

HCR

1

Alaska State Legislature
House of Representatives
Minority Leader

JAN 12 2001

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Representative Ethan Berkowitz
District 13

Date: January 12, 2001

To: Representative Carl Morgan, House C&RA Committee Co-Chair
Representative Kevin Meyer, House C&RA Committee Co-Chair

From: Ethan Berkowitz

Re: HCR 1 hearing

House Concurrent Resolution 1 (short title "Statewide Comprehensive Energy Plan Task Force") has received a referral to the House Community & Regional Affairs Committee. Copies of the sponsor statement, the bill, and a letter issued to affected parties are attached. Please schedule the bill for a hearing.

HCR 1 seeks to establish a Task Force that will examine the condition of Alaska's energy resources, identify areas of necessary improvement, and recommend actions to achieve short- and long-term goals. Beyond that, the responsibilities of the Task Force are very general. This is intentional as I look forward to input during the committee process ensuring that the final product reflects a consensus-building process.

I look forward to working with you and your staff on HCR 1. Please contact my aide, Patrick Flynn, or me if you have questions. Thank you in advance for your consideration.

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Representative Ethan Berkowitz
District 13

House Concurrent Resolution 1

**"Relating to establishing a Task Force on a
Statewide Comprehensive Energy Plan."**

Sponsor Statement

Throughout Alaska we depend on a variety of energy resources - diesel, wind, natural gas, coal, and hydro to name a few - to provide the power Alaskans need. Ensuring that we have sufficient power to fuel economic development and maintain health and safety is critical to Alaska's future.

House Concurrent Resolution 1 seeks to establish a Task Force that will examine the condition of Alaska's energy resources, identify areas of necessary improvement, and recommend actions to achieve short- and long-term goals.

In order to move forward and achieve the prosperity and quality of life that is part of Alaska's promise, we must secure reliable, affordable energy. I would appreciate your support.

January 12, 2000

«FirstName» «LastName», «JobTitle»
«Company»
«Address1»
«City», Alaska «PostalCode»

Dear «Title» «LastName»,

I write to request your assistance in developing a statewide comprehensive energy plan for Alaska. Reliable and affordable energy is critical to our economic development and public health and safety. I recently introduced legislation to establish a task force to develop such a plan.

The bill proposes that your organization be a member of this task force. Your expertise and insight into energy issues are instrumental in developing a comprehensive plan, and your participation would be invaluable.

I also know that your assistance is critical to move the bill through the legislature this session.

Thank you in advance for your assistance and participation. I look forward to hearing from you soon.

Regards,

/s/

Ethan Berkowitz

Enclosures: House Concurrent Resolution 1
Sponsor Statement

Title	FirstName	LastName	JobTitle	Company	Address1	City	Postal Code
Mr.	Kevin	Ritchie	Executive Director	Alaska Municipal League	217 Second Street, Suite 200	Juneau	99801
Ms.	Julie	Kitka	President	Alaska Federation of Natives	1577 C Street	Anchorage	99503
Mr.	Eric	Yould	Executive Director	Alaska Rural Electrical Cooperative Association	703 West Tudor Road #200	Anchorage	99503
Ms.	Judy	Brady	Executive Director	Alaska Oil & Gas Association	121 West Fireweed Lane, Suite 207	Anchorage	99503
Mr.	Jamie	Kenworthy	Executive Director	Alaska Science & Technology Foundation	4500 Diplomacy Drive, Suite 515	Anchorage	99508-5918
President	Mark	Hamilton	President	University of Alaska	P.O. Box 755000	Fairbanks	99775-5000
Mr.	Frank	Dillon	Executive Director	Alaska Trucking Association	3443 Minnesota Drive	Anchorage	99503
Mr.	Mano	Frey	Executive President	Alaska State AFL-CIO	2501 Commercial Drive	Anchorage	99501
Ms.	Nan	Thompson	Chair	Regulatory Commission of Alaska	1016 West Sixth Avenue	Anchorage	99501-1963

From Rep Guess

Am #2 passed

page 2, Line 20 insert a new number

(12) one member appointed by the executive
director of Denali Commission

(13) one member appointed by the
executive director of AIDEA

From Halco - yw bill

Page 1, Line 15 insert as new number 3:

to recommend financing options including federal, state or municipal grants, bonds or other means; and

Renumber 3 to 4

AM#1 passed



Alaska State Legislature

HOUSE COMMITTEE ON COMMUNITY AND REGIONAL AFFAIRS

Representative Carl Morgan
Co-Chairman
Committee Aide, Bill Lawrence
(907) 465-3882

Representative Kevin Meyer
Co-Chairman
Committee Aide, Lorali Meier
(907) 465-6588

MEMORANDUM

DATE: February 20, 2001
TO: Terry Cramer, Legislative Legal Services
FROM: Lorali Meier, Committee Aide H-C&RA
RE: Committee Substitute for HCR 1

HCR 1, Relating to establishing a Task Force on a Statewide Comprehensive Energy Plan, received two amendments from the House Community and Regional Affairs Committee.

Please incorporate the attached amendments into a committee substitute. The CS in final form will be fine. I'd like to submit this to the chief clerk by this afternoon.

Thank you.

Attachments.

FISCAL NOTE

STATE OF ALASKA
2001 LEGISLATIVE SESSION

Fiscal Note Number: 1
 Bill Version: _____
 (H) Publish Date: _____

Revision Date/Time (Note if correction): _____ Dept. Affected: _____
 Title: HCR 1 Statewide Comprehensive Energy BRU: _____
 Plan Task Force Component: _____
 Sponsor: Rep. Berkowitz Component Number: _____
 Requester: HC&RA _____

Expenditures/Revenues (Thousands of Dollars)

Note: Amounts do not include inflation unless otherwise noted below.

OPERATING EXPENDITURES	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007
Personal Services						
Travel						
Contractual						
Supplies						
Equipment						
Land & Structures						
Grants & Claims						
Miscellaneous						
TOTAL OPERATING	0.0	0.0	0.0	0.0	0.0	0.0

CAPITAL EXPENDITURES						
-----------------------------	--	--	--	--	--	--

CHANGE IN REVENUES ()						
-------------------------------	--	--	--	--	--	--

FUND SOURCE (Thousands of Dollars)

1002 Federal Receipts						
1003 GF Match						
1004 GF						
1005 GF/Program Receipts						
1037 GF/Mental Health						
Other (Specify Type)						
TOTAL	0.0	0.0	0.0	0.0	0.0	0.0

Estimate of any current year (FY2001) cost: 0.0

POSITIONS

Full-time						
Part-time						
Temporary						

ANALYSIS: (Attach a separate page if necessary)

Prepared by: Lorali Meier, Committee Aide HC&RA Phone 465-6588

Representative:  Date 2/16/01
 Committee Chair

Alaska State Legislature
House of Representatives
Minority Leader

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House Concurrent Resolution 1 seeks to establish a Task Force that will examine the condition of Alaska's energy resources, identify areas of necessary improvement, and recommend actions to achieve short- and long-term goals.

In order to move forward and achieve the prosperity and quality of life that is part of Alaska's promise, we must secure reliable, affordable energy. I would appreciate your support.

Legislative Research Services

Alaska State Legislature
Legislative Affairs Agency
Division of Legal and Research Services


State Capitol
Juneau, AK 99801
Phone: 907-465-3991
Fax: 907-465-3908

January 10, 2001

JAN 10 2001

Memorandum

TO: Representative Ethan Berkowitz

FROM: Cherie Nienhuis 
Legislative Analyst

RE: Bibliography of Statewide Energy Studies, 1990 to Present
Research Request 01.045

You asked for a bibliography of all statewide energy studies that have been done for the state of Alaska from 1990 to present. We contacted the Alaska State Library, the Alaska Industrial Development and Export Authority and the Alaska Energy Authority within that agency, the University of Alaska Anchorage Institute of Social and Economic Research, and the Alaska Housing Finance Corporation.¹ We also conducted a search of our own Legislative Research library database.

The results of our inquiries are shown below. If you desire a copy of any of the studies listed, please do not hesitate to contact us.

Available from the Alaska State Library

"Power Cost Equalization Program Manual," by the Alaska Public Utilities Commission, Alaska Energy Authority, 1990.

"Power Cost Equalization Program: Cost Reduction Options to the Legislature," by the Alaska Public Utilities Commission, Alaska Energy Authority, 1992.

"Alaska Energy Authority Strategic Plan," by R.W. Beck & Associates, 1993.

"Alaska Energy Strategy," by the Alaska Dept. of Community & Regional Affairs, Division of Energy, 1994.

"Alaska Rural Energy Initiative," by the Alaska Dept. of Community & Regional Affairs, Division of Energy, 1995.

"Division of Energy Mission and Programs," by the Alaska Dept. of Community & Regional Affairs, Division of Energy, 1997.

"Energy Update," by the Alaska Dept. of Community & Regional Affairs, Division of Energy, 1997 and 1998.

Available from the Legislative Research Library

"Alaska State Energy Corporation (An Overview of the Restructuring Plan for the Alaska Energy Authority), by the Office of the Governor, 1992.

"Alaska Energy Plan – Rural (Draft)", by the Alaska Industrial Development and Export Authority, Denali Commission, and U.S. Dept. of Agriculture, 1999.

Available from the Institute of Social and Economic Research

"The Economic Significance of the Power Cost Equalization Program," by the Institute of Social and Economic Research, 1998.

"Rural Energy Plan," by the Alaska Dept. of Community & Regional Affairs, Division of Energy, 1999.

"Reports and Recommendations of the Governor's Blue Ribbon Panel," by the Alaska Dept. of Community & Regional Affairs, Division of Energy, 1999.

¹ At our request, the Alaska State Library conducted a search of their library holdings, and a search of the "WorldCat" database, which accesses library holdings nationwide. We spoke with Richard Emerman at AIDEA and Steve Colt at ISER, both of whom have a long history of working with Alaska energy issues. We found that there were many energy reports produced in the 1970s and 1980s, but that this activity dropped off significantly in the 1990s.

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Anchorage Daily News

Alaska needs an energy policy

Compass: Points of view from the community

(Published February 12, 2001)

We depend on energy in many forms, at prices equitable to business, industrial and domestic users. Both major presidential candidates emphasized the need for a national energy policy during the recent campaign. Since taking office, President Bush has reconfirmed his commitment to a national energy policy.

The importance of energy to Alaskans' economy and lifestyles is much greater than in other states. This is because of our energy reserves, both developed and undeveloped, the employment of many Alaskans in the energy industry; the importance of oil revenues to state and local governments; and the need for and difficulty of providing energy at reasonable cost to both urban and rural communities.

Alaska's per-capita consumption of energy is extremely high. Our major industries, including commercial fishing, tourism, transportation, mining and logging, are all heavy energy consumers. High energy costs in Alaska -- whether for home heating, auto fuel, electricity, or industry -- affect our lifestyles, our pocketbooks and our economy.

Just as the nation needs to develop an energy policy to guide and balance its energy dependence, Alaska should develop an energy policy to prepare for the future. Alaska is fortunate to have vast energy reserves and is the major energy exporting state, but because of our large size and remoteness from national and world markets, Alaska is unique among the 50 states in the urgency of its need to develop a state energy policy.

No one source of energy will meet our needs. Alaska and the rest of the United States need to develop several sources to address the local and regional diversity in availability and demand for energy.

Alaska will continue to play a major role in supplying oil, and perhaps natural gas, to the rest of the United States. Our huge North Slope gas reserves, once they become available to Alaska's major population centers and the Lower 48, will contribute substantially to improved air quality and reduced emission of greenhouse gases.

Advances in fuel cell technology are making it possible to convert fossil fuels to available energy with far greater efficiency and much less pollution than through conventional combustion. Natural gas is the fuel of choice for fuel cells. The Postal Service in Anchorage is the first in the nation to install a fuel cell using natural gas to assure uninterrupted electric power for its electronic equipment. Any surplus electricity that is generated enters the Anchorage, Kenai and Railbelt intertie system.

Alaska might develop and use energy from a variety of sources in addition to fossil fuels. Hydropower, for instance, has potential in Southeast Alaska and other Gulf of Alaska coastal communities.

Alaska could be a leader in development and marketing of wind power generation technology, which has seen substantial improvements in recent years. As a result, wind generation of electricity is proving economically feasible in Kotzebue, thanks to a state-supported trial program. In many parts of Western and northwestern Alaska and probably in most coastal communities, wind generation could reduce dependence on diesel fuel currently used in community power plants. This could reduce the high costs of barging fuel during limited freight seasons.

There is a rapidly expanding market for wind power generation throughout the world. Alaska has greater wind power generation potential than any other state and more than most other countries.

Several other energy sources occur around the state. They include local reserves of coal, natural gas and geothermal energy; tidal and wave power; and solar power. These offer potential for seasonal balance with wind generation.

It is clear that Alaska needs to prepare for its energy future through development of an energy policy that goes beyond but also includes the current focus on a gas pipeline. An energy policy must be based on an accounting of our current and anticipated energy needs, consideration of present and projected energy transmission systems, an assessment of our known and potential energy resources, potentials for energy conservation in building design and efficiency, and assessment of environmental costs of energy options.

I urge Gov. Knowles and the Legislature to jointly develop an energy policy for Alaska.

David R. Klein is professor emeritus with the Institute of Arctic Biology at the University of Alaska Fairbanks.

Close Window

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SCREENING REPORT FOR ALASKA RURAL ENERGY PLAN

DRAFT

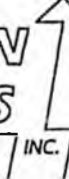
Prepared for the

**Alaska Industrial Development
and Export Authority**

November 2000

Prepared by

In association with
**Electric Power Systems, Inc.
The Financial Engineering Company
HDR Alaska, Inc.
Precision Power, LLC
URS/Dames & Moore**

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Executive Summary

This report has been prepared for the Alaska Industrial Development and Export Authority (AIDEA), U.S. Department of Agriculture Rural Development, and the Denali Commission, and is one component of Phase 2 of the Alaska Rural Energy Plan. The report presents a screening analysis conducted to develop a short list of strategies and technologies that hold the most promise for reducing the cost or improving the reliability in rural Alaska. The selected strategies and technologies will be evaluated in more detail as Phase 2 progresses.

Strategies and technologies considered in this screening analysis are divided into six categories:

- Diesel efficiencies
- End-use conservation
- Space and water heating
- Fuel price strategies
- Alternative technologies
- Bulk fuel storage

Specific strategies within each of these topic areas were identified in Phase 1 of the Rural Energy Plan, which was prepared in 1999, or by the consultant team for this screening analysis. Strategies and technologies related to diesel efficiencies, fuel price strategies, end-use conservation, and alternative technologies were evaluated for their potential to significantly reduce the cost of electricity. Strategies related to space and water heating, including waste heat recovery systems and biomass systems, were evaluated for their potential to reduce the cost of heating. Strategies related to construction and financing of bulk fuel storage facilities were evaluated for their potential to reduce the cost of such facilities or to reduce reliance on public funding for such facilities.

Table ES-1 shows the strategies and technologies selected for further study.

Table ES-1. Short List of Strategies and Technologies Recommended for Further Study

Topic Area	Category	Strategy or Technology
High Cost of Electricity	Diesel Efficiencies	Switchgear Improvements
		Microprocessor-Based Engine Controls
	End-Use Conservation	Lighting
		Appliance Upgrades
Alternative Technologies	Wind Power	
Reliability		Microprocessor-Based Protective Relays
Space and Water Heating		Insulation and Weatherization
		Heater Upgrades
		Waste Heat Recovery Systems
		Conversion of Electric Water Heaters
		Water Conservation Devices
Bulk Fuel Storage		Local Contributions to Tank Farm Financing ^a

^a Several other strategies related to the construction of bulk fuel storage facilities are recommended for field testing, but not for further study to assess their potential.

The only alternatives included on the short list are those projected to result in significant benefit to a significant number of people and communities in the near term, assuming that the approach is implemented aggressively. For alternatives intended to address the high cost of electricity, benefits must be projected in the absence of government grants or low interest loans, since virtually any alternative can provide benefits to consumers if a large enough subsidy is provided.

To help identify strategies or technologies that should be considered for further study, AIDEA suggested as a general guideline that, to warrant inclusion on the short list (Table ES-1), any measure to reduce the cost of electricity should be able to lower rates by at least \$0.01 per kilowatt-hour in at least 5 communities within a 5-year period. It is not the intent of AIDEA or the consultant team to rule out alternatives that do not meet these criteria from further consideration or support. The intent is to focus on those alternatives that meet these criteria and to give them priority consideration.

End-use conservation is the only category in which a majority of considered strategies are recommended for further study. Most of the diesel efficiency strategies considered did not meet the criteria for further study. In alternative technologies, only one strategy (wind) of the 12 considered met the criteria. However, more study is recommended for specific issues related to interties.¹ In fuel price strategies, no strategies met the criteria for further study. (While these strategies would be useful and should be considered by all utilities in the course of regular business practices, none appears to have the potential to reduce the cost of electricity by \$0.01 per kilowatt-hour (kWh) for a large number of communities.)

