Renewable Power and Energy Efficiency: Policies in Iowa and Other States

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The Iowa Policy Project

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Global security and economic uncertainty have led policymakers and leaders to examine the strategic alternatives provided by renewable power generation and energy efficiency measures. The primary sources of renewable power generation are wind, solar, biomass and hydropower. Ethanol and other renewable fuels also represent potential sources of fuel for electric power generation purposes but have more relevance to transportation. In recent years, many states have experimented with policy initiatives related to renewable energy and energy efficiency. This report provides a primer on innovative programs and experiences from other states and current programs in Iowa. Included in the report are responses to four specific questions designed to address this topic:

- What have states done to encourage renewable energy?
- What "best practices" do states use for energy efficiency and to what extent are special charges to consumers used to fund energy efficiency programs?
- What are the experiences in the various states with "net metering" regulations?
- What are the wage levels and benefits for jobs associated with renewable energy?

What have states done to encourage renewable energy?

States use two primary approaches for encouraging renewable energy. First, 47 states offer voluntary incentives to encourage renewable power generation. Voluntary financial incentives include low-interest loans, tax credits, tax exemptions and other incentives for construction and operation of renewable power generation facilities and renewable energy use. Voluntary incentive programs may be funded from general government revenues, tax expenditures, or from targeted charges and fees. The second approach, used by a majority of states, is to require utilities to implement programs. These programs include renewable portfolio standards (RPS) that require utilities to provide specified minimum levels of renewable energy to their customers, net billing requirements for utility customers who generate their own power, and mandatory green-power program offerings for utility customers. Depending on the type of mandated program offering, the regulatory costs and/or savings are absorbed by the affected utilities and/or passed on to some or all customers. Some states have also facilitated the creation of markets for tradable "green certificates."

Iowa policies include a combination of voluntary incentives and mandatory approaches. Iowa's voluntary incentives include awareness programs, loans, research grants and selec-

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tive tax exemptions and credits for certain renewable energy sources. Iowa policies include several mandatory programs. Iowa's renewable portfolio standard (RPS) requires rate-regulated utilities to purchase 105 MW of renewable capacity, which has been surpassed. Iowa also mandates net-billing requirements for rate-regulated utilities. Starting in January 2004, all Iowa electric utilities will have to offer green-pricing programs to their customers.

What "best practices" do states use for energy efficiency and to what extent are special consumer charges used to fund energy efficiency programs?

Programs to promote energy efficiency involve an array of public- and private-sector programs including awareness programs and incentives for residential, industrial or public sector facilities, and other specific energy uses. Energy users are often unaware of the potential for savings from adjusting practices and/or applying different technologies. Thus the energy cost savings generated can often be used to finance implementation of energy efficiency practices. Other funding sources include general revenues, tax credits, mandated program offerings and contributions by utilities. So-called "system-benefit charges" (SBC) are charges levied on consumer utility bills. Funds from these charges generate revenues that are used for education, promotion of energy conservation, rebates for energy-efficient appliances, and incentives for incorporating energy-efficient technologies and management practices in new building construction and remodeling projects.

Iowa is recognized as a leader in energy efficiency. The state administers a comprehensive set of awareness and incentive programs that target government, industry and community facilities. While some state and federal revenue sources help fund these programs, energy cost savings are also used to pay for energy management improvements for non-profit facilities such as public and private schools, hospitals, private colleges, and local governments. While Iowa currently does not impose a system-benefits charge on customer bills, since 1990 the Iowa Legislature has required utilities to collect an annual charge on all gas and electric utility intrastate gross operating revenues to provide a limited amount of funding for research on energy efficiency, renewable energy and the environment. In Iowa, energy-efficiency programs offered to customers by investor-owned utilities are reviewed in proceedings before the Iowa Utilities Board, to determine the goals, methods and cost-effectiveness of the proposed programs. The net added costs for energy-efficiency programs are implicitly spread over the utility's customer billings.

What are the experiences in the various states with "net metering" regulations?

Thirty-seven states require utilities to offer "net billing" or "net metering" to customers who wish to generate electricity from their own power generation equipment. Net billing allows utility customers with their own generators to put power on the utility's distribution grid when a surplus of power is generated and to buy power from the utility when external power is needed. Some states require that all utilities offer net billing to their customers, while others require only some utilities to do so. The systems and fuels that are eligible for net metering also vary, but typically include wind, hydro and solar. The methods for calculating and crediting consumers for the net excess generated (NEG) power to be purchased by the utility vary by state. Limits on system size, and grid connection requirements and costs also vary by state.

Iowa has a number of rural electric cooperatives and municipal utilities that voluntarily offer net-billing programs to customers. Only rate-regulated utilities — MidAmerican Energy and

Alliant Energy — are required to offer net metering in Iowa. These two utilities account for approximately 70 percent of Iowa's power. Each has a unique net-metering program. Alliant subsidiary Interstate Power and Light pays an "avoided cost" rate for the customer's net excess generated above their own usage. The utility's avoided costs are typically similar to the cost at which the utility buys energy. So, a customer that generates excess power is paid at a lower rate than the full retail price that customers pay the utility. For customers with systems that generate less than 500 kW in capacity and that generate more power than they use, MidAmerican Energy provides a credit to the customer's account for the net excess generated and allows the customer to use the credits in the future.

What are the wage levels and benefits for jobs associated with renewable energy?

Wages earned by workers in many renewable energy fields are currently below the statewide averages for electric and natural gas production and distribution workers. However, they compare very favorably with prevailing wages in the non-metro counties where many of these facilities are located. For example, after construction is complete, a utility-scale wind farm may provide a dozen jobs at $38,000 to $48,000 with standard benefits. Such wages are often 50 percent to 100 percent above the local county average wage. Average wages for renewable energy sectors can be expected to grow over time relative to the other sectors given the relative newness of renewable energy jobs compared to jobs reported for similar Standard Industrial Classification (SIC) codes in the state. As a new industry matures, the wages paid in the sector will reflect greater lengths of employment that are more typical for other sectors of the economy.

Finally, the fiscal impacts of renewable energy facilities on nearby communities are likely to depend on the scope and scale of operations and the business structure of the owners. Several studies suggest that the direct employment for renewable energy facilities may be small in relation to the indirect employment generated. Utility-scale operations are more likely to attract additional specialized equipment manufacturing functions to the area. Also, in the case of wind farms, the farmland lease payments to landowners are likely to be small in relation to the returns to capital investment in turbines, etc. So to the extent that such renewable facilities generate profits for owners, a greater share of the profits will be retained in the local area if the facilities are owned by municipal utilities, cooperatives, and/or local private investor groups in contrast to ownership by nationally traded public companies.

Policy Implications and Observations

Our review of Iowa policies and innovative programs from other states provides a basis for identifying several potential policy options for Iowa:

- **Increasing the Iowa Renewable Energy Purchase Requirement.**

Iowa requires regulated utilities, through a renewable portfolio standard (RPS), to use a small amount of renewable energy. Iowa's existing RPS of 105 MW of renewable capacity was met in 1999 and has been surpassed. A goal of 1,000 MW by 2010 was proposed by the Governor's Energy Policy Task Force in 2001 but has not been adopted legislatively. Iowa policy makers have both a rationale and precedent for raising the RPS. The effectiveness of this policy approach has been demonstrated to work for Iowa. Goals set by the

Governor or by planning commissions carry less weight than establishing minimum requirements through law. While it may be encouraging that utilities have made new investments, or pledged to do so, such announcements may be in partial response to federal incentives that are scheduled to sunset during 2003. The developments provide an opportunity for Iowa to contemplate even higher RPS levels of renewable power generation in the future.

- **Explore the Development of Green Power Certificate Markets.**

Green power certificate markets are emerging nationally. Certificates are sold by utilities that generate or use green power. Certificates are bought by utilities less able to use green power due to location and other factors. Certificate markets develop in response to state programs requiring utilities to (1) purchase minimum amounts of renewable energy and/or (2) offer renewable energy purchase options to consumers. Iowa requires rate-regulated utilities to purchase renewable energy, but purchases by rural electric cooperatives and municipal utilities occur on a voluntary basis. States such as Texas and Wisconsin require all utilities to purchase “green power.” Having a certificate market becomes more important if Iowa considers requiring all utilities to purchase green power. But even if Iowa doesn’t, a certificate program may still be beneficial due to Iowa’s consumer purchase option. Starting in January 2004, all Iowa electric utilities (rate-regulated, rural electric cooperatives, and municipal utilities) are required to offer their consumers a green power purchase option. A certificate market would encourage even greater renewable power generation because the renewable power can be used more efficiently. Recently, a certificate market was authorized for Iowa wind power production tax credits, so Iowa has established a related model and precedent for consideration.

