

Biomass Program Overview

Introduction

The Biomass Program is an integral component of EERE's efforts to diversify the U.S. energy supply. The program works with industrial partners, national laboratories, universities, and other stakeholders to develop the technologies and systems needed to cost-effectively turn abundant domestic biomass resources into clean, affordable, and sustainable biofuels. In recent years, the program has been primarily geared toward development and deployment of ethanol from non-food feedstocks, but is now expanding its scope to additional alternative fuels, such as bio-butanol, green gasoline, jet fuel, and diesel. For information on the program's advanced biofuels activities, view the following presentations from the program's Biomass 2009 conference:

http://www1.eere.energy.gov/biomass/pdfs/Biomass_2009_Adv_Biofuels_I_Reed_Intro_Outline.pdf and
http://www1.eere.energy.gov/biomass/pdfs/Biomass_2009_Adv_Biofuels_II_Reed_Intro_Outline.pdf

Successive Generations of Biofuels



**Corn
Ethanol**



**Cellulosic
Ethanol**



**Advanced
Biofuels**

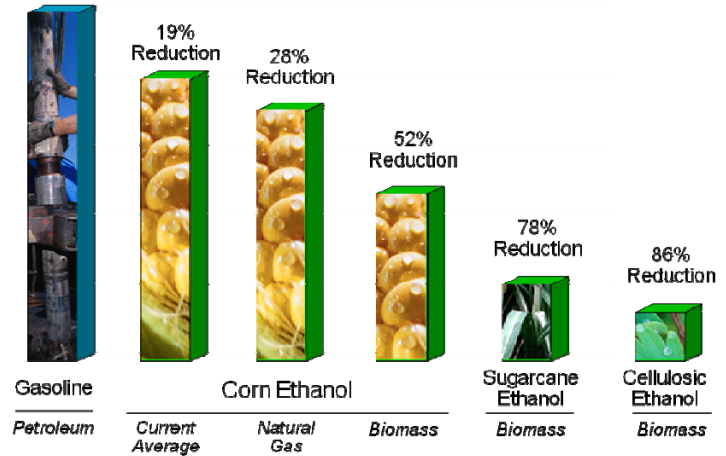
Need for Alternative Energy Sources

Americans rely on fossil fuels to meet their energy needs. Unfortunately, these fuels release harmful emissions into the environment and often must be imported from other countries – a threat to U.S. energy security. In addition, fossil fuels are a finite resource and scientists estimate that they will be depleted within the next 50-100 years. For these reasons, the U.S. government is committed to developing alternative energy sources, including renewable resources like biomass.

Opportunity for Biofuels

Biofuels made from abundant, renewable feedstocks offer significant benefits over conventional liquid fuels. Growth of the biomass industry is creating new markets and employment for farmers and foresters, as well as job opportunities in processing and distribution. Biofuels also provide a number of environmental advantages over conventional fossil fuels – most notably a reduction in greenhouse gas (GHG) emissions. Finally, use of domestically produced biofuels improves energy security by reducing reliance on foreign sources of energy and decreasing the threat of supply disruptions due to natural disasters, political instability, and price volatility. For more information on benefits, access the Benefits section of the Biomass Program site at http://www1.eere.energy.gov/biomass/biomass_benefits.html.

Biofuels Reduce Greenhouse Gas Emissions: Reductions Vary by Feedstock and Type of Energy Used for Processing



Source: Wang et al. *Environ. Research Letters*, May 2007; Wang et al. *Life-Cycle Energy Use and GHG Implications of Brazilian Sugarcane Ethanol Simulated with GREET Model*, Dec. 2007.

Challenges to Increased Biomass Use as a Fuel Source

Recognizing the potential benefits of biofuels, Congress passed the Energy Independence and Security Act of 2007, which requires that renewable fuels collectively contribute at least 36 billion gallons to the total U.S. transportation fuel supply by 2022 and meet interim supply targets. This legislative target calls for unprecedented growth in our biofuels industry, which today produces about 9 billion gallons of ethanol annually. Challenges to widespread deployment of biofuels include the need for new systems and networks to efficiently produce, harvest, and transport large quantities of diverse feedstocks; advanced technologies to cost-effectively convert that biomass into fuels; and an expanded and improved distribution and end-use infrastructure to deliver these fuels to consumers across America.

Program Vision & Mission

The program’s vision is to achieve a viable, sustainable, U.S. biomass industry that produces renewable biofuels, bioproducts, and biopower; enhances U.S. energy security; reduces U.S. dependence on oil; reduces greenhouse gas emissions; provides other environmental benefits; and creates economic opportunities across the nation. To reach this goal, the program will develop and transform the renewable and abundant biomass resources in the United States into cost-competitive, high-performance biofuels, bioproducts, and biopower. This will be achieved through targeted research, development, and demonstrations leading to deployment in integrated biorefineries, supported through public and private partnerships.

Program Cost-Reduction Goals

Reducing the cost of cellulosic ethanol is critical to biofuels adoption. The program’s near-term goal is to develop breakthrough technologies needed to make cellulosic ethanol cost-competitive with corn-based ethanol by 2012. To achieve its cost targets, the program is focused on increased productivity and efficiency in the areas of feedstock logistics and conversion.

