CORNERSTONE MACRO

Economics, Policy, Strategy & Technicals

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PERMIAN – MASSIVE POTENTIAL, INFRASTRUCTURE COMMITMENTS NEEDED SOON

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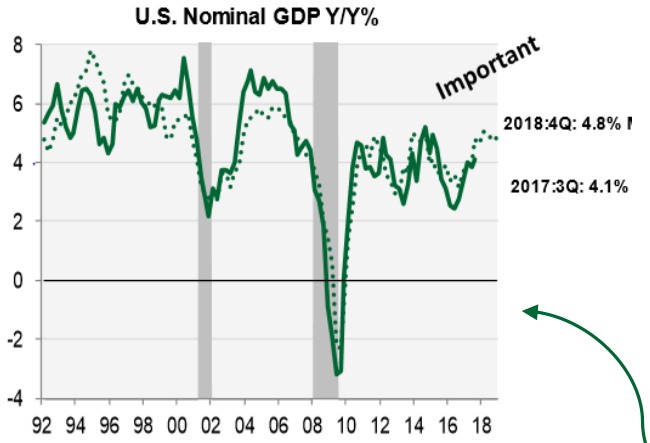
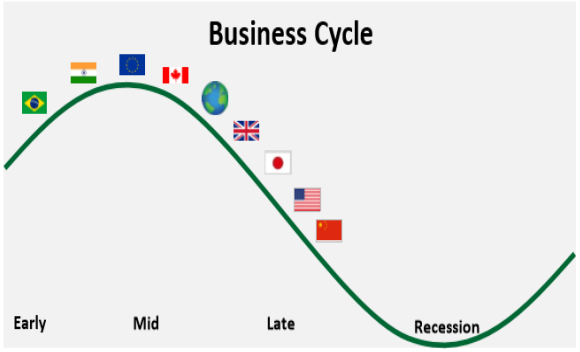
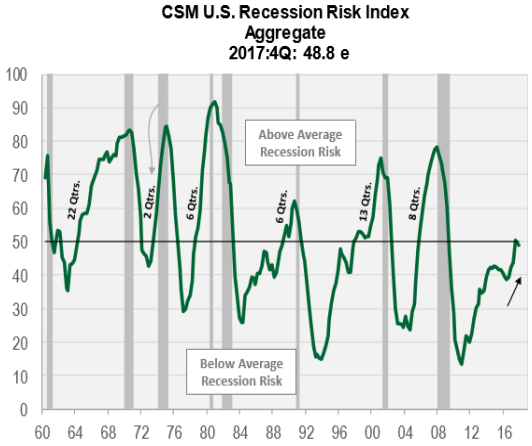
IT'S THE ECONOMY, WHY START HERE – A LATE CYCLE SPURT



In our central oil and gas forecast scenarios, global GDP growth accelerates modestly though NOT in a 'Synchronized' way. We see fewer headwinds with key economies hugging different phases of their business cycles.

Out of Sync in 2018, from Nancy Lazar's Global Eco Outlook link





In the US

- Nominal GDP accelerates next year;
- While a recession is unlikely until 2020

Fears on China recede

- We expect decelerating growth … and stability

A late cycle spurt, keeps the pressure on Permian pumpers

Source: CSM Economics Team

RISING CALL ON AMERICAN SHALE: $60 WTI ROUGHLY BALANCES

$60 WTI; $2.85 HH	Levels (Mb/d)			Y/Y Growth (kb/d)		
	2017	2018	2019	2017	2018	2019
Call on Shale (crude + NGLs)*		10.2	11.2		**1,580**	**950**
Supply	97.8	99.8	102.1	110	1,970	2,310
Shale (crude+NGLs)	8.7	10.0	11.1	570	**1,370**	**1,080**
Mideast Opec crude	24.6	25.2	26.3	-360	590	1,090
Libya crude	0.8	1.1	1.3	450	310	160
Nigeria crude	1.5	1.8	1.9	90	210	100
Venezuela crude	2.1	1.7	1.6	-270	-370	-120
Other Opec crude	3.6	3.5	3.3	-250	-150	-130
Opec NGLs	6.6	6.7	6.8	-110	60	80
Non-Opec ex Shale	49.8	49.8	49.9	-10	-50	60
Russia crude	11.0	11.0	11.3	10	-10	310
Demand	98.6	100.3	101.9	1,620	1,690	1,560
OECD	47.4	48.0	48.5	460	590	500
US	19.9	20.3	20.5	200	390	240
Other OECD	27.5	27.7	27.9	260	200	260
Non-OECD	51.3	52.4	53.4	1,160	1,100	1,060
China	12.8	13.2	13.5	540	390	320
India	4.6	4.8	5.1	70	230	260
Other EM Asia	9.0	9.2	9.4	270	210	210
Mideast	9.4	9.5	9.5	-10	60	40
LatAm	6.9	7.0	7.1	130	110	120
Other Non-OECD	8.6	8.7	8.8	160	100	110

$60 WTI; $2.85 HH	End Year Level (million barrels)			Y/Y Change (kb/d)		
	2017	2018	2019	2017	2018	2019
Inventory	7,551	7,405	7,529	-250	-400	340
Surplus Inventory**	176	-78	-110	-910	-700	-90

*Sets surplus inventory to 0 for end 2018 and end 2019.

**Based on commercial inventory demand cover relative to 2010-2014 average.

There is plenty of room for shale to grow, assuming:

1. **Oil demand stays on track**
2. **Opec + Russia maintain the production agreement through Q3 2017** (or there about)

The table to the left shows the bigger moving parts of our global oil supply/demand balances, and how they fit together to leave room for US producers to balance the market at ~$60/b WTI. That is to say, how, **at ~$60/b WTI, our modeled shale growth roughly matches the "Call on Shale"**.

- We wrap up the Opec et al. agreement at the end of Q3 2017, when we expect nominal OECD inventories will cross below their trailing five year average (a stated Opec target).

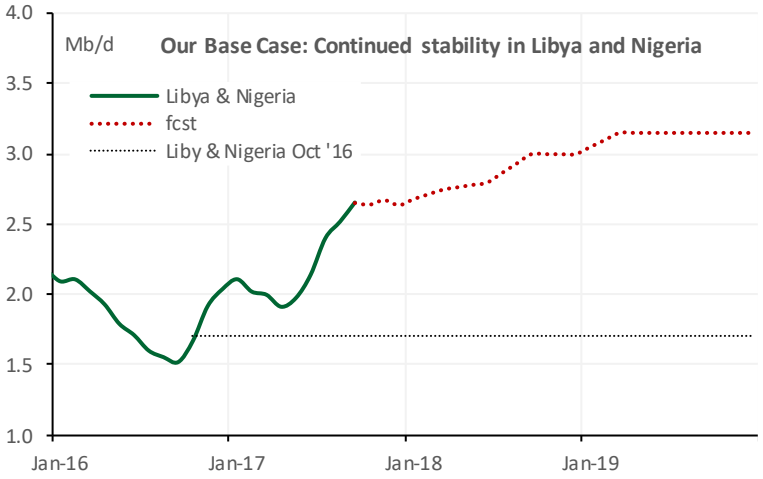
Aside from supply projections for Mideast Opec and Russia, the other key pieces of the balance are the pace of inventory draws, steady demand growth, and relative stability in Libya, Nigeria, and Venezuela (which declines but does not implode).

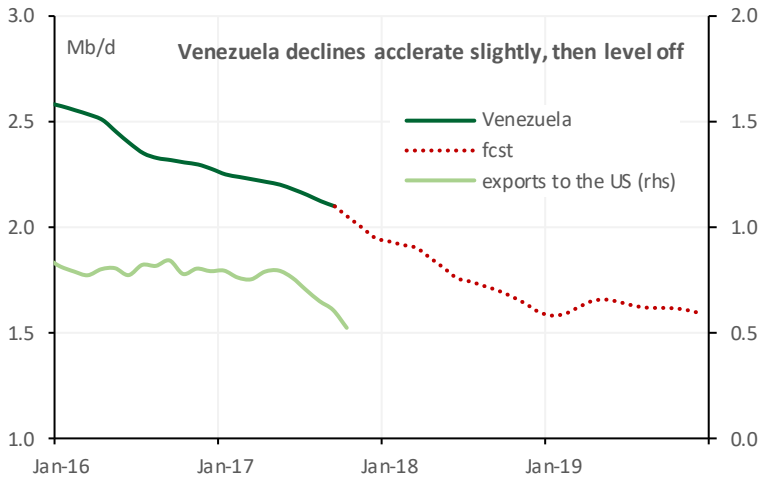
- For the "Call on Shale", we assume inventories decline to the ~2010-2014 average demand cover. Different metrics for "surplus inventory" could lead to slightly more or less room for shale, and this metric errs on the conservative side.

This leaves room for shale crude oil and NGLs to grow ~1.26 M/b per annum the next two years (annual average, not Q4/Q4). We model ~1.23 Mb/d of annual average growth per annum at $60/b WTI, just a hair below the "call".

Source: IEA, JODI, BP, Rystad Energy, Petrologistics, HPDI, EIA, Company Estimates, Country Data, The BLOOMBERG PROFESSIONAL™ Service, CSM Research

GLOBAL OIL SUPPLY RISKS RISING



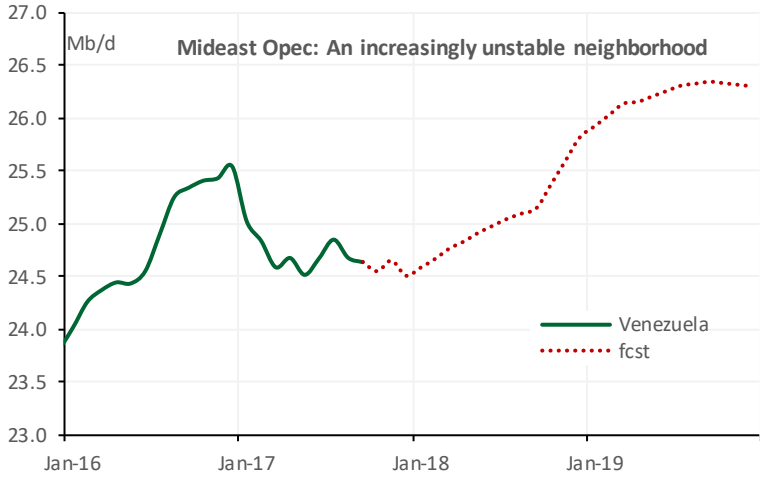


We do not project any major supply disruptions in our central scenario, leaving upside to our price outlook if something big falls over. And risks are rising, with tensions flaring up in the Mideast and Nigeria, Libya in a precarious political position, and the clock ticking on Venezuela.

Reports of Venezuelan crude contaminated with water and falling exports to the US (which pays in cash, not debt forgiveness) are two red flags indicating that production/processing in Venezuela may be hitting some roadblocks. We accelerate declines in our central scenario, before leveling off in 2019 – but clearly there is risk of a larger disruption and we continue to monitor the situation.

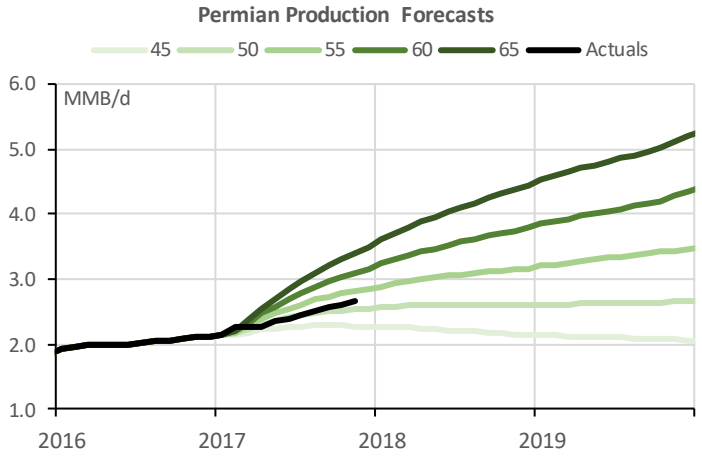
Meanwhile unrest in Nigeria is one again threating to take supply offline and conflicts across the Mideast appear to be intensifying.

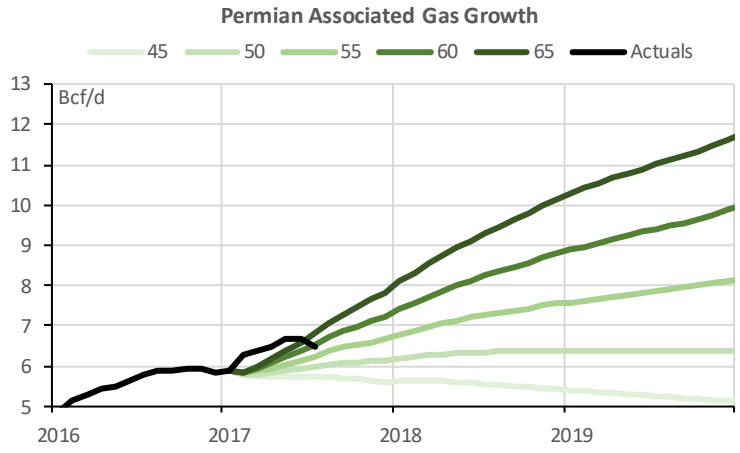
Steady growth through 2018-2019 may be a lot to ask, and still depends more on above ground issues than field capacity.

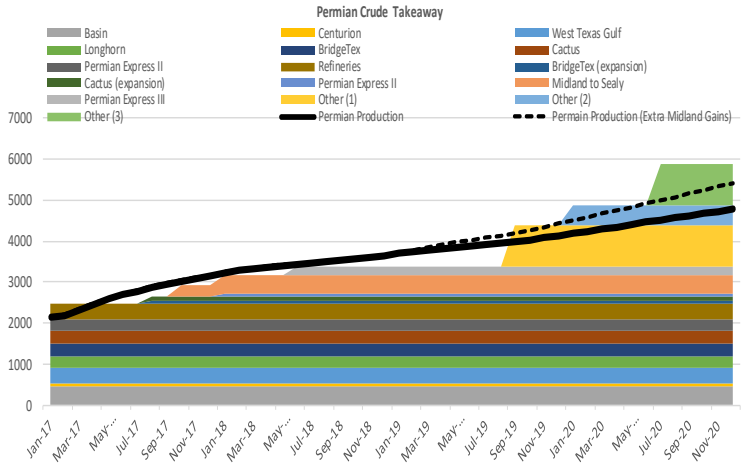


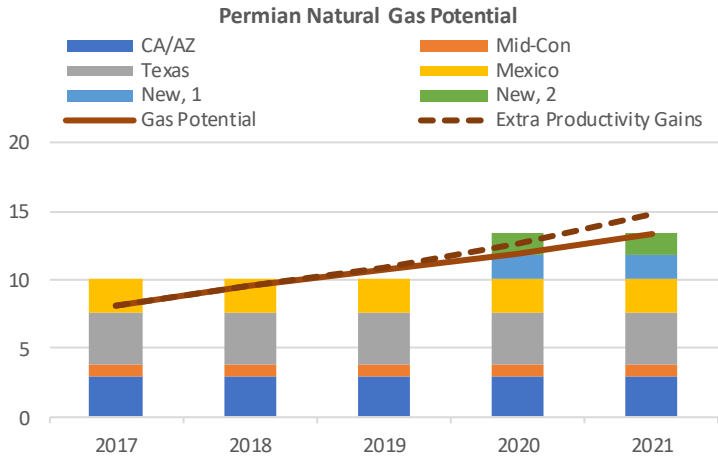
Source: IEA, JODI, BP, Rystad Energy, Petrologistics, CSM Research

PERMIAN OFFERS SIGNIFICANT POTENTIAL IF THERE IS TAKEAWAY









Source: HPDI, PXD, EPD, CSM Research

2018-'19 CONSTRAINTS ON SHALE RAISE OIL PRICE-SPIKE RISK

What if:
- Global oil demand growth accelerates more;
- while Nopexus underperforms and Opec restraint extends

Then:
Call on US shale would exceed infra-structure constraints by a wider margin

