

Carbon Neutral by 2050? A Spatiotemporal Analysis of Energy Trends Across US States



Alvaro Mendoza Grisales & Daniel Hartless,
UF Civil Engineering

Problem Statement:

The US hopes to be carbon neutral by 2050. One huge step towards this goal is the transition from tradition generation sources to renewable sources. Our goal is to provide a spactiotemporal descriptive analysis of the current energy system, comparing regions, typical voting patterns, and geography to draw insights as to what might cause an area to produce more renewable energy.

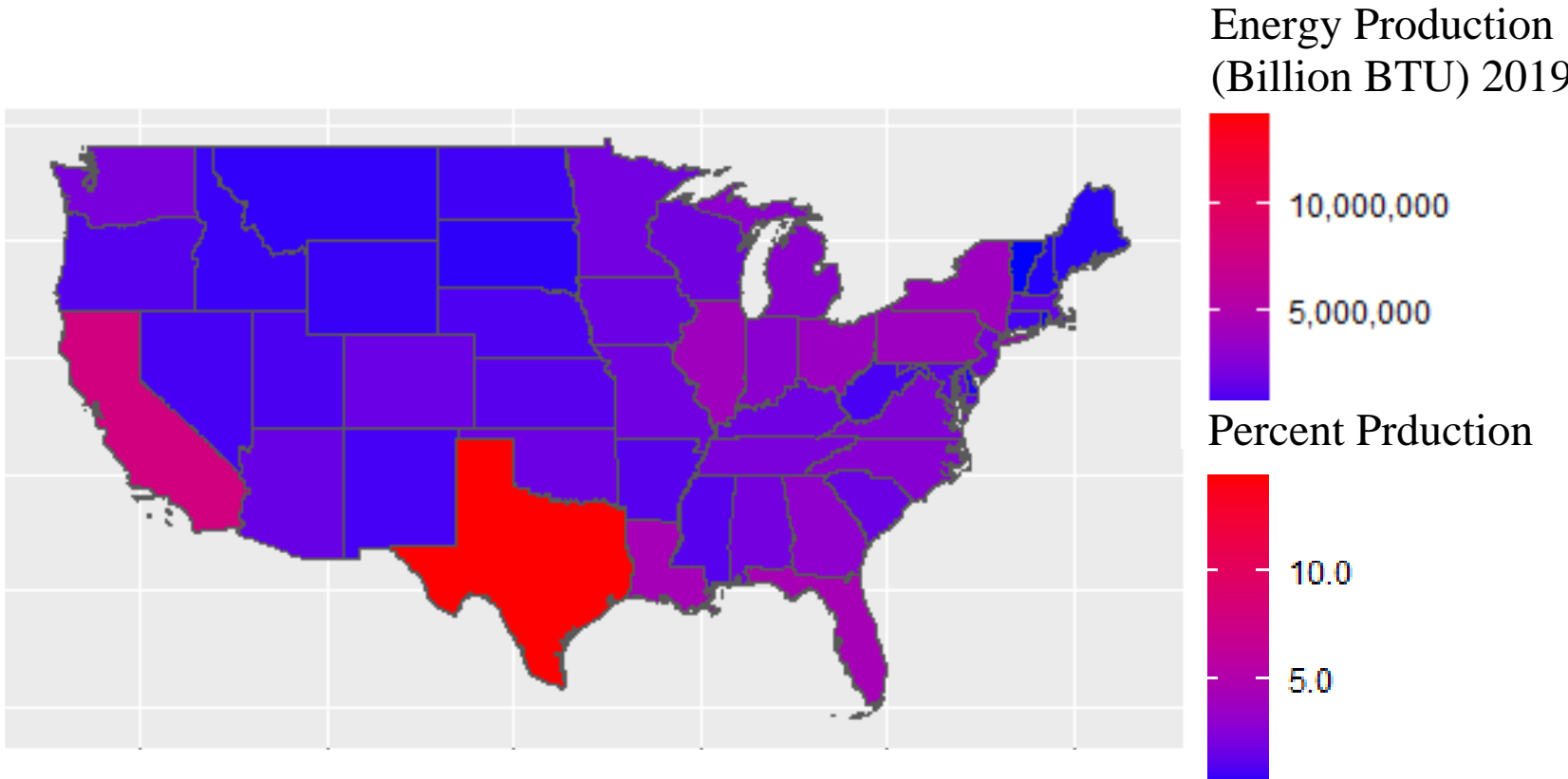
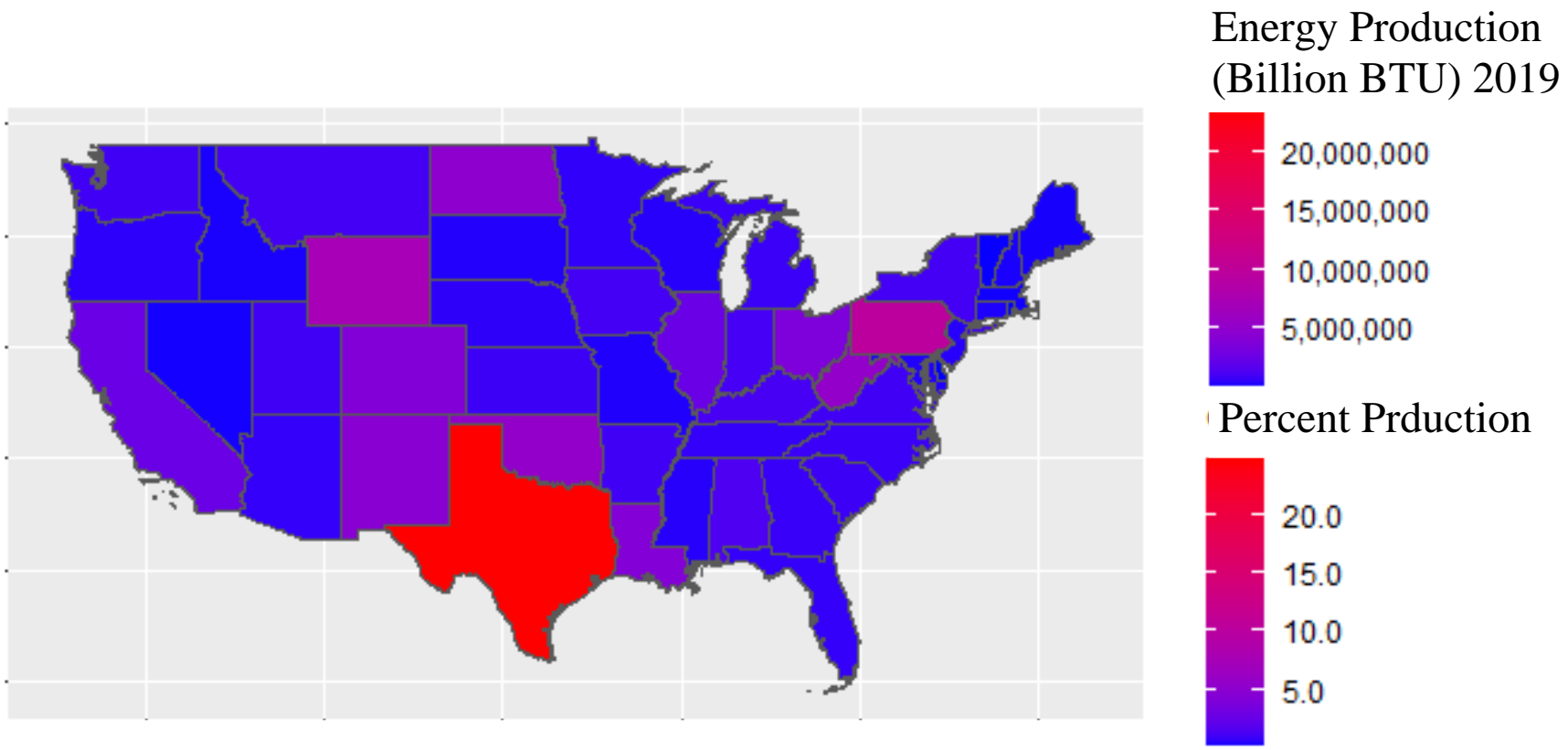
Research questions:

- 1. How much energy is generated per state?
- 2. What are the types of energy and what percent do they represent?
- 3. What percent of renewables are produced in traditionally Republican vs Democratic states?
- 4. How have energy trends changed in the past 30 years?

Methods of Analysis:

We comparatively analyzed the energy production at the state level in the US, specifically highlighting reliance on fossil fuels, as well as nuclear and renewable production. We also dove deeper into the types of energy produced by states, based on typical voting patterns. Lastly, we looked at these tends over the past 30 years. This analysis was performed as data from the EIA and ACS was compiled and organized using dplyr and basic statistical methods in R. We relied heavily on ggplot to visualized the data, both specially and temporally.

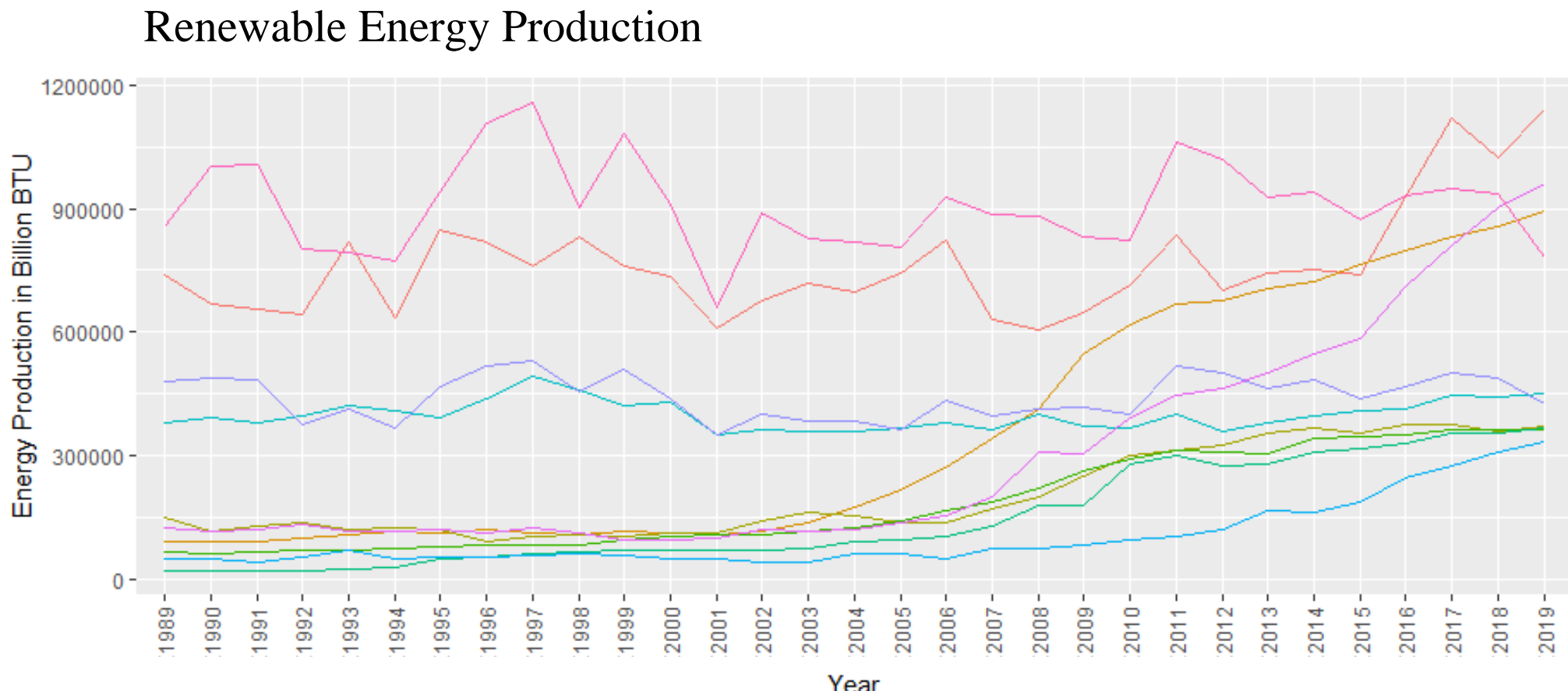
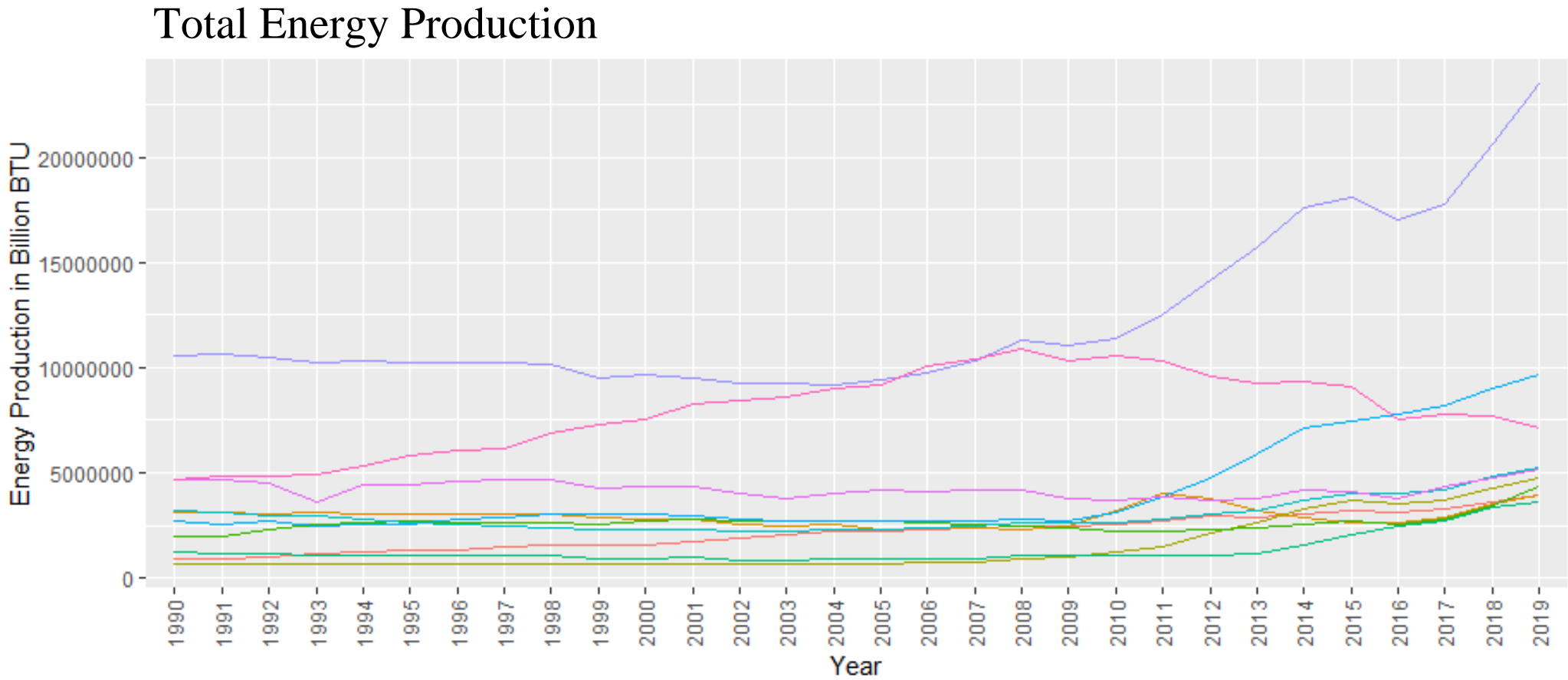
1. How much energy is generated and consumed per state?



