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Cover Page Footnote

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ABSTRACT
In the last 35 years, wind energy in the United States has transformed from being radical and experimental to becoming a mainstream, feasible, and efficient source of electricity. In this article, we compare wind energy acceptance to acceptance of other energy sources, in particular solar, coal, natural gas, and oil. Through an online survey of 1317 adults throughout the United States, we also examine the impact of individual-level characteristics such as gender, race, age, socio-political factors, and value orientation on a person's support for renewable energy policy. We find that support for wind energy is higher than for fossil fuels for all groups regardless of demographics, educational attainment, or political ideology. However, support for wind energy policies is highest among millennials, non-whites, college educated, liberals, and those with high egoistic and biospheric values.

KEYWORDS
Energy policy, sustainable energy, wind energy

INTRODUCTION

In the last 35 years, wind energy in the United States (US) has transformed from being radical and experimental to becoming a mainstream, feasible, and efficient source of electricity (Rand and Hoen 2017). In 2019 it accounted for 7.3 percent of US electricity demand and represents the largest source of new electric capacity additions (American Wind Energy Association 2019). Wind energy is widely viewed as a plentiful electricity source that can provide many environmental, health, and social benefits. Specifically, increasing wind energy, along with other renewables, is viewed by many as necessary to avoid the catastrophic effects of climate change (Intergovernmental Panel on Climate Change, 2011).

In the past 15 years, studies examining public perception of wind energy in the United States have substantially increased from under 5 a year before 2005 to upwards of 25 a year by 2016 (Rand and Hoen 2017). Studies of public perceptions of and responses to wind energy attempt to understand, describe, and explain how the public views wind energy and how they respond or may respond to its construction. Understanding public perceptions of and responses to wind energy can help facilitate communication between policymakers, industry, and the public. Although knowledge about public perception and responses does not ensure acceptance or adoption, its absence can result in failure (Boudet 2019).

The vast majority of wind energy acceptance studies conducted in the United States focus on case studies of residents living near one or a few locations of wind farms. These case studies provide insight to the reasons why a small minority (typically 10-30 percent) of residents have unfavorable views of wind energy or do not approve of wind farm construction (Rand and Hoen 2017). However, there is poor comparability between case studies, leading some researchers to question whether wind acceptance research is “running out of steam” (Ellis and Ferraro 2017).

While wind farms arguably have the most impact on people living closest to wind turbines, the development of wind energy has an impact on all people as more wind development will lead to less energy production from other sources, such as coal, and can assist in more fossil fuel plant closures. This can result in negative impacts, such as job loss in these other energy sectors, or positive impacts, such as job creation in green industries, better environmental conditions, and improved health of residents living near such facilities (Kravchenko and Lyerly 2018). Because an increase in wind energy has the potential to impact people living near other sources of energy extraction, development, and consumption, nationwide surveys of wind support are also of value. Nationwide studies may become of increasing importance as the federal government begins a serious commitment to decreasing greenhouse gas emissions, which is most certainly to happen the next time Democrats control the executive and legislative branches of government (Biden 2020).

Given the increasing importance for nationwide studies and the need for more specific wind policy questions, we ask the following: How does wind energy acceptance compare to acceptance of other energy sources, in particular solar, coal, natural gas, and oil? How do individual-level characteristics such as gender, race, age, educational level, political

ideology, and value orientation impact people's support for wind energy policy? We attempt to answer these questions by examining support for wind policy for 1317 adults throughout the United States along with their associated demographic, socio-political, and ideological characteristics. We then discuss the policy implications of our results with respect to the future of renewable energy policy and to creating a just energy transition.

BACKGROUND

Wind Energy in the United States

Wind power in its current form has a much shorter history in the US than other sources of energy. Until the late 1970s, electric utilities depended largely on a combination of oil, coal, and hydroelectric, and to a lesser extent on nuclear and natural gas, to generate power. In 1978, none of the electricity generated by utilities for retail sale was created by wind power (U.S. Department of Energy 2002). Before 1978, large, regional utilities rejected wind technology due to the perception of it being expensive and uncertain. In the 1970s, wind-generated electricity was projected to cost five to six times that of coal and oil-generated electricity (Federal Energy Administration 1976). Wind technology was also considered risky by local utilities that controlled power generation and distribution in the United States.

However, the late 1970s experienced a dramatic change as oil prices had been rising since the 1973 Saudi oil embargo, causing electricity prices to greatly increase. The sharp increase in electricity prices prompted policymakers to search for other energy sources that would reduce the US's dependence on foreign oil. This in turn created an opportunity for environmental groups to promote new energy technologies more effectively (Sine and David 2003). During this period, environmental activists and organizations such as the Sierra Club, Friends of the Earth, and others began to actively promote an agenda that called for an efficient use of energy from all sources and an increase in renewable energy (McCloskey 1992).

Environmental activists argued that despite wind technology being underdeveloped, it was a better energy source than conventional sources for several reasons. First, unlike fossil fuels, the process of generating wind power did not produce air or water pollution. Second, it had an advantage over hydroelectric facilities as its environmental footprint was smaller and it could be placed in locations with little or no potential for hydroelectric power. Third, wind is a local energy source and promotes local jobs. Finally, as technology progressed, wind power had the long-

term potential to be priced similarly to conventional energy sources (Sine and Lee 2009).

With the passage of the 1978 National Energy Act, entrepreneurs could construct nonutility facilities free from utility regulation. In addition, utilities were required to interconnect nonutility power plants and to purchase power from these facilities at the utilities' generation cost. In the 14 years following the act, hundreds of entrepreneurs attempted to construct wind energy facilities. However, entrepreneurial activity mostly occurred in California during this period rather than in the more windy accessible land in Texas, Nebraska, and North Dakota (Sine and Lee 2009).

In 1992, the Energy Policy Act authorized a production tax credit of 1.5 cents per kilowatt-hour of wind-power-generated electricity. This led to a reestablished focus on renewable energy use. Beginning in the 1990s, the federal government also produced research and development funding to develop technologies to help reduce the cost of wind turbines. In addition, state governments passed new requirements for electricity generation from renewable sources. Electric power marketers and utilities began to offer electricity generated from wind and other renewable energy sources to their customers (EIA 2019). These policies and programs resulted in an increase in the number of wind turbines and in the amount of electricity produced by wind.

