Executive Summary

Statewide Economic Values of Alternative Energy Sources and Energy Conservation

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A report for

The Iowa Policy Project

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By David Swenson & Liesl Eathington

Development of alternatives to traditional energy production has for many years held an attraction for those who want to move away from use of nonrenewable, polluting fossil fuels to generate electricity. The Governor's Energy Policy Task Force has proposed a legislatively established goal of achieving 1,000 megawatts (MW) of renewable energy generating capacity by 2010. This comes as Iowa utilities are preparing for or planning new electric generating stations fired by coal and natural gas. An expansion of alternative energy sources, to be considered seriously, requires a review of the economic implications of this alternative course.

This report estimates economic values associated with three energy scenarios. The first two entail alternative energy production in Iowa, while the third involves a set of energy conservation measures that have been compiled by state officials. These values are estimated using an input-output model of the Iowa economy. (See Page 2.) These economic results would be independent of health-cost reductions or environmental benefits due to better air quality, which we do not address.

The basics of the three analysis scenarios are, in summary:

- Isolating the total economic value associated with both current and near-term electricity production from wind sources in Iowa.
- Isolating the total economic value associated with substituting switchgrass for 5 percent of the average capacity from traditional coal-fired plants.
- Isolating the current-dollar savings to commercial establishments, institutions and households attributable to demand-side energy conservation measures implemented during the past decade.

Scenario 1. Iowa's Wind-Energy Industries

Iowa is a desirable state for wind-energy production, ranking 10th nationally in potential. Developers are acting on this potential. Iowa has or soon will have 650 medium- to large-scale wind turbines, which will annually produce 1,554,785 megawatt-hours (MWh) of electricity. This production is equal to 3.6 percent of the total amount of electricity produced in Iowa in 2001. The following table shows the input-output model estimates of the direct, indirect and induced economic effects of investments in present and planned wind-energy production. (For an explanation of the input-output method of analysis, see the box on Page 2.)

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This project was conducted privately for The Iowa Policy Project and should not be construed as an Iowa State University or a State of Iowa study.

Table S1. Wind Energy Production: Total Economic Values

	Direct	Indirect	Induced	Total
Total Industrial Output (sales)*	$ 116,526,782	$ 43,224,373	$ 16,082,438	$ 175,833,593
Labor Income	2,466,200	17,811,540	6,016,411	26,294,151
Value Added (inc. labor income)	65,509,831	28,973,576	10,158,833	104,642,240
Jobs	65	519	268	852

*Total Industrial Output: gross sales of electricity, plus subsidies.

The study found that 1,554,785 MWh of wind-produced electricity produces $116.5 million in direct industrial output (gross sales of electricity and federal production subsidies). This includes $65.51 million in earnings to workers, payments to investors and indirect taxes, and 65 jobs. With spinoff effects seen from the input-output model of the Iowa economy, the industry can account for $175.8 million in total industrial output and 852 jobs.

Scenario 2. Switchgrass to Energy

Electricity can be generated by co-firing switchgrass in a coal-fired power plant. Switchgrass, a perennial plant grown on conservation land or for forage or landscaping, has no clear market in Iowa. It has been promoted as an alternative energy source because it is environmentally sustainable and it will provide farmers an alternative crop option. This scenario, reported in Table S2, benefited from recent test-burn data at the Alliant plant near Ottumwa, Iowa, which was monitored by the U.S. Department of Energy and the Iowa Department of Natural Resources, and from recent Iowa State University research carefully accounting for the costs of switchgrass production in Iowa.

The 45 MW of switchgrass to electricity capacity, which at continuous production would be equivalent to a 38.25 MW capacity level, would create a demand for 274,013 tons of switchgrass annually. At this level of production, farmers would directly produce $16.3 million in industrial output, which would mean $6.4 million in payments to workers, farmers, and investors, and 331 jobs. Economic spinoffs included, this production would yield $26.6 million in

What we're measuring: Economic values

In Tables S1-S3, values include both direct and spinoff effects. **Direct values** are amounts directly associated with the industry being studied. **Indirect values** include purchases by the industry and employment supported by them. **Induced values** result from spending by workers in the industry being studied and some spending by workers in the supplying firms. **Total values** are the sum of those categories. Information from the input-output model in this study measure:

- **Industrial output –** Generally, a measure of sales in a year. See footnotes with each table.
- **Labor income –** Workers' earnings and normal return to sole proprietors.
- **Value added –** Labor income (above) and investors' earnings.
- **Jobs –** Positions; most manufacturing jobs will be full time, full year; in the agriculture sector, many jobs will be part time or seasonal.

