



ENERGY

WTI and the Changing Global Dynamics of the International Crude Oil Trade

JANUARY 2017

Authors: Daniel Brusstar, Paul Wightman, and Elizabeth Hui

The new storage and pipeline infrastructure in the United States is so significant that it is likely to have a transformational impact on the crude oil market for years to come. These changes are likely to spur more trading in U.S. domestic grades and will magnify the role of WTI as a global benchmark.

The catalyst for this transformation has been the sharp rise in U.S. oil production, and more recently, the lifting of the export ban on U.S. crude that occurred at the end of 2015. In order for the U.S. to turn itself from a net crude importer to exporter, several key pipelines had to be reversed. At the same time, oil refiners and storage operators along the Gulf Coast set about increasing the amount of available storage capacity. A number of new terminals are in the process of being built along the U.S. Gulf Coast to handle the rising number of ships arriving to load crude destined for the international markets. These infrastructure changes will transform the U.S. into the marginal supplier of the world rather than a regional supplier. This will allow producers to take advantage of arbitrage opportunities that present themselves beyond U.S. shores.

U.S. CRUDE OIL PRODUCTION PROVES RESILIENT

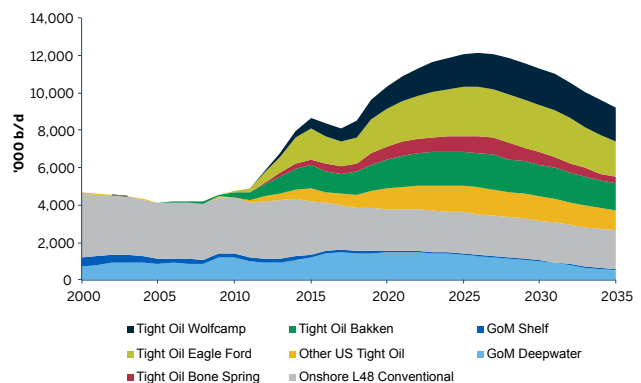
U.S. crude oil production has risen substantially from 5.1 million barrels per day (b/d) in January 2009 to 8.8¹ million b/d in October 2016, after its most recent peak of 9.55 million b/d in March 2016. U.S. oil producers have proved resilient in adapting to the lower oil price environment, defying expectations for significant production declines. However, output has not been unaffected, and since April 2015, output in the U.S. has fallen by around 800,000 b/d (October 2016), according to the Energy Information Administration (EIA).

U.S. drillers have had to be proactive at managing their costs to adapt to the lower oil price environment. With lower costs, some U.S. producers are able to continue producing when oil prices are much lower than had previously been envisaged.

The lifting of the export ban has created new opportunities for U.S. producers. This means that in countries outside of North America, U.S. crudes are able to compete alongside crudes from Europe and Asia. Houston is fast becoming a major export hub, and the infrastructure is being constructed and altered to accommodate higher export volumes. Traders will benefit from increased operational flexibility to seek out arbitrage opportunities in the global oil markets.

Wood Mackenzie have forecast the longer-term outlook for supply in the United States, and according to their analysis, supply is expected to remain healthy for years to come. Based on the chart below, total crude supply that is already slated for commercial production is expected to plateau at around 12 million b/d during the period of 2025 to 2030. This would imply a supply gain of around four million b/d from 2017 to 2025.

Chart 1: U.S. Crude Oil Supply Forecast Remains Extremely Robust



Source: Wood Mackenzie; H1 2016 dataset

Oil production in the non-conventional “tight” oil areas are a focus for U.S. drillers, and production volumes are expected to remain robust going forward. “Tight” oil refers to the crude oil produced from shale, sandstone and limestone formations, as typically found in the Permian Basin, Bakken, and Eagle Ford areas. The Permian Basin includes the Wolfcamp and Bone Spring areas. Crude oil production from the onshore conventional areas have declined, but this is replaced by

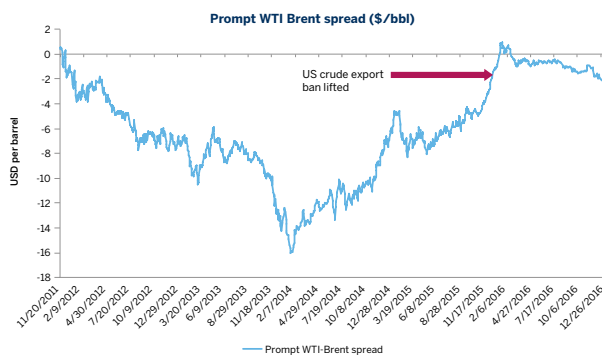
¹ Energy Information Administration: https://www.eia.gov/dnav/pet/pet_crd_crpdn_adc_mbbldp_m.htm

tight oil production from the Permian Basin, Eagle Ford, and Bakken. Chart 1 clearly shows the switch from conventional oil to non-conventional tight oil through 2035.

