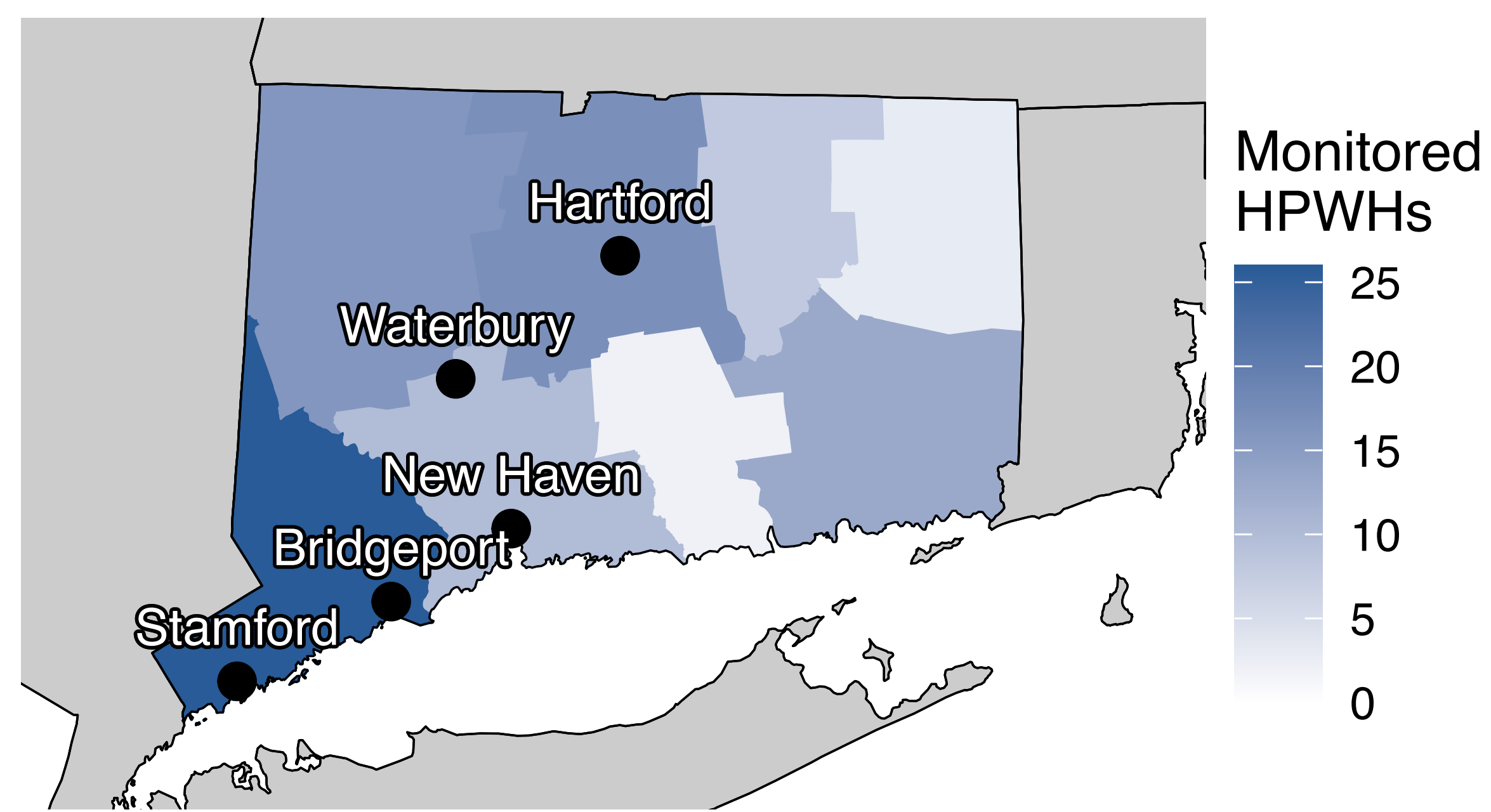
