Bakken Well Economics & Production Forecasting

House Energy and Natural Resources
January 9, 2015

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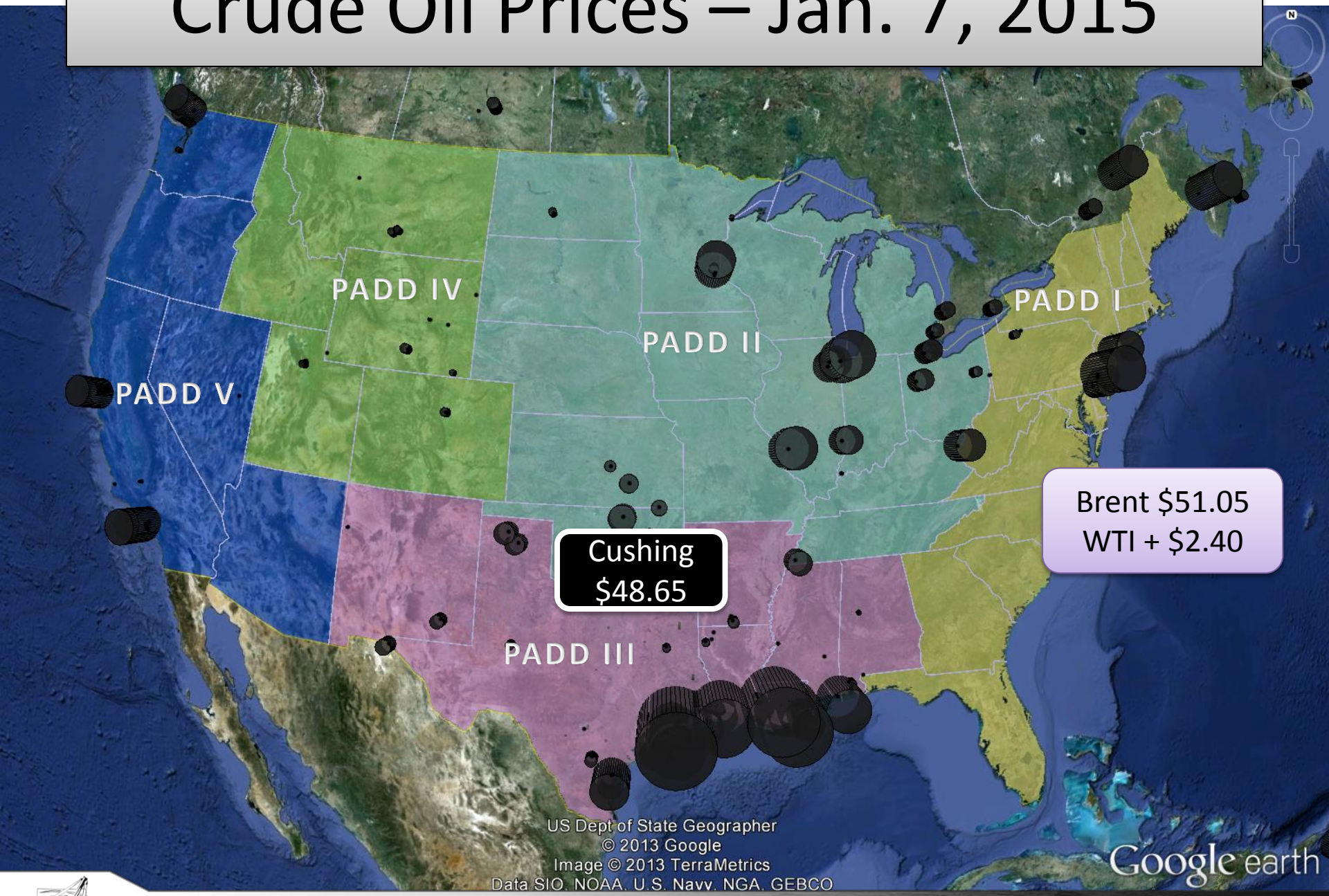
Geological Engineer
Director, North Dakota Pipeline Authority

Rebuilding Oil & Gas Forecasts to Support Midstream Development

Crude Oil Prices – Jan. 7, 2015



ND Pipeline Authority Web Presentation

Bakken Well Economics

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Director
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Pipeline Authority

Please view replay video on the Pipeline Authority website for full commentary of the following slides

Revised: January 1, 2015

Objective

Define where the Bakken/Three Forks system is economic in a lower oil price environment.

Method

Analyze past well performance across the region and estimate well economics for various production levels.

Disclaimer

The goal of this work is not to imply individual company actions or intentions. All view expressed are strictly that of Justin J. Kringstad.

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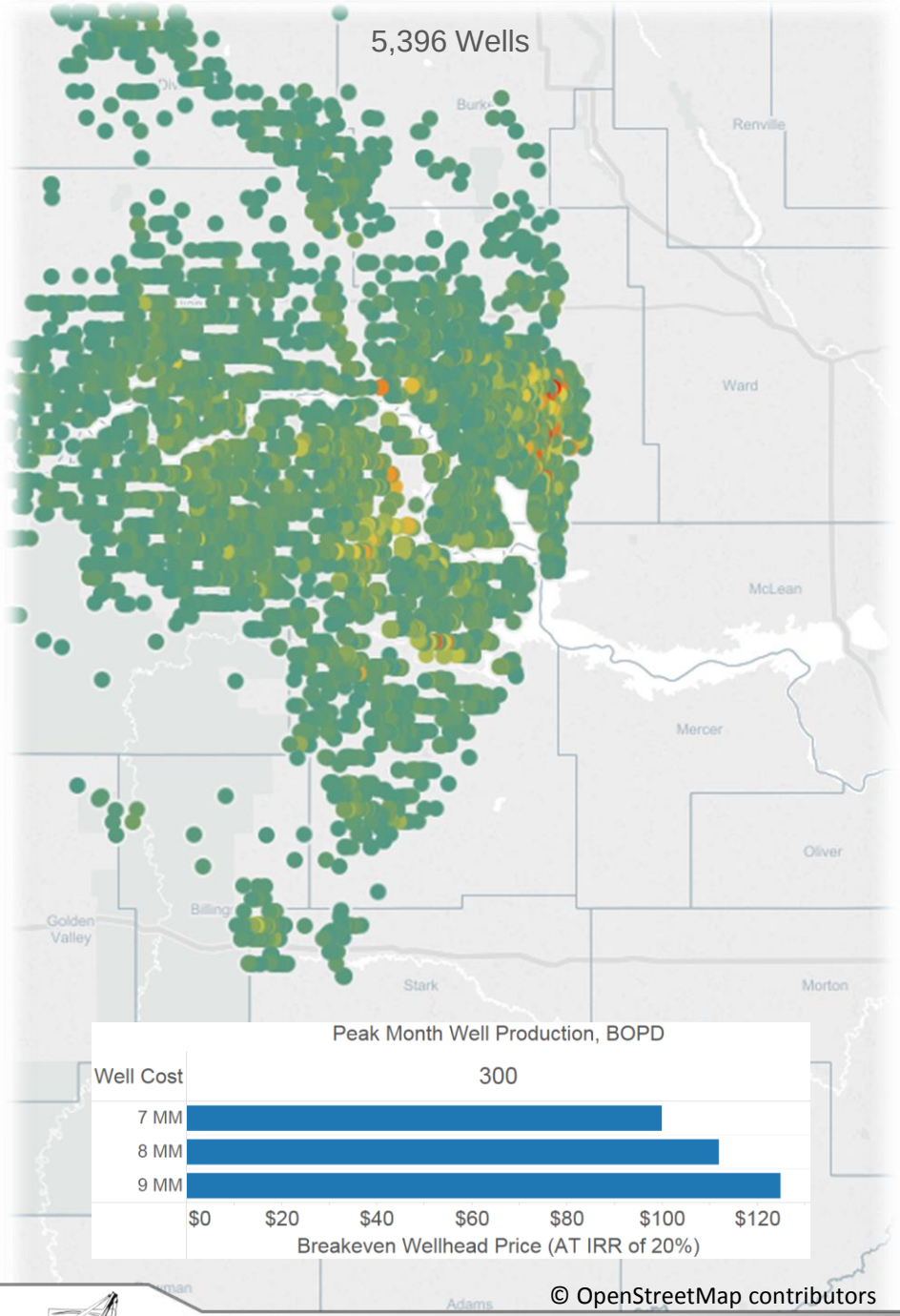
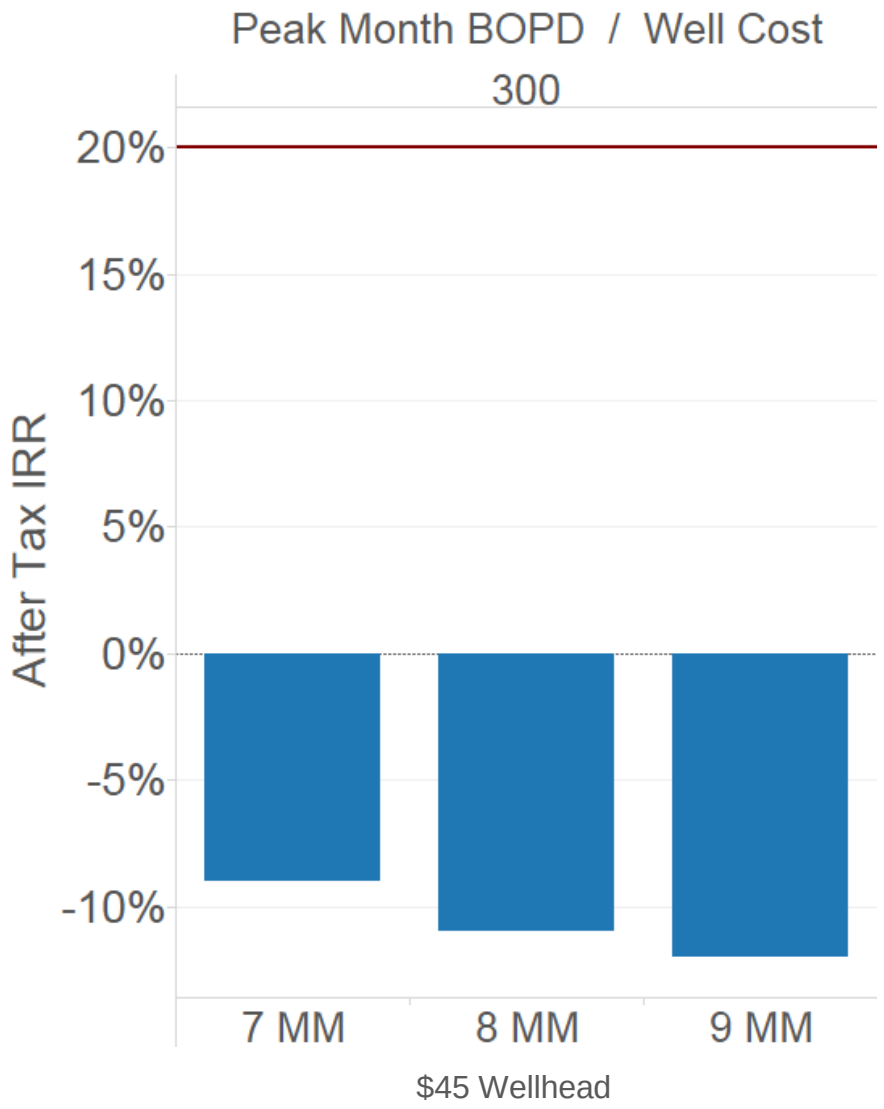
Key Economic Assumptions

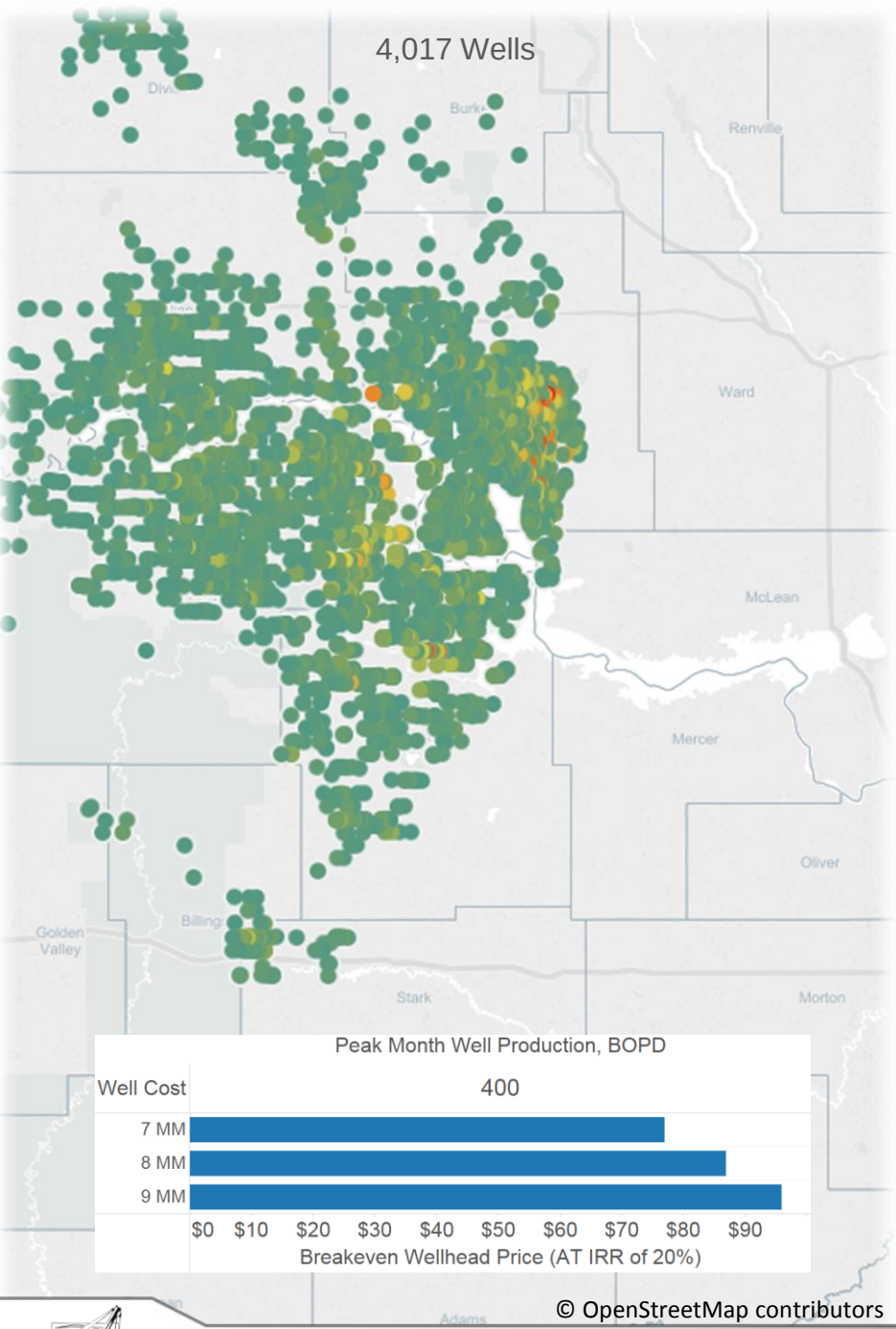
- $7-$9 Million Well Costs
- $45/BBL Wellhead Pricing
- 1/6 Royalty
- Zero Flaring
- Minimum 20% IRR to drill (calculated after production taxes and royalties)
- No Tax Incentives Included
- Production rate is 30-day average
- All Bakken/Three Forks wells drilled in 2008+

