

This Iowa State Summary educates policymakers and the public about EERE investments and their positive impacts in Iowa.

Iowa

The U.S. Department of Energy (DOE) is pursuing an all-of-the-above approach to developing every source of American energy. The Office of Energy Efficiency and Renewable Energy (EERE) leads DOE efforts to build a strong clean energy economy, a strategy that is aimed at reducing our reliance on foreign oil, saving families and businesses money, creating middle-class jobs, and reducing pollution.

This strategy will position the United States as the global leader in clean energy, increasing our nation's competitiveness. In 2012, \$268 billion was invested globally in clean energy, a 500% increase since 2004.¹¹ Trillions of dollars will be invested in the coming decades. Clean energy represents one of the most important economic development races of the 21st century. We face a stark choice—the clean energy technologies of tomorrow can be invented and manufactured in Iowa and the rest of the United States for domestic use and export around the world, or we can cede global leadership and import those technologies from China, India, Germany, and elsewhere.



Iowa's Clean Energy Resources and Economy

- Clean Economy Jobs (2010): 30,800+
- Average Annual Growth Rate of Clean Economy Jobs (2003-2010): 3.3%
- Average Annual Wage of Clean Economy Jobs (\$2009): \$35,237¹

By harnessing its vast natural resources, Iowa has become a leader in renewable energy production. Iowa was the largest producer of ethanol in the United States in 2011—accounting for more than a quarter of the nation's fuel ethanol production.² Iowa, home to nine wind industry manufacturing facilities in 2010, ranks second in the country in installed wind capacity, with 4,322 megawatts installed at the end of 2011.³ This installed wind capacity is estimated, in an average year, to supply approximately 20% of Iowa's entire in-state electricity generation.⁴ Iowa's high utilization of wind power has propelled the state to third in the nation for total installed renewable electricity capacity.⁵ Additionally, Iowa's potential for using biopower produced from solid materials is second in the country, behind only Illinois.⁶

Iowa owes part of its success to its early policy support for renewable energy. The first capacity target in Iowa's Alternative Energy Law, passed in 1983, was met in 1997.⁷ This early success led to former Iowa Governor Vilsack's 2003 call for Iowa to deploy 1,000 MW of renewable energy—a goal that was met in 2006.⁸ Although Iowa's renewable energy capacity requirements are met mostly by wind, other eligible resources include solar, waste management, resource recovery, refuse-derived fuel, agricultural crops or residues, wood-burning facilities, and small hydropower facilities.⁹

The state has also made a strong commitment to energy efficiency. Iowa's investor-owned utilities more than doubled the budgets of their efficiency programs from 2002 to 2007, passing the \$100 million mark in 2006.¹⁰

U.S. DEPARTMENT OF
ENERGY

Energy Efficiency &
Renewable Energy



EERE and Iowa

EERE helps create Iowa’s clean energy economy today, developing and delivering innovative, market-driven solutions for the following:

- **Sustainable transportation** – making transportation cleaner and more efficient through solutions that put electric drive vehicles on the road and replace oil with clean domestic fuels
- **Renewable electricity generation** – reducing the cost of renewable energy through solutions that squeeze more usable power from sustainable resources and improve the economics of manufacturing and installation
- **Energy-saving homes, buildings, and manufacturing** – developing cost-effective energy-saving solutions that help make our country run better through increased efficiency—promoting better plants, manufacturing processes, and products; more efficient new homes and improved older homes; and other solutions to enhance the buildings in which we work, shop, and lead our everyday lives.

EERE Investments in Iowa

EERE invests in Iowa through a broad range of clean energy projects, from energy efficiency to biofuels, wind, advanced manufacturing, and other technologies. EERE supports cities, communities, and families in developing innovative, cost-effective energy solutions through the research, demonstration, and deployment activities we conduct with Iowa and its businesses, universities, Ames Laboratory, nonprofits, and local governments.

