# We will be starting soon!

*Thanks for joining us*

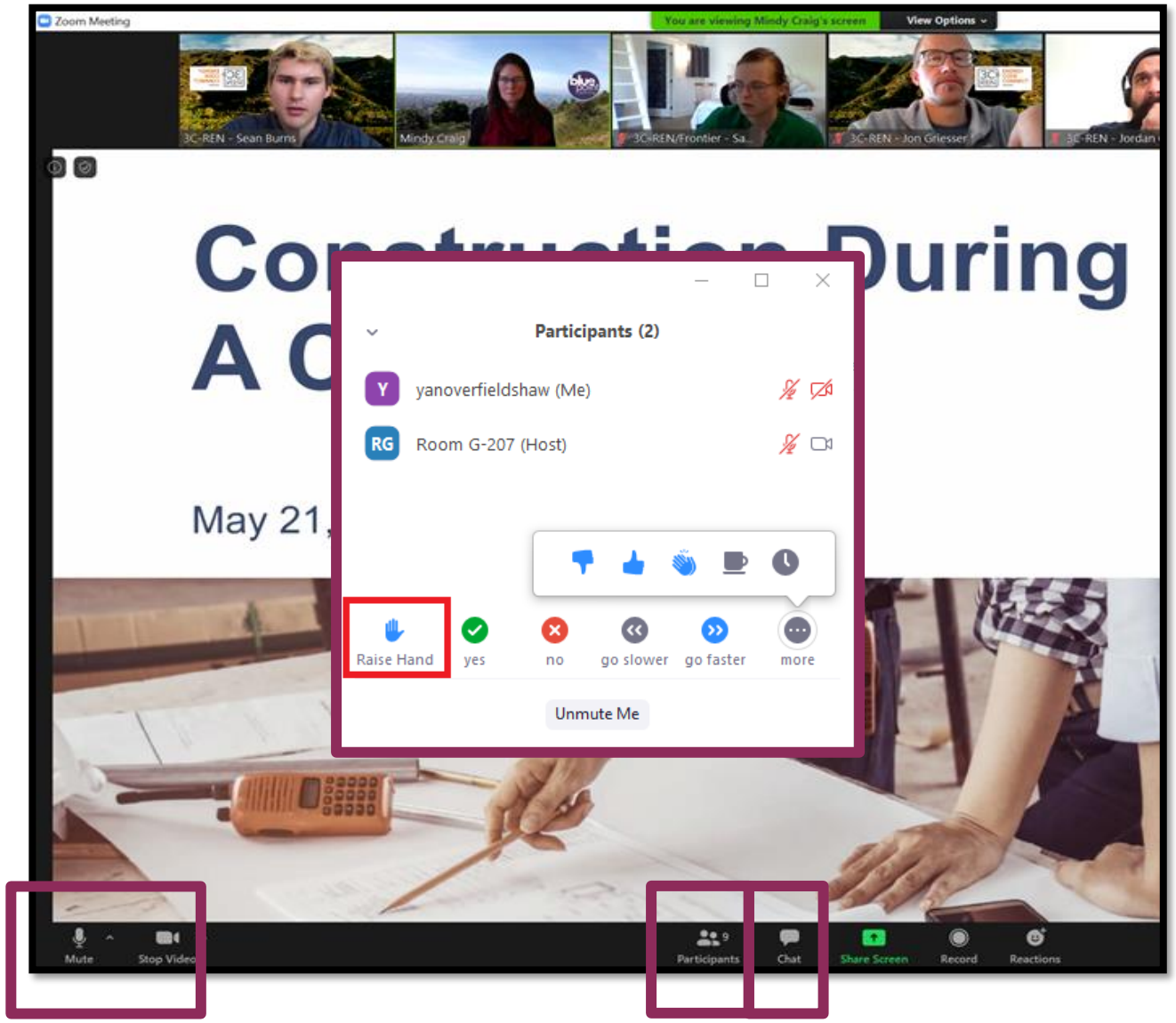
# Building the Future: Electrification Strategies for Electricians

*Larry Waters – Electrify My Home*

October 17th, 2024

# Zoom Orientation

- Please be sure your full name is displayed
- Please mute upon joining
- Use "Chat“ box to share questions or comments
- Under "Participant" select "Raise Hand" to share a question or comment verbally
- The session may be recorded and posted to 3C-REN's on-demand page. Feel free to ask questions via the chat and keep video off if you want to remain anonymous in the recording.



# 3C-REN: Tri-County Regional Energy Network

- Three counties working together to improve energy efficiency in the region
- Services for –
  - **Building Professionals:** industry events, training, and energy code compliance support
  - **Households:** free and discounted home upgrades
- Funded by ratepayer dollars that 3C-REN returns to the region


3C REN ENERGY CODE CONNECT

3C REN BUILDING PERFORMANCE TRAINING

3C REN HOME ENERGY SAVINGS

# 3C-REN Programs

- Energy Code Connect (ECC)
  - Industry Trainings and Regional Forums
  - Energy Code Coach: Title 24 Compliance Support Hotline (805) 220-9991
- Building Performance Training (BPT)
  - Industry Trainings & Certification for current and perspective building professionals
  - Helps workers thrive in an evolving industry
- Home Energy Savings (HES)
  - Flexible Home Energy Upgrades
  - Multifamily (5+ units) & Single Family (up to 4 units)

# BUILDING PERFORMANCE TRAINING

- Earn while you learn: Heat Pump Water Heater Installs
  - Hands on, in the field training
  - **Earn $300 when you participate**


