6 JUNE 2018

Height Commentary

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Permian Oil Production / Pipeline Capacity

Pipeline Constraints Could Delay Permian Production Growth

THE TAKEAWAY

Oil producers in West Texas are experiencing some growing pains as production threatens to outpace takeaway capacity for both oil and associated gas. These issues are only becoming more acute since we last discussed takeaway constraints and limits on gas flaring in early April. Now, gas pipeline capacity reportedly is 98% full and the Midland oil price is heavily discounted to WTI, implying a high transportation cost for additional barrels out of the Permian basin. Eventually, the pipelines will come – especially for crude oil – but for now we believe producers will consider delaying new well completion out or regard for limited pipeline capacity and the worry that limits to natural gas flaring could create significant operational disruptions for wells. Uncertainty around flaring rules is a meaningful headwind in both Texas and New Mexico, where methane venting and flaring traditionally went unregulated but would be subject to federal regulation in many areas.

Permian Pipeline Constraints Are Taking Their Toll

Crude oil pipelines in West Texas are functionally at capacity, though pipelines continue to explore tricks and tools (like adding drag reducing agents) to get the most out of their infrastructure. Even so, production growth continues – with crude production topping 3.2 million barrels per day in May, according to EIA (Figure 1), up from 2.8 million barrels per day at the end of 2017.

As we discuss in today's report, takeaway constraints on the gas and oil side are likely to hamper production growth through 2018 and 2019 despite new crude pipes coming on line early next year, and we believe output by year end will be closer to 3.5 million barrels per day rather than the projected 4 million barrels per day.

Incremental gas pipeline capacity will not be available until late 2019. Even then there are few projects in the queue. As a consequence, producers are likely to rely more heavily on flaring, but this option is more limited than the market might expect.

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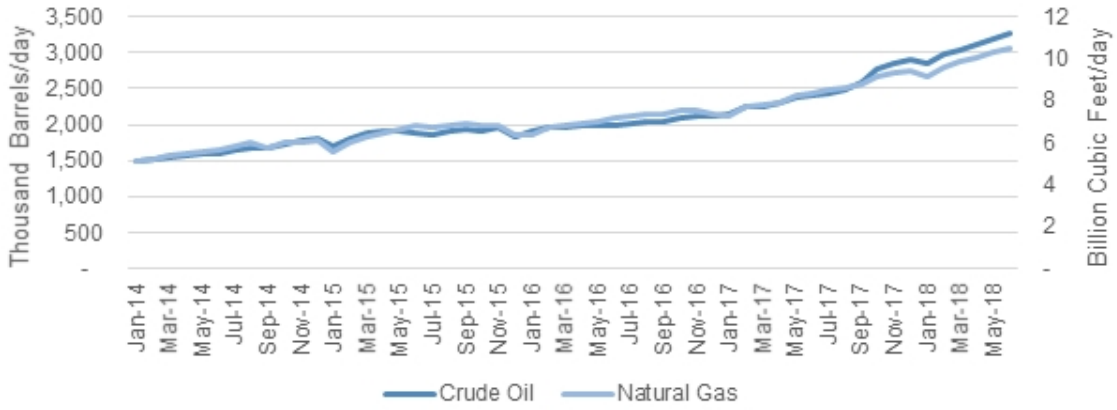
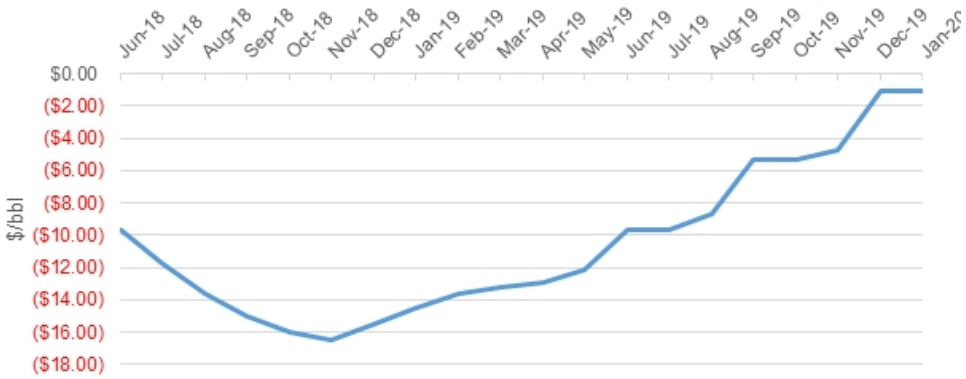
Figure 1 - Permian Crude Production (mmbbl/d) and Natural Gas Production (Bcf/d)



