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Public Perceptions of Energy Scarcity and Support for New Energy Technologies: A Western U.S. Case Study

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Abstract: This study examines public concern for energy security and support for public investment in new energy technologies. Using household survey data from the western U.S. states of California, Idaho, Oregon, and Washington, socio-demographic characteristics, environmental values, and policy relevant knowledge are analyzed as drivers of energy security and technology investment orientations. Findings suggest that a majority of respondents in each state believe that not enough money is being spent on energy research, that the country has insufficient energy resources, and that new technologies can support future energy security. Multivariate analyses indicate that some socio-demographic variables (e.g., gender and education), ideology, and environmental value orientations also have an impact on energy security orientations and support for technology investment.

Keywords: energy technology; energy security; public opinion

1. Introduction

This study contributes to the literature on determinants of public perceptions of new energy technologies and energy security by analyzing the impact of public energy-related knowledge, environmental value orientations, political ideology, and socio-demographic characteristics on public perceptions of energy security and new energy technologies. More specifically, using public opinion survey data from four Western states in the United States, we investigate public perceptions of: (1) the state of the country's energy supply; (2) being personally affected by the shortage of electricity in the next 5 years; (3) support for government investment into new energy technologies; and (4) the ability of new energy technologies to meet future energy demands.

In the process of policy formulation and implementation, one cannot ignore public opinion, especially in democratic societies like the United States [1–5]. Motivation to investigate public opinion toward energy-related issues and new energy technologies comes from the fact that the U.S. is a high energy consumer society with heavy reliance on fossil fuels in electricity generation and the transportation sector. Therefore, energy supply security is a central political and policy issue. At the same time, the country strives toward a low-carbon economy, diversifying its energy portfolio to include a larger share of renewable energy and other alternative energy technologies, including smart meters, electric vehicles, carbon capture, storage, and energy efficiency technologies [6]. Such policy innovations reflect the country's planning of energy independence and security, where renewables (i.e., wind, sun, biomass, nuclear) can be an alternative to traditional energy sources (e.g., coal, oil, and gas), which are finite in supply and are influenced by global fuel market price fluctuations [7–9]. A number of studies find strong support among the general public for renewable energy as a major source for future electricity portfolios [10–13]. In addition, the transition to low-carbon sources of energy satisfies environmental concerns and provides the added benefit of reduced marginal social costs, allowing the U.S. to respond to international diplomatic pressures of reducing CO_2 emissions from burning

conventional fossil fuels. Despite a number of climate commitments, the U.S. remains one of the top emitters of greenhouse gases per capita [14,15].

Extant research on public support and opposition toward new energy technologies emphasizes the role of place, geographic proximity, land-use regulations, socio-economic impacts, fairness, and trust in shaping public opinion [2,16–18]. These studies investigate public perceptions of concrete energy projects, which are likely to carry specific drawbacks or opportunities for communities directly affected by new developments. On a more abstract level, other studies explore the general public's familiarity with new energy technologies, including wind energy [19], offshore renewable energy [20], smart meters [21,22], and electric vehicles [23]. These studies find that public opinion concerning energy technologies is often rooted in the degree to which those technologies are perceived as risky, with uncontrollable and catastrophic impacts [24], or tampering with natural processes [25–27].

However, to understand public opinion on broader energy policies in the era of low-carbon energy transition, there is a need to further analyze public orientations on energy-related questions. There is a lack of research that inquires into public perceptions of national and personal energy security issues, the level of government funding towards new energy technologies, and the ability of new technologies to meet energy demands of the future. This research addresses this gap in the literature. Moreover, we contribute to research on public opinion of energy policy and technologies by investigating the drivers of public perceptions that include environmental value orientations, political ideology, public knowledge, and socio-demographic characteristics.

