



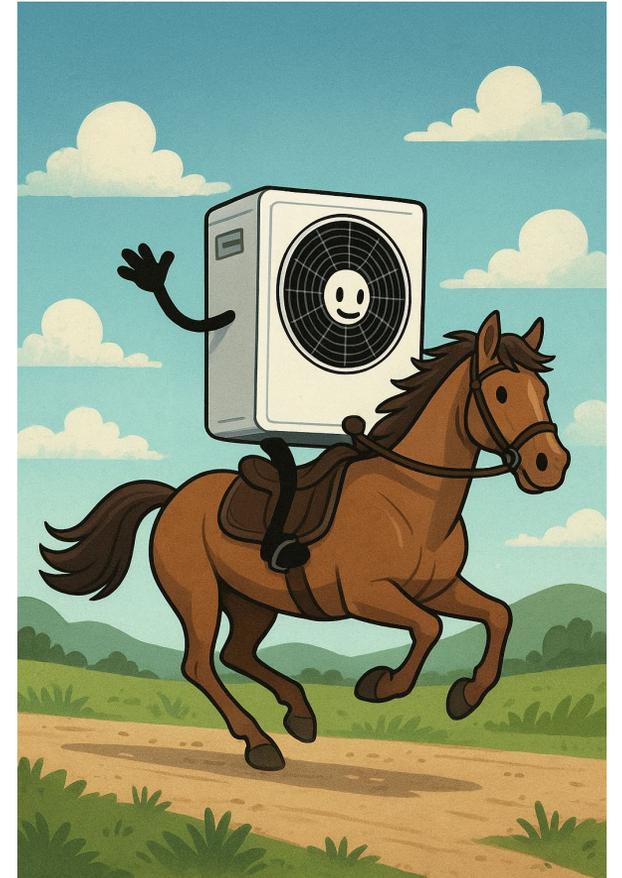
# Should we take a step back from setbacks?

*Evidence from a mixed methods study of heat pump customer AMI and survey data*

