

CALIFORNIA ENERGY POLICY AND PERCEPTIONS IN THE 21ST CENTURY

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Abstract:

Rarely does an industry touch each citizen's everyday life while simultaneously garnering such little public attention as the energy industry does. From the fuel powering our vehicles to the energy flowing into our homes powering our laptops, TV's and lights the energy industry enables our modern lifestyles, but this is not without consequence. As our economies attempt to decarbonize their current infrastructures and further embrace alternative energy technologies, a concerted effort must be made to ensure solutions are being pursued that work for everyone and not a select few. To do this, new energy policies must be considered and implemented in an immediate effort but only with the general public's overall support. The state of California has committed itself to one of the most aggressive renewable energy targets in the world with the pledge to obtain 100% of its energy needs from renewable energy sources by the year 2045. This lofty goal will only be achieved with the strong public support needed to maintain this commitment and to keep political figures in office that also share these priorities. In order to assess public support for renewable and traditional energy technologies, survey data from an Oregon State University study are examined. Findings suggest that there is widespread support for renewable energy development and the support is strongest among the most highly educated and liberal respondents, while those with lower levels of education and conservatives are more supportive of traditional energy sources and less informed about energy policy.

Introduction

Undoubtedly, attempting to understand unique energy policies that shape our societies can be extremely challenging. Energy is being generated by many different sources that each have their own distinct challenges and advantages and in many instances are also being generated in distant locations only being brought to the consumer once their demand is needed. As newer alternative energy technologies are being developed and implemented our policies that regulate and require these technologies are only going to continue to get more and more complicated. Even with these policies becoming incredibly difficult to follow and comprehend it has simultaneously become more important than ever to understand and weigh in on our energy policies to make sure residents are having a say in ensuring energy policies are sustainable, affordable, and are limiting carbon emissions.

Understanding how demographic factors shape our attitudes toward energy policies is an important step in moving forward and developing progressive policies that limit our carbon emissions and foster in more sustainable energy technologies. For the sake of this research, an analysis will be done on a comprehensive Food-Water-Energy Nexus survey conducted by Oregon State University throughout the western states of California, Oregon, Washington, and Idaho. This study offers a wide array of information from which multiple demographic factors can be examined as they relate to the respondent's levels of understanding, their preferences and their values regarding the energy industry and policies. Specifically, the California portion of the data will be examined in this MPP Essay. As the national leader in progressive energy policies, it is important to examine how these early policies and developments are impacting the states citizens and also how the population is receiving these changes because it may serve as an early example of what our thoughts and developments may become nationwide on these topics.

Level of education, household income levels, and political ideology initially appear to have a stronger relationship with progressive energy policies and overall energy policy knowledge. If this is proven to be accurate it may indicate an overall lack of knowledge, resources and exposure to these technologies could be to blame for some NIMBY cases and more widespread resistance to mainstream adoption throughout the Pacific Coast region. But, does level of education or level of household income more so than other factors impact levels of support for renewable energies? What is it about education or income that could be driving this support, and does it also lead to additional demographic changes such political affiliation?

The research questions that will be guiding this research are how large of a role do personal factors play in shaping the public's views of renewable energy policies? Can a single demographic influence used as independent variables indicate progressive energy policy support or are there no clear trends to be identified during this process? If information does indicate a steady trend in a direction, can an explanation be offered that signifies an even deeper cause or opportunity for growth? Is public understanding a barrier these technologies are facing? In order to meaningfully address the unique challenges being faced and continue to build sustainable and efficient energy policies, these basic questions must be understood.

Essay Organization

This essay will be organized around exploring each variable and its overall impact on the survey questions being asked. Before getting to that however, a thorough explanation on why it is important to singularly examine California's data and current situation will be presented. With the nation's largest population base and economy, California faces unique energy challenges that must not only be addressed but done so with sustainable, efficient means. The state has

committed itself to some of the most aggressive renewable energy standards in the world with the pledge to generate all its energy from renewable sources by the year 2045. There will have to be many hurdles that are crossed before that can happen and chiefly among them will be gaining and maintaining the public support of the state's residents.

Without this, these commitments will not be met, and an unfortunate precedent may be set for others to reference when developing their own targets. If there is a continued lack of interest in the development and implementation of energy policies, then this leaves the door open for lobbyist and special interest groups to steer the discussion away from the public's best interest and more towards their own agendas. Successful policies and programs should represent popular public opinions and it's no coincidence that successful elected officials and their teams give credence to these public opinions. Typically, public opinion is a key if not a sole factor in determining whether states choose to expand or end established policies.

Following the California context, a literature review of relevant sources will also be presented. Most of the information being analyzed for this essay was found in the Food Water Energy survey that will be further detailed in the literature review. A heavy emphasis was placed on the role of the participant's level of education and their preferences, values, and knowledge levels of energy policies as well as their overall level of household incomes, and political ideologies. It must be noted that the survey respondents were slightly older, more affluent and had higher levels of formal education than the California public so this may impact the survey responses. These variables were examined using a variety of tests to obtain the information necessary to complete this research.

Before we can investigate the specifics of this data it is important that we first understand the state of California's energy commitments and goals and understand why they are important.

Most states in this country have renewable energy standards and targets however none of them are as lofty and as important California's. These policies are not able to be developed and implemented in a bubble and instead must first be supported and accepted by the state's residents. Without this, they would not be able to be put into place and ultimately be accomplished.

California Case Study Context

According to the California Air Resources Board, in 2017 the state of California emitted 424.1 million metric tons of CO₂ into the atmosphere every year while simultaneously having some of the highest priced electricity in the country and often is unable to produce enough of it for its citizens which requires it to import energy derived from fossil fuels from outside of the state (California Air Resources Board, 2017). In 2019 the national average price per kWh was registered at 10.58 cents per kWh while the average price inside of California was 16.7 cents per kWh (US EIA, 2019). Other than the state of Texas, California also has the largest demand for energy which also creates the second largest carbon footprint in the country which makes the search for renewable sources not only a preferred option but a necessary one (US EIA, 2017).

Today one of the most important factors for robust development of an economy is security of energy supply. Energy security concerns along with threats of carbon dioxide emissions and consequently global warming are rapidly rising in importance for developed countries (Aslani, 2014). California has not only realized that the days of burning fossil fuels to create energy are numbered but are now committing to renewable energy and efficiency goals that will cut the amount of carbon being introduced into the atmosphere and will have big impacts on local economies and communities.

As a result of the current reality that we are facing as a planet, the state of California has committed itself to some of the most aggressive policies that reduce greenhouse gas emissions by emphasizing the creation of renewable energy sources (Milanes, 2018). First begun in 2002, the state developed and signed into law the Renewable Portfolio Standard (RPS) program with Senate Bill 1078 which mandated the requirement of 20% electricity generation be produced by renewable resources by the year 2017. The Legislatures intent for establishing the RPS was to increase the diversity, reliability, public health, and environmental benefits of the state's electricity supply (Mack, 2015).

Following the initial RPS, the state of California signed SBX-1 into law in April 2011 which moved the RPS target to 33% production of total energy from renewable sources by 2020. Governor Edmund G. Brown, Jr., remarked at the signing that "This bill will bring many important benefits to California, including stimulating investment in green technologies in the state, creating tens of thousands of new jobs, improving local air quality, promoting energy independence, and reducing greenhouse gas emissions" (Energy.Ca.Gov, 2017).

In October 2015, Governor Brown again raised the renewable energy target by signing Senate Bill 350 which contained the provision which mandates retail sellers and publicly owned utilities to procure 50% of the entire state's electricity needs from renewable sources by the year 2030 (Energy.Ca.Gov, 2017). This bill also created additional energy efficiency standards that are projected to reduce the state's energy requirements by up to 25%. In 2018 this target was again amended when Senate Bill 100 was signed into law, which further increased the RPS to 60% by 2030 and requires the entirety of the state's electricity to come from carbon-free resources by the year 2045.

According to the National Council of State Legislatures (Kolesnikoff, 2020), California's current Renewable Energy Portfolio Standard levels are:

- 44% of retail sales by December 31, 2024
- 52% of retail sales by December 31, 2027
- 60% of retail sales by December 31, 2030
- 100% clean energy by 2045

These are major steps towards reducing our greenhouse gas emissions and proves that California is leading this movement by example. This commitment to 100% renewable energy by 2045 is one of the most significant commitments of its type that has ever been attempted. On its own, California houses the fifth largest economy, one that has a tremendous appetite for fossil fuels which makes this quest not only extremely difficult but also virtually impossible without the buy in and support of the state's residents.

California's commitment to its aggressive renewable energy standard is important because it establishes California as one of the nation's leader in clean energy being one of only 5 states to pledge to be running off of 100% renewable energy by 2045 (Kolesnikoff, 2020). The California Energy Commission (CEC) 2018 Total System Electric Generation estimates that the state generated about 33% of its electricity from renewable sources in 2018 as opposed to the overall renewable energy generation of 16% of the national's total and a state average of 6.8% generation of renewable energy (US EIA, 2020), which means California greatly outperforms the national average in this sector. As California continues to set these aggressive renewable energy targets, it encourages local governments in other parts of the country to update their own standards and push beyond for more aggressive goals.