Sustainable Transportation



Making Cellulosic Ethanol from Corn Cobs and Stover at a Commercial Scale

 Emmetsburg, Iowa
EERE investment: \$100M

EERE has partnered with **POET-DSM Advanced Biofuels** to break ground on its pioneering commercial-scale demonstration plant in Emmetsburg, Iowa. This commercial facility will have the capacity to process 700 dry metric tons per day of non-food cellulosic material—primarily corn cobs—and produce 20 million gallons of lignocellulosic ethanol (an advanced biofuel) per year. POET estimates that the Emmetsburg plant will create about 200 jobs at its construction peak, with 35 permanent jobs when the refinery is completed. The plant will also create an estimated \$14 million of local economic activity; this figure includes new

revenue for farmers, as well as the wages of local workers hired by farmers. This first-of-a-kind demonstration facility is helping to prove the commercial viability of the lignocellulose-to-ethanol process, as well as accelerate the development of commercially viable methods to sustainably harvest, transport, and store corncobs and stover as feedstock to make biofuels.¹²



Members of the POET-DSM Advanced Biofuels team, as well as state and federal officials, break ground at the site of Project LIBERTY in Emmetsburg, Iowa, on March 13, 2012. *Photo from POET*

Clean Cities Coalitions Help Stakeholders Choose Smart Transportation Solutions

 Des Moines, Iowa
EERE investment: \$30K annually to each coalition

EERE coordinates a network of nearly 100 Clean Cities coalitions—self-organized groups of local community, government, and business stakeholders whose efforts to adopt smart transportation solutions have displaced more than 4.5 billion gallons of gasoline and diesel since 1993. In 2011, the **Iowa Clean Cities Coalition** reduced fuel consumption by the equivalent of nearly 568,000 U.S. gallons of gasoline, and prevented more than 2,000 tons of greenhouse gas emissions. The coalition, which includes more than 60 businesses, local governments, and other organizations, also works to promote the use of 300 alternative fuel and charging stations in the state.

Renewable Electricity Generation



Western Iowa Technical Community College Provides Hands-On Education for Wind Technicians

 Sioux City, Iowa
EERE investment: \$500K

Partnering with EERE, **Western Iowa Technical Community College (WITCC)** built a new wind energy training laboratory—expanding learning opportunities and training for



jobs in wind energy and other energy-related fields. With this technologically advanced learning laboratory, the college is identifying and procuring wind-energy-related equipment, instrumentation, and supplies; integrating this equipment into the WITCC curricula; and providing technical training to students and new workers that will bolster their employment opportunities in energy-related professions.



Students work on a wind simulator for a wind energy class. *Photo from Sioux City Journal Communications*

Providing Students with Sustainable Energy Education



Estherville, Iowa
EERE investment: \$500K

Working with EERE, **Iowa Lakes Community College** developed a Sustainable Energy Education Center (SEEC) that will encourage students to explore sustainable energy's feasibility and applications. The center promotes increased commercialization of clean heating, cooling, and lighting systems by demonstrating geothermal, solar photovoltaic, and other technologies. SEEC plans to expand the facilities of its Wind Energy and Turbine Technology Program, which currently offers a two-year Associate in Applied Science program that provides students with field experience and prepares them for careers in the wind energy industry.¹³

Expansion will include installing a donated wind nacelle on a 30-foot tower; enclosing both this nacelle and a second Vestas 3.0-megawatt nacelle as a classroom laboratory; adding additional classrooms and laboratory facilities; and installing environmentally friendly and high-efficiency technologies to decrease SEEC energy use. The center also educates community residents, hosting evening seminars on small-scale wind energy generation options and energy-efficiency strategies.¹⁴

Advanced Manufacturing Initiative Is Advancing U.S. Wind Turbine Construction Growth



Newton, Iowa
EERE investment: \$2.1M

As a part of a collaboration among EERE, Sandia National Laboratories, the State of Iowa's Office of Energy Independence, Iowa State University, and TPI Composites (a wind turbine blade manufacturer), the **Advanced Manufacturing Initiative** seeks to improve manufacturing processes by improving labor productivity in wind turbine blade construction. In order to accelerate and improve the blade manufacturing process, TPI and its partners have modeled new factory configurations, tested non-destructive inspection capabilities, and modeled and tested new automation technologies and prefabrication techniques. Over the course of the project, TPI has achieved a 15% improvement in labor productivity and reduced the time required to manufacture a turbine blade by 37%. This work continues to enable growth in domestic blade manufacturing, ensure supply chain advantages, and improve our overall national competitiveness in advanced manufacturing.