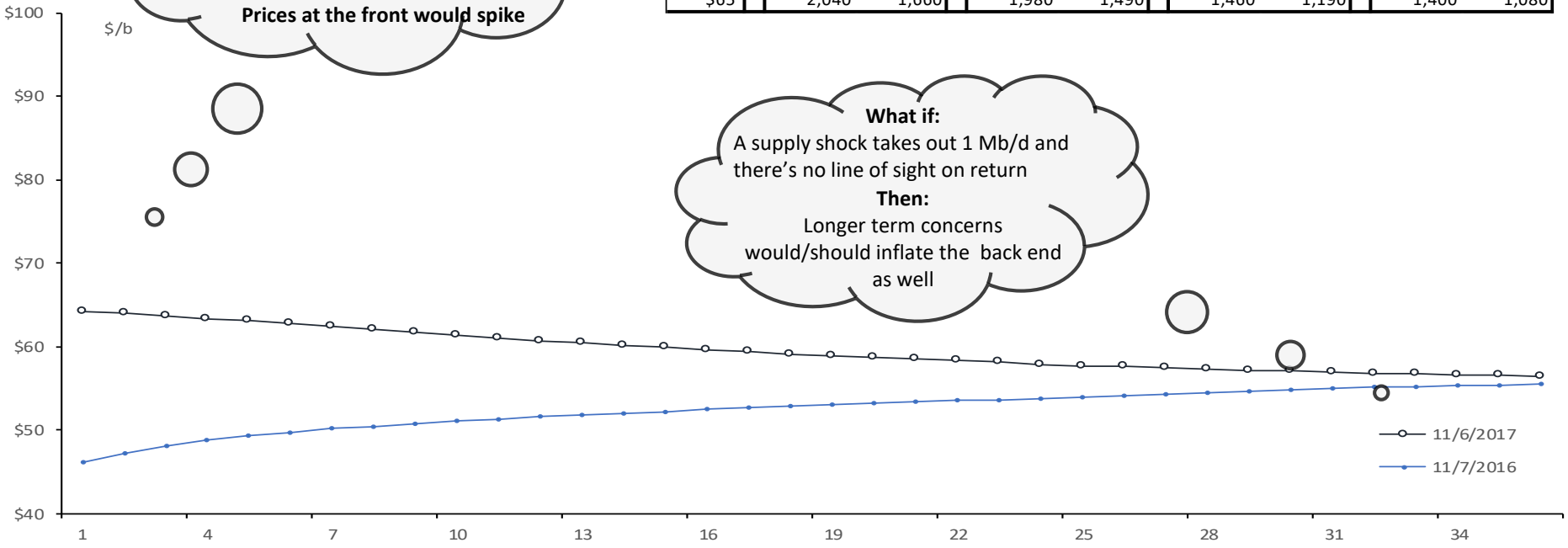
Prices at the front would spike

The model says: Price sensitivity of US shale should be a 'soft' price cap …

Price Scenario	Shale Crude + NGLs				Shale Crude			
	Y/Y Growth (kb/d)		Q4/Q4 Growth (kb/d)		Y/Y Growth (kb/d)		Q4/Q4 Growth (kb/d)	
WTI	2018	2019	2018	2019	2018	2019	2018	2019
$45	-310	-360	-410	-280	-330	-380	-440	-300
$50	150	70	10	60	40	-40	-110	-10
$55	760	530	620	560	510	330	360	380
$60	**1,370**	**1,080**	**1,300**	**1,080**	**960**	**770**	**890**	**770**
$65	2,040	1,660	1,980	1,490	1,460	1,190	1,400	1,080

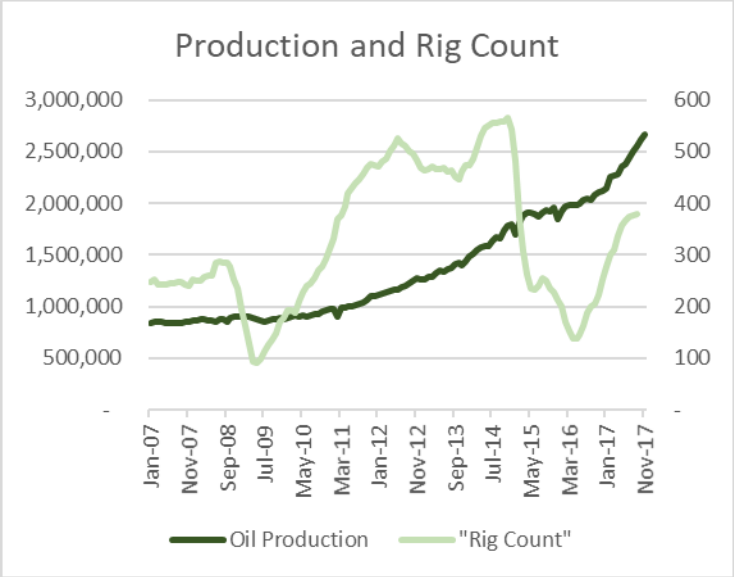
What if:
A supply shock takes out 1 Mb/d and there's no line of sight on return

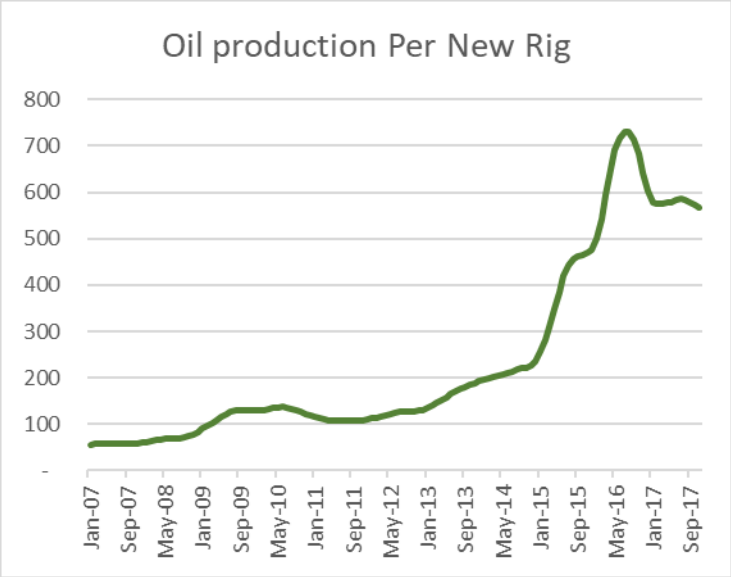
Then:
Longer term concerns would/should inflate the back end as well



Source: HPDI, EIA, Company Estimates, The BLOOMBERG PROFESSIONAL™ Service, CSM Research

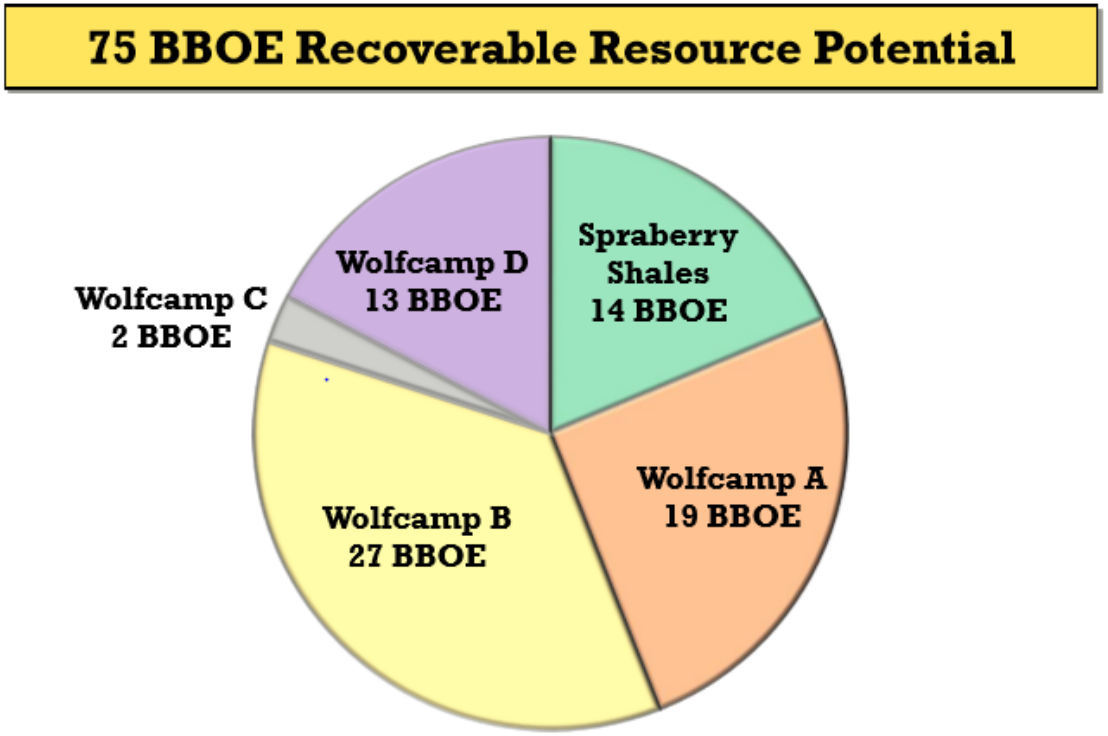
PERMIAN : PRODUCTION PER RIG SHARPLY HIGHER, THOUGH A DIP IN RECENT EIA DPR





Source : EIA

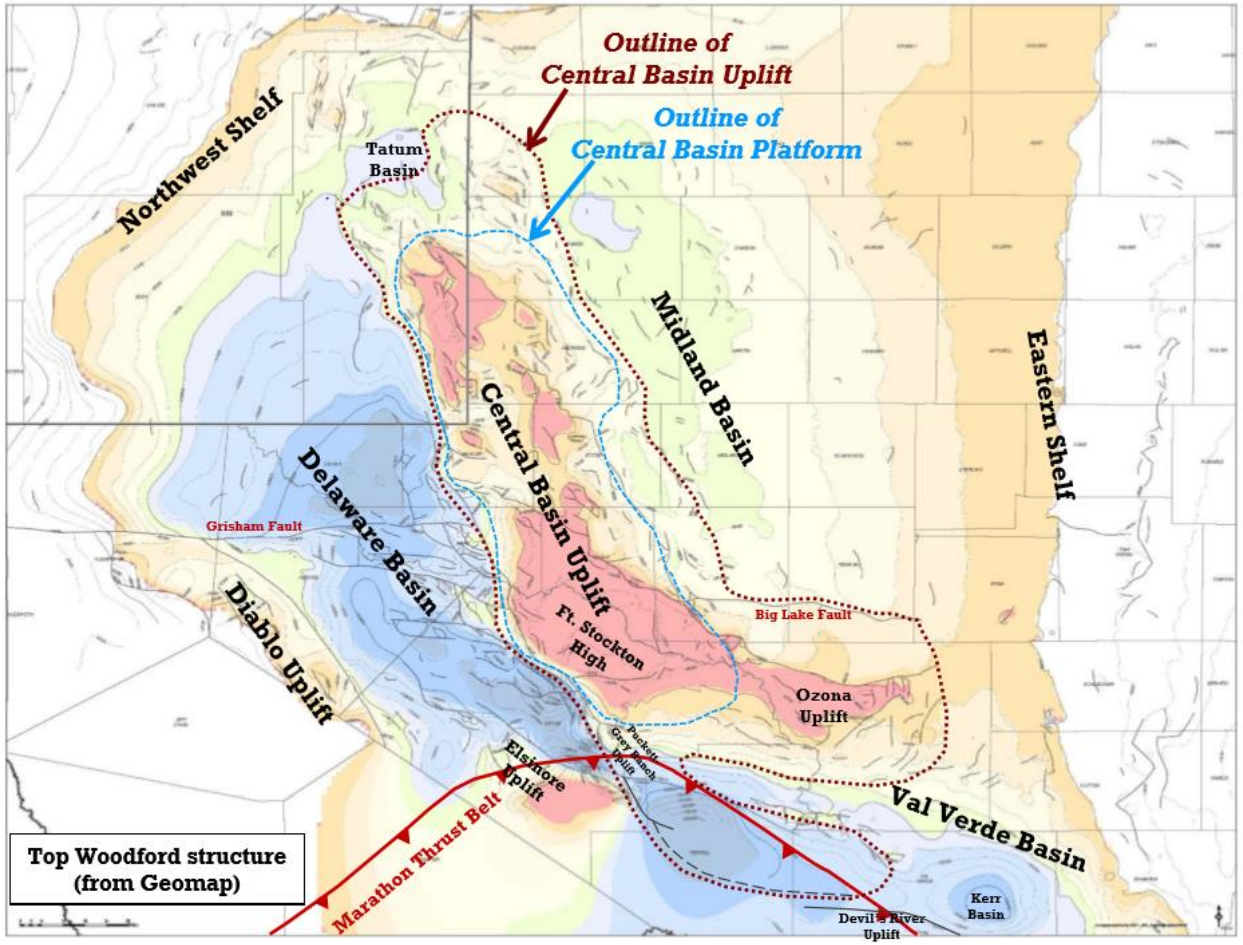
MIDLAND RESOURCES : AMONG WORLD LARGEST OIL FIELDS



- 75 BBOE recoverable resource potential in shale intervals where successful horizontal wells have been drilled
- Assumes 140-acre spacing on 75% of acreage and downspacing to 100-acres on 25% of acreage; additional down-spacing potential exists

Source : PXD

LARGE AERIAL EXTENT IN DELAWARE AND MIDLAND



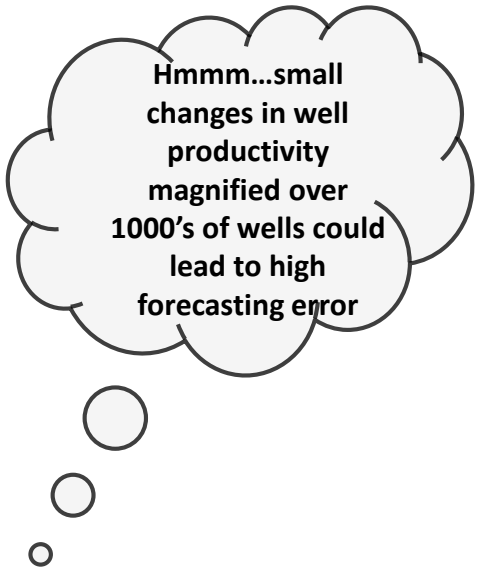
Source : PXD

FORECASTING SHALE PRODUCTION : A TRICKY PROBLEM

- 800 rigs running in the US key shale basins = 8000+ wells per year

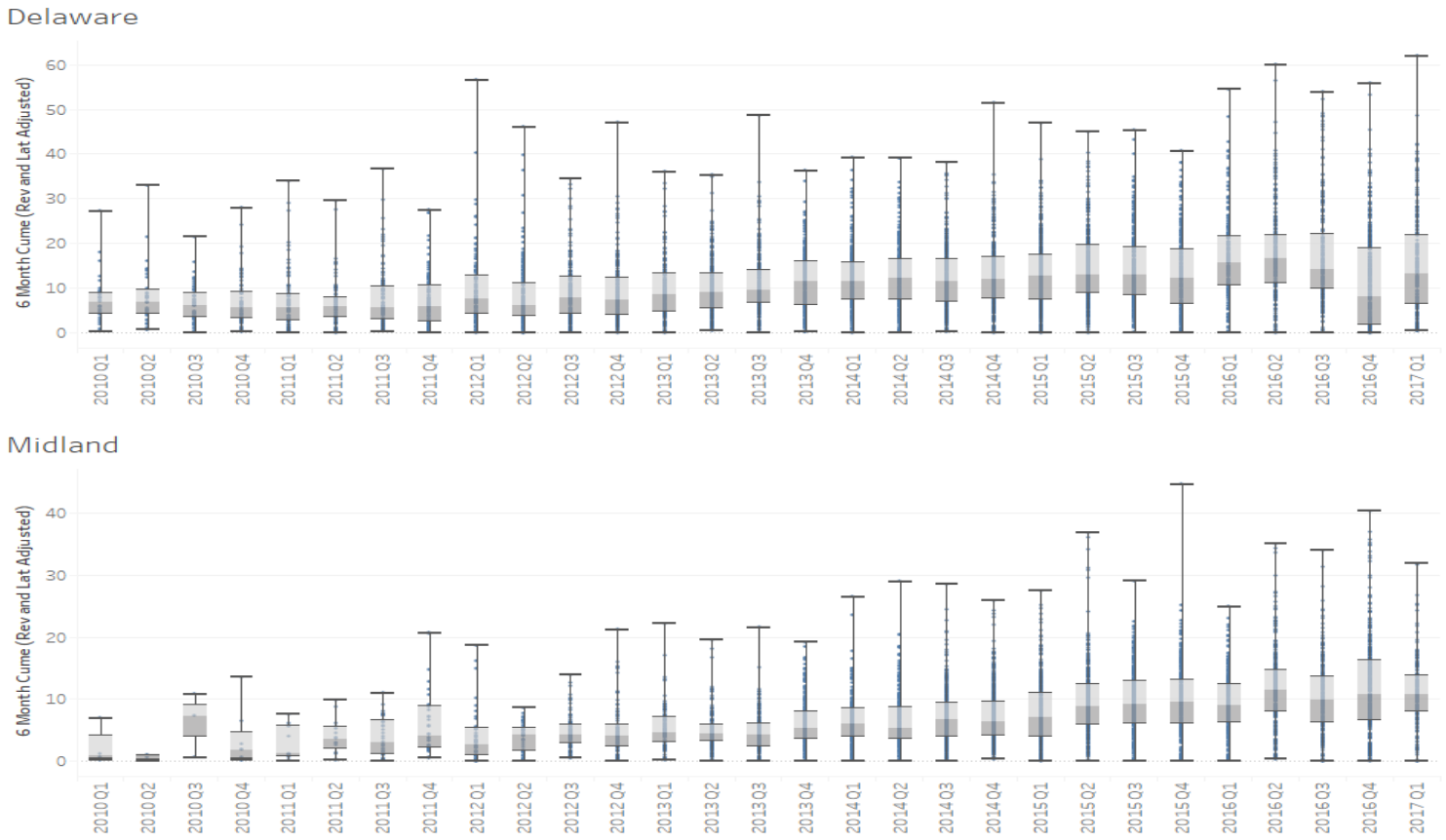
- Shale Growth is a function of
  - Current Well Recoveries
  - Future Technology Improvement
  - Long run unknowns (decline rates, GoR ratios)
  - Cash availability (cash margins, balance sheets)
  - Drilling and completion costs
  - Supply cost inflation
  - Inventory and high-grading
  - Animal spirits (outspend)
  - Development (efficient) vs delineation (inefficient)
  - Infrastructure spending
  - Infrastructure availability
  - The macro environment
  - The global "*Call on American Shale*"

