

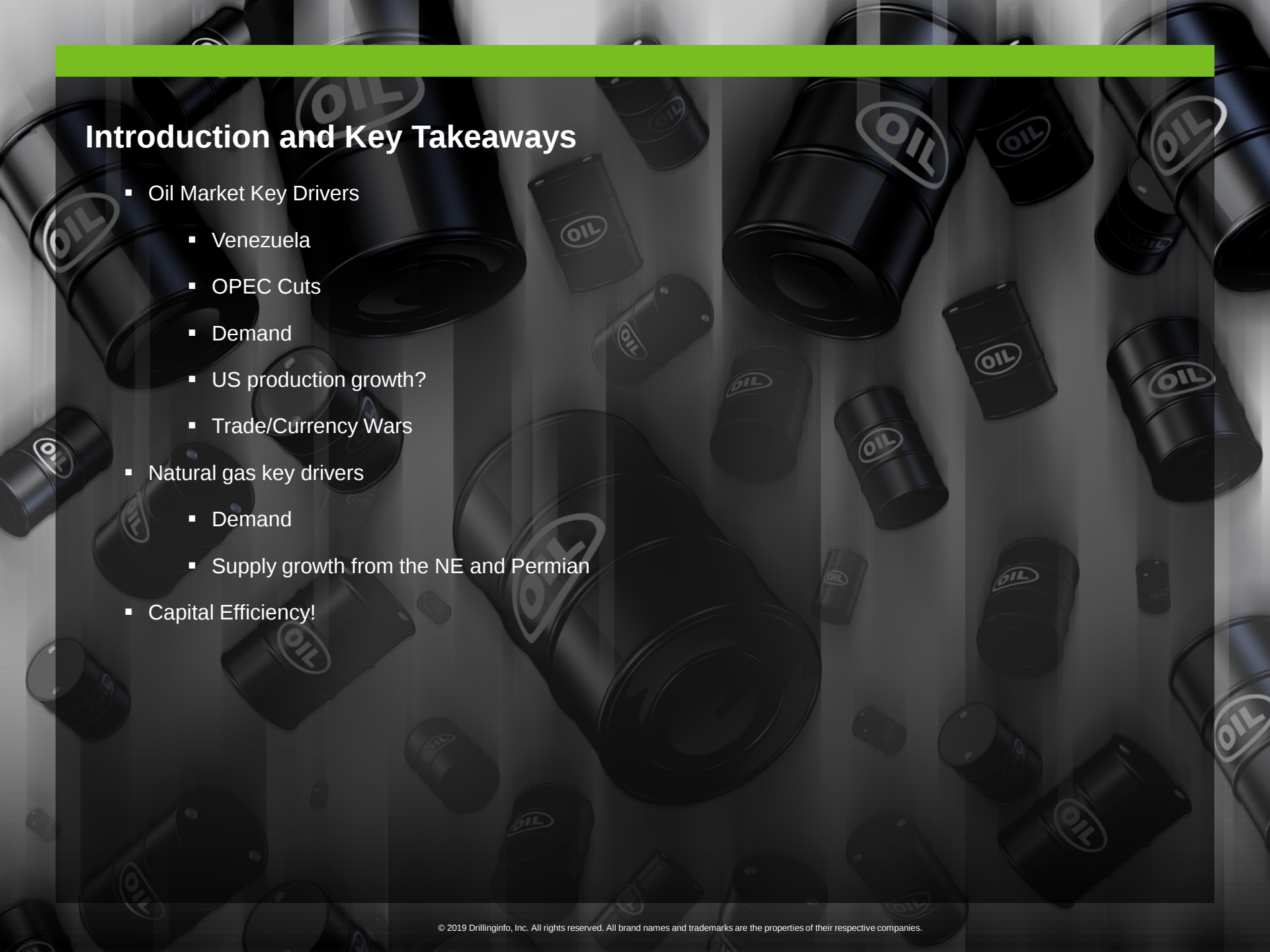


Pricing in Politics

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Introduction and Key Takeaways

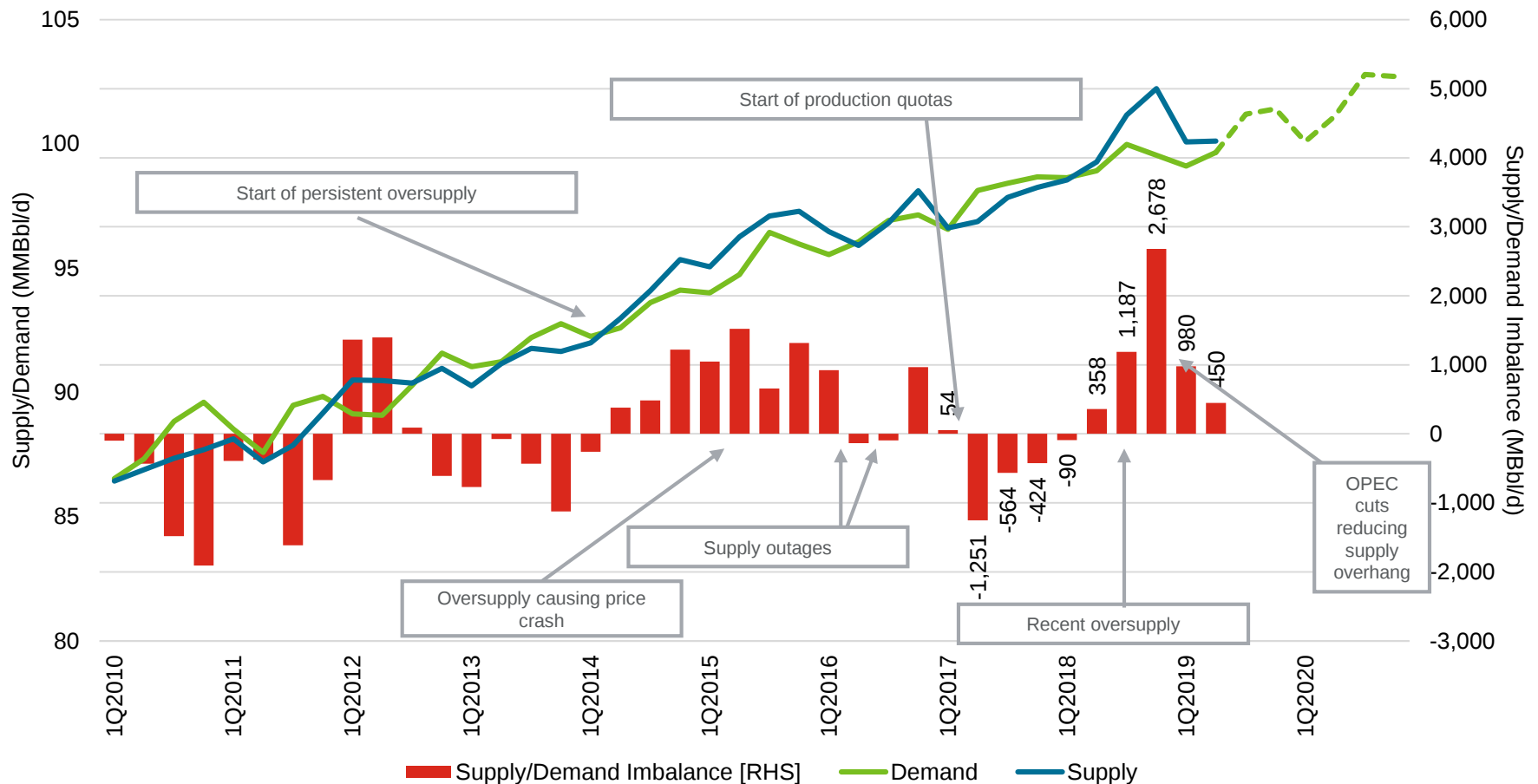
- Oil Market Key Drivers
 - Venezuela
 - OPEC Cuts
 - Demand
 - US production growth?
 - Trade/Currency Wars
- Natural gas key drivers
 - Demand
 - Supply growth from the NE and Permian
- Capital Efficiency!