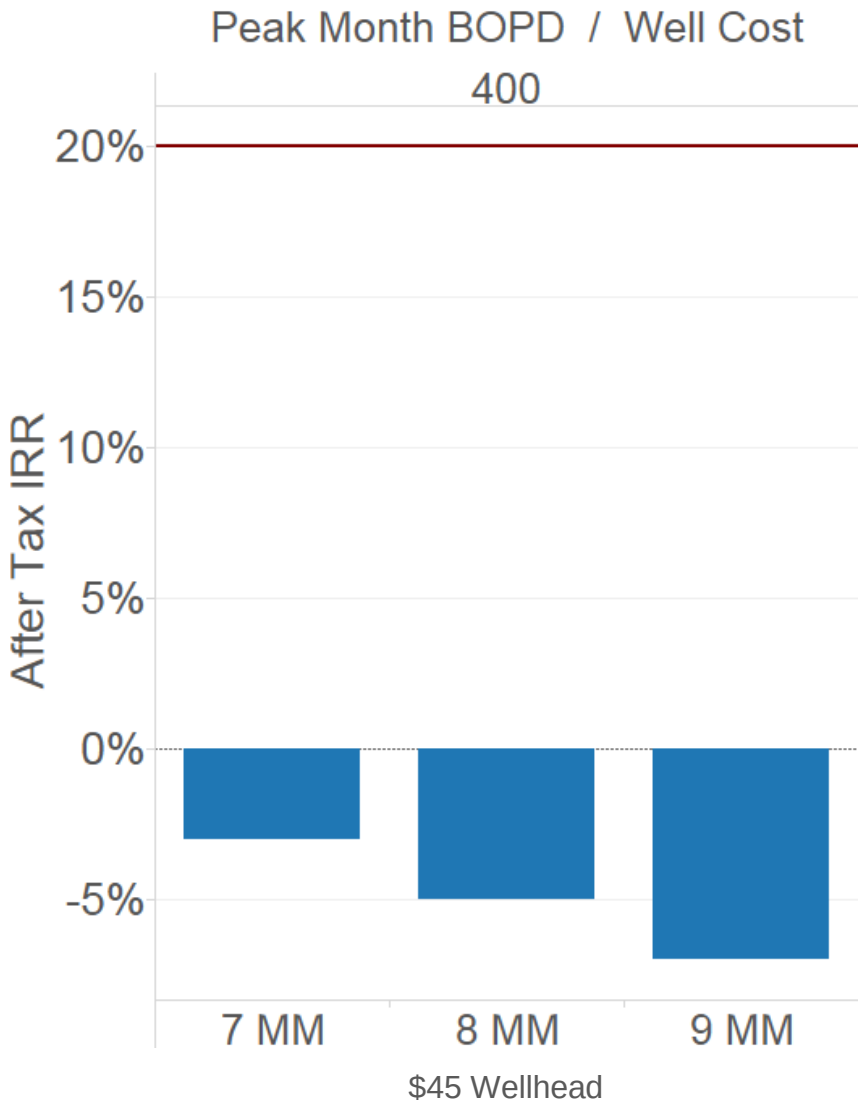
Peak Month Minimum 300 BOPD



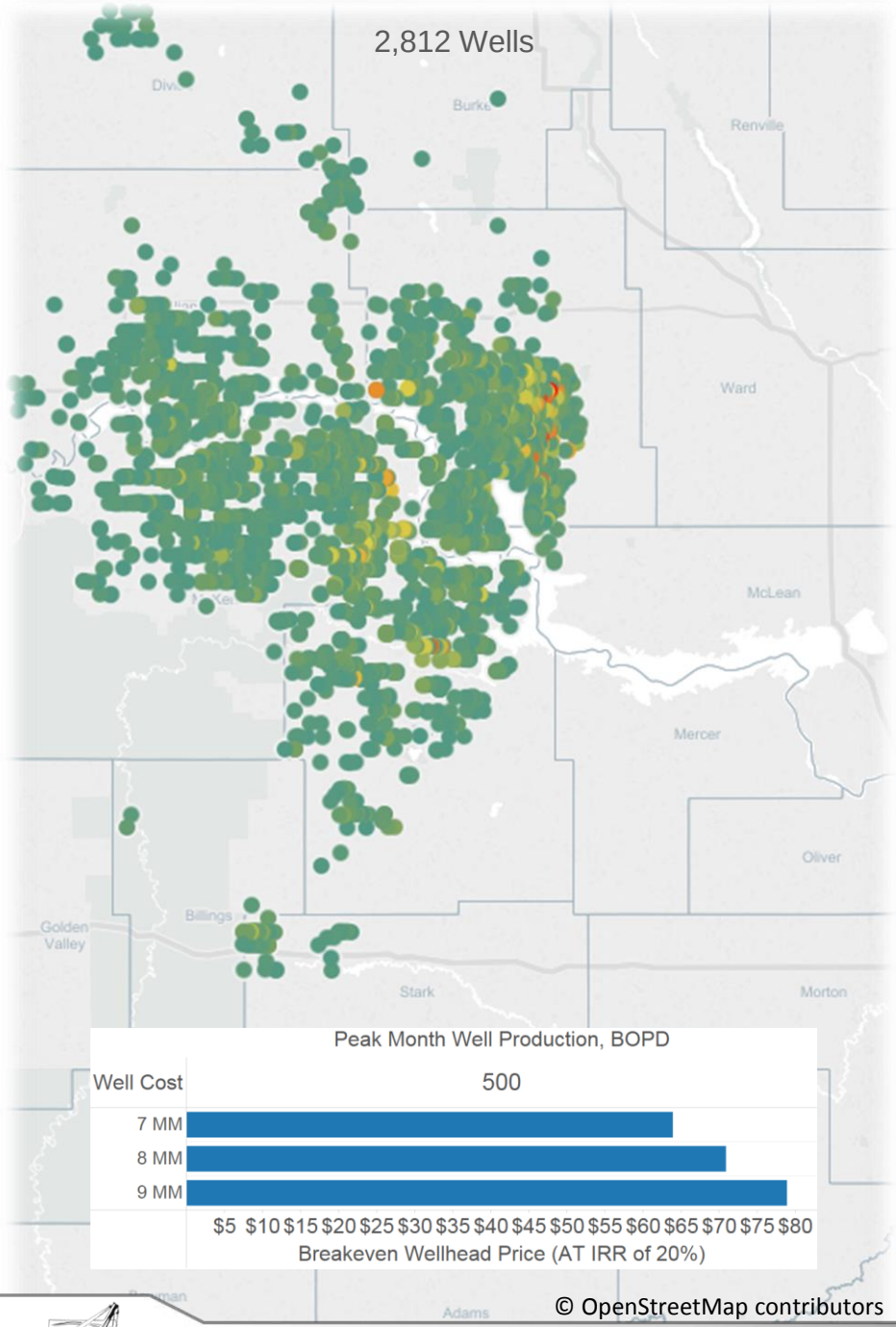


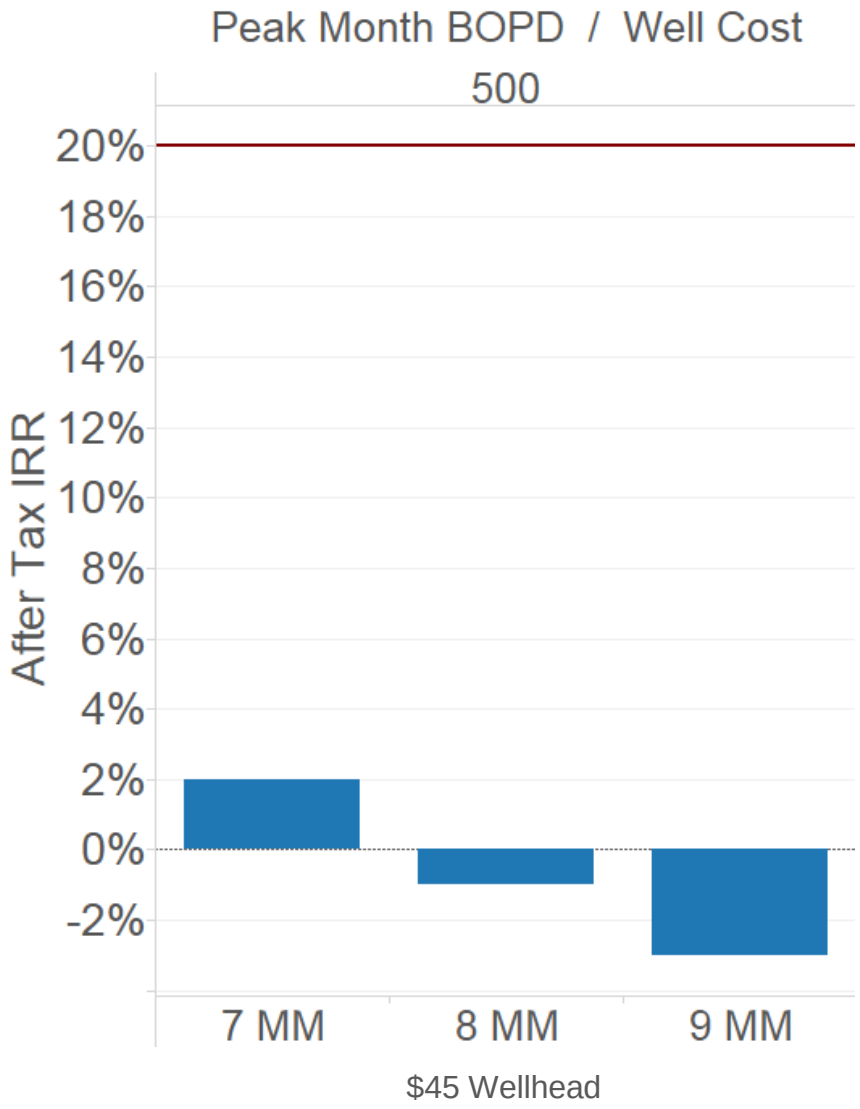
Peak Month Minimum 400 BOPD



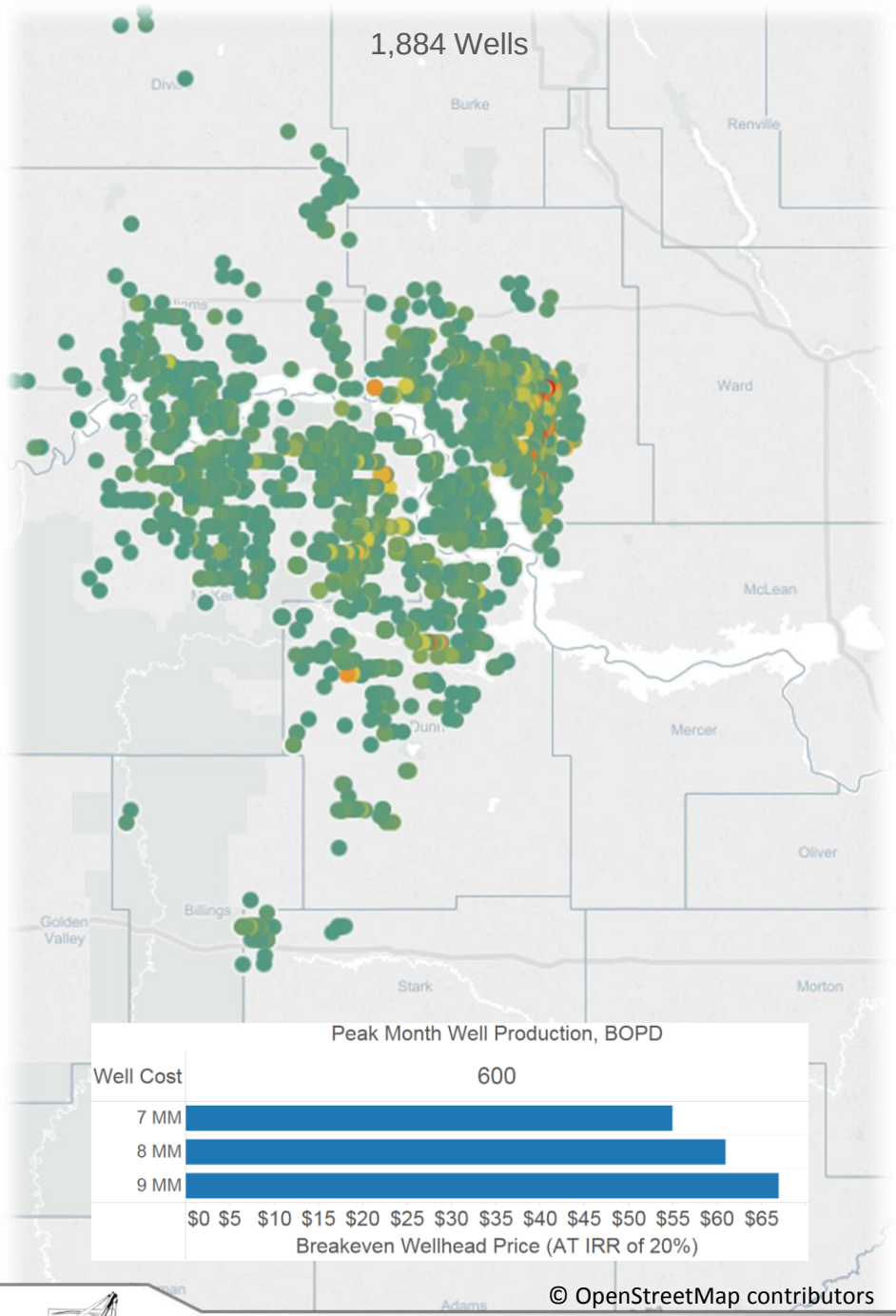


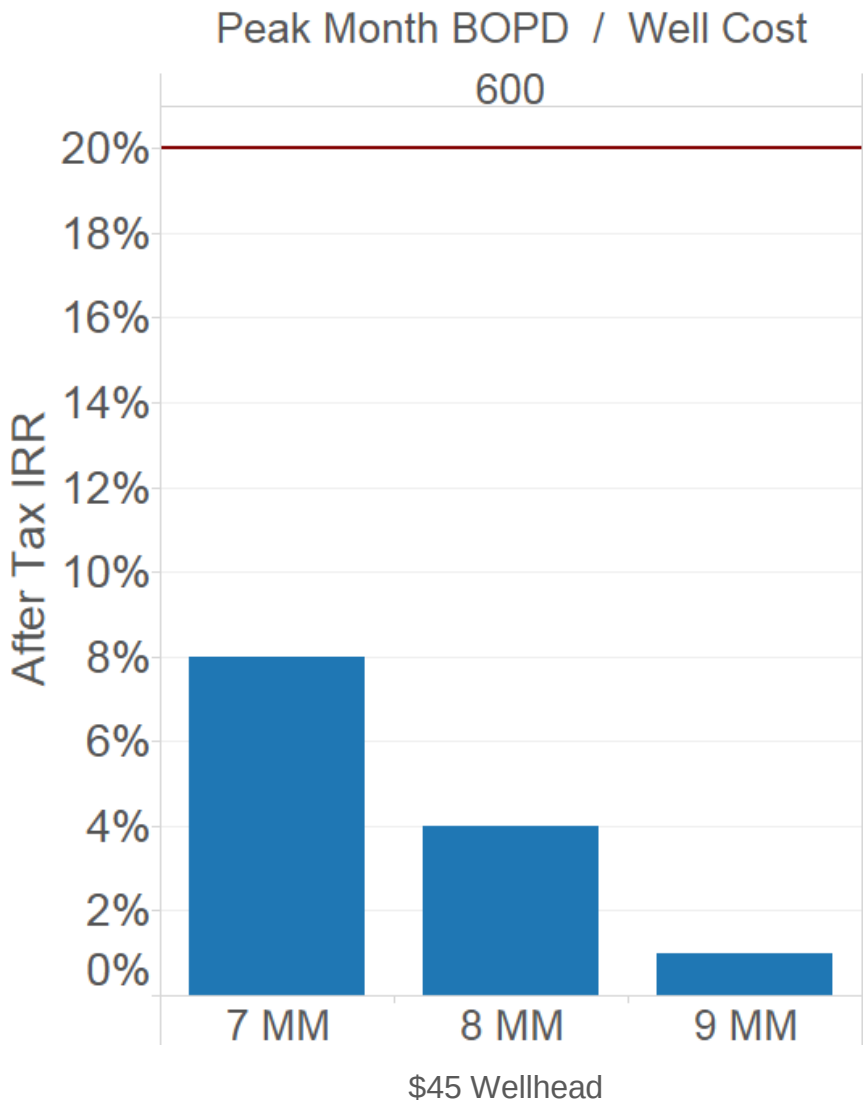
Peak Month Minimum 500 BOPD



