gas plays, as examples:
 - Shallow (SE Alberta/SW Sask.)
 - Jean Marie
 - Deep Basin

- The key uncertainty is the proportion of tight gas production from fracture-stimulated Mesozoic zones deeper than 6000 feet



Three tight gas plays – all on growth trends

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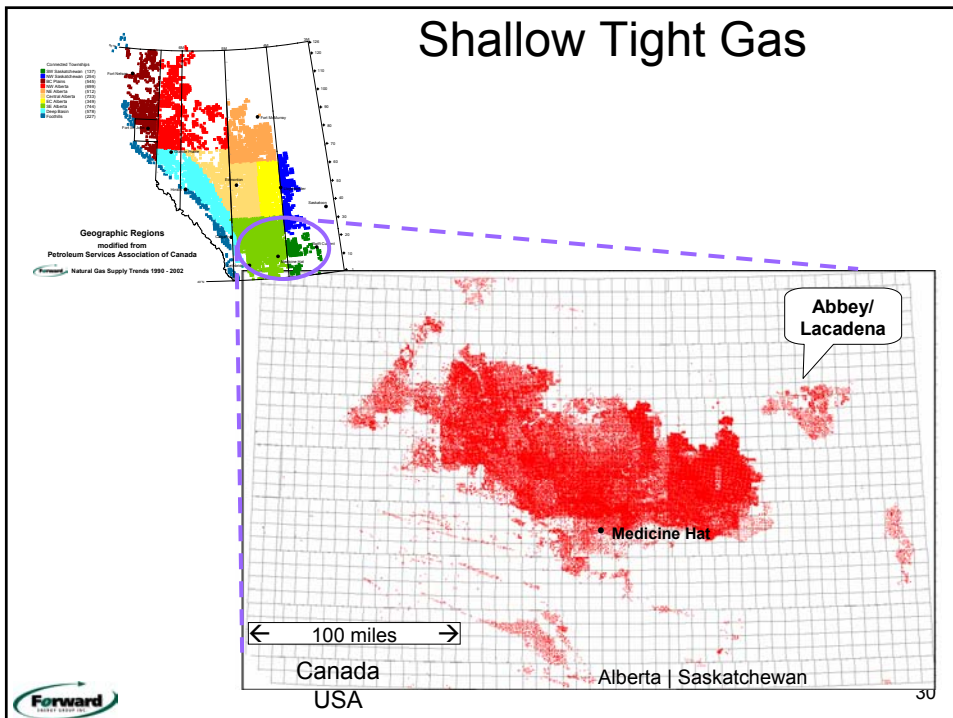
Shallow: SE Alberta/SW Saskatchewan

- Shallow fracture-stimulated, low-permeability Upper Cretaceous reservoirs in the Sweetgrass Arch area of southeast Alberta and southwest Saskatchewan
- Well depth: 2000-2500 ft, predominantly vertical
- 2004 production: 1.7 Bcfd in 2004, 10% of WCSB production
- 95% of the over 33,000+ events connected since 1990 have been fracture stimulated

