

***Canadian Tight Gas:  
Developing and Applying  
a Workable Definition***

**Bob Dixon and Dave Flint**

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***Western Canada Tight Gas Resource  
Characterization Project***

Natural Resources Canada - GSC

Devon Canada Corporation  
Husky Oil Operations Ltd.  
Imperial Oil Limited  
Petrel Robertson Consulting Ltd.  
Talisman Energy Inc.  
TransCanada Pipelines Limited

NEB, CGPC, BCMEMPR, EUB, Sask IR, ARI, USGS, EIA




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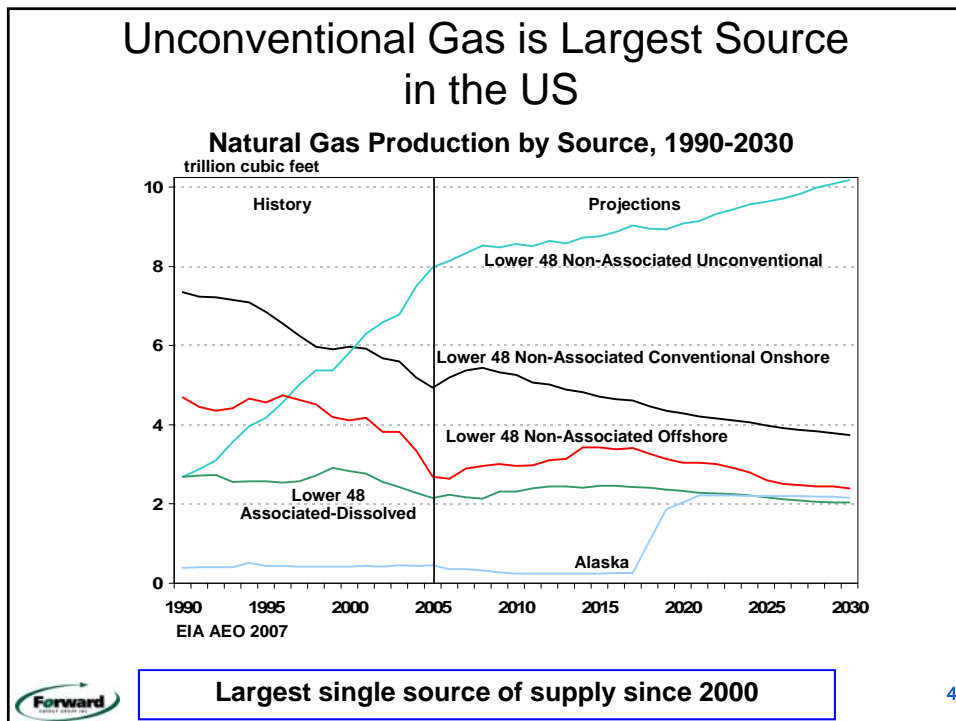


