

# Delivering Advanced Biofuels & Bioproducts to the Marketplace

A Progress Report from the Department of Energy Bioenergy Research Centers

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## The Bioenergy Research Center Charge

The U.S. Department of Energy-funded Bioenergy Research Centers (BRCs) are conducting research to develop a viable and sustainable domestic biofuel and bioproducts industry from dedicated bioenergy crops such as switchgrass, poplar, and energy sorghum. This research has the potential to boost future energy security, lower greenhouse gas emissions, diversify the range of available bio-based products, and create jobs in rural areas.

Each BRC is led by a DOE National Laboratory or a top university, and consists of a multidisciplinary partnership involving experts from science and engineering, as well as from private companies and non-profit organizations. Geographically diverse, each BRC takes a unique approach to improving and scaling up the production of advanced biofuels and bioproducts, and each is focused on biomass energy crops with promise for its particular region.

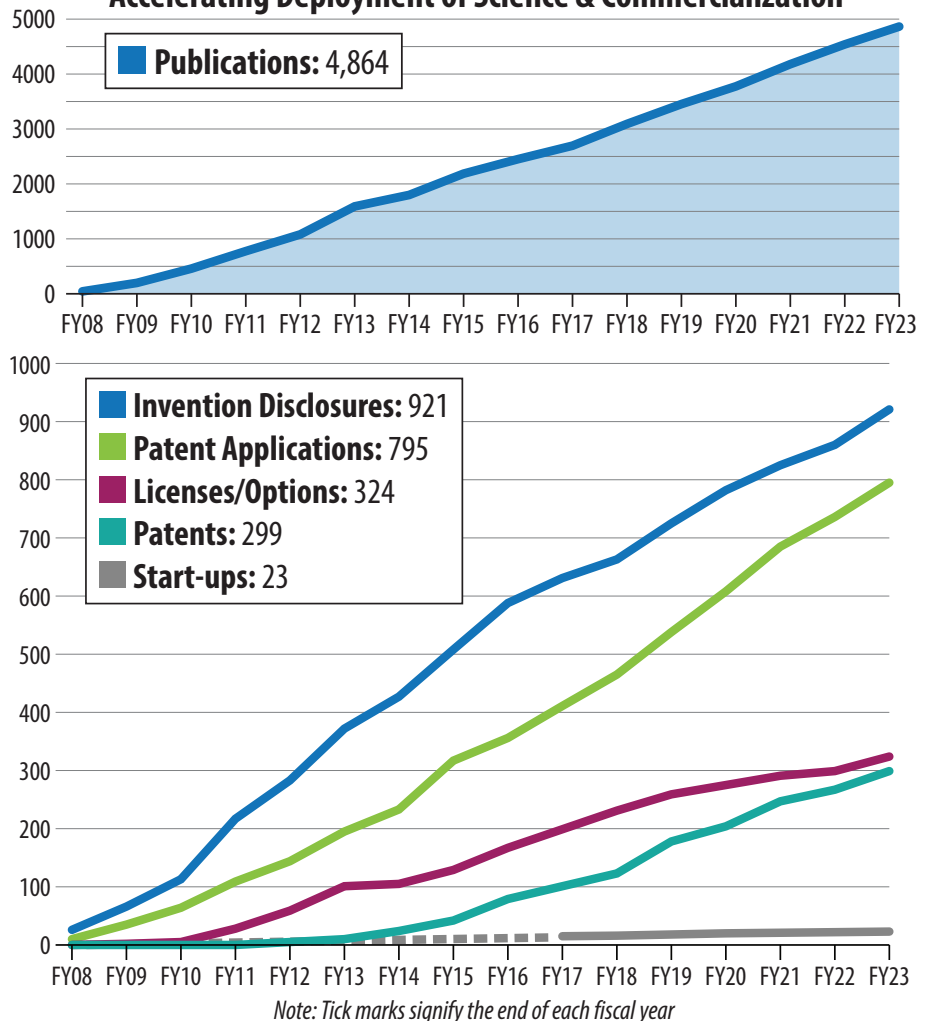
First created by the Department of Energy in 2007, the BRCs expanded from three centers to four in 2017. In this next phase of the BRCs, research has expanded from an initial focus on ethanol to advanced biofuels such as isobutanol, and to bioproducts that can replace chemicals currently derived from petroleum or natural gas.