- Shale Models Are Helpful For Scenario "What-If's"



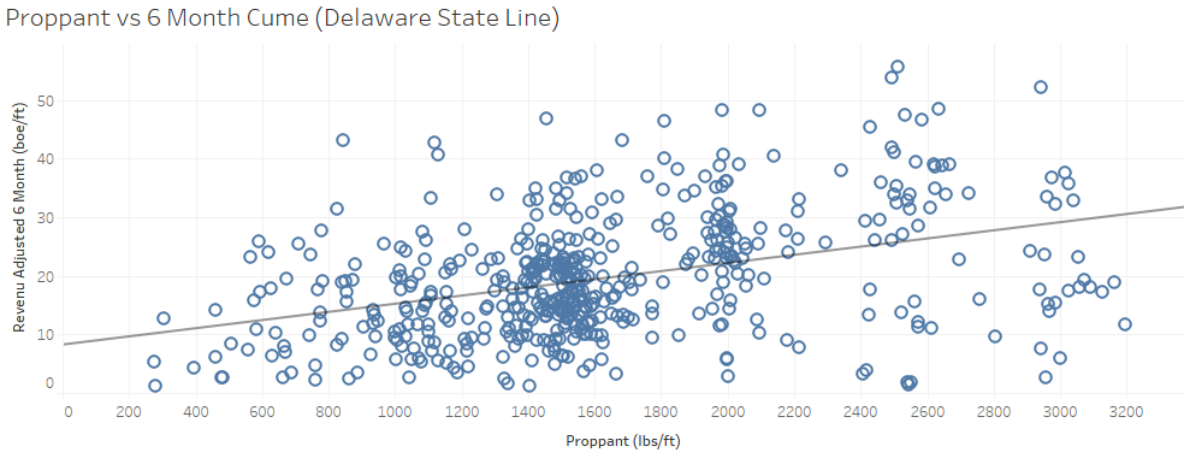
Source : Cornerstone Macro

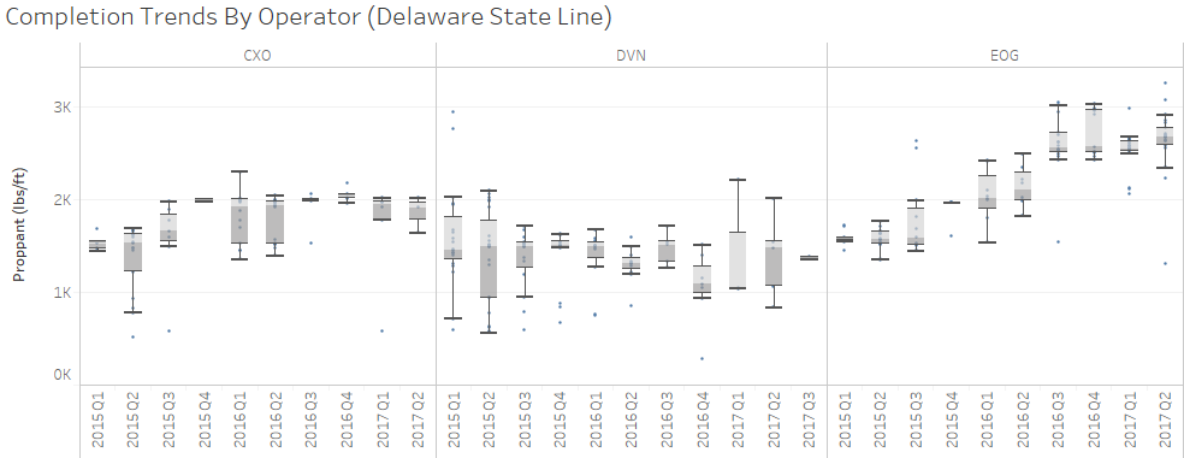
PRODUCTIVITY HAS BEEN IMPROVING AT THE WELL LEVEL



Source : Drilling Info, Cornerstone Macro

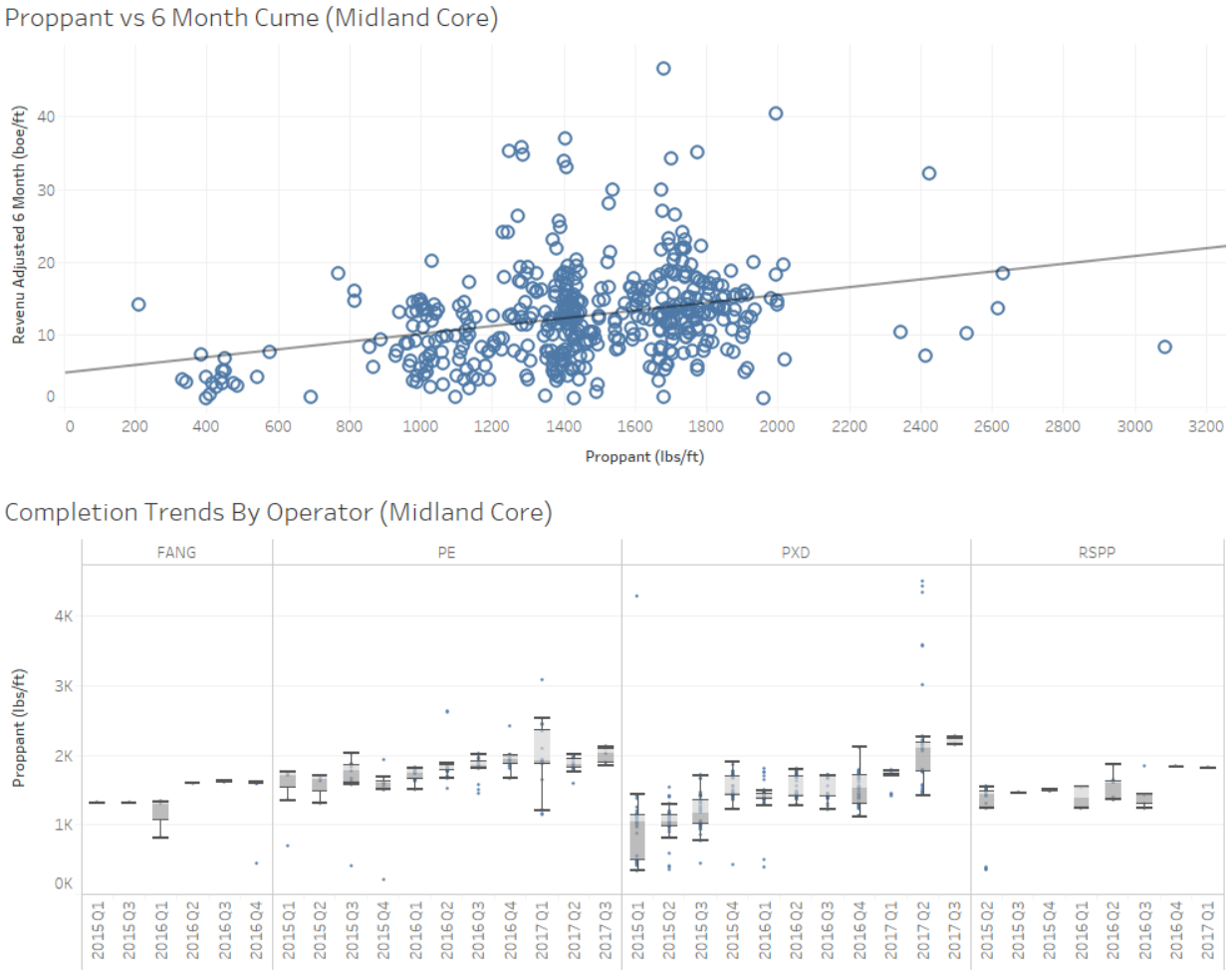
DELAWARE STATELINE : PROPPANT AND PRODUCTIVITY





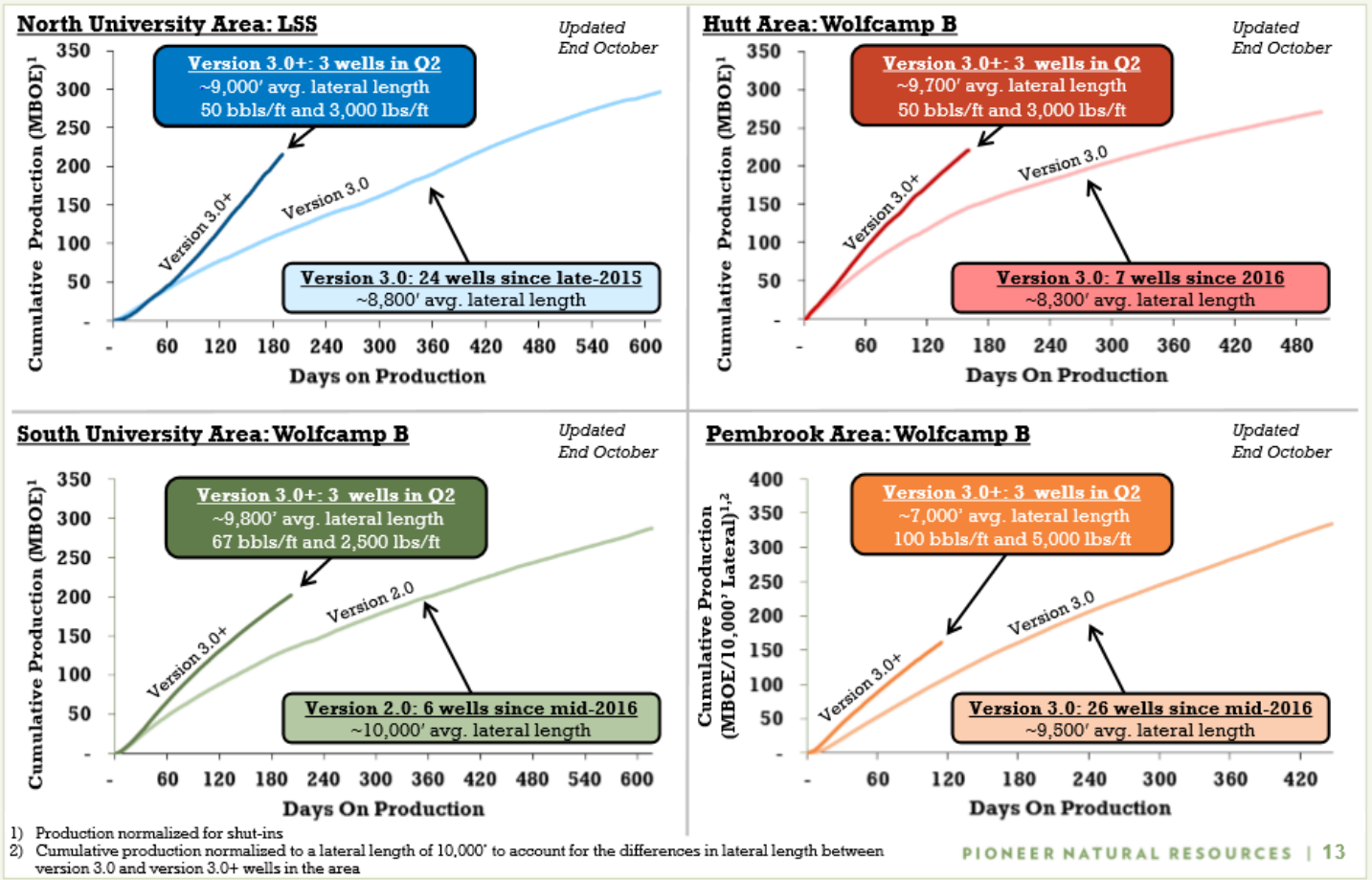
Source : Drilling Info, Cornerstone Macro

MIDLAND CORE : PROPPANT USE & PRODUCTIVITY



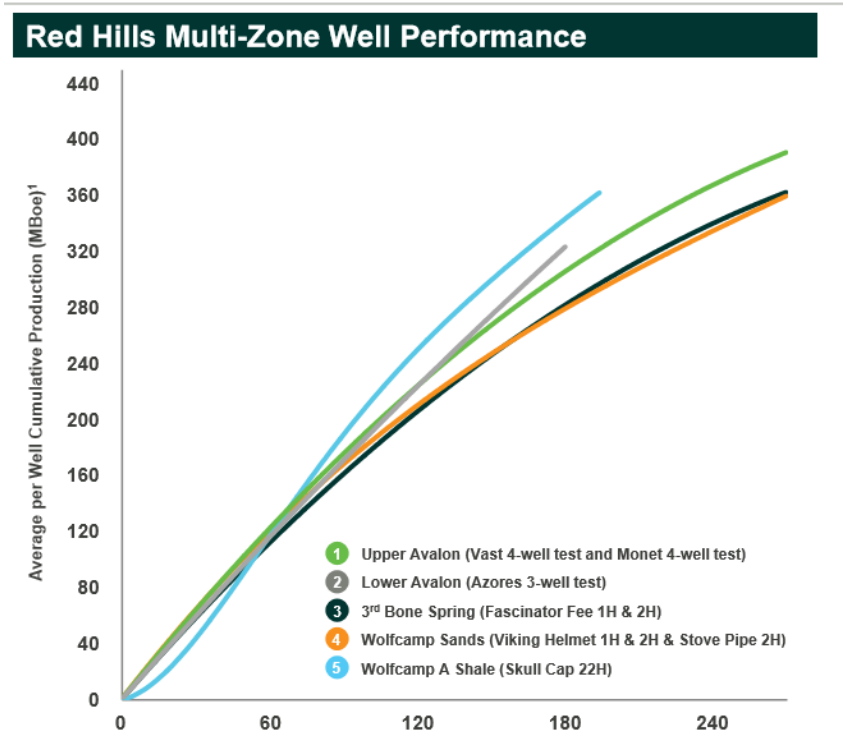
Source : Drilling Info, Cornerstone Macro

