

Clean Energy Economic Development Series

IOWA'S WIND ENERGY JOURNEY



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Prepared by Collaborative Economics
for Environmental Defense Fund

Report prepared for

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ABOUT THIS REPORT

Collaborative Economics has analyzed the clean energy economy in all 50 states for the Pew Charitable Trusts and National Governors Association, and for many states and communities from California to Delaware, from Silicon Valley to St. Louis. Collaborative Economics published the country's only Green Innovation Index, focusing on changes in jobs, companies, financing, and other indicators of innovation in California. As importantly, we have worked directly with practitioners at the state and local levels all across the country to develop strategies to encourage development of clean energy sectors.

We have been struck by the determination with which public and private sector leaders are working together to turn the clean energy opportunity into an economic development "win" for their state or community. They focus on the basic "blocking and tackling" of job creation - encouraging market growth, streamlining permitting processes, making strategic investments, training workers, and helping companies find places to grow.

Through tracking the experience of individual firms in the clean energy sector (see LessCarbonMoreJobs.org), Environmental Defense Fund research continues to show that job creation in the clean energy sector - as in all sectors - must begin with creating customers. A focus on job training that ignores the need to simultaneously create customers may see trained job seekers, but little actual hiring. In contrast, regions that focus on nuts and bolts efforts, particularly in the key areas of market demand (notably creating customers now), seeding innovation, company recruitment and workforce development, are most likely to succeed.

The clean energy economy is growing, state by state, community by community, across the country. Job creation and private investment in manufacturing, installation, R&D, and other services are signs that the market is rewarding innovative, competitive companies. The reason for this success goes well beyond any single public policy, investment, or training program. Indeed, the formula that is working is a mix of federal, state, and local government initiatives, private sector economic development efforts, and industry associations and collaborations. It is also the result of bipartisan efforts to help stimulate market demand, seed innovation, then capture the economic benefits for people and places in these states. While these actions can occur independently, economic growth can be more successful with a multi-faceted approach that involves collaboration across sectors and stakeholders.

Every state and community that has experienced the benefits of a growing clean energy economy has blazed its own trail. Each one has a distinctive energy mix, set of natural assets, and existing industry strengths in manufacturing, agriculture, research, or other areas. What they have in common is the recognition that clean energy is a tangible opportunity for economic growth, just as it was biotechnology, information technology, or other opportunities in years past. In these states and communities, leaders find more reasons to work together on practical steps to promote job creation, than oppose one another to gain political advantage.

Their stories - their journeys - are clearly in the early stages. They would be the first to say they have a long way to go. But, as Colorado, Iowa, Ohio, and others have shown, states and communities can take action and get results in the form of new jobs, companies, and innovation that helps meet immediate needs and set the stage for future economic growth.



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OVERVIEW OF IOWA'S ECONOMIC JOURNEY INTO WIND ENERGY

Iowa has demonstrated that the wind energy industry has tremendous potential to contribute to local economies. In recent years, Iowa's wind energy activity has surged and the state is now one of the nation's top wind employers with more than 6,000 jobs (AWEA, 2012a).

- **Iowa is a leader in wind installations** with the second highest installed wind capacity in the nation and is one of only two states that receive over 20 percent of electricity from wind power (AWEA, 2012a; and Wisner and Bolinger, 2012). Iowa's growth was kick-started by the nation's first renewable portfolio standard passed in 1983.
- **Iowa is an epicenter of wind activity because it is the state where supply meets demand and is home to world leaders in the wind industry.** Iowa has leveraged its historical manufacturing strength to flex capacity into wind component manufacturing and has attracted more major wind industry manufacturers than any other state (AWEA, 2012a). Companies have been drawn to Iowa by its skilled workforce, transportation infrastructure, availability of industrial suppliers, local customer base, and bipartisan support from Iowa leaders. Iowa's strong wind manufacturing supply chain is boosted by the aggressive pace of installations in the state and surrounding areas. Iowa is ready to continue to expand wind installation and business opportunities throughout the value chain.
- **Iowa community colleges and universities are leading the way in terms of training the wind industry workforce.** Iowa's community colleges are aggressively training wind energy technicians and analysts, and nearly all of Iowa's 15 colleges have wind training courses. Iowa Lakes Community College had one of the first wind technician training programs approved by the American Wind Energy Association (AWEA, 2012c). Iowa universities are increasingly expanding into wind-related programs and research in collaboration with industry partners.

How has Iowa built its wind energy economic sector? Iowa's success cannot be attributed to any single effort; stakeholders have worked across jurisdictions, companies, and political party lines to collectively build a robust, diverse wind energy economy.

Stakeholders have worked collaboratively to stimulate demand for wind energy products and services, foster wind energy innovation, and help the state capture economic benefits from the sector's growth. Building off the state's history in manufacturing, its talented workforce, and rich renewable energy resources, Iowa has successfully diversified its economy and become a leader in the wind energy industry.

Iowa's clean energy economy is centered on the wind, biofuels, and energy efficiency sectors and includes companies across the value chain, ranging from wind component manufacturers and biofuel producers to energy efficient construction. Workers in the renewable energy sector are even more varied than the companies; installers, technicians, sales representatives, engineers and scientists all contribute to the renewable energy economy.

Given the depth and breadth of activities occurring throughout Iowa, this report will focus primarily on the wind industry to demonstrate how Iowa has developed a strong clean energy economy. This report will first discuss the actions Iowa stakeholders have taken to stimulate market demand, seed innovation, and capture the economic benefits, and then show the results of those actions to date.

IOWA'S WIND ENERGY ECONOMY ACTIONS

A robust clean energy economy is based on strong customer demand for products and services with ongoing innovation to advance the sector.

A region can develop all or part of this economy locally through focused actions in three different categories: stimulating demand, seeding innovation, and capturing economic benefits. These types of actions may be focused in just one category, but sector growth can be more successful with a multi-faceted approach that involves collaboration across sectors and stakeholders.

A diverse set of stakeholders play roles in building a strong wind energy economy. These stakeholders can include local, state, and federal government, as well as private companies, academic institutions, and organizations. Iowa stakeholders have worked across sectors to create a unique atmosphere that fosters a growing wind energy economy. The Iowa Action Timeline in Figure 1 exhibits a sample of actions that have helped stimulate demand, seed innovation, and capture the economic benefits of the wind energy industry. Iowa's stakeholders consistently employed strategic actions across all three categories, pulling forward end market growth as well as pushing markets into new innovations and local production and installation since the 1980s. These actions are explained in greater detail in the following sections.

