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A Comparative Analysis of Energy Policy and Markets in Ohio, Iowa, and Minnesota and Respective Impacts on Renewable Energy Development

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Abstract

With the climate crises worsening it is important that governments adopt effective policies to support renewable energy development. This is imperative considering the greenhouse gas emissions that fossil fuels, the conventional energy sources, emit. With a lack of direction from the federal government since the early 2000s, the states have been mostly left to support renewables with their own policy development. Between the three midwestern states of Iowa, Ohio, and Minnesota, Ohio lags far behind in terms of renewable energy growth while Iowa and Minnesota are national leaders. A state such as Ohio has likely seen less growth due to the presence of a fossil fuel industry, and more conservative state legislature compared to Iowa and Minnesota since the early 2000s. Although a mandate such as a Renewable Portfolio Standard will likely not be politically supported in Ohio, policies that are less regulatory such as financial incentives or a Mandatory Green Power Option, may make a positive difference in the Ohio's renewable energy growth as they have done in Iowa and Minnesota. Additionally, a more prevalent environmental movement in Ohio, led by younger progressive voters, may spur some policy change. Renewable energy development in Ohio could also increase under an overarching federal climate policy, although additional research is necessary to determine the effects that such a policy would have on states with stagnant renewable energy growth.

Keywords: renewable energy, Iowa, Ohio, Minnesota, policy, development

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According to the Intergovernmental Panel on Climate Change (IPCC), the Earth has been consistently warming since the Industrial Revolution; temperatures have increased approximately .2° C each decade over the last thirty years (IPCC, 2018). In this century alone, the effects of global warming will likely prove to be severe. Rising sea levels, intense and frequent storms, a more ice-free Arctic, heatwaves, etc., are expected (National Aeronautics and Space Administration (NASA), n.d.). To avoid the worst effects that climate change may bring, we must try to halt warming to 1.5°C above pre-industrial levels (IPCC, 2018). Although there will still be major negative impacts, humans have a greater chance of living a sustainable life at 1.5°C above pre-industrial levels while also protecting the Earth's ecosystems. (IPCC, 2018).

To level off human induced global warming at 1.5°C above pre-industrial levels, global carbon dioxide and other greenhouse gas emissions must be significantly and quickly reduced. The U.S. Energy Information Administration (EIA) states that in 2018, the burning of fossil fuels directly contributed to 75% of U.S. greenhouse gas emissions (EIA, n.d.). Ultimately, energy sources such as coal, natural gas, and petroleum are unsustainable if the 1.5°C goal is to be reached due to the enormous amount of greenhouse gases they emit. With an increase in technology and a growing global population, simply reducing energy consumption is unrealistic. Over the next couple of decades, the United States must transition its energy portfolio from consisting primarily of fossil fuel sources to renewable energy sources such as wind, solar, hydropower, geothermal, or biomass.

The current status of renewable energy in the U.S. varies greatly across the individual states. This is in large part due to the lack of central, federal planning or policy that supports the development of renewables nationwide. Some basic incentives exist at the federal level including

the Federal Renewable Electricity Production Tax Credit or Investment Tax Credit (which will be described below). Still, the more comprehensive public policy has been developed at the state level and implemented since the early 2000s. While some states have found incredible success in driving renewable energy development, others have not. This paper will consider the existing literature focused on state level renewable energy policies and compare the policies of Iowa, Minnesota, and Ohio which are three Midwestern states that have progressed much differently in their development of renewables. While Iowa and Minnesota are much further along in renewable energy development, Ohio lags far behind both despite being regionally similar and with a larger population. After the status of each state is provided, policy recommendations will be made in conjunction with the literature. These recommendations are important considering the urgency in which fossil fuel based emissions must decrease in the coming years and decades.