PXD's 3Q17 "VERSION 3.0+" UPDATE



Source : PXD

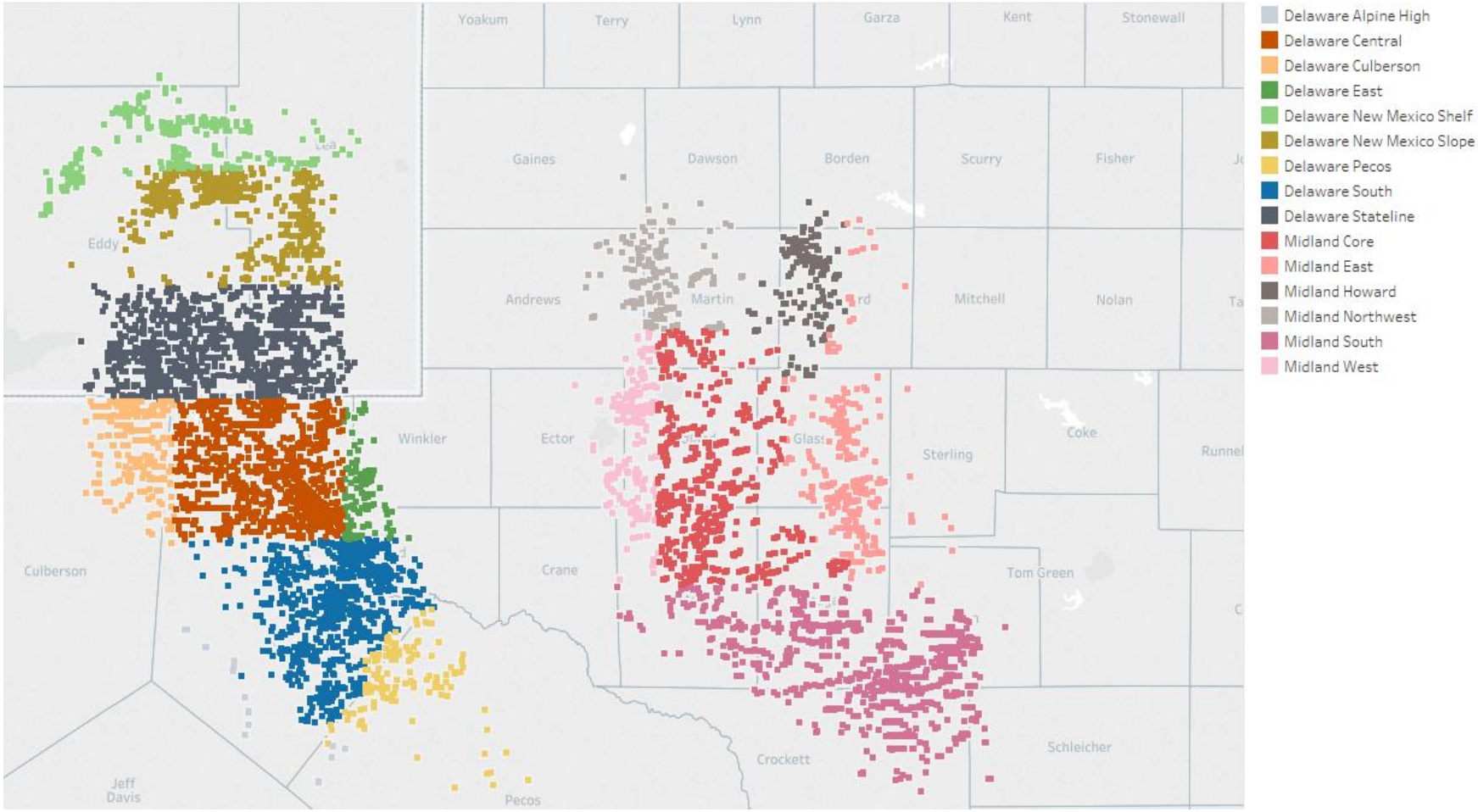
DELAWARE STATE LINE : STACKED PAY AND MONSTER WELLS



CXO "*In Red Hills, we recently brought online the Viking Helmet 1H, a Wolfcamp Sands well with a 20-day peak rate of more than 3,000 barrels of oil equivalent made up of 85% oil*"

Source : CXO

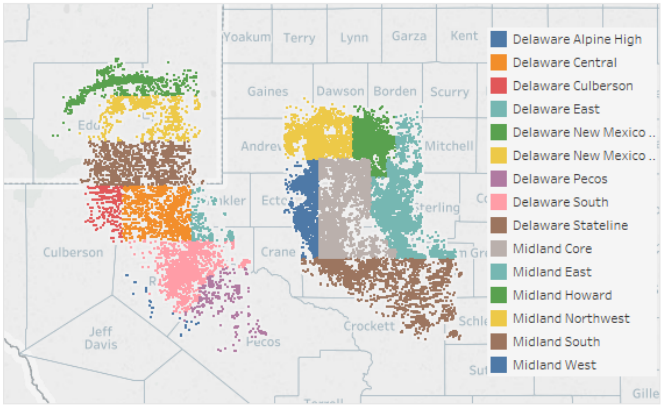
THE PERMIAN IS VAST : SUB-BASIN TRENDS ARE KEY



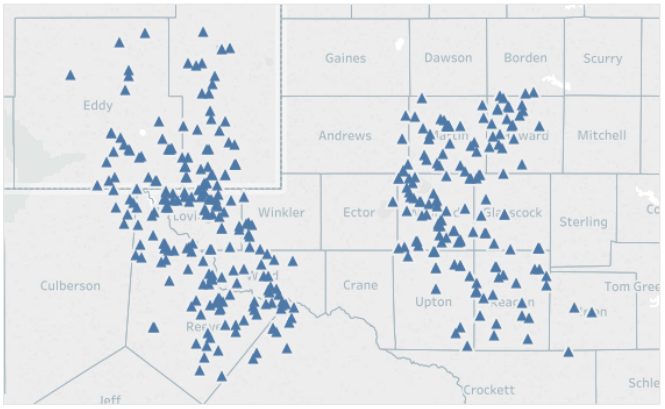
Source : Drilling Info, Cornerstone Macro

RIGS ARE SPREAD ACROSS THE PERMIAN, DELINEATING THE PRIZE

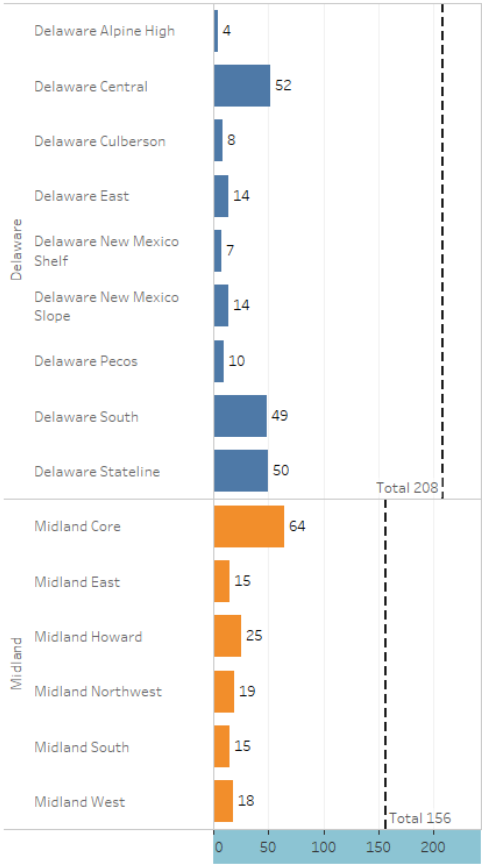
Sub Basins



Current Rig Activity



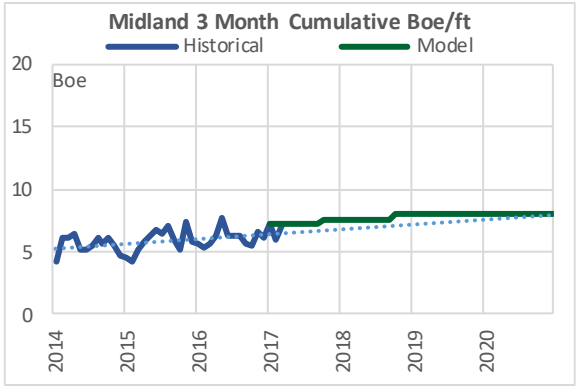
Rig Count

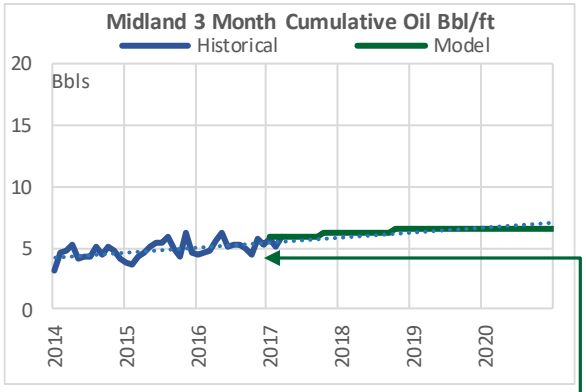


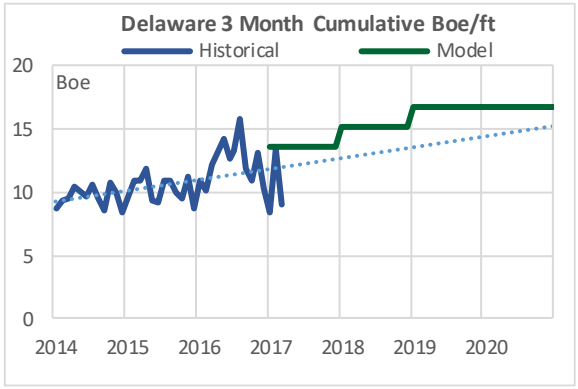
As the industry finalized delineation, one would expect the rigs to start focusing on the best areas. We can change sub-basin activity in the model

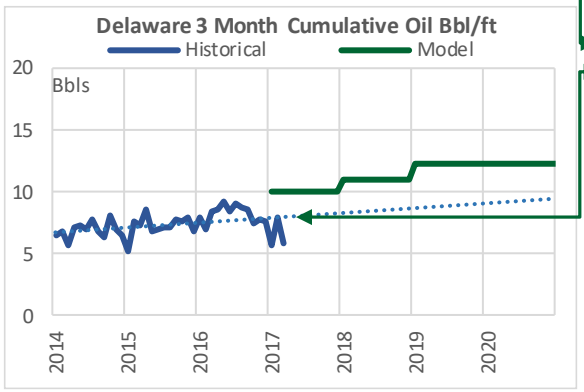
Source : Drilling Info, Cornerstone Macro

OUR PERMIAN PRODUCTIVITY TRACKER & FORECASTS









Given productivity is so important – here are the current inputs to the Permian model

- The dotted line shows an extrapolation of the trend in productivity since 2014. "Model" shows our projections
- On the left we show productivity based on total volumes produced (oil and gas). On the right we show oil only volumes

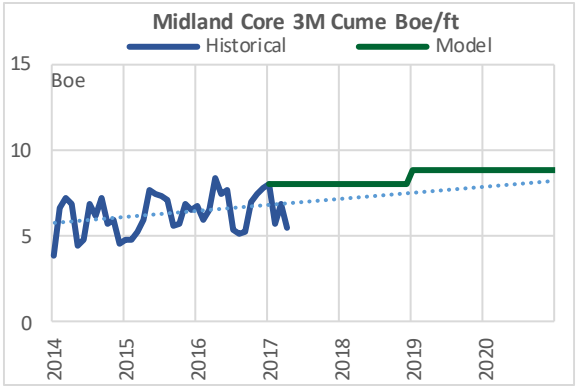
It is interesting to see that Midland productivity dipped in 2H17 and so did the Delaware

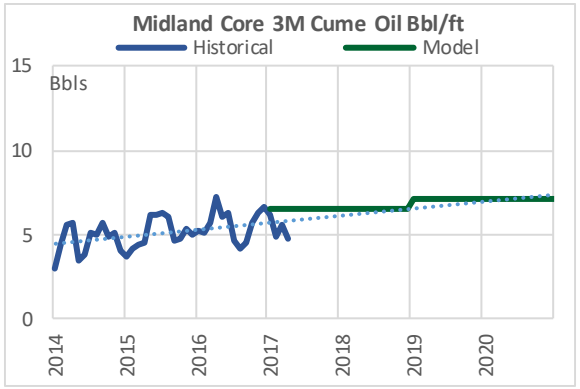
We think sub-basin delineation plays a part…read on!

We use 3 month cumulative production per lateral foot drilled as a productivity proxy

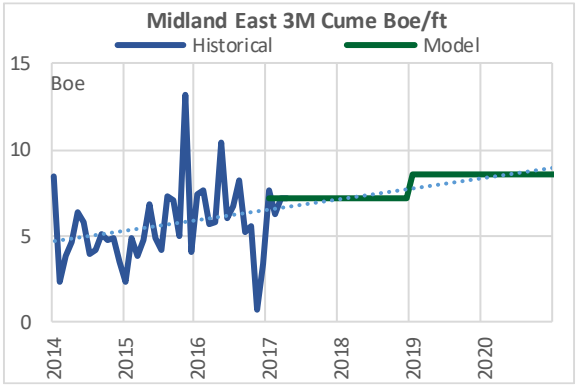
Source: HPDI, CSM Research

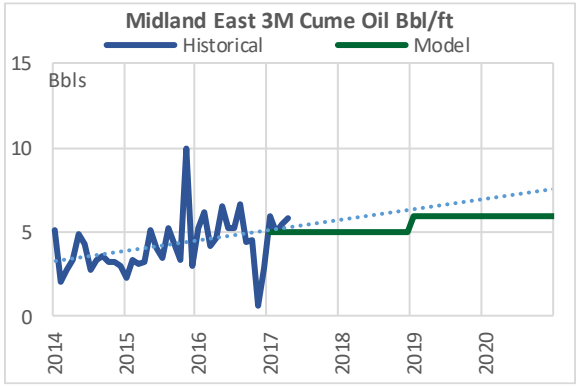
MIDLAND WELL PRODUCTIVITY TRACKER





In the Core Midland, we assume productivity gains should extend

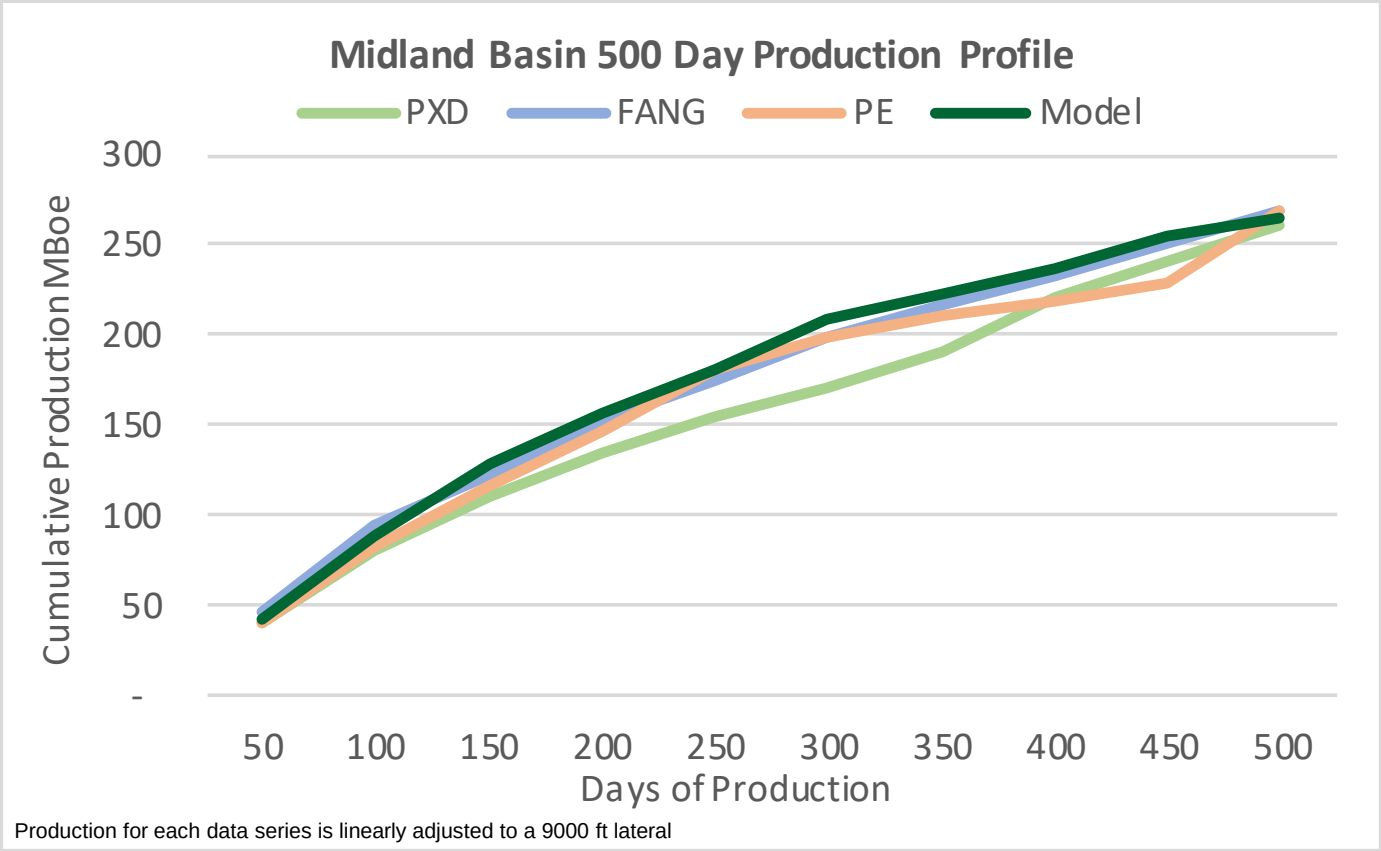




In the Eastern Midland, the trend is rising over time but recent data have been flatter

