

2010 API Pipeline Conference

Beyond 1st Generation Biofuels – What Comes Next?

April 2010

New biofuels development

Challenges that new biofuels present for pipeline operators

- High level review of industry
- EIA Annual Energy Outlook
- RFS2

Solutions being implemented to accommodate movement

- Timeline to commercial new biofuels

Transitioning to new biofuels

- Isobutanol
- Biohydrocarbons

High level review of industry

Past

Very efficient industry

- Inexpensive crude oil
- Assets optimized for gasoline
- Finished products from refiner
- Products known
 - Gasoline
 - Diesel
 - Jet
- Pipelines/terminals optimized
- Some regulation
 - CAA; focus on air quality
- Consumer segmented by
 - Price, Brand, Convenience

Present

Industry in transition?

- More Canadian crudes
- Demand shift toward distillate
- Terminal blended products
- Product lines increased
 - Gasoline (w/wo etoh)
 - E85
 - Diesel (w/wo biodiesel)
 - Jet
- Lower pipeline throughputs
- More terminal blending needs
- Significant increase in regulations
 - Ozone, Sulfur, MSAT2, RFS2
- Consumer numb and confused

Future Vision

Industry transitioned

- Bio/petro crude integration?
- Distillate biofuels
- Finished products from refiner
- Products known
 - Gasoline
 - Diesel
 - Jet
- Optimize existing assets
 - Refining & Pipeline/terminal
- Regulations: go to national spec?
- Regain consumer confidence

- Relative to new biofuels
 - integration into existing downstream assets is paramount
 - hydrocarbon production is the optimal solution
 - give the consumer equivalent, if not better, performance
- Ethanol, Biodiesel were expedient, but what do we really need going forward?

US Product Demand Forecast

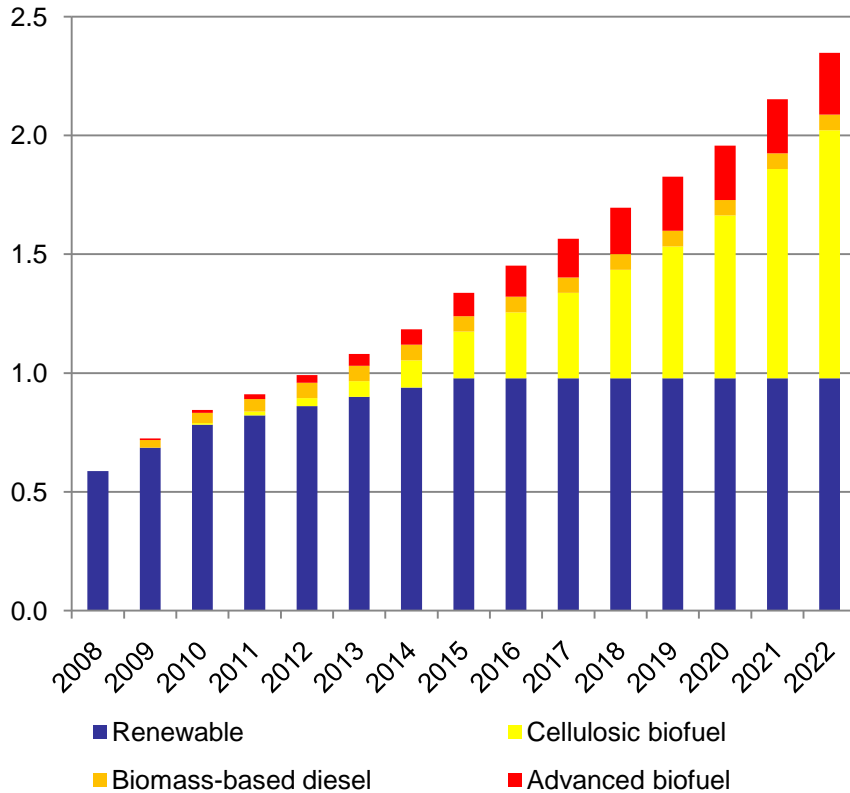
Million barrels/day	2005	2009	2022
Total Gasoline Demand	9.16	9.00	9.55
From Projected Renewable Fuels	0.25	0.70	1.24
From Petroleum Based Gasoline	8.91	8.30	8.31
Total Jet/Diesel Demand	4.85	4.55	5.51
From Projected Renewable Fuels	0.00	0.05	0.28
From Petroleum Based Distillate	4.85	4.50	5.22

