Thinking about a US fracing ban. What is at stake?

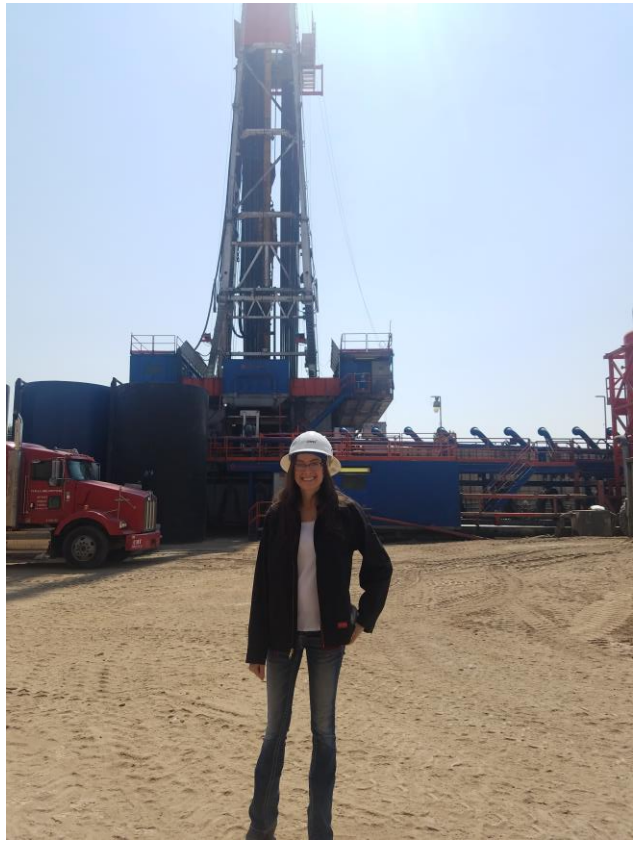
TRISHA CURTIS – PRESIDENT AND CO-FOUNDER

TRISHA@PETRONERDS.COM

BARCLAYS – NEW YORK, NEW YORK

FEBRUARY 13TH, 2020

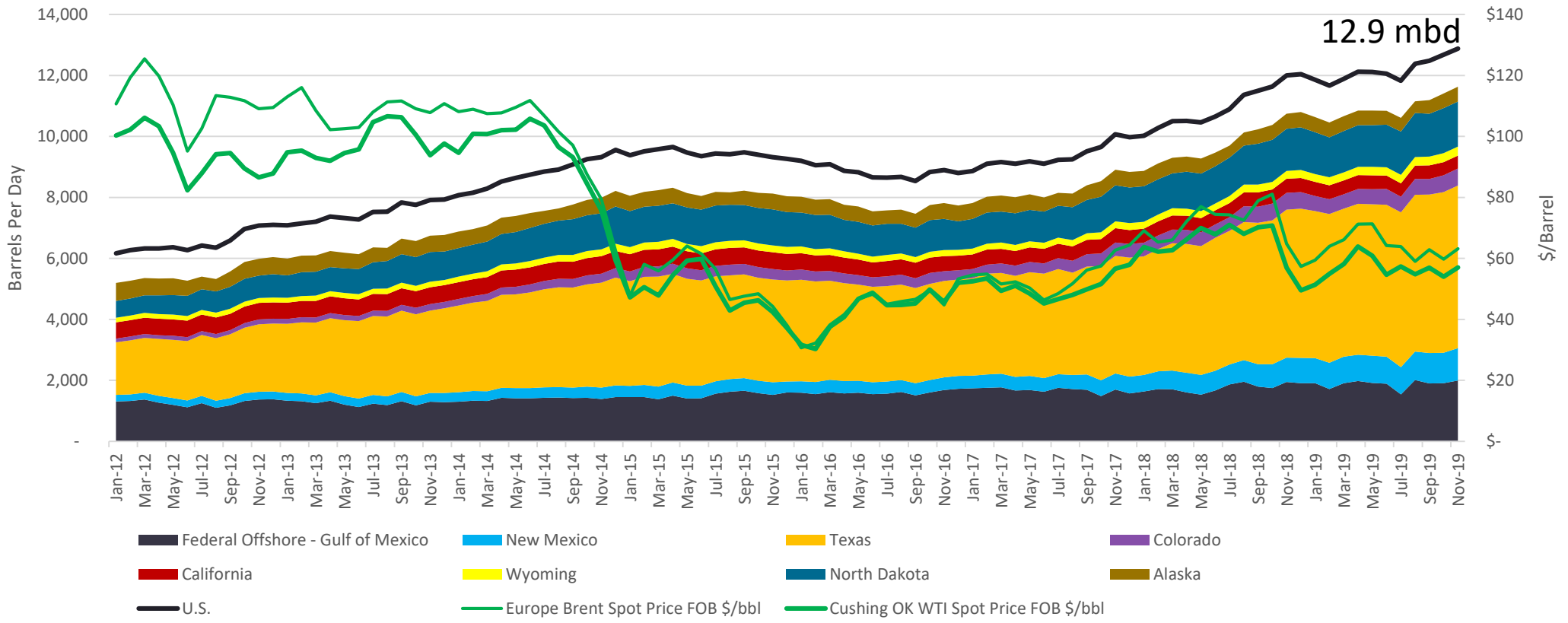
About PetroNerds and Our Services



- 10 years of US shale experience and expertise
- Boutique energy analytics and advisory firm, specializing in US shale oil, based in Denver, CO
- Personalized, data-driven advisory services
- Help our clients understand how the oil market impacts their business
- Provide data and actionable insights as needed, not off the shelf reports and forecasts

A PetroNerd:

US Crude Oil Production

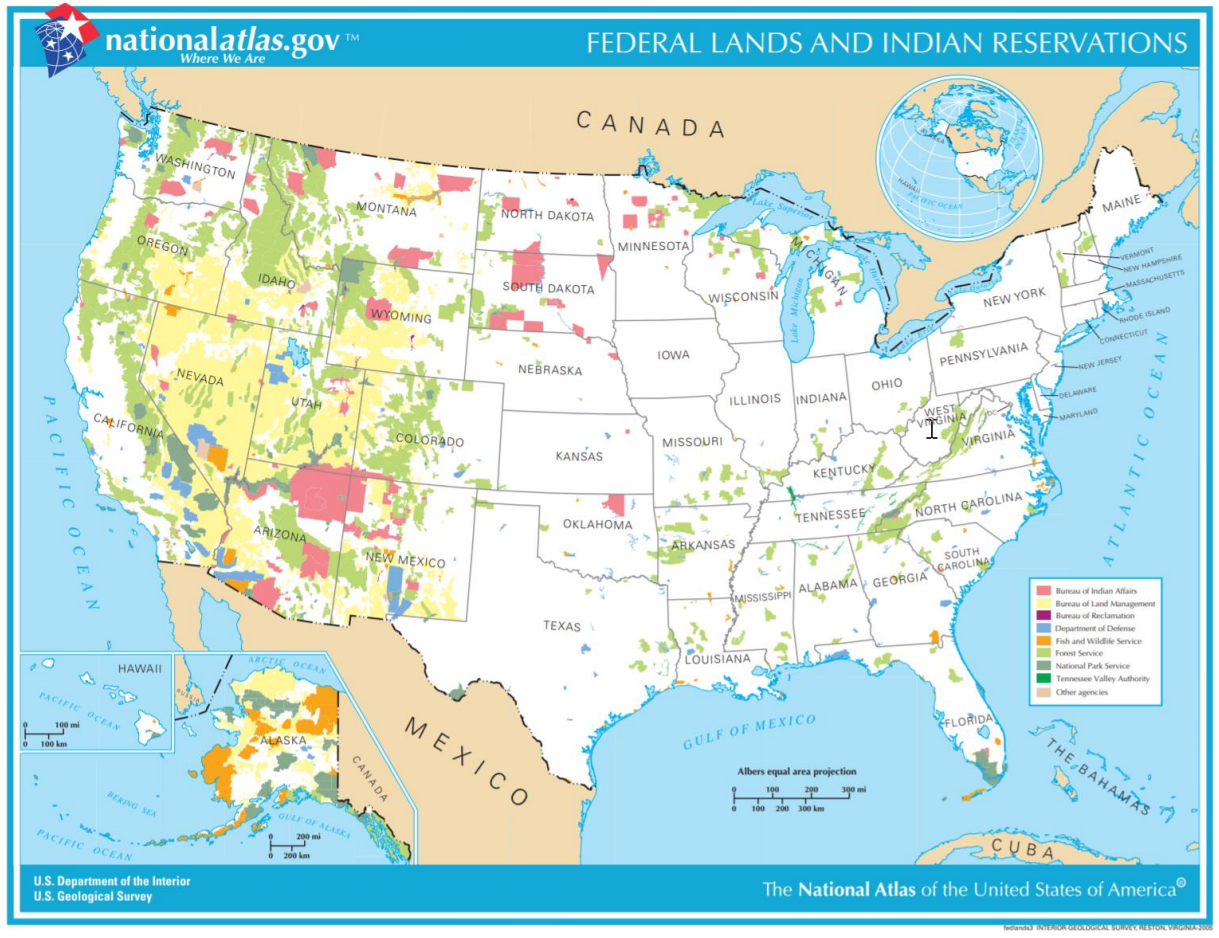


Source: EIA

US Shale Complexities in Context of a Fracing Ban

1. A fracing ban would not be happening in a vacuum.
2. It would be happening on the back of already low oil prices, weakened demand, investor pressure, efficiency gains, and changes in sentiment on oil and gas.
3. A few things to keep in mind:
    1. US shale has upended the global oil and gas market and will continue to do so. The speed at which global projects, from the offshore to the onshore, are brought online has increased and the cost has come down, competing with US short cycle crude oil production (Norway, Guyana, Brazil, Russia).
    2. The world produces and consumes roughly 100 mbd.
    3. The US and the world has responded incredibly on the supply side and technological increases and advances have and WILL continue to take place.
    4. The service sector will continue to remain under pressure and will morph over time.
    5. It is important to understand the context of pressure on US operators and their response during that time.

US Federal Lands Map

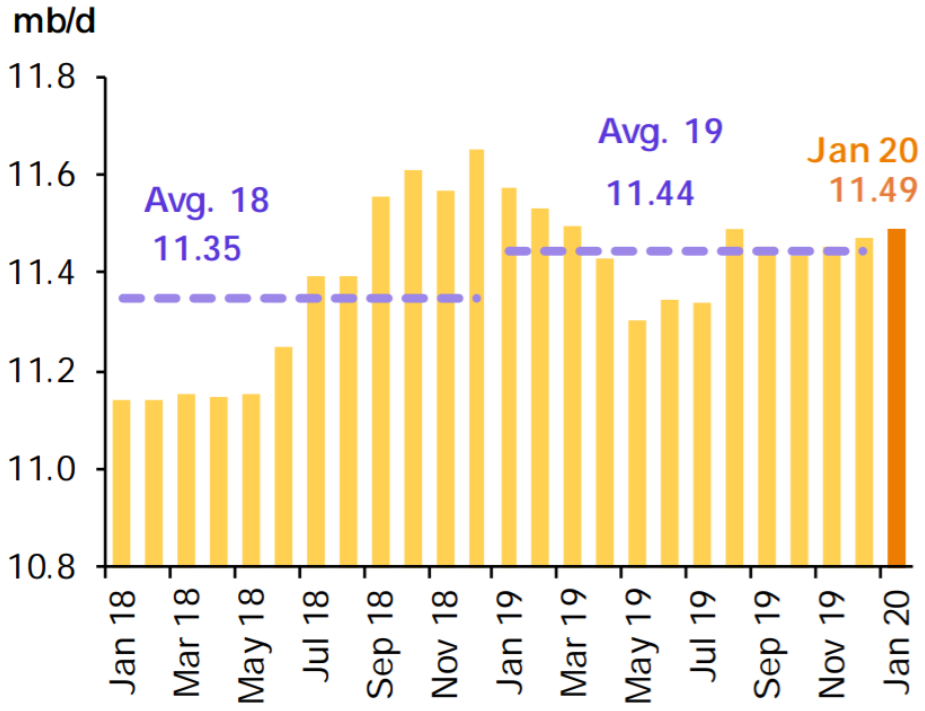


OPEC and Russian Production

	2017	2018	2019	Nov 19	Dec 19	Jan 20
Algeria	1,047	1,042	1,022	1,027	1,017	1,012
Angola	1,634	1,505	1,401	1,283	1,408	1,374
Congo	252	318	326	314	327	293
Ecuador	530	519	528	535	541	537
Equatorial Guinea	133	125	117	120	121	124
Gabon	200	186	208	198	220	196
Iran, I.R.	3,813	3,553	2,357	2,107	2,095	2,086
Iraq	4,446	4,550	4,680	4,641	4,569	4,501
Kuwait	2,708	2,746	2,687	2,707	2,709	2,665
Libya	811	952	1,097	1,183	1,140	796
Nigeria	1,658	1,719	1,786	1,782	1,751	1,776
Saudi Arabia	9,954	10,311	9,771	9,868	9,676	9,733
UAE	2,915	2,986	3,077	3,110	3,063	3,034
Venezuela	1,911	1,354	793	719	732	733
Total OPEC	**32,013**	**31,865**	**29,851**	**29,595**	**29,368**	**28,859**

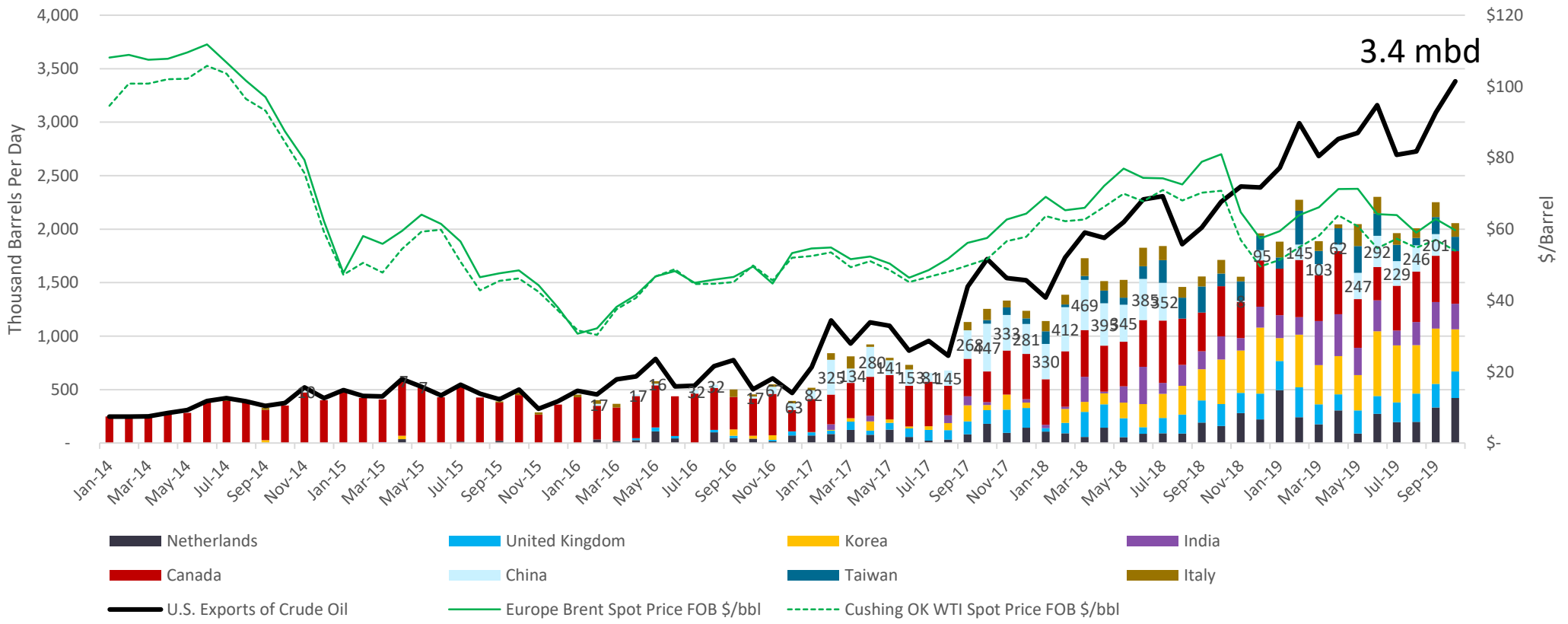
Notes: Totals may not add up due to inde
Source: OPEC Secretariat.

