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Argus White Paper:
The US Gulf coast: The new center for global benchmarks

The lifting of the US crude export ban is the final step in the US Gulf coast becoming a benchmark center for the global oil market. North Sea production remains under threat of decline, especially as prices remain low, and new basket crudes are inevitable. Mideast Gulf production is limited by destination and resale restrictions. The Dubai market follows other markets instead of leading, and continues to see extreme domination by a few participants. No standout marker crude has yet emerged in Asia Pacific and the region is relying on a very distant Brent.

The US Gulf coast now offers hope to the global industry that a new benchmark center can emerge. The US has deep reserves, transparent and actively traded physical markets, sensible regulation, extensive infrastructure and now crude can be both imported and exported. The US Gulf coast markets reported by Argus for LLS, WTI, Mars and ASCI trade in significant volume – and in multiple iterations per day, unlike cargo-based markets in other regions (see table).

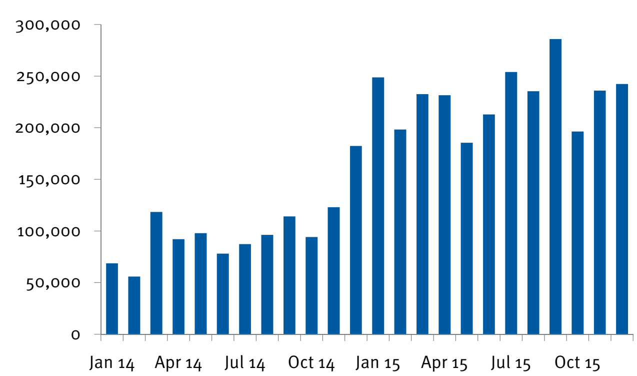
The US Gulf coast also provides price discovery in heavier grades. Medium sour crude benchmarks are available in Mars and ASCI. And heavy sour crude WCS is arriving into Houston in increasing volumes and spot market emergence at Houston is inevitable (see chart).

The array of light sweet and heavy sour price discovery at one location offers a strong alternative to the North Sea and Mideast Gulf markets (see chart).

The US has become the world's new swing producer. The production response to price may not be immediate, but it is guaranteed – and it will be driven by market forces, not national government policy. New export infrastructure has

Average physical volume	b/d last 3 trade months
Argus Sour Crude Index (ASCI)	512,274
Argus WTI Midland	430,381
Argus Mars	357,589
North Sea Forwards	329,348
BFOE physical cargoes	313,043
Argus LLS	186,754
Argus WTI Houston	121,186
Maya formula	81,600

Canadian heavy shipments to Texas *b/d*



Pricing in a world of US exports

"I would expect to see some crudes that previously priced off Brent move to WTI."

– Tim Bullock, CEO Litasco, speaking at Argus Americas Crude Summit, 21 January 2016

Petroleum

illuminating the markets

to be built at the US Gulf coast and industry needs to adapt. But by the end of this decade we may well see pricing across the Atlantic basin looking to the US Gulf coast for its primary physical and financial benchmarks for a wide array of crude grades.

WTI Houston at the center of the action

At the very center of this new import/export hub at the US Gulf coast is the WTI Houston market. Spot trade for West Texas Intermediate (WTI) crude at Houston, Texas, has grown rapidly, reflecting both steady production out of the Permian basin in west Texas as well as expanded pipeline capacity delivering WTI to Houston. The Argus volume-weighted average for WTI at Houston is the most transparent indicator of value for the light grade at the US Gulf coast. The market is underpinned by infrastructure suitable for spot trade, segregated storage and a freely tradable spot market. WTI Houston is also backed by robust field production that creates both the surplus volumes needed for a spot market to work properly and the confidence that supply will be available for years to come.

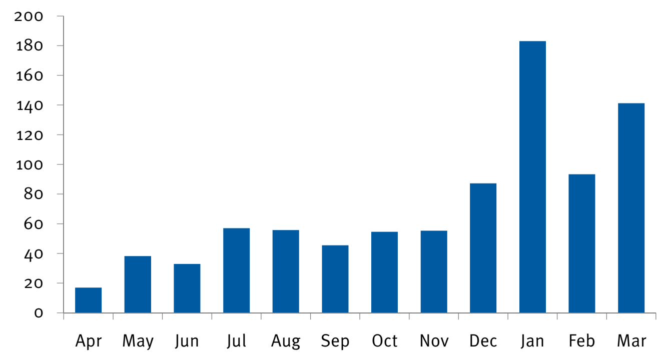
Proof of its emerging importance can be seen in its price behavior relative to existing benchmark prices. As the physical glut of crude at Cushing and in west Texas was transferred to the Gulf coast, the price of Argus WTI Houston converged with that of LLS and Brent. At the moment of the export ban being lifted, prices were demonstrating that the entire Atlantic basin was looking to the Gulf coast as the center of price determination (see chart).

