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I N C O R P O R A T E D

Q2 2019: U.S. Refining Margins Bounce Back

Special Topic: Could Philadelphia Energy Solutions (PES) come back as just Point Breeze refinery?

Houston, August 5, 2019

Baker & O'Brien, Inc.'s 19Q2 *PRISM*¹ update showed a substantial increase in U.S. refining cash margins compared to the prior quarter. All PADDs showed increases versus the first quarter, with the biggest increases coming in PADDs 4 and 5.

Much of the quarterly improvement in margins can be attributed to increases in gasoline cracks. Gasoline prices were up over 20% in the second quarter compared to the first quarter while crude prices were up less than 10% during this time period. Compared to a year ago, refining margins were mixed, showing improvements in PADDs 2 and 5 while PADDs 1, 3, and 4 were lower.

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

| | <u>19Q2 vs. 19Q1</u> | <u>19Q2 vs. 18Q2</u> |
|---------------------|----------------------|----------------------|
| PADD 1 | 3.82 | -0.45 |
| PADD 2 | 5.50 | 1.61 |
| PADD 3 | 3.24 | -1.93 |
| PADD 4 | 9.95 | -1.34 |
| PADD 5 | 7.11 | 3.78 |
| U.S. Overall | 4.47 | -0.25 |

EIA data indicated a 5.8% increase in gasoline consumption compared to the prior quarter and a 0.1% increase

compared to 18Q2. The higher gasoline demand has translated into higher 321 crack spreads for both the U.S. Gulf Coast and Midcontinent with those spreads almost doubling compared to the previous quarter. While the LLS – Maya price differential improved from the previous quarter, it still remains lower than in 2017 and 2018. This continues to be a challenge for U.S. Gulf Coast coking refineries.

Key Refining Margin Metrics, \$/Bbl.

| | <u>2019</u> | <u>2019</u> | <u>2019</u> | <u>2018</u> | <u>2017</u> |
|--------------------|-------------|--------------|-------------|---------------|---------------|
| | <u>June</u> | <u>Q2</u> | <u>Q1</u> | <u>Annual</u> | <u>Annual</u> |
| WTI | 54.67 | 59.81 | 54.86 | 64.92 | 50.87 |
| LLS | 61.29 | 66.94 | 62.37 | 69.96 | 54.11 |
| Brent | 64.09 | 68.85 | 63.17 | 71.06 | 54.26 |
| LLS – Maya | 2.53 | 5.07 | 3.81 | 7.49 | 7.01 |
| USGC LLS 321* | 11.44 | 12.19 | 6.38 | 11.29 | 13.34 |
| USGC LLS 6321** | 8.75 | 9.34 | 5.72 | 8.27 | 9.86 |
| Chicago WTI 321*** | 22.28 | 24.70 | 12.93 | 17.40 | 17.71 |

* 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*TM 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: Could Philadelphia Energy Solutions (PES) come back as just Point Breeze refinery?

Philadelphia Energy Solutions (PES) announced on June 26, 2019, that it was shutting down its 335 MB/D refinery in Philadelphia, PA. This announcement came just five days after a major fire destroyed a portion of the refinery. This turned out to be the last straw for the facility that has been struggling financially for many years. Baker & O'Brien released an article on [June 30, 2019](https://www.bakerobrien.com/news/Baker_and_O'Brien_Authors_Article_on_the_Shutdown_of_the_Philadelphia_Energy_Solutions_Refinery/),² discussing the potential fuel supply impacts to the Northeast from a closure of the refinery. Considering the refinery was a combination of two facilities (Point Breeze and Girard Point - shown in the map to the left in Figure 1), what would the product yield slate potentially look like in a hypothetical world where the refinery restarted with only the Point Breeze facility?

The initial refining facility at Point Breeze was constructed in 1870 by Atlantic Refining Company, while the Girard Point facility was constructed in the 1920s by Gulf Oil. Over the years, the facilities were modernized and expanded. Ownership changed hands several times, with the two facilities integrating in 1995 under the Sunoco banner. Sunoco, now a subsidiary of Energy Transfer, reportedly contemplated closure of the refinery in 2012 but subsequently formed a joint venture (JV), called Philadelphia Energy Solutions, with The Carlyle Group. After a bankruptcy restructuring in 2018, Credit Suisse Asset Management and Bardin Hill became majority shareholders in the partnership, leaving The Carlyle Group/Energy Transfer JV with a minority stake.

