Hurricane Harvey Overview

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**** Client Note**** The next issue of the Hurricane Harvey Overview will be released on Tuesday, the 19th of September, 2017.

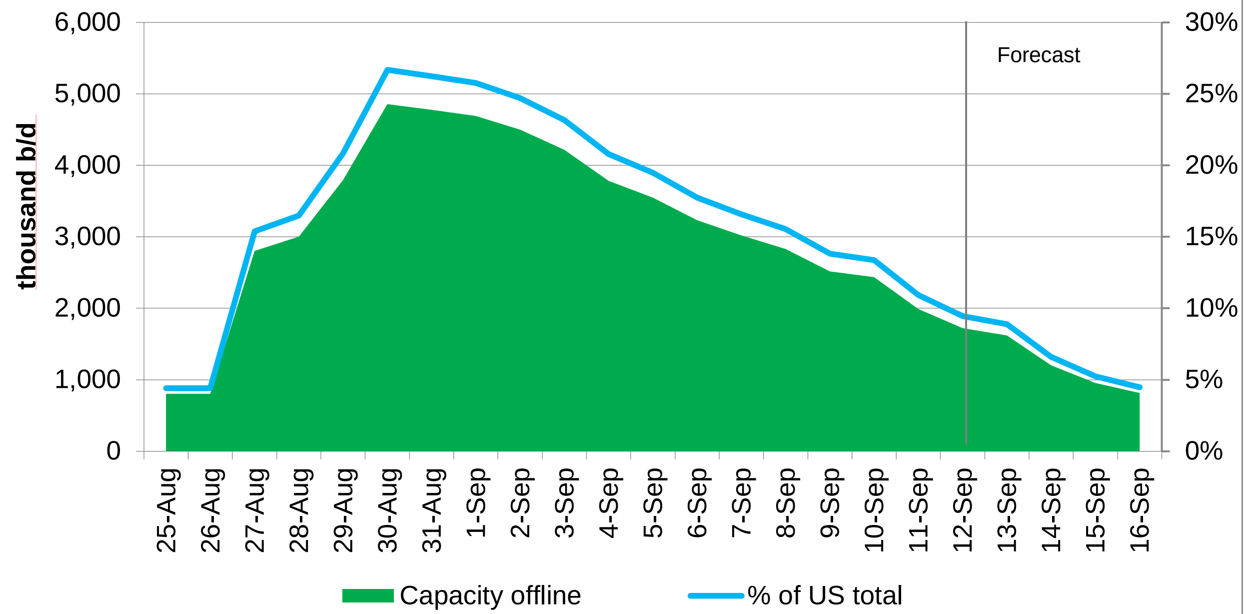
Key themes for the effects of Hurricane Harvey are: “lingering system disruptions” with refineries as well as chemical assets slowly returning to pre-event operating rates; “unintended/ unexpected consequences in the supply chain” such as WTI-Brent spreads increasing, ground logistics systems overloaded due to direct storm recovery as well as USGC asset recovery operations, low availability of key co-products ranging from ethanol to alpha-olefins; and finally, “unexpected inventory builds in portions of the supply chain” ranging from crude inventory build to potential shortages in upstream chemical products such as propylene and ethylene.