Graph 5 - 21: Russia's monthly liquids supply



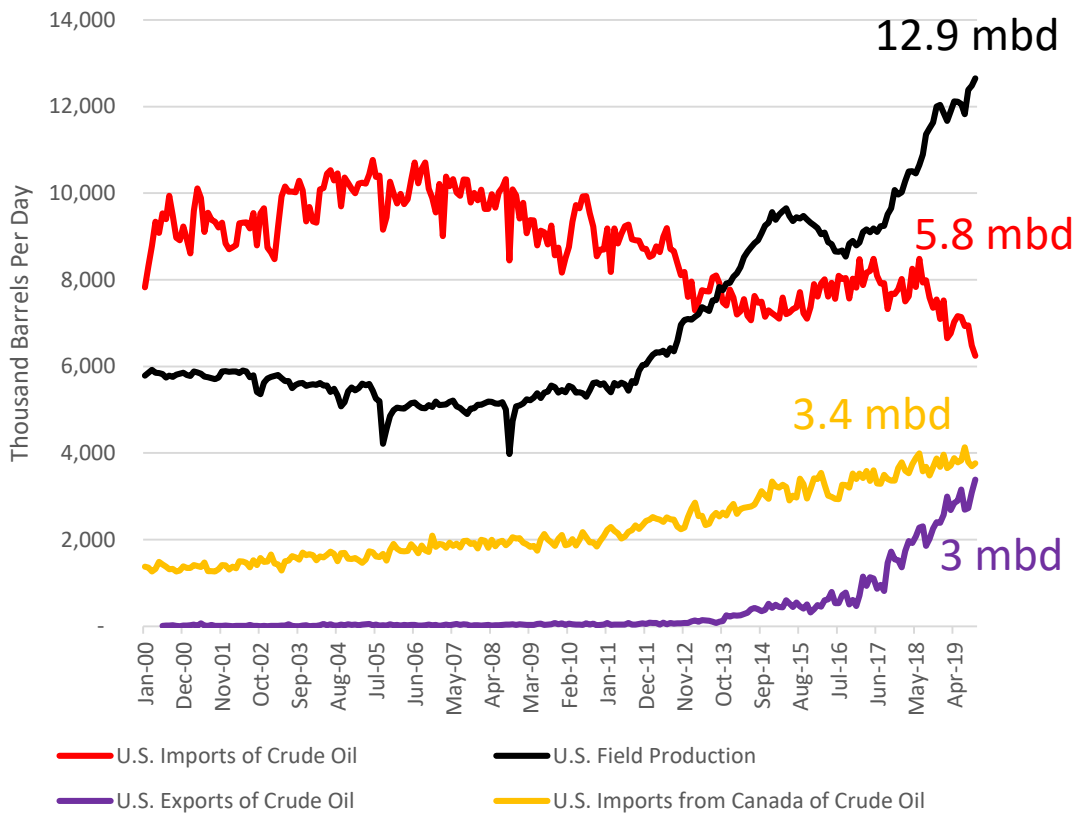
Sources: Nefte Compass and OPEC Secretariat.

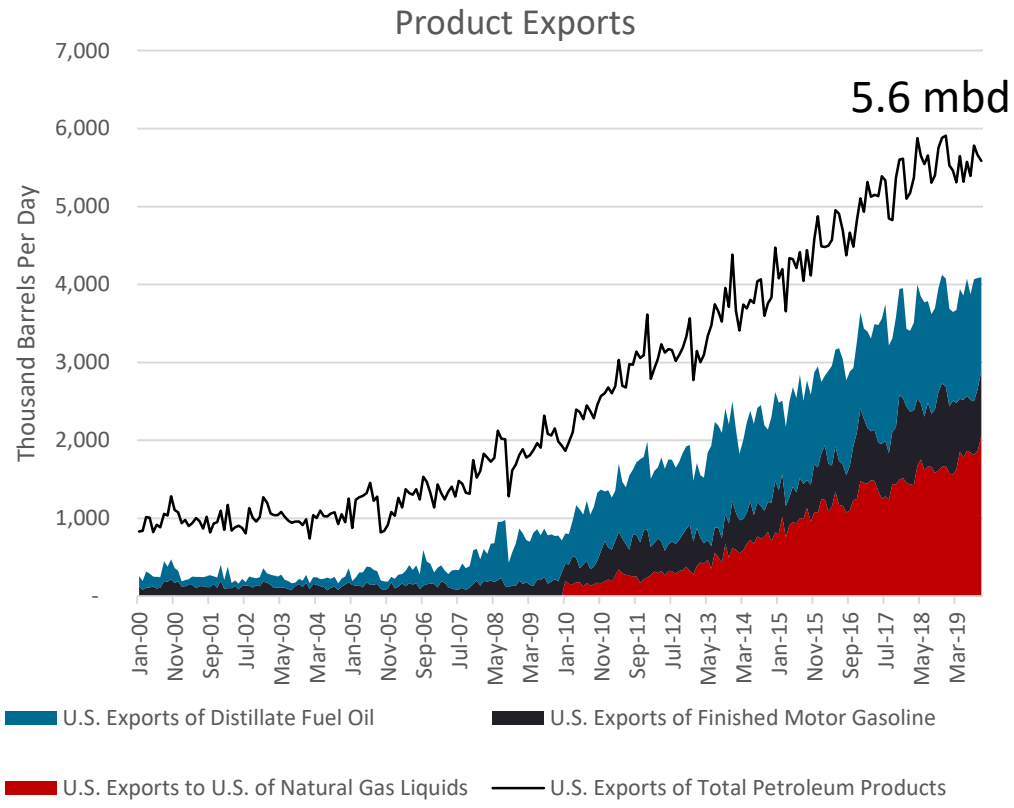
US Crude Oil Exports



Source: EIA

US Crude Oil Imports and Exports





Source: EIA

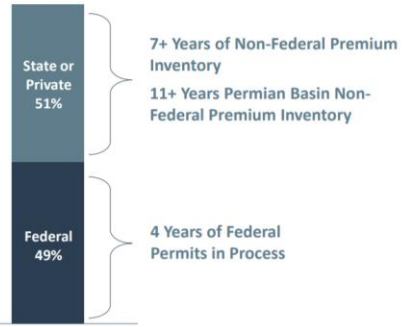
EOG

Diverse and Flexible Portfolio of Inventory and Acreage

EOG's Non-Federal vs. Federal Position

Premium Locations[1]

10,500



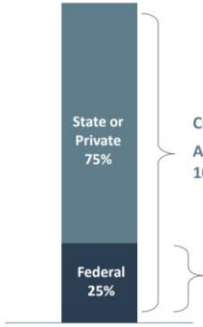
7+ Years of Non-Federal Premium Inventory

11+ Years Permian Basin Non-Federal Premium Inventory

4 Years of Federal Permits in Process

U.S Acreage[2]

4.3 MM Acres



Currently Drilling in 6 Basins

Active Exploration Program Across 10+ Basins

80% Total Federal Acreage HBP[3]

90% Permian Basin Federal Acreage HBP[3]

(1) 46% of Permian and 5% of Powder River Basin premium locations are on Non-Federal land.
(2) 50% of Permian and 33% of Powder River Basin acreage is on Non-Federal land.
(3) Held By Production.

3Q 2019 20

Oil and Gas Regulatory Process Promotes Balanced Regulatory Framework

Checks and Balances

Executive Order
- Subject to Judicial Review
- Requires Constitutional Authority

Process for Regulatory Changes Governed by Federal Law
- New Regulations must be Consistent with Existing Laws
- Subject to Public Review

Stakeholder Interests Are Aligned

Revenues from Federal Lands Shared with the States

Oil and Gas Revenues Provide Significant Budget Support
- Public Education, Health Care, Infrastructure Projects

Industry Activity Provides Jobs and Economic Benefits to Local Communities

U.S. Energy Production Driver of U.S. Economic Growth and Energy Independence

3Q 2019 21

Source: EOG Q3 2019 Investor Presentations

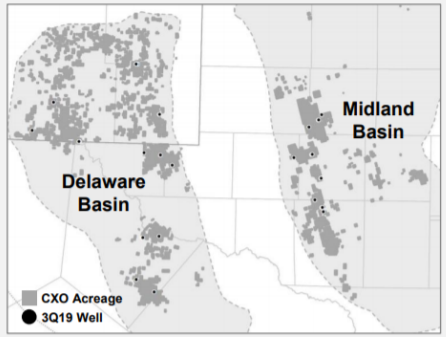
Concho Natural Resources

3Q19 Operational Performance

High-Quality Asset Base

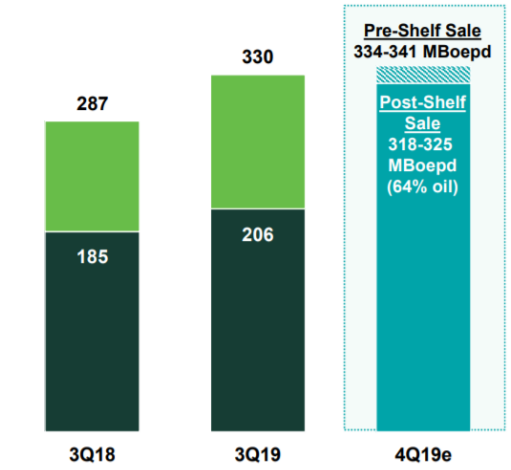
Diversified portfolio provides capital allocation flexibility

- Federal lands represent 1/5th of total net acreage position
- Permit ~1 year in advance of operations



Production Above High End of Guidance

Quarterly Volumes & 4Q19 Outlook (MBoepd)



- 3Q19 total production & oil production above high end of guidance
- 4Q19 guidance includes expected impact from remaining spacing tests
  - Future development plans to prioritize wider spacing

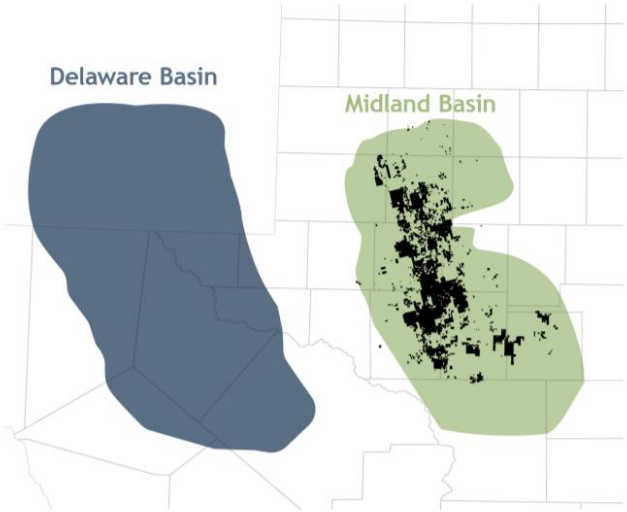
CXO acreage as of December 31, 2018, pro forma for announced transactions. 4Q19e production guidance Pre-Shelf Sale includes a full quarter of production volumes for the New Mexico Shelf; Post-Shelf Sale volumes based on November 1, 2019 close date and therefore include one month of production volumes for the New Mexico Shelf.

5

Source: Concho Natural Resources, Q3 2019 Investor Presentations

Pioneer Natural Resources

Competitive Advantages of the Midland Basin



	Delaware Basin	Midland Basin
Political Risk	Significant federal land exposure	No federal land exposure
Well Costs	Deeper basin requires higher development costs	Shallower basin yields lower development costs
Oil Quality	Light oil (45° - 50° API gravity) is trading at a discount (~$0.75) to Midland pricing	High quality oil (38° - 44° API gravity) trades at a premium to lighter oil
OPEX	50% greater water cut[1] results in higher produced water expense	Reduced water cut drives lower produced water expense
Commodity Mix	Lower oil percentage (more gas production)	Higher oil percentage (less gas production)

Economic advantages of the Midland Basin generate higher corporate returns

PIONEER NATURAL RESOURCES

1) Source: Horizontal raw data provided by RSEG.

8

Source: Pioneer Natural Resources Q3 2019 Investor Presentations

Exxon Q3

Neil Mehta

…As we go into the election season here in the United States, how do you think about risks around federal public lands and what that means for your exposure, and thinking about that in the context of New Mexico, Alaska and the Gulf of Mexico?

Neil Hansen

…it's difficult to speculate on the impact of a policy without details on implementation. I think any effort obviously to ban fracking would have a negative impact on industry efforts to develop resources like the Permian. There is no doubt on that, but when you look at the motivation of those policies, I mean if the underlying concern is about risk of climate change and emissions reduction, we certainly share similar concerns. But we think they are more effective policies and we also think there are technology advances that are required.

For example, we've been a very long-term vocal advocate of a revenue-neutral carbon tax. It's uniform it's transparent, it will incentivize the market to find solutions. I think any efforts to ban fracking or restrict supply will not remove demand for the resource. If anything, it will shift the economic benefit away from the U.S. to another country and potentially impact the price of that commodity here and globally.

The other thing we're trying to do Neil is, is help policymakers understand the tremendous benefits that resource development brings to economies, that brings to employment and to society. In fact, a recent study was done. I don't know if you saw this, but the development in the Permian, our development in the Permian Basin for New Mexico, will generate approximately $64 billion in economic benefits over the next 40 years.

Chevron Q3

Neil Mehta

….You continue to trend above your target levels. Can you just talk, Jay, with some detail about, how the plan is progressing in the Permian and any comments that you would have on sort of this upcoming U.S. election? And any impacts the way you think about prosecuting your acreage?

Jay Johnson

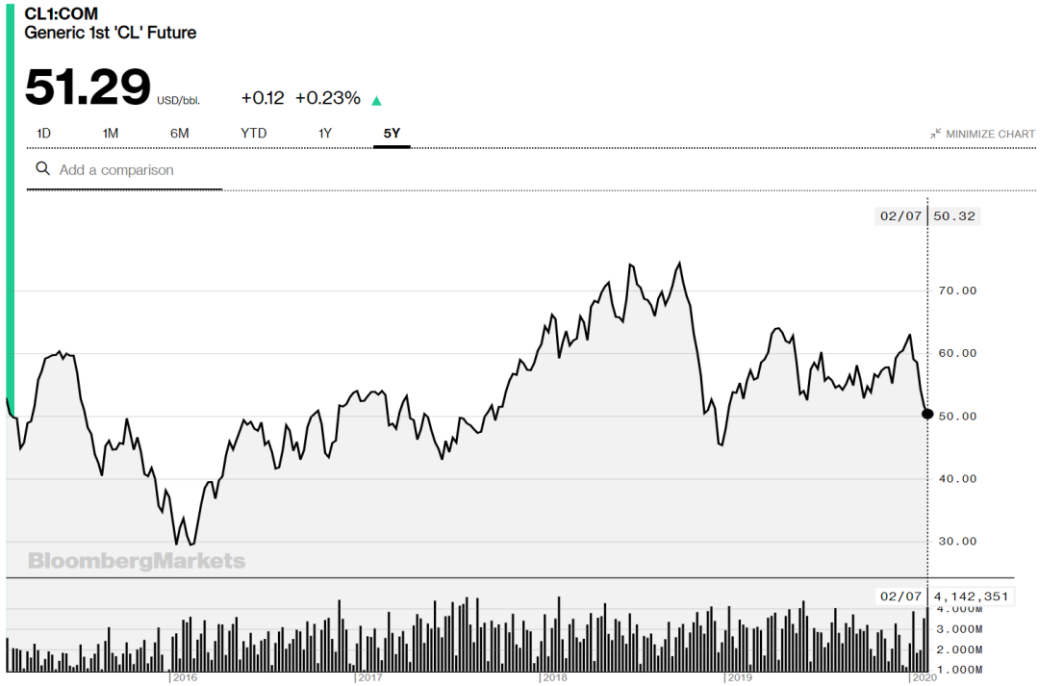
…In terms of the upcoming election, look, hydraulic fracturing has been done for millions of wells, not only in the U.S. but around the world. It's done safely. It's done effectively. We learn more about it all the time. And it's really unlocked an economic -- huge economic benefit for the country, as well as for the companies involved.

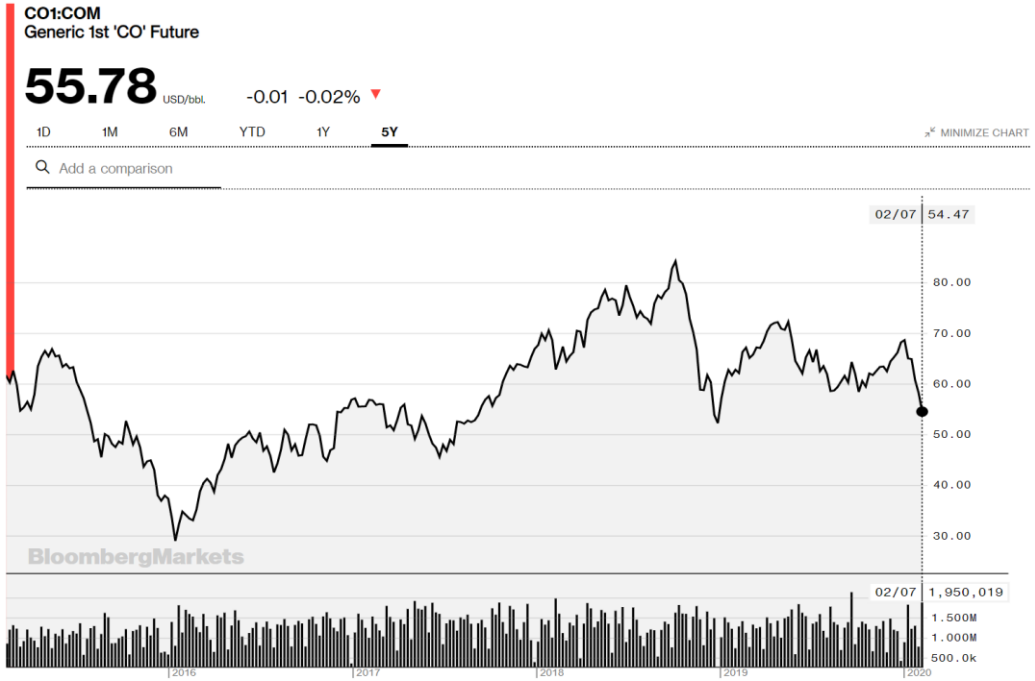
It's also unlocked some environmental benefits in terms of the proliferation of gas, which isn't always to our benefit from a profit standpoint, but it's a great fuel for the U.S. If you look at it from our company standpoint, we have less than about 10% of our Permian unconventional acreage that is on federal land and all of that is in New Mexico. So from a relative standpoint, while we would not like to see any kind of restrictions on hydraulic fracturing it's -- that's the context for our company.