*Learn More: https://www.3c-ren.org/building-performance-training*

# Who's This Dude?

- 1982 (UTI), with these tools

- Certs along the way

- 2015 – only heat pumps

- 2020, founded Electrify My Home

Larry Waters
President, Electrify My Home

# Agenda

- Introductions
- Electrification market in California
- Business and growth opportunities
- Electrification planning
- Emerging technologies for home electrification

# Electrify My Home – Electrification Pioneers

## Our Mission:

*To provide the **most efficient** cost-effective electrification solutions to California homeowners, to practice **good stewardship** of the electrical panel, and to **train and influence** other contractors to do the same.*

ELECTRIFY MY HOME

# Electrify My Home Trade Pro Series

- Goal – provide a crash course on Electrification
- Let you know how we got here and where we're going
- Point out enormous business opportunities
- Open your eyes into better ways to serve your customers

# #ElectrifyEfficiently Areas of Focus

- Building electrification (single family residential)
- HVAC & water heating (heat pumps)
- Overcoming home electrification barriers
- Approaches that optimize for comfort, efficiency, resilience, and low operational cost
- All audiences will benefit, especially contractors and industry professionals

# Electrification Backdrop


# Live Better, Electrically – 1956

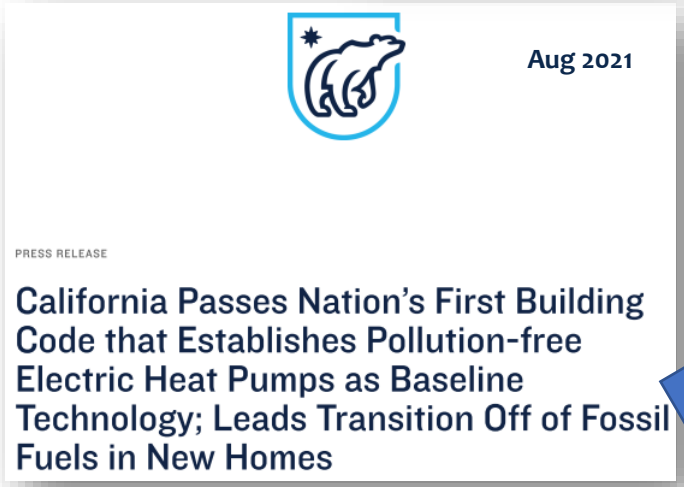
# Policies & Decisions Leading to This Point
## *Primary Drivers = Health, Air Quality, Climate Change*


| 1963 | 1968 | 1970 | 1976 | 1988 | 1990 | 2005 | 2006 | 2016 | 2018 | 2018 |
|---|---|---|---|---|---|---|---|---|---|---|
| US clean Air Act Amended 1965/67<br>1970/77 | C.A.R.B. Board Forms | Clean Air Act shifts Fed's role allowing states to limit | A.Q.M.D formed across the state | CA Clean Air Act becomes Law | Clean Air Act amended & admin by US EPA | CA EO S-3-05 sets GHG emission targets | AB 32 CA Global Warming Solutions Act | SB 32 40% below 1990 levels by 2030 | Executive Order B-55-18 takes a step further… requires carbon neutrality by 2045 | SB 1477 Technology & Equipment for Clean Heating (TECH) Initiative |

# Fast Forward – It's Happening Again
# Building Electrification is Here to Stay!


6MM Heat Pumps by 2030


Air Quality Concerns Driving Policy




Code Prioritizing Heat Pumps


Plans Signaling Demise of Furnaces


# 6 Million

## Heat Pumps Installed

California has a goal of 6 million heat pump installations in less than 7 years

# No New Gas

## Furnaces & Water Heaters

The California Air Resources Board has initiated plans to phase out new gas furnace & water heater installs. Starting even earlier in the Bay Area.

# 70+ Cities Have Adopted Building Codes to Phase Out Gas in New Buildings

1.Carlsbad
2.Berkeley
3.Windsor
4.San Luis Obispo
5.San Mateo
6.Santa Monica
7.Menlo Park
8.San Jose
9.Davis
10.Marin County
11.Mountain View
12.Morgan Hill
13.Palo Alto
14.Alameda
15.Milpitas
16.Santa Rosa
17.Pacifica
18.Mill Valley
19.Saratoga
20.Brisbane
21.Healdsburg
22.Los Gatos
23.Cupertino
24.San Francisco
25.Los Altos Hills
26. Campbell
27. San Mateo County
28. Richmond
29. Hayward
30. Santa Cruz
31. Burlingame
32. San Anselmo
33. Piedmont
34. Redwood City
35. East Palo Alto
36. Los Altos
37. Millbrae
38. Sunnyvale
39. Ojai
40. Oakland
41. Albany
42. San Carlos
43. Daly City
44. Petaluma
45. South San Francisco
46. Sacramento
47. Santa Barbara
48. Emeryville
49. Fairfax
50. Encinitas
51. Santa Clara
52.Solana Beach
53.Santa Clara County
54.Contra Costa County
55.Half Moon Bay
56.Belmont
57.Hillsborough
58.Hercules
59.Pasadena
60.Martinez
61.San Bruno
62.Livermore
63.Portola Valley
64.Ventura County
65.Pleasanton
66.San Leandro
67.Glendale
68.Dublin
69.Corte Madera
70.Atherton
71.Riverside
72.San Rafael
73.Los Angeles
74.San Pablo
75.Agoura Hills
76.Carpinteria


Image Source: Sierra Club

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