

Lower 48 gas supply and challenges

R.T. Dukes – February 2019

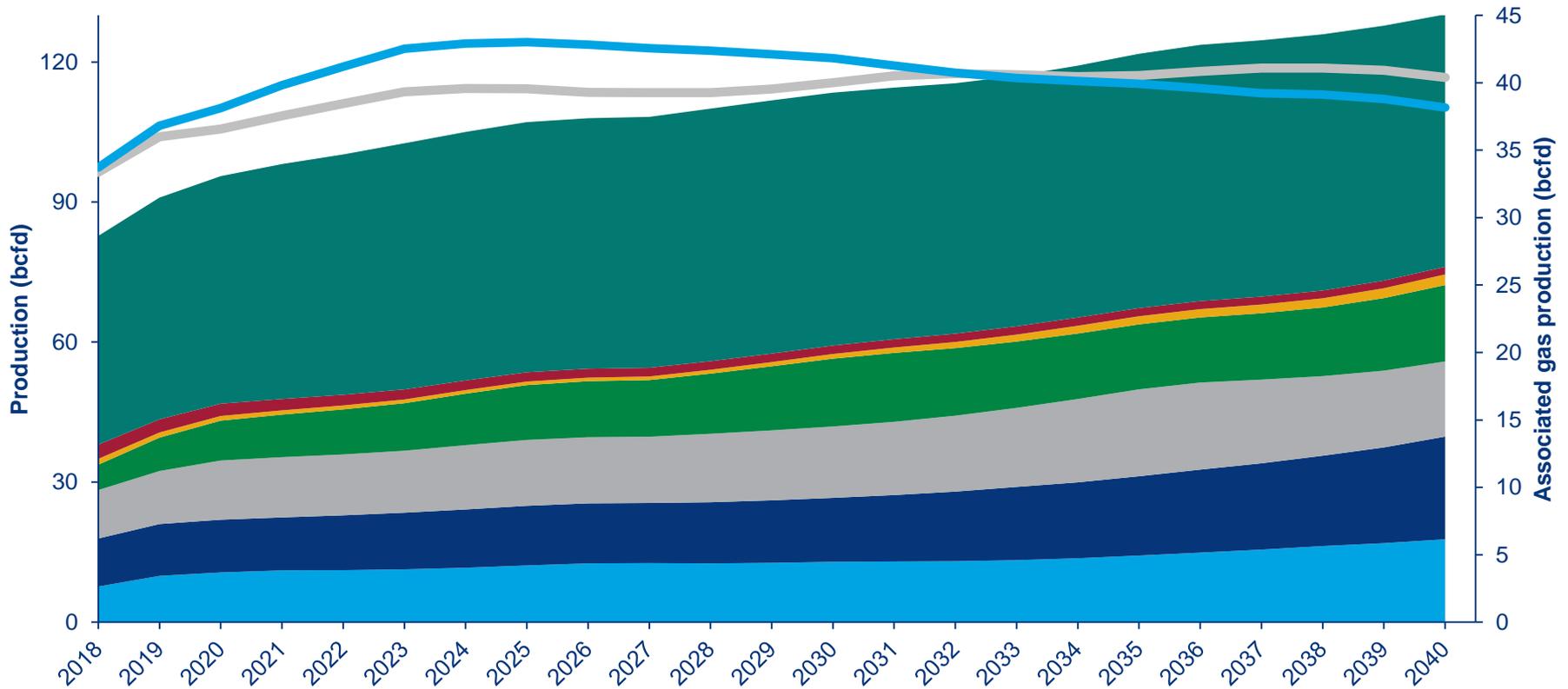


Natural gas supply forecast

US lower 48 natural gas: associated gas takes more market share

Permian in the drivers seat, but it's not alone

US Lower 48 natural gas production*



Source: Wood Mackenzie

