

OUR 110-YEAR-OLD HOME OF THE FUTURE

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2023 UTILITY ENERGY FORUM

OUR HOUSE

- Located in Sacramento, CA - Climate Zone 12
- Curtis Park - historic neighborhood with large trees
- Craftsman style
- Built in 1910, purchased in 2011
- 2,300 Sq. Ft.



- All gas appliances
- SMUD for electricity, PG&E for gas
- Mostly original, but new-ish wiring & 200-amp panel



OUR HOUSE - BEST LAID PLANS

- Our plan was to begin an energy efficient remodel right away
- Surprise! Structural problems caused delays
- While extremely frustrating, the delays ended up being a good thing ...
 - Converting from gas to electric wasn't so much on our radar
 - SMUD did not yet have rebates for electrification as they do now
- We ended up spending the next 7 years scraping up the money to fix the structure, and it was finally time to begin planning our next project - a kitchen remodel
- Unfortunately, we had a large chase for the water heater flue that came up through one edge of our kitchen

1. HEAT PUMP WATER HEATER (2018)

Considerations

- ☑ Gain space in the kitchen by removing flue
- ☑ Lower water heating costs
- ☑ SMUD rebates!



| COST | |
|-----------------|----------------|
| Water Heater | \$1,200 |
| Other parts | \$500 |
| Electrical | \$300 |
| Plumbing | \$1,400 |
| Subtotal | \$3,400 |
| SMUD rebate | -\$2,500 |
| Tax credit | -\$300 |
| NET COST | \$600 |

Now \$2,000!

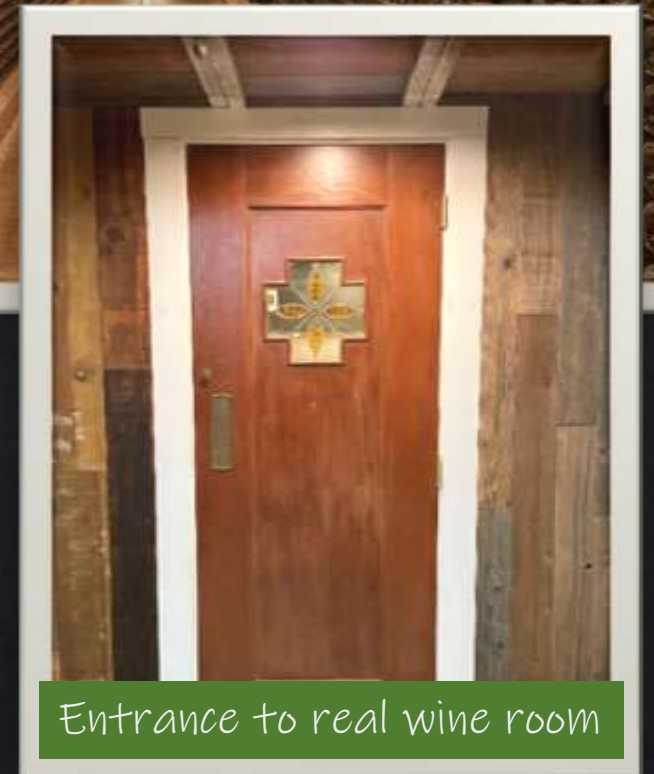
1. HEAT PUMP WATER HEATER (2018)

Non-Energy Benefits

- ☑ Expels cold air
- ☑ Directed the cold air into our wine room. Free wine chiller!!

Lessons Learned

- ☑ Mixing valve installed backwards
- ☑ Relying on heat pump mode may require higher temps (130-140°F)



2. ELECTRIC CAR - Tesla Model 3 (2019)

Considerations

- ☑ Reduce our carbon footprint
- ☑ Stop paying for gasoline/No more long gas lines
- ☑ Reduced maintenance/cost per mile



| COST | |
|--------------------------------|-----------------|
| Tesla Model 3 | \$35,000 |
| Long range, All-wheel drive | \$13,500 |
| Other upgrades | \$4,000 |
| Electrical work | \$200 |
| Subtotal | \$53,900 |
| Fed tax credit | -\$3,750 |
| NET COST | \$50,400 |

Now
\$7,500+



Why Tesla?

- ☑ Best-performing EV on the market
- ☑ Long range (310 miles)
- ☑ Best charging network, by far!

3. INDUCTION STOVE (2019)

Considerations

- ☑ Remodeling the kitchen!
- ☑ Superior performance
- ☑ Improve indoor air quality
- ☑ Reduce heat in the kitchen
- ☑ SMUD rebate

| COST | |
|-----------------|----------------|
| Range | \$2,800 |
| Electrical work | \$200 |
| SMUD Rebate | -\$500 |
| TOTAL | \$2,500 |



Other stuff

- Makes more noise than we'd like
- Cookware already induction-compatible

4. HEAT PUMP HVAC & INSULATION (2020)

Considerations

- ☑ Upstairs unit malfunctioning
- ☑ Downstairs unit – no A/C!
- ☑ Poor insulation, leaky house
- ☑ Improve efficiency/reduce energy bills
- ☑ SMUD rebates
- ☑ LAST gas appliance in the home!
- ☑ Timing was perfect
 - Pandemic lockdown

| COST | |
|-----------------|-----------------|
| 2 X 3-ton units | \$27,700 |
| Seal & Insulate | \$3,800 |
| Subtotal | \$31,500 |
| SMUD rebates | -\$11,500 |
| Fed tax credit | -\$500 |
| NET COST | \$19,500 |

- New Fed tax credits:
- \$2,000 for heat pump
 - \$1,200 for insulation
- New SMUD rebate:
- \$3,500 each

4. HEAT PUMP HVAC & INSULATION (2020)

Non-Energy Benefits

- ☑ SUPER QUIET outdoor unit
- ☑ WAY more comfortable
 - ☑ Fan is variable speed. No BLAST of hot or cold air
 - ☑ Fewer thermostat wars!
- ☑ Saved space in our basement
- ☑ Outdoor unit is smaller, more discreet



5. SOLAR ROOF & BATTERY (2022)

Considerations

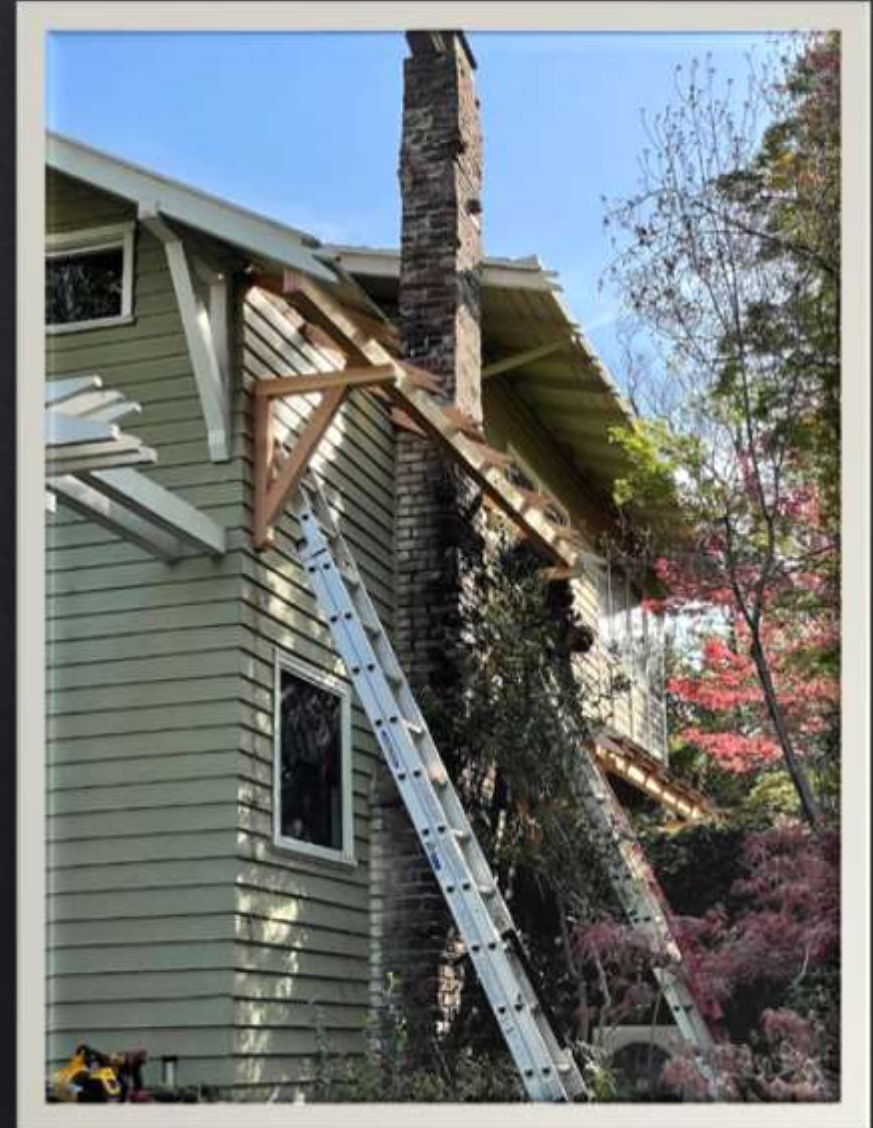
- ☑ Needed new roof
- ☑ Long-lasting, durable product
- ☑ Zero energy, low carbon home
- ☑ Energy resilience
- ☑ Eliminate asphalt roofing waste