1.1. Environmental Value Orientations and Ideology

Environmental values are commonly measured utilizing the New Ecological Paradigm (NEP) from Dunlap et al. [28]. The NEP scale consists of a range of ecological worldview aspects, such as a personal stance on humans' place in the ecosystem, the balance of nature, the rights of humans to modify the environment, and others. As expressed in the Values-Beliefs-Norms (VBN) model of environmental decision-making [29], values, or intuitive rather than calculative logic, can serve as reliable indicators of perceptions toward emergent clean energy technologies [30]. Extant literature finds support for the pro-NEP position as a significant indicator of positive attitudes toward new alternative energy sources [31] and government investments in alternative energy [32]. In this study, we investigate if and in what way environmental values shape public perceptions of new energy technologies, government investments in new energy technologies, and concerns regarding the security of energy supplies.

In addition to environmental values, Simon and Moltz [33] argue that political ideology and political party identification are significant moderators of public opinion about funding proposals in the areas of the natural environment, science, and alternative energy. In the area of climate change research, there are consistent findings that Democrats and more liberally-minded individuals are perceived to be more supportive of climate policies than Republicans and more conservatively-minded individuals [34–38]. Yet, there is a lack of investigation into the role of political ideology in shaping public opinion on energy security and alternative energy sources in the United States.

1.2. Knowledge

A review of the relevant literature demonstrates conflicting results about the role of policy relevant knowledge factors in influencing public opinion. Pierce et al. [39] found that more energy-informed citizens were more supportive of renewable energy policies. Hobman and Ashworth [31] discovered that a provision of additional information about a range of alternative energy technologies leads to greater public support for the use of said technologies. At the same time, Wolske et al. [27] contend that more information about carbon removal technologies may actually discourage public support, due to learning about new risks and potential impacts.

1.3. Socio-Demographic Characteristics

Steel et al. [32] show that younger and more educated respondents are more likely to support government policies related to clean energy technologies. Pierce and Steel [40] find that women and older individuals display a greater opposition towards alternative energy technologies. In regard to the public opinion on energy security, Knox-Hayes et al. [6] argue that women, less educated, and older individuals are more concerned over energy security. In this research, we investigate the following socio-demographic characteristics: age, gender, education, and income.

Our research objective is to understand how environmental value orientations, knowledge factors and socio-demographic characteristics are associated with concerns over energy security and public perceptions of new energy technologies in the U.S. context.

2. Materials and Methods

To address our research objectives, public opinion survey data were collected through household surveys conducted in California, Oregon, Washington, and Idaho in 2013. These states were selected because of their commitment to and investment in new clean energy technologies as part of their participation in the 2008 Pacific Coast Collaborative (PCC). The PCC is a regional approach to solving policy issues such as environmental protection and climate change, which has led the states to pursue aggressive renewable portfolio standards (RPS) and policies that encourage innovation in renewable energy technologies. In 2016, PCC states and the Canadian Province of British Columbia signed the 2016 Pacific Coast Climate Leadership Action Plan, which updated efforts at greenhouse gas emissions mitigation and adoption of community-scale renewable energy technologies. The state of Idaho is included as a control comparison. While it is also in the U.S. west and borders Oregon and Washington and is also heavily reliant on cheap energy from hydroelectric sources, it is more politically conservative and has not pursued state policies that promote the development and implementation of renewable energy technologies.

A mail survey with an additional link to an online option was sent to random samples of over 1400 households in each state. Even under the most strict sampling rules, assuming a 50/50 split in the population (i.e., 50% answer one way, while 50% answer the other way), to be 95% confident that an estimate from a sample survey is within +/− 3 percentage points of the true population value, a random sample of 1067 is needed for a population of 1 million and over [41]. Therefore, our sample size meets accepted standards of survey design. Samples were provided by a commercial research company that has exhaustive databases of households comprised of telephone directories, state departments of motor vehicle records, and other household information sources. Dillman's [41] Tailored Design Method was used in questionnaire design and implementation, which includes multiple reminder waves for non-responses and structured survey instruments and cover letters. A systematic sampling approach was applied within each household by asking those residents with the most recent birthday and over 18 years old to take the survey. Three waves of the mail questionnaires were distributed, followed by a final telephone reminder. Survey response rates vary only marginally across the four states, with the highest percentage in Oregon (51.5%), followed by 48.9% in Washington, 48.3% for California, and 46.6% for Idaho. Given the nature of the questions in the survey and the protections in place to protect individual respondent's identities, the Oregon State University Institutional Research Board determined that the research was "exempt" and therefore did not require full board review for ethical concerns.

