

# IOWA ENERGY CENTER

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**Advancing Iowa's Energy Efficiency and  
Renewable Energy Use Through Research,  
Demonstration and Education**

# **Overview of the Iowa Energy Center**

**Floyd E. Barwig**  
**Director**

# **Background**

**Est. 1990 by the Iowa Energy Efficiency Act**

**Funded by a surcharge on intra-state electric and natural gas sales**

**Working with Iowa's universities, colleges and private nonprofit organizations**

**Administered by Iowa State University**

**Guided by a 13-member advisory council**

# Budget

**Receive 85 cents from every \$1,000 in intrastate electric and natural gas utility revenues in Iowa**

**Operates under salary cap, currently \$769,632**

**Fiscal Year 2005 Budget = \$3.12 Million**

- 52% on grant programs**
- 17% on collaborative research**
- 20% employee salaries and benefits**
- 11% on operations**

# **Focus Areas**

**Building & Industry Energy Efficiency**

**Biomass to Fuels and Chemicals**

**Renewable Resource Assessment**

**Wind, Solar and Biomass**

**Information and Education for Energy Users**

**Alternate Energy Revolving Loan Program**

# **Research Grant Opportunities**

## **Annual Competitive Grant Process**

**Iowa-based groups to conduct energy-related research, demonstration and education projects**

**These projects vary in size and complexity**

**Conducted throughout the state with Iowa's universities, colleges, community colleges, and private nonprofit organizations**

# **Conference & Small Demonstration Grant Opportunities**

**Open Grant Solicitation Process**

**Mission-related conference, workshop, seminar,  
exhibit, demonstration project**

**Matching funds required up to the maximum grant  
limit of \$7,500**

**Conducted throughout the state with Iowa's  
universities, colleges, community colleges, and  
private nonprofit organizations**

# **ENERGY RESOURCE STATION**

**Researching energy performance in buildings with real-time, real-life systems.**

**Testing and demonstrating commercial heating, ventilation and air conditioning, building controls and lighting systems.**

**Saving Iowa building and business owners money and energy by increasing energy efficiency and through training.**

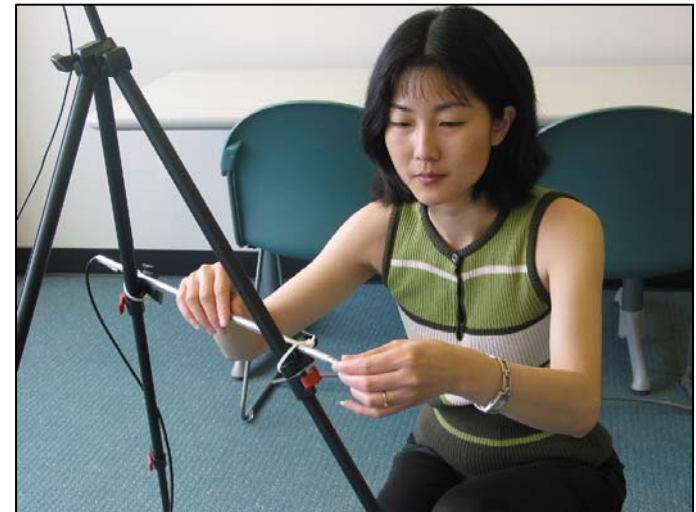




# ENERGY RESOURCE STATION

## A facility with unequaled capabilities

Four matched pairs of test rooms are identical in their construction and heating and cooling loads - allowing side-by-side comparison of the systems that control them.



# **NATIONAL BUILDING CONTROLS INFORMATION PROGRAM**

**Established by the Energy Center  
with support from the US EPA**

**Facilitating the adoption of  
energy efficient building  
control products and strategies**

**Testing, demonstration, education and dissemination of  
product information**



# **BECON**

## **Biomass Energy Conversion Facility**

**Providing credible,  
first-hand information on  
renewable, biomass-based  
fuels and chemicals**

**Innovation & Collaboration**

**Pilot-scale biomass conversion systems**



# BECON

## Biodiesel

An alternative for diesel fuel is produced when vegetable oils and animal fats are mixed with alcohol in this process. Oils from both plants and animals - not just soybeans – can make biodiesel.