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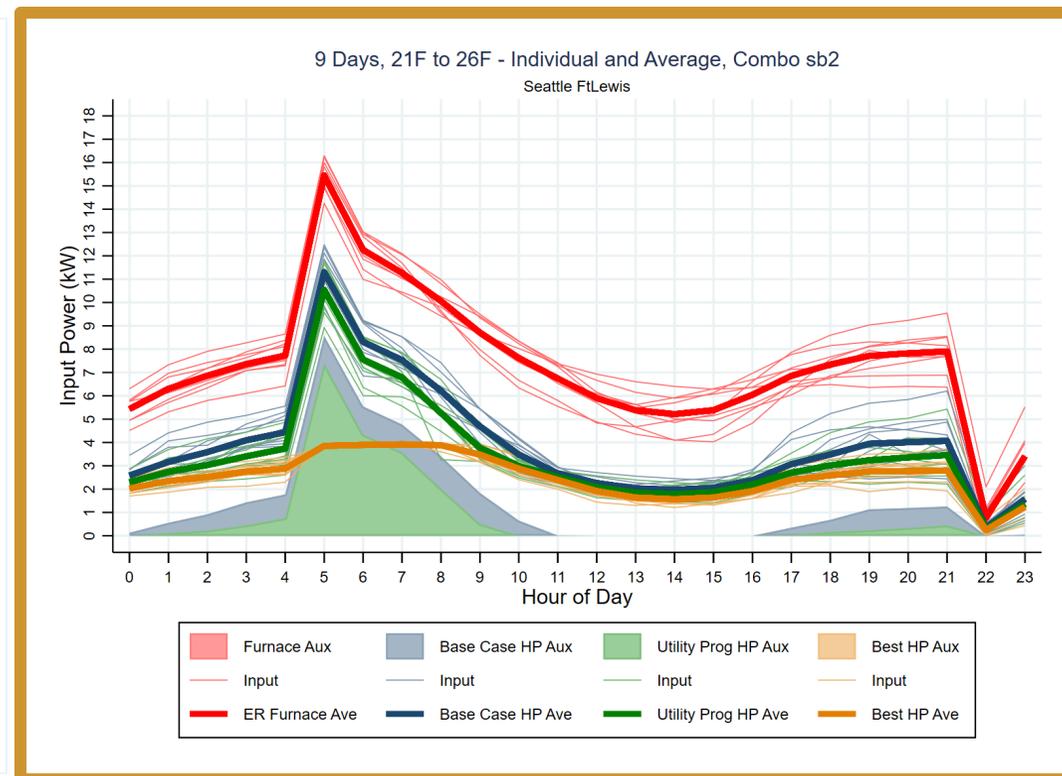
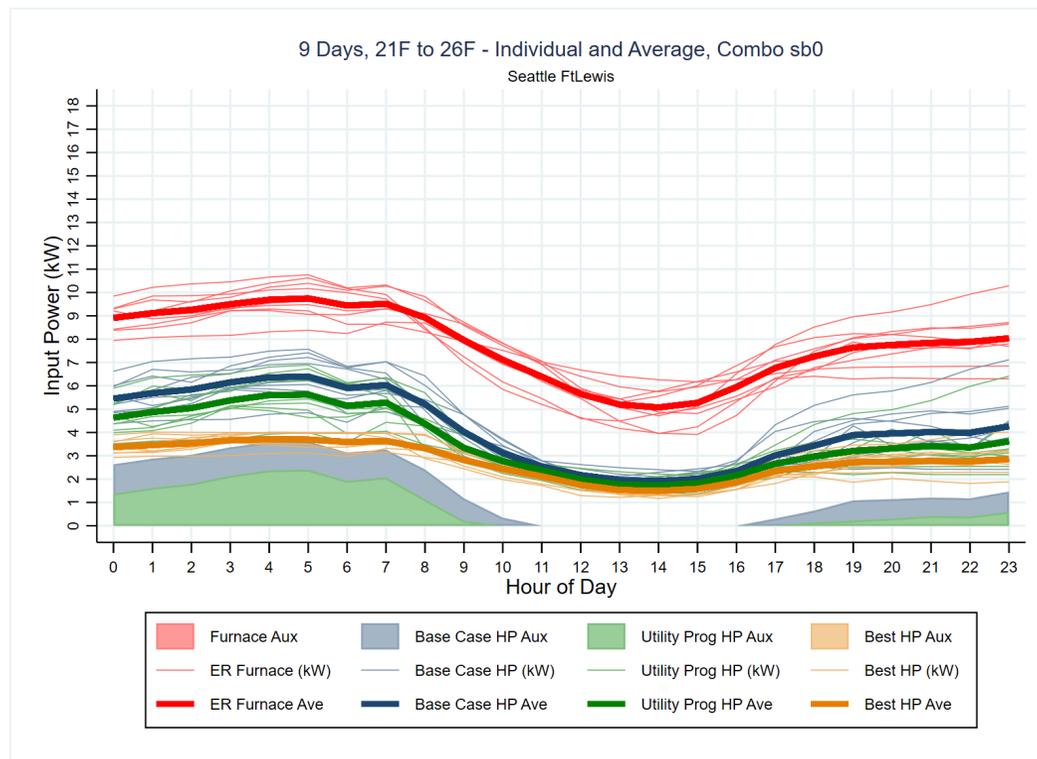
# Heat Pumps are Coming!

