



January 2011 Status Report

**MN Department of Commerce,
Office of Energy Security**
B24563 – University of Minnesota

Initiative for Renewable Energy and the Environment

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INSTITUTE ON THE
ENVIRONMENT

UNIVERSITY OF MINNESOTA
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UNIVERSITY OF MINNESOTA

Twin Cities Campus

*Initiative for Renewable Energy & the Environment (IREE)
Institute on the Environment*

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Summary of Contract Allocations

Allocation Type	Number of Projects	Awarded Dollars
Large Grants	8 Projects	\$ 2,145,585.00
Seed Grants	12 Projects	\$ 791,622.00
FY 2009 Admin Costs		\$ 59,793.00
TOTAL		\$ 3,000,000.00

IREE Large Grants

The IREE Large Grant projects selected to receive IREE funding from the Department of Commerce Contract B24563 are listed below. These projects are 2-3 years in duration. First year funding was awarded from the MNDOC contract B24563 additional funding was provided for project through other IREE funding allocations. Large grants are intended as one-time, strategic “venture capital” awards to launch potentially transformative projects in emerging fields of importance for renewable energy and the environment.

Thermochemical Fuels: Solar at Night

PROJECT DETAILS		GOAL
IREE Project #	RL-0001-09	To harvest and store solar concentrated energy via high-temperature, thermochemical processes. Faculty and students will collaborate with national and international experts to develop processes and reactors that gasify biomass with concentrated solar energy. As a result, the fuel produced during the day could be stored, transported and used where/when it is needed.
B24563 Funding	\$382,344.00	
Other Funding	\$517,742.00	
Project End Date	6/30/2012	
Project Lead	Jane Davidson	
Department	Mech Engineering	

Evaluation, Validation & Demonstration of Small-Scale Renewable Energy Systems for Homes & Businesses

PROJECT DETAILS		GOAL
IREE Project #	RL-0007-09	To evaluate small-scale renewable energy systems and become an accredited performance test center. The team will work to create a business model and to jumpstart the infrastructure for a self-sustaining, fee-based center, which can facilitate the testing, validation and demonstration of such systems.
B24563 Funding	\$304,790.00	
Other Funding	\$0.00	
Project End Date	6/30/2012	
Project Lead	Michael Reese	
Department	UMN, Morris	

Combining Geothermal Energy Extraction and CO₂ Sequestration to Produce Clean, Renewable, Carbon Negative Electricity

PROJECT DETAILS		GOAL
IREE Project #	RL-0014-09	To investigate the feasibility of developing a geothermal power plant that generates electricity in low to intermediate heat flow regions (such as Minnesota), while sequestering carbon dioxide in the subsurface. This project could reduce climate change caused by human activities while utilizing Earth's natural heat flow as an energy source.
B24563 Funding	\$244,700.00	
Other Funding	\$255,300.00	
Project End Date	6/30/2012	
Project Lead	Martin Saar	
Department	Geology & Geophysics	

Laterally Integrated Photovoltaic Systems

PROJECT DETAILS		GOAL
IREE Project #	RL-0019-09	To develop an inexpensive, integrated package using holographic concentrator optics to split the solar spectrum and direct each band toward polycrystalline solar cell components. This system could reduce the expense and complications of multi-junction cells, mechanical tracking and concentrator optics in current photovoltaic systems.
B24563 Funding	\$403,320.00	
Other Funding	\$396,680.00	
Project End Date	6/30/2012	
Project Lead	Philip Cohen	
Department	Electrical and Computer Engr	

Air Pollution Impacts of Conventional & Alternative Fuels: A Spatial and Temporal Life Cycle Analysis Decision Support Tool

PROJECT DETAILS		GOAL
IREE Project #	RL-0026-09	To perform a spatially- and temporally-explicit life cycle assessment for several biofuels and the fossil fuels they displace. This research will provide critical new knowledge about the costs, benefits and tradeoffs in greenhouse gas emissions and air quality related to biofuel production systems.
B24563 Funding	\$171,239.00	
Other Funding	\$428,547.00	
Project End Date	6/30/2012	
Project Lead	Julian Marshall	
Department	Civil Engineering	

