The Bioenergy Research Centers Address Key Science Themes

	Sustainability	Feedstock Development	Deconstruction	Conversion
GREAT LAKES BIOENERGY RESEARCH CENTER	Long-term studies of producing bioenergy crops on marginal land	Designing improved dedicated bioenergy crops	Renewable biomass deconstruction and separation	Novel biomass conversion microbes
cbi THE CENTER FOR BIOENERGY INNOVATION	Water and nutrient use in dedicated bioenergy crops	Multi-omics tools for development of high-yield bioenergy crops	Integrated and consolidated thermophilic bioprocessing	Drop-in biofuels and bioproducts from biomass and lignin residues
JBEI Joint BioEnergy Institute	Studies of environ-mental resilience of engineered bioenergy crops	Plants engineered for atom-economical conversion into bio-fuels and bioproducts	Feedstock-agnostic biomass deconstruction with renewable ionic liquids	High throughput synthetic biology tools and hosts for scalable, atom economical, biofuel & bioproducts
CABBI Center for Advanced Bioenergy and Bioproducts Innovation	Integrated economic and environmental analyses for biomass supply	"Plants as Factories" concept for biofuels and bioproducts		Automated biofoundry concept for fuels and bioproducts

FACT SHEET

July 17, 2017

NAME OF CENTER: The DOE Great Lakes Bioenergy Research Center (GLBRC)

LEAD INSTITUTION: University of Wisconsin-Madison

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR: Donohue, Timothy

PARTNER INSTITUTIONS: Michigan State University (East Lansing, Michigan), Texas A&M University (College Station, Texas), Michigan Technology University (Houghton, Michigan), University of British Columbia (Vancouver, British Columbia, Canada)

LOCATION OF CENTER: University of Wisconsin-Madison (Michigan State University is a major partner)

FUNDS/SUPPORT FROM OTHER SOURCES:

Cost share over 5 years from the University of Wisconsin-Madison and Michigan State University.

PROJECT DESCRIPTION:

Developing sustainable ways to produce the transportation fuels and products that are currently derived from petroleum is among society's greatest challenges. GLBRC envisions a future in which specialty biofuels derived from dedicated bioenergy crops replace a substantial fraction of the liquid transportation fuels and products that are currently produced from petroleum, while providing substantial environmental benefits and expanding economic opportunities for biofuel refiners, farmers and communities. The path that GLBRC will take to help realize this vision includes research activities to address identified knowledge gaps in the production of specialty biofuels and bioproducts from dedicated bioenergy crops that are grown on marginal, non-agricultural, lands.

PROJECT OBJECTIVES:

The following objectives will produce knowledge and advances to develop integrated lignocellulosic biorefineries, industrial systems that produce a profitable mix of fuels and products from as much of the plant as possible.

- Comprehensive Integration of the Field-to-Product Pipeline.
- Sustainable Production of Bioenergy Crops with Desirable Traits.
- Efficient Conversion of Biomass into Specialty Biofuels and Bioproducts.

FACT SHEET

July 17, 2017

NAME OF CENTER: The DOE Center for Bioenergy Innovation (CBI)

LEAD INSTITUTION: Oak Ridge National Laboratory (ORNL), Oak Ridge, Tennessee

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR: Tuskan, Gerald A.

PARTNER INSTITUTIONS: University of Georgia (Athens, Georgia), National Renewable Energy Laboratory (Golden, Colorado), University of Tennessee (Knoxville, Tennessee), The Samuel Roberts Noble Foundation (Ardmore, Oklahoma), Colorado State University (Fort Collins, Colorado), Dartmouth College (Hanover, New Hampshire), University of Colorado-Boulder (Boulder, Colorado), University of North Texas (Denton, Texas), University of California-Riverside (Riverside, California), West Virginia University (Morgantown, West Virginia), Pennsylvania State University (College Station, Pennsylvania), GreenWood Resources (Portland, Oregon), University of Wisconsin-Madison (Madison, Wisconsin), Massachusetts Institute of Technology (Cambridge, MA)

LOCATION OF CENTER: ORNL Campus, Oak Ridge, Tennessee

FUNDS/SUPPORT FROM OTHER SOURCES:

- ORNL for a state-of-art phenotyping greenhouse, computing, fellowships, and administrative staff support
- NREL for equipment and computing
- University of Georgia for instrumentation and administrative support
- UTK and UTIA for graduate students, staff and indirect support
- In-kind from GreenWood Resources for the field site and plant materials, and
- Dartmouth, WVU, MIT, PSU, CU-Boulder, UNT, Noble Foundation, UW-Madison for graduate student support, equipment, indirects, and staff support.

PROJECT DESCRIPTION:

The Center for Bioenergy Innovation (CBI) vision is to accelerate domestication of bioenergy relevant, non-model plants and microbes to enable high-impact valorization at multiple points in the bioenergy supply chain. Conceived to foster a legacy of fundamental scientific understanding, enabling capabilities, and transformative innovations, CBI has identified research targets to overcome key barriers for the current bioeconomy in (1) high-yielding, robust feedstocks, (2) lower capital and processing costs via consolidated bioprocessing (CBP) to specialty biofuels, and (3) methods to create valuable byproducts from the lignin residues.

