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Renewable Energy in Iowa

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RENEWABLE ENERGY IN IOWA

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INTRODUCTION

Iowa is located in both the geographic center of the United States and at center stage for the nation's energy transition from fossil fuels to renewables. For the last three decades, Iowa has been a national leader in wind energy despite relatively little explicit climate policy. Increasing numbers of turbines in Iowan fields have caused the energy industry to become entwined with agriculture, an integral part of the state's identity. Discussions of the role of renewables in the state's energy mix now occur daily among small-town Iowans, and the state's position among the earliest of presidential campaign battlegrounds means these conversations are amplified nationally every four years. Iowa's future as a renewable energy leader depends on sound state-level policies.

I. HISTORY OF RENEWABLE ENERGY IN IOWA

Demographics and Background

Geography and Demography. Iowa is a mid-sized midwestern state in the “Corn Belt” of the United States of America. Its total resident population is roughly 3.046 million, as of the 2010 US Census, making it the 30th most populous state.¹ Its total land area is approximately 56,300 square miles (approx. 145,700 square kilometers), making it the 26th largest state in the nation.² 64% of Iowa's population live in urban areas, according to the definition of the US Census Bureau, making it the 11th most rural state in the country by fraction of population.³

Economy. Despite its high rural population ranking, and its national reputation, Iowa's economy is diversified. Its yearly Gross Domestic Product (GDP) in 2017 was approximately 184 billion 2017 USD, the 29th highest in the nation⁴, of which only 7.7 billion 2017 USD is attributable to agricultural, forestry, fishing, and hunting activities. This ratio of agricultural production to total state GDP, approximately 4.2 percent, is still much higher than the national total of .868 percent, as is the proportion of manufacturing production to total GDP in Iowa, which is approximately 18 percent compared to 11 percent for the nation. Iowa's absolute agricultural output is second in the nation, behind only the 3 times larger⁵ and nearly 13 times more populous⁶ California. Over 92% of land in Iowa is rural farm land⁷ (see figure 1), used for either agriculture or pastureland. Iowa ranks in the top 5 states in the nation in percentage of land devoted to these businesses. Approximately 123,000 acres of land in Iowa is federally owned, about 0.3% of the total land area in the state, which is the lowest percentage of any state in the nation⁸.

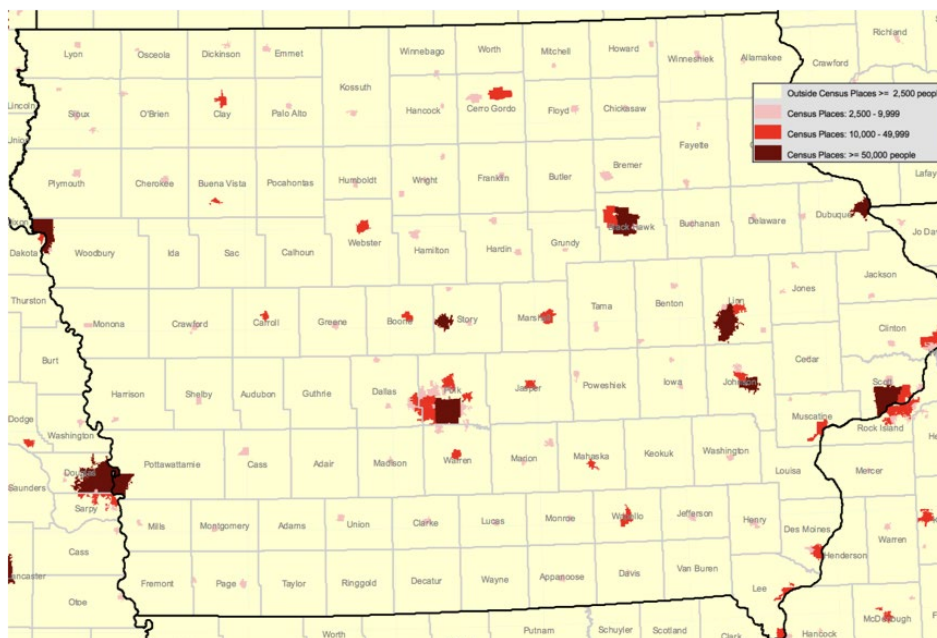


Figure 1: Iowa is predominantly rural, according to the categorization of the US Census Bureau. Map adapted from Environmental Research Service.

Politics. Iowa is a “purple” state, in the language of party politics. Of the 2.033 million Iowans registered to vote, approximately 631,000 indicate a Democratic party preference, approximately 653,000 indicate a Republican party preference, and approximately 733,000 indicate no party preference as of January 2019⁹. In the last 11 years (since 2008), Iowa has been served by Democratic and Republican governors, lieutenant governors, secretaries of state, and US Senators. 3 of the last 11 years have seen Democratic majorities in Iowa’s US House delegation including 2019, 4 of the last 11 have seen Republican majorities, and 4 years have seen a split delegation, 2-2. Iowans supported Barack Obama during both the 2008 and 2012 US Presidential elections, and supported Donald Trump in the 2016 election. The Iowa House of Representatives is currently divided between 53 Republicans and 47 Democrats. The State Senate is divided between 32 Republicans and 18 Democrats.¹⁰

Although the traditional school of thought suggests that Democrats would, generally speaking, support the market interventionist approach of subsidizing renewables development with Republicans rarely supporting such efforts, wary of the implications on the size of government, Iowa’s senior US Senator of nearly 40 years, Chuck Grassley, has long stood as a supporter of renewables. Indeed, Senator Grassley has been a continuing ally in Washington for renewable energy sources since his early days of support for the federal Energy Policy Act of 1992, which put in place the now-well-known federal Production Tax Credit. Senator Grassley’s support, which has no doubt set the tone for many rank-and-file members of the Republican party on renewable energy for decades, comes from a commitment and belief in energy independence for the state and for the nation.

Emissions. The disproportionate importance of agriculture and goods manufacturing results in Iowa having the 11th highest CO₂ emissions per capita in the US (though its total emissions, 83 million metric tons annually, puts it squarely in the center of states, at the 25th highest).

Existing Energy Mix and Renewable Energy Potential

Energy History. Iowa's electricity is generated through a mix of coal, nuclear, natural gas, and wind power. While the state lacks fossil fuel resources of its own, it imports subbituminous coal by rail from Wyoming, and natural gas through several interstate pipelines. For the past 25 years, coal has remained the predominant component of the state's generation capabilities; however, its share of the market is quickly diminishing. In 1992, coal was responsible for 84% of the state's electricity generation, but that total has plummeted to 44% as of 2017. As shown in Figure 2, while the raw amount of energy produced by coal has been relatively stable over that period, higher levels of total energy consumption have been supported mostly through the addition of wind turbines.¹¹ Additionally, this wind power has allowed Iowa to become a net exporter of electricity beginning in 2008. In addition to generating revenue, this has allowed for a decreased reliance on out-of-state coal power.

