Can Renewable Portfolio Standards Explain the U.S. States' Advancement of Wind Energy?

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Introduction

It seems as though wind farms are popping out of thin air these days. The magnitude of how large these farms are is also ever-increasing. *E&E News* has been following a large multi-state wind farm capable of producing enough energy to power the annual consumption of two and a half million people. The project developed by a company called SunZia is expected to send the energy produced by wind turbines in New Mexico across Arizona and into California. This will be the largest transmission line for wind energy in the nation. A local newspaper based in New Mexico called *Desert Exposure* explains the complications of getting the green light for a project like this. The transmission lines will travel across 250 miles of state, federal, and private land. This demonstrates how vast the stakeholders of this project are.

What is causing this growth in wind energy investment? Is this case an exception, or is there a larger political trend happening? While the national government has yet to pass substantial incentives for renewable energy, some states have taken matters into their own hands in advancing a renewable future. According to the U.S. Energy Information Administration (EIA), thirty-eight states have adopted Renewable Portfolio Standards (RPS) as of 2020. The EIA defines a RPS as a policy that either requires or encourages utilities to meet a set percentage of renewably sourced energy for their customers within a set timeframe. For example, Minnesota's RPS is 26.5% renewable by 2025. Can these policies take partial credit for the increased wind capacity in the states or are there other factors that are responsible for this trend?

Context of American Environmental Policy

Where is the United States in terms of climate policies, or rather policies that increase the

country's share of renewable generation? Many scholars have studied the complexities within the United States' environmental law and policies. Scholar Barry Rabe from the University of Michigan has plenty of experience in this realm. In one of his publications, he claims that we are in the era of "contested federalism." Rabe defines this as high activity from the national and state levels of government (Rabe, 2011). Under this principle, environmental policies would have a sense of fluidity within the system. Some states will act on certain climate issues while others will not. When an environmental issue goes beyond a state's borders it is called transboundary. Greenhouse gas emissions are an example of this. The air pollution from one state will cross another state's lines. These transboundary issues can only be solved by the federal government.

Rabe also writes specifically about the state's actions on environmental policies in another piece. In this work, he describes the powers the states have in regulating environmental issues (Borick & Rabe, 2010). There is a concept that states are innovators and act quickly on issues. This idea is challenged, however, since states do not have certain powers at their disposal. States can only make agreements with one another over problems that cross state borders. One state cannot force another to comply with their rule.

Other works specialize in ranking the states on their existing policies, incentives, and programs. The State Energy Efficiency Scorecard does just that. Sponsored by the American Council for an Energy Efficient Economy, the Scorecard ranks California in first place for having the most ongoing energy-efficient programs and policies. Most of the Northeastern states follow California in being at the top. Minnesota was ranked first place among the Midwest. These states have shown themselves to be leaders in creating energy efficiency and shifting to renewables. There are many factors that make these states leaders.

Factors Affecting Wind Capacity

Many states have large wind resources. It would be difficult to drive throughout the state of Iowa without seeing one of the state's significant wind farms. The state's plains make wind energy suitable for large-scale electricity generation. But besides the obvious factor of geographic location, there are many other aspects at play. For example, how does the media influence perceptions about wind energy? This question is addressed in a study conducted by scholars Jennie C. Stephens, Gabriel M. Rand are Leah L. Melnick. This research team chose Texas, Minnesota, and Massachusetts to analyze (Stephens et al., 2009).

They searched a database for articles covering wind energy in each of the states' most popular news outlets. They hoped to gauge the overall salience of wind energy in the three states. A model called Socio-Political Evaluation of Energy Deployment or SPEED was applied to control political contexts. Their goal through this research is to comprehend the overall media coverage and influence on wind energy. Their study found interesting trends in Minnesota specifically. Media coverage of wind energy increased significantly when installations took place in the state. A less obvious finding is that of the three states Minnesota newspapers put wind energy-related articles on the front page more frequently. Minnesota was more likely than other states to frame wind energy as a possible solution to climate change. This suggests wind power has some level of salience in the state.

Media is not the only factor contributing to wind deployment. Stakeholders ultimately decide a wind energy project's future. The media's influence on wind energy has been the center of many studies. One of which chose the four states of Massachusetts, Minnesota, Montana, and Texas because of their very different characteristics and wind deployment strategies (Fischlein et al., 2014). In their analysis, the same SPEED framework utilized by the previous study was used. Eighty-four key stakeholders within industry, the public sector, and non-governmental

organizations were interviewed and then compared to the media coverage from their respective states.

