

Energy Development and Transmission Interim Committee

Justin J Kringstad

Geological Engineer

Director

North Dakota Pipeline Authority



August 14, 2019

Presentation Outline

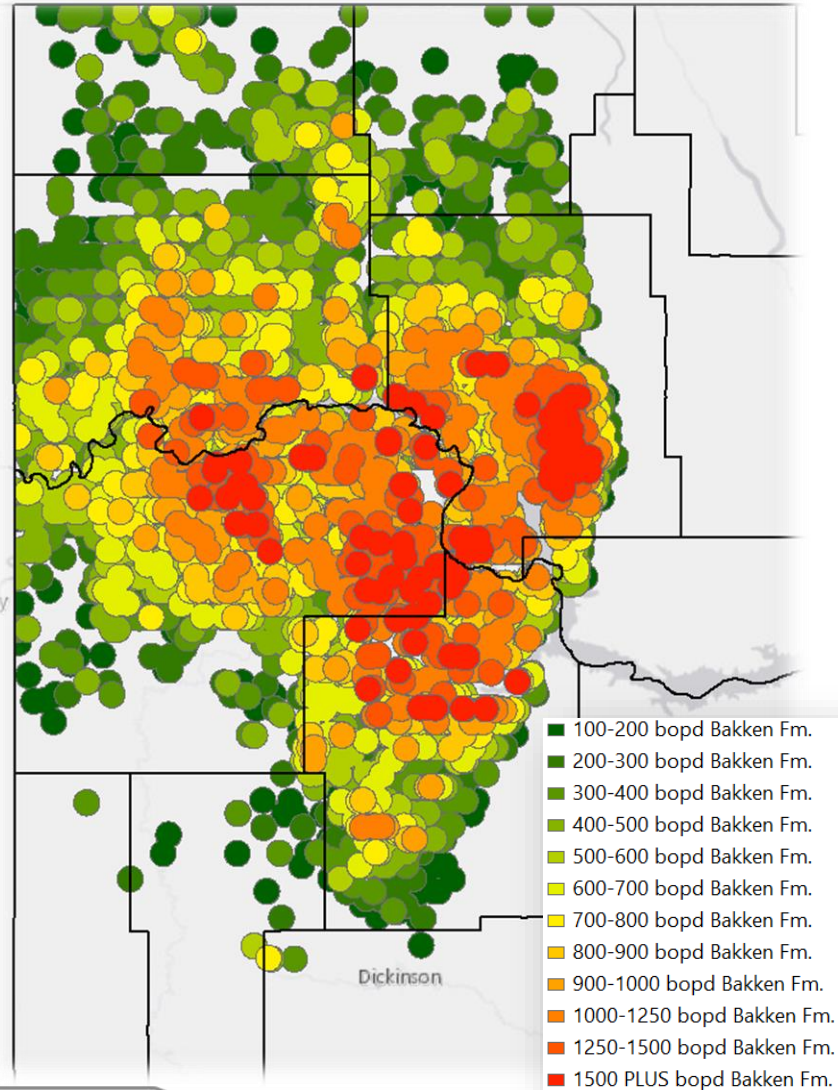
- **Economics**

- Current Activity and oil transportation dynamics
- Understanding current and future oil production
 - Pricing update
 - Activity
 - Oil forecasts
- North Dakota natural gas production
 - Flaring and gas capture
 - Natural gas liquids

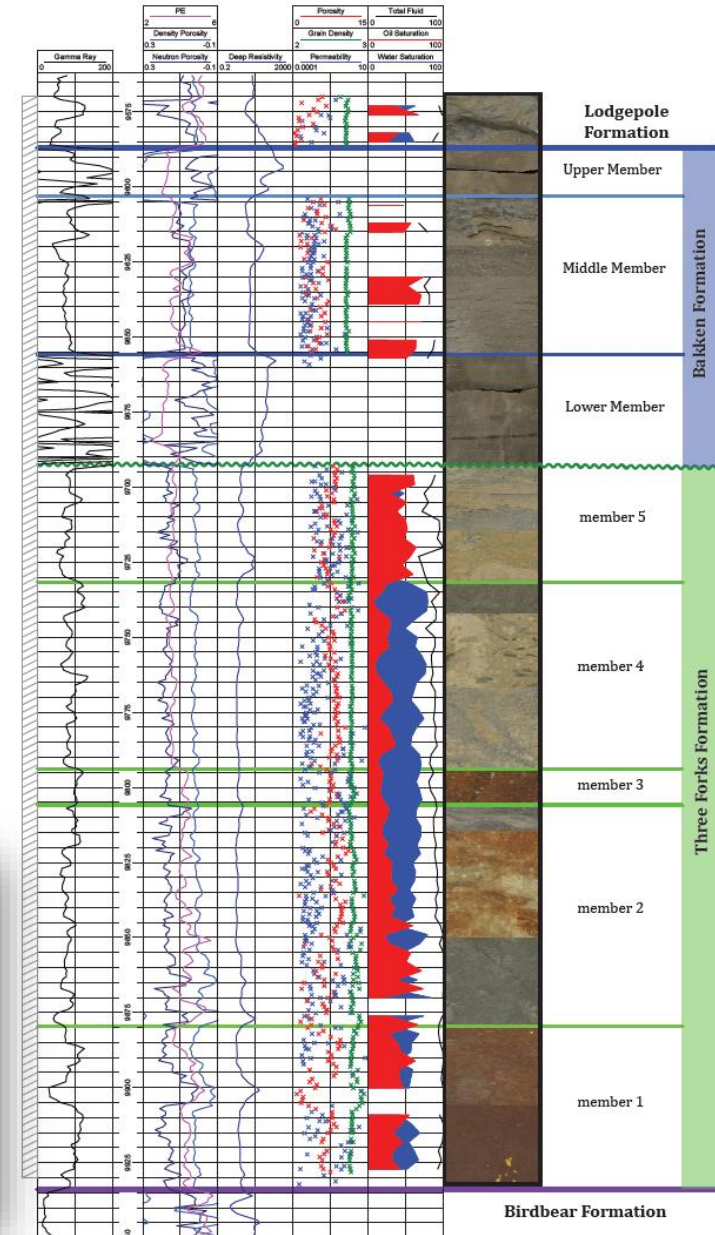
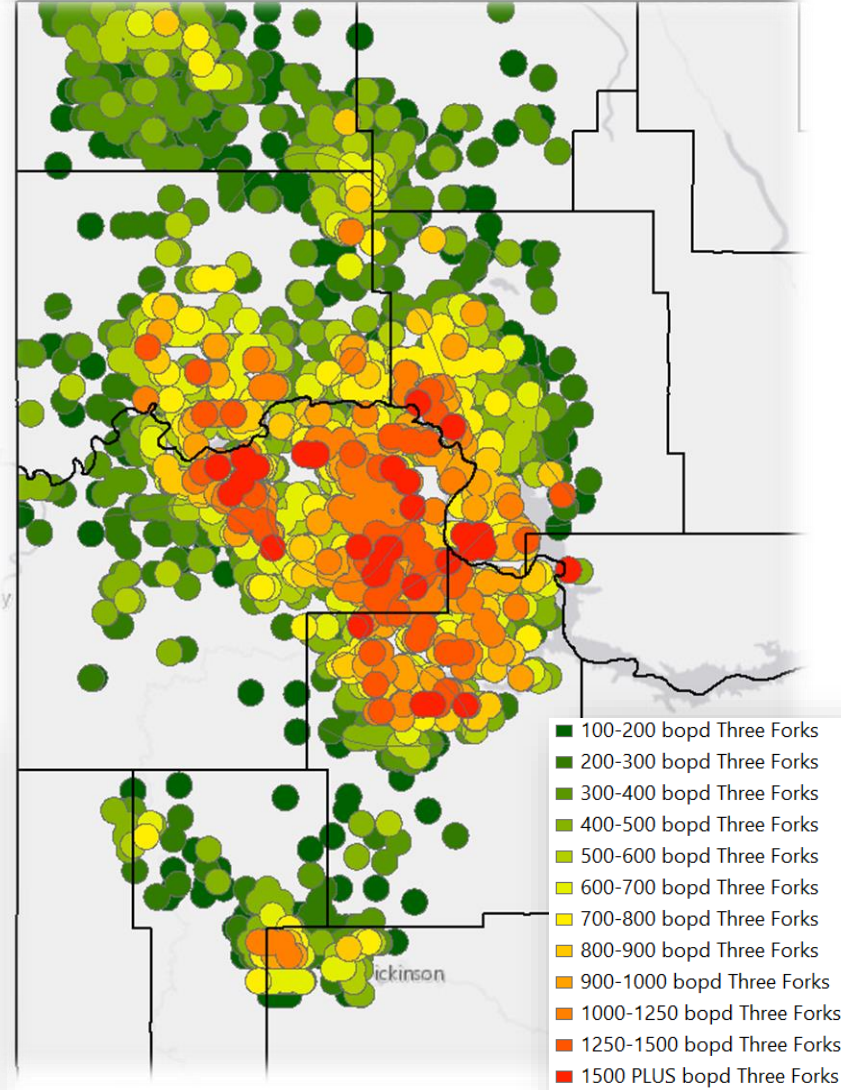


Bakken & Three Forks Formations

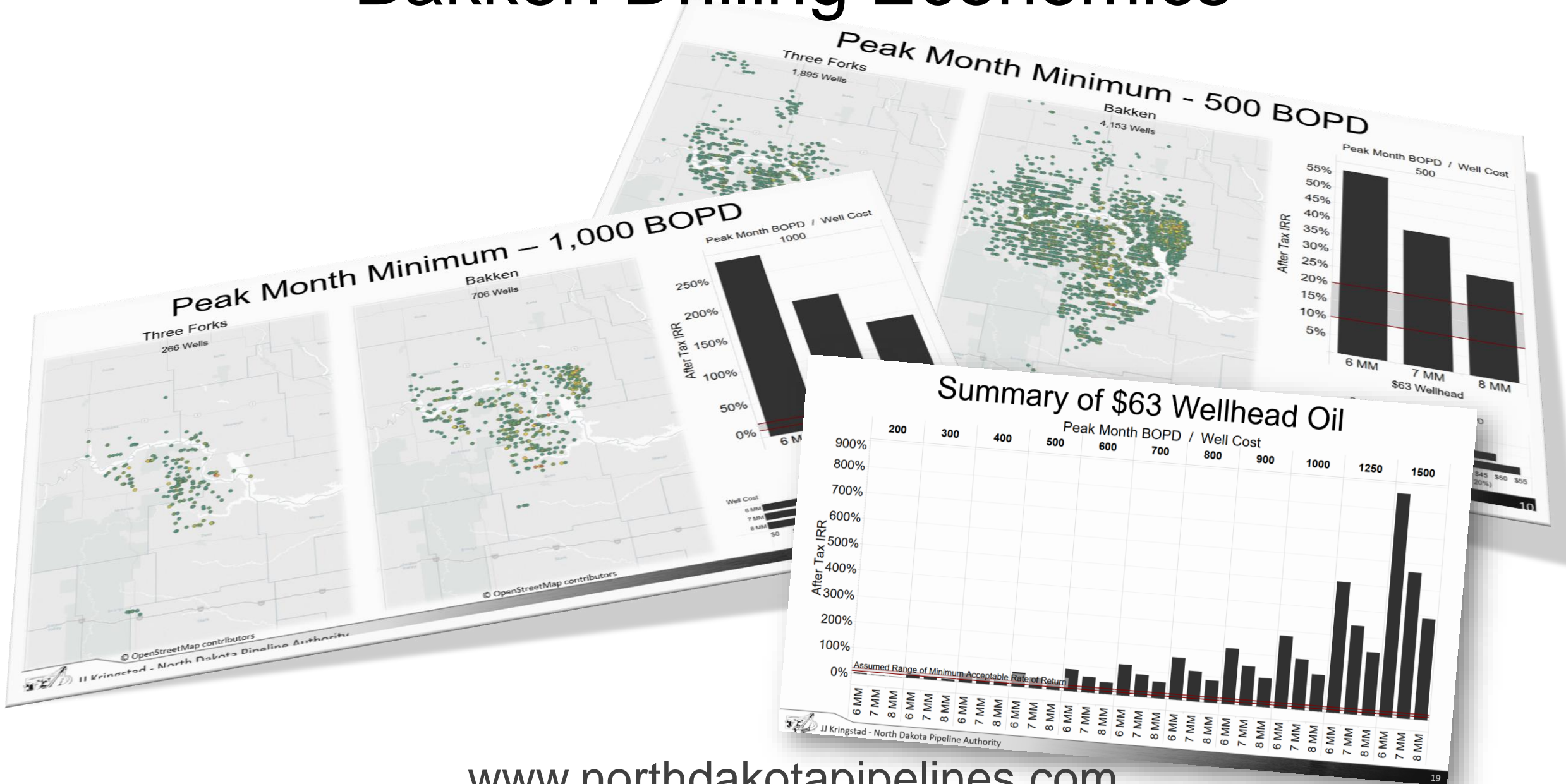
Bakken Formation



Three Forks Formation



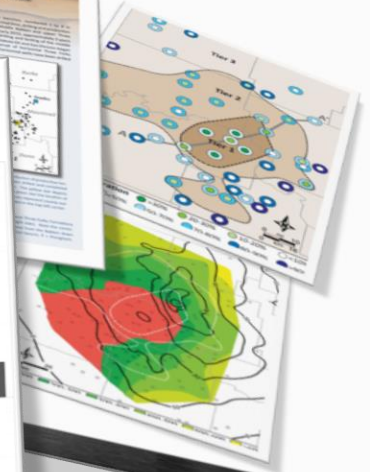
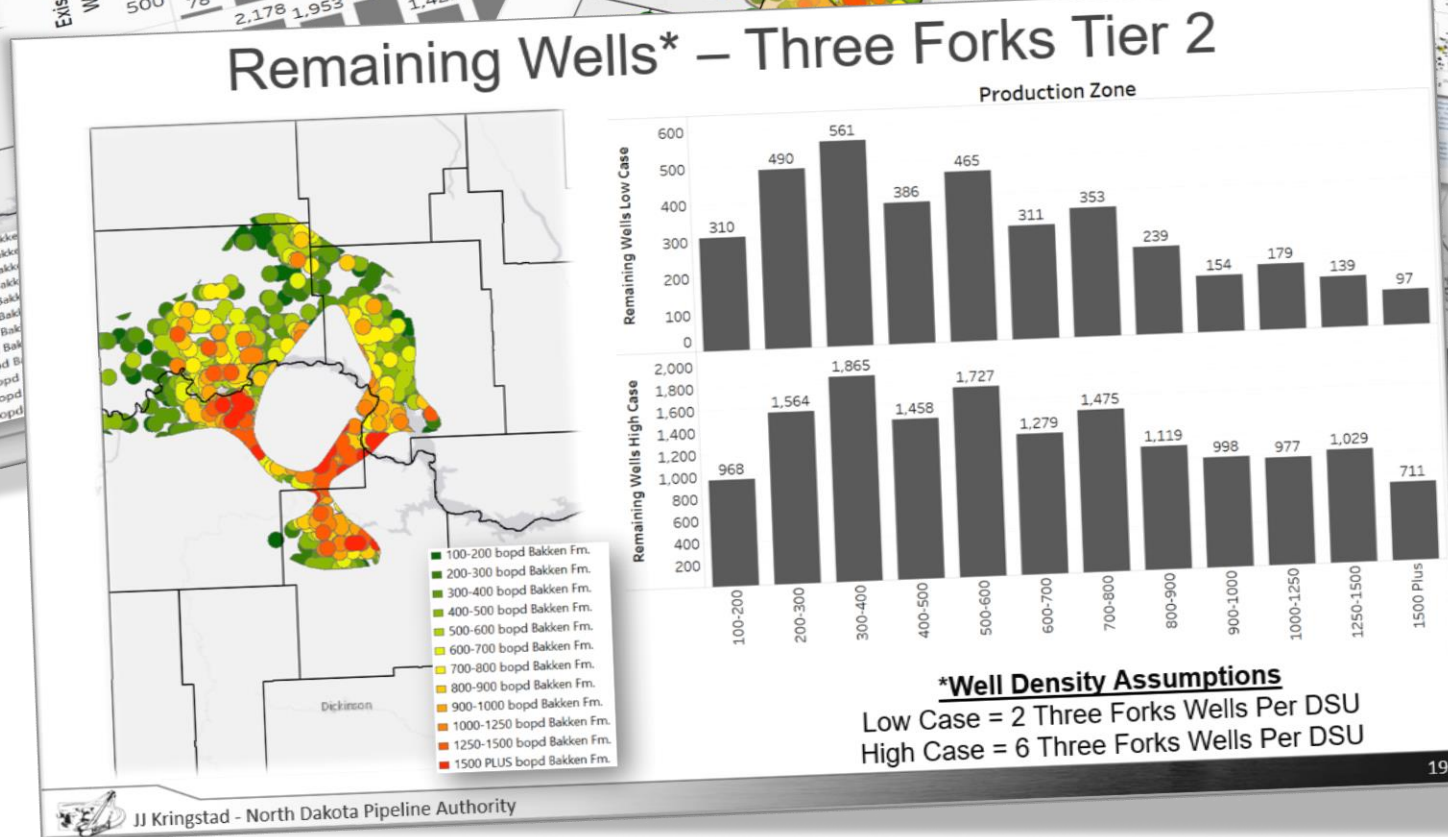
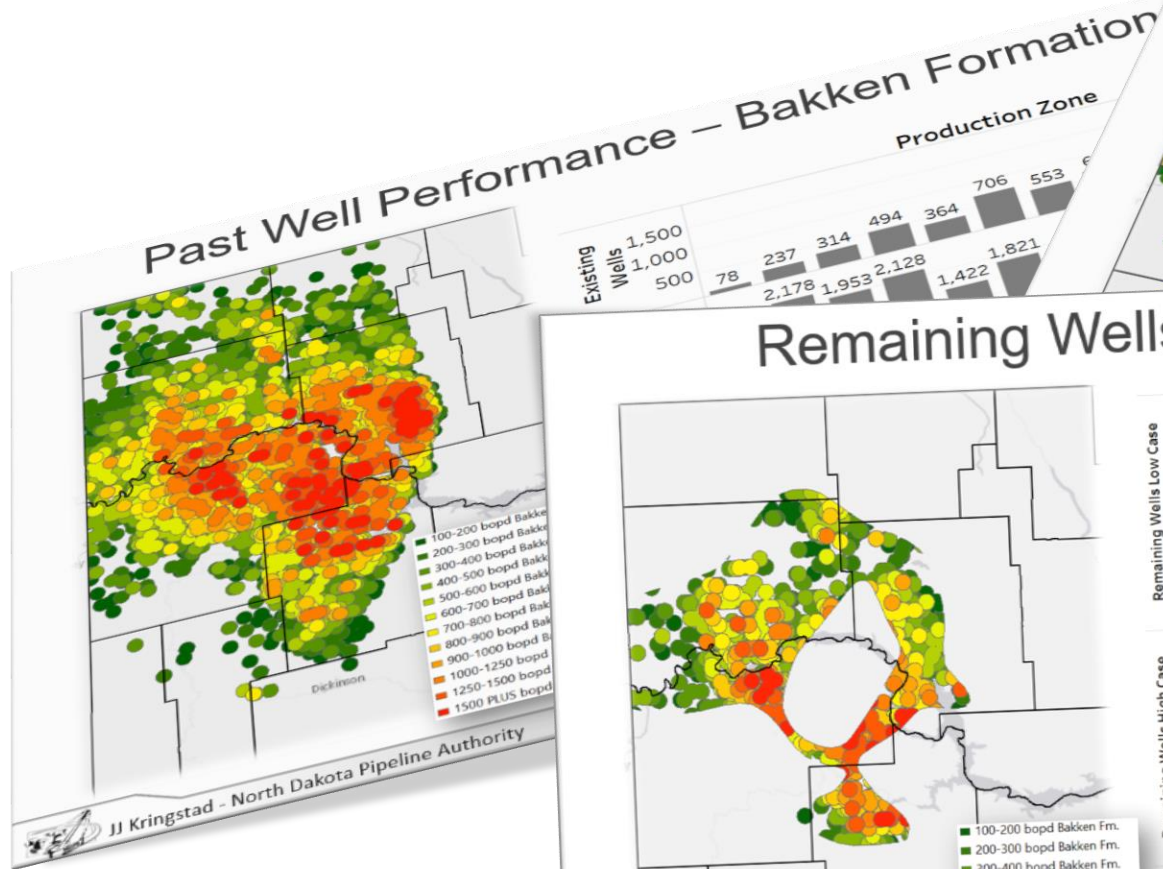
Bakken Drilling Economics