| COST | |
|------------------------|----------|
| Roof (non-solar tiles) | \$16,900 |
| Solar - 6.05 kW DC | \$12,200 |
| Powerwall - 13.5 kWh | \$7,500 |
| Powerwall installation | \$3,500 |
| Discounts | -\$4,000 |
| Structural work | \$16,600 |
| Subtotal | \$52,700 |
| Fed tax credit | -\$7,000 |
| NET COST | \$45,700 |

SOLAR ROOF - STRUCTURAL SUPPORT



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ROOF INSTALL UNDERWAY



SOLAR ROOF - FINISHED PRODUCT

Cool Features

- Active tiles: tempered glass
- Non-active: Textured metal insulated tiles
- Replace individual tiles
- Slate look
- 25-year warranty



SOLAR ROOF - MORE COOL FEATURES

Air circulation behind the tiles helps keep roof cool



Ridge vents



Soffit vents

SOLAR ROOF - STRENGTH

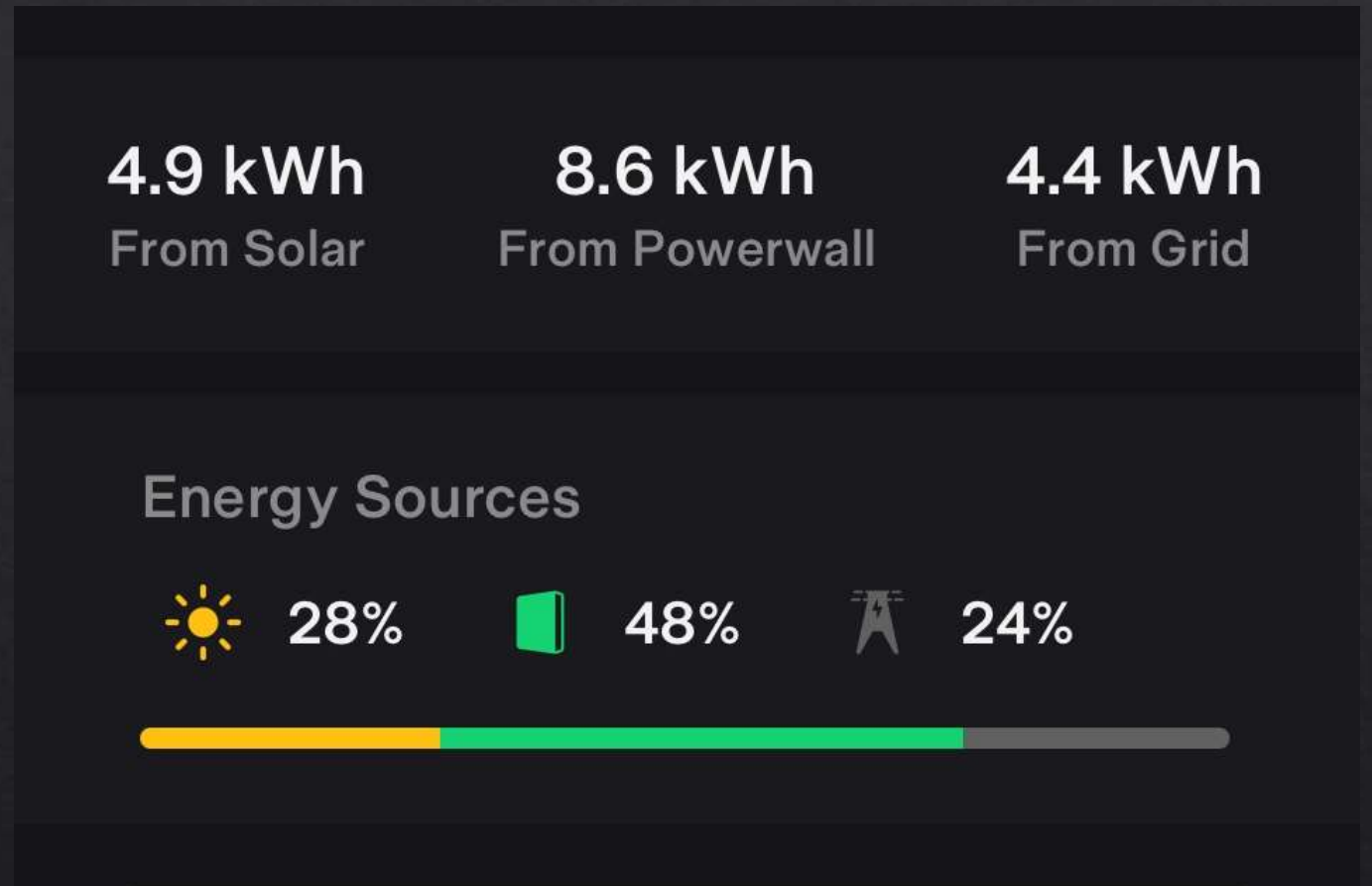
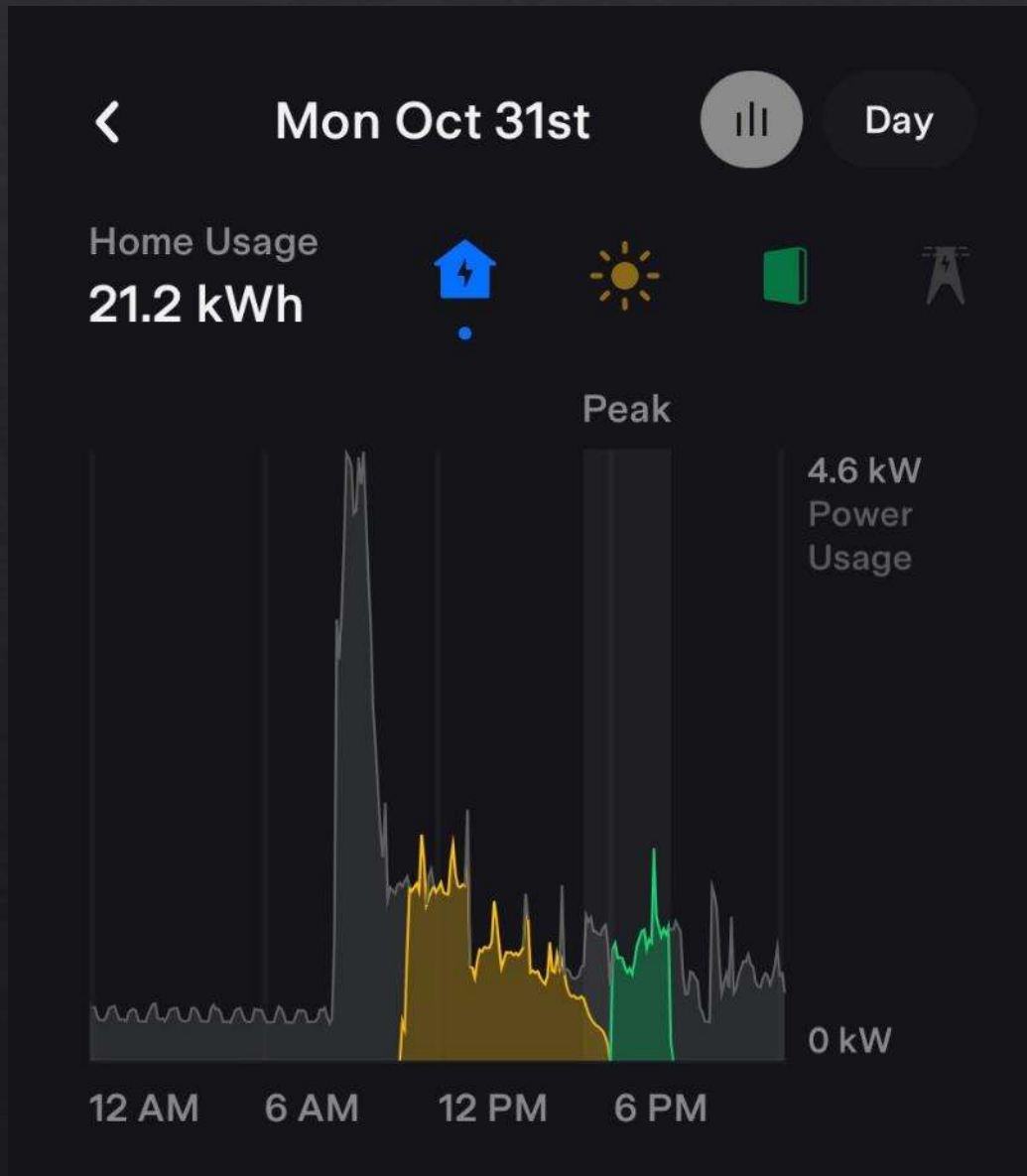


