

US HYDROCARBON EXPORT UPDATE

PREVIEW | FundamentalEdge Report | November 2019



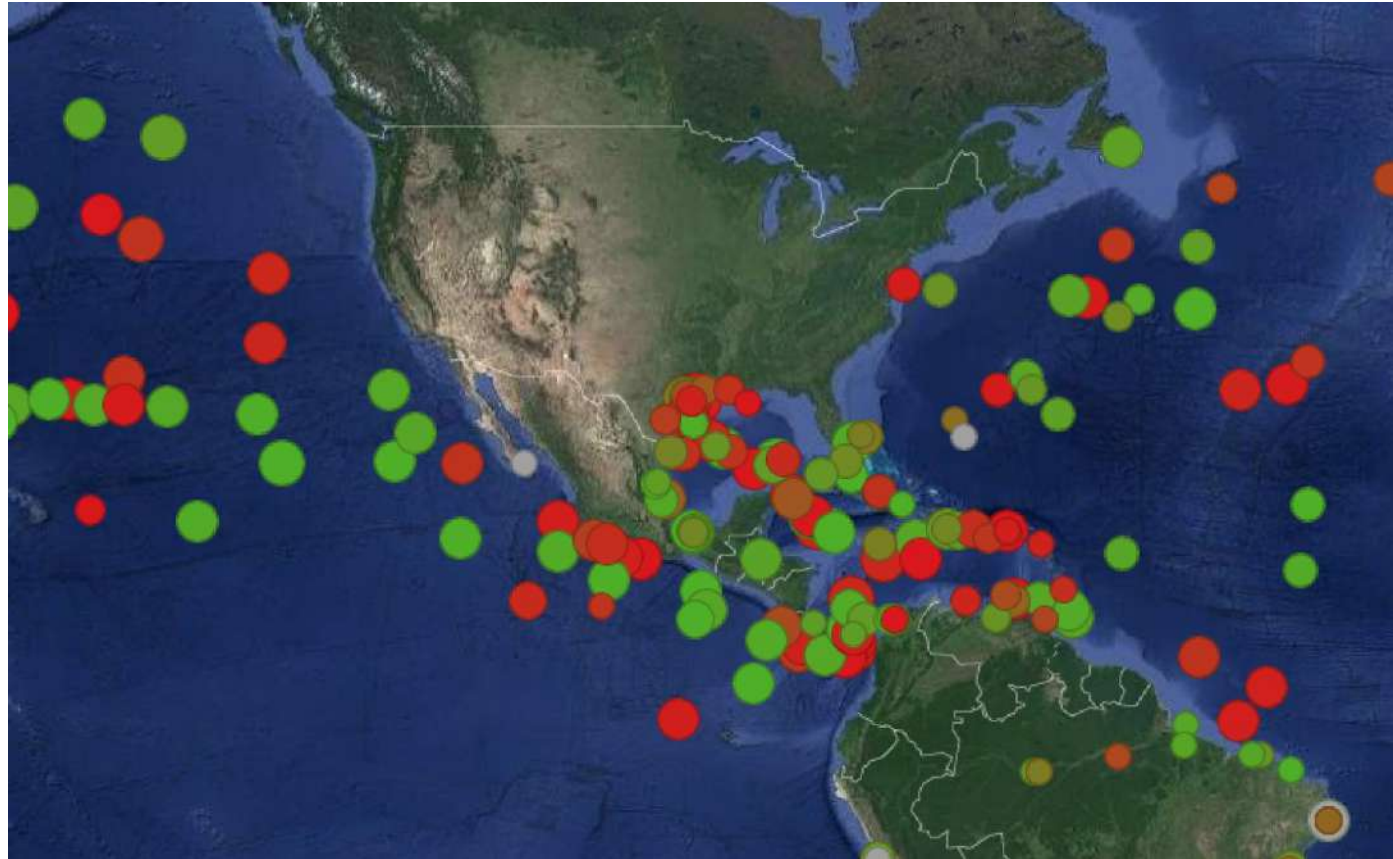
Introduction and Key Takeaways

- This month's update of the *FundamentalEdge* report series leverages recent work by the Strategy & Analytics Group to track the movement of tankers globally using AIS data and provides an updated view of US hydrocarbon export activity.
- Driven by horizontal drilling and hydraulic fracturing, US hydrocarbon production has surged. Exports have become the key mechanism for clearing the US market. Investments in pipeline capacity and export infrastructure have recently begun to come online, leading to increased export flow.
- Exports of **liquefied natural gas** (LNG) totaled more than 5.0 Bcf/d in August according to the DOE. Cheniere's Sabine Pass terminal exported 54% of the total, followed by the company's Corpus Christi terminal exporting 23%. Dominion's Cove Point at 15% and Cameron LNG at 8% make up the balance. Enverus estimates that through the first 18 days of October, LNG exports were roughly 4.1 Bcf/d, with Freeport LNG coming online but maintenance limiting exports from Cove Point. Elba Island appears to have received a cooldown cargo but had not started exports as of yet.
- On the **NGL** side, exports of propane and butane (LPG) totaled nearly 1.2 million barrels per day in August according to data from the US Census Bureau. Of that, 1.15 million barrels per day were exported from the following four customs districts: Houston, Philadelphia, Port Arthur, and Seattle. The majority of exports (71%) were loaded from the Houston customs district, which includes Freeport and Corpus Christi. After Houston, 11% shipped from Philadelphia, 10% shipped from Port Arthur, and 4% from Seattle. Enverus estimates that through the first 18 days of October, exports from these four districts rose to nearly 1.4 million barrels per day, driven by Enterprise bringing online an expansion project at their Houston Ship Channel terminal.
- US exports of **crude oil** reached 2.7 million barrels a day in August according to the US Census Bureau. Ninety-four percent of those barrels (virtually all those exported over the water) were exported from the customs districts of Houston, Port Arthur, New Orleans, and Anchorage. Houston includes Freeport and Corpus Christi. Enverus estimates that exports from Corpus have grown by over 500K bbls/d from that point into mid-October. This has been driven by the startup of the EPIC & Cactus II pipelines.

Export Tracking: Leveraging AIS Data

- In 2000, the International Maritime Organization mandated universal automatic identification system use on all tankers, passenger vessels of 150 gross tonnage or greater, and other ships of 300 gross tonnage or greater (500 gross tonnage or greater in domestic voyages).
- A vessel's automatic identification system (AIS) transponder transmits information describing the vessel; movement details such as location, speed and heading; and voyage-specific information such as the vessel's draft, destination, and ETA.
- These transmissions were limited by the fact that terrestrial receivers are capable of only receiving the data from vessels within a 40 nautical mile radius of their location. Over time, satellite solutions have become available that capture this data globally.
- AIS data provides tremendous insight into the movement of tankers and other vessels on a global basis.
- Enverus is mapping the movements captured by AIS to nearly 2,000 docks in more than 700 terminals on an ever-growing list.

