Wood Mackenzie
A Verisk Analytics Business

Gaining Perspective: Insights from Wood Mackenzie

AADE Luncheon
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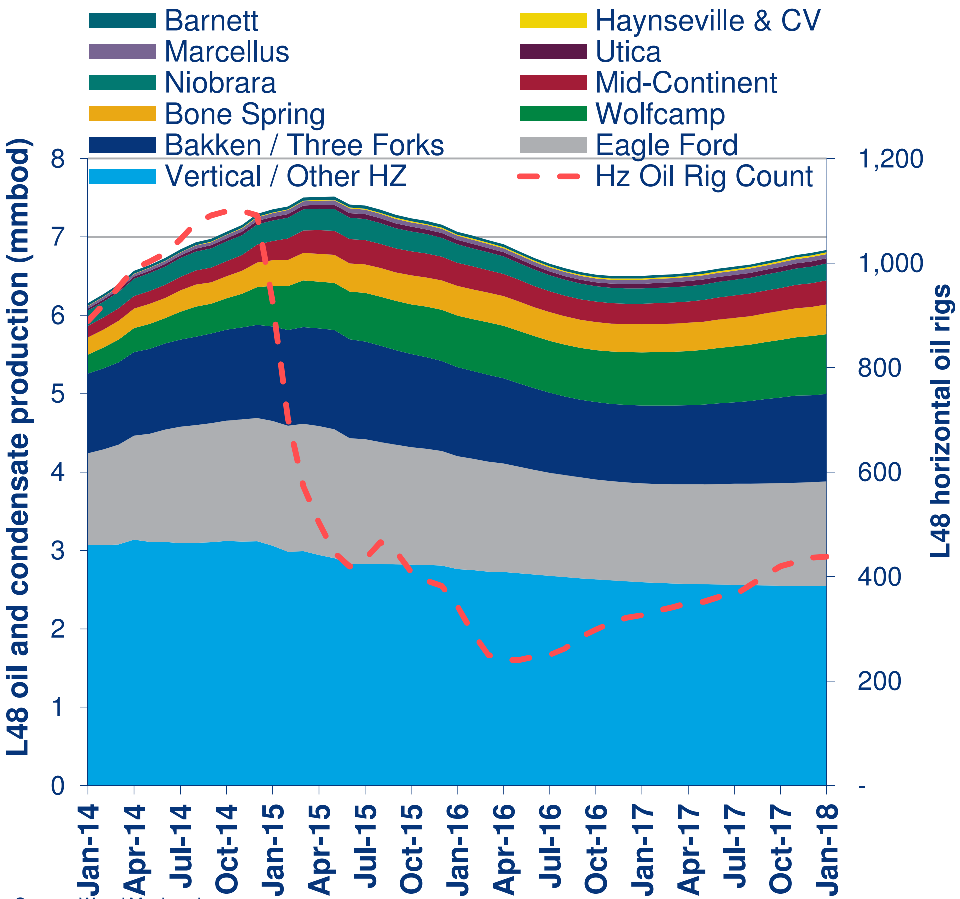
L48 oil production – Base case

Monthly production drops by 1 mmbod in base case

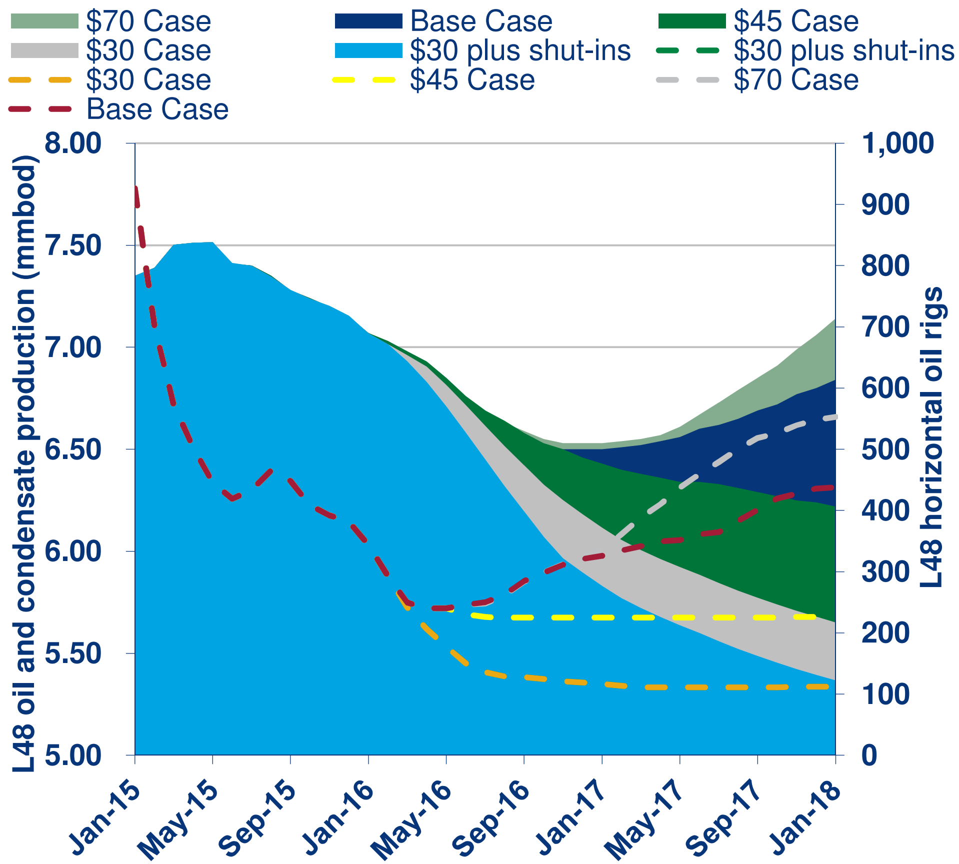
- Production falls from a peak of 7.5 mmb/d in April 2015 to low of 6.5 mmb/d in January 2017