Using this model, they find that socio-political contexts vary across the selected states. For the media portion of their results, they found strong similarities to the previous study. The exception is that wind energy was found to have the highest salience in Massachusetts instead of Minnesota. In the interviews, they found that stakeholders from Minnesota and Massachusetts weighed wind energy as a benefit rather than a negative. These findings suggest that Minnesota's media and stakeholders frame wind energy in a positive frame. This can only encourage further development in the state's wind capacity. This demonstrates that one uniform policy from the national government will likely be challenged by the states and within congress. It is more likely that states will create their own policies that reflect stakeholders' viewpoints to successfully implement policies like RPS. This suggests that socio-political contexts are essential factors on the deployment of wind energy.

How are Renewable Portfolio Standards Implemented and Are They Effective?

Renewable energy policies may have the most direct impact on wind energy. A successful policy must consider many factors including the ones discussed in the previous section. The rest of this paper will discuss in what contexts RPS is implemented. It will then review the differing opinions on the policy's effectiveness.

Arguably, the starting point for most policies is public opinion. When policies are deemed unpopular, they may fall through the cracks in being passed. Scholars have tested this theory. Public opinion may be crucial to the policy's success since it can drive salience on the

issue (Stokes & Warshaw, 2017). This idea suggests that the public make the issue important to legislators. Research focuses on how the framing and design of these policies affect public opinion. Scholars conduct a survey experiment on a large national sample of U.S. citizens. For their experiment to be valid they must differentiate between states that do and do not have RPS in place. This helps them answer their second question: Does positive public opinion of RPS increase the chance of adoption for states without this policy? Ultimately, they find that when RPS are framed in a way that emphasizes health benefits and job creation most of the public is on board (Stokes & Warshaw, 2017). These health benefits are often framed around air quality in the study. This ties air quality as both a health and environmental concern.

Under a democracy, public opinion is one of the major drivers of creating change. When questions of how to make a renewable policy popular are answered, then the real work can begin. This study is important since it asks and answers this question. Their main argument is that policies must be framed to show a correlation with economic and health benefits to be implemented even among skeptics of renewable energy.

When a renewable energy bill does appear before a state government it may not make it very far. There are many obstacles for any bill to be passed. The next study by Stokes and Breetz questions under what circumstances are RPS being passed. They study renewable policies in the transportation and electricity sectors (Stokes & Breetz, 2018). The relevant portion of their study covering wind energy includes RPS in the analysis. Their case studies in the two sectors examine the creation and revision of the policies over a twenty-five-year period. Their goal was to understand the political circumstances of the enactment of these policies. In all cases, it was found that renewable policies were more likely to be passed when they are a part of a larger bill.

Another key highlight from their findings is that for most states, renewable policies were expanded or extended beyond their original scope.

Once these bills are passed by the state, they most often directly influence electric utilities. How these utilities respond varies. An analysis of each of the fifty U.S. states' utilities was conducted (Delmas & Montes-Sancho, 2011). They studied RPS and Mandatory Green Power Options, a regulation that is similar to RPS. After controlling for social, natural, and political contexts they found that RPS has a negative impact on renewable energy capacity. They do find, however, that investor-owned utilities are more likely to respond to these policies. This study suggests that the consumers drive the push for more renewables. They name these consumers "green residential customers." They also find that natural resources, such as wind, are not only factor predicting RPS potential success. States with a majority Democratic government and a high frequency of environmental group memberships facilitate effective policies.

The difference between public and private utilities' response to these policies can be explained by the customer demographics of each. Consumers of investor-owned electricity are more influential in encouraging utilities to advance their supply of wind electricity. The types of electricity providers are often broken down into two categories, these are independent power producers and electric utilities. Independent power producers can be owned privately or publicly. The energy they produce is often sold to utilities. IPPs are often considered the innovators in the energy sector (Alova & Caldecott, 2021). They do not operate out of a governmental body and therefore act more like a business. Electric utilities can also be owned privately or publicly, they differ since they often sell all the energy they produce and operate the distribution of electricity (EIA, n.d.). Their main argument is that ultimately, RPS cannot answer why states have invested

in renewable energy. There are other social and political contexts that are more influential to RPS effectiveness.

Thus far this section has discussed studies that have analyzed the context of RPS implementation. There is little literature on the effectiveness of RPS on wind energy in particular. The research of Karen Maguire fills this gap in the research. Using a meta-analysis approach, Maguire pieces together other relevant studies to conduct her own findings (Maguire, 2016). She uses RPS and Green Power Purchase (GPP) programs in her examination. GPP differs from RPS as it is an additional fee utilities create to charge customers for using renewable energy. Her work suggests that neither of these policies make a significant impact on wind energy capacity. She suggests that the structure of the policy is the issue. She argues that the lack of a binding constraint damages the impact of the policy.

There is a notion that RPS can be effective in certain circumstances. Other research contradicts Maguire's findings. Scholar Janak Joshi from Hood College analyzes how RPS affects renewable energy capacity (Joshi, 2021). They conducted this study by using two existing models for renewable energy capacity. They then factor in some variables to make the models more relevant to their examination. Joshi finds that RPS increases renewable capacity from solar energy. The effect is even more significant for wind capacity. They estimate that RPS increases renewable energy by slightly over one-third of the current capacity. Thus, their argument is that RPS is effective in its goal to increase the share of renewable energy.