Strategies and technologies considered in the reliability and space and water heating categories were recommended for further study if they were economically viable and would produce obvious benefits in the near future. Six strategies met these criteria. For example, the strategy recommended for further research to improve reliability of electricity in rural Alaska (installation of microprocessor-based relays) was found to be economically justifiable based solely on savings associated with lower costs for distribution system equipment and maintenance. The benefits from improved system reliability associated with these relays could be significant and could be enjoyed by residents of rural Alaska at little or no cost (the cost is offset by other savings).

Because limited funds were available for this analysis, each alternative was examined only to the point that a conclusion could be reached about its potential to meet the screening criteria. As soon as it became unlikely that an alternative would pass the test, the analysis of that alternative was discontinued. For many alternatives, therefore, the analysis is very brief.

Analyses were based on data from the State of Alaska Power Cost Equalization Program, existing literature on energy systems in Alaska, public programs and agencies such as the Rebuild America Program and Alaska Community Development Corporation, the Alaska Energy Authority Circuit Rider Program, equipment manufacturers. The analyses also incorporate information from interviews with specialists and utility personnel throughout the state.

¹ Limited additional research is recommended to determine whether the costs and benefits of single wire ground return transmission lines and direct current cables might make interties viable in more locations.

▶ **2000 COMPREHENSIVE ENERGY PLAN UPDATE**

Iowa Energy plan

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▶ Energy and Geological Resources Division • Iowa Department of Natural Resources
Wallace State Office Building • Des Moines, Iowa 50319 • (515) 281-8681

director's message



▶ Dear Iowans,

The next time you are driving on a highway through the Iowa countryside, take a minute to think of all the natural resources within your view. A pristine, blue sky. Fields of rich, black soil. Pathways of natural grasses and prairie flowers. Trickling creeks and rivers.

This land of ours is rich in natural resources, and our mission is to protect and nourish those resources for future generations.

Few natural resources are as intrinsic to our way of life — yet pose such a potential threat — as energy. We are continually challenged to find ways to improve efficiencies in our energy use, and where possible, develop renewable resources that can help us build a sustainable future.

In the ten years since the original writing of the *Comprehensive Energy Plan*, we have come a long way. More than 300 wind turbines are turning their blades in northern Iowa, creating clean energy. Our schools are saving millions of dollars in energy costs because of efficiency improvements. And indigenous crops such as switchgrass are being cultivated for energy production.

The year 2000 marks a decade of progress, and a year of new beginnings for energy efficiency and renewable energy in Iowa. Perhaps the greatest challenge in the near future will be a restructured electric utility industry. Our response to this change and others will help define Iowa's energy future, and our ability to continue to protect our valuable natural resources.

The *2000 Comprehensive Energy Plan Update* provides a summary of Iowa's progress during the last decade, as well as future developments and recommended policy actions. I also would like to emphasize another contributor to Iowa's energy plan — you.

Each of us is a caretaker of the land. Whether it's energy, water, or soil, how we use these resources today dictates the health and wellbeing of Iowa's future. Each of us is responsible for ensuring our state is as vital and productive during the decades to come as it has been during our lifetimes. Together, we can make it happen.

Sincerely,

A handwritten signature in dark ink, appearing to read "Paul Johnson".

Paul Johnson
Director

▶ Iowa code chapter 473.3

The goal of this state is to more efficiently utilize energy resources, especially those that are nonrenewable or that have negative environmental impacts, in order to enhance the economy of the state and to decrease the state's dependence on energy resources from outside the state by reducing the amount of energy used. This goal is to be implemented through the development of programs that promote energy efficiency and energy conser-

vation by all Iowans, through the development and enhancement of an energy efficiency industry through the development of indigenous energy resources that are economically and environmentally viable, and through the development and implementation of effective public information and education programs. State government shall be a model and testing ground for the use of energy efficiency systems.

executive Summary

▶ In 1990, the State of Iowa authored the *Comprehensive Energy Plan*, establishing future direction for the management of Iowa's energy resources. Included in the plan were these goals:

- ▶ To meet all future demand for energy by increasing efficiency rather than supply; and
- ▶ To increase the use of alternative energy resources from 2 percent of Iowa's total energy consumption to 5 percent by the year 2005 and 10 percent by 2015.

Ten years later, the *2000 Energy Plan Update* provides an overview of Iowa's current energy trends, progress on the state's energy goals, and most importantly, solutions for how the state should proceed in the new millennium.

energy trends and links to the economy and the environment

During most of the 1990s, Iowa's economy experienced growth and stability. This factor, combined with stagnant energy prices, helped to increase Iowa's energy consumption by more than 20 percent between 1990 and 1996, faster than the national average. Meanwhile, Iowa's energy bill reached \$6.1 billion in 1995.

Energy production has a direct link to the health of Iowa's environment, affecting air quality, soil and water conservation. Continued focus on conservation and environmental responsibility will be an important strategy for the state.

investments in energy programs

Iowa's energy programs generate economic and environmental dividends for generations to come. During the last decade, significant funding has been allocated to improving energy efficiency and developing renewable energy in the state, saving money for Iowa citizens.

With only \$5 million in federal funds, state government has helped implement more than \$122 million in efficiency improvements in the public sector, saving nearly \$17 million in *annual* energy costs.

According to information submitted to the Iowa Utilities Board, Iowa's investor-owned (except natural gas), municipal and cooperatively owned electric utilities invested more than \$305 million in energy efficiency programs between 1990 and 1998, creating significant energy and financial savings.

progress on iowa's energy agenda

The *1990 Iowa Comprehensive Energy Plan* established 11 strategies, called a "New Energy Agenda for Iowa," to improve energy efficiency and develop renewable energy in the state. The 2000 update outlines major developments toward implementing these strategies. Key accomplishments include:

- ▶ The creation of two wind farms with 315 turbines in northern Iowa in 1999, making Iowa the third largest producer of electricity from wind in the United States.
- ▶ The agricultural energy management program, helping Iowa farmers decrease nitrogen fertilizer use. From 1985-1998, the program saved more than \$460 million in energy costs.
- ▶ The Building Energy Management program through the Department of Natural Resources, delivering nearly \$76 million in cost savings to Iowa's schools, hospitals, local governments and other public-sector facilities.
- ▶ The development of the largest switchgrass demonstration project in the nation by Chariton Valley Resource Conservation & Development, Inc. in southern Iowa, working to commercialize switchgrass for energy applications.

future directions

Many challenges and opportunities face the state in the new millennium. Iowa's development of responsible solutions to these challenges will ensure the continued growth of energy efficiency and renewable energy programs, in turn creating a sustainable economy and environment.

Electric Utility Restructuring. The most historic change to Iowa's use of electricity in the near future will be the restructuring and deregula-

tion of the electric utility industry. By law, Iowa is committed to establishing an electricity industry that provides reliable, efficient, environmentally safe, and least-cost energy at prices accurately reflecting the long-term cost of using energy resources. Future restructuring legislation must include energy efficiency and renewable energy funding as a component. The Department of Natural Resources, in cooperation with several state and regional organizations, has established five core objectives to be included in any future restructuring legislation for Iowa.

Environmental Protection. The importance of protecting and conserving natural resources will intensify during the next century. Concern about the effects of human activity on air quality, soil erosion and water quality has raised environmental awareness to new levels.

Global Climate Change. While uncertainty surrounds the issue of global climate change, the effect of greenhouse gases on the Earth must be studied and understood by governments, businesses and citizens. Iowa could gain strong economic opportunities through the strategies being developed to address climate change.

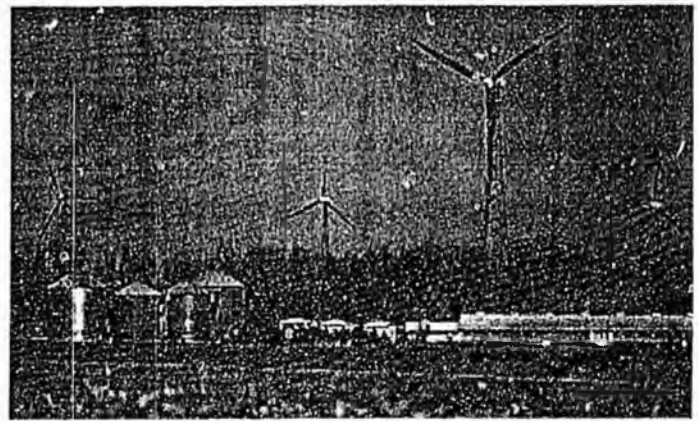
Carbon Trading. Emissions credit trading is considered a viable environmental tool by economists, and is currently being used on the Chicago Board of Trade for sulfur dioxide emissions. A carbon trading system could be a boost to Iowa's economy, especially to the agricultural sector.

Technology. Technological advancements promise sustainability for the 21st century. Many technologies being researched today could be the solutions for minimizing environmental risks and bolstering economies for tomorrow. Iowa is well positioned to help demonstrate and commercialize these technologies.

policy options

To ensure the continued commitment and development of renewable energy and energy efficiency in Iowa, the following policy options are recommended.

1. As part of any electric utility restructuring legislation, include the following conditions:
 - ▶ Establish a 10-percent renewable energy portfolio standard by 2015.
 - ▶ Require net metering arrangements.
 - ▶ Establish an efficiency and renewable energy fund.
 - ▶ Include fuel disclosure with utility bills.
 - ▶ Create a carbon trading program.



The largest wind farm project in the nation began producing electricity in June 1999 near Storm Lake, Iowa.

2. Promote individual responsibility to the environment among every community and citizen.
3. Support and encourage research of global climate change in Iowa.
4. Consider tax incentives as an alternative for stimulating renewable energy development and expansion.
5. Encourage distributed power development.
6. Promote the establishment of a fuel quality standard in Iowa.
7. Support customer choice pricing for energy created from renewable resources.
8. Continue executive and legislative emphases on state government energy efficiency.
9. Research the feasibility of a revolving loan fund for small energy efficiency projects in public-sector buildings.
10. Continue ensuring that energy efficiency improvements are made based on lifecycle cost analysis.
11. Work to educate Iowans about building energy codes, especially in the construction industry.
12. Support continued education and research on energy efficiency and renewable energy technologies.
13. Support and encourage concepts of integrated crop and live stock management.
14. Promote and support strategies for transportation efficiency in Iowa.

Introduction

“Indeed, if we do not save our environment now, nothing we have accomplished in human endeavor can long be sustained.”

— Charles A. Lindbergh

► One decade ago, the state of Iowa authored the *Iowa Comprehensive Energy Plan*, providing direction and pathways to help the state more effectively manage its energy resources. Energy’s link to Iowa’s economy and environment is an important reason for the development of the plan, and has been the basis for many successful energy programs developed during the last ten years. Today, many exciting opportunities await the energy industry as a new century and millennium begin.

At the heart of the original *Iowa Comprehensive Energy Plan* were two goals, created in partnership with dozens of organizations, businesses, legislators and public citizens:

- To meet all future demand for energy by increasing efficiency rather than supply; and
- To increase the use of alternative energy resources from 2 percent of Iowa’s total energy consumption to 5 percent by the year 2005 and 10 percent by 2015.

Iowa has progressed far on its journey toward reaching these goals and achieving a sustainable energy future. The *2000 Comprehensive Energy Plan Update* showcases many of the accomplishments of the last decade. The document discusses Iowa’s economic and environmental trends from the last ten years, and how they relate to energy use. It also provides an overview of energy funding, programming and achievements, defined under 11 key strategies established in 1990.

But the journey is far from over. While significant inroads have been made, Iowa has not yet achieved the two goals set out in the *1990 Iowa Comprehensive Energy Plan*. The goals were created to ensure Iowa can sustain its economy and environment. Now, it is time to build on past successes and make the goals a reality.

Iowa has excelled in creating new markets for energy efficiency and renewable energy,

especially maximizing economic opportunities through smart energy practices. From new wind farms to energy-efficient schools, financial returns have been a driving force behind many changes in the way Iowa uses and produces energy. The state has proven that energy used in an efficient manner does not inhibit economic growth – but can actually encourage it.

Now, as Iowa and the world face a new century, environmental awareness and advocacy will also play a critical role in Iowa’s energy choices. The state has the tools and expertise to position itself as a leader in environmental responsibility.

Iowa’s energy agenda for 2000 and beyond will be designed to create economic opportunities that are environmentally sound. This document discusses the critical developments and barriers that will affect this goal, and policy options that could provide solutions. Additionally, the update briefly reviews accomplishments from the last two years, helping to measure short-term results while achieving the goal of providing a biennial update, as prescribed by law.

background

The year 2000 marks the 10th anniversary of the *Iowa Comprehensive Energy Plan*. The document, its biennial updates and data addendums serve as the main publications for benchmarking and tracking Iowa’s energy programs and policies.

The original plan was written by the Iowa Department of Natural Resources (DNR), with input from an advisory committee and dozens of organizations, utilities, legislators, business people and educators in the state. The public provided feedback through a series of focus groups.

Updates measuring progress on the goals of the 1990 plan are published every two years by the Iowa DNR, with input from a committee of state and national representatives.

energy use and links to the economy and environment

► Energy is a component of daily life. From running industries to motoring cars, energy is necessary for continued productivity and comfort for Iowans. At issue is how Iowa can most efficiently use energy resources while still growing its economy – and how do current energy resources positively or negatively impact Iowa's environmental health?

Many factors have shaped Iowa's energy consumption during the last decade. Overall, Iowa has experienced economic growth, stable population trends and low energy prices. While these factors are favorable in many ways, the consequence has been more than a 20 percent increase in Iowa's energy consumption from 1990 to 1996. Iowa's energy consumption is expected to grow an additional 4.4 percent from 1996 to 2000, reaching 1,140 trillion Btu in 2000.

Iowa's annual energy bill reached just under \$6.1 billion in 1995, with an average of 3 percent growth each year since 1990. This was due mainly to increased energy consumption. The state's energy bill is projected to reach \$6.4 billion by 2000.

In contrast, energy prices *declined* 2.5 percent per year (when adjusted for inflation) from 1990-1995.

trends in consumption by fuel source

In 1989, low prices and high availability caused coal to replace petroleum as Iowa's most consumed fuel. Almost all of the coal burned in Iowa comes by rail from out of state, mainly from Wyoming. While coal has a market share of 35 percent of total consumption, it also represents the smallest fuel *expenditure*, demonstrating coal's low costs during the

past decade. Coal prices are projected to decrease by 4.7 percent from 1996 to 2000.

Natural gas made a comeback in the 1990s because of changes in energy policy, federal clean air regulations (it produces less pollutants than coal and petroleum), growth of the delivery infrastructure, and recent price stability. It represents about 25 percent of Iowa's total energy consumption. Natural gas prices are expected to decrease 1.5 percent between 1996 and 2000.

A growing transportation sector and recent low crude oil prices have kept petroleum use strong in Iowa, at 34 percent of total energy consumption. Petroleum is Iowa's greatest fuel expenditure, with

► expenditures by fuel source 1995 figures

	In Millions, Nominal Dollars
Coal	\$ 389.4
Natural Gas	1,008.5
Petroleum	2,933.4
Nuclear	29.2
Biofuels	9.5
Electricity	2,069.2
Electric Utility Fuel	-347.6*
TOTAL	6,091.5

* The figure -347.6 is the cost paid by the electric utilities for fuel to generate electricity already accounted for in other fuels such as coal, natural gas and petroleum. To avoid double counting, this figure is subtracted from the total expenditure.

more than twice as much spent on petroleum than on coal and natural gas combined. Petroleum prices are projected to increase 1.7 percent between 1996 and 2000.

The "Other" category includes nuclear and renewable resources such as hyuro, geothermal, wind, solar and biofuels. It represented 6 percent of total energy consumption in 1996. The renewable energy component of this category is projected to grow 31 percent in Iowa from 1990 to 1999, due primarily to the construction of two wind farms that provide between 70 MW and 95 MW of effective capacity* for the state. Also, "Other" was the fastest growing fuel category in the nation from 1990-1996, representing 11 percent of total U.S. consumption in 1996.

Iowa's sectors and their energy use

The four main energy-consuming sectors in Iowa are the industrial, commercial, residential and transportation sectors.

