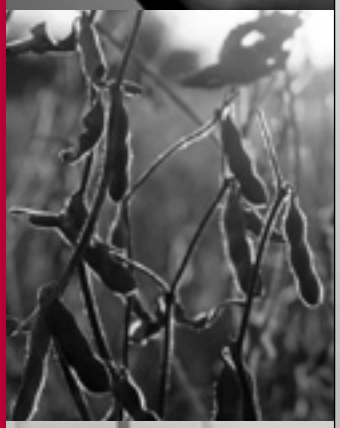

ANNUAL REPORT 2003

IOWA ENERGY CENTER

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A LETTER FROM THE DIRECTOR

The average refrigerator sold today uses 75 percent less energy than the average refrigerator sold 30 years ago. Read that again. It's a huge change! How did it happen?

First, let's examine what didn't happen. It did not happen overnight. It did not result from one magical new technical development. It did not happen because of one person or group. The change was not that quick and simple.

Over the past 30 years researchers and manufacturers - including key manufacturers here in Iowa - made continuous improvements in small increments: better insulating materials, new refrigerants, better compressors, better product designs. No one improvement made all the difference, but put together they made an astounding change in energy efficiency. At the same time government, first at the state and later at the Federal level, enacted standards to promote energy efficient refrigerators. Utility programs provided incentives for consumers to purchase products even better than those required by standards. The appliance industry made sure that consumer features and convenience were not lost along the way. Many people worked hard on many fronts. The net result is vastly improved energy efficiency for a major home appliance.

"We are persistent; to help Iowa, we keep our work constantly moving forward."

Four lessons stand out in this refrigerator story: first, little steps matter; second, many people are involved in making large changes; third, persistence is required: and fourth, persistence pays off.

Iowa's and our nation's energy issues, including supply security and reliability, affordability and minimal environmental impact, are complicated matters. They will not be resolved by one magic bullet solution that improves energy efficiency instantly or shifts our economy to renewable energy sources in the blink of an eye. Years of effort in many subjects will be required. Seeing what has happened with refrigerators, however, we know that great progress is possible.

The Iowa Energy Center's portfolio of activities reflects this reality. We are not seeking one big solution to Iowa's energy needs; we don't believe that one magic solution exists. Instead, our portfolio includes many projects seeking to improve Iowa's energy efficiency and use of renewable energy one piece at a time. We work with a variety of people in Iowa and around the nation to do this work; academic researchers, businesses, government agencies, advocacy groups, and individual citizens are all partners in making advances. We are persistent; to help Iowa, we keep our work constantly moving forward. And that persistence will eventually pay off with more energy efficiency and use of renewable energy in Iowa's future.

-Floyd Barwig

ADVISORY COUNCIL

The Advisory Council provides the Energy Center and its director 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 (as of December 31, 2003):

Education and Research Sector

Bettsey L. Barhorst
President, Hawkeye Community College

James Bloedel
Vice Provost for Research and Advanced Studies, Iowa State University

Tonya Peeples
Associate Professor, The University of Iowa

James E. Swartz
Dean of the College and Vice President for Academic Affairs, Grinnell College

Kichoon Yang
Dean of the College of Natural Sciences, University of Northern Iowa

Public Sector

Jennifer Easler
Iowa Department of Justice, Office of Consumer Advocate

Mark Lambert
Member, Iowa Utilities Board, Iowa Department of Commerce

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

Sharon Tahtinen
Public Service Executive, Energy & Waste Management Bureau, Iowa Department of Natural Resources;
Chair, Advisory Council

Utility Sector

Jack Alexander
Senior Vice President - Supply and Marketing, MidAmerican Energy Company

Kim Colberg
Manager, Linn County Rural Electric Cooperative; Vice Chair, Advisory Council

John Bilsten
General Manager,
Algona Municipal Utilities

Daniel L. Mineck
Vice President, Engineering and Environmental, Alliant Energy, Inc.

Our Team

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

Julie Charlson
Secretary

Maria Corsi, M.A. Sc.
NBCIP Technical Director

William Haman, P.E.
Industrial Program Manager
AERLP Manager

John House, Ph.D.
Research Engineer

Denise Junod
Secretary

Curtis Klaassen, P.E.
Energy Resource Station Manager

Keith Kutz
Administrative Specialist

Amy Swenson
Communications Specialist

Norm Olson, P.E.
BECON Project Manager

Patty Prouty
Secretary

Associations

Iowa Energy Center Memberships

Association of State Energy Research & Technology Transfer Institutions
Compressed Air Challenge
Consortium for Energy Efficiency
Iowa Association for Energy Efficiency
National Association of State Energy Officials
National Fenestration Rating Council
New Buildings Institute
U.S. Green Building Council

Who We Sponsor

Iowa State University, PrISUm Solar Car
National Lighting Product Information Program
University of Northern Iowa, Center for Energy and Environmental Education (CEEE): Electrathon, Energy Poster Contest and Junior Solar Sprint
University of Northern Iowa, Solar Boat Team
Youth and Energy Scholarship, State Science and Technology Fair of Iowa

BECON

Biomass Energy Conversion Facility

Leading by Example

In BECON, the Energy Center has established a environment for researchers and educators to turn promising ideas into actual commercial-scale biomass conversion units.