In terms of survey response bias, we compared demographic data from the U.S. Census to survey data (Table 1). The Census data used is only for the section of the population that is 18 years and older as this aligns with the samples used. Survey respondents are slightly more affluent, older, and educated when compared to the Census data for each state. This finding is typical for survey research respondents [42]. The percentage of female and male respondents is almost identical to the Census data for all four states.

Table 1. Survey Response Bias.

California		
Demographic Variable	**Survey Sample**	**Census Estimates** [1]
Mean Age (Over 18)	47.7	47.1
Median Household Income	$50,000–$74,999 (Survey category 6)	$60,883 (2006–2010 adjusted average)
Gender (Over 18)	Male 51.3%, Female 48.7%	Male 49.5%, Female 51.5%
Associates Degree or Higher (Over 18)	40.3%	36.7%
Idaho		
Demographic Variable	**Survey Sample**	**Census Estimates** [1]
Mean Age (Over 18)	52.6	48.0
Median Household Income	$50,000–$74,999 (Survey category 6)	$46,890 (2006–2010 adjusted average)
Gender (Over 18)	Male 49.9%, Female 50.1%	Male 50%, Female 50%
Associates Degree or Higher (Over 18)	42.3%	39.1%
Oregon		
Demographic Variable	**Survey Sample**	**Census Estimates** [1]
Mean Age (Over 18)	55.3	49.5
Median Household Income	$50,000–$74,999 (Survey category 6)	$49,260 (2006–2010 adjusted average)
Gender (Over 18)	48.7% Male, 51.3% Female	48.4% Male, 51.6% Female
Associates Degree or Higher (Over 18)	38.1%	35.0%
Washington:		
Demographic Variable	**Survey Sample**	**Census Estimates** [1]
Mean Age (Over 18)	50.3	48.5
Median Household Income	$50,000–$74,999 (Survey category 6)	$57,224 (2006–2010 adjusted average)
Gender (Over 18)	48.3% Male, 51.7% Female	48.7% Male, 51.3% Female
Associates Degree or Higher (Over 18)	44.8%	38.8%

[1] Data obtained from the U.S. 2010 American Community Survey.

3. Results

Measures related to the concern over energy supply, being personally affected by energy shortage, support for government investments into research and development of alternative energies, perceptions of new energy technologies, political ideology, environmental beliefs, knowledge about energy, and socio-demographic characteristics were formed from survey responses. The survey questions used to create variables are provided in Appendix A. See Appendix B for descriptive statistics for all measures.

To assess how informed the public is about energy policy, we asked respondents to report their level of familiarity with renewable energy policy. Response categories were oriented on a four-point scale ranging from 1 = "Not informed" to 4 = "Very well informed" (mean = 2.12). To assess respondents' knowledge about energy, we asked three energy-specific questions: (1) what is the largest source of energy for electricity in your state?; (2) what economic sector uses the greatest share of electricity in your state?, and (3) what does it mean to be "off-grid"? Answers to these questions were formed into a Quiz index ranging from 0 = no correct answers to 3 = three correct answers (mean = 1.09).

Ideology was measured on a five-point scale from liberal to conservative (1 = "Very liberal" to 5 = "Very conservative"; mean = 3.03). Environmental values were measured using the New Ecological Paradigm (NEP) six-item scale. Answers ranged from 6 = low level of support for NEP to 30 = high level of support for NEP (mean = 21.02; see Appendix A).

