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U.S. Q1 REFINING MARGINS FLAT QUARTER-TO-QUARTER

Special Topic: Gas-to-Liquids – Ready for "Prime Time"?

Houston, May 8, 2014

Baker & O'Brien, Inc.'s Q1 2014 release to *PRISM*[1] subscribers reflects a very modest quarter-to-quarter increase in average U.S. refining margins. The market conditions for the recent quarter were mixed, with generally narrower crude oil price differentials offset by higher refining crack spreads. Adverse weather conditions in the form of low temperatures and heavy snow accumulations in some markets brought challenges to the entire supply chain from crude deliveries to the gas pump.

PRISM Cash Margins vs. Previous Periods ($/Bbl.)

	14Q1 vs. 13Q4	14Q1 vs. 13Q1
PADD 1	0.16	-4.18
PADD 2	1.07	-9.92
PADD 3	0.07	0.34
PADD 4	-0.78	-5.95
PADD 5	-0.90	-6.08
U.S. Overall	**0.09**	**-3.54**

PADDs 1 and 3 exhibited slight margin improvements, while PADD 2 had a somewhat larger improvement. PADDs 4 and 5 experienced a decline in refining margins versus the previous quarter. Rising natural gas prices, which increased by over $1/MMBtu, were also a drag on refinery profitability.

Compared to Q1 of the previous year, margins declined considerably in all PADDs except for PADD 3. The margin decline was primarily due to a significant narrowing of the WTI-Brent price spread. PADD 3 bucked the trend, mostly due to a weakening crude oil price structure, evidenced by LLS trading at a discount of over $3/Bbl. to Brent, versus a premium to Brent in Q1 2013.

On a successive quarter-to-quarter basis, the WTI-to-Brent discount narrowed by slightly more than $2/Bbl. The more notable change was in the LLS-to-Brent discount which declined by almost $4.50/Bbl. from Q4 to Q1. While this decline negatively impacted cracking refineries in PADD 3, coking refineries realized an improvement in the LLS-Maya price differential (over $3/Bbl.) leading to higher margins for those refineries.

Key Refining Margin Metrics, $/Bbl.

	2014 April	2014 Q1	2013 Q4	2013 Annual	2012 Annual
WTI	102.01	**98.68**	97.42	97.93	94.16
LLS	104.15	**104.36**	100.98	107.31	111.72
Brent	107.68	**108.20**	109.29	108.62	111.58
LLS – Maya	10.78	**15.08**	11.65	9.94	12.14
USGC LLS 321*	18.23	**10.92**	9.38	10.63	9.81
USGC LLS 6321**	12.91	**7.12**	7.07	6.92	6.58
Chicago WTI 321***	22.98	**19.21**	12.42	22.83	29.24

