

North Dakota Oil & Gas Research Program

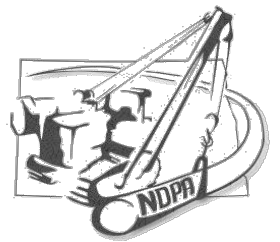
Justin J Kringstad

Geological Engineer

Director

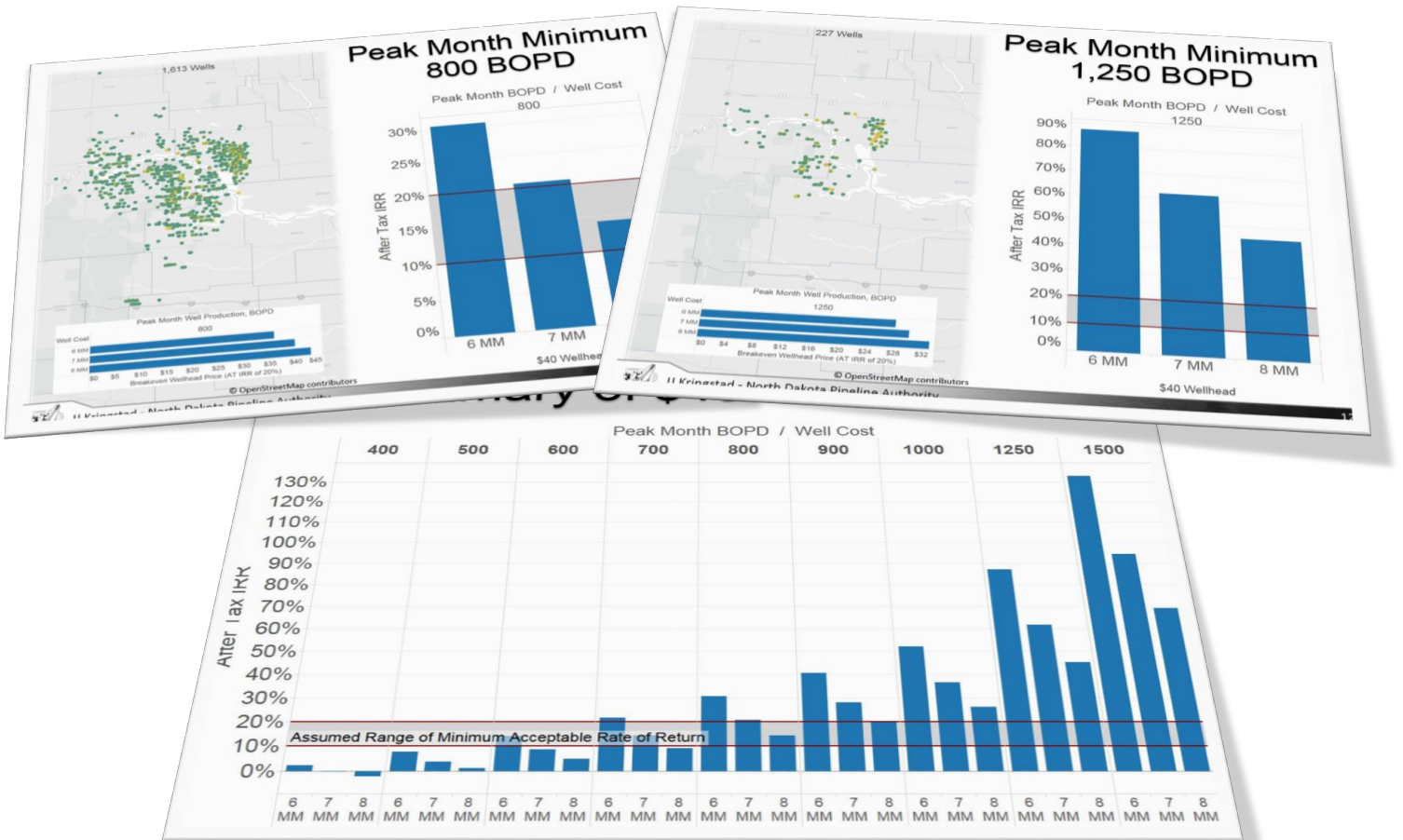
North Dakota Pipeline Authority

May 22, 2017

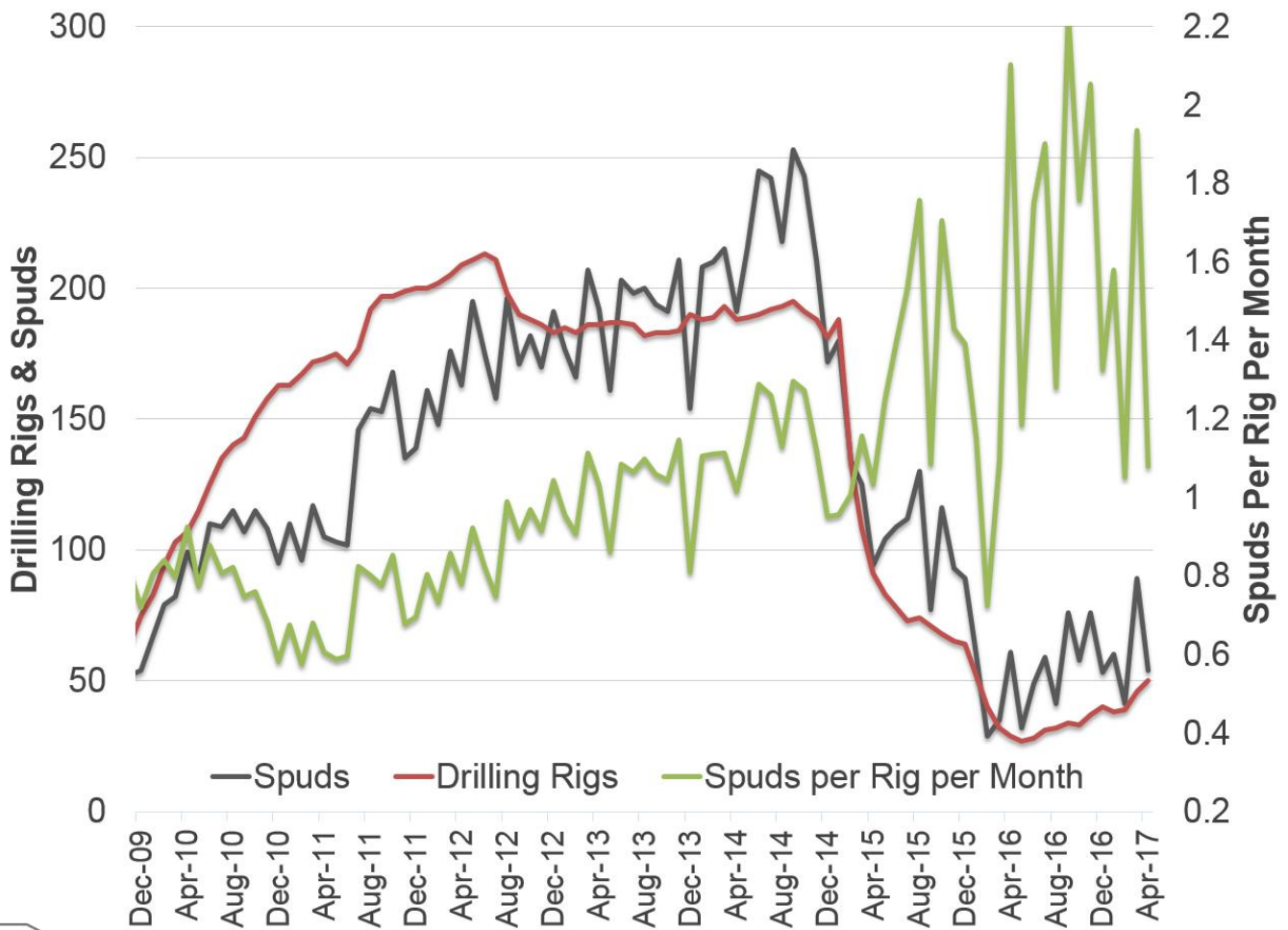


March 2017 – Bakken Economics Updated

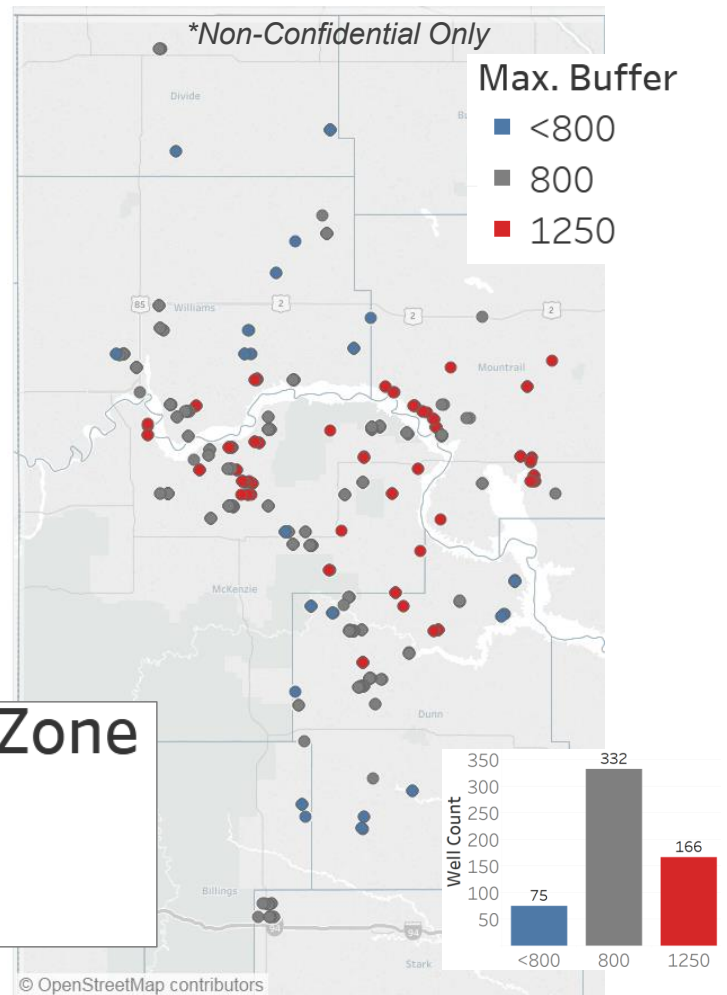
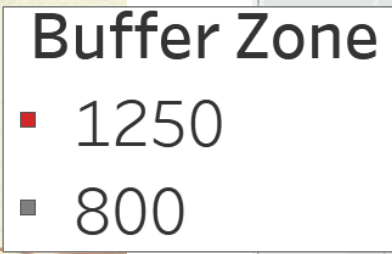
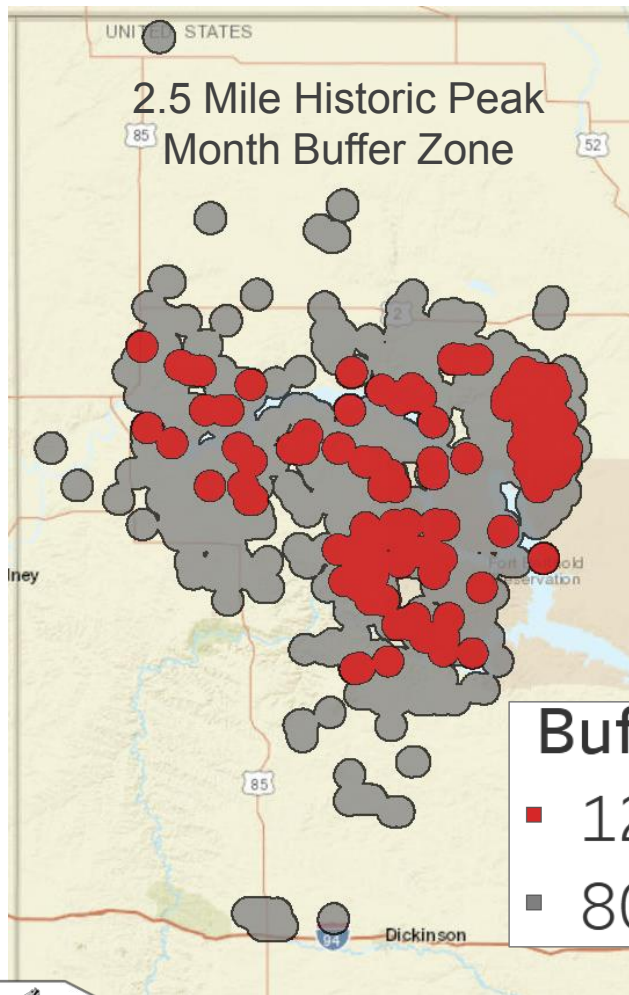
Slides Available Online



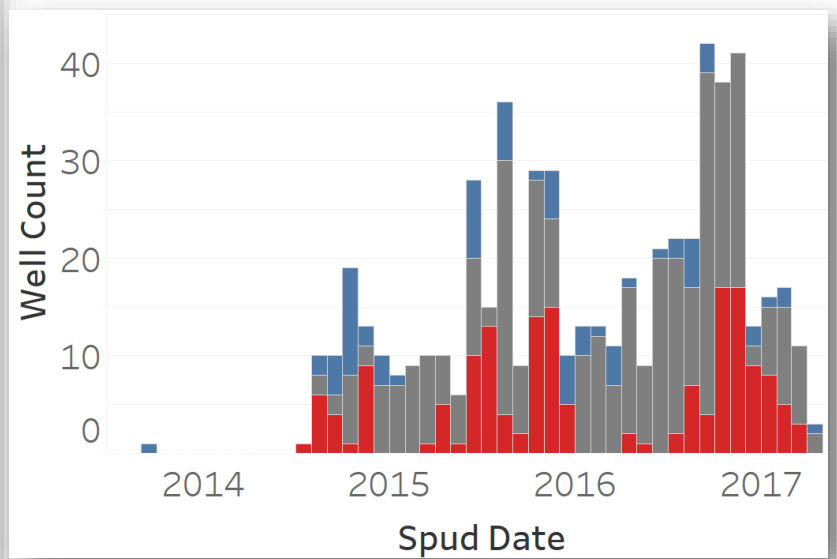
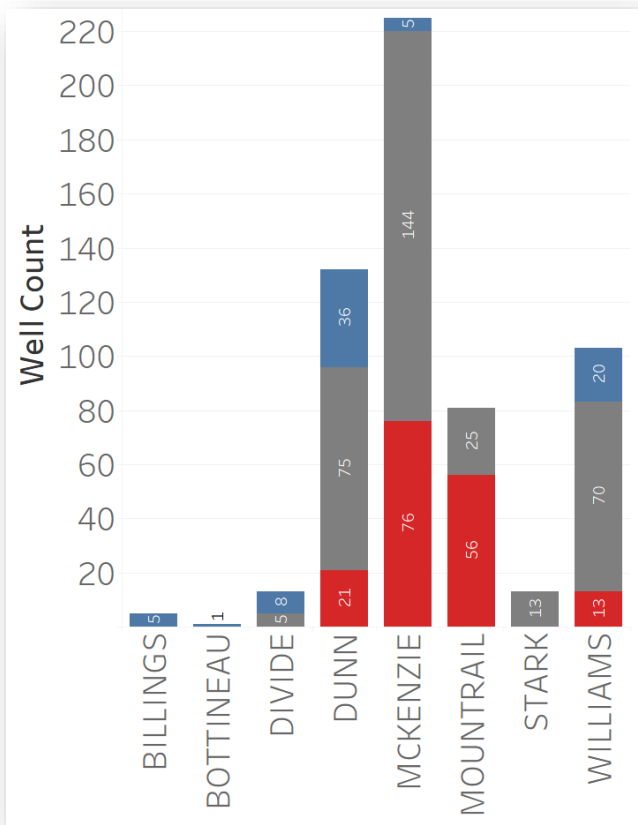
North Dakota Drilling Activity



DUC's* - Proximity to High Performing Wells



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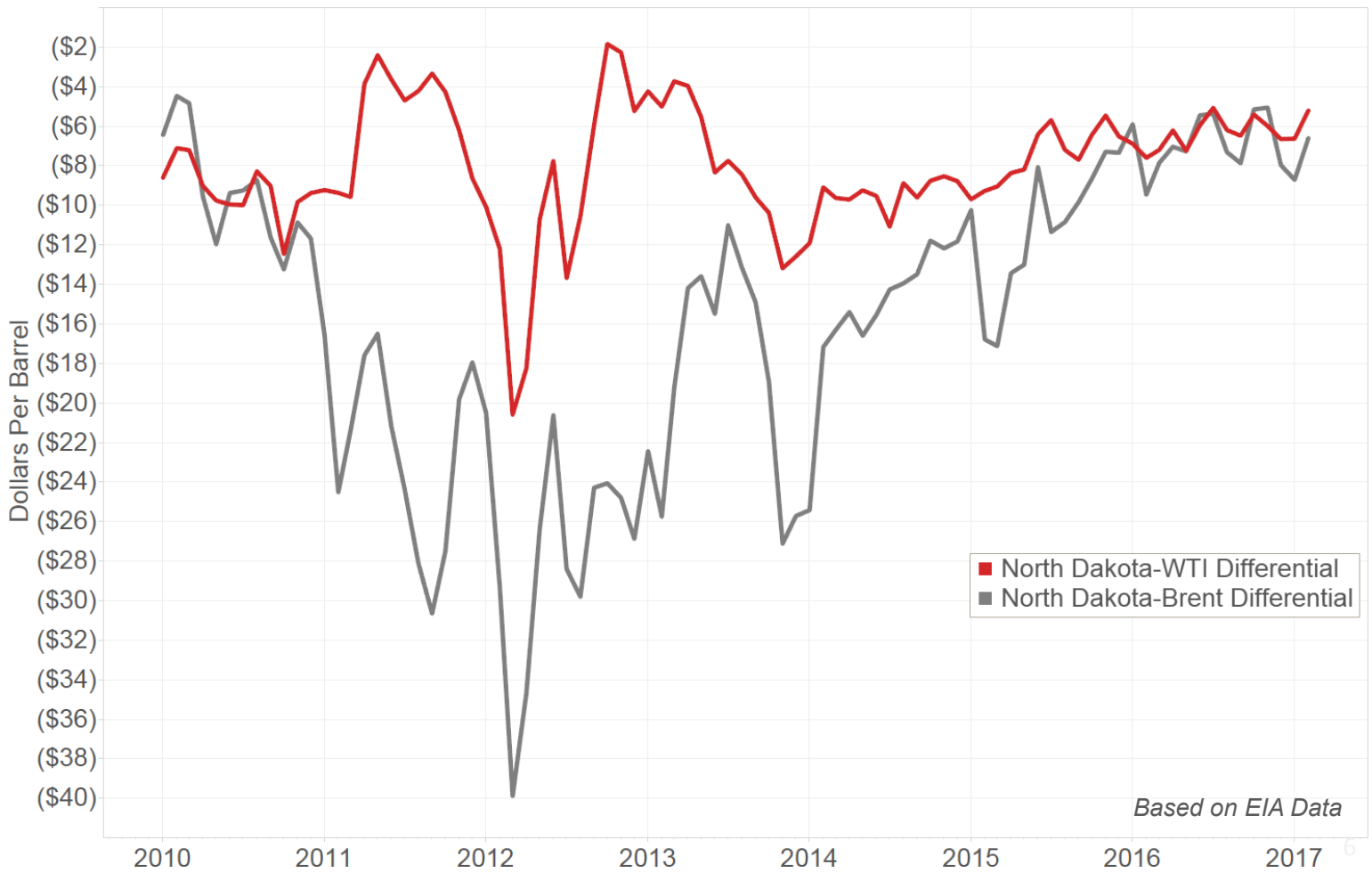
Max. Buffer

