Appalachian Natural Gas Production

A Macro Analysis

DUG Appalachia 2024

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Petroleum Consultants

Topics

- Horizontal Shale Production Outlook – *Past and future*
- LNG Demand – *Current and future capacity*
- Midstream Trends – *Bringing new capacity online*
- Pricing Expectations – *Short-term and long-term outlook*

Production Outlook

Production Outlook – *Past and Future*

- Marcellus and Utica Over The Years – *Where are we on the learning curve?*
- Current Well Performance – *Have we hit a plateau?*
- Horizontal Shale Production – *Have we reached peak gas in Appalachia?*
- Marcellus Development Outlook – *Offsetting the base decline with new development*
- Recent Production Trend

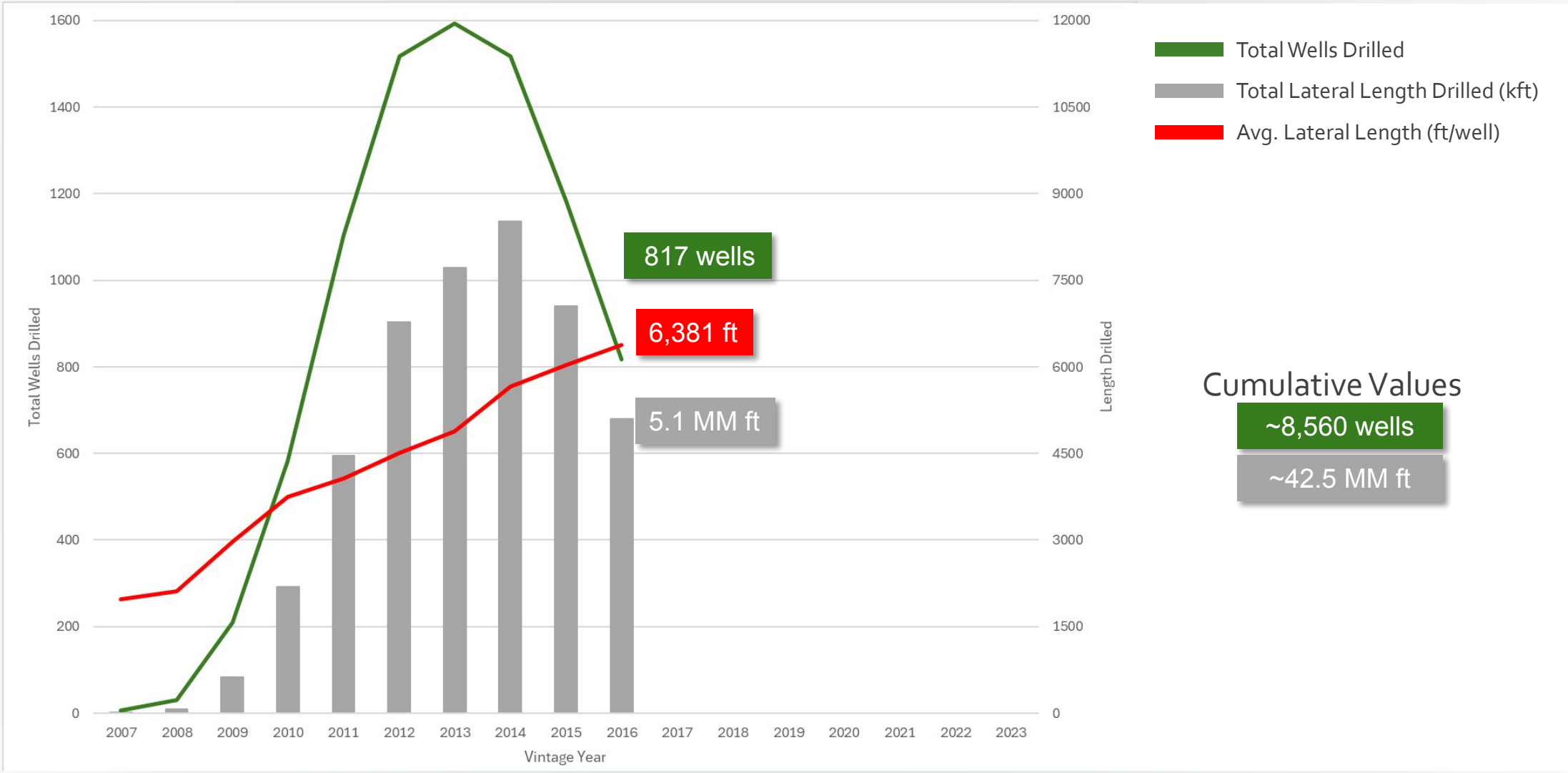
Marcellus Over the Years – *in 2014*

Cumulative Values

~6,561 wells

~30.4 MM ft

Marcellus Over the Years – *in 2016*

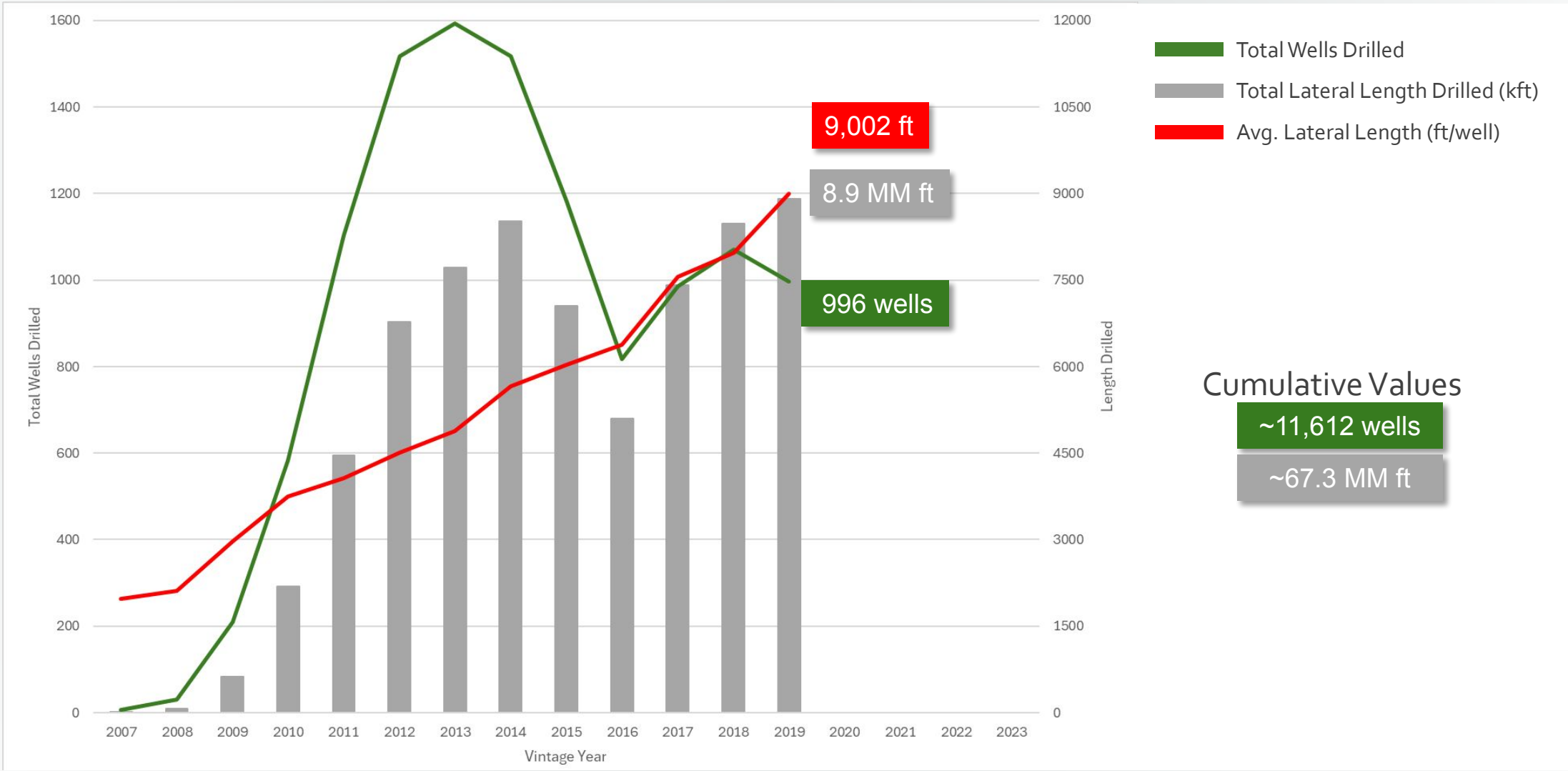


Cumulative Values

~8,560 wells

~42.5 MM ft

Marcellus Over the Years – *in 2019*

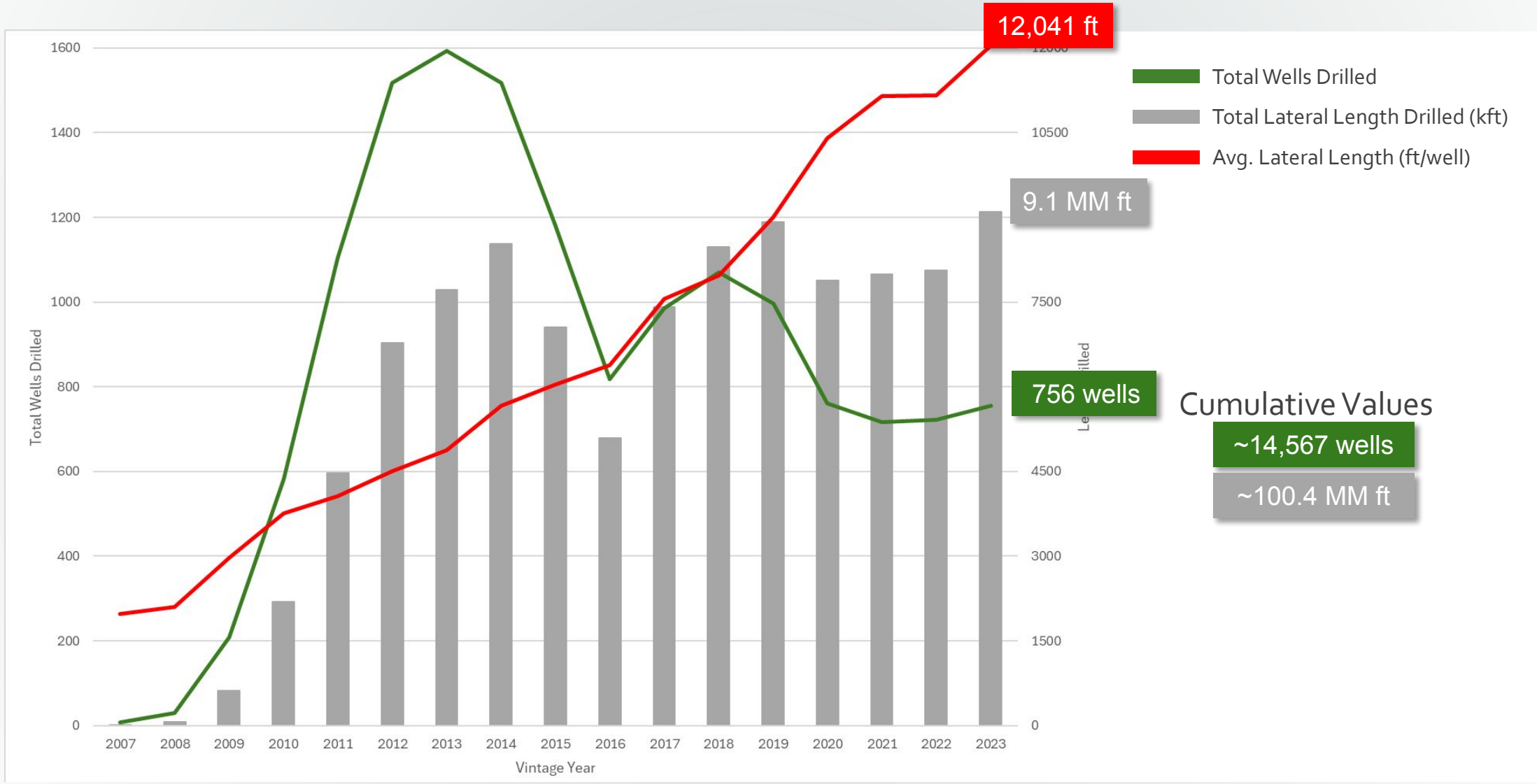


Cumulative Values

~11,612 wells

~67.3 MM ft

Marcellus Over the Years – *in 2023*



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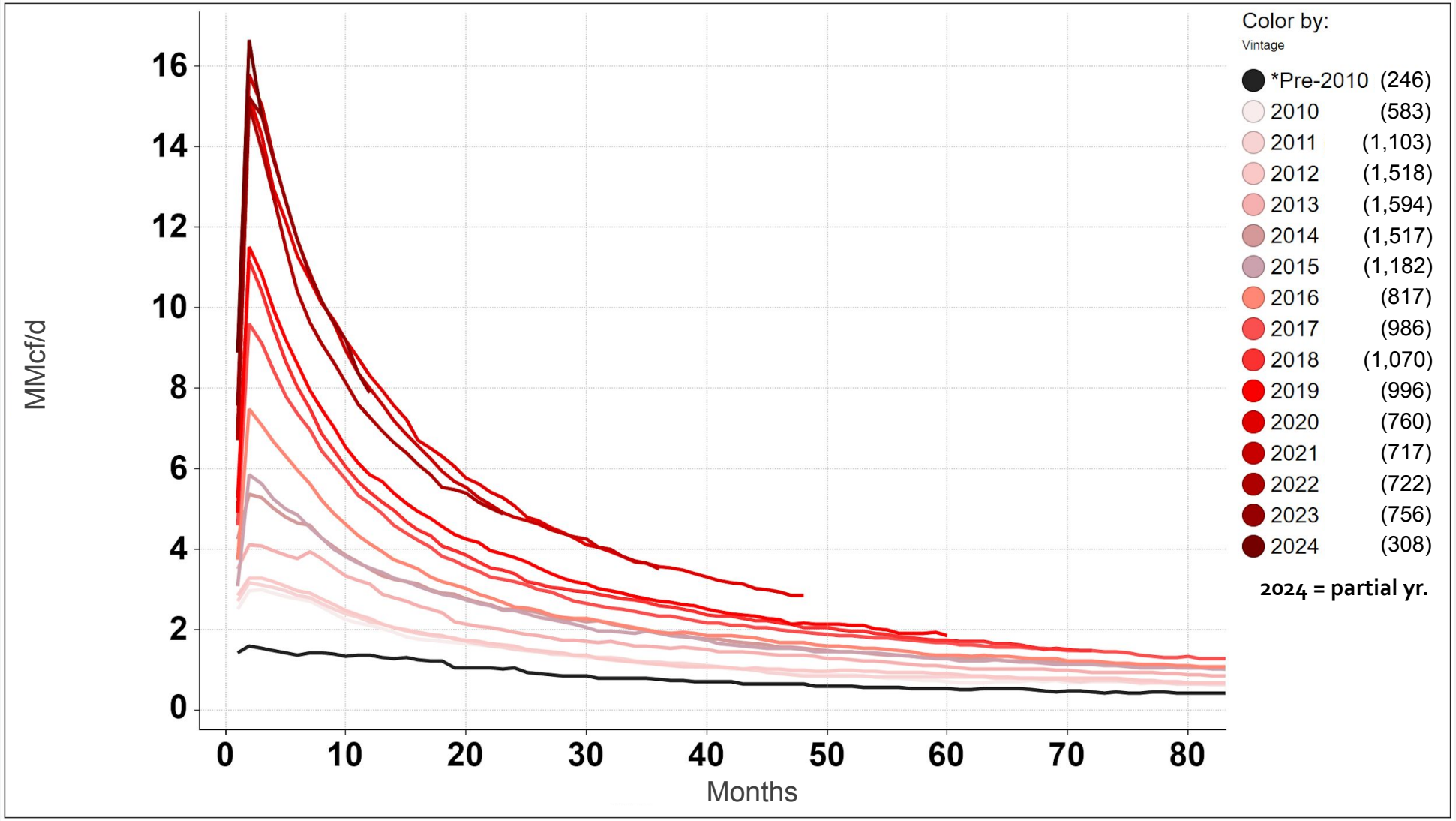
Average Well Performance by Vintage

Marcellus: All Wells (Wells: ~14,800 | Cum. Lateral: ~110 MM ft.)



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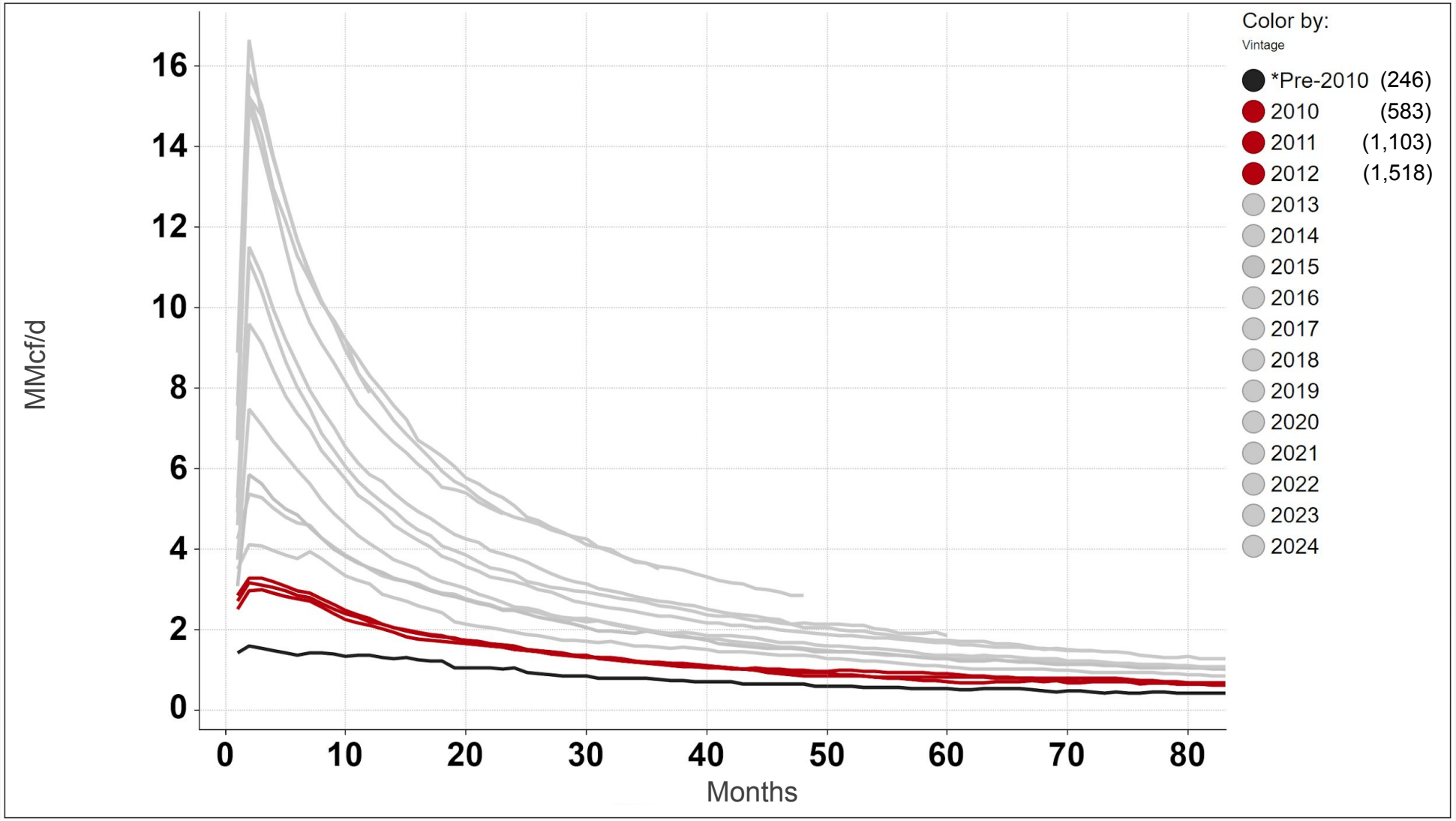
Average Well Performance by Vintage

Marcellus: 2010-2012 (Wells: ~3,200)



