APPALACHIAN, PERMIAN AND STACK UPSTREAM

PREVIEW | FundamentalEdge Report | March 2019

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FundamentalEdge
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Key Takeaways

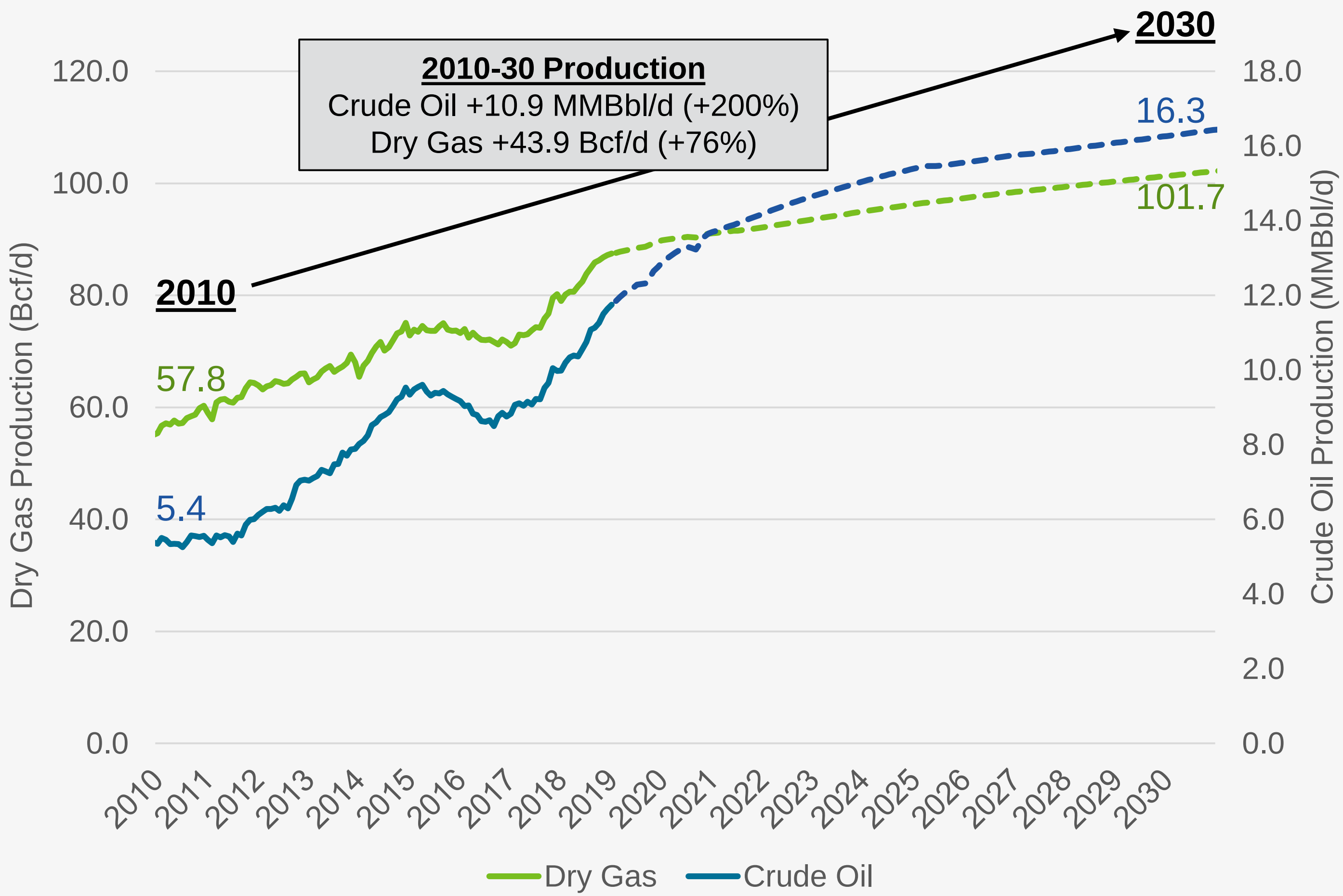
- ***Appalachian, Permian and STACK Upstream*** is the March 2019 installment of Drillinginfo's FundamentalEdge series. This is an interim report covering the most recent trends in the upstream sector for three key basins in the US.
- Crude oil and natural gas production continue setting record highs in the US. This growth is happening despite the lower rig count, as horizontal rigs hold higher initial production rates compared to traditional vertical drilling.
- In the Permian basin, economics support strong production growth, with many areas holding breakevens as low as $30-40/Bbl. The Delaware basin leads the production gains for the Permian, where type curves show gains as high as 40% per year.
- In the Anadarko basin, the STACK play is expected to bring more than 50% of the oil and gas production growth in the next 5 years. Within the STACK, many different formations are targeted across the play, as the over-pressured window and the normally pressured window yield different results across the play in terms of well results.
- In 2018, dry gas production in the Appalachian basin increased by almost 4 Bcf/d following the commencement of service of multiple pipelines that allowed the gas to reach a final destination market. Based on DI's type curve analysis, the area in Pennsylvania North (part of the Marcellus) holds the best economics, yet drilling activity continues to be restricted by takeaway capacity constraints in this area. The midstream capacity additions have mainly benefited Utica producers, therefore attracting most of the production activity.
- Much of the content in this month's FundamentalEdge is sourced from "DI Basin Reports". For more information on the in-depth basin reports, please click the link on the final slide.

Upstream Intro – Oil and Gas Production

US production of crude oil and natural gas has seen a dramatic increase over the past 10 years. This rapid growth is expected to continue over the next 10 years.

