

Growing America's Energy Future: Renewable Bioenergy

The emerging U.S. bioenergy industry is using a range of biomass resources to provide a secure and growing supply of transportation fuels, electric power, and bioproducts. Using our abundant, renewable biomass resources can reduce U.S. oil dependence, decrease impacts on climate, stimulate economic growth, and create green jobs.

Strategic Goal

Develop sustainable, cost-competitive technologies to enable the large-scale production of biofuels, bioproducts, and biopower that will lower carbon emissions and reduce dependence on oil.

The Renewable Fuel Standard (RFS) in the Energy Independence and Security Act (EISA) of 2007 underscores the value of biofuels in improving our national energy security. EISA requires that advanced biofuels supply at least 21 billion gallons of U.S. motor fuels by 2022. Meeting the RFS will require unprecedented growth in the U.S. bioindustry over the next decade.

Success in achieving this growth will depend on the development of efficient new systems and networks to sustainably produce, harvest, and transport large quantities of diverse feedstocks; advanced technologies to cost effectively convert biomass into fuels; and an expanded and improved distribution and end-use infrastructure to deliver these fuels to consumers across America.

Strategic Approach

In partnership with industry and others, the Biomass Program is developing advanced technologies and real-world solutions to dramatically



DOE's Biomass Program is accelerating development of a sustainable U.S. bioindustry to improve our nation's energy security, stimulate the economy, and reduce climate impacts.

reduce costs and spur the growth of a new bioindustry in America. Through research, development, and demonstration (RD&D), we are advancing technologies to accelerate the sustainable production of clean, affordable biofuels, biopower, and bioproducts.

To support advanced bioenergy production goals, our researchers focus on unlocking the potential of diverse, non-food biomass resources, such as switchgrass, agricultural and forest residues, municipal waste, and algae. These efforts will yield biopower, bioproducts, and a range of advanced biofuels, including cellulosic ethanol, renewable gasoline, jet fuel, and renewable diesel.

Commitment to Sustainability

The program's sustainability efforts address environmental, social, and economic issues along the entire bioenergy supply chain. The program is committed to maximizing environmental benefits while mitigating concerns. Through field research, modeling, and advanced analysis, the program investigates the life-cycle impacts of bioenergy production on greenhouse gas emissions, air quality, soil quality, water, biodiversity, and land use.

Integrated Biorefinery Demonstrations

The Biomass Program provides cost-shared support for construction and start-up of demonstration-scale and commercial-scale biorefineries that use a variety of conversion technologies and feedstocks to produce advanced biofuels.

In addition, our geographically diverse pilot- and demonstration-scale biorefinery projects are validating technologies that produce advanced biofuels, bioproducts, and heat and power in integrated systems. The aim is to encourage private investment in commercial-scale replications.

Technology Pathways

The most economical way to produce biofuels is in integrated biorefineries, where the biomass can be used to produce fuels, high-value bioproducts, and power. Key challenges are to effectively integrate complex feedstock and conversion systems to lower production costs.

New processes are increasing conversion efficiencies and yields.



Biofuels will make efficient use of a broad range of biomass feedstocks across the nation.

Sustainable Biomass Supply and Logistics

The success of the U.S. bioindustry depends to a large extent on the quantity and quality of biomass available, and on the industry's ability to collect, store, and transport it cost-effectively. In cooperation with diverse partners, the program is identifying sustainable biomass feedstock resources, developing economically viable and environmentally sound production methods, and designing feedstock logistics systems to ensure resource readiness.

Conversion Processes

The Biomass Program is exploring new technologies to cost effectively break biomass into components that are more easily converted into fuels. The program conducts RD&D on several conversion processes—two of the main ones being biochemical and thermochemical.

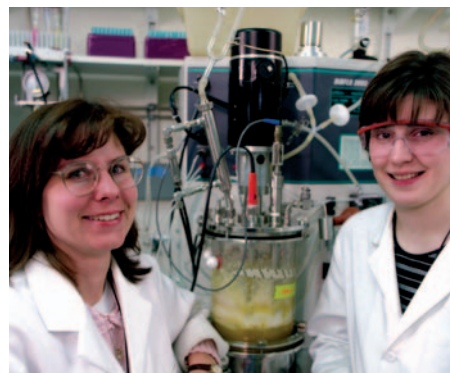
Biochemical Conversion: The biochemical conversion process uses chemicals and enzymes to break down cellulose into sugars, which can then be fermented to produce alcohol

fuels, including ethanol and others. Researchers are working to reduce the cost of pretreatment and enzymatic hydrolysis processes and are also exploring robust new fermentation microorganisms. Future research will explore integration of biological and chemical catalysis to produce a wider range of advanced fuels and products.

Thermochemical Conversion: The thermochemical conversion process uses heat and pressure or chemicals to break down biomass into a synthesis gas (syngas) or bio-oils, which can then be burned for power; converted to fuels such as ethanol, gasoline, and diesel; or used to make other products. Researchers are focusing on cost-effective options for gas cleanup, development of high-yield catalysts for fuel synthesis, and other thermochemical routes to biofuels that might take advantage of the existing petroleum infrastructure.

Distribution and End Use

Increases in bioenergy use will require more efficient strategies for transport, storage, and delivery. To move large volumes of biofuels into major markets, for example, we need an efficient distribution infrastructure to serve consumers across the country. The Biomass Program is working with



The Biomass Program's research and development efforts have helped to lower the cost of cellulosic ethanol.



Ethanol is the most widely used biofuel today and is available in a variety of blends.

state and local government leaders, industry, and others to identify options that can best meet this challenge.

Use of E10 (a blend of 10% ethanol and 90% gasoline) has nearly saturated the fuels market. To demonstrate the feasibility of using higher blends, the program is working with DOE's National Laboratories and the Environmental Protection Agency to test the impact of E15 and E20 on vehicles, small engines, and fueling infrastructure.

For More Information

Contact the EERE Information Center 1-877-EERE-INF or 1-877-337-3463 or visit www.biomass.energy.gov.

Bioindustry Creates Green Jobs

A robust bioindustry will create high-paying jobs in a range of fields, from farming and trucking to biochemical engineering and microbiology. While projections of job creation vary, analysts agree that the sector is likely to be a powerful jobs stimulus.

Fuel pump photo courtesy of Blend Your Own Ethanol.