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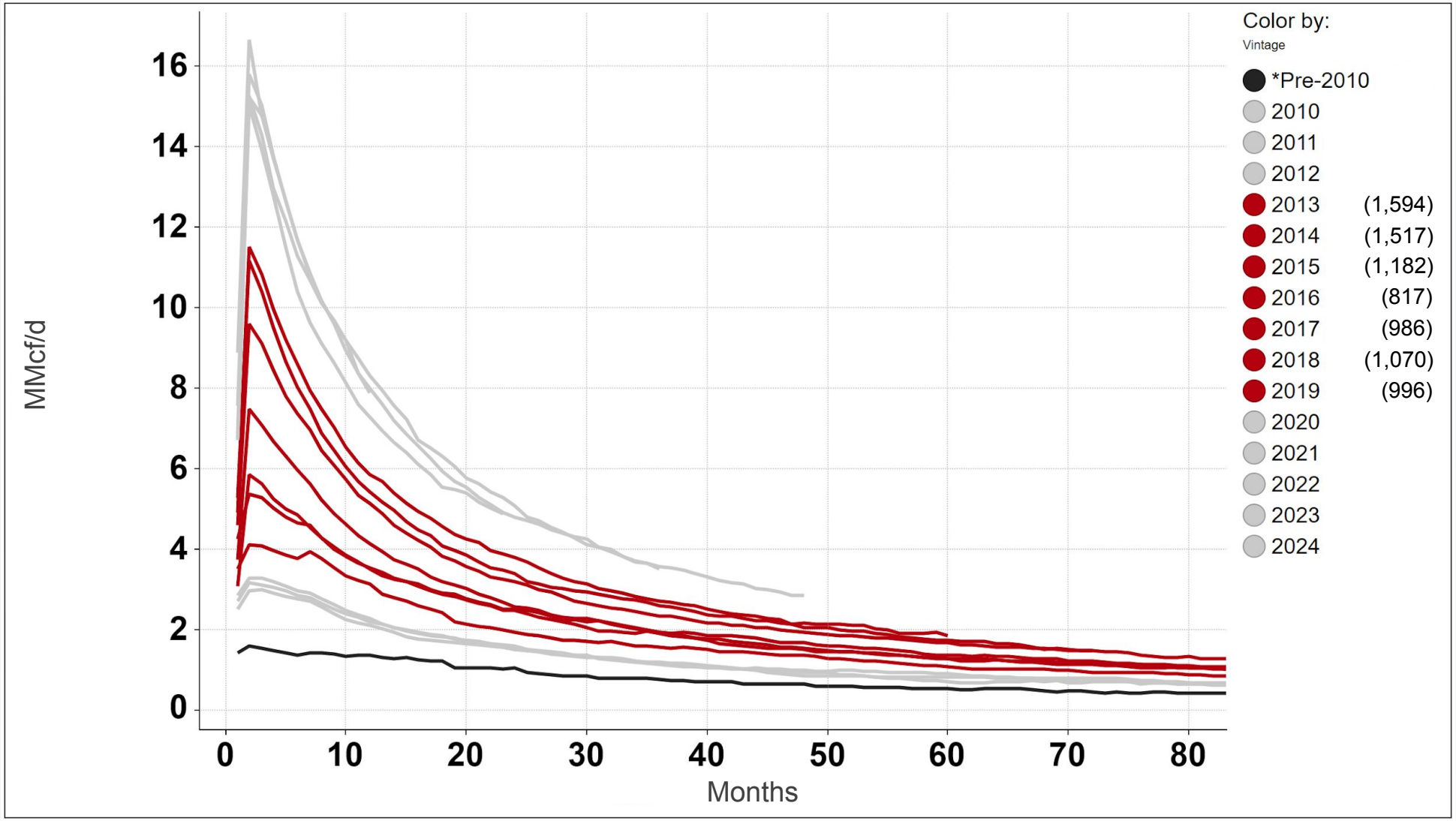
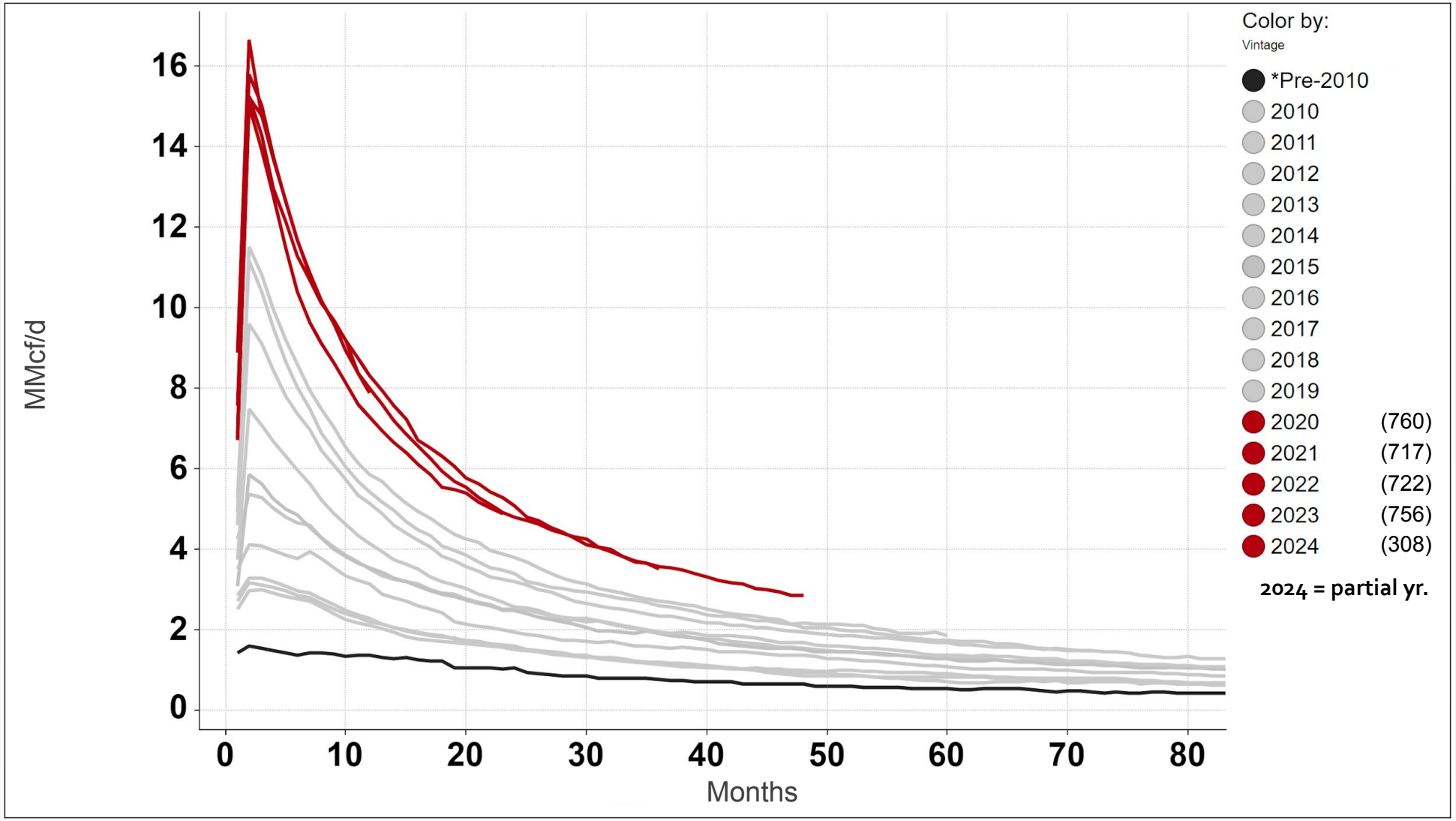
Average Well Performance by Vintage

Marcellus: 2013-2019 (Wells: ~8,200)

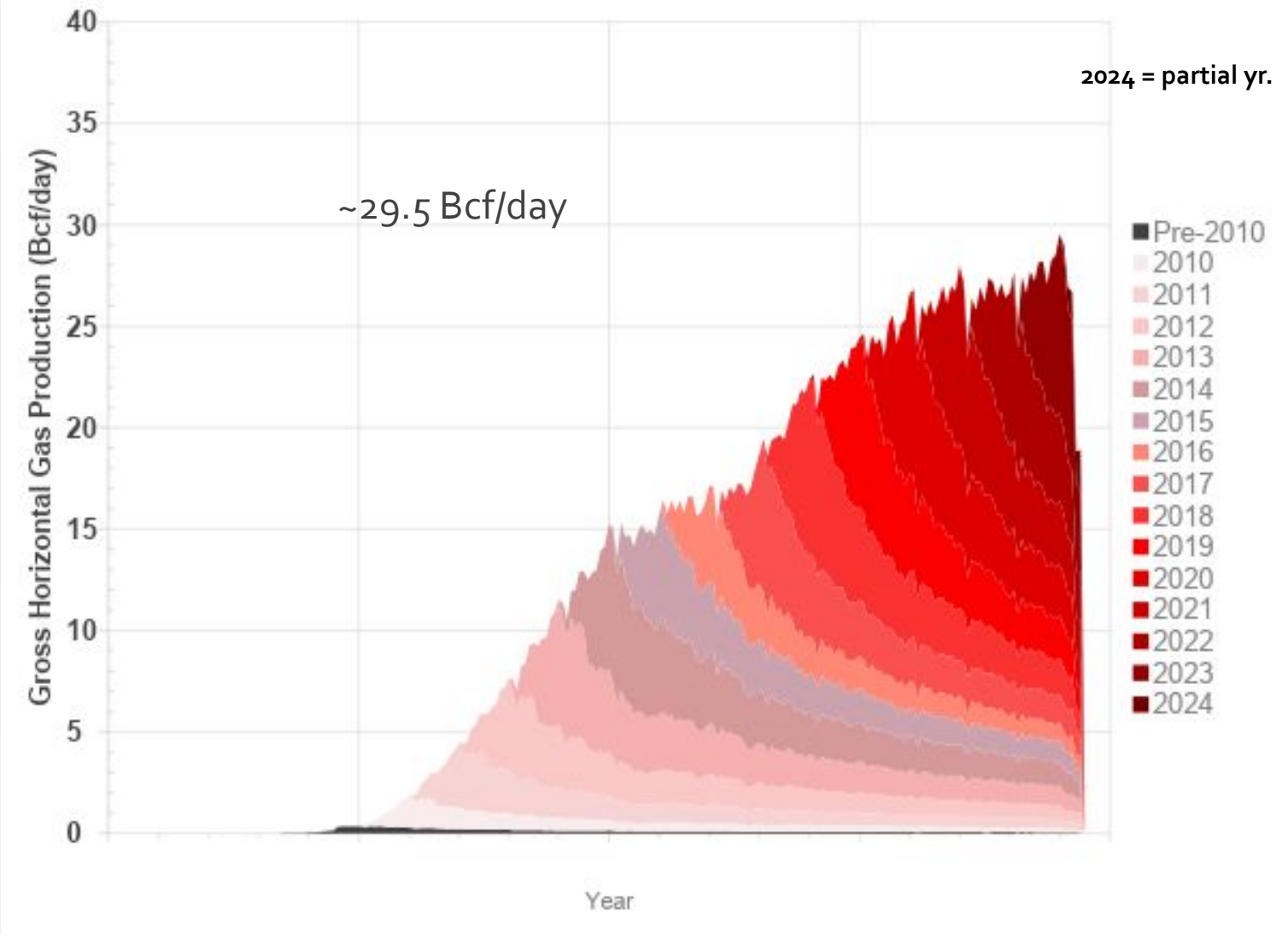


Average Well Performance by Vintage

Marcellus: 2020-2024 (Wells: ~3,300)

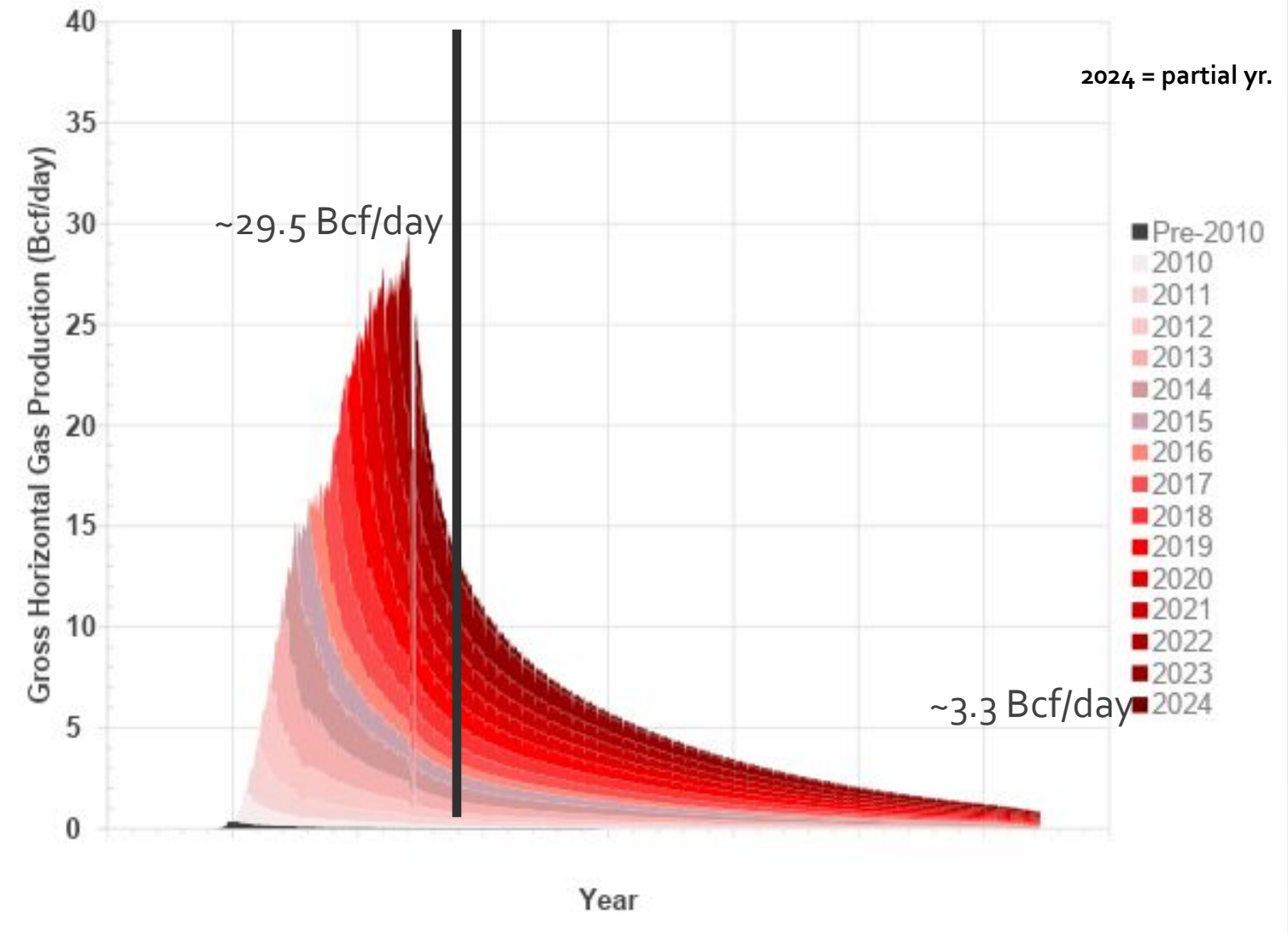


Marcellus Horizontal Gas Production
Historical

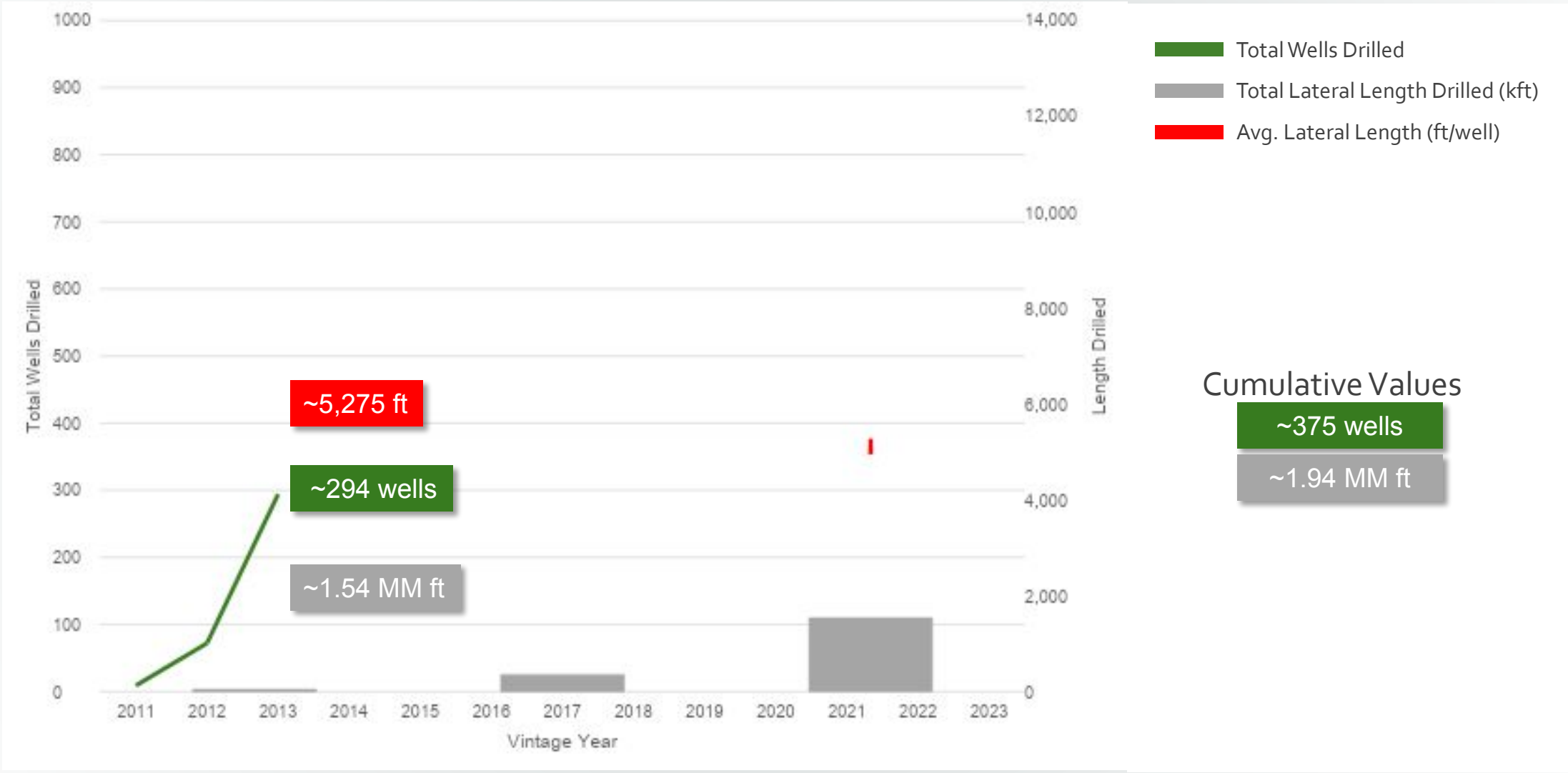


Marcellus Horizontal Gas Production

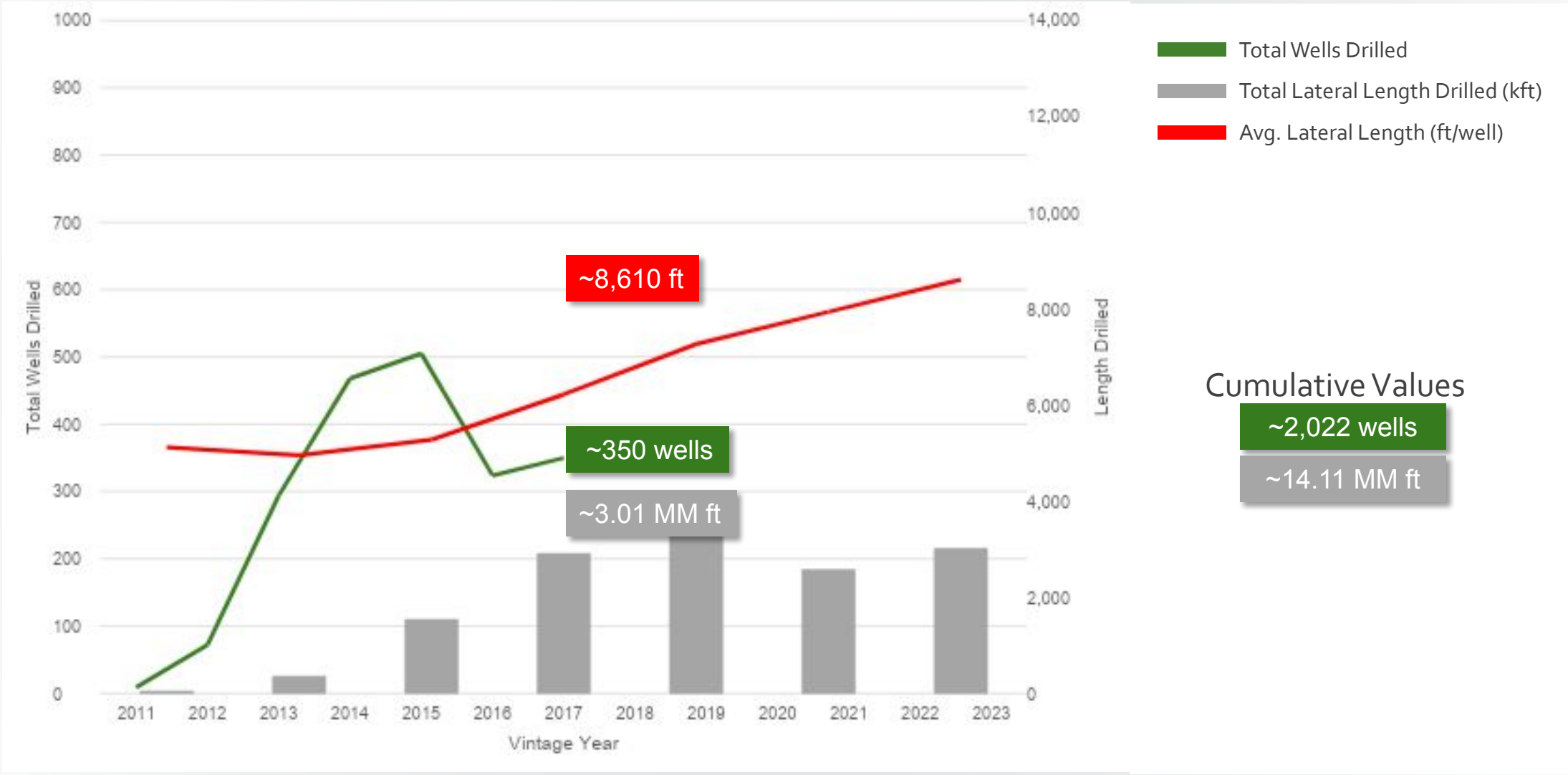
Historical and Projected – Existing Wells Only



