

# EmPower ND Commission

**Justin J. Kringstad**

*Geological Engineer*

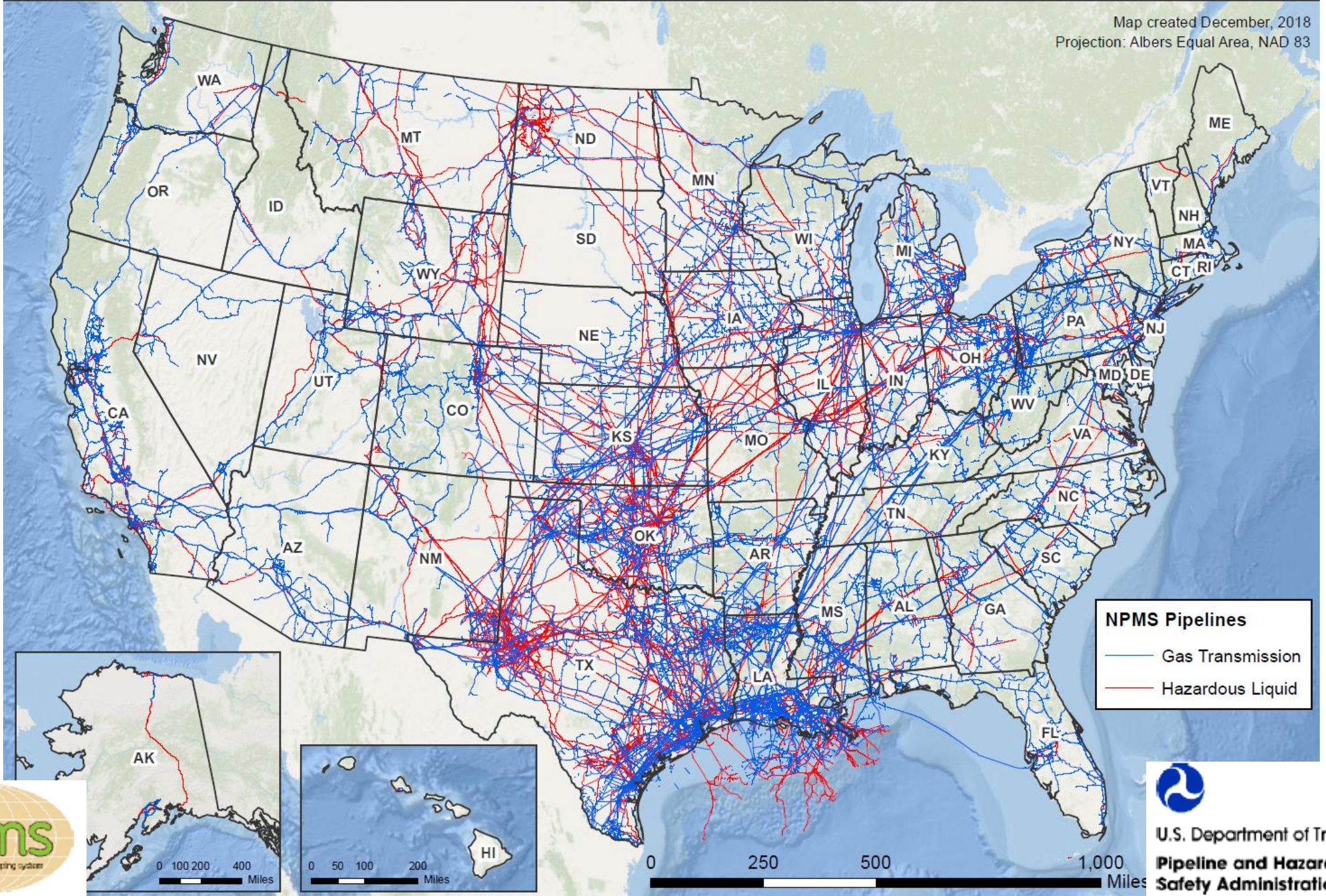
*Director*

*North Dakota Pipeline Authority*

February 4, 2020

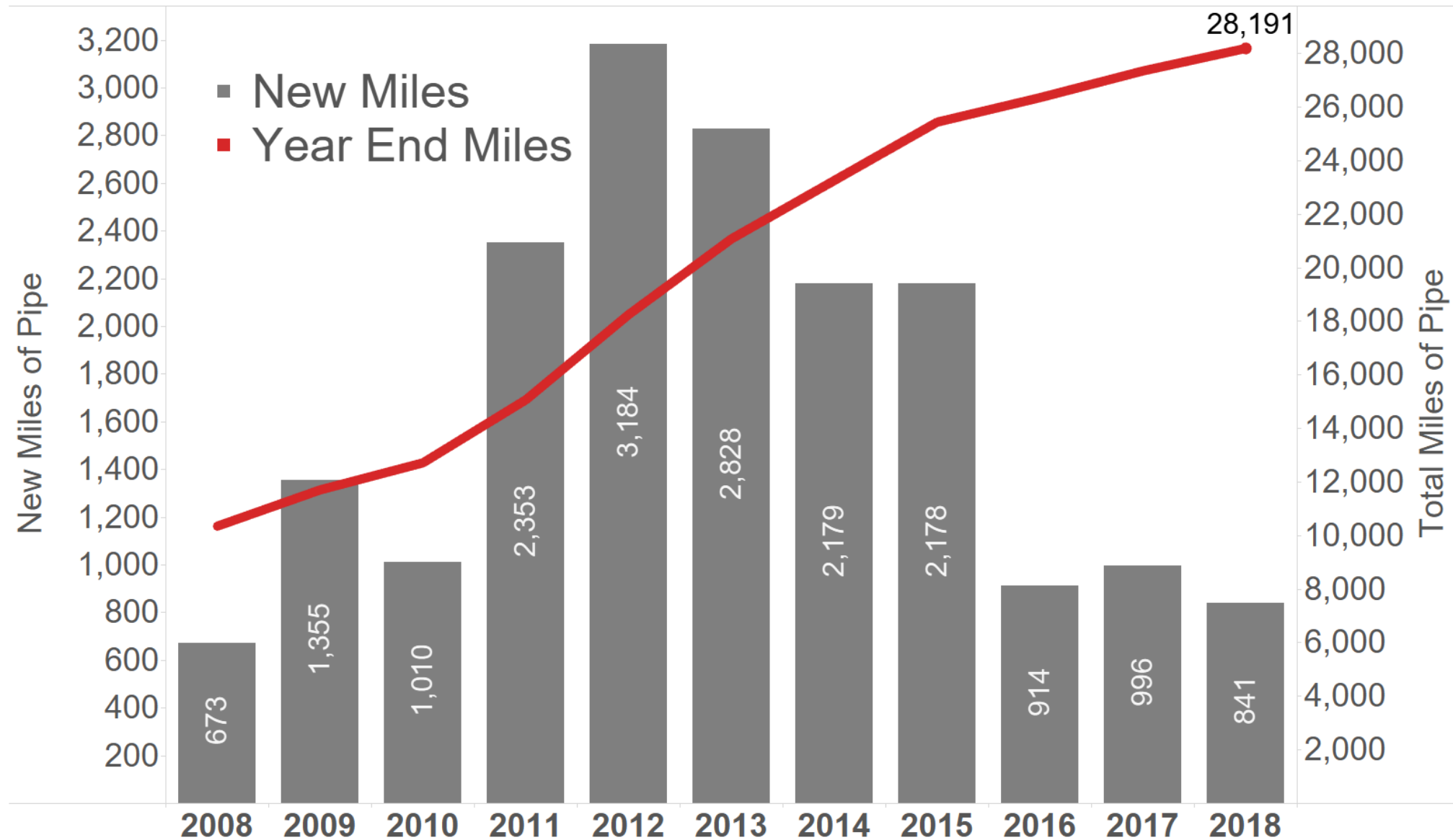








# North Dakota Pipeline Construction

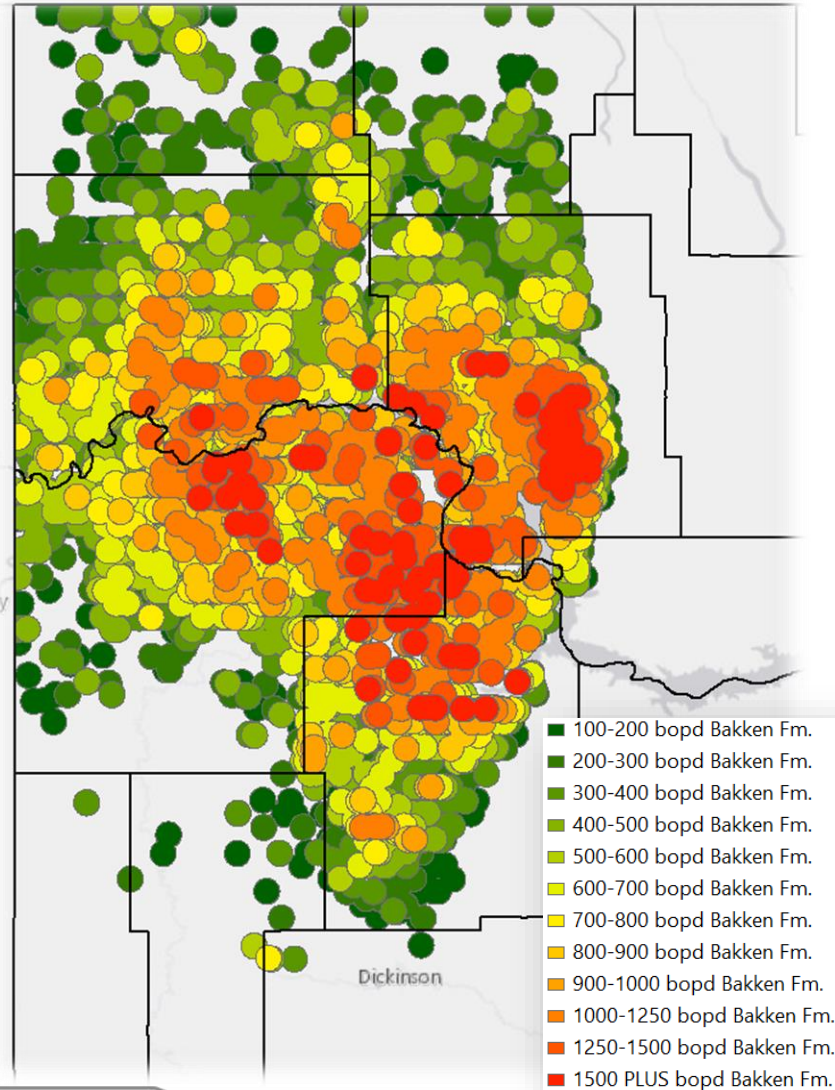


Sources: NDIC & PHMSA

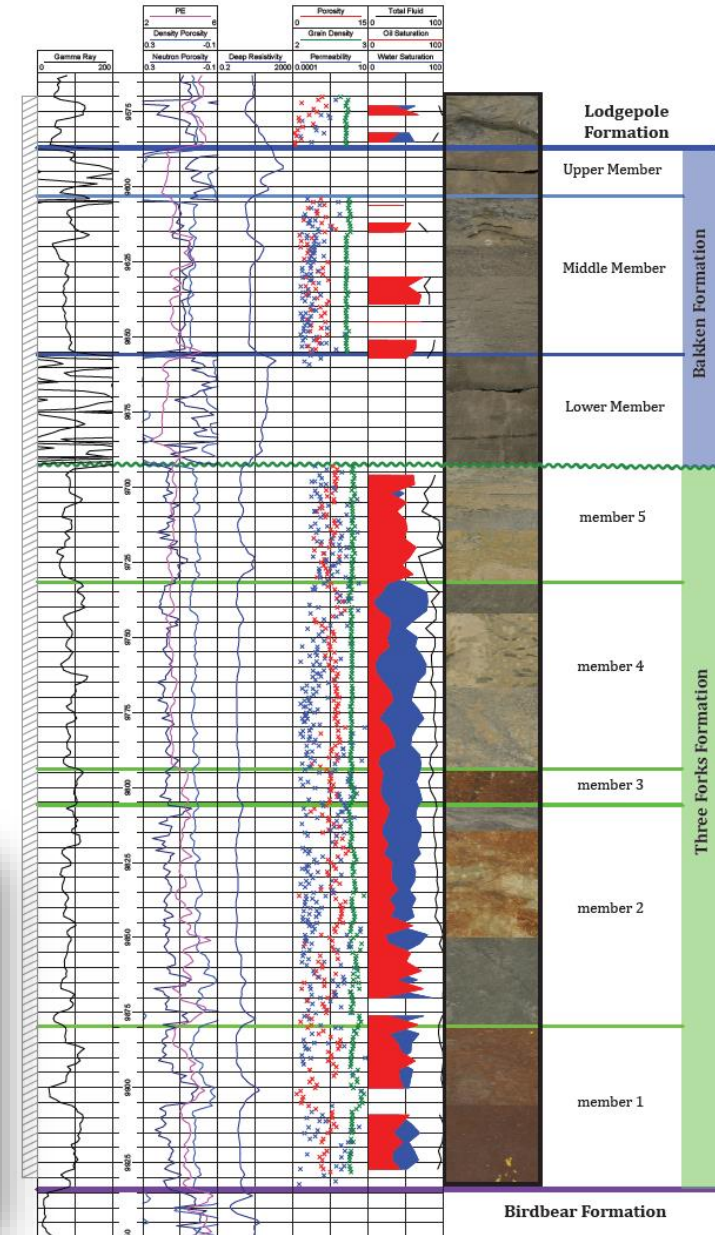
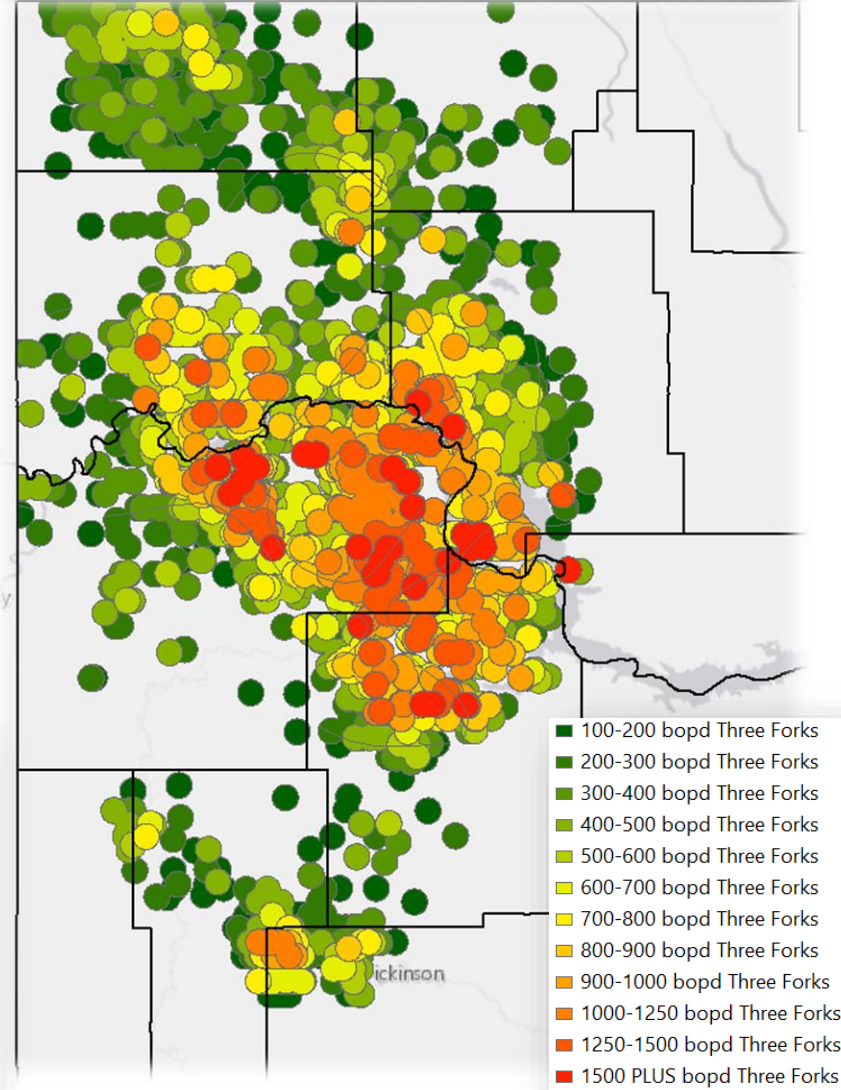


# Bakken & Three Forks Formations

Bakken Formation

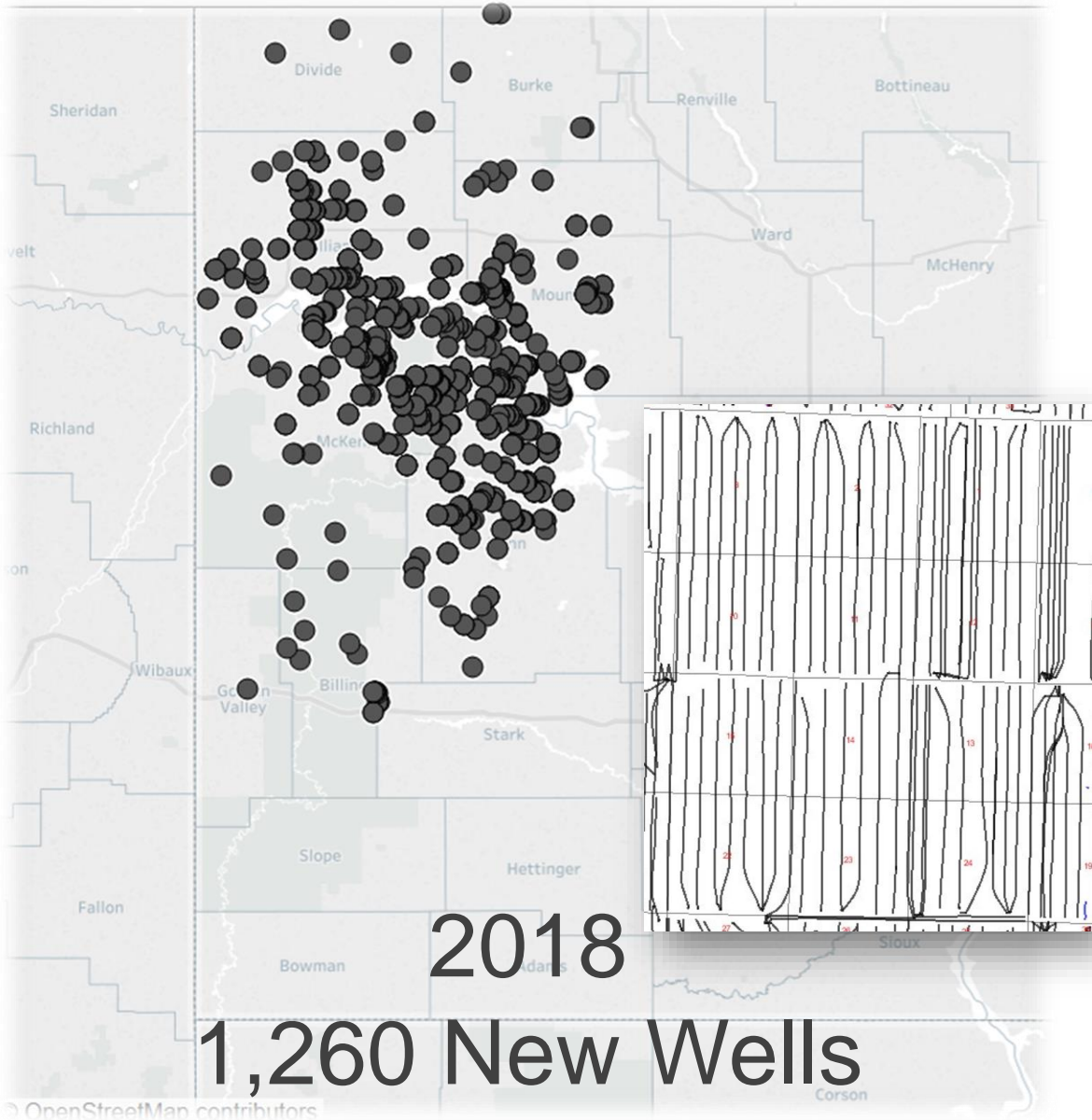
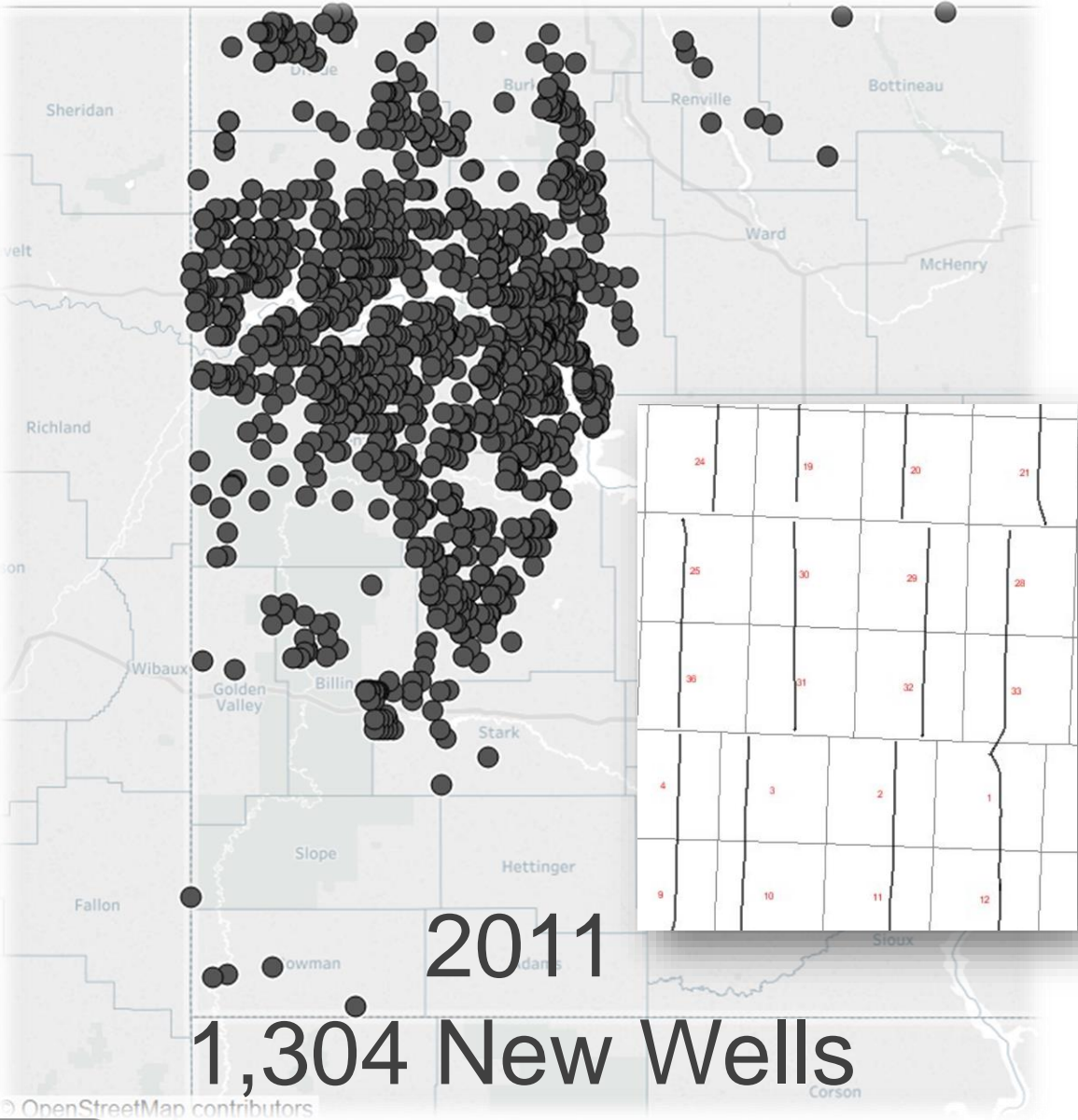