Types of Renewable Energy Policies

It is important to understand the multiple energy policies that have been used to promote renewable energy development. As mentioned previously, certain tax credits have been offered at the federal level to promote renewable energy. The Renewable Electricity Production Tax Credit, or PTC, was enacted in 1992 and applies to wind, geothermal, and biomass technologies (NC Clean Energy Technology Center, 2021). This commercial tax credit applies for 10 years after a facility begins operation and is 1.5 cents per kW/h adjusted for inflation every year. The federal Business Energy Investment Tax Credit, or ITC, for commercial and industrial sectors currently applies to solar, small wind, geothermal, and offshore wind (NC Clean Energy Technology Center, 2021). It is one of the best tax incentives for solar that exist, with a 26% tax credit towards investments in solar systems (NC Clean Energy Technology Center, 2021). It is slowly being phased out over the next five years.

Apart from these tax credits, there are few largescale federal renewable energy policies. However, the states have utilized a wide range of different renewable energy policies, some of which are financial incentives and others direct regulation. The U.S. Environmental Protection Agency (EPA) lists many of these policies; certain tax credits, loan programs, or grant programs (EPA, n.d.). Another common policy is net metering, which essentially allows "residential or commercial customers" to give excess energy that they produce from renewables back to the grid and receive payment for this provided energy and is typically used by homeowners (EPA, n.d.).

One of the more popular and comprehensive forms of direct regulation includes a state Renewable Portfolio Standard, or RPS. With the adoption of an RPS, utilities within a state are required to obtain a certain percentage of their energy portfolio from renewable energy sources (EPA, n.d.). Typically, this percentage requirement increases over time, so the state's overall renewable energy portfolio and renewable development are expected to increase as well. Currently, Iowa, Ohio, and Minnesota have all adopted an RPS, including thirty other states and Washington, D.C. (Shields, 2021)

Another more recently adopted renewable energy policy includes a mandatory green power option or MGPO. More of a market-based approach, this policy requires that utilities offer their customers a green energy "choice" for their electricity. According to the Center for Climate and Energy Solutions (2017), only seven states have adopted a version of an MGPO. Notably, Iowa and Minnesota are two of the seven states.

The policies discussed here have generally been the most prominent across the states. This does not mean that these are the exclusive renewable energy policies. Some states including Iowa, Minnesota, and Ohio have others that will be discussed further in the state comparisons.

However, they are the policies that have been researched the most heavily and are focused on in the literature.

Literature Review

Many of the state level renewable energy policies were adopted within the last twenty to twenty-five years, and particularly in the early 2000s. Therefore, much of the relevant literature is from this the same period, or soon after these policies had been adopted by multiple states. The literature tends to focus on different aspects of energy policies, for example, the specific effect on wind energy development or actual renewable energy generation versus installed capacity. However, generally, researchers are able to agree on the complexity of this policy issue because of varying policy designs and factors that will determine a state's renewable development progress. (Bird et al., 2005, Carley, 2009, Yin & Powers, 2010, Delmas & Montes-Sancho, 2011, Shrimali & Kniefel, 2011). This complexity can make energy policies and their effectiveness more difficult to measure and understand. Although determinations have been made across the literature on different energy policies and their effectiveness, these conclusions are varied.

Both Bird et al. (2006) and Yin and Powers (2010) found that RPSs are an effective policy to promote renewable energy, although Bird et al. (2006) analyzed wind energy development specifically. Bird et al. (2006) find that RPSs have directly led to early increases in wind energy in states such as Iowa and Minnesota and are the most effective policy that a state can implement to benefit wind energy production. However, it is also concluded that windier states in conjunction with an increase in natural gas prices have made wind energy more affordable and competitive in certain states (Bird et al., 2006). Although natural gas prices did reach as high as $12/cubic feet in late 2005, throughout the last decade they have decreased considerably, generally staying between $2 and $6 per cubic feet (EIA, n.d.). While the cost of

producing wind energy has also decreased, there may not be as clear of a correlation between natural gas prices and the ability for wind energy to grow today as there was in the early 2000s.