Utica/Pt. Pleasant Over the Years – *in 2013*



Utica/Pt. Pleasant Over the Years – *in 2017*



Cumulative Values

~2,022 wells

~14.11 MM ft

Utica/Pt. Pleasant Over the Years – *in 2023*

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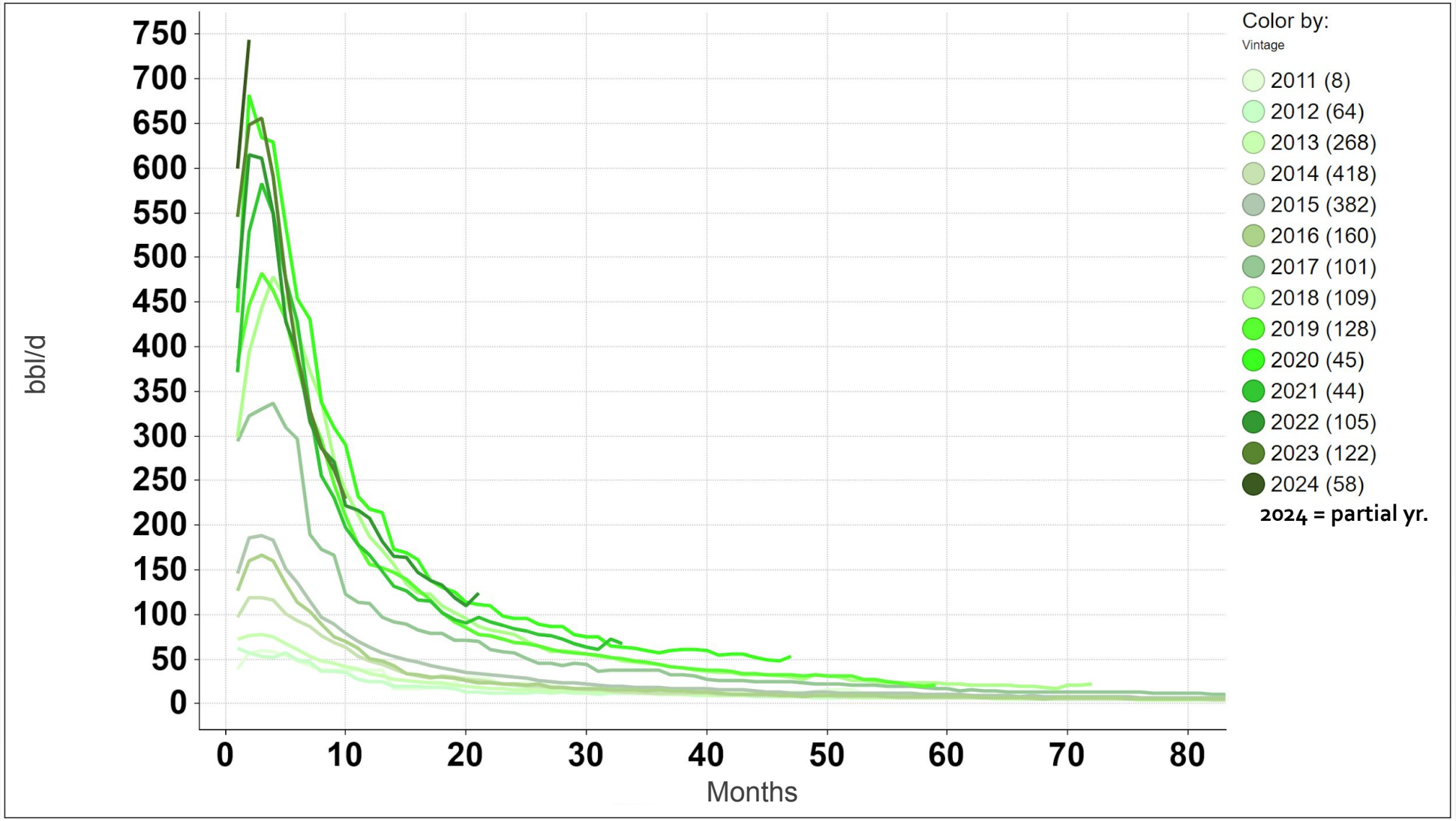
Average Well Performance by Vintage

ica Oil Production: All Wells (Wells: ~2,000 | Cum. Lateral: ~17.5 MM ft.)



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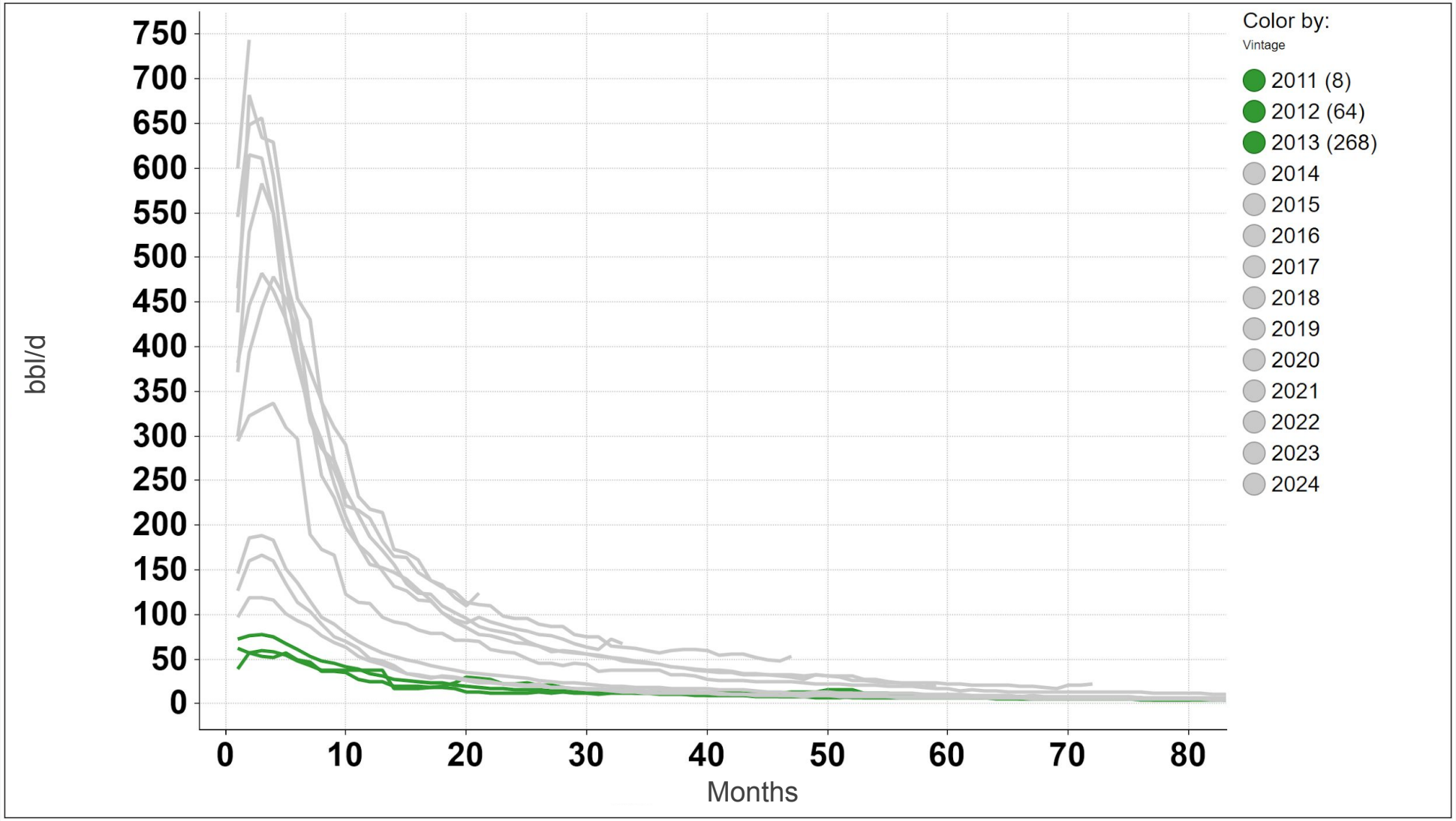
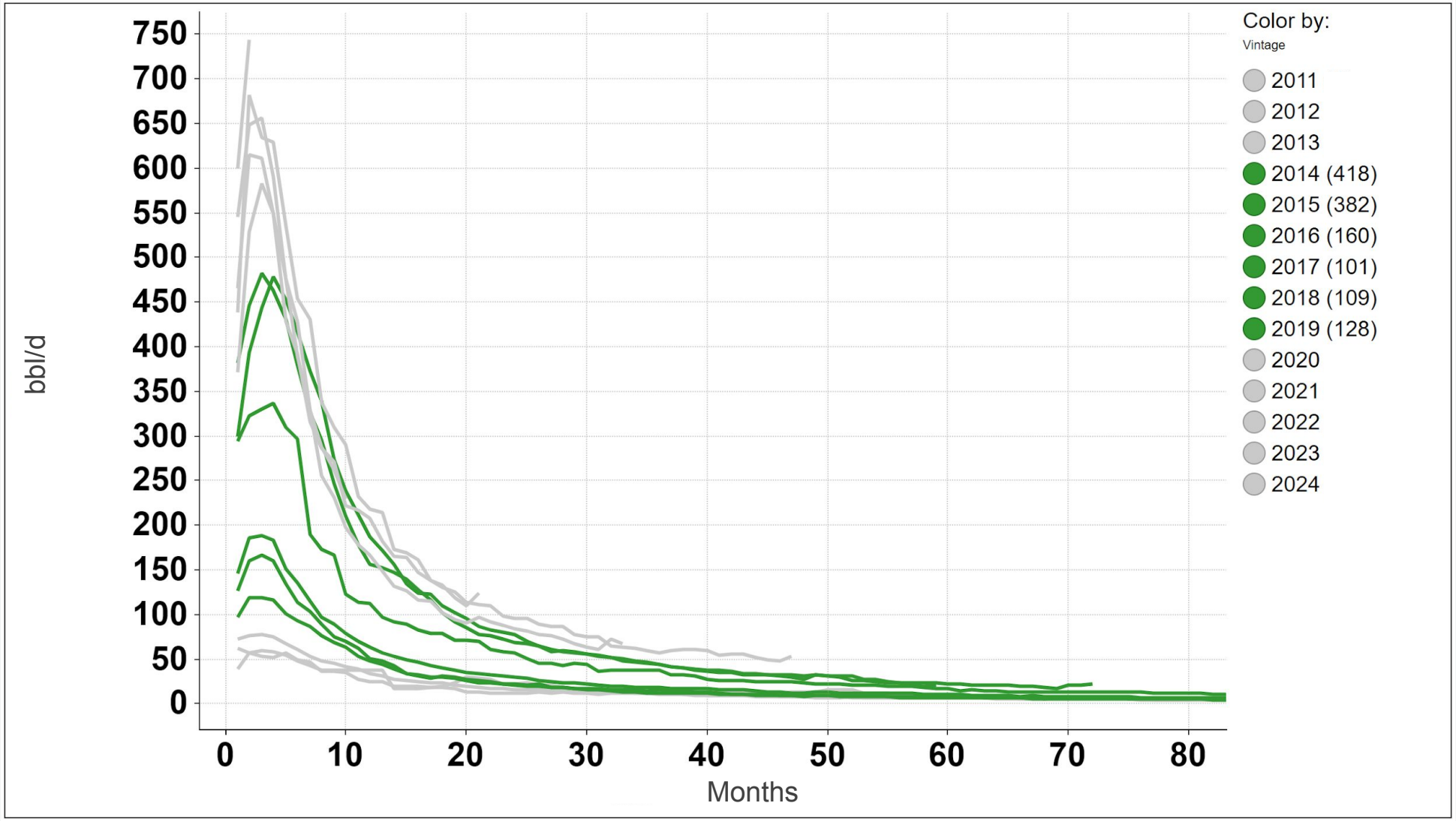
Average Well Performance by Vintage

Utica Oil: 2011-2013 (Wells: ~340)



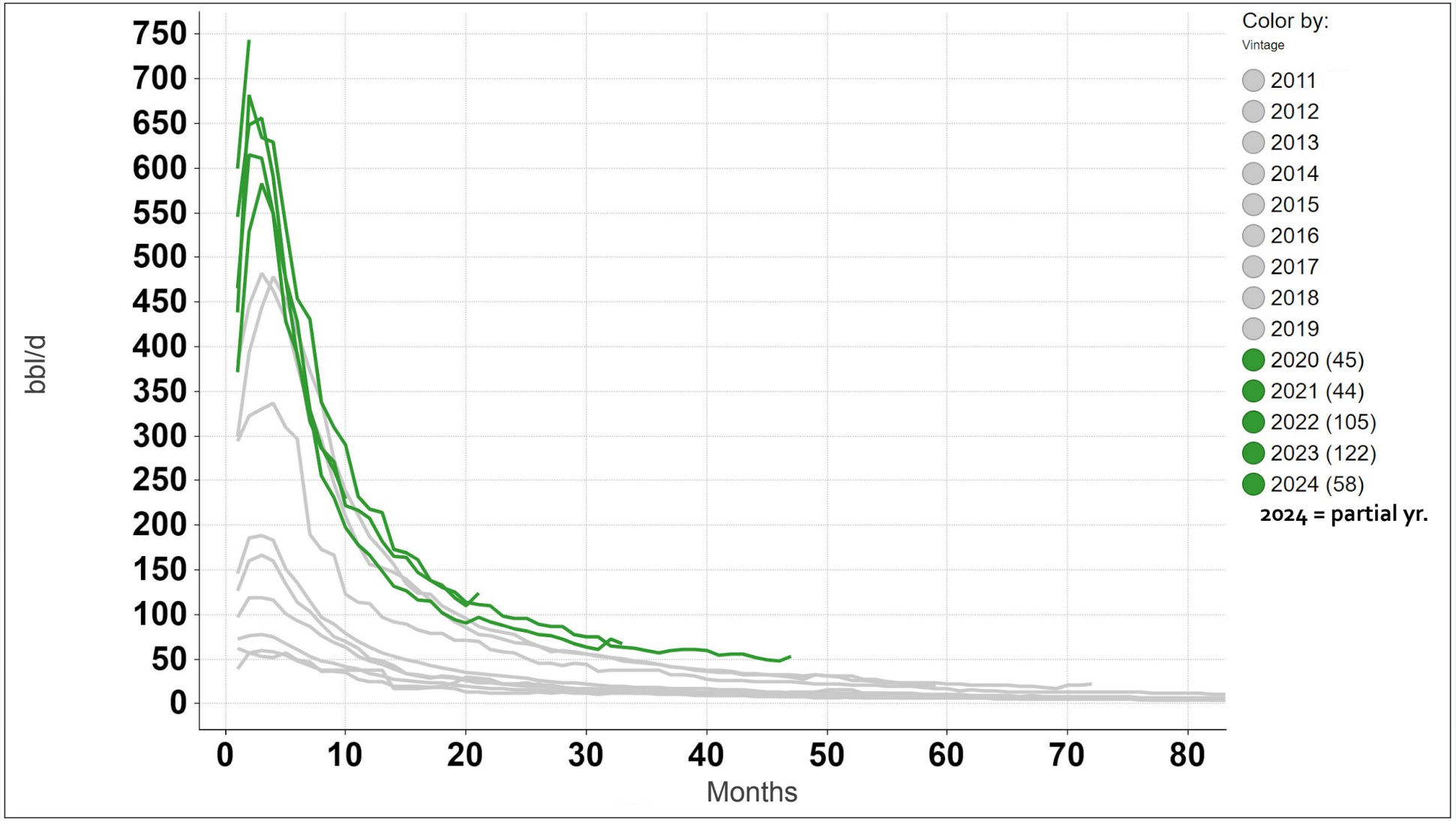
Average Well Performance by Vintage

Utica Oil: 2014-2019 (Wells: ~1,300)



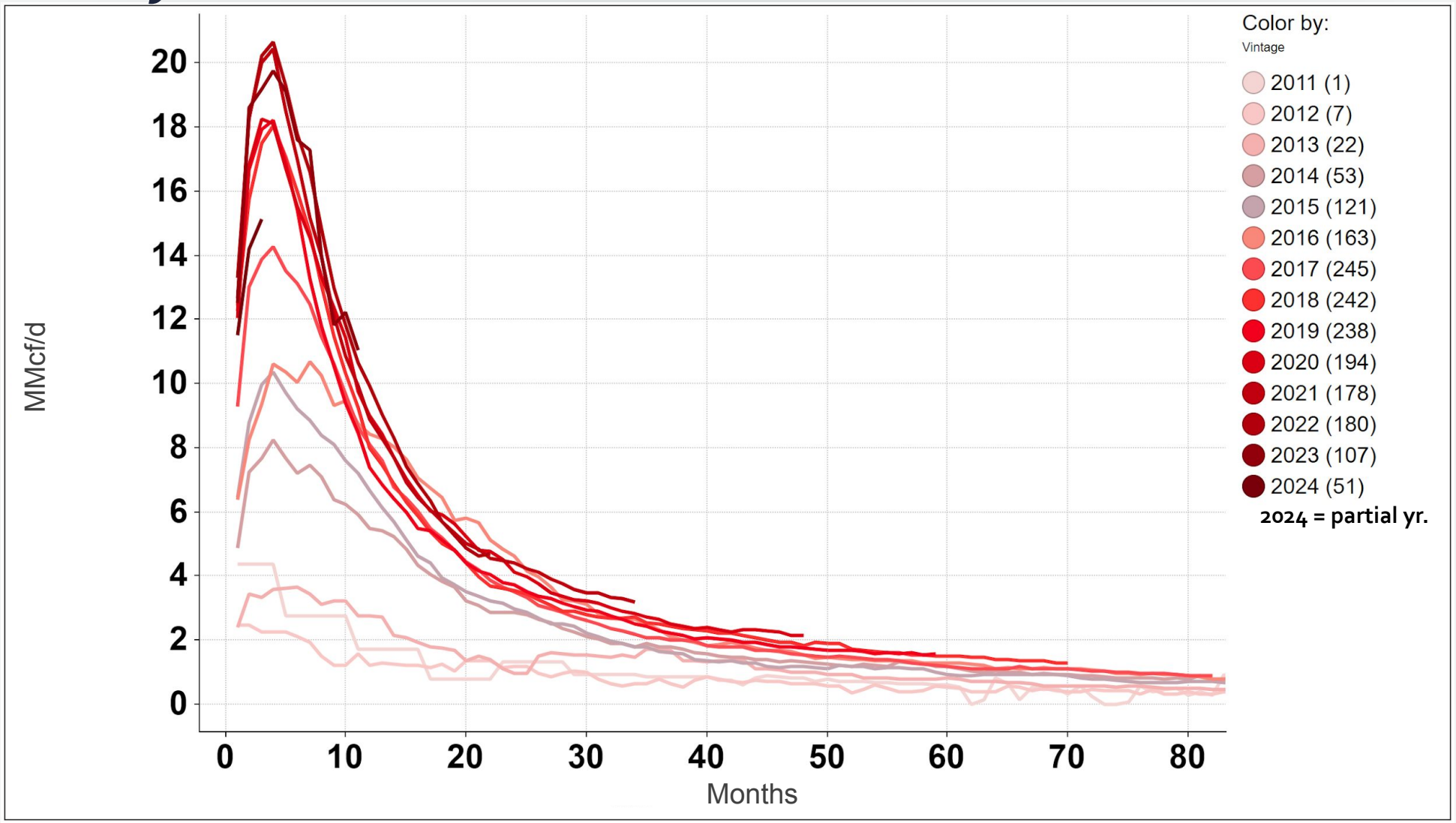
Average Well Performance by Vintage

Utica Oil: 2020-2024 (Wells: ~370)



Average Well Performance by Vintage

Utica Dry Gas: All Wells (Wells: ~1,800 | Cum. Lateral: ~18.6 MM ft.)