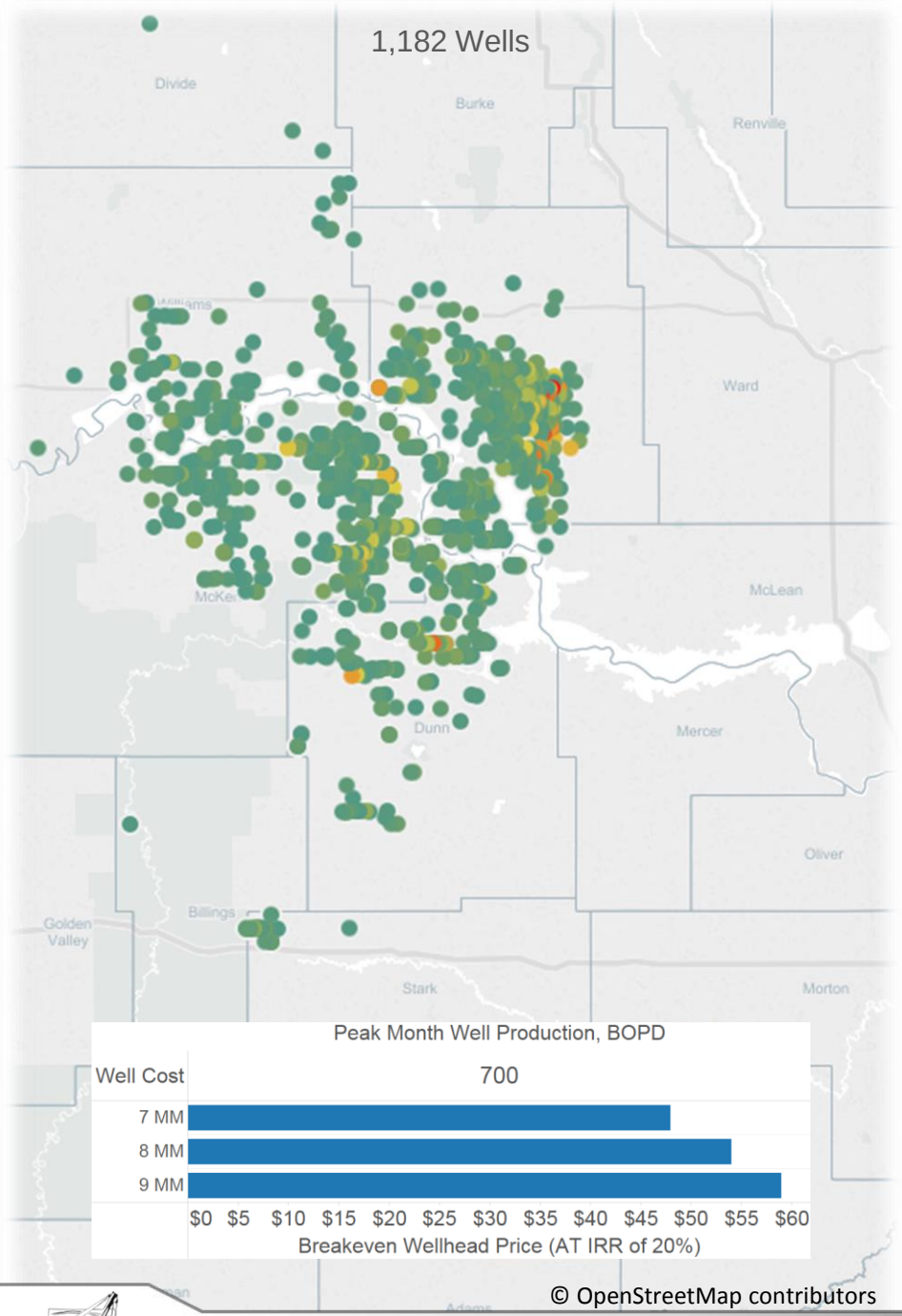


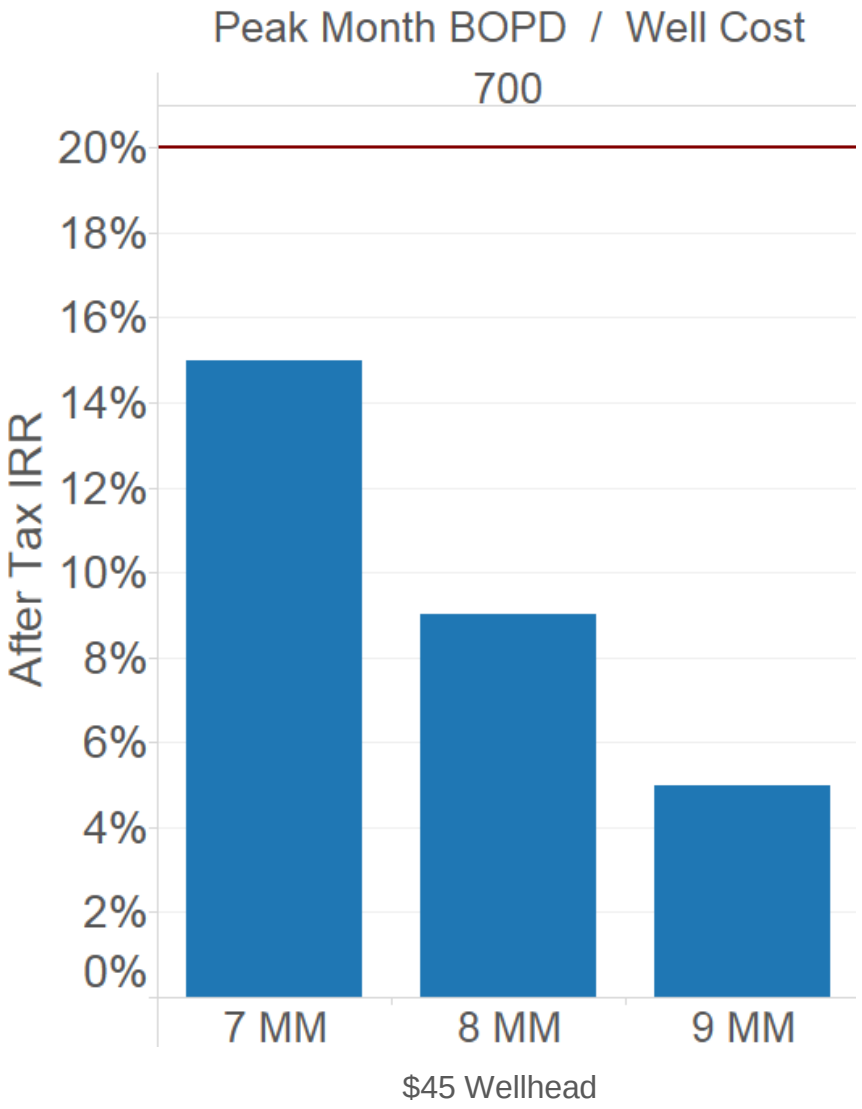
Peak Month Minimum 600 BOPD



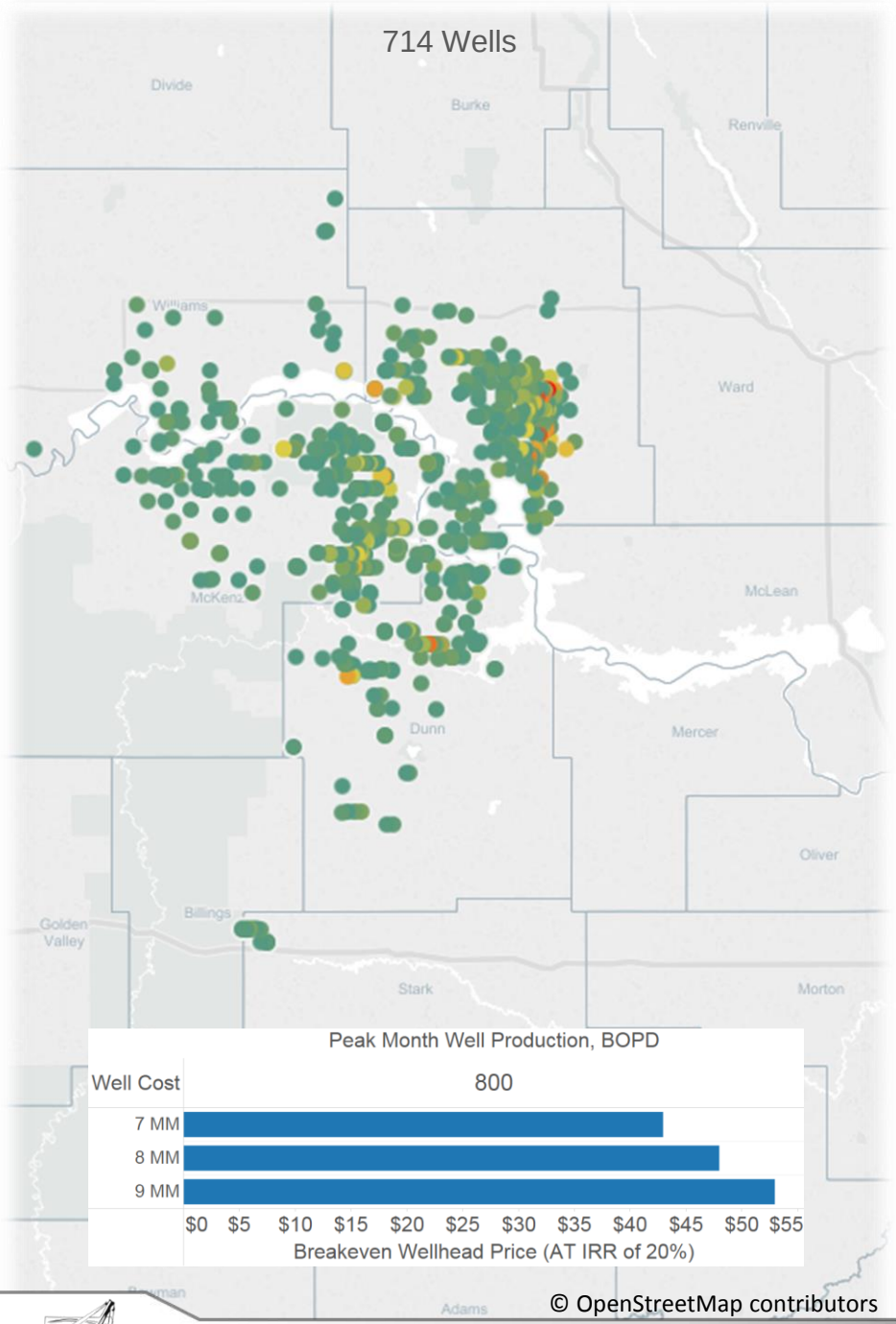


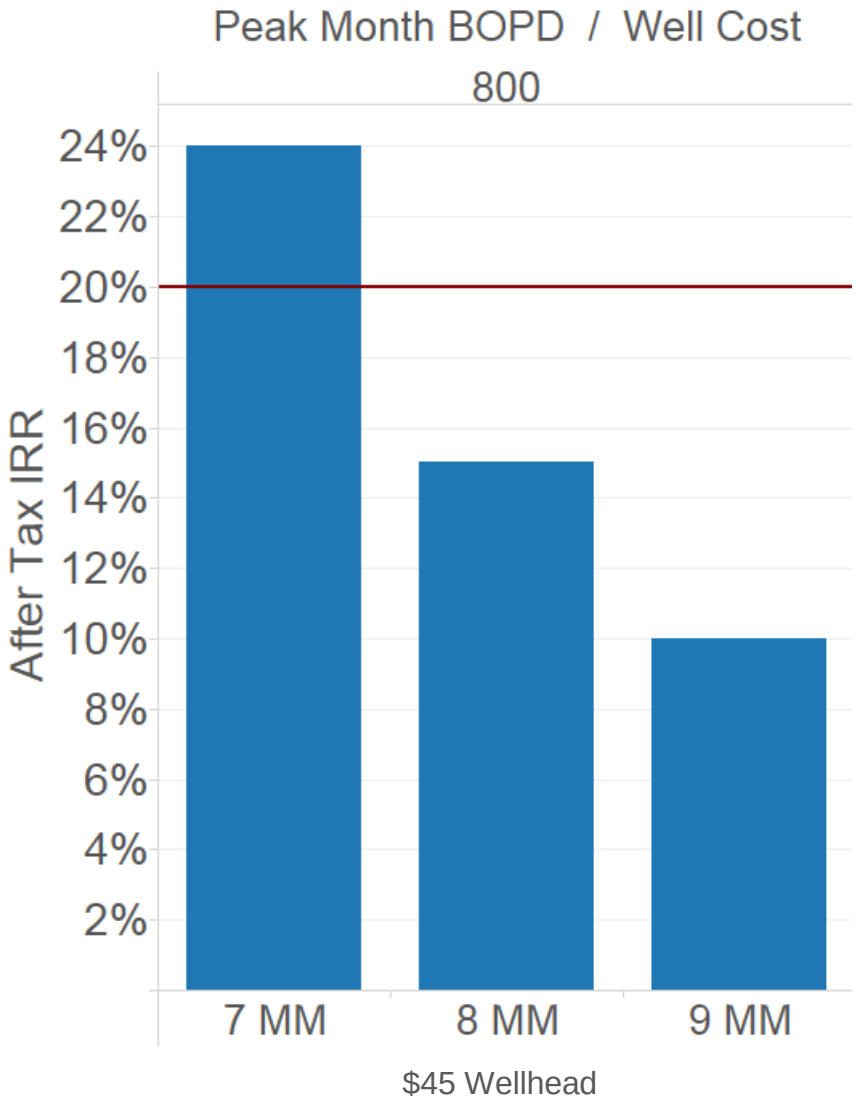
Peak Month Minimum 700 BOPD



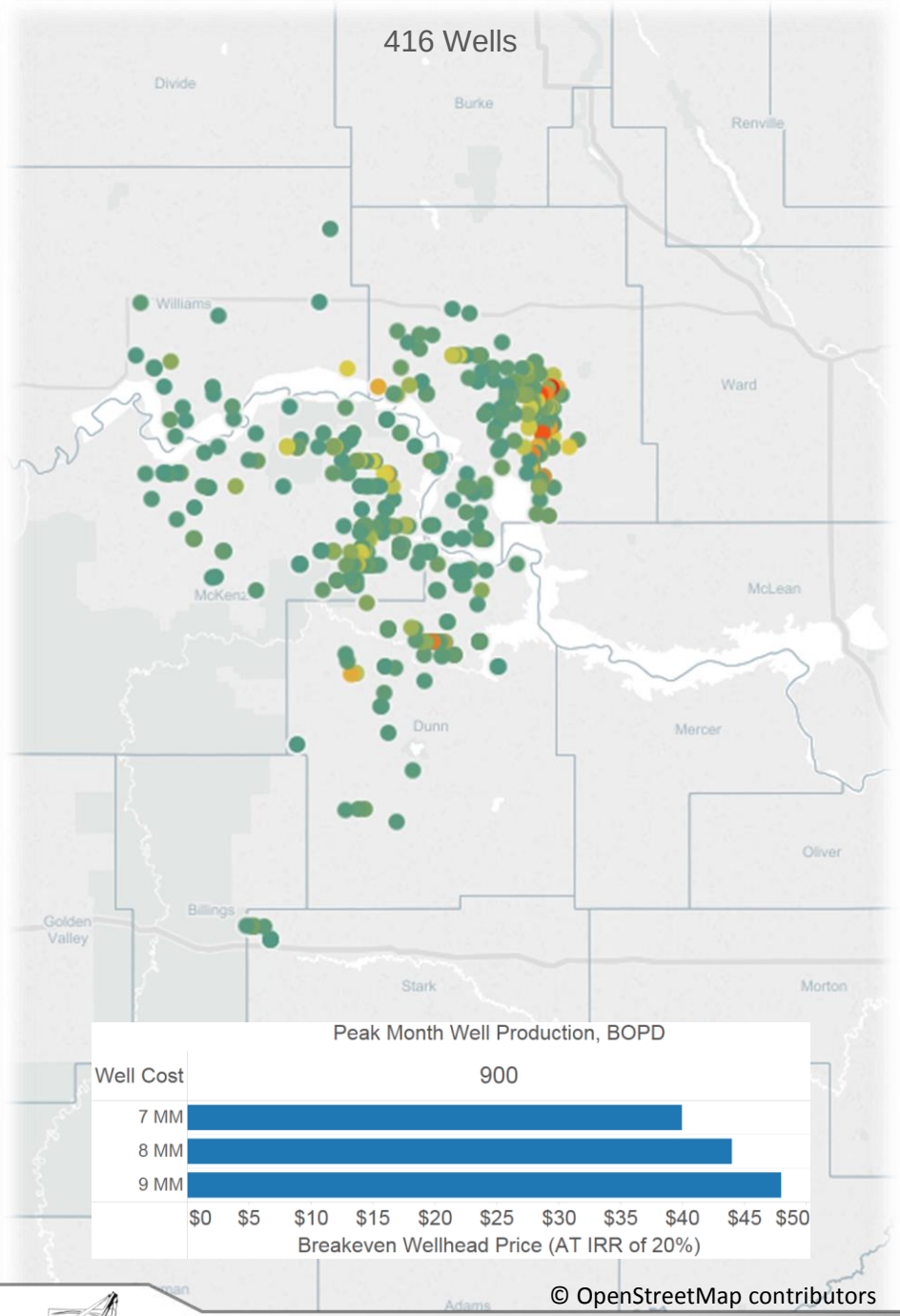