- State legislators are encouraging conversions from fossil fuel systems to heat pumps to mitigate the effects of climate change.
- A large-scale conversion is likely to have impacts on our utility systems, what should we study and prepare for?



# Deep Setbacks = Demand Spikes?

- Early modeling suggests deep set-backs of HPs could lead to large morning peaks.
  - Does the real world look like this? How often?
- If true, could these demand spikes be mitigated with utility intervention?

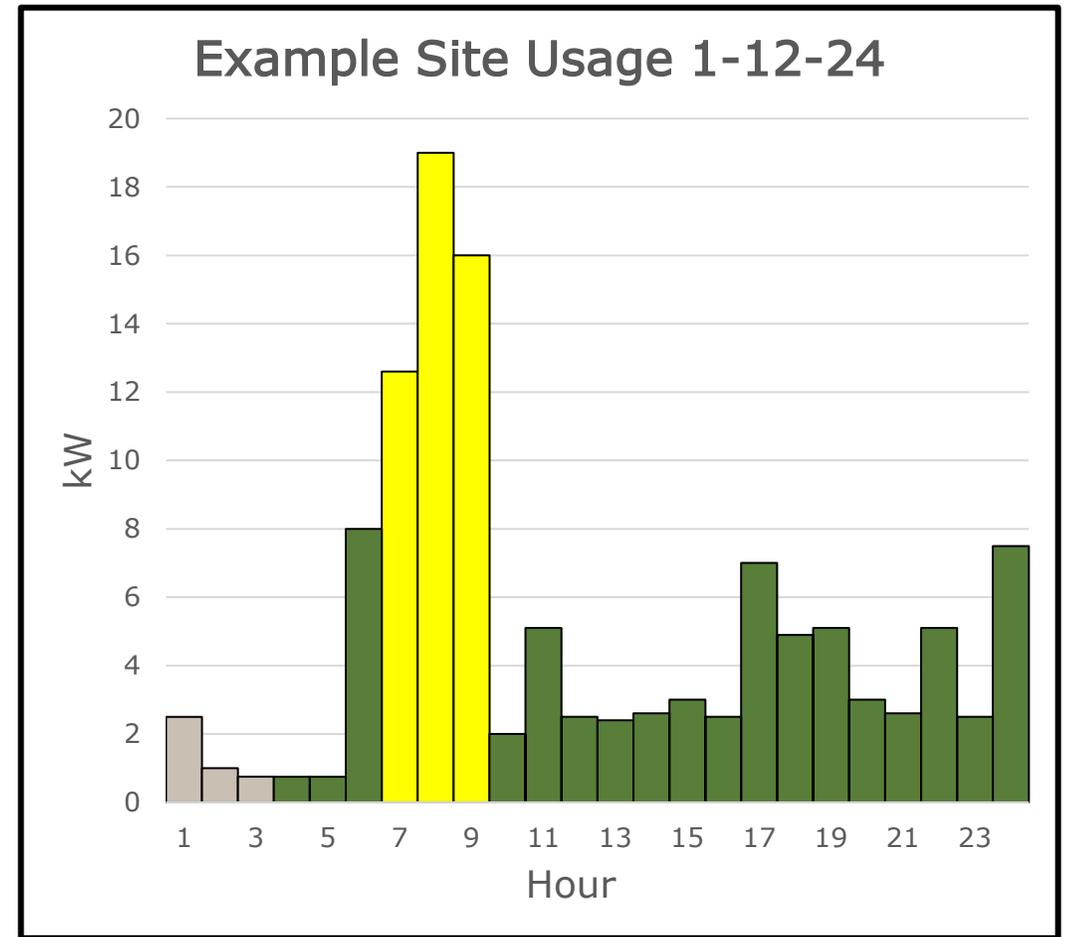


Source:  
Larson  
Energy  
Research 3

**Key Question:** Are thermostats setbacks driving peak demand?

**Phase 1 (2024): Identified potential HP spikes with AMI data**

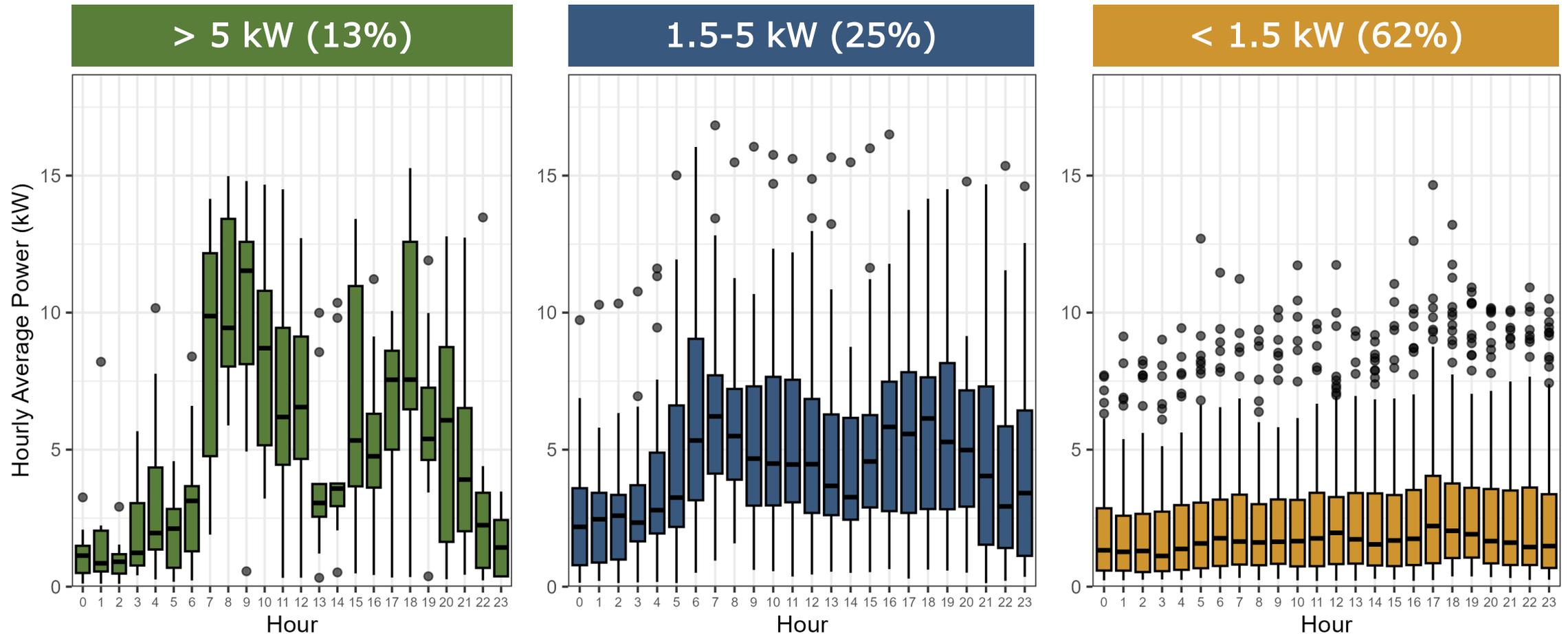
AMI analysis of 2,973 Tacoma Power heat pump (HP) sites to explore morning HP usage spikes coincident with winter peak, based on HP program and state auditor data.