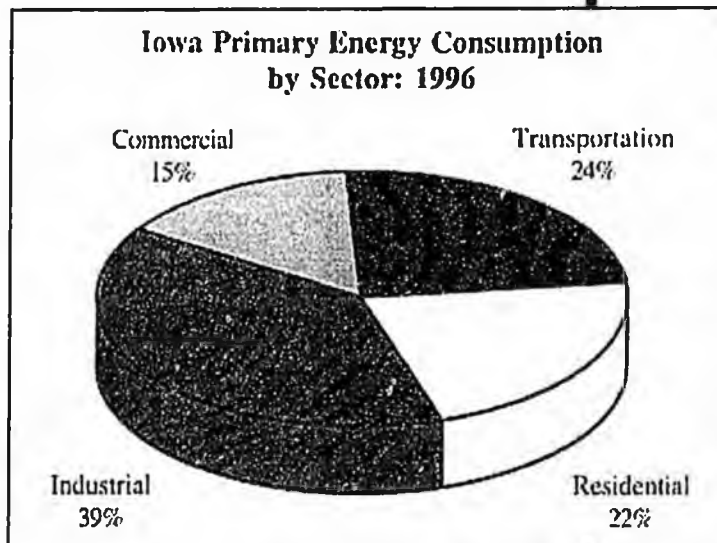
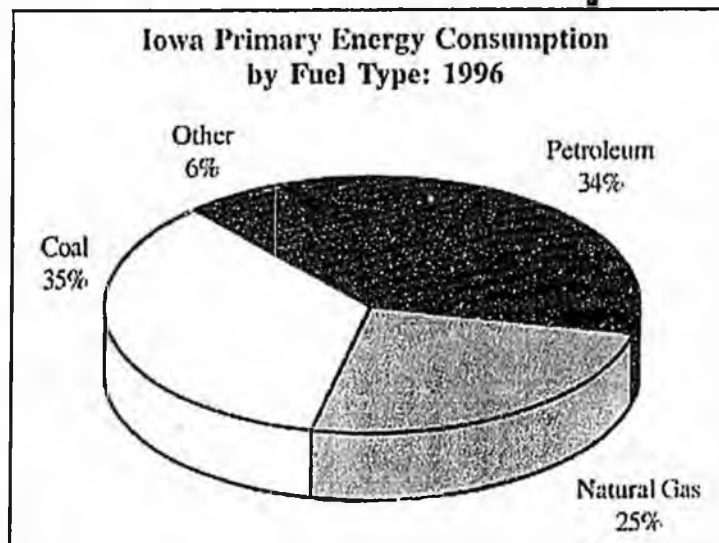
A growing economy and increased demand for industrial products kept the industrial sector (which includes agriculture) the largest consumer of energy, with 38 percent of total consumption in 1996. The industrial sector's energy use is projected to grow 4.8 percent between 1996 and 2000.

The commercial sector represented 15 percent of Iowa's total energy consumption in 1996. Due to a strong economy, increasing commercial activity and low efficiencies, growth in the commercial sector's energy use is expected to increase 3.6 percent between 1996 and 2000.

The residential sector has been able to stabilize its energy consumption during the decade at 22 percent of total consumption, a result of energy-efficient construction techniques and education on building energy codes. Growth in energy use is expected to be 4.4 percent from 1996 to 2000.

In comparison, the transportation sector, representing 24 percent of the total, has been steadily increasing its energy consumption. Growth has been supported by higher levels of transported consumer goods, increased miles driven in the state, and the growing propensity of Iowans to drive larger vehicles. Low petroleum prices also have contributed to increased demand for petroleum products by consumers. The transportation sector should increase its energy use by 5.3 percent between 1996 and 2000.

*Effective capacity is calculated from the wind farms' total 236 MW nameplate capacity, using a range of 30 percent to 40 percent for a capacity factor, given the variations that can occur in wind energy production over a geographic area.



► sources for energy statistics

Statistics are obtained from the Energy Information Administration (EIA), a branch of the United States Department of Energy. The Energy Information Administration collects, analyzes and distributes energy data on a statewide level. The most recent data available from the EIA is 1996 for consumption figures, and 1995 for expenditure figures. The DNR makes projections for 1996-2000 based on EIA models. All projections regarding price trends are in nominal dollars, which means they are not adjusted for inflation. For a comprehensive account of Iowa's energy trends, please refer to the *Data Addendum* to the *2000 Energy Plan Update*.

▶ iowa in numbers

Population:	2,848,603
Gross State Product:	\$76.3 billion
Unemployment:	3.8%
Miles of Roads:	112,803
Annual Energy Consumption:	1,091 trillion Btu
Annual Energy Bill (1995 figure):	\$6.1 billion
Gasoline Consumed Annually:	1.5 billion gallons
Average Price for Gallon of Gasoline:	\$1.19
Energy Consumed From Renewable Resources:	26.6 trillion Btu
Percentage of Energy Resources that Are Imported to Iowa:	98%

Because the most recently available information from the Energy Information Administration is from 1996, all figures are from that year, to provide consistency.

connecting energy use to the economy

Many statistics regarding Iowa's economy can be indicators for energy use patterns in the state. Population growth, trends in gross state product, and how much energy is needed to produce goods, are all related to the state's energy use levels. By linking these types of statistics, Iowa can better understand energy's role in the economy and create solutions for most effectively managing energy resources.

Population

Population trends are a factor that can affect energy consumption patterns. As an example, during the early 1980s the farm crisis pushed many households out of the Midwest. Energy use reached a 14-year low in 1987. While economic problems were the primary cause for the dip in energy use, population drops also played a role. As the economy recovered in the early 1990s, Iowa's population began to rise, growing from 2.78 million in 1990 to nearly 2.85 million in 1996. Meanwhile, the energy consumed in the state from 1990 to 1996 increased more than 20 percent.

Energy Bill and Gross State Product

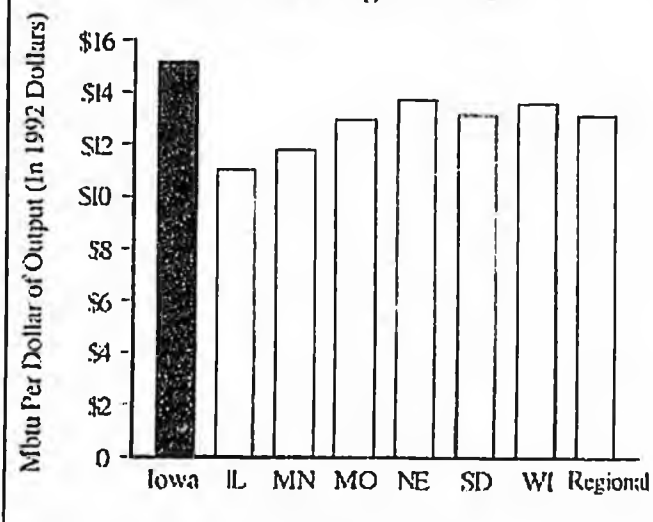
From 1990 to 1996, Iowa's gross state product (GSP), a measure of economic productivity, increased 39 percent. By 1995, Iowa's energy bill as a percentage of GSP was 8.5 percent – down from 13 percent in 1985 – due to rising personal incomes alongside low energy prices, advancing technologies and increasing

efficiencies. Additionally, Iowa's energy prices averaged about 72 cents lower per million Btu, or 9 percent less, than energy prices in surrounding states in 1996.

Energy Intensity

The ratio between energy use and GSP is the energy intensity of a state (Energy Consumption of All Sectors/GSP). Energy intensity demonstrates the amount of energy needed to produce a dollar's worth of output. While Iowa's energy intensity has decreased about 1 percent each year since the 1970s, it is the highest in the region, compared to Minnesota, Missouri, Illinois, Wisconsin, Nebraska and South Dakota.

Comparison of Energy Intensities for Iowa and Surrounding States: 1996



Many factors contribute to the intensity level of a state, including weather conditions, technology choices, differing rates of incorporating energy efficiency, and types of industrial activity. Also, Iowa's number of road miles per capita is one of the highest in the region, suggesting a decentralized population and rural economy. Both factors can increase a state's energy intensity. While the specific reasons for energy intensity disparities among Midwest states have not been investigated, the differences may suggest that Iowa has greater opportunities for efficiency improvements than similar states in the region.

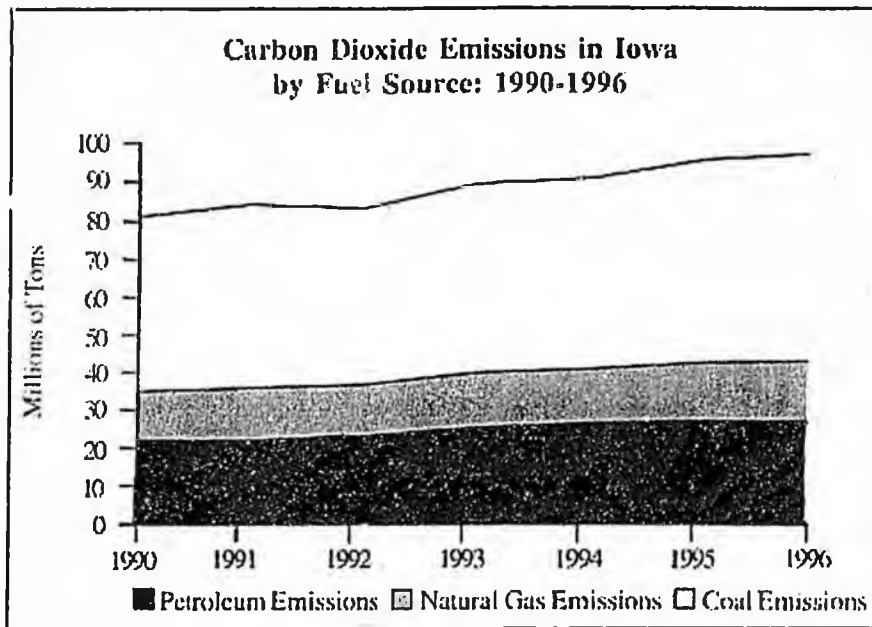
connecting energy use to the environment

Just as energy is integral to economic productivity, the use of energy also affects Iowa's environment. Every activity, including tilling land, producing goods, and treating water has an environmental implication – whether positive or negative.

Air Quality

Fossil fuel combustion is the leading source of air pollution, especially carbon monoxide, nitrous oxides, sulfur oxides, volatile organic compounds (VOCs), ground-level ozone (smog) and particulate matter. Several pollutants are primarily emitted by the transportation sector and by industries, with the larger sources being electric utilities and heavy manufacturers. The pollutants emitted can cause health risks, especially among people in sensitive groups.

According to the Environmental Protection Division of the DNR, Iowa's air rates "good to moderate quality" on most days. Iowa is one of only 12 states currently in attainment with federal air standards, due to cooperation among many industries and businesses to stay in compliance. Despite these efforts, a few areas in Iowa exceeded federal health standards in 1999 with at least five days when the air was unsafe to breathe for sensitive groups. Additionally, in 1996, the Cedar Rapids area experienced the second highest level of sulfur dioxide detected in the United States



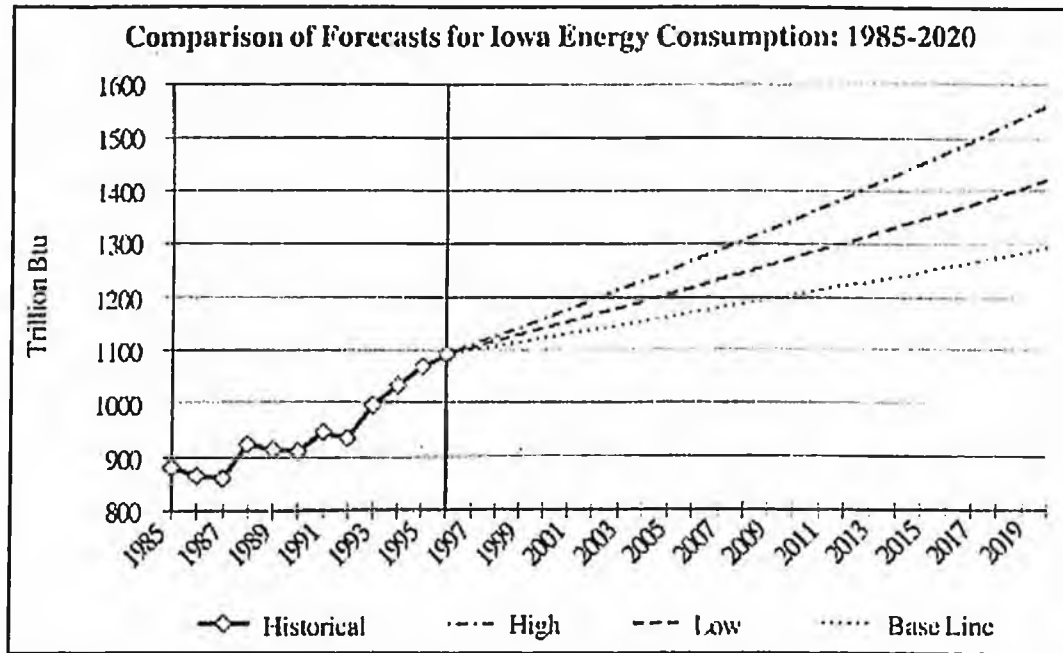
that year. Trends of this sort make continuous compliance with air quality standards, efficient use of energy, and development of cleaner energy resources a necessity for the state.

Air toxins – including harmful substances such as mercury and benzene – are a growing concern to be addressed in Iowa. In spite of dramatic emissions reductions in newly designed cars and trucks, about 40 percent of the state's air toxins come from vehicle use. Another 40 percent come from smokestack emissions. Unlike neighboring states such as Minnesota and Wisconsin, Iowa lacks a monitoring and control program for airborne toxins due to insufficient staff and resources.

Another air emission often generated from energy production is carbon dioxide (CO₂). While CO₂ is not a regulated pollutant, the levels of the gas emitted from fossil fuel burning are believed to be creating a "greenhouse effect" and thus contributing to global climate change. The chart above demonstrates the levels of carbon dioxide produced from Iowa's energy production.

Other Environmental Links

From 1996 to 1998, the Iowa DNR helped facilitate the Comparative Risk Assessment Project, evaluating pressing environmental concerns for the state. The project involved more than 600 Iowans including environmental experts, public health officials, state agency representatives, legislators, and the general public to determine 21 core environmental risks in Iowa. Included in the project was an analysis of energy's impact on those risks, which included water quality, housing safety, soil erosion, animal production and global climate change. The



following links were found between energy and environmental issues:

- ▶ Reduced tillage practices on farmland can decrease soil erosion while saving one to two gallons of diesel fuel per acre planted. In Iowa, this amounts to potentially saving 20 to 40 million gallons per year of diesel fuel, reducing dollars spent on fuel by \$15 to \$20 million per year without yield loss. (Iowa State University, Integrated Farm Management Demonstration Program, Comprehensive Report, Aug. 1995.)
- ▶ The major contaminants to Iowa's water, after sediment from soil erosion, are nitrogen fertilizer and pesticides. The energy embodied in fertilizer accounts for the majority of energy consumed in crop production. Nitrogen fertilizer is the single largest energy source in corn production, representing nearly 70 percent of the total energy used. (Leopold Letter, Spring 1998.) Reducing the amounts of chemicals and nitrogen would greatly improve Iowa's surface and groundwaters while decreasing energy use.
- ▶ One gallon of improperly disposed used motor oil can render one million gallons of

water undrinkable, according to the National Oil Recyclers Association. Additionally, two gallons of used oil can generate enough electricity to run the average household for a day.

energy forecasts for the future

Based on current trends, Iowa's total energy consumption is forecasted to increase 1.1 percent each year through 2020. In the event that Iowa experiences high economic growth during the same period, energy consumption is expected to increase 1.5 percent each year.

With this increased energy use comes environmental and economic repercussions. From an environmental standpoint, continued focus will remain on issues such as water quality and air emissions, both in Iowa and internationally. As more information becomes available and federal environmental standards become stricter, Iowa's strategies to protect its environment will become increasingly important.

Economically, energy expenditures in Iowa are projected to grow .9 percent each year through 2020 if energy consumption increases and the state's economy remains strong.

funding for energy efficiency and renewable energy programs: 1990-2000

Investments in Iowa's energy programs generate economic and environmental dividends for generations to come. During the last decade, a significant amount of funding has been allocated to improving energy efficiency and developing renewable energy in the state. More importantly, that funding is returning money to Iowa citizens through economic benefits, while improving the quality of the state's air, water and overall environmental health.

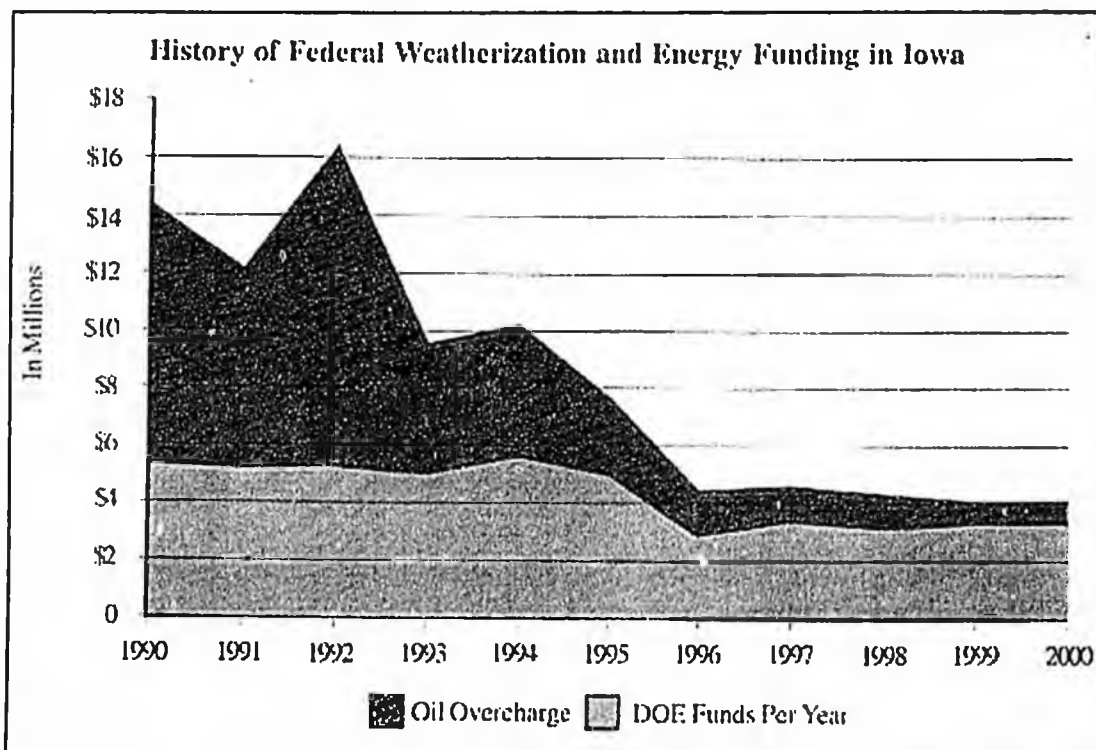
This section provides an overview of energy program funding in Iowa from 1990-2000. As the descriptions demonstrate, energy funding has been invested in programs that create significant cost savings while avoiding emissions. Often, sectors are targeted where the energy programs can have the most dramatic effects. The funding has been a critical cornerstone for consistent progress in managing Iowa's energy resources. In recent years, these funding sources have begun to decline. As an example, the major funding sources for state government programs (see descriptions that follow) have declined by more than 75 percent since their peak in 1992.

state government programs

The Department of Natural Resources (DNR) and the Department of Human Rights (DHR) are the two primary state agencies responsible for implementing energy programs to assist Iowans. The DNR delivers comprehensive energy efficiency and renewable energy programs, while the DHR administers the state's low-income weatherization program.