ACTIONS TO BUILD THE WIND ENERGY ECONOMY

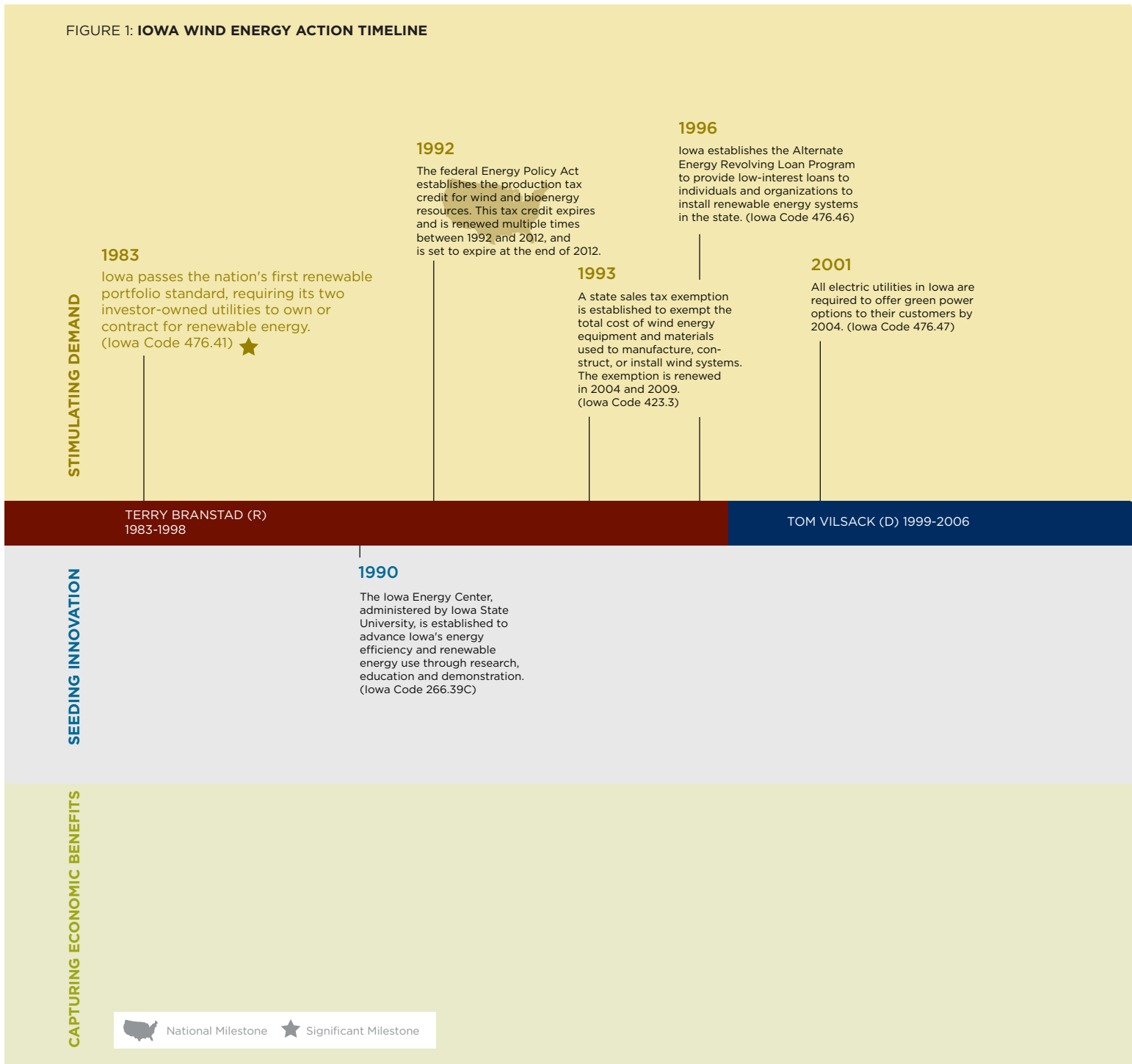
Stimulating Demand - Initiatives that increase consumer demand for wind energy by increasing affordability, removing barriers, or setting standards for clean energy.

Seeding Innovation - Actions to increase local wind energy innovation by investing in research and development, funding new startup companies, or creating supportive networks.

Capturing Economic Benefits - Actions to recruit and support wind-related companies while also promoting and aligning job creation and workforce development.