Source: Wood Mackenzie

Over 1.5 mmb/d range for 2018 between $30 & $70 oil

- If $30 per barrel WTI were to persist, we would expect another decrease from of 1.7 mmb/d by 2018

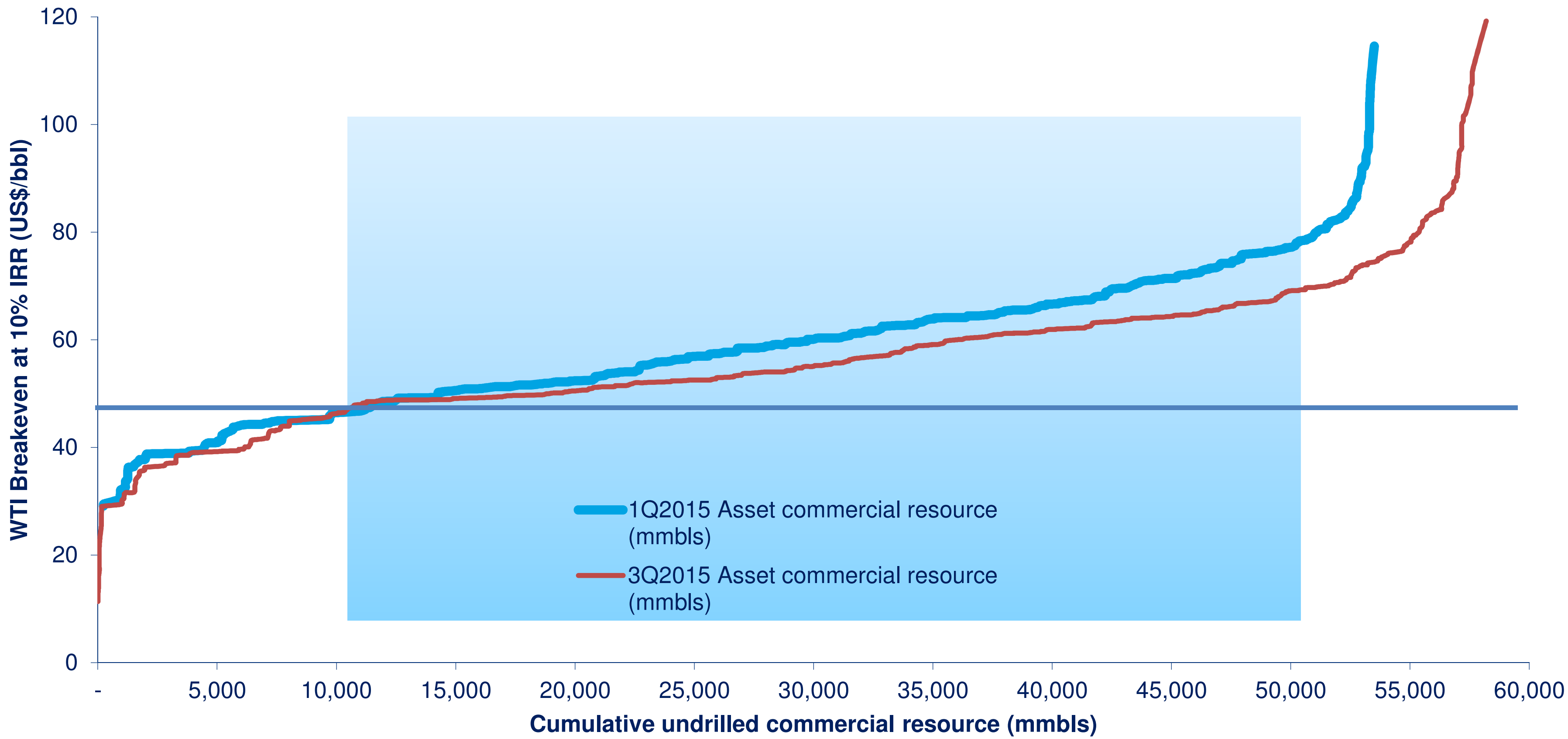


Source: Wood Mackenzie

An evolving US tight oil cost curve

New cumulative liquids resource by breakeven for US assets

- **In the range between 10 and 50 bn bbls, 1.8 billion barrels is added for every US$1.00 increase in price, versus 1.3 billion barrels in early 2015**