The WTI-Brent spread has become a true indicator of value for the U.S. crude exporters. With the spread trading between \$1 and \$2 per barrel discount to Brent, traders say that increased volumes of WTI linked crude oils may flow to countries outside of the US and Canada. Part of this is due to the relatively low cost of freight with traders able to benefit from the ability to offer a US bound cargo and a now a US origin crude oil export cargo as a single transaction to a ship owner. Without US crude oil exports being permissible, ship owners were previously only able to pick up US bound cargoes and struggled to find any return cargoes leaving their vessels out of place for subsequent voyages. Shipowners now have the choice of a back-haul crude oil cargo or a refined product cargo as the US exports both. This tended to result in higher freight costs to a charterer due to the lack of economies of scale (for the ship owner).

Further, the recent expansion of the Panama Canal allows for enhanced shipping alternatives for cargoes to transit from the U.S. Gulf to the Far East. The significant discounts for WTI compared to Brent from the past are unlikely to re-appear as any mispricing would be quickly re-aligned through a rise in U.S. crude exports, which was not the case in the past when U.S. crude remained non-exportable.

Chart 2: WTI-Brent Arbitrage Price Narrows as U.S. Crude Oil Export Ban is Lifted



Source: Exchange data

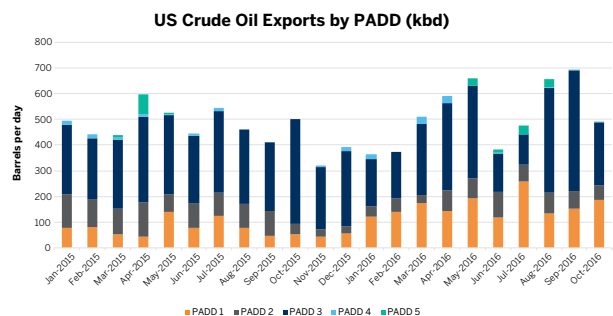
The WTI-Brent spread, when measured as a percentage of flat price, has changed significantly since 2012. Previously, when WTI was trading at a \$28 per barrel discount to Brent, this represented around 23% of the flat price crude value. Currently, the WTI is trading between \$1.00 and \$1.50 discount to Brent, or 3% of the flat price. Volumes of WTI-Brent Futures and Options remain strong, and traders see the value in the spread as the true measure of the viability of U.S. exports.

U.S. EXPORTS ARE INCREASING

The lifting of the U.S. export ban has seen the volume of U.S. crude sold beyond North America rise noticeably. The volumes of U.S. exports will largely depend on the value of the WTI-Brent spread, and therefore volumes will be volatile when measured on a month-by-month basis. According to EIA data, the volume of crude oil sold to non-Canadian destinations averaged nearly 200,000 b/d over the January through August 2016 period, up substantially from 40,000 b/d in 2015. In October 2016, which is the latest data available, U.S. crude exports rose to 491,000 b/d.

Crude oil exports from PADD 3, which encompasses the U.S. Gulf Coast region, rose to a record high of 410,000 b/d in August 2016, surpassing the previous peak recorded in October 2015.

Chart 3: U.S. Crude Oil Exports by district (PADD)



Source: Energy Information Administration

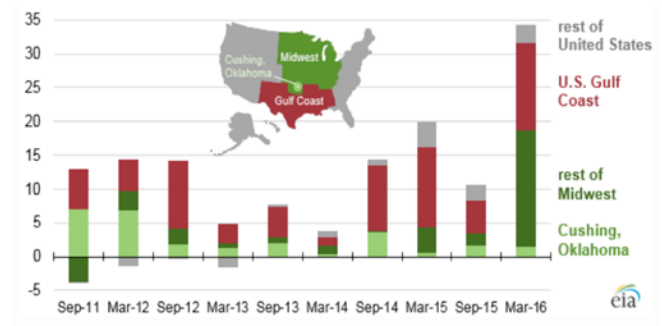
EXPANSION OF CRUDE OIL INFRASTRUCTURE IN THE U.S. GULF COAST

The U.S Gulf Coast comprises approximately 55% of the U.S. crude oil storage capacity, while Cushing comprises 13%. In recent years, storage capacity has seen an increase to accommodate the growing crude oil production. Moreover, commercial companies have continued to make investments in expanding their infrastructure portfolios.