- 3X stronger than traditional tiles
- Class 3 hail resistance
- Class F wind resistant (130 mph)

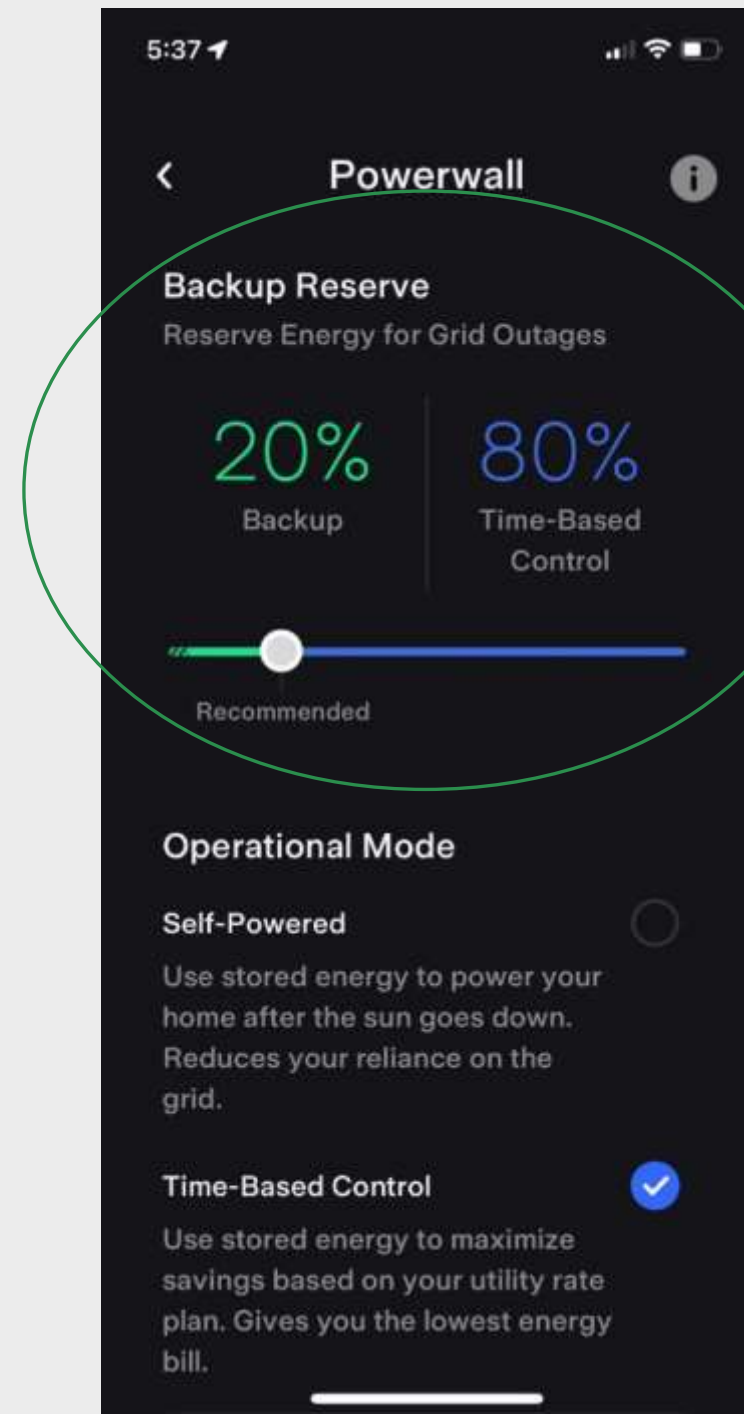
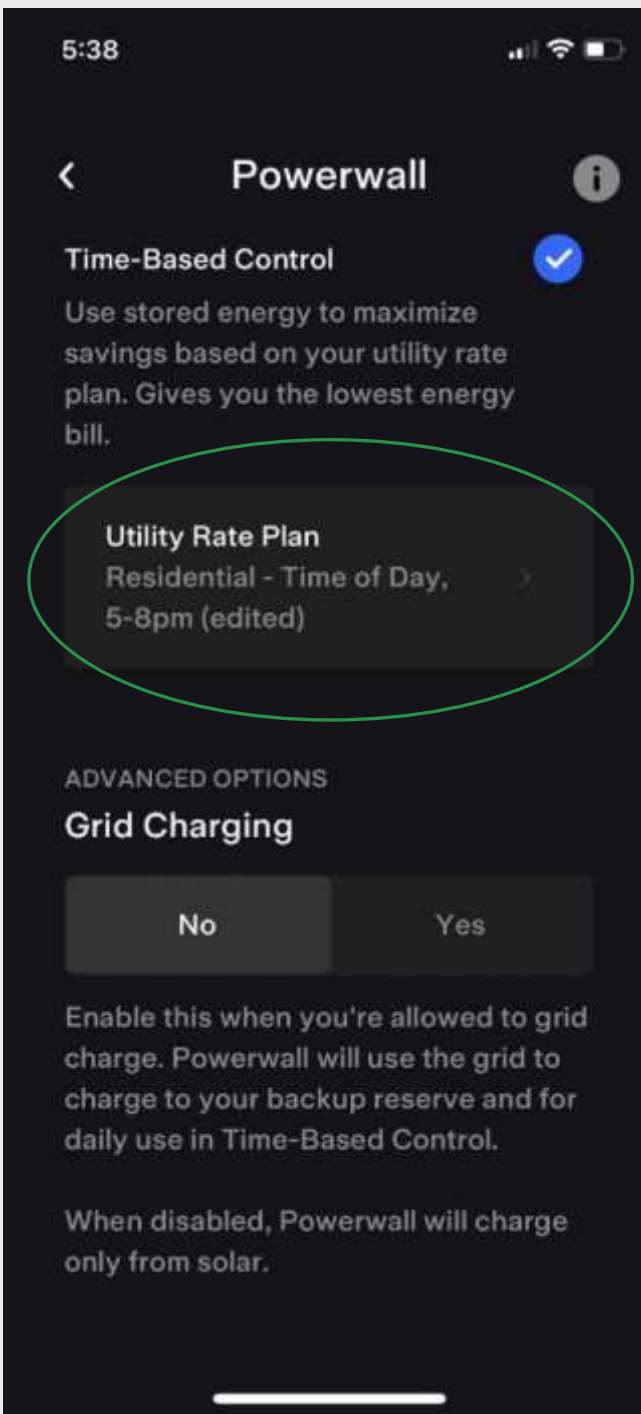
POWERWALL & INFRASTRUCTURE