Three Forks Formation

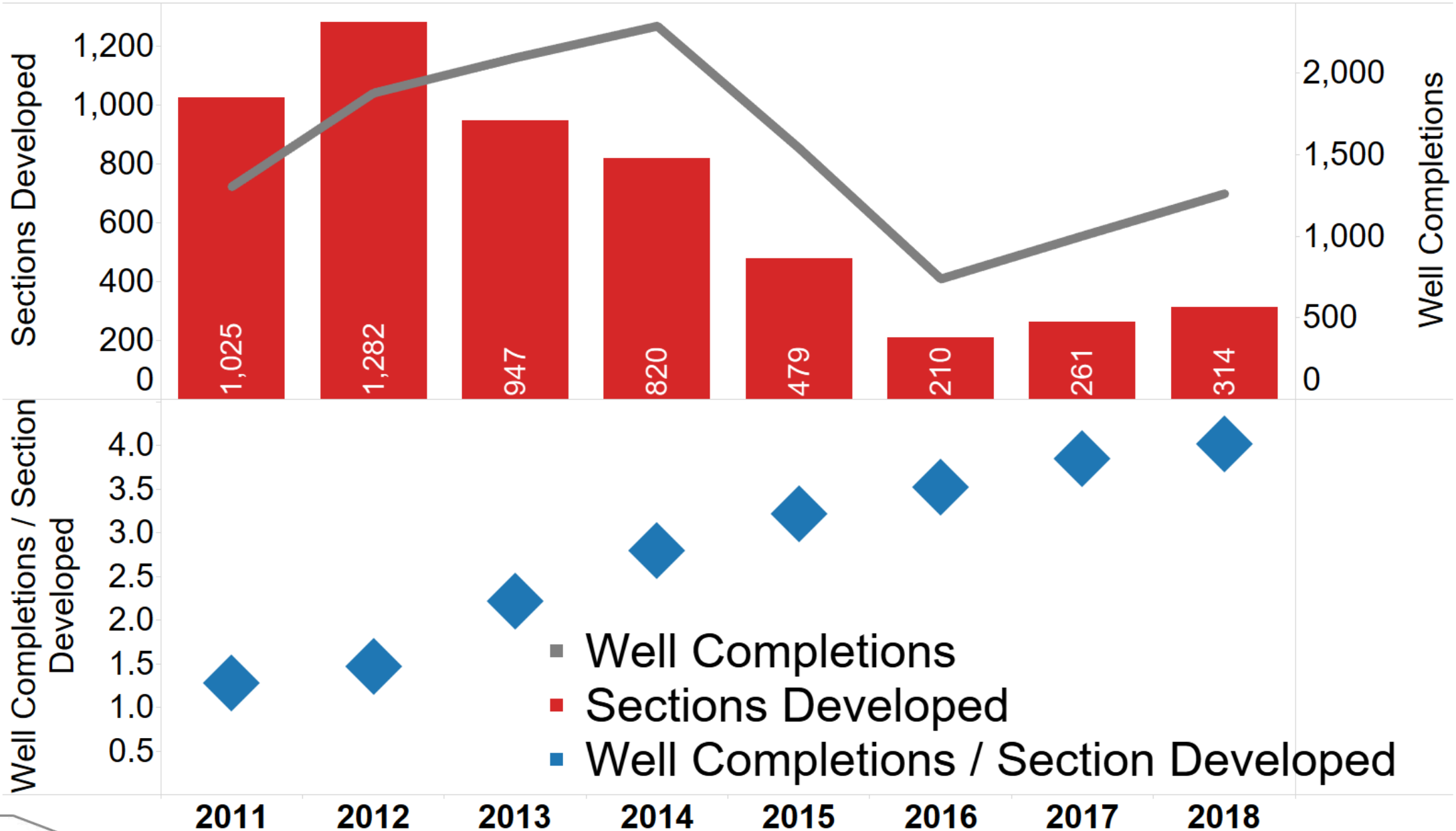




# North Dakota Well Completions and Spatial Development

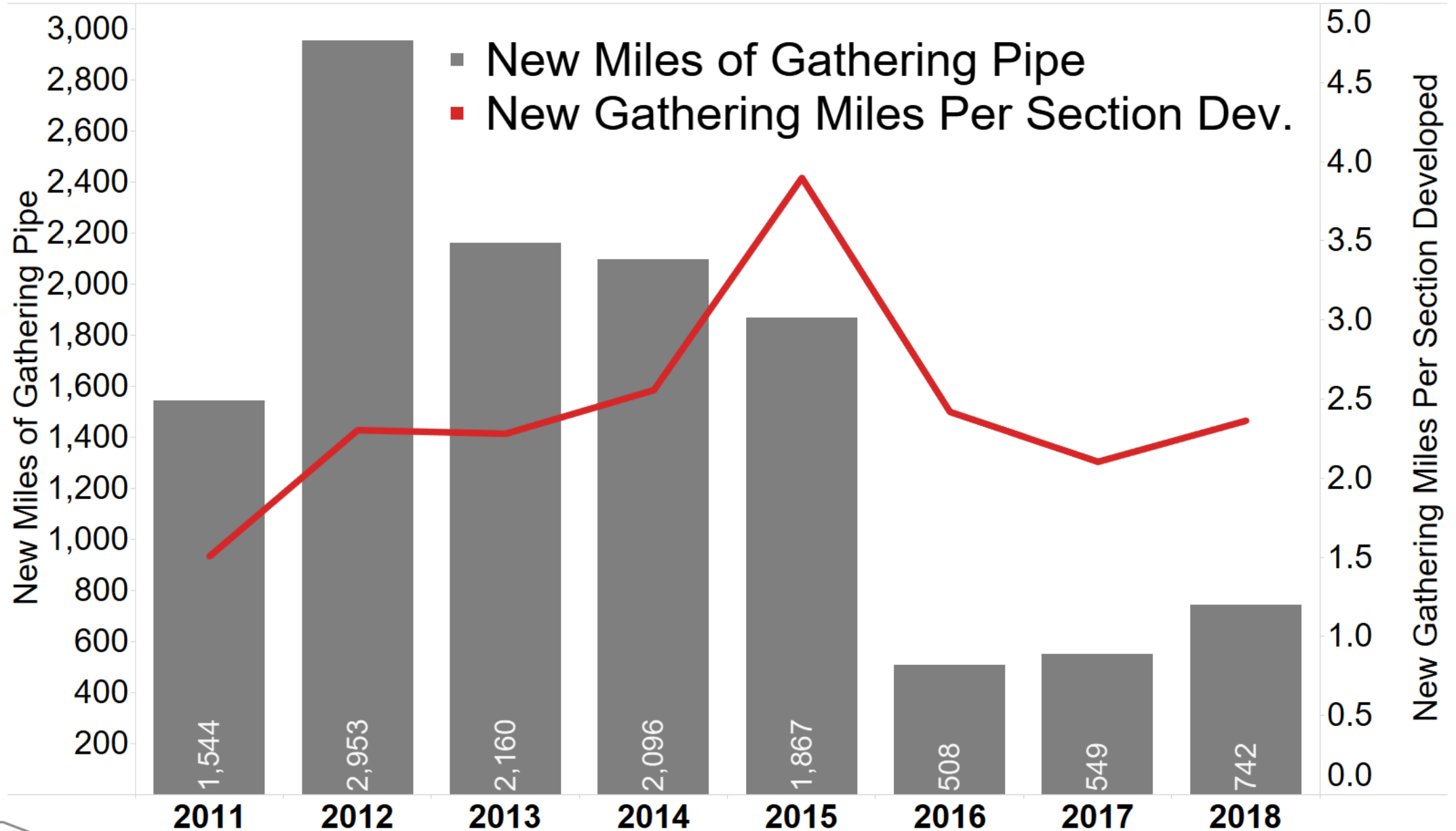


# North Dakota Well Completions and Developed Sections

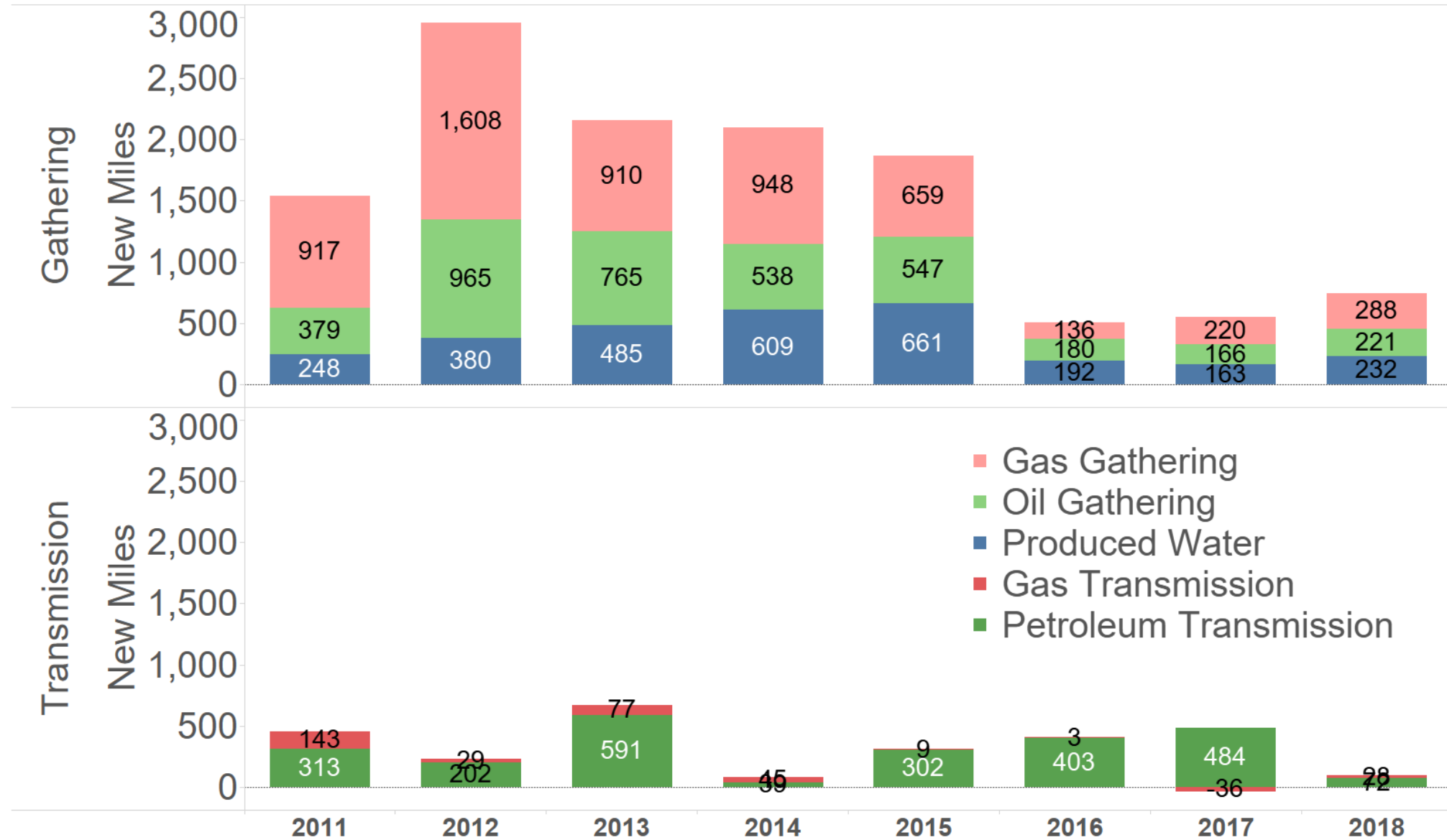




# North Dakota Gathering Pipeline Development



# North Dakota Pipeline Construction



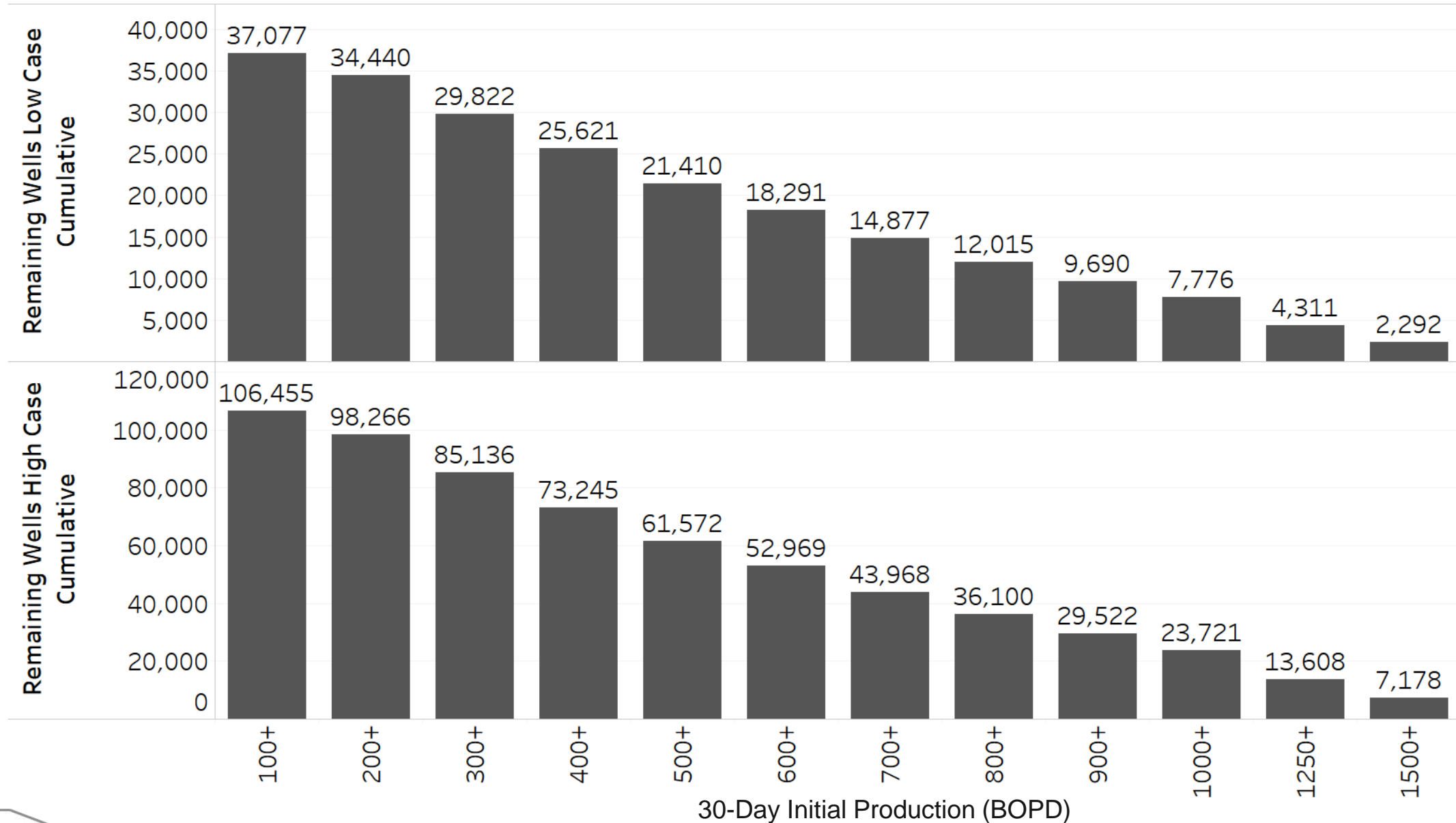
Sources: NDIC & PHMSA





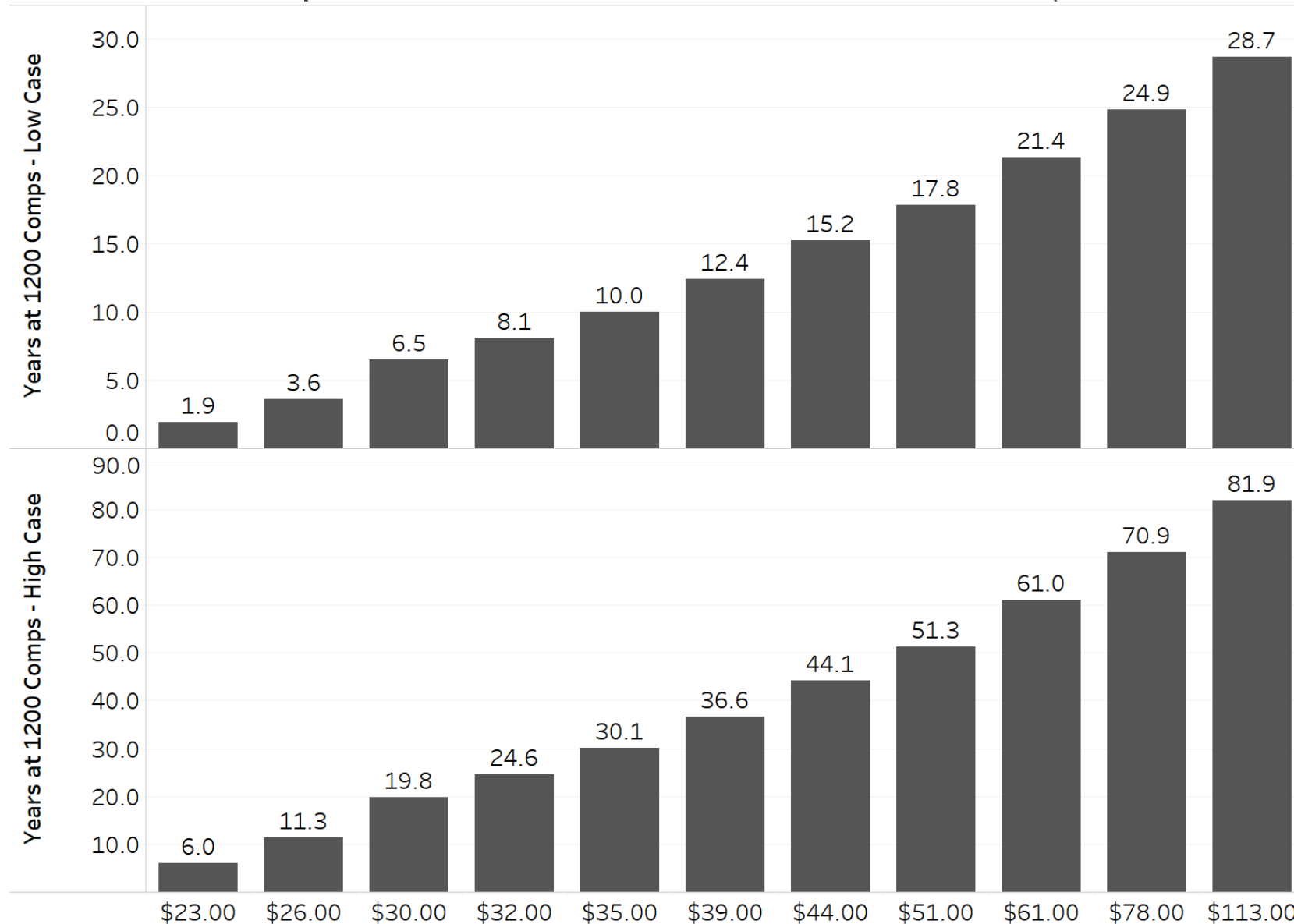
# Cumulative Remaining Wells – Peak Month Minimum BOPD

## Production Zone



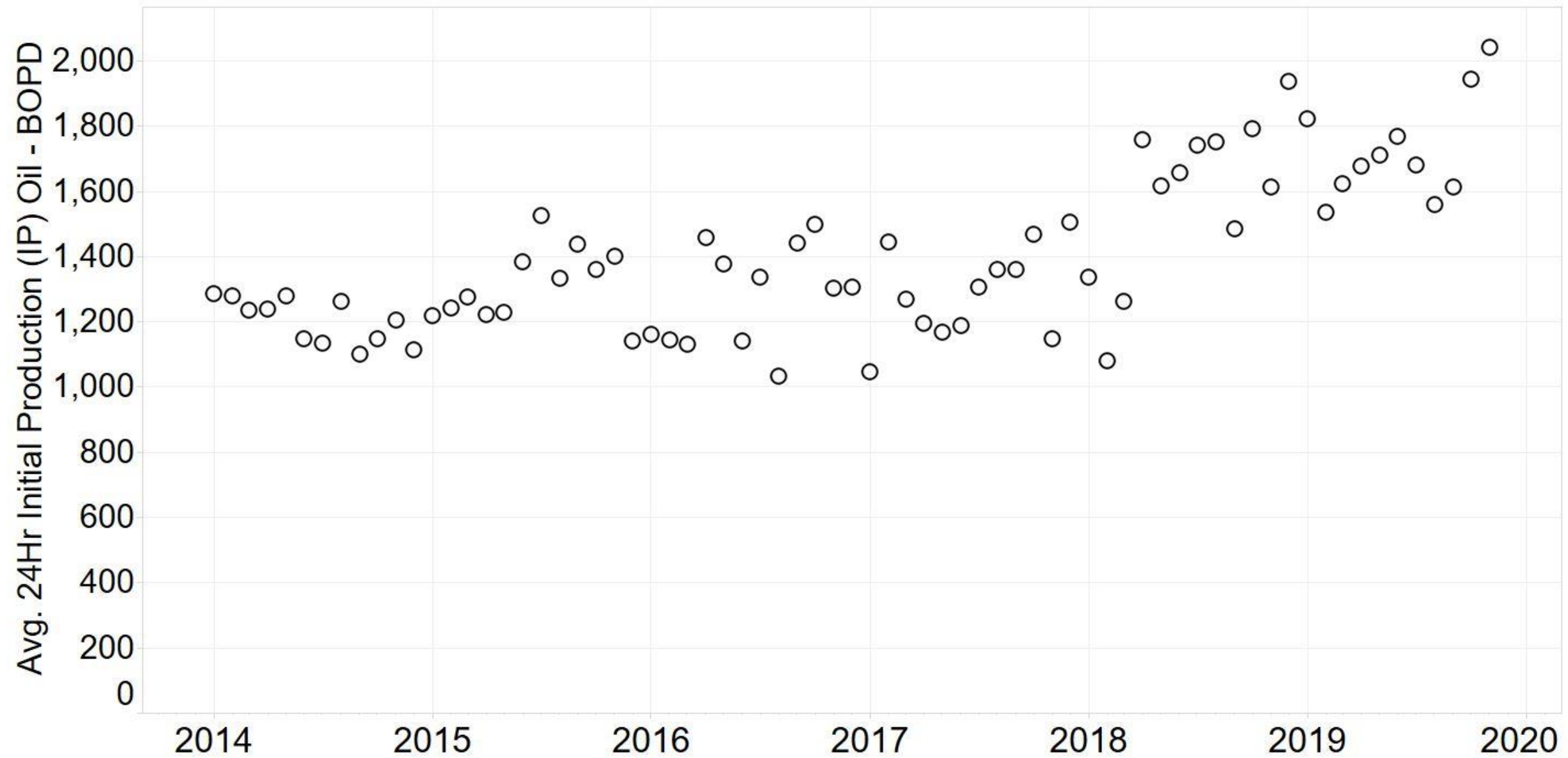
# Years Remaining\* / Minimum Wellhead Oil Price

\*Assumes 1,200 Completions Per Year and \$7MM Well Costs (20% After Tax IRR)

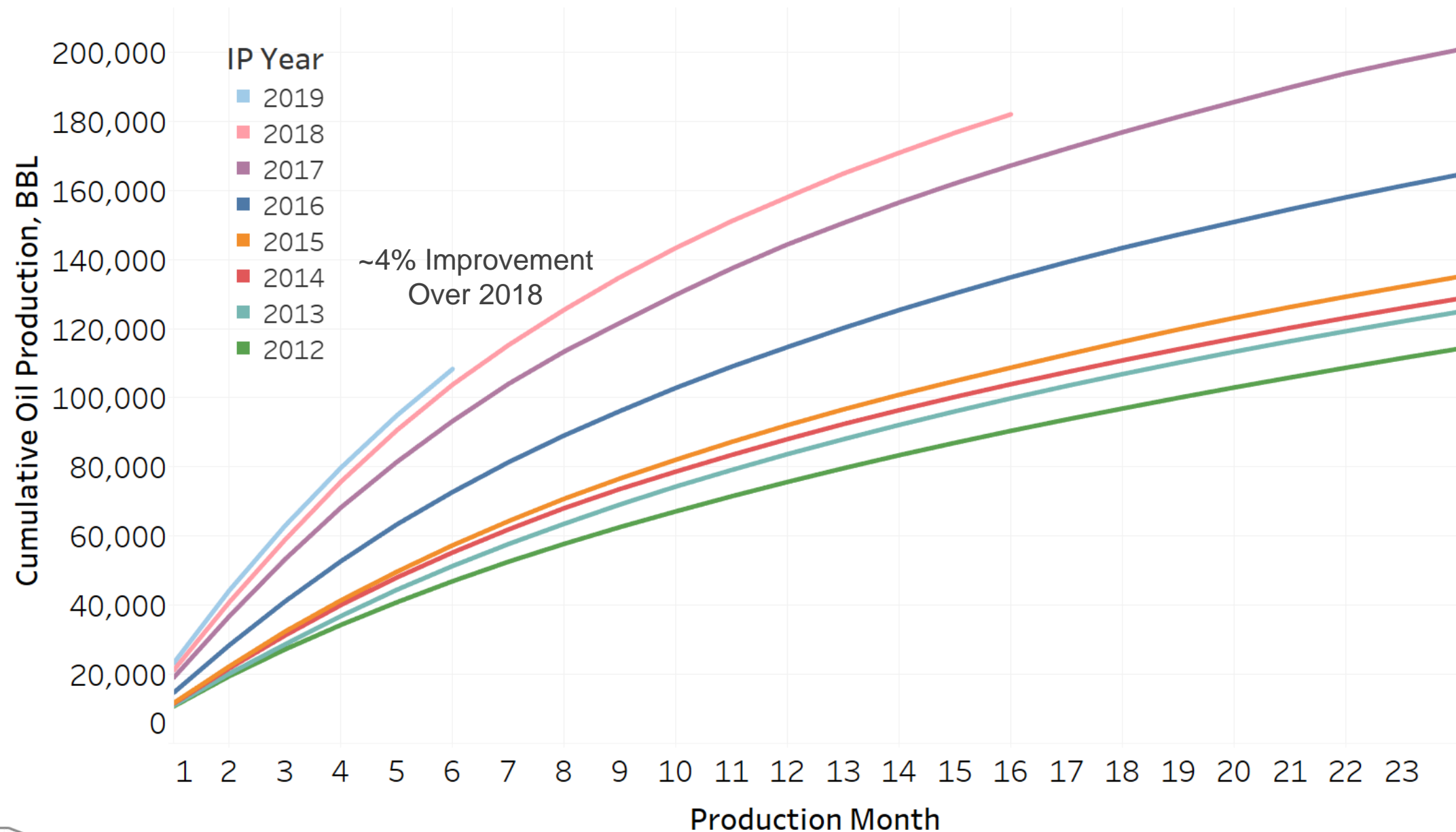




# Statewide Initial Oil Production Rates – 24hr



# Statewide oil Performance



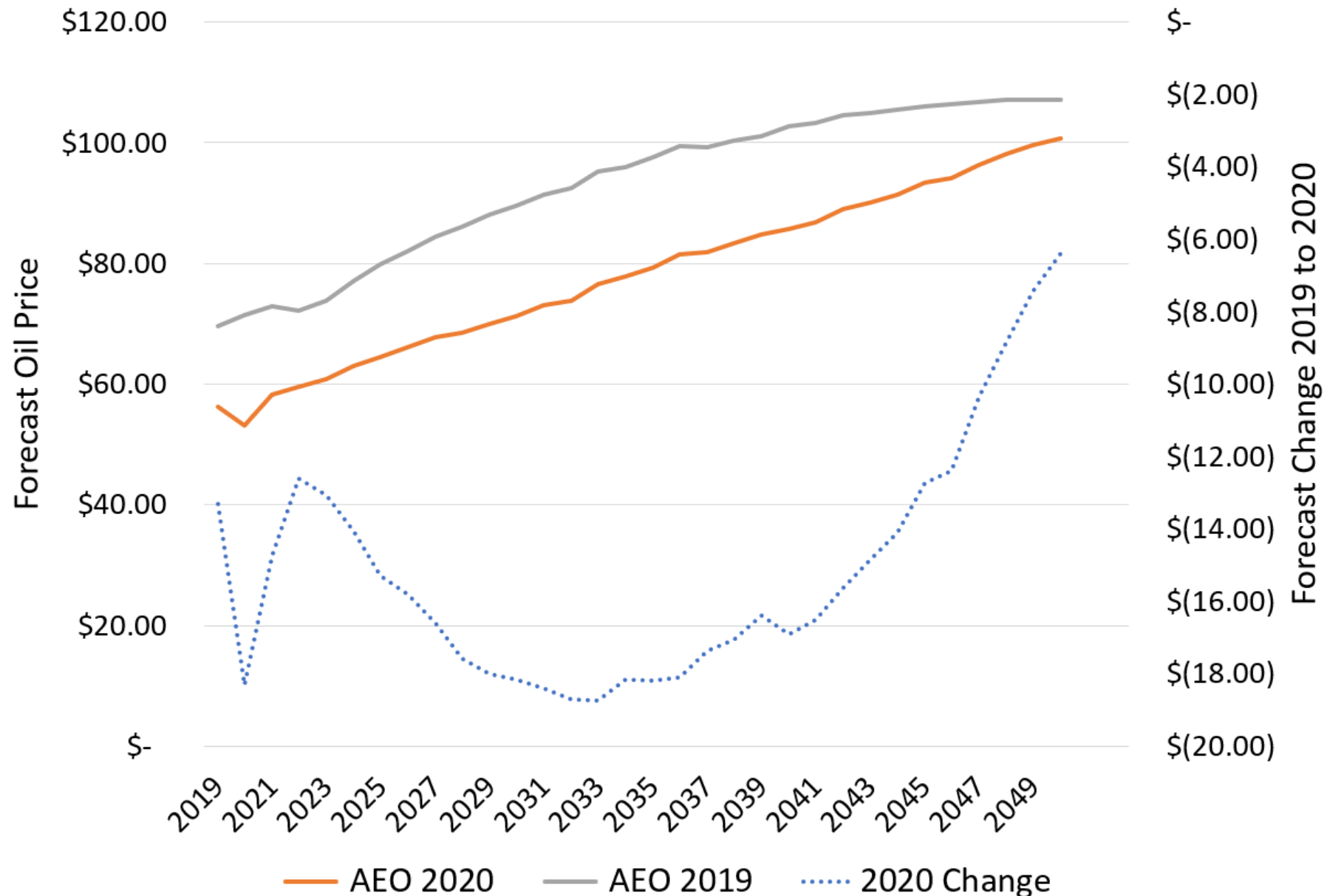


## **Presentation Forecast Note:**

Many forecasts are in “draft” status as the EIA has recently released their 2020 Annual Energy Outlook with a revised oil price forecast. Final forecast updates/revisions will be available in mid-February.