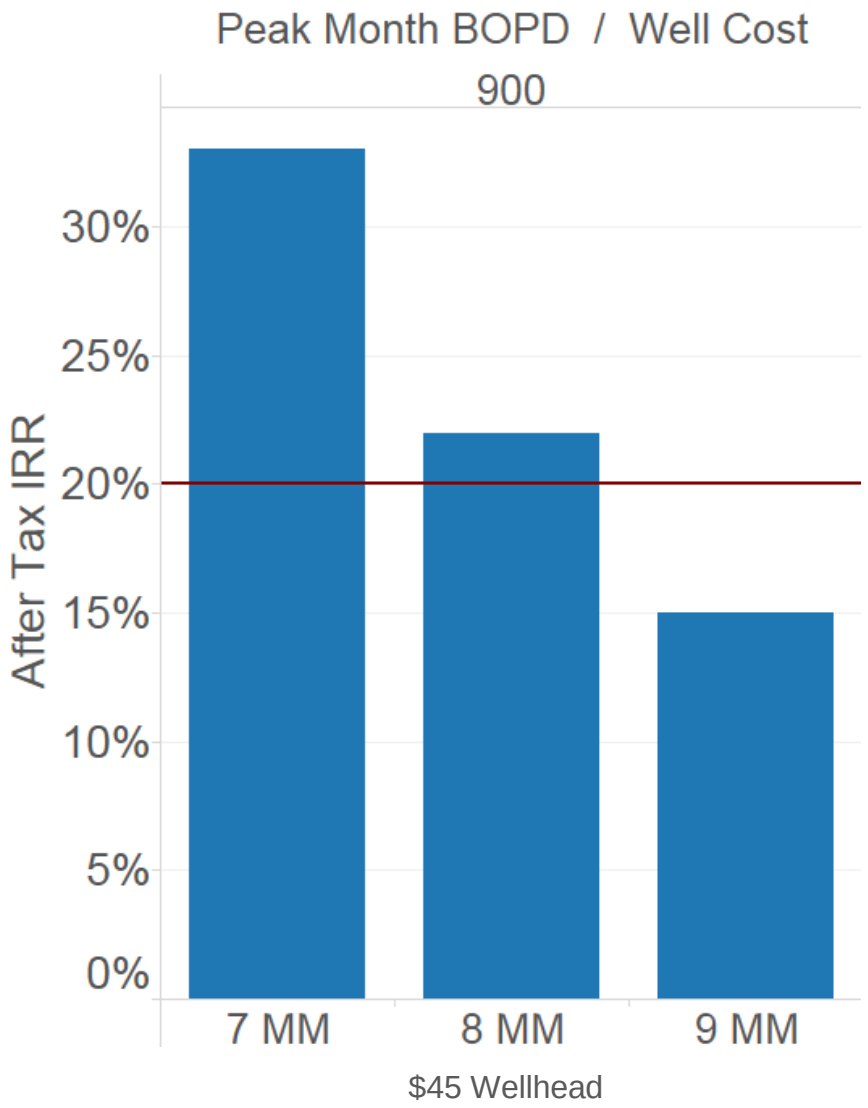
Peak Month Minimum 800 BOPD



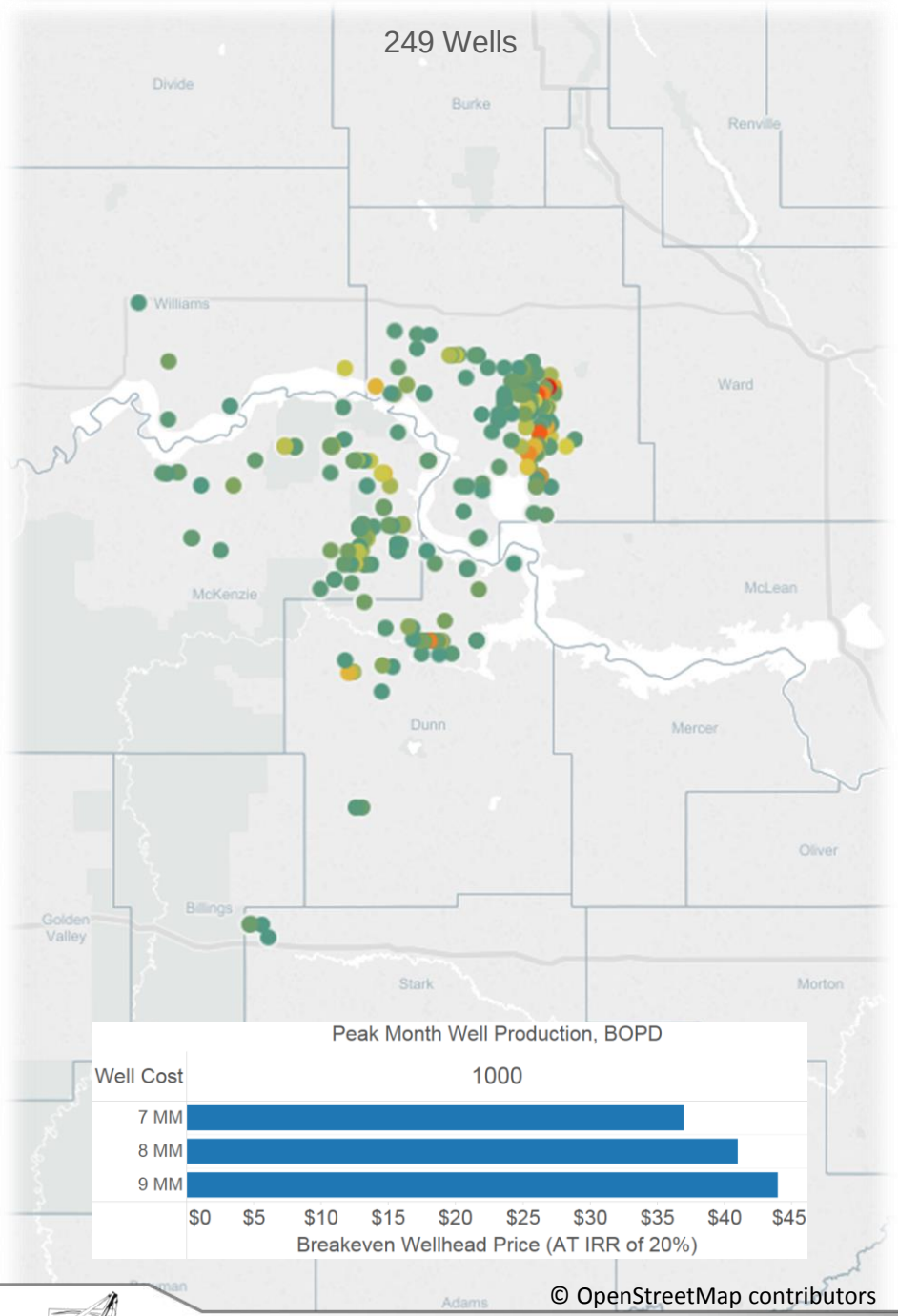


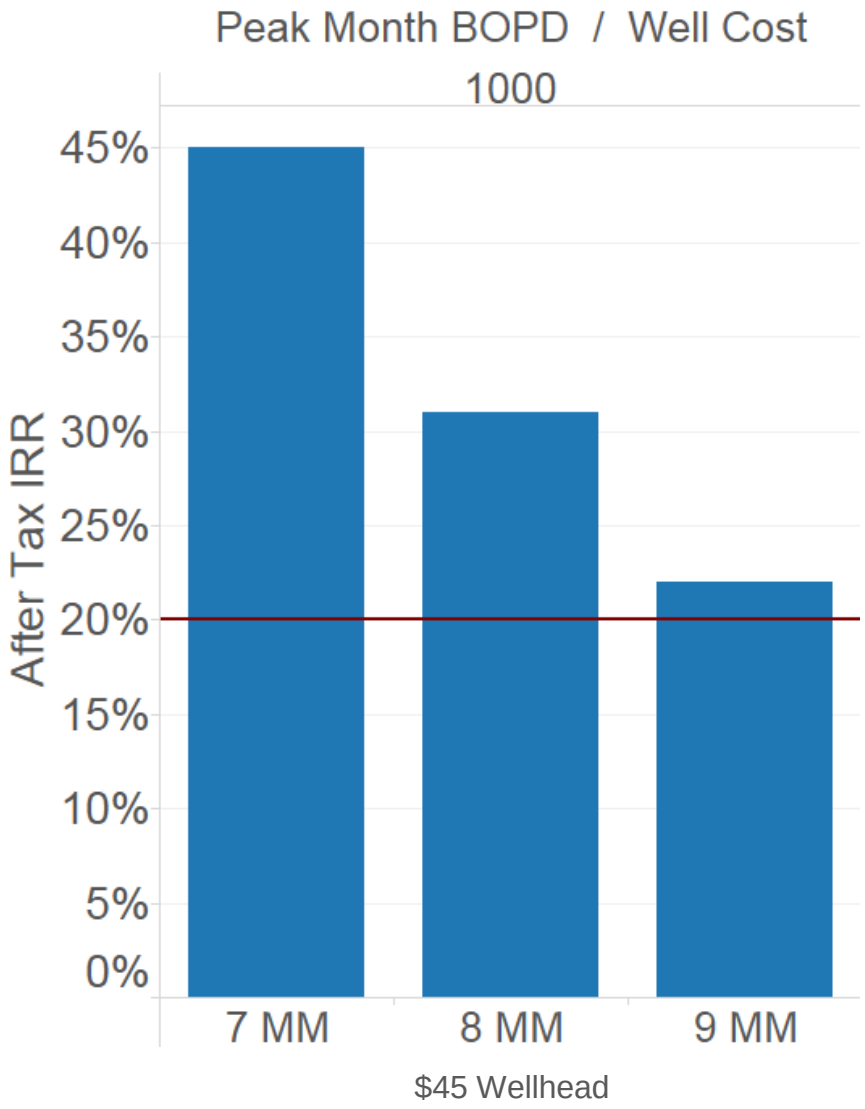
Peak Month Minimum 900 BOPD



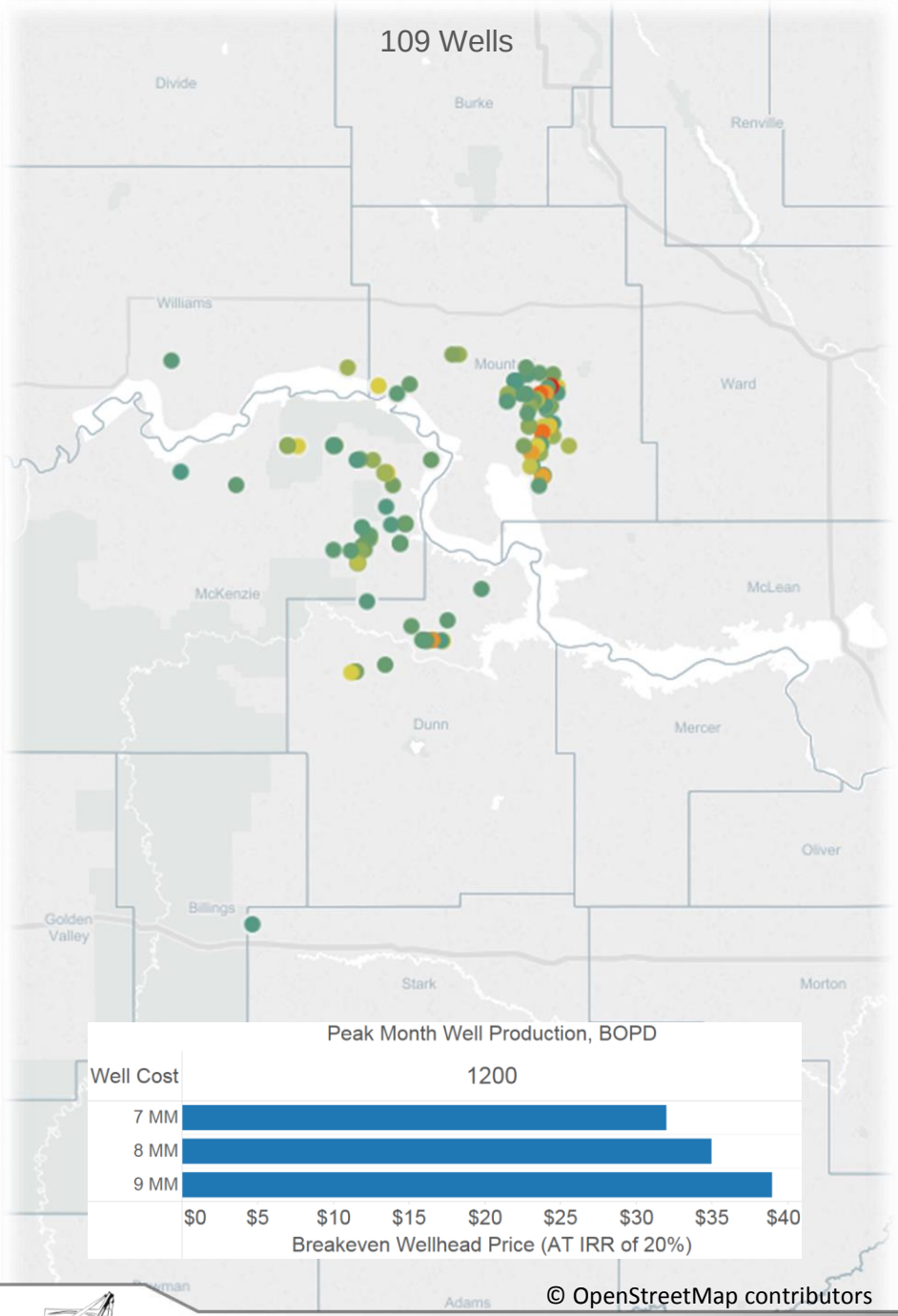


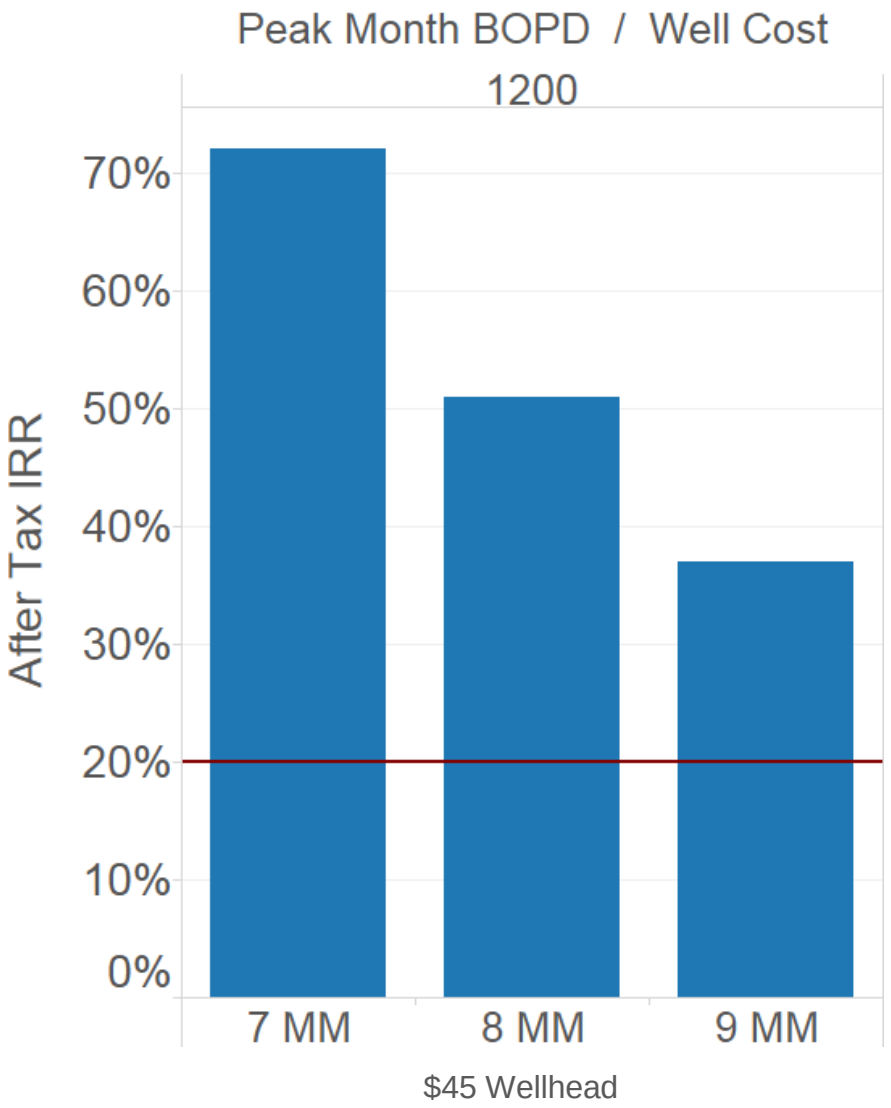
Peak Month Minimum 1,000 BOPD