POWERWALL & SOLAR PERFORMANCE - THE APP

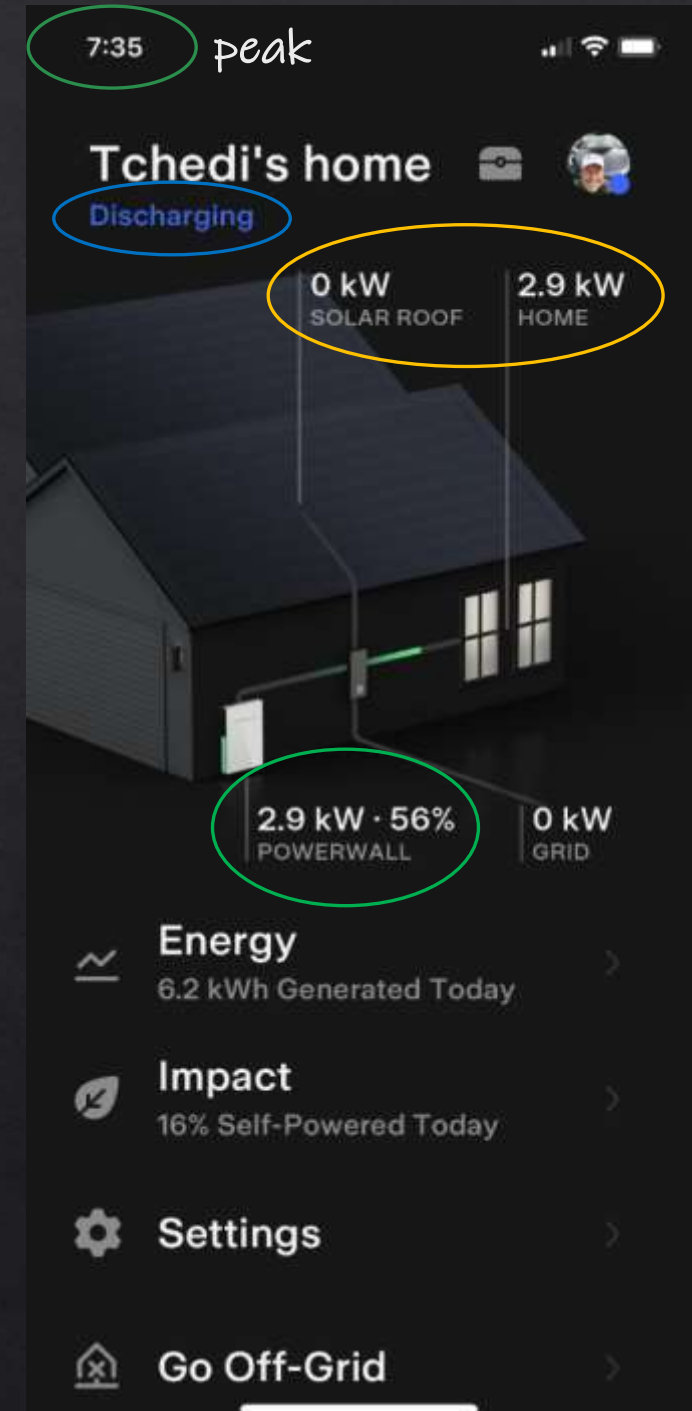
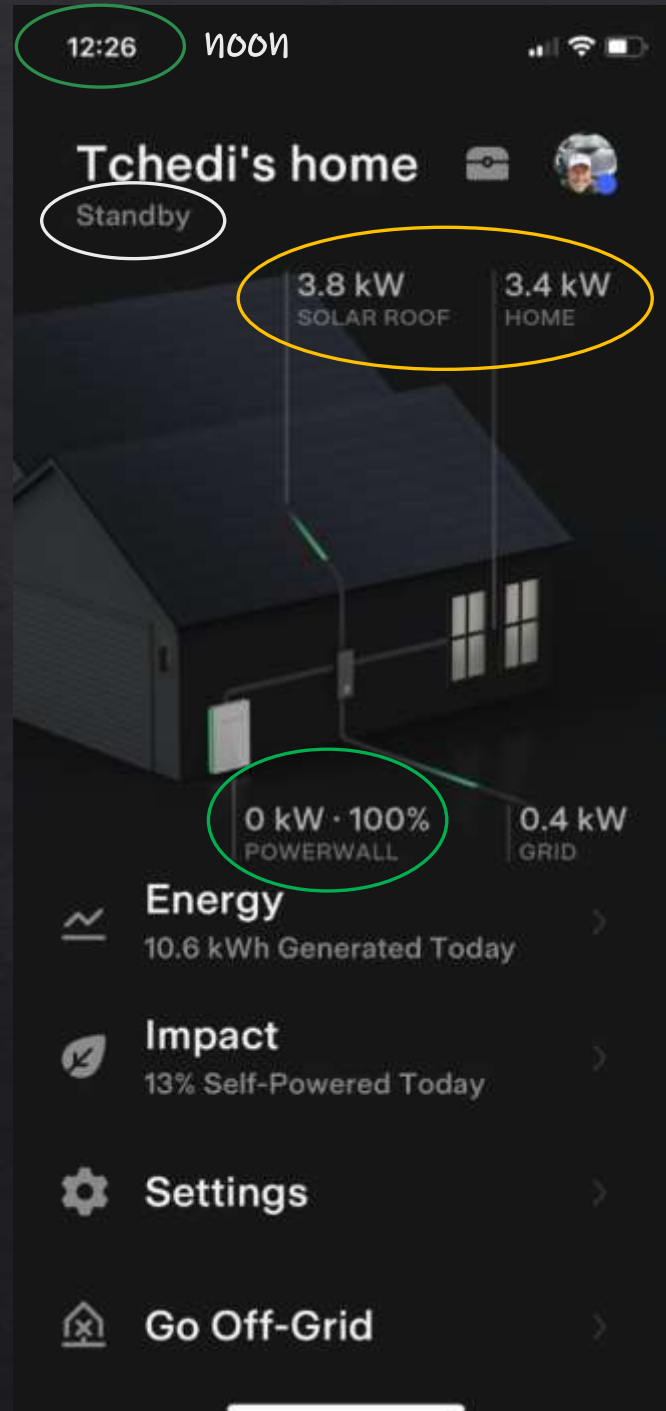
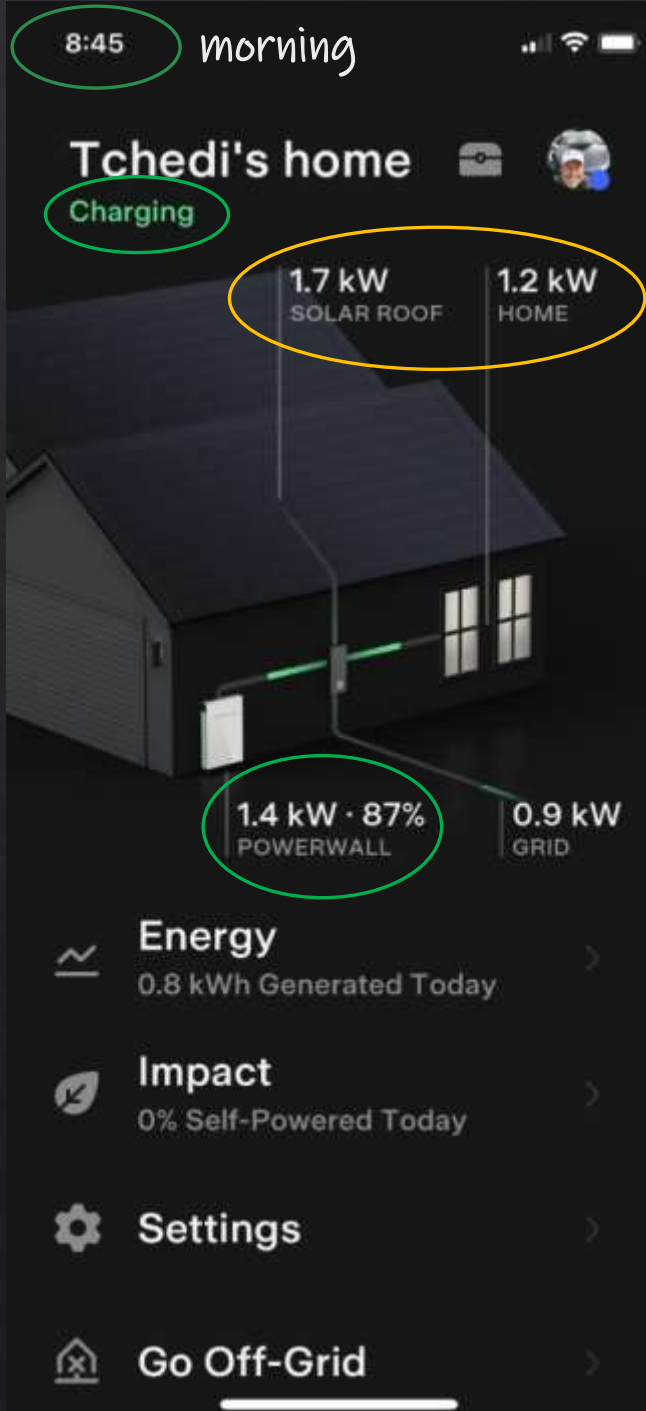