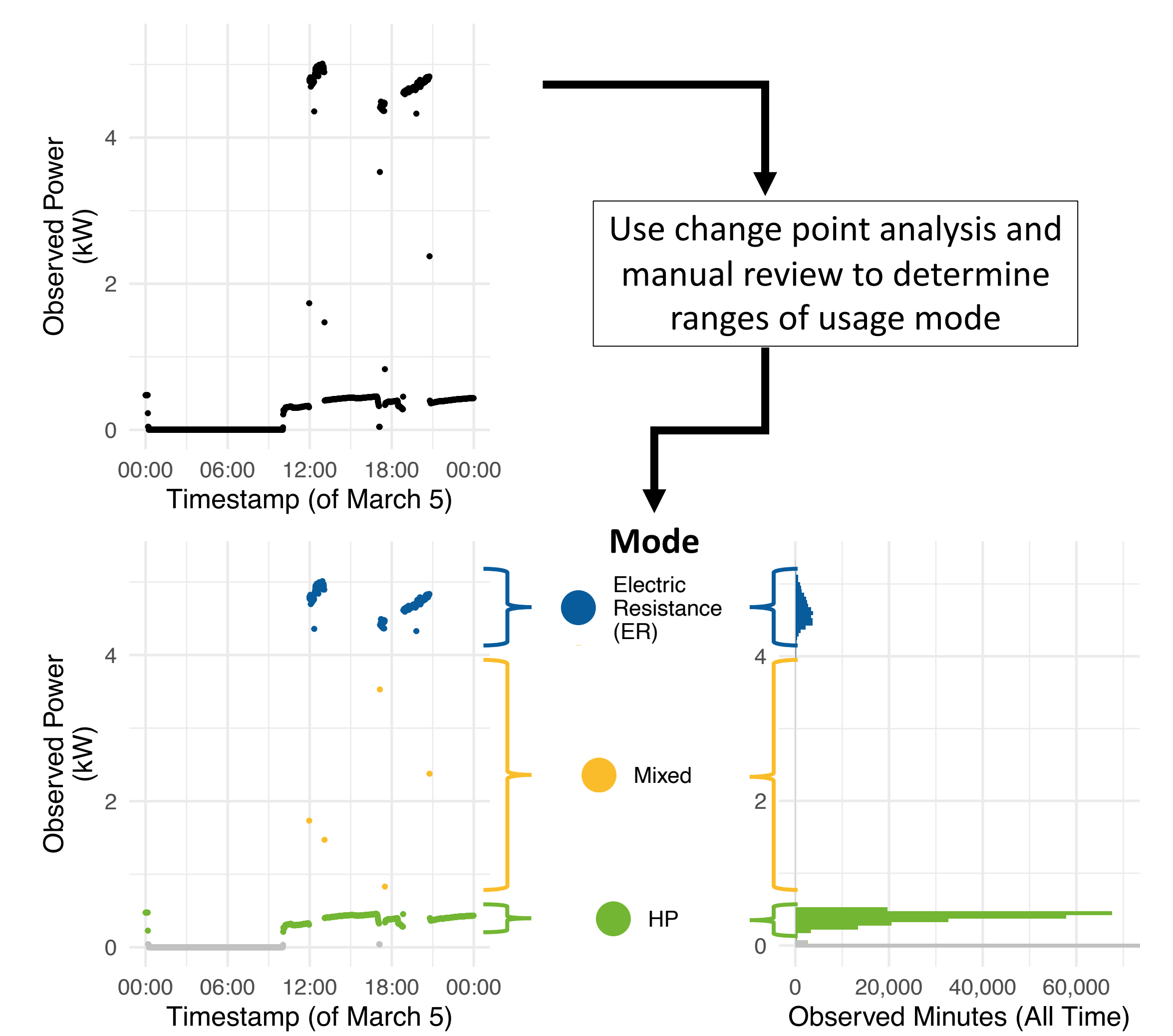


