
Exports Balance Propane, but Demand Threatens Shipper Returns

Falling inventories push up prices to close export window.

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Data Sources for this Publication

- ▶ CME Group
- ▶ U.S. Energy Information Administration

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Domestic Production Boom Spurs Exports

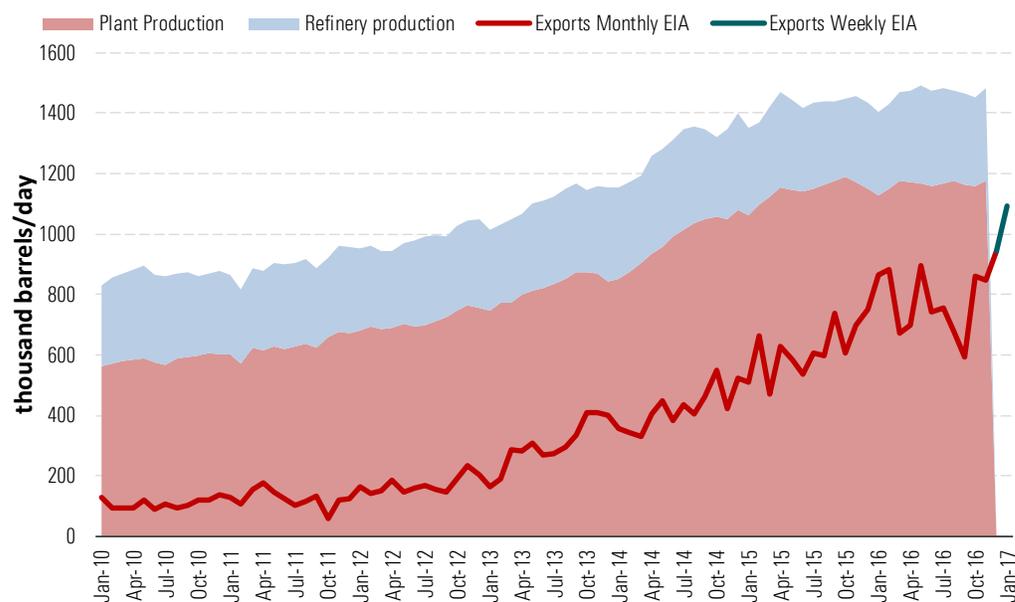
U.S. propane output from natural gas processing plants more than doubled between 2010 and 2015 as a result of the shale boom. With domestic demand effectively static, the surplus is largely destined for overseas markets, and exports have jumped fivefold over the same five-year period. However, export terminal capacity now looks overbuilt, and shipper commitments have bid up U.S. propane prices to uncompetitive levels—leading to cargo cancellations. With domestic demand for propane from petrochemical plants expected to increase in the next two years, the strain on export supplies will continue to affect terminal operators. This note reviews developments in the domestic and international propane markets.

Shale Bounty

Propane is one of five natural gas liquids along with ethane, normal butane, isobutane, and natural gasoline. Propane is produced either by fractionation of gas liquids suspended in natural gas at the wellhead, that are extracted by gas processing plants, or as a fraction of crude oil extracted by refinery distillation. In the past five years, expanded production of natural gas and crude during the shale boom resulted in surging output of natural gas liquids, or NGLs, at gas processing plants. Monthly U.S. Energy Information Administration data show production of propane at gas plants more than doubling from 564 thousand barrels per day, or mb/d, in January 2010 to peak at 1,190 mb/d in October 2015. Since then, production has leveled off—the latest value is 1,176 mb/d in November 2016. Over the same period, the volume of propane produced by refineries according to EIA, has remained level at about 300 mb/d (Exhibit 1).

Demand

Domestic demand for propane is primarily for residential and industrial heating and cooking, with consumption peaking during winter. Propane is also used in agriculture for crop drying, as an alternative engine fuel, and as a feedstock for petrochemical steam cracking. Domestic demand remained relatively static as supply expanded in recent years, leaving the export market as the primary destination for the surplus. Since 2010, EIA data shows exports of propane (and smaller quantities of its petrochemical derivative propylene—tallied together) jumped fivefold from an average 109 mb/d in 2010 to 616 mb/d in 2015 and (by combining monthly and weekly data) to an average 787 mb/d in 2016. The run-up in propane exports has accelerated in the past year, peaking during the third week of December 2016 at over 1.3 mmb/d and averaging over 1 mmb/d during January 2017.