FIGURE 1: IOWA WIND ENERGY ACTION TIMELINE

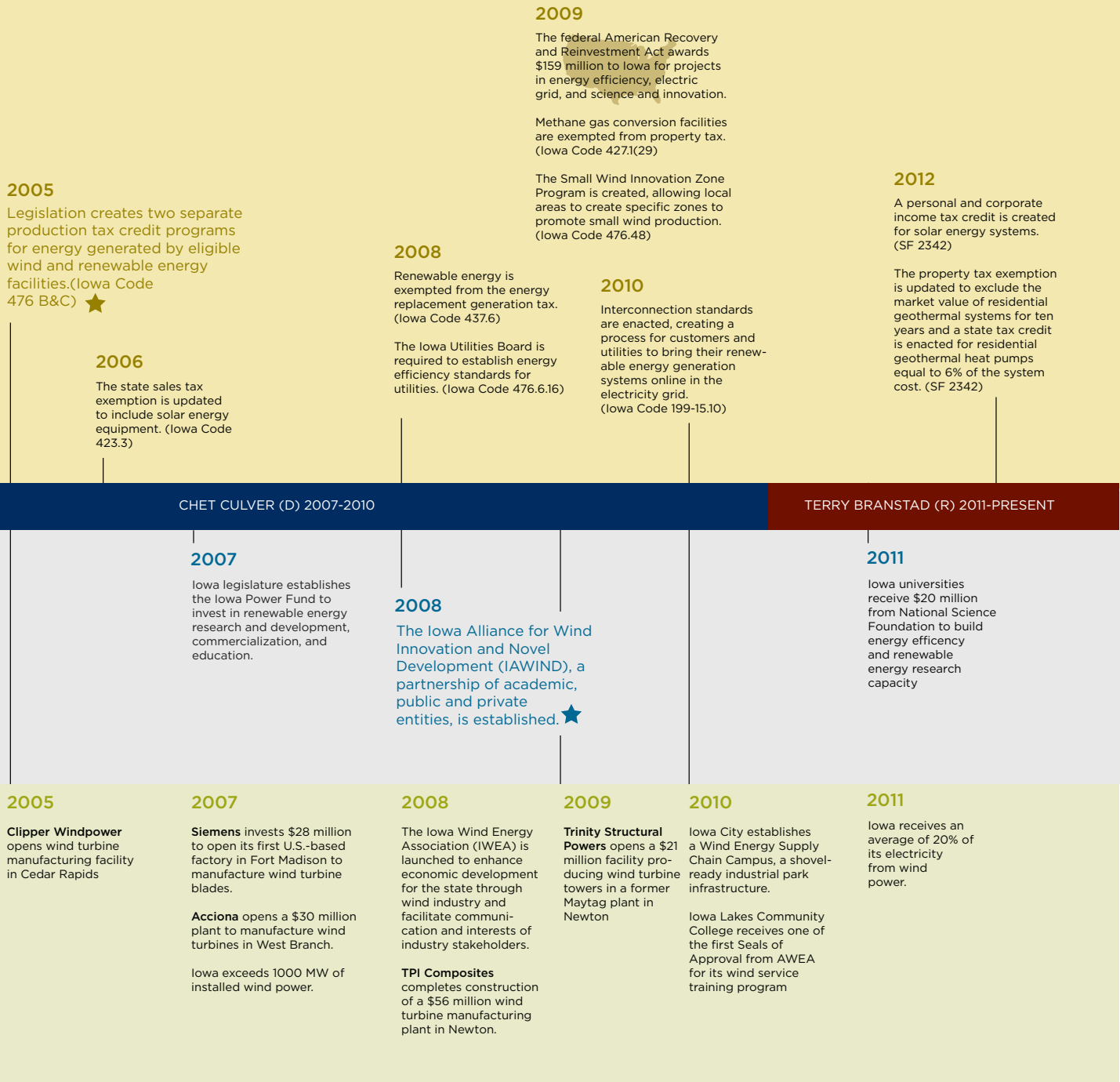


STIMULATING DEMAND

Stimulating demand for wind energy products and services increases the wind energy customer base. Policymakers could remove regulatory barriers to expand access to renewable energy, create financial incentives to increase affordability, or set standards for increased renewable energy use. These actions send a market signal to wind companies that there will be local demand for products. Many companies opt to ramp up production of goods and services in response. Iowa's policymakers and organizations have implemented a number of these actions in the past decade to stimulate consumer demand and expand the wind energy market.

Iowa was one of the first states to promote wind energy and has shown consistent support for the wind industry across political parties, organizations, and geographic boundaries. Renewable energy policies in Iowa have been implemented under both Republican and Democratic administrations. Top-level leaders in the Iowa General Assembly, as well as the state's U.S. senators and representatives, have helped reduce regulatory hurdles and create incentives to increase renewable energy economic development.

Iowa governors have repeatedly prioritized expansion of the wind industry as well. Republican Governor Terry



Branstad, during his first term, oversaw a kick start in the state's renewable energy economy with the passage of the nation's first renewable portfolio standard (RPS) in 1983. Democratic Governor Tom Vilsack signed a key state law in 2005 to provide a tax credit for renewable energy production. Democratic Governor Chet Culver helped bolster the renewable energy sector by creating the Iowa Power Fund in 2007 to invest in renewable energy research and development projects in the state (NC State, 2012). Governor Branstad has demonstrated continued support for the industry in his current term by speaking out in support of extending the Federal wind production tax credit (Henderson, 2012).

Regulatory standards can help stimulate demand for

renewable energy by providing a market signal to businesses that there will be local customers for wind products and services, and that the state is supportive of the sector's efforts. Iowa's landmark 1983 RPS requires the state's two investor-owned utilities to own or contract for a combined total of 105 megawatts (MW) of renewable energy. Eligible resources include solar, wind, waste management, resource recovery, refuse-derived fuel, agricultural crops or residues, woodburning facilities, or small hydropower facilities. While the utilities have long surpassed this standard, it set an early precedent for the state's leadership in renewable energy and gave the state a head start in reducing hurdles for renewable energy installations. For example, the state has since allowed utilities to receive

approval on revised electricity rates before installing new renewable energy generation, reducing the financial risk of new installations.

Iowa stakeholders have implemented a range of financial incentives to stimulate consumer demand for wind energy products and services, including a property tax exemption and a sales tax exemption for wind and solar equipment and materials. Iowa is one of the few states with a state renewable energy production tax credit, providing 1-1.5 cents per kilowatt hour, which is a significant benefit to local renewable energy producers. The Iowa Energy Center administers the Alternative Energy Revolving Loan Program, which was created in 1996 and is funded by the state's investor-owned utilities and state bonds. This loan program provides a zero percent interest loan to an individual or business for 50 percent of the cost of a renewable energy system (NC State, 2012). The Federal Government has also helped stimulate demand for a variety of clean energy projects through the American Recovery and Reinvestment Act, which provided the Iowa government and private companies with \$159 million in funding for clean energy projects ranging from energy efficient upgrades and weatherization to funds for the state energy program (U.S. Department of Energy, 2010).

In addition to renewable energy-specific policies and

actions, Iowa has attracted wind energy companies through business incentives and policies that lower the cost of doing business in Iowa. For example, Iowa revised its income tax rules to incentivize companies to locate facilities and create jobs in Iowa. These tax advantages include a 50 percent deductibility of federal taxes from Iowa corporate income and only taxing based on the percentage of sales income in the state (Iowa Economic Development Authority, 2012a). Iowa also has a New Jobs Training Program to provide customized training and employee development to new or expanding businesses through the Iowa community college network (Iowa Economic Development Authority, 2012b).

Iowa was the first in the nation to exceed 20 percent wind generation. Much of our success stems from the leadership of Iowa's Governors, Congressional Delegation and the Iowa Legislature, all of whom have recognized the job creation and economic development impact of the wind energy industry. As the rest of the nation looks to follow our example, Iowa businesses and communities support the wind energy industry and are poised to meet the national demand for wind turbine components and services.