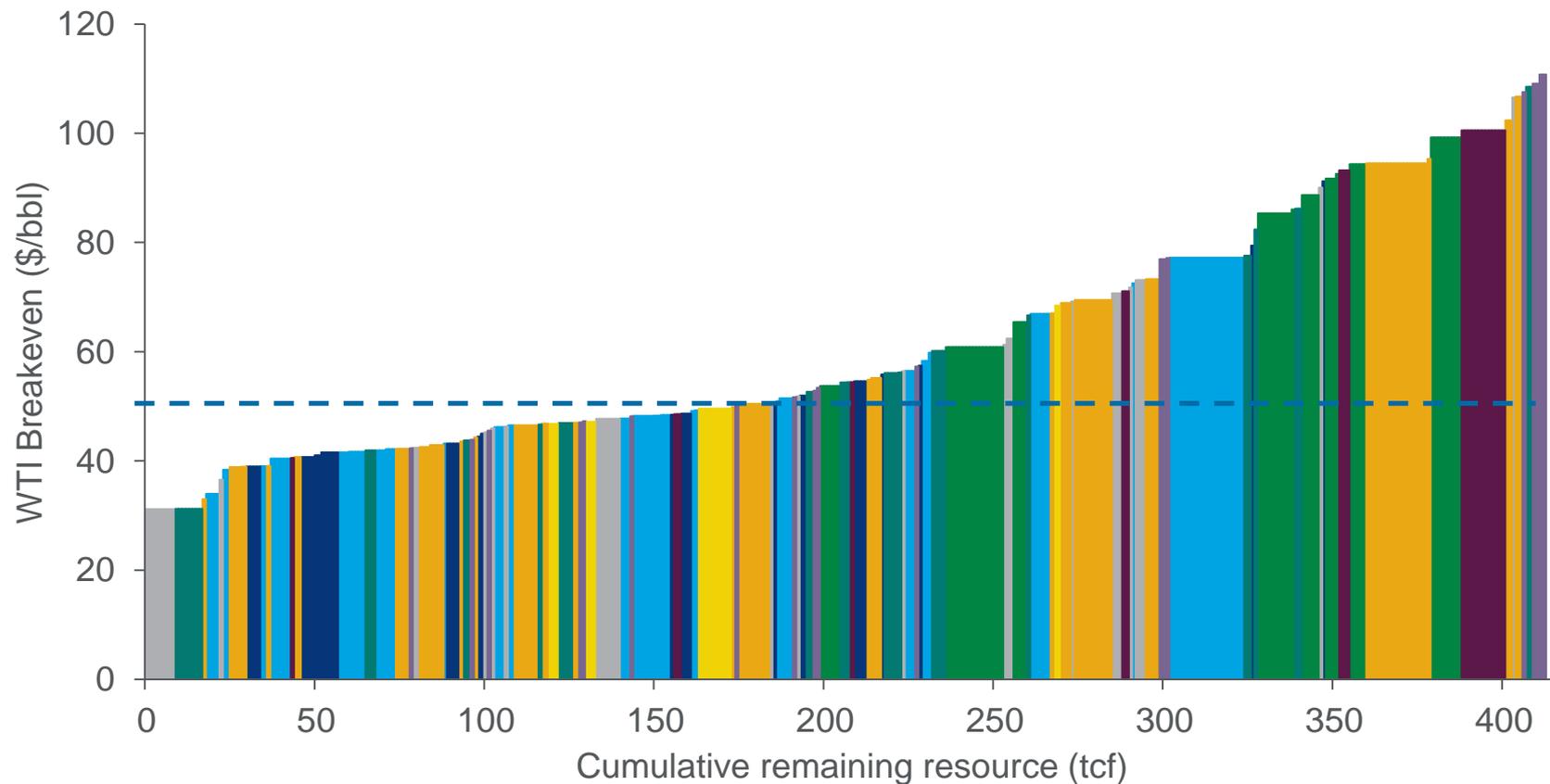
*Gas supply forecast is based on North America Gas Service base case Henry Hub real price forecast 2018-2040

Cost curves

Associated gas: Almost 200 tcf is economic with \$50 oil

Are estimates still conservative?

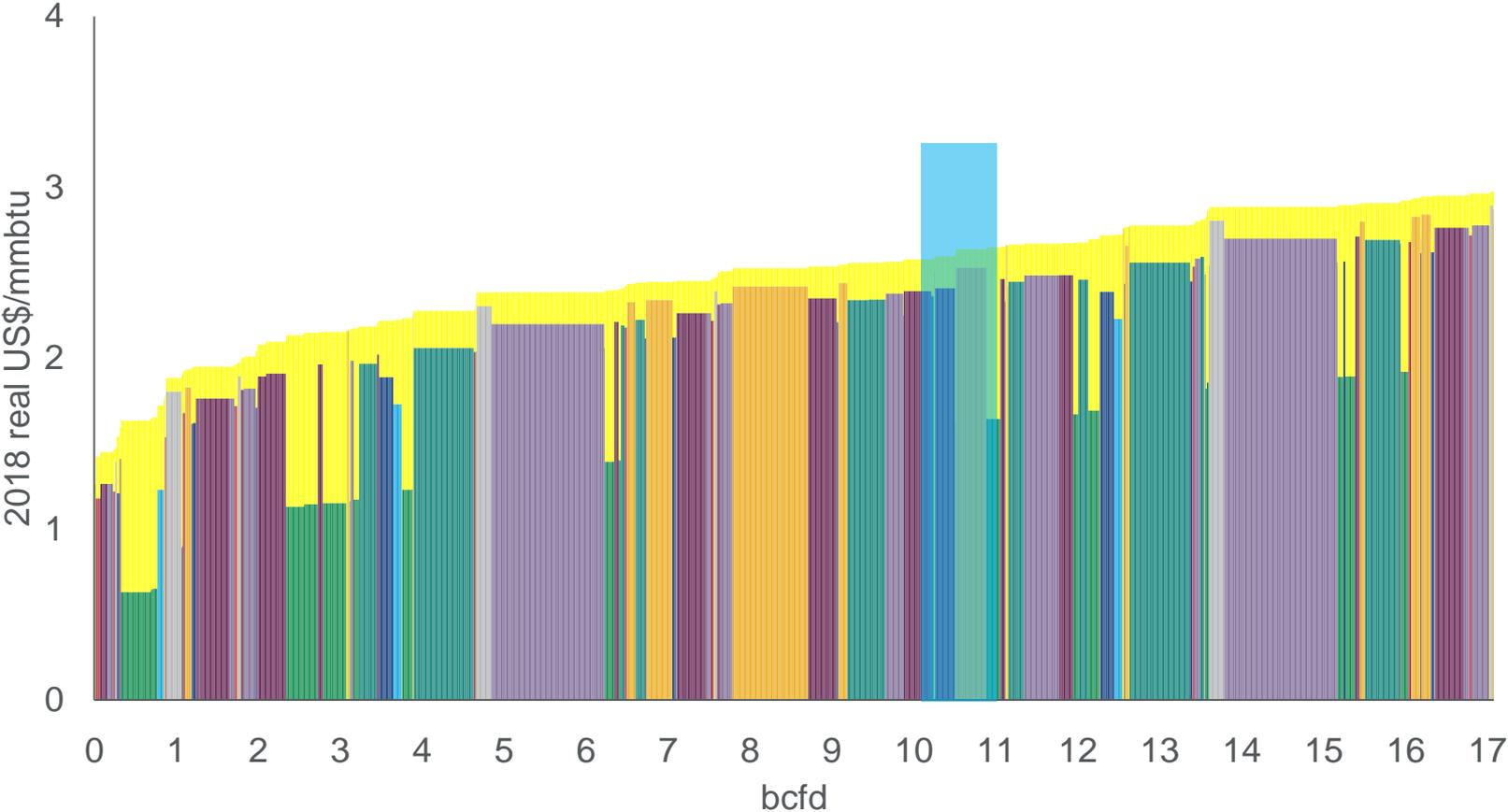
Remaining associated gas resource by play