Over the past 20 years, North America has experienced rapid growth in utility-scale wind farms. In the United States, approximately 60,000 wind turbines have been built, while Canada has over 6,500 and Mexico has approximately 2,000 (Canadian Wind Energy Association nd; Hurtado Sandoval 2015; USGS 2018). As a result, in the United States, over 114,000 people were employed in the wind energy sector in 2019, an increase of 35 percent since 2015. Additionally, over 500 factories across 42 states build parts for windmills. These figures are expected to grow much higher as more states pass energy policies with strict requirements for clean, renewable energy. The U.S. Energy Information Administration expects non-hydroelectric renewable energy such as solar and wind to be the fastest growing source of US electricity generation for 2019 and 2020. The EIA's short-term energy outlook forecasts wind generation to grow by 12 percent in 2019 and 14 percent in 2020—resulting in renewable energy sources producing 13 percent of total US electricity generation by 2020. The share of total US generation from wind energy is projected to increase from 7 percent in 2018 to 9 percent in 2020 (EIA 2019).

Determinants of Support for Wind Policy

Case-study design. The majority of wind acceptance studies are conducted at the local level. The case-study approach has uncovered several factors associated with residents living near windmills or proposed wind farm sites and their attitudes about the local wind facility. Several studies find anticipated economic effects to be strongly correlated with support of proposed wind developments as well as attitudes about existing wind farms (Bidwell 2013; Brannstrom et al., 2011; Jacquet 2012; Slattery et al. 2012; Songsore and Buzzeli 2015). Those who perceive wind energy development to have positive economic aspects including rural economic development (Mulvaney et al. 2013), job creation (Slattery et al. 2012), local tax revenue (Slattery et al. 2012), increased tourism (Groth and Vogt 2014), reduced electricity rates (Baxter et al. 2013), and landowner compensation (Jacquet 2012) are more likely to accept wind energy development.

While there are many perceived benefits of wind development, not everyone supports wind energy. Studies find that those who perceive wind energy development to lead to reduced property values (Abbott 2010; Firestone and Kempton 2007), a decrease in tourism (Landry et al. 2012), and an increase in economic inequality (Walker et al. 2014) are more likely to oppose wind energy development. Other factors that have been found to increase opposition of local wind development include the level of sound annoyance one experiences from wind turbines (Fast et al. 2016; Firestone et al. 2015), a perception of diminished scenic beauty due to wind turbines (Bosley and Bosley 1988; Bush and Hoagland 2016; Jacquet and Stedman 2013; Phadke 2010), perceived threats to place attachment--the identities, connections, and meanings attached to a particular location (Devine-Wright 2009), perceived threats to wildlife, particularly birds and bats (Firestone et al. 2012; Williams and Whitcomb 2007), a perception of being left out of the planning process (Bohn and Lant 2009; Phadke 2011), and an increased frequency of viewing wind turbines (Olson-Hazboun et al. 2016).

Other proposed explanations for acceptance of wind development at the local level include concerns about dependence on foreign energy sources (Firestone et al. 2009), personal and moral values (Bidwell 2013) and attitudes toward local or federal government policy (Fast and Mabee 2015; Petrova 2014). Of interest to the current study, Bidwell (2013) used the values-belief-norms (VBN) model (Stern et al. 1999) to examine how one's value orientation impacts support for wind energy development. In this study, values did not have much of a direct effect on support for wind

energy. However, they found that certain value orientations had notable total effects through their influences on other variables. In particular, biospheric values, defined as altruism toward nonhuman species, bolstered support for wind energy. However, egoistic values, defined as values based on self-interest, did not have a direct or indirect effect on wind energy support.

Throughout the case-study literature, demographic variables such as gender and income do little to explain variation in wind energy support (Bidwell 2013; Firestone et al. 2015; Jacquet and Stedman 2013; Olson-Hazboun et al. 2016). Other individual-level variables, such as race and political ideology, are rarely measured, and when they are, are found to not be significant. However, mixed evidence exists for age and education. With respect to age, some studies find a negative effect with wind farm acceptance (e.g. Jacquet 2012), while others find no relationship between age and wind farm support (e.g. Olson-Hazboun et al. 2016). As for education, Olson-Hazboun et al. (2016) find a positive relationship between education and wind support, while others cease to find a direct relationship between the two variables (e.g. Bidwell 2013).

National and regional studies. When it comes to studying wind energy perceptions and support for wind policy at the national and regional levels in the United States, far fewer studies exist. Some factors that influence residents' support of wind energy at the local level (those living near existing or proposed wind facilities) remain significant at the regional and national level. For instance, Larson and Krannich (2016) find in their study of wind support of Utah residents that those who believed wind farms provide opportunities for economic benefits and do not have threatening visual effects were more likely to accept wind farm construction close to their home. In addition, Klick and Smith (2010) find in a national sample of US residents that those who perceived wind energy as important for reducing imported energy, emitting no greenhouse gases, and being a symbol of renewable energy were more supportive of wind energy. Those who perceived wind turbines as noisy were less supportive of wind energy.

However, for national and regional studies, demographic variables appear to have more of an effect on wind energy support than they do for case studies. For instance, several researchers have found a negative relationship between age and wind energy support (Hamilton et al. 2019; Larson and Krannich 2016). Millennial and younger generations are much more likely to prioritize the development of wind and other renewable energy over expanding fossil fuels than are baby boomer and older

generations (Hamilton et al. 2018; Pew Research Center 2019). The effect of gender on wind farm support is mixed. Some researchers have found that males are significantly more likely to consider wind farm construction near their homes (Larson and Krannich 2016) and more supportive of wind energy expansion (Peterson et al. 2019). On the other hand, others do not find a relationship between gender and support for wind or renewable energy at the national level (Klick and Smith 2010; Hamilton et al. 2018). Like at the case-study level, studies of wind energy support at the regional and national levels rarely analyze data on race and ethnicity. Klick and Smith (2010) provide evidence that African Americans are less supportive of wind energy than are whites. However, it is unknown how many African Americans were in their national sample, although they report that African Americans were underrepresented.

Political ideology and education are more often included as independent variables in national studies of wind support. At the national level, liberals and Democrats are more likely to support wind energy than conservatives and Republicans (Hamilton et al. 2018; Peterson et al. 2019). At the state level, political ideology is significant for some states (e.g. New Hampshire) but not for others (e.g. Utah) (Hamilton et al. 2019; Larson and Krannich 2016). The effects of educational attainment on wind energy support are more mixed with some researchers finding no effect at the national (Peterson et al. 2019) or state (Larson and Krannich 2016) levels and others finding a positive effect of education on the prioritization of wind energy at the national and state levels (Hamilton et al. 2018).