Existing Energy Mix. Iowa is a national leader in harnessing wind, generating 34% of its energy through turbines as of 2018. This production level makes Iowa the second-largest wind energy producing state in terms of raw energy produced and in terms of proportion to the state's electricity generation mix.¹²

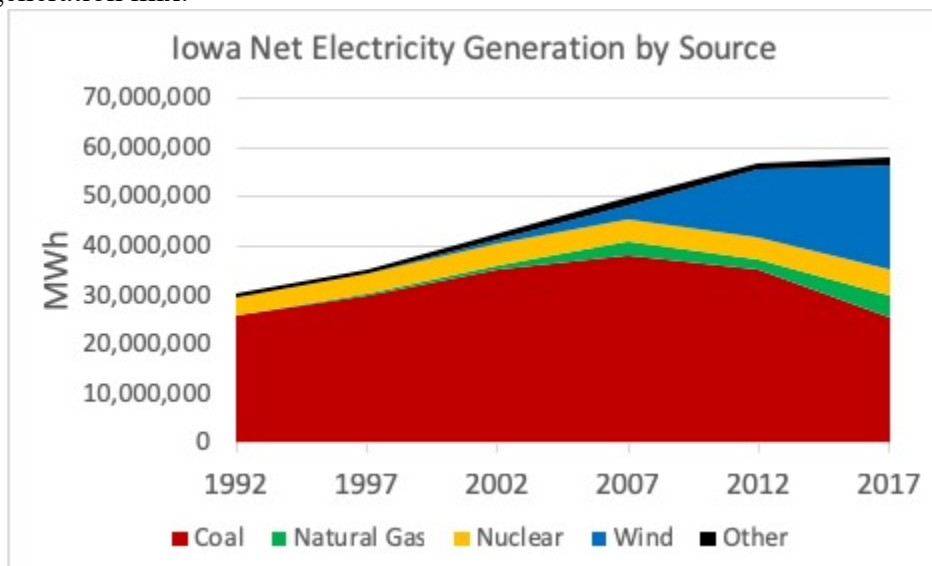


Figure 2. Data from EIA Iowa annual energy summary.¹⁰

Renewables Potential. Geographically, Iowa is very capable of making renewable energy a substantial component of its energy portfolio. Iowa has some of the strongest winds in the Midwest, particularly in the northwestern portion of the state. Figure 3 shows a map of Iowa's wind potential overlaid with the locations of its current utility-scale turbine facilities. In 2017, Iowa produced 21,400,000 megawatt-hours (MWh) of wind energy, yet this number is small compared to the estimated 551,000,000 MWh of wind energy theoretically accessible by 50m turbines.¹³ Most turbines being installed now have hub heights of at least 80m, and while multiple sources document wind speeds accessible at those heights within Iowa, a translation of those numbers into a theoretical wind energy potential does not seem to be readily available.

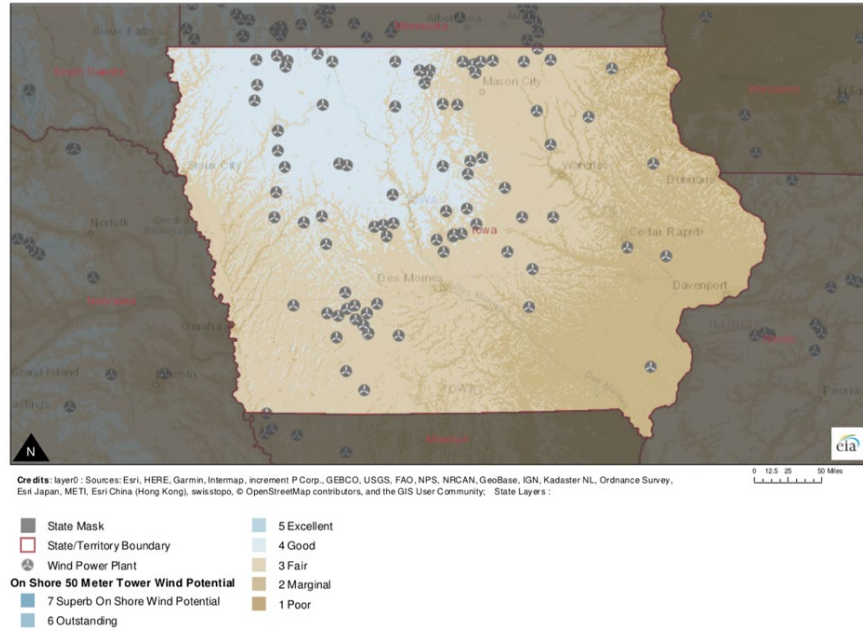


Figure 3. Iowa wind energy potential plotted against existing wind power plants.¹⁴

In terms of solar energy, the state is on equal footing with most of the Midwest. Figure 4 shows a map of Iowa’s solar energy potential overlaid with the locations of its utility-scale solar facilities. Currently, solar energy only constitutes an approximate 94,000 MWh of the state’s annual energy production of 58,000,000 MWh. Solar energy could play a bigger role, however, as a study by NREL estimates that rural utility-scale photovoltaic (PV) generation facilities alone (ignoring urban utility-scale PV and rooftop PV) could theoretically produce almost 7 billion MWh of energy annually.¹⁵

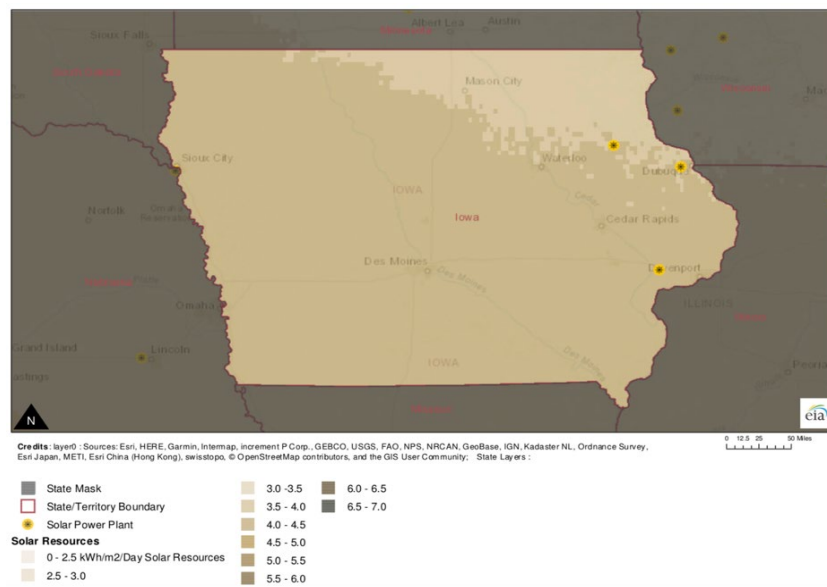


Figure 4. Iowa solar energy potential plotted against existing solar power plants.¹⁶

Both solar and wind resources will compete with established land use if they are to grow. The majority of wind and solar resource potential is situated in areas primarily used for farming, as shown in Figure 5. Most wind resources are located near cultivated crops, while solar energy is mostly available on cultivated crops and open pastures. While wind has been the state's renewable energy choice to date, new data suggest that a combination of solar and wind might be prudent. Overlapping solar PV data from the NREL PVWatts version 1.0 and wind data from the Iowa Energy Center's wind energy calculator suggests that solar energy is strongest when wind resources are at their lowest.¹⁷ Thus, this complementary approach could possibly reduce some of the intermittency issues associated with renewable energy and make it a viable strategy for Iowa's energy future.

