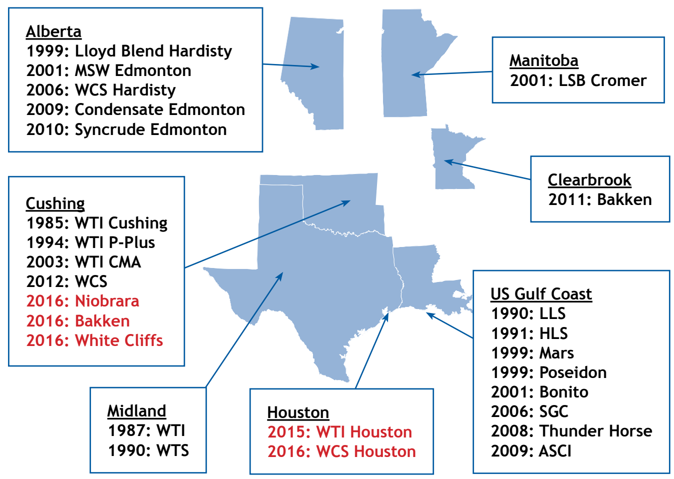
Argus White Paper:
Rockies crude trading at Cushing — Increased transparency for US light tight oil

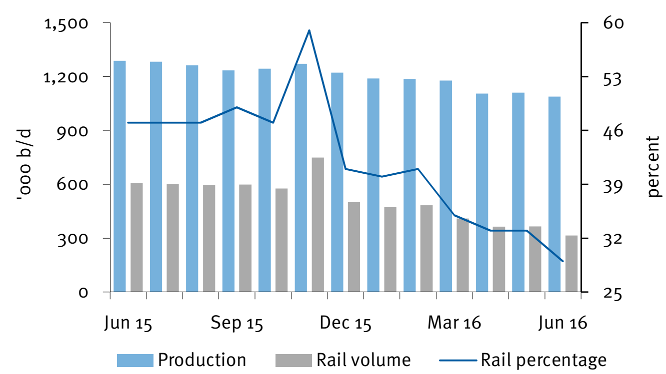
In spite of falling US crude output, Argus has continued to identify new opportunities to lend transparency to crude oil values at major trading hubs in the US market. Having introduced a price assessment for WTI Houston in February of 2015, Argus initiated a daily price for Canadian heavy WCS at Houston in early 2016. Now, as infrastructure has developed sufficiently to support spot trade of Rockies and North Dakota crude streams at Cushing, Argus is launching daily volume-weighted average price assessments on Niobrara (NIO), White Cliffs (WCC) and Bakken Light Sweet (BLS) at Cushing. These new assessments greatly increase the market's ability to manage risk around crude markets in both the US midcontinent and the US Gulf coast (see graphic at right).



Shift from rail

Although the market has seen some price assessments offered at rail-loading sites around the Rockies and North Dakota regions, it is clear that the bulk of spot trade is shifting to pipeline hubs. This trend has accelerated as new Cushing-destined pipelines such as Saddlehorn, Double H, Pony Express and White Cliffs have come into service. These pipelines are capturing increased shipper volumes as adverse arbitrages, rail car design concerns and other factors are reducing the volume of crude moving to market by rail (see graph at right).

Williston Basin (Bakken) movements of crude by rail



— North Dakota Pipeline Authority

As the market moves increasingly to pipe, assessments of value at the region's principal pipeline hub of Cushing, Oklahoma, are particularly relevant. Cushing features sufficient storage to keep the new grades segregated, and Argus has received a growing volume of reported trades for all three grades. A significant amount of this trade is done on a spot basis for delivery in the

Petroleum

illuminating the markets

Niobrara (NIO)	SemGroup's White Cliffs Pipeline accepts Niobrara from 35-44° API and <0.4% sulphur.
	Tallgrass Energy's Pony Express Pipeline accepts Niobrara from 34-42° API and <0.42% sulphur.
Bakken Light Sweet (BLS)	Tallgrass Energy's Pony Express Pipeline accepts Bakken at Guernsey, Wyoming, from 40-46° API and <0.2% sulphur.
White Cliffs (WCC)	The grade is a blend of "Niobrara" and "DJ Common Grade Crude Petroleum" shipped on the White Cliffs Pipeline.

prompt month, providing the data needed to create a daily index of value that can be used in mark-to-market accounting, cash flow projections, risk management and other functions.

