What is “Driving” U.S. Gasoline Production?

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Discussion Points

• Economic Demand Drivers and Indicators

• Challenges to U.S. Gasoline/Diesel Production
  – Refining Costs
    ❖ New Tier 3 Sulfur Regulations
    ❖ RINS Costs and Alternatives

• Relative Costs of Production

• Product Exports
  – Record Exports – More Growth Ahead?
  – Mexico demand – Challenges and Alternatives
“After six consecutive monthly gains, the U.S. LEI (Leading Economic Index) is at its highest level in over a decade. Widespread gains across a majority of the leading indicators points to an improving economic outlook for 2017…” The Conference Board.
A year-over-year increase in summer highway travel, projected to be 2.3%, is partially offset by a 1.0% increase in fleet-wide fuel efficiency.

Domestic refinery production will be about 70,000 B/D higher this summer than last summer.

-U.S. EIA
Airline Miles Setting Records

- Travelers are flying more miles than ever before

- While airlines are becoming more slightly adept at filling flights (increasing load factors). Total available seat miles are rising even faster

Source: U.S. DoT
United States Gasoline Demand Forecast

Motor gasoline consumption and gross exports
million barrels per day

<table>
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<tr>
<th>Year</th>
<th>Consumption</th>
<th>Exports</th>
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<td>2000</td>
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2016 history projections

Combined Motor Gasoline Consumption and Gross Exports

Source: EIA 2017 Annual Energy Outlook
- Through the last two decades, numerous events/regulations have impacted domestic refinery profitability.
- The regulatory actions shown below have increased a refinery’s operating costs.

**Major Events Affecting Refiners**

- Tier 2 Gasoline Sulfur Reduction
- On-Road Diesel Sulfur Reduction (ULSD)
- RFS2 Compliance
- Low Domestic Crude Oil and Natural Gas Prices
- Tier 3 Gasoline Sulfur Reduction

Through the last two decades, numerous events/regulations have impacted domestic refinery profitability. The regulatory actions shown below have increased a refinery’s operating costs.
• Tier 3 limits gasoline sulfur to no more than 10 ppm sulfur on an annual average
  – Annual average, began Jan 1, 2017, per gallon cap of 80 ppm
• Applies to United States and territories, excluding California
  – Refiners and importers
• Includes Average, Banking, and Trading (ABT)
  – Volumes produced prior to 2017 that are below 30 ppm generate credits (five year lives) that are valid until Dec 31, 2019
• Three year delay for small refiners until 2020 (<155,000 bpcd company / 75,000 bpcd single refinery crude charge in 2012)

Note: Federal Register, April 28, 2014
No public/exchange sulfur credit trading yet

Assuming sulfur credits priced at $700 / million ppm sulfur gallons:
- At 25 ppm average and 50,000 BPD gasoline production
- Difference of 15 ppm to Tier 3 spec of 10 ppm
- $700 x 15 ppm x 50,000 BPD x 42 / 1 million = $22,000 /day
- Approximately $0.44/bbl or 1 cent / gallon
• Created by the U.S. Congress in 2005 and expanded in 2007 (RFS2)
  – Original Intent:
    ❖ Enhance U.S. energy security by replacing some imported petroleum with domestically produced ethanol.
    ❖ Drive investment in renewable fuels such as cellulosic and advanced biofuels
  – Requirements:
    ❖ The RFS program requires renewable fuel to be blended into motor-vehicle fuels and fuels for non-road, locomotive, and marine engines in increasing amounts each year.
    ❖ Refiners must annually purchase a set amount of renewable fuels (renewable volume obligation [RVO]).
    ❖ Refiners are required to submit renewable fuel credits to the Environmental Protection Agency (EPA) to show that they have covered their annual obligations.
    ❖ **Renewable Identification Numbers, or RINs**, are generated by the production of biofuels—one RIN is generated for each gallon of fuel in the RFS program—and can be bought and sold by refiners, as well as banked for future use.
Ethanol consumption has displaced about 600,000 BPD of gasoline
This will level off unless the 10% ethanol blend wall is exceeded by broad acceptance of E15 or E85
To address the infeasibility of the RFS2, the EPA has responded by reducing the original targets set forth by Congress.

For 2016, the EPA required over 4 billion gallons less renewables to be blended into gasoline and diesel compared to the original RFS2. While this 18% reduction has helped, it did not prevent a significant rise in RIN costs.
• Volatility driven by uncertainty of EPA adjustments
RFS compliance costs increased from 5.5 cents per gallon on average in 2015 to 8.4 cents per gallon year in 2016. They are back down to 6.7 cents per gallon to date in 2017.

SOURCE: Platts, Baker & O’Brien analysis
In 2015, RIN costs accounted for approximately 28% of the total operating costs (excluding feedstock cost) to produce a barrel of light oil (gasoline and distillate).

Source: Baker & O’Brien PRISM

(1) Other costs include environmental, insurance, and Ad Valorem taxes.
Crude oil costs gave the typical USGC refinery a significant advantage compared to refiners in Northwest Europe (NWE) and Asia Pacific (AP).

Other costs include environmental, insurance, and Ad Valorem taxes.

(1) Other costs include environmental, insurance, and Ad Valorem taxes.
(2) Includes internally produced fuel, catalyst, and chemicals.