Source: HPDI, CSM Research

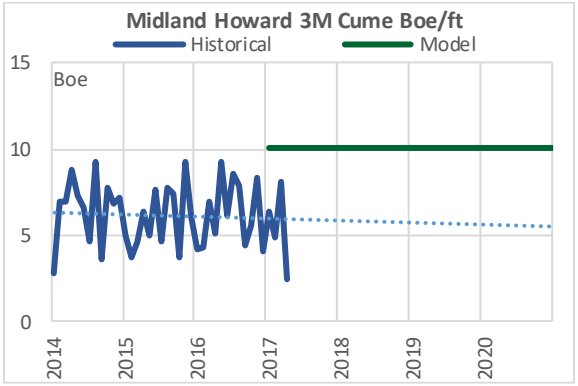
MIDLAND CORE PRODUCTION PROFILE COMPARISON

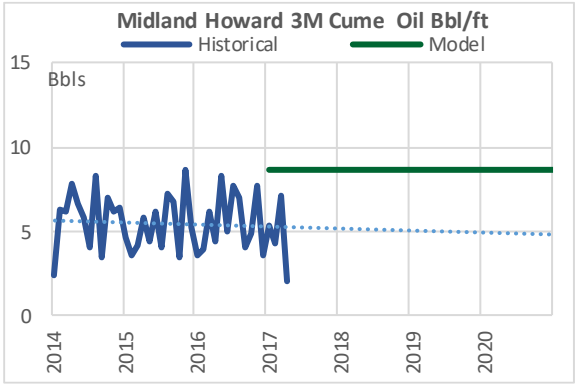


Production for each data series is linearly adjusted to a 9000 ft lateral

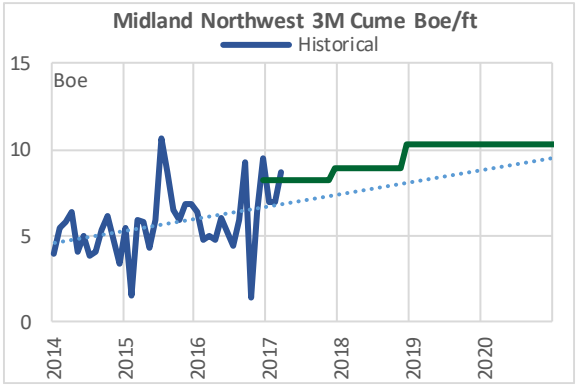
Source: HPDI, PXD, FANG, PE, CSM Research

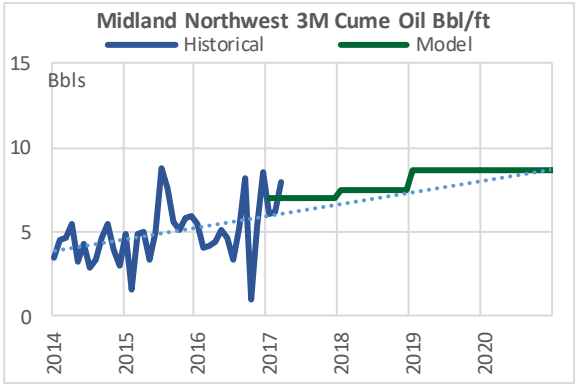
MIDLAND WELL PRODUCTIVITY TRACKER (CONT.)





Howard County is in delineation but new completions have delivered stronger productivity and oil cuts are rising

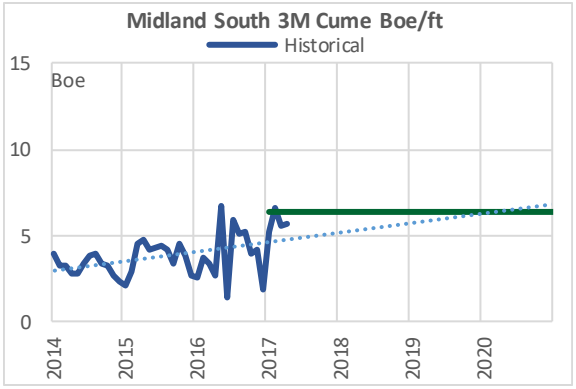


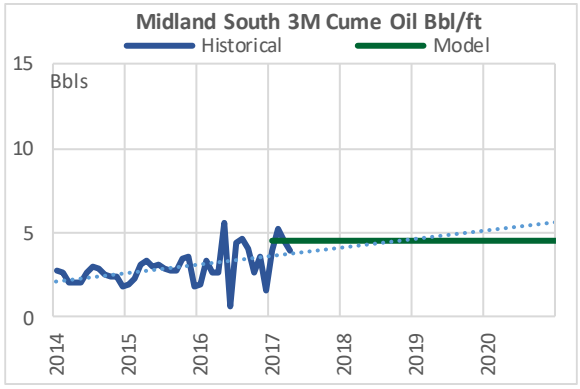


In the North West of the Midland, there has been strong improvement in productivity which we expect will increase productivity into 2018-2019

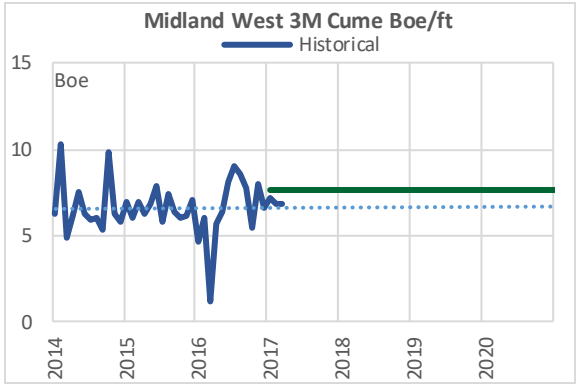
Source: HPDI, CSM Research

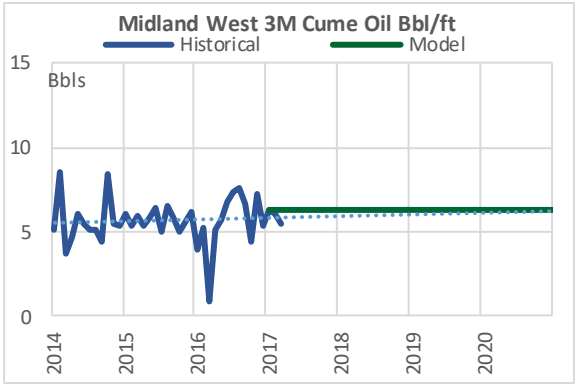
MIDLAND WELL PRODUCTIVITY TRACKER (CONT.)





The legacy southern Midland continues to be an area of weak productivity

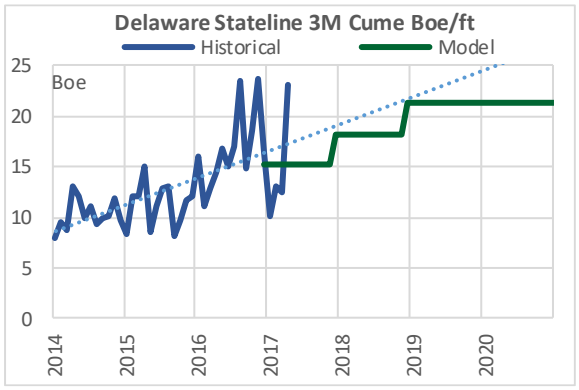


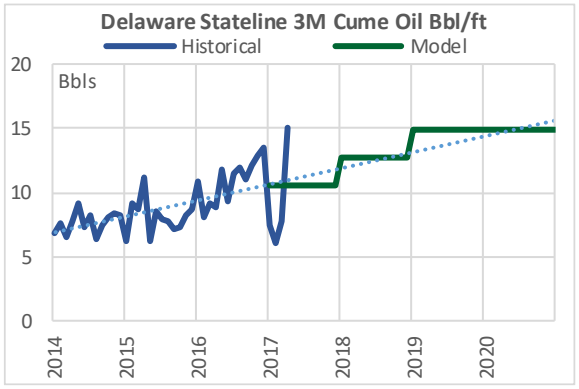


As you move closer to the Central Basin Platform, there are potential resources which we include in Midland West – this area has only a few rigs running

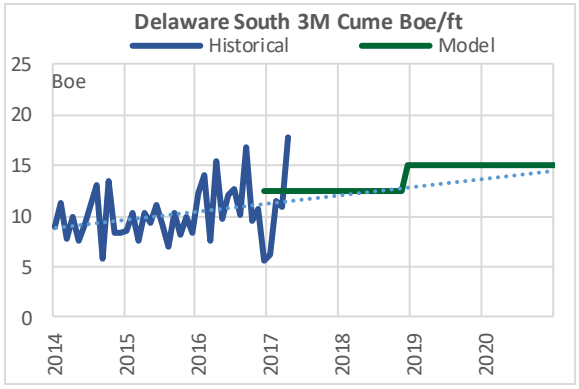
Source: HPDI, CSM Research

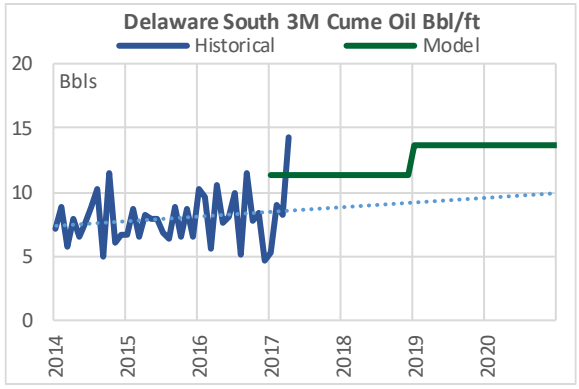
IMPROVING DELAWARE WELL PRODUCTIVITY





The Delaware State Line has been the standout shale performer in the last 18 months

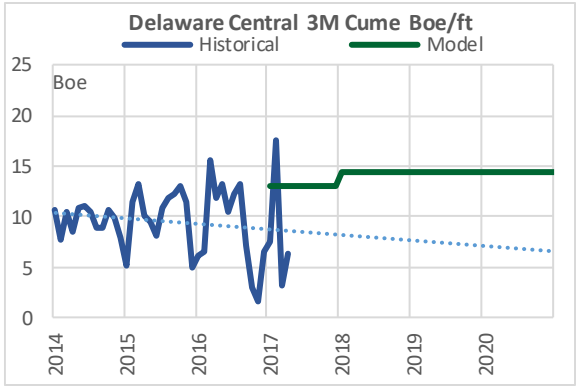


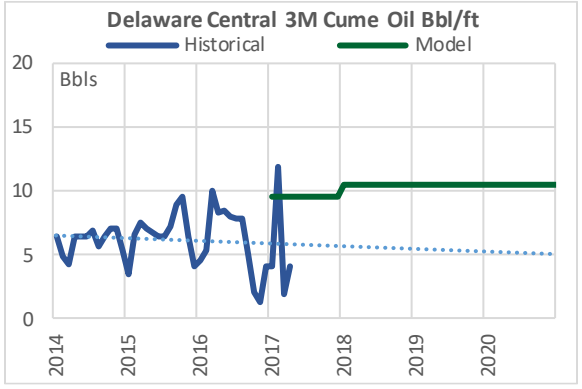


There has also been strong improvement in the Oily Southern Delaware

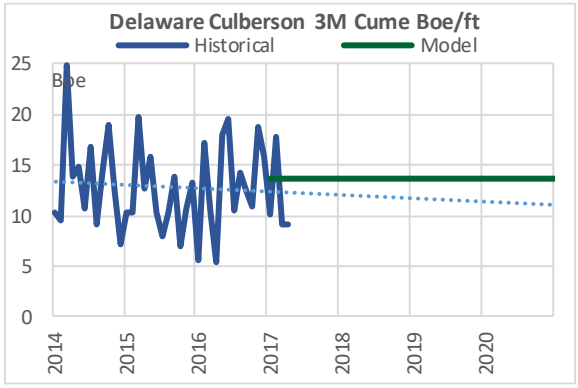
Source: HPDI, CSM Research

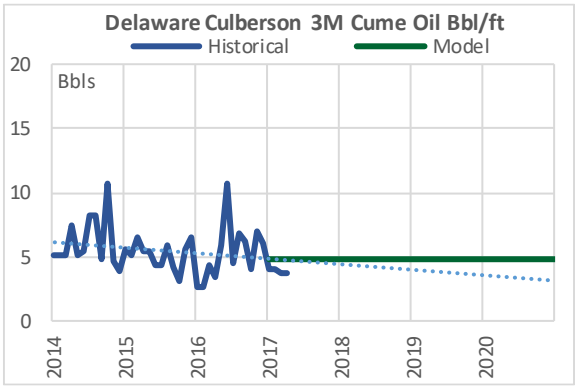
IMPROVING DELAWARE WELL PRODUCTIVITY





The Central Delaware has been underperforming even though the rocks have been strong. As the key operators move into development mode, we expect strong improvement

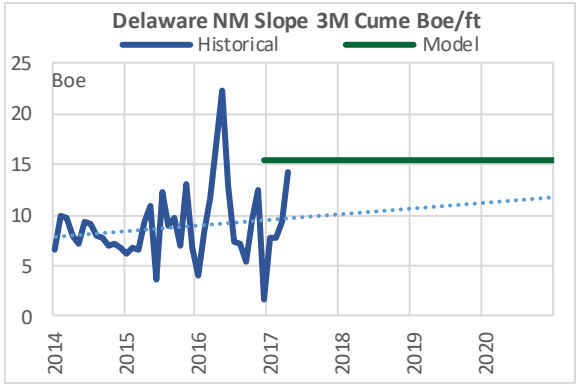


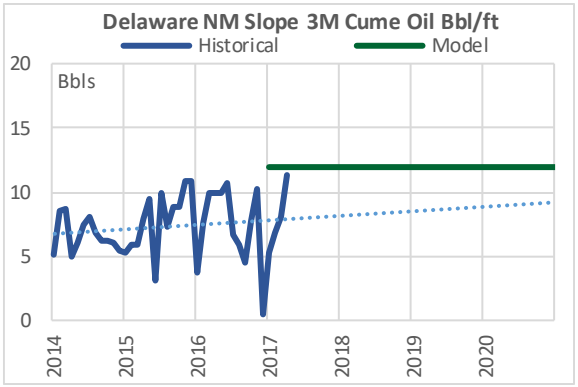


Culberson is gassier with strong cumes overall, but a lower oil cut

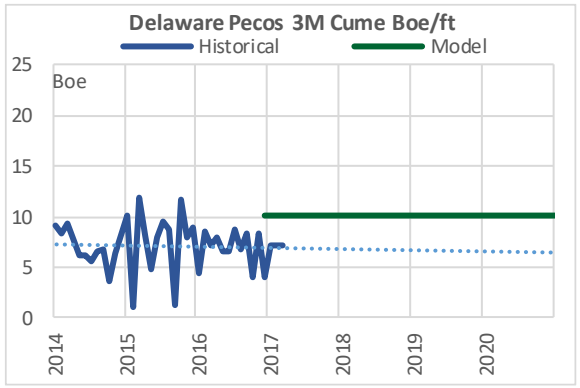
Source: HPDI, CSM Research

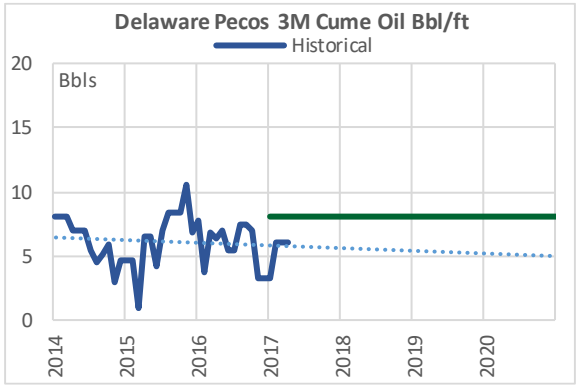
IMPROVING DELAWARE WELL PRODUCTIVITY





Recent wells have been encouraging for the New Mexico "Slope" in the Northern Delaware