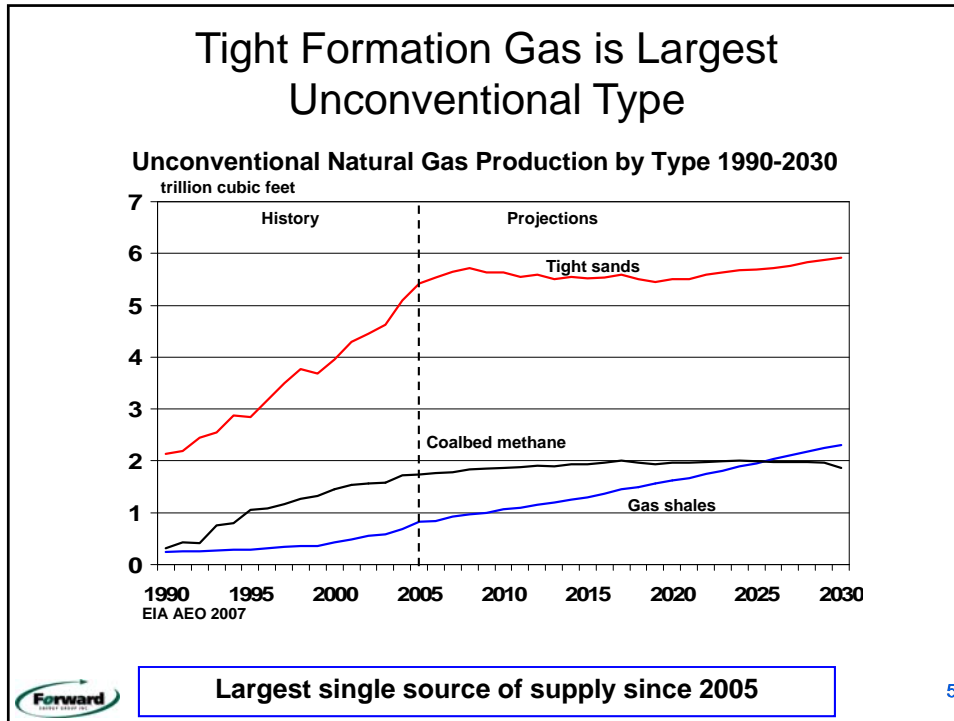
### Outline

- Introduction
- Tight Gas in USA/Canada
- Definitional Issues
- 0.1 mD Myth
- Adopted Definition
- Application of Definition



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### Tight Gas in Western Canada

Tight gas is an expression widely used by:

- Publicly-traded firms to describe plays and activity in financial disclosure
- Technical associations, professionals and academics
- Journalists in trade publications
- Government agencies (rarely)

According to these sources:

- Tight gas is developed and producing in Western Canada
- The undeveloped resource base is believed to be large
- Supply from tight gas will increase as industry learns to develop and apply appropriate technology

**High expectations**

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## Tight Gas Not Reported in Canada

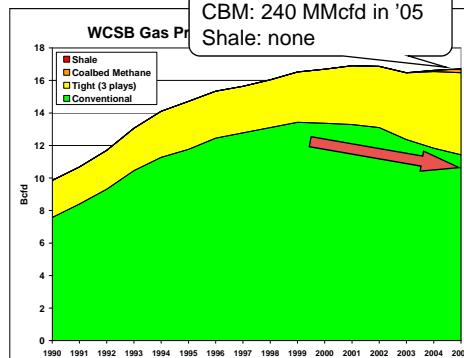
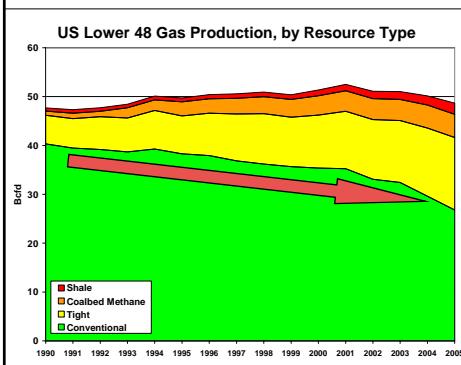
- Tight formation gas is not defined and distinguished from “conventional”
- Current tight gas production and size of future opportunity remain uncertain
- Geographic and stratigraphic distribution and reservoir characterization of tight gas plays not available in public reports
- Tight gas resource potential not included in CGPC, federal or provincial agency estimates
- Supply potential and opportunities to increase tight gas supply not founded on consistent definition, play characterization and resource estimates

GIP estimates up to 1500 Tcf in the early 1980s  
Is the resource really there?



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## Gas Production Profiles



US Lower 48

- Conventional gas in decline
- Tight gas in lower 48 over 30% of 2005 total
- CBM and shale gas significant

Western Canada

- CBM growing rapidly
- Tight gas not reported – estimate over 30% of 2005 total
- Conventional gas in decline

Better understanding of tight gas is important



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## Different Resource Models

### CONVENTIONAL

1. Discrete gas pools in ocean of water
2. Only high quality reservoir accumulates gas in place
3. Discovery is uncertain, recovery is certain
4. Discovery process is efficient
5. R&D to increase success
6. Remaining resource, in small undiscovered pools, is small
7. Official view of WCSB remaining resources

*"Glass is mostly empty"*

### UNCONVENTIONAL

1. Pervasive gas saturated accumulations
2. Very large gas in place in reservoir of all qualities
3. Discovery is certain, recovery is uncertain
4. Recovery is inefficient but improves with technology
5. R&D to improve recovery and characterization
6. Remaining resource in lower quality reservoirs is large
7. US and industry view of WCSB remaining resources