US Shale

AND THE BROADER OIL MARKET IMPACT

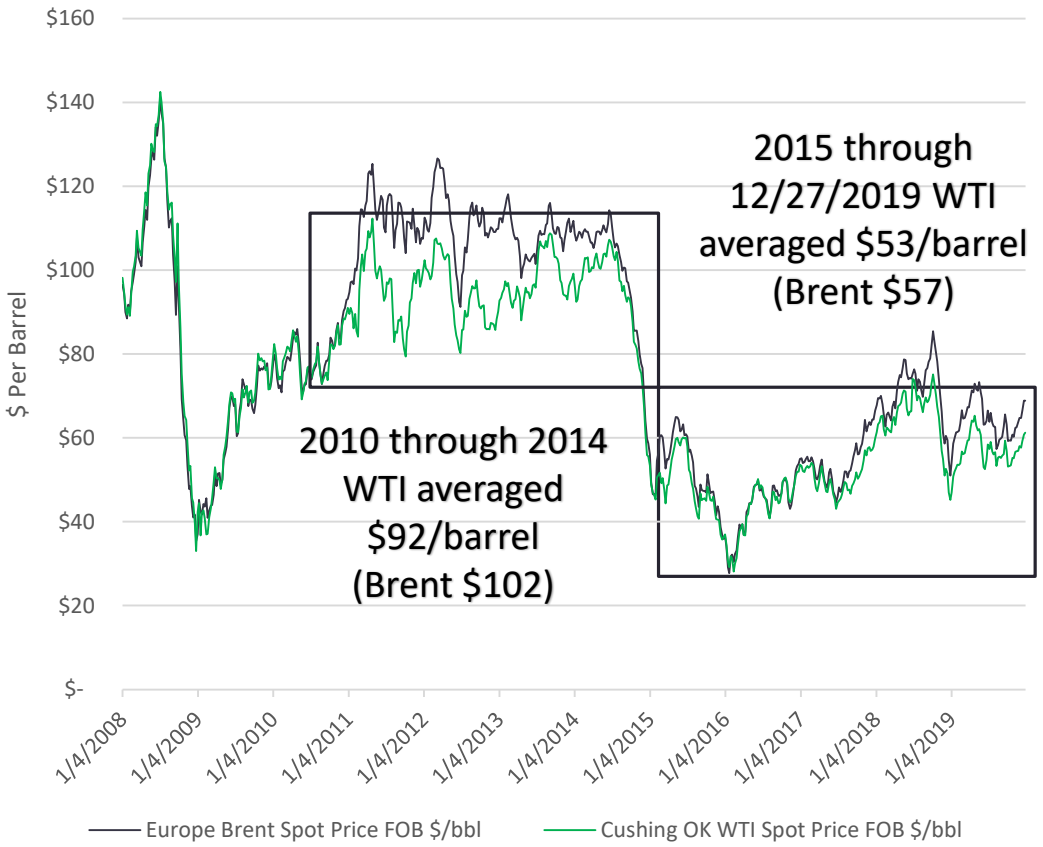
Oil Prices





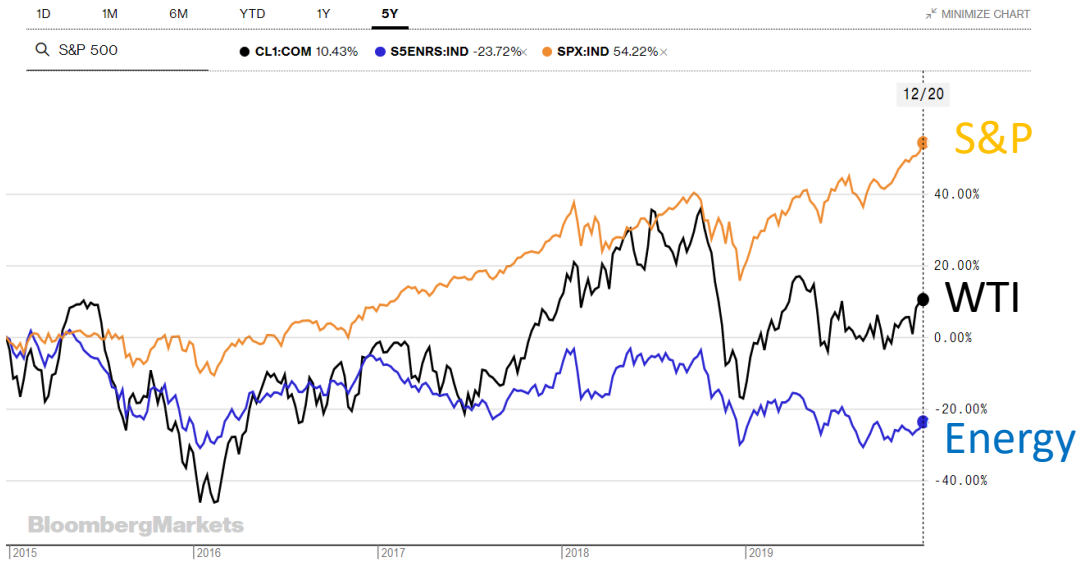
Source: Blooomberg

The Shift in Price and Public Market Sentiment



Source: EIA, Blooomberg

The S&P 500 Energy Index now accounts for just ~4-5% percent of the S&P 500



Market Pressure for Public Companies

Market Pressure	
Muted Oil Prices (Plenty of Supply, Demand Growth Concerns)	Investor Pressure – Returns, Spacing/Inventory, ESG, Climate Change, Peak Demand

S&P 500 Shrinkage – Loss of Generalist Investor	
Permian Focus – Rockies & Williston Basin producers struggling for attention	Small and Mid-Large Cap Pressure

Transition and Shake Out	
Limited capital access and an expectation that many small and mid-cap producers will be unable to survive a prolonged downturn	Production has remained resilient

S&P 500 Energy Components

S&P 500 Energy Components

Performance

screen flipcharts download

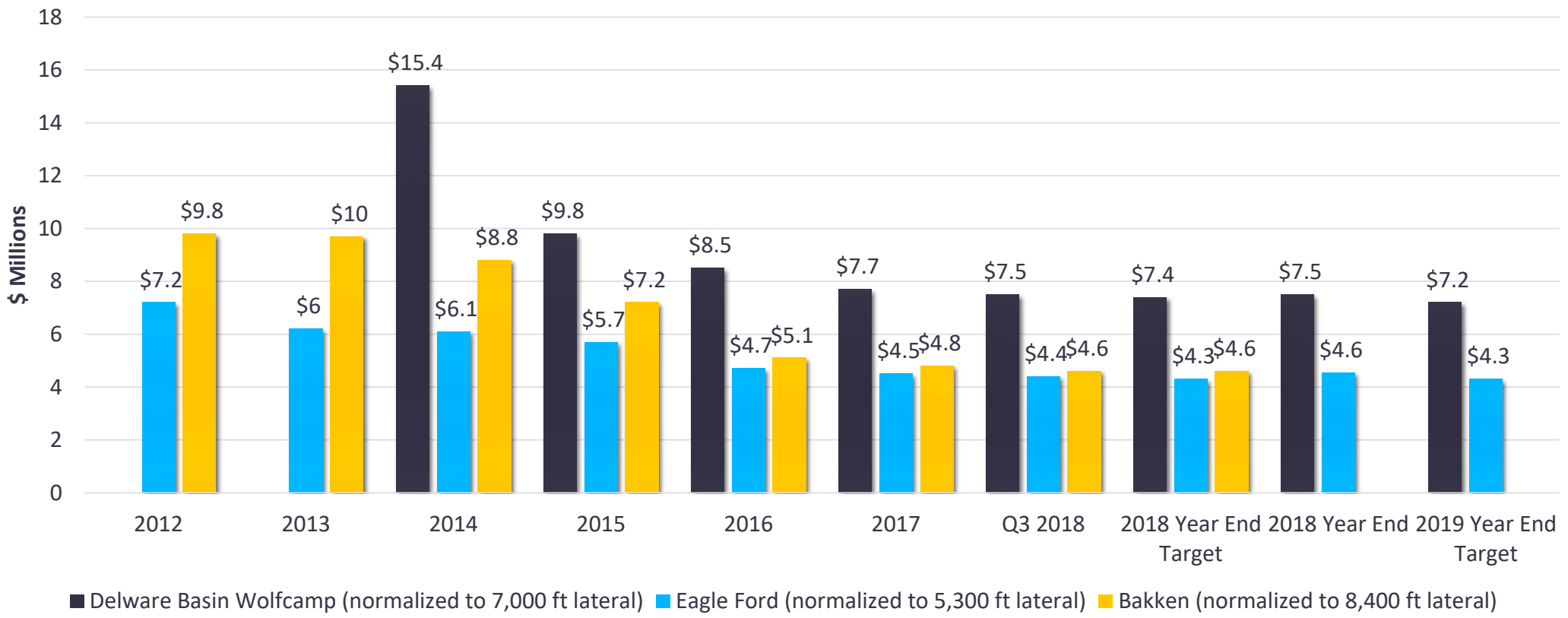
Symbol	Name	Last	Wtd Alpha	YTD %Chg	1M %Chg	3M %Chg	52W %Chg	Links
APA	Apache Corp	28.31	-11.93	+10.65%	+8.40%	+28.41%	-14.40%	
BKR	Baker Hughes A Ge Co. Cl A	21.76	-12.50	-14.83%	-14.36%	-0.32%	-5.74%	
COG	Cabot Oil & Gas Corp	14.40	-45.61	-16.89%	-15.97%	-23.68%	-43.52%	
COP	Conocophillips	60.65	-7.66	-6.38%	-6.31%	+6.64%	-6.77%	
CVX	Chevron Corp	110.57	-9.45	-8.13%	-7.97%	-6.28%	-1.00%	
CXO	Concho Resources Inc	78.98	-24.38	-9.31%	-6.97%	+19.57%	-32.27%	
DVN	Devon Energy Corp	22.39	-19.41	-13.57%	-12.77%	+4.88%	-16.41%	
EOG	Eog Resources	76.10	-20.68	-8.83%	-8.15%	+6.34%	-22.77%	
FANG	Diamondback Energy	78.59	-26.56	-15.09%	-13.13%	-10.32%	-21.28%	
FTI	Technipfmc Plc	16.82	-34.55	-21.43%	-19.56%	-16.90%	-26.82%	
HAL	Halliburton Company	21.92	-25.16	-10.13%	-9.88%	+7.90%	-28.72%	
HES	Hess Corp	57.80	-3.06	-13.08%	-12.62%	-14.35%	+11.96%	
HFC	Hollyfrontier Corp	46.53	-14.77	-8.60%	-9.08%	-20.09%	-14.33%	
HP	Helmerich & Payne	39.96	-28.48	-11.82%	-9.84%	+0.60%	-25.62%	
KMI	Kinder Morgan	21.32	+14.55	+0.66%	+1.09%	+5.65%	+18.06%	
MPC	Marathon Petroleum Corp	53.12	-18.85	-12.41%	-12.60%	-22.42%	-17.72%	
MRO	Marathon Oil Corp	11.94	-25.22	-12.11%	-11.46%	-0.62%	-24.98%	
NBL	Noble Energy Inc	20.66	-10.37	-16.65%	-15.90%	+1.59%	-8.55%	
NOV	National-Oilwell	20.94	-26.92	-16.33%	-15.96%	-12.04%	-29.62%	
OKE	Oneok Inc	74.97	+15.07	-0.86%	-0.91%	+4.75%	+17.96%	
OXY	Occidental Petroleum Corp	40.73	-37.42	-1.09%	+1.50%	-3.71%	-38.69%	
PSX	Phillips 66	95.90	-2.45	-13.81%	-13.18%	-19.28%	+2.87%	
PXD	Pioneer Natural Resources Company	140.36	-0.09	-6.87%	-7.12%	+10.90%	+0.55%	
SLB	Schlumberger N.V.	33.95	-22.86	-15.20%	-14.77%	-2.01%	-22.52%	
VLO	Valero Energy Corp	86.81	+1.62	-7.01%	-6.56%	-13.62%	+7.33%	
WMB	Williams Companies	21.46	-23.93	-9.27%	-8.77%	-7.32%	-19.34%	
XEC	Cimarex Energy Company	45.82	-36.33	-12.54%	-11.56%	+3.87%	-38.81%	
XOM	Exxon Mobil Corp	64.56	-17.63	-7.54%	-7.68%	-5.73%	-9.77%	
Symbol	Name	Last	Wtd Alpha	YTD %Chg	1M %Chg	3M %Chg	52W %Chg	Links

Source: https://www.barchart.com/stocks/indices/sp-sector/energies?viewName=performance

Permian Basin Top Producers

Company	Daily Oil (b/d)
OCCIDENTAL PETROLEUM	462,117.93
CONCHO RESOURCES	308,098.22
PIONEER NATURAL RESOURCES	293,943.19
DIAMONDBACK ENERGY	255,530.76
EOG RESOURCES	245,658.55
EXXON MOBIL	238,835.16
CHEVRON	154,648.49
PARSLEY ENERGY	118,445.03
APACHE	115,075.66
CIMAREX ENERGY	108,299.70
ENDEAVOR ENERGY RESOURCES	105,698.95
DEVON ENERGY	98,934.41
ENCANA	92,650.86
MEWBOURNE OIL COMPANY	82,134.84
SM ENERGY	81,314.38
CROWNQUEST OPERATING	70,408.16
SHELL	69,486.35
CENTENNIAL RESOURCE DEVELOPMENT	61,930.82