## Alcohol Fermentation

Microorganisms convert organic material, such as sweet sorghum or switchgrass, from one chemical form into another. The resulting product is purified and used in other processes.

# BECON

## Thermal Gasification

This process transforms solid biomass into gas through partial combustion in the absence or near absence of oxygen. This gas can be burned in a boiler, internal combustion engine, fuel cell or an advanced gas turbine.



## Pyrolysis

Biocrude is produced when biomass is subject to varying temperatures and pressures during pyrolysis.

# BECON

## Biomass Conversion Processes

### Anaerobic Digestion

The controlled decomposition of biomass in an oxygen-free environment produces methane, carbon dioxide and other chemicals.



### Supercritical Fluids

Fluids, when raised to high pressures and temperatures, exhibit unexpected and interesting capabilities to convert biomass into a variety of chemicals.

# BECON

**Making a combined biorefinery system possible.**

**The biomass to fuels and chemicals conversion processes can be combined to create exciting economic possibilities for Iowa and enhance operating efficiencies.**



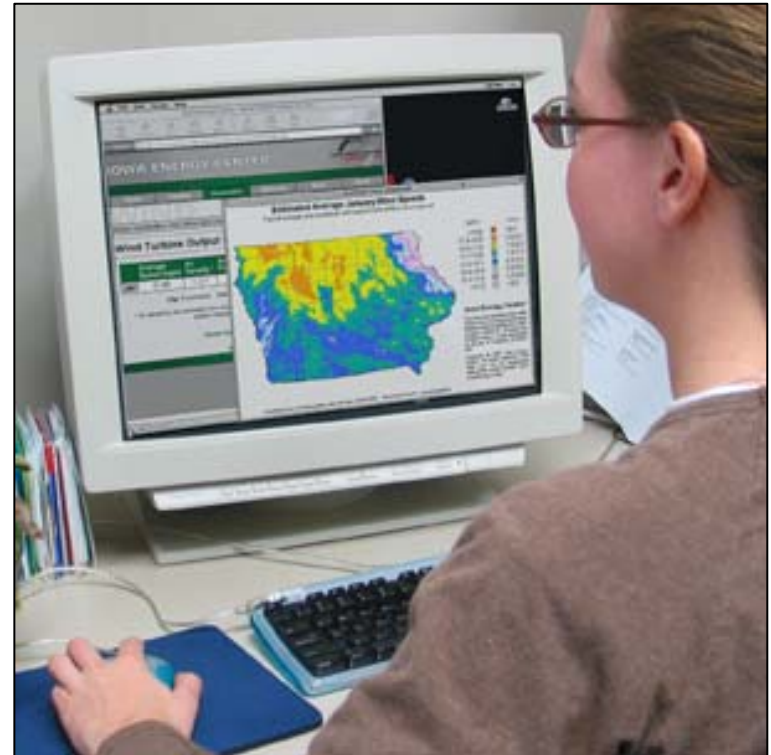
# ONLINE RENEWABLE ENERGY RESOURCE ASSESSMENTS

