JOURNAL OF
EMERGING INVESTIGATORS

Article

The impact of political ideologies on renewable energy adoption

Anushka Ghorpade[1], Kunal Paralikar[2]
[1] Dublin High School, Dublin, California
[2] Medtronic, Minneapolis, Minnesota

SUMMARY

Due to the growing urgency of climate change, renewable energy technologies have become an increasingly popular source of energy. However, differing perceptions on the urgency of climate change along political party lines may result in variable rates of adoption of these renewable energy technologies. This study explores the hypothesis that Republican states are less inclined to adopt renewable energy technologies than Democratic states. To test this hypothesis, we analyzed overall renewable energy production across two Democratic states (Washington and California) and two Republican states (Texas and Florida). We investigated correlations between the energy production of each state and used t-tests to assess statistical significance. Contrary to our hypothesis, however, we concluded that there was no observable correlation between political ideologies and renewable energy adoption. In fact, Texas, a Republican state, showed the fastest renewable energy production growth rate and produced the most wind energy compared to California, Washington, and Florida. Our findings suggested that factors beyond party lines likely influence state-level decisions regarding renewable energy sources. Understanding these factors is critical to create policies to combat climate change and drive renewable energy adoption worldwide.

INTRODUCTION

The popularity of renewable energy technologies has surged due to the rising energy demand and the environmental impacts of nonrenewable energy production. The increase in atmospheric carbon dioxide and nitrous oxide levels has intensified the greenhouse effect, a process that traps the Suns heat at the Earth's surface, contributing to the overall warming of the planet (1). The urgent need to address this issue has resulted in a growing emphasis on the development of renewable energy technologies worldwide. However, transitioning from nonrenewable to renewable forms of energy requires political will, new technologies, investment, and widespread support from the community.

There has been a growing number of renewable energy initiatives aimed at producing 100% clean energy throughout the United States. The Clean Energy State Alliance (CESA) is a partnership of various public organizations working together to promote the adoption of clean energy in the United States (2). According to CESA, as of 2024, 22 states have established targets to achieve 100% clean energy by 2050 (2). Of these 22 states, 15 (68%) have Democratic affiliations (2). Conversely, only 2 Republican affiliated states, Nebraska and Louisiana, hold the same goals (2). The remaining five states are swing states and have had varying affiliations, as classified by presidential election results from 2012-2020 (3). Additionally, according to the National Conference of State Legislatures, 51% of states with clean energy targets are Democratic, compared to 33% of Republican states (4). Democratic states tend to set more aggressive goals, such as achieving 100% renewable energy by 2045, while Republican states generally adopt less ambitious targets, with some, like Montana, even repealing previous renewable energy standards (4). Superficially, the larger number of Democratic states setting clean energy goals may suggest a preference for renewable energy production compared to Republican states.

One potential explanation for this disparity could be political differences regarding the perception of climate change and thus affect the adoption of renewable technologies. A survey conducted by the Pew Research Center in 2019 revealed that 90% of Democrats agreed that the government should be doing more to address the impacts of climate change (5). There were no significant ideological divisions within the Democratic party on this issue, with a broad consensus across moderates and liberals (5). In contrast, 39% of Republicans believed the government was not doing enough but there was more division along ideological, gender, and generational lines (5). For example, 65% of moderate Republicans believed that the government was not doing enough to reduce the effects of climate change, while only 24% of conservative Republicans shared the same view (5). Half of conservative Republicans believed that the government was doing enough, while 26% believed that the government was doing too much (5). Overall, these poll findings suggest that Republicans may have a greater difference in opinion on the impact of climate change and may view it as a less urgent issue than Democrats.

If conservative Republicans perceive less urgency for government intervention on climate change, Republican state governments may be less motivated to use renewable energy technology. This lack of urgency may also stem from the greater efficiency and established infrastructure of nonrenewable energy sources, which have been in the market longer, making them more readily available and accessible. Additionally, some Republican leaders have been known to question or deny the existence of climate change, which can influence public perception and delay efforts towards adopting renewable energy solutions (6). These factors further incentivize the continued use of nonrenewable energy. Conversely, the greater enthusiasm to implement

https://doi.org/10.59720/23-258

renewable energy technologies in Democratic states may result in a higher level of renewable energy adoption.