Biomass Research and Development Initiative

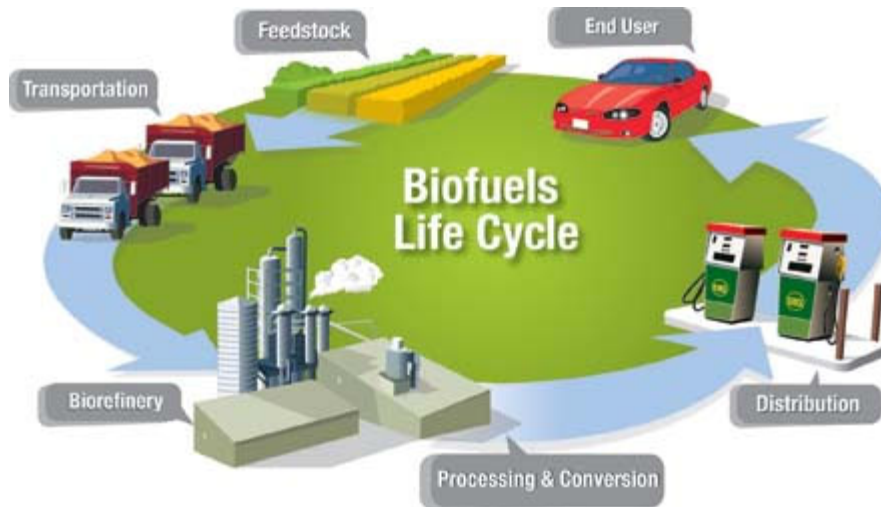
The Biomass Program works closely with the Biomass Research and Development (R&D) Board (Board), a multi-agency effort that coordinates all federal biobased products and bioenergy R&D activities. The Board was mandated by the *Biomass R&D Act of 2000* and repealed and replaced by the Food, Conservation, and Energy Act of 2008 (Section 9008). The Board is co-chaired by the U.S. DOE and USDA and includes senior-level officials from 10 agencies and the President’s Office of Science and

Technology Policy. The Biomass R&D Technical Advisory Committee consists of approximately 30 senior representatives from industry, academia, and state government, and provides guidance to the Board on technical issues. The program relies on these organizations to help guide its RD&D efforts and coordinate these efforts with those of other agencies. The BRDI website is located at <http://www.brdisolutions.com/default.aspx>.

Biomass Program RD&D

The Biomass Program is engaged in RD&D projects across the biofuels supply chain. These areas include the following:

- **Feedstock Production** – Sustainable feedstock production includes all of the steps required to produce biomass feedstocks to the point they are ready to be collected or harvested from the field or forest. This includes plant breeding and genomics, crop selection, crop development, and ultimately crop production. The Biomass Program focuses its sustainable feedstock production R&D in three main areas: Resource Assessment, Resource Development, and Sustainability. This work is conducted in conjunction with the Oak Ridge National Laboratory and through Regional Biomass Energy Feedstock Partnerships, led by the Sun Grant Initiative Universities. More information is available at http://www1.eere.energy.gov/biomass/feedstocks_sustainable_production.html.
- **Logistics** – Feedstock logistics encompasses all of the unit operations necessary to move biomass feedstocks from the land to the biorefinery and to ensure that the delivered feedstock meets the specifications of the biorefinery conversion process. Biomass Program work in the area of Feedstock Logistics is conducted in partnership with the Idaho National Laboratory and a variety of industrial partners. It focuses on four main areas of R&D: Harvest and collection, handling, storage, and transportation. Visit http://www1.eere.energy.gov/biomass/feedstocks_logistics.html for additional details.
- **Converting Feedstocks into Fuels** – Research in this area includes biochemical and thermochemical pathways for conversion of feedstocks. The program’s integrated biorefineries projects provide data at scale to validate the viability of sustainably converting a wide range of biomass feedstocks into biofuels, biopower, and bioproducts. Processing and conversion is described at http://www1.eere.energy.gov/biomass/processing_conversion.html.
- **Distribution** – The Biomass Program is working with state and local government leaders, industry, and others to identify options for the development of an efficient distribution infrastructure that can reach consumers across the country. Learn more at <http://www1.eere.energy.gov/biomass/plant-to-pump.html>.
- **End-use Infrastructure** – The program is seeking ways to make ethanol available to consumers through significant expansion of the E85 infrastructure, and is testing the impact of intermediate ethanol blends, such as E15 or E20, on legacy vehicles and small engines. More information is available at <http://www1.eere.energy.gov/biomass/infrastructure.html>.



Additional activities include:

- **Analysis** – The Biomass Program uses a wide range of analytical tools, data, and methodologies to support decision making, guide research, and demonstrate progress toward goals. Most analyses fall under two broad categories: strategic analysis and portfolio analysis. Strategic analysis addresses cross-cutting issues to help frame overall program direction and goals. Portfolio analysis, by contrast, ensures that Program activities and projects are aligned to meet the research and development (R&D) targets necessary to accomplish program goals. Each of the Program's technology platforms conduct R&D portfolio analyses in their areas of focus. Analysis activities are described at http://www1.eere.energy.gov/biomass/biomass_analysis.html.
- **Sustainability Efforts** – Analyses on water, feedstock production, indirect land use, biodiversity, and GIS tools will help ensure that biofuels leave a smaller environmental footprint than conventional fuels throughout their lifecycle. Information is available at <http://www1.eere.energy.gov/biomass/sustainability.html>.