BECON is open to researchers from all of Iowa's universities, colleges and community colleges, private non-profit organizations and their research partners from the private sector.

BECON remains a destination for people interested in biomass-to-fuels and chemicals research. Hundreds of people toured the facility in 2003, and Norm Olson, project manager at BECON, gave 55 facility tours and presentations, sharing the BECON story with people around the country. BECON continues to be the host site for the National Biodiesel Technology Workshop, offered by Jon Van Gerpen, professor of mechanical engineering at Iowa State University, and funded by a major grant from the National Renewable Energy Laboratory.

Getting There from Here

At the BECON facility we are stretching the legs of systems that will move the United States from a petroleum centered economy to a biomass-based economy that could bring new life to rural communities across Iowa.

The science behind the bio-based economy isn't new – it just hasn't been aggressively pursued since cheap petroleum came on the scene in the 1930's and 40's. These biomass resources are literally spread across Iowa in the form of plant-derived materials such as corn stover or agricultural waste such as animal manure. The science at BECON converts Iowa's biomass resources to valuable chemicals, fuel, and materials.

The Beginnings of a Biorefinery

Biorefineries have the potential to produce fuels, plastics, polymers, lubricants, adhesives, electricity and heat from biomass much like petroleum refineries are geared to create a multitude of products. The advanced systems used to process Iowa's biomass at such a refinery are operational at BECON and are being used by the best researchers the country has to offer. At BECON, we are studying:

Supercritical Fluids have a high dissolving power making it ideal for biomass conversion to chemicals and fuels. The process is fast and versatile, uses relatively compact equipment to quickly convert biomass into sugars, organic acids, hydrogen, methane and a host of other chemicals.

Alcohol Fermentation uses sugars produced from biomass. The sugars are sent to the fermentation tank where they are converted to ethanol and other biochemicals. Through distillation – the removing of water and solids – the product can be further purified.

Anaerobic Digestion is the controlled decomposition of biomass in an oxygen-free environment. In the anaerobic digestion tank, several types of bacteria break down or digest the biomass, first into organic acids and alcohols, and then methane and carbon dioxide.

Biodiesel is produced from reactions that take place when vegetable oils and animal fats are mixed with alcohol and a catalyst. Biodiesel fuel can be manufactured from a wide variety of fats and oils from both plants and animals.

Thermal Gasification involves transforming solid biomass into a gas through partial combustion. Biomass is placed in a gasifier, and at controlled temperatures and pressures, the feedstocks produce a low-Btu gas that can be burned in a boiler. In the future, researchers look for the gas to fuel internal combustion engines, fuel cells or gas turbines.

Pyrolysis is similar to thermal gasification except instead of producing low-Btu gas, the process produces biocrude, a liquid similar to crude oil. By subjecting the biomass to varying temperatures and pressures, oils with different characteristics can be produced.

A Colorful Palette at BECON

A vision of Iowa as the leader in the biomass to fuels and chemicals industry has been put to canvas by Iowa artist Dean Biechler and four college art students.

"The murals represents what Iowa can give back to its people and the people of the world – everything from food to energy," said Biechler. "It also represents a generational sharing and exposure to the opportunities provided in biomass research."

Student artists: Christin Meyer, ISU; Sarah Thede, ISU; Katie Baedke, UNI; and Jessica Stensland, ISU.

The BECON murals are a project of ISU Art on Campus Program, University Museums in cooperation with the Energy Center. Mural dedication will take place in 2004.

ERS

Energy Resource Station

- Home to the Energy Center's Commercial Building Energy Efficiency Program.
- A nationally known research, demonstration and training facility conceived of, designed and built by Iowans.
- A resource for Iowan's seeking information about building energy efficiency.

The ERS is designed for testing and demonstration of multiple, full-scale commercial building HVAC systems. No other facility in the nation has the system capabilities that are integrated within the ERS, making it a truly unique laboratory building.

The information gathered at this research facility provides practical information for building owners, architects, engineers and building operators on cost-effective, energy-efficient technologies for commercial and industrial buildings. The ERS also provides an environment for hands-on training for this group of energy professionals – showing rather than telling them how to maximize the efficiency of the building systems they already have and what to look for when it comes time to invest in new HVAC equipment.

Tests performed at the ERS measure the performance of an entire integrated energy system rather than simply testing separate pieces of equipment. This method of testing emphasizes the interactive effects of HVAC, building controls and lighting energy use.

A significant portion of the testing performed at the ERS in 2003 involved assessments of daylighting systems. Daylighting is the use of natural light in a building. Properly integrated into a building's design, daylighting techniques reduce the need for electric lighting, thereby reducing the heat produced by lighting fixtures, allowing for a smaller air conditioning system and less energy use.