The infrastructure investment in the U.S. Gulf Coast has transformed WTI into a waterborne crude, with extensive export capacity. The Seaway Pipeline links Cushing, Oklahoma to the Houston export market, with 850,000 b/d capacity. The Transcanada Marketlink Pipeline provides additional capacity of 700,000 b/d from Cushing to Houston. Further, the Magellan BridgeTex and Longhorn Pipelines carry up to 475,000 b/d from Midland, Texas to Houston. In addition, the Dakota Access Pipeline will provide additional capacity of around 450,000 b/d delivering Bakken crude oil to Houston when completed in 2017. All in all, the Houston market has become export-focused, with a terminal network with storage capacity of 65 million barrels and an additional 20 million barrels of storage capacity projected to come into service in 2017.

In Louisiana, the Louisiana Offshore Oil Port (LOOP) is planning to transform itself into a dual-use terminal that will handle both exports and imports. LOOP is expected to allow Ultra-Large Crude Carriers (ULCC's) and Very-Large Crude Carriers (VLCC's) to load for export starting in 2018. Currently, LOOP can only handle in-bound crude oil tankers offloading crude oil for the refineries along the Gulf Coast. In addition, LOOP operates 70 million barrels of storage capacity, with additional tankage under construction.

Chart 4: Change in U.S. working crude oil storage capacity (Sept 2011 – March 2016 in millions of barrels)

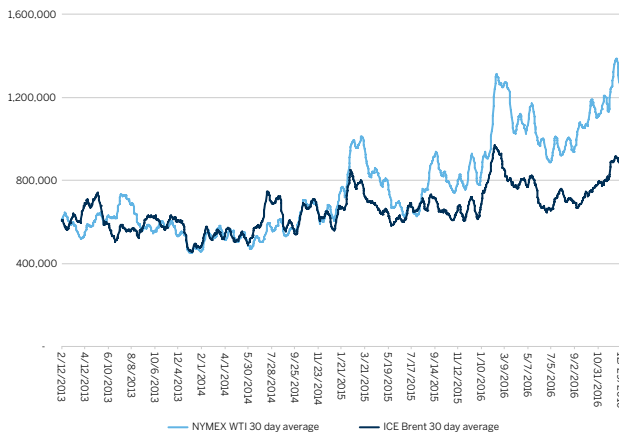


Source: U.S. Department of Energy (Energy Information Administration) <http://www.eia.gov/todayinenergy/detail.php?id=26772> (June 22, 2016)

NYMEX WTI FUTURES VOLUMES OUTPACE BRENT FUTURES

Volumes on the NYMEX Light Sweet Crude Oil Futures contract (“WTI futures”) have been strong, in part reflecting the higher levels of volatility in both crude oil and refined products. The total volume of WTI futures when compared to Brent futures has been rising sharply, and the gap between the two contracts has been widening. According to exchange data, the total volume of NYMEX WTI Futures traded for year-to-date (through December 31 2016) was 1.1 million contracts per day compared to 785,000 lots per day in ICE Brent Futures. Over the full-year 2015, WTI average daily volume was 800,000 lots per day, and Brent average daily volume was 685,000 lots per day. Year on year growth in WTI Futures is around 36%.

Chart 5: NYMEX WTI vs. ICE Brent Futures: 30-Day Average Daily Volume



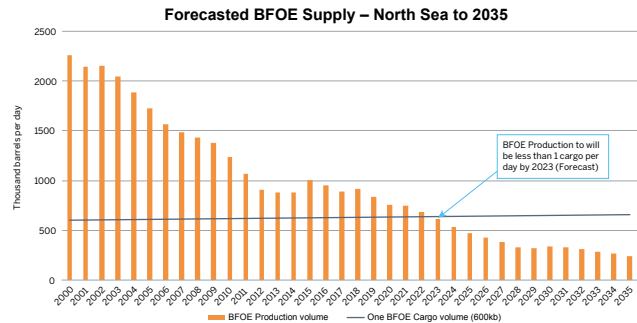
Source: Exchange Date (CME Group and ICE Futures Europe)

BRENT PRODUCTION IN DECLINE

As the crude oil supply picture continues to strengthen, the opposite would appear to be happening in the North Sea, where production output is set to decline sharply as producers struggle to contain the effects of the falling oil price.