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Crude Oil

Global Oil Supply and Demand

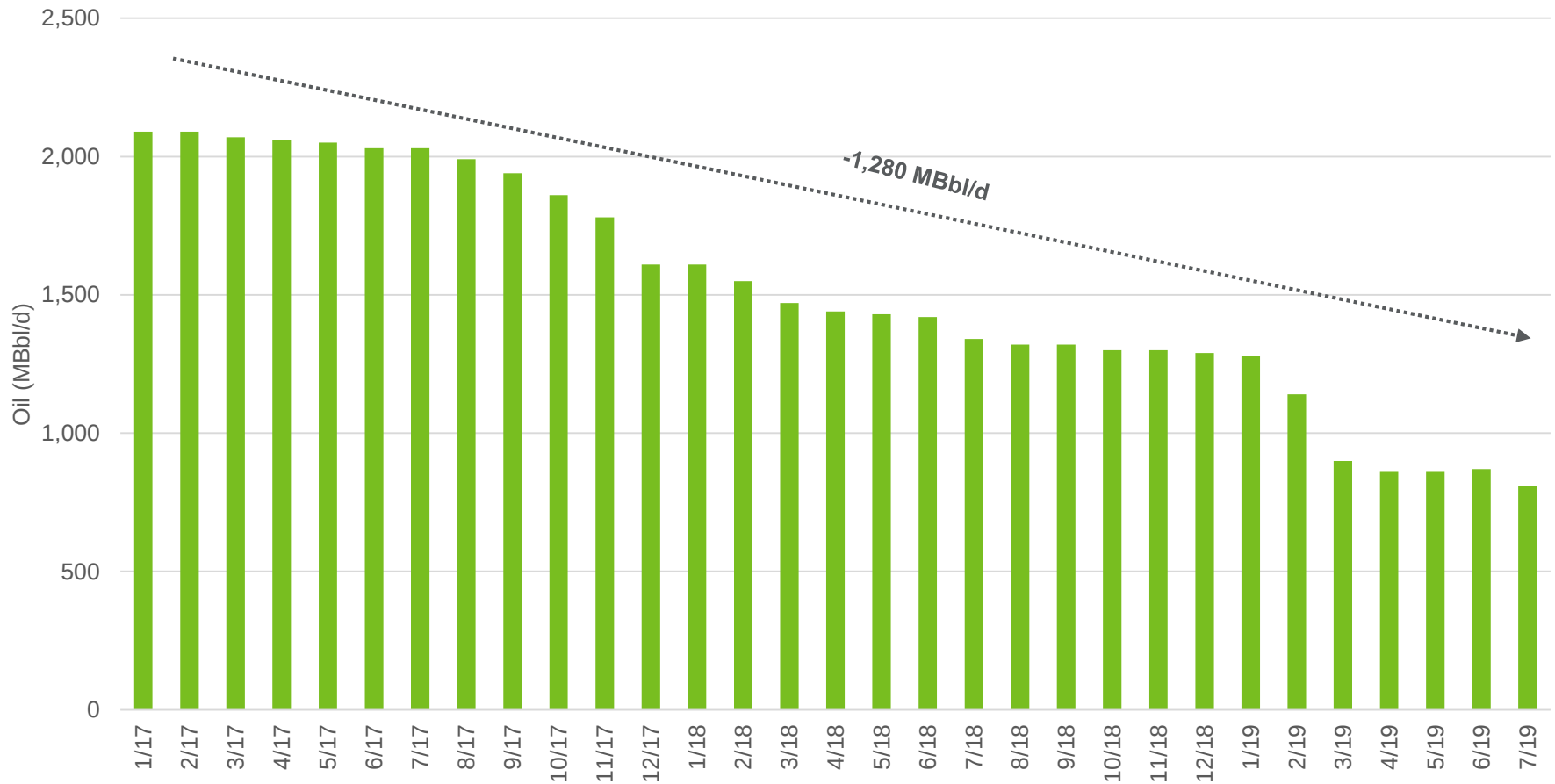
Global Supply and Demand



Source: IEA MODS

Venezuela's Spiraling Production Decline

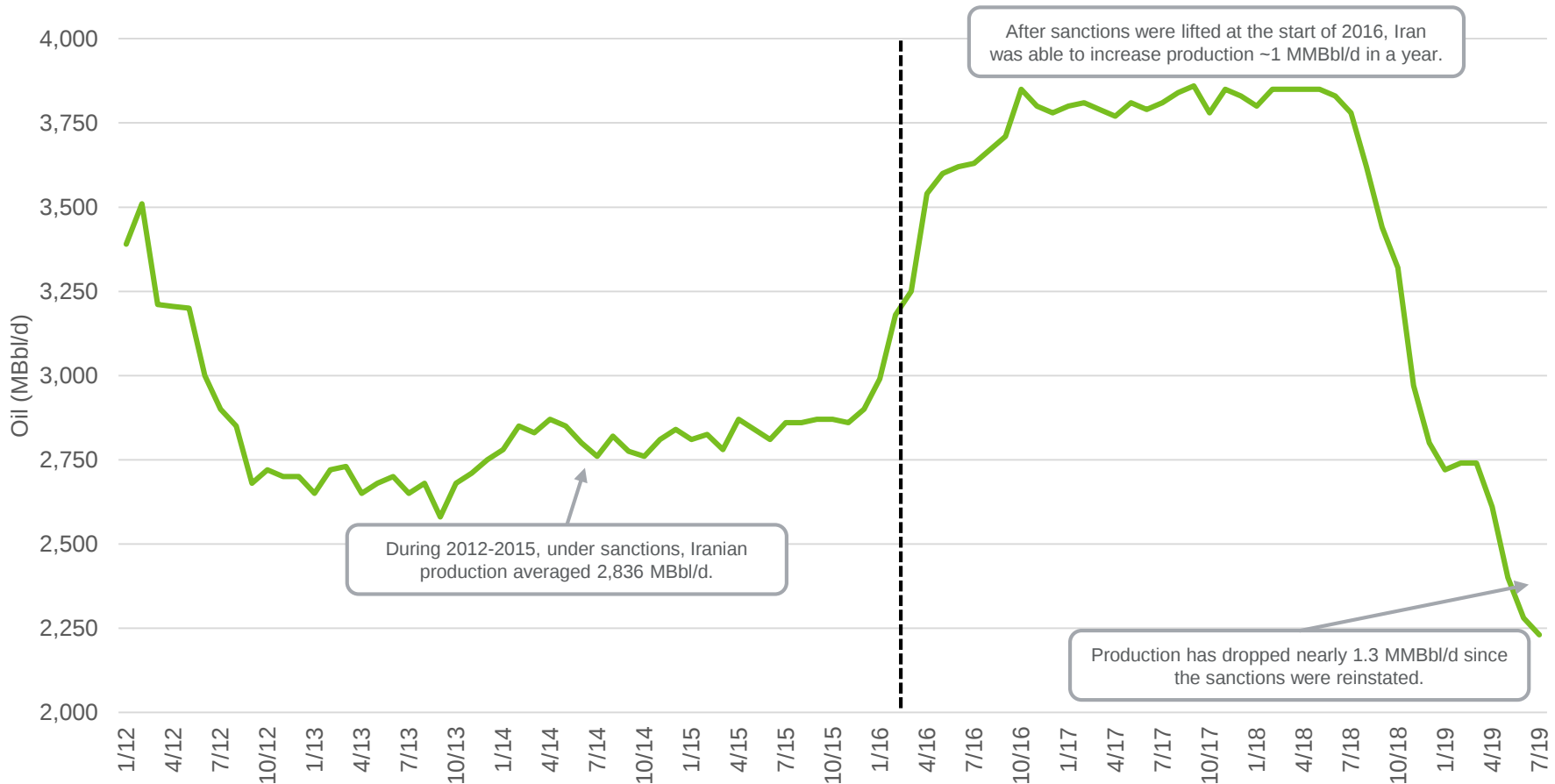
Venezuela Crude Oil Production



Source: IEA MODS

Possible Impact of Iranian Sanctions

Iran Crude Oil Production



Source: IEA MODS

OPEC: Compliance, Sanctions, and the Adjustment

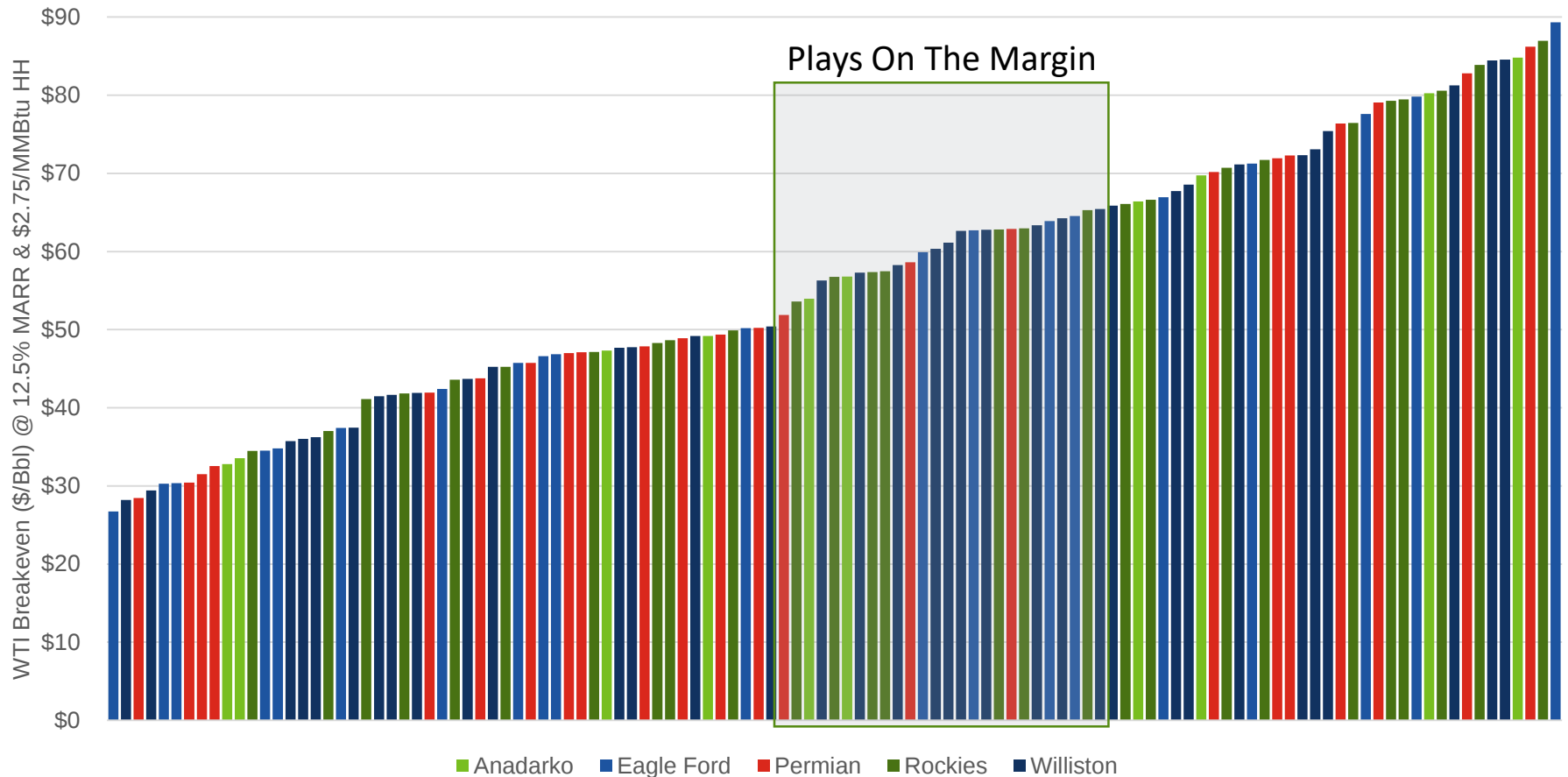
OPEC Quotas Update

Member	Quota (MBbl/d)	July 2019 (MBbl/d)	Compliance (MBbl/d)	Sustainable Cap (MBbl/d)	Spare Cap? (MBbl/d)
Saudi Arabia	10,311	9,650	661	12,040	2,390
Iraq	4,512	4,780	-268	4,880	100
UAE	3,072	3,070	2	3,350	280
Kuwait	2,724	2,690	34	2,920	230
Nigeria	1,685	1,750	-65	1,800	50
Angola	1,481	1,400	81	1,580	180
Algeria	1,025	1,030	-5	1,080	50
Ecuador	508	540	-32	540	0
Congo	315	340	-25	350	10
Gabon	181	200	-19	200	0
Eq. Guinea	123	120	3	130	10
Total	25,937	25,570	367	28,870	3,300

