U.S. Refined Product Exports

Developments, Prospects and Challenges

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2017 EIA Energy Conference
Washington, D.C.
June 27, 2017
U.S. Moves from Importer to Exporter*

**2005 Exporters**
1: Russia
2: Kuwait
3: Saudi Arabia
4: Venezuela
5: Algeria

**2005 Importers**
1: U.S. 2455 MBPD
2: Japan
3: Spain
4: China
5: Indonesia

**2016 Exporters**
1: U.S. 2487 MBPD
2: Russia
3: Saudi Arabia
4: UAE
5: India

**2016 Importers**
1: Japan
2: Singapore
3: Mexico
4: Australia
5: Indonesia
6: Brazil

*imports/exports on net basis
Source: EIA/IEA/Pemex/JODI
Global Refining Capacity Shifts
2005-2016

All Units in MBPD

World 12107 14%
Canada 120 6%
U.S. 1374 8%
Latin America -187 -2%
U.S. 1374 8%
Europe/Eurasia -2104 -11%
Middle East 1942 27%
Africa 404 13%
Asia/Pacific 9506 39%
Russia 691 13%
Non-OECD Asia 10146 62%
OECD Asia -640 -8%

Additional ~2 Million BPD under threat

Source: BP Statistical Review, EIA, Pemex, Others
Drivers of U.S. Competitiveness

Advantaged Crude Costs

Free Market Principles, Economically and Politically Stable

Most Advanced, Complex Refineries

Highly Skilled, Flexible Workforce

U.S. Refining Competitiveness

Tight Oil/Gas Benefits

Low Energy Costs

Low Capital/Operating Costs
Foreign Refinery Projects Have Been Troubled

**Latin American Importers**
- Trinidad & Tobago (ULSD)
  - $500M+ over, 3 yrs. late
- Cartagena (Expansion/Upgrade)
  - $4B over & 3 yrs. late
- Talara (Expansion)
  - $3.5B, >10 yr. project
- Pacific Refinery
  - Announced 2007, $13B est., no funding

**Mideast Exporters**
- Premium I & II (Proposed/Grassroots)
  - Delayed 5-6 yrs., $20B each
- Abreu e Lima (Grassroots)
  - $16B over & 4 yrs. late
- Comperj (Grassroots)
  - Spent $15B & Indefinitely postponed
- Al-Zour (Refinery)
  - $5B over, 7 yrs. late
- Yanbu (JV/Grassroots)
  - $4B over budget
- Ruwais (Grassroots)
  - $10B, 2 yrs. late
- Jubail (JV/Grassroots)
  - $6B over budget
- Jazan (Grassroots)
  - $2B over, 2-3 yrs. late
US Refiners Take Advantage of LatAm Troubles

2016 Delta is 2.5 MMBPD
Imports from US >2.3 MMBPD

Source: BP Statistical Review, EIA, Pemex, Others
Mexican Reform Has Led to More Imports

Salina Cruz outage will result in elevated imports over near term

Source: BP Statistical Review, EIA, Pemex, Others

* Gasoline and Diesel
## U.S. Gulf Coast (PADD III) vs. Mexico Refineries

<table>
<thead>
<tr>
<th>Mexico</th>
<th>U.S. Gulf Coast</th>
</tr>
</thead>
<tbody>
<tr>
<td># of Refineries: 6</td>
<td># of Refineries: 43*</td>
</tr>
<tr>
<td>Total Capacity: 1540 MBPD</td>
<td>Total Capacity: 9140 MBPD</td>
</tr>
<tr>
<td>Average Size: 257 MBPD</td>
<td>Average Size: 213 MBPD</td>
</tr>
<tr>
<td>Total Coking: 156 MBPD, 10%</td>
<td>Total Coking: 1625 MBPD, 18%</td>
</tr>
<tr>
<td>Total Cracking: 423 MBPD, 27%</td>
<td>Total Cracking: 3095 MBPD, 34%</td>
</tr>
<tr>
<td>Total Upgrading: 579 MBPD, 37%</td>
<td>Total Upgrading: 5980 MBPD, 66%</td>
</tr>
<tr>
<td>Total Hydrocracking: 0 MBPD, 0%</td>
<td>Total Hydrocracking: 1260 MBPD, 14%</td>
</tr>
<tr>
<td>Crude Runs: 943 MBPD</td>
<td>Crude Runs: 8390 MBPD</td>
</tr>
<tr>
<td>Utilization: 61%</td>
<td>Utilization: 91%</td>
</tr>
<tr>
<td>Yields: Gasoline 35%, Diesel 24%</td>
<td>Yields: Gasoline 52%, Diesel 32%</td>
</tr>
<tr>
<td># of Employees/MMBBL: 28,000</td>
<td># of Employees/MMBBL: 3000-7000</td>
</tr>
</tbody>
</table>