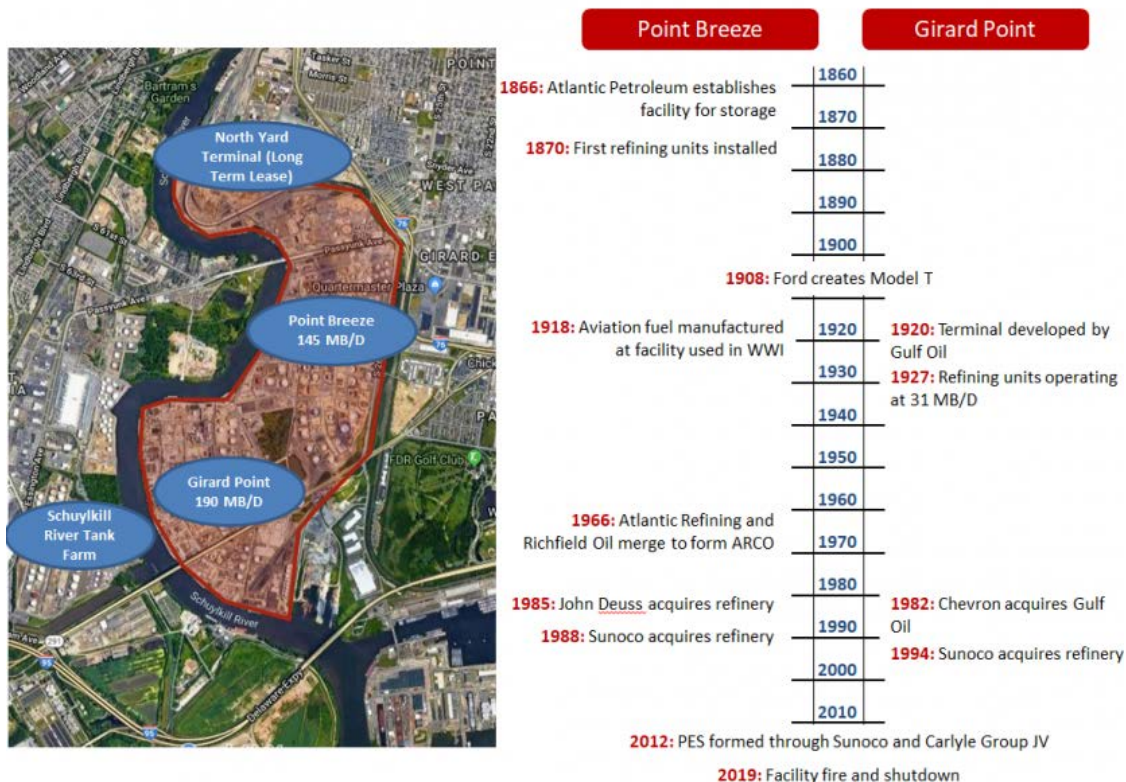


Figure 1. PES Refinery Facilities and Timeline
Sources: PES, Google Maps, and Baker & O'Brien

² "Market Impacts of Philadelphia Energy Solutions' Refinery Shutdown," June 30, 2019, https://www.bakerobrien.com/news/Baker_and_O'Brien_Authors_Article_on_the_Shutdown_of_the_Philadelphia_Energy_Solutions_Refinery/

PES is the latest in a long line of refinery closures directly affecting the Northeast market over the past decade. During this time, more than 800 MB/D of refining capacity has been removed, as plotted in Figure 2 below, including the closure of PES (pink layer to the upper-right). (*The Hess Port Reading refinery’s production capacity has been used in place of its crude capacity.) Note that two of the facilities, which were closed in this timeframe - Valero’s Delaware City and Phillips 66’s Trainer refineries (blue- and pink-striped layers, respectively) - were subsequently restarted under new ownership. In addition to the local shutdowns, other key Northeast refined-product suppliers located outside of the region have also shut down in this time period. These refineries include Hovensa St. Croix and Valero Aruba (both reportedly restarting under new ownership) and Imperial Dartmouth in Nova Scotia.