Overnight period =  Peak Period = 

# Phase 1 Peak Day Loadshapes

Results showed 38% of sites had a morning spike >1.5 kW on the Jan 12<sup>th</sup> system peak

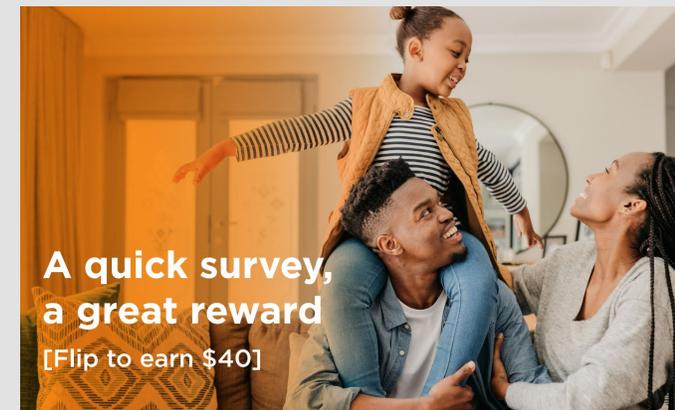


# Phase 2 Customer Survey

- Sample drawn from Phase 1 sites
  - Oversampled HP program participants, high and medium spike customers and lacked emails on some customers.
  - Survey results are weighted to reflect average Tacoma heat pump customers
- Recruited customers via email and mailer between February and April of 2025

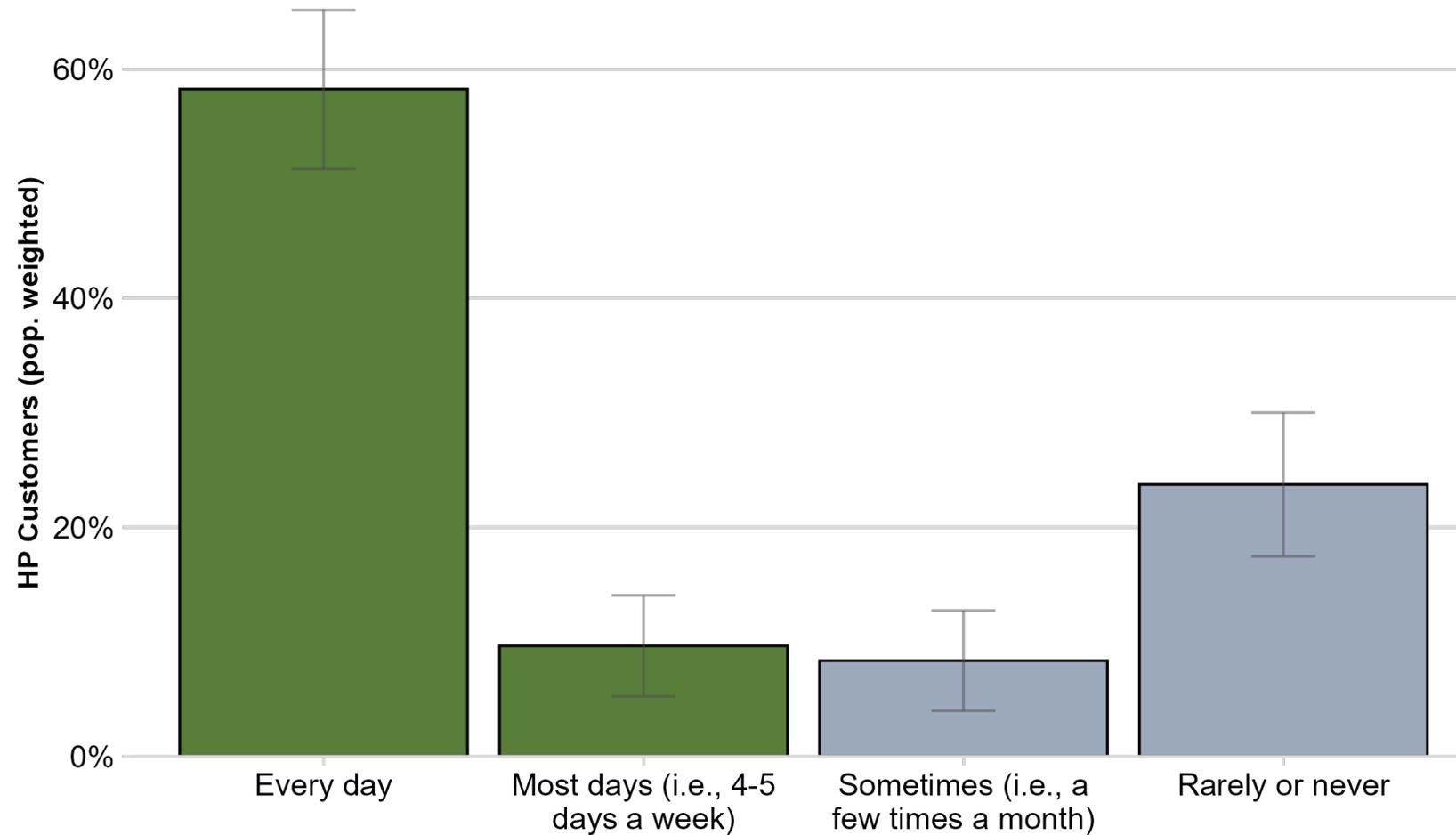
Sampling	
Sites Contacted	1,600
Surveys Completed	330
Response Rate	25%
<i>Completion Rate</i>	<i>21%</i>

