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Harvey Postmortem: The Fate of Gulf Coast Refineries

Cluster of plants unlikely to depart hurricane alley.

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Data Sources for This Publication
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In the Path of Storms

More than 50% of the nation's refining capacity is in the Gulf Coast region dubbed by the Department of Energy as Petroleum Administration for Defense District 3 (9.7 million barrels/day out of a total 18.0 mmb/d capacity in the Lower 48). That total includes 49 refineries producing transportation fuels (gasoline, diesel, jet kero). Of those 49, no fewer than 37—with 8.7 mmb/d or 48% of capacity—are in the path of coastal storms. Hurricane Harvey knocked out more than 20% of U.S. refining capacity in two days, raising questions about how vulnerable the nation's transport fuel supply is to weather events. This note reviews Harvey's impact and considers the feasibility of dispersing the cluster of refineries in the Gulf Coast's hurricane alley.

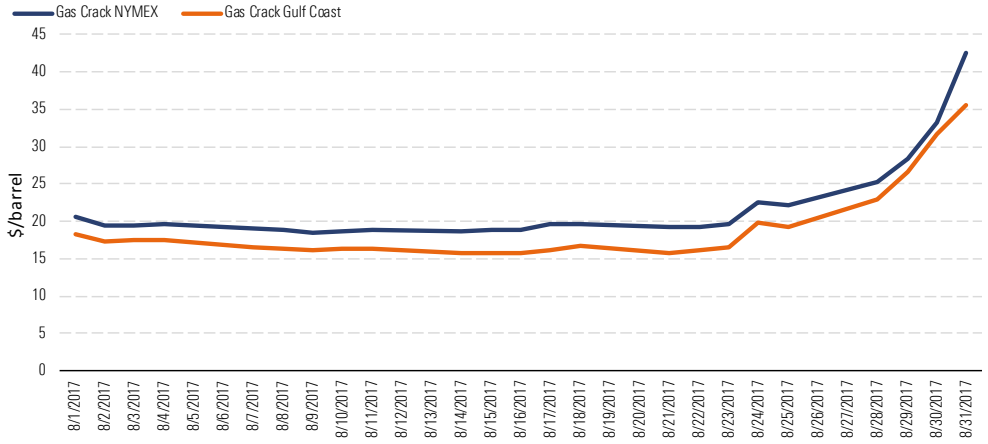
Running Out of Crude

As we discussed in a note last week (see Harvey Refinery Casualties Could Increase), aside from wind and flood damage from the storm, refineries were shut down or forced to reduce throughput because they were running out of crude. They could not source supplies because pipelines were out of operation and because Harvey shut down every port in Texas. In addition to refineries, the storm and its aftermath of flooding closed offshore Gulf of Mexico production and Eagle Ford South Texas shale wells. Many regional pipelines were shut by power outages and flooding, while others could not operate because refineries were not producing enough refined product to keep them full. Major pipelines out of the Permian Basin in West Texas that deliver crude to Houston and Corpus Christi and the 700 mb/d TransCanada Cushing Marketlink that runs south from Cushing, Oklahoma to Nederland, Texas were shut for operational reasons and will probably stay closed until restarted refineries need feedstock again.

Crack Spikes

The refinery and infrastructure disruption caused gasoline prices in Texas, on the East Coast and throughout the nation to rise sharply as refinery closures threatened looming shortages, while crude prices fell slightly in anticipation of lower demand. The result was a significant jump in gasoline cracks – the spread between gasoline and crude prices. The CME Nymex futures gas crack between New York Harbor gasoline and Cushing, Oklahoma, West Texas Intermediate crude for September delivery, increased more than $20per barrel from $22.46 per barrel on Aug. 24, 2017 (the day before the storm made landfall) to $42.65 per barrel on Aug. 31. Over the same period the Gulf Coast delivered gasoline premium to local light Louisiana sweet crude jumped $15.73 per barrel (Exhibit 1).