Source: IEA MODS

US Oil Breakevens

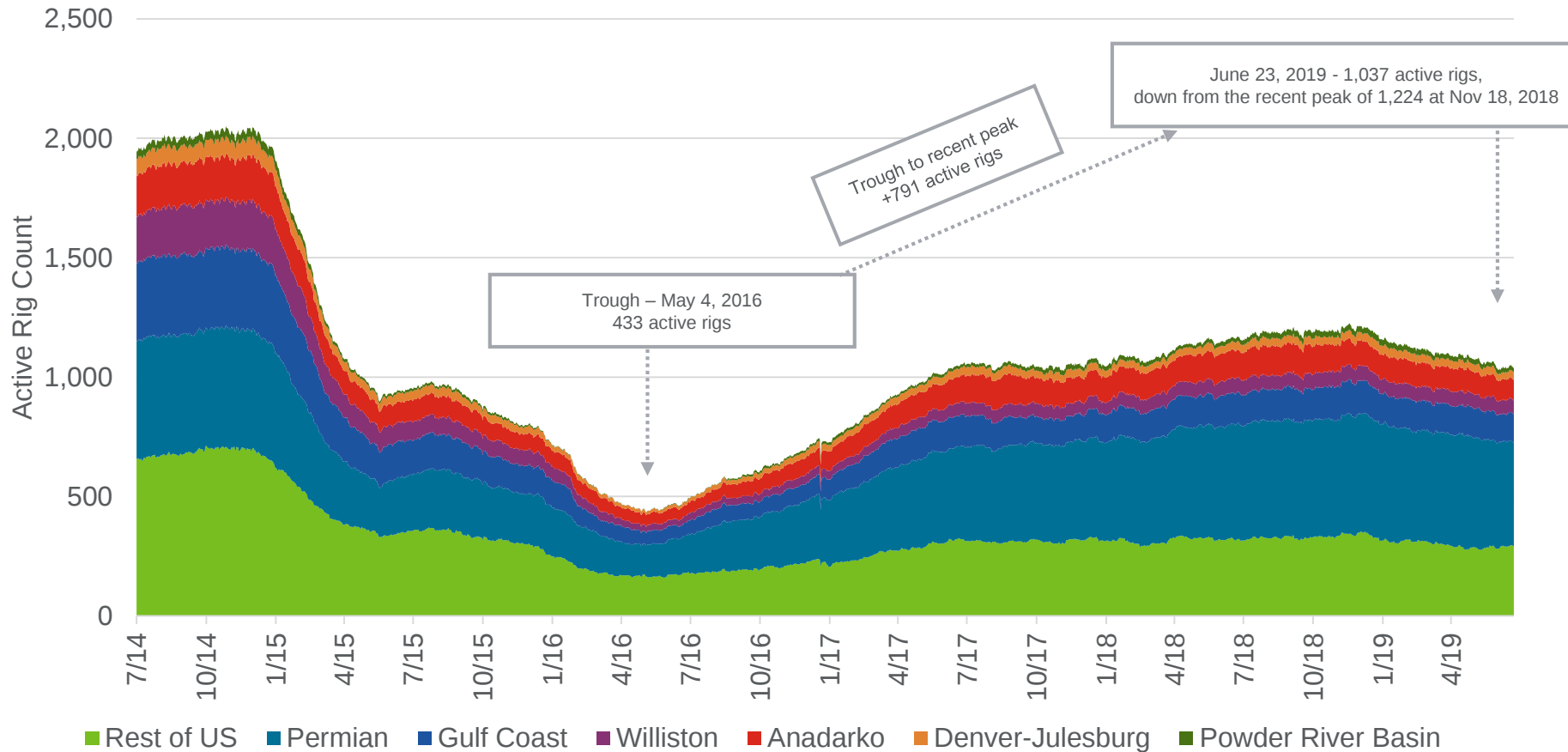
Crude Oil Breakevens



Source: DI Prodcast

US Rig Count: Trough to Peak

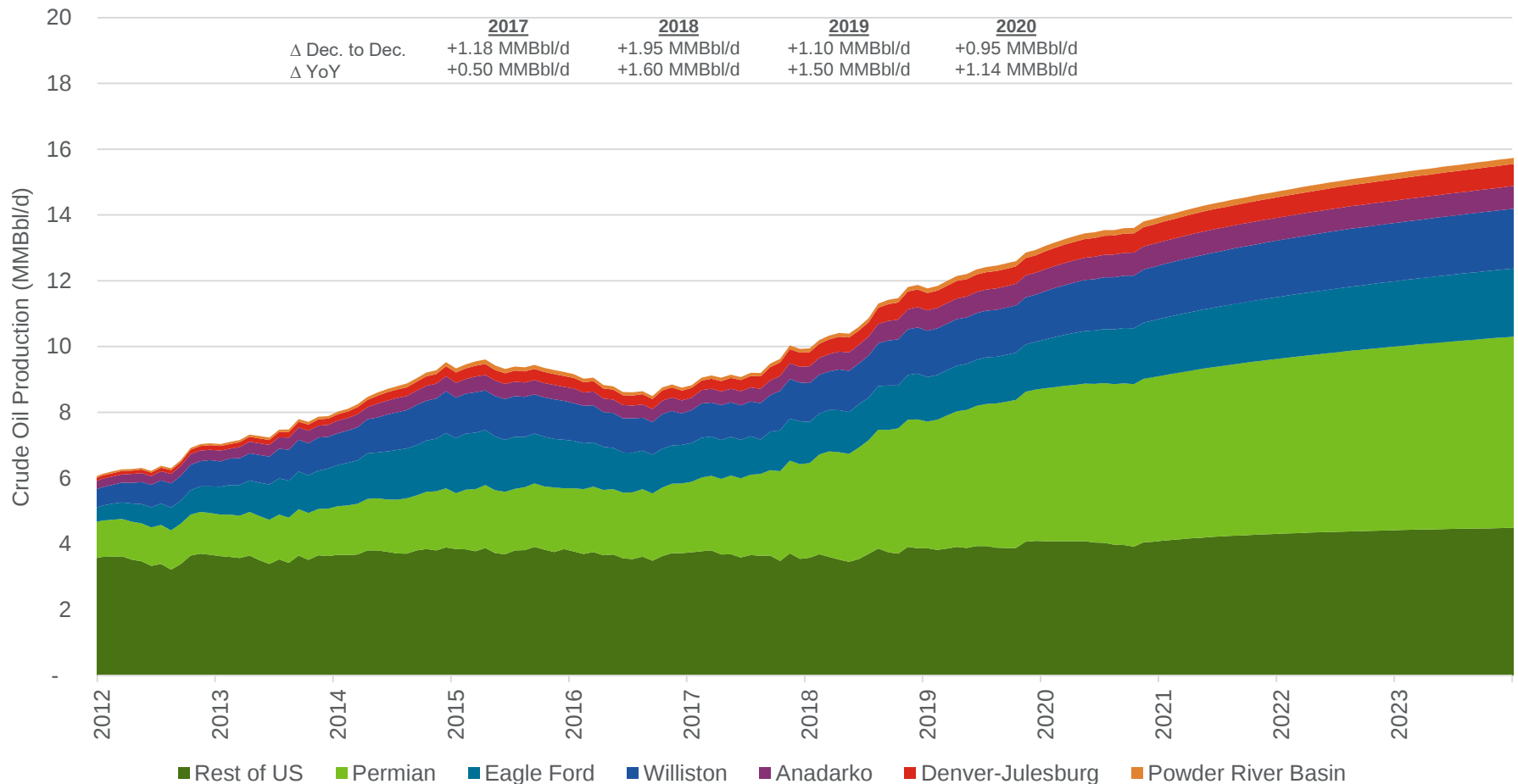
Rig Count by Basin



Source: DI Rig Analytics

US Oil Production

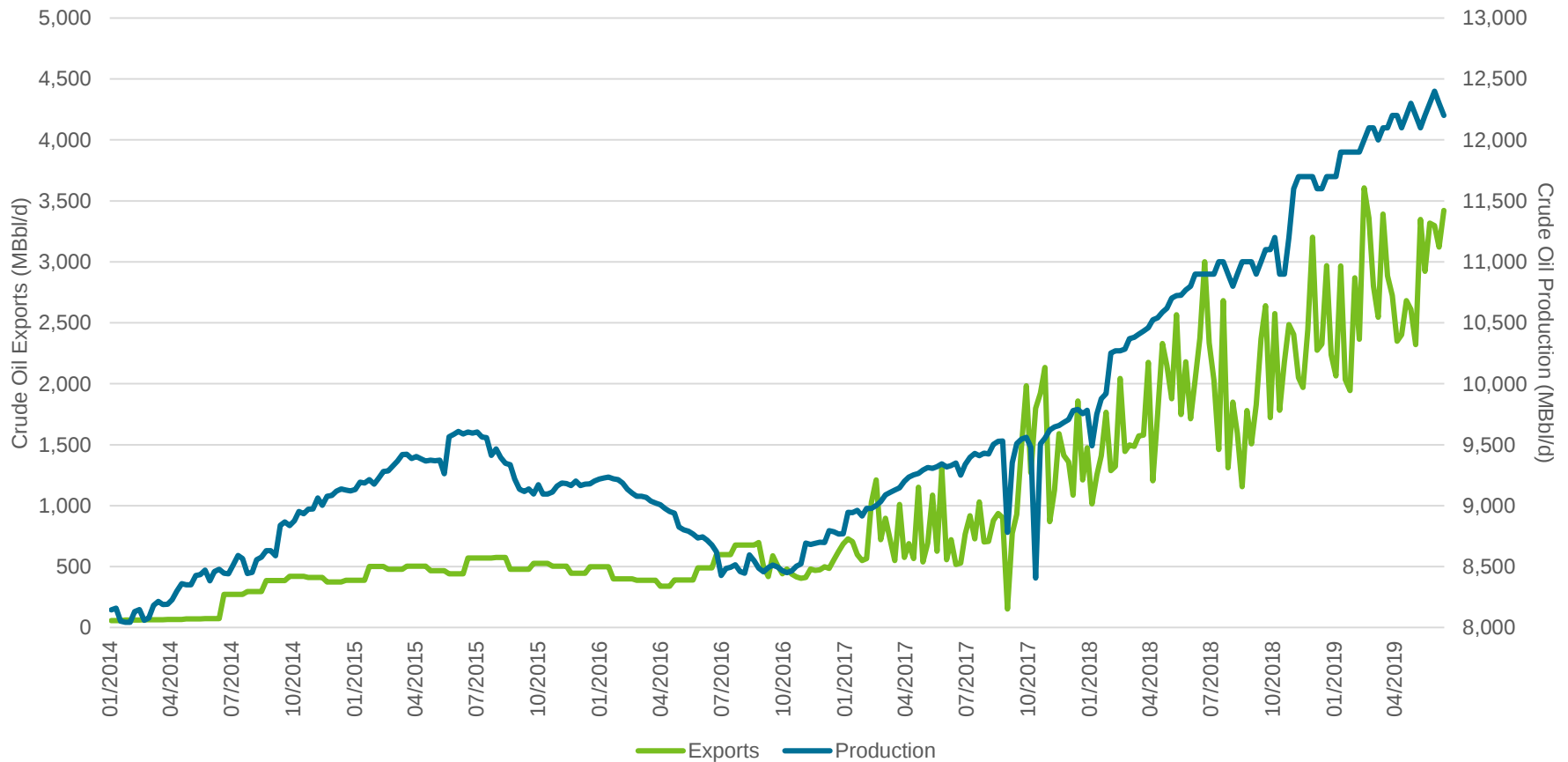
US Crude Production



Source: DI Prodcast

US Oil Exports: Weekly Volumes

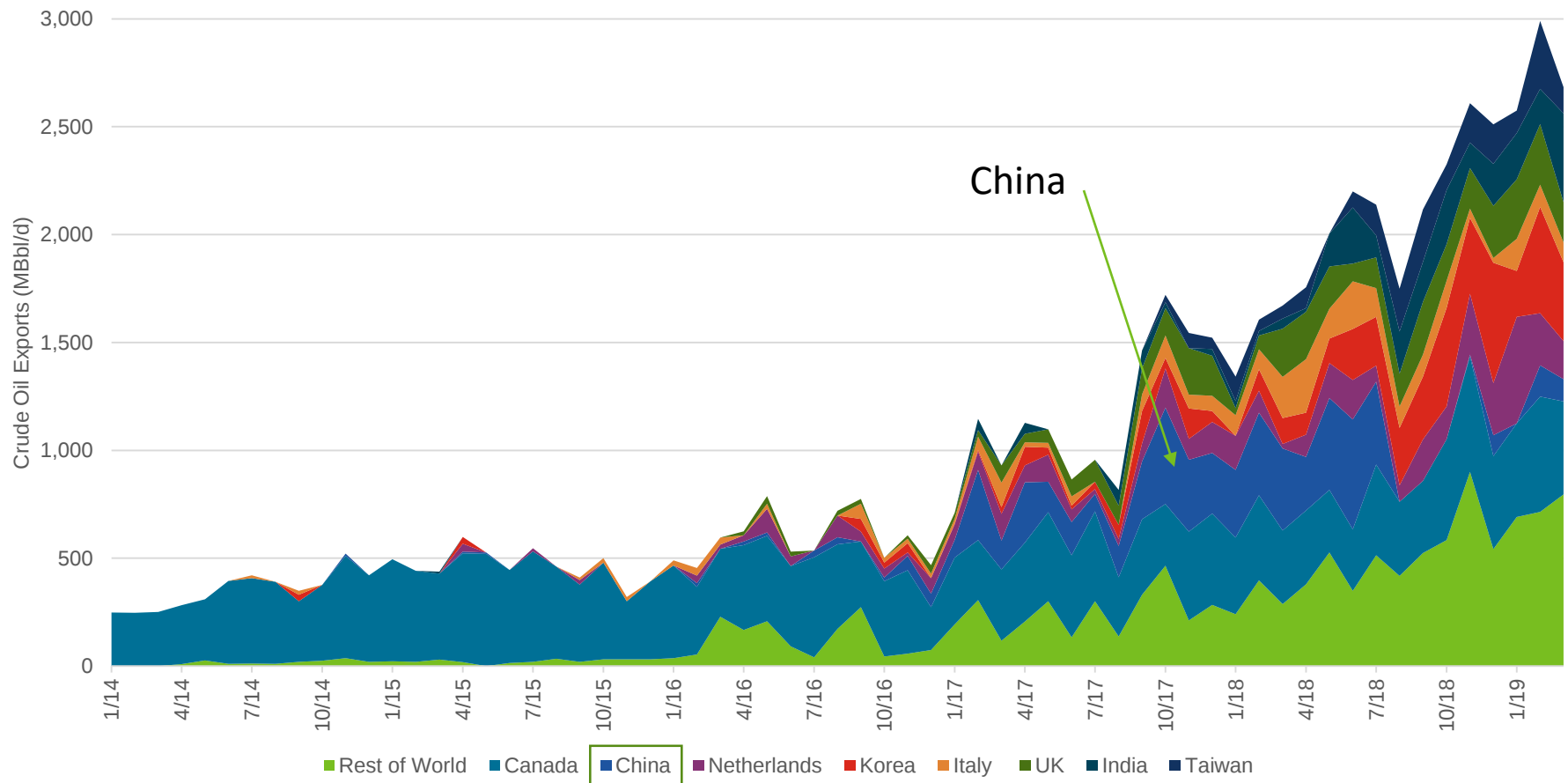
US Oil Production and Exports



Source: EIA

US Oil Exports: Destinations

US Oil Exports by Destination



Source: EIA

Permian: Growing Long-Haul Pipeline Capacity

Capacity out of the Permian Basin will increase by just under 2.1 MMBbl/d this year.

Plains' Cactus II pipeline (670 MBbl/d) began line fill in July, with partial service in August.

Energy Transfer's Permian Express IV (120 MBbl/d) and the EPIC NGL pipeline (400 MBbl/d, temporarily in crude service) also have Q3 starts.

Phillips 66 plans to bring its 900 MBbl/d Gray Oak pipeline online in late Q4.

Long-haul capacity will see a 150 MBbl/d increase in 2020, when EPIC brings online its 550 MBbl/d dedicated crude oil pipeline (and subsequently takes its NGL pipeline out of crude service).

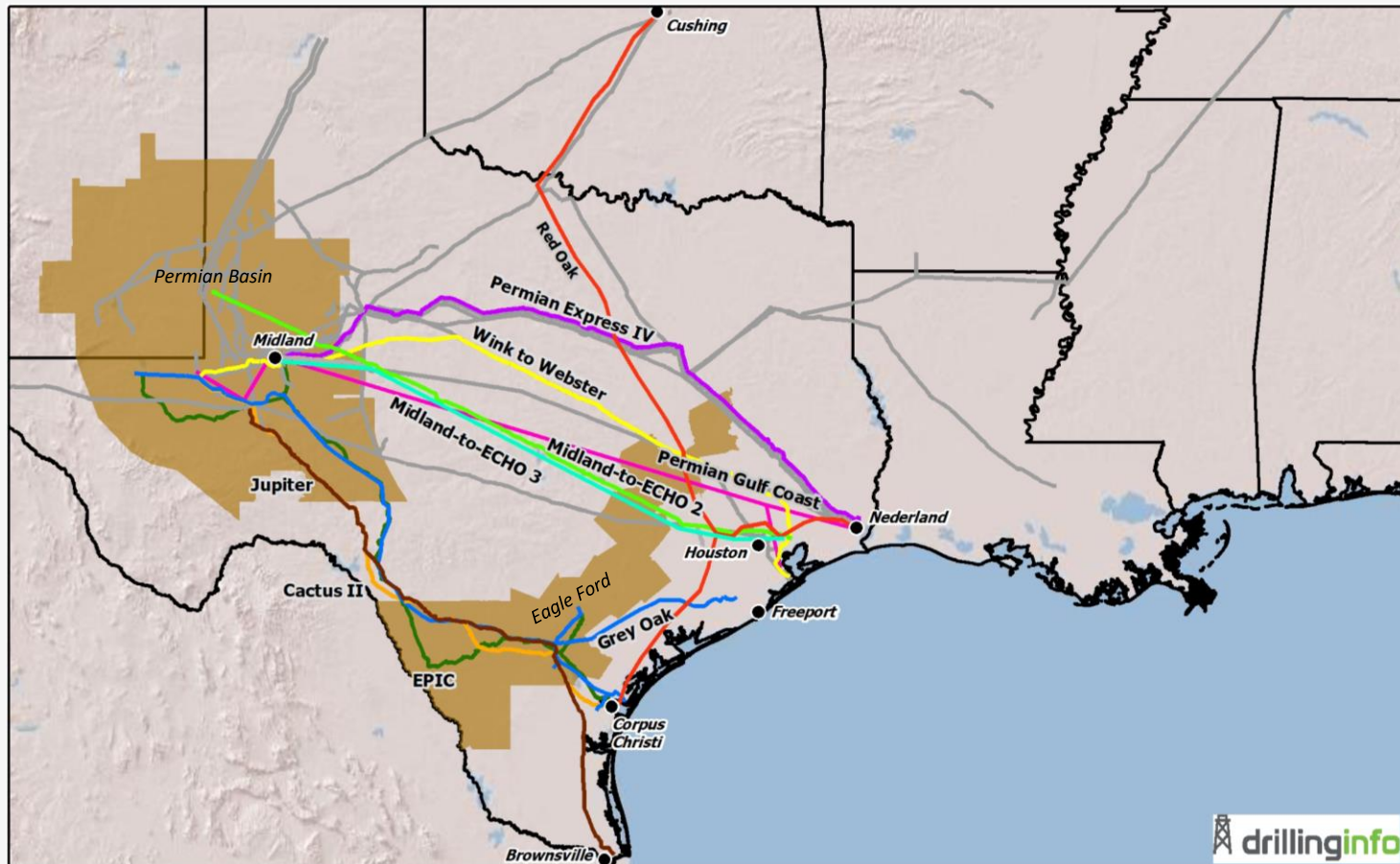
Four projects with 2021 startups (Wink-to-Webster, Midland-to-ECHO 3, Permian Gulf Coast, and Jupiter) are competing for shipper interest. It is unlikely all four will reach FID given individual system capacities of up to 1 MMBbl/d.

Permian Gulf Coast (600 MBbl/d) is unlikely to proceed due to loss of key backers.

Phillips 66's Red Oak (400 MBbl/d) will provide a connection to Plains' Sunrise pipeline at Wichita Falls.

IMAGE 1

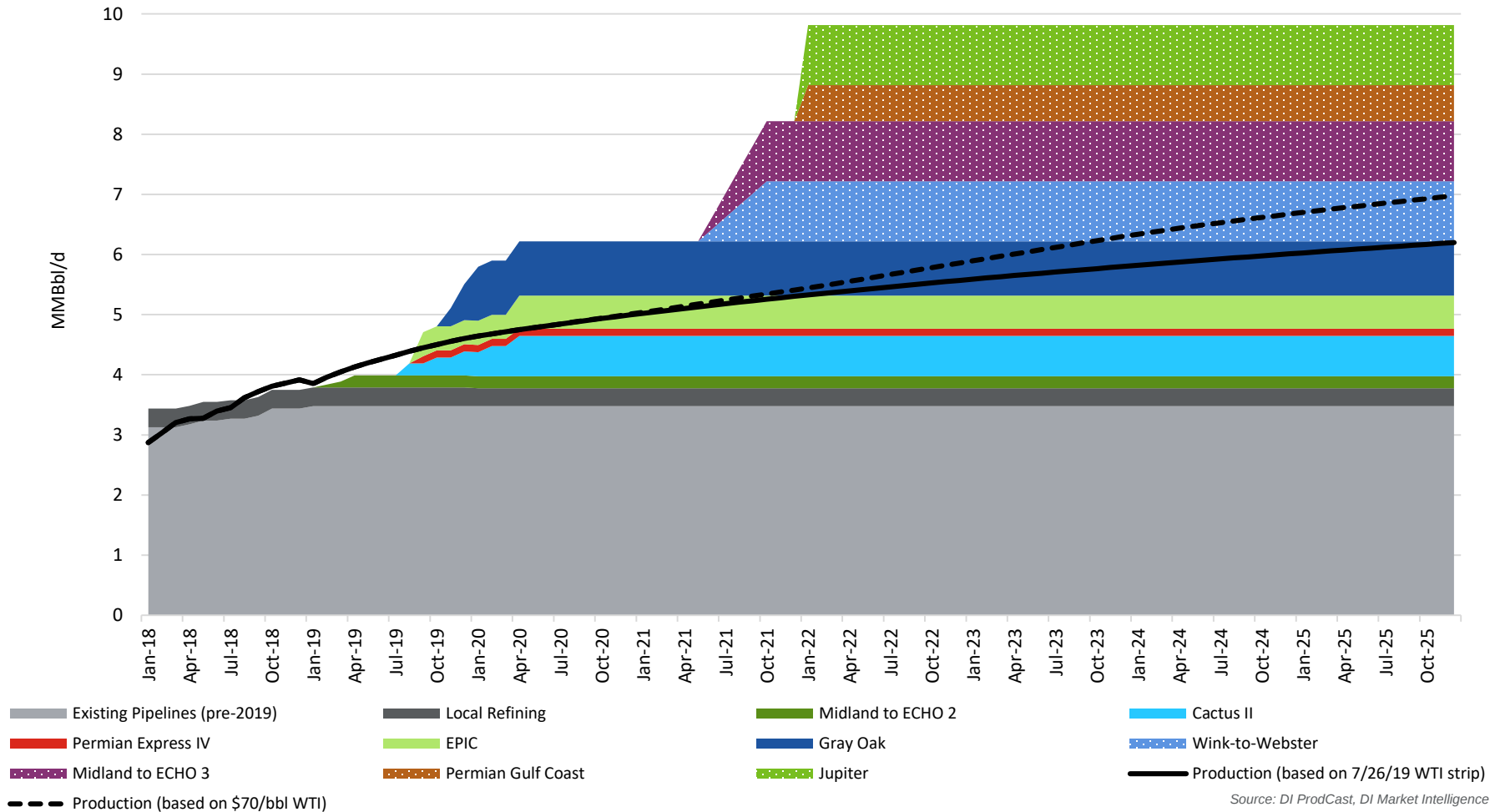
New Long-Haul Pipelines to Come Online August 2019 Through 2022



Gray-shaded pipelines indicate systems that commenced commercial operations on or before 7/31/19.

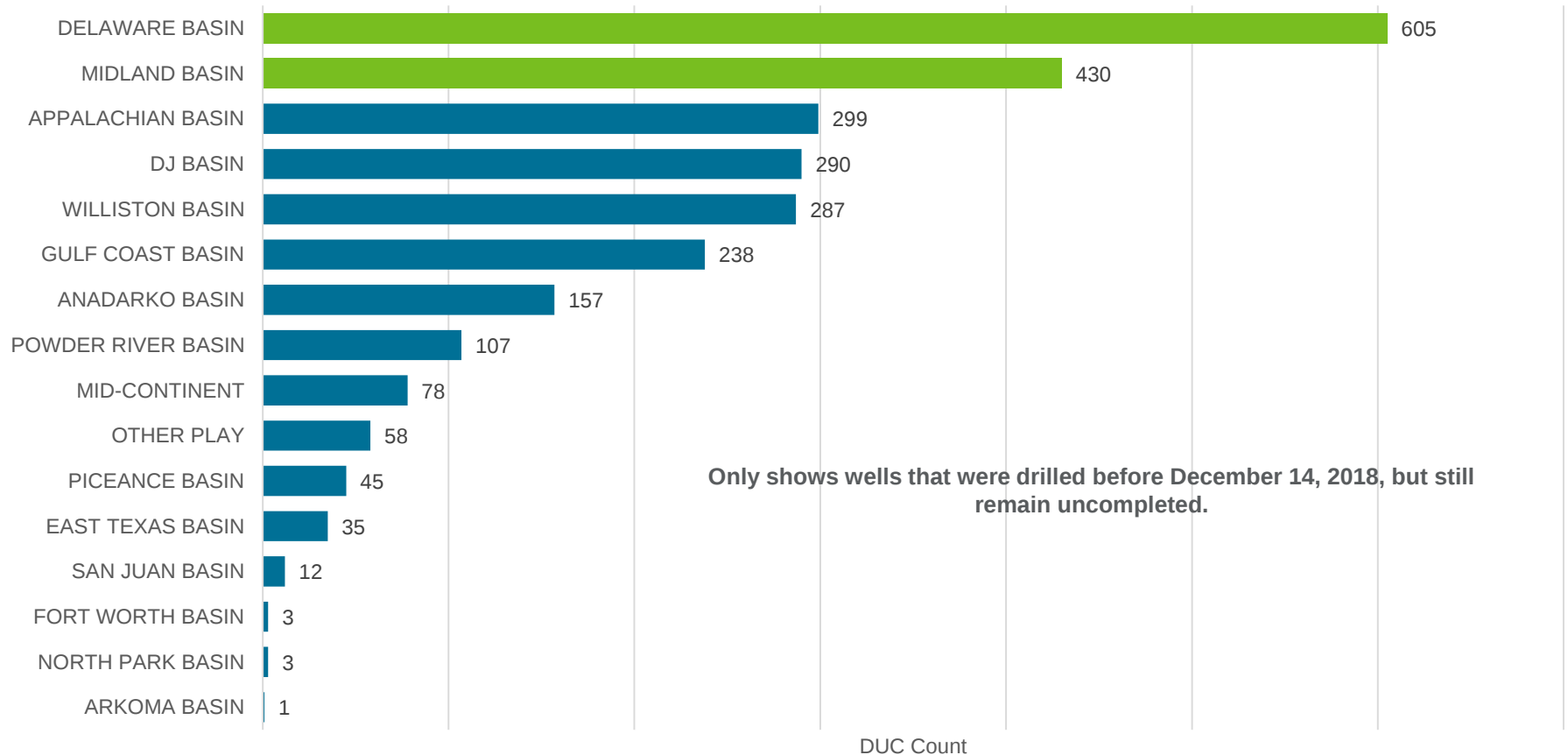
Permian: Oil Production vs. Takeaway Capacity

