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ANOTHER ONE BITES THE DUST - MARKET IMPACTS OF PHILADELPHIA ENERGY SOLUTIONS' REFINERY SHUTDOWN

June 30, 2019

Philadelphia Energy Solutions (PES) announced last week (on June 26) 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, which turned out to be the last straw for the facility that has been struggling financially for many years. Today, we consider the various market impacts that will likely follow the closure of the PES refinery, including its effect on fuel supply, where the closure leaves refinery production capacity in the region and how the refined product supply will need to adjust in response.

The PES refinery, which has a long history in the Philadelphia region, is currently made up of two adjacent facilities located at Point Breeze and Girard Point (shown in the map to the left in Figure 1). 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 have been modernized and expanded, and ownership has changed hands several times, as shown in the timeline to the right in Figure 1, 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) with The Carlyle Group called Philadelphia Energy Solutions, or PES. 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.

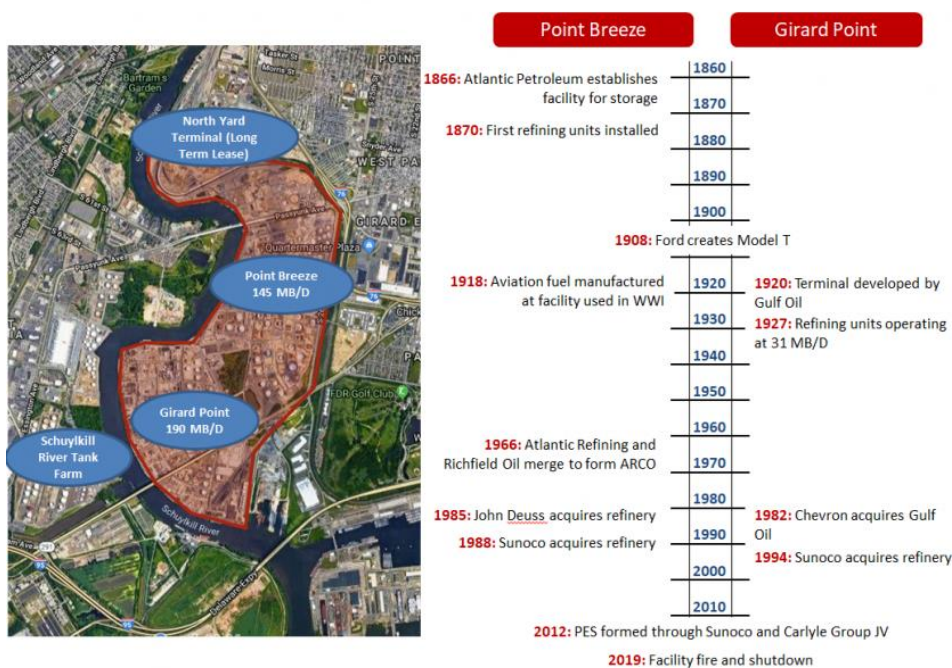


Figure 1. PES Refinery Facilities and Timeline. Sources: PES, Google Maps, Baker & O'Brien



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On June 21, 2019, an explosion and fire was reported in the hydrofluoric (HF) alkylation unit at Girard Point, which led to an unplanned shutdown of the facility. Fortunately, there were no major injuries. Alkylate is a premium gasoline blendstock, which is highly valuable to a refinery due to its high octane level, low sulfur content, and low Reid Vapor Pressure (RVP). While fires can occasionally occur at refineries, this incident apparently caused significant damage to the alkylation unit and ultimately forced the entire facility to shut down. Whether the incident caused damage to other process units or infrastructure at the refinery — or whether it was more of a containment problem for alkylation feedstock — is not known at this time.

The fire in the alkylation unit provides evidence of just how important every process unit is in a refinery. Refineries function as a system, and without key process units and logistics in place, an interruption on one process unit can cause major ramifications to other processes that are dependent on that unit. In the case of the PES alkylation unit, it causes a reaction between volatile pressurized liquids isobutane and butylene (“mixed C4 streams”; note some refineries also use propylene feed) to make the premium gasoline blendstock, alkylate. Isobutane and butylene are both contained within mixed C4 streams produced inside the refinery by process units that crack molecules, such as fluid catalytic crackers (FCCs), cokers, hydrocrackers, etc.; these components are individually worth much less than gasoline. Without an alkylation unit, PES would be forced to either sell these mixed C4 streams at a significant loss or perhaps reduce refinery throughput due to limited storage capacity. In other words, those streams must go somewhere and without the logistics in place, the operation of the refinery is compromised.