PROJECT OBJECTIVES:

The long-term goals of CBI are:

- Identify and utilize key plant genes to create high yielding bioenergy crops, which display better uniformity and increased sustainability, by harnessing natural diversity via genomic selection and focusing on the perennial feedstocks - poplar and switchgrass.
- Convert these feedstocks to specialty biofuels with recognized fuel utility (C4 alcohols and esters) at high rates, titers and yield by engineering anaerobic CBP microbes.
- Maximize process and product value by research on in planta modifications of lignin and biological funneling of lignin to large-market, value-added co-product chemicals and materials.

FACT SHEET

July 17, 2017

NAME OF CENTER: The DOE Joint Bioenergy Institute (JBEI)

LEAD INSTITUTION: Lawrence Berkeley National laboratory

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR: Jay Keasling

PARTNERING INSTITUTIONS: Sandia National Laboratories (Livermore, California and Albuquerque, New Mexico), University of California-Davis (Davis, California), University of California-San Diego (San Diego, California), University of California-Santa Barbara (Santa Barbara, California), Pacific Northwest National Laboratory (Richland, Washington), University of California-Berkeley (Berkeley, California), Clemson University (Clemson, South Carolina), Iowa State University (Ames, Iowa), TeselaGen Biotechnology, Inc. (San Francisco, California)

LOCATION OF CENTER: Emeryville, California

FUNDS/SUPPORT FROM OTHER SOURCES: California Energy Commission, Teselagen Biotechnology, Inc., Heising-Simons Foundation

PROJECT DESCRIPTION:

The vision of JBEI is that bioenergy crops can be converted into economically-viable, carbon-neutral, biofuels and renewable chemicals currently derived from petroleum, and many other bioproducts that cannot be efficiently produced from petroleum. JBEI's mission is to establish the scientific knowledge and new technologies in feedstock development, deconstruction and separation, and conversion needed to transform the maximum amount of carbon available in bioenergy crops into biofuels and bioproducts. When fully scaled, JBEI's technologies will enable the production of replacements for petroleum derived gasoline, diesel, jet fuel, and bioproducts. In doing so, JBEI will reduce the nation's dependence on fossil fuels, significantly reduce the amount of carbon added to the atmosphere, reduce contamination of the environment, and provide the scientific tools and knowledge required to transform the bioenergy marketplace.

PROJECT OBJECTIVES:

JBEI will develop:

- bioenergy crops engineered to have low susceptibility to disease and drought and be readily deconstructed into sugar and aromatic intermediates that can be nearly fully utilized by the engineered biofuel- and bioproduct-producing microorganism;
- an integrated, feedstock agnostic deconstruction process using renewable and biocompatible ionic liquids that liberates a high yield of the sugars and lignin-derived intermediates suitable for biological conversion;
- microorganisms engineered with a metabolism to simultaneously utilize the sugars and aromatics resulting from the deconstruction process (and thus match the composition of the engineered plants) and produce a variety of fuels and bioproducts at industrially relevant titers, rates and yields (TRY).
- new technologies and methods to meet current & future needs in biofuels research by increasing throughput, decreasing reagent use, increasing measurement fidelity and reducing assay time.

FACT SHEET

July 17, 2017

NAME OF CENTER: Center for Advanced Bioenergy and Bioproducts Innovation (CABBI)

LEAD INSTITUTION: University of Illinois at Urbana-Champaign

PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR: Evan H. DeLucia

PARTNERING INSTITUTIONS: Brookhaven National Laboratory (Brookhaven, N.Y.), Lawrence Berkeley National Laboratory Joint Genome Institute (Berkeley, Calif.), USDA-ARS (Houma, La., and Peoria, Ill.), Iowa State University (Ames, Iowa), Princeton University (Princeton, New Jersey), Mississippi State University (State University, Miss.), University of California-Berkeley (Berkeley, Calif.), West Virginia University (Morgantown, W.Va.), Boston University (Boston, Mass.), University of Wisconsin-Madison (Madison, Wis.), Colorado State University (Fort Collins, Colo.), University of Idaho (Moscow, Idaho), University of Florida (Gainesville, Fla.), University of Nebraska (Lincoln, Neb.), Institute for Systems Biology (Seattle, Wash.), HudsonAlpha Institute for Biotechnology (Huntsville, Ala.)

LOCATION OF CENTER: University of Illinois, Urbana-Champaign, Illinois

FUNDS/SUPPORT FROM OTHER SOURCES:

- Matching funds from University of Illinois and partner institutions;
- Illinois Bioprocessing Research Laboratory,
- Carl R. Woese Institute for Genomic Biology (IGB); and
- Energy Farm facility.

PROJECT DESCRIPTION:

To accelerate the development of a U.S. bioeconomy, CABBI will conduct innovative research in Feedstock Development, Conversion, and Sustainability that integrates 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 — whatever their source. CABBI is founded on the “plants as factories” paradigm, in which biofuels, bioproducts, and foundation molecules for direct application or conversion are synthesized directly in plant stems. CABBI will 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.

PROJECT OBJECTIVES:

Over five years CABBI will provide:

- a regionally-adaptive yet national-scale platform for grass-based biorefining based on feedstocks with improved yield and resource use efficiency;
- a broad set of platform microorganisms, and automated tools to build these microorganisms, to produce value-added products from plant-produced feedstocks or substrates; and
- an integrated economic and environmental framework for determining feedstock supply and its sustainability.

CABBI will develop transformative technologies for the economic and sustainable production of fuels and chemicals from plants. A defining feature of CABBI will be its strong infrastructure critical to a major interdisciplinary research effort: co-location of core research activities in a single physical space; coordinated communications with external partners; and research teams built upon existing, productive collaborations.