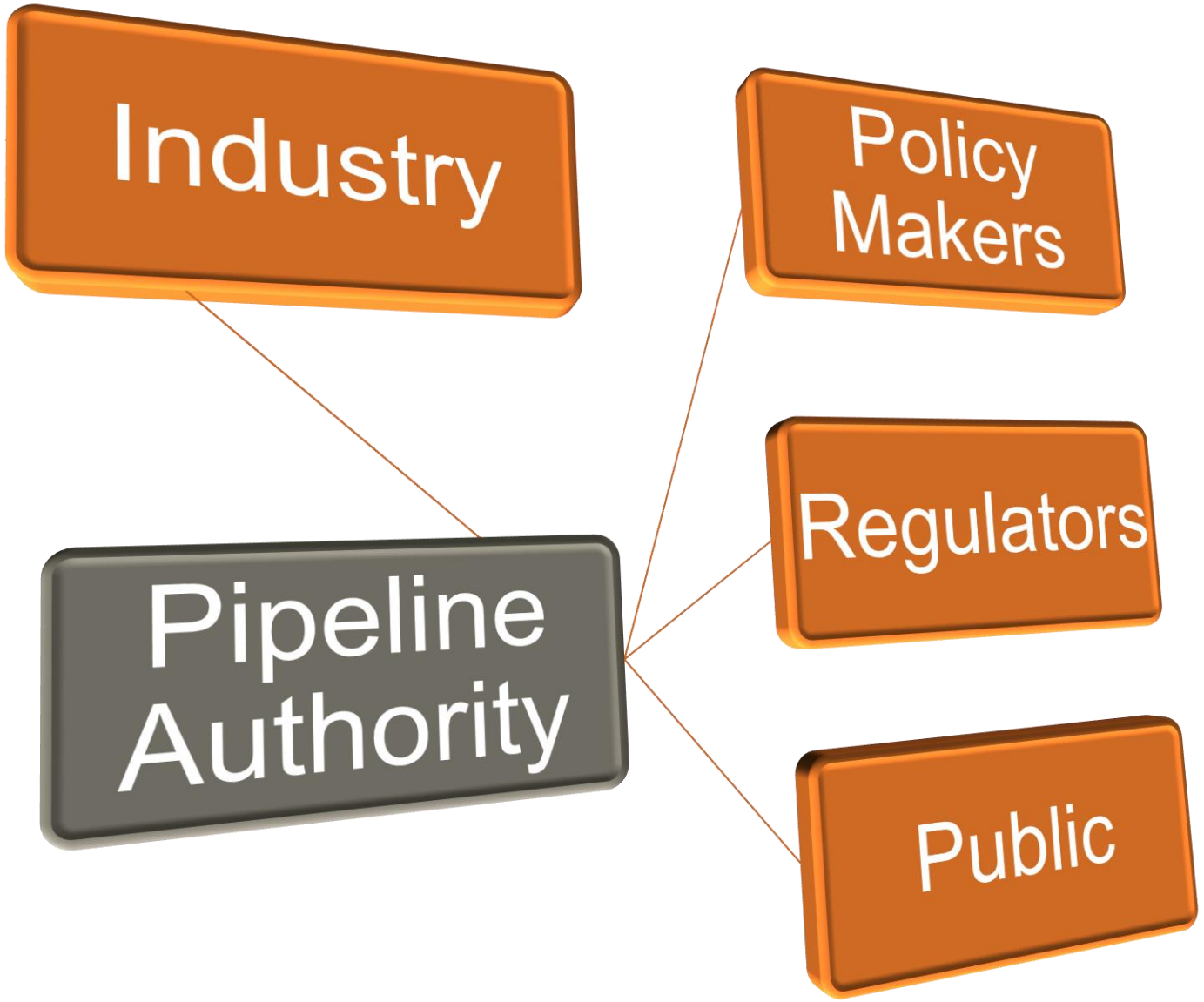
Understanding North Dakota's Petroleum Development and Transportation Dynamics

Justin J Kringstad
Geological Engineer
Director
North Dakota Pipeline Authority

July 11, 2018


Industry
Policy Makers
Pipeline Authority
Regulators
Public

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
- Pipeline construction update

Objective

Define where the Bakken/Three Forks system may be economic in the current 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.

Neither the State of North Dakota, nor any agency, officer, or employee of the State of North Dakota warrants the accuracy or reliability of this product and shall not be held responsible for any losses related to its use.

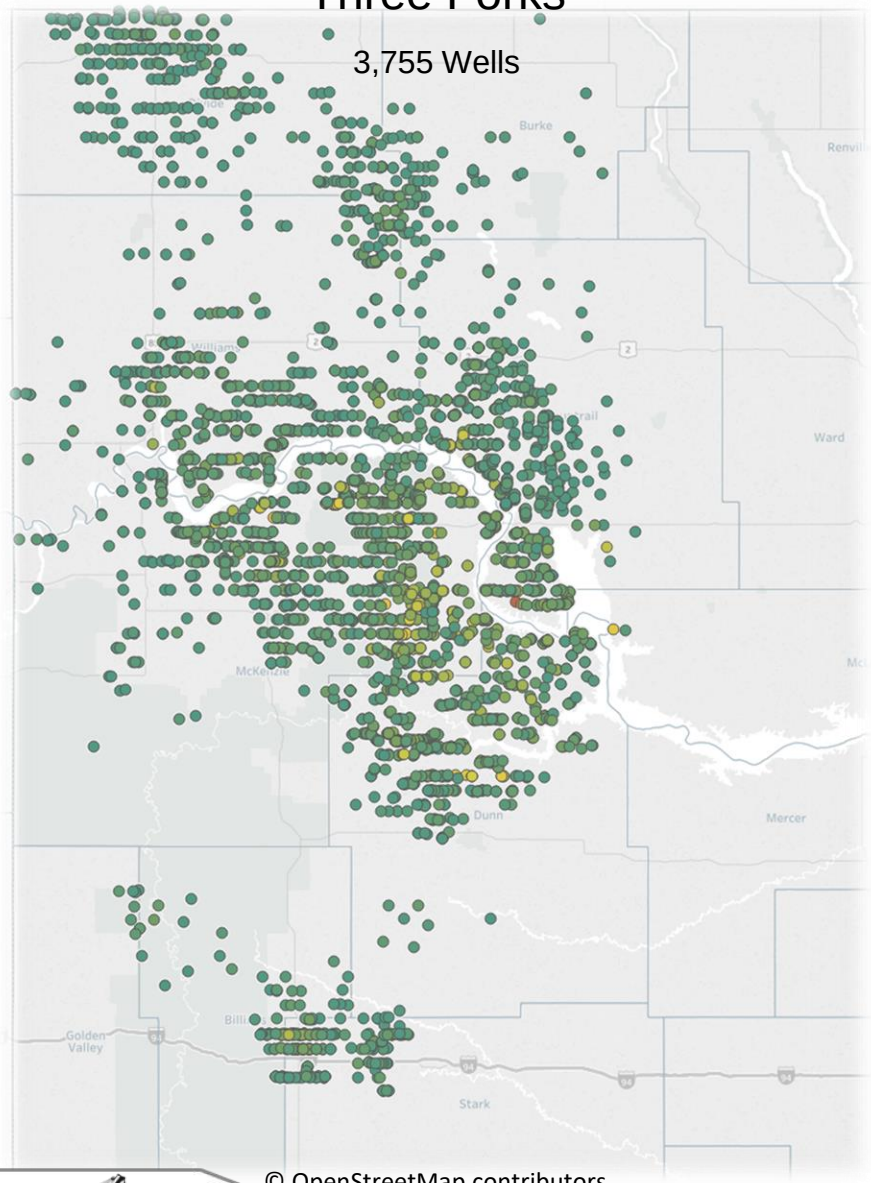
Key Economic Assumptions

- $6-$8 Million Well Costs
- $63/BBL & $6.00/MCF Wellhead Pricing
- 1/6 Royalty
- Zero Flaring
- Assumed 10-20% 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 - 200 BOPD