Argus brings transparency to the Houston market

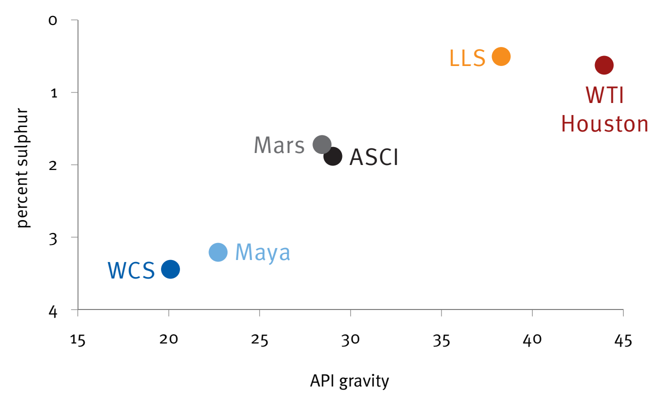
The emergence of a spot market in Houston for WTI was initially facilitated by Magellan Midstream, which put in place an in-tank transfer system at its Magellan East Houston terminal that allowed for the open trading of barrels. Since the launch of the WTI Houston assessment in February 2015, spot market traded volumes increased significantly (see chart). Participation expanded to include majors, refiners, producers and trading houses.

The spot market liquidity that has been so strong for WTI at Midland in recent years is now expected to transfer down to Houston. All this liquidity will support the Argus WTI Houston quote and make the accompanying financial markets more

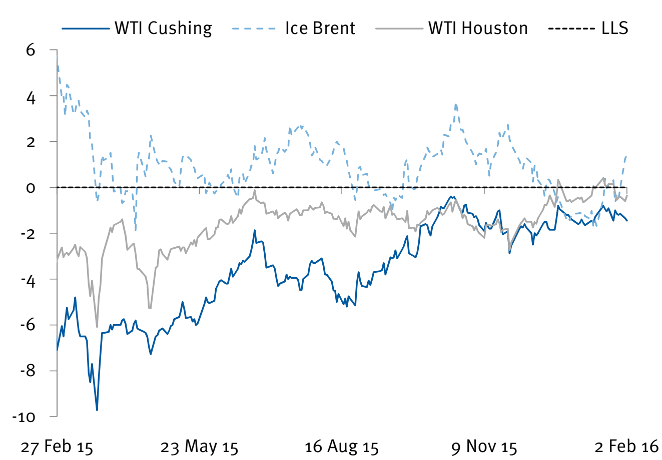
WTI Houston trade month *'000b/d*



Array of Argus markers



Benchmark spreads to LLS Gulf coast *$/bl*

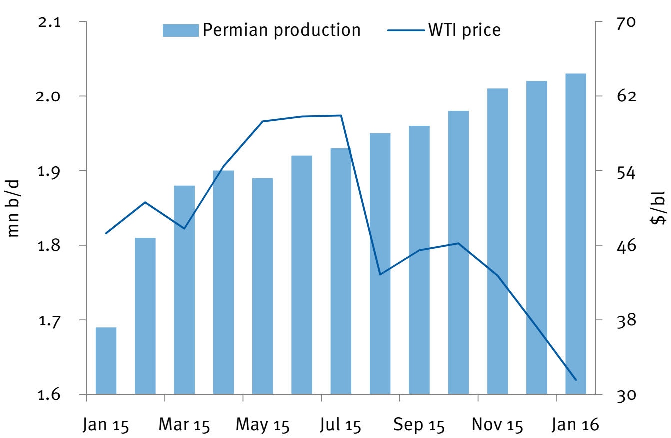


useful as a hedge. As a result of the growth in the physical market, both CME and Ice now list several futures contracts for WTI Houston, all of which are settled on the Argus price assessment for the grade (see table).

