2007 ANNUAL REPORT
research education demonstration
The Energy Center continues to push ahead in both areas of our mission: energy efficiency and renewable energy. Using energy sparingly and wisely continues to be the foundation for a sustainable energy future.
2007 was a busy year in Iowa, where the intense coverage of our first-in-the-nation caucus shared the spotlight with, and often times was overshadowed by energy. Governor Culver and the General Assembly created the new Office of Energy Independence and the Iowa Power Fund, expanding the focus on energy efficiency and renewable energy. Iowa’s investor-owned utilities have been developing new plans to submit to the Iowa Utilities board for their energy efficiency programs. Wind farms in Iowa keep expanding and manufacturers of wind turbines and components are locating new factories in the state. At the same time, Iowa’s biofuels industry – ethanol and biodiesel – has reached a scale only dreamed of a few years ago.

It was a busy year for the Energy Center as well. As you will see in this annual report, the Energy Center continues to push ahead in both areas of our mission: energy efficiency and renewable energy.

Using energy sparingly and wisely continues to be the foundation for a sustainable energy future. You’ll find some innovative examples of energy efficiency discussed here: using data mining to improve the energy efficiency of fossil fuel power plants; studying the performance of a model energy efficient building to see what can be learned and how that knowledge can be transferred to the design of other buildings; and using soy-based lubricants to improve the energy performance of railroads, a key part of our nation’s transportation system.

At BECON, the Energy Center’s biomass research facility, work continues to go forward on turning biomass into a host of useful chemicals using a range of different processes. In the same way that the petroleum industry makes hundreds of products ranging from pharmaceuticals to road tar from a barrel of crude oil, a biochemicals industry is emerging that will make a host of products from the bounty of Iowa’s land. The emergence of the ethanol and biodiesel industries is exciting, but it is just the beginning!

We hope you enjoy this report on the Energy Center’s progress in 2007. As always, if you have comments or suggestions for the Energy Center’s future direction, please let me know.
The Advisory Council provides the Energy Center input on planning and budgeting issues, ensures the Energy Center’s portfolio of activities is balanced and makes certain procedures are fair, equitable and open. This dedicated group of 13 voting members, listed by constituency, served from July 1, 2006 through June 30, 2007.
Advisory Council

Education & Research Sector
Siobahn Morgan, Ph.D.  
(term began June 7, 2007)  
Associate Dean, College of Natural Sciences, University of Northern Iowa

Tonya Peeples, Ph.D.  
Associate Professor, Chemical and Biochemical Engineering, The University of Iowa

Diane Rover, Ph.D.  
Associate Dean, Engineering Administration, Iowa State University

Beverly Simone, Ph.D.  
President, Southeastern Community College

James Swartz, Ph.D. (Chair)  
Dean of the College and Vice President, Academic Affairs, Grinnell College

Jill Trainer, Ph.D.  
(term ended 4/30/2007)  
Associate Vice President, Sponsored Programs, University of Northern Iowa

Utility Sector
John Bilsten  
General Manager, Algona Municipal Utilities

Kim Colberg  
Manager, Linn County REC

Dean Crist  
Vice President, Regulation, MidAmerican Energy Company

Vern Gebhart  
Vice President, Customer Service Operations, Alliant Energy

Public Sector
Jennifer Easler, JD  
(Vice Chair)  
Iowa Department of Justice, Office of Consumer Advocate

Sandra Larson  
Deputy Director, Research and Technology Bureau, Highway Division, Iowa Department of Transportation

John Norris  
Chairman, Iowa Utilities Board, Iowa Department of Commerce

Brian Tormey  
Chief, Energy and Waste Management Bureau, Iowa Department of Natural Resources

Our Team
Floyd E. Barwig, A.I.A.  
Director

Julie Charlson  
Secretary

William Haman, P.E.  
Industrial Program Manager and Alternate Energy Revolving Loan Program, Manager

John House, Ph.D.  
Research Engineer

Denise Junod  
Secretary

Keith Kutz  
Administrative Specialist

Norm Olson, P.E.  
Biomass Energy Conversion (BECON) Facility, Manager

Patty Prouty  
Secretary

Amy Swenson  
Communications Specialist
Energy Efficiency

2007 Statewide Energy Efficiency Study, Mary Losch, University of Northern Iowa, Center for Social and Behavioral Sciences