Gas supply potential more than enough at sub-\$3 gas

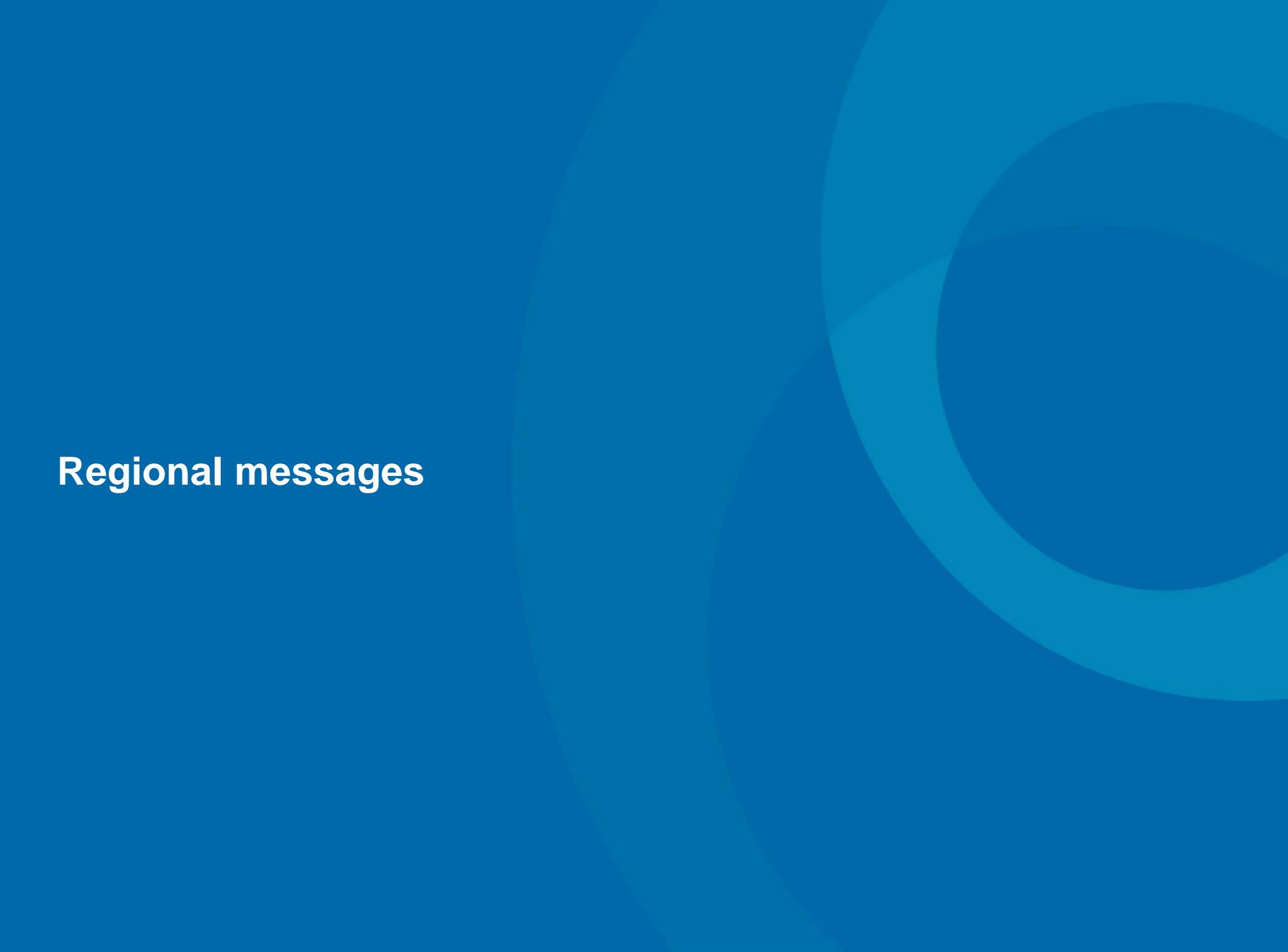
Haynesville continues to move down the supply curve