Permian Crude Infrastructure



US DUC Count: Building Quickly

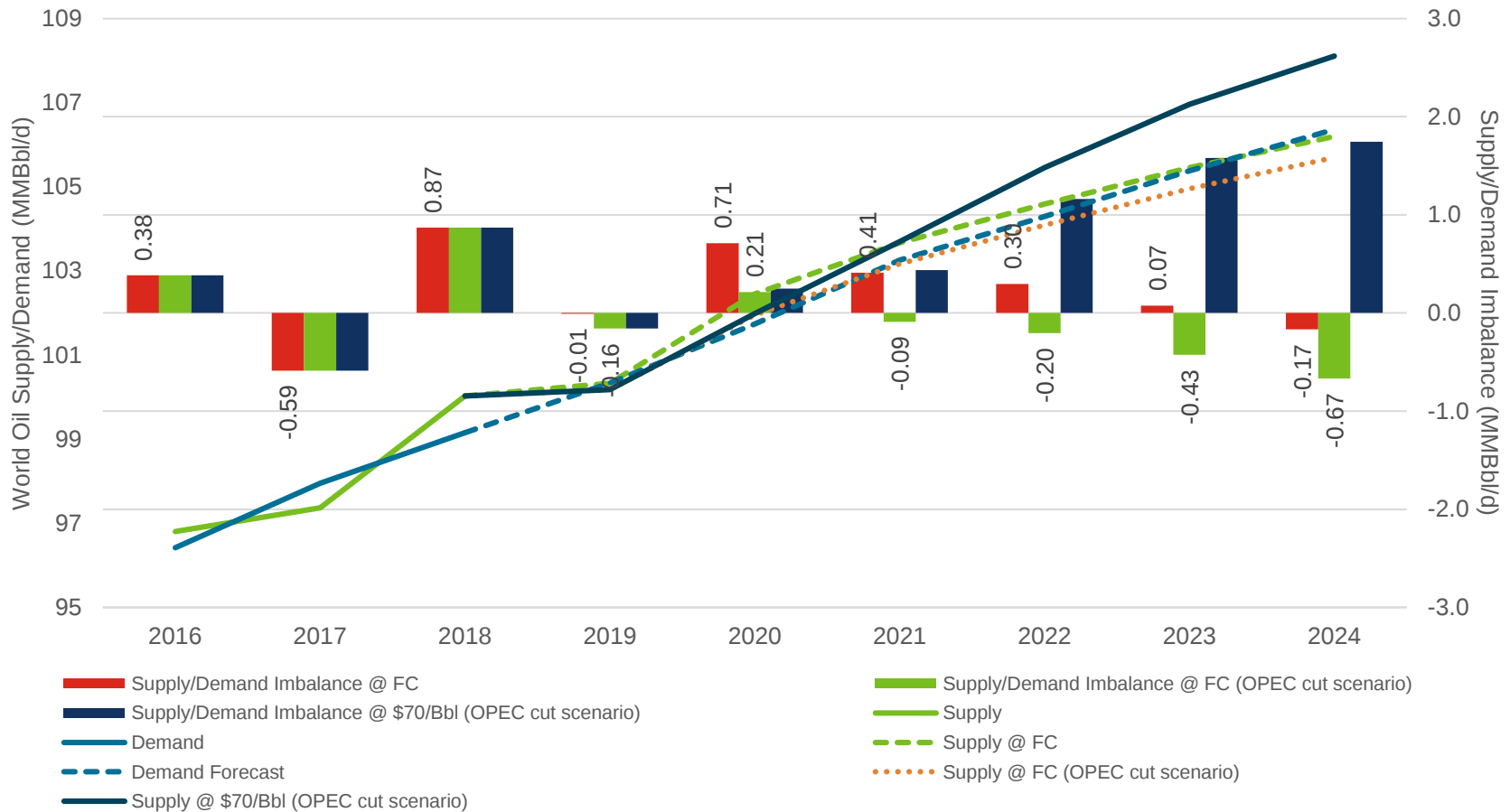
US DUC Count by Basin



Source: DI Rig Analytics

Long-Term Forecast: Global Supply/Demand

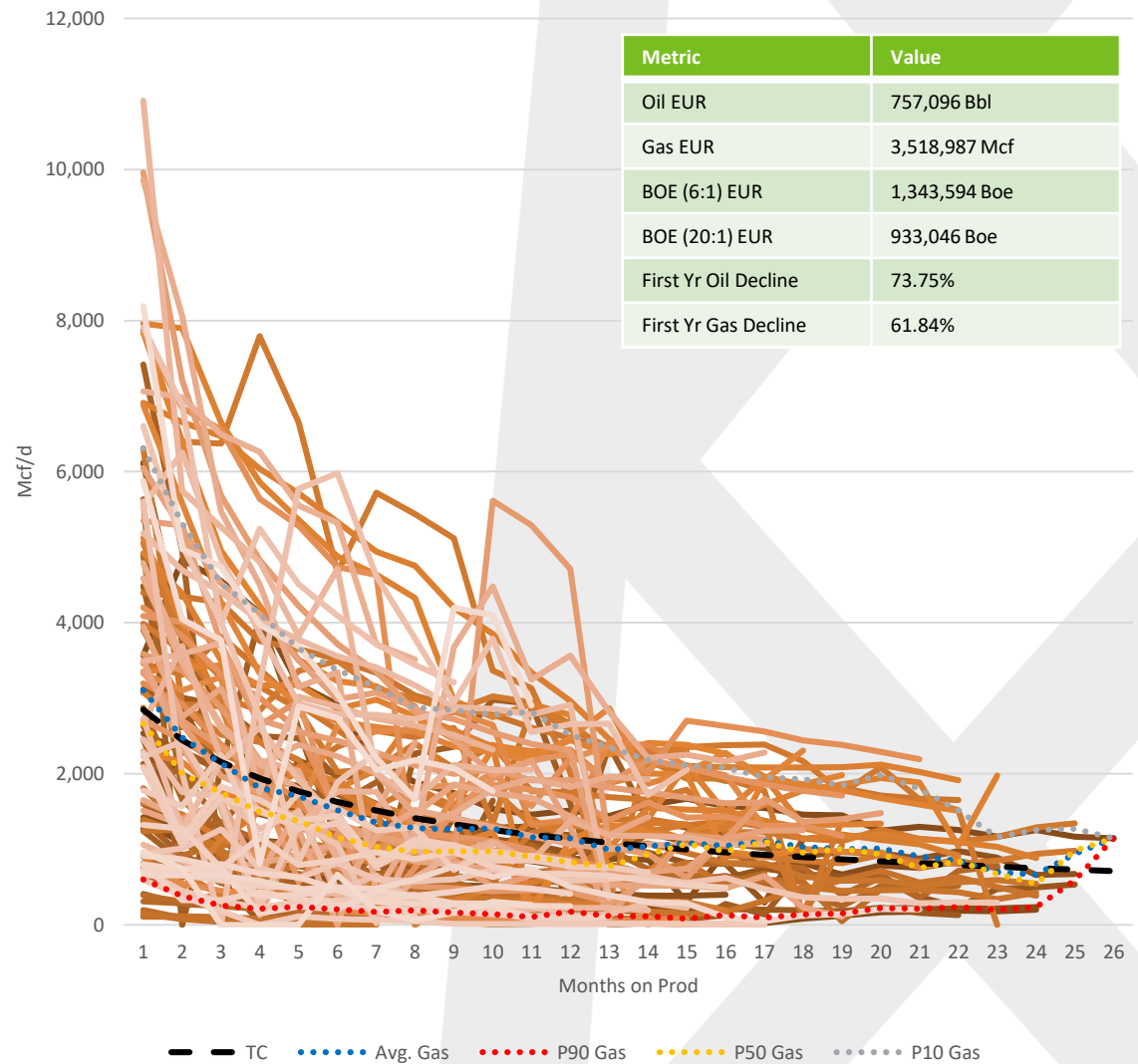
Global Supply and Demand



Source: DI Prodcast, IEA MODS, IEA OMR

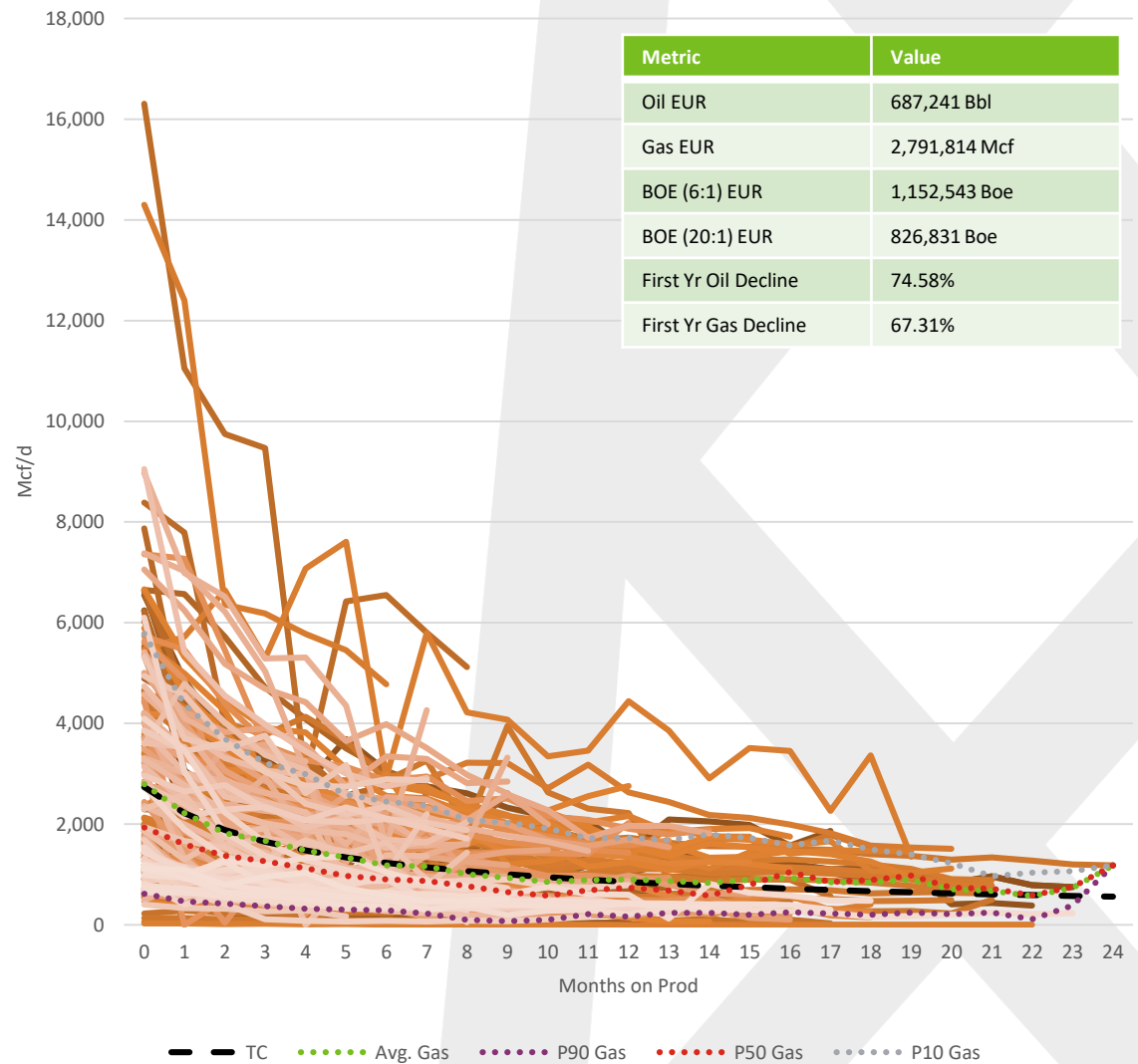
S DW WC PARENT TC NORMALIZED

- The chart on the left shows a plot of all parent wells in Ward, Winkler, Pecos, Reeves, & Loving County drilled into the Wolfcamp formations since 2015 with 1,500-2,500 lbs/ft of proppant & 4,500-11,000 ft of perf interval. The productivity of these wells has been normalized to reflect a modern completion of 7,500 ft perf interval (80% effectiveness) & 2,000 lbs/ft of proppant (30% effectiveness).
- The black dashed line is the type curve fit to the average productivity of the gas stream. The red dotted line is P90, yellow P50, & green P10 of the normalized well data set. Parent wells produce a ~100 Bbl/ft & ~470 Mcf/ft EURs (~180 Boe/ft). On average, parent wells perform better than child wells (see next slide).
- For large spacing units (1,280+ acres/well), offset wells' performance should not be impacted by others. As more wells get drilled within a fixed drainage area, the wells will interfere with each other more quickly. Interference will only get noticeable as spacing gets tighter (say, < 320 acres/well). Otherwise, effects will be too small to distinguish from the normal decline profile.
- Existing ("parent") wells will likely not see the impact of child or infill wells as time has likely passed and the well is producing too little to be impacted. However, child & infill wells drilled into the same drainage area later will not perform as well, since the area has already been subjected to pressure declines due to the production from the existing well.



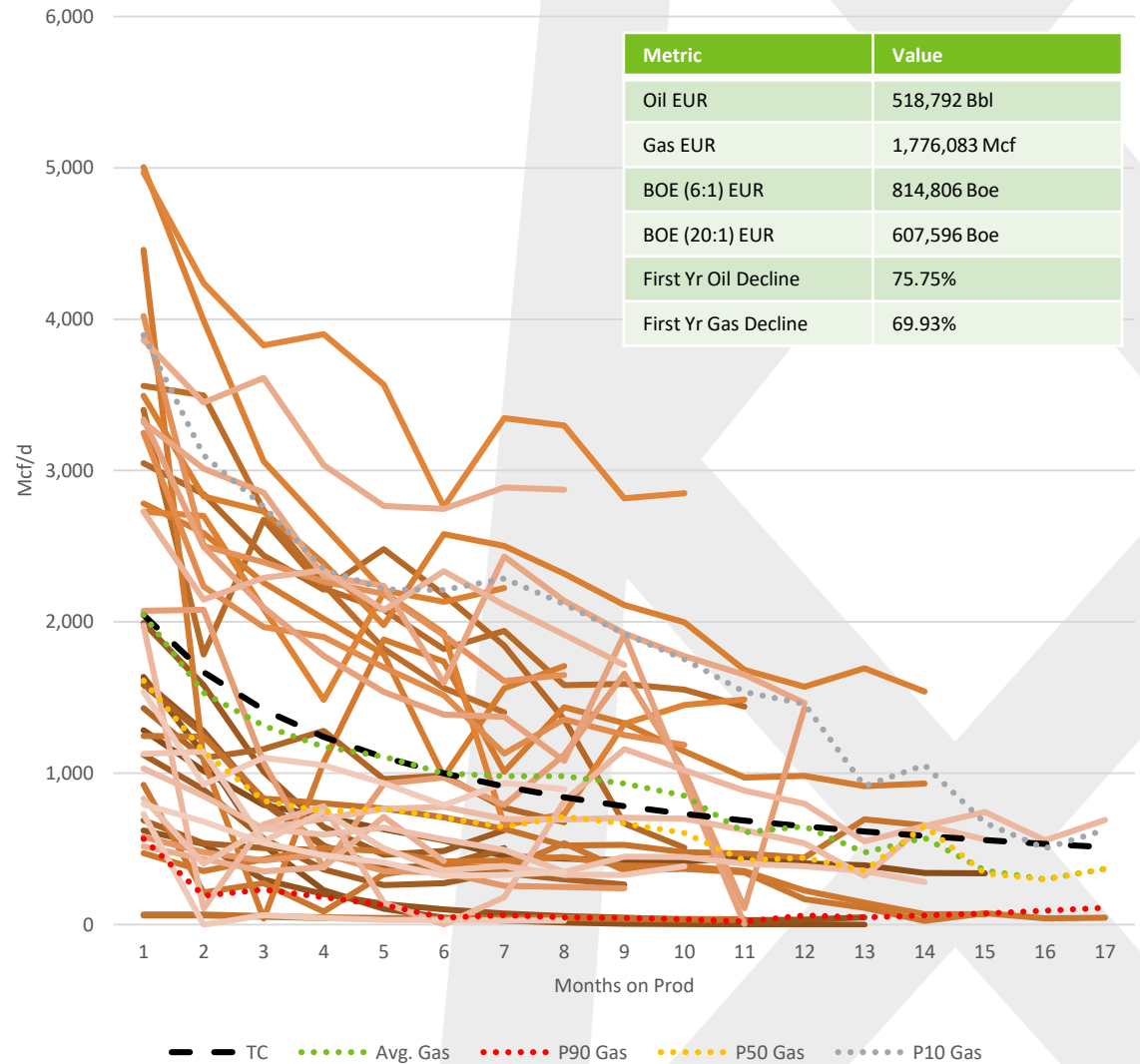
S DW WC CHILD TC NORMALIZED

- The chart on the left shows a plot of all child wells in Ward, Winkler, Pecos, Reeves, & Loving County drilled into the Wolfcamp formations since 2015 with 1,500-2,500 lbs/ft of proppant & 4,500-11,000 ft of perf interval. The productivity of these wells has been normalized to reflect a modern completion of 7,500 ft perf interval (80% effectiveness) & 2,000 lbs/ft of proppant (30% effectiveness).
- The black dashed line is the type curve fit to the average productivity of the gas stream. The red dotted line is P90, yellow P50, & green P10 of the normalized well data set. Child wells produce a ~92 Bbl/ft & ~370 Mcf/ft EURs (~150 Boe/ft). That is 92%, 79%, & 83% of average parent oil, gas, & Boe EURs.
- Child wells have performed poorer than parent wells in the Southern Delaware, but their performance is still relatively better than child wells drilled in the Southern Midland & in other plays like the STACK.
- Due to the parent/child well relationships & infill well interference observed in the Southern Midland, companies like Laredo have had to “up-space” their drilling programs.
- In the STACK, some child wells drilled with tight spacing have yielded as low as 30% of the productivity of parent wells.