Few studies examine the impact of value orientation on wind energy support at the regional or national level. One exception is Larson and Krannich's study on Utah residents' views of wind energy. They find that having an ecological worldview (similar to rating high for biospheric values) is positively related to supporting wind energy. However, to our knowledge, no studies have examined the impact of other value types on wind energy support at the national level. When compared to fossil fuels, wind is both more environmentally safe and economically beneficial as the price for wind energy continues to fall and is now as cheap as or cheaper than coal and natural gas (Weise 2019). In addition, both wind and solar industries employ more than those working in coal mining or other fossil fuel extraction: 446,000 compared to 211,000 (Marcacci 2019). Therefore, the self-interest values inherent in the egoistic value type may be positively related to supporting alternative energy policies such as wind farm construction.

Summary of Hypotheses

To investigate how individual-level variables affect support for wind policy at the national level, we test the following hypotheses:
Educational attainment (Hypothesis 1), egoistic values (Hypothesis 2), and biospheric values (Hypothesis 3) are positively related, whereas age (Hypothesis 4) is negatively related to policy that supports the wind industry and willingness to live near a wind farm. In addition, men (Hypothesis 5), racial and ethnic minorities (Hypothesis 6), Democrats (Hypothesis 7), and liberals (Hypothesis 8) are more supportive of policy that helps the wind industry and are more willing to live near a wind farm than are women, whites, Republicans, and conservatives.

METHODS AND SURVEY INSTRUMENT

Survey Procedure

We selected Amazon Mechanic Turk (Mturk) to administer the survey. A key advantage of Mturk is that it allows researchers to access a population, in this case Americans over the age of 18, relatively affordably and quickly. However, respondents opt in to the platform and are not nationally representative. Nevertheless, recent research shows that survey results from Mturk are valid and generalizable. Mullinix et al. (2015) replicated 20 different experiments with Mturk and found over 80 percent to have comparable results. With respect to political ideology, Clifford, Jewell, and Waggoner (2015) found that liberal and conservative respondents on Mturk had similar personalities and value types as their ideological counterparts in the general population. Lastly, Berinsky, Huber, and Lenz (2012) show that Mturk respondents are more representative than respondents from many convenience samples.

We opened the survey to all people living in the United States who were 18 or older. As a significant percentage of Mturk users are from India, we double-checked by first asking respondents to list a place-based town they called home. We deleted all respondents who listed a place outside of the US as home from the sample. We paid respondents $1 USD to complete a 10-minute survey. In all, we surveyed 1317 respondents. Table 1 provides complete demographic information of the respondents.

Conceptual Framework and Analysis

Questions from the survey provide us with our dependent variables and theoretical constructs. Survey questions used for the analysis had been pre-tested and previously used in a study dedicated to perceptions on

Table 1: Descriptive Statistics of Respondents: Support of Wind Energy, 2019

Category	Responses	% or Mean
Gender	Male	55.00%
	Female	45.00%
	Other	0.40%
Age	In years	35.00
Race	White	68.00%
	Hispanic or Latino	7.00%
	Black	15.00%
	Asian	11.00%
	Middle Eastern	0.70%
	Native American	2.00%
	Some other race or ethnicity	0.60%
Education	8th grade or less	0.00%
	Some high school, no degree	1.00% 9.00%
	High school degree	16.00%
	Some college, no degree	9.00%
	Associate's degree	48.00%
	Bachelor's degree	14.00%
	Master's degree or Professional degree	3.00%
Political Affiliation	Republican	31.00%
	Democrat	41.00%
	Independent	24.00%
	Other	4.00%
Political Ideology	Liberal	41.00%
	Moderate	26.00%
	Conservative	30.00%
	Unsure/Other	3.00%
Biospheric Value Orientation	Additive Index of 4 items 4= minimum 20 = maximum	14.36
Egoistic Value Orientation	Additive Index of 4 items 4 = minimum 20 = maximum	14.40
Attitude toward existing wind development	1=Very Negative – 5=Very Positive	3.94
Attitude toward additional/future wind development	1=Very Negative – 5=Very Positive	4.15
The US government should do more to help the wind industry	1=Strongly Disagree – 5=Strongly Agree	3.96
More effort should be made to employ more people in the wind industry	1=Strongly Disagree – 5=Strongly Agree	4.01
I would support a wind farm being constructed within sight of my home	1=Strongly Disagree – 5=Strongly Agree	4.00

energy policy that had been administered to the general public in the summer of 2018 (Crowe and Li 2020) and to college students in the spring and summer of 2019. For each index of three or more indicators, we used principal component analysis with oblique rotation to ensure unidimensionality for each particular index.

Dependent variables. We calculated means and performed one-sample t tests for six dependent variables. Respondents were asked to identify whether they had a negative or positive attitude toward several energy sources. These included coal, natural gas, oil, wind, and solar energy. Respondents rated each energy source on a five-point scale from very negative (coded as 1) to very positive (coded as 5).

We conducted bivariate statistics on two dependent variables. The first asked respondents to identify their attitude toward existing wind development. The second asked respondents to identify their attitude toward additional/future wind development. Variables were measured on a five-point scale from very negative (coded as 1) to very positive (coded as 5).

We conducted ordered logistic regression on three dependent variables: two dependent variables predicting respondent attitudes regarding government support of the wind industry and one dependent variable predicting one's preference to live near a wind farm. We asked respondents whether they believed (1) the US government should do more to help the wind industry, (2) if more effort should be made to employ more people in the wind industry, and (3) if they would support wind farm construction where one or more windmills would be within sight of their home. All variables were measured on a five-point scale from strongly disagree (coded as 1) to strongly agree (coded as 5).

Theoretical constructs. To analyze the effect of demographic characteristics on the dependent variables, we test for age, gender, and race/ethnicity. We measure age with five dichotomous variables by generation. Generation Z consists of respondents ages 18-23. Millennials are ages 24-42. Generation X are respondents ages 43-54. Respondents who are between 55 and 73 are Baby Boomers, and the Silent Generation consists of respondents ages 74 and up. Baby Boomer serves as the reference category in the models. Gender is a dichotomous variable with male coded as 1 and all other coded as 0. Race is a dichotomous variable with respondents who identified as white only coded as 1 and all other races and ethnicities coded as 0.

We test the effects of three socio-political variables: highest level of educational attainment, political affiliation, and political ideology. Educational attainment is a dichotomous variable with respondents who had completed at least some college and higher coded as 1 and those with no college experience coded as 0. We categorize respondents into four main political affiliations: Democrat, Republican, Independent, and Other. Republican serves as the reference category in the models. To

measure political ideology, we asked respondents whether they were liberal, moderate, conservative, or unsure/other. Conservative serves as the reference category in the models.