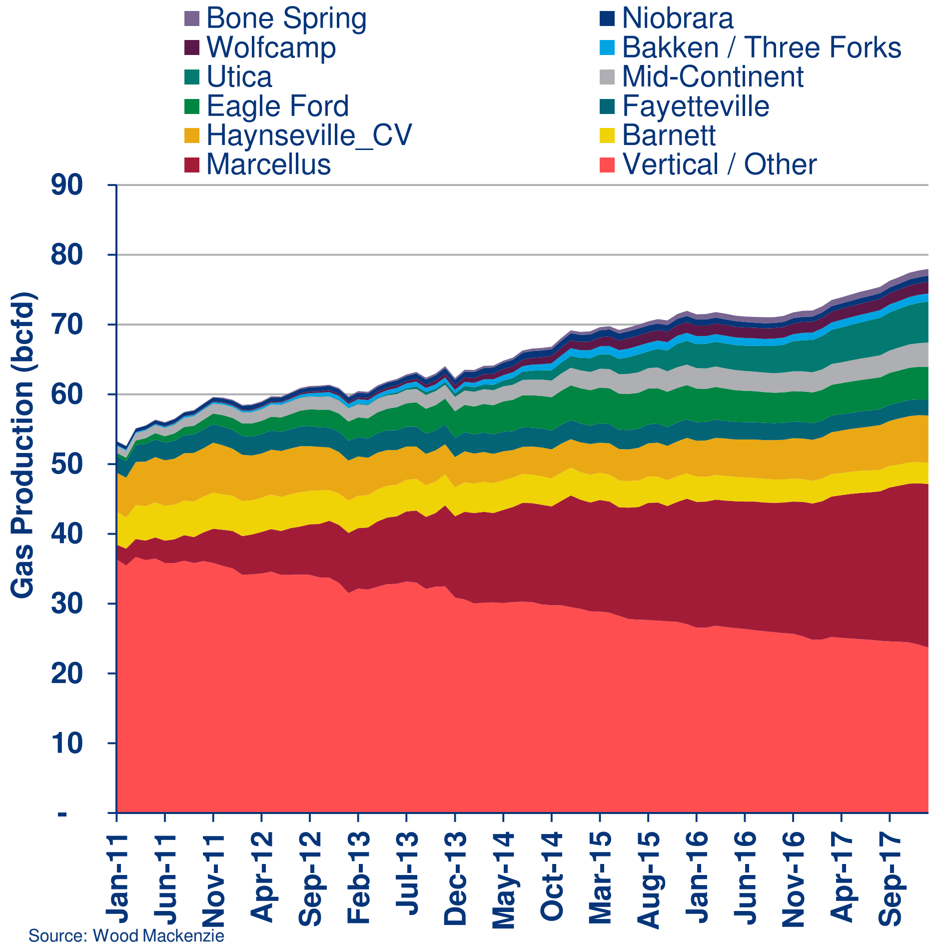


Source: Wood Mackenzie GEM

Current L48 gas production

Total L48 dry gas production by play

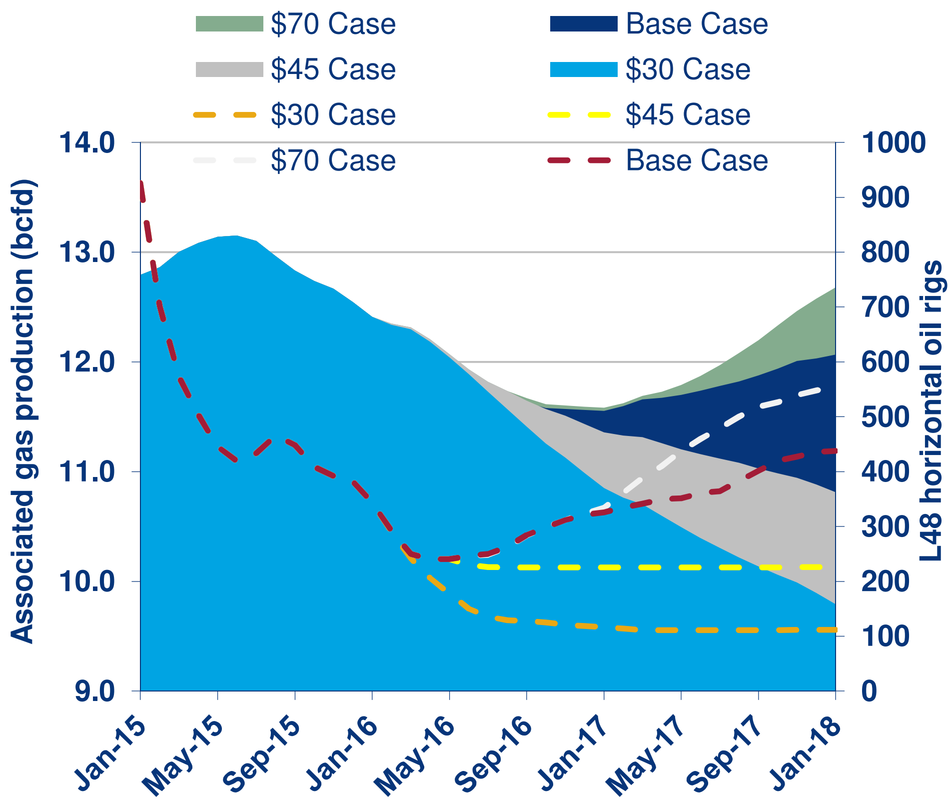
- Total dry gas production has steadily increased to-date this decade and is expected to continue to increase as supply grows in the northeast