- <800
- 800
- 1250

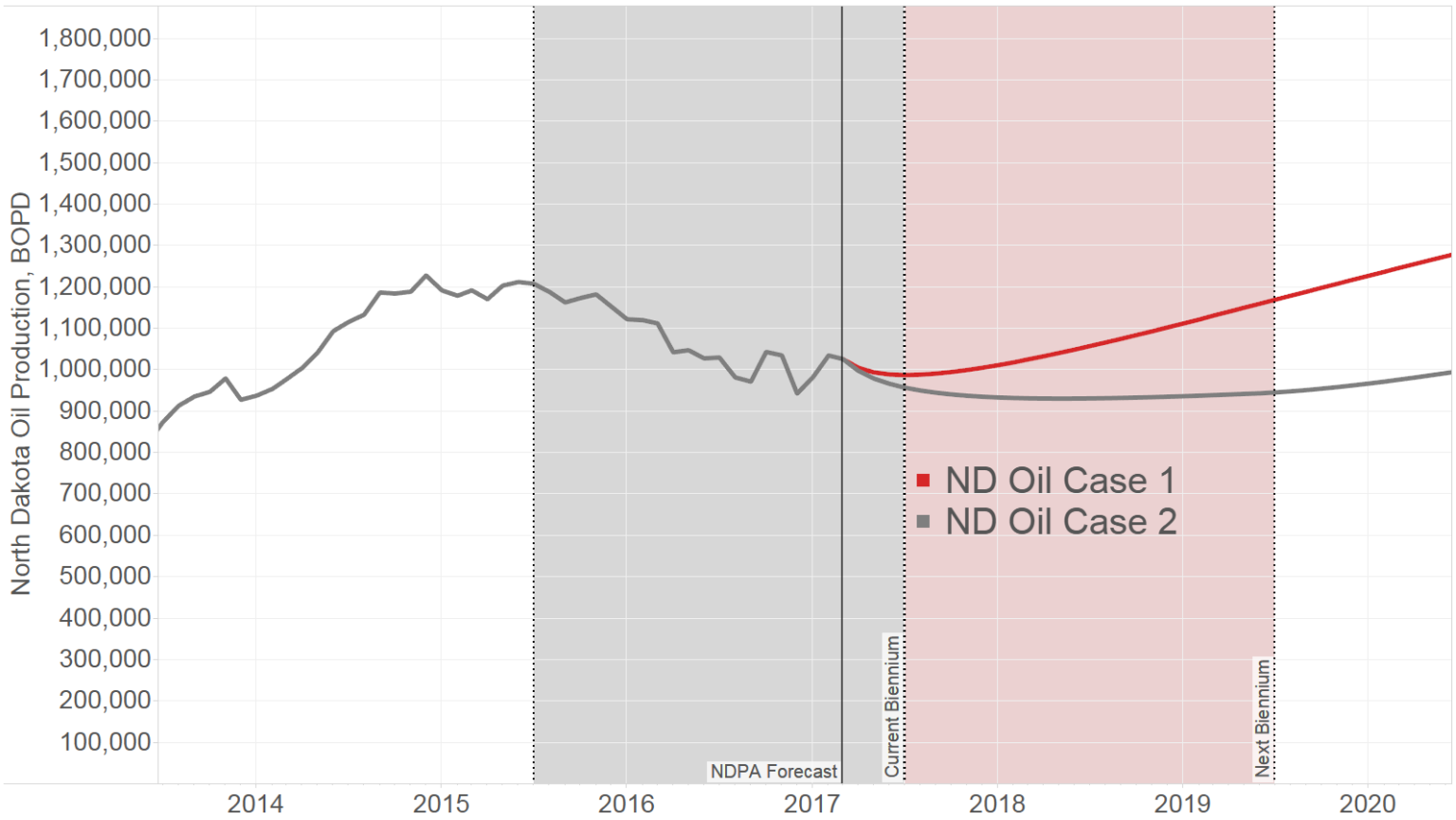
**Non-Confidential Only*



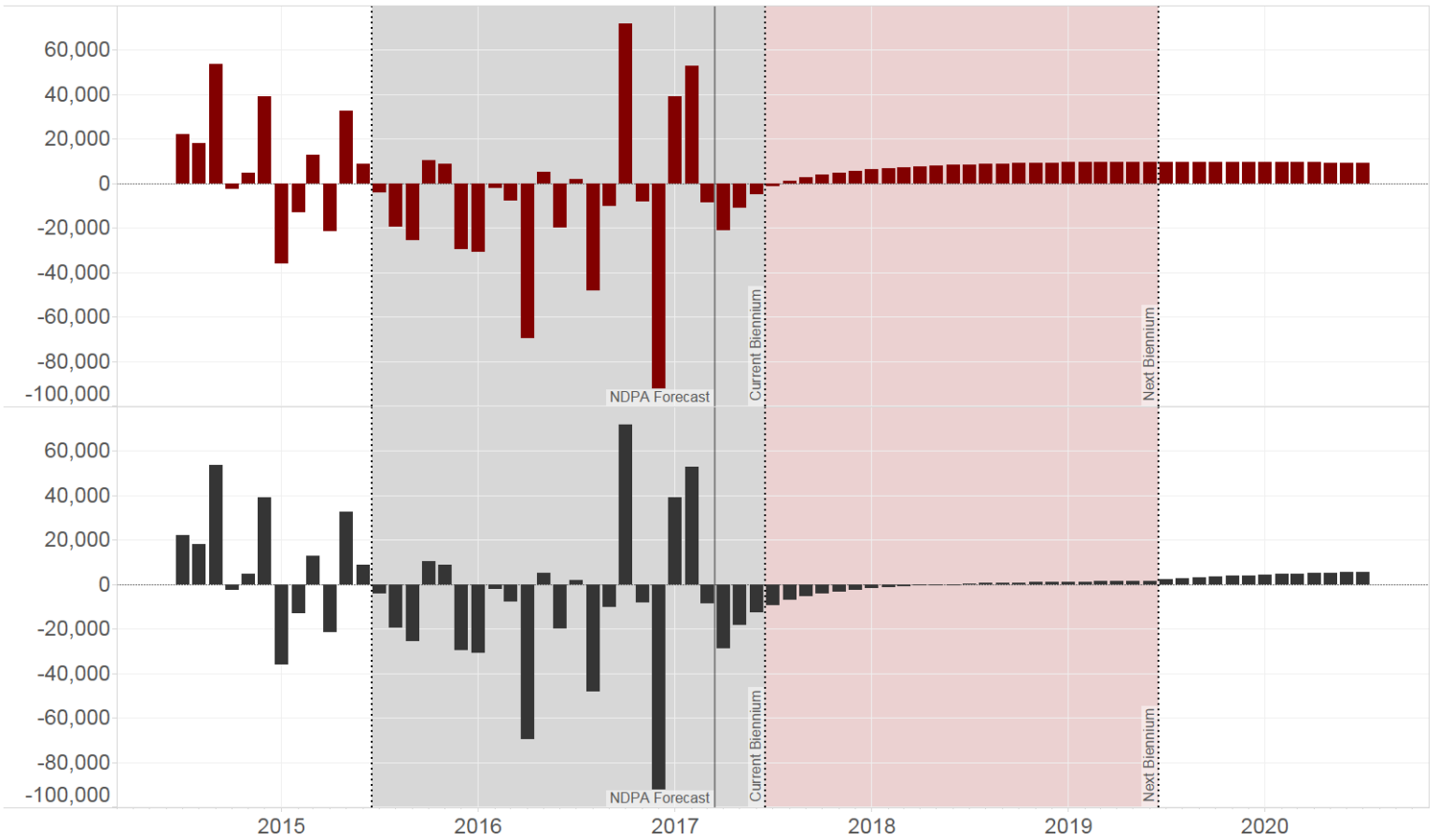
North Dakota Oil Differential



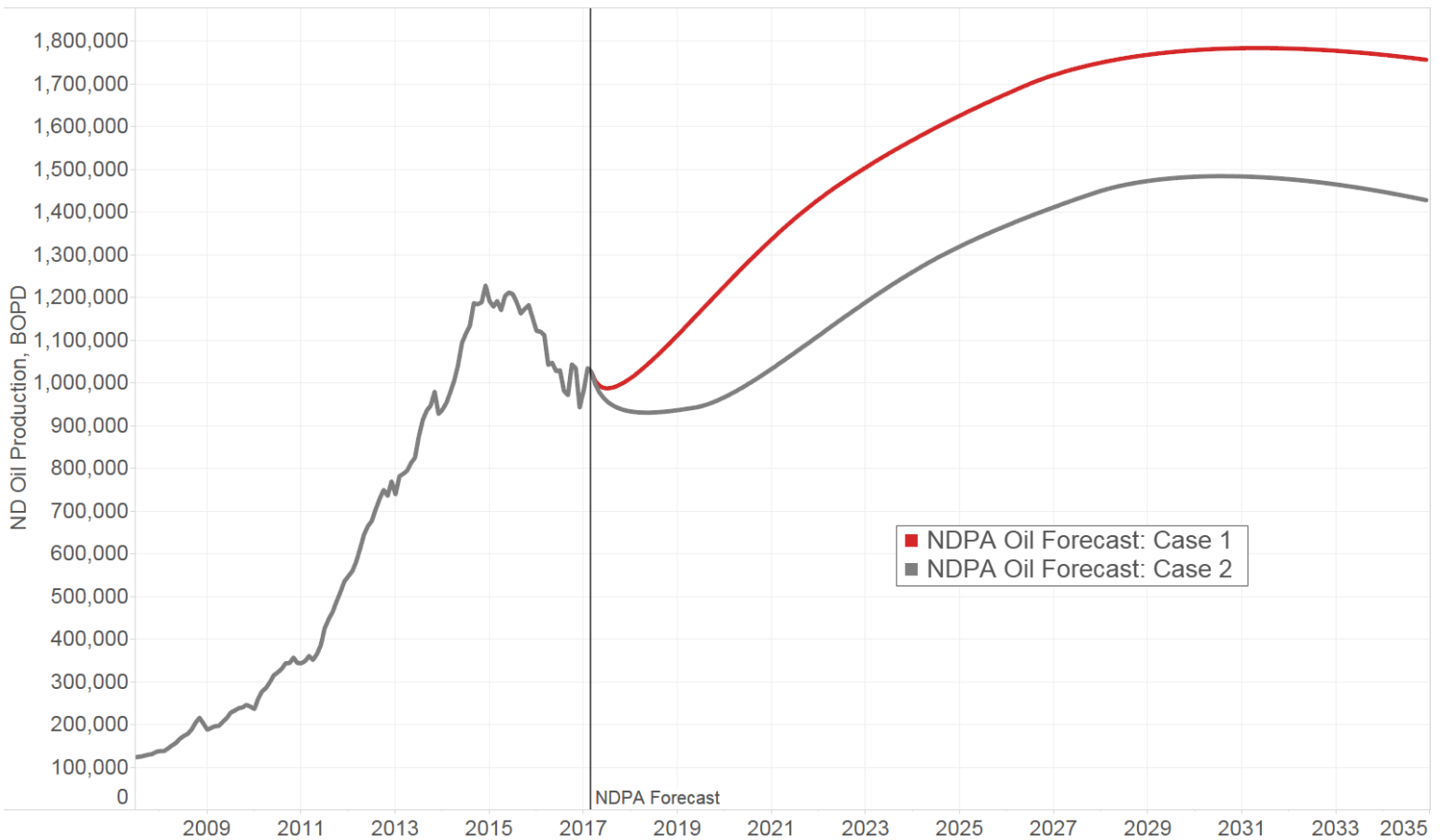
NDPA ND Oil Production Forecast



NDPA ND Oil Production Forecast



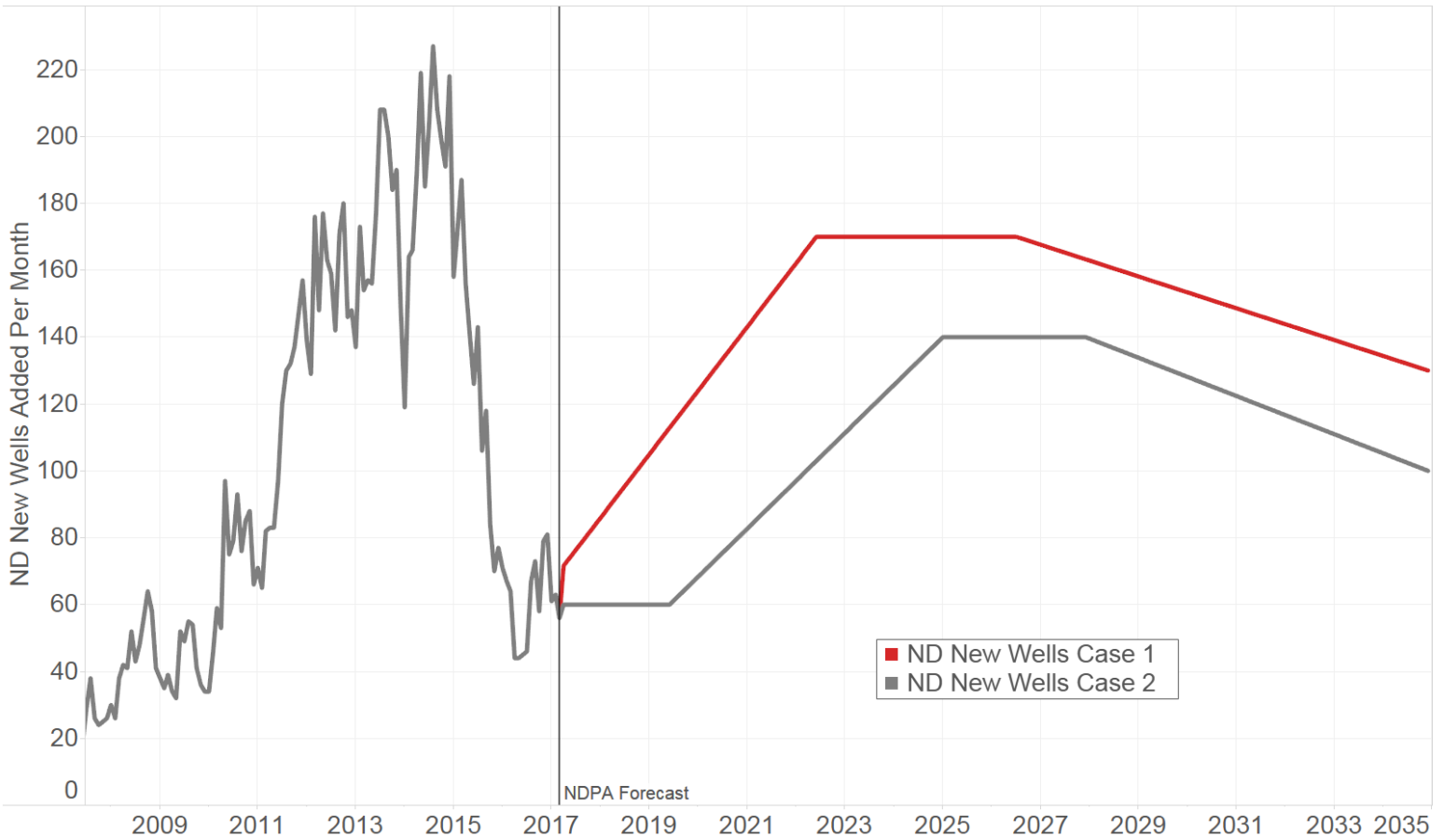
North Dakota Oil Production Forecast



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



North Dakota Forecast Activity Assumptions



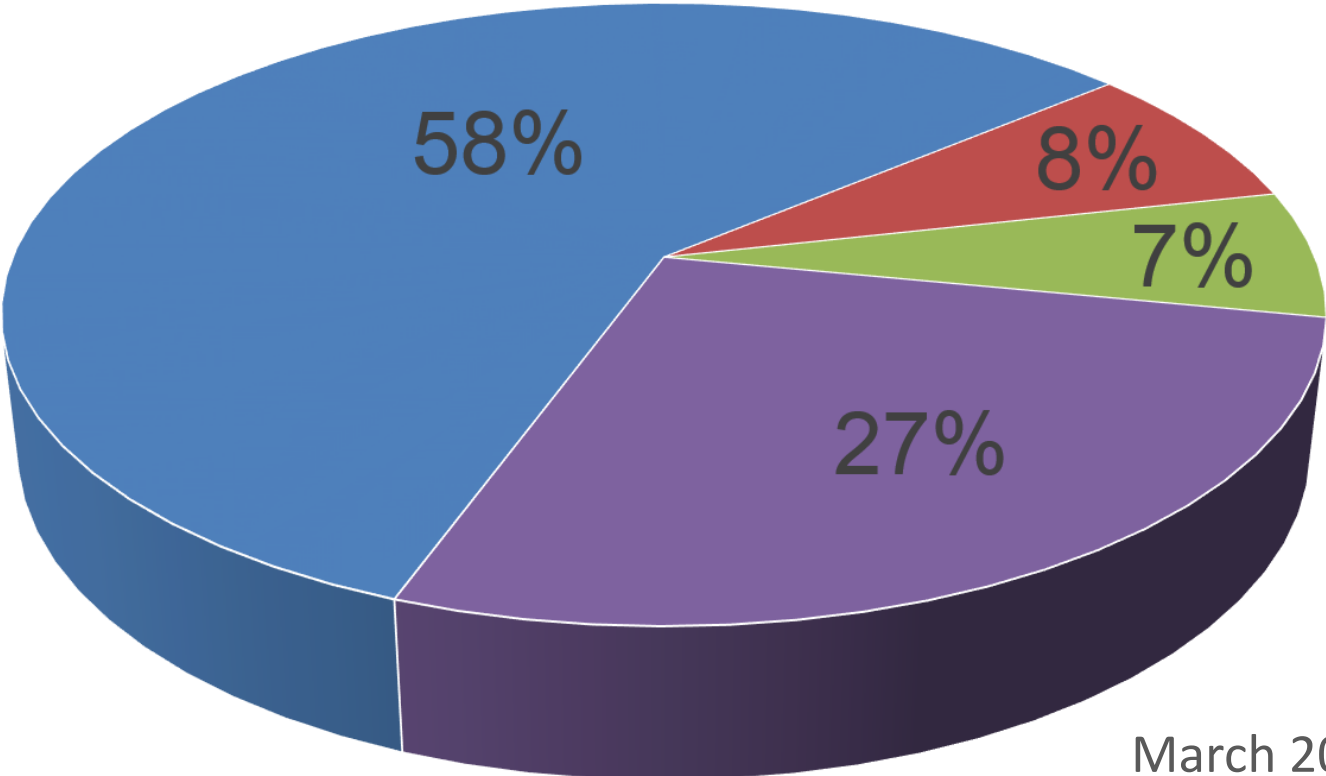
US Williston Basin Oil Production - 2017

MONTH	ND	Eastern MT*	SD	TOTAL
January	981,380	52,239	3,553	1,037,172
February	1,034,248	53,448	3,718	1,091,414
March	1,025,638			
April				
May				
June				
July				
August				
September				
October				
November				
December				