The longer term viability of the North Sea is being called into question with producers either selling assets or cutting back on capital expenditures, which will curtail output in future years. Economists are predicting that North Sea output could decline sharply from 2017 onwards as the lower price environment puts pressure on the production outlook. In our analysis of the Wood Mackenzie upstream data, the decline of the Brent, Forties, Oseberg and Ekofisk (BFOE) fields from 2020 onwards is expected to be significant. Based on their data, production is expected to fall from the current 850,000 b/d to under 600,000 b/d by 2023 which is less than one cargo of crude oil per day. This assumes that no changes to the number of crudes in BFOE complex are made before then.

Chart 6: Production Profile for the North Sea – 2016 to 2035 (in b/d)



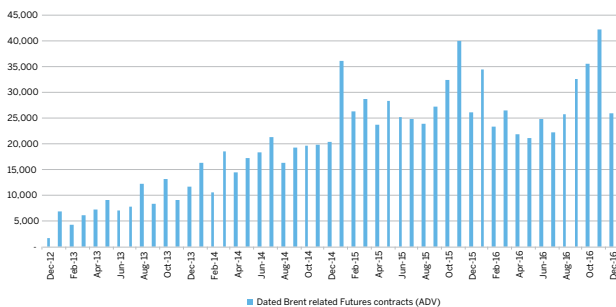
Source: Wood Mackenzie (H1 2016 dataset)

Leading price reporting agency Platts (a division of S&P Global Inc.) has been making changes to the cash BFOE mechanism (or forward Brent market) and Dated Brent benchmarks by widening the delivery window from 15-days to month ahead. This increases the number of physical cargoes that can be delivered into the Dated Brent assessment. However, they (Platts) are continuing to look at possible solutions to address the issue of falling output in the North Sea and how to maintain stability in the Dated Brent benchmark in the years ahead. Platts have considered adding new grades into BFOE, but this is likely to alter the quality of Brent, and further modifications may be required to deal with the changing quality. Platts is considering the addition of a Norwegian crude oil stream called Troll² which is classified as Light Sweet. This crude, if formally adopted by the market, could be potentially added to the basket of crude oils, referred to as BFOE, that make up Platts Dated Brent. This is the first possible addition to BFOE since 2007.

DATED BRENT-RELATED DERIVATIVES REMAIN A FOCUS

In the Brent futures complex, in addition to the monthly Brent futures, there are also Dated Brent futures contracts, which traders use to hedge specific shorter-term exposure to physical Dated Brent. These futures contracts are a mixture of interrelated monthly and weekly futures contracts and form part of the overall Brent complex. The suite of Dated Brent futures contracts provide a critical component for traders hedging Dated Brent risk on a shorter or longer term basis. The cleared volume of Dated Brent futures contracts has risen steadily over the past four years. According to exchange data, overall cleared volumes of Dated Brent futures were around 26,000 lots per day in 2016, up from 8,000 lots per day in 2013.

Chart 7: Dated Brent-related Futures: Cleared Average Daily Volumes (ADV)



Source: Exchange data

As a result of these changing dynamics, NYMEX WTI has re-established its position as the premier pricing reference and is well placed to fulfil its role as the main crude price reference in the Atlantic Basin, as the supplies of WTI and other linked crudes (to WTI) begin to displace other light sweet crude streams. European and Asian refiners have been offered U.S. crude oil on a WTI-related pricing basis which will help to cement the role of WTI in the global crude oil marketplace.

SUMMARY

The rise in importance of the U.S. crude market comes at a challenging time for crude oil markets in Europe. In the North Sea, as oil producers battle to maintain output in a lower oil price environment, U.S. drillers would appear to have a much more flexible cost base on which to adjust to different levels of price. Given the rise in U.S. production over the past five years, the role of WTI as the price reference for the marginal barrel of oil has increased significantly, and consequently, WTI has become the price leader again.

One potential opportunity could be that global markets adopt more WTI based pricing into their crude oil contracts. The lifting of the U.S. export ban has had a significant impact on global oil flows, and will lead to greater market efficiencies as companies look to gain arbitrage opportunities with the improved logistics of free trade. As a result, WTI has fully re-gained its status as the leading indicator for price discovery in the crude oil market.



CME GROUP HEADQUARTERS

20 South Wacker Drive
Chicago, Illinois 60606
cmegroup.com

CME GROUP GLOBAL OFFICES

Chicago
+1 312 930 1000

Singapore
+65 6593 5555

Houston
+1 713 658 9292

Tokyo
+81 3 3242 6228

New York
+1 212 299 2000

Calgary
+1 403 444 6876

São Paulo
+55 11 2787 6451

Washington D.C.
+1 202 638 3838

London
+44 20 3379 3700

Hong Kong
+852 2582 2200

Seoul
+82 2 6336 6722

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