A Comparison of Building Energy Simulation Software to Actual Building Energy Use, Gregory Maxwell, Iowa State University, Mechanical Engineering

Alternatives to Truck Engine Idling, Shauna Hallmark, Iowa State University, Center for Transportation Research and Education

An Energy and Cost Analysis of Residential Ground-Coupled Heat Pumps in Iowa, Francine Battaglia, Iowa State University, Mechanical Engineering

Educating for Behavior Changes in Energy Use, Jack Yates, University of Northern Iowa, Center for Energy and Environmental Education

Energy Efficiency Testing and Demonstration Facility, Mark Baethke, Des Moines Area Community College

Energy Monitoring Project, Patricia Higby, University of Northern Iowa, Center for Energy and Environmental Education

Hybrid Electric School Bus Deployment and Evaluation, Shauna Hallmark, Iowa State University, Center for Transportation Research and Education

Measuring Fuel Savings from Soy-Based Gage-Face Lubricant on Rail Track Straightaways, Lou Honary, University of Northern Iowa, National Ag Based Lubricants Center

Meta-Control of Combustion Efficiency with a Data Mining Approach, Andrew Kusiak, University of Iowa, Mechanical and Industrial Engineering

Reducing Energy Costs in Ethanol Production Through Improved On-Farm Storage Methods of High Moisture Distiller Feeds, Daniel Loy, Iowa State University, Animal Science

School Energy Efficiency Assessment and Assistance Project, Patricia Higby, University of Northern Iowa, Center for Energy and Environmental Education

Synthesis of Energy Efficiency in Street Lighting, Neal Hawkins, Iowa State University, Center for Transportation Research and Education

Technical and Research Support for Iowa Energy Center Building Energy Efficiency Program, Ron Nelson, Iowa State University, Mechanical Engineering

Yield Improvement in Steel Casting, Christoph Beckermann, The University of Iowa, Mechanical and Industrial Engineering
Renewable Energy

Biohydrogen Production from Renewable Organic Wastes, Shihwu Sung, Iowa State University, Civil, Construction and Environmental Engineering

Biomass Energy Conversion (BECON) Facility, Robert Brown, Iowa State University, Center for Sustainable Environmental Technologies

Biorefinery Supply Chain Research and Development Project, Jill Euken, Iowa State University, Extension

Demonstrate Diesel Engine Combustion Using Ammonia as an Alternative Fuel, Song-Charng Kong, Iowa State University, Mechanical Engineering

Emulsion Photopolymerization of Synthetic Monomers onto Corn Starch, Julie Jessop, The University of Iowa, Chemical and Biochemical Engineering

Evaluation of Scenarios for the Industrial Use of Sweet Sorghum, Robert Anex, Iowa State University, Agricultural and Biosystems Engineering

Hybrid Thermal/Biological Conversion of Biomass to Industrial Chemicals, Robert Brown, Iowa State University, Center for Sustainable Environmental Technologies

Installation and Testing of Photovoltaic Energy Systems, Michael Pate, Iowa State University, Center for Building Energy Research

Literature Review of Hydrogen Production, Storage, Transportation and Utilization Technology, part one Tonya Peeples, The University of Iowa, Chemical and Biochemical Engineering, part two James Swartz, Grinnell College

NOx Emissions From Biodiesel Burned in Utility Generators, part one Anne Kimber, Iowa Association of Municipal Utilities, part two Song-Charng Kong, Iowa State University, Mechanical Engineering

A Participatory Approach to Assess the Future of the Bioeconomy in Greene County, Monica Haddad, Iowa State University, Community and Regional Planning

Polymers from Furfural, Julie Jessop, The University of Iowa, Chemical and Biochemical Engineering

Preserving High-Moisture Corn with Ozone, Carl Bern, Iowa State University, Agricultural and Biosystems Engineering

A Sequential Fermentation Biorefinery to Produce Ethanol from Corn Processing Co-Products, Hans van Leeuwen, Iowa State University, Civil, Construction and Environmental Engineering

Sequential Solid-State Fermentation of Corn Stover and Swine Manure, Kenneth Moore, Iowa State University, Agronomy

Supercritical Water Gasification of Biomass, Gary Aurand, The University of Iowa, Chemical and Biochemical Engineering

The Role of Thermochemical Processing in Future Biorefineries, Robert Brown, Iowa State University, Center for Sustainable Environmental Technologies