Executive Summary

		Product Expert Contributors
Refining	IHS Markit estimates that 13 of the 20 affected refineries are at or near normal operating rates. Five of the other seven are actively in the process of restarting or ramping up runs. However, the amount of capacity offline is still significant. Including the impact of refineries that are partially operational, IHS Markit estimates that around 1.7 million b/d of distillation capacity (9% of US total) is offline as of September 12. For this reason, gasoline prices have been relatively slow to decline. However, gasoline prices may decline sharply in the coming week due to the arrival of European product cargoes and Hurricane Irma affecting demand.	Rob Smith
U.S. Fuels Markets	Crude oil did not receive much of a collateral surge from the spike in refined product prices. This week’s EIA report may feature one of the largest inventory increases in recent memory, and next week could provide more of the same. Many tankers of crude were slow steaming or moored in the Gulf of Mexico and only in September have they been able to reach their U.S. port destinations.	Tom Kloza
Logistics	Major Gulf coast ports have all re-opened although on an individual basis there may be Coast Guard mandated restrictions that are still being enforced especially regarding vessel draft as debris empties into Gulf Coast ports and also navigation/ travel restrictions as water runoff causes unforeseen currents. The three major Class I railroads in the area – Union Pacific Railroad, BNSF Railway and Kansas City Southern Railway -- have effectively restored service on their networks, but delays linger. Freight demand is returning to Houston, as immediate emergency relief gives way to longer-term rebuilding needs.	Bill Cassidy and Paul Tossetti
Crude	A persistently wide Brent-WTI price spread is the most telling signal that US crude oil markets are in surplus with a still-significant chunk of Gulf Coast refining capacity offline and crude exports temporarily minimized in the wake of Hurricane Harvey. US crude oil production is still expected to surpass its previous 2015 monthly average peak by the end of the year despite the temporary dip caused by the storm.	Aaron Brady
NGLs	The US Energy Information Administration (EIA) published the first weekly propane/propylene inventory post Hurricane Harvey which showed a sharp increase in inventory due to curtailed exports and chemical demand as a result of the storm. The increase was substantially higher than market expectations prior to the storm published by IHS subsidiary OPIS. This led to some immediate weakening of propane prices following the release of the data and a higher differential to other global propane market prices. Compared to previous hurricanes, Harvey was the first which hit the US Gulf Coast after its transformation to being the largest source of waterborne exports due to the shale boom. Thus, it was the first hurricane which effected global LPG prices.	Debnil Chowdhury
Chemicals	Base Chemical assets are slowly recovering from Hurricane Harvey. Estimates for ethylene and propylene operating rates are near 50 percent of pre-hurricane rates. While direct feedstock costs have not changed dramatically; indirect costs, while transient, are expected to be very high. For Polyolefin plastics, operating rates are reduced with polyethylene rates more restricted than polypropylene. Availability of alpha-olefins for LLDPE and HDPE co-monomers may be a concern for some producers. For aromatics, octane values are well above pre-event levels, increasing the cost structure for BTX. Downstream aromatics derivatives such as phenol and acetone continue with limited supply. Distribution bottlenecks in rail and trucking will continue to exhibit longer lead times at higher costs due to system recovery still underway as well as competitive demand for logistics assets to provide supplies to hurricane damaged locations.	Dewey Johnson

Refining

Gulf Coast refining capacity offline



Source: IHS Markit

The Gulf Coast refining industry is slowly returning to service. IHS Markit estimates that 13 of the 20 affected refineries are at or near normal operating rates. Five of the other seven are actively in the process of restarting or ramping up runs. However, the amount of capacity offline is still significant. Including the impact of refineries that are partially operational, IHS Markit estimates that around 1.7 million b/d of distillation capacity (9% of US total) is offline as of September 12. This is down from around 4.8 million b/d (27% of US total) at the peak of the flooding.

At this point, it is difficult to predict how quickly the remaining offline capacity returns to service. The refineries that are offline or in the process of restarting are all large and relatively complex. Under ideal circumstances, it can take upwards of a week to resume normal operations at such facilities, and some appear to have suffered flood damage.

Because of the amount of refining capacity that remains offline (and perhaps Irma-related market jitters), gasoline prices have been slow to decline. It has now been nearly two weeks since the peak of Gulf Coast flooding and the NYMEX RBOB spot price remains about 20% above its pre-Harvey levels. In contrast, prices had largely returned to normal by this point after Katrina. Looking forward, gasoline prices may decline sharply in the coming week due to the arrival of European product cargoes and Hurricane Irma affecting demand.

U.S. Fuels Markets

Without another hurricane threat to U.S. refining, we are now past peak with U.S. gasoline prices. The largest declines are likely to come in the states that saw the greatest late August/early September spikes. East of the Mississippi markets look to see drops of perhaps 5-10cts gal per week. The declines are probably set to begin in earnest with the first day of autumn.

Sub-$50 bbl crude oil prices would under ordinary circumstances equate to street prices in the $2.25 gal neighborhood or lower. Gasoline fetches much more than crude at the moment on worries that at least 1-million b/d of Gulf Coast refining may be down (post-Harvey) until October.

In August, we saw at least one week where gasoline demand was measured at more than 9.8-million barrels per day. Don't be surprised to see one of the upcoming September weeks with demand about 1-million b/d lower. Part of this is post-Hurricane demand destruction, but part of it is the lumpiness that tends to lift driving season demand and depress demand during normal weeks (particularly with shopping migrating more to online purchases).

Florida terminals are being resupplied as we speak. Marathon's facilities appear to be open throughout the state and that company has the most extensive network of logistics in the Sunshine state. Cargoes from Europe took alternate routes to the East Coast but should soon arrive and Louisiana-sourced material delayed for 5-7 days is en route to Florida. The problem may come via lack of ethanol - - -at least two unit trains did not make the usual trip from Midwest to Florida locations.