CHART 1

US Crude Oil and Dry Gas Production



Source: DI ProdCast

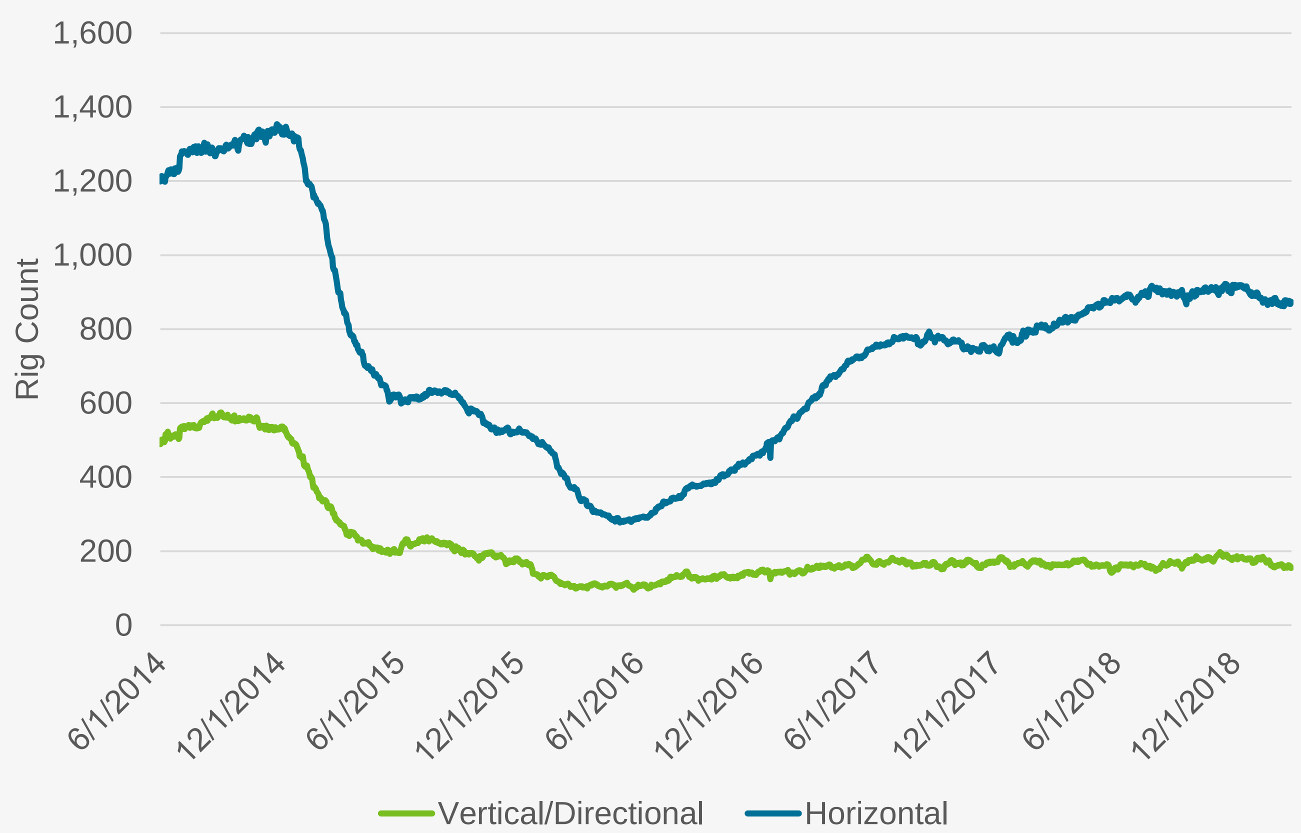
US Rig Count

Horizontal rigs have been making a comeback since the decline of 2015-16. However, in late 2018 and early 2019, horizontal rigs have declined with the collapse of oil prices, falling from 922 rigs on Nov. 16, 2018, to 874 rigs on Feb. 25, 2019.

Vertical rigs have remained relatively constant since the 2015-16 collapse.

CHART 2

Historical Rig Count by Trajectory



Source: DI Rig Analytics

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PERMIAN BASIN

Permian Basin – Crude Production

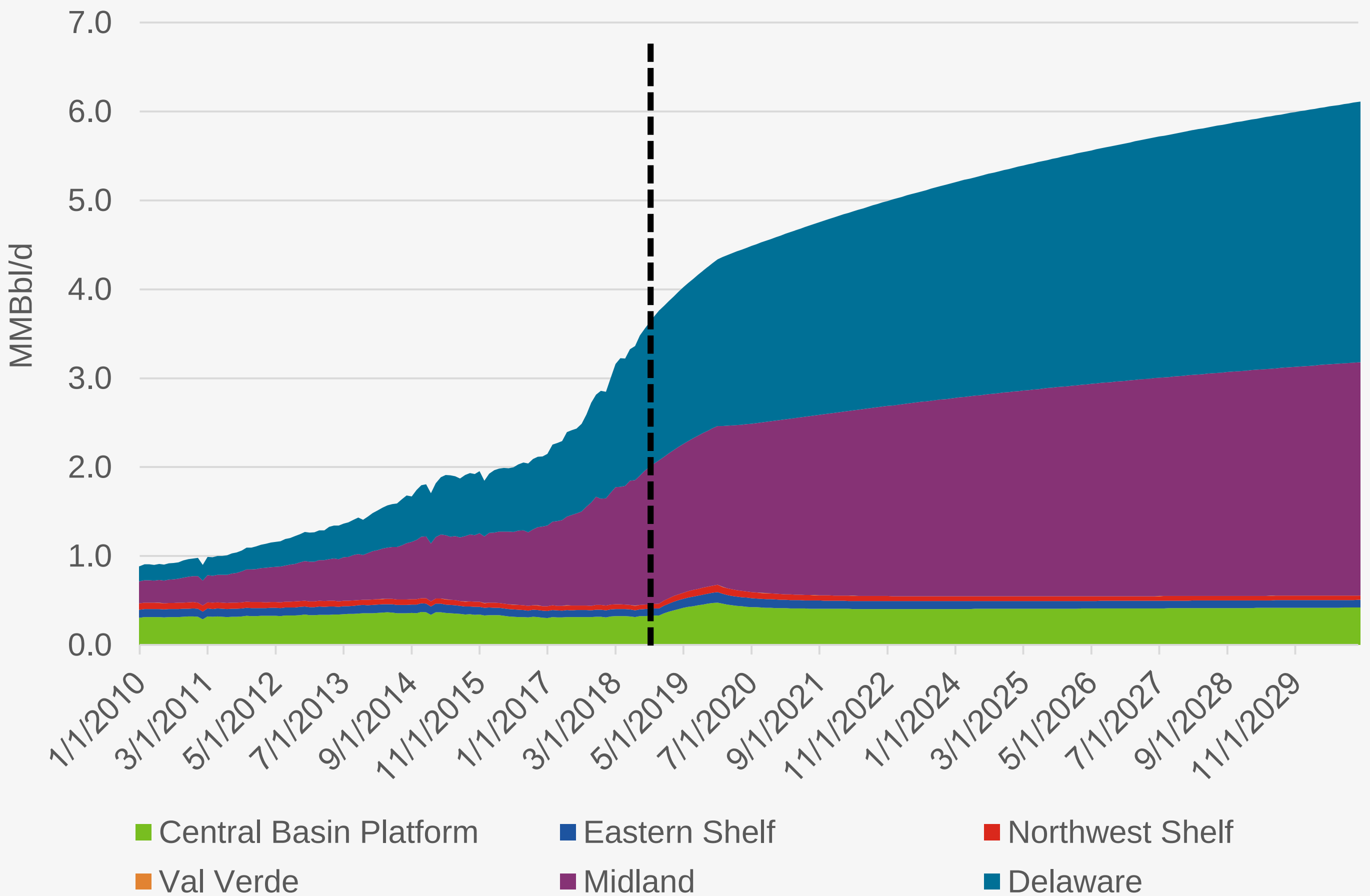
Permian crude production was 3.76 MMBbl/d at the end of 2018, over 900 MBbl/d more than the at same time in 2017.