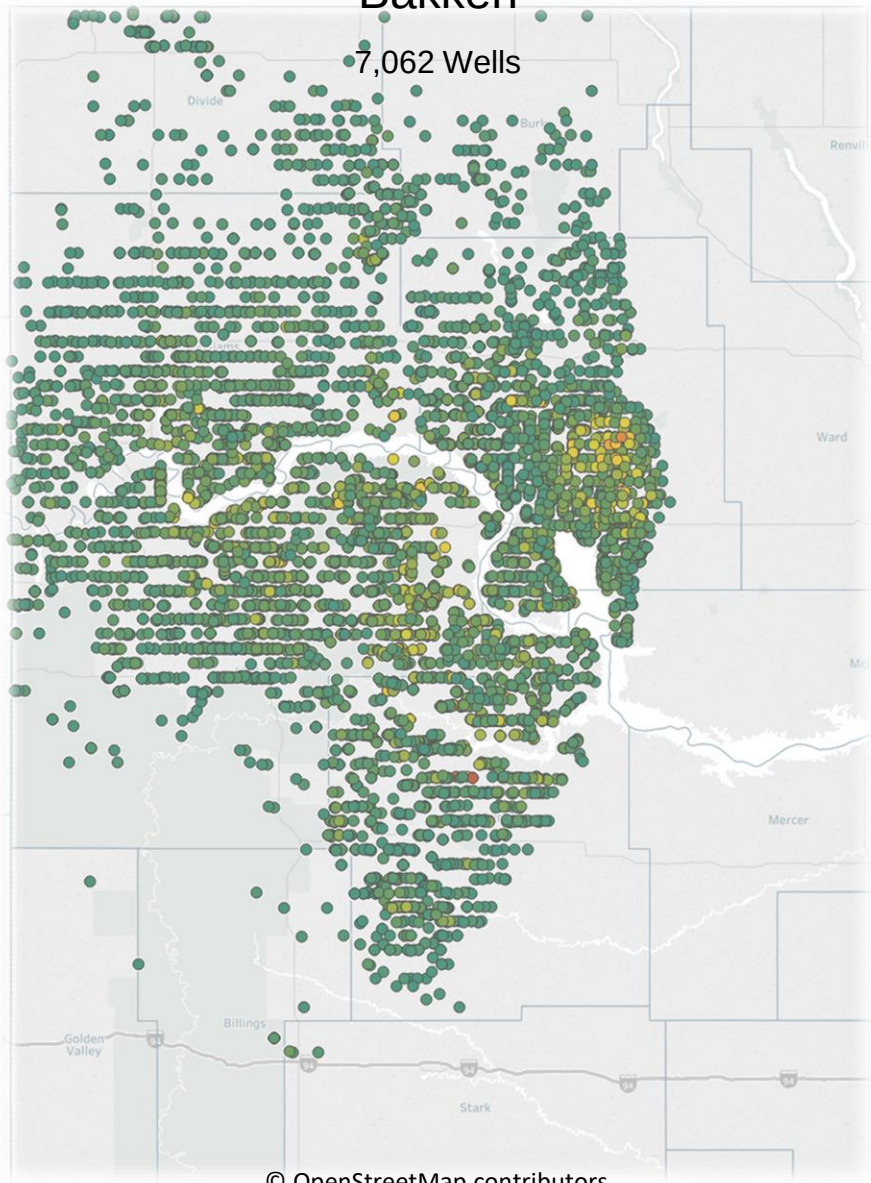
Three Forks

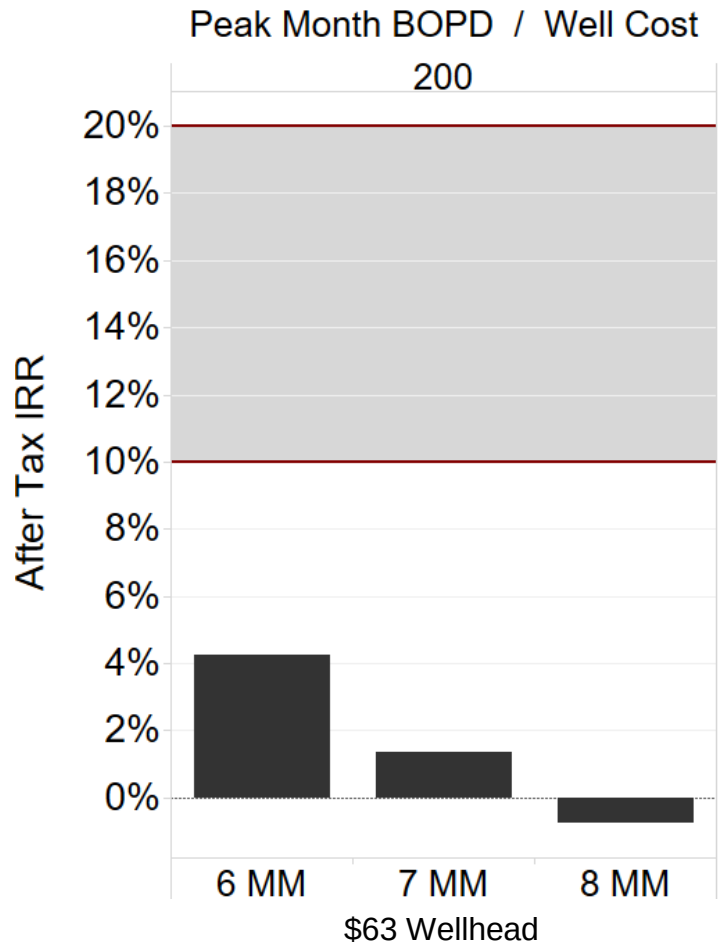
3,755 Wells

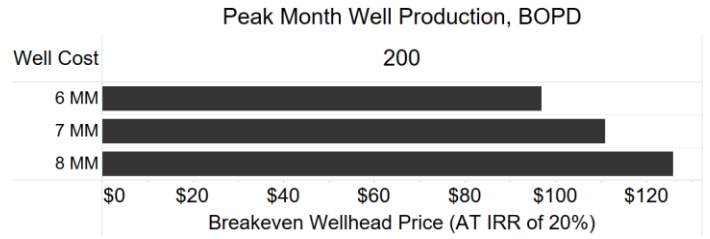


Bakken

7,062 Wells



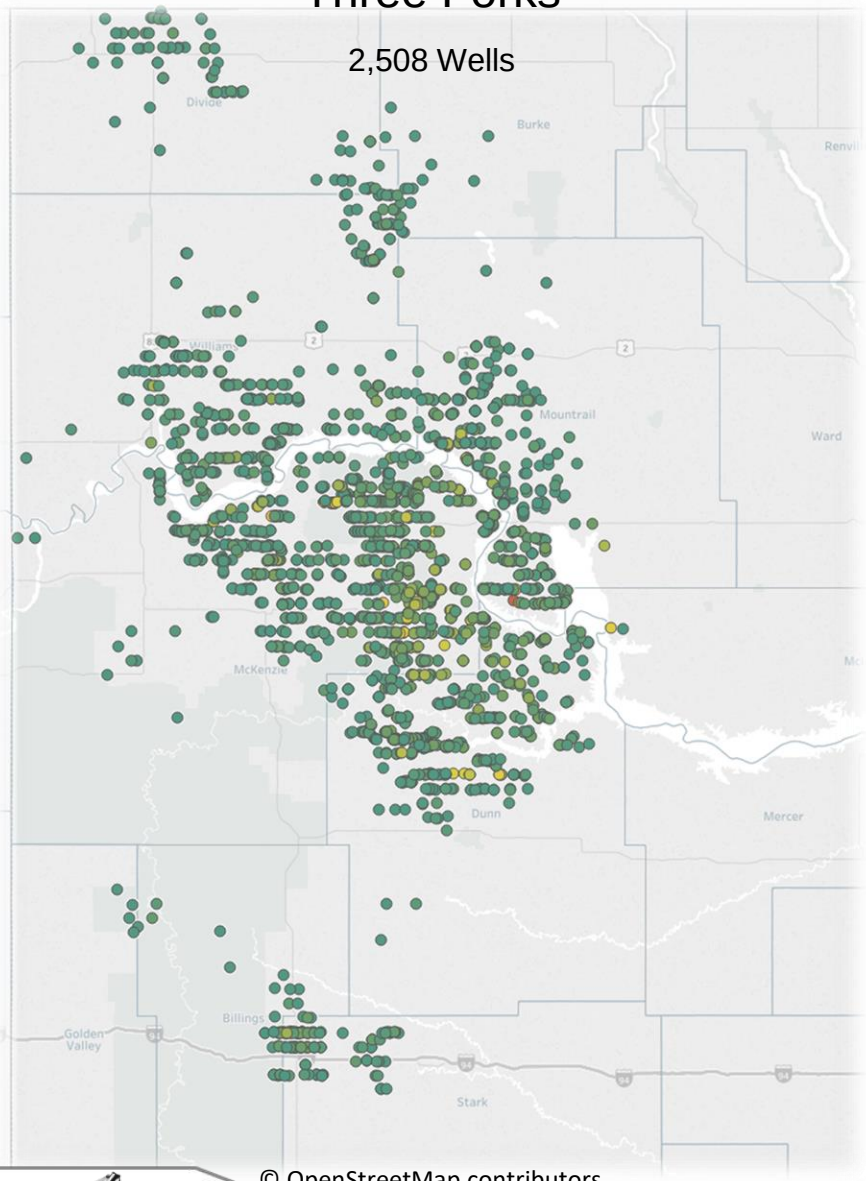




Peak Month Minimum - 400 BOPD

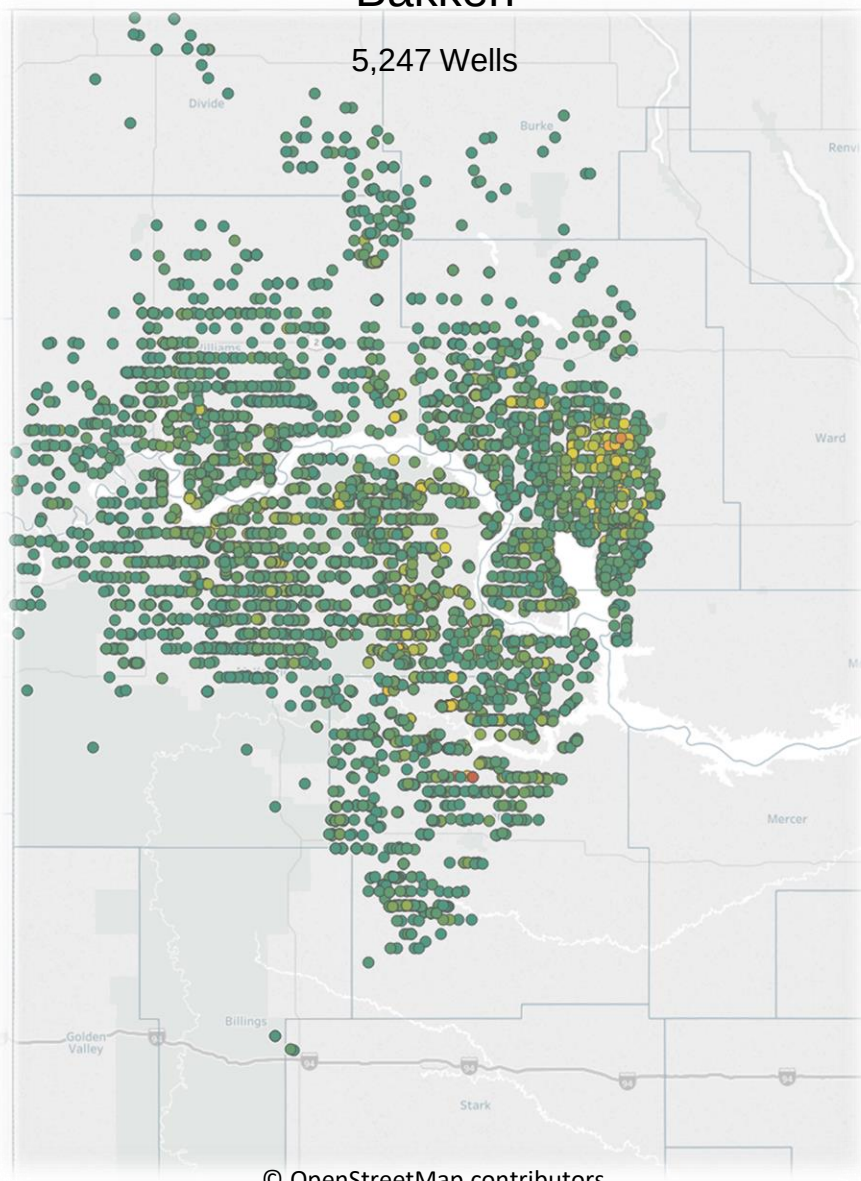
Three Forks

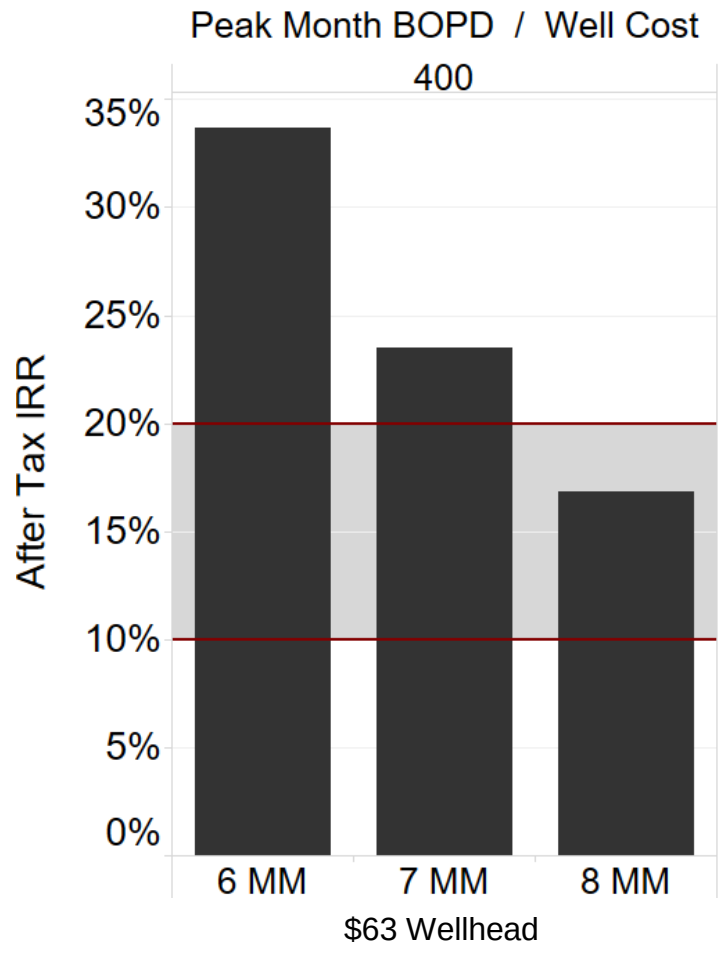
2,508 Wells

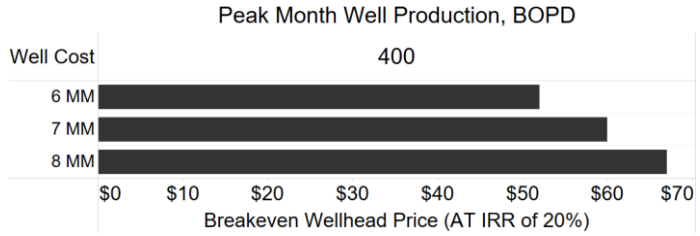


Bakken

5,247 Wells



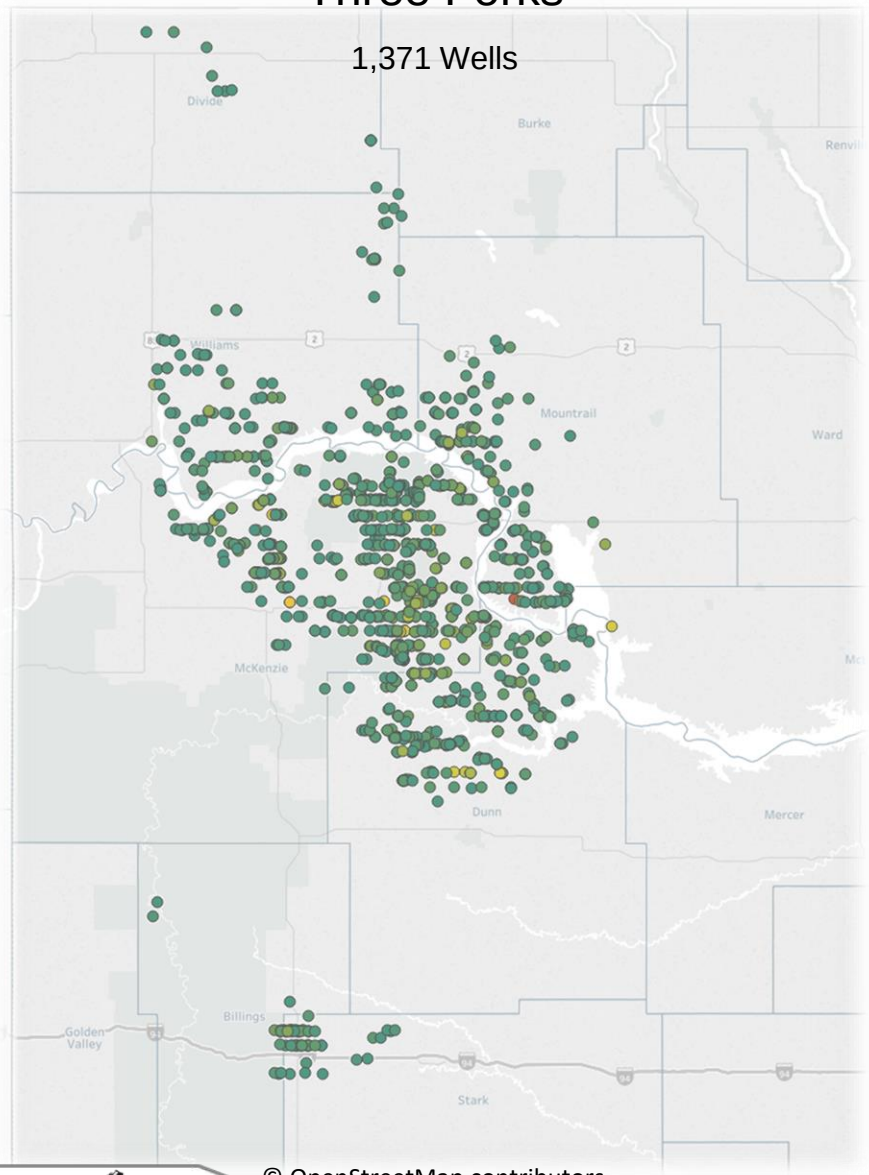




Peak Month Minimum - 600 BOPD

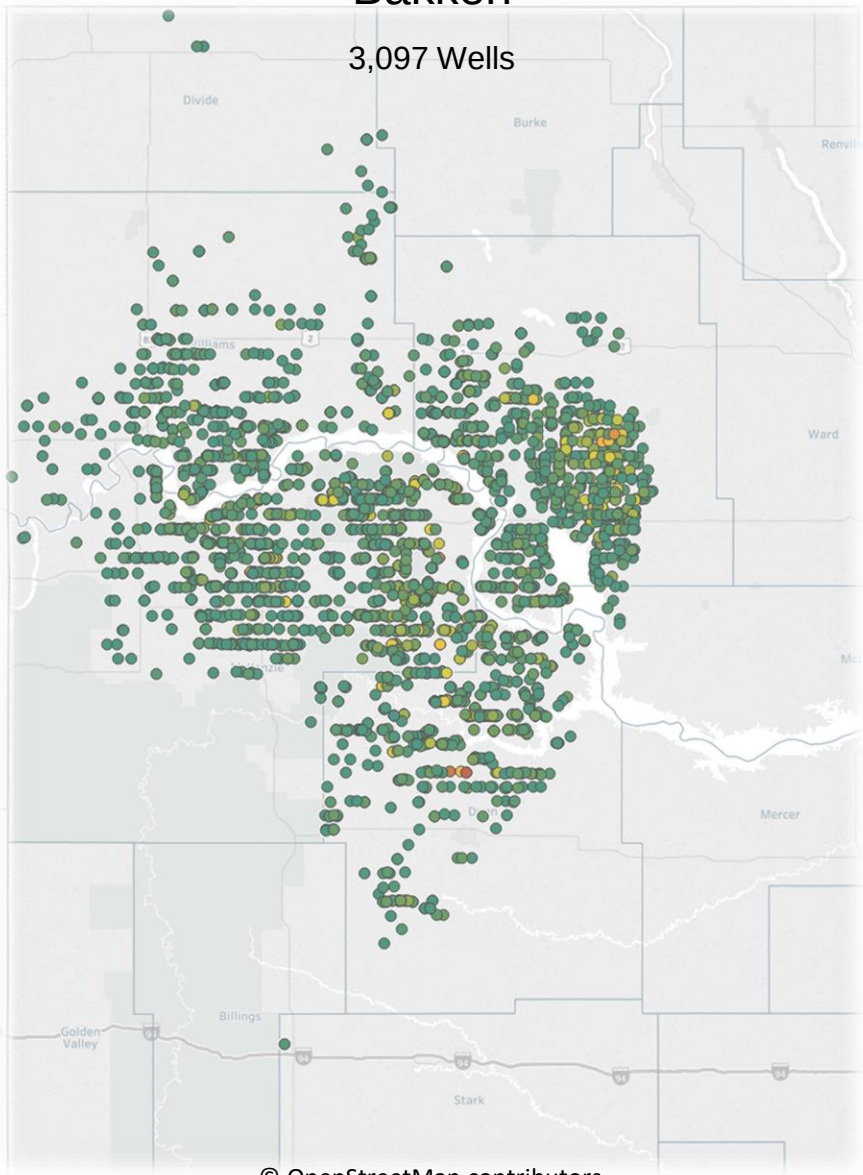
Three Forks

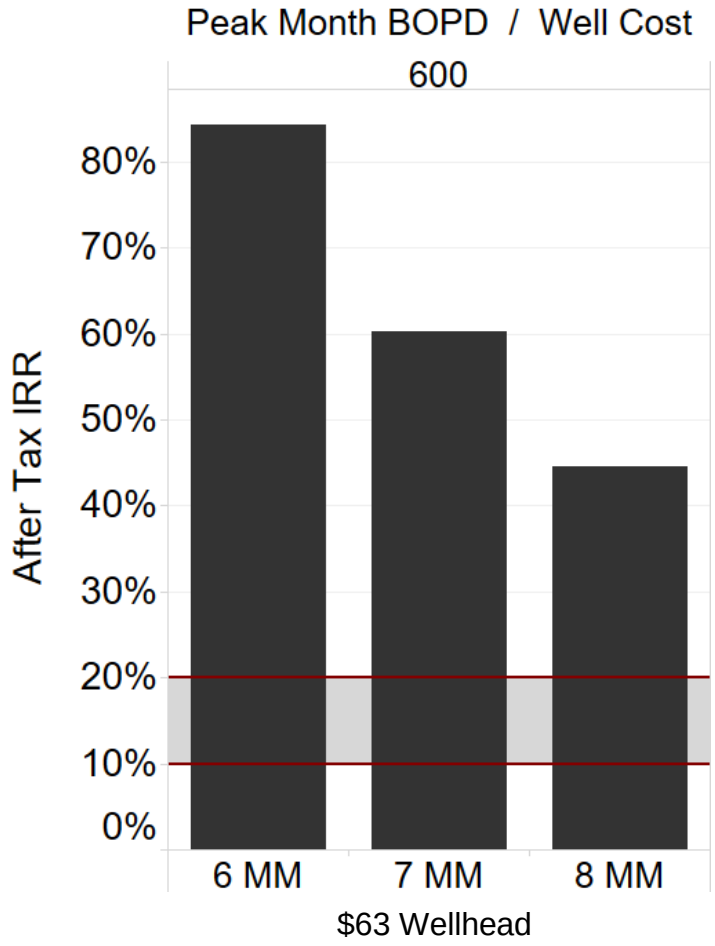
1,371 Wells

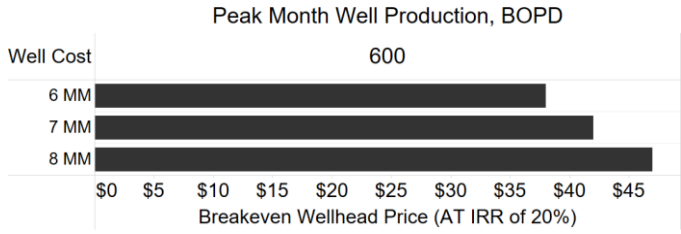


Bakken

3,097 Wells



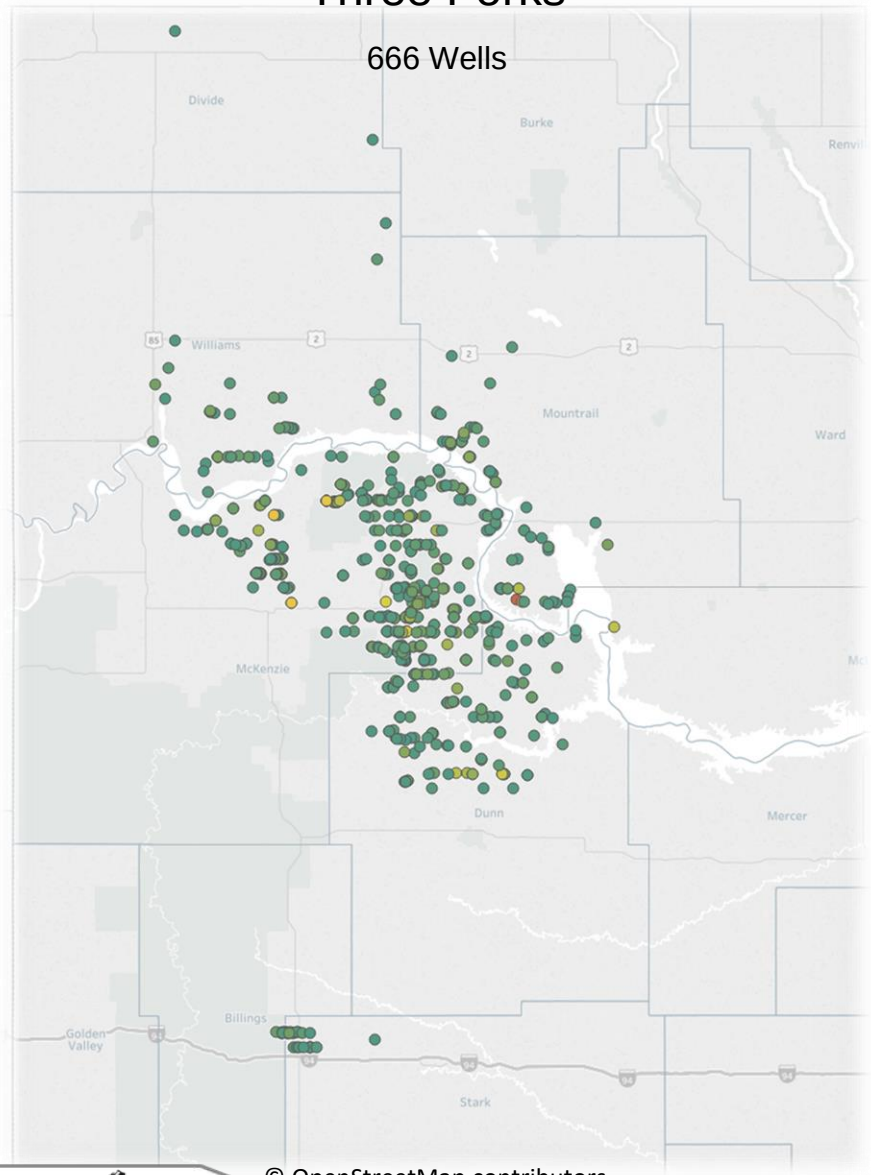




Peak Month Minimum - 800 BOPD

