Iowa Department of REVENUE

Wind Energy Production Tax Credit
and
Renewable Energy Tax Credit

Tax Credits Program Evaluation Study

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Preface

Iowa Code Section 2.48 directs the Legislative Tax Expenditure Committee to review all tax expenditures with assistance from the Department of Revenue. This law also provides a schedule for such reviews and requires a review in 2014 of the Wind Energy Production Tax Credit and the Renewable Energy Tax Credit. In addition, the Department was directed to assist the legislature by performing periodic economic studies of tax credit programs. This is the first evaluation study completed for the Wind Energy Production Tax Credit and the Renewable Energy Tax Credit expenditure.

As part of the evaluation, an advisory panel was convened to provide input and advice on the study's scope and analysis. We wish to thank the members of the panel:

Janalee Caviness	Wind Energy Business Representative
Liesl Eathington	Iowa State University
Denny Harding	Iowa Farm Bureau
Barb Lewison	Iowa Department of Revenue
Mike Prior	Iowa Wind Energy Association
Ellen Shaw	Iowa Utilities Board

The assistance of an advisory panel implies no responsibility for the content and conclusions of the evaluation study. This study and other evaluations of Iowa tax credits can be found on the evaluation study web page on the Iowa Department of Revenue website.

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Executive Summary

The Wind Energy Production Tax Credit and the Renewable Energy Tax Credit are State tax credits awarded for the production of energy from wind and other renewable sources. The Wind Energy Production Tax Credit is equal to $0.01 per kilowatt-hour of electricity generated from wind at facilities located in Iowa. The Renewable Energy Tax Credit is equal to $0.015 per kilowatt-hour of electricity. Different rates apply for other forms of energy production.

Applications for tax credit eligibility are subject to review and approval by the Iowa Utilities Board and tax credit certificates are awarded by the Department of Revenue. Under both programs, the tax credits for production by each approved facility are available for a ten-year period from the facility's in-service date. The tax credits are nonrefundable with a seven year carryforward and are also transferable.

No new facilities can be approved after 2012 under the Wind Energy Production Tax Credit program. The program is limited in aggregate to facilities with 50 megawatts nameplate capacity. The Renewable Energy Tax Credit program is limited in aggregate to 363 megawatt nameplate capacity for wind energy facilities and 53 megawatts for facilities based on other forms of energy. The total capacity of currently operational wind projects and non-wind projects are 80 megawatts and 22.6 megawatts, respectively.

The major findings of the study are these:

Other State and Federal Incentives for Renewable Energy

- Forty-five states and the District of Columbia offer some form of tax incentive for the production of energy from renewable sources or for improved energy efficiency. Twenty-nine states, including Iowa, offer incentives affecting individual or corporation income tax. Fifteen states offer tax credits that target large-scale energy production or investment in renewable energy production facilities.
- Six states offer production tax credits for renewable energy that are allocated based on the amount of energy generated, such as per kilowatt hour. In addition to Iowa, these states are Arizona, Florida, Maryland, New Mexico, and Oklahoma.
- New Mexico and Maryland offer fully refundable production tax credits. In Oklahoma, tax credits earned in 2014 and after may be refunded at 85 percent of their value.
- The rate for Iowa's Renewable Energy Production Tax Credit, $0.015 per kilowatt hour, is the highest state tax credit rate for energy produced from wind and other non-solar sources.
- Iowa is the only state whose production tax credits are fully transferable.
- The federal Renewable Electricity Production Tax Credit has figured prominently in the development of renewable energy since its inception in 1992. In 2014,

production based on certain technologies including wind qualified for $0.023 per kilowatt hour.

Literature Review

- Findings of academic research related to incentives for renewable energy include the following:
    - The uncontrollable nature of wind generator output, in the absence of a suitable and scalable method of intermediate storage, is the primary obstacle to expanding the use of wind. It is possible that sufficient infrastructure to transmit renewable energy on a large scale would make more extensive use of wind-based energy more feasible.
    - Government policies, including renewable portfolio standards, sales tax exemptions, property tax exemptions, and tax credits can positively affect wind energy development and have encouraged the growth of wind energy in the U.S.

The Electric Power Industry and Wind Energy in Iowa

- Between 2000 and 2014, growth in wind energy capacity in Iowa increased by a factor of more than 28 and outpaced growth nationally. Nearly nine percent of the United States' wind energy capacity is located in Iowa. Wind is the source of 27 percent of electricity generated in Iowa, the highest of any state.
- As of 2012, there were 75 wind power plants in Iowa, consisting of more than three thousand individual wind turbines. Eighteen plants were operated by one of Iowa's two rate-regulated investor-owned utilities, ten were owned by municipally-owned utilities or rural electric cooperatives, and 46 were operated by independent power producers. One was operated for commercial or industrial use.
- Wind Energy Production Tax Credits are available to facilities regardless of whether they are owned by utilities or independent power producers. The Renewable Energy Tax Credit is limited to facilities owned by independent power producers or rural electric cooperatives.
- Operational wind energy projects approved for either Wind Energy Production Tax Credits or Renewable Energy Tax Credits are located in 15 counties in Iowa.

Wind Energy Production and Renewable Energy Tax Credit Awards and Claims

- In 2013, the total value of Renewable Energy Tax Credit awards was $5.6 million. The average certificate amount was $16,000. Since its beginning, a total of $21.8 million in tax credits has been awarded under the program. Of this amount, 95 percent has been transferred to third parties.
- Since its inception, the Wind Energy Production Tax Credit program has awarded $5.2 million in tax credits. Overall, 87 percent of the total program award amount has been transferred.

- Eighty of the 363 MW of wind energy capacity available for tax credits under the Renewable Energy Tax Credit program are associated with operational projects as of December 2014. This program would award an estimated $21.5 million in tax credits in any year in which aggregate operational capacity were 363 MW.
- Fifty-six percent of Wind Energy Production Tax Credits awarded in 2013 were to Iowa residents. Fifty-two percent of Renewable Energy Tax Credits awarded in 2013 were to Iowa residents.
- A total of $19.0 million in Renewable Energy Tax Credits and $3.8 million in Wind Energy Production Tax Credits have been claimed beginning in tax year 2007.
- Wind Energy Production and Renewable Energy Tax Credits were awarded for wind energy generated in 2013 for 158,000 MWh and 315,000 MWh, respectively.
- In 2007, wind energy for which tax credits were granted under either the Wind Energy Production and Renewable Energy Tax Credit program accounted for 2.9 percent of wind energy generated by independent power producers in Iowa and 1.3 percent of the state's total wind-generated electricity. Between 2007 and 2013, these percentages increased to 6.8 percent and 3.0 percent, respectively.
- The amount of energy produced by each project compared to its nameplate capacity is known as its capacity factor. Over the course of these tax credit programs, the capacity factors of projects receiving tax credits have generally increased. Between 2007 and 2013, the median capacity factor increased from 22 percent to 41 percent. This trend seems to reflect advancements in wind energy generation technology.

Economic Analysis of the Wind Energy and Renewable Energy Tax Credits

- Virtually all tax credits awarded under Wind Energy Production Tax Credit and Renewable Energy Tax Credit programs are transferred. Tax credits that are transferred are typically exchanged for less than their face value to third-party purchasers who may then claim the full value of the tax credit against Iowa tax liability.
- The increase in property tax revenue as result of facilities for which Wind Energy Production or Renewable Energy Tax Credits have been awarded is estimated to be $958,000 in FY 2015. The property tax revenue increase as a result of currently operational projects is estimated to reach $1.8 million in FY 2021.
- The aggregate increase in property tax revenue to local jurisdictions as a result of wind energy facilities is attenuated by Iowa Code section 427B.26 which provides for special assessment of wind energy conversion property.

I. Introduction

The Wind Energy Production Tax Credit and the Renewable Energy Tax Credit programs provide tax credits for the production of energy from wind and other renewable sources by qualified facilities in Iowa. The purpose of this evaluation study is to analyze tax data and other pertinent information in order to assess these two tax credits with particular attention to the nature of their utilization and economic impact.

Section II of this report provides background on the tax credits, including a description of tax credit application and award procedures. Section III provides information about similar tax credits in other states. Section IV provides a review of existing literature concerning markets and tax incentives for renewable energy. Section V provides an overview of the electric power industry in Iowa, with a particular focus on wind energy. Section VI presents data regarding Wind Energy Production Tax Credit and the Renewable Energy Tax Credit awards and claims. Section VII provides an analysis of the economic effects of the credits. The final section of this report provides a brief conclusion.

II. Background of the Wind Energy Production and Renewable Energy Tax Credits

Both the Wind Energy Production Tax Credit and the Renewable Energy Tax Credit became effective on July 1, 2005 to incentivize the production of renewable energy or heat. Since their initial enactment, both credits have been modified or expanded.

Although Iowa Code does not include language concerning the legislature's intent in enacting the Wind Energy Production Tax Credit or the Renewable Energy Tax Credit, the programs are unambiguously intended to promote production of energy from wind and other renewable sources in Iowa. Adopted under Iowa Governor Tom Vilsack, both programs were elements of an administration goal to achieve 1,000 MW capacity from renewable sources (Vilsack, 2003). Upon signing the Renewable Energy Tax Credit program into law, Governor Vilsack referenced Iowa's natural resources and the State's responsibility to protect the environment for future generations (Vilsack, 2005).

A. Wind Energy Production Tax Credit

The Wind Energy Production Tax Credit is provided for in Iowa Code Chapter 476B. The value of the tax credit is equal to $0.01 per kilowatt-hour of electricity sold or generated for on-site consumption. To be eligible for the tax credit, a facility must produce electricity from wind, be located in Iowa, and must be approved by the local board of supervisors and the Iowa Utilities Board (IUB). Facilities must be placed in service within 18 months of approval by the IUB. This 18 month deadline, however, may be extended an additional 12 months upon request. There is no limit to the number of extensions that may be granted. A qualified facility must also have been originally placed in service between July 1, 2005 and July 1, 2012. Accordingly, no new facilities can be approved under this program. Initially set at July 1, 2007, the closing date for the placed-in-service period was extended twice by Iowa lawmakers prior to 2012.

For applications filed on or after March 1, 2008, the facility must consist of one or more wind turbines connected to a common gathering line which has a combined nameplate capacity of between two and thirty megawatts (MW)[1]. For applications filed on or after July 1, 2009, eligibility was expanded to specified entities which produce electricity for their own use. Specified entities include public and private colleges or universities, public and private elementary and secondary schools, and public hospitals. These facilities must consist of wind turbines with a combined nameplate capacity of three-fourths of a megawatt or greater.

Wind Energy Production Tax Credit awards are not directly capped. However, the total capacity eligible to be approved for credits is limited. The program's limit was 450 MW when initially enacted. Effective in 2009, it was reduced to 150 MW. In 2011, the Legislature reduced the program limit to 50 MW aggregate nameplate capacity. Facility eligibility designations were granted on a first-come, first-served basis by the IUB. Tax credit certificates are awarded by the Iowa Department of Revenue (IDR) based on annual energy production reported by the facility. Tax credits for each approved facility are available for a ten-year period from the initial in-service date of the facility.

Wind Energy Production Tax Credits are nonrefundable, which means that while they offset tax liability, any credit amount greater than tax liability in the initial tax year of claim is not paid to the claimant and remains unused. (A refundable tax credit, by contrast, provides a net payment, or "refund," to the taxpayer in the event the credit amount exceeds tax liability.) Unused Wind Energy Production Tax Credit awards can be carried forward for up to seven tax years. The tax credits are also transferable, which means they may be sold by the awardee. Thus, the awardee may elect to sell all or part of the tax credit to one or more other taxpayers, which is beneficial if the awardee does not have sufficient tax liability to fully use the credit. Such an exchange may be desirable to the purchaser since the credit may be purchased at a discount; i.e., for less than its tax value. There is no limit to the number of times the Wind Energy Production Tax Credit may be transferred. The tax credits may be applied against corporation income, individual income, franchise, insurance premium, sales and use, and replacement taxes

B. Renewable Energy Tax Credit

The Renewable Energy Tax Credit is provided for in Iowa Code Chapter 476C. It is available to producers or purchasers of energy from an eligible renewable energy facility approved by the IUB. The tax credit can also be received for renewable energy produced for on-site consumption provided the facility is capable of producing not less than three-fourths megawatts. In addition, under Iowa Code §476.48, Renewable Energy Tax Credits are allowed for wind energy systems of one hundred kilowatts or less in Small Wind Innovation Zones. A Small Wind Innovation Zone is any political subdivision of the State, such as a city, county, or school district, that has declared itself such by adopting a model ordinance as provided in the Code of Iowa. To date, no

[1] Nameplate capacity, or rated capacity, is a measure of the sustained full-load output of an electrical generator under ideal conditions.

applications have been submitted for Renewable Energy Tax Credits pursuant to the Small Wind Innovation Zone provision.