Market consequences should also be analyzed. One study looks at the key factors that influenced the top twelve wind energy-producing states (Bird et al., 2005). In their analysis, they find that RPS and state or federal tax incentives directed at individuals and businesses were the

most effective policies driving renewable energy being used among these states. They also noticed that states with competitive renewable energy markets successfully increased the price of natural gas, thus making wind energy more attractive to consumers. This study is important since it is one of the few examinations of market-based incentives and price setting within wind energy.

The literature points out that RPS is often not found to be the major driver towards advancing wind energy. Factors such as political climate, public opinion, markets, and geographic wind resources all contribute more significantly to advancing wind energy than RPS. Scholars have many hypotheses as to why. Most of which point to the structure of the policy doing more harm than good. Other states that the relationship between all of wind energy's stakeholders is too complex. The results often suggest that RPS cannot explain the recent advancement in the states' wind energy arsenal.

The U.S. lacks federal renewable energy policies. Instead, the states lead in policies aimed at increasing the country's share of renewable energy. Scholars have studied many of the possible reasons for this. However, there is plenty of room in this field of research. A significant gap can be found for wind energy specifically. The overwhelming majority of the literature focuses on renewable energy as a whole. However, wind energy continues to be a viable option as an energy source. Therefore, literature is behind on examining the possible future of our nation's energy.

This review of the literature has demonstrated some of the factors that influence the nation's wind energy capacity. Arguably, the most substantial factor influencing wind capacity is policy, thus RPS was chosen to be reviewed. There is no cohesive opinion on this policy's effectiveness. The scholarly work in this area is very contradictory. This makes the case for more

examinations of the policy's effectiveness. Ultimately, the literature has demonstrated that wind energy is a salient issue in which there is a great divide. Not all states have invested in this resource. This is a topic that needs more research. This is crucial to the nation's renewable future.

Methods and Analysis

The literature asking whether renewable portfolio standards are effective at increasing wind electricity generation is inconsistent. A few studies distinguish the effect of RPS in the different types of electricity providers. However, these studies are often outdated and conducted at the beginning of the policy's enactment. There has been significant advocacy around renewable energy technologies and the adoption of RPS has become more popular. States are also developing their wind energy capacity at a higher rate than ever before. Thus, the research question should be revisited.

The wind electricity generation data used was accessed through the U.S. Energy Information Administration's (EIA) Electricity Data Browser. The tool allows users to indicate the scope and context of desired data. When I retrieved the data from the EIA, I made sure to select total net generation sorted by the states' utilities broken into two categories. These two types are electric utilities and independent power producers (IPP). The significant difference between the two types of electricity providers is how they are owned. Electric utilities are private businesses and IPPs are owned publicly. Thus, there are two variables showing the states' net generation from wind. Much of my analysis compares the effectiveness of RPS on both types of electricity providers. The unit of analysis is on the states, however, not the individual electricity providers.

A third variable that will serve as the independent variable throughout the analysis will measure strength the RPS of the states. I use this to sort states depending on their type of RPS for the year 2021. This data is derived from a study that analyzes the effectiveness of RPS (Joshi, 2021). I have adjusted this data into nominal, ordinal, and interval types of variables. This allows different factors to be measured in relation to RPS. There are other variables that will serve as controls. The States dataset provided by (Polluck?) has many variables that measure a state's political ideology. This will be used to gauge to what extent RPS and partisan leaning effect the potential wind capacity among the states.

Statistical Tests

The goal of RPS is to incentivize the investment of renewable energy. States either require or greatly encourage electricity providers to increase their share of renewable energy production. These standards set a minimum limit in which electricity providers much use a renewable source to generate electricity. Therefore, we may observe a distinct difference between states without a form of RPS and those without. I expect that in comparison of the states, those with RPS will have more electricity generation from wind energy than those without. This test will include two tests, one including net generation from electric utilities and one for independent power producers.

Hypothesis One: RPS effect

There is the notion that these policies have little effect on wind generation as a whole. It may be because these policies are only structured to be goals, they are not enforced, and therefore are not taken seriously. To test this notion, I have selected variables derived from the

EIA that illustrate the net wind electricity generation from the states' electricity providers. This idea serves as the null hypothesis.

The independent variable is a simple nominal variable sorting states into a "yes" or "no" category. The variable is coded 0 for "no" and 1 for "yes". The independent variable is ordinal as to ranks the states on their amount of wind energy generation. This data was derived from the U.S. Energy Information Administration. The dependent variable was binned with two equal cut points dividing it into the three categories of high, middle, and low amounts of wind generation. The crosstabulation indicates that there is no pattern to be observed. There is not much distinction between those with RPS and those without.

