

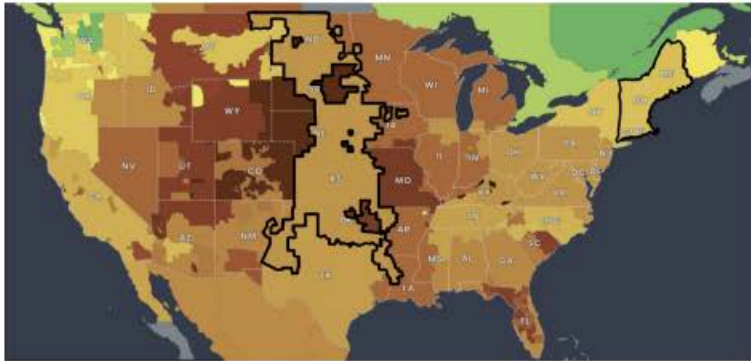
Problem Statement

How does CO₂ intensity vary across different U.S. regions, and which energy sources contributed to these variations over the past three years (2021-2023)?

Methodology



Region Selection



Southwest Power Pool and ISO New England

Data Scraping

Extract raw energy mix data from the electric grids' web APIs (Southwest Power Pool and ISO New England).

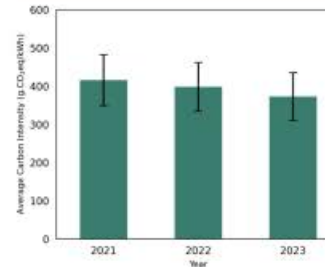
Data Cleaning

Clean up the raw data from different sources to unify their format.

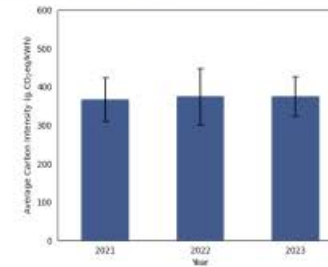
Data Analysis

Examine data in yearly and monthly granularity.

Yearly Average CO₂ Intensity (2021-2023)



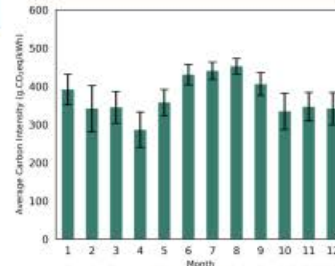
1(a) SWPP yearly



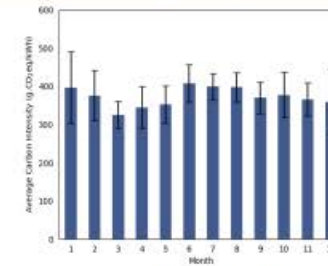
1(b) ISO-NE yearly

- High: ~420 (SWPP), ~380 (ISO-NE)
- Low: ~380 (SWPP), ~370 (ISO-NE)
- CO₂ intensity has small changes over the past 3 years

Monthly Average CO₂ Intensity



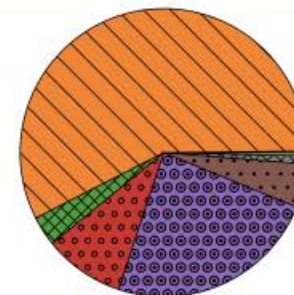
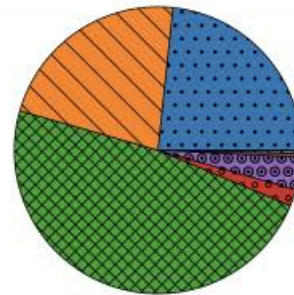
2(a) SWPP monthly



2(b) ISO-NE monthly

- There is more monthly variation in figure 2(a) as compared to figure 2(b) due to high renewable ratios

Energy Mix



- coal
- gas
- wind
- hydro
- nuclear
- unknown
- biomass
- solar
- oil

Conclusion

While high renewable ratio implies low carbon intensity, it also means that there are high variations in carbon intensity. This emphasizes the need for different fields to come up with solutions on how to harness low carbon, but high variation energy sources to reduce carbon footprints.