The Changing U.S. Refining Landscape
Past, Present and Future

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Dallas, TX
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U.S. Refining is YUGE!

DONALD TRUMP: I LOVE WINNING
Agenda

• Evolution to Dominance

• Key Issues and Challenges
U.S. Refining Industry is the Global Leader

<table>
<thead>
<tr>
<th>Region</th>
<th>Complexity, % Upgrading Capacity</th>
</tr>
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<tbody>
<tr>
<td>U.S.</td>
<td>62%</td>
</tr>
<tr>
<td>China</td>
<td>30%</td>
</tr>
<tr>
<td>India</td>
<td>35%</td>
</tr>
<tr>
<td>Rest Asia/Pac</td>
<td>21%</td>
</tr>
<tr>
<td>Europe</td>
<td>27%</td>
</tr>
<tr>
<td>Middle East</td>
<td>11%</td>
</tr>
<tr>
<td>Former USSR</td>
<td>14%</td>
</tr>
<tr>
<td>Cent/South America</td>
<td>26%</td>
</tr>
<tr>
<td>Africa</td>
<td>9%</td>
</tr>
</tbody>
</table>
Becoming Lean and Mean

Capacity Rationalization

“Bulking Up”

Pre-Deregulation
>300 Refineries
Avg. Cap. <60 MBPD
Factors Leading to U.S. Dominance

- Advantaged Crude Costs
- Free Market Principles, Economically and Politically Stable
- Most Advanced, Complex Refineries
- Low Energy Costs
- Highly Skilled, Flexible Workforce
- Low Capital/Operating Costs
- Challenges: Demand Growth, Regulation, Competition
- Foreign Refinery Operating/Expansion Problems

Tight Oil/Gas Benefits
Global Refining Capacity Shifts
2005-2017

All Units in MBPD

Additional 1-2 Million BPD under threat

Source: BP Statistical Review, JODI, EIA, TM&C Estimates
U.S. Moves From #1 Importer to #1 Exporter of Products

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

2017 Exporters
1: U.S. 3062 MBPD
2: Russia
3: Kuwait
4: India
5: South Korea

2017 Importers
1: Japan
2: Mexico
3: Australia
4: Indonesia
5: Brazil

*All Values Represent Net Imports / Exports

Source: EIA/IEA/Pemex/JODI
US Refiners Take Advantage of LatAm Troubles

2017 Delta was 3.6 MMBPD
Imports from US >2.7 MMBPD
Source: BP Statistical Review, EIA, Pemex, Others
Corporate Transformation

• Free markets drove not only rationalization but also restructuring
  – Ownership shift from integrated model to independents
  – Consolidation and concentration
• Both developments led to more efficient operations
  – More price responsive (profit centers not cost centers)
  – More directed and efficient deployment of capital

*Pro forma data assuming completion of Marathon-Andeavor merger
Agenda

• Evolution to Dominance

• Key Issues and Challenges
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 and Threat of “Peak Demand”
  – Impact of higher prices
  – 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) could be a substantial boost for a a few years
USGC Increasing Dependency on Exports

Source: EIA
LatAm Market Approaching Saturation?

31% gasoline supplied by US
37% of distillate supplied by US

Source: BP Statistical Review, EIA, Pemex, Others
Foreign Refinery Projects Have Been Troubled

- **Latin American Importers**
  - Pacific Refinery
    - Announced 2007, $13B est., no funding
  - Talara (Expansion)
    - $3.5B, >10 yr project
  - Cartagena (Refinery)
    - $4B over & 3 yrs late
  - Trinidad & Tobago (ULSD)
    - $500M+ over, 3 yrs late
  - Premium I & II (Refineries)
    - Delayed 5-6 yrs, $20B each
  - Abreu e Lima (Refinery)
    - $16B over & 4 yrs late
  - Comperj (Refinery)
    - $15B & No Progress

- **Mideast Exporters**
  - Al-Zour (Refinery)
    - $5B over, 7 yrs late
  - Yanbu (Refinery)
    - $4B over budget
  - Jazan (Refinery)
    - $2B over, 2-3 yrs late
  - Jubbil (Refinery)
    - $6B over budget
  - Ruwais (Refinery)
    - $10B, 2 yrs late

- Asian importers working to build refineries, often with Mideast help
- Indian private refiners have been successful
- Russian modernization program
- Mexican reform has lead to lower utilization/more imports – AMLO impact?
Global Demand Growth

<table>
<thead>
<tr>
<th>Product</th>
<th>2018 to 2025 Global Growth by Product (MBPD)</th>
<th>Annual %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasoline</td>
<td>3,102</td>
<td></td>
</tr>
<tr>
<td>Distillates</td>
<td>3,707</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>3,020</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>9,829</td>
<td>1.2%</td>
</tr>
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</table>

**Source:** TM&C

*Average Annual Growth

- **U.S.:** 0.6%
- **Latin America:** 1.4%
- **Europe:** -0.5%
- **Asia Pacific:** 2.0%
- **Africa:** 2.3%
- **Rest of the World:** 2.0%