**Incentives:**  
\$20 for completing survey +  
\$20 for photos  
(Tango gift cards)



# Overnight Thermostat Setbacks - Frequency

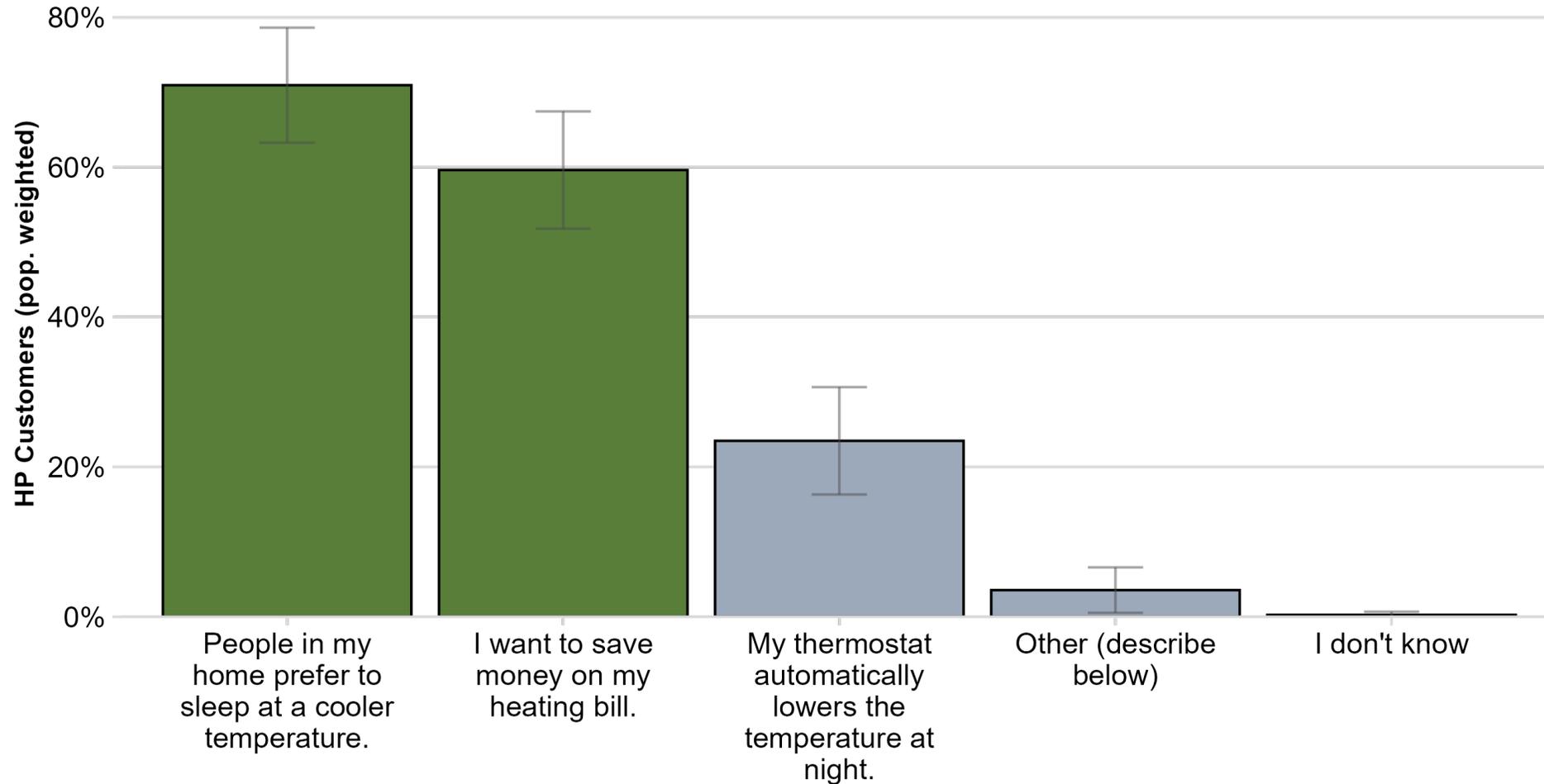
**67% of HP customers report using setbacks every day/most days.**