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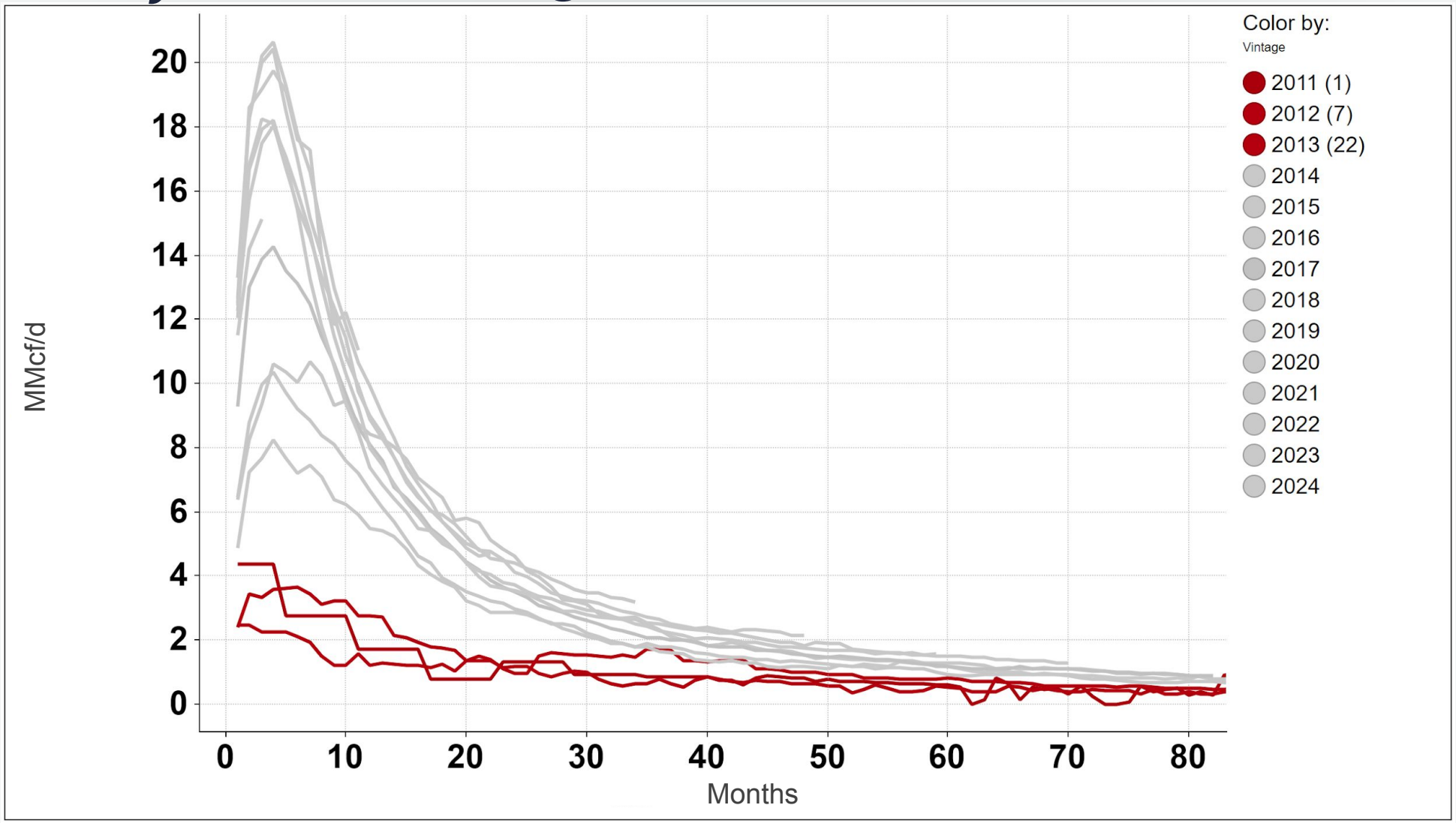
Average Well Performance by Vintage

Utica Dry Gas: 2011-2013 (Wells: ~30)



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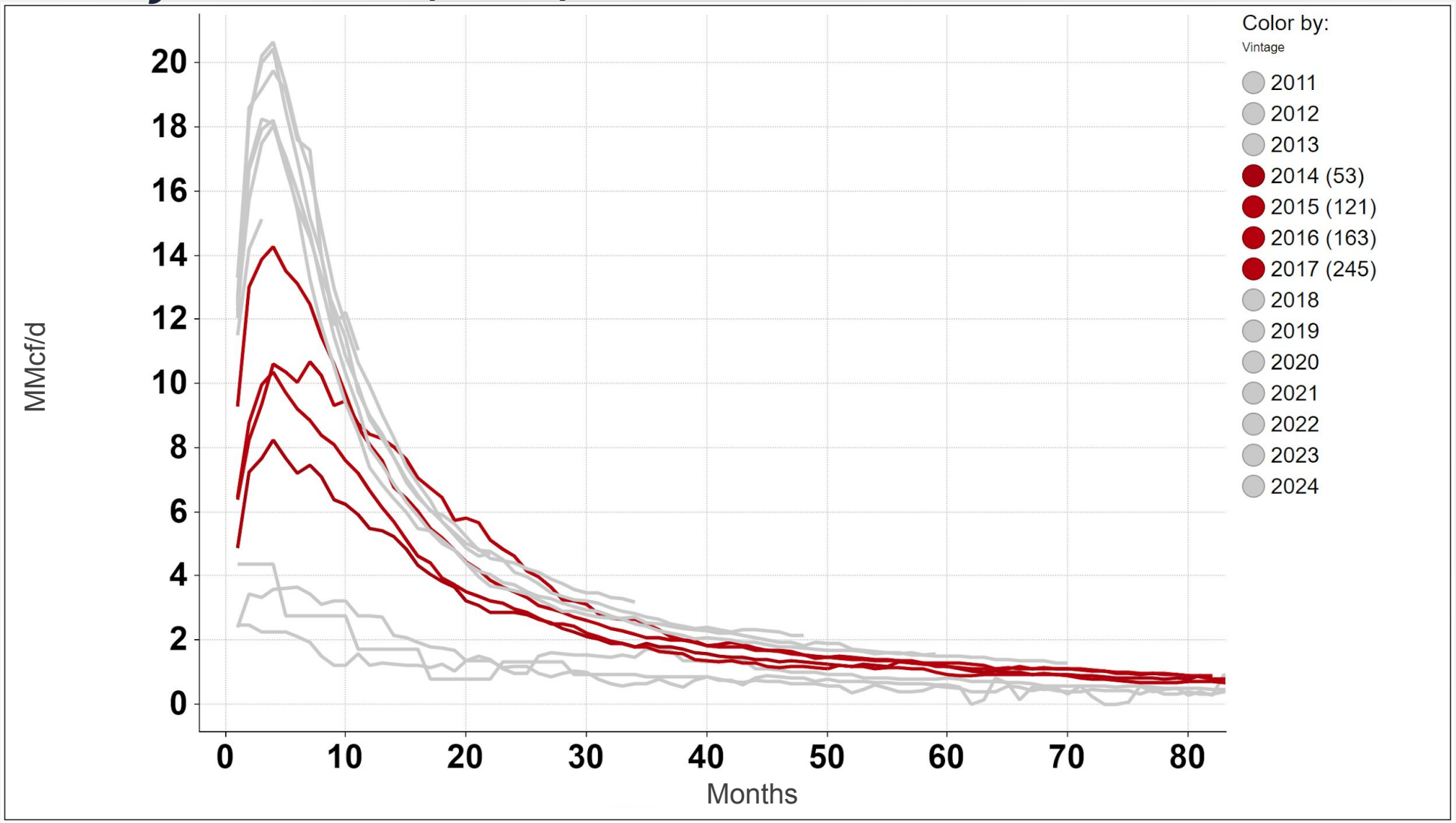
Average Well Performance by Vintage

Utica Dry Gas: 2014-2017 (Wells: ~582)



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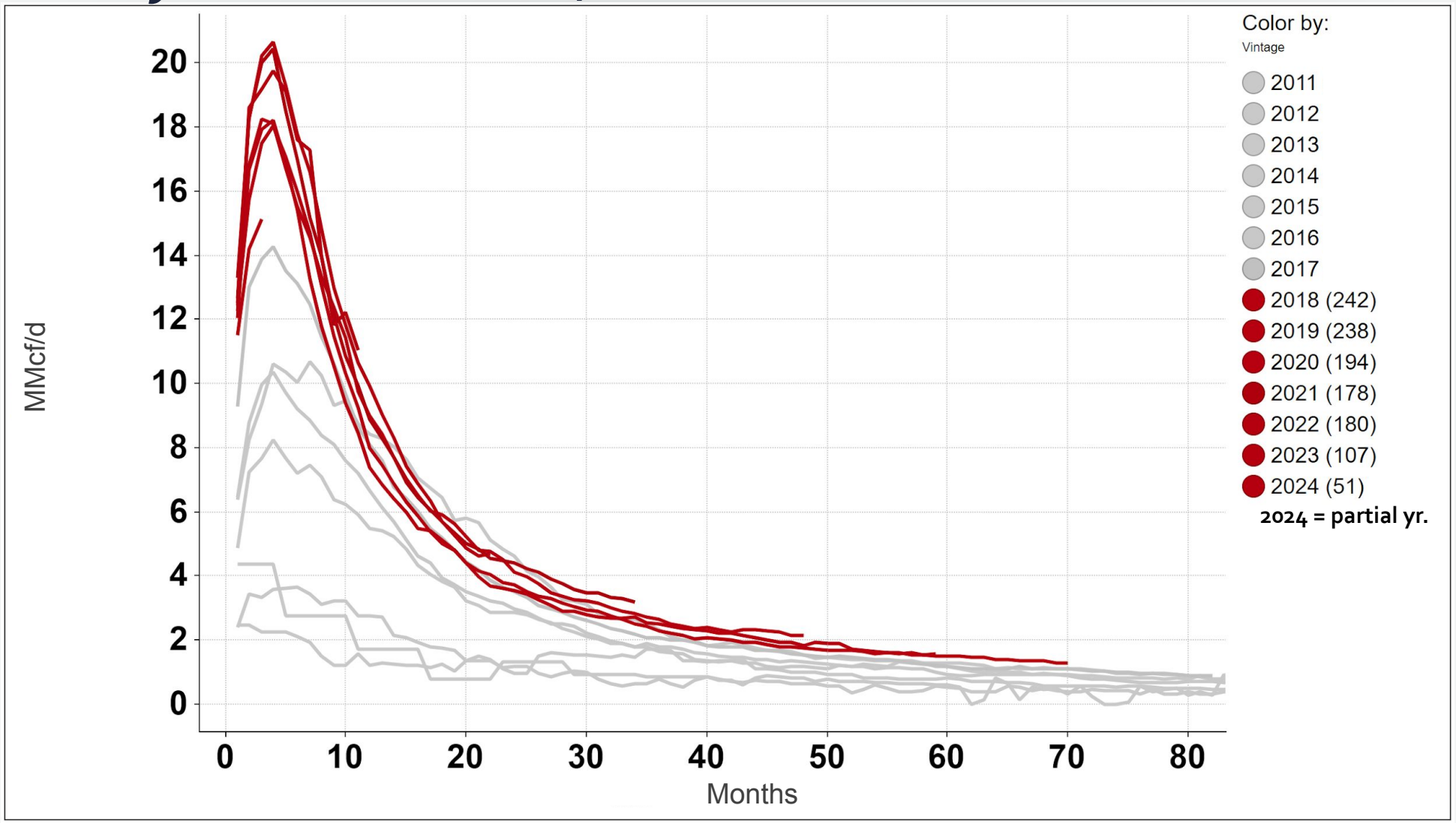
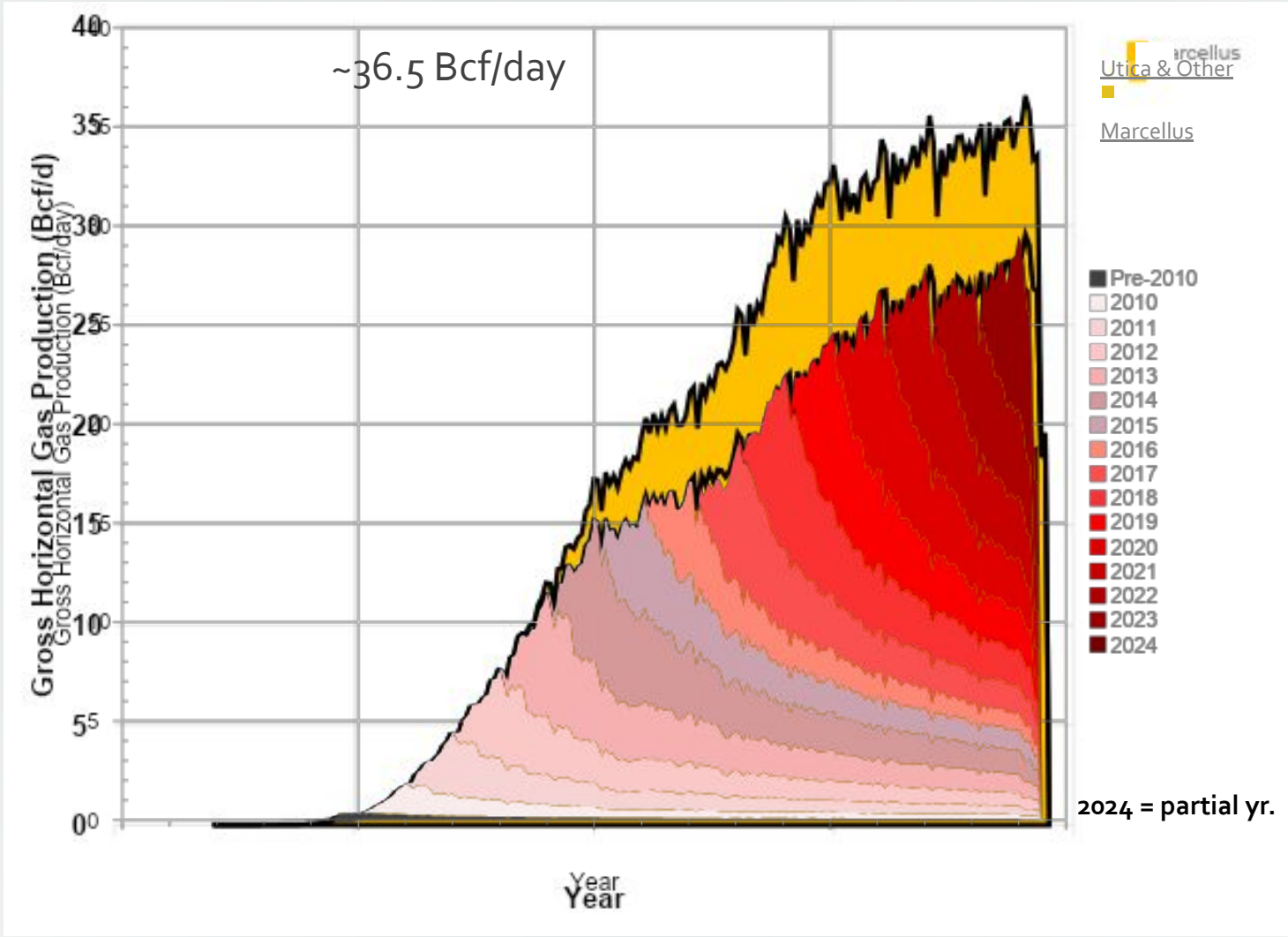
Average Well Performance by Vintage

Utica Dry Gas: 2018-2024 (Wells: ~1,190)