S DW WC INFILL TC NORMALIZED

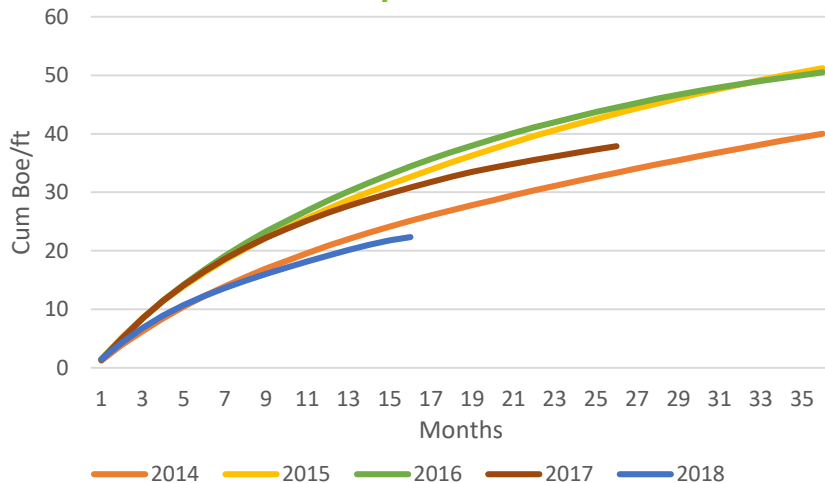
- The chart on the left shows a plot of all wells classified as an infill in Ward, Winkler, Pecos, Reeves, & Loving County drilled into the Wolfcamp formations since 2015 with 1,500-2,500 lbs/ft of proppant & 4,500-11,000 ft of perf interval. The productivity of these wells has been normalized to reflect a modern completion of 7,500 ft perf interval (80% effectiveness) & 2,000 lbs/ft of proppant (30% effectiveness).
- The black dashed line is the type curve fit to the average productivity of the gas stream. The red dotted line is P90, yellow P50, & green P10 of the normalized well data set. Infill wells produce a ~70 Bbl/ft & ~235 Mcf/ft EURs (~110 Boe/ft). That is 70%, 50%, & 61% of average parent oil, gas, & Boe EURs. Also, that is 76%, 64%, & 73% of average child oil, gas, & Boe EURs.
- Infill wells are markedly worse than parent & child wells. This is not a surprise when considering reservoir engineering principles & drainage area.
- It is prudent to note that even the infill wells are producing 800+ Mboe EURs, which could easily compete with recoverables per well in a lesser basin.



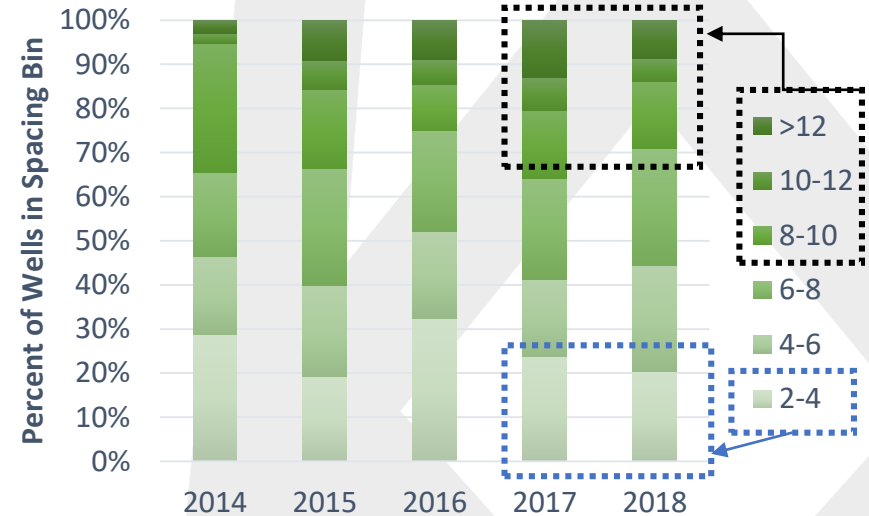
SCOOP/STACK: SPACING TRENDS

- In the SCOOP/STACK, there have been increasing concerns that aggressive down-spacing programs have negatively impacted well productivity.
- While there does appear to be type curve degradation at the play level, operators have consistently been spacing wells at an average of six to seven wells per section prior to any type curve degradation trends.
- The amount of “cube” pad development has been offset by activity expanding out of the core to less-developed regions with much smaller pads, noted on the bar chart; 20-25% of wells are drilled in both the large and small pad bins.
- This equal distribution of well spacing practices illustrates the difference in the operational philosophies and geological variance in the play. Isolated analysis is required to understand spacing impact. Spacing has been consistent across each of the sub-plays, as seen in the graph to the lower right.

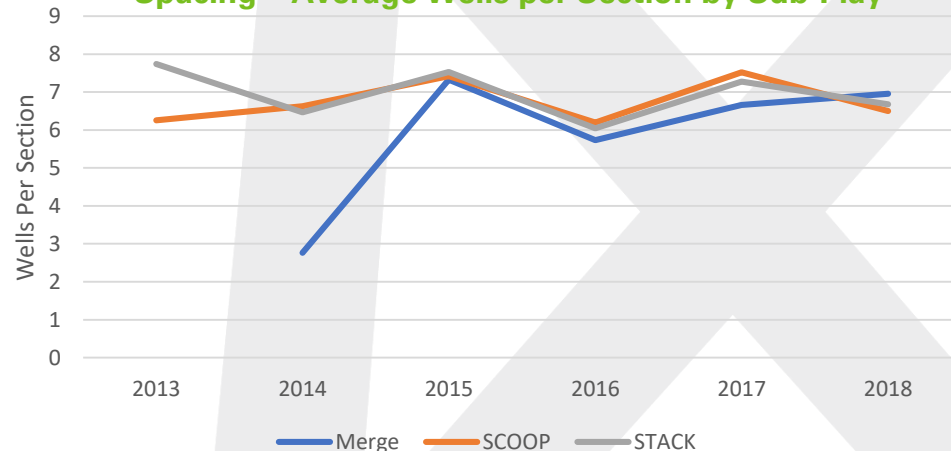
Well Productivity Over Time, Cum Boe/ft



Spacing – Wells per Section Over Time



Spacing – Average Wells per Section by Sub-Play

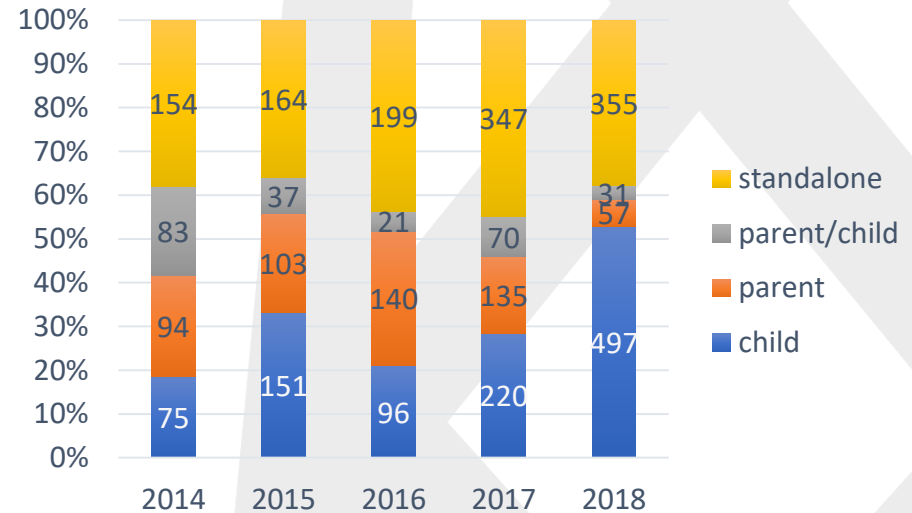


SCOOP/STACK: PARENT/CHILD PRODUCTIVITY

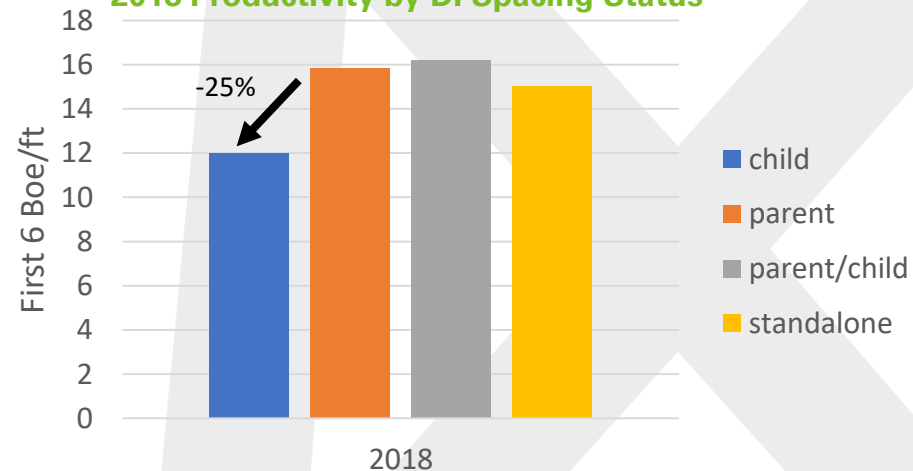
- The other component of analyzing well interference is analyzing parent/child well relationships.
- The number of child wells drilled per year has greatly increased over the past two years, approximately five times the number from 2016 to 2018.
- By isolating wells that were completed in 2018, there is a 25% productivity decrease from parent to child wells.
- The SCOOP/STACK has a handful of emerging regions. Standalone wells (no offset wells in a half-mile radius) have accounted for roughly 40% of new wells drilled since 2016.
- While the wells in the emerging, non-core areas will not have interference issues, an operator may be still be learning best practices in the area.
- Although the performance degradation of the basin may not be all because of well interference & parent/child issues, DI's spacing analysis shows that it is clearly playing a role.

Notes: The spacing status is analyzed for current time, not when the wells were drilled. The "parent/child" status is when a well is a parent to a well or a group of wells and also a child to a well or group of wells.

Count of Parent/Child Wells Over Time



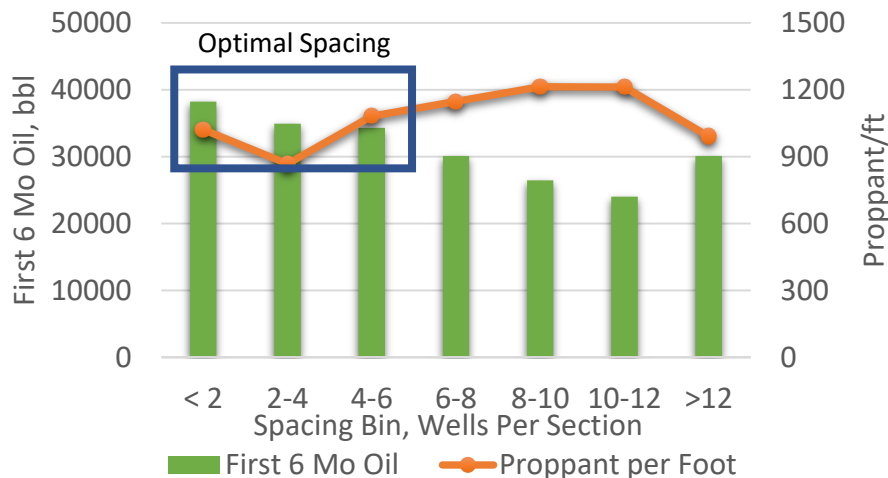
2018 Productivity by DI Spacing Status



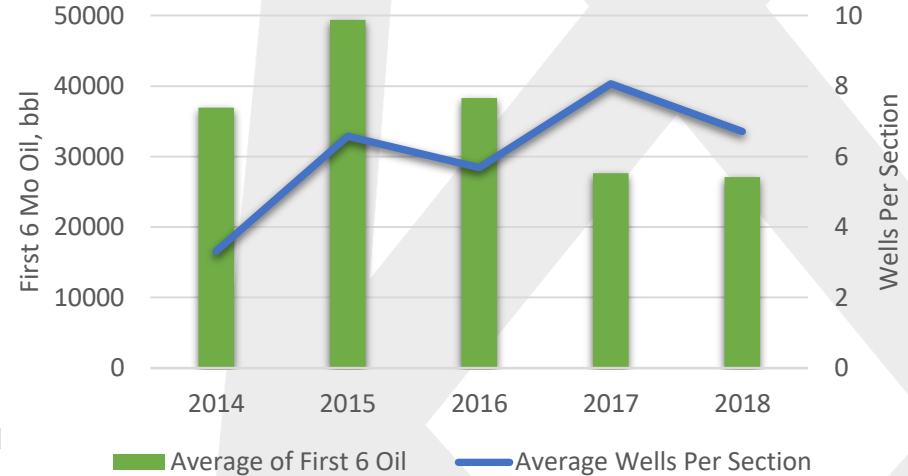
SCOOP/STACK: A CASE STUDY

- This slide analyzes a case study for an operator targeting the Mississippian in the normal-pressured window of the STACK in Kingfisher County.
- The operator increased their well spacing from six to eight wells per section from 2016 to 2017. At the same time, they increased proppant intensity ~40%. This resulted in a ~30% loss in productivity, shown in the graphs on the right.
- Optimal spacing & completion combination appears to be six wells per section, with a frac of 800-1,000 lbs/ft for this operator in the area & formation.
- An aggressive development plan of increasing frac intensity and down-spacing can greatly impact productivity to negative side.