Time-of-Flight Gasification Measurements, Albert Ratner, The University of Iowa, Mechanical Engineering

Use of Supercritical Fluids and Other Novel Methodologies for the Production of High-Value Compounds from Biomass, Walter Trahanovsky, Iowa State University, Chemistry
The Energy Center funds conferences, workshops, exhibits, events and small demonstration projects that fall within our mission areas of energy efficiency and renewable energy.
Memberships

American Wind Energy Association
American Council for an Energy-Efficient Economy
Alliant Energy Second Nature
Association of State Energy Research and Technology Transfer Institutions
Building Owners and Managers Association
Consortium for Energy Efficiency
EPA Green Power Partnership
International Ground Source Heat Pump Association
Iowa Association for Energy Efficiency
Iowa Heat Pump Association
Midwest Rural Energy Council
New Uses Council
New Buildings Institute
US Green Buildings Council

Sponsorships

American Council for an Energy Efficiency Economy
  • Energy Efficiency in Agriculture
Iowa State University
  • Solar Car Team - PrISUm
  • SAE Formula Racing Team (E85 Competition)
  • Solar Decathlon
State Science and Technology Fair of Iowa
  • Youth & Energy Scholarship Fund
  • Administration Sponsorship
National Energy Education Development Project
  • 13 Iowa Teachers’ Scholarships
University of Northern Iowa
  • Iowa Energy Poster Contest
  • Solar Splash Boat Team
  • Electrathon Competition
  • Junior Solar Sprint
The University of Iowa
  • Solar Bike Team

Collaborations

Compressed Air Challenge
National Lighting Product Information Program
New Buildings Institute
National Biodiesel Training, Iowa State University and University of Idaho
Professional Development at the Energy Resource Station

**Iowa Energy Center Sponsored**
- Geothermal Accredited Installer Training
- Geothermal Design Workshop
- Illuminating Engineering Society of North America, Webcast host site
- Daylight in Every Building Workshop
- American Society of Heating, Refrigerating and Air-Conditioning Engineers, Indoor Environmental Design-Practical Solution, satellite broadcast host site
- Illuminating Engineering Society of North America: Lighting for Hospitals and Health Care Facilities, Webcast host site
- Portland Energy Conservation, Inc., Commissioning Training

**Events Sponsored by Other Energy-Related Groups**
- Iowa Department of Natural Resources, State of Iowa Facilities Improvement Corporation Training
- Associated Buildings and Contractors Plumbing II, III, and IV weekly classes
- Omaha Hydro Winpump Seminar
- Iowa Department of Natural Resources, Iowa Waste Exchange Training
- Iowa Department of Natural Resources, Energy Analyst Workshop

- Alliant Energy-Interstate Power and Light, Performance Edge Training
- Johnson Controls Training
- Holophane Company, Roadway Lighting Seminar
- Energy Center conference grants for professional development on next page.
Conference Grants

2nd Annual Energy Efficient Healthy Home Conference & Trade Show,
Dan Burkhart, Iowa State University, Fayette County Extension

48 Hours of Light, Rich Dana,
E-Community, Grinnell

2006 Iowa Energy Summit - Make a Difference, Laura Riley, Iowa Association for Energy Efficiency

2006-2007 Energy Education Outreach Programs, Patricia Highby, University of Northern Iowa, Center for Energy and Environmental Education

2007 GeoExchange Conference,
Diane Hanson, Iowa Heat Pump Association

2007 Momentum is Building Conference, Jim Sayers,
Iowa Marketing Group

Achieving Energy Efficiency with Electric Motors and Drives,
Alexandre Kisslinger, Iowa State University, Center for Industrial Research and Service

Achieving Energy Efficiency Improvements for Industrial Refrigeration Systems,
Alexandre Kisslinger, Iowa State University Center for Industrial Research and Service

Can East Side LEED Decorah Towards Greater Sustainability,
David Faldet, East Side School Development Committee

Center for Energy and Environmental Education 2006-2007 Lecture Series,
Carole Yates, University of Northern Iowa, Center for Energy and Environmental Education

Engineers for a Sustainable World National Conference, Craig Just,
The University of Iowa, Engineers for a Sustainable World

Energizing Iowa Workshop Series,
Michelle Kenyon Brown,
Iowa Renewable Energy Association

Energy and Sustainability Expo 2006,
Dave Jackson, The University of Iowa, Energy Conservation Advisory Council