Yin and Powers (2010) also find that RPSs are an effective renewable energy policy, however, they specifically measured "in-state" renewable energy capacity growth. Ultimately, a state can reach its RPS goals through Renewable Energy Credit, or REC, trading across states. That is, utilities in one state can buy a REC that represents a certain megawatt-hour of renewable electricity that was produced in another state to achieve the percentage of renewable energy required per the RPS. This concept is important when considering how effective an RPS will be for a state's renewable energy development. Although Yin and Powers (2010) find a positive significant relationship between RPSs and in state renewable energy development, they also conclude that states which allow more REC trading will have a less effective RPS. This is somewhat of an unsurprising conclusion; if utilities are able to rely on REC trading to reach their RPS goals, there will be less incentive to invest in in-state renewable energy generation.

Interestingly, Carley (2009) finds mixed effectiveness of RPSs and also acknowledges the other factors that may contribute to a state's success in renewable energy generation. Overall, Carley (2009) finds that "RPS policies are…encouraging *total* RE investment and deployment but not effectively increasing the *percentage* of RE generation in states' electricity portfolios" (p. 3097). Even though "total" renewable energy may increase, if energy demand (and therefore energy usage) is increasing at a faster rate, then the percentage of renewable energy that makes up a state's portfolio will not change and may even go down. As Carley (2009) explains this could be highly problematic if the overall goal is to be reducing the ratio of fossil fuel use to renewable energy use. However, there are other important significant factors Carley (2009) found when analyzing state renewable energy development, including their bureaucratic

capacity, whether other RPS policies exist regionally, and if they are deregulated. However, again, deregulated states have higher total investments in renewable energy compared to regulated states, not higher total percentages.

The most recent literature, including both Delmas and Montes-Sancho (2011) and Shrimali and Kneifel (2011) finds that even when compared to an RPS, a Mandatory Green Power Option is found to be most the effective policy in increasing renewable energy capacity and generation. Delmas and Montes-Sancho (2011) state that more direct regulation policies such as "RPS, disclosure, and tax incentives have proven to be insignificant". While this is for a variety of reasons including the difficulty in the enforcement or potential REC trading issue which Yin and Powers (2010) discussed, ultimately Delmas and Montes-Sancho (2011) state that the market itself is an important tool that can and will increase renewable energy development. Shrimali and Kneifel (2011) found similar results, especially that an MGPO was an effective policy that led to the increase in renewable energy development, specifically capacity. Both Shrimali and Kneifel (2011) and Delmas and Montes-Sancho (2011) explain that the green customers of these utilities are the reason behind the success of an MGPO. That is, residents that have an option to purchase electricity from renewable sources have done so, and that this market demand itself has driven an increase in renewable energy capacity.

Although Delmas and Montes-Sancho (2011) and Shrimali and Kneifel (2011) find RPSs to be a less effective policy, they explain that it may be more successful in some circumstances, for example, with investor owned utilities rather than publicly owned, and when only considering certain renewable energies such as geothermal and solar energy. However, generally, RPSs do not significantly contribute to an increase in renewable energy capacity in some states,

particularly where renewable capacity that already exists is able to be counted in the RPS requirement (Shrimali and Kneifel, 2011).

Similar to Carley (2009), Delmas and Montes-Sancho (2011) do recognize that other factors can contribute to the effectiveness of a policy including "high presence of Sierra Club membership, green residential customers, and democratic representatives" (p. 2282). Delmas and Montes-Sancho (2011) explain that high numbers of individuals within these groups create more advocacy within a state for positive environmental policies and behaviors. Overall, researchers themselves not only describe the complexity in determining what the most successful renewable energy policy designs are, but the mixed results that the literature provides also demonstrate this complexity. Additionally, there has been much less intensive research completed on renewable energy policies within the last decade and it is important to consider this when analyzing the current renewable energy development progress within Iowa, Minnesota, and Ohio. The following three sections will examine not only the renewable energy progress within each of these states, but what energy policies are being implemented and why these policy differences have occurred.