Estimates from Baker & O’Brien’s *PRISM*TM modeling system show that, under normal operation, the entire gasoline pool at PES was composed of about 15% alkylate. Without alkylate, and assuming no other process units were damaged in the fire, the amount of on-spec gasoline that the facility is able to manufacture would be restricted. Typically, such an incident would result in a shorter-term shutdown to repair and rebuild the unit. However, in the case of PES, which was already experiencing financial distress, this doesn’t appear to have been an option — even without the fire, a permanent shutdown was likely in its future. Since gasoline generates roughly half of the refinery’s revenue, the loss of alkylate coupled with the cost of rebuilding the facility would, in any event, be a severe financial penalty for the refinery. However, in this case, the event compounded the financial woes already being experienced.

PES is the latest in a long line of refinery closures along the Northeast over the last decade. The Petroleum Administration for Defense District (PADD) 1 market can be a challenging place to operate a refinery due to: (1) a lack of pipeline access to domestic crude oil supply (U.S. production can only move there via rail or Jones Act vessel), resulting in a heavy reliance on imported crude oils); (2) higher operating costs; and (3) competition for market share from Gulf Coast refiners via the Colonial Pipeline. On the flip side, Northeast consumers benefit from a local source of refined products, particularly when constraints hit other supply sources (such as hurricanes in the Gulf of Mexico).

In the past 10 years, more than 800 Mb/d of refining capacity has been removed from the Northeast market, 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 that were closed in this timeframe — Valero’s Delaware City and Phillips 66’s Trainer refineries (blue- and pink-striped layers, respectively) — were subsequently



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restarted. In addition to these, other key Northeast refined-product suppliers located outside of the region also have shut down in this time period. These include Hovensa St. Croix and Valero Aruba (both in the Caribbean, and both reportedly restarting under new ownership,) and Imperial Dartmouth in Nova Scotia.

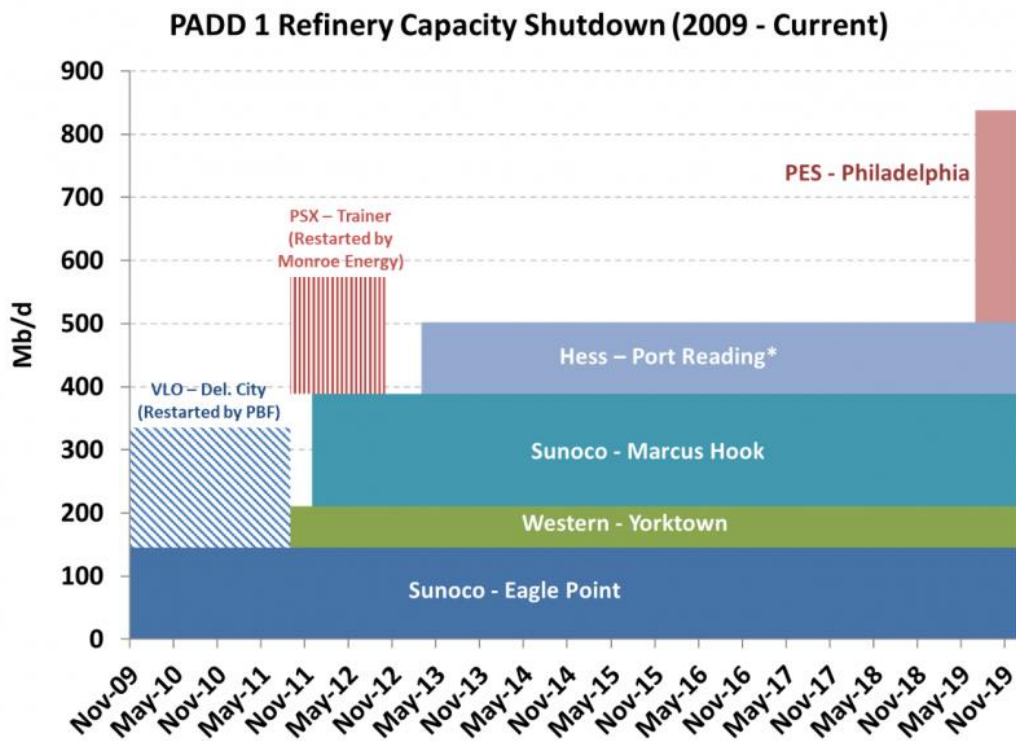


Figure 2. Refining Capacity Closed in PADD 1. Sources: Energy Information Administration and Baker & O'Brien

With PES shutting down, Baker & O'Brien estimates that 150 Mb/d of locally produced gasoline and 117 Mb/d of distillates (diesel and jet fuel), among other products, will no longer be available to the regional market. So how much production capacity remains in PADD 1? Figure 3 shows the remaining refineries (blue icons and rectangles) and the related pipelines in relation to the now-closed PES refinery (gray icon and rectangle):