Illustrating LPG Tanker Location Using AIS Data



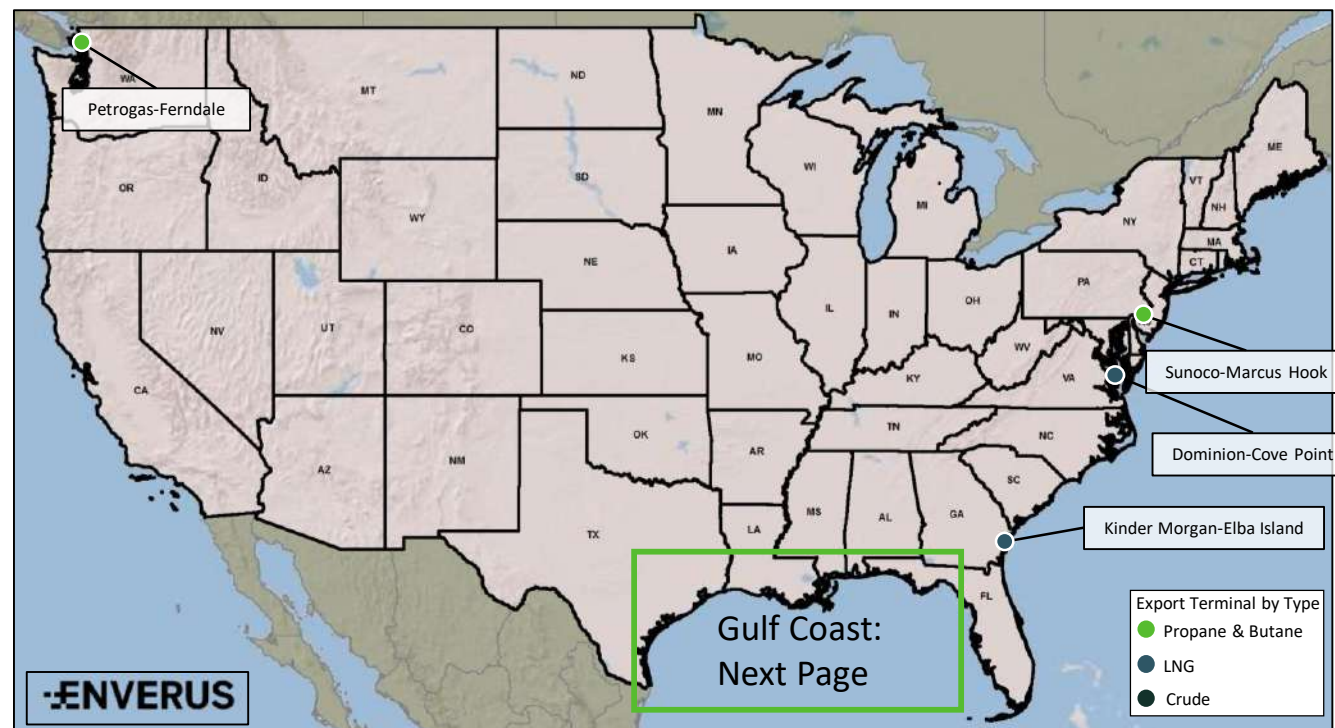
Source: VesselTracker, Enverus

Export Tracking: Key US Terminals (excl-Gulf Coast)



- The majority of export infrastructure is on the US Gulf Coast. This is where much of the investment in infrastructure is taking place.
- Outside of the Gulf Coast, there are several facilities exporting US LNG, NGLs, and crude.
- On the West Coast, the Petrogas Ferndale terminal is located in the Seattle customs district. This facility exports propane and butane predominantly to Asian markets.
- On the East Coast, Sunoco's Marcus Hook terminal exports propane, butane, and ethane from the Marcellus and Utica shale.
- Further south, Dominion's Cove Point terminal exports natural gas sourced from the Marcellus and Utica.
- Kinder Morgan's Elba Island facility is a smaller-scale LNG liquefaction plant located near Savannah.
- Not pictured is the Alyeska Terminal in Valdez, Alaska. The majority of vessels at this terminal load Alaskan North Slope crude for transport to West Coast refiners. Exports of the grade have been increasing.

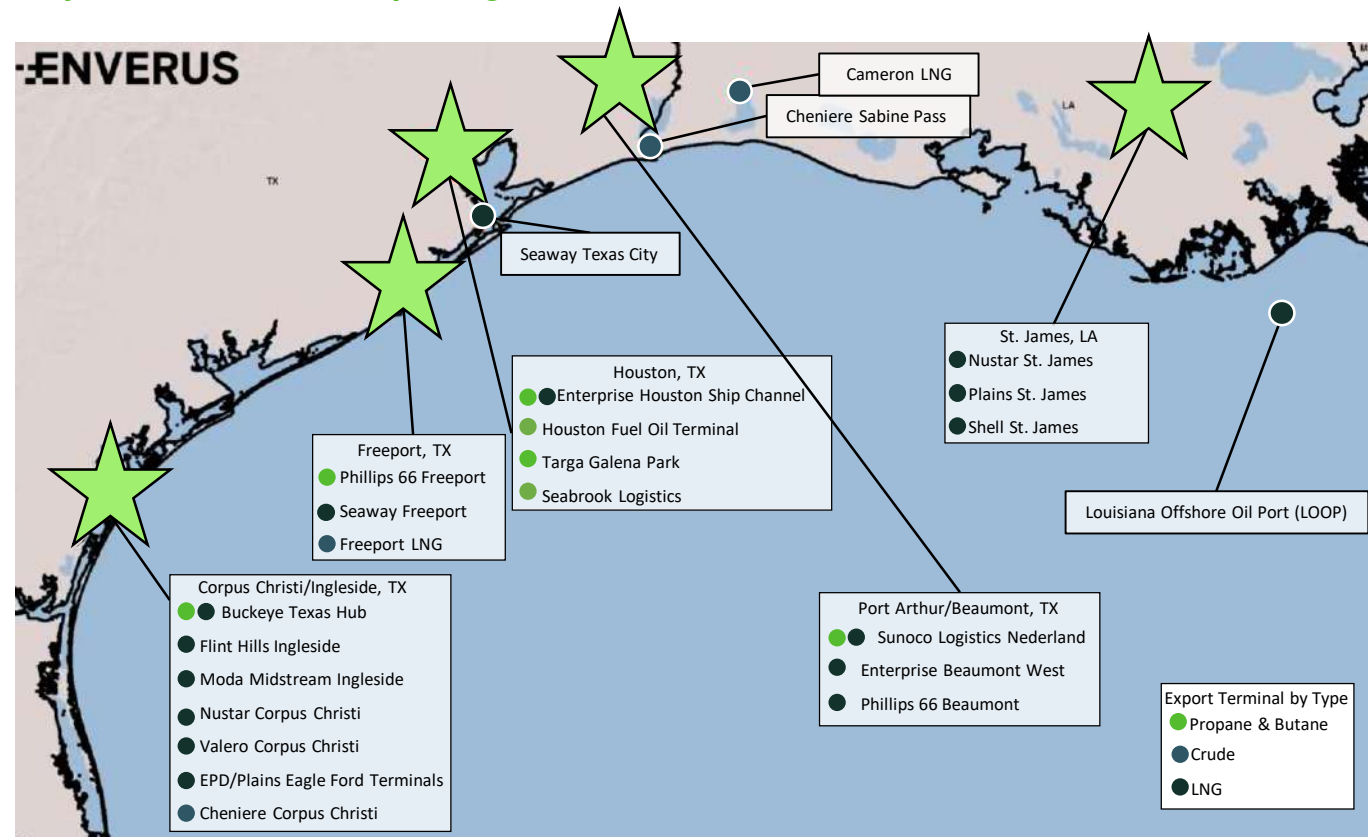
Key US Terminals for Exporting LNG, NGLs, and Crude