In the state of California alone, nearly 20 percent of all carbon emissions come from the generation of electricity (California Air Resources Board, 2017). This may seem like a manageable amount when compared to some other parts of the country. However, when the size of the state's residential, commercial and agricultural energy requirements is factored in, this amount becomes staggering: equal to 440 million metric tons of greenhouse gas emissions annually as of 2015 (Clegern, 2017).

According to a 2018 International Renewable Energy Agency (IRENA) report, renewable generation increased at an annual average rate of 6.4% between 2009 and 2014. During the same period, the annual growth rate outpaced growth in electricity demand and in generation from non-renewables. This same report also determined that "the price of PV modules dropped by more than 80% and the cost of electricity from solar PV fell by almost 75% in the years between 2010 and 2017. The price of wind turbines dropped by about 50% (depending on the market) over the same period, and the costs of onshore wind electricity fell by almost 25%" (Page 59). With the energy industry seeing this much technological breakthrough the question must be asked, does all of this have an impact on how people perceive these sources of energy?

Even with all this new energy generation, California is still by far the largest net importer of energy in the United States. According to the US Energy Information Administration, the state imported nearly a third of its total energy consumption from other states. Because California depends so heavily on other states energy generation, it is important that this imported energy comes from renewable sources otherwise it does nothing to lower the overall carbon footprint. By hitting the aggressive targets that the state has committed to, it will be able to demonstrate the effectiveness of renewable energy sources to its neighbors which in turn should increase the likelihood of this energy being created through sustainable resources.

If we are going to study the specific influences that play into the state's energy policies and conservation ideologies, an understanding of the greater California demographics must also be established. According to the 2018 U.S. Census, 82.9% of the state's population are high school graduates and another 33.3% are bachelor's degree holders. Also, according to the 2018 U.S. Census the median household income within the state was \$75,277. That is an important figure to remember when comparing residents' feelings on specific policies and ideals against their household incomes. What is considered a high household income in some states may differ significantly from other more expensive states such as California. California's neighbors have medium household incomes of \$63,246 (Oregon), \$58,646 (Nevada), and \$59,246 (Arizona), all considerably less than California while the US median household income was \$61,937.

As previously mentioned, none of this would be possible without the support of California's residents therefore it is imperative that we understand who these individuals are and why it may be that they are so willing to embrace these progressive new ideas and goals. These demographics are very complex and not often as black and white as we would like to believe. Does California's robust economy lead to higher levels of education which in turn leads to salaries that are above the national average? And are individuals with higher levels of education and money even more likely to support these ideas? And is any of this data that can be used to get increased public support for renewable energy technologies and policies outside of a state like California?

Literature Review

Finding sources that spoke to the specific variables identified was challenging with very little data offered on the state of California level. With that said, there was still enough data

available to make clear determinations as well as address the later to be addressed hypothesis. Most of this data supports each other in finding that household income, level of education, and political affiliation are all directly related to energy policy ideals and preferences. Some found differing levels of support however the consensus was nearly unanimous. These sources were a collection of internet and physical peer reviewed journals along with relevant books written by some of the foremost authorities in the renewable energy policy fields.

Before the relationships between individual variables can be understood it is important to understand why these opinions and levels of support are important. Stokes (2017) points out that not only does public support play an integral part in policy implementation but the design and the framing of the policy conversely influences public support. Framing potential policies around economic and air quality issues makes Renewable Portfolio Standards (RPS) much more agreeable for much of the population than if they were to be based around Climate Change.

The first variable researched is the relationship between political ideologies and level of support for renewable energy. Funk and Kennedy (2016) determined that individuals across the political spectrum widely support the expansion of renewable energy sources, but the expansion of fossil fuels is divided along political ideologies. In this Pew research, only 14% of liberals support the expansion of coal mining with 17% supporting the expansion of fracking meanwhile 73% of conservatives support the expansion of coal mining and 70% support the expansion of fracking. These are trends that are also examined in the research presented in this paper.

Political affiliation and ideology are further defined as common traits for individuals when determining how they feel on energy policies. According to Mayer and Smith (2016), conservatives that are less educated are more likely to support the expansion of fossil fuels while more educated ones are more likely to oppose this expansion. They also found that among low

income conservatives, there was minimal deviation for their support of expansion of fossil fuel pipelines however this support decreased as conservatives' level of education increased. Conversely, they found that as Democrats level of education increased, so did their level of support for pipeline expansion. Regarding the expansion of offshore drilling, the authors found very little deviation in levels of support across the political spectrum among those with lower levels of education however those that identified as extremely conservative saw their levels of support for offshore drilling increase as their level of education also increased. Overall, their research concluded that there is significant evidence to support that level of education and political affiliation were major contributing factors in the levels of support for fossil fuel expansion.

Lawrence Hamilton (2019) also reaches these conclusions in his work by finding that self-described Democrats were 53% more likely to support renewable energy than the republicans questioned. He also goes on to determine that while level of education is an important variable it can be heavily influenced by the individual's political ideology thus potentially indicating that political ideology may be the stronger variable of the two. Furthermore, he finds that increased education may actually decrease identified conservatives' level of support for renewables while simultaneously having the reverse impact on Liberals.

Slightly conflicting with Lawrence Hamilton's 2019 findings, Marcos J. Pelenur and Heather J. Cruickshank (2012) interestingly find that their results indicate that individuals with a degree or more of education saw their personal behavior/lifestyle as a barrier (i.e. they may be less willing to compromise comfort or time). This raises the question of whether level of education increases self-awareness or makes individuals less likely to compromise when it is not convenient for them to do so? This study was done measuring energy efficiency and barriers to

entry for individuals. Studies mimicking these results are plentiful but what studies do not typically measure is energy policy knowledge, values, and preferences. We can make assumptions based on these researchers work and how participants reacted to climate change and energy efficiency, but it still leaves something to be desired on energy policy.

In his own studies, Anthony Leiserowitz found that “liberals, females, minorities, individuals with higher educational achievement, and members of environmental groups were more likely to support higher taxes to mitigate climate change” (Leiserowitz, Page 62). Lawrence Hamilton (2012) has similar observations as well pointing out that “Belief and concern about anthropogenic climate change increase with education or science literacy among individuals who identify themselves as Democrats or liberals, but do not increase (and may even decrease) with education or literacy among Republicans and conservatives” (Hamilton, Page 236). Hamilton continues to find that survey questions being answered correctly regarding renewable energy and climate change were done so more frequently as education levels increased.

Perhaps as strong of an indicator as any in determining individuals’ level of support for renewable energy is the level of household incomes for these individuals. In their book *Cheap and Clean* Ansolabehere and Konisky (2016) conduct a comprehensive study of nationally representative survey data on U.S. public opinion of energy issues over the course of a decade. They are able to determine that generally American’s mostly do not favor carbon taxes or other progressive energy policies, instead preferring additional regulations of emissions, even though such regulations are much less effective in reducing carbon emissions and do not raise any additional revenues. Additionally, they show that Americans primary inclination in determining their energy preferences are related to cost followed by environmental impact. This sentiment

may be a result of individuals that possess higher levels of education also typically generate higher levels of household incomes. A common theme throughout this research is individuals' choices being financial based before environmental based.

According to the Berkeley Economic Review, there may be some significant challenges and tradeoffs that take place along the state's pursuit of 100% renewable energy by 2045. The economic review notes that the average price of electricity is going to increase fairly drastically as the number of renewable sources increases for an indeterminable amount of time. Therefore, the question must be asked how much are the states inhabitants willing to pay to decrease their CO2 emissions? With the large number of residents prioritizing economics over the environment this may be an additional barrier for the industry. Additionally, less than half of the current electrical grid is equipped to handle mass amounts of renewable energy flowing into it. Upgrading the entire grid system would require vast amounts of capital which would only result in further increases for Californian's. This could prove to be extremely worrisome for lower income households and may further push them towards an all of the above approach.

According to the Yale Program on Climate Change, women are more likely than men to care about the environment and have stronger opinions on climate change. While their research did return similar levels of participants that felt climate change was occurring, women were far more likely to identify the severity of it and believe it is harming the country. Women were also more likely to be versed in scientific studies on climate change and renewable energies but were also more unsure of the overall situation than their male counterparts. This is an interesting finding but also may be attributed to becoming more aware of unknowns as they become more informed. Among conservative participants in their study, women were far more likely than men (63% vs 39%) to believe that climate policies harm the economy. Overall, Republican Male

respondents were far more likely to support the increase in fossil fuel use and the reduction in environmental protections than any other demographic group measured in the study.