State Policy Analysis

Iowa

Iowa is one of the nation's leaders in renewable energy development and has made the greatest progress compared to Minnesota and Ohio. According to the EIA (n.d.), in 2019 Iowa generated over 40% of its electricity from renewable energy. However, almost all of this energy was generated from wind power; solar energy and biomass only accounted for around two percent of the state's generated energy. The remaining energy in the state comes mostly from

coal, with natural gas and nuclear contributing to around a fifth of Iowa's energy profile (EIA, n.d.).

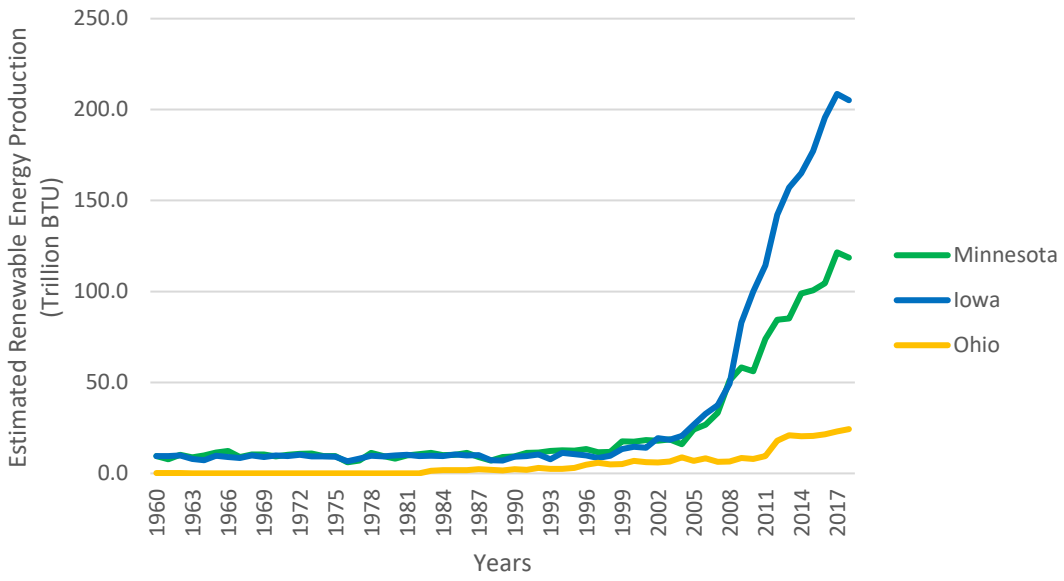
Iowa enacted renewable energy policies earlier than most states and had the first RPS in the nation with the Alternative Energy Production Law (AEL), enacted in 1983. This RPS required that two of the state's largest investor owned utilities, MidAmerican Energy and Alliant Energy Interstate Power and Light produce "or…contract for" 105 MW of renewable energy combined (NC Clean Energy Technology Center, 2018). This 105 MW goal has been well surpassed, considering that the state had a renewable generation capacity of around 10,400 MW in 2020 (EIA, 2020). What is perhaps surprising is that Iowa never updated or amended the (AEL) after 1983 and yet, the state is one of the furthest along in its renewable energy development. This seems to imply that there have been other factors and potential policies that have contributed to this renewable energy growth since 1983. According to the EIA (2020) primary energy production data from 1960 to 2018, there is a clear increase in renewable energy production between 2002 and 2008, and then an even sharper increase from 2008 and beyond, as shown in Figure 1. There are certain energy policies adopted around this time that could explain these increases in renewable energy production in Iowa.

