

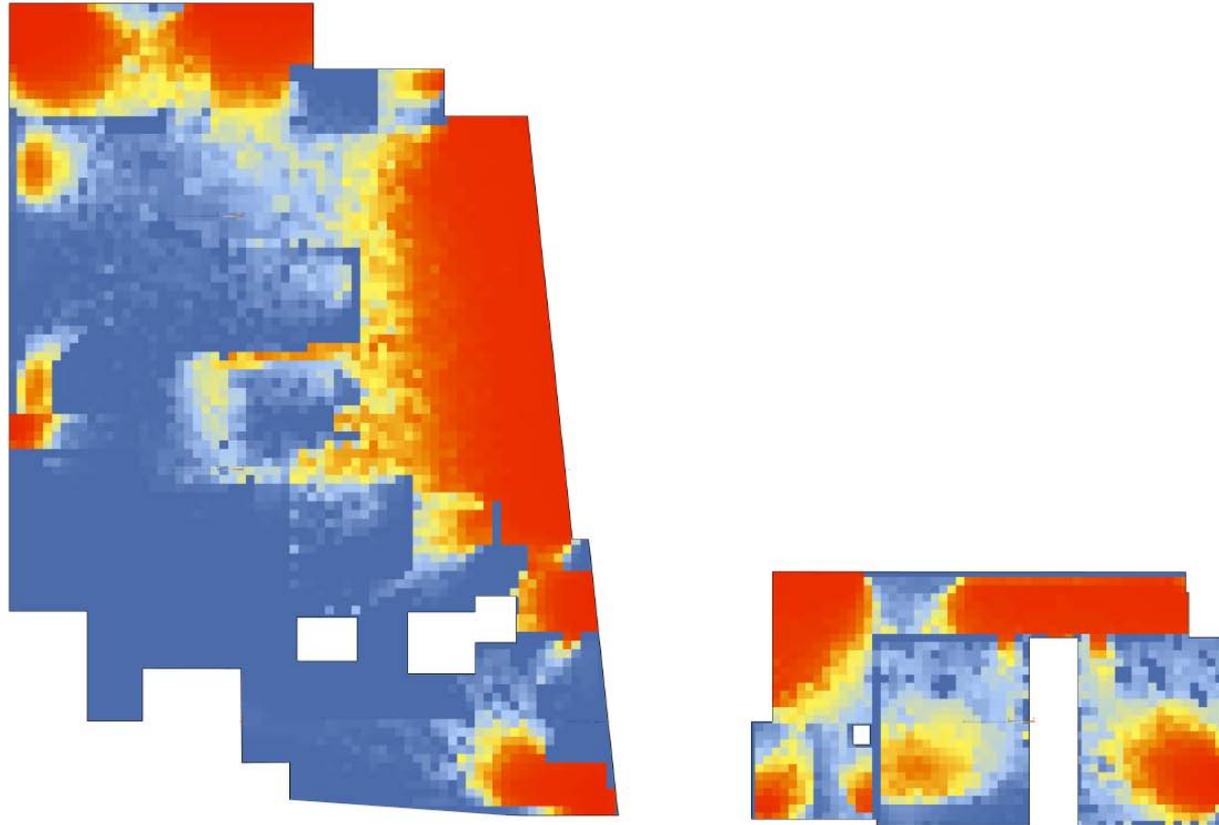
# Current Technology in Residential Energy Modeling

---

Corey Squire, Sustainability Coordinator at  
Lake | Flato Architects

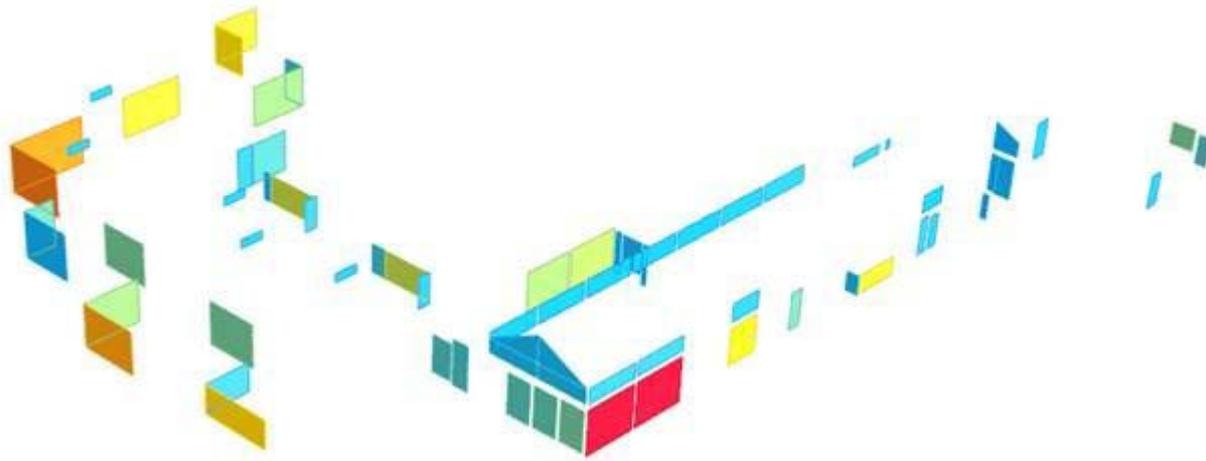


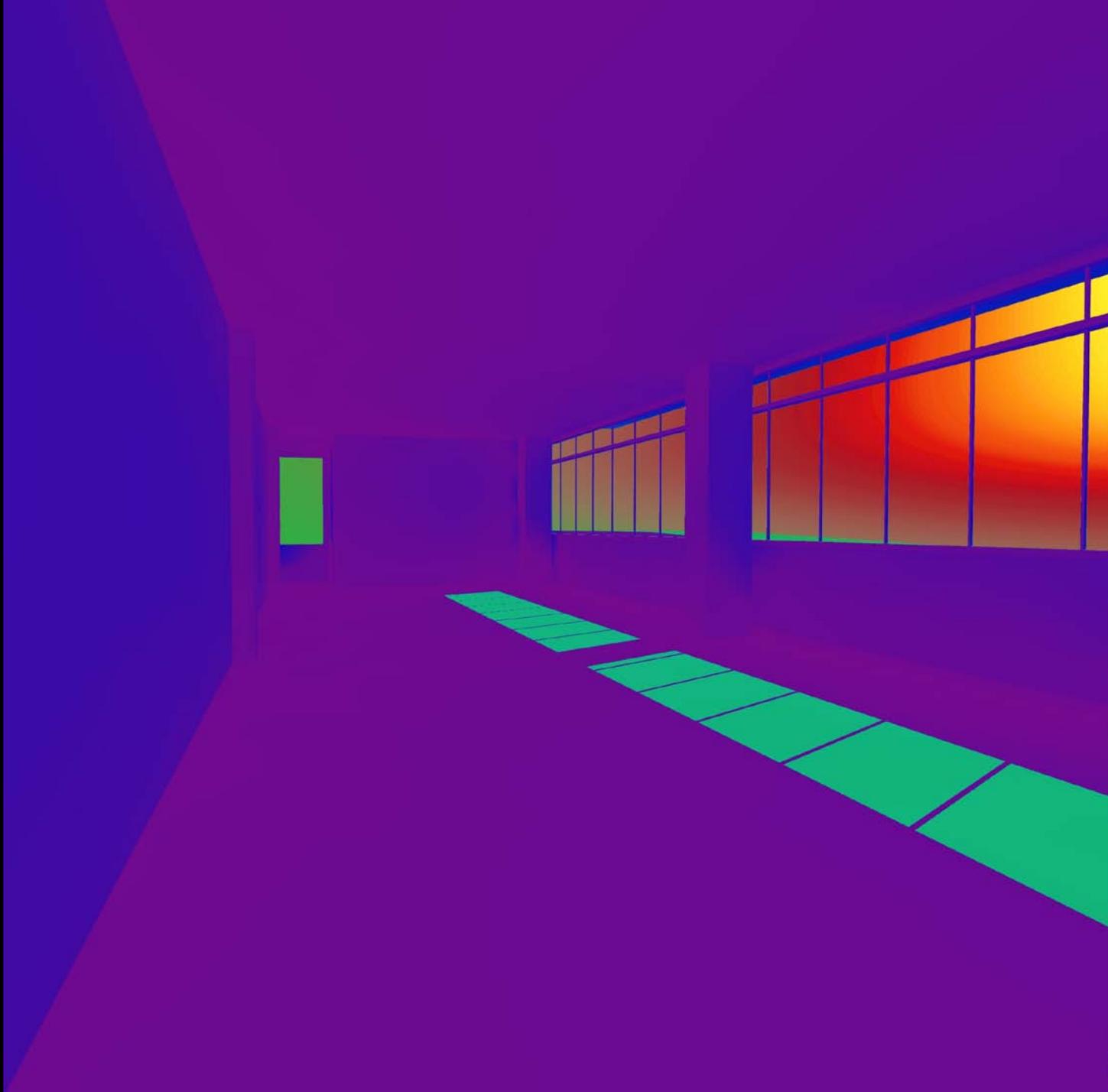
# SUSTAINABILITY COORDINATING?



Floor 2

# SUSTAINABILITY COORDINATING?





Champion ↘

↙ Project Manager

Guys, let's talk  
window wall ratio







# Energy Efficiency



60W



13W



9W

80%

30%

85%



Time of Use



60W



100%



0W



$$13\text{W} * 24\text{h} = 312\text{Wh}$$



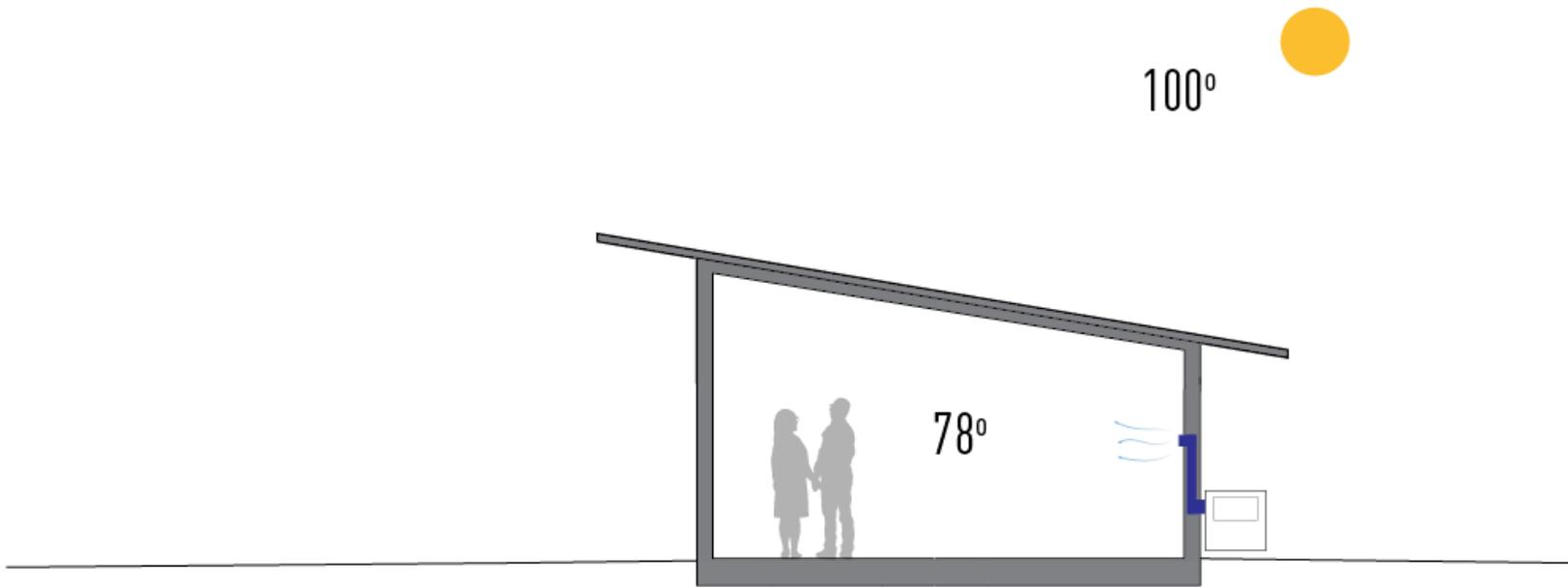
$$9\text{W} * 24\text{h} = 216\text{Wh}$$