(Table 1)

(Table 2)

Even when we divide the electric providers by their type. This is tested by running two crosstabulations. One table's dependent variable represents electric utility net generation and the other table's dependent variable represents IPP net generation. Independent power producers with high amounts of wind energy generation are slightly more likely to not have to comply with a RPS. This means that IPPs are often producing high amounts of wind energy regardless of an RPS instructing them to do so. Electric utilities that produce low and middle amounts of wind generation comply with RPS more often. However, for utilities producing high amounts of wind energy this is not the case. This may suggest that the null hypothesis is correct and that RPS are ineffective in increasing states' use of wind energy. However, this is a simple test, and the answer requires more analysis.

Hypothesis Two: RPS Aggression Effect Over Time

The previous tests lack complexity. There was only a distinction between those that have RPS and those who do not. Each state adopts their own type of RPS, meaning there is not one universal policy states are opting into. Some states choose higher percentages and closer deadlines. These are categorized as stricter forms of RPS. There are certainly states who enact a less serious approach. They may choose to set a smaller percentage of renewable energy generation by a faraway deadline. There will also be states in the middle of both sides.

How does the severity of the RPS affect utility investment in renewables and wind generation specifically? A relaxed RPS may not raise any alarms and fail to increase utility investment in wind. An aggressive RPS may cause utilities to shift gears and greatly develop their wind generation. In comparison of the states, I expect to see a greater share of wind generation for those having stricter RPS, than those with loose RPS.

(Figure 1)

(Figure 2)

To test this hypothesis, I created an independent variable that is a scale which represents strict and loose forms of RPS. I modeled a standard RPS based on climate scientists' current recommendations for carbon emission goals in regard to climate change. Many scientists agree that sourcing 100% of our energy from renewable technologies by 2050 is the only way to keep temperatures and our climate in stable conditions.

Therefore, I used a formula that subtracts points away from states depending on two pieces of their standard. A timeline that is too relaxed in comparison to the year 2050 will cost

the state points. The same is done for RPS who are farther away from a 100% renewable energy standard. The independent variable for this test is an interval variable where a lower number represents great difference from the scientists' goal and a larger number aligns with the recommendation.

The dependent variable shows the difference in wind generation between the years 2011 and 2021. A positive number on the Y-axis shows increased wind generation and a negative value shows decreased wind generation. The scatterplot was used to show the relationships between the variables. Figure 1 shows the generation from the states' Independent Power Producers (IPP) of wind in relation to their form of RPS. States without an RPS will have a lower number on the x-axis. The regression line shows a very small positive correlation between strict RPS and higher wind electricity generation.

The same test was done but with the dependent variable measuring total wind generation from the states' electric utilities. The effect appears to be slightly higher for the states' electric utilities as seen in Figure 2. However, the regression coefficient is lower. The scale in electricity generation for electric utilities is smaller, thus the line is steeper. However, the states of Ohio, West Virginia, Colorado, and Minnesota are acting as outliers and may be the cause of increasing this positive effect. This was also tested using the crosstabulation method. The same independent and dependent variables were used and binned to fit within a crosstabulation's parameters.

(Table 3)

(Table 4)

A crosstabulation was also used to gauge the trend for the year 2021. The independent and dependent variables are once again ordinal with three categories. The crosstabulation accepts the hypothesis since the plurality of states with high wind generation also have a strict RPS. The opposite effect is found for states with low wind generation. These tests suggest that the level of aggressiveness of RPS influences wind generation, at least on a small scale.

Hypothesis Three: Partisan effect

Now that RPS have been tested by their level of aggression on RPS we can dive deeper. What other effects besides the policy may be pushing states to develop wind energy? Previous studies have questioned what makes RPS able to pass. For this policy to be effective it needs to advance passed state legislatures. The results of these studies often indicate that Democratic state governments are more open to RPS. Therefore, the effect of partisan aligning may be playing a role in the wind energy investment trend. By sorting states by their political leaning, we can gauge to what degree this is a partisan issue. Liberal states such as California are often viewed as leaders in renewable energy technologies such as wind. But is this truly the case?

To test this another variable must be created. The previous independent variable that ranks states on their type of RPS will become ordinal using the visual binning method. This will allow a crosstabulation to be used. The dependent variable will be the same ordinal ranking of states on their amount of wind electricity generation used before. An additional control variable will be used to sort states in between liberal and conservative. This derived from the states dataset's interval variable call citizen_ideology. A low-ranking state is conservative, and a high-ranking state is liberal.

(Table 5)

(Table 6)

This hypothesis was tested using a crosstabulation. The independent variable is a binned ordinal variable of the previous test. The dependent variable is a binned ordinal variable ranking the wind generation from electric utilities and IPP. The variables were grouped using an additional ordinal variable to measure the political ideology of the states. This test is limited to the small unit of analysis that is the states.