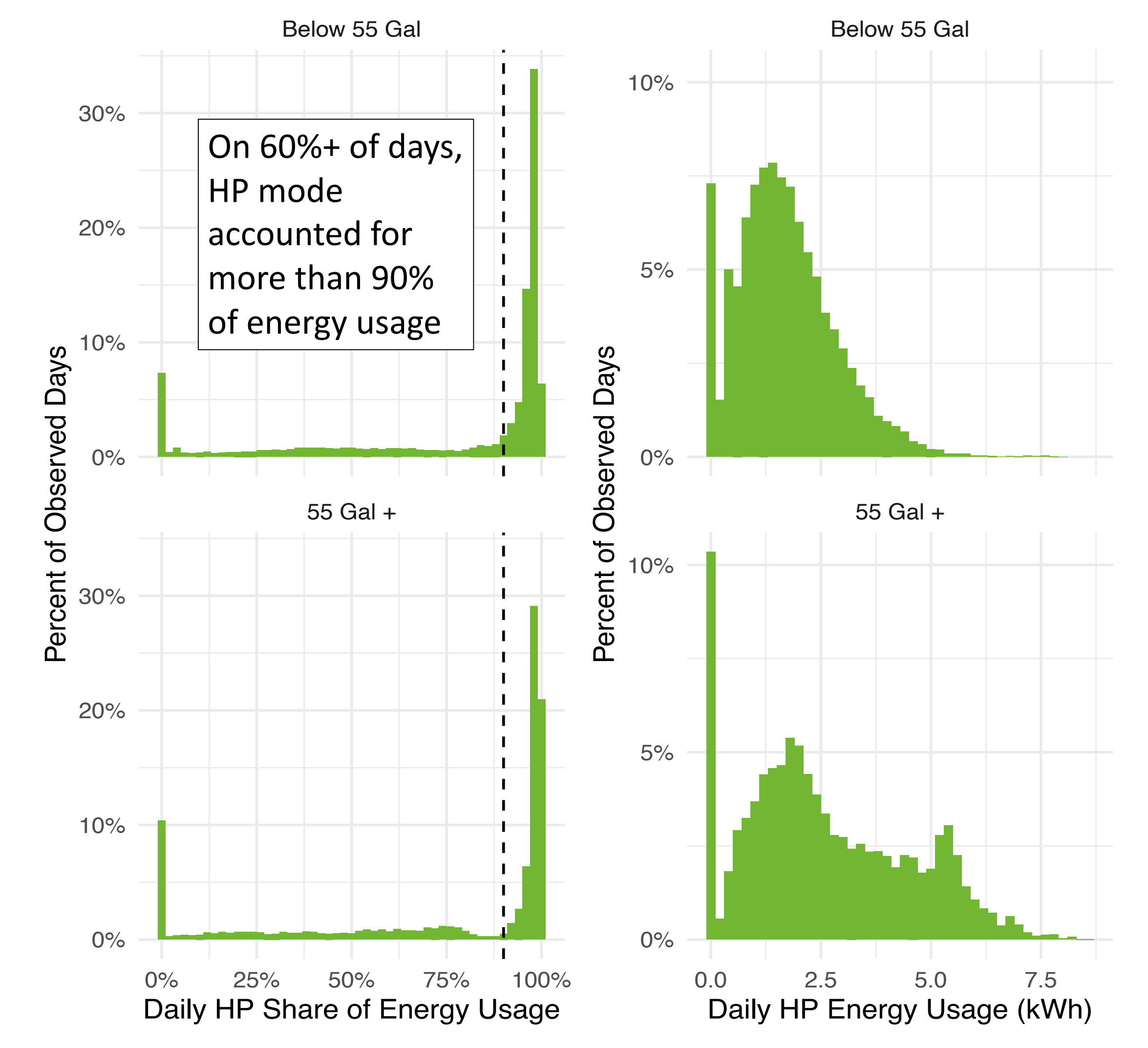
1 Collect heat pump water heater data



2 Determine operation mode for every minute



3 Calculate kWh in each mode



# Estimating Savings from Heat Pump Water Heater Monitoring Data

Unlock real-world savings with HPWH monitoring data! Estimate energy savings for various efficiency scenarios without the hassle of pre-installation monitoring. Discover how our flexible method projects future savings, empowering program planners with existing data for smarter decisions.