Demographic variables included the gender of the respondent (male vs. female; 51% female), age in years (mean = 49), income on a 10-point scale (1 = "less than $10,000" to 10 = "$200,000 or more"; mean = 5.32) and formal education attainment on an 8-point scale (1 = "less than high school" to 8 = "postgraduate degree"; mean = 5.17).

Descriptive statistics for questions about public perceptions of energy scarcity and electricity shortage reveal within sample and across state variation (Table 2). The difference between states is not statistically significant for the question about national energy resources (Chi-square = 11.094, $p = 0.521$), but is statistically significant for the question about concern over personal energy scarcity (Chi-square = 33.092, $p = 0.001$). The majority of respondents (over 50%) in all states agree or strongly agree that the country does not have a sufficient supply of energy resources. The largest percent of respondents who agree with this statement live in California, while the largest percent of people who disagree live in Idaho. Regarding the concern about being personally affected by electricity shortages in the next 5 years, there is significant variation across states. Yet, similarly to the previous question, respondents from California and Oregon express a higher level of concern compared to respondents from Idaho and Washington. Additional Chi-square tests comparing state by state separately revealed that for concern about being personally affected by a shortage of electricity, Californian respondents were significantly more concerned in each state-by-state comparison. Perhaps this is not surprising given the brownouts and power outages Californians have experienced over the past decade [40]. In addition, Idaho respondents were significantly different from each of the states, with fewer respondents being concerned about possible future power shortages. This may be attributable to the abundant, dependable, and low cost hydroelectricity available to most Idaho residents [40].

Table 2. Public perceptions of energy scarcity; variation across states.

Question: How much do you agree or disagree with the following statements concerning energy policy?				
"I am concerned that our country doesn't have enough energy resources."				
	California	**Idaho**	**Oregon**	**Washington**
	Percent	Percent	Percent	Percent
Strongly Disagree	11.9	12.1	9.9	10.1
Disagree	16.4	19.1	16.3	18.0
Neutral	12.9	12.8	14.5	16.3
Agree	27.3	26.7	29.6	27.0
Strongly Agree	31.4	29.2	29.7	28.6
N =	688	685	754	711
Chi-square =	11.094, $p = 0.521$			
"I am concerned about being personally affected by shortage of electricity in the next five years."				
Strongly Disagree	11.0	8.6	11.8	11.1
Disagree	20.7	26.6	21.1	27.7
Neutral	24.8	28.5	29.4	27.9
Agree	25.7	23.6	24.5	22.0
Strongly Agree	17.8	12.7	13.2	11.3
N =	690	687	755	714
Chi-square =	33.092, $p = 0.001$			

Evaluating the descriptive statistics of public perceptions of new energy technologies, we observe that the responses are skewed toward agree and strongly agree answers for both statements: (1) that not enough money is being spent on research and development of alternative fuels and (2) that new technologies will make it possible to have enough electricity for all in the future (Table 3). Similar to the findings about perceptions of energy scarcity, a larger percentage of respondents from California and Oregon expressed concern over the level of funding for research and development. Also, a larger proportion of respondents from California and Oregon believed in the future potential of new energy technologies, compared to respondents from Idaho and Washington. In both cases the difference between states is statistically significant (Chi-square = 23.466, $p = 0.024$ and Chi-square = 21.925, $p = 0.038$, respectively).

Table 3. Public perceptions of new energy technologies; variation across states.