www.northdakotapipelines.com



Bakken-Three Forks Drilling Inventory Study



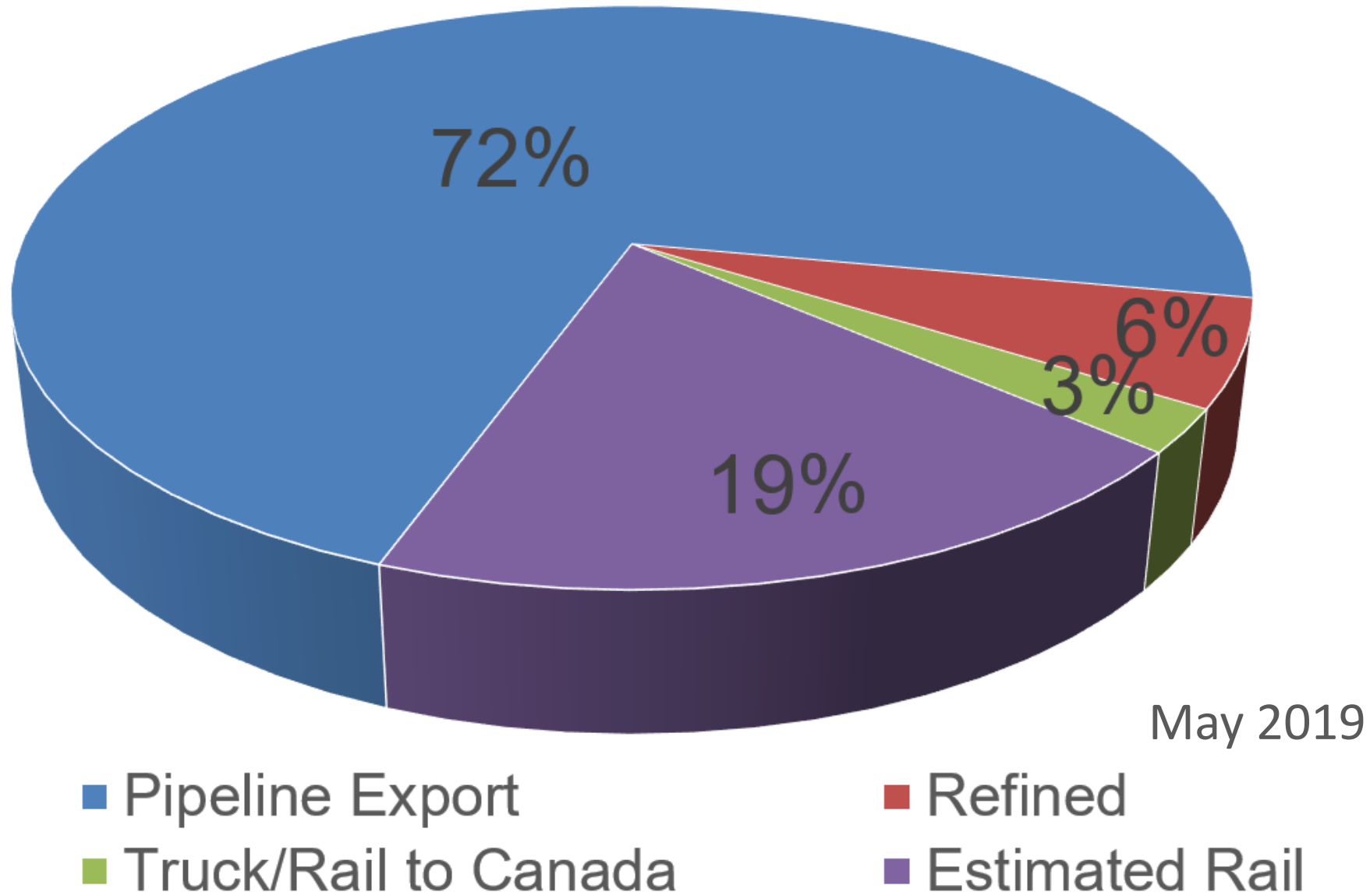
www.northdakotapipelines.com

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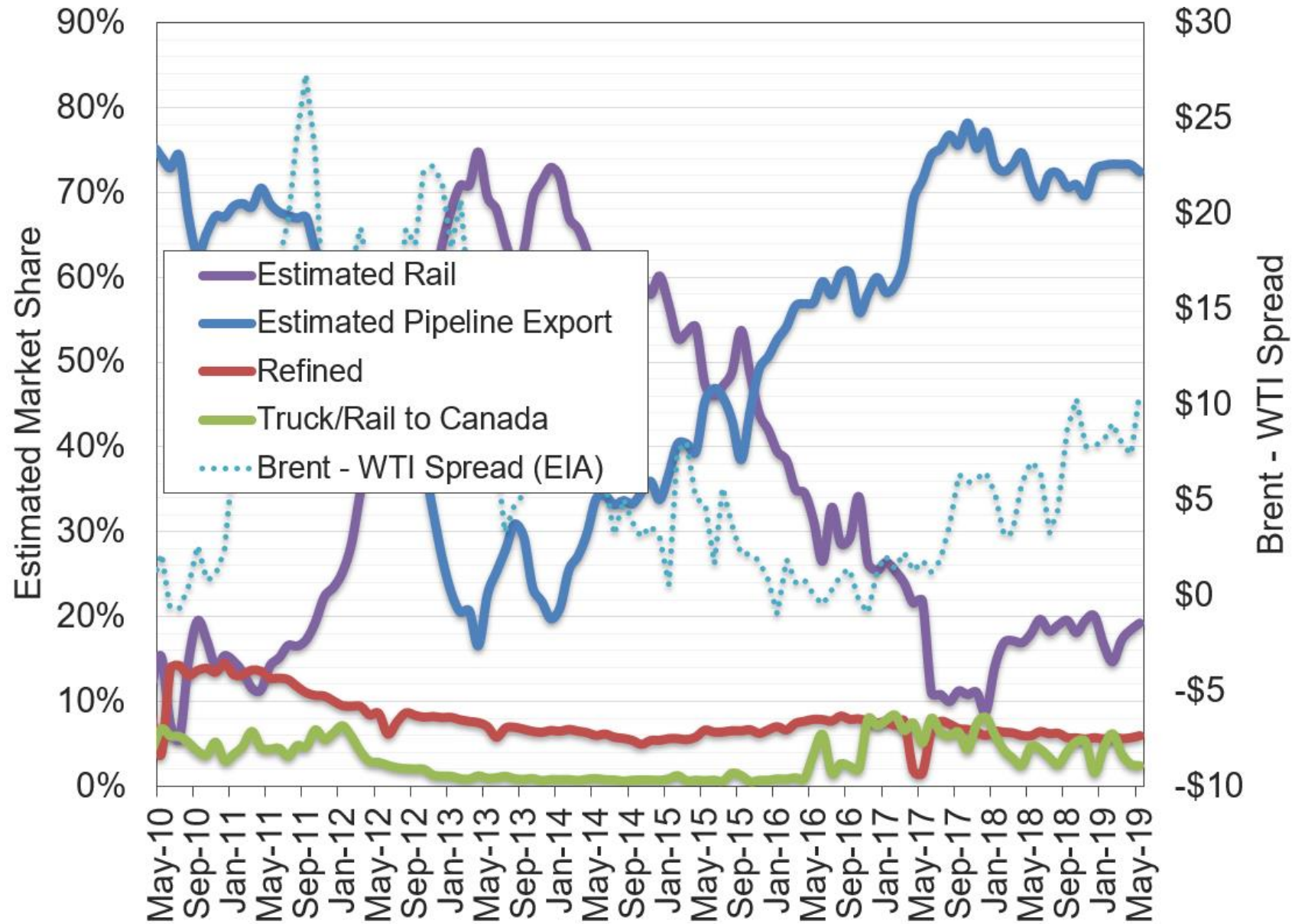
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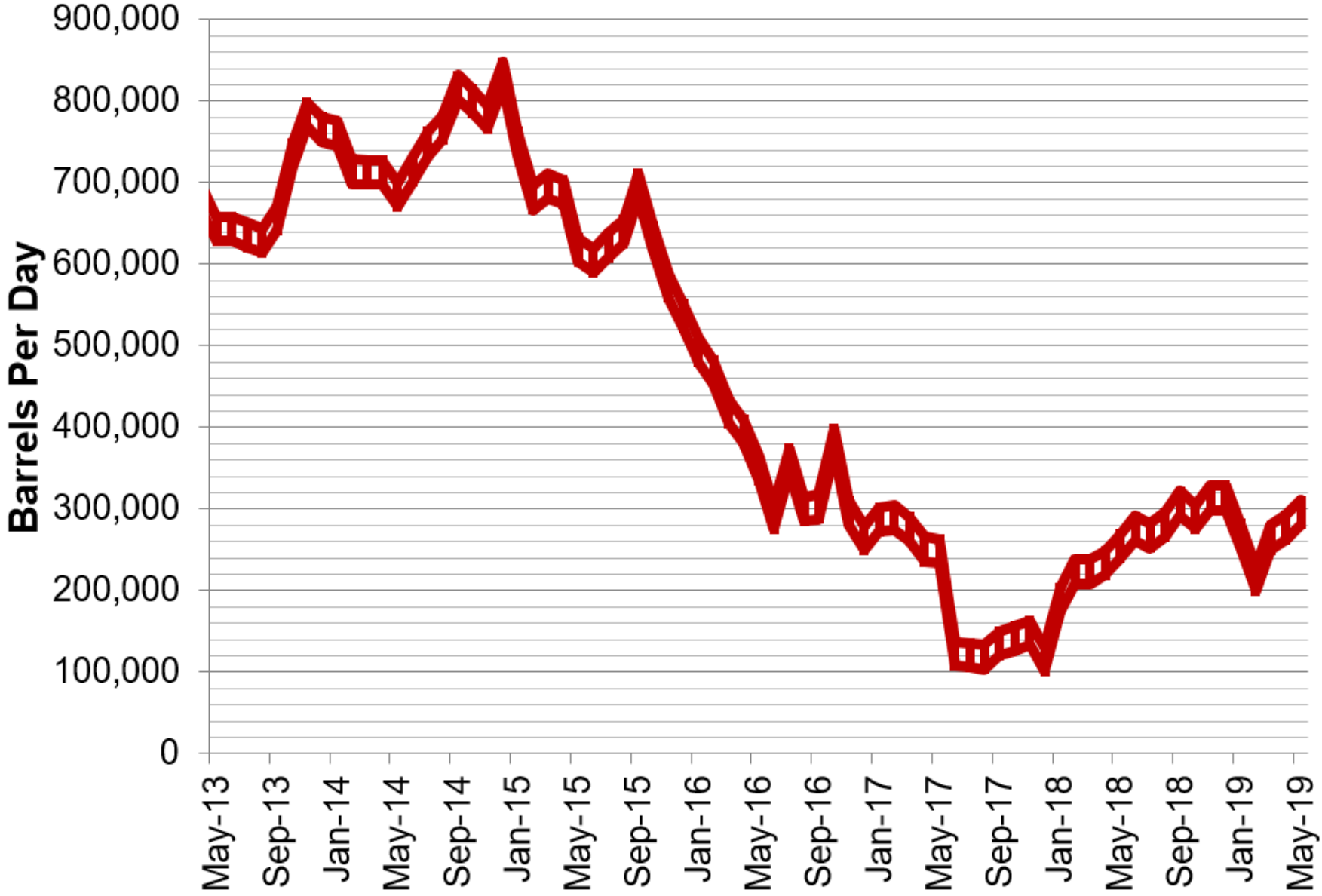
Estimated Williston Basin Oil Transportation



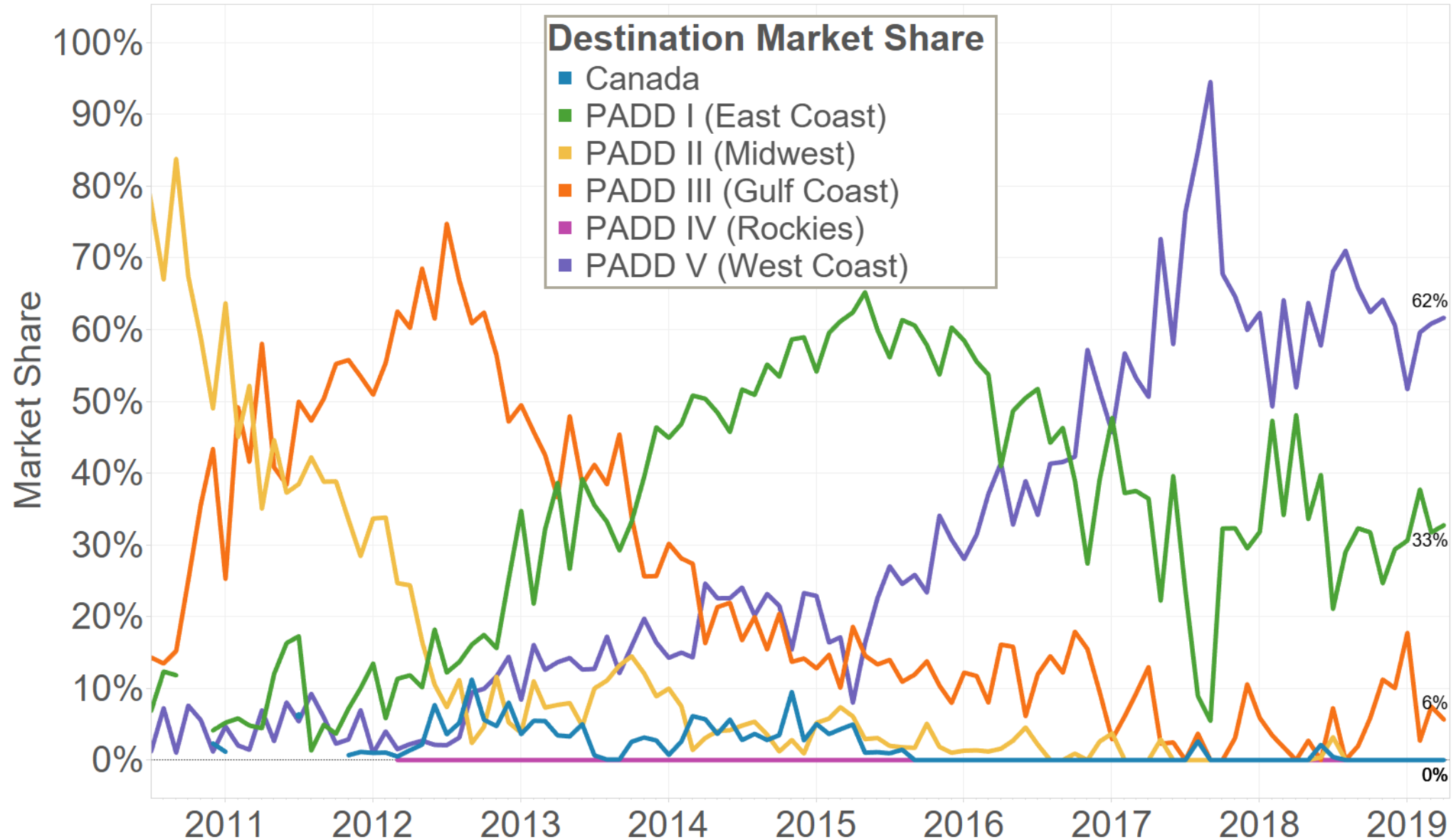
Estimated Williston Basin Oil Transportation



Estimated ND Rail Export Volumes



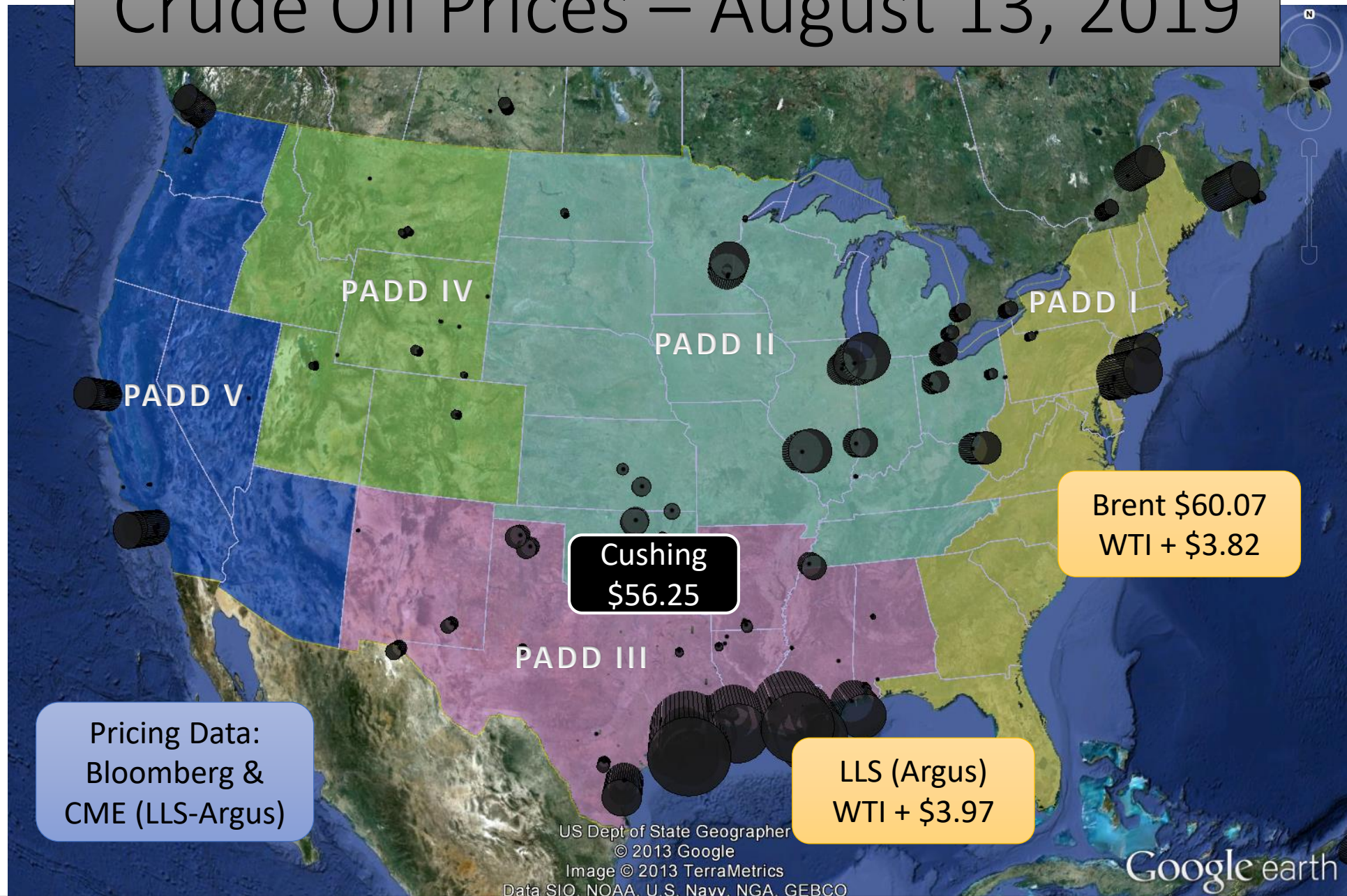
Rail Destinations Market Share (April 2019)



Data for Rail Destination Market Share Provided by the US Energy Information Administration



Crude Oil Prices – August 13, 2019

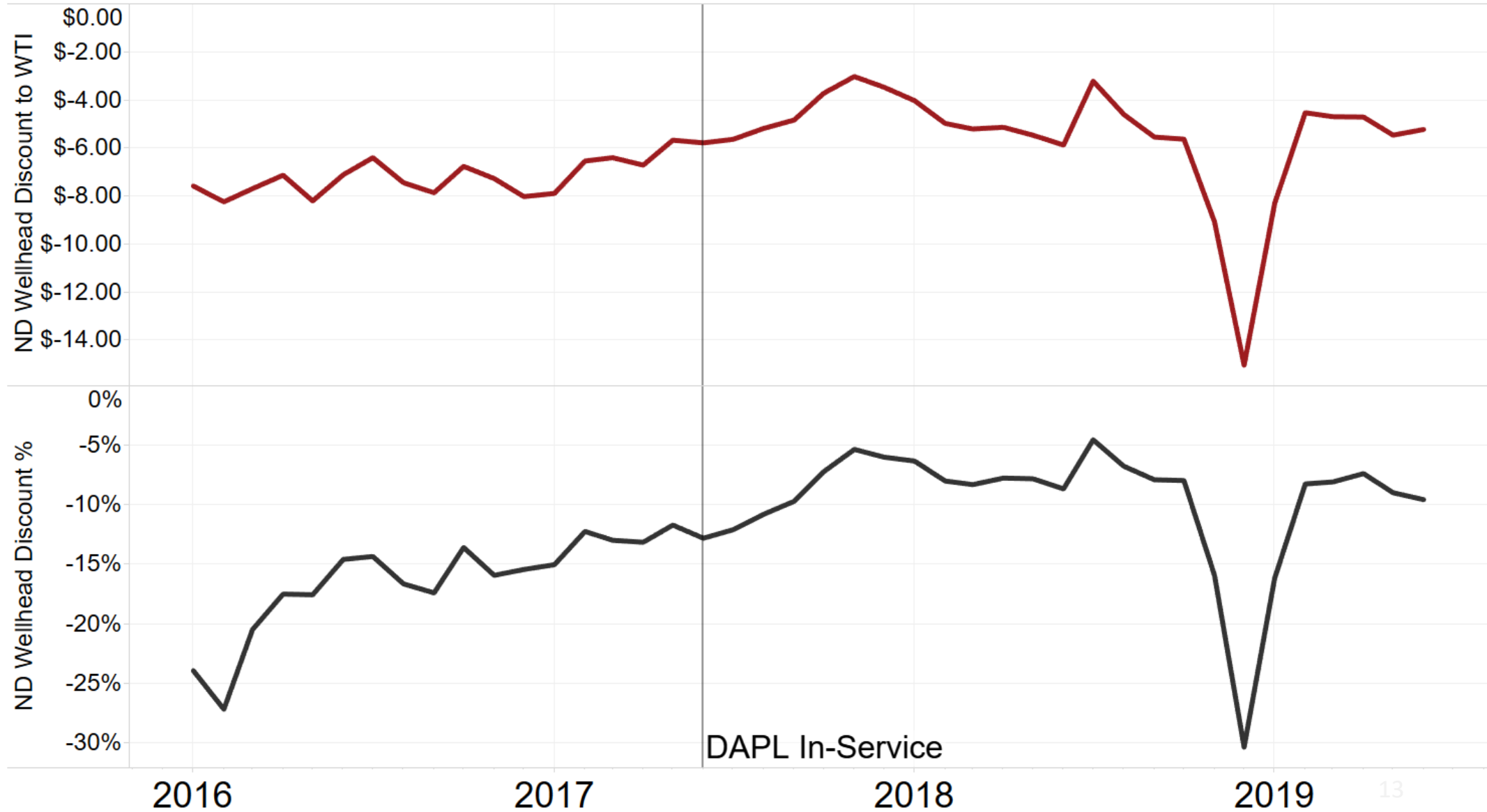


Presentation Outline

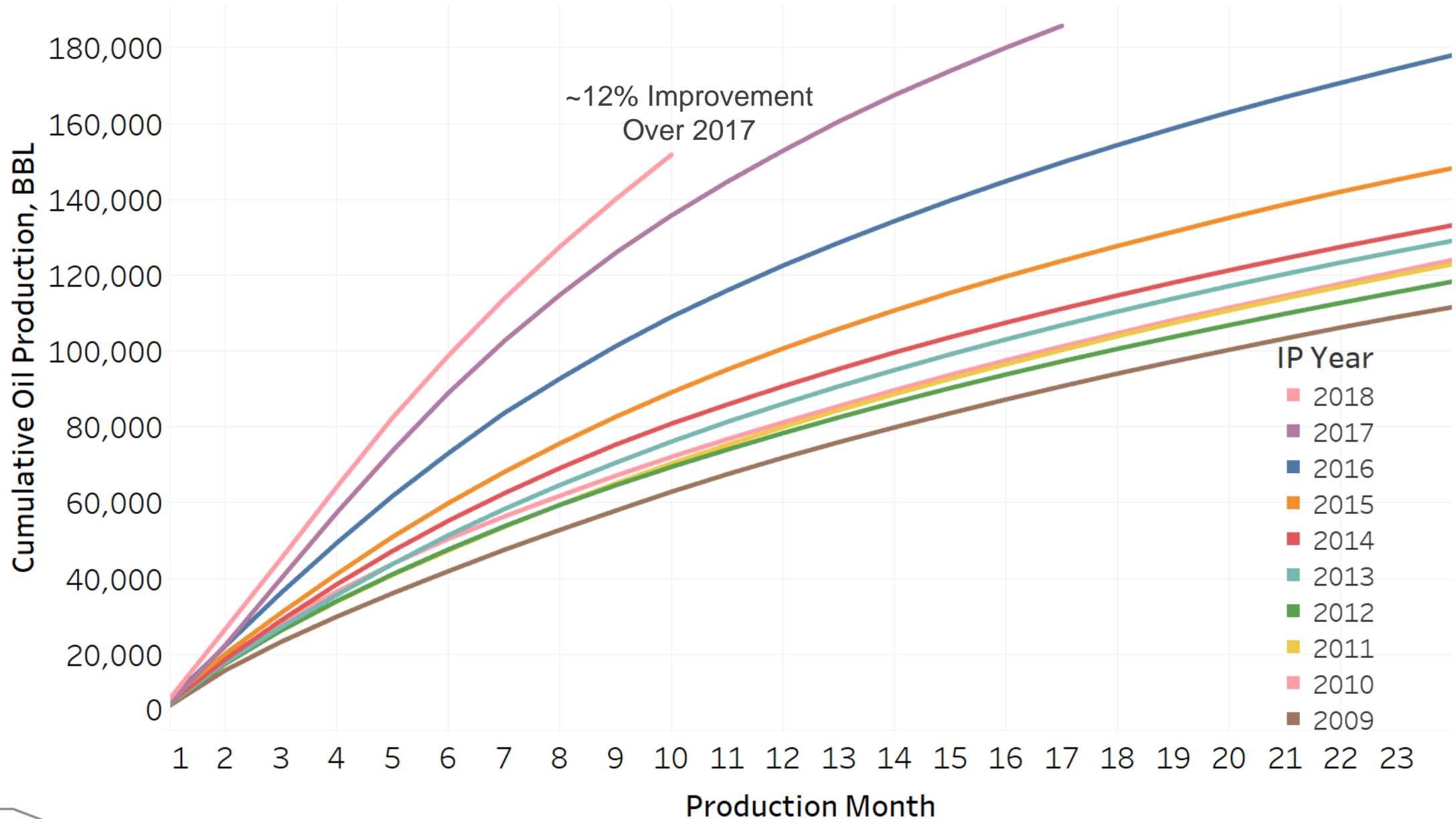
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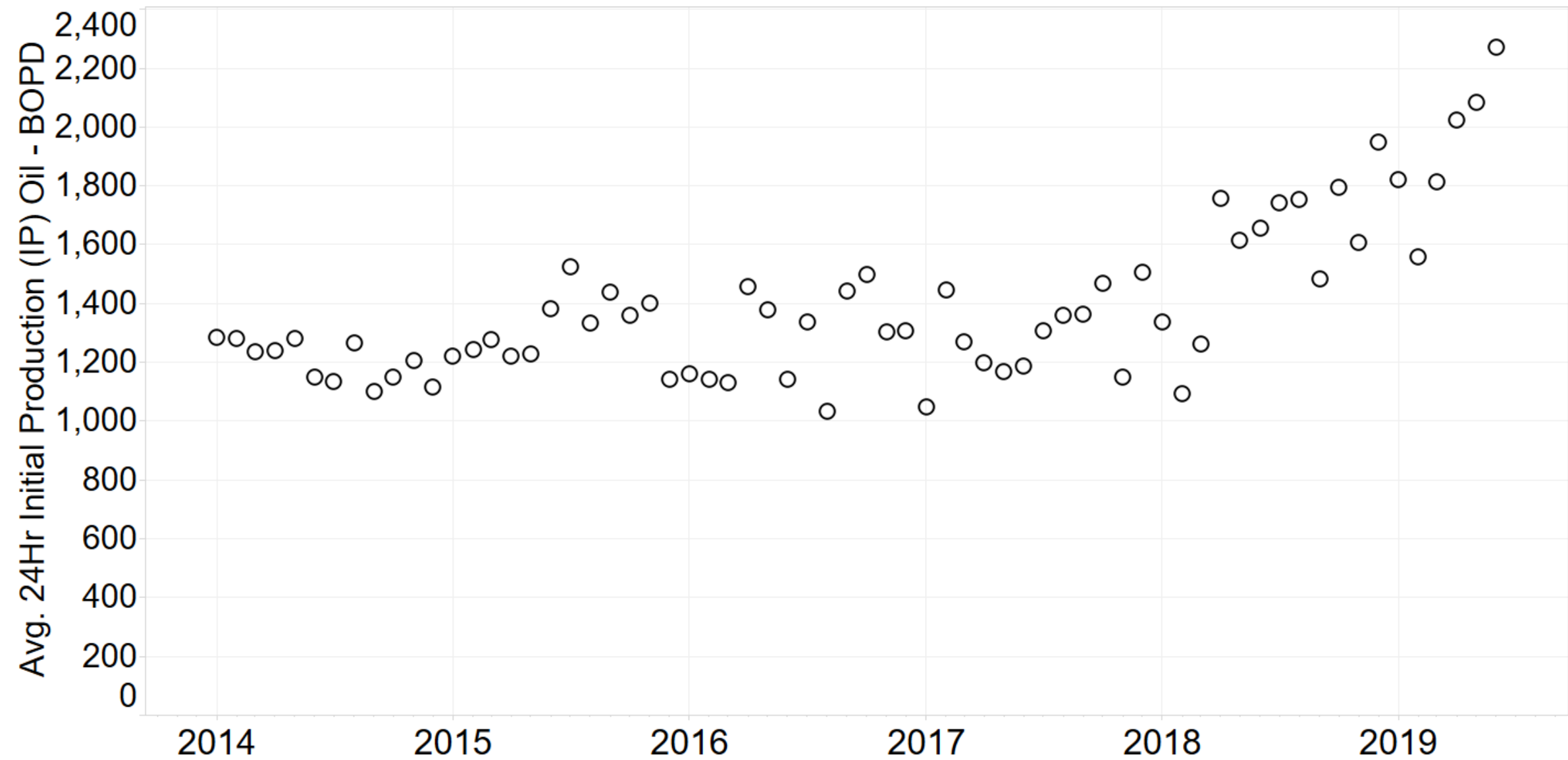
North Dakota Oil Differential to WTI