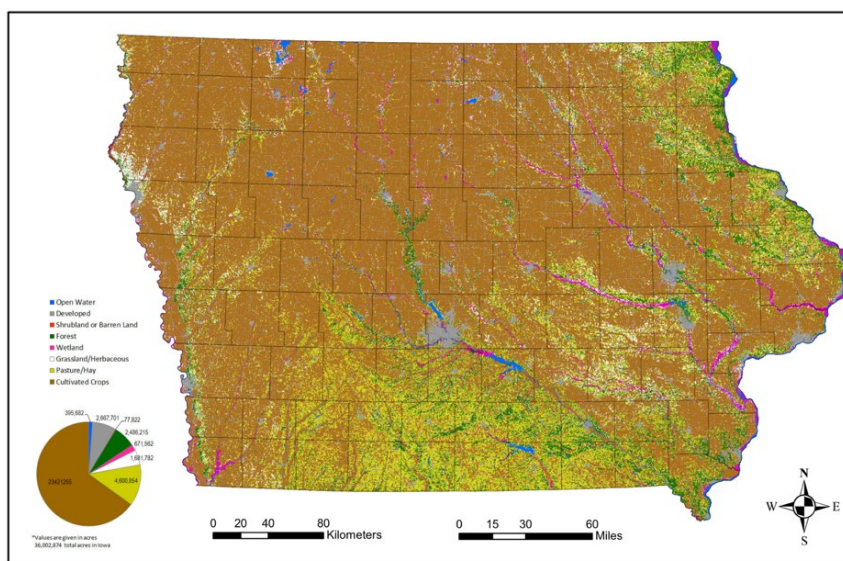


Figure 5. Cultivated crops occupy areas with the highest solar and wind energy potential.¹⁸

Electricity Sector Entities and Their Plans

Iowa's two investor-owned utilities (IOUs), MidAmerican Energy Company (MidAmerican) and Interstate Power and Light Co. (commonly known as Alliant) provide 75% of the state's electricity, serving 72% of the population. The rest of the energy mix is split between municipal utilities and rural electricity cooperatives, respectively totaling 11% and 14% of electricity sales.¹⁹ These entities cover all of the state's energy needs, and starting in 2008 they began to provide a surplus as well. As of 2017, Iowa exported roughly 16% of its generated electricity to surrounding regions.

Going forward, Iowa will forgo its nuclear electricity plans. The owner of the state's single nuclear power plant announced in 2018 that it plans to close the facility in late 2020, citing abundant wind resources as the primary motivator.²⁰ The latest major energy facility constructed in the state was a natural-gas fired power plant, representing a \$700 million investment by Alliant. It began operating in 2017 and has sufficient capacity to provide energy to an estimated 500,000 homes.²¹

Iowa's largest IOU, MidAmerican, began construction on a major wind farm in summer 2018.²² Slated for completion at the end of 2019, this project is part of the company's larger Wind XI

plan, representing the largest economic development project in the history of the state. The 275 turbines will supply 550 MW of wind generation capacity, and MidAmerican says that this addition will allow it to supply 90% of its customers' electricity through renewable energy.²³

Local Narratives about Wind Energy

The Des Moines Register, Iowa's leading newspaper, has taken a balanced approach to reporting on the rapid growth of the wind industry. Recent articles identify individual farmers and organized opposition groups in counties throughout the state that are working to fight the expansion of wind development in their communities. Many of these same articles share the opinions of farmers, county commissioners and politicians who see wind power as an economic opportunity to save rural towns. This is also true at the local level, where feelings about wind expansion not only vary from county to county, but between neighboring farms. The following subsections summarize these competing local narratives.

What are wind opponents saying?

Most complaints against wind developments in Iowa can be categorized in three ways: physical side effects, economic impacts, and unfairness in the process.

Physical side effects. Wind turbines hurt the eyes and the ears. Neighbors complain about the coordinated blinking red lights on the turbines shining in their windows, keeping them up at night. Even more annoying are the seasonal strobe effects made by the flickering shadows of the blades. The whooshing sound makes outdoor conversation difficult and some fear low-frequency "infra-sound" is making them sick.²⁴ Turbines often kill bats and birds, and some dairy farmers are worried that stray voltage will affect the milk supply in their cows.²⁵ Critics also say the turbines are ugly.

Economic impacts. Neighbors fear wind turbines will lower their property values. Some question whether converting some of the nation's most productive farmland into concrete and metal is worth the cost. They see the federal tax credits for wind energy as proof that the industry is not economically viable.²⁶

Unfairness in the process. Opponents argue that there are not enough rules restricting where turbines are built. Twenty of Iowa's 99 counties lack any zoning ordinances at all²⁷, while 17 have ordinances specific to wind energy (see *Siting Policy* below).²⁸ Those ordinances vary with regard to who approves new wind farms. Some decisions come from unelected officials who serve on a board in a volunteer capacity and others are elected county supervisors.²⁹ While eminent domain has not been used for siting wind turbines, neighbors who turn down developers are helpless to stop the effects of one built a half mile away on a neighboring farm. Many complain that landowners who agree to lease their land for wind development do not reside on the land and therefore do not understand the negative implications. The underlying narrative among opponents is that wind development has been pushed on rural Iowans unfairly by city dwellers who would never accept the annoyances of blinking lights, whooshing sounds, and lowered property values.³⁰

Organized Opposition

While opponents have attempted to use many of these “nuisance” arguments to stop wind developments or to slow their growth, they are largely unsuccessful. According to Roger McEowen, the Kansas Farm Bureau professor of agricultural law and taxation at Washburn University School of Law in Topeka, “Landowners have to show that a wind farm is an unreasonable interference with their use and enjoyment of their property. And mere aesthetics are usually not enough to make such claims.”³¹ Instead, many lawsuits argue that the process for siting the wind turbines proceeds without legal authority.

Residents in Palo Alto County, in North Central, Iowa, formed the Coalition for Rural Property Rights (CRPR) after filing a lawsuit against Invenegy and MidAmerican. CRPR has expanded to include rural residents in Minnesota as well.³² The Palo Alto lawsuit alleges that the County Board of Supervisors did not have the legal authority and did not follow proper procedures in granting wind ordinances. The suit was dismissed in July, 2018 but has been appealed by the residents. As of August, 2018, Palo Alto County had paid more than \$130,000 in legal fees involved with the lawsuit.³³

In Madison County, home of the famous covered bridges, residents against a proposed MidAmerican wind farm formed the Madison County Coalition for Scenic Preservation (MCCSP) in 2018.³⁴ Zoning regulations in Madison County would require a special variance for wind development. The county board of adjustment approved such a variance in July, 2018. In response, MCCSP filed a petition in district court requesting that a higher court hear their concerns.³⁵

While the outcome of the Madison County wind farm is still in question, wind opponents in Fayette County scored a big victory in 2018 when a district court judge ruled that three turbines built near the city of Fairbank had to be taken down. The City of Fairbank and nearby property owners sued the county and wind developers based on their interpretation of a 1973 zoning ordinance which allows “electric and gas transmission and regulating facilities” to be built without a special permit from the board of adjustment.³⁶ District Court Judge John Bauercamper agreed with the city that wind turbines are electrical generating devices that did need special approval. The developers, Mason Wind and Optimum Renewables, built the turbines after having received the consent of county officials while the litigation made its way through the courts. After the Iowa Supreme Court refused to hear their appeal, Mason Wind had no recourse but to remove the turbines, and they were dismantled in November, 2018 at a cost of \$150,000 per turbine.³⁷

Outright victories like the one in Fayette County, especially after turbines have been built, are quite rare. It is more common, however, for opponents to delay projects, as in Madison County, or to make the process so difficult for developers that projects never get off the ground.

What are proponents saying?

Despite the opposition, stakeholders from farmers to politicians see huge benefits from the expansion of wind energy.

Supporting farmers. Farmers, many of whom are suffering from low crop prices due to the trade war with China, can earn as much as \$10,000 per turbine each year. These leases occupy as little

as ½ acre, leaving much of their farmable land intact.³⁸ Wind developments also bring jobs back to communities, shoring up institutions like hospitals and schools that are essential to the rural way of life.