Exhibit 1 New York CME Futures and Gulf Coast Gasoline Cracks

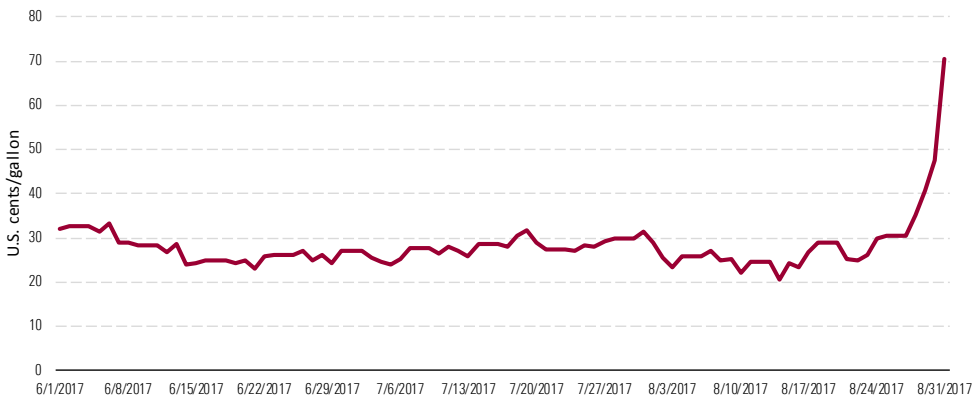


Source: Morningstar, CME Group

At the retail level, motorists in Texas and the rest of the country face higher gasoline prices at best and product shortages at worst as the impacts of shuttered refineries and a disabled distribution system work themselves out over the coming months. To help alleviate the gasoline shortage, the Department of Energy made severalemergency crude loans—totaling up to 4.5 million barrels—on Aug. 31, 2017 - from its strategic petroleum reserve in Louisiana, to help Phillips 66, Marathon and Valero continue operations at their Louisiana plants. The Environmental Protection Agency also issued waivers on fuel specifications to ease downstream blending requirements.

The impact of all this infrastructure damage and disruption at the Gulf Coast was seen not just in the PADD 3 region, but also elsewhere in the United States and internationally. As we detailed in our October 2016 Outlook on East Coast refining (see East Coast Refining: Winners and Losers After the Shale Boom) refiners in that region supply just 16% of local demand for gasoline and diesel, with an average 1.5 mmb/d of gasoline and 0.7 mmb/d of diesel being delivered by pipeline from the Gulf Coast and the rest via imports. Last week the Colonial pipeline, the main conduit delivering gasoline and diesel to East Coast markets, had to curtail deliveries because of lack of supply from Houston refineries. The resulting threat of shortage in East Coast markets and the higher New York gas cracks noted already opened a wide arbitrage opportunity for traders to book cargoes from Northwest Europe to the U.S. Atlantic Coast. The premium of New York gasoline to Northwest Europe increased by 37% to 41 cents per gallon from Aug. 24–31, 2017 and the demand for tankers pushed freight rates up 47% over the same period (Exhibit 2).

Exhibit 2 New York Gasoline Premium Over Northwest Europe



Source: TRRC, Morningstar

Suppliers on the U.S. Atlantic Coast, shopping for gasoline and diesel supplies in Europe to make up for Harvey-related shortages, found themselves competing with other international buyers trying to make up for Gulf Coast refinery outages. Most notably, those buyers included Mexican national oil company Pemex, which has relied on imports from the U.S. for an average 402 mb/d of gasoline and gasoline blending components as well as 224 mb/d of diesel during the first six months of 2017, according to the Energy Information Administration- the vast majority of those barrels coming from the Gulf Coast (see our November 2016 note Sailing Around the Wall? U.S. Refined Product Exports to Mexico). With 22% of U.S. refining capacity down, Pemex and other Latin American countries reliant on exports from Gulf Coast refineries have been scrambling to buy supplies from Canada and Europe, bidding up gas prices around the Atlantic Basin.

Refinery Concentration

Once the dust settles and Texas Gulf Coast residents begin the lengthy process of rebuilding and recovery, questions will be raised about why the U.S. refining and petroleum distribution system proved so vulnerable to a natural disaster like Harvey? The most obvious answer to that question is the concentration of refining capacity in one region – such that a single storm – albeit a mighty one – knocked out over 20% of refining capacity.

