
Growing Permian Shale Dominance

Premier basin with location and quality advantage.

Morningstar Commodities Research

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Data Sources for This Publication

EIA
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Last Basin Standing

The West Texas and New Mexico Permian basin has become the nation's top oil and number-two natural gas-producing basin in the shale era. The Permian share of U.S. domestic output has expanded steadily at the expense of other plays. Even as the shale sector in general has suffered from a major bust this year caused by the impact of the coronavirus pandemic on oil demand, the Permian is the go-to basin for remaining producers. This note explains Permian expansion at the expense of rivals and why it could be the last shale basin standing.

We recently discussed prospects for a recovery in U.S. shale output after a second major bust in five years (see [Will Shale Output See New Highs?](#)). In the past decade, output from shale formations expanded to encompass 63% of total U.S. crude production or 7.75 million barrels/day in 2019. This year shale output retreated to average 7.39 mmb/d between January and September, but still represented 65% of total production. We concluded that a souring investment environment for oil and gas production plus uncertainty about demand and prices in the short-term, limit prospects for shale to recover or surpass previous heights any time soon.

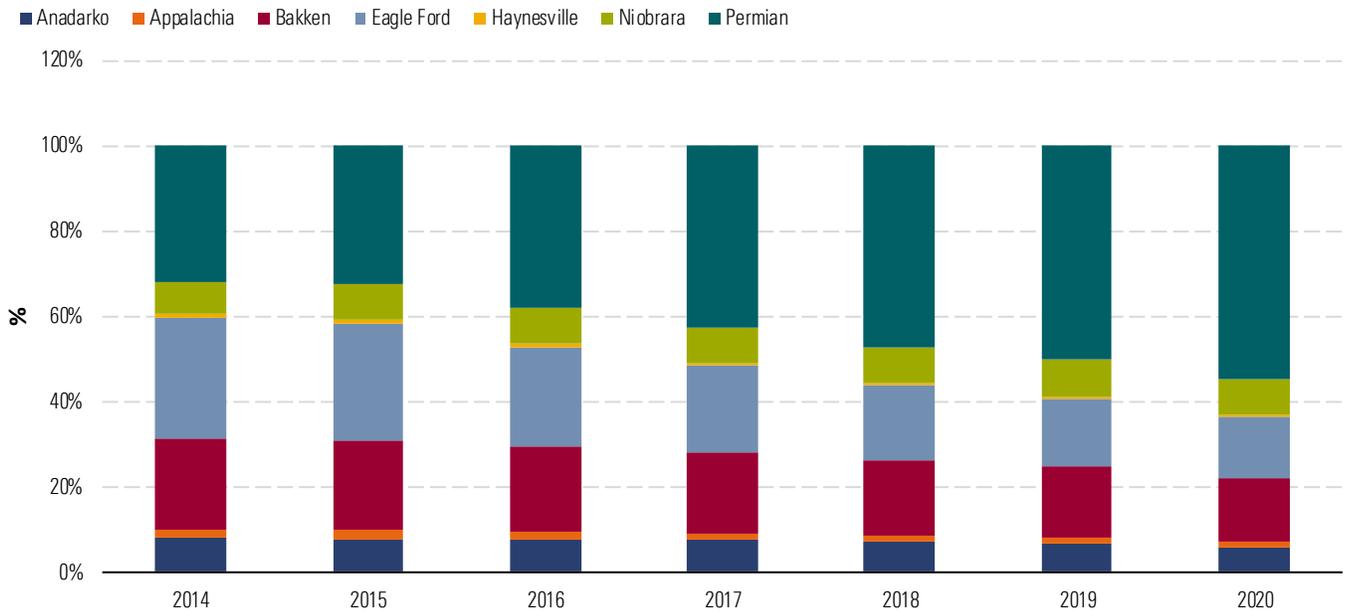
Our analysis for that discussion involved a closer look at the evolution of production in the seven major shale basins. Data from the Energy Information Administration's, or EIA's, monthly Drilling Productivity Report, or DPR, shows shale production of oil and gas in these basins since 2007. Of the seven, drilling in five is oil-focused, while the other two—the Haynesville in Texas, Arkansas and Louisiana and the Appalachian Marcellus and Utica Basins in Pennsylvania, Ohio and West Virginia—are natural gas-focused. The top three oil-focused basins are the Permian in West Texas and New Mexico, the Eagle Ford in South Texas and the Bakken formation in North Dakota. The Anadarko that traverses Oklahoma and the Texas Panhandle and the Niobrara Rockies formation in Colorado and Wyoming are smaller oil-focused basins. The monthly DPR data shows decade-long growth in annual average shale oil production from these basins with output increasing fivefold from 1.7 mmb/d to 8.64 mmb/d between 2010 and 2019. Within that overall growth clear regional trends emerged after 2014, primarily reflecting increasing dominance of the West Texas and New Mexico Permian Basin.