In addition to the demographic and socio-political predictors, we also include predictors measuring value orientations. Two indexes assess an individual's value orientation. We present the questions used to assess value orientation in Table 2. We assess biospheric value orientation with four statements that focus on perceptions of the natural environment (mean inter-item correlation = .33). We assess the egoistic value dimension with four statements that deal with one's beliefs about self-interest (mean inter-item correlation = .30). Response categories included 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, and 5 = strongly agree. We reverse coded negatively worded statements before the creation of each index. Higher values indicate stronger levels of each value orientation.

Table 2: List of Items in Each Index: Support of Wind Energy, 2019

Biospheric Values	1. Nature exists primarily to be used by humans.
	2. Ecological rather than economic factors must guide our use of natural resources.
	3. When humans interfere with nature, it often produces disastrous consequences.
	4. The state should lower environmental standards to keep and attract industry.
Egoistic Values	1. In a fair system, people with more ability should earn more.
	2. A free society can only exist by giving companies the opportunity to prosper.
	3. Life tends to reward those who work harder from those who do not.
	4. Making money is the main reason for hard work.

Note: We used questions taken from Brasier et al. (2013) to create the biospheric and egoistic indexes.

Analytic Strategy

We first examine mean scores for perceptions of different energy sources for various subgroups and compare respondents' perceptions of wind energy to their perceptions of other energy sources. Next, we assess univariate and bivariate statistics of our independent variables on attitudes

toward existing wind energy and additional/future wind energy. Then, we perform ordered logistic regression in Stata to test our formal hypotheses. Because our sample skewed young and male, we calculated and applied probability weights for age and gender to all analyses. We test the effects of demographic, socio-political, and personal values on one's support for wind policy and one's willingness to live near a wind farm. We conduct average marginal effects on age, race, education, and political ideology to interpret their impact on support for renewable energy policy. Variance Inflation Factor scores for all the independent variables were under 3.0, suggesting little multicollinearity among variables.

FINDINGS

Respondents' Views about Different Energy Sources

Table 3 presents the mean scores for respondents' attitudes toward different sources of energy. On average, respondents favored solar energy the most followed closely by wind energy. Both mean scores fell between positive and very positive (4.32 and 4.27 respectively). Respondents were on average neutral toward natural gas (3.28), while they leaned more negatively concerning oil and coal (2.78 and 2.59 respectively). These figures held for almost all subsets of respondents based on gender, age, college education, or political ideology with a few exceptions. Conservatives were neutral about coal and oil (3.20 and 3.39 respectively). Perceptions of solar, wind, and natural gas were consistent regardless of demographic or socio-political variables.

When comparing perceptions of wind energy to other energy sources, it rates lower than solar (mean difference = -0.05) while consistently rating higher than coal (mean difference = 1.68), oil (mean difference = 1.49), and natural gas (mean difference = 0.98) regardless of demographic or socio-political variables.

Respondents' Views of Wind Energy

Table 4 presents the mean scores for respondents' attitudes toward existing wind development and additional/future wind development by category. Overall, respondents favor wind development. The mean scores for all respondents for existing and additional wind development equated with a positive attitude (3.94 and 4.15 respectively). For every single category of respondent, respondents ranked additional/future wind development more positively than existing wind development. For existing wind development, the category of respondents who had the most positive attitude were those who ranked higher than the median score for

Table 3: Univariate and Bivariate Statistics for Select Independent Variables by Energy Source, 2019

	Wind	Solar	Wind vs. Solar	Coal	Wind vs. Coal	N. Gas	Wind vs. N. Gas	Oil	Wind vs. Oil
Liberal (N=527)	4.5 (0.8)	4.5 (0.7)	1.8	2.1 (1.1)	-49.2*	3.0 (1.1)	-32.6*	2.3 (1.2)	-42.9*
Moderate (N=329)	4.2 (0.9)	4.2 (0.9)	-0.2	2.7 (1.2)	-24.0*	3.4 (1.0)	-15.1*	2.8 (1.1)	-25.4*
Conservative (N=386)	4.0 (0.1)	4.1 (0.9)	1.3	3.2 (1.0)	-16.0*	3.6 (1.0)	-8.0*	3.4 (1.1)	-11.7*
Male (N=702)	4.2 (0.9)	4.2 (0.9)	0.9	2.7 (1.3)	-32.5*	3.4 (1.1)	-20.0*	2.9 (1.2)	-28.9*
Female (N=573)	4.3 (0.7)	4.4 (0.8)	1.9	2.5 (1.2)	-39.5*	3.2 (1.0)	-28.2*	2.7 (1.1)	-36.2*
White Only (N=813)	4.3 (0.9)	4.3 (0.8)	2.0+	2.5 (1.2)	-43.3*	3.2 (1.1)	-28.6*	2.6 (1.1)	-42.3*
Non-White (N=462)	4.3 (0.9)	4.3 (0.8)	0.4	2.8 (1.2)	-26.4*	3.4 (1.1)	-17.5*	3.1 (1.2)	-20.9*
No College (N=126)	4.2 (0.9)	4.2 (0.9)	0.5	2.5 (1.2)	-16.3*	3.3 (1.0)	-10.0*	2.6 (1.0)	-16.3*
Some College and higher (N=1147)	4.3 (0.9)	4.3 (0.8)	1.7	2.6 (1.2)	-47.5*	3.3 (1.1)	-31.8*	2.8 (1.2)	-42.3*
Gen Z (N=69)	4.1 (0.9)	4.3 (0.8)	1.3	2.4 (1.0)	-14.6*	3.0 (1.1)	-8.6*	2.5 (1.0)	-13.2*
Millennial (N=921)	4.3 (0.8)	4.9 (0.8)	0.2	2.7 (1.2)	-34.0*	3.3 (1.1)	-28.2*	2.8 (1.2)	-36.2*
Gen X (N=182)	4.3 (0.9)	4.4 (0.8)	1.9	2.3 (1.1)	-23.3*	3.3 (1.2)	-12.5*	2.6 (1.1)	-20.4*
Baby Boomer (N=106)	4.3 (1.0)	4.5 (0.8)	2.1+	2.4 (1.2)	-15.7*	3.4 (1.1)	-9.2*	2.8 (1.2)	-13.8*
Total (N=1275)	4.3 (0.9)	4.3 (0.8)	2.0+	2.0 (1.2)	-50.0*	3.3 (1.1)	-33.1*	2.8 (1.2)	-45.0*

+p < .05; *p < .001. Means reported with standard deviations in parentheses.