Based on this data, we hypothesized that Republican states adopt less renewable energy technologies than Democratic states. To test this hypothesis, we gathered renewable energy production data from 1990 to 2020 for four states: Washington, California, Texas, and Florida. Among these, Washington and California were politically aligned with Democrats and Texas and Florida were politically aligned with Republicans. We used correlation and t-tests to compare energy production and identify similarities and differences between the four states. However, we found no correlation of political ideologies on renewable energy adoption. Hence, despite the political differences in the perception of climate change, our analysis found no significant correlation between political ideologies and renewable energy adoption. This suggests that while political affiliation may influence certain climate policies, other factors likely play a more critical role in shaping renewable energy production across states.

RESULTS

To study if Republican states used less renewable energy than Democratic states, we first examined the renewable energy generated over a 30-year period (from 1990 to 2020) using data obtained from the U.S. Energy Information Administration's Annual Electric Generator Report (7). We considered solar thermal and photovoltaic, pumped storage (hydropower), wind, and other biomass (biogas) as renewable energy sources. We analyzed four states: Washington, California, Texas, and Florida. Specifically, we selected California and Texas due to their larger size and population, which would allow a more comprehensive representation of renewable energy trends in places with greater energy demands and in geographically expansive locations. Washington and Florida, being smaller and less populated, provided a contrast for examining states with different characteristics. This allowed us to compare pairs of states with similar attributes but varying political alignments. The correlation analysis examined all six pairs: Washington and California, Washington and Texas, Washington and Florida, California and Texas, California and Florida, and Texas and Florida.

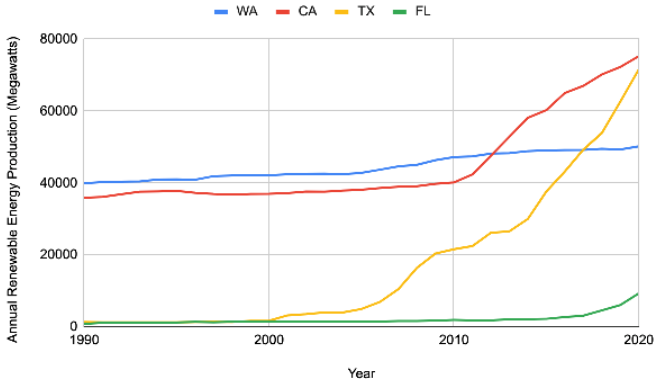

Figure 1: Total renewable energy production in Washington (WA), California (CA), Texas (TX), and Florida (FL) from 1990 to 2020. Data collected from renewable energy production reports published by the U.S. Energy Information Administration (EIA) (7). The x-axis shows the years, and the y-axis shows the annual renewable energy production in megawatts.

State (Affiliation)	Correlation Coefficient	P-value
CA (Dem) x WA (Dem)	0.857	7.90E-30
TX (Rep) x FL (Rep)	0.867	0.00221
CA (Dem) x TX (Rep)	0.969	1.80E-11
CA (Dem) x FL (Rep)	0.831	1.53E-24
TX (Rep) x WA (Dem)	0.913	1.19E-34
WA (Dem) x FL (Rep)	0.659	2.25E-55

Table 1: Pearson's correlation coefficient and p-values over thirty years (1990-2020) for Washington (Democratic), California (Democratic), Texas (Republican), and Florida (Republican). Democratic (Dem) states and Republican (Rep) states were compared using Pearsons's correlation coefficient which analyzes the strength and direction of the linear relationship between states' renewable energy production (16). Values closer to 1 indicate a stronger correlation, while values closer to 0 indicate no correlation. P-values derived from a two-tailed t-test determined statistical significance in renewable energy production trends between states with a significance cutoff of 0.05 where values below 0.05 indicate a statistically significant difference in data between each pair of states.

