Introduction to Data Science

Key Drivers of Electricity Usage in July

Background

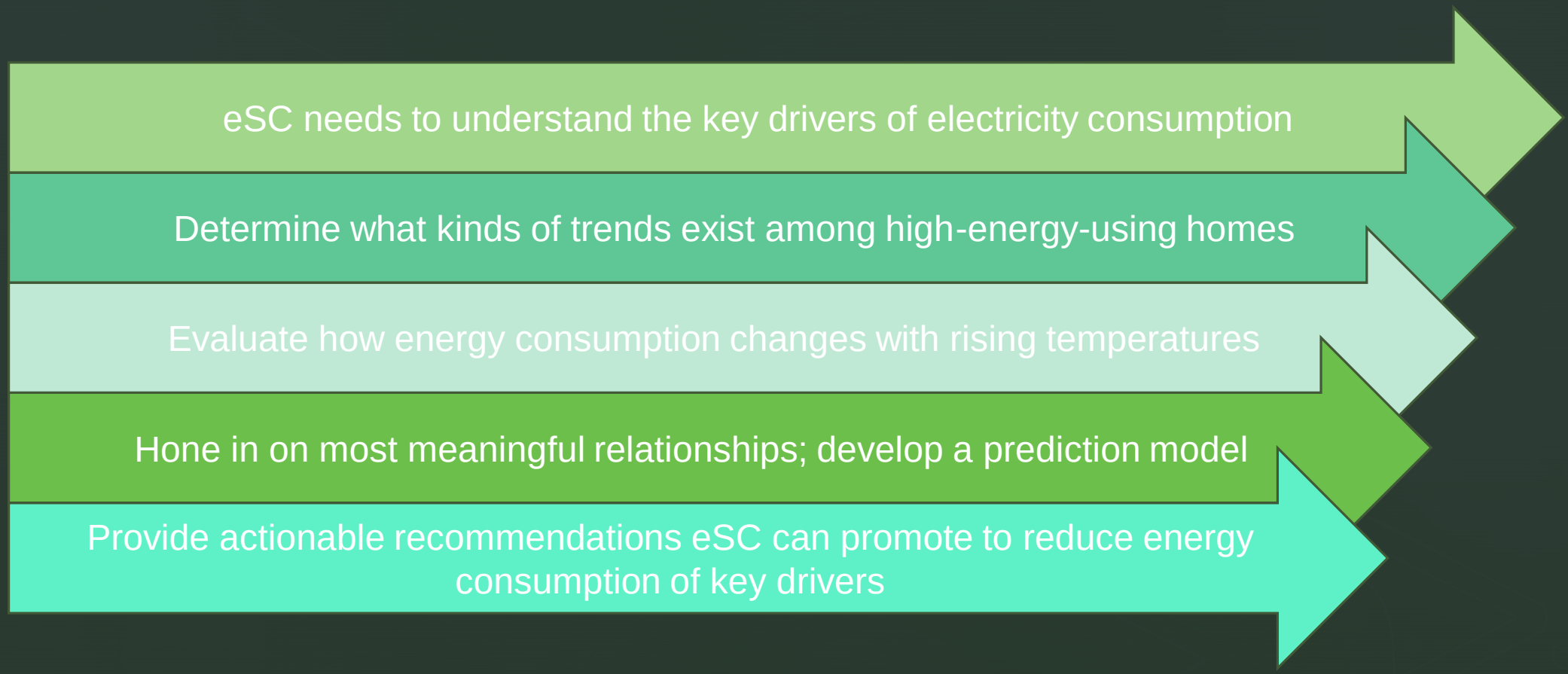
Global warming is threatening to increase extreme temperatures seen in peak months, namely July

Increased temperatures consequently increase electricity demand, as consumers need to cool their homes and power their devices

Too much demand for electricity may lead to overload ed power grids and cause blackouts