Prospects for Alternative Energy Development in the U.S. West (2017) written by John C. Pierce and Brent S. Steel attempted to identify whether an individual's values, knowledge, and geographic location has any effect on whether they support the development and implementation of alternative energy technologies. The book does an excellent job of portraying the differences and the challenges between conservationists and environmentalists. It is often assumed that these two ideologies are mutually exclusive however this is quite often not true and their agendas conflict with one another. Additionally, it was identified that public perception is generally positive for renewable energy development in principle but declines when it is proposed in a specific place. Installation of the technology, especially in geographic proximity to the proposed site, tends to result in an increase in public support. This is information that directly leads into where the majority of this essay draws its data from.

Guiding this research will be some core hypothesis that have been developed in an attempt to explore the most relevant variables that would provide insight into the state's populations energy preferences and how this has impacted the energy policy development within the state. The first hypothesis examined is whether increased levels of formal education are associated with higher levels of support for renewable energy. If there is a relationship here, understanding what is gained through increased education that is not gained otherwise would be a tremendous step towards more widespread adaptation of these new sources of energy.

The next hypothesis studied is that, increased levels of household income are associated with higher levels of support for progressive energy policies. It is broadly believed that with increased levels of education also comes higher levels of income but is there statistical data to

support this assumption? If this is not true but we still see the higher income households still support renewable energy expansion could it mean that it is a stronger indicator of support than level of education? Along with Levels of education and household income levels, it is also being hypothesized that the respondent's political ideology is indicative of the participants level of support for renewable energy policies.

Understanding the demographics that go into supporting renewable energy development alone will most likely not offer enough of a widespread perspective to gain a complete understanding and as a result, additional independent variables will be getting explored. The final hypothesis being proposed is that political ideology is also directly linked to participants level of support for environmental conservation and renewable energy support. This is an interesting avenue to explore because it is the more polarizing variable to examine but also has more layers than it appears to on the surface. When pairing this variable with levels of education and household income the results may be surprising

Hypotheses

Based on the literature, the following were the hypotheses tested using random household survey data collected in California in 2018:

- H1: Increased levels of formal education are associated with higher levels of support for renewable energy.
- H2: Increased levels of household income are associated with higher levels of support for progressive energy policies.
- H3: Political ideology is indicative of participants level of support for renewable energy development with self-identified liberals more supportive of renewables than their conservative counterparts.

Data and Methods

Most of the information being analyzed in this essay is going to be found in the OSU Food-Water-Energy survey identified earlier in the literature review. A heavy emphasis is being placed on the role of the participant's level of education and their preferences, values, and knowledge levels of energy policies as well as their overall level of household income, as well as the role political ideologies play on these variables. The authors of this survey were faculty members at Oregon State University and was originally meant to measure the knowledge levels and public opinions of the Food-Water-Energy Nexus in the states of California, Washington, Oregon, and Idaho. The survey participants were selected randomly by the University staff using an outside organization which generated random households for participation with the original study being approved by the Oregon State University Institutional Research Board on December 6th, 2017 and was conducted throughout the Spring of 2018.

Participation in this survey was completely voluntary with their consent being given both physically and online. The combined California response rate for this survey was 37.2% for a total N of 435. 31.7% of the respondents chose to complete the online questionnaire with the remaining respondents participating through mail in services. Survey participants were required to be over the age of 18 and have the eligibility to vote. A comparison between respondents to the questionnaire and the 2010 California Census data, showed that the respondents to this survey were more likely to be older, more affluent, and more educated than the general state population. These demographics may affect the results of the survey which is why it must be considered. The data was overrepresented by left leaning respondents, more than most of the previous studies done so this must also be taken into account. While nearly all the data contained in this research project was derived from this existing survey data set, there were additional

outside resources that were consulted throughout the research process that were found to be consistent with the OSU Survey data.

The first step in conducting this survey was to mail prospective participants postcards bringing the survey to their attention as well as detailing how to complete the online survey. After participants received the postcard, they received a physical copy of the survey, personal words encouraging their participation along with prepaid business postage for their responses should they choose to participate. The authors believe the average time of completion on these surveys was between 8 and 10 minutes per participant. These prospective participants were selected randomly by a third-party random sampling company using the USPS Computerized Delivery Sequence File (CDS). This resource generated a total of 1,170 households within the state of California for potential participation.

The survey questionnaire was originally designed to elicit barriers to food-water-energy nexus policies. I examined selected demographic preferences and opinions and how they shaped opinions on energy policies, specifically. In order to do this SPSS was used to run analysis and to identify trends in this research. Multiple variables overall are being examined along with a variety of tests being run to obtain the information necessary to complete this research. Cross tabulations and frequency distributions will play a large role in this research in order to analyze the relationships between multiple variables such as level of income or education levels and levels of support for a variety of different energy policy preferences. Understanding how these demographic groups feel about the state's energy markets and policies and how they impact the development of policies is paramount to serving citizens as effectively as possible as well as identifying the local government's perceived shortcomings as well as successes. Identifying the

primary influences on support for progressive energy policies is an important part of developing and successfully implementing progressive energy policies.

Cross tabulations and frequency distributions played a large role in this research to analyze the relationships between variables such as level of income or education levels and levels of support for a variety of different energy policy preferences. Additionally, Chi-Squares, ANOVA tables, and multivariate regressions are also playing a large role in analyzing the information and testing the hypothesis stated previously. All of these functions are needed to verify the picture that each are showing. The data (which will be covered in depth in the findings) does support the hypothesis of elevated education levels, household incomes, and political ideologies do indicate an increase in overall support for progressive energy policies and further renewable energy development. The different variables being singled out and examined throughout this research will be what the factors of Levels of education, Household income, and political affiliation play in one's level of support for renewable energy policies within the state of California. Each of these variables will be looked at using the same methods.

Table 1. Variable measurements and descriptive statistics

| Variable | Question | Descriptive Statistic |
|-----------------------|----------------------------|-----------------------|
| Level of Education | 1= Less than HS | 1= 1.1% |
| | 2= High School Grad | 2= 13.8% |
| | 3= Some College | 3= 52.2% |
| | 4= 4 Year Degree or Higher | 4= 32.6% |
| <hr/> | | |
| Household Income | | |
| | 1= <\$10,00 - \$34,999 | 1= 23.6% |
| | 2= \$35,000 - \$74,999 | 2= 38.2% |
| | 3= \$75,000 - \$150,000+ | 3= 37% |
| <hr/> | | |
| Political Affiliation | | |
| | 1= Very Liberal | 1= 26.0% |
| | 3= Somewhat Liberal | 3= 17% |
| | 5= Moderate | 5= 17.2% |
| | 7= Somewhat Conservative | 7= 28% |
| | 9= Very Conservative | 9= 9.6% |

Empirical Findings

Level of Education: Much support that is held in the general public for renewable energy technologies is because of the dirty nature of traditional sources of fuel and the subsequent anthropogenic climate change that comes as a symptom with this pollution. Using this as an initial metric to base the research on it is important to examine the discussion of whether the

Earth's increase in temperature is due to manmade activities or a result of natural patterns. Table 1 shows how the respondent's level of education influenced their beliefs on this hot button topic issue.

Table 2: Level of Education and Climate Change Beliefs

| N= 434 Chi-Square: 46.088a | Grade School | Middle School | High School | Some College | College Graduate | Graduate School Degree |
|----------------------------------|-----------------|------------------|----------------|-----------------|---------------------|------------------------------|
| Human Activity | 0% | 27.3% | 41% | 55% | 69.9% | 76.4% |
| Natural Patterns | 100% | 45.5% | 40% | 35.3% | 18.2% | 13.9% |
| Don't Know | 0% | 27.3% | 19% | 8.8% | 12% | 9.7% |
| N = | 1 | 13 | 198 | 118 | 69 | 35 |

Chi-Square Tests 1-1: Level of Education and Climate Change Belief

| | Value | df | Asymptotic Significance (2-sided) |
|------------------------------|---------------------|----|--------------------------------------|
| Pearson Chi-Square | 46.088 ^a | 14 | .000 |
| Likelihood Ratio | 46.747 | 14 | .000 |
| Linear-by-Linear Association | 26.797 | 1 | .000 |
| N of Valid Cases | 635 | | |

Examining this cross tabulation, it is clear that there is a relationship between level of education and the survey respondent's opinions on the warming of our climate. Beginning with those with only a middle school level education only 27.3% of the respondents felt the warming of the climate was attributed to human activity while 45.5% felt it was part of the natural weather patterns. We see these numbers even out with those at the High School level of education with 41% believing it is human activity based with 40% believing it is natural weather patterns.

This trend continues for the "some college" category with 55% believing the warming of the climate is human caused with 27.1% stating it is pattern based. The numbers for human

linked increase to 69.9 and 76.4 percent among the college graduate and graduate school demographics while the number believing the warming of the climate is pattern-based decreases to 18.2 and 13.9 percent among these same groups.