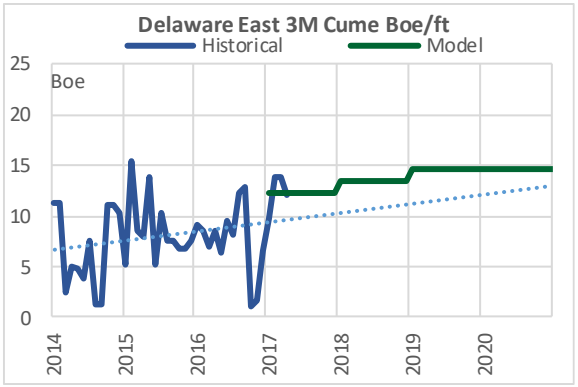


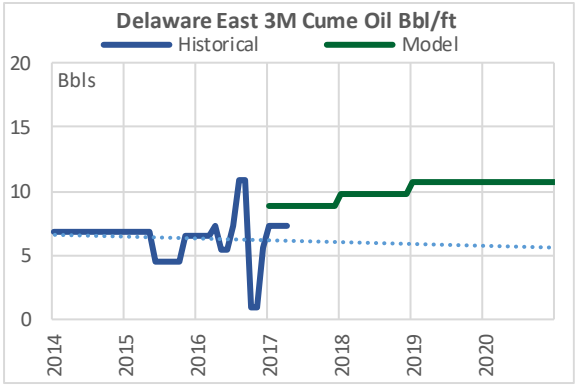


Some operators are finding success in Pecos county in the Southern Delaware but the average remains low

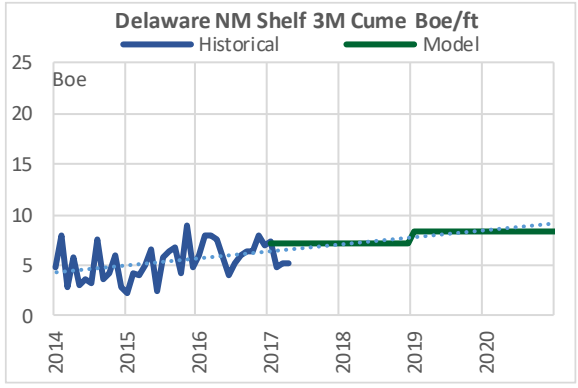
Source: HPDI, CSM Research

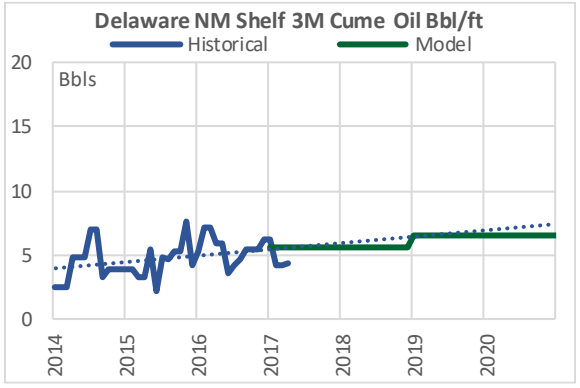
IMPROVING DELAWARE WELL PRODUCTIVITY





The Eastern Delaware bumps up against the Central Basin Platform and should have strong oil cuts

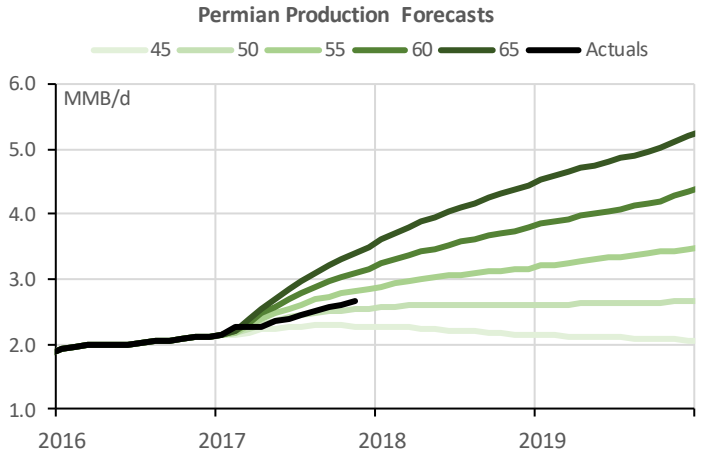


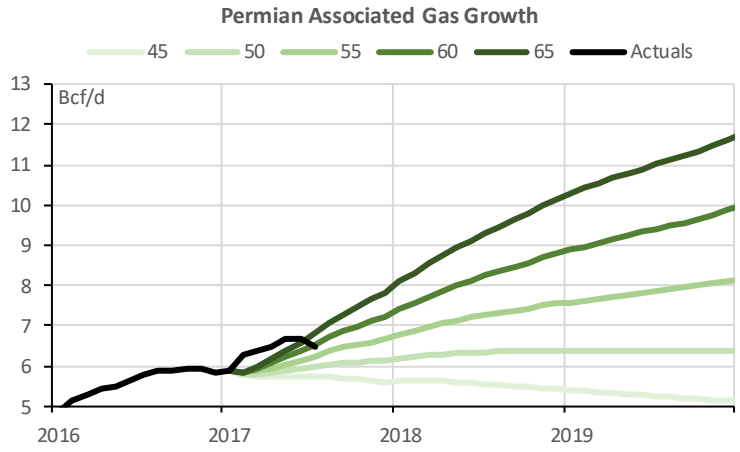


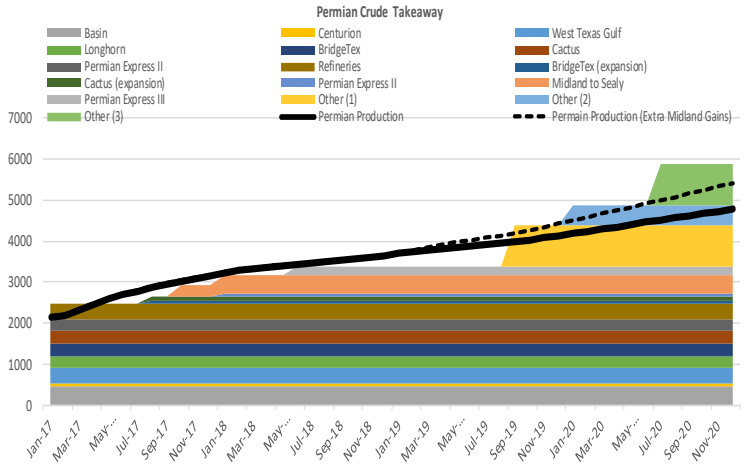
Some operators are finding success in Pecos county in the Southern Delaware but the average remains low

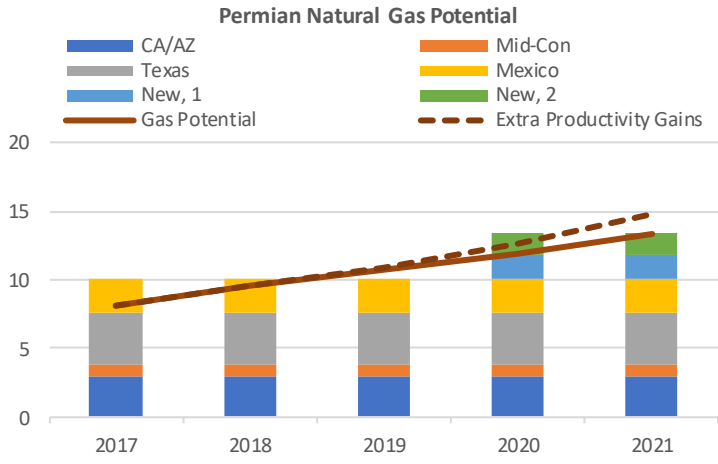
Source: HPDI, CSM Research

SO FAR SO GOOD, BUT WHAT ABOUT TAKEAWAY



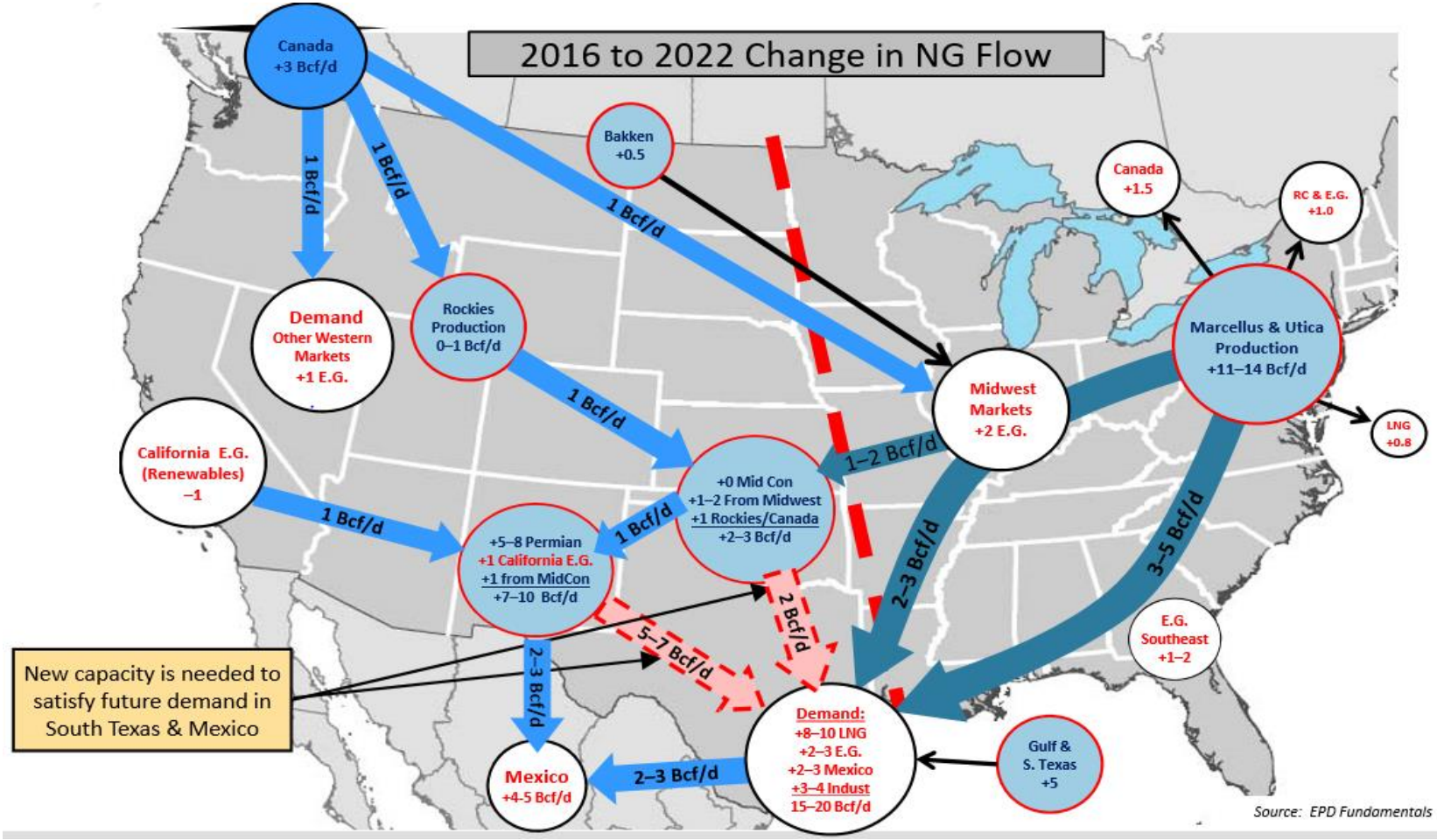






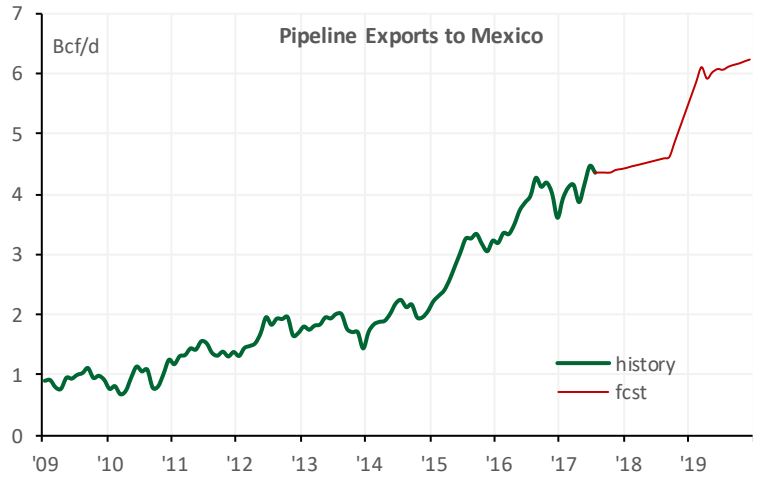
Source: HPDI, PXD, EPD, CSM Research

US NATURAL GAS SUPPLY AND DEMAND



Source: EPD

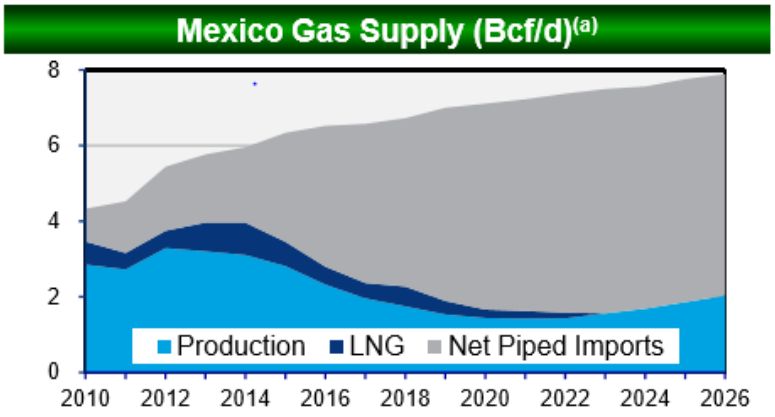
PIPELINE TRADE: EXPORTS UNDER THE WALL TO MEXICO

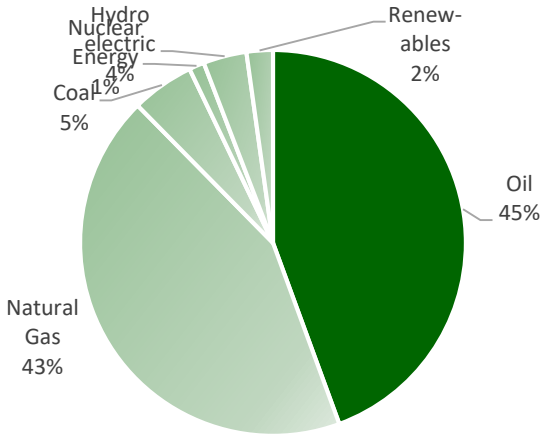


Pipelines to Mexico are running below 50% utilization. Exports to Mexico underperformed our expectations in 2017, trending broadly flat, even with ~2.5 Bcf/d of capacity adds from Comanche Trail and Trans-Pecos out of West Texas. We apply a more conservative forecast to above ground pipe this time around.

Additional South Texas export projects include the 2.6bcfd Sur de Texas – Tuxpan subsea line.

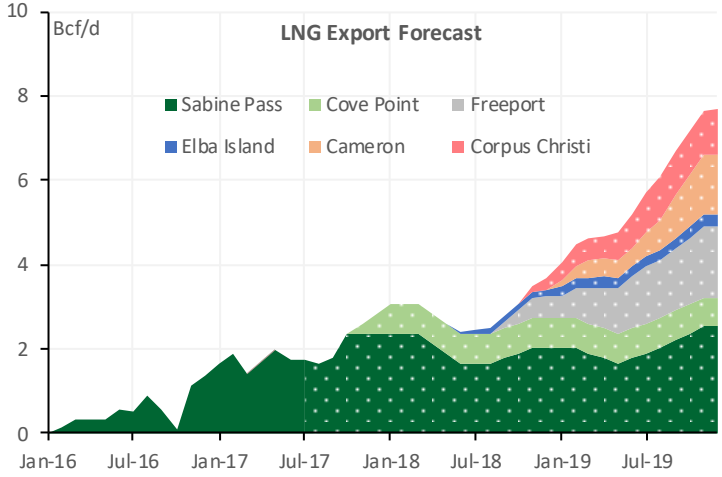
Much will depend on domestic demand growth and domestic production decline trends.