The main funding sources for state government energy programs have been Oil Overcharge Funds (see sidebar on page 13) and the federal government. Low-income weatherization also receives funding from investor-owned utilities.

As demonstrated in the following chart, federal funding for energy programs coordinated by the state has been decreasing over the last decade.



**Department of Natural Resources
Energy Programs**

During the last ten years, the Iowa DNR has successfully leveraged small amounts of funding into millions of dollars of financial savings. This has been achieved by creating partnerships with businesses, financiers, public facilities and other organizations to reach statewide audiences and create the most savings possible.

The DNR's Building Energy Management (BEM) programs demonstrate the agency's effectiveness in leveraging funds. With only \$5 million in funding for program administration, BEM has attracted more than \$122 million in private investments to achieve the following results in nonprofit and taxpayer-supported institutions (such as schools, local governments, hospitals and private colleges).

BEM Results	Total
Dollars of Implemented Improvements	\$122,258,709
Projected Annual Savings	\$16,984,818
CO ₂ avoided, tons per year	322,712
NOx avoided, tons per year	628
SOx avoided, tons per year	7,093
Particulate avoided, tons per year	828

Note: Emissions avoidance numbers are based on unit of energy saved and calculated from monitoring information from the DNR's Environmental Protection Division and conversion factors from the U.S. Environmental Protection Agency.

Another program the DNR administered, in partnership with several agricultural and educational organizations, was the agricultural energy management program. With \$26 million in funding, this program delivered from 1985-1998:

- ▶ \$460 million in cumulative energy cost savings
- ▶ 3,070 million pounds in reduced nitrogen fertilizer
- ▶ 614 million gallons in the energy equivalent of avoided diesel fuel use
- ▶ 5,860,000 tons in avoided CO₂

The Iowa DNR-Energy Bureau's core funding streams historically have been oil overcharge funds (77.7 percent) and grants from the U.S. Department of Energy (17.9 percent). The Energy Bureau has been successful in obtaining about \$11 million in special grant money from the Department of Energy since

1993. The funds are used to implement the DNR's energy efficiency and renewable energy programs. The DNR also receives annual appropriations from the State of Iowa (4.4 percent).

Department of Human Rights Low-Income Weatherization Program

The Department of Human Rights (DHR) administers the state's low-income weatherization program. The purpose of the program is to increase energy efficiency of dwellings owned or occupied by low-income individuals, reducing their energy expenditures and improving health and safety. The following chart demonstrates low-income weatherization's funding streams during the last decade. Funding from the investor-owned utilities is coordinated by the DHR and used to fill in gaps from federally funded programs.

Weatherization Funding: 1990 to 2000	Total
Department of Energy	\$41,000,000
Oil Overcharge Funds	\$18,720,000
Investor-Owned Utilities	\$13,600,000
Total	\$73,320,000

energy and environmental centers

Iowa's three energy and environmental centers provide research, demonstration and educational opportunities that help shape Iowa's knowledge of energy efficiency and renewable energy, as well as the state's understanding about the effects of energy use on the environment. Two of the centers, the Iowa Energy Center and the Center for Global and Regional Environmental Research, were established by the Iowa Legislature. Funding for them comes from an assessment on Iowa's gas and electric utilities.

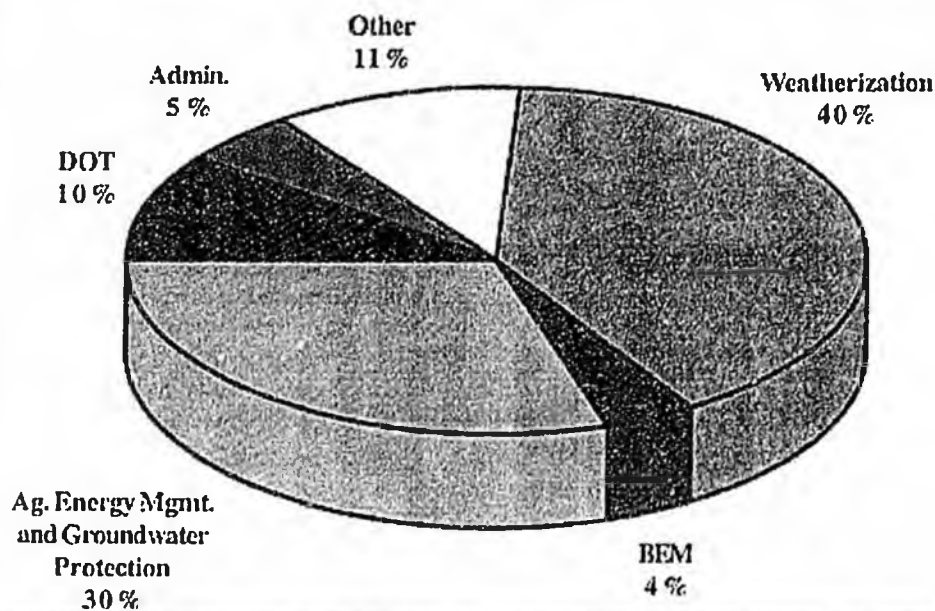
The Iowa Energy Center (IEC) in Ames had an annual budget of about \$2.5 million in fiscal year 1998-99. This money helped fund research and demonstration projects, educational opportunities and administration costs. The IEC also manages the Alternate Energy Revolving Loan Program (AERLP), which provides zero-interest financing to organizations and individuals for up to 50 percent of the construction costs (with a ceiling of \$250,000) of alternate energy production facilities in Iowa. The state's investor-owned utilities have provided \$5.93 million in funding for the AERLP.

Continued on page 14

▶ Oil Overcharge Funds

In the 1980s, a series of federal court rulings found oil companies had violated pricing regulations during the previous decade. The courts established the Oil Overcharge Funds, apportioning oil company penalties to states to compensate for violations. Iowa received nearly \$73 million of these funds between 1987-2000, which were allocated to energy management programs in the state. An Energy Fund Disbursement Council was established to oversee the appropriations, and funding continues to be administered by the Iowa Department of Natural Resources-Energy Bureau. A report on oil overcharge appropriations and accounting is published annually and available to the public.

Oil Overcharge Fund Disbursement: 1987-2000



Oil Overcharge Funds have decreased by 92 percent between 1990 and 2000. While the funds have gone to programs that have created tremendous energy savings, the funding sources are now almost completely exhausted. The pie chart above demonstrates how Oil Overcharge Funds have been distributed, according to the following categories:

▶ **Weatherization** – This program provides energy efficiency improvements for dwellings owned or occupied by low-income individuals. Received \$29,256,934 between 1987-2000. (Note: this number includes both Department of Human Rights programs and other weatherization programs that received Oil Overcharge Funds.)

▶ **Agricultural Energy Management** – This program provides education and marketing to farmers to improve management of nitrogen fertilizer and eliminate over-application in Iowa, saving \$460 million in energy costs from 1985-1998. Received \$22,285,000 between 1987-2000.

▶ **BEM** – The Building Energy Management Program, administered by the Iowa DNR, creates cost-effective energy efficiency improvements in public facilities. Received \$2,900,000 between 1987-2000.

▶ **DOT** – Programs implemented by the Iowa Department of Transportation improve transportation efficiency and include the intermodal transportation loan program and several studies and demonstration projects. Received \$7,150,000 between 1987-2000.

▶ **Admin.** – Administration costs are applied to help disburse, manage, monitor and evaluate program results from Oil Overcharge Funds. Received \$3,925,000 between 1987-2000.

▶ **Other** – Programs considered miscellaneous help fund demonstration projects on energy efficiency and renewable energy, such as a study on amorphous semiconductors at Iowa State University. Received \$7,896,302 between 1987-2000.

The Center for Global and Regional Environmental Research (CGRER) in Iowa City also receives funding from an assessment on Iowa's utilities, and has an annual operating budget of about \$435,000. This money funds global climate change research and education, GIS technology, publications, speakers and administration. The Center also leverages funds to obtain external funding for research by CGRER members. In 1998, external funding totaled \$14.8 million.

The Center for Energy and Environmental Education (CEEE) in Cedar Falls, established by the University of Northern Iowa (UNI), has a budget of about \$420,000 per year to pay for operations, professional staffing and special projects. Through financial support from UNI, Cedar Falls utilities, state and federal grants, and private foundations, CEEE conducts 12 to 14 environmental education projects per year, the majority of which focus on energy. Examples include the Iowa Energy Poster Contest and the Iowa Electrathon.

utility investments

Iowa's utilities, including investor-owned, municipal and rural electric cooperatives, make significant investments in energy efficiency programs. From 1990 through 1998, spending from Iowa's utilities (not including investor-owned or municipal natural gas utilities) totaled \$305 million. Spending and results are highlighted in charts on these two pages.

Investor-owned electric utilities are required to assess the potential for energy efficiency in their service territories and develop plans to meet potential savings, according to standards established by the Iowa Utilities Board (IUB) in consultation with the Iowa DNR. Prior to 1996, spending targets were 2 percent of gross operating revenues for electric utilities and 1.5 percent for natural gas utilities. Since 1996, spending is determined by plans approved in contested proceedings conducted by the IUB. The funds have been invested in programs for the residential, commercial and industrial sectors. Funding also goes to Iowa's energy research centers.

Investor-Owned Electric Utility Efficiency Program Societal Costs and Results: 1990-1998

Program Area	Societal Costs* (In Millions)	Societal Benefits* (In Millions)	Capacity Savings (MW)	Energy Savings (MWh)
Residential Energy Efficiency	\$ 60.0	\$ 90.0	52.9	81,254
Low-Income Energy Efficiency	\$ 3.0	\$ 4.0	1.5	6,321
Nonresident Energy Efficiency	\$ 97.0	\$ 291.0	104.5	540,509
Trees	\$ 6.0	\$ 0.0	n/a	n/a
Research & Development (Centers)	\$ 11.0	\$ 0.0	n/a	n/a
Residential Load Management	\$ 40.0	\$ 86.0	91.2	3,849
Nonresidential Load Management	\$ 91.0	\$ 262.0	390.5	3,364
Miscellaneous	\$ 16.0	\$ 6.0	n/a	16,974
Total	\$ 323.0	\$ 738.0	640.5	652,270

*Societal costs are "the sum of the present values of utility program costs (excluding customer incentives), participant costs, and any increased utility supply costs for each year of the useful life of the measure." Societal benefits are "the sum of present values of the utility avoided supply and energy costs including the effects of externalities." The societal benefits shown are not net benefits.

Note: This information does not include investor-owned natural gas utility spending and savings. The information was compiled by the Iowa Utilities Board based on information self-reported by the utilities.

**Municipal-Owned and Rural Electric Cooperative Utility
Efficiency Results: 1990-1998**

Program Area	Municipal Capacity Savings (MW)	Municipal Energy Savings (MWh)	REC Capacity Savings (MW)	REC Energy Savings (MWh)
Residential Energy Efficiency	6.9	8,359	15.05	63,613
Low-Income Energy Efficiency	n/a	665	n/a	n/a
Nonresident Energy Efficiency	28.8	34,783	3.40	12,418
Trees	n/a	n/a	n/a	n/a
Research & Development (Centers)	n/a	n/a	n/a	n/a
Residential Load Management	133.9	1,863	49.58	0
Nonresidential Load Management	56.1	446	.21	0
Miscellaneous	51.5	53,894	n/a	n/a
Total	277.2	100,010	68.23	76,031

Note: Municipal utilities and rural electric utilities are not required to report societal benefits. The information was compiled by the Iowa Utilities Board based on information self-reported by the utilities.

**Cumulative Utility Spending On Energy Efficiency Programs:
1990-1998**

Program Area	Investor-Owned Electric Utilities* (In Millions)	Municipal Utilities (In Millions)	Rural Electric Cooperative Utilities (In Millions)
Residential Energy Efficiency	\$ 51.85	\$ 1.13	\$ 18.55
Low-Income Energy Efficiency	\$ 3.93	\$.11	\$ n/a
Nonresident Energy Efficiency	\$ 66.33	\$ 5.32	\$ 3.96
Trees	\$ 6.01	\$.63	\$ n/a
Research & Development (Centers)	\$ 15.30	\$.24	\$ 2.25
Residential Load Management	\$ 43.42	\$ 1.96	\$ 7.85
Nonresidential Load Management	\$ 47.55	\$.15	\$.61
Miscellaneous	\$ 8.37	\$ 13.60	\$ 5.92
Total	\$ 242.75	\$ 23.12	\$ 39.15

TOTAL SPENDING BY ALL UTILITIES: \$305.02 MILLION

*Note: Natural-gas utilities are not included. The information was compiled by the Iowa Utilities Board based on information self-reported by the utilities.

progress on iowa's energy agenda: eleven strategies

The 1990 Iowa Comprehensive Energy Plan established 11 strategies, called a "New Energy Agenda for Iowa," to improve energy efficiency and develop renewable energy in Iowa. State government, utilities, businesses and individuals have accomplished significant achievements in the areas of research, technology, demonstration and commercialization of efficiency techniques and homegrown energy resources. The following descriptions provide an overview of these accomplishments.

1. Make It Easier to Use Less Electricity. Many significant achievements in efficiency have been made over the course of the last decade. From school districts installing new lighting systems, to industries improving their productivity, improved efficiency in electricity use has been an important goal for state government, utilities and other Iowa organizations. Accomplishments of the public and private sectors during the last decade are outlined in many of the strategies that follow.

Several state government agencies have been involved in overseeing energy efficiency development in the last decade. The Iowa Utilities Board, as part of the Department of Commerce, is responsible for approving energy efficiency program spending by the investor-owned utilities. The Department of Natural Resources is the state agency charged with providing energy policy recommendations and developing energy efficiency and renewable energy programs. The Department of Human Resources administers low-income weatherization programs. These programs and others are described here.

2. Improve Fuel Efficiency of the State's Transportation Sector.

As the second greatest energy user, the transportation sector can reduce its consumption through better efficiency. The following policies and initiatives describe progress in Iowa:

- ▶ **Traffic Light Synchronization.** In 1992, Iowa law (Senate File 419) began requiring all cities with more than three traffic lights to establish a traffic light synchronization program in accordance with Iowa Department of Transportation (DOT) rules. This law resulted from a 1987 Motor Vehicle Fuel Reduction Program to demonstrate traffic light synchronization in 19 Iowa communities, saving fuel by avoiding unnecessary stops.
- ▶ **Intermodal Transportation Loan Fund.** The Iowa DNR and the Iowa DOT have created a revolving loan fund for intermodal transportation projects in Iowa. The most common intermodal transportation methods use rail cars to haul semi trailers loaded with freight to hubs or terminals. Once the freight arrives at the terminal, the freight is driven shorter distances by truck. The long-distance hauling efficiencies of rail transportation save energy and costs. The same processes can be applied to waterways or air travel. The intermodal revolving loan fund program helps small businesses and communities develop, construct, and operate intermodal facilities.
- ▶ **Iowa's Clean Air Attainment Program.** As part of federal efforts to improve air quality and reduce emissions in the transportation sector, the Iowa DOT established the Iowa Clean Air Attainment Program (ICAAP). The program provides \$4.7 million in funding each year to city, county and state governments for projects that create traffic flow improvements, reduce vehicle miles traveled, eliminate single-occupant vehicles, and develop other transportation improvement..
- ▶ **Telecommuting Study.** Iowa legislation requested the Iowa DNR and the Iowa DOT to implement a study and demonstration project on the benefits of telecommuting. In the early 1990s, selected state employees worked at home two to three days per week, via computers and fax machines. The goal of the projects was to test the feasibility of telecommuting to save energy and allow work from remote locations. The study achieved better results than the projected 44,000 fewer driving miles, 1,700 gallons of motor fuel saved, and increased productivity among staff.
- ▶ **Mass Transit.** Iowa currently has 35 public transit systems, each providing services in communities with more than 20,000 in population. There are also 16 multi-county regional transit systems providing services in all areas of the state. Iowa has been recognized as a leader in the field of rural public transportation, largely as a result of

code provisions requiring any agency spending public funds on passenger transportation services to coordinate with local systems. In the late 1980s, oil overcharge funding helped pay for rural communities' transit system programs and urban transit systems for carpooling and other services.