Interestingly we also see the number of respondents responding “don’t know” to these questions decrease with a rise in the education levels. Among Middle School levels of education 27.3% stated they did not know whether the warming of the climate was human caused or natural patterns with this number dropping to 12% among college graduates and down further to 9.7% among those at the graduate level. The corresponding Chi-Square above also supports the conclusion that there is a strong relationship between level of education and how the respondents answered this question. The probability of .000 suggests that the relationship is significant, and the analysis of the data was correct. Additionally, the Chi-Square value of 46.088 also demonstrates that this outcome was not likely to be a result of chance.

Given the clear results of the previous data presented above, it must be acknowledged that level of education absolutely is a decisive variable in determining one’s belief in climate change. It is important that these same respondents’ level of knowledge and understanding is measured and see if we can see the same pattern broken down here when level of education is controlled as the independent variable.

Additionally, before we can begin to better understand the significance of the role these influences play in this discussion a detailed look at how informed the participants were overall should first be introduced. Table 2 below shows how informed the participants were regarding energy policy overall. The frequency table shows that there is an overall lack of knowledge of energy policy with more than 71% of the respondents identifying as “not informed” or as only being “somewhat informed.” Only 18% of respondents felt that they were “informed” with only

10% feeling they were “very well informed.” With such large amounts of respondents feeling uninformed on the topic it is clear that there needs to be enormous improvements on this front if there is going to be any type of continued progress. Is this gap in knowledge a result of lack of information availability or is it a symptom of something else entirely such as the topic being overly complex which turns people off of the topic? This lack of confidence in their knowledge base also may indicate their downstream levels of support for renewables may also only be soft support and they could be persuaded differently by alternative information.

Table 3: How Informed Respondents are on Energy Policy

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|-----------|--------------------|-----------|---------|---------------|--------------------|
| Valid | Not Informed | 155 | 35.6 | 35.8 | 35.8 |
| | Somewhat informed | 156 | 35.9 | 36.0 | 71.8 |
| | Informed | 78 | 17.9 | 18.0 | 89.8 |
| | Very well informed | 44 | 10.1 | 10.2 | 100.0 |
| | Total | 433 | 99.5 | 100.0 | |
| Total N = | 435 | 100.0 | | | |

Breaking down the same data but asking the participants to “indicate their level of opposition or support for increasing funding for research on renewable energy technologies “ and using this as the dependent variable and leaving level of education level as the independent variable offers a different look at the responses with a minimal change in the dependent variables. For instance, if the same respondent felt the rise in global temperatures was due to manmade activities than we should assume they would also support an increase in funding for renewable energies and vice versa. Table 4 below depicts this information.

Table 4. Education Level and Support for Renewable Energy Funding

| | | | | |
|--|---------------------------|--------------------|-------------------|-----------------|
| <i>Question:</i> A number of policy options have been proposed to manage energy resources. Please indicate your level of opposition or support for each of the following options - Increase federal funding for research on renewable energy technologies. | | | | |
| | Level of Education | | | |
| Renewable Support | High School | Some College/ A.A. | Bachelor's Degree | Graduate Degree |
| Oppose: | 55.3% | 22.9% | 2.4% | 3.4% |
| Neutral: | 12% | 8.4% | 23.2% | 10.3% |
| Support: | 32.3% | 55.5% | 74.4% | 86.2% |
| N= | 65 | 227 | 82 | 58 |

| | Value | df | Asymptotic Significance (2-sided) |
|------------------------------|----------------------|----|-----------------------------------|
| Pearson Chi-Square | 125.736 ^a | 24 | .000 |
| Likelihood Ratio | 133.176 | 24 | .000 |
| Linear-by-Linear Association | 48.903 | 1 | .000 |
| N of Valid Cases | 432 | | |

Over 55% of the high school graduates surveyed opposed the increase in federal funds to renewable energies while only 3.4% of respondents that had some post graduate studies or possessed post graduate degrees opposed this same issue. Nearly 75% of the participants that possessed bachelor's degrees were supportive of this issue. But is this overwhelming support a symptom of being more educated or are there secondary and tertiary factors that play into it? Are self-identified liberals more likely to become more educated and drive this demographic instead of being the other way around? Either way, there is an unmistakable trend that demonstrates that support for increasing federal funding for research on renewable energy technologies directly

risers as the respondent's level of education does. We see drastic increases in support at every education level.

Attempting to get more confirmation on the proposed hypothesis, I ran an ANOVA Table analysis (shown below) on these same variables. The goal for this testing was to demonstrate that as education increases so too does the level of awareness of energy policies among individual participants. The total combined mean for these groups was 2.03. Within the groups the mean was less, coming in at .921 and between groups it 2.697. As the level of education increased, we also see a corresponding increase in the mean for each group. The P-Value is shown in the table is .008, which signifies that the relationship is statistically significant.

Table 5. Level of Education and Self Assessed Informedness on Energy Policy

| Level of Education and Understanding of Energy Policy | | | | | | |
|--|----------------|----------------|-----|-------------|-------|---------------|
| | | Sum of Squares | df | Mean Square | F | Sig / P-Value |
| In general, how well informed would you consider yourself to be concerning the following issues? - Energy Policy * What is your level of formal education? | Between Groups | 16.182 | 6 | 2.697 | 2.928 | .008 |
| | Within Groups | 391.484 | 425 | .921 | | |
| | Total | 407.667 | 431 | | | |

| Measures of Association | | |
|--|------|-------------|
| | Eta | Eta Squared |
| In general, how well informed would you consider yourself to be concerning the following issues? - Energy Policy * What is your level of formal education? | .199 | .040 |

The effects size (eta) is .199 which falls between minimal and medium strength. Had this number been higher we would have been able to say more confidently that the claim of level of

education having a direct influence on energy policy awareness was true however, given all of these factors in its entirety, I believe we have to accept the hypothesis that education levels do influence level of knowledge because of the high P-value and the rise in means as education levels increased.

Next, I wanted to gain an understanding of where these factors would take us when the respondents were asked a pointed question on whether they supported building additional power plants. The results of this question would be predictable if political affiliation were being used as the independent variable but instead, I am using level of education to weigh their responses against. Table 6 below depicts the results. Again, we see opposition to the expansion of traditional energy sources as education rises but unlike the other tests done, we see a sharp increase in support between College graduates and those holding graduate degrees by nearly 10%. I am unable to determine the cause of this spike in support, but I believe it is due a simultaneous “all of the above” approach that may be preferred by some demographic groups.

Table 6. Education Levels and Support for Building Power Plants

| | | | | |
|---|---------------------------|--------------------|-------------------|-----------------|
| <i>Question:</i> A number of policy options have been proposed to manage energy resources. Please indicate your level of opposition or support for each of the following options – Build Additional Power Plants. | | | | |
| | Level of Education | | | |
| Building Additional Plants | High School | Some College/ A.A. | Bachelor's Degree | Graduate Degree |
| Oppose: | 6.1% | 17.6 % | 30.1% | 13.8% |
| Neutral: | 10.8% | 37% | 37.3% | 41.4% |
| Support: | 83.1% | 45.4% | 32.5% | 44.8% |
| N= | 65 | 227 | 83 | 36 |

| | Value | df | Asymptotic Significance (2-sided) |
|------------------------------|---------------------|----|-----------------------------------|
| Pearson Chi-Square | 76.451 ^a | 24 | .000 |
| Likelihood Ratio | 82.175 | 24 | .000 |
| Linear-by-Linear Association | 15.427 | 1 | .000 |
| N of Valid Cases | 433 | | |

In order to find out if this all of the above hypothesis persists; I ran the same cross tabulation as table 6 but swapped out the power plant question for support for building oil pipelines. This information is included below as Table 7. Again, we see the respondent's level of support for building oil pipelines decrease as their level of formal education does. This information taken with the respondent's clear pattern of opposition for the building of power plants as formal education levels rose demonstrates an overall pattern relating to fossil fuel use. We can confidently state that level of education does impact levels of support for fossil fuel use with increased levels of formal education correlating with decreased support for their use. Based solely on this information we cannot say that this opposition to fossil fuels translates to support

for renewable energy policies but does suggest there may be an opening here for increased support.