Permian Dominance

Permian Basin output and dominance has grown every year at the expense of the Eagle Ford and the Bakken. Together these three basins produced 81%-84% of total shale crude output on an annual average basis between 2014 and 2020. Over that period, the Permian share of total oil output from shale basins increased from 32% in 2014 to 55% in 2020. In contrast, Eagle Ford's annual average share of

output fell from 28% in 2014 to 15% in 2020 and Bakken's output fell from 22% in 2014 to 15% in 2020 (Exhibit 1). Production from the smaller Anadarko increased every year between 2014 and 2019 but retreated this year to just 6% of total output. The Niobrara formation has maintained relative output at a steady 8% of oil shale output since 2015.

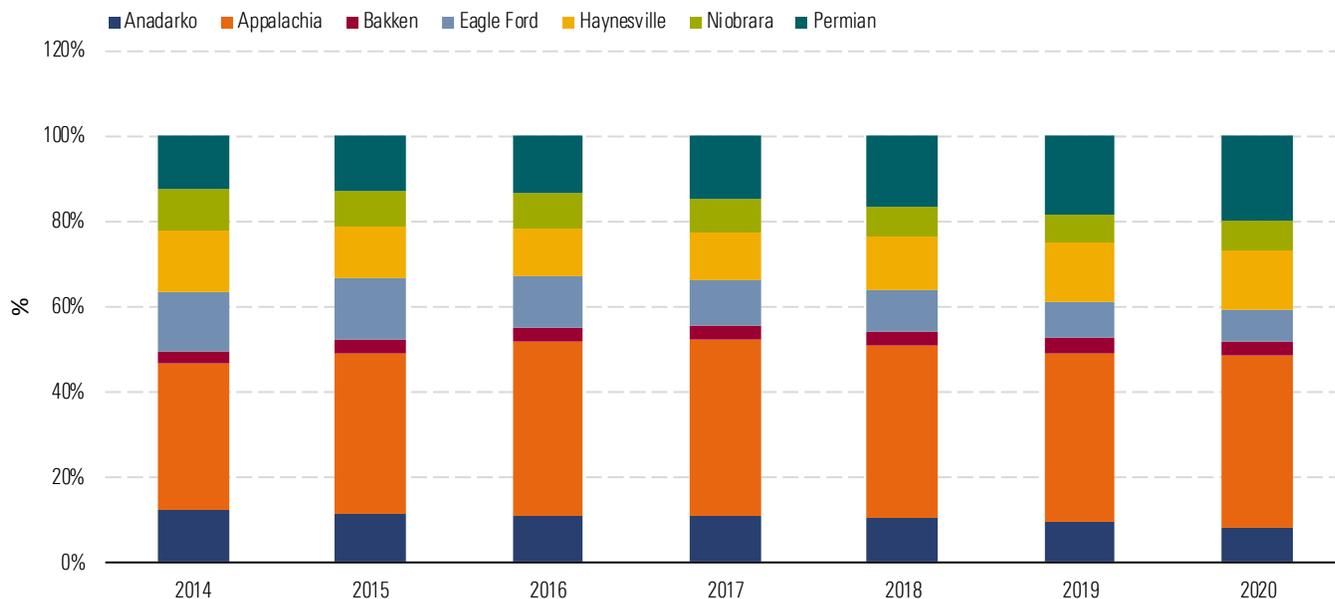
Exhibit 1 Shale Oil Production Percentage by Basin 2014-2020



Source: EIA, Morningstar.

Natural Gas

Shale gas dominance over the past seven years has been shared between the Northeast Appalachia Basin and the Permian, with other basins losing share of total output since 2014. The dominant gas-focused region is the Marcellus and Utica shale formations in Appalachia where annual average output represented 35% of total shale basin production in 2014, growing to 42% in 2017 before retreating to 40% in 2020. The Permian Basin is primarily oil-focused but partly as a result of associated gas from crude wells, it produced 12% of shale basin gas output in 2014, increasing in each of the past seven years to 20% in 2020. The Haynesville has consistently represented 11%-14% of shale basin gas output during the past seven years and DPR forecasts it will produce 11.81 billion cubic feet/day in 2020 on the back of strong demand from Gulf Coast liquified natural gas export liquefaction plants (Exhibit 2).