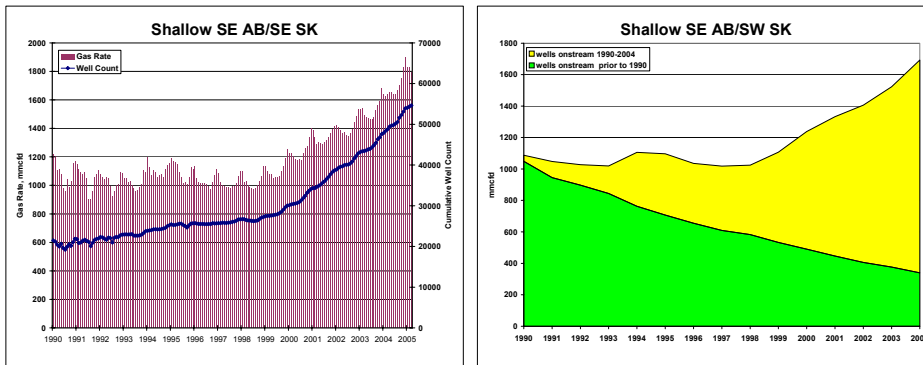


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Shallow Tight Gas



Shallow Tight Production



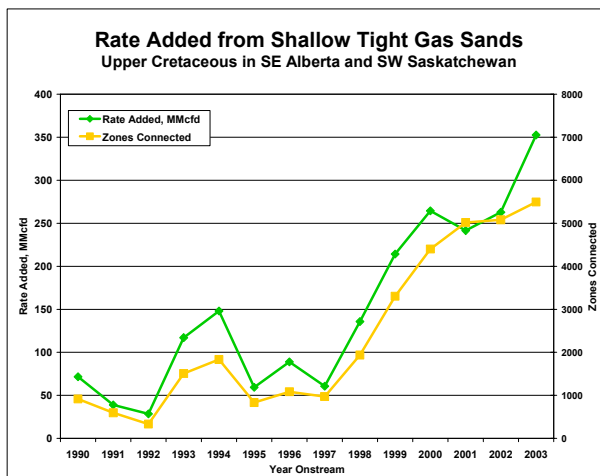
- Intense activity: 1.8 Bcfd from 66,000+ wells onstream (to Apr05)
- Average well rate: 33 Mcfd
- Steady production to 2000, 9%/year growth rate since



Infills, extensions and new discoveries

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Shallow Tight Gas Rate Additions



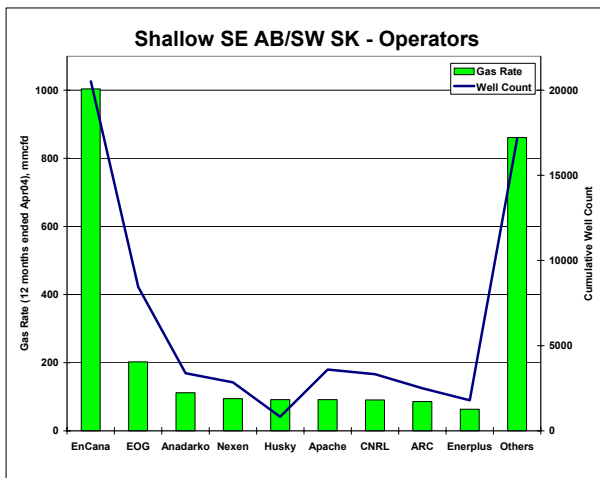
- 5000+ new wells connected each year
- Supply additions increasing to 350 MMcfd/year, above the annual loss due to decline (~150 MMcfd)



Resource play: continuous activity to keep production rate going

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Shallow: Operators



- EnCana largest operator, by far; 1.0 Bcfd (42% of total play)
- EOG second largest, but only 8% of volume
- Nearly 200 other operators share the activity
- Variance in average rate per well reflects internal play diversity