**Wind Manual**

**Wind and Solar Tools**

**Resource Maps**

**Assessment Calculators**





# Wind Energy Manual

**WIND ENERGY MANUAL**  
**Iowa Energy Center**

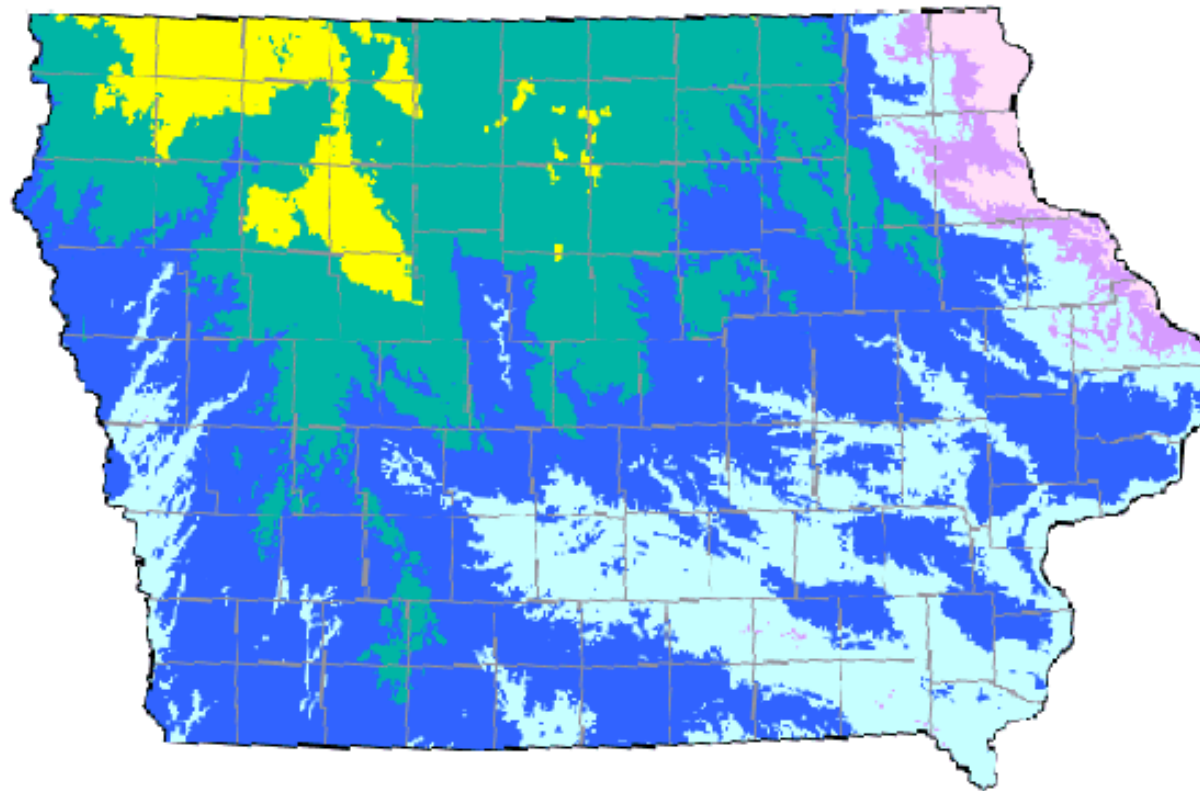










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# IEC Wind Assessment Study

## Estimated Average Annual Wind Speeds

Typical average wind speeds on well exposed sites at 50 m above ground



| MPH       |   | m/s     |
|-----------|---|---------|
| >19.0     |  | >8.5    |
| 17.9-19.0 |  | 8.0-8.5 |
| 16.8-17.9 |  | 7.5-8.0 |
| 15.7-16.8 |  | 7.0-7.5 |
| 14.5-15.7 |  | 6.5-7.0 |
| 13.4-14.5 |  | 6.0-6.5 |
| 12.3-13.4 |  | 5.5-6.0 |
| <12.3     |  | <5.5    |

### Iowa Energy Center

This map was generated from data collected by the Iowa Wind Energy Institute under Iowa Energy Center Grant No. 93-04-02. The map was created using a model developed by Brover & Company, Andover, MA.

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# Wind Turbine Calculator Input

## Wind Turbine Output Calculator

|   |   |
|---|---|
| Currently Viewing Cities For Louisa County  | <a href="#">Switch To A Different County</a>                            |
| Select <b>Town</b> :  | Columbus Junction ▾   |
| Select <b>Period</b><br><small>(Hold down Shift, Ctrl, or Command To Select Multiple)</small>   | All<br>Annual<br>January  |
| Use <b>best in 8 km</b> :<br><small>(Annual Only)</small>   | Yes: <input type="radio"/> No: <input checked="" type="radio"/>         |
| Select <b>Turbine Type</b> :  | Vestas 225-29 ▾   |
| Select <b>Units of Measurement</b> :  | Metric: <input type="radio"/> English: <input checked="" type="radio"/> |
| Enter <b>Tower Height</b> <small>(meters/feet):</small><br><small>(Enter in meters if "Metric" was selected. Enter in feet if "English" was selected)</small> | 165   |
| Enter <b>Number of Turbines</b> :   | 1   |
| Enter <b>Loss Factor (%)</b> :  | 12  |
| Display <b>Frequency Distributions</b> :  | No ▾  |
| <input type="button" value="Calculate"/>  |   |