Dry-gas annual new drill supply curve at Henry Hub (2021-2023)



Source: Wood Mackenzie

Regional messages

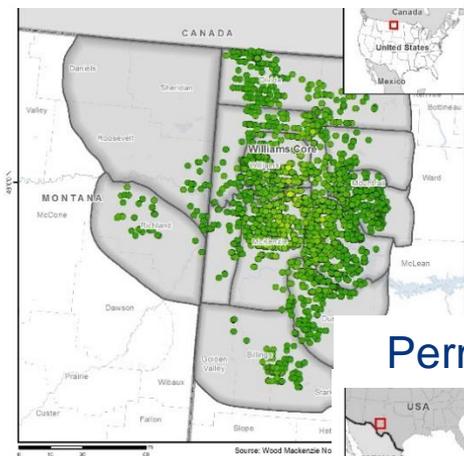


Gas content varies greatly within US “tight oil” plays

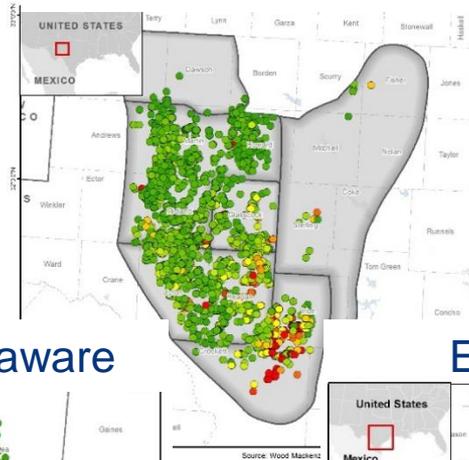
Some areas are more than 50% gas

Cum365 gas-to-oil ratio (GOR) by play

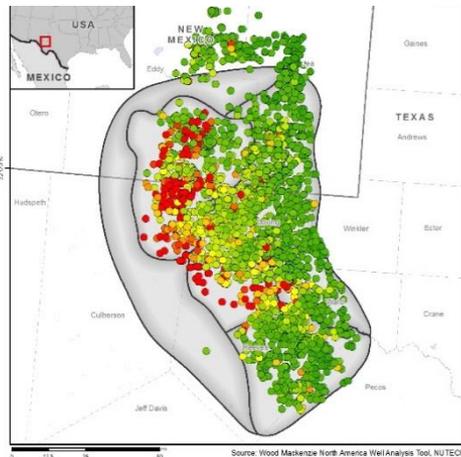
Bakken



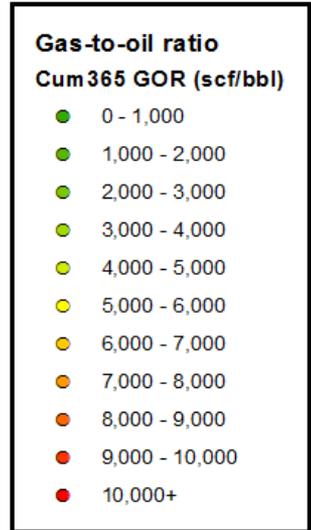
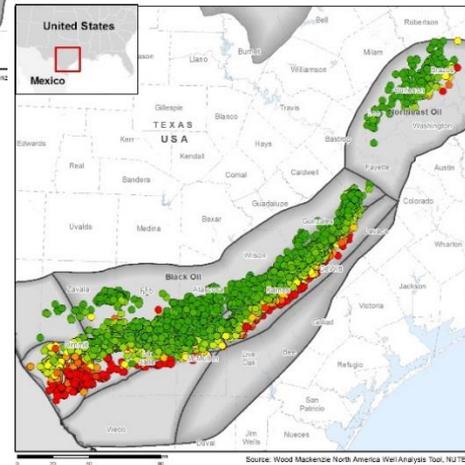
Permian-Midland