Most states contribute a negligible amount of energy to the US, while a few states generate almost all of the US power. Texas is the most notable of the top generators, with Pennsylvania, Wyoming, and West Virginia also contributing largely. Energy consumption is more even across states and based on factors such as size, population, and GDP.

4. How have Energy trends changed in the past 30 years.

Energy Production (in Billion BTU) from 1990 to 2019 in the 10 Highest Energy Producing States

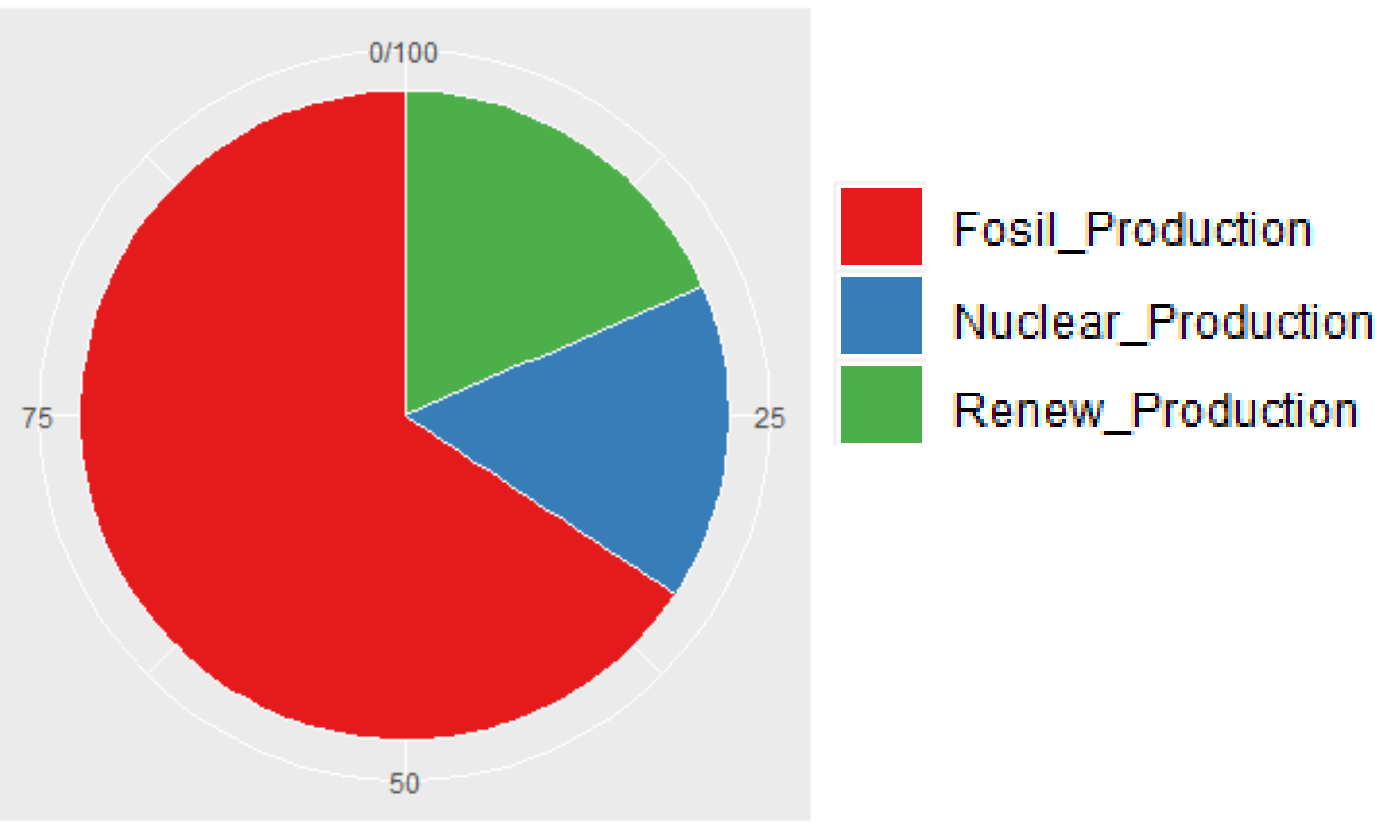


Total and renewable energy production has been trending upwards over the past 30 years, with a steeper incline in the past 15. Renewables have increased drastically, especially in the past 15 years.

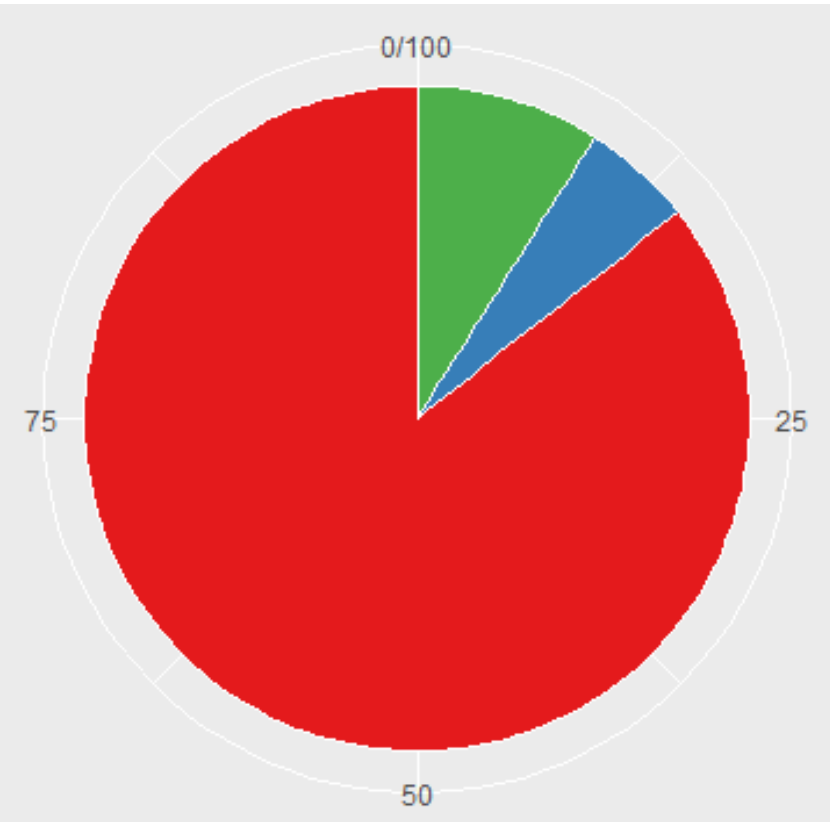
3. What percent of renewables are produced in traditionally Republican vs Democratic states?

Traditionally Democratic states generate a higher percentage of renewables and nuclear energy, compared to fossil fuels.