Pipeline takeaway capacity has not quite materialized to take all the new oil production, but many new crude pipes are on their way. New pipelines like Enterprise's (**EPD**) Midland to Sealy pipeline (575,000 bbl/d) and projects by Magellan (**MMP**) and Plains All American (**PAA**) are expected to add meaningful crude takeaway capacity to the market by early 2019. The Midland WTI to Cushing WTI discount improves meaningfully starting in the first quarter of 2019, with legs up in the second and third quarters as capacity from PAA's Cactus II Pipeline (650,000 bbl/d, 3Q2019) and the Grey Oak project (700,000 bbl/d, 4Q2019) by Phillips 66 (**PSX**) and Andeavor (**ANDV**) enter service. Combined, the market will have well north of 6 million barrels per day of total takeaway capacity by the middle of 2020, including existing and new pipelines and local refinery demand. This is more than adequate to support production growth from the region (currently 3.2 million bbl/d), making the acute shortage of pipeline capacity for crude oil a significant but short-term problem.

Figure 2 - WTI Midland to WTI Cushing Differential Futures ($/bbl)



Takeaway capacity for natural gas is not so promising, leaving oil producers to wait at least a year before meaningful new pipeline capacity materializes, particularly Kinder Morgan's (**KMI**) Gulf Coast Express (1.9 Bcf/d, 4Q2019) (Figure 3).

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Figure 3 - Gas Pipeline Project List

Pipeline	Owner	Capacity (Bcf/D)	Projected In-Service	Target Market
Gulf Coast Express	Kinder Morgan	1.90	4Q2019	Corpus Christi
Pecos Trail Pipeline	Namerico	2.00	3Q2019	Corpus Christi
Permian - Katy Pipeline	Boardwalk, Sempr	2.00	3Q2020	LNG Exports
Permian Global Access	Tellurian	2.00	2025	LNG Exports
Roarunner II Expansion	ONEOK	0.64	4Q2019	NW Mexico
Old Ocean Pipeline	EPP, ETP	0.40	2Q2018	USGC

Developers have been somewhat slow to announce new pipeline projects on the natural gas side, though producers are less likely to seek it out, given that natural gas is a byproduct of oil production; therefore, pipelines are not as likely to see successful solicitations of interest. Nonetheless, the pipeline constraint is very real, and gas cannot be trucked out of Texas like crude oil. In aggregate, there is substantial pipeline capacity serving the region, but much if it goes underutilized. As we wrote in April, The West Coast is not a growing demand region and adequately supplied as-is. The same can be said of the mid-continent, which receives gas from all corners of North America with Appalachian volumes growing due to new capacity like the ETP Rover and ENB Nexus pipelines. East, to the Gulf Coast, is the best bet for Permian associated gas over the long term, but those pipelines take time. Mexico is also promising, with substantial cross-border pipeline capacity. As we will discuss later, Mexican pipes continue to face delays (not unlike their American peers), and Mexico will remain a significant LNG importer through the end of this decade.

Finally, if an operator must produce oil and has nowhere to dispose of the gas, they must flare it. As we wrote in April, and as the market increasingly appreciates, gas flaring is a limited option in Texas. We do not anticipate significant regulatory actions from the Texas Railroad Commission at this time, but we believe that operators will continue to self-police and avoid becoming overly dependent on the RRC's leniency.

Flaring is on the Rise, but for How Long?

As Figure 1 shows, output growth for gas production is beginning to lag behind crude as operators seek to concentrate production on less gassy wells and as gas flaring increases. Gas flaring in Texas is already prolific and flaring in the Permian increased 60% through 2017, according to data from the Railroad Commission. Producers in the Permian regions in West Texas vented or flared 1.5 billion cubic feet of natural gas in November 2017 (18.25 Bcf annualized), the latest month for which RRC data is available. Venting and flaring throughout Texas exceeded 7 Bcf in November (86 Bcf annualized), meaning that Permian flaring, while substantial, accounted for just over 20% of total gas flared. Still, this is an enormous volume of gas, and the RRC must issue flaring permits for the vast majority of it. Accordingly, flaring permits are flying through the door at the RRC. As we understand it, operators have had no trouble securing 45-day flaring permits. (Below is a refresher on the permit process.)