I-Renew Energy Expo 2007,
Michelle Kenyon Brown,
Iowa Renewable Energy Association

LEED Intermediate Training Workshop, Dave Harmelink,
United States Green Building Council Iowa Chapter

Minimizing Home Energy Use through Optimization of the Wood-Soy Foam Building Envelope, Craig Just,
The University of Iowa, Engineers for a Sustainable World

Odyssey Day Tradeshow, Jessica Zopf,
American Lung Association
Think bigger. It’s more than just ethanol and biodiesel. It’s more than wind energy. The potential for biobased products and alternate energy is tremendous, and Iowa has positioned itself to reap the benefits of an emerging industry in our country and the world. The Energy Center strives to support this growth by sponsoring and developing alternate energy related research, education and demonstration projects that are relevant to Iowans.

While ethanol and biodiesel capture the headlines, we’re working to fulfill the vision of developing biobased products (fuels, chemicals and materials) that can replace the hundreds of products drawn from a barrel of petroleum.

At the Energy Center’s Biomass Energy Conversion (BECON) Facility in Nevada, Iowa, we conduct internal research as well as host researchers and industry who are investigating the potential of “biomass to chemicals and fuels.” Corn stover, obsolete seed corn, manure, wood chips, switchgrass and many other biomass varieties hold the keys to replacing petroleum-based products. Biomass feedstocks contain the building blocks of the fuels and chemicals that we use every day.

In fiscal year 2007, the Energy Center continued our commitment to the alternate energy arena. We sponsored 19 grants- some focus on emerging areas of alternate energy and others dig a little deeper in areas already established.

An Industry Connection - Frontline BioEnergy, LLC

The Energy Center’s BECON facility provides a platform for Iowa researchers and industry to gain experience with innovative biomass conversion technologies so that large-scale applications operate optimally. Frontline BioEnergy is one such Iowa company working at BECON to fine-tune their gasification technology prior to its installation at their partner facility, Chippewa Valley Ethanol Company in Benson, Minn. At BECON, Frontline works with many different feedstocks and experiments with a variety of preparation methods for agriculture residues such as corn stover or wheat straw. Using Iowa State University professor Robert Brown’s thermal gasification pilot plant at BECON,
Frontline is developing a clean producer gas from biomass. This producer gas will replace natural gas within the ethanol production process, reducing emissions of greenhouse pollutants and the reliance on imported fuels, saving the ethanol plant money and providing another crop for local farmers.

**Supercritical Fluids - Biomass to Chemicals and Fuels**

Using supercritical fluids to convert biomass to chemicals is similar to the geological conditions thought to have, long ago, produced existing petroleum and natural gas deposits from ancient biomass. Common liquids such as water or carbon dioxide, placed under high pressure and high temperatures, show acidic or solvent-like characteristics. Under such conditions these readily available, safe and cost-effective fluids can effectively convert biomass to sugars or into a mixture of oils, organic acids, alcohols and methane – the building blocks of products such as pharmaceuticals, adhesives, cosmetics, detergents, plastics and more.

Our approach to the conversion process is multifaceted. The supercritical fluids research at BECON, which is setting the baseline for understanding the scientific principles behind the high-speed biomass conversion, is supported by the U.S. Department of Energy. Additionally, an Energy Center grant to Gary Aurand at The University of Iowa, “Supercritical Water Gasification of Biomass,” allows him to investigate the initial reaction aspects of supercritical fluids. Walter Trahanovsky, an Iowa State University professor, is researching supercritical fluids separations and reactions–work that is funded through an Energy Center grant, “Use of Supercritical Fluids and Other Novel Methodologies for the Production of High-Value Compounds from Biomass.”

**Photovoltaic Demonstration**

Photovoltaic (PV) energy systems show promise as a renewable energy source in Iowa. To demonstrate the performance of PV, the Energy Center funded a student grant to Michael Pate at Iowa State University to install two grid-connected systems operating at our facilities.

The stationary system is located at the Energy Center’s main office building in Ames and is attached to the roof structure. The dual-axis tracking system is located at the Energy Center’s BECON Facility. Both systems are fully equipped with high accuracy instrumentation and data acquisition, and their performance is available real-time on the Energy Center’s Web site.

