



Aviation Biofuels Projects

FAA REDAC Subcommittee on Environment and Energy
March 26 2014

Zia Haq

Lead Analyst, DPA Coordinator

DOE Biomass Program and Hydrocarbon Fuels

- 7 integrated biorefinery projects are investigating hydrocarbons from biomass resources:

Haldor-Topsoe
REII
Solazyme
ClearFuels
Amyris
Sapphire
UOP

- Projects are all pilot or demonstration scale.



For more information visit:

http://www.eere.energy.gov/biomass/integrated_biorefineries.html

Advanced Biofuels for DoD

- **President Obama:** DOE + USDA + Navy to collaborate with the private sector to initiate “drop-in” biofuels industry to meet the transportation needs of DoD and the private sector
- **DOE, USDA & Navy:** MOU signed by Secretary Chu, Vilsack, and Mabus to support sustainable, commercial-scale biorefineries to produce hydrocarbon jet and diesel biofuels in the near-term
- **Construct / retrofit several “Pioneer” Biorefineries:**
 - Drop-in hydrocarbon biofuels meeting military specifications
 - Geographically diverse locations to enable market access
 - No adverse impact on food / feed supplies
 - Demonstrate commercial viability to encourage private-sector investment
 - Utilize Defense Production Act (DPA) for flexible joint funding and spending



DPA Title III Advanced Drop-In Biofuels Production Project

Company	Location	Feedstock	Conversion Pathway	Annual Capacity (M gpy)
Emerald Biofuels	Louisiana	Fats, Oils, and Greases	Hydroprocessed Esters and Fatty Acids (HEFA)	86.0
Natures BioReserve	South Sioux City, NE	Fats, Oils, and Greases	Hydroprocessed Esters and Fatty Acids (HEFA)	53.0
Fulcrum Brighton Biofuels	Western United States	Municipal Solid Waste	Gasification – Fischer Tröpsch (FT)	17.0
Red Rock Biofuels	Lakeview, OR	Woody Biomass	Gasification – Fischer Tröpsch (FT)	14.0

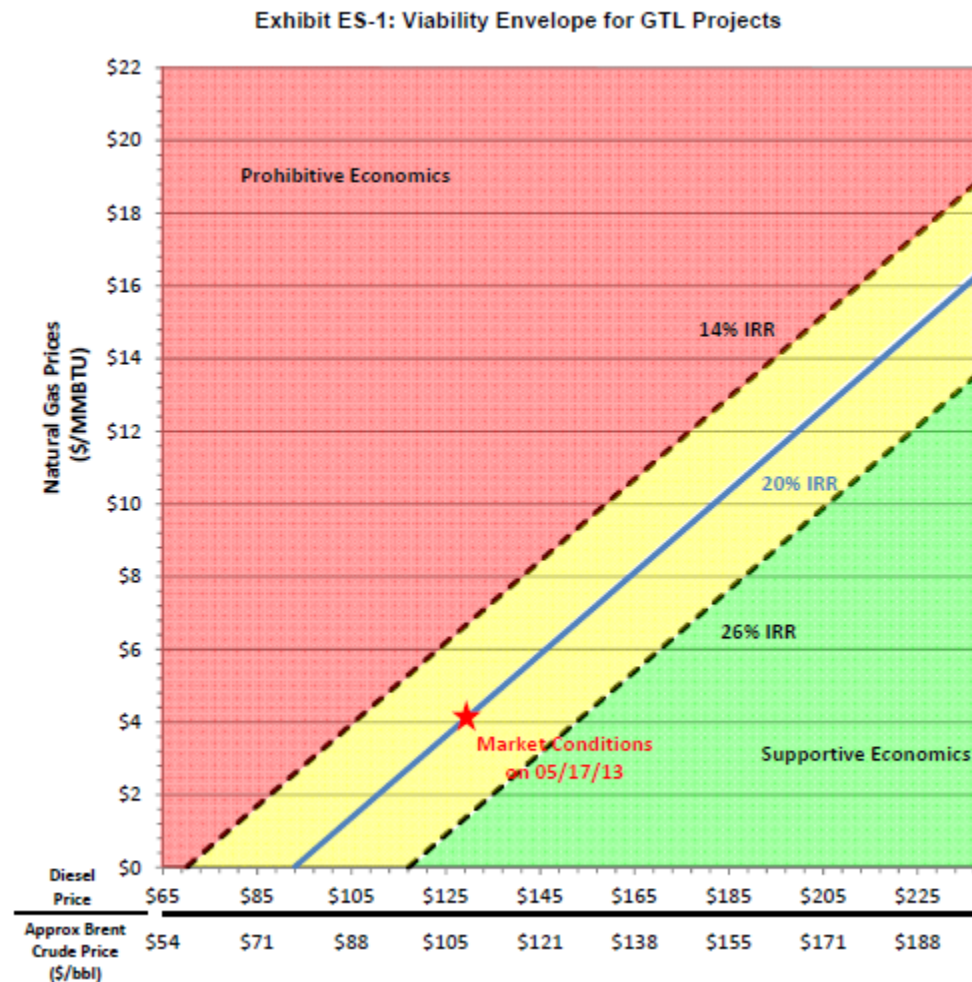
Natural Gas/Biomass to Liquids Workshop

- The recent development of the increased availability of low cost natural gas has increased opportunities to consider the use of natural gas as a feedstock for conversion into liquid hydrocarbons (GTL).
- Co-conversion of natural gas with biomass (GBTL) has the potential of increasing yield of liquid product while also having lower greenhouse gas emissions relative to petroleum.
- DOE is interested in further understanding how the use of natural gas and biomass may be optimized and integrated into a conversion process to produce liquid fuels.
 - Office of Energy Efficiency and Renewable Energy
 - Office of Fossil Energy
 - ARPA-E

GBTL Workshop Results

- Rationale for integrating biomass and natural gas resources to produce liquid transportation fuels is: greenhouse gas reduction and the need for a specific C/H ratio in the fuel
- GBTL processes can produce transportation fuels with 50% lower GHG emissions if substantial amounts of lignocellulosic biomass is co-processed with natural gas
- GBTL processes have significantly higher yields than processes converting only biomass
- Stranded biomass and stranded natural gas offer near-term opportunities to utilize currently unutilized feedstocks
- Research challenges: down-scaling GTL systems, improved catalysts, biochemical conversion processes, feeding biomass into pressurized systems, production of co-products, and many more.

Gas-to-Liquids Cost of Production



Source: NETL, "Analysis of Natural Gas-to Liquid Transportation Fuels via Fischer Tropsch", DOE/NETL-2013/1597, September, 2013.