Input-output modeling basics

Input-output modeling (I-O) is a method of economic analysis that helps us to understand the extent and value of transactions among industries, households, institutions, and with the rest of the nation and the world. An I-O model is an accounting of these transactions for a particular region. It is a static model that uses relatively current information about an economy to simulate how that economy reacts to changes in industrial output; returns to workers, owners, and investors or to changes in the regional supply of specific commodities. I-O models help us to quantify a range of industrial interactions and outcomes. For a full explanation of I-O modeling, see our full report at www.iowapolicyproject.org.

Table S2. Switchgrass for Energy: Total Economic Values

	Direct	Indirect	Induced	Total
Total Industrial Output (sales)*	$ 16,281,842	$ 6,608,523	$ 3,729,472	$ 26,619,837
Labor Income	4,395,731	1,998,976	1,393,624	7,788,332
Value Added (inc. labor income)	6,377,662	3,573,036	2,350,424	12,301,121
Jobs	331	77	62	470

*Total Industrial Output: gross sales of switchgrass produced for energy.

industrial output considering all sectors of the economy and 470 total jobs. The major impact of substituting switchgrass for coal is to take dollars that were previously flowing to out-of-state coal producers and, instead, to put them in the pockets of Iowa farmers and others in Iowa who depend on the spending of those farmers.

Scenario 3. Demand Management Energy Savings

For years the Iowa Utilities Board has documented savings to the state from energy conservation (demand-side energy management). In 2000, the IUB documented 1,027,352 MWh of energy savings from residential energy efficiency programs, nonresidential energy efficiency programs, and from load management practices. This savings value grows annually as businesses and households continue to adopt energy-saving practices and purchase energy-saving appliances.

Table S3. Energy Conservation, 2000: Total Economic Values

	Direct	Indirect	Induced	Total
Total Industrial Output*	$ 41,051,848	$ 5,680,075	$ 6,592,351	$ 53,324,273
Labor Income	9,216,479	2,132,129	2,468,736	13,817,344
Value Added (inc. labor income)	15,610,813	3,190,561	4,155,323	22,956,696
Jobs**	423	79	111	612

*Total Industrial Output: energy conservation savings that were converted to household spending.
**The first three columns do not add to the total 612 due to rounding.

Of the 1,027,352 MWh in energy conserved, 20 percent (208,378 MWh) was for residential (household) programs, and 80 percent (818,874 MWh) was for nonresidential users. Energy conservation measures in 2000 saved residential users $16.8 million and saved nonresidential users $39.5 million.

These values were converted into residential savings and reduced business costs, which were then translated into higher returns for workers, owners and investors. When converted into household spending and entered into an input-output model of the Iowa economy, the kilowatt-hour savings yield the following economic outcomes: $53.3 million in total industrial output, $22.96 million in value added, which included $13.8 million in labor income, and 612 jobs.

Key Findings

Alternative energy development offers an opportunity to retain and generate dollars in Iowa.

In terms of industrial output, our analysis finds that every $1 million in wind-energy production (sales of electricity) supports $508,954 in spinoff sales in all other Iowa industries. This compares with a $244,811 spinoff effect for every $1 million in the industrial output of all other, mostly coal-fired, electricity production. An important factor in this difference is that all other electricity producers must obtain fuels – coal, fuel oil and natural gas – from outside of Iowa. Secondly, the price for wind includes a federal subsidy, and, third, the initial wind farms in Iowa received a price higher than wholesale power costs of traditional sources. Compared to traditional electricity production in the state, wind energy has a higher output multiplier – its spinoffs in the state economy are greater. There are only small differences in job and income effects between wind energy production and other electricity industries in Iowa, as demonstrated in Table S4. Because of this, policymakers may consider other grounds – including environmental and health aspects that we do not consider in this study – to encourage different energy production choices. The wind industry generates a similar number of jobs per $1 million of production as traditional utilities, but its average labor income per $1 million of industrial output is lower than for traditional utilities.