biospheric value orientation (4.16) followed closely by liberals (4.14) and Democrats (4.13). Those who had the least positive attitudes toward existing wind development were those who ranked lower than the median score for biospheric value orientation (3.69), those who were unsure about their political ideology (3.74), and conservatives (3.77). For additional/future wind development, once again those who ranked higher than the median score for biospheric value orientation (4.46), liberals (4.38) and Democrats (4.35), had the most positive attitudes. Those who had the least positive attitudes toward additional/future wind development were those who ranked lower than the median score for biospheric value

Table 4: Univariate and Bivariate Statistics for Independent Variables by Attitudes Toward Wind Energy, 2019

	Existing Wind Development			Additional/Future Wind Development			
	Mean	SD	T value	Mean	SD	T value	N
35 and Older	4.02	0.86	2.73**	4.22	0.91	2.27*	539
34 and Younger	3.89	0.89		4.10	0.92		773
Men	3.87	0.90	-3.21**	4.06	0.97	-3.75***	723
Women	4.03	0.84		4.25	0.84		592
White Only	3.96	0.89	1.16	4.15	0.92	0.34	833
Non-White	3.90	0.86		4.13	0.91		482
Some College and higher	3.94	0.88	0.37	4.16	0.91	1.47	1184
No College	3.91	0.91		4.03	0.99		126
Democrat	4.13	0.80	6.38***	4.35	0.82	6.84***	536
Republican	3.78	0.91	-4.37***	3.92	0.97	-5.98***	410
Independent	3.84	1.00	-2.28*	4.10	1.01	-1.05	322
Unsure/Other	3.88	1.00	-0.53	4.06	1.01	-0.63	48
Liberal	4.14	0.81	7.04***	4.38	0.79	7.98***	544
Moderate	3.84	0.88	-2.51*	4.08	0.91	-1.61	346
Conservative	3.77	0.92	-4.65***	3.89	1.00	-6.85***	393
Unsure/Other	3.74	0.86	-1.28	4.10	0.98	-0.30	31
Egoistic Values (median and higher)[a]	3.97	0.84	0.94	4.11	0.92	-1.46	693
Egoistic Values (below median)	3.92	0.92		4.19	0.92		609
Biospheric Values (median and higher)[b]	4.16	0.80	10.05***	4.46	0.77	13.83***	688
Biospheric Values (below median)	3.69	0.90		3.80	0.95		613
Total	3.94	0.88		4.15	0.92		1314

[a] The median value for egoistic value orientation was 15. [b] The median value for biospheric value orientation was 14.
*p < .05; **p < .01; ***p < .001.

orientation (3.80), conservatives (3.89) and Republicans (3.92). For both existing and future wind development, significant differences in attitudes exist based on age, gender, political affiliation, political ideology, and biospheric values. Those older than 35, women, Democrats, liberals, and those with biospheric value scores higher than the median had more positive views about wind development than did their counterparts. On the other hand, those 34 and younger, men, Republicans, Independents, moderates, conservatives, and those scoring below the median for biospheric values had less positive views about wind development.

Predictors of Supporting Wind Policy

Table 5 shows results from ordered logistic regression models predicting support toward wind policy. For the demographic variables, significant differences exist between Baby Boomers and other generations. Millennials were more likely than Baby Boomers to support policy that would help the wind industry and to support policy that would help employ more people in the wind industry ($\beta = 1.950$, $p < 0.001$; $\beta = 1.458$, $p < 0.001$, respectively). Whereas, Generation Z, Millennial, Generation X, and the Silent Generation were more likely than Baby Boomers to support wind farm construction where one or more windmills would be within sight of their homes ($\beta = 0.546$, $p < 0.05$; $\beta = 1.902$, $p < 0.001$ $\beta = 0.259$, $p < 0.05$; $\beta = 0.106$, $p < 0.01$, respectively). Furthermore, white respondents were less likely to support policy that would help the wind industry and would help employ more people in the wind industry than were non-white respondents ($\beta = -0.202$, $p < 0.10$; $\beta = -0.467$, $p < 0.001$, respectively).

As for the socio-political variables, respondents with at least some college education were more likely to support policy that would help the wind industry and support wind farm construction where one or more windmills would be within sight of one's home ($\beta = 0.329$, $p < 0.10$; $\beta = 0.357$, $p < 0.05$, respectively). In addition, a significant relationship existed between political ideology and support of wind policy. Liberals were more likely than were conservatives to agree that the US government should do more to employ more people in the wind industry ($\beta = 0.567$, $p < 0.001$). Liberals were also more likely than were conservatives to agree that more effort should be made to employ more people in the wind industry ($\beta = 0.540$, $p < 0.001$). Furthermore, liberals ($\beta = 0.613$, $p < 0.001$) were more likely than were conservatives to support a wind farm being constructed where one or more windmills would be within sight of their home. As for political partisanship, Democrats were more likely than were Republicans to agree that the US government should do more to help the wind industry ($\beta = 0.460$, $p < 0.01$). Furthermore, other political partisans were less likely than were Republicans to agree that the US government should do more to help the wind industry and to employ more people in the wind industry ($\beta = -0.656$, $p < 0.05$; $\beta = -0.765$, $p < 0.05$, respectively).

Value orientation was also significantly related to one's perception of the federal government helping the wind industry. A positive relationship existed between how one scored on both the biospheric index and egoistic index ($\beta = 0.321$, $p < 0.001$; $\beta = 0.069$, $p < 0.001$, respectively) and believing that the US government should do more to help the wind

Table 5: Ordered Logistic Regression Models Predicting Attitudes toward Wind Policy, 2019

Independent and Control Variables	Help Wind Industry	Help Employ Wind Workers	Live Near a Wind Farm
Gen Z (18-23)	0.302	0.326	0.546*
	(0.233)	(.230)	(0.233)
Millennial (24-42)	1.95***	1.458***	1.902***
	(0.519)	(0.518)	(0.527)
Gen X (43-54)	0.141	0.030	0.259*
	(0.128)	(0.127)	(0.130)
Silent Gen (74 +)	0.061+	0.048	0.106**
	(0.033)	(0.032)	(0.038)
Sex (Male)	0.051	-0.046	0.089
	(0.127)	(0.125)	(0.125)
Race (White)	-0.202+	-0.467***	-0.108
	(0.120)	(0.120)	(0.117)
Education (some college +)	0.329+	0.117	0.357*
	(0.185)	(.185)	(0.183)
Democrat (yes)	0.460**	0.168	0.160
	(0.156)	(0.154)	(0.153)
Independent (yes)	-0.075	-0.276	0.126
	(0.159)	(0.156)	(0.155)
Other Political (yes)	-0.656*	-0.765*	-0.257
	(0.313)	(0.316)	(0.315)
Liberal (yes)	0.567***	0.540***	0.614***
	(0.163)	(0.161)	(0.160)
Moderate (yes)	0.024	0.141	-0.017
	(0.155)	(0.152)	(0.151)
Unsure/Other (yes)	0.418	0.241	0.099
	(0.386)	(0.379)	(0.392)
Egoistic Value	0.069***	0.060**	0.068***
	(0.021)	(0.021)	(0.021)
Biospheric Value	0.321***	0.287***	0.235***
	(0.021)	(0.021)	(0.020)
Pseudo R_2	0.133	0.106	0.081
N	1280	1281	1275