EnCana largest Shallow Tight Gas operator

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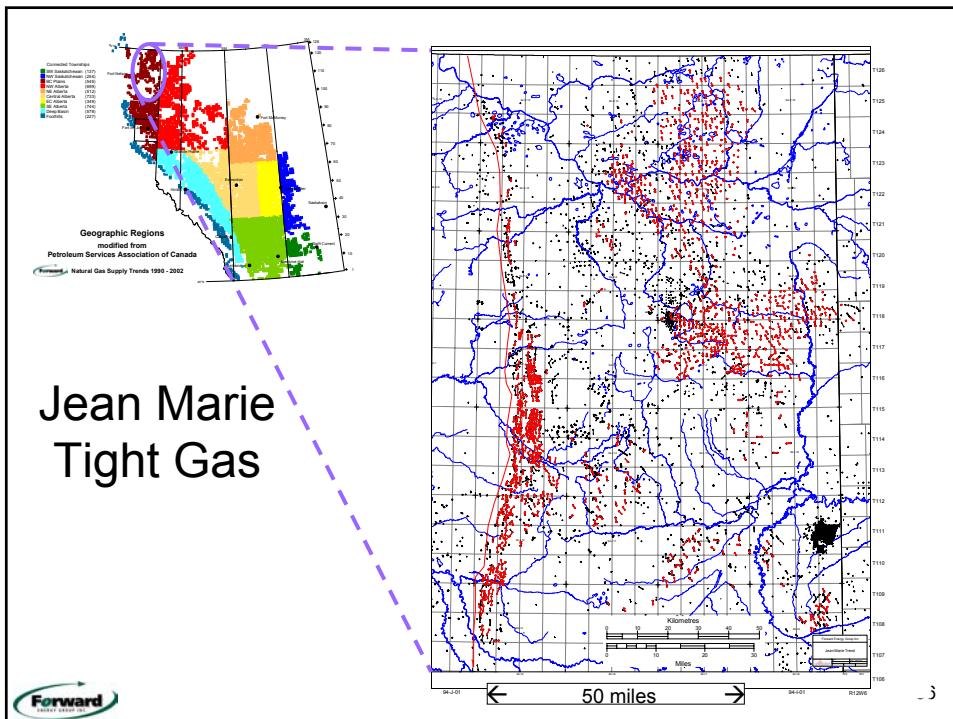
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Jean Marie

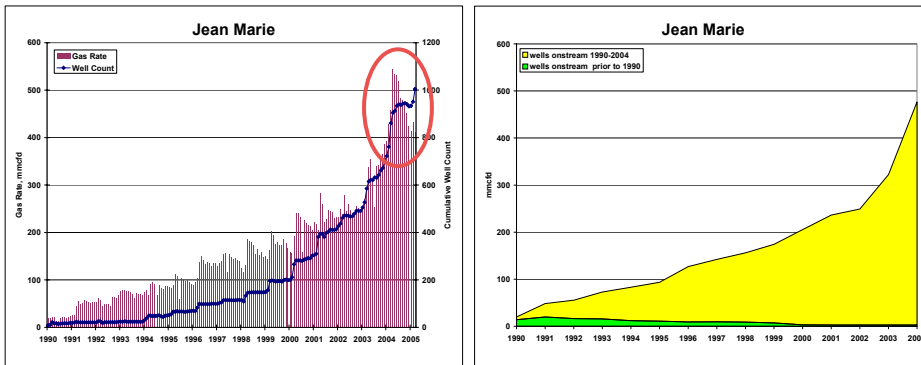
- Gas-charged, under-pressured shelf carbonates of the Devonian Jean Marie Formation in NE British Columbia, typically drained by horizontal wells
- Well depth: 4000-4500 ft – TVD:
- Horizontal leg length: average 2900 ft, up to 5000 ft
- Jean Marie sources produced about 0.5 Bcfd, 3% of 2004 WCSB production



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Jean Marie Production



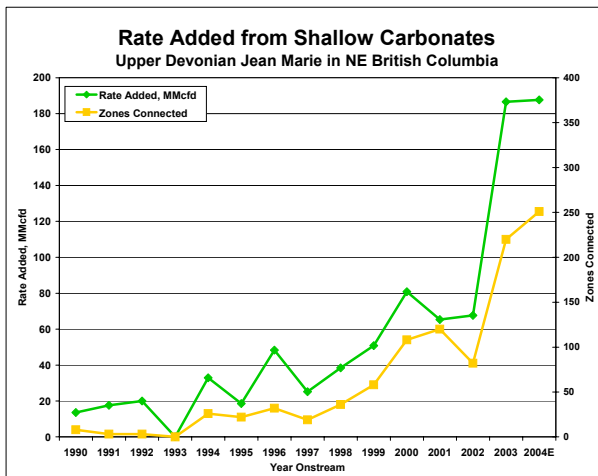
- 2004: 480 MMcfd from ~1000 wells onstream; average well rate: 480 Mcfd
- Very little base production; recent growth from application of technology