Permian-Delaware



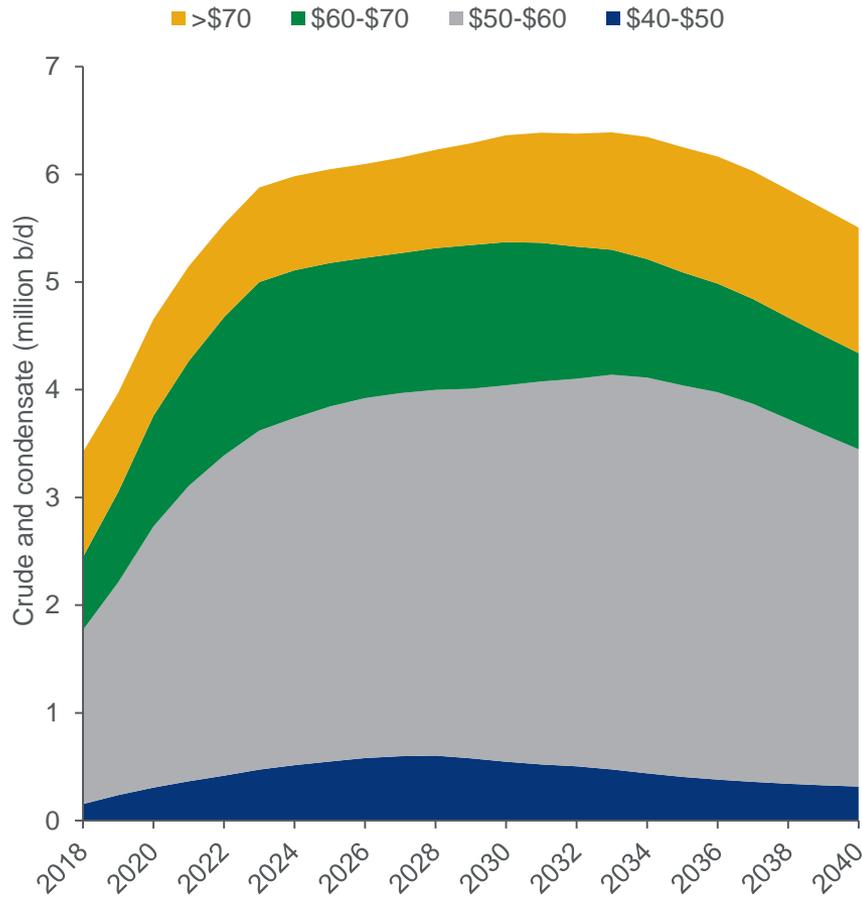
Eagle Ford



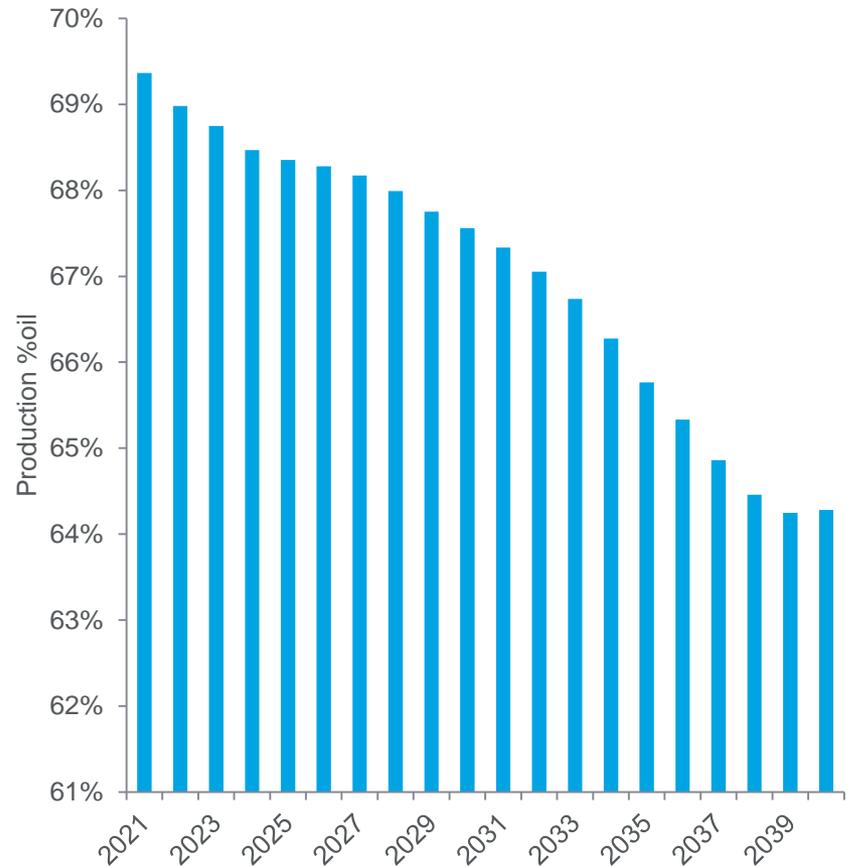
Is the Permian really a gas play?