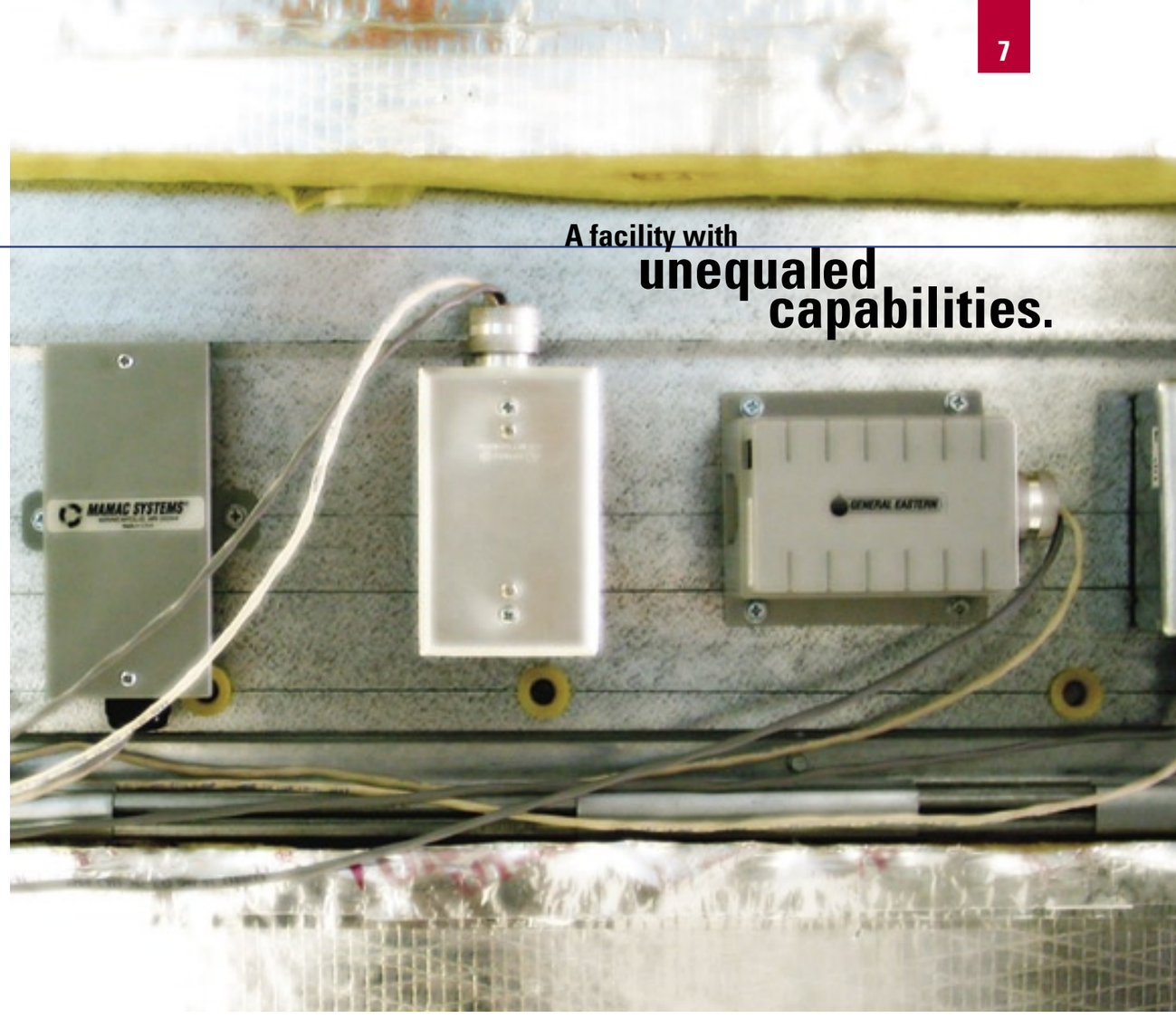
To further the study of the daylighting's impact, the Energy Center has taken an active role in the nationwide program, **Daylight Dividends**. This Lighting Research Center (LRC) led program is aimed at increasing the use of daylighting to improve indoor environmental quality and reduce electric lighting energy use. In 2003, focus groups were held across the country with building designers, developers, owners, and managers to define the barriers (both human and technical) to implementing daylighting. Due in part to the Energy Center's active partnership, Des Moines was selected as one of the five sites to host a focus group. The Daylight Dividends project looked to the ERS team to capture a portion of the technical data as well.

The ERS team also conducts testing for the **Daylighting Performance: HVAC and Lighting Energy Smart Schools Project**. This research project investigates the thermal and lighting energy requirements of three different daylighting scenarios while monitoring the light levels and collecting information on lighting quality. The unique testing facilities at the ERS were equipped with various window types, light fixtures, and daylighting controls to gauge and analyze the effectiveness of the three scenarios. The National Association of State Energy Officials, Lawrence Berkeley National Laboratory and the Energy Center of Wisconsin head up the Smart Schools Project.

In addition to its involvement with daylighting research, the Energy Center is part of a collaborative on building commissioning.