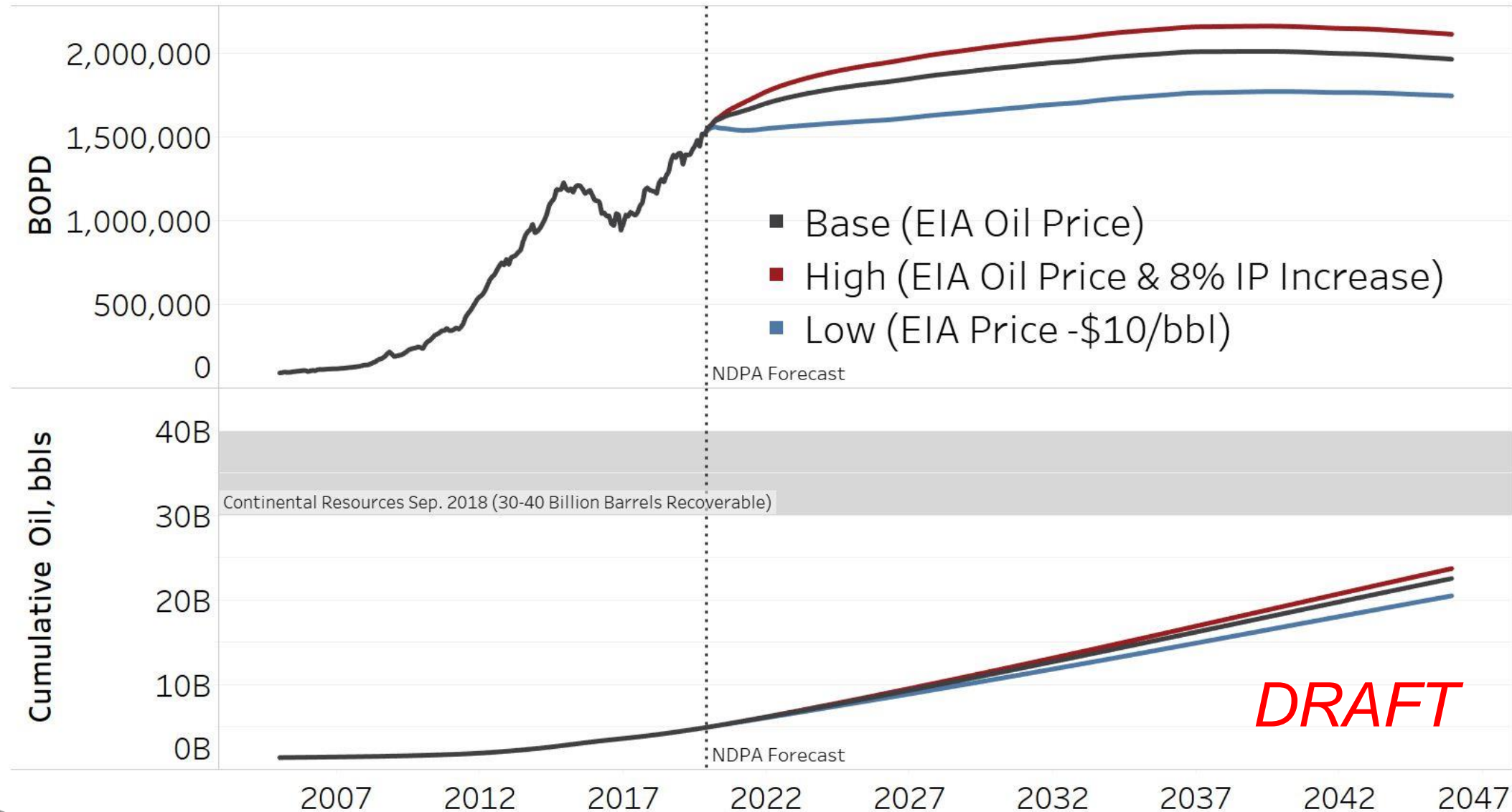
# EIA Oil Price Forecasts - Reference Case



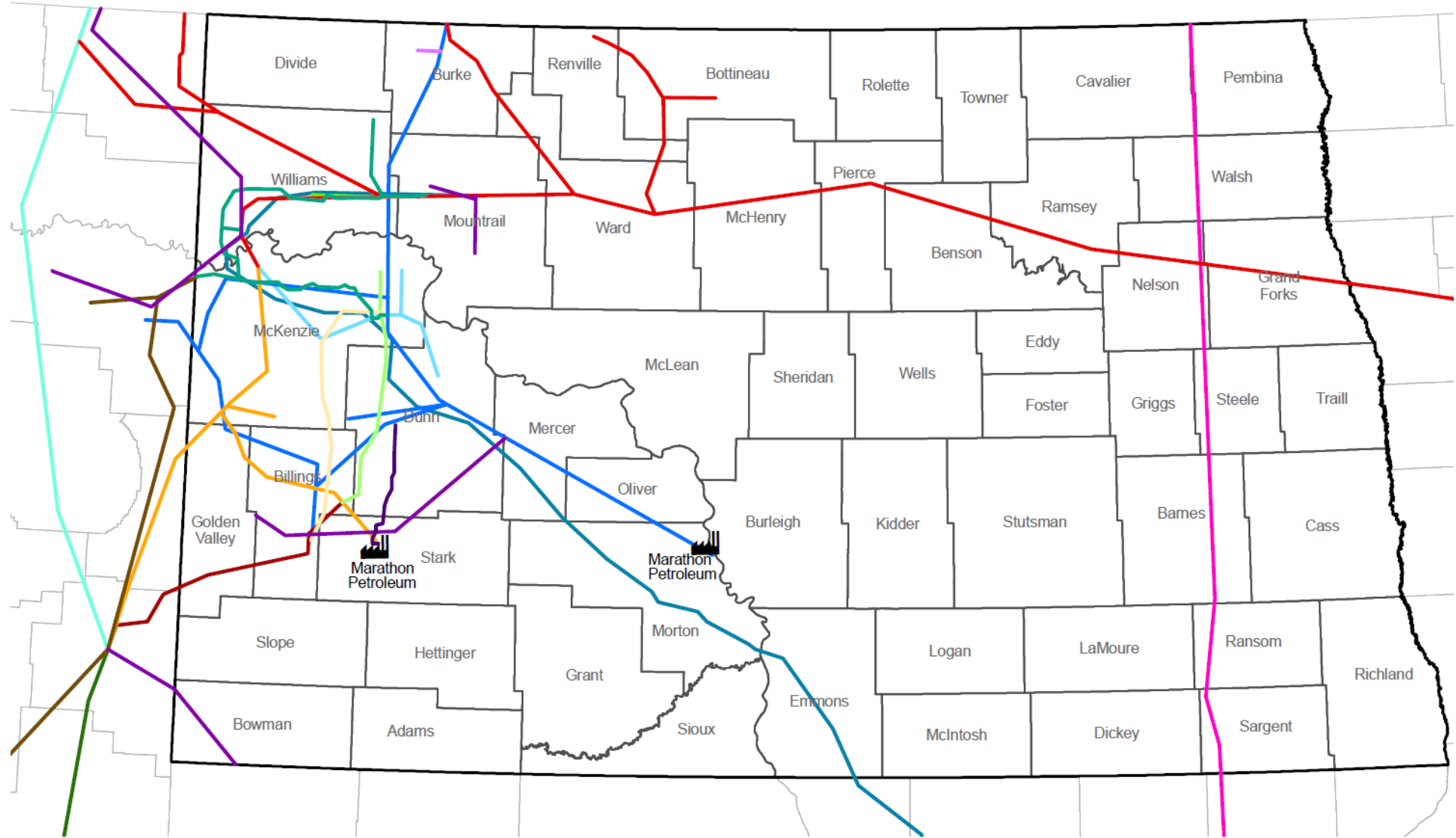


# North Dakota Oil Production Forecast

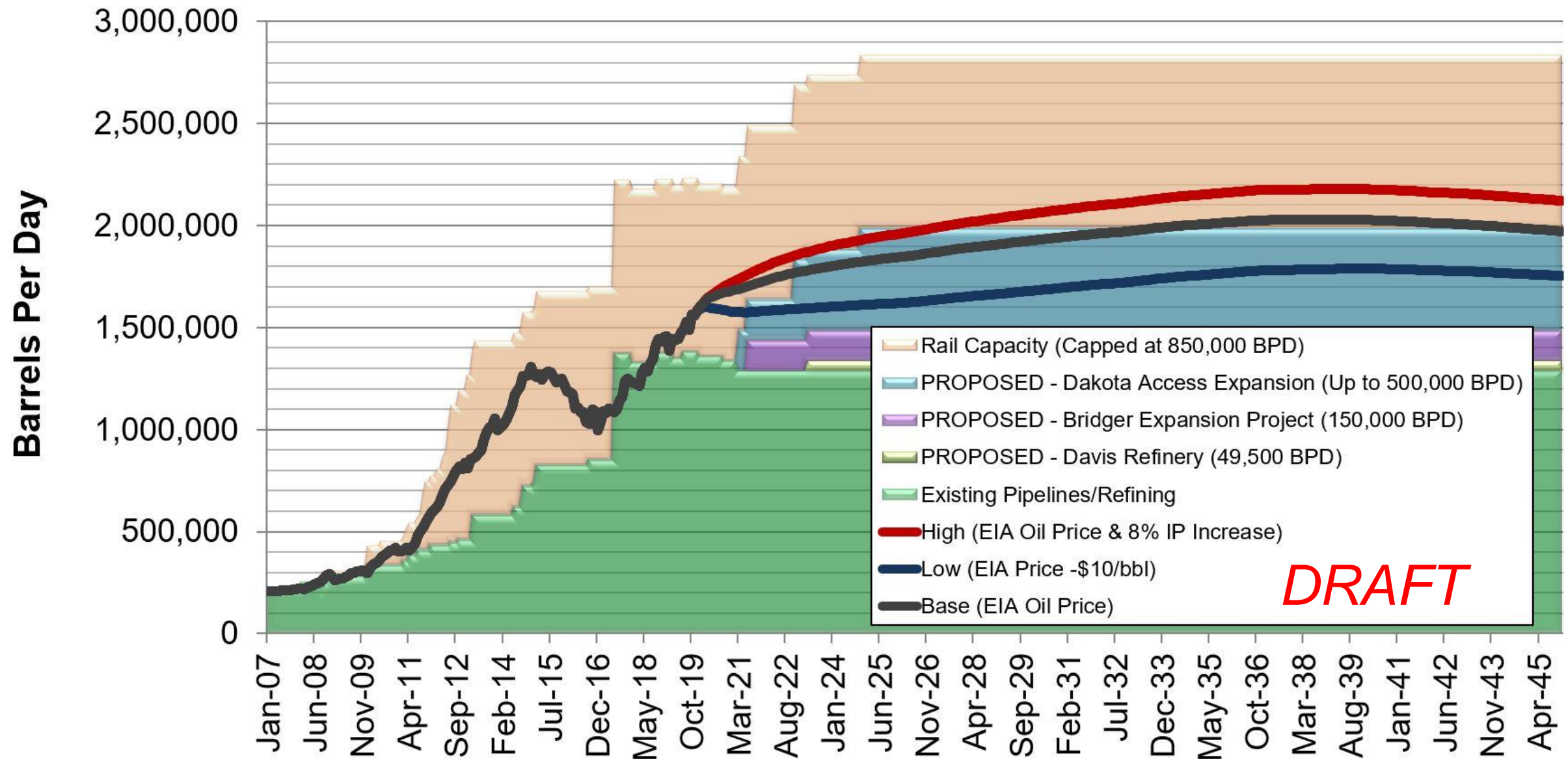
*Assumes Current Technology – Enhanced Oil Recovery Not Included*



# North Dakota Crude Oil Pipelines



# Williston Basin Oil Production & Export Capacity, BOPD

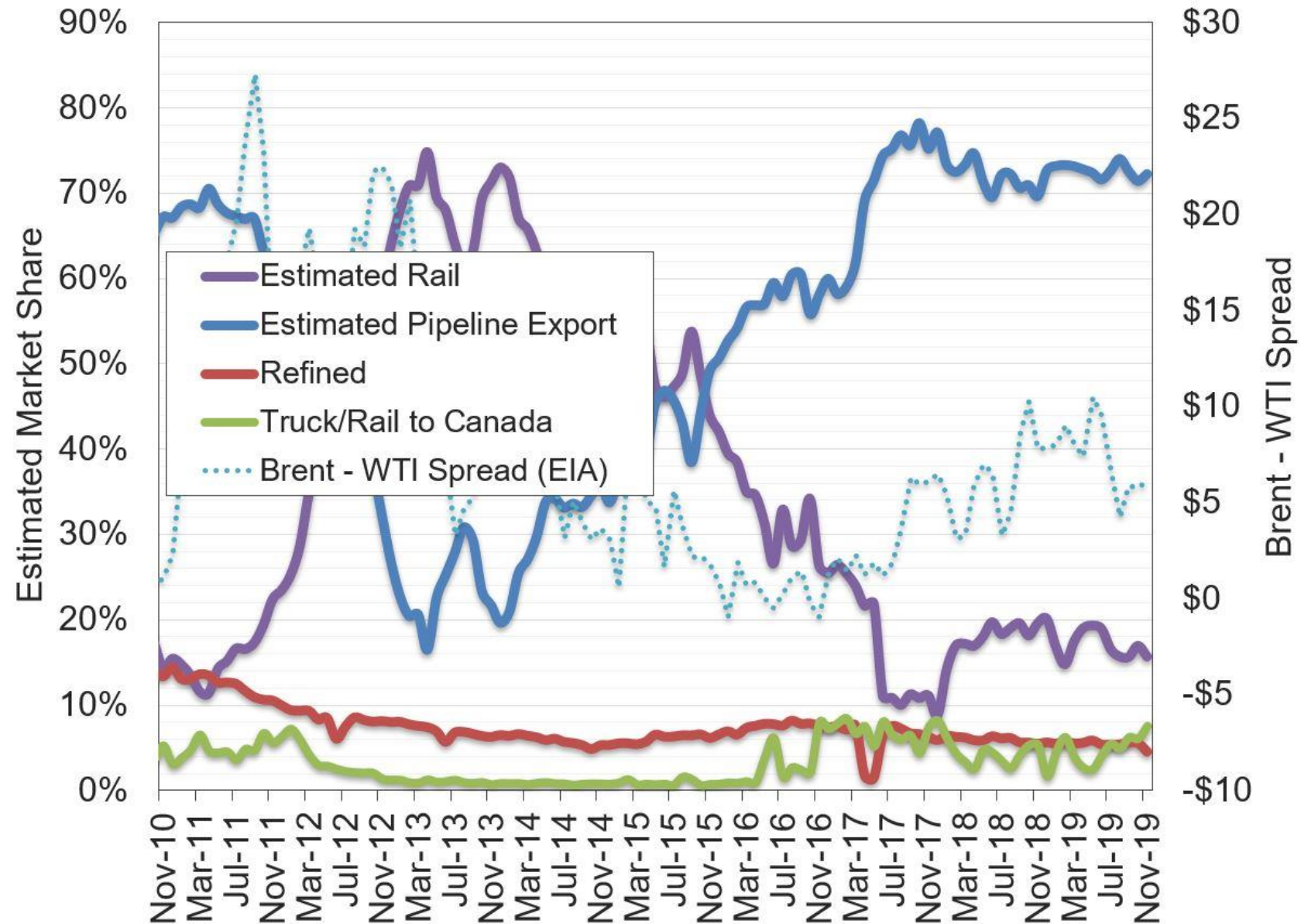


*Production forecast is for visual demonstration purposes only and should not be considered accurate for any near or long term planning.*





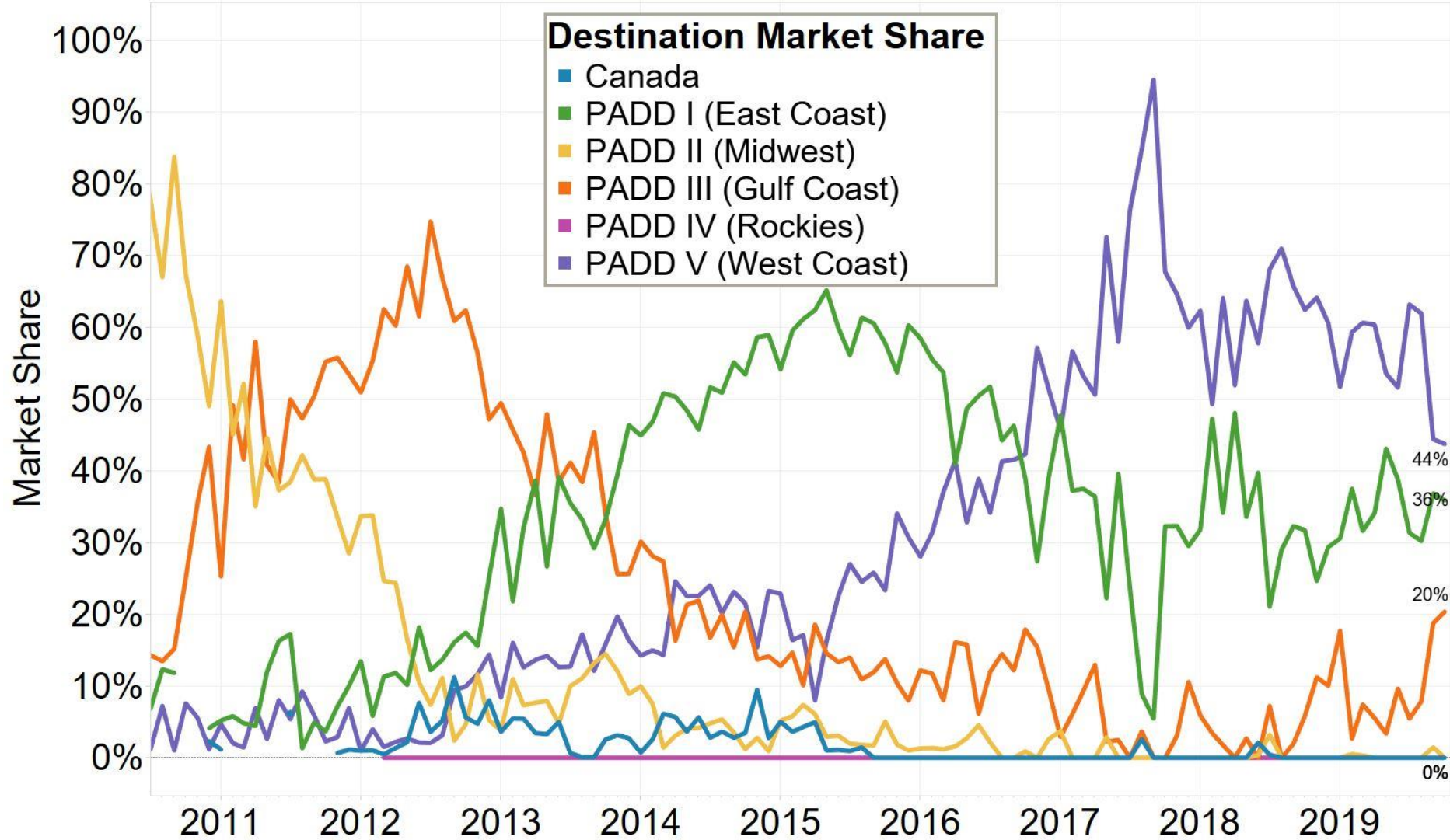
# Estimated Williston Basin Oil Transportation