Three Forks

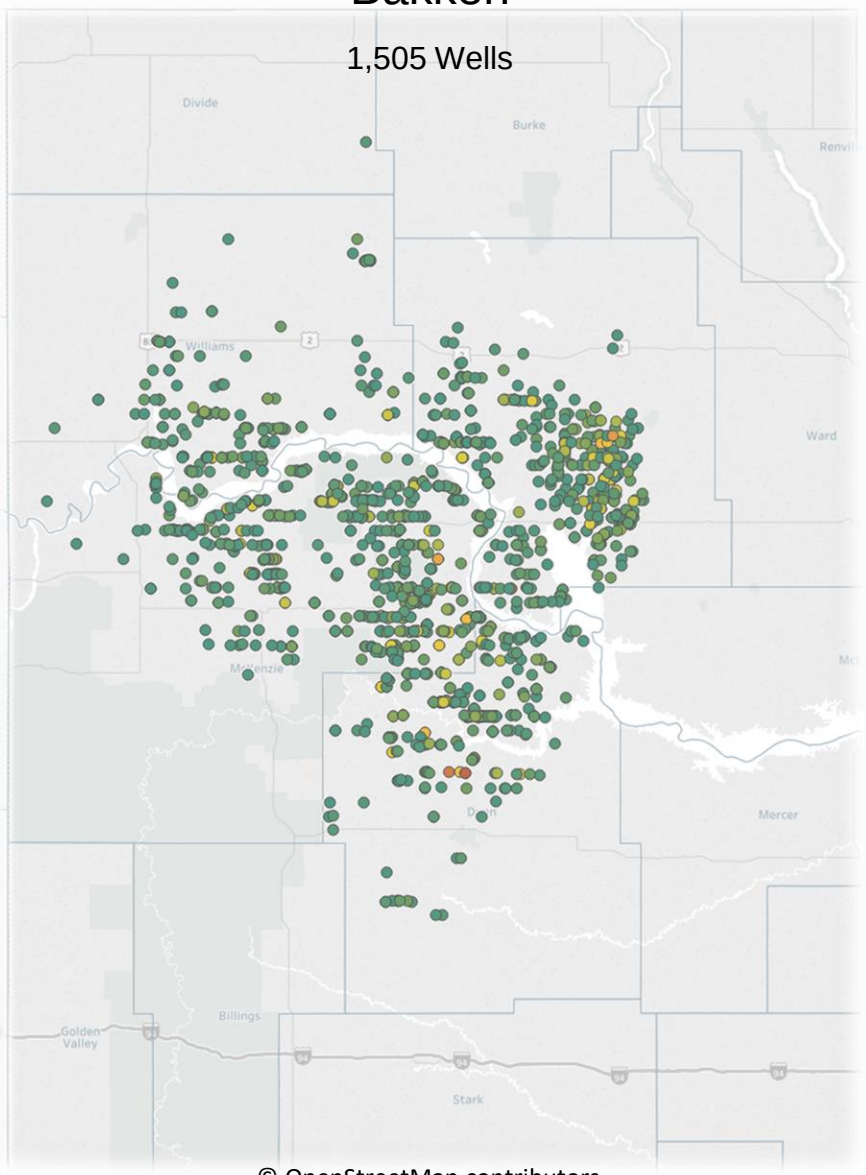
666 Wells



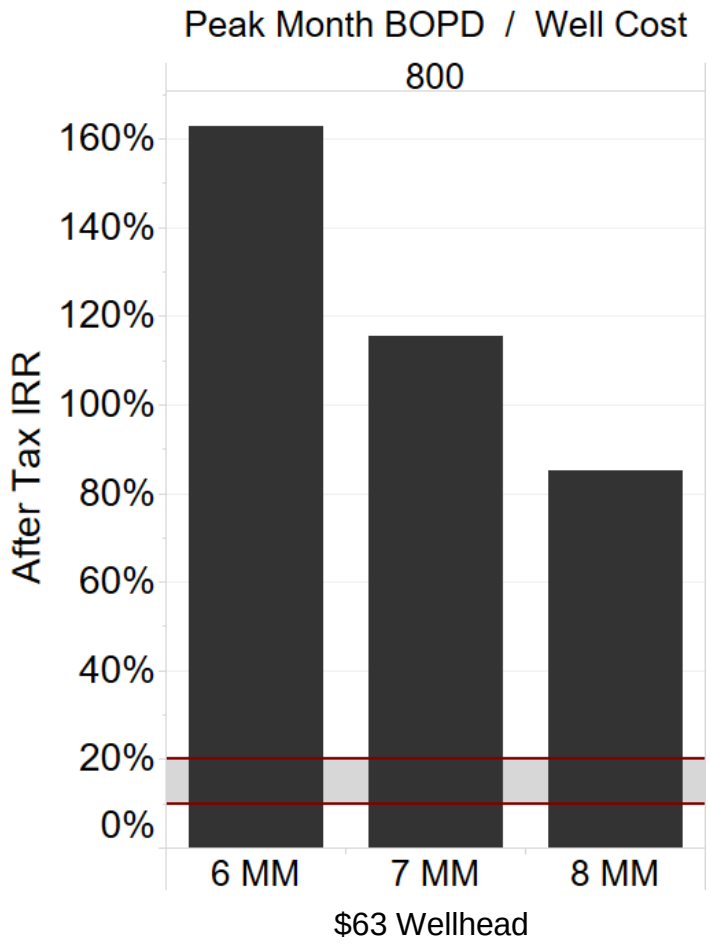
© OpenStreetMap contributors

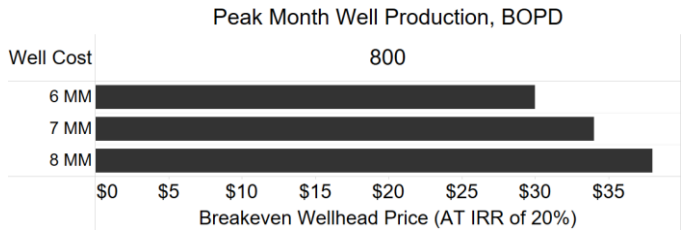
Bakken

1,505 Wells



© OpenStreetMap contributors

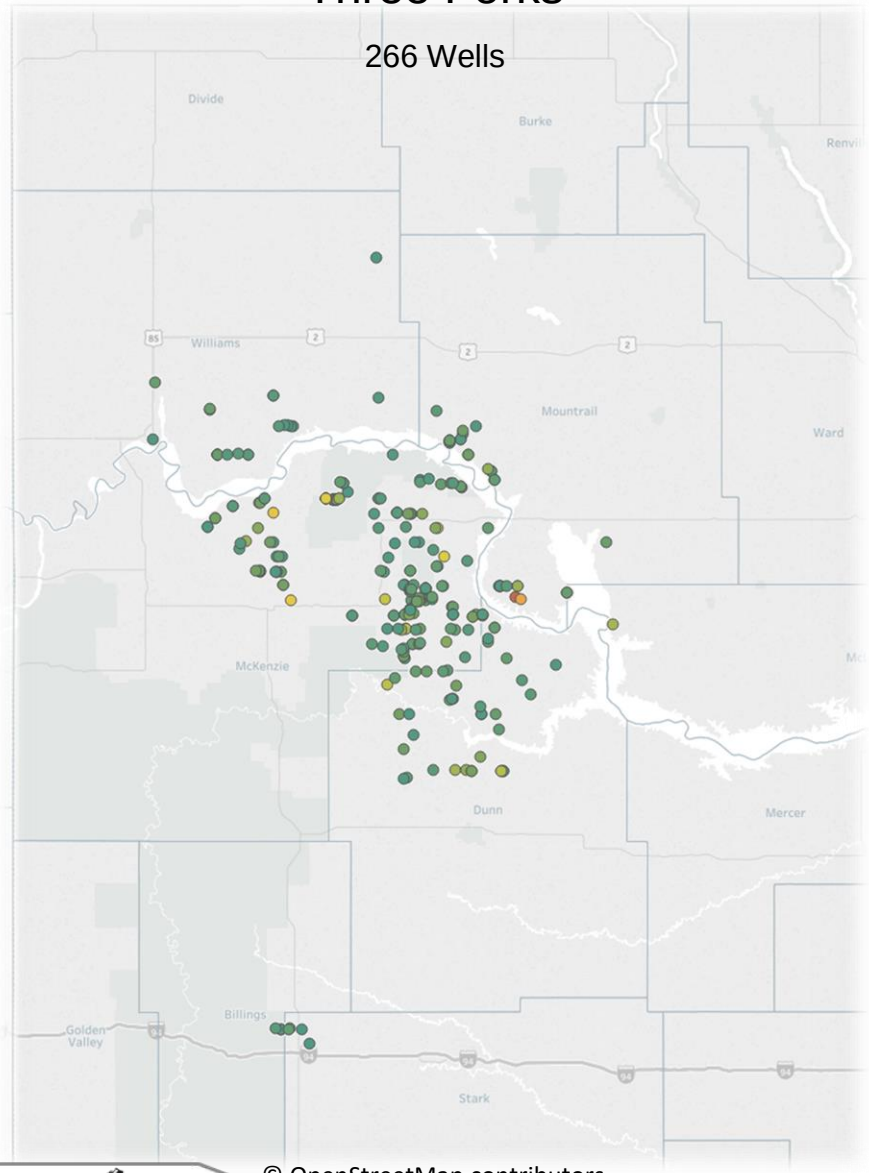




Peak Month Minimum – 1,000 BOPD

Three Forks

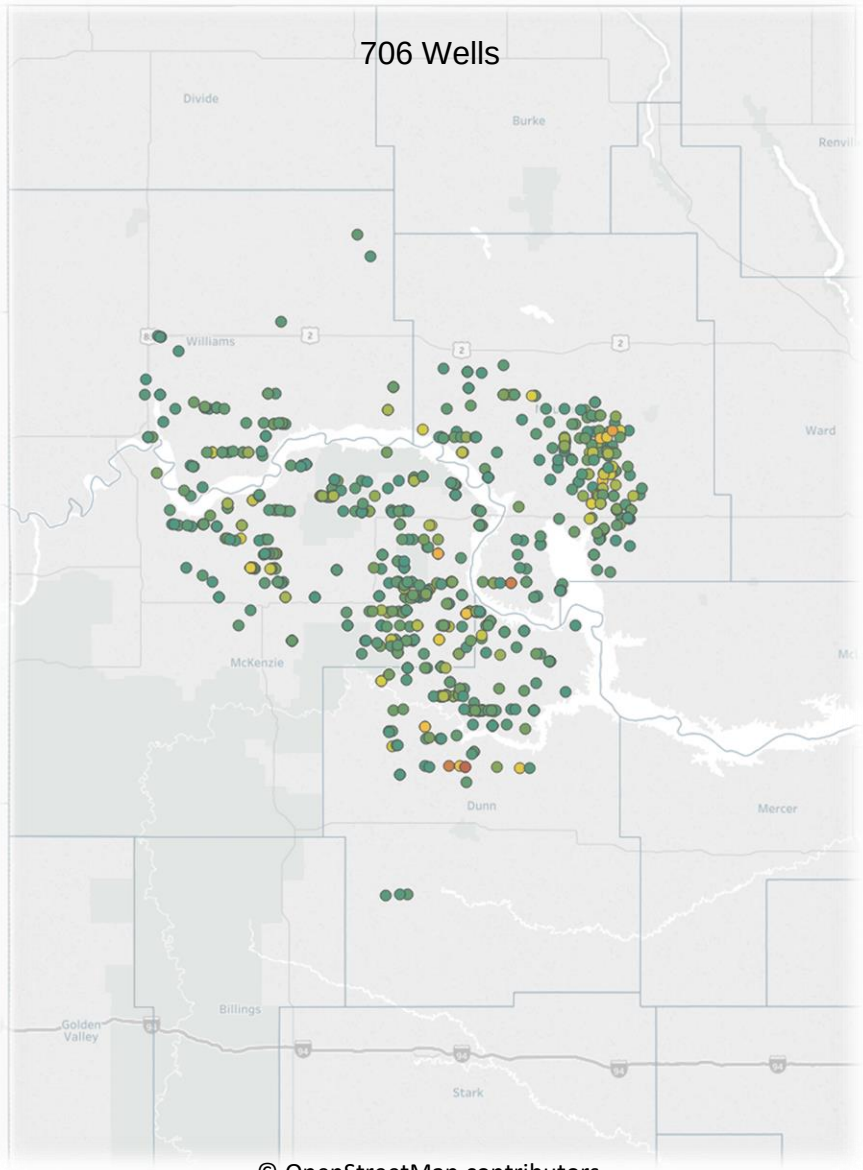
266 Wells



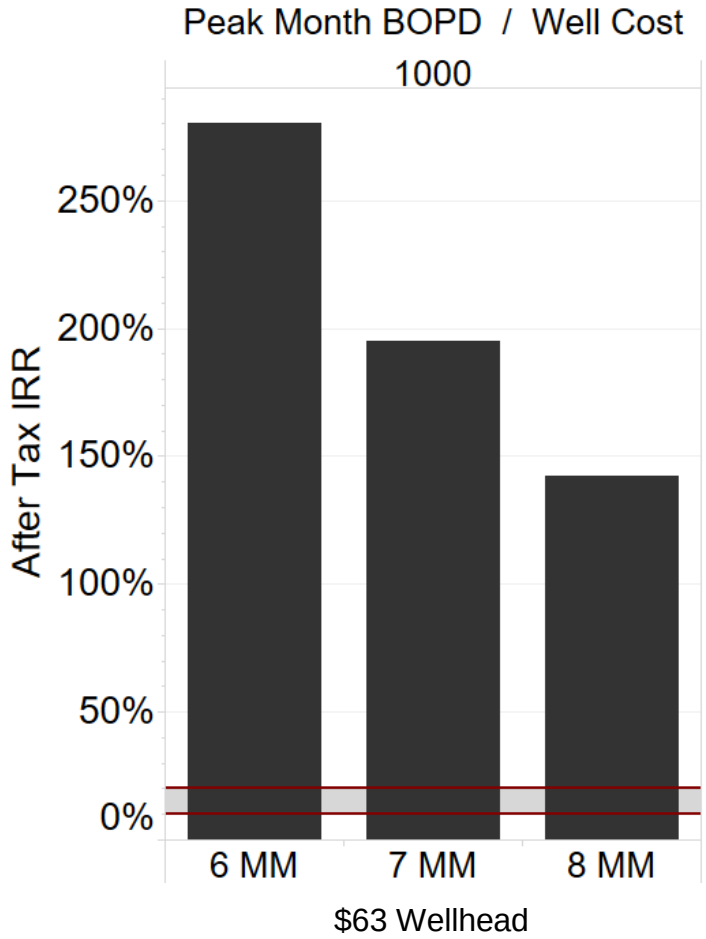
© OpenStreetMap contributors

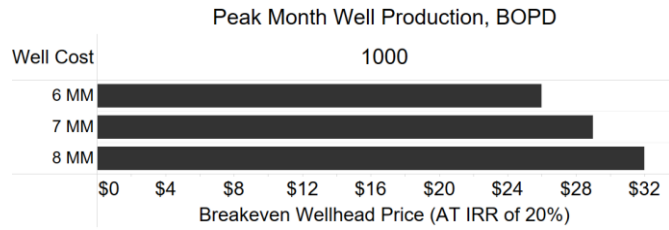
Bakken

706 Wells



© OpenStreetMap contributors

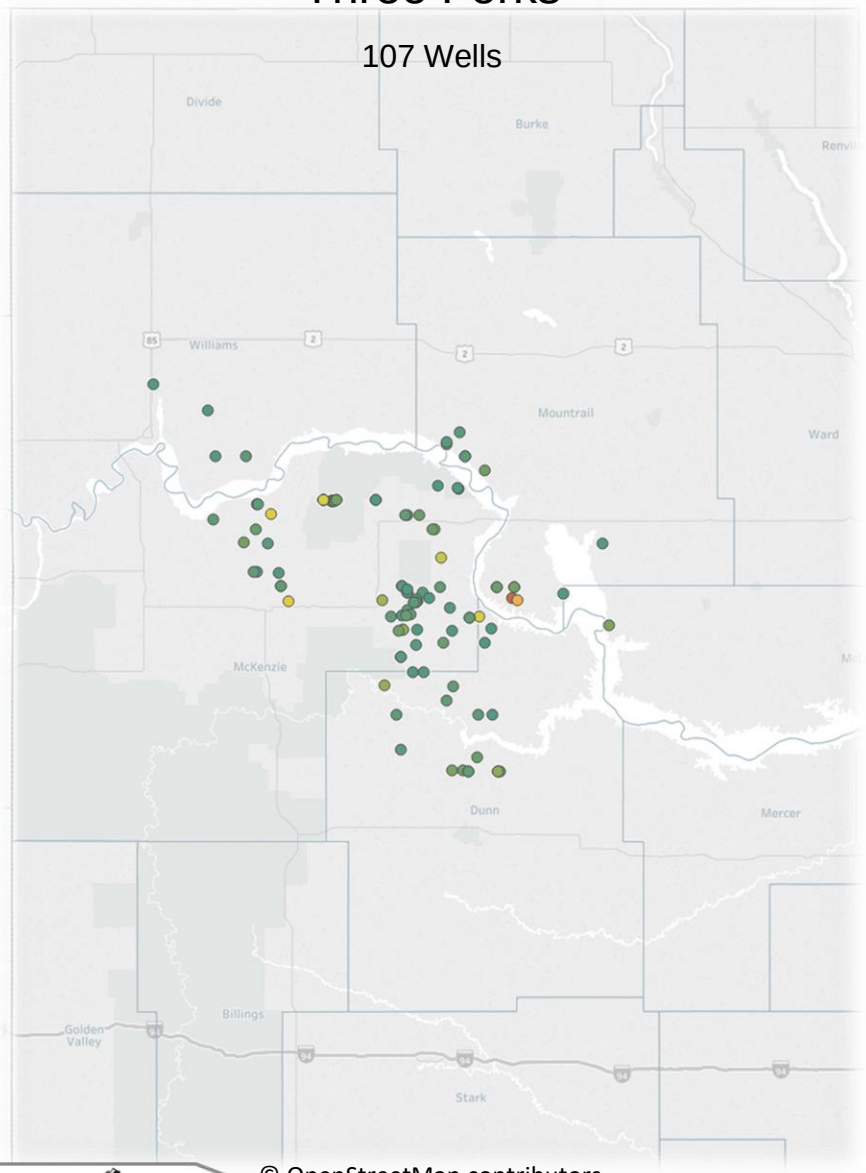




Peak Month Minimum – 1,250 BOPD

Three Forks

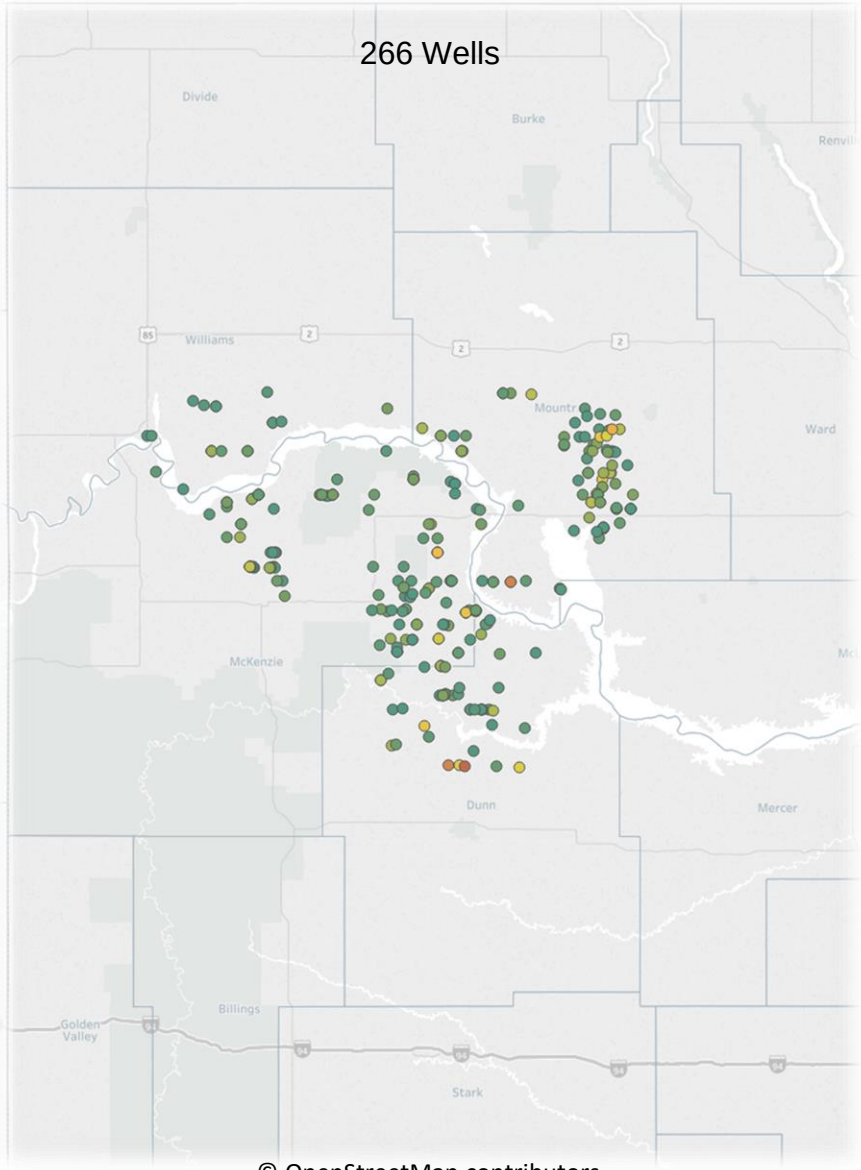
107 Wells



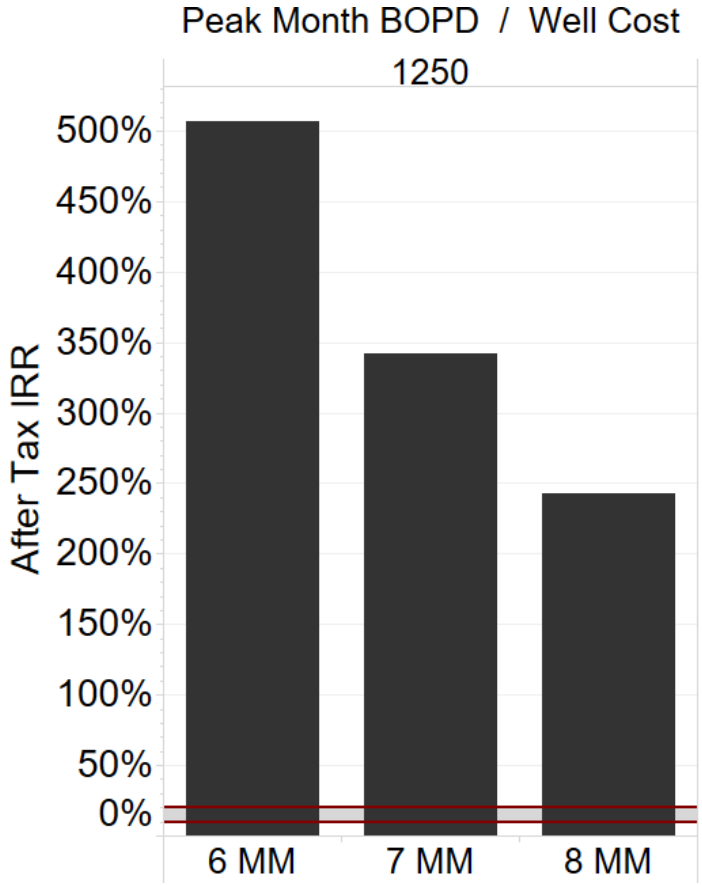
© OpenStreetMap contributors