The value of the tax credit is equal to $0.015 per kilowatt-hour of electricity, $4.50 per million British thermal units (MMBTU) of heat for a commercial purpose, $4.50 per MMBTU of methane gas or other biogas used to generate electricity, or $1.44 per one thousand standard cubic feet (Mcf) of hydrogen fuel generated by and purchased from an eligible renewable energy facility. For purposes of the tax credit, a renewable energy facility may be one that converts wind energy, solar energy, biomass, or refuse, or which recovers biogas or methane gas. Co-generation facilities, which simultaneously generate electricity and useful heat, are also eligible. The renewable energy facility must be located in Iowa.

In 2014, the deadline by which facilities must be placed in service was extended from January 1, 2015 to January 1, 2017. Since the establishment of the credit in 2005, when it was set at January 1, 2011, the Legislature has extended this deadline a total of three times.

Credits are not directly capped. However, the maximum amount of aggregate generating capacity that can be approved for the credit is limited by law. Originally set at 90 MW for wind projects and 10 MW for other renewable energy projects, these limits have been increased several times. In 2006, they were doubled to 180 MW and 20 MW for wind projects and other renewable projects, respectively, and a limit of 167 billion British thermal units (BTU) was placed on tax credits for heat produced for a commercial purpose by a refuse conversion facility. Effective in 2009, the limit for wind energy was increased to 330 MW. In 2011, the Legislature again increased the limits from 330 MW to 363 MW for wind projects and from 20 MW to 53 MW for other renewable energy projects. In addition, a taxpayer can only be approved for 2.5 MW nameplate capacity under the Renewable Energy Tax Credit program.

As with the Wind Energy Production Tax Credit, facility eligibility designations are granted on a first-come, first-served basis by the IUB and tax credit certificates are awarded by the IDR based on annual energy production reported by the facility. Tax credits for each approved facility are available for a ten-year period from the facility's initial in-service date. Tax credits are nonrefundable, but unused credits can be carried forward for up to seven years. The Renewable Energy Tax Credit may be transferred to any person or entity, but each tax credit certificate can only be transferred once. The tax credits may be applied against corporation income, individual income, franchise, insurance premium, sales and use, and replacement taxes

At least one project has been awarded part of a tax credit for electricity generated for on-site consumption. In that case, the electricity consumed on site represented just 0.2 percent of the total production eligible for the credit. A small number of other projects produce electricity that is likely primarily for use on site. However, because such electricity is sold to a utility under an agreement whereby the consumer receives credit for the electricity generated, the tax credit is awarded in view of the sale rather than on

the basis of the on-site consumption provision of either tax credit program. No project has been awarded either a Wind Energy Production Tax Credit or Renewable Energy Tax Credit solely on the basis of generation for on-site consumption.

C. Tax Credit Application and Award Procedures

As indicated above concerning both the Wind Energy Production Tax Credit and the Renewable Energy Tax credit, initial applications for project eligibility are filed with and evaluated by the IUB. The IUB may grant eligibility to projects that meet program requirements and for which program capacity is available. Such projects are said to be approved on a preliminary basis and must be operational by a specified deadline, usually 18 months from approval, although operational deadlines may be extended 12 months upon request and Iowa law does not limit the number of such requests that may be granted. Subsequent to preliminary approval, operational projects submit annual applications to the IUB which include, among other elements, information about the amount of energy generated during the year. Based on this information, the IUB may recommend that the IDR issue a tax credit certificate, or award, for the amount of energy generated. Once awarded a tax credit, facility owners may claim the tax credit to offset their own Iowa tax liability or may transfer the tax credit certificate as provided by law. The amount of any unclaimed tax credit may be carried forward to subsequent tax years.

D. Project Waiting List

Once approved by the IUB, projects must be operational by a specified deadline. Operational deadlines may be extended, however, and extensions have been granted for at least 55 approved projects that are not yet operational. Once the program's aggregate capacity limit has been met by approved projects, including those that are operational as well as non-operational projects, additional project applications are placed on a waiting list. This procedural matter is currently relevant for the Renewable Energy Tax Credit program only since no new projects can be approved for the Wind Energy Production Tax Credit program under current law.

Because operational deadlines may be extended for up to 12 months for an unlimited number of times, and tax credits are available for ten years from the first date of production rather than from the date of approval, projects have no programmatic disincentive for failing to meet the initial operational deadline. In 2009, directed by legislation enacted earlier in the year, the Iowa Utilities Board reviewed waiting list procedures for the Renewable Energy Tax Credit. The purpose of the review was to assess whether approved projects were making satisfactory progress towards operational status, whether projects awaiting approval continue to seek approval, whether approved projects are committed to becoming operational once they obtain eligibility, and whether any changes to procedures were warranted (IUB, 2010). The report acknowledged that projects "with approved eligibility have an incentive to maintain their queue position as long as possible, and no incentive to leave the queue prematurely, if they encounter difficulties becoming operational before the […] deadline" (p. 2). Nevertheless, the IUB found no evidence that projects used the time allowed for reaching operational status inefficiently. Based on its findings, the IUB recommended no changes be made to the enabling statute or to its own procedures concerning eligibility.

III. Other State and Federal Incentives for Renewable Energy

A. Overview of Incentives for Renewable Energy

The Database of State Incentives for Renewables and Efficiency (DSIRE) is a web-based catalog of state and federal incentives for renewable energy and energy efficiency. Sponsored by the U.S. Department of Energy, it includes information about states' tax credits and other tax incentives for generating power from renewable sources. TaxCreditResearch.Com is an additional comprehensive source of information regarding state tax credits of all kinds including those related to renewable energy. The following analysis is adapted from these two sources as well as from information published by government agencies of various states.

According to the DSIRE database, all 50 states and the District of Columbia offer some form of incentive for renewable energy or energy efficiency, which may include not only tax-related incentives but also grants, loans, and other forms of industry support. Such incentives vary widely. They include financial inducements to homeowners to install energy-efficient appliances as well as negotiated support to industry for major capital investment projects. In addition, they embrace a wide range of energy technologies, including, for example, those based on solar, geothermal, and biomass energy sources.

The example of Iowa illustrates the variety of incentives available among the states. In addition to the Wind Energy Production and Renewable Energy tax credits, Iowa provides a State sales tax exemption for wind energy equipment and systems-related materials as well as a five-year property tax exemption for value added by solar and wind energy systems. Iowa's Solar Energy System Tax Credit, equal to 60 percent of the federal residential energy efficient property tax credit for solar energy systems, provides a maximum incentive of $5,000 for expenditures associated with the installation of a solar energy system at a primary residence. For business installations of solar energy systems, the Iowa tax credit also equals 60 percent of the related federal energy tax credit, where the Iowa tax credit is capped at $20,000 per installation. Iowa also provides a Geothermal Heat Pump Tax Credit equal to 20 percent of the federal residential energy efficient property tax credit allowed for geothermal heat pumps. Moreover, as do other states, Iowa provides support for renewable energy development in ways that go beyond tax policy. These include loan programs like the Alternate Energy Revolving Loan Program (AERLP). This program, administered by the Iowa Energy Center and funded by the state's investor-owned utilities, provides loans to build renewable energy production facilities in Iowa. Available to non-rate-regulated utilities since 2009, this program has been cited by Iowa wind energy experts as instrumental in the promotion of wind energy production in the state. In addition to state-sponsored incentives, numerous utility-sponsored grant, loan, and rebate programs are available.

B. General Tax Incentives for Renewable Energy

Forty-five states and the District of Columbia offer some form of tax incentive for the production of renewable energy or for investments in improved energy efficiency. In a number of these states these incentives are limited to the domains of property tax and sales tax. However, 29 states, including Iowa, offer incentives affecting individual or

corporation income tax, whether in the form of tax credits or deductions. Twenty-two states offer one or more tax credits that incentivize the utilization of renewable energy as well as improved energy efficiency in conventional technologies. Also counted among these credits are those for certain technologies designated by their respective states as "alternative" although they rely on carbon-based feedstock. For example, Montana offers a tax credit for the use of wood-burning stoves and Kentucky provides incentives for processes that use oil shale, tar sands, or coal as their primary raw material.

Among the 22 states that offer tax credits for renewable energy or energy efficiency, tax credits for the use of wind technologies are available in 17 states; credits for the use of solar energy (by any of various means) are available in 20 states; credits for the use of biomass are available in 16 states; and credits for the use of anaerobic digestion technology are available in nine states. The first of these credits was established in 1977. However, all but five of the credits identified were enacted after 2000.

The nature of these tax credits varies markedly in terms of such aspects as eligible system sizes, credit amounts, and total funding. Eligible systems range in size from those intended for residential use to those intended for commercial or industrial purposes. Fifteen states offer tax credits distinguished by their targeting of large-scale energy production or investment, whether related to renewable energy or to alternative energy sources. These include, for example, the tax credits provided for in Kentucky's Incentives for Energy Independence Act. Available on a negotiated basis to companies that construct or upgrade renewable or alternative energy facilities, the value of these credits may extend to 100 percent of corporation income tax arising from a given project. Montana's Alternative Energy Investment Tax Credit provides a credit of up to 35 percent of the tax on income from investment in facilities that produce renewable or alternative energy. These credits also include Missouri's Wood Energy Production Credit, which provides a credit of $5 per ton of processed biomass materials.

C. Production Tax Credits for Renewable Energy

In six of the 15 states that offer tax credits for large-scale production of energy, the tax credits are allocated on a per kilowatt hour (kWh) basis (see Table 1). This approach sets such programs apart as what are typically called production tax credits. In addition to Iowa, these states are Arizona, Florida, Maryland, New Mexico, and Oklahoma. (This list does not include Missouri whose "Wood Energy Production Credit," despite its name, is not based on amount of energy produced but on the amount of biomass consumed.) In all of these states the tax credit is allowed for wind- and solar-based power production. All of these states, except Oklahoma, allow the tax credit for biomass; four, including Iowa, allow a tax credit for production based on landfill gas; and three, including Iowa, allow a credit for production using anaerobic digestion technology.

In addition to the production tax credits available in various states, the federal Renewable Electricity Production Tax Credit (PTC) was enacted in 1992 as part of the Energy Policy Act. This corporation tax credit may be claimed for 10 consecutive years after a qualifying facility is placed in service. Set to terminate at various points in its

legislative history, Congress extended the PTC most recently in 2014 to include projects for which construction began prior to December 31, 2014. The PTC expired in 1999, 2002, 2004, and 2014 and was subsequently re-instated (Congressional Research Service, 2014). Retroactively extended after each period of lapse, the PTC has figured prominently in the development of renewable energy since its inception (Holmes and Papay, 2011; Congressional Digest, 2013; Congressional Research Service, 2014).

Like other production tax credits, the federal PTC is calculated on a per kWh basis for electricity generated. Qualifying projects receive the credit for the first ten years of production. Although originally limited to incentives for electricity derived from wind and certain biomass-based sources, the program was expanded in stages to cover production by additional renewable sources, including solar.

State production tax credit rates vary by the form of energy as well as by the generator's year of service. Rates vary by year of service in three states, including Arizona, New Mexico, and Oklahoma. New Mexico's Renewable Energy Production Tax Credit provides $0.015 per kWh for solar-based energy starting in the first year the generator is placed in service; the rate rises to $0.04 per kWh in the sixth year of generator service, and then decreases to $0.02 in year ten. Arizona's Renewable Energy Production Tax Credit is similar, except that its schedule begins at $0.04 per kWh and stairsteps down to $0.02 per kWh in year ten. Over the course of a decade, the New Mexico and Arizona programs provide an annual average credit rate of $0.027 per kWh for solar-based electricity. The amount of Oklahoma's credit varies by the calendar year of production. For electricity generated in 2003, its rate was $0.0075 per kWh; for electricity generated between 2004 and 2006, the rate was $0.0050 per kWh; and for electricity produced in 2007 and after, the rate is $0.0025 per kWh.

Tax credit rates vary by form of energy source for the federal PTC and in four states, including Iowa, Arizona, Maryland, and New Mexico. Indexed to inflation from a base amount specified by the original statute, in 2014 the federal credit equaled $0.023 per kWh for electricity derived from wind, closed-loop biomass, and geothermal sources during the calendar year, and $0.011 per kWh for other qualified sources. As noted above, Arizona and New Mexico provide tax credits of $0.027 per kWh, on average, for electricity produced from solar energy. Under the programs in these same two states, electricity produced from wind or biomass receives a credit equal to $0.01 per kWh. Maryland provides tax credits at a rate of $0.0085 per kWh of production from all sources except co-generation, for which the tax credit is $0.005 per kWh. Iowa offers different rates for production of commercial heat and hydrogen fuel. Overall, tax credit rates are higher for solar energy than for other forms and tax credit rates are somewhat lower for co-generated electricity.