Marcellus, Utica & Other Horizontal Gas Production

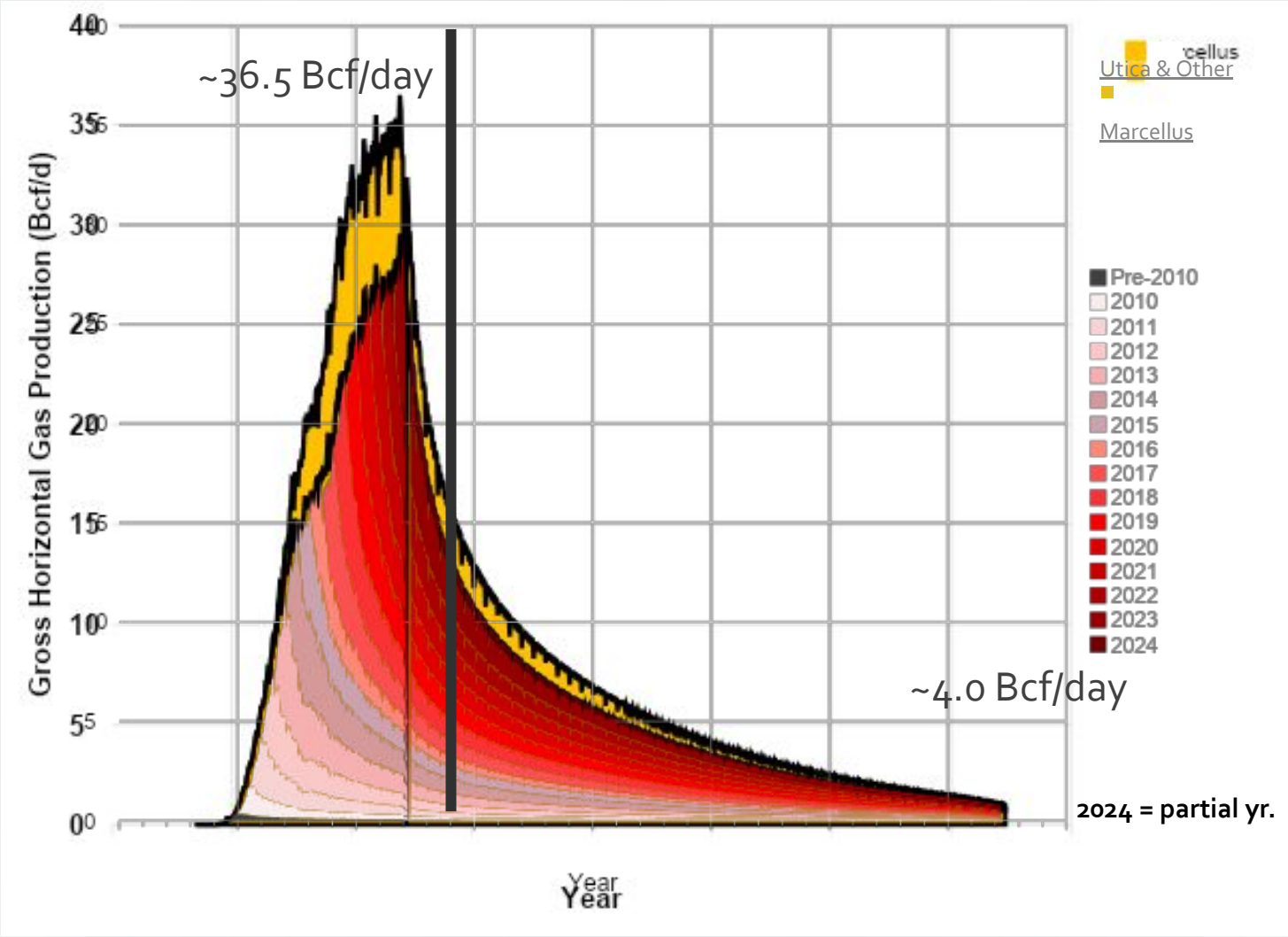
Historical



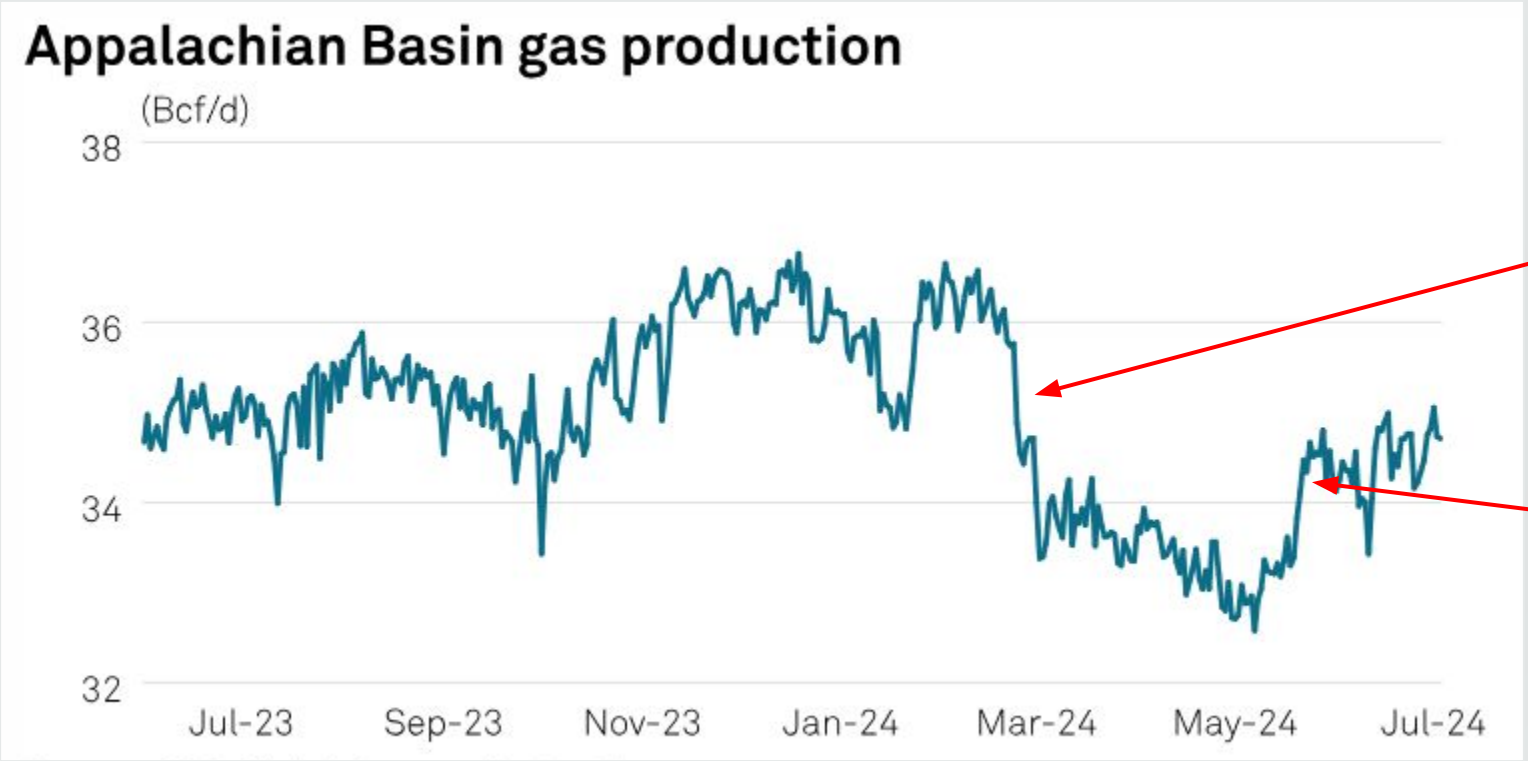
2024 = partial yr.

Marcellus, Utica & Other Horizontal Gas Production

Historical and Projected – Existing Wells Only



Recent Production Trend

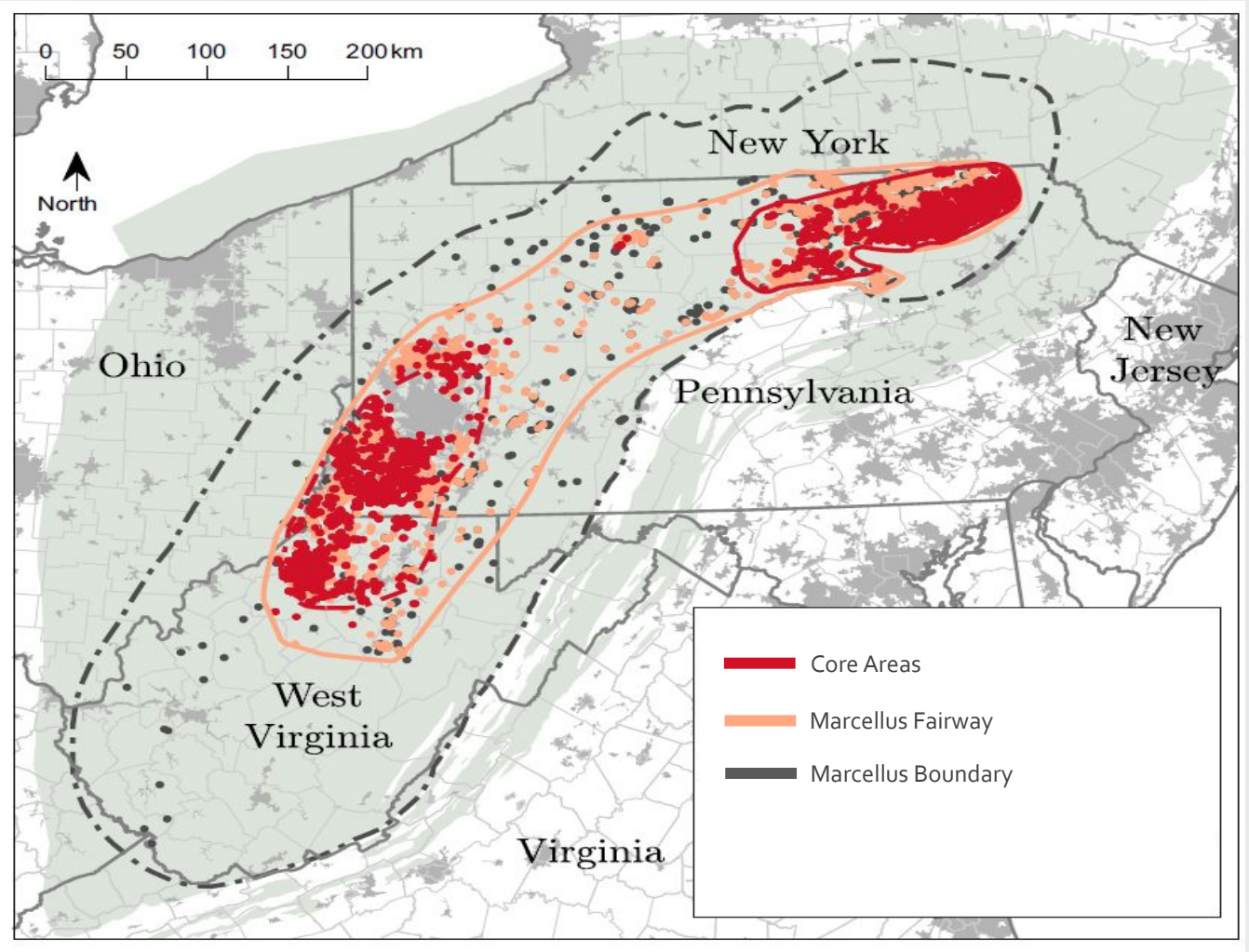


Cuts in response to low gas prices

Resumed production by operators and higher utilization on MVP

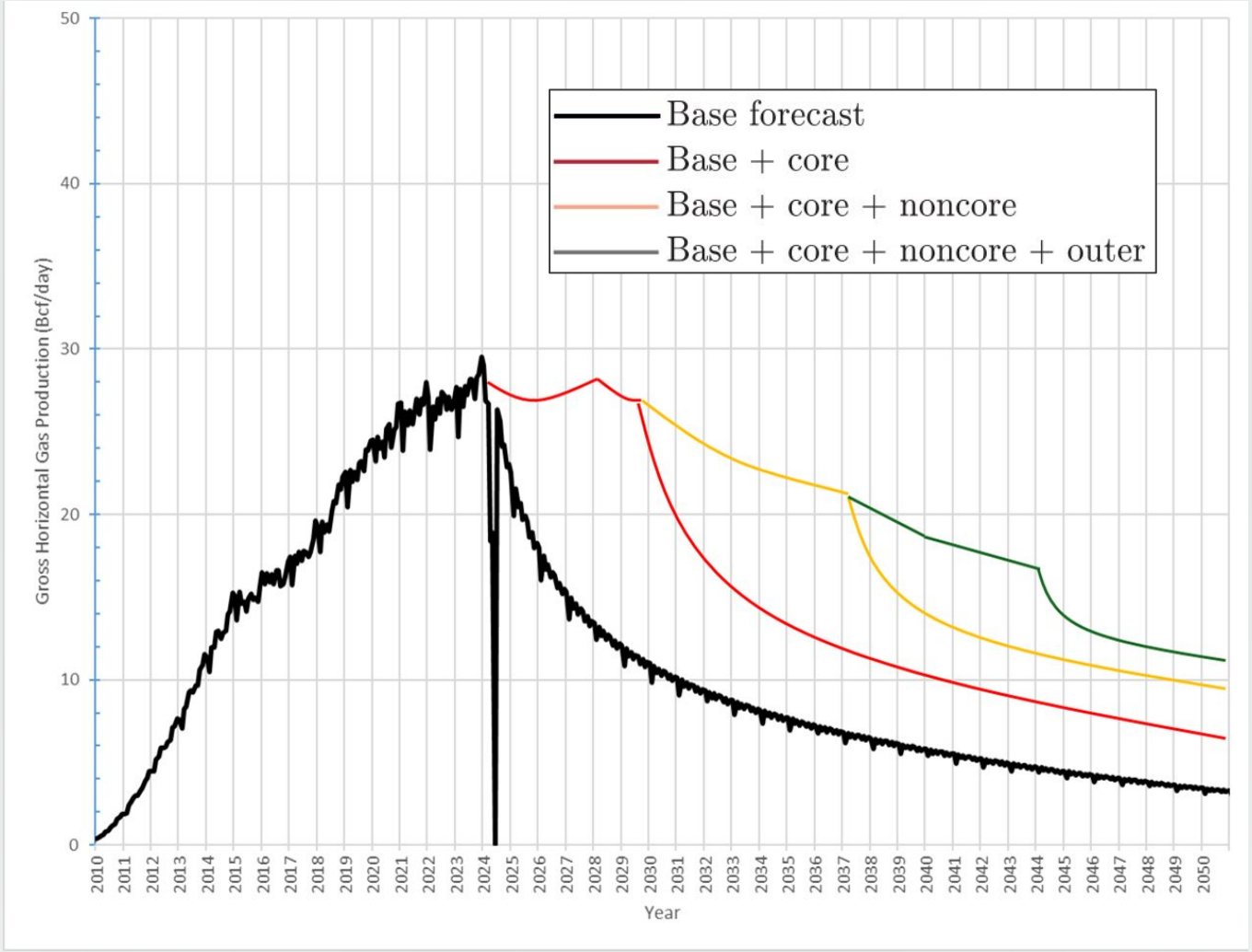
Source: S&P Global Commodity Insights

Marcellus Development Outlook



https://archives.datapages.com/data/bulletns/2024/01jan/BLTN21078/bltn21078.html?doi=10.1306%2F10242221078

Marcellus Development Outlook



LNG Demand

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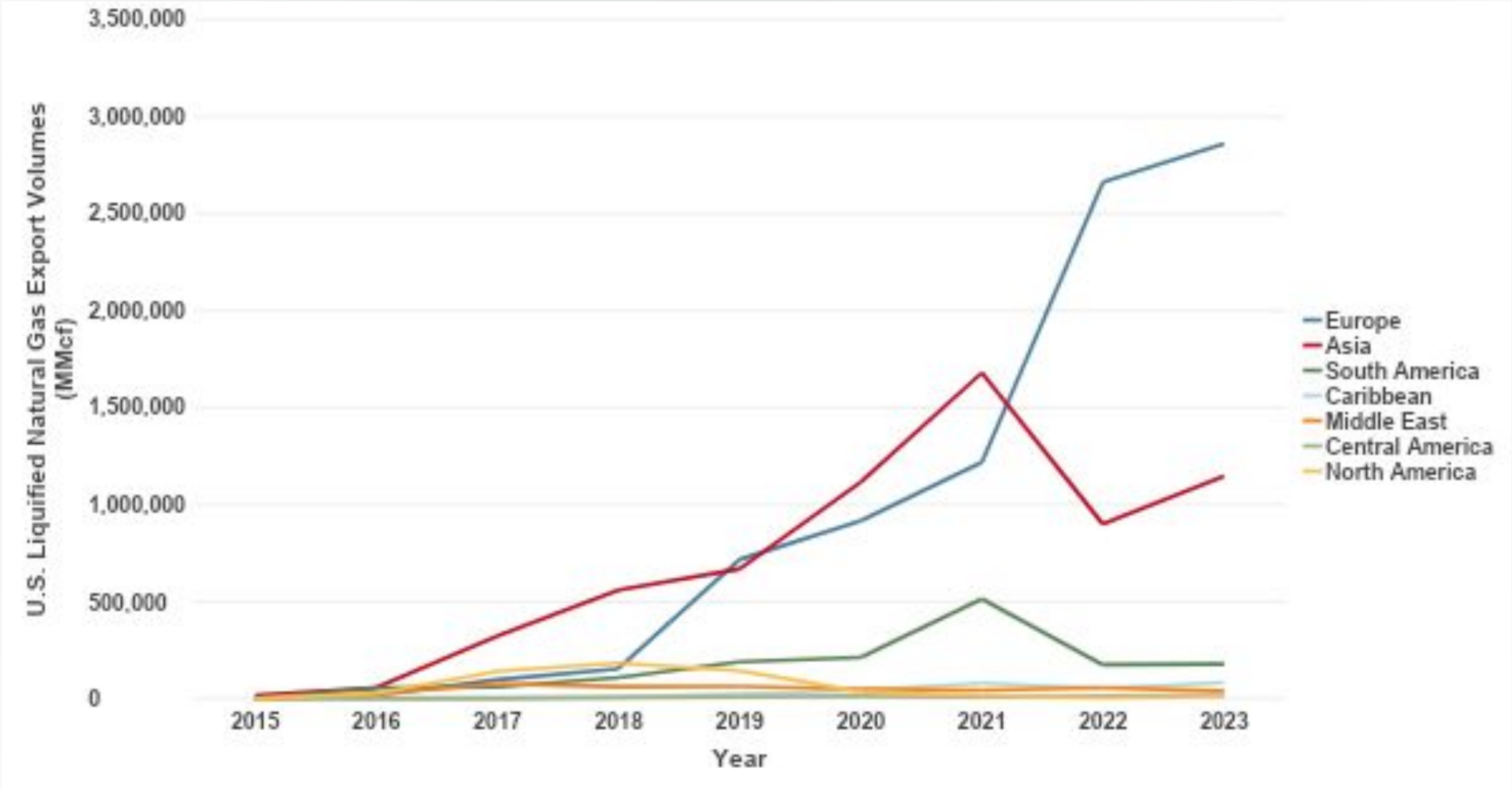
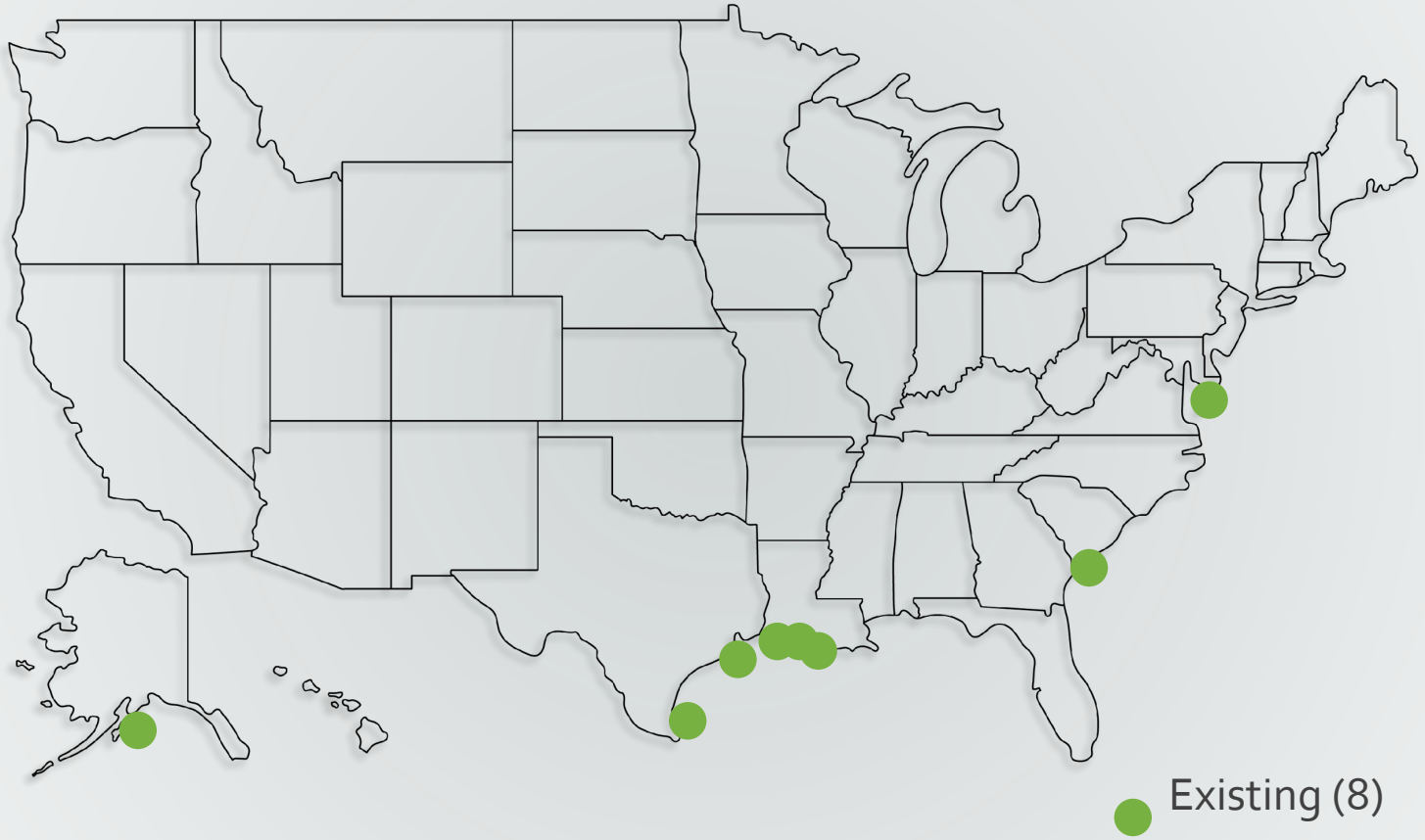
U.S. LNG Annual Exports – Where are they going?