The first major policy of the 2000s is the advanced ratemaking principles which Iowa adopted in 2001. This policy allowed utilities to build and own renewable energy much more easily and made it less risky for them to do so. According to the Iowa Utilities Board (IUB) (n.d.), "Utility companies were previously required to wait until new plants actually went on line before learning how regulators would treat their investment", or what electricity rates regulators would place on these utility companies. Now, utilities would know in advance what their regulated rates would be, thereby increasing the chances that they would construct their own

renewable energy facilities, which in Iowa's case, has been mostly wind (IUB, n.d.). This has likely contributed to the increase in in-state renewable energy generation and may result in less REC trading.

Figure 1

Estimated Renewable Energy Production vs. Time



Another policy created in this period was Iowa's MGPO. Effective in 2004, all Iowa utilities were required to offer their customers an electricity option from a renewable source (NC Clean Energy Technology Center, 2016). Notably, this is also the policy that both Delmas and Montes-Sancho (2011) and Shrimali and Kneifel (2011) find to be the most effective at increasing renewable energy.

Financial incentives are an additional policy Iowa has used to spur renewable development. Although the literature is mixed regarding tax incentives (for example, Bird et al. (2006) finds them important, while Carley (2009) and Delmas and Montes-Sancho (2011) did not), Iowa began offering two different tax credits in 2005 for renewable energy. The Wind Energy Production Tax Credit was 1.0 cents kW/h of electricity produced from a wind source (Good,

2019). More broadly, the Renewable Energy Tax Credit was 1.5 cents kW/h of electricity produced from wind, solar, biomass, refuse, or methane gas recovery source (Good, 2019). These tax credits may be a more effective type of tax credit, since they are actually reducing the cost of producing the electricity, instead of only reducing the cost of constructing renewable energy. Although eligibility for these credits have now passed, a property tax exemption for renewable energy systems is still ongoing as well as a solar energy systems tax credit (Good, 2019, NC Clean Energy Technology Center, 2020)

Although Iowa's early RPS goals may have aided in early renewable energy development, it seems clear that other policies contributed to growth in the early to mid-2000s.

Minnesota

While Minnesota has not reached the level of renewable energy development that Iowa has, as evident in Figure 1, the state can still be considered a national leader, comparatively. In 2019, a fourth of Minnesota's generated electricity was derived from renewable energy, most of which is from wind power (EIA, 2020). Fairly similar to Iowa, the rest of the state's energy portfolio consists of coal, natural gas, and nuclear power (EIA, 2020). Also as seen in Figure 1, there was a steady increase in renewable energy production starting in the early 2000s that has only continued. While Minnesota has some policy similarities with Iowa, there are some important differences as well.

Similar to Iowa, Minnesota established an MGPO in 2001 (OpenEI, n.d.). This mandate also required utilities to offer a "green option" to all electricity consumers. Unlike Iowa, Minnesota ended their MGPO in 2009 once their voluntary RPS, which was established in the early 2000s as well, became mandatory in 2007 (OpenEI, n.d.). Therefore, the MGPO is

currently not active although there was a large increase in renewable energy production on a similar trajectory with Iowa in the years that it was.

Although Minnesota's RPS was established much later than Iowa's and was voluntary until 2007, the state has created a more comprehensive policy with much greater benchmarks than the 105 MW of renewable energy in Iowa. Gradually the benchmark requirements have increased since the RPS adoption. Minnesota's largest utility, Xcel Energy, needed to obtain 31.5% of its electricity from renewable energy sources, with 1.5% of this being from solar by 2020 (NC Clean Energy Technology Center, 2018). Other public utilities were required to reach 20% renewable energy with an additional 1.5% from solar by 2020, and all other non-public utilities needed to reach 20% renewable energy by 2020. Other public and non-public utilities must also reach 25% renewable energy by 2025. All of these requirements have already been surpassed, even the 25% by 2025 requirement, demonstrating the continued growth that Minnesota has achieved (EIA, 2020). Additionally, the state has a goal for public utilities to reach 10% of electricity from solar energy by 2030 (EIA, 2020).