Tax credit rates also vary among the states. The lowest tax credit rates are offered in Oklahoma, whose Zero-Emission Facilities Production Tax Credit provides a maximum of $0.0075 per kWh. Maryland's production tax credit is $0.0085 per kWh (except for co-generated power). In four states, including Iowa under the Wind Energy Production Tax Credit, the credit is $0.01 per kWh. Iowa's Renewable Energy Production Tax Credit

rate, at $0.015 per kWh for wind power, is the highest available state credit for non-solar energy in the country.

Five of the states specify aggregate limits on program awards. Arizona, Florida, Maryland, and New Mexico place annual caps on the dollar amount of awards in aggregate and on a per taxpayer basis. New Mexico's aggregate limits are the highest, with awards for wind and biomass capped at $20 million and $4 million per taxpayer. Its tax credit for solar energy production is capped at $20 million statewide and $8 million per taxpayer. With wind, biomass, and solar combined, New Mexico's aggregate limit is $40 million. Maryland's program is limited to $25 million per year and $2.5 million per taxpayer; Arizona's is limited to $20 million and $2 million per taxpayer; and Florida's limit is $10 million and $1 million per taxpayer. Program amounts are limited less directly in the other states. Iowa limits both the Wind Energy Production Tax Credit and the Renewable Energy Tax Credit in terms of aggregate megawatt nameplate capacity eligible for awards over the life of the program. These limits represent an upper bound for overall costs of the program and the program outlay is limited by the productive efficiency of approved generators. Oklahoma does not specify a limit on awards; however its rates are the lowest in the country. No limit was specified for the federal credit.

In the event that awarded tax credits exceed tax liability, states make various provisions for their refundability or carryforward. Two states, New Mexico and Maryland, offer fully refundable credits. In Iowa, nonrefundable credits may be carried forward seven years. In Arizona and Florida, the carryforward limitations are set at five years. In Oklahoma, unused credits earned through 2013 may be carried forward ten years; credits earned in 2014 and after may be refunded at 85 percent of their value. Unused credits from the federal PTC can be carried forward for 20 years.

Iowa is the only state whose production tax credits are fully transferable. In Florida, credits may be transferred only in cases of corporate mergers or acquisitions. Tax credits awarded under Oklahoma's program prior to January 1, 2014 were transferable. Tax credits awarded after this date are not transferrable but may be refunded at 85 percent of their value.

IV. Literature Review

A. Renewable Energy Markets

Logan and Kaplan (2009) identified four basic features of the market for wind energy. Specifically, it is characterized by 1) high fixed costs, 2) comparatively low costs for operations and maintenance, 3) the variable and intermittent nature of wind as a natural resource, and 4) high costs for system integration due to the need for system redundancy to back up variable wind resources. In identifying key factors of wind energy development, Bird, et al. (2005) noted several of these features as well. In addition to wind resources and transmission access, they identified the comparative costs of conventional energy sources, siting and permitting concerns, and overall electricity

demand as basic drivers of development. Though the ability to effectively promote wind energy development is thus constrained by such factors, states have little or no control over any of them. Nevertheless, these authors conclude that state tax incentives, among other policies, can positively affect wind energy development.

Numerous studies have attempted to model or evaluate the costs of generating energy from renewable sources, including wind (e.g., Faundez, 2008; Mount et al., 2012; Giberson, 2013). Such studies invariably concern the key technological obstacles to expanded use of renewable sources. Ferguson (2008) cites the uncontrollable nature of wind generator output in the absence of a suitable and scalable method of intermediate storage as the primary obstacle to expanding the use of wind. Numerous others support this view (Logan and Kaplan, 2009; Shiosansi, 2011; Green and Vasilakos, 2012; Mount, et al., 2012).

Despite the well-attested challenges for wind and other renewables, enthusiasm for their potential can be also found in the literature. One example is Warburg (2012), who, while acknowledging the enormous challenges associated with wider implementation of wind and other renewables, argues that, "in raw terms, our wind energy resource—like our solar potential—vastly outstrips our current and future power needs" (p. ix-x).

Warburg cites transmission as the technological lynchpin to expanded use of wind and other forms of renewable energy. In this view, such expansion is contingent on transmission infrastructure to connect the renewable resources of the nation's more remote places with its population centers, including a modernized grid that efficiently coordinates the distribution of electricity from where it is being generated at any given moment to where it is needed. Others seem to support this view. Green and Vasilakos (2012) cite the example of Denmark which exports power on windy days and imports power from hydro-electric sources when needed. Likewise, Swenson (2009) cites transmission as crucial to making use of wind resources.

B. Incentives for Renewable Energy

Despite the interest in wind and renewable energy technologies generally, and in incentives for wind and renewables in particular, research into the relationship between incentives and investment in renewable energy is limited. Garcia, Alzate, and Barrera (2012) employed economic models to assess the effectiveness of regulatory incentives for increasing the use of renewable energy. They identified important challenges for renewables, the intermittent availability of such resources and the absence of economies of scale notable among them. While they did not investigate tax credits as a particular strategy, their research found that, because of the particular challenges, incentives are necessary to achieve optimum investment.

Song (2011), however, found that renewable energy policies do not necessarily lead to increased production of renewable energy. Using panel data from 26 countries, the author examined the effects of various kinds of policies, including tax incentives, on such measures as the attainment of production targets, reducing greenhouse emissions, and cost-effectiveness. Song found that quantity-based requirements, such

as renewable portfolio standards (RPSs), were more effective than price-based incentives; in other words, policies that require energy suppliers to meet a given quota of renewable energy were more effective than financial subsidies. Song theorized that this is because quantity-based requirements offer suppliers greater flexibility in meeting demand with renewables. Song's findings are consistent with what appears to be a broad consensus concerning the impact of RPSs. Such standards, or their functional equivalents, require electricity retailers to obtain a given share of electricity from renewable sources. By some accounts, RPSs have greatly encouraged the growth of wind energy in the U.S. (Congressional Digest, 2013).

Iowa was the first state to adopt an RPS (U.S. Department of Energy, 2014). The state's Alternative Energy Production Law, enacted in 1983, initially created an incentive rate program which required investor-owned utilities (IOU) to purchase renewable energy at certain rates. By 1997, the law had been formally interpreted as a capacity-based standard whereby the state's IOUs were obligated to purchase or generate electricity associated with a combined total of 105 MW of renewable-source capacity. The law mandates no increases. The state's IOUs, whose 2012 production capacity from wind-based sources alone was 2481 MW, met this standard by 2000 (U.S. Department of Energy, 2013). Thus Iowa's RPS played no role in the growth of the state's wind energy industry since at least that time.

Micheli (2013) approached the connection between tax credits and investment in renewable energy with attention to the so-called "learning by doing" effects on future production costs. According to the concept of learning by doing, economies of scale are achieved as a result of implementation and technological innovation, which may be supported through public incentives like tax credits. In Micheli's words, "The intuition of subsidizing wind energy is essentially that higher demand of wind electricity stimulates the turbine producer industry and it can be a catalyst to learning and reducing production costs" (p. 453). Micheli modeled learning by doing effects on the production costs of wind power and found that subsidizing investments based on quantity of energy produced (i.e., as with tax credits) was one of three available approaches to regulators that lead to optimal levels of resource allocation. Garcia, et al, (2012) and Brunel (2014) also argued in favor of supporting wind and renewables through tax and regulatory policy on the premise that it can encourage learning by doing and bring about long-term productivity gains.

C. Evaluation of the Federal Renewable Electricity Production Tax Credit

A limited literature focuses on the relationship between tax policy and renewable energy production. Most research on the relationship between tax credits and renewable energy outcomes concerns the federal Renewable Electricity Production Tax Credit. Since its beginnings in 1992 under the Energy Policy Act, this tax credit has been extended nine times; four of these extensions occurred retroactively after the credit had expired. Most recently, the credit was extended for one year at the end of 2014. Currently the tax credit cannot be claimed for projects begun after January 1, 2015, although it may be claimed for projects started before that date.

The literature concerning this tax credit includes both criticism and advocacy. Critics, including Furchtgott-Roth (2013) and Loris (2013), argue that wind energy is fundamentally inefficient and that the tax credit is wasteful. According to Furchtgott-Roth, for example, “North America will soon be the leading oil producer in the world, so we no longer need to subsidize a less-efficient technology” (p. 436). Whatever its merits, the argument is premised on a critique of the underlying technology for wind energy. Furchtgott-Roth also addresses the broader environmental concerns that provide much of the impetus for wind energy expansion. The author argues that because India and China have not reduced emissions, “It makes no sense for America to spend billions on an inefficient energy source to reduce emissions when it will make little change in the global climate” (p. 436). Furchtgott-Roth argues, in short, that wind power is costly, inefficient, and unnecessary.

Loris’s thesis is that subsidies of any sort engender inefficient capital allocation. Loris argues as follows (p. 329):

> The PTC expired in 2000, 2002, and 2004, and annual wind installation decreased by 93 percent, 73 percent, and 77 percent, respectively. Wind energy advocates call this a boom-and-bust cycle created by unstable policy, but it is more likely a case of the wind PTC’s oversupplying a market and artificially propping up a large portion of wind production.

As Loris admits, the apparent relationship between the periodically impending end to the tax credit for new facilities and peaks in wind investment is open to different interpretations. In any event, the literature concerning the federal PTC is largely uniform on the question of whether it has resulted in expanded development of renewable energy. That is, various sources, including a number of critics, agree that the credit has led to greater production than would have occurred in its absence.

In a 2008 report, U.S. Department of Energy researchers suggested that the wind industry has acted opportunely on policy incentives when they are available (U.S. Department of Energy, 2008). Riti (2010) cited this same report as evidence that available technology (including solar panels, wind turbines, and fuel cells) can provide sufficient renewable energy to form a large part of the nation’s energy infrastructure. Riti noted that these technologies have yet to achieve economies of scale; initial capital costs prevent their installation on a sufficiently large scale to offset production by conventional means. Riti concluded, “Achieving scalability continues to be the intransigent problem that impedes investment and widespread implementation. This lack of investment is in turn preventing scalability, thus perpetuating a stalling cycle within the industry” (p. 787). This reasoning would thus suggest that incentives are necessary to engender economies of scale.

According to some researchers, the episodic availability of the PTC has, if anything, suppressed investment in wind and other forms of renewable energy. Wiser, Bolinger, and Barbose (2007) argued that it has led to underinvestment in turbine manufacturing

and otherwise made the credit less effective than it would be under a more stable and predictable tax credit program. Nevertheless, they also found that "The PTC, coupled with the rising cost of conventional fuels, R&D advances, and a variety of state policies, has stimulated significant – though erratic – growth in the use of wind power" (p. 79). Ernst (2013) noted that by incentivizing the end product of electrical generation itself, production tax credits directly reduce the costs of renewable energy production. Riti concurred, asserting that the PTC has stimulated renewable energy investment by allowing the costs of renewable energy to be competitive with those of conventional technologies.

A 2011 study prepared for the American Wind Energy Association evaluated the impacts of alternative scenarios related to the then-uncertain extension of the PTC (Navigant Consulting). The study found that extending the federal PTC through 2016, rather than allowing it to expire at the end of 2012, would increase installed capacity by 70 percent and double the number of wind energy-related jobs. The study also assessed these alternative scenarios in terms of their broader economic impacts and environmental effects and found substantial positive impacts of extending the credit on both fronts. A state-by-state analysis of the cumulative impact of a PTC extension on employment and wind energy investment found that Iowa was one of three states where employment impacts were greatest (Navigant Consulting, 2011).

In a 2013 study, Ernst likewise examined the respective impact of various hypothetical scenarios related to the extension of the federal PTC. Ernst distinguished between total cost of the credit and its cost-effectiveness in terms of its effect on the aggregate cost per kWh of additional electricity generated and the aggregate cost per GW of additional wind energy capacity. Ernst found that extending the credit through at least 2023 would be the most cost-effective of the scenarios examined but, perhaps not surprisingly, also the most costly to the U.S. treasury in terms of foregone tax revenues. Thus, the author found that given a primary policy objective of maximizing installed capacity, extending the PTC through 2023 would yield the most favorable results. On the other hand, terminating the credit would require the least expense. Ernst also found that the frequent expirations and extensions of the PTC were a source of uncertainty among wind energy developers which a longer-term and more reliable tax policy would obviate.