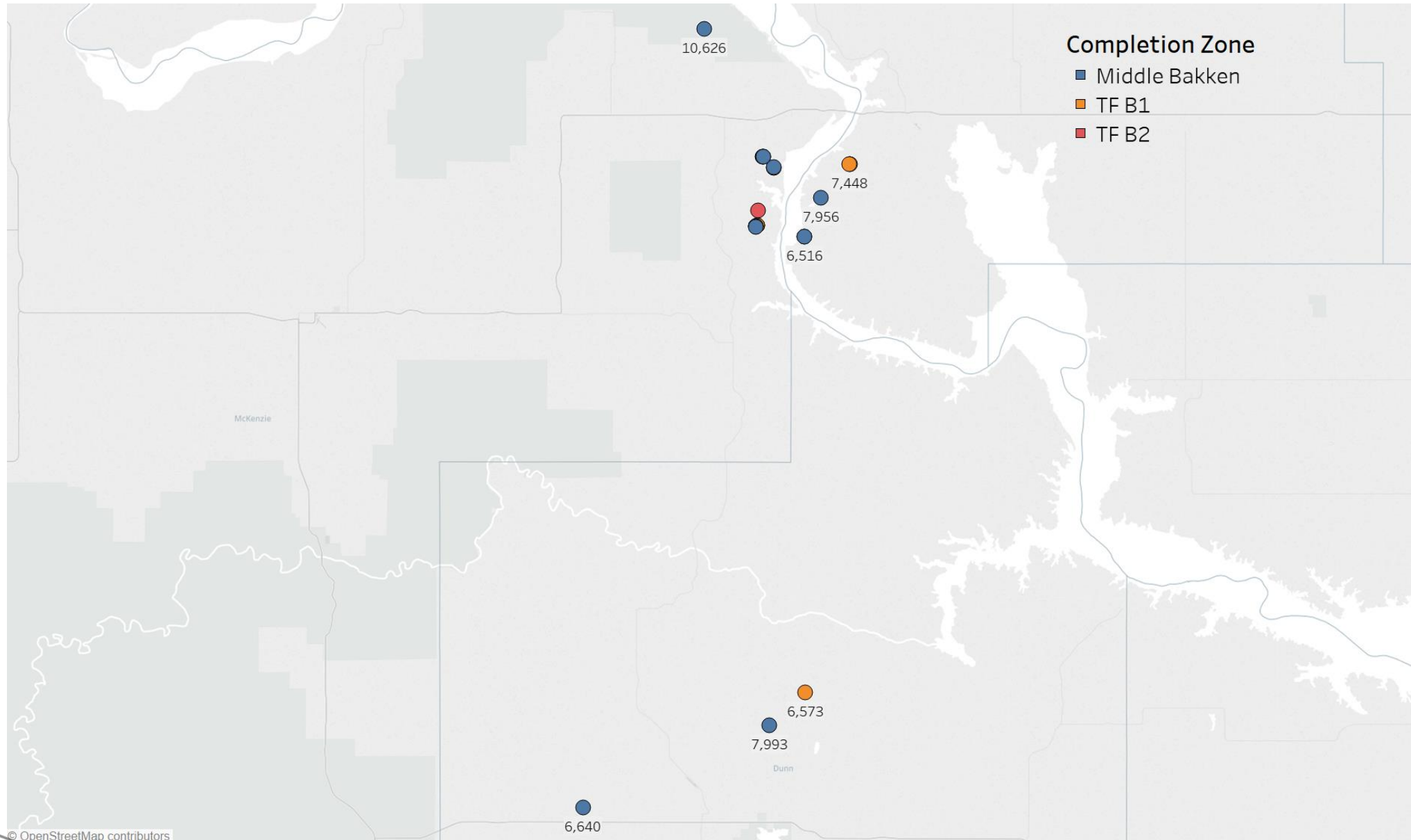
Statewide Oil Performance



Statewide Initial Oil Production Rates – 24hr



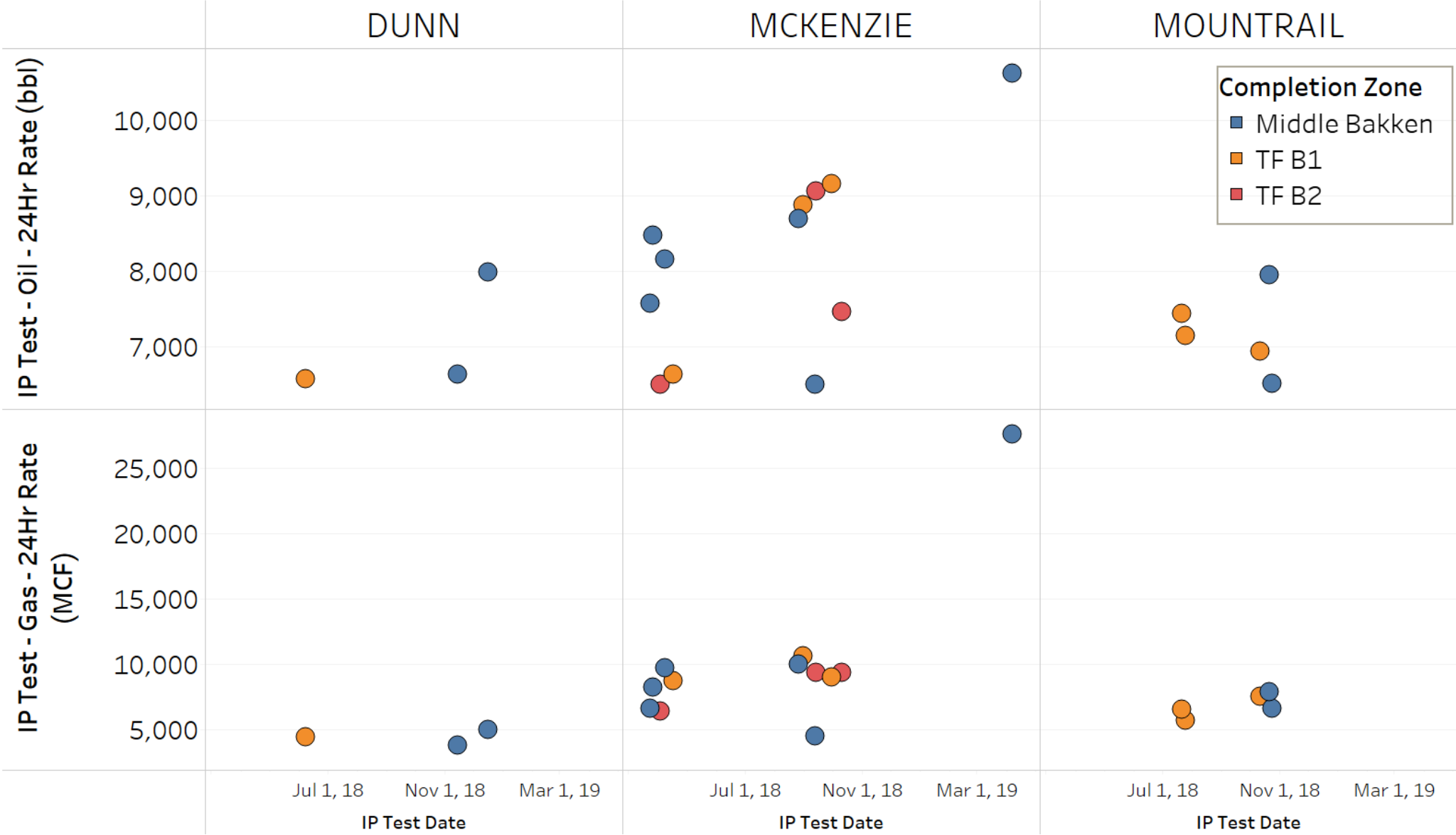
Top 20 IP Rates (Oil)



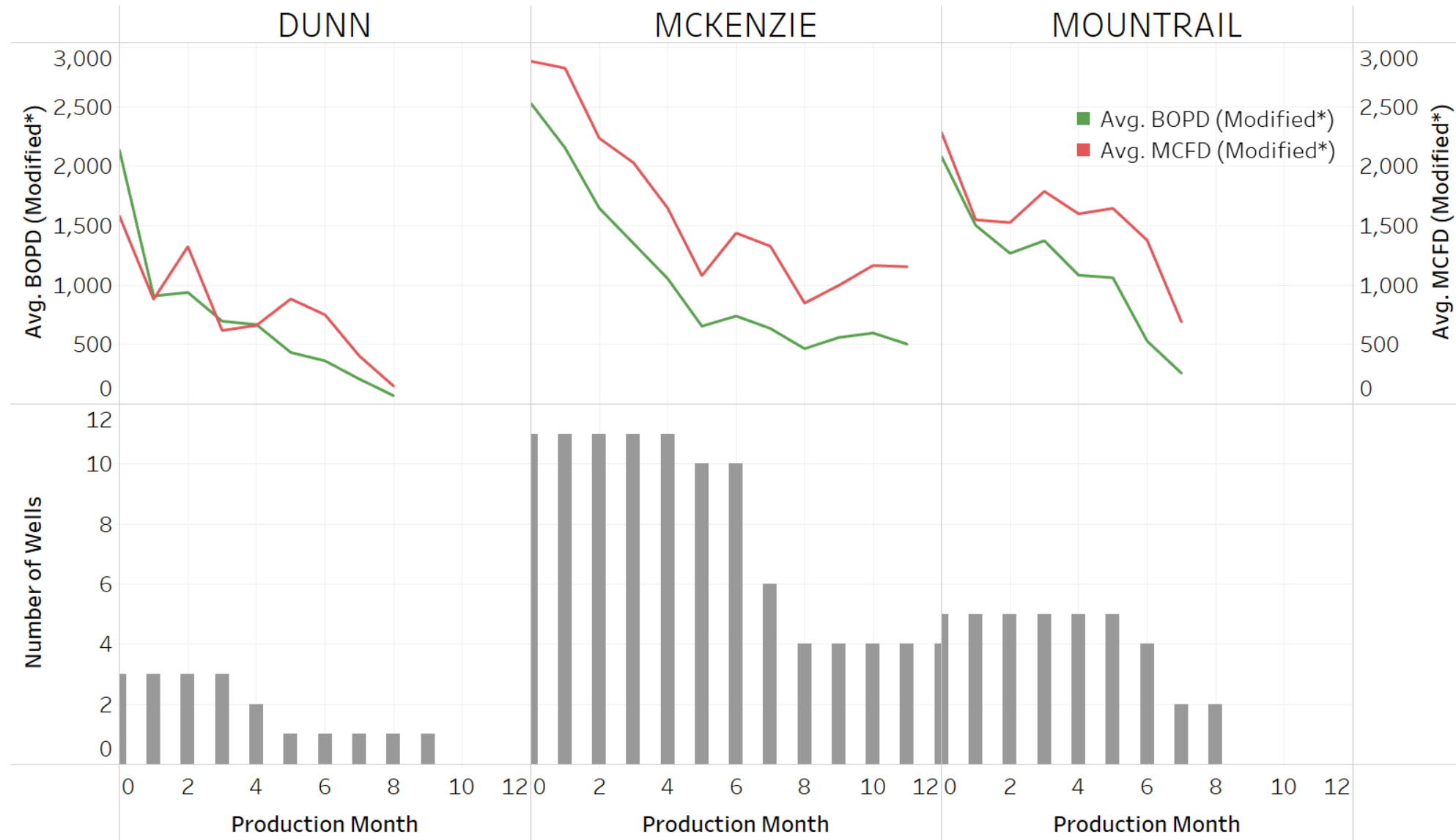
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Top 20 Oil IP Rates & Associated Gas IP



Top 20 IP Rates (Oil)

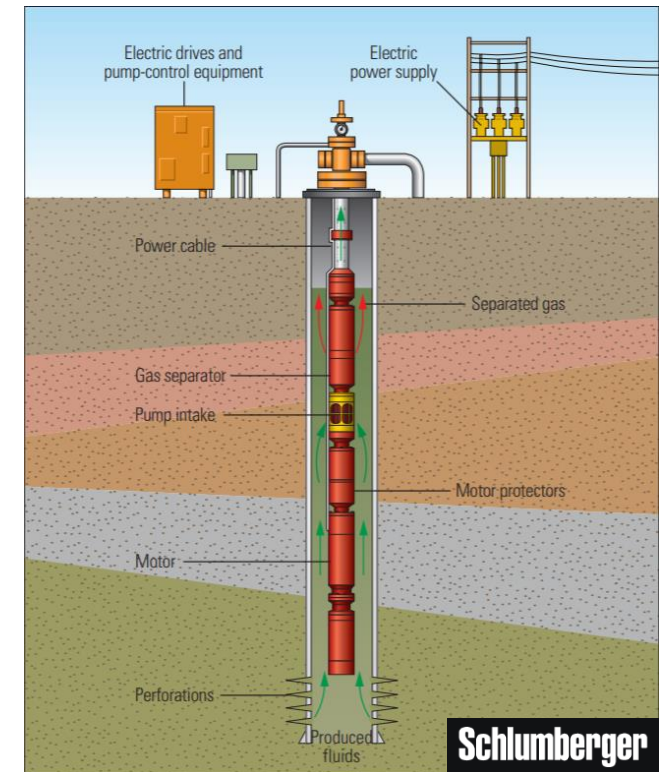


*Month "0" is a partial month with daily production calculated using "Days on production". Months 1+ use calendar days to calculate daily rate.



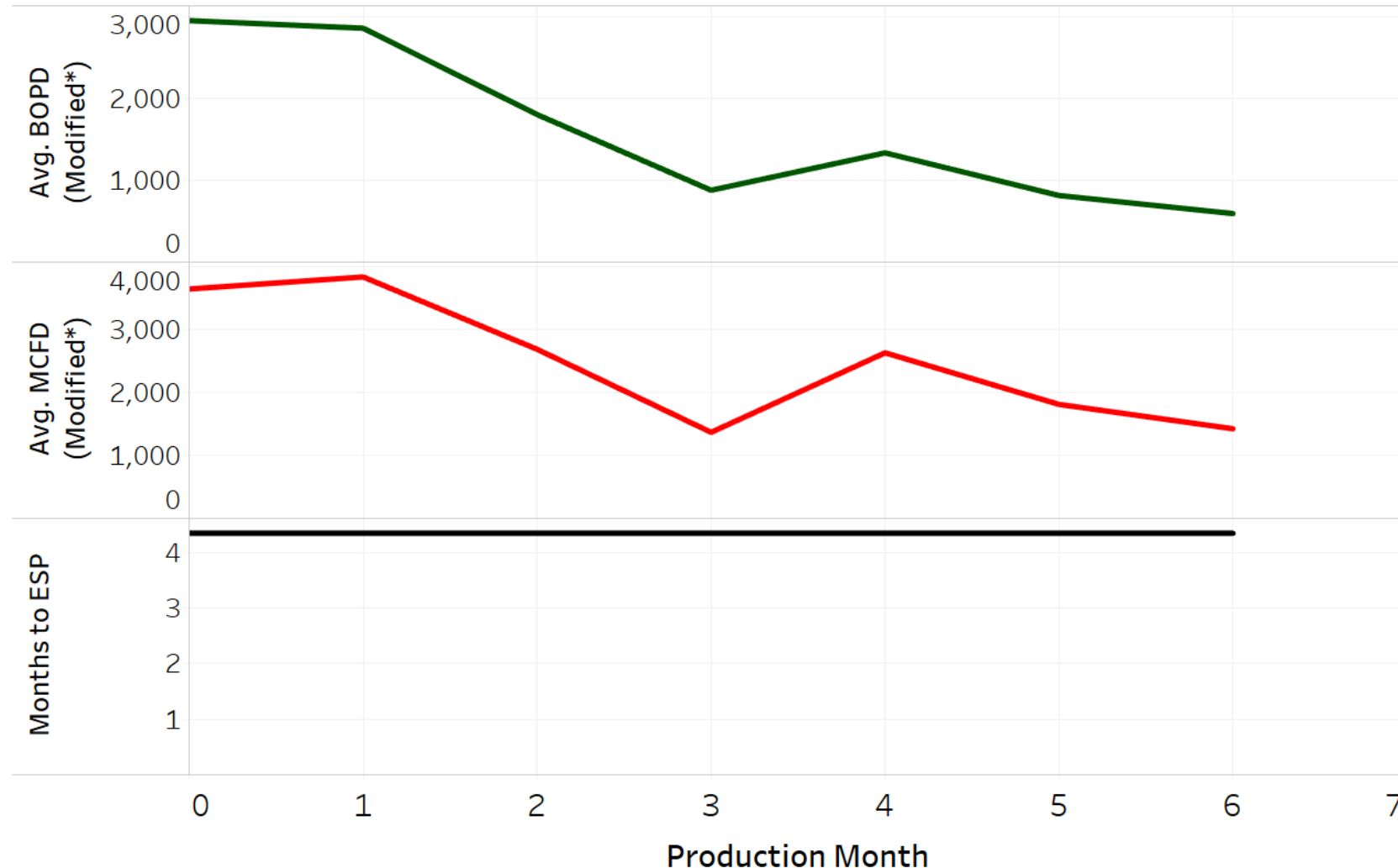
Top 20 IP Rates (Oil)

Electrical Submersible Pump (ESP) Timeline



Impact of ESP on Production Profiles

Well: SIBYL USA 44-19TFH (Mountrail County)



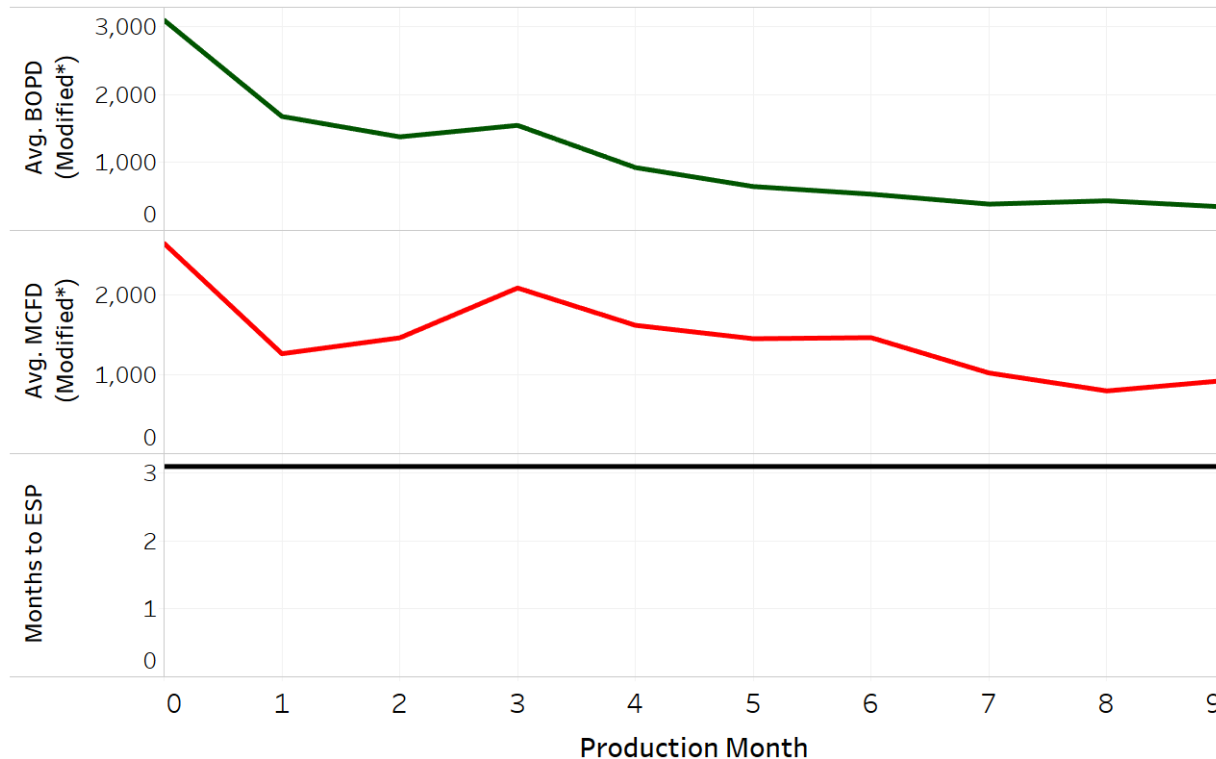
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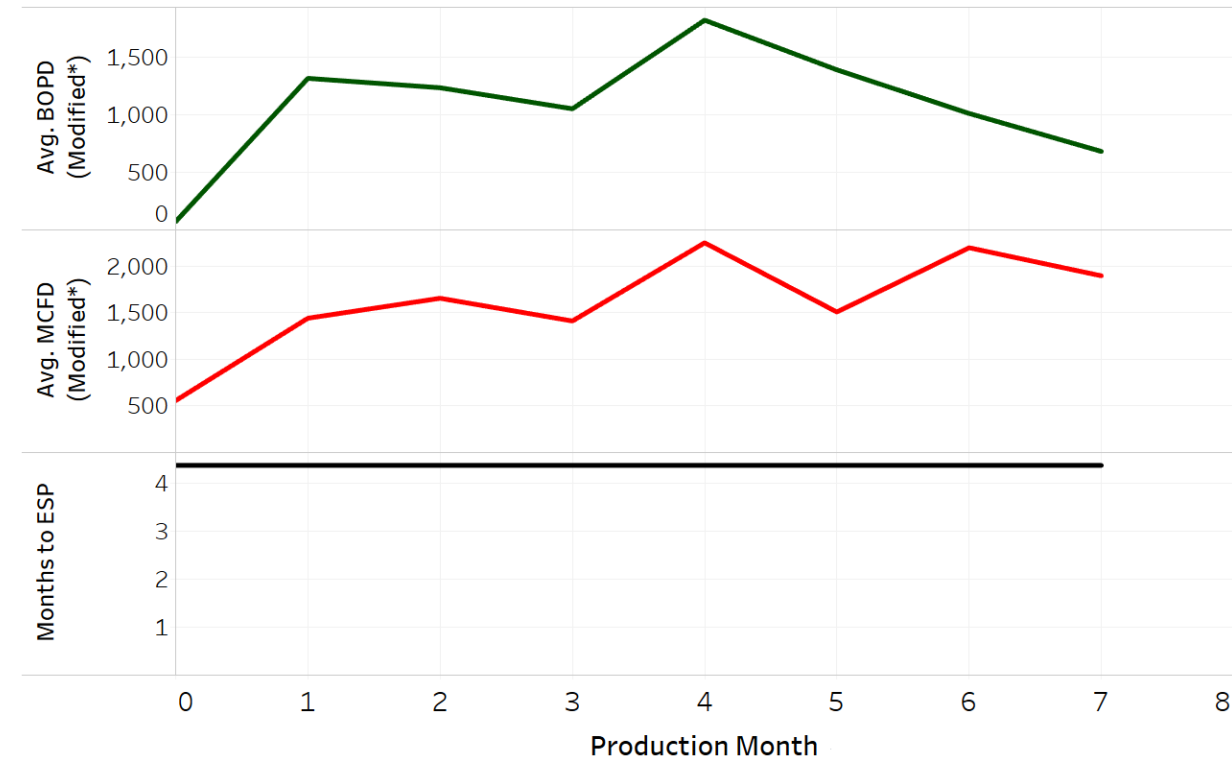
Impact of ESP on Production Profiles