- ▶ **Car Pooling and Other Projects.** Several Iowa companies and organizations are implementing programs to encourage fuel efficiency. Many corporations provide incentives for car pooling and use of mass transit. RideShare is a vanpooling program helping central Iowa workers commute to Des Moines. Currently, 58 vans, carrying up to 13 passengers each, provide rides in central Iowa through RideShare. Many cities across Iowa have similar carpooling programs.

3. Make Iowa's Buildings More Efficient Energy Users.

Iowa's buildings – including public facilities, industries and businesses – are primary targets for many energy management programs administered in the state. Outcomes from these programs are diverse and significant:

- ▶ **Building Energy Management.** The objective of the Iowa DNR's Building Energy Management programs is to improve efficiency in Iowa's taxpayer-supported facilities. Two core programs, the Iowa Energy Bank and the State of Iowa Facilities Improvement Corporation (SIFIC), have delivered nearly \$17 million in annual energy savings from only \$5 million in federal funding between 1989-1999. The Iowa Energy Bank targets schools, hospitals, local governments, private colleges and other nonprofit organizations. The State of Iowa Facilities Improvement Corporation targets state government agencies. The below chart demonstrates the cumulative financial and environmental savings from these programs.

- ▶ **Rebuild Iowa.** In 1997, the Iowa DNR added Rebuild Iowa to its energy programs. Based on the U.S. Department of Energy's Rebuild America program, Rebuild Iowa targets entire communities, helping them decrease energy bills, improve efficiency and reduce waste. To date, Des Moines, Sioux Center, Wapello County, Hancock County, Waterloo, Cedar Falls, Pella, Harlan and Le Mars have all participated in Rebuild Iowa, with the following cumulative results:

Rebuild Iowa	Results
Dollars of Implemented Improvements	\$6,211,047
Projected Annual Savings	\$ 592,705
CO ₂ avoided, tons	11,253
NO _x avoided, tons	22
SO _x avoided, tons	433
Particulate avoided, tons	28

- ▶ **Industrial Assessment Center.** The Industrial Assessment Center (formerly the Energy Analysis and Diagnostic Center) at Iowa State University (ISU) provides small- and medium-sized manufacturers comprehensive industrial productivity assessments performed at no cost. Teams of engineering faculty and students conduct energy audits to identify opportunities for improving productivity, reducing waste, and saving energy. Since its inception in June 1991, the Industrial Assessment Center at ISU has assisted 212 companies in implementing more than \$9 million in improvements.

- ▶ **Total Assessment Audit.** The potential for improving efficiency in industrial facilities was realized in 1992 through Iowa's first Total Assessment Audit (TAA), a comprehensive analysis of the company's productivity and quality control. Crane Valves, a metal casting

Results for Public Sector Programs: 1989-1999

	Energy Bank	SIFIC	Total	
Cumulative Implemented				<i>Note: Emissions avoidance numbers are based on unit of energy saved and calculated from monitoring information from the DNR's Environmental Protection Division and conversion factors from the U.S. Environmental Protection Agency.</i>
Improvements	\$88,187,702	\$34,071,007	\$122,258,709	
Projected Annual Savings	\$10,226,799	\$6,758,019	\$16,984,818	
Annual CO ₂ avoided, tons	194,309	128,402	322,712	
Annual NO _x avoided, tons	378	250	628	
Annual SO _x avoided, tons	4,271	2,822	7,093	

manufacturer in Washington, Iowa, received a TAA through a joint project by Iowa Southern Utilities (now part of Alliant Energy), the Iowa Energy Center (IEC), the Metal Casting Center (whose participation was funded by the IEC) at the University of Northern Iowa, and other organizations. The project helped Crane Valves increase production by 78 percent and decrease energy use per unit by 29 percent in a one-year period. The facility has consistently outperformed the industry since it implemented the TAA recommendations. Iowa State University and the Iowa Energy Center are currently working with other Iowa industries to implement TAAs.

- ▶ **Energy Resource Station.** In 1995, the Iowa Energy Center opened the Energy Resource Station in Ankeny. The Energy Resource Station serves as a research, testing, demonstration and training facility for energy and building design professionals. The facility helps its audiences better understand the integration of equipment into buildings and systems, effective energy management practices, improved diagnostic and control mechanisms and other applications.
- ▶ **Building Energy Codes.** Iowa's building codes provide energy standards in new construction for both residential and nonresidential buildings. Requirements include: adherence to the 1992 U.S. Model Energy Code, which sets standards for designing building envelopes and reducing air infiltration; observance of thermal and lighting efficiency standards; and compliance with ASHRAE energy standards for construction of nonresidential buildings.
- ▶ **Lifecycle Cost Analysis.** Iowa Code Chapter 72.5 requires that all building projects paid for with public funds must be constructed using the lowest lifecycle cost analysis, rather than simple payback. Lifecycle costing accounts for the value of construction and equipment over time – which includes energy cost savings due to efficiency – rather than just upfront costs.

4. Improve the Efficiency of Residences to Make Them More Affordable.

The majority of Iowans live in single-family dwellings they either own or are purchasing. Helping these residences save energy can reduce energy costs and improve comfort. Following are

accomplishments being made in residential energy efficiency:

- ▶ **Utility Programs.** During the 1990s, more than 38 percent of investor-owned utility spending for energy efficiency was allocated to the residential sector. This funded a variety of programs, including rebates on energy-efficient equipment, free energy audits, direct load control programs, peak-energy demand programs, energy-efficient new construction incentives, interruptible programs, tree planting programs, and low-income weatherization (see bullet below). Municipal utilities and rural electric cooperatives also have provided several programs for residential customers.
- ▶ **Low-Income Weatherization.** The Low-Income Weatherization Program, administered by the Iowa Department of Human Rights, is authorized by Title IV of the Energy and Conservation and Production Act. The purpose of the program is to increase energy efficiency of dwellings owned or occupied by low-income individuals, reducing their energy expenditures and improving health and safety. In addition, all utilities in Iowa offer customer contribution funds that often are matched by utilities. These contributions provide energy assistance and weatherization for low-income customers as needed.
- ▶ **Home Energy Rating System.** Iowa law required the state to establish an energy efficiency rating system by July 1, 1993. The Iowa Home Energy Rating System (HERS) provides a comprehensive audit of a home's energy efficiency, including insulation, windows, air leakage and HVAC equipment. To date, about 900 homes in Iowa have received HERS ratings. Energy-efficient mortgages, a result of the program, provide higher lending limits to homebuyers in Iowa purchasing homes with strong HERS ratings. In 1999, the Fire Marshal's Office of the Iowa Department of Public Safety acknowledged HERS as a voluntary method of compliance with the 1992 Model Energy Code.
- ▶ **Private Company Innovations.** Several Iowa companies have worked extensively during the 1990s to help consumers become more energy efficient. Appliance manufacturers like Maytag and Amana have manufactured equipment that meets the U.S. Environmental Protection Agency's Energy Star® standards. In 1997, Maytag introduced the most energy-efficient washer in the country, called the Neptune.

5. Increase the Energy Efficiency of Agricultural Operations and Encourage the Production of Energy Crops.

Energy management represents important economic and environmental opportunities for one of Iowa's most important industries – agriculture. Because of Iowa's diverse natural resources, coupled with strong agricultural expertise, many accomplishments have been made in energy efficiency and renewable developments on Iowa farms:

- ▶ **Agricultural Energy Management.** Because nitrogen fertilizer use (both to produce and apply it) is the most energy intensive agricultural process, one of the most successful examples of efficiency in Iowa is the agricultural energy management program. For more than a decade, state government agencies and agricultural organizations have worked with Iowa farmers to reduce their use of nitrogen fertilizer through educational and marketing programs. From 1985 through 1998, their efforts have helped create a cost savings of more than \$460 million. The energy saved amounts to the equivalent of 614 million gallons of diesel fuel.
- ▶ **Precision Management.** The Iowa DNR is spearheading a demonstration project that will use precision agricultural technologies including Global Positioning Systems and Geographic Information Systems to demonstrate to Iowa's farmers how to optimize nitrogen fertilizer applications on manured cornfields.
- ▶ **Switchgrass Demonstration.** Chariton Valley Resource Conservation & Development (RC&D) Inc., a rural development organization in Centerville, began coordinating a nationally recognized switchgrass initiative in southern Iowa in 1992. With support from several state agencies and private businesses, Chariton Valley is working to commercialize switchgrass for energy applications. A cooperative agreement with the U.S. Department of Energy was established in 1996 toward this purpose. The group is working with Alliant Energy to conduct a series of large-scale co-fire tests with switchgrass and coal at the Ottumwa Generating Station. The test is planned for spring of 2000. Project partners plan to generate 35 megawatts, or 5 percent of the plant's generating capacity, from switchgrass. Annual switchgrass requirements are estimated at 200,000 tons harvested from 40,000 to 50,000 acres.
- ▶ **Carbon Sequestration.** Carbon sequestration refers to the absorption of carbon dioxide and storage as organic carbon in the roots, woody parts and leaves of plants, building up organic material in the soil. Because of efforts to reduce greenhouse gases, switchgrass' ability to sequester carbon could add to its value. Two carbon sequestration projects in Iowa are:
 - ▷ Iowa State University (ISU) is working to quantify carbon sequestration and its benefits at Chariton Valley RC&D's demonstration site. The research will be used to produce a model for predicting carbon sequestration potential in the region.
 - ▷ The Center for Global and Regional Environmental Research is working with Chariton Valley RC&D to compare greenhouse gas emissions from coal combustion versus switchgrass burning. The results will be used to determine the costs and benefits of replacing coal with the prairie grass for electricity production.
- ▶ **Leopold Center.** The Leopold Center for Sustainable Agriculture was established in Iowa law as part of the Iowa Groundwater Protection Act of 1987. Its mandated missions are to identify impacts of agricultural practices, contribute to the development of profitable farming systems that conserve natural resources, and cooperate with Iowa State University Extension to inform the public of new findings. Renewable energy development is an important part of the sustainable agricultural practices promoted through the Leopold Center.
- ▶ **Integrated Energy Farm Model.** The Iowa DNR and Sunrise Energy Cooperative of Blairstown began work in 1994 on a computer model and business plan for a hypothetical integrated energy farm. The farm uses by-products from each of the farm's activities to develop additional value-added products. For example, cow manure is used to fertilize corn crops, which in turn are used to produce ethanol. The computer model was made available to the public in 1998.
- ▶ **Energy Crops in Ames.** The City of Ames, Iowa State University, and the Iowa DNR have collaborated since 1990 to initiate an agroforestry energy system at the Ames Municipal Wastewater Treatment Plant in which trees and herbaceous crops are grown and fertilized with treated, dry sludge. On

about 40 acres of land, project partners have planted alternate rows of fast-growing cottonwood trees and herbaceous crops such as switchgrass, forage sorghum and rye to enhance yields. As markets develop, partners plan to make the crops available for electricity and ethanol production.

- ▶ **Fast-Growing Trees.** Poplar trees have been researched and demonstrated as potential energy crops at several sites across Iowa. The University of Iowa and other partners have been studying poplar trees as energy crops in the Amanas. In Colo, several organizations established a wood-for-energy demonstration in Hickory Grove County Park in 1986.
- ▶ **Corn Stover.** In 1997, Iron Horse Custom Farming, a harvesting contractor, initiated a corn-stover collection operation for biomass-derived products near Harlan, Iowa. The company collected more than 50,000 tons of corn stover to produce furfural – an oily liquid used as a solvent and for making dyes, laquers and other solutions. Expansion of this operation may involve marketing corn stover as an ethanol feedstock for other energy sources. The Center for Sustainable Environmental Technologies at Iowa State University considers corn stover to be Iowa's largest biomass resource.
- ▶ **Biomass Plan.** In 1994, the Iowa DNR published the Iowa Biomass Plan, providing strategies and recommendations for developing biomass and energy crops in Iowa. The plan evolved to include all renewable energy resources, and was renamed in 1999 as *The Iowa Renewable Energy Resource Guide*.

6. Encourage the Development of Alternative Energy Production as an Effort to Diversify Iowa's Energy Resource Base.

"Homegrown" energy has realized enormous growth in Iowa since 1990. Its development has established strong financial opportunities, diversified the state's energy resources, and improved Iowa's air, water and soil quality. Results include:

- ▶ **Renewable Energy Policies.** Several policy measures helped develop Iowa's renewable energy production. These included:
 - ▷ The Alternative Energy Production Law, requiring the state's investor-owned utilities to purchase a total of 105
 - ▷ megawatts of electricity produced from renewables (Code of Iowa 476.44.2).
 - ▷ Net metering, creating a mechanism for consumers to interconnect their small renewable energy facilities. (Iowa Administrative Code 199-15.11(5)). Note: an August 1999 court ruling overturned the net metering law, banning mandatory net metering arrangements. That court ruling is now under appeal.
 - ▷ Creation of the Iowa Energy Bank, which provides low-cost financing to taxpayer-supported facilities interested in using renewable energy resources for electricity and heat production, and to make energy-efficiency improvements (Code of Iowa 473.19).
 - ▷ Creation of the Office of Renewable Fuels and Co-Products at the Iowa Department of Agriculture and Land Stewardship and the Value-Added Agricultural Products and Processes Financial Assistance Program at the Iowa Department of Economic Development (Code of Iowa 159A).
 - ▷ The Alternate Energy Revolving Loan Program, providing zero-interest financing to organizations and individuals constructing alternate energy production facilities in Iowa (Code of Iowa 476.46).
 - ▷ The Iowa ethanol sales tax exemption, providing a one-cent decrease on the retail price of ethanol-blended fuel (Code of Iowa 452A.3).
 - ▷ Establishment of a sales tax exemption from the sale of property used to convert wind energy to electrical energy (Iowa Administrative Code, 701-18.56 (422,423)).
 - ▷ The federal Energy Policy Act of 1992, providing several incentives to foster renewable energy development and production.
 - ▷ Extension of the federal ethanol tax exemption through 2007, ensuring the continued growth of the industry through a tax break of 5.4 cents per gallon, with modest decreases every two years.
 - ▷ Establishment of a tax exemption for publicly owned landfills converting methane gas for energy production (Iowa Administrative Code 701-80.12 (427)).
 - ▷ The provision for biodiesel demonstration projects at the Iowa Department of Transportation (Code of Iowa 159A).
- ▶ **Ethanol Production.** Ethanol is Iowa's most highly consumed renewable energy resource. Production of ethanol in Iowa grew from 272

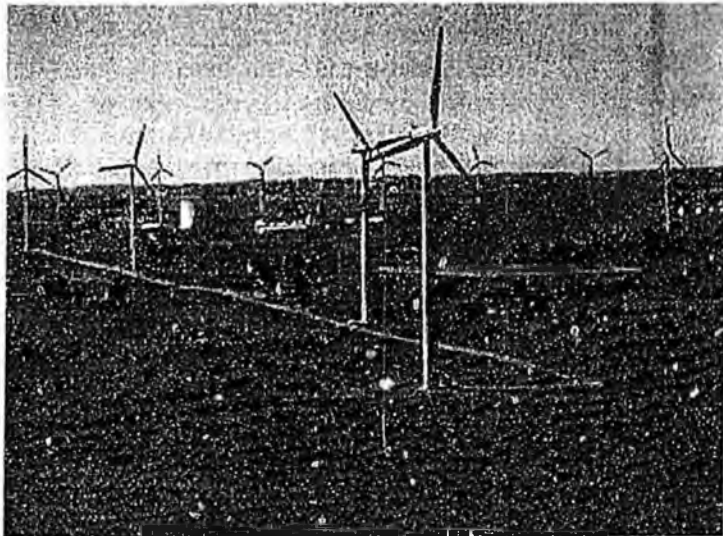
million gallons in 1990 to 384.5 million gallons in 1997, which is then exported globally. By 1999 ethanol accounted for:

- ▷ Almost 643 million gallons of ethanol-blended fuel sold in Iowa, representing 43 percent of motor fuel market share;
- ▷ more than \$1.7 billion in economic activity;
- ▷ approximately \$730 million added to the value of the state's corn crop;
- ▷ 13,250 jobs affected by the ethanol industry, including 2,550 directly related jobs; and
- ▷ \$111 million in tax revenue collected from the production and sale of ethanol.

▶ **Blairstown Ethanol Plant.** Iowa's first farmer-owned ethanol plant, in Blairstown, began construction in 1998. Upon completion, more than 300 farmers will profit from the five to eight million gallons of ethanol to be produced there each year, generating a projected \$8 million in economic activity. It joins the state's three other ethanol production facilities – a Cargill plant in Eddyville and Archer-Daniels-Midland plants in Cedar Rapids and Clinton – which produced 384.5 million gallons of ethanol in 1997, more than 25 percent of total U.S. production.

