Explanatory Note

Deriving Hourly Electric Load Shape for Space Heating/Cooling and Water Heating

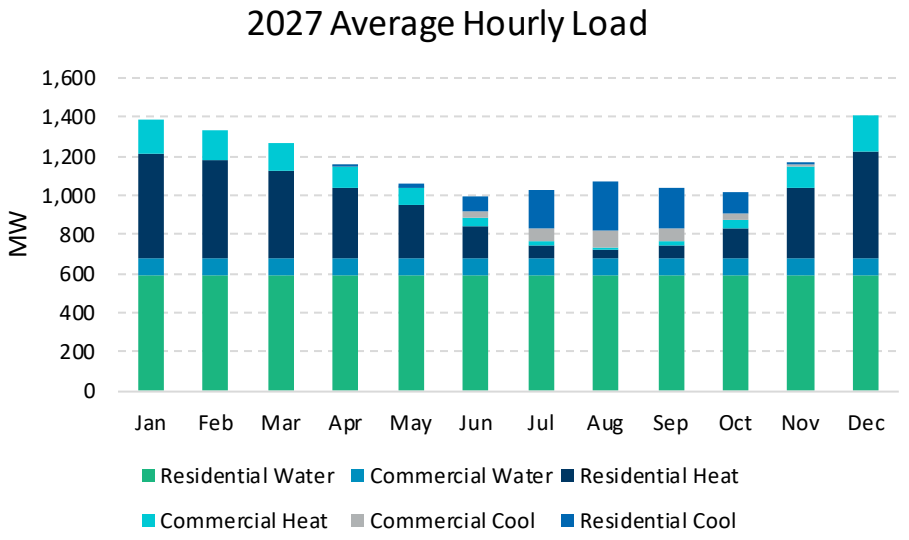
Methodology

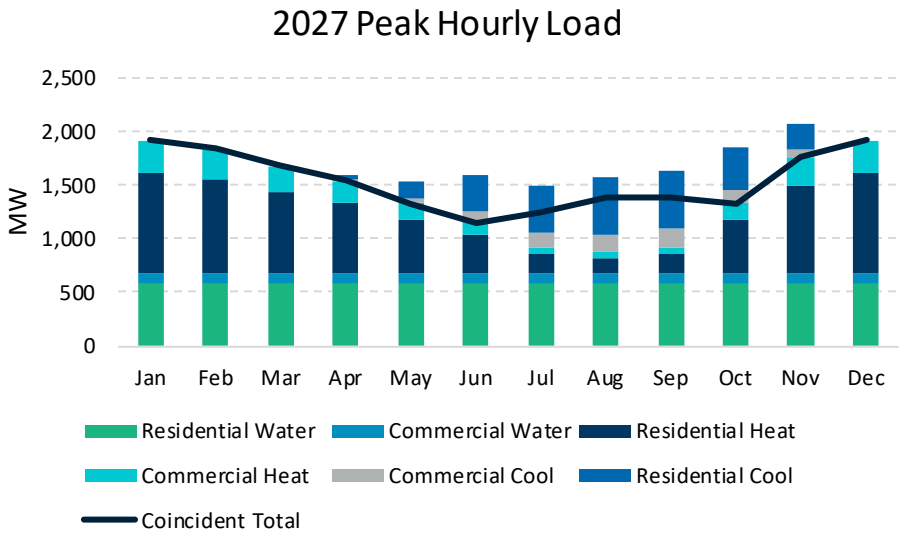
Space heating and cooling

1. Compile hourly temperature series for Southern California by hour based on the hourly Heating and Cooling Degree Days from NOAA data*
2. Construct effective hourly heating and cooling demand using temperature data:
   - Hourly effective heating demand = 70^{O}F – Temperature
   - Hourly effective cooling demand = Temperature – 65^{O}F
   - Hourly effective heating and cooling demand made into an 8,760-shape by dividing hourly demand in each hour by the annual totals (both in ^{O}F)
3. Combine hourly effective heating/cooling load (from Step 2 above) with the efficiency of heat pumps at different temperatures to derive hourly electric load shapes
4. Use the hourly electric load shape (from Step 3 above) to allocate the annual electric energy gained through conversion (in MWh) to derive an hourly electric load shape in MW

Water Heating

5. Combine water heating demand (assumed flat in all hours) with the efficiency of electric technology at room temperature
6. Using the calculation from Step 5 above allocate the annual electric energy gained through water heating conversion in MWh to derive an hourly electric load in MW





* https://www.ncdc.noaa.gov/cdo-web/search

** https://www.aga.org/globalassets/research--insights/reports/aga_study_on_residential_electrification.pdf