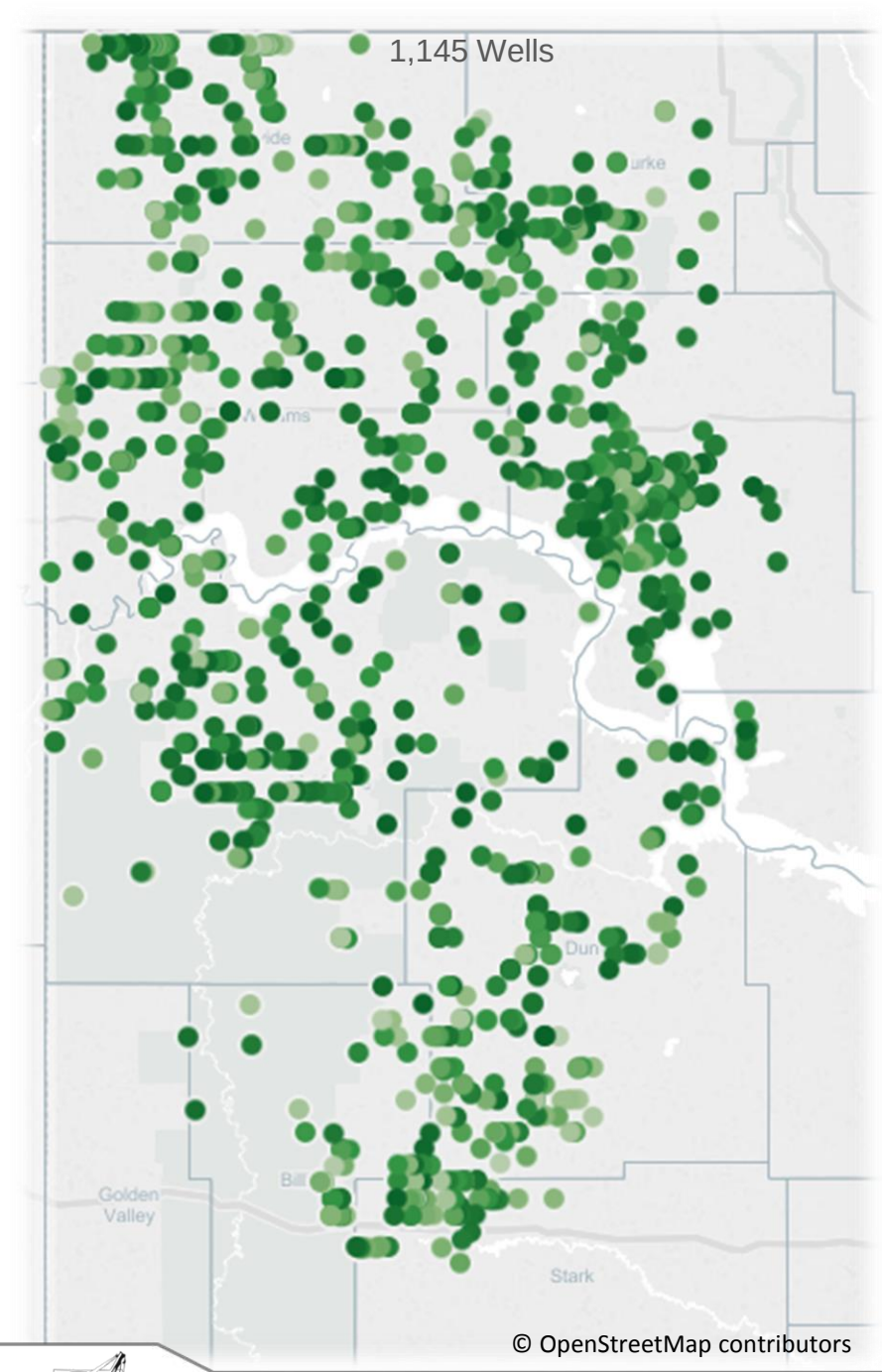




Peak Month Minimum 1,200 BOPD







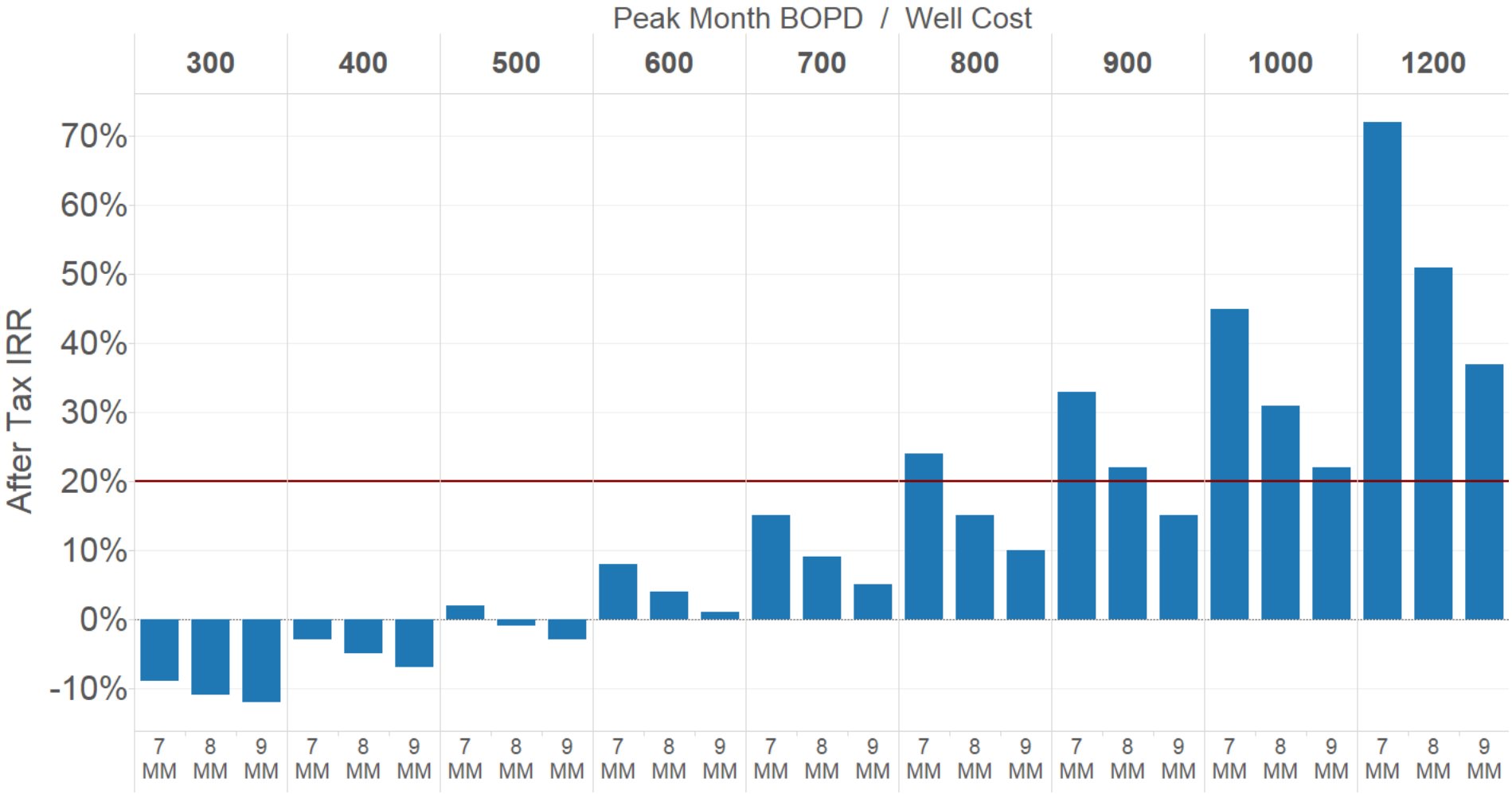
Peak Month: 100-300 BOPD*

*Low production wells also occur in areas deemed “Core” or “Hot Spot”.

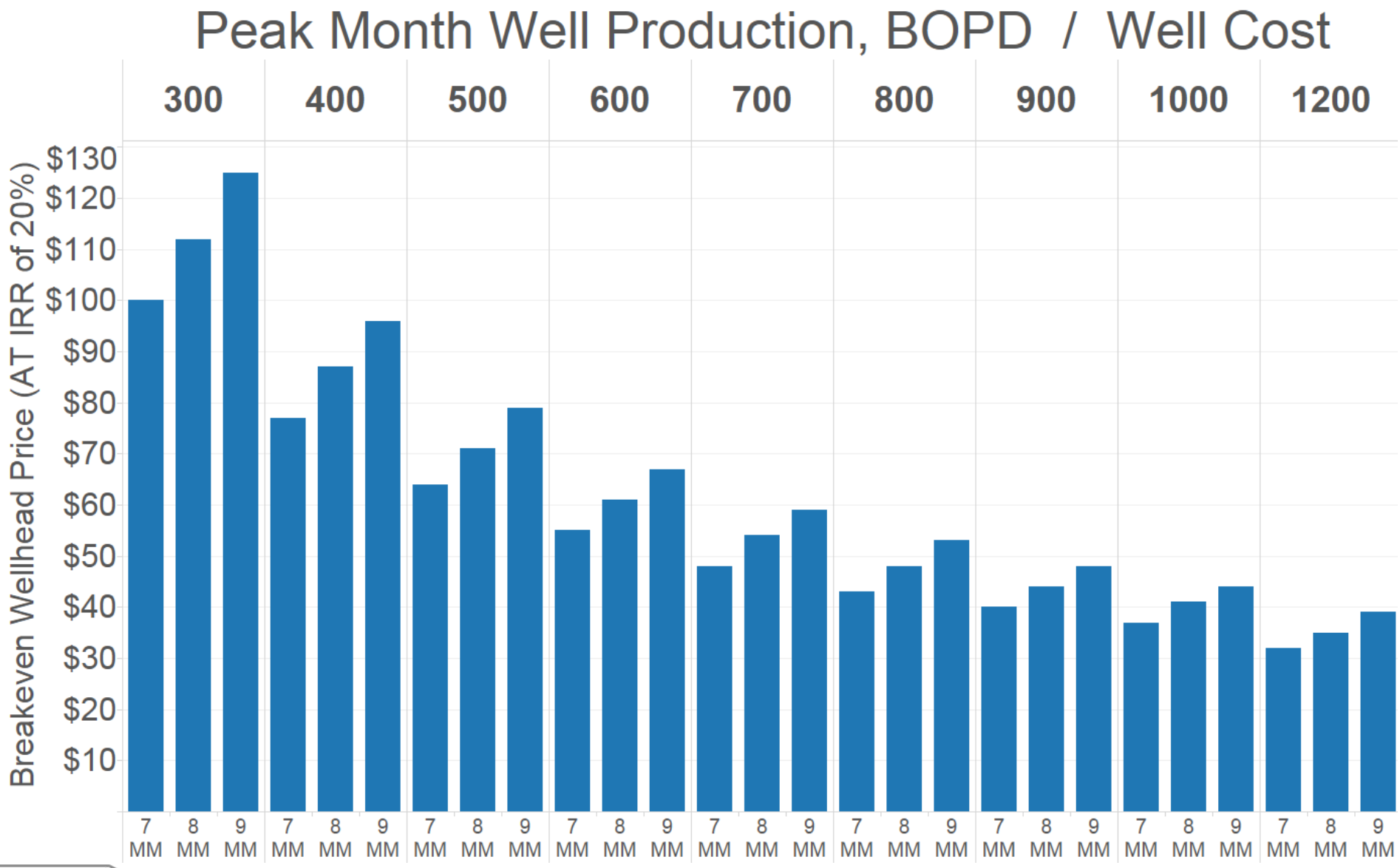
Risk is still present in most areas.

