US Refining Industry:
Forecasts, Capacity, Challenges

Crude Oil Quality Group

Cindy Schild, API
February 26, 2009
Overview

- Prices, Earnings & Forecasts
- Domestic Refinery Industry
  - Capacity
  - Environmental Expenditures
  - Dieselization
  - Heavier Crude Slates
- Canadian Oil Sands
- Future Considerations
- Energy Policy
World Oil Consumption

Total Consumption (Left Axis)

Annual Growth (Right Axis)

EIA Forecast

Source: EIA, Short-Term Energy Outlook, February 2009
OPEC Surplus Crude Oil Production Capacity

Note: Shaded area represents 1997-2007 average (2.8 million barrels per day)

Source: EIA, Short-Term Energy Outlook, February 2009
Diesel, Gasoline and Crude Prices

2/18/2009

- Diesel (AAA) $2.31
- Gasoline (AAA) $1.95
- Crude Oil (NYMEX) $0.82

Source: NYMEX (WTI crude oil) and AAA (gasoline and diesel)
What consumers are paying for at the gasoline pump

Crude Oil: 72%
Refining and Retailing: 17%
Taxes: 11%

8.3% earnings*

*Earnings differ by company. Figure represents average for the first 9 months of 2008 industry earnings for every dollar of sales calculated from data reported by Oil Daily.

Source: Average of gasoline components from January through September 2008 as reported by EIA.
## EIA Price Forecast

<table>
<thead>
<tr>
<th></th>
<th>Year</th>
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<tr>
<td><strong>WTI Crude</strong>&lt;sup&gt;a&lt;/sup&gt; ($/barrel)</td>
<td></td>
<td>72.32</td>
<td>99.57</td>
<td>43.14</td>
<td>54.50</td>
<td>37.7</td>
<td>-56.7</td>
<td>26.3</td>
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<tr>
<td><strong>Gasoline</strong>&lt;sup&gt;b&lt;/sup&gt; ($/gallon)</td>
<td></td>
<td>2.81</td>
<td>3.25</td>
<td>1.95</td>
<td>2.19</td>
<td>16.0</td>
<td>-40.2</td>
<td>12.5</td>
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<tr>
<td><strong>Diesel</strong>&lt;sup&gt;c&lt;/sup&gt; ($/gallon)</td>
<td></td>
<td>2.88</td>
<td>3.79</td>
<td>2.28</td>
<td>2.55</td>
<td>31.5</td>
<td>-39.7</td>
<td>11.8</td>
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<tr>
<td><strong>Heating Oil</strong>&lt;sup&gt;d&lt;/sup&gt; ($/gallon)</td>
<td></td>
<td>2.72</td>
<td>3.36</td>
<td>2.30</td>
<td>2.45</td>
<td>23.7</td>
<td>-31.8</td>
<td>6.6</td>
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<td><strong>Natural Gas</strong>&lt;sup&gt;d&lt;/sup&gt; ($/mcf)</td>
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<td>13.03</td>
<td>13.62</td>
<td>11.64</td>
<td>11.53</td>
<td>4.5</td>
<td>-14.5</td>
<td>-0.9</td>
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<sup>a</sup> West Texas Intermediate  
<sup>b</sup> Average Regular Pump Price  
<sup>c</sup> On-Highway Retail  
<sup>d</sup> Residential Average

Source: EIA, Short-Term Energy Outlook, February 2009
First 3 Quarters of 2008 Earnings by Industry (net income/sales)

- Pharmaceuticals and Medicines: 25.5%
- Chemicals: 14.5%
- Beverage and Tobacco Products: 13.1%
- Electrical Equipment, Appliances and Components: 12.3%
- Computer and Peripheral Equipment: 10.7%
- All Manufacturing Less Autos: 8.5%
- Oil and Natural Gas: 8.3%
- Aerospace Products and Parts: 8.2%
- Machinery: 8.0%
- Iron, Steel and Ferroalloys: 7.4%
- Apparel and Leather Products: 7.3%
- All Manufacturing: 7.2%
- Food: 5.5%
- Furniture and Related Products: 4.9%
- Paper: 2.8%
- Plastics and Rubber Products: 2.4%
- Textile Mills and Textile Product Mills: -2.9%
- Motor Vehicles and Parts: -7.9%

Sources: Based on company filings with the federal government as reported by U.S. Census Bureau and Oil Daily.
Return on Investment (net income/net investment in place)

Source: EIA, Performance Profiles of Major Energy Producers, Table CY8 various issues and 2006 and 2007 S&P figure compiled by PWC from Compustat data.
## Capital Spending (Where Funds Will Go for U.S. Projects)