Growth slows and gas production will prove resilient

Permian production by breakeven tranche



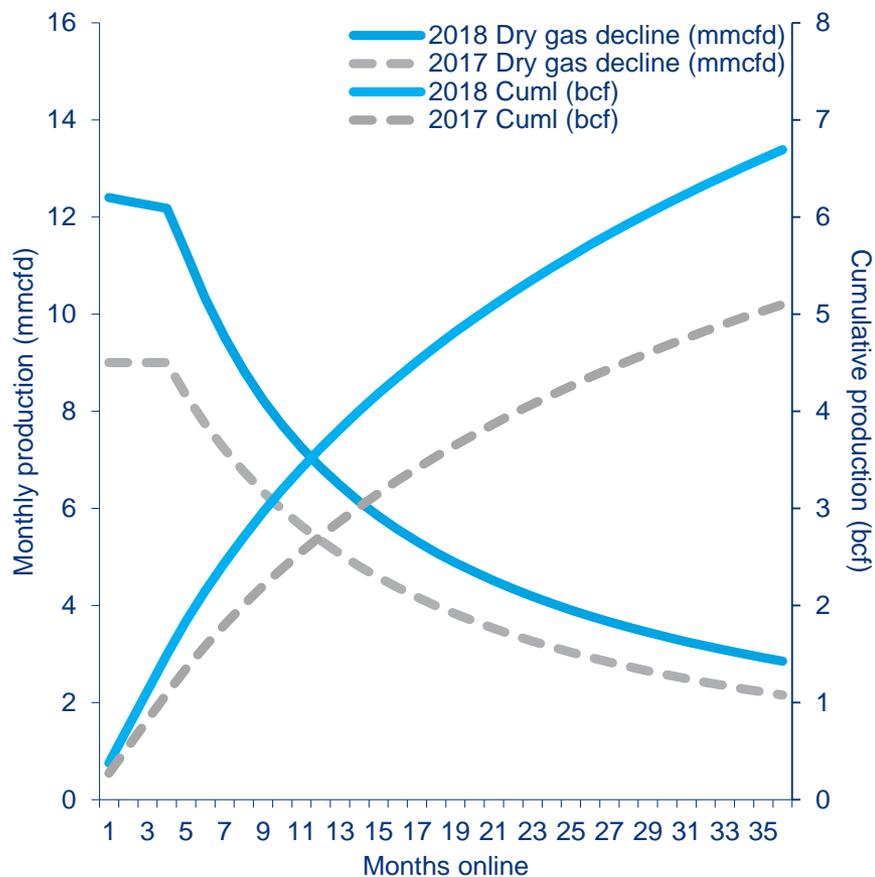
Permian production % oil over time



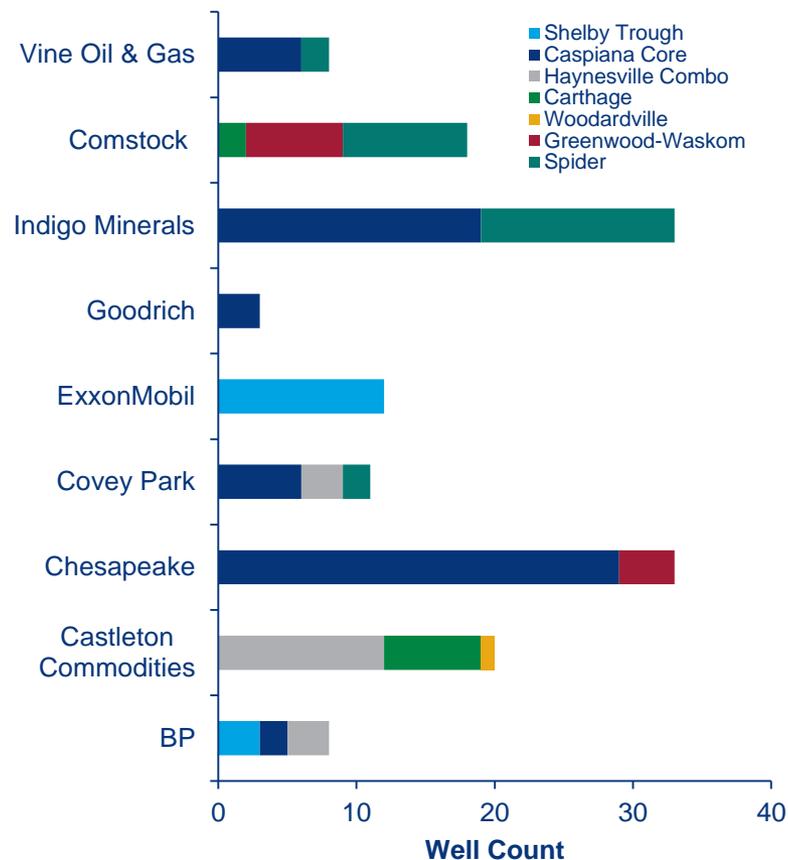
Haynesville core expanding? Shelby Trough looks more like the core