11



Estimated Williston Basin Oil Transportation



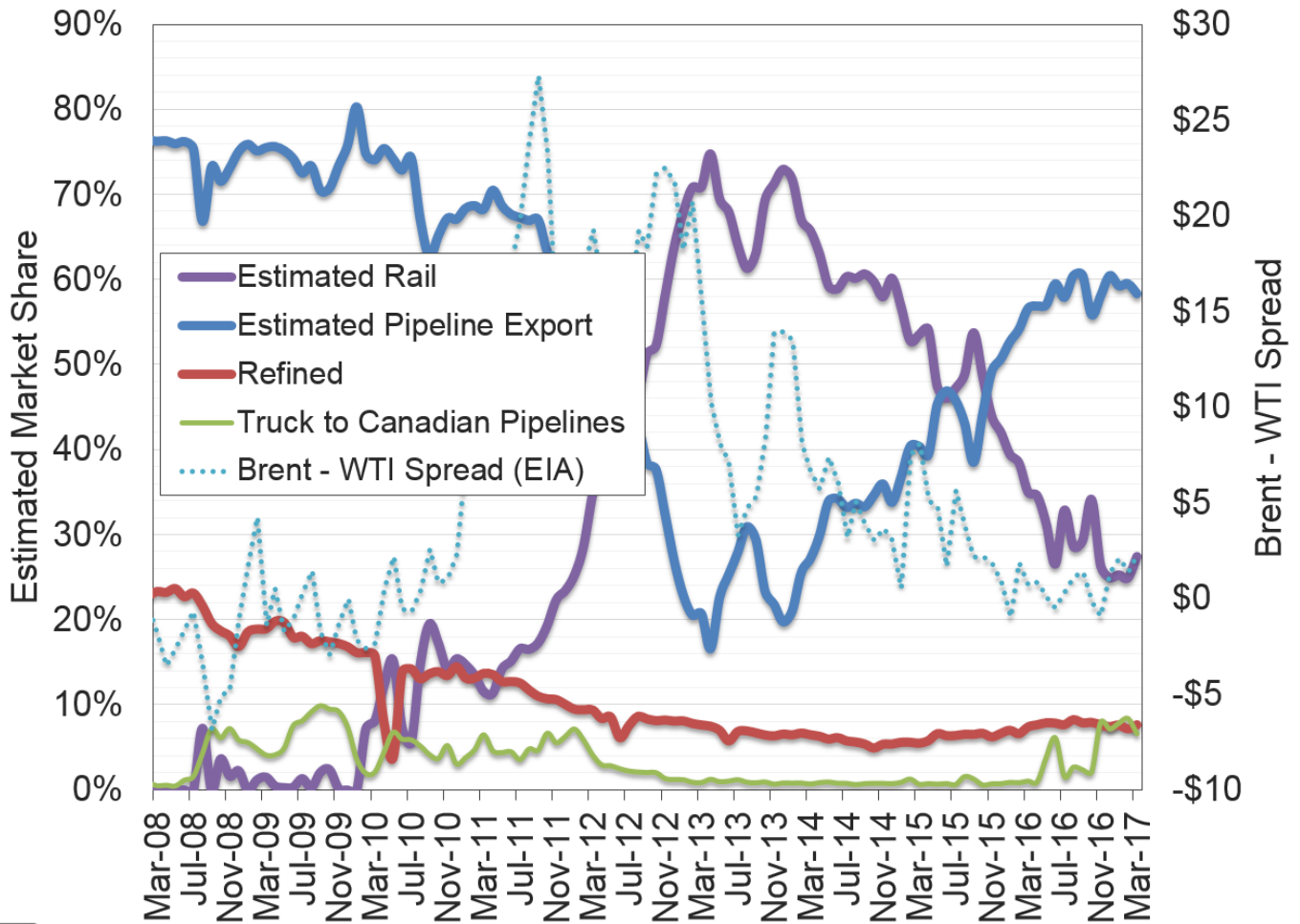
March 2017

- Pipeline Export
- Refined
- Truck to Canadian Pipelines
- Estimated Rail

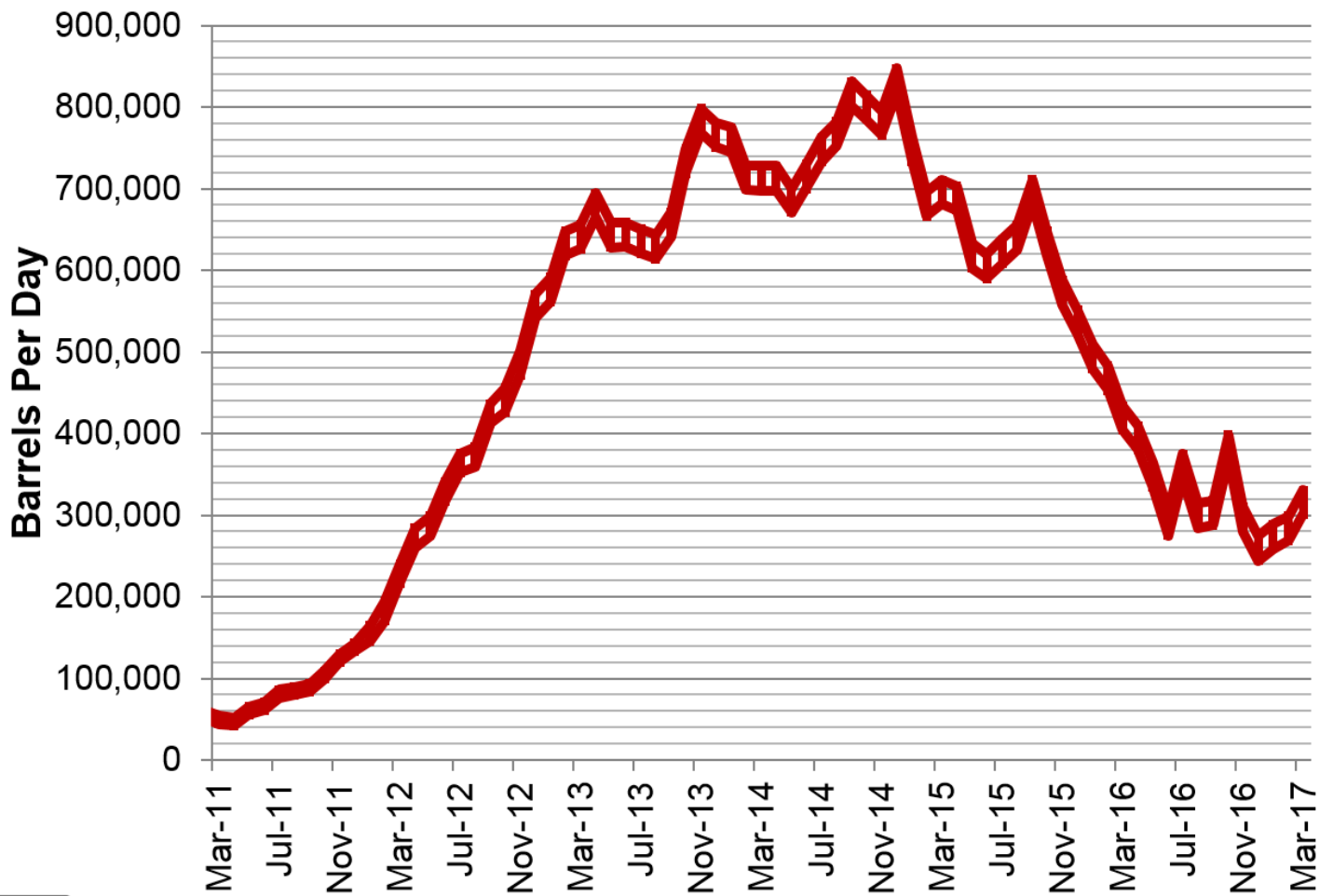
12



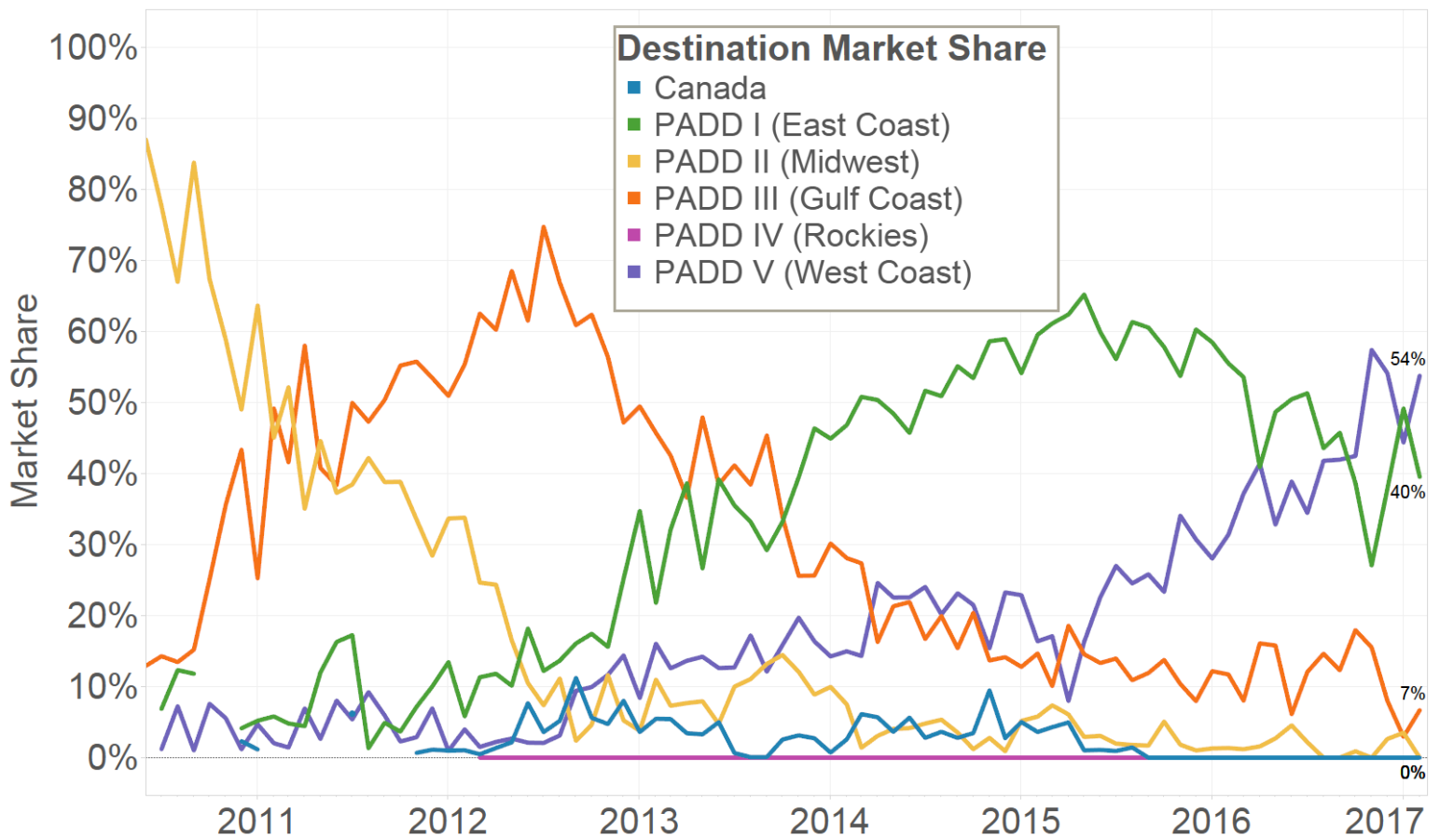
Estimated Williston Basin Oil Transportation



Estimated ND Rail Export Volumes



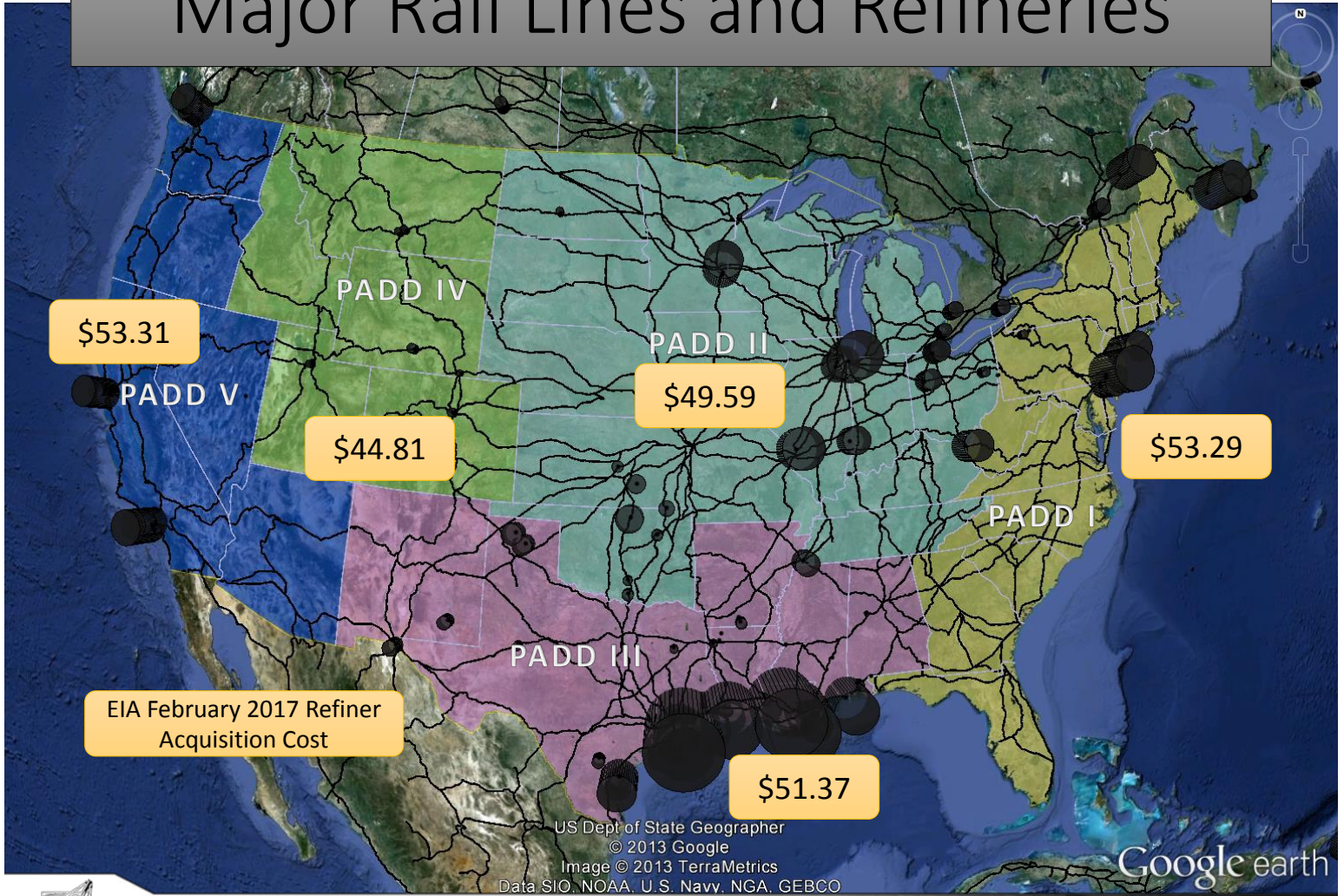
Rail Destinations Market Share (Feb. 2017)



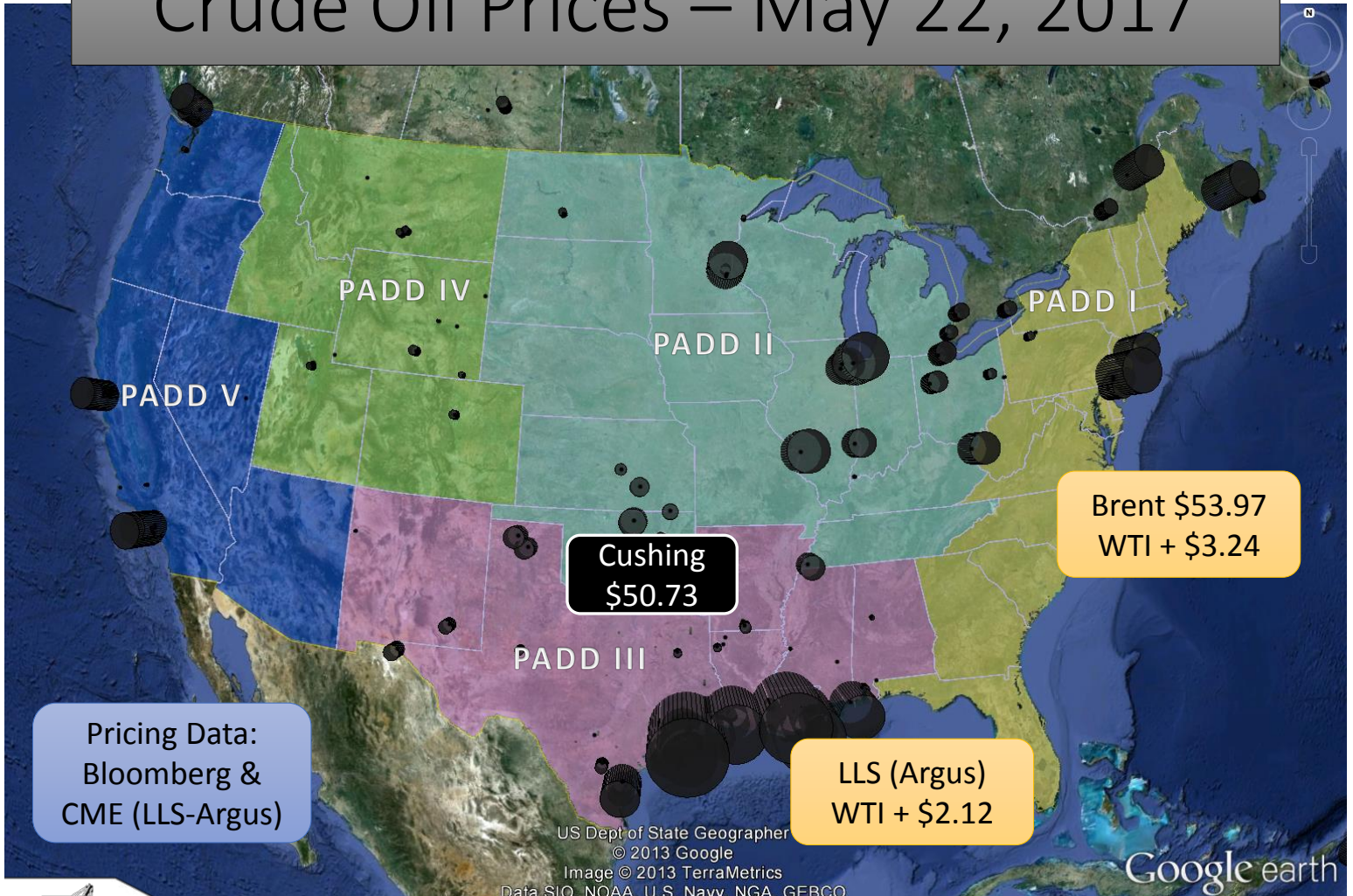
Data for Rail Destination Market Share Provided by the US Energy Information Administration