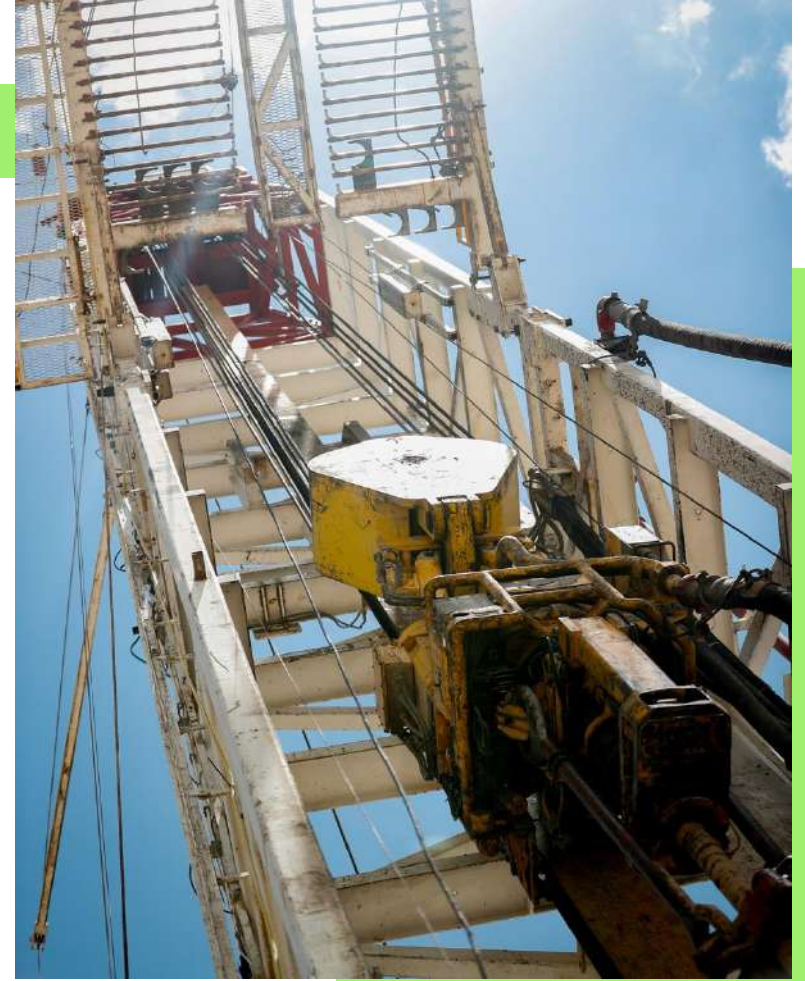
Export Tracking: Key US Terminals (Gulf Coast)

- The Gulf Coast is home to the bulk of US hydrocarbon exports including LNG, NGLs, and crude.
- The most active terminal for exporting both crude and NGLs is the Enterprise products terminal on the Houston Ship Channel.
- The Cheniere Sabine Pass LNG terminal is the oldest and largest LNG export terminal in the US.
- Only the Louisiana Offshore Oil Port is capable of fully loading a VLCC (2 million barrels of crude capacity). The Moda Midstream terminal (formerly owned by Oxy) is capable of partially loading a VLCC, as is the Seaway Texas City terminal.
- In order to fully load VLCC's or even Suezmax tankers, smaller vessels in the Aframax class perform ship-to-ship transfers off the coast.
- Enverus's August edition of the Fundamental Edge report covered the outlook for export terminals along the Gulf Coast. Several of these are being planned offshore and able to fully load VLCCs.

Key US Terminals for Exporting LNG, NGLs, and Crude



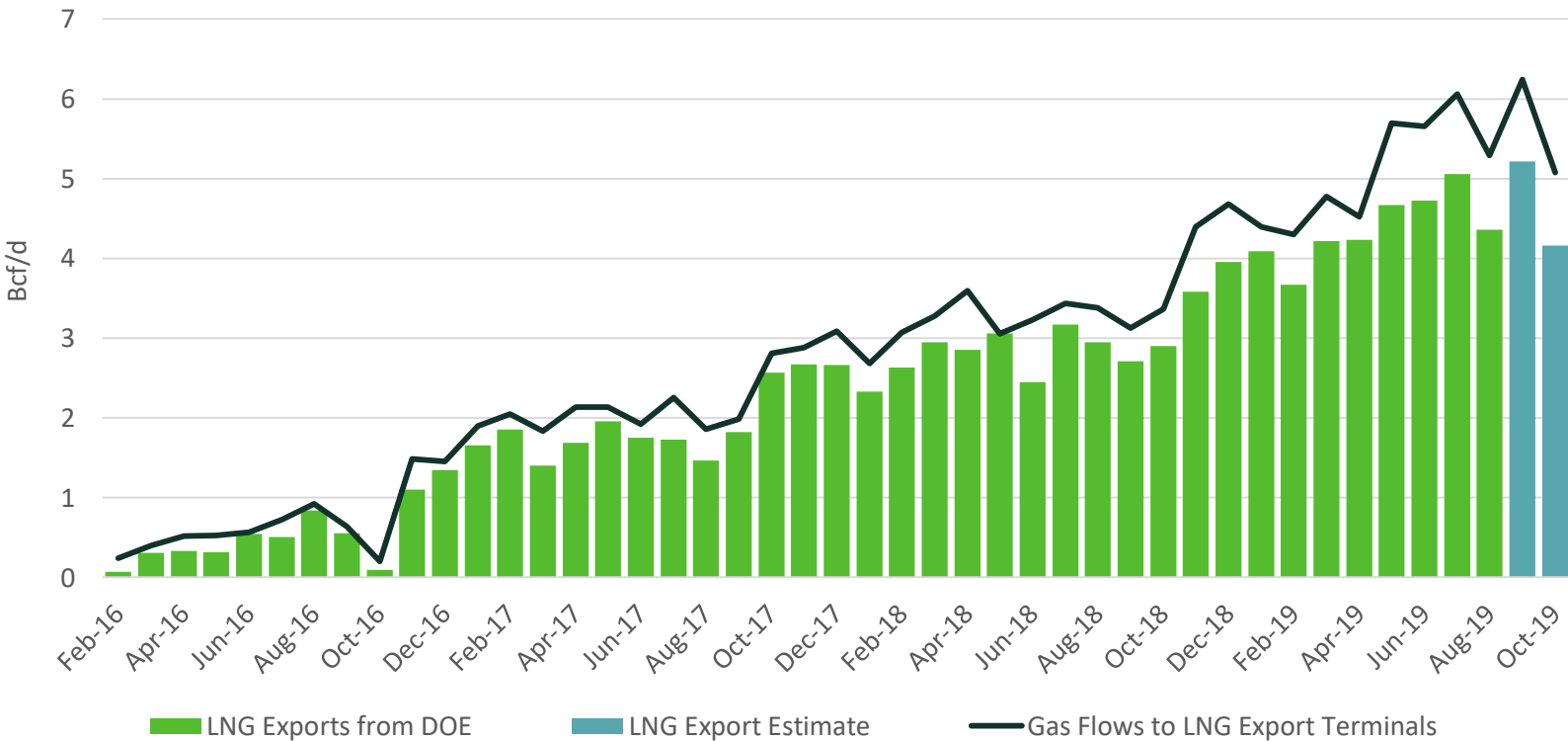
LNG Exports



US LNG Exports: Overall

- Exports of liquefied natural gas from US terminals hit a record in July 2019, based on data from the US Department of Energy.
- Enverus tracks both gas nominations into US export terminals and vessel movements out of those terminals. Estimates for gas flows into LNG export terminals are roughly 15% higher than estimated export volumes captured by tracking vessels. This results from gas use by the LNG liquefaction process.
- Our tracking data suggests that exports set a new record in September 2019. This was driven by higher exports from Cheniere's Corpus Christi terminal and the Elba Island terminal being brought online.