Table 7. Levels of Education and Support for Building Oil Pipelines

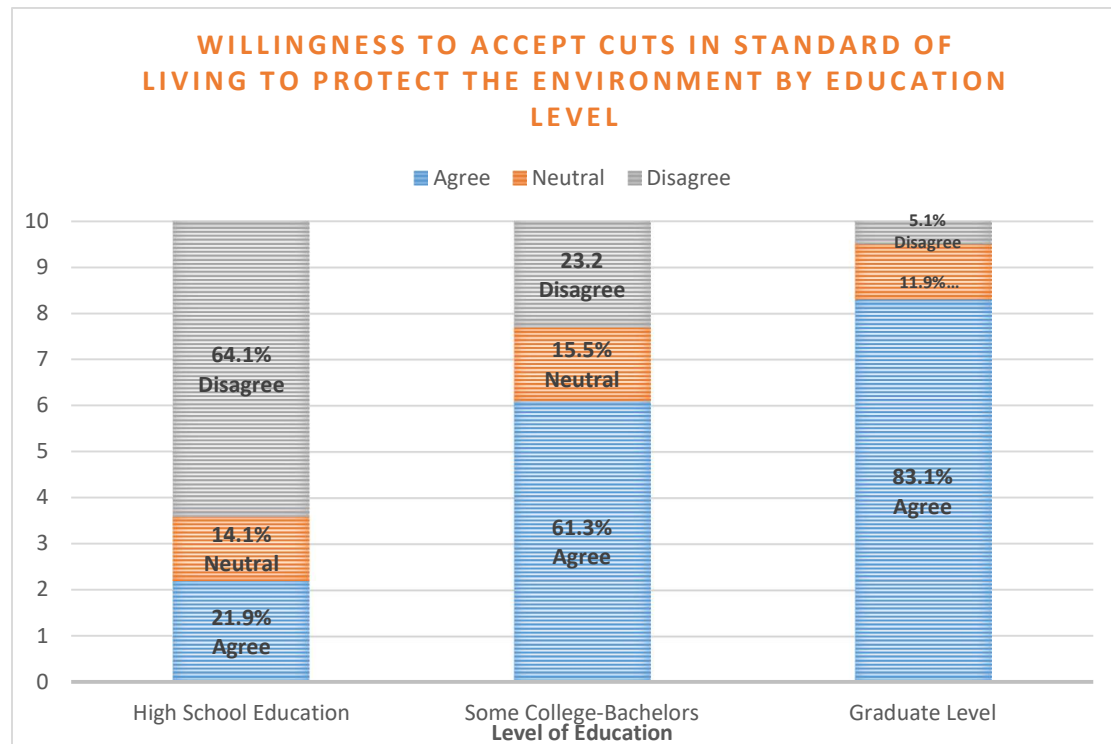
| | | | | |
|---|---------------------------|--------------------|-------------------|-----------------|
| <i>Question:</i> A number of policy options have been proposed to manage energy resources. Please indicate your level of opposition or support for each of the following options – Build pipelines to bring oil from other regions. | | | | |
| | Level of Education | | | |
| Building Oil Pipelines | High School | Some College/ A.A. | Bachelor's Degree | Graduate Degree |
| Oppose: | 13.8% | 52.4 % | 59% | 33% |
| Neutral: | 12.3% | 12.7% | 24% | 47.2% |
| Support: | 73.8% | 34.8% | 16.8% | 17.4% |
| N= | 65 | 227 | 82 | 58 |

| | | | |
|------------------------------|---------------------|----|-----------------------------------|
| | Value | df | Asymptotic Significance (2-Sided) |
| Pearson Chi-Square | 89.961 ^a | 24 | .000 |
| Likelihood Ratio | 96.877 | 24 | .000 |
| Linear-by-Linear Association | 34.090 | 1 | .000 |
| N of Valid Cases | 433 | | |

Continuing with the evaluation of levels of education, it was identified that there is also an established relationship between the respondent's willingness to accept cuts in their standard of living in order to protect the environment and the respondent's level of education. Participants with graduate level educations were found to be nearly 62% more likely to be willing to make these sacrifices than respondents whose highest level of education was high school. Table 8 below illustrates this point. There could be many explanations for why this may be, but it is an interesting concept to explore. It is much easier to make sacrifices when you have more

resources to do so. This perception could be a barrier that was not anticipated earlier in this research. Is it fair to ask those with limited resources to sacrifice what they have while other more successful individuals may not be feeling the sacrifices equally? This also assumes that individuals with higher educations also have on average higher household incomes.

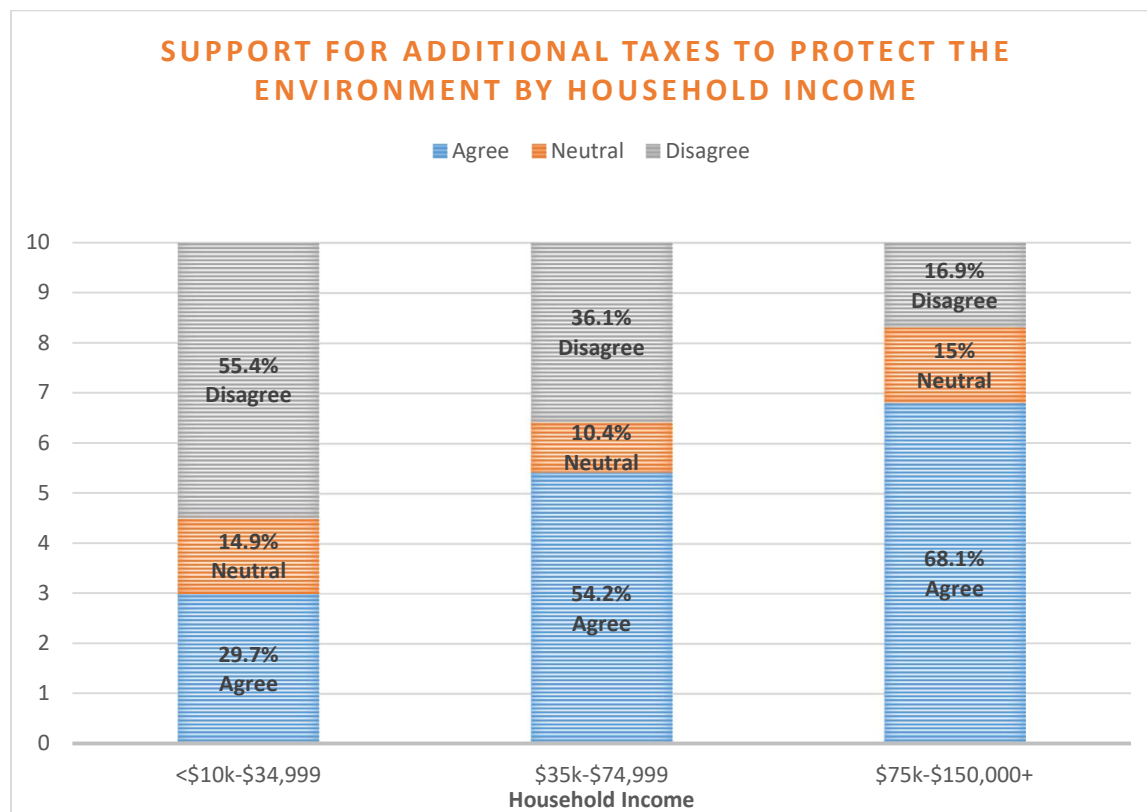
Table 8. Willingness to Accept Cuts to Protect the Environment



Household Income: The second hypothesis measured using this survey data explores the role household income plays in determining support for renewable energy policies. Similar to measuring level of education's role in this discussion it is important to first understand the outside influences that surround this question. The figure below captures the growing disparity between income levels and their support of increasing taxes to help protect the environment. Much of California's cost of living are among the nation's most expensive and because of this, household incomes are often stretched very thin, so it is no surprise that lower income homes

overwhelmingly disapprove of additional taxation. This is a similar pattern as we seen when measuring levels of education. Those with more resources are also the ones that are willing to sacrifice more to protect the environment and embrace renewable energy technologies.

Table 9. Household Income Levels and Support for Taxes to Protect the Environment



In order for the respondents to be in support or opposition of certain energy policies and preferences they should first have a certain level of understanding of the current policies in place. Table 10 presents results on how informed the respondents felt regarding energy policies. We see an anticipated trend in this table, as household incomes rise so too does the feeling of being informed. Households bringing in less than \$14,999 felt they were not informed at a 60% rate while at the opposite end of the spectrum (Households making over \$150,000) only 27.2% felt they were not informed. Only 15% of households making between \$15,000 and \$34,999 felt they

were at least informed while 40.8% of households making greater than \$150,000 felt they were at least informed. This is a glaring disparity between these two demographic groups.