Source: Wood Mackenzie

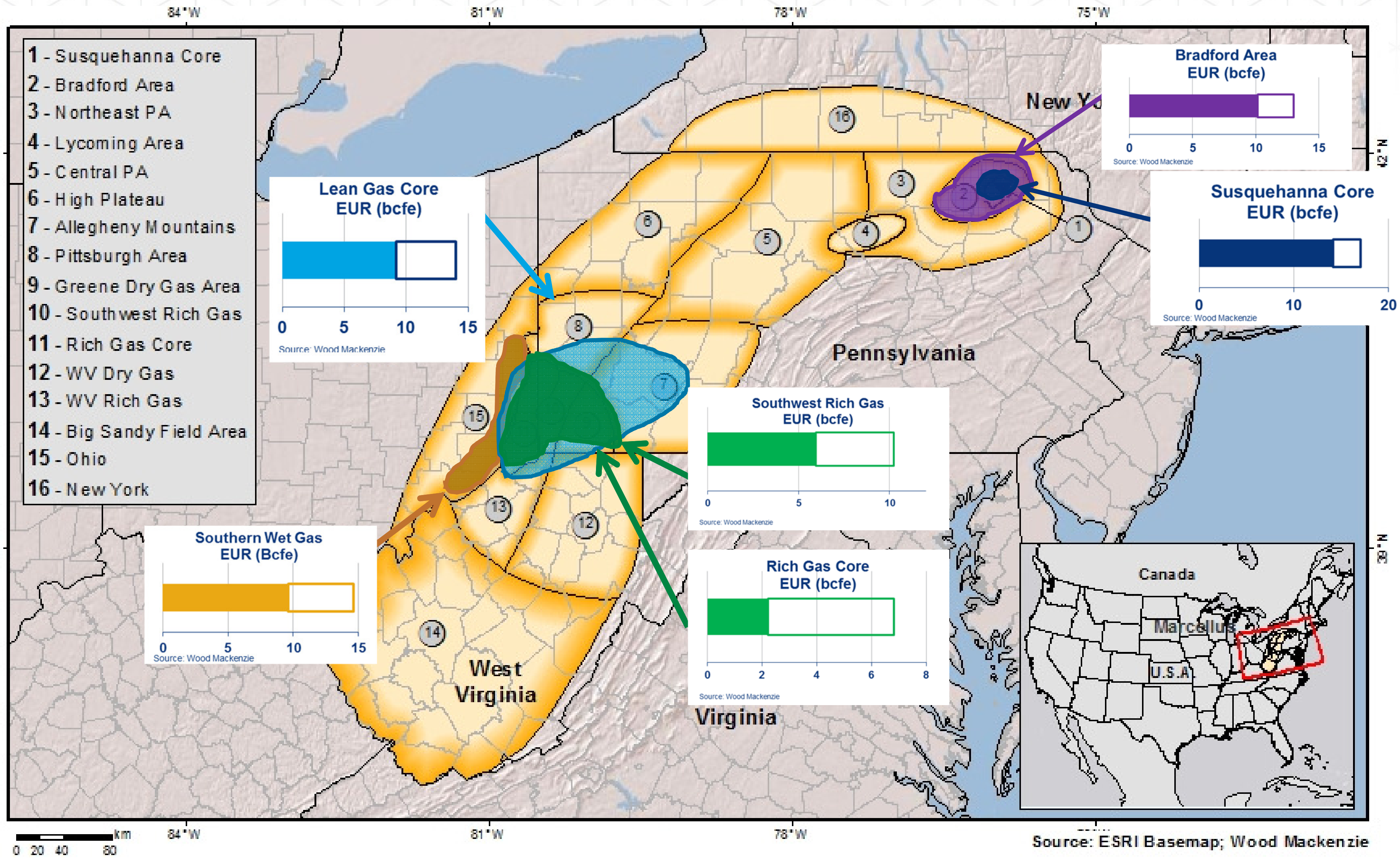
Associated Gas Scenarios

- Lower oil prices for longer could have a significant impact to gas supply in the US given short-term northeast constraints



Source: Wood Mackenzie

Well productivity in gas plays has outperformed liquids plays

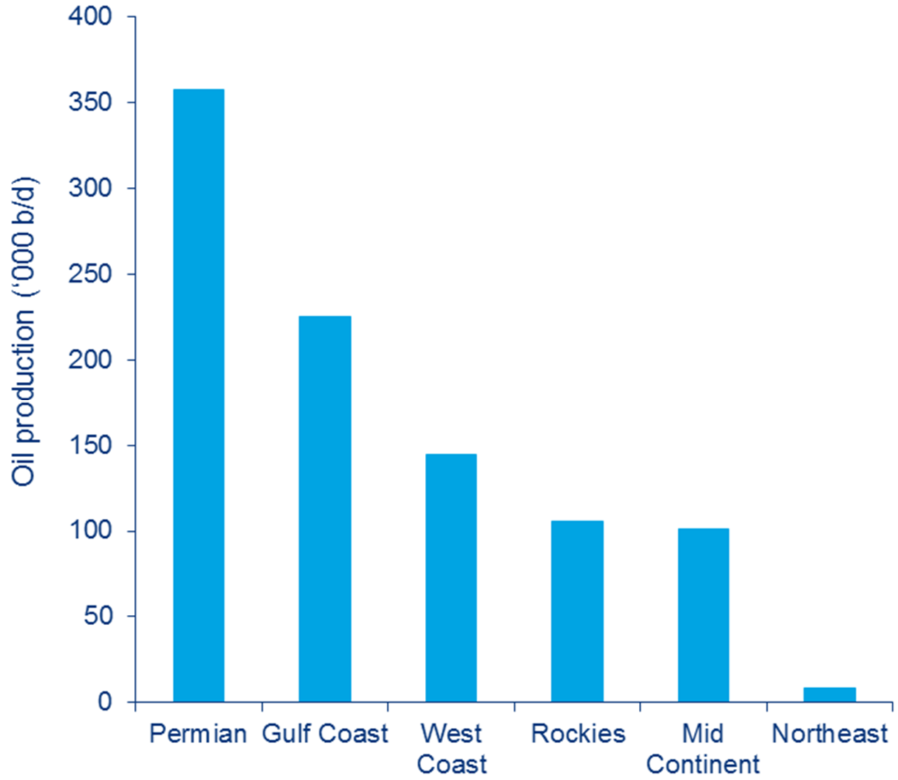


Source: ESRI Basemap; Wood Mackenzie

Stripper wells make up over 10% of total US production

Texas and California have most to potentially loose

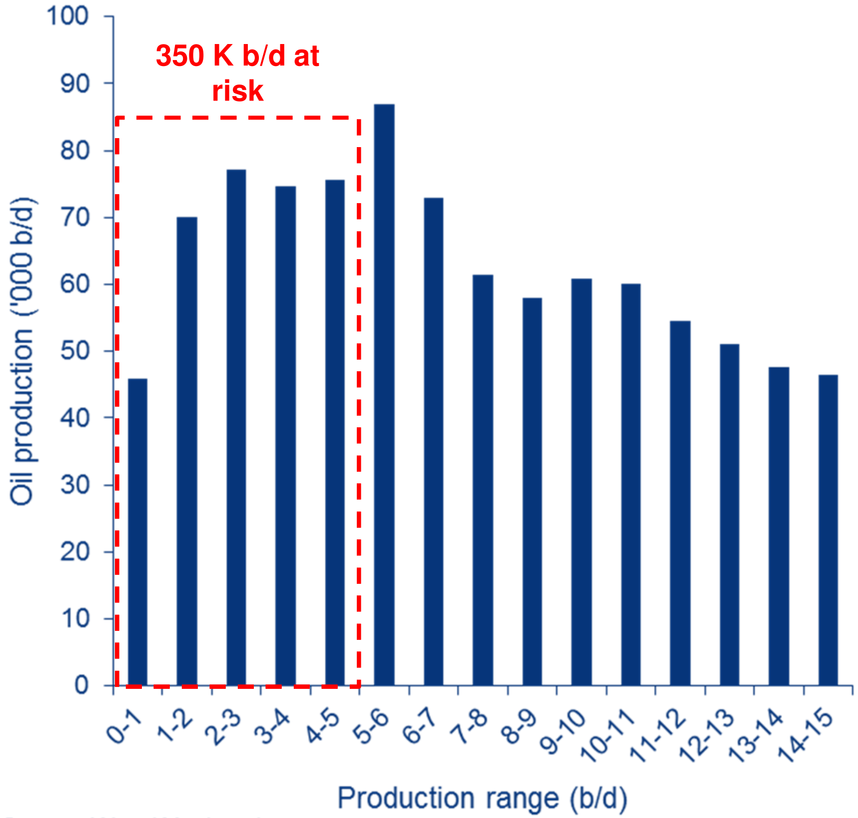
- Texas and California have the largest number of stripper wells in the U.S