By the end of 2019, Permian crude production is expected to reach 4.3 MMBbl/d, increasing 575 MBbl/d from the end of 2018.

Permian production is expected to continue to grow, with 2030 production reaching 6.11 MMBbl/d

CHART 3

Permian Crude Oil Production by Play



Source: DI ProdCast

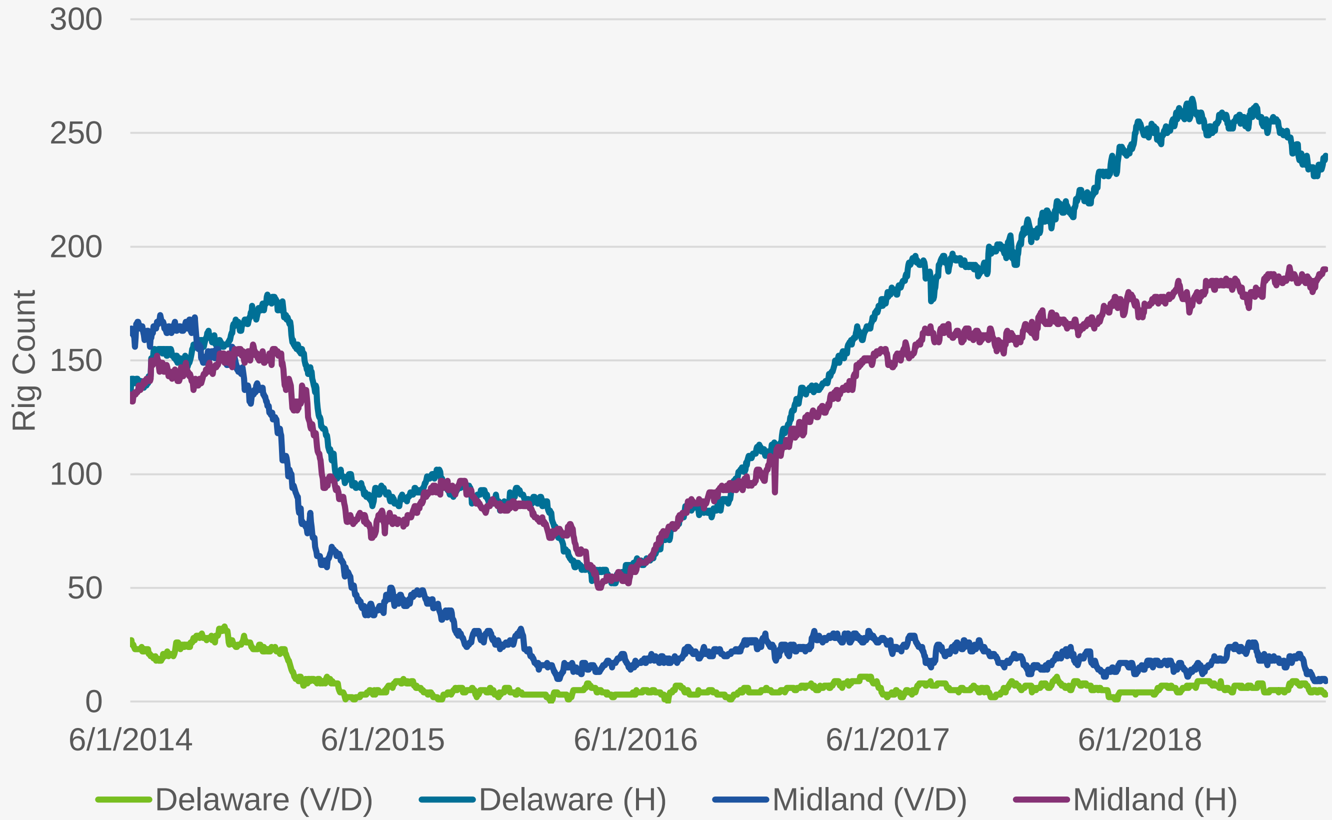
Permian – Rig Count by Orientation

The Permian horizontal rig count gains have been led by the Delaware since the lows of 2016.

However, as of late, the Delaware horizontal rig count has taken a dive, down to 240 rigs on Feb. 25, 2019, compared to 265 rigs on Aug. 16, 2018.

CHART 5

Permian Rig Count by Play and Trajectory



Source: DI Rig Analytics

Permian – Continued Growth in the Delaware Basin

Activity in the Delaware basin has skyrocketed as oil prices continue to support activity in the basin. In 2018, the number of horizontal spuds set a record high of 2,910.

Efficiencies in the Delaware have increased YoY from 2013 forward. From 2013 to 2017, efficiencies increased by 10% or more each year, with efficiencies from 2016 to 2017 increasing 40%. Wells drilled in 2018 have topped 2017 and have produced the highest IP rates in the basin.