*Harold Prior, Iowa Wind Energy Association
Executive Director*

SEEDING INNOVATION

Iowa has increased activity in wind energy innovation by funding research and development (R&D) projects and establishing collaborative networks to share R&D resources. Iowa stakeholders, particularly universities and companies, have leveraged local installation and manufacturing activity to cultivate an atmosphere that fosters innovative technologies and processes.

The Iowa Alliance for Wind Innovation and Novel Development (IAWIND) was founded in 2008 to stimulate collaboration among and within universities and industry partners on wind-related research, testing, and training. IAWIND partners experts at Iowa's three public universities with private companies to help support and facilitate research needs. For example, academic researchers are working with Siemens Energy to develop a low-cost carbon fiber derived from biorenewable feedstock to be used in turbine blades.

Iowa stakeholders have established a variety of other wind R&D programs. Iowa is part of the Experimental Program to Stimulate Competitive Research (EPSCoR) program to help the state improve research capacity in a variety of areas. In 2011, Iowa received funding from the National Science Foundation (total \$20 million over five years) to build renewable energy and energy efficiency research capacity at Iowa's three public universities. The project includes a wind specific component, led by the University of Iowa, to help Iowa establish laboratories and be a leader in topics such as wind speed modeling and wind turbine blade performance and reliability (Iowa EPSCoR, 2012). Iowa State University administers the Iowa Energy Center, which includes a research grant program for Iowa-based nonprofit groups to conduct renewable energy and energy efficiency R&D projects.

Governor Chet Culver worked with the Iowa General Assembly to invest in renewable energy and energy efficiency industry innovation by establishing the Iowa Power Fund in 2007. The fund is designed to support R&D, commercialization, and implementation of early stage technologies that will reduce the state's dependence on fossil fuels and establish Iowa as a leader in the energy industry. The fund has invested more than \$71 million in 50 competitive projects, leveraging over \$604 million in matching industry funds and activities (Iowa Office of Energy Independence, 2012).

Iowa also utilizes general programs for promoting innovation in renewable energy. The Research Activities Credit, for example, provides a refundable tax credit for up to 6.5 percent of R&D investment made in Iowa by private companies. This program includes a specific program for research on innovative renewable energy generation components manufactured or assembled in Iowa.

IAWIND provides the mechanism to connect talented faculty and Iowa's universities and community colleges with the Iowa wind industry. The research funding program provided by IAWIND benefits both industry and the faculty.

P. Barry Butler, IAWIND principal investigator and Provost of University of Iowa

Iowa Alliance for Wind Industry Novel Development (IAWIND) is a partnership with state and local governments, community colleges, Regents Universities, the private sector, and the Federal Government. IAWIND was formed in 2008 when it was awarded a \$3 million grant from the Iowa Power Fund to support training and research projects, and established a board of directors that awards the project funds. IAWIND is designed to coordinate and implement research, training, and education to meet the demand of local wind companies and enhance relationships among wind stakeholders. Iowa's academic researchers are now increasingly engaging in partnerships and discussions on common wind research problems and are sharing testing resources with other universities and wind companies.

IAWIND's activities are focused around three main programs to provide a full spectrum of support to the wind industry: research, internships, and training.

- **Research** – IAWIND provides funding for Iowa university professors to work with Iowa companies to solve common research problems. Each participating company is required to match research funds for the project.
- **Internship** – IAWIND helps fund an internship program for Iowa students to work with wind energy companies in Iowa. This program has proven successful in opening dialogue with wind companies and providing Iowa students with hands on experience in the wind industry.
- **Technical Training** – IAWIND works with community colleges to help them purchase equipment to expand their wind-related training programs. This program increases the preparedness of Iowa's workforce in the latest wind energy technologies.

CAPTURING ECONOMIC BENEFITS

In order to help the region capture the benefits of the growing wind energy economy, public and private stakeholders have worked collaboratively to align job creation and workforce development activities with recruiting and supporting companies. This alignment is a critical strategy to ensure that there are both job opportunities and trained workers in an area, and to capitalize on the positive business environment created from the stimulating demand and seeding innovation actions. Actions to capture the economic benefits include training a skilled wind energy workforce, recruiting companies to locate and grow in the region, and encouraging the deployment of wind products. State and local organizations are working across jurisdictions and with multiple stakeholders to promote wind energy economic development in Iowa. Iowa has numerous organizations to support the renewable energy industry, ranging from economic development organizations to associations that build networks among industry partners. These organizations help create an economic environment in which renewable energy companies want to locate and grow.

State and local organizations have demonstrated their commitment to the renewable energy sector by targeting it as an industry for development. The Iowa Economic Development Authority (IEDA), for example, has identified the wind energy industry as a targeted industry for Iowa to grow. The IEDA leverages Iowa strengths of a strong wind market, a central location with convenient transportation routes, a highly educated and productive workforce, and a pro-business state government to attract new companies in the Iowa wind supply chain.

Local economic development organizations are also taking the initiative to expand and support the wind industry. For example, Iowa City, with its Iowa City Area Development Group, created a Wind Energy Supply Chain Campus on 173 acres of city-owned property. It is envisioned as an industrial park equidistant from nearby large wind manufacturers Acciona and Clipper Windpower. The area has been certified as “shovel ready” to facilitate the development process for wind-related companies. The Eastern Iowa Economic Development Alliance also has a focus on the wind industry. The alliance works to attract business and investment, helps with site selection, and facilitates access to workforce training and recruitment resources. The Greater Des Moines Partnership also supports wind industry expansion and targets advanced manufacturing industry, which includes wind component manufacturing.

The **Iowa Economic Development Authority (IEDA)** actively recruits wind component manufacturers, service companies, and wind farms to make Iowa an epicenter for wind-related companies. IEDA connects potential companies with key members of the industry in Iowa to learn firsthand about the benefits of locating there. IEDA works with communities and businesses to create a recruitment package that includes assistance such as direct financial assistance, tax credits, job training funds, technical assistance, site location reviews, or regulatory process assistance.

IEDA also works with stakeholders to create a responsive environment that meets wind industry needs. For example, when the industry started expanding in Iowa, IEDA reached out to community colleges for training support for the industry. Since then, nearly all of Iowa's community colleges offer wind training courses.

