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## Next to You: A Transformation in Propane Markets

### *Much More Supply near Demand Regions: Opportunities and Challenges*



- U.S. propane production from gas processing has more than doubled, driving export growth and increasing price exposure to global markets
- Much of the new supply is closer to Northeast and Midwest propane demand centers, improving local access
- Domestic propane demand will remain flat, but spiking demand during ‘perfect storm’ winter events could challenge propane delivery networks
- New pipelines, rail facilities, storage and export terminals are being added, making propane markets more interconnected, flexible and resilient
- Increasingly, volumes from new propane producing regions are transported by rail; new rail facilities are coming on line; rail can be less ratable than pipeline deliveries
- New infrastructure will enable regional propane shortfalls to be mitigated by rail deliveries, inter-regional flows and temporary cuts in exports
- Despite the new propane plenty, propane retailers must remain vigilant, and take steps to ensure an efficient and reliable supply chain

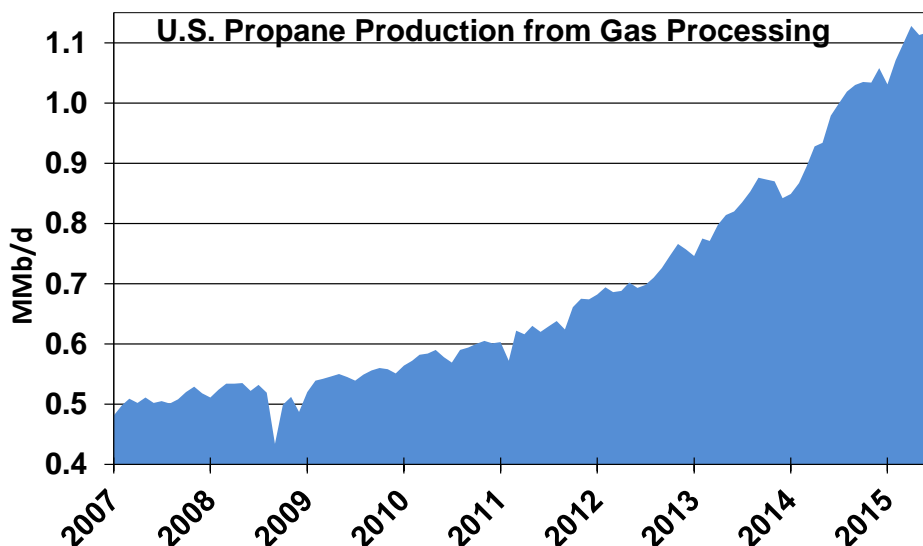
From a position as a net propane importer just a few years ago, the U.S. now produces almost twice as much propane as is consumed in the country. The balance moves to global markets, with export volumes doubling over the past two years. The result has been a transformation in the dynamics of the market to the benefit of the domestic propane industry. Much of that supply growth is coming from the Northeast and Midwest, location of almost 80% of total consumer propane demand in the U.S. – residential/commercial, industrial, motor fuel, and agricultural demand. The location of that production to nearby markets has significantly improved supply reliability, as have huge investments that the industry has made in transportation infrastructure – both pipeline and rail – to move those barrels to market.

Consequently the U.S. propane industry is now in a much better position to handle a “Perfect Storm” of extreme demand events than it was in the winter of 2013-14 when the propane market was roiled by critically low inventory levels in the Midwest with dramatic consequences for prices. But even though all of the new production makes such events much less likely in the future, the transformation in propane markets over the past two years brings with it a number of challenges,

including greater exposure of domestic propane to global markets, more complex inter-regional supply dynamics, a more diverse supply chain, all in the context of limited domestic demand growth.

In an effort to assess how these market developments could impact the prospects for disruptions similar to those that occurred during the “Perfect Storm” winter, the Propane Education and Research Council (PERC)<sup>1</sup> earlier this year contracted with RBN Energy to assess market developments that could affect the prospects for future propane-supply disruptions, and to suggest actions to alleviate the risk of such market turmoil. This report summarizes some of RBN’s analysis and conclusions from the PERC study.