- **Special Consumer Charges to Encourage Energy-Efficient Purchases.**

Iowa could implement “system-benefits charges” to consumers, providing funds for rebates for purchase of energy-efficient appliances. The current phaseout of the state sales tax on residential energy bills offers nearly three more years in which the impact of the new charges on customers could be offset. As currently scheduled, the phaseout runs through Jan. 1, 2006, when the sales tax is scheduled to be totally removed. A communitywide experiment in Bern, Kansas, involved replacement of old washing machines with energy-efficent machines, creating an estimated 36 percent savings in water and 57 percent savings in electricity. This experiment involved the use of Maytag Neptune washers, which are produced in Newton, Iowa, and demonstrates how encouraging use of energy-efficient products also can have spin-off benefits in the Iowa economy.

- **Investment Preferences for Local Institutions to Retain Local Benefits.**

Wage rates earned by workers in renewable energy are likely to compare very favorably with prevailing wages in the counties where these facilities are located. To the extent that such renewable facilities are profitable, a greater share of the returns will be retained to benefit the local area if facilities are owned by local private investor groups, area cooperatives, and/or municipal utilities in contrast to ownership by nationally traded public companies. Policies that encourage locally oriented or Iowa-based ownership encourage higher levels of retained regional benefits from profits and returns on capital investment.

- **Equal Access to Policy Incentives.**

Different rules govern various energy providers in the area of renewable portfolio standards, net metering and energy efficiency programs. This means Iowa utilities and their customers do not necessarily possess equal access to renewable energy development opportunities or energy efficiency measures. Certain projects that may be feasible for one utility may not be as feasible in another utility's service area. Iowa has taken a step toward creation of a level playing field through the state's Mandatory Utility Green Power Option. Starting in January 2004, each utility – rate-regulated, rural electric cooperative or municipally owned – must file a green power plan and tariffs with the Iowa Utilities Board. A regular review of the differences in these plans, by the IUB and General Assembly, would potentially contribute to harmonizing the implementation of the state's renewable energy policies and provide more awareness and clarity of direction for stakeholders.

■ **Technology-Neutral Policy Incentives.**

Policy efficiency and effectiveness in attaining a higher level of renewable energy can be achieved by creating a "level playing field" for all renewable generation technologies whatever their source. Establishing differential incentives or preferences often results in pitting fledgling energy industries against each other. Incentives for wind energy can be balanced with incentives for other renewables, such as solar or biomass. If the incentives are technology-neutral, then the policy allows emerging technologies with the most potential for efficiently enhancing productivity and economic returns to successfully emerge from the incentive framework. If the incentive structure favors one technology over the others, then the potential for achieving maximum benefits for society from renewable energy become arbitrarily limited. It must be recognized, however, that state policies may not always be able to offset imbalances created by federal policy.

■ **Public Information on Prices and Contracts.**

While some utility and wind-generation interests may want price information to be confidential for competitiveness reasons, the lack of public pricing information for renewable energy projects may impede the ability of other potential project sponsors from assessing opportunities and feasibility of new projects. If an open market is desired, buyers and sellers should have equal access to market information, such as prices paid and contract terms. Public information on market prices and purchase contracts can be key elements in generating feasibility studies for potential investors. It can be argued that public access to prices and contract terms is a necessary condition, if the state wishes to encourage a wide range of investors to consider renewable energy projects that are economically feasible for the long term. Public price and contract reporting can also be justified to help assure that predatory pricing does not occur by utilities that both generate their own renewable power and purchase renewable power from smaller captive suppliers with less market power. In addition, many suppliers of renewable energy have received public assistance in achieving their industry standing.

The Iowa Policy Project

For the full report, see www.iowapolicyproject.org

The Iowa Policy Project was founded in the summer of 2000 to produce and disseminate research on a broad set of issues of importance to the citizens of Iowa. We are a non-profit and non-partisan organization. We engage scholars to produce sound, independent research.

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Introduction

Dependence on external energy resources, rising costs of power generation facilities, and increased uncertainty regarding terrorism and global security have spurred policymakers, leaders and citizens to examine renewable energy resources and energy efficiency measures. Many states have experimented with policies to encourage renewable energy and energy conservation. The purpose of this report is to provide a broad perspective on innovative state programs and to compare these programs to current programs in Iowa.

This report responds to four questions developed by the Iowa Policy Project regarding renewable energy and energy efficiency policy in Iowa and other states:

- What have states done to encourage renewable energy?
- What “best practices” do states use for energy efficiency and to what extent are special charges to consumers used to fund energy efficiency programs?
- What are the experiences in the various states with “net metering” regulations?
- What are the wage levels and benefits for jobs associated with renewable energy?

The Iowa Policy Project engaged the authors to conduct an objective review of the literature within a limited time frame. The project was conducted during the period of December 2002 to March 2003. The questions:

The authors of the study include graduate students and faculty in the Department of Economics, Iowa State University. Matthew Ritsema is a Graduate Research Assistant, Mark A. Edelman is Professor of Economics and Interim Director of the Community Vitality Center, and Daniel M. Otto is Professor of Economics. This project was completed in conjunction with ongoing research and applied policy analyses supported by the National Renewable Energy Laboratory (NREL), the Iowa Energy Center and the Community Vitality Center.

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What have states done to encourage renewable energy?

A. Nature, Scope, and Context

The primary sources of renewable power generation are wind, solar, biomass and hydro power. Ethanol and other renewable fuels also represent potential sources of fuel for electric power generation purposes but have more relevance to transportation. Policy approaches to encourage renewable power generation include subsidized loans, grants, state tax credits, tax exemptions, anti-pollution programs, “green power” programs, and renewable energy percentage requirements. Loans and grants are used to defray project construction costs. Production tax credits are used to adjust operating margins. Mandated renewable energy purchase requirements — often called renewable portfolio standards (RPS) — are attempts to influence demand for renewable energy. Anti-pollution programs tend to impose costs on energy resources that compete with renewable energy sources. Green power programs rely on consumer preferences and willingness to pay for power produced in an environmentally friendly way.

State programs operate in tandem within the federal energy policy. While this report focuses on state programs, federal policy cannot be ignored. For example, the federal government provides a production tax credit (PTC) and Renewable Energy Production Incentive (REPI) for qualifying entities and qualifying uses such as solar, wind, geothermal or biomass generation technologies subject to rulemaking restrictions [31]. Currently the federal PTC and REPI are about 1.8 cents per kWh and adjusted periodically for inflation. This means the federal subsidy for eligible wind generation facilities is equivalent to about 21 percent of the retail price of electricity. The federal PTC may dwarf some state incentives. So, federal policy sets the context for state policies.

Various characteristics of state renewable energy programs are found in Table 1.1 and 1.2. Table 1.1 includes attributes regarding tax and financial incentives and voluntary assistance programs. Table 1.2 provides information on mandatory program offerings, regulations and information on outreach and education programs.

Currently, 47 out of 50 states provide financial incentives to use or develop renewable energy [6]. The only states that currently do not provide incentives are Kentucky, Louisiana and Maine. Financial incentives range from: personal and corporate income tax credits/rebates, sales tax exemptions, property tax credits/exemptions, loans, grants, industry recruitment incentives, leasing/sales incentives, and production tax credits and incentives.

In addition, a number of states are experimenting with mandatory programs. For example, 13 out of 50 states have renewable portfolio standards. This means energy sellers must reach a minimum percentage of renewable energy in their generation mix and the minimums must be reached by specified deadlines or penalties are imposed. Net billing programs are used in 37 out of 50 states to encourage development of small-scale customer-owned renewable energy generation systems (Table 1.2).

Thirty states offer “green pricing” and/or “green building” programs to electricity consumers. A green pricing program requires an electricity seller to offer customers power produced from renewable sources, usually at a higher price. Green building programs reward builders who incorporate energy-efficient techniques and the use of renewable sources of energy in building construction.

B. Iowa Policies and Programs

Iowa implements a variety of voluntary financial incentives and assistance programs to encourage renewable energy projects. Included on the Iowa Department of Natural Resources website are:

- The Iowa Energy Bank
- Alternate Energy Revolving Loan Program (AERLP)

- Research grants for energy efficiency and renewable energy
- State of Iowa Facilities Improvement Cooperation (SIFIC)
- Wind energy equipment sales tax exemption
- Wind energy replacement generation tax exemption
- Local option special assessment of wind energy devices
- Methane gas conversion property tax exemption
- Solid waste alternatives program
- Ethanol-based fuels excise tax exemption
- Ethanol blended gasoline tax credit
- Value-added agricultural products and processes financial assistance program — Iowa Renewable Fuel Fund
- Rural economic value-added mentoring program
- Solar energy system property tax exemption.

For example, the Iowa Department of Natural Resources administers the Iowa Energy Bank Program, which provides technical and financial assistance for installing renewable energy improvements by public and non-profit institutions such as schools, hospitals, local governments and colleges. The amounts and terms vary [14].

The Iowa Energy Center sponsors research and provides information on renewable energy technologies. About a third of the Center's funds are spent on renewable energy research and demonstration projects. The Center has produced wind and solar resource maps for the state and conducts a variety of reseawrch projects at its Biomass Energy CONversion (BECON) facility in Nevada. The Iowa Energy Center also administers the Alternate Energy Revolving Loan Program (AERLP) [16]. This program is available to assist in financing renewable energy systems. The AERLP provides up to 50 percent of the total loan, up to $250,000 at zero percent interest for wind generators and other renewable projects. The remainder of the loan is financed through other lenders. Funds from loan repayments are made available to new loan applicants.