**Ammonia as a Fuel – a Developing Story**

Since 2004, the Iowa Energy Center has led efforts to organize an annual ammonia fuel conference. Ammonia is seen by some as the ultimate fuel – produced from any energy source [wind, solar, biomass, hydro, OTEC (ocean thermal energy conversion), nuclear, natural gas, coal, etc.], and used by any prime mover (gasoline engine, diesel engine, fuel cell, gas turbine and more). Early research shows ammonia is cost competitive; is safer than gasoline and propane; at end use, is greenhouse gas emissions free; offers extensive and established storage, transportation and delivery options; meets 2015 Freedom Car Targets today; and has the potential to be used directly in efficient and low-cost fuel cells.

To further investigate this area, the Energy Center supported a student grant to Iowa State University professor Song-Chaung Kong. “Demonstrate Diesel Engine Combustion Using Ammonia as an Alternative Fuel.” The work focused on combustion and emissions characteristics of a diesel engine that burned ammonia and biodiesel. The research resulted in a successful demonstration of the feasibility of ammonia combustion in diesel engines. Combustion of ammonia alone does not produce carbon dioxide, which is a greenhouse gas.

A full list of the Energy Center’s renewable energy grants can be found on page 6 of this report.
Waste not. Energy efficiency and alternate energy must work in tandem to truly be effective, and the Iowa Energy Center was structured by the legislature to work with both. Our efficiency portfolio continues to fund projects that focus on using energy wisely—in manufacturing, building operation and maintenance, transportation, at home and more.

To follow is just a highlight of our efforts. A list of the Energy Center-sponsored efficiency-related professional development, sponsorships and conferences is on page 9. A full list of our efficiency-related grants is found on page 5.

ERS

Located on the Des Moines Area Community College campus in Ankeny, the Energy Resource Station is designed for simultaneous testing and demonstration of multiple, full-scale commercial building HVAC (heating, ventilating and air conditioning) systems. No other facility in the nation has the system capabilities that are integrated within the Energy Resource Station, making it a truly unique laboratory building. Research done there paves the way for building owners, architects, engineers and building operators to design and run facilities with efficient energy strategies that are also comfortable for the building occupants.

IAMU building monitoring

Early in the planning stages for a new Iowa Association of Municipal Utilities (IAMU) office building, a commitment was made to sustainable and energy efficient building practices. This commitment resulted in a high performance, low energy and sustainable facility, attained on a modest budget. In a five-year case study, the staff at the Energy Center’s Energy Resource Station has continuously monitored the actual building energy performance, with separate metering for lighting, HVAC, general use (plug loads) and other building energy loads. When comparisons of actual energy use against common benchmarks were drawn, it showed that the IAMU office building has only 25% of the metered energy use and operates at one-third of the energy cost when compared to a typical small office building located in the Midwest.

The building case study and energy monitoring results are the basis of the Energy Center’s demonstration, outreach and education efforts on how sustainable and energy efficient building practices can be obtained with a modest construction budget. The case study was presented at the 2006 ACEEE Summer Study on Energy Efficiency in Buildings, and is available on the Energy Center’s Web site.

CO2 Sensor Testing – an NBCIP energy efficiency project

As part of an HVAC system, a demand-controlled ventilation strategy saves energy and increases occupants’ comfort by measuring building carbon dioxide (CO2) levels and adjusting the ventilation rate accordingly. A space with more people has higher levels of CO2—increasing the need for ventilation; fewer people in space means the CO2 levels are lower and the ventilation requirements are less. The accuracy of the CO2 sensor is vital to the success of a demand-controlled system as the ventilated air must be heated or cooled to assure occupant comfort, which uses energy.

The National Building Control Information Program (NBCIP) is partnering with Gregory Maxwell, professor at Iowa State University, to test
wall mounted CO$_2$ sensors for HVAC applications. Maxwell has designed and constructed a chamber that will allow fifteen transmitters to be tested over a range of temperatures, pressures, relative humidities and CO$_2$ concentrations that are typical of conditions experienced in real-life applications.

The CO$_2$ test results will help building operators and designers improve the operation of control systems, saving energy for the owners and increasing occupant comfort. NBCIP is funded by the Energy Center, California Energy Commission, and NSTAR Electric and Gas.

