Potential Transportation Fuel Supply and Price Impacts of HF Ban

Proposed Rule 1410
Working Group Meeting #6

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Presentation Topics

• Refinery assets – portion of larger portfolio
• Capital for refining projects
• Investment decision guidance & approved projects
• Likelihood of alkylation replacement
• Implications for regional supply, fuel prices, competition, and contingency planning
Refinery Assets
Valero and PBF combined domestic refining assets represent 16.5 percent of U.S. crude oil processing capacity as of January 1, 2017:
- 18.7 percent catalytic cracking
- 18.5 percent alkylation

Valero Energy operates 15 refineries in the U.S., Canada and United Kingdom:
- 2.63 million barrels per day crude processing capacity according to Energy Information Administration (EIA) and Oil & Gas Journal (O&GJ)

PBF Energy operates 5 refineries in the United States:
- 0.84 million barrels per day crude processing capacity according to EIA
Catalytic cracking and alkylation processing units are primary sources of gasoline blending components.

Sources: EIA and O&GJ.
Southern California refineries represent a minority of the companies’ respective portfolio capacities.

Sources: EIA and O&GJ.
Capital for Refining Projects
Majority of capital expenditures for U.S. projects go to upstream activities
  • 79.3 percent in 2015, 61.5 percent in 2016 & 76.2 percent for 2017

Only a small portion usually goes towards refining and marketing projects
  • 7.3 percent in 2015, 9.1 percent in 2016 & 8.3 percent for 2017
Investment Decisions & Approved Projects
Capital Approval for Projects

- Refining companies have specific guidance for capital expenditures
  - Non-discretionary (Maintenance & dividends)
  - Discretionary (Projects, acquisitions & stock buy-backs)
  - Limits of total capital expenditures (CAPEX)

Valero Energy

Growth Capex

- 25% IRR hurdle rate for refining projects
- Lower hurdle rate for steady cash flow midstream projects

Recent Valero Discretionary Projects & IRRs

• Meraux refinery hydrocracker conversion
  – $260 million, 25 percent unlevered IRR at 2014 prices
  – Operational December 2014

• McKee refinery diesel recovery improvement and crude unit expansion
  – $160 million, 45 percent unlevered IRR at 2014 prices
  – Completed in 2015

• Corpus Christi and Houston refinery light topping expansion projects to handle greater quantities of lighter crude oils – 160 KBD additional processing capacity
  – $750 million, 50 percent unlevered IRR at 2014 prices
  – Corpus Christi work completed in 2015
Likelihood of Alkylation Replacement
Alkylation Replacement Costs

• If an HF ban were compelled it is unlikely either or both companies would elect to make such changes to their facilities
  – Alkylation process unit projects are extremely expensive
    • A recent project approved for the Valero Houston refinery is estimated to cost $300 million for an alkylation unit with a capacity of 13,000 barrel per calendar day
    • Capacity of the alkylation units at Valero Wilmington and PBF Torrance are 22,000 and 24,200 barrels per day capacity, respectively
    • These alkylation unit capacities are each nearly twice the capacity, meaning the potential costs for such projects at the two California refineries could, at a minimum, easily approach or exceed $500 million *per facility* – excludes spent acid regeneration
    • Burns & McDonnell estimated $600 million for Torrance facility, additional $300 for spent acid regeneration capacity
  – These estimated costs for such a replacement project could be near or exceeding the value of the refinery when one considers that ExxonMobil sold the entire Torrance refinery to PBF Energy for $537.5 million
Capital & Business Logic

• You own a mid-size car with financing payments for another three years
  – Would a bank loan you money to replace your working transmission that amounted to a sum greater than the value of your vehicle? – Probably not

• You own a 3 bedroom home with 20 years remaining on your mortgage
  – Would a mortgage company loan you money to replace your working HVAC system that amounted to a sum greater than the assessed value of your home? – Probably not

• You own a complex refinery in Southern California
  – Would a board of directors agree to commit discretionary capital to replace your working alkylation process unit that amounted to a sum greater than the resale value of your entire refinery and had a negative IRR? – Probably not
Likelihood of Alkylation Replacement

• It goes against sound business principles that the Valero and PBF board of directors would agree to spend an amount of capital on two refinery assets that would be greater than the valuation of the facilities and would incur a negative IRR

• Conclusion – if the HF ban is approved, the two Southern California refineries would likely cease operations some time prior to the effective deadline

• Therefore the particulars regarding the amount of time necessary to obtain all permits, complete engineering, demolish the existing alkylation units, and construct the new process units would be less relevant
Refinery Closure Implications – Regional Supply
Western States More Isolated than Rest of U.S.