The crosstabulation may indicate that among the political leaning of the states the RPS remains inconsistent in predicting the states amount of wind generation. The results seem truly random at a glance, however, states that are more liberal have a stricter form of RPS and low amounts of wind electricity generation. Conservative states are more likely to have a loose form of RPS and low wind electricity generation. In fact, out of all conservative states, only one has an aggressive form of RPS. However, there is no indication that strict RPS states have more wind electricity generation than relaxed RPS states.

Discussion

The literature on RPS implies that it does not have a significant effect on wind energy development. The results of my tests accept this argument. My test does prove that RPS creates a positive effect on wind generation, however, this effect is very small. In the larger scale of a state's electrical load, the push from RPS is miniscule. There are many possible reasons as to why RPS fails to largely advance wind energy. This topic should be researched due to the economic and environmental gains from wind energy. One suggestion is that RPS are often not enforced. In many cases, they are treated as goals for utilities instead of requirements. Adjusting

the policy so that it holds utilities more accountable may cause a different effect than the current model. This could be done through tax incentives or a formal restriction.

Of the two types of electricity providers, IPP are significantly more apt to invest in wind energy projects. There is nothing to suggest that this commitment from IPPs for wind energy is the result of its respective state's RPS. Instead, it is likely that the structure and motivations of IPP are what drives them towards renewable energy, including wind. This is likely due to the differing structures of IPP and electric utilities. Since utilities are governing bodies, their decision-making process is slower and less innovative than IPPs.

My analysis did not account for geographic factors. States with the largest wind resource may also be states who refuse to adopt RPS. In other cases, states with hardly any wind resource may also choose the strictest approach to a RPS. My analysis also did not include any economic incentives. A state that greatly incentives wind energy through tax breaks or subsidies may advance wind development regardless of a RPS. I recognize the importance of these variables and hope to account for them in any future research of mine on this topic.

Appendix

Table 1: IPP Net Generation from Wind (MW) 2021 Sorted by the Presence of RPS

			Does this state have a RPS?		
			No	Yes	Total
IPP Net Generation from wind (MW) 2021	Low	Count	8	9	17
		Percent	40.0%	31.0%	34.7%
	Middle	Count	6	11	17
		Percent	30.0%	37.9%	34.7%
	High	Count	6	9	15
		Percent	30.0%	31.0%	30.6%
Total		Count	20	29	49
		Percent	100.0%	100.0%	100.0%

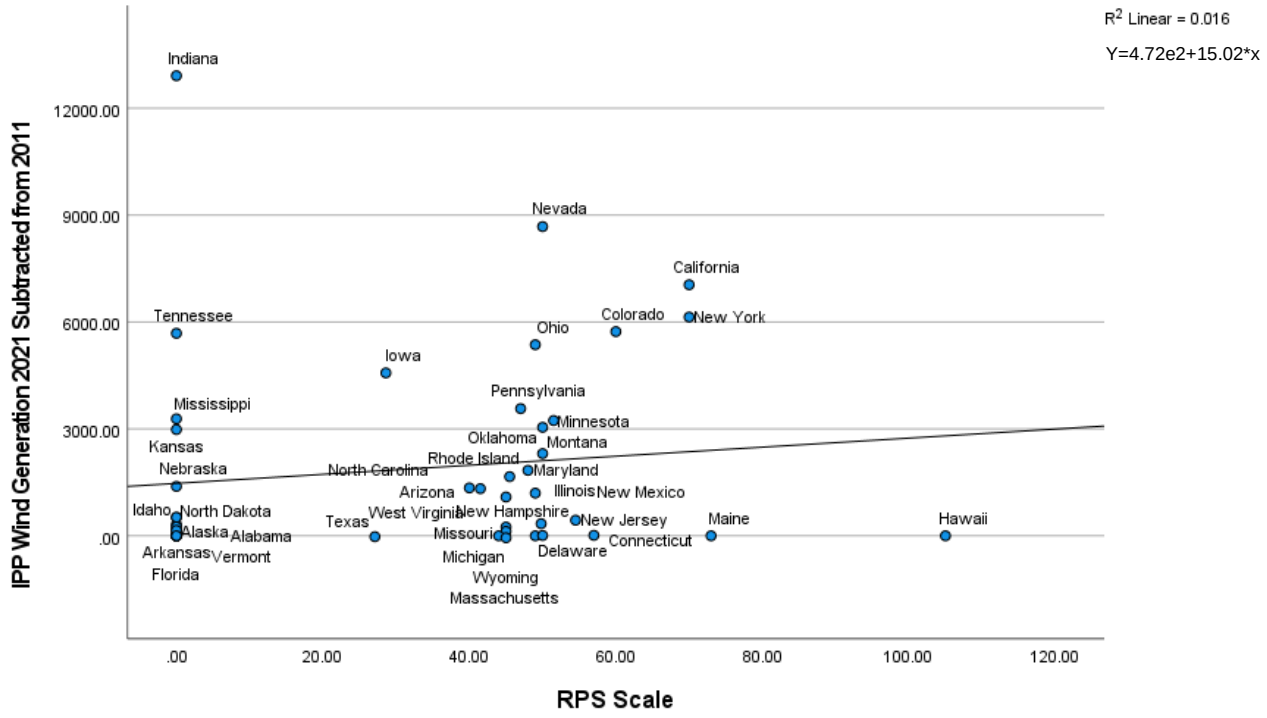
Chi Square = .493
Phi = .100, Cramer's V= .100
*Significant at .05, **Significant at .01