Completion intensity rising

Type curve comparison: 2017 vs 2018



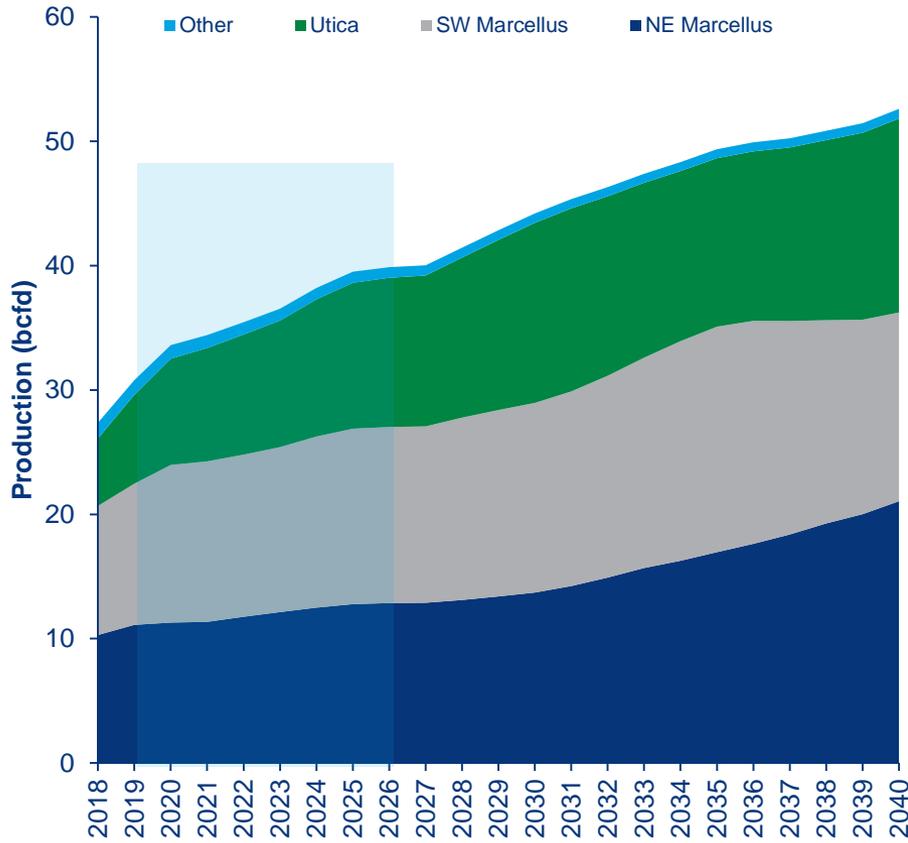
Operators with laterals between 8,000 to 10,000 ft



Competition between gas plays intensifies

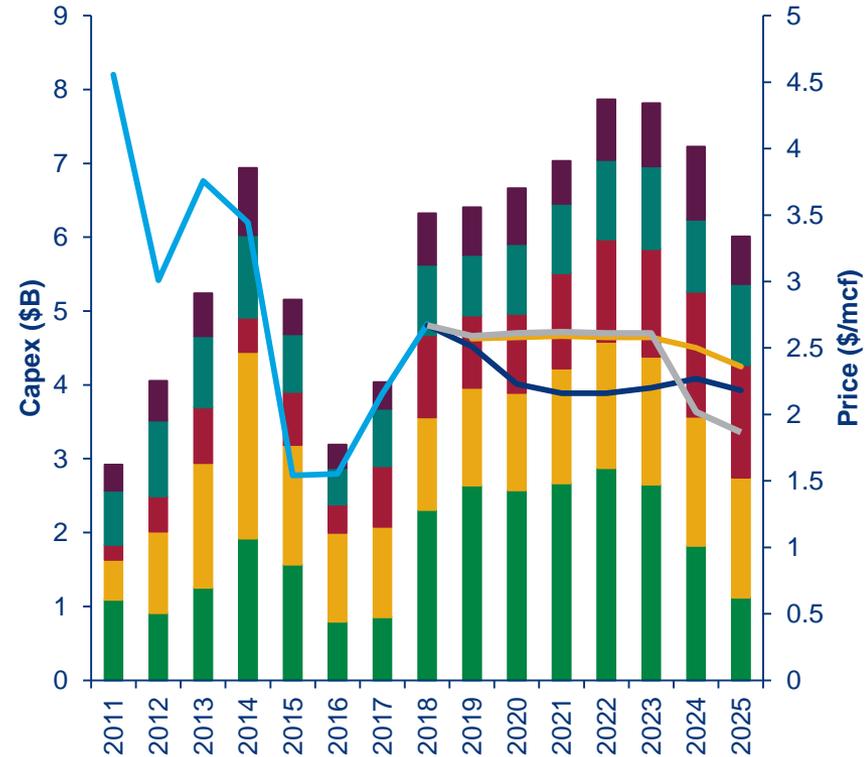
Will the Northeast dominate?