A study by Bird and others (2005) examined the factors related to investment in wind energy in the twelve states where capacity had been developed most substantially. These authors focused on state-level policies rather than federal policies and market factors. Writing nearly a decade ago, they noted Iowa's overachievement in wind power production and attributed it to a high level of commitment on the part of policymakers. In particular they noted Iowa's Alternative Energy Production Law, the State's sales tax exemptions for solar, wind, and hydroelectricity equipment, and the State's property tax exemption for market value added by solar and wind energy systems. The two tax credits considered in this study had only just been enacted when this study was published. Runge and Tiffany (2007) also cited Iowa as a leader and a model among the states for its incentive structure.

V. The Electric Power Industry and Wind Energy in Iowa

As of 2014, installed wind-generated electrical capacity of the United States is just over 61 gigawatts (GW) (American Wind Energy Association [AWEA], 2014). Having increased from approximately 2.4 GW in 2000, the nation's capacity grew by a multiple of more than 25 during those fourteen intervening years (U.S. Energy Information Administration [EIA], 2013a). Even so, growth of wind capacity in Iowa outpaced growth nationally, increasing by a factor of more than 28 (EIA, 2013a). Despite ranking seventh among the states in terms of wind energy potential, Iowa has an installed wind energy capacity of 5.1 GW, third highest of the fifty states, behind California and Texas (AWEA, 2014). Iowa accounts for nearly nine percent of national wind energy capacity (EIA, 2013a). Moreover, Iowa leads the nation in share of electricity generated from wind (EIA, 2014a). Wind accounts for 27 percent of electricity generated in Iowa; by comparison, it makes up approximately four percent of total electricity generated in the U.S. (EIA, 2014a).

A. Brief Profile of the Electric Power Industry

The U.S. Energy Information Administration (EIA) collects information about electric power plants with its annual electric generator report, the *EIA-860*. The most recent data available from this report concerns plants that were operational in 2012.[2] Power plants with a generating capacity of at least 1 MW are required to provide information for this report. Based on data from the *EIA-860*, in 2012, the aggregate electric output of all facilities located in Iowa was 56.7 million MWh (see Table 2). Seventy-seven percent of this electricity was produced by the electric utilities sector, which includes municipally-owned utilities and rural electric cooperatives as well as investor-owned utilities. An additional four percent was produced by generators which produce electricity primarily to support the activities of commercial or industrial establishments rather than for sale to consumers. The remaining 19 percent of electricity produced in 2012 was generated by the independent power production sector. Each of these sectors is described below.

Utilities are entities that are aligned with distribution facilities for delivering electricity primarily for public use (EIA, 2014b). That is, utilities maintain the infrastructure for providing electricity to consumers. Utilities include investor-owned utilities, municipally-owned utilities (MOUs), and rural electric cooperatives (RECs).

IOUs are private companies financed by shareholder equity and bondholder debt; nationally, most are financially sizable, multi-state operations (Regulatory Assistance Project, 2011). Because utilities are natural monopolies, IOUs are subject to state regulation. In Iowa, the rates and services of investor-owned utilities that serve more than 10,000 customers are regulated by the Iowa Utilities Board (IUB). Although three IOUs operate in Iowa, one serves a small number of customers. The IUB regulates the rates of two IOUs, MidAmerican Energy Company and Interstate Power and Light Company.[3] These two IOUs serve 72 percent of Iowa customers (IUB, 2013).

[2] Individual plant data for 2013 is scheduled for release in February 2015.
[3] Interstate Power and Light (IPL) is the utility subsidiary of Alliant Energy Company serving Iowa.

MOUs are city-owned and governed by local elected officials. The IUB does not regulate rates or services of MOUs but does regulate MOUs with respect to certain other matters specified by Iowa Code. RECs are private, nonprofit entities governed by customer-elected boards. With the exception of a single REC which has opted for rate regulation, the rates of RECs in Iowa are not regulated. As customer demand varies, utilities may purchase needed power or sell excess power via a wholesale market. In Iowa this process is facilitated by a Regional Transmission Organization.

Independent Power Producers (IPPs) are distinct from utilities. IPPs generate electricity for sale to utilities, whether directly or through the Regional Transmission Organization. Such sales are governed by a power purchase agreement between each IPP and the power purchaser. Power purchase agreements, which are subject to regulation by the Federal Energy Regulatory Commission, stipulate terms of sale, including price, for a period of several years. Federal law requires utilities to purchase power produced by IPPs at their wholesale rate.[4]

B. Wind Energy Generation by Sector

As noted above, the electric utilities sector (which includes IOUs, MOUs, and RECs) generates slightly more than three quarters of the electricity produced in the state. However, of this total, a comparatively modest 17 percent is produced from wind (see Table 2). By contrast, 60 percent of electricity produced by IPPs in 2012 was generated from wind, accounting for 47 percent of the state's wind-generated electricity.

Based on the *EIA-860*, there were 75 wind power plants in Iowa in 2012, consisting of more than three thousand individual wind turbines. Eighteen plants were operated by one of Iowa's two rate-regulated investor-owned utilities, ten were owned by municipally-owned utilities or cooperatives, and 46 were operated by IPPs. One was operated for commercial or industrial use.

In general, utility-owned power plants are much larger in terms of generating capacity than plants owned by IPPs (see Table 3). As of 2012, IOUs operated 18 wind power plants in Iowa. These had an average nameplate capacity of 137.8 MW. Only two had a capacity of less than 30 MW. The nameplate capacity of the remaining 16 plants ranged from 59 MW to 444 MW. The 46 plants operated by IPPs, by contrast, had an average nameplate capacity of 53.6 MW. Half of these plants had a capacity of less than 30 MW.

Wind Energy Production Tax credits are available to facilities regardless of their ownership sector (i.e., whether they are owned by utilities or by IPPs). However, tax credits are for wind energy that is sold on the basis of either a power purchase agreement with a utility or via an interconnection agreement for sale in a wholesale power pool market, except where a credit may be provided for electricity generated for on-site consumption. As a practical matter, then, the tax credit offers an incentive primarily for plants operated by cooperatives and IPPs. This is because Iowa's rate-regulated IOUs generate electricity principally for sale to retail consumers and are

[4] Public Utility Regulatory Policy Act (PURPA) of 1978

assured a reasonable return by means of the rate-regulation process (Regulatory Assistance Project, 2011). The Renewable Energy Tax Credit is limited by statute to facilities owned by IPPs and cooperatives.

C. Tax Credit Projects

Based on information published by the Iowa Utilities Board, there are four wind energy projects operating with approval for Wind Energy Production Tax Credits under Iowa Code Chapter 476B as of 2014. These four projects were approved for a combined nameplate capacity of 50 MW, the maximum available for the tax credit (see Table 4). Among applications filed since 2005, three have expired and applications for an additional two projects are in queue for the credit. The total capacity of projects with active applications (including those that are operational and those in queue) is 122.5 MW. The only benefit to being in queue is if the capacity limit under the tax credit was to be increased by the Legislature. Without that, the two projects will receive no tax credits.

Under the Renewable Energy Tax Credit program, awards for wind energy production are limited to projects with a combined 363 MW generating nameplate capacity; awards for energy production based on other forms of renewable energy are limited to projects with an additional 53 MW aggregate nameplate capacity and 167 billion BTU of heat for a commercial purpose. Thus, the Renewable Energy Tax Credit provides for awards in any of three categories, which for ease of reference can be labeled “476C wind,” “476C other,” and “476C 167 Billion BTU.”

As of December 2014, a total of 161 wind energy projects have been approved under the Renewable Energy Tax Credit wind program. The combined capacity of these projects is 361.55 MW, just below the 363 MW maximum available for the credit. Of the 161 approved projects, 48 are operational and 113 are not yet operational. The 48 operational projects represent 80.05 MW of generation capacity. Applications for an additional 21 projects, which represent a combined 52.5 MW of capacity, have been filed and are waiting for approval in the event that other facilities fail to become operational and drop off the list prior to the December 31, 2016 deadline

D. EIA Data and Tax Credit Data

In the context of the *EIA-860*, a wind power plant is one or more wind turbines interconnected to a common utility system through, in general, a single substation (EIA, 2014c). This definition is consistent with that of an eligible wind energy production facility as defined for the Wind Energy Production Tax Credit under Iowa Code Section 476B.1, except that this code section limits the generating capacity of eligible facilities. In general, eligible facilities are one or more wind turbines connected to a common gathering line which have a combined nameplate capacity of between two and thirty megawatts. Note that projects eligible for this tax credit may be a part of a larger single facility. For example, a 20 MW project that is eligible for a Wind Energy Production Tax Credit may be part of a facility with 100 MW total nameplate capacity. In such instances, the energy production eligible for the tax credit is a pro-rated percentage of the total electrical output of the plant.

Under Iowa Code Chapter 476C, Renewable Energy Tax Credit wind energy conversion facilities are defined as systems that collect and convert wind into energy to generate electricity. Wind energy facilities may be a single wind turbine that transmits power to a single substation along with other wind turbines. Under this tax credit program, projects are limited to 2.5 MW capacity for each owner. A single wind power plant, as defined for the *EIA-860,* may consist of multiple individual projects approved for tax credits under the Renewable Energy Tax Credit program.

Although EIA plant-level data and IUB project-level data are not directly analogous, in general, EIA plant data can be cross-referenced based on the name of the plant to public information concerning operational plants eligible to receive Wind Energy Production and Renewable Energy Tax Credits. The 2012 *EIA-860* does not contain data for all wind power plants in Iowa for which tax credits have been awarded to date, however. This is primarily because a number of plants approved for tax credits became operational after 2012. In addition, EIA data is in general limited to plants of 1 MW generating capacity or more. Of the approximately 130 MW of capacity approved for tax credits under both tax credit programs as of 2013, *EIA-860* report data is available for plants that account for 114 MW. Those tax credit-recipient projects are associated with 20 separate wind energy plants for which data was available from the EIA in 2012 (see Table 5 and Figure 1). Note that, based on EIA data, the total MW capacity of these 20 plants was 522 MW, a much larger total than the 130 MW of aggregate capacity approved for tax credits. This is because, as noted above, a single wind power plant as defined for the *EIA-860* typically consists of multiple individual generators, only some of which may have been approved for tax credits. In addition, tax credits may be approved for a share of total MW capacity at a larger, single facility.

Wind energy projects approved for either Wind Energy Production Tax Credits or Renewable Energy Tax Credits are located in 15 counties in Iowa (see Figure 2). Broadly speaking, the bulk of the capacity of approved tax credits is located in the western half of the state from as far south as Adair and Cass counties to the state's border with Minnesota. In eight counties, wind energy projects approved for tax credits amount to less than 5 MW. More than 10 MW are located in each of seven Iowa counties. Three of these counties, including Crawford, Greene, and Palo Alto, each contain more than 20 MW of capacity.

An additional thirteen non-wind renewable energy projects have been approved for the Renewable Energy Tax Credit. These include ten projects under the 476C other category which utilize eligible technologies including biomass conversion and solar energy. Altogether, these ten projects have been approved for 53 MW of electrical capacity, the maximum allowed for this category of projects. Three of these ten projects are operational.

The other three non-wind projects are facilities that produce commercial heat. Each has been approved for a one-time credit for production of 55 billion BTU, or a combined 165 billion BTU, under the 476C 167 Billion BTU commercial heat category of the program. Iowa Code specifies that the maximum amount of heat energy production capacity for

which a single entity is eligible is 55 billion BTU. Therefore these facilities only receive one tax credit award under the program, unlike the 476C wind and 476C other facilities that can receive tax credit awards for ten consecutive years.

VI. Wind Energy Production and Renewable Energy Tax Credit Awards and Claims

A. Tax Credit Awards and Transfers

Since the beginning of these programs, a combined total of $26.9 million Wind Energy Production and Renewable Energy Tax Credits have been awarded. Distinctively among the State's tax credits, Iowa Code requires that certificates for both programs be issued directly to facility owners, including individual shareholders in the case of facilities owned by pass-through entities. Certificates are issued based on production during the tax year for which a credit is claimed, except that in the first full tax year for which a facility is eligible, awards may be claimed for more than 12 months of production stretching back to the first month of production.

In 2007, the first year of awards for the Renewable Energy Tax Credit, the Iowa Department of Revenue awarded 22 tax credit certificates for $1.5 million; these credits were awarded to 19 distinct projects, including wind, other, and 167 Billion BTU projects (see Table 6a). The average award for each project was $79,000 and the average certificate was only slightly lower at $68,000, indicating that comparatively few certificates were issued for each project. The total amount of awards grew to $2.6 million in the subsequent year and remained below $3 million until 2012. Meanwhile, project average awards increased to $129,000 in 2008 and have remained above $106,000 since. In 2013, the most recent complete year for which award data is available, the value of awards was $5.6 million and the average tax credit certificate was $16,000. Since 2007, a total of $21.8 million in tax credits has been awarded under the program. Of this amount, $20.7 million, or 95 percent, has been transferred to third parties. Ninety-nine percent of credits issued in years prior to 2013 have been transferred.