▶ **Two Wind Farms.** Iowa became the third largest producer of wind energy in the United States in 1999, when MidAmerican Energy and Alliant Energy signed contracts with wind developers to purchase electricity from wind farms in Buena Vista and Cerro Gordo counties. More than 300 750 kW turbines will provide enough energy to power almost 70,000 homes. The wind farm development resulted from the 1982 Alternative Energy Production Law, requiring Iowa investor-owned utilities to purchase a total of 105 MW of energy generated from renewable resources.

▶ **Individual Wind Turbines.** While the two wind farms represent the greatest magnitude of wind energy, many smaller turbines were built during the 1990s by schools, businesses and individuals. These projects helped demonstrate and build awareness about wind energy potential in Iowa. In 1998, a group of seven municipal utilities installed three 750-kW turbines near Algona. Turbines at schools in Spirit Lake, Nevada, Akron-Westfield, Clay Central-Everly, Forest City, and Sentral School in Fenton demonstrated renewable



Part of the 56-turbine wind farm near Clear Lake in Cerro Gordo County.

resources while saving energy costs and emissions. Thousands of Iowans witnessed wind energy from turbines at the Iowa State Fair and along the interstate highway system at Sun-Prairie Apartments in Des Moines, Shafer Systems, Inc. in Adair, and Boondocks Truckstop near Williams, in addition to hundreds of other turbines across the state.

▶ **Methane Recovery.** One of Iowa's emerging renewable energy technologies is methane energy recovery. The production of electricity or heat from captured methane is occurring at several Iowa wastewater treatment plants, landfills and livestock facilities.

- ▷ Currently at least 19 Iowa municipal wastewater treatment plants capture methane for on-site use and electricity generation. These plants collect more than 1.2 million cubic feet of biogas per day, enough energy to heat 2,555 homes annually.
- ▷ Iowa has two landfill-gas-to-energy projects, one near Des Moines and the other in the Cedar Rapids area, with electric-generating capacities of 5.5 MW and 2 MW, respectively. An additional project is planned for Fort Dodge, and Iowa has at least 11 candidate landfills, according to the U.S. Environmental Protection Agency.
- ▷ Methane recovery from livestock facilities is being aggressively researched in Iowa, due to its potential to control odors, mitigate environmental problems and introduce a profit stream for farmers. In 1998, an advisory committee was

formed to support the development of methane recovery technologies on the farm. Spearheaded by the Iowa DNR, the advisory committee includes representatives from state and federal agencies, agricultural organizations, utilities and environmental groups. Currently two demonstration projects are being conducted in Iowa – one at the Steve and Audrey Crawford Farm near Nevada, and the other at SWine USA near Creston.

- ▶ **Mitchell Mill Dam.** Hydropower is the leading renewable energy resource used for electricity production in Iowa, with 134 MW of capacity. The state's most recent hydropower installation occurred in 1998 when the Mitchell Mill Dam Project came on line with the first of two electric generators. The original dam and hydroelectric plant were constructed in 1925 and then deeded to the Mitchell County Conservation Board in 1962 by Interstate Power Company, at which time hydroelectricity production halted. The Mitchell County Conservation Board, with financial assistance from the Alternate Energy Revolving Loan Fund and a private bank, returned hydropower to the dam to preserve the site as a historic resource and improve recreation on the waters.

7. Incorporate Environmental Costs and Benefits Associated with Energy Production and Use into All Public and Private Energy Policy and Program Decisions.

In the last decade, Iowa has evaluated and measured environmental results from energy use in some areas. Here are some specific examples of environmental assessments:

- ▶ **State Government Emissions Accounting.** The Iowa DNR incorporates emissions savings into all accounting of results from state government energy programming. By analyzing the emissions created from different energy inputs (i.e. coal), and then calculating how much the use of those resources was decreased through energy efficiency improvements, the Iowa DNR can determine emissions avoidance.
- ▶ **Iowa Greenhouse Gas Action Plan.** In 1996 the Iowa DNR contracted with the Center for Global and Regional Environmental Research to develop the Iowa Greenhouse Gas Action Plan. This project, in three phases, created a

standardized baseline inventory of Iowa's greenhouse gas emissions; provided strategies to reduce emissions; and will eventually map annual carbon sequestration in Iowa's soil and vegetation. The purpose of the carbon mapping is to establish a baseline inventory for verifying and certifying storage of carbon dioxide in Iowa's soil for future carbon trading markets.

- ▶ **Comparative Risk Assessment Project.** From 1996 through 1998, the Iowa DNR helped implement the Iowa Comparative Risk Assessment Project, funded through the U.S. Environmental Protection Agency. With cooperation and input from more than 600 Iowans, including private citizens, businesses, researchers, nonprofit organizations, legislators and representatives of local, state and federal government, the study established a list of Iowa's greatest environmental risks. The two-year process integrated public surveys, town meetings, extensive technical reports and several committee meetings. The top environmental concerns included water quality, housing safety, soil erosion, animal production, global climate change and overuse of nonrenewable energy.

- ▶ **MTBE Ban.** In 1999, the state of Iowa banned the sale of methyl tertiary butyl ether (MTBE) in motor vehicle fuels, due to its potential harm to groundwater sources. MTBE is a fuel additive used to boost the oxygenate level of gasoline. The DNR is also required to study and monitor the potential effects of MTBE on Iowa's environment.

8. Designate the Iowa Department of Natural Resources as Lead Agency for Coordinating the State's Energy Policy.

The Iowa DNR has taken a leadership role in framing energy policy for the state of Iowa. The Energy Bureau of the DNR was designated as the state's energy policy arm through Iowa Code 473.7. In this capacity, the Energy Bureau provides policy recommendations to the Governor's Office and the Iowa Legislature, administers state energy funding disbursements such as Oil Overcharge Funds, and implements programs to increase energy efficiency and renewable energy in the state. Examples of the Energy Bureau's effectiveness include:

- ▶ Direction of the state's energy emergency plans, helping to avoid emergency situations through constant monitoring and forecasting of energy markets.
- ▶ Establishment of energy efficiency policy and programs, including the State of Iowa Facilities Improvement Corporation (SIFIC) – the nation's first performance contract for

implementing energy-efficiency improvements in state agencies. The success of SIFIC led to the development of the Energy Bank and Rebuild Iowa.

- ▷ Creation and support of policy for renewable energy development. An example of the DNR's strong involvement in this arena is its assistance in establishing the Alternative Energy Production Law, requiring investor-owned utilities to purchase 105 MW of electricity produced from renewable resources. This law led to the installation of more than 300 wind turbines in Iowa.
- ▷ Development and support of ethanol policy in Iowa and the nation. As examples, the Energy Bureau has worked closely with the Governor on the Governors' Ethanol Coalition, and has been instrumental in helping Iowa state government create one of the largest flexible-fuel vehicle fleets in the country.

On a national level, the DNR is the designated Iowa representative on the State Energy Advisory Board, which is a committee of state representatives providing guidance to the Department of Energy and Congress. DNR officials also have held leadership roles in the National Association of State Energy Officials, the Washington voice for the specific priorities of state and territory energy offices. Through the DNR's leadership in these two organizations and others, Iowa has benefited through increased funding and recognition of its energy programs.

9. Develop Better Energy Data Collection, Forecasting and Evaluation Techniques and Programs for State Government Energy Planning.

Collecting and evaluating energy data is a central activity for the Iowa DNR-Energy Bureau. The DNR's energy analysts track state, national and international energy trends, including petroleum prices, electricity consumption and renewable energy growth, to name a few. A goal is to create historical benchmarks that will aid in developing energy projections about the future. This information is analyzed and used by Iowa's legislative and executive branches to make informed decisions about Iowa's energy picture. The data also helps analysts prepare for and evaluate the severity of potential energy emergencies.

The DNR communicates energy trends through the biennial *Data Addendum* to the *Comprehensive Energy Plan Update*. Additionally, the Iowa public is informed about petroleum,

propane and other relevant price information through press releases and the DNR website.

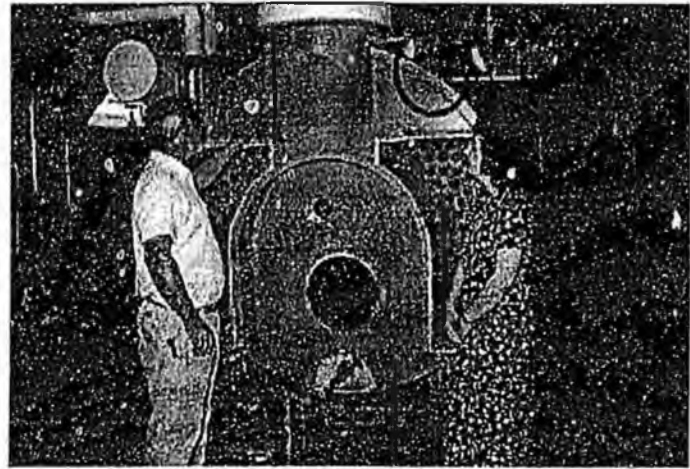
10. Develop, Commercialize and Promote Energy Efficiency and Alternative Energy Technologies and Businesses.

For energy efficiency and renewable energy to be successful, the technologies and services associated with them must become adapted, promoted and distributed to mass markets. In Iowa, the following are examples of business and industrial innovation:

- ▶ **Alternate Energy Revolving Loan Program.** In 1996, Iowa legislation (Code of Iowa 476.46) established the Alternate Energy Revolving Loan Program (AERLP), which provides zero-interest financing to organizations and individuals for up to 50 percent of the construction costs (with a ceiling of \$250,000) of alternate energy production facilities in Iowa. The program is administered by the Iowa Energy Center (IEC) and funded by Iowa's investor-owned utilities through a three-year assessment against their total gross intrastate operating revenues during calendar years 1995 through 1997. The IEC has received about \$5.93 million for the program.
- ▶ **Government Vehicle Fuel Standard.** Since January 1993, Iowa's local, county and state governments have been required by law to use ethanol-blended fuel in all applicable vehicles. Additionally, Iowa's state government owns more than 500 Flexible Fuel Vehicles (FFVs), which run on E10, E85, regular gasoline, or any combination of the three.
- ▶ **E85 Infrastructure.** Iowa has one of the largest E85 (85 percent ethanol, 15 percent gasoline) infrastructures in the nation, with five retail fuel sites for consumers and five stations for state-owned vehicles. Most of these stations were opened in 1995-1998, as Flexible Fuel Vehicles (FFVs) operating on E85 became more widely available, especially in the government sector. In 1998, state government fuel pumps dispensed more than 167,000 gallons of E85, while retail pumps sold 51,000 gallons.
- ▶ **Commercial Production of FFVs.** Several major car manufacturers began mass-producing FFVs in the late 1990s. Tens of thousands of vehicles, including cars, trucks and minivans made by Ford, General Motors,

Chrysler and Mazda are being made available to the public.

- ▶ **Governors' Ethanol Coalition.** The Governors' Ethanol Coalition (GEC) was created in 1991 to develop national and international markets for ethanol. Representing 23 states plus Sweden, Brazil, Canada and Mexico, the coalition's work includes market research, policy recommendations, and promotion of an E85 infrastructure. Former Governor Terry Branstad served as chair of the GEC in 1997. Governor Tom Vilsack served as vice chair in 1999, and will chair the coalition in 2000.
- ▶ **State of Iowa Facilities Improvement Corporation (SIFIC).** In 1986, Iowa state government established SIFIC, the largest performance contract for the public sector in the United States at that time. The creation of SIFIC allowed for Iowa's state agencies to make cost-effective energy improvements and save taxpayers money. Its creation, along with the Iowa Energy Bank, serves as a model for how the private and public sectors can partner to finance and implement improvement projects.
- ▶ **Iowa Energy Bank.** The Iowa DNR's Energy Bank program provides low-cost financing to taxpayer-supported facilities interested in using renewable energy resources for electricity and heat production, and to make energy-efficiency improvements. Several Iowa school districts, such as Forest City and Akron-Westfield, have taken advantage of the program to install wind turbines. It also has generated economic activity through construction and equipment projects for the local communities where energy efficiency improvements have been implemented.
- ▶ **Intermodal Transportation Loan Fund.** The intermodal revolving loan fund program (details of the program appear on page 16) helps small businesses and communities develop, construct, and operate intermodal facilities. Funding can be used to extend rail lines, airport runways, service roads, or to purchase equipment for intermodal facilities.
- ▶ **Office of Renewable Fuels and Co-Products.** The Iowa Department of Agriculture and Land Stewardship (IDALS) established the Office of Renewable Fuels and Co-Products in



Glenwood State Hospital-School, a state-owned facility, saves thousands of dollars each year through energy efficiency and natural resource improvements.

1991 to encourage the production and consumption of alternative fuels made from Iowa's agricultural commodities, as well as co-products from renewable fuel processing. Through strong marketing and educational efforts, IDALS is helping to make Iowans aware of the benefits of using renewable transportation fuels. IDALS also provides business planning assistance grants to new or expanding innovative value-added businesses and renewable fuel facilities, and funding for various research and demonstration projects. The state agency also works in cooperation with groups such as Farm Bureau and the Iowa Corn Growers Association to promote alternative fuels.

- ▶ **Department of Economic Development.** The Iowa Department of Economic Development's Value-Added Agricultural Products and Processes Financial Assistance Program (VAPPFAP) encourages increased processing of agricultural commodities produced in the state of Iowa. The program provides business organizational assistance to new, innovative, value-added businesses and renewable fuel facilities.
- ▶ **Microelectronics Research Center.** Researchers at the Microelectronics Research Center (MRC) at Iowa State University have been working on thin film semiconductors for use in photovoltaic systems since the 1970s. MRC is currently conducting research on the reliability of thin-film photovoltaics and their transferability to Iowa. Information gathered by MRC has been applied in space programs for NASA.
- ▶ **BECON.** In 1999 the Iowa Energy Center completed construction of the Biomass Energy CONversion (BECON) facility in Nevada, Iowa. BECON is a research and demonstration center

for biomass products and technologies, especially thermal gasification, pyrolysis, anaerobic digestion, fermentation and biodiesel.

- ▶ **Energy Leadership Awards.** The Iowa DNR's Iowa Energy Leadership Awards recognize the most outstanding achievements and leadership in energy efficiency and renewable energy in the state. The awards promote the accomplishments of businesses, industries, communities, universities, schools, utilities and numerous other organizations that are working to more effectively use energy resources. Since their inception in 1989, the Energy Leadership Awards have recognized more than 50 organizations for their accomplishments.

11. Focus Educational Efforts on Key Groups in Iowa Society to Enhance Understanding and Commitment to Energy Efficiency and Use of Alternative Resources.

Education has been a strong strategy for encouraging effective management of Iowa's energy resources, including:

- ▶ **Iowa Energy Center.** The Iowa Energy Center (IEC), located in Ames, was established in 1990 through legislation to create a research, demonstration, and educational organization for energy efficiency and renewable energy in the state. The IEC receives its funding from an annual assessment on the gross intrastate revenues of Iowa's gas and electric utilities. In addition to administering the Alternate Energy Revolving Loan Fund, the IEC has established an array of research, demonstration and educational projects that address energy-related issues and the associated economic and environmental impacts. The IEC also has two research facilities – the Energy Resource Station in Ankeny and the Biomass Energy CONversion (BECON) facility in Nevada.
- ▶ **Center for Global and Regional Environmental Research.** The Center for Global and Regional Environmental Research (CGRER) in Iowa City also was established in 1990 through the same legislation and funding stream as the Iowa Energy Center. The purpose of CGRER is to create programs addressing global environmental change. Funds are used to support research by faculty and staff from Iowa's colleges and universities on environmental change. Examples of their work include the Iowa Greenhouse Gas Action Plan, poplar tree and buffer

strip demonstrations, international energy management research, and educational workshops on environmental issues.

- ▶ **Center for Energy and Environmental Education.** The Center for Energy and Environmental Education (CEEE) at the University of Northern Iowa in Cedar Falls opened its doors in 1994. CEEE focuses on environmental learning for K-12, college students, professionals and the general public. Among its activities are the Iowa Energy Poster Contest, Rebuild Cedar Falls, the Iowa Electrathon, the development of an energy curricula for K-12 students and the creation of a full-time energy educator position. CEEE also is involved with many efficiency programs in the Cedar Falls area.
- ▶ **Energy and Environmental Organizations.** Many organizations in the state create educational programs supporting and promoting energy efficiency and renewable energy in Iowa. A list of many of these organizations is included on pages 37-39 of this document.
- ▶ **Watt Savers.** The Iowa Sustainable Energy for Economic Development Coalition, through a grant from the Iowa Energy Center, developed a publication in 1997 called *Watt Savers – Iowa's Energy Success Stories*, featuring case studies of energy efficiency programs by both private and public organizations.
- ▶ **Training and Workshops.** Many professional trainings and workshops have been facilitated in Iowa during the 1990s. Organizations such as the Iowa DNR, the Iowa Energy Center, Iowa Association of Municipal Utilities, Iowa State University, Iowa Association for Energy Efficiency, and the Iowa Renewable Energy Association sponsored dozens of educational opportunities on issues such as facility operations, building energy codes, wastewater treatment efficiency, and many others. Thousands of professionals received training through these workshops and conferences.
- ▶ **The Iowa Energy Summit.** Coordinated by the Iowa DNR and CEEE, the Iowa Energy Summit brings together student teams from Iowa high schools to actively debate issues regarding the state's energy future. Through their work on the Iowa Energy Summit, students improve their knowledge in areas such as energy efficiency, renewable energy, the economics and politics of energy, and the central position that energy plays in everyday Iowa life.

future challenges & Opportunities

▶ The year 2000 marks the beginning of new paths toward an energy-wise future in Iowa. Many challenges and opportunities face the state in the new century and millennium. Iowa's development of responsible solutions to these challenges will ensure the continued growth of energy efficiency and renewable energy, which will in turn help create a sustainable economy and environment.