The list of refiners deferring turnarounds from autumn 2017 to winter/spring 2018 continues to grow. XOM in Joliet and Billings has already made such a move, and Citgo will defer Lemont work until 2018 as well. HollyFrontier is deferring work at its El Dorado, Kansas facility and there are reports that Marathon will put off maintenance at Robinson, Illinois.

Logistics

Status of Gulf marine ports

Major Gulf coast ports have all re-opened although on an individual basis there may be Coast Guard mandated restrictions that are still being enforced especially regarding vessel draft as debris empties into Gulf Coast ports and also navigation/ travel restrictions as water runoff causes unforeseen currents.

Status of rail/truck

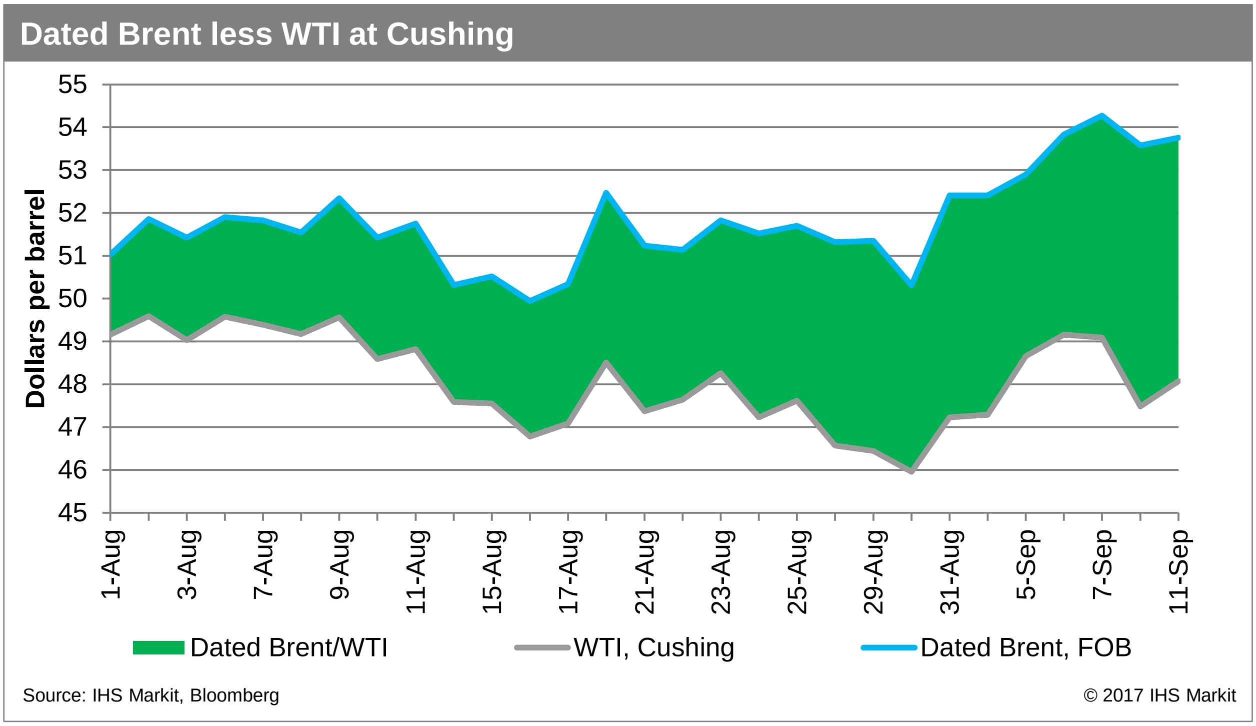
Rail: The three major Class I railroads in the area – Union Pacific Railroad, BNSF Railway and Kansas City Southern Railway -- have effectively restored service on their networks, but delays linger. By Sept. 9, Union Pacific Railroad had reduced the number of miles out of service from 1,750 at the peak of disruption to 50 miles. KCS and BNSF said their Houston area subdivisions were all operational. However, service delays are expected thanks to a backlog of freight and reduced train speed limits due to repair work. UP put an additional 145 locomotives in service to handle the surge in traffic and plans to add 65 more.

Why will service delays take so long to resolve? "As we inspect areas of track, we learn of additional repairs required," UP said. "Reroutes create crew shortages and disrupt car flows. Many customers facilities remain closed. We are also diligently working through the backlog of trains and car inventories." Those factors will push up costs for the railroads and, undoubtedly for their customers, possibly for several months. Harvey is expected to have a "long tail," one analyst said.