Traditionally Democratic States

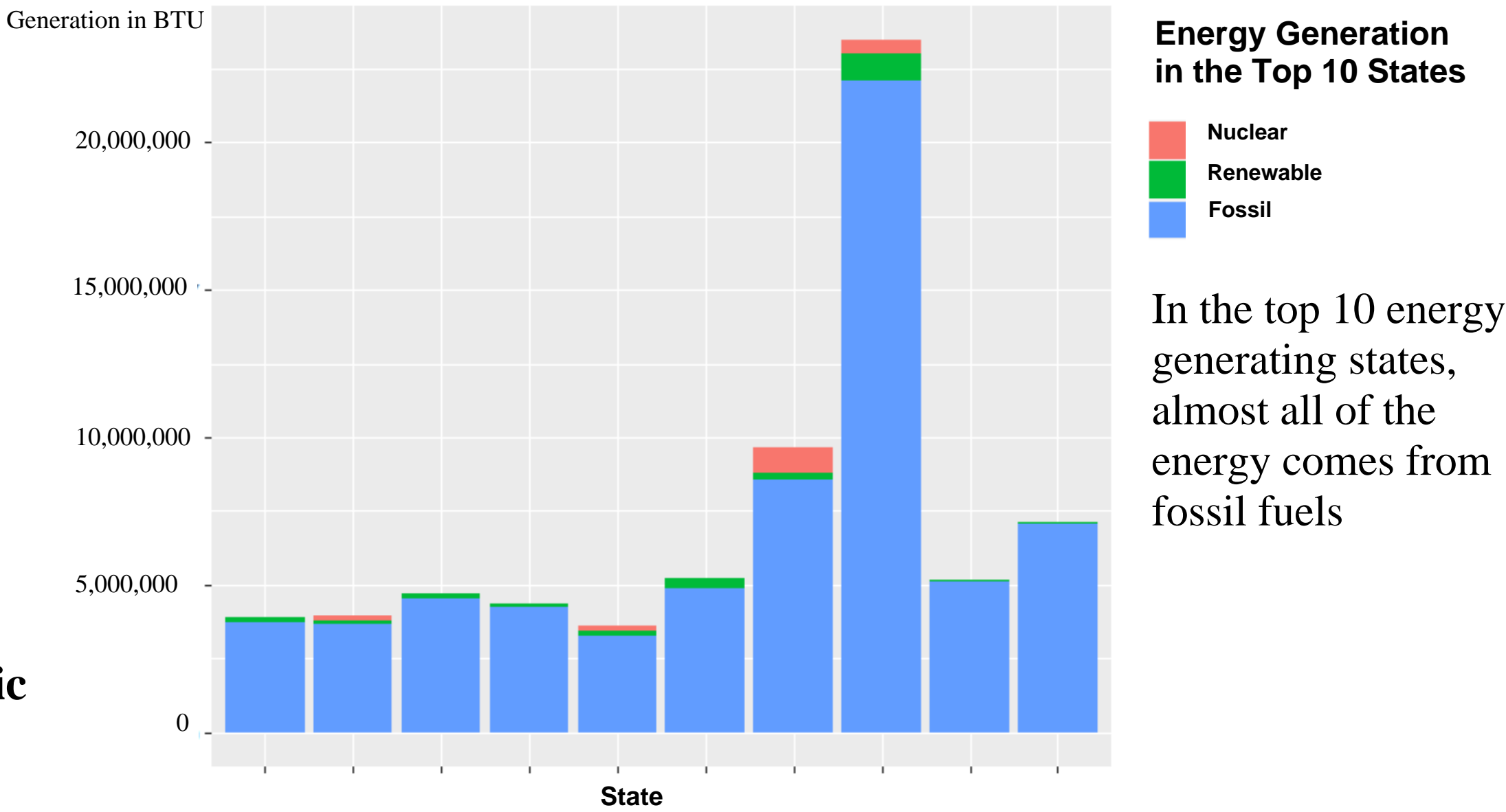


Traditionally Republican States



Generation of Fossil, Nuclear, and Renewable Energy in Traditionally Democratic and Republican States

2. What are the types of energy and what percent do they represent?



Conclusion:

The US has a goal of being carbon neutral by 2050. But, currently more than 60% of current generation comes from fossil fuels and the top energy generating states rely even more heavily on fossil fuels. Over the past 15 years a huge spike in renewables gives hope towards this goal and seems to be largely driven by political factors.

Data Sources:

Our Geography data came from ACS Census data:
<https://www.census.gov/programs-surveys/acs>
The Energy Generation and Consution data came from the EIA database:
<https://www.eia.gov/>