Source: Annual Energy Outlook 2008, 2009, 2010 release date 12/2009

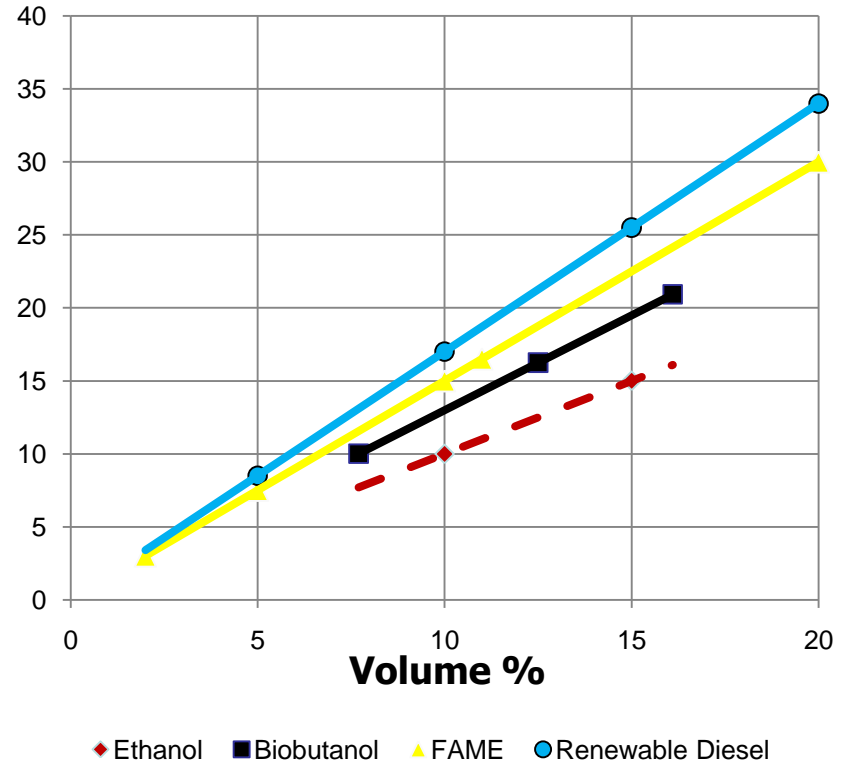
- EIA Annual Energy Outlook
 - Forecasts ethanol as the prime renewable fuel
 - Renewable fuel projections are less than the RFS2 targets
- Based on the data, from a distribution viewpoint , the industry could see
 - Further declines in shipping gasoline, but increased terminal blending
 - Shipping growth with increasing distillate demand
- Based on the data, for new biofuels, producers may possibly
 - Develop products that can be pipeline shipped (inbound/outbound)
 - Put more focus on distillate products