*"Glass is mostly full"*



**Test unconventional view of Deep Basin plays**

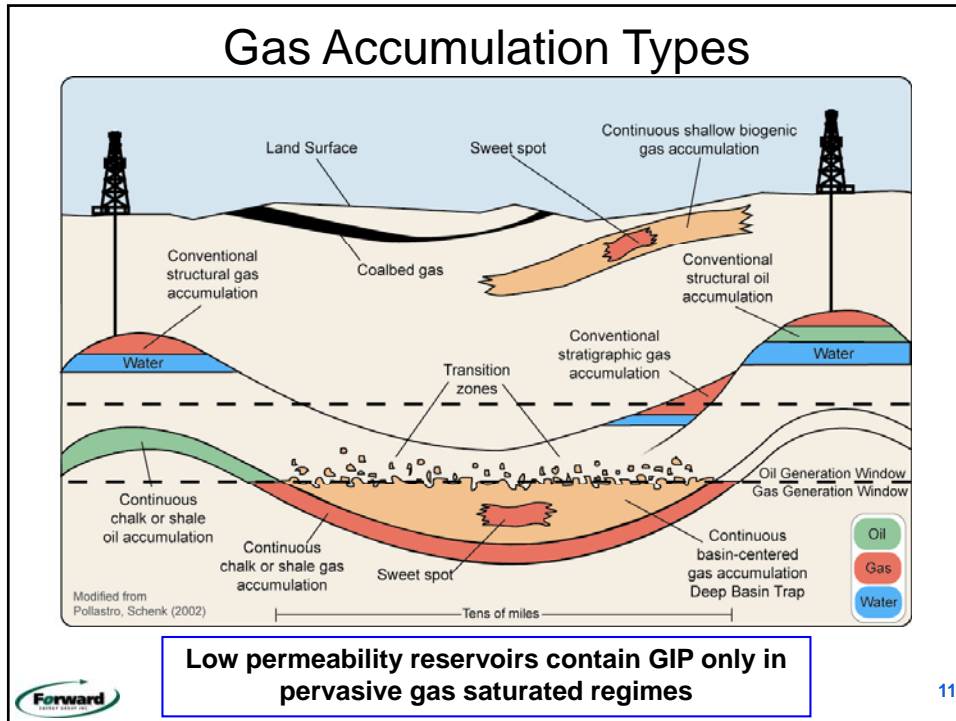
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## Project Objectives

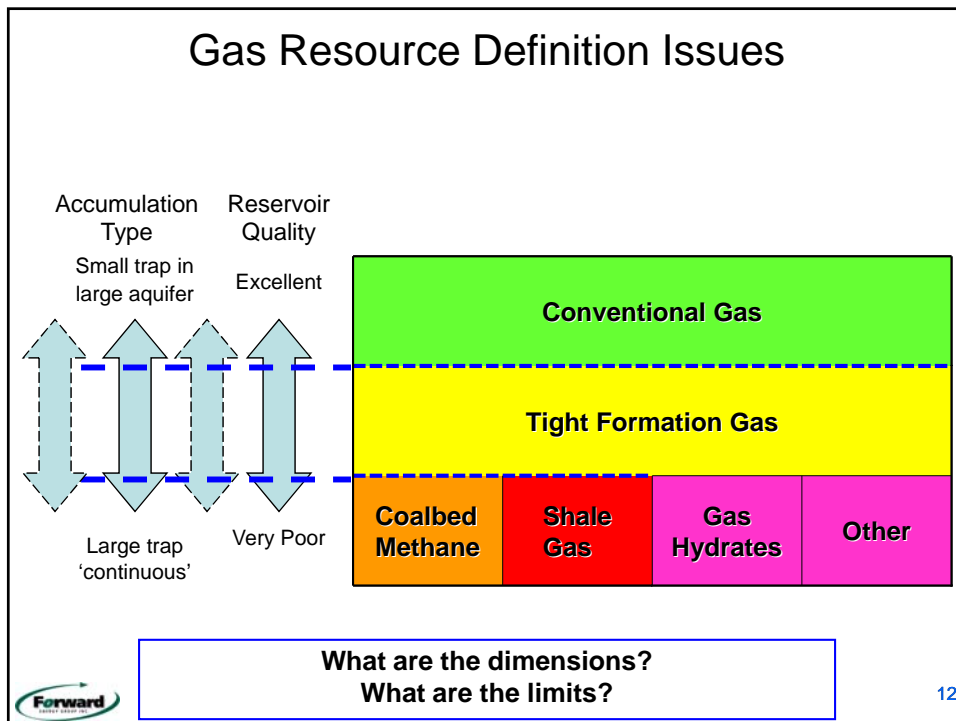
1. Communicate clearly the tight gas opportunity by establishing a **workable definition** for tight gas accepted by stakeholders
2. **Characterize** the tight gas opportunities into play types and analyze their supply trends
3. **Estimate** remaining tight gas resource potential and model its future conversion into supply.
4. Summarize resource and **supply potential** and **identify technology** and opportunities to maximize development of tight gas in Western Canada.