Iowa also implements a variety of mandatory programs to encourage renewable energy. Iowa has implemented a renewable portfolio standard (RPS). The 1983 Alternative Energy Production (AEP) law required rate-regulated utilities to purchase power from renewable energy sources. In 1991, the Alternative Energy Production (AEP) law amended the 1983 law and limited the purchase requirement to a total of 105 MW (Code of Iowa 476.41-476.45). The 105 MW was allocated to Iowa's two rate-regulated utilities — MidAmerican Energy and Alliant Energy. The RPS was met in 1999 and has since been surpassed [16]. In 2001, the Governor's Energy Policy Task Force [28] recommended a new renewable production goal of 1,000 MW by 2010. However, this goal has not been adopted by legislative action.

Net billing programs allow households, businesses, schools, etc., to deduct from their utility energy bills the amount of electricity generated from their own sources and in some cases to sell extra power to utilities. In Iowa, only rate-regulated utilities are required to allow net billing for their customers. MidAmerican Energy limits participation to 500 kW or less in facility capacity. Iowa's rural electric cooperatives and municipal utilities may offer net billing programs to their customers. Trade association officials for rural electric cooperatives and municipal utilities report some member experimentation with net billing. However, load-leveling problems can be experienced by small utilities serving customers with large generation capacity that in turn may rely on intermittent wind resources.

Iowa has implemented a green power program to stimulate renewable energy projects. Starting in January 2004, all Iowa electric utilities (rate-regulated, rural electric cooperatives, and municipal utilities) are required to offer a green power purchase program to their customers under Iowa's Mandatory Utility Green Power Option (HF 577). Each utility must file its green power plan and tariffs with the Iowa Utilities Board. In recent years, the non rate-regulated trade groups in Iowa have expressed more support for (1) incentives for distributed power programs that would deploy fuel cells and micro-turbines [11], and (2) development of an underground compressed gas facility to store energy for utility scale wind farms [10].

C. Innovative Programs in Other States

States that require Renewable Portfolio Standards (RPS) are setting goals to increase the diversity of energy production. Texas has one of the largest RPS requirements in the nation. According to a recent study by Lawrence Berkeley National Laboratory, Texas will exceed the initial RPS goal of 850 MW of renewable energy by 2005. By that date, Texas will have over 930 MW of wind capacity [35]. According to this report, RPS compliance costs are low and almost insignificant due to a low cost web-based tracking system. In addition, Texas was the first state to create a market for tradable energy certificates, which will be used to verify compliance and reduce the costs of the programs [35].

Due to high wind speeds, wind projects in Texas have been able to deliver power to the grid for less than 3 cents per kWh after factoring in the federal production tax credit (PTC) to those who generate renewable energy. The federal government provides both a production tax credit (PTC) for eligible corporations and an equivalent Renewable Energy Production Incentive (REPI) for systems owned by municipal utilities and nonprofit Rural Electric Cooperatives (RECs). So, states that offer production tax credits for renewable energy systems often consider providing an equivalent credit for systems owned by municipal and other government utilities.

Wisconsin's RPS system requires that by December 31, 2010, at least 2.2 percent of energy sold to customers is from renewable sources. The state has also created a credit-trading program allowing energy retailers to buy and sell renewable energy credits in lieu of producing renewable energy. The credit-trading program is administered by the Wisconsin Public Service Commission. Violation or misleading certification of renewable resources can lead to fines up to $500,000 [6].

Minnesota, Montana and Washington require all electric utilities to offer "green power" programs to their customers [6]. Some utilities charge green customers more per kWh, but with a promise that as prices for conventional power fluctuate, the customers registered on the green program will see less fluctuation in their prices.

In the state of Washington, all utilities that have more than 25,000 metered customers are required to offer their customers the option to purchase green power. A block package, for example, allows the consumer to buy green power in “blocks” of 100 kWh for a price of $1 to $4 per month. In some cases, consumers opt for a 100 percent renewable package that locks in a price. This allows consumers to insulate themselves from utility price fluctuations and to avoid increased costs.

For example, Puget Sound Energy is an investor-owned utility that offers services to the Seattle metropolitan area. It offers green power to its residential customers beginning at $4 per month. This buys 200 kWh of renewable energy. Customers can purchase additional 100 kWh blocks of power increments at the same rate [24].

Several states offer rebates in sales or property taxes as an incentive to increase the construction of renewable energy systems [6]. Minnesota offers an exemption in property taxes for land used for wind energy. The state also grants a state production tax credit for renewable systems under two megawatts. Any increase in land value from use with photovoltaic equipment is tax-exempt. Several other tax preferences and financial incentives are also provided for renewable energy and ethanol production.

Wisconsin offers rebates to homeowners and low-interest loans to aid those who construct solar panels, wind systems and solar water heating systems [6]. The loans are in amounts of $1,000 to $20,000 and are paid back at 1.99 percent APR. The state also offers grants up to $50,000 or 50 percent of costs to renewable energy firms in marketing, training employees, and other services to aid in the consumption of renewable energy. Schools are eligible for grants for educational purposes.

Regarding incentives that sunset, a note of caution may be in order. Participants at an October 2001 symposium, “Iowa Opportunities for Renewable Power Generation,” [5] indicated lack of interest in repeating scenarios of large short-lived incentives that were experienced after an earlier energy crisis. Several participants recalled the energy crisis of the late 1970s and the onslaught of big incentives designed to sunset after a few years. The participants recalled that too many people entered the sector and were forced to leave when the short-lived incentives, profits and public interest subsided.

Also some discussion may be in order regarding the use of investment incentives, production incentives or a combination. The identification of industry entry barriers and an infant industry rationale are often used to justify investment incentives for new and developing industries. New industries can face mature competition and monopolistic practices that must be overcome before a new industry segment can be sustained. A rationale for production incentives on the other hand is often used when ongoing externalities exist that prevent fair market returns from being realized in the market. The exemption of clean air standards for existing power plants and the strategic security considerations of energy independence are two examples of externalities. Finally, a discussion of the distribution of the benefits from the incentives may be in order because they may vary by project depending on the facility ownership and market structure characteristics for the power produced.

Table 1.1 State Tax and Financial Incentives for Renewable Energy

State	Personal Tax	Corporate Tax	Sales Tax	Property Tax	Rebates	Grants	Loans	Industry Recruitment	Leasing/ Sales	Production Incentive
Alabama	1 S					1 S	1 U			
Alaska			1 S				1 S			
Arizona	2 S		1 S		2 U				2 U	
Arkansas		1 S						1 S		
California	2 S	1 S		1 S	3 S, 8 U	3 S	2 S, 1 U	1 S	3 U	
Colorado	1 S	1 S			1 L					2 L
Connecticut		2 S	1 S	1 S			1 S			
Delaware					1 S					
Florida			1 S		3 U	1 U				
Georgia	1 S	1 S					1 L	1 S		
Hawaii	2 S	3 S	1 S		1 S, 3 U		1 S			
Idaho	1 S									
Illinois				1 S	1 S	2 S				
Indiana				1 S		5 S				
Iowa		**1 S**	**2 S**	**3 S**		**1S***	**3 S**			
Kansas	1 S	1 S		1 S		1 S				
Kentucky										
Louisiana										
Maine										
Maryland	2 S	2 S	2 S	1 S	1 S		2 S			
Massachusetts	2 S	3 S	1 S	1 S	1 S	2 S				
Michigan						1 S				
Minnesota			2 S	1 S	1 S	1 S	2 S			2 S
Mississippi							1 S			
Missouri		1 S					1 S			
Montana	3 S	1 S		1 S		1 S	1 S	1 S	1 U	
Nebraska							1 S			
Nevada			1 S	2 S	2 U					
New Hampshire				1 S			1 S			
New Jersey			1 S		1 S					
New Mexico		1 S								
New York	1 S	1 S		1 S	2 S, 1 U	1 S	1 S			
North Carolina	1 S	1 S		1 S			1 S	1 S		
North Dakota	1 S	1 S	1 S	1 S						
Ohio	1 S	2 S	1 S	2 S			1 S			
Oklahoma		1 S						1 S		
Oregon	1 S	1 S		1 S	4 U		1 S, 3 U			1 U
Pennsylvania					1 L	1 S, 3 U	3 L			1 U
Rhode Island	1 S		1 S	1 S	2 S	1 S				
South Carolina					1 U					
South Dakota				1 S						
Tennessee							1 S			
Texas		1 S		1 S	1 U		1 U	2 S	1 U	
Utah	1 S	1 S								
Vermont			1 S	1 S						
Virginia				1 S			1 S	1 S		
Washington			1 S		1 S, 1 U		1 L	1 S		2 U
West Virginia		1 S		1 S						
Wisconsin				1 S	1 S, 1 U	2 S	1 S			
Wyoming									2 U	

