Biofuel Outlook

Terrence Higgins

EIA: August 1, 2012
I: Global Overview

II: Focus on Americas

A. Brazilian Ethanol Supply

B. U.S. Biofuel

1. RFS Requirements
2. Ethanol Limitations
3. Advanced Biofuel
Global Outlook
Biofuel Mandates in 2012

Africa: Countries beginning to set mandates

North America: RFS2, LCFS, intermediate blends

Asia Pacific: High variance in blend levels

Europe: RED implementation, sustainability and GHG savings

Latin America: More countries push for mid- and higher level ethanol blends

Middle East: Ethanol & jatropha R&D projects; algae

Source: Hart Energy's Global Biofuels Center, June 2012
Current Mandates in Asia

**NORTH KOREA**
- E5 Nationwide except selected states

**JAPAN**
- B2

**SOUTH KOREA**
- B2

**CHINA**
- E10 in 10 provinces

**MONGOLIA**
- B2

**PAKISTAN**
- E10, B2

**BHUTAN**
- E3, B2.5

**BANGLADESH**
- INDIA

**Hong Kong**
- Macau

**Taiwan**
- NEPAL

**SRI LANKA**
- MALAYSIA

**BRUNEI**
- CAMBODIA

**THAILAND**
- VIETNAM

**LAOS**
- BURMA

**PHILIPPINES**
- SINGAPORE

**INDONESIA**

**Key:**
- Nationwide mandate
- Partial mandate
- E10 (or E5) available on market
- ETBE - blended gasoline

Source: Hart Energy’s Global Biofuels Center, July 2012
Supply & Demand for Ethanol

Source: Hart Energy’s Global Biofuels Center, June 2012
Supply & Demand for Biodiesel

Source: Hart Energy’s Global Biofuels Center, June 2012
Global Trends

- Global biofuel will increase by 70% by 2020 and nearly double by 2025
- In 2020 88% of demand in North America, Latin America and Europe U.S. and Brazil will account for ¾ of ethanol.
- Ethanol: Strongest growth from U.S. and Brazil
- Biodiesel: Strongest growth from EU
- By 2020 biofuel potential to reach 7% of gasoline plus road diesel demand
- Difficulty meeting far reaching program goals in EU and U.S.
- EU competition for Brazilian sugar cane ethanol
Focus on the Americas
Brazil Otto-Fuel Demand Outlook

Fill rates will continue to reflect gasoline-ethanol price relationship.

Source: Hart Energy’s Global Biofuels Center, March 2012
Upsurges in domestic demand – driven by softer prices – will periodically drive down net export availability. Even during peak years of availability, net exports will fall below most forecasts (e.g., Ministry of Agriculture, ICONE, UNICA, etc.)

Source: Hart Energy’s Global Biofuels Center, March 2012
“RFS2” Program Requirements

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US Ethanol Blend Wall Scenario

- **E10**
  - 2011

- **E15 (winter only)**
  - 2012: 1 bar
  - 2015: 2 bars

- **E15 (summer only)**
  - 2015: 1 bar

* E15 used in Model Year 2001*
RFS versus Ethanol Blend Capability

Source: Hart Energy's Global Biofuels Center, June 2012
**Next Generation Operating Capacity**

25 operating next generation biofuels pilot/demo plants in the U.S.

- 18 cellulosic ethanol plants with capacities ranging from 1,600 gallons per year to 1.5 million gallons per year
- 5 FT or HVO renewable diesel plants: undisclosed to 0.07 gallons per year to 5 million gallons per year
- 2 for biogasoline or biojet

2 operating commercial plants in the U.S.

- Gevo: 18 million gallons per year of butanol
- Dynamic Fuels: 18 million gallons per year of HVO renewable diesel
Projects with Cellulosic Feedstock

Capacities of Operating and Proposed Projects with Cellulosic Feedstock

- Operating 2012
- Including Proposed

- Biobutanol
- FT Liquids / Hydrocarbons, Jet fuel
- Cellulosic Ethanol
- Hydrogenated vegetable oil / animal fat
- Synthetic gasoline

Source: U.S. & Brazil Ethanol Outlook to 2022, April 2012
Continued growth from Brazil, but exports will fall below expectations

E10 blend wall concerns, E15 only limited solution

E15 and higher blending constraints and limited E85 use will keep ethanol below RFS requirements

RFS faces fundamental challenges

- Blend wall
- Shortage of cellulosic biofuel
- Slow commercialization of advanced biofuel technologies
- Near term limits on sugarcane ethanol imports
Outlook and Conclusions

- Changes to RFS2 likely
- Advanced biofuels costly and limited, but offer improved opportunity for incremental biofuel introduction
- Drop in fuel advantages over ethanol
Thank You! / Questions?
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