Question: How much do you agree or disagree with the following statements concerning energy policy?				
"Not enough money is being spent on research and development of alternative fuels."				
	California	**Idaho**	**Oregon**	**Washington**
	Percent	Percent	Percent	Percent
Strongly Disagree	3.8	6.1	5.9	5.1
Disagree	11.1	14.9	10.1	12.9
Neutral	22.7	21.3	20.2	25.5
Agree	29.0	29.2	30.7	28.1
Strongly Agree	33.5	28.5	33.1	28.4
N =	687	685	752	711
Chi-square =	23.466, $p = 0.024$			
"New technologies will make it possible to have enough electricity for all of us in the future."				
Strongly Disagree	1.0	2.8	2.5	2.7
Disagree	4.7	9.5	7.3	6.9
Neutral	18.3	17.2	19.7	18.7
Agree	39.4	37.1	35.8	38.7
Strongly Agree	36.6	33.5	34.7	33.1
N =	688	687	755	713
Chi-square =	21.925, $p = 0.038$			

As with the analyses presented in Table 2, additional Chi-square tests were conducted for state-to-state comparisons. Concerning the statement that not enough money is being spent on research and development, California and Oregon respondents were not significantly different in their responses, and the same can be said with Idaho and Washington respondents. However, the Chi-square analyses showed that California and Oregon respondents were significantly different from Idaho and Washington survey participants in their level of agreement and disagreement with the statement. California and Oregon respondents were slightly less like to disagree with the statement and more likely to agree.

For the final statement in Table 2, concerning new technologies contributing to electricity for all in the future, the additional Chi-square results show that California respondents were significantly different from the other three states in their agreement with the statement. While over 70 percent of respondents in each state agreed or strongly agreed with the statement, Californians were significantly less likely to disagree with the statement and more likely to agree with the statement when compared to each other state separately.

Due to skewed distribution of dependent variables, measures were recoded into binary variables (1 = agree, 0 = else) and a logistic regression analysis was performed to estimate the relationships between dependent and explanatory variables. Table 4 highlights results of the logistic regression output for two dependent variables: concern over energy scarcity and concern over personal energy shortage. Among socio-demographic factors, the findings indicate that being female and having a higher level of formal education is significantly associated with a lower level of concern over energy scarcity, while higher income is significantly associated with a lower level of personal concern over energy shortage. For the knowledge variables, respondents who are more familiar with renewable energy policy are less likely to be concerned over energy scarcity, while those with a better performance on an energy quiz have lower levels of concern over personal energy shortage. Among value and ideology factors, a higher score on the New Ecological Paradigm scale is associated with greater concerns about U.S. energy security, as well as personal energy security. Finally, being more politically conservative has shown to be associated with greater concern over personal energy security.

Table 4. Logistic regression estimates for energy security beliefs.

	Concern That the Country Does Not Have Enough Energy Resources [a]	**Concern over Being Personally Affected by Energy Shortage** [b]
	Coefficient (S.E.)	**Coefficient (S.E.)**
Age	−0.004 (0.003)	−0.003 (0.003)
Gender	−0.228 ** (0.086)	−0.331 *** (0.087)
Education	−0.090 ** (0.035)	−0.123 *** (0.038)
Income	−0.011 (0.020)	−0.053 ** (0.020)
Familiar	−0.287 *** (0.055)	0.079 (0.055)
Quiz	−0.054 (0.058)	−0.217 *** (0.058)
NEP	0.060 *** (0.009)	0.042 *** (0.009)
Ideology	−0.089 (0.048)	0.223 *** (0.048)
N =	2641	2648
Chi−square =	166.438 ***	115.498 ***
Percent correctly predicted =	63.3%	63.7%
Nagelkerke R2	0.082	0.058
	$^{**}p \leq 0.01$; $^{***}p < 0.001$	

[a].1 = Agree that country does not have enough energy resources, 0 = else.[b].1 = Agree will be personally affected by energy shortage, 0 = else. NEP = New Ecological Paradigm.

Table 5 presents results of the logistic regression for the second set of dependent variables on energy technology beliefs. Here, we discover diverging results regarding the influence of gender. Females express greater concern that not enough money is spent on research and development of technologies. At the same time, they are less likely to think that technologies will provide energy for all in the future. Respondents with more advanced formal education are less likely to believe in the impact of technology on future energy supply, while higher income level is associated with lower level of concern that not enough resources are being spent on research and development. Concerning the impact of environmental values, those respondents with higher NEP scores are more likely to agree that not enough money is being spent on research and development. Finally, being politically conservative is associated with lower levels of concerns over the shortage of funding for research and development of new energy technologies and lower levels of perception that technologies will supply energy for all in the future.