Mapped wells drilled 2012-2014

Summary of $45 Wellhead Oil



Breakeven Summary

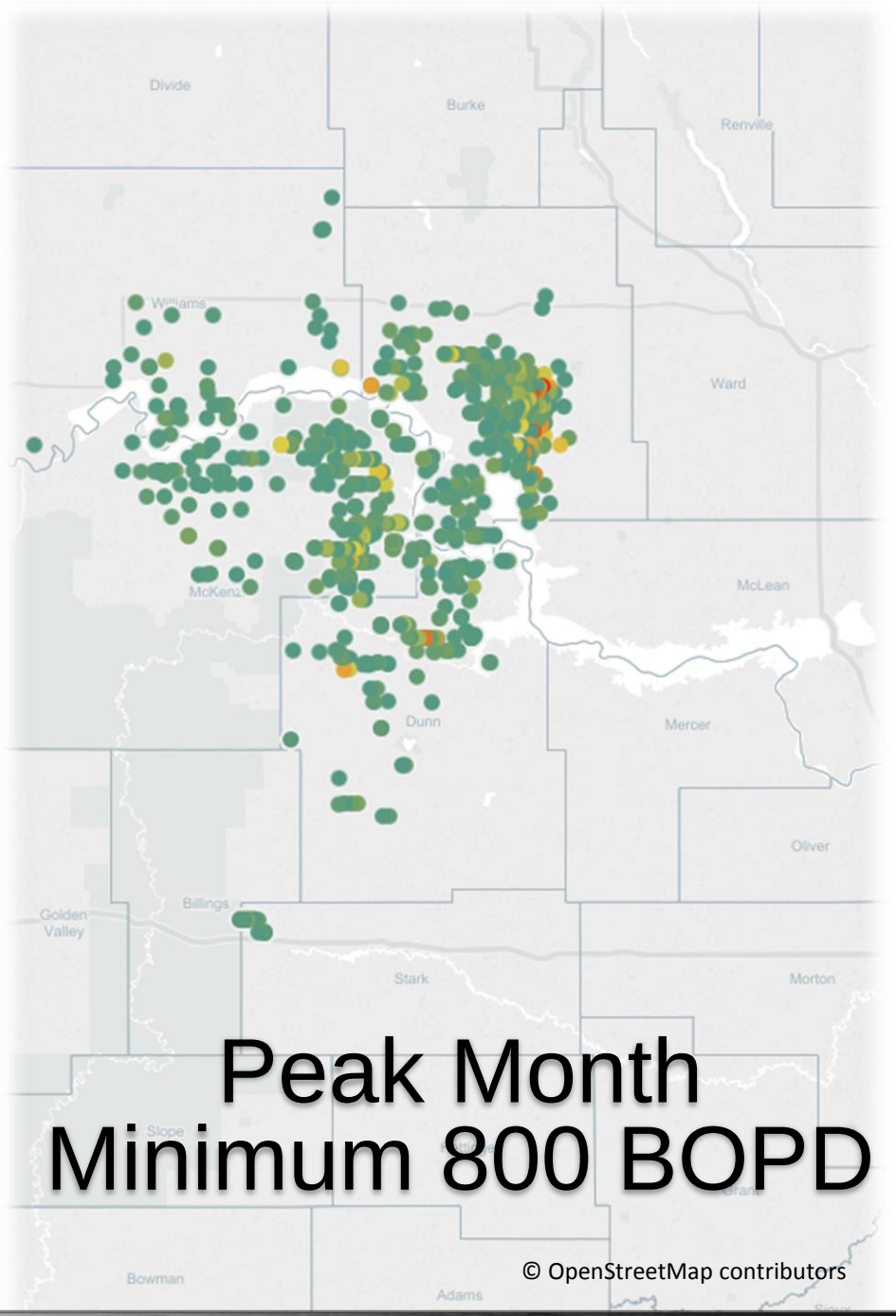


Options for drilling outside 800 BOPD footprint:

1)Prove location is viable in low price environment (lower costs, improved IP, etc.)

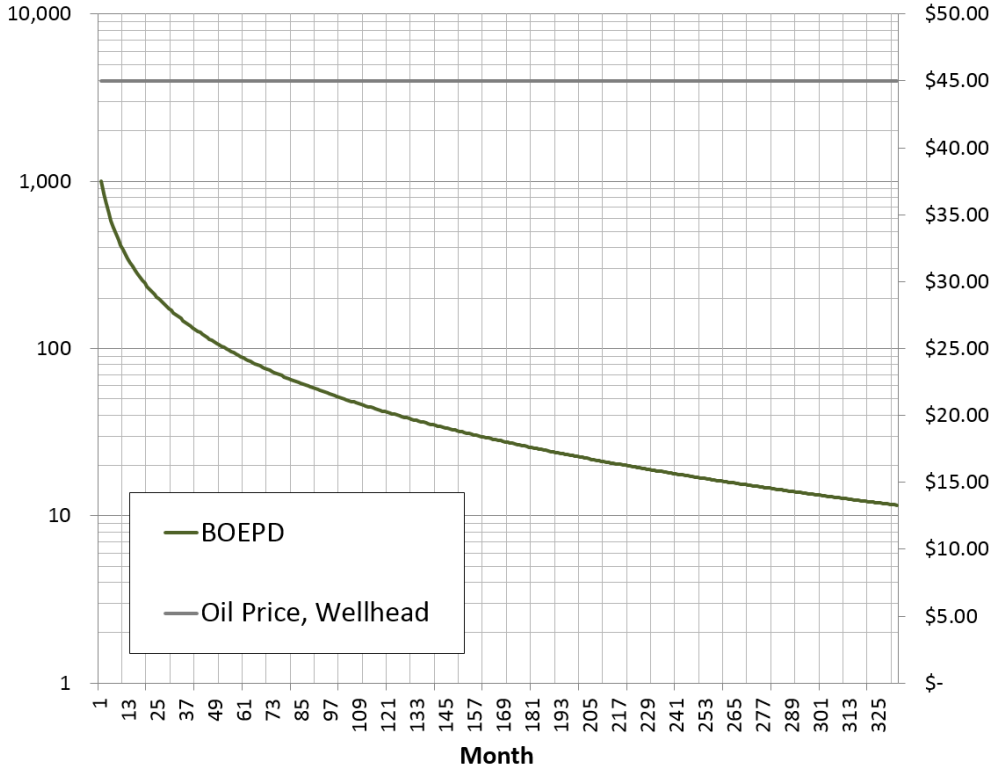
2)Move rig to better geology (inside or outside of basin)

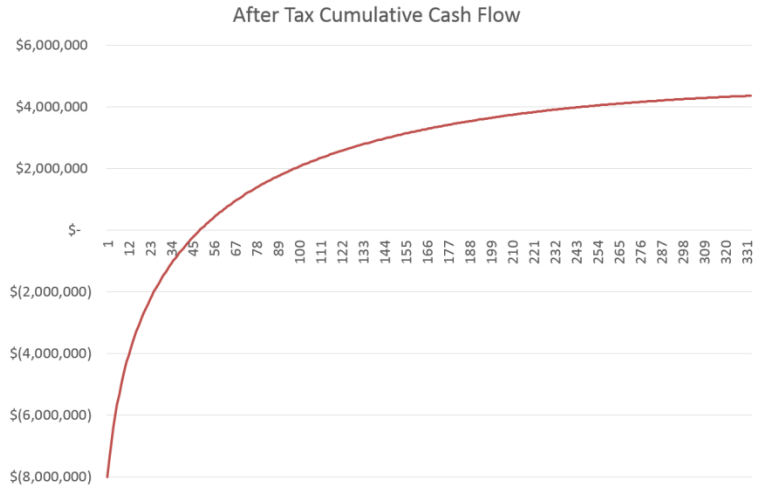
3)Release rig

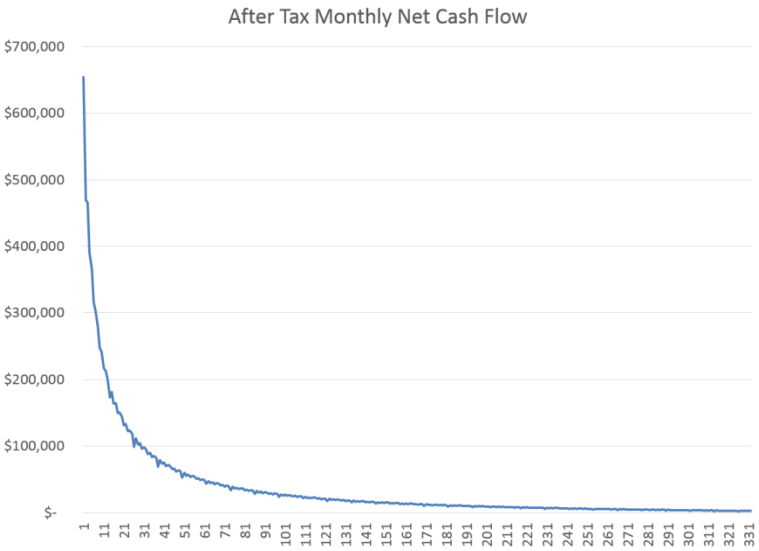


800 BOPD Well Example

- $8 MM Well
- $45/bbl oil and $6/mcf gas
- AT IRR = 15%
- AT NPV (10) = $0.93 MM
- Simple Payback = 4.0 Years







Additional Considerations

- Can well costs come down further?
- Individual company budgets, cash flows, hedges, obligations, and management strategies
- Competition from other plays
- Completion technology continues to improve
  - Higher volumes of proppant and water
  - Higher density drilling success

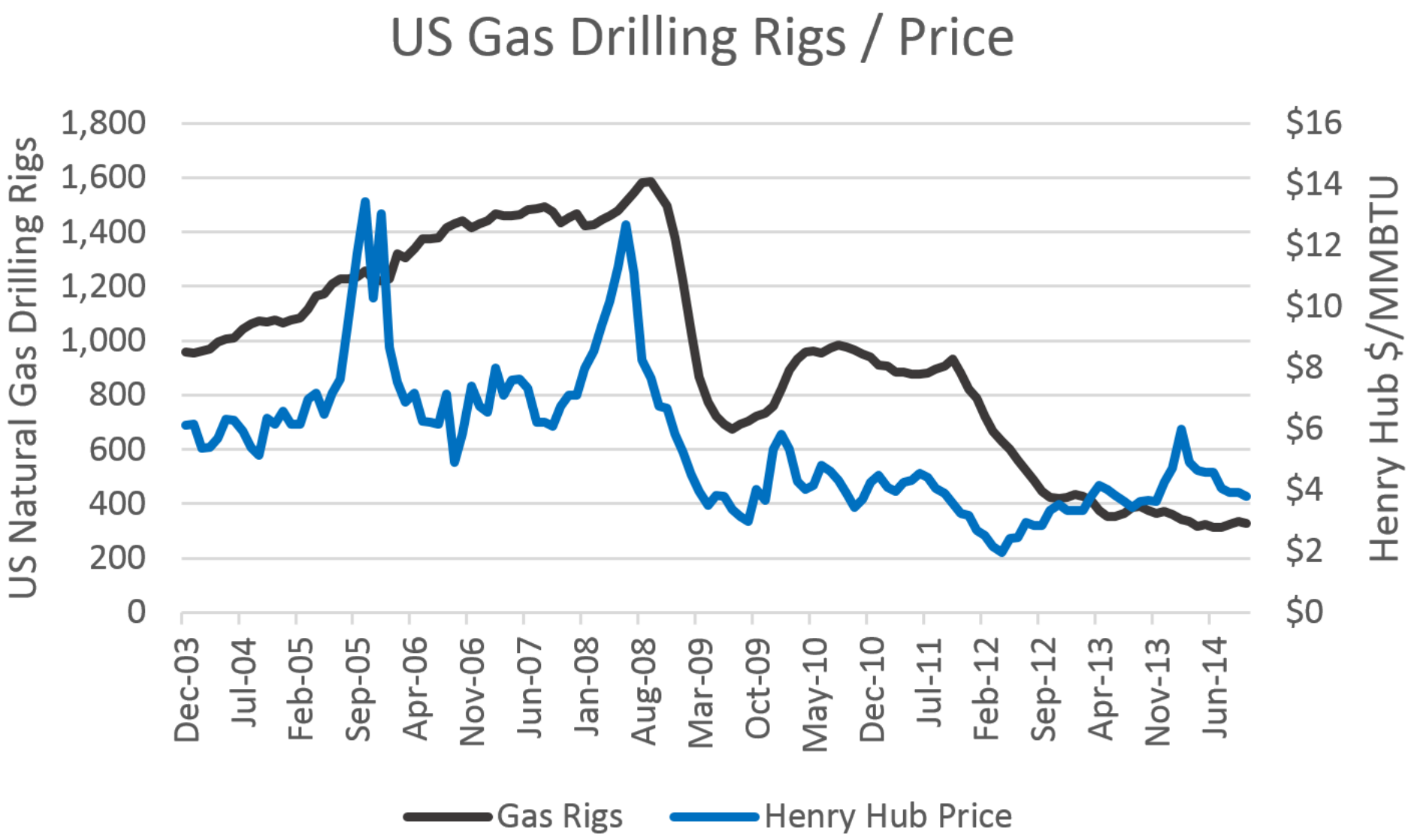
Arguments

- Well economic assumptions too optimistic or conservative
  - Jump to lower or higher well performance footprints
- Some rigs are not drilling Bakken/Three Forks wells
  - No economics were run on wells in other formations

Next Steps

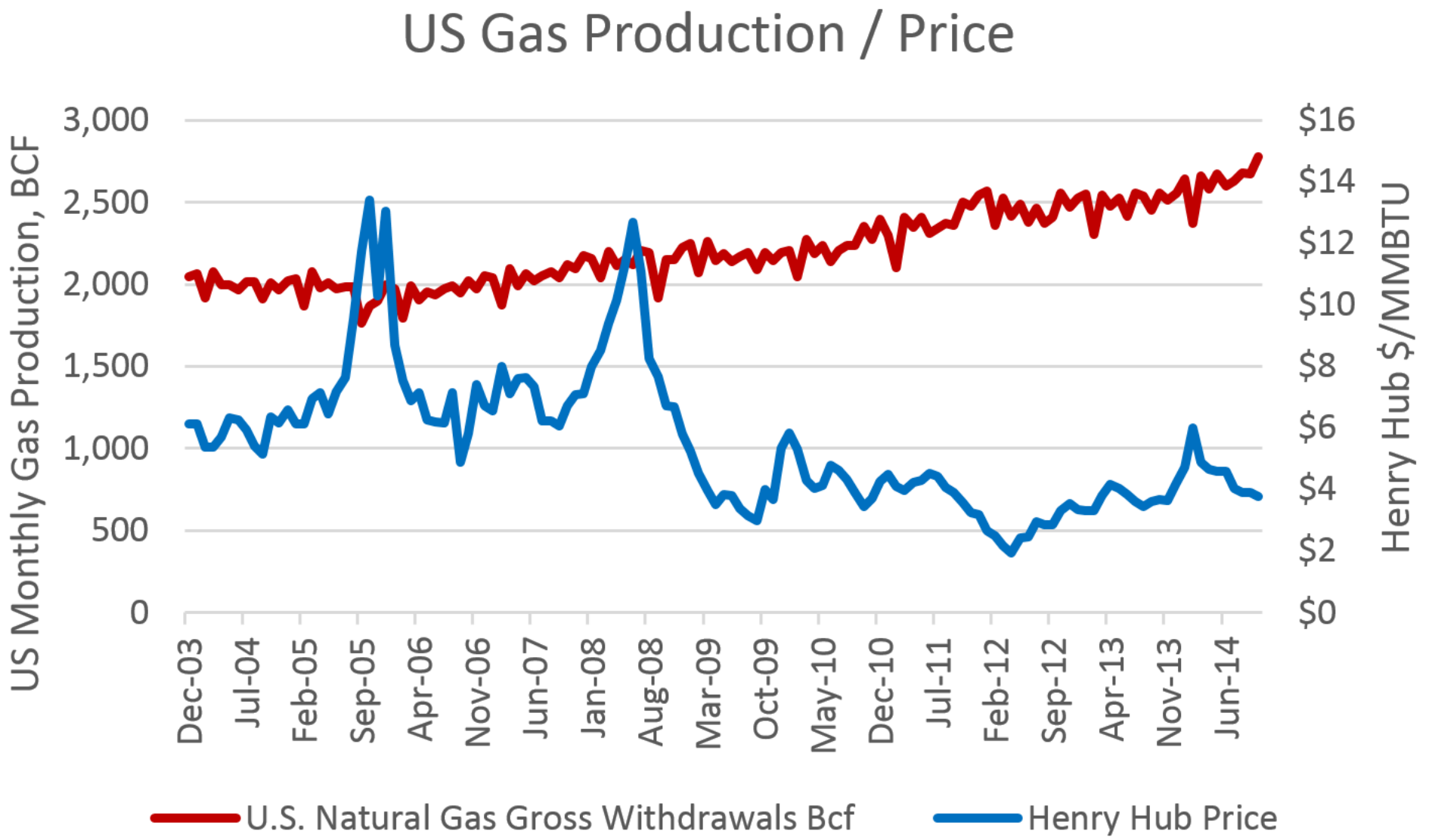
- Use the findings to refine crude oil and natural gas forecasts for the region
- Continue to monitor pricing, production, and technology to further enhance our understanding of well economics in North Dakota

Can We Learn from Natural Gas?



