

The Bioenergy Technologies Office (BETO) supports targeted research, development, demonstration, and deployment (RDD&D) activities to advance the sustainable, nationwide production of advanced biofuels that will displace a share of petroleum-derived fuels, mitigate climate change, create jobs, and increase United States energy security.

## What We Do

- ✓ Research and Development focused on addressing technical barriers, providing engineering solutions, and developing the scientific and technological underpinnings of a bioenergy industry.
- ✓ Demonstration to de-risk bioenergy production technologies through validated proof of performance at the pilot-demonstration, and pioneer-scales, and to conduct activities that will transform the biofuels market by reducing or removing barriers to commercialization.
- ✓ Analysis and Sustainability that works across the supply chain with BETO's Feedstocks, Conversion, and Demonstration & Market Transformation technology areas to support the development of a sustainable bioeconomy.

## Program Goals/Metrics

- Through RDD&D, make drop-in hydrocarbon fuels competitive with petroleum-based fuels at a modeled price of mature technology of \$3/gge (\$2011), with GHG emissions reduction of 50% or more compared to petroleum derived fuels, based on Energy Information Administration projected gasoline wholesale prices in 2017.
- By 2017 validate a mature technology plant model price of ethanol production, based on actual IBR project plant performance data and compared to the target of \$2.15/gallon ethanol (2007).

## FY 2016 Priorities

- **Feedstocks Supply and Logistics** will continue to focus on feedstock supply and logistics efforts to help meet 2017 biomass feedstock cost targets (from \$115/Dry Matter Ton (DMT) in fiscal year (FY) 2015 to \$95/DMT in FY 2016, and then \$80/DMT in FY 2017).
- **Algae and Advanced Feedstocks** will focus on research to address yield, productivity, and integration of downstream logistics at the pre-pilot scale. This will support validating the potential for algae supply and logistics systems to produce 5,200 gallons of oil (or equivalent biofuel intermediate) per acre of cultivation per year by 2022. This will also achieve a modeled nth plant minimum selling price of \$3.27/gge (2011) of raw biofuel intermediate by FY 2022 that will enable the final fuel production price of \$3/gge.
- **Conversion Technologies** will select pathways for validation at integrated bench and/or pilot scale in FY 2017. BETO will fund research consortia to further the integration of bio-oils into petroleum refineries; advance the development of biological and chemical catalysts and clean sugar production; support the resolution of gasification and gas-to-liquids issues identified in FY 2014 workshops; and continue incubator, carbon fiber and other evolving renewable chemicals activities.
- **Demonstration and Market Transformation** will focus on integrated production and scale-up of drop-in hydrocarbon biofuels, with new investments that will accelerate the momentum for advanced biofuel manufacturing and will broaden the portfolio of hydrocarbon fuel production at pilot and demonstration-scale. Markets for advanced biofuels will be considered, including co-designing next-generation engines to better utilize biofuels through the Fuel and Vehicle Systems Optima collaboration with the Vehicle Technologies Office.

(Dollars in Thousands)	FY 2014 Enacted	FY 2015 Enacted	FY 2016 Request
Feedstocks	46,972	32,000	38,800
Conversion Technologies	101,384	95,800	99,186
Demonstration and Market Transformation	64,790	79,700	87,514
Strategic Analysis and Cross-Cutting Sustainability	12,146	11,000	14,000
Biopower/Cookstoves	1,998	0	0
NREL Site-Wide Facility Support	5,000	6,500	6,500
<b>Total, Bioenergy Technologies</b>	<b>232,290</b>	<b>225,000</b>	<b>246,000</b>

## Key Accomplishments

- **Significant Progress in Reducing Costs for Advanced Biofuels**
  - BETO’s five high-tonnage feedstock logistics projects (which included partnerships with original equipment manufacturers) demonstrated significant cost reductions of approximately \$13 per dry ton.
  - BETO’s thermochemical conversion research and development achieved a \$4.09/GGE target, down from a cost of \$4.60 in FY 2013. This keeps BETO on track to achieve the cost target of \$3.39/GGE by 2017.
  - The National Renewable Energy Laboratory demonstrated an innovative technology to break down and convert lignin to key intermediate molecules that could enable the future development of cost-competitive products from lignin.
- **Two commercial-scale cellulosic ethanol production facilities opened**
  - POET-DSM’s **Project LIBERTY** in Emmetsburg, Iowa, held its grand opening in September 2014, becoming the first commercial-scale cellulosic ethanol plant to use corn waste as a feedstock. The plant is designed to produce up to 25 million gallons of cellulosic ethanol per year from corn waste harvested by local farmers in a 30–40-mile radius of the facility.
  - The grand opening of **Abengoa’s** cellulosic ethanol plant in October 2014 marked the third commercial-scale facility to open in the country. The plant will produce cellulosic ethanol from non-edible corn stalks, stems, and leaves harvested within a 50-mile radius of the facility. At full capacity (25 million gallons of cellulosic ethanol per year), the Hugoton, Kansas, facility will process up to 1,000 tons of biomass per day.



*Photo courtesy of POET-DSM*  
 POET-DSM’s Project LIBERTY cellulosic ethanol plant in Emmetsburg, Iowa.



*Photo courtesy of Abengoa.*  
 Energy Secretary Moniz attends the opening of Abengoa’s cellulosic ethanol plant in Hugoton, Kansas.