Source: EIA, KMI, Company Estimates, CSM Research

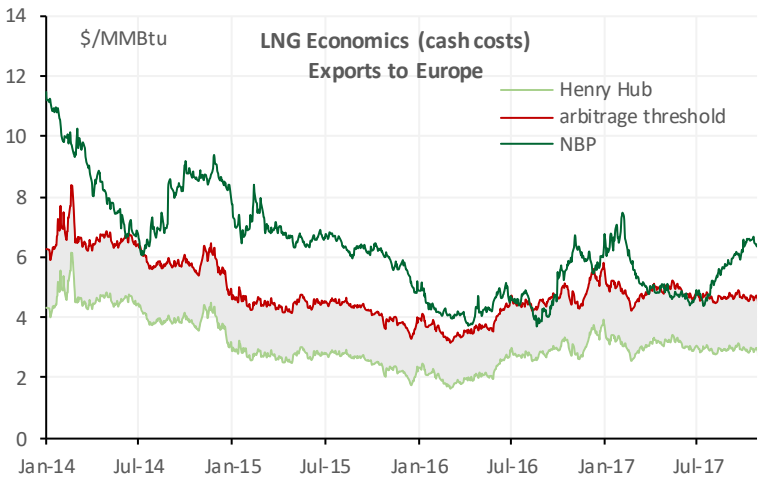
SHIFTING TRENDS: EXPORTS, THE POWER OF LNG

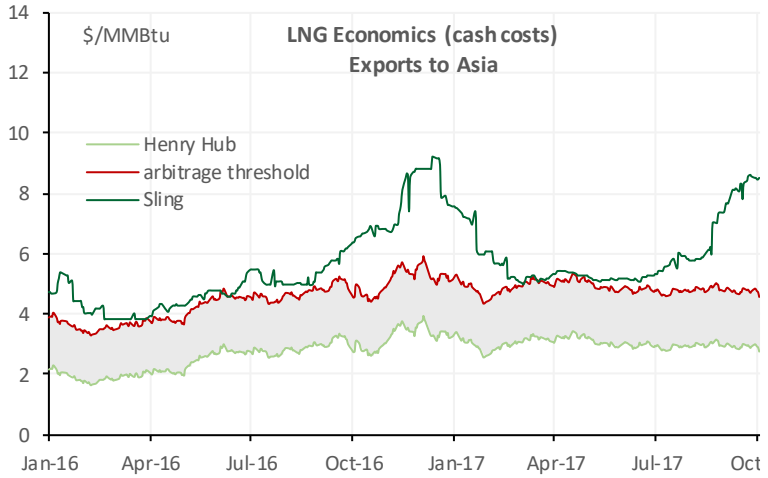


Liquified Natural Gas exports – How much capacity comes on line and what might its utilization be … Big chunks of export capacity began to come on line last year. That capacity nearly doubles by late next year to 4 Bcf/d and then more than doubles over the course of 2019 to nearly 9 Bcf/d

With both NWE and Asia spot markets tracking higher than last year, the arbs from the US opened earlier

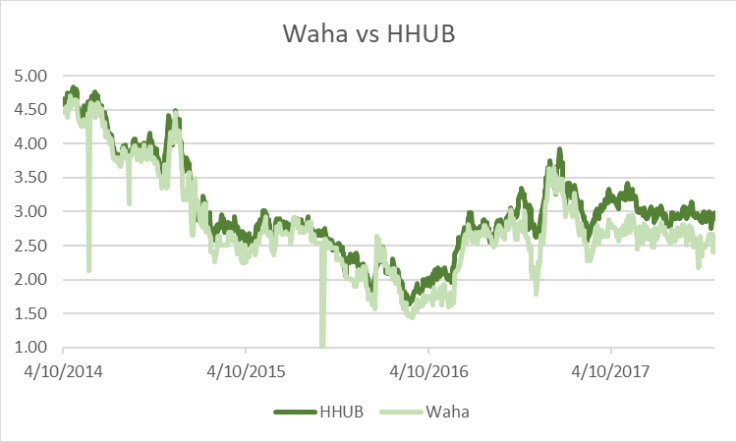
18.5bcfd of FERC approved projects, 9.7bcfd of projects under construction, another 20bcfd pending approval



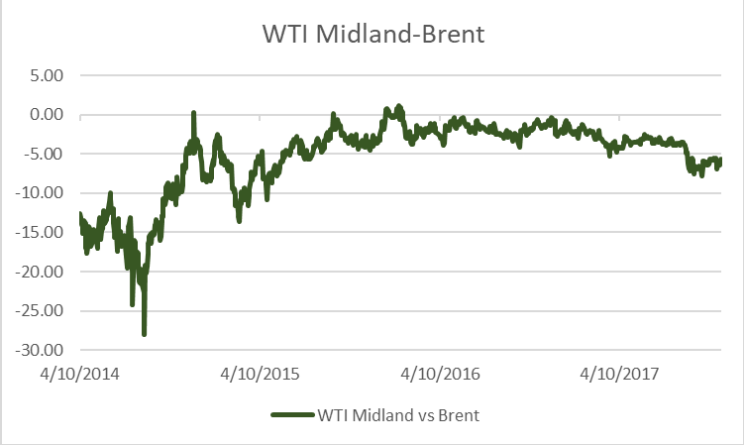


Source: The BLOOMBERG PROFESSIONAL™ Service, EIA, Company Estimates , CSM Research

PERMIAN DIFFS HERE TO STAY



Discounts have emerged for Waha gas and could persist for some time

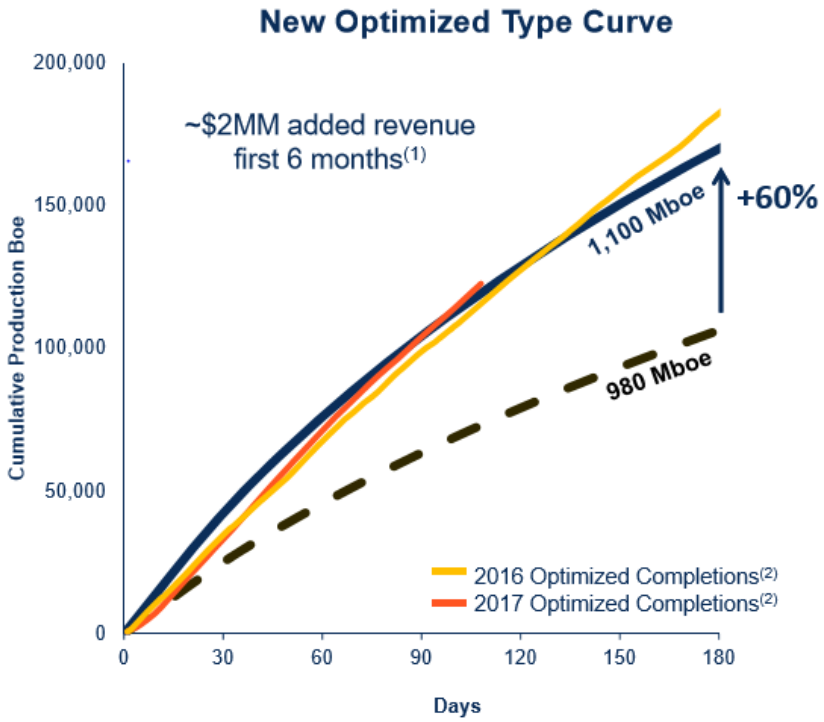


Discounts for WTI-Midland are also likely to persist for much of 2018

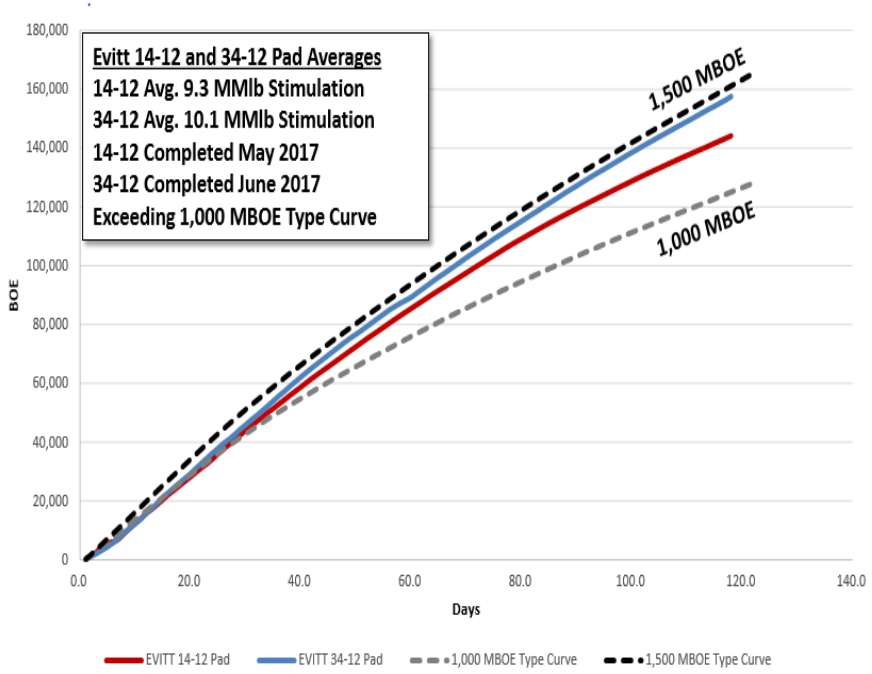
Source: The BLOOMBERG PROFESSIONAL™ Service, CSM Research

IF THE PERMIAN HITS A BOTTLENECK – BAKKEN HAS IMPROVED SIGNIFICANTLY

CLR : Improving Completions



WLL : Improving Completions

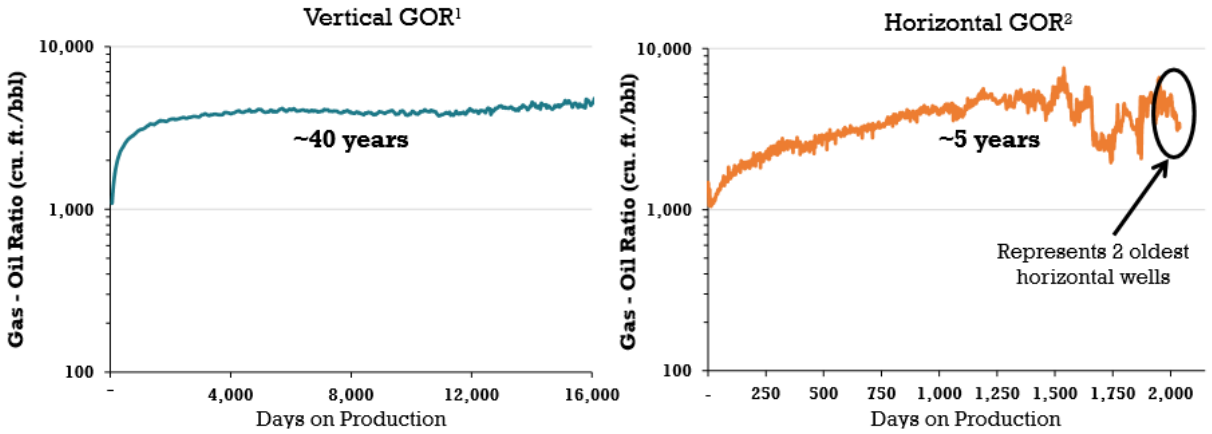


Source: CLR, WLL

PXD TALKS GOR

GRADUALLY INCREASING GORs OVER THE LIFE OF A WELL HAVE BEEN OBSERVED IN THE SPRABERRY/WOLFCAMP FOR DECADES

- **Normal for reservoirs driven by solution gas to experience increasing GORs over time**
- **Not experiencing any changes in oil decline with rising GORs**
- **Increasing GORs on horizontal wells is consistent with the long-dated history of increasing GORs on vertical wells in the Spraberry/Wolfcamp**
  - However, because horizontal wells contact more surface area and draw down pressures faster, the GORs on these wells are increasing somewhat faster than vertical wells



Slides 24 and 25 in the Appendix provide GOR and oil content/performance history on Pioneer's early horizontal wells

1) Source IHS – Represents ~15,000 vertical wells drilled in the Spraberry, Dean and Wolfcamp intervals
2) Represents all 770 Pioneer PDP horizontal wells as of year-end 2016

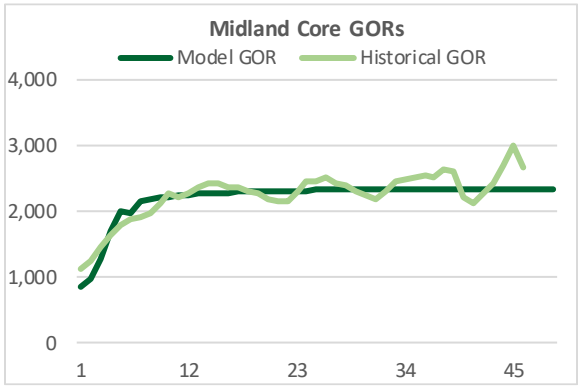
PIONEER NATURAL RESOURCES | 9

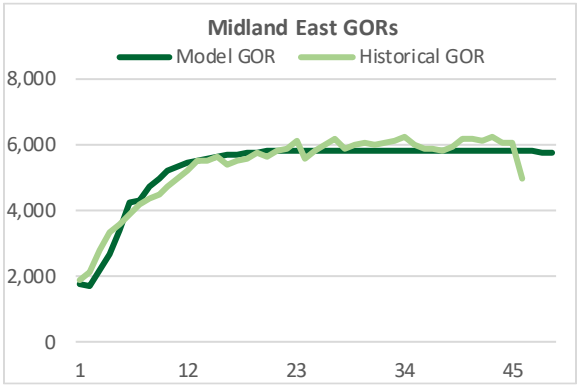
This is from all the vertical drilling that we've done over those 40 years, but you hit about 4,000 cubic feet per barrel after about 10 years and then you ultimately reach an asymptote of about 4,500 after 40 years.

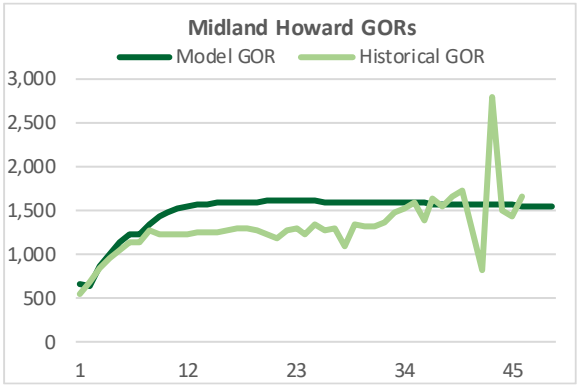
[ED – start at 85% trend towards 60% over three years]

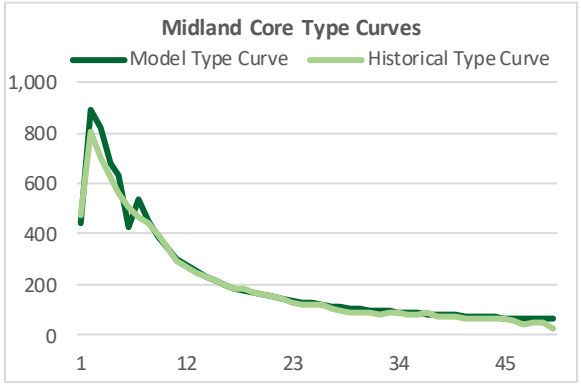
Source : PXD 2Q17

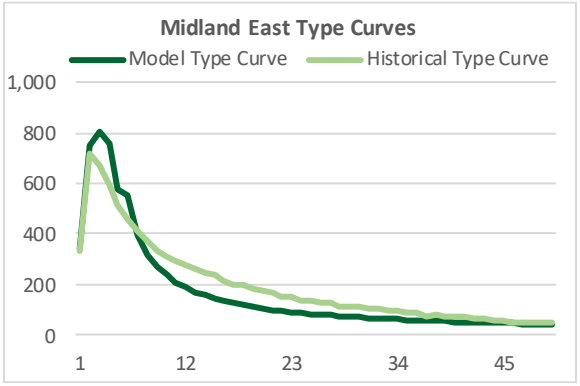
SELECT LONG RUN WELL PERFORMANCE AND GOR