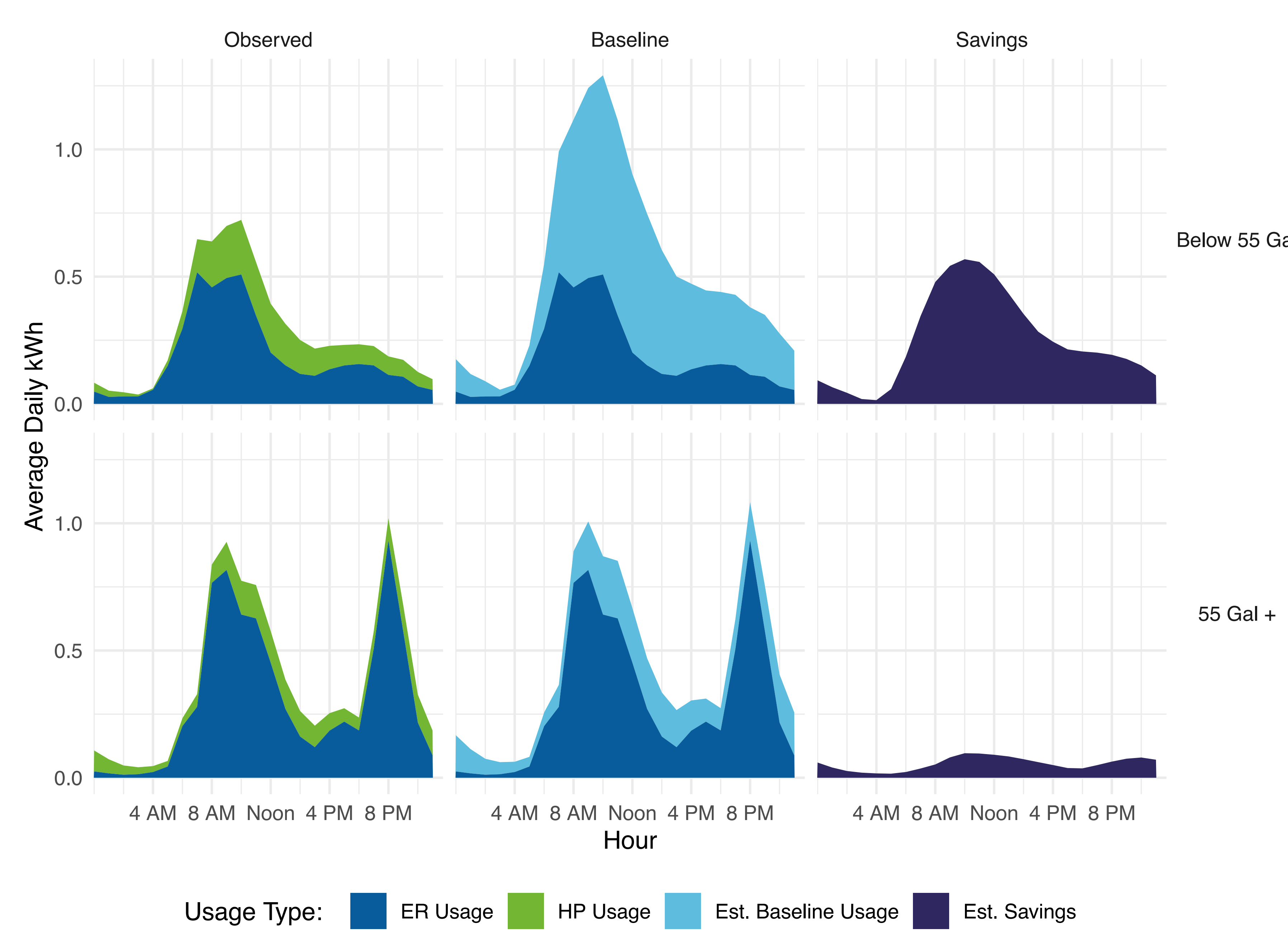
4 Calculate and apply efficiency factor to HP usage to estimate avoided energy usage