Converting Solid Biomass to Hydrocarbon Liquid Fuels

PROJECT DETAILS		GOAL
IREE Project #	RL-0032-09	To develop catalytic reforming techniques for converting biomass to hydrocarbon liquid fuels using a thermochemical process.
B24563 Funding	\$143,192.00	
Other Funding	\$106,808.00	
Project End Date	6/30/2011	
Project Lead	Roger Ruan	
Department	Bioprod & Biosystems Engr	

The following Large Grants have completed the portion of their project that was funded by the DOC B24563 Contract.

Biofuels for the Farm: New Technologies for the Production of Biofuels in Small Systems

PROJECT DETAILS		GOAL
IREE Project #	RL-0004-09	To develop catalytic processes and reactor configurations for the conversion of biomass to fuels, small-scale engine technology that can handle significant variations in feedstock composition, and process modeling and energy integration approaches for small-scale systems.
B24563 Funding	\$200,000.00	
Other Funding	\$400,000.00	
Project End Date	6/30/2012	
Project Lead	Michael Tsapatsis	
Department	Chemistry	

Sustainable Polymers: Tomorrow's Advanced Materials

PROJECT DETAILS		GOAL
IREE Project #	RL-0009-09	To design, prepare and implement advanced polymers from biomass for a wide range of applications, and to establish a Center for Sustainable Polymers at the U of M. The team of scientists and engineers will lead research projects aimed at developing commercially feasible, pressure-sensitive adhesives, toughened plastics and polyurethanes from renewable resources.
B24563 Funding	\$296,000.00	
Other Funding	\$504,000.00	
Project End Date	6/30/2012	
Project Lead	Marc Hillmyer	
Department	UMN, Morris	

Please visit the [IREE Projects Database](#) for more information on the Large Grants.

IREE Seed Grants

The IREE Seed Grant projects selected to receive IREE funding from the Department of Commerce Contract B24563 are listed below. These projects are 1-2 years in duration. Funding was awarded from the MNDOC contract B24563. Seed grants are intended to explore the potential for high-risk, high-potential projects that are in the initial stages of development.

Enhanced Biogas Formation from Animal Waste: Evaluation of a New Technology for Increased Biogas Quality and Quantity

PROJECT DETAILS		GOAL
IREE Project #	RS-0006-09	To evaluate the scientific basis for enhanced biogas production, as well as improved gas composition produced by an anaerobic digester using the Hogen process.
B24563 Funding	\$67,716.00	
Project End Date	6/30/2011	
Project Lead	Michael Sadowsky	
Department	Soil, Water & Climate	

Hydrostatic Transmission for Wind Power Generation

PROJECT DETAILS		GOAL
IREE Project #	RS-0008-09	To assess the potential economic and technical advantages of using a hydrostatic transmission rather than a mechanical gear box for wind power generators.
B24563 Funding	\$57,406.00	
Project End Date	5/30/2011	
Project Lead	Kim Stelson	
Department	Mechanical Engineering	

Minnesota Microorganisms for Electrical Biocatalysis: Novel Bacteria from Minnesota Habitats that Use Electrodes to Increase Bioproduct Value and Capture Carbon

PROJECT DETAILS		GOAL
IREE Project #	RS-0013-09	To identify novel bacteria and obtain new models for the study of organisms able to link electricity to biological carbon capture and biocatalysis.
B24563 Funding	\$70,000.00	
Project End Date	6/30/2011	
Project Lead	Daniel Bond	
Department	Microbiology	

Universal Utility Interface for Plug-in Hybrid Electric Vehicles with Vehicle-to-Grid Functionality

PROJECT DETAILS		GOAL
IREE Project #	RS-0025-09	To develop a novel interface between a utility and PHEV battery pack in order to demonstrate a complete system with bidirectional power flow capabilities.
B24563 Funding	\$70,527.00	
Project End Date	5/31/2011	
Project Lead	Ned Mohan	
Department	Electrical and Computer Engr	