Under the Wind Energy Production Tax Credit program, the Iowa Department of Revenue has issued fewer certificates for fewer projects than under the Renewable Energy Tax credit. In order to maintain confidentiality of taxpayer information, the number of certificates awarded under Wind Energy Production Tax Credit and average certificate amounts are not reported by year. Wind Energy Production Tax Credit awards were first made in 2009. In 2013, awards totaled $1.6 million for four projects. Since its inception, the program has awarded $5.2 million in tax credits (see Table 6b). As with the Renewable Energy Tax Credit, virtually all of the tax credits issued prior to 2013 have been transferred. Overall, including certificates issued in 2013, 87 percent of program awards have been transferred.

As noted above, as of December 2014, 80 MW of the 363 MW of wind energy capacity available for tax credits under the Renewable Energy Tax Credit program are associated with operational projects. In the event that all awarded capacity becomes

operational, the value of program awards would be substantially larger than the value of awards made for the most recent tax year. For example, assuming the same production efficiency per megawatt capacity as was applicable in 2013, the Renewable Energy Tax Credit program would award $21.5 million in tax credits in any year in which aggregate operational capacity were 363 MW. Thus, as more wind capacity comes on line, the fiscal impact of the Renewable Energy Tax Credit will be much greater than is reflected in this analysis.

B. State of Residence of Awardees

Tax credit certificates issued through these two programs are issued directly to facility owners including individual shareholders; therefore, it is possible to identify the state of residence of tax credit recipients in both programs. Under the Wind Energy Production program, tax credits were issued to 19 individual owners totaling $1.6 million for award year 2013 (see Table 7). Of these owners, ten, or 53 percent, were Iowa residents and nine were residents of other states. The distribution of amounts awarded was approximately proportionate; 56 percent of the total amount awarded in 2013 was to Iowa residents and 44 percent was to nonresidents.

Of the 351 recipients of Renewable Energy Tax Credit awards in 2013, 291 were Iowa residents. Iowa residents thus accounted for 83 percent of this program's recipients and $2.9 million (52%) of the approximately $5.6 million of tax credits awarded under the program and nonresidents received $2.7 million (48%). The high proportion of awards received by nonresidents under both tax credits, which are nonrefundable, may partly explain why such a high percentage of awards are transferred.

C. Tax Credit Claims by Tax Type

A total of $19.0 million in Renewable Energy Tax Credits have been claimed for tax years 2006 through 2014 (see Table 8). Note that certificates awarded in a given year may be claimed for a prior tax year in the case of entities that file tax returns on a fiscal year basis; conversely tax credits can be claimed against insurance premium pre-payments due prior to the end of a tax year. Claims for tax year 2006 were $960,000. Claims for tax year 2012 and 2013 reached $3.2 million under this program.

Wind Energy Production Tax Credits were first claimed in tax year 2009. With the small number of claims, annual information cannot be presented. Claims under this program exceeded $1 million in 2012. Since 2009, a total of $3.8 million in Wind Energy Production Tax Credits have been claimed.

Awards made under the Wind Energy Production and Renewable Energy Tax Credit programs are claimed against various tax types (see Table 9). Considering all claims to date for both programs combined, 33 percent were against insurance premium tax; 27 percent of the total claimed amount was against corporation income tax; 18 percent was against franchise tax; and just 5 percent was against individual income tax. Sixteen percent of the total claimed amount was against replacement tax, which is a form of excise tax paid by gas, electric, and water utilities in lieu of property tax. The average claim varies by tax type as well, ranging from $358,000 for replacement tax to $4,400 for individual income tax. There have been 537 claims for Wind Energy Production and

Renewable Energy Tax Credits. Recall that nearly all of the tax credits were transferred, so claimants are typically not the original taxpayers who were awarded the tax credits.

D. Energy Production Statistics

Both the Wind Energy Production and the Renewable Energy Tax Credit awards are based on the amount of energy produced by the approved facilities. Thus awards are tied to the productivity of those facilities. Based on tax credit awards, incentivized wind energy production is compared to EIA wind energy production statistics for all independent power producers (IPPs) in Iowa, as well as total wind energy production in the state (see Table 10).

Wind energy for which Renewable Energy Tax Credits were awarded totaled 35,000 MWh in 2007, or 2.9 percent of wind energy generated by IPPs in Iowa and 1.3 percent of the total wind-generated electricity produced in the state. In the subsequent six years, with Wind Energy Production Tax Credits first awarded in 2009, the wind energy produced under both tax credit programs increased by a multiple of more than thirteen, to 473,000 MWh in 2013. Production for which tax credits were awarded in 2013 accounted for 6.8 percent of wind energy generated by IPPs and 3.0 percent of the total wind-generated electricity produced in the state (see Figure 3). It should be emphasized that, whether or not it was also eligible for either the Wind Energy Production Tax Credit or Renewable Energy Tax Credit, electricity generated from wind during this period was also generally eligible for the federal PTC. Based on information provided by IUB, owners of 28 of the 51 wind energy facilities eligible for Wind Energy Production or Renewable Energy Tax Credits anticipated claiming the federal PTC. The owners of an additional 17 facilities indicated they would instead elect to claim a federal Section 1603 investment tax credit or equivalent cash grant.

To forecast future tax credit awards, a key statistic is generation facilities' capacity factor. For this analysis, the capacity factor is defined as the amount of wind energy produced by a project as a percentage of the project's nameplate capacity. While nameplate capacity reflects maximum generation capacity of any electricity facility, facilities typically have capacity factors somewhat below nameplate capacity. This is particularly true of generators that rely on intermittent renewable resources like wind energy. Capacity factors are also affected by transmission capacity and electricity demand. Although capacity factors for wind generators vary markedly by geographical location and weather cycles, an efficiency of 35 percent represents a useful national benchmark (EIA, 2014d).

For the Wind Energy Production and Renewable Energy Tax Credits, each project's nameplate capacity is specified in its tax credit application approved by the IUB. Note that, though it is not typical, projects may consist of more than a single wind turbine; in those cases, capacity factor calculations are based on the combined megawatt capacity of the project as a whole.

In 2007, credits were awarded to 17 wind projects (see Table 11). On average, based on tax credit awards, these projects operated at 18 percent capacity. In that year, the minimum capacity factor was 8 percent and the project with the highest factor operated

at 30 percent of capacity. As of 2013, the number of wind energy projects for which credits were awarded was 50. The minimum capacity factor remained low, at 5 percent, but projects' average capacity factor increased to 38 percent and maximum capacity factors of projects in the two tax credit programs had reached 49 percent.

In 2013, twenty-five, or half, of the wind projects approved for tax credits under both the Wind Energy Production and Renewable Energy Tax Credit programs operated at capacity factors of between 40 and 45 percent (see Figure 4). Thirty-nine, or about 80 percent, of these wind projects operated at factors of between 35 and 45 percent. Four projects had capacity factors of greater than 45 percent and no projects operated at factors of greater than 50 percent. Three projects had capacity factors of less than 15 percent.

Over the course of these tax credit programs, capacity factors of tax credit-recipient projects have increased. Between 2007 and 2013, the median capacity factor increased from 22.3 percent to 40.6 percent (see Figure 5). This trend seems to primarily reflect advancements in wind energy generation technology, a supposition borne out by the steady escalation in the maximum capacity factor of generators in the programs over the period. In addition, the median capacity factor of facilities in their first year of production increased steadily over the period. Considering only those years in which at least five facilities reported their first year of production, the median capacity factor of first-year facilities increased from 22.3 percent in 2007, to 35.6 percent in 2011, to 38.0 percent in 2012, and to 41.5 percent in 2013. On the other hand, the trend is not only the result of new projects coming on line. The increase in the median capacity factor between 2007 and 2013 reflects quite steady increases in the capacity factors of all facilities, not just new facilities. The median capacity factor of facilities in place since 2007 increased from 22.3 percent in that year to 39.5 percent in 2013. This may, in part, have been due to upgrades to machinery such as the addition of trailing edge extensions to existing blades or generator upgrades. Looking forward, capacity factors may well increase further.

VII. Economic Analysis of the Wind Energy Production and Renewable Wind Energy Tax Credits

A. Delimitations of the Analysis of Renewable Energy

Examination of virtually any aspect of renewable energy invariably touches on a number of other serious and topical issues. Foremost among these are concerns around global climate change and the consumption of carbon-based feedstocks to which renewable energy offers an alternative. However, analysis of the extent to which the Wind Energy Production and Renewable Energy Tax Credits contribute to a broader shift away from reliance on fossil fuels is beyond the scope of this evaluation study. For an analysis of the impact of global climate change on Iowa, see the work of the Iowa Climate Change Advisory Council (2011), a body established by Iowa Code and charged with developing policy options for reducing greenhouse gases.

Other important questions around renewable energy relate to its underlying practicality. Of particular note is whether and in what manner renewable capacity might be scaled up to meet base load demands, since the prospects for large-scale utilization of renewables are premised on certain tentative technical contingencies. For example, a key challenge for wind energy is that wind is variable and somewhat unpredictable. As noted in Section IV, any future large-scale adoption of wind-based energy would likely require an automated grid and large-scale transmission capacity, perhaps in combination with some kind of intermediate storage, in order to direct electricity from where it is being generated to where it is needed. The intuition underlying such a vision is that while wind is not always blowing everywhere, it is always blowing somewhere. With sufficient transmission capacity sufficiently integrated, so the reasoning goes, something approaching base load wind energy production would be feasible. A description of the technical and practical conditions for fuller reliance on renewable energy is beyond the scope of this study.

Finally, wind energy is at the heart of a broad network of industry in Iowa. The state is home to major manufacturers of wind energy machinery and related systems including turbines, blades, towers, and control components. These enterprises, along with the construction and maintenance of wind facilities and associated business activity, account for considerable investment in the state. The industry's impact ripples through the economy in countless ways. This evaluation study does not attempt to assess the nature and extent of this economic ripple effect nor measure the economic impact that results from the Wind Energy Production and Renewable Energy Tax Credit programs.

B. Issues Surrounding Transferable Tax Credits

Tax credits awarded under both the Wind Energy Production Tax Credit and Renewable Energy Tax Credit programs are transferable. As described in Section I, this means that tax credit recipients may sell the credit to third parties who may then use the purchased credit to offset their own Iowa tax liability. Because the tax credit may be purchased at a discount from its face value, it is attractive to buyers. Likewise, for tax credit awardees whose tax liability is limited, the exchange is appealing because they would otherwise be unable to benefit from the nonrefundable tax credit.

Transfers are private transactions. Information about transfer sales prices is not available. Based on general information published about tax credit exchanges, credits are generally sold at a discount of 5 to 15 percent (see, for example, Conservation Resource Center, 2014; Goodman, 2012; Tozzi, 2013). Anecdotally, the price for transferred Renewable Energy Tax Credits ranged as low as $0.88 per $1.00 of credit value in past years and has settled more recently at around $0.92.

As reported above, virtually all tax credits awarded under the Wind Energy Production Tax Credit and Renewable Energy Tax Credit programs have been transferred. The finding has implications for the value of the programs' support for wind and other forms of renewable energy. Specifically, it indicates that tax credit recipients receive, perhaps, $0.90 of each dollar foregone by the State in the interest of subsidizing renewable energy production. Secondarily, the exchange of tax credits at a discount provides a tax

benefit to the tax credit purchaser that is surely unintended by the program. The authors of an article published by the Research Division of the Federal Reserve Bank of St. Louis (Rothstein and Wineinger, 2007, p. 66) state their concern with credits that are transferable but not refundable as follows:

> A potential problem with credits that are just transferable is straightforward: A $1 tax credit does not sell for $1, but the credit will cost the taxpayers of [the State] that amount when it is redeemed. Money that was supposed to support public programs ends up as profit to the buyer of the credits. In contrast, if the tax credits were *also* refundable, then every tax dollar spent on the tax credit would go toward the intended activity.

The policy implications of transferability are a topic of some currency among lawmakers in various states as well. For example, Oklahoma recently reviewed transferability of awards made under its Zero-Emission Facilities Production Tax Credit program (Goodman, 2012). Under this program, credits were formerly transferable. As a result of a recent change to the program, however, credits awarded after the beginning of 2014 are not transferrable but may be refunded at 85 percent of their value.