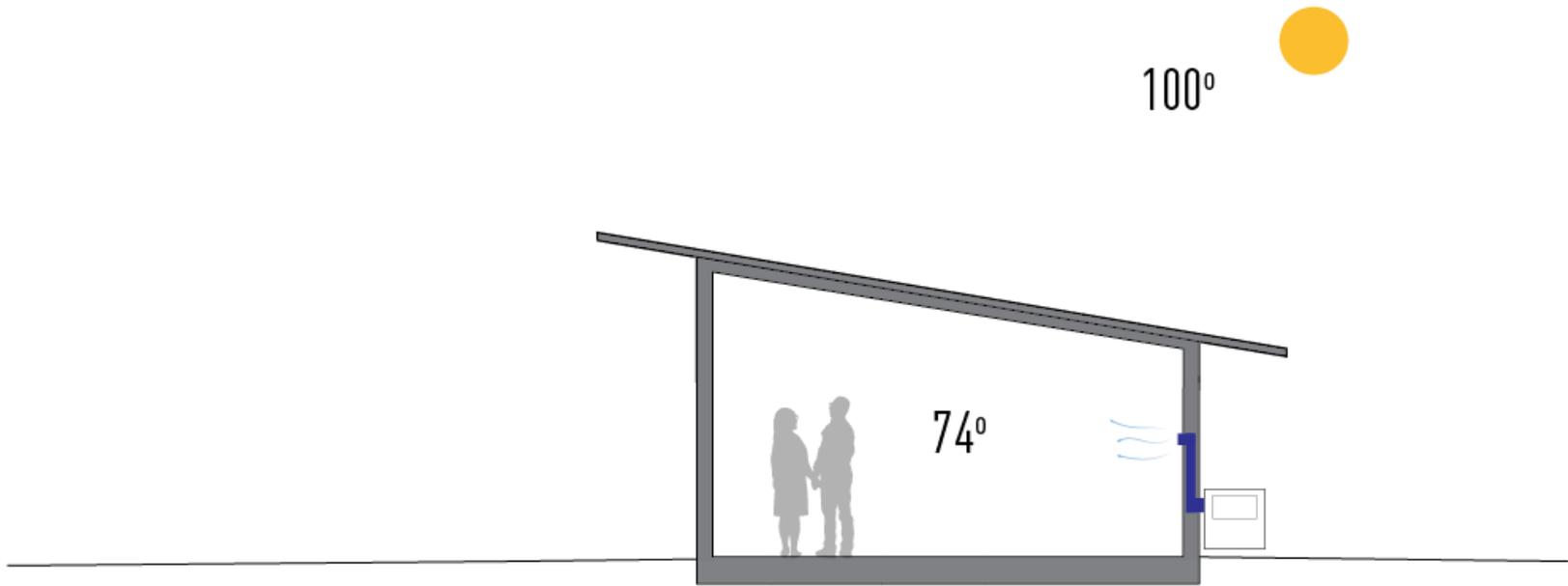


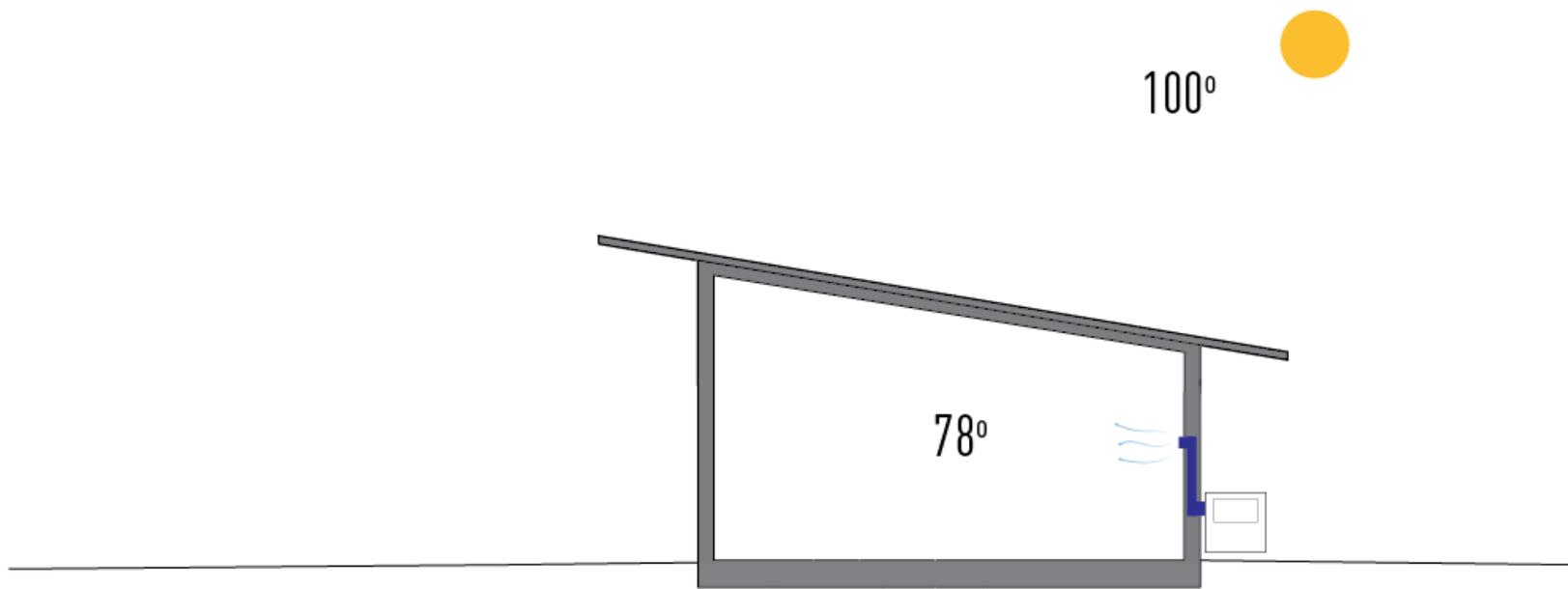
$$13\text{W} * 3\text{h} = 39\text{Wh}$$

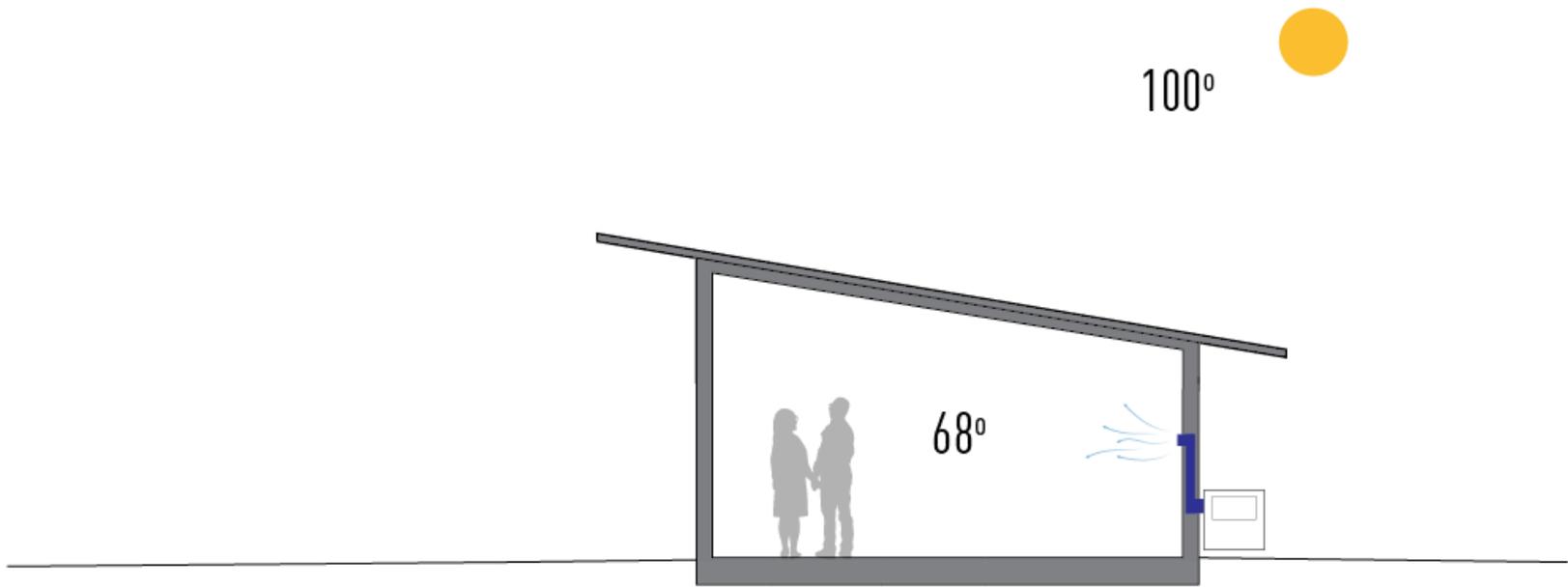


The most comfort for the  
least energy





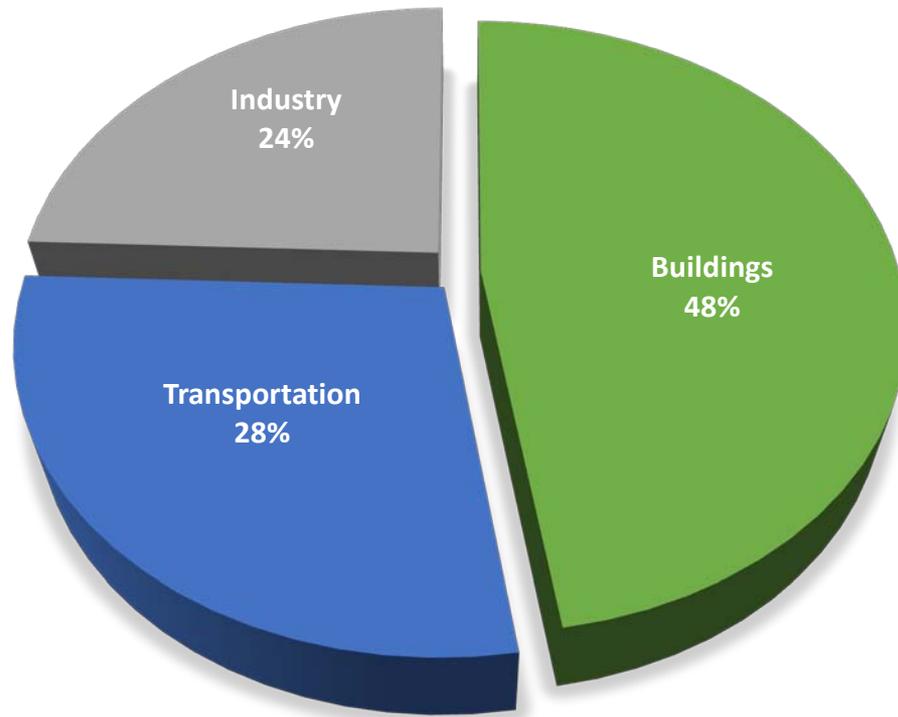


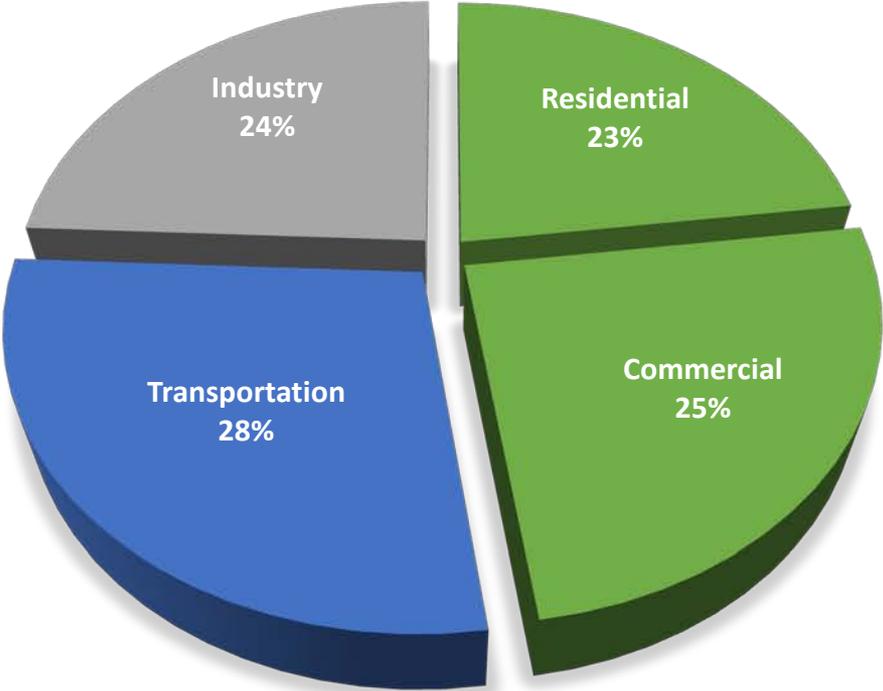


Energy that is used to  
benefit people is not wasted



Why  
Houses  
?