Building commissioning is a systematic evaluation that ensures a building performs according to the design intent, contract documents, and the owner's operational needs. The complexities of building systems make commissioning an important part of energy savings and occupant comfort.

Building Commissioning - Innovation to Practice is a two-year project directed at overcoming owner and industry barriers to the adoption of building commissioning. This project is one of the first awarded under the State Technologies Advancement Collaborative (STAC) (For more information on STAC see page 11.)



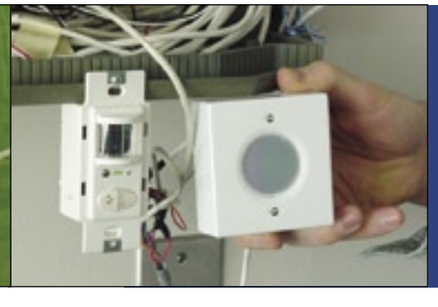
A facility with **unequaled capabilities.**

Additional System Testing

Adaptive Fuzzy Logic Control Project. Iowa State University mechanical engineering professor, Ron Nelson, is developing an adaptive fuzzy logic controller for HVAC applications using the test systems at the ERS. In 2003, trial runs of this controller, which enables a computer to act more like a human operator when making HVAC system decisions, have progressed.

Task 22 – Building Energy Analysis Tools: Analyzing Solar and Low-Energy Buildings. This Iowa State University and International Energy Agency project compares the results of various building simulation programs with actual operating data gathered from test rooms at the ERS.

Development and Validation of Adaptive and Optimal Control Strategies for HVAC. Researchers from The University of Iowa use the ERS facility to investigate energy-efficiency measures for the operation and control of HVAC systems.



The Promise of Daylighting

Some of the testing in 2003 at the ERS involved evaluating the performance of self-commissioning photo sensors. Sensors of this type hold the promise of simplifying the setup of daylighting systems, overcoming one of the barriers to more widespread use daylighting systems.

NBCIP

National Building Controls Information Program

Buildings constructed with energy, economic, and environmental performance levels that are substantially better than standard practice are considered high performance buildings. These buildings are touted as energy efficient, healthy and comfortable places to learn, work and play.

Through the National Building Controls Information Program (NBCIP) the Energy Center has teamed with Portland Energy Conservation, Inc., to carry out a case study of a high performance building in the Pacific Northwest. The information gathered will reveal if the building is actually running at a high performance level and identify potential changes to improve performance. Once identified, these changes will be implemented and the building's performance will be measured again, providing much needed before and after data on how building systems can cost less to operate and continue to provide a comfortable working environment.

A major contributor to a building's energy use is the heating, ventilation and air conditioning (HVAC) system. In order to achieve the potential efficiencies and savings of an HVAC system, the professionals working with the system – from design to installation to operation – must understand how their actions and decisions can impact system energy use in either a positive or a negative way. An NBCIP project on the horizon would develop an Application Guideline for designers, installers and operators to eliminate confusion and ensure correct on-site interpretation of a system's design, configuration and operation for return fan systems.

Nationwide, building owners, facility managers and professionals have learned about NBCIP. Program outreach activities have included presentations at the Department of Energy's conference, Energy 2003, in Orlando, Florida, the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Madison Chapter meeting in Wisconsin, and the Consortium for Energy Efficiency's Winter Meeting in San Francisco.

DDC Online – Sponsoring Partners

The Energy Center has opened its popular site, www.ddc-online.org, for commercial sponsorship. Direct Digital Controls (DDC) Online Platinum level sponsors receive a customized link and banner, as well as a listing on the sponsors section of the site. These partnerships help fund the ongoing site maintenance and updating.

Since the Energy Center launched DDC Online it has grown as a valuable and unique resource, receiving an average of 6,000 unique visitors per month. Consulting engineers, product specifiers, and designers regularly reference the site, both for its practical product comparison database and for its DDC educational material. Information available on the site is regularly used for courses and seminars on DDC systems. The architecture diagrams developed for and used at www.ddc-online.org have set an industry standard that is modeled by DDC some manufacturers to showcase products in their own marketing materials.

Addressing the need for building control system information.

NBCIP was established by the Energy Center with support from the U.S. Environmental Protection Agency and NSTAR Electric and Gas Corp., to facilitate the adoption of energy efficient building control products and strategies through testing, demonstration, education and dissemination of product information.

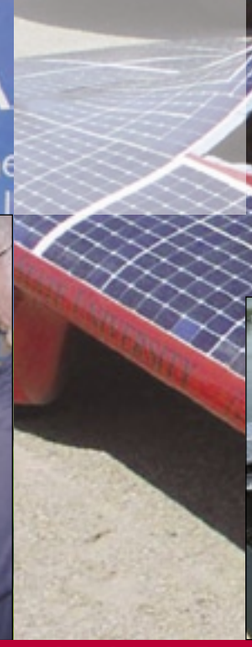
Building control systems are a complex technology that changes rapidly. A multitude of controllers, software, sensors and devices are currently available, but there is a lack of credible information concerning the actual performance of control systems and control strategies. It has become increasingly difficult for building owners, facility managers and professionals who design, specify, install and operate control systems to understand and compare the attributes and shortcomings of control systems, fully exploit their capabilities and implement the most energy efficient control strategies.

