IOWA energy BULLETIN

Department of Natural Resources
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Energy Industry Gears Up for Fuel Cells

In the future, Iowans could generate electricity at their homes and businesses without pollution, and drive vehicles that emit only water as exhaust. Fuel cells have the potential to make these visions a reality and revolutionize the energy industry.

What is a fuel cell?

A fuel cell uses a chemical reaction to generate power without combustion. In principle, a fuel cell operates like a battery. Unlike a battery, however, a fuel cell does not run down or require recharging. It will produce energy in the form of electricity and heat as long as there is a fuel source to provide hydrogen. Since the fuel cell relies on chemistry and not combustion, there are few emissions of any kind. (See diagram on page six for how a fuel cell works.)

Where did fuel cells come from?

The first fuel cell was built in 1839 by Sir William Grove, a Welsh scientist who thought it possible to generate electricity by reacting hydrogen with oxygen. In the 1960s, the U.S. space program chose fuel cells over other power sources for electricity generation in spacecraft. Fuel cells still provide electricity for today's space shuttles.

What are the benefits of fuel cells?

Fuel cells are highly efficient, versatile, require low maintenance, and are adaptable for many applications — from running cars to heating and lighting entire buildings. Most importantly, fuel cells generate power with little to no pollution. The U.S. Department of Energy projects that if 10 percent of automobiles nationwide were powered by fuel cells:

- oil imports would be cut by 800,000 barrels a day;
- regulated air pollutants would be cut by one million tons per year; and
- 60 million tons of the greenhouse gas carbon dioxide would be eliminated.

Use of ethanol and renewable energy resources (such as biomass and solar power) in fuel cells could also lead to economic growth in Iowa's agriculture and energy industries, reducing pollution and dependence on imported fuels.

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In This Issue.....

Message from Sharon Tahtinen

"It's in the Way That You Use It"

There's an old Eric Clapton song entitled "It's in the Way That You Use It" that seems to be the perfect slogan for sustainability. What's more, it's a message many Iowans will tune into in the very near future.

This month, the U.S. Environmental Protection Agency awarded the Iowa DNR a $200,000 grant to encourage sustainable development in Iowa communities. The project will bring together state and local governments, businesses and private citizens to create economic growth strategies that reflect environmental responsibility.

The grant looks not only at energy efficiency projects — an important focus for the DNR Energy Bureau — but also at waste reduction, water quality and air pollution. These issues powerfully affect each other and every aspect of our environment.

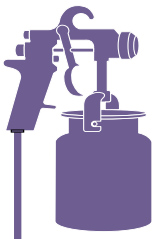
One reason sustainable growth is so exciting for Iowa is because it relies on techniques and technologies that already exist. Strategies such as new lights in buildings and more efficient treatment plants will save dollars while making the state's water cleaner, skies clearer and quality of life better.

In fact, that's exactly how we define sustainability: smart growth, healthy environment. As the song says, it's in the way that we use our resources that defines our success — not just today, but for future generations.

Sincerely,

Sharon A. Tahtinen

Sharon A. Tahtinen
Energy Bureau Chief



New Power for Compressed Air

Compressed air systems are vital to the operation of nearly every industrial plant. They are used to run air tools, paint sprayers, pressure washers and other equipment. Air-powered devices are popular because they are reliable and compact. However, an *inefficiently* running compressed air system can mean a drain on a company's electricity and finances.

Unfortunately, compressed air systems are inherently inefficient, converting only 10 to 20 percent of their energy input into usable compressed air. Additionally, compressed air energy can cost seven to 10 times more than electrical energy in mechanical or process-related work. Identifying ways to improve efficiency in these systems can provide a boost to a company's bottom line.

Join the Compressed Air Challenge™

Fundamentals of Compressed Air Systems training workshops will be held at several locations across Iowa in the summer and fall of 1999. The workshops will help industries understand the costs of using compressed air systems and how to improve their efficiency. The training is part of a national program called the Compressed Air Challenge, designed to help industries cut costs, save energy, and increase productivity. The workshops are sponsored by the Iowa Energy Center and several other organizations, including the DNR.

