The U.S. Biodiesel/Renewable Diesel Market
Factors Driving Change Through 2017

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USDA’s Interest in Biofuels
USDA Programs and Activities Support Industry

**USDA Interests**

- Advance the biomass economy to support rural communities.
- Report on biofuel markets & demand for grains & oilseeds to support market efficiency.

**USDA Programs & Activities**

- 2014 Farm Bill Energy Title IX has $694 million in ‘mandatory’ funding (loans & payments) covering crop research & biomass handling technologies for cellulosic fuels, biorefinery redesign to produce advanced fuels and bio-based products, and education. Additional ‘discretionary’ funding supports research. Grants to build market infrastructure to expand delivery of high ethanol blends.
- Office of the Chief Economist supports biofuel market studies & research.
- FAS market reports on the EU and 14 other countries; interagency monthly, near-term forecasts on US corn & soyoil use in biofuels, and annual, long-term projections on US and foreign agricultural markets.
- FAS overseas market promotion to expand the global ethanol market.
- FAS foreign policy engagement on barriers to biofuel trade.
The Renewable Fuel Standard sets long-term policy. EPA rulings setting annual volumes drove BBD use above statutory minimum while state mandate & tax policy support local demand. Legal challenges, federal tax policy, and trade policy create risk.

BBD = BD + RD. BD = biodiesel (fatty acid methyl ester); RD = renewable diesel (only HVO is commercialized) + small amount of biojet fuel; MGs (million gallons); BLs (billion liters).
Early Years
2000-04: Limited Production and Use; No Trade

- Federal support limited to feedstock subsidy (shared with ethanol) and education program
- No state mandates/incentives
- Captive fleets create limited demand
- Very limited production capacity

BBD = BD + RD. BD = biodiesel (fatty acid methyl ester); RD = renewable diesel (only HVO is commercialized) + small amount of biojet fuel; MGs (million gallons); BLs (billion liters).
Expansion & Collapse
2005-10: Exports are Key Driver; Domestic Use is Unstable

- CCC Bioenergy Prog (2000-6)
- Federal tax credit (2005 – today)
- State mandates/incentives (2005 – today)

Supply | Demand
---|---
Imports | Exports
Production | Domestic Use

Domestic Use Rises
- $1/gal federal tax credit
- state mandates/incentives
- production shifts from mainly soyoil to multi-feedstock production in 2008 to control costs

Supply and Demand
2003-2015

MGals
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0

BBD = BD + RD. BD = biodiesel (fatty acid methyl ester); RD = renewable diesel (only HVO is currently commercialized); MGs (million gallons); BLs (billion liters).
Expansion & Collapse
2005-10: Exports are Key Driver; Domestic Use is Unstable

- 50% of production exported by 2008 (mostly Europe)
- Production capacity swells to 2.5 BGs

Exports Drive
Two-thirds of Production Expansion

Supply           Demand

BD Imports                      BD Exports
BD Production                   BD Domestic Use

Supply & Demand Bar Chart

- 2005-10: Exports are Key Driver; Domestic Use is Unstable
- Federal tax credit (2005 – today)
- State mandates/incentives (2005 – today)
- CCC Bioenergy Prog (2000-6)

BBD = BD + RD. BD = biodiesel (fatty acid methyl ester); RD = renewable diesel (only HVO is commercialized) + small amount of biojet fuel; MGs (million gallons); BLs (billion liters).
Expansion & Collapse
2005-10: Exports are Key Driver; Domestic Use is Unstable

CCC Bioenergy Prog (2000-6)
Nat Biodiesel Ed. Prog (2008 – today)
Federal tax credit (2005 – today)
State mandates/incentives (2005 – today)

Supply           Demand
Exports Collapse
➢ Europe imposes Cv/AD duties
Domestic Use Collapses
➢ RFS2 ruling delayed 20 months to June 2010
➢ 12-month lapse in blenders credit (2009)
➢ Financial Crises of 2008 freezes credit markets, and ensuing severe recession causes on-road diesel use to drop 9% from 2008 to 2009

MGals
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0

3.0 BLs
1.5 BLs

BBD = BD + RD. BD = biodiesel (fatty acid methyl ester); RD = renewable diesel (only HVO is commercialized) + small amount of biojet fuel; MGs (million gallons); BLs (billion liters).
Expansion Resumes on Surer Footing
2011-12: RFS 2 Builds Domestic Use; Trade is Limited

First RFS2 rulings impacting BD and RD use are finalized in June 2010 (20 months late); BBD & UAB obligations (mandates) reach 1 BGs & 490 MGs by 2012, respectively.

BBD = biomass-based diesel (BD+RD); UAB = undifferentiated (non-cellulosic) advanced biofuels (measured in ethanol vols).

<table>
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<th>Year</th>
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1/ Volumes are in ethanol-equivalent. Actual volumes blended will be lower if any portion contains fuels with energy content greater than ethanol.
2/ Not published by EPA. "Implied" volumes are calculated by subtracting total advanced by total renewable fuel. Nearly all is corn ethanol.
3/ BBD values are actual vols, not ethanol-equivalent vols. Multiply biodiesel & renewable diesel values by 1.5 and 1.7 to find ethanol-equivalent vols.
4/ Starting in 2012, BBD volumes may be no less than 1 billion gallons.
5/ Not published by EPA. Known as "undifferentiated (non-cellulosic) advanced biofuel." Equals total advanced minus cellulosic biofuel minus (BBD x 1.5). Negative values for 2010 and 2011 indicate that obligations for BBD were set high enough so that when met no additional advanced biofuel was needed to meet obligation for Total Advanced.