BATTERY SETTINGS

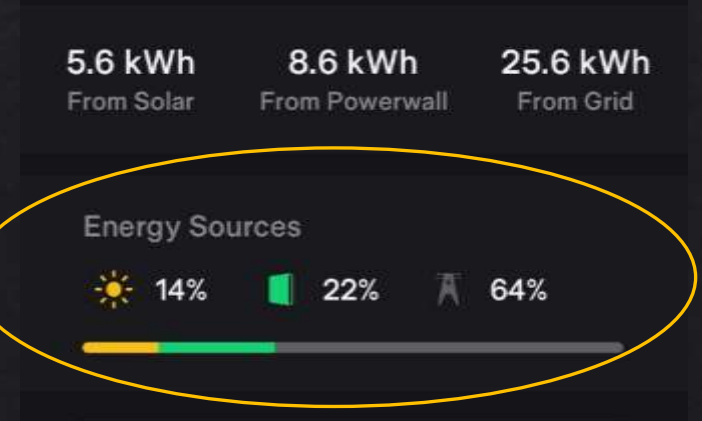
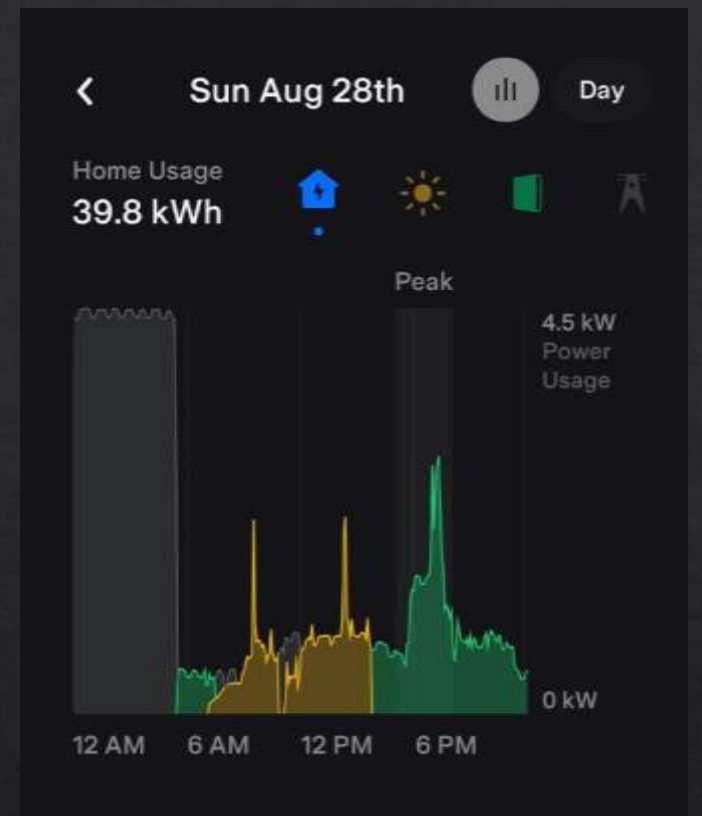
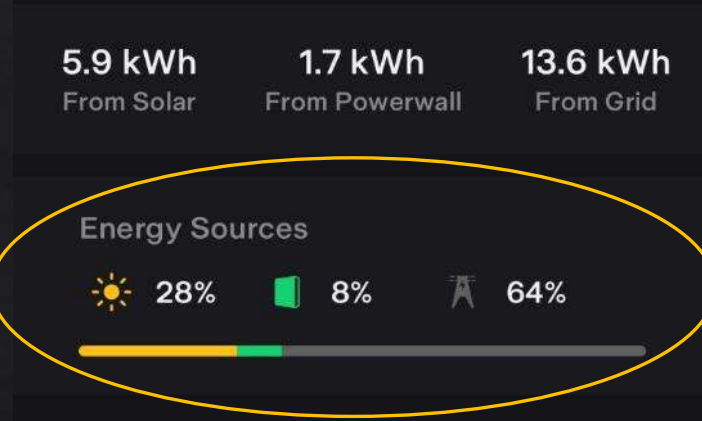
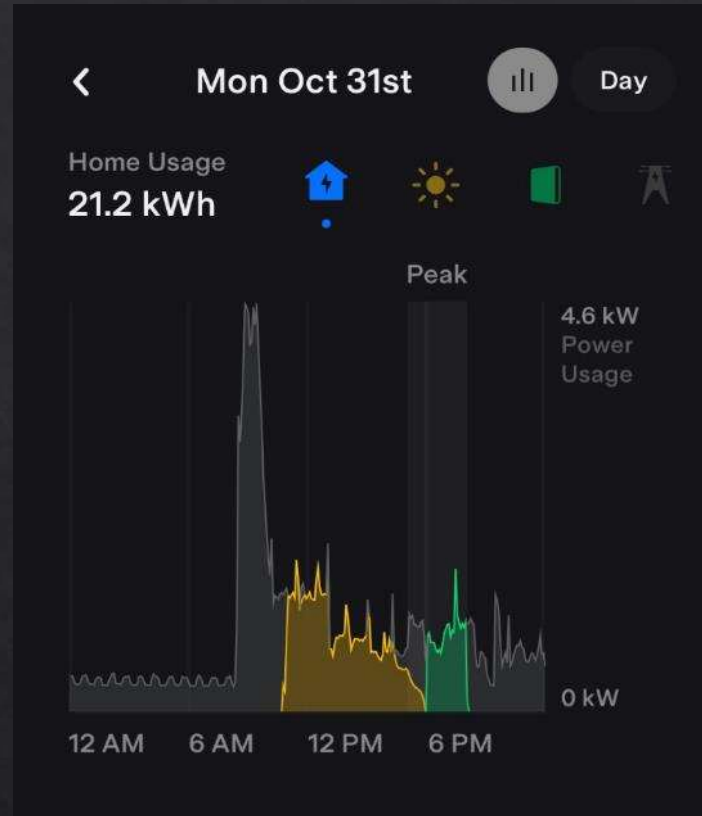
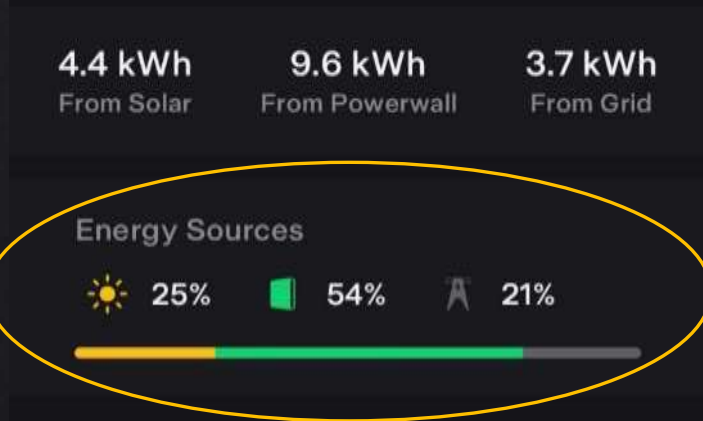
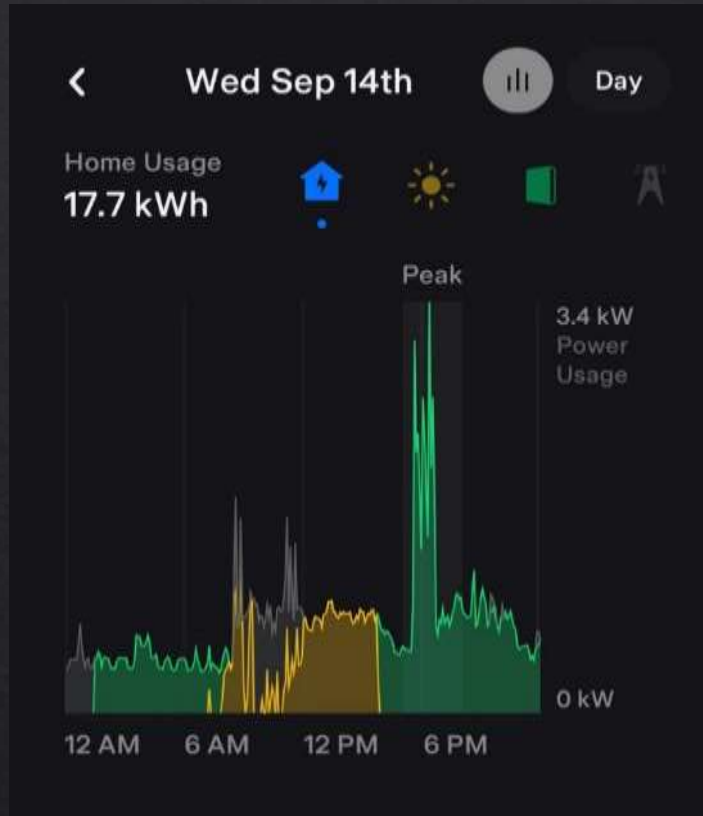