For more information on the *Fundamentals of Compressed Air Systems* workshops, contact Patti Cale with the Iowa Association of Municipal Utilities at (515) 289-1999; e-mail: energy@iamu.org; or visit the Compressed Air Challenge website at www.knowpressure.org

it's time to apply for the

1999 Iowa Energy Leadership Awards!

The Iowa Department of Natural Resources is now accepting applications for the 1999 Iowa Energy Leadership Awards. The Energy Leadership Awards recognize the success and ingenuity of Iowans for their efforts in developing energy efficiency programs and renewable energy resources. Past winners include schools, utilities, private companies and various other organizations — many have gone on to gain national recognition for their energy programs.

By applying, organizations can demonstrate how their programs exemplify the use of renewable energy resources and energy-efficiency strategies. Organizations can also nominate another group or individual who they think would qualify for an Energy Leadership Award, or have them contact the DNR for an application.

Awards will be presented at the Iowa All Energy Expo on September 24. The Expo is sponsored by the Iowa Renewable Energy Association (I-Renew), the United Nations Association, Iowa Association for Energy Efficiency and several other organizations. This year's application deadline for the awards is June 15, 1999.

For more information about the Iowa Energy Leadership Awards, or to get an application, contact Julie Tack at (515) 281-8665; e-mail: jtack@max.state.ia.us Or visit the DNR-Energy Bureau website for an application at http://www.state.ia.us/dnr/energy

1999 Student Energy Leadership Award Winners

The DNR is pleased to honor two students with Iowa Student Energy Leadership Awards for their projects on energy efficiency and renewable energy. The students were chosen from approximately 40 entries related to energy at the Iowa State University Science and Technology Fair March 26 and 27, 1999. The two students will receive their awards as part of the annual DNR Iowa Energy Leadership Awards luncheon on September 24.

Middle School Winner — "Pass on the Glass"

Kevin Heisdorffer, an eighth grader at Pekin Middle School, performed a "hot test" and a "cold test" to determine the effectiveness of different types of insulation in the summer and winter. He monitored the ambient temperature and the temperature of the insulation, then compared the results to determine the insulation with higher performance.

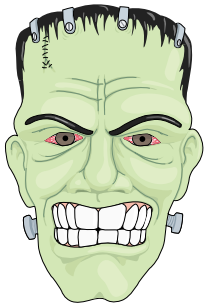
High School Winner — "Wrap Up Your Energy Savings"

Corey Menning, an eleventh grader at Algona High School, compared four types of house wrap. His tests included resistance to exfiltration, temperature performance, puncture resistance, and moisture infiltration. He discovered that one of the four brands of house wrap exhibited superior performance in each test.

Did You Know...

Each year Iowa's hog and cattle feedlots produce 36 million tons of biomass (manure) -- enough to generate electricity for 107,000 Iowa homes.