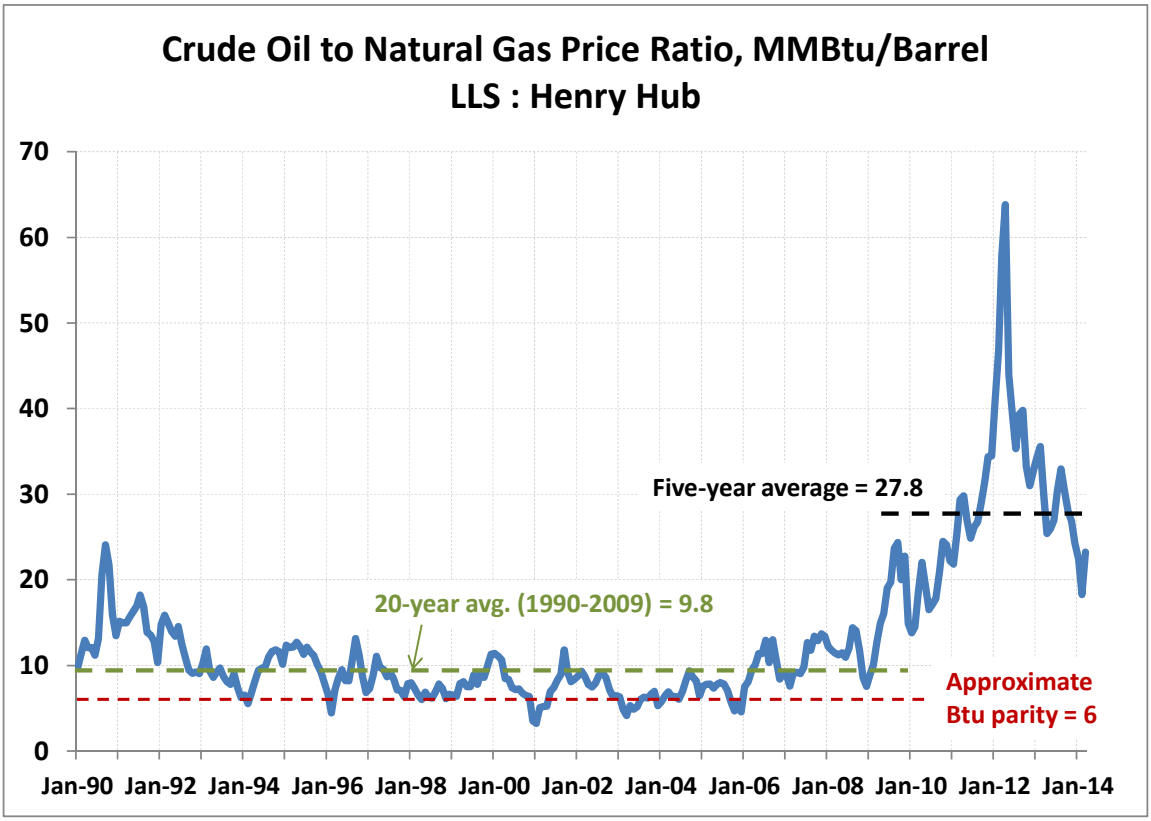
** LLS deemed conversion to 67% conventional 87R gasoline and 33% ULSD*
*** LLS deemed conversion to 50% conventional 87R gasoline, 33% ULSD and 17% Fuel Oil*
**** WTI deemed conversion to 33% conventional 87R gasoline, 33% RBOB and 33% ULSD*

[1] *PRISM*™ is Baker & O'Brien's refinery modeling and database system that includes operational and economic performance details for refineries in the U.S., Canada, Europe, and Asia.

Special Topic: Gas-to-Liquids – Ready for "Prime Time"?

In some parts of the world, such as Japan and Saudi Arabia, natural gas essentially competes directly with crude oil for power generation, and the prices for both fuels are generally at parity, on a heat-content basis. However, in the U.S., true head-to-head competition between oil and gas has become almost non-existent, as liquid fuels have been almost entirely eliminated from the U.S. power sector, most notably in recent power plant refueling/renovation projects in Florida.

On a heat content basis, the price of crude oil (on a dollar per barrel basis) should be approximately six times that of natural gas (on a dollar per million Btu basis). In practice, this theoretical ratio does not account for relative burner efficiencies, environmental impacts, and other factors that must be considered when burning oil. As shown in the chart below, for about 20 years preceding the U.S. shale gas boom, the ratio of oil to gas averaged about 10, about 60% above the Btu parity point. However, following advances in drilling technology, a surplus of gas has meant that, for the last five years, the ratio has averaged almost 28, and, at times, exceeded 40:1. Recently, gas has traded above $4/MMBtu, and the ratio has been in the range of 20 to 25.



The widening spread between oil and gas prices, and its persistence for about five years running, has prompted a number of initiatives to capture the economic benefit of "cheap gas," including usage as vehicle fuel (as both liquefied natural gas and compressed natural gas), calls for measureable reductions in coal-fired power generation, projects to export LNG, and gas-to-liquids (GTL) projects for direct use in fuel markets.