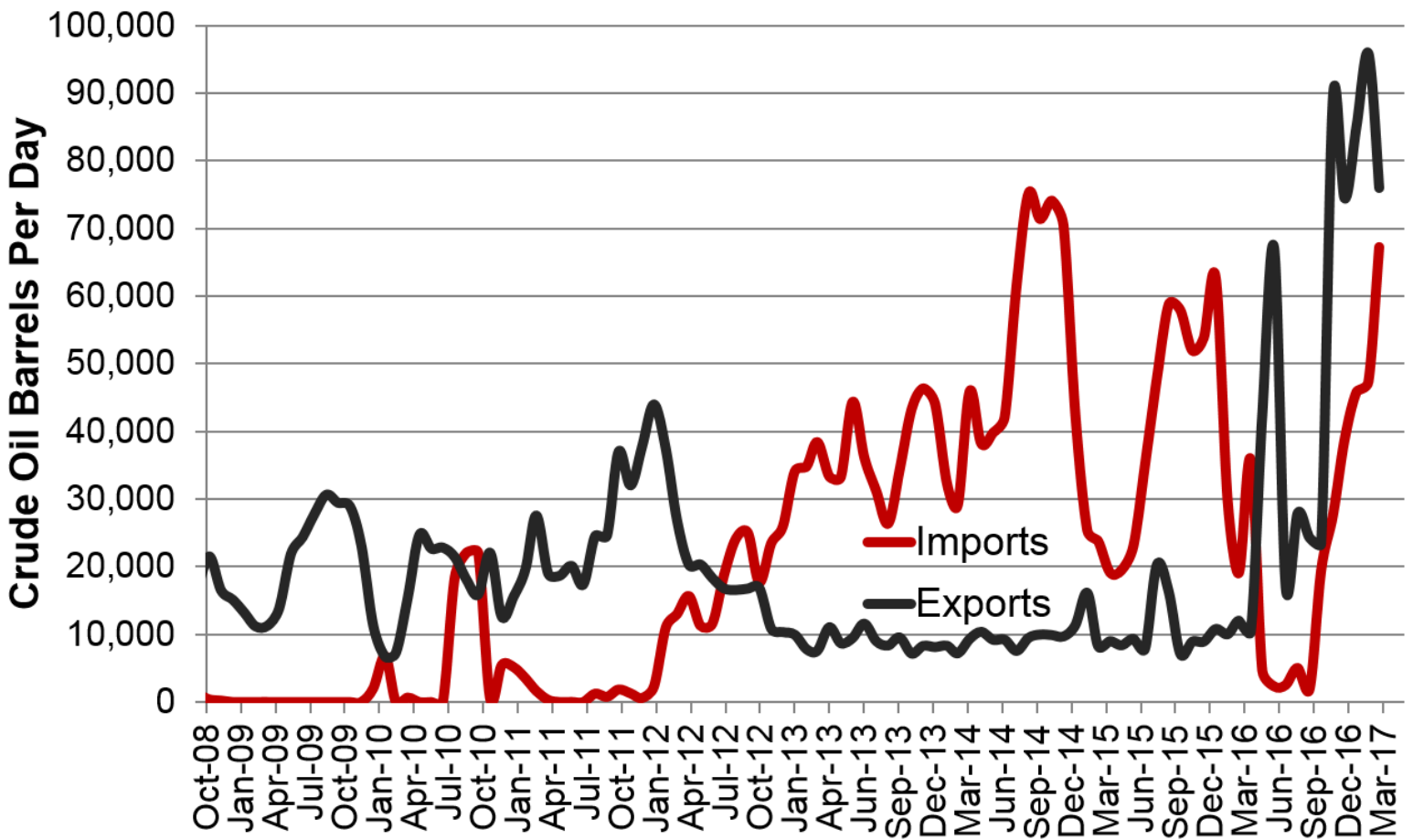
Major Rail Lines and Refineries



Crude Oil Prices – May 22, 2017



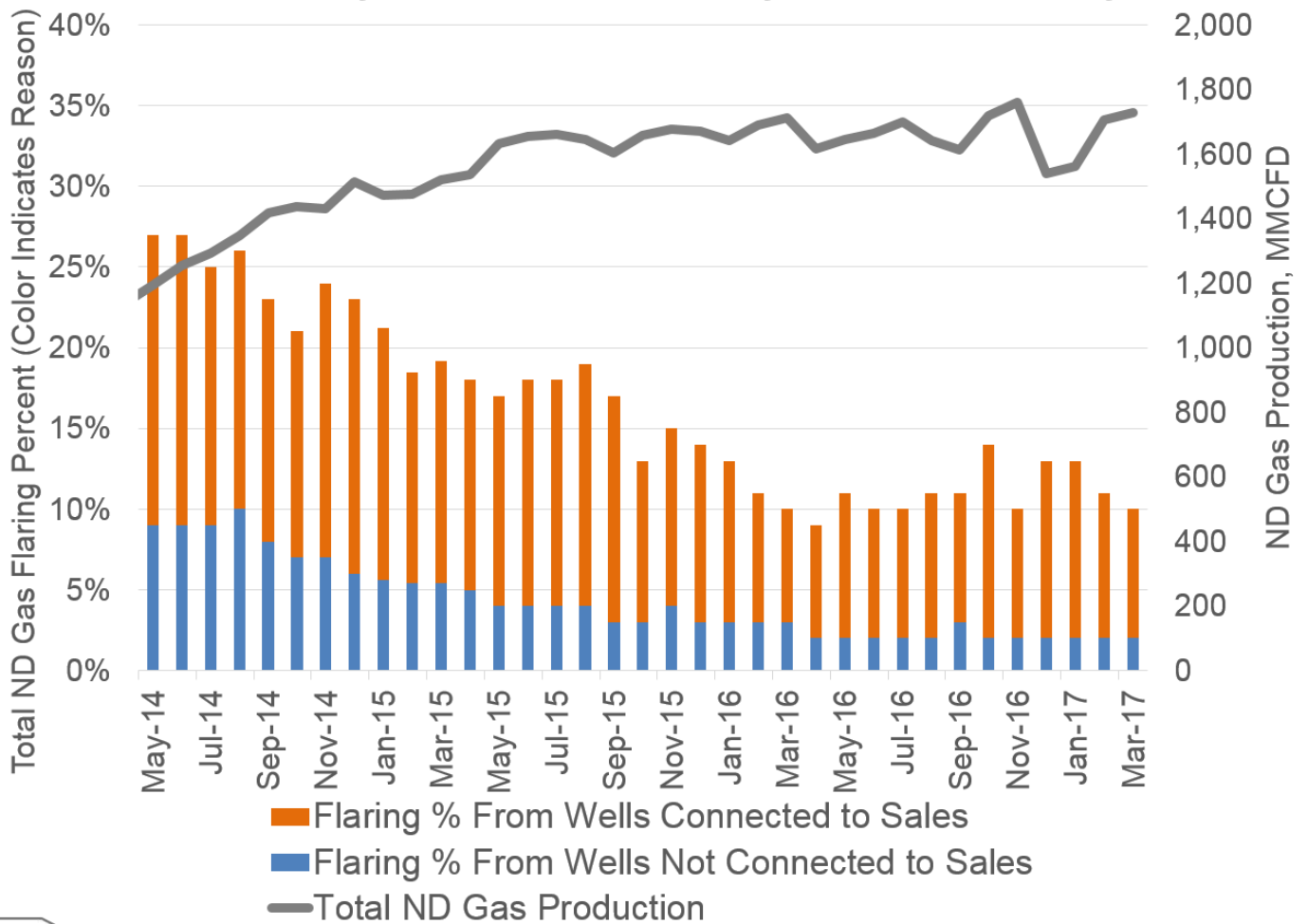
Williston Basin Truck Imports and Exports with Canada



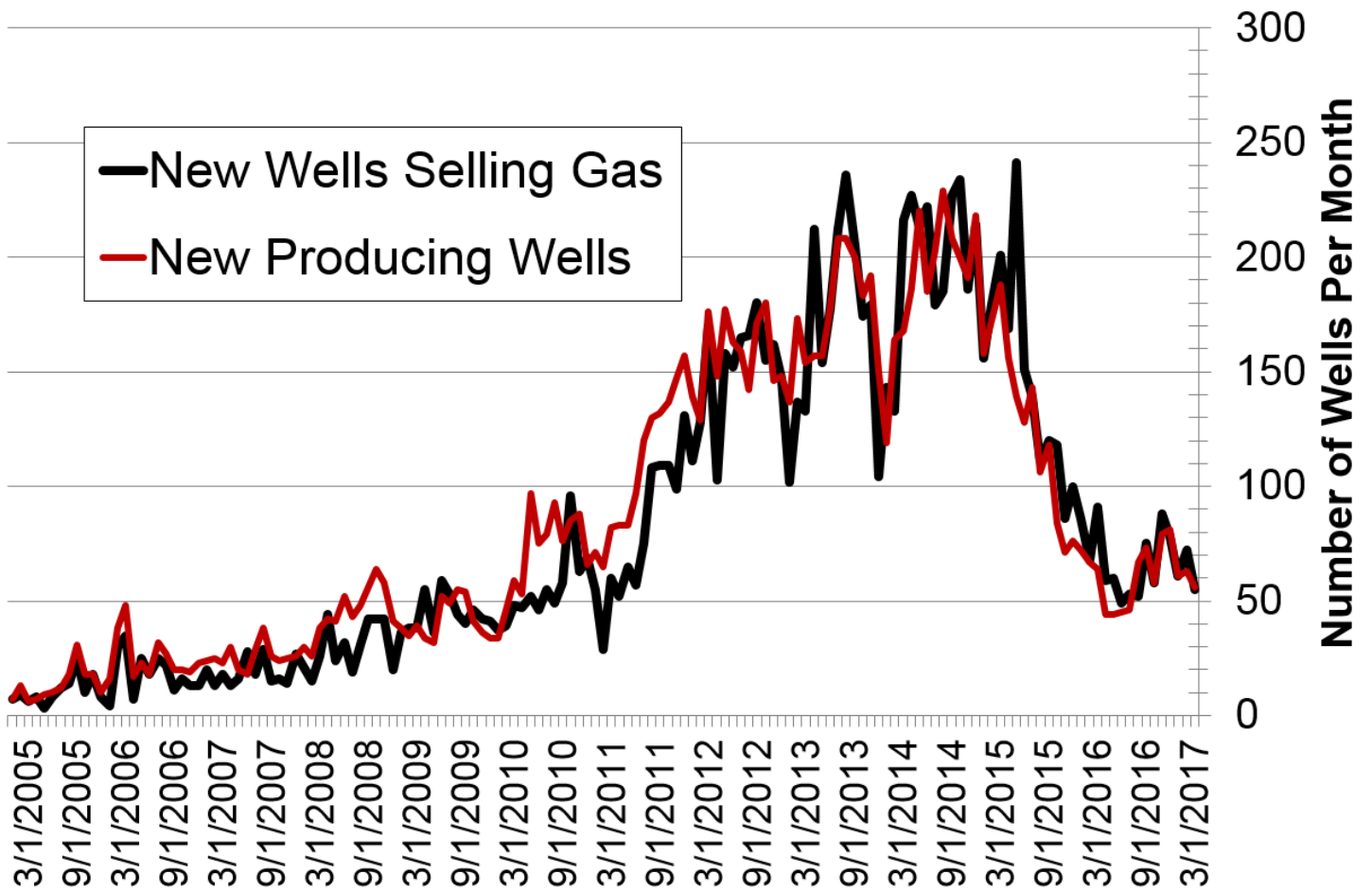
Data for truck imports/exports chart is provided by the US International Trade Commission



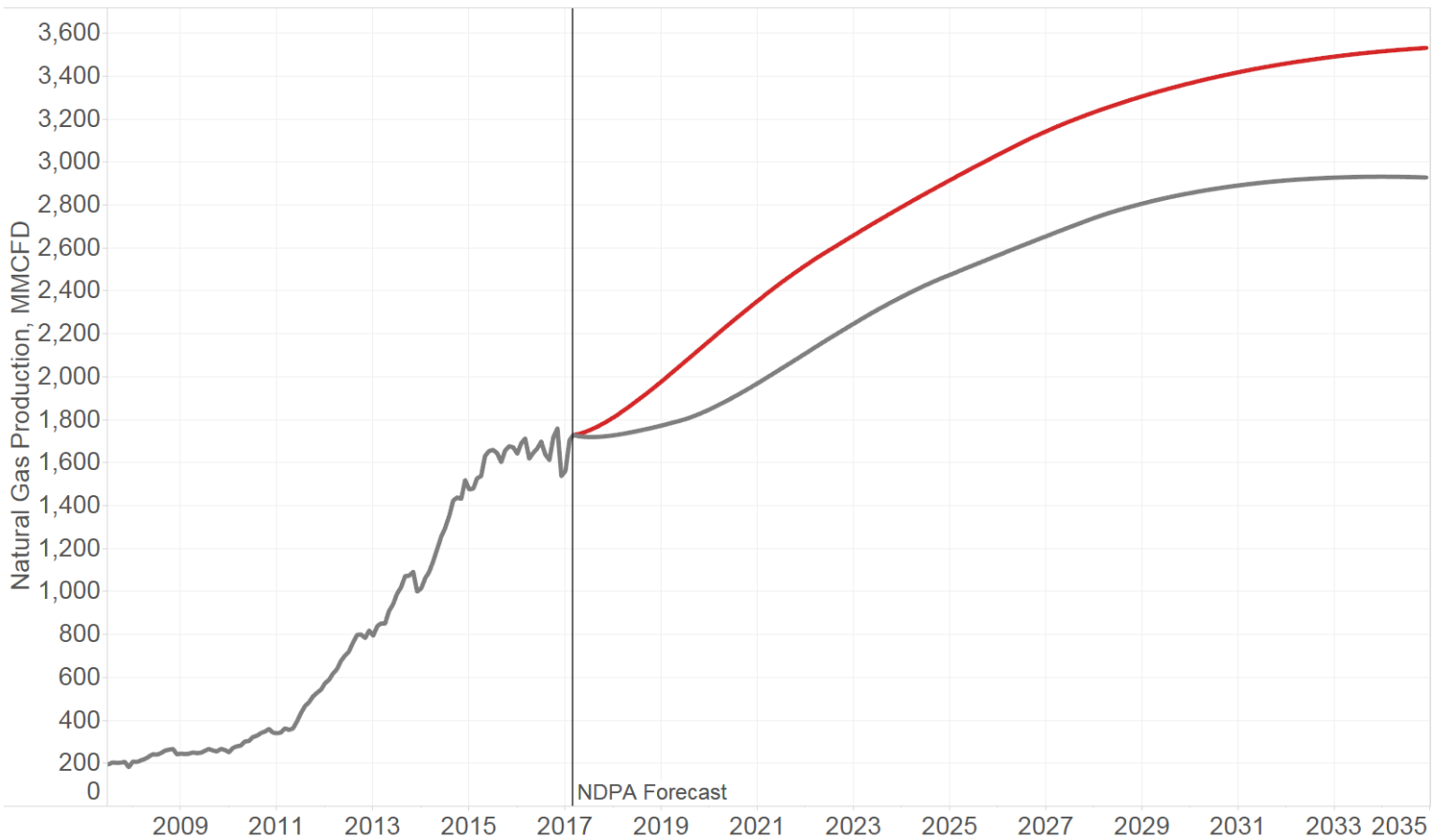
Solving the Flaring Challenge



Solving the Flaring Challenge

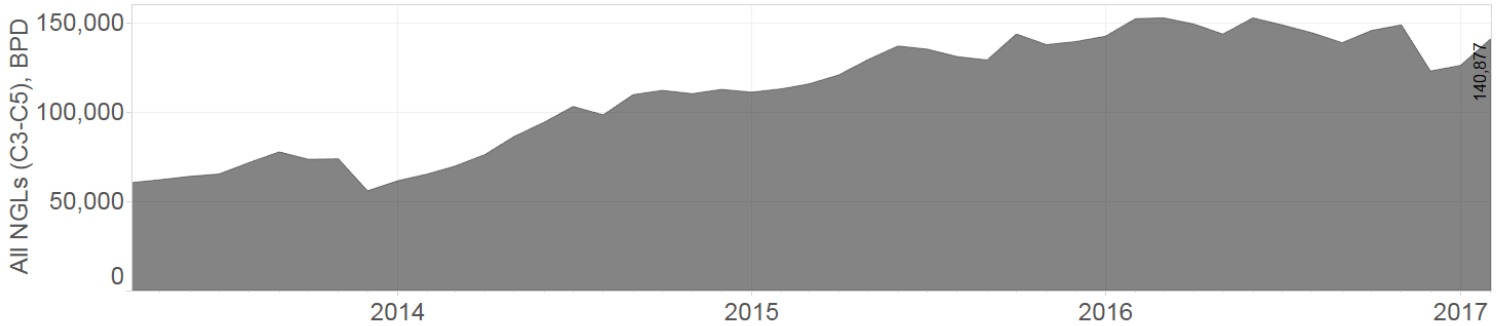


NDPA ND Gas Production Forecast

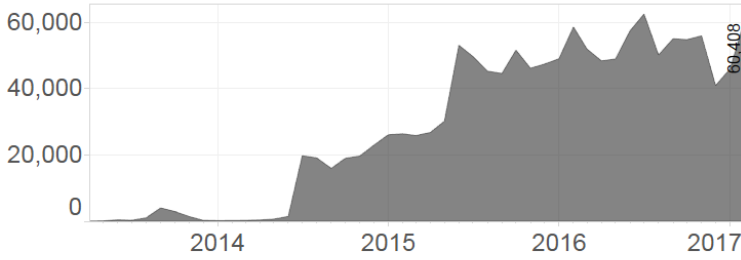


Plant Natural Gas Liquids - (Feb 2017)