The case of Oklahoma provides an example of one state's response to the recognition that, where tax credits are transferable and nonrefundable, awardees typically do not realize a credit's full value when it exceeds their state tax liability. Oklahoma lawmakers apparently determined that their state's general fund, rather than third-party purchasers with no necessary stake in renewable energy, ought to be the beneficiary of any discount that would otherwise result from a transfer sale by offering awardees the option to claim the tax credit as refundable, but for a value less than one hundred percent.

Substantial upfront capital is generally required to finance renewable energy projects. Although the Wind Energy Production Tax Credit and the Renewable Energy Tax Credit are awarded for energy that is generated and sold, State financial incentives, including tax credits, are used to offset these upfront costs (Iowa Environmental Council, 2011). Published accounts indicate that tax credits are a critical source of investment capital once they are transferred even if the value of the credit is somewhat diminished as a result.

In a presentation describing a single wind farm composed of several projects approved for the Renewable Energy Tax Credit (Wind, 2006), one of the projects' associates outlined the enterprise's investment strategy. Funding elements included United States Department of Agriculture Section 9006 grants to several owners and zero interest loans for renewable energy development, like those available from the Iowa Alternate Energy Revolving Loan Program. According to the presentation, "all of these were necessary [for the project] to be competitive" (Wind, 2006).

C. Property Tax Implications

One consideration of the economic impact of the Wind Energy Production and Renewable Energy Tax Credits is the property tax revenue impact of incentivized wind energy projects. Iowa Code section 427B.26 allows cities and counties to adopt ordinances to provide for special valuation of wind energy conversion property for property tax purposes. Where such ordinances are adopted, special assessment is applicable to all wind conversion property, not only that for which tax credits are granted under the Wind Energy Production and Renewable Energy Tax Credit programs. Under this code section, wind energy conversion property is assessed at a graduated percentage of its net acquisition cost. In its first year after installation, wind energy conversion property is assessed at zero percent of its net acquisition cost. Assessment in subsequent years is based on a percentage that increases by five points each assessment year until the seventh and subsequent years, when it remains at thirty percent of the net acquisition cost. Thus Iowa law provides a tax break of 100 percent for wind energy conversion property in the first year after it is acquired, 95 percent in the second year, and so on (see Table 12).

Although the aggregate increase in property tax revenue to local jurisdictions is attenuated by Iowa Code section 427B.26, increases in the assessed value of property as a result of wind turbine installation, nevertheless, result in increases in property tax revenues to local taxing jurisdictions. The following estimates the property tax increases resulting from the construction of wind energy conversion property incentivized by the Wind Energy Production Tax Credit and the Renewable Energy Tax Credit. Information and assumptions used for calculating an estimate of this property tax revenue impact are summarized in Table 13. The assumptions include, for each year since the inception of the tax credit programs, the aggregate megawatt capacity of turbines entering into service, estimates of the acquisition costs associated with this wind energy conversion property, and estimates of the tax rates applicable to such property. Given these elements, estimated property tax liability for wind energy conversion property entering into service in each year can be computed according to the special assessment schedule outlined Iowa Code section 427B.26 for each year of service and summed for each tax year. Such an analysis assumes that local special valuation ordinances are applicable for all of this property.

Estimates of the number of megawatts entering into service in each year since 2006 are based on tax credit program records. For purposes of this estimate, it is assumed that each project's first year of operation and its first year of assessment is one year from the date of its respective approval for the tax credit program. Since acquisition cost estimates are expressed on a per megawatt basis, property tax impact estimates are based on the aggregate megawatt capacity of wind turbines entering into service under the program in each assessment year.

Estimates of wind turbine acquisition costs are based on cost and performance projections by Black and Veatch published by the U.S. Department of Energy for land-based wind systems installed in years 2005 through 2030 (U.S. Department of Energy, 2009). These estimates include costs for turbines, towers, foundations, installation, and

connection and thus approximate the acquisition costs properly calculated for property tax purposes consistent with guidance provided by the Iowa Department of Revenue (2014). According to these estimates, wind system acquisition costs totaled $1.65 million per megawatt in 2006 constant dollars and remained at this level through at least 2010. For this analysis, these costs are assumed to be applicable to wind systems built in Iowa through 2013. Costs expressed in 2006 dollars were adjusted to account for inflation using the Bureau of Labor Statistics Consumer Price Index for all urban consumers.

Based on these cost assumptions and on the megawatt capacity of wind turbine systems entering into service, it is estimated that the aggregate acquisition cost of wind energy conversion property for which tax credits were awarded under the Wind Energy Production and Renewable Energy Tax Credit programs was $58.9 million in 2006. The aggregate value of systems entering into service each subsequent year through 2013 varied from zero to $55.7 million. The estimated applicable property tax levy rate for this analysis is the statewide average of consolidated rates in rural taxing districts for applicable assessment years; consolidated rates for future years are assumed to remain constant at levels applicable to the 2013 assessment year.

Given the assumptions outlined above in regard to the value of wind energy conversion property for which tax credits have been awarded and the special assessment schedule, the counties wherein this property is located first gained a property tax revenue increase as a result of the installation of this property in FY 2009 (see Table 14). Note that taxes on property assessed in a given year are due in the fiscal year that begins in the following calendar year. Thus taxes on property assessed in 2006, for example, are due in fiscal year 2008. According to the schedule in Chapter 427B.26, wind energy conversion property is assessed at zero percent of its acquisition cost in its first assessment year. The aggregate amount of this property tax revenue increase to local jurisdictions was estimated to be $80,000 in FY 2009. As of FY 2015, this revenue increase is estimated at $958,000. The property tax revenue increase to counties where wind energy conversion property eligible for credits under these two programs is located is estimated to reach $1.8 million by FY 2021. Altogether, for fiscal years 2009 through 2021, the property tax impact of projects that are operational as of 2014 is estimated to be $12.6 million. This analysis does not account for any additional investment that might occur under the program in future years. Nor does it account for property tax revenue increases as a result of wind energy conversion property that has not been awarded a tax credit under the Wind Energy Production or Renewable Energy Tax Credit programs.

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Renewable Energy Tax Credit

Tax Credits Program Evaluation Study

Tables and Figures

Table 1. Production Tax Credits for Renewable Energy by State

State	Production Tax Credit Program	Tax Type C: Corporation Income I: Individual Income	Eligible Technologies W: Wind S: Solar B: Biomass AD: Anaerobic Digestion O: Other[1]	Credit Amount	Maximum Incentive	Transfer-ability	Eligible System Size	Refund-ability	Carry-forward	Initial Year
Federal	Renewable Electricity	C	W, S, B, O	$0.023/kWh for wind, geothermal, closed-loop biomass; $0.011/kWh for other eligible technologies	None	No	150 kW minimum	No	20 years	1992
Arizona	Renewable Energy	C, I	W, S, B, O	Solar: Varies by year of service from $0.01/kWh - $0.04/kWh Wind and Other: $0.01/kWh	$2 million per taxpayer per year; $20 million total per year	No	5 MW minimum	No	5 years	2011
Florida	Renewable Energy	C	W, S, B, O	$0.01/kWh	$1 million per taxpayer per year; $10 million total per year	Yes, after merger or acquisition	Not specified	No	5 years	2012
Iowa	Renewable Energy	C, I	W, S, B, AD, O	$0.015/kWh $4.50/MMBTU commercial heat $1.44/Mcf hydrogen fuel	363 MW for wind; 53 MW for other renewable energy	Yes	2.5 MW per qualifying owner. Other limitations apply.	No	7 years	2005
	Wind Energy	C, I	W	$0.01/kWh	50 MW	Yes	2 MW – 30 MW in general.	No	7 years	2005
Maryland	Clean Energy	C, I	W, S, B, AD, O	$0.0085/kWh $0.005/kWh for co-fired electricity	$2.5 million per taxpayer per year; $25 million total per year	No	Not specified	Yes	None	2006
New Mexico	Renewable Energy	C	W, S, B, AD, O	Solar: Varies by year of service from $0.015/kWh - $0.04/kWh Wind and Other: $0.01/kWh	Wind, biomass: $4 million per taxpayer and $20 million total per year; Solar: varies up to $8 million per taxpayer and $20 million total per year	No	Minimum of 1 MW	Yes	None	2002
Oklahoma	Zero-Emission Facilities	C	W, S, O	Varies by year of production from $0.0025/kWh - $0.0075/kWh	Not specified	Only credits awarded before 2014	Minimum of 1 MW	Yes, at 85%	None	2003

1. “Other” eligible technologies may include those based on or employed to generate the following: co-generation, geothermal electric, hydrogen, hydrokinetic energy, hydropower, landfill gas, ocean thermal energy, small irrigation power, tidal energy, and wave energy.

Sources: U.S. Department of Energy Database of State Incentives for Renewables and Efficiency (DSIRE); TaxCreditResearch.Com
Note: Only includes production tax credits; i.e., programs for which the credit amount is based on production per kWh. It excludes other forms of incentive such as investment tax credits, tax credits whose purposes pertain only to energy efficiency, and tax exemptions.

Table 2. Electricity Generation in Iowa by Sector and Energy Source, 2012

Sector	Energy Source	MWh Produced in 2012	Percent of Sector Total MWh	Percent of Energy Source Total MWh
Commercial or Industrial[1]	Wind	2,928	0.1%	0.0%
	All Other[2]	2,268,273	99.9%	5.3%
	Total	2,271,201	100.0%	4.0%
Electric Utilities	Wind	7,451,851	17.2%	53.1%
(IOUs, MOUs, and RECs[3])	All Other	35,934,085	82.8%	84.3%
	Total	43,385,936	100.0%	76.6%
Independent Power Producers	Wind	6,577,712	59.7%	46.9%
	All Other	4,440,555	40.3%	10.4%
	Total	11,018,267	100.0%	19.4%
All Sectors	Wind	14,032,491	24.8%	100.0%
	All Other	42,642,913	75.2%	100.0%
	Total	56,675,404	100.0%	100.0%

Source: U.S. Energy Information Administration

1. Commercial and industrial sectors include generators that produce electricity primarily to support the activities of commercial or industrial establishments.
2. “All other” includes coal, conventional hydroelectric, natural gas, nuclear, other biomass, and petroleum.
3. IOUs are investor owned utilities. MOUs are municipally owned utilities. RECs are rural electric cooperatives.

Table 3. Number and Aggregate Capacity of Electricity-Generating Plants in Iowa by Sector and Energy Source, 2012

Sector	Energy Source	Number of Plants	Nameplate Capacity (MW)	Average Nameplate Capacity
Commercial or Industrial[1]	Wind	1	1	1.0
	All Other[2]	53	696	13.1
	Total	54	697	12.9
Rate-Regulated Investor Owned Utilities	Wind	18	2,481	137.8
	All Other	100	8,852	88.5
	Total	118	11,333	96.0
Municipally Owned Utilities and Rural Electric Cooperatives	Wind	10	158	15.8
	All Other	336	1,853	5.5
	Total	346	2,011	5.8
Independent Power Producers	Wind	46	2,464	53.6
	All Other	69	767	11.1
	Total	115	3,231	28.1
All Sectors	Wind	75	5,104	68.1
	All Other	558	12,167	21.8
	Total	633	17,271	27.3

Source: U.S. Energy Information Administration

1. Commercial and industrial sectors include generators that produce electricity primarily to support the activities of commercial or industrial establishments.
2. “All other” includes coal, conventional hydroelectric, natural gas, nuclear, other biomass, and petroleum.

Table 4. Tax Credit Project Nameplate Capacity in Production and Program Capacity Cap by Year

	Wind Energy Production Tax Credit		Renewable Energy Tax Credit Wind Projects		Renewable Energy Tax Credit Non-Wind Projects	
Year	MW Capacity in Production	Total Program Capacity Cap	MW Capacity in Production	Total Program Capacity Cap	MW Capacity in Production	Total Program Capacity Cap
2007	0	450	36	180	8	20
2008	0	450	36	180	18	20
2009	21	150	36	330	18	20
2010	21	150	37	330	8	20
2011	21	50	45	363	18	20
2012	50	50	61	363	18	53
2013	50	50	80	363	23	53

Source: Iowa Utilities Board
Note: The table indicates capacity as of the end of each calendar year.