The Iowa Wind Energy Association (IWEA) is a unique organization that unites all players in the wind energy field. IWEA has dozens of member companies and organizations and a board of directors representing diverse segments of the wind industry. IWEA networks various members of the wind industry and provides a unified voice for legislative efforts.

The Iowa Energy Center, established by the Iowa General Assembly in 1990, also supports the renewable energy industry in Iowa. The Energy Center is designed to serve Iowans by providing reliable, objective tools and information, as well as educational resources for Iowa residents and businesses. For example, the Iowa Energy Center funded and hosts a wind assessment study and calculator to help individuals and developers evaluate the potential for wind turbines in their town.

In addition to building a favorable business environment and enhancing networks, preparing Iowa's workforce for wind energy jobs has also been important to capturing economic benefits of the sector. Iowa has implemented a variety of training programs to ensure that local workers are equipped for wind sector jobs ranging from R&D to maintenance and installation.

The Iowa universities involved in IAWIND offer a range of classes and programs to prepare students for renewable energy R&D and management. The University of Iowa, for example, has a Wind Power Management track in the school of Mechanical and Industrial Engineering to educate students in the design, operations, and maintenance of wind farms. The University of Northern Iowa also offers bachelor and graduate degree programs in engineering that focus on applied renewable energy R&D in addition to a manufacturing technology program.

Iowa State University recently launched the Wind Energy Initiative in the College of Engineering. The goal of the program is to combine research and education to make wind energy competitive with other energy sources. The program includes a new wind energy minor for undergraduates starting in the Fall 2012, a 10-week intensive wind research and training experience for undergraduates, and a new PhD program launching in Fall 2012 in Wind Energy Science, Engineering, and Policy that will graduate at least 30 U.S. students in five years (Engineering Research Institute, 2012).

Iowa community colleges are working with wind industry stakeholders to design training programs for new and incumbent workers. Iowa Lakes Community College is a national leader among community colleges and had one of the first American Wind Energy Association (AWEA) approved wind turbine service technician programs (AWEA, 2012c). Iowa Lakes' Wind Energy & Turbine Technology program has five training labs and is training about 200 students a year in construction, operations and maintenance of wind turbines (Prior, 2012). Nearly all of Iowa's 15 community colleges have training classes related to renewable energy systems, and many have either full associate's degree programs or certificate programs for wind energy technicians. For example, Des Moines Area Community College has a Wind Turbine Technician program and Iowa Western Community College has a Sustainable Energy Technology: Renewable Energy program.

The Iowa Workforce Development office is also helping prepare workers through an American Recovery and Reinvestment Act State Energy Sector Partnership grant to train and place workers in the renewable energy and energy efficiency sectors. The project is designed to serve businesses, dislocated workers, and underemployed and unemployed Iowans with training funds in industries such as wind energy and energy efficient construction and retrofits. For example, this grant allowed Kirkwood Community College to develop its Energy Production and Distribution Technologies program. Through this grant, Kirkwood works collaboratively with local wind manufacturing companies Acciona and Clipper Windpower to train workers for jobs in the sector (Iowa Workforce Development, 2012).

Iowa Wind Energy Association (IWEA) is a nonprofit organization designed to support the growth of the wind industry in Iowa, including supply chain companies and wind turbine installations. Established in 2008, IWEA now has over 150 members representing all aspects of the wind industry, ranging from universities, governments and manufacturing companies, to developers and utilities.

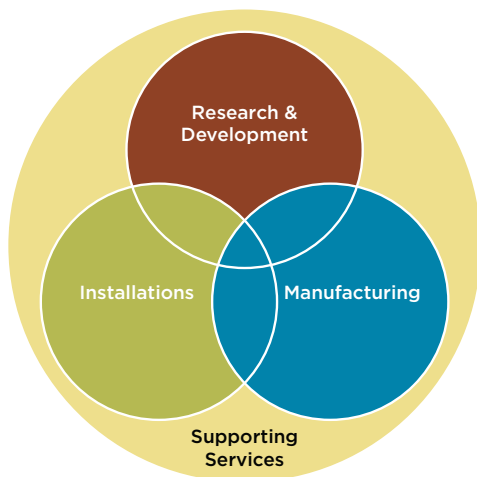
IWEA hosts events and webinars, and provides a unified industry voice on legislative efforts. Each year, IWEA conducts an Annual Membership Meeting and Wind Conference in Iowa. The conference attracts industry experts, community and federal representatives, and hundreds of attendees. The meetings are an opportunity for industry partners to connect with each other and further expand the wind industry in Iowa.

WIND ENERGY ECONOMY RESULTS

Iowa has embraced the wind industry, which has allowed the state to diversify its economy while maintaining its rural roots and manufacturing strengths. The actions that Iowa stakeholders have taken to build a robust wind energy economy have led to impressive results. The state has emerged as a leader in wind component manufacturing and has demonstrated strong customer demand for wind energy products and services. In addition, as shown in the action timeline (Figure 1), wind-related companies are increasingly choosing Iowa as a place to locate and grow, bringing significant economic benefits to the state.

IOWA'S ENERGY TECHNOLOGY VALUE CHAIN

FIGURE 2
ENERGY TECHNOLOGY VALUE CHAIN



The investment and work to stimulate demand, seed innovation, recruit companies, and develop a new workforce has paid dividends across the value chain. Iowa has built a wind energy economy that includes a variety of companies and activities, all of which operate across the energy technology value chain. The segments of the value chain may exist independently, but provide a more robust economic cluster when all segments are developed and work together. Figure 2 illustrates the interaction of the energy technology value chain segments. Iowa now boosts companies that provide each of these activities:

Research & Development: R&D activities are carried out primarily by research institutions, such as federal laboratories, universities, or private company research divisions. R&D activities foster an environment centered on developing new products and processes so that the state can become a leader in innovation.

Manufacturing: Manufacturing involves production of a technology and includes companies throughout the supply chain, ranging from component suppliers to those assembling complete units for sale to consumers.

Installation: Installation of clean energy technologies, such as developing wind turbine farms, will occur in response to market demand. Companies involved in activities such as site assessment, logistics, transportation, and construction play an important role in installation.

Supporting Activities: A variety of other activities are critical to supporting clean energy technology. These supporting organizations facilitate interactions among players, provide funding, educate consumers, advocate for business friendly policies, or provide technical support and product maintenance services.