Table 2: EU Net Generation from Wind (MW) 2021 Sorted by the Presence of RPS

			Does this state have a RPS?		
			No	Yes	Total
EU Net Generation from Wind (MW) 2021	Low	Count	10	16	26
		Percent	50.0%	55.2%	53.1%
	Middle	Count	3	5	8
		Percent	15.0%	17.2%	16.3%
	High	Count	7	8	15
		Percent	35.0%	27.6%	30.6%
Total		Count	20	29	49
		Percent	100.0%	100.0%	100.0%

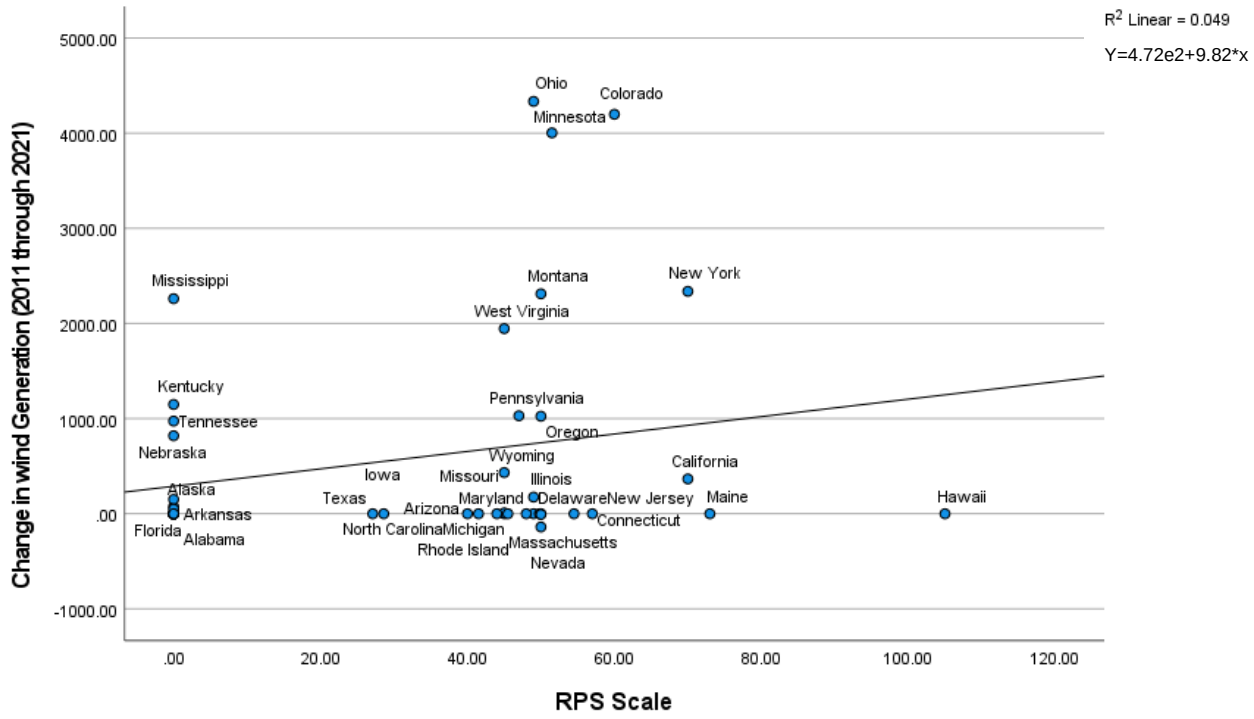
Chi Square = .309
Phi = .079, Cramer's V= .857
*Significant at .05, **Significant at .01