Additional Examples

Well File: 32012



Well File: 33942

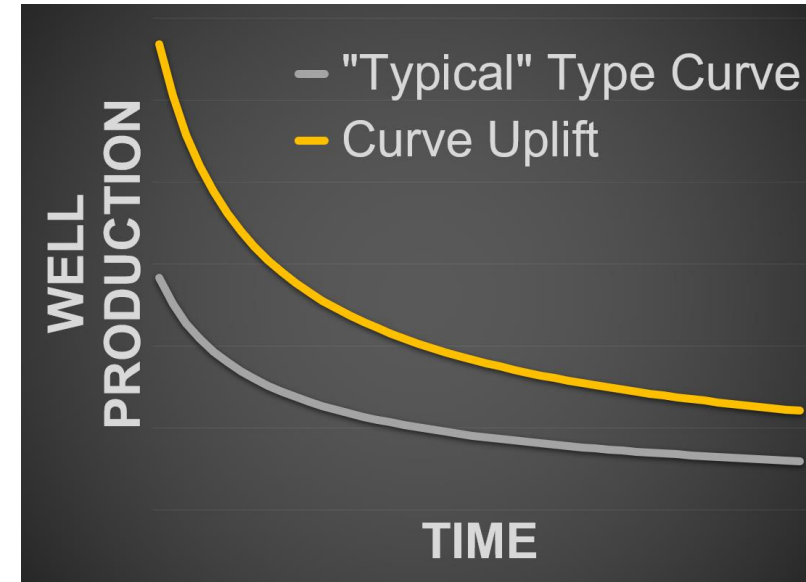
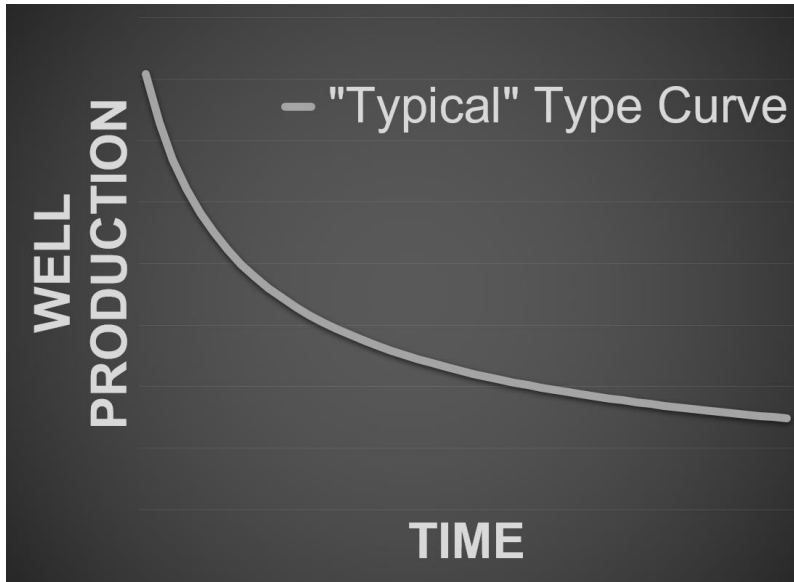


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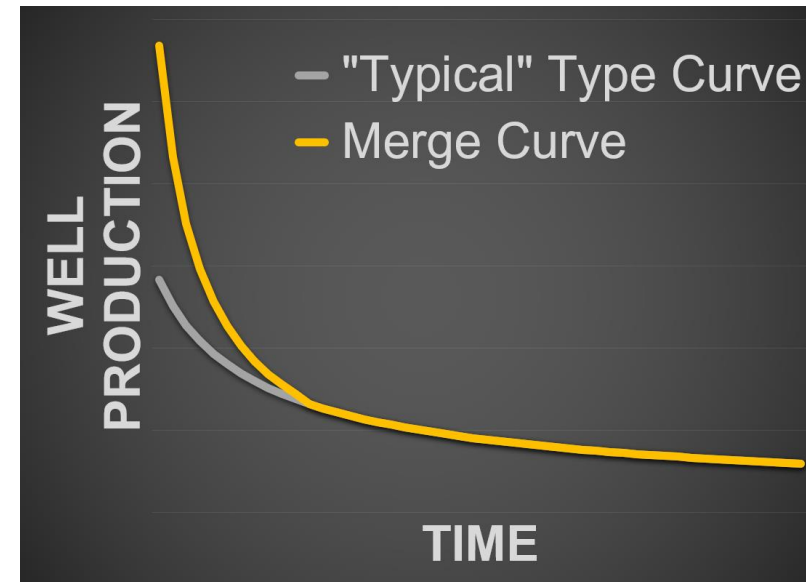
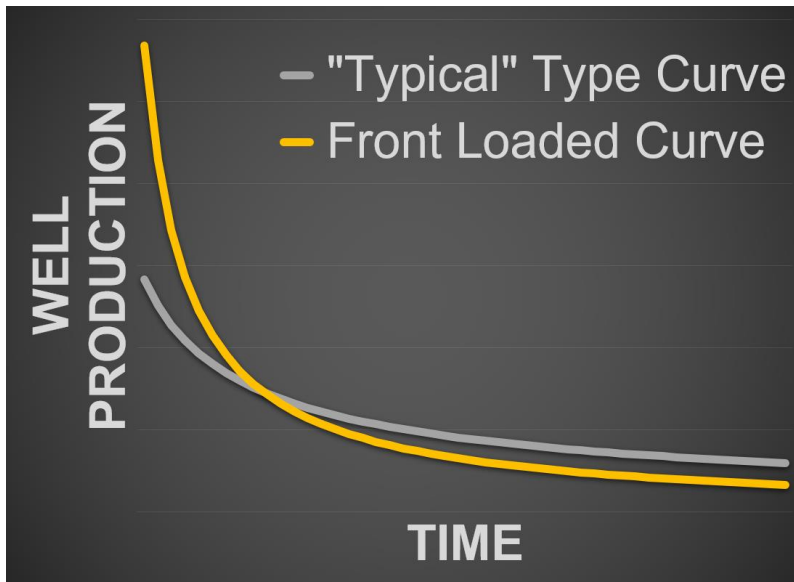
High Initial Production (IP) Scenarios

"Typical" type curve used as a comparison example for how high IP wells may perform over time.



In this example, the entire production curve over time is uplifted relative to a "typical" well. Well economics and EUR are both improved.

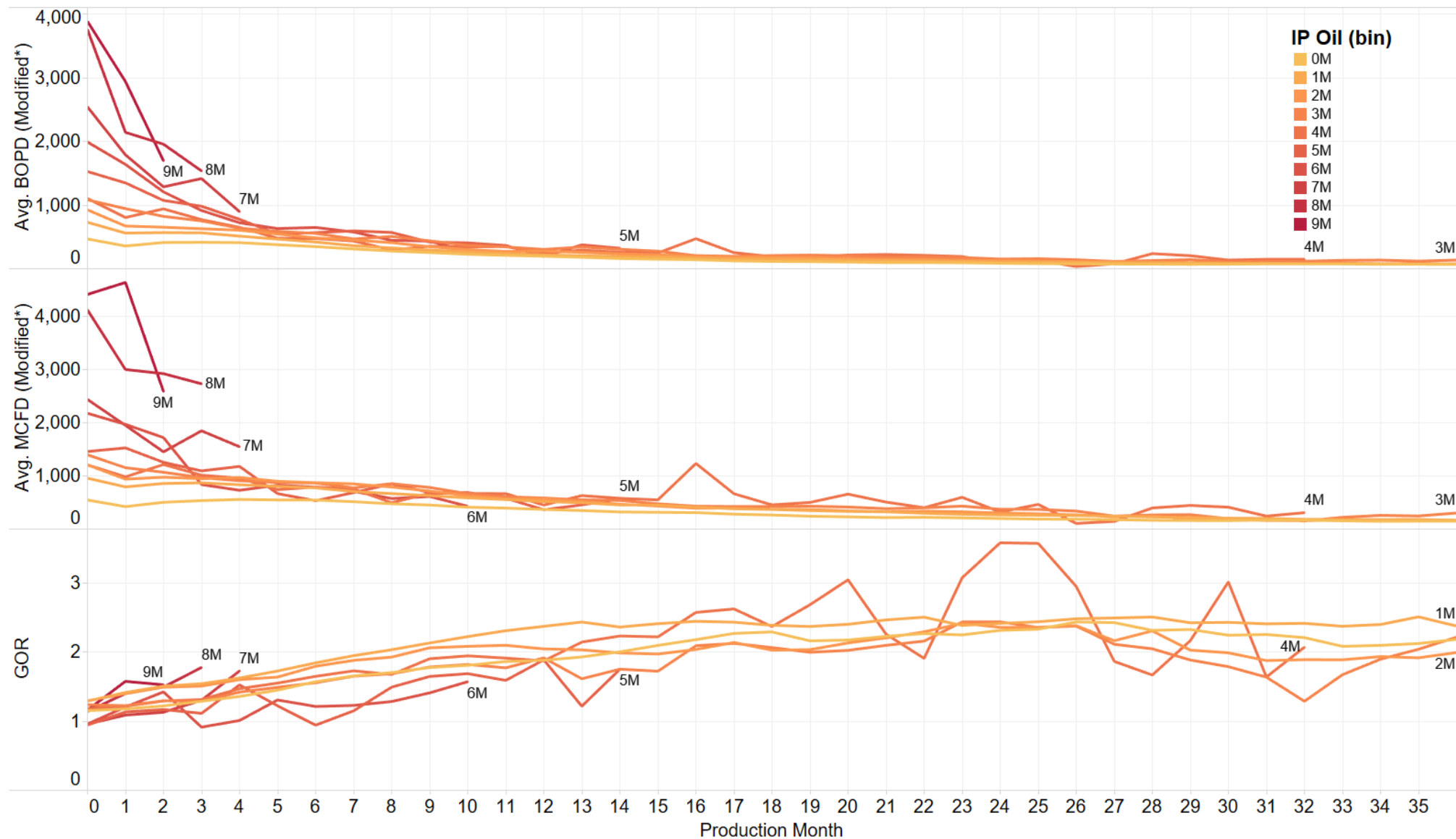
In this example, only the early life of the well is higher relative to a "typical" well. Early well economics improve, but uncertainty exists if EUR will improve or suffer with the high IP rate.



In this example, the early life of the well is higher relative to a "typical" well. Early well economics improve along with an incremental EUR improvement.



Oil/Gas IP Bin Comparison

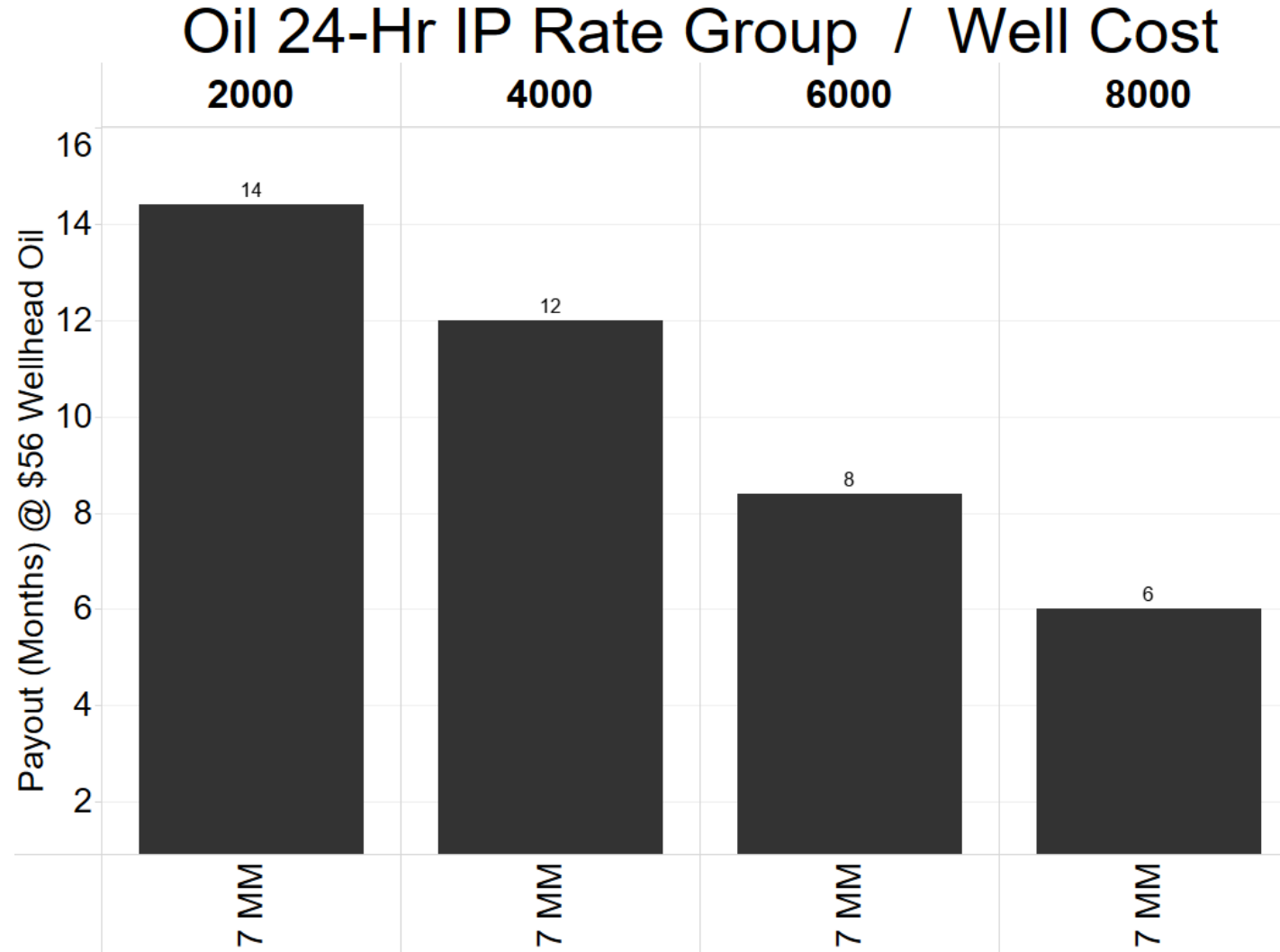


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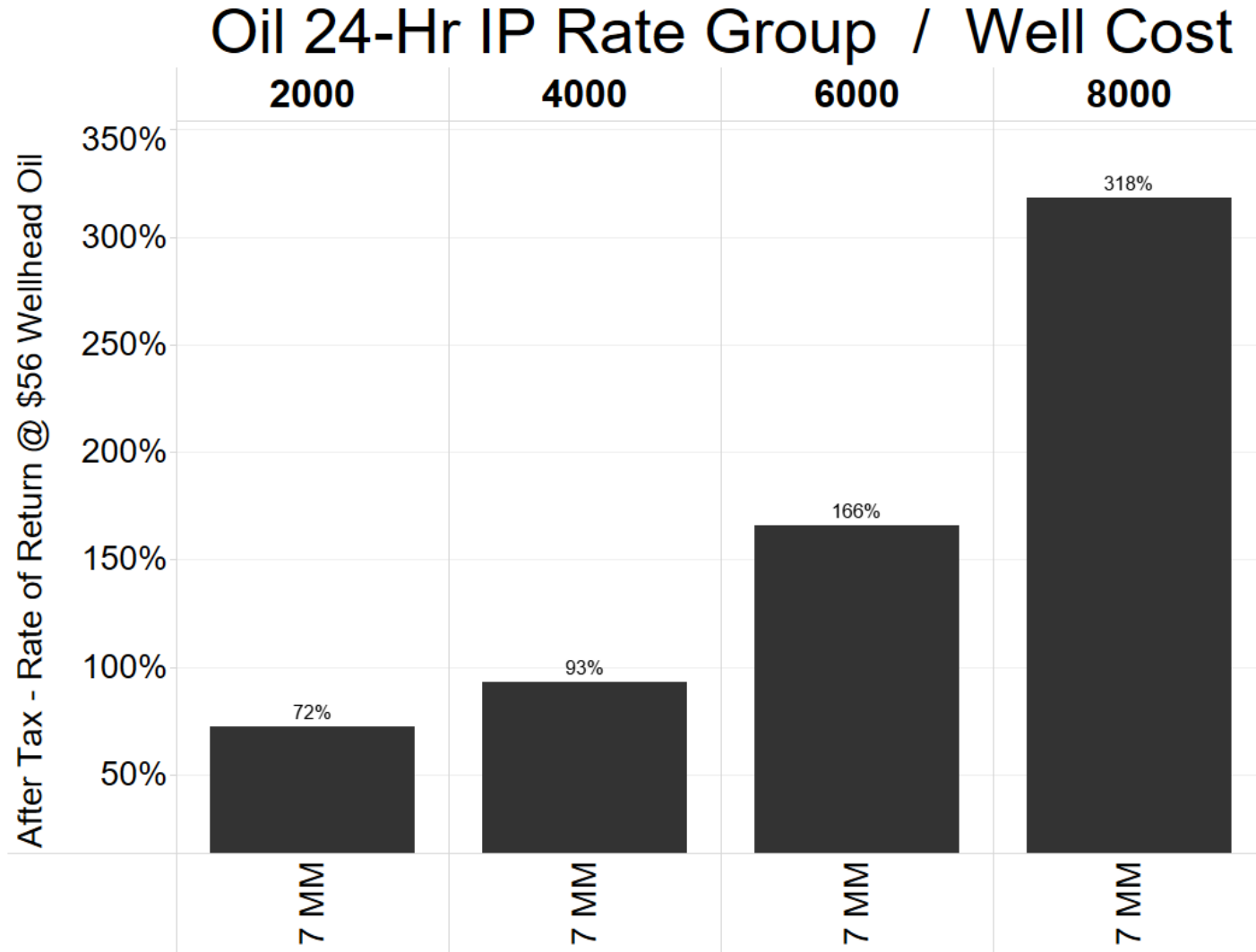
Economic Incentive to Higher IP Rates

Example: Payout Period Using \$7 million well cost

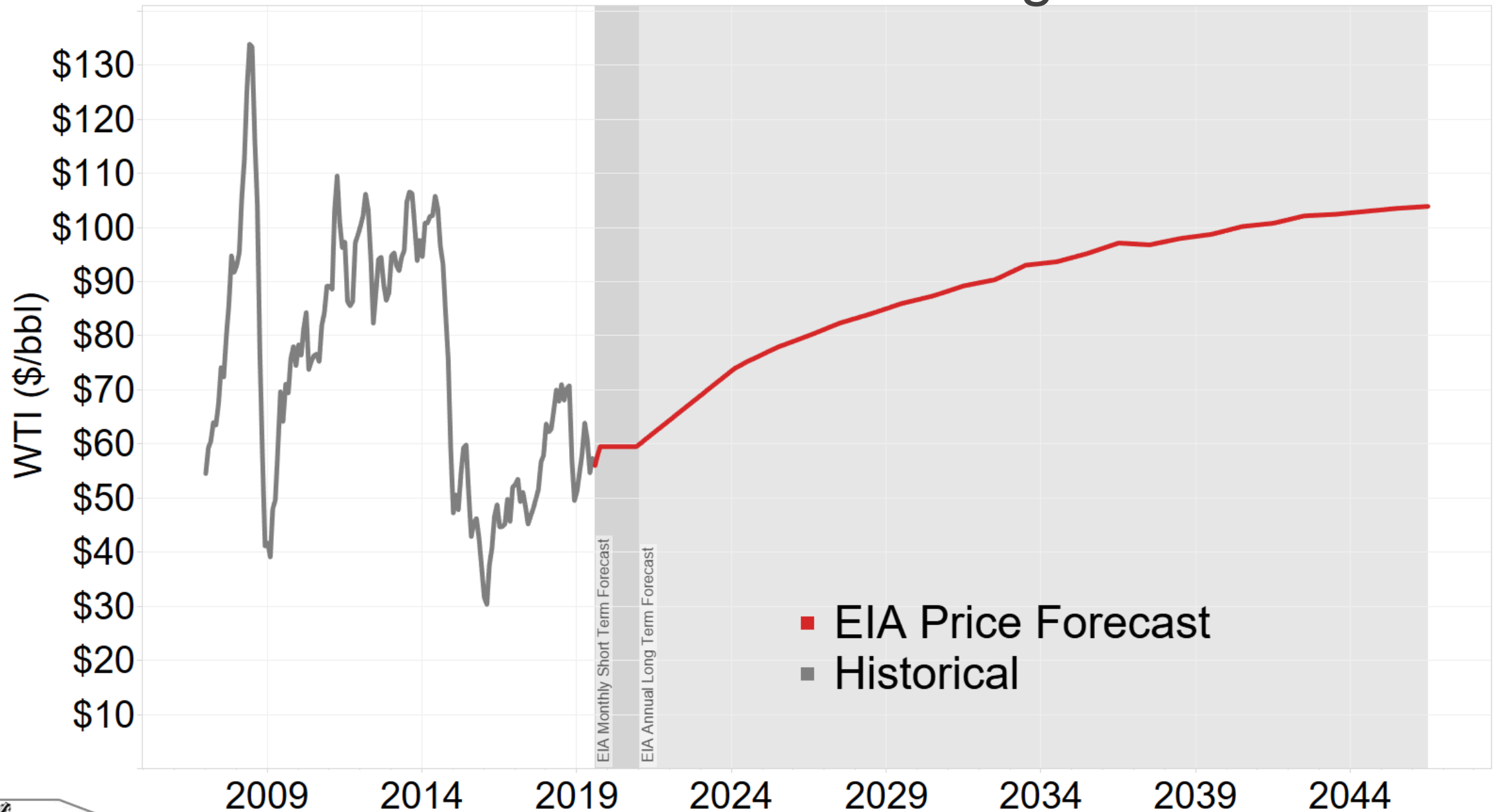


Economic Incentive to Higher IP Rates

Example: Rate of Return Using \$7 million well cost

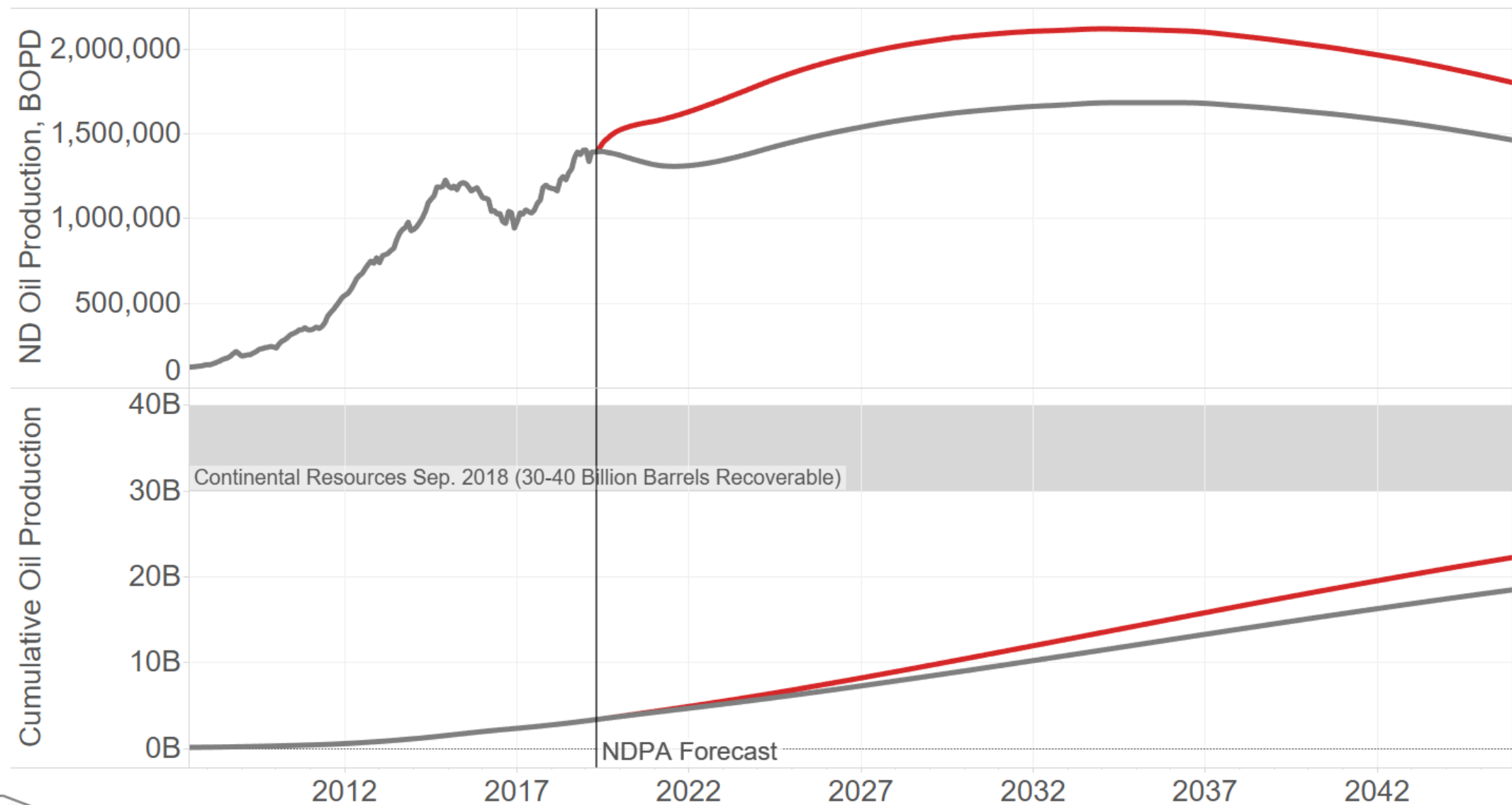


EIA Forecasted Oil Price – August 2019

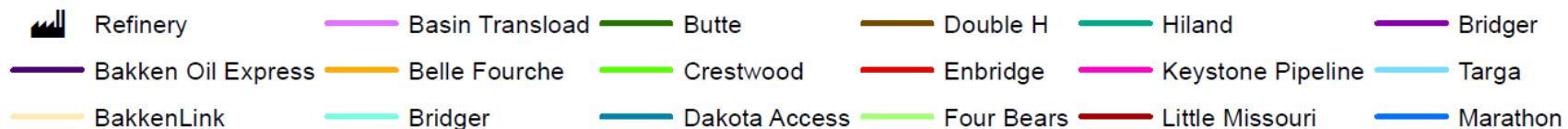
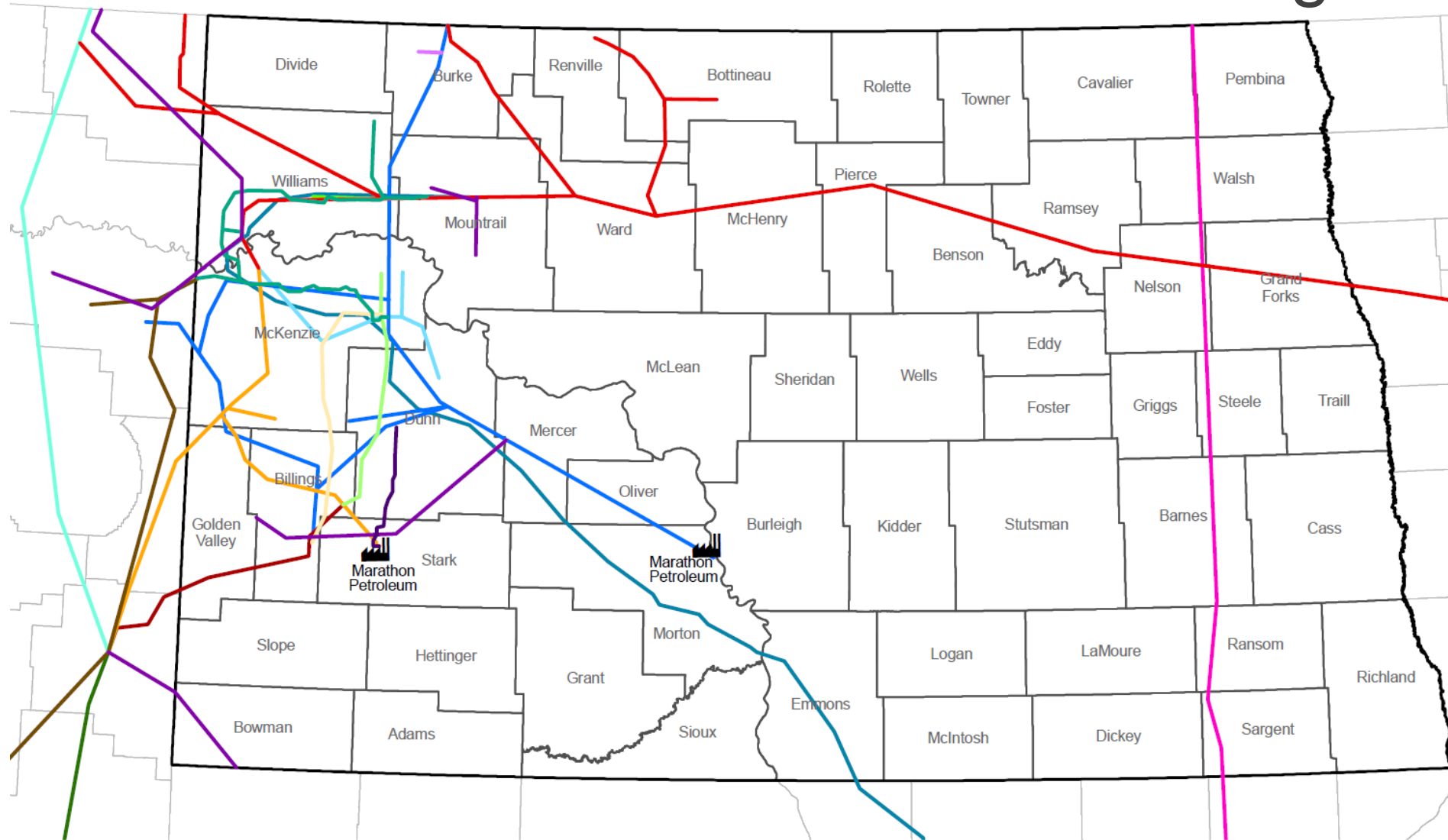