Table 5. Logistic regression estimates for energy technology beliefs.

	Not Enough Money Spent on Research and Development [a]	New Technologies Make It Possible to Have Energy for All in the Future [b]
	Coefficient (S.E.)	**Coefficient (S.E.)**
Age	0.000 (0.003)	0.001 (0.003)
Gender	0.253 ** (0.094)	−0.202 * (0.093)
Education	0.008 (0.037)	−182 *** (0.039)
Income	−0.045 * (0.022)	0.031 (0.021)
Familiar	−0.042 (0.059)	0.004 (0.058)
Quiz	0.113 (0.062)	−0.115 (0.062)
NEP	0.115 *** (0.010)	0.008 (0.010)
Ideology	−0.520 *** (0.053)	−0.176 *** (0.052)
N =	2640	2646
Chi-square =	472.019 ***	55.279 ***
Percent correctly predicted =	67.9%	71.9%
Nagelkerke R2	0.222	0.030
* $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$		

[a] 1 = Agree that not enough money spent on research and development of alternative fuels, 0 = else. [b] 1 = Agree new technologies will make it possible to have electricity for all in the future, 0 = else.

4. Discussion

4.1. Environmental Value Orientations and Ideology

Reflecting results of previous studies that show a connection between environmental value orientations and pro-environmental behaviors, such as displaying positive attitudes for new alternative energy sources [31] and government investments in alternative energy [32], this study finds that pro-environmental values are associated with public perceptions that not enough resources are being devoted to research and development of new energy technologies and greater concerns about the U.S. energy security, as well as personal energy security. At the same time, these respondents do not seem to support the idea that new technologies can ensure energy supply for all in the future. It is possible that respondents with higher biocentric scores on the NEP scale are concerned about the potential negative impacts of new technologies on the environment [24–27], and thus, the extent to which technologies should serve as a solution to energy problems in the future. Building on the research by Simon and Moltz [33], who contend that political ideology is a strong predictor of public opinion about government spending in areas of environment and technologies, we demonstrate that conservatives are less concerned about the insufficiency of government funding towards research and development of new energy technologies, and are also less likely to believe that alternative energy technologies are capable of being an adequate energy resource in the future. Government investment in new energy technologies implies a number of politically sensitive issues concerning the role of

government involvement in the energy market and growth of renewable energy market share. Our findings suggest that conservative leaning respondents are reluctant to provide government support for new energy technologies [40]. At the same time, conservatives also displayed higher concern about experiencing personal energy shortages.

4.2. Knowledge

Similar to prior studies on the connection between knowledge and public opinion about new technologies [27,31,40], we found that greater familiarity with renewable energy policy is associated with lower concerns over the country's energy scarcity. It is possible that respondents who are more familiar with renewable energy policy have a better understanding of energy policy in general and, therefore, are confident in the ability of the market and the government to ensure a reliable energy supply in the future, regardless of the type of energy technologies employed to accomplish that. As we show, trust in new energy technology's ability to provide energy supply for all in the future is not associated with renewable energy policy familiarity. In regard to the energy knowledge quiz, respondents who scored higher on the quiz, have fewer concerns about being personally affected by the electricity shortage in the next 5 years. It is worth mentioning that questions on the quiz were state-specific. Therefore, our findings showcase an idea that being informed about local energy issues is associated with lower levels of concern about being personally affected by shortages of energy supply. Interestingly, neither familiarity with renewable energy policy nor energy knowledge variables are associated with perception of the level of government funding of new technologies or the power of new technologies to ensure a sustainable supply of energy in the future. This discovery suggests a diversion from previous research findings on the connection between knowledge and public opinion about new technologies [27,31,40]. We establish that familiarity with general energy issues and renewable energy policy is not necessarily associated with public perceptions on government investments into new energy technologies or on the technical capabilities of those technologies.

