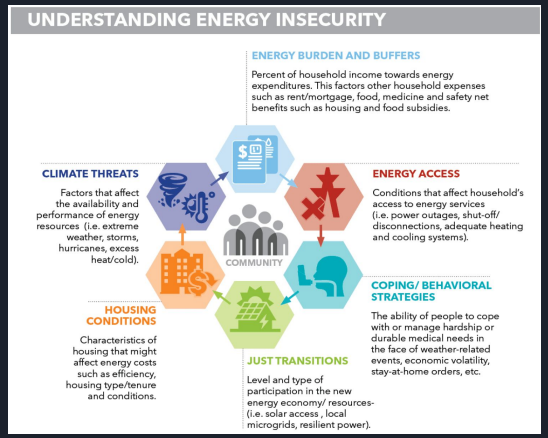
Solar Infrastructure and Energy Insecurity in the US

Eddie Andujar, Prashanthi Subbiah, Clarice Tee

Research Question

Is the presence of solar infrastructure within a given area correlated with local levels of household energy insecurity?

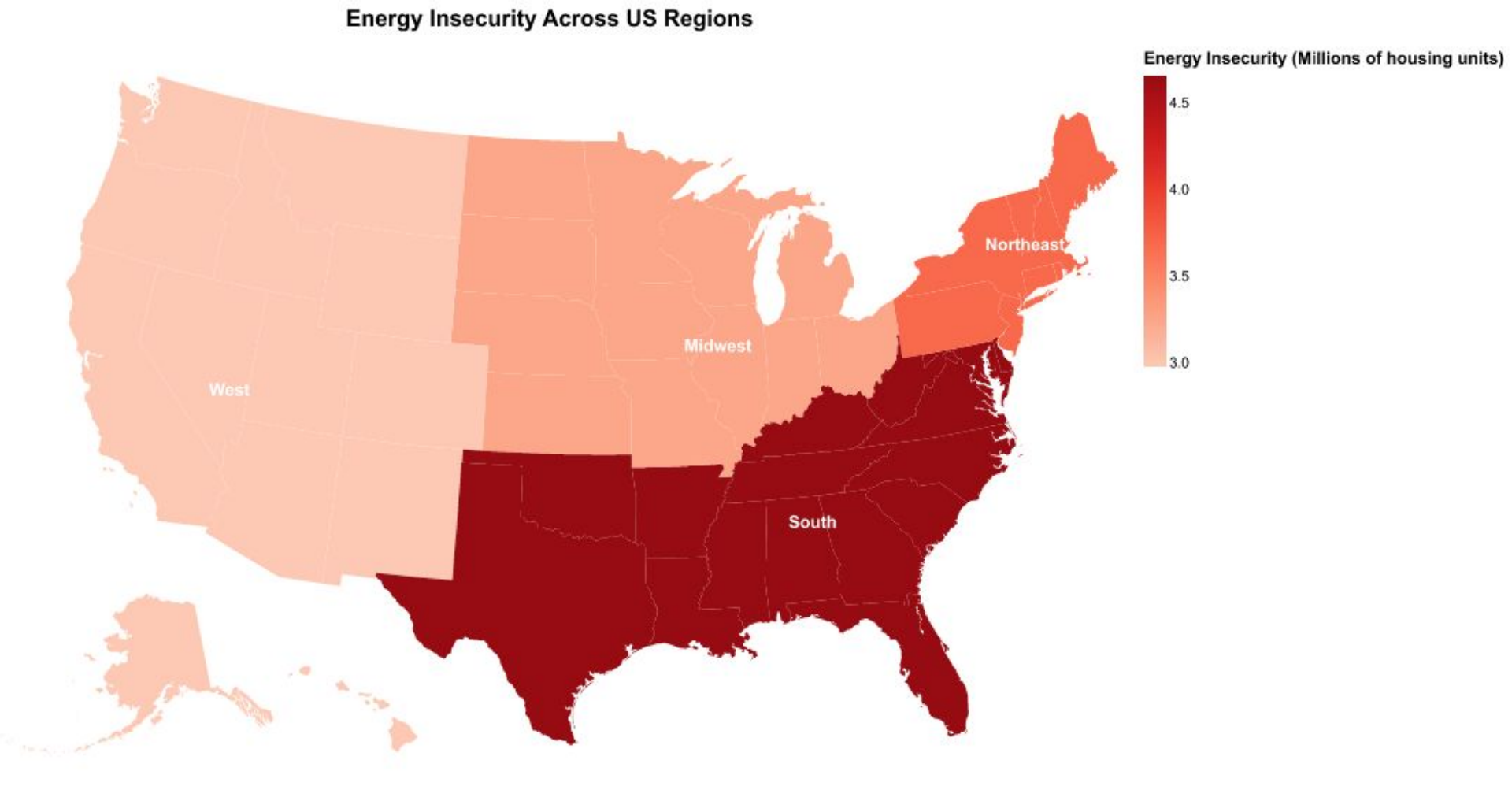
- What regions of the US would benefit the most from policy targeting energy insecurity?
- Where is solar infrastructure most developed across the country?