- PBF Energy operates a 190-Mb/d refinery in Delaware City, DE. The refinery was acquired in March 2010 from Valero, which had previously shut down the refinery in November 2009. After a period of maintenance and modifications, the refinery was restarted by PBF in June 2011.
- PBF also operates a 185-Mb/d refinery in Paulsboro, NJ. The refinery was acquired in late 2010 from Valero and, unlike the Delaware City facility, was still operating at the time of purchase.
- Phillips 66 (P66) operates the 258-Mb/d Bayway refinery in Linden, NJ.
- Monroe Energy, a subsidiary of Delta Air Lines, operates a 185-Mb/d refinery in Trainer, PA. The refinery was acquired in June 2012 from Phillips 66, who had previously shut down the refinery in September 2011; it was restarted in September 2012 by Monroe.



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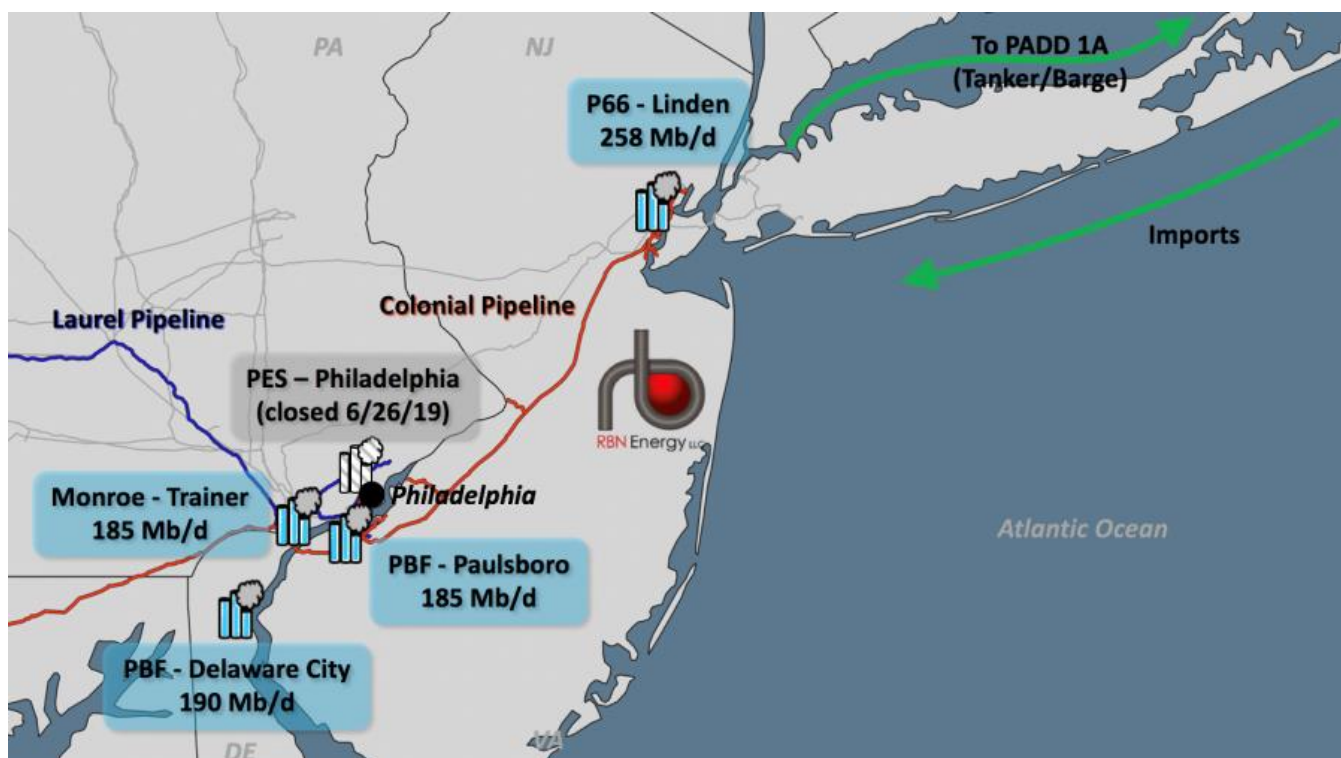


Figure 3. Remaining Refineries and Related Infrastructure in PADD 1. Sources: RBN, EIA and Baker & O'Brien

This set of Northeast refineries — even when it included PES — produce only a small portion of the gasoline and diesel needed to meet PADD 1 demand. The black bar segments across the bottom of the three charts in Figure 4 shows the gasoline, diesel and jet fuel produced by the Northeast refineries, while the red bar segments shows net deliveries of each refined product from PADD 3 (Gulf Coast), primarily via Colonial Pipeline (red line in Figure 3), the green bar segments show volumes delivered into PADD 1 from PADD 2 (Midwest), and the purple bar segments show waterborne imports. The black line across the top of each chart shows PADD 1 consumption. With Colonial Pipeline seasonally at full capacity, it will be difficult for that system to push more barrels from the Gulf Coast via pipeline into the Northeast market. Therefore, imports will have to increase to balance the demand requirement. The closure of PES could also affect the ongoing effort by Buckeye Partners to make bidirectional the western Pennsylvania portion of the Laurel Pipeline (blue line in the map above), which now flows west, to facilitate movements of gasoline and diesel from the Midwest into the Northeast market.