Figure 1: RPS Aggression in Relation to IPP Net Generation from Wind (MW) 2021



Pearson's R = .081
*Significant at .05, **Significant at .01

Figure 2: RPS Aggression in Relation to EU Net Generation from Wind (MW) 2021



Pearson's R = .189
*Significant at .05, **Significant at .01

Table 3: IPP Net Generation from wind (MW) 2021 Sorted by RPS Aggression

			RPS Scale			Total
			Relaxed	Moderate	Aggressive	
IPP Net Generation from Wind (MW) 2021	Low	Count	9	4	4	17
		Percent	47.4%	26.7%	28.6%	35.4%
	Middle	Count	6	7	4	17
		Percent	31.6%	46.7%	28.6%	35.4%
	High	Count	4	4	6	14
		Percent	21.1%	26.7%	42.9%	29.2%
Total		Count	19	15	14	48
		Percent	100.0%	100.0%	100.0%	100.0%

Chi Square = 3.437
Somer's D = .193
*Significant at .05, **Significant at .01

Table 4: EU Net Generation from Wind (MW) 2021 Sorted by RPS Aggression

			RPS Scale			
			Relaxed	Moderate	Aggressive	Total
EU Net Generation from Wind (MW) 2021	Low	Count	11	9	6	26
		Percent	57.9%	60.0%	42.9%	54.2%
	Middle	Count	4	2	2	8
		Percent	21.1%	13.3%	14.3%	16.7%
	High	Count	4	4	6	14
		Percent	21.1%	26.7%	42.9%	29.2%
Total		Count	19	15	14	48
		Percent	100.0%	100.0%	100.0%	100.0%

Chi Square = 2.201
Somer's D = .129
*Significant at .05, **Significant at .01

Table 5: IPP Net Generation from Wind (MW) 2021 Ranked by RPS Aggression Controlling for Citizen Ideology

Citizen Ideology Index				RPS Scale			
				Relaxed	Moderate	Aggressive	Total
Conservative	IPP Net Generation from wind (MW) 2021	Low	Count	6	1	0	7
			Percent	50.0%	33.3%	0.0%	43.8%
		Middle	Count	2	2	1	5
			Percent	16.7%	66.7%	100.0%	31.3%
		High	Count	4	0	0	4
			Percent	33.3%	0.0%	0.0%	25.0%
	Total		Count	12	3	1	16
			Percent	100.0%	100.0%	100.0%	100.0%
Moderate	IPP Net Generation from wind (MW) 2021	Low	Count	1	1	0	2
			Percent	20.0%	14.3%	0.0%	11.8%
		Middle	Count	3	2	2	7
			Percent	60.0%	28.6%	40.0%	41.2%
		High	Count	1	4	3	8
			Percent	20.0%	57.1%	60.0%	47.1%
	Total		Count	5	7	5	17
			Percent	100.0%	100.0%	100.0%	100.0%
Liberal	IPP Net Generation from wind (MW) 2021	Low	Count	2	2	4	8
			Percent	66.7%	40.0%	50.0%	50.0%
		Middle	Count	1	3	1	5
			Percent	33.3%	60.0%	12.5%	31.3%
		High	Count	0	0	3	3
			Percent	0.0%	0.0%	37.5%	18.8%
	Total		Count	3	5	8	16
			Percent	100.0%	100.0%	100.0%	100.0%
Total	IPP Net Generation from wind (MW) 2021	Low	Count	9	4	4	17
			Percent	45.0%	26.7%	28.6%	34.7%
		Middle	Count	6	7	4	17
			Percent	30.0%	46.7%	28.6%	34.7%
		High	Count	5	4	6	15
			Percent	25.0%	26.7%	42.9%	30.6%
	Total		Count	20	15	14	49
			Percent	100.0%	100.0%	100.0%	100.0%

Chi Square = 5.5 (Liberal), Chi Square = 2.72 (Moderate), Chi Square = 5.5 (Conservative)
Somer's D = .203 (Liberal), Somer's D = .2.84 (Moderate), Somer's D = 0.02 (Conservative)
*Significant at .05, **Significant at .01

Table 6: EU Net Generation from Wind (MW) 2021 Ranked by RPS Aggression Controlled for Citizen Ideology

				RPS Scale			
Citizen Ideology Index				Relaxed	Moderate	Aggressive	Total
Conservative	EU Net Generation from wind (MW)2021	Low	Count	7	2	0	9
			Percent	58.3%	66.7%	0.0%	56.3%
		Middle	Count	1	0	1	2
			Percent	8.3%	0.0%	100.0%	12.5%
		High	Count	4	1	0	5
			Percent	33.3%	33.3%	0.0%	31.3%
	Total		Count	12	3	1	16
			Percent	100.0%	100.0%	100.0%	100.0%
Moderate	EU Net Generation from wind (MW) 2021	Low	Count	3	3	1	7
			Percent	60.0%	42.9%	20.0%	41.2%
		Middle	Count	1	1	1	3
			Percent	20.0%	14.3%	20.0%	17.6%
		High	Count	1	3	3	7
			Percent	20.0%	42.9%	60.0%	41.2%
	Total		Count	5	7	5	17
			Percent	100.0%	100.0%	100.0%	100.0%
Liberal	EU Net Generation from wind (MW) 2021	Low	Count	1	4	5	10
			Percent	33.3%	80.0%	62.5%	62.5%
		Middle	Count	2	1	0	3
			Percent	66.7%	20.0%	0.0%	18.8%
		High	Count	0	0	3	3
			Percent	0.0%	0.0%	37.5%	18.8%
	Total		Count	3	5	8	16
			Percent	100.0%	100.0%	100.0%	100.0%
Total	EU Net Generation from wind (MW) 2021	Low	Count	11	9	6	26
			Percent	55.0%	60.0%	42.9%	53.1%
		Middle	Count	4	2	2	8
			Percent	20.0%	13.3%	14.3%	16.3%
		High	Count	5	4	6	15
			Percent	25.0%	26.7%	42.9%	30.6%
	Total		Count	20	15	14	49
			Percent	100.0%	100.0%	100.0%	100.0%