Exhibit 1 U.S. Propane Production and Exports

Source: EIA, Morningstar

Overseas propane demand is driven in part by heating and cooking in countries such as Mexico (see our November note [Sailing Around the Wall](#)), but more significantly by the petrochemical industry in Asia. Propane is typically exported as liquefied petroleum gas, or LPG—a mixture made up mostly of propane with a smaller quantity of butane (about 5%). LPG exports are largely waterborne and typically transported in specialized vessels that use refrigeration to maintain cargoes in a liquid state, which allows a greater volume to be carried. The biggest very large gas carriers, or VLGCs, hold from 60,000-85,000 cubic meters (equivalent to 375,000-530,000 barrels). The June 2016 expansion of the Panama Canal now accommodates VLGCs, cutting the journey time from the Gulf Coast to Japan almost by half and reducing the cost of exports to Asia.

Terminal Build Out

The build-out of U.S. LPG export terminals began in 2013, with Enterprise Products Partners bringing its initial 115 mb/d Channelview terminal on line, close to Mont Belvieu, Texas, the major U.S. NGL fractionation, storage, and trading hub. We estimate that capacity at major LPG export terminals now exceeds 1.4 mmb/d. Exhibit 2 lists these facilities and their capacity. Most are on the Gulf Coast, with one terminal at Marcus Hook outside Philadelphia, Pennsylvania, that is fed with NGLs from the Marcellus and a small legacy terminal at Ferndale in Washington state that exports Canadian LPG. Not included in our list is the Buckeye/Trafigura Texas Processing Hub in Corpus Christi that has capacity to store over 1 million barrels of refrigerated LPG and marine dock capacity to ship 350 mb/d of refined product, but an unknown LPG export capacity. Volumes out of Corpus are still relatively minor, according

to the Port of Corpus Christi that reported total propane shipments from Corpus (including the Occidental Ingleside terminal) only averaged 12.5 mb/d between January and November 2016.

Exhibit 2 LPG Export Terminals

Owner	Facility	Location	Capacity mb/d
Enterprise	Channelview	Houston	660
Targa	Galena Park	Houston	230
Sunoco Logistics	Mariner South	Houston	200
P 66	Freeport	Freeport	150
Occidental	Ingleside	Corpus Christi	110
Sunoco Logistics	Marcus Hook	Philadelphia	50
Petrogas	Ferndale	Washington State	30
		Total	1780

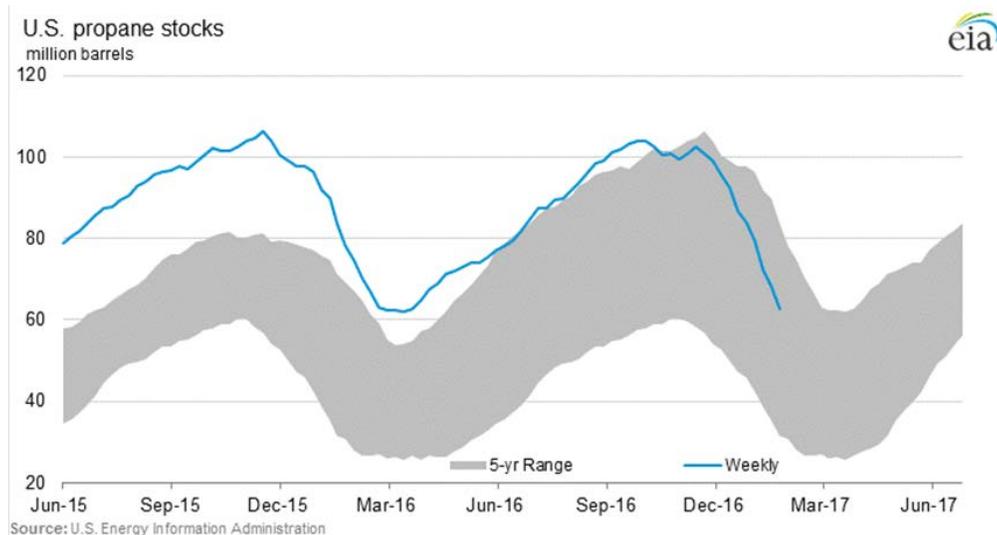
Source: Morningstar, Company Presentations

This dramatic build-out of export terminal capacity in response to higher propane production now looks to be overbuilt—and isn't done yet. During the second half of 2017, the Sunoco Logistics Marcus Hook terminal will expand to handle an additional 225 mb/d of LPGs to be shipped on the Mariner East 2 pipeline, currently under construction. Another terminal in Longview, Washington, owned by Waterside Energy, currently awaiting permitting, is designed to export up to 67 mb/d delivered by rail from Canada. The construction of these terminals was backed by long-term minimum volume commitments requiring payment of cancellation fees in the case shippers didn't use the facility. If export volumes are reduced for any reason, then shippers become liable to pay these fees, which could amount to millions of dollars. This already happened during the summer of 2016 when an LPG glut in Asia caused cancellations by at least five trading companies out of the Enterprise and Targa terminals during July.