NBCIP provides unbiased, accurate, reliable, manufacturer-specific information on building control systems to guide and improve the selection, installation, operation and maintenance of control products and strategies for building applications.

OUTREACH 2003

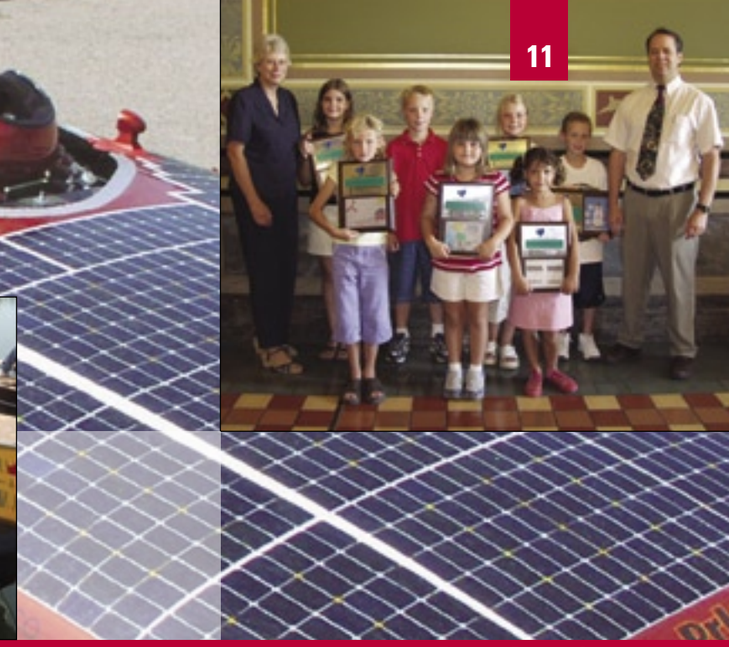
Iowa State Fair

State Science & Technology Fair of Iowa



PrISUm Solar Car Team

UNI Solar Boat Team



Energy Poster Contest

Iowa Industries of the Future

IIOF is a cooperative effort with Iowa companies to develop and deliver advanced technologies and best practices that increase energy efficiency, improve environmental performance, and boost productivity. The Energy Center supported the establishment of agriculture and metal casting industries as the first areas of focus for IIOF. The latest areas of focus are food processing and water wastewater. Three grants were awarded to the Center for Industrial Research and Service (CIRAS) at Iowa State University to further establish the Energy Center as a partner in IIOF; "Iowa Industries of the Future - Water/ Wastewater," "Iowa Industries of the Future - Food Processing," and "Enhancing Energy Efficiency and Conservation and Productivity in the Food Processing Industry in Iowa."

"The Energy Center supported the establishment of agriculture and metal casting industries as the first areas of focus for IIOF."

Water Wastewater Systems

There is potential to achieve significant savings within the water wastewater system industry, and the Energy Center is actively pursuing this energy efficiency opportunity. Several manuals and tools have been developed with Energy Center grantees to address this huge energy user.

Water and wastewater energy usage has become a significant national priority and much of the work completed in Iowa has received notice across the country. The American Council for an Energy Efficient Economy (ACEEE) and the Consortium for Energy Efficiency (CEE) have initiated projects in this field. The ACEEE will be facilitating a national road mapping effort for this industry to identify focused areas where opportunities for further research and technology deployment are needed. William Haman has been invited to sit on the advisory board for that effort. CEE, working through its utility members, is researching and developing programs and tools that will address the energy efficiency of the water and wastewater industries. Haman is currently sitting on the steering committee for that effort as well.

Youth & Energy Scholarships

Five Iowa high school students received a total of $7,500 in Youth and Energy Scholarships from the Iowa Energy Center during the 2003 State Science and Technology Fair of Iowa.

Scholarships were awarded to West Central Valley High School senior, Adam Forshier; West Central Valley sophomore, Danielle Wilson; Central Lee High School junior, Breanne Hunold; Algona High School sophomore, Chad Lane; and Keota High School senior, Mike Alexander. The scholarships are awarded to students with outstanding projects that focus on renewable energy and energy efficiency.

Biodiesel Technology Workshop

BECON was once again the host site for a biodiesel workshop series. Jon Van Gerpen, professor of mechanical engineering at Iowa State University leads this educational project, which included business management for biodiesel producers, biodiesel analytical methods, and biodiesel production technology. These courses were developed by Van Gerpen with support from the National Renewable Energy Laboratory (NREL) and U.S. Dept. of Energy (DOE) – Office of Biomass Programs. The biodiesel pilot plant at BECON is used for the laboratory and hands-on training portion of the education project.

Remote Site Monitoring

Weller Center, Central College, Pella, Iowa. The ERS staff is collecting data on the effectiveness of daylighting systems and occupancy controls in academic buildings.