WORKING WITH INDUSTRY TO DRIVE INNOVATION

Iowa's wind energy R&D-related activities are focused on universities working directly with companies to improve processes and create innovative technologies. These industry partnerships are helping manufacturers make better, more reliable wind turbines and leading to cheaper wind energy. Research projects range from improving wind measurements and analysis to examining fiberglass blade performance during construction and operation. A few recent examples include:

- Acciona**, a major wind manufacturer, is working with Iowa State University researchers to design a 100-meter concrete wind turbine tower and install it in Cedar County, Iowa. The research project leverages \$16 million from Acciona and \$3 million from the Iowa Power Fund. The research will help commercialize the new AW-3000 turbine and will include a new type of concrete turbine tower that has the potential to cut the cost of wind power and create more local jobs. Turbines built on concrete towers are significantly taller than traditional steel towers, increasing efficiency and productivity. These towers will be constructed on-site, which also provides the potential to create more local jobs in wind installation (Ford, 2011).
- Anemometry Specialists** recently announced it would match a \$300,000 grant from IAWIND for a professor at Iowa State University to develop a buoy-mounted measurement platform that would make offshore wind energy assessment more cost-effective. This new technology has the potential to reduce the costs of offshore wind production by four percent (Anemometry Specialists, 2012).

Iowa's progress in renewable energy innovation can also be demonstrated by patents. Figure 3 shows that Iowa has increased patents for clean energy over the last decade. Iowa continues to have significant strength in biotechnology innovation building from its agricultural expertise, but is also an increasingly notable player in wind innovation with six patents in 2010-2011. Table 1 shows that Iowa had no wind patents in the 1992-1993 period and then jumped to 12th in the nation in the 2010-2011 period. Given the increase in academic R&D programs and partnerships with wind manufacturing companies, Iowa is well positioned to maintain a leadership role in wind patents and innovation.

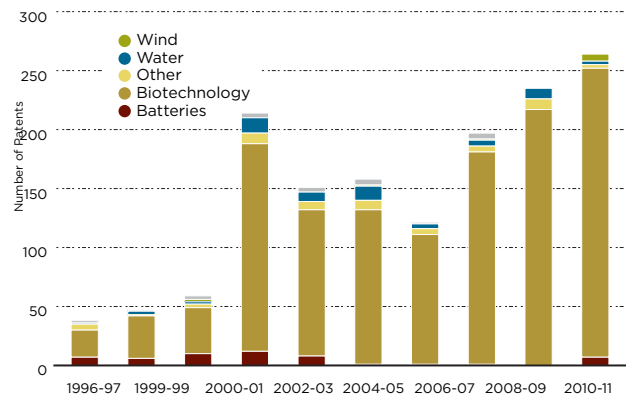
Iowa's actions to seed innovation also have significant economic impacts. For example, Iowa commissioned an analysis of the first 31 projects invested in through the Iowa Power Fund. Of the \$38.3 million invested, the study found that, even in a low scenario estimate, the 20-year economic impact will be an additional 8,500 jobs with a total payroll of \$3.8 billion, and the activities could generate more than \$475 million in state revenue and more than \$390 million in local property taxes. The impact during the life of the projects (eight years, from 2007-2014) is also significant, with a cumulative \$181 million economic output, nearly \$63 million in workers earnings, and average annual employment of about 200 (Impact DataSource, 2010). Iowa also estimated that IAWIND, which includes research and training activities, will lead to \$3.4 million in economic activities, 1,350 jobs, and \$176 million in worker earnings over the next 20 years (Iowa Office of Energy Independence, 2010).

TABLE 1
IOWA NATIONAL RANKING IN
CLEAN ENERGY PATENTS

	1992-93	2010-11
Biotechnology	22	7
Wind	50	12
Overall	25	17

Note: Iowa had zero wind patents in 1992-1993 and therefore tied for last in national rank.
DataSource: 1790 Analytics, Patents by Technology; USPTO Patent File

FIGURE 3
CLEAN ENERGY PATENTS
IOWA



Data Source: 1790 Analytics, Patents by Technology; USPTO Patent File
Analysis: Collaborative Economics
Note: "Other" category includes electric vehicles, energy infrastructure, hybrid systems, hydro power, fuel cells, and solar; "Biotechnology" includes biofuels and biochemicals

MANUFACTURING COMPANIES RESPONDING AND GROWING

Iowa is one of the few states with manufacturing companies that produce all of the main components of a wind turbine — turbines, blades and towers — and has attracted more major wind manufacturers than any other state. Wind-related companies have chosen to locate and expand in Iowa because of stakeholder's actions to stimulate demand, seed innovation, and capture economic benefits of the wind industry. Wind-related companies take advantage of Iowa's collaborative environment, political support, financial incentives, and workers with skills ranging from plant managers to assemblers and welders.

Iowa has leveraged its manufacturing strength to expand into wind component parts. Iowa receives 17.8 percent of its gross domestic product (GDP) from manufacturing, ranking it sixth in the nation among states dependent on manufacturing, and more than 10 percent of Iowa jobs were in manufacturing as of 2010 (CIRAS, 2011). Iowa manufacturers have used their experience with large equipment production to expand into wind components. Iowa's large machinery manufacturing companies are an ideal fit for producing the large components for wind turbines. Companies such as John Deere and Caterpillar have capitalized on this opportunity and have flexed their manufacturing capacity to also produce wind turbine components. In the past ten years, Iowa has increasingly become a center for international wind industry leaders, including two turbine manufacturers, two blade manufacturers, and a tower manufacturer. In 2005, Clipper Windpower became one of the first major manufacturers to locate in Iowa. Clipper chose Iowa because of the state's proximity to wind resources, availability of suppliers, and support from Iowa's leaders, among other reasons (Iowa Department of Economic Development, 2008).

Acciona Windpower North America LLC invested over \$30 million to open its first U.S. wind turbine facility in West Branch, Iowa in 2007 (Acciona, 2012). The Iowa Department of Economic Development noted that, according to Adrian LaTrace (Acciona's North American vice president of manufacturing), "Acciona looked at sites throughout the upper Midwest. Iowa was selected due to its excellent logistical proximity to a large number of Acciona wind power projects in the United States, and also due to factors such as the nearby industrial supplier base, an available and skilled workforce, technical training centers, and support from state and local governments." Acciona also received an incentive package from the state that included a loan, infrastructure assistance, and tax benefits from programs like the High Quality Job Creation program (Iowa Department of Economic Development, 2008).