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Figure 4 - Permian Vented and Flared Gas (Bcf/Month)

We believe that the Permian region could be on track to flare as much as 50 Bcf through 2018 – a whopping 173% increase over last year's peak – which would increase flaring throughout Texas to nearly 120 Bcf annually. These are noticeable numbers – for regulators like the RRC, for politicians, and for the public. Venting and flaring of natural gas, especially in the summer, causes nitrogen oxide and ozone formation, leading to air quality issues, asthma attacks and other health problems. Certainly, environmental groups will take issue with widespread flaring (they already do), but what we're anticipating is more bipartisan. Most individuals do not want to see meaningful degradation to air quality and health. We think operators will be sensitive not to lean heavily on flaring as an outlet for unwanted gas. Constrained gas pipelines and caution around excessive flaring will likely contribute to slower growth in oil production throughout 2018 and 2019 until meaningful new gas takeaway capacity comes online.

Mexican Exports Are Still a Few Years Away

Mexico could be a meaningful outlet for natural gas volumes, particularly as gas basis differentials in West Texas widen, but protests and legal challenges have brought needed pipeline development to a near-halt south of the border. In 2017, the U.S. exported on average 4.28 bcf/d to Mexico through pipelines and 0.4 bcf/d via LNG shipments, slightly over half of Mexico's 8 bcf/d of natural gas demand. Despite economic advantages for pipeline gas, we believe LNG will comprise an increasingly larger share of total exports in the near term, as more LNG import terminals come online and pipeline projects continue to stall. Projects like TransCanada's (**TRP**) 2.6 bcf/d Sur de Texas-Tuxpan pipeline and the 510 MMcf/d Guayamas-El Oro segment of Sempra's (**SRE**) Sonora pipeline continue to face legal problems. TRP's project is delayed by an injunction brought by fishermen in the Tuxpan. The prospects of the Texas-Tuxpan line coming online by the end of 2018 continue to look dim. SRE's Guayamas-El Oro line is tied up in a case brought by the Yaqui indigenous group, and developers are unable to continue construction or repair on a section of the line while the case proceeds. However, SRE is making serious progress on its Energia Costa Azul LNG terminal on Mexico's Baja California peninsula, already securing three critical permits in Mexico. This project will help U.S. natural gas reach booming LNG markets like China and Japan in the Pacific. Additionally, Howard Energy Partners' 600 MMcf/d Nueva Era Pipeline is expected to come online in 3Q2018, albeit more than a year behind schedule.

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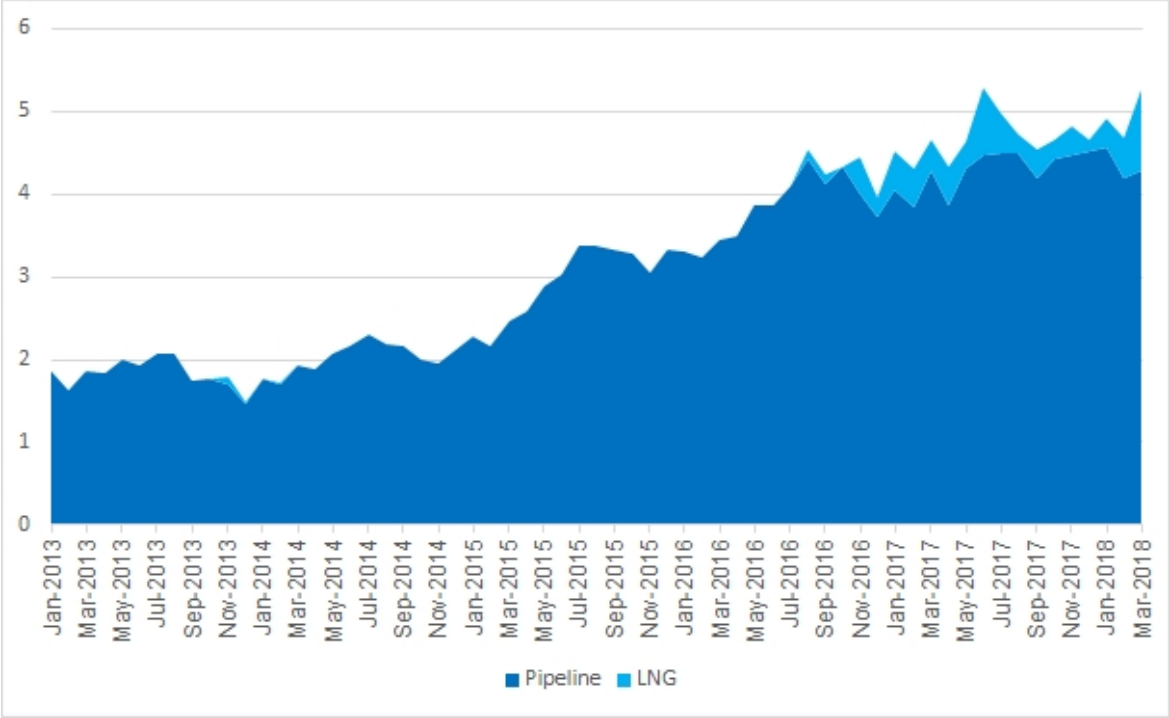
Figure 5 - US Gas Exports to Mexico by Pipe and LNG (Bcf/d)