Table 10. Household Income Levels and Self Assessed Informedness Concerning Energy Policy

| <i>Question:</i> In general, how well informed would you consider yourself to be concerning the following issues? - Energy Policy | | | | |
|---|--------------|-------------------|----------|--------------------|
| Household Income | Not Informed | Somewhat Informed | Informed | Very Well Informed |
| Less Than \$14,999: | 60% | 40% % | 0% | 0% |
| \$15,000-\$34,999: | 43.1% | 41% | 9.4% | 6.3% |
| \$35,000-\$74,999: | 36.1% | 34.3% | 16.8% | 12.6% |
| \$75,000-\$99,999: | 35.4% | 32.3% | 22.9% | 9.4% |
| \$100,000-\$149,999: | 23.8% | 38.1% | 26.2% | 11.9% |
| \$150,000 and Above: | 27.2% | 31.8% | 27.2%% | 13.6% |

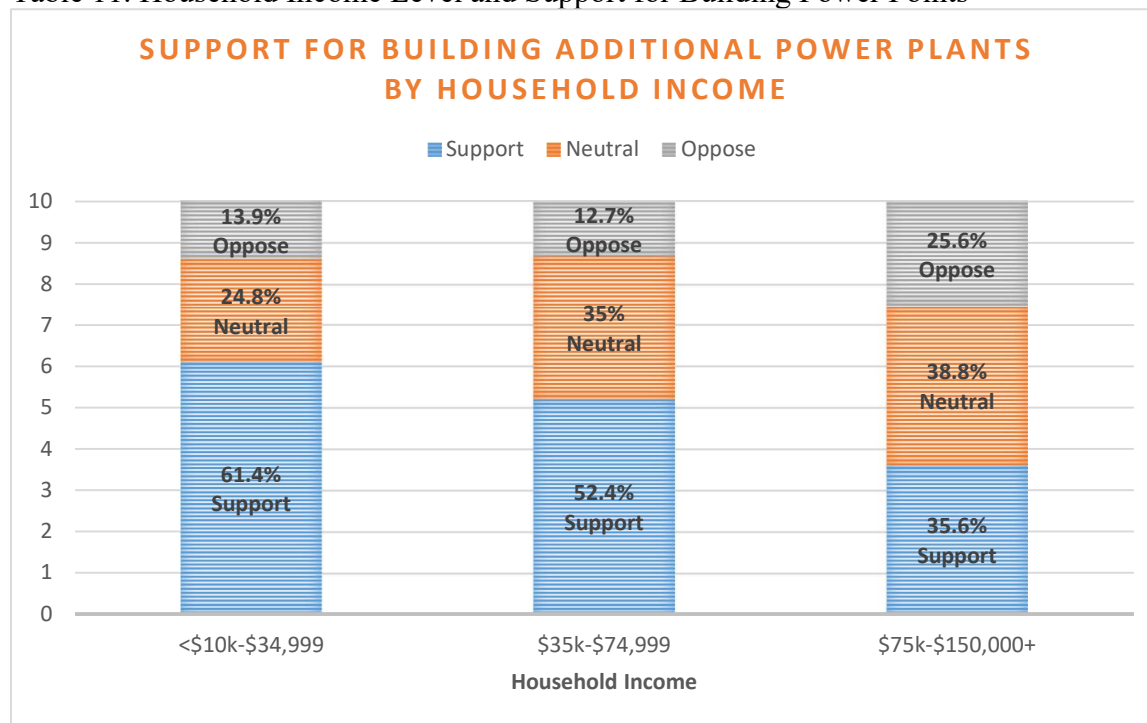
| | Value | df | Asymptotic Significance (2-Sided) |
|------------------------------|---------------------|----|-----------------------------------|
| Pearson Chi-Square | 35.920 ^a | 27 | .117 |
| Likelihood Ratio | 41.881 | 27 | .034 |
| Linear-by-Linear Association | 9.728 | 1 | .002 |
| N of Valid Cases | 426 | | |

Support for alternative energy technologies are also often directly related to one's household income as well. It is difficult to know for sure why the support of these methods breaks down this way, but it may have something to do with the overall level of education associated with the higher level of household income. 66.4% of the survey's respondents either supported or strongly supported increasing the amount of federal funds going to the research of renewable energy technologies while only 21% fell into the opposed or strongly opposed

categories. The data also suggests that all levels of household income support the expansion of nearly all fuel types, but this resonates much stronger with the lower income households. This is most likely because of the economic values the cheaper fuels could bring. This may also again suggest that they have a stronger preference for economic benefits over environmental gains.

Below is the level of support and standard deviations for demonstrating the support building new power plants has based on the average household income. As the figure shows, acceptance for policies increasing the number of existing power plants peaks in the \$25,000 to \$34,999 income range. This spike may be the result of the survey only attracting 24 participants in the \$0-\$24,999 income range and the \$25,000 to \$34,999 range being the first measured income range to have a large sample size of respondents (77 in this range alone). There is a good chance had the lower incomes been represented more heavily in this survey the mean support would have been higher than where it currently stands.

Table 11. Household Income Level and Support for Building Power Points



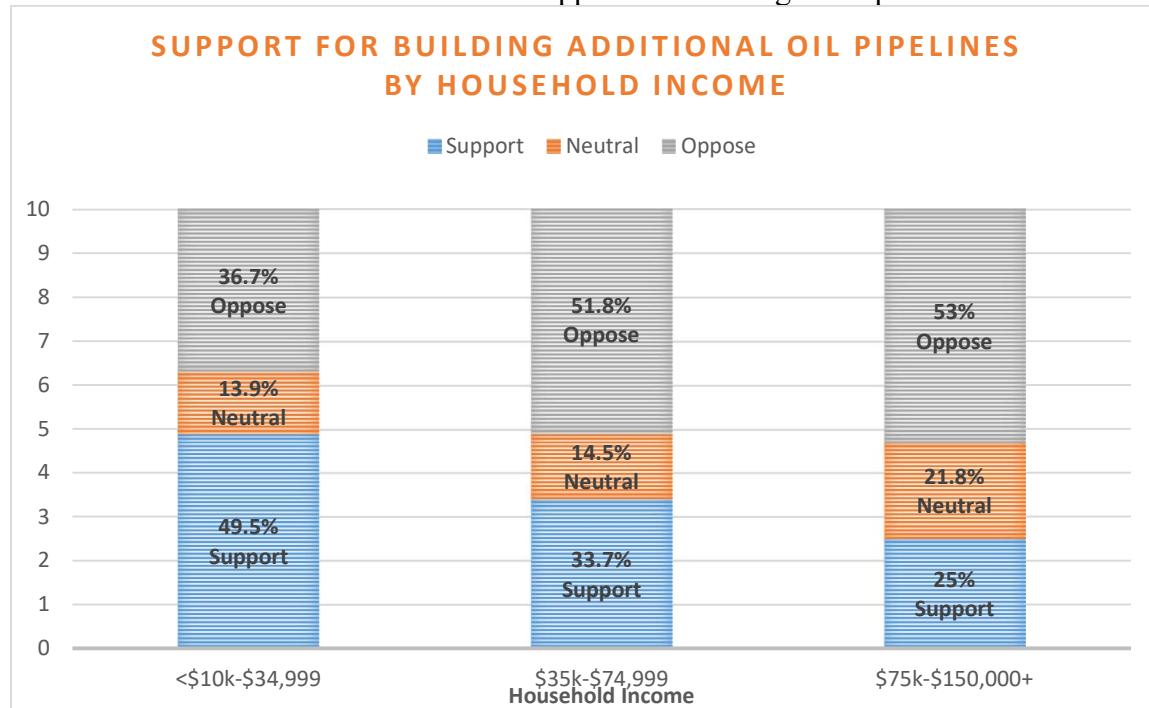
Californian's widely support the overall expansion of all sources of energy production but do so with varying degrees of support from differing demographics. The levels of support for renewables and fossil fuels are consistent with Baldassare, Bonner and Kordus (2017) and Ansolabahere and Konisky (2016)'s findings as well. I do however find a direct correlation between household income and the types of fuels and energy policies supported with higher income households preferring the expansion of renewables to fossil fuels while lower income households still prefer the expansion of oil pipelines, fracking, and building additional power plants.

For example, households with an annual income of \$0-\$10,000 are nearly twice as likely to support the creation and use of pipelines to transport oil from other regions as households in the \$75,000 to \$150,000 category. This finding is also in line with the average support for building new power plants. Only 11% of households making under \$50,000 oppose of building of new power plants but on the other end of this income spectrum households making between \$100,000 and \$199,999 are 35% likely to oppose of the building of these new power plants. Middle class families, falling between \$50,000 and \$99,999 were just under 18% likely to oppose the construction of these new plants.

These lower income households are most likely believing the expansion of these existing sources will benefit them economically. This belief in economic benefits overshadows environmental concerns with these existing sources of energy production. This may hint that these households place a higher value on economic strength and standing than environmental protection. This increased support for traditional fuel sources may also be attributed to the levels of education in this category. As was previously shown, a majority of the high levels of support