Increasing the tax base. County Supervisors, like Willie Van Weelden of Mahaska County, point to the huge benefits to their local tax base: “[After the five-year tax abatement for MidAmerican’s new Mahaska County wind farm ends,] the valuation added to Mahaska County will be a little over \$300 million. Right now, our total valuation is about \$1 billion, so it’ll add almost a third to our valuation. That’s going to be a good thing for Mahaska County.”³⁹ In O’Brien County, where the highest concentration of turbines in Iowa is located, officials expect to receive \$7.3 million annually in tax revenue from its turbines.

Attracting new industries. Apple, Facebook, Google, and Microsoft have all opened data centers in Iowa in the last four years. Companies like to build data centers in Iowa because it has cheap, environmentally friendly energy sources.⁴⁰

Achieving climate goals. The mayor of Iowa City, home to the University of Iowa, and the Johnson County Board of Supervisors have made pledges to adopt the Paris Climate Goals at the city and county levels.⁴¹ Increasing renewable energy from wind, as well as solar and biomass, are key components of their plans.

Local Narratives on Distributed Solar Energy

Although high-level policies by the state legislature have stated support for distributed generation, until the recent pilot program on net metering began in 2017, third-party projects (where a customer buys power from a facility built and operated by a third party that is linked to the IOU grid) have been ineligible to net meter. This has excluded many projects from economic viability, and has long been a frustration of Iowans with the Iowa Utilities Board (IUB).

The issue of third-party-financed projects’ eligibility for net metering came to a head prior to the pilot in the case of the city of Asbury. Asbury signed a Power Purchase Agreement (PPA) with Eagle Point Solar, an Iowa-based solar developer, to install rooftop solar on their city hall and wastewater treatment plant and act as owner of the installed panels, selling 100% of the energy produced to the city. The second of these two solar installations would have been 356 kW, enough to offset about 90% of the building’s annual energy use⁴².

Prior to proceeding with the project, Eagle Point sought and received a declaratory ruling from the Board that such a third-party ownership arrangement wouldn’t eliminate Asbury’s eligibility to net meter using power generated by the solar installations⁴³. As was standard practice at that time, the Board declared that Eagle Point would be classified as a public utility under such an arrangement, making Asbury ineligible to net meter. This decision by the board was appealed all the way to the Iowa Supreme Court, which upheld a lower court’s ruling that the Board’s decision was in error of interpretation of the law. This was the final case in a string of litigation on the Board’s net metering policy; all throughout, the Iowa Supreme Court continually affirmed the validity and right of a third-party PPA arrangement (like that of Asbury and Eagle Point) to net meter. This series of litigation, along with pushes from renewables development advocacy

groups, led to the Board's agreement to update their net metering policies through the current pilot.

Iowa's net metering policies are being updated in a pilot program that began in May 2017 and will run through May 2020. The pilot programs for each of the two IOUs change crucial aspects of the previously-established net metering policy, at the demand of the Board. Firstly, the new tariffs dictate that installations are allowed to net meter if they are rated at up to 1MW, double the old upper limit. Additionally, and most critically to the history of net metering, both IOUs have committed to allowing third-party agreements, such as the one between Eagle Point and Asbury, to net meter with all the rights afforded to residential customers. This change in IOU tariffs, brought about by the Board mandate to update net metering tariffs to encourage more net metering⁴⁴, is critical in ensuring logical economics for residential and municipal scale solar development.

II. POLICY LANDSCAPE

Explicit Climate Policy

Renewable Portfolio Standards (RPS). While Iowa has very few explicit climate policies, it became the first state in the nation to adopt an RPS in 1983 when it enacted the Alternative Energy Law (AEL). The RPS required Iowa's two IOUs to contract for a combined total of 105 MW of renewable energy.⁴⁵ In 2001, the goal was modified, made voluntary, and increased to 1000 MW.⁴⁶ Since then, Iowa has blown past the standard and, by the end of 2018, had more than 8,422 MW of wind capacity installed.⁴⁷ Unlike many states with an RPS, the Iowa state legislature has not held a vote to repeal the AEL during the 2010s.⁴⁸ This may be due to the fact that Iowa had long since surpassed its voluntary RPS.

Energy Efficiency Resource Standards (EERS). Iowa does not have an EERS and IOUs are not mandated to meet certain goals for energy savings. However, they are required to submit assessments of energy consumption and opportunities for savings to the IUB. Municipal-owned utilities and electric cooperatives must also submit their proposed goals for energy savings to the IUB. For 2014-2018, Iowa's two IOUs set the same goal of increasing efficiency savings by 1.2% per year.⁴⁹

Greenhouse Gas (GHG) Emission Reduction Plans. In 2007, the state legislature enacted SF 485 which created the Iowa Climate Change Advisory Council (ICCAC). The council's mandate was to report and monitor GHG emissions and suggest plans for feasible paths to various reduction goals by 2050. Additionally, the Council was to report annually to the governor and the legislature on emissions and trends, but the Council was disbanded in 2011. For a brief time, Iowa also explored a cap and trade system through the Midwestern Regional Greenhouse Gas Reduction Accord. The accord consisted of six midwestern states, but they are no longer pursuing cap and trade.⁵⁰

Tax Policy

Iowa has a number of tax incentives to encourage renewable energy development. Some of these incentives have been phased out, some have a waiting list, and others continue to play a vital role in influencing how renewable development occurs in the state.

Renewable Energy Production Tax Credits. Enacted in 2005, Iowa Codes 476B and 476C were similar to the federal tax credit but on a smaller scale. 476B offered a \$0.01/kWh credit for wind facilities with nameplate capacities between 2 MW and 30 MW, with a maximum program eligibility of 150 MW. This maximum eligibility was later reduced to 50 MW in 2011.⁵¹ To qualify, facilities had to be placed in service before July 1, 2012.⁵² Since the scale of recent windfarms is in the 100s of MW and MidAmerican's Wind XI project for 2019 is projected to be 2000 MW⁵³, it is clear that this program was intended for small to medium sized systems. The capacity for this program was reached very early, and the program ceased to play a large role in incentivizing wind development. Code 476C, on the other hand, continued to be relevant until its discontinuation at the end of 2017, largely due to the addition of 10 MW of solar eligibility. The program had reached its capacity in 2015 when the additional 10 MW designated for solar were added.⁵⁴ Solar development is quite small relative to wind in Iowa, so the additional 10 MW of solar eligibility were important incentives for smaller projects. For example, the 476C credit, which amounts to \$0.015/kWh, will pay out \$18,000 per year to the Farmers Electric Cooperative in Kalona, Iowa for their 950 kW array. Over ten years this will cover 10% of the original project cost.⁵⁵ When it became clear that the legislature would not renew the credit, many developers of small projects hurried to complete them by the December 31, 2017 deadline. Both the 476B and 476C tax credit certificates are transferable and may be applied toward the state's individual income, corporation income, franchise, insurance premium, sales and use, or replacement tax.⁵⁶

Renewable Energy Equipment Sales Tax Exemption. Since 2016, Iowa exempts solar, wind, and hydroelectric equipment from its 6% sales tax. This includes all equipment and materials used to install, manufacture, or construct these energy systems.⁵⁷ The revenue from sales taxes and gross receipts comprises \$4.6 billion, 47% of Iowa's state tax revenue. This is the largest source of state revenue, followed by state income taxes (41.8%) and license taxes (9.7%), so the exemption represents a significant degree of support for renewables.⁵⁸