*During the winter, how often do you turn your heat down overnight?*

# Reason for Using a Setback

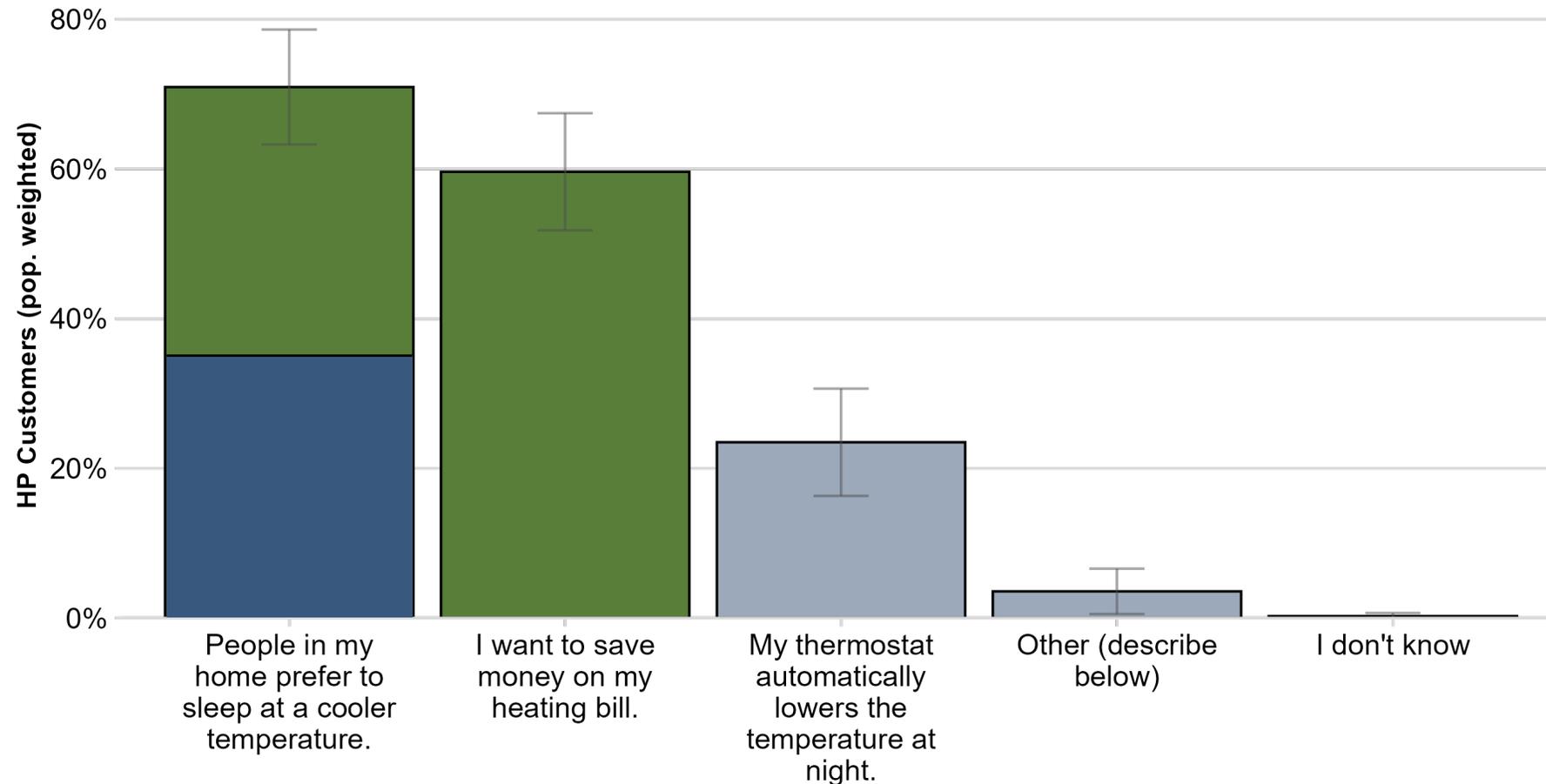
**HP customers use setbacks primarily to stay cooler at night and to save money.**



*Bars add to more than 100% as participants were allowed to report multiple reasons*