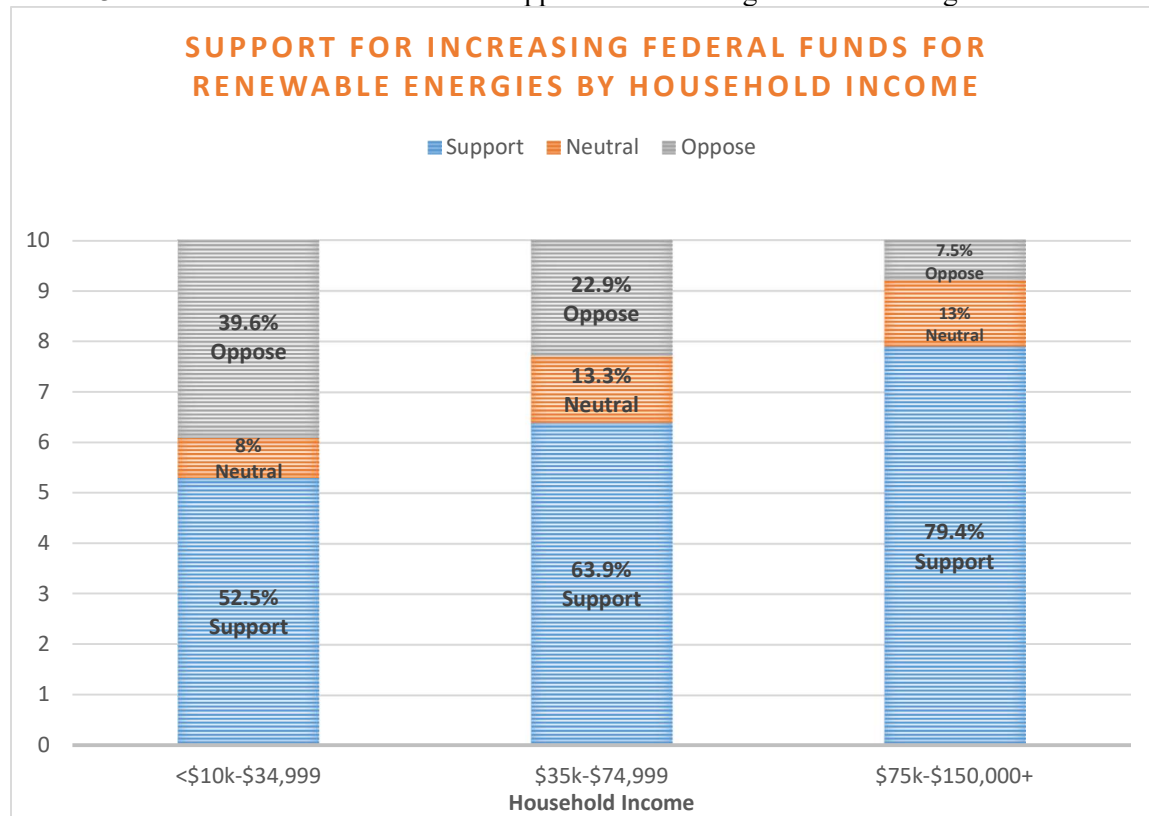
for additional power plants and oil pipelines come from the high school educated and some college level of education categories along with the lower to lower middle-income households.

Table 12. Household Income Level and Support for Building Oil Pipelines



The last but potentially most important empirical finding that helps support the hypothesis of levels of household income determining level of support for renewable energy technologies is presented below in Table 13. When asking the respondents what their level of support is for increasing federal funding for renewable energy technologies the results could not be more telling. We see 39.6% of households making less than \$34,999 oppose this idea while the households making between \$75,000 and more than \$150,000 support this idea at an 80% rate. This demonstrates that there is a strong relationship between these two variables indefinitely. The levels of support and opposition fluctuate precisely as the levels of income increase and decrease.

Table 13. Household Income Levels and Support for Increasing Federal Funding for Renewables



More focused questioning on energy policies and preferences would have been very beneficial in my opinion. This survey covered the broad food water and energy nexus and is very good at this but there is still room for more detailed coverage on the specific arms of the nexus and in this case, energy policy. This might prove to be the primary limiting factor in future research without more surveying being done.

Political Ideology: It is important to examine how the support levels were determined in this study because the number of participants in the study were not evenly distributed throughout this category of groups which could cause some of the information to be misleading or skewed. For instance, this survey has a large sample size of self-identified liberals but only 4 self-identified very conservatives. While the state is considerably liberal politically, this over

representation may also cause the study to not be a good representation of the actual population of the state.

The cross tabulation below breaks down the levels of support across the full political spectrum. 90 percent of self-identified liberals support or strongly support the expansion of renewable energy while the remaining 10 percent were found to be neutral. On the other end, only 27 percent of the conservatives polled supported the increase in federal funding of renewables with 68 percent opposing it. Of those 86 found to oppose this increase, only 1 was on the left side of the moderate scale. This comes out to nearly 99% of those in opposition residing as moderates to conservatives. This large sample size suggests that this is not the result of any outliers but instead an actual ideological response to the question being asked on the questionnaire.

Overall, this leaves 46% of the self-identified conservatives in opposition to the increase in federal funding for renewable energy technologies. It is unable to be determined if this opposition is to the increase in federal funds in general being spent (a traditional conservative argument) or a more targeted rejection of renewables themselves. This would require additional survey data to answer but would be valuable information to obtain, especially on the state level because it may be appealing for conservatives to think of this being handled on this state level. A valid question to raise is why are renewables so appealing to Liberals and not to Conservatives? Is it due to perceived efficiency and availability challenges or perhaps is it due to pricing concerns? If this question could be answered it may in turn decrease the number of Californians in opposition to the expansion of renewable energy technologies by giving policy makers, industry, and local organizers the ability to address these concerns held by the minority directly.

Table 14. Ideology and Support for Increasing Federal Funding for Renewable Energy

| | | | |
|--|-----------------|-----------------|---------------------|
| <i>Question:</i> A number of policy options have been proposed to manage energy resources. Please indicate your level of opposition or support for each of the following options - Increase federal funding for research on renewable energy technologies. | | | |
| | Ideology | | |
| Renewable Support | <i>Liberal</i> | <i>Moderate</i> | <i>Conservative</i> |
| <i>Oppose</i> | 0.5% | 14.7% | 46.0% |
| <i>Neutral</i> | 7.3% | 20.0% | 14.3% |
| <i>Support</i> | 92.1% | 65.3% | 39.8% |
| N = | 191 | 75 | 161 |

Chi-square =134.463, $p = .000$

The survey data suggests that people often believe that renewable energy is more expensive than its fossil fuel counter parts. Therefore, lower income households often have diminished opinions and levels of support for renewables. Overall higher household incomes were found to be associated with more progressive energy policies. Interestingly however, when asked how informed the participants were on energy policies the mean for households making less than \$10,000 came in around 1.5 while households making more than \$150,000 came in around 2.4 out of a possible 5.

Are self-identified liberals more likely to become more educated and drive this demographic? Examining the respondents political ideologies and comparing to their education levels it was able to be determined that self-identified “very liberals” all the way down to “moderates” in this survey were much more likely to pursue and obtain post graduate degrees than their conservative counter parts. Because of the small sample size on the conservative end of the political spectrum it is difficult to know if these results are reflective of the overall society

or if the information is misleading. What can be determined indefinitely is that moderates through conservatives have higher rates of high school being the highest level of education while liberals have a higher rate of having some college experience.

There has not been any data yet that seems to suggest that there a link between political affiliation and household income. Also, while there is no obvious link between these two, there is the evidence to suggest that higher income households prefer progressive energy policies. This data suggests that this remains true regardless of political affiliation meaning higher income self-identified conservatives may be more likely to support renewable energy developments than lower income conservatives. The likely explanation for these sentiments is the widespread belief that renewable energy sources are considerably more expensive than their fossil fuel counterparts. It may also be possible that the liberals that support renewable energy expansion derive their support through education while the conservatives that support renewable energy expansion derive their support from have the extra household income to off-set the perceived additional costs of renewable energy.

Both levels of formal education and household income levels indicated that there is a direct correlation between these variables and the survey respondent's energy policy preferences and ideologies. For example, only 27.3% of respondents with a middle school education felt that climate change is being caused by human activities while 76.4% of respondents with a graduate degree felt that climate change was caused by human activities. Also, an outstanding 55.3% of respondents with a high school education opposed increasing federal funds for renewable energy research while 76.4% of participants with graduate degrees supported these measures. With regard to levels of household income, households with more income were far more likely to pay

increased taxes as well as make additional sacrifices in their own lives in order to benefit the environment.

Policy Implications

The state of California already has some of the most aggressive renewable energy policies in place and is well on its way towards accomplishing its energy targets. With the state already generating over a third of its total energy consumption from renewable resources it does appear that the current policies are in fact working but what remains to be seen is if they are going to be sustainable as it becomes more difficult to produce this renewable energy during peak consumption hours which often do not coincide with peak generating hours for renewables. This need to bridge the energy gap here is outside of this discussion but there is still considerable policy implications and recommendations that are achieved through this questionnaire.

It should not be an enormous surprise that self-identified liberals favored the expansion of renewable energy sources but what was a surprise was how such a large percentage of conservatives felt that this expansion was unnecessary. They may feel this as a result of several different factors however an increased educational program on the state's energy initiatives and achievements would pay dividends in the future when trying to solicit the states population's continued support for these programs and targets.

A better understanding by the state's lower income households on the benefits of renewable energy is also sorely needed. Most feel that these new energy sources are more expensive than traditional fossil fuel sources of energy which makes them more reluctant to embrace these changes. Most also fail to consider the secondary and tertiary impacts of the continued use of fossil fuels on air and water quality as well as their health and wellness. According to the American Lung Association of California, a 2004 report found that amongst

other health concerns; 6500 premature deaths, 4000 hospital admissions for respiratory disease, 3000 hospital admissions for cardiovascular disease, and 350,000 asthma attacks are caused annually in California alone by the burning of fossil fuels (American Lung Association, 2004). All of these health issues caused by the burning of fossil fuels have serious impacts on the economy from medical bills that disproportionately saddle low income and middle class families with their burdens to the loss of productivity and missed days of work due to illness.