# Estimated ND Rail Export Volumes



# Rail Destinations Market Share (Oct 2019)



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



# Natural Gas Update



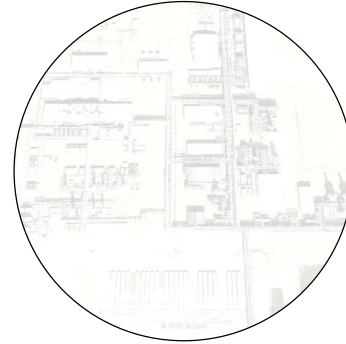
## Production

- Technology
- Markets



## Gathering

- Capacity
- Connections



## Processing

- Capacity
- Location



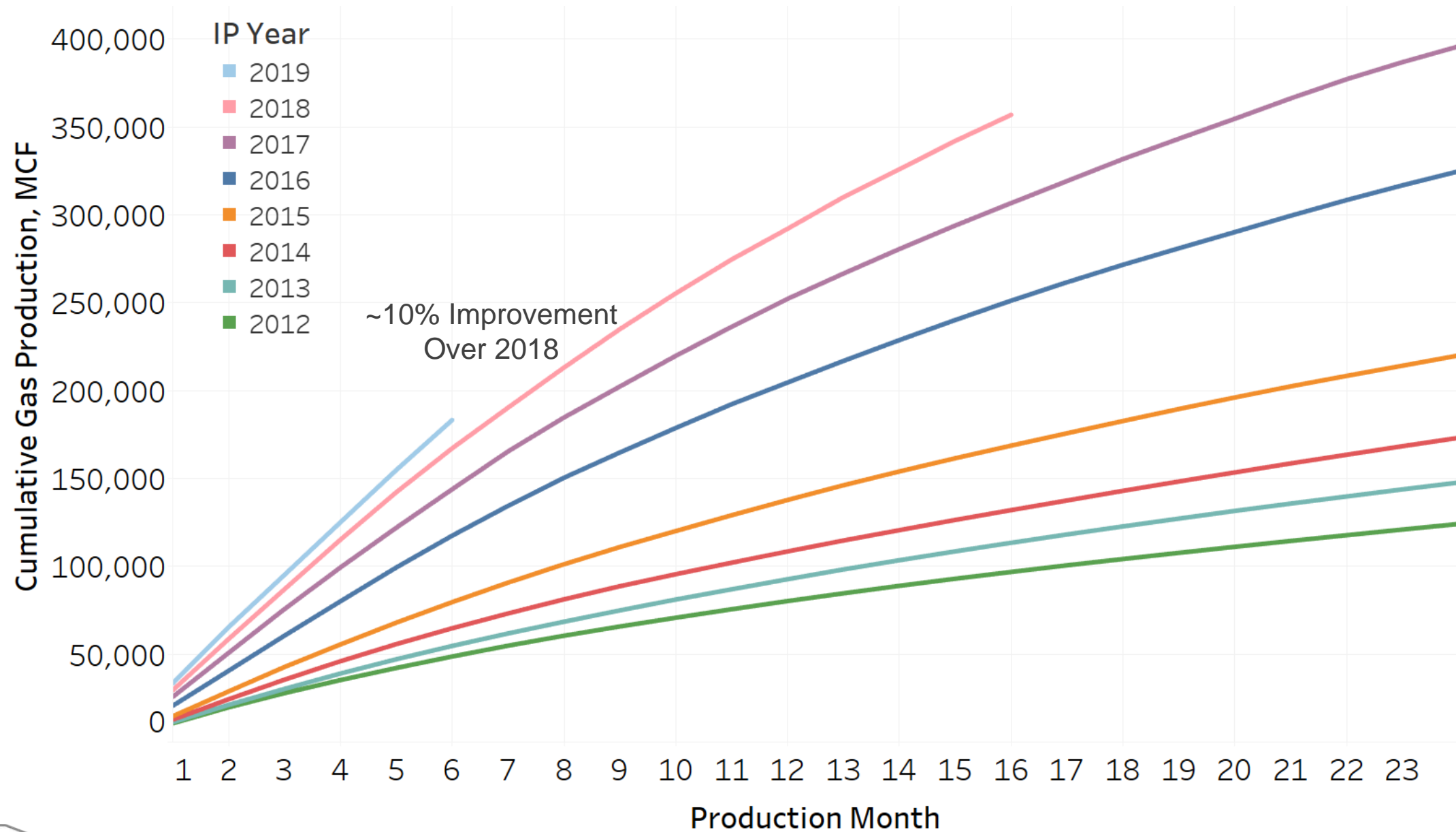
## Transmission

- Dry Gas
- Natural Gas Liquids

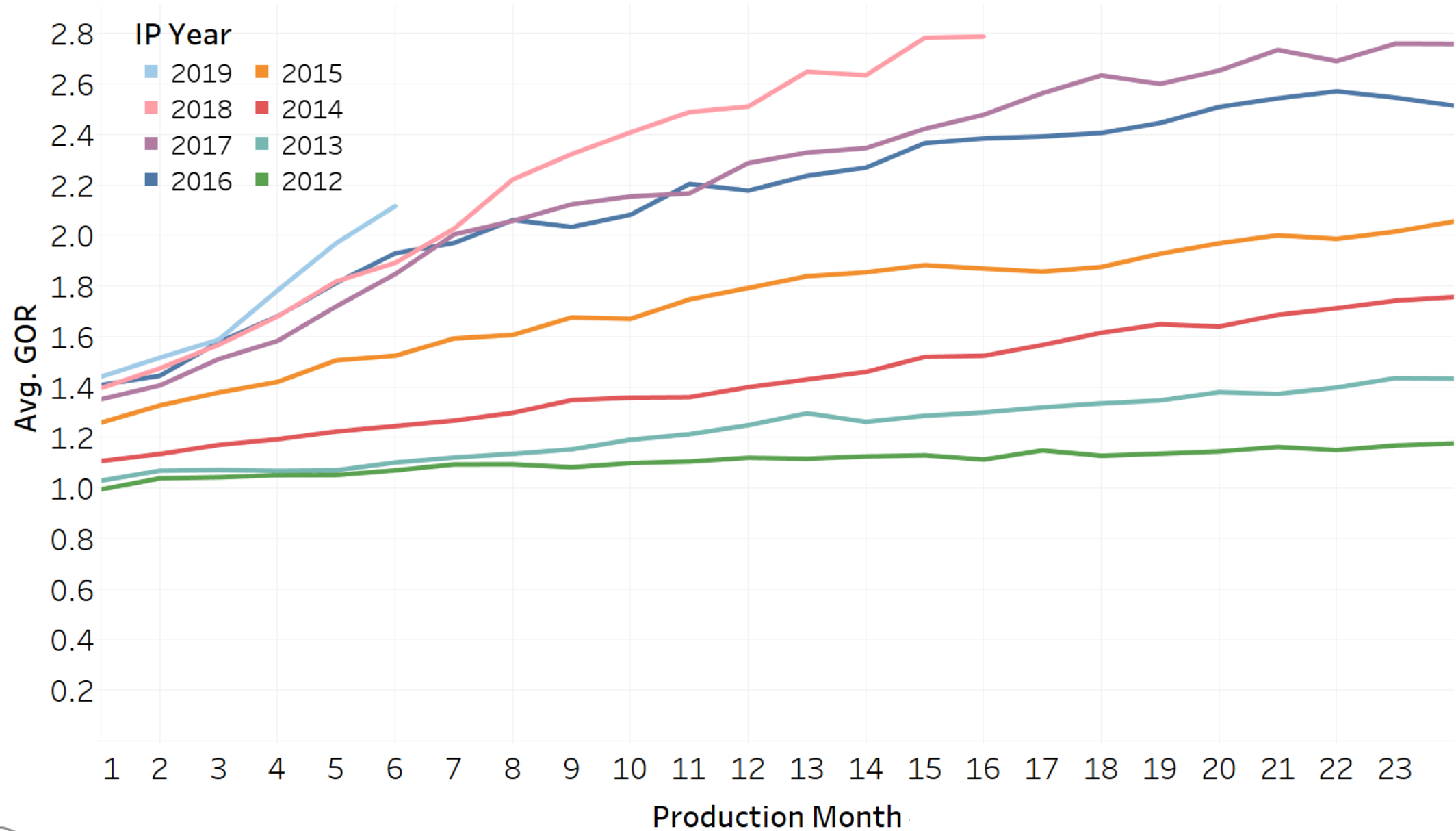




# Statewide Gas Performance

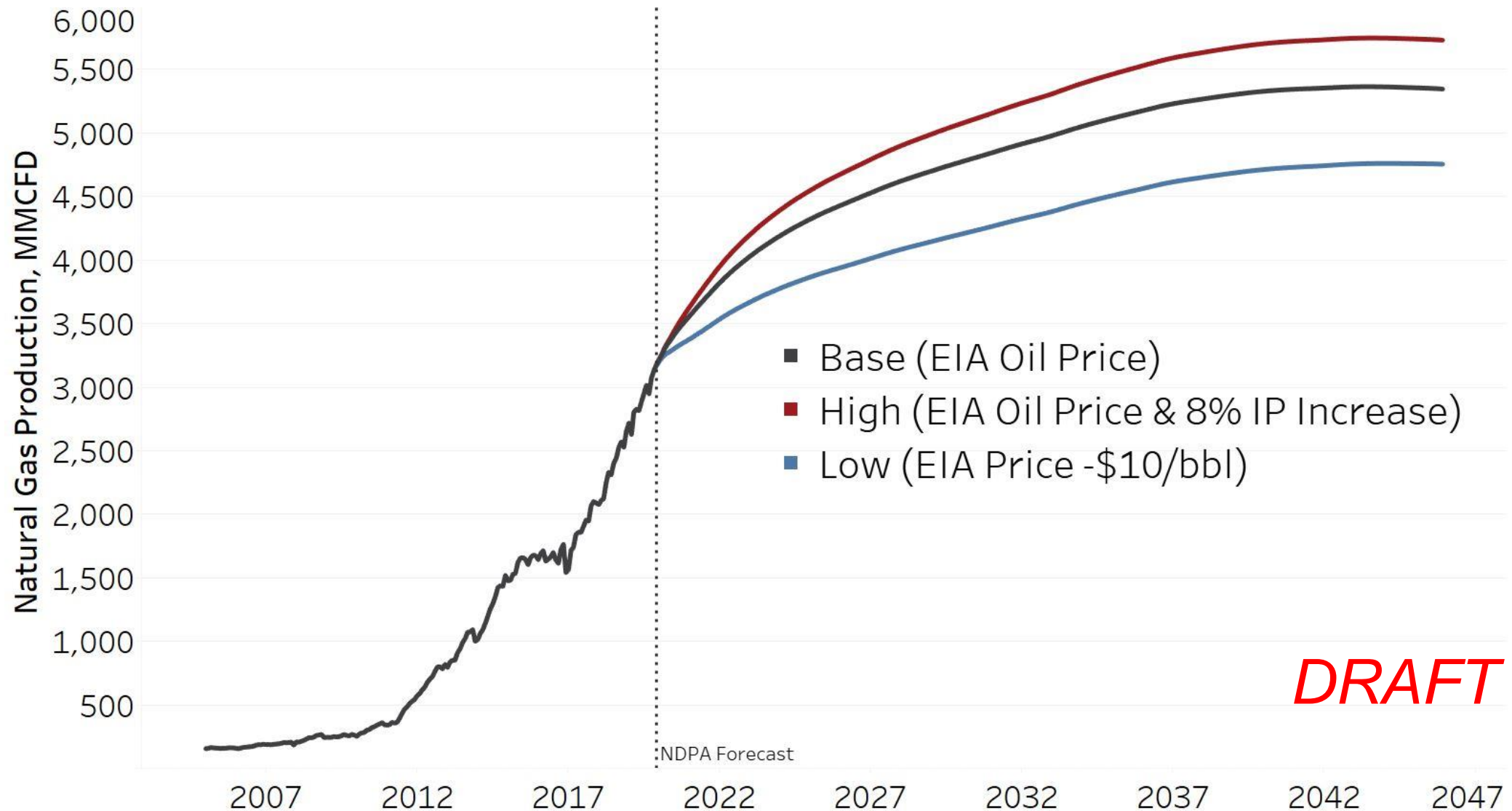


# Statewide Gas-Oil Ratio

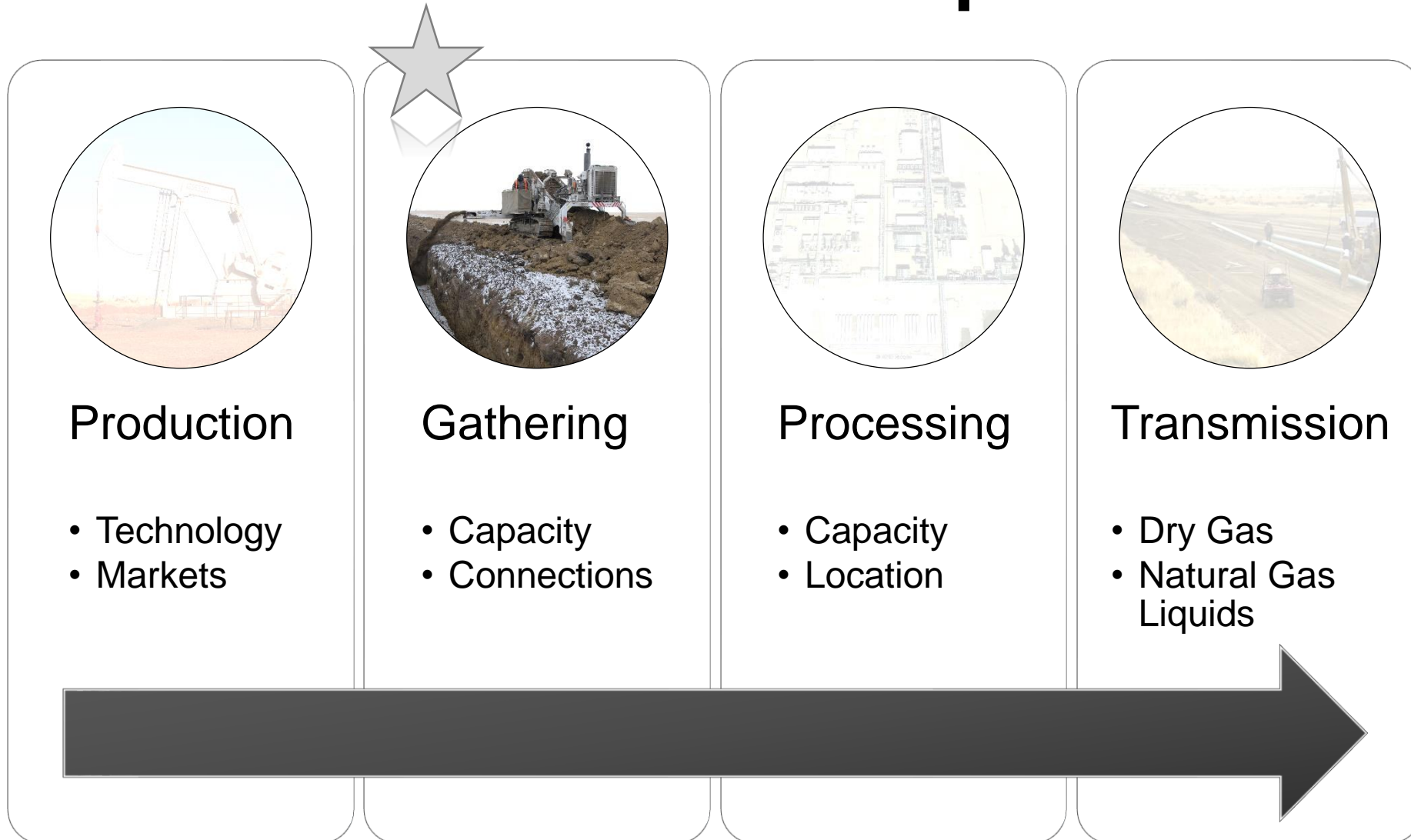


# NDPA North Dakota Gas Production Forecast

*Assumes Current Technology – Enhanced Oil Recovery Not Included*

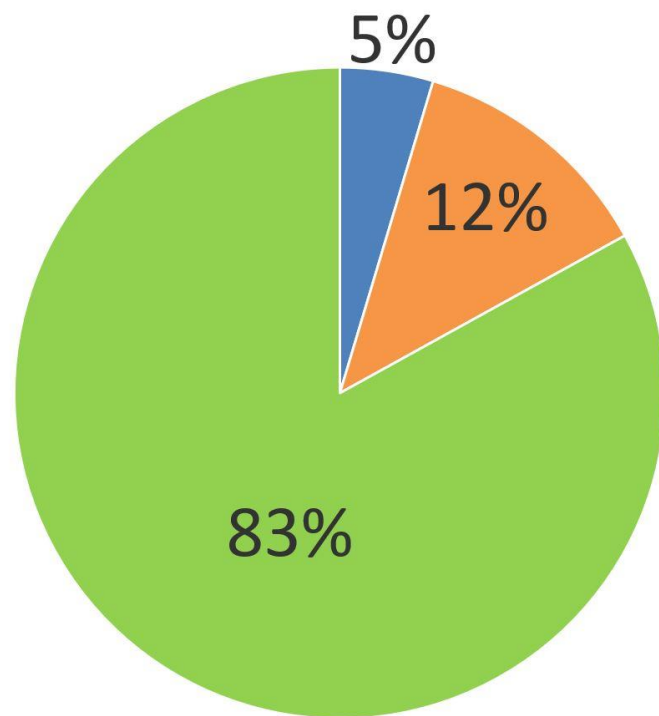


# Natural Gas Update





# 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.

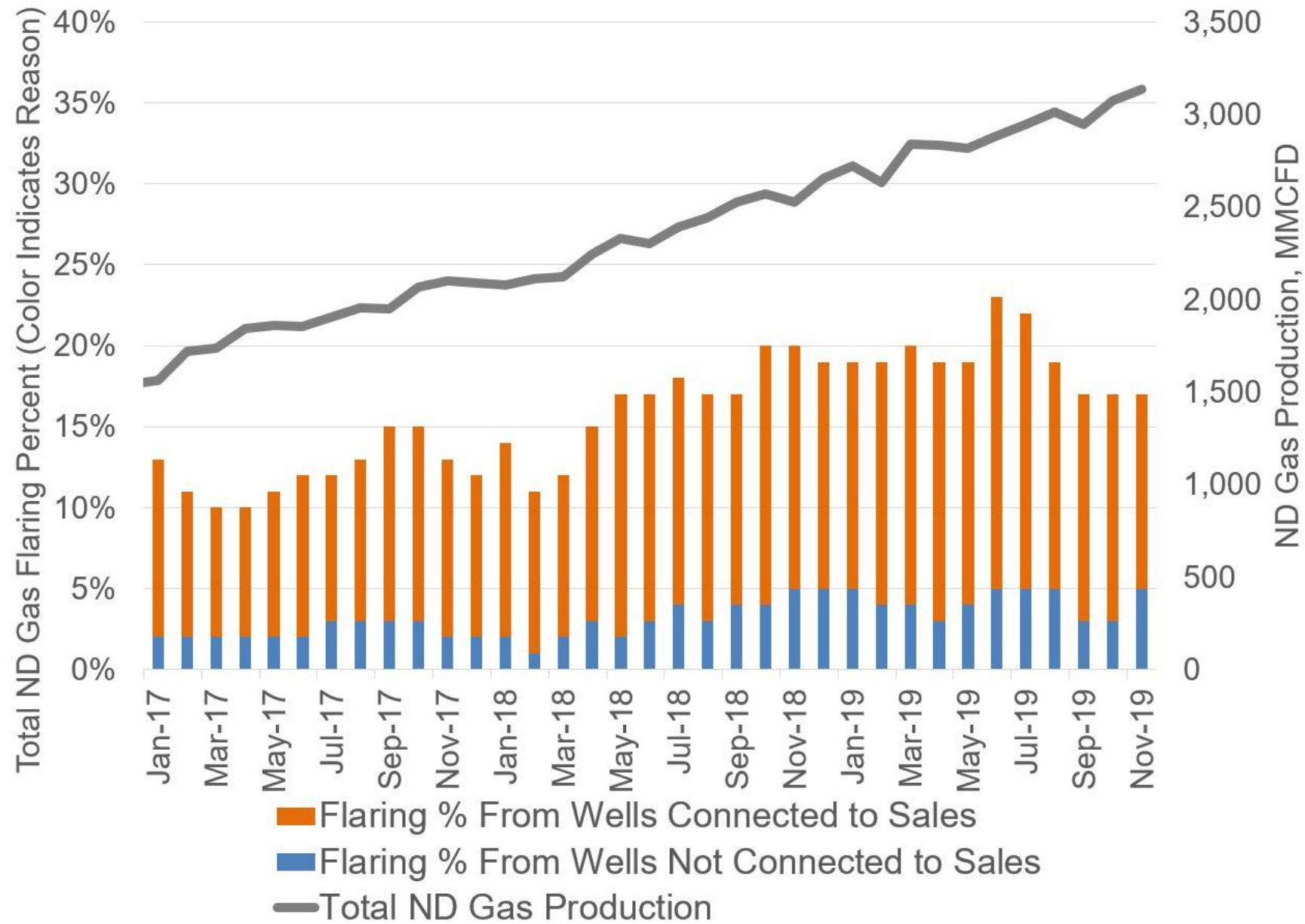
## Simple Terms

**Blue** – Lack of pipelines  
**Orange** – Challenges on existing infrastructure

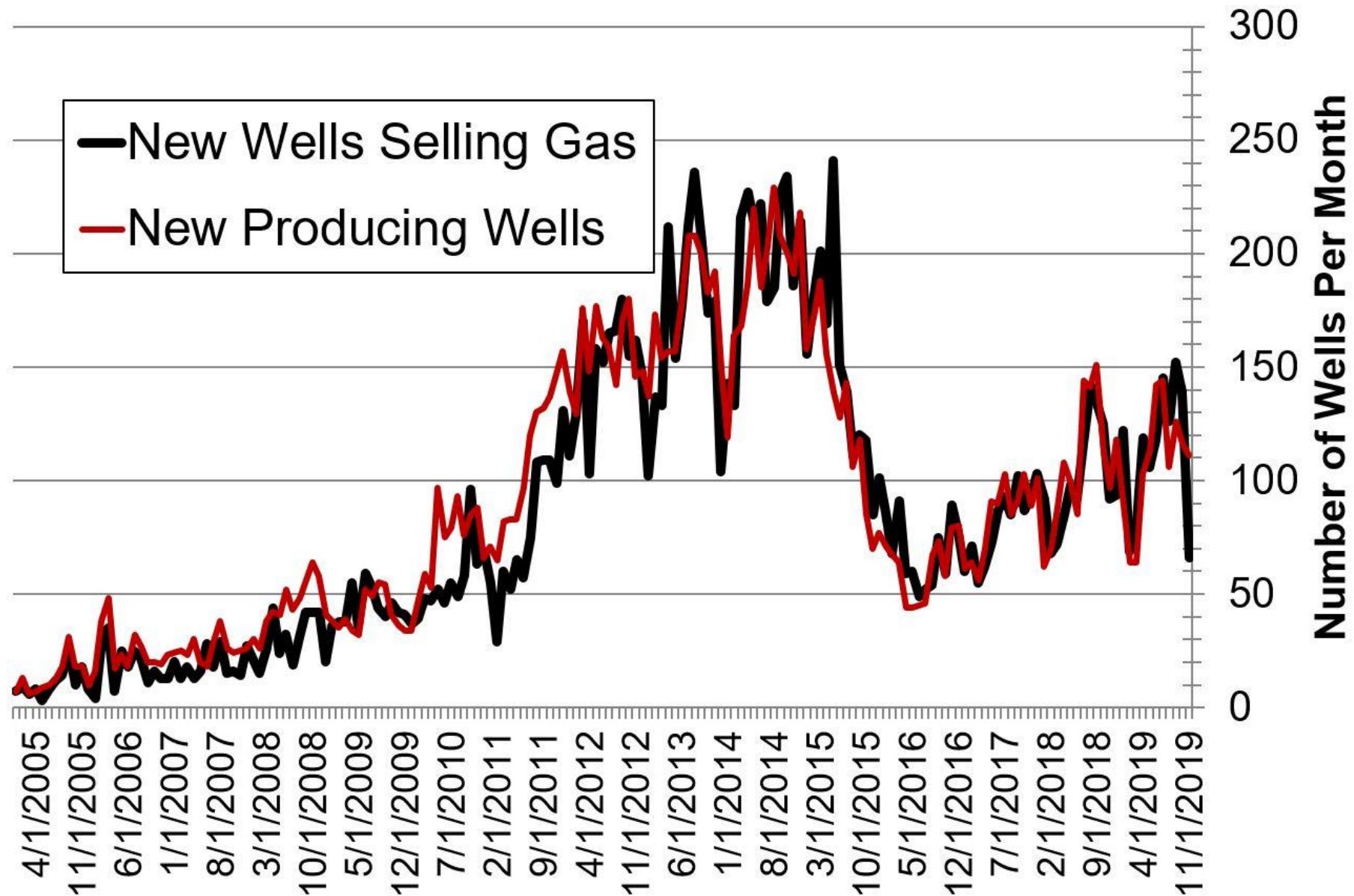