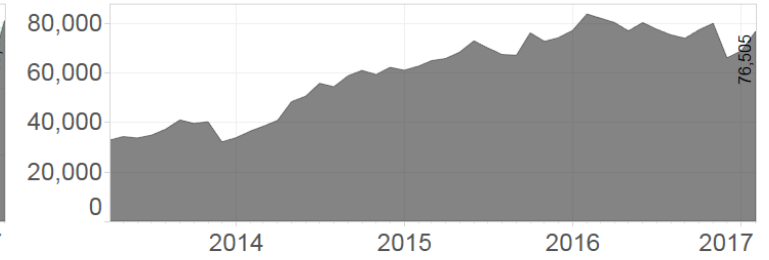
All NGLs, BPD



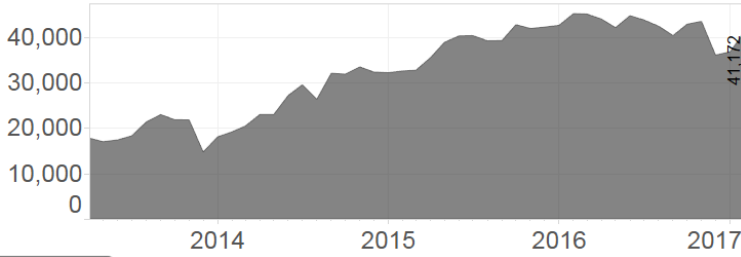
Ethane, BPD



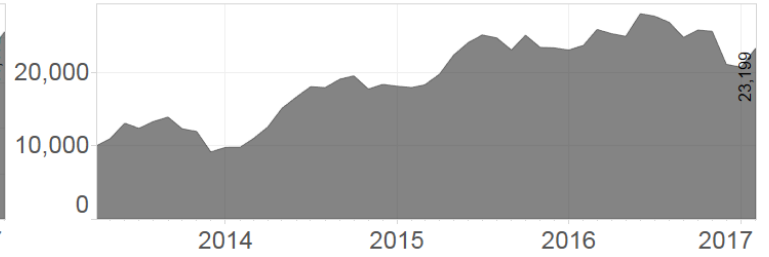
Propane, BPD



Butane, BPD

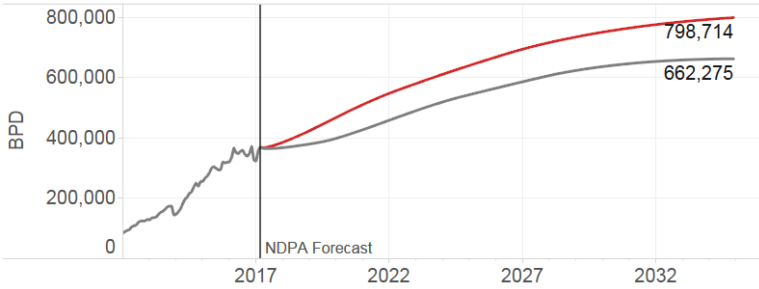


Natural Gasoline, BPD

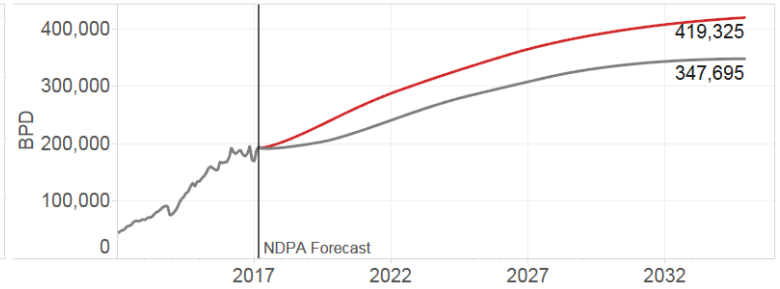


North Dakota Captured* NGL's

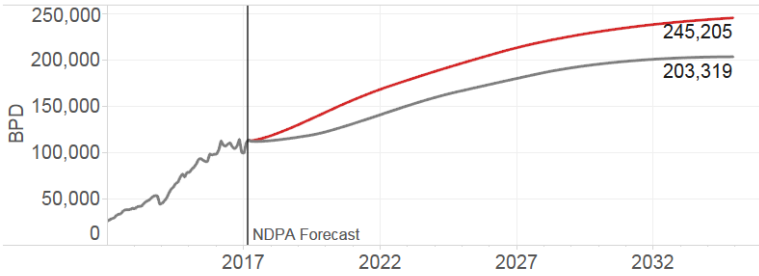
All Natural Gas Liquids



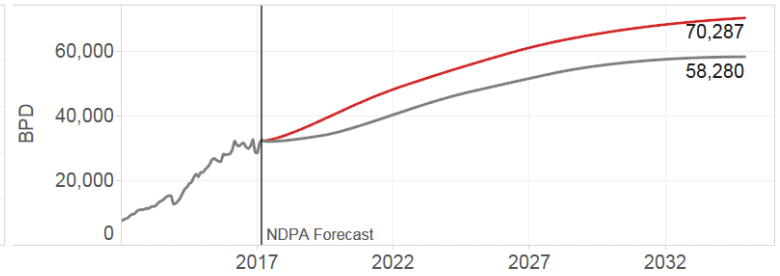
Ethane



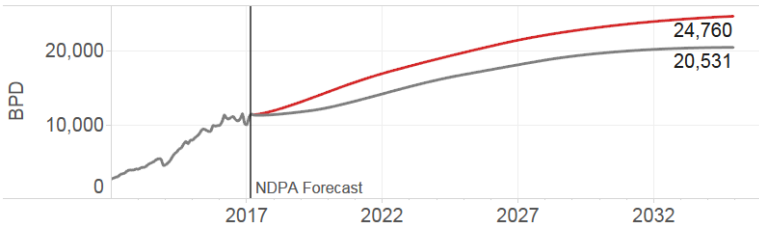
Propane



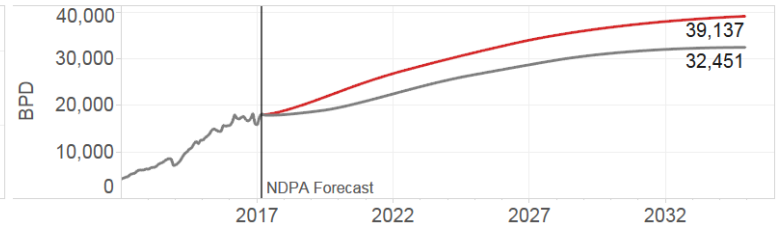
Butane



Isobutane



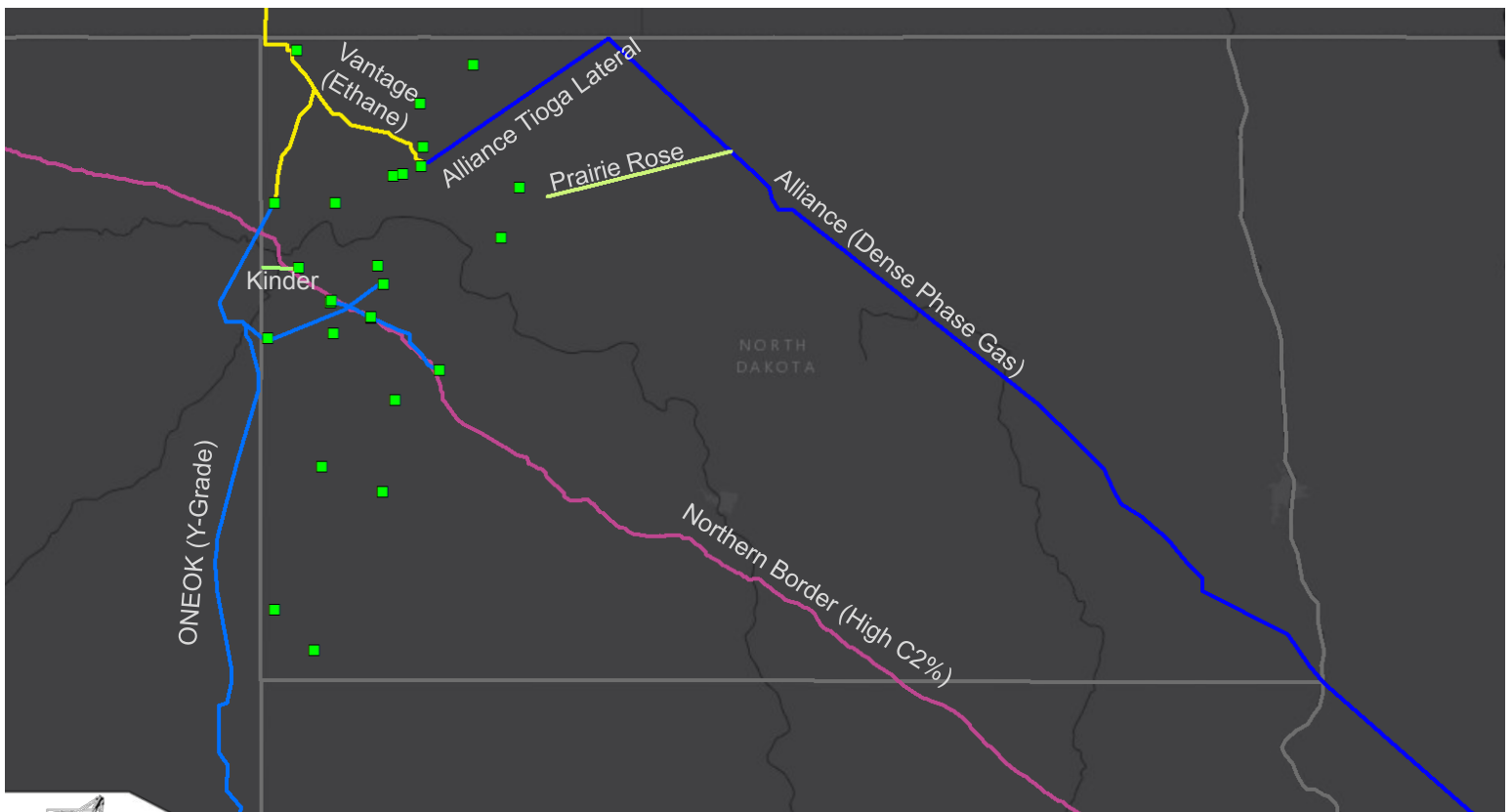
Natural Gasoline



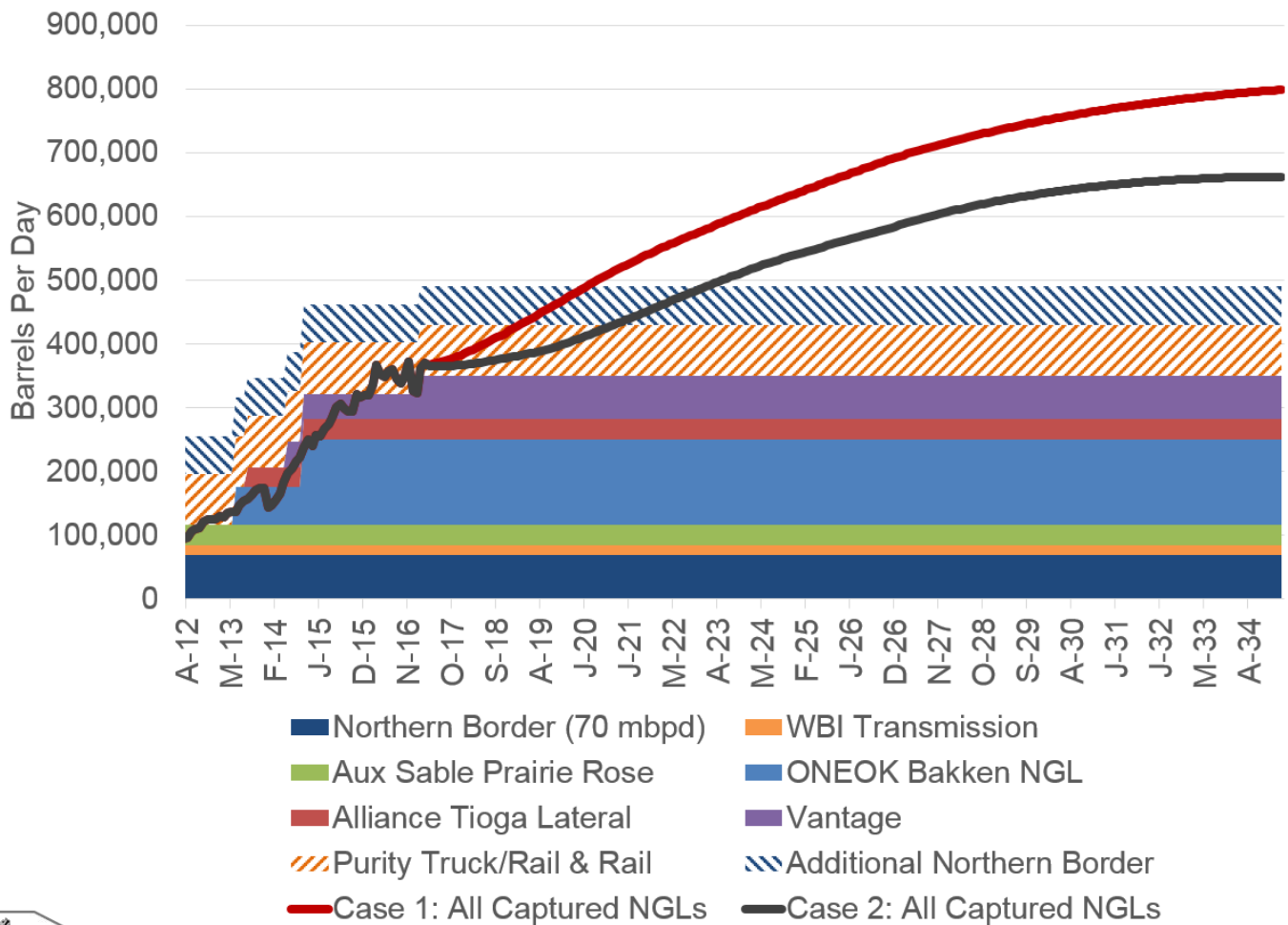
*Non-flared NGL's & Assumes 10 GPM



Major NGL Pipeline and Processing Infrastructure



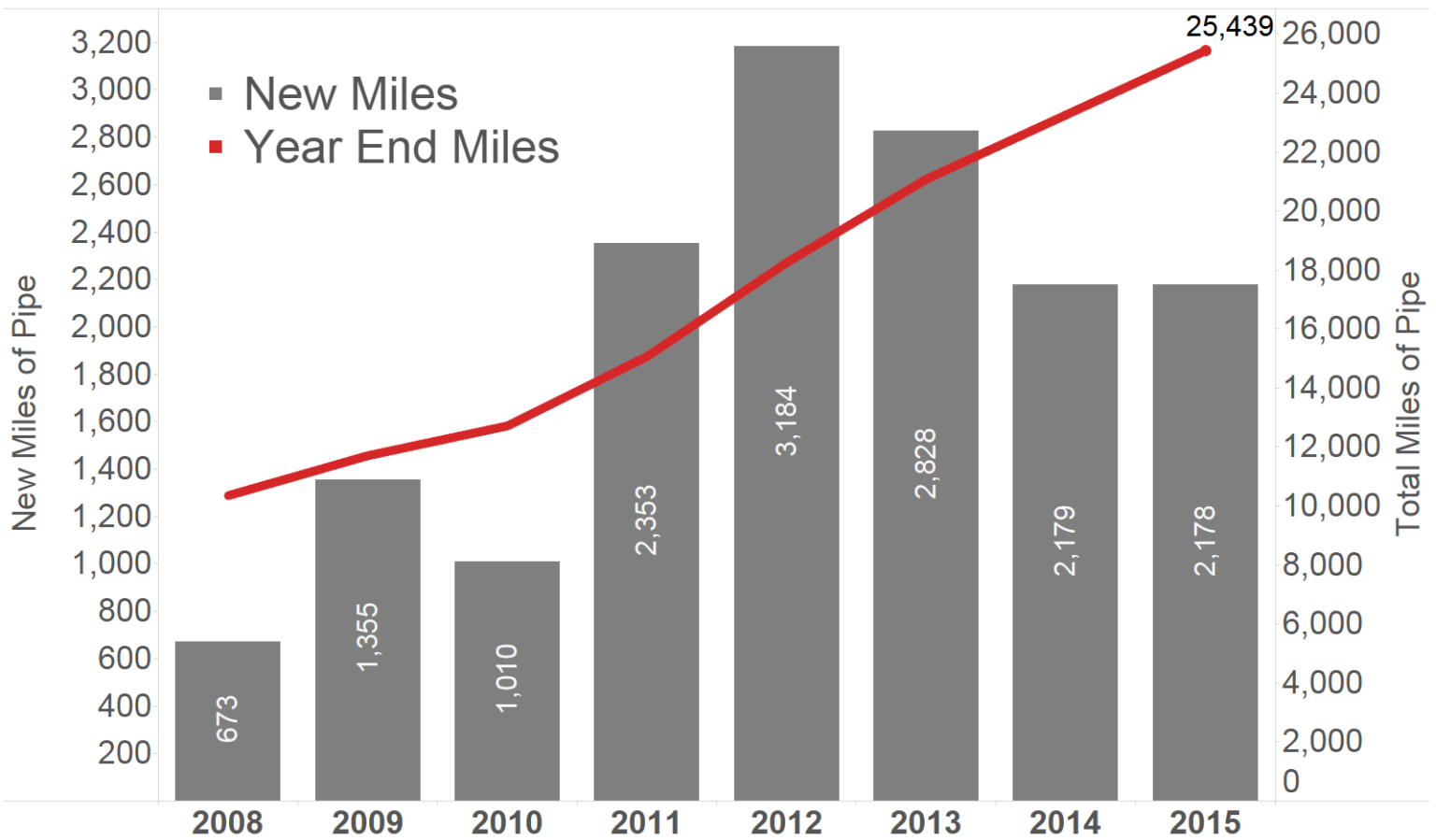
NGL Capacity Is Complicated...