+p < .10. *p < .05. **p < .01. ***p < .001. Unstandardized coefficients reported with standard errors in parentheses

industry. Likewise, scoring high on the biospheric and egoistic indexes was positively related to the perception that the government should do more to employ more people in the wind industry (β = 0.287, $p < 0.001$; β = 0.060, $p < 0.01$, respectively). Finally, scoring high on both indexes was positively related to supporting a wind farm being constructed within view of one's home (β = 0.235, $p < 0.001$; β = 0.068, $p < 0.001$, respectively).

The average marginal effects of select independent variables are presented in Table 6. For demographic variables, age and race had significant marginal effects. With respect to age, millennials are significantly more likely to strongly agree with wind policy than Baby

Table 6: Average Marginal Effects for Respondents: Support for Wind Energy, 2019

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Millennial						
	Help Wind	-0.07***	-0.09***	-0.14***	-0.03*	0.33***
	Employ Wind	-0.05**	-0.05**	-0.14**	-0.04**	0.28**
	Live Near Wind	-0.07***	-0.09***	-0.16***	-0.07***	0.38***
Liberal						
	Help Wind	-0.02***	-0.03***	-0.04***	-0.01*	0.10***
	Employ Wind	-0.02**	-0.02**	-0.05***	-0.01**	0.10***
	Live Near Wind	-0.02***	-0.03***	-0.05***	-0.02***	0.12***
White Only						
	Help Wind	0.01	0.01	0.02+	0.00	-0.03+
	Employ Wind	0.02***	0.02***	0.04***	0.02**	-0.09***
	Live Near Wind	0.00	0.01	0.01	0.00	-0.02
Some College Education						
	Help Wind	-0.01+	-0.02+	-0.02+	-0.00	0.06+
	Employ Wind	-0.00	-0.00	-0.01	-0.00	0.02
	Live Near Wind	-0.01+	-0.02+	-0.03+	-0.01+	0.07*

+p < .10. *p < .05. **p < .01. ***p < .001.

Boomers. Millennials are 33.1 percentage points more likely than Baby Boomers to strongly agree that the US government should do more to help the wind industry, 27.8 percentage points more likely to strongly agree that more effort should be made to employ more people in the wind industry, and 38.1 percentage points more likely to strongly support wind farm construction where one or more windmills would be within sight of their home. As for race, respondents who identified as white only were less likely than non-white respondents to strongly agree with wind policy. White-only respondents were 3.4 percentage points less likely than non-white respondents to strongly agree that the US government should do more to help the wind industry and 8.9 percentage points less likely to strongly agree that more effort should be made to employ more people in the wind industry.

As for the socio-political variables, respondents who identified as liberal were more likely to strongly agree with wind policy than respondents who identified as conservative. Liberals were 9.6 percentage points more likely than conservatives to strongly agree that the US government should do more to help the wind industry, 10.3 percentage points more likely to strongly agree that more effort should be made to employ more people in the wind industry, and 12.3 percentage points more likely to strongly support wind farm construction where one or more

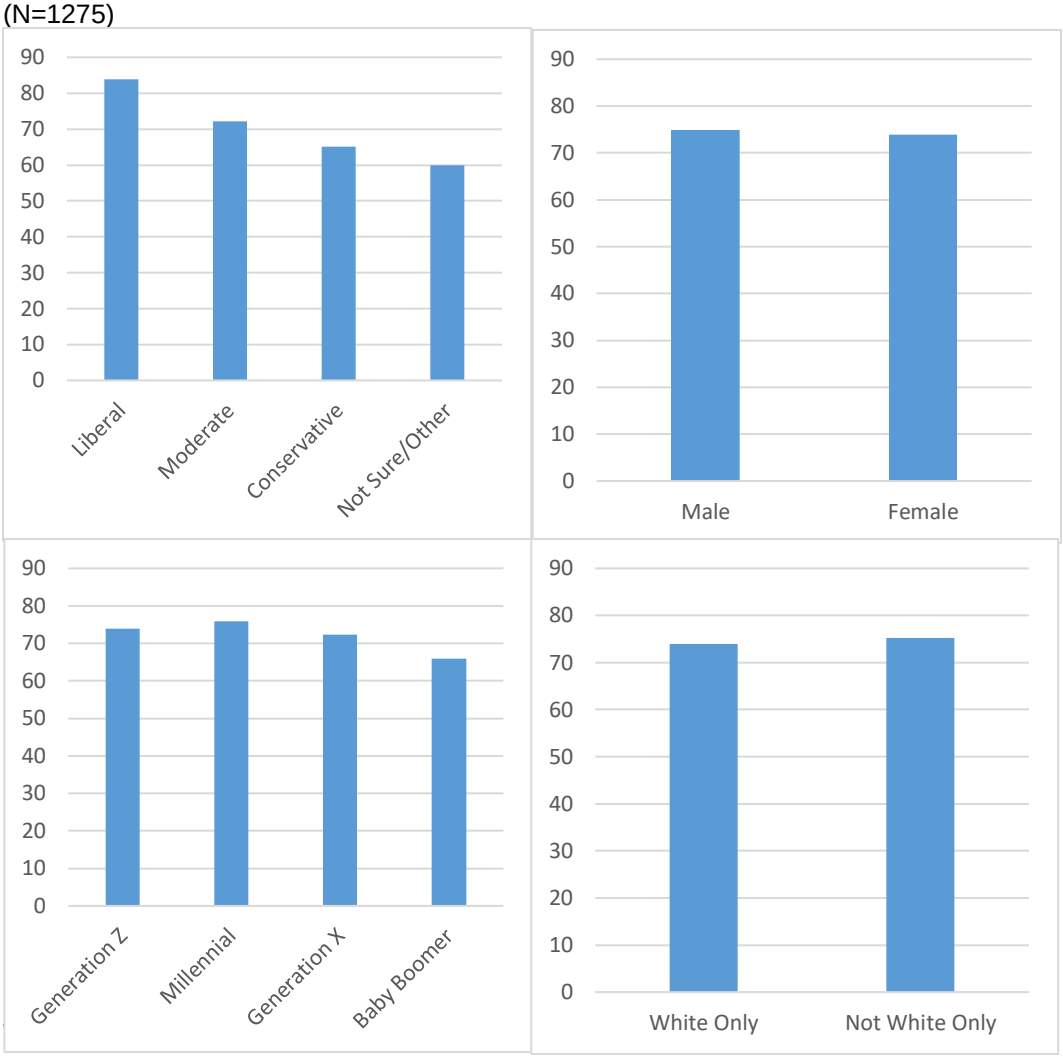
windmills would be within sight of their home. Similarly, respondents with at least some college education were more likely to strongly agree with wind policy than respondents with no college education. Those with some college education were 5.6 percentage points more likely to strongly agree that the US government should do more to help the wind industry and 7.2 percentage points more likely to strongly support wind farm construction where one or more windmills would be within sight of their home.