Nov. 2019 Data – Non-Confidential Wells



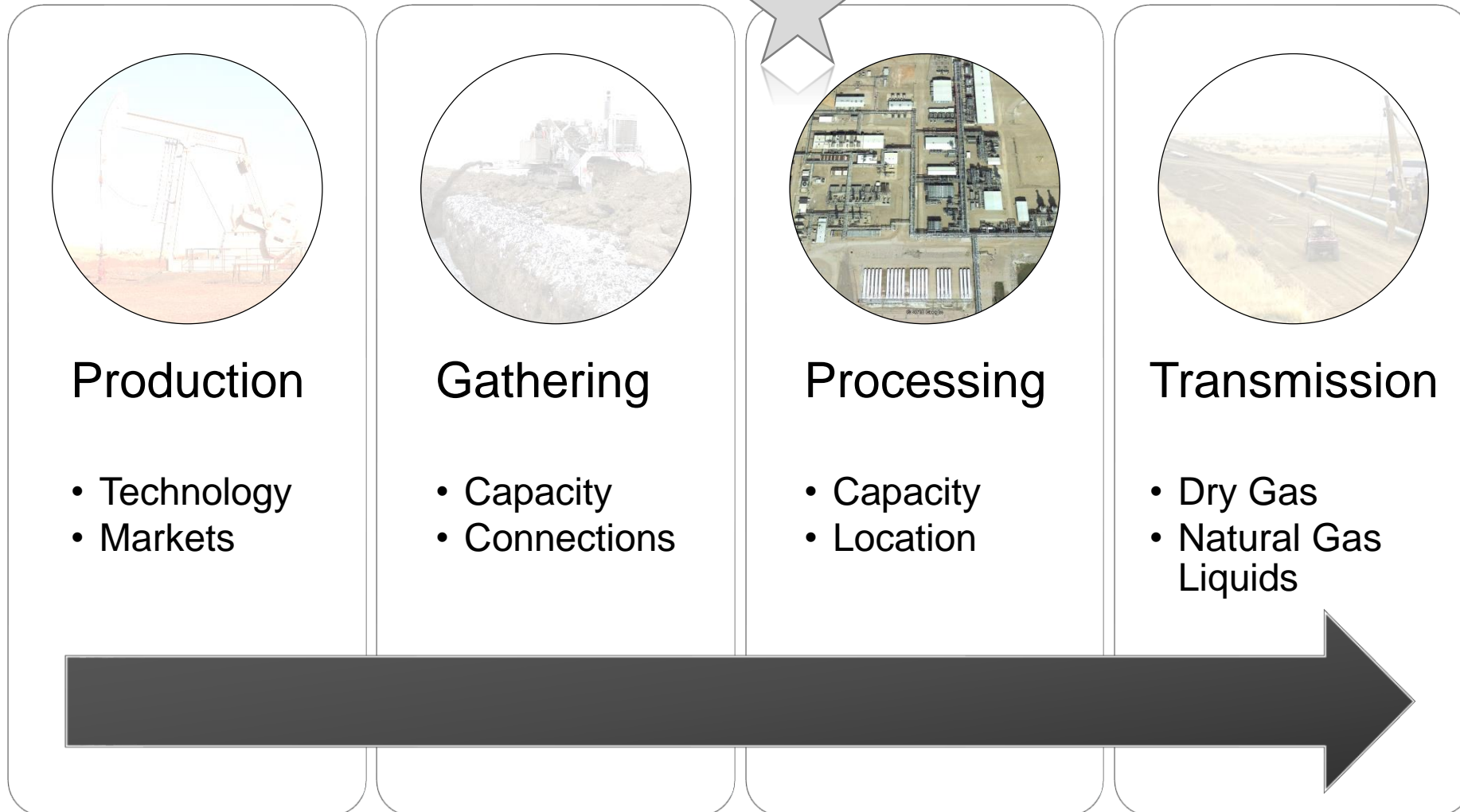
# Solving the Flaring Challenge



# Solving the Flaring Challenge – Gas Connections

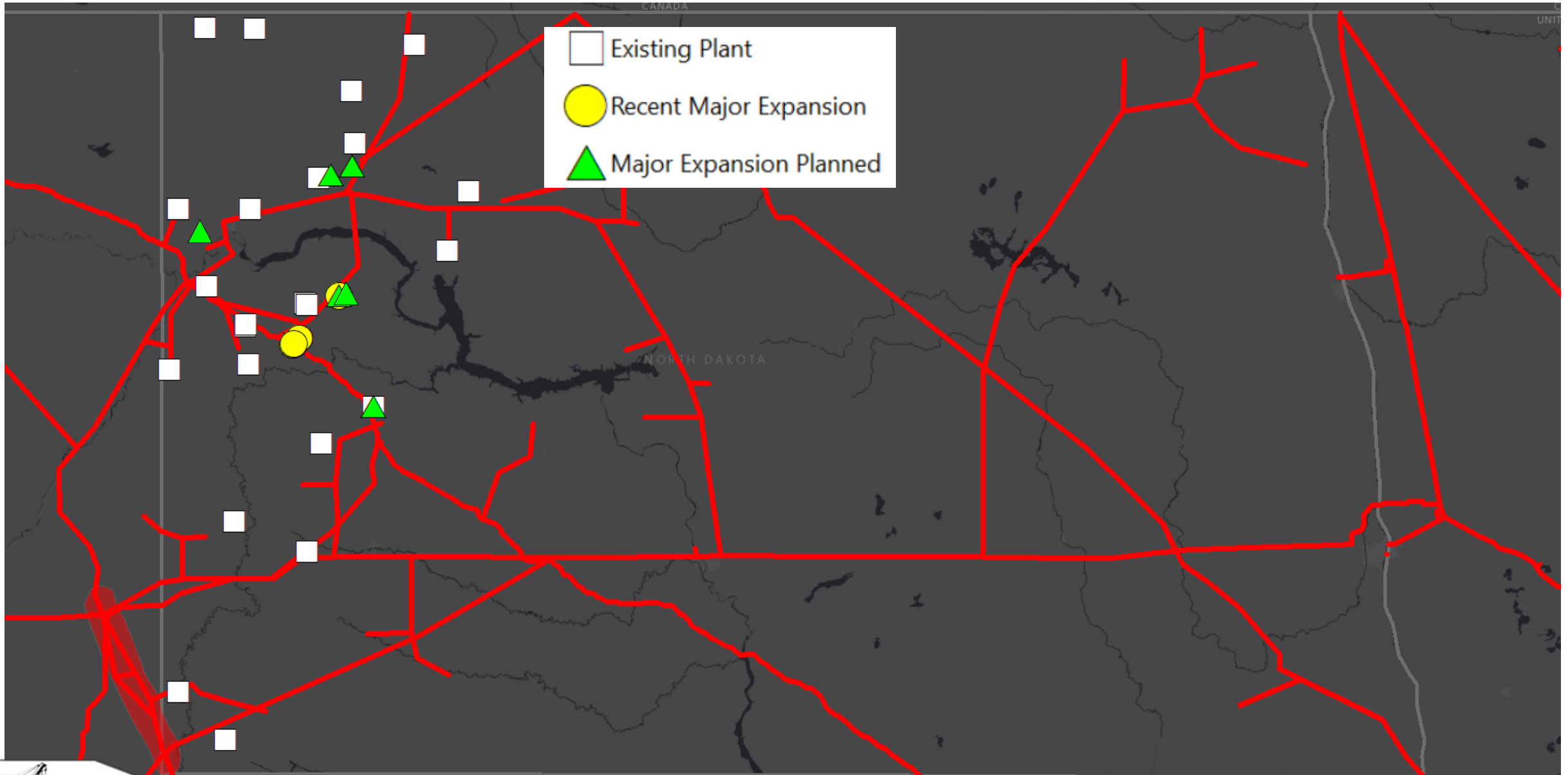


# Natural Gas Update



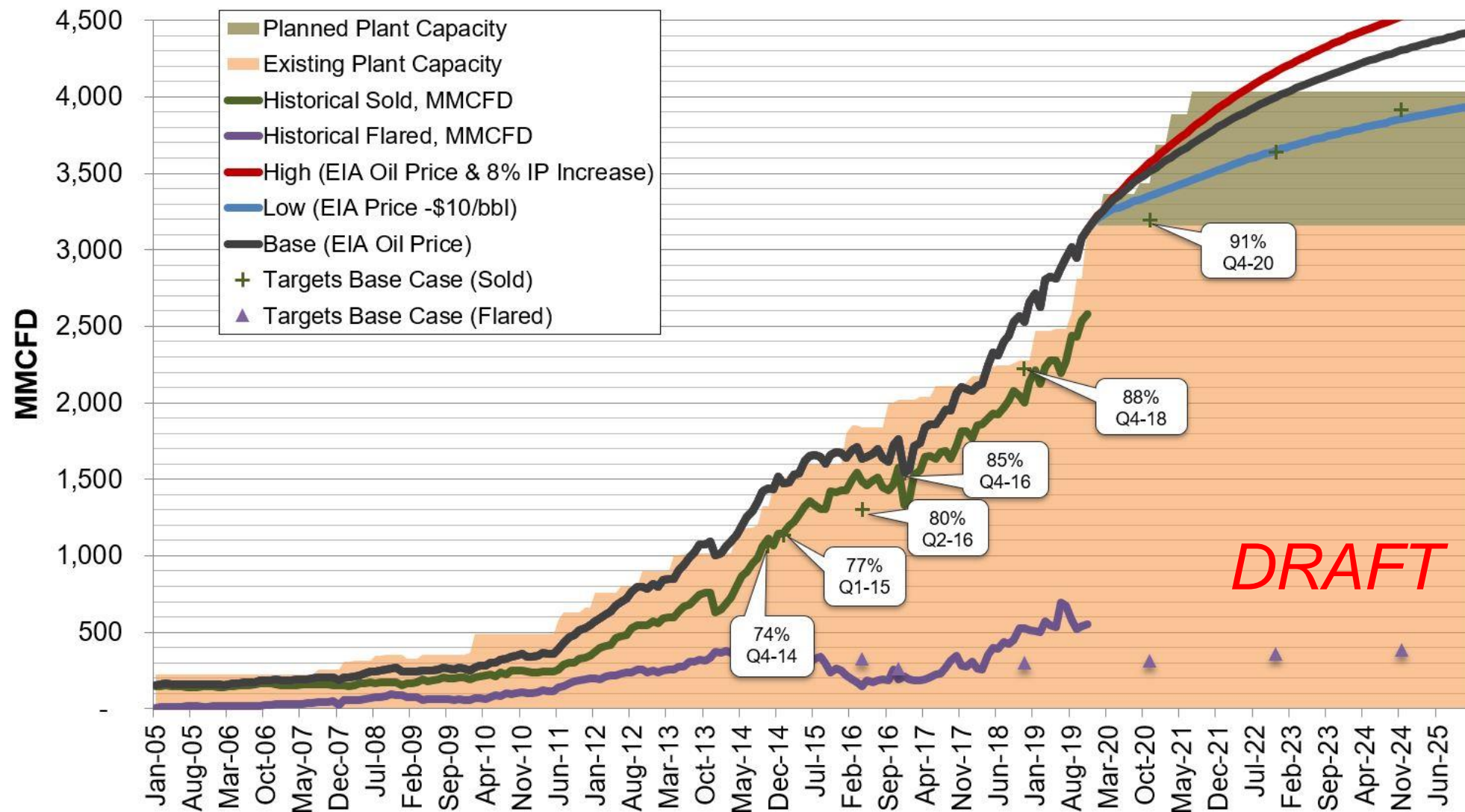


# Gas Processing Expansions



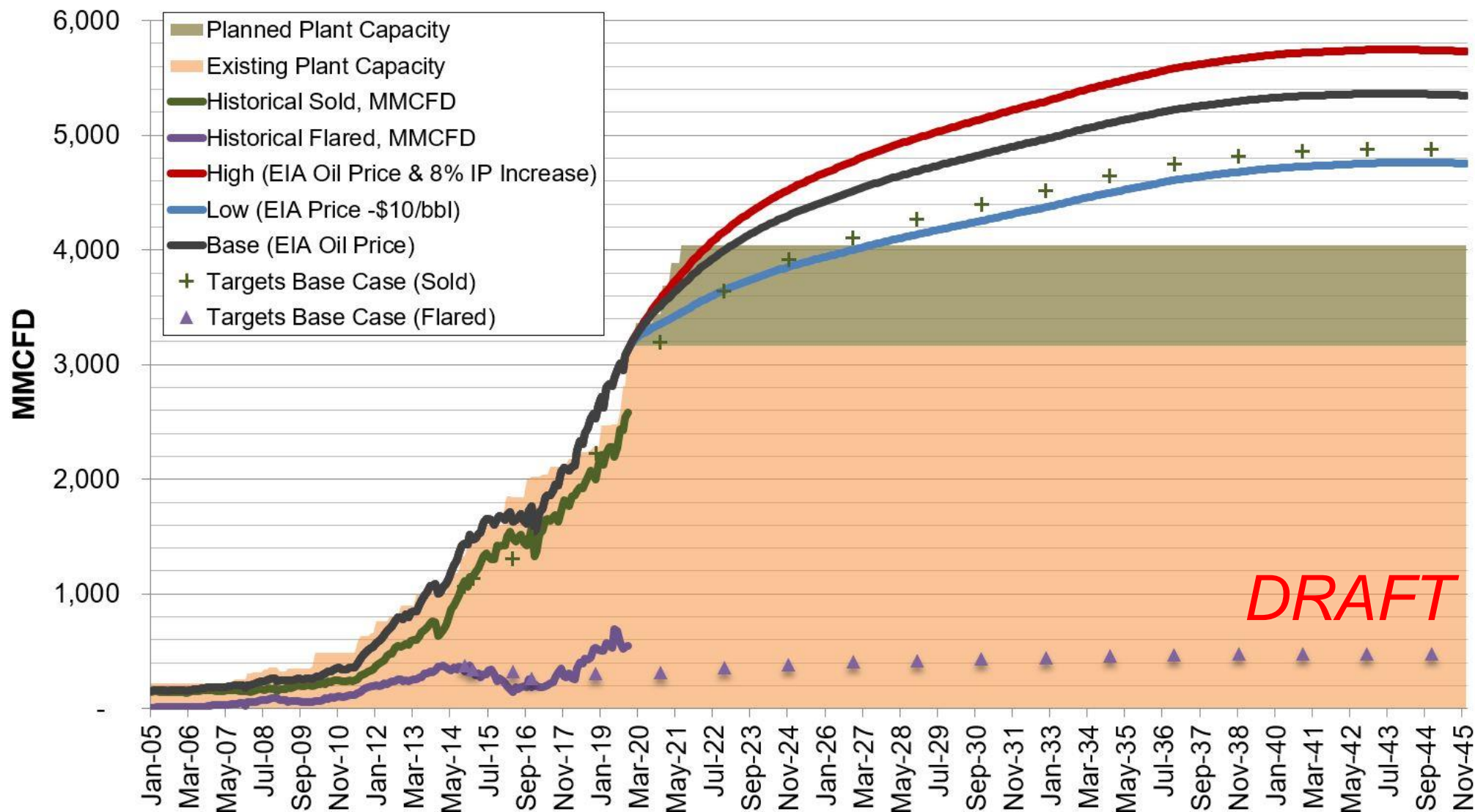
# Solving the Flaring Challenge

*Assumes Current Technology – Enhanced Oil Recovery Not Included*

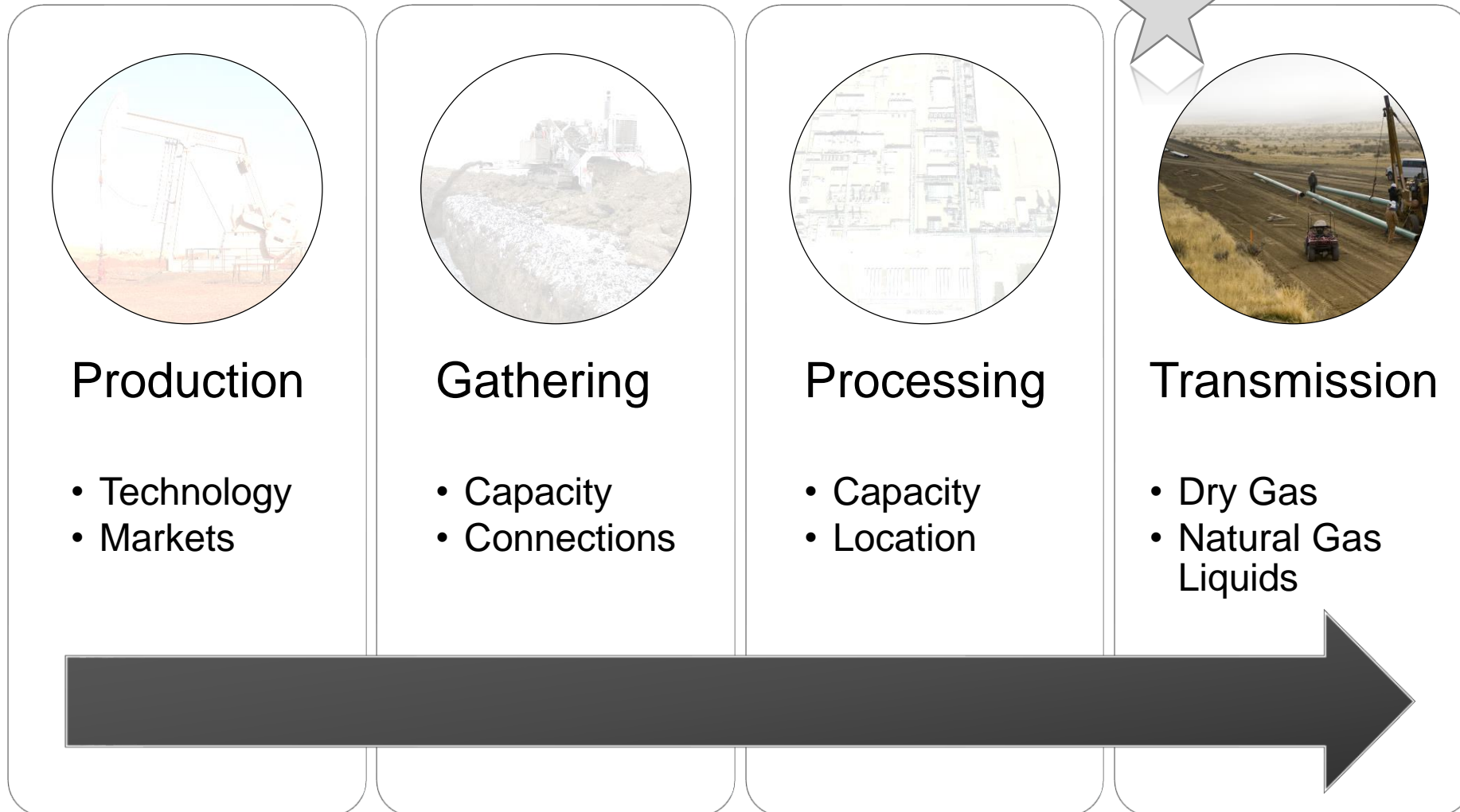


# Solving the Flaring Challenge

*Assumes Current Technology – Enhanced Oil Recovery Not Included*



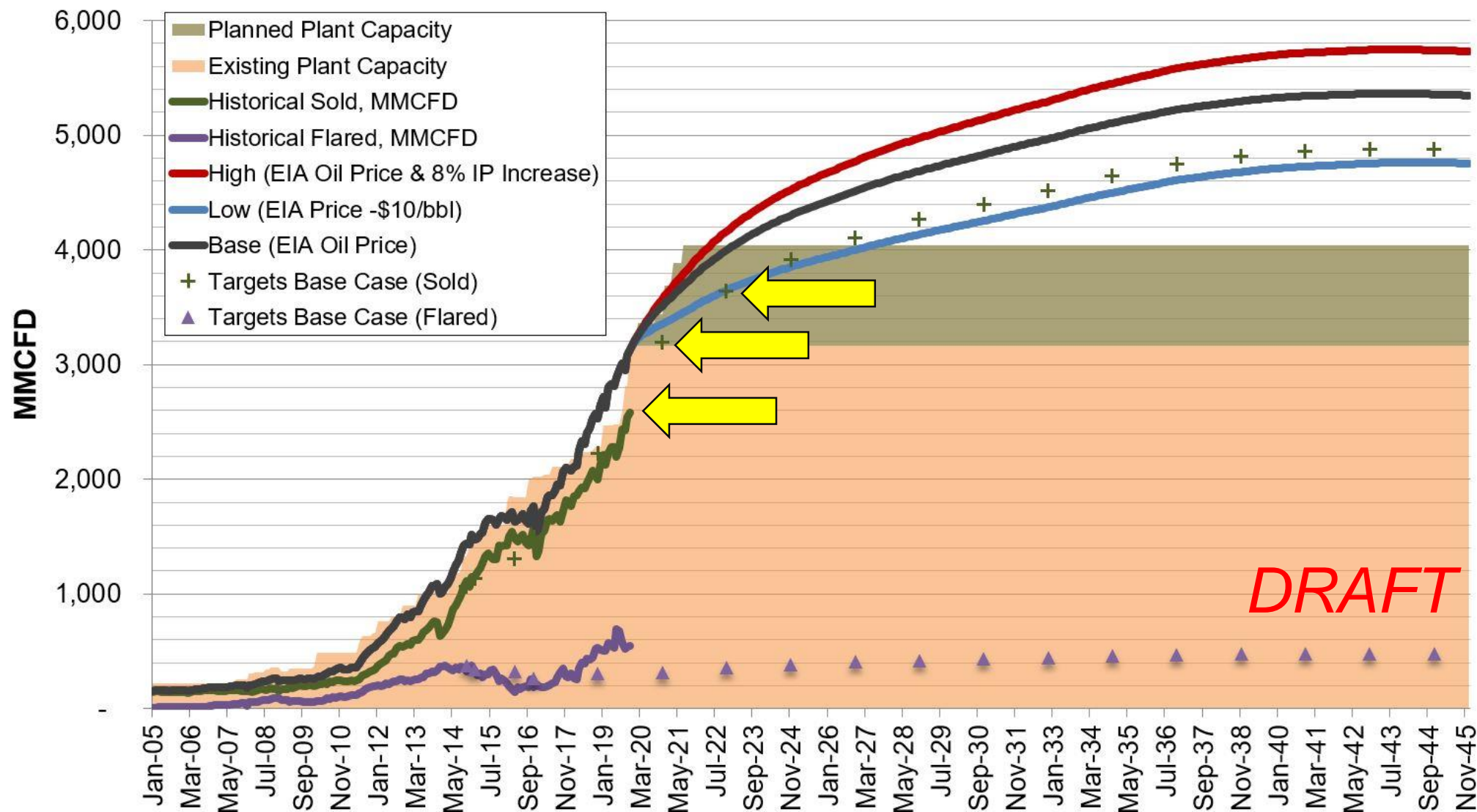
# Natural Gas Update



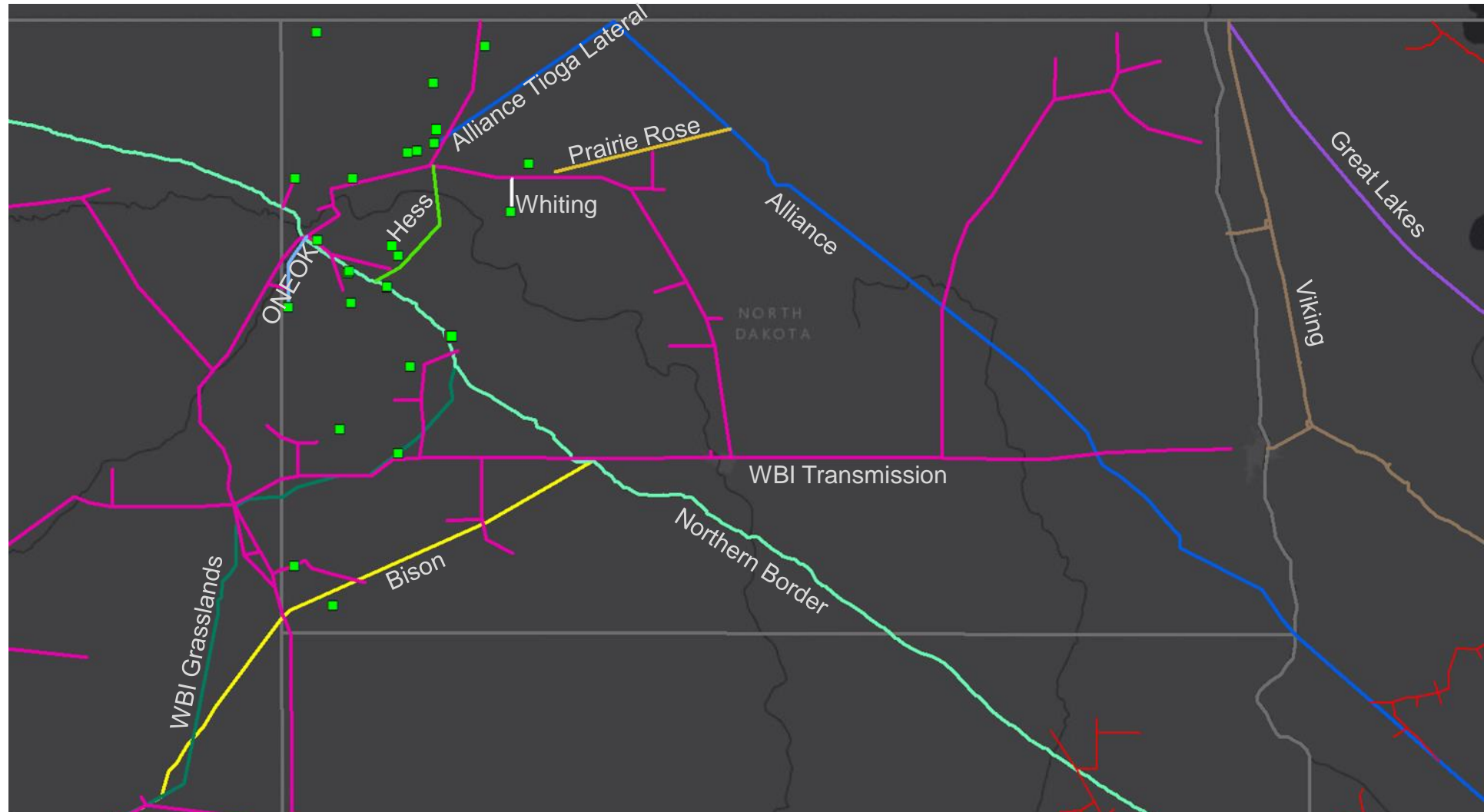


# Solving the Flaring Challenge

*Assumes Current Technology – Enhanced Oil Recovery Not Included*



# Major Gas Pipeline and Processing Infrastructure



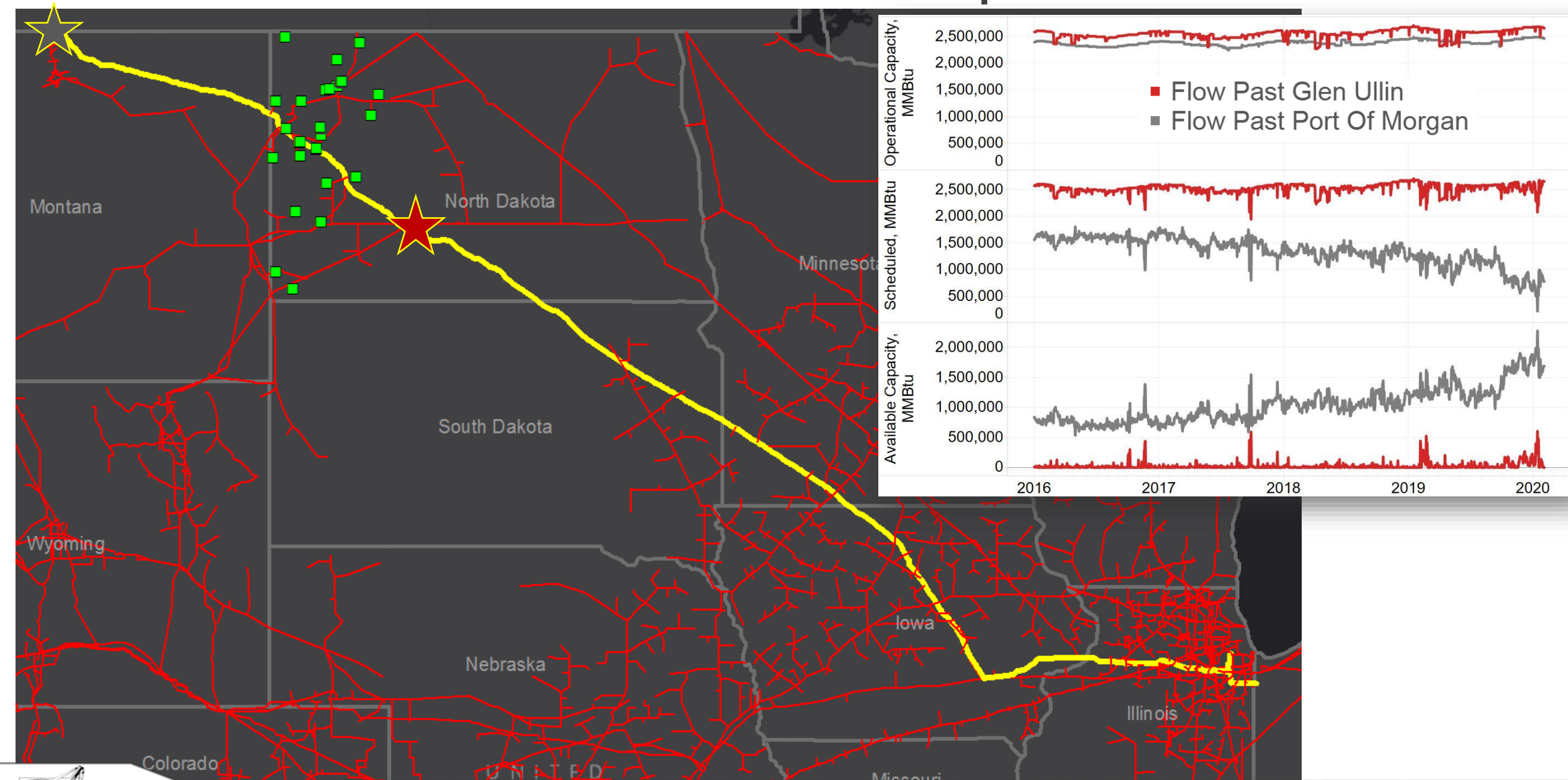
# WBI Energy – North Bakken Expansion Project