Most growth to come from petrochemical feedstocks – LPG/NGLs

Growth continues to be supplied by US refineries

West Africa is potential New Frontier for U.S.
Global Crude Capacity Additions 2018-2022(1)

Regional Capacity Additions, Million BPD

<table>
<thead>
<tr>
<th>Region</th>
<th>Probable</th>
<th>Announced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asia Pacific</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>FSU</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Africa</td>
<td>0.5</td>
<td>1</td>
</tr>
<tr>
<td>Middle East</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Europe</td>
<td>0.1</td>
<td>0.2</td>
</tr>
<tr>
<td>Latin America</td>
<td>0.1</td>
<td>0.2</td>
</tr>
<tr>
<td>Canada/Mexico</td>
<td>0.5</td>
<td>1</td>
</tr>
<tr>
<td>U.S.</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>World</td>
<td>14</td>
<td>21</td>
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Global product demand increase(2)
About 1 Million BPD excess capacity growth – implies some rationalization

(1) Adjusted for projected utilization of 88%
(2) Adjusted for non-petroleum fuels

Source: TM&C forecast
Regulatory Environment - The Trump Factor

• Climate Change – Moving rapidly away from any anti-carbon policies

• Alternative Fuels – No new initiatives/existing programs threatened
  – CAFE relaxation post-2021 is most significant move by the Administration

• RFS – Politics are complicated and bipartisan
  – Small refiner waivers and possible rule changes to ease burden have caused RIN costs to drop significantly this year

• Permitting – Major positive change vs. Obama Administration
  – All segments of industry (upstream, midstream, and downstream) benefitting

• General Deregulation – Fewer roadblocks, lower costs for industry

• Tax Policy – Lower corporate taxes are stimulating investment/growth

• Trade Policy – Potential for major negative impacts to the industry
  – Trade war would significantly decrease global economic growth
  – Positive movement with Europe/Mexico – China is the big unknown
IMO - Who Goes First?

- Poor Company Financials
- Charter Model Disincentives
- LNG Retrofits Not Economic
- Waste Disposal Issues

High Capital Cost
Long Lead Times
Permitting Hurdles
Refineries With Greatest Need are Least Capable Financially

Both Ship’s owners and refineries delay (or don’t have time for) investments – leading to surplus fuel oil in 2020
Impacts of IMO Regs.

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

Europe and Asia have greater fuel oil production, impacts could be significant for some refineries – especially privately owned European plants

Significant Compliance Uncertainty

TM&C estimates about 2 Million BPD of fuel oil will be displaced by distillates.

Expect bump in ULSD relative to HSFO

Widening heavy/light spread

Turner, Mason & Company
CONSULTING ENGINEERS
Prospects Very Regional

• PADD I – Continue to be most challenged
  – Very competitive market; USGC/Canada/Europe all fighting for share
  – Disadvantaged crude supply environment (no P/L’s, Jones Act)
  – Lost 500 MBPD earlier in decade; More rationalization possible
  – RFS relief is welcome development

• PADD II – IMO advantaged; pipeline approvals key
  – Heavy capable refiners will benefit from IMO crude discounts
  – Advantaged access to Canadian crude; cross border pipeline constraints
  – Stagnant regional demand; pipelines to access PADD I markets needed

• PADD III – Significant variability/ability to export products is key
  – IMO will advantage heavy crude refiners; those with hydrocrackers
  – Given P/L constraints, advantaged access to Permian crude is big plus
  – Demand and refining developments in Latin America and globally will
determine product export prospects
Regional Trends/Prospects (cont.)

• PADD IV – Both supply and demand benefits
  – Only region where domestic production exceeds crude runs
  – Access to Canadian/Bakken crude adds to supply advantage
  – Relatively strong demand growth
  – Disadvantages: small/limited ability to access other markets/isolated

• PADD V – Strong potential; stronger threats
  – Challenging Regulatory Environment – costs, permitting, demand
  – Region about 1 refinery long; outages cause shortages/high margins
    • Limited and high cost alternate product supply options
  – Declining local crude supply/limited access to new LTO production
    • LCFS/Lack of pipeline capacity limit Canadian crude access
  – Any regulations which lead to a refinery closure could result in extended period of elevated margins (HF alky ban, etc.)
Final Thoughts

• Product Demand Will Be Key to Refining Prospects
  – Dependent on economic growth; tougher than ever to forecast
  – Demographics – population growth, economic maturation, lifestyle changes,
  – Impacted by new technologies – breakthroughs in alternatives and efficiencies, driverless vehicles, others
  – Still A Number of Years Away From Peak Demand Globally – Although we are likely at “Peak Demand Growth”

• 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 be handicapped by excess regulation
  – IMO LS Bunker rules will be a major competitive benefit for many U.S. plants
  – U.S. product exports should grow; reach/exceed 6 MMBPD by 2025
  – Can expect more rationalization of capacity in Europe/OECD Asia/LA
    • Perhaps as much as 2 million BPD post-2020
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