# Reason for Using a Setback Cont.

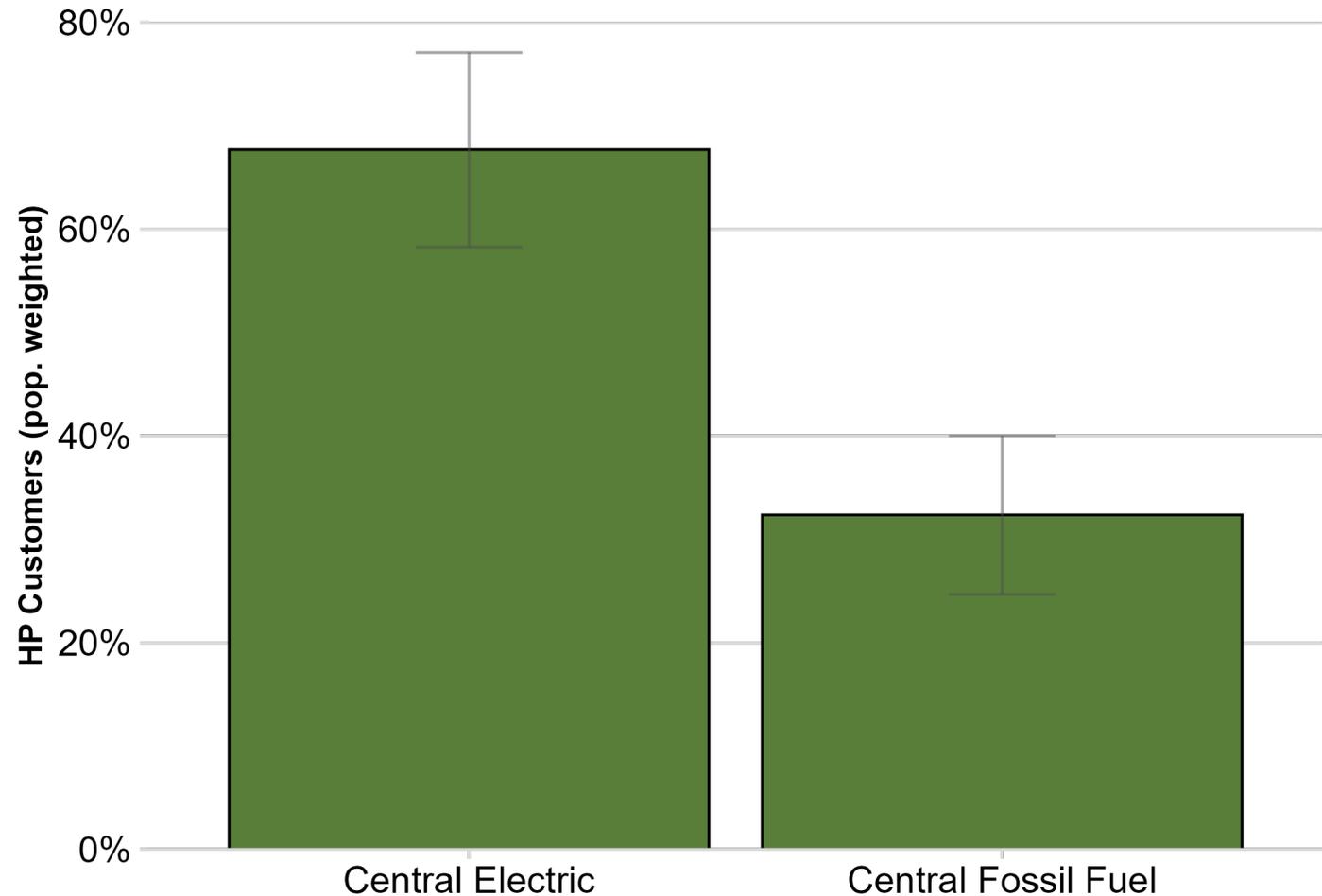
**35% of HP customers are using setback ONLY for sleeping temperature – another 35% also want bill savings**



*Bars add to more than 100% as participants were allowed to report multiple reasons*

## 68% of heat pump customers likely have central (ducted) electric backup.

- Customers survey responses often did not accurately characterize their central backup heating equipment
- Heating equipment photos revealed that a much larger portion of customers have central electric backup than was reported
- Loadshapes showed that many of the customers who did not provide photos have electric backup as well