Data & Methods

For our data analysis, we used to government survey agencies to collect information on our variables of interest:

- The **2020 Residential Energy Consumption Survey** collects data on household energy consumption and an energy insecurity index based off of whether households can pay their electricity and have reliable access to HVAC.
- The **US Geological Survey** provides a comprehensive database of solar photovoltaic plants and their energy capacity across the entire country.
- The power capacity dataset had 4,185 rows tagged by state. We transformed the dataset to include region and division columns to match the energy insecurity dataset, then filtered to the year 2020.
- We then aggregated based on region and division and merged the datasets to create one where where each row represented the level of development (AC power capacity) and the energy insecurity index in the associated area.

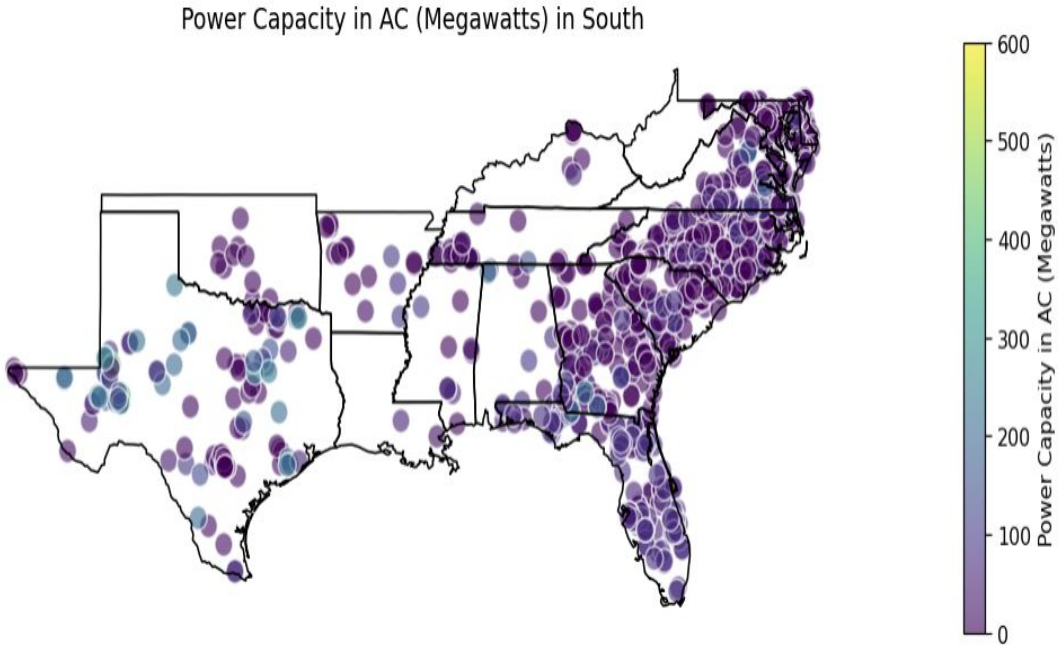

Energy Insecurity Across US Regions
Energy Insecurity (Millions of housing units)
4.5
4.0
3.5
3.0
West
Midwest
Northeast
South