Given limited expectations for other avenues of surplus gas use (save, perhaps for LNG export projects, ethane crackers, and exports to Mexico), there is no doubt that the driving force for GTL in the U.S. is unprecedented. But, can GTL gain momentum? Is it finally ready for "prime time"? Actions by the two global GTL leaders, Shell and Sasol, suggest that the answer is "yes" and "no." Shell recently cancelled its mega-project (140,000 B/D) in Louisiana, but Sasol is in the midst of detailed engineering studies; however, the final investment decision on its 96,000 B/D plant (also in Louisiana) is not expected until 2016. Thus, it seems that the earliest that a large-scale GTL plant will be up and running is 2020 or later, *several years after* the first LNG export projects are expected to be operating.

The "lack of traction" gained by the megaprojects may well leave the door open to small-scale plants with a capacity of 5,000 B/D or less. These smaller plants have several attractive features: they are viewed as more "portable" (less of a large-scale commitment for gas supply and more applicable to "niche" situations); they are certainly "less intrusive" in the established markets for naphtha, diesel, and waxes (i.e., it is likely harder to capture the full value for 20,000 B/D of paraffinic naphtha, than it is for, say, 1,000 B/D); they require a much smaller capital outlay (reduced challenges for raising capital); and the timeline for implementation can be compressed. The table below summarizes some of the small-scale GTL projects already announced.

The main reasons for the lack of smaller "commercial-scale" GTL plants include the following: (1) the low liquid yield of the GTL products when compared to the amount of feed gas consumed (thermal efficiency); (2) the high capital cost per barrel; and (3) the availability and maturity of the underlying technology (of course, uncertainty about the long-term oil to gas price spread is always potentially the primary factor that delays decisions).

Until the first commercial-scale plant is built, commissioned, and operating successfully, nobody can be sure if and when these challenges faced by the small-scale technology developers are going to be conquered. However, with over 40 claimed technology developers in the U.S. alone, and many more in the rest of the world, it will be survival of the fittest. Until then, prime time may have to wait.

Active Small-Scale GTL Projects

Announced	Partner(s)	Location	Technology	Capacity (B/D)	Completion Date
Sep-12	Calumet Specialty Products Partners	Karns City, PA	Velocys	1,000	2014
Mar-13	Marcellus GTL	Duncansville, PA	---	2,000	2015
Mar-14	Juniper GTL	Westlake, LA	SGC Energia	1,000	2015
Sep-13	Pinto Energy	Ashtabula, OH	Velocys	2,800	2016
Feb-13	EmberClear GTL MS Inc.	Natchez, MS	---	14,000	2017
Feb-13	EmberClear GTL	Newtown, PA	---	14,000	2017
Mar-14	Republic of Kazakhstan	Kazakhstan	CompactGTL	3,000	2017
Jan-13	G2X Energy	Lake Charles, LA	Exxon	12,500	2017
Mar-14	JV (Waste Mgmt; NRG; Ventech; Velocys)	Oklahoma City, OK	Velocys	N/A	N/A

About Baker & O'Brien

Baker & O'Brien is an independent professional consulting firm specializing in technology, economics, and management practice for the international oil, gas, chemical, and related industries. With offices in Dallas, Houston, and London, the firm focuses primarily on the downstream industry and assists clients with strategic studies, mergers and acquisitions, and technology evaluations. The firm also provides expert services to support insurance claims, investigate operating incidents, and support a wide range of commercial disputes in the energy industry.

About PRISM

Baker & O'Brien's *PRISM* software is used to perform detailed analysis of individual refineries and the refining value chain from crude oil load port to products truck rack. The system combines a large historical database with a robust refinery simulator to provide analytical support to competitive assessments, strategic planning, crude oil valuation, and delivered cost of supply. The *PRISM* database currently includes operational and economic performance details for all refineries in the U.S. and Canada, most refineries in Europe, and over 50 refineries in the Asia Pacific region. The *PRISM* system is available for license and is used in consulting assignments for Baker & O'Brien clients.

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