In 1990, Washington and California each exhibited high renewable energy production, with Washington starting at 39,890 megawatts and California at 35,926 megawatts (**Figure 1**). However, their production levels remained rather stagnant from 1990 to 2010. In 2010, California started showing signs of a more substantial increase, reaching 60,278 megawatts by 2015, while Washington increased less rapidly to around 49,114 megawatts by 2015. In comparison, Texas began with lower production in the beginning, producing only 1,336 megawatts of renewable energy. However, Texas displayed rapid growth starting around 2007 that progressed at a faster pace than the other three states, ultimately surpassing Washington's production in 2017 with 49,293 megawatts compared to Washington's 49,208 megawatts. On the other hand, Florida generally produced considerably less renewable energy than the other three states. Florida began with a production of 817 megawatts in 1990 and grew to 2,234 megawatts by 2015 – displaying relatively minimal growth throughout the past three decades.

The correlation analysis showed that California and Texas had the strongest correlation in energy production, with a coefficient of (r = 0.969), suggesting similar growth trajectories over time (**Table 1**). Furthermore, Washington and Texas demonstrated a higher correlation (r = 0.913) than California and Washington (r = 0.857). Hence, Texas, a Republican state, demonstrated a stronger correlation with the two Democratic states than those states did with each other.

Given the geographical disparity between the four states, we wanted to normalize the total production of each state by their respective land areas (**Figure 2**). Using land area to focus on the physical capacity of each state to harness renewable energy, as larger states may have more room for infrastructure like solar farms or wind turbines. Initially, Texas had lower normalized renewable energy output compared to other states – due to its large size and proportionally lower output. In comparison, Washington had the highest normalized value, indicating a higher level of energy production relative to the available surface area. By 2015, California's production was higher than that of Texas and Florida, reaching 0.368 MW/square mile; however, Washington's production stood out as notably higher, at 0.688 MW/square mile. As before, Florida

https://doi.org/10.59720/23-258

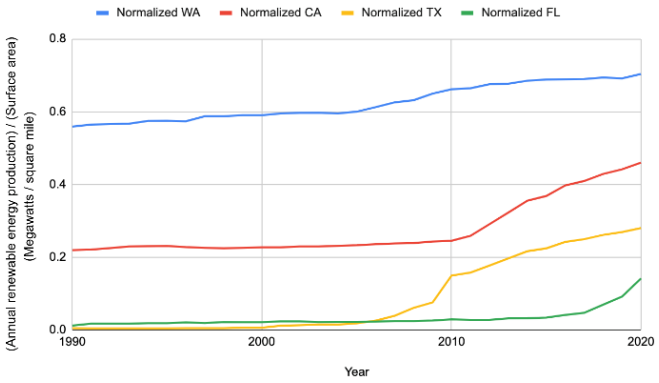

Figure 2: Annual renewable energy production from years 1990 to 2020 normalized to the surface area of Washington (WA), California (CA), Texas (TX), and Florida (FL). Data collected from renewable energy production reports published by the U.S. Energy Information Administration (EIA) (7). The x-axis shows the years, and the y-axis shows the normalized value in megawatts per square mile.

remained as the state with the lowest normalized value.

Subsequently, we conducted t-tests to compare the energy production values between each pair of states. The resulting p-values (**Table 1**) indicated that all six pairs of states had p-values below 0.005, highlighting the distinct differences in energy production.

We noticed that Washington's high renewable energy production levels were primarily attributed to hydropower. It is important to note that the establishment of dams in Washington began in the 1950s, primarily driven by the need for energy generation, not by a deliberate push for renewable energy as climate change and modern environmental concerns were not yet prominent. To better understand the influence of more recent political ideologies on renewable energy efforts we conducted a separate analysis focused on non-hydropower sources. Additionally, we shortened the timeframe to twenty years (2000-2020) to exclude the first ten years, which skewed the data due to minimal production changes and the dominance of hydropower as a form of energy (8). This overshadowed political influences on the adoption of other renewable sources which grew significantly after the 2000s (7). These distinctions are important because the political motivations behind energy decisions in the 1950s were likely influenced by economic and industrial goals rather than environmental sustainability, which plays a more significant role in today's energy policies.