North Dakota Oil Production Forecast – Aug. 2019

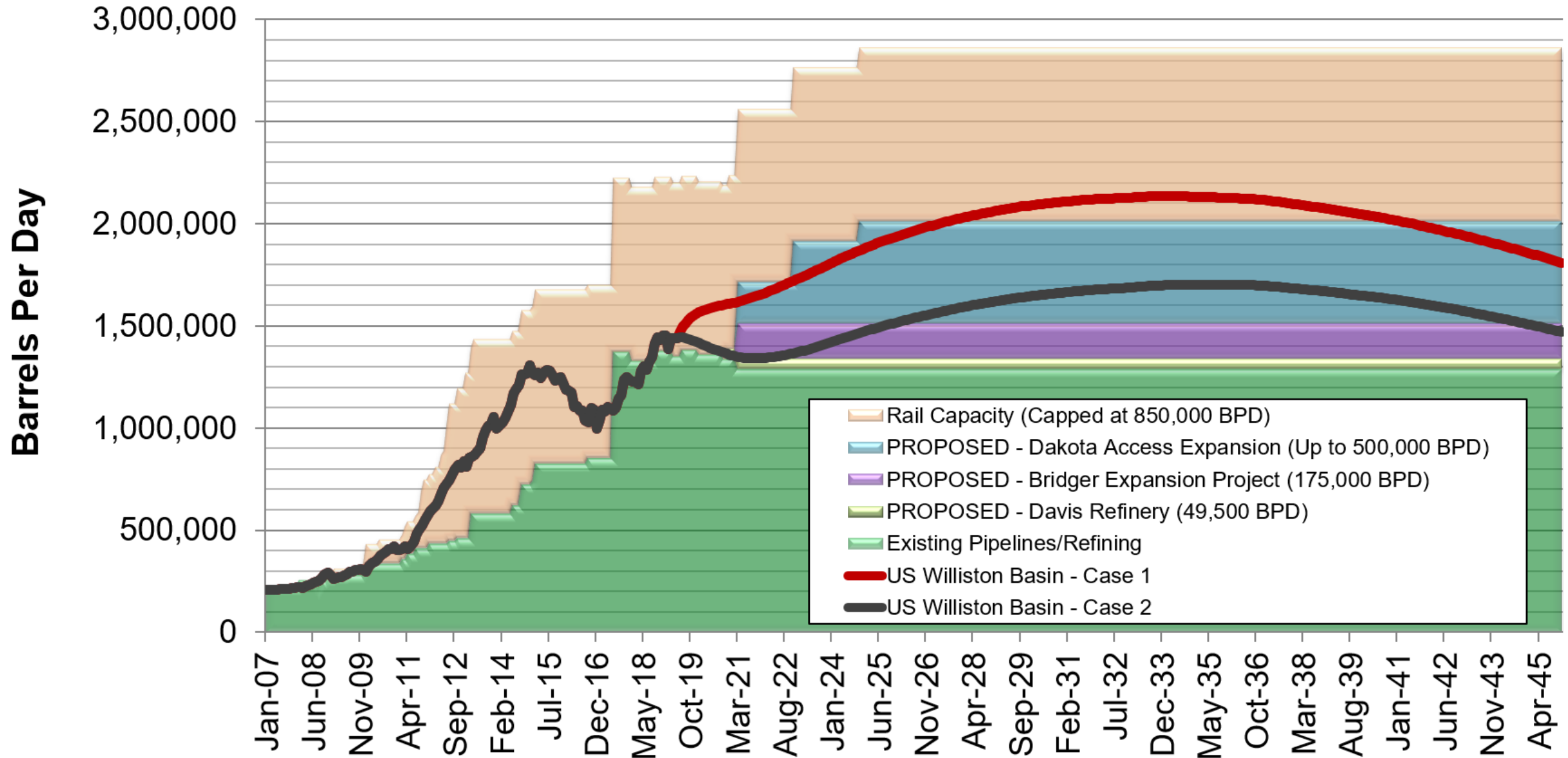
Assumes Current Technology – Enhanced Oil Recovery Not Included



Crude Oil Transmission and Refining



Williston Basin Oil Production & Export Capacity, BOPD



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



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- **North Dakota natural gas production**
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Natural Gas Update



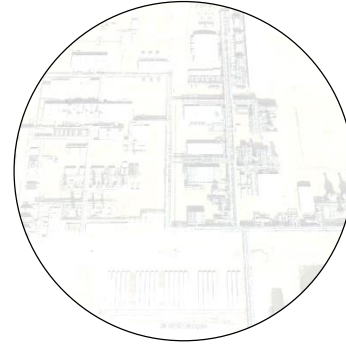
Production

- Technology
- Markets



Gathering

- Capacity
- Connections



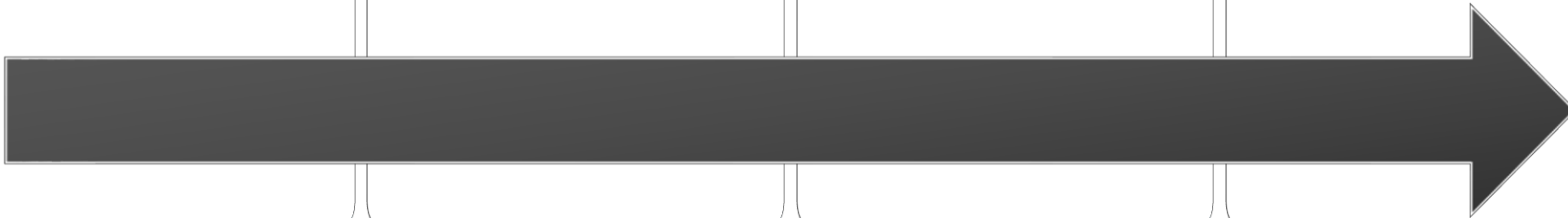
Processing

- Capacity
- Location

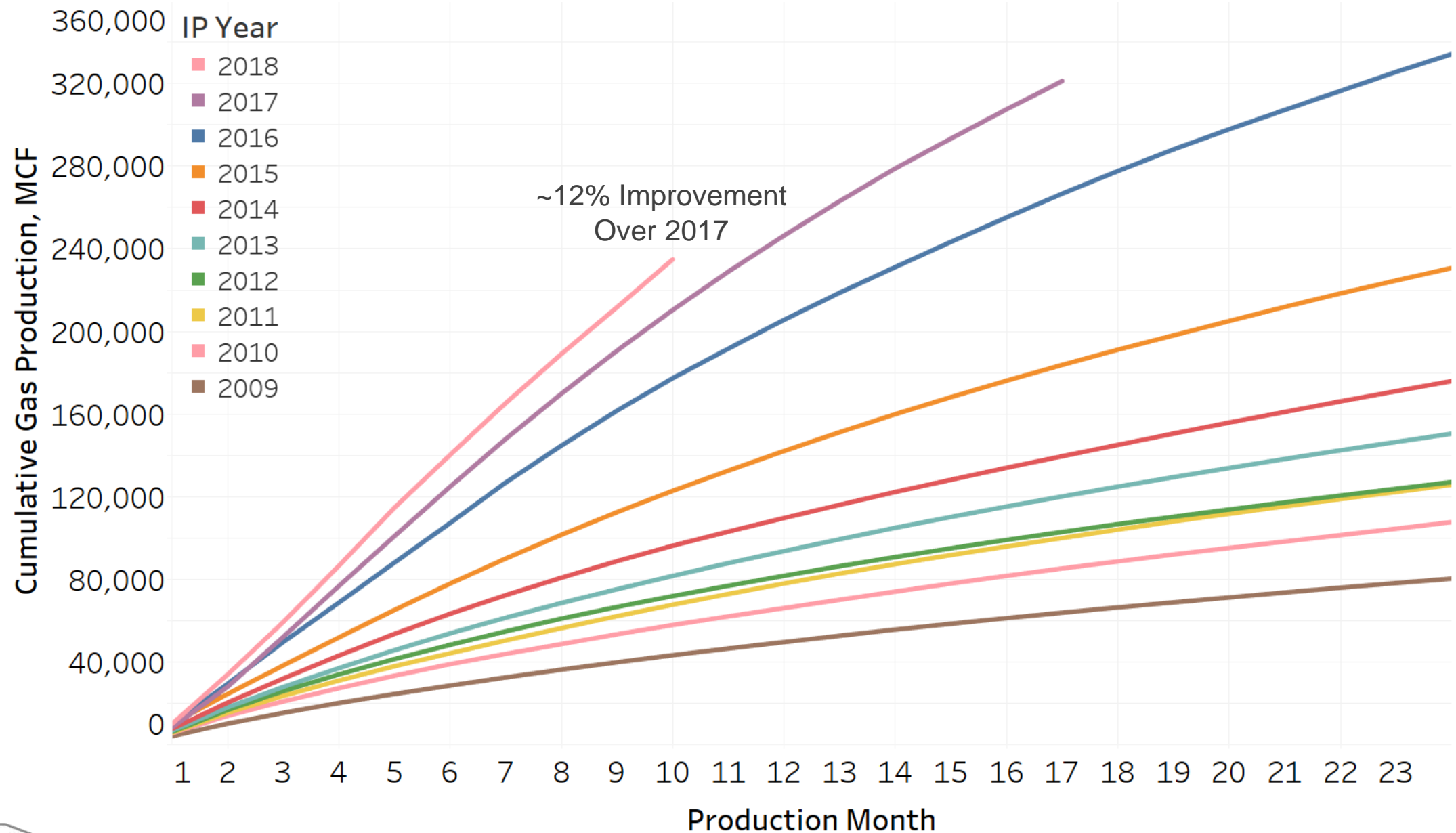


Transmission

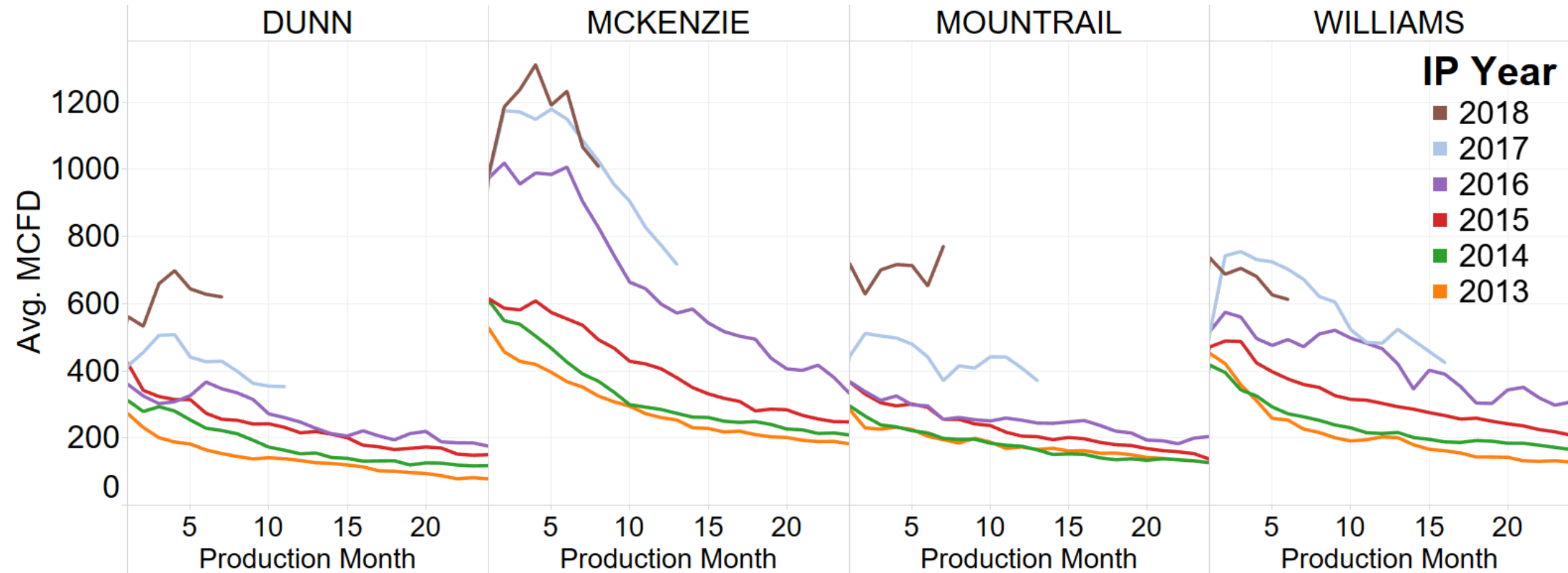
- Dry Gas
- Natural Gas Liquids



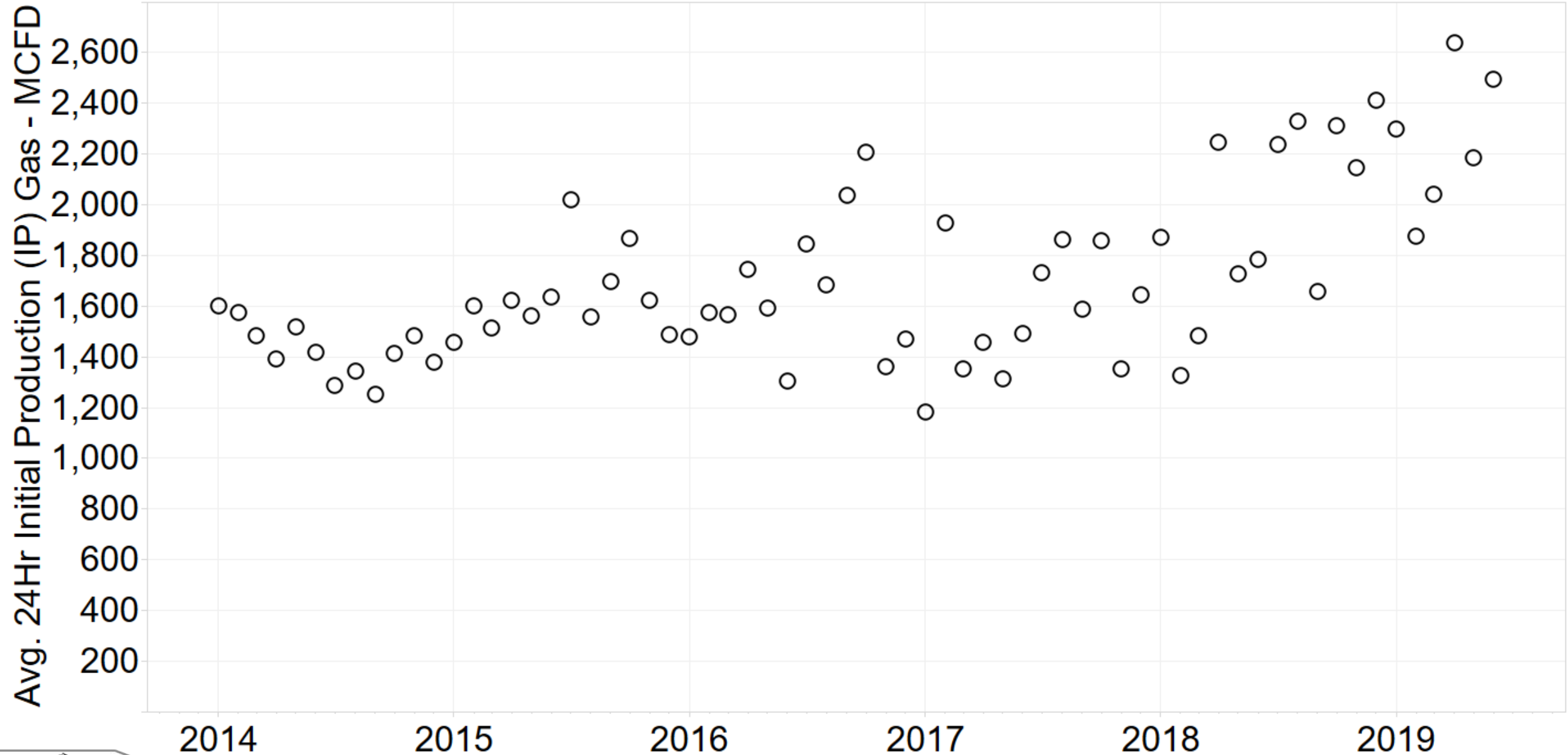
Statewide Gas Performance



Bakken and Three Forks Gas Performance

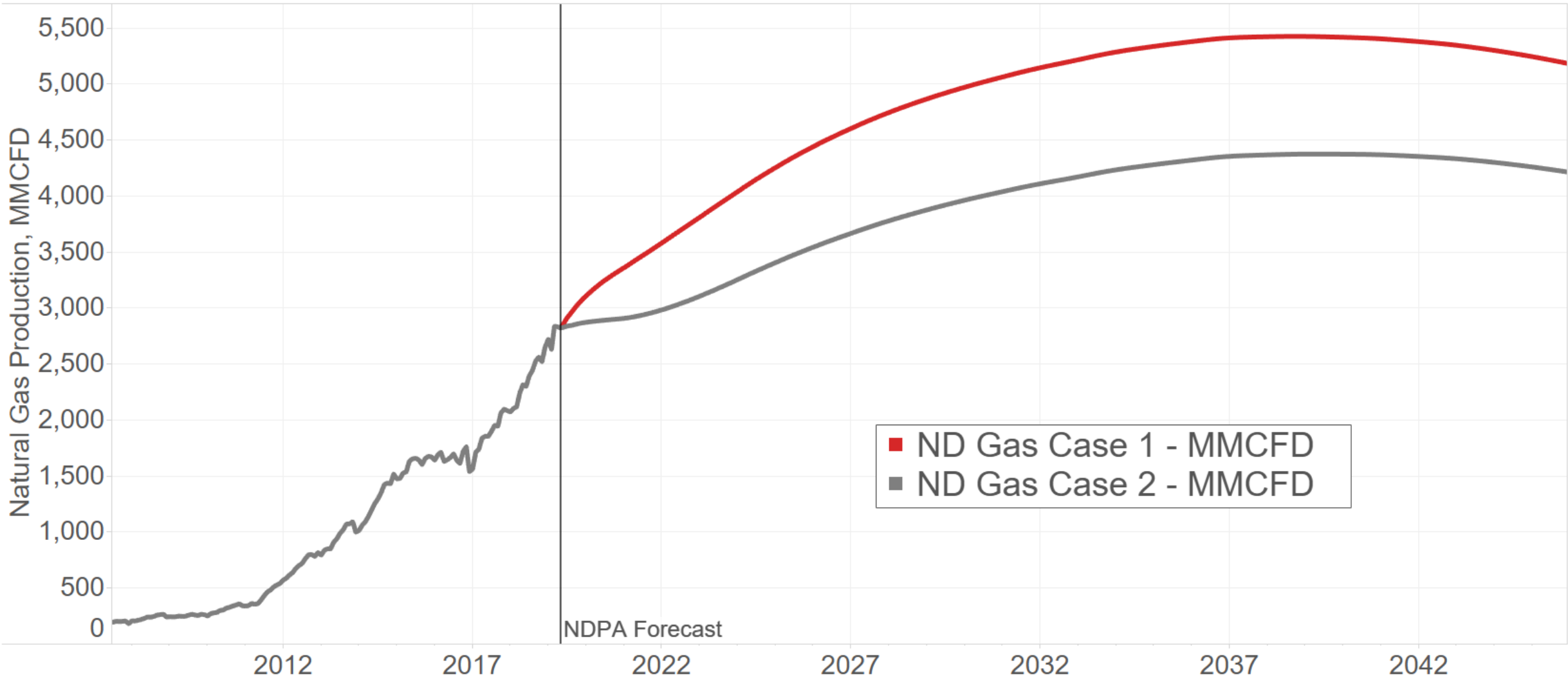


Statewide Initial Gas Production Rate: 24hr

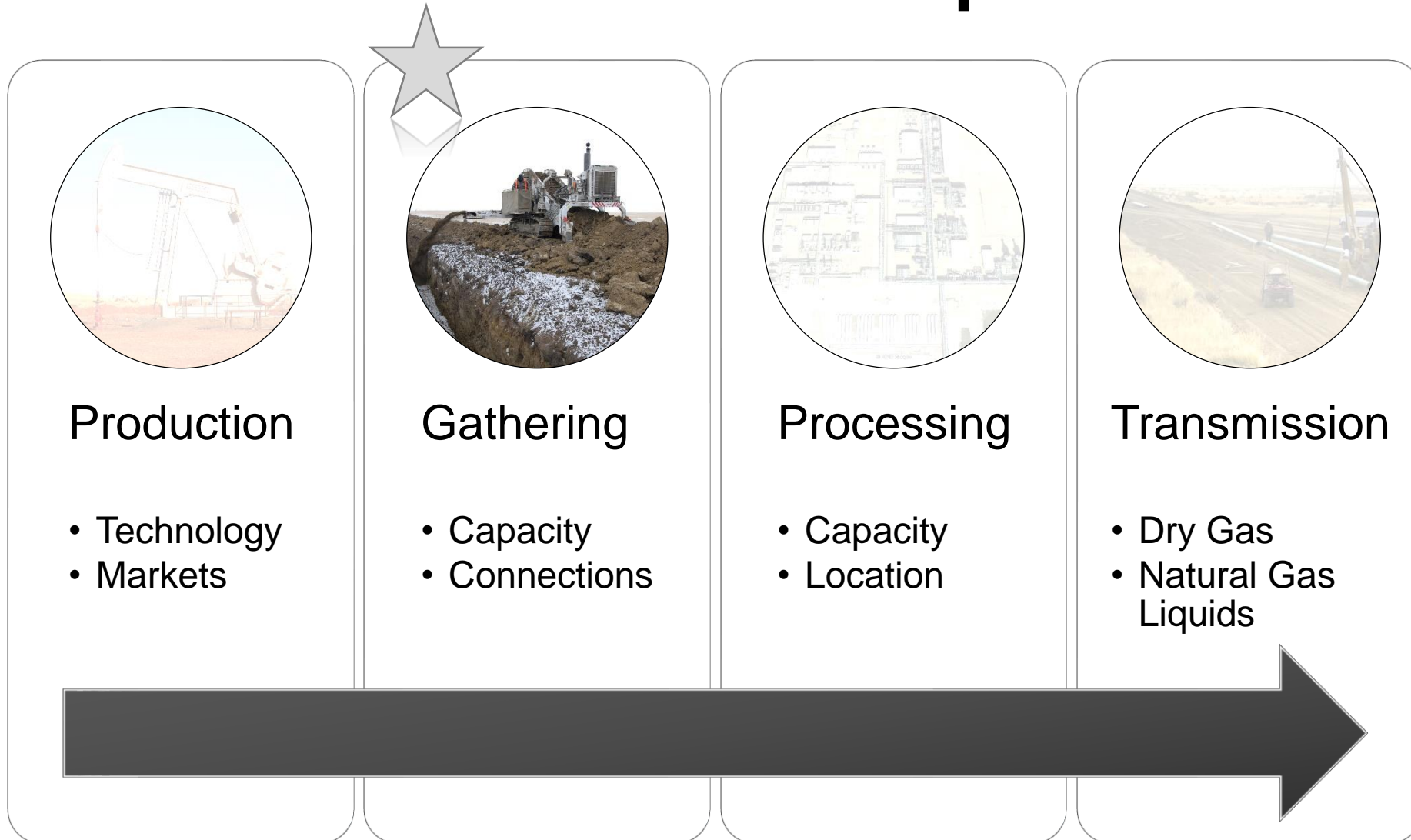


North Dakota Gas Production Forecast – Aug. 2019

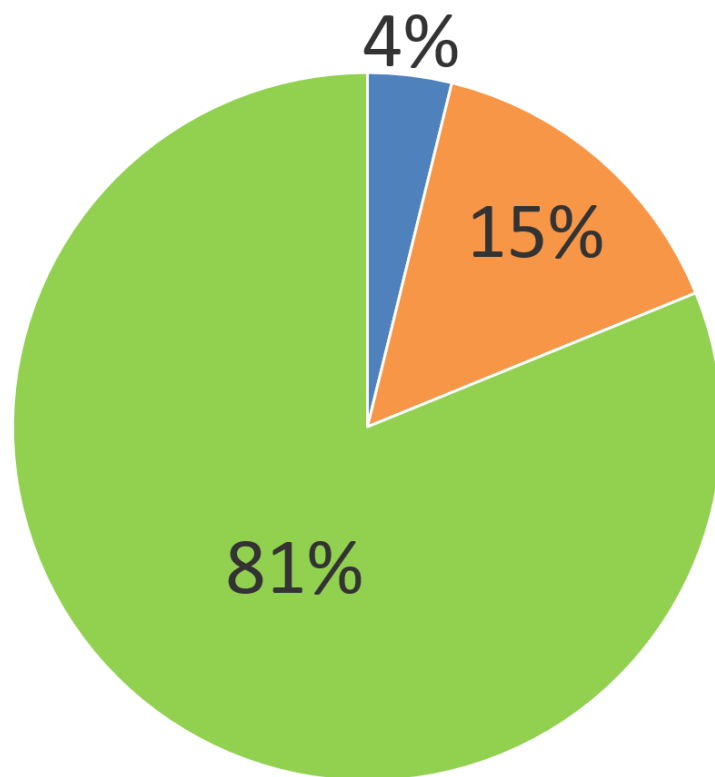
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Natural Gas Update