S = State/Territory L = Local U = Utility/Energy Service Co.
Source: Database of State Incentives for Renewable Energy [6]

Table 1.2 State Policies on Renewable Portfolio Standards, Net Metering, Mandatory Green Power, Green Pricing, Installation Certification and Outreach

State	RPS	Net Metering	Required Green Power	Utility Green Pricing Programs	Voluntary Installer Certification Programs	Outreach Programs
Alabama				2		
Alaska						1 S
Arizona	1 S	1 S		3		1 S, 3 L
Arkansas		1 S				1 S
California	1 S	1 S		9	1 S	1 S, 9 L
Colorado		3 U		7	1 S	1 S, 3 L
Connecticut	1 S	1 S				
Delaware		1 S				1 S
Florida		1 U		8	1 S	1 S
Georgia		1 S		1		1 S
Hawaii	1 S	1 S		1		1 S, 2 L
Idaho		1 S		2		1 S
Illinois	1 S	1 U				1 L
Indiana		1 S		4		1 S
Iowa	**1 S**	**1 S**	**1 S**	**3**		**1 S**
Kansas				1		
Kentucky		1 U		2		1 S
Louisiana						
Maine	1 S	1 S				1 S
Maryland		1 S				1 S
Massachusetts	1 S	1 S				3 L, 1 U
Michigan				4	1 S	1 S
Minnesota	2 S	1 S	1 S	6		
Mississippi				2		1 S
Missouri				1		
Montana		1 S	1 S	1		1 S
Nebraska				3		
Nevada	1 S	1 S		1		1 S
New Hampshire		1 S				1 S
New Jersey	1 S	1 S				2 S
New Mexico		1 S				1 S
New York		1 S			1 S	1 S, 1 L
North Carolina						1 S
North Dakota		1 S		1		
Ohio		1 S, 1 U		1	1 S	1 S
Oklahoma		1 S				
Oregon		1 S, 1 L		9		1 S
Pennsylvania		1 S				1 S, 1 L
Rhode Island		1 S				1 S
South Carolina				1		1 S
South Dakota				1		
Tennessee				1		
Texas	1 S	1 S, 1 U		4	1 S	1 S
Utah		1 S		1		1 S, 1 L
Vermont		1 S				1 S
Virginia		1 S				1 S
Washington		1 S, 1-U	1 S	13		1 S, 1 U
West Virginia						
Wisconsin	1 S	1 S		7	1 S	1 S
Wyoming		1 S		1		1 S

S = State/Territory L = Local U = Utility/Energy Service Co.
Source: Database of State Incentives for Renewable Energy [6]

What "best practices" do states use for energy efficiency and to what extent are non-bypassable system-benefit charges (charges to consumers) used to fund energy efficiency programs?

A. Nature, Scope, and Context

A key characteristic of energy efficiency programs is that they potentially generate savings in future energy costs. A new technology or management practice becomes economically feasible to adopt when the value of the future savings is greater than the initial investment. In many cases, energy efficiency strategies generate sufficient savings to pay back the initial investment within a few years. In a world of perfect knowledge, all financially feasible energy savings strategies would be implemented. However, in the real world, for energy efficiency programs to work successfully, two conditions must be present. First, the appropriate business or household decision-makers must be aware of the opportunities for energy cost savings. Second, the financial rewards must be high enough and payback risks low enough so as to stimulate implementation of the energy efficiency practices and/or technologies.

One novel demonstration of the potential impacts of energy efficiency was co-sponsored by the U.S. Energy and Interior Departments along with a Rural Water Association in Bern, Kansas, a community of 204 people, in 1997 [32]. Local residents of the town washed a week's worth of clothes using existing washers to establish a baseline during an initial Saturday of the experiment. Then the old washers were replaced with Maytag donated Neptune™ washers. The 101 households washed their clothes again on a subsequent Saturday. A comparison of the results reported in *USA Today* showed the second wash used 36 percent less water and 57 percent less electricity than during the baseline wash. Prior to the experiment, the community was facing water shortage problems. The mass conversion to energy-efficient appliances helped to reduce the immediate need for water infrastructure expansion. This unique community experiment not only generated potential savings for individual households, but also infrastructure savings for the community and its taxpayers. The Department of Energy website reports that such washers may save an estimated $120 per year on the utility bill compared to the standard 10-year old model [30]. Recently, a media report indicated that Maytag will soon announce another innovative energy-efficiency design in the near future.

Not surprisingly, state policy initiatives for energy efficiency involve an array of public and private sector awareness and incentive programs. A comprehensive set of approaches potentially encourages use of energy-efficient technologies, management practices and energy-efficient designs for remodeling existing buildings and constructing new residential, commercial, industrial and public-sector facilities.

Funding sources may include public revenues, tax expenditures, earmarked user charges and fees, and/or mandated programs financed by utilities and their customers. One rationale for targeting user charges and fees is to align the revenue sources with the sectors and individuals who benefit from the energy savings programs. An example of this strategy is to collect a system-benefits charge (SBC) or fee applied to electricity bills of consumers and to fund energy-efficiency programs targeted to the consumers. In recent years, this approach has emerged in conjunction with passage of electric utility deregulation in many states. Another approach used in some states is to require utilities to provide energy-efficiency programs. The mandated program approach internalizes the costs that are paid by the utility and/or recovered from charges to customers. Since both approaches to funding represent attempts to internalize costs for those who benefit, the preferred approach may depend on policymaker preferences for delivery of programs. Targeted charges and fees are consistent with having energy-efficiency programs provided by state agencies, educational institutions, and other non-utility contractors. The mandated program approach is more consistent with having utilities deliver energy efficiency programs directly to their customers.

According to one source [34], 14 states other than Iowa have enacted a System Benefit Charge (SBC). Typically the charge is no more than 0.01 percent of the bill. By 2012, it is anticipated that these 14 state programs will annually collect $3.5 billion. The charges are used to fund various programs, such as support and development of wind, solar, geothermal, biomass, landfill gas, ocean-based, hydro, and fuel cells. The charges also support educational programs involving energy conservation and renewable energy.

If a state chooses to provide no energy-efficiency programs, a measurable drag on the economy potentially emerges long term. States that do provide energy-efficiency programs contribute to enhancing their economies to the extent that energy-efficiency programs generate future energy savings in excess of original investment costs.

B. Iowa Policies and Programs

Iowa is regarded as a leader in encouraging energy efficiency. The Energy Bureau of the Iowa Department of Natural Resources develops and updates a state energy plan [15]. The Governor’s Energy Policy Task Force recommended further energy-efficiency measures in its October 2001 report [28]. A stated goal of the current plan is to meet all future demand for energy by increasing efficiency rather than increasing supply. In addition, the Task Force recommended a consistent, statewide program of the delivery of energy-efficiency programs.

The Iowa Department of Natural Resources (IDNR) manages a comprehensive set of programs to promote energy efficiency funded in part from state and federal revenue sources, but also the savings from the energy-efficiency measures create incentives for implementation. For example, the Iowa Energy Bank also provides technical assistance and finances energy-efficiency improvements for public and non-profit institutions [14]. This program involves three steps starting with an initial energy audit. Second, engineers develop an energy-efficient equipment retrofit plan. Third, a lease-purchase agreement, or capital loan note is executed through a regional investment bank to finance the improvements, which are repaid from energy savings. This program is expected to facilitate more than $500 million in improvements using private funds in combination with minimal state and federal support.

Iowa has established similar programs designed for communities, industry and state government buildings. The Rebuild Iowa program is a collaborative initiative designed to help communities identify, implement and finance cost-effective energy-efficiency improvements.

The State of Iowa Facilities Improvement Corporation (SIFIC) is a nonprofit corporation that helps state agencies to implement cost-effective energy improvements. Website information indicates SIFIC has saved more than $77 million in energy costs to-date and avoided more than 400,000 tons of air emissions annually.

The Iowa Energy Center conducts energy-efficiency research, demonstrations and education projects. These projects cover a wide range of efficiency issues in Iowa's energy picture – addressing energy use in agriculture, industry, commecial businesses, municipalities and residential areas. The Center's research and demonstration programs are funded by a targeted utility charge. Iowa does not directly impose a system-benefits charge on utility customers. However, since 1990, Iowa has imposed a charge of one-tenth of 1 percent on gas and electric utility intrastate total gross operating revenues each year (Iowa Code 2003: Section 476.10A). Eighty-five percent of these revenues are allocated to the Iowa Energy Center for research on renewable energy and energy-efficiency research, demonstrations and education programs. Fifteen percent of these revenues go to the Center for Global and Regional Environmental Research at the University of Iowa.

In addition, the private sector is involved in energy-efficiency programs. The Iowa Utilities Board approves plans by rate-regulated utilities to provide energy-efficiency programs under Iowa Code 476.6, Subsection 19. The net added costs for energy efficiency programs are implicitly spread over the utility's customer billings. Such Energy Efficiency Plans are to include a range of programs tailored to the needs of all customer classes, including residential, commercial and industrial customers, for energy-efficiency opportunities. In addition, the energy-efficiency plans are to target low-income persons including cooperative programs involving community action agencies to implement energy-efficiency programs for low-income qualified households in the community or county.