Construction Update



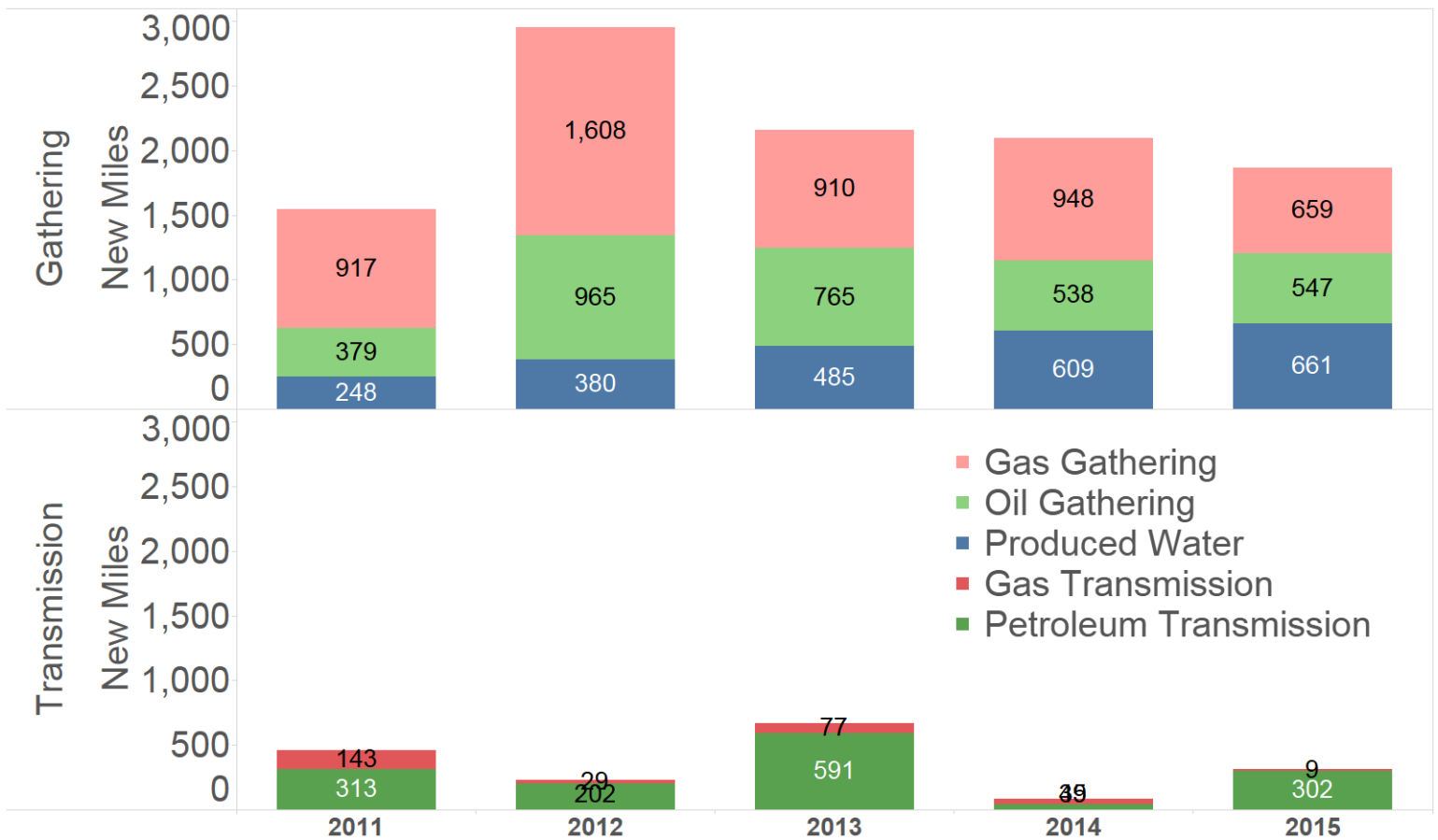
North Dakota Pipeline Construction



Sources: NDIC & PHMSA



North Dakota Pipeline Construction



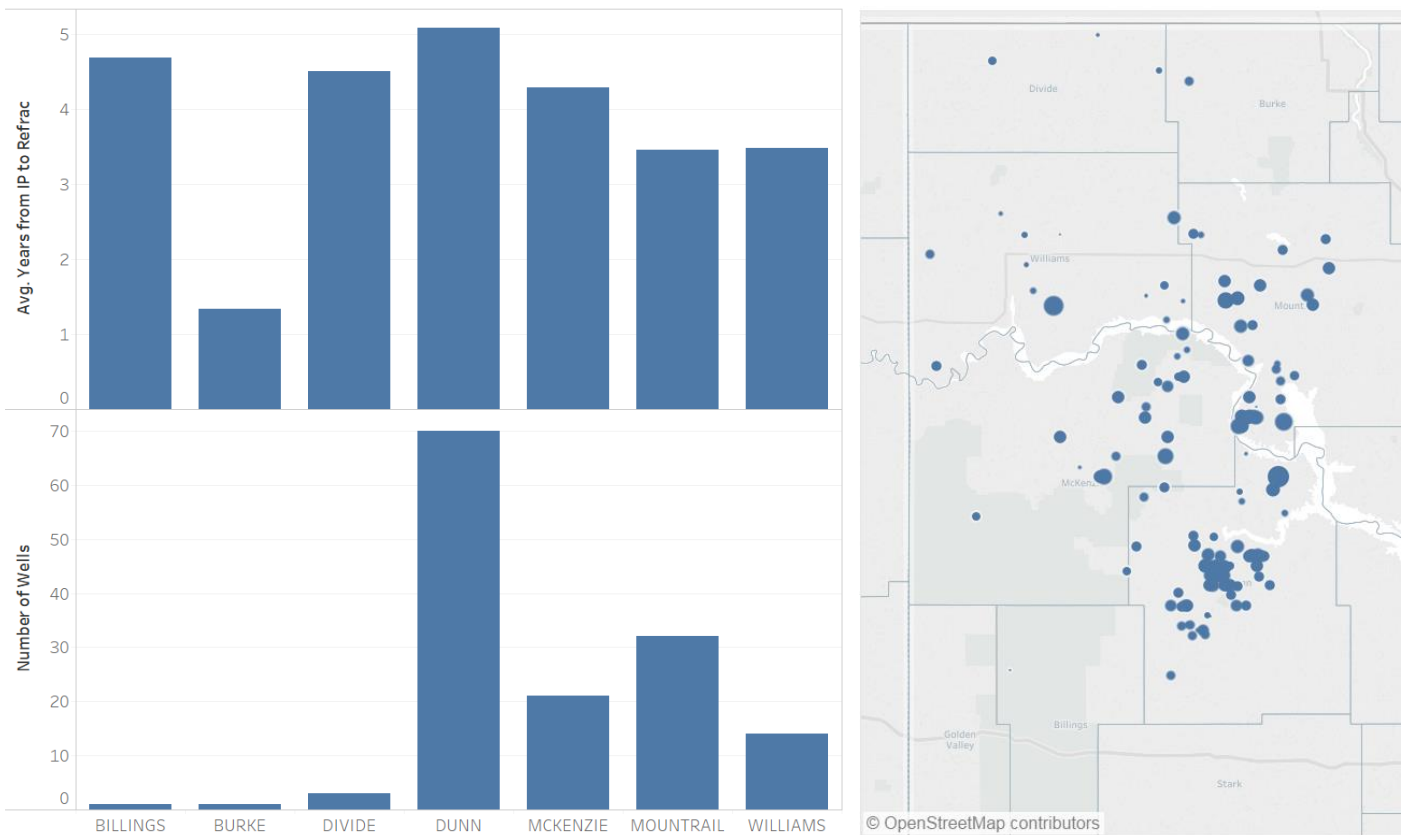
Sources: NDIC & PHMSA



Bakken Refracs



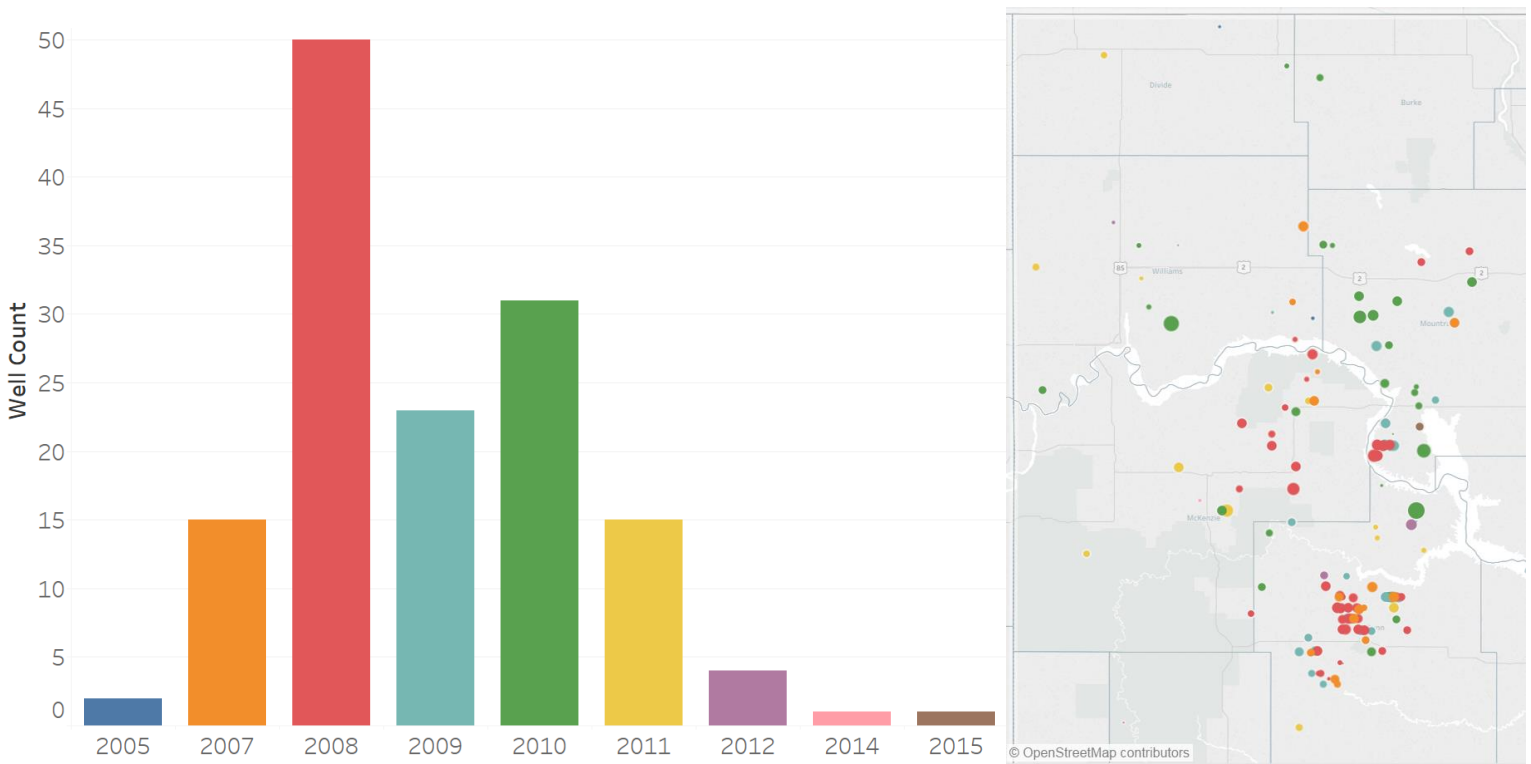
Refracs In the Bakken*



**While careful work was performed to discover as many non-confidential, modern refracs as possible, this data set is likely not all inclusive.*



Spud Year of Bakken Refrac Wells*



**While careful work was performed to discover as many non-confidential, modern refracs as possible, this data set is likely not all inclusive.*