The Atoms Family at the Science Center of Iowa

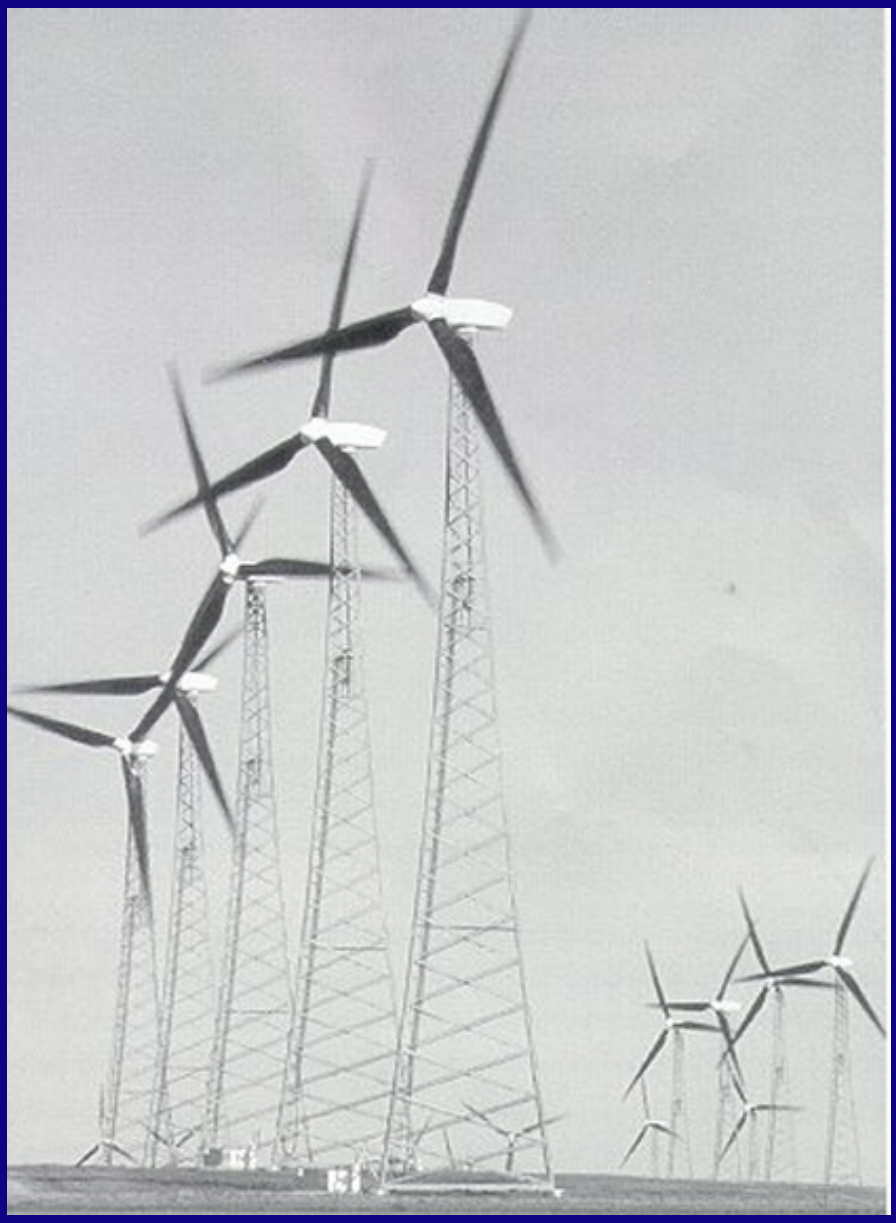


This summer visitors to the Science Center of Iowa in Des Moines will enter the world of Hollywood's classic 1930s horror movies as the famous monsters of the silver screen demonstrate the awesome power of the atom.

The Atoms Family exhibition will open May 29, and will run through September 12. The exhibit encourages exploration of energy concepts -- the power of the sun, energy conservation, energy transformation, electricity, and fossil fuels. Computer interactives, hosted by Frankenstein, Dracula, the Mummy, and Wolfman, will help visitors understand atomic structure and explain the role of atoms in matter and energy.

For more information, call the Science Center at (515) 274-4138.