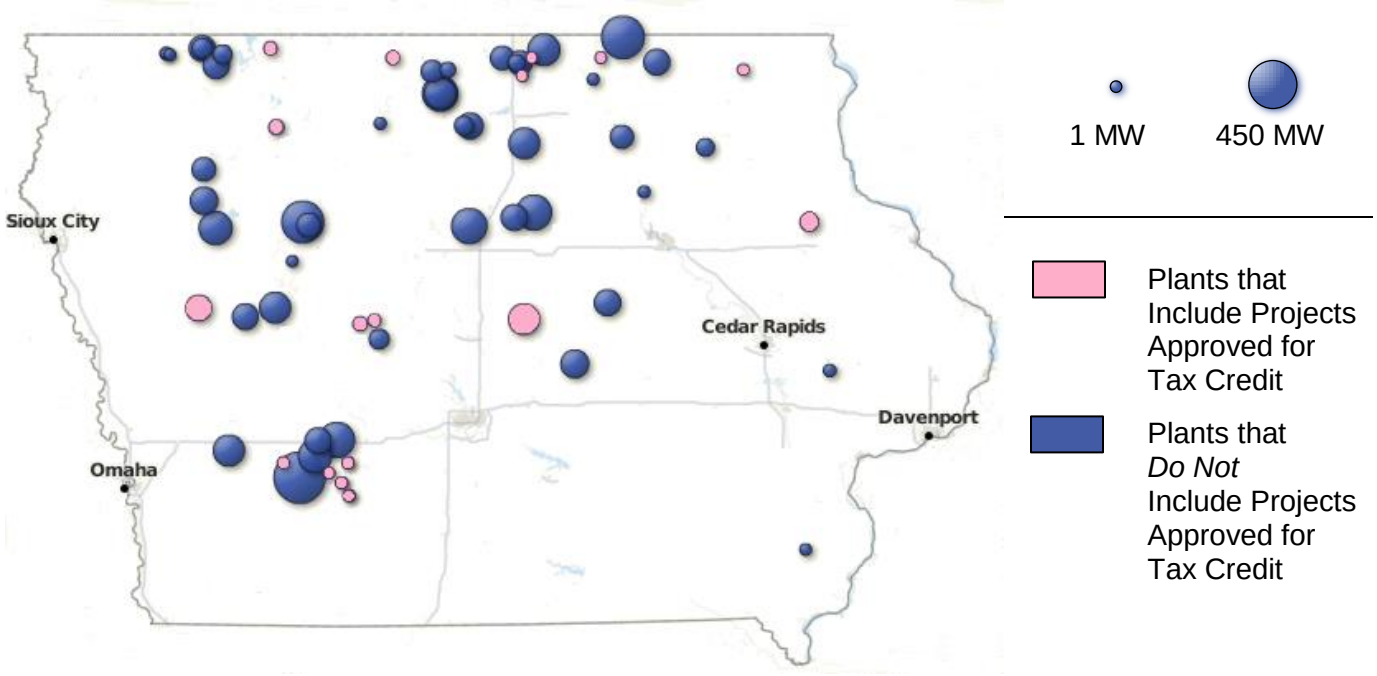
Table 5. Number and Capacity of Wind Energy Plants in Iowa by Sector and Wind Energy Production or Renewable Energy Tax Credit Approval

Sector	Plants that Include Projects Approved for Tax Credit		Plants that *Do Not* Include Projects Approved for Tax Credit		Total	
	Number of Plants	Plant Total MW Capacity	Number of Plants	Plant Total MW Capacity	Number of Plants	Plant Total MW Capacity
Rate-Regulated Investor Owned Utilities	0	0	18	2,481	18	2,481
Municipally Owned Utilities and Rural Electric Cooperatives	2	21	8	137	10	158
Independent Power Producers	18	501	28	1,963	46	2,464
Commercial or Industrial	0	0	1	1	1	1
All Sectors	20	522	55	4,582	75	5,104

Sources: Iowa Utilities Board and U.S. Energy Information Administration

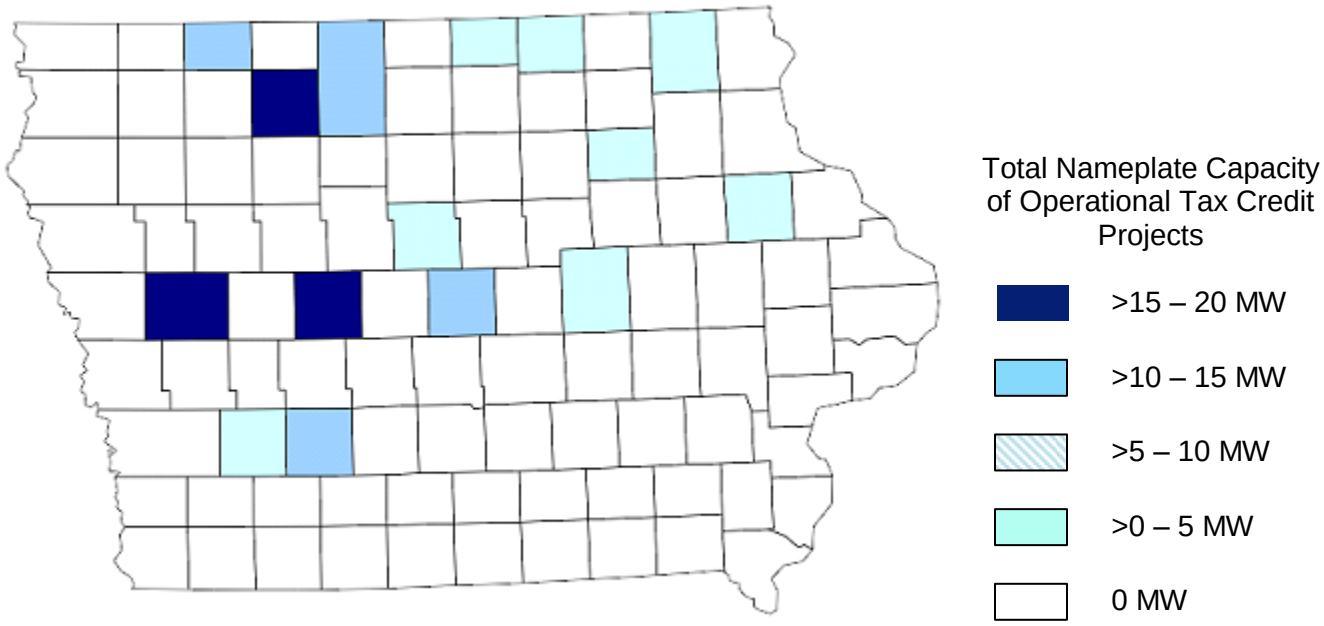
Note: Based on data available from the U.S. Energy Information Administration for 2012 matched by plant name to data published by the Iowa Utilities Board. The plant total MW capacity may be greater than the capacity approved for tax credits. A plant may consist of more than a single project approved for a tax credit. EIA plant level data is not available for all projects for which tax credits have been approved to date.

Figure 1. Location and MW Capacity of Wind Energy Plants in Iowa



Sources: Iowa Utilities Board and U.S. Energy Information Administration
Note: Based on data available from the U.S. Energy Information Administration for 2012 matched by plant name to data published by the Iowa Utilities Board. A plant may consist of more than a single project approved for a tax credit. A plant's total MW capacity may be greater than the MW capacity approved for a tax credit. EIA plant level data is not available for all projects for which tax credits have been approved to date.

Figure 2. Total Nameplate Capacity of Operational Tax Credit Wind Projects by County



Source: Iowa Utilities Board

Table 6a. Renewable Energy Tax Credit Awards and Transfers by Year

Renewable Energy Tax Credit							
Award Year	Number of Projects	Number of Tax Credit Certificates	Total Award Amount	Average Total Award for Project	Average Certificate Amount	Transfers	Percent Transferred
2007	19	22	$1,492,898	$78,574	$67,859	$1,492,898	100.0%
2008	20	25	2,570,197	128,510	102,808	2,563,960	99.8%
2009	19	22	2,398,784	126,252	109,036	2,398,784	100.0%
2010	21	24	2,503,361	119,208	104,307	2,455,105	98.1%
2011	28	93	2,984,743	106,598	32,094	2,947,700	98.8%
2012	38	145	4,219,009	111,027	29,097	4,100,292	97.2%
2013	50	352	5,622,381	112,448	15,973	4,767,698	84.8%
Total		683	$21,791,373	$111,802	$31,905	$20,726,437	95.1%

Source: Iowa Department of Revenue

Table 6b. Wind Energy Production Tax Credit Awards and Transfers, 2009 through 2013

Wind Energy Production Tax Credit					
Number of Tax Credit Certificates	Total Award Amount	Average Total Award for Project	Average Certificate Amount	Transfers	Percent Transferred
45	$5,166,306	$358,647	$114,807	$4,510,821	87.3%

Source: Iowa Department of Revenue
Note: To maintain confidentiality of taxpayer information, program statistics are reported for years 2009 through 2013 combined.

Table 7. Wind Energy Production and Renewable Energy Tax Credit Awards by Awardee State of Residence, 2013

Tax Credit Program	Iowa				Other States				Total			
	Recipients		Awards		Recipients		Awards		Recipients		Awards	
	Number	Percent of Total	Amount	Percent of Total	Number	Percent of Total	Amount	Percent of Total	Number	Percent of Total	Amount	Percent of Total
Wind Energy Production	10	53%	$878,621	56%	9	47%	$698,544	44%	19	100%	$1,577,165	100%
Renewable Energy	292	83%	2,942,228	52%	60	17%	2,680,153	48%	352	100%	5,622,381	100%
Total	302	81%	3,820,849	53%	69	19%	3,378,697	47%	371	100%	7,199,546	100%

Source: Iowa Department of Revenue

Table 8. Renewable Energy and Wind Energy Production Tax Credit Claims by Tax Year

Tax Year	Renewable Energy Tax Credit	Wind Energy Production Tax Credit
2006	$960,970	$ --
2007	721,571	--
2008	1,831,604	--
2009	2,768,378	*
2010	2,389,710	*
2011	1,979,382	*
2012	3,231,025	*
2013	3,225,972	*
2014	1,855,142	*
Total	$18,963,754	$3,804,999

* To maintain confidentiality of taxpayer information, Wind Energy Production Tax Credit claims are reported for years 2009 through 2014 combined. There were no claims for Wind Energy Production Tax Credits for years prior to 2009.

Source: Iowa Department of Revenue, IA 148 Tax Credits Schedule
Note: Tax years 2013 and 2014 are incomplete.

Table 9. Tax Credit Claims by Tax Type, Tax Years 2007 through 2014

	Wind Energy Production and Renewable Energy Tax Credits			
Tax Type	Number of Claims	Total Claim Amount	Percentage of Total Claims	Average Claim Amount
Corporation	49	$6,086,519	27%	$124,215
Franchise	54	4,002,976	18%	74,129
Individual	239	1,051,532	5%	4,400
Insurance Premium	173	7,465,670	33%	43,154
Replacement	10	3,579,259	16%	357,926
Sales & Use	12	582,797	3%	48,566
Total	537	$22,768,753	100%	$42,400

Source: Iowa Department of Revenue, IA 148 Tax Credits Schedule
Note: Tax years 2013 and 2014 are incomplete.