Source: Wood Mackenzie

~350k b/d at risk at $30 and under

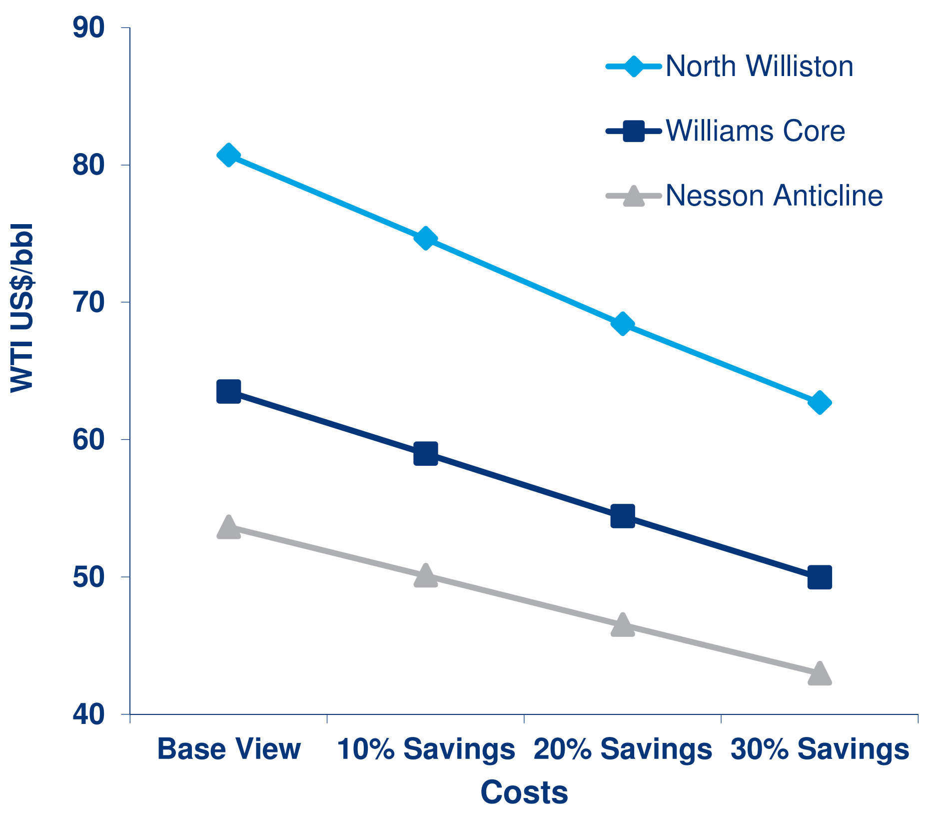
- If a well produces 5 b/d, the most an operator will receive in a month is approximately $4,500 / month before transport cost