Trucking: Freight demand is returning to Houston, as immediate emergency relief gives way to longer-term rebuilding needs. That's putting more pressure on already rising truck rates. The impact is being felt nationwide. For the week ending Sept. 2, the US average dry van spot market rate posted by DAT Solutions, a load board operator, rose 12 cents to $1.90 a mile. In Dallas, outbound spot truck rates rose 26 cents per mile. On the Dallas-to-Houston lane, however, spot rates were jolted upward by $1.60 per mile. An increase in dry van rates, as well as flatbed and refrigerated pricing, will have a knock-on effect on liquid bulk truck rates.

Higher transportation costs are in the forecast for any chemical or refined product companies utilizing truck as well as rail transport for several months.

Crude



A persistently wide Brent-WTI price spread is the most telling signal that US crude oil markets need more time to return to normal in the wake of Hurricane Harvey. The price differential, about $3 per barrel before the storm, is now over $6, a sign that US crude oil supplies are increasing surplus relative to the international market. That surplus has emerged as a still significant chunk of Gulf Coast refining capacity remains offline (although most facilities are recovering). This has temporarily reduced US domestic crude processing. At the same time, port and pipeline closures earlier this month has caused a disruption in US crude oil exports, which dipped to just 150,000 b/d the week ending September 1st (they had been averaging about 900,000 b/d year-to-date).

Last week's EIA report showed a 4.6 million barrel increase in US crude oil stocks, and there are expectations for perhaps an even bigger build in this week's report. Refinery crude runs, although recovering, are still nowhere near the pre-Harvey level; meanwhile, a surge of imported crude into re-opened Gulf Coast ports is now likely, as cargoes delayed by the storm begin unloading. A resumption of US crude exports should temper the oversupply situation, but it will likely take some time to ramp volumes back up despite favorable arbitrage economics.

Hurricane Irma appears to have had negligible impact on US crude oil production, although a handful of platforms evacuated personnel in advance of the storm. As Gulf of Mexico and onshore production returns to normal, we expect US overall crude output to surpass its previous 2015 monthly average peak by the end of the year.

Critical crude oil terminals in the Caribbean also shut-down as Irma approached, although they are now re-opening. NuStar Energy’s 13 million barrel crude and fuel storage terminal in St Eustacius (Dutch Antilles) was reportedly damaged, although the extent was unknown.

NGLs

The US Energy Information Administration (EIA) published the first weekly propane/propylene inventory post Hurricane Harvey which showed a sharp increase in inventory due to curtailed exports and chemical demand as a result of the storm. U.S. propane and propylene supplies built by 6.3 million barrels over the week ended September 1, according to EIA's Weekly Petroleum Status Report, released at 11:00 ET Thursday morning. The build, measured over the course of a reporting week during which Hurricane Harvey decimated large swaths of the U.S. Gulf Coast, far surpassed the average 3.5 million bbl projected by respondents polled in OPIS' survey yesterday and even bested a 4-5 million bbl guess, the highest prediction among them. Total inventories now stand at 79.9 million bbl, still some 19.4% below their total from the same week last year. Regionally, Gulf Coast (PADD 3) stocks built 4.5 million bbl, Midwest (PADD 2) stocks 1.4 million bbl, East Coast (PADD 1) stocks 300,000 bbl and stocks in PADDs 4 and 5 200,000 bbl.

Compared to previous hurricanes, Harvey was the first which hit the US Gulf Coast after its transformation to being an insignificant exporter in the global market to the largest source of waterborne exports. The US is now responsible for 33% of global waterborne NGL exports and is a major source for Asian residential, commercial, and chemical demand. Thus, it was the first hurricane which effected global LPG prices with the differential between Mont Belvieu and Japanese propane increasing from $65/ton prior to the storm to $90/ton after.

Chemicals

Ethylene

The percentage of total US ethylene production offline currently sits at about 10% and total US ethylene consumption capacity in a similar range, with 3 or 4 crackers still idled and at different stages of the start up process, all others are at different points the ramp up to full rates stage.   The new ethylene units that were slated to come online over the next 6 months are expected to be delayed by a minimum of 30 days; IHS Markit is still evaluating the timing of new units. Texas as a whole has more ethylene capacity compared to derivative capacity, which put relatively more ethylene production at risk compared to derivative capacity. Given that more ethylene production was affected versus derivative consumption, the ethylene market may see a temporary tightening of supply and hence higher prices that approach affordability levels. A large capacity unit for alpha olefins is still down which could impact many players ability to produce co-monomer PE.   A deeper dive into start up and ramp up timing for the ethylene chain would indicate a pull of ethylene inventory from the high Q2 reported levels, but the actual amount of pull is a difficult call, ranging anywhere from 100-250 MM# at this point of forecasting the ramp ups. What is known is Asian and European markets are signaling towards higher prices in the last few days anxious about the supply gap created by the storm.