# Wind Turbine Calculator Output

## Wind Turbine Output Results

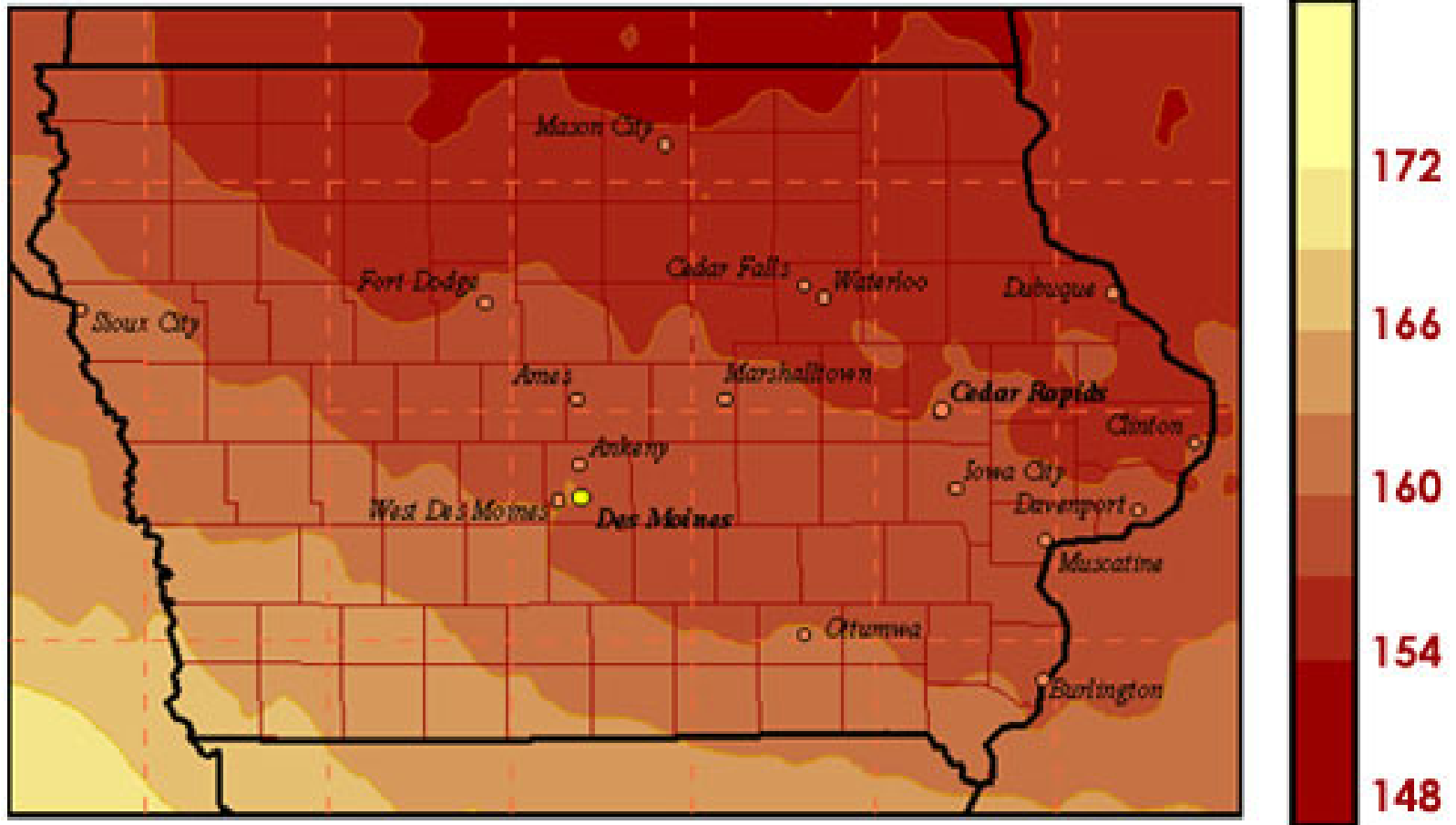
|               | Average Speed (mph) | Air Density * | Average Wind Power Density (W/m <sup>2</sup> ) | Capacity Factor (%) | Estimated Output for Period (kWh) |
|---------------|---------------------|---------------|--|---------------------|-----------------------------------|
| <b>Annual</b> | 13.37               | 1.237         | 223  | 21.89               | 427,413                           |
| <b>Jan</b>    | 14.6                | 1.294         | 277  | 27.37               | 43,379                            |
| <b>Feb</b>    | 14.11               | 1.288         | 264  | 25.61               | 36,821                            |
| <b>Mar</b>    | 15.16               | 1.254         | 304  | 29.02               | 47,431                            |
| <b>Apr</b>    | 15.4                | 1.228         | 332  | 29.71               | 48,014                            |
| <b>May</b>    | 13.46               | 1.201         | 218  | 21.51               | 36,728                            |
| <b>June</b>   | 12.34               | 1.182         | 165  | 16.89               | 28,366                            |
| <b>July</b>   | 11.42               | 1.171         | 122  | 12.88               | 22,552                            |
| <b>Aug</b>    | 11.08               | 1.175         | 109  | 11.54               | 20,144                            |
| <b>Sep</b>    | 11.75               | 1.189         | 134  | 14.20               | 23,706                            |
| <b>Oct</b>    | 12.78               | 1.221         | 175  | 18.39               | 30,888                            |
| <b>Nov</b>    | 14.13               | 1.254         | 267  | 25.28               | 39,999                            |
| <b>Dec</b>    | 14.17               | 1.288         | 268  | 25.90               | 41,227                            |