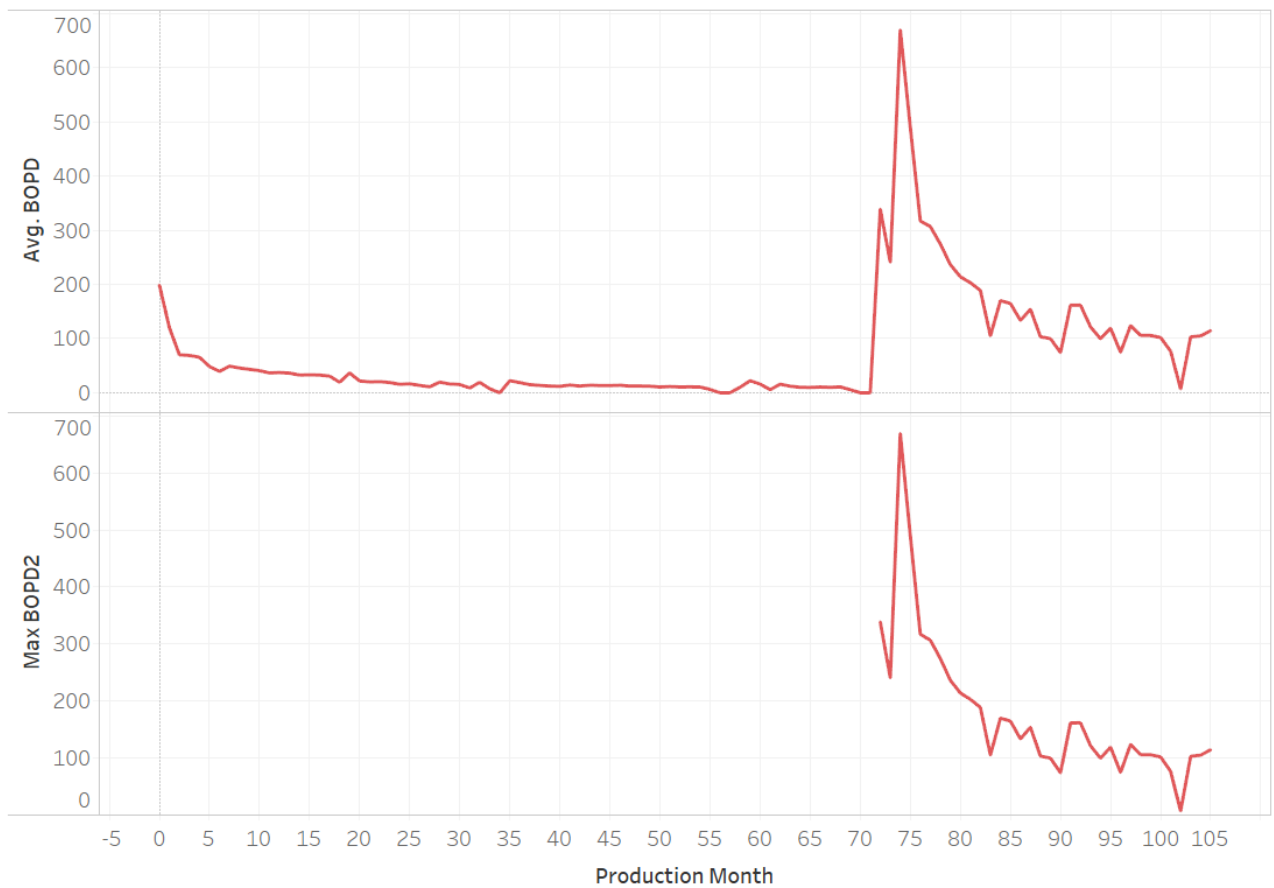
Performance Pre/Post Refrac

BOPD



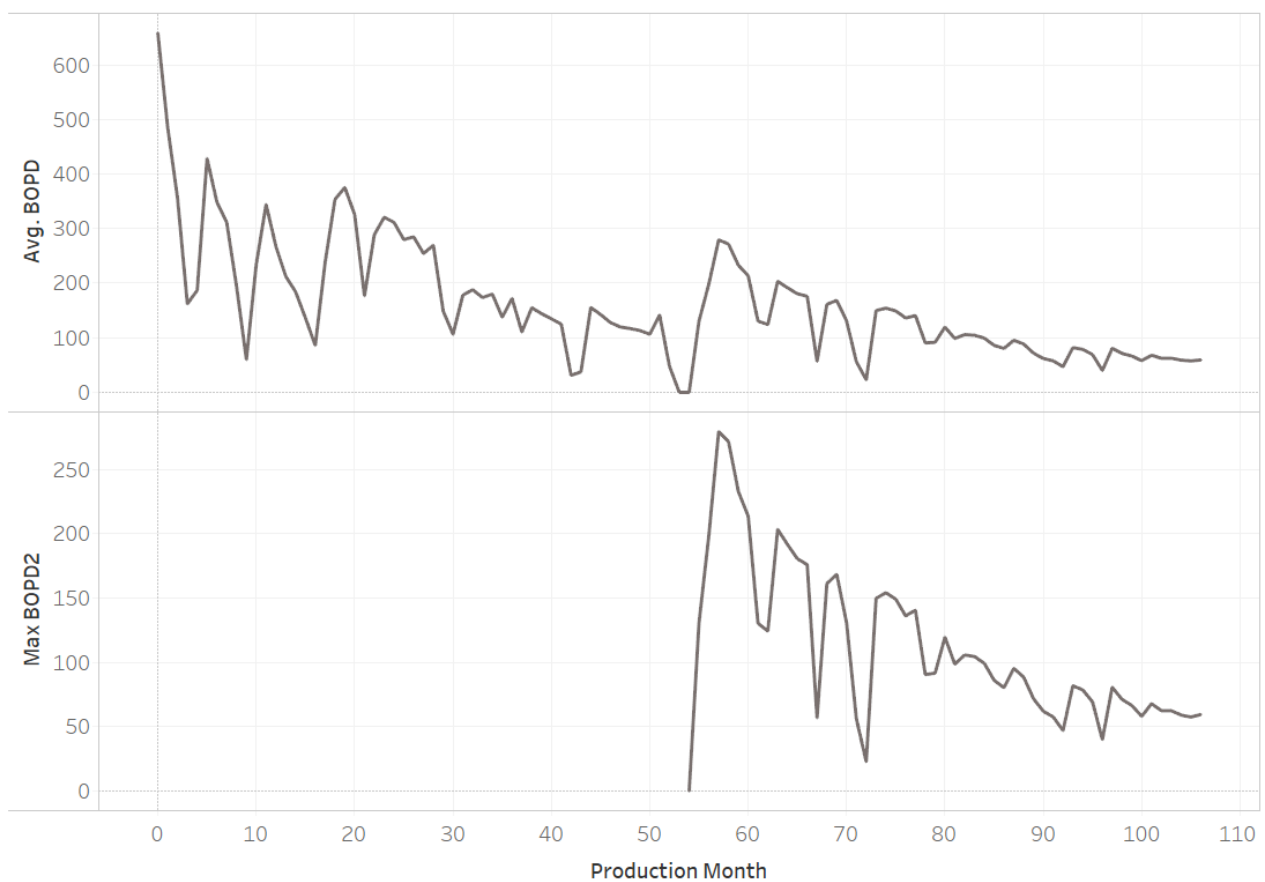
Performance Pre/Post Refrac

BOPD



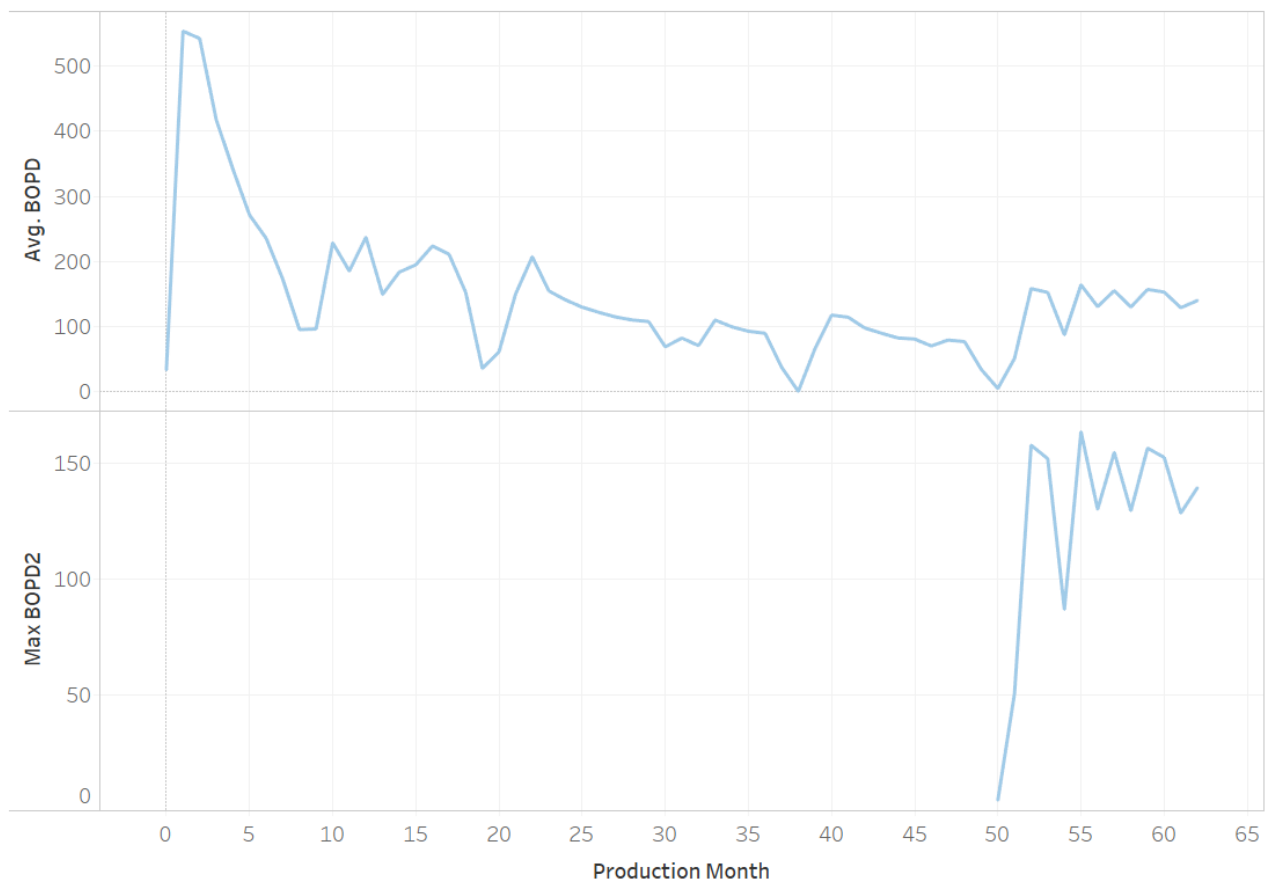
Performance Pre/Post Refrac

BOPD

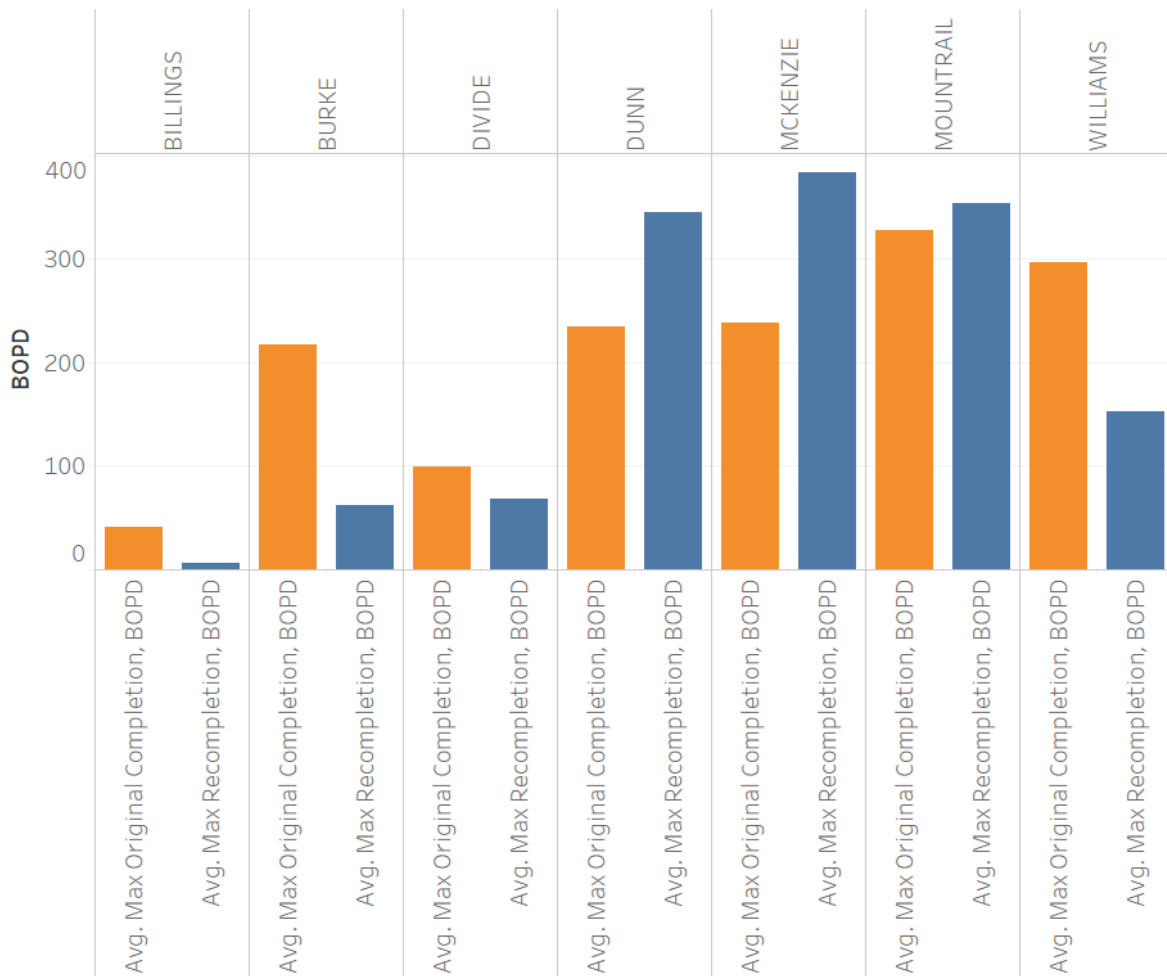


Performance Pre/Post Refrac

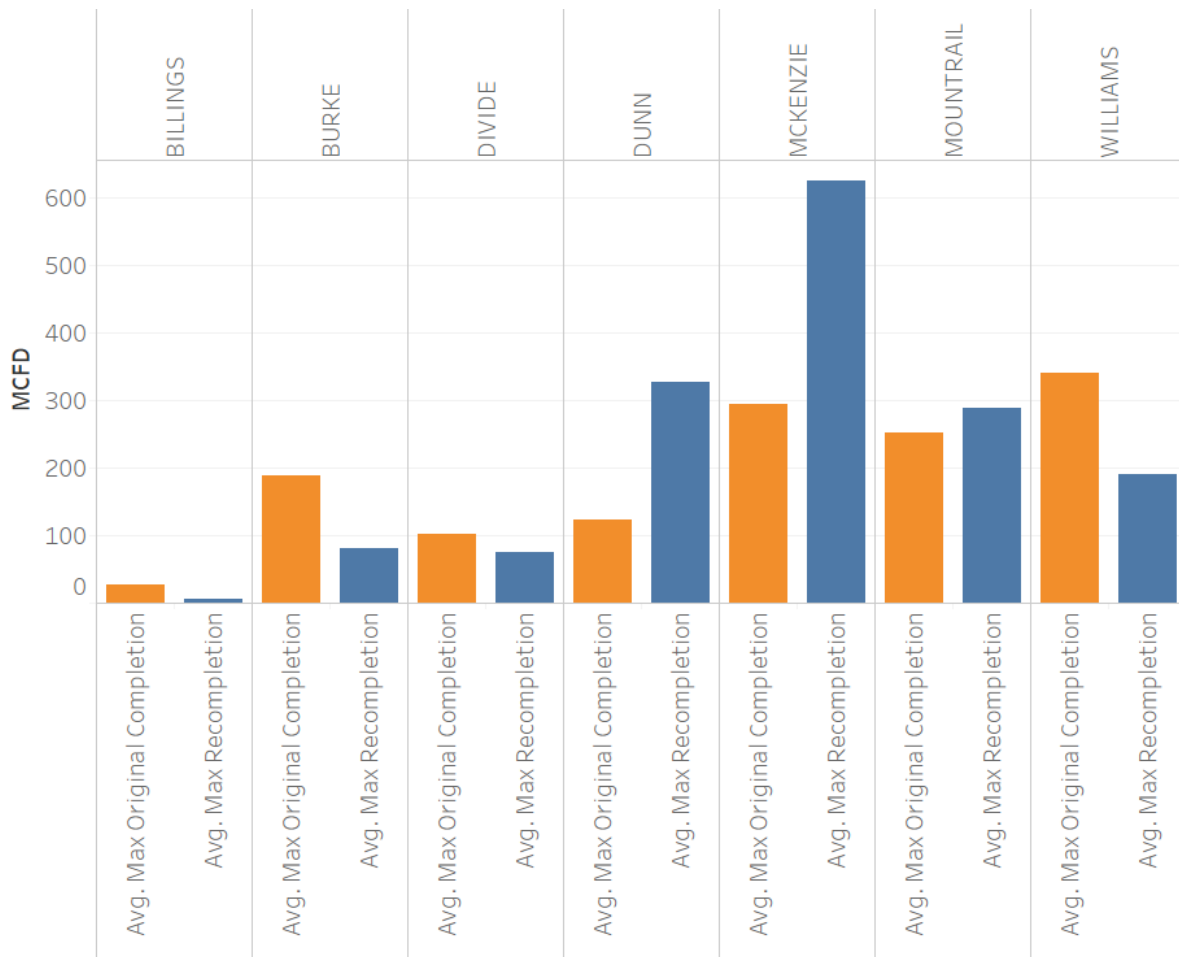
BOPD



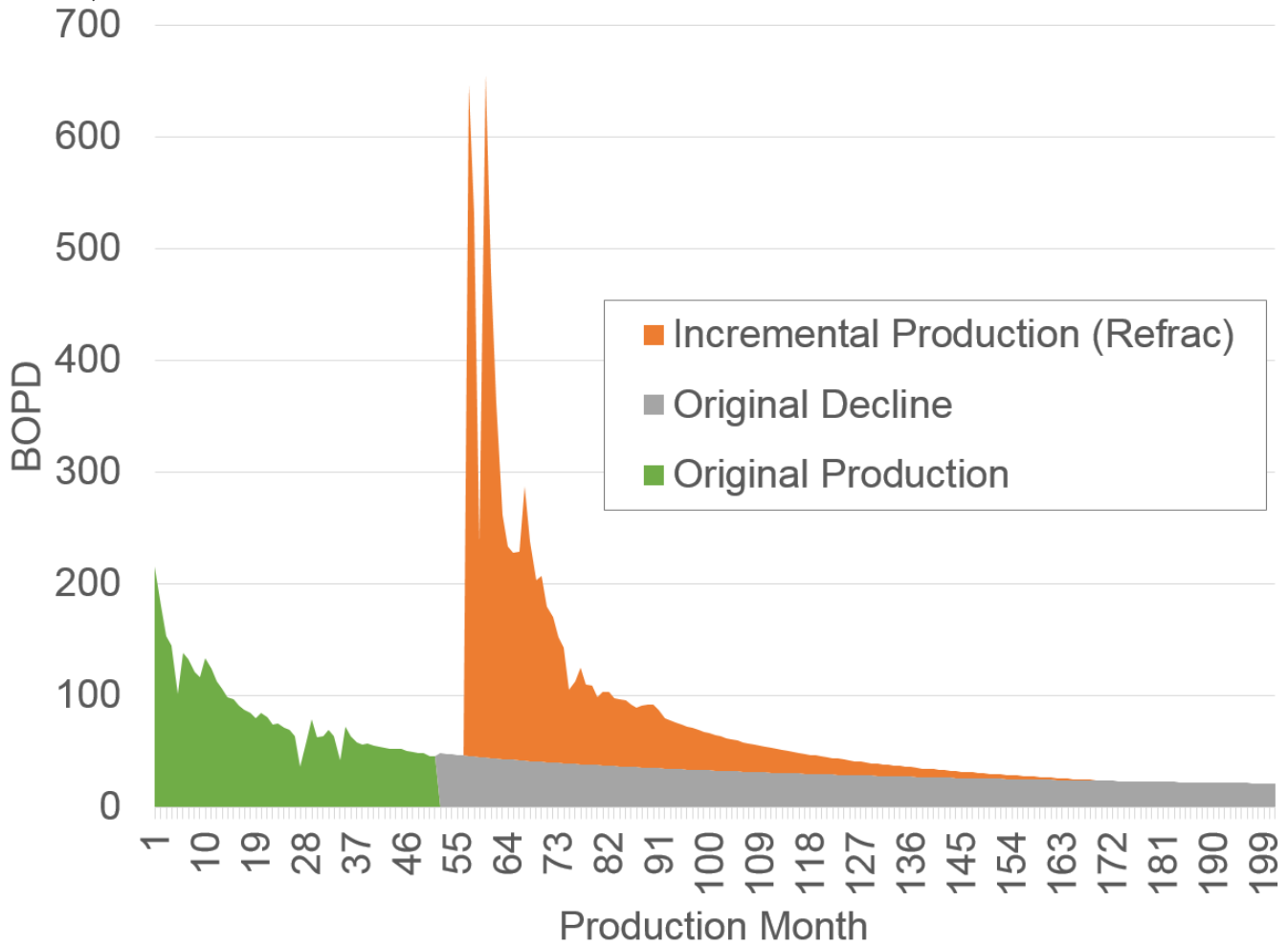
Performance Pre/Post Refrac



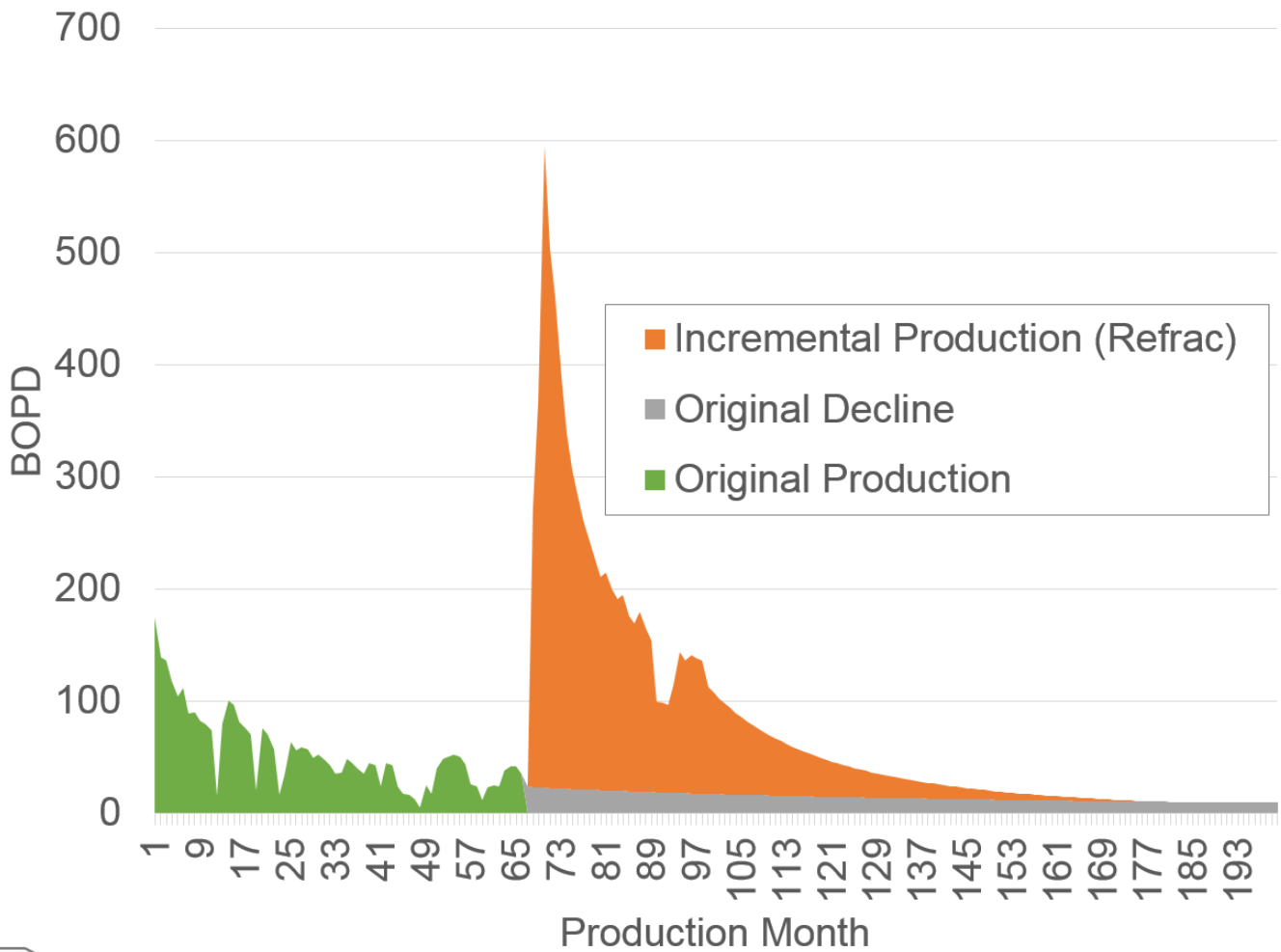
Performance Pre/Post Refrac



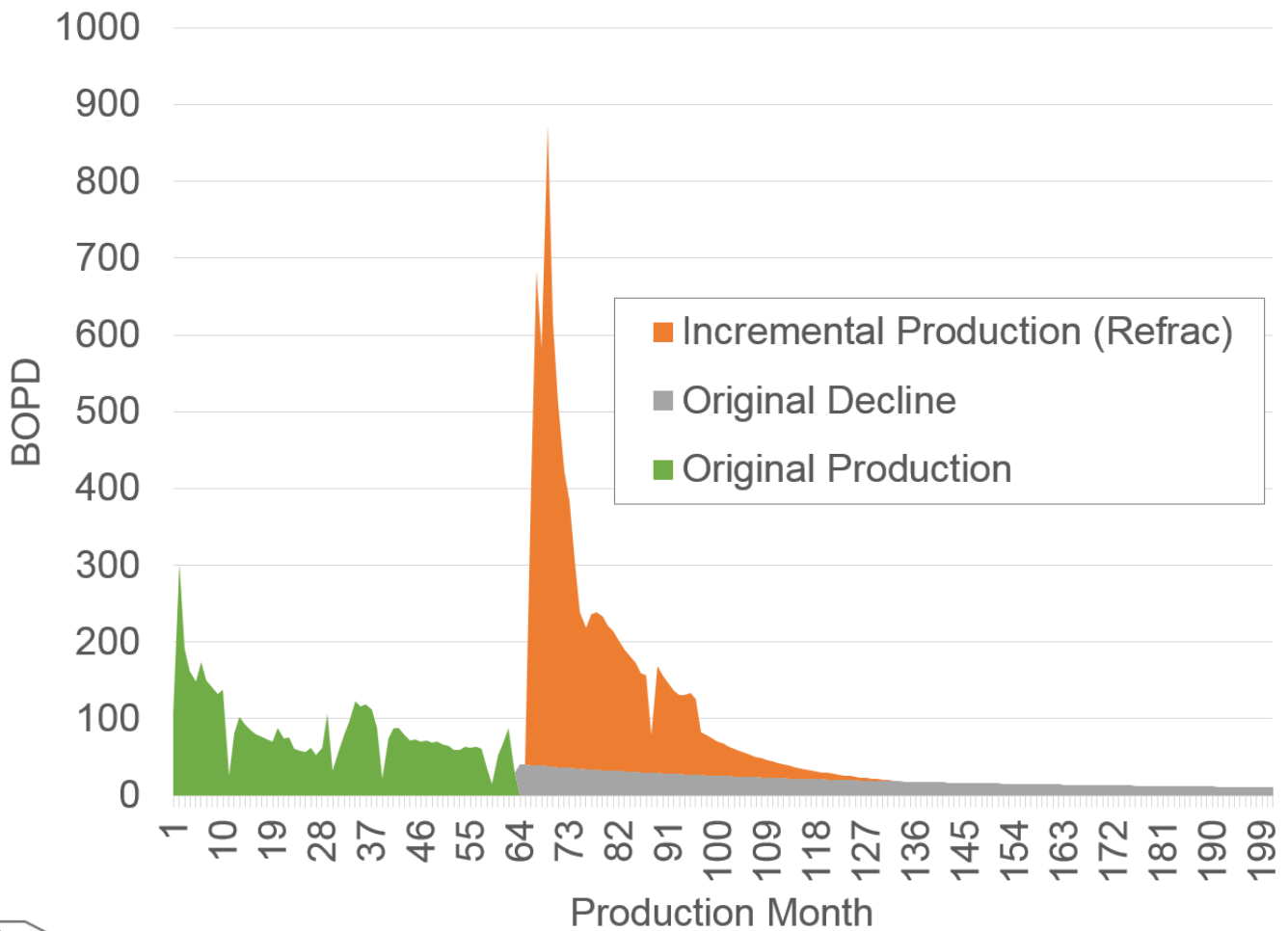
209,000 Barrels of Incremental Production



257,000 Barrels of Incremental Production



253,000 Barrels of Incremental Production



Refrac Candidates

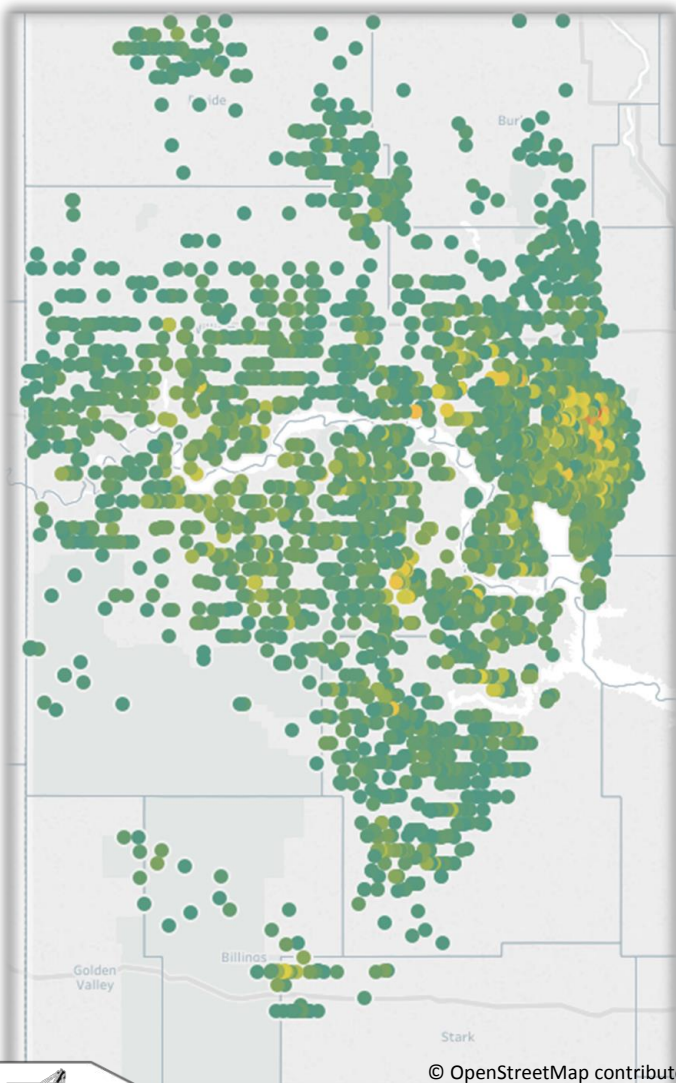
- Refrac selection is based on a number of criteria, many of which are not available in the public domain
- Refracs have been performed with success on a wide range of well ages and performance
- Refracs are designed to address one or more reservoir level issues impacting well performance (e.g. scaling, embedment, proppant rearrangement, fines generation, etc)
- The following work is not intended to imply a well will be refraced, but rather that the wells fit a certain criteria that may make them a near term candidate for refrac.