CHART 6

Delaware Spuds by Year

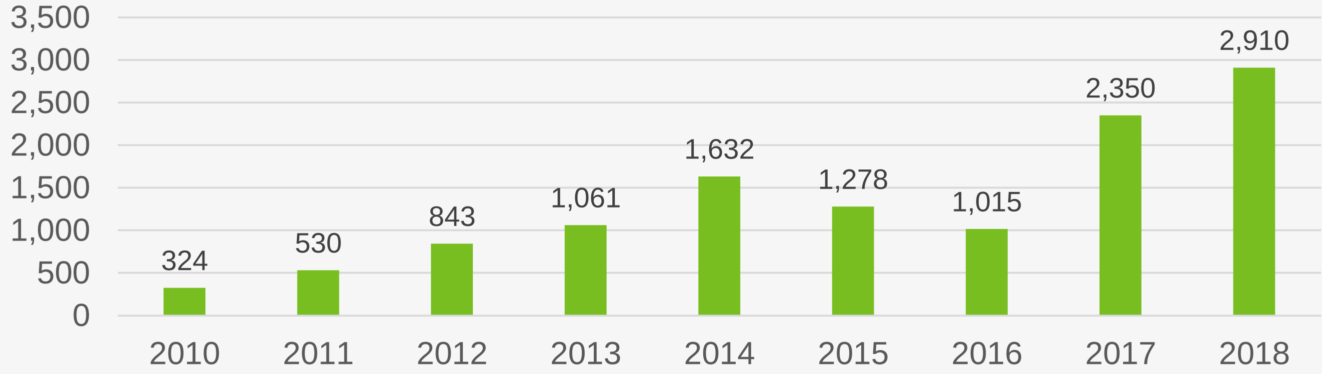
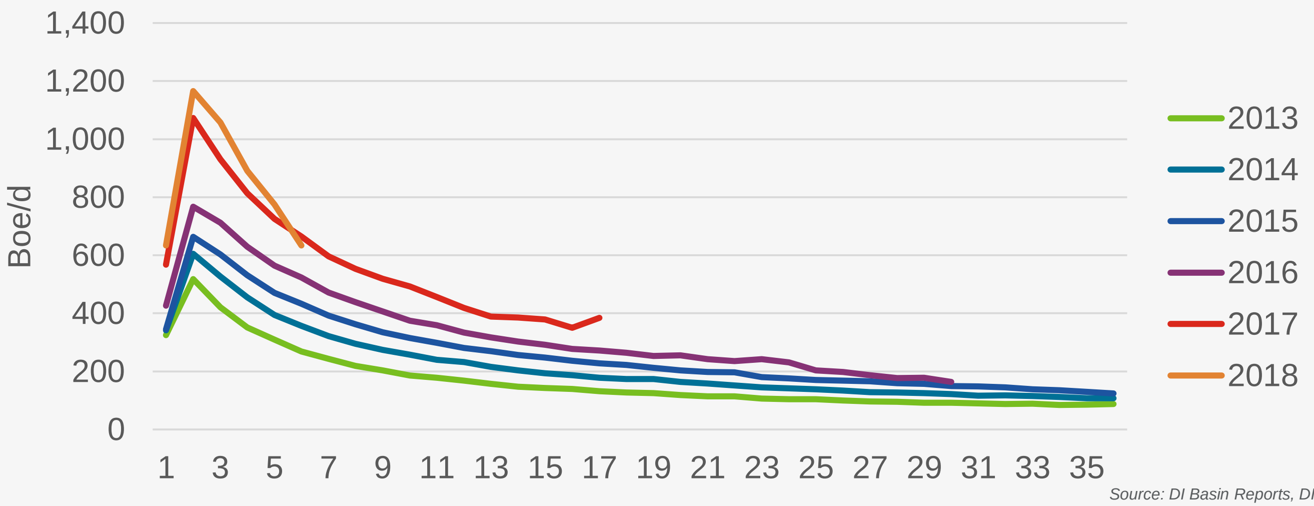


CHART 7

Delaware: Vintage Type Curve



Source: DI Basin Reports, DI Wellcast

Permian: Midland Basin DI Area Type Curve Summary

The Midland basin contains 25 DI type curve areas generated based on geological structure, thickness and GOR.

DI creates 63 individual type curves within the areas created as we split these out by geological formation.

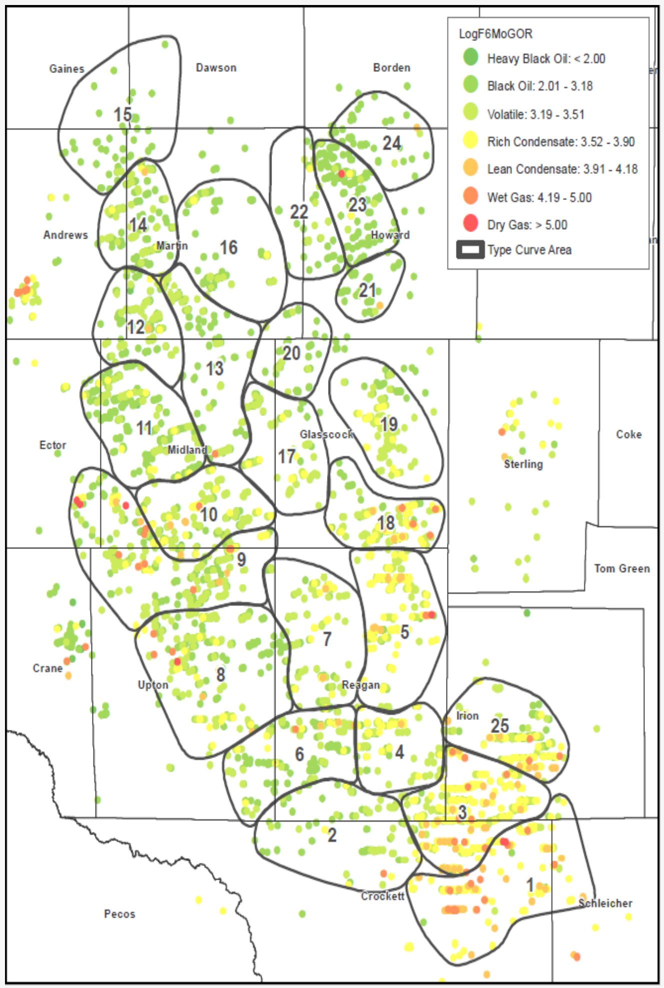
Drillinginfo's area type curve economic analysis follows the drilling activity and trends seen from the A&D market.

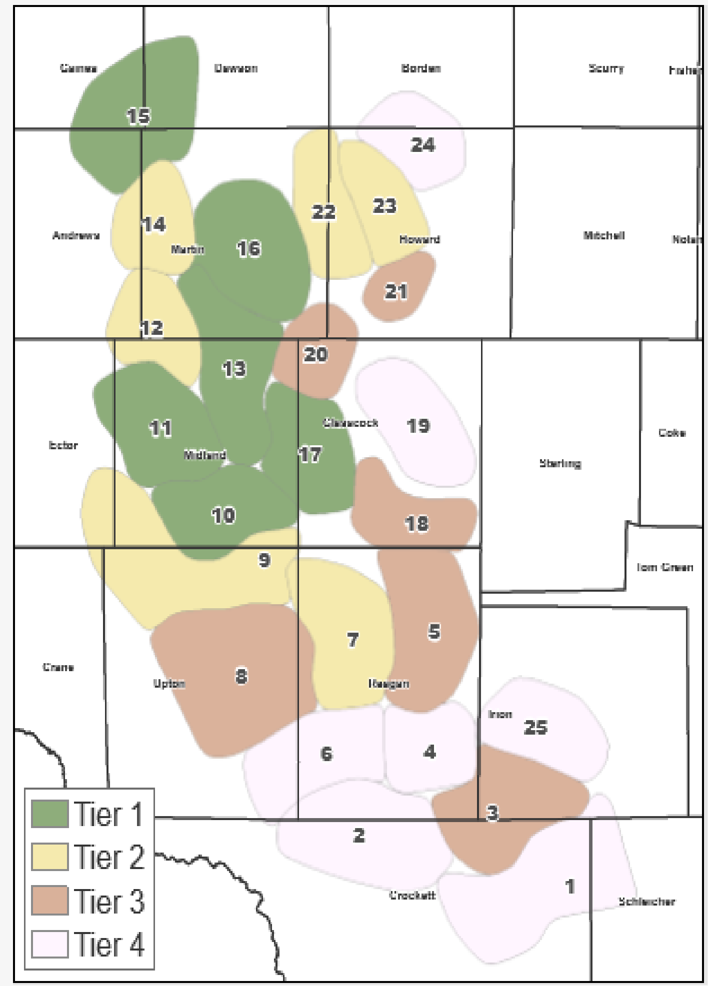
There is a clear depiction of a core Tier 1, with lower tiers moving farther from the best areas in the basin.