Client wants to avoid having to build additional facilities to support demand

Problem Definition



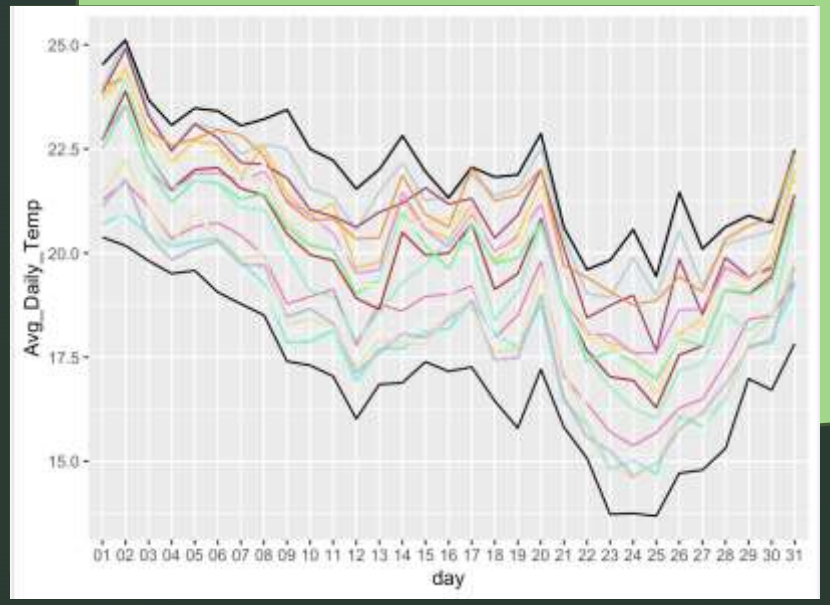
Available Data

- ✓ 46 counties
- ✓ Hourly data 2018
- ✓ Temperature (C)
- ✓ Relative Humidity (%)
- ✓ Wind Speed
- ✓ Wind Direction
- ✓ Radiation

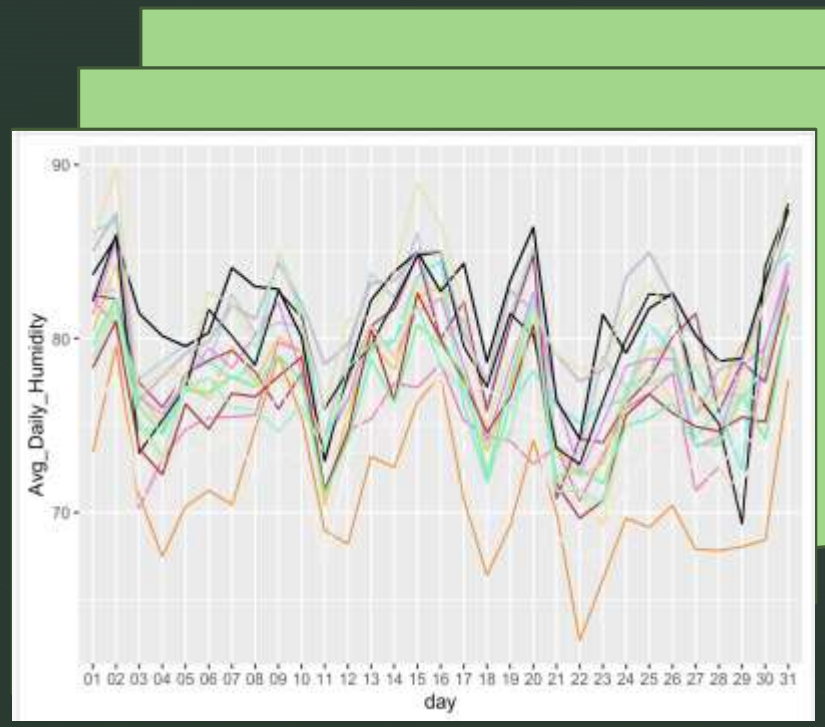
- ✓ 5710 houses
- ✓ Homes have unique building id
- ✓ All counties in SC
- ✓ Single-Family Residential Homes
- ✓ 171 different attributes