Assumed baseline efficiencies:

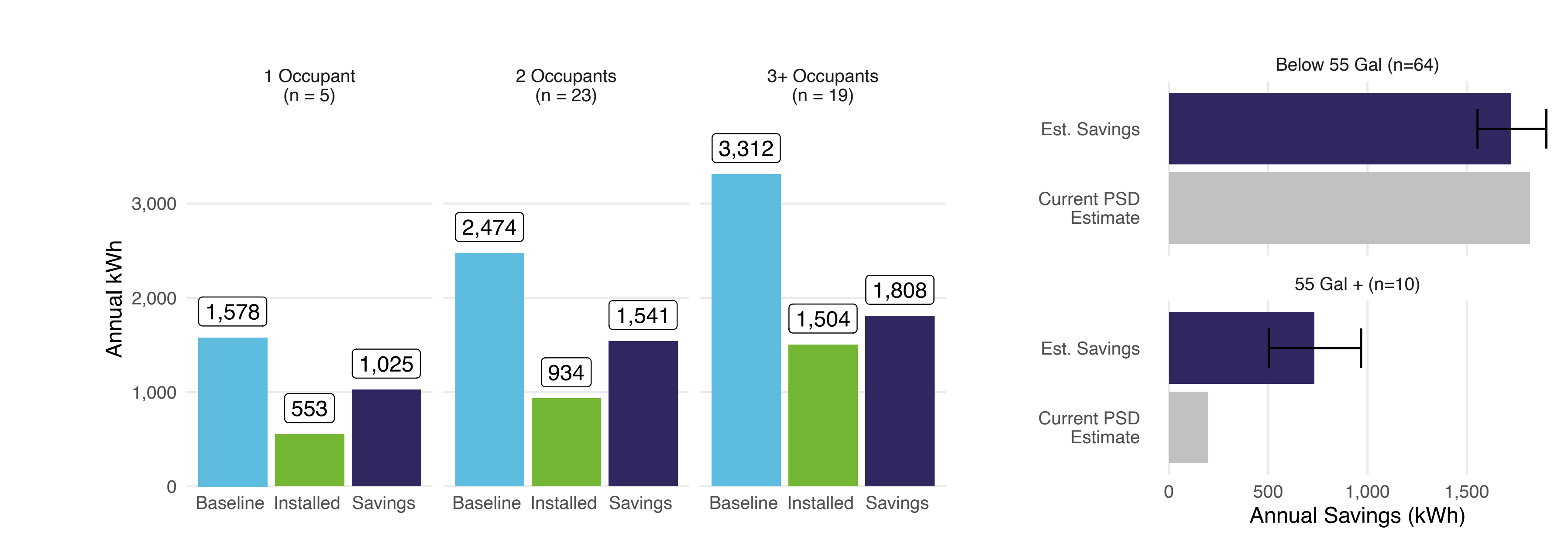
- below 55 gallons = 0.945
- 55+ gallons = 2.000

The most common actual UEF for HPWHs in study is ~3.4

5 Calculate baseline kWh as avoided energy and ER usage



6 Calculate savings from actual kWh and estimated baseline kWh



## Key Equations

Equation 1: HPWH Heat Pump Efficiency Factor Calculation

$$HPWH \text{ Efficiency Factor} = \frac{(UEF_{installed} - UEF_{baseline})}{UEF_{baseline}}$$