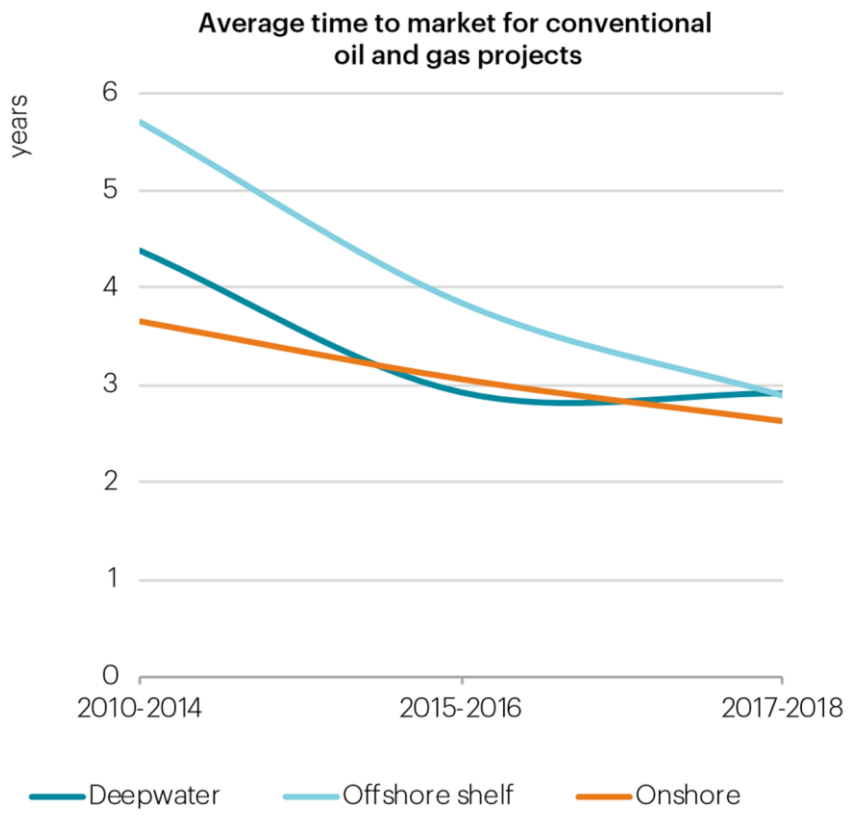
EOG Completed Well Costs



2020 Target: $6.9 million

Source: PetroNerds, EOG Investor Presentations

Conventional Cycles Getting Shorter



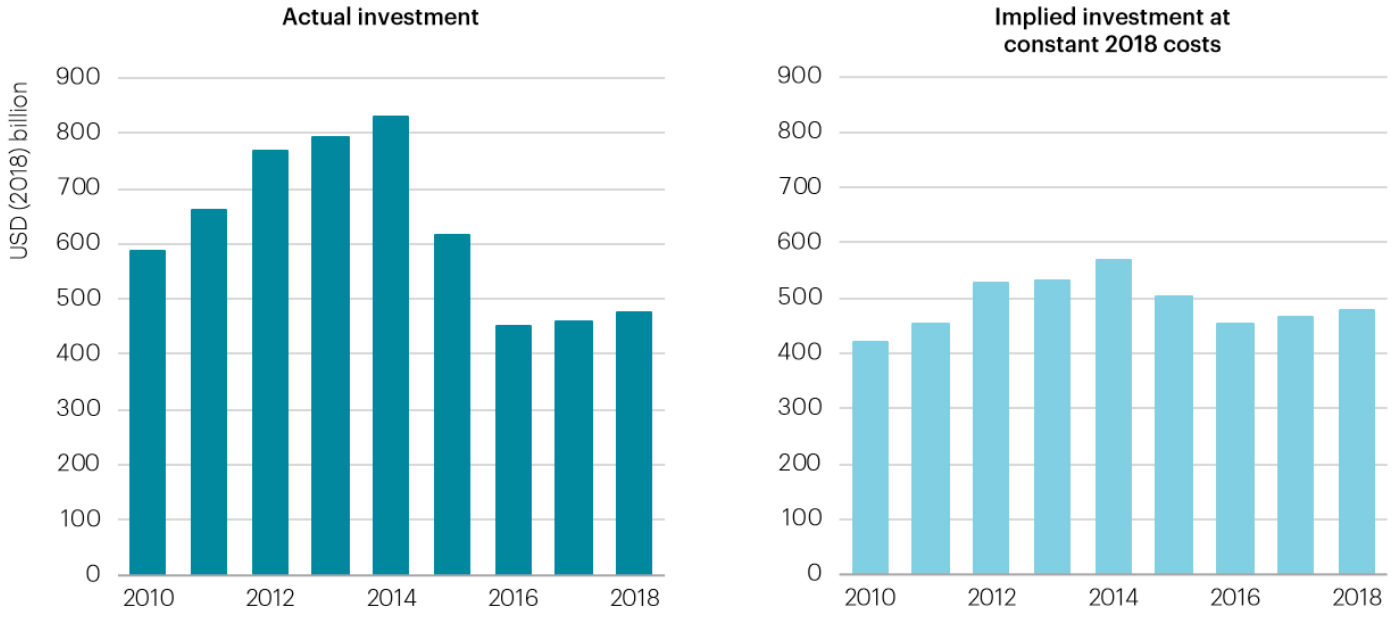
This IEA chart shows project development times for *conventional* upstream oil and gas projects declining precipitously across all project types.

Unconventional technology and lessons learned from the short-cycle business model are one of the primary contributing factors to the decline in project development times.

Source: IEA *World Energy Investment 2019*

Cost Deflation

Investment in upstream oil and gas – actual spend vs implied investment at constant 2018 cost levels



Cost-adjusted upstream oil and gas investment was 15% higher in 2018 than 2010.

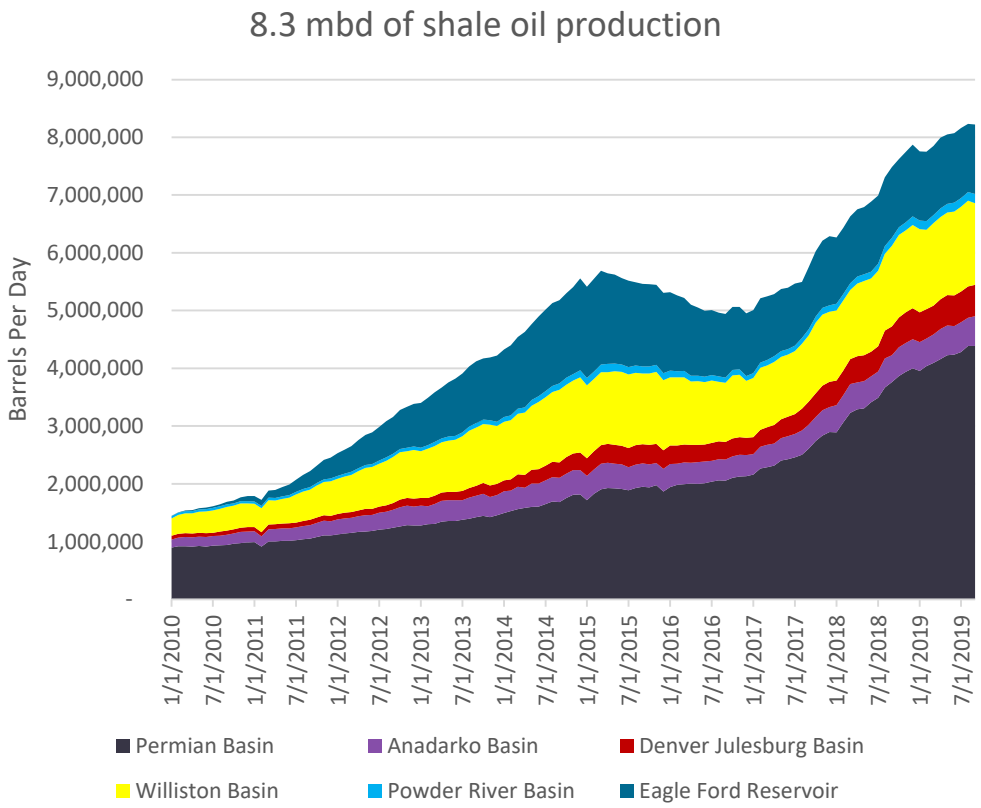
Although IEA has been a leader of the 'investment shortfall' bandwagon, more nuanced data, in this case from IEA, shows that the shortfall is a complex and misleading issue – particularly when combined with the previous chart showing reduced project times for conventional development.

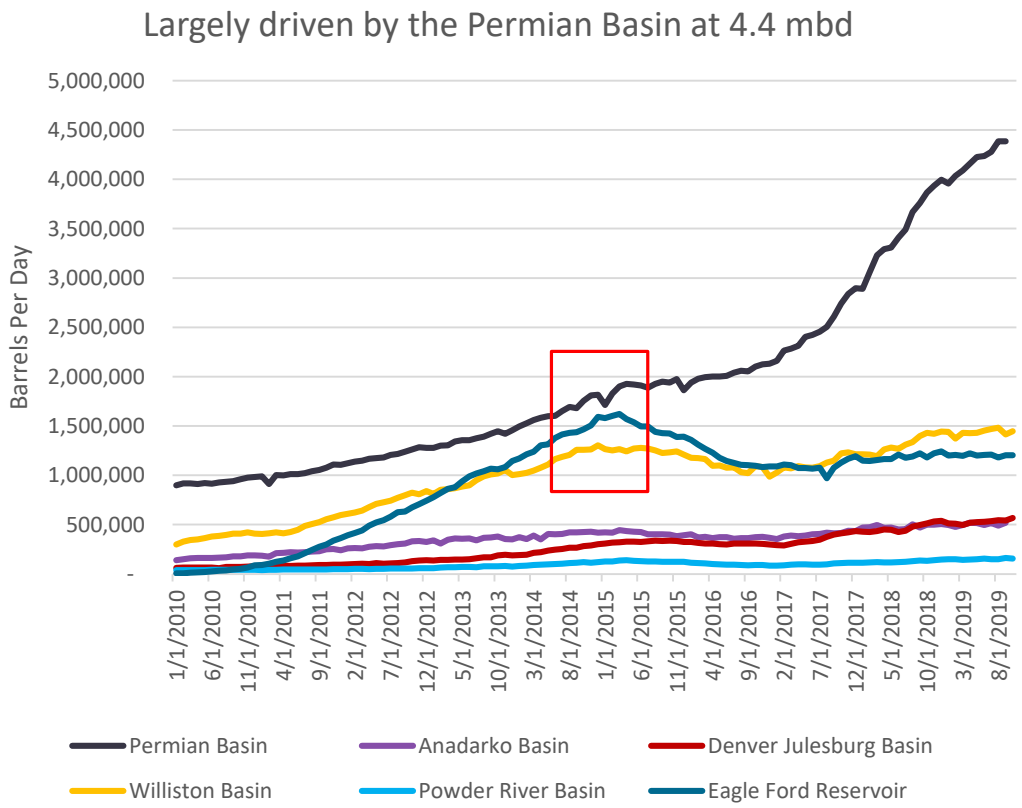
Source: IEA *World Energy Investment 2019*

Production and Productivity

PERMIAN BASIN FOCUS

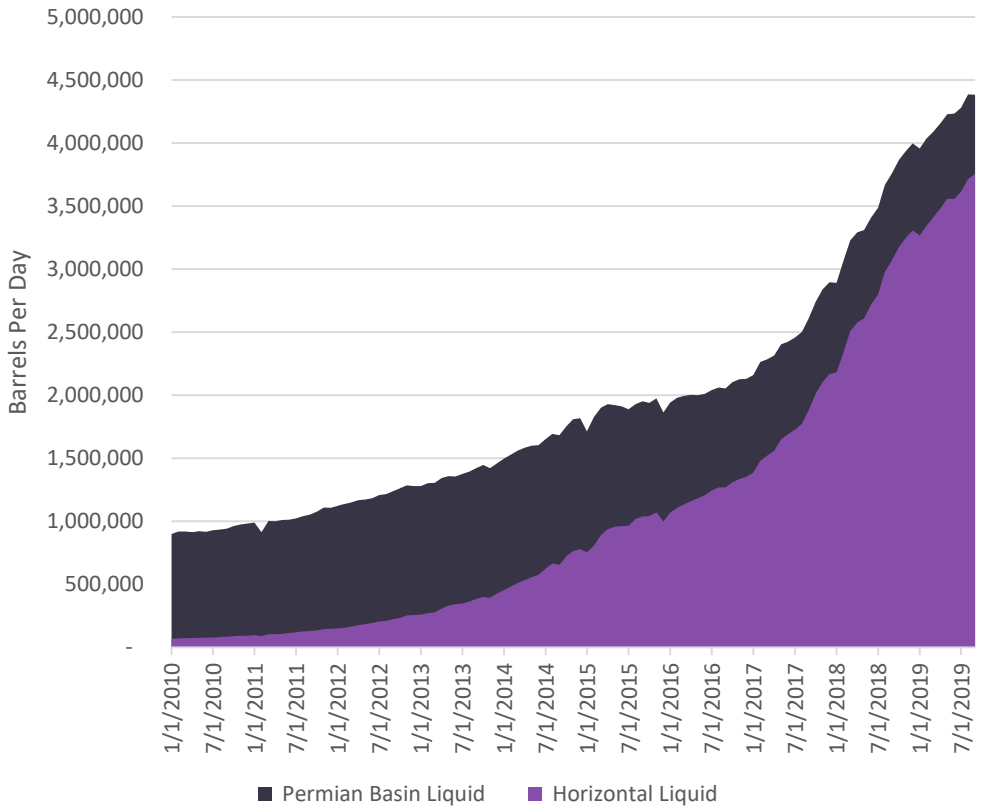
US Shale Oil Production

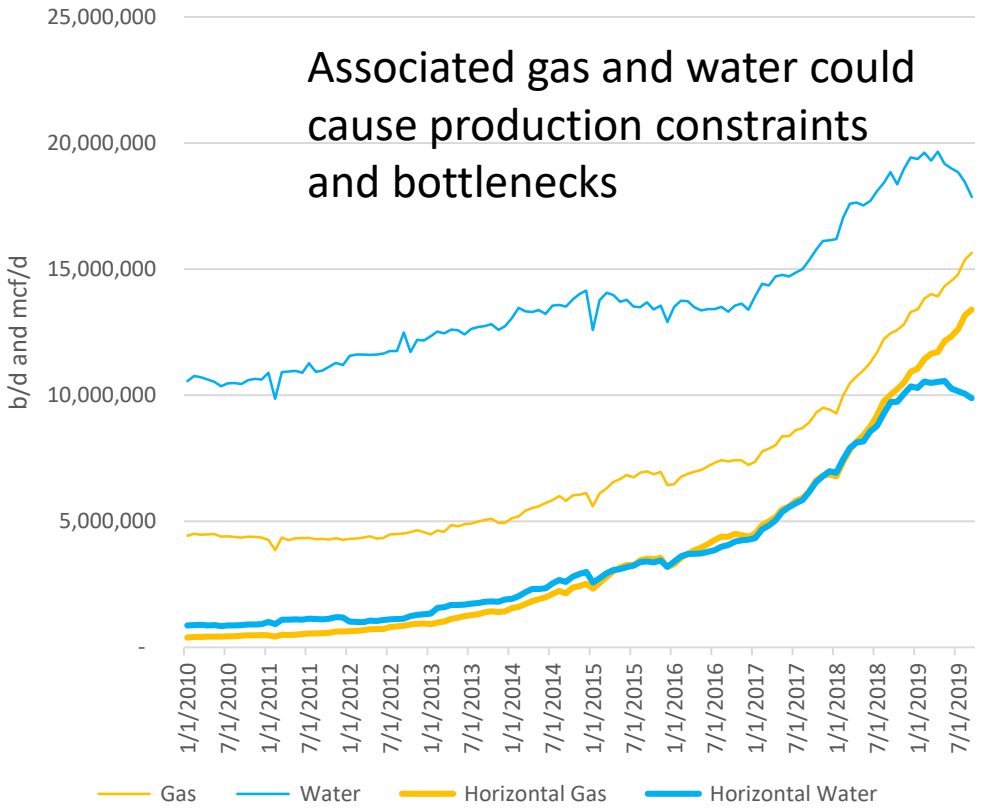




Source: PetroNerds, DrillingInfo

Permian Basin Production

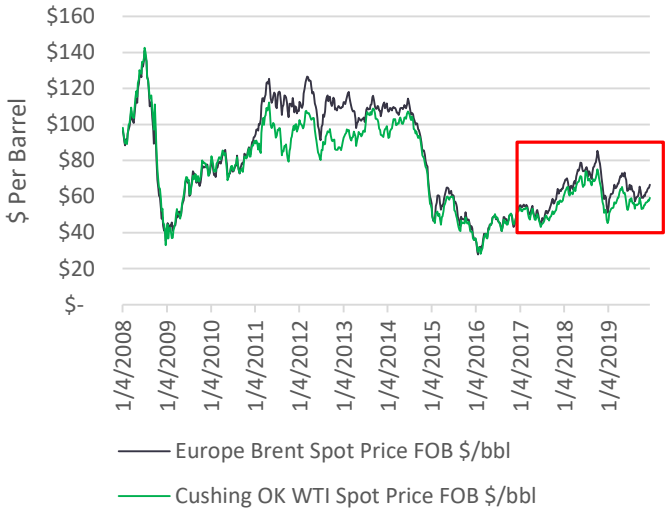


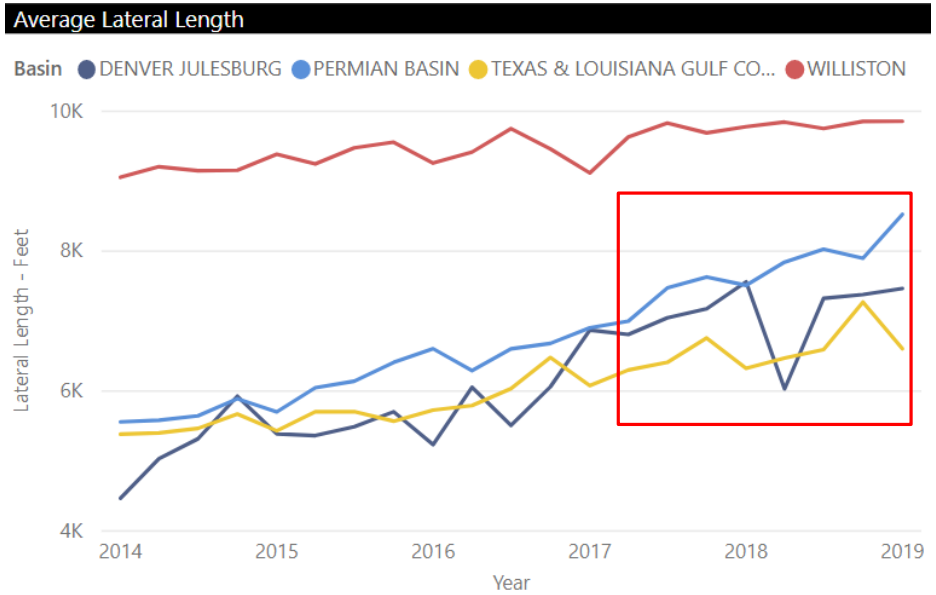


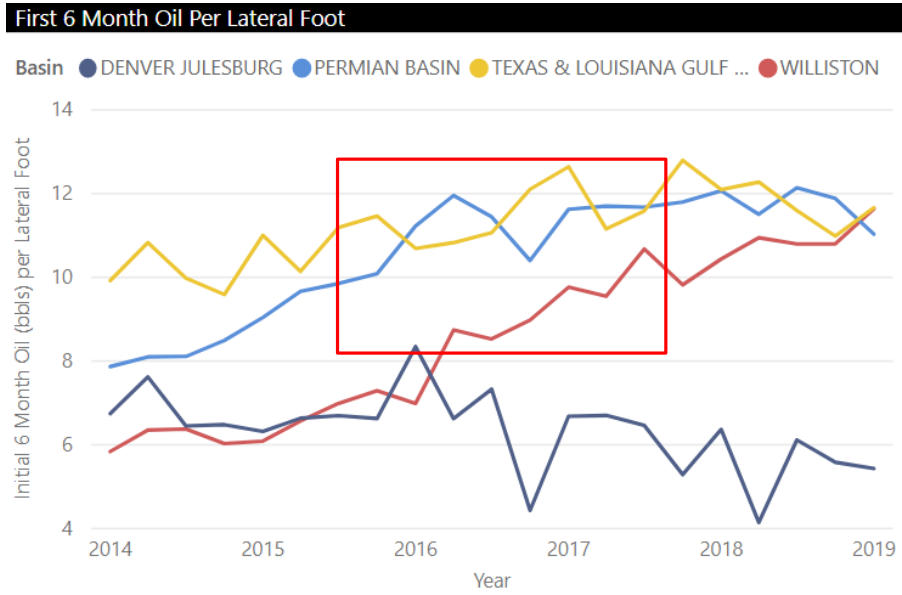
Source: PetroNerds, DrillingInfo

Changes in the Market

- Despite lower and rangebound oil prices, longer lateral lengths and correlated production increases have continued.