Together the BRCs are addressing the challenges of converting biomass to biofuels and bioproducts on a scale far greater than any effort to date.

**“To meet the energy needs of a growing vehicle fleet, a diverse set of transportation fuels will be required. We look to BRC researchers for new knowledge and scientific discoveries that will support the sustainable production of advanced biofuels.”**

- Candace Wheeler, Former Technical Fellow at General Motors

## Accelerating Deployment of Science & Commercialization



# Bioenergy Research Centers at a Glance



## Center for Advanced Bioenergy and Bioproducts Innovation | [cabbi.bio](http://cabbi.bio)

The Center for Advanced Bioenergy and Bioproducts Innovation (CABBI), led by the University of Illinois at Urbana-Champaign, is developing efficient ways to grow, transform, and market biofuels and other bioproducts by integrating recent advances in genomics, synthetic biology, and computational biology to increase the value of biomass crops. CABBI represents a transformative research model designed to accelerate bioproduct development while retaining the flexibility to assimilate new disruptive technologies, regardless of their source. The center aims to develop the predictive capability to determine which feedstock combinations, regions and land types, market conditions, and bioproducts have the potential to support the ecologically and economically sustainable displacement of fossil fuels.

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## Center for Bioenergy Innovation (CBI) | [cbi.ornl.gov](http://cbi.ornl.gov)

The Center for Bioenergy Innovation (CBI), led by Oak Ridge National Laboratory, seeks to accelerate domestication of bioenergy-relevant, non-model plants and microbes to enable high-impact, value-added coproduct development at multiple points in the bioenergy supply chain. In this endeavor, CBI is pursuing a host of new technologies to alleviate critical cost barriers facing the emerging bioeconomy. Specifically, the center is creating robust, high-yielding feedstock plants using genetic technology and bioengineering; developing biocatalytic methods for high-yield production of advanced biofuels that can be blended with existing transportation fuels; and studying ways to produce valuable byproducts from lignin left over after biomass processing.

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## Great Lakes Bioenergy Research Center (GLBRC) | [glbrc.org](http://glbrc.org)

The Great Lakes Bioenergy Research Center (GLBRC) is a cross-disciplinary research center led by the University of Wisconsin-Madison. With Michigan State University and other partners, GLBRC is developing sustainable biofuels and bioproducts from dedicated energy crops grown on marginal lands. GLBRC has three integrated areas of research – sustainable cropping systems, efficient biomass conversion, and field-to-product integration – that together will help replace petroleum-derived fuels and products and enable a new generation of biorefineries. GLBRC's mission is simple: to create biofuels and bioproducts that are economically viable and environmentally sustainable.

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## Joint BioEnergy Institute (JBEI) | [jbei.org](http://jbei.org)

The Joint BioEnergy Institute (JBEI), led by Lawrence Berkeley National Laboratory, is working to convert bioenergy crops into economically viable, carbon-neutral biofuels and renewable chemicals currently derived from petroleum, and other bioproducts that cannot be efficiently produced from petroleum. Ultimately, JBEI aims to advance basic understanding of plant cell walls, biomass recalcitrance, and microbial physiology; to establish predictive biosystems design tools for plants, microbes, and enzymes; and to develop technologies for feedstock-agnostic deconstruction, coproduction of fuels at less than \$2.50 per gallon, and production of drop-in fuels and novel bioproducts.

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## Enabling Commercialization, Creating Opportunity

The BRCs are enabling a new generation of biorefineries and developing a portfolio of new bio-based products, methods, and tools for use in the biofuels industry. Using a broad range of genome-driven research methods, BRC technologies represent a variety of approaches to different bottlenecks in the current biofuel pipeline. Some technologies focus on improved ways of breaking down biomass for conversion into fuel, some on engineering plants with the characteristics most advantageous for biofuels, and still others on creating bioproducts that can help make advanced biofuels economically viable. In total, the BRCs have successfully launched 23 start-up companies, disclosed over 900 new inventions, and optioned or licensed out hundreds of technologies.

**"These inventions will be the new startups, the new fuels that will be in our tanks, the renewable materials in our lives, and the manufacturing jobs in America."**

- Jay Keasling, Joint BioEnergy Institute (JBEI) Chief Executive Officer