Acciona is working with local companies to build a wind industry cluster in Iowa. The company is helping to expand the local supply chain with its goal to source 90 percent of its parts locally, and currently sources 80 percent of its completed turbine and tower from North American companies (U.S. Department of Energy, 2012). Acciona is also working with local researchers to build new innovative wind technologies, such as its new concrete tower design.

In 2007, **Siemens** opened a 600,000 square foot facility in Fort Madison, Iowa to manufacture wind turbine blades. Siemens is now the largest employer in Fort Madison, with 600 employees at the plant and an estimated 350 indirect jobs created from the plant's activities. Fort Madison was chosen for its strategic location for shipping turbine parts to wind power projects across the country. A rail yard was added to the facility in 2008, using existing railroad infrastructure to more efficiently transport the turbine parts (Siemens, 2010). In 2012, Siemens was selected by MidAmerican Energy, Iowa's largest energy company, to provide all 176 utility-scale turbines that will be installed this year, providing an additional 407 megawatts of wind power. This expansion will create even more Iowa jobs in the manufacturing, installation, and maintenance of turbines (DeFreitas, 2012).

Iowa's major wind manufacturers, manufacturing infrastructure, and skilled workers are drawing additional suppliers to the state. For example, Spanish-based Goian, which provides lifts for people and equipment inside support towers for wind turbines, followed its major customer Spanish-based Acciona's lead and also opened a location in Iowa (Bzdega, 2008). The Iowa Department of Economic Development, Greater Des Moines Partnership, and City of Ankeny worked collaboratively to win the new facility out of Goian's five candidate states (Moerman, 2008).

TPI Composites is another example of a company that worked with state and community leaders in Newton, Iowa to build a plant on the site of a former Maytag facility. The plant employs about 500 local workers, many of whom were laid off when the Maytag plant closed. TPI now manufactures turbine blades for GE Power, which sells turbines throughout the Great Plains. In addition to wind-specific manufacturing companies, numerous manufacturers are a part of the Iowa wind supply chain and provide parts to the major wind manufacturers (Iowa Department of Economic Development, 2008).

Iowa now has over 200 wind-related businesses (Terry Branstad, 2012). AWEA estimates that there are more than 3,000 jobs in wind manufacturing alone (out of the 6,000 total jobs), making Iowa a leading state in wind manufacturing employment (AWEA 2012a).

Goian is confident that our decision to place our first North American facility in the Des Moines area will be an excellent investment. We have easy access to the suppliers, customers and workforce that will grow our company well into the future.

Iñaki Sancho, General Manager of Goian North America LLC on the announcement of locating its facility in Iowa (Moerman, 2008)

The federal **Production Tax Credit**, which provides an income tax credit for the production of electricity from utility-scale wind turbines, is set to expire at the end of 2012. As of October 2012, uncertainty about its renewal still loomed, contributing to a slowdown in the U.S. market demand for new wind turbines. . Consequently, multiple Iowa wind manufacturers are laying off workers. For example, in August Clipper announced a 32 percent reduction in workforce (76 workers in Iowa) (Dewitt and Franzman, 2012) and in September Siemens announced a layoff of 407 workers in Fort Madison. Siemens noted that the difficult market conditions due to lack of congressional action on the tax credit contributed to its decision (Pitt, 2012).

WIND ENERGY INSTALLATIONS

Iowa's rich wind resources, combined with actions to stimulate demand for renewable energy installations, have allowed Iowa companies to dramatically increase their deployment of wind products and services in recent years. Iowa is the 7th windiest state and is currently ranked 2nd in installed wind capacity. Table 2 shows the top five states in wind installations. Texas has the most installations, but is also ranked first in wind resource potential. Iowa is narrowly ranked higher than California, but is far ahead of Illinois and Oregon. Figure 4 displays Iowa's growth in wind capacity, which reached 4,524 megawatts by the end of the second quarter 2012 (AWEA 2012b). This is nearly double the amount of wind power in five years and is over four times the national average. Iowa is one of only two states that have exceeded 20 percent of state generated electricity coming from wind (Wiser and Bolinger, 2012).

Utilities are actively involved in clean energy installations, stimulating the local economy and creating installation jobs. The large investor owned utility MidAmerican Energy has become an active supporter of wind energy and has played a leadership role in installations. MidAmerican is first in the nation in ownership of wind-powered capacity among rate regulated utilities and by the end of 2012 will own over 2,200 MW of wind generation, which will account for over 30 percent of its generation capacity powered by wind. MidAmerican began installing wind turbines in Iowa in 2004 and expanded to take advantage of the economic value in wind power (MidAmerican Energy, 2012). Iowa's policies, such as advanced approval

of electricity rates before installing wind turbines, have facilitated this growth by reducing the risk of investment recovery.

Iowa also has many wind industry companies that were founded or have expanded in the state. These companies provide marketing, advertising, legal services, site assessment, and a range of other services to the wind industry. Anemometry Specialists, for example, is a full service wind assessment company that helps identify and assess potential installation locations, manages installation projects, and conducts inspections and maintenance on turbines.

Iowa has achieved this installation activity without sacrificing overall economic progress. Figure 5 shows that Iowa's electricity bill compared to GDP is on par with the rest of the U.S. and Iowa's GDP has continued to outpace changes in electricity bills even while renewable energy installations increased.