A New Dawn in Wind Energy



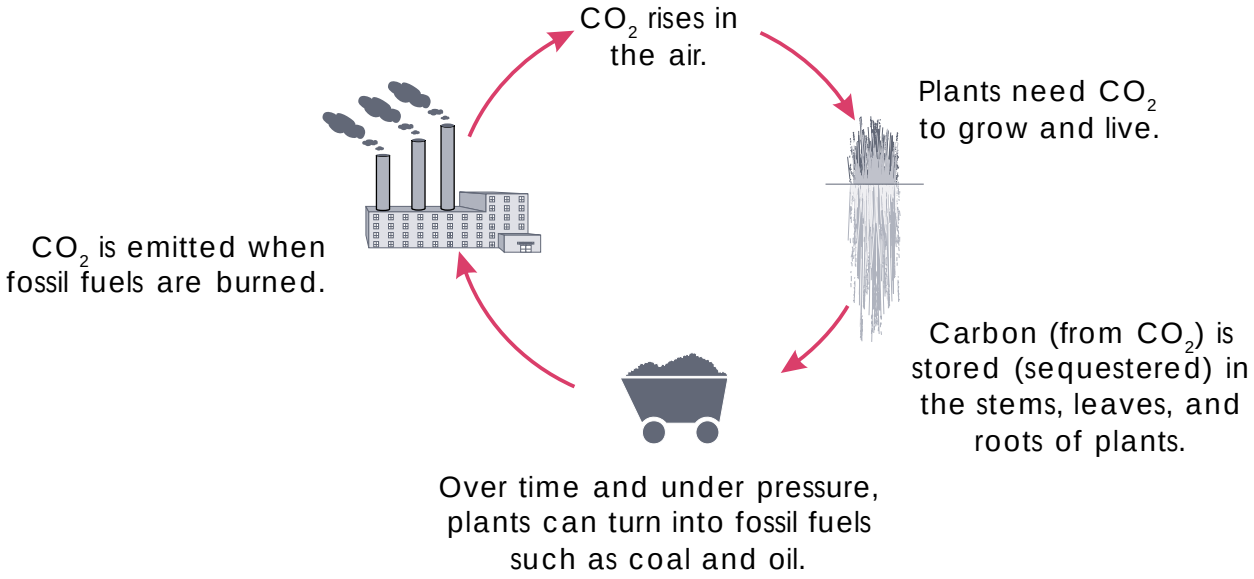
Iowa is now home to the single largest wind project in the nation. With 193 megawatts of electricity generating capacity, 259 wind turbines in Buena Vista County are being constructed this spring across the rolling plains that make this part of the state so favorable for harnessing wind energy.

The wind farm, along with 56 new turbines in Cerro Gordo County, make Iowa the third largest producer of wind energy in the nation, behind only California and Minnesota.

The turbines in Buena Vista County were constructed by Enron Corporation from Texas and will be producing electricity by July 1, 1999. The power generated will be purchased by MidAmerican Energy and Alliant Energy.

Exploring the Potential of Carbon Sequestration

The Carbon Cycle



As a fundamental process of life on Earth, the carbon cycle — which is the storing, releasing and recycling of carbon in the ecosystem — is gaining close scrutiny from scientists, economists and industries studying the effect of carbon dioxide in the atmosphere.

For millions of years the carbon cycle has operated effectively. However, modern industry has caused a drastic increase in fossil fuel use, forcing significantly more carbon into the atmosphere (carbon dioxide) than the carbon cycle is used to handling.

What is Carbon Sequestration?

While energy efficiency and renewable energy development are important tools for reducing the amount of carbon dioxide *emitted*, new focus is being placed on how carbon *sequestration* can decrease carbon levels in the air.

Carbon sequestration, as part of the carbon cycle, occurs when plants take in carbon and store it in their stems, roots and leaves. This carbon can then be found in the soil.

In the future, industries and governments may be able to place a positive value on the amount of carbon they sequester, and a negative value on the amount they emit. These values could eventually lead to a carbon trading system.

In a carbon trading system, a country or industry could meet air emission reduction goals by: 1) reducing emissions, 2) purchasing reduction "credits" from a country or industry that met its reduction goal, or 3) a combination of both. Iowa's agricultural sector could be highly affected by carbon trading, both as an emitter and a sequesterer. The ag industry may realize significant economic opportunities from a trading system due to the carbon sequestered by crops.

Creating a Baseline

The first step toward understanding how carbon sequestration could play a role in Iowa's economy and environment is by creating a baseline inventory of how much carbon the state currently sequesters. The DNR is working with the Center for Global and Regional Environmental Research at the University of Iowa to map annual carbon storage in Iowa's soil and vegetation. Additionally, the project will determine how strategies such as planting energy crops, buffer strips, roadside prairies, or native hardwood trees can increase the amount of carbon sequestered from the atmosphere.

For More Information

The issue of carbon sequestration will grow in importance as research, demonstration and information-sharing increase on how to address the world's greenhouse gas emission concerns. To find out more, contact Tami Foster of the DNR at (515) 281-7015; e-mail: tfoster@max.state.ia.us

Gearing Up for Fuel Cells

continued from page 1

What is the future of fuel cells?