Solar Energy Systems Tax Credit. The Solar Energy Systems (SES) tax credit is an income tax credit available for residential and commercial systems. While the focus of this section is on utility scale renewable tax policy, the relatively small amount of solar development in Iowa means that even incentives for smaller projects can play a significant role. Moreover, recent actions by the state legislature regarding the tax credit provide insight into the state's appetite for further incentivizing solar and renewables in general. The current law allows a 15% state tax credit up to \$5,000 for individuals and \$20,000 for corporations. The cumulative value of the credits available is limited to \$5,000,000. Demand for solar is enough that there has been a waitlist to claim the credits each year since 2014.⁵⁹ The credit is currently set to phase out by 2020 with the cumulative allocated funds diminishing to \$3,186,388 in 2019 and \$0 in 2020.⁶⁰

Energy Replacement Generation Tax Exemption. Wind energy conversion property eligible for a tax credit or subject to special wind energy property taxes (see below) are exempted from the

state's replacement tax. It is noteworthy that solar energy systems are not included among the exempted energy systems.⁶¹ The Iowa state legislature created the replacement tax so that in-state energy producers that had been previously subject to property taxes would not be at a competitive disadvantage to out-of-state producers with no property tax liability. The tax, which is imposed on the generation and transmission of electricity and the delivery of natural gas, was intended to be revenue neutral, closely matching the amounts previously paid in property taxes so that local governments did not suffer a loss in revenue.⁶² Generated electricity is taxed at a rate of \$0.0006/kWh.⁶³ The replacement tax is assessed by an assessor from the Iowa Department of Revenue instead of a county assessor, but the utilities pay these taxes where the costs are incurred just as they would for property taxes. Although, as discussed, the tax was intended to be revenue neutral, over the past ten years revenue has annually averaged .8% lower (\$1.2 million less annually) than the General Property Tax Equivalent (GPTE) for a ten-year difference of \$12.6 million, a net difference that is ultimately to the benefit of utilities deploying wind generation.⁶⁴ The law also exempts energy produced from landfill methane gas or by self-generators producing wholly for their own consumption. Large hydroelectric generators are subject to the tax but pay a reduced rate of \$0.000001847/kWh.

Property Tax Exemptions for Renewable Energy Systems. Since 1978, the market value added to a property by solar and wind have been exempted from property taxes for the first five full assessment years after completion if the energy is stored or used at the site where it is produced. Systems that produce intermittent grid exports through net metering are also eligible.⁶⁵ These exemptions are for small-scale energy systems. Utility-scale energy producers are not subject to property taxes because they pay the replacement tax, except for wind. Instead, local communities have the option of a *special assessment of wind energy devices*.

Under the special assessment, any city or county may pass an ordinance which assesses the value of wind energy conversion equipment at 0% of its net acquisition cost for the first year and increasing by 5% each year until it reaches 30% in the seventh and succeeding years until the 20th year.⁶⁶ Although not a required ordinance, all utility-scale wind farms in Iowa have been assessed under the local option for special assessment.⁶⁷

This assessment is completed by a county assessor and the taxes are paid to local tax districts like counties, schools, townships, fire departments, etc. If a city or county does not pass the ordinance for a special assessment, wind energy devices could be assessed at market value or might be eligible for the five-year exemption available for smaller-scale utilities, after which they would be assessed at 100% of market value, but this default has never been explored because of community acceptance of the special assessment.

Public Utility Commission (PUC) Policy

The IUB and Iowa Electric IOUs. The Iowa Utilities Board is the unit of Iowa state government empowered to regulate rates and services of electric, natural gas, and water utilities. The three-member board sets policies and rates in accordance with Iowa law. The stated mission of the Board is to “regulate utilities to ensure that reasonably priced, reliable, environmentally responsible, and safe utility services are available to all Iowans.”⁶⁸ The board oversees regulations on Iowa's two IOUs, Alliant and MidAmerican.⁶⁹

Iowa and IUB Policy on Net Metering. Small-scale producers of (especially, though not exclusively) solar power who are linked to the electricity grid to provide power at times act as net providers and at other times net consumers. Net metering is a term referring to the practice of these producers, who are said to control “distributed generation” (DG) facilities, earning credit when they are net providers, which can be applied to offset the cost of power during the times where they are net consumers.

Iowa state statutes do not explicitly require utilities to participate in net metering⁷⁰, but the authority for the board to authorize net metering is implicit through the board’s enforcement of the Public Utility Regulatory Policies Act (PURPA), as well as Iowa Code Section 476.41 (and its supporting sections), which states “It is the policy of this state to encourage the development of alternate energy production facilities.”⁷¹

Net metering and third-party relationships. Iowa’s net metering policies were first established in the 1980s. At that time, there was no built-in guidance as to whether third-party relationships still enabled customers the right to net meter. Because of the lack of concrete guidance on third-party relationships and renewed interest in them in the early 2010s as distributed renewable power generation became economically viable, the Board faced a great deal of attention on their net metering policies. A number of cases came before the Board in which IOUs in the state claimed that such third-party relationships shouldn’t afford the customer the right to net meter, because the owner/operator of the DG facility themselves served as a utility. This argument was generally accepted by the Board at that time, setting policy for about 5 years. However, in response to customer concerns and a number of cases before the Board and Iowa Supreme Court, Iowa’s net metering policies are currently in the process of being updated through a pilot program that will run through 2020. The policies of both IOUs in this pilot program afford these third-party relationships the right to net meter.

Siting Policy

Siting Wind Generation. Iowa employs a split system for siting authority as it pertains to wind power, dividing the responsibility between the state government and the local governments. Facilities with a generation capacity greater than 25 MW fall partially within the jurisdiction of the IUB. Wind plants with a smaller generation capacity are left entirely to the zoning discretion of local governments.⁷²

Large-Scale Wind Projects. Wind developers wishing to build a “large-scale” (>25 MW) project must apply to the IUB for a certificate before any construction can take place.⁷³ In this process, the IUB assess the proposed project’s impact to ensure that it won’t interfere with economic development, environmental health, or adequate and reliable electric service. Having established this and once the certificate is issued, a project may proceed in its proposed location, assuming that local siting requirements have been met.

Local Siting Requirements of Wind. Iowa’s 99 counties have a mix of approaches on how to regulate the creation of new wind energy plants. 17 counties have ordinances specifically tailored to wind energy (see figure 7). These counties are primarily in the center of the state and in the northwestern region, where wind energy and wind power facility densities are the highest.

Interestingly, 20 counties have no imposed zoning ordinances whatsoever, allowing wind projects to proceed with relatively little interference from the government.