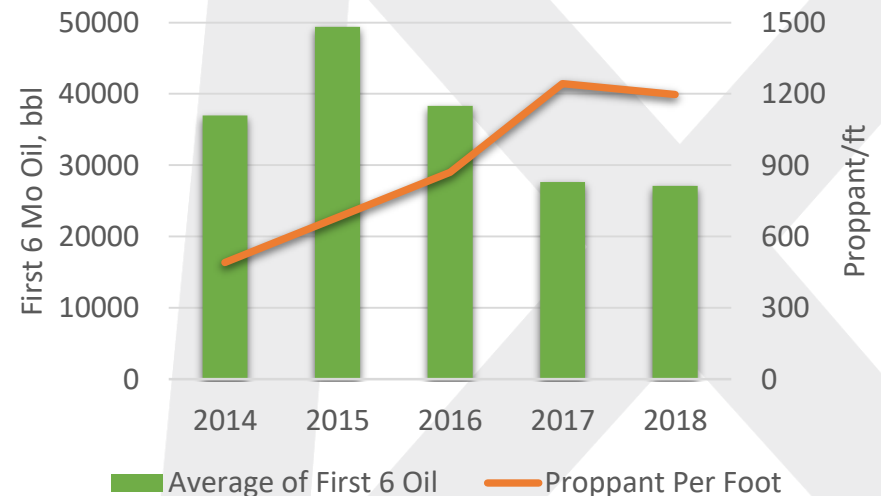
Proppant Intensity vs Productivity by Wells per Section



Wells Per Section vs Productivity



Proppant Intensity vs Productivity by Year

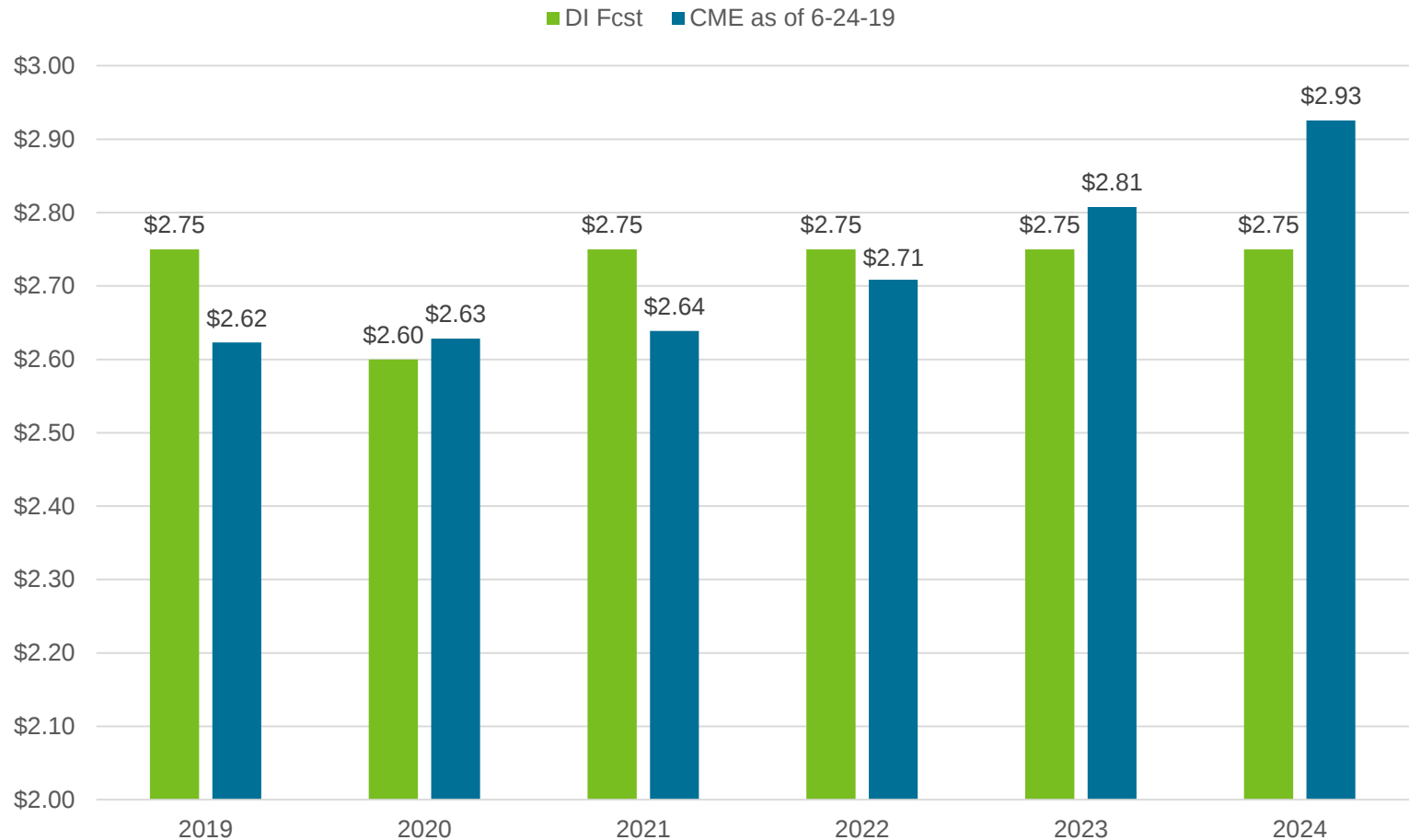


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Natural Gas

DI Natural Gas Five-Year Price Forecast: \$2.60-\$2.75

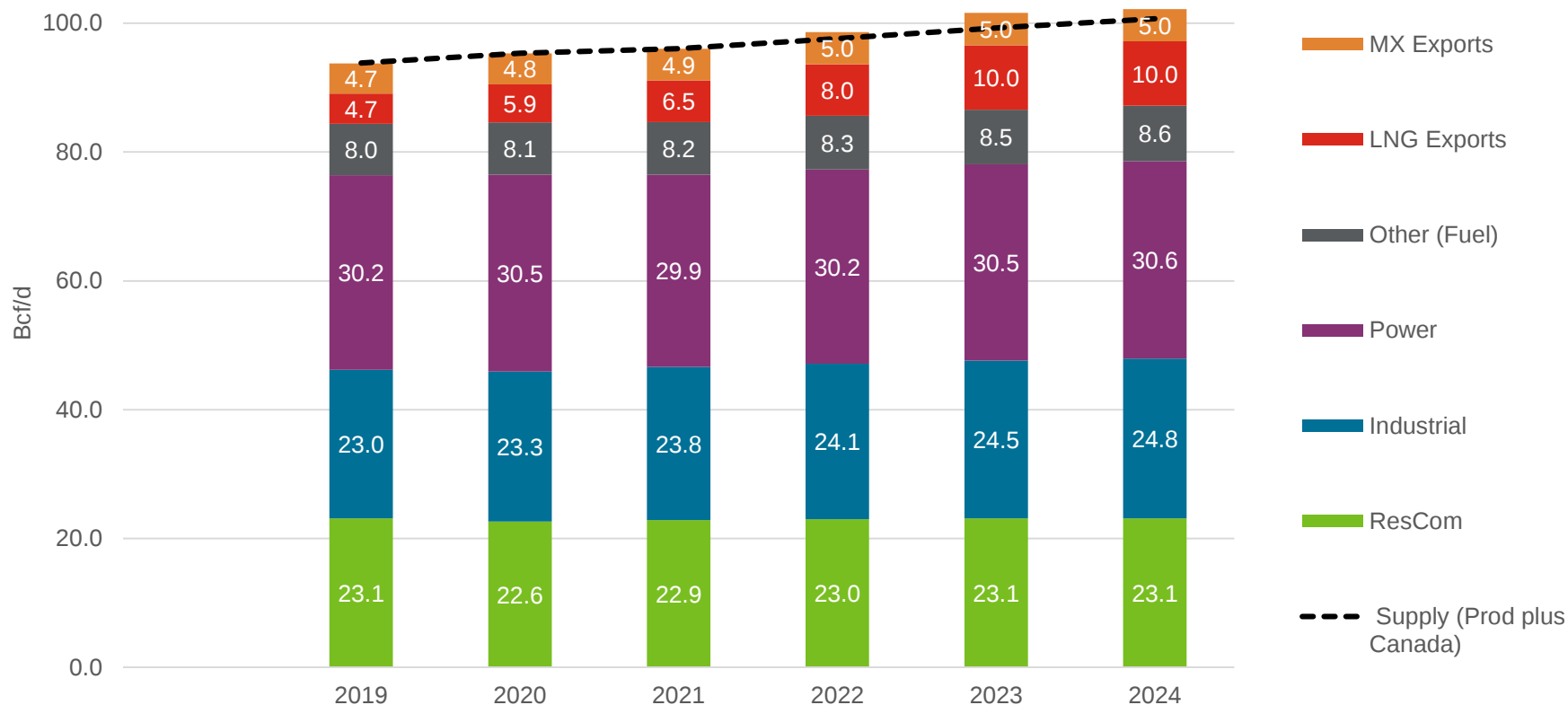
Henry Hub (\$/MMBtu)



Source: CME, DI Analysis

Total Supply and Demand

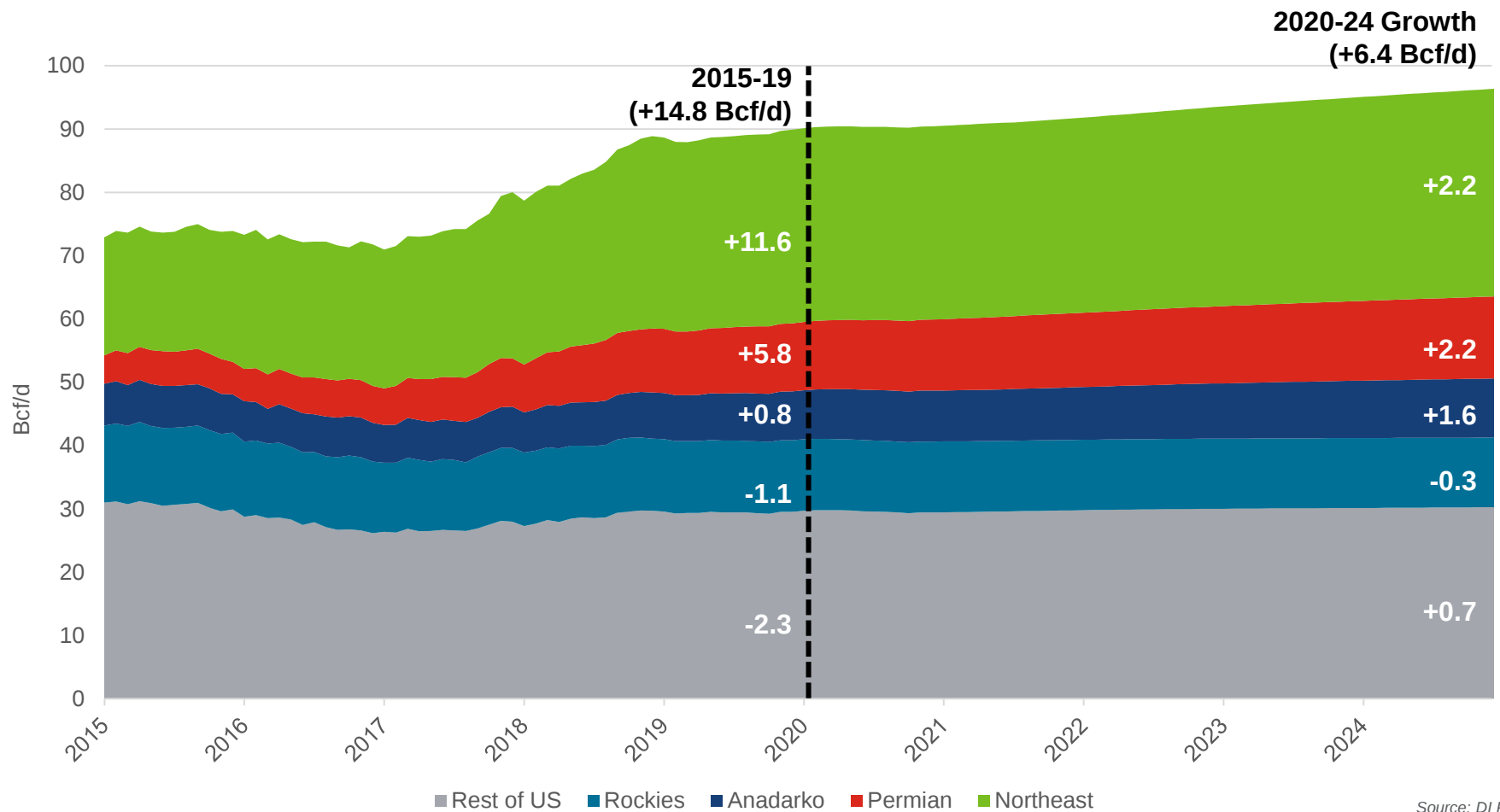
Natural Gas Five-Year Outlook



Source: DI ProCast, DI Analysis

Dry Gas Production Outlook

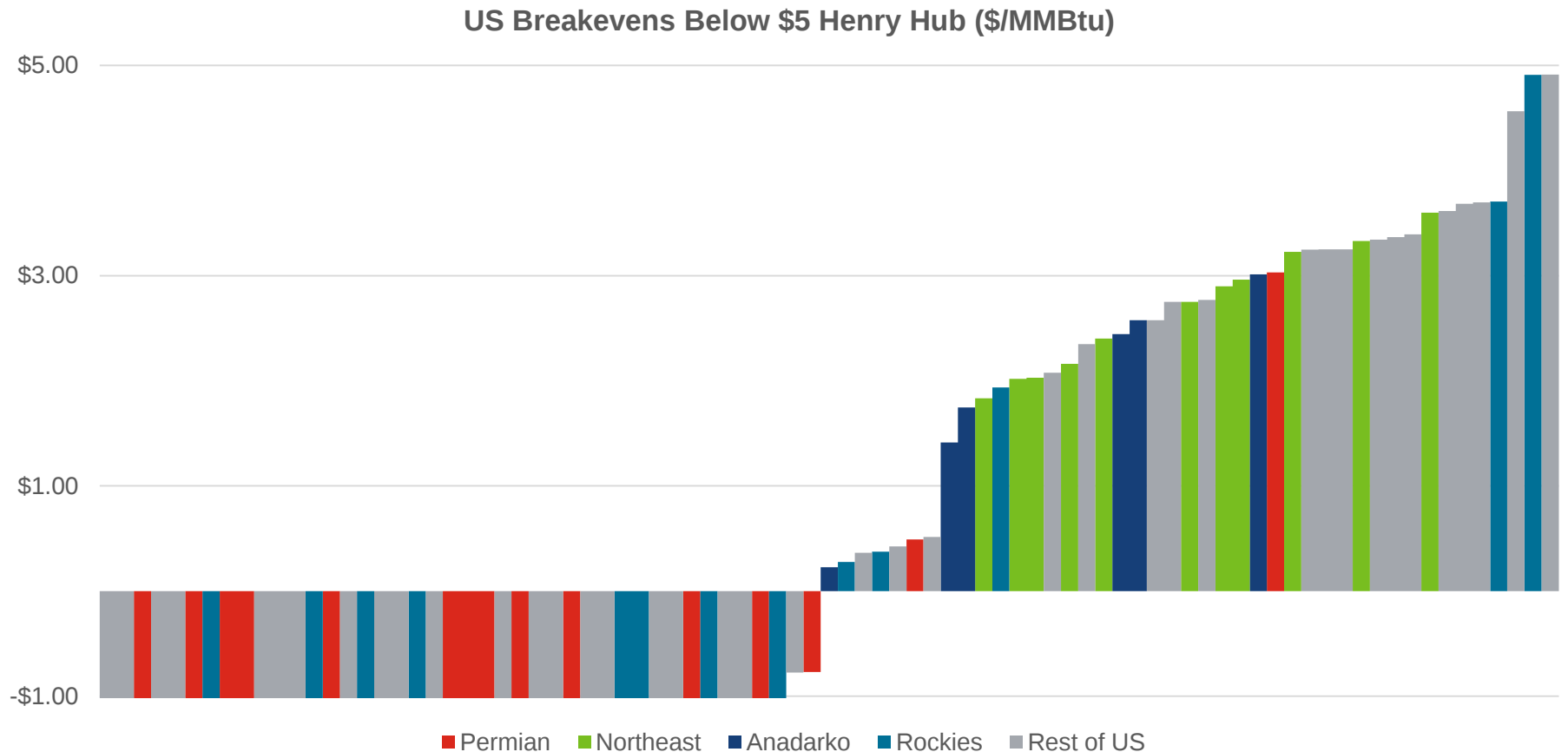
Five-Year Gas Production Forecast by Region