A website for one investor-owned utility, for example, provides public information on energy-saving tips and do-it-yourself steps to make homes and businesses more energy efficient. In addition, there are (1) free home energy audits, (2) access to energy consultants, (3) low-interest financing for high energy-efficiency products through a proprietary lender, (4) rebates on high-efficiency furnaces, air conditioning, and heat pumps, (5) rebates of $20 per window for installation of high-efficiency replacements, and (6) rebates for new home construction using standards for energy-efficient homes. In one construction project, energy rebates amounted to $2,300 or 1.5 percent of the value of the new home.

While rate-regulated utilities in Iowa may provide appliance rebates as part of their energy-efficiency programs, Iowa has no general policy for providing rebates for energy-efficient appliances applicable to all energy users. As a leading manufacturer of energy-efficient washing machines, water heaters and other appliances, such a strategy would potentially provide Iowa with a two-pronged economic benefit — increased levels of appliance production and energy savings.

Finally, Iowa is phasing out the state retail sales tax applied to residential energy consumers. Starting in January 2002, Iowa began the process of phasing out the state sales tax levied on residential gas and electricity as well as home heating fuel services over a five-year period (2001, HF1). The sales tax rate declines by 1 percent each January 1 with the total tax eliminated by January 1, 2006. However, the local option sales tax will continue to be applied to residential gas, electricity and home heating fuel services after the January 1, 2006, date. Policymakers might consider broadening the system-benefit charges during the period that the sales tax is being phased out. Such a policy would cushion the economic impacts on residential consumers while expanding funds for energy-efficiency programs that would contribute to a reduction in future energy costs.

C. Innovative Programs in Other States

California and Illinois are two states that impose system-benefits charges (SBC) on consumer utility bills. Such revenue streams are not necessarily limited to use for energy-efficiency programs. The California Energy Commission allocates SBC revenues to four main accounts: existing technologies, new renewable resources, emerging technologies, and consumer programs. Each account is used to aid in the construction, production, and maintenance of renewable energy systems, along with educating the general public about renewable energy. California is the only state we have identified that allocates funds for existing renewable energy projects.

Illinois collects its funds through a $.50 charge per month from households and small business and $37.50 per month from larger energy consumers [6]. The state is expecting to receive about $100 million a year for about 10 years. About $200 million to $225 million of the fund is being used for energy efficiency and renewable energy programs, while another $25 million is being used on clean coal technologies. Illinois allows funds to be expended for the refurbishment of small hydro facilities [12]. Other states limit the use of these funds to new projects.

New York initially committed to a three-year program, with total funding of $234.2 million. Of that, $161 million was allocated for energy efficiency programs. New York also is using the funding to construct an additional 40 MW of wind energy, green buildings, and additional research and development. The funding also started the New York Energy $mart programs [6]. During the first three years, the program has saved consumers $121 million in utility bills, reduced annual electricity consumption by about 932 million kWh, and helped create or sustain 2,300 jobs. Ohio uses its funds as a loan program and for low-income individuals. Eligible program uses for the loan include solar energy, wind energy, biomass, hydropower and fuel cells.

Another approach for encouraging energy efficiency is for states to provide incentives for purchase of energy-efficient appliances. Some states provide sales tax credits, exemptions, or rebates on energy-efficient appliances. Appliances that exceed the minimum levels of Energy Star efficiency guidelines set by the U.S. Department of Energy and the Environmental Protection Agency are often eligible [1]. These tax incentives are applied to appliances such as clothes washers, air conditioners, heat pumps, water heaters and vehicles.

Maryland and Minnesota currently have enacted such Energy Star programs. Maryland is estimating that the program is costing the state $5 million over five years. Since the state of Oregon does not impose a state sales tax, an income tax credit is used. Oregon officials estimate that the income tax credits have been worth approximately $40 million to date.

Another type of tax incentive is represented by “green building” tax credits. A “green building” is a building that uses energy-efficient materials and construction methods. To offset the increased costs of green buildings, tax credits are being offered by New York, Maryland and Massachusetts [1]. New York determined that the extra costs of a given improvement would be paid back in about 10 years by utility bill savings. Massachusetts believed that the costs would be paid back within six years. The benefits associated with green building tax credits include, reduced utility costs, higher productivity, and reduced operating and maintenance costs. Some of the public benefits include a projected increase in employment, increased construction spending, reduced health costs, and reduced environmental costs.

Table 2.1 Broad-Based System-Benefits Charges and Eligibility of Renewable Resources*

State	Wind	Solar	Geothermal	Biomass	MSW	Ocean-based	Hydro	Fuel Cell**
CA	X	X	X	X	X	X	X	X
CT	X	X		X		X		X
DE		X						
IL	X	X		X			X	
MA	X	X		X	X	X	X	X
MT	X	X	X	X			X	X
NJ	X	X	X	X		X		X
NM	X	X	X	X			X	X
NY	X	X	X	X			X	X
OH	X	X		X			X	X
OR	X	X	X	X	X		X	
PA	X	X	X	X	X		X	X
RI	X	X		X			X	X
WI	X	X	X	X		X	X	X

* Iowa is not included since Iowa’s system-benefits charge is not applied directly to consumers.
Source: Lawrence Berkeley National Laboratory [33]

What are the experiences in the various states with net metering regulations?

A. Nature, Scope, and Context

Currently, 37 states have regulations on net metering for the utilities [6]. However, several differences occur across the states in terms of methods, eligibility, and sources of energy. Net metering regulations can often be a key element in determining the feasibility or lack thereof for wind, solar and biomass operations.

Net billing or net metering small customers who install an alternate energy or renewable energy facility to generate electricity primarily for their own use. Such customers often produce their own electricity with wind power when the wind is blowing or solar power when the sun is shining. However, these customers are also linked to the utility transmission or distribution grid so they can receive power from the utility when they are unable to generate sufficient power to meet their needs. Under certain conditions, these customers also sell electricity to the utility if they generate power in excess of their own needs.

Net metering allows smaller customers to "net" the power flows to and from the utility during the monthly billing period. Two meters are often used. One records power sent to the customer and the other records the power sent to the utility. With advancing technology, power flows in both directions can now be recorded with a single bi-directional meter that is in essence two meters in one. For example, if a net metering customer consumed 1,000 kWh from the utility in a month and generated 900 kWh, the customer would only pay the utility for 100 kWh. The meter runs forward and backward and at the end of the month only the "net" amount of power flow is measured. If the customer produces 1,100 kWh in a month, the excess sent to the utility company is accounted for or valued in different ways.

Many utility interests argue that this netting process in effect allows a customer to "sell" power generation back to the utility at the utility's retail rate, rather than the lower avoided cost rate as calculated in the Public Utility Regulation Policies Act of 1978 (PURPA). On the other hand, customers who generate their own power argue that they are simply using power that they generate. Policies in 37 states generally agree with the latter view when the customer generates less power than is used. However, the valuation of any excess power generated by the customer is handled differently. Here the methods for calculating avoided costs are relevant. Methods used to calculate "avoided costs" are typically designed to separate (1) avoided power generation costs of the utility from (2) the costs that the utility cannot avoid such as maintenance of transmission and distribution lines. Rates based on avoided costs are sometimes subject to negotiation.

Most states with net metering laws impose capacity or size restrictions on customer generation facilities and restrict the eligibility to customers that generate electricity using non-fossil fuels. The eligible energy sources typically include, wind, hydroelectricity, solar, geothermal, fuel cells, and biomass [6]. Many programs also restrict the peak amount of energy that can be produced for customer eligibility. Some states like Idaho and Iowa only require investor-owned utilities to have net-metering programs [8]. Most states with net metering laws implemented them after 1995. Many are still being evaluated and/or revised.

For a customer-owned generator such as a wind turbine to sell energy to the utility, the turbine must be connected to the utility's transmission or distribution lines. In addition, the wind turbine output must be in synchronization and at the same frequency as the utility. Turbine generators require equipment for conversion of direct current and alternating currents. For safety reasons all customers operating generators in parallel with the utility must be able to sense the loss of utility power and disconnect from the system when the power is down for maintenance or repair. Otherwise utility workers risk working on live power lines. So, interconnection costs and management becomes a factor in hooking customer power generation equipment up to the transmission and/or distribution system. In some states, customers contend that utilities overcharge for interconnection costs in order to discourage customers from purchasing their own power generation equipment and using the net metering option.

National Renewable Energy Laboratory (NREL) and other organizations are sources of information on net metering and limitations [22]. NREL recently evaluated net metering programs and concluded that it may encourage renewable energy, particularly in regions with higher energy costs. In some states, net metering is exempt from certain energy fees such as "exit" fees and "departing load" fees when electricity markets are deregulated.