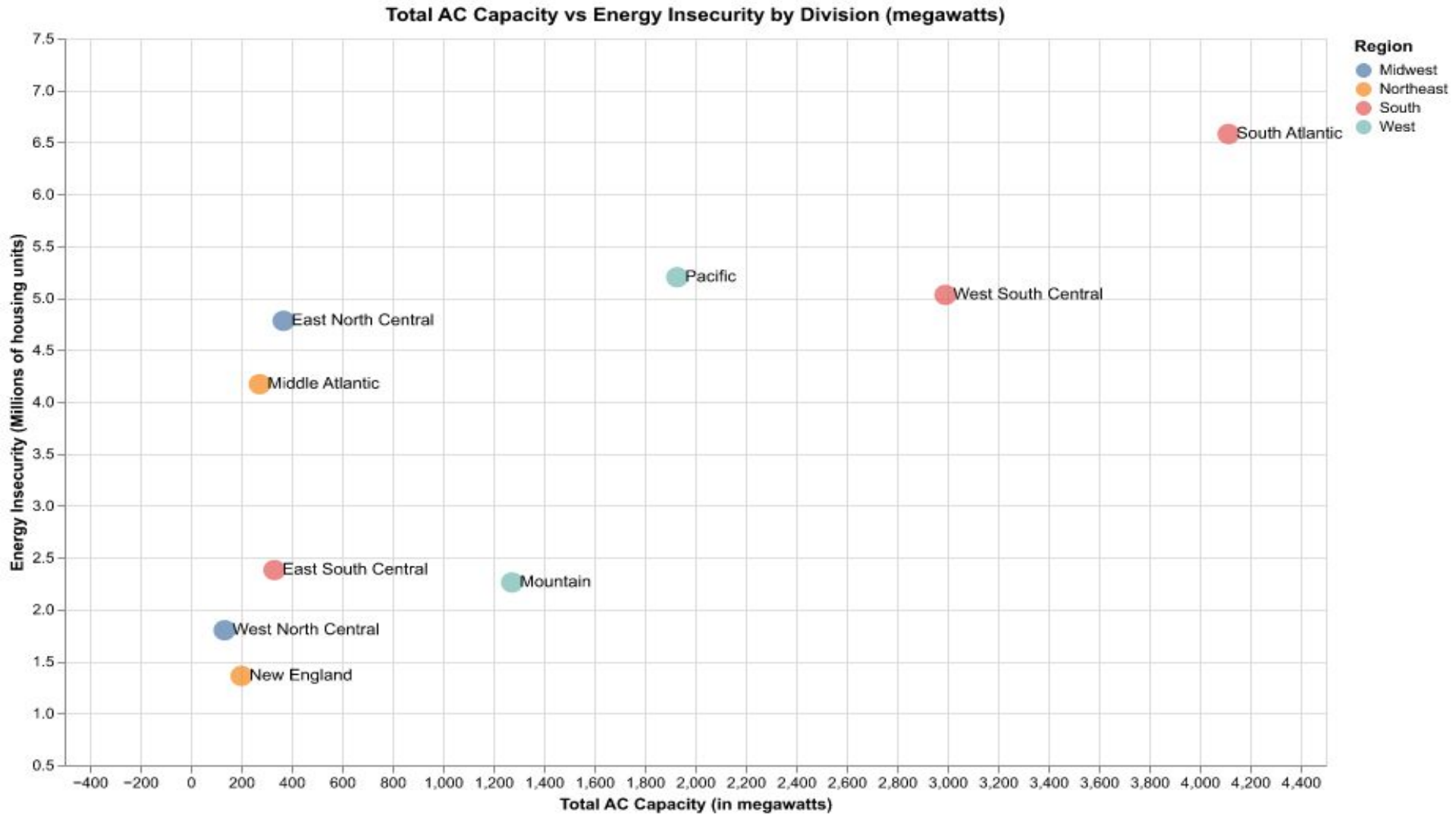
- We first transformed the data into a choropleth that allowed us to visualize the landscape of energy insecurity across the country.
- The Southwest and Southeast appear to be the most energy insecure areas of the country, while the West is relatively secure.
- Let’s use our dashboard to check how that compares to solar infrastructure.

Power Capacity in AC (Megawatts) Across the US

Select Region:

South




Total AC Capacity vs Energy Insecurity by Division (megawatts)
Energy Insecurity (Millions of housing units)
Total AC Capacity (in megawatts)
Region
Midwest
Northeast
South
West
South Atlantic
Pacific
West South Central
East North Central
Middle Atlantic
East South Central
Mountain
West North Central
New England

Discussion

- While we were able to use python code to create detailed visualizations of the energy and infrastructure landscape, we did not identify any strong correlation between the two.
- This raises the question of whether solar infrastructure investment may in fact be crowding investment away from protecting households, though this remains inconclusive.
- Another possibility, if we buy into the weak positive correlation, is that higher capacity solar is being deployed to more insecure regions. Perhaps over time, this will lead positive effects, we're simply too early to spot them.

Future Outlook

- At a glance, it appears that solar infrastructure investment doesn't hold the key to alleviating energy insecurity, but we need further research to rule it out.
- An interesting follow-up would be to link our newly created dataframe with data on weatherization programs per regions. Unfortunately, current publicly available weatherization data is limited.
- However, the visualizations from our dashboard and dataframe can serve as useful policy tools to help better target energy insecure areas in the US or identify where solar infrastructure is most or least developed.