US Gas Flows to Export Terminals and LNG Exports

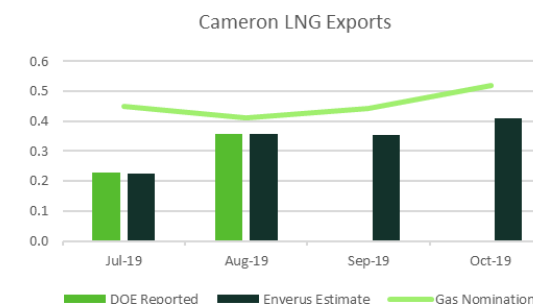
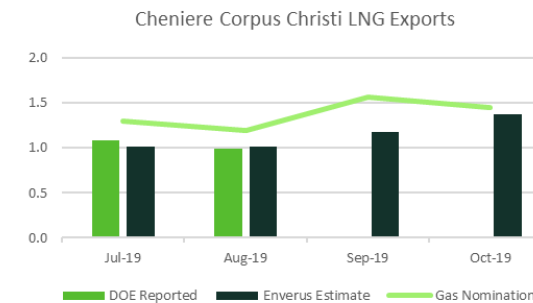
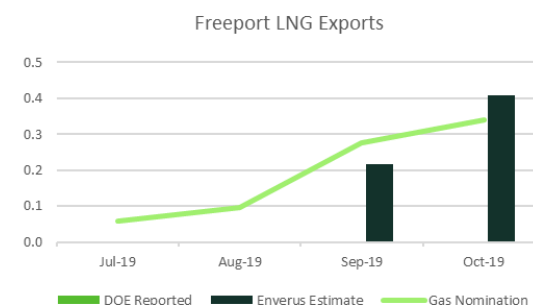
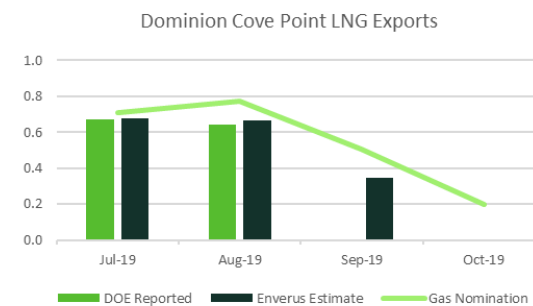
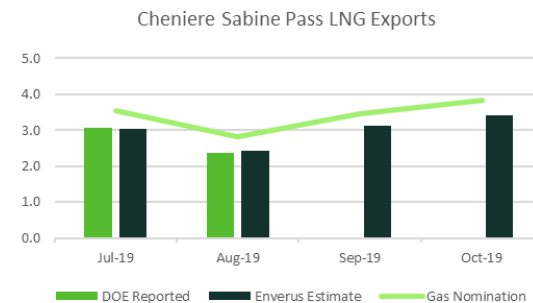


Source: DOE, Enverus OptiFlo

US LNG Exports: By Terminal

- Cheniere's Sabine Pass terminal is the largest of the US LNG export terminals, regularly shipping over 3 BCF of gas per day. Exports from the facility grew in September and through the first 18 days of October.
- Cheniere's Corpus Christi is the second-largest US LNG export terminal and has also seen increased exports in September and October.
- Dominion's Cove Point terminal went down for maintenance from September 20 through October 13, resulting in lower export volumes compared to previous months.
- Cameron LNG saw increased volumes in September and October.
- While the lag associated with DOE data results in no information on Freeport, the terminal commenced operations in September.
- Elba Island will be the newest US LNG export terminal and appears to have received a cooldown cargo with the tanker Gemmata arriving October 12. No export loadings were observed through October 18.

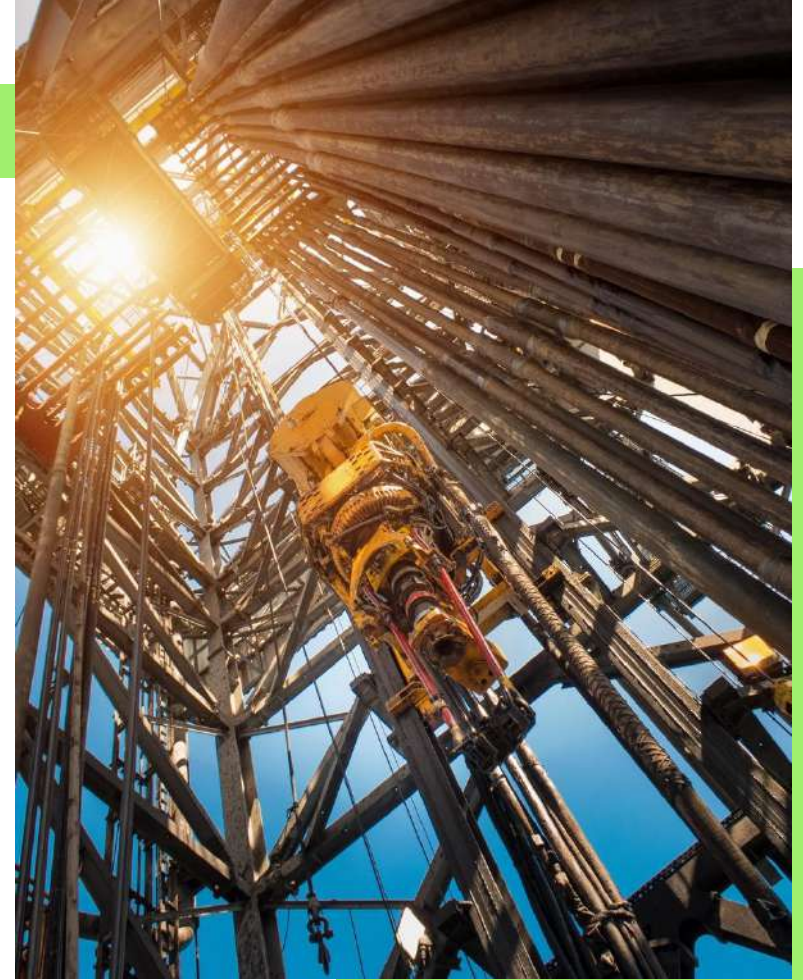
Gulf Coast LNG Terminals Breakout



Source: DOE, Enverus Analysis

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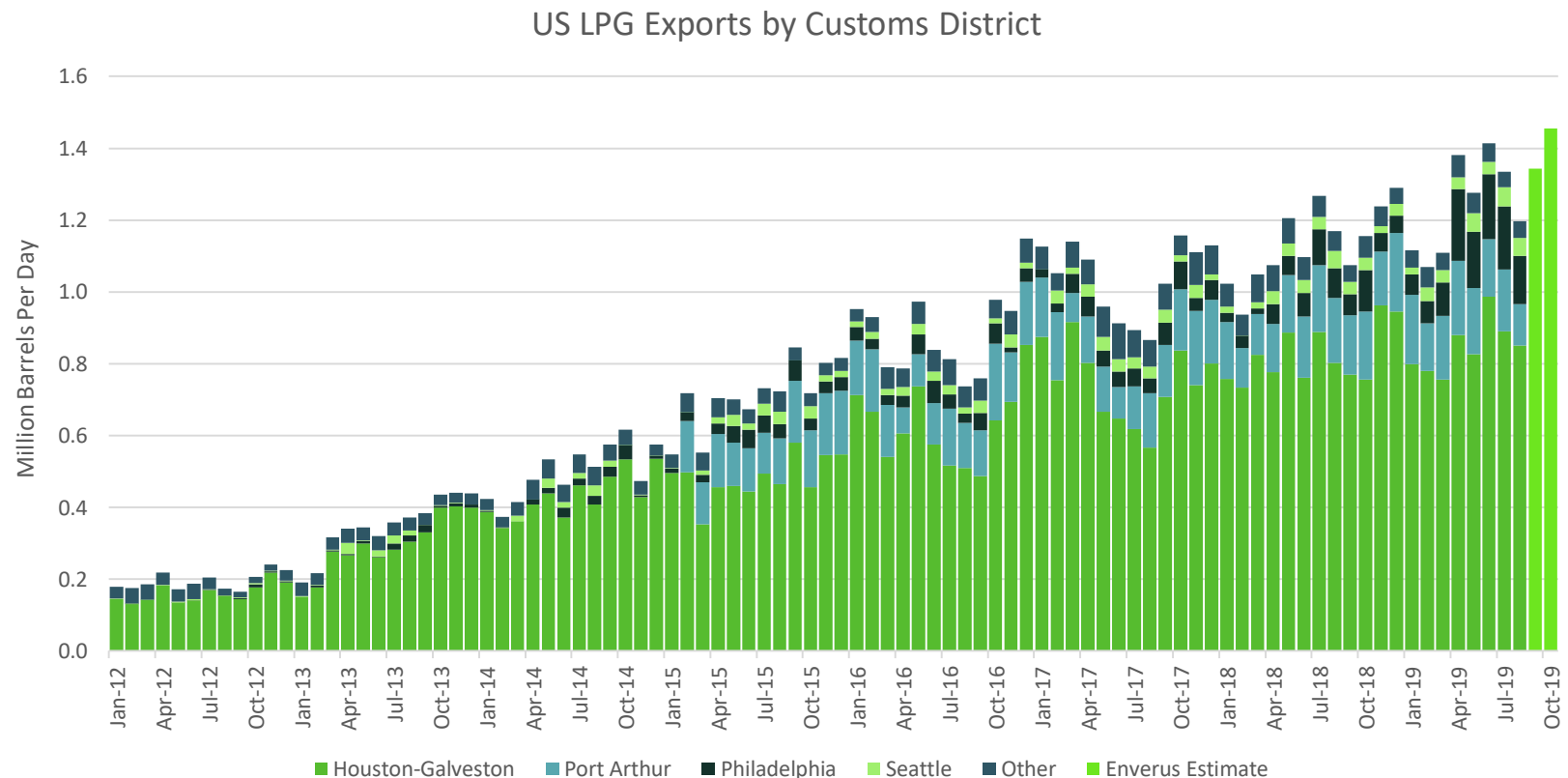
LPG Exports