Exhibit 2 Shale Gas Production Percentage by Basin 2014-2020

Source: EIA, Morningstar.

Quality

The Permian's crown as the top oil and number-two gas-producing basin is attributable to the combination of quality crude and location. Permian output quality makes the basin's light sweet crude grade, West Texas Intermediate, desirable and recognizable to refiners worldwide. The evolving Gulf Coast crude export market is centered on Midland grade WTI crude shipped by pipeline from the Permian's trading hub. Although increasing volumes of Permian crude from the western Delaware Basin section of the play in West Texas and New Mexico are West Texas Light quality, at least some of that is blended with heavier West Texas Sour crude to meet the more valuable WTI Midland specification. Underpinning the WTI quality brand is its role as benchmark for the world's most liquid crude futures contract on the CME Nymex exchange. By comparison crude from the South Texas Eagle Ford has a poor-quality reputation, suffering from a wide variation in density across the basin and a tendency to high-wax content, which is unattractive to refiners because it can harm their equipment.

Location, Location

North Dakota Bakken crude is arguably better quality than WTI, typically yielding more middle distillate components that, until COVID-19 wrought havoc on truck and airplane demand, was considered more valuable to refiners. That quality premium isn't enough though, to overcome the negative impact of location. Production in relatively remote North Dakota adds transport costs to Bakken crude deliveries to Gulf Coast refineries or export docks. Although conduits such as the 570,000 b/d Energy Transfer, Dakota Access pipeline that came online in 2017 delivering Bakken crude to the Midwest and the Gulf Coast, have been built, the latter is still embroiled in contentious permit disputes. Bakken crude has a history of

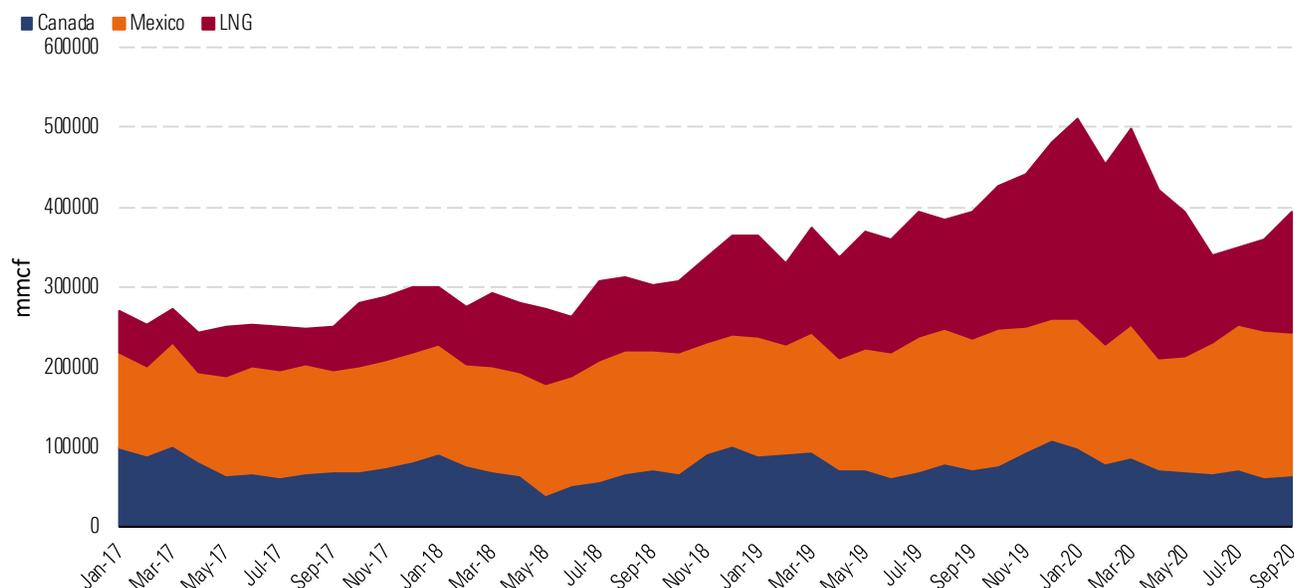
transportation challenges including early reliance on expensive rail options before the Dakota Access Pipeline, or DAPL. On top of managing crude transport challenges, Bakken producers also initially struggled to find transport and markets for associated natural gas their wells produced.