Jean Marie – an emerging play

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Jean Marie Rate Additions

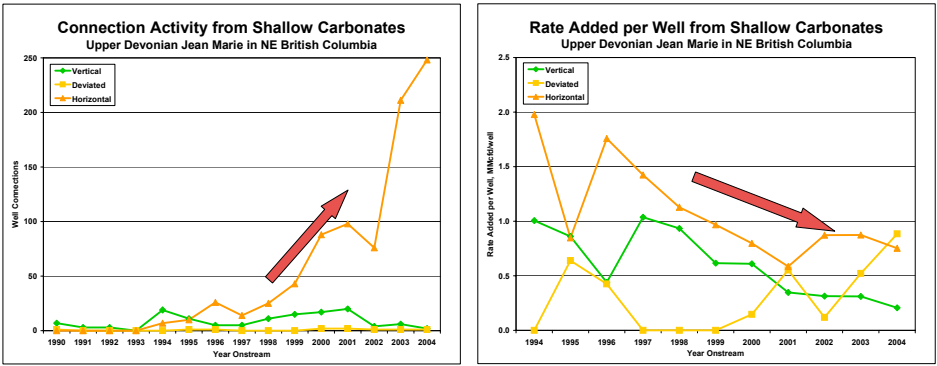


- 250 new wells connected each year
- Supply additions nearly 200 MMcfd, above the loss due to decline
- Average initial rate decreasing – to 750 Mcfd/well in '04



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Jean Marie: Horizontal Drilling

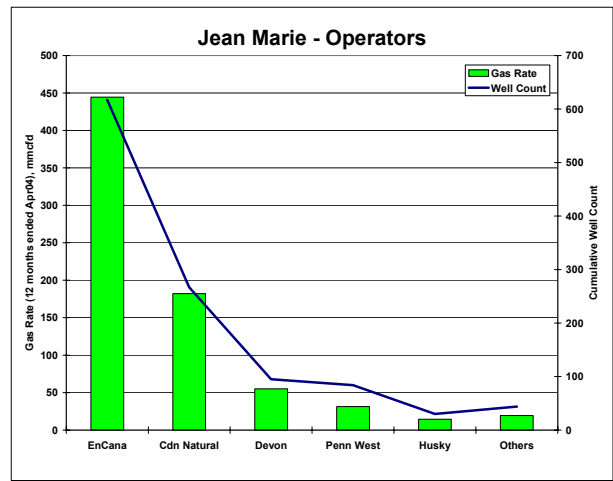


- Full scale deployment of horizontal, under balanced drilling technology, commencing in 1999, enhanced play development
- Over 95% of recent wells in Jean Marie play are horizontal
- Productivity of horizontal wells 20-100% better than vertical wells



Horizontal technology made this play

Jean Marie: Operators



- Jean Marie play characterized by few operators
- EnCana is the largest; nearly 450 MMcf/d, or 60% of the total
- CNRL and Devon operated 24% and 7%, respectively



EnCana dominates the Jean Marie play

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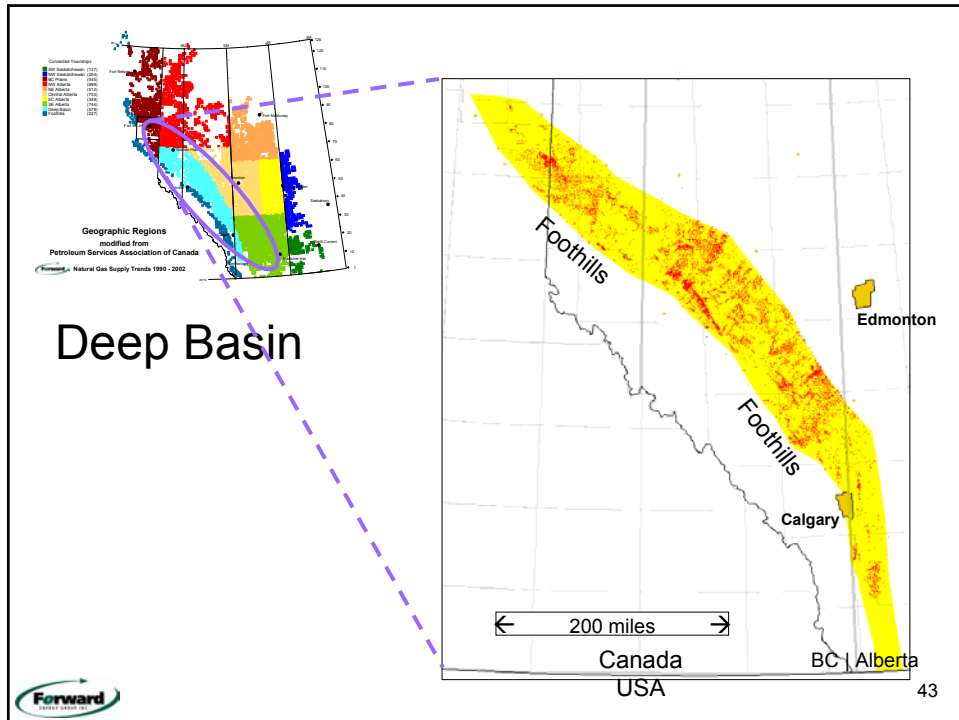
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Deep Basin