US LPG Exports: Overall

- According to the latest data available from the US Census Bureau, nearly 1.2 million barrels per day of propane and butane (LPG) were exported in August 2019.
- Over 95% of these exports traveled through four main customs districts within the US: Houston (which contains Freeport and Corpus Christi), Port Arthur, Philadelphia, and Seattle. These four districts have made up more than 90% of US exports since June 2017.
- The Houston district has made up roughly 70% of total exports during that time period. The district contains the country's most active terminals: Enterprise's Houston Ship Channel and Targa's Galena Park. It also contains the Buckeye terminal in Corpus Christi and the Phillips 66 terminal in Freeport.
- The remaining districts contain one major LPG export terminal each. Port Arthur contains the Sunoco Nederland terminal, Philadelphia contains Sunoco Marcus Hook, and Seattle containing the Petrogas Ferndale terminal.

US Exports of Propane and Butane by Customs District



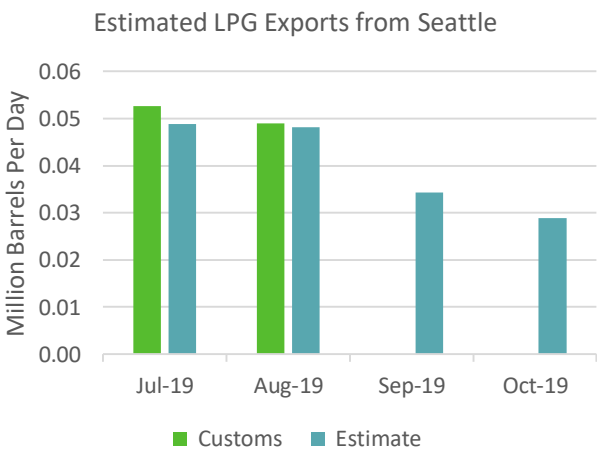
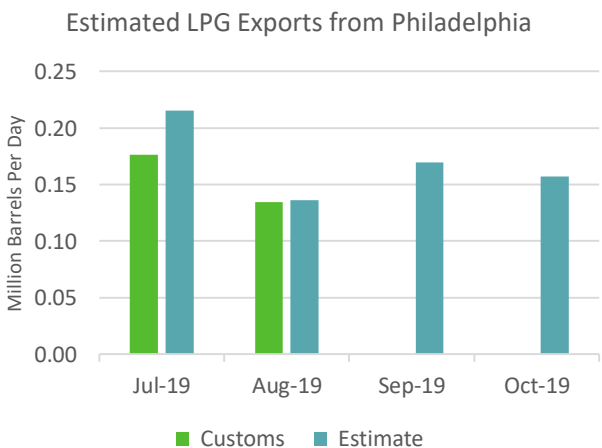
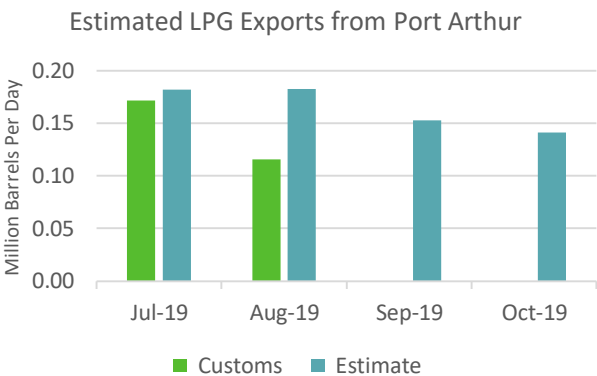
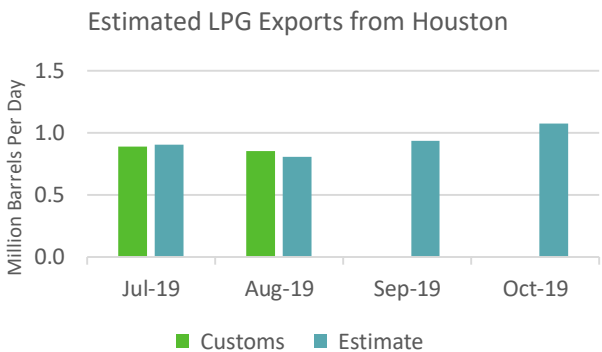
Source: US Census Bureau USA Trade, Enverus Analysis

US LPG Exports: Comparison between Gov't Data and Estimates



- The charts to the right show a comparison of US Census Bureau data at a district level to Enverus's estimate of exports.
- That data is lagged by over a month, from the conclusion of each month.
- On an overall level, Enverus observed an increase in export activity during the first 18 days of October. This was entirely driven by an increase in export activity from the district of Houston.