SOLAR AND BATTERY PERFORMANCE

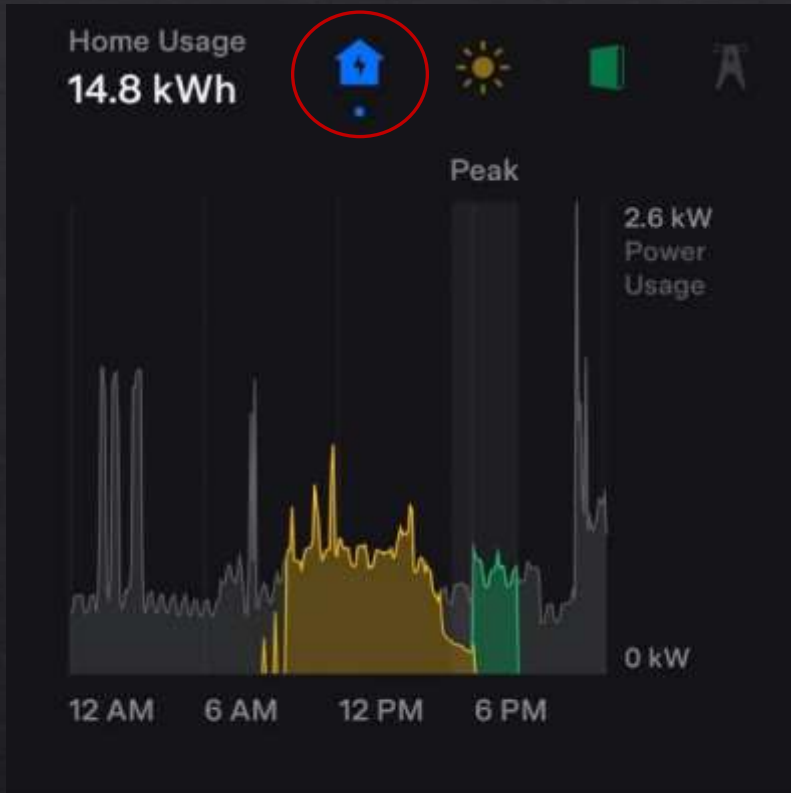
Typical day



POWERWALL & SOLAR PERFORMANCE - Nice Day



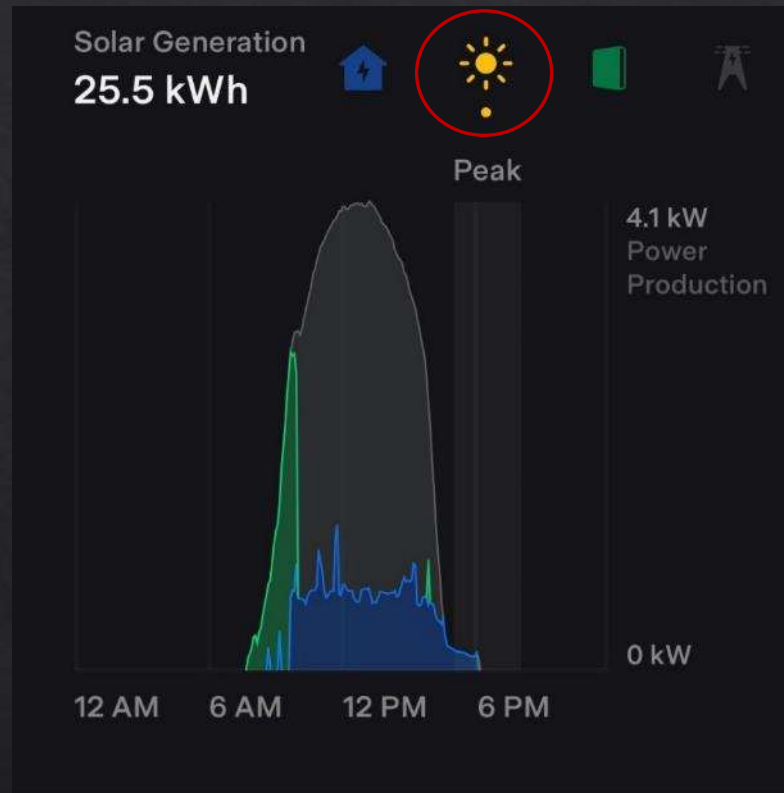
POWERWALL/SOLAR PERFORMANCE - Hot Day in Oct