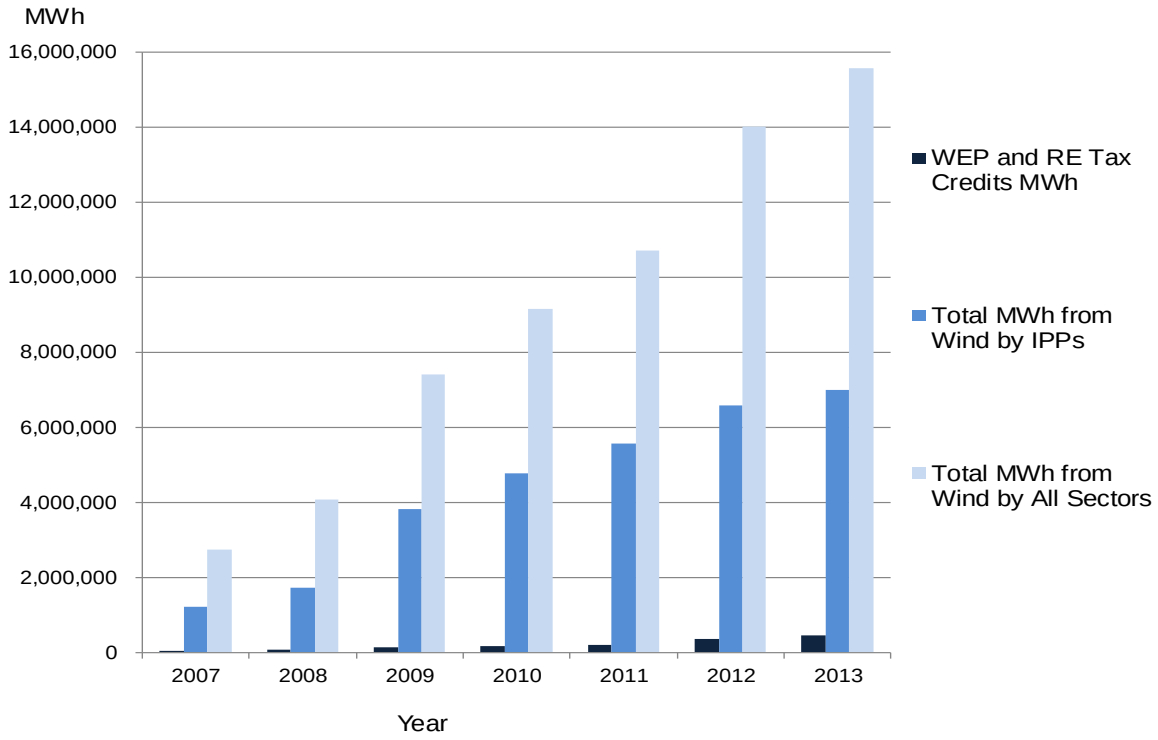
Table 10. Electricity Generated from Wind Under the Wind Energy Production and Renewable Energy Tax Credit Programs and Total in Iowa by Year

Year	Wind Energy Production (WEP) and Renewable Energy (RE) Tax Credits MWh	MWh Electricity Generated from Wind by Independent Power Producers (IPPs)	Total MWh Electricity Generated from Wind	Percentage of IPP-Generated Wind Energy awarded WEP and RE Tax Credits	Percentage of Total Wind Energy awarded WEP and RE Tax Credits
2007	35,462	1,226,201	2,756,676	2.9%	1.3%
2008	74,641	1,729,503	4,083,787	4.3%	1.8%
2009	142,276	3,822,460	7,420,520	3.7%	1.9%
2010	178,674	4,763,532	9,170,337	3.8%	1.9%
2011	216,088	5,583,457	10,709,177	3.9%	2.0%
2012	359,097	6,577,712	14,032,491	5.5%	2.6%
2013	473,135	7,001,541	15,571,494	6.8%	3.0%

Sources: Iowa Department of Revenue and U.S. Energy Information Administration

Note: Megawatt hours generated from wind under the Wind Energy Production and Renewable Energy Tax Credit programs are based on tax credits awarded and are presented in the table by award year. As of the publication of this evaluation study, U.S. Energy Information Administration data on electricity production is available *at the sector level* for years through 2013.

Figure 3. Megawatt Hours Generated from Wind Under the Wind Energy Production and Renewable Energy Tax Credit Programs Compared to Sector Totals by Year



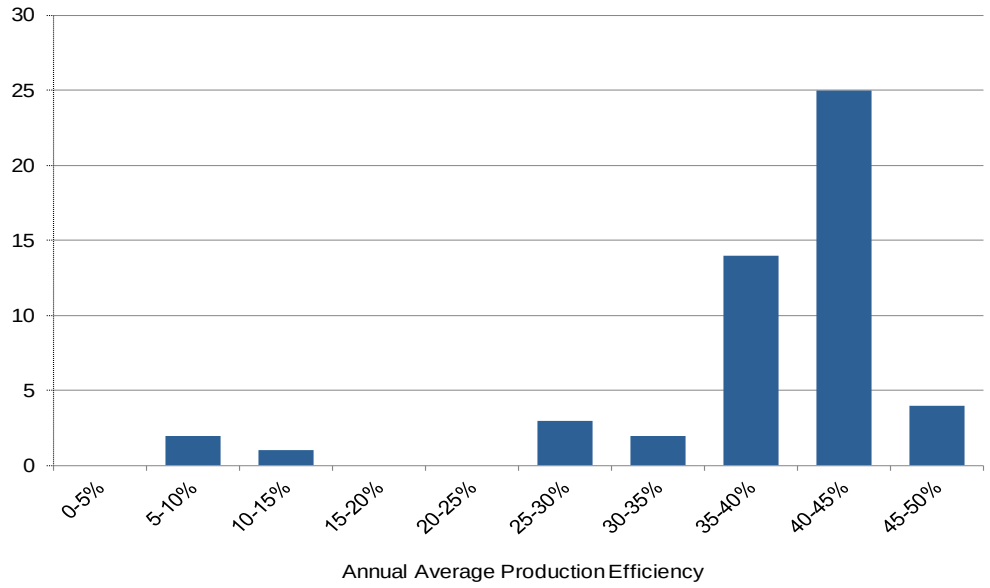
Sources: Iowa Department of Revenue and U.S. Energy Information Administration.
Note: Data on megawatt hours generated from wind under the Wind Energy Production (WEP) and Renewable Energy (RE) Tax Credit programs is based on tax credits awarded.

Table 11. Production Efficiency of Wind Energy Production and Renewable Energy Tax Credit Wind Projects by Year

Year	Number of Projects	Average Efficiency	Median Efficiency	Minimum Efficiency	Maximum Efficiency
2007	17	18.4%	22.3%	7.6%	29.9%
2008	17	23.9%	26.8%	5.1%	35.9%
2009	19	29.5%	29.3%	23.3%	35.3%
2010	22	30.5%	32.5%	4.7%	40.4%
2011	28	34.7%	38.1%	5.4%	45.3%
2012	39	36.6%	38.3%	3.5%	47.0%
2013	51	38.7%	40.6%	5.3%	48.9%

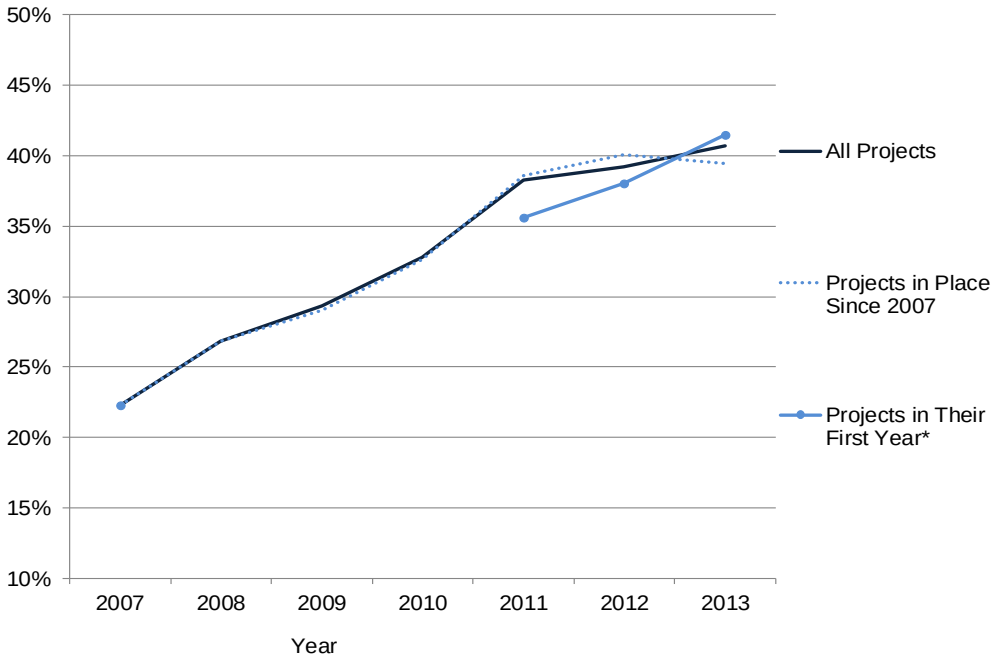
Source: Iowa Department of Revenue

Figure 4. Number of Wind Energy Production Tax Credit and Renewable Energy Tax Credit Wind Projects by Production Efficiency in 2013



Source: Iowa Department of Revenue

Figure 5. Median Capacity Factor of Wind Energy Production Tax Credit and Renewable Energy Tax Credit Wind Projects by Year



Source: Iowa Department of Revenue
* Includes only years in which at least five facilities reported their first year of production.

Table 12. Special Valuation of Wind Energy Conversion Property

Assessment Year	Percentage of Net Acquisition Cost that Comprises Special Valuation
1st	0%
2nd	5%
3rd	10%
4th	15%
5th	20%
6th	25%
7th and Subsequent	30%

Source: Iowa Code Section 427B.26
Note: Special valuation is the amount subject to tax.

Table 13. Assumptions for Calculating Property Tax Impact Associated with Wind Energy Production and Renewable Energy Tax Credit Wind Projects

Year Entering Service/ Assessment Year	Estimated MW Entering into Service	Estimated Acquisition Cost Per MW	Estimated Aggregate Acquisition Cost	Estimated Applicable Property Tax Levy Rate
2006	35.7	$1,650,000	$58,910,000	27.20
2007	0.0	1,697,364	0	27.23
2008	0.9	1,762,118	1,590,000	27.36
2009	21.0	1,756,473	36,890,000	27.68
2010	31.2	1,785,248	55,700,000	27.46
2011	1.7	1,841,341	3,100,000	26.82
2012	27.7	1,879,546	52,060,000	26.23
2013	11.8	1,907,063	22,500,000	26.08

Source: Iowa Department of Revenue

Table 14. Estimate of Property Tax Impact Associated with the Wind Energy Production and Renewable Energy Tax Credit Wind Projects

Special Assessment Schedule

	Year of Turbine Service													
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Est. Levy Rate	27.2335	27.2335	27.3637	27.6827	27.4605	26.8212	26.2334	26.0850	26.0850	26.0850	26.0850	26.0850	26.0850	26.0850
2006	0%	5%	10%	15%	20%	25%	30%	30%	30%	30%	30%	30%	30%	30%
2007		0%	5%	10%	15%	20%	25%	30%	30%	30%	30%	30%	30%	30%
2008			0%	5%	10%	15%	20%	25%	30%	30%	30%	30%	30%	30%
2009				0%	5%	10%	15%	20%	25%	30%	30%	30%	30%	30%
2010					0%	5%	10%	15%	20%	25%	30%	30%	30%	30%
2011						0%	5%	10%	15%	20%	25%	30%	30%	30%
2012							0%	5%	10%	15%	20%	25%	30%	30%
2013								0%	5%	10%	15%	20%	25%	30%

Estimated Aggregate Assessed Value

	Year of Turbine Service													
Assessment Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
2006	$ -	$ 2,945,250	$ 5,890,500	$ 8,835,750	$ 11,781,000	$ 14,726,250	$ 17,671,500	$ 17,671,500	$ 17,671,500	$ 17,671,500	$ 17,671,500	$ 17,671,500	$ 17,671,500	$ 17,671,500
2007		-	-	-	-	-	-	-	-	-	-	-	-	-
2008			79,295	158,591	237,886	317,181	396,476	475,772	475,772	475,772	475,772	475,772	475,772	475,772
2009				1,844,296	3,688,592	5,532,889	7,377,185	9,221,481	11,065,777	11,065,777	11,065,777	11,065,777	11,065,777	11,065,777
2010					2,784,987	5,569,973	8,354,960	11,139,946	13,924,933	16,709,919	16,709,919	16,709,919	16,709,919	16,709,919
2011						155,133	310,266	465,399	620,532	775,665	930,798	930,798	930,798	930,798
2012							2,603,171	5,206,343	7,809,514	10,412,686	13,015,857	15,619,029	15,619,029	
2013								1,125,167	2,250,334	3,375,501	4,500,668	5,625,835	6,751,001	

Estimated Aggregate Property Tax

	Fiscal Year													
	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
	$ -	$ 80,210	$ 161,186	$ 244,597	$ 323,512	$ 394,976	$ 463,583	$ 460,961	$ 460,961	$ 460,961	$ 460,961	$ 460,961	$ 460,961	$ 460,961
		-	-	-	-	-	-	-	-	-	-	-	-	-
		-	-	2,195	4,355	6,380	8,321	10,342	12,411	12,411	12,411	12,411	12,411	12,411
		-	-	-	50,645	98,933	145,146	192,434	240,542	288,651	288,651	288,651	288,651	288,651
		-	-	-	-	74,697	146,119	217,939	290,585	363,232	435,878	435,878	435,878	435,878
		-	-	-	-	-	4,070	8,093	12,140	16,187	20,233	24,280	24,280	24,280
		-	-	-	-	-	-	67,904	135,807	203,711	271,615	339,518	407,422	407,422
		-	-	-	-	-	-	-	29,350	58,700	88,050	117,400	146,750	176,100
Total	$ -	$ 80,210	$ 161,186	$ 246,793	$ 378,513	$ 574,986	$ 767,239	$ 957,673	$ 1,181,796	$ 1,403,851	$ 1,577,798	$ 1,679,098	$ 1,776,352	$ 1,805,702

Source: Iowa Department of Revenue