West Coast petroleum product supply map

California Energy Commission

Source: U.S. Energy Information Administration.
California Fuels Market - Isolated

- California’s market is nearly self-sufficient, so supplies of gasoline and diesel fuel from outside of California are not routinely needed to balance out supply with demand
  - Imports of gasoline and blending components account for only 3 to 6 percent of supply
- The California market is geographically isolated from other locations in the United States that produce refined products
- Pipelines connect California refining centers to distribution terminals in Nevada and Arizona, but these pipelines only operate in one direction – sending gasoline and other transportation fuels to these neighboring states
- California market is isolated by time and distance from alternative sources of re-supply during unplanned refinery outages
Balance of Other Regions Varies

- U.S. Gulf Coast (PADD 3) large net **exporting** region
  - During 2014, region consumed an average of 2.5 million barrels per day (b/d) of transportation fuels yet produced 7.5 million b/d
- U.S. East Coast (PADD 1) large net **importing** region
  - During 2014, region consumed an average of 4.9 million b/d of transportation fuels but only produced 1.0 million b/d, representing 20 percent of the region’s supply
Gasolines Flows – Southern California

- Net importer via marine
- Usually close to balance
- Foreign imports when needed & economic
- Domestic imports rare
- Imports from N. Calif. normal portion of their supply – volumes fluctuate based on refinery outages
- Pipeline exports to NV & AZ
  - 5 times N. Calif. volumes
- Foreign exports minimal
- Domestic exports eliminated
- Exports to N. Calif. rare – volumes fluctuate based on refinery outages

Source: California Energy Commission
Diesel Flows – Southern California

- Large net exporter
- Foreign imports when needed & economic
- Domestic imports rare
- Imports from N. Calif. Related to refinery outages
- Pipeline exports to NV & AZ
  - 3 times N. Calif. volumes
- Foreign exports declined
- Domestic exports eliminated
- Exports to N. Calif. rare – volumes fluctuate based on refinery outages

Pipeline Exports out of Southern California averaged roughly 1.8 million barrels per month over the entire time period. Diesel pipeline exports appear to be decreasing from a rough average of 2 million barrels in 2007 to 1.5 million in 2016.
Loss of Refining Capacity Impacts Markets – Historical Example

- The Torrance ESP explosion and subsequent inability of ExxonMobil to operate their primary gasoline-producing process equipment for 17 months necessitated a rebalancing of the transportation fuels market for West Coast
  - Decreased local supply had to be replaced by combination of increased imports from outside the region and decreased shipments to Nevada and Arizona

<table>
<thead>
<tr>
<th>Demand (MBPD)</th>
<th>2014</th>
<th>2015</th>
<th>Change</th>
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<tr>
<td>Domestic</td>
<td>1543</td>
<td>1575</td>
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<tr>
<td>Export</td>
<td>55</td>
<td>42</td>
<td>(13)</td>
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<tr>
<td>Total</td>
<td>1598</td>
<td>1617</td>
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<table>
<thead>
<tr>
<th>Supply (MBPD)</th>
<th>2014</th>
<th>2015</th>
<th>Change</th>
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<td>Production</td>
<td>1410</td>
<td>1345</td>
<td>(65)</td>
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<tr>
<td>From PADD 3</td>
<td>130</td>
<td>145</td>
<td>15</td>
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<tr>
<td>From PADD 4</td>
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<td>50</td>
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<tr>
<td>Inventory</td>
<td>(4)</td>
<td>15</td>
<td>19</td>
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<tr>
<td>Imports</td>
<td>21</td>
<td>62</td>
<td>41</td>
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<tr>
<td>Total</td>
<td>1598</td>
<td>1617</td>
<td>19</td>
</tr>
</tbody>
</table>

Source: Energy Information Administration.
Gasoline Market – ESP Explosion

- 2015 vs. 2014 Changes March thru December
  - Marine imports jump
    - Foreign imports increased by 14.1 million barrels or 46.1 KBD
    - Washington imports increased by 1.4 million barrels or 4.5 KBD
    - N. Cal. transfers increased by 2.5 million barrels or 8.3 KBD
  - Pipeline exports decline
    - Arizona exports declined by 1.2 million barrels or 4.1 KBD
    - Las Vegas exports dropped by 1.4 million barrels or 4.4 KBD

Source: California Energy Commission
Regional Supply Impacts – Valero & PBF Refinery Closures

Stillwater Associates performed a detailed assessment

Supply impacts of two refineries being closed down expected to be greater in magnitude, of longer duration, and higher in costs to motorists and truckers than those resulting from the temporary loss of gasoline production capability at Torrance refinery following the ESP explosion on 2/18/15