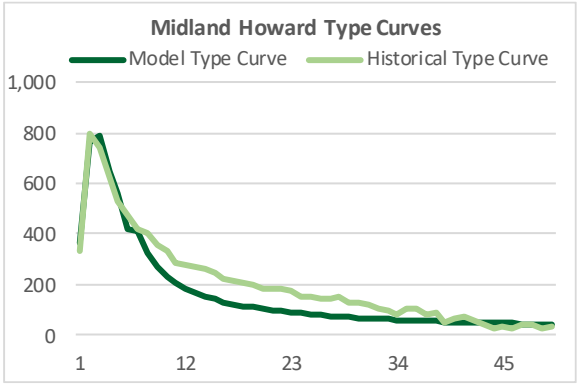






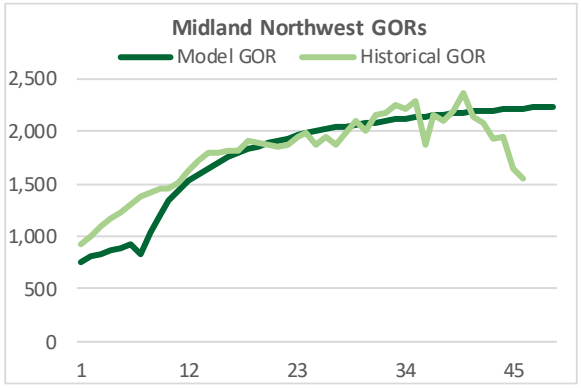


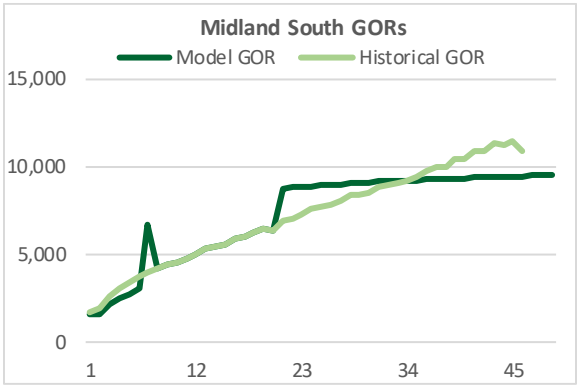


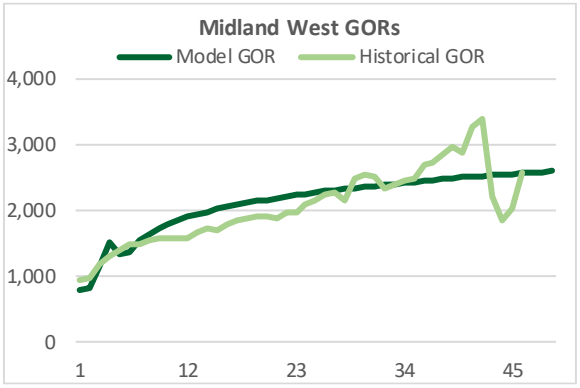


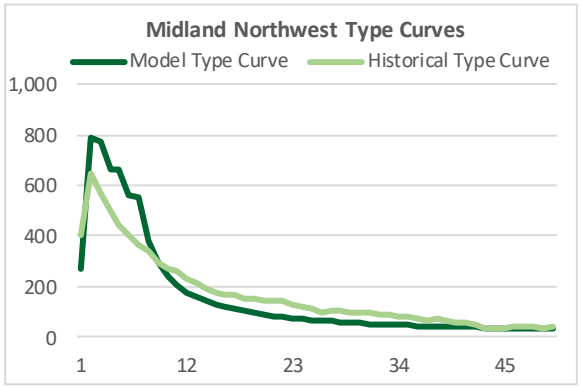
Source: HPDI, CSM Research

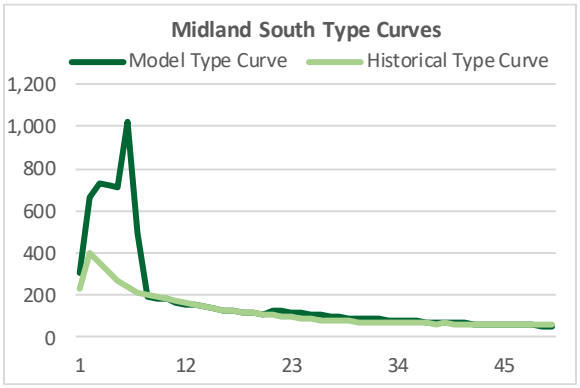
SELECT LONG RUN WELL PERFORMANCE AND GOR

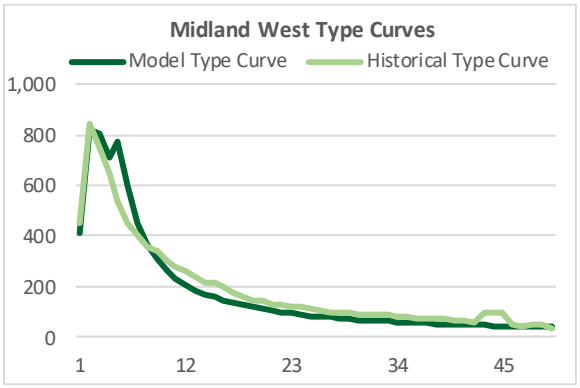






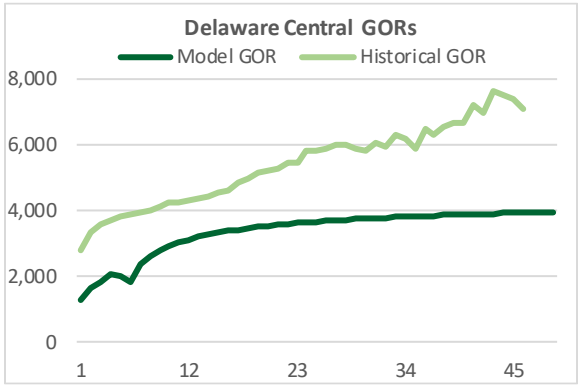


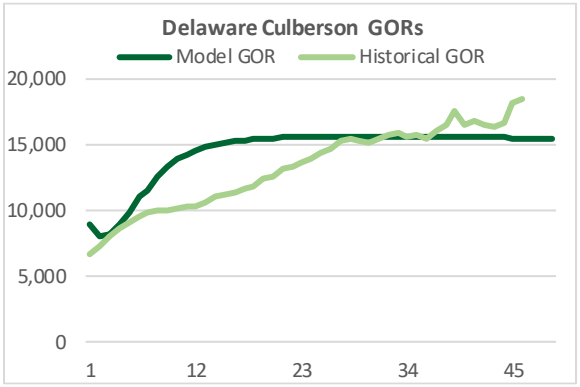


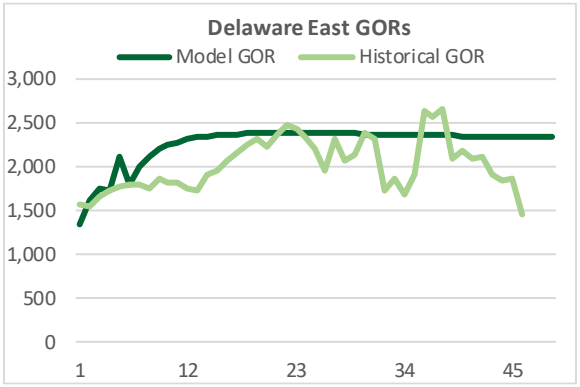


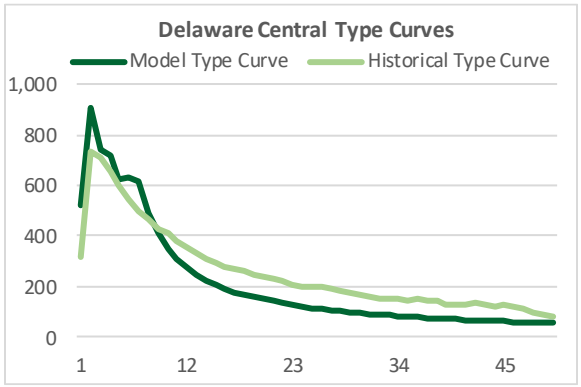
Source: HPDI, CSM Research

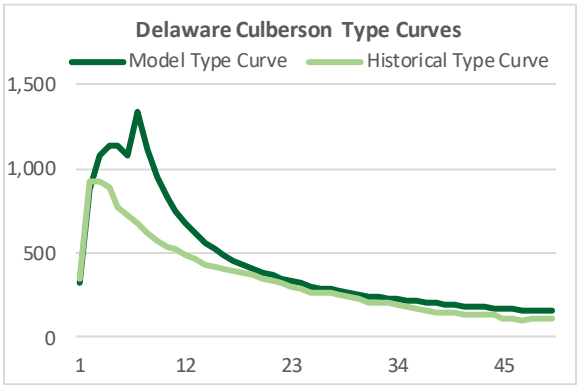
SELECT LONG RUN WELL PERFORMANCE AND GOR

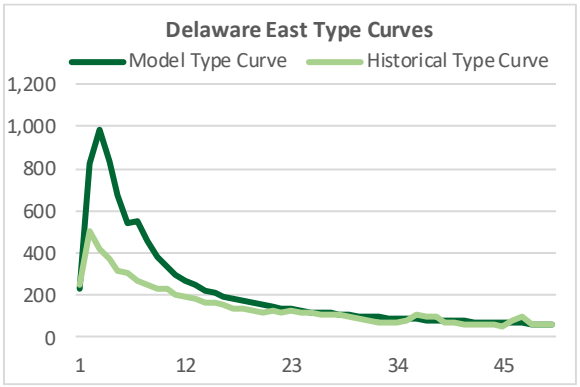












Note: We have assumed drilling activity is focused on the oilier parts of the Delaware Central region

Source: HPDI, CSM Research

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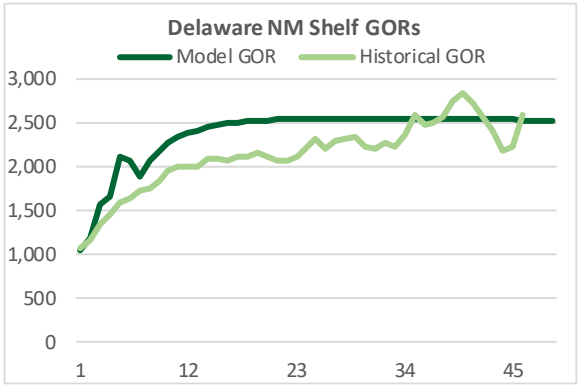

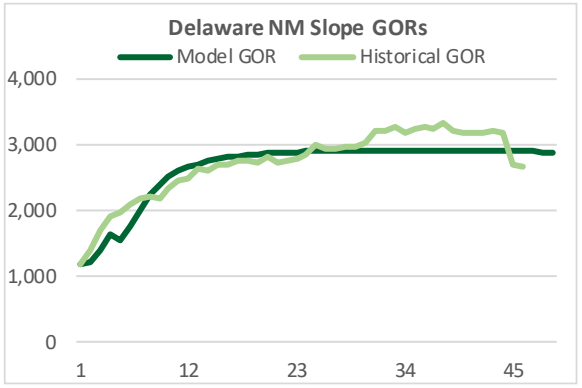

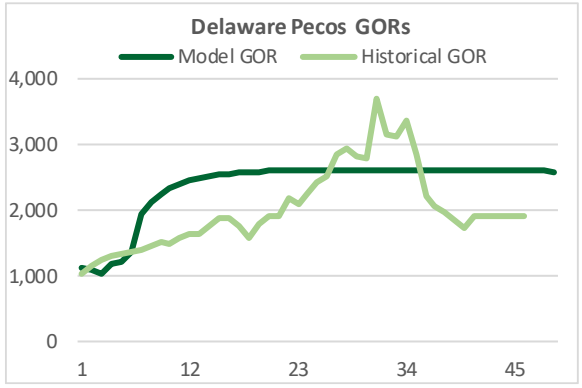

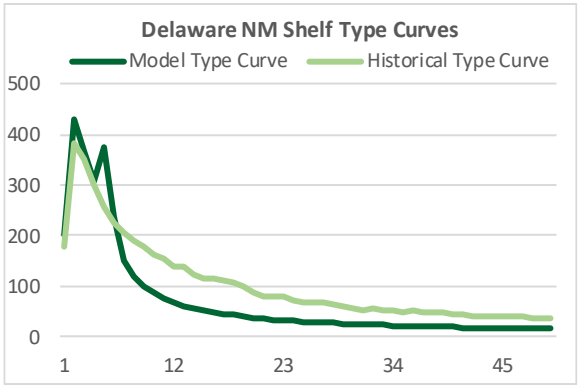

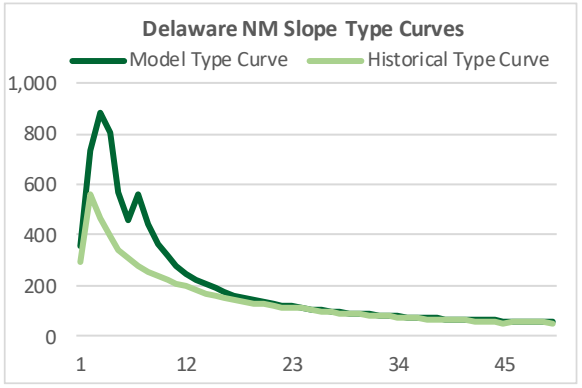

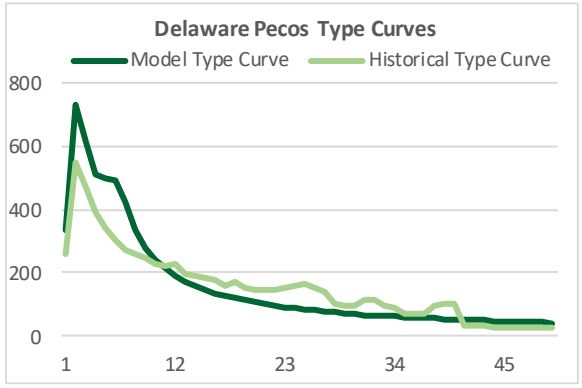

Source: HPDI, CSM Research

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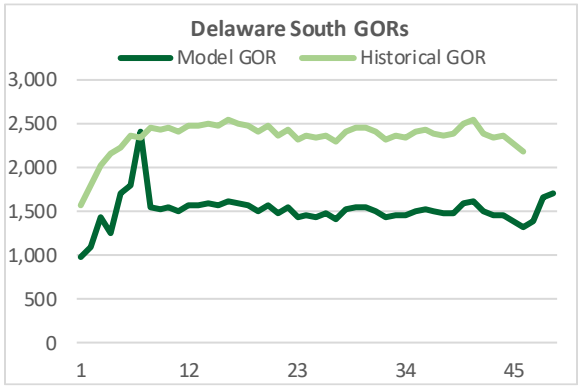

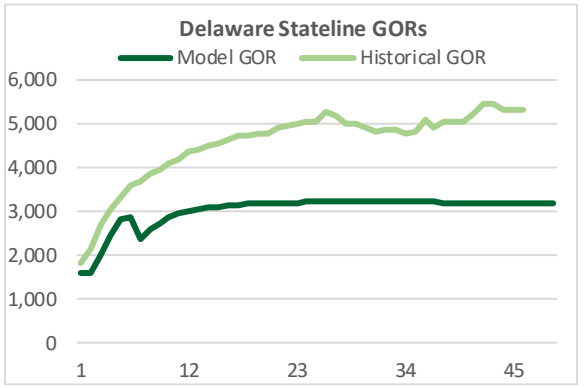

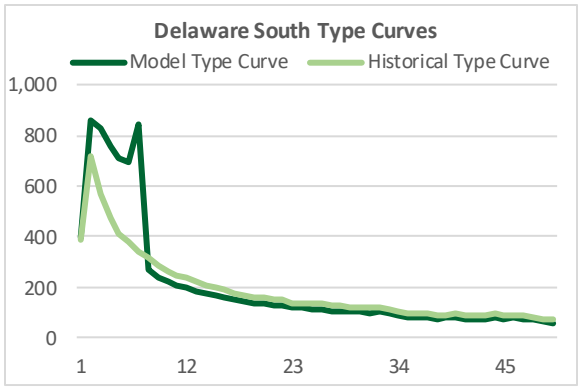

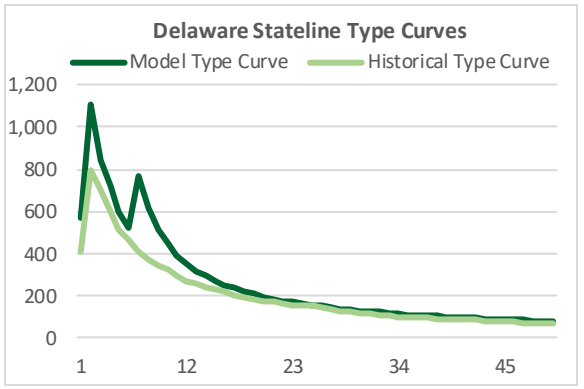

Note: We have assumed drilling activity is focused on oilier parts of the Delaware South and Stateline regions

Source: HPDI, CSM Research