Comparison of LPG Export Estimates to Customs Data by District



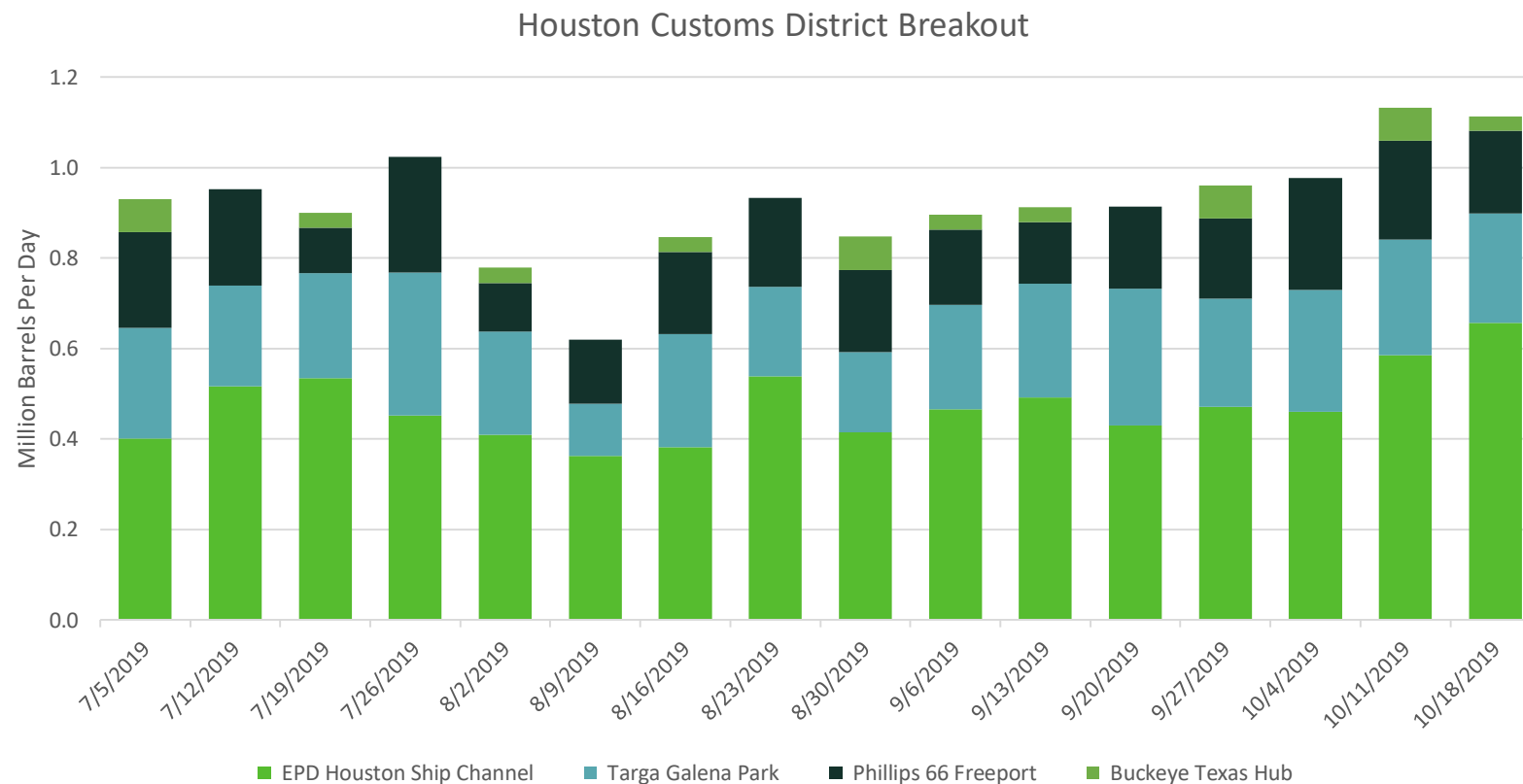
Source: US Census Bureau USA Trade, Enverus Analysis

US LPG Exports: Breaking Out Houston Growth



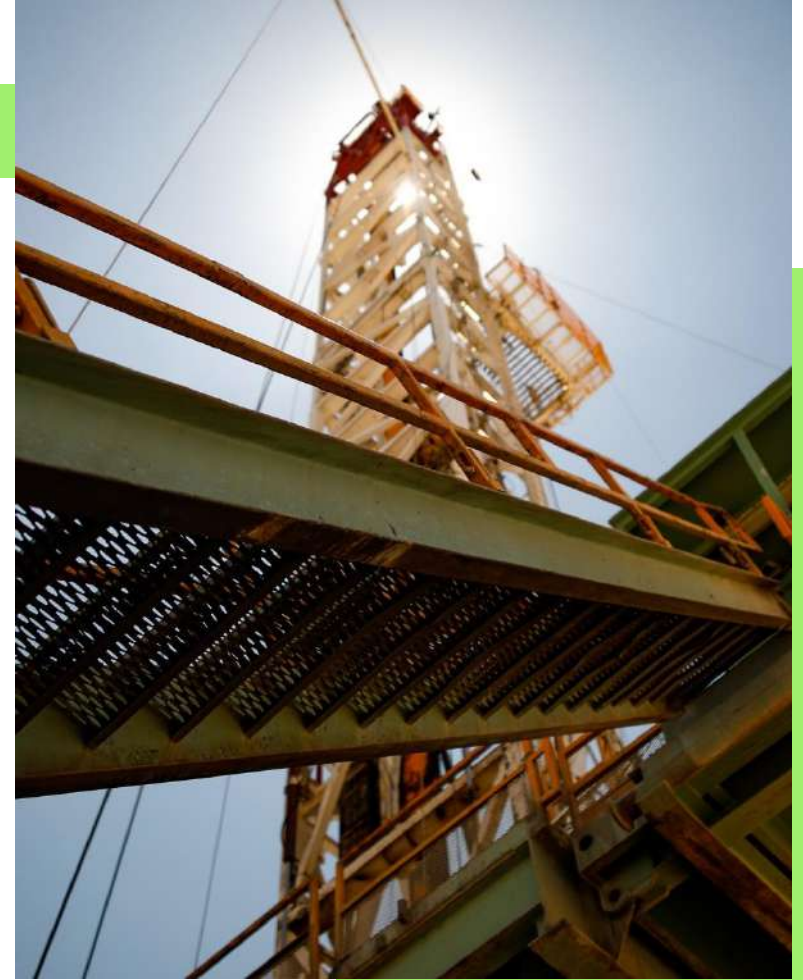
- Houston had two infrastructure expansion projects that came online at the beginning of October 2019.
- The largest project was at the Enterprise Products Houston Ship Channel terminal. This project was expected to increase LPG loading capacity at the terminal by 175K bpd. Additional loadings at Enterprise have been observed since the week of October 11.
- The second project was the rebuilding of dock 2 at Targa's Galena Park terminal. Growth as a result of this project has been less obvious. However, we have seen a vessel activity at that dock restart.