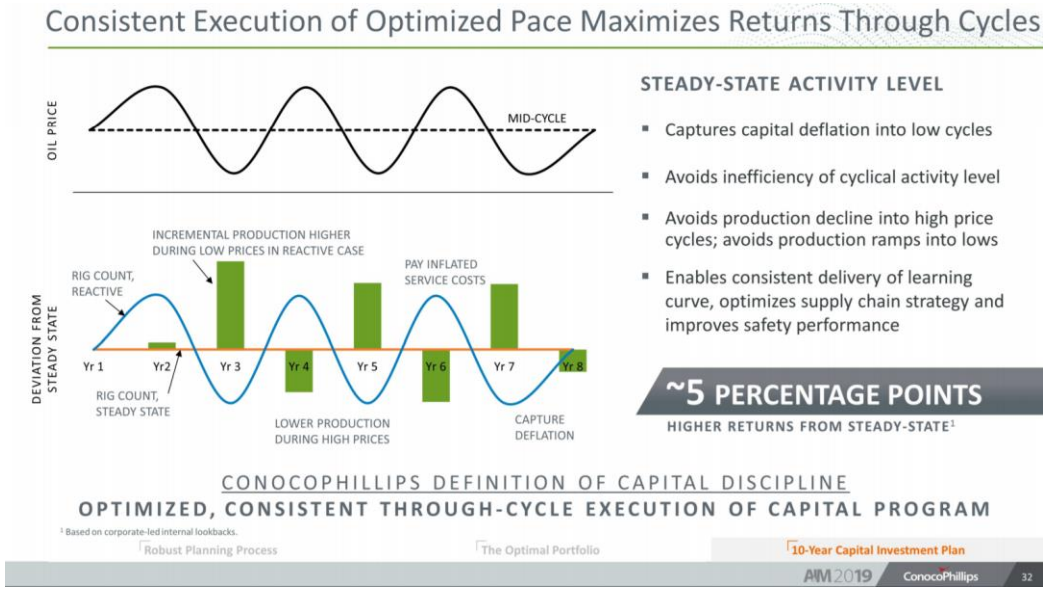
Lower range bound prices

Source: PetroNerds, raw data DrillingInfo

Longer laterals drilled and lateral lengths steadily increasing

Productivity gains

Moving Away from Cycle Chasing: Majors Shift to Steady Activity and CAPEX



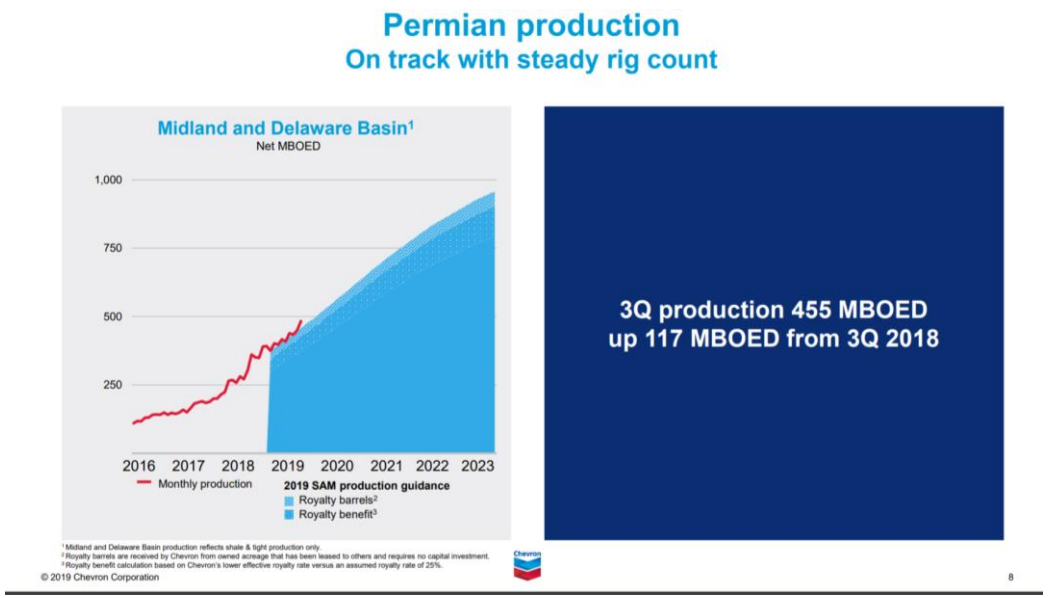
ConocoPhillips' analyst day presentation discusses the "look backs" they have performed on their shale activity in the Bakken and Eagle Ford and how much capital was squandered by chasing prices and responding by adjusting activity levels.

They would end up dropping rigs when rig day rates were low and end up bringing on production when oil prices were low.

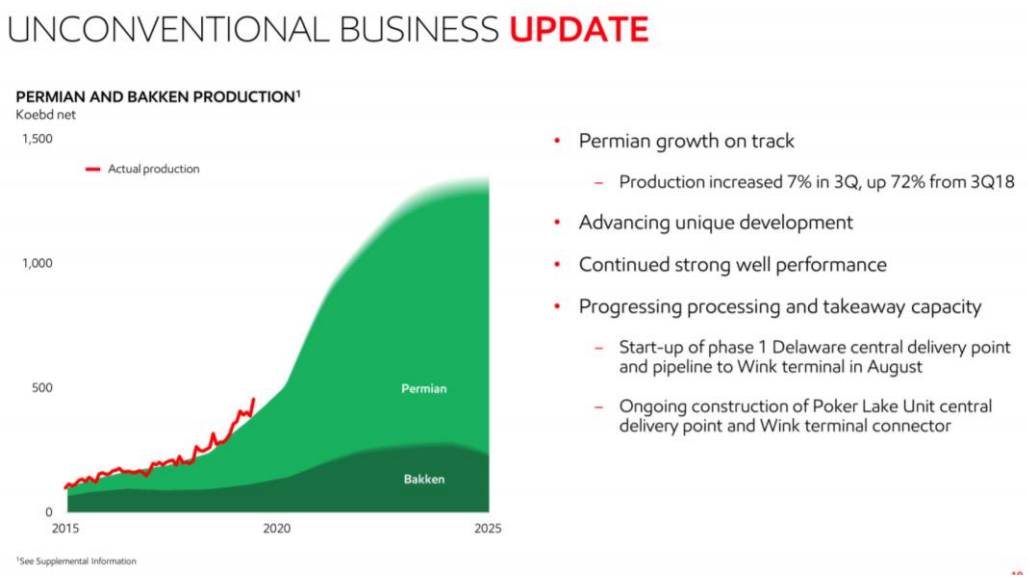
They expect to achieve five percent higher returns by keeping activity levels stable and not chasing cycles.

Majors Continue Growth in the Permian Basin

Short cycle, competitive, strong breakevens, growth now - not later.

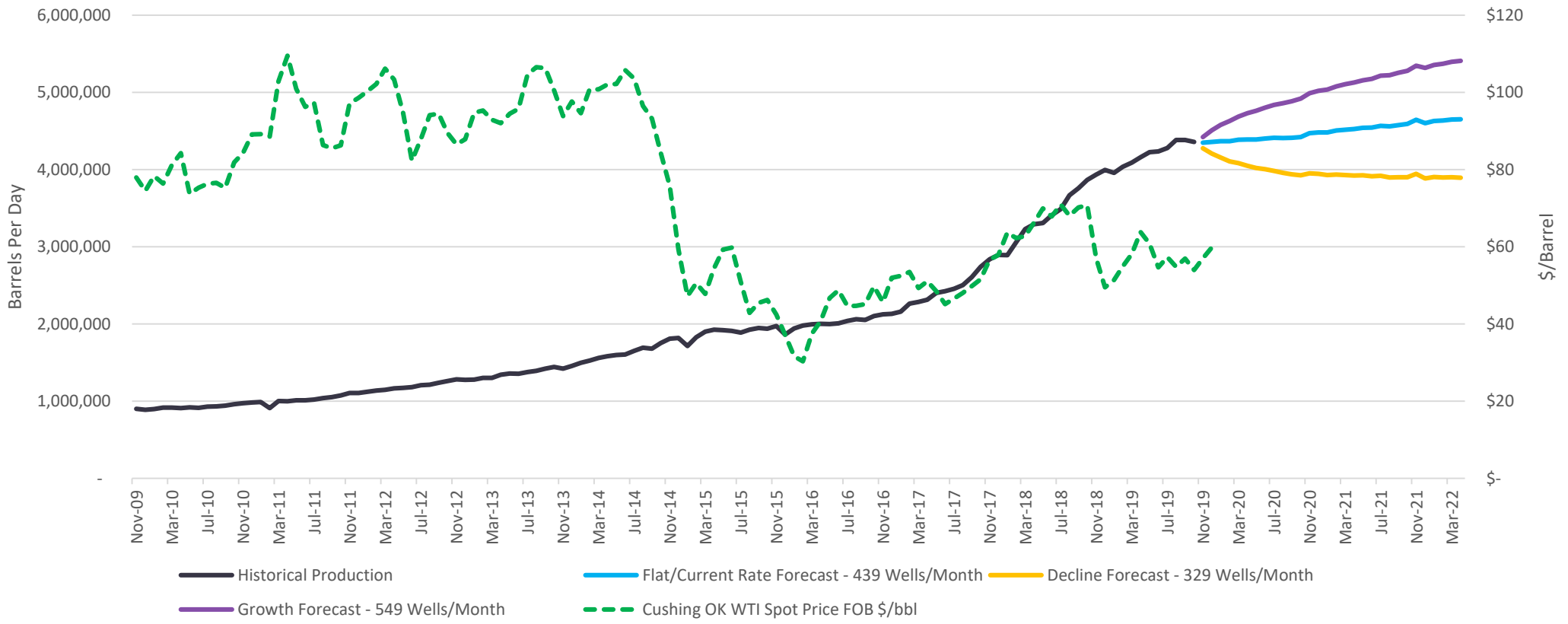


Source: Chevron Q3 2019 Earnings, November 2019

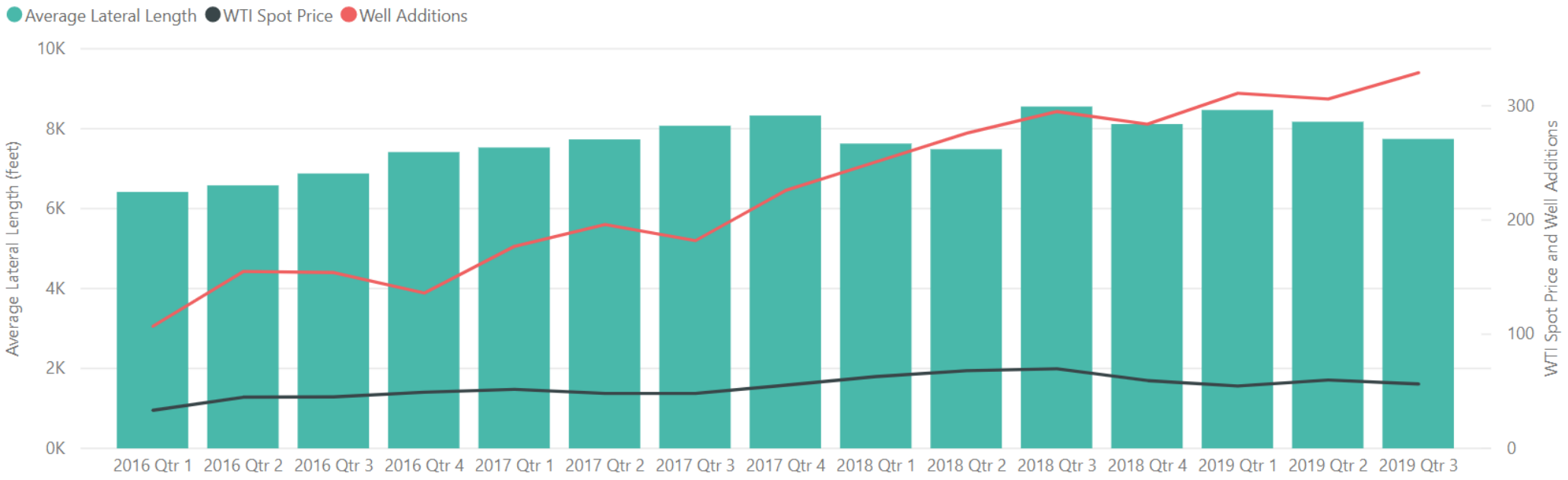


Source: ExxonMobil Q3 Earnings, November 2019

Permian Basin Production Forecast



Combo Look:
Concho, Diamondback, EOG, and Exxon



Source: PetroNerds, raw data DrillingInfo

Are well spacing issues really going to kill the boom?

THE WALL STREET JOURNAL.