## Project Highlights

- 63 Miles - 24" Pipeline
- 20 Miles - 12" Pipeline
- \$220+ Million
- 350,000 MCFD Capacity (expandable)
- End of 2021 Proposed Completion
- Residue Gas Service From North of Lake Sakakawea to Northern Border Pipeline in McKenzie County

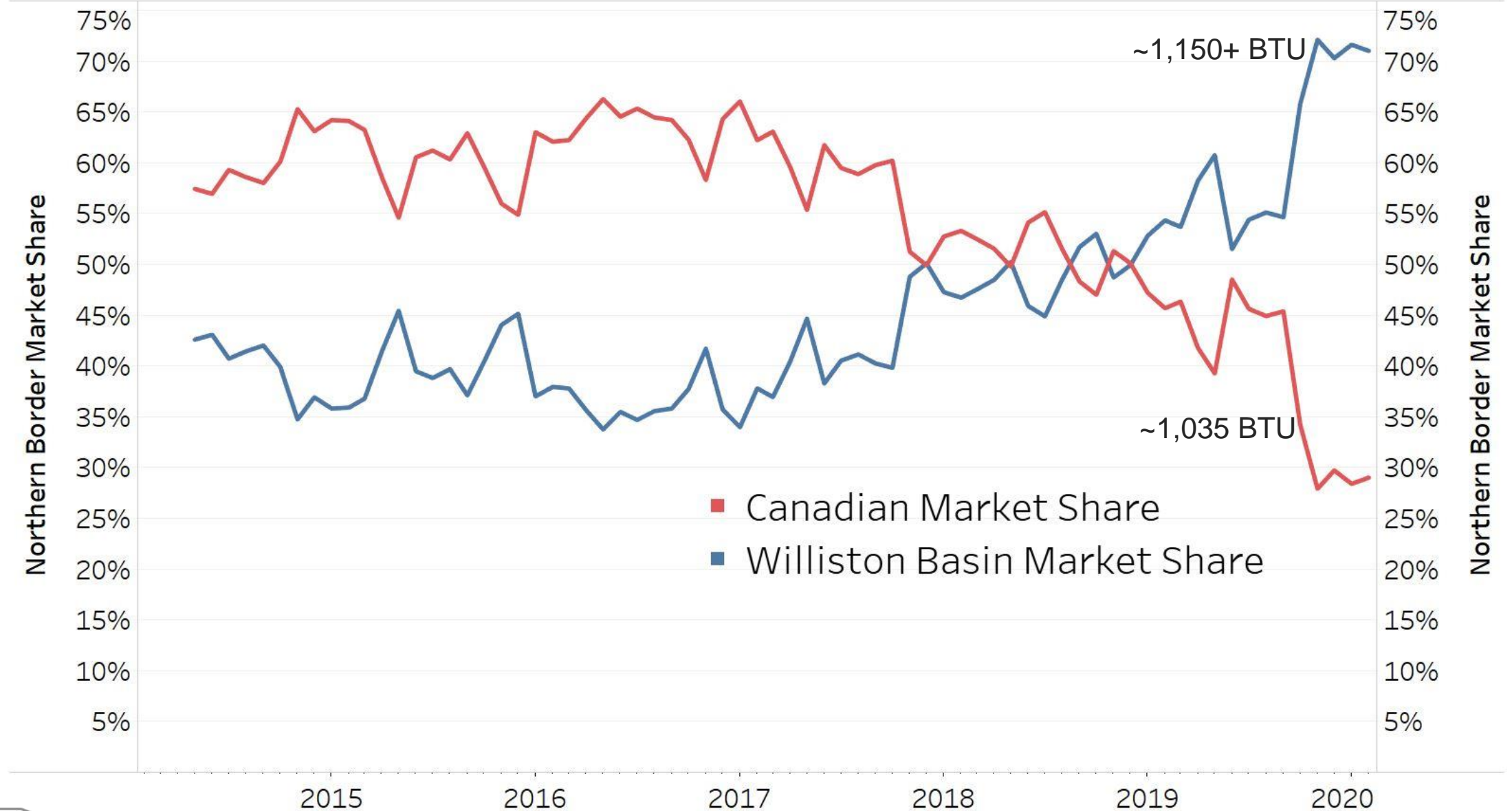


# Northern Border Pipeline

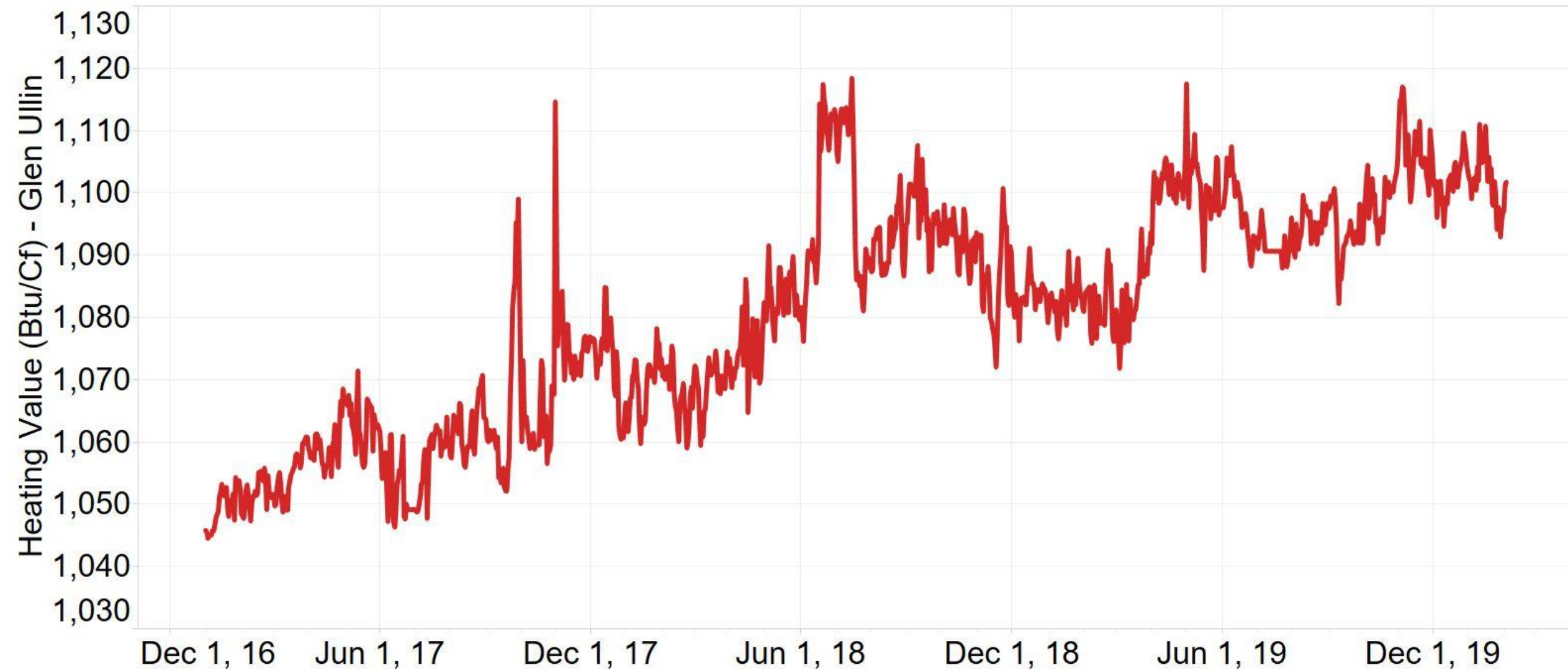




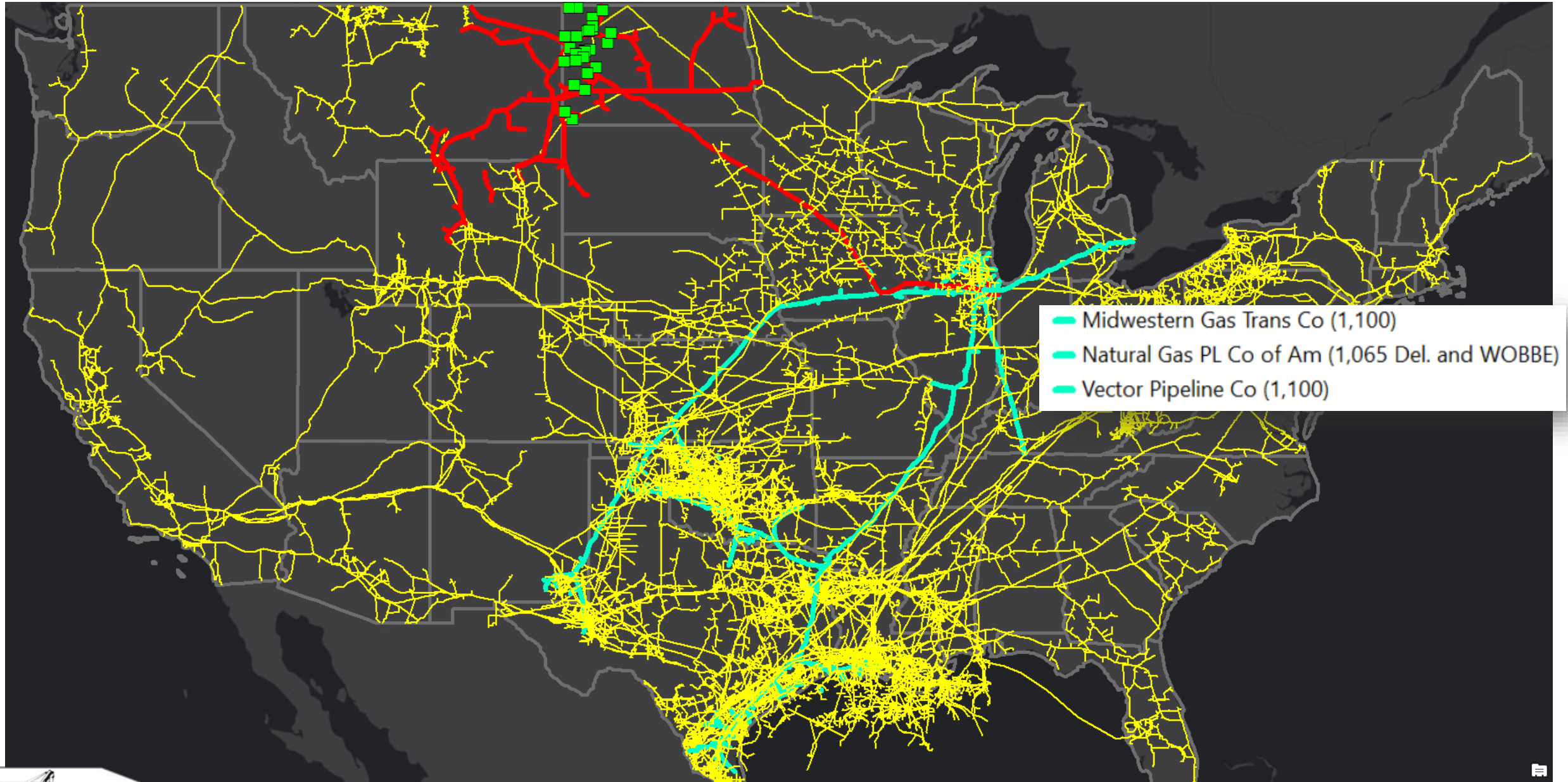
# Northern Border Pipeline Market Share



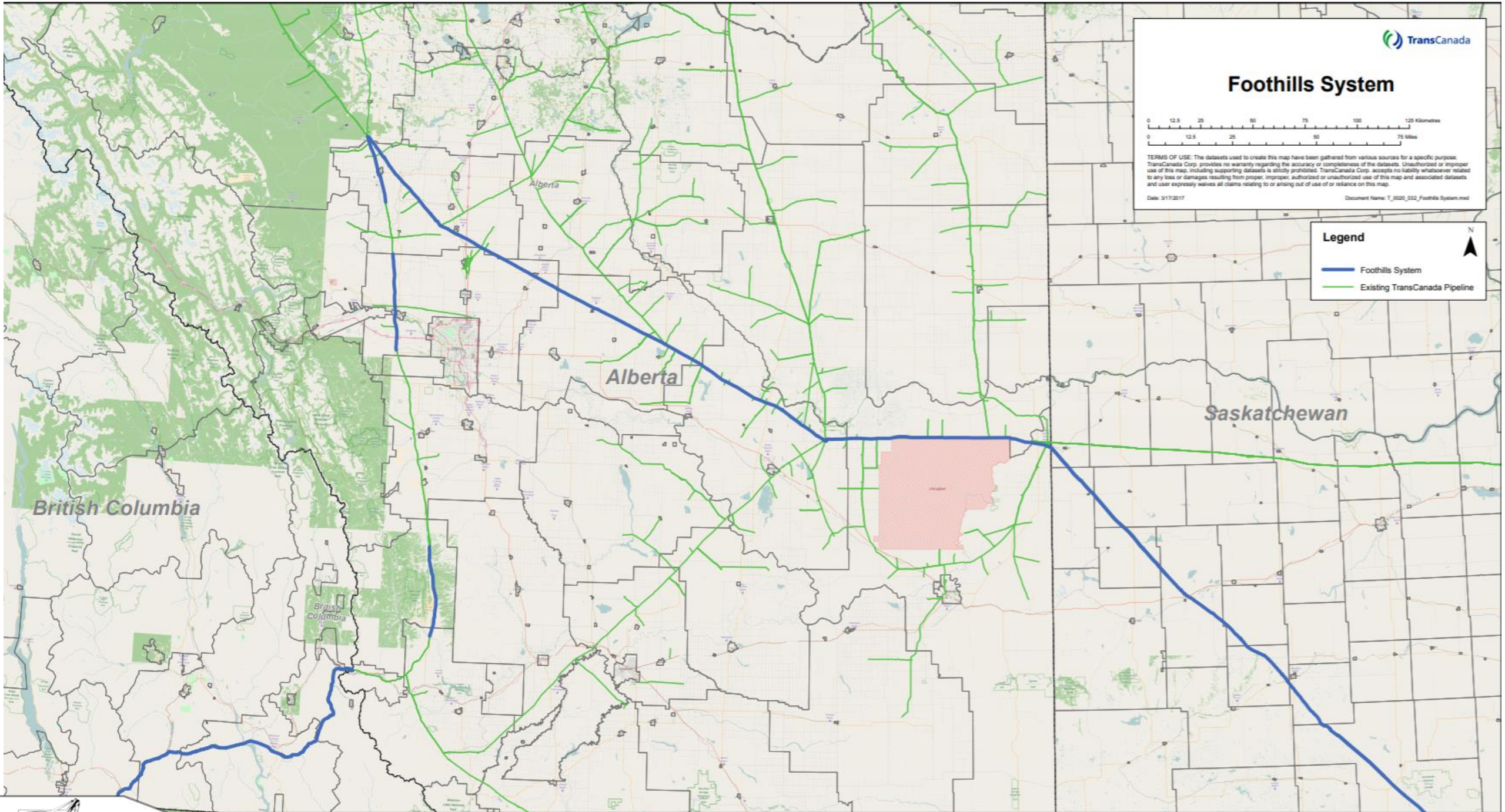
# Northern Border BTU at Glen Ullin, ND



# NB Pipeline Interconnects With Known BTU Limits







# Foothills System



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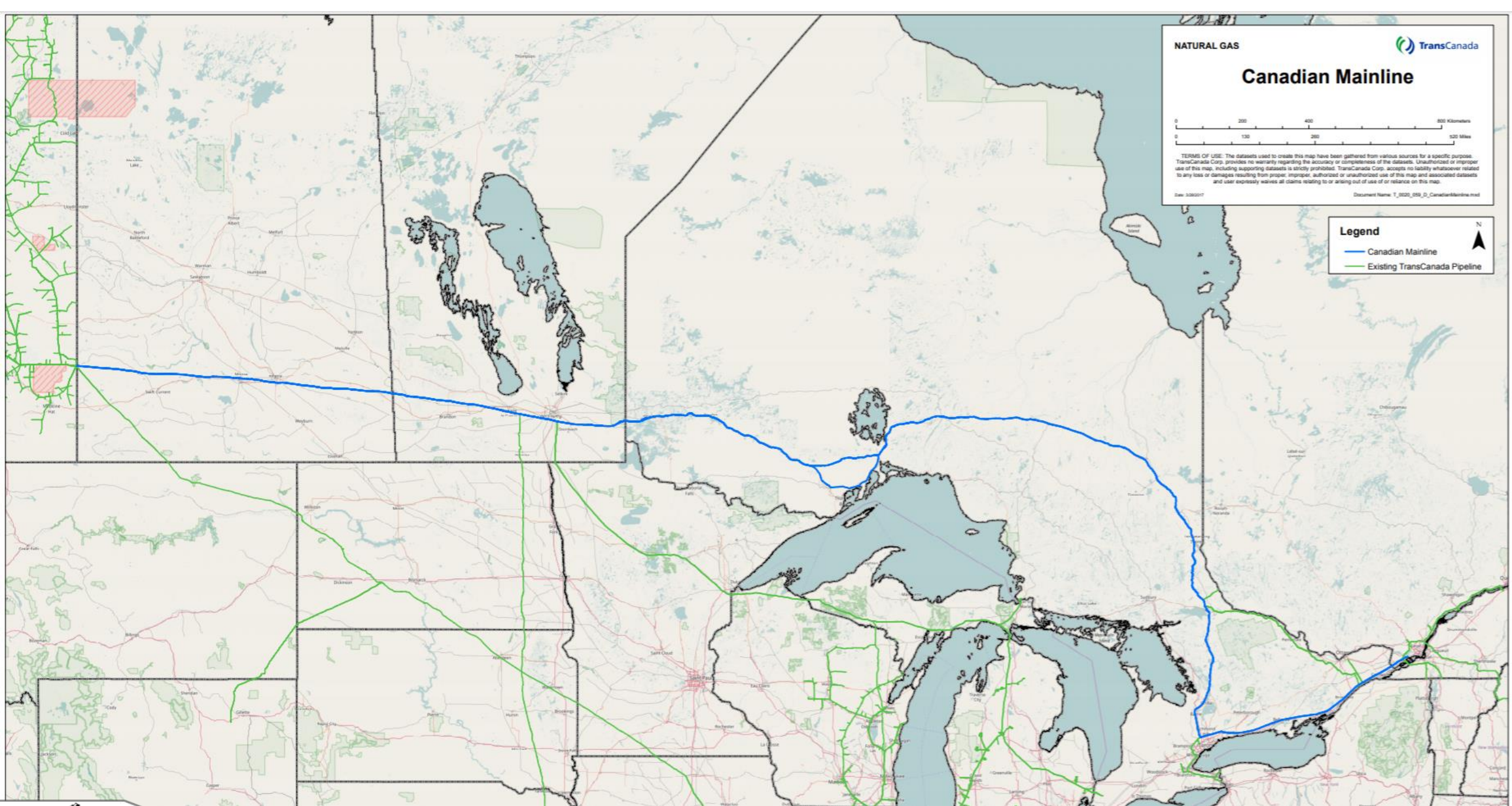
Date: 3/17/2017 Document Name: T\_0020\_032\_Foothills System.mxd

## Legend

- Foothills System
- Existing TransCanada Pipeline







NATURAL GAS



## Canadian Mainline



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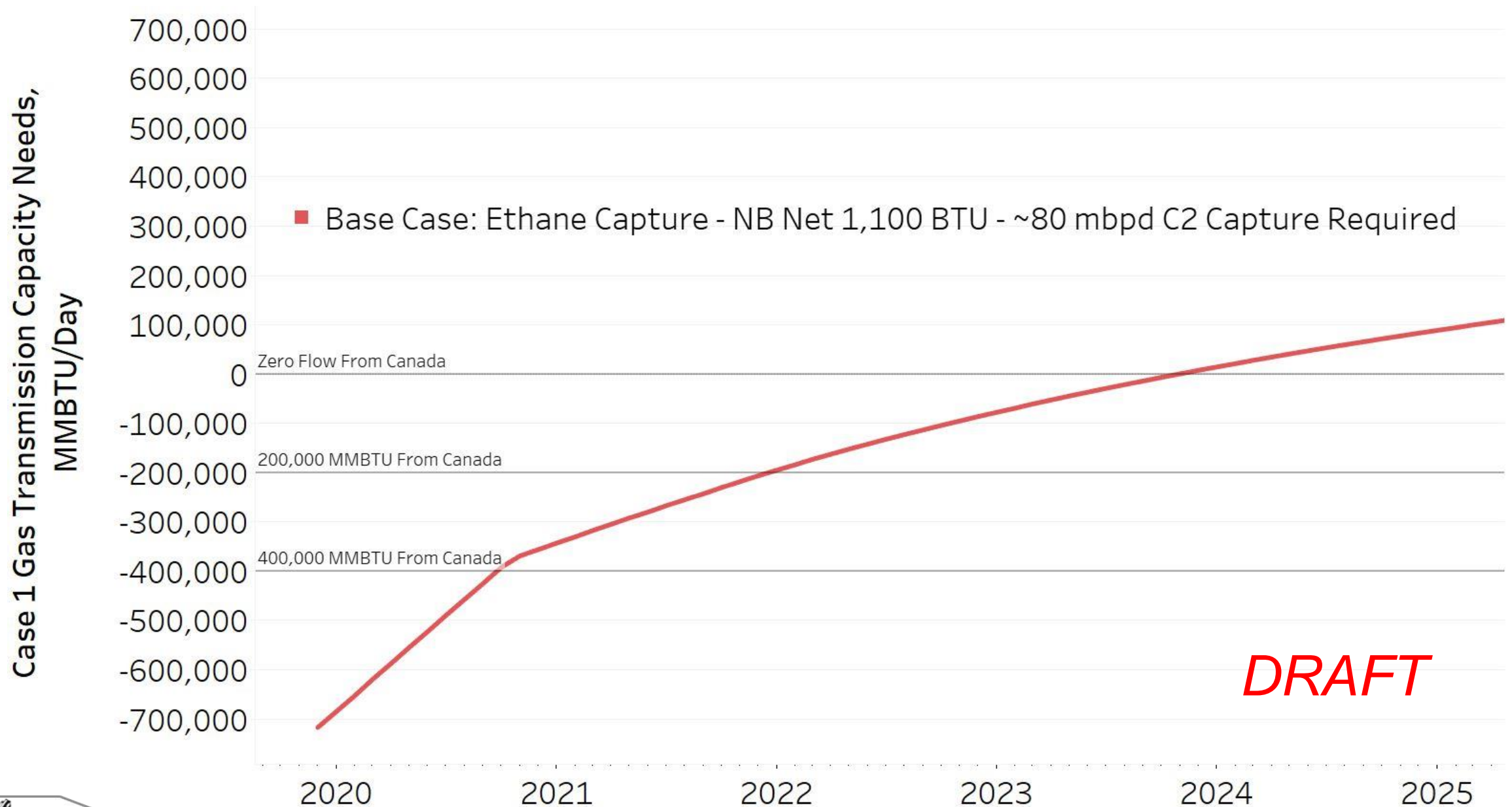
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### Legend