Chi Square = .8.83 (Liberal), Chi Square = 2.04 (Moderate), Chi Square = 7.63 (Conservative)
Somer's D = .025 (Liberal), Somer's D = .295 (Moderate), Somer's D = .039 (Conservative)
*Significant at .05, **Significant at .01

References

Alova, G., & Caldecott, B. (2021). A machine learning model to investigate factors contributing to the energy transition of utility and independent power producer sectors internationally. *iScience*, *24*(9), 102929. https://doi.org/10.1016/j.isci.2021.102929

Berg, W., Vaidyanathan, S., Jennings, B., Cooper, E., Perry, C., DiMascio, M., & Singletary, J. (2020). *The 2020 State Energy Efficiency Scorecard*. 204.

Bird, L., Bolinger, M., Gagliano, T., Wiser, R., Brown, M., & Parsons, B. (2005). Policies and market factors driving wind power development in the United States. *Energy Policy*, *33*(11), 1397–1407. https://doi.org/10.1016/j.enpol.2003.12.018

Bond, C. (2022, November 11). Arizona Approves Massive Transmission Line. *Environment & Energy Publishing*

Delmas, M. A., & Montes-Sancho, M. J. (2011). U.S. state policies for renewable energy: Context and effectiveness. *Energy Policy*, *39*(5), 2273–2288. https://doi.org/10.1016/j.enpol.2011.01.034

Electric Power Annual 2020 - U.S. Energy Information Administration. (n.d.). Retrieved November 6, 2022, from https://www.eia.gov/electricity/annual/

Fischlein, M., Feldpausch-Parker, A. M., Peterson, T. R., Stephens, J. C., & Wilson, E. J. (2014). Which Way Does the Wind Blow? Analysing the State Context for Renewable Energy Deployment in the United States: State Context for Renewable Energy Deployment in the US. *Environmental Policy and Governance*, *24*(3), 169–187. https://doi.org/10.1002/eet.1636

Glossary - U.S. Energy Information Administration (EIA). (n.d.). https://www.eia.gov/tools/glossary/index.php?id=Independent%20power%20producer

Joshi, J. (2021). Do renewable portfolio standards increase renewable energy capacity? Evidence from the United States. *Journal of Environmental Management, 287*, 112261. https://doi.org/10.1016/j.jenvman.2021.112261

Maguire, K. (2016). What's powering wind? The effect of the U.S. state renewable energy policies on wind capacity (1994–2012). *Applied Economics, 48*(58), 5717–5730. https://doi.org/10.1080/00036846.2016.1184375

Osterreich, E. & Hamilton, W. (2022, November 2). Harnessing the Sun and Wind. *Dessert Exposure.*

Rabe, B. (2011). Contested Federalism and American Climate Policy. *Publius, 41*(3), 494–521.

Rabe, B. (2021) Racing to the Top, the Bottom, or the Middle of the Pack? The Evolving State Government Role in Environmental Protection. *Environmental Policy: New Directions for the Twenty-First Century* (11th ed.). SAGE Publications Inc.

Stephens, J. C., Rand, G. M., & Melnick, L. L. (2009). Wind Energy in US Media: A Comparative State-Level Analysis of a Critical Climate Change Mitigation Technology. *Environmental Communication*, *3*(2), 168–190. https://doi.org/10.1080/17524030902916640

Stokes, L. C., & Breetz, H. L. (2018). Politics in the U.S. energy transition: Case studies of solar, wind, biofuels and electric vehicles policy. *Energy Policy*, *113*, 76–86. https://doi.org/10.1016/j.enpol.2017.10.057

Stokes, L. C., & Warshaw, C. (2017). Renewable energy policy design and framing influence public support in the United States. *Nature Energy*, *2*(8), Article 8. https://doi.org/10.1038/nenergy.2017.107

U.S. Energy Information Administration - EIA - Independent Statistics and Analysis. (n.d.). Retrieved November 6, 2022, from https://www.eia.gov/state/search/?sid=US