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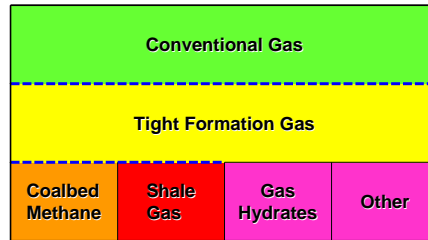


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### Tight Gas Resource Definition Criteria

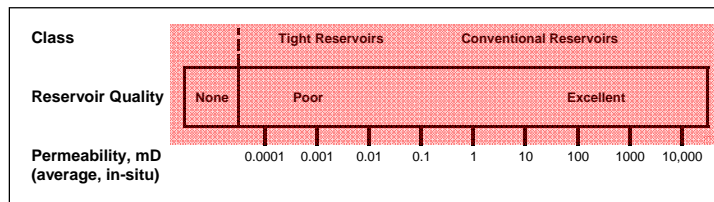


- ✓ Pervasive gas saturation
- ✓ Free gas produced by gas expansion
- ✓ Clastic and carbonate reservoirs
- ☒ Reservoir quality continuum
- ☒ Technology application
- ☒ Economics



**Workable**

### Reservoir Quality: The 0.1 mD Myth



#### Tight Formation Designation

- US tax credit program for wells drilled 1977 to 1992
- Area-average in-situ formation permeability < 0.1 mD
- Historical tight gas designation generalized to basin-formation and field-formation – includes areas previously excluded
- New plays included based on USGS continuous accumulation criteria – not screened by permeability criteria
  
- In-situ permeability is difficult to measure and average
- Average permeability is only one of several factors that determine flow rate, ultimate recovery and economics

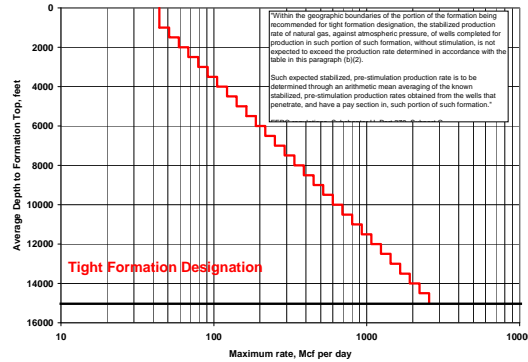


**US tight gas plays include all reservoir qualities**



## Reservoir Quality: The 0.1 mD Myth

Rate - Depth Limits for Tight Formation Gas



- Rate-depth limits classified formations with low productivity for their depth as tight formation gas
- Shallow biogenic gas



US tight gas plays include all reservoir qualities

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## Definition Workshop Outcomes

**Definition:** All gas resources occurring as free gas in the pores of clastic and carbonate reservoirs in regionally-pervasive continuous gas accumulations will be defined as tight gas resources. *Adopted working definition.*

Characterize the resource potential of **the complete spectrum of reservoir qualities** within these gas accumulations