5.0 kWh From Solar 1.0 kWh From Powerwall 8.8 kWh From Grid

Energy Sources

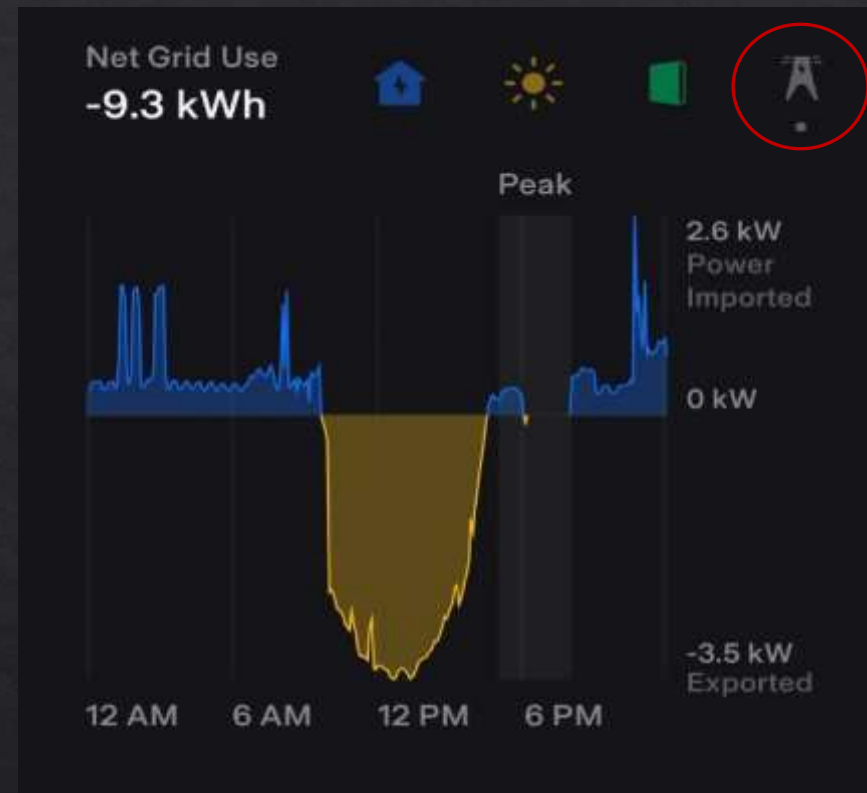
34% 7% 59%



5.0 kWh To Home 2.5 kWh To Powerwall 18.0 kWh To Grid

Energy Destinations

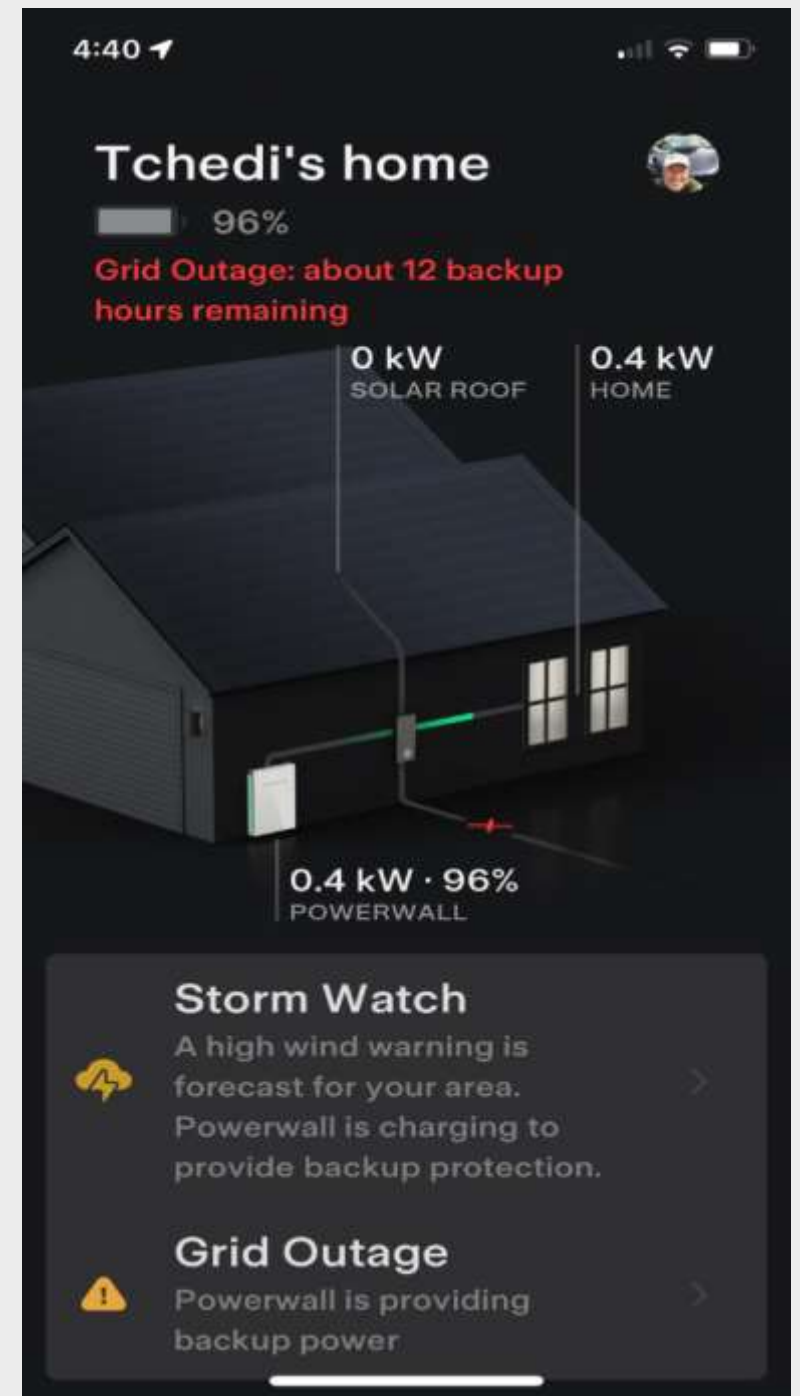
20% 10% 71%



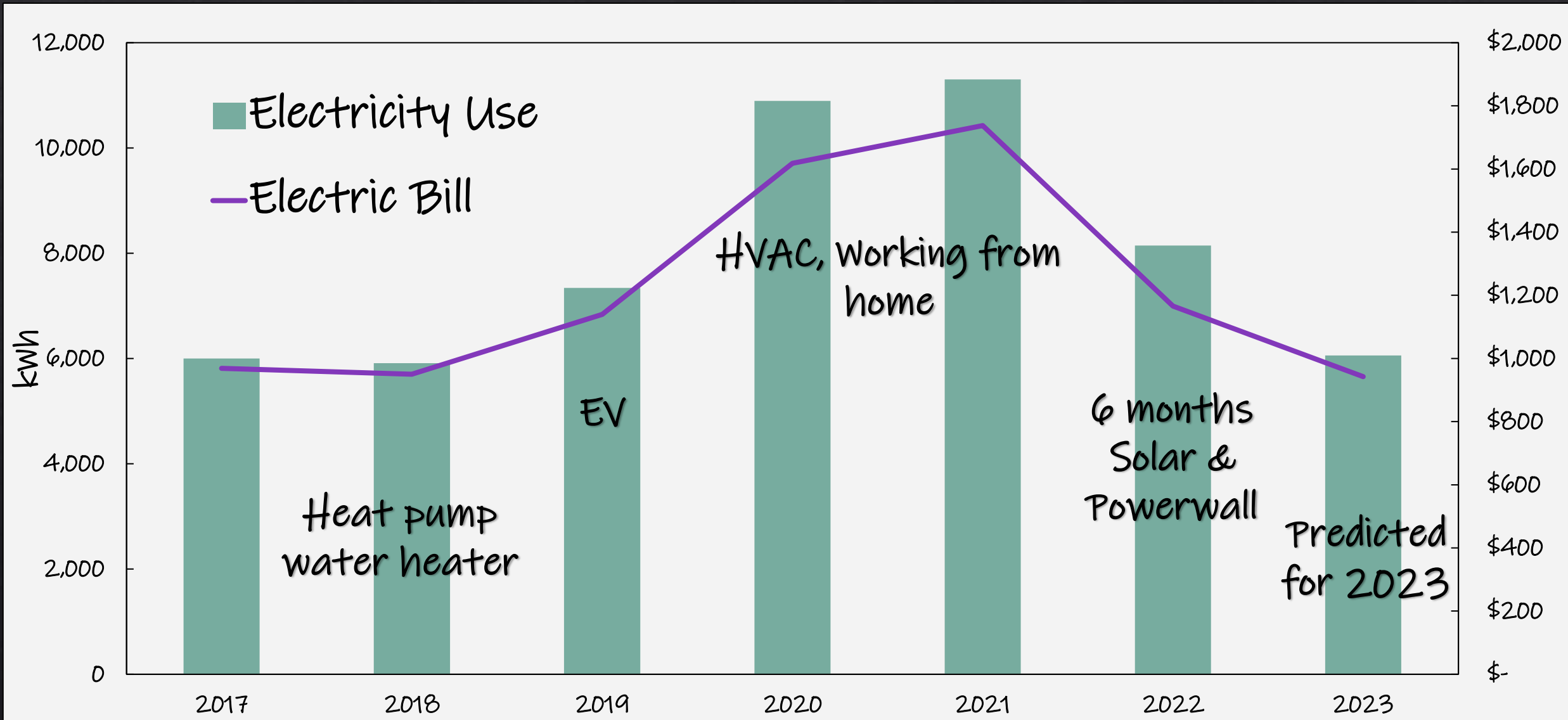
8.8 kWh From Grid 18.1 kWh To Grid -9.3 kWh Net Usage