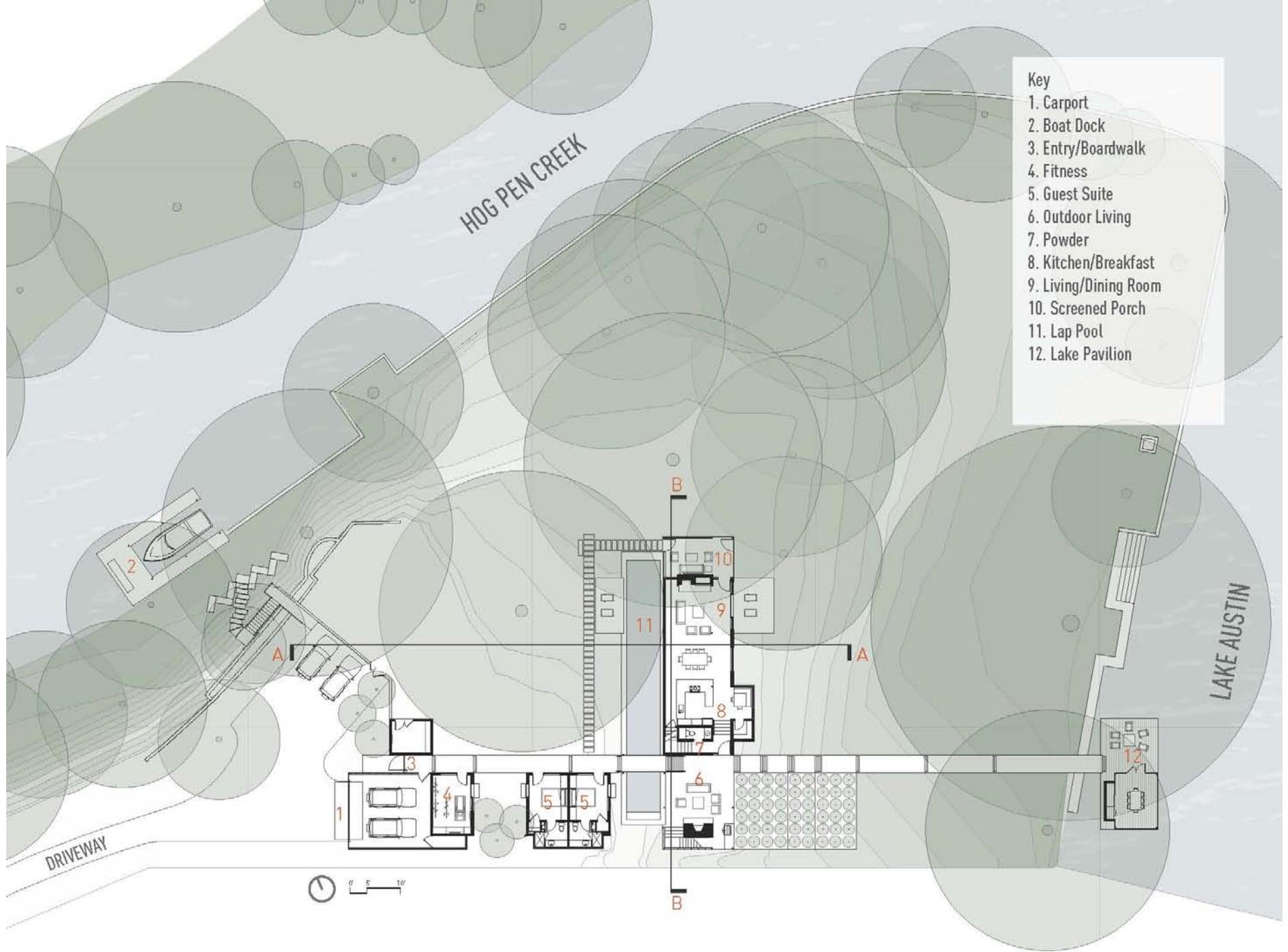




# Case studies



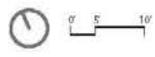
- Key
- 1. Carport
  - 2. Boat Dock
  - 3. Entry/Boardwalk
  - 4. Fitness
  - 5. Guest Suite
  - 6. Outdoor Living
  - 7. Powder
  - 8. Kitchen/Breakfast
  - 9. Living/Dining Room
  - 10. Screened Porch
  - 11. Lap Pool
  - 12. Lake Pavilion



HOG PEN CREEK

LAKE AUSTIN

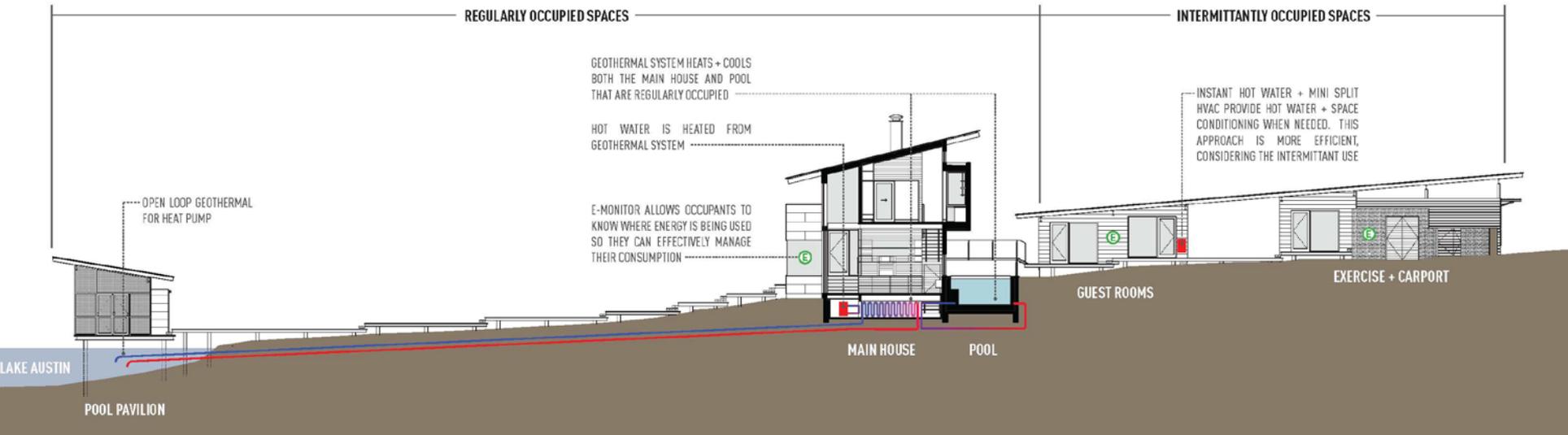
DRIVEWAY











**REGULARLY OCCUPIED SPACES**

**INTERMITTANTLY OCCUPIED SPACES**

GEOTHERMAL SYSTEM HEATS + COOLS BOTH THE MAIN HOUSE AND POOL THAT ARE REGULARLY OCCUPIED

HOT WATER IS HEATED FROM GEOTHERMAL SYSTEM

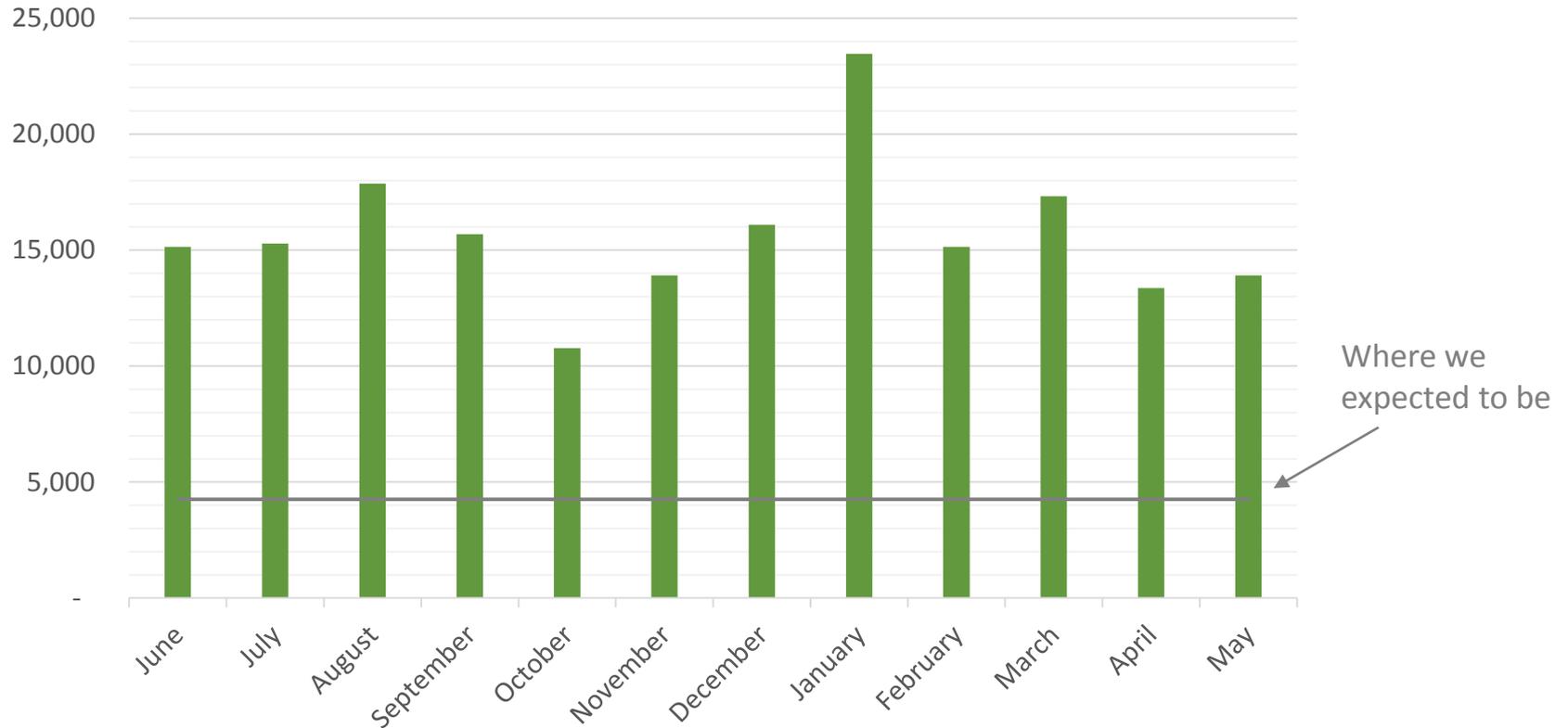
E-MONITOR ALLOWS OCCUPANTS TO KNOW WHERE ENERGY IS BEING USED SO THEY CAN EFFECTIVELY MANAGE THEIR CONSUMPTION

INSTANT HOT WATER + MINI SPLIT HVAC PROVIDE HOT WATER + SPACE CONDITIONING WHEN NEEDED. THIS APPROACH IS MORE EFFICIENT, CONSIDERING THE INTERMITTANT USE

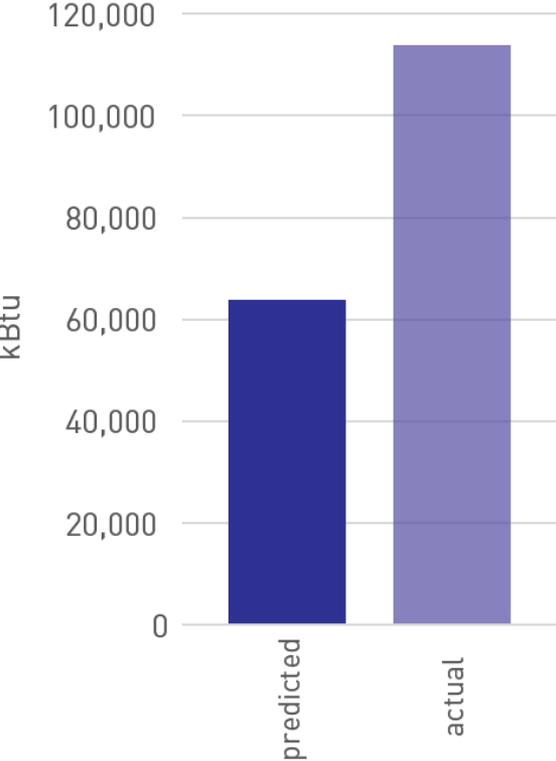
OPEN LOOP GEOTHERMAL FOR HEAT PUMP

LAKE AUSTIN  
POOL PAVILION  
MAIN HOUSE  
POOL  
GUEST ROOMS  
EXERCISE + CARPORT

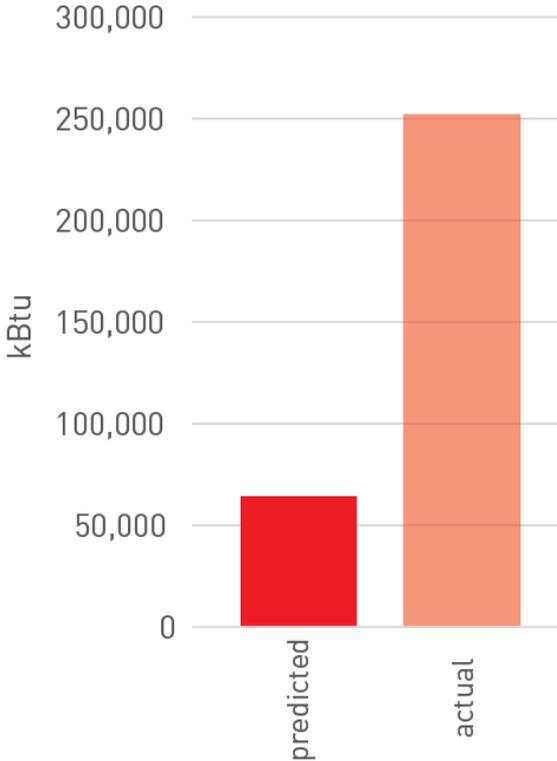
# Measured Monthly Energy 2013-2014 (kBtu)