Solving the Flaring Challenge



Statewide

GREEN – % of gas captured and sold
Blue – % flared from zero sales wells
Orange – % flared from wells with at least one mcf sold.

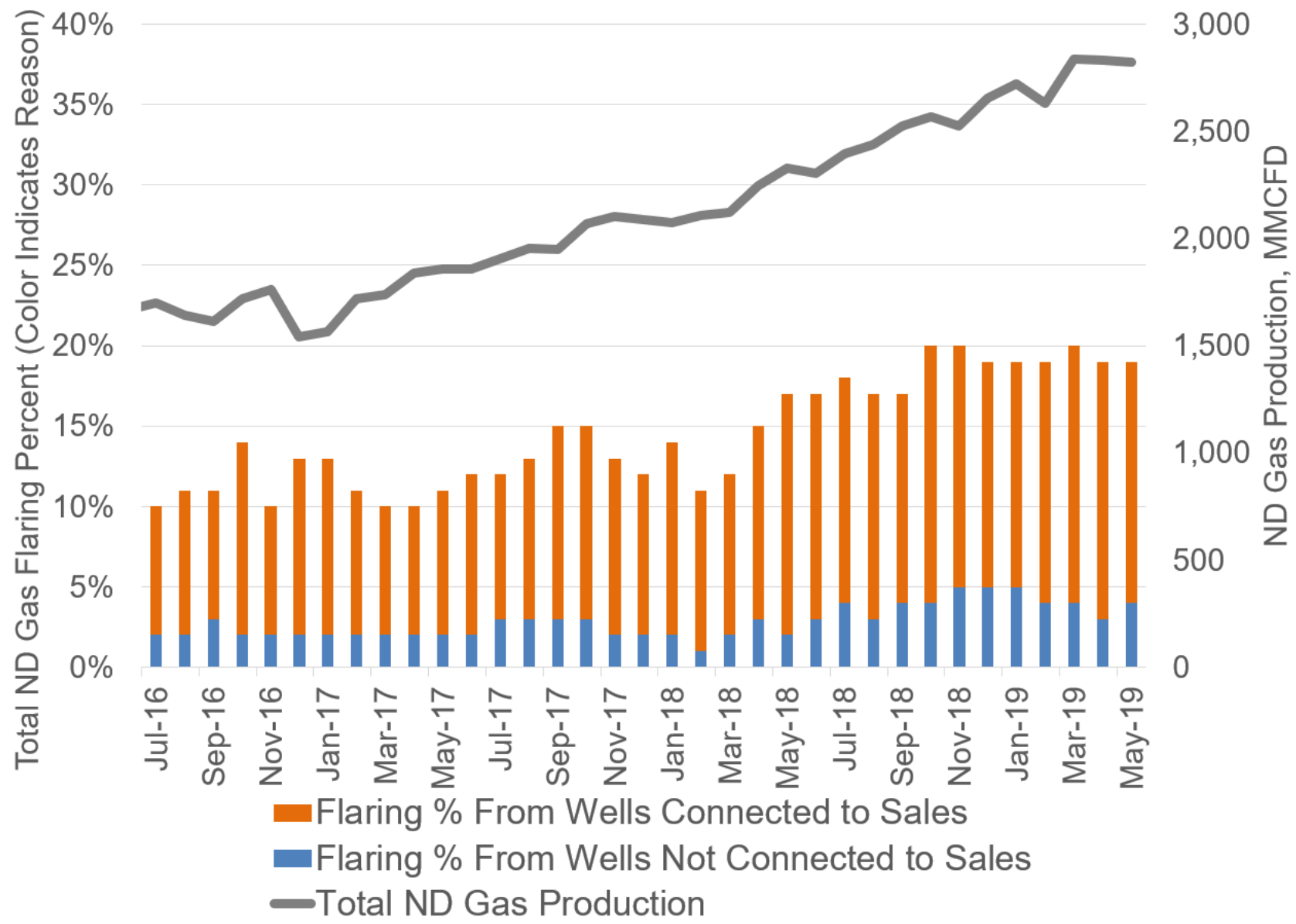
Simple Terms

Blue – Lack of pipelines
Orange – Challenges on existing infrastructure

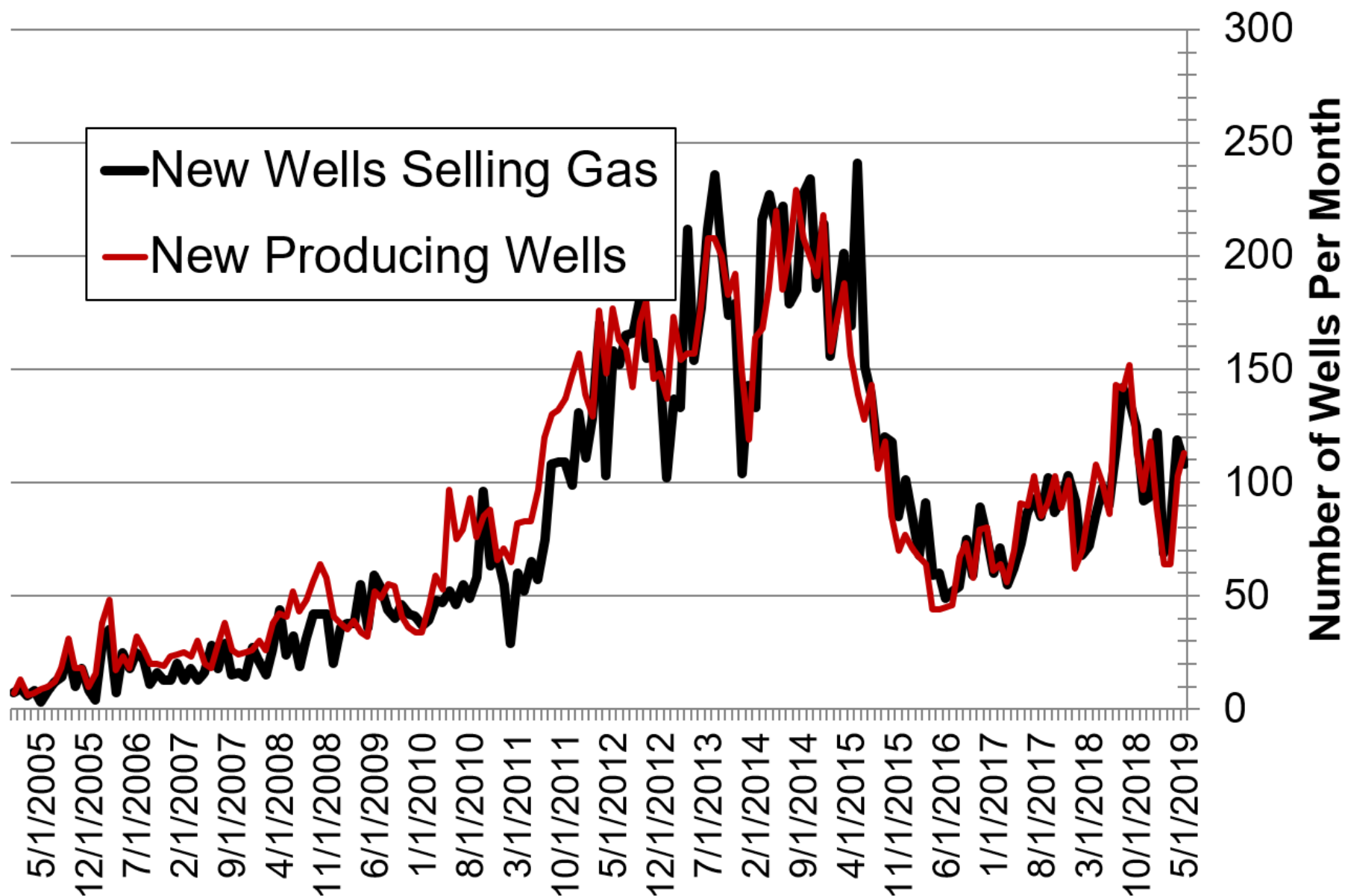
May 2019 Data – Non-Confidential Wells



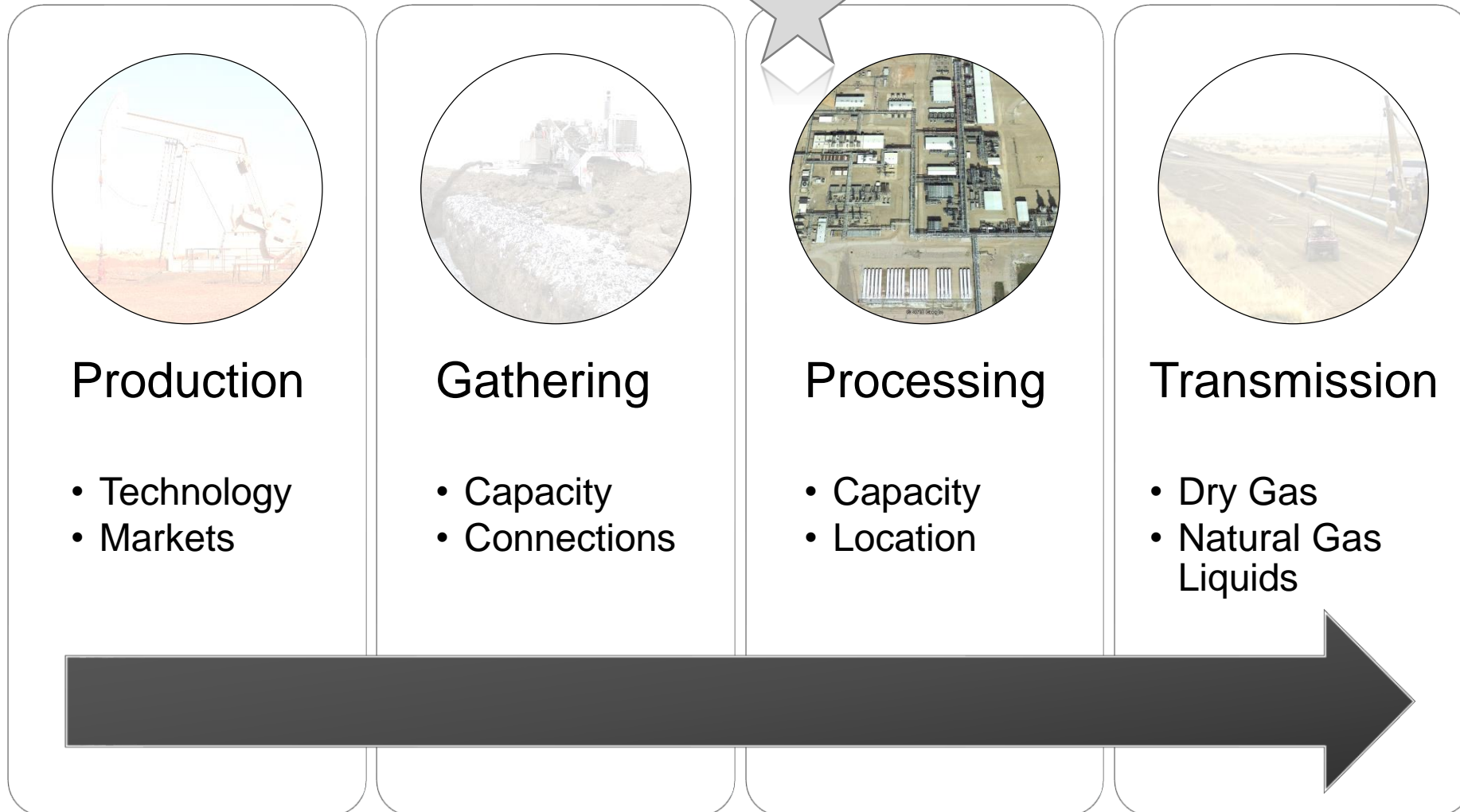
Solving the Flaring Challenge



Solving the Flaring Challenge

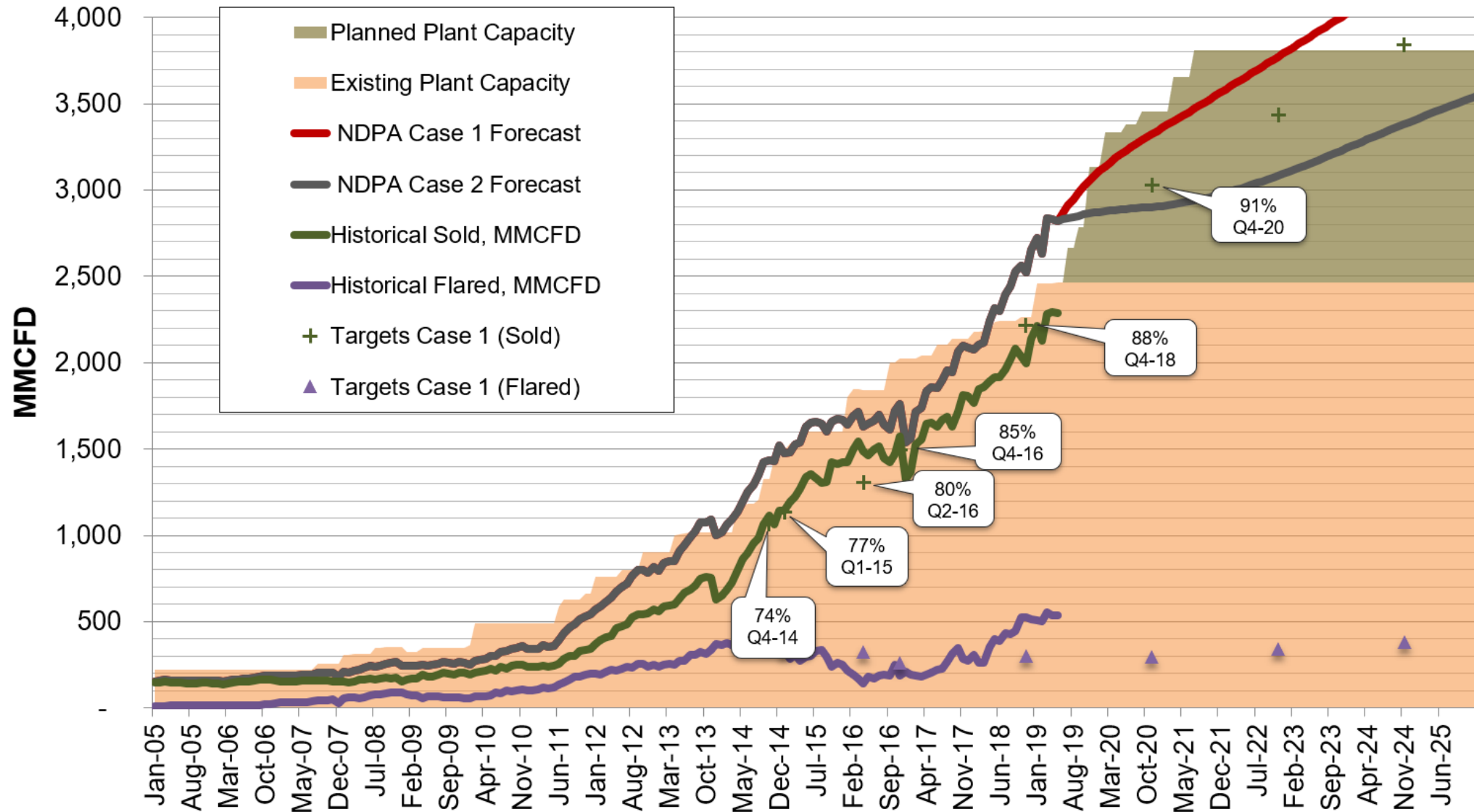


Natural Gas Update



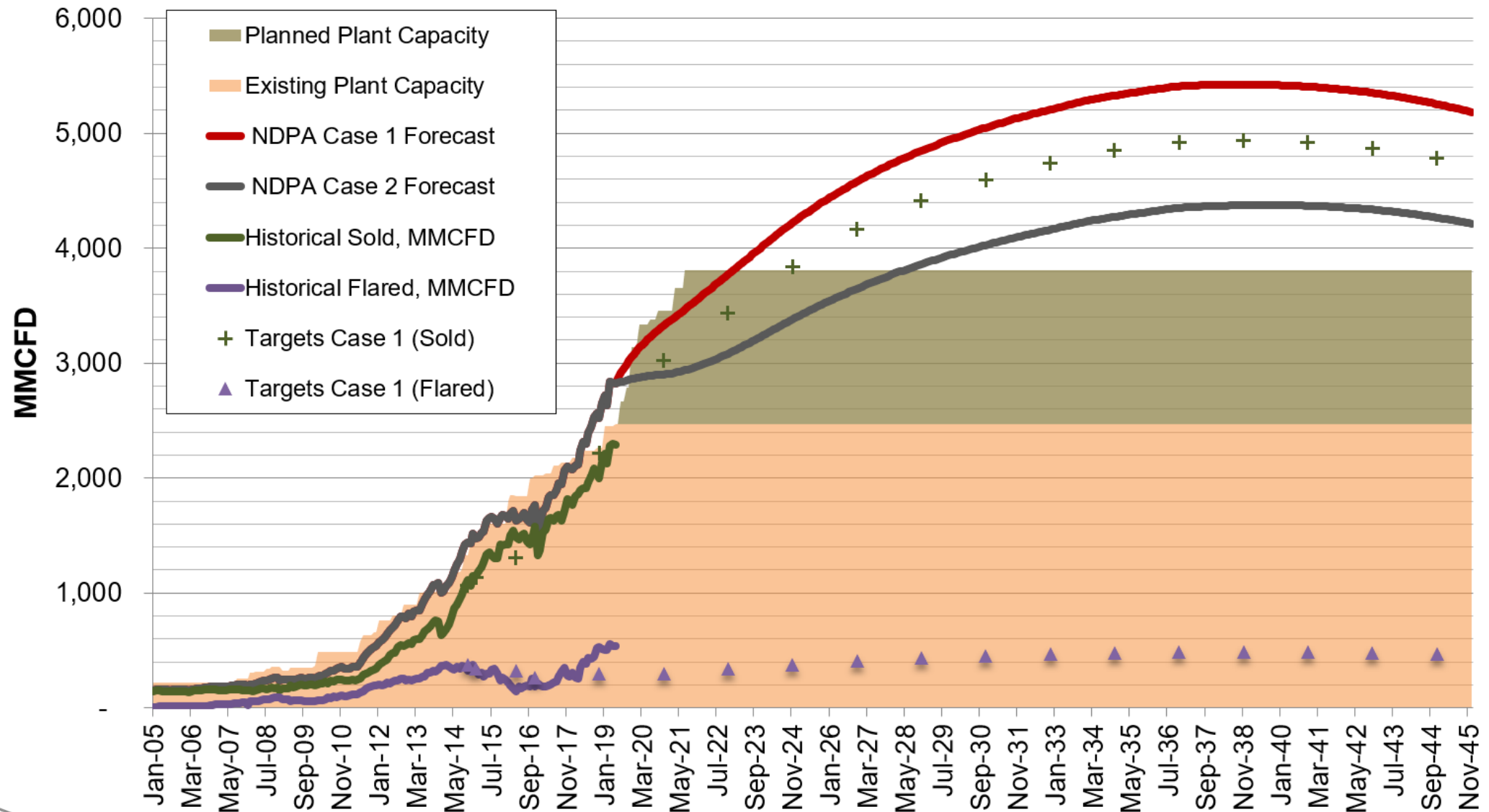
Solving the Flaring Challenge

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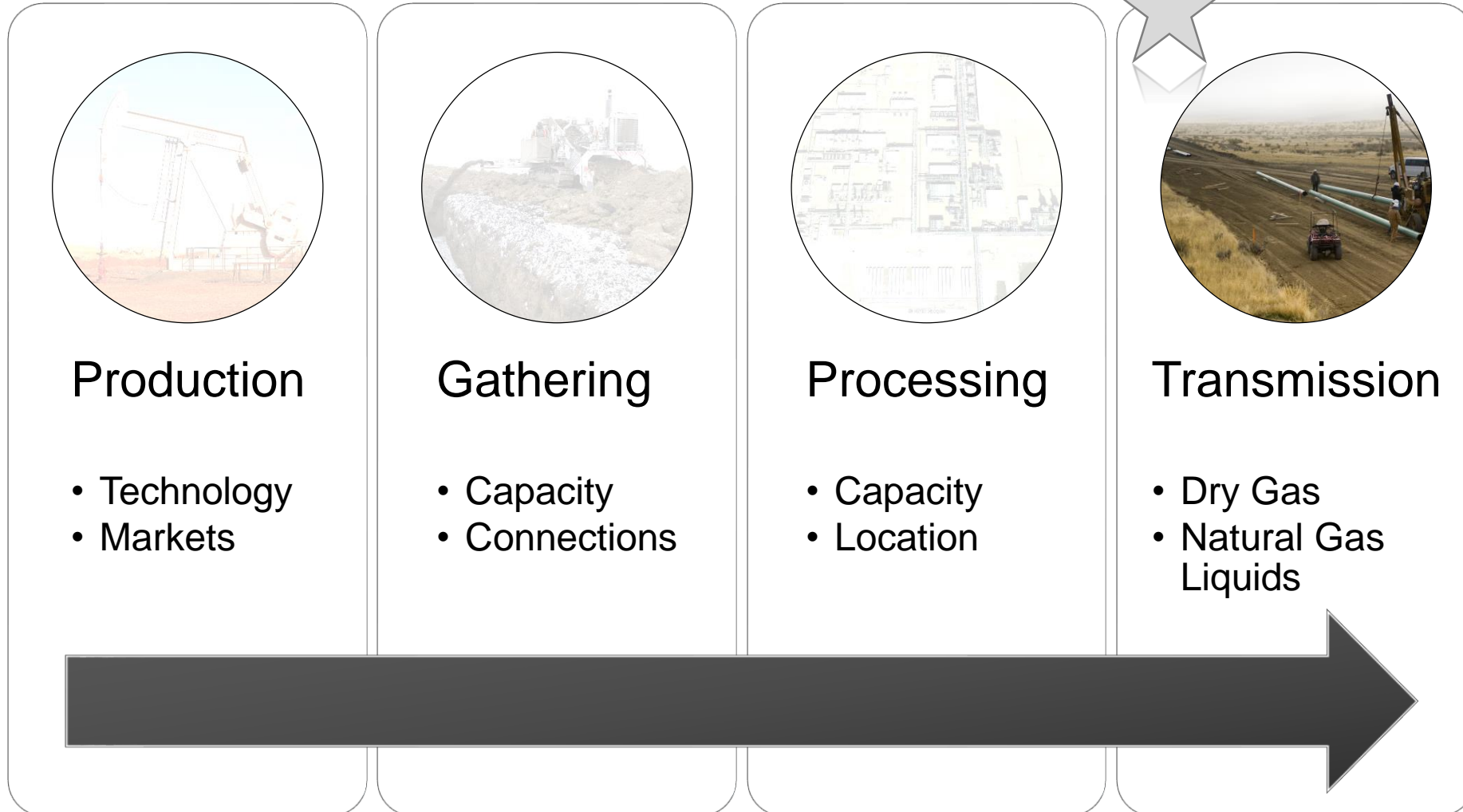