Fuel cell technology is being developed in the automobile industry, as well as in residential and business sectors. Application of the technology is expected to grow rapidly in coming years.

DaimlerChrysler recently unveiled NECar 4, a car with a 70-kilowatt fuel cell that runs on stored liquid hydrogen. The U.S. Department of Energy has awarded $70 million to national firms and educational institutions for research in fuel cells and high-efficiency automobile engines. DaimlerChrysler, along with automakers including Ford, General Motors and Honda, are aiming to market fuel cell cars by 2004.

One fuel cell industry expert predicts the potential U.S. market for residential and small-business use of fuel cells could reach 140 million homes by 2030, with sales reaching $50 billion a year.

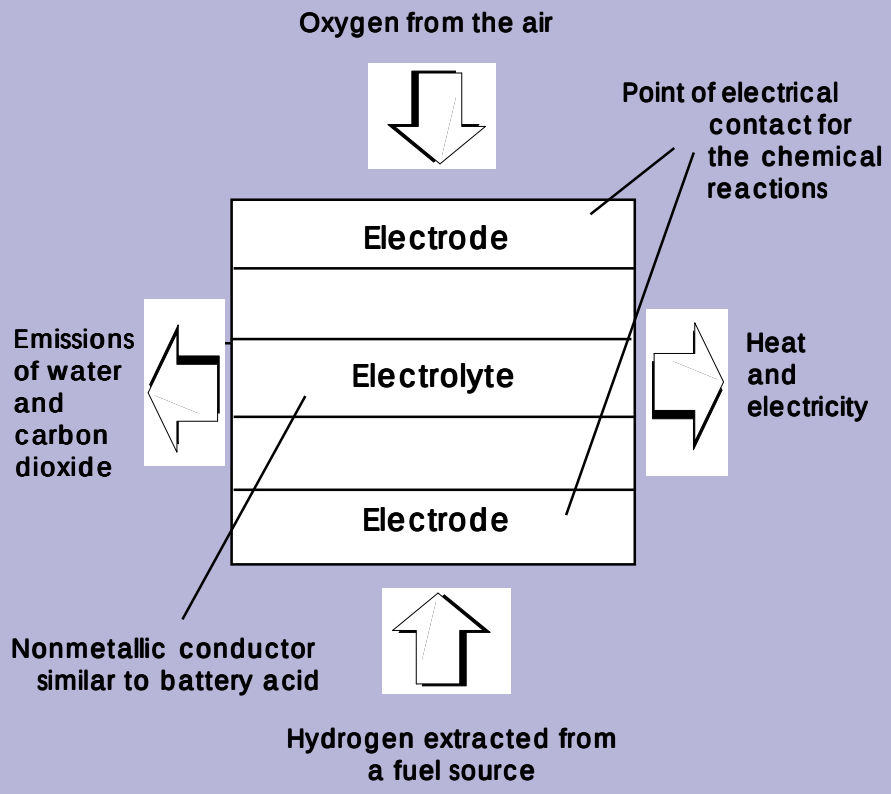
Fuel cell research and development is also taking place in Iowa:

♦ The Iowa Energy Center's Biomass Energy Conversion facility (BECON) is exploring how to produce biofuels that are clean enough for use in fuel cells, and

♦ The University of Iowa, through a $250,000 grant from the Iowa Energy Center, is studying ethanol and its potential use in fuel cells.

For more information, contact Dewayne Johnson with the DNR at (515) 281-7018, e-mail: djohnso@max.state.ia.us, or visit *Fuel Cells 2000's* website at http://www.fuelcells.org

How A Fuel Cell Works



A fuel cell consists of two electrodes (conductors that establish electrical contact) sandwiched around an electrolyte, which carries the electric current. Oxygen passes over one electrode and hydrogen over the other, generating electricity and heat. Oxygen comes from the air, and hydrogen is extracted from an outside fuel source. The fuel source can be hydrogen, methanol, ethanol, natural gas, liquefied petroleum gas, biomass or solar power.