Plunging Inventories

Current domestic and international propane market conditions suggest a new bout of cancellations is likely as U.S. propane prices increased early in 2017 in response to higher demand for exports, closing the arbitrage for shipments to Asia. As we mentioned, export volumes have been on a tear lately, and combined with higher seasonal domestic demand have caused a 46% fall in propane inventories during the past 10 weeks from 104 million barrels on Nov. 18, 2016 to 56 million barrels on Feb. 3, 2017 (Exhibit 3). The inventory slide pushed U.S. propane prices to their highest levels since October 2014 in early February 2017.

Exhibit 3 Propane Inventory



Source: EIA

Price Arbitrage

Two primary factors determine how competitive U.S. propane exports are in international markets. The first is the price difference between the U.S. Gulf (Mont Belvieu) and destination markets. This price difference should cover shippers' terminal throughput fees (estimated by RBN Energy at 8-10 cents/gallon) as well as freight charges that are currently 12 cents/gallon to Asia according to Platts. Exhibit 4 shows differentials between Mont Belvieu propane and the Argus Far East propane index converted to cents/gallon. The Arb averaged 50 cents during 2015—easily supporting profitable exports. However, during 2016, the average spread fell to just 18 cents/gallon, making exports only borderline profitable and causing cancellations in July and August when the Arb narrowed to 10 cents/gallon. A runup in the spread since last summer came to an end in December, falling to 12 cents/gallon in early February. At these spread levels, exporters are not making money and must consider the alternative of writing off their terminal costs with a cancellation.

Exhibit 4 Asia Propane Premium to U.S. Gulf



Source: CME Group

Steam Cracker Feedstock Options

The second factor influencing propane exports is relative price compared with petrochemical feedstock alternatives in the destination market. As we explained in a June 2016 note (see [Narrow Crude to Gas Ratio](#)) typical international petrochemical steam crackers use the petroleum refined product naphtha as a feedstock, but they can also process lighter liquids such as propane if the economics make sense. Cracker economics depend on the price of the main output, ethylene, but various byproducts such as propylene also make a difference. Naphtha produces more byproducts than propane, but if propane prices are low enough, then returns can be higher when using propane as feedstock. If cracker economics favor naphtha over propane (usually when the ratio of propane to naphtha price is above 90%) then demand for propane declines as chemical plants switch to naphtha. This is currently the case in Asia, a situation made worse by higher propane prices in the U.S. driven up by falling inventories.

Increasing Domestic Demand

During 2017, domestic demand for propane should receive a boost from a new Enterprise propane dehydrogenation, or PDH, plant expected on line in second-quarter 2017 that will consume 35 mb/d of propane. PDH plants produce the petrochemical building block propylene from propane. The Enterprise plant is the third U.S. PDH plant built since 2010 in expectation of growing demand for propylene. However, lower propylene prices led to half a dozen additional PDH plants being canceled or postponed with only one more plant still expected to be built, by Taiwan conglomerate Formosa Plastics at Point Comfort, Texas, that will not come on line until 2018 or 2019.

Perhaps more significantly, eight new petrochemical crackers will come on line along the U.S. Gulf Coast over the next two years that are primarily designed to use the lightest and most prolific NGL, ethane, as feedstock. However, at least one plant, owned by Dow Chemical will be able to switch to propane. A

number of existing crackers also have that flexibility. This raises the prospect of another increase in domestic propane demand. If U.S. ethane production is not sufficient to feed new cracker demand, then propane will be substituted where switching is possible— putting further pressure on propane supplies available for export and inevitably raising prices.

Outlook

In the short term, continued heavy propane inventory draws support for higher U.S. propane prices, but we expect a drop-off in exports because of the closed arbitrage window to Asia. Once inventory levels stop falling so rapidly, then propane prices will fall again to allow exports to balance the propane market. However, as we have noted, domestic demand for propane as a petrochemical feedstock is expected to increase in the next two years. With overbuilt export capacity keeping up demand from committed shippers, U.S. propane prices will be pushed higher— making exports uncompetitive again. This cycle of surplus demand will result in committed shippers paying additional terminal cancellation fees. Relief can only come in the form of an increase in gas liquids production from shale in response to higher prices, a mechanism that has a quite lagged response time. That delayed response may be too slow to save some terminal contract shippers that don't have deep pockets to cover their losses. ■■

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