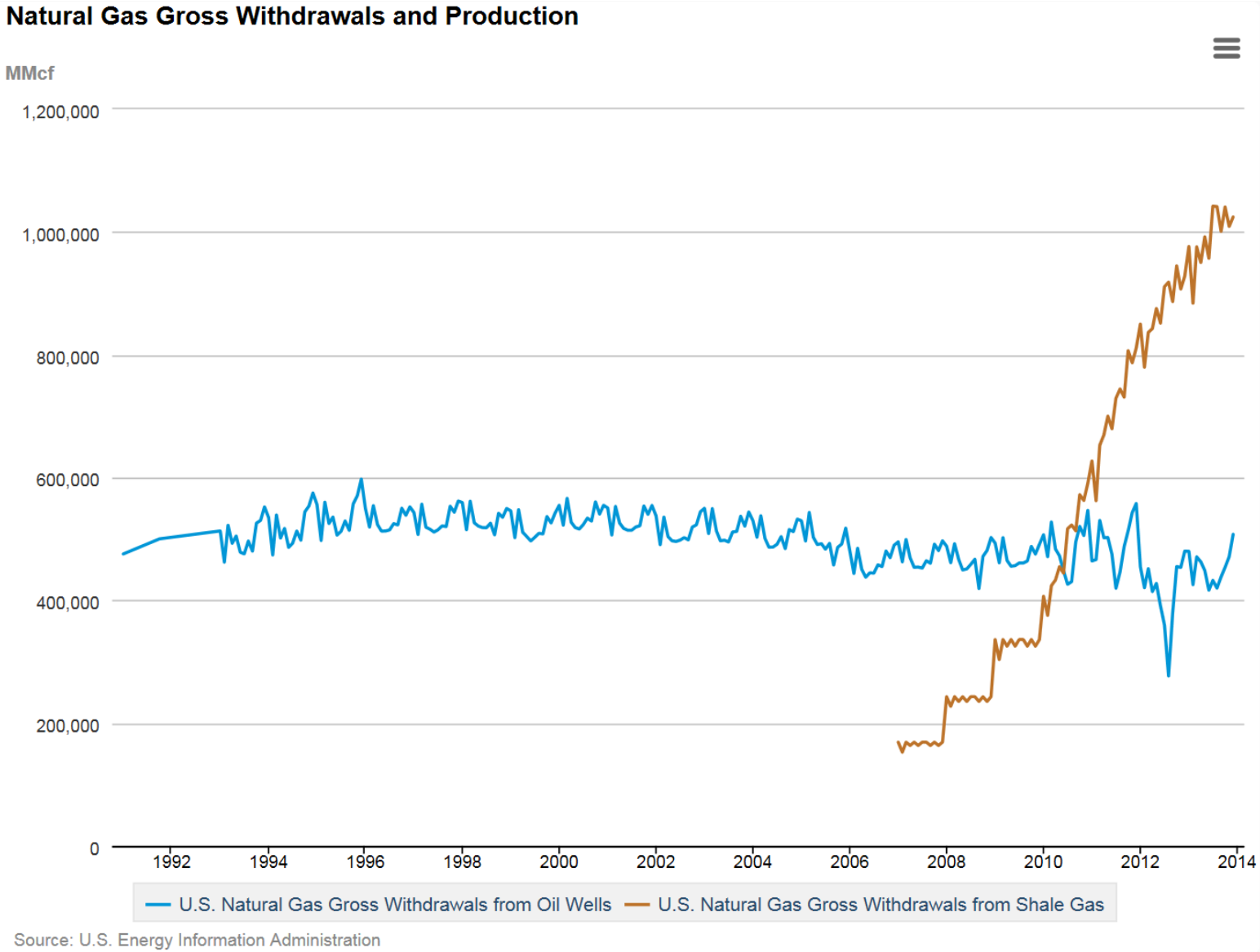
Source: EIA Data

Can We Learn from Natural Gas?

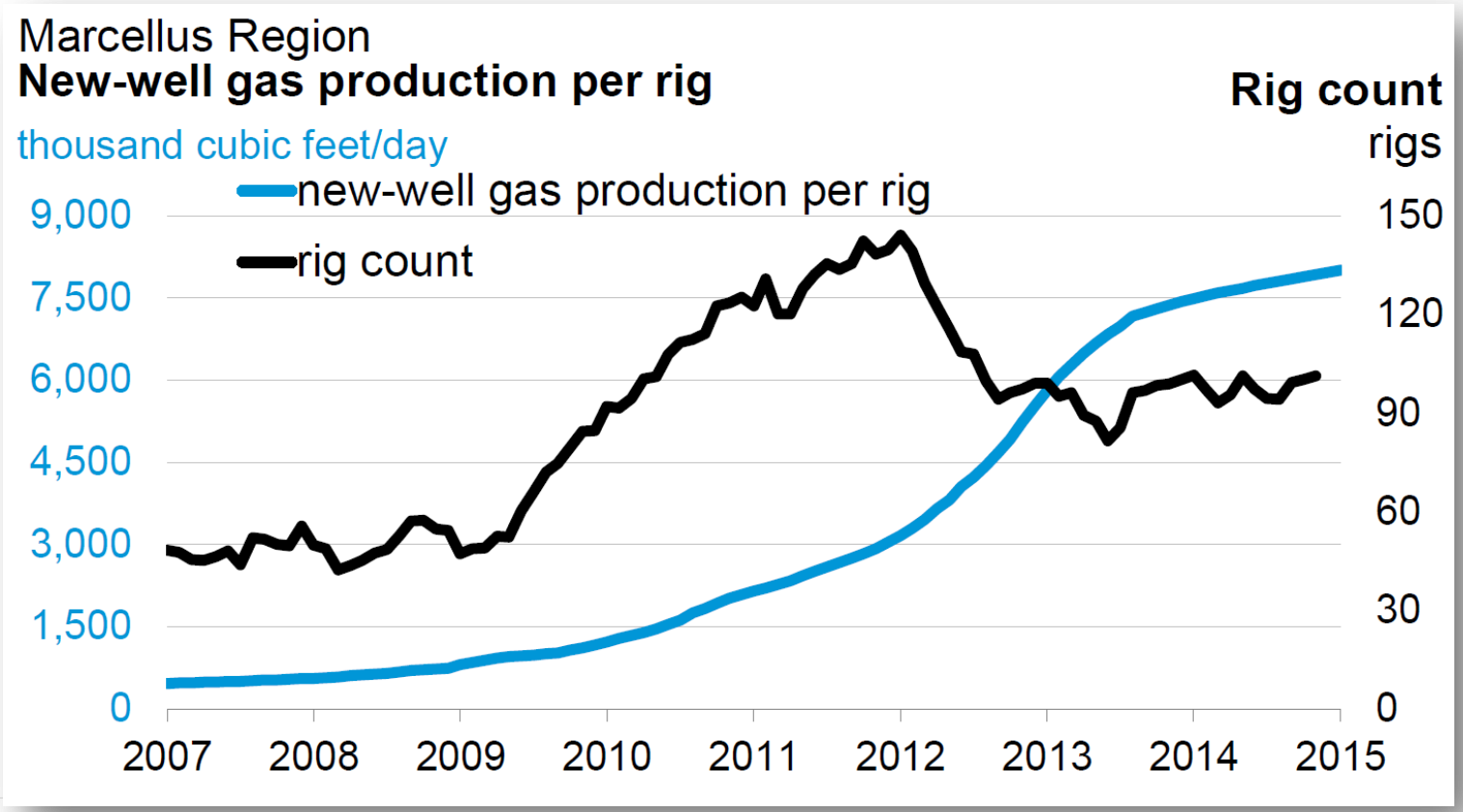


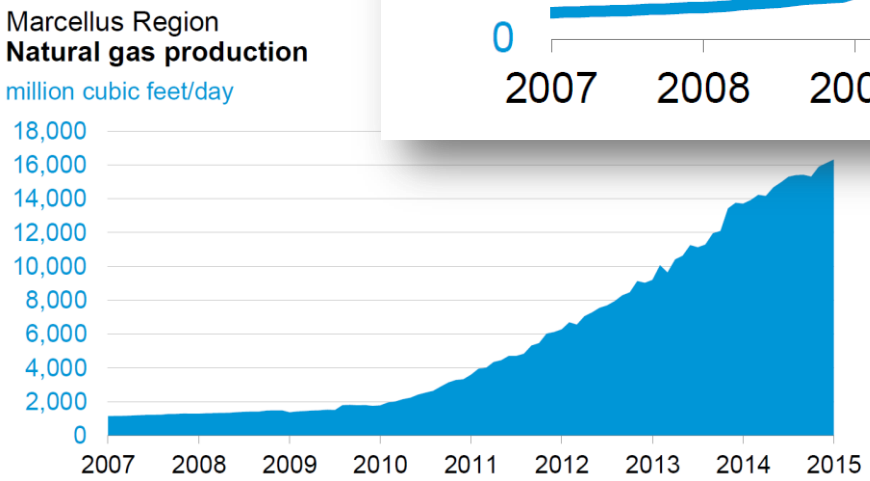
Source: EIA Data

Can We Learn from Natural Gas?



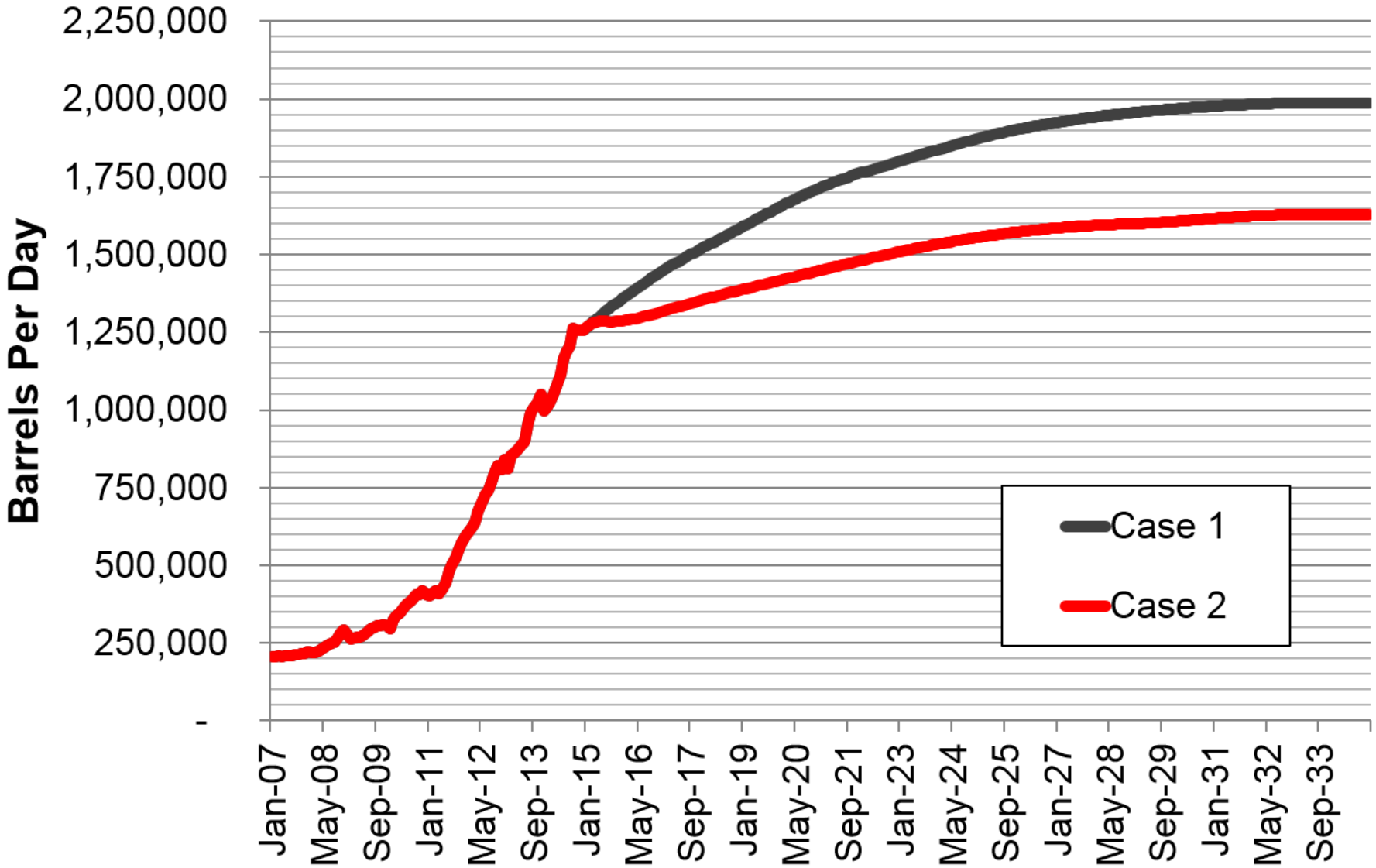
Marcellus Reaction to Low Prices





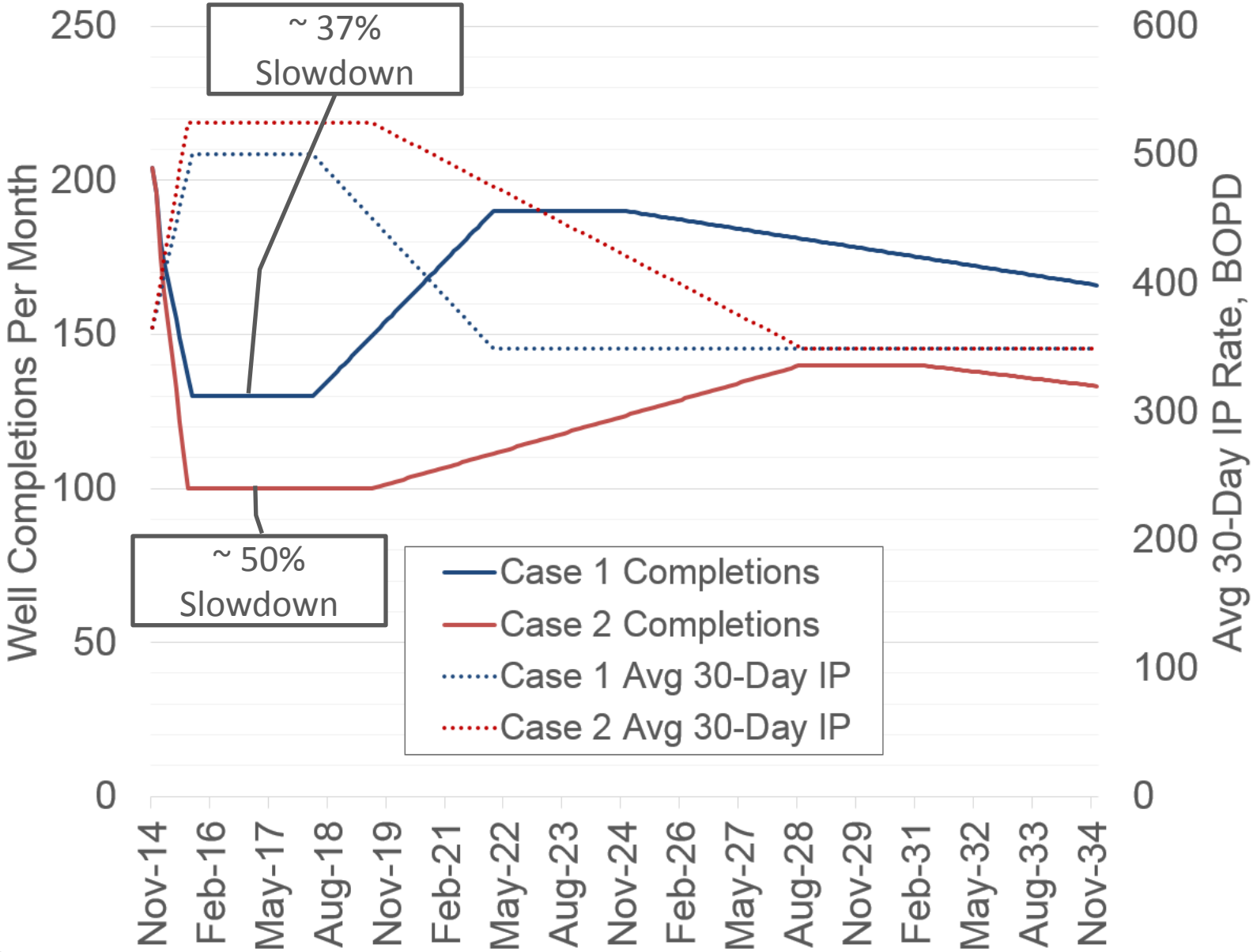
Source: U. S. Energy Information Administration | Drilling Productivity Report