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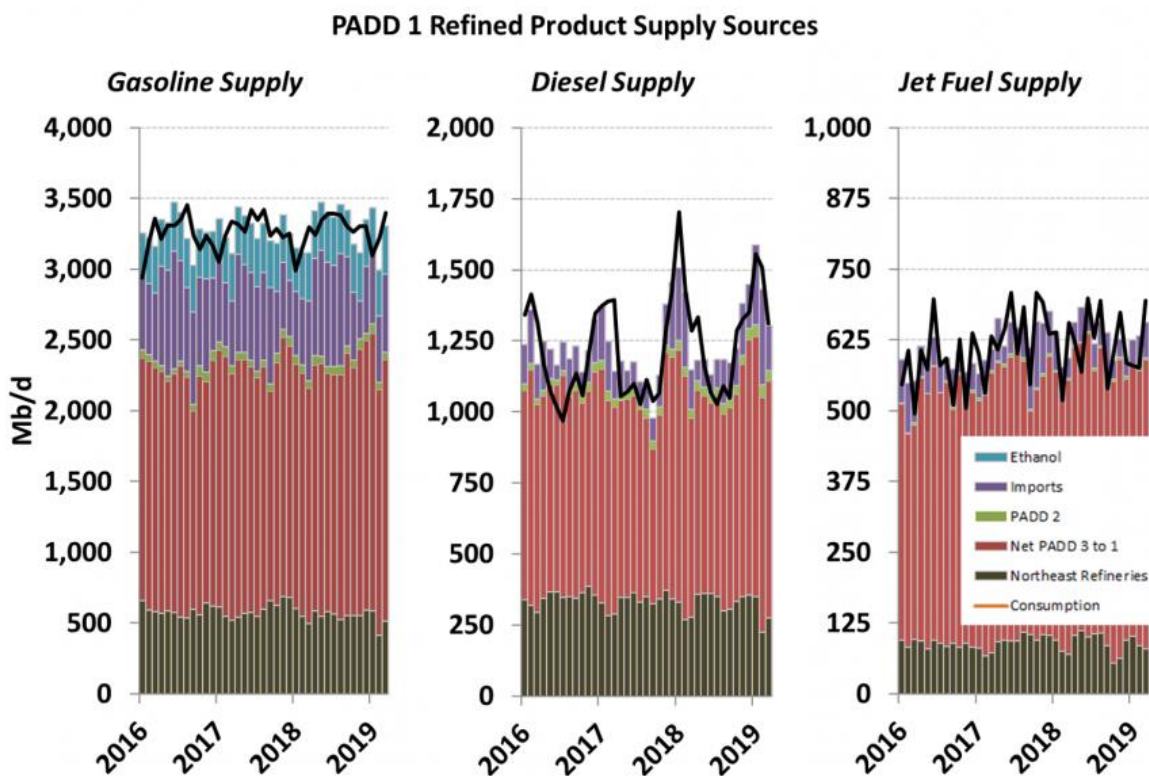


Figure 4. PADD 1 Refined Product Supply Sources. Sources: EIA and Baker & O'Brien Analysis

Reduced local supply in the Northeast market has already had an immediate price effect, with New York Harbor (NYH) prices strengthening compared to other markets. We expect that Northeast prices will have to remain more robust on average to attract additional supplies and/or refining runs, which will benefit the remaining refiners in the region.

The closure of PES represents the end of an era for the 150-year old facility. But in the context of the Northeast refining market, it's yet another symptom of the challenging dynamics for refiners in the region. As for the remaining facilities in PADD 1, access to cheaper domestic or Canadian crude oil supply would certainly help refiners potentially survive additional headwinds that may come their way — we'll leave that thought for another day.

Note: The article was authored by Amy Kalt of Baker & O'Brien and published on RBN Energy's Daily Energy Post on June 30, 2019.

"Another One Bites the Dust" was written by Queen bassist John Deacon, and appears as the third cut on side one of Queen's eighth studio album, The Game. It was the fourth single released from the album in August 1980, and went to #1 on the Billboard Hot 100, #2 on the Hot Soul Singles, and #2 on the Disco Top 100 charts.

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