Source: EIA, PEMEX

*Refineries >35 MBPD
Future Challenges

• Market Issues
  – Growing dependency on export markets
  – Market saturation in traditional markets; will have to extend reach to markets where U.S. has fewer advantages/more competition
  – Risk of global refining capacity overbuilding
    • Importing countries – Asia/LatAm/Africa and exporting countries - ME/India/Russia

• Demand Growth – Both Domestic and Global

• Competition From Alternatives
  – Direct substitutes – biofuels/CNG/LNG/CTL/GTL
  – Move to Electrical Vehicles (EV’s)

• Regulations
  – Stifle demand/increase costs/limit access/distort markets
  – Increased regulation in other regions can advantage U.S. refiners
    • Tighter fuel specifications in developing countries provide opportunities
    • IMO LS Bunker rules (2020) will be a substantial boost
USGC Increasing Dependency on Exports

Exports, % of Gasoline Production

Exports, % of Diesel Production

Source: EIA
LatAm Market Approaching Saturation?

- 31% gasoline supplied by US
- 30% diesel supplied by US

Source: BP Statistical Review, EIA, Pemex, Others
Global Demand Growth

2016 to 2025

Global Annual Growth (MBPD)

<table>
<thead>
<tr>
<th></th>
<th>Gasoline</th>
<th>Distillates</th>
<th>Other</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016 to 2025</td>
<td>2,751</td>
<td>5,466</td>
<td>1,293</td>
<td>9,510</td>
<td>0.9%</td>
</tr>
</tbody>
</table>

West Africa is potential New Frontier for U.S.

Impacted by Energy Reform

Other
Distillates
Gasoline

Source: TM&C forecast

*Average Annual Growth
Alternate Fuels Impact Limited Thru 2025

- Low oil prices have made alternatives less attractive
  - Growth has/will be driven by regulatory action
- Essentially all growth in the U.S. has been ethanol
  - Limited additional room due to “blend wall”
- EV replacement of gasoline vehicles difficult to predict
  - TM&C doesn’t expect significant penetration before 2025
  - Longer term, Autonomous Vehicle (AV) introduction could be game changer
Global Crude Capacity Additions 2017-2021\(^{(1)}\)

Global product demand increase\(^{(2)}\) Excess of 1.9 MMBPD

Regional Capacity Additions, Million BPD

- Asia Pacific
- FSU
- Africa
- Middle East
- Europe
- Latin America
- Canada/Mexico
- U.S.
- World

Probable  Announced

(1) Adjusted for utilization
(2) Adjusted for non-petroleum fuels

Source: TM&C forecast
An Exception: Indian Refining Success

1999 660 MBPD Reliance Jamnagar $6.0 billion
2008 580 MBPD Reliance Jamnagar $6.0 billion
2012 185 MBPD Essar Vadinar $1.9 billion
2021 1,200 MBPD IOCL / HPCL / BPCL Maharashtra $30 billion

Source: TM&C forecast, Others
2020 LS Bunker Will Advantage U.S. Refiners

U.S. Refineries – Limited FO production
Most refiners will benefit from: higher distillate cracks/wider heavy crude discounts

TM&C estimates that 1.2 to 2.0 Million BPD of fuel oil will be displaced by lighter streams, especially distillates.

Europe and Asia - greater fuel oil production/simpler refineries. Impacts most significant for privately-owned European plants

Significant bump in ULSD vs. HSFO margin
Widening heavy/light spread

Source: TM&C forecast
Final Words

• U.S. Should Continue to Be World Leader in Refining
  – Ability to maintain and grow product exports will be critical (esp. for USGC)
  – Challenged by new refining capacity in both importing/exporting countries
  – Important not to be handicapped by excess regulation
  – Benefits of domestic production growth are real; limited by removal of crude export restrictions
  – Can expect more rationalization of capacity in OECD Europe/Asia

• Export Product Demand Growth will Continue but Slow
  – Market limitations/slowing world petroleum demand growth
  – U.S. Capacity/Throughput increases limited; based on export economics
  – With domestic demand declining, growth will be needed to sustain rates
  – Should capture incremental LatAm growth and compete for West African
  – Asian market will be a challenge due to competition and high transit costs
  – U.S. product exports can reach/exceed 6 million BPD by 2025
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