**City:** Columbus Junction **Turbine:** Vestas 225-29 **Tower Height:** 165 feet

\* Air densities are estimated from standard atmospheric densities corrected for the monthly average surface temperature and the elevation above sea level.

# Iowa's Solar Resource

Yearly Averaged Global Irradiance (Watt/sq.m)



# SPONSORSHIPS & OUTREACH

**Youth & Energy Scholarship**  
43 scholarships totaling \$70,875  
to Iowa high school students  
since 1997.



**ISU Team PriSUM**  
**ISU E-85 Race Car**  
**UNI Electrathon**  
**UNI Energy Poster Contest**  
**UNI Solar Boat**

# INFORMATION AND EDUCATION

Providing balanced, research-based energy information and education through:

Conferences

Speaking Engagements

State Fair

[www.energy.iastate.edu](http://www.energy.iastate.edu)



# Consumer Information



## IOWA ENERGY CENTER Home Series

**Book 1: Home Tightening,  
Insulation, and Ventilation**

**Book 2: Home Heating and Cooling**

**[CLICK HERE FOR MORE INFORMATION](#)**



# ALTERNATE ENERGY REVOLVING LOAN PROGRAM (AERLP)

Encouraging the Development  
of Alternate Energy  
Production Facilities in Iowa



# AERLP Description

- **Created by Iowa legislature in May 1996**
  - 1997 Iowa Code, Section 476.46
  - Amendment to the 1990 Iowa Energy Efficiency Act
- **Funded via**
  - Iowa's investor-owned utilities
- **Competitive application process**
- **Eligibility**
  - All individuals and groups except Iowa's gas and electric utilities that are not required to be rate regulated
- **Partnered with the banking community**
  - Origination and servicing of loans
  - Matching funds
- **Owner reporting requirements**

# AERLP Program Highlights

## ■ AERLP Funds

- up to 50% of the financed project cost
- \$250,000 maximum
- 0% interest rate
- 20 year maximum term
- negotiated repayment schedule
- repayments revolved back into fund for further loans

## ■ Lender Funds

- matching funds not less than AERLP
- market rate interest rate
- loan term not less than AERLP term
- repayment collection & distribution to AERLP



# **IOWA ENERGY CENTER**

**[www.energy.iastate.edu](http://www.energy.iastate.edu)**

**515-294-8819**