Use of Transcriptomics to Identify Lignin-Degrading Enzymes in Fungi

PROJECT DETAILS		GOAL
IREE Project #	RS-0028-09	To better understand how lignin is broken down—a process that is vital to converting complex feedstocks to biofuel.
B24563 Funding	\$75,000.00	
Project End Date	3/31/2011	
Project Lead	Steve Gantt	
Department	Plant Biology	

State Climate Action Planning: Geography of Regional and National Climate and Renewable Energy Policy

PROJECT DETAILS		GOAL
IREE Project #	RS-0034-09	To investigate Minnesota’s greenhouse gas reduction policy and renewable technology choices by analyzing results from 14 state climate action plans facilitated by the Center for Climate Strategies.
B24563 Funding	\$69,100.00	
Project End Date	5/30/2011	
Project Lead	Elizabeth Wilson	
Department	Humphrey Institute	

The following Seed Grants have completed their research and expended all of their B24563 awarded funding.

Next Generation Dye-Sensitized Solar Cells

PROJECT DETAILS		GOAL
IREE Project #	RS-0009-09	Photovoltaic devices convert solar energy into electricity; in order to improve their performance, this project aims to reveal the unknown events that occur immediately after light absorption in dye-sensitized solar cells.
B24563 Funding	\$70,000.00	
Project End Date	8/30/2010	
Project Lead	David Blank	
Department	Chemistry	

Biohydrogen-Based Biofuel Cells: Highly Efficient and Clean Electricity Generation Using Mixed Wastewater Feedstocks – A Rural Development Project

PROJECT DETAILS		GOAL
IREE Project #	RS-0010-09	To investigate the feasibility of developing a biological fuel cell system, which consists of a bio-hydrogen-producing fermenter connected to an enzyme-based fuel cell that can produce electricity directly from waste biomass.
B24563 Funding	\$70,000.00	
Project End Date	8/30/2010	
Project Lead	Jun Zhu	
Department	S. Research & Outreach Ctr	

Reduction of Carbon Dioxide to Methane Using Nanostructured Heterojunction Photocatalysts

PROJECT DETAILS		GOAL
IREE Project #	RS-0021-09	To examine and establish a new class of nanostructured photocatalysts with the aim of converting carbon dioxide and water to methane using sunlight.
B24563 Funding	\$69,178.00	
Project End Date	6/30/2010	
Project Lead	Eray Aydil	
Department	Chem Eng. & Material Sci.	

Creation of Energy Efficient Inorganic-Bonded Structural Insulated Panels

PROJECT DETAILS		GOAL
IREE Project #	RS-0029-09	To combine the properties of chemically-bonded inorganic binders with regionally-sourced and underutilized red pine forest thinnings in order to create moisture-, decay-, fire-, and mildew-resistant structural insulated panels. Compared to traditional structural insulated panels, the new products will require much less energy to produce.
B24563 Funding	\$52,650.00	
Project End Date	6/30/2010	
Project Lead	Matthew Aro	
Department	NRRI; UMN, Duluth	

Hydrothermal Carbonization of Algae and Agricultural Wastes: Synthetic Bio-coal

PROJECT DETAILS		GOAL
IREE Project #	RS-0037-09	To use carbon that has been fixed and sequestered by algae and other plant materials to rapidly and efficiently produce synthetic coal.
B24563 Funding	\$70,000.00	
Project End Date	12/30/2010	
Project Lead	Michael Sadowsky	
Department	Soil, Water & Climate	

Improved Energy Production for Large Wind Turbines

PROJECT DETAILS		GOAL
IREE Project #	RS-0039-09	To study the tradeoffs associated with controlling wind turbines, with the potential impact of enabling the construction of larger, more efficient wind turbines.
B24563 Funding	\$50,000.00	
Project End Date	6/30/2010	
Project Lead	Gary Balas	
Department	Aerospace Eng & Mechanics	

Please visit the [IREE Grants Database](#) for more information on the Seed Grants.