Tiers are based on a weighted score using EURs, proven formations and economics.

CHART 10

Midland Type Curve Summary





Source: DI Basin Reports, PLS, 1Derrick

ANADARKO BASIN

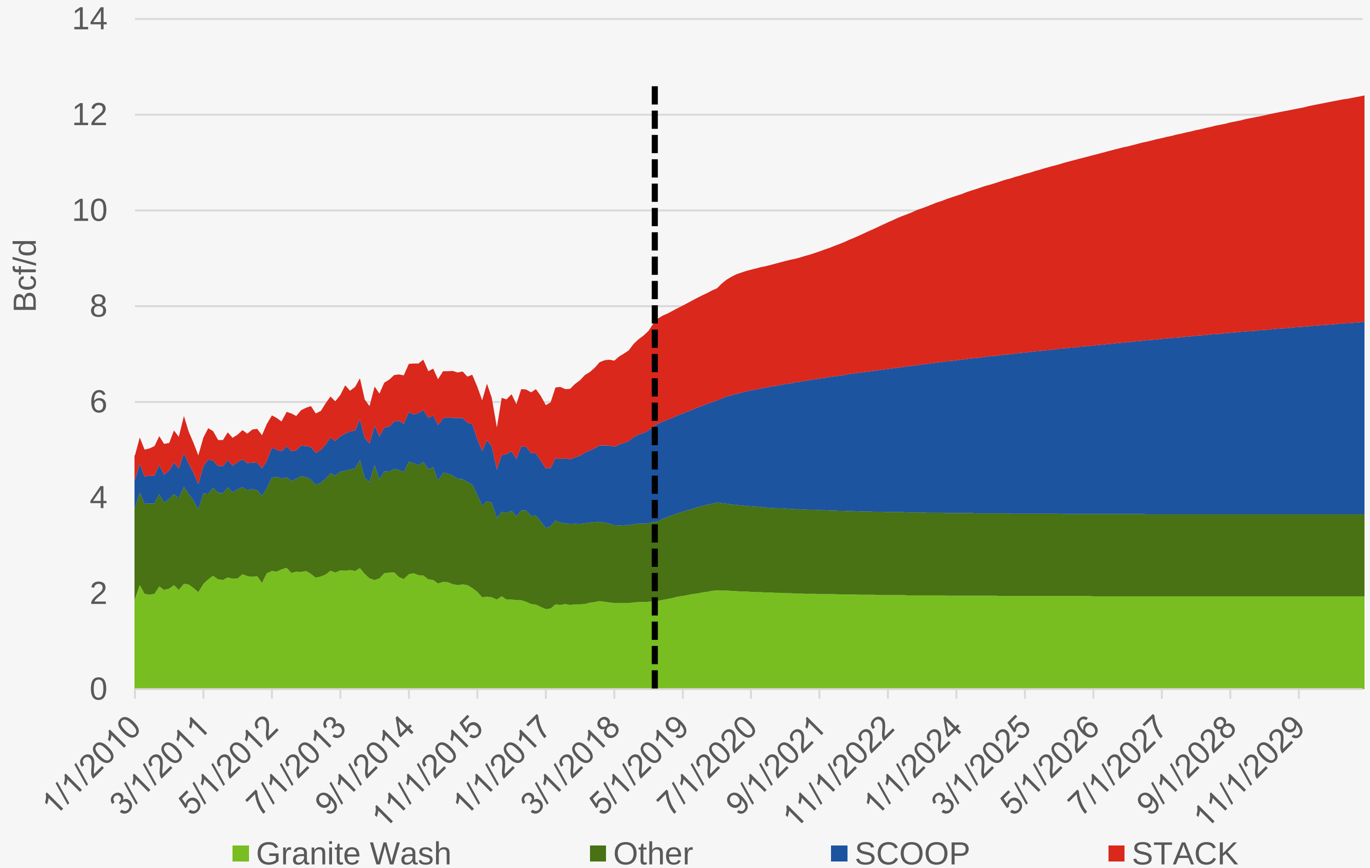
Anadarko – Gas Production

Similar to crude, the STACK is expected to be the growth driver of gas production in the Anadarko basin, followed by the SCOOP.

Anadarko gas production is expected to reach 12.39 Bcf/d in Dec. 2030, up from 7.75 Bcf/d at the end of 2018.