DISCUSSION

In this study, we surveyed over 1300 adults living in the United States to better understand how demographics, education, political identity, and value orientation influence their support for wind energy policies. Evidence shows that a majority of Americans (62 percent) are at least somewhat worried about climate change. Similarly, the percent of Americans who believe climate change is caused by human activities has steadily increased from 46 percent in 2012 to 62 percent in 2018 (Leiserowitz et al. 2019). Because a transition from fossil fuels to renewable energy is viewed as necessary to fight climate change, it is important to study what factors impact support for policies that will aid in a transition toward renewable energy sources.

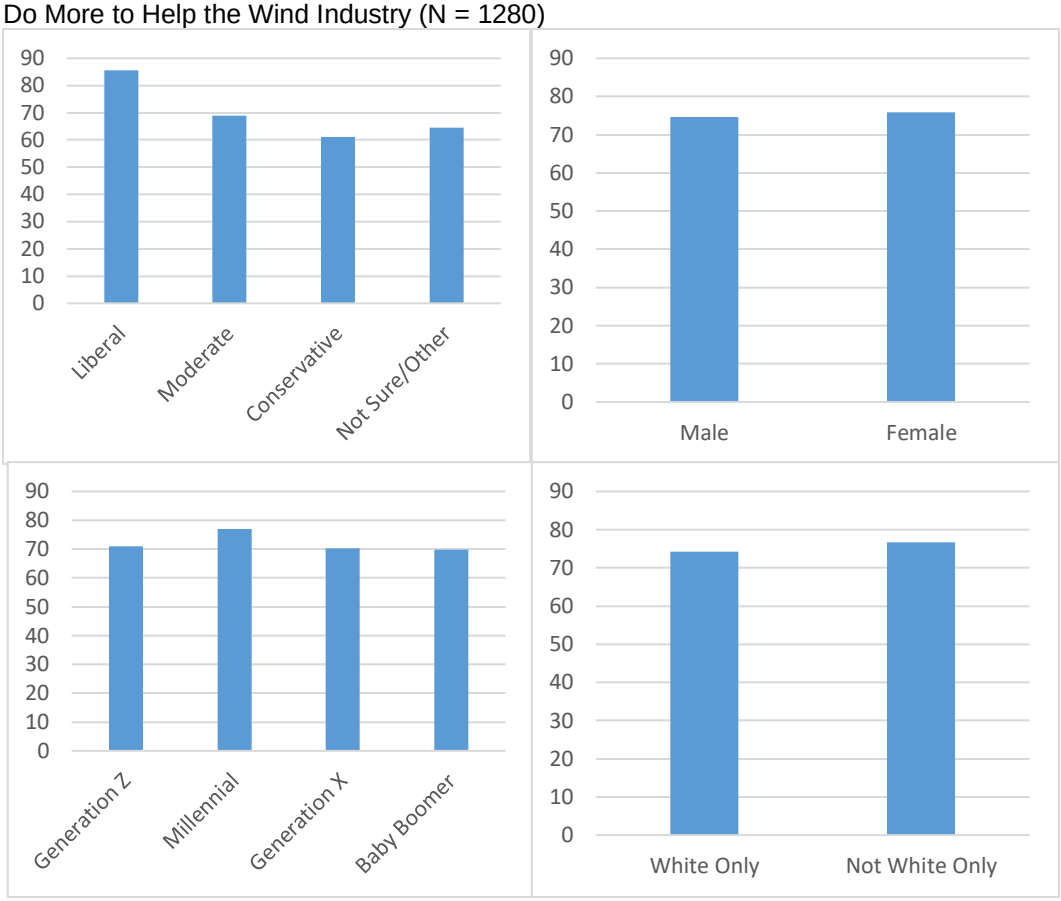
First, we examined how people perceive wind compared to other major sources of energy. Respondents consistently ranked wind favorably, regardless of their age, gender, race, level of education, or political identity (see Figures 1 and 2). Also, regardless of age, gender, race, level of education, or political identity, respondents ranked wind energy more favorably than coal, natural gas, and oil. Public support away from fossil fuels and toward sustainable energy mimics national (and global) agreements to reduce overall greenhouse gas emissions. Increasing wind and other sustainable energy will be key to meeting these goals. While some people have positive attitudes toward fossil fuels, our data show that they have even more positive attitudes toward sustainable energy sources. These attitudes hold for future development and government assistance. Thus, our survey results suggest that support for fossil fuels and clean energy are not at odds with each other. Furthermore, respondents, regardless of political affiliation or ideology, believe that the US government should do more to help the wind industry and that there should be more effort to employ more people in the wind industry. Thus, our research shows that not only do people have more favorable attitudes about sustainable energy, but also, they want policies that provide for energy justice.

Figure 1: Percent Who Somewhat or Strongly Agreed That They Would Support Wind Farm Construction Where One or More Windmills Would Be Within Sight of Their Home (N=1275)



ideology, and value orientation are strong indicators of support for wind policies. We found full support for hypotheses two, three and eight and partial support for hypotheses one, four, six, and seven. We did not find any support for hypothesis five. Respondents who rated high for both egoistic and biospheric values were more favorable toward policies that benefitted the wind industry and workers and were more likely to want to support wind farm construction near their homes than respondents who rated lower for these value types. With respect to political ideology, liberals were more supportive of wind energy policies and were more likely to support wind farm construction within view of their homes than were conservatives. Older respondents, particularly Baby Boomers, were less supportive of wind energy policies, while respondents with more formal education were more supportive of government assistance for the wind industry and living near a wind farm. Democrats were more likely than

Figure 2: Percent Who Somewhat or Strongly Agreed That the US Government Should Do More to Help the Wind Industry (N = 1280)



were Republicans to agree that the government should do more to help the wind industry, while non-white respondents were more likely than were white respondents to agree that more effort should be made to employ people in the wind industry.

