Implications of Increasing U.S. Crude Oil Production

By
John Powell
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U.S. crude oil production is up dramatically since 2010 and will continue to grow rapidly; this has implications for:

- Refinery operations
- Refinery investment
- Logistics infrastructure investment
- Exports of petroleum products
- Exports of crude oil
Increased U.S. crude oil production has resulted in:

- Declines in U.S. crude imports
- Changes to refinery operations
- Logistical constraints in moving crude from production areas to refining areas
- Discounted prices for domestic “landlocked” crude vs. international seaborne crude

<table>
<thead>
<tr>
<th>U.S. Crude Prices (dollars per barrel)</th>
<th>2008</th>
<th>2012</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>WTI crude (U.S.)</td>
<td>99.67</td>
<td>94.05</td>
<td>(5.62)</td>
</tr>
<tr>
<td>Brent Crude (International)</td>
<td>96.94</td>
<td>111.63</td>
<td>14.69</td>
</tr>
<tr>
<td>Difference</td>
<td>2.73</td>
<td>(17.58)</td>
<td>(20.31)</td>
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</tbody>
</table>
Crude import qualities have shifted as refiners replace imported crude with domestic production

Crude imports by quality
thousand barrels per day

Source: U.S. Energy Information Administration

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Refiners have increased processing of light sweet domestic tight oil by:

- Increasing crude runs to use any “unused” light sweet capacity
- Backing out imports of light sweet crude
- Blending different qualities of crude
- Depending on relative pricing of different qualities of crude, bypassing units designed to process heavy crude
- Depending on financial incentives, investing in refinery hardware to accommodate more light crude
Discounted prices for tight oil

- Discounted prices result from lack of logistics infrastructure to move domestic crude to refining centers

- Pipeline capacity increasing but still inadequate: crude is moving via pipeline to the Midwest and the Gulf Coast

- Crude-by-rail is expanding quickly: crude is moving to the Gulf Coast as well as to refining centers on the East and West Coasts
Discounted prices for “landlocked” domestic tight oil have incentivized refiners

Crude oil prices, rolling 5 day average dollars per barrel

Source: Bloomberg
Logistics infrastructure: rail is expanding to serve the East and West Coasts as well as the Gulf

<table>
<thead>
<tr>
<th>East Coast rail projects</th>
<th>Location</th>
<th>Operating capacity</th>
<th>Planned capacity</th>
<th>Planned operating</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Midstream Terminals</strong></td>
<td></td>
<td>(thousand barrels per day)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Global Energy Partners</td>
<td>Albany, NY</td>
<td>160</td>
<td>160</td>
<td></td>
</tr>
<tr>
<td>Buckeye</td>
<td>Albany, NY</td>
<td>130</td>
<td>130</td>
<td>2013</td>
</tr>
<tr>
<td>Plains All American</td>
<td>Yorktown, VA</td>
<td></td>
<td>130</td>
<td>2013</td>
</tr>
<tr>
<td>Sunoco Logistics Eagle Point</td>
<td>Westville, NJ</td>
<td>40</td>
<td>80</td>
<td>2013</td>
</tr>
<tr>
<td>Eddystone Rail (Enbridge &amp; Canopy Prospecting)</td>
<td>Philadelphia, PA</td>
<td></td>
<td>80</td>
<td>2013</td>
</tr>
</tbody>
</table>

| **Refinery Terminals**                       |                  | (thousand barrels per day) |                |                   |
| Philadelphia Energy Solutions                | Philadelphia, PA | 140                | 140              | 2013              |
| PBF Refining                                 | Delaware City, DE| 110                | 40               | 2013              |
| Phillips Bayway                               | Linden, NJ       | 60                 | 60               | Developing        |

**Totals**                                      | 440              | 530                |                  |                   |

*Source: Industry announcements*
Discounted crude prices and low natural gas prices have supported product exports

Annual U.S. net imports of total petroleum products, 1949 – 2012
million barrels per day

Source: EIA, Petroleum Supply Monthly and Annual Energy Review

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How much more tight oil can be absorbed by changing refinery operations and blending different crude oil qualities?

- Varies by refinery
- Light end processing capability could be stressed
- Heavy end processing units could be underutilized
- Total crude processed could decline
- Product yields could shift - more gasoline / less diesel
Will market conditions support capital investment?

• What about capital investment to increase light crude processing capability?
  – Some refiners have announced capital investment plans to support processing additional light crude
  – Decision to invest depends upon expectations about duration and magnitude of economic incentives and access to tight oil
  – Varies by refinery

• Will discounts for “landlocked” crude persist?
  – Price discounts will vary as infrastructure bottlenecks come and go
  – Pipeline projects to expand capacity will be completed but tight oil production will increase
  – Rail projects will continue but unclear whether long term rail will be competitive
  – Impacts incentive for upstream investment
Will the export market for petroleum products continue to absorb U.S. refinery production?

• Exports principally supply Latin America and Europe

• Projected growth in Latin American gasoline and diesel demand could be supplied by increased local refinery production, limiting growth in U.S. supply to the region

• European demand projected to slow

• U.S. refineries not currently competitive to supply Asia with diesel and gasoline
Export licenses not generally required for petroleum products

- Petroleum products include both finished products and intermediates
  - Finished products include motor gasoline, diesel fuel, jet fuel, etc.
  - Intermediates include naphtha, reformate, vacuum gasoil, etc.

- Petroleum products include topped/split crude

- Condensate is subject to Commerce Department export licensing rules
  - Note: EIA treats condensate as a natural gas liquid, which is considered a petroleum product
Crude oil exports require licenses

1. Alaska Cook Inlet
2. To Canada for consumption there
3. Heavy California crude up to 25 MBPD
4. Strategic Petroleum Reserve oil in connection with an exchange of refined products
5. Foreign-origin crude oil where the exporter can demonstrate that the oil is not of U.S. origin and has not been commingled with oil of U.S. origin

Presidential determination that it is consistent with national interest
U.S. crude exports to Canada have doubled since 2005 and could continue to increase as pipeline and rail capacity expands.

Monthly U.S. crude oil exports to Canada and rest of world (thousand barrels per day).

Source: U.S. Energy Information Administration.
U.S. dependence on imported liquids depends on both supply and demand

U.S. liquid fuel supply
million barrels per day

Source: EIA, Annual Energy Outlook 2013 and Short-Term Energy Outlook, April 2013

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For more information


Short-Term Energy Outlook | www.eia.gov/steo

Annual Energy Outlook | www.eia.gov/aeo

International Energy Outlook | www.eia.gov/ieo

Monthly Energy Review | www.eia.gov/mer

Today in Energy | www.eia.gov/todayinenergy