CHART 12

Anadarko Dry Gas Production by Play



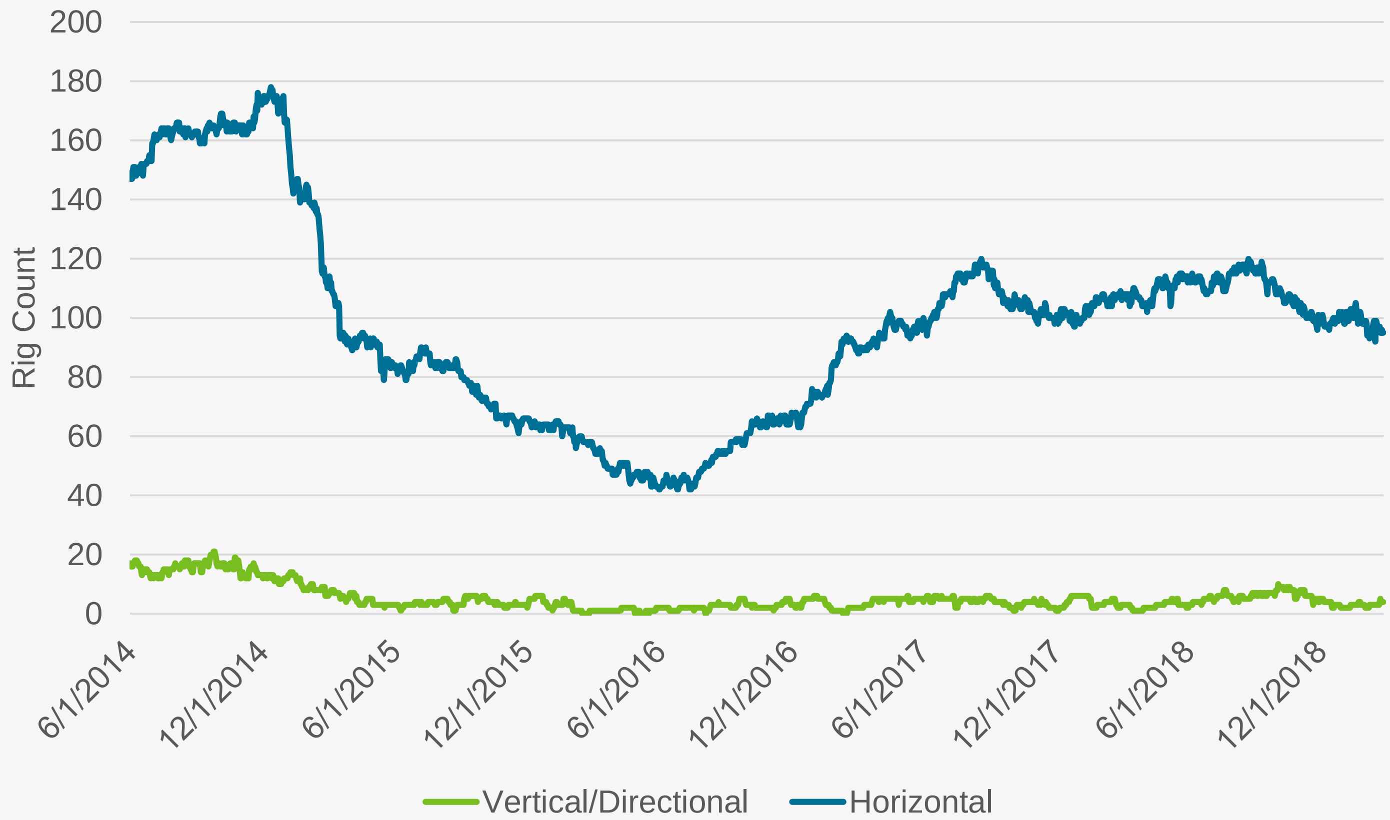
Source: DI ProdCast

Anadarko – Rig Count

Anadarko horizontal rigs have been between 100 and 120 since mid-2017. In Feb. 2019, the rig count dropped to levels under 100.

CHART 13

Anadarko Rig Count by Trajectory



Source: DI Rig Analytics

STACK – Horizontal Activity Over Time

The activity in the STACK has picked up significantly since the play's establishment as a premier basin with top-tier economics.

In 2015, activity was focused on the core, with operators targeting either the Woodford or the Meramec formation in the over-pressured window.

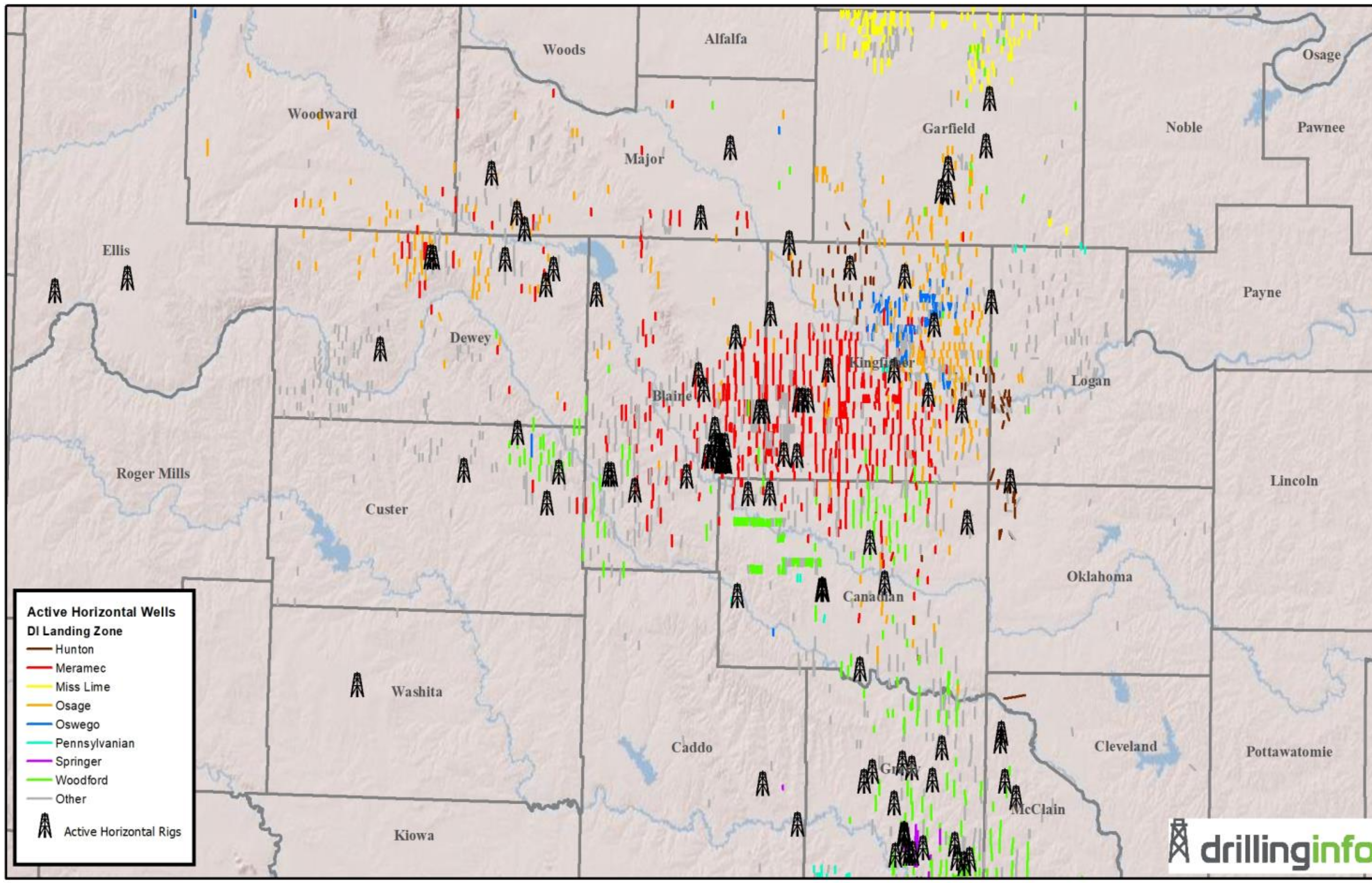
In 2016, operators moved farther out of the core to the normally pressured window and tried to delineate the larger area.