Bakken

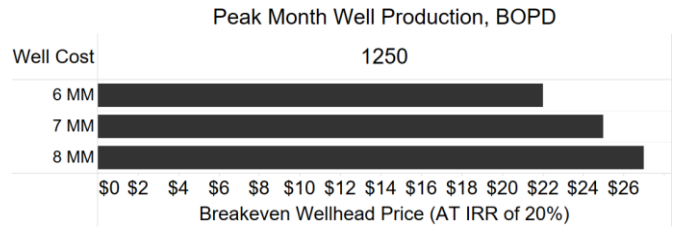
266 Wells



© OpenStreetMap contributors



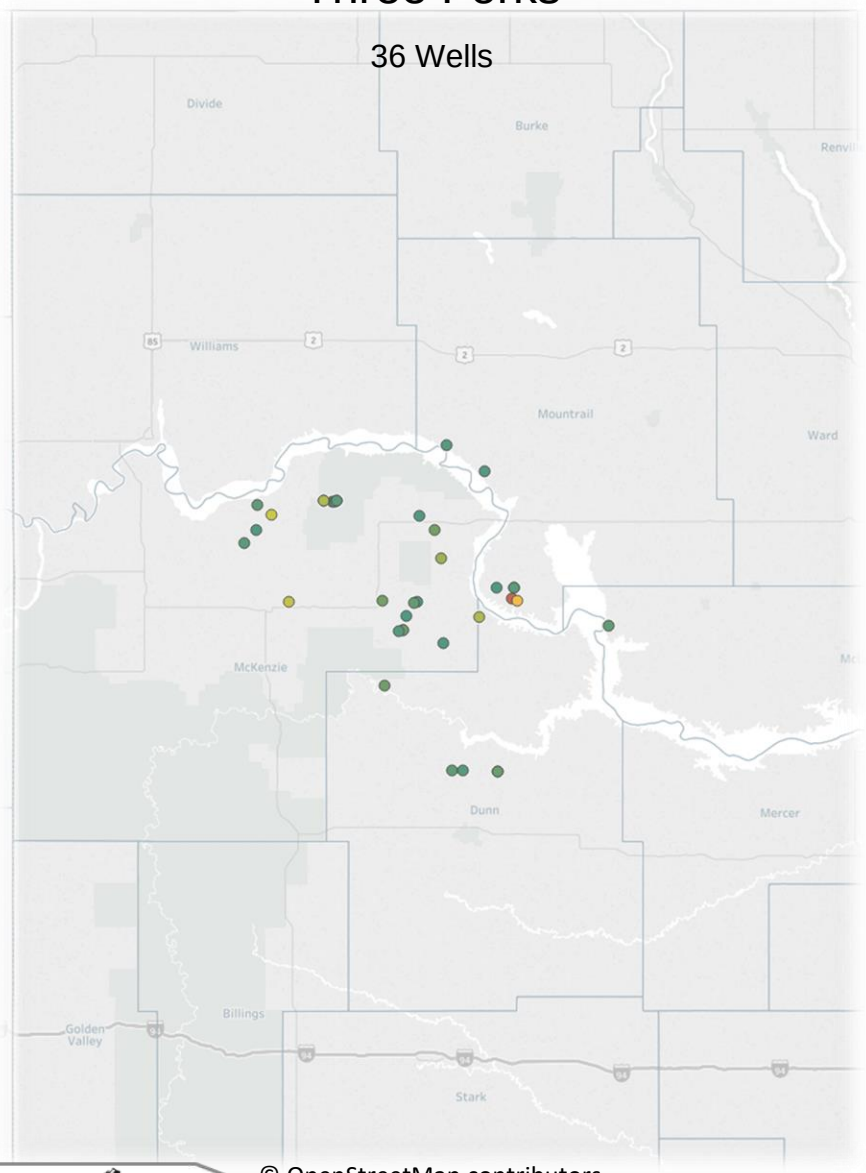
$63 Wellhead



Peak Month Minimum – 1,500 BOPD

Three Forks

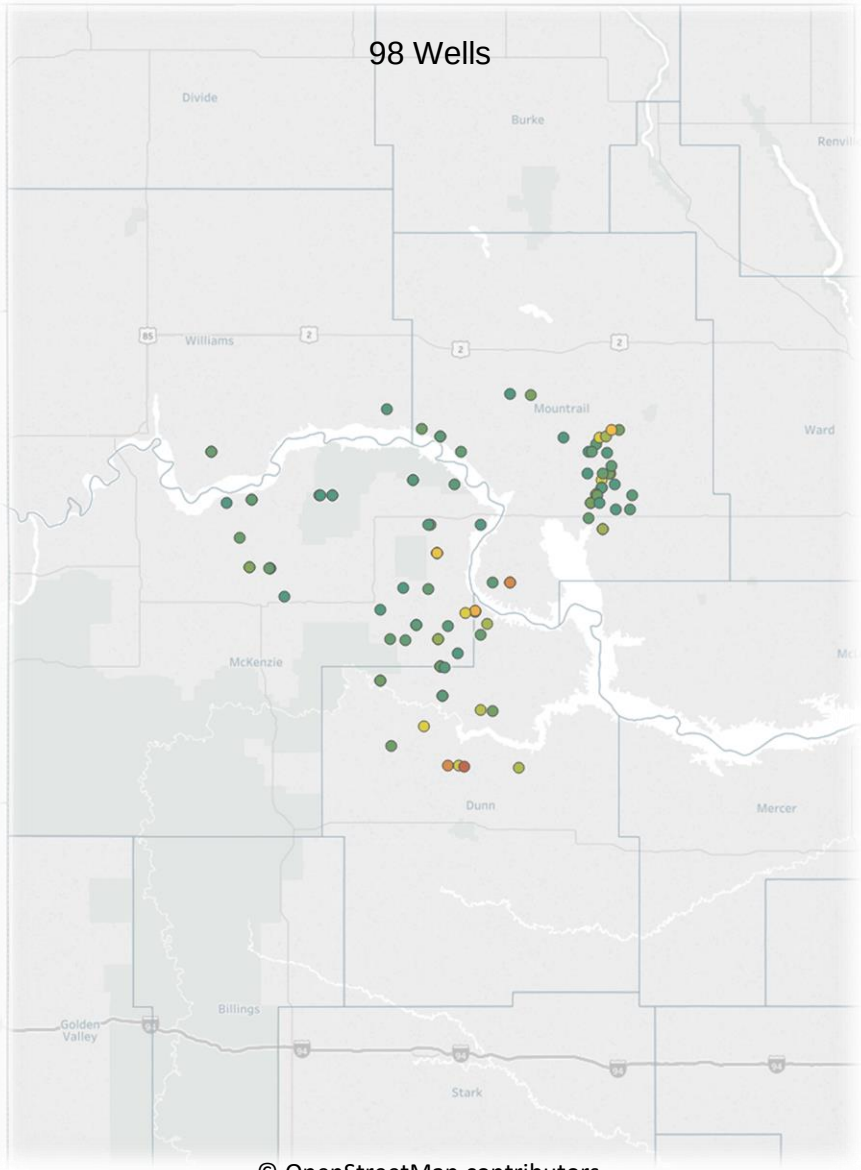
36 Wells



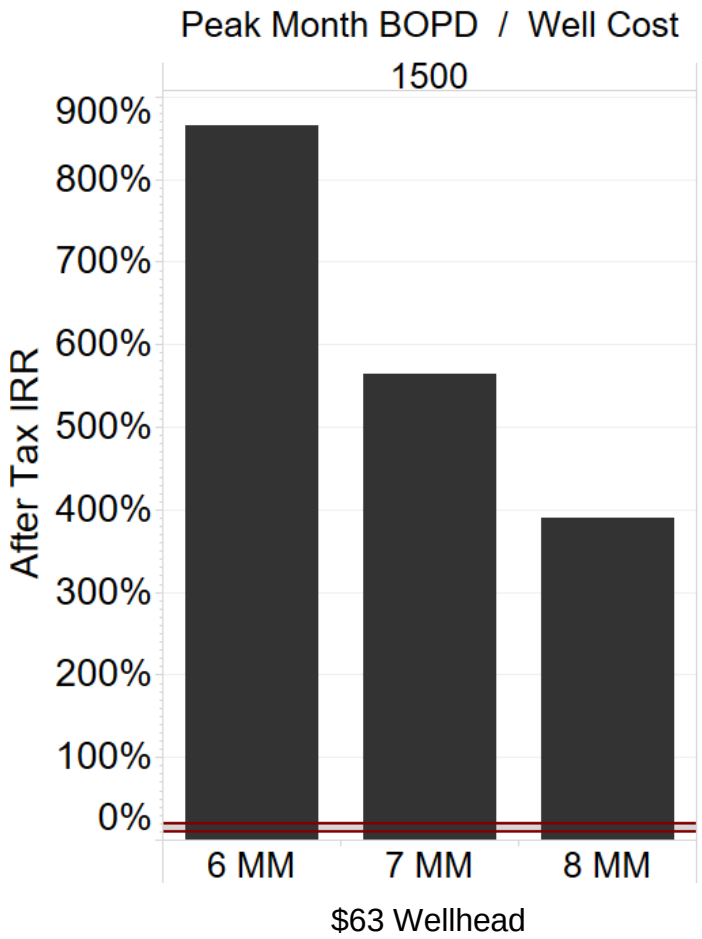
© OpenStreetMap contributors

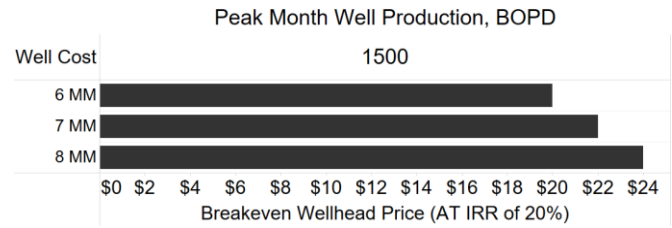
Bakken

98 Wells

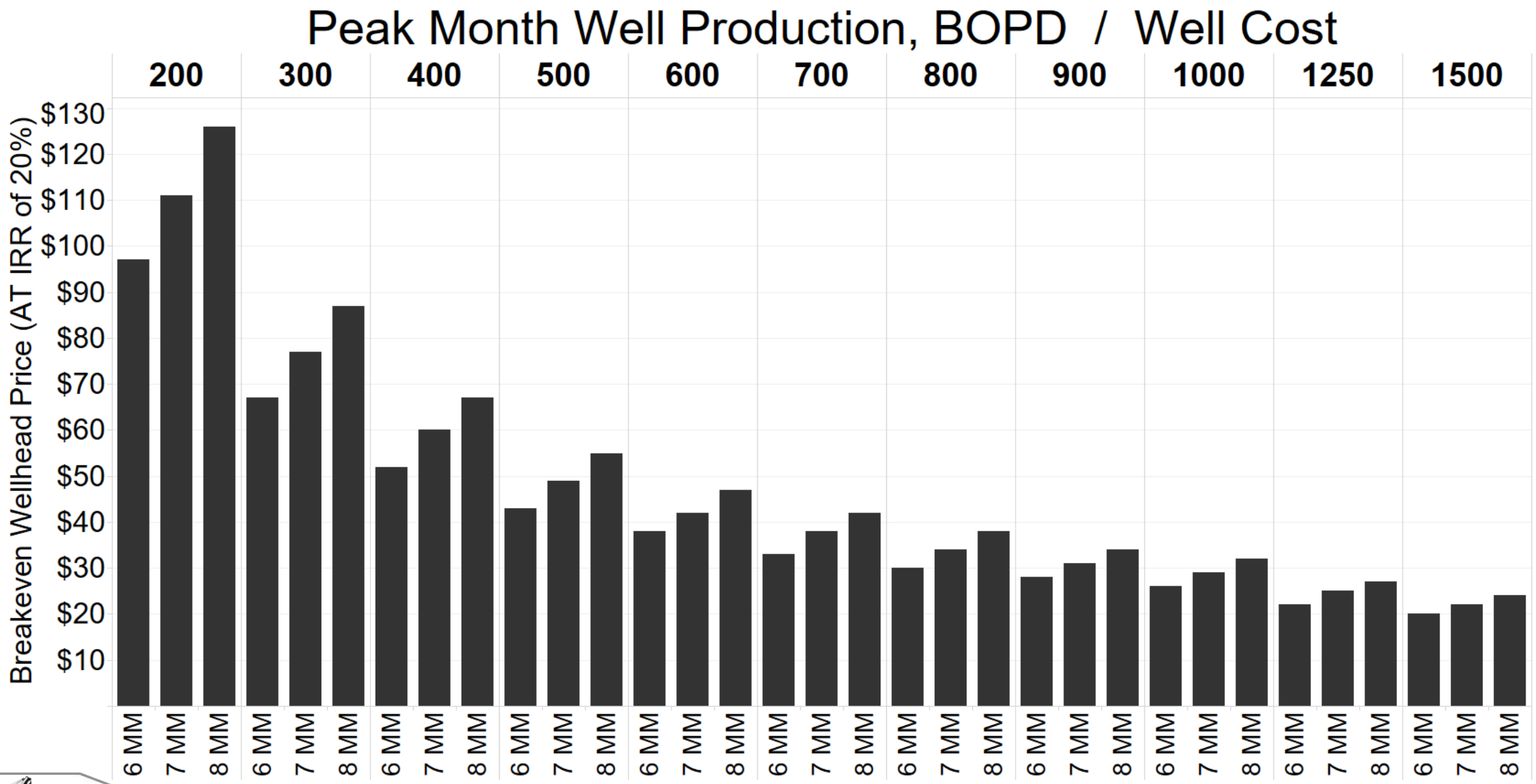


© OpenStreetMap contributors





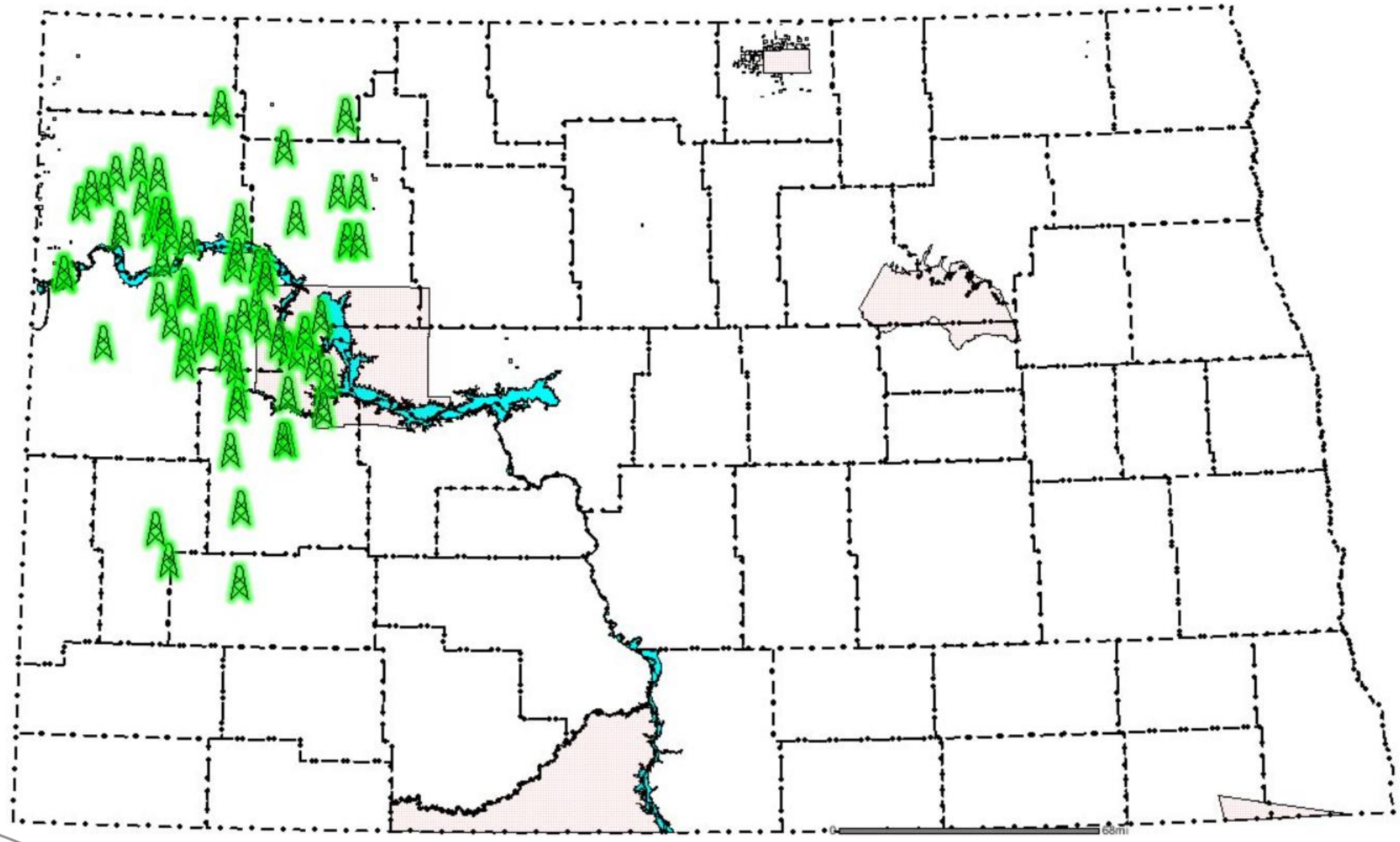
Breakeven Summary



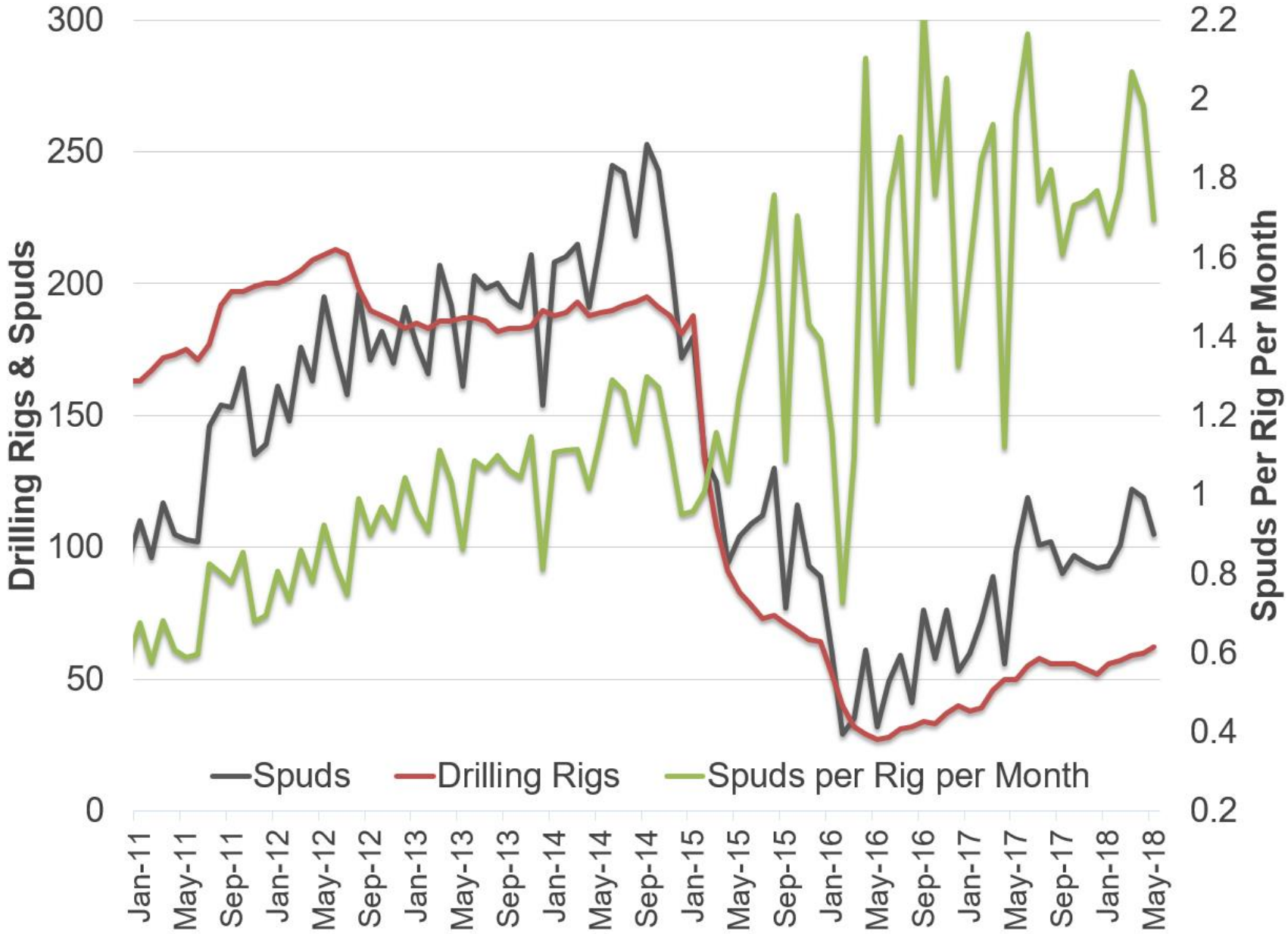
Presentation Outline

- 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
- Pipeline construction update

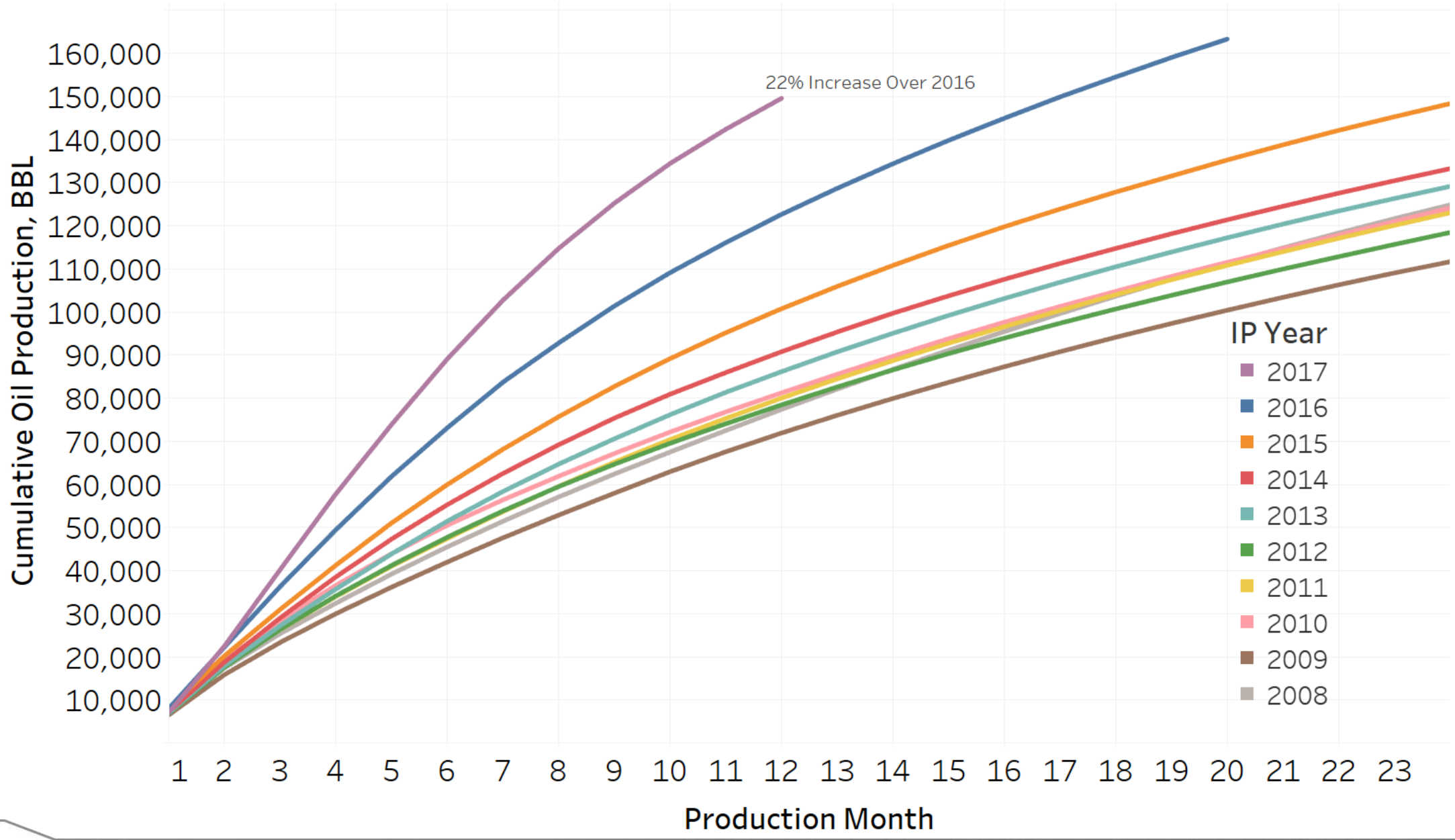
Drilling Activity – 65 Rigs (July 6, 2018)