Solving the Flaring Challenge

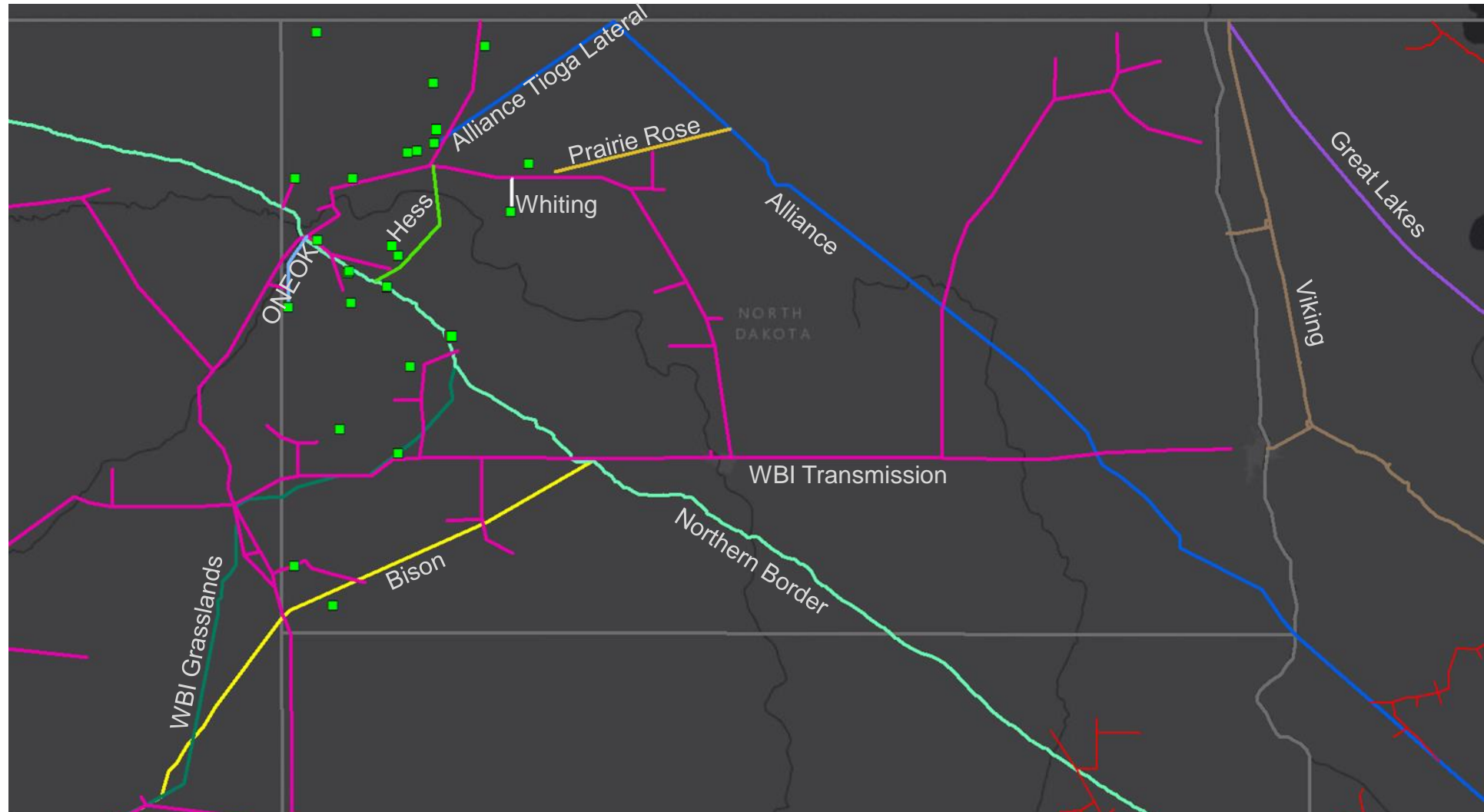
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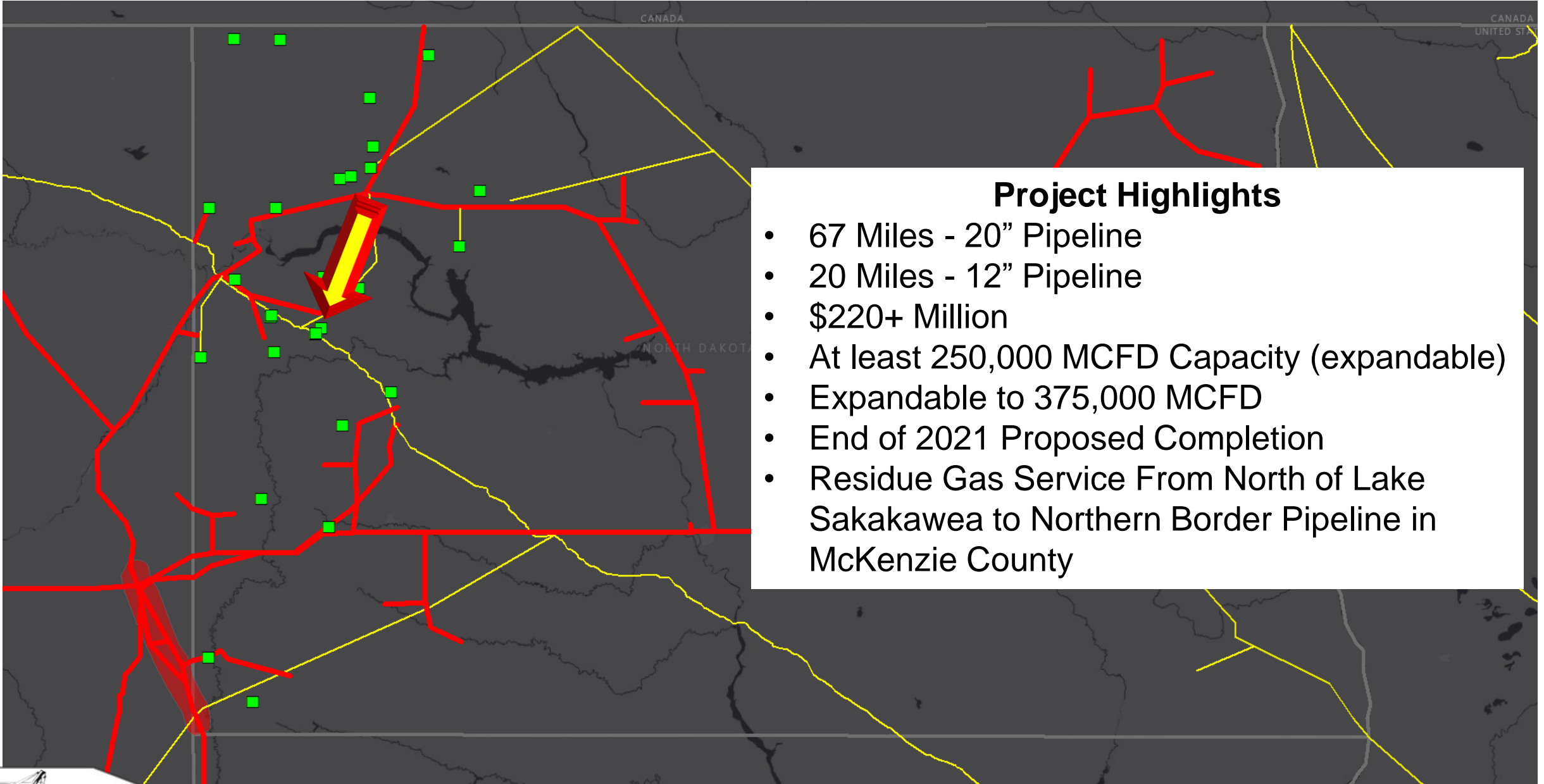
Natural Gas Update



Major Gas Pipeline and Processing Infrastructure



WBI Energy – North Bakken Expansion Project



Project Highlights

- 67 Miles - 20" Pipeline
- 20 Miles - 12" Pipeline
- \$220+ Million
- At least 250,000 MCFD Capacity (expandable)
- Expandable to 375,000 MCFD
- End of 2021 Proposed Completion
- Residue Gas Service From North of Lake Sakakawea to Northern Border Pipeline in McKenzie County



WBI Energy – North Bakken Expansion Project

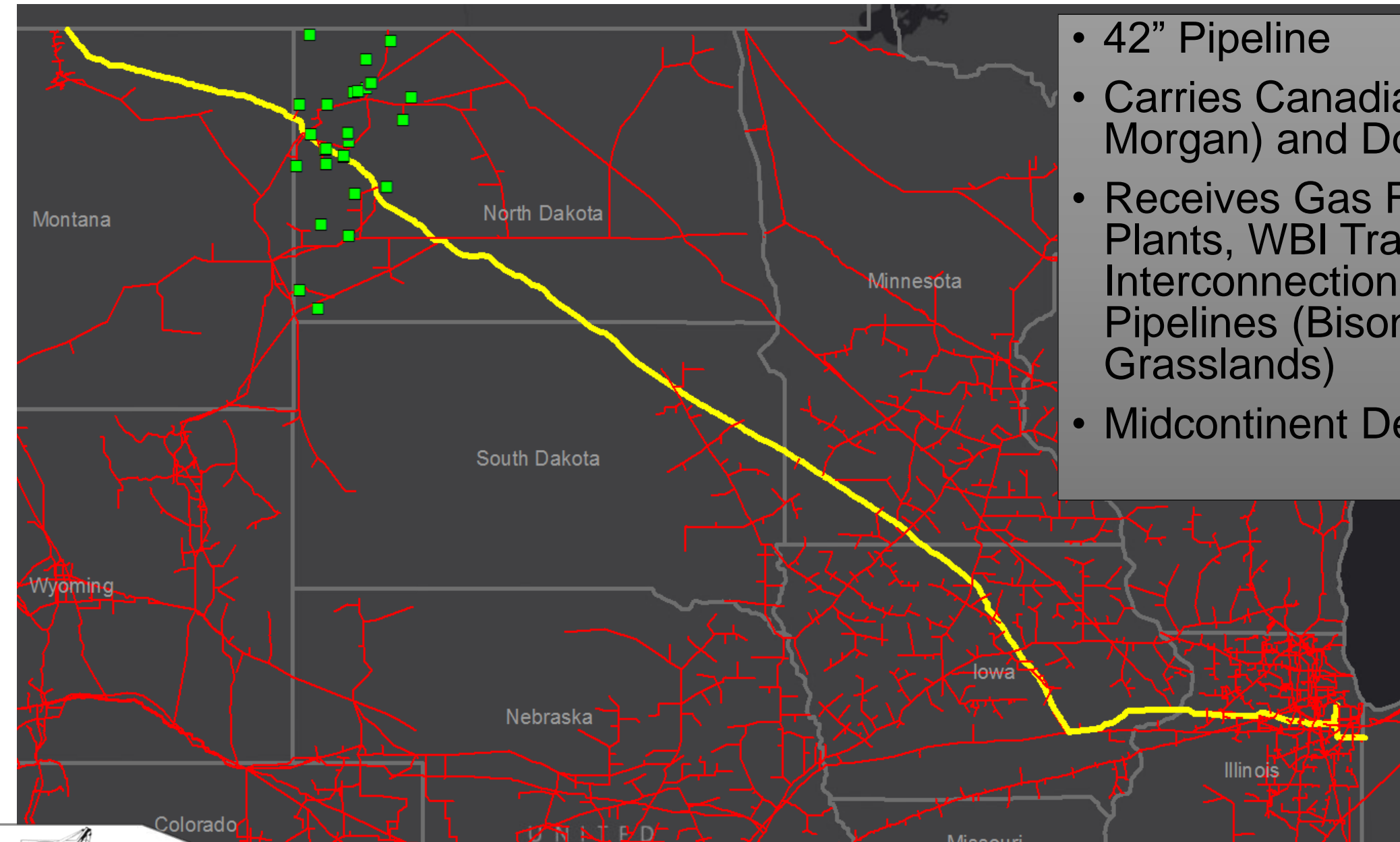
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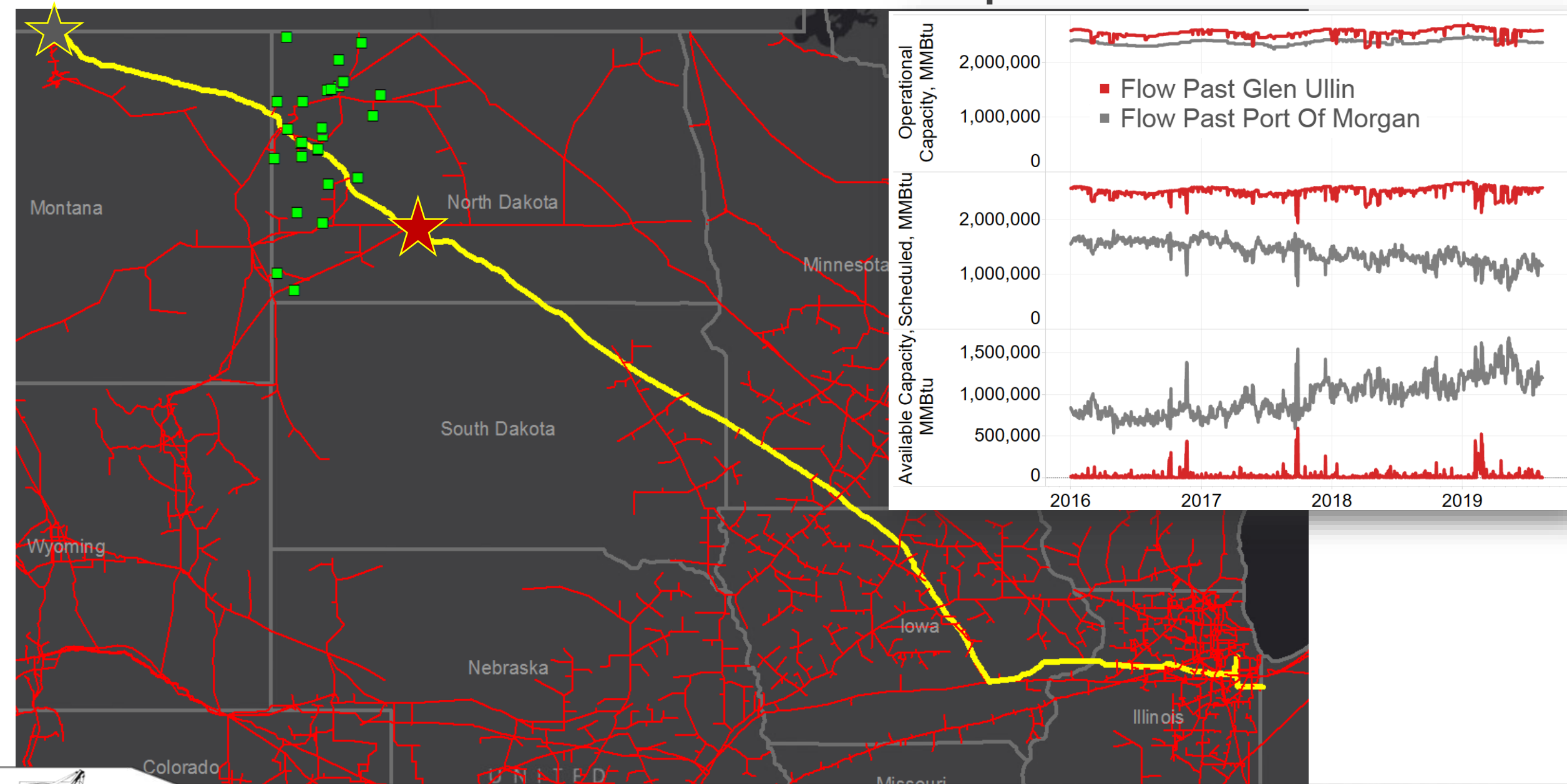


Northern Border Pipeline

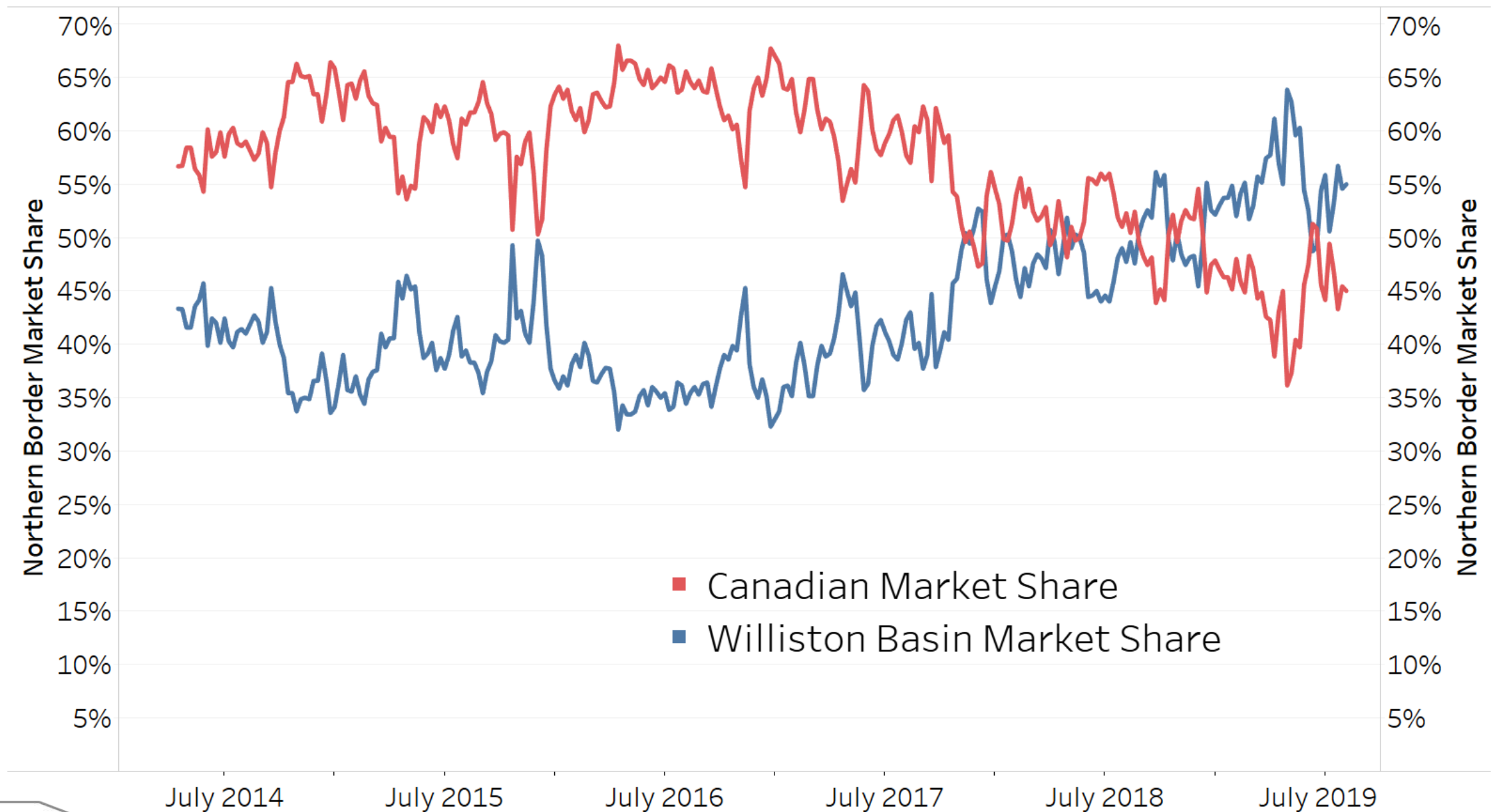
- 42" Pipeline
- Carries Canadian (Port of Morgan) and Domestic Gas
- Receives Gas From ND Plants, WBI Transmission Interconnections, and WY Pipelines (Bison & Grasslands)
- Midcontinent Deliveries



Northern Border Pipeline

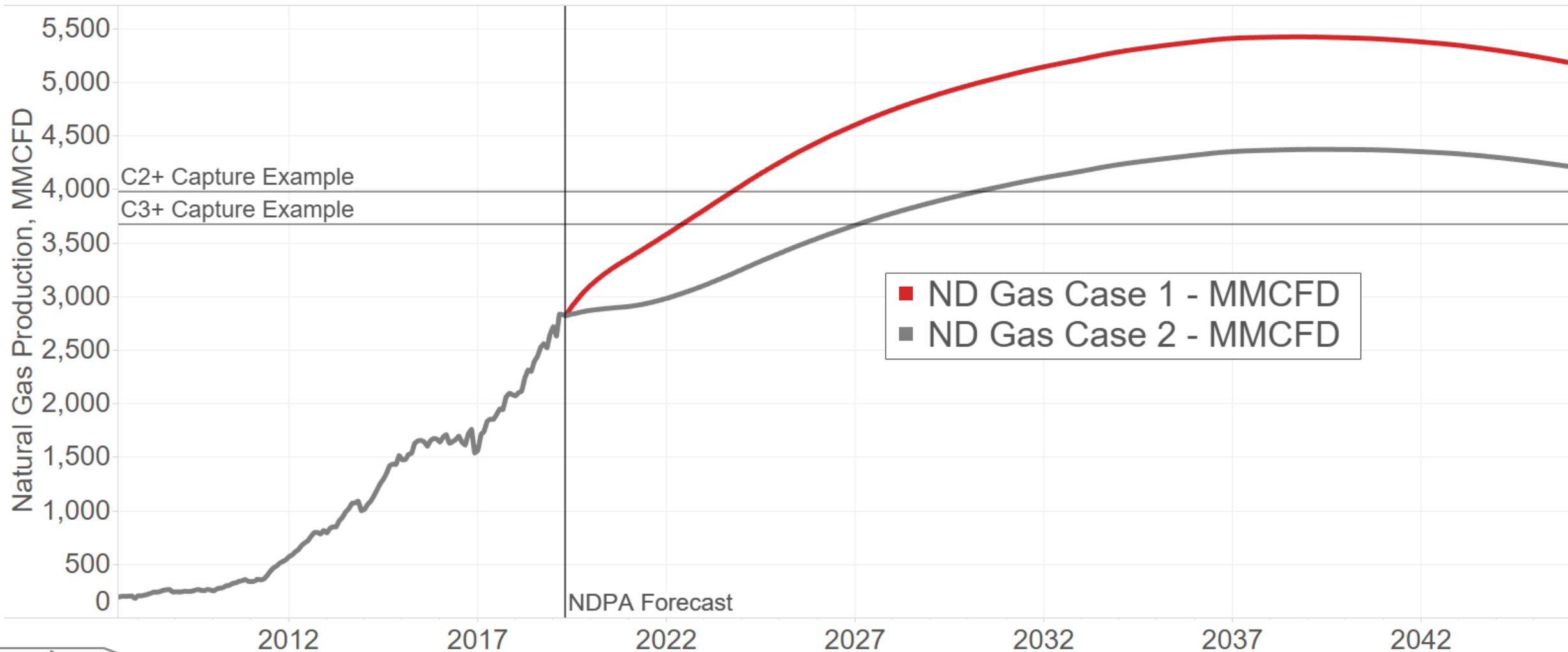


Northern Border Pipeline Market Share



Simplified Example NB Calculations

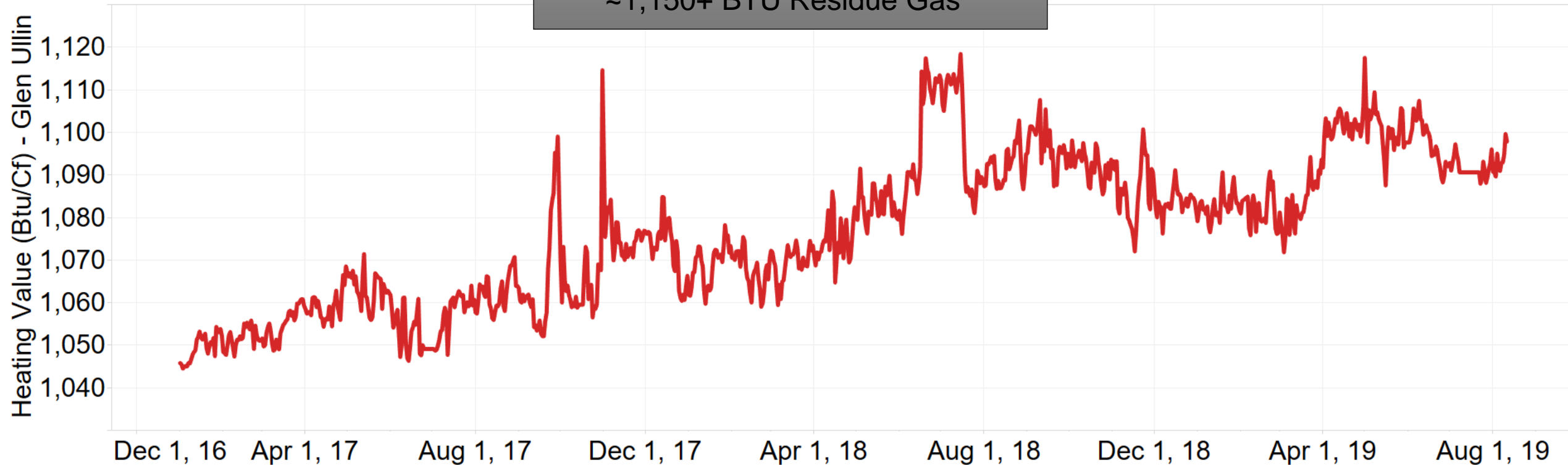
Conclusion: **IF** no other gas export options open and all other deliveries on other pipelines stay static, ND gas production could increase 0.83-1.13 BCFD (from May-19) before Northern Border is 100% Bakken production. **BTU management becomes increasingly important for Bakken residue gas.**