Source: EIA

Permian Flaring Regulations: A note on process

Texas Railroad Commission (RRC) Statewide Rule 32 allows E&P companies to flare gas while drilling new wells and for 10 days after a well's completion. New wells need to flare casinghead gas before production can commence, often for more than 10 days. For temporary periods of flaring, companies can apply for 45-day permits up to a maximum of 180 days. The RRC typically grants these exceptions for companies awaiting pipeline construction or experiencing maintenance issues.

Requests for exceptions longer than 180 days and for volumes greater than 50 thousand cubic feet of gas per day require an RRC hearing and can only be granted in a final order. Applicants for permanent exception must provide a cost-benefit analysis, offer an estimate of gas reserves, identify the nearest pipeline capable of accepting gas, and pay $375 per well. Importantly, wells must be isolated from any gathering lines to receive extended exceptions. In practice, the RRC generally approves exception requests up to two years (e.g. Continental Trend Resources, Inc.)

If a well-operator still needs to flare gas after the two-year period—whether for capacity constraints, gathering line maintenance, or pipeline construction—the operator can apply for either a temporary permit (up to 180 days) or a permanent exception (up to two years). The RRC issues permits on a need-basis and views each application as a separate event. There is no technical limit for how many permits the RRC can grant to a given well operator.

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While some environmental groups have pushed for more stringent flaring regulations, the RRC does not have any pending rulemakings to change Statewide Rule 32. The Environmental Defense Fund wrote a report in November 2017 arguing the 80 BCF flared from 2014 to 2015 was wasteful and underscored the need for new regulations. We anticipate Permian drillers will need to burn at least 10 times that amount by the end of 2018 to allow Permian oil production to reach 4 MMBBL/D in crude output. Environmentalists like the EDF would staunchly oppose this level of flaring and put pressure on the RRC to change regulations, in our view.

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COMPANIES MENTIONED IN THIS REPORT

Andeavor (ANDV), Enbridge Inc (ENB), Enterprise Products Partners LP (EPD), Energy Transfer Partners LP (ETP), Kinder Morgan Inc (KMI), Cheniere Energy Inc (LNG), Magellan Midstream Partners LP (MMP), Plains All American Pipeline (PAA), Phillips 66 (PSX), Sempra Energy (SRE), TransCanada Corp (TRP)

RISKS

The legislative and regulatory agendas are subject to change at the discretion of leadership. Unprecedented economic conditions could instigate unanticipated and/or sweeping shifts in policy. Predicting the future is a hazardous endeavor and economic / market forecasting is an imprecise science. Actual outcomes may differ substantially from our forecasts. The predictions and opinions expressed herein are subject to change at any time.

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I, Katie Bays, certify with respect to each security or issuer covered in this research report that (i) the views expressed in this research report accurately reflect my personal views about those subject securities or issuers and (ii) no part of my compensation was, is, or will be, directly or indirectly, related to the specific recommendations or views expressed by me in this research report.

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