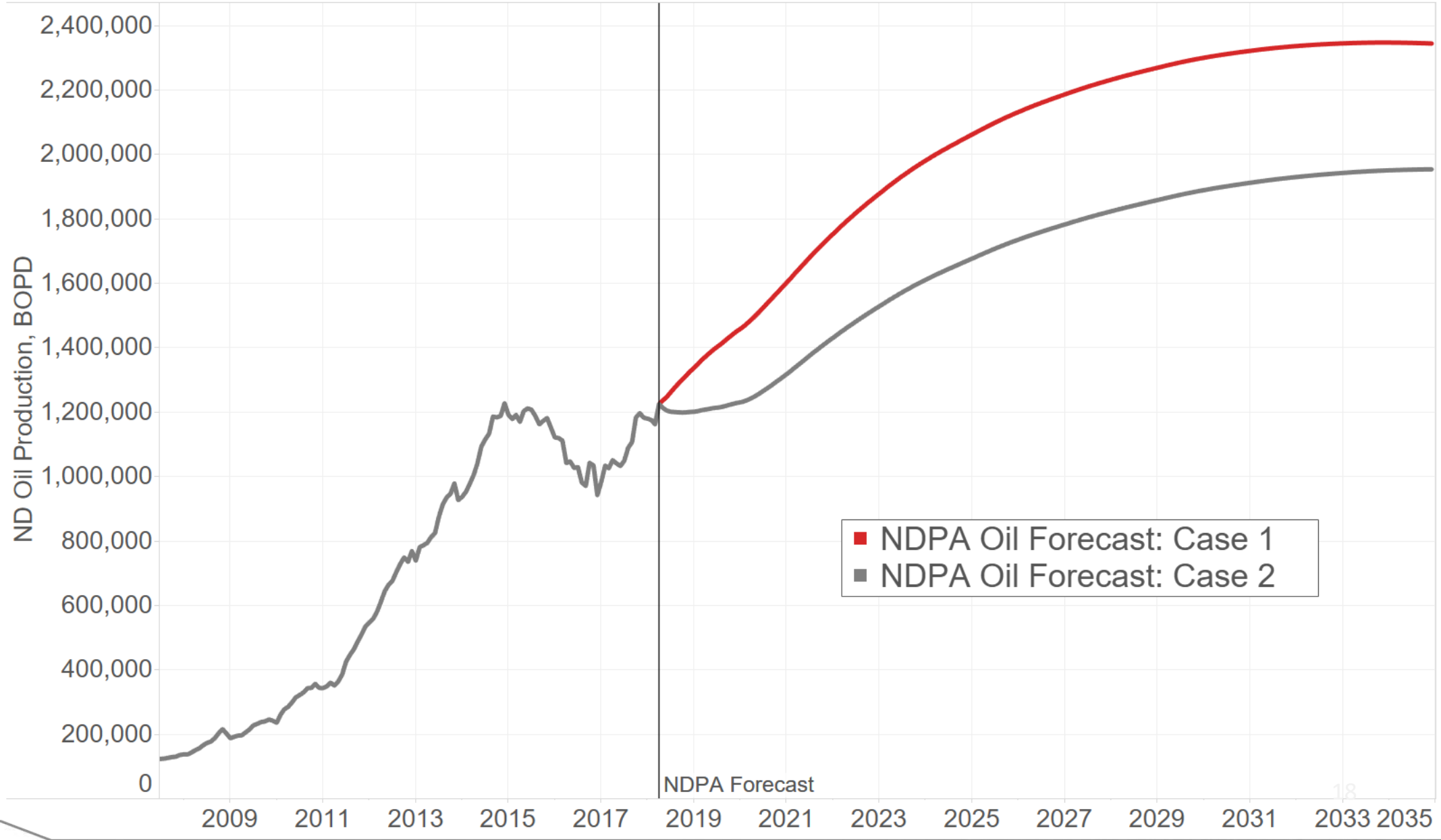
North Dakota Drilling Activity



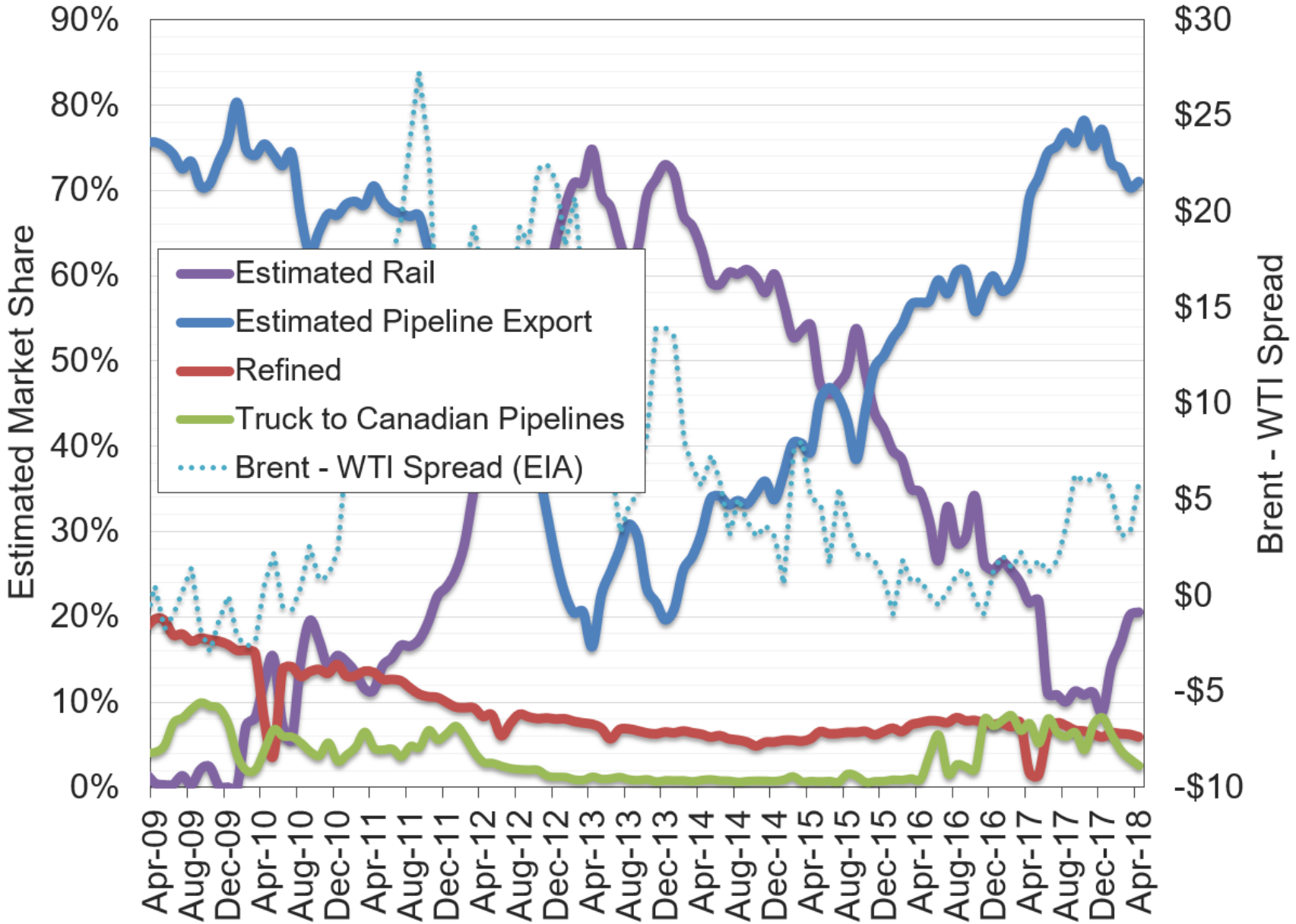
Statewide Oil Performance



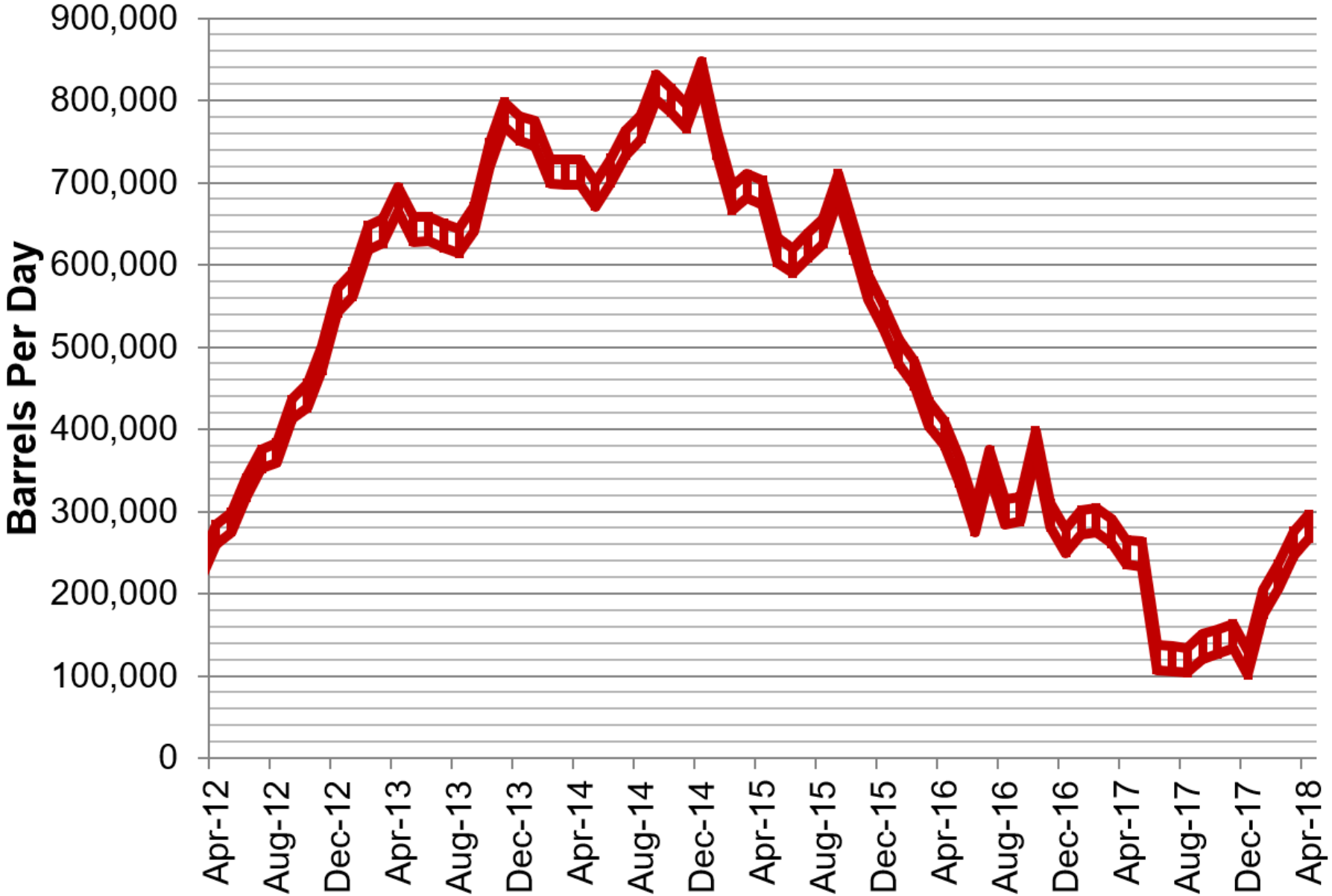
North Dakota Oil Production Forecast



Estimated Williston Basin Oil Transportation



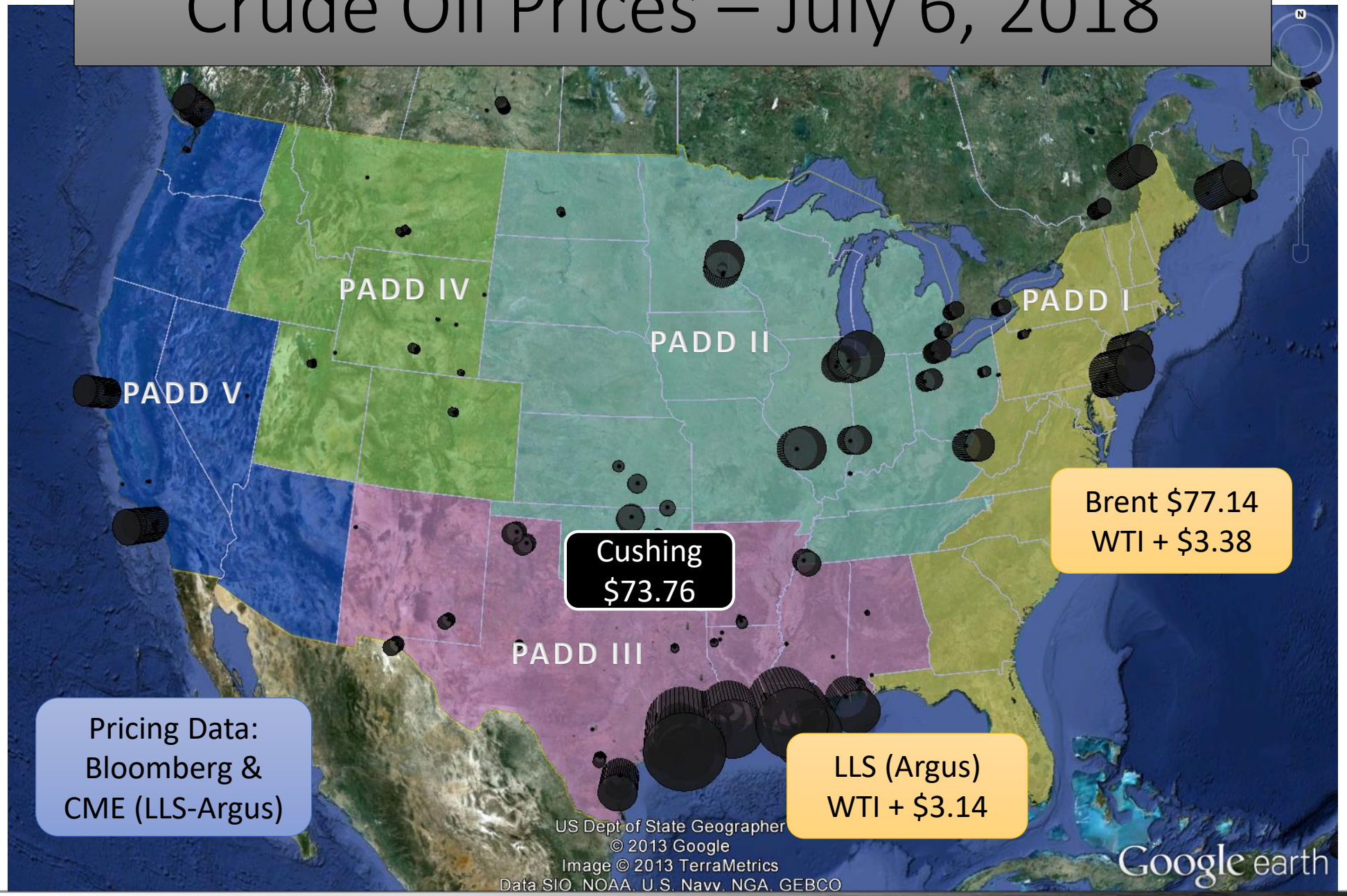
Estimated ND Rail Export Volumes



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
- Pipeline construction update

Crude Oil Prices – July 6, 2018



North Dakota Impact of Smaller Discount

- 2016 Weighted Average Discount: $7.71
- June 2017 - April 2018 Wt. Average Discount: $4.66
- $3.05/BBL Improvement Post DAPL Commercial In-Service

- 376,694,561 Taxable Barrels In June 2017 - April 2018
- Wt. Avg. Tax Rate in June 2017 - April 2018: 9.74%

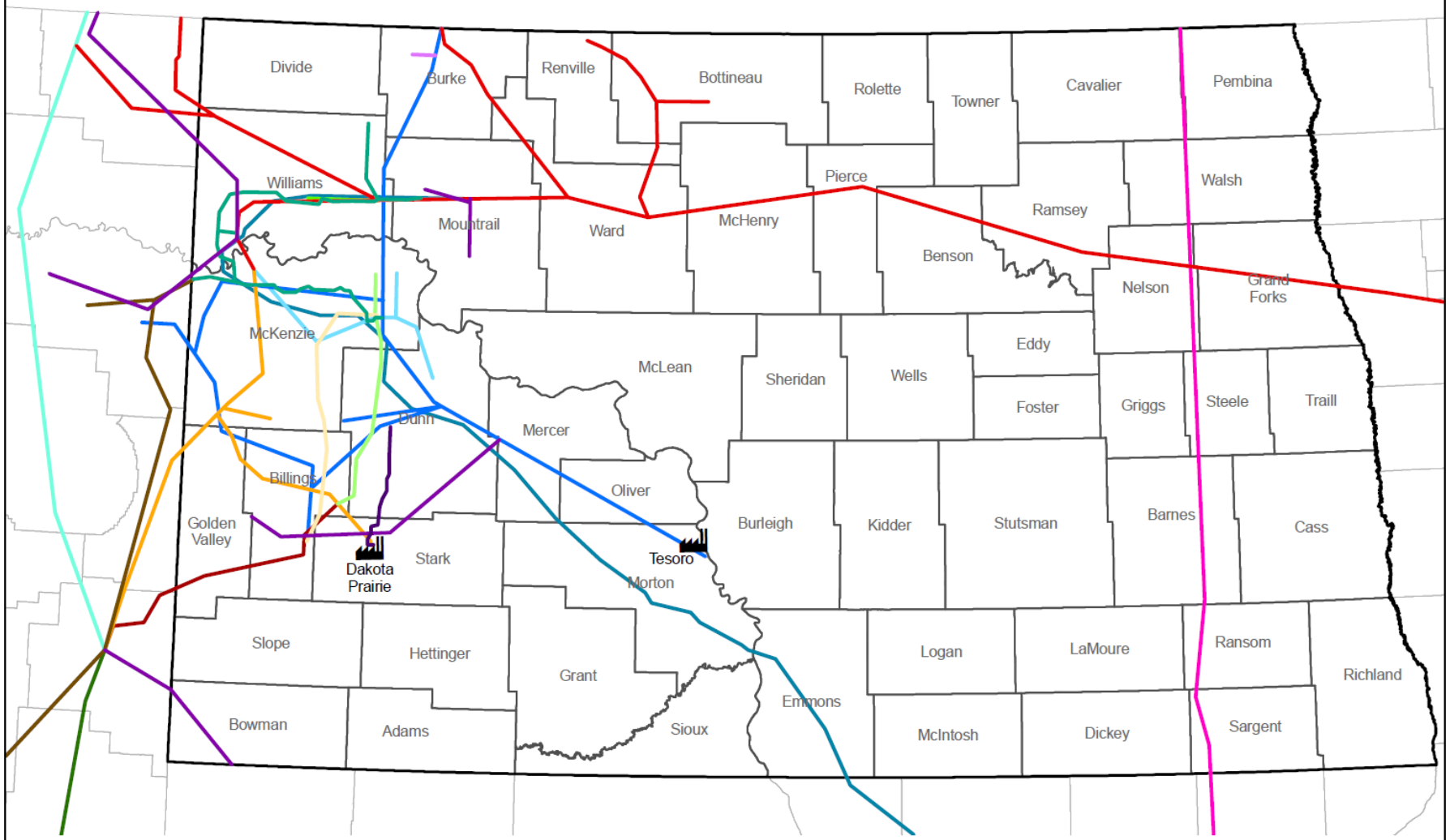
<u>Eleven Month Revenue Impact</u>

- 9.74% x 376,694,561 x $3.05 =

$111+ Million Additional State Revenue
When Compared to Avg. 2016 Discount

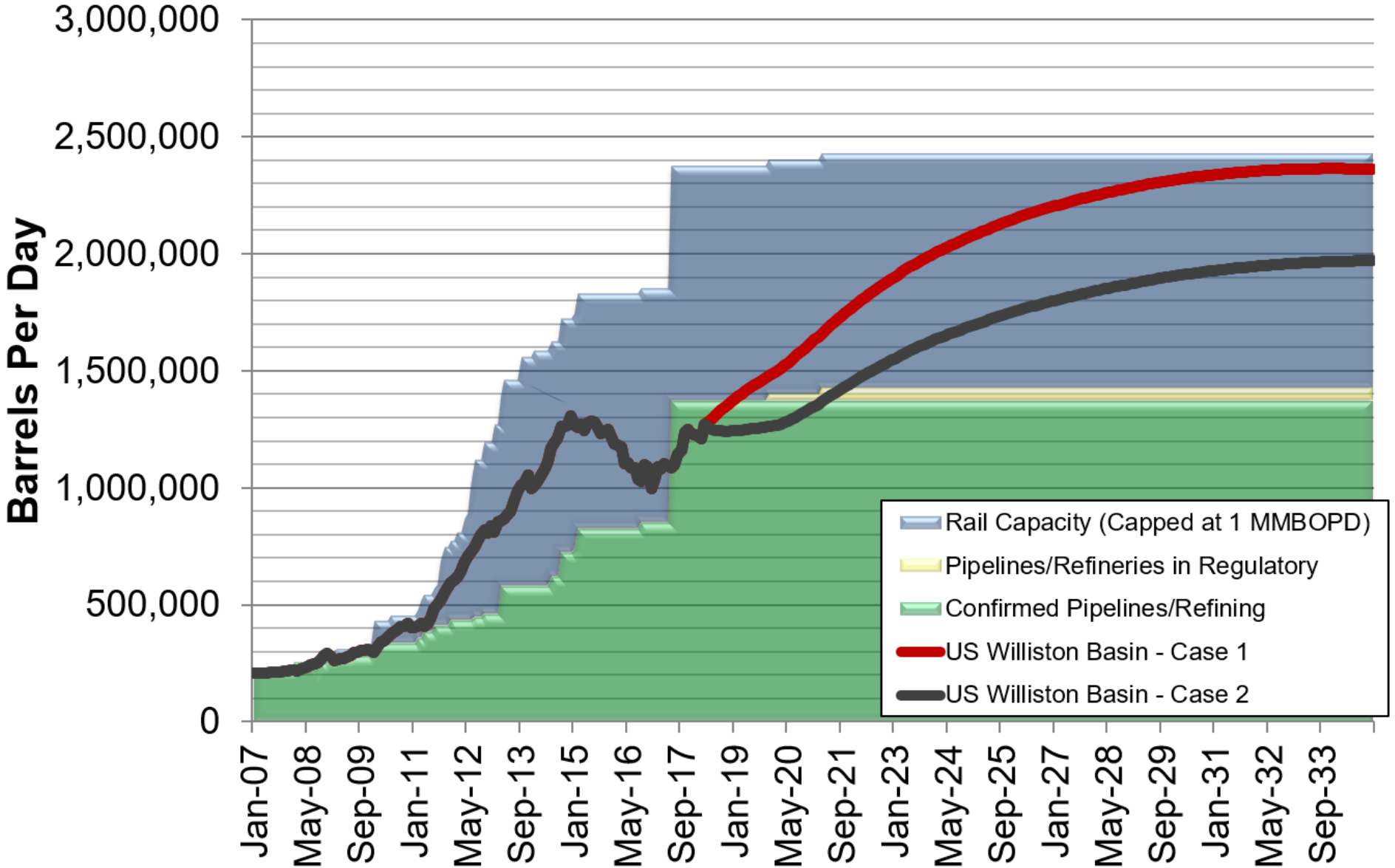
Does Not Include Royalty Owner
and Industry Revenue Impact

North Dakota Crude Oil Pipelines



Date: 6/2/2017

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.