**Energy Efficiency**

**Data mining – maximizing the efficiency of power plants**

Data mining is an emerging science that finds useful patterns in large volumes of information. With support from an Energy Center grant, Andrew Kusiak, professor in the Department of Mechanical and Industrial Engineering at The University of Iowa, is using data mining techniques to create a diagnostic and predictive software system aimed at assisting operators and engineers to maximize the energy efficiency of power plants. By using the historical data from key variables such as pressures, temperatures and air flow, Kusiak developed the Data Mining Combustion Optimizer (DACOMO) to monitor and automatically recommend control parameter changes to improve the combustion efficiency of the UI Power Plant’s fluidized bed boiler. Initial test results have showed DACOMO could increase efficiency by at least one percent, which if applied in a commercial scale power plant, has enormous potential for savings.

**Pursuing energy savings in the steel casting industry**

A typical steel foundry in Iowa uses 750 billion BTU of natural gas and electric energy combined—approaching a cost of $5 million. This energy intensive industry has room for improvement in its casting yield (most foundries melt twice as much steel as will be shipped as finished product) and in quality control (4% of the castings are re-melted due to defects). Christoph Beckermann, professor in the department of Mechanical and Industrial Engineering at The University of Iowa, is using a grant from the Energy Center to develop and deploy new software simulation technologies that are intended to help reduce energy consumption in the steel foundry industry through improvements in casting techniques and mold designs. The focus of three concurrent efforts optimize the quantity of steel that is required to be melted by minimizing the waste that results from defects or oversized molds required for machined surface faces.

**Potential for rail transport efficiency - soy-based lubricant**

The application of soybean-based lubricants has been tested in the rail transportation industry, which uses lubricants on rail curves to reduce friction, thus saving fuel and reducing wear on both the train and track. Building on his findings that soy-based lubricants exceed the performance of most conventional greases at economical prices approaching petroleum-based greases, Lou Honary at the National Ag-based Lubricant (NABL) Center at the University of Northern Iowa, investigated the use of lubricants on rail straightaways. The results of this Energy Center funded project were positive; soy-based lubricants increased the train’s energy efficiency on the straightaways and have low environmental impact.

In an industry of the size of railroad transportation, both in the US and globally, a small improvement in fuel efficiency and maintenance can have a huge effect. According to officials at NABL, the real savings from wide application of soy-based lubricant, including track straightaways, will most likely come as a result of price increases projected for petroleum and diesel fuel.

**The Home Series – a guide to energy efficiency at home**

The Energy Center’s Home Series books continue to be a popular resource for at-home efficiency tips. The fourth book, Major Appliances, will become available for distribution in December 2007. To distribute the books, the Energy Center continues to partner with Iowa’s businesses and non-profits that offer the Home Series to clients as a customer service. State Energy Offices in Arkansas, Illinois and Minnesota have also used the books.
Activity in the Alternate Energy Revolving Loan Program has been at an all time high. During calendar year 2006 a record $3.8 million in AERLP funds were distributed for construction of alternate energy production facilities in Iowa.

Recently, the AERLP funds helped finance two community wind farms: the seven-turbine Hardin Hilltop project in Greene County and the ten-turbine Cross Winds project in Palo Alto County.

“The AERLP was a difference maker – I’m not sure we could have done the project without it,” said Bill Sutton, one of the Greene County wind turbine owners.

When AERLP funds are paired with tax incentives and the 2002 Farm Bill Section 9006 financing, projects become more cost competitive, increasing the interest in the loan program and making the application process more competitive. Intense competition for the available revolved funds is anticipated to continue in future years as Iowans interest in developing renewable energy options grows.

Since the inception of the AERLP, approximately $140 million in renewable energy production facilities have been constructed in Iowa with assistance from the program’s financing. It’s a proven state-initiated economic development tool.

The AERLP was created by the state legislature in 1996 and was funded by Iowa’s investor-owned utilities. AERLP initial funding totaled $5.9 million, which was collected over a three-year period from 1995 through 1997. Since that time, the program has loaned over $10.5 million in support of 74 commercial, school and independent power producer projects – primarily wind turbines and biomass-to-energy projects.

The nature of the revolving loan program ensures that the funding source will continue to be available to other applicants into the future. As loans are repaid to the AERLP, that money ‘revolves back’ into the program and becomes available to fund new renewable energy projects. The amount of money available at any given time depends on the number of applications, amount of funds requested, outstanding loan balances and overall repayment rate.

Technical application cycles for projects with a total financed capital cost of $50,000 or less are accepted on a continuous basis. All other application cycles run on a quarterly basis and close on, or the first business day following Oct 31, January 31, April 30 and July 31.