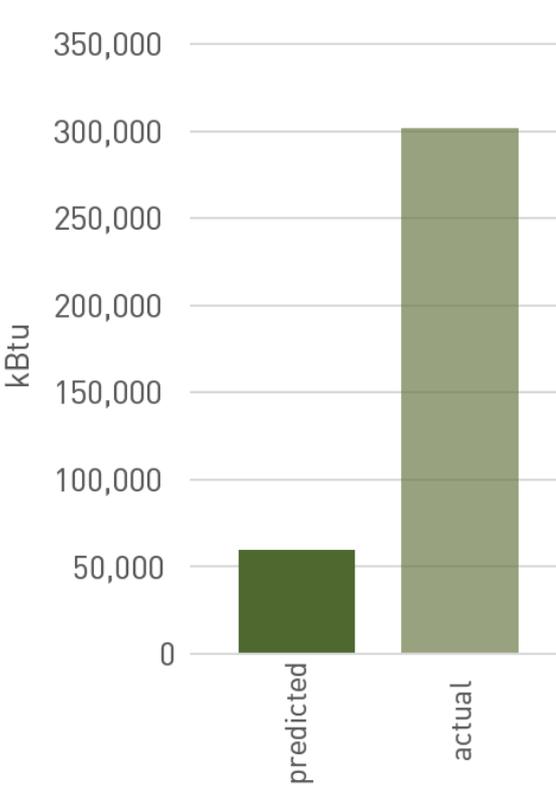
Uvalde Ranch  
modelled in REM/Rate

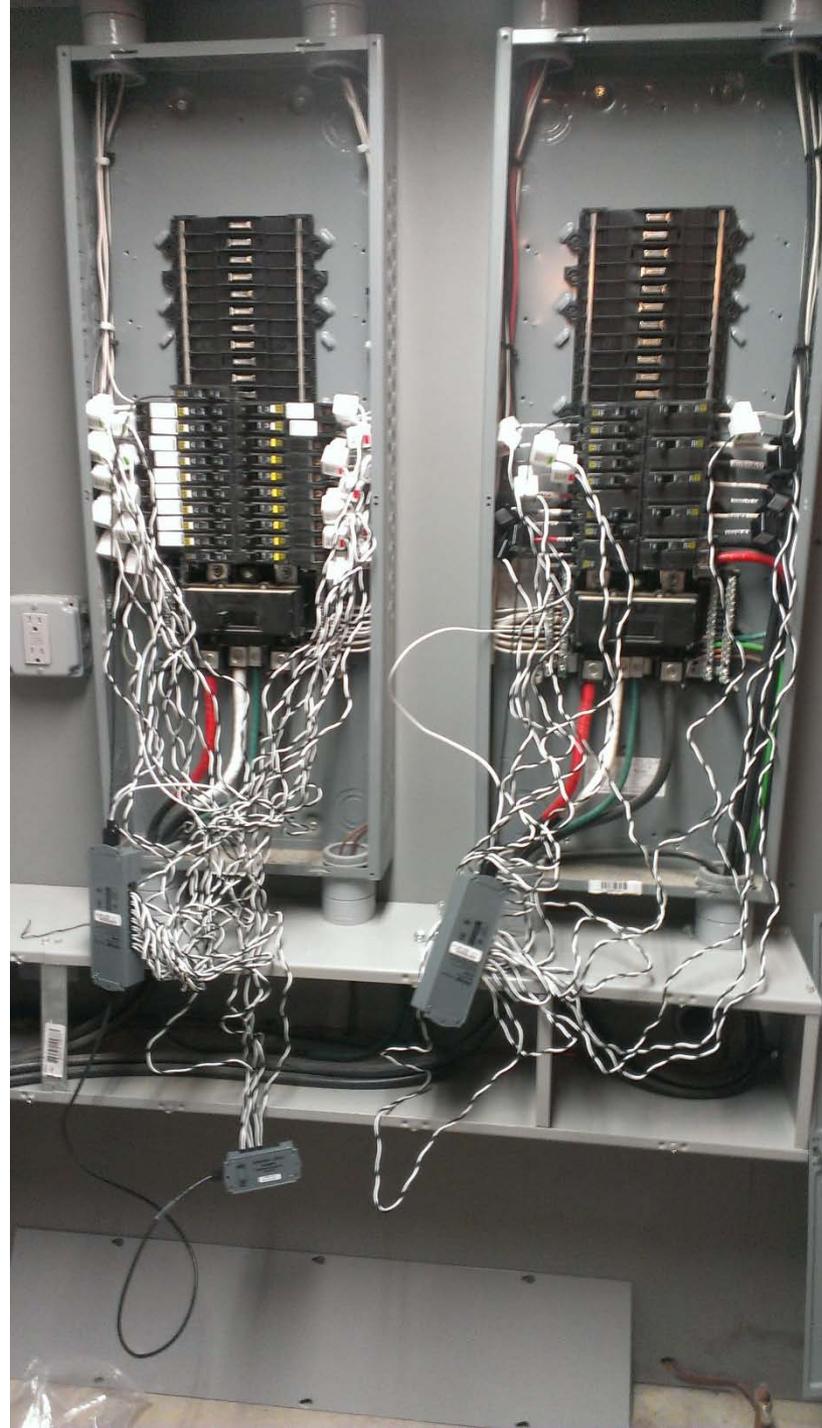


Hog Pen Creek  
modelled in REM/Rate



Long Island Retreat  
modelled in REM/Rate





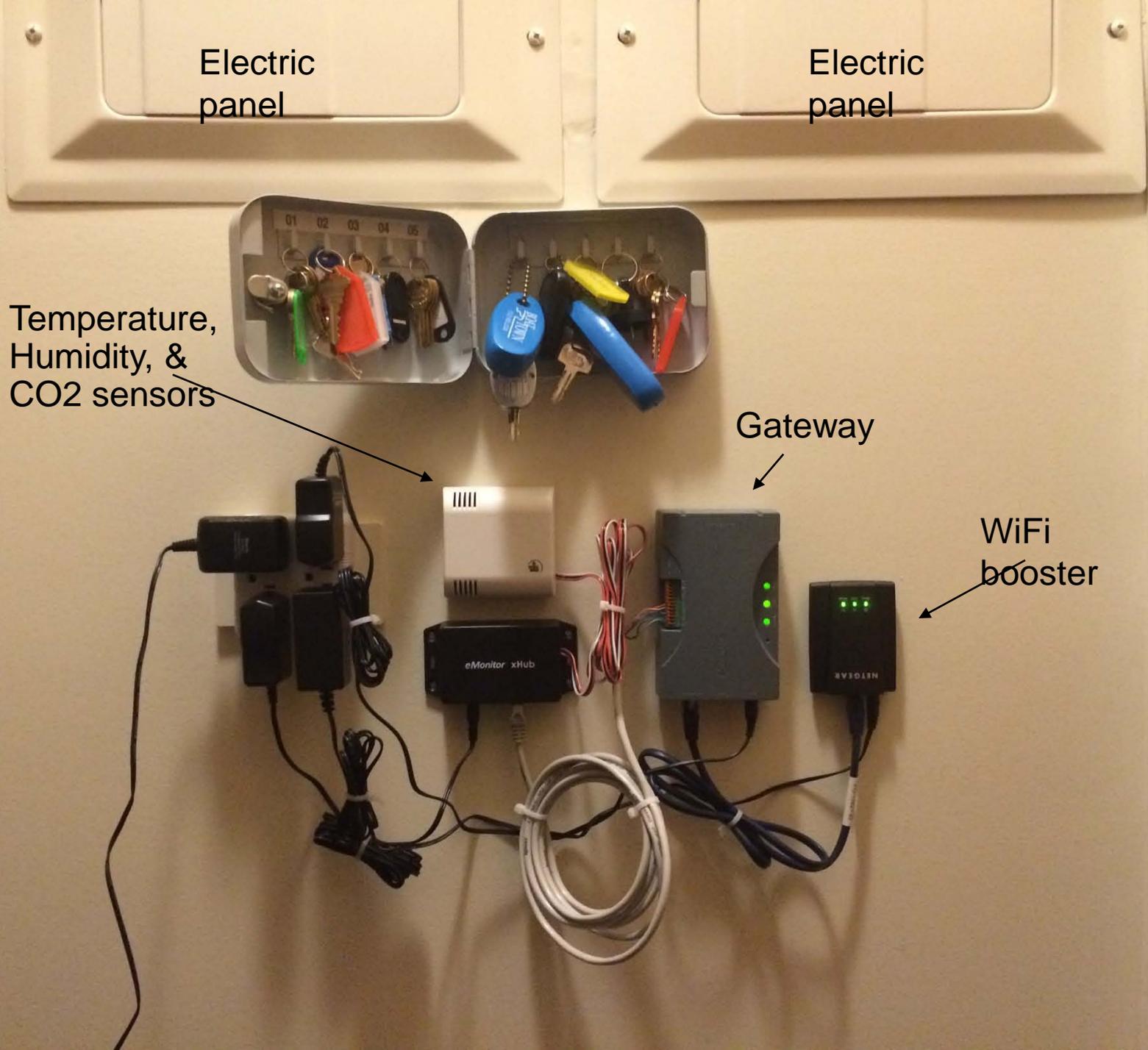
Electric panel

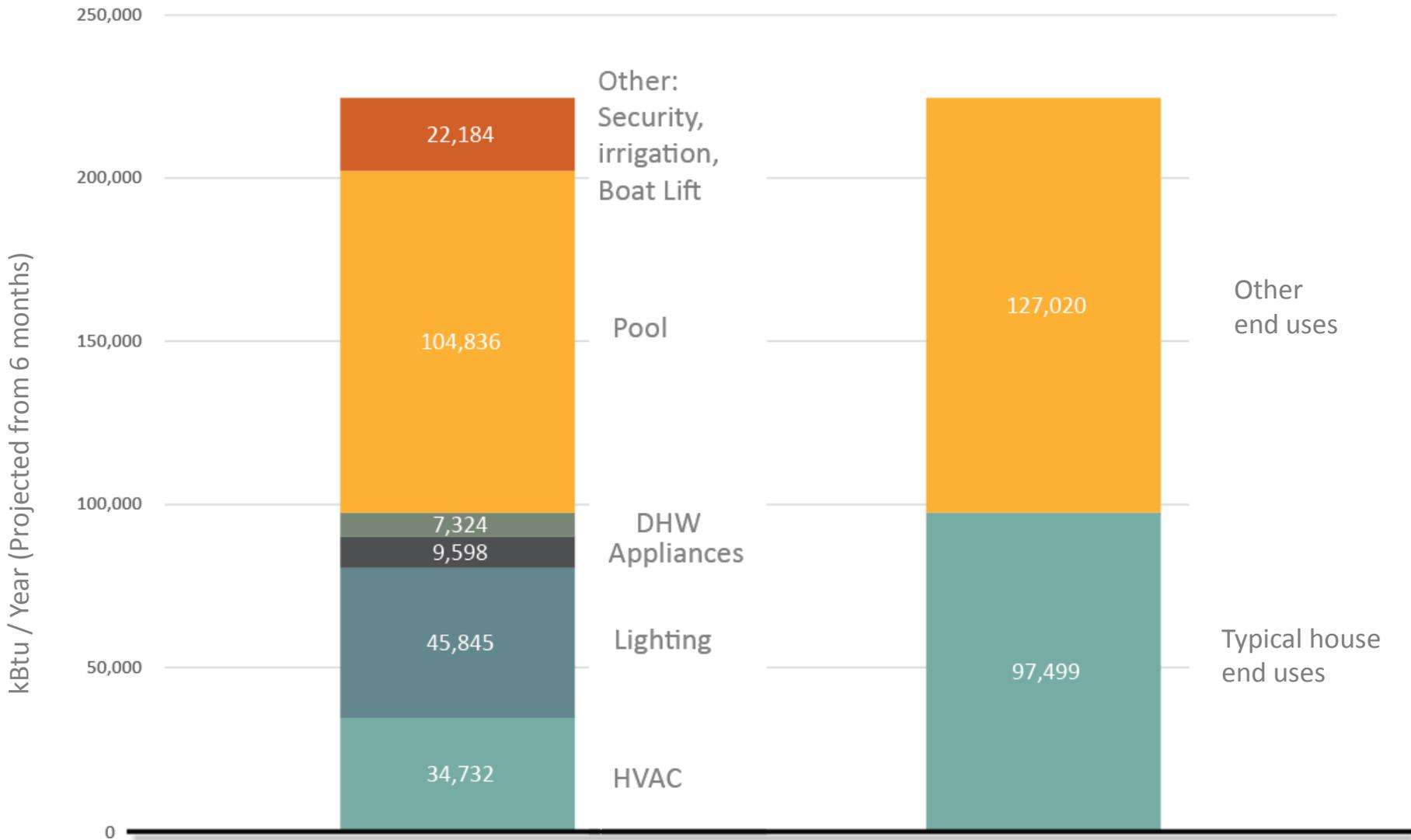
Electric panel

Temperature, Humidity, & CO2 sensors

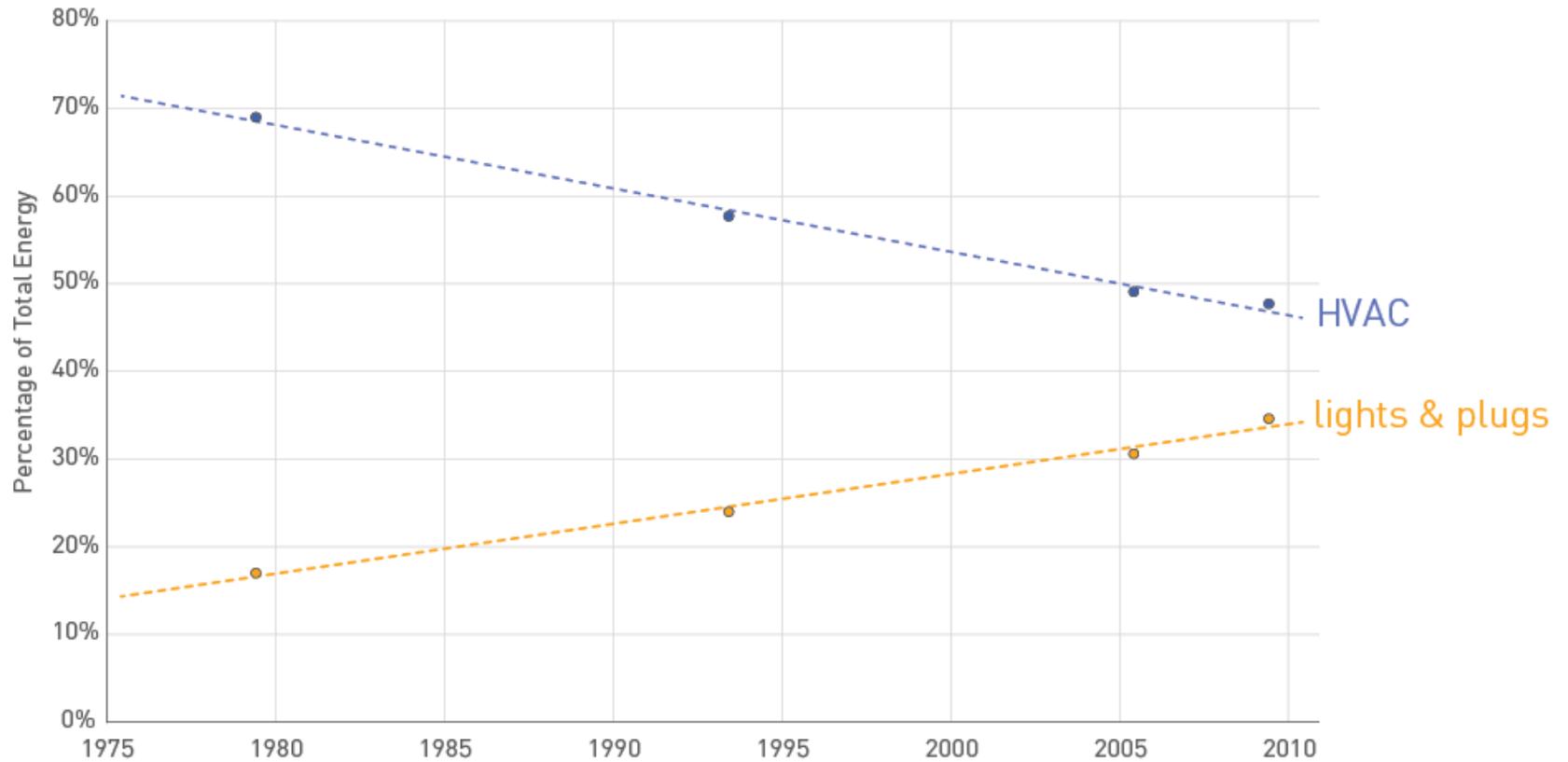
Gateway

WiFi booster

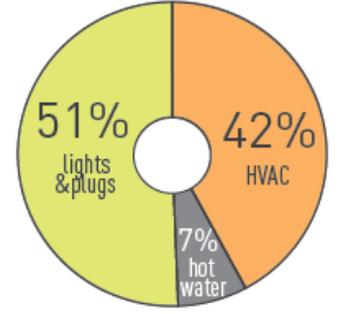




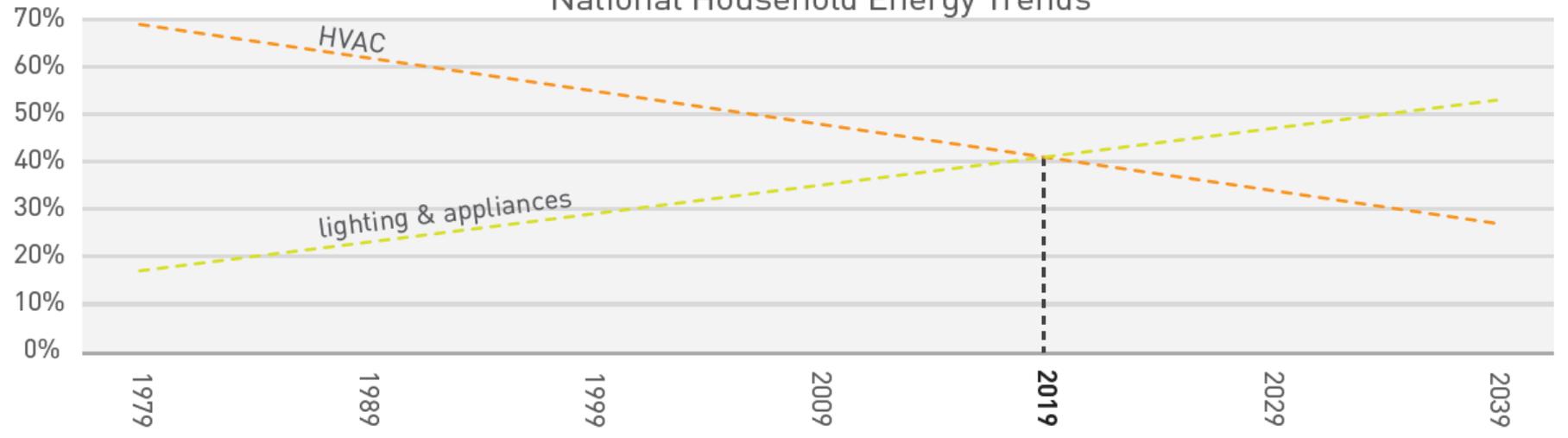
# Energy End Use Trends



LIF Average  
112,550 kBtu  
annually/household