B. Iowa Policies and Programs

In Iowa, only rate-regulated utilities are required to offer net metering to their customers who want to interconnect renewable energy facilities. Iowa's net metering rules are imposed by rulings of the Iowa Utilities Board as part of a 2002 settlement involving a net metering case that was before the Iowa courts. As a result, the net metering programs for Iowa's two major rate-regulated utilities, Alliant Energy and MidAmerican Energy, are somewhat different and unique. Alliant Energy applies a traditional net metering calculation that allows the customer to deduct power generated from the power used when the power generated is less than the power used. When more power is generated than is used, the net excess generation (NEG) is purchased by the utility at an avoided cost rate. The price for power generated based on the utility's avoided costs is less than the retail price.

MidAmerican Energy similarly allows the customer to deduct the power generated from the power used when the power generated is less than the power used. However, when more power is generated than used, the net excess generation (NEG) is credited to the customers account and deducted in the future during periods when the net usage by the customer is greater than the amount generated. Under this "power banking" approach, the customer that generates power potentially benefits by not having to pay the higher retail price of electricity. MidAmerican Energy does impose a 500 kW size limit for customers under this net metering program. The "power banking" approach potentially provides greater economic benefits as long as the difference between the retail price and the avoidance cost is greater than the time value (interest and opportunity cost) of power credited to the customer.

At a recent symposium, one Iowa utility official stated there has been steady growth in the number of customers who are seeking the net metering option and who want to connect generators to transmission and distribution lines to simplify their use of the electricity and/or to sell power back to the utility. In general, rate-regulated utilities may negotiate rates for projects above 100 kW, but must establish standard tariff rates for smaller customers.

In Iowa, rural electric cooperatives and municipal utilities are not required to offer net metering programs to individual customers. Trade associations for each group report some evidence of experimentation with net billing, but express reservations regarding mandating net metering due to the potential for load leveling management problems that could be experienced by smaller utilities serving many large customers with own generation capacity that rely on intermittent wind sources.

C. Innovative Programs in Other States

Minnesota's net metering program includes all utilities and eligible customers must have peak power generating capacity of less than 40 kW, with no statewide enrollment limit. Only renewable resources and co-generation are eligible for net metering. All net excess generation (NEG) is purchased back from the retailer at the "average retail utility energy rate." Minnesota is one of five states where net metering is imposed by legislative statute. In 2000, the Minnesota Department of Commerce reported that there were 110 facilities with net metering arrangements. Eighty facilities included wind turbines [20]. Twenty-three facilities included photovoltaic solar systems.

In Wisconsin, net metering is available only to customers of investor-owned utilities (IOUs), and only if those customers have a peak power output of less than 20 kW [33]. Monthly NEG is purchased by the utility at the retail rate for renewables, and avoided cost for non-renewables. All methods of energy production are applicable to net metering. Only Minnesota and Wisconsin purchase NEG at retail price.

In California, all utilities must offer net metering to all eligible customers. Eligible customers must have a peak capacity of less than 1,000 kW. Only solar and wind energy generation are eligible for net metering. Customers are billed annually, and any excess generation is granted to the utility. Some districts offer bi-directional time-of-use metering (real time metering) [6]. Los Angeles Department of Water and Power, the nation's largest municipal utility in the nation, is exempt from net metering.

In the late 1990s several utilities in several different states have challenged net metering, but regulations remain intact in most states [36]. Since net metering is relatively new in many states, consumers have not been greatly aware of the opportunities. In some cases, utilities do not actively promote net metering. For profitability and competitive reasons most utilities would prefer to use their own power generation facilities first. Additionally, consumers who wish to generate power must overcome the entry costs, potential legal obstacles, and the technical interconnection requirements safely.

Table 3.1 Summary of State Net Metering Programs throughout the United States

State	Utilities	Eligible Fuels	Eligible Customers	Limit of System Size	Limit of Overall Enrollment	Treatment of Net Excess Generation	Authority
AZ	IOU & REC	Renewables, cogeneration	All customer classes	<100 kW None	None	Monthly NEG purchased at avoided cost	Arizona Corporation Commission
AR	All	Solar, wind, hydro, geother-mal, biomass	All customer classes	25 kW (res) 100 kW (commer-cial/agri)	None	Not specified	
CA	All	Solar and wind	All customer classes	1,000 kW	None	Customers billed annually; excess gen. to utility*	Legislature
CO	Individual utilities	All resources	All customer classes	10 kW	None	NEG carried over month-to-month	Public Service of Colorado Company
CT	IOU	Solar, wind, hydro, fuel cell, sust. biomass	Residential only	No limit	None	NEG purchased at avoided cost	Public Utility Commission
DE	All	Renewables	All customer classes	25 kW	None	Not specified	
FL	Smyrna Beach Utilities	Photovoltaic	All customer classes		None	Not specified	Smyrna Beach Utilities Commission
GA	All	Solar, wind, fuel cells	Residential, commercial	10 kW (res) 100 kW	0.2 % of pvs. year's annual peak	NEG credited to next month; unused credits granted to utility without comp.#	
HI	All	Renewables, cogeneration, fuel cells, microturbines	Residential, commercial	10 kW	0.5 % of each utility's peak demand	Customer-genera-tors billed annually; excess gen. to utility	Dept of Business, Ec. Development & Tourism
ID	IOU	Renewables, cogeneration	Idaho Power only, residen-tial, small comm.	100 kW	None	Monthly NEG purchased at avoided cost	Public Utility Commission
IL	Com Ed only	Solar and wind	All customer classes	40 kW	0.1 % of annual peak demand	Monthly NEG purchased at avoided cost	
IN	IOU	Renewables, cogeneration	All customer classes	1,000 kW	None	Monthly NEG granted to utility	Public Utility Commission

* (CA) Also allows bi-directional time-of-use metering.
# (GA) At end of annual period, any unused credits are granted to utility without compensation.

IA	Rate-regulated utilities	Renewables	All customer classes	No Limit	None	Monthly NEG purchased at avoided cost	Iowa Utilities Board
KY	LG & E and KU	Solar, wind, micro-hydro	Residential, commercial	10 kW (res.) 25 kW (commercial)	None	NEG carried until next billing period, will not be paid	Kentucky Public Service Commission
ME	All	Renewables, fuel cells, recycled munic. solid waste	All customer classes	100 kW	None	NEG credited to next month; any unused credits granted to utility without comp.#	Public Utility Commission
MD	All	Solar	Residential, schools	80 kW	0.2 % of 1998 peak demand	NEG carried over to next month, otherwise not specified	Legislature
MA	All	Renewables, cogeneration	All customer classes	60 kW	None	Monthly NEG purchased at avoided cost	
MN	All	Renewables, cogeneration	All customer classes	40 kW	None	Monthly NEG purchased at "average retail utility energy rate"	Legislature
MT	IOU	Solar, wind and hydro	All customer classes	50 kW	None	NEG credited to next month; any unused credits granted to utility without comp.#	
NV	All	Solar and wind	All customer classes	10 kW	100 customers for each utility	Annualization allowed, no compensation required for NEG	Legislature
NH	All	Photovoltaic, wind, hydro	All customer classes	25 kW	0.05 % of annual peak	NEG carried over to each month	
NJ	All	Photovoltaic and wind	Residential, small commercial	No limit (100 kW proposed)	0.1 % of peak or $2 million annual fin. impact	NEG credited to next month; any unused credits purchased at avoided cost	
NM	All	Renewables, cogeneration	All customer classes	10 kW	None	Customer credits - utility has two options*	Public Service Commission
NY	All	Photovoltaic	Residential	10 kW	0.1 % of 1996 peak	NEG credited to next month; any unused credits purchased at avoided cost	Legislature
ND	IOU	Renewables, cogeneration	All customer classes	100 kW	None	Monthly NEG bought at avoided cost	Public Utility Commission
OH	All	Solar, wind, hydro, biomass, landfill gas, fuel cells, microturbines	All customer classes	No limit	1.0 % of peak demand for each retail electric provider	NEG purchased at unbundled generation rate, shown as credit on next bill	

(MT) At end of annual period, any unused credits are granted to utility without compensation.
* (NM) At utility's option, customer is credited on the next bill for (1) purchase of NEG at utility's avoided cost; or (2) kWh credit hour for NEG that carries over from month to month.