Main Office Building, Iowa Association of Municipal Utilities, Ankeny, Iowa. In 2003 an upgrade of the monitoring system allows the Energy Center team online access to live energy data and information on this high performance office building.

State Technologies Advancement Collaborative

The STAC agreement allows the States and DOE to move energy research, development, demonstration, and deployment forward using an innovative project selection and funding process. The National Association of State Energy Officials (NASEO), the Association of State Energy Research and Technology Transfer Institutions (ASERTTI), and the DOE have established in STAC an organization that allows States and Territories and the Federal Government to better collaborate on energy research, development, demonstration and deployment projects. Floyd Barwig, the Energy Center director, serves as the Vice Chair of the STAC Executive Committee that implements this pilot project.

Total Assessment Audit

The Total Assessment Audit (TAA) is an integrated energy, waste and productivity evaluation process carried out by a team of experts selected specifically for a particular manufacturing facility. The Energy Center developed the TAA to improve productivity, reduce waste and enhance competitiveness of the audited company. The Energy Center provided funding for the Iowa Manufacturing Extension Partnership (IMEP) to implement the assessments.
The North Star Steel TAA came to a close in 2003. The Wilton, Iowa plant used the specialized energy use and waste management assessments in five production areas, revealing the potential to save $2.6 million annually against project costs of $8.2 million. The plant's assessment information will be shared with other North Star Steel mills across the country.

The Energy Center, CIRAS, IMEP, along with MidAmerican Energy Co., were partners in North Star Steel's DOE Industries of the Future funded project.

Compressed Air Challenge

The Energy Center continues to be an active sponsor in the Compressed Air Challenge® (CAC). William Haman, Industrial Programs Manager at the Energy Center, is a member of the CAC board and also serves on the Compressor Performance Verification Technical Committee for the Compressed Air and Gas Institute (CAGI).

"Warren Distribution is grateful to the Iowa Energy Center for holding the Compressed Air Challenge."

John Gage, Warren Distribution, Council Bluffs, IA, Compressed Air Challenge Training Attendee

2003 brought the release of the Best Practices for Compressed Air Systems manual. The manual provides the tools needed to reduce the operating costs associated with the use of compressed air and to improve the reliability of the entire system. In October 2003, the new manual was the foundation for the Energy Center sponsored Fundamentals and Advanced Management of Compressed Air Systems training held at Eastern Iowa Community College in Muscatine, IA. This CAC training session recorded the highest attendance since trainings were initiated in Iowa.

2003 GRANTS

ENERGY EFFICIENCY

03F-01 Ron M. Nelson
Iowa State University
Technical and Research Support for Iowa Energy Center Building Energy Efficiency Program

03S-01 Viktor Martisovits
Central College
Weller Center Case Study

03S-03 Michael B. Pate
Iowa State University
Development of Compressed Air Systems Textbook

03-04 Steven Andrle
Center for Transportation Research and Education, Iowa State University
Alternatives to Truck Engine Idling

03S-05 Ronald Cox
CIRAS, Iowa State University
Iowa Industries of the Future – Food Processing Industry

03-06 Timothy Sullivan
Center for Industrial Research and Service (CIRAS), Iowa State University
Enhancing Energy Efficiency and Conservation and Productivity in the Food Processing Industry in Iowa

03S-06 Ronald Cox
CIRAS, Iowa State University
Iowa Industries of the Future - Water/Wastewater

02-02 Anne Kimber
Iowa Association of Municipal Utilities
Water and Wastewater Treatment Technology Tool for Determining Energy and Treatment Costs in Iowa

01-04 Ron M. Nelson
Iowa State University
Development and Testing of an Adaptive Fuzzy Logic Controller for HVAC Applications

96-08 Gregory M. Maxwell
Iowa State University
A Comparison of Building Energy Simulation Software to Actual Building Energy Use

96-10 Theodore Smith
The University of Iowa
Validation of Energy-Efficiency Measures for Operation of Building HVAC Systems

RENEWABLE ENERGY

03-01 Bradley Chamberlain
Luther College
Development of Novel Polyesters, Poly(ester amides) and Polyolefins Derived from Renewable Resources

03-02 Julie Jessop
The University of Iowa
Emulsion Photopolymerization of Synthetic Monomers onto Corn Starch

03-03 Jill Euken
CIRAS, Iowa State University
Biorefinery Supply Chain Research and Development Project

03S-04 Julie Jessop
The University of Iowa
Polymers from Furfural

03-05 Lou Honary
Ag-Based Industrial Lubricants (ABIL), The University of Northern Iowa
Measuring Fuel Savings from Soy-Based Gage-Face Lubricant on Rail Track Straightaways

02-01 I. C. Anderson
Iowa State University
Production of Ethanol and Other Chemicals from Corn Stover and Sorghum

02S-03 Walter Trahanovsky
Iowa State University
Use of Supercritical Fluids and Other Novel Methodologies for the Production of High-Value Compounds from Biomass