Source: Baker & O’Brien PRISM
Excluding crude oil and feedstock costs, the typical USGC refinery was at a disadvantage in terms of operating costs compared to refiners in Northwest Europe (NWE) and Asia Pacific (AP).

Exports do not carry the cost of RINS and allow the U.S. refiners to compete globally.

Source: Baker & O’Brien PRISM

(1) Other costs include environmental, insurance, and Ad Valorem taxes.
(2) Includes internal fuel costs.
Options to Mitigate RFS Cost: Export Gasoline and Diesel

Combined U.S. Gasoline and Diesel Exports by Country

(1000's Bbl/D)

Dec 2016 hits record highs

Source: EIA

Source: EIA
Gasoline and Diesel Exports

Are exports seasonal?

Combined U.S. Gasoline and Diesel Exports by Country
(1000's Bbl/D)

Dec 2016 hits record highs

Source: EIA
Can Exports Grow?

U.S. Gasoline + Diesel Exports
(1000's of Bbl/D)

Dec-2016 Record
3-Month Record All Countries
3-Month Record excl. Netherlands + Singapore
3-Month Record excl. Europe + Asia

Source: EIA, Baker & O'Brien analysis

Source: EIA
Shipping Rates to Caribbean

Source: 2016 Platts Avg. Rate – 37MT
Shipping Rates to West Africa

Source: 2016 Platts Avg. Rate – 37MT
Shipping Rates to Brazil

Source: 2016 Platts Avg. Rate – 37MT
Fuel Exports to Mexico

• Common Gasoline and Diesel Exporters to Mexico Include:
  – Valero
  – Marathon
  – Shell-Pemex Deer Park
  – Western (El Paso)
  – CITGO
  – Flint Hills Refining
  – Exxon Mobil

• MTBE Exporters Include:
  – TPC
  – Lyondell
  – Enterprise
Summary of Gasoline Exports to Mexico

Advantages

• Octane
• RVP
• Sulfur
• RINS

Disadvantages

• Aromatics / Olefins
• Scheduling Challenges
• Segregated Tanks Required
• Multiple Products
Refiners Requirements for Export to Mexico

- Relationship with PMI (Pemex)
- Deepwater Port
- Dedicated Tanks
- Flexible Shipping Schedule
- Multiple Products Lifted (250-300 mbbls)
  - Gasoline
  - Alkylate
  - ULSD
- Accounting for Exports
  - Customs Paperwork
  - Possible Foreign Trade Zone Accounting
Options for New Entrants to Export to Mexico

- Sell Partial Volumes to Traders
- Sell Components to Traders
- Contract Tanks at Trans-Shipment Facility
  - Houston Ship Channel Options
  - Mississippi River Options
  - Offshore Options
- Possible Complications if MTBE is Needed
Refined Products Shipments to Mexico

- Houston
- New Orleans
- Corpus Christi
- Tuxpan
- Veracruz

Traditional Routes
Ship Unloading at Tuxpan

Source: Google Earth
Rail Opportunities to Mexico

- KC Southern Rail
- Ferromex
Approximate Rail Costs

- **Corpus Christi**: $3-$4/Bbl
- **New Orleans**: $7-$9/Bbl

Legend:
- $9-$11/Bbl
- $7-$9/Bbl
- $5-$7/Bbl
- $4-$5/Bbl
- $3-$4/Bbl
What about Pipelines into Mexico?

• **Existing Cross Border Pipelines**
  - El Paso
  - Laredo
  - Brownsville

• **Two New Competing Pipelines**
  - Howard Energy Partners
  - Magellan / TransMontaigne
Proposed Pipelines

- **Corpus Christi** to Monterey
  - **Expected Tariff:** $5.75/BBL

- **Proposed 16” Pipeline**: Magellan/TransMontaigne
- **Continuous Barge Movements**
  - **Proposed 12” Pipeline**: Dos Aguilas
  - **Proposed 16” Pipeline**: Magellan/TransMontaigne

Map showing routes from Corpus Christi to Monterey via Laredo, Cadereyta Refinery, and Brownsville.
Project Overview

- **Length**: 287 miles in total
  - 151 miles in the US
  - 136 miles in Mexico

- **Pipeline size**: ≥12” diameter

- **Transportation Capacity**: 72,000 bpd, expandable to 90,000 bpd

- **Receipt Points**: Corpus Christi and USGC refineries

- **Delivery Points**: Laredo, Nuevo Laredo, Monterrey

- **Transit Time**: ~36 hours to Laredo
  ~60 hours to Monterrey

- **Products**: Gasoline, ULSD, Jet fuel

- **Terminals**: Four terminals

- **Storage Capacity**: 1.2 MMbbls

Linking refineries in the USGC directly with markets in Northern Mexico
Michael Porter (1990): The Competitive Advantage of Nations

“Countries should be exporting products from those industries where all four components of the diamond are favorable, while importing in those areas where components are not favorable.”
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“Countries should be exporting products from those industries where all four components of the diamond are favorable, while importing in those areas where components are not favorable.”
• The U.S. refining industry is producing at record levels.
  – Macro-economic drivers are positive
  – Low refining costs

• Tier 3 costs have increased average gasoline production costs.

• RINS costs can significantly impact domestic production costs.
  – However, exports do not incur this cost.

• U.S. refiners have healthy incentives to export.
  – Competition from foreign refiners has not impeded growth
  – Absent an unforeseen event, exports will continue to grow and bolster U.S. margins
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