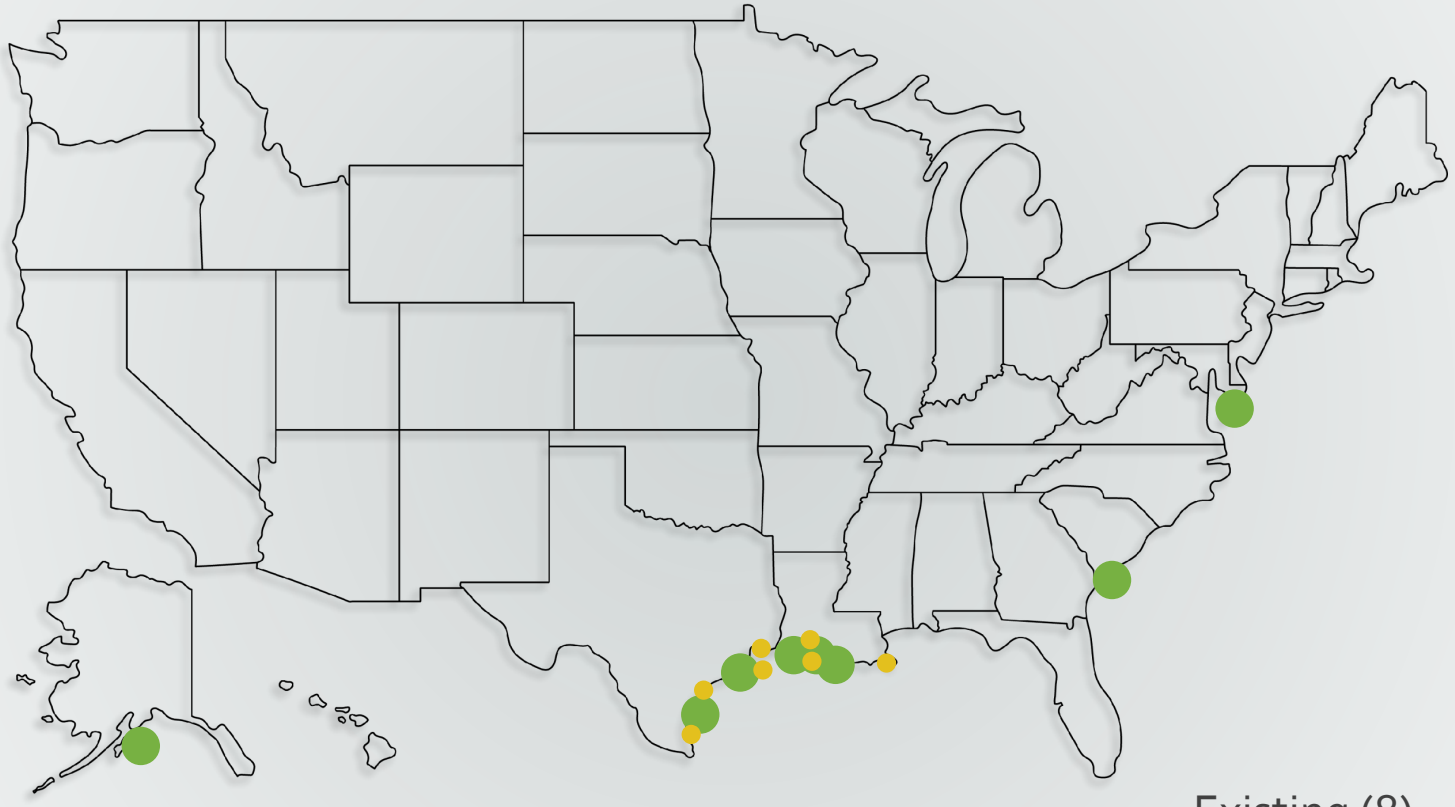
U.S. LNG Export Terminals
Current Operational



Data sourced from FERC as of October 22, 2024 (https://www.ferc.gov/media/us-lng-export-terminals-existing-approved-not-yet-built-and-proposed)
*Locations are approximate

U.S. LNG Export Terminals

Under Construction



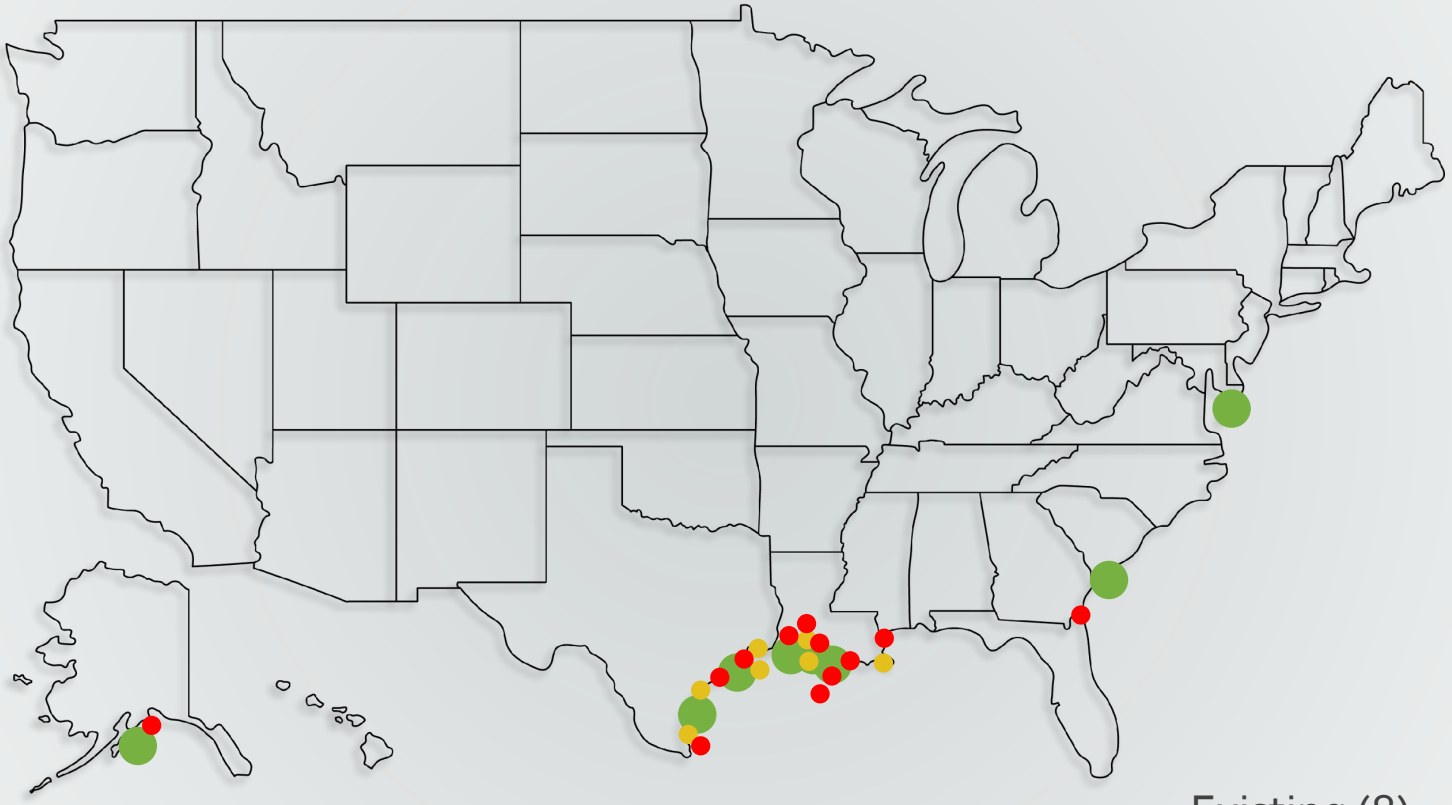
Existing (8)

Approved, Under Construction (7)

Data sourced from FERC as of October 22, 2024 (https://www.ferc.gov/media/us-lng-export-terminals-existing-approved-not-yet-built-and-proposed)

*Locations are approximate

U.S. LNG Export Terminals
Not Under Construction



- Existing (8)
- Approved, Under Construction (7)
- Approved, Not Under Construction (12)

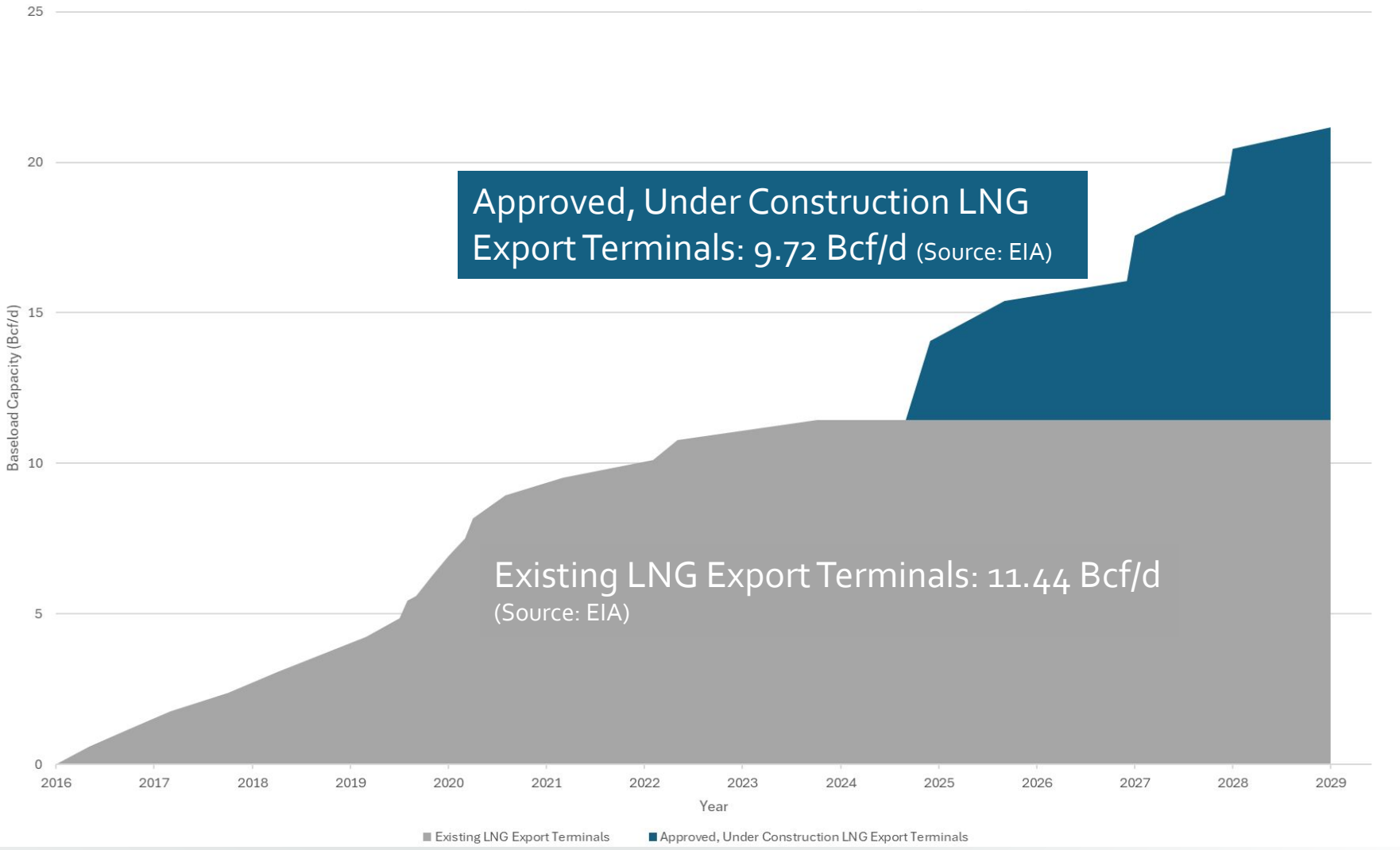
Data sourced from FERC as of October 22, 2024 (https://www.ferc.gov/media/us-lng-export-terminals-existing-approved-not-yet-built-and-proposed)

*Locations are approximate

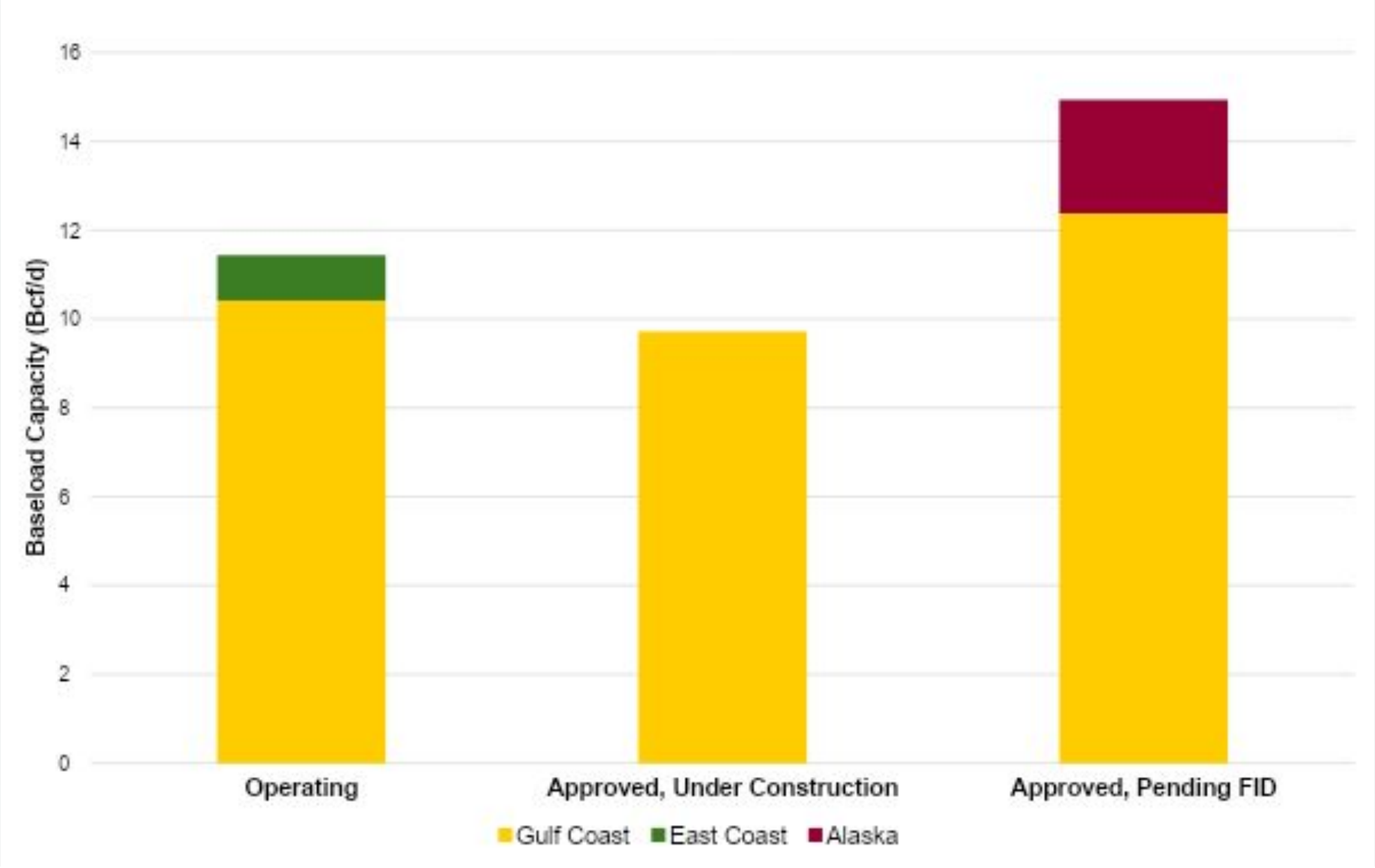
U.S. LNG Export Capacity (2016-2029)

An additional 14.93 Bcf/d of potential exports not shown - pending Final Investment Decisions

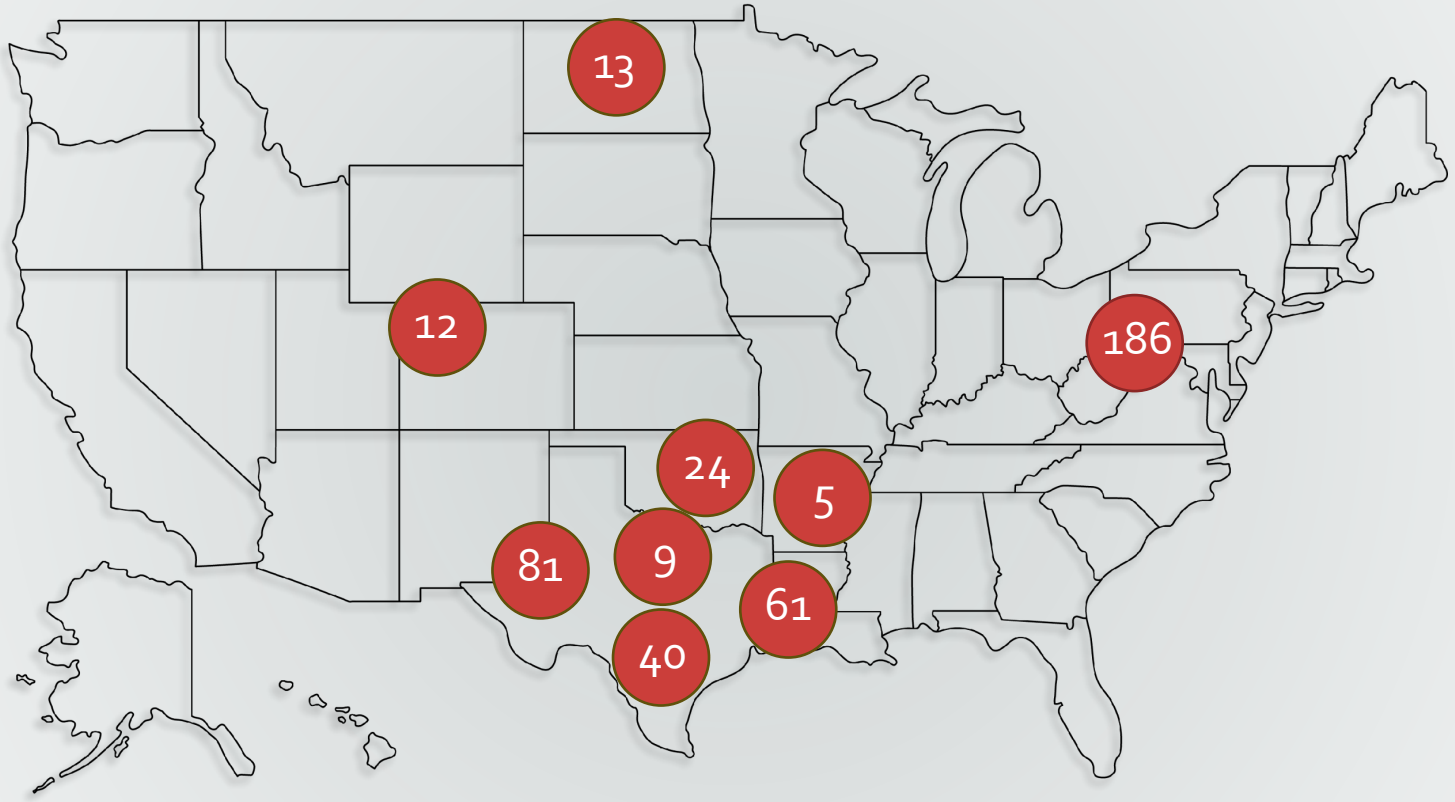
(Source: EIA)



U.S. Liquified Natural Gas Export Capacity



U.S. Proved Natural Gas Reserves (Tcf)



Source: EIA as of April 29, 2024
(https://www.eia.gov/naturalgas/crudeoilreserves/pdf/Table_4.pdf)
**Locations and values are approximate*