- Canadian Mainline
- Existing TransCanada Pipeline



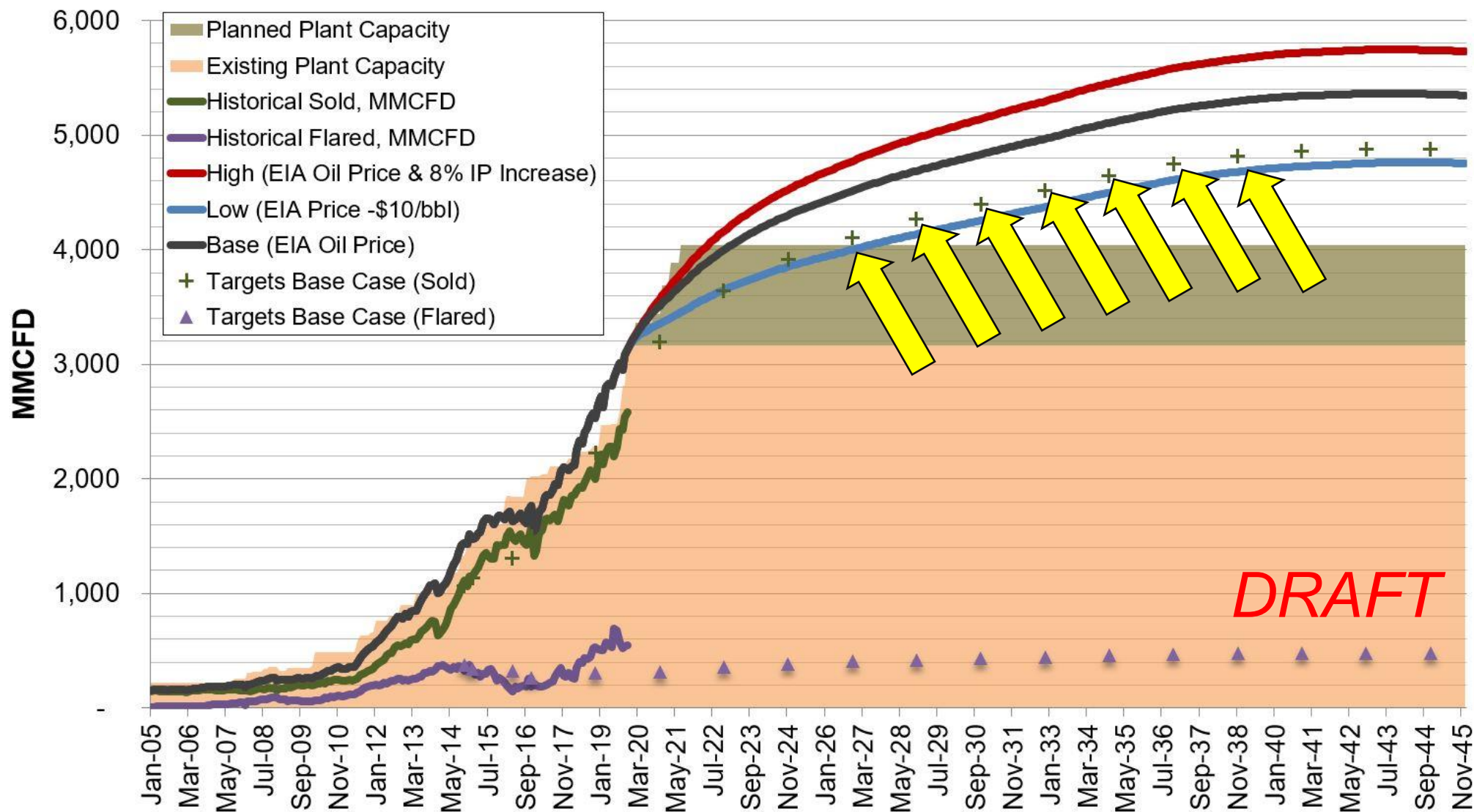
# Northern Border – BTU Calculations\*



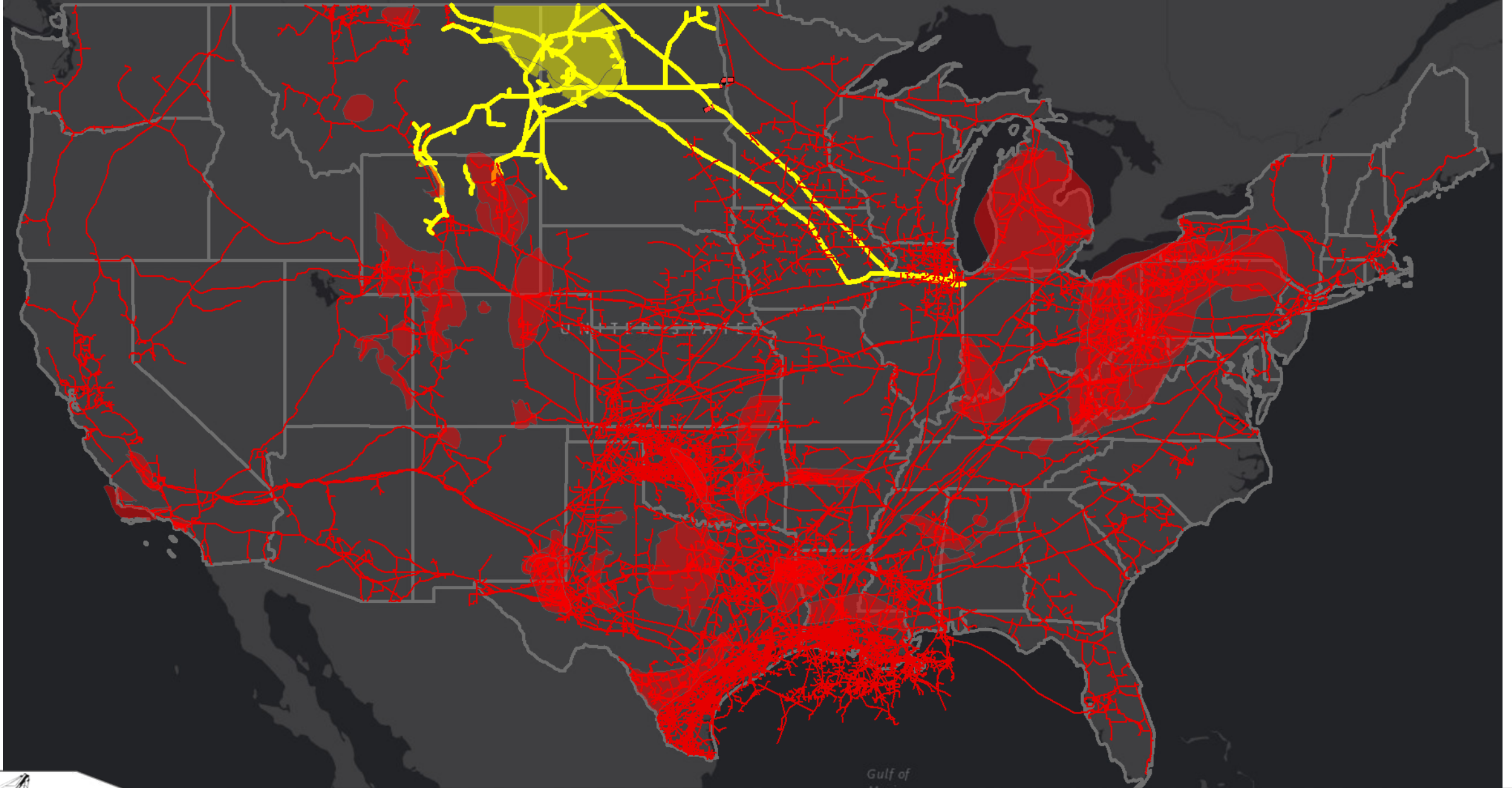


# Solving the Flaring Challenge

*Assumes Current Technology – Enhanced Oil Recovery Not Included*

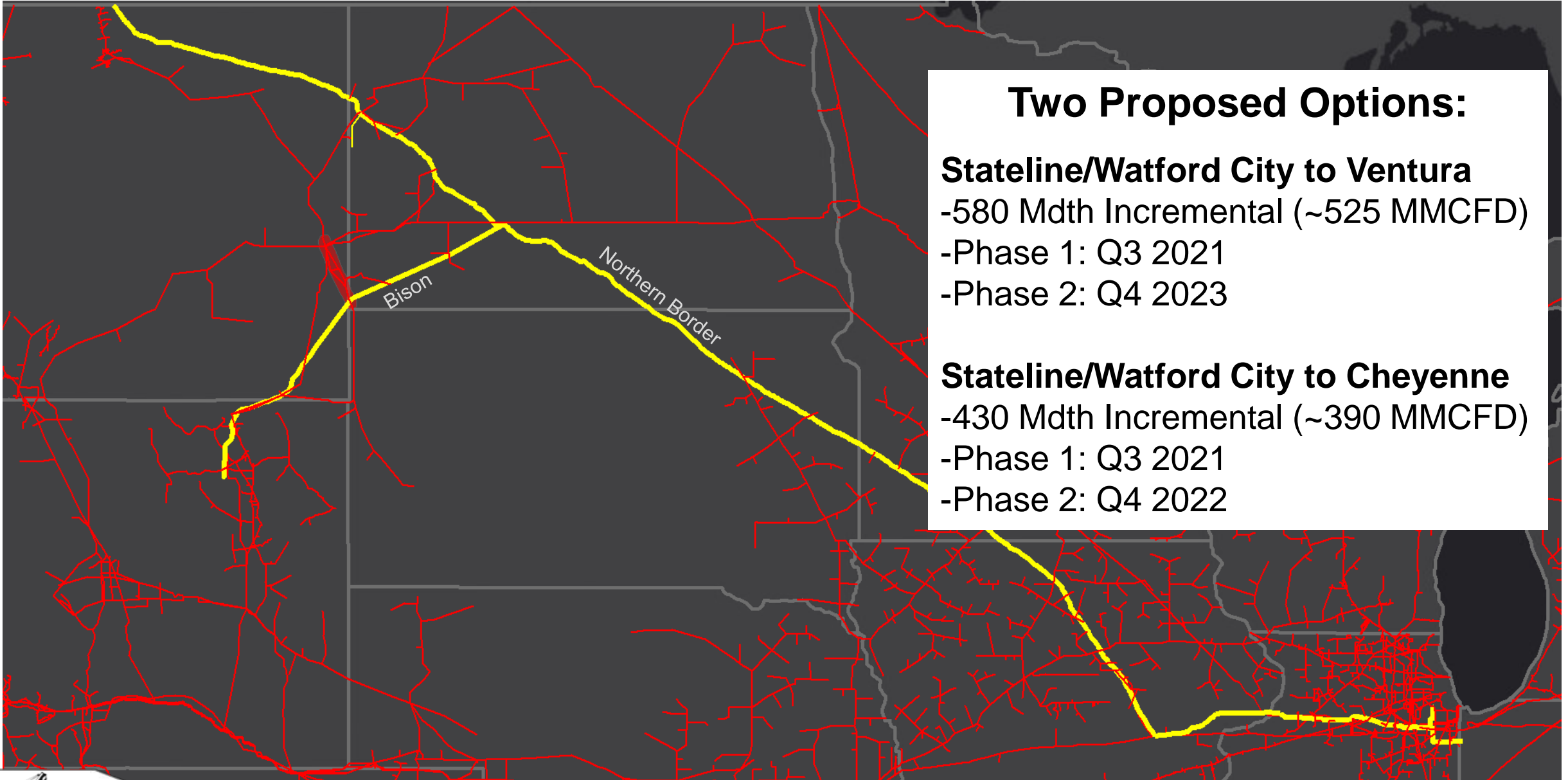


# Bakken Natural Gas Infrastructure

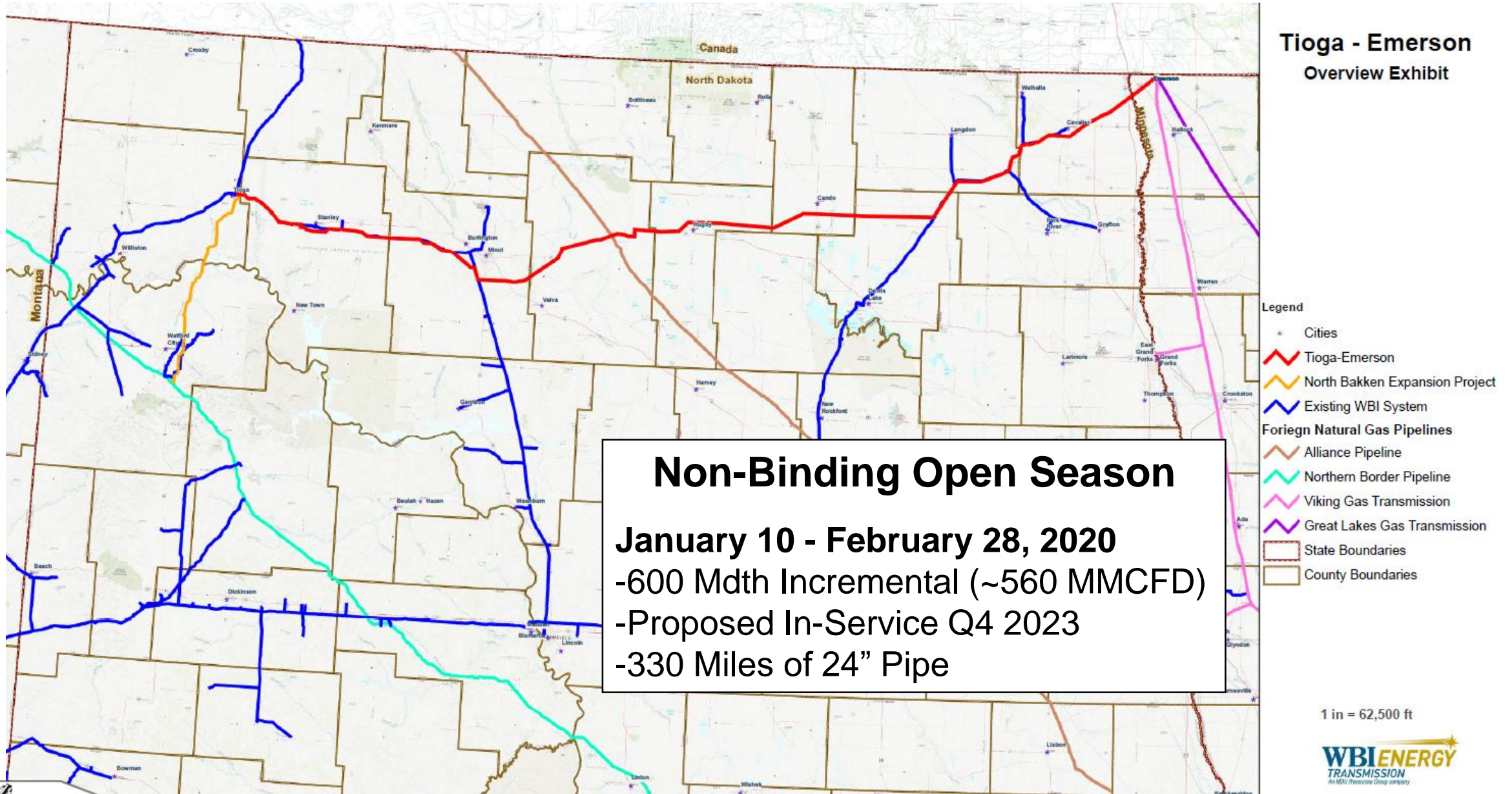




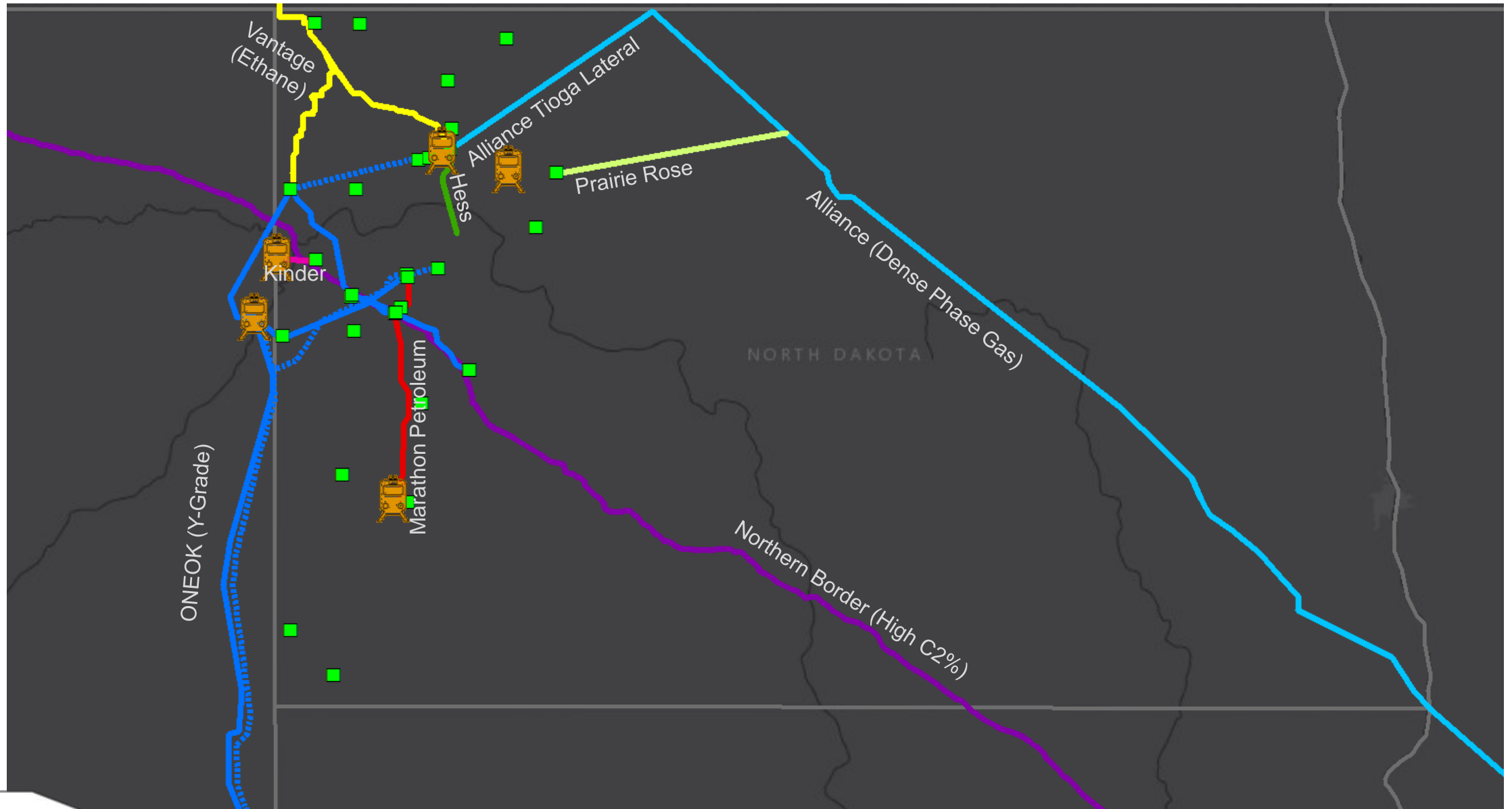
# Northern Border Proposed Expansion Options