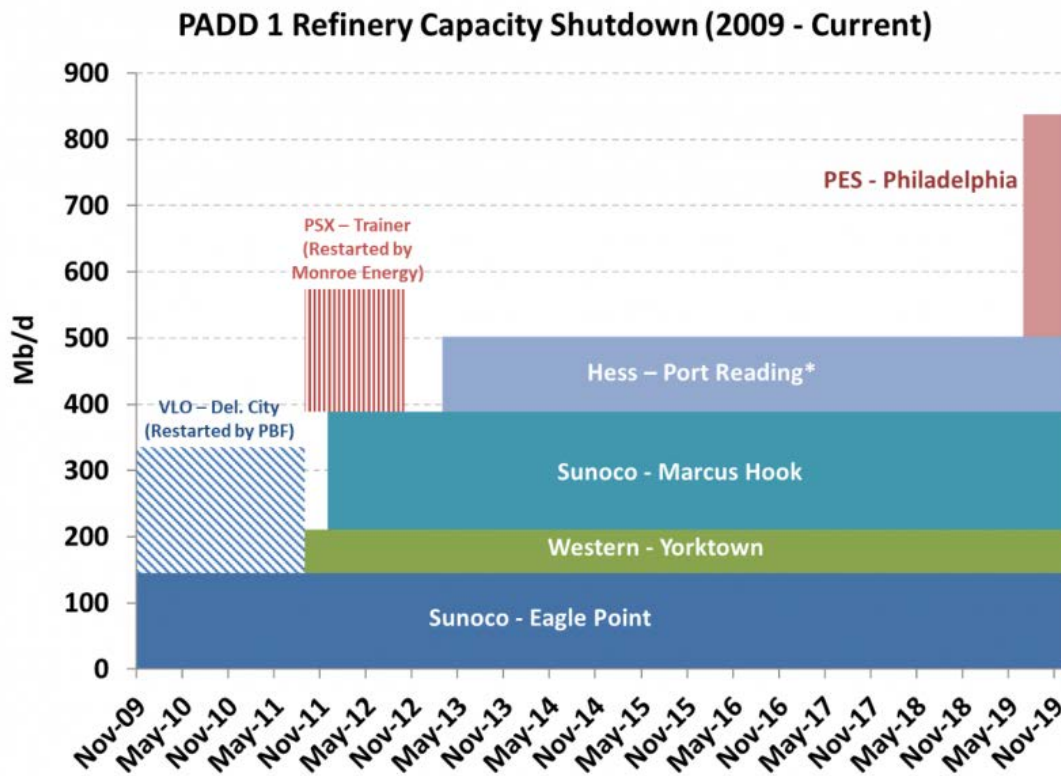


Figure 2. Refining Capacity Closed in PADD 1
Sources: Energy Information Administration and Baker & O’Brien

After the shutdown announcement, there has been speculation as to whether PES could restart the Point Breeze portion of the facility while continuing with the full closure of Girard Point. This would likely involve some capital investment to isolate the facility but, given that the refineries were once operated as stand-alone facilities, it could be possible to do so. However, a more pertinent question is would it be economically viable?

To get an idea of what a Point Breeze facility cash margins might look like, we used *PRISM*'s existing PES configuration and modified it by removing aspects from the Girard Point facility. The resulting model has a crude capacity of 145 MB/D versus 335 MB/D of the integrated site. The resulting crude slate should be similar although Girard Point is known to have processed slightly more acidic crudes, which could limit slate flexibility for Point Breeze. After configuring the model, Point Breeze can be compared to its peers to get an idea of the relative cash margins:

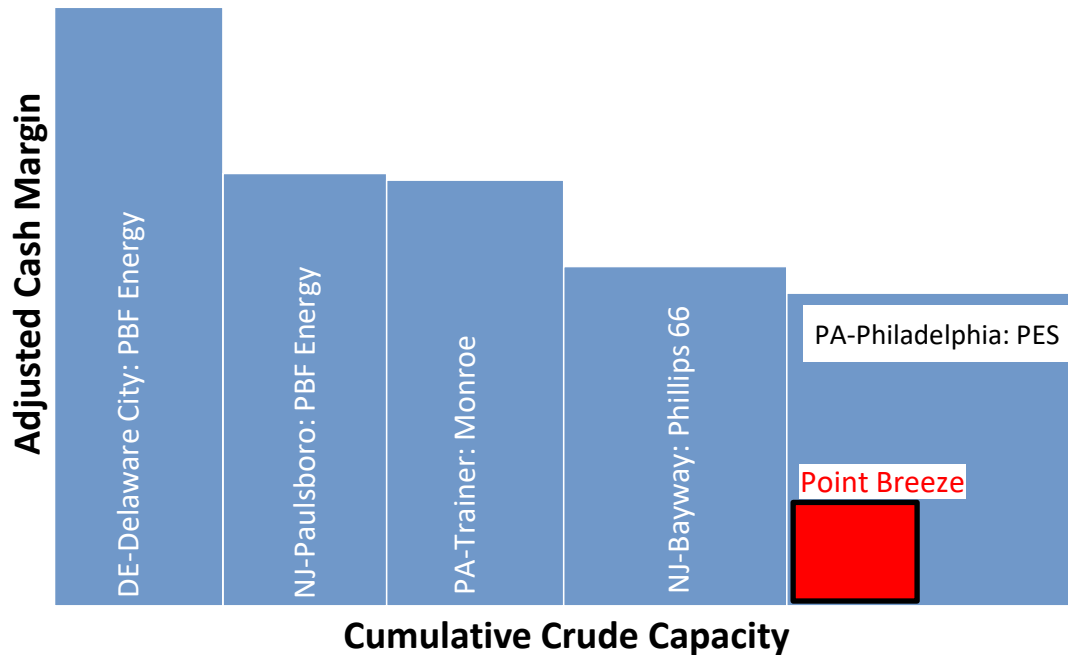


Figure 3. Adjusted 2018 Cash Margin in PADD 1B
 Source: *PRISM*

This analysis suggests that Point Breeze by itself may not present an attractive economic case for restart. Further analysis would be required but, using 2018 pricing conditions and our assumptions on configuration, the cash margin of a Point Breeze facility would have been less than half of the integrated PES complex. This is primarily due to a number of challenging intermediate streams, which translate to product downgrades and, hence, a degraded economic performance. Use of certain units at the Girard Point facility might yield a more viable option, assuming the units are undamaged and could be reintegrated for a reasonable capital cost.

On the upside for the refinery, PADD 1 is now even shorter on refined products. This should increase regional crack spreads. With Colonial Pipeline capacity constrained, the upper PADD 1 regions will be forced to increase imports. This would certainly improve the economics of a standalone facility but may not be enough to justify resumed operation.

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 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.

Contact: Amy Kalt
(832) 358-1453
amy.kalt@bakerobrien.com