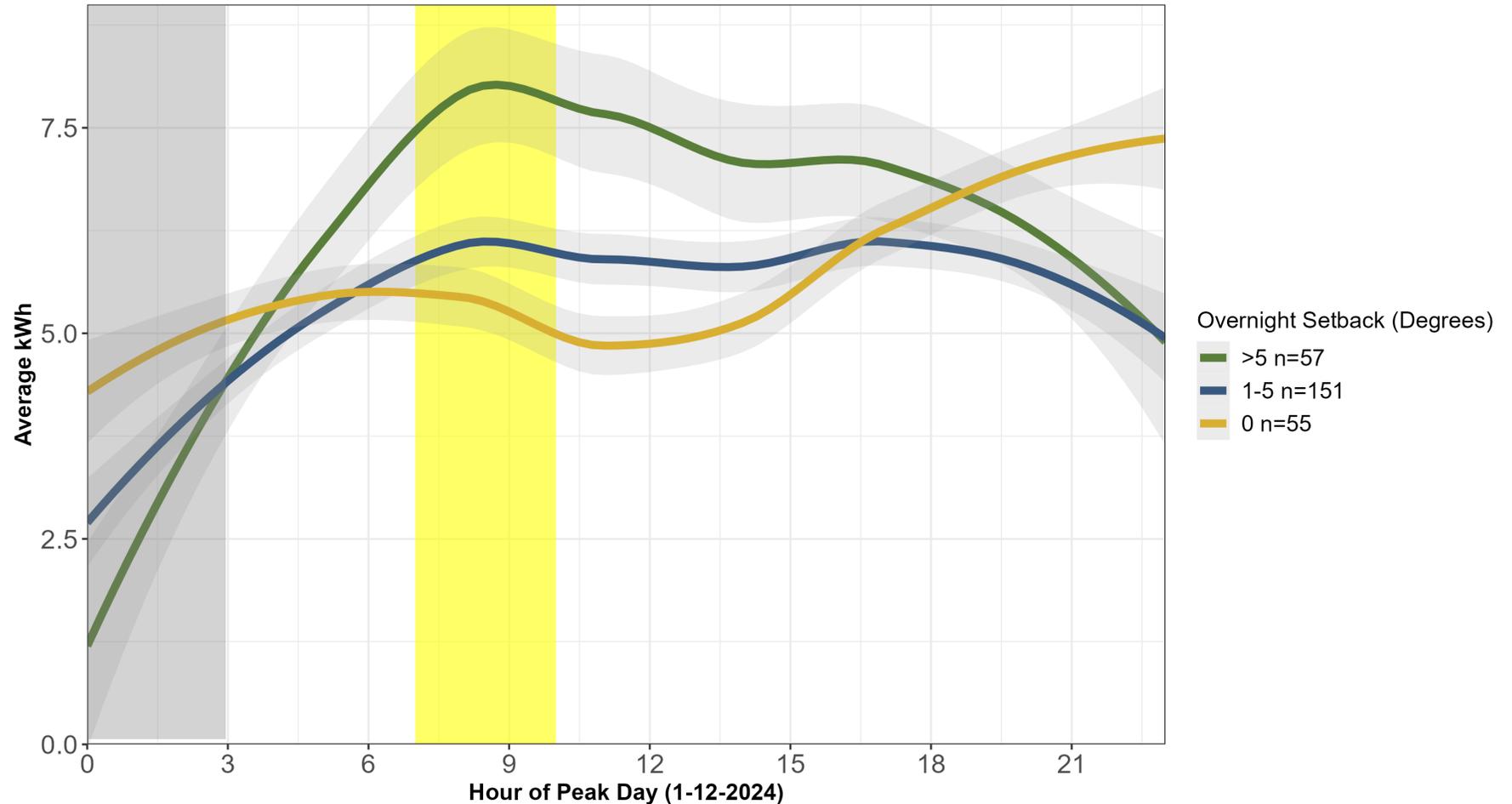


## Setbacks drive morning spikes

Setback (Degrees)	Weighted Average Demand Spike (kW)
>5	5.5
1-5	2.9
0	0.8

**Spike:** (avg. 7-10am usage)  
 - (avg. 12-3am usage)

*Shading = 95% confidence interval around the group mean*



To mitigate demand spikes, customers were asked about their willingness to do/allow the following:

Solution	Willing to Change
Small change to setback (1-2°) on the 5 coldest nights	70-95%*
Large change to setback (>3°) on the 5 coldest nights	25-55%*
Allow an HVAC contractor adjust their heat pump	45%
Allow Tacoma Power to install smart thermostat & remotely adjust temperature on 5 coldest nights (if no smart thermostat)	21-40%*
Allow Tacoma Power to remotely adjust existing smart thermostat on the 5 coldest nights	5-33%*
Change their setback behavior every winter night	25-30%*

\*Customers randomly assigned to either \$25 or \$50 incentive; range indicates high and low for all questions.

- 1. How are central heat pump customers using overnight setbacks?**
  - Most use a setback (80%), with the most common setback size being 1-5 degrees
- 2. Why do HP customers use setbacks?**
  - Most commonly, for comfort (70%) and savings (60%)
- 3. What kind of backup heat do HP customers have?**
  - 68% of HP customers have central electric backup heat
- 4. What factors affect whether a site has a morning spike?**
  - Setback size appears to drive morning spikes, but only for HP customers with central electric backup heat
- 5. What did we learn to inform program design?**
  - Many customers are willing to make small changes to their setback on the coldest nights or allow a contractor to adjust their heat pump.
  - Only ~20-40% of customers appear willing to allow control of their thermostat

- Tacoma Power AMI data shows notable demand spikes on coincident peak days for HP customers. Mitigating these demand spikes could save ~1 MW/1000 customers.
- Survey of customers shows that these demand spikes are correlated with high overnight setbacks
- Customer willingness to make changes was highest for interventions that were minimally invasive or required only small changes
  - Reducing their setback on the 5 coldest nights of the year by a small amount
  - Allowing an HVAC contractor to adjust their heat pump
- Customers were less willing to:
  - Allow Tacoma Power control of their thermostats
  - Change their setback on all winter nights



# Questions??

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