- ✓ Distinct energy file for each building id
- ✓ Hourly Data 2018
- ✓ 42 sources of energy consumption
- ✓ Measured in kWh or kWh/sqft

Counties Varied in Daily Temperature, but Followed Trend

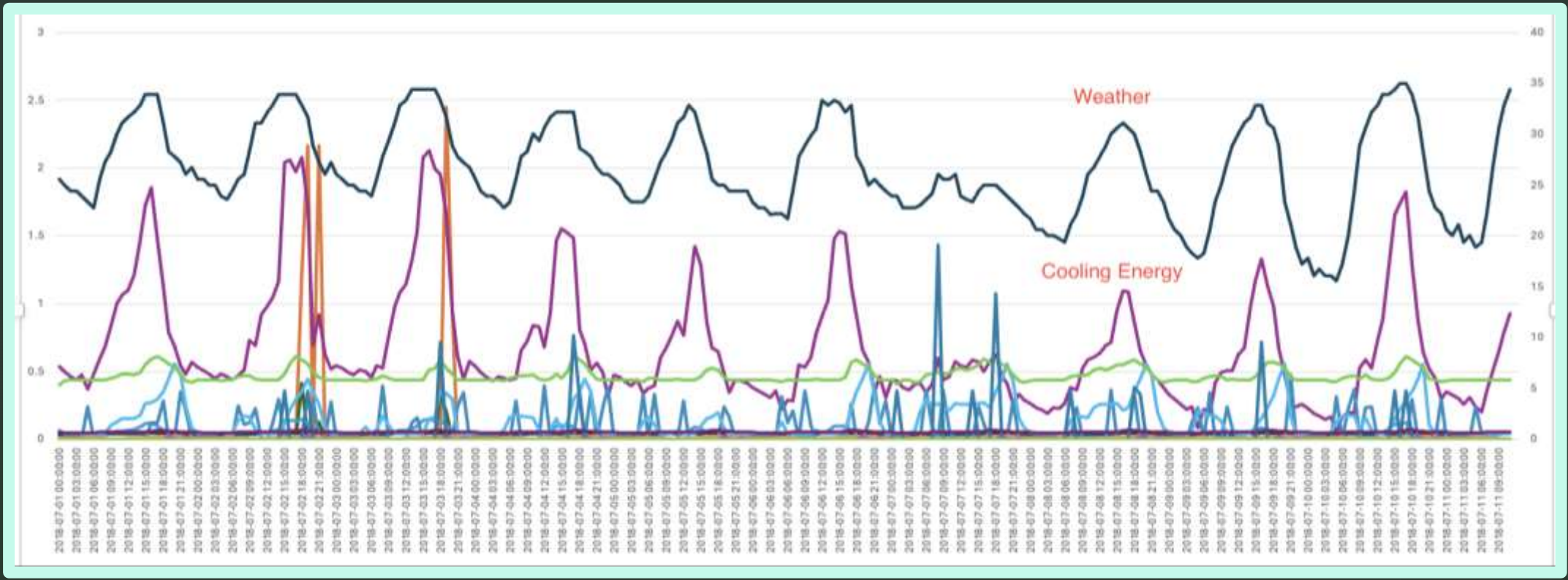


Average Daily Temperature for July by County

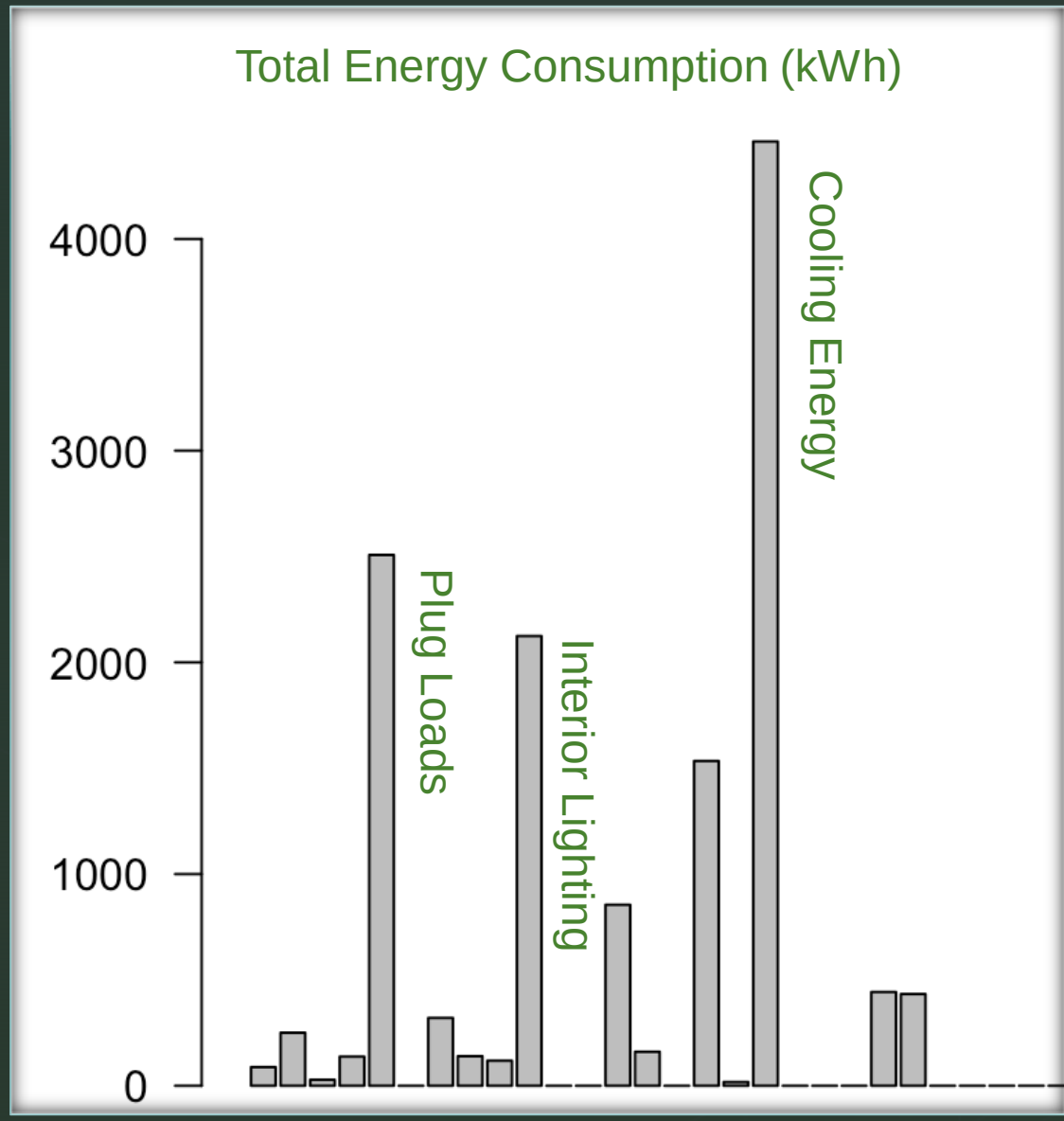