In 2017, activity focused on infill drilling and downspacing. In this time frame, the well results started to suffer due to frac hits/spacing issues.

The results from the tests led to the move in 2018 to try and delineate the play farther northwest. Operators also started looking south to the area termed as the Merge which falls between the STACK and the SCOOP.

CHART 16

STACK Horizontal Activity



Source: DI Basin Reports

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APPALACHIAN BASIN

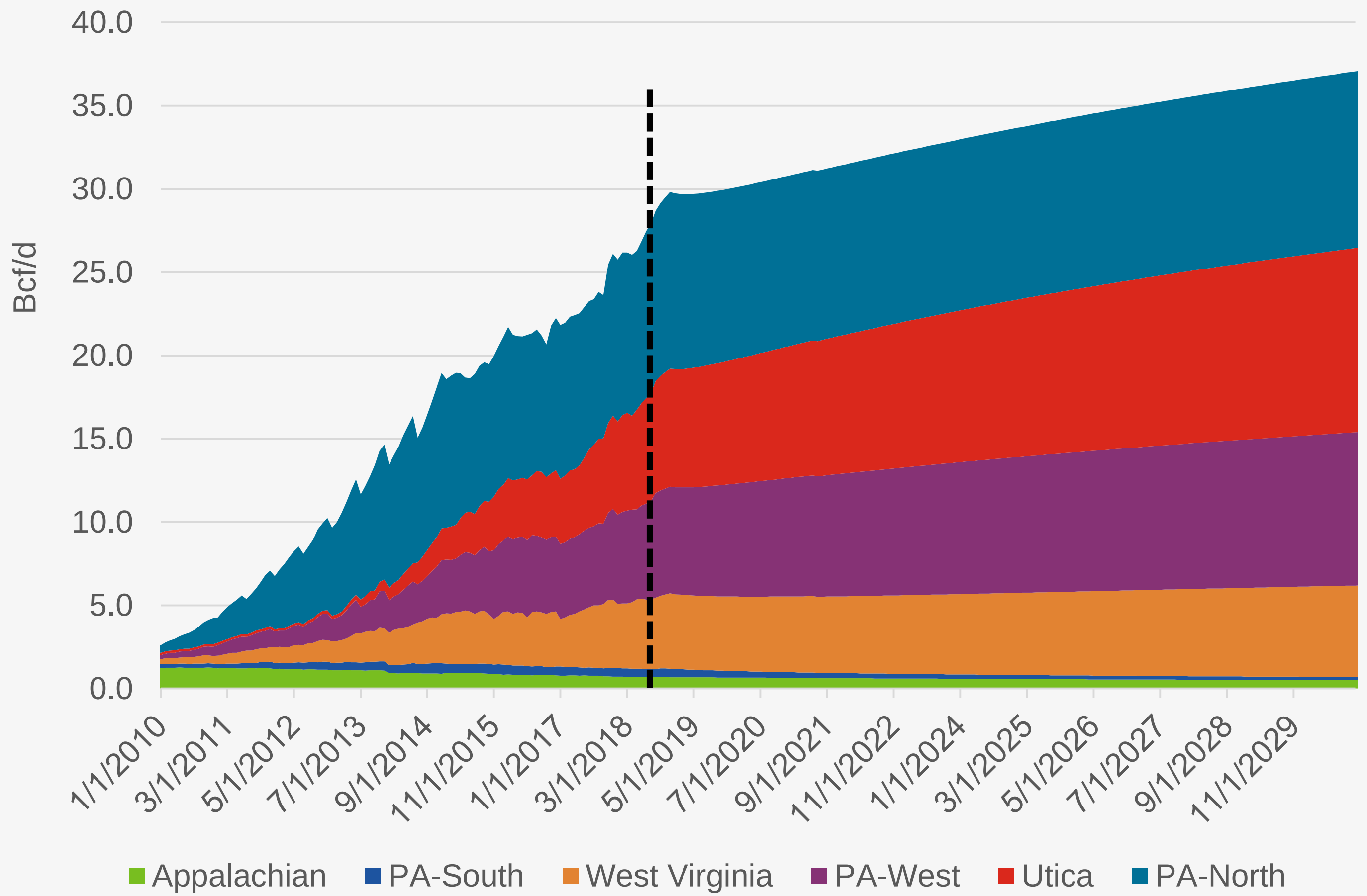
Appalachian Basin

Appalachian production is expected to continue to climb to record levels.

The basin is expected to reach 37.1 Bcf/d by the end of 2030, up from 29.82 Bcf/d in Dec. 2018.