Energy-Saving Homes, Buildings, and Manufacturing



Iowa State University Industrial Assessment Center Supports Hundreds of Small Businesses to Reduce Energy Costs



Ames, Iowa

Partnering with EERE, **Iowa State University's** Industrial Assessment Center (IAC) provides small and medium-sized manufacturing companies with no-cost energy assessments, while also serving as an important training ground for the next generation of energy-savvy engineers. With IAC assistance, manufacturers have saved more than \$16 million in energy costs by performing 486 assessments to date—averaging about \$35,600 in savings per assessment. Nationally, these assessments helped participating manufacturers save more than \$5.6 billion in energy costs.¹⁵



Nanocoatings for High-Efficiency Industrial Hydraulic and Tooling Systems Increase Productivity and Energy Efficiency



Boone, Iowa
EERE investment: \$4.5M

Eaton Corporation—in collaboration with EERE, Oak Ridge National Laboratory, Iowa State University, Ames Laboratory, and Greenleaf Corporation—has developed a nanocoating technology that reduces friction between machine parts by up to 97% and wear on those parts by up to 99%. Machine parts are slowed down by friction, and using this technology will require less work, so the machines last longer and utilize less energy.¹⁶ The nanocoating can be applied to any metal surface, so the range of applications is potentially enormous. Ames estimates that applying nanocoatings to the rotor blades of industrial and commercial pumps alone could reduce overall U.S. industrial energy usage by 31 trillion British thermal units annually by 2030, or save \$179 million a year.¹⁷ Other common machinery that would benefit from the nanocoating includes cutting and grinding tools. As companies integrate nanocoating technology into their machinery to lower downtime and energy consumption, consumers will benefit as the cost of manufactured goods declines in tandem.

Allsteel: A Superior Energy Performance Certified Facility



Muscatine, Iowa

EERE provided training that helped **Allsteel’s Muscatine plant** reach Gold Certification in the Superior Energy Performance program in 2012.¹⁸ Allsteel, a furniture manufacturer, has implemented operational changes and capital project improvements that have led to a 10.2% reduction in energy consumption at the Muscatine facility. These improvements will help Allsteel realize significant cost savings and boost its competitiveness.¹⁹

Appliance Rebate Program Benefits Thousands of Iowans



Statewide
EERE investment: \$2.8M

In 2010, the **State of Iowa** implemented a residential appliance rebate program with American Recovery and Reinvestment Act (ARRA) funding from EERE and leveraged \$2 million in additional state funds to double existing utility rebate levels. More than 7,000 Iowans quickly obtained \$100–\$500 rebates to purchase ENERGY STAR® qualified appliances such as air conditioners, dishwashers, furnaces, heat pumps, refrigerators, and water heaters. The program has helped Iowa residents reduce their electric utility bills by replacing old, inefficient appliances with new, energy-efficient models, which has resulted in considerable energy savings for residents

and benefits for the state economy.²⁰ Manufacturers, utilities, consumers, and small businesses reported huge successes in the quick and easy use of these rebates.

Deploying Clean Energy Solutions in Iowa Communities

EERE investments help deploy energy efficiency and renewable energy projects in communities across Iowa. These investments catalyze economic development, create jobs, generate clean energy, and reduce utility bills. Many of these investments are a result of the American Recovery and Reinvestment Act (ARRA). Of the more than \$143 million in EERE ARRA funds that were allocated to Iowa for deployment projects, almost 99% has been spent as of January, 2013 through the Energy Efficiency and Conservation Block Grant Program, State Energy Program, and Weatherization Assistance Program.