HERS Approved as Code Compliance Tool

The Fire Marshal's Office of the Iowa Department of Public Safety has approved the Home Energy Rating System (HERS) as a voluntary method of compliance with the 1992 Model Energy Code. This approval allows building code officials to use HERS to verify code compliance in Iowa's residential sector.

"It has not been the policy of this office to endorse specific products or systems, except in those cases where either statutes or administrative rules provide for it," said Roy Marshall, state fire marshal. "We recognize, however, that there are alternate methods of achieving and determining compliance with the Model Energy Code. HERS provides a point system by which Model Energy Code compliance can be determined."

HERS has also been approved as a voluntary code compliance tool by other state agencies and the National Association of State Energy Officials.

For more information on HERS, contact Tami Foster at (515) 281-7015; e-mail: tfoster@max.state.ia.us

Cedar Falls Utility Begins Green Power Program

Cedar Falls Utilities (CFU) has launched *Wind Energy for Our Future*, a voluntary program for customers wanting to support renewable energy in their community.

"This is something our customers were really interested in," said Doris Kelley, marketing director for CFU. Starting March 10, utility customers could pay an additional $2.50 on monthly utility bills to support new wind turbines near Algona. The turbines are owned by CFU and six other municipal utilities. To date, nearly 600 households have signed up for the program.

CFU created *Wind Energy for Our Future* as a way to increase public involvement in reducing air pollution, while improving the environment and quality of life in the Cedar Falls area.

For more information, contact Doris Kelley, marketing director for Cedar Falls Utilities, at (319) 268-5222; e-mail: djkelley@CFUnet.net

Iowa Renewable Energy Guide Now Available through DNR

The DNR-Energy Bureau has published the *Iowa Renewable Energy Resource Guide*. The objective of this 52-page publication is to illustrate the current and future direction of "homegrown" energy in Iowa. The *Iowa Renewable Energy Resource Guide* provides in-depth descriptions of Iowa's most significant homegrown energy resources, along with their past growth, current status, and future opportunities in the state. From wind, to biomass, to hydropower, this publication overviews the importance of renewable energy to Iowa's environment and economy. For a copy, contact Julie Tack, energy information specialist for the DNR, at (515) 281-8665; e-mail: jtack@max.state.ia.us

IOWA energy BULLETIN

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Calendar of Events

June 10-12. Des Moines, Iowa. World Pork Expo. Iowa State Fairgrounds. The National Pork Producers Council and the U.S. Environmental Protection Agency AgSTAR Program will display a working model of a digester/biogas recovery unit at the Environmental Education Center. Contact Jenny Felt at (515) 223-2600.

June 18-20. Amherst, Wisconsin. *Renewing the American Dream*, 10th Annual Renewable Energy Fair, featuring workshops, exhibits, displays, tours and entertainment. Sponsored by Midwest Renewable Energy Association. Contact MREA at (715) 592-6595; e-mail: MREAinfo@wi-net.com

June 19-23. Seattle, Washington. American Society of Heating, Refrigerating, and Air-Conditioning Engineers Annual Meeting. Contact ASHRAE Customer Service at (800) 527-4723.

June 20-23. Burlington, Vermont. *Windpower 99*, conference and exhibition. Sponsored by the American Wind Energy Association. Contact AWEA at (202) 383-2500; e-mail: laura_keelan@awea.org

August 12-22. Des Moines, Iowa. The Iowa State Fair; the Iowa Renewable Energy Association (I-Renew) will be using the sun to power the American Republic stage near the Heritage Village area. Stop by and learn about how to put renewable energy to work in your everyday life. Volunteers to help staff the booth welcome. Contact Dewayne Johnson at (515) 281-7018 or Nancy Ewald at (319) 338-3200.

September 23-26. Cedar Rapids, Iowa. The Iowa All Energy Expo: *Forging New Partnerships in Energy and the Environment*. Sheraton Four Points Hotel and Hawkeye Downs. The DNR Iowa Energy Leadership Awards will be presented at the Expo. Contact Patti Cale at (515) 289-1999; e-mail: patti.cale@iamu.org

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