Northeast production forecast



Source: Wood Mackenzie

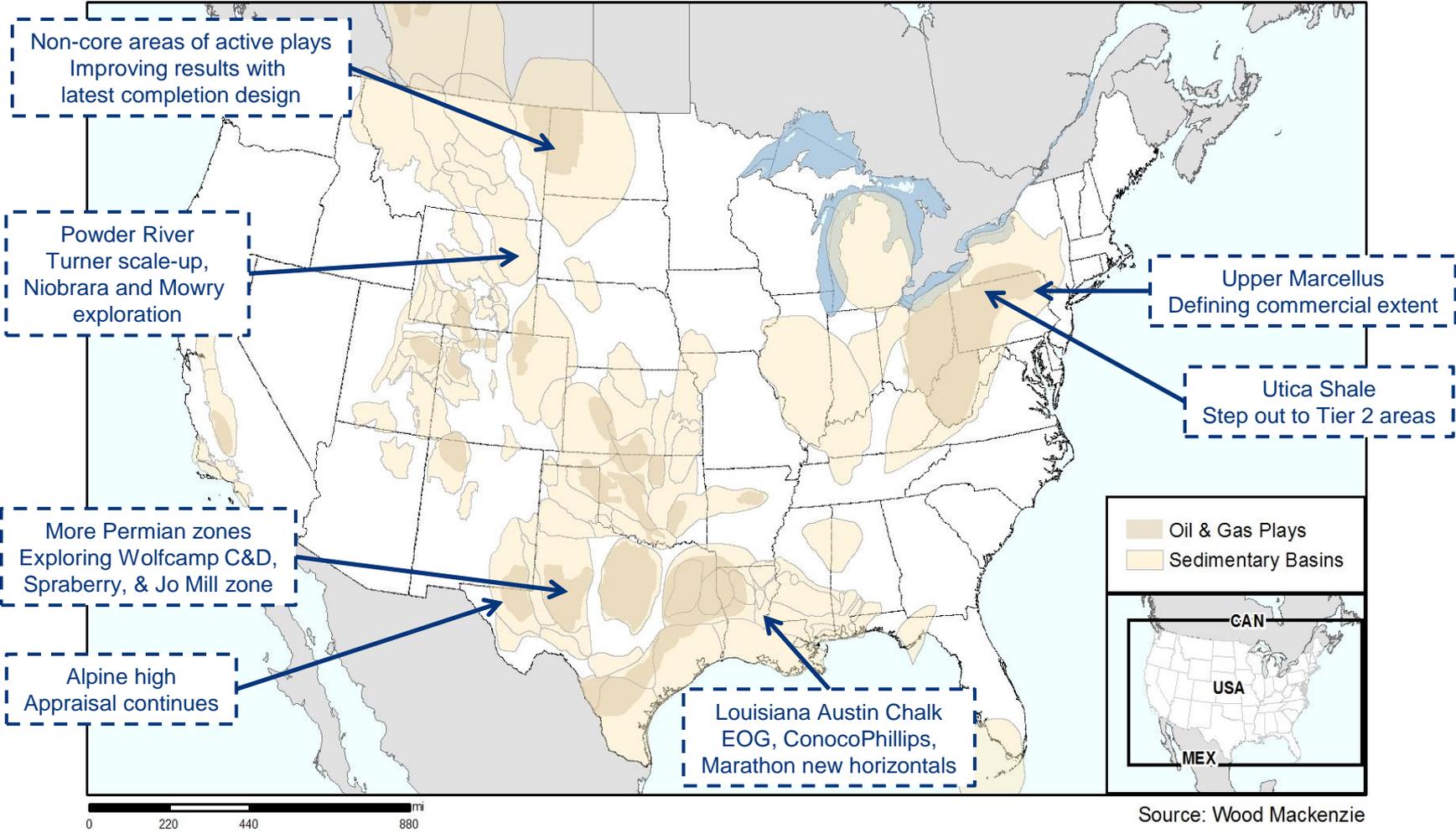
Capex spend by company vs. local price



Source: Wood Mackenzie; [North America gas long-term outlook H2 2018: Pressure mounts for dry gas plays](#)
*based on Wood Mackenzie projections

Lower 48 exploration and other step-out activity

More tier 1 assets coming?





Q&A



A Verisk Business

R.T. Dukes – *Insight into US Unconventionals*

Research Director – US Lower 48 Upstream Research

Introduction

R.T. is widely recognized as a global leader in US unconventional oil and gas. Mr. Dukes advises companies at the executive and board level, as well as being a regular speaker at international industry conferences.

He's a media favorite that you'll find quoted in various print and broadcast media outlets.

Biography

R.T. began his career covering the Barnett Shale as horizontal drilling took off and later managed Wood Mackenzie's Rockies research as Bakken Shale development exploded. His roots in East Texas mean the Haynesville Shale is close to home. By design or maybe happenstance, he has been at the forefront of almost every shale story. He authored research highlighting the potential of tight oil years before US production surged.

He has spent most of his career in the weeds of unconventionals and is leaned on for evaluating the impact to local and global markets. He is a recognized thought leader and is a contributor to many US and macro-market publications at Wood Mackenzie. At the firm, he has worked in various research and consulting roles and contributed to valuation and due-diligence work that accounts for billions in transactions.

Mr. Dukes is a native Texan and calls Houston home. More importantly he is a proud husband and father. He spends most evenings and weekends as a youth sports coach. He graduated Cum Laude from Texas A&M University with a bachelors degree in accounting and a masters degree in finance. He serves on the Former Student Advisory Board for the Professional Program in Accounting.

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