Wisconsin Energy Institute
UNIVERSITY OF WISCONSIN–MADISON

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FEDERALLY SUPPORTED RESEARCH
AT THE WISCONSIN ENERGY INSTITUTE (WEI)

WHO WE ARE

The Wisconsin Energy Institute (WEI) is helping to solve one of the world's greatest challenges: developing sustainable alternatives to meet society's ever-growing need for power, fuels, and chemicals. Our scientists and engineers are generating the knowledge and clean technologies that will accelerate the world's transition to sustainable, resilient, and affordable energy systems. We are committed to turning innovative ideas into transformative, low-cost solutions that open new markets, create jobs, and generate new economic opportunities for communities nationwide, all while reducing the environmental impacts of producing power, fuels, and chemicals. WEI acts as a nexus among researchers, scholars, policymakers, and industry to drive multidisciplinary energy research and train future energy leaders.

RESEARCH FUNDING AT A GLANCE (2018-19)

Research Funding at WEI

$25.7 million

Total research funding from the following agencies:
- U.S. Department of Energy
- U.S. Department of Agriculture
- National Science Foundation

Research Funding at UW–Madison

$87.6 million U.S. Department of Energy

$21.1 million U.S. Department of Agriculture

$85.2 million National Science Foundation

CURRENT GRANTS

Great Lakes Bioenergy Research Center

The Great Lakes Bioenergy Research Center (GLBRC), created in 2007 by the U.S. Department of Energy (DOE), is a cross-disciplinary research center led by UW–Madison. With Michigan State University and other collaborators, GLBRC draws on the expertise of over 400 scientists, engineers, students, and staff to develop sustainable alternatives to petroleum-derived fuels and products. GLBRC research focuses on three areas—sustainable cropping systems, efficient biomass conversion, and field-to-product integration—needed to enable a new generation of biorefineries that will produce economically and environmentally sustainable biofuels and bioproducts. Since 2007, GLBRC scientists and engineers have produced more than 1,300 scientific publications, 218 patent applications, 110 licenses or options, and five start-up companies.

U.S. DEPARTMENT OF ENERGY

Modeling the evolution of the U.S. electrical power grid

Funded by the U.S. DOE's Advanced Research Projects Agency–Energy (ARPA-E), a collaborative team led by UW–Madison is developing data sets for large-scale models of the rapidly evolving U.S. electrical power grid. Federal regulations severely limit access to real-world data due to concerns that it might be used to guide malicious attacks on grid infrastructure, despite its potential utility for research. The team is developing "realistic but not real" grid models to enable researchers to explore specific grid-related questions, such as how to effectively integrate solar and wind energy, improve energy storage technologies, and enhance electric energy markets without compromising grid security.

U.S. DEPARTMENT OF ENERGY

Characterization of high temperature molten salts for energy generation

A UW–Madison team, supported by the U.S. DOE's Nuclear Energy University Program (NEUP), is experimentally investigating radiative heat transport in molten salts, with direct applicability to molten salt reactors and salt-cooled reactors. The research will improve optical characterization of molten salts and contribute to advanced computational tools that are used to simulate the behavior of reactor systems under different scenarios and improve reactor design and safety. The work will also establish a user facility for the analysis of fuel-bearing salts, which will support technological development, training, and data collection critical to the development of molten salt reactors.

Developing field pennycress as a new biofuels feedstock

Supported by the U.S. Department of Agriculture (USDA) National Institute of Food and Agriculture (NIFA), a team including UW–Madison is working to genetically improve the agronomic traits of field pennycress, a potential winter annual oilseed cover crop and biofuels feedstock in the Midwest, to generate varieties suitable for commercialization. As a cover crop, pennycress can be seeded after corn harvests and harvested before soy planting, producing additional biomass and income from existing farmland while reducing soil erosion and nutrient runoff. Targeted plant traits include high seed yield, reduced seed coat fiber for an improved nutritional profile, reduced seed dormancy, faster maturation, and low levels of glucosinolate, which produces pungent mustard oils when the plant is crushed.

Management impacts on pollinators on conservation lands

UW–Madison researchers, working with the USDA Natural Resources Conservation Service (NRCS), are exploring how different land conservation and restoration practices affect pollinating insects' populations, habitat, and food resources. The team is studying bumblebees on conservation easements in Wisconsin that have undergone varying degrees of management, with a goal of identifying landscape factors and conservation practices that contribute to restoration quality and support healthy populations of beneficial insects. The work aims to develop a set of recommendations to guide management decision-making and support pollinators on conservation lands.

Supporting beneficial insects in agricultural landscapes

Funded by the USDA's National Institute of Food and Agriculture, a UW–Madison team is studying how different types of natural and agricultural landscapes support predatory insects such as ladybeetles, which eat soybean aphids and other agricultural pests. As an important source of biological pest control, ladybeetles can help reduce the cost, labor, and health and environmental impacts associated with using chemical pesticides on farm fields. The team is exploring how the composition and arrangement of mixed agricultural landscapes affects ladybeetle populations in Wisconsin.

Unraveling microbial strategies for metabolic gene regulation

Today's wastewater treatment systems rely on bacteria that break down and remove nutrients and other materials from wastewater under oxygen-rich conditions. The aeration process accounts for a large portion of the energy cost of this process. Funded by the National Science Foundation, a UW–Madison team is developing and testing a framework to study transcriptional regulation in complex microbial communities that will allow them to explore how nutrient-removing bacteria regulate their gene networks in response to low-oxygen conditions due to minimal aeration. The results may advance water treatment processes as well as allow further exploration of gene regulation in environmental bacteria.