OK	All	Renewables, cogeneration	All customer classes	100 kW and annual 25,000 kW	None	Monthly NEG is granted to utility	Oklahoma Corporation Commission
OR	All	Solar, wind, fuel cell, hydro	All customer classes	25 kW	At least 0.5 % and utility's historic 1-hour peak load*	NEG purchased at avoided cost or credited to next month**	
PA	All	Renewables, fuel cells	All customer classes	10 kW	None	Monthly NEG is granted to utility	PECO Energy Company
RI	Narragansett Electric	Renewables, fuel cells	All customer classes	25 kW	1 MW	NEG credited to next month; any unused credits granted to utility without comp.#	Public Utility Commission
TX	IOU and REC	Renewables	All customer classes	50 kW	None	Monthly NEG purchased at avoided cost	Public Utility Commission
UT	All	Solar thermal electric, photo-voltaic, wind, hydro, fuel cells	All customer classes	25 kW	0.1 % of 2001 peak demand	NEG credited to next month; any unused credits granted to utility without comp.#	Utah Dept of Natural Resources
VT	All	Solar, wind, fuel cells using renewable fuel, anaerobic digestion	Residential, commercial, agricultural	15 kW, except renewables 125 kW for an. digesters	1 % of 1996 peak	NEG credited to next month; any unused credits granted to utility without comp.#	
VA	All	Solar, wind, hydro	Residential, commercial	10 kW (res.) 25 kW (commercial)	0.1 % of annual peak demand	NEG credited to next month; excess carries over to next annual period	
WA	All	Solar, wind, hydro, fuel cells	All customer classes	25 kW	0.1 % of 1996 peak, with no less than half for renewables	NEG credited to next month; any unused credits granted to utility without comp.#	Legislators
WI	IOU	All resources	All retail customers	20 kW	None	Monthly NEG bought at retail rate for renewables, avoided cost for non-renewables	Public Service Commission
WY	IOU and REC; Municipals exempt	Solar, wind, hydro	All customer classes	25 kW	None	NEG credited to next month; utility buys unused credits at avoided cost.##	

* (OR) Beyond 0.5 percent, eligibilty may be limited by regulatory authority.
** (OR) At end of annual period, unused credits shall be granted to low-income assistance programs, credited to customer or "dedicated to other use" as determined by regulatory authority.
\# (RI, VT, UT, WA) At end of annual period, any unused credits are granted to utility without compensation.
\## (WY) At end of annual period, unused credits are purchased by utility at avoided cost.

Sources: American Wind Energy Association [2]; Database of State Incentives for Renewable Energy [6]; and Wan, Yih-huei and Green [35].

What are the wage levels and benefits for jobs associated with renewable energy?

A. Methods of Analysis

In this report, the analysis of wages and benefits for renewable energy jobs relies on secondary data sources and governmental administrative data sets. Current wage data for all utility workers combine the data for three separate Standard Industrial Classification (SIC) codes. The three separate codes are electricity production and distribution (SIC 491), natural gas production and distribution (SIC 492), and other utility services (SIC 493). The wage data for Table 4.1 were obtained from the Iowa Workforce Development files and from the Bureau of Labor Statistics. After reviewing the SIC code definitions and data for counties in which wind farms have emerged, we conclude that many of the newly emerging renewable energy fields have been classified in the electricity production and distribution category (SIC 491) and other utility services category (SIC 493).

In addition, switchgrass and manure methane production activities are generally conducted in connection with ongoing farming enterprises, therefore 2001 farm income is used as an estimate for the opportunity costs for farm income generated from renewable energy jobs conducted in conjunction with farming enterprises. It should be noted that farm income might vary significantly from year to year and region by region.

Three multi-county clusters in Iowa (NC, NW, and SC) were selected for wage analysis purposes. Each area was selected due to the location of one or more renewable energy projects in the multi-county cluster area. However, individual county data are not available due to confidentiality limitations on the use of U.S. Census data. For example, the Northwest (NW) area includes one of the largest wind farms in the world, with 257 turbines producing 193 MW, enough power for 72,000 homes. The North Central (NC) area includes two utility scale wind energy facilities. One facility has 55 turbines with a capacity of 42 MW. The other has 89 larger turbines, which have a capacity of 80 MW. In addition the region is home to several utility scale wind turbines owned by school districts. The South Central (SC) area is centered on a project involving co-firing switchgrass with coal. A test burn was conducted for 100 hours and this project is still in an experimental stage.

It is important to note that wages paid by utility scale operations may be significantly different from the wages paid by smaller companies that may assign an employee part-time duties for maintaining smaller scale power generation equipment. Even for some smaller scale operations, however, maintenance of power generation equipment is sometimes specialized enough to warrant outsourcing with private companies under contract. For example, Waverly Power and Light owns three wind turbines. Two are a part of a distant wind farm and the third is located in the local area. All are maintained under contract by private entity.

In addition, wages for on-farm energy production such as manure biogas generation and switchgrass production are likely to be evaluated on an opportunity cost basis related to the crop production or general mechanic maintenance skills required for performing such activities. Thus, the opportunity provided by these activities are more often evaluated in terms of additional income generated relative to income from other alternative farming enterprises. Wages for such operations tend to increase as the skill-levels required increase and as the size of operation warrants assignment of at least one specialized full-time employee to manage and maintain specialized digesters, engines and turbine equipment.

B. Analysis of Findings

According to the results presented in Table 4.1, jobs in the electric and natural gas production and distribution services pay well above the state average wage for all jobs — averaging about $53,000 per year compared to $28,000 per year for the overall state average wage. At the county cluster level, these utility-related jobs also pay above the overall county average wage. To calculate the average wages for the multi-county cluster, the sum of all annual wages was divided by the sum of total employees. The utility job wage rates ranged from $40,000 to $50,000 per year compared to average wage for all jobs in the multi-county cluster at $22,300 to $24,000. Thus, wages for these sectors are nearly double the average for the counties.

The wage scale for electric and natural gas utility workers in non-metro counties in NW Iowa, NC Iowa, and SC Iowa generally average well below the overall state average for workers in these same sectors. Among utility sector workers, those in the other utility services category in NW Iowa are paid at the low end of the salary range, averaging about $40,000. This result is not too surprising given the relatively new nature of these wind energy jobs and the non-metropolitan location of the potential jobs in renewable energy enterprises.

Information on wage scales for wind-energy farm workers, analyzed using secondary data sources, are consistent with wage scales reported in the budget sheets included in economic impact studies done by BBC Consulting on wind farms in New Mexico and in Iowa [3]. Annual salaries for turbine maintenance technicians were budgeted at about $38,000 per worker in these reports, and would be in the range reported in the secondary data after adjustments for inflation.

Primary data contacts with a private company responsible for maintenance of a northern Iowa wind farm also confirm that the $38,000 to $48,000 salary range is accurate and that a standard benefits package is typically provided. During construction, a utility scale wind farm generates about one job for each 2-3 turbines. After construction is completed, the ongoing maintenance requirements generate about 1 fte of technicians and other workers per 10 to 15 turbines. It is also important to note that the industry size standard is increasing for new utility scale turbine construction projects. Two years ago, 1 MW turbines were marketed as the typical utility scale standard. Today 1.8 MW may well be the utility standard that is emerging for new wind farms. Some offshore turbines in Europe are approaching 5 MW capacity.

Based on the analysis of the secondary data supplemented with primary observations, we conclude that the wage rates earned by workers in the renewable energy field are likely to compare very favorably with prevailing wages in the counties where these facilities are located. These wage rates are likely to be below the statewide averages for electric and natural gas production and distribution workers. However, this result is not surprising given the non-metro location of most of the renewable energy jobs and the relative newness of these jobs. The renewable energy jobs are relatively new in comparison to wages for similar SIC codes that are reported in the statewide averages. So, we can expect the average wage for

Table 4.1 Pay Reported for Selected Utility Sectors and Farm Income

Job Category/ Region-Area	Average Pay by Job Category and Area	Percent Above or Below Iowa Average Pay
All Jobs (2000)		
Iowa Statewide	$ 27,976	Iowa Avg.
NW Iowa	22,376	- 20.0 %
NC Iowa	24,165	- 13.6 %
SC Iowa	25,370	- 9.3 %
All Utility Jobs (2000)		
Iowa Statewide	$ 52,263	86.8 %
NW Iowa	43,705	56.2 %
NC Iowa	52,465	87.5 %
SC Iowa	46,099	64.8 %
Electric Services: SIC Code 491X (2000)		
United States	$ 63,819	128.1 %
Iowa Statewide	48,943	74.9 %
NW Iowa	43,736	56.3 %
NC Iowa	42,259	51.1 %
SC Iowa	36,557	30.7 %
Gas Services: SIC Code 492X (2000)		
United States	$ 73,268	161.9 %
Iowa Statewide	53,907	92.7 %
NW Iowa	49,555	77.1 %
NC Iowa	67,058	139.7 %
SC Iowa	26,501	- 5.3 %
Other Utility Services: SIC Code 493X (2000)		
United States	$ 65,086	132.6 %
Iowa Statewide	53,547	91.4 %
NW Iowa	40,975	46.5 %
NC Iowa	50,391	80.1 %
SC Iowa	48,505	73.4 %
Net Farm Business Income/Farm (2001)		
NW Iowa	$ 31,247	11.7 %
NC Iowa	21,053	- 24.7 %
SC Iowa	20,100	- 28.7 %

Sources: Iowa Workforce Development Department, Bureau of Labor Statistics, Iowa State University Extension.

Definitions:

NW Iowa – Northwest Iowa county cluster

NC Iowa – North Central Iowa county cluster

SC Iowa – South Central Iowa county cluster

All jobs – is the average wage of all paying jobs, including electric and gas utility services.

All utility jobs – all paying jobs in the electric and gas utility services sector.