POWERWALL PERFORMANCE

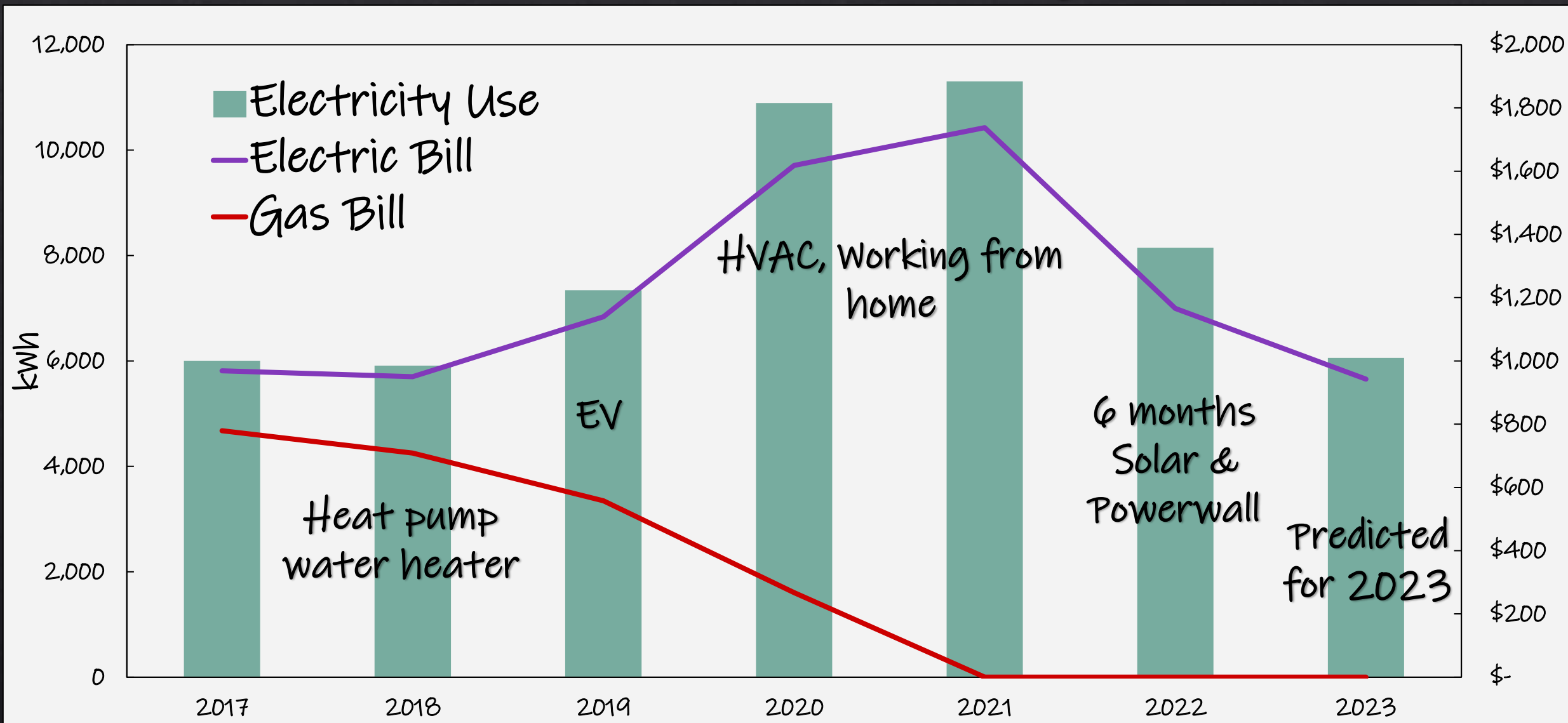
- Storms knocked out power
- Smooth transition to battery backup
- Battery coverage
 - 12 hrs with minimal uses
 - Requires managing loads



RESULTS: Electric Usage / Bills



RESULTS: Electric Usage / Bills



NOTES ON UTILITY BILL SAVINGS

- Estimated total energy bill for 2023: \$950
 - \$300 of this is for SMUD's fixed infrastructure charge
- Estimated total energy bill savings
 - \$1500 in gas bills (from going all-electric)
 - \$800 in electricity bills (from solar & battery storage)

TOTAL PAID / AVOIDED COSTS

| | Before Rebates | Net Cost* | Would have cost | w/ metal roof |
|------------------------------|----------------|------------|-----------------|---------------|
| Water Heater | \$3,400 | \$600 | \$2,000 | \$2,000 |
| Car | \$53,900 | \$50,400 | \$32,700 | \$32,700 |
| Stove | \$3,000 | \$2,500 | \$2,000 | \$2,000 |
| HVAC | \$27,700 | \$15,700 | \$18,200 | \$18,200 |
| Insulation | \$3,800 | \$3,800 | \$2,000 | \$2,000 |
| Roof (incl. structural work) | \$33,500 | \$33,500 | \$36,850 | \$50,800 |
| Solar - 6.05kW DC | \$12,200 | \$12,200 | \$18,150** | \$18,150** |
| Battery | \$11,000 | \$7,700 | - | - |
| Battery + Solar discount | -\$4,000 | -\$4,000 | - | - |
| | \$144,500 | \$118,750* | \$112,400 | \$126,350 |

Std vehicle

Gas system

No battery

* After rebates & tax credits

** Assumes \$3/watt installed

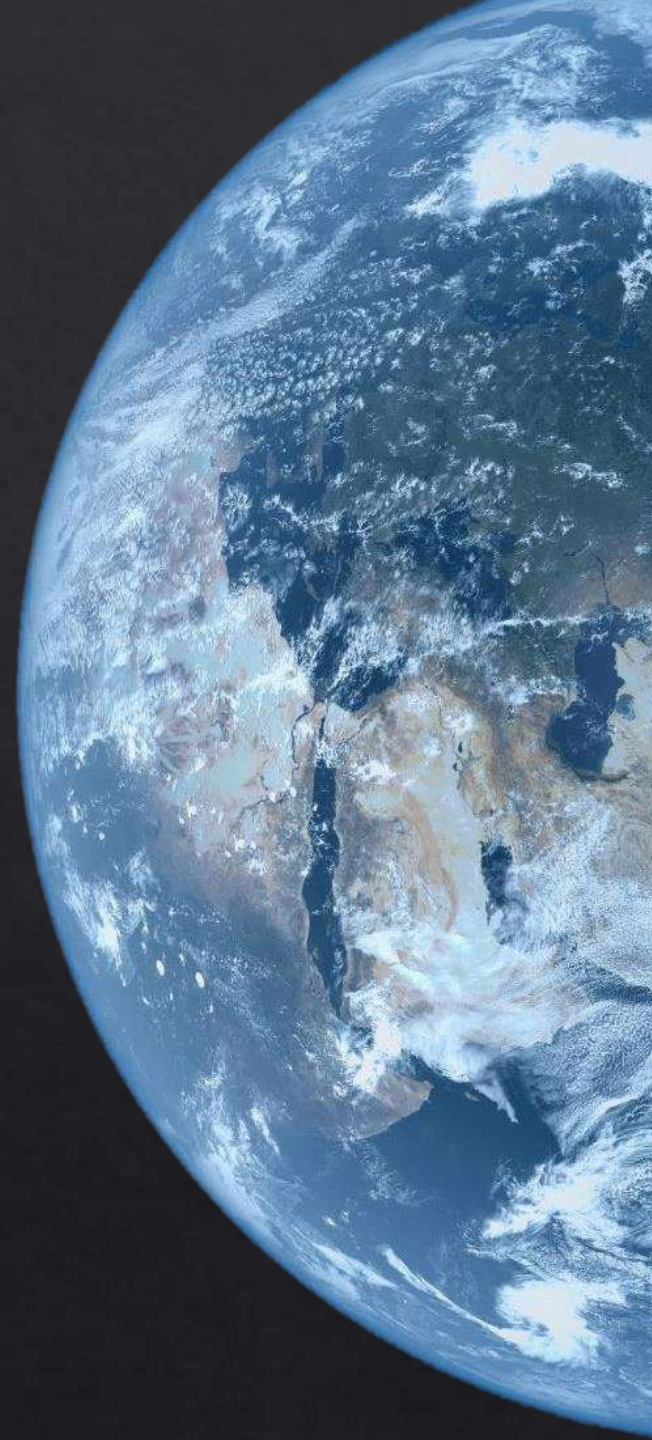
CARBON SAVINGS

- Savings from avoided:
 - Natural gas: 3.1 Tonnes/yr
 - Electric vehicle: 1.9 Tonnes/yr
 - kWh (offset by solar): 1.2 Tonnes/yr
- Total carbon saved: 6.2 Tonnes/yr
- Equivalent to carbon released by:
 - 694 gallons of gasoline consumed
- Equivalent to carbon sequestered by:
 - 7.4 acres of U.S. forest



CONCLUDING THOUGHTS

- *Can everyone afford to do this?*
 - Many technologies are cost-effective
 - New incentives are significant
 - Fed tax credits (now)
 - Fed rebates for income-qualified (2024)
 - Utility incentives, TECH incentives (CA Only)
- *Challenges?*
 - Familiarity
 - Leading edge can be bleeding edge
- *Remember, you don't have to do everything at once*
 - Retrofit when things break
 - Remodel when you have the budget
- **REMODEL LIKE THE WORLD DEPENDS ON IT**
 - ... because it DOES!



THE END

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