02S-04 Robert Brown
Iowa State University
Biomass-Derived Hydrogen from a Thermally Ballasted Gasifier

01-01 Shihwu Sung
Iowa State University
Biohydrogen Production from Renewable Organic Wastes

01-02 Brent Shanks
Iowa State University
Catalytic Conversion of Lignocellulose-Derived Sugars to Polyols

00-04 Dora Guffey
Chariton Valley Resource Conservation and Development, Inc., Iowa State University BioComposites Group, and the Center for Advanced Technology Development (CATD)
Agroplastics: Feasibility of Blending Biomass with Plastic Resins

98-05 Robert Brown
Iowa State University
Hybrid Thermal/Biological Conversion to Industrial Chemicals

98-06 Jon Van Gerpen
Iowa State University
Development of a Biodiesel Pilot Plant and Research Facility

99-01 Gary Aurand
The University of Iowa
Supercritical Water Gasification of Biomass

CONFERENCE and DEMONSTRATION

03C-05 Marielle Savard
Maharishi University of Management
ECO-FAIR 2003

03C-06 Barry Deuel
Golden Hills Resource Conservation and Development, Inc.
Wind Energy Workshop

03C-08 Gary Bickmeier
Iowa State University Extension Service
Rural Residential Energy Use

03C-09 Patti Cale-Finnegan
Iowa Association for Energy Efficiency
Energy Efficiency: Make It Happen

03C-10 Mike Lubberden
Central College
Showcasing Photovoltaic Energy for the Future

03C-11 Kara Beauchamp
Iowa Renewable Energy Association
2003 Iowa Renewable Energy Expo

03C-12 Chuck Soderberg
Iowa Marketing Group for: Central Iowa Power Cooperative, Cedar Rapids; Corn Belt Power Cooperative, Humboldt; Dairyland Power Cooperative, LaCrosse, WI.; Northwest Iowa Power Cooperative, LeMars.
2004 Momentum is Building Conference

03C-13 Roy Goettig
Iowa Heat Pump Association
Understanding GeoExchange HVAC Systems and Their Value

03C-14 Kay M. Kollmorgen
Prairie Partners RC&D
Wind Rights and Lease Arrangements Workshop

Some photos provided by ABIL, Prairie Partners RC&D of Humboldt, IA.

AERLP

Alternate Energy Revolving Loan Program

Not since rural electrification have the gravel roads in northwest Iowa received so much traffic. Dirt laden contractor trucks come barreling down the gravel roads, kicking up dust as they go. They turn at newly made driveways cut through fields of soybeans or corn; in the clearing, a recently-formed concrete foundation. Upon these foundations, literally piece-by-piece, a wind turbine grows from the ground up, topped with the nacelle and adorned with the turbines blades. These towering electricity generating facilities are inarguably appropriately placed. Iowa has renewable resources that are ripe for the picking.

Alternate energy projects receive a great deal of attention, especially when a wind turbine becomes the highest structure in town or when a new biodiesel refinery brings jobs and economic development to a rural community. As evidence of that interest, AERLP presentations by Energy Center personnel increased again in 2003. The AERLP provides a financial incentive to make the projects a reality and in turn these facilities boost morale and add to a community's economic portfolio.

Successful AERLP applicants receive a single, low-interest loan from a combination of AERLP and lender funds. The Energy Center provides loan funds equal to 50 percent of the project's financed cost (up to $250,000) at zero percent interest. Matching financing must be obtained from a lender of the applicant's choice. The lender originates the loan and services the principal repayments to the Energy Center. The maximum loan term is 20 years.

Technical applications for projects with a total financed cost of $50,000 or less are accepted on a continuous basis. All other applications are received in cycles that run on a quarterly basis with deadlines on January 31, April 30, July 31 and October 31. The AERLP has been successful in leveraging its funds towards the construction of renewable energy projects. As of December 31, 2003, 34 projects have been financed, with AERLP funds totaling $4,923,362. The AERLP funds have been leveraged against a total of $83.9 million in projects. Loan repayment terms for the projects vary in length from three to twenty years.

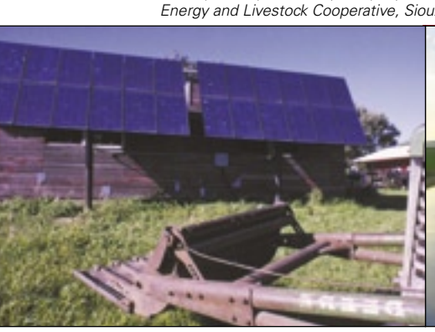
The current portfolio of loan projects has a weighted payback of 9.5 years. A cash flow analysis, based on a projected payback period of 10 years and a participation level consistent with the program's history, indicates the program is financially stable.

The Energy Center continues to explore ways to improve AERLP for all parties. In 2002 the Iowa Legislature approved the use of interest from the AERLP for administration and promotion of the program.

The Iowa Legislature created the AERLP in 1996 as an amendment to the 1990 Iowa Energy Efficiency Act. The program was funded by a three-year assessment, totaling $5.9 million, on the gross intrastate operating revenues of Iowa's investor-owned gas and electric utilities.

