Tailgate Blues:
NGL Markets and Natural Gas Processing Economics

- **Natural gas liquids are playing an increasingly important role in energy markets. NGL production is growing fast, and surplus supplies are moving to export markets**
- **The NGL content from the major shale gas plays varies widely, not just across individual plays but among areas within each play and from well-to-well in each area**
- **A firm grasp of the dynamics of natural gas processing requires a rigorous understanding of gas processing economics**
- **The Frac Spread provides a simple measure of the relationship between the price of natural gas and the weighted average price of NGLs**
- **The MQQV model developed by RBN Energy allows for a more encompassing and accurate assessment of natural gas processing economics**
- **The model determines the economic uplift provided by processing specific gas inlet streams, and assesses the potential value of ethane rejection. *Model downloads included with this report.***

Natural gas liquids (NGLs) are an important segment of the U.S. oil and gas market, making up about 25% of hydrocarbon liquids produced. Volume growth is coming on strong. NGL production from natural gas processing increased from 1.7 MMb/d in early 2009 to almost 3.0 MMb/d in 2014 and is expected to continue growing to 4.5 MMb/d by 2019. Although NGL prices are down relative to their peak levels in 2011, the value of NGLs remains at least double the price of natural gas on a per-BTU basis. As a result, producers have continued to focus much of their natural gas drilling activities on *wetter*, higher-NGL content shale plays. In addition, the ramp-up of U.S. crude oil production since 2011 has brought with it *associated gas* that tends to have a high NGL content, further increasing NGL volumes.

With these market changes, NGL already exceeds U.S. demand, and that gap between supply and demand is increasing. In recent months almost 50% of gas plant production of *propane* has been exported, mostly to overseas markets. It is a similar story for *natural gasoline*, with almost half of that NGL product exported, primarily to Canada for use as a *diluent* – blended with heavy crude so that it can be moved via pipeline. And natural gas processors can now make far more *ethane* - the largest component of the NGL barrel - than the U.S. petrochemical industry can

consume, leaving them with two primary options for excess supplies: rejecting ethane into the natural gas stream or exporting ethane. In 2014, about 330 Mb/d of ethane—approximately 20% of what could otherwise be produced--is being rejected – sold as natural gas at BTU value rather than produced as liquid ethane and used as a petrochemical feedstock.

But even with widespread rejection of ethane, total NGL production is growing rapidly, and an NGL infrastructure building boom is underway. During the 2013-15 period, more than 70 new gas processing plants will come online, adding nearly 15 Bcf/d of new processing capacity. The Gulf Coast, the Appalachian region and Midcontinent/Rockies region each account for about one-third of the capacity increase. In addition, over the same three-year period 11 large NGL pipeline projects have been or will be developed, most involving delivery of mixed NGLs (*y-grade*) to the Gulf Coast. New *fractionators* to split the mixed NGL streams into the five NGL *purity products* are also being built, both in Mont Belvieu, TX and in Appalachia.

As these assets are completed and new NGL production flows into the market, the consequences for each NGL product are different, depending on demand and disposition alternatives for that product. It is clear, however, that the U.S. can—and will continue to—produce more NGLs than it can consume. The result will be significant exports.

Natural Gas Processing Economics

Despite the important role of NGLs, these markets are not well understood, both due to their complexity and the unique aspects of their production, transportation, storage and use. This RBN Energy Drill-down Report illuminates one of the most misundertood aspects of NGL markets – the extraction of NGLs from natural gas. Most NGLs are produced by removing liquids from natural gas at a natural gas processing plant, soon after it leaves the wellhead. There are about 600 of these processing plants in the U.S. They work basically by cooling the natural gas stream down to the point where the liquids condense out of the gas, leaving a *dry* or *residual gas* stream that can be moved in a pipeline to natural gas markets. Without such NGL extraction, about half of the natural gas in the U.S. could not be transported to market because its BTU content would be too high to meet pipeline standards. NGLs are removed for another reason as well: the added value they provide. NGLs are almost always worth more than natural gas, and removing them provides producers and gas processors with very attractive margins.

To understand the dynamics of natural gas processing--when NGLs must be extracted to meet pipeline standards, when it makes economic sense to extract NGLs, what drives ethane rejection, and a myriad of related issues--it is necessary to understand natural gas processing economics. That includes the calculations for determining NGL volumes from a particular natural gas stream, the reduction (*shrinkage*) of that natural gas stream after removal of those NGLs, and the value implications of NGL extraction based on the difference between natural gas and NGL prices.

This RBN Energy Drill-down Report examines those natural gas processing economics in the context of recent developments in NGL markets. The analysis begins with an overview of the NGL family of products – ethane, propane, normal butane, isobutane and natural gasoline. The remainder of this report then reviews:

- Current NGL market developments
- The process of separating NGLs from the raw gas stream
- The “Frac Spread”, a common measure of NGL processing economics, and
- A detailed RBN-developed model for assessing and understanding natural gas processing economics

This RBN Energy Drill-Down Report is available for individual subscription at rbnenergy.com as part of RBN's Backstage Pass premium content service.

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