Our findings are akin to more recent national-level research on wind energy support that find age to be negatively related to wind support and Democrats and liberals to be more supportive of wind policy than Republicans and conservatives (Hamilton et al. 2018; Peterson et al. 2019). The current research study is one of only a few that analyzes the effect of race on wind energy support. Unlike Klick and Smith (2010) who found white respondents to be more supportive of wind energy, we found that non-white respondents were more supportive of policies that assist in the employment of more people in the wind industry. This finding aligns with recent research that shows that whites have the lowest level of reported concern for the environment when compared to African Americans, Latinos, and Asian-Americans (Pearson et al. 2018) and that whites are less willing to pay more for renewable energy than racial and ethnic minorities (Gustafson et al. 2019). Because African Americans and

Latinos have higher unemployment rates than whites and on average earn less than whites, their concern for the environment coupled with the opportunity to be employed in a high-paying sector may contribute to the stronger levels of support for wind energy policies.

An additional contribution of the current study is the analysis of value orientation on support for wind energy policy. Egoistic and biospheric value orientations were both positively associated with support for wind energy policy and willingness to support wind farm construction near one's home. The biospheric value findings support previous research that show a relationship between biospheric values and environmental concern and pro-environmental attitudes (Nordlund and Garvill 2003; Steg et al. 2005; Stern et al. 1995, 1999). However, the findings for egoistic value orientation are in contrast to previous research on egoistic values and environmental concern. Previous research finds that people with high egoistic values, those based on self-interest, are more likely to show less environmental concern. This is most likely due to a conflict in the desire to gain wealth or power and to preserve the natural environment. Our findings suggest that the value conflict disappears when it comes to supporting wind energy policy. While growth in wind energy will lead to less greenhouse gas emissions, thus helping the environment, the wind industry also employs thousands of people and pays landowners royalties. Thus, it can assist many people in gaining wealth.

In the future, researchers should seek to gather longitudinal data to understand how support of wind policy changes before, during, and after a place transitions to more sustainable energy supplies. While case-study approaches to wind energy development show that it is important to research those closest to wind farms, it is also important to study those living near fossil fuel power plants and those living near fossil fuel extraction. A transition away from fossil fuels toward sustainable energy will impact people differently. While some living near windmill farms may enjoy royalties from having one or more wind turbines on their land, others may be annoyed by the noise or appearance of the wind turbines. While some may lose their jobs from working in the coal industry, others may see improved health from the closure of the nearby coal plant.

Illinois would make a good study area for future research. In 2020, Illinois had 12 community colleges and universities with wind energy education and training programs (Office of Energy Efficiency & Renewable Energy 2020). The state passed the Future Energy Jobs Act of 2016 that set a goal for Illinois to get 25 percent of its electricity from renewable sources such as wind farms, solar farms, and rooftop solar panel by 2025

and is poised to pass a second bill that sets an aggressive target of decarbonizing the state's energy by 2030 and powering the state completely on renewable energy by 2050 (Irfan 2019). The state currently receives 31 percent of its energy from coal and about 9 percent from renewable energy. To achieve 100 percent renewable electricity, it would require a displacement of over 80 percent of the current energy production workforce (Irfan 2019). To handle such a large energy transition, the new bill would create business incubators for energy contractors, with an emphasis on communities that would lose fossil fuel jobs. While helping to create jobs in regions that have seen a loss in fossil fuel jobs is important, more may be needed to help develop a sense of place that identifies with renewable energy. One must take into consideration how renewable energy will fit in with the current landscape, especially in rural areas where the majority of large energy developments are located and where residents tend to be older, white, less formally educated, and more conservative (Pew Research Center 2018).

CONCLUSION AND POLICY IMPLICATIONS

Despite decades of scientific consensus and increasing amounts of news coverage on fossil fuel consumption and climate change, the United States is still locked in a divide over whether climate change is human-caused and if so, what actions to take to minimize damage. These divides are increasingly along partisan and ideological lines. It is not enough to draw attention to the divide. Instead, social scientists must take steps to solve the communication problem that exists in an increasingly politically divided country. Portraying sustainable energy production as economic development and environmental progress can be used to bring diverse audiences together to mobilize to fight climate change and to improve the economy. One way to do this is to emphasize how transitioning to clean energy can help employ displaced workers in fossil fuel industries. For example, for most coal jobs, there are reasonably well matched, well-paying solar jobs. Using data from the Bureau of Labor Statistics, Louie and Pearce (2016) examined all current coal industry positions, the skills needed for each, and the average salaries for each position. For each category of coal position, they matched it to an equivalent solar position and salary. For instance, an operations engineer in the coal industry could be retrained to be a manufacturing technician in the solar industry and receive about a 10 percent salary increase. They found that for every level of education and skill level there were equivalent employment opportunities in solar that provided a living wage. They found that after

retraining, technical workers would earn more in the solar industry than what they previously earned working in the coal industry.

As the US economy continues to evolve, employment in the wind industry is projected to grow. Wind turbine technician is one of the US's two fastest-growing jobs, along with solar installer (U.S. Bureau of Labor Statistics 2019). It is important to note that the wind industry creates jobs for people living in states without current wind farms. Over 500 factories across 42 states build parts for wind turbines. This includes dozens of wind-related manufacturing facilities located in the south—the region of the United States with very few wind farms (American Wind Energy Association 2019). By creating accessible and relatable narratives, such as economic boosts and financial savings, for nontraditional audiences, policy makers, journalists, and activists can expand their reach and impact. Particularly during a time when the US executive branch of the federal government does not support sustainable energy, it is important for government officials, nongovernmental organizations, journalists, and researchers to be able to work together to design and target their messages about a green economy—one defined by low greenhouse gas emissions, resource efficiency, and social inclusion (United Nations Environment Programme 2019). As the results from a previous study shows (Crowe nd), while respondents on average tend to support clean energy policies, framing such policies as environmental progress and economic benefits will lead to more support for clean energy policy. However, in the case of wind energy, while 75 percent of respondents would support nearby wind farm construction, improvement in design and technology may be necessary to garner additional support from those who do not like their appearance or noise they produce. Nevertheless, almost all may welcome policy that emphasizes job creation, particularly in areas with significant job loss, in addition to reduced electric bills and environmental benefits.

DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

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