The state government does not set a minimum setback distance for wind turbines, leaving that decision to counties. Most counties with wind ordinances establish a minimum setback distance from property lines as 1.1 to 1.25 times a turbine's total height. Setback distances from residential structures are usually within a range of 1,000 to 1,250 feet.⁷⁴

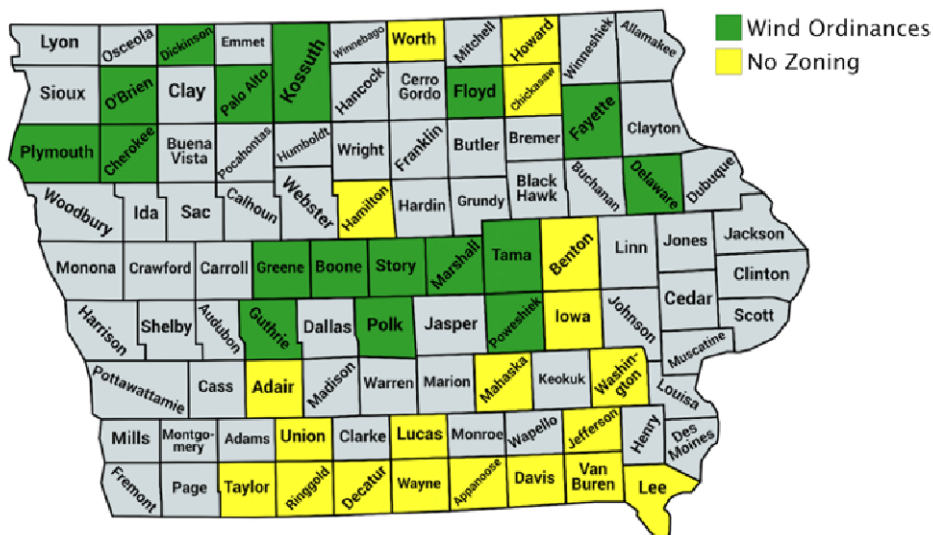


Figure 7. Data from Wind Exchange⁷⁵

Small Wind Innovation Zone. The Small Wind Innovation Zone Program, a policy enacted in 2009, helps to facilitate even more wind energy growth in the state. The law allows for the creation of specialized zones for wind generation facilities with a nameplate capacity of less than 100 kW. Eligible facilities constructing a plant within the zone can take advantage of optimized local and state benefits and an expedited process for siting and connecting to an electric utility. This essentially puts state and county governments mostly in lockstep in supporting wind energy.

Siting Solar Generation. There are no zoning requirements for solar generation set at the state level. The IUB has policies outlining the process of connecting generation facilities to the grid, but there is no certification requirement comparable to that for wind energy. Local governments have full control over solar zoning, but the state encourages practices conducive to solar energy production. Thus, solar energy siting is left to local government entities. Cities and counties are permitted to establish solar access regulatory boards to evaluate applications for solar access easements, in which landowners voluntarily give usage rights to a solar developer.⁷⁶ In the event that a necessary landowner refuses to grant usage rights, the relevant solar access regulatory board can create an easement so long as the nonconsenting party is fairly compensated.⁷⁷ Projects voluntarily agreed to by a solar developer and the appropriate landowners may proceed without interference. A final key regulation worth mentioning is that local governments have the authority to prohibit subdivision deeds which have “unreasonable restrictions on the use of solar collectors.”⁷⁸

The lack of explicit solar regulation is quite possibly due to the fact that solar energy currently comprises only 0.01% of Iowa's energy mix⁷⁹. Therefore, solar hasn't demanded the complex and nuanced approach that applies to taxing wind thus far.

Infrastructure

By account from the IUB, state policies have rarely set out to prioritize deployment of renewables through direct investment in electricity infrastructure⁸⁰. However, IOUs have at times set out to support private distributed generation through investment in infrastructure, specifically through smart meters.

Transmission Infrastructure. Iowa's approach to transmission infrastructure is not an active one. The 2006 IUB report stated that Iowa's IOUs had over 1,000 miles of transmission lines greater than 50 years old. This represents approximately 10% of the total reported miles. Nearly 60% of Iowa's reported lines are 30 years old or older."⁸¹

Smart Meters. Much more relevant to Iowa's infrastructure development in support of renewable energy is proliferation of smart meters. These meters are more affordable for the utilities because they cut costs on meter readers and allow for more accurate readings. They also have the benefit of encouraging net metering – more precise readings of peak and average power use allow the IUB to more fairly price the power sold from DG back into the grid, which works to benefit everyone involved. There has been some pushback from residents⁸² who want the option to opt out of the meters⁸³ and who recently won the right to keep their analog meters until they stop functioning⁸⁴. One of Iowa's two IOUs has already installed smart meters for 2/3 of their customers, and they expect to have smart meters rolled out fully (barring those residents grandfathered in to analog meters) by 2019⁸⁵.

Public Lands

Iowa ranks 49th in the nation in terms of percentage of publicly owned land in the state.⁸⁶ Federal land constitutes only 0.3% of the state's area,⁸⁷ and state-owned land accounts for even less. In terms of siting renewable energy projects, public land management doesn't play a large role. There is no regulation governing the siting of renewable energy projects on or near public use areas, and no legislative proposals to change that fact have been put forward in the past 5 years. The lack of regulation is likely due to the abundance of wind energy resources elsewhere in the state, making the need to specifically address public-use areas insignificant.

III. ANALYSIS

In this section we aim to explain the policy recipe that has enabled Iowa to become a national leader in wind energy and why it lags behind in solar energy.

Wind Energy

Iowa is a national leader in renewable energy with little to no explicit climate policy. The growth of the wind industry is due in large part to the abundance of open windy spaces and favorable financial incentives. The outsized role of agriculture in the state's economy supports a culture of individuals familiar with using land to make money and, generally, respecting the rights of one's

neighbor to do the same. Public land is too small a factor to affect the construction of wind generation facilities and siting laws are generally very conducive toward wind energy. Thus, the tax regulatory landscape for wind stands out as the most reasonable and apparent factor to influence wind deployment in the near future.

As a “purple” state politically, support for wind in Iowa comes from both Republicans and Democrats. While an assessment of more recent bills proposed in the Iowa legislature reveals state Democrats are introducing explicit climate policies and state Republicans are stopping them in committee, Republicans have their own reasons for supporting renewables. Whether they believe in climate change or not, Republicans in Iowa can support the growth of wind and solar for their ability to create jobs and maintain rural ways of living.

There is no doubt that Federal Renewable Energy Production Tax credits have influenced the rapid development of wind energy systems in Iowa. Iowa’s own production tax credits certainly complemented the federal credits initially, but they focused on small to medium sized systems and the small capacity of the program meant the impact was limited. The elimination of Codes 476B and 476C for future developments suggests that legislators believe the industry no longer needs incubating. The number of turbines planned for the next few years with no state tax credit seems to support that conclusion for wind, though added incentives would likely spur even more wind deployment.

Apart from the federal tax credit, property taxes on renewable energy systems in Iowa are perhaps the most influential financial lever for the expansion of the industry. Under the special assessment of wind energy devices, developers can save millions of dollars in taxes. At the same time, when working with a community to get a new project sited, wind developers point to the future taxes they will pay as a bargaining tool. MidAmerican says it has paid \$65 million in property taxes since 2004⁸⁸ and estimates that its Wind XI project will generate more than \$500 million over the 40-year life of the project.⁸⁹

Iowa has more than 2,000 taxing authorities including cities, counties, school districts and townships, among others.⁹⁰ In fiscal year 2018-2019, Iowa property taxes amounted to \$5.7 billion, of which 1.3% (\$77 million) come from utilities.⁹¹ Only .01% of property tax revenue funds state government expenses while the remaining 99.99% go to local taxing authorities.⁹²

For many counties, the property tax revenue from wind has become a significant portion of their tax bases. In Franklin County, the revenue from 300 turbines installed in 2010 and 2012 accounts for more than 14% of the county budget. Buena Vista County’s turbines were installed 15 years ago, but they continue to receive \$1.2 million in tax revenue with \$611,000 supporting local schools.⁹³ O’Brien County, one of Iowa’s windiest, expects to get \$7.3 million in property tax revenue annually from its 318 turbines.⁹⁴

These generous economic incentives for counties to adopt renewables are also why zoning regulation has been largely successful. While the state has the right to grant generation certificates to wind facilities greater than 25 MW, the fact that counties have all the control over zoning discretion is important. This tactic helps avoid community resentment in cases where the

state might have intervened to force turbines into a community, and it allows communities to decide what level of renewables penetration is right for their individual counties.