Quality drives price

Differences in quality have been the main driver in price differences among the three new Cushing grades. Other factors affecting the price differentials include supply and demand fundamentals involving production in North Dakota, Colorado and Wyoming, blending needs at Cushing, and regional refinery utilization rates. Pipeline policies have helped to define the grades by quality.

Production history and outlook

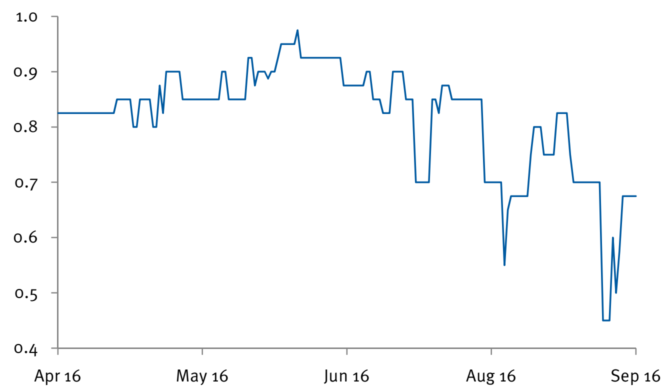
In spite of declining rig counts and production rates from the regions that produce Bakken, Niobrara and White Cliffs crude, the long-term outlook for production from these areas is robust. Producers have reported operating costs per well falling to about half of 2013 costs, and many of these producers have indicated to investors that these lower costs, when paired with some expected rise in international crude prices, will open opportunities for increased production in 2017 and beyond.

The fall of international crude prices from mid-2014 has blunted the output growth trend and led to some declines. But volumes of these grades traded on a spot basis at Cushing have increased even as overall produced volumes have fallen. And rig rates in both the Bakken and Niobrara regions have recently ticked upward. The new production achieved per rig has increased steadily. Given new pipeline connections to Cushing, a resumption of production growth should translate into rising volumes of spot trade in these grades at the Cushing market center.

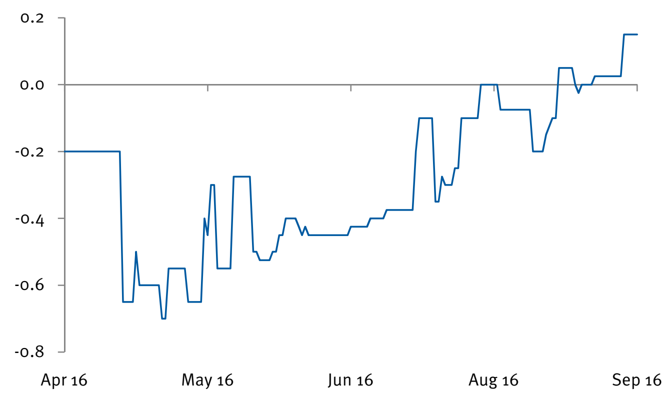
Recent price differentials vs WTI Cushing

(reflect deals done and bids/offers reported to Argus; WTI = 0)

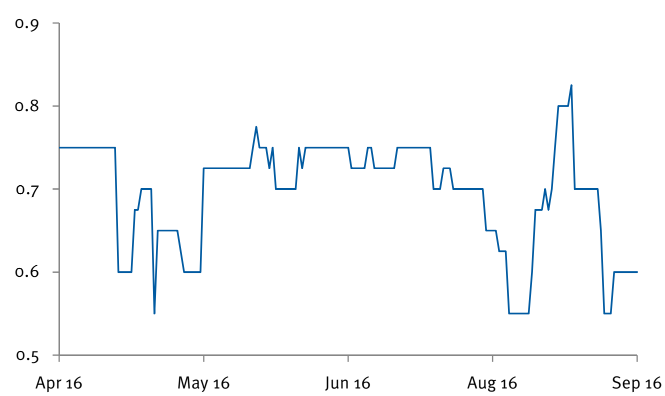
Niobrara Cushing ***$/bl***



White Cliffs Cushing ***$/bl***



Bakken Cushing ***$/bl***



Argus methodology

Argus Bakken Light Sweet, Niobrara and White Cliffs at Cushing trade and are assessed at differentials to the WTI Cushing benchmark, and physical contracts roll forward in line with the US crude pipeline schedule. Argus assessments for these grades will be volume-weighted averages of all deals done throughout the 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 for each grade. This entire-day volume-weighted average methodology is the same approach used for other US pipeline crudes, including the WTI Midland, LLS, ASCI and Mars 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

Argus WTI Houston vs. WTI Trade Month 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

Argus WTI CMA Trade Month 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