Average Daily Relative Humidity for July by County

Cooling Energy and Plug Loads Follow Similar Trend to Weather

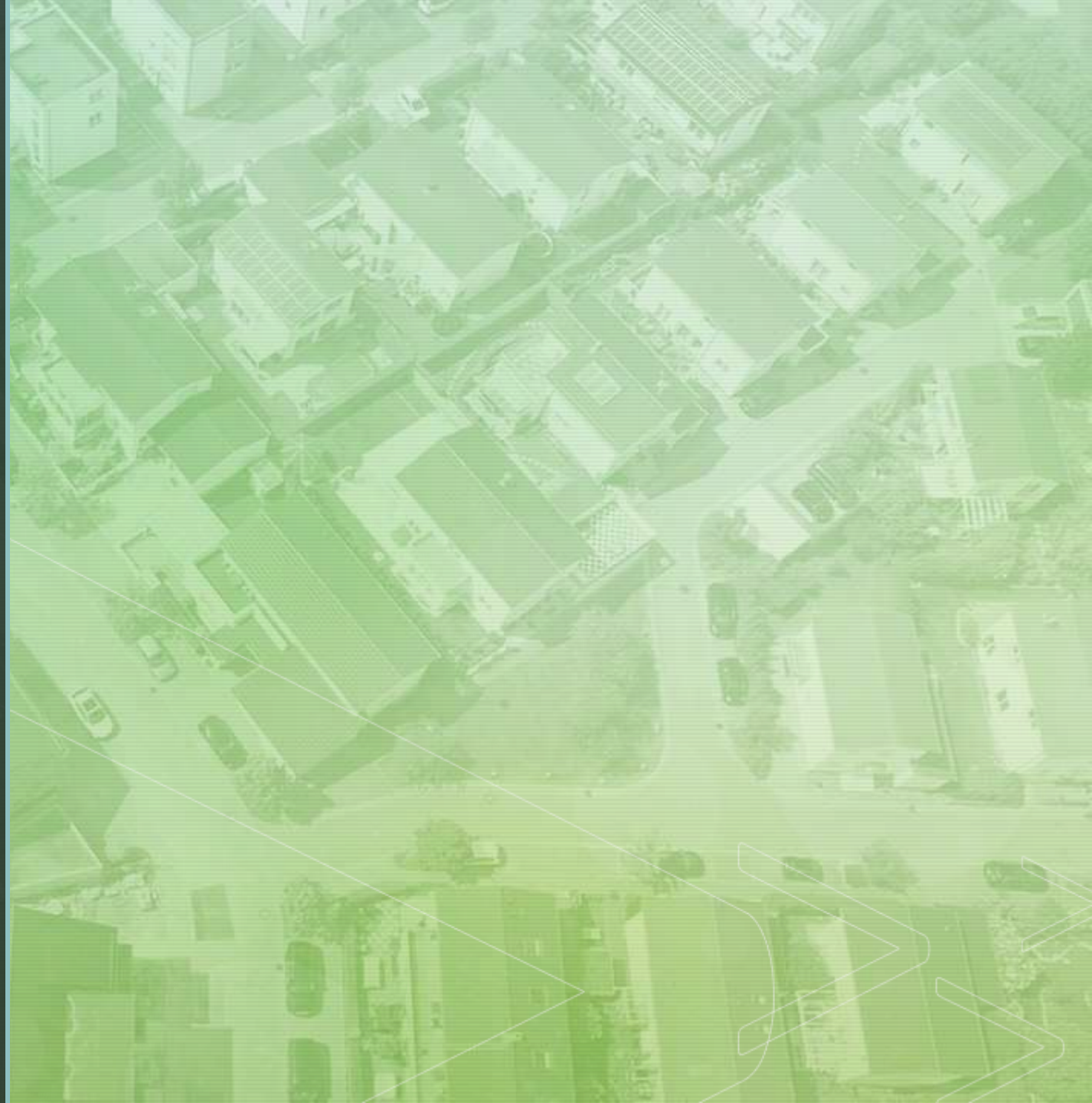


Key Drivers of Electricity Consumption

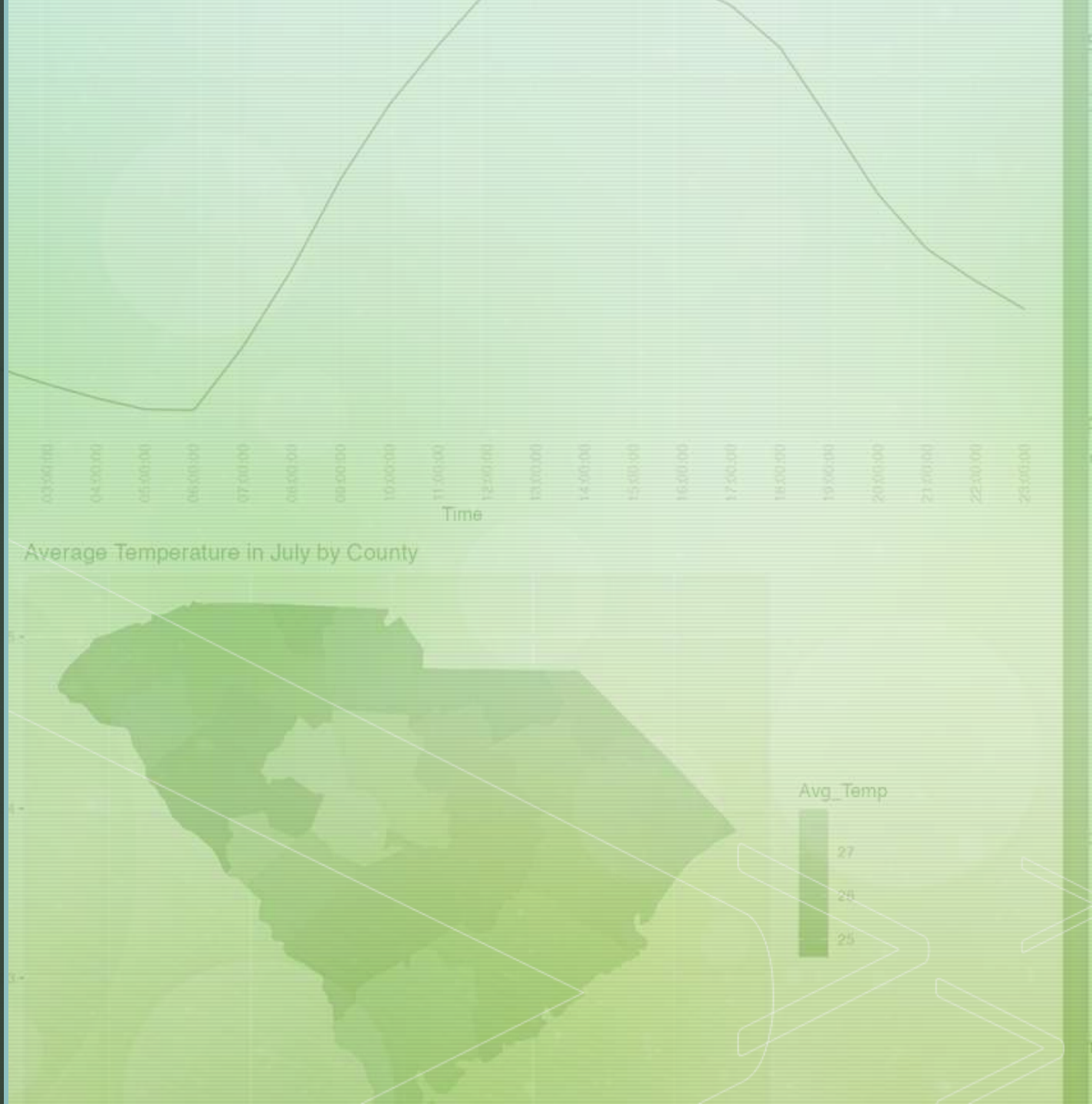


Identifying House Attributes Which Contribute to Key Consumption Drivers

- Square Footage
- HVAC Type
- Location
- Number of Occupants
- Average Usage
- Time of Day
- Home Leakage (windows, ducts, insulation)



Shiny App Demo



Recommendation

- ✓ Provide smart plugs/light timers to households based on number of occupants
- ✓ Offer rebate for homeowners who purchase smart thermostat
- ✓ Monthly reports compare usage to county average
- ✓ Target High Usage homes first

Follow-up Analysis

Select a subset of houses to supply smart plugs

Monitor energy usage in these homes for an extended time; compare actual energy usage to our prediction model

Determine whether smart plugs are significantly reducing energy consumption in key drivers