4.3. Socio-Demographic Characteristics

Contrary to findings by Knox-Hayes et al. [6], we discover that women are less concerned about energy security issues when compared to men. This is an interesting finding, because a number of studies in sociology and psychology demonstrate systematic differences between men and women in attitudes toward risk, arguing that on average women tend to be more risk averse [43]. Thus, in our work, we would expect women to be more concerned about the energy security issue than men. However, as Eckel and Grossman [43] contend, when looking at gender attitudes toward risk, it is important to account for other demographic factors such as knowledge, wealth, marital status and others. It is possible that in our study women are less concerned about energy security issues because our sample is slightly more affluent and with higher level of education than the population. At the same time, women are also more likely to perceive a shortage of government funding towards research and development of new technologies. Attesting to the connection among the demographic factors, we find that more educated respondents are less likely to be concerned over energy security in the future, personally and for the nation as a whole. It is possible that respondents with a higher level of education enjoy higher incomes, and therefore, a greater sense of personal security over any future event. To support this statement, we show that those with higher incomes are less concerned about being personally impacted by electricity shortage in the next 5 years. Furthermore, respondents with higher levels of formal education are less likely to believe in the power of new technologies to support a reliable supply of energy in the future. It is possible that the more educated public accepts a more cautious view about the successful and rapid integration of new technologies into the market. As we observe, respondents leaning toward conservative political views also take on a more reserved stance about the feasibility of new energy technologies securing a sustainable supply of energy in the future. Finally, age did not play a role across any of the analyzed opinions. This is an interesting finding, as we may expect that the respondents belonging to the generation that lived through the oil crisis of

the 1970s, a period infamous for oil shortages and high energy prices [44], would be more concerned about energy shortages in the future. At the same time, we may also assume that a younger generation would be leaning toward higher trust of new energy technologies.

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Conflicts of Interest: The authors have declared that no competing interests exist.

Appendix A

Dependent Variables					
How much do you agree or disagree with the following statements concerning energy policy?					
	Strongly Disagree	**Somewhat Disagree**	**Neutral**	**Somewhat Agree**	**Strongly Agree**
I am concerned that our country doesn't have enough energy resources.	1	2	3	4	5
I am concerned about being personally affected by shortage of electricity in the next five years.	1	2	3	4	5
Not enough money is being spent on research and development of alternative fuels.	1	2	3	4	5
New technologies will make it possible to have enough electricity for all of us in the future.	1	2	3	4	5

Sociodemographic Variables
We now have a few concluding questions to check if our survey is representative of all types of people. Please remember that all answers are completely confidential to the extent permitted by law.

What is your current age in years _____?

Please indicate your gender? 1. Female 2. Male

What level of education have you completed?

1. Grade School	5. Some college
2. Middle or junior high school	6. College graduate
3. High school	7. Graduate school
4. Vocational school	8. Other _____?

Which category best describes your household income (before taxes) in 2014?

1. Less than $10,000	6. $50,000–$74,999
2. $10,000–$14,999	7. $75,000–$99,999
3. $15,000–$24,999	8. $100,000–$149,999
4. $25,000–$34,999	9. $150,000–$199,999
5. $35,000–$49,999	10. $200,000 or more

Knowledge Questions

Familiarity:

In general, how well informed would you consider yourself to be concerning renewable energy policy issues in (state)—such as wind, solar, wave, and biomass energy?