Different Environment

Historically the Gulf Coast refinery concentration developed in a very different oil supply and demand environment to today. These refineries are among the most sophisticated in the world and they were configured 15–20 years ago to process a slate of heavy sour crude. At that time, U.S. crude production was falling and the only signs of expansion were in the offshore Gulf of Mexico. International supplies of the lighter and sweeter crudes that can be processed by less sophisticated plants were becoming harder

to find and getting more expensive. Gulf Coast refiners invested in coking capacity to process heavy crude from Mexico and Venezuela that was expected to be less expensive and more plentiful than lighter crudes (see our August 2016 note Gulf Coast Refiners Enjoy Higher Margins From Processing Heavy Crude). A growing reliance on imports made coastal locations advantageous to refiners because of the ease of access to international supply, enhanced by developments such as the Louisiana Offshore Oil Port that allows ultra large crude carriers to unload directly to huge storage caverns in Louisiana that also stage offshore Gulf of Mexico production (see our April 2017 note Can LOOP Ever Be A Gulf Coast Cushing). Concentrated refining capacity on the Gulf Coast supplied refined products to downstream markets via long distance pipelines such as the Colonial system.

Changed Assumptions

Many of the crude supply assumptions behind today's Gulf Coast refinery setup have changed dramatically over the past seven years with the advent of shale oil. U.S. crude imports have declined, especially those lighter crudes that shale supplies largely light and sweet in quality can replace. U.S. refiners have invested in new or expanded capacity to process lighter crudes, particularly simple distillation units known as condensate splitters (see our June 2017 note Condensate Splitters Face Gulf Coast Headwinds). Surging domestic production of shale crude in North Dakota and Texas has led to significant replumbing of the domestic crude distribution system. These changes have largely been devoted to delivering supplies to the Gulf Coast. At the same time, as we explained in a July note (see Refiner's Slow Response To Shale Bounty), U.S. refining capacity has expanded by 8% and crude throughput has increased by more than 1 million barrels per day since 2010 while domestic demand for refined products has been fairly static, but healthy refining margins on the Gulf Coast have sustained a boom in exports. In other words, the Gulf Coast refining industry has increasingly become export focused, underlining the advantage of its coastal location.

Reasons to Stay Put

Relocation Costs

However, despite all the changes in crude supply and refined product demand, two compelling reasons dictate that Gulf Coast refineries will stay put and continue to face the risk of interruption by storms like Harvey. The first reason is the huge investment cost of building new refineries further afield in places like West Texas or North Dakota. Arguably such investments would make sense by taking advantage of abundant shale supplies to process oil closer to production and further away from the threat of storms. The reality is that the potential returns from relocating significant capacity to the shale fields do not justify the up-front cost. Although these refineries would be closer to feedstock supply, they would be further from domestic and international refined product demand. That means new pipeline infrastructure would be needed to deliver product. Limited attempts to pursue the logic of this investment agenda include the 20 mb/d Dakota Prairie refinery in North Dakota, completed in 2015, that lost money in its first year and was sold to Andeavor at a loss in 2016. In this case the benefits of cheap crude could not overcome the disadvantages of distance to market.

Peak Demand

The second compelling reason for refiners to stay put is the growing burden of environmental regulation. Building large-scale refineries anywhere—especially near big populations—is a permitting nightmare. At the same time, closing an existing "legacy" refinery invokes huge cleanup liabilities. As if these restrictions weren't enough, the refining industry faces possibly its biggest challenge in the next 30 years: the prospect of "peak demand." That means demand for transport fuels could decline precipitously in the face of renewable alternatives such as electric vehicles. Many oil companies argue vocally that this is just scare talk and that demand for petroleum fuels will be around for a long time. But when it comes to making billion-dollar investments in new refineries in the U.S. that can only be justified by a 30–50-year plant life, the peak demand argument cannot help but make a dent in the business case.

Lessons Learned

In the aftermath of Harvey, as officials review the lessons learned, the prospect of relocating refineries to disperse the Gulf Coast concentration is almost certainly a nonstarter. U.S. refiners have grown accustomed to a great deal of regulation over the past 40 years as well as to having their livelihood threatened by alternatives eroding their market share. As a result, they are unlikely to find massive new investment an attractive response to the worst storm in Texas' history.

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