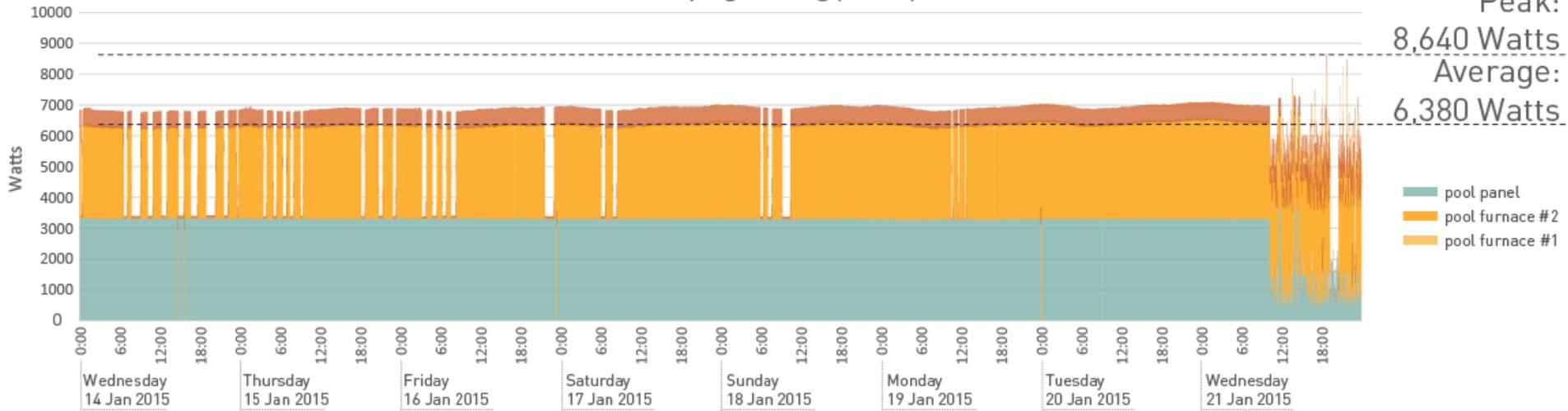
### National Household Energy Trends





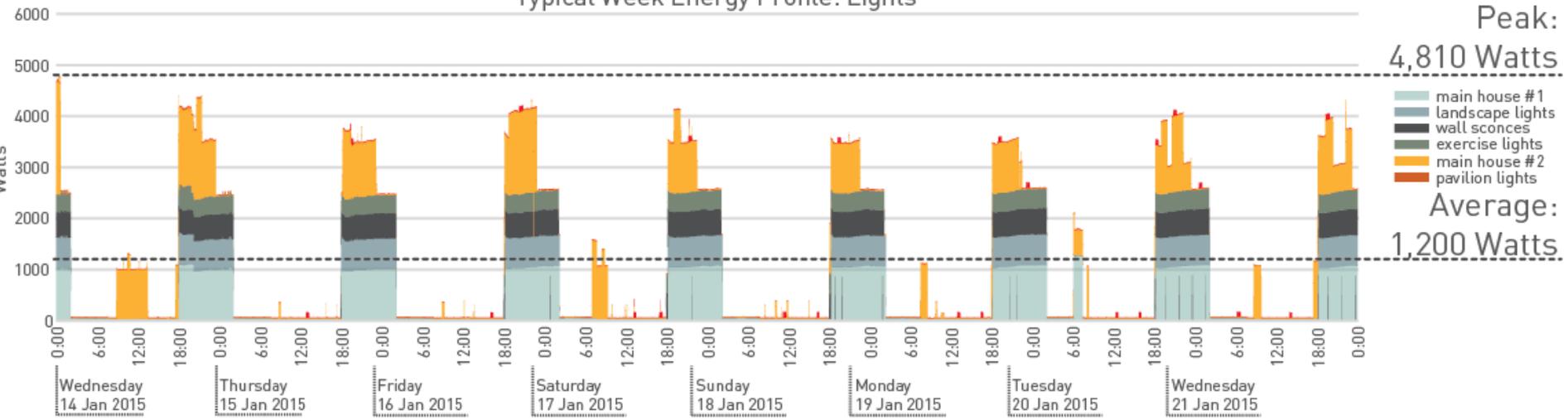
Pool: before re-programming (winter)

Peak:  
8,640 Watts  
Average:  
6,380 Watts





### Typical Week Energy Profile: Lights



Peak:  
4,810 Watts

Average:  
1,200 Watts

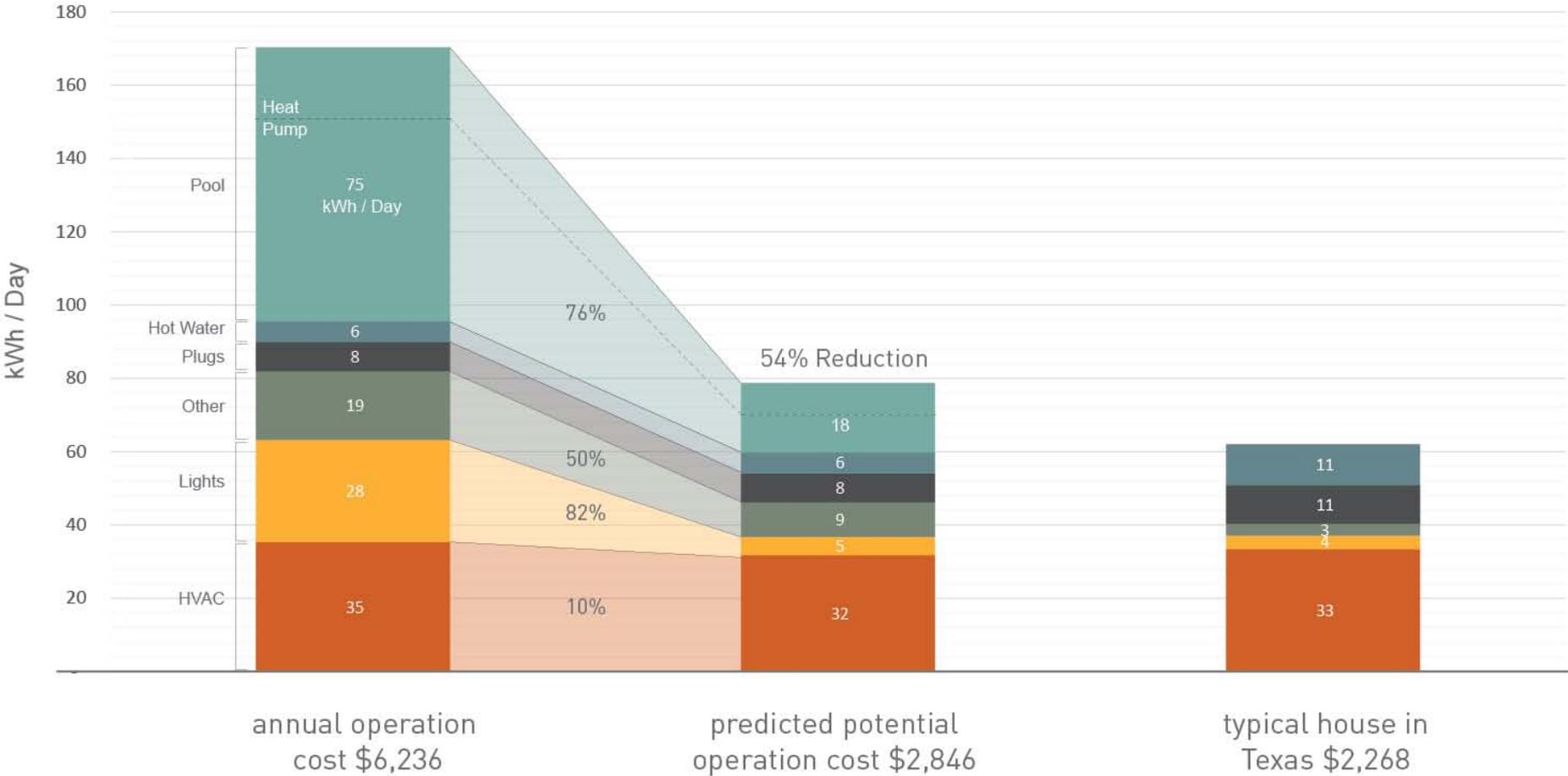
- main house #1
- landscape lights
- wall sconces
- exercise lights
- main house #2
- pavilion lights





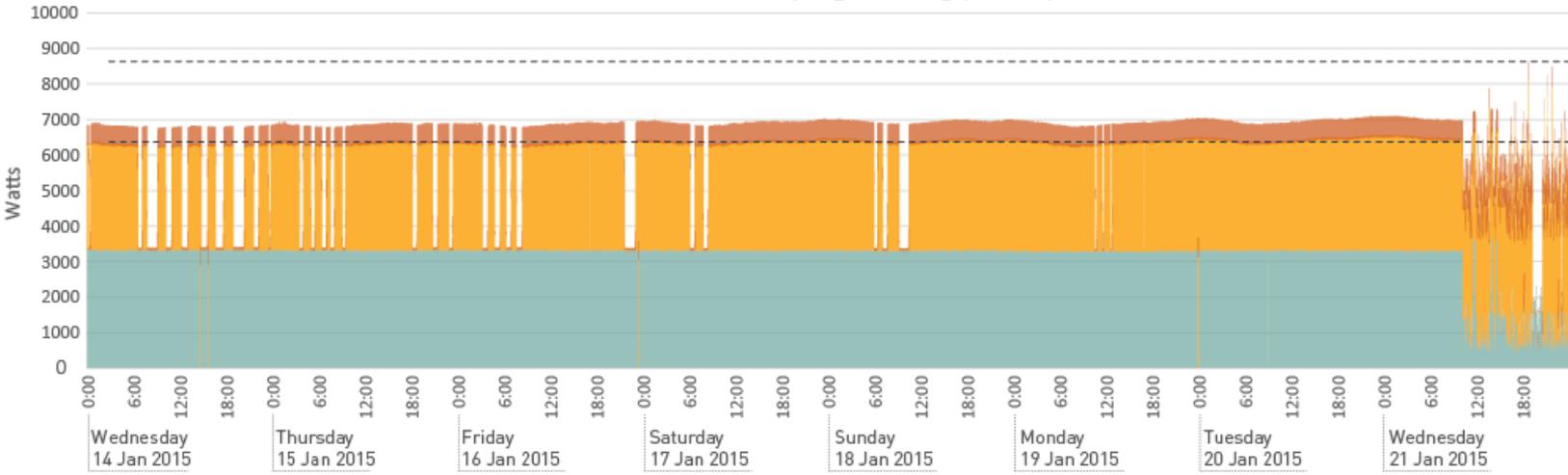
# Hog Pen Creek

potential annual operational savings ~ \$3,390



Pool: before re-programming (winter)