Building Clean Energy Infrastructure

With financial and technical support from EERE, energy officials at the state level and in 25 communities have selected and overseen the completion of hundreds of projects that are delivering the benefits of clean energy throughout Iowa. EERE allocated more than \$62 million in ARRA funds to support activities that

- Contributed to the increased energy efficiency of more than 400 buildings (more than 10.5 million square feet) through building retrofits
- Installed more than 400 kilowatts in renewable energy capacity from wind, solar energy, solar thermal energy, and geothermal energy systems
- Funded nearly 100 workshops, educating more than 2,200 people on how to perform energy audits and upgrades and install renewable energy systems
- Installed nearly 500 energy-efficient streetlights and approximately 650 energy-efficient traffic signals.

Weatherizing Homes for Lower Income Families

Iowa has spent 100% of the nearly \$81 million in ARRA funds it received from EERE to weatherize more than 11,000 homes. To date, this effort has resulted in total annual energy savings of more than 342 billion British thermal units and prevented more than 30,000 metric tons of greenhouse gas emissions—the equivalent of taking more than 5,800 passenger vehicles off the road for a year.²¹ The projects have enabled income-eligible families to save hundreds of dollars per year on heating and cooling bills by improving their homes’ energy efficiency, as well as the health and safety of home environments.²²



Deployment Project Examples

Engaging with Kirkwood Community College to Reduce Electricity Costs with a Wind Turbine on Campus



Kirkwood, Iowa
EERE investment: \$1M

Kirkwood Community College installed a Clipper Wind Power 2.5-megawatt wind turbine on its Cedar Rapids campus, which will produce one-third of the campus' electricity annually and is projected to provide an annual energy savings of \$300,000.²³ Kirkwood built the turbine to meet environmental objectives and serve as a technical training facility. As a high demand for wind turbine technicians exists, Kirkwood graduates are finding jobs at a high rate. The turbine also serves as a hands-on laboratory for students enrolled in the Energy Production and Distribution Technologies Program.²⁴

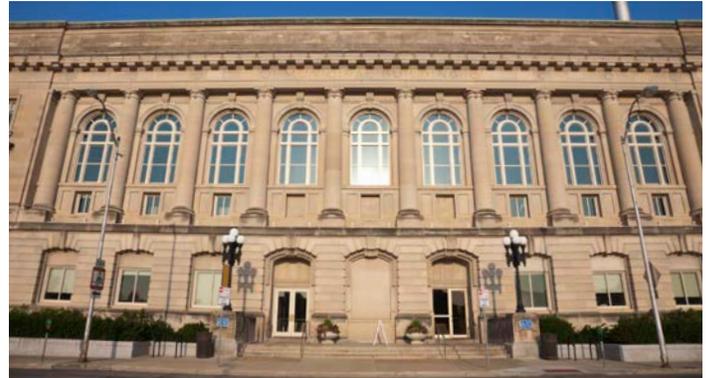
Reducing Energy Consumption and Cutting Costs for Des Moines Area Community College Campuses



Des Moines Area, Iowa
EERE investment: \$780K

Iowa's largest two-year college, **Des Moines Area Community College (DMACC)**, installed energy-efficient lighting systems and retrofitted the heating and ventilation systems on its campuses, thus saving energy and reducing the school's carbon footprint. The college also installed a 100-kilowatt wind turbine on its Ankeny campus.²⁵ Energy projects across six DMACC campuses are expected to reduce annual energy use by 16% and save the college more than \$260,000 in energy

costs each year.²⁶ DMACC's energy-efficiency efforts will reduce the school's operating expenses, which helps keep tuition rates lower for students.



The City of Des Moines made energy-efficiency enhancements across the city, which included retrofitting its City Hall building with energy-efficient window upgrades. *Photo from iStock 2110420*

Supporting Energy Efficiency for Important Public Buildings in Des Moines



Des Moines, Iowa
EERE investment: \$1.9M

The **City of Des Moines** moved forward with a number of projects that enhance energy efficiency across the city, such as building retrofits and the purchase of fuel-efficient hybrid vehicles for its fleet. The city pursued energy-efficient window upgrades for the Des Moines City Hall and Central Police Station, providing cost savings and reducing energy use.