As this report is released (October 2015), U.S. propane production continues at record levels. Over the past seven years, total domestic propane output has increased by nearly 75% from an average of 0.8 million barrels per day (MMb/d) in 2008 to 1.4 MMb/d during the first half of 2015. Most of that growth has been driven by an increase in propane production at natural gas processing plants, which has more than doubled, from 0.5 MMb/d in 2008 to 1.1 MMb/d in 2015 (see Figure 1). Propane production from U.S. oil refineries, meanwhile, remained relatively constant at about 300 Mb/d.



**Figure 1 - U.S. Propane Production from Gas Processing 1/2007-7/2015; Source: EIA**

While total U.S. production of propane has been rising, domestic demand for propane has remained largely unchanged, and is expected to stay close to current levels as modest declines in residential and commercial demand are offset by a slight increase in demand by the petrochemical sector (mostly new propane dehydrogenation—or PDH--plants). With domestic propane consumption levels flat, propane exports have been increasing sharply to help absorb new production and balance the market. As recently as 2007, the U.S. was *importing* an average of 160 Mb/d of propane. By 2014, with the expansion of several dock facilities, the U.S. was *exporting* about 420 Mb/d, and over the past few months, export volumes have continued to increase, growing to almost 700 Mb/d by mid-2015. With such a large portion of U.S. propane

<sup>1</sup> The Propane Education and Research Council (PERC) is a unique organization, authorized by Congress in 1996 with the passage of the Propane Education and Research Act. PERC’s mission is to promote the safe and efficient use of propane, particularly the “odorized” variety used in residential, commercial, agricultural and transportation markets.

production being exported, international markets now have a much greater impact on domestic propane prices. When international demand triggers higher prices in global markets, more U.S. propane will move to those markets, pulling domestic prices upward. Conversely, lower international demand will put downward pressure on U.S. prices since the marginal U.S. propane barrel now moves to those markets. As in the U.S., international propane prices are influenced by weather, petrochemical demand and the relationship of propane prices to those of other fuels. Increasingly, domestic prices will be influenced by these factors in both the domestic and international arenas.

Even though domestic supply has increased dramatically, it is important to recognize that access to growing volumes of propane does not eliminate the potential for domestic supply problems and price volatility. During the Polar Vortex winter of 2013-14, a compounding series of events led to serious demand-related issues in the propane market. In 2013, increasing propane production and new propane export dock capacity combined to drive huge growth in propane exports, and that growth in exports drew down inventories during the summer. Then, in late fall, the propane market experienced an unusual increase in agricultural crop-drying demand, pulling Midwest inventories down further just before the winter heating season started. And finally, with propane supplies already depleted due to increased crop-drying demand, the northern sections of the U.S. experienced several consecutive months of unusually cold—or Polar Vortex--weather. Propane inventories in the Northeast and Midwest fell to critically low levels, customer deliveries were disrupted and prices spiked. On January 24, 2014, the OPIS propane price index at Conway, KS jumped to more than \$4.30/gal, roughly 10 times higher than where it stands in early October 2015 as this report goes to press.

While the market events of the Polar Vortex winter were severe, they were not without precedent; cold weather, heavy crop-drying use and other demand events are to be expected in the propane market. So a key issue for the propane industry is, ‘what should be done to prepare for the possibility for another “perfect storm” of demand events, and to minimize the potential for propane shortages and price spikes?’ To address this issue, three questions must be answered:

- What has changed in the propane market since the events of the Polar Vortex winter of 2013-14?
- Do those changes make the market more or less susceptible to disruption from such events?
- What actions can the propane industry take to reduce the impact of such events?

Answering these questions requires a thorough analysis of historical propane market data, and the use of that analysis and a wide range of other inputs to model future propane, supply, demand, logistics and pricing. The analysis needs to consider a sufficiently broad time period to be meaningful, and must reflect both geographic and seasonal trends to truly assess market dynamics. Toward that end, RBN developed a model of the monthly U.S. propane market at the PADD level, with PADD referring to the five Petroleum Administration for Defense Districts used by the Energy Information Administration (EIA) in collecting and analyzing liquid hydrocarbon production, consumption and other data. The model RBN built employs 120 months of data—back to 2005—to create a calibrated base case, and forecasts 120 months forward to 2025. Historical data for monthly supply, inventories and imports/exports is sourced primarily from EIA, while for demand RBN combined EIA numbers with data from the American Petroleum Institute (API) covering residential, commercial, industrial, agricultural, and motor fuel consumption of propane. Other inputs such as propane transportation flows and petrochemical demand came from a variety of sources. Meanwhile, future propane production from natural gas processing and refineries in the model is based on RBN production forecasts, which build total NGL production up from crude oil and natural gas projections.