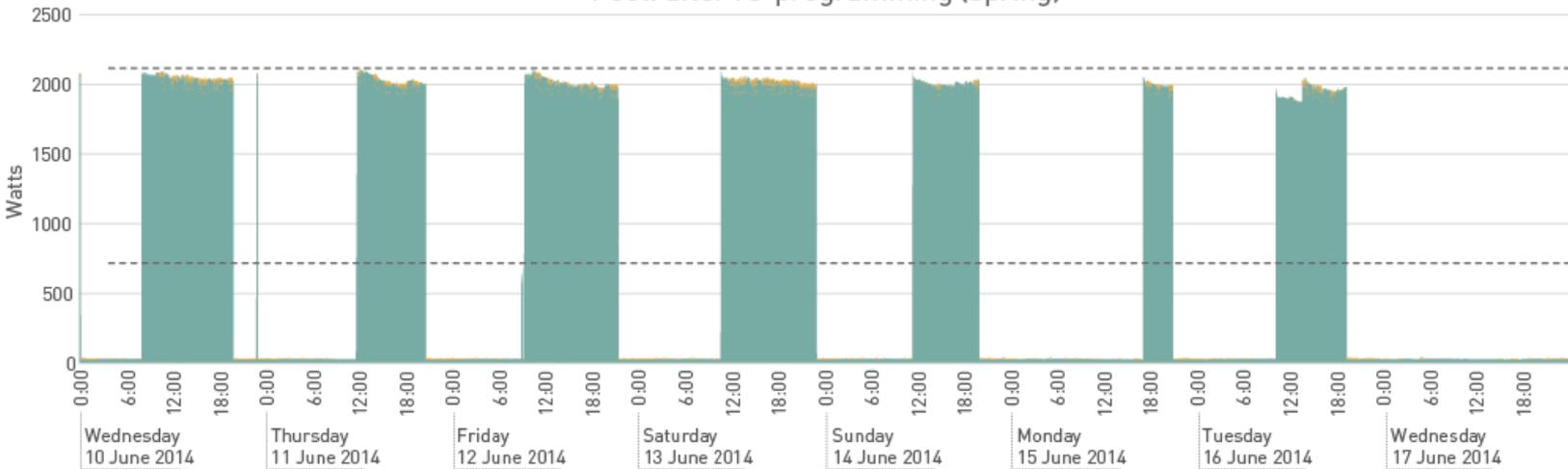
Peak:  
8,640 Watts  
Average:  
6,380 Watts



Pool: after re-programming (spring)

Peak:  
2,110 Watts

Average:  
720 Watts



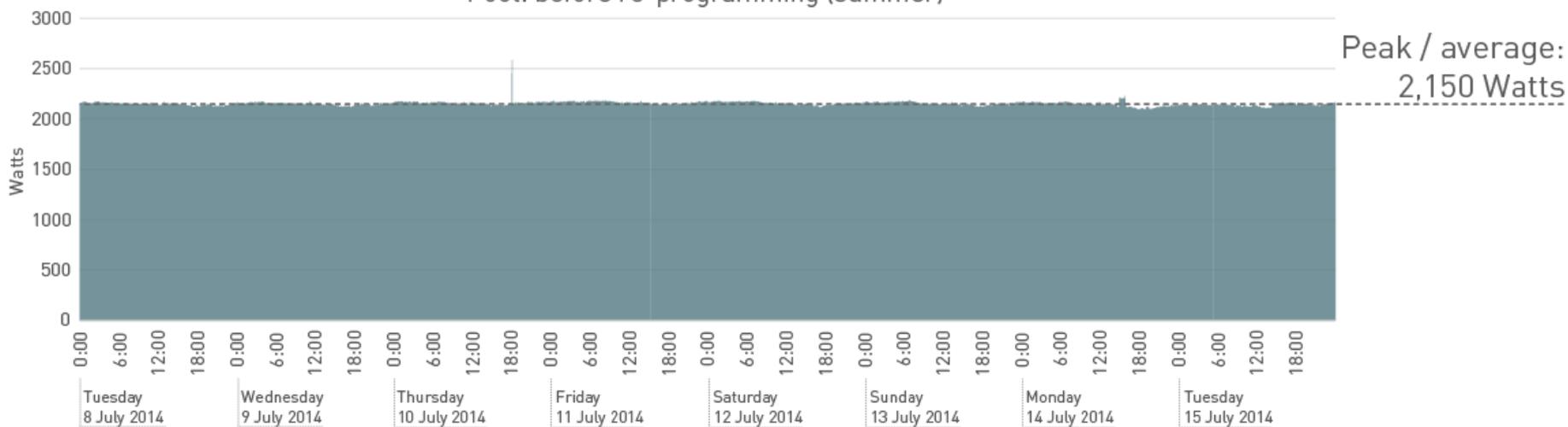




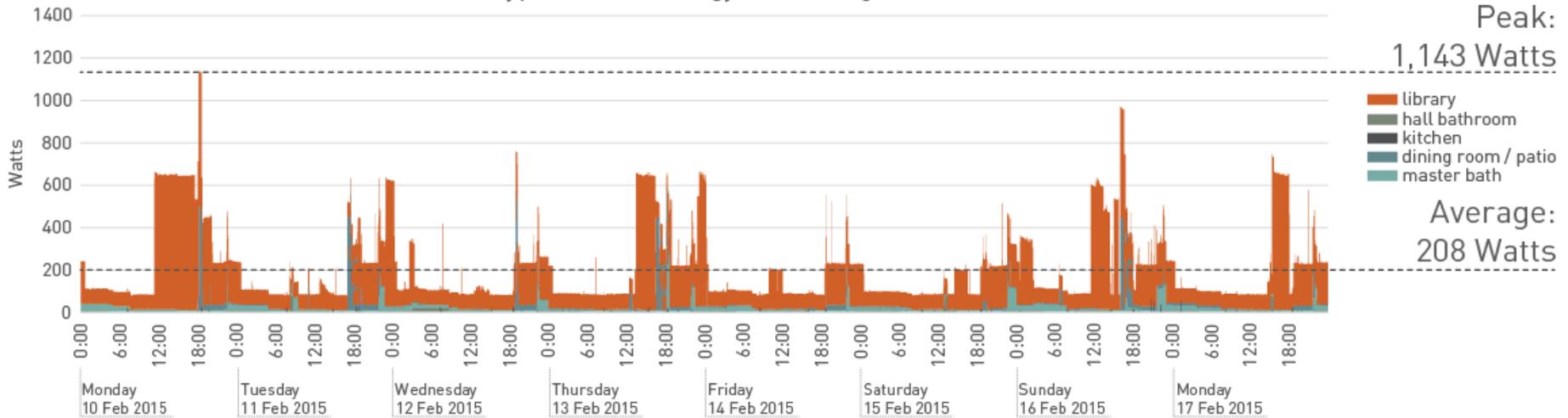




### Pool: before re-programming (summer)



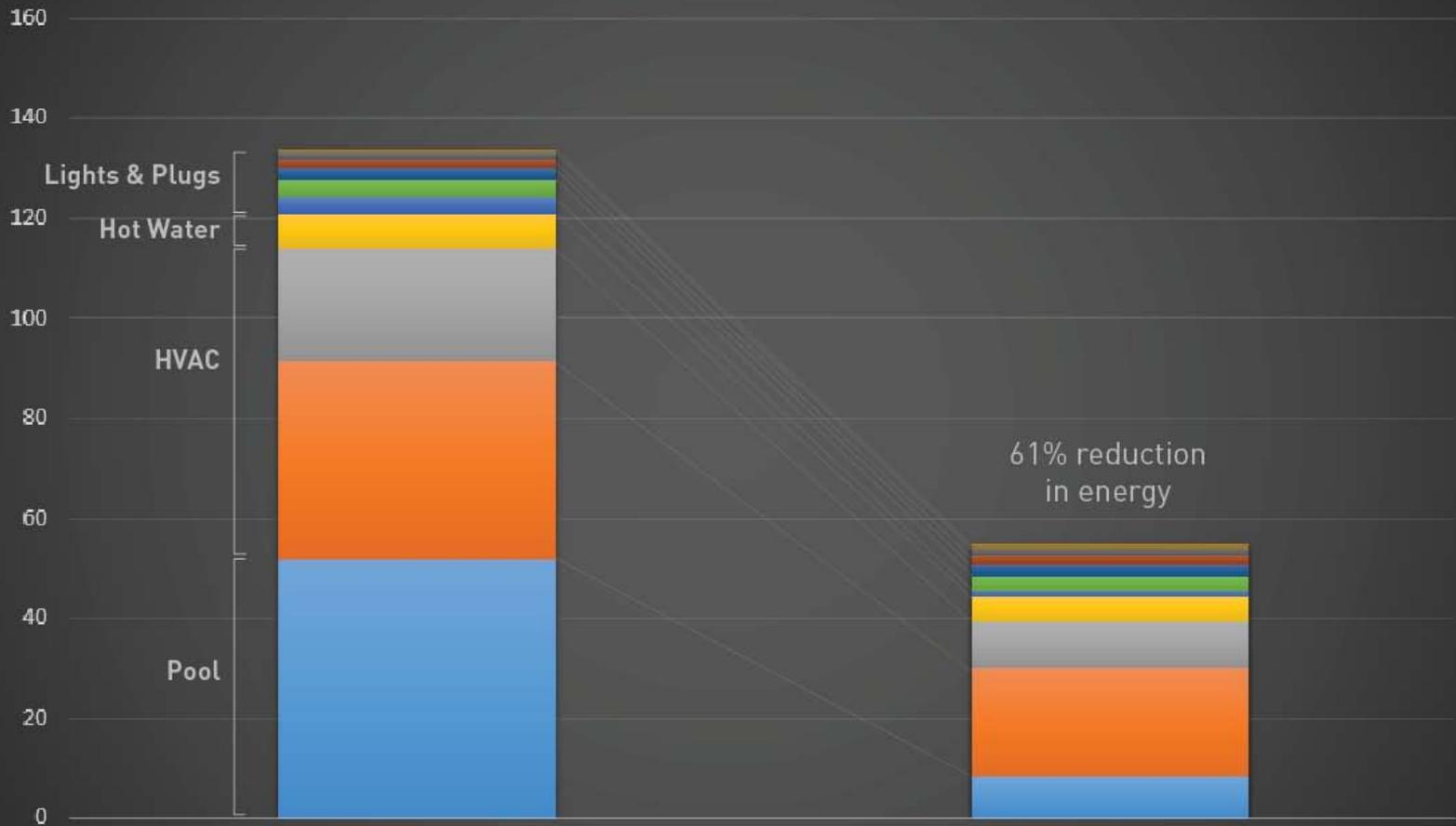
### Typical Week Energy Profile: Lights



$$10 \text{ Lights} * 50 \text{ Watts} / 216 \text{ sf} = 2.31 \text{ W/sf}$$

Recommended LPD for an operating room = 2.2 W/sf

# kWh per Day During the Summer

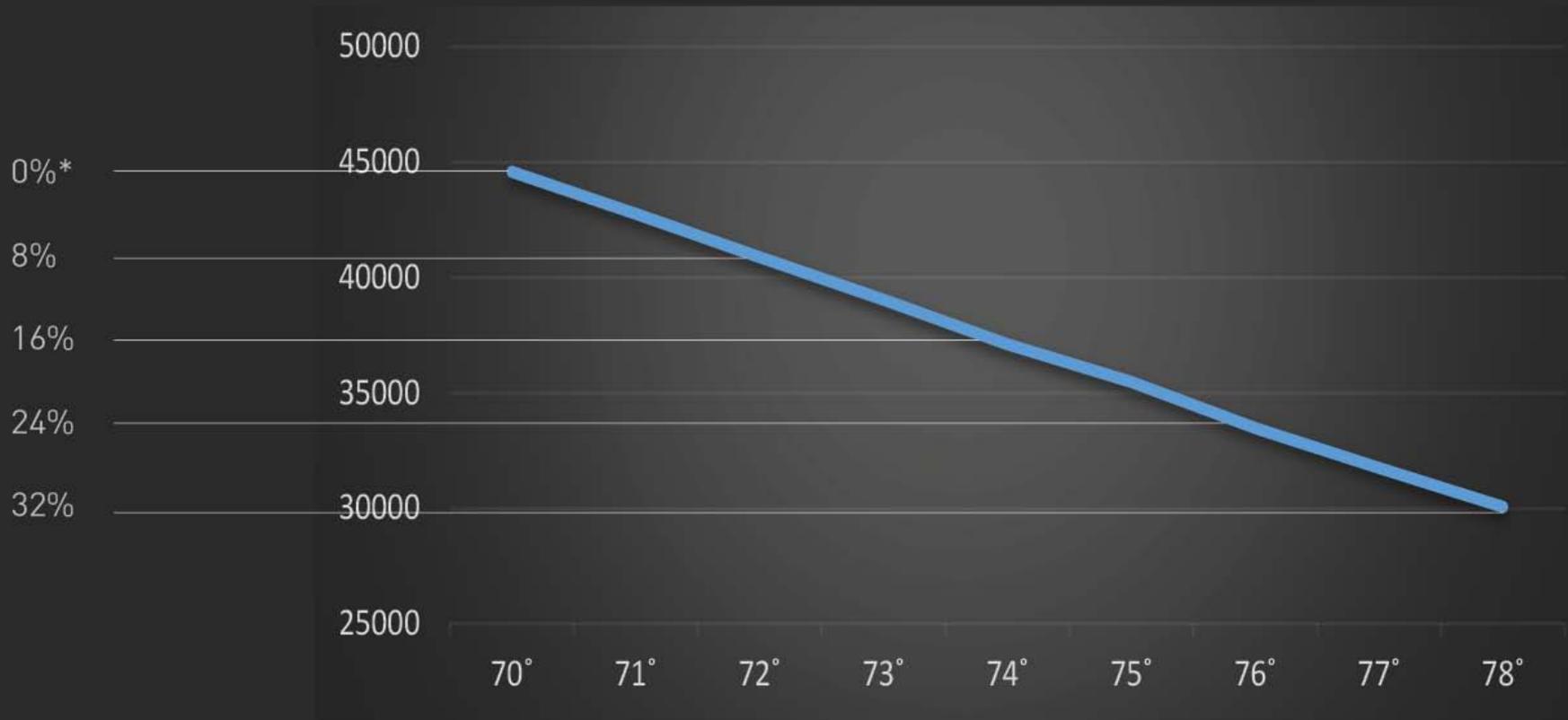


Predicted Annual  
Operation Cost \$5,860

Predicted Potential  
Operation Cost \$2,285

# Summer Set Point Savings

Comfort depends on many factors including temperature, activity level, and clothing. While thermal comfort can vary from person to person, most people who are sitting or standing in typical summer clothing tend to be comfortable around 76 degrees. Try adjusting the thermostat a few degrees at a time to see what temperature is most comfortable. Remember that the ideal temperature is different depending on the season.