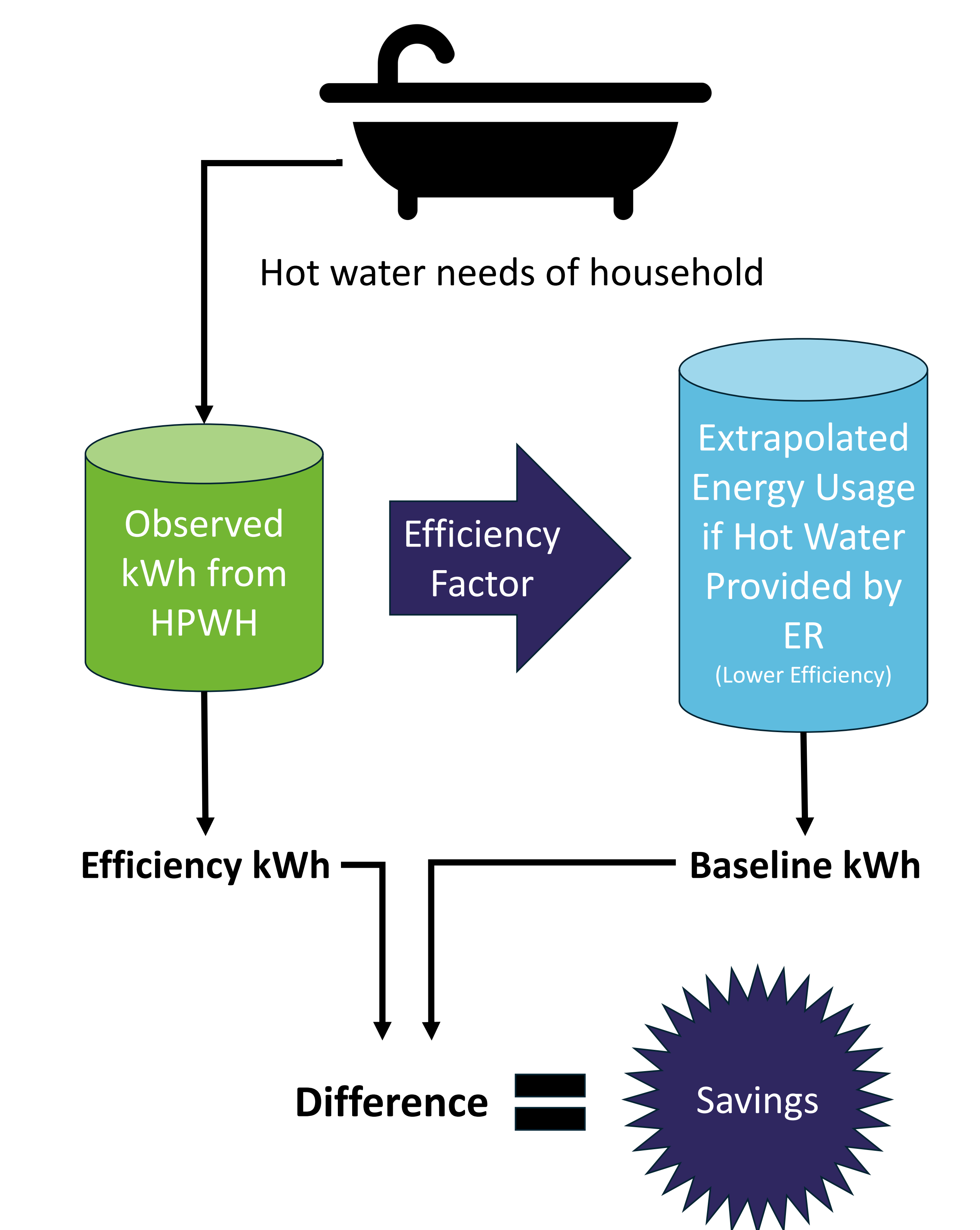
Equation 2: HPWH Baseline Energy Use Calculation

$$Baseline \text{ kWh} = (HP \text{ kWh}_{observed} \times HPWH \text{ Efficiency Factor}) + ER \text{ kWh}_{observed}$$

Equation 3: HPWH Savings Calculation

$$HPWH \text{ Savings kWh} = Baseline \text{ kWh} - (HP \text{ kWh}_{observed} + ER \text{ kWh}_{observed})$$

## Method Overview



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