When excluding hydropower, California began with higher production of renewable energy, but Texas surpassed it by 2007, producing 9165 megawatts to California's 6560 megawatts of energy (**Figure 3**). Additionally, the total production of renewable energy for Washington decreased from approximately 40,000 megawatts to around 20,000 megawatts by 2015. In fact, in 2015 Washington fell behind both California and Texas, producing approximately 20,000 megawatts less than California and approximately 30,000 megawatts less than Texas. We once again found that Texas and California exhibited the highest correlation values (r = 0.965), indicating the greatest similarity between their renewable energy production patterns (**Table 2**). While Florida and Washington showed the lowest correlation value (r = 0.588) compared to the other pairs, they still exhibited a moderate correlation in terms of energy production patterns. Notably, Washington and Texas displayed a higher correlation than Texas and Florida, indicating that the two Republican states had a weaker correlation in production compared to a Republican state and a Democratic state.

Upon normalizing the energy production (excluding hydropower) by surface area (**Figure 4**), the differences between the states decreased. California had the highest normalized renewable energy production except for a short period from 2007 to 2012, during which Texas surpassed it. Florida and Washington had less normalized production and appeared similar in production by state-size rather than by political association. The t-test results (**Table 2**), except between California and Texas, had p-values below 0.05, indicating differences in energy production. The comparison between California and Texas yielded a p-value of 0.299, indicating that the energy production was not significantly different between these two states. The comparison between Washington and Florida yielded a p-value of exactly 0.05. All other state pairs yielded p-values below the threshold of 0.05, suggesting they were significantly different.

In the analysis of solar energy production, California consistently emerged as the frontrunner, with a steadily increasing production throughout the 20-year period (**Figure 5**). On the other hand, Washington had the lowest solar production, with even Florida – typically the lowest in overall renewable production - surpassing it in solar energy generation. Texas initially had low production and experienced a data gap from 2003 to 2009. However, after that period, its production began to steadily increase, aligning with the broader energy production trends observed in the state. Both Washington and Florida initially had no solar energy production data, with Washington not producing solar energy for the first six years and Florida for the first eight years. Overall, California led the four states in terms of solar energy production.

Regarding wind energy production, California started with the highest production and saw a steady increase over the 20-year period, reaching a peak of approximately 12,000 megawatts in 2020 (**Figure 6**). In comparison, Texas began with lower production than California but experienced a significant surge in 2008, establishing a substantial lead over the other three states. By 2020, Texas was producing nearly 60,000 megawatts in wind energy per year. While Washington had higher wind energy production compared to its solar

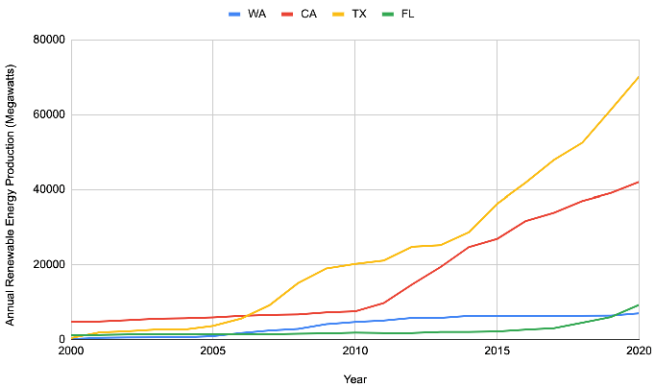

Figure 3: Annual renewable energy production excluding hydropower in Washington (WA), California (CA), Texas (TX), and Florida (FL) from 2000 to 2020. Data collected from renewable energy production reports published by the U.S. Energy Information Administration (EIA) (7). The x-axis shows the years, and the y-axis shows the annual renewable energy production in megawatts.

https://doi.org/10.59720/23-258

State (Affiliation)	Correlation Coefficient	P-value
CA (Dem) x WA (Dem)	0.832	0.0104
TX (Rep) x FL (Rep)	0.862	0.00429
CA (Dem) x TX (Rep)	0.965	0.299
CA (Dem) x FL (Rep)	0.814	0.000834
TX (Rep) x WA (Dem)	0.885	0.0411
WA (Dem) x FL (Rep)	0.588	0.0500