In Iowa, the phase-in structure of the special assessment of wind energy devices, which causes tax revenue to gradually increase from year one to year seven, might enable wiser budgeting than alternative structures in states that receive their property tax revenue in year one. Nevertheless, deciding how to spend this extra tax revenue can be a controversial issue for many counties and municipalities. The question is often whether to use the revenue for special projects outside the regular budget or to add it to the general fund and decrease the overall tax burden. Such was the case with the revenue from the Highland Wind Energy Project in the Primghar area of O'Brien County last year. A special committee was convened and a survey conducted about how to spend the money. Meanwhile, concerned citizens voiced their opinion that the tax revenue should be added to the general fund and used to support the schools and decrease taxes.⁹⁵ This dilemma is typical because new projects are more visible to the public and can be helpful reminders of the benefits of wind development.

The special assessment of wind energy devices in Iowa has enabled the rapid growth of the wind industry. At the same time, the additional property tax revenue generated by the new wind farms is sustaining small rural towns and counties that are struggling with decreasing populations. Serving the needs of both the developers and the communities has been a key to the success of this program. Looking ahead to the next five years, one of the biggest questions that remains about these financial incentives is whether or not they will be fully deployed to maximize the potential of solar energy systems as they have been for wind.

Solar Energy

Unlike wind, solar development in Iowa is slow. We believe this is due to differences in the footprint and tax structures of wind compared to solar. The state's lax regulation of solar energy makes it promising for potential solar energy developers, but the abundance of wind energy and the positive public attitude toward harnessing it have resulted in few solar plants being built thus far.

Solar farms have a bigger footprint than wind farms. This means more land previously taxed as usable farm land is consumed by the installation of a solar array than wind turbines. Taxing authorities collect replacement taxes from the energy generated from solar, but these values are on average less than general property tax equivalents (GPTEs). Since these taxes are taxed by state authorities and combined with other utility replacement taxes, they are less likely to be seen by local communities as a direct benefit from a solar farm. Thus, a utility hoping to gain siting approval for a new solar farm may have a more difficult time communicating the financial benefits of the farm to the local community.

The phase-out of the smaller scale Solar Energy Systems (SES) tax credit, which has had a waitlist for years, and the attempt in 2018 to end it early, are clear indications that the legislature is pulling back financial incentives for the renewable industry in general as a result of the established success of wind in the state. It is unknown whether removing these credits will negatively impact the growth of the industry.

Given the extent to which investor-owned utilities promote how much they pay in property taxes for wind energy systems, it is striking how different the tax structure works for utility-scale solar installations. The two systems pay different taxes, assessed by different entities, at different rates. Wind energy equipment is subject to property taxes, assessed by a county assessor or assessors. For their solar generating equipment, utilities pay the replacement tax assessed by an assessor at the Iowa Department of Revenue. Both of these tax revenues are paid to local tax authorities. The Iowa Department of Management maintains records of yearly replacement taxes paid by utilities and their GPTEs. As noted above, the replacement taxes average \$1.2 million below their GPTEs. It is impossible to ascertain which portion of the replacement taxes paid by any one utility are directly generated by their utility-scale solar facilities since the taxes are summed for each utility's generation and transmission then divided among the local tax districts.⁹⁶ Without seeing the direct tax benefits from solar, local communities may have been historically less inclined, and continue to be less inclined, to support siting future utility-scale facilities.

Opportunities

Wind has provided many benefits to Iowa. It is relatively cheap, provides financial benefits to small towns through property taxes, creates jobs, and is cleaner and better for the environment than energy produced by fossil fuels. Wind has its downsides, however. Critics complain about noise and flickering shadows from the spinning blades, the blinking red lights, and the visual impact of the towers. The siting limitations of the tall turbines raise issues of property rights and some fear they will reduce property values. Additionally, there are times when the wind does not blow and the grid must rely on more expensive, fossil fuel plants to provide back-up power. This is especially costly when so-called "peaker" plants must be fired-up on short notice to meet spikes in energy demand, usually as people return home from work and turn on their appliances.

Utility-scale solar energy systems on the other hand, have relatively few negative externalities. The panels can easily be hidden from view, noise is minimal, and there are no flickering shadows or red lights. More importantly, solar is complementary to wind. While wind turbines are most productive at night and during the winter, solar produces most energy during the day and in the summer. Solar production also peaks when the sun is at its hottest, in the late afternoon and evening, which overlaps with peak energy demand times.⁹⁷

Growth in the solar industry will provide economic benefits to areas of Iowa unsuitable for wind development. For example, Muscatine County is considered a poor location for wind turbines, but it is among the state's best for utility-scale solar. At the same time, many strong areas for wind development, like Lyon, Osceola, and Dickinson counties, also have strong potential for solar.⁹⁸ Thus, growth of the solar industry would not pull development away from windy areas, but rather would expand the renewable energy boom to new locations and complement existing renewable energy deployment in the state. Moreover, increasing solar capacity can be a multiplier for wind. The complimentary nature of the two systems means increasing the state's solar capacity makes wind more viable. Encouraging the growth of the solar industry will continue to spur the growth of the wind industry as well.

IV. POLICY RECOMMENDATIONS

A New Solar RPS

Although Iowa's 1983 RPS has not been a major contributing factor to renewables deployment in the last 20 years, it created the initial momentum which allowed Iowa to become a national leader in wind development. It contributed to the development of the federal Production Tax Credit, authored by Iowan Senator Chuck Grassley.⁹⁹ By 2018, the wind industry directly employed 10,000 Iowans and paid \$58 million in state and local taxes and \$20-30 million in land lease payments, annually.¹⁰⁰ While much of the success of wind energy in Iowa is due to favorable conditions (lots of windy, open areas) and increasing affordability, it would not have begun without the goal set by the original RPS.¹⁰¹

In January 2019, State Senator Joe Bolckcom, a Democrat representing Iowa City, proposed IA SF 105, a solar energy minimum purchase standard. It would replace the current RPS mentioned above with a new standard setting a minimum amount of solar energy required to be purchased or produced by IOUs. The utilities would have to meet 1,500 MW of solar by 2020, 2,000 MW by 2022, and 3,000 MW by 2025. The bill is currently pending in the State Senate Commerce Committee.¹⁰²

A similar bill, IA HF 346, was proposed in February, 2019 by Representative Charles Isenhardt of the Iowa State House of Representatives. Rather than create a new RPS, HF 346 updates the original RPS by specifically requiring the IOUs to purchase minimum quantities of solar energy capacity. In a nod to the original 1983 mandate, the initial requirement is modest, requiring each IOU to own or purchase only its share of 105 MW of solar capacity by 2021. By 2025, the requirement increases to 2500 MW, a significant increase but still less than one third of the 2018 nameplate capacity of Iowan wind energy. Importantly, HF 346 incentivizes the IOUs to build solar energy storage capacity by allowing solar storage facilities to count toward their requirements. Additionally, the bill requires that at least 10% of the solar power produced or purchased come from DG facilities with nameplate capacities of 25 kilowatts or less.¹⁰³

Updating the RPS will boost the growth of the Iowan solar industry. In Iowa, solar is in a similarly nascent state as wind was 30 years ago. Iowa currently ranks 35th nationally, in terms of solar energy production.¹⁰⁴ However, as it is with wind, Iowa is rich in technical solar potential, ranked 16th in the nation, ahead of Florida, Georgia, Missouri, North Carolina, and South Carolina.¹⁰⁵ One reason for the slow growth of solar compared to wind is that until recently, photovoltaic solar facilities were less cost-effective per MWh than wind turbines. Currently, utility-scale solar is within the same range of affordability as wind. Besides wind, it is cheaper per MWh than every other form of electric generation, and becoming more affordable every year.¹⁰⁶ Because of these favorable conditions, solar development in Iowa is ready to grow, and the updated RPS will further signal to solar developers that Iowa is open for business. With only 100 MW of solar capacity, the solar industry in Iowa already supports more than 100 businesses.¹⁰⁷ Increasing that capacity 25-fold in the next six years will create hundreds of jobs.