1. Not informed
2. Somewhat informed
3. Informed
4. Very well informed

Energy Quiz:

Here are a few specific questions about energy. Many people don't know the answers to these questions, so if there are some you don't know just leave them blank and continue.

a. The largest source of energy for electricity in your state is:

1. Coal
2. Hydroelectric
3. Natural Gas
4. Nuclear

b. Most electricity in your state is used by the:

1. Residential Sector (e.g., households)
2. Commercial Sector (e.g., retail stores)
3. Industrial Sector (e.g., factories and mills)
4. Transportation Sector

c. Being "off-grid" means:

1. Producing one's own electricity
2. Getting electricity from another state
3. Having no electricity
4. Being energy efficient

The Quiz variable is an additive index of correct answers. Correct answers are: (a) Idaho, Oregon and Washington–hydroelectric; California–natural gas; (b) California, Oregon and Washington–transportation; Idaho–industrial; (c) Producing one's own electricity.

New Ecological Paradigm Index					
Listed below are statements about the relationship between humans and the environment. For each, please indicate your level of agreement.					
	Strongly Disagree	**Mildly Disagree**	**Neutral**	**Mildly Agree**	**Strongly Agree**
The balance of nature is very delicate and easily upset by human activities.	**1**	**2**	**3**	**4**	**5**
Humans have the right to modify the natural environment to suit their needs.	**1**	**2**	**3**	**4**	**5**
We are approaching the limit of people the earth can support.	**1**	**2**	**3**	**4**	**5**
The so-called "ecological crisis" facing humankind has been greatly exaggerated.	**1**	**2**	**3**	**4**	**5**
Plants and animals have as much right as humans to exist.	**1**	**2**	**3**	**4**	**5**
Humans were meant to rule over the rest of nature	**1**	**2**	**3**	**4**	**5**
Statements 2, 4 and 6 above were recoded to: 5 = biocentric response and 1 = anthropocentric response. The items were then used in an additive index that ranges from 6 to 30. Chronbach's alpha is 0.759.					

Political Ideology				
On domestic policy issues, would you consider yourself to be?				
1. Very Liberal	2. Liberal	3. Moderate	4. Conservative	5. Very Conservative

Appendix B

Variable	Questions/Categories	Descriptive Statistics
	Dependent Variables	
Concern over energy supply	*"I am concerned that our country doesn't have enough energy resources."* Categories ranging from 1 = "Strongly disagree" to 5 = "Strongly Agree"	mean = 3.477 std.dev. = 1.36 N = 2838
Being personally affected by energy shortage	*"I am concerned about being personally affected by shortage of electricity in the next five years."* Categories ranging from 1 = "Strongly disagree" to 5 = "Strongly Agree"	mean = 3.06 std.dev. = 1.2 N = 2846
Research and development	*"Not enough money is being spent on research and development of alternative fuels."* Categories ranging from 1 = "Strongly disagree" to 5 = "Strongly Agree"	mean = 3.68 std.dev. = 1.18 N = 2835
New technologies will ensure future energy supply	*"New technologies will make it possible to have enough electricity for all of us in the future."* Categories ranging from 1 = "Strongly disagree" to 5 = "Strongly Agree"	mean = 3.95 std.dev. = 1.01 N = 2843

Independent variables		
Age	Age in years (range = 18 to 98)	mean = 49.3 s.d. = 16.10 N = 2845
Gender	1 = female, 0 = male	mean = 0.51 N = 2840
Education	Formal educational attainment (1 = less than high school to 8 = postgraduate degree)	mean = 5.17 s.d. = 1.25 N = 2811
Income	Household income before taxes in 2017. (1 = less than $10,000 to 10 = $200,000 or more)	mean = 5.32 s.d. = 2.15 N = 2727
Informed about energy policy	Level of self-assessed familiarity with renewable energy policy. (1 = not informed to 4 = very well informed)	mean = 2.12 s.d.= 0.77 N = 2848
Quiz	Energy quiz score. (0 = no correct answers to 3 = three correct answers)	mean = 1.09 s.d. = 0.74 N = 2848
Ideology	Subjective political ideology (1 = Very liberal to 5 = Very conservative)	mean = 3.03 s.d. = 0.99 N = 2829
NEP	New Ecological Paradigm (6 = low level of support to 30 high level of support)	mean = 21.02 s.d. = 5.29 N = 2835

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