Get Ready – Fast-Growing NGL Production and Exports Driving Infrastructure Build-Out

Larger Players With 'Well-to-Water' NGL Networks Leading the Way

- **NGL production continues to soar, and new infrastructure is required to deal with the higher volumes.**
- **The focus of development is the Permian — new processing plants and new NGL pipeline capacity to Texas's Gulf Coast.**
- **New fractionation and export capacity is also being built and planned.**
- **Most of the new infrastructure is being developed by a handful of larger midstreamers that own and operate 'well-to-water' NGL networks.**
- **Enterprise's new plan for $3.1 billion in projects suggests the boom in development is far from over.**

1. Introduction

Since the advent of the Shale Revolution in 2008, U.S. production of crude oil has increased by about 160% and natural gas production is up about 90%. As amazing as that may be, the real star of hydrocarbon growth is NGLs. U.S. production of mixed NGLs (aka Y-grade) at gas processing plants has more than tripled — up an extraordinary 260% over the past 15 years to more than 6.5 MMb/d. And it's not just NGL *production* that's up sharply; so are *exports* of NGL purity products, especially LPG (propane and normal butane) and ethane.

To get what's going on with U.S. production of the mixed stream of natural gas liquids collectively known as NGLs (ethane, propane, normal butane, isobutane and pentanes+), it's important to understand the relationship between NGLs and the production of crude oil and natural gas — after all, they all come from the same holes in the ground in hydrocarbon-rich areas like the Permian, Bakken, and Eagle Ford. Because of their common origin, RBN refers to the three commodity streams (crude, gas and NGLs) as the "drillbit hydrocarbons."

These days, about 80% of drilling in the U.S. is primarily directed at crude oil production, which makes sense because (generally speaking) crude is the most valuable of the drillbit hydrocarbons on a per-Btu basis. Crude doesn't emerge from shale plays on its own, of course — instead, it emerges with associated gas, a gurgling combination of methane (natural gas), mixed NGLs and various impurities. The composition

of this oil/natgas/NGLs stew varies widely, not only between shale basins but *within* each basin and *from well to well* — and even *within each well over time*.

The differences in drillbit-hydrocarbon composition between oil-focused basins, within basins and from well to well is easy to wrap your head around — depending on location, there will be variations in rock and hydrocarbon content within that rock. As for the changes in composition over time at individual oil-focused wells in key shale basins, they tend to result from an increasing gas-to-oil ratio (known as the GOR and calculated as Mcf of gas per barrel of oil). In other words, the output of individual wells and entire shale basins tend to become "gassier" from year to year. The main reason for rising GORs is that gas type curves generally tend to be shallower — meaning they decline less quickly — than oil type curves. Also, additional natural gas and NGLs tend to be captured as gathering and processing infrastructure is built out and restrictions on flaring tighten.

As you would expect, the trajectory of GORs differs from basin to basin, depending on a number of factors such as the degree of recent drilling activity (again, new wells tend to be oilier than older ones) and where E&Ps are choosing to drill within the basin. Due largely to its extraordinary production growth during the Shale Era and its proximity to the mammoth NGL storage and fractionation hubs in Mont Belvieu, TX, and smaller hubs down Texas's Gulf Coast in Sweeny and Corpus Christi, the Permian plays an outsized role in NGL production — so does the Eagle Ford, albeit to a lesser degree. In the Permian, the average GOR has increased by more than 10% since 2017 (from 3.4 to 3.8) and in the Eagle Ford it has increased by even more (from 5.1 to 6.0).

That increase of 0.4 in the Permian's GOR may not sound all that profound — until you consider that the basin now produces more than 6.1 MMb/d of crude and that the higher GOR translates to an increase of more than 2 Bcf/d of gross gas — an enormous volume to be sure. Production in the Permian, like in several other oil-focused shale plays, has another important characteristic — namely, the associated gas produced there is richly saturated with NGLs. NGL content in associated gas is often measured in gallons per Mcf of gas, or GPM. Depending on the hydrocarbon mix of the basin in question, each Mcf of associated gas may have anywhere from a couple to several GPM of mixed NGLs entrained within it.

The recovered GPM across the U.S. has been rising steadily since 2008, from 1.3 GPM back then to more than 2.3 GPM today. A rising GOR coupled with a rising GPM means that now, on average, for every barrel of crude oil produced in the U.S., 9.4 Mcf of gross gas is produced and 22 gallons of mixed NGLs (9.4 x 2.3 = 22) — or about half a barrel of NGLs (22/42). A major reason for the rising GPM is that new, highly efficient processing infrastructure has enabled a higher percentage of NGLs to be recovered from the gas stream.

There are at least a couple of other things to consider. One is that in shale plays like the Permian that have experienced a buildout of efficient new processing capacity, the average recovered barrel of mixed NGL production tends to contain a greater portion of lighter components like ethane and LPG than heavies. Another is that, as with crude oil and natural gas, as production of NGLs has ramped up during the Shale Era, surplus production has pushed its way into international markets to the point where the U.S. is now a leading exporter of crude, gas and NGLs. Just as noteworthy, while the U.S. is exporting about 30% of the crude oil it produces (up from only 4% in 2014) and 20% of its natural gas (up from 6% in 2014), fully 40% of its produced NGLs are now exported, with a whopping 60% of propane production sent abroad.

The rise in U.S. NGL production over the past decade and a half was accompanied by a massive buildout of NGL-related infrastructure: everything from gas gathering systems and gas processing plants to NGL pipelines, fractionators, ethane-consuming steam crackers along the Gulf Coast (and in western Pennsylvania), and export terminals capable of loading and sending out large volumes of ethane and LPG. While many individual infrastructure assets are owned and operated by a number of midstream companies of various sizes, a substantial portion of NGL volumes flow through larger "well-to-market" or "well-to-water" networks owned by a handful of larger midstream companies.

Developed over many years and with a lot of forethought, each of these multifaceted networks can take NGLs from where they emerge from underground (the well) all the way to the export dock (the water), often with only minimal (or no) assistance from others. That start-to-finish management of the NGL stream provides a number of important benefits — chief among them, the ability to operate with extraordinary efficiency, collect fees from shippers each step of the way, and feed pipelines, fractionators, storage and export terminals along the network's value chain. In this Drill Down Report, we describe these NGL networks

in detail. They include the Gulf Coast-focused networks owned and operated by Enterprise Products Partners, Energy Transfer, Targa Resources and Phillips 66 and the Northeast-focused network owned and run by Energy Transfer.

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