Similar to Iowa, Minnesota does offer some tax incentives to promote renewable energy development in the state. There is a complete sales tax exemption on the installation of both solar and wind energy systems (NC Clean Energy Technology Center, 2021, NC Clean Energy Technology Center, 2020). Additionally, both wind and solar are exempt from some property tax (NC Clean Energy Technology Center, 2021). Although these are significant tax incentives, especially when used in combination with the federal PTC or ITC, none are a production tax credit as seen in Iowa. Therefore, there could be less of an incentive to actually generate renewable energy with these tax incentives.

Ohio

As seen in Figure 1, Ohio has seen overall significantly less renewable energy development with a more stagnant trend compared to Iowa and Minnesota. In 2019 only about 3% of Ohio's in state electricity generation was from renewables (EIA, 2020). Around three - fifths of this renewable energy generation are from wind sources (EIA, 2020). The rest of the energy profile consists of coal, natural gas, and nuclear, with coal contributing to about 37% of the state's net generation and about 44% from natural gas (Center for the New Energy Economy, n.d.).

Similar to other states, including Minnesota, Ohio established an RPS by the late 2000s. The state's Alternative Energy Portfolio Standard (AEPS) was established in 2008, requiring that utilities obtain 12.5% of their electricity from renewables by 2025 with 0.5% of this being from solar (NC Clean Energy Technology Center, 2018). Benchmarks were set beginning in 2008 in order to reach this goal. However, in 2014 Ohio became the first state to freeze their RPS program with S.B. 221; this pushed back all RPS benchmark requirements for two years which would not resume until 2017 (NC Clean Energy Technology Center, 2018). Additionally, utilities no longer had to gain half of their renewables from in state resources, as the original AEPS required (NC Clean Energy Technology Center, 2018). The most detrimental piece of legislation to the AEPS was the controversial Ohio House Bill 6 from 2019. The AEPS requirement was lowered to only 8.5% by 2026 and would be completely eliminated after (EIA, n.d., PUCO, n.d.).

Besides the discontinuation of the AEPS, other Ohio laws have made it difficult for renewable energy to flourish in the state. In 2014, Ohio established one of the strictest wind turbine setback requirements in the country, making it difficult for wind developers and investors

to want to come to Ohio (Kowalski, 2014). According to Romich (2012), “each turbine must be setback from the nearest property line a distance equal to one and one tenth times the height of the turbine”. This is certainly a barrier that has not existed in states like Iowa and Minnesota, where wind development has clearly been growing.

Ohio has tax incentives that are similar to Minnesota. The Qualified Energy Property Tax Exemption for projects 250 kW or less includes a “100% exemption from public utility tangible personal property tax and real property tax” for “renewable, clean coal, advanced nuclear, and cogeneration energy projects” (The Ohio State University CFAES, n.d.). Similar to Minnesota, this tax incentive does not include production costs.

Discussion

Naturally, the question arises of why Ohio lawmakers have been less supportive of renewable energy policies compared to other states. Perhaps it is because Ohio has a bigger fossil fuel industry consisting mostly of coal and natural gas, which are notably absent in both Iowa and Minnesota; neither Iowa nor Minnesota produces natural gas and only Iowa produces some coal which is shipped to the state from Wyoming (EIA, 2020, EIA, 2020). Alternatively, Ohio produces both coal and natural gas from reserves within the state, with a natural gas boom occurring since 2012 (EIA, 2020). There seems to be continued support at the state level for fossil fuels, particularly coal, even when they are no longer economically efficient. This can be seen most recently with House Bill 6, where two old coal plants and nuclear power plants were bailed out in the largest political corruption scandal in Ohio history (Sawmiller, 2020). And, renewable energy requirements were eliminated as a result of House Bill 6, as discussed earlier.