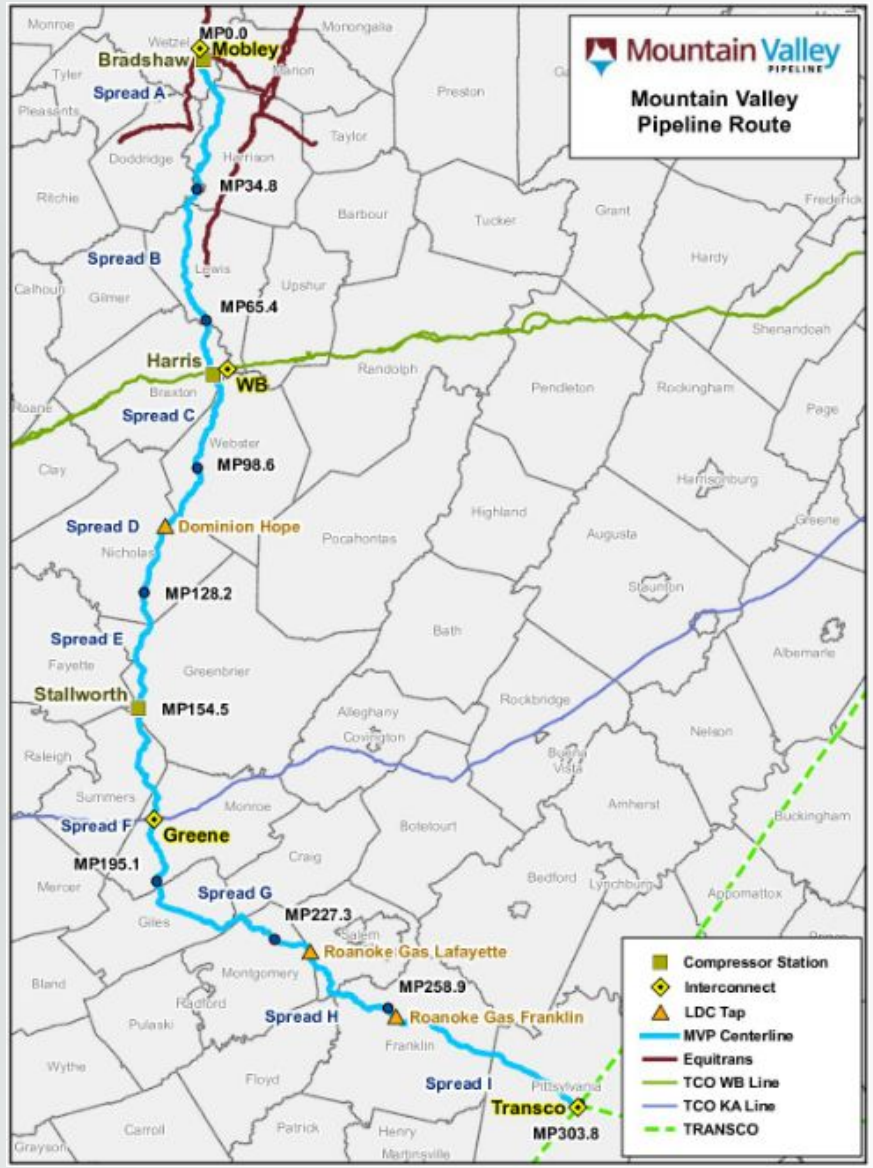
Midstream Trends

Midstream Update and Trends in Appalachia

- New pipeline projects and expansions should continue to help increase export capacity from the region
- The industry needs more projects to move gas to the Southeast, which is experiencing the largest regional demand growth for natural gas
- Infrastructure upgrades and additions in the basin facilitate in-basin use of gas, such as natural gas fired powerplants
- Some operators are vertically integrating by acquiring midstream to hedge against gathering and transportation costs in times of low-price environment

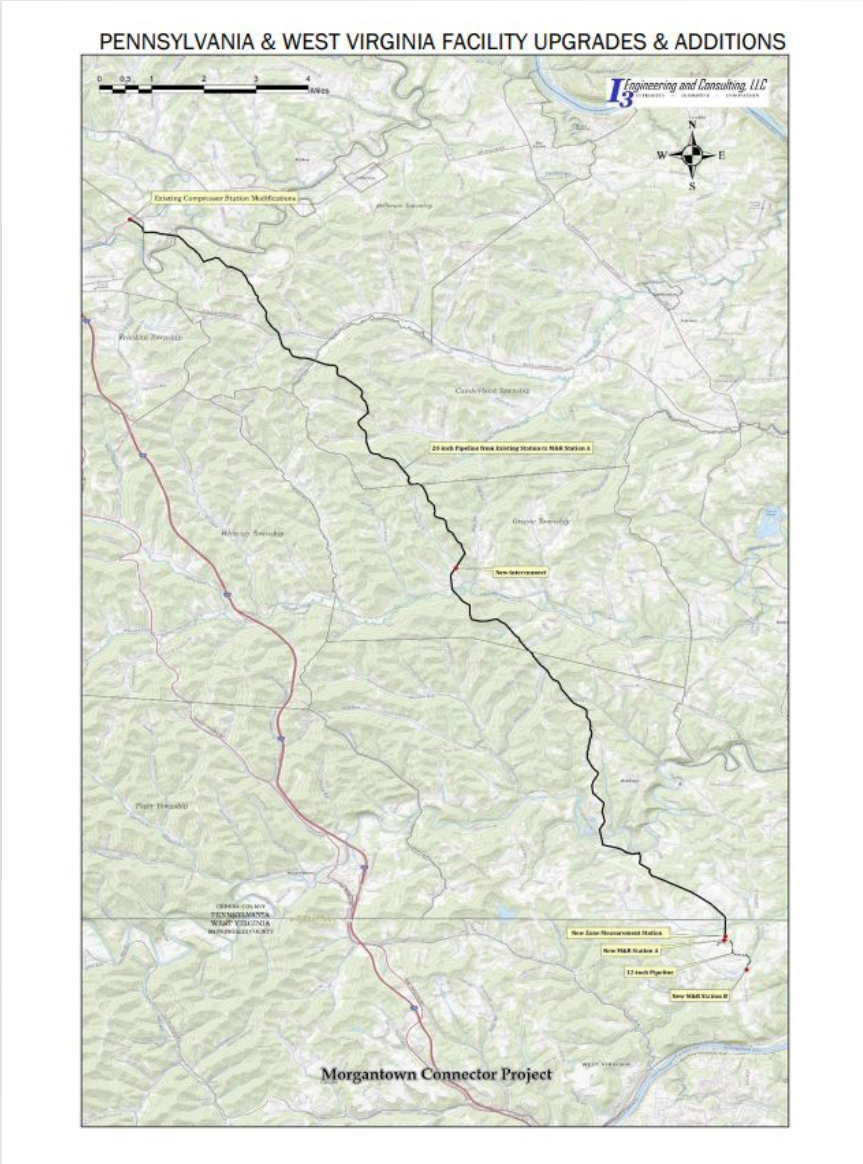
Mountain Valley Pipeline (MVP)

- MVP extends from Wetzel County, West Virginia for approximately 303 miles to Pittsylvania County, Virginia and will help meet growing demand in southwestern Virginia
- MVP can deliver up to 2 Bcf/day primarily from the Marcellus and Utica Shales, to the mid- and South Atlantic regions of the U.S.
- MVP began commercial operations on June 14, 2024.
- MVP alone doesn't solve the over-supply issue in the northeast; however, it is another expansion of the system to provide additional outlets for Marcellus and Utica gas.



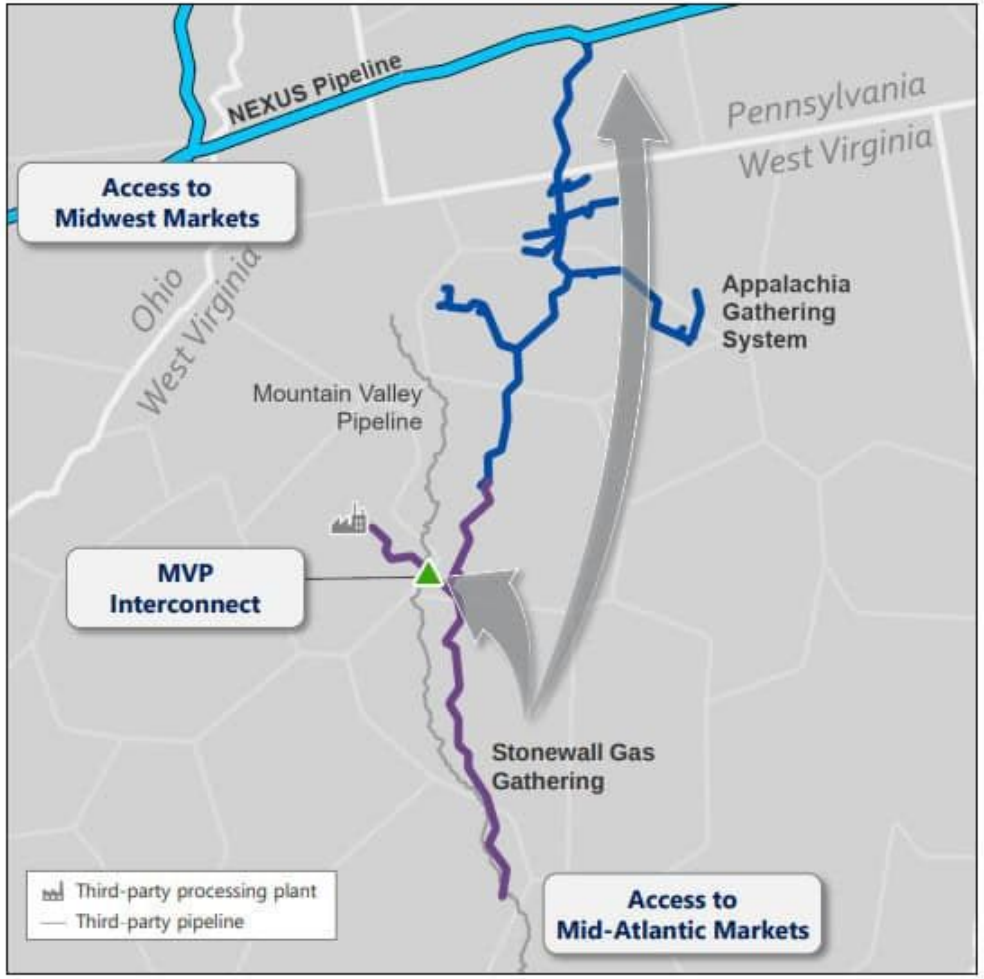
Morgantown Connector Project

- 20 miles of 20" pipe from Greene County, PA to Monongalia County, WV
- Will deliver gas to 1,200MW combined cycle power plant in Monongalia County
- Will deliver gas to a local distribution company that will deliver gas to heat homes and power local businesses



MVP Interconnect

Expansion increases interconnect capacity and access to growing Mid-Atlantic market



New agreement expanding Mountain Valley Pipeline (MVP) interconnect

- Increases outlet capacity on Stonewall by 100 MMcf/d
  - Expected to be in-service 1H 2026

Strong commercial structure with new customer

- Anchored by a long-term contract with a large privately held producer
- Demand-based contract protects project economics

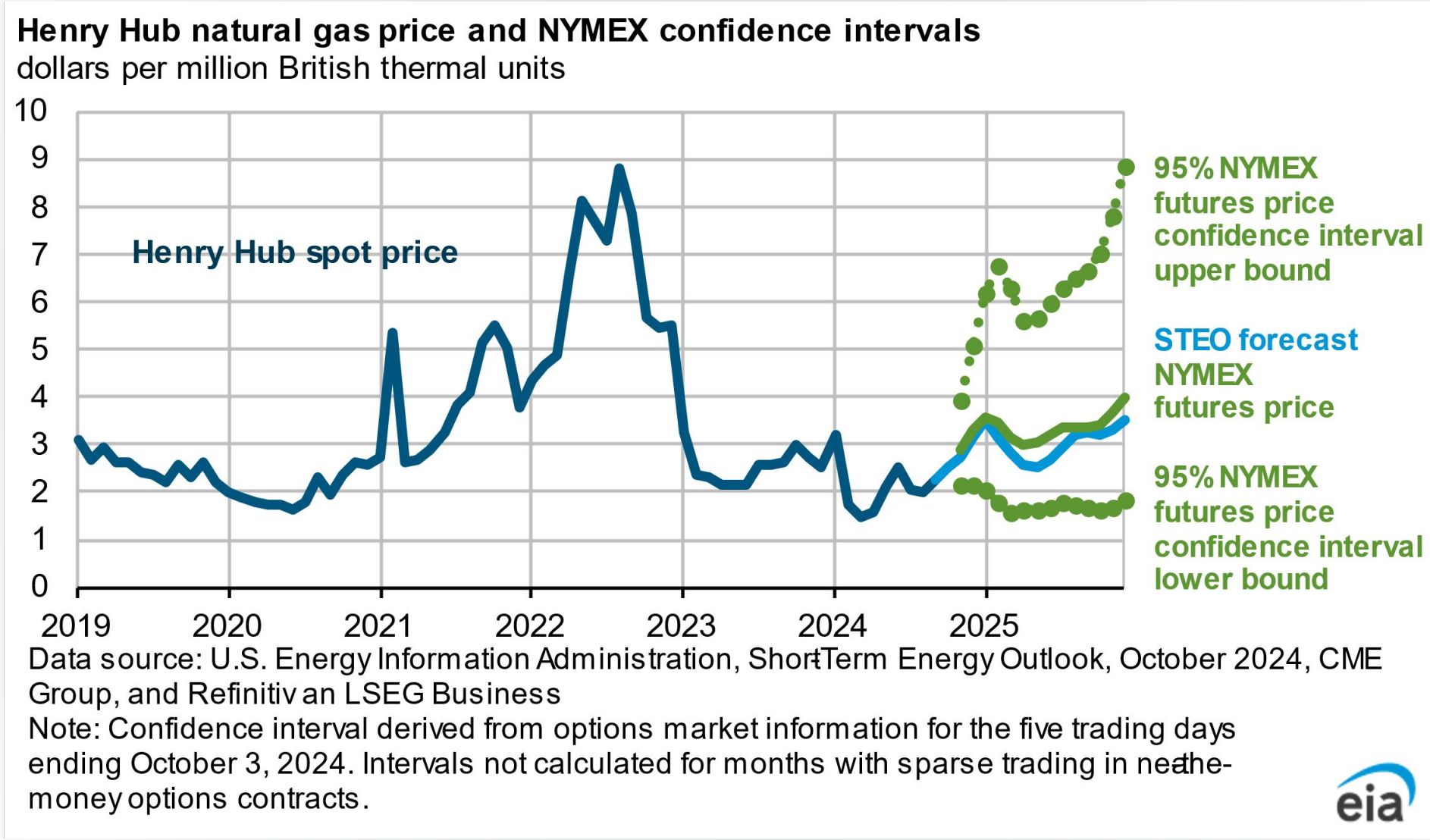
Source: DT Midstream Third Quarter 2024 Earnings Call October 29, 2024

Vertical Integration in Appalachia

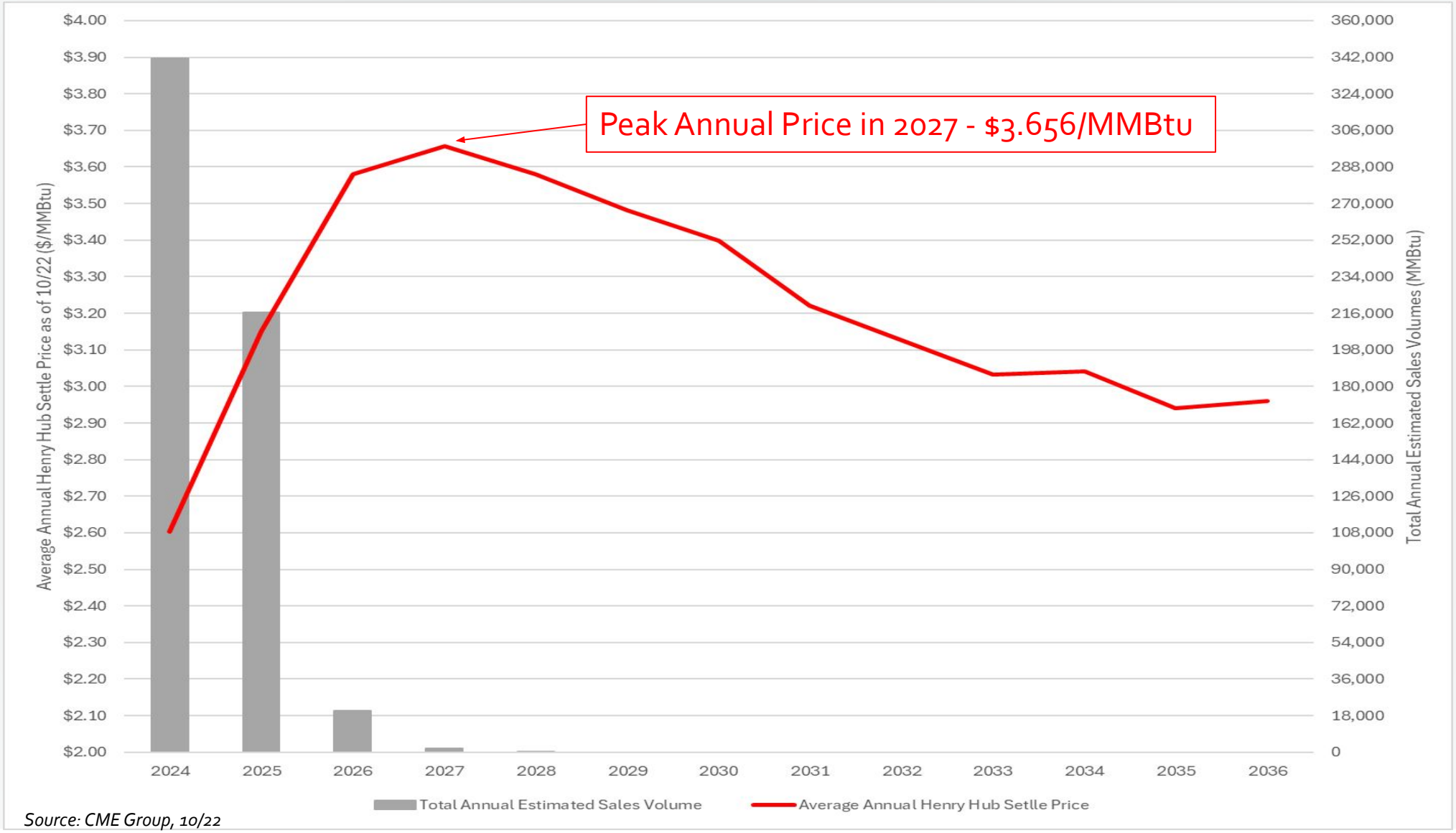
- EQT Merger with Equitrans Midstream Corporation (July 2024)
- EQT acquisition of THQ-XcL Midstream (Effective July 2022)
- Antero Acquisition of the Mountaineer Midstream Partners LP (Summit Midstream Partners LP) for $70M (May 2024)
- Various other companies own and operate some combination of midstream and upstream assets
- Will this be a continuing trend to reduce costs and build efficiency and resiliency in times of low commodity prices?