TABLE 2
TOP STATES IN TOTAL WIND INSTALLATIONS*

1	Texas	10,648 MW
2	Iowa	4,524 MW
3	California	4,425 MW
4	Illinois	3,055 MW
5	Oregon	2,820 MW

* Wind installations as of second quarter 2012
DataSource: AWEA, 2012a

FIGURE 4
WIND ENERGY INSTALLATIONS
IOWA

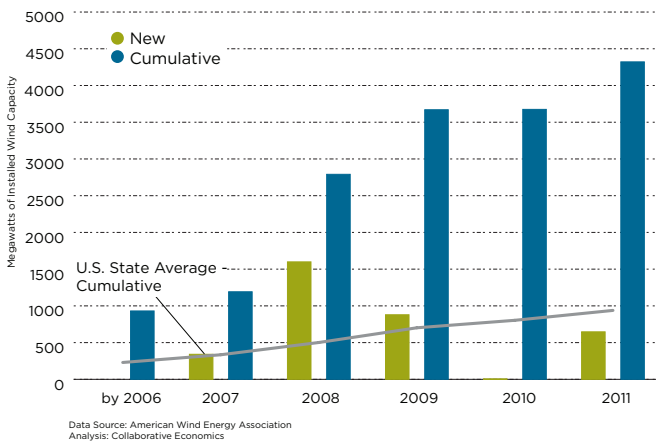
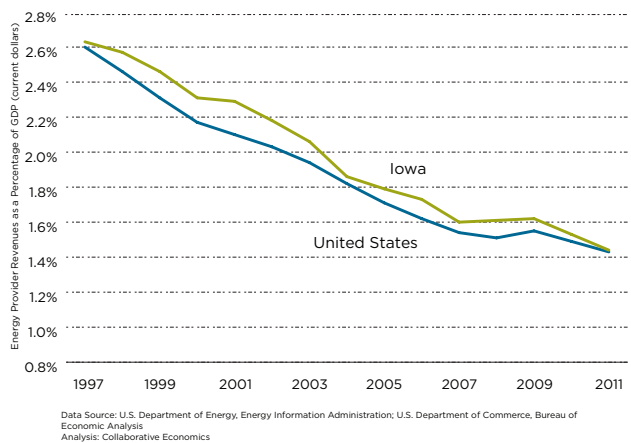


FIGURE 5
ELECTRICITY BILL AS A PERCENTAGE OF GDP
IOWA



SUMMARY: IOWA'S WIND-RELATED ECONOMY

In summary, Iowa's value chain segments (R&D, manufacturing, installation, and supporting services) have demonstrated progress in response to stakeholder actions and market demand. Iowans across the state are seeing the benefits of the wind industry. Iowa farmers and landowners, for example, have embraced the wind industry as a partner through leasing land to installers, while still being able to farm the land around the turbines. A recent poll shows that 85 percent of Iowa voters see wind energy as a positive benefit to the state (Haberman, 2012).

Table 3 summarizes a few key economic benefits to Iowa from the wind energy industry. Iowa is one of the top employers in the wind industry, with more than 6,000 direct and indirect jobs in 2011. The manufacturing sector contributes jobs to workers generally in more urban areas, but installations also bring significant benefits to the state's rural economy. The wind industry, for example, contributes \$19.5 million in annual property tax payments by wind project owners and \$13 million in annual lease payments to land owners (AWEA 2012a). An Iowa farmer may receive an additional \$6,000 per acre for each turbine annually. Rural Pocahontas County alone has over 200 wind turbines installed and has received over \$3 million dollars in tax revenue from these wind turbines during the past three years (IWEA, 2012).

These outcomes show a robust and diverse wind energy economy in Iowa.

We've found an available and highly skilled workforce in Iowa. The Iowa Department of Economic Development, Alliant Energy, the Cedar Rapids Area Chamber of Commerce and the city of Cedar Rapids also provided significant support to help us launch our production facility.

Jim Dehlsen, former Clipper CEO, on expanding operations in Iowa (Iowa Department of Economic Development, 2006)

TABLE 3
IOWA WIND-RELATED ECONOMY

Workers	6000+
Companies	200+
Annual Payroll	\$ 70+ million
Percent of Electricity Generated from Wind	20%
Annual Property Tax Contribution From Wind Project Owners	\$19.5 million
Annual Lease Payments to Land Owners	\$13 million

DataSource: Terry Branstad, 2012. AWEA, 2012a. Greater Des Moines Partnership

Founded in 2002, **Anemometry Specialists** provides comprehensive wind energy assessment services to utilities and developers in Iowa and around the world. Based in the small community of Alta, Iowa, Anemometry Specialists employs 27 full time employees and installs meteorological towers that collect data on conditions such as temperature, wind speed, and humidity to determine whether the site is appropriate for a wind farm. The company also conducts studies and analyses that help both large- and small-scale wind projects access financing. Anemometry Specialists has grown substantially with the rise of the wind industry in Iowa, doubling in size and revenue for six years and maintaining a 20 percent growth rate since the recession (Anemometry Specialists, 2011).

CONCLUSION

Iowa's wind energy economy has grown as a result of multi-stakeholder, bipartisan actions to stimulate demand for wind products and services, foster innovation, and help the state capture economic benefits from the industry's growth. R&D activity, wind manufacturing, and wind energy installations have all substantially increased in Iowa in recent years. This progress demonstrates Iowa's success in creating a diverse, robust wind energy economy and establishing the state as a leader in the wind energy industry.

- **Iowa policymakers have helped stimulate consumer demand for renewable energy products and services.** Iowa was the first state to pass an RPS and is one of the few states with a state renewable energy production tax credit, which helped show the state is supportive of the renewable energy industry.
- **Iowa is increasing its role in wind energy innovation and researchers are collaborating with industry partners to advance the wind energy industry.** New organizations such as IAWIND and university wind technology programs will help solidify Iowa's role in wind energy R&D.
- **Iowa state and local officials have made significant strides to capture the economic benefits of the wind energy industry growth.** Iowa is one of the few states that manufactures all major parts of the wind turbine and has dozens of companies throughout the wind supply chain, creating jobs across skills spectrum. Iowa is also taking a leading role in training the workforce for wind industry jobs through its strong community college wind training programs.

Iowa, like other states, is vulnerable to market uncertainties such as those surrounding the federal wind production tax credit. There is broad agreement among Iowa's U.S. Congressional delegation, Governor, and state legislators that the production tax credit would help the state maintain its economic momentum. However, Iowa's experience to date in creating a wind industry cluster will allow it to leverage opportunities in other clean energy industries, such as biochemicals or solar, as it moves towards a more diverse clean energy economy.

ACRONYMS

AWEA – American Wind Energy Association

GDP – Gross Domestic Product

IAWIND – Iowa Alliance for Wind Innovation and Novel Development

IEDA – Iowa Economic Development Authority

IWEA – Iowa Wind Energy Association

MW – Megawatts

R&D – Research and Development

RPS – Renewable portfolio standard

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- **Monica Stone** – Iowa Department of Administrative Services

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