RBN developed monthly supply/demand propane market models for two supply scenarios: “Growth” and “Contraction”, with the Growth Scenario reflecting how propane supply and demand would be affected if oil prices were to rise back to the \$90/bbl level over the next five years and the Contraction Scenario reflecting the effects of oil prices that continue at \$65/bbl or lower for the same time period. These two supply scenarios were then considered in conjunction with two RBN demand cases--Normal Weather and Severe Weather—to assess how the market would function under normal weather conditions and under stress-inducing weather like what occurred during the Polar Vortex winter. Figure 2 shows annual propane production and demand under the Growth Scenario/Normal Weather combination.

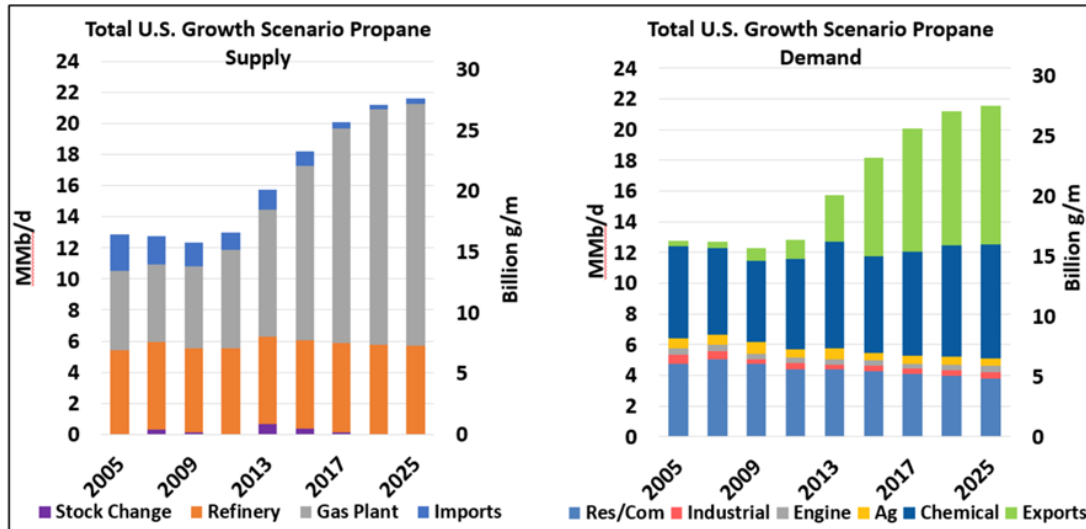


Figure 2 – Growth Scenario/Normal Weather Case; Source: RBN Energy

Because of the significance of very different supply/demand dynamics in each region of the U.S., this analysis was completed for each of the five PADD regions.

Demand in the Normal Weather case is based on weather-normalized demand and incremental petrochemical demand--mostly from PDH units. For the model’s Severe Weather case, RBN assumed a repeat of the 2013-14 Polar Vortex winter as it affected each of the five PADDs. In all cases, it was assumed that propane produced but not consumed in the U.S would be exported, constrained by export economics. PADD-level seasonal imbalances were resolved by a combination of inventory changes, inter-PADD transfers and imports/exports. The output is a month-by-month supply/demand balance at the PADD level, combined to the U.S. as a whole.

The model, its findings, and RBN’s resulting recommendations are discussed in this report. In essence, the news for the propane sector is good. Increased propane production close to primary demand areas, as well as a propane transportation network that is more interconnected and flexible, allows adjoining regions to help solve problems nearby. Consequently the U.S. propane industry is in much better position to handle a “Perfect Storm” of events than it was in the winter of 2013-14. Nevertheless, to the end-use customer, the only supply that matters is that which can be reliably and affordably delivered to their tank when and where they need it. So propane retailers must continue to diligently prepare for short-term market events that can disrupt the supply chain. Through careful planning, operational best practices and prudent contracting, the retail propane industry is in an excellent position to navigate the uncertain waters of today’s energy markets.

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