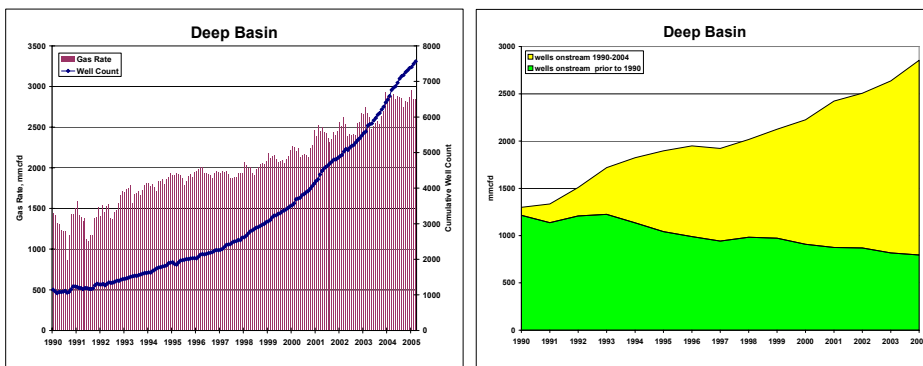
- Definition of the Deep Basin characteristics:
 - Gas charged area in west-central Alberta (and parts of BC), just east of the Foothills disturbed belt
 - Located in recent to Jurassic stratigraphic groups
 - Deeper than 6000 ft
- A large portion of these reservoir rocks are low permeability, or 'tight'
- Well depth: 7000-11,000 ft; average 8400 ft; predominantly vertical
- The Deep Basin play produced about 2.6 Bcfd, 15% of 2004 WCSB production



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Deep Basin Production



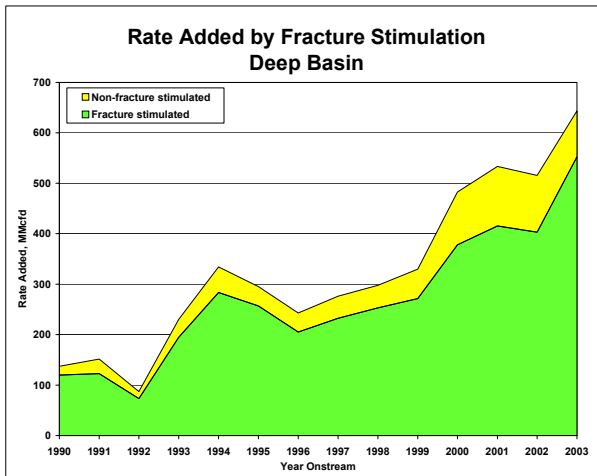
- Increasing activity: 2.9 Bcfd from 7600+ wells onstream (to Apr05)
- Average well rate: 400 Mcfd
- Steady production growth from 1990, 7%/year compound annualized growth rate