LPG Export Estimates for Houston Weekly by Terminal



Source: US Census Bureau USA Trade, Enverus Analysis

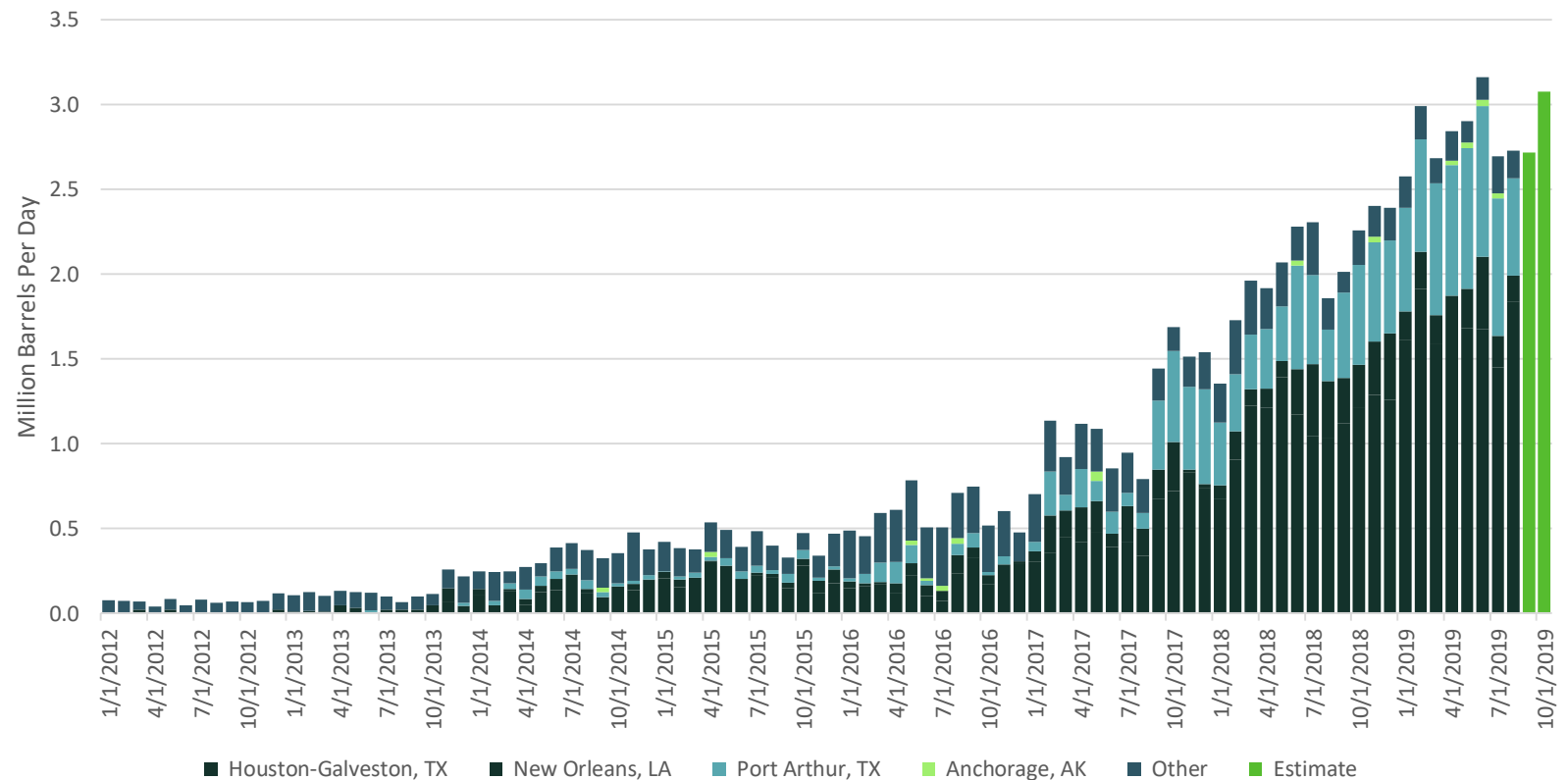
Crude Oil Exports



US Crude Oil Exports: Overall

- From 1975 to December 2015, the US had a ban on exports of crude oil. This law coupled with the balance of the US crude market led to a low level of crude export activity.
- Some exports were permitted, mainly involving the shipment of crude oil to Canada.
- Exports of Alaskan North Slope crude were also allowed out of Valdez within the Anchorage customs district provided the export took place on a Jones Act (US flagged/US crewed/US built) tanker.
- As US crude oil production skyrocketed, increased pressure on the export ban resulted in its lifting in December 2015.
- The major customs districts involved in the exportation of US crude are Houston, New Orleans, Port Arthur, and Anchorage.
- The Houston district contains the ports of Freeport and Corpus Christi, while New Orleans contains St. James and LOOP.

US Exports of Crude Oil by Customs District

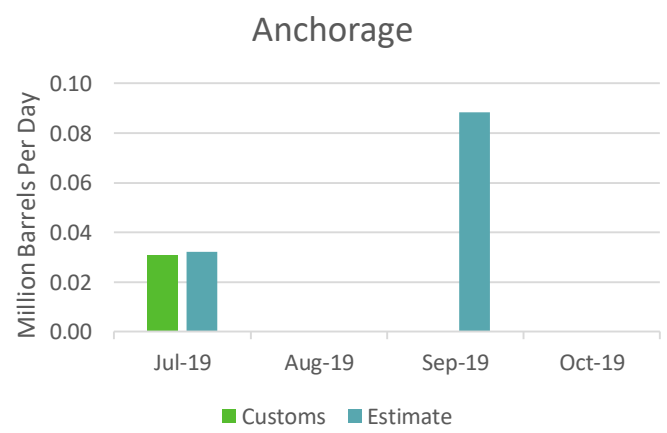
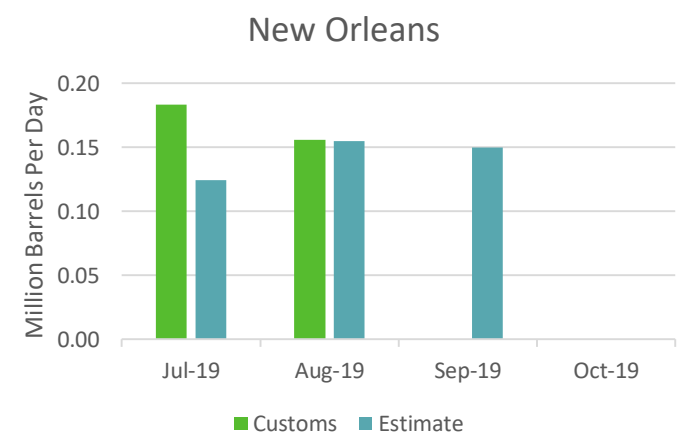
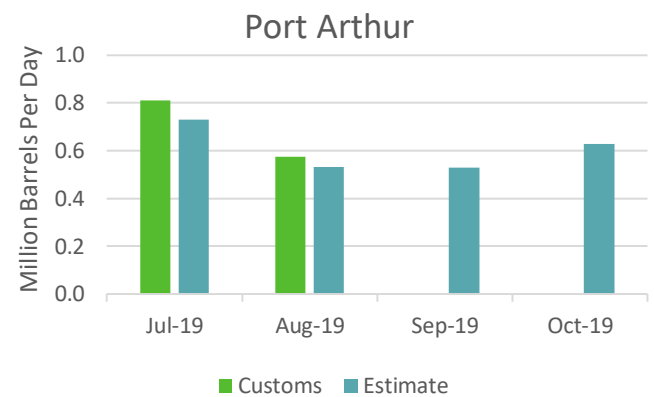
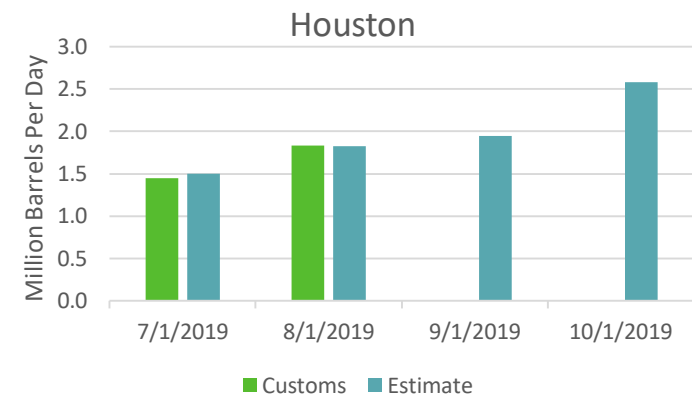


Source: US Census Bureau USA Trade, Enverus Analysis

US Crude Exports: Comparison between Gov't Data and Estimates



- The charts to the right show a comparison of US Census Bureau data at a district level to Enverus's estimate of exports.
- As like most government reported data, the US Census Bureau data is lagged by nearly a month, from the conclusion of each month.
- Enverus observed an increase in export activity during the first 18 days of October. This was entirely driven by an increase in export activity from the district of Houston.
- The increase in export activity from the district that contains Corpus Christ, coincides with the startup of two new pipelines from the Permian to Corpus, EPIC, and Cactus II.