Source: DI ProdCast

US Breakevens – Associated Gas Dominates

US Natural Gas Breakevens

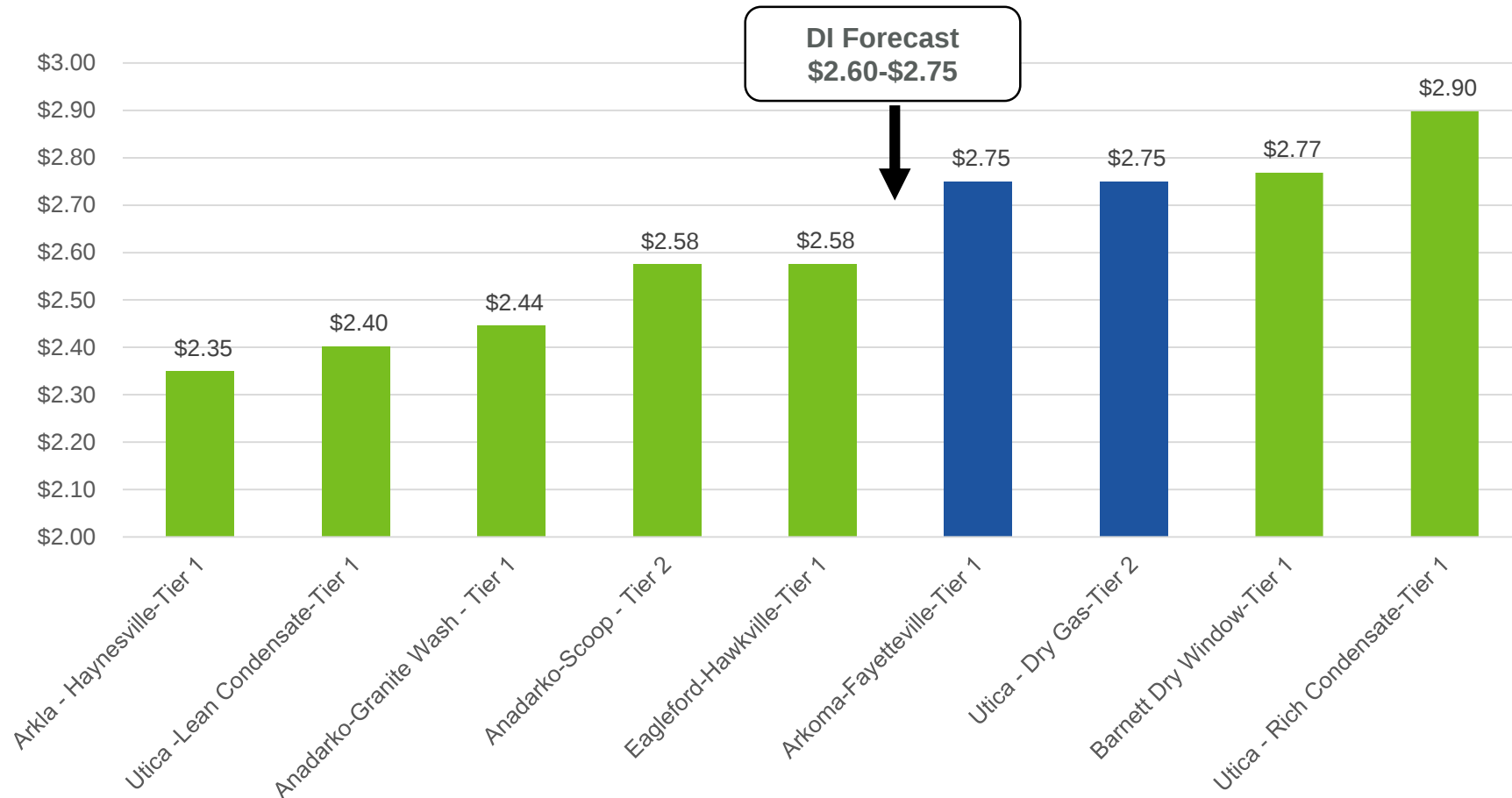


Source: DI Prodcast

Key Gas Breakeven Thresholds

Key Gas Breakeven Thresholds

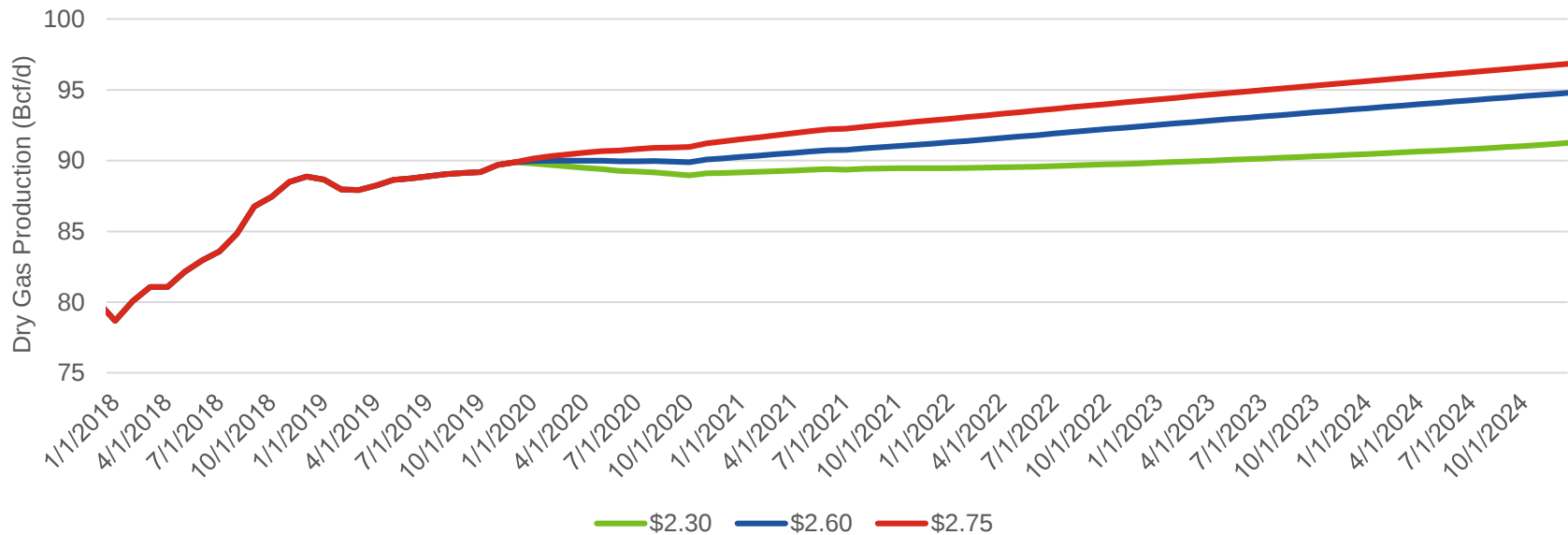
HH Breakeven (\$/MMBtu) @ 12.5% MARR & \$60/Bbl WTI



Source: DI Prodcast

Dry Gas Production Sensitivity to Prices

Dry Gas Production – Gas Price Scenarios (Assumes WTI = \$55/Bbl)



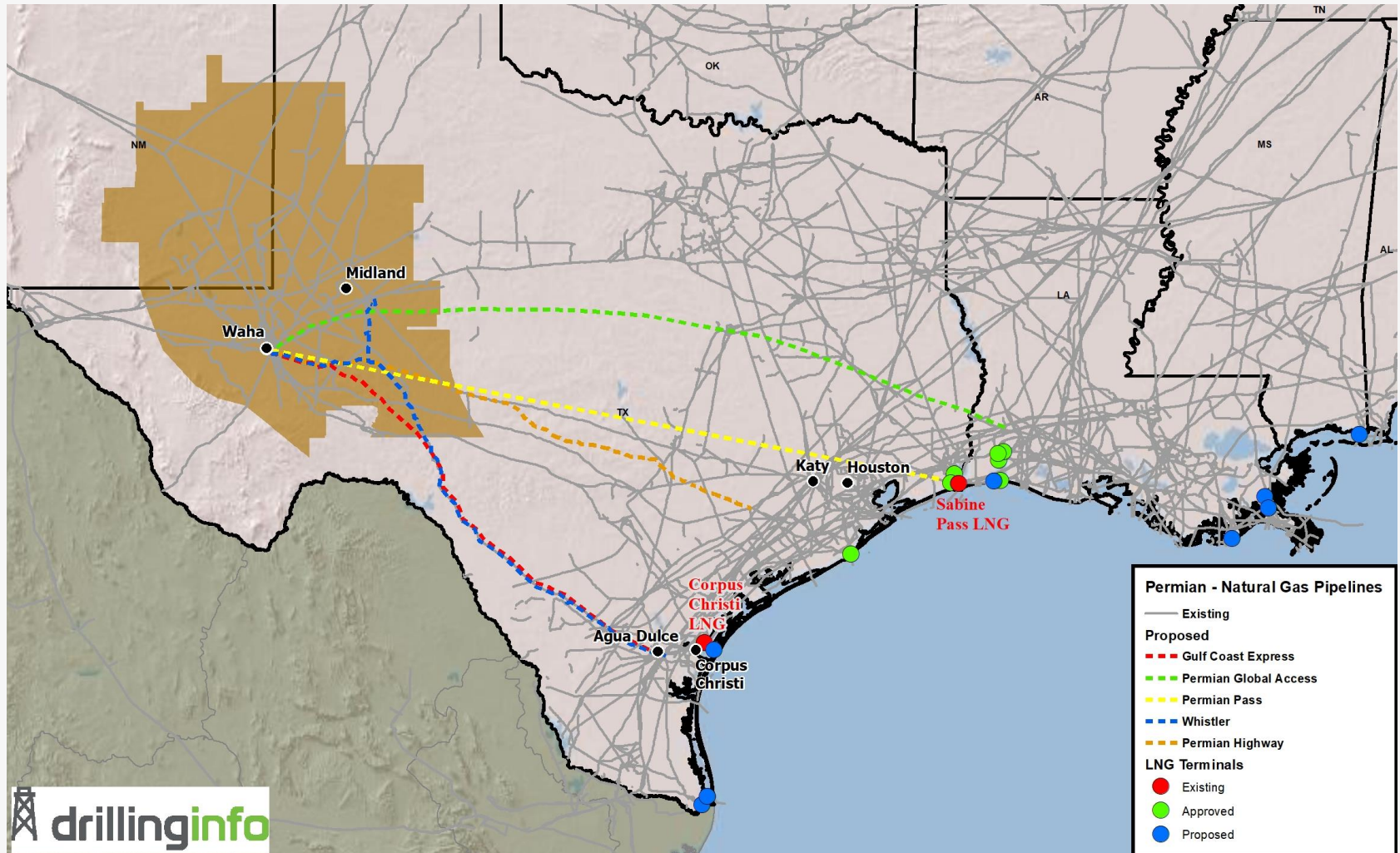
Gas Price Scenario	Base Date = 12/1/2019	vs. 12/1/2020	vs. 12/1/2024
\$2.30	89.7	89.1 (-0.60)	91.1 (+2.02)
\$2.60	89.7	90.1 (+0.40)	94.6 (+4.6)
\$2.75	89.7	91.2 (+1.53)	96.7 (+5.5)