Propylene

The amount of confirmed propylene production assets offline sharply dropped to 13% of the PGP/CGP with RGP supply offline also lower at 7%. However, there is a significant amount of assets either in restarting activities or reduced rates is near 60%. What is not known is the amount of viable on-spec production rates at each of these assets. The offline assets include CP Chem Cedar Bayou, Equistar LaPorte, Shell Deer Park, and ExxonMobil Beaumont. Of these, CP Chem Cedar Bayou seems to have suffered significant damage due to excessive flooding and may be down significantly longer. RGP production is also returning with refineries in restarting activities and ramping up. Downstream splitters at Enterprise are at full capability but starved for RGP feedstock due to refineries restarts and lower crude runs at refining assets.

Consumers of propylene (derivatives) have observed a stronger rate of recovery and now seem to be limited by propylene supply. Multiple producers are either on force majeure or asking customer base for voluntary allocation. The propylene market forward remains difficult to predict since both producers and consumers are down; however, price pressure will be sharply upward from pre-storm levels based on stronger derivative capability against limited supply as well as higher propane costs. A study of previous storms indicates the level of storm "premium" peaks at the second month, in this case – October. This premium, based on history, lasts for 3-4 months. Both the European and Asian markets have seen some increase in pricing since pre-storm timing.

Polyethylene

US PE producers continue to make progress relative to restarting operations that had been impacted by Hurricane Harvey. IHS Markit estimates suggest that approximately 24% of US PE production capacity remains offline as of today while another 30% of US capacity is operating at reduced rates. Alpha olefin supply constraints are also believed to be constraining operating rates as the site associated with approximately half of the US linear alpha olefin production capacity was significantly impaired by the Hurricane and could be offline for several weeks.

PE producers are unusually misaligned with regard to their respective price increase announcements with effective dates ranging from September 1 to October 1. The referenced misalignment may result in a delay in the application of any of the announced price increases until October 1.

Polypropylene

While not all plants are at yet at full rates at this time due mostly to propylene monomer constraints, we estimate that 98% of North American nameplate capacity is now online. Rail cars are shipping out of the gulf coast but there continue to be supply issues in specific cases where applications require specified grades. On the worse case side, we have seen reports of allocation levels for impact copolymer of 50% through the fourth quarter. However, most buyers are getting at least 70% and higher allocations for September and October. The market is heavily focused on supply over price this month and we are seeing a wide range of price premiums for September product. Contract market expectations are hovering around a substantial price increase in September between a combination of propylene monomer and margin implementation by PP producers.

Benzene

Most refineries are in the restart process with each refinery progressing at a different pace depending on the extent of damages suffered during the storm. The restart process can normally take up to two weeks to complete with each unit needing to be assessed. The Corpus Christi area refineries had about a one week head start and should be expected to return to normal operations before the Houston and Port Arthur area refineries. The Galveston/Texas City refineries never shutdown and were the first to be back to normal operations. A number of FM announcements were issued but only one had an allocation which was announced to be 40 percent. However, benzene derivative operations have also been hit hard with the smaller derivatives, cumene and cyclohexane, taking the brunt of the impact. Hurricane Harvey caused the spot benzene price to spike by about $0.12 per gallon to near $2.80 per gallon, but it has since softened to under $2.70 per gallon. The price spike during Hurricane Harvey, so far, has been less than seen during previous hurricanes to hit the Gulf Coast region.

Chlor Alkali/Vinyls

As the Houston area continues to recover from the storm, Covestro at Baytown is still under force majeure for caustic soda and HCl. While the company is making progress getting some of their units back online and working through personnel, raw material, and logistics issues, there are still a few matters that need to be resolved. Operations at OxyChem are improving and they expect limited impact from the rail industry embargoes. These embargoes that were once in place for the rail industry in and around Houston have since been lifted, but rail shipments will be challenging due to the rail congestion that may incur as a result of alternative routes. As of today, all PVC producers have announced a 5 cpp price increase. OxyVinyls VCM operations in LaPorte, Texas are back online, while operations in Ingleside, Texas and Deer Park, Texas are ramping up and expected to restart within the next week, fueling expectations of a strong September close.

Methanol

Operations are getting back on track with units restarting both up and downstream. Logistics have improved in the ports but remain limited by rail and truck. Spot market activity has waned after a small rush over the last couple of weeks. Prices have plateaued.

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