MARKETS

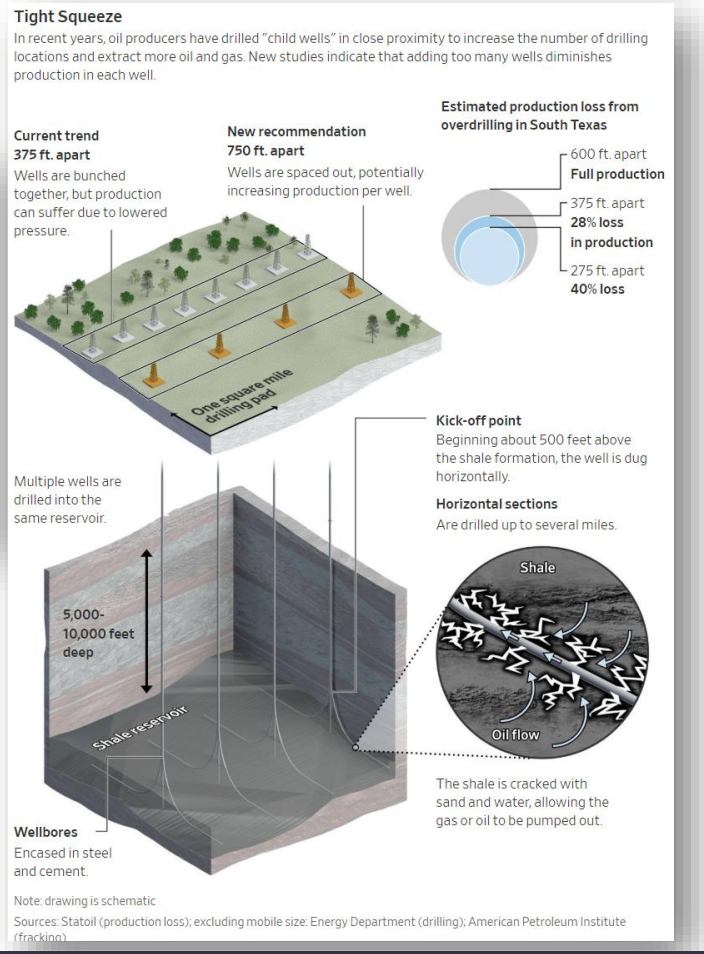
Shale Companies, Adding Ever More Wells, Threaten Future of U.S. Oil Boom

Newer wells drilled close to older wells are generally pumping less oil and gas and could hurt output, leading frackers to cut back on the number of sites planned and trim overall production forecasts

By Christopher M. Matthews, Rebecca Elliott and Bradley Olson

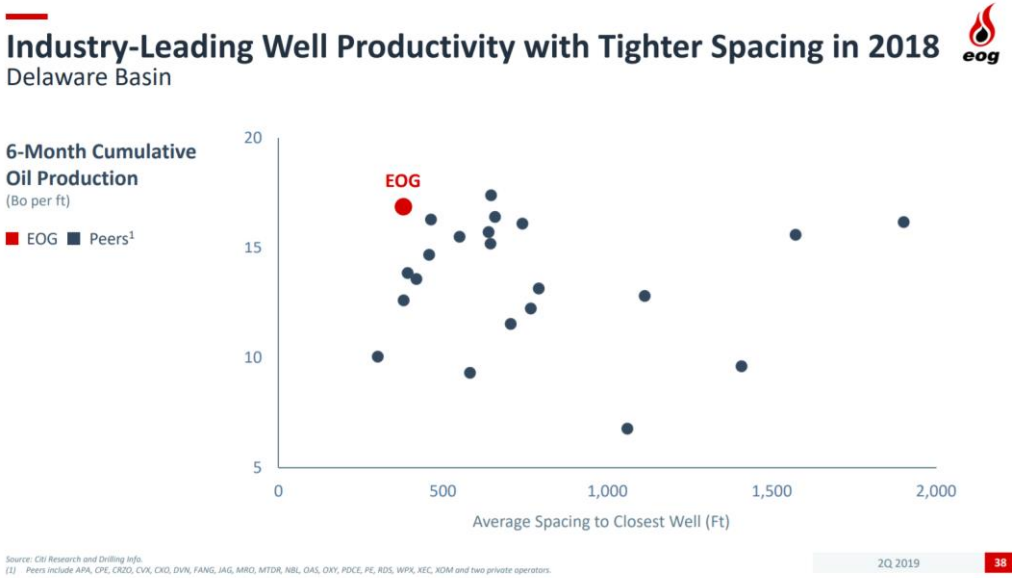
0 COMMENTS

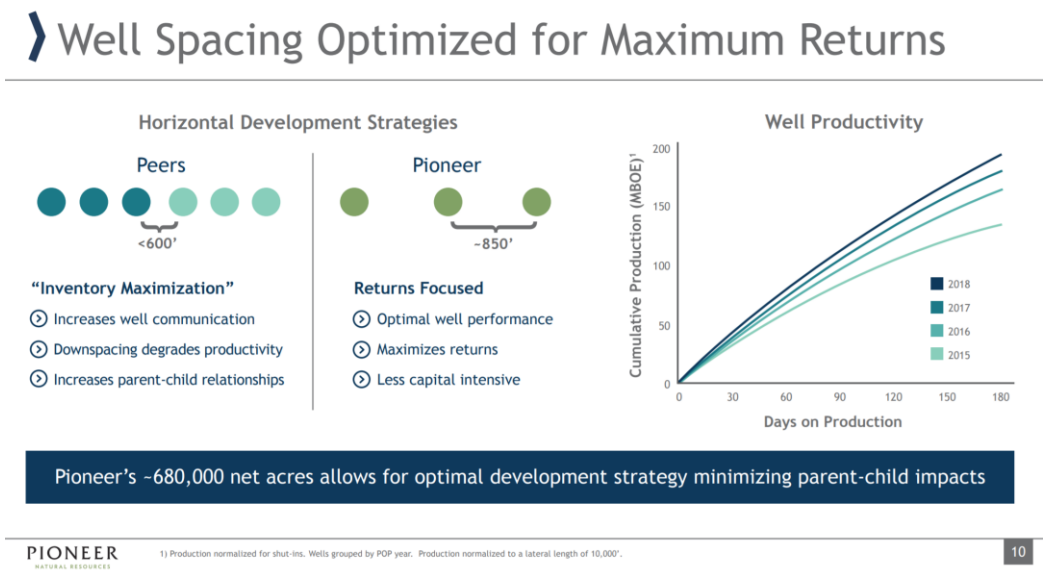
March 3, 2019 6:26 p.m. ET



Differentiated Views on Well Spacing

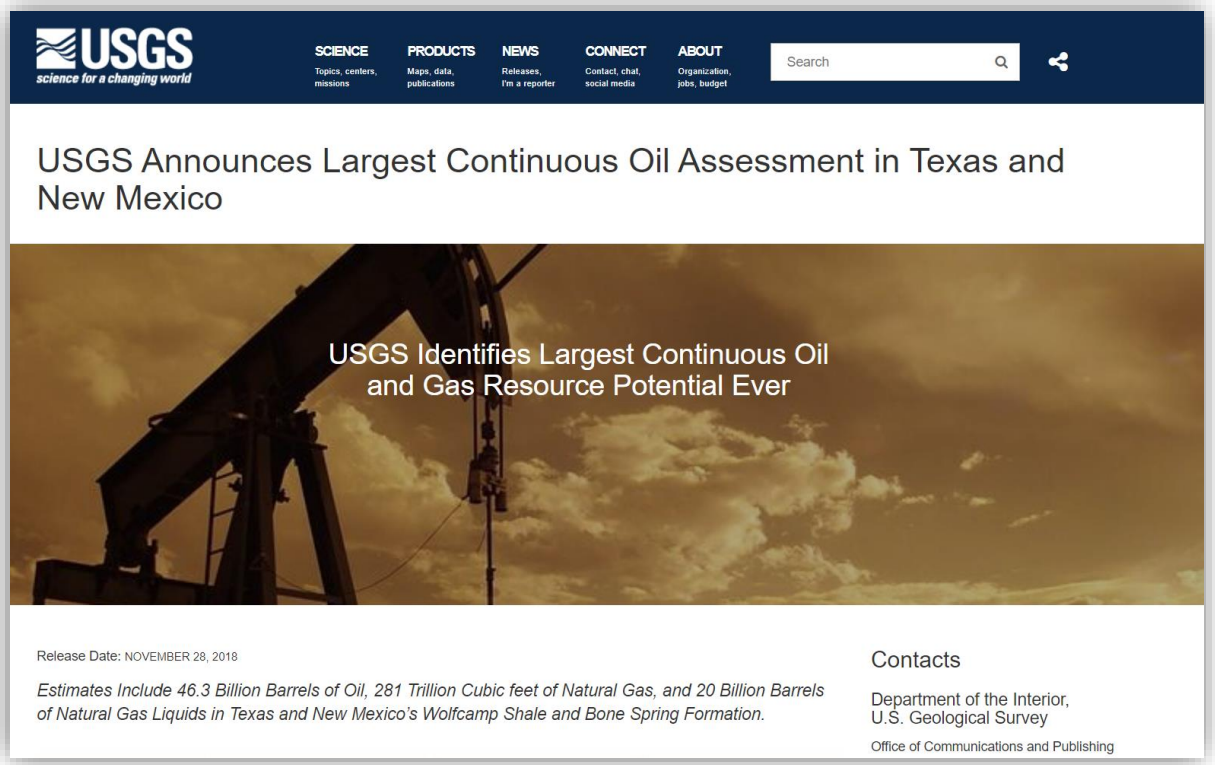
Not a one size fits all - EOG vs. PXD on Well Spacing

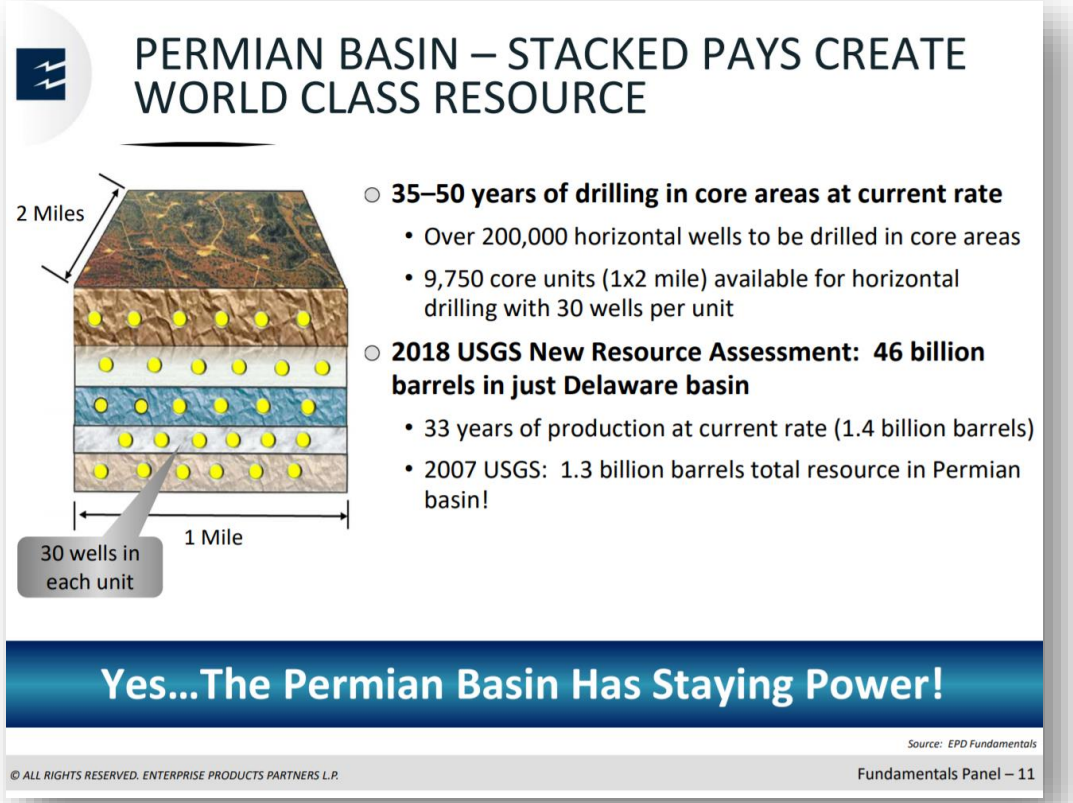




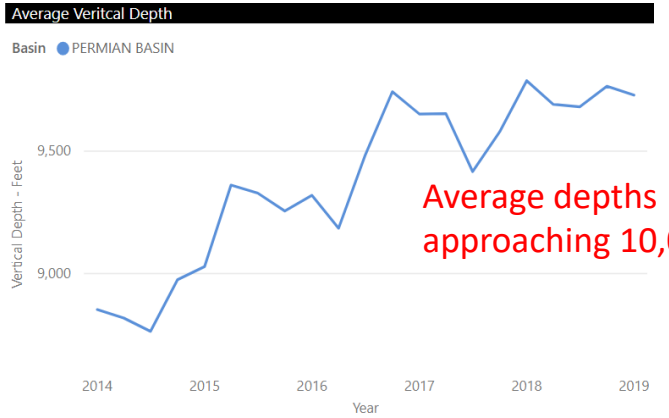
Source: EOG Q2 2019 Earnings, Pioneer Natural Resources September 2019 Investor Presentation

Understanding the Hype: Long-Term Potential – "Stacked Pay"

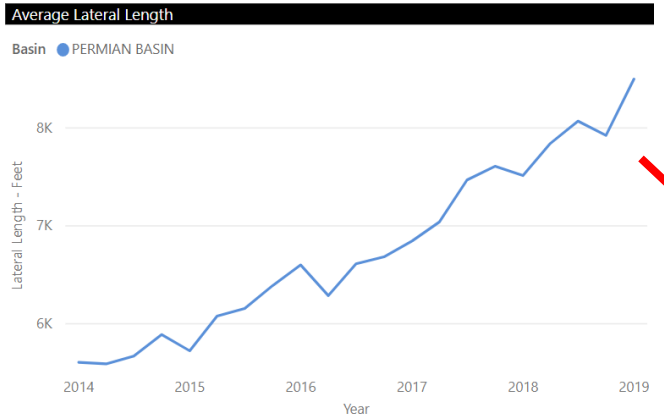


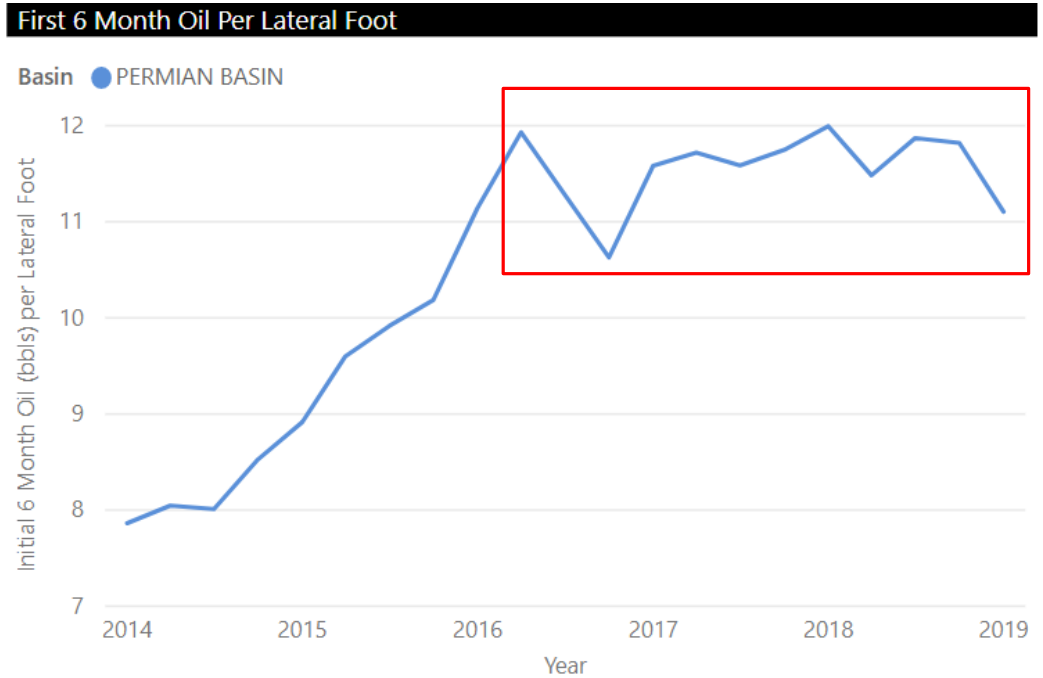


Permian Basin Productivity



Average depths approaching 10,000 ft

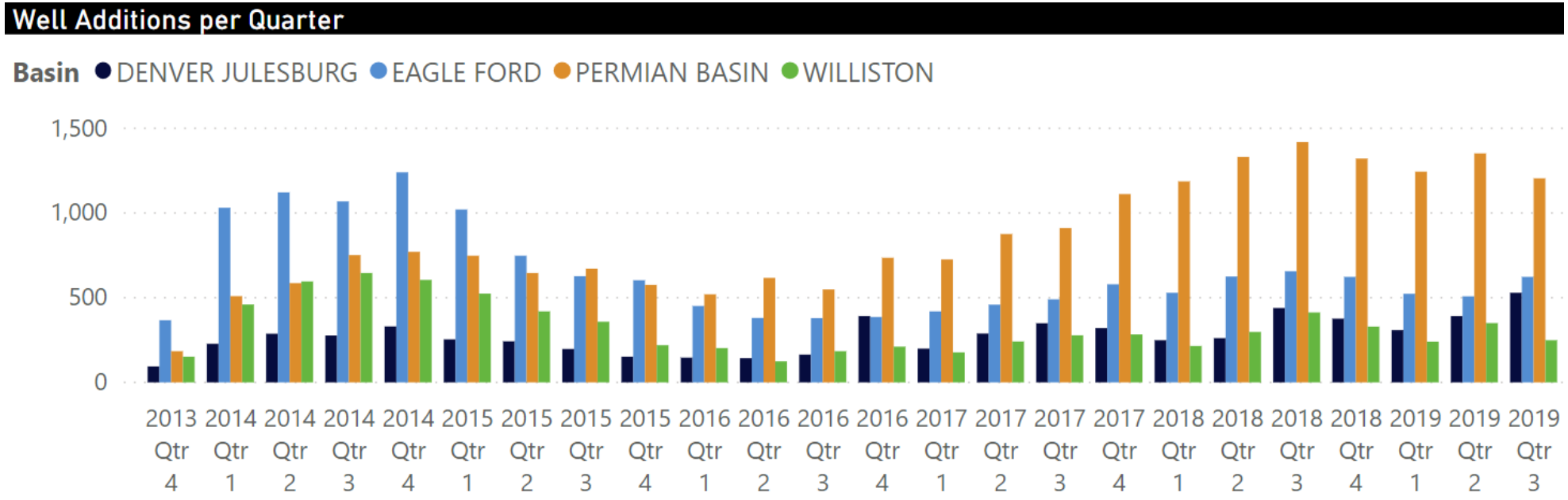




While productivity appears to be flattening, it is not it is not experiencing diminishing marginal returns as lateral lengths continue to increase, meaning productivity remains stable on barrels per lateral foot basis while efficiency improvements continue to be made.