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<tbody>
<tr>
<td><strong>Exploration/Production</strong></td>
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<tr>
<td>Drilling/Exploration</td>
<td>130,200</td>
<td>4.2</td>
<td>125,010</td>
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<td>124,000</td>
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<td>Production</td>
<td>24,750</td>
<td>4.2</td>
<td>23,760</td>
<td>0.8</td>
<td>23,560</td>
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<td>OCS Lease Bonus</td>
<td>5,250</td>
<td>87.8</td>
<td>2,795</td>
<td>205.8</td>
<td>914</td>
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<td><strong>Subtotal</strong></td>
<td><strong>160,200</strong></td>
<td><strong>5.7</strong></td>
<td><strong>151,565</strong></td>
<td><strong>2.1</strong></td>
<td><strong>148,474</strong></td>
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<tr>
<td><strong>Other</strong></td>
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<tr>
<td>Refining</td>
<td>13,000</td>
<td>57.0</td>
<td>8,280</td>
<td>-8.0</td>
<td>9,000</td>
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<td>Petrochemicals</td>
<td>1,000</td>
<td>19.0</td>
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<td>7.7</td>
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<td>Marketing</td>
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<td>20.0</td>
<td>2,500</td>
<td>0.0</td>
<td>2,500</td>
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<td>Crude and Products Pipelines</td>
<td>6,629</td>
<td>269.1</td>
<td>1,796</td>
<td>1,173.8</td>
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<td>Natural Gas Pipelines</td>
<td>5,710</td>
<td>30.8</td>
<td>4,367</td>
<td>94.5</td>
<td>2,245</td>
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<td>Other Transportation</td>
<td>1,200</td>
<td>23.7</td>
<td>970</td>
<td>14.1</td>
<td>850</td>
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<td>Mining, Other Energy</td>
<td>1,200</td>
<td>20.0</td>
<td>1,000</td>
<td>0.0</td>
<td>1,000</td>
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<tr>
<td>Miscellaneous</td>
<td>5,000</td>
<td>22.0</td>
<td>4,100</td>
<td>10.8</td>
<td>3,700</td>
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<tr>
<td><strong>Subtotal</strong></td>
<td><strong>36,739</strong></td>
<td><strong>54.0</strong></td>
<td><strong>23,853</strong></td>
<td><strong>18.0</strong></td>
<td><strong>20,216</strong></td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>196,939</strong></td>
<td><strong>12.3</strong></td>
<td><strong>175,418</strong></td>
<td><strong>4.0</strong></td>
<td><strong>168,690</strong></td>
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Source: *Oil & Gas Journal*, April 28, 2008
Oil and Natural Gas New Investments and Earnings

Source: Ernst & Young
Domestic Refining Industry
Capacity Grows as Number of Refineries Falls

[Bar chart showing the trend of refining capacity and the number of refineries from 1990 to 2020.]

Source: API
Refining Capacity Additions

- Current crude distillation capacity: ~ 17.6 MBD
- Over the last decade, the equivalent of almost one new good size refinery each year added through expansions (1.9 MBD)
- EIA expects another 800,000 – 1 MBD to be added by 2010

- Why Expansion v. New?
  - More cost-effective
  - Able to bring online more quickly
  - NIMBY can be less
  - Infrastructure already in place
Environmental Expenditures

- Refiners expand & upgrade units, while:
  - spending billions to meet clean fuels and environmental regulations
  - $54.5 billion from 1997-2006 (largely due to sulfur reduction in gasoline & diesel)
U.S. Environmental Expenditures since 1990 (by sector)

Dieselization & Heavy Crude Slates
Diesel Demand

- US refineries historically configured to maximize gasoline production

- Diesel-fueled vehicles have made up less than 5% of the U.S. light-duty vehicle market

- Over past 5 years, US diesel demand has been roughly triple the growth rate of gasoline – 3% per year, now accounting for 1/5 of highway fuel

- Even with weakened demand in 2008, distillate demand expected to grow while gasoline demand expected to decline
Moving Toward Diesel

Announced Expansion Capacity

Courtesy of KBC Advanced Technologies; March 2008
U.S. Refineries Are Processing Increasingly Higher Sulfur Crude Oils
U.S. Refinery Crude Oil - API Gravity

Source: DOE, EIA "Crude Oil Input Qualities"

Heavier Crude
U.S. Imports of Crude and Products

- 21% Canada
- 14% Saudi Arabia
- 10% Venezuela
- 8% Mexico
- 7% Algeria
- 6% Nigeria
- 5% Iraq
- 4% Russia
- 4% Angola
- 3% Virgin Islands
- 18% Other

Source: EIA, Petroleum Supply Monthly, November 2008
Canadian Oil Sands

- Canada is U.S.’ number one supplier of oil & natural gas
- 99% of Canadian exports go to U.S.
- About half of Canadian crude oil imported to this country is derived from oil sands
- With current technology, Canada’s oil sands are second only to Saudi Arabia in global oil reserves
- 173 BB of crude is trapped in the sands
- Oil sands production is expected to jump from 1.2 MBD to 3.3 MBD by 2020 according to CAPP
Oil Sands Benefits

- Canadian oil is a reliable and plentiful strategic resource available from a friendly neighbor.