During the last ten years, Iowa has made strong commitments to energy efficiency and renewable energy development, putting in place the policies, funding streams and infrastructure to help programs succeed. Iowa's continued dedication to sound energy management practices will be crucial in future decision making.

Several key areas that will require strategic planning for energy development are described in this section.



Iowa's environment can gain important benefits through better energy practices and cleaner energy sources.

electric utility restructuring

The most historic change to Iowa's use of electricity in the near future will be the restructuring of the electric utility industry. Currently in Iowa, electricity generation and distribution are managed by a single utility for a defined service area, acting as a regulated monopoly. Through restructuring, electricity services will become increasingly competitive.

By law, Iowa is committed to establishing an electricity industry that provides reliable, efficient and environmentally safe energy at least-cost prices that accurately reflect the long-term cost of using energy resources. Future restructuring legislation must include energy efficiency and renewable energy funding as components. See the next page for a description of environmental conditions recommended by the Iowa DNR to be included in restructuring legislation.

environmental protection

The importance of protecting and conserving natural resources will intensify during the next century. Concern about the effects of human activity on air quality, soil erosion and water quality has raised environmental awareness to new levels. Additionally, stronger federal regulations to control and rectify environmental risks will affect every economic sector in the nation.

These demands make it necessary for Iowa and its citizens to understand their roles in protecting the environment. The first step of natural resource conservation is personal advocacy and responsibility.

On a broader level, many organizations in Iowa are working to coordinate efforts to monitor environmental quality and educate the public. An example is IOWATER, a statewide volunteer water quality monitoring program being coordinated by state agencies and nonprofit organizations. In another project, Chariton Valley Resource Conservation and Development, Inc. in southern Iowa is demonstrating the water quality and wildlife habitat effects of switchgrass in watershed protection applications.

► Electric Utility Restructuring Sustaining Energy Efficiency and Renewable Energy

The Department of Natural Resources, in cooperation with several state and regional organizations, has established five core environmental objectives to be included in any future restructuring legislation for Iowa:

1. Establishment of a Renewable Energy Portfolio Standard.

This requirement would specify that a percentage of the electricity consumed in Iowa be generated from renewable energy resources, according to the following timeline:

- An additional 4 percent of total electricity consumption from renewable resources by 2005.
- 7.5 percent by 2008, and
- 10 percent by 2015.

These percentages and timeframes have been established based on previous goals for renewable energy in Iowa. Currently, 2 percent of Iowa's electricity consumption originates from renewables. An additional 4 percent provides a reachable short-term goal. The goal for 7.5 percent is consistent with federally proposed guidelines and provides an interim goal. Finally, Iowa established the goal of 10 percent by 2015 in the *1990 Iowa Comprehensive Energy Plan*.

2. Accommodation of Net Metering Arrangements.

This provision calls for all electric service providers to accommodate consumer choice in Iowa by providing net metering arrangements. Doing so offers a mechanism for consumers to interconnect their small-scale renewable energy generating facilities, while permitting them to offset electricity use that would otherwise be purchased at retail rates from their utility.

3. Preservation of Energy Efficiency and Renewable Energy Programs.

This condition provides \$52 million per year for 15 years to fund energy efficiency and renewable energy programs. As part of program implementation, the money will be raised through a nonbypassable charge (a standard charge all customers must pay) on consumers' electric bills and assessed based on energy use.

The Iowa Department of Natural Resources (DNR) will develop and contract for program delivery, prioritizing based on: existing analyses of public-sector energy efficiency needs; previous analyses by the Iowa Utilities Board; and the biennial state energy plan. Concurrently, a third party contracted by the DNR will conduct a needs assessment of the primary energy-using sectors (i.e. transportation, residential, commercial, industrial) and identify future programming priorities. An implementation plan will be devised with assistance from a statewide stakeholder advisory committee, and evaluation of program effectiveness will be conducted by a third party and submitted to the legislature biennially, including an assessment of market failures.

During the transition to a competitive market, this mechanism will sustain the energy programs, funding levels and goals that have been passed into law and implemented in Iowa during the last decade. The funding level of \$52 million was established according to: a review of past spending levels and results; a previous assessment of Iowa's energy efficiency needs; and spending levels from other states with energy efficiency and renewable energy programs. Per capita, the allocation falls in the middle of national trends for similar funding streams as part of other states' utility deregulation legislation.

4. Inclusion of Fuel Disclosure with Utility Bills.

This requirement mandates utilities disclose the sources of a customer's electricity supply, and the air emissions associated with those sources. The disclosure will appear quarterly with customer bills. This information ensures Iowans can make informed choices about competing suppliers regarding the amount of energy they produce from fossil fuels, nuclear, renewable resources and other sources.

5. Provision for Emissions Trading.

This stipulation provides for the monetary value of emissions reductions produced from programs funded through the nonbypassable charge to be reinvested in further programming. This accommodation will ensure that the total value of these programs is returned to Iowa citizens through continued programming.

global climate change

The Earth's environment and climate experience constant and natural states of change. However, concern is building about the pace of change caused by human activity, especially related to energy use.

While uncertainty surrounds the issue of global climate change, a few factors are agreed upon by scientists. Energy use, through the consumption of fossil fuels, is contributing unprecedented levels of carbon dioxide and other greenhouse gas emissions into the atmosphere. The effect of those gases must be studied and understood by governments, businesses and citizens. These actions should begin now, rather than waiting.

According to *Building a Safe Climate, Sound Future*, a publication by British Petroleum, General Motors, Monsanto and the World Research Institute, "we have come to believe that there should be no inherent conflict between properly conceived economic development and protection of the Earth's environment." The publication goes on to recommend strategies such as developing renewable energy, advancing energy efficiency technologies, understanding carbon sequestration, and improving agricultural practices.

In the near term, Iowa and the world have much to gain from taking actions that also will reduce the risks of human-induced climate change. Doing so can provide significant returns to the state's economy and environment.

The Iowa Greenhouse Gas Action Plan, written in 1996 by the Center for Global and Regional Environmental Research and sponsored by the Iowa DNR and the U.S. Environmental Protection Agency, recommended 34 strategies for reducing greenhouse gas emissions in Iowa. Sixteen of the strategies could save the state up to \$300 million annually from reduced energy costs, with an additional environmental savings of \$32 million annually from avoided emissions. The 16 cost-effective, immediate strategies include:

1. Reforestation of marginal lands
2. Production of energy crops
3. Nitrogen fertilizer management for crop production efficiency and reduction of over-applications (since fertilizer is the most energy-intensive agricultural input)
4. Reclamation of methane gas at large hog lots
5. Continued improvement of farm efficiency
6. Improved vehicle fleet efficiency

7. Discouragement of single-occupancy trips
8. Creation of carbon dioxide emissions inventories among utilities
9. Development of wind power
10. Demand side management
11. Emissions trading among utilities
12. State voluntary programs (Iowa Energy Bank, Rebuild Iowa, etc.)
13. Federal voluntary programs (Green Lights, Energy Star programs, etc.)
14. Emissions trading among industries
15. Creation of carbon dioxide emissions inventories among industries
16. Residential energy efficiency programs

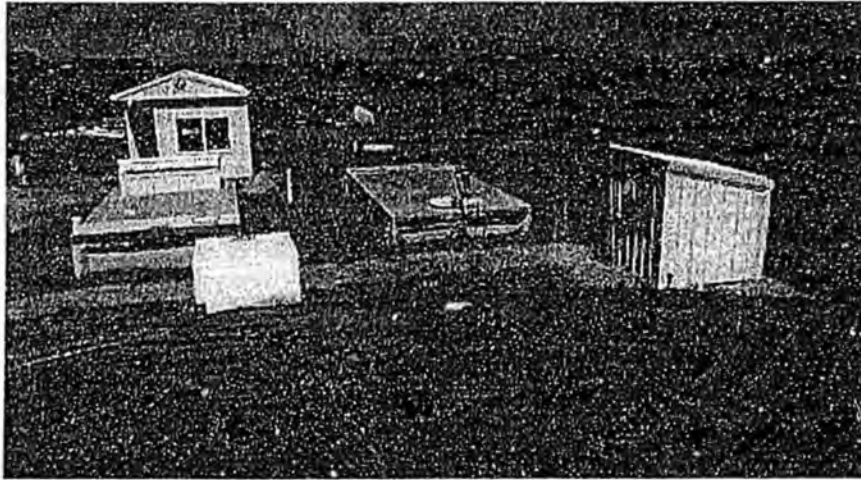
carbon trading

The Kyoto Treaty on global climate change, if implemented, would include the option for worldwide trades of carbon dioxide emissions credits. Emissions credit trading has long been considered a viable environmental tool by economists, and is currently being used on the Chicago Board of Trade for sulfur dioxide emissions.

In a carbon trading system, monetary values would be placed on emissions credits, similar to stocks and commodities traded on the stock exchange. 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 could realize strong opportunities from a carbon trading system. The agricultural industry may have the potential to participate in trading due to the carbon sequestered by soil and crops. Sequestration is the absorption and storage of carbon in the roots, woody parts and leaves of plants, building up organic material in the soil. For the purposes of carbon trading, a landowner may be able to sell credits for the sequestered carbon to those required to reduce carbon dioxide emissions.

Another area of opportunity is energy efficiency in buildings. By measuring energy savings from improved efficiency in Iowa facilities, many organizations also track emissions avoidance. As an example, Iowa DNR Building Energy Management programs have reduced carbon dioxide emissions by more than 320,000 tons annually in Iowa's public sector. In the future, these emissions could be given monetary values on a carbon trading market. Any return could then be reinvested in future energy efficiency programming. The Iowa DNR is currently researching the potential of a carbon trade from its energy efficiency programs.



Demonstration of methane energy recovery from a livestock operation at the Steve and Audrey Crawford Farm near Nevada, Iowa.

technology

Technological advancements hold the promise of sustainability for the 21st century. Many of the technologies being researched today could be the solutions for minimizing environmental risks and bolstering economies of tomorrow. The challenge for Iowa and the world is to provide the productive settings that allow technology to be demonstrated and commercialized — eventually reaching the hands of industries and citizens. The development of these technologies within the state could clearly position Iowa as a renewable energy leader and technology exporter.

Some technologies that could transform the energy industry include:

- ▶ **Fuel cells** use oxygen and hydrogen to generate power through a chemical reaction. Since heat or electricity are produced through a chemical reaction not combustion, there are few emissions of any kind, other than water. Fuel cell technology is being developed rapidly in the automobile industry, with several major manufacturers projecting to have models available by 2004. The residential and business sectors are already using fuel cells to provide energy to hospitals, greenhouses and industrial plants.
- ▶ **Gasification** is the partial combustion of biomass to produce a low-heat content gas. Researchers are experimenting with switchgrass, outdated seedcorn and other plant materials to create cleaner burning gases that can be used in boilers, internal-combustion engines, fuel cells and other equipment. The Iowa Energy Center's Biomass Energy CONversion facility (BECON) is working to improve processes for turning biomass into gas.
- ▶ **Methane recovery** from Iowa's livestock, landfill and wastewater treatment facilities could help Iowa turn wastes into energy sources. The captured methane can fuel engine generators, boilers, steam turbine generators or fuel cells. Several landfills and wastewater plants are using methane for on-site heat and electricity production. Two Iowa swine facilities are working with researchers to demonstrate methane recovery technology on the farm.
- ▶ **Microturbines** are a new generation of small turbine-generators emerging in the energy field. Research is underway to make microturbines accept virtually any low-grade biomass-derived gas from wood waste, crop residues, anaerobic digester gas, and landfills. Microturbines could make dispersed generation of electricity more feasible.
- ▶ **Precision management** of nitrogen fertilizer on cornfields can be accomplished via advancing technologies known as Global Positioning Systems (GPS). Through digitalized soil maps and aerial photography, agronomists are able to analyze and tailor the amount of nitrogen fertilizer needed on different cornfields. This allows fertilizer applications to be optimized, improving efficiencies and reducing the energy inputs into agricultural processes.
- ▶ **Wind turbines greater than 1 MW** are now available and being installed in the nation and the world. Because of advancing technologies, the development of stronger blades allows turbines to be larger, providing higher electricity output more efficiently and cost-effectively.

recommended policy Options

► To ensure the continued commitment and development of renewable energy and energy efficiency in Iowa, the following policy options are recommended.

1. Incorporate the proposed DNR amendment (see page 27) into future restructuring legislation, with inclusion of the following conditions:

► **Establish a renewable energy portfolio standard**, requiring a specified amount of electricity consumed in Iowa to be generated from renewable resources, according to the following timeline:

- ▷ An additional 4 percent of total electricity consumption from renewable resources by 2005,
- ▷ 7.5 percent by 2008, and
- ▷ 10 percent by 2015.

► **Require net metering arrangements**, ensuring consumers have a mechanism for interconnecting their small-scale renewable energy generating facilities and offsetting their electricity use that would otherwise be purchased at retail rates from their utility.

► **Preserve energy efficiency and renewable energy programs** by providing \$52 million per year for 15 years to fund energy efficiency and renewable energy programs through a non-bypassable charge on all consumers' electric bills. The Iowa DNR would be the designated agency to administer funding.

► **Include fuel disclosures with utility bills** to ensure Iowans can make informed choices about competing suppliers regarding the amount of energy they produce from fossil fuels, nuclear, renewable resources and other sources.

► **Provide for an emissions trading program**, so that the monetary value of emissions reductions produced from energy programs funded through the nonbypassable charge can be reinvested into further programming.

2. Work cooperatively with the federal government, state agencies, nonprofit organizations and industries to encourage voluntary efforts to protect Iowa's water, air and soil quality. Promote individual responsibility of the environment among every Iowa community and citizen.

3. Support and encourage research of global climate change in Iowa, especially as it relates to the state's contribution to the issue. Determine ways Iowa can leverage opportunities associated with climate change solutions.

4. Consider tax incentives as an alternative for stimulating renewable energy development and expansion. New tax incentives could come in the form of production tax credits, investment tax credits, sales tax reductions and property tax reductions.

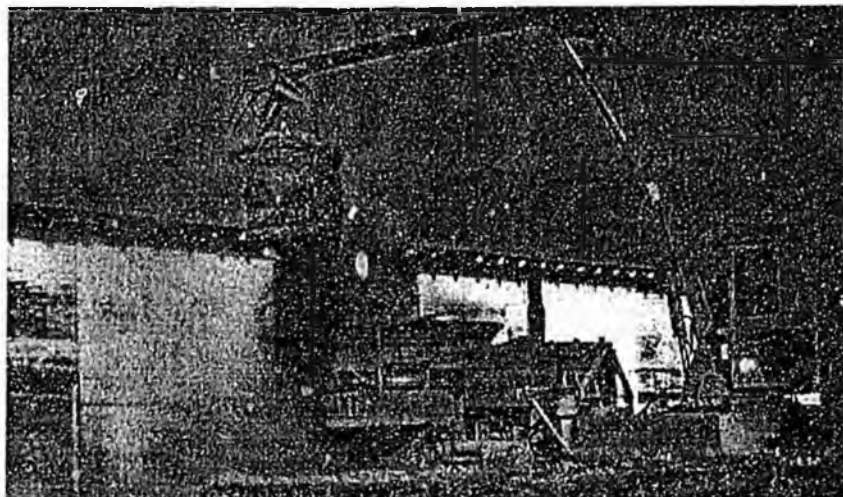
5. Encourage the development of distributed power, which is the small-scale generation of electricity at a site closer to its end-use than central-station generation and is often interconnected to the central distribution system, or directly connected to a customer's facility.

6. Promote the establishment of a fuel quality standard in Iowa, whereby fuel sold in Iowa would require a minimum of 10-percent ethanol blend.

7. Support customer choice pricing; for example, utilities could give consumers the option to purchase electricity generated from renewable resources.

8. Continue executive and legislative emphases on government efficiency to promote Iowa's leadership role in the effective use of energy resources while saving energy costs.

9. Research the feasibility of establishing a revolving loan fund for the implementation of smaller energy efficiency projects among taxpayer-supported facilities, so money could be easily accessed to implement cost-effective improvements.



Switchgrass, a native Iowa prairie grass, is an emerging renewable energy crop being grown, processed and marketed in southern Iowa.