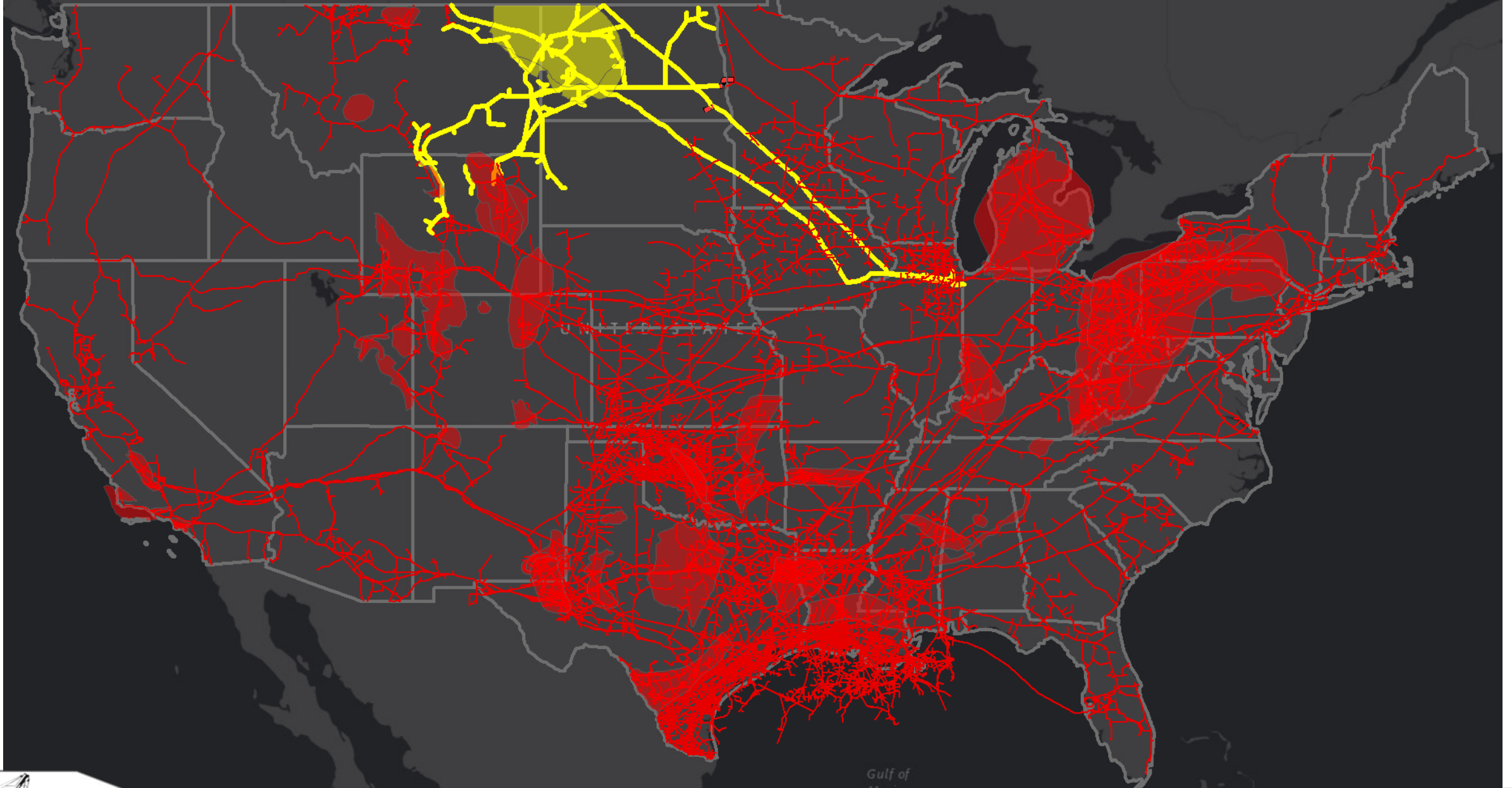
Simplified Example NB Calculations

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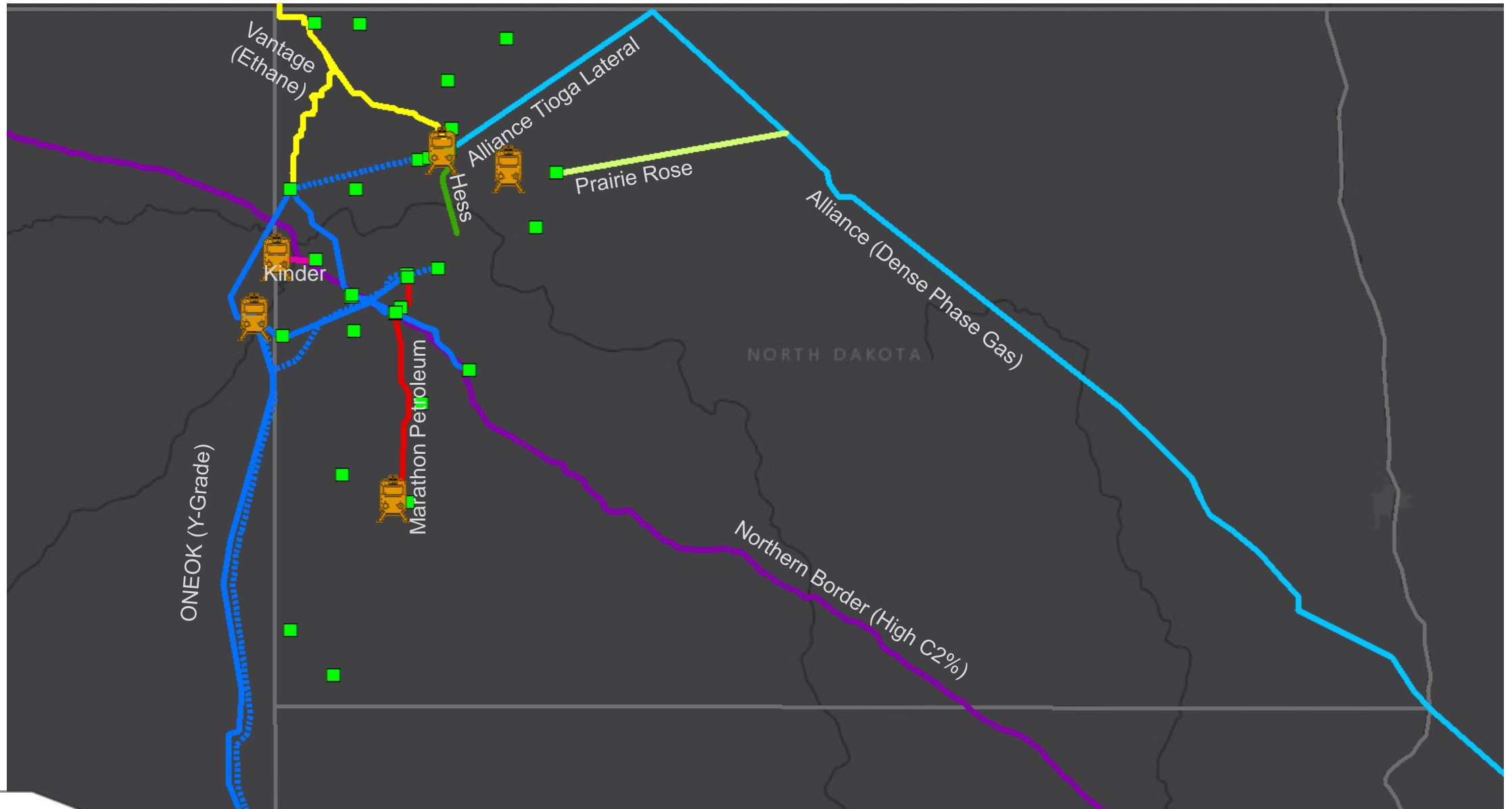
- Gas Plants With C2+ Capture
~1,010+ BTU Residue Gas
- Gas Plants With C3+ Capture
~1,150+ BTU Residue Gas



Bakken Natural Gas Infrastructure

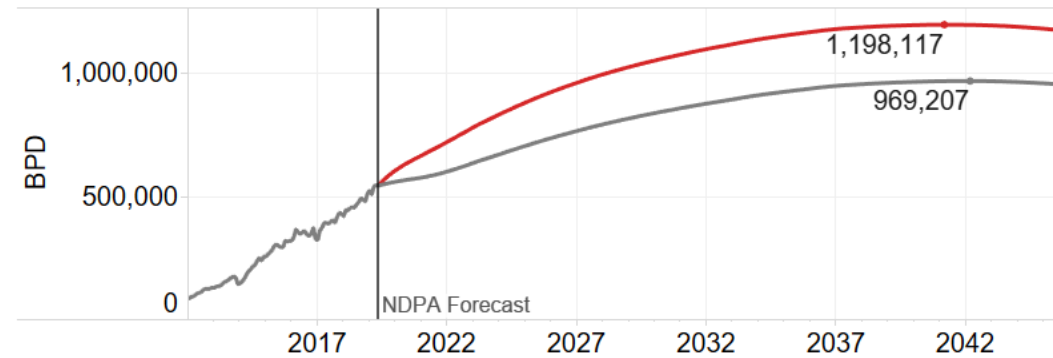


Regional NGL Infrastructure

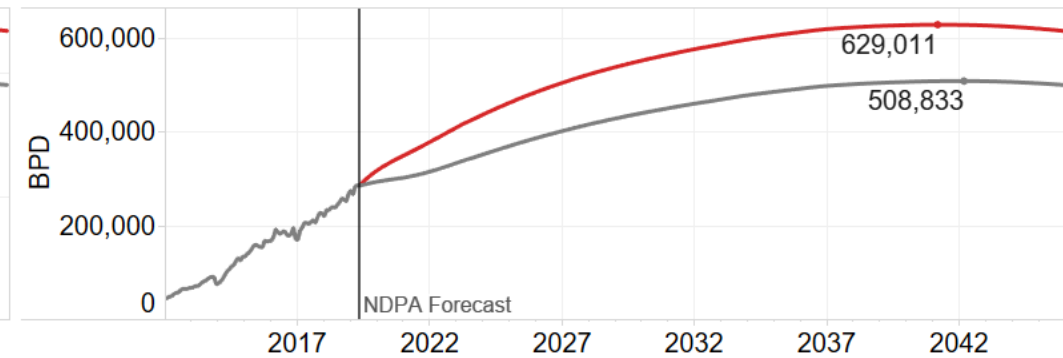


North Dakota Captured* NGL's – Aug. 2019

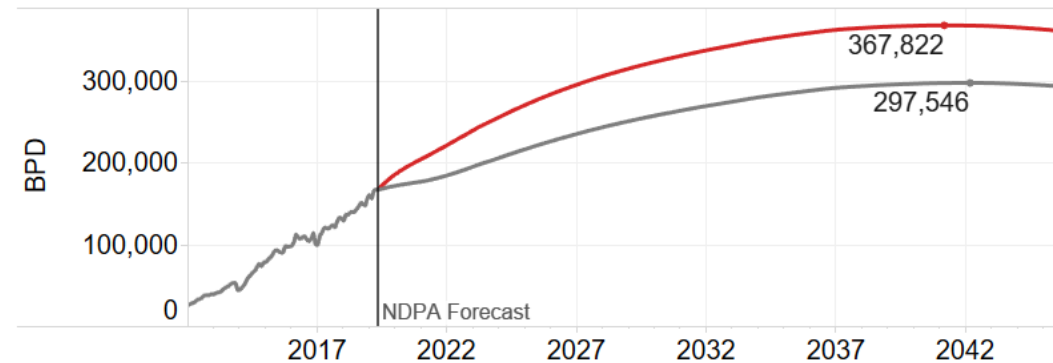
All Natural Gas Liquids



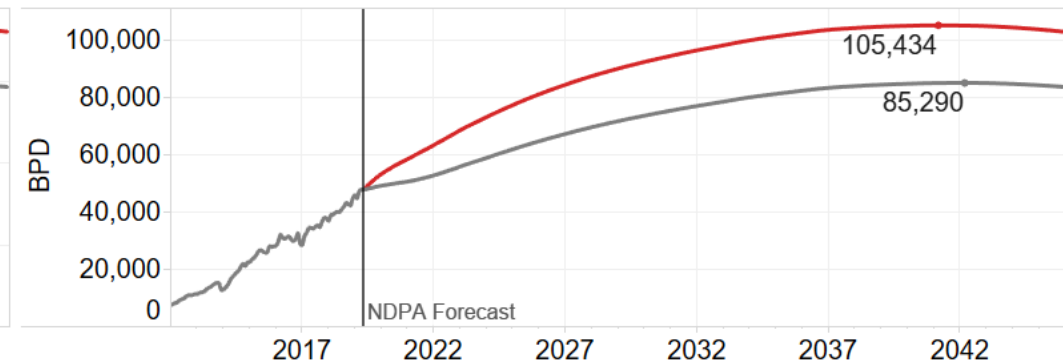
Ethane



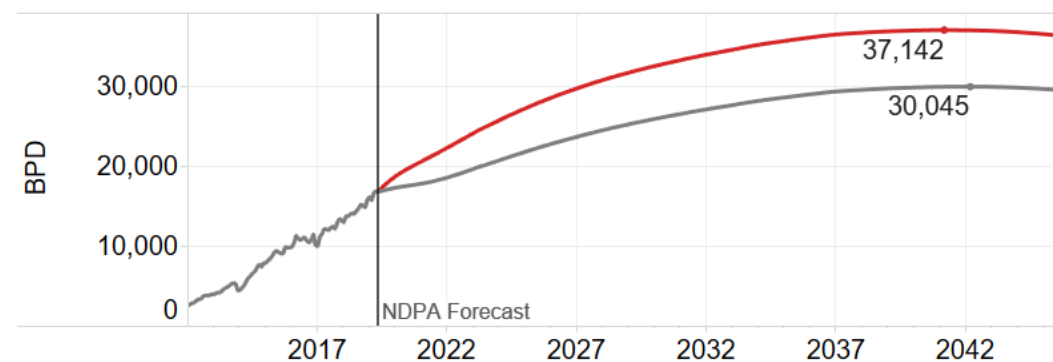
Propane



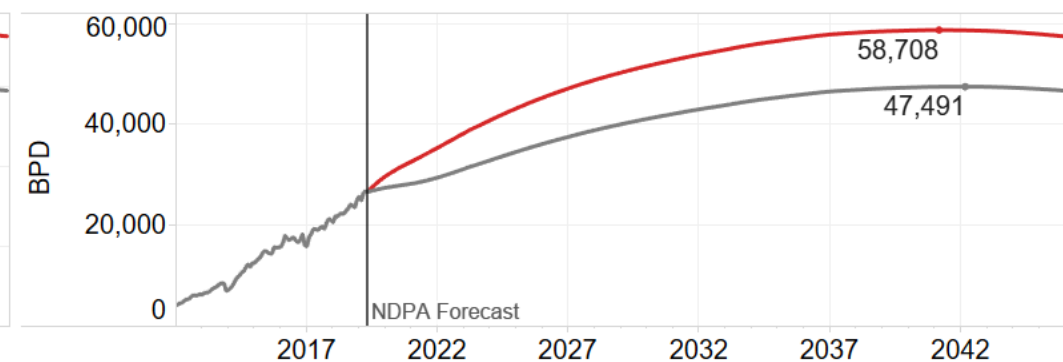
Butane



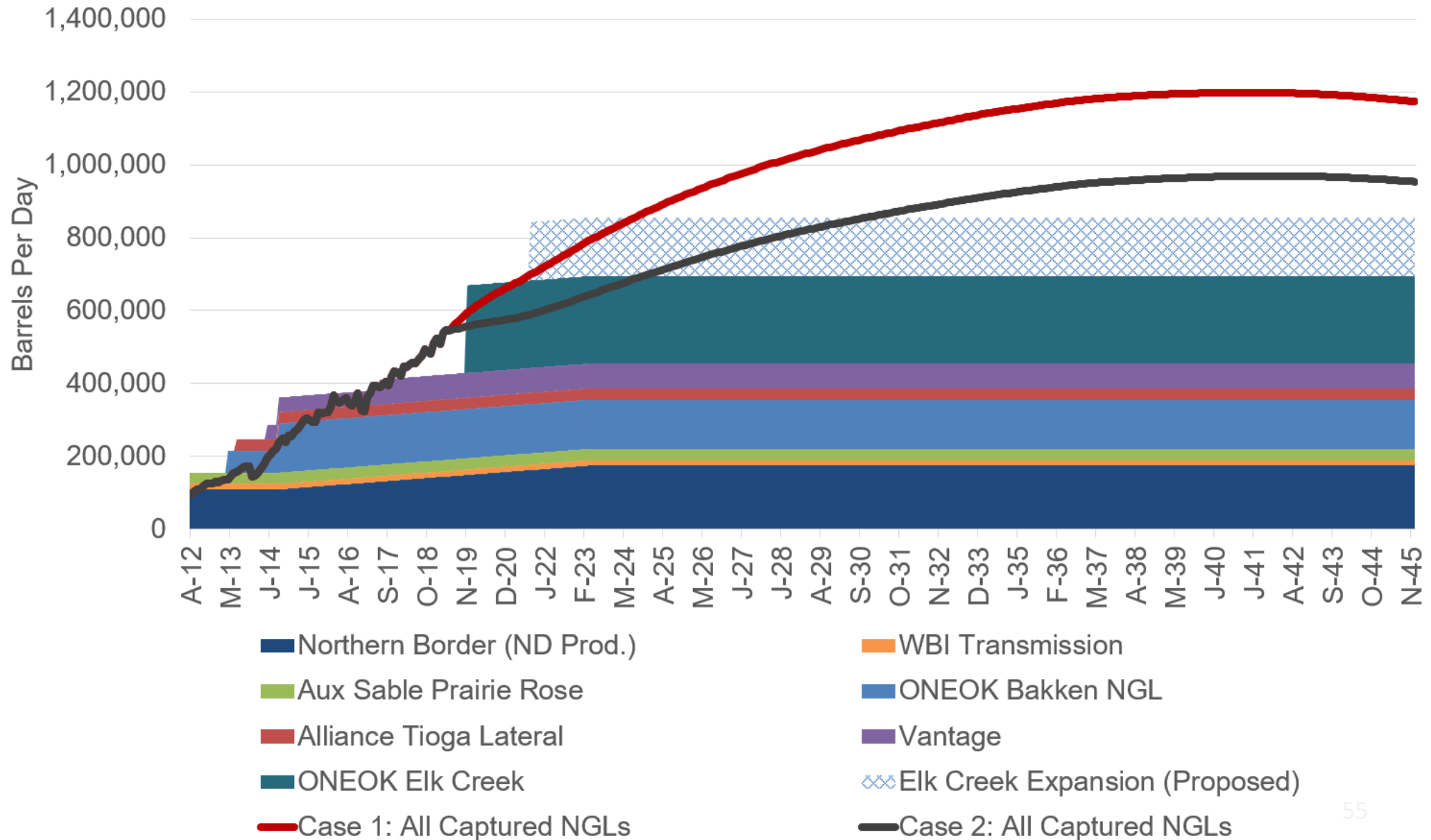
Isobutane



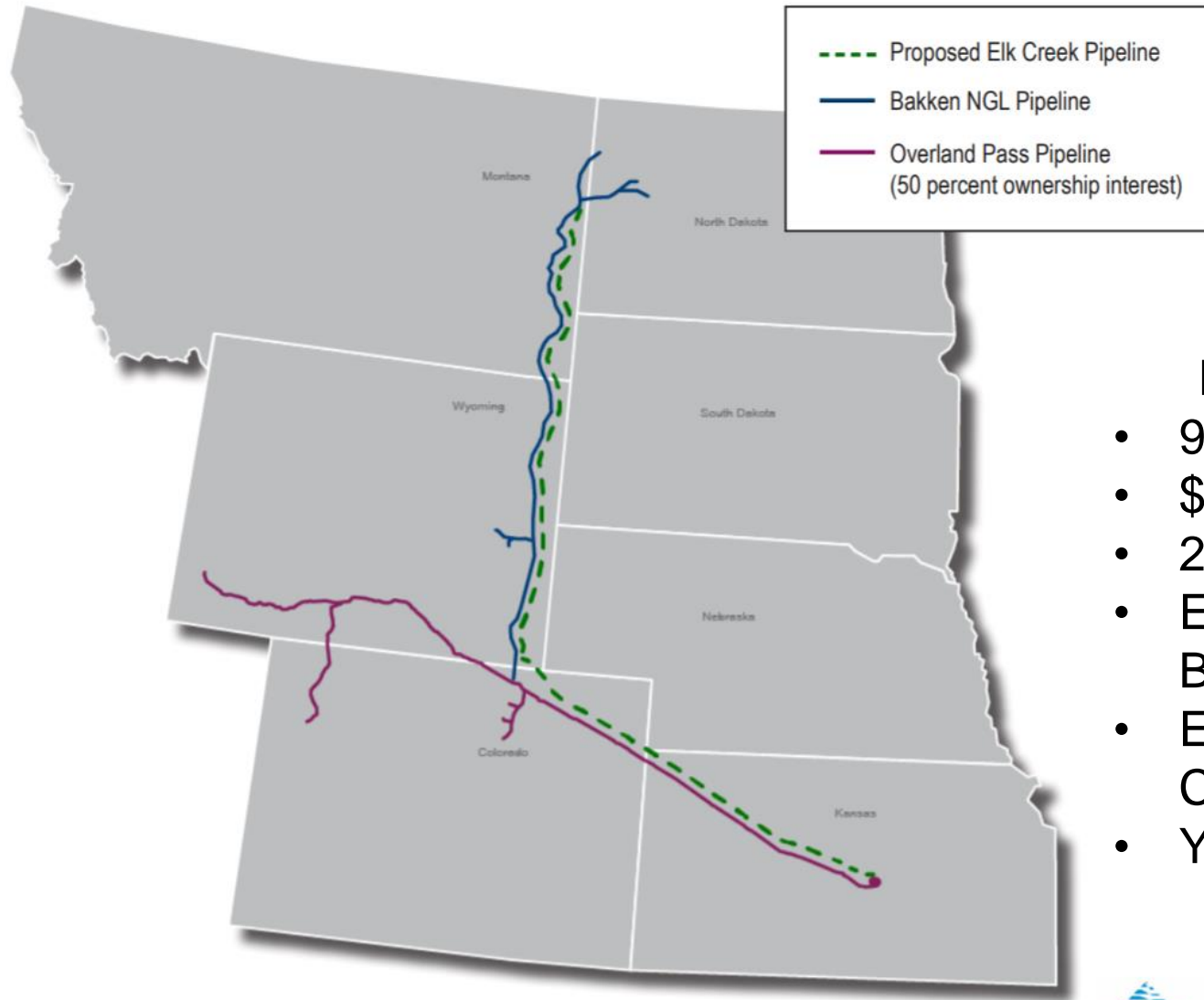
Natural Gasoline



NGL Pipeline Takeaway Options



ONEOK Elk Creek NGL Pipeline



Project Highlights

- 900 Miles - 20" Pipeline
- \$1.4 Billion
- 240,000 BPD Capacity
- Expandable to 400,000 BPD
- End of 2019 Proposed Completion
- Y-Grade Transportation



Contact Information

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E-mail: jjkringstad@ndpipelines.com



**Know what's below.
Call before you dig.**

Websites:

www.pipeline.nd.gov
www.northdakotapipelines.com