Forecasting Williston Basin Oil Production, BOPD

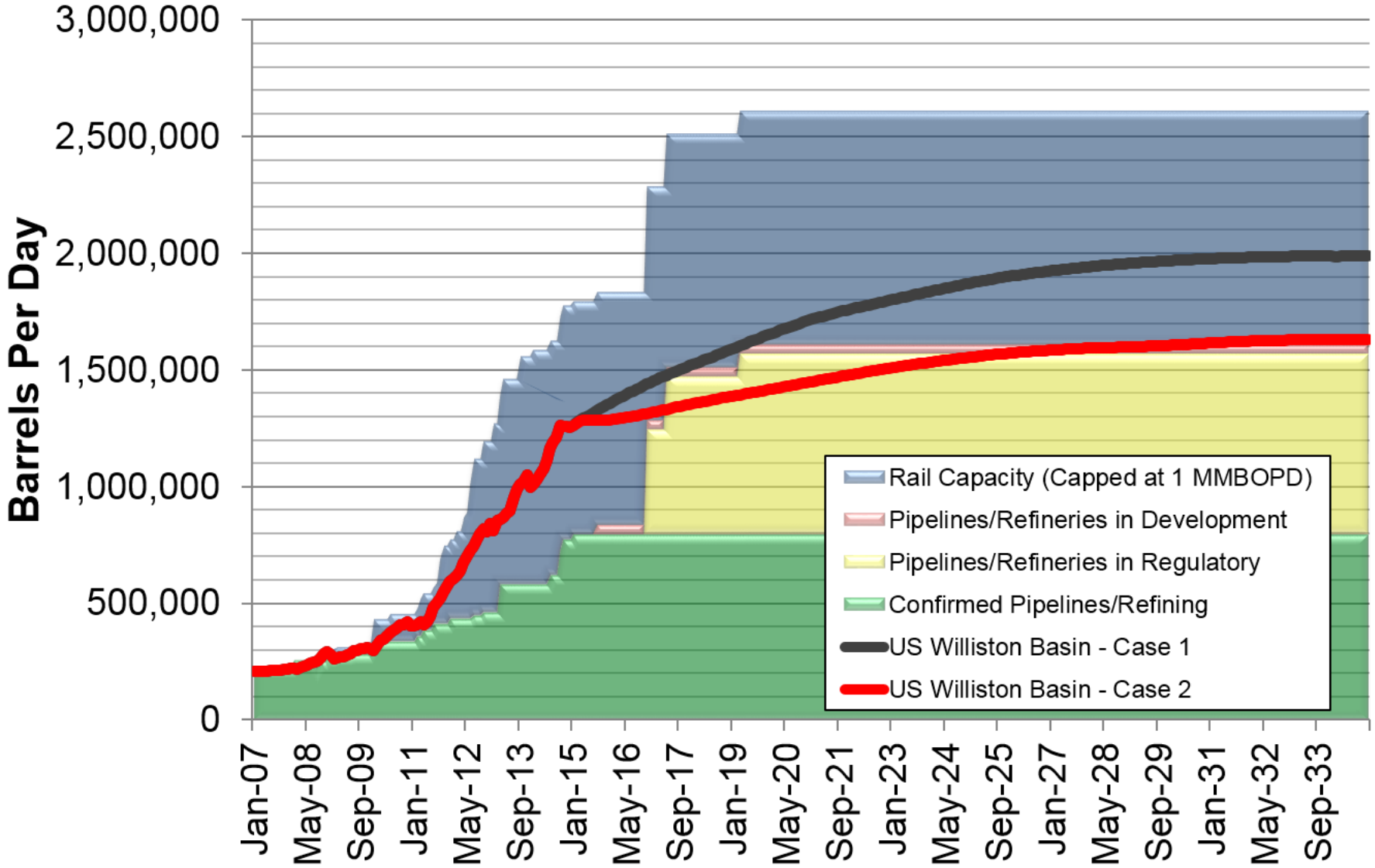


Production forecast is for visual demonstration purposes only and should not be considered accurate for any near or long term planning.

Forecasting Assumptions



Williston Basin Oil Production & Export Capacity, BOPD



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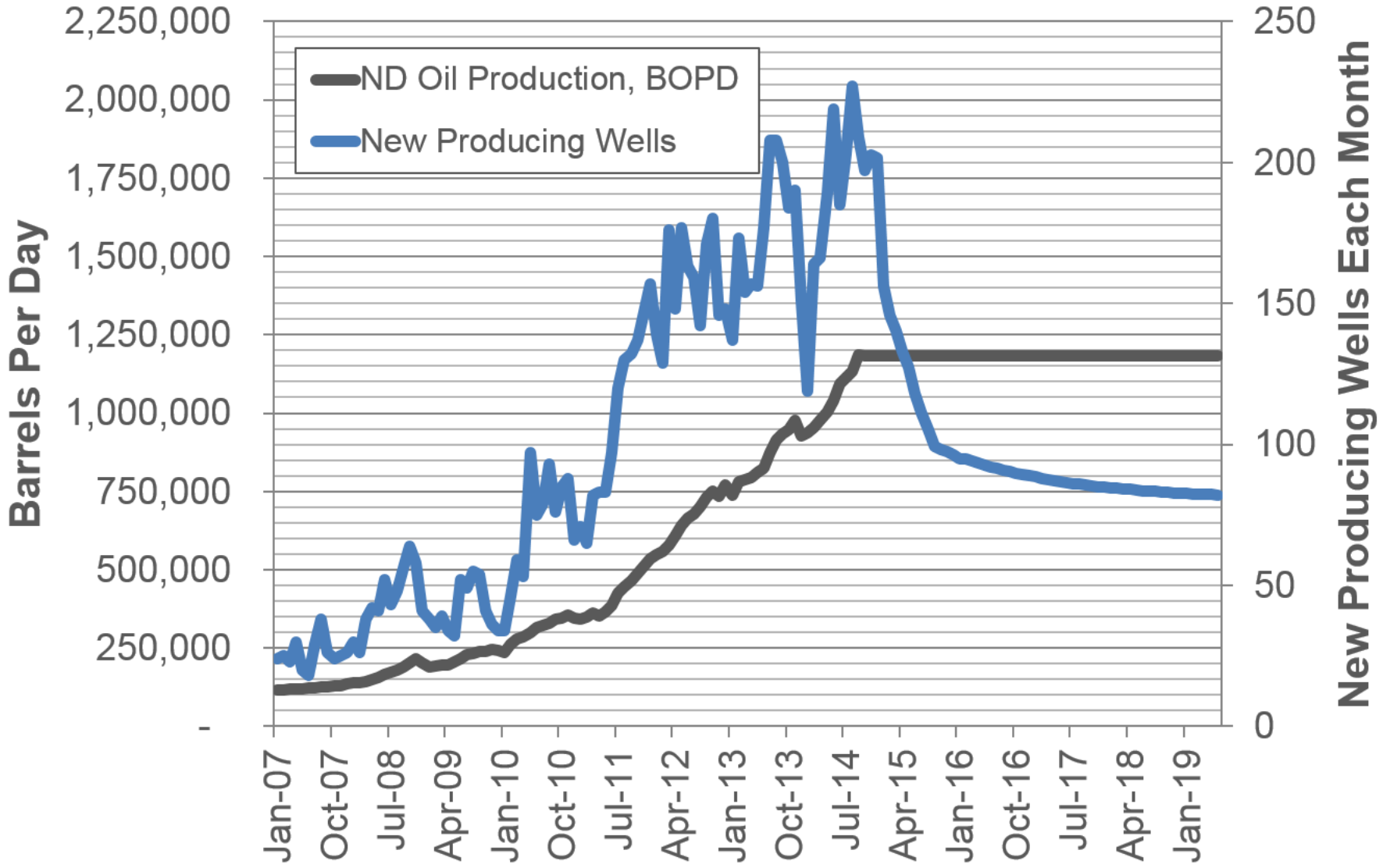
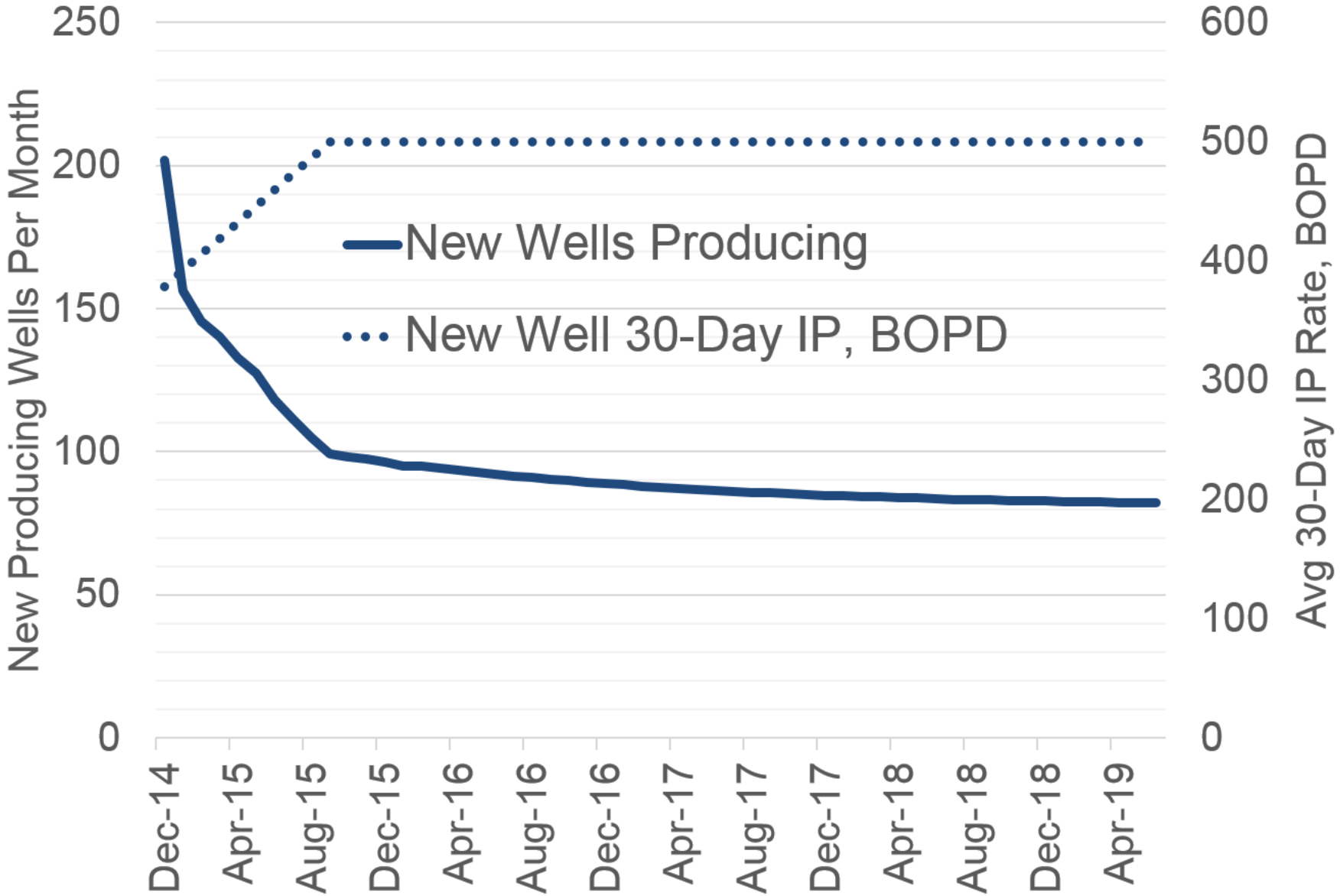
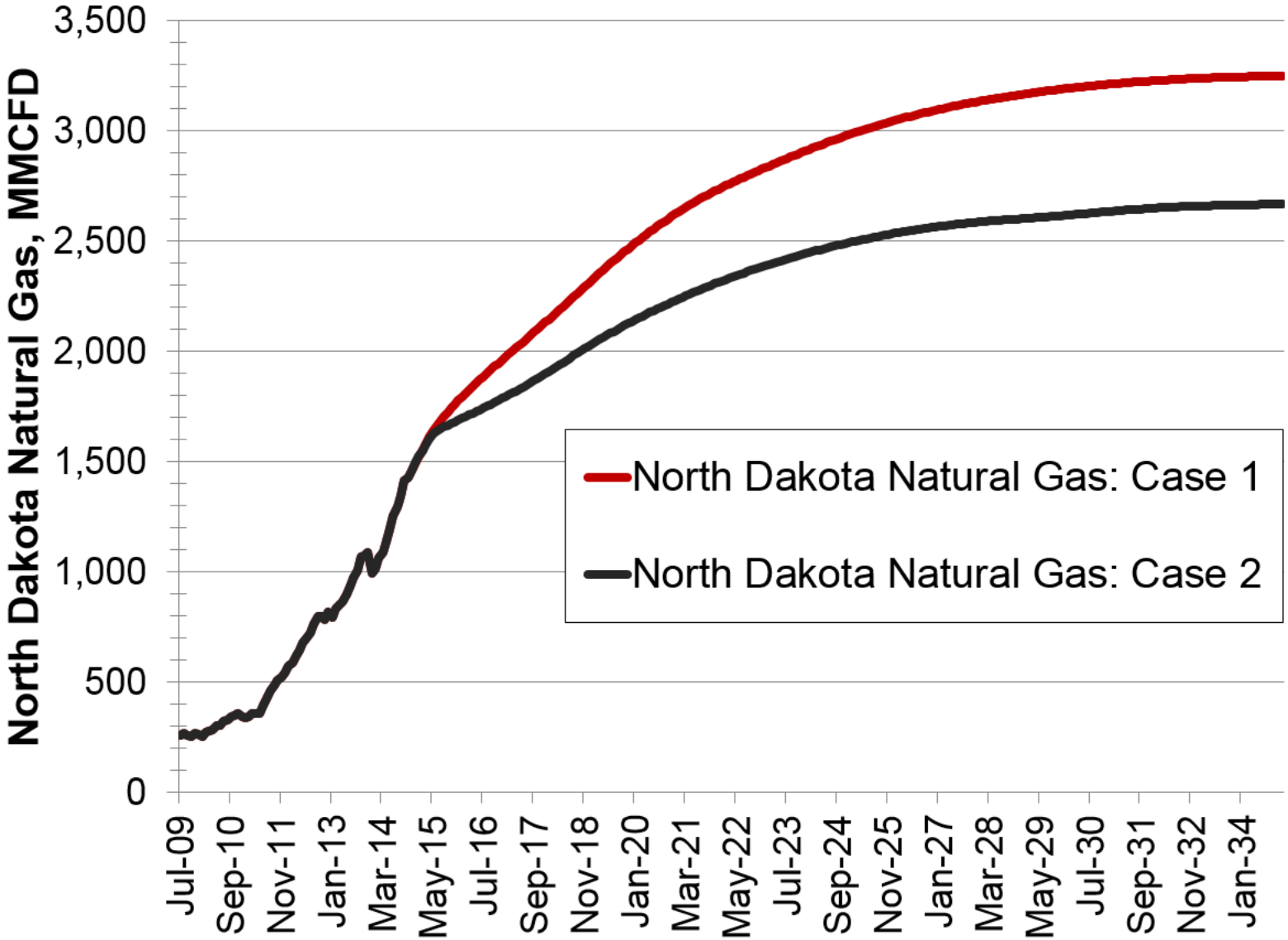
Forecasting Exercise – Hold Oct 2014 Production



Forecasting Exercise – Hold Oct 2014 Production



North Dakota Natural Gas Forecast, MMCFD



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