<table>
<thead>
<tr>
<th></th>
<th>Thousand Barrels/Day</th>
<th>Base</th>
<th>Refinery Shutdown</th>
<th>Net Change</th>
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<tr>
<td><strong>Refinery Input</strong></td>
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<tr>
<td>Crude - Domestic</td>
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<td>0</td>
<td>(140)</td>
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<tr>
<td>Crude - Foreign</td>
<td>60</td>
<td>0</td>
<td>(60)</td>
<td></td>
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<tr>
<td>Imported FCC Feed</td>
<td>32</td>
<td>0</td>
<td>(32)</td>
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<tr>
<td>Imported Alkylate</td>
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<td>0</td>
<td>(1)</td>
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<tr>
<td>LPG/Other</td>
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<td>0</td>
<td>(17)</td>
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<tr>
<td><strong>Total Input</strong></td>
<td>250</td>
<td>0</td>
<td>(250)</td>
<td></td>
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<tr>
<td><strong>Refinery Production</strong></td>
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<td></td>
<td></td>
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<tr>
<td>Ally Feed</td>
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<td>0</td>
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<td></td>
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<tr>
<td>Gasoline</td>
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<td>(153)</td>
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<tr>
<td>Jet Fuel</td>
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<td>(26)</td>
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<tr>
<td>Diesel</td>
<td>46</td>
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<td>(46)</td>
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<td>LPG/Other</td>
<td>12</td>
<td>0</td>
<td>(12)</td>
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<tr>
<td><strong>Total Liquid Products</strong></td>
<td></td>
<td>237</td>
<td>0</td>
<td>(237)</td>
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<tr>
<td>Memo: Total G+J+D</td>
<td>225</td>
<td>0</td>
<td>(225)</td>
<td></td>
</tr>
</tbody>
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Source: Stillwater analysis
Refrinery Closure Implications – Fuel Prices
California Gasoline Price Changes
Retail, Rack and Refinery Wholesale

Refinery wholesale peaked July 10
Rack wholesale peaked July 13
Retail peaked July 16

Source: CEC analysis of AAA and OPIS prices.
HF Ban – Fuel Price Implications

• Permanent loss of process units primarily creating gasoline blending components (catalytic cracking & alkylation) would be 60.4 percent greater than the temporary loss associated with the Torrance outage
  – 207.9 KBD versus 129.6 KBD

• Incremental impacts on gasoline costs for consumers and businesses could be as bad or worse than those of experienced for the duration that the Torrance ESP was out of operation
  – Gasoline prices averaged 26 cents per gallon greater than normal for 17 months
  – Equates to incremental costs of $5.6 billion for motorists & businesses

• Closure of two refineries would also increase prices for diesel and jet fuel
Refinery Closure Implications – Competition
Crude Oil Processing Capacity - Statewide

- California crude oil processing capacity would be more concentrated by refinery ownership post closure of Valero Wilmington and PBF Torrance.

Current
- Portion operated by Andeavor, Chevron & P66 would rise from 69.8 to 79.9 percent of total.

Post Closures

Source: EIA. Units in barrels per day.
Southern California crude oil processing capacity would be more concentrated by refinery ownership post closure of Valero Wilmington and PBF Torrance.

Portion operated by Andeavor & Chevron would rise from 62.8 to 82.0 percent of total.
Gasoline-Related Process Capacity - Statewide

- California catalytic cracking & alkylation processing capacity would also be more concentrated by refinery ownership post closure of Valero Wilmington and PBF Torrance.

Portion operated by Andeavor, Chevron & P66 would rise from 59.0 to 75.8 percent of total.
Gasoline-Related Process Capacity – S. Calif.

- Southern California catalytic cracking & alkylation processing capacity would also be more concentrated by refinery ownership post closure of Valero Wilmington and PBF Torrance.

Portion operated by Andeavor & Chevron would rise from 49.9 to 80.2 percent of total.
Refinery Closure Implications – Contingency Planning
Refiners – Surge Production Capability

Northern California CARB Gasoline Production (with 5-Year High-Low Band)

SF Bay Area refineries react to supply shortfall & higher margins – consistently producing above the high-low historical range.

Source: California Energy Commission.

Data through December 25, 2015
Loss of Excess Refining Capacity

- Closure of two Southern California refineries will decrease statewide refining surge capacity.
- Ability of remaining Southern California refineries to ramp up refinery output will be greatly diminished as region transitions to a significant net importer of gasoline and other refined petroleum products.
  - Will decrease ability to send supplies to Northern California in response to:
    - Significant unplanned refinery outages.
    - Catastrophic earthquake in the greater San Francisco Bay Area.

S. Calif. – Gasoline Flows

California Energy Commission
Del Amo oil field in southern Torrance, circa 1938 – Daily Breeze.

Circa 2014 - LA-Curbed & Google Earth.