Updated: ECarter, OGA/FAS/USDA, May 2018.
Advanced biofuels remain far behind original schedule due to lack of cellulosic fuels. EPA rulings increased the “space” for BD/RD above the original schedule thru 2014, reduced it slightly below in 2015-17, and lowered it still further below in 2018.

- **BBD** can also fill the “conventional” biofuel category but this is rare. Schedule for RFS 2 ends in 2022.
Expansion Continues
2013-17: EPA Rulings & California’s LCFS Build Domestic BBD Use; Renewable Diesel Arrives; Biodiesel Imports Surge Then Retreat

CCC Bioenergy Program 2000-6
Nat Biodiesel Ed. Prog (2003 – today)
Federal tax credit (2005 – today)
State mandates/incentives (2005 – today)
RFS2, EPA rulings, RINs (2009 – today)
California LCFS (2013 – today)

MGals

10.6 BLs

Supply

Imports

Exports

Demand

Production

Domestic Use

BBD = biomass-based diesel (BD+RD). BD = mostly road transport biodiesel, some off-road transport and heating oil; RD = mostly drop-in road transport renewable diesel, but some biojet starting 2016. UAB = undifferentiated (non-cellulosic) advanced biofuels (ethanol vols).
# US Biodiesel & Renewable Diesel Market
## Annual Supply/Demand Balances

### US Biomass-based Diesel (BBD) Supply/Demand, MGals

BBD = Biodiesel (FAME) + Renewable Diesel (RD); RD = drop-in renewable diesel (transport & heating oil) + biojet fuel

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<th>IMPORTS FAME</th>
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<td>1,712.0</td>
<td>198.5</td>
</tr>
</tbody>
</table>

Export reliance = exports/production
Import reliance = imports/dom. use


Sources:
- Fame Production: 2000-05 (CCC Bioenergy Program, USDA); 2006-10 DOE Industry Survey (Rpt M311K); 2011-forward (DOE/EIA)
- Fame Trade: DOC/US Census Bureau, B30-100 Chapt. 38 HTS codes (assume B100) plus Petroleum Oils Containing Biodiesel (>B30) Chapter. 27 HTS codes (assume average B5 content) beginning 2012. Include errata updates thru 2017
- RD Imports: DOE/EIA "Company Level Imports" from Petroleum and Other Liquids, product code = 205
- RD Domestic Use: derived by balancing all other elements of supply and demand.
- Fame Stocks: DOE/EIA Monthly Energy Review (MER), Table 10.4
- RD Stocks: EIA Monthly Petroleum Supply Report (PSM) minus MER
Imports from Argentina were shut down beginning Sept 2017 with the imposition of anti-dumping and countervailing duties. Imports from Indonesia ended in 2017 before duties were imposed.
State Policies Create Regional Pools of Demand

- Beginning 2013, California’s LCFS & carbon market have raised the use of BBD, and pushed the state’s blending rate to three times the national average or 13% by 2017. As an aside, biogas rose to 67% of the state’s LNG/CNG market in 2017. Oregon has more recently adopted a similar program.
- Other state tax credits and blend mandates create regional pools of demand. Following California, in descending order of size, are Texas, Illinois, Oregon, Minnesota, New York (residential/commercial heating), Iowa, and Pennsylvania.

Earlier BBD Trade Surplus Has Become a Trade Deficit

- Small trade deficit in 2005-6, was followed by a surplus in 2007-12 which was especially large (140-380 MGs) in 2007-9 with biodiesel exports to EU peaking prior to the EU imposition of AD/Cv duties.
- Since 2013, the trade balance has remained negative peaking at (-)810 MGs in 2016 due to 1) little overall growth in exports (EU duties applied in 2009 were extended in 2015), and 2) expanding imports, mainly biodiesel from Argentina (Indonesia as well) and renewable diesel from Singapore.
- From 2016 to 2017, the deficit fell by half as imports declined due to the imposition of US AD/Cv duties on Argentina & Indonesia.

Future Market Expansion Through Higher Blending, Not Fuel Pool Growth

- Distillate fuel oil use was 60.8 BGs in 2016, of which 40.2 BGs was used on-highway and 5.6 BGs for heating oil. EIA projects the on-highway pool will decline thru 2035 assuming fleet efficiency gains.
- Biodiesel use of 2.35 BGs (2017) equals a national average blend rate close to B4 for markets now blending, so there is a lot of room to expand from a technical standpoint since nearly all OEMs approve the use of B20. By comparison, Brazil, Argentina & Indonesia are near or just above B10.
- B10 for US nationwide on-highway plus the Northeast heating oil market currently equals about 4.4 BGs of biofuel; extending B10 to the entire distillate market raises the figure to 6 BGs.

EIA (US Energy Information Administration); OEMs (original equipment manufacturers); LCFS (Low-Carbon Fuel Standard); CI (carbon intensity); AD (anti-dumping); Cv (countervailing).