Peak Month Minimum 200 BOPD

3,074 BKN Wells
Spud 2007-2011

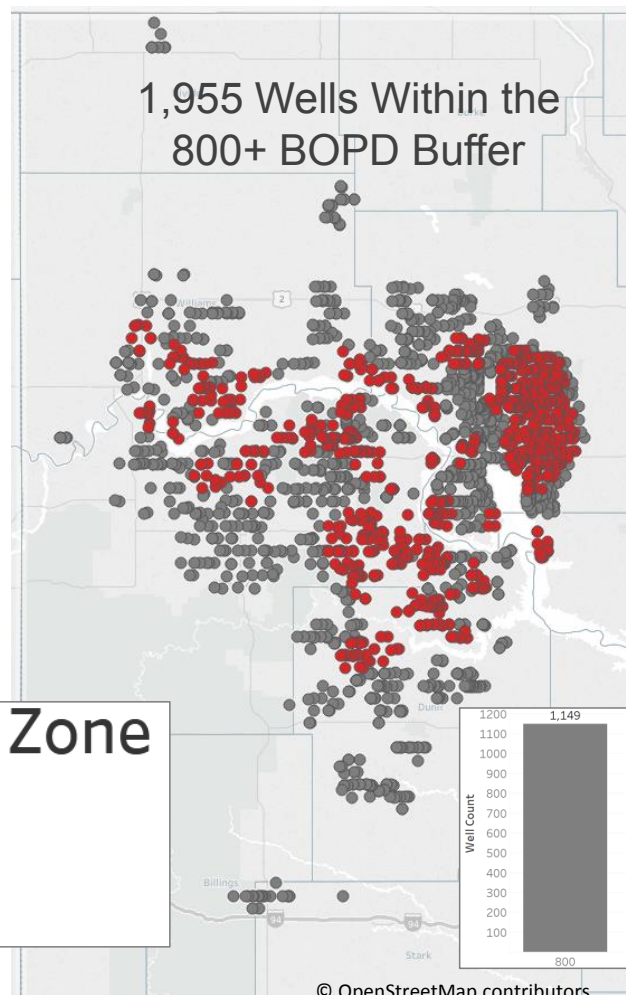
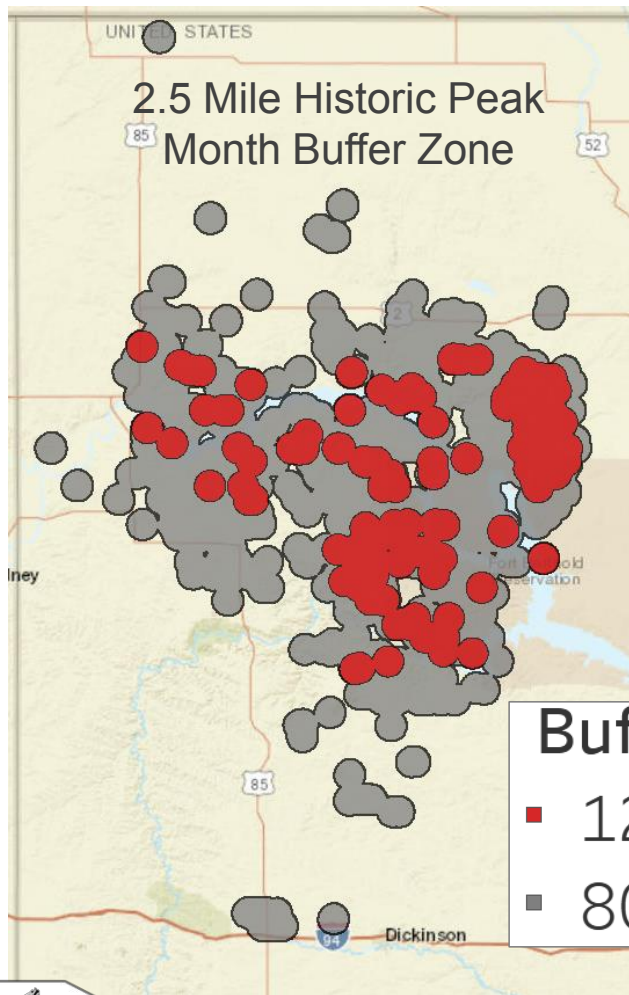
Potential Near term
Refrac Candidates?



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Proximity to High Performing Wells



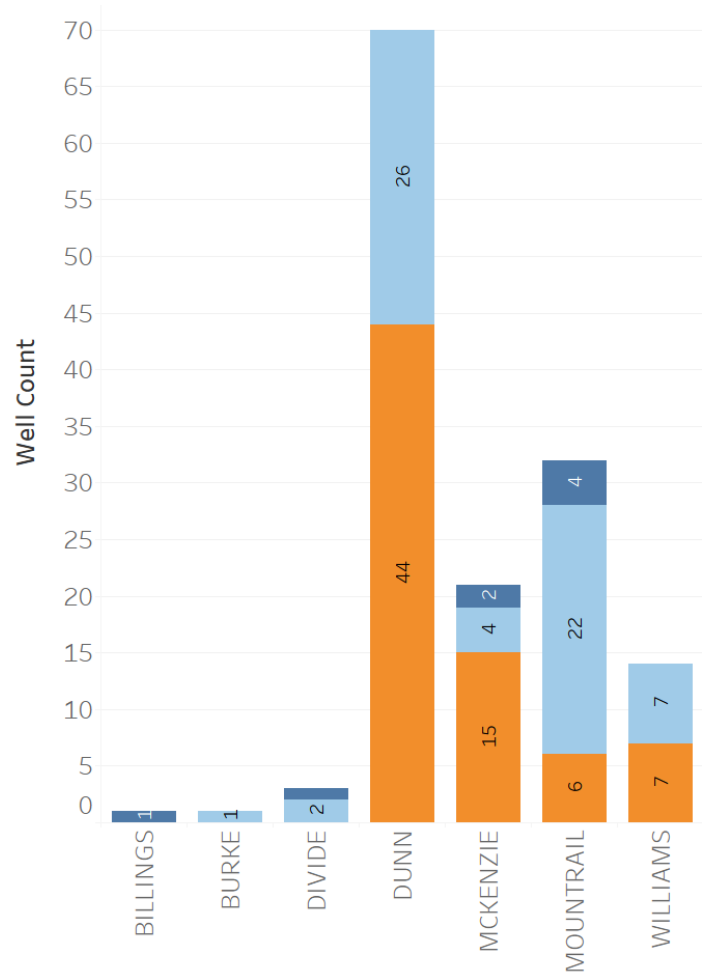
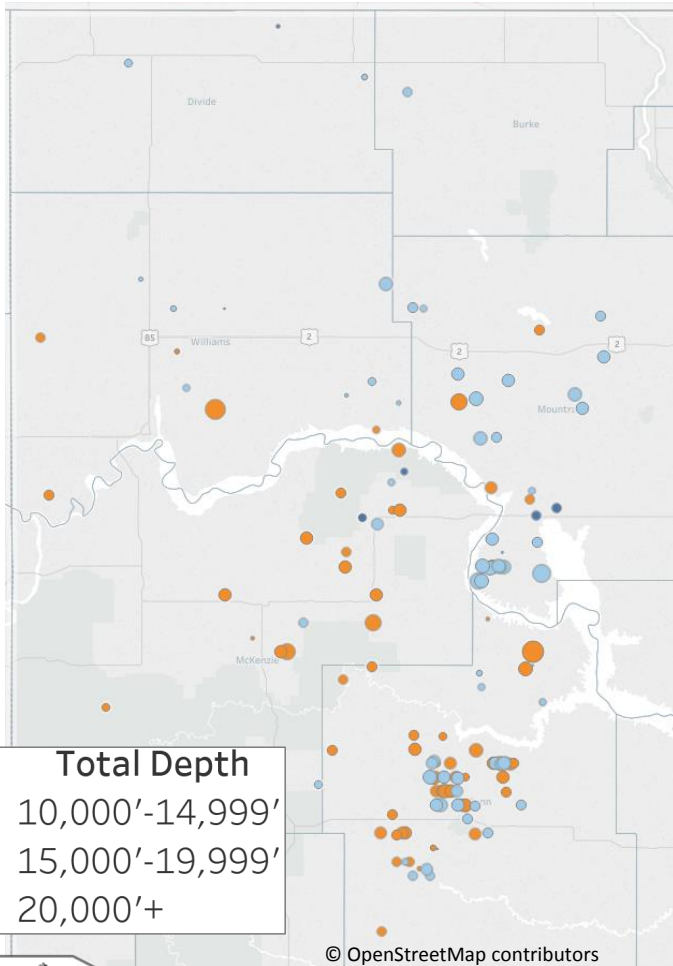
Buffer Zone

- 1,250
- 800

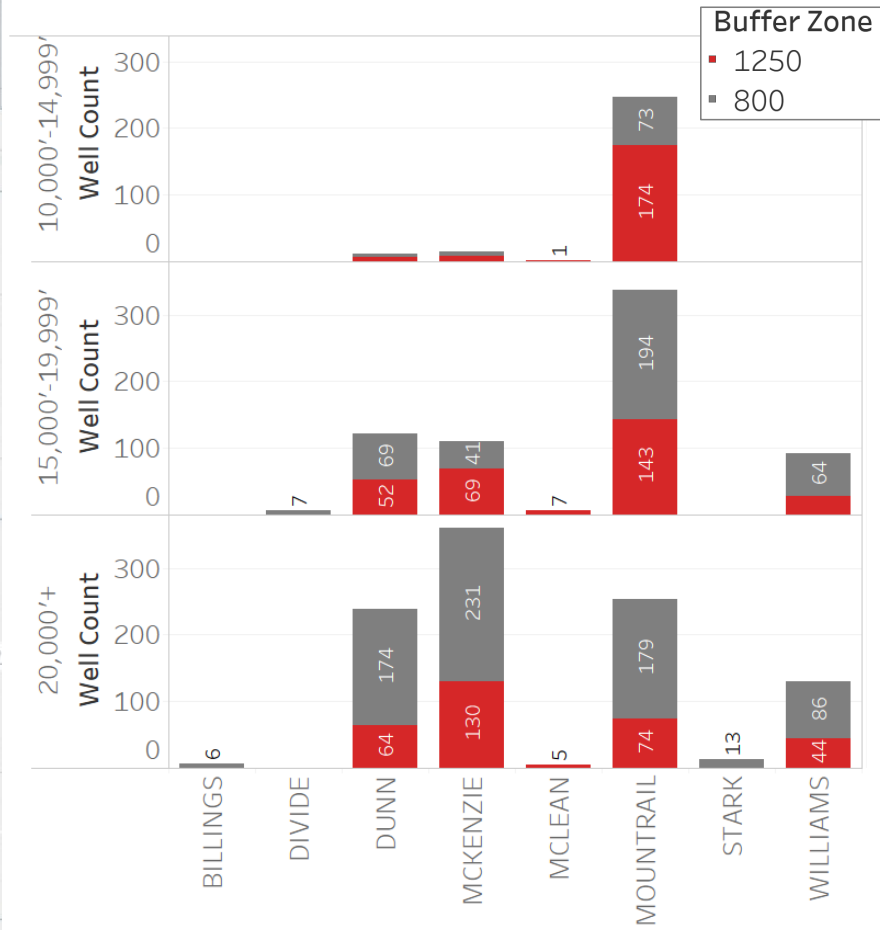
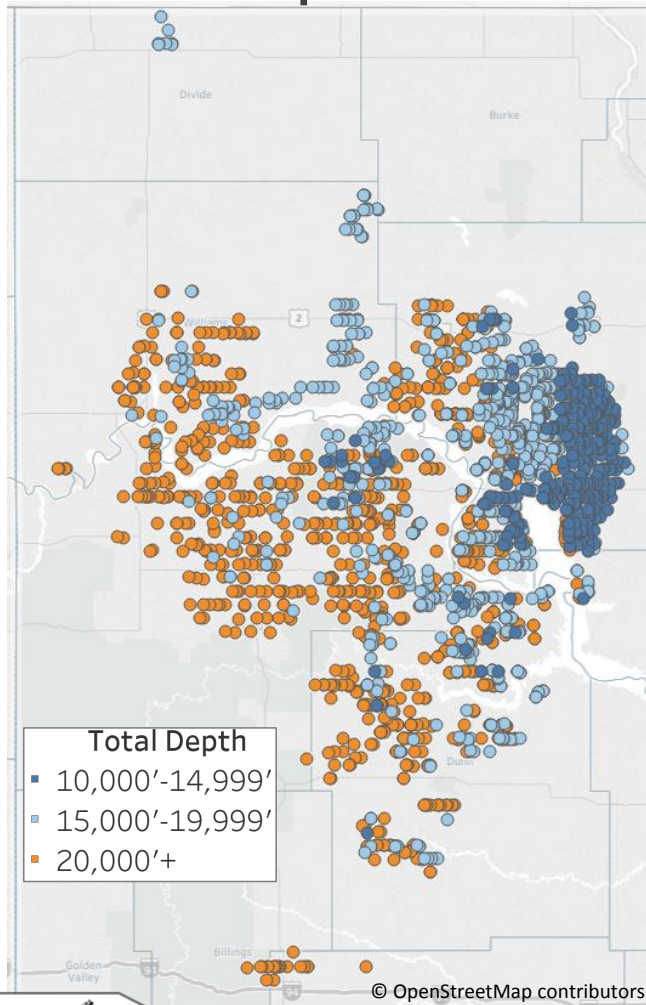
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Total Depth of Previously Refraced Wells

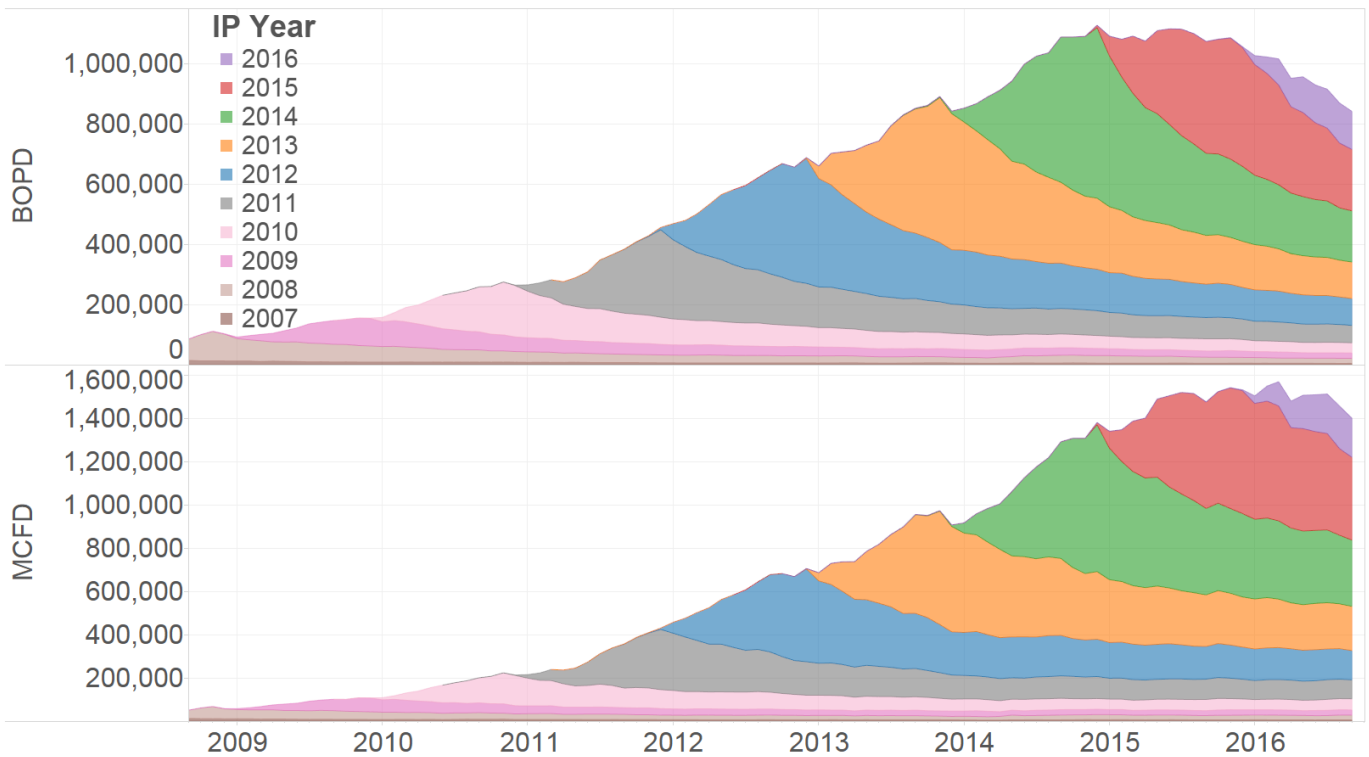


Total Depth & Buffer Zone of the 1,955 Wells



Base Production Declines*

Refracs Have the Potential to Alter These Declines



*Non-Confidential Bakken/Three Forks Production Only



Next Steps

- How does ND's production profile shift if/when horsepower is added or reallocated to refracs?
- How do the economics of a refrac compare to a new drill and completion?
- How does ND's midstream industry react to meet shifting production volumes? (Locally & Regionally)



Contact Information

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Websites:

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



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