The Energy Center manages the AERLP for the State in addition to its legislative mandate to support energy efficiency and renewable energy research, education and demonstration projects.

AERLP Case Studies Available

In an effort to capture the impact of the loan program and to educate prospective renewable energy project owners, the Energy Center has made available case studies of the projects. These reports feature the project history, system performance, operation and maintenance, and overall owner satisfaction with the renewable energy production facility. Nine case studies are available on the Energy Center’s Website and more will be posted as they are completed.
AERLP Results

Since the 1996 inception of the AERLP, 153 new and 24 resubmitted applications have led to 74 projects receiving funding. These facilities have an annual energy production equivalent of 1,714,715 MWh.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomass*</td>
<td>0</td>
<td>0 MWh</td>
<td>18</td>
<td>1,548,449 MWh</td>
</tr>
<tr>
<td>Large Wind</td>
<td>19</td>
<td>121,539 MWh</td>
<td>38</td>
<td>163,016 MWh</td>
</tr>
<tr>
<td>Small Wind</td>
<td>1</td>
<td>35 MWh</td>
<td>10</td>
<td>285 MWh</td>
</tr>
<tr>
<td>Hydro</td>
<td>0</td>
<td>0 MWh</td>
<td>1</td>
<td>2,863 MWh</td>
</tr>
<tr>
<td>Hybrid**</td>
<td>0</td>
<td>0 MWh</td>
<td>3</td>
<td>84 MWh</td>
</tr>
<tr>
<td>Solar</td>
<td>2</td>
<td>5 MWh</td>
<td>4</td>
<td>18 MWh</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>22</td>
<td>121,579 MWh</td>
<td>74</td>
<td>1,714,715 MWh</td>
</tr>
</tbody>
</table>

* includes the electrical equivalent of projects producing fuels such as ethanol, biodiesel and wood. ** includes a combination of solar, hydro, small wind and biomass.
The Iowa Energy Center receives core annual funding from an assessment on the intrastate revenues of Iowa’s gas and electric utilities. These ratepayer monies flow to the Energy Center (see below) and are used to fund Iowa-focused energy research and education. A portion of the funds are used to pay staff salaries and the operational expenses associated with the research and education programs. While the Energy Center, in conjunction with its Advisory Council, sets our own research and education priorities, oversight of the funds is provided by several different entities. This oversight ensures that the Energy Center spends the ratepayer funds appropriately and within our legislated mission.

**Assessment Funds**

IUB = Iowa Utilities Board; U of I CGRER - The University of Iowa, Center for Global and Regional Environmental Research; ISU = Iowa State University; OSPA = Office of Sponsored Programs Administration; SPA = Sponsored Program Accounting; HRS = Human Resource Services
**FY 2007 Expenditures**

For fiscal year 2007, the Energy Center received just over $3.9 million from the utility assessment, and $318,085 in research funding from federal, state and private sponsors.

For this reporting period, the Energy Center spent $4.2 million, 80% of which was spent directly on research and education projects.

**FY 2007 Competitive Grant Program Expenditures**

The Energy Center issues competitive grants under two broad categories: energy efficiency and renewable energy. The Energy Center spent more than $1.8 million on competitively funded research during fiscal year 2007.

**FY 2007 Collaborative Research & Education**

In addition to issuing competitive grants the Energy Center partners with national organizations on research and education projects. By working through larger, national collaborative groups, the Energy Center achieves excellent funding leverage on projects that would not have the same benefit to the State if they were performed only within Iowa. Other activities include funding for student-run projects, energy education for teachers, and a variety of outreach projects that benefit the general public.

**FY 2007 Sponsored Research Funding Received**

To address needs in specific technical areas, the Energy Center occasionally seeks external research funding. These funds augment the assessment funds and enable the Energy Center to conduct targeted research of benefit to Iowans.
Contact Information

Iowa Energy Center
2521 University Boulevard, Suite 124
Ames, IA 50010
(515) 294-8819 • iec@energy.iastate.edu

Energy Resource Station
2006 South Ankeny Boulevard
Ankeny, IA 50023
(515) 965-7055 • ers@energy.iastate.edu

BECON
Biomass Energy Conversion Facility
1521 West F Avenue
Nevada, IA 50201
(515) 382-1774

On the Web:
www.energy.iastate.edu
www.buildingcontrols.org
www.ddc-online.org

The Iowa Energy Center is administered by Iowa State University