Deep Basin tight gas: significant and growing

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Deep Basin Fracture Stimulations



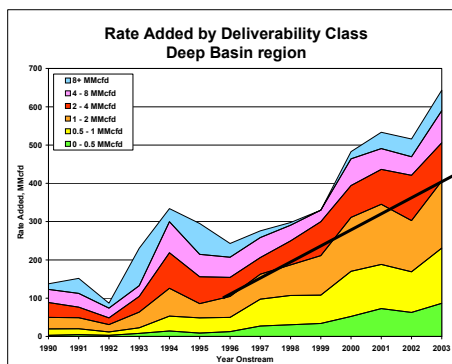
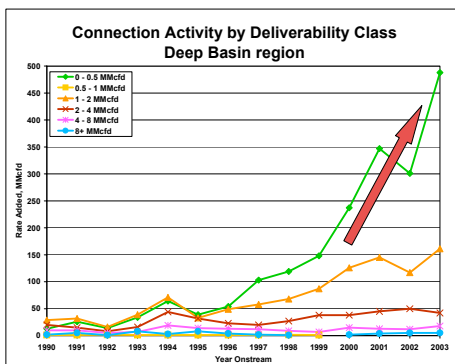
- A majority of the wells in this Deep Basin play are fracture stimulated
- 80-85% of these rate adds from fractured wells



Fracturing technology - a necessary component

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Deep Basin Deliverability Class



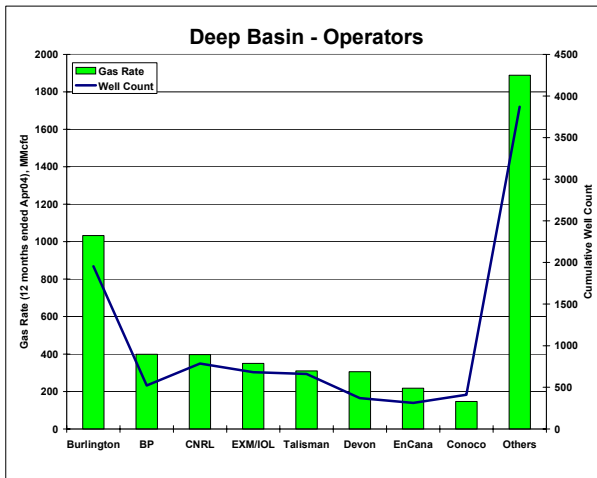
- Extraordinary growth in the number of low rate (<0.5 MMcfd and 1-2 MMcfd) connections since 1995; number of connections in the higher rate classes has remained relatively constant
- Rate additions from lower deliverability wells (<2.0 MMcfd) increased from 30% to 65% of annual rate additions



Pushing the marginal economic limit has lead to growth in overall rate additions from lower deliverability wells

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Deep Basin: Operators



- Approximately 200 operators share the activity; no single operator dominates
- Burlington largest operator; 1.0 Bcfd (23% of total play)
- BP and CNRL second largest, but only 9% of volume each



Burlington: largest Deep Basin operator

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Where To From Here?

- Outstanding issues:
 - No clear working definition of tight gas
 - Lack of accepted characterization of plays and resources
 - Size and scope of resource potential/opportunity is not agreed
 - Focus on enabling technologies not as well understood
- Resolution: Forward Energy is embarking on a tight gas characterization project
 - Multi-client
 - Wide support: industry, government, agency
 - Multi-year



A solid grounding in the definition and extent of tight gas in the WCSB required - to lead to solid investment decisions

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Key Messages

- The WCSB is a large, diverse and dynamic basin; many opportunities available to all types and sizes of operators
- Unconventional gas is one of the few components of the WCSB with sustainable growth potential
- CBM is in relative infancy in Canada; tight gas is a continuing program
- Tight gas, developed through the resource play mechanism, is a major focus for selected operators
- Technology developments have been, and will continue to be a major factor in resource development



**The sky is not falling - the sky is growing
The challenge is cost-effective rate additions**

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***Tight Gas in Western Canada:
An Important and Continuing Component of
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