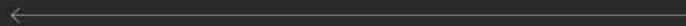
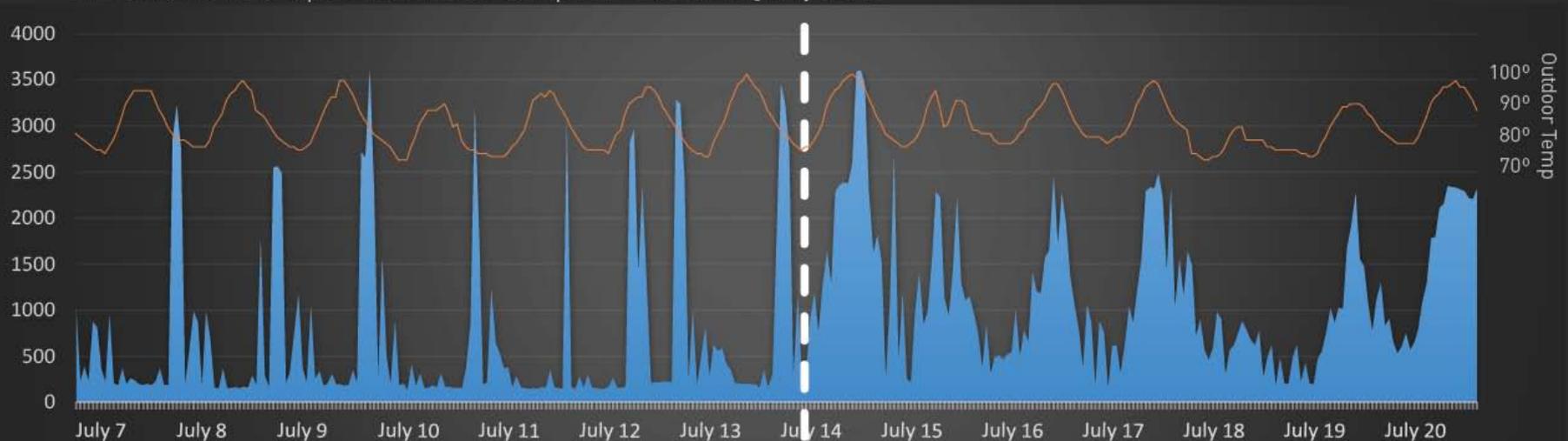
\*Percent reduction in HVAC consumption from 70 degrees

Set Points Potential Savings - \$494

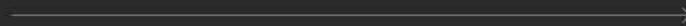
# Programing the Thermostat

Depending on how often you are away from home, there's a lot of potential energy savings from programming setbacks into the thermostats. Setting the thermostat to 85 degrees in the summer and 50 degrees in the winter while you're not at home will save significant energy. As a general rule of thumb, if no one is home for two hours or more, set back the thermostat.

This is a controlled experiment that we set up in a house during July 2014



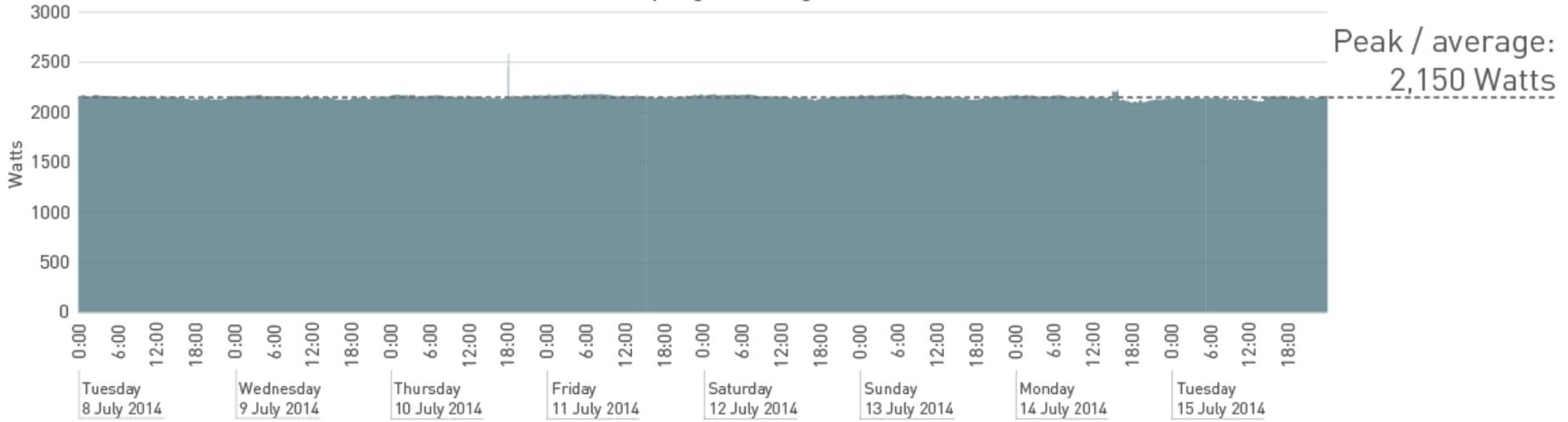
HVAC Energy use with a setback during non-occupied hours



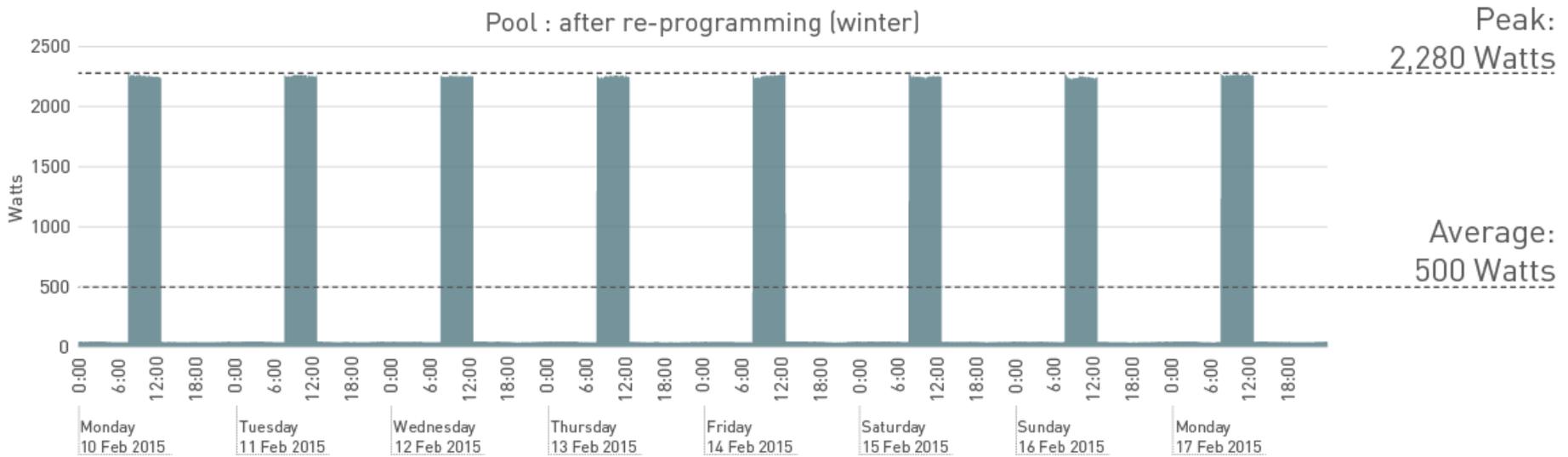
HVAC Energy use when the system is running regardless of occupancy

Scheduling Potential Savings - \$659

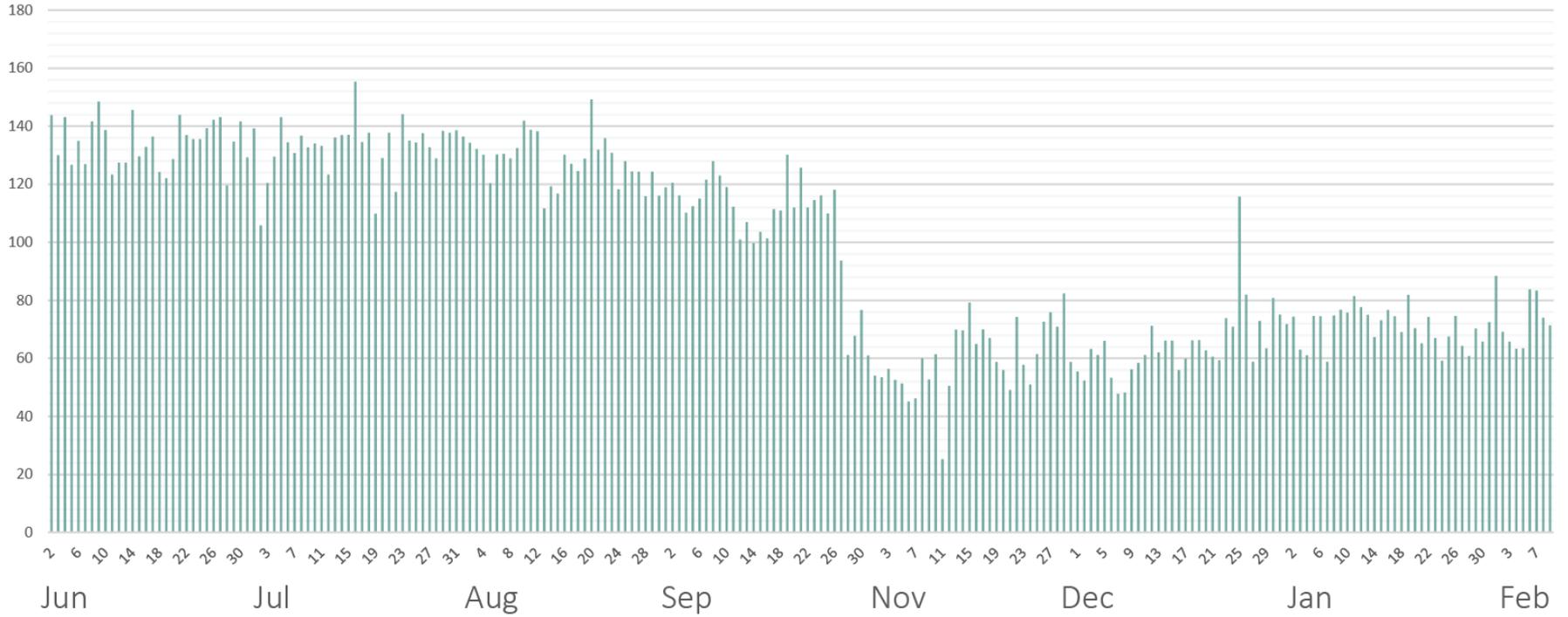
Pool: before re-programming (summer)