Source: Wood Mackenzie

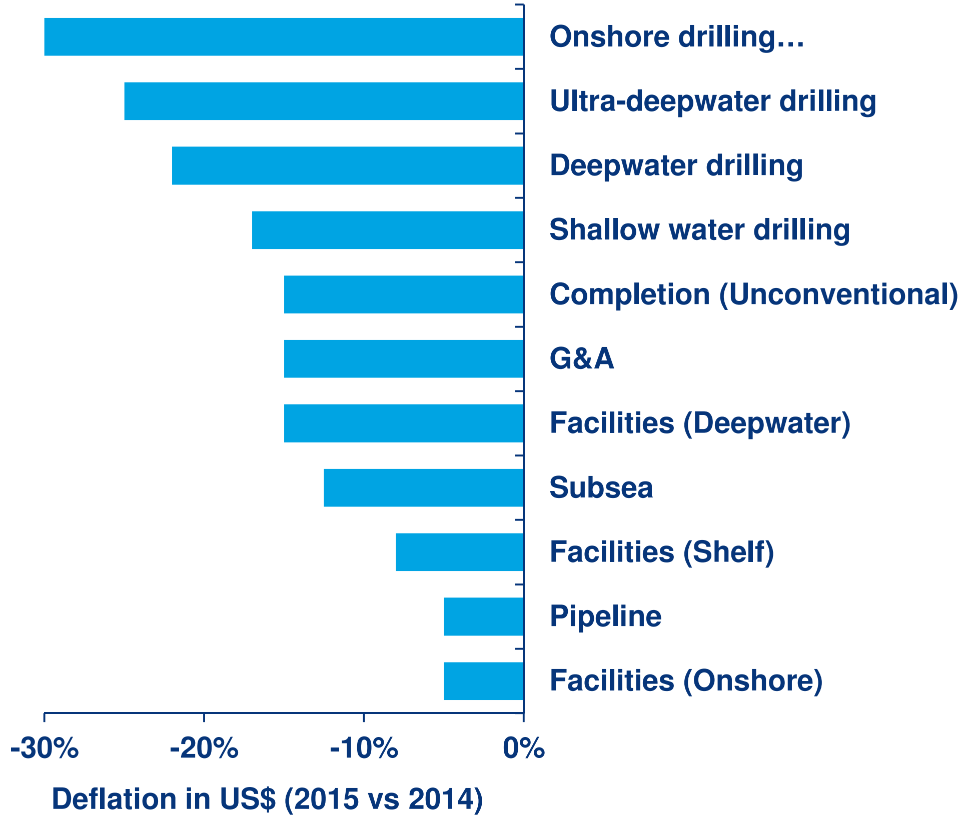
Cost deflation by category

US Lower 48 cost deflation is expected to average 30-35% during 2015-2016



Source: Wood Mackenzie

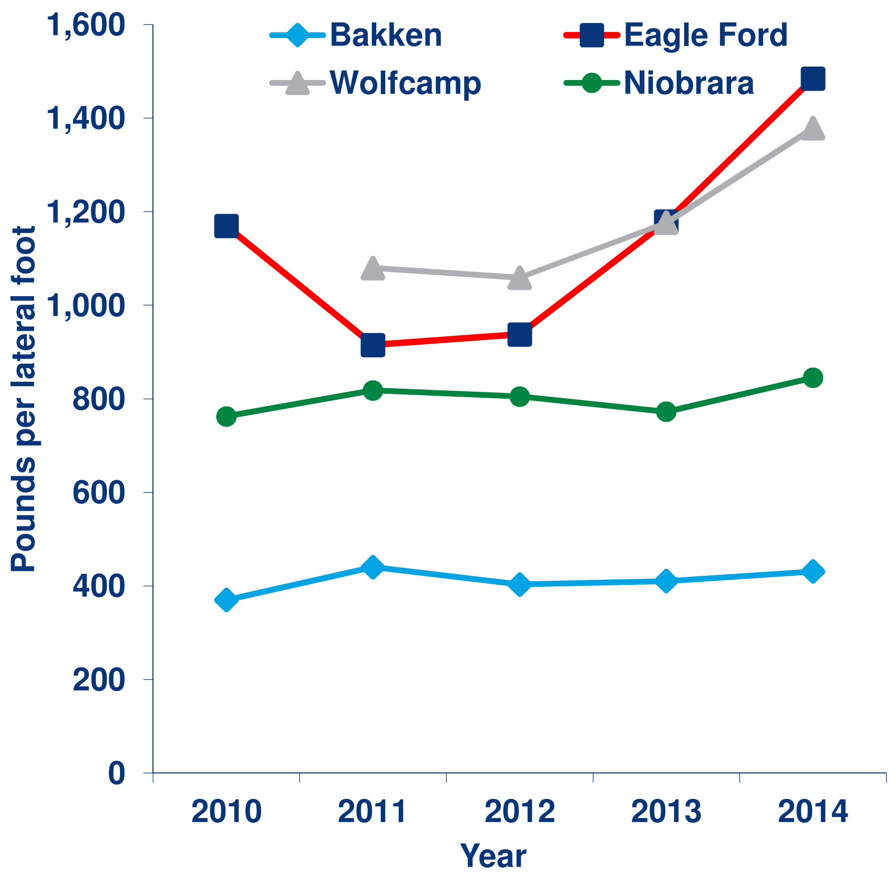
But remember still more capex cuts are needed



Source: Wood Mackenzie. Based on survey of E&P companies in Jan 2015

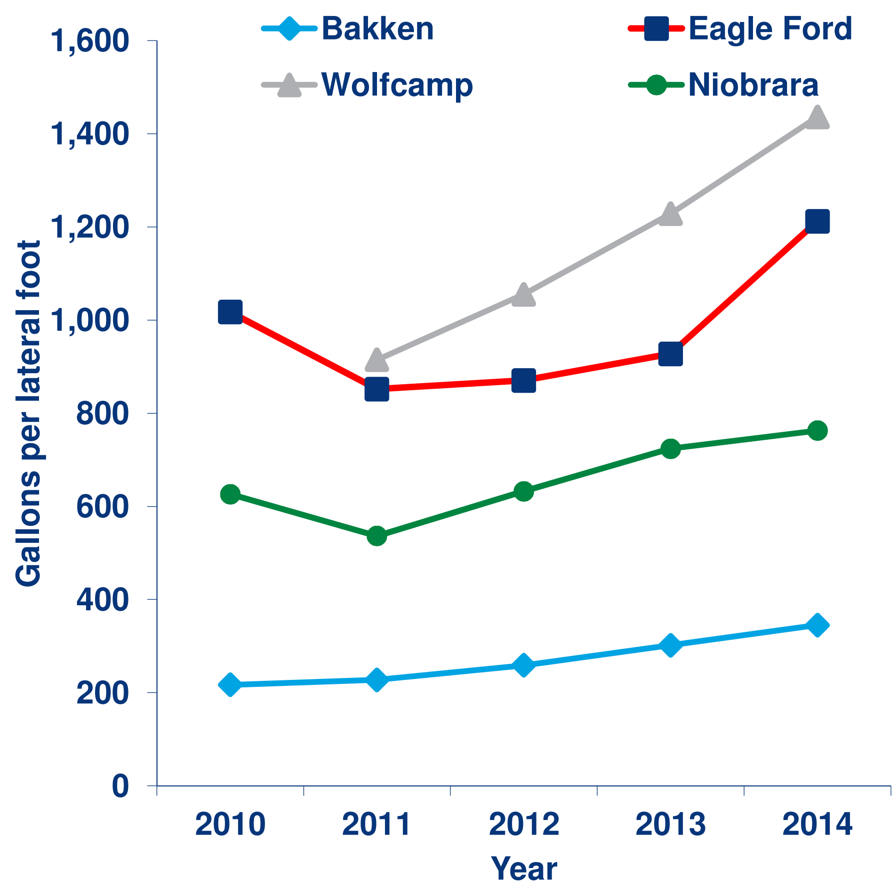
Intensity of Eagle Ford completions has grown quickly