Source: DI ProCast

Natural Gas Infrastructure Map

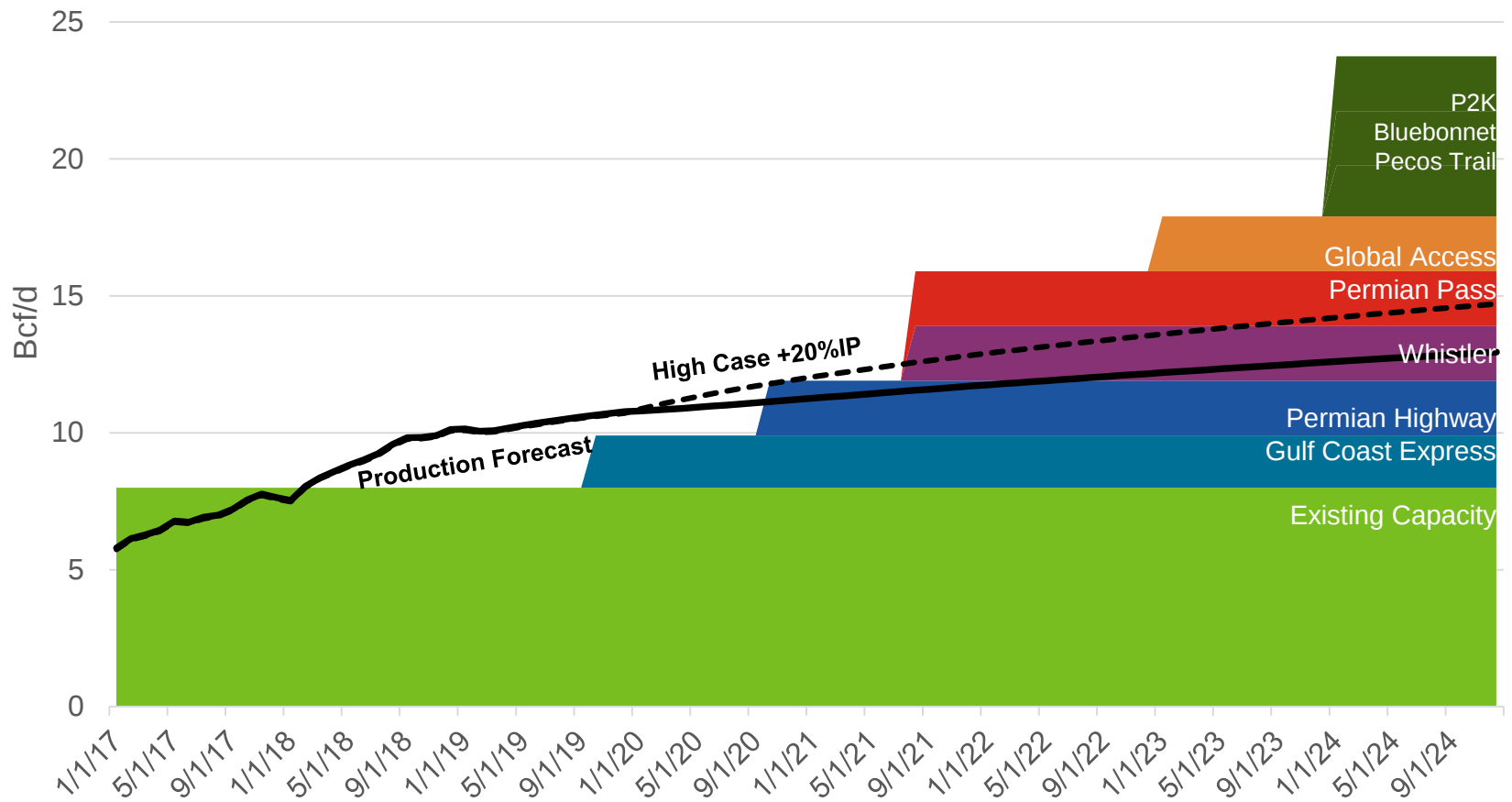
IMAGE 5

Permian to Gulf Coast Infrastructure Map



Permian Gas Production Constraints to Remain

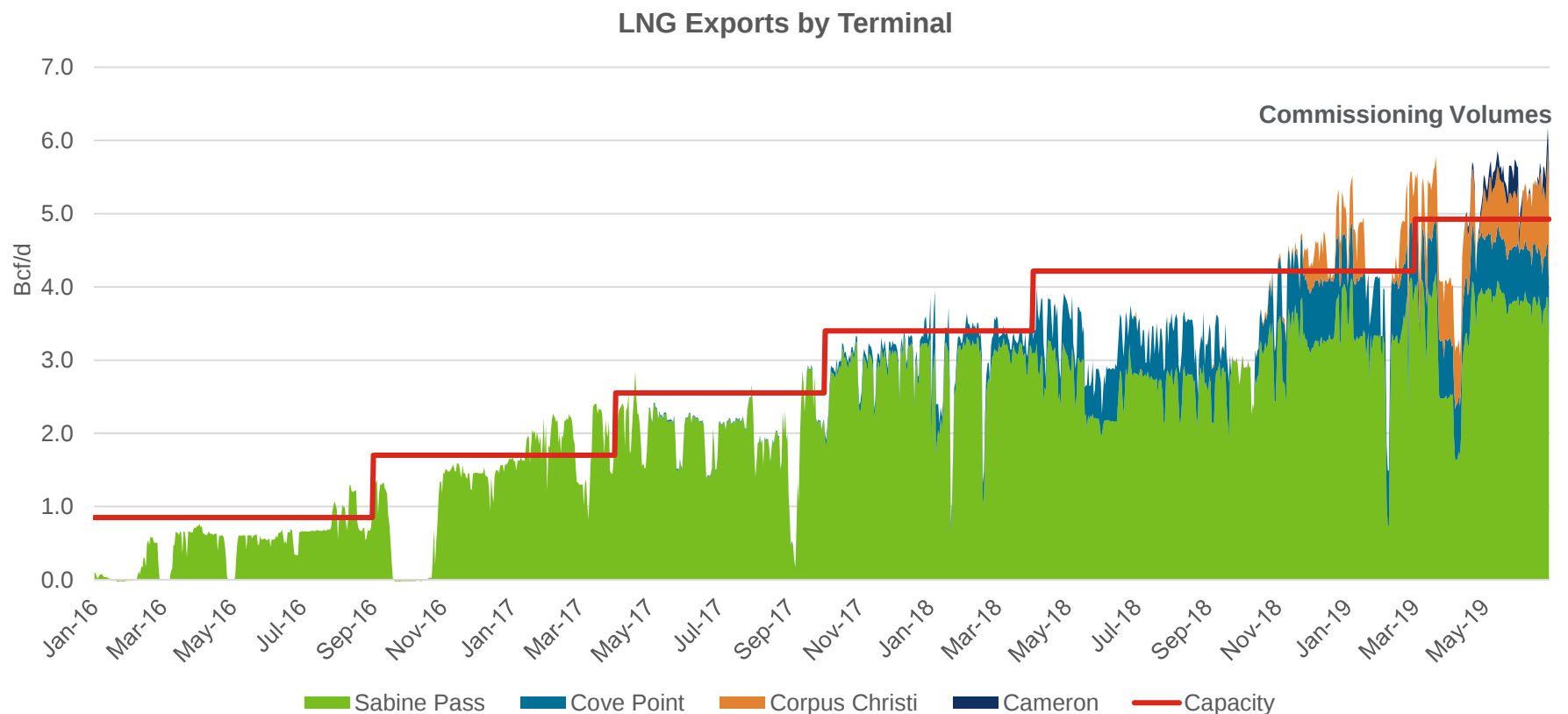
Permian Gas Production vs. Takeaway



Source: DI ProdCast, DI Analysis

LNG Exports Growing at Unprecedented Rate

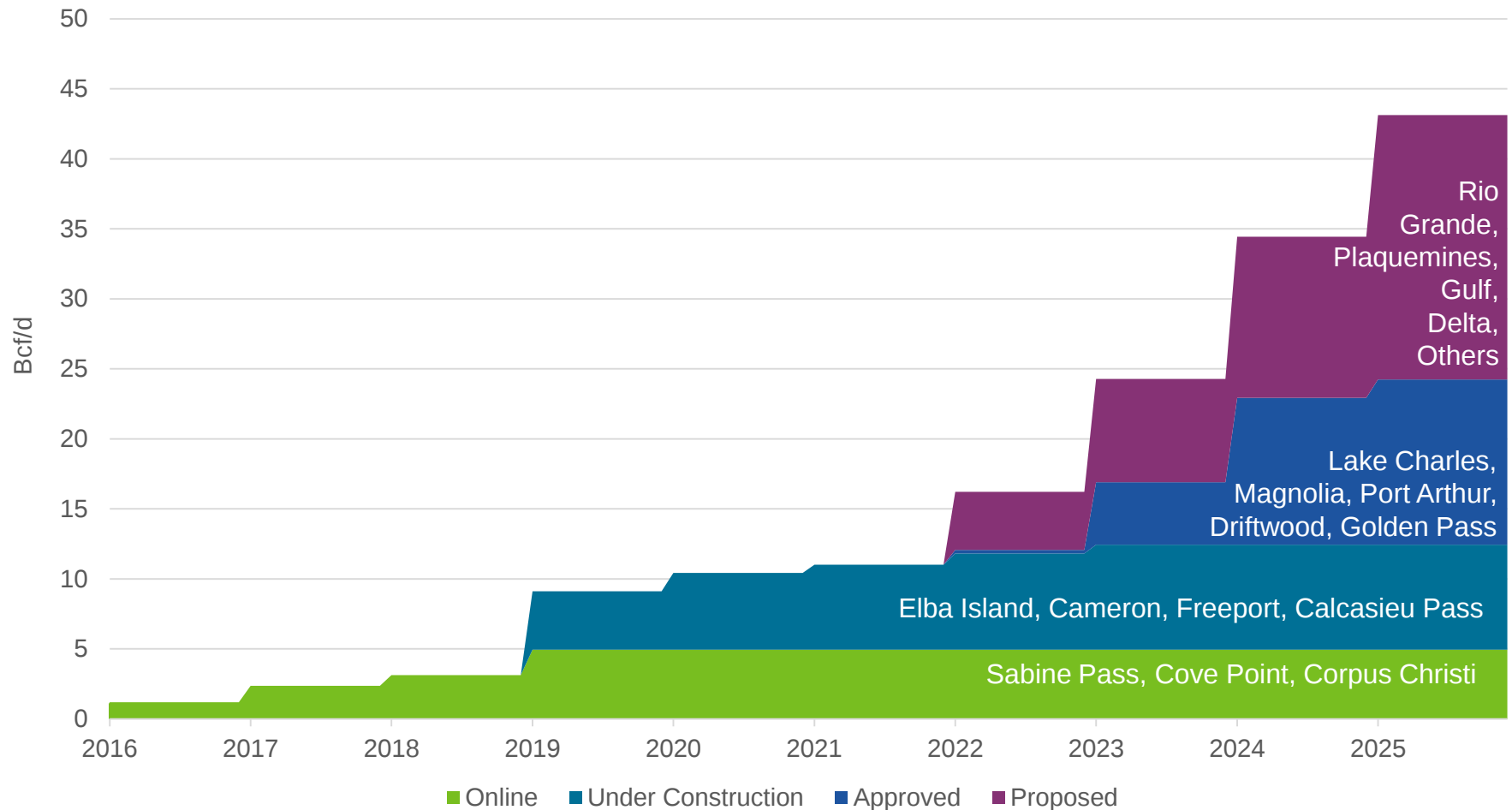
Historical LNG Exports



Source: Bloomberg

96% of US LNG Export Capacity Located in the Gulf Coast

All Proposed LNG Liquefaction Terminals

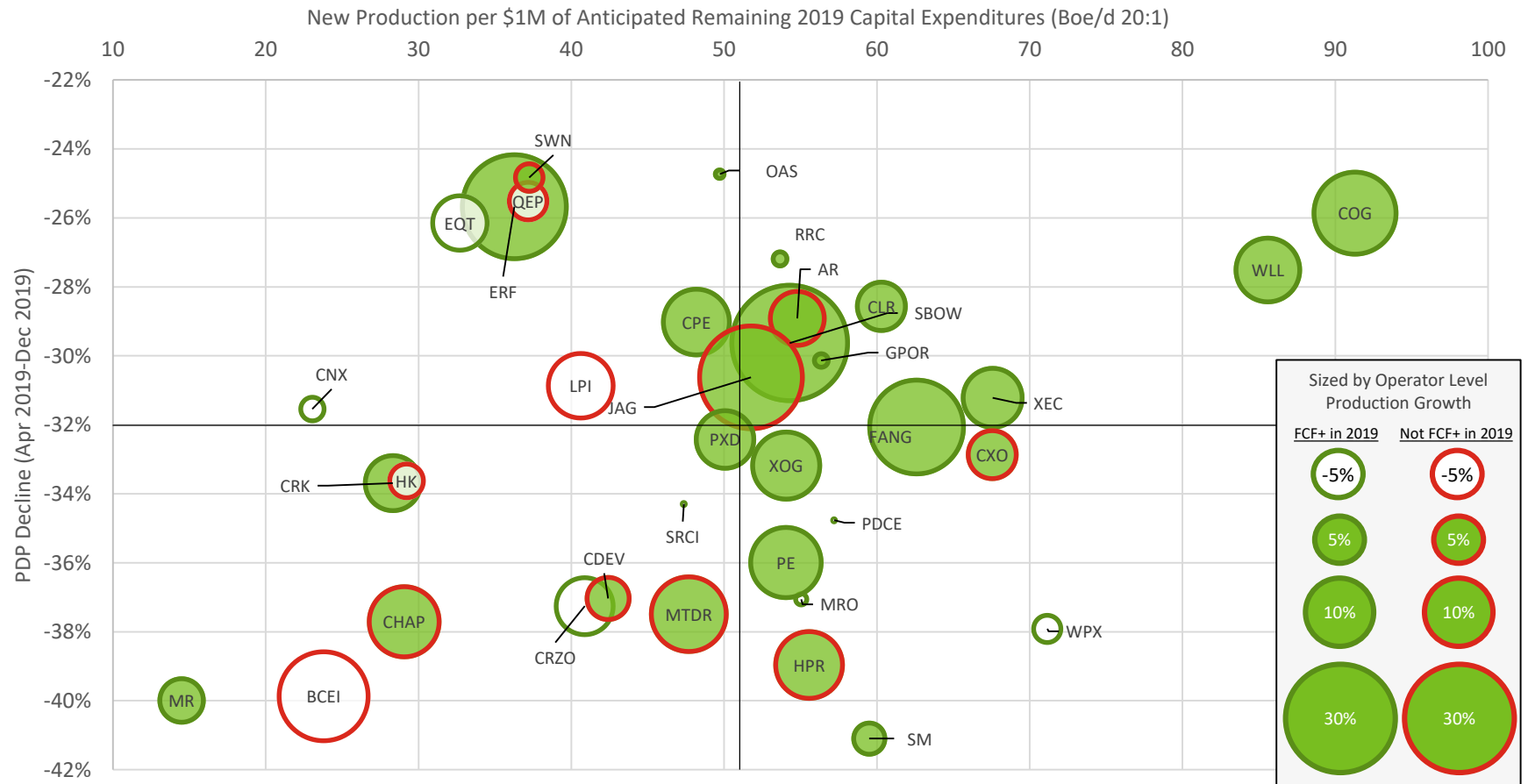


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Q1'19 Financial Update

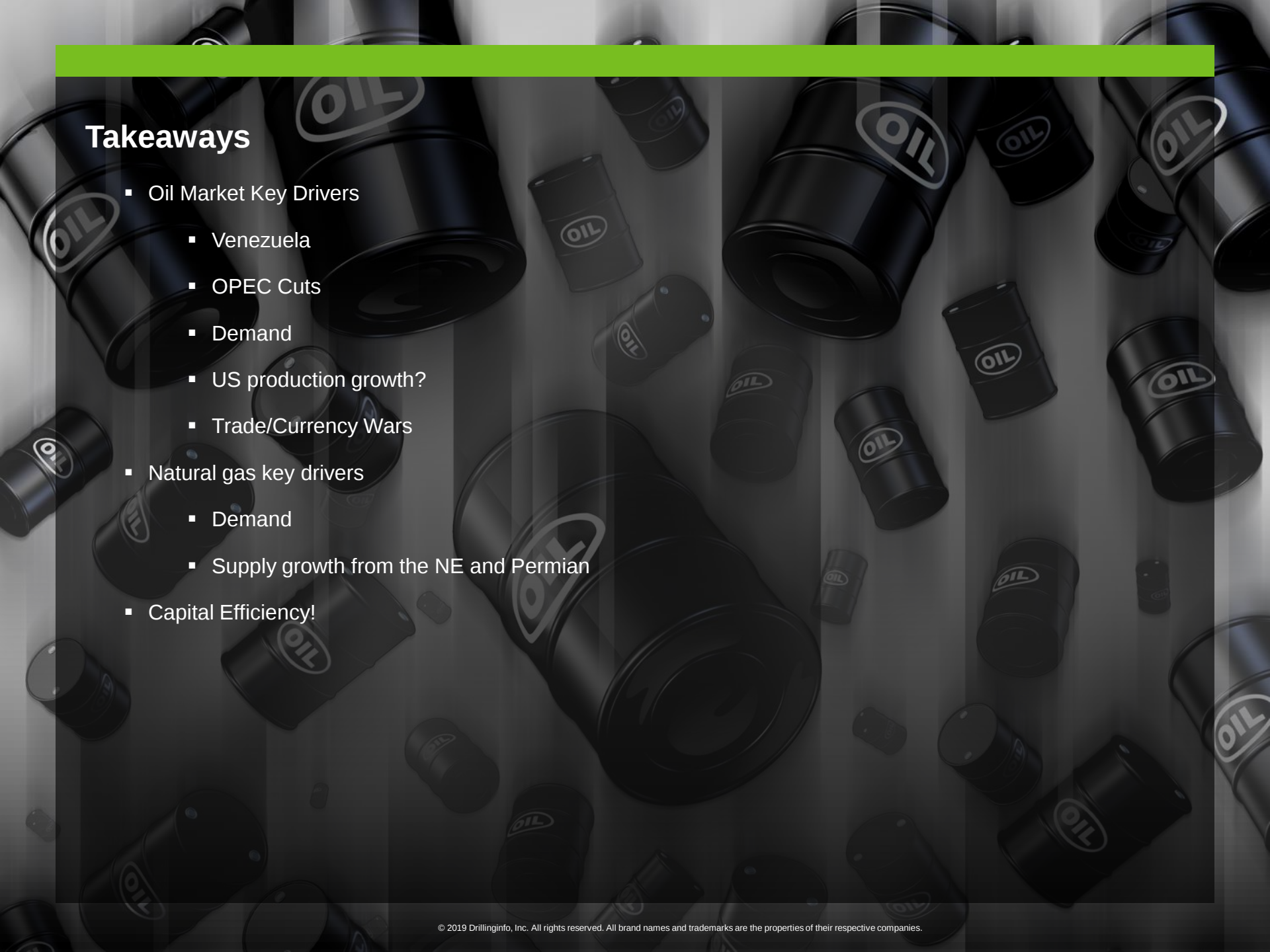
Capital Efficiency

Production Decline Relative to Consensus Capital for the Balance of 2019*



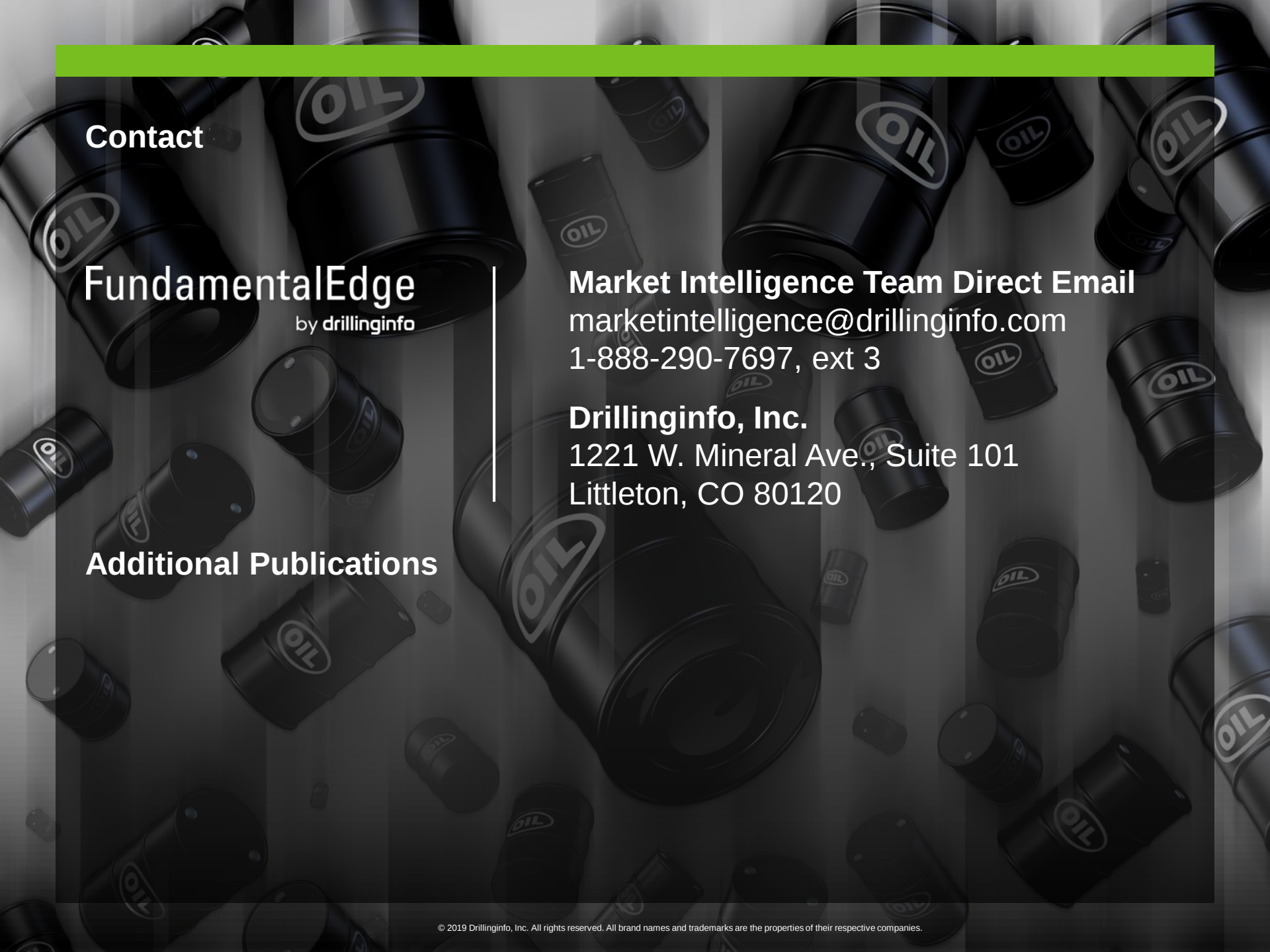
Source: Bloomberg, Company Filings, DI Research

*From April 2019 to December 2019, sized by overall production growth, forecasted production and decline volumes are gross operated from major US basins only.



Takeaways

- Oil Market Key Drivers
 - Venezuela
 - OPEC Cuts
 - Demand
 - US production growth?
 - Trade/Currency Wars
- Natural gas key drivers
 - Demand
 - Supply growth from the NE and Permian
- Capital Efficiency!



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