A State-Level Analysis of Renewable Energy and EV Intensity

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Example Solution 1

Part 0: libraries

Part 1: Defining Research Question

Chosen Question: Do states with higher shares of renewable energy also have more electric vehicle registrations per energy use in 2023?

Part 2: Data Preparation and Cleaning

```
# A tibble: 6 x 2
  state                total_renew_use_2023
  <chr>                               <dbl>
1 Alaska                              11762
2 Alabama                            223458
3 Arkansas                            87277
4 California                        1065179
5 Colorado                           115062
6 District of Columbia                2796
```

```
# A tibble: 6 x 2
  state      total_energy_use_2023
  <chr>                      <dbl>
1 Alaska                    736892
2 Alabama                  2042819
3 Arkansas                 1063785
4 Arizona                  1604222
```

```
5 California               5364639
6 Colorado                 1244446
```

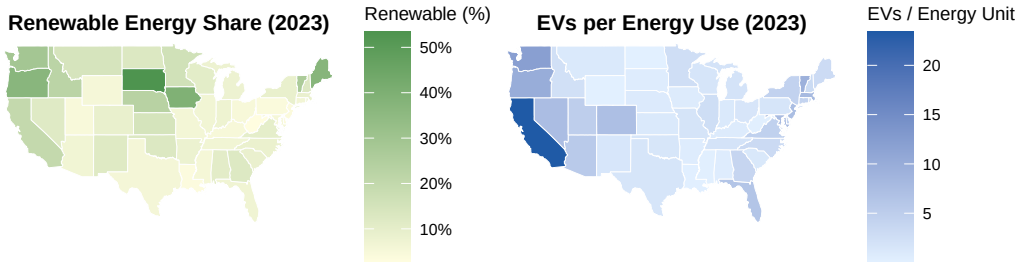
```
# A tibble: 6 x 2
  state      ev_registration_count_2023
  <chr>                           <dbl>
1 Alabama                         13047
2 Alaska                           2697
3 Arizona                         89798
4 Arkansas                         7108
5 California                    1256646
6 Colorado                        90083
```

Part 3: Joining / Pivoting Datasets for Analysis

```
# A tibble: 6 x 6
  state      total_renew_use_2023 total_energy_use_2023 ev_registration_count_~1
  <chr>                     <dbl>                 <dbl>                    <dbl>
1 Alaska                    11762                736892                     2697
2 Alabama                  223458               2042819                    13047
3 Arkansas                  87277               1063785                     7108
4 California              1065179               5364639                  1256646
5 Colorado                 115062               1244446                    90083
6 Delaware                   8040                195446                     8435
# i abbreviated name: 1: ev_registration_count_2023
# i 2 more variables: renewable_share_2023 <dbl>, ev_per_energy_unit_2023 <dbl>
```

To explore whether states with higher shares of renewable energy also have more electric-vehicle (EV) registrations per energy use, I joined three state-level datasets: renewable energy consumption, total energy consumption, and EV registrations. The combined table allowed direct comparison across all states. I then created two new variables: the percentage of renewable energy out of total energy use and the ratio of EV registrations to total energy use.

Part 4: Mapping Visualization



Part 5: Analysis

The two maps above compare each state's share of renewable energy and the number of electric vehicle (EV) registrations per total energy use. I noticed some states with cleaner electricity mixes, such as Washington, Oregon, and Vermont, also tend to show relatively high EV intensity, suggesting that EV charging in these regions is more likely powered by renewable sources. In contrast, other states with high EV intensity but only moderate to low renewable shares, such as California and Florida, indicate that a significant portion of charging demand is still met by non-renewable generation. Overall, the visualizations reveal that the relationship between renewable energy share and EV adoption varies widely across the United States. While EVs reduce direct emissions, the cleanliness of the electricity used to charge them depends heavily on each state's energy mix. In many states, the electricity powering EVs still comes partly from non-renewable sources including fossil fuels.