Proppant usage across major tight oil plays



Source: Wood Mackenzie

Water usage across major tight oil plays

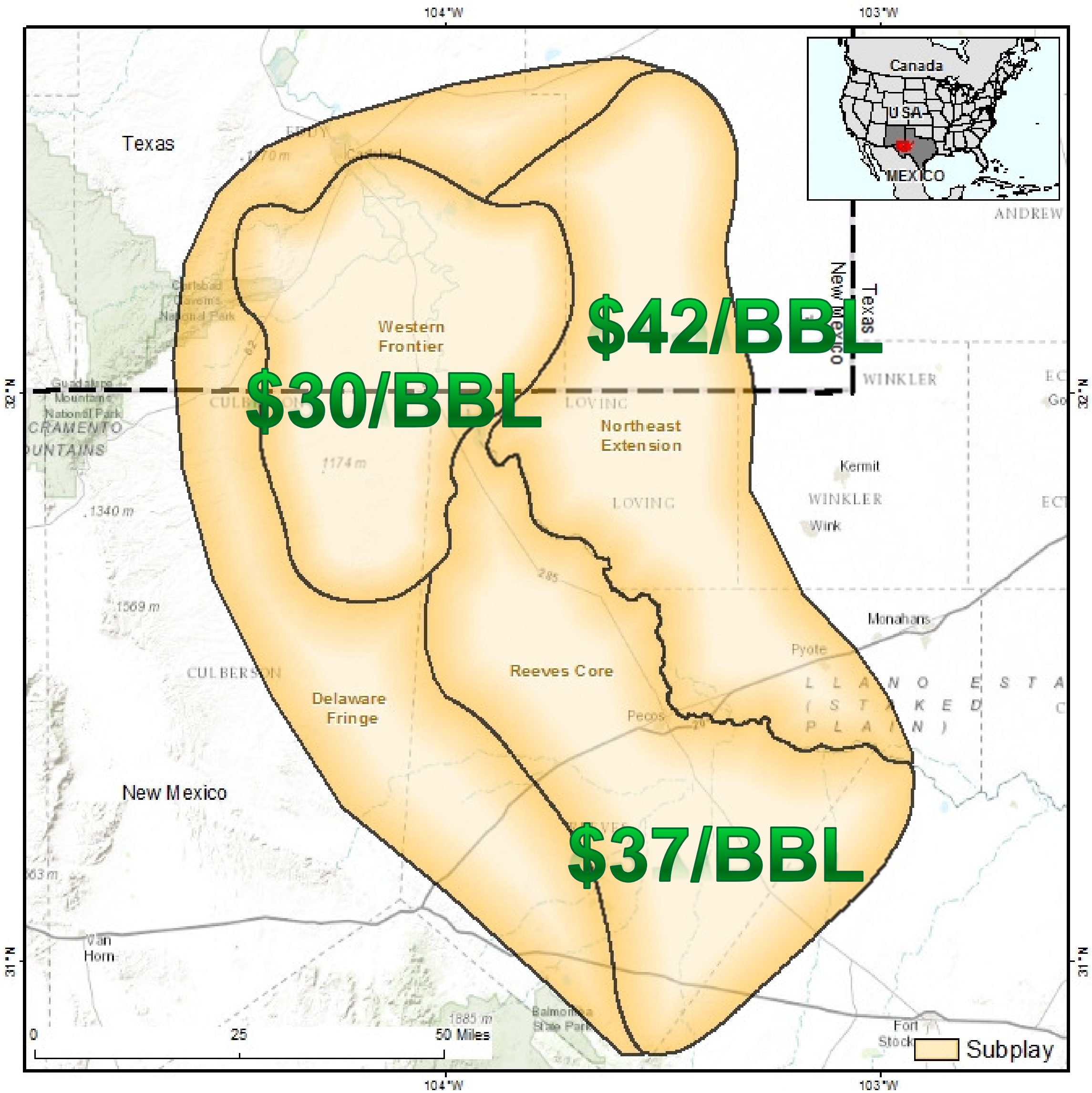


Source: Wood Mackenzie

Delaware Wolfcamp sub-play breakeven map

Type well update notes

- We have considered over 1,600 wells in this analysis from our North America Well Analysis Tool.
- Significant improvements have been made across the basin. On average, EURs have increased by about 30%.
- Despite service pricing falling close to 35% from 2014 to 2015, all-in well costs have only fallen by roughly 15%. Operators are incorporating more technology and raw materials to wells today, which is reflected in well productivity.



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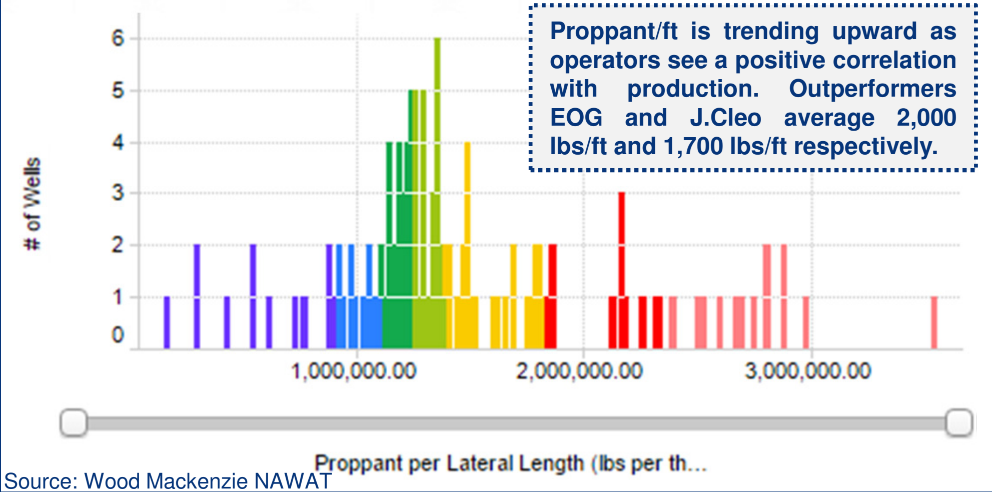
Reeves Core well design