Source: US Census Bureau USA Trade, Enverus Analysis

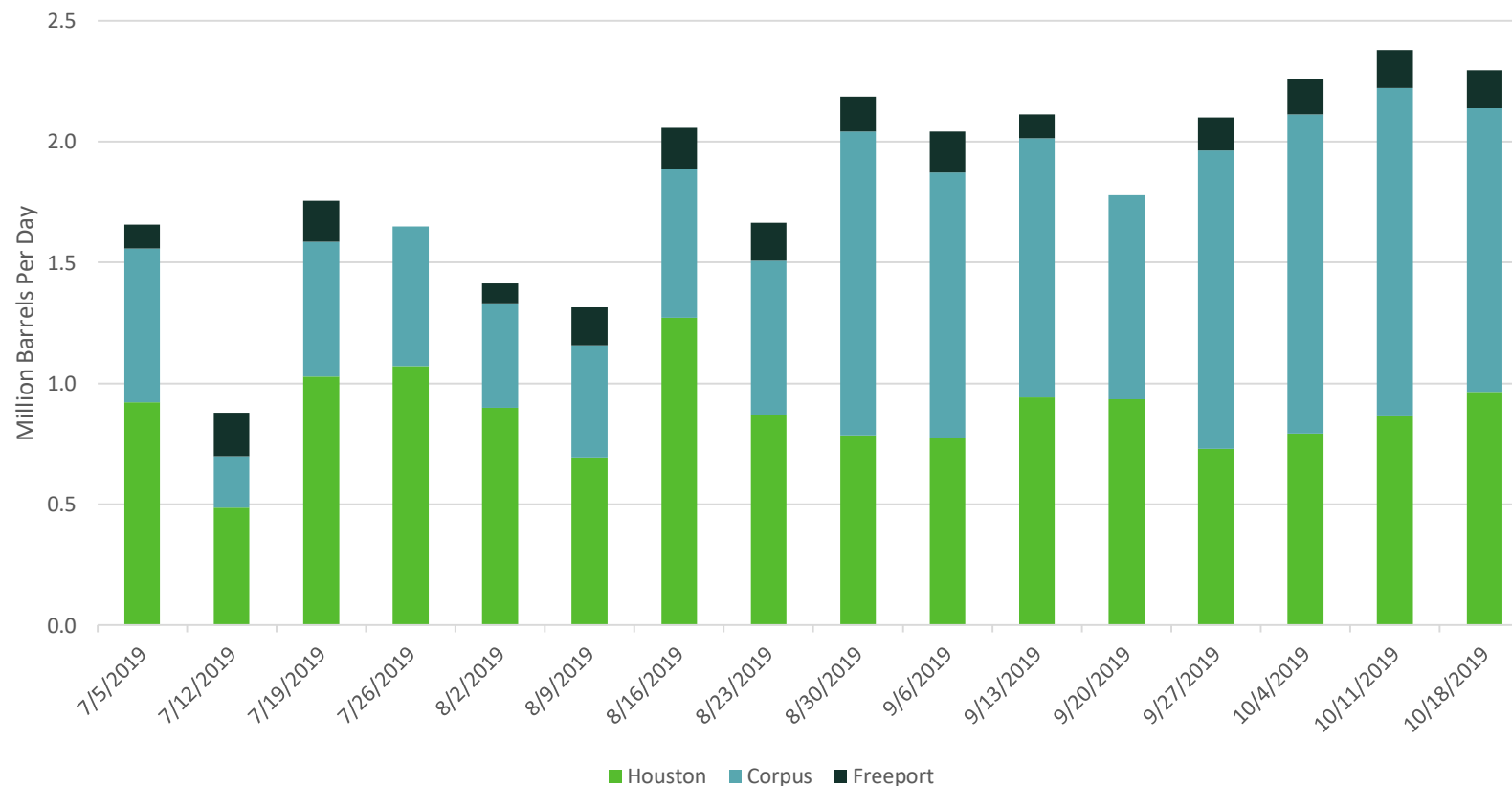
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US Crude Oil Exports: Breaking Out Houston Growth



- Driving the increase in crude exports from the Houston customs district have been two additional pipelines now delivering crude into the Corpus Christi area.
- These pipelines are EPIC and Cactus II. Cactus II has a capacity of 670,000 barrels per day while EPIC provides 400,000 from the Permian and Eagle Ford Basins and will increase to 550,000 when EPIC brings its crude line to market in 1Q2020.

Houston Customs District Breakout



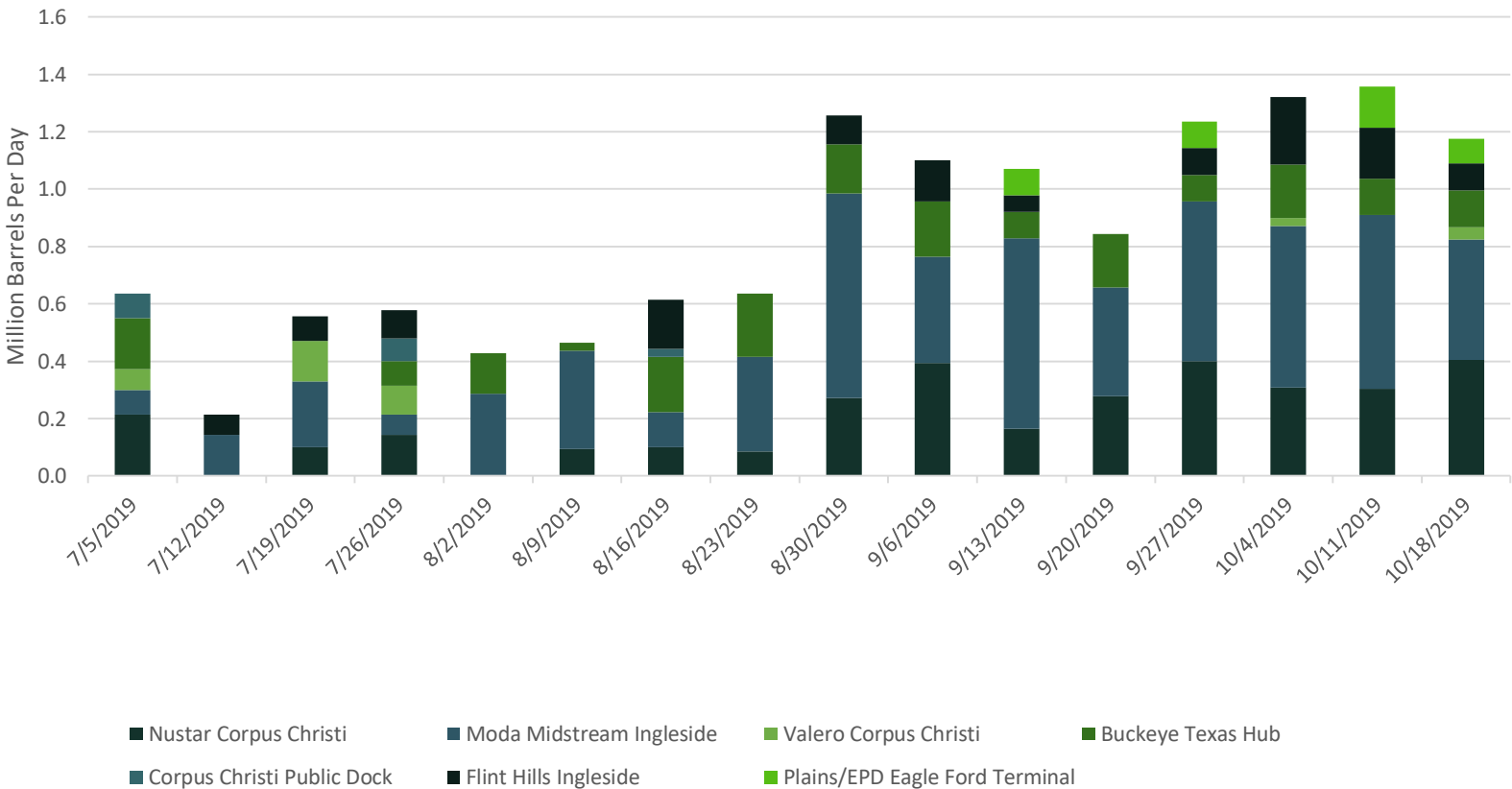
Source: US Census Bureau USA Trade, Enverus Analysis

US Crude Exports: Corpus Christi by Terminal



- The biggest growth in exports by terminal within the Corpus Christi area has been at the Moda Midstream Ingleside terminal. That terminal is now routinely sending out partially loaded VLCCs.
- The Plains/Enterprise joint venture Eagle Ford terminal is also now up and running, with its first cargo having departed the week of September 13.

Corpus Christi Breakout by Terminal



Source: US Census Bureau USA Trade, Enverus Analysis

CONTACT

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This is a preview of the full report.

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