Permian producers face few such transport challenges. Although West Texas and New Mexico are relatively unpopulated they are hundreds, not thousands of miles from Gulf Coast refineries and export docks. The Permian has also been a major producing basin since the 1930s that has been through multiple phases of development. That leaves plenty of existing natural gas and crude oil pipeline in the ground or rights of way that can be repurposed by shale developers to expedite the transport of new production to market. In the past several years as crude oil infrastructure has been built across the U.S. to accommodate the shale boom, projects in Texas have faced fewer permit hurdles than longer distance interstate pipelines such as those from North Dakota or the Rockies to the Gulf Coast.

Markets

Not only is the Permian located closer to markets, the region is the nation's largest refiner and exporter of crude. In 2019 Gulf Coast refineries processed 53% of domestically refined crude and 93% of crude exports left Gulf Coast ports making the region a magnet for crude supplies.

And unlike the Bakken, the Permian is blessed with two nearby markets for natural gas exports, Mexico by pipeline and Gulf Coast liquefaction facilities that produce liquified natural gas, or LNG, for tanker shipments to world markets. These are the largest overseas markets for U.S. natural gas besides Canada, consuming 10 bcf/d on average in 2019 or 11% of domestic output, according to EIA (Exhibit 3). In the past two years large multitrain liquefaction plants that convert natural gas to a freezing liquid have come online at Freeport and Corpus Christi, Texas. These plants convert up to 3 bcf/d of natural gas into LNG for export from Texas. Other LNG plants built and planned along the Gulf Coast in Louisiana add to the demand for supplies that create a market for associated natural gas captured from oil wells. As well as LNG, the EIA reports the Gulf Coast region exported an average 5.1 bcf/d of natural gas by pipeline to Mexico in 2019.

Exhibit 3 U.S. Natural Gas Exports 2017-2020

Source: EIA, Morningstar.

Gas Liquids

The Gulf Coast is also home to the nation's largest concentration of fractionators and petrochemical plants. These form a ready market for raw mix—the liquids extracted from natural gas by gas processing plants. Raw mix is fractionated to extract purity gas liquids called propane, butane, isobutane, ethane and natural gasoline. These have many uses but their main markets are feedstock for domestic and international petrochemical plants and refinery gasoline blend components. According to EIA data an average 23.9 bcf/d of natural gas was processed in Texas during 2019, from which 2.3 mmb/d of gas liquids was extracted, representing 47% of U.S. total liquids production of 4.9 mmb/d. An average 1.3 mmb/d of gas liquids was exported from the Gulf Coast region in 2019. For Permian producers these nearby end-use markets provide opportunities to extract incremental value from natural gas and gas liquids that might be flared or blended into the gas stream in other regions.

Advantages

Abundant hydrocarbon resources and nearby markets provide strong advantages to the Permian Basin that explain its growing dominance among shale plays. Layered formations of shale deposits in the Permian sweet spot Midland and Delaware Basin acreage reward drillers with crude, natural gas and wet gas containing gas liquids, adding to returns and lowering break-even prices. These advantages continue to attract investors despite a souring environment for the oil and gas sector in 2020. Even as major oil companies like ExxonMobil, Chevron and ConocoPhillips cut back on drilling budgets in response to low oil prices, they aren't abandoning prime acreage in the Permian.

Given our expectation that overall U.S. shale crude output won't recover to 2019 levels until 2022 at least, we believe the Permian will continue to dominate shale crude production at the expense of other basins in coming years. The investment mentality of producers is now farming rather than wildcatting. The days of money is no object, "drill baby drill" investment in shale basins are over. Easy access to regional and export markets support ongoing Permian production and offer expansion opportunities overseas. Shale is responsive to the boom-and-bust pattern of oil and gas development because it allows producers to crank up output quickly when prices and demand are high and pull back quickly when they aren't.

Last Basin

In an era where energy transition places a ceiling on demand for hydrocarbons, flexibility is increasingly important for producers navigating a changing landscape. The Permian's quality and location advantages make it the premier shale basin today and qualify it to be the last shale basin standing in a future world where oil demand is shrinking. ■■■

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