Table S4. Wind Energy and Switchgrass Co-Firing vs. Other Electricity Industries in Iowa: Estimated Total Economic Effects Per $1 Million in Direct Output

	Wind Energy	Switchgrass	All Electrical
Total Industrial Output	$ 1,508,954	$ 1,634,940	$ 1,244,811
Labor Income	225,649	478,345	289,854
Value Added	898,010	755,512	971,093
Jobs	7.3	29	6.9

Alternative energy development will reduce demand for and burning of coal in Iowa.

All of the energy scenarios reduce coal imports to the state. Not only does less money flow out of the Iowa economy to pay for the coal, but pollution from the coal is eliminated. We have left the analysis of environmental benefits to others, but we note that the decrease in coal use from the three scenarios is significant.

Table S5. Out-of-State Coal Purchases Redirected Under Three Scenarios

Wind energy (3.6 % of total electric output)		980,000 Tons
Switchgrass (45 MW co-fired with coal)*		213,700 Tons
Energy Conservation programs existing in 2000		638,200 Tons
Total Coal Savings – Actual and Potential		1,831,900 Tons
at $15/Ton =	**$27,478,500**	

*This figure reflects 38.25 MW of continuously used capacity. A new coal-fired plant operates 85 percent of the time. Thus, 45 MW of capacity fired by switchgrass translates to 38.25 MW of continuous operation.

Augmenting coal with switchgrass will not significantly affect costs to consumers.

Switchgrass is more expensive, per unit of heat produced, than traditional fuels. At current costs of production, were a 900 MW capacity plant to include 45 MW of capacity co-fired by switchgrass, it would increase total fuel costs by 16.5 percent. Other costs of production would not increase, however, and the average increase in total electricity costs from such a plant would be just 2.1 percent. In order to make this option competitive with other, traditional forms of energy, it is likely that subsidies will need to be paid to producers of switchgrass or to the utilities using it. These subsidies might include permitted harvesting of switchgrass from Conservation Reserve Program (CRP) acres and a federal production tax credit.

Energy conservation saves Iowa residents and businesses millions

Residential and non-residential energy efficiency programs already in place in Iowa have reduced energy consumption. The resulting money saved is freed up to be spent on other goods and services. Much of this spending accrues to Iowa businesses and residents; the end result is about $53 million in annual sales of goods and services in other sectors of the Iowa economy resulting from the savings in utility bills.

Policy Conclusions – The Iowa Policy Project

This report demonstrates the economic effects that flow from the development of two alternatives to traditional energy production and from energy conservation measures already in place. The authors were commissioned by the Iowa Policy Project to make this economic assessment; they were not asked to make policy recommendations. Based on their study, the Iowa Policy Project makes the following conclusions and recommendations.

There are important benefits to the Iowa economy from developing renewable energy resources and expanding energy conservation. Direct spending inside the state by energy industries, their employees and their customers has direct effects and spinoff effects on other industries in the state economy. Policies that will encourage development of renewable energy and energy conservation will keep more Iowa dollars in the state, working for Iowans. Our recommendations:

Increase the percentage that utilities should purchase or produce from renewable energy.

Both wind-energy and switchgrass co-firing have been demonstrated to be workable energy strategies for Iowa, carrying potential for direct benefits and economic spinoffs. Growth in renewable energy would increase the benefit to the Iowa economy. Increasing the present state-established mandate for renewable capacity will benefit Iowa.

Renew federal production tax credits for renewable energy.

Federal production tax credits are important to current wind-energy generation in Iowa and to the economic values noted in the study. These expired at the end of 2001. A permanent loss of such subsidies could slow the development of wind sites in Iowa.

Provide federal Conservation Reserve Program (CRP) payments for land where switchgrass is grown and harvested.

At this stage in its development, the switchgrass industry requires extra-market support. Allowing Conservation Reserve Program participants to harvest their switchgrass crop for biomass could increase the potential participation of farmers. In addition, the federal production tax credit should be changed so it can apply to switchgrass.

Encourage energy efficiency programs that lead to further savings in importation of fuel, especially coal.

Energy efficiency programs not only save money for energy consumers, but provide them with more disposable income to spend in the state. Conserving energy also reduces the demand for coal imports.

Gather information at the state level from wind generators about the costs of wind-energy production, and ensure reasonable public access to the portions of that information that are relevant to the formation of public policy

Wind producers are receiving subsidies, and seek public policies that encourage further wind-energy development. For policymakers to make accurate decisions, producers should be required to open their books to regulators, just as investor-owned utilities are required to do.

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.