RFS2 Summary

Target Volume
Million bbl/day

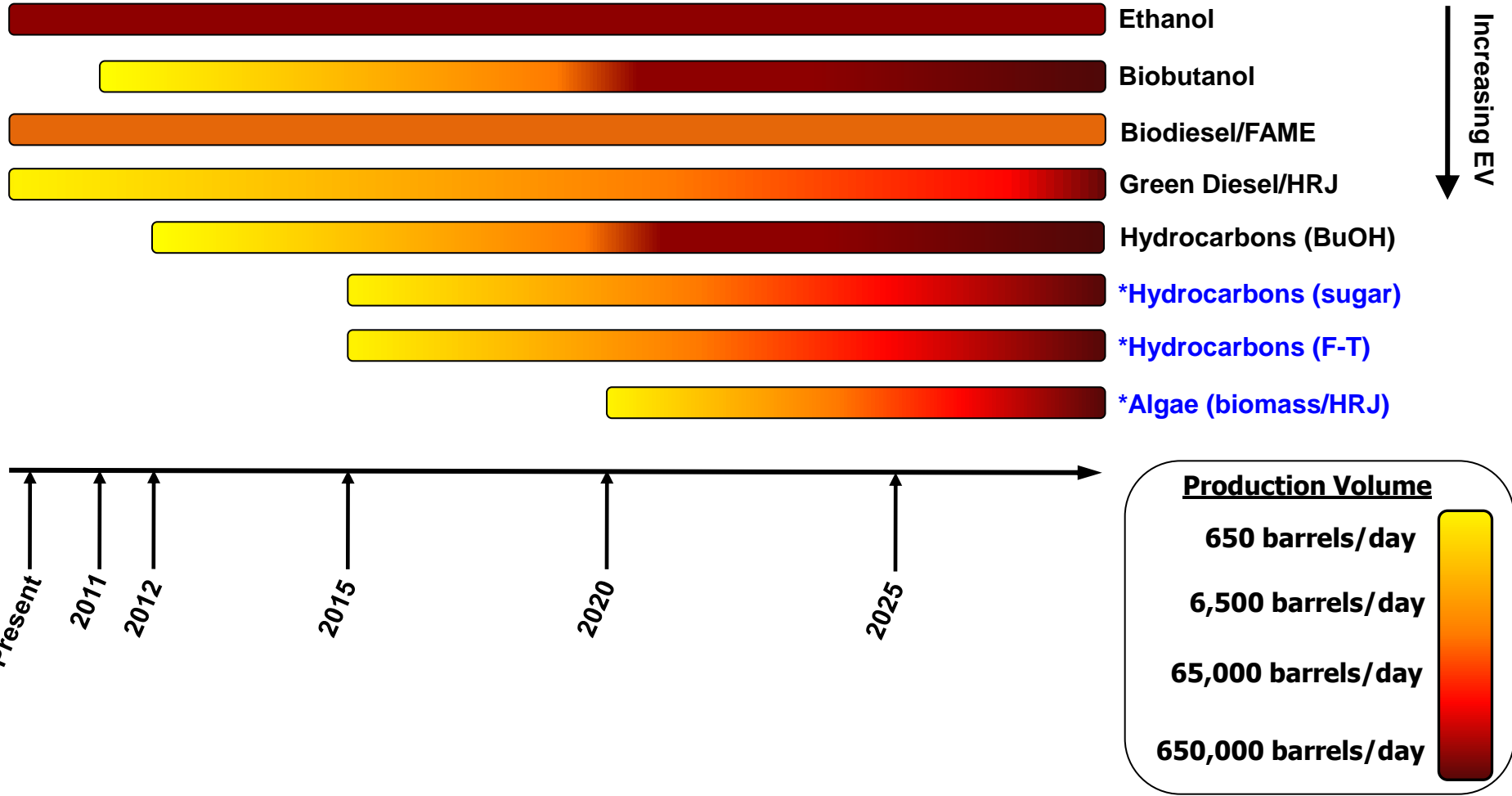


RIN-gallons generated per 100 gallons finished product



- To meet their RVO's, an obligated party will optimize
 - those renewable products with the greatest Equivalence Value (EV)
 - to the highest volume allowed by specification
 - subject to overall value chain cost and availability

Timeline to Commercial New Fuel Production



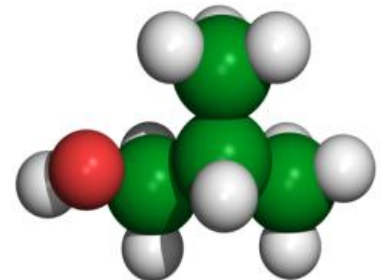
- Based on today's knowledge, biobutanol provides the best, near term new product opportunity, as a gasoline blendstock and to produce hydrocarbons