If solar is so affordable, some may wonder why an updated RPS is necessary. Indeed, Iowa's two IOUs are already moving toward increasing their solar capacity. The updated RPS asks them to move faster. It sets a goal that the IOUs and developers can plan for and sends a message that

Iowa is pro-clean energy. Outside business interests such as Google, Microsoft, and Facebook, have already demonstrated that they will invest in Iowa to gain access to clean energy.¹⁰⁸ The updated RPS will increase this type of investment. Moreover, updating the RPS makes sense precisely because solar is cost-effective. It is an achievable goal.

Updating the RPS will tackle intermittency issues. The bill spurs the development of complementary renewable energy systems and encourages the development of solar energy storage systems. While utility-scale photovoltaic solar systems are extremely affordable, storage systems are less cost-effective.¹⁰⁹ The storage provisions, however, are most helpful at overcoming intermittency issues and lowering energy costs by reducing reliance on fossil-fueled peaker plants. While encouraging their development by counting storage systems towards the solar energy capacity requirements, the bill does not mandate the IOUs to own or purchase them. Thus, the IOUs can build or purchase storage facilities to offset intermittency issues. The bill is cost-effective for consumers by mandating the most-affordable type of energy production, but offers flexible compliance mechanisms that incorporate the most effective means of tackling intermittency.

Replace solar replacement tax with property tax

Taxing Iowa's solar facilities based on property value rather than energy generation could benefit local communities and incentivize easier siting. Iowa's special assessment of wind energy devices benefits utilities by phasing in property taxes in 5% increments over seven years and capping their tax liability at 30% of net acquisition value. At the same time, property tax revenues from wind energy devices provide large windfalls to local taxing authorities. It is easy to trace these property tax revenues to their source, making clear the benefits of wind turbines to local communities, but it is nearly impossible to do the same with solar energy systems because they are taxed through the energy generation replacement tax. Moreover, revenues from the energy replacement tax have not kept up with the property taxes they were meant to replace. It is likely that local taxing authorities would gain tax revenue if solar energy systems were taxed based on property value instead of energy generation, though this calculation would depend on the net acquisition cost of the solar farm relative to its production capacity. However, it is certain that it would be easier to link these tax benefits to their solar energy sources. More directly linking the benefits to the source would facilitate expansion of the solar industry.

Distributed Generation: Opportunity for growth of solar and renewables

Given the explained merits of solar in Iowa, an expansion of solar deployment benefits businesses and communities, including those supported by wind energy. While tax policy is an important area for consideration, improved distributed generation policies have the most potential to promote solar deployment.

Explicit policies from state legislature are unnecessary. On February 27th, 2019 a bill was introduced in the Iowa State House (whose authors admit that MidAmerican assisted in its production) which would require private generators who don't pay delineated grid costs to pay additional fees to the IOUs; such a policy would jeopardize the economic viability of distributed generation in the state.¹¹⁰ IOUs claim that this legislation would force solar developers to pay

their “fair share” toward the infrastructure they use, but this argument is a red herring for two main reasons.

IOUs save money on distributed generation. In the alternative economic model to distributed solar, the IOUs would continue to provide power to customers as usual; but this results in losses and additional costs to the utilities. Although difficult to pin down economically, savings associated with not having to transmit this power long distances and avoiding requirements on transmission and generation capacity have been shown in other states like Minnesota to be as high as 14.5 cents per kWh. This more than balances the economic impact on the IOU’s bottom line associated with a lack of explicit grid fees for customers who net meter.

Distributed generation cost of business favors IOUs. MidAmerican charges residential customers on their default schedule approximately 10.6 cents per kWh during the summer¹¹¹. But under their current agreement with the IUB, distributed generation producers can only carry forward excess production credits, measured in kWh, to other months in the same year, and then must cash them out at the avoided cost rate¹¹².

For customers carrying production forward, they might expect to carry the credits in to the winter months where solar isn't as available due to fewer sunlight hours and more cloud cover¹¹³, on average. But the cost of energy per kWh in the winter is 20% lower than in the summer on MidAmerican's default residential price plan¹¹⁴. So, customers generate electricity that they give to MidAmerican during its peak operational hours and time of the year, and in exchange they get a credit to give back to MidAmerican during off-peak hours and season. When a customer is forced to cash out their excess credits at the end of the year, they must do so at an avoided cost rate, estimated to be 2.5 cents per kWh¹¹⁵. This mark-down is a poor alternative to carrying forward credits. The utility is clearly economically favored in this arrangement – private solar producers give their power to MidAmerican, assisting MidAmerican in meeting its peak demand, in exchange for a credit. Since solar panels work best during the summer, customers are least likely to be applying their credits during that time of the year and must instead use it during a time of the year where their power would be 20% cheaper or cash it out for less than 25% of its initial value to MidAmerican. Because of the current rate structure, utilities already experience an outsized benefit, and an expansion of the fees they collect, as is proposed in this bill, is unnecessary.

The future of net metering legislation. Bills in the state legislature such as House Study Bill 185 threaten the state’s net metering policies. Policies established by the IUB guaranteeing net metering rights for customers signing PPAs with third-party developers and ensuring fairness in rates charged by utilities for grid access are crucial in establishing a regulatory environment where Iowans can take advantage of environmental conditions favoring solar energy generation in their state. In order not to undermine the work of the IUB in maintaining an effective economic model for renewables development, and therefore to encourage solar deployment in the state, the Iowa State Legislature should not impose further influence on the specifics of net metering policies.

Intelligent expansion and transparency of transmission infrastructure. It is unfortunate that Iowa does not take a more active role in shaping the trajectory and geography of energy development

by upgrading energy infrastructure. In particular, upgrading Iowa’s aged transmission lines is a clear opportunity for the state-level intervention.

We recommend that the IUB create and publicly provide a hosting capacity map based on infrastructure capabilities on a local basis, in the style of Illinois.¹¹⁶ This resource should give information on transmission capacity at least to the county level. Such a resource would be beneficial to state legislators, who may wish to legislate new requirements and opportunities to shape the geographic landscape of renewables through inevitable upgrades to transmission infrastructure, as well as private citizens and corporations hoping to participate in the state’s expanded third-party net metering regulations. This capacity map resource would be a productive use of taxpayer funds.

CONCLUSION

Over the last 20 years Iowa has become a national leader in renewable energy in spite of a lack of strong explicit climate policies. Most of its renewable development is a result of an abundance of rural terrain, strong wind, and favorable tax incentives. To stay at the forefront of renewable energy development over the next 20 years, Iowa must make intentional investments in infrastructure and promote policies to nurture the development of solar energy and storage to complement its current wind generation.

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