Well design parameters

	WoodMac Base	Trend
Lateral length (ft)	4,600	Flat
Proppant lb/ft	1,350	Up
Water/foot	1,500 gal.	Up
API gravity	42	Flat
Spacing (ft)	660	Tighter
Drill days	30	Faster
Acreage risk %	80%	Improved
Well cost	$7.5 million	Improved

Distribution of proppant per '000 foot

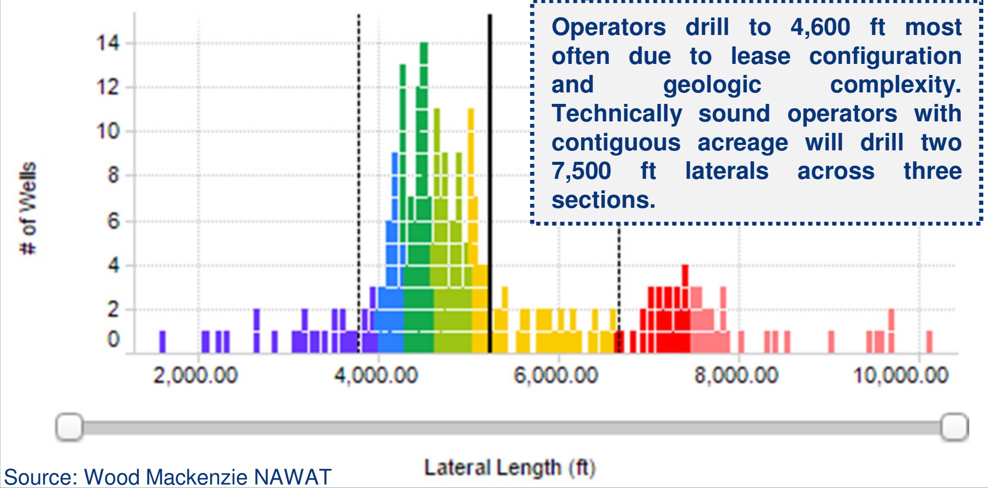
Proppant/ft is trending upward as operators see a positive correlation with production. Outperformers EOG and J.Cleo average 2,000 lbs/ft and 1,700 lbs/ft respectively.



Source: Wood Mackenzie NAWAT

Distribution of lateral length

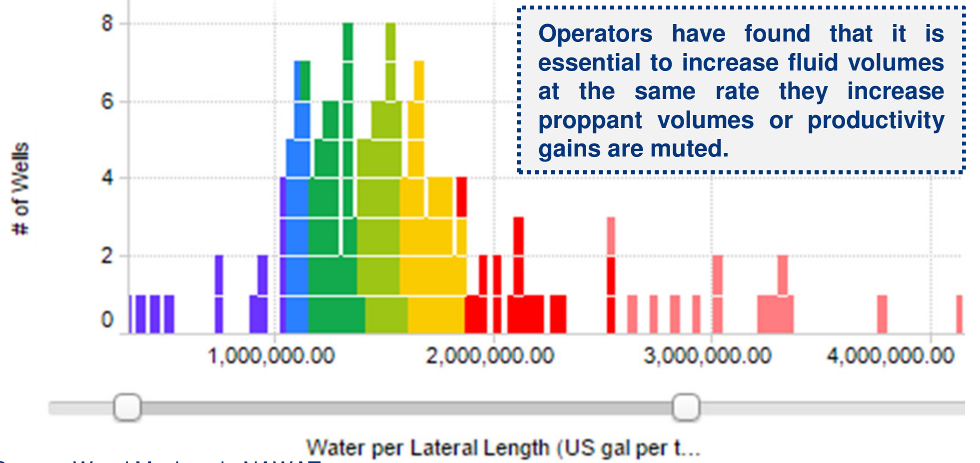
Operators drill to 4,600 ft most often due to lease configuration and geologic complexity. Technically sound operators with contiguous acreage will drill two 7,500 ft laterals across three sections.



Source: Wood Mackenzie NAWAT

Distribution of fluids per '000 ft

Operators have found that it is essential to increase fluid volumes at the same rate they increase proppant volumes or productivity gains are muted.



Source: Wood Mackenzie NAWAT

Frac now, pay later?

Only an option for the biggest

Schlumberger

HALLIBURTON

"…look at additional ways of doing business with our customers, different business models, push beyond where we have been today…" – Halliburton CEO Dave Lesar

Smaller service firms need cash now

BASIC ENERGY SERVICES

Key Energy Services

C&J Energy Services

TRICAN WELL SERVICE

SEVENTY SEVEN ENERGY

CALFRAC WELL SERVICES

Weatherford

Service companies may break the traditional model

2013 – SLB acquires a 50% stake in Forest Oil's Eagle Ford position in exchange for a $90 million drilling and completions carry

1996 – HAL and Lyco (acquired by Enerplus) team up to successfully exploit the Montana Bakken

What will the winning strategies need?

- **E&P’s must not too frequently put jobs out for bid**
  - Establishing a solid SOP with a service provider and consistently improving will trump the constant swapping of new suppliers

- **Continued pressure on service sector margins may have unintended consequences**
  - An overbuild in service capacity in all OFS sectors will likely result in bankruptcies and consolidation
  - Surviving companies will be able to quickly increase margins as fewer participants remain in the marketplace

- **Smarter ways of working with the service sector**
  - Bespoke designs and variation from plan during the development can add significantly to cost pressures
  - Solutions include:
    - earlier engagement between operators and the supply sector in design specification/planning
    - increased equipment standardisation
    - greater awareness of the cost of design variations during critical stages of the project
    - vertical partnerships aimed at reducing project complexities

Q&A

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