Front page photo from iStock/6855177; page 2: iStock/17393871, Dennis Schroeder, NREL 19156; page 3: Jim Tetro, U.S. Department of Energy Solar Decathlon

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A Proven Track Record

Snapshot of National Outcomes from EERE Investments

EERE's Return on Investment for Clean Energy Technologies

- EERE's \$931 million investment in vehicles combustion engine R&D from 1986 to 2007 achieved a net benefit of \$69 billion (2008 dollars) in fuel savings for users of heavy-duty diesel trucks.²⁷
- EERE's \$3.7 billion investment in solar photovoltaic R&D from 1975 to 2008 resulted in a net economic benefit of \$15 billion (2008 dollars) due to module efficiency and reliability improvements.²⁸
- EERE's \$1.7 billion investment in wind energy R&D from 1976 to 2008 resulted in a net economic benefit of \$8.7 billion (2008 dollars) due to wind turbine efficiency, energy capture, and reliability improvements.²⁹
- A 2001 National Academy of Sciences analysis found that investments of \$1.6 billion in energy efficiency R&D in the first two decades of DOE's existence from 1978 to 2000 realized a net economic benefit of approximately \$30 billion (1999 dollars).³⁰

Sustainable Transportation

- EERE research has helped reduce production costs of automotive lithium-ion batteries by more than 50% since 2008 and is on track to reach its goal of enabling cost-competitive market entry of plug-in hybrid electric vehicles within the next 10 years.
- EERE's activities to achieve cost-competitiveness for biofuels have resulted in the recent achievement of reaching a modeled cellulosic ethanol production cost of \$2.15 per gallon of ethanol (or \$3.27 per gallon of gasoline equivalent).
- EERE's efforts have reduced the projected costs of automotive fuel cells (assuming high-volume manufacturing) by more than 35% since 2008 and 80% since 2002—doubling the durability of fuel cells from 950 hours of demonstrated operation in 2006 to more than 2,500 hours of operation on the road.³¹

Renewable Electricity Generation

- Without EERE involvement, the average solar photovoltaic (PV) module production cost per watt would have been \$5.27 in 2008, rather than \$1.92. EERE has accelerated solar industry progress by an estimated 12 years.³²
- Without EERE involvement, cumulative wind power deployment through 2008 would have been less than a third of actual 2008 levels. EERE has accelerated the overall progress of the wind industry by an estimated 6 years.³³

Energy-Saving Homes, Buildings, and Manufacturing

- More than 6,200,000 homes have been weatherized with EERE funding provided to states or leveraged from other sources with EERE support since 1976—creating an average energy savings of \$350 or more per year and avoiding \$1.6 billion in energy costs during winter 2005 alone for all households weatherized.³⁴
- Due to EERE appliance standards implemented through 2012, a typical household today already saves about \$180 per year off its utility bills. Households can expect to save more than \$300 per year by 2030, as they replace their existing appliances with newer models that use less energy—a cumulative savings to consumers of more than \$900 billion by 2020, and more than \$1.6 trillion through 2030. The cumulative energy savings of these standards phased in through 2012 will be about 70 quadrillion British thermal units (quads) of energy through 2020, and will amount to 120 quads through 2030. (The United States consumes a total of about 100 quads of energy per year.)³⁵
- EERE and its partners in the manufacturing sector have successfully launched 220 new, energy-efficient technologies, received 78 R&D 100 Awards, and delivered technical assistance to more than 33,000 industrial plants.³⁶
- Since 2005, EERE has facilitated \$3.1 billion of efficiency investments in federal government facilities from performance-based contracts, which will result in energy cost savings of approximately \$8.5 billion over the life of the energy-saving measures. The savings on utility bills and operation and maintenance created through the facility upgrades will be used to pay for the project over the term of the contract, and the agencies will continue to save money and energy after the contract term has ended.³⁷

The Office of Energy Efficiency and Renewable Energy is at the center of creating the clean energy economy today. We lead U.S. Department of Energy efforts to develop and deliver market-driven solutions for renewable electricity generation; sustainable transportation; and energy-saving homes, buildings, and manufacturing. To learn more about the activities of the Office of Energy Efficiency and Renewable Energy, visit eere.energy.gov. If you have questions or comments about the information in this document, please contact us at EE.Communications@ee.doe.gov.