The AERLP is open to all individuals and groups, except non-rate-regulated utilities, seeking financial incentives to construct renewable energy production facilities in Iowa.

Some photos provided by Jacquelyn's Photography and Siouxland Energy and Livestock Cooperative, Sioux Center, IA.



Investing in Iowa's future through low-interest financing to encourage **renewable energy production and development.**

AERLP PROGRAM OUTCOME

Of the 75 new and 17 resubmitted applications*, 34 projects have received funding. The projects constructed resulted in the annual production equivalent to 1,485,950 MWh.

AERLP Loans Made	$4,923,362
Leverage Resources	$83,866,695
Constructed Project Costs	$88,750,057

Biomass	11	1,452,182 MWh**
Large Wind	13	30,648 MWh
Small Wind	6	179 MWh
Hydro	1	2,863 MWh
Hybrid	2	75 MWh ***
Solar	1	5 MWh
Total	34	1,485,950 MWh

* Received as of December 31, 2003.

**Includes the electrical equivalent of projects producing ethanol and biodiesel fuels.

***Includes a combination of solar, small wind, or biomass.

FINANCIAL INFORMATION

The Iowa Energy Center receives core funding from an assessment on the intrastate revenues of Iowa's gas and electric utilities. For fiscal year (FY) 2004 (July 1, 2003 – June 30, 2004) the Energy Center received approximately $2.81 million from the utility assessment. The assessment funds are used to support energy research, demonstration, and education programs as well as staff salaries and operating expenses related to the Energy Center's legislated mission. Payroll and procurement services, including some grant administration functions, are provided to the Center by Iowa State University.

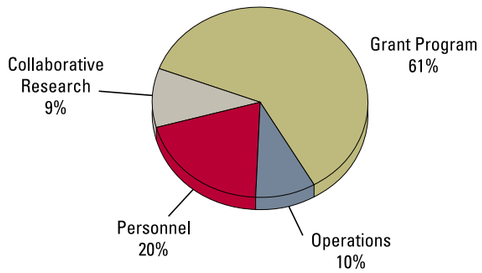


Figure 1: FY 2004 Expenditures

The Energy Center's FY 2004 expenditures* are represented by four major expense categories in Figure 1.

The Energy Center issues competitive grants under two broad categories: energy efficiency and renewable energy. Grant funds are committed on an annual basis and are allocated based on an annual prioritization of research needs and available funds. To enhance the likelihood of project success and maximize the Energy Center's investment, grant recipients are encouraged to commit matching funds on their projects. Grant Program funding commitments for FY 04 are shown in Figure 2.

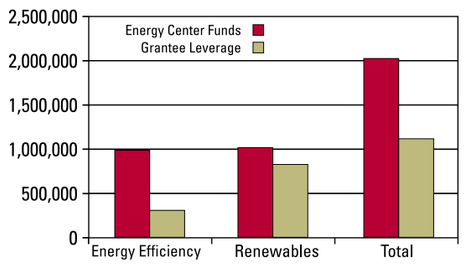


Figure 2: FY 2004 Grant Program Funding Commitments

Collaborative research agreements are another tool for diversifying the Energy Center's research portfolio and maximizing the leverage of the Energy Center's research funds. In FY 04, the Energy Center participated in six collaborative research projects involving state, federal, and industrial partners. As shown in Figure 3, the Energy Center's investment in these six projects was approximately $90,000 while the total investment from all partners totaled over $1.5 million. Iowa businesses and communities reap economic benefits from these collaborations.

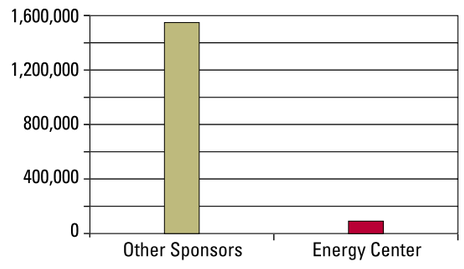


Figure 3: Leverage Through Collaborative Research Projects

To address needs in specific technical areas, the Energy Center occasionally seeks external research funding. During FY 04, the Energy Center expects to receive approximately $267,000 in targeted funding from federal and private sponsors (Figure 4). These projects enhance the Energy Center's ability to fulfill its legislated mission and provide useful information to Iowa individuals, businesses and communities.

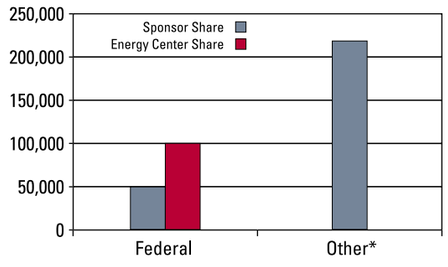


Figure 4: Sponsored Research Funding Received

*Estimated expenditures. Final FY 04 expenditures will be available in September 2004.

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IOWA ENERGY CENTER

Advancing Iowa's Energy Efficiency and Renewable Energy use through Research, Education and Demonstration.