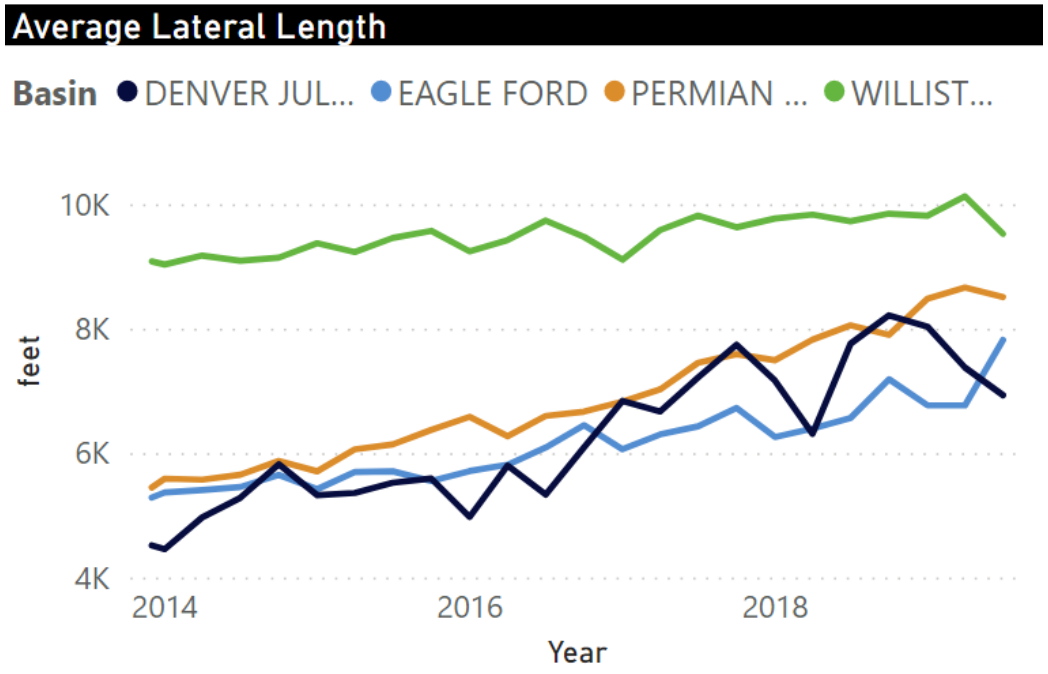
Source: PetroNerds, raw data DrillingInfo

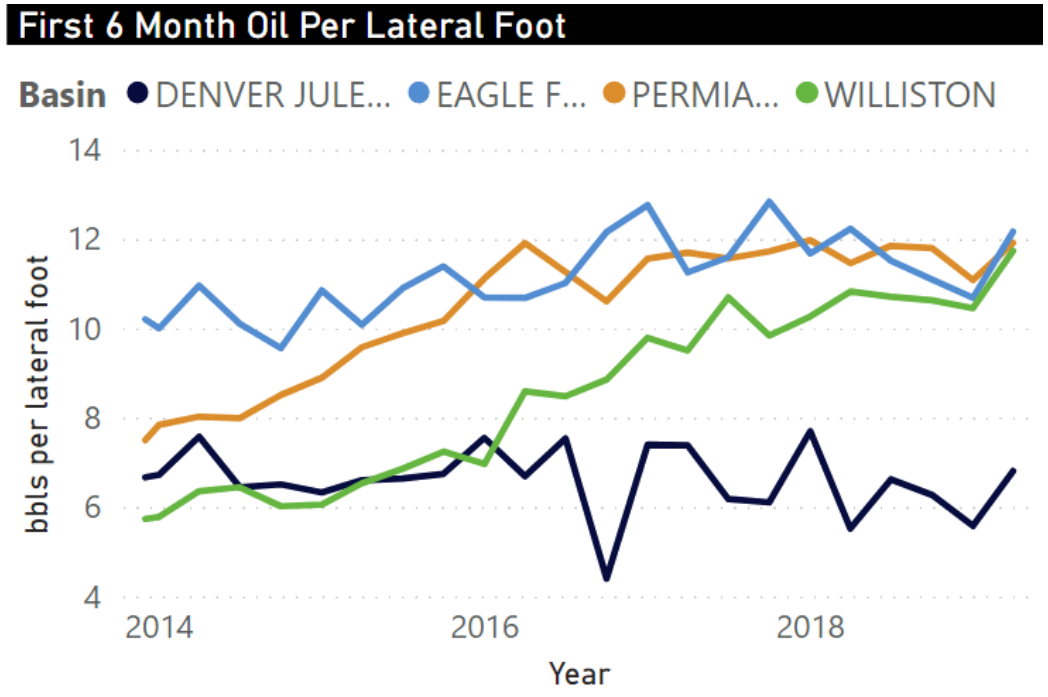
Well Additions by Play



Source: PetroNerds, raw data DrillingInfo

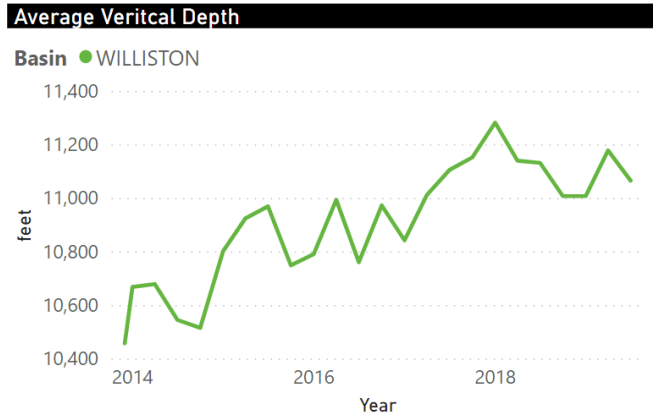
Productivity by Play

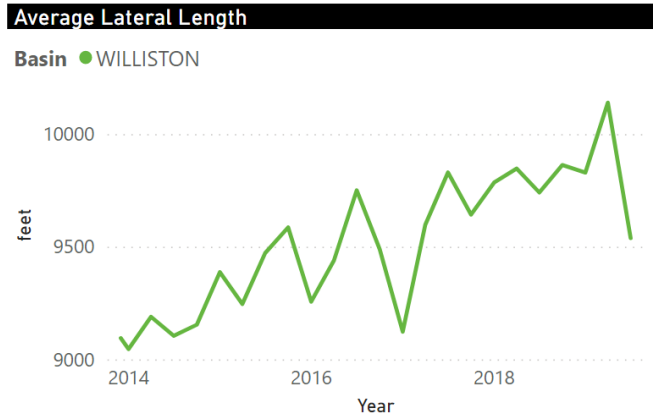


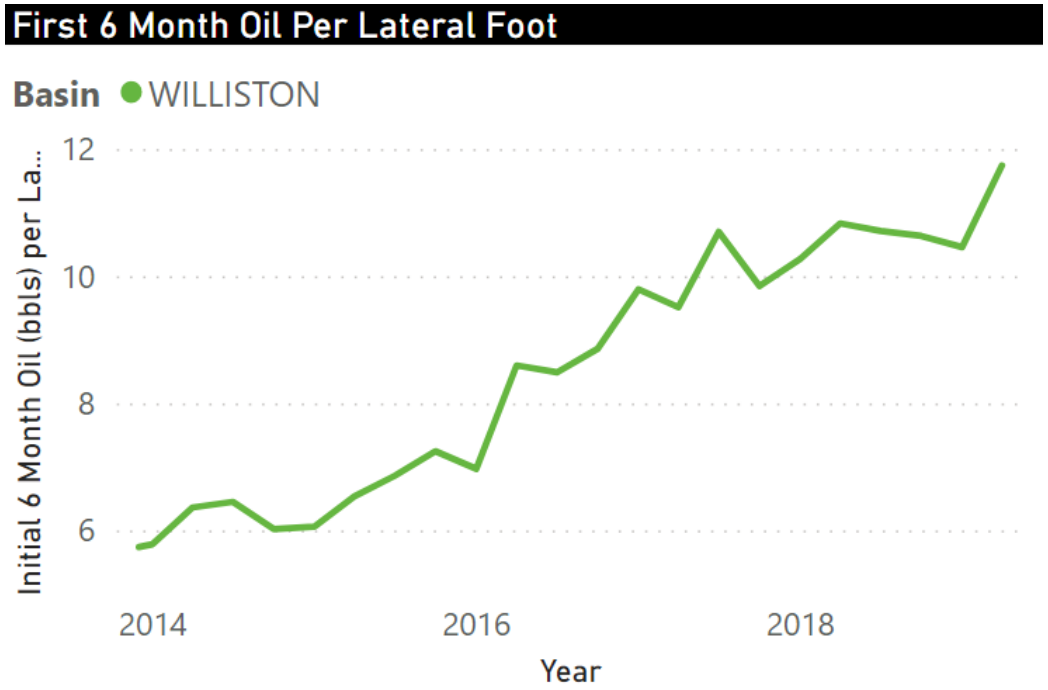


Source: PetroNerds, raw data DrillingInfo

Williston Basin Productivity Continues to Disprove Skeptics



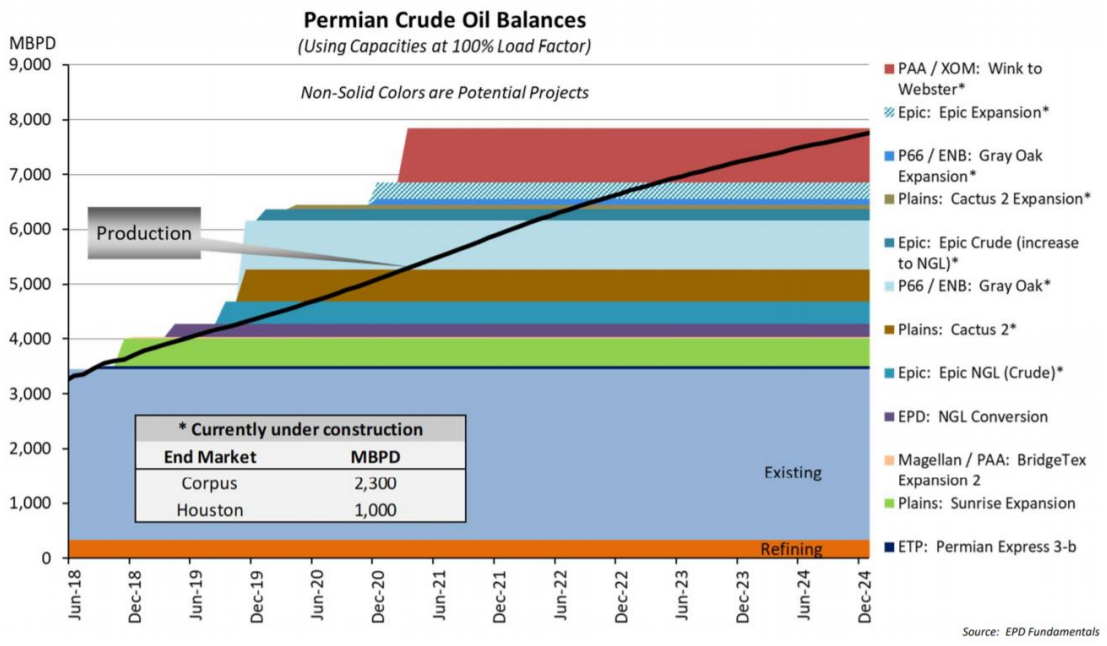




Source: PetroNerds, raw data DrillingInfo

Appendix

Bottlenecks Alleviated by New Pipelines



Source: Enterprise Products Partners Analyst Meeting Presentation, April 2019

WTI Midland (Argus) vs. WTI Financial Futures Quotes

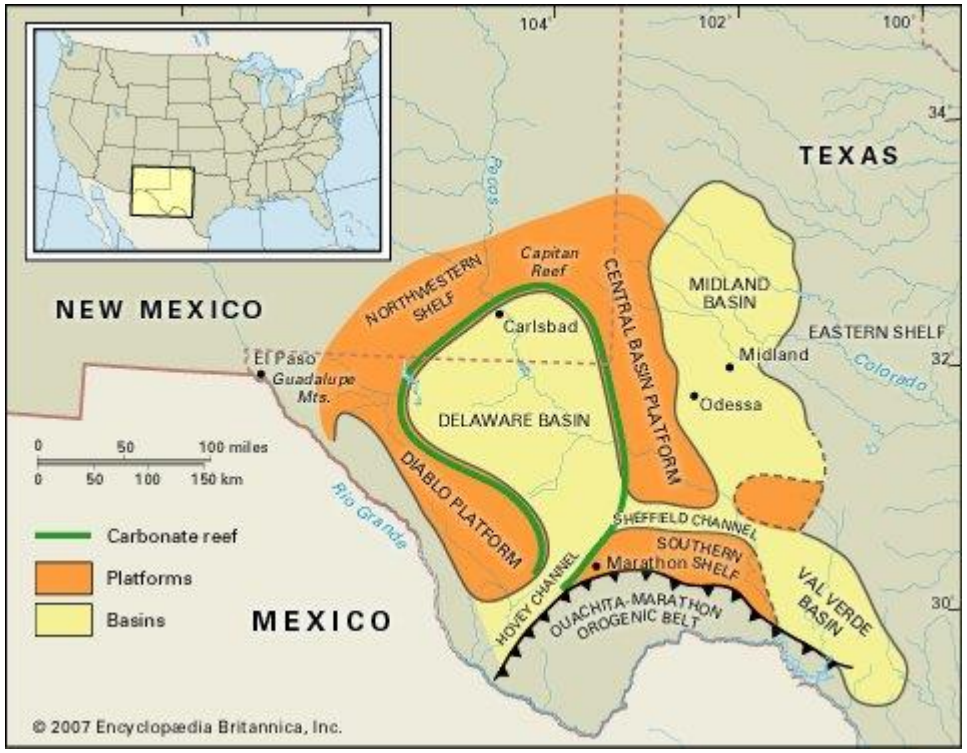
Globex

View Another Product

Quotes | Settlements | Volume | Time & Sales | Contract Specs | Margins | Calendar

Month	Options	Charts	Last	Change	Prior Settle	Open	High	Low	Volume	Hi / Low Limit	Updated
JAN 2020	OPT		-	-	0.79	-	-	-	0	No Limit / No Limit	16:45:00 CT 29 Jan 2020
FEB 2020	OPT		-	-	0.89	-	-	-	0	No Limit / No Limit	16:45:00 CT 29 Jan 2020
MAR 2020	OPT		-	-	1.19	-	-	-	0	No Limit / No Limit	16:45:00 CT 29 Jan 2020
APR 2020	OPT		-	-	1.27	-	-	-	0	No Limit / No Limit	16:45:00 CT 29 Jan 2020
MAY 2020	OPT		-	-	1.29	-	-	-	0	No Limit / No Limit	16:45:00 CT 29 Jan 2020
JUN 2020	OPT		-	-	1.31	-	-	-	0	No Limit / No Limit	16:45:00 CT 29 Jan 2020
JUL 2020	OPT		-	-	1.32	-	-	-	0	No Limit / No Limit	16:45:00 CT 29 Jan 2020
AUG 2020	OPT		-	-	1.32	-	-	-	0	No Limit / No	16:45:00 CT 29 Jan 2020

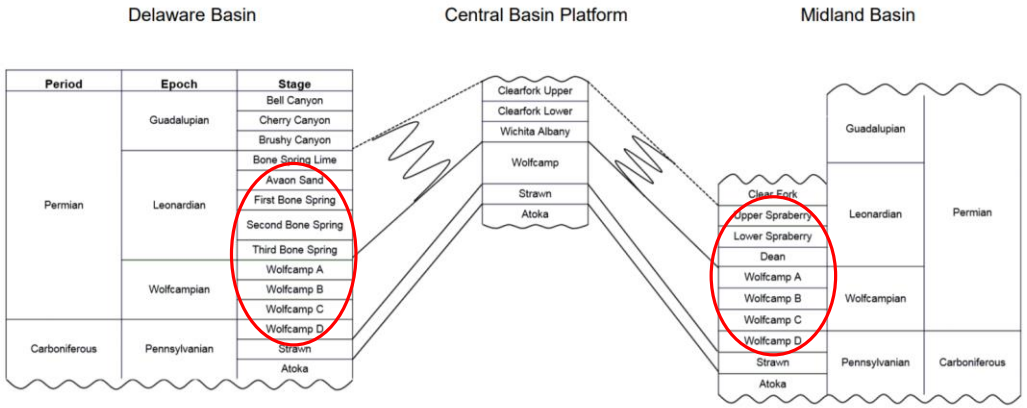
Permian Basin Geology and Targets



The prospect of stacked payzones and multiple targets combined with relatively tight well spacing has drawn investment.