More recently, Vasseur (2016) supports this notion that “existing interests” such as a fossil fuel industry do prevent renewable energy development progress (p. 297). Additionally,

his research suggests that a neoliberal (typically conservative and free-market oriented) state government is less likely to create policy that supports renewable energy. Even if a conservative state does create renewable energy policies, they are generally incentive based, and not mandates (Vasseur, 2016). Politically, this can demonstrate why Ohio has seen less renewable energy growth than Iowa and Minnesota. Although Iowa is generally considered a Republican-led state, a closer look at who controls the legislature reveals that it is less "red" than Ohio, particularly in the years where many of Iowa's renewable energy policies were passed in the early to mid-2000s (National Conference of State Legislatures (NCSL), n.d.). For example, Iowa's legislature had split control by 2004 and were fully controlled by Democrats between 2006 and 2010 (NCSL, n.d.). Ohio has had Republican-controlled legislatures every year since 2002 except between 2008-2010 where the House was controlled by Democrats (NCSL, n.d.). This Republican dominance, in combination with a more prominent fossil fuel industry, may help explain why Ohio has not seen the progress in renewable energy development that Iowa and Minnesota have.

Recommendations & Conclusion

There are clearly many factors that contribute to a state's success in developing renewables. This is certainly the case for the three states that were examined. Between the three states, one of the more notable policy differences is that Iowa and Minnesota have had, or currently have an MGPO and Ohio does not. They both are also regulated states, although there is yet to be strong research in the literature suggesting that that one market condition is better than the other. Overall, Ohio has simply adopted policies that have hindered renewable energy development in the state, or at least disincentivized it. It may be the case that Ohio's Republican-led legislature in combination with the state's fossil fuel industry has hindered development as Vasseur (2016) suggests. If Ohio is unable to rely on strict mandates such as an RPS, the state could potentially

adopt a “less regulatory” policy with an MGPO or tax incentives similar to Iowa’s that could help spur development. Ultimately, policies that support renewable energy are still necessary at this point in Ohio, where such little progress has been made. Although new wind and solar is now cheaper over their lifetime compared to coal, the marginal costs of electricity generation at existing coal plants, for example, are similar to wind and solar (Marcacci, 2020). That is, the cost of producing an additional megawatt-hour of electricity from an existing coal plant is in a similar range to the cost of producing an additional megawatt hour of electricity from a new wind or solar installation, around $26-$42/MWh (Marcacci, 2020). In a state like Ohio where the fossil fuel industry is still prominent, this cost difference is likely not going to be enough yet, especially considering the likely scenario that Ohio will remain a Republican-controlled state. Therefore, it might be necessary for the federal government to take on a greater policy role concerning renewable energy, whether that is increasing the federal PTC, or adopting more overarching climate policy such as a carbon tax that would force renewable development across all states. Further research may be necessary to determine what the renewable development impact on states such as Ohio would be with the adoption of different federal energy policies. However, true climate policy action at the federal level remains uncertain as well considering that Republicans in Congress are generally opposed to such policies.

There is the potential for a more prevalent environmental movement in Ohio to spur policy change at the state level without needing to rely on the federal government. Both Carley (2009) and Delmas and Montes-Sancho (2011), as mentioned earlier, suggest that an increase in citizens concerned with the environment generally leads to positive changes in renewable energy policy and development. Whether this is through the presence of groups such as the Sierra Club, or younger and more progressive voters working at the grassroots level, Ohioans may be able to

convince Republicans to support renewable energy. Alternatively, an environmental movement by younger and more progressive voters could create a more politically balanced or democratically leaning Ohio legislature that would be more sympathetic towards environmental issues.

Despite Ohio's renewable development scenario, Minnesota, Iowa, and many other states are continuing to see renewable energy growth. The country's electricity portfolio is diversifying every year as renewable energy continues to be installed. Although renewables are becoming increasingly cost-effective, it is clear that a combination of state energy policies since the early 2000s have aided in getting renewable energy to this point. Understanding and supporting effective state energy policies will be critical as we combat climate change moving forward.

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