SIC Code 491X – all paying jobs in electric power, distribution, and services sector.

SIC Code 492X – all paying jobs in the gas production and distribution sector.

SIC Code 493X – all paying jobs in other/ new combination utilities – electric power distribution, and services sector.

Net farm business income / farm;
Based on comparison of regional Farm Business Association accrual net farm income.

the renewable energy sectors to grow relative to other similar sectors over time as this new industry matures. As an industry matures the wages paid in the sector will reflect greater lengths of employment by employees — a key explanatory factor in wage levels.

Finally, the fiscal impact of renewable energy facilities on communities in the region are likely to depend on the scope and scale of operations and the ownership business structure. Several studies suggest that the direct employment for such facilities may be small in relation to the indirect employment generated and that utility scale operations are more likely to attract additional specialized equipment manufacturing functions to the area. Also in the case of wind farms, the farmland lease payments to landowners are likely to be small in relation to the returns to capital investment in turbines, etc. So, to the extent that such renewable facilities generate profitable equity returns to ownership, a greater share of the returns will be retained in the local area if facilities are owned by local private investor groups, area cooperatives, and/or municipal utilities in contrast to ownership by nationally traded public companies.

Observations and Potential Issues in Iowa Policy and Energy Markets

This review of Iowa policies and innovative programs from other states provides a basis for identifying several potential issues that may be of interest to Iowa policymakers, leaders, and citizens.

A. Increasing Iowa's Renewable Portfolio Standards. From a historical perspective, Iowa's renewable portfolio standard (RPS) is credited for providing the stimulus for much of the renewable energy production that is now available in the state. Iowa's renewable portfolio standard (RPS) requires rate-regulated utilities to purchase 105 MW of renewable capacity. The RPS was met in 1999 and has since been surpassed. In 2001, the Governor's Energy Policy Task Force recommended a new renewable production goal of 1,000 MW by 2010. However, this goal has not been adopted by legislative action. Therefore at this point, such a goal only represents a recommendation for which there is no penalty if the goal is not reached.

B. Expanding the Iowa Renewable Portfolio Standard with a Certificate Market. Iowa's current renewable portfolio standard (RPS) only requires rate-regulated utilities to purchase renewable capacity. Iowa's two rate-regulated utilities — MidAmerican Energy and Alliant Energy — account for 70 percent of Iowa's power. Rural Electric Cooperatives and Municipal Utilities are excluded from the required renewable energy purchases in Iowa. Other states such as Texas and Wisconsin require all utilities to purchase green power. Recognizing that not all smaller and localized utilities are in position to efficiently use renewable energy facilities due to proximity and other factors, other states have facilitated the development of markets to trade green power certificates. These certificates can be sold by utilities that are in position to use renewable power and bought by those who cannot. Starting in January 2004, all Iowa electric utilities (rate-regulated, rural electric cooperatives, and municipal utilities) are required to offer green power purchase programs to their customers under Iowa's Mandatory Utility Green Power Option. Whether a certificate market should be based on utility purchases, consumer purchases, or a combination is a subject for further examination. To appropriately position Iowa, Iowa policymakers and industry officials may wish to examine more in depth the potential and emergence of national markets for renewable energy certificates.

C. Offsetting Sales Tax Phase Out With System-Benefits Charges. Iowa is currently phasing out the state retail sales tax applied to residential energy consumers. The sales tax rate declines by 1 percent each January 1 with the total tax eliminated by January 1, 2006. Broadening the system-benefits charges during the period that the sales tax is being phased out potentially cushions the economic impact on residential consumers at the same time that expanded energy efficiency program incentives would contribute to a reduction in future energy costs. The novel communitywide Bern, Kansas, experience from replacing old washers with Maytag Neptune™ washers created an estimated 36 percent savings in water and 57 percent savings in electricity is just one example of potential outcomes from energy efficiency programs.

D. Investment Preferences for Local Institutions to Retain Local Benefits. Based on the analysis of the secondary data supplemented with primary observations, we conclude that the wage rates earned by workers in the renewable energy field are likely to compare very favorably with prevailing wages in the counties where these facilities are located. To the extent that such renewable facilities generate profitable returns to capital investment and ownership, a greater share of the returns will be retained to benefit the local area if facilities are owned by local private investor groups, area cooperatives, and/or municipal utilities in contrast to ownership by nationally traded public companies.

E. Equal Access to Policy Incentives. Because rate-regulated utilities, rural electric cooperatives and municipal utilities often operate under different rules for renewable portfolio standards, net metering, and energy efficiency programs, Iowa utilities and their consumers do not necessarily possess equal access to renewable energy development opportunities or energy efficiency measures. A renewable energy project that may be feasible and of interest to one utility may not be of interest or economically feasible across the section in another utility's service area. Rate regulated utilities are required to provide net metering opportunities not available in other service areas. Rebates for energy efficient appliances may be offered by rate-regulated utilities, but may not be available through other power providers. Iowa has taken a potential necessary step for creating a level playing field. Starting in January 2004, all Iowa electric utilities (rate-regulated, rural electric cooperatives, and municipal utilities) are required to offer green power purchase programs to their customers under Iowa's Mandatory Utility Green Power Option. Each utility must file its green power plan and tariffs with the Iowa Utilities Board. Therefore, the opportunity to harmonize renewable energy polices currently rests with the IUB and/or further authority and direction by the General Assembly.

F. Technology-Neutral Policy Incentives. Should Iowa policy and federal policy for that matter promote technology neutral public policy incentives? At a recent ISU Symposium, representatives of wind power interests suggested federal Production Tax Credits (PTC) and Renewable Energy Production Incentives (REPI) provided a measure of neutrality in incentives available among investor-owned utilities, cooperatives and municipal utilities interested in wind farms and that it was important to gain federal reauthorization of both. However, others representing solar, biomass, and other technologies, argued that such incentives were not available to them. Each technology has potential limitations for which others do not. For example, wind turbines are limited when the wind doesn't blow and solar panels are limited when the sun doesn't shine. Technology-neutral incentives allow the emerging technologies with the most potential for efficiently enhancing productivity and economic returns to successfully emerge from the incentive framework. If the incentive structure favors one technology over the others, then the potential for achieving maximum benefits for society from renewable energy become arbitrarily limited. It should be recognized that it may be difficult for state policies to offset imbalances created by federal policy.

G. Scale-Neutral Policy Incentives. Should Iowa policy encourage development of the most efficient size of renewable energy projects or should preferences be given to smaller operations in renewable energy project development? Net metering programs, for example, tend to emphasize development of small-scale equipment sufficient for generating power for a single customer's own use. Consumers who produce power for their own use essentially receive retail prices. Larger scale projects are more likely to receive prices more akin to "avoided" costs. Avoided costs that are calculated by utilities for existing coal plants may range from 1.5 cents to 2.5 cents per kWh. Many of the existing plants were constructed before the Clean Air Act and continue to receive exemptions to keep consumer costs lower. Power generated from newly constructed power plants may cost 3.5 cents to 4 cents per kWh or more. Utility scale wind farms may generate power from 2.7 cents to 4 cents per kWh. In terms of pricing for power generated, it appears that some renewable projects may qualify for pricing at retail cost, some are priced at avoided cost, and some receive a negotiated price that is not publicly disclosed. Thus, policymakers must balance the new technology development and distributed power generation benefits provided by small-scale operations against the longer run benefits of a uniform pricing policy that may tend to encourage the most efficient scale of power generation facilities. A full analysis of the scale questions would require delving into the question of distributed power. Small systems hooked to the system at the distribution level have many advantages that we are unable to analyze in this brief report.

H. Public Information on Prices and Contracts. Purchase prices for power generated from the utility scale wind farms in Iowa are arrived at via sealed bidding processes and filed with the Iowa Utilities Board; however the prices at which power is bought and sold remain confidential. While some utility and wind generation interests may seek to keep price information confidential for competitiveness reasons, the lack of public pricing information for renewable energy projects potentially impedes the ability of other potential project sponsors from assessing opportunities, project feasibility, and entry into the industry. Open market conditions imply that buyers and sellers have equal access to market information such as prices paid and contract terms. If this is not the case, then conditions for "unequal and potentially unfair" bargaining power may exist in the market. Public information on market prices and purchase contracts can be key elements in generating feasibility studies and due diligence for potential investors. For example, Iowa does have public disclosure laws for agricultural contracts to assure fair marketing practices. When entrepreneurs are unable to find reliable price information and contract terms, they are less likely to commit resources for even considering the potential opportunities available. Under the current system, some renewable producers receive price incentives that are different from those received by other producers. The rationale for current practices may rest on existence of externalities or other policy objectives. If no rationale is present, public reporting of price and contract information would potentially help to create a more efficient market for renewable energy. This lack of information was pointed out in an earlier IPP sponsored report by Swenson and Eathington [27]. It can be argued that if Iowa wishes to promote renewable energy projects that are economically feasible long term, then prices and contract terms for power purchases should be transparent to all who may wish to consider the feasibility of renewable energy projects.

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