CHART 17

Appalachian Natural Gas Production by Play



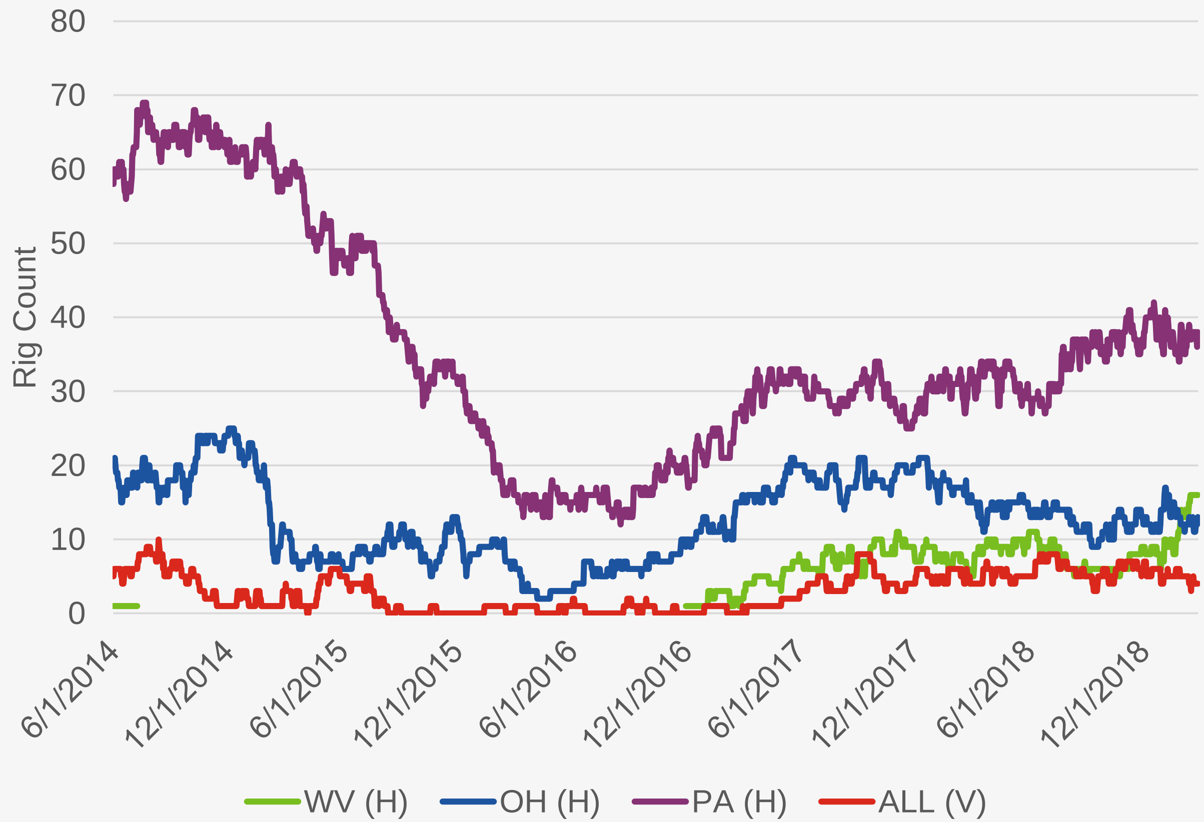
Source: DI ProdCast

Appalachian – Rig Count

Pennsylvania is the main driver of horizontal rig activity in the Appalachian, followed by Ohio and West Virginia.

CHART 18

Appalachian Rig Count by State and Trajectory



Source: DI Rig Analytics

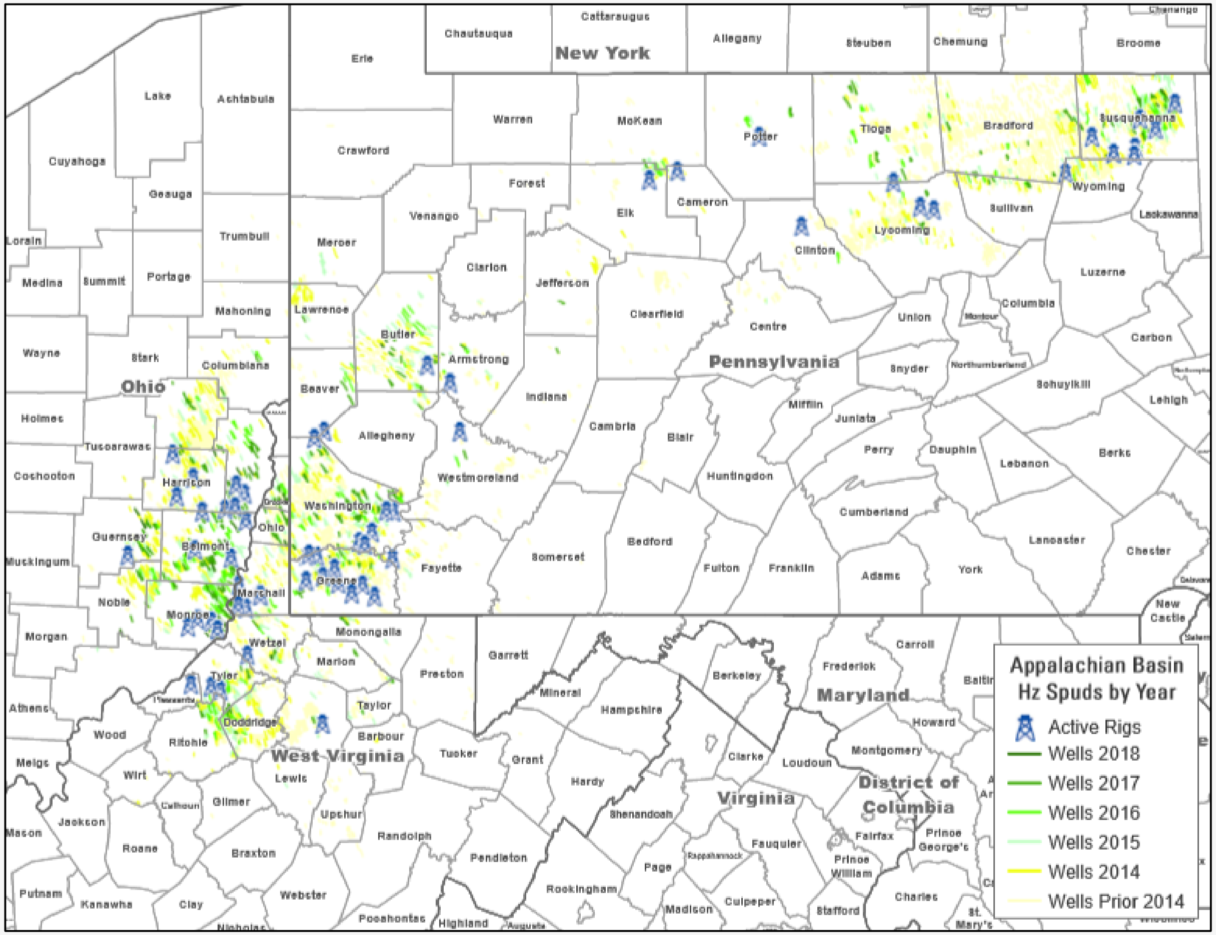
Appalachian – Rigs and Spuds

The basin has seen more than a decade of drilling activity. The Marcellus was the first target in the basin, inside PA, with the Utica in OH seeing a large rise in activity over the past few years.

Most of the activity in the basin currently takes place in the Utica, despite the northeast area containing multiple Tier 1 areas. This is mainly due to the lack of takeaway capacity from PA-North.

CHART 20

Appalachian Rigs and Spuds



Source: DI Basin Reports

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DI BASIN REPORTS

DI Basin Reports

DI Basin Reports combine various DI products to investigate the activity and performance of key plays.

DI creates Basin Reports for the following play areas: Midland, Delaware, Eagle Ford, STACK, SCOOP, Williston, Powder River, Haynesville, DJ, and Central Basin Platform.

Each individual Basin Report includes a basin overview, operator positions and transaction analysis, type curve and economic analysis, and a geological overview.

Contact

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This is a preview of the full report.
If you are interested in learning more, please contact your MarketView account manager of businessdevelopment@drillinginfo.com, and for immediate help: 1 (800) 282-4245 x1

Thank you!

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