**Regionally-pervasive gas accumulations** be classified as tight gas areas and reviewed in the following priority:

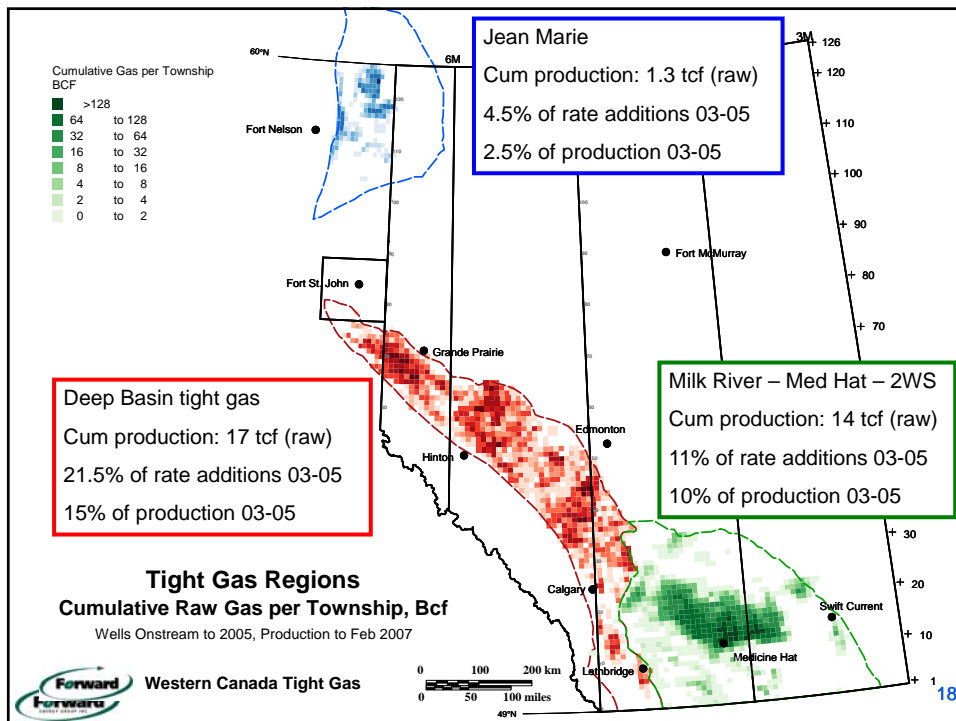
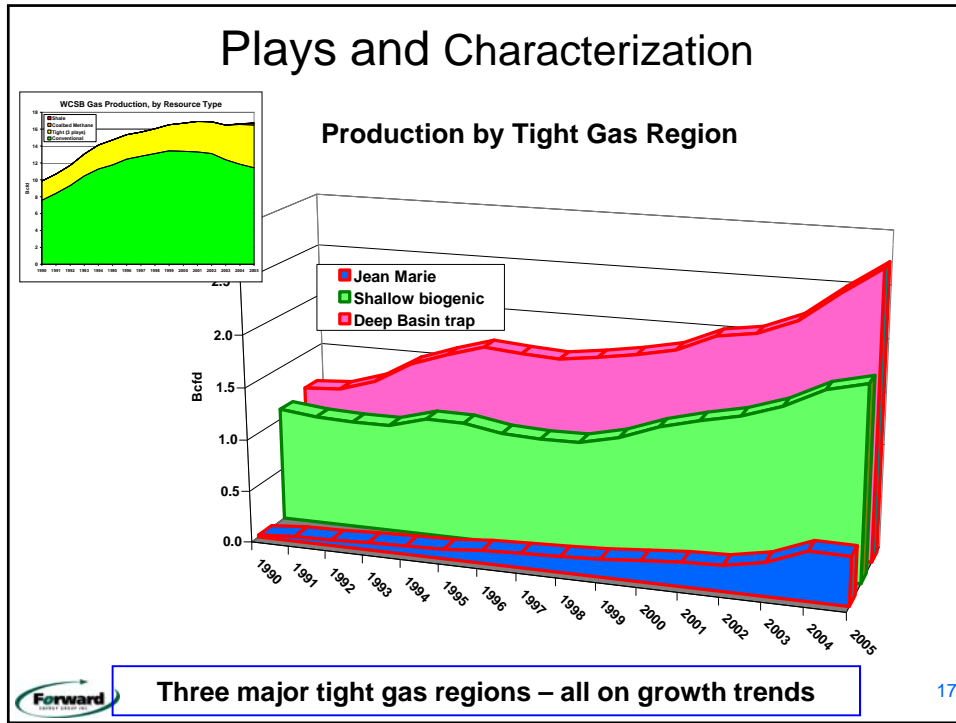
- Deep Basin trap *Primary characterization focus*

- Shallow biogenic gas
- Jean Marie Fm, B.C.
- Additional accumulations



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## Conclusions

- Unconventional gas is a significant and growing component of total gas supply, in both USA and Canada
- Tight gas is the largest part of the unconventional portfolio – over 30% of the WCSB output
- Supply potential and opportunities to increase tight gas supply not founded on consistent definition, play characterization and resource estimates
- Regionally pervasive gas accumulations host tight gas resources, regardless of the reservoir quality
  - The 0.1 mD cutoff is a myth
- Workable tight gas definition: free gas in the pores of clastic and carbonate reservoirs in regionally-pervasive continuous gas accumulations

**Adopted definition is workable for developing resource estimates**



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