Consistent quality, consistent production

Argus WTI Houston is supported by clear quality specifications. The WTI Houston market consists of Permian WTI crude shipped to the Magellan East Houston terminal via the 275,000 b/d Longhorn and 300,000 b/d BridgeTex pipelines, both of which set specification requirements for volumes moving through their lines. Once at the terminal, WTI is stored in segregated tanks. This differentiates WTI Houston from Domestic Sweet (DSW) crude at Cushing or Houston. DSW is a blended barrel – often a blend of WCS and Bakken – that can vary significantly in quality and value. Argus WTI Houston provides a stable quality against which more variable qualities can be traded.

The WTI Houston market is backed by Permian production, which remains resilient despite extended periods of low crude prices (see chart [production bar chart overlayed with price line]). At the start of 2016, Permian production was averaging just over 2mn b/d while the Eagle Ford and Bakken fields have seen sharp declines. This flow directly encouraged spot market trading in Houston.



WTI and LLS become global benchmarks

Brent has become less significant in price discovery in the global oil markets, and WTI and LLS have become the most important global benchmark crudes. In fact, statistically speaking, in recent months LLS appears to be providing more information to the global markets than both WTI and Brent. This makes sense from a fundamental viewpoint. With US light sweet shale oil as the new de-facto swing supply source, LLS, the US Gulf Coast light sweet marker, reflects the refining region where the most shale oil is consumed.

– Societe Generale Cross Asset Research,
“Price Discovery in Oil Markets,” 2 June 2015

The Argus methodology

WTI Houston trades at differentials to the WTI Cushing benchmark and physical contracts roll forward in line with the US Gulf coast pipeline schedule. Argus WTI Houston is a volume-weighted average of all deals done throughout the entire trading day at a differential to WTI Cushing. This average differential is then applied to the Nymex settlement price to arrive at a fixed price. This entire-day volume-weighted average methodology is the same approach used for other US Gulf coast and midcontinent crudes including the highly successful Argus Sour Crude Index and the Argus LLS benchmark.

The US Gulf coast now presents an important alternative pricing matrix for the Atlantic basin and perhaps beyond. The deep financial market for WTI at Cushing forms a foundation. The physical grades at the US Gulf coast price at a differential to futures and act to fine tune that WTI futures price to the true clearing market at the Gulf coast. Those prices are available from Argus in robust volume-weighted averages. Argus LLS and Argus WTI Houston provide the light sweet markers, Argus Mars and ASCI the medium sour markers, and soon Argus WCS at Houston will mark heavy sour values.

The US has already become the world’s swing producer. The next step is for the US markets to become the world’s benchmarks.

Chicago Mercantile Exchange (CME) Futures:

WTI Houston (Argus) Financial Futures

WTI Houston (Argus) Trade Month Futures

WTI Houston (Argus) vs. WTI BALMO Futures

WTI Houston (Argus) vs. WTI Financial Futures

WTI Houston (Argus) vs. WTI Trade Month BALMO Futures

WTI Houston (Argus) vs. WTI Trade Month Futures

As well as:

LLS (11 contracts)

Mars (4 contracts)

Argus Sour Crude Index (ASCI) (4 contracts)

WTI Midland (4 contracts)

WTS (4 contracts)

Argus WTI Formula Basis Calendar Month Futures

Argus WTI Trade Month Futures

Intercontinental Exchange (ICE) Futures:

Argus WTI Houston vs. WTI 1st Line Future

As well as:

LLS Contracts (8 contracts)

Mars (4 contracts)

Argus Sour Crude Index (ASCI) (4 contracts)

WTI Midland (2 contracts)

WTS (2 contracts)

Argus WCS (Cushing) Crude Oil Future

Argus Bakken (Clearbrook) Crude Oil Future

Contact information

Houston:
2929 Allen Parkway, Suite 700
Houston, Texas 77019
Tel: +1 713 968 0000
Fax: +1 713 622 2991

New York:
500 Fifth Avenue, Suite 2410
New York, NY 10110
Tel: +1 646 376 6130
Fax: +1 646 376 6143

Calgary:
144 — 4th Avenue SW, Suite 1600
Calgary, AB, Canada T2P 3N4
Tel: +1 403 695 1799

Rio de Janeiro:
Av. Nossa Senhora de Copacabana
330 – salas 1003/1004
Copacabana, Rio de Janeiro, RJ
Tel: +55 21 3514 1450

Email: moreinfo@argusmedia.com
Web: www.argusmedia.com
Twitter: @argusmedia