Researchers from the Massachusetts Institute of Technology have found that California suffers the worst health impacts from air pollution in the country, with about 21,000 early deaths annually. The same study found that nationally, pollution from electricity generation also still accounts for 52,000 premature deaths annually (Chu, 2013). Whether the American Lung Associations number of 6,500 premature deaths is accurate or the greater number found by MIT (21,000) is closer to reality one thing should be agreed upon, this is in fact a public health crisis that should be getting more attention, especially because we currently have the technologies and resources to combat it.

Committing to one of the country's most aggressive Renewable Energy Portfolio Standards has without a doubt, been very beneficial for California's economy as well. The fastest growing sector of the economy in terms of job creation is the renewable energy industry. For example, California's economy has been growing more vigorously than the U.S. as a whole. Since the recession ended in 2011, California jobs have grown by 14.4 percent, compared to 9.8 percent for the nation. The San Francisco Bay Area attracts 50 percent of national venture capital dollars. Drilling down on the microeconomics of clean energy and clean technology illuminates many bright spots. The state boasts about 500,000 green jobs, including more than 100,000 in the solar energy sector alone (Busch, 2015).

Furthermore, between the years of 2009 and 2011, 52,000 to 75,000 construction jobs alone were created in the solar and wind industries and by 2016 at least 100,050 people were employed in the solar industry in just the state of California (Mundaca, 2015). The U.S. Department of Energy's annual Energy and Jobs Report (2017) reports that the generation of electricity from oil, coal, and gas combined employs just under 187,000 people while the total number of people employed in the solar sector alone is around 374,000.

We see these economic gains and medical benefits while still well below the state's overall targets and the data suggests these trends would only continue if renewable energy output is increased responsibly. More needs to be done to increase the levels of knowledge in under educated and lower income homes to increase the overall levels of support for further renewable energy expansion throughout the state. In doing this, the wide gap that makes this such a politically polarized topic may begin to be bridged which would only make the target of 100% renewable energy even more achievable.

The high levels of support for not only renewables but also fossil fuel sources across middle to lower income households but also those with high school or below levels of education only suggests that an all of the above approach is desirable if that keeps energy affordable. It can be interpreted that this shows that these respondents do not necessarily prefer one type of energy production over another type which is good news for renewables. If generators and the state can keep growing renewables at this pace, there is no reason that the population would not willingly adopt these methods as long as it is abundant and affordable.

An exhaustive educational campaign would also benefit the state's efforts tremendously. This effort should focus on better explaining the economic benefits of renewable energy sources for all Californians. This would do a great deal to increase awareness and also directly address

the pricing and financial misconceptions that surround the renewable energy industry.

Effectiveness of this campaign would easily be measured and would be shown in the increased levels of support for renewables and potentially an overall decrease in the levels of support for the all of the above approaches currently preferred.

Conclusion

Attempting to arrive at a clear conclusion is difficult at best when dealing with such large amounts of data. Isolating the variables needed and analyzing the relevant information was key to arriving at the necessary data which was used in attempting to answer the stated hypothesis. Examining how citizens feel about energy policy is becoming more important as the effects of the high amounts of carbon in our atmosphere are becoming clearer. Before any progress can be made towards implementing progressive energy policies the population's feelings and levels of understanding must first be understood. This will help identify potential barriers to implementation that can then be properly addressed and overcome.

Given all of the data analyzed and presented, I am confident in stating that level of education does impact not only individual's level of energy policy understanding but also their values and preferences regarding renewable energy technologies and the energy industry as a whole. There is also clear data that demonstrates that the respondent's beliefs of what is causing the warming of the planet are directly linked to their level of formal education with 41% of high school educated individuals believing it is from manmade activities while 76% of graduate school educated respondents feeling it is from manmade activities.

This trend continued when applying the same measurements but changing the dependent variable from one dealing with climate change to one asking their level of understanding of energy policy as well as their levels of support or opposition for traditional fossil fuel sources of

energy. 32% of respondents with High school as their highest level of formal education felt that we should increase federal funding on renewables while 55% oppose this idea. On the opposite end of this spectrum 86% of respondents with experience in graduate school support increasing federal funding for renewables while only 3% opposing this idea. This further shows that the relationship between levels of formal education and support for progressive energy policies is as strong as was hypothesized.

Lower income households also favor the continued use of fossil fuels, but this support diminishes as household incomes rise. Similar to the examination of the level of formal education in the survey respondents, the data also makes clear that there is a strong relationship between household income and support for progressive energy policies as with the previous variables. The strength of this relationship does not appear to be as strong as levels of education, however. For instance, when prompted what the respondent's level of support was for building additional power plants those making less than \$34,999 answered that they opposed this idea at a 14% rate while those making over \$75,000 only opposed this idea at a rate of 25.6%. When asked what their level of support was for expanding the use of oil pipelines these same groups opposed this concept at rates of 36.7% and 53% respectively.

It is difficult to distinguish whether there is any correlation between these two variables. Typically, those with higher levels of formal education also have higher household incomes. But do these same individuals have higher levels of income as result of the higher levels of formal education or is the inverse true with those with more formal education obtaining more education due to having more flexibility and opportunities to seek out these options? And also, for these same people, is it the elevated education that increase their support for progressive energy policies or is the increased household incomes that enables these people to embrace renewables

because they feel they can pay higher prices and taxes than those at the lower end of the spectrum? Deciphering these two variables should be one of the primary objectives of future research on this topic. It could play a major role in identifying future barriers to more widespread implementation and embracement by large populations.

Political Ideology is also a deciding factor as hypothesized with 46% of the conservative participants stating that they oppose spending federal funds on the expansion of renewable energy research while only .5% of liberal participants were against this idea. It must be acknowledged however that the liberal participants in the study were also more likely to have a higher level of education than their conservative counterpart which makes this a more difficult variable to measure as opposed to the two previous variables. It is unable to be determined whether it is due to the participants level of education or their political affiliation that drives these levels of support or opposition.

The use of survey data is a great first step in creating a better understanding of the public opinions held of California's rapidly developing energy industry. In order to answer a lot of the remaining or created questions following this data further surveying should be pursued. Furthermore, future testing should be done on each individual arm of the food-water-energy nexus and not done all at once in a combined format. The questionnaire was forced to only cover the very basics of each part of the nexus and was unable to dig into any of it too deeply. These short roots limit what researchers and analysts can pull from this data. A survey based solely on energy could still utilize the same methods that were carried out with this study. Some of the variables examined may be stronger indicators than other however they all point in the same direction.

There would also be value in asking pointed questions about these same respondents' energy policy preferences. Would their preferences be increased taxation on energy industries and individuals alike or would a more regulation heavy approach be preferred because it does not immediately impact the consumers of these energy resources? I would hypothesize when asked what their levels of understanding on these specific energy policies are, the results would indicate the participants are far more uninformed than they identified themselves to be when they answered the broad general question in this survey.

It also appears that there is a certain level of 'all of the above' opinions held by a lot of the respondents regardless of the variable examined. I believe this is why we did not see as strong of a relationship between levels of education and household incomes on their levels of support for progressive energy policies and technologies. This was found to be especially relevant with those in the middle-income areas. This was demonstrated when only around 13% of the total respondents making less than \$74,999 opposed the idea of building additional power plants. So, while these same groups overwhelmingly supported the adoption of increased renewable energy capabilities, they also supported fossil fuel sources of energy at high rates as well.

Overall, the data is suggesting that high levels of the survey respondents prefer an "all of the above" approach to generating and providing electricity for consumption. Lower income households favor the continued use of fossil fuels, but this support diminishes as the household income raises. Lower income conservatives were the most likely to favor building new fossil fuel power plants and oil pipelines while high income liberals were the most likely to support expanded renewable energy technologies and making sacrifices in their daily lives to include paying higher taxes to benefit and protect the environment.

All of the identified demographic groups examined also had large appetites for requiring new construction meets high efficiency standards (mean=3.74) and increasing funding for renewable energy development (mean=3.58). These same groups also overwhelmingly disapprove of relaxing the environmental standards for the energy industry with a mean of 2.03. These surveys do suggest that people may be more willing to make environmentally friendly concessions than we typically believe.

Lastly, in a state as large and diverse of opinions as California, it is not surprising that so many different geographic areas possess so many different opinions and ideologies. Adding the question of what part of the state the participant resides in would allow researchers to dig even further into the demographics that surround this issue. California is home to some of the most liberal pockets in the United States along the coast but also is home to some of the most conservative communities in the country in the inland portions of the state. These same factors can also be said of household incomes and levels of education that are becoming characteristics of certain parts of the state. It is naïve to think there will be a single solution that will be embraced by all factions so more research must be done to identify more specific barriers to entry for these communities.

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