Table 2. Pearson's correlation coefficient and p-value for twenty years (2000-2020) excluding hydropower for Washington (Democratic), California (Democratic), Texas (Republican), and Florida (Republican). Democratic (Dem) states and Republican (Rep) states were compared using Pearsons's correlation coefficient which analyzes the strength and direction of the linear relationship between states' renewable energy production (16). Values closer to 1 indicate a stronger correlation, while values closer to 0 indicate no correlation. P-values derived from a two-tailed t-test determined statistical significance in renewable energy production trends (excluding hydropower) between states. It has a significance cutoff of 0.05 where values below 0.05 indicate a statistically significant difference in data between each pair of states.

energy production, it still fell short of California and Texas in overall production. Florida did not record any values for wind energy production.

DISCUSSION

Our initial hypothesis was that political ideologies impact the adoption of renewable energy technology. Specifically, we believed that states aligned with the Republican Party, influenced by sections of the party denying climate change, might be less inclined to embrace renewable energy. However, this study revealed little to no correlation between political ideology and the adoption of renewable energy at the state level. While California and Washington, both Democratic states, had higher energy production in earlier years compared to Texas and Florida, this trend was primarily due to factors like state size and reliance on hydropower. We ultimately found that political ideologies appeared to have no significant impact on the implementation of renewable technologies. This was illustrated by the fact that Texas (Republican) and California (Democratic) were the most similar in renewable energy production. Our findings suggest that other factors, such as geographical or economic considerations, may have a more substantial influence on renewable energy implementation rather than political beliefs.

Geographical location and climate were crucial factors to consider. Washington has limited sunlight and thus make solar energy a far less favorable option compared to other renewable technologies (8). In contrast, California experiences abundant sunlight and possesses extensive open areas, allowing for the widespread installation of solar panels, thereby contributing to its leadership in solar energy production. Texas has abundant open land, to facilitate wind energy production and has emerged as the top wind energy producer among the four states (9). Florida relied more on solar energy than wind energy and had lower overall production of renewable energy, due to push back from its utilities.

California has shown consistent and sustained growth in renewable energy production across various sectors, possibly due to state-level initiatives like the California Solar Initiative (CSI) established in 2006 (10). Meanwhile, Texas experienced a rapid surge in production from 1990-2020. Although initially lagging behind California and even Washington, Texas underwent a dramatic increase in energy production from 2008 onwards, primarily driven by the wind energy boom in the state (9). This substantial increase allowed Texas to reach production levels comparable to California, signifying its significant progress. This is partly attributed to the fact that Texas was one of the first states to establish a Renewable Portfolio Standards (RPS) in 1999 (11). It initially required that 2000 megawatts of energy must be derived from renewable energy sources (11). In addition, Texas's wind power is cheaper than fossil fuels, which could justify greater adoption (12). Texas's separate energy grid and shorter transmission lines also aids its wind energy distribution, which is a prevalent issue for many other states (9).

The prominence of hydropower in Washington's energy production can be traced back to the use of dams as an energy source since the 1950s. The development of dams in Washington and across the nation was primarily driven by energy efficiency rather than a deliberate effort to promote renewable technology for environmental or sustainable purposes (8). Excluding hydropower from the analysis further contradicts our hypothesis, as it demonstrates Washington's relatively low production of other types of renewable energy compared to states like Texas and California. However, in 2022, Washington provided 67% of the nation's hydroelectric power (8). As a result of its extensive hydropower, Washington was second to Texas in the nation's renewable energy production. While Washington's dams may not have been originally developed for the purpose of renewable energy generation, they nevertheless allow Washington to beat most other states in renewable production. Washington may not need to utilize other forms of renewable energy because they excel in the production of hydroelectric power. However, removing hydropower from the analysis was necessary to focus on the development of newer renewable technologies, such as wind and solar, which reflect more recent efforts in renewable energy expansion.