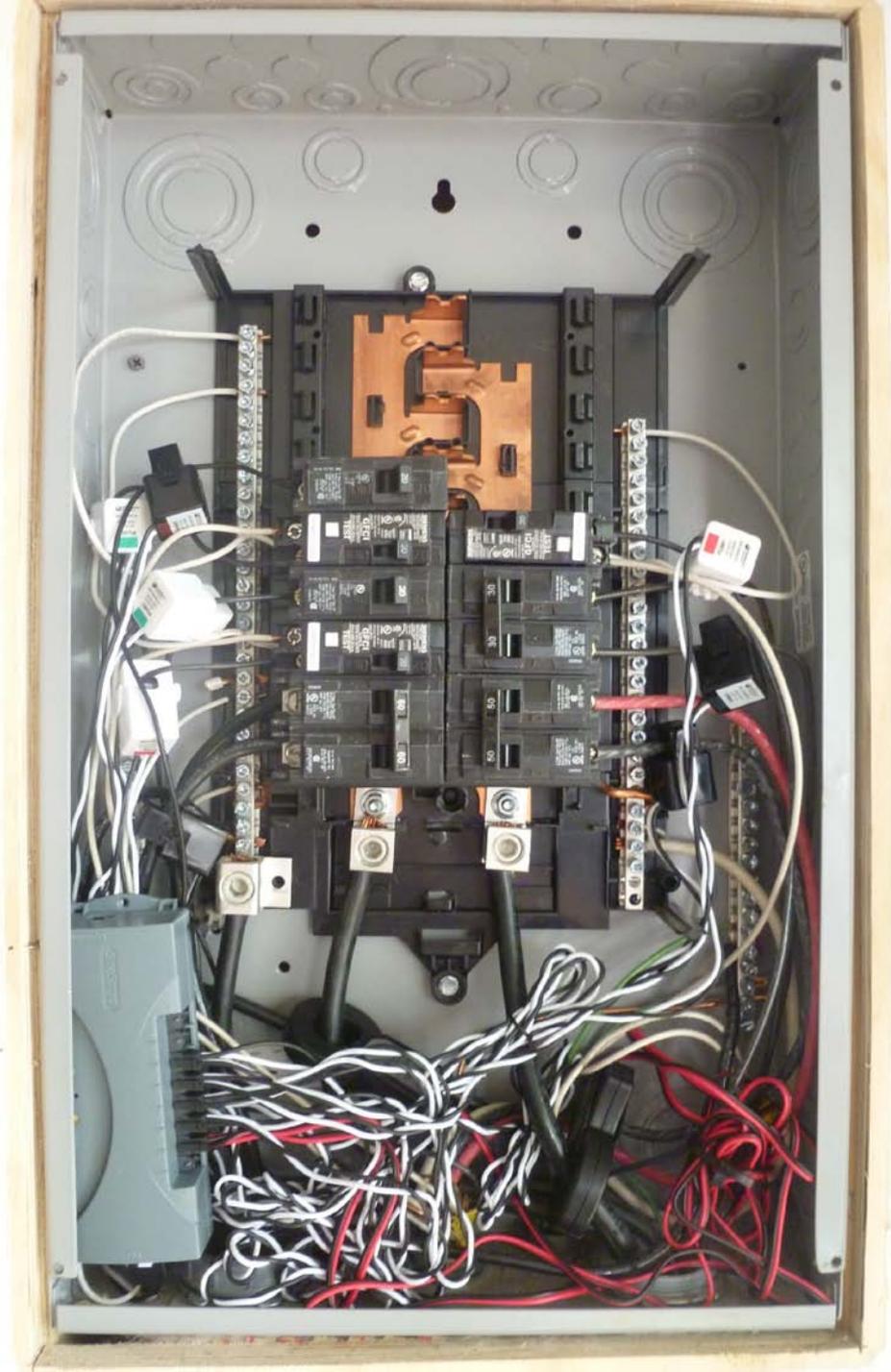
Pool : after re-programming (winter)

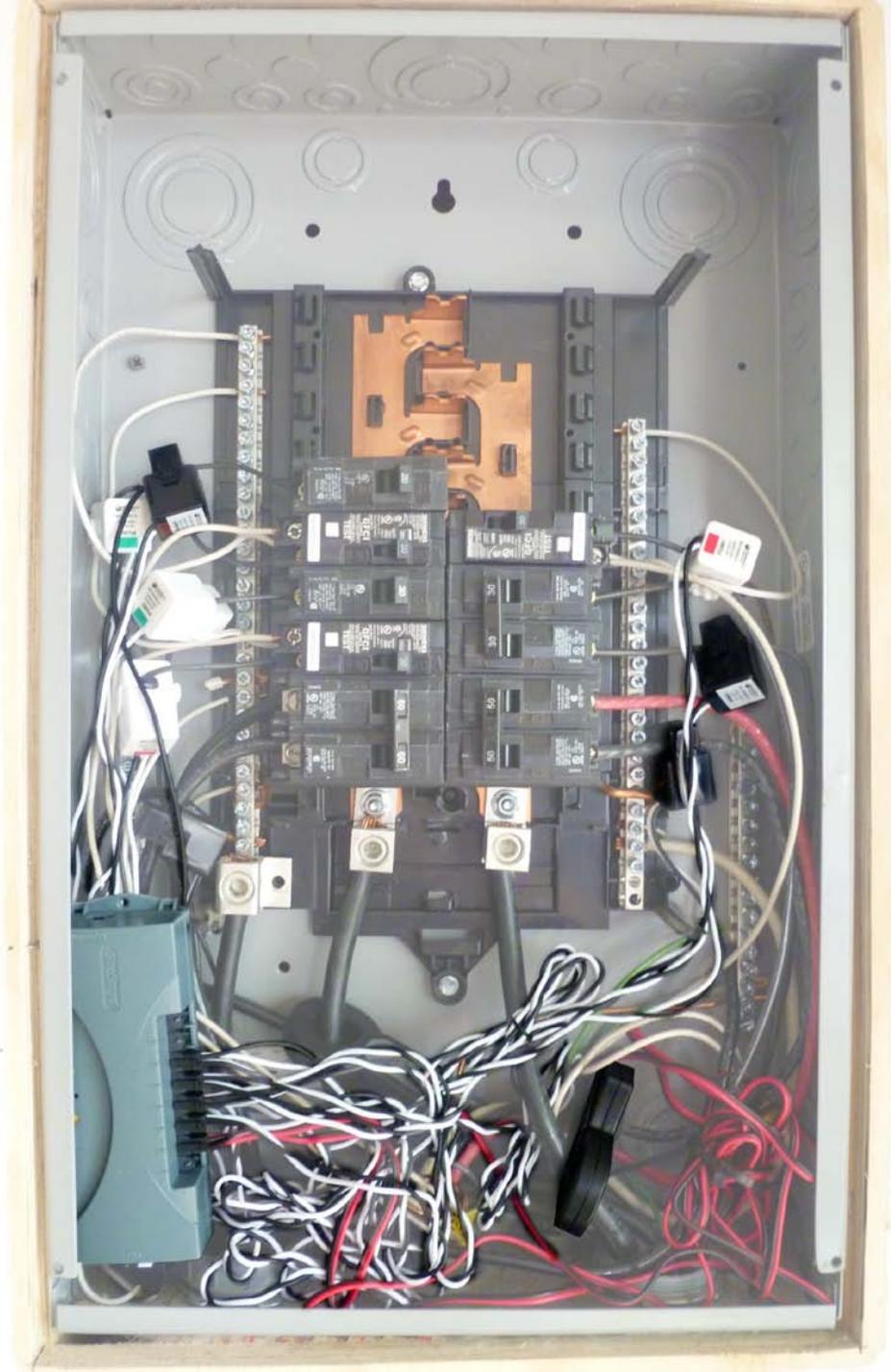


# Daily Energy at Clark Ranch (kWh)



# The Monitoring System







Share My **SiteSag** Window

Measured Power i



Top Appliances/Circuits On Now

- Refrigerator (111w)
- Air Handler / Thermostat (77w)
- Internet strip / kitchen ... (9w)
- Bedroom outlet - lamp (8w)
- 
- 
- 
- 
- 
- 

30-Day Carbon Footprint i

TX Avg.	My CO <sub>2</sub>
1537 lbs.	1111 lbs.

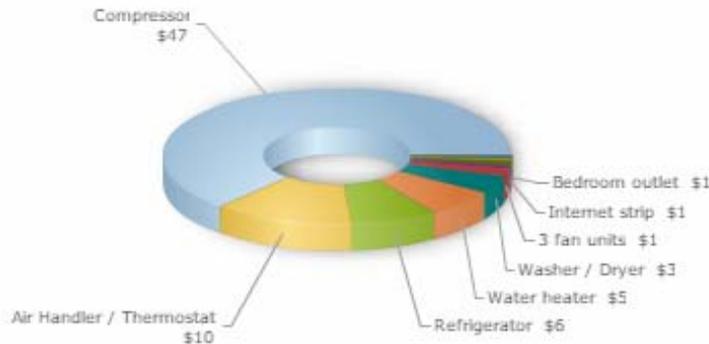
30-Day Phantom Power **\$1** i

Sensors i

<span style="color: green;">●</span> %RH	42%
<span style="color: green;">●</span> Carbon dioxide	536 ppm
<span style="color: green;">●</span> Temperature	85°F

Where I've used electricity in the past 30 days: Top 12 Circuits

Click a slice or label for detail / [View All Circuits](#)



kWh  Cost

Electricity Cost by Month i

This Month	To date: \$47	\$76
Last Month	To same day: \$48	\$77

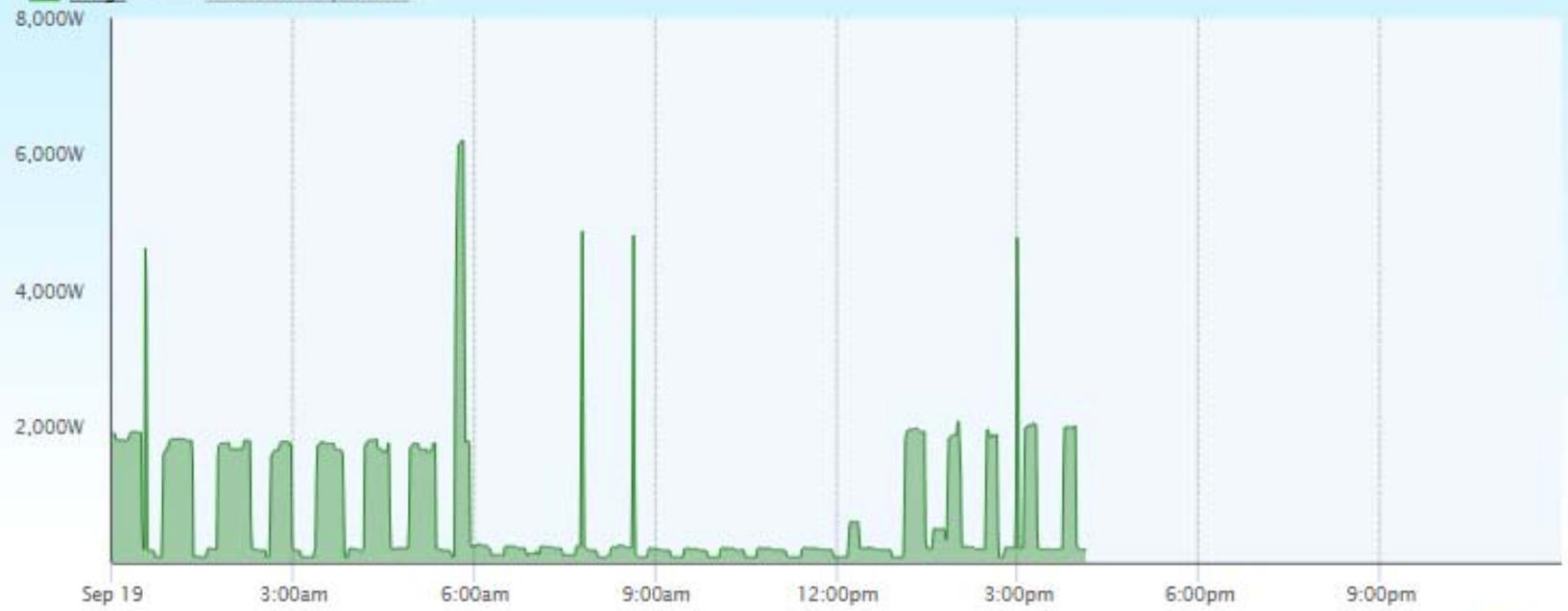
Top 4 Users by Cost - Last 30 days

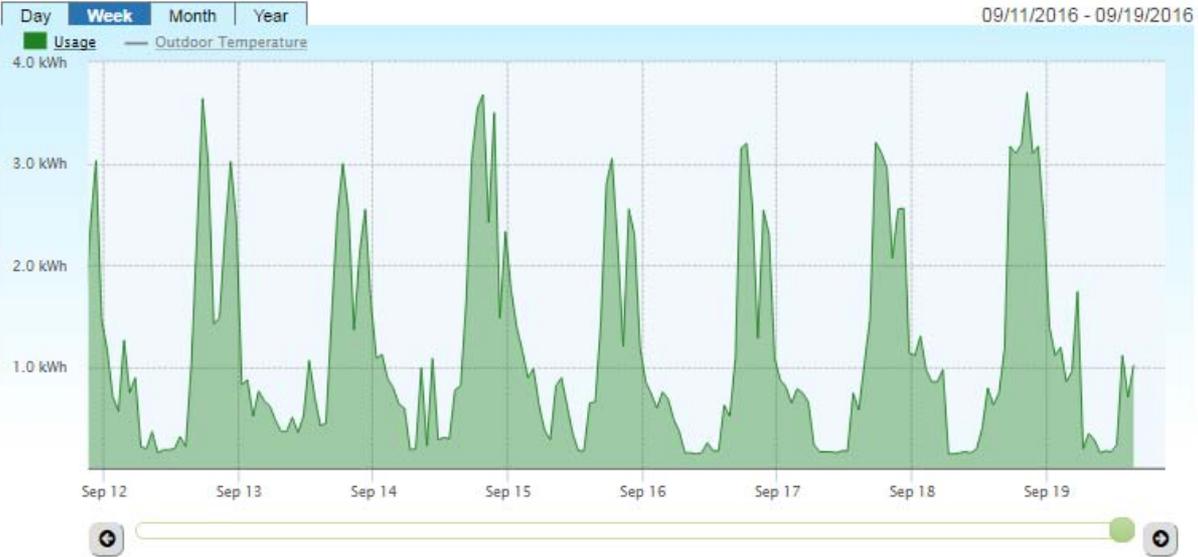


Day Week Month Year

Monday 09-19-2016

Usage Outdoor Temperature





# The Feedback Loop



Drivers barely slow



Drivers slow by an average of 14%

- Energy should be used to provide comfort
- We often don't know where energy is being used
- Monitoring energy use is an inexpensive and effective way of savings energy and money
- Occupants much play an conscience and active roll in preventing energy waste in their homes.

Thank You!