- US investments to transport and refine oil sands are important to increase supply flexibility, America’s energy security and reliability while reducing risk of supply disruptions.
Refinery Investments

• U.S. refineries are currently undertaking or planning for over $30 billion worth of expansion to process oil sands

• Additional processing units needed:
  – Coking and vacuum distillation capacity
  – Sulphur recovery and hydrogen production
  – Metallurgy upgrades if the bitumen is processed on site
  – Additional upgrades to hydroprocessing units may be required due to concerns with diesel distillate product quality

• Environmental controls needed to ensure meet permit conditions
Plans to Move Canadian Oil to US Refineries

Canadian and US Crude Oil Pipelines
(Source: Canadian Association of Petroleum Producers)
Refinery Expansions for Oil Sands

- Motiva - Port Arthur refinery
- ConocoPhillips/Encana partnership - Wood River and Borger refineries
- BP – Whiting refinery
- Marathon – Garyville and Detroit refineries
- (Hyperion & Yuma new refineries)
New Refineries and Infrastructure Expansions Would Create New Jobs

- Hyperion Elk Point, SD – New 400,000 BD
  - 8,000 construction jobs and 1,800 permanent jobs

- Clean Fuels Yuma, AZ - New 150,000 BD
  - 3000 construction and over 600 permanent jobs

- ConocoPhillips Wood River, IL – 100,000 BD expansion
  - 3,000 construction jobs & 100 permanent jobs
Refining Oil Derived from Oil Sands in US

• This is not new
  – U.S. refineries have been producing fuels from oil sands-derived crude oil for years

• And it’s not that different from other heavy crude oils
  – Crude oil derived from oil sands has characteristics similar to crude oil produced from Venezuela and certain parts of Mexico that has been refined at U.S. refineries for years
Crudes: Lifecycle CO₂ Emissions/Barrel

- Products produced from oil sands do not have significantly different CO₂ impact than other crudes processed in the US

Tom McCann and Associates, 2001
Future Considerations for Infrastructure Expansion & Investment Decisions
Refinery Project Considerations

• Supply/Demand Expectations

• Energy Policy Decisions
  – Climate legislation
  – Tax disincentives
  – CAFE (fuel efficiency)
  – Other mandates (e.g., ethanol, biodiesel)
Energy Policies Should . . .
Policy Choices Needed to Ensure Future Energy Security

- Increase, not decrease energy production by promoting all sources.
- Encourage energy efficiency as a core American principle.
- Encourage investment in advanced technologies and long-term energy initiatives.
- Allow market forces to allocate products and adjust to changing conditions.
- Refrain from new taxes that make it more expensive to develop our domestic supplies.
- Support the need to participate actively in global energy markets rather than isolate the U.S.
Any Questions?

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Given the current and projected worldwide energy demand, The U.S. needs all sources of commercially viable energy, as well as a greater commitment to energy efficiency and energy conservation.

- Biofuels, including ethanol are an important resource

- Almost 73% of all gasoline now produced in the U.S. includes ethanol
  - Last year (through November) our industry used 8.7 billion gallons of ethanol

- API supports a realistic and workable renewable fuels standard (RFS)

- Our companies have long been pioneers in developing alternatives and expanding our utilization of existing sources of energy

- A patchwork of state-by-state ethanol mandates or low-carbon fuel standards beyond the national RFS create additional boutique fuels that will likely interfere with the flexibility that Congress provided in the national RFS program
  - State ethanol blending legislation also interferes with RFS compliance

- **Advanced Cellulosic Biofuel**
- **Non-cellulosic Advanced:**
  - Sugar Ethanol
  - Co-processed Renewable Diesel
- **Biomass-based Diesel:**
  - Biodiesel-ester
  - Standalone Renewable Diesel
- **Non-advanced Renewable Fuel:**
  - Conventional Corn-starch Ethanol

- **GHG Reduction Requirements:**
  - 50% GHG
  - 50% GHG
  - 60% GHG
  - 20% GHG*

*For new construction only. Existing corn-based ethanol facilities have no reduction requirement.
Future U.S. Energy Demand
The U.S. will require 11 percent more energy in 2030 than in 2007.

*Includes ethanol from 2007-2030
Source: EIA, AE0 2009