Throughout the study, Florida remained an exception when it came to renewable energy production. Florida produced significantly less than every other state, including Texas (which shares the same political affiliation) and Washington

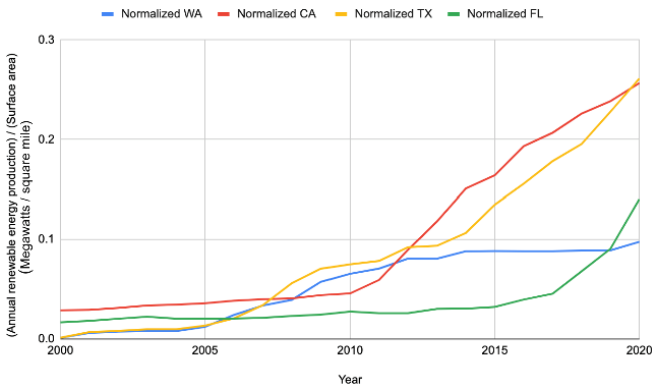

Figure 4: Annual renewable energy production from 2000 to 2020 excluding hydropower normalized to the surface area of Washington (WA), California (CA), Texas (TX), and Florida (FL). Data collected from renewable energy production reports published by the U.S. Energy Information Administration (EIA) (7). The x-axis shows the years, and the y-axis shows the normalized value in megawatts per square mile.

https://doi.org/10.59720/23-258

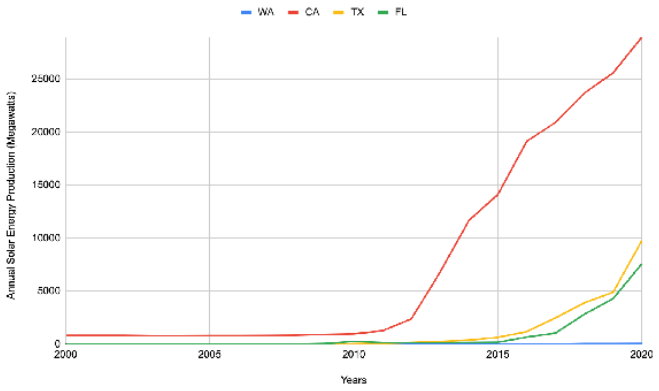

Figure 5: Annual solar energy production in Washington (WA), California (CA), Texas (TX) and Florida (FL) from 2000 to 2020. Data collected from renewable energy production reports published by the U.S. Energy Information Administration (EIA) (7). The x-axis shows the years, and the y-axis shows the annual solar energy production in megawatts.

(which the same relative land area). Florida, nicknamed the "sunshine state," does not utilize its capacity to use solar energy despite being the fourth largest energy-consuming state (13). One reason for this is pushback by Florida's utilities (13). Essentially, as more customers adopt rooftop solar and pay less to utilities, the fixed cost of maintaining the grid are shifted onto non-solar customers (13). To mitigate this, the utilities push for additional fees on solar users which reduces the financial incentive for switching to solar energy (13). However, local governments in Florida have released more incentives to grow the number of solar users, so there may be an increase in solar production in the future (14).

While our study presented an analysis of the relationship between political ideologies and renewable energy production, we must acknowledge several limitations. Firstly, the analysis focused on a select group of states (Washington, California, Texas, and Florida) which may not represent the diverse range of political, geographic, and economic factors influencing renewable energy adoption across all US states. Hence, our findings may not generalize to all states or to the entire nation. Additionally, we only analyzed the impact of political ideologies and did not include other influential factors like state-level policies, economic incentives, and technological advancements that may also push towards or away from renewable energy production. State level policies may have a greater influence on renewable energy adoption since state legislatures may not always reflect the political preference shown in presidential elections. This discrepancy arises because state level political control can differ from overall party preference of the state, affecting the policy outcome more directly. Future research addressing such limitations could provide a more expansive analysis that better explains the relationship between political ideology and renewable energy adoption such as looking into the various incentives given by states and how they help develop renewable energy production. The lag after a new state policy is implemented could also be analyzed to understand the general attitudes of the leadership in each state. On the other hand, future work could analyze the relationships between energy sources and the overlap between states which produce the same form of energy—for example, looking into states with the highest wind production and identifying the similarities in their environment, access to technology, and local politics. From that, states that continuously produce a lower amount of renewable energy could be assessed for an overlap of factors that negatively affect production.

