

Colorado

Colorado can leverage its existing, abundant biomass resources to produce biofuels and high-value products. The Bioenergy Technologies Office (BETO) enables the development of novel technologies that can be used to establish Colorado as a leader in the bioeconomy.

Colorado's biomass resources offer a sustainable strategy to stimulate economic growth, improve U.S. energy security, reduce carbon emissions, and create new jobs.



Economy

Colorado spent **\$10.8 billion** on petroleum for transportation in 2013. Investments in Colorado **biofuels help keep a larger portion of those dollars within the state** to stimulate economic development and add to the state's **72,600+ jobs** in green goods and services.



Energy

Colorado embodies the “**all-of-the-above**” strategy by developing its abundant conventional and renewable energy resources. **Locally produced bio-based fuels and products** support this strategy—producing economic benefits and establishing the state as a **clean energy leader**.



Environment

In 2012, petroleum use by Colorado's transportation sector released **26.1 million metric tonnes of carbon dioxide**. On a life-cycle basis, advanced biofuels can **reduce greenhouse gas emissions by ≥ 50%** compared to petroleum—helping to reduce environmental impacts.



Feedstocks

Utilization of **municipal solid waste, energy crops, and algae** can all contribute to the production of biofuels and products. Colorado could leverage over 1 million metric tonnes of **wood waste** and 2 million metric tonnes of **agricultural residues** annually to develop advanced biofuels.

Strategic policies and investments help *bridge the gap* between promising research and large-scale production of advanced biofuels.

The **Bioscience Discovery Evaluation Grant Program** aids in the growth of the bioscience industry in Colorado. Since 2007, the program has helped to establish 45 new Colorado companies that commercialize biofuels and other bioscience technologies.

In addition to funds provided to NREL, the U.S. Department of Energy (DOE) has awarded over **\$471 million** to university, national laboratory, and industrial partners in Colorado to research, develop, and deploy sustainable bio-based fuels and products since 2005.

In 2015, **OPX Biotechnologies** (acquired by Cargill) was selected to receive up to **\$2 million** to develop novel metabolic engineering pathways for high-performance lubricants from cellulosic biomass.

Colorado is Home to the National Renewable Energy Laboratory (NREL)

Renewable Bioenergy Program

NREL is developing technologies to sustainably convert non-food biomass resources to fuels, chemicals, and materials.

Integrated Biorefinery Research Facility (IBRF)

NREL's IBRF enables researchers and industry partners to develop, test, and demonstrate novel biochemical processes for the production of bio-based fuels and products.

Thermochemical Users Facility (TCUF)

The TCUF enables the testing and development of reactors, filters, catalysts, and other thermochemical conversion unit operations at an industrially relevant scale.

Energy Systems Integration Facility (ESIF)

The ESIF enables high-performance computing and collaborators to accelerate the integration of renewable energy and energy efficiency technologies into legacy energy systems.

Why Colorado?



Abundant biomass resources (NREL estimates 3.4 million metric tonnes per year) provide a locally sourced supply chain for biofuels production. 

National leadership in innovative research supports growth of the bioeconomy; NREL has 300 licensable, patented technologies, and in 2014, it had 242 new and 657 total active technology partnership agreements. 

Developing in-state resources supports the “all-of-the-above” energy strategy and clean energy goals. 

State policies recognize the social, economic, and environmental benefits of biofuels and products. 

DOE has supported the **Colorado Center for Biorefining and Bioproducts (C2B2)**—a cooperative research and educational center combining the work of Colorado universities and NREL—as well as individual projects from the **University of Colorado**, **Colorado School of Mines**, and **Colorado State University**. DOE seeks to convert promising biofuel and biotechnologies research into commercial production.

BETO University Projects in Colorado

Operated by:	Colorado State University		University of Colorado and C2B2		Colorado School of Mines
Project:	Building a more efficient biomass cookstove	Identifying genes that control biomass production using rice for increased productivity	Developing rapid solar-thermal chemical reactor systems for the conversion of biomass	Modifying <i>Escherichia coli</i> (E.coli) to produce biofuels	Producing algae and co-products for energy
Location:	Fort Collins	Fort Collins	Boulder	Boulder	Golden
Stage:	Research and development (R&D), lab testing	R&D	R&D	R&D	R&D
Primary product:	Clean biomass cookstoves	Genetics data for development of second-generation bioenergy grasses	Syngas	Ethylene and isobutanol	Algae and co-products
Feedstock:	Multiple (woody crops: coconut, fir, oak, and wood pellets)	Rice	Multiple (grass, sorghum, corn stalks and leaves, wood waste, and algae)	N/A (E. coli)	Waste carbon dioxide water, plus nutrients

For more information on Colorado's energy portfolio and the economic benefits of biofuels, visit: eia.gov/state/analysis.cfm?sid=CO
energy.gov/eere/bioenergy/about-bioenergy-technologies-office-growing-americas-energy-future-replacing-whole-core.org/files/pdfs/states/Colorado.pdf (based on 2011 survey by the Bureau of Labor Statistics)
 For more information on Colorado's biomass resources and environmental impacts, visit: epa.gov/otaq/fuels/renewablefuels/documents/420f12078.pdf
eia.gov/environment/emissions/state/state_emissions.cfm
eere.energy.gov/bioenergy/pdfs/billion_ton_update.pdf, maps.nrel.gov/biofuels-atlas

For more information on Colorado clean energy initiatives and DOE partnerships, visit: advancecolorado.com/funding-incentives/financing/bioscience-discovery-evaluation-grants
nrel.gov/biomass/
nrel.gov/biomass/integrated_biorefinery_research_facility.html
nrel.gov/biomass/thermochemical_users_facility.html
energy.gov/eere/bioenergy/financial-opportunities