Pricing Expectations

Pricing Expectations



Natural Gas Futures Settlements Prices



Source: CME Group, 10/22

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Petroleum Consultants

First of Month Benchmark Prices
Per SEC Regulations

2023	$/MMBtu				$/bbl			
		APPALACHIA				ERGON CRUDE		
	HENRY HUB LOUISIANA	EASTERN GAS SOUTH**	COLUMBIA GAS	TEXAS EASTERN M-2	WEST TEXAS INTERMEDIATE CUSHING, OK	OH, PA, NY TIER 1	WV TIER 1	MARCELLUS - UTICA CONDENSATE
January 1	$3.550	$2.285	$2.515	$2.180	$80.26	$79.26	$79.26	$63.26
February 1	$2.675	$2.530	$2.535	$2.620	$76.41	$75.41	$75.41	$59.41
March 1	$2.510	$2.150	$2.130	$2.160	$77.69	$76.69	$76.69	$60.69
April 1	$2.095	$1.790	$1.870	$1.765	$75.67	$74.67	$74.67	$58.67
May 1	$2.280	$1.715	$1.930	$1.710	$75.66	$74.66	$74.66	$58.66
June 1	$2.100	$1.415	$1.640	$1.360	$70.10	$69.10	$69.10	$53.10
July 1	$2.515	$1.270	$1.660	$1.275	$70.64	$69.64	$69.64	$53.64
August 1	$2.570	$1.145	$1.285	$1.135	$81.37	$80.37	$80.37	$62.37
September 1	$2.565	$1.350	$1.365	$1.350	$85.55	$84.55	$84.55	$66.55
October 1	$2.695	$0.910	$0.965	$0.730	$90.79	$89.79	$89.79	$71.79
November 1	$3.320	$2.165	$2.190	$2.135	$80.44	$79.44	$79.44	$61.44
December 1	$2.765	$2.065	$2.135	$1.985	$74.07	$73.07	$73.07	$55.07
1ST DAY OF MONTH AVERAGE 2023	**$2.637**	**$1.733**	**$1.852**	**$1.700**	**$78.22**	**$77.22**	**$77.22**	**$60.39**

https://wrightandcompany.com/product-prices/

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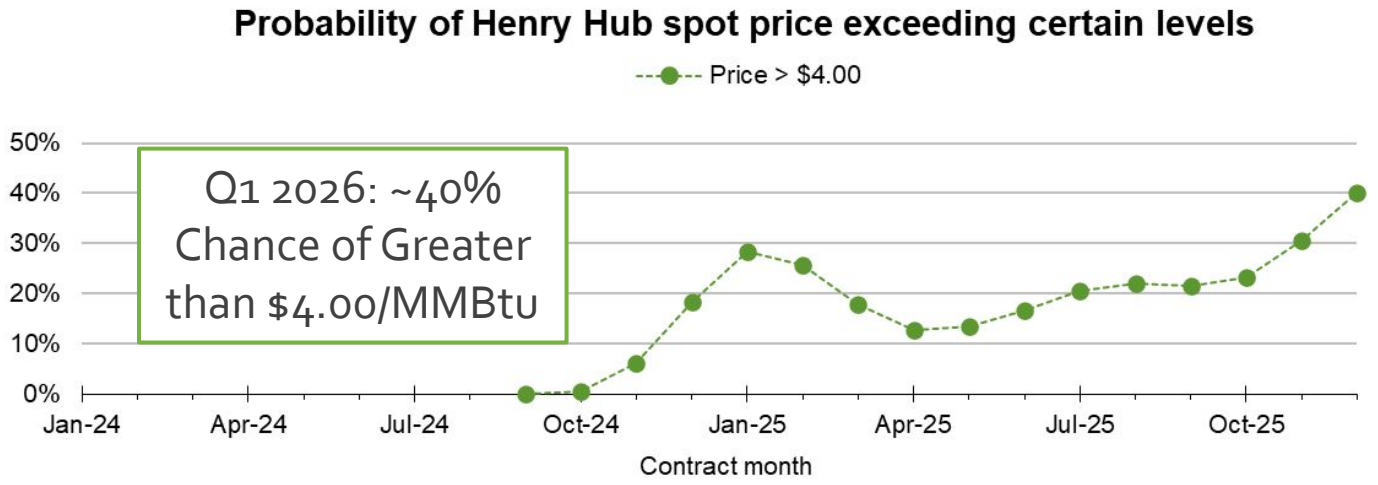
Petroleum Consultants

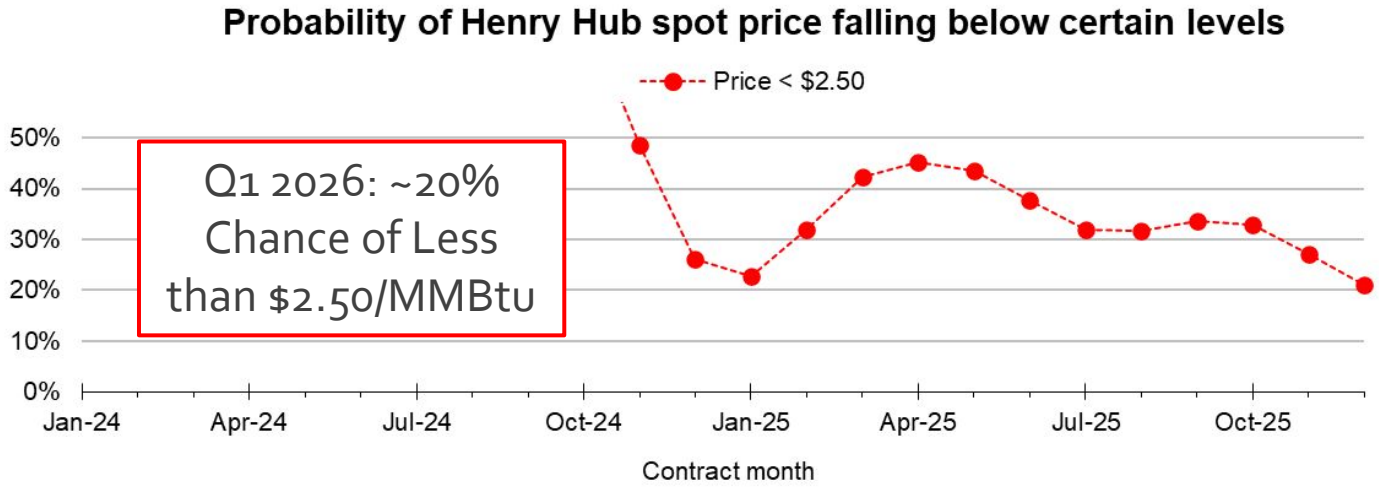
First of Month Benchmark Prices
Per SEC Regulations

2024	$/MMBtu				$/bbl			
		APPALACHIA				ERGON CRUDE		
	HENRY HUB LOUISIANA	EASTERN GAS SOUTH**	COLUMBIA GAS	TEXAS EASTERN M-2	WEST TEXAS INTERMEDIATE CUSHING, OK	OH, PA, NY TIER 1	WV TIER 1	MARCELLUS - UTICA CONDENSATE
January 1	$ 2.560	$ 1.800	$ 1.980	$ 1.890	$ 71.65	$ 70.65	$ 70.65	$ 52.65
February 1	$ 2.230	$ 1.580	$ 1.690	$ 1.650	$ 73.82	$ 72.82	$ 72.82	$ 54.82
March 1	$ 1.660	$ 1.375	$ 1.370	$ 1.370	$ 79.97	$ 78.97	$ 78.97	$ 60.97
April 1	$ 1.560	$ 1.355	$ 1.380	$ 1.350	$ 83.71	$ 82.71	$ 82.71	$ 64.71
May 1	$ 1.680	$ 1.425	$ 1.460	$ 1.315	$ 79.00	$ 78.00	$ 78.00	$ 60.00
June 1	$ 1.770	$ 1.125	$ 1.170	$ 1.045	$ 76.99	$ 75.99	$ 75.99	$ 57.99
July 1	$ 2.390	$ 1.405	$ 1.750	$ 1.380	$ 83.38	$ 82.38	$ 82.38	$ 64.38
August 1	$ 1.930	$ 1.470	$ 1.570	$ 1.525	$ 76.31	$ 75.31	$ 75.31	$ 57.31
September 1	$ 1.910	$ 1.435	$ 1.470	$ 1.430	$ 73.55	$ 72.55	$ 72.55	$ 54.55
October 1	$ 2.655	$ 1.335	$ 1.400	$ 1.320	$ 69.83	$ 68.83	$ 68.83	$ 50.83
November 1	$ 1.870	$ 1.480	$ 1.525	$ 1.450	$ 69.49	$ 68.49	$ 68.49	$ 50.49
December 1								
1ST DAY OF MONTH AVERAGE 2024	$ 2.020	$ 1.435	$ 1.524	$ 1.430	$ 76.15	$ 75.15	$ 75.15	$ 57.15
TWELVE-MONTH RUNNING AVERAGE	$ 2.082	$ 1.488	$ 1.575	$ 1.476	$ 75.98	$ 74.98	$ 74.98	$ 56.98

https://wrightandcompany.com/product-prices/

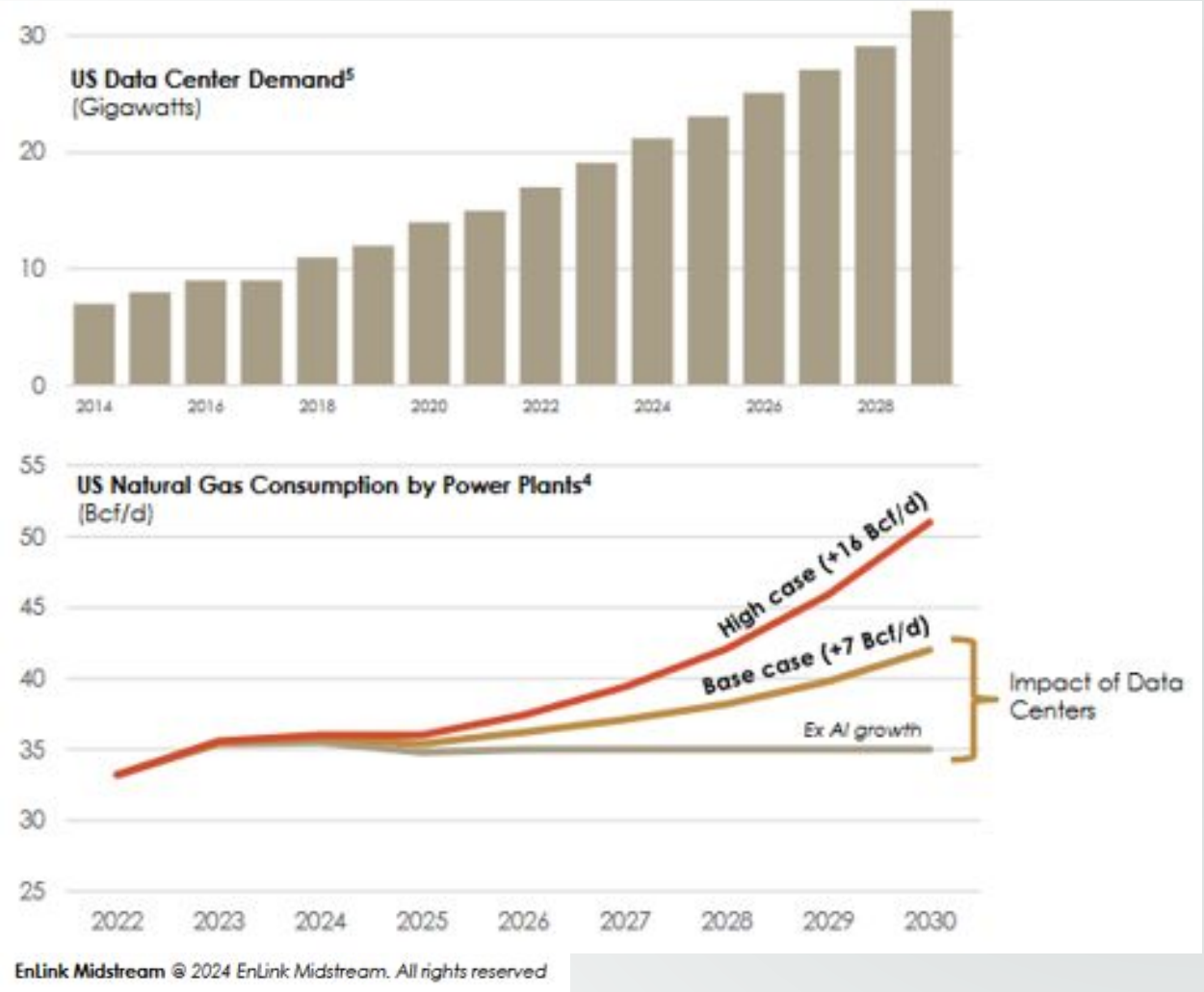
What Are The Odds?





Notes: Probability values calculated using NYMEX market data for the five trading days ending August 1, 2024.
Values not calculated for months with little trading in "close-to-the-money" options contracts.
Source: EIA Short-Term Energy Outlook, August 2024, and CME Group (http://www.cmegroup.com)

What's Going To Bring Prices Up?



Recent Headlines

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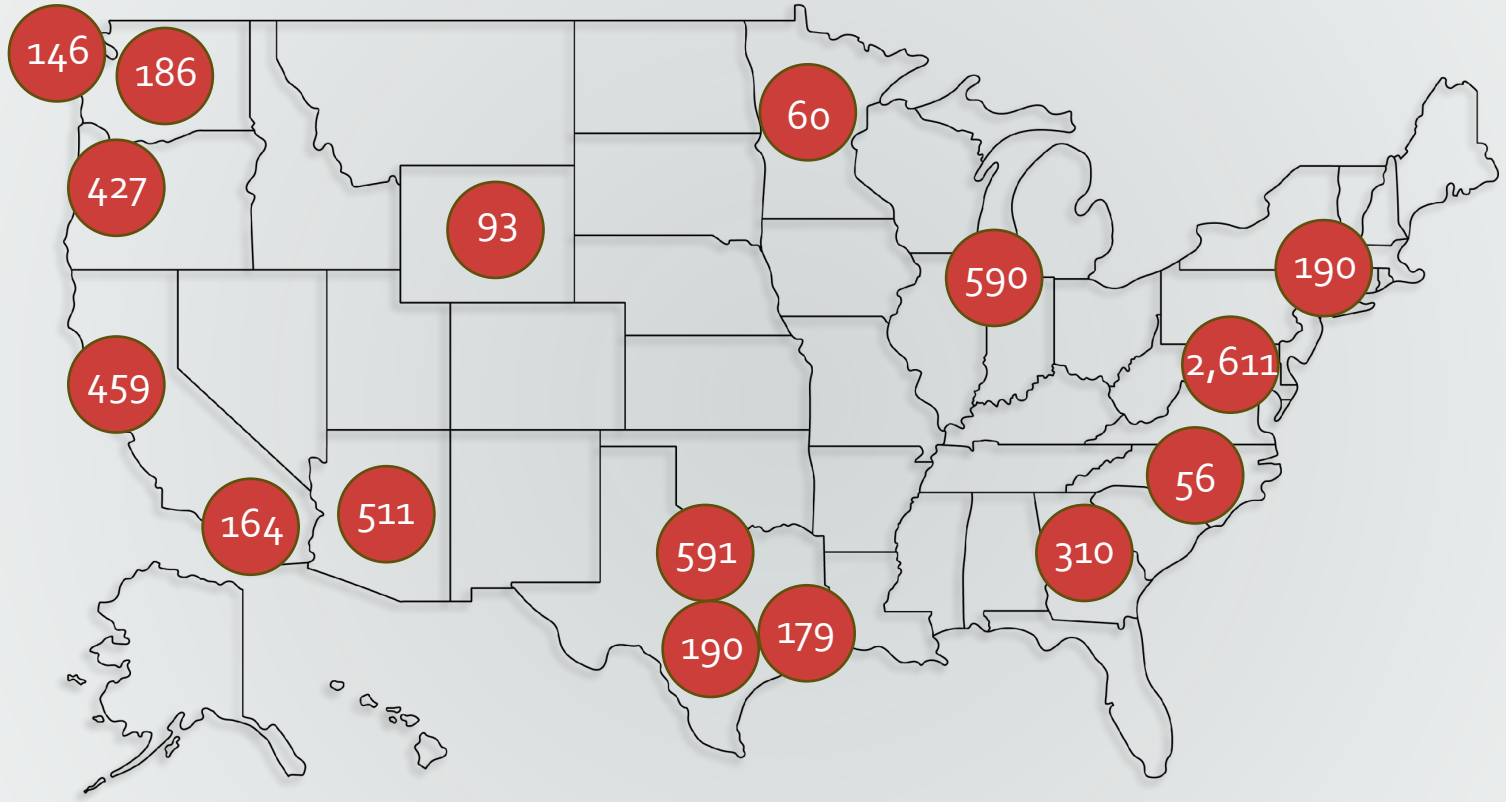
Largest Data Center Locations

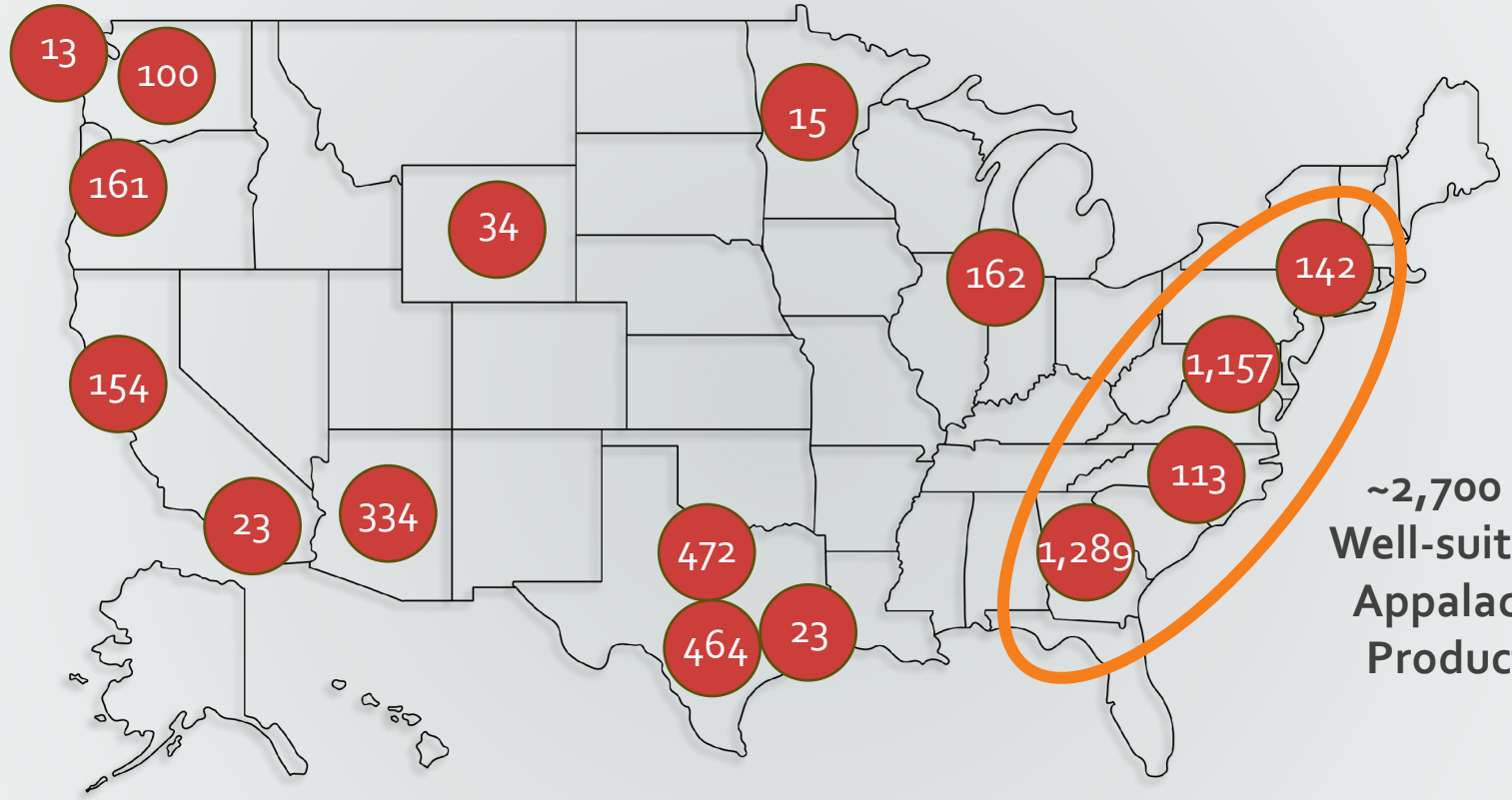
Current Inventory (Megawatts)



Source:
https://www.cbre.com/insights/reports/north-america-data-center-trends-h1-2024

Largest Data Center Locations

Under Construction Inventory (Megawatts)



~1,950 MW All Other

~2,700 MW Well-suited for Appalachian Production

Source:
https://www.cbre.com/insights/reports/north-america-data-center-trends-h1-2024

Conclusions

- Only 20 years – Anniversary of Renz #1

- Almost 20,000 wells drilled, billions of revenue generated, countless jobs created

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- Under any scenario, oil and natural gas remain essential for global growth and prosperity
- The Appalachian shale gas accumulation is the one of the largest in the world
- The economic benefits of the MVP highlight the need to increase development of natural gas pipelines across the U.S.
- LNG exports and data centers will be significant drivers for demand, increasing gas prices
- Wright is bullish for $4.00 gas price in 2026
- Energy companies will solve the worldwide energy demand

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Thank you!

Serving the petroleum industry for more than

36 YEARS

Founded by D. Randall Wright, President - 1988

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