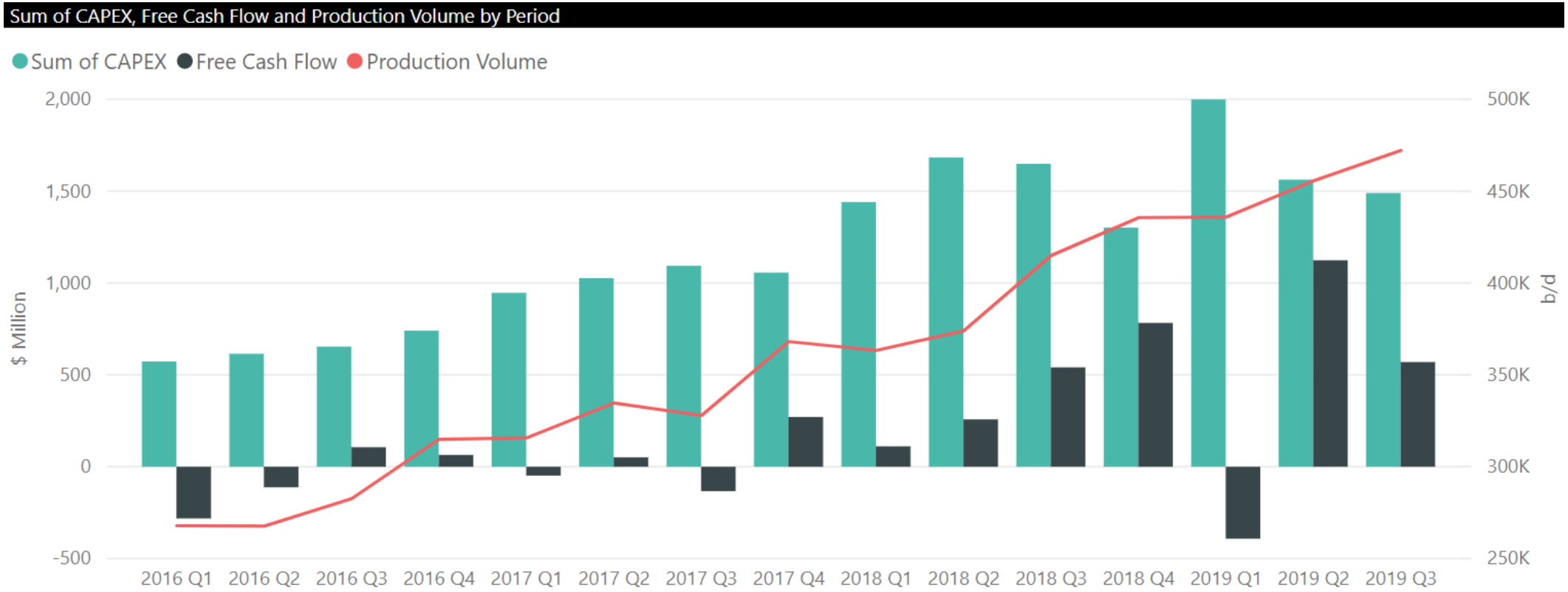
October 2018

Figure 2. Generalized stratigraphic schema of upper Carboniferous through upper Permian intervals for the Permian Basin



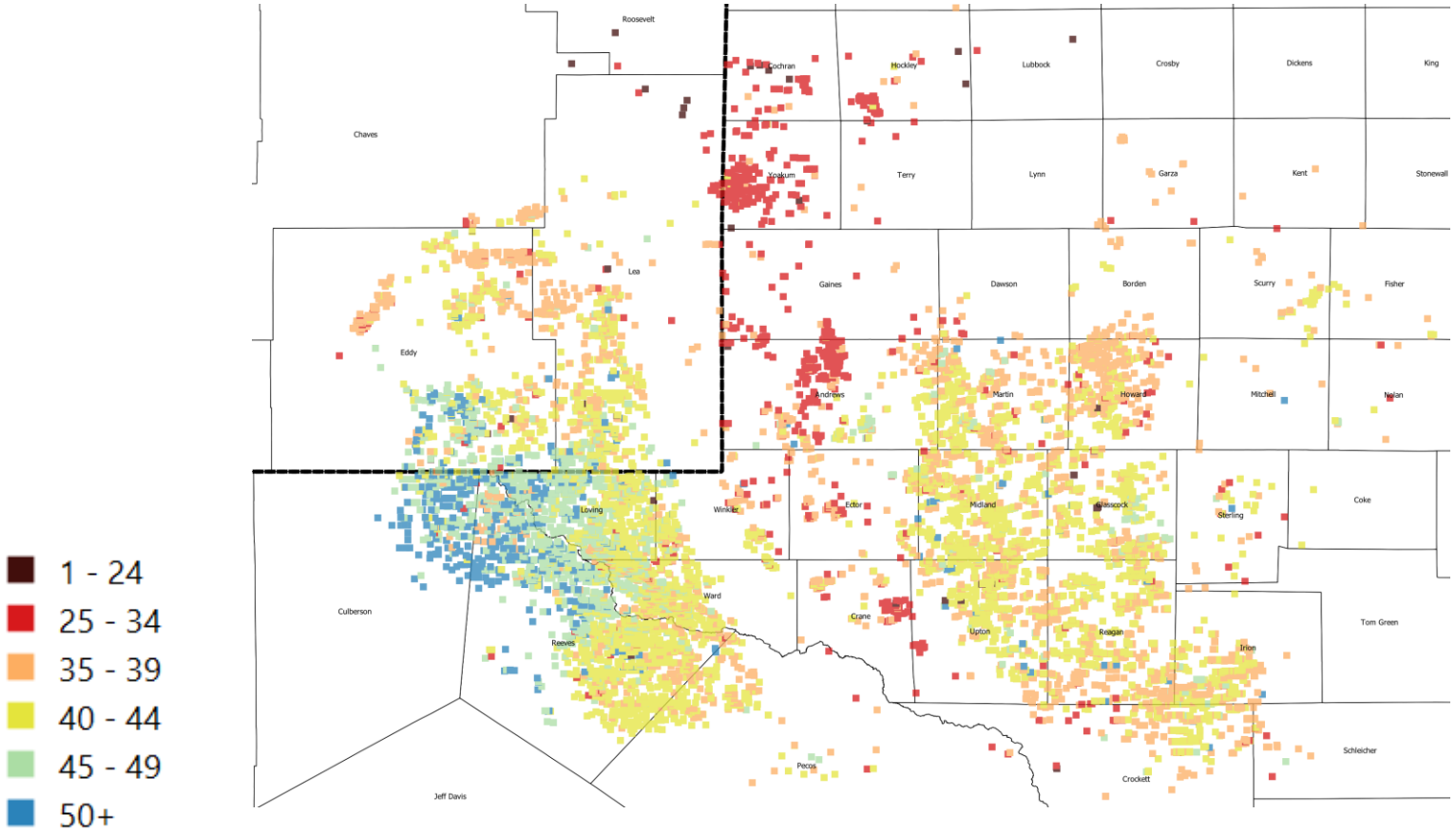
Source: U.S. Energy Information Administration based on DrillingInfo Inc., U.S. Geological Survey.

EOG - CAPEX, Production, and Free Cash Flow



Source: PetroNerds

Permian Basin API Gravity for Horizontal Wells



Source: PetroNerds, DrillingInfo

Evolution of Investor Pressure

Pre-2014: Need to diversify beyond the Bakken

2014 Oil Price Correction: Pump and produce, High IPs, Cash Flow

2015 to 2016: PERMANIA, Prices are sub-$60, buy anything and everything (dry powder, no production, at any cost), FOMO

I. Strict drilling and leasing requirements follow

2017: Begin focusing on cash flow

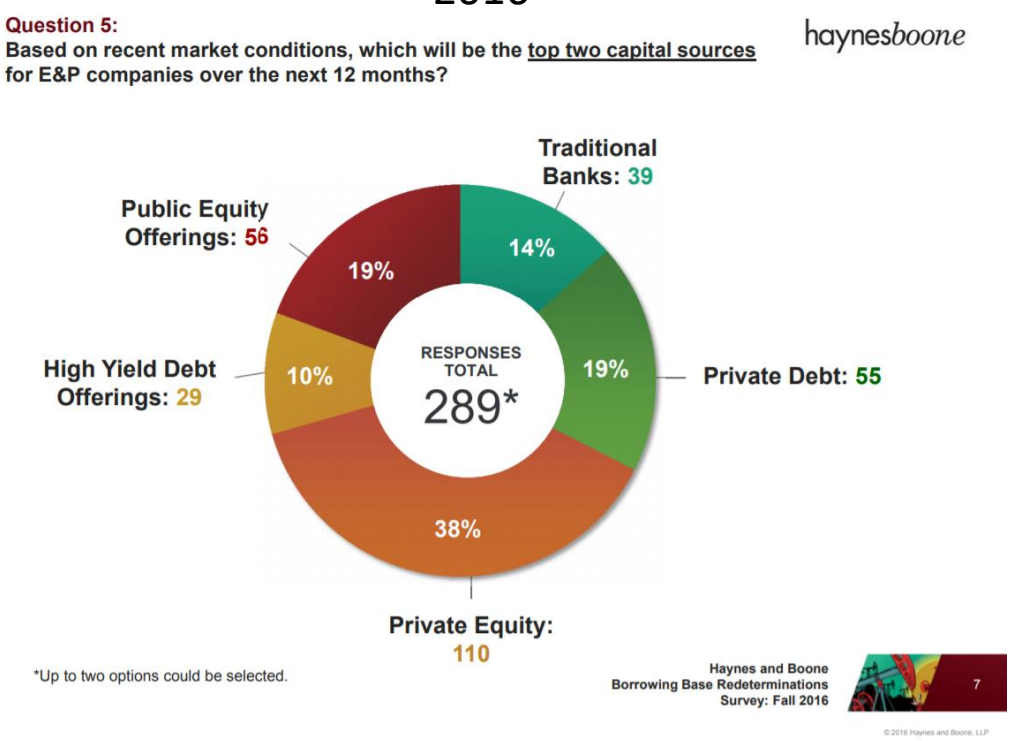
2018: Investor pressure on returns and free cash flow continues to build, oil prices move up

2019: Generalist investor has left the shale space. Free cash flow neutrality is not enough, serious returns are needed.

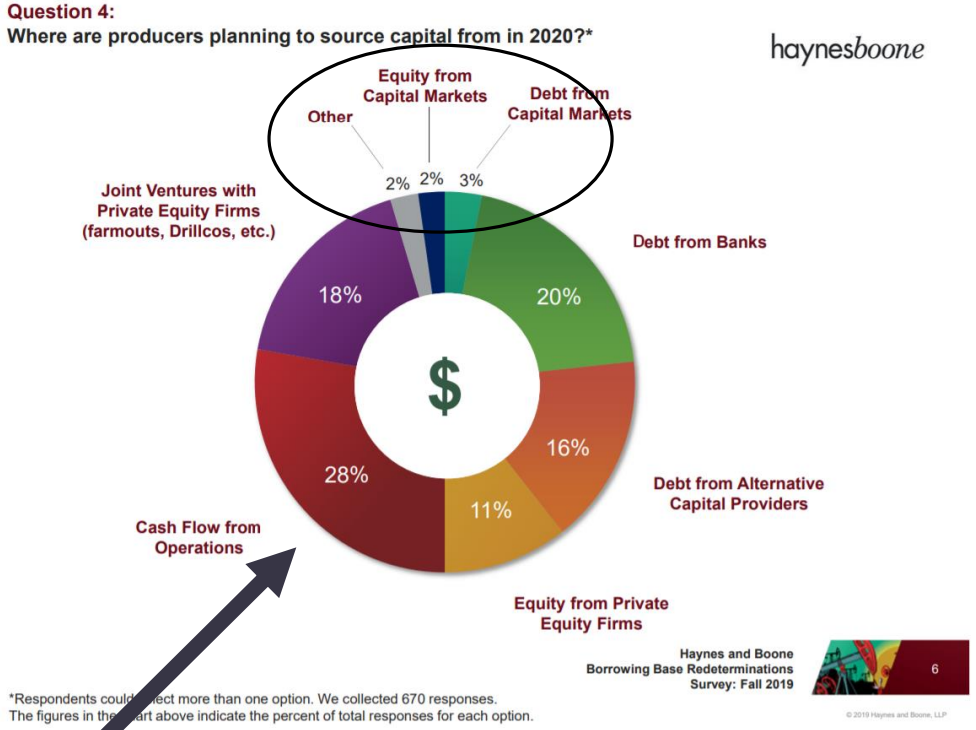
I. Expected more mergers and acquisitions
II. Favored majors and short cycle
III. Unclear what would drive share price growth

Capital Sourcing Shift

2016



2020



Reduction in Need for Services

Efficiencies across the oil and gas D&C value chain are impacting the service sector, from hydraulic fracturing to drilling.

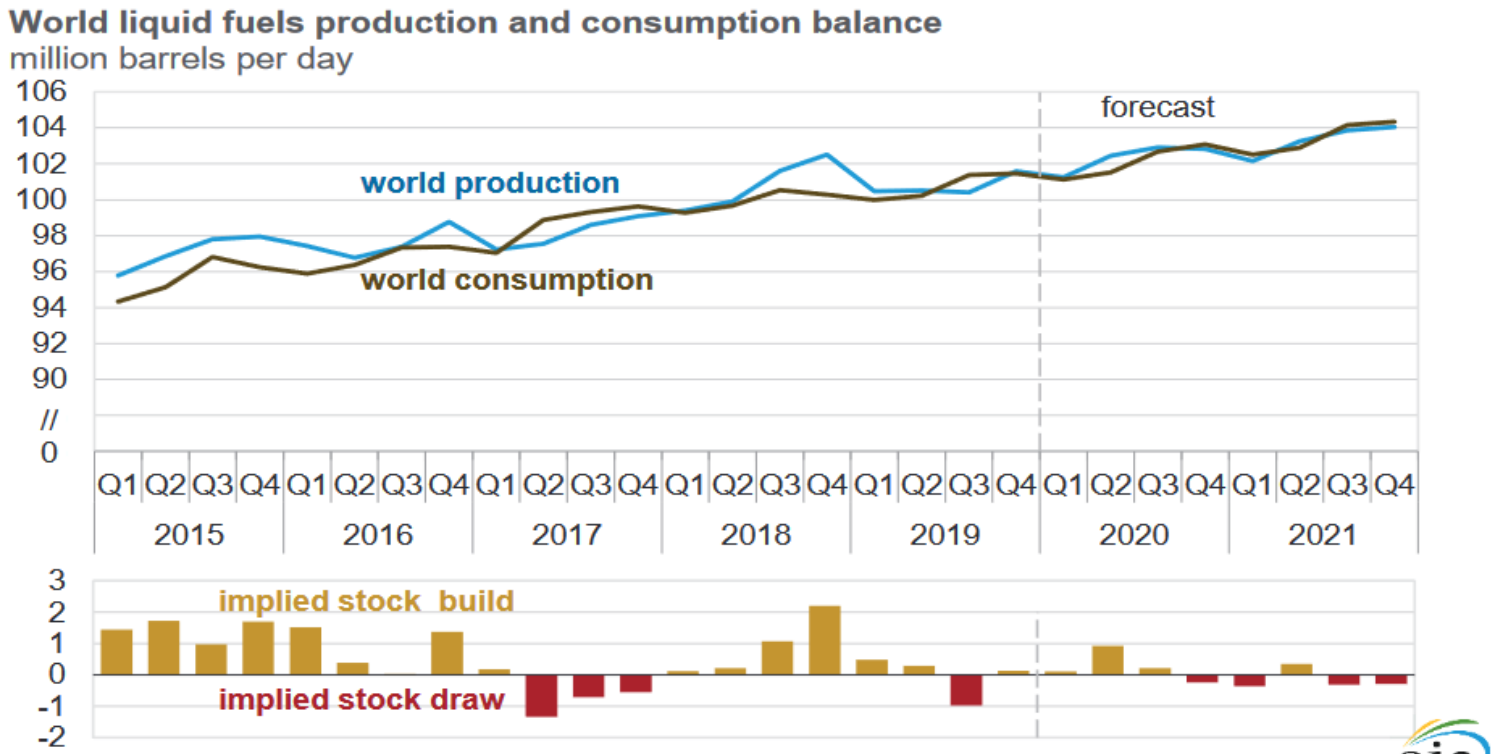
The incremental growth in lateral lengths has had a material impact on service companies as it has occurred during a period of modest prices and investor pressure. The average foot treated per day has gone up as the average lateral length drilled has as well.

Operators are drilling and completing more lateral feet with less equipment/manpower and more efficient use of horsepower.

….efficiency gains across the industry have raised the number of frac stages completed by each fleet by 10% to 20%, which implies a 10% or so decrease in the required active frac fleets. The slowing pace of frac activity in the second half of 2019 is leading to a further reduction of demand for frac fleets, resulting in pricing pressure on services.

Liberty Oilfield Services, Chris Wright, Q3 2019

Supply and Demand



Source: Short-Term Energy Outlook, January 2020