Biobutanol

Biobutanol encompasses four distinct isomers

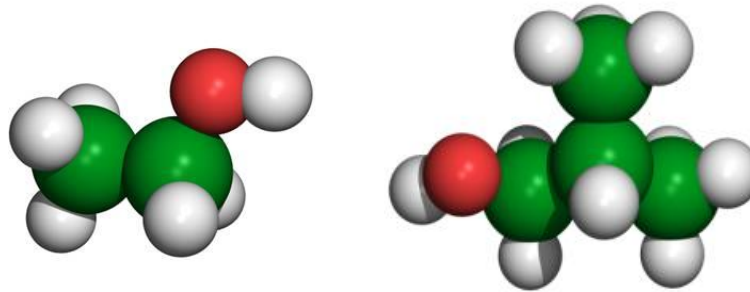
Isobutanol: an elegant platform molecule

- Can now be made inexpensively via fermentation
- Already used in the chemical industry
- Well known safety data
- Hydrocarbon-like character makes it useful as a fuel blendstock
 - Excellent fuel blendstock properties
 - Compatible with existing industry infrastructure
 - Compatible with gasoline engines of all types
- Easily converted to “drop-in” hydrocarbons
 - Specialty chemicals
 - Plastics
 - Fuels



Drop In Hydrocarbon Platform

Using renewable ethanol and isobutanol, 80% of all petrochemicals and 100% of all hydrocarbon fuels can be produced



BUTYLENES

Tires, Consumer Goods,
Durable Plastics



XYLENE

Fibers, Clothing, Bottles,
Cars, Packaging



PROPYLENE

Clothing, Fibers, Cars,
Packaging, Household Goods



FUELS

Gasoline, Jet, Diesel,
Bunker, Heating, Avgas



Transitioning to New Fuels

Integrity

Stress Corrosion Cracking Concerns
 Material Compatibility Concerns
 DRA Impact

MTBE

None
 None
 None

Ethanol

Some
 Manageable
 Unknown

Biobutanol

None
 Unlikely
 Unknown

Biohydrocarbon

None
 None
 None

Quality

Current gasoline blendstock limit
 Current distillate blendstock limit
 Regularly ship neat product via pipeline

2.7% O₂
 NA
 Yes

3.5% O₂
 NA
 Qualified No

2.7% O₂
 NA
 Qualified Yes

None
 None
 Yes

Operations

Blend location
 RIN-gallons/100 gal finished product
 Tax Credit
 Segregated storage for blends

Refinery
 NA
 NA
 No

Terminal
 10.00
 \$0.45
 Yes

Refinery/Terminal
 16.25
 \$0.60
 Initially → No

Refinery
 30+
 \$0.50 - \$1.00
 No

- Ultimately, biohydrocarbons are the best renewable solution
 - No pipeline/terminal issues on Integrity, Quality, or Operations
 - Best solution to meet existing regulations
 - Optimizes existing infrastructure
- Solving ethanol's issues may not be the best long term approach considering the opportunities being developed
- Biobutanol is a great transition from 1st generation biofuels to biohydrocarbons

New Biofuels Summary

- **Integrate/Maximize existing infrastructure efficiency**
 - Transportation fuels industry: what is really needed
 - Value chain cost: supply blendstock/distribute product via pipelines
- **Develop products**
 - That optimize demand shifts, regulatory (RFS2) issues
 - That achieve timely economies of scale at low cost
 - Prioritize best near term opportunities
 - Isobutanol has outstanding overall properties for gasoline pool
 - Isobutanol is an elegant platform molecule to produce biohydrocarbons
- **Relative to pipelines, strategically transition to new biofuels**
 - Move towards products with no Integrity, Quality, or Operations issues



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New Fuels

Thank You

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