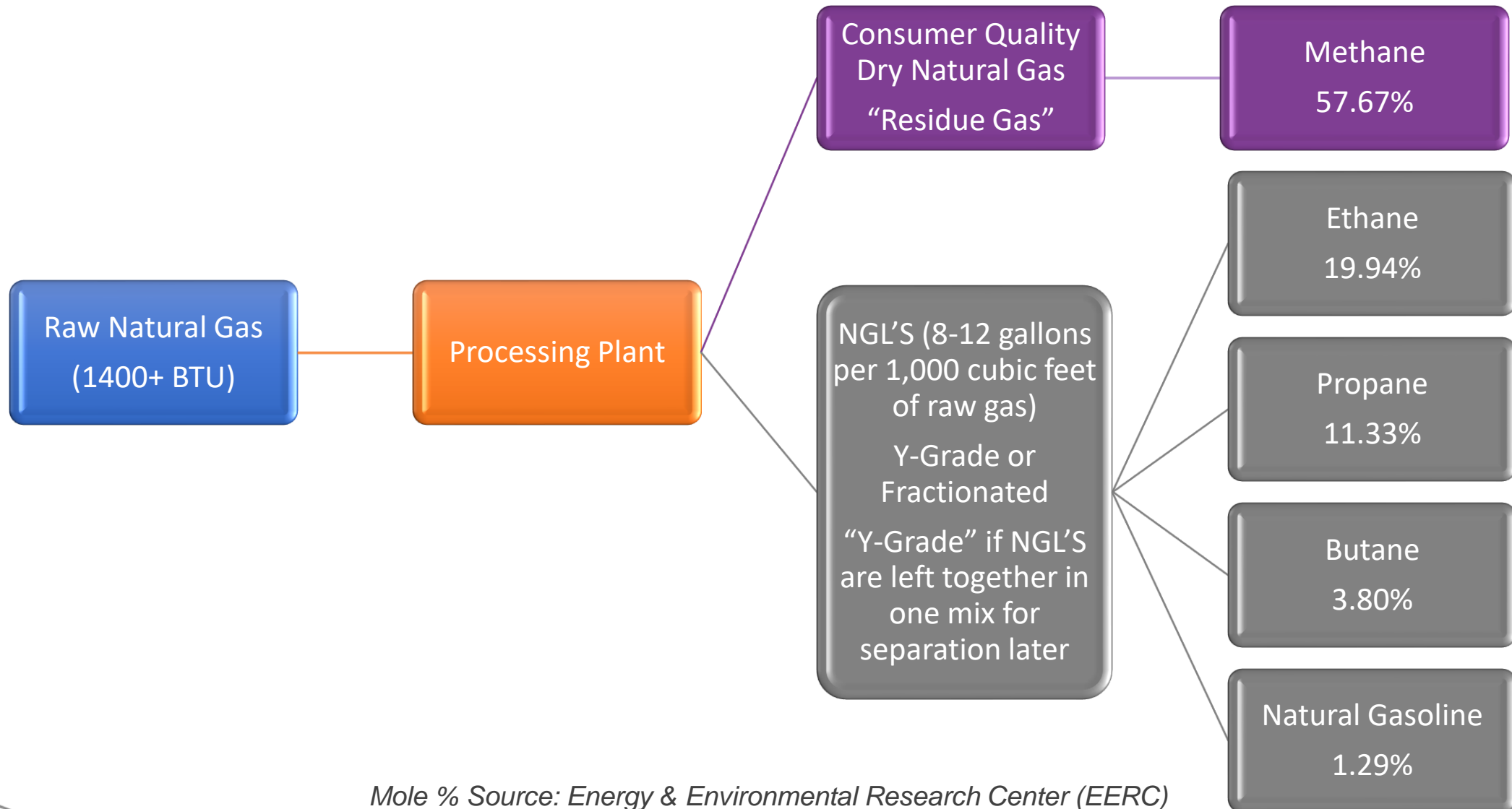
# WBI Energy Tioga to Emerson Proposal



# Regional NGL Infrastructure

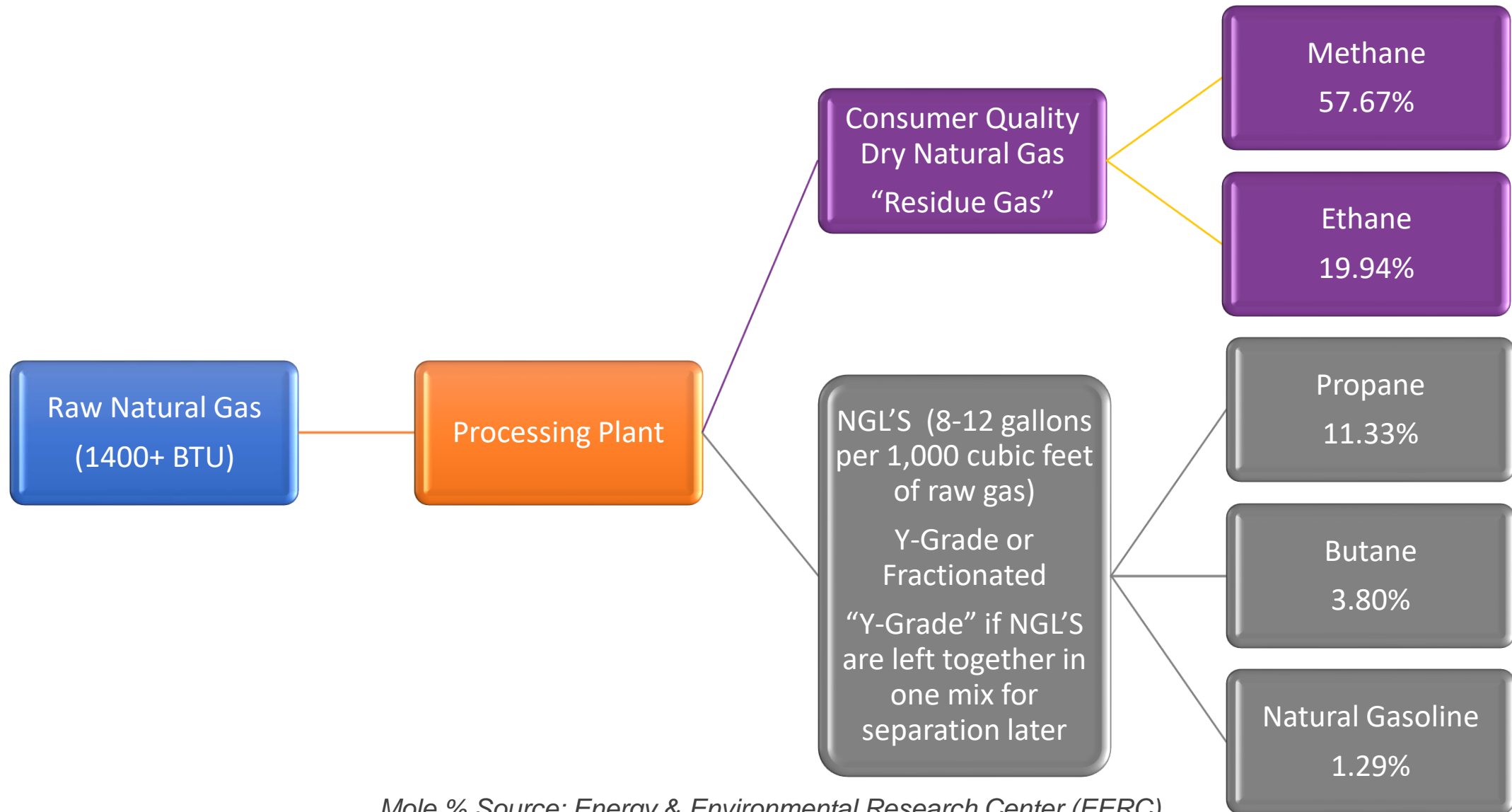


# Natural Gas Processing – “Ethane Capture”

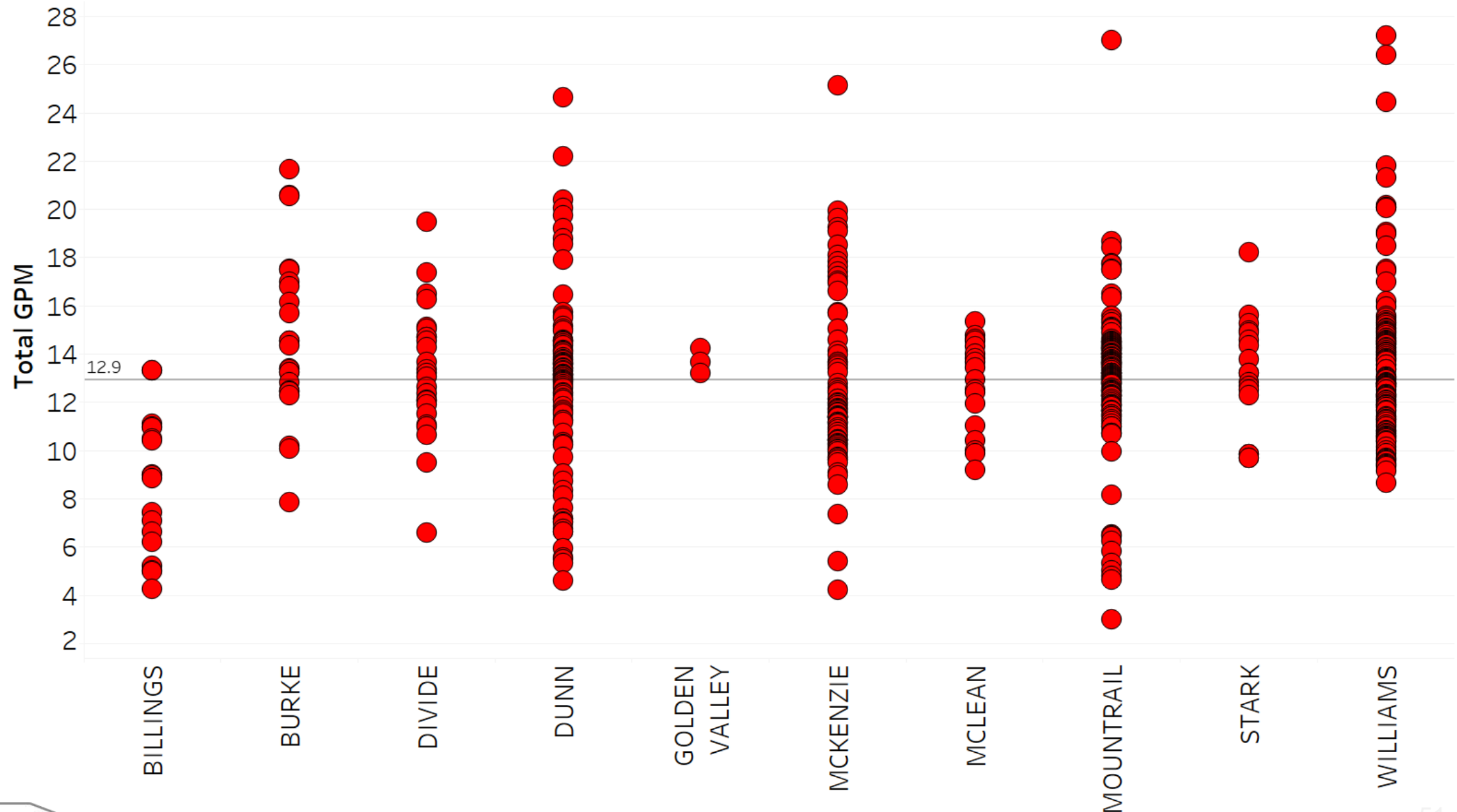




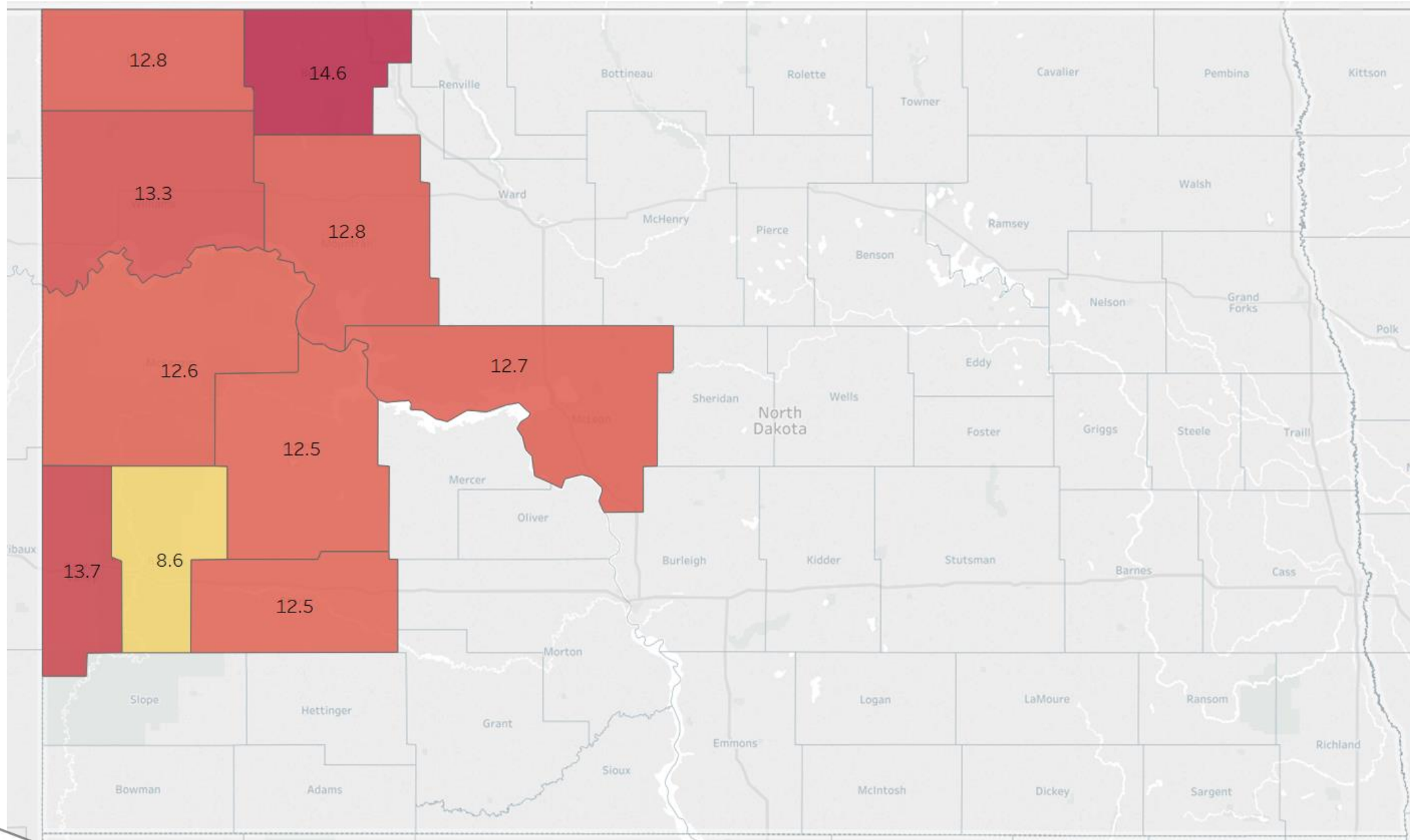
# Natural Gas Processing – “Ethane Rejection”



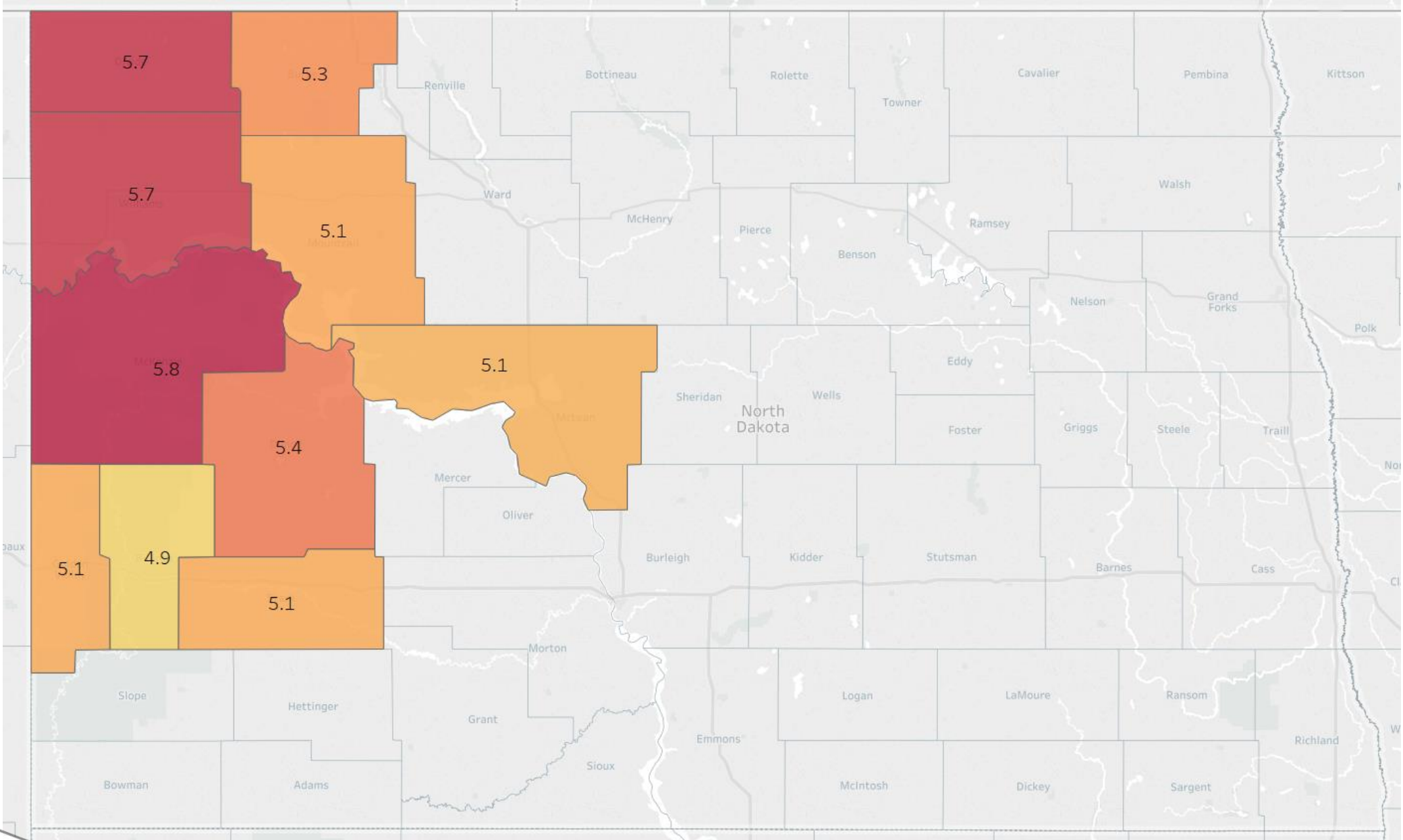
# Bakken – Three Forks Average NGL Content (GPM)



# Bakken – Three Forks Average NGL Content (GPM)

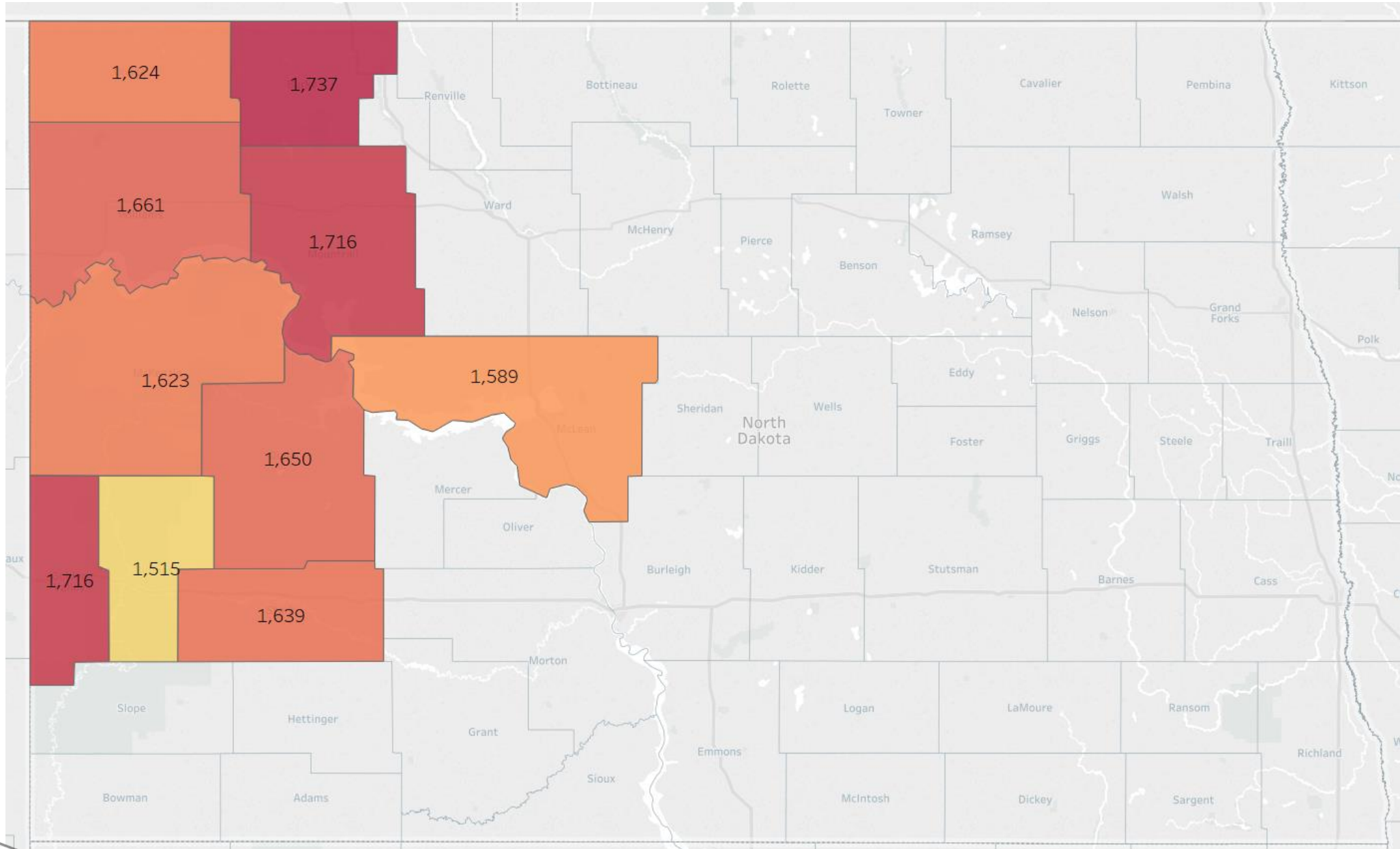


# Bakken – Three Forks Average Ethane Content (GPM)





# Bakken – Three Forks Average Gas BTU



# Assumed NGL Content for NDPA NGL Forecasts

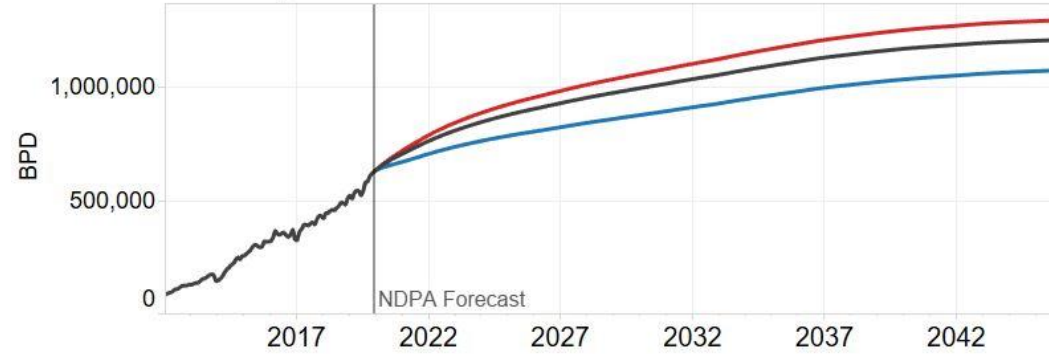
Component	Mole %	GPM	% of Liquids
Nitrogen	5.21%	NA	NA
Carbon Dioxide	0.57%	NA	NA
Hydrogen Sulfide	0.01%	NA	NA
Methane	57.67%	NA	NA
Ethane	19.94%	5.32	52.5%
Propane	11.33%	3.11	30.7%
Isobutane	0.97%	0.32	3.1%
Normal Butane	2.83%	0.89	8.8%
Isopentane	0.38%	0.14	1.4%
Normal Pentane	0.55%	0.20	2.0%
Hexane+	0.36%	0.16	1.5%
<b>Totals</b>	<b>99.82%</b>	<b>10.14</b>	<b>100.0%</b>

<b>Gas Stream BTU Value</b>	<b>1,399</b>
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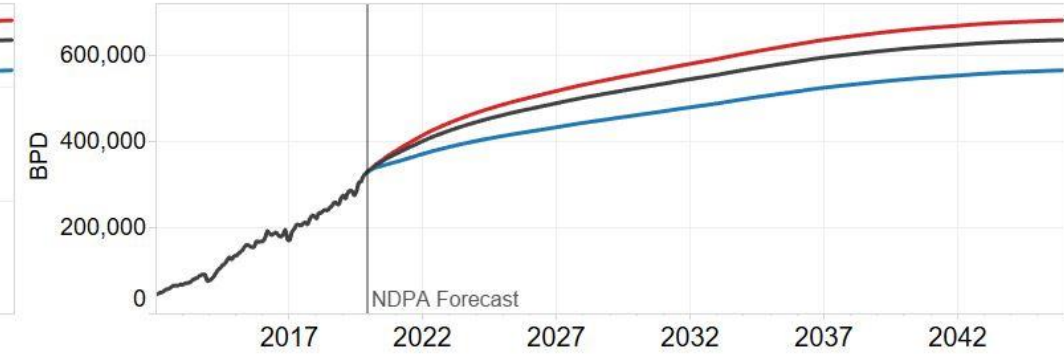
*Mole % Source: Energy & Environmental Research Center (EERC)*

# North Dakota Captured\* NGL's

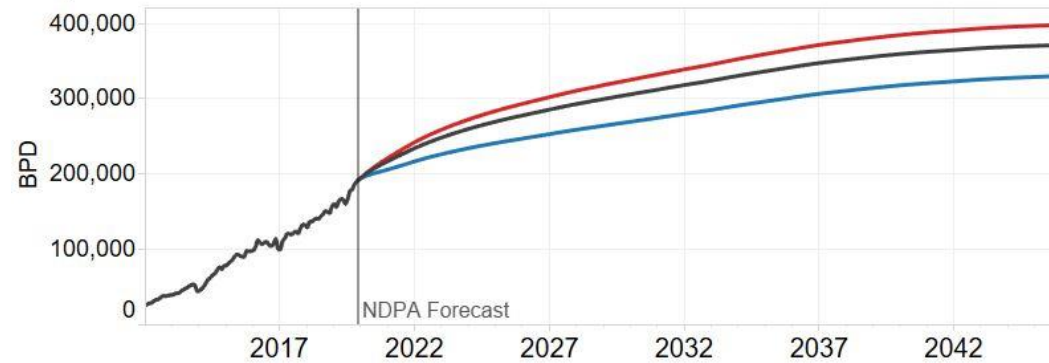
All Natural Gas Liquids



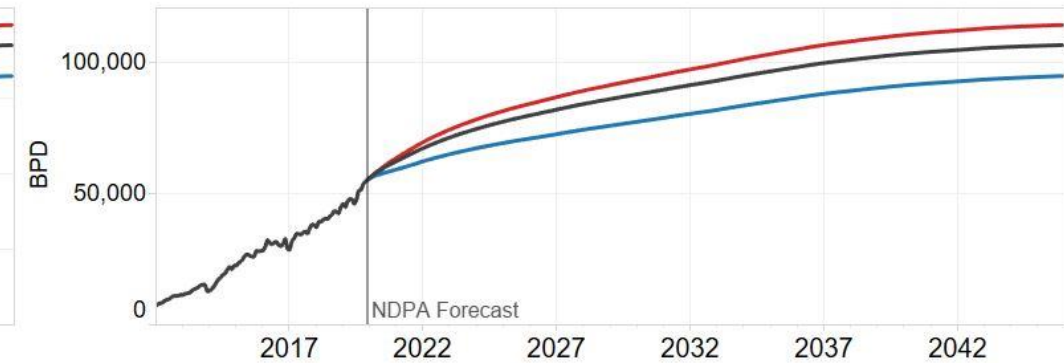
Ethane



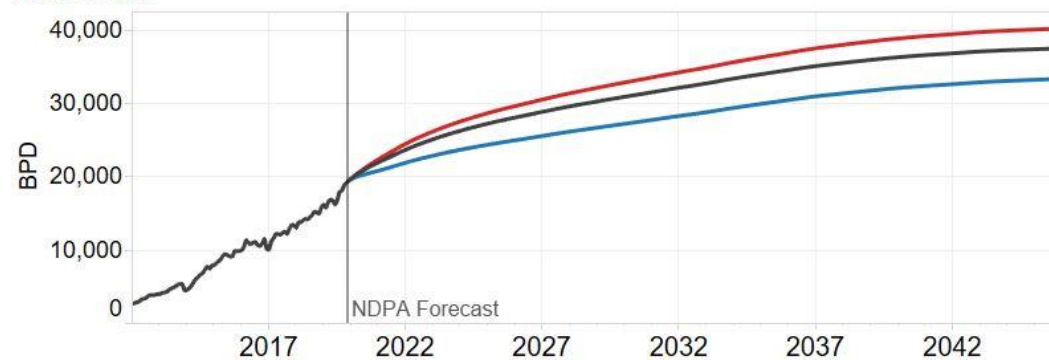
Propane



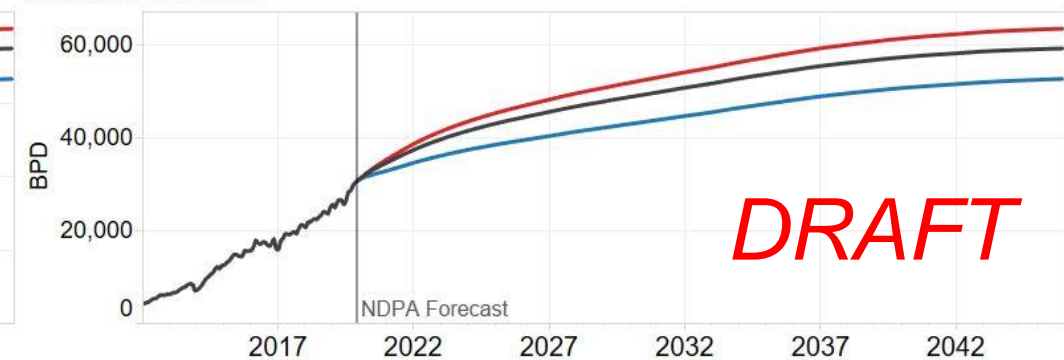
Butane



Isobutane



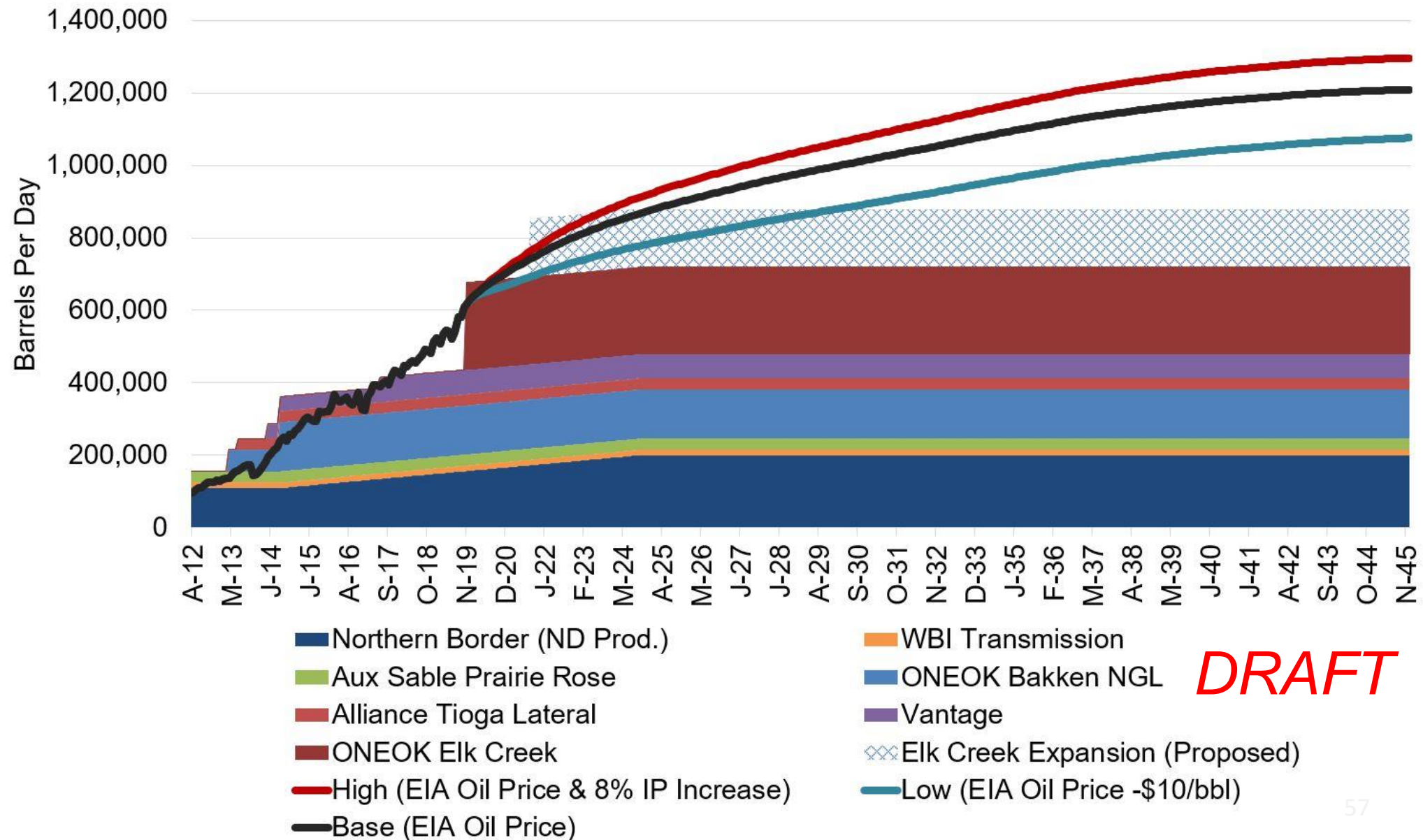
Natural Gasoline



**DRAFT**



# NGL Pipeline Takeaway Options





# Contact Information

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North Dakota Pipeline Authority

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

Websites:

[www.pipeline.nd.gov](http://www.pipeline.nd.gov)  
[www.northdakotapipelines.com](http://www.northdakotapipelines.com)