10. Continue ensuring that energy efficiency improvements are implemented based on cost effectiveness as determined by lifecycle cost analysis (the cost of equipment over its lifetime, which takes into consideration energy use and maintenance), rather than simple payback periods (which consider only the initial purchase cost of equipment).

11. Work to educate Iowans about building energy codes, especially among the construction and building professional industries.

12. Support continued education and research among universities and professionals to develop

energy efficiency and renewable energy technologies.

13. Support and encourage concepts of integrated crop and livestock management for their collective benefits of environmental protection, energy conservation and economic efficiency.

14. Promote and support strategies for transportation efficiency in Iowa, including updated stoplight synchronization programs, expanded intelligent transportation systems technologies, increased opportunities for telecommuting, car pooling, van pooling, etc.

two-year program **Update**

► *The Comprehensive Energy Plan Update* is designed to measure progress on the energy efficiency and renewable energy goals established for Iowa in 1990. Every two years, the Department of Natural Resources, with assistance from several state and national organizations, provides energy trends and program results in this document. While previous chapters of this *2000 Comprehensive Energy Plan Update* overviewed accomplishments from the last decade, this section discusses the specific achievements of the past two years in energy efficiency, renewable energy and energy education.

energy efficiency developments

Through improved lighting, better construction techniques and reduction of waste, Iowa's public facilities, residences and industries are saving significant amounts of money and energy.

Public Sector Efficiency

The goal of the Iowa Department of Natural Resources' (DNR) Building Energy Management (BEM) program is to improve energy efficiency in the state's taxpayer-supported facilities. Since its inception, BEM has helped public-sector buildings implement \$122 million in improvements with nearly \$17 million in annual cost savings. The three main programs for achieving these savings are the State of Iowa Facilities Improvement Corporation (SIFIC), the Iowa Energy Bank and Rebuild Iowa.

SIFIC, a nonprofit corporation providing state agencies with lease-purchase financing of energy-efficiency improvements, reached a major milestone in 1999. Because of the financial success of the program, the bond issue was called in for early redemption – 13 months prior to the original call-in date. The early redemption saved Iowa taxpayers nearly \$130,000 in interest.

Iowa's schools, hospitals, local governments and private colleges continue to achieve solid financial results through the Iowa Energy Bank. The strength of the program lies in the ability of energy improvements to pay for themselves through the decrease in a facility's utility bills. In the last two years the Energy Bank has enrolled more than 60 new clients in its program.

Rebuild Iowa began in 1996 as an extension of the U.S. Department of Energy's Rebuild America program. Iowa's initiative helps communities identify, implement and finance cost-effective improvements. By June 30, 1999 more than 905 buildings representing 228 building owners had enrolled in the program. Community participants currently include Cedar Falls, Harlan, LeMars, Webster City and Pella. An exciting landmark came in 1998 when Rebuild Webster City won the National Rebuild Partner of the Year Award from the U.S. Department of Energy.

Residential Energy Efficiency

Energy efficiency in homes is a key focus for several energy programs in Iowa. The Home Energy Rating System (HERS) is an important method for measuring energy efficiency in residences. In 1999, the state fire marshal acknowledged HERS as an approved program for complying with residential building energy codes in the state.

Residential efficiency programs often focus on education and training of building professionals. The Iowa DNR has hosted several workshops on building energy codes during the last two years. In 1999, the DNR received a grant to incorporate HERS into Rebuild Iowa. HERS will serve as a tool for increasing energy efficiency improvements in new and existing homes in Rebuild communities. Through the program, local residents will be trained as HERS raters, and improvements will be made by area contractors to keep business activity within local economies.

In the private sector, utilities continue to provide energy audits, rebates and free energy-

efficient equipment to Iowa households. Additionally, some homebuilders are beginning to incorporate energy efficiency techniques into their construction. In 1998, Skogman Homes, Cedar Rapids, won an Iowa Energy Leadership Award for committing to building all new homes to the Energy Star standards established by the Environmental Protection Agency (EPA). Skogman Homes, which builds around 120 homes a year, is the leading builder of energy-efficient homes in the state. In 1999, the north-central Iowa chapter of Habitat for Humanity, based in Mason City, won an Energy Leadership Award for building the first Habitat home in Iowa to meet U.S. EPA Energy Star Standards.



Skogman Construction Company, Cedar Rapids, is the largest builder of energy-efficient homes in Iowa. The company builds about 120 homes a year that meet EPA Energy Star Standards.

Commercial and Industrial Efficiency

The industrial sector is Iowa's greatest consumer of energy. Several programs focus on helping Iowa industries reduce waste and control energy inputs in their production processes.

The Industrial Assessment Center at Iowa State University provided 50 small and medium-sized manufacturers comprehensive industrial assessments during the last two years to improve productivity, reduce waste, and save energy. Additionally, the Total Assessment Audit (TAA) continues to be an important demonstration program sponsored by the Iowa Energy Center (IEC). Five Iowa industries are currently receiving TAAs through financial assistance from the IEC and professional expertise from several other organizations. The case studies are being prepared to demonstrate the effect TAA services can have on industries. The IEC has partnered with the Manufacturing Extension Partnership, under Iowa State University Extension, to move the program beyond case studies and into a statewide service.

renewable energy developments

"Homegrown" energy continues to be a growing industry in Iowa. Because of the state's natural resources and agricultural expertise, renewable energy has accelerated its position as a viable commodity and an important contributor to electricity and heat production in the state.

Wind Power

In 1999, 315 750-kW wind turbines in Buena Vista, Cherokee, and Cerro Gordo counties began generating electricity, making Iowa the third largest producer of power from wind, behind California and Minnesota. Enron Wind Corporation of Texas and FPL Energy Inc. of Florida installed the turbines, and MidAmerican Energy and Alliant Energy are purchasing the power generated. They are the largest turbines in the United States and are expected to provide between 590 million and 790 million kWh of electricity per year. Additionally, the wind farm in Buena Vista and Cherokee counties is the largest of its kind in the nation.

The wind farms came on the heels of a collaborative effort by seven Iowa municipal utilities from Algona, Cedar Falls, Ellsworth, Estherville, Fonda, Montezuma and Westfield to install three 750-kW wind turbines near Algona; the turbines are expected to produce more than five million kWh per year. Additionally, Waverly Light and Power purchased two 750-kW turbines located in Buena Vista County.

School districts in Iowa continue to be leaders in adopting wind energy for electricity production. In 1999, Forest City Community School District and Akron-Westfield Community School District each installed 600-kW wind

turbines projected to save a total of more than \$110,000 in annual energy costs. Clarion-Goldfield School District will also install a turbine to meet their electricity needs, and the Spirit Lake Community School District is seeking to add a second turbine to its facility.

With growing interest in wind power, more research is being conducted to understand potential in Iowa. The Iowa DNR contracted with Iowa State University to assess the effect turbines have on each other when grouped together on a wind farm. Data obtained from the study will be used in a software package to help wind developers design multiple-turbine arrays.

Switchgrass

Many Iowa organizations are continuing work to make switchgrass – a native Iowa prairie grass – an energy commodity in Iowa and the nation. Switchgrass' potential as an energy crop, its environmental benefits, and use in non-energy products such as fiberboard and paper make it a growing choice among some Iowa farmers for planting on marginal lands.

Plans are underway to co-fire switchgrass and coal in a test burn at Alliant Energy's Ottumwa Generating Station in spring of 2000. Besides burning switchgrass for energy, researchers at Iowa State University (ISU) are testing switchgrass gasification – using heat to transform switchgrass into a gas – and analyzing the theoretical performance of a fuel cell operated on gas made from switchgrass. ISU is also investigating ethanol production from switchgrass.

Iowa's main switchgrass demonstration site, coordinated by Chariton Valley RC&D, began conducting biomass cropping and wildlife impact projects in 1998. The demonstrations are designed to optimize switchgrass yields, enhance water quality, and protect wildlife habitat by testing a variety of switchgrass management strategies.

Chariton Valley RC&D has also contracted with the Center for Global and Regional Environmental Research to compare the greenhouse gas emissions of coal versus switchgrass from electricity production.

Methane Recovery

Methane recovery at livestock facilities is one of Iowa's most promising energy production technologies, helping to control odor, reduce the risk of pollution, decrease methane emissions and offset fossil fuel consumption.

In 1998, an Iowa advisory committee formed to support the development of a methane energy recovery program. The program demonstrates and promotes methane recovery at livestock confinements and other methane-producing operations in Iowa. Under the program, an anaerobic digester and methane-fired boiler were installed at Steve and Audrey Crawford's swine finishing operation near Nevada in 1998, becoming fully operational in spring of 1999. Work also began in 1998 on the installation of an anaerobic digester and engine generator at SWine USA, a newly constructed farrow-to-wean operation near Creston.

Ethanol

Ethanol products are Iowa's most consumed renewable energy resources. In 1999, use of ethanol-blended gasoline by Iowa motorists averaged 43 percent. Success of the ethanol industry was sustained in 1998 through state and federal government decisions to extend ethanol tax incentives until the year 2007.

Iowa's first farmer-owned ethanol production plant began construction in fall of 1998. Sunrise Energy Cooperative of Blainstown will produce five to eight million gallons of ethanol annually, generating \$8 million in annual economic activity.

On a national level, the Governors' Ethanol Coalition (GEC) continues to promote ethanol in world markets. Governor Tom Vilsack served as the vice-chair in 1999 and will chair the GEC in 2000.

Currently, the Iowa DNR is working with Limestone Bluffs Resource Conservation & Development Area to conduct a pre-feasibility study investigating the potential of a cellulose-to-ethanol conversion plant in Iowa.

Biodiesel and Soy-Based Lubricants

Emerging petroleum replacements made from plant material include biodiesel and soy-based lubricants. The State of Iowa established a law in 1998 requiring state agencies to use biodegradable crop oils in government vehicles and equipment, as budgets allow.

In 1998 the Iowa DNR concluded a demonstration project at the WACO Community School District in which four buses used up to 70-percent biodiesel-blended fuel to study the advantages and disadvantages of the diesel alternative.

The Iowa Department of Transportation (DOT) has tested biodiesel for use in its maintenance vehicle fleet, using 34,350 gallons of soy oil in one project. In 1999, the DOT received funding from state appropriations to continue its biodiesel demonstrations.

The University of Northern Iowa (UNI) is one

of the nation's testing grounds for soy-based products. BioSOY, a replacement for hydraulic fluid, was developed by UNI's Ag-Based Industrial Lubricants (ABIL) Research Program. BioSOY has been demonstrated to perform as well as high-grade petroleum-based oil. ABIL also created Soy Trak, a biodegradable grease to reduce friction between train wheels and railroad tracks. Another product being patented is Bio Trans, a soybean-based oil developed for use in electrical transformers, fluid-filled transmission cables and other applications.

Another product helping to replace petroleum-based products is soy ink. Currently, about 99 million pounds of soybean oil are used to manufacture printing inks in the United States.

Hydropower

Iowa's first new hydropower project in decades came online in 1998. The Mitchell County Conservation Board, with financial assistance from the Iowa Energy Center's Alternate Energy Revolving Loan Program, worked to install two electric generators at the Mitchell Mill Dam on the Cedar River. The site's 600-kW electrical generating capacity will supply the energy use needs of up to 618 homes.

Solar

Solar technology is being studied and used on a limited scale in Iowa. In 1997 the Iowa DNR, with assistance from the National Renewable Energy Laboratory, completed a market assessment on solar thermal technology to dry corn, concluding that solar power used in conjunction with propane can be an economical choice.

The Iowa Department of Transportation (DOT) has begun to use solar-powered equipment along Iowa roadways. The DOT now employs more than 100 solar-powered message signs, traffic recorders, weigh-in-motion detectors, and Road Weather Information Systems throughout the state.

In 1999, the Iowa State University solar car, PrISUM, placed fifth in the national Sunrayce, an educational program culminating in a biennial cross-country race of solar-powered cars.

energy education

Iowa's educators and energy organizations are teaching students, professionals and citizens how to implement change in their management of energy resources. Following are examples of the

many efficiency and renewable energy education programs throughout Iowa.

Primary and Secondary Education

The Iowa DNR and the Center for Energy and Environmental Education (CEEE) created the annual Iowa Energy Summit in 1998, bringing together teams from Iowa high schools to research and debate policy about Iowa's energy future. Through their work, students improved their knowledge in areas such as energy efficiency, the economics and politics of energy, renewable energy, and the central position that energy plays in everyday life.

CEEE organizes several other energy education initiatives. The Iowa Energy Poster Contest targets students in grades one through six, increasing awareness of Iowa's renewable resources and energy efficiency. The Iowa Electrathon, first organized by CEEE and the Iowa Renewable Energy Association in 1997, teaches high school students how to build and race electric cars. Another initiative, a Model United Nations Summit on Climate Change, was co-sponsored in 1999 by the Iowa United Nations Association and the Stanley Foundation. The event targeted upper elementary, middle and high school students on the risks, challenges and solutions for climate change.

Several other organizations provide elementary energy education. MidAmerican Energy offers support materials and energy programs for teachers to use in the classroom. The Science Center of Iowa features exhibits with energy themes and offers an outreach program that introduces students to the properties of electricity.

University Education

The three state universities, Iowa State University, The University of Iowa, and University of Northern Iowa, work extensively in the research and development of energy efficiency and renewable energy. Examples include: geothermal heat pumps, methane recovery, building design, wind, alternative-fuel vehicles and agricultural applications. These research efforts have tremendous impact on the long-term use of energy in Iowa.

Universities and colleges are also providing energy-related educational opportunities. Des Moines Area Community College and Northeast Iowa Community College offer classes and associate degrees in energy-related fields. The Center for Sustainable Environmental Technologies (formerly the Center for Coal and the

Environment) at Iowa State University trains graduate students in renewable energy-related fields.

Another example of energy education is the University of Northern Iowa's "Rebuild the Cedar Valley Energy Conservation Program" in which students conduct community-wide energy audits for homes and small businesses.

Professional Training

In the area of professional training, the DNR sponsors several workshops on subjects such as building operator training, building energy codes, compressed air and motor efficiency, lifecycle cost analysis, new technologies and climate change. The IEC's Energy Resource Station provides extensive professional educational opportunities on topics ranging from geothermal heat pumps to building operations. The training efforts are continuous and provide a strong foundation for hands-on energy knowledge in the state.

In 1999, the Iowa Association of Municipal Utilities prepared *Tap Into Savings: How to Save Energy and Money in Your Water or Wastewater System*, a technology assessment report and workshop on energy efficiency in municipal facilities.

General Public

During the last two years, the DNR created an energy exhibit at the Iowa State Fair called *Prairie Grass Power* about the energy potential of switchgrass. In 1999, a methane digester demonstration appeared at the World Pork Expo and the Farm Progress Show. Additionally, CEEE, in cooperation with Cedar Falls Utilities, has a full-time energy educator who promotes energy efficiency and renewable energy to a variety of audiences. Other educational opportunities for the general public come in the form of conferences and seminars on efficiency and renewable energy sponsored by several Iowa organizations.

Organizations

For more information about energy efficiency or renewable energy, contact:

Iowa Department of Natural Resources- Energy Bureau

Wallace State Office Building
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Website: <http://www.ia.state.us/dnr/energy>
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Ag-Based Industrial Lubricants

University of Northern Iowa
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Waverly, IA 50677
Telephone: (319) 352-5218
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American Wind Energy Association

122 C Street NW - Suite 380
Washington, DC 20001-2109
Telephone: (202) 383-2500
Website: <http://www.awea.org>
E-mail: windmail@awea.org

Center for Energy and Environmental Education

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CEEE
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Website: <http://www.uni.edu/ceec>
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Center for Global and Regional Environmental Research

204 IATL
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Center for Sustainable Environmental Technologies

286 Metals Development Building
Ames, IA 50011-3020
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Website: <http://www.webbook2.ameslab.gov>
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Chariton Valley Resource Conservation and Development

19229 Highway 5
Centerville, IA 52544
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Website: <http://www.cvrcd.org>
E-mail: cvrcd@se-iowa.net

Council of Great Lakes Governors Regional Biomass Energy Program

35 E. Wacker Dr., Suite 1850
Chicago, IL 60601
Telephone: (312) 407-0177
Website: <http://www.cglg.org/projects/biomass/>
E-mail: fkuzel@cglg.org

The Energy Efficiency and Renewable Energy Clearinghouse

PO Box 3048
Merrifield, VA 22116
Telephone: (800) 363-3732
Website: <http://www.eren.doe.gov/>
E-mail: doe.erec@nciinc.com

Energy Rated Homes of Iowa

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Telephone: (515) 752-7162 ext. 125
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Energy Resource Station

Des Moines Area Community College
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Website: <http://www.energy.iastate.edu>
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GeoExchange Office

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Website: <http://www.alliantenergy.com>

Governors' Ethanol Coalition
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Website: <http://www.ethanol-gec.org>
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Iowa Corn Promotion Board
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Iowa Department of Agriculture and Land Stewardship - The Office of Renewable Fuels and Co-Products
Wallace State Office Building
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Iowa Department of Natural Resources-Waste Management Assistance Division
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Note: The contents of this document do not necessarily reflect all opinions of the advisory committee.