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**
- Pipeline construction update

Natural Gas Capture

Production

- Technology
- Markets

Gathering

- Capacity
- Connections

Processing

- Capacity
- Location

Transmission

- Dry Gas
- Natural Gas Liquids

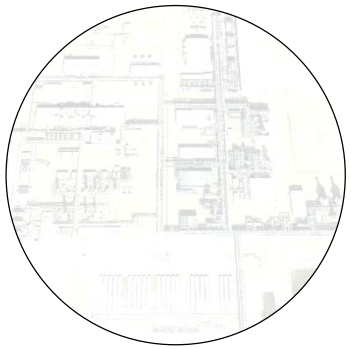
Natural Gas Capture

Production

- Technology
- Markets

Gathering

- Capacity
- Connections



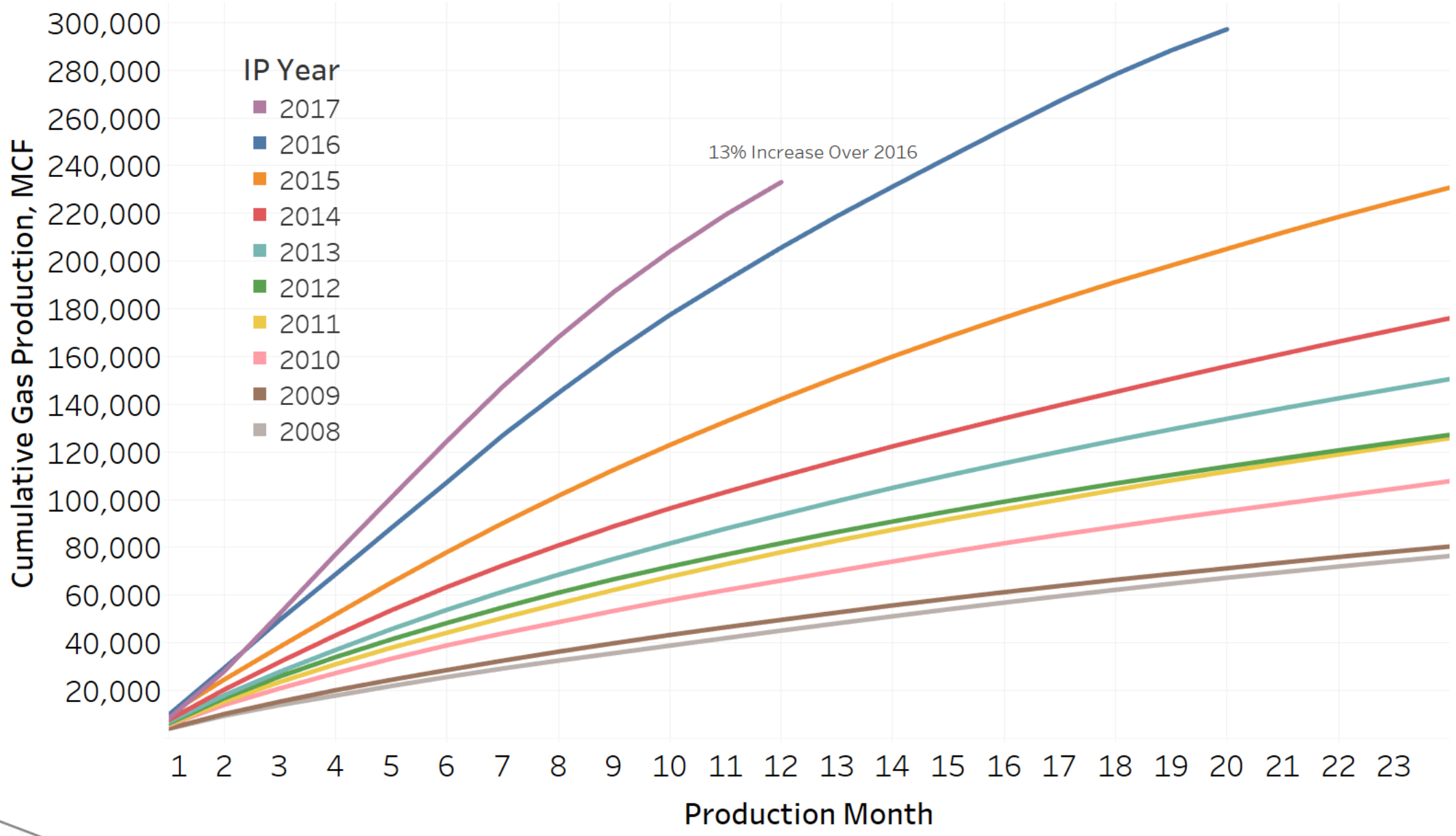
Processing

- Capacity
- Location

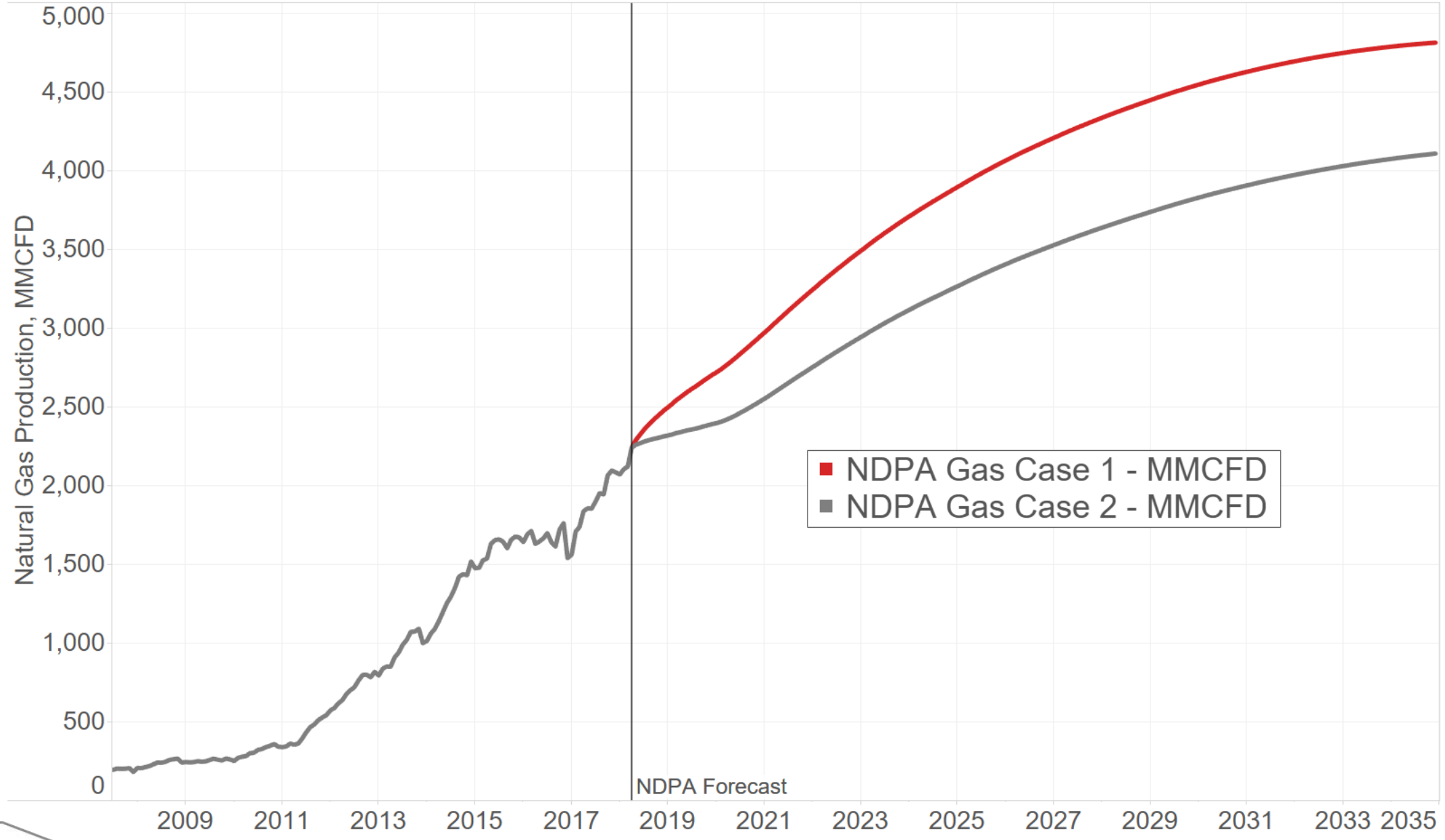
Transmission

- Dry Gas
- Natural Gas Liquids

Statewide Gas Performance



NDPA North Dakota Gas Production Forecast



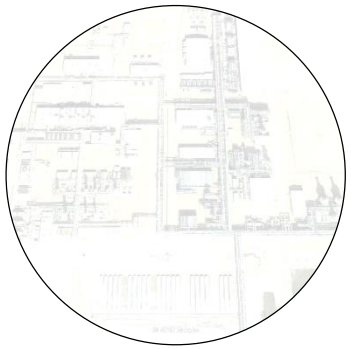
Natural Gas Capture

Production

- Technology
- Markets

Gathering

- Capacity
- Connections



Processing

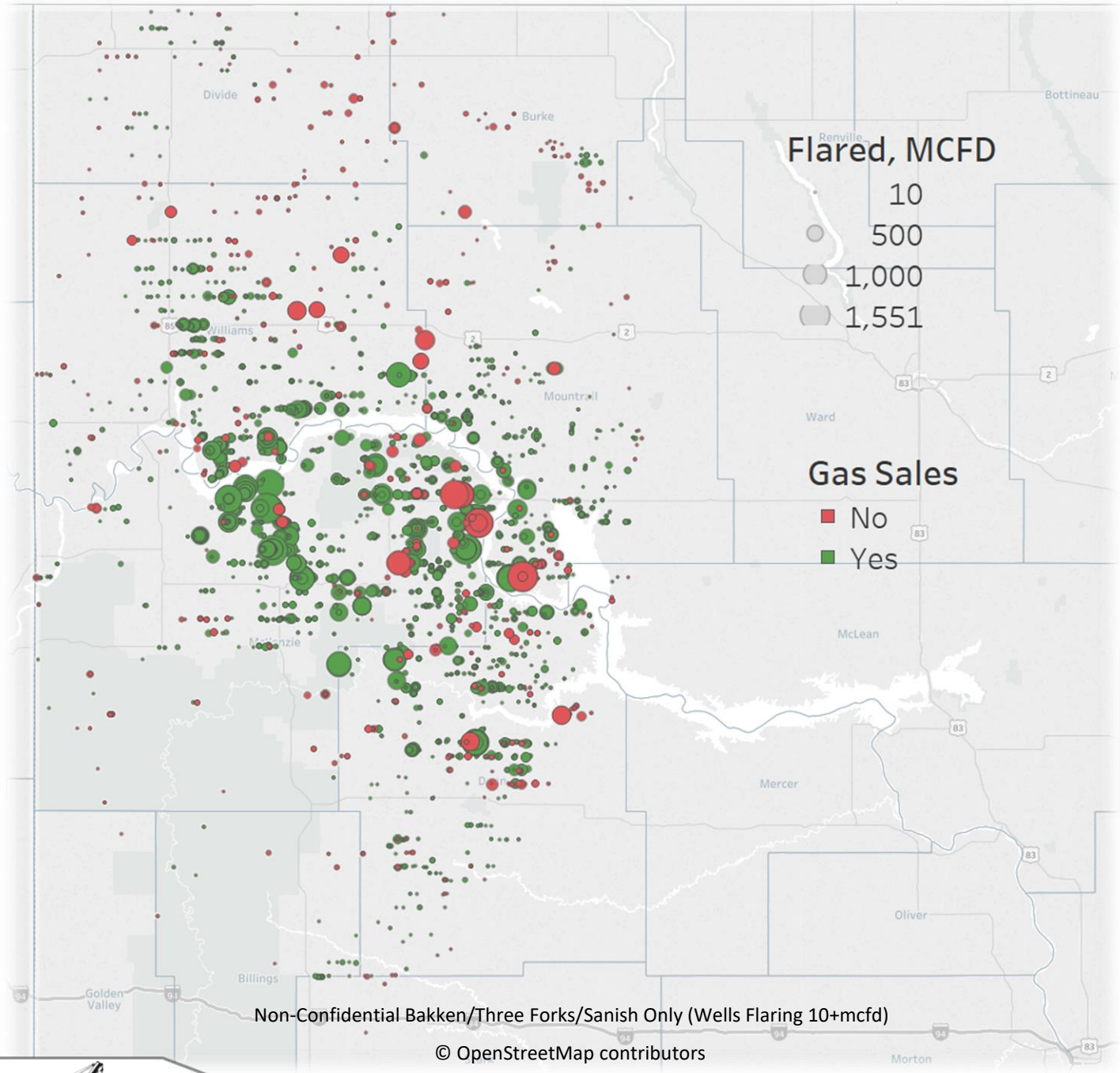
- Capacity
- Location

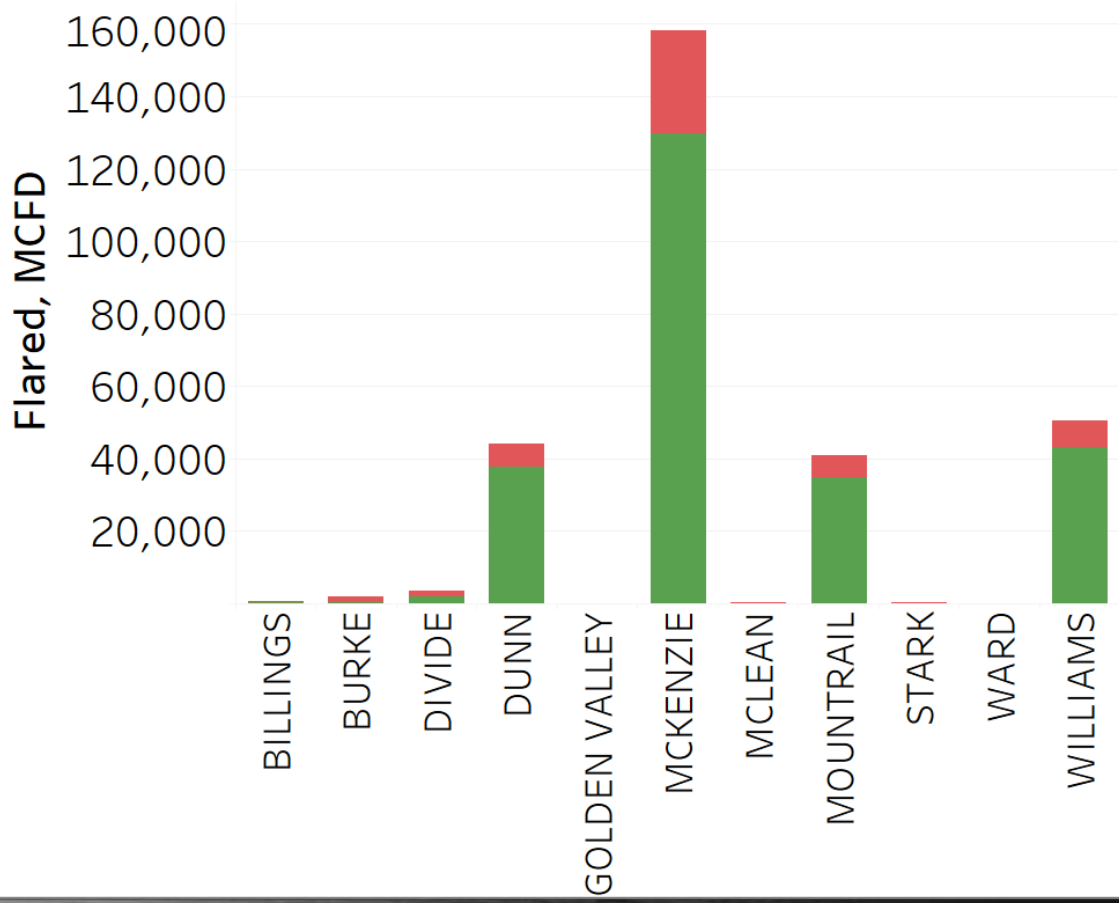
Transmission

- Dry Gas
- Natural Gas Liquids

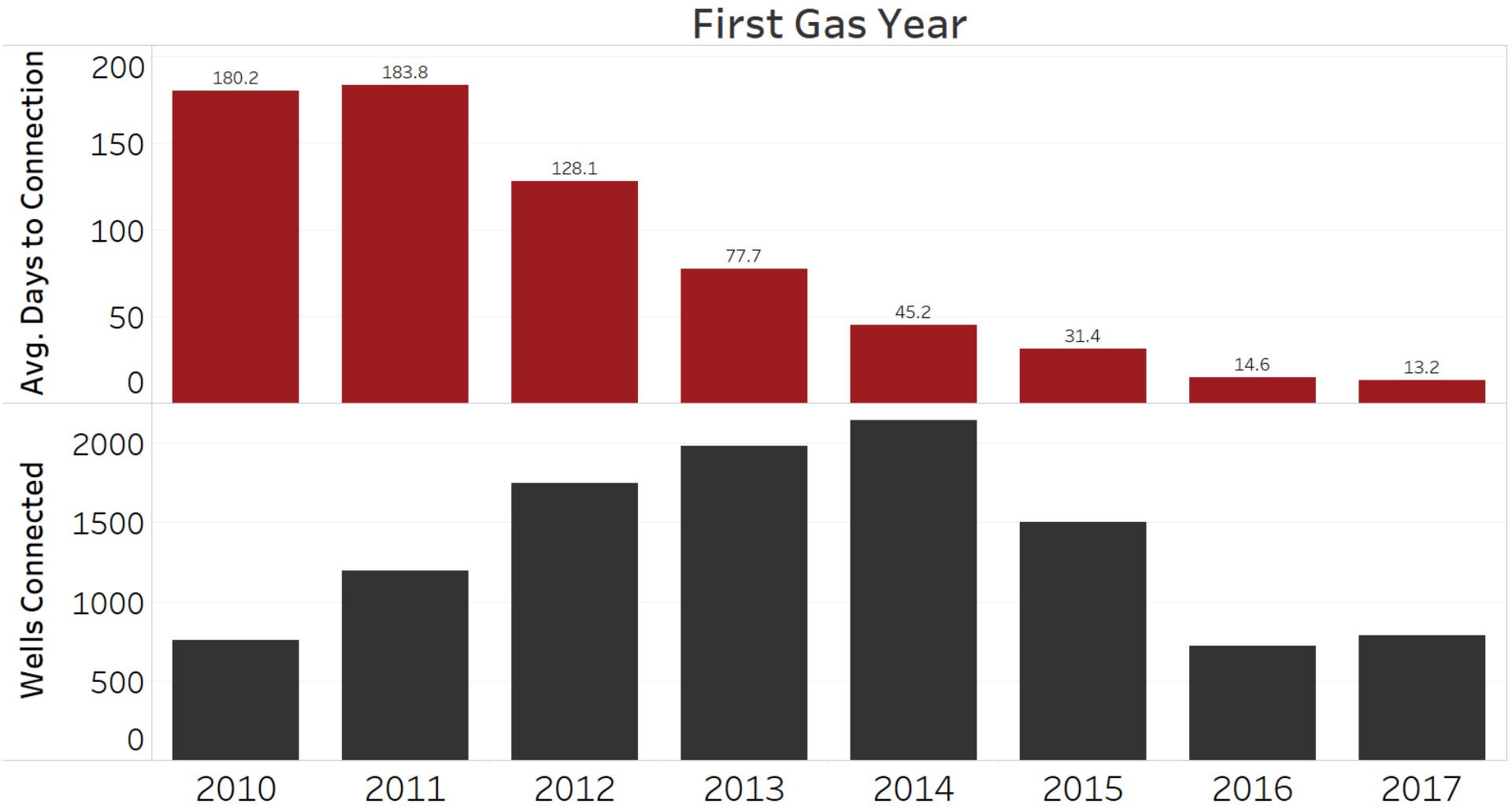
Solving the Flaring Challenge

April 2018





Days to Connect to Gas Gathering



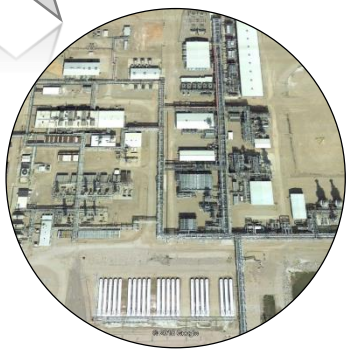
Natural Gas Capture

Production

- Technology
- Markets

Gathering

- Capacity
- Connections