In conclusion, this study set out to investigate whether political ideologies would drive renewable energy production. Contrary to our hypothesis, the past two decades of data suggest that political bias does not affect renewable energy production, with other factors playing a more significant role in driving renewable energy adoption. These findings suggest that while the political beliefs might influence certain aspects of policy, practical considerations such as resource availability, state level economic incentives, and existing infrastructure have a greater impact on renewable energy implementation.

MATERIALS AND METHODS

Renewable energy production information was collected from the U.S. Department of Energy's records that document energy produced in the United States categorized by state and energy type (7). This dataset allowed for the extraction of raw data on total renewable energy production for each state for every year of production. For solar and wind energy data, there were slight gaps. In solar production, Texas had a gap from 2003 to 2009, Washington from 2000 to 2006, and Florida from 2000 to 2008. In wind production, Washington experienced a gap in 2000, while Florida had no wind production data.

To investigate the impact of political ideologies, two traditionally Republican states, Texas and Florida, and two traditionally Democratic states, Washington and California, were selected. Since 1988, Washington has voted in favor of the Democratic party in each presidential election (3). Similarly, since 1992, California has voted for the Democratic presidential candidate in each election (3). Conversely, Texas has voted for the Republican presidential candidate in each election since 1980 (3). Since 1980, Florida has mostly voted for the Republican presidential candidate, with the exceptions of 1996, 2008, and 2012 elections (3). Although it swings more than Texas, Florida offers an example of a state that mostly voted for the Republican candidate and had solar energy potential. This selection included states with varying surface

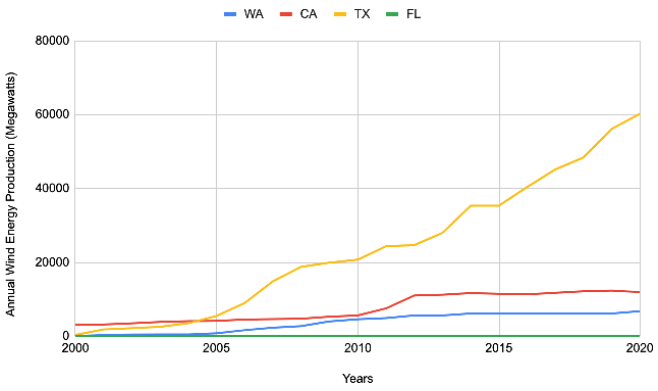

Figure 6: Annual wind energy production in Washington (WA), California (CA), Texas (TX), and Florida (FL) from 2000 to 2020. Data collected from renewable energy production reports published by the U.S. Energy Information Administration (EIA) (7). The x-axis shows the years, and the y-axis shows the annual wind energy production in Megawatts.

https://doi.org/10.59720/23-258

areas and populations. Each had varying surface areas, with California spanning 163,696 square miles, Washington with 71,362 square miles, Texas with 268,597 square miles and Florida with 65,758 square miles (15).

For this analysis, data was analyzed for the past thirty years, from 1990 to 2020. The specific renewable energy sources classified in the dataset included solar thermal and photovoltaic, pumped storage, wind, and other biomass. These are referred to as solar, hydropower, wind, and biogas energy respectively in this paper.

We assessed the relationship between states and their renewable energy production trends. Correlation analysis determined the strength and direction of the relationship between two sets of data (16). Pearson correlation coefficients were calculated to quantify the strength and direction of linear relationships between variables, focusing on trends in renewable energy production across different states over the given period (16).

T-tests were used to assess the likelihood of two data sets originating from the same population. A two-tailed test was used because it allows for detecting differences in either direction between the populations, providing a more holistic comparison (17). The likelihood of the two populations being similar can be obtained by the p-value, an output of the t-test. Specifically, higher p-values would indicate that the underlying data sets (annual renewable energy production) are not significantly different (17). To better compare the renewable energy production trends of various states using t-tests, these production numbers were normalized to the area of each state prior to doing the t-tests. All statistical analysis, including the calculation of the Pearson correlation coefficients and the two-tailed t-tests, was conducted using Microsoft Excel.

Received: October 3, 2023
Accepted: August 21, 2024
Published: January 13, 2025

REFERENCES

1. NASA. "What Is the Greenhouse Effect?" NASA Science, science.nasa.gov/climate-change/faq/what-is-the-greenhouse-effect. Accessed 10 Oct. 2024.
2. Clean Energy States Alliance. "Table of 100% Clean Energy States." Clean Energy States Alliance, www.cesa.org/projects/100-clean-energy-collaborative/guide/table-of-100-clean-energy-states/. Accessed 3 Mar. 2023.
3. "State Electoral Vote History." 270toWin, www.270towin.com/state-electoral-vote-history/. Accessed 30 May 2023.
4. National Conference of State Legislatures. "State Renewable Portfolio Standards and Goals." National Conference of State Legislatures, www.ncsl.org/energy/state-renewable-portfolio-standards-and-goals#undefined. Accessed 10 Oct. 2024.
5. Funk, Cary, and Meg Hefferon. "U.S. Public Views on Climate and Energy." Pew Research Center, 25 Nov. 2019, www.pewresearch.org/science/2019/11/25/u-s-public-views-on-climate-and-energy/. Accessed 10 Jun. 2023.
6. Frazin, Rachel. "123 House and Senate Republicans Deny Climate Science: Analysis." The Hill, 18 July 2024, thehill.com/policy/energy-environment/4778682-house-senate-republicans-deny-climate-science-analysis/. Accessed 20 Oct. 2024.
7. "Detailed State Data." U.S. Energy Information Administration (EIA), www.eia.gov/electricity/data/state/. Accessed 3 Mar. 2023.
8. "Washington - State Energy Profile Analysis." U.S. Energy Information Administration (EIA), 2016, www.eia.gov/state/analysis.php?sid=WA. Accessed 4 Mar. 2023.
9. Clemente, Jude. "The Great Texas Wind Power Boom." Forbes, www.forbes.com/sites/judeclemente/2016/10/11/the-great-texas-wind-power-boom/?sh=77ff6569c6aa. Accessed 11 Jun. 2023.
10. "Renewables Portfolio Standard." California Energy Commission, www.energy.ca.gov/programs-and-topics/programs/renewables-portfolio-standard. Accessed 20 Oct. 2024.
11. Wiser, Ryan, and Ole Langniss. "The Role of Renewables Portfolio Standards in the U.S. and Germany." Lawrence Berkeley National Laboratory and German Aerospace Center, www.osti.gov/servlets/purl/790029. Accessed 25 Oct. 2024.
12. Dyson, Mark. "Wind and Solar Are Saving Texans $20 Million a Day." Rocky Mountain Institute (RMI), 3 Aug. 2022, rmi.org/wind-and-solar-are-saving-texans-20-million-a-day/. Accessed 25 Oct. 2024.
13. "Florida Utilities Say Solar Doesn't Work in the Sunshine State, but It Sure Does in Georgia." Tampa Bay Times, 30 Jan. 2015, www.tampabay.com/news/business/energy/florida-utilities-say-solar-doesnt-work-in-the-sunshine-state-but-it-sure/2215830/. Accessed 10 Jun. 2023.
14. Moore, Timothy. "Florida Solar Incentives." Forbes, 30 July 2024, www.forbes.com/home-improvement/solar/florida-solar-incentives/. Accessed 11 Nov. 2024.
15. State Area Measurements and Internal Point Coordinates." U.S. Census Bureau, www.census.gov/geographies/reference-files/2010/geo/state-area.html. Accessed 10 Mar. 2023.
16. Correlation Coefficient Review." Khan Academy, 2017, www.khanacademy.org/math/statistics-probability/describing-relationships-quantitative-data/scatterplots-and-correlation/a/correlation-coefficient-review. Accessed 10 May 2023.
17. Bevans, Rebecca. "An Introduction to T Tests | Definitions, Formula and Examples." Scribbr, 31 Jan. 2020, www.scribbr.com/statistics/t-test/. Accessed 10 May 2023.