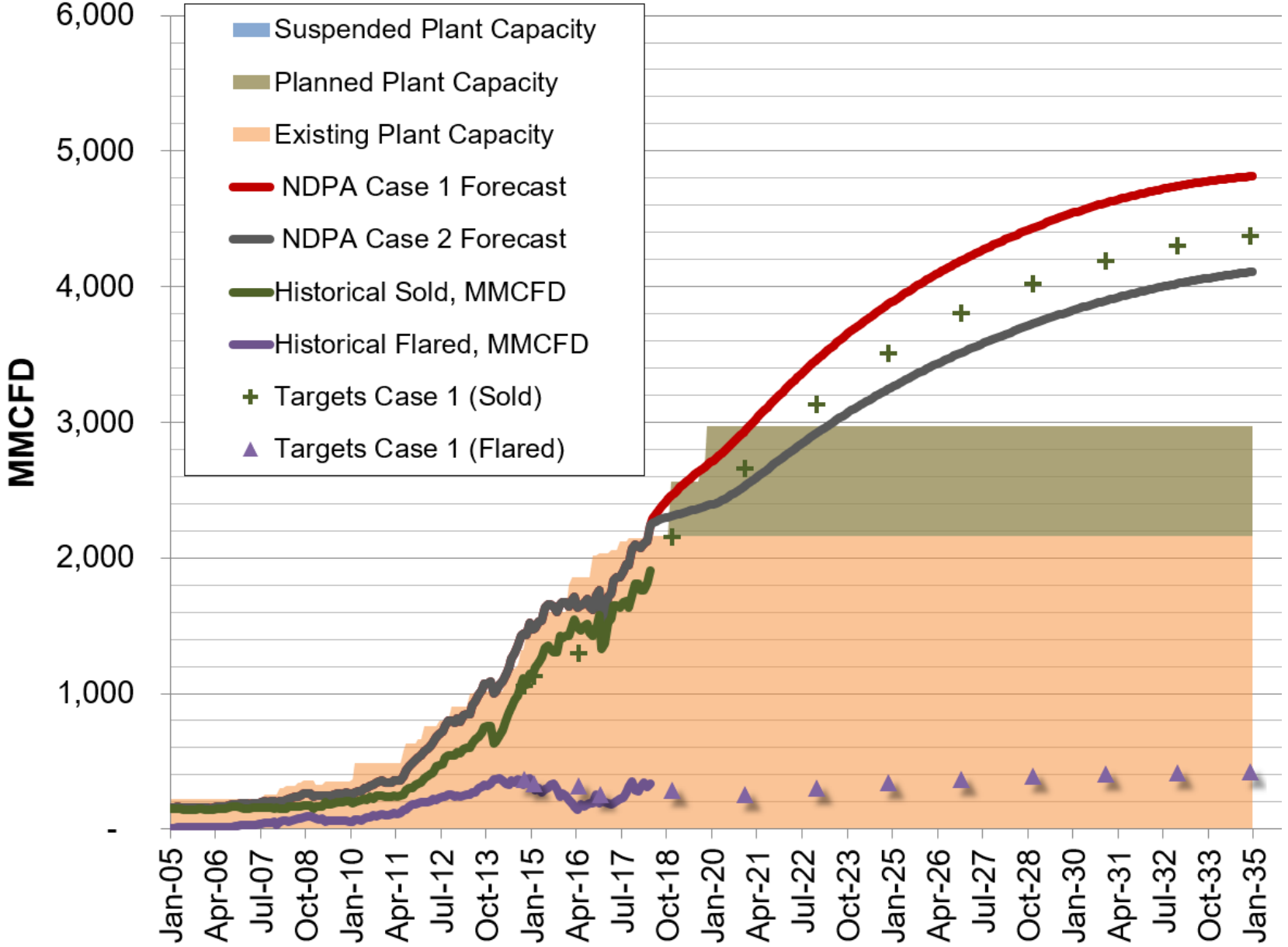
Processing

- Capacity
- Location

Transmission

- Dry Gas
- Natural Gas Liquids

Solving the Flaring Challenge



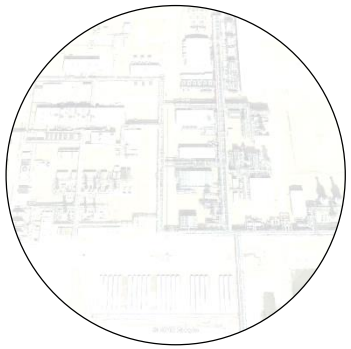
Natural Gas Capture

Production

- Technology
- Markets

Gathering

- Capacity
- Connections



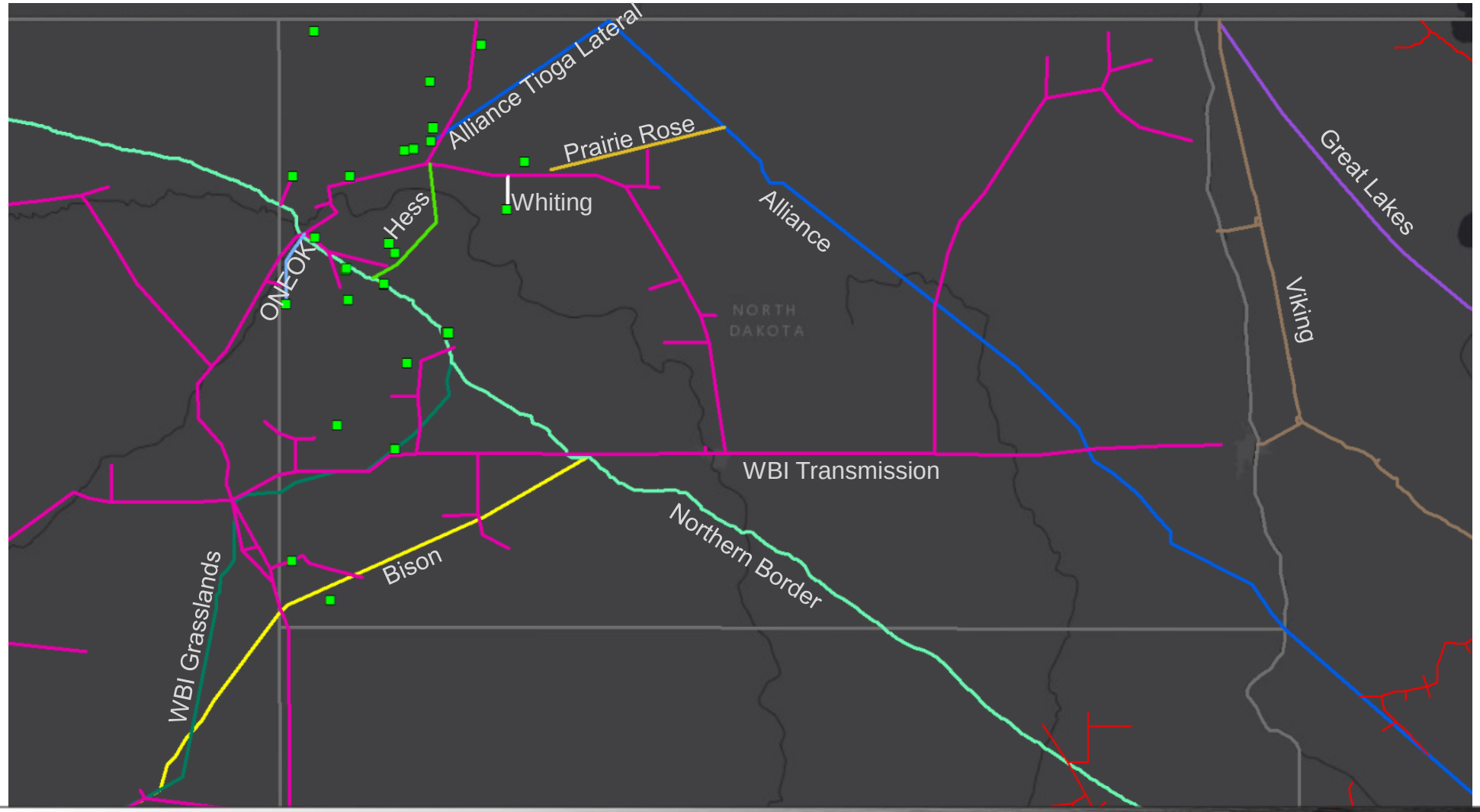
Processing

- Capacity
- Location

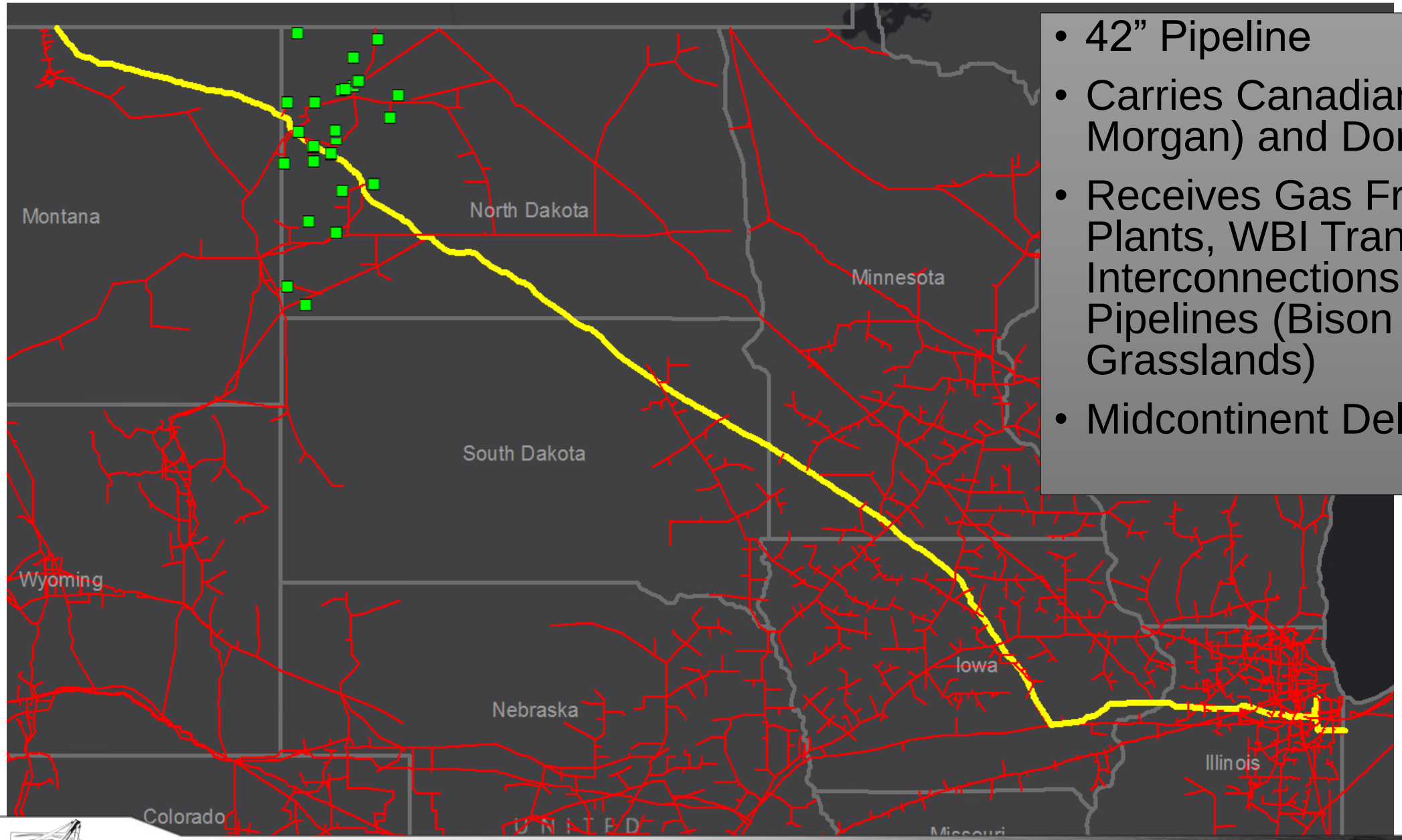
Transmission

- Dry Gas
- Natural Gas Liquids

Major Gas Pipeline and Processing Infrastructure



Northern Border Pipeline

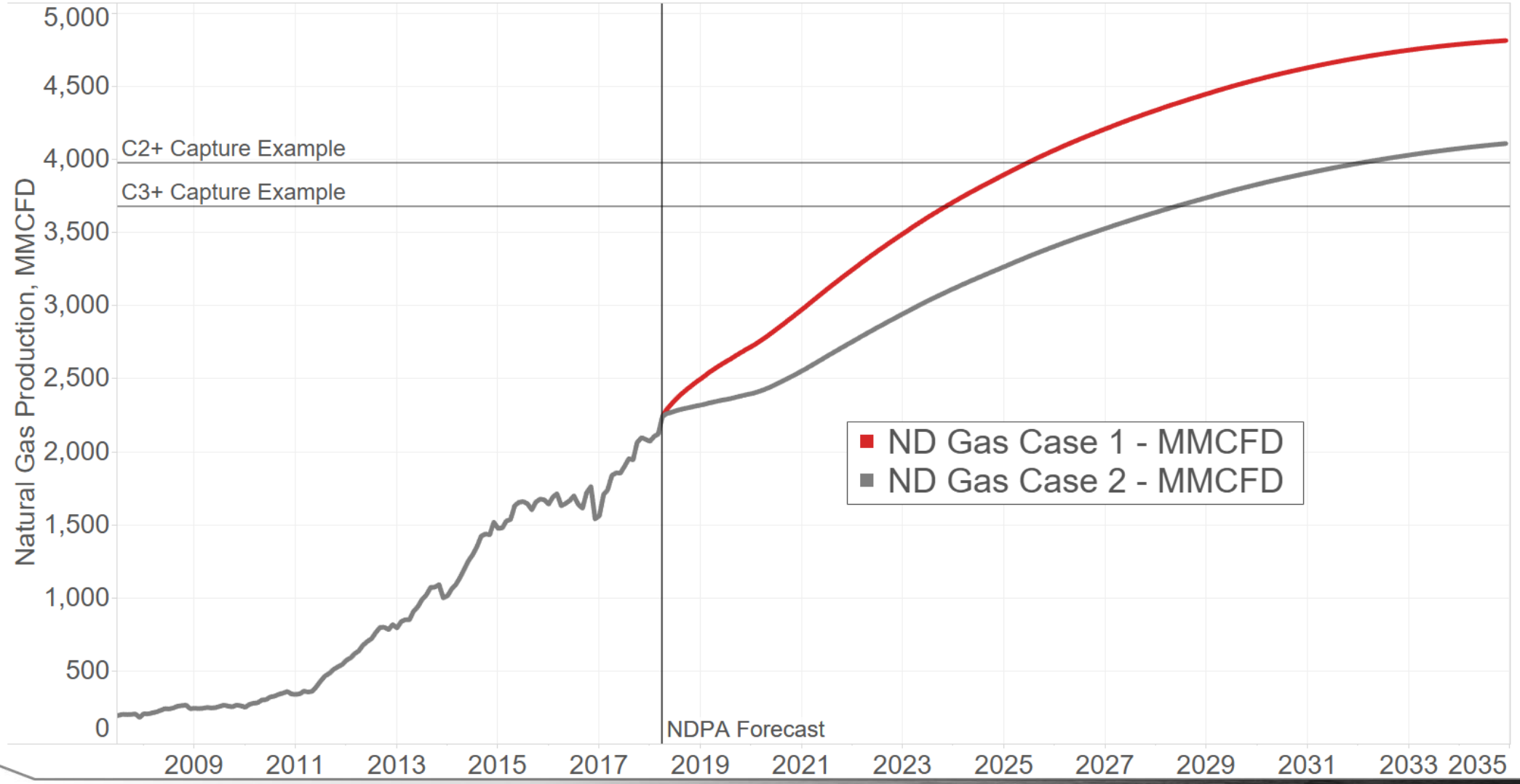


- 42” Pipeline
- Carries Canadian (Port of Morgan) and Domestic Gas
- Receives Gas From ND Plants, WBI Transmission Interconnections, and WY Pipelines (Bison & Grasslands)
- Midcontinent Deliveries

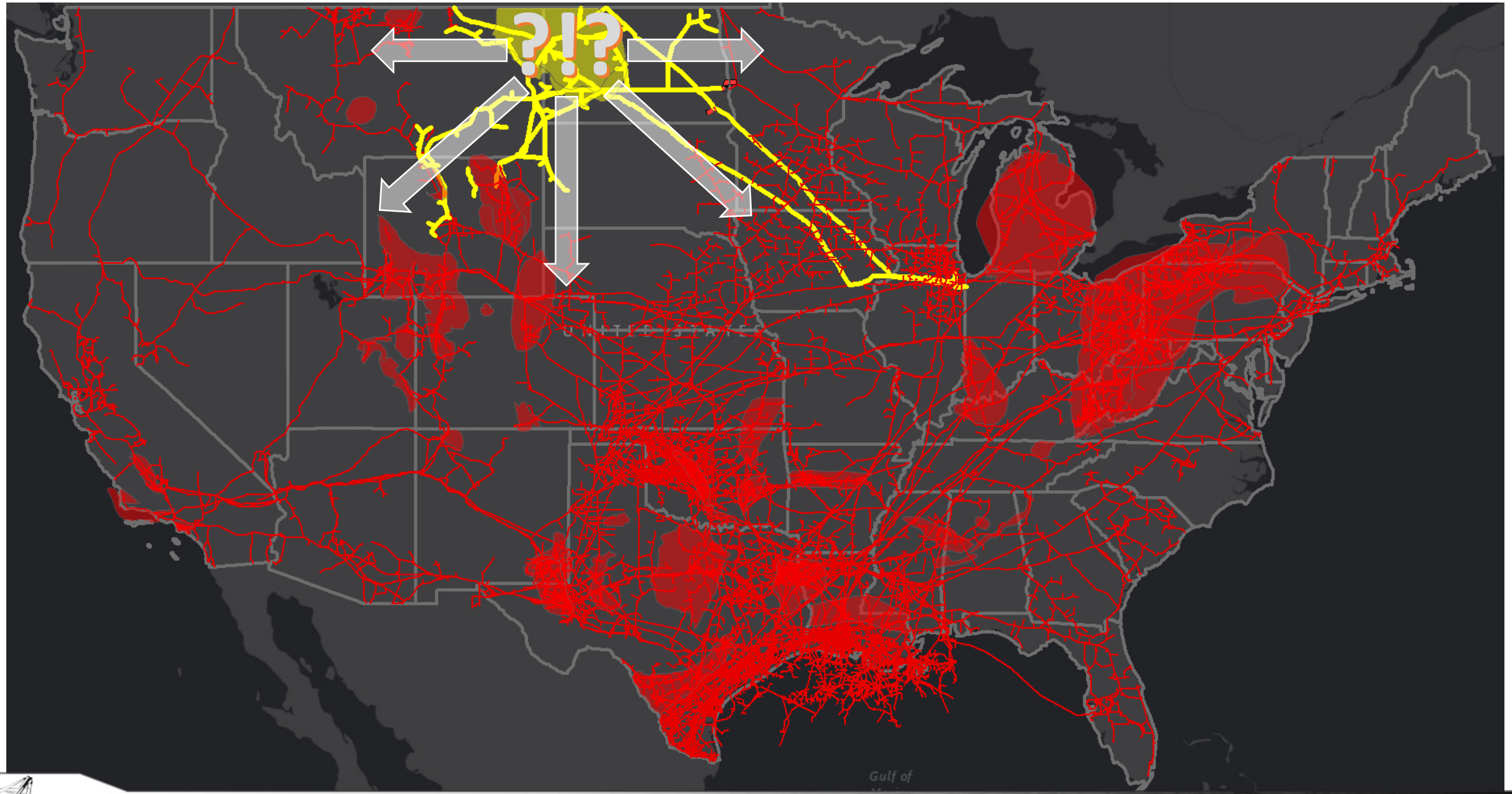
*Data Source: Northern Border IPS

Simplified Example NB Calculations

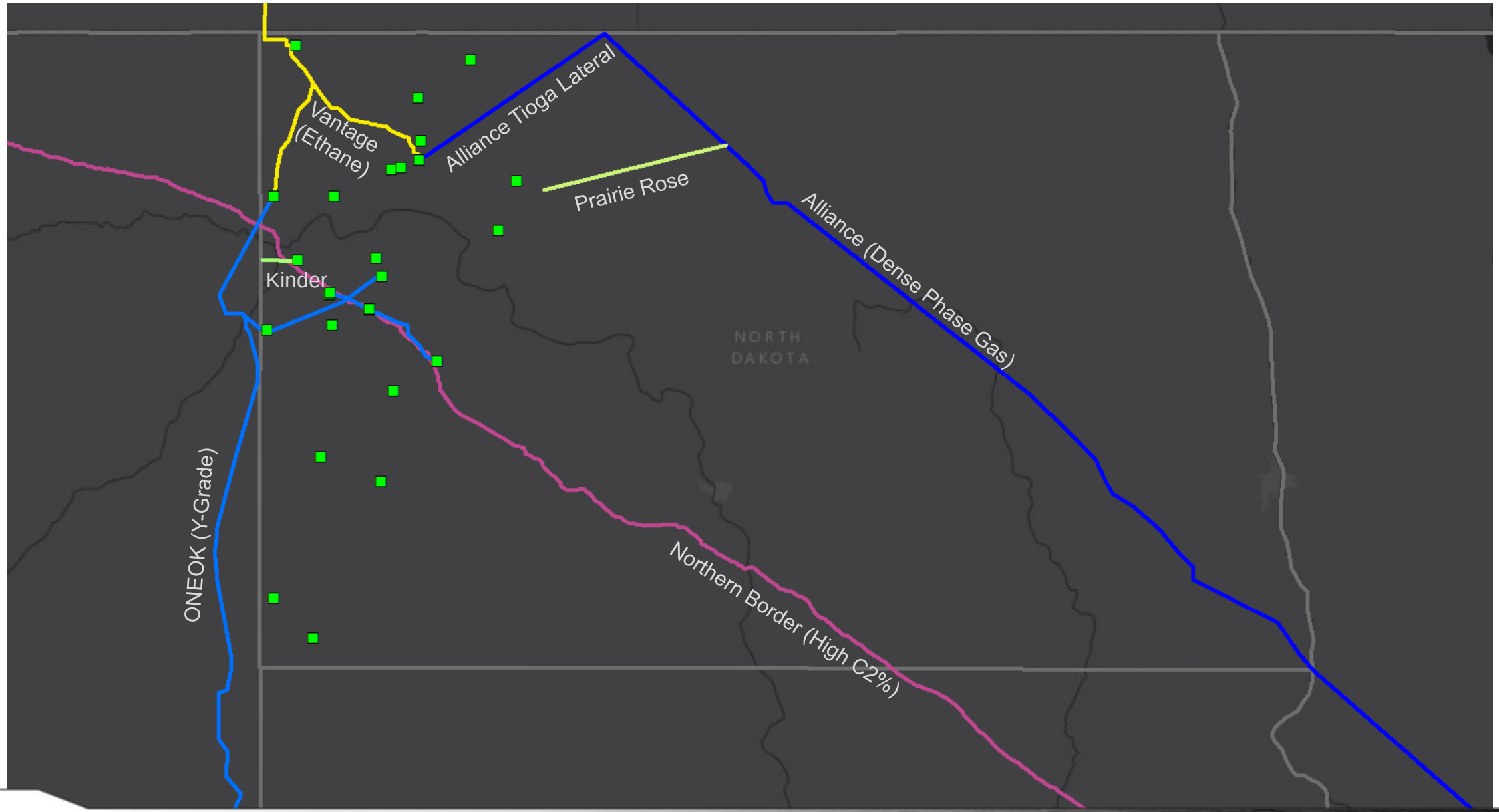
Conclusion: **IF** no other gas export options open and all other deliveries on other pipelines stay static, ND gas production could increase 1.43-1.73 BCFD (from Apr-18) before Northern Border is 100% Bakken production. **BTU management becomes increasingly important for Bakken residue gas.**



Now What?

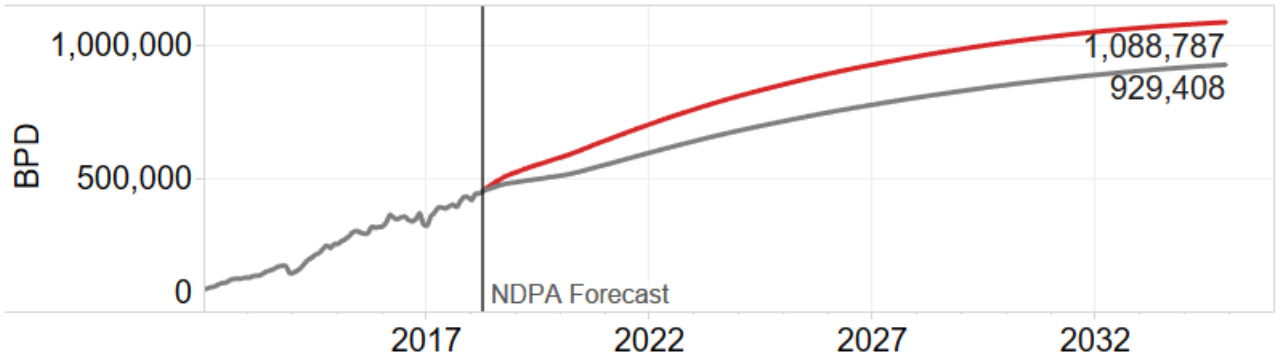


Regional NGL Infrastructure

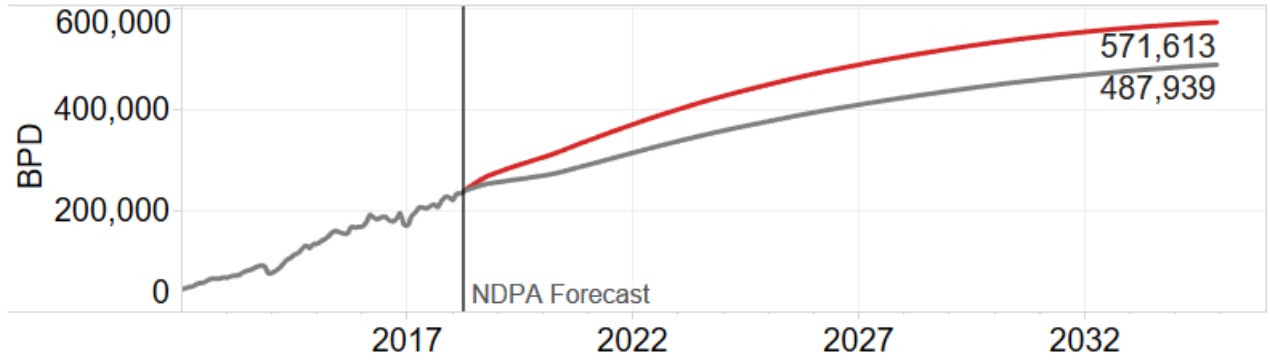


North Dakota Captured* NGL's

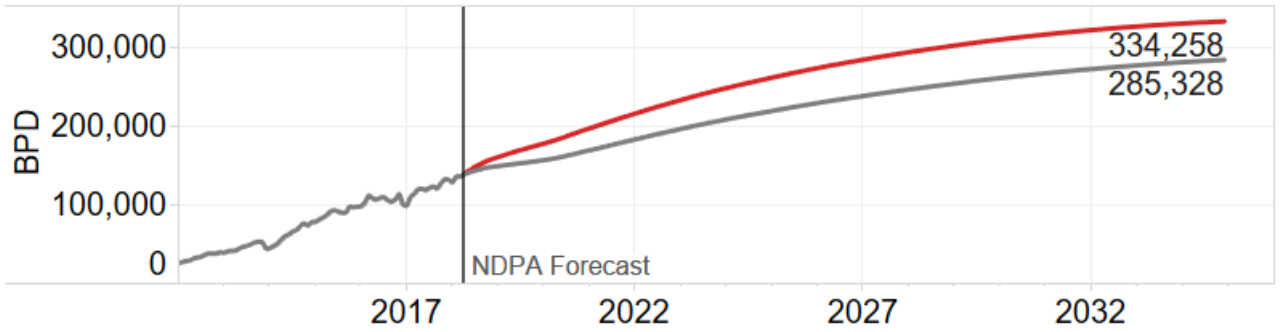
All Natural Gas Liquids



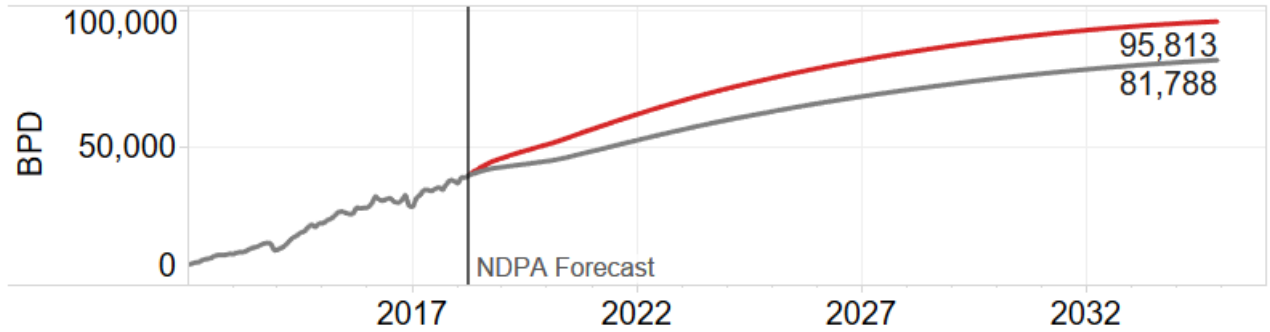
Ethane



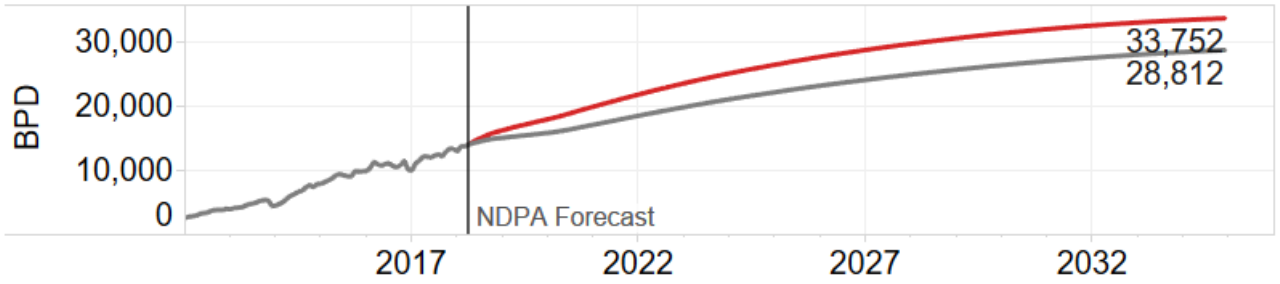
Propane



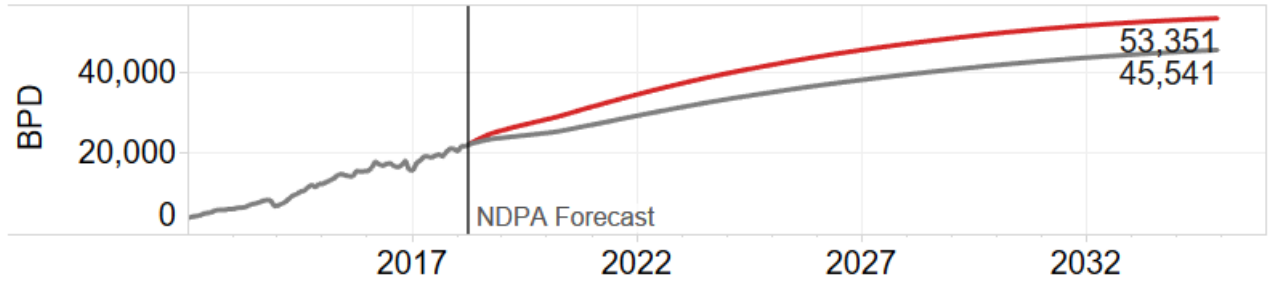
Butane



Isobutane

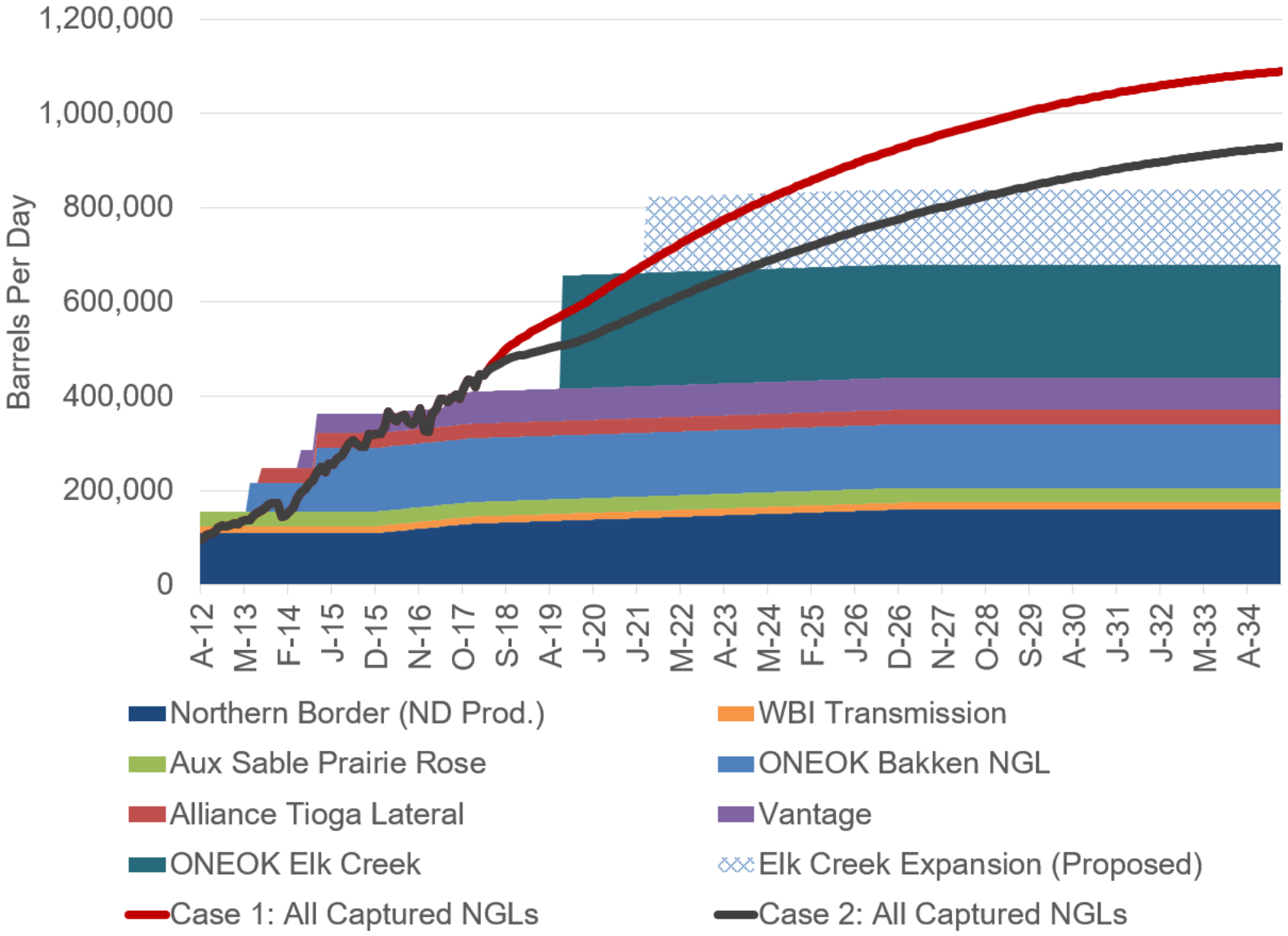


Natural Gasoline

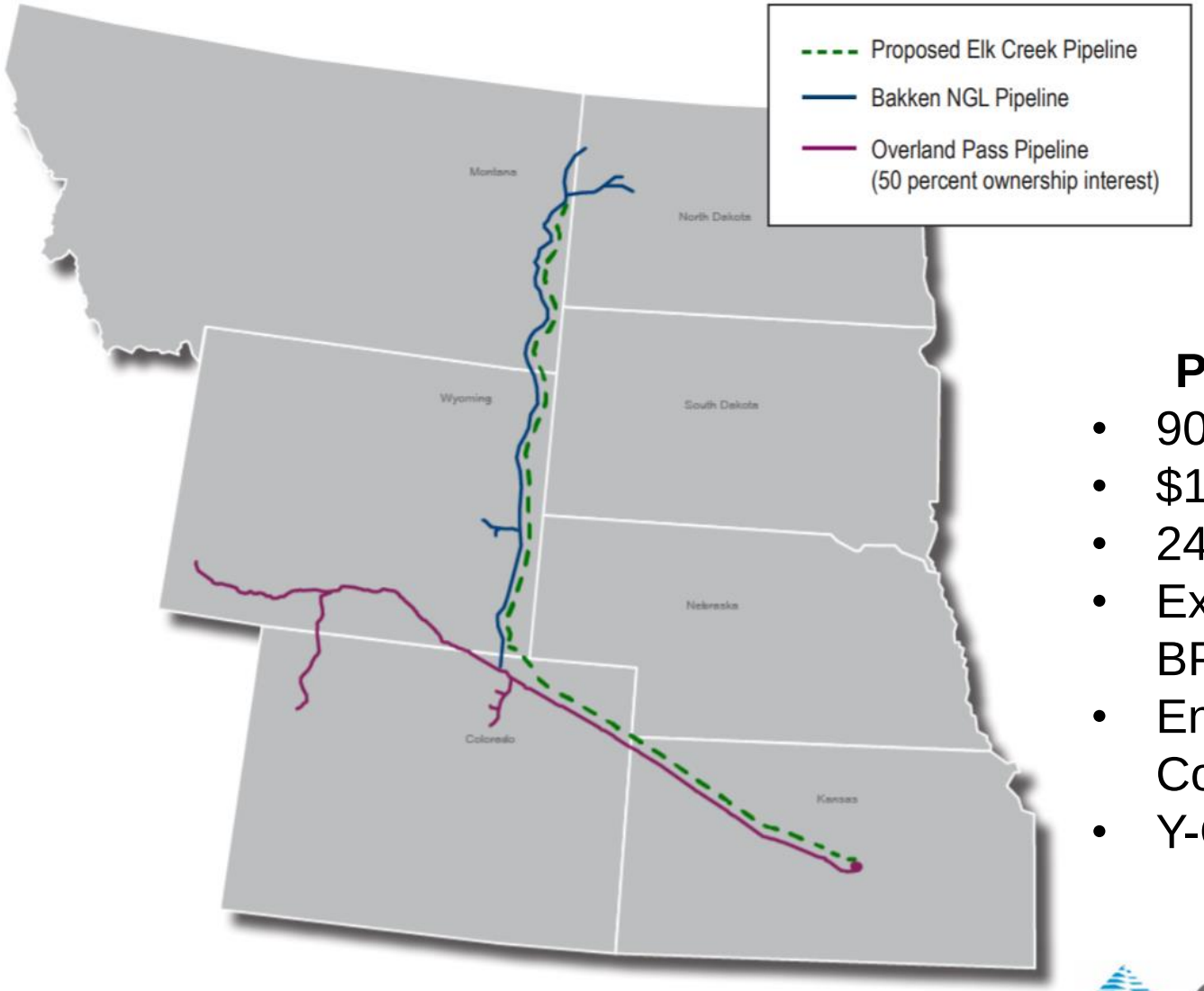


*Non-flared NGL's & Assumes 10 GPM

NGL Pipeline Takeaway Options



ONEOK Elk Creek NGL Pipeline



Project Highlights

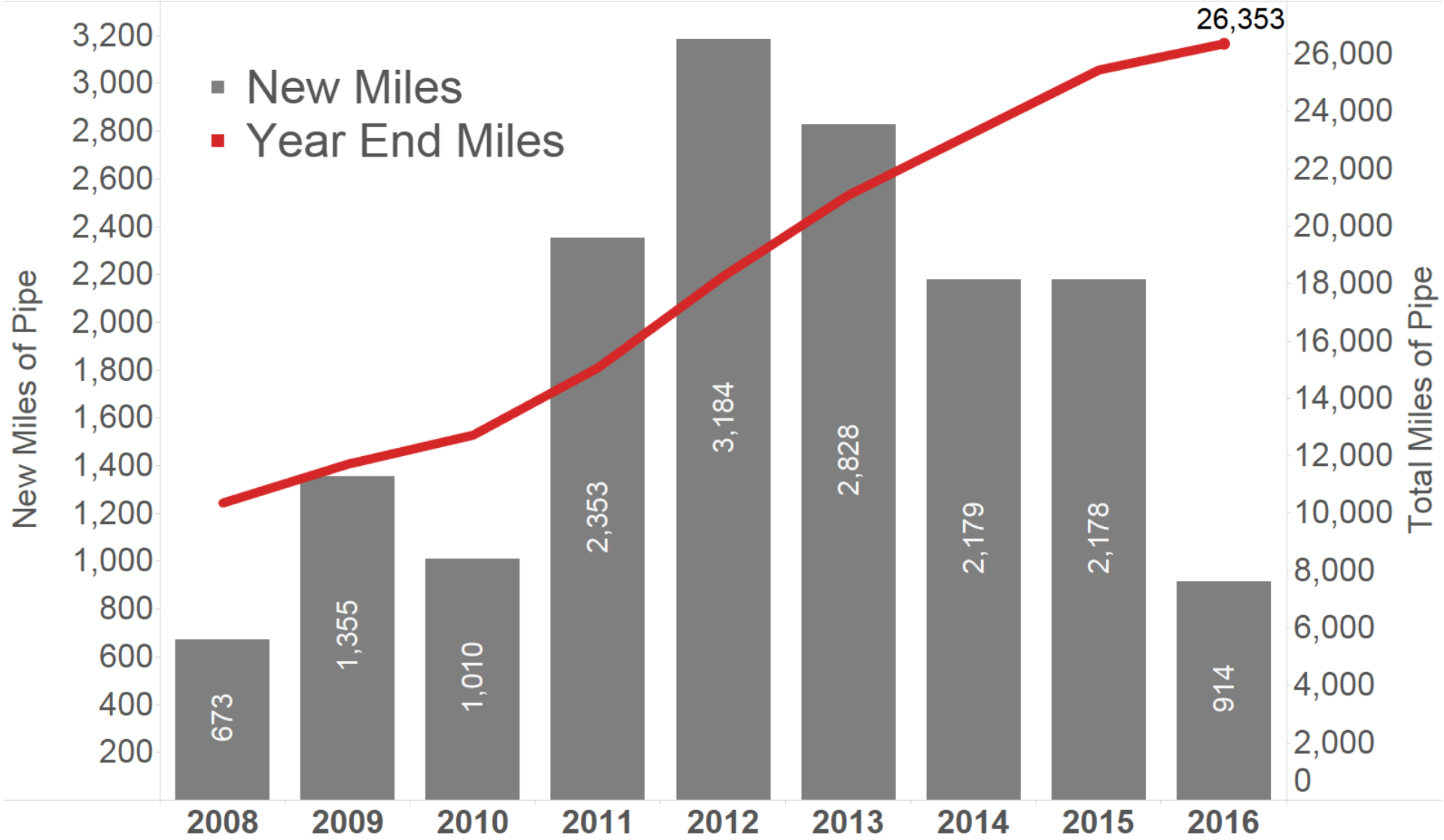
- 900 Miles - 20” Pipeline
- $1.4 Billion
- 240,000 BPD Capacity
- Expandable to 400,000 BPD
- End of 2019 Proposed Completion
- Y-Grade Transportation

ONEOK

Presentation Outline

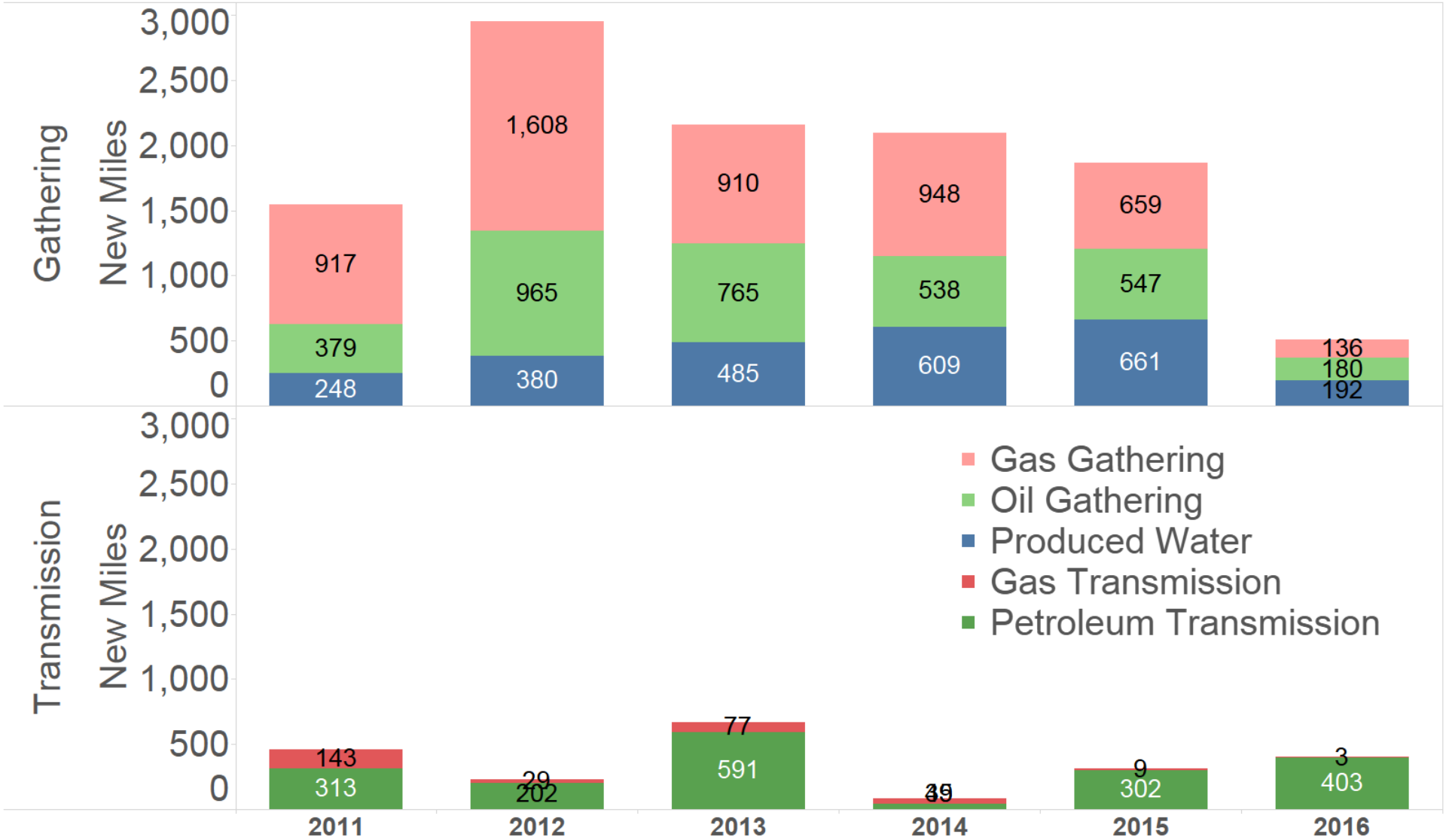
- Economics
- Current Activity and oil transportation dynamics
- Understanding current and future oil production
  - Pricing update
  - Activity
  - Oil forecasts
- North Dakota natural gas production
  - Flaring and gas capture
  - Natural gas liquids
- **Pipeline construction update**

North Dakota Pipeline Construction



Sources: NDIC & PHMSA

North Dakota Pipeline Construction



Sources: NDIC & PHMSA

Contact Information

Justin J. Kringstad, Director

North Dakota Pipeline Authority

600 E. Boulevard Ave. Dept. 405
Bismarck, ND 58505-0840

Phone: (701)220-6227
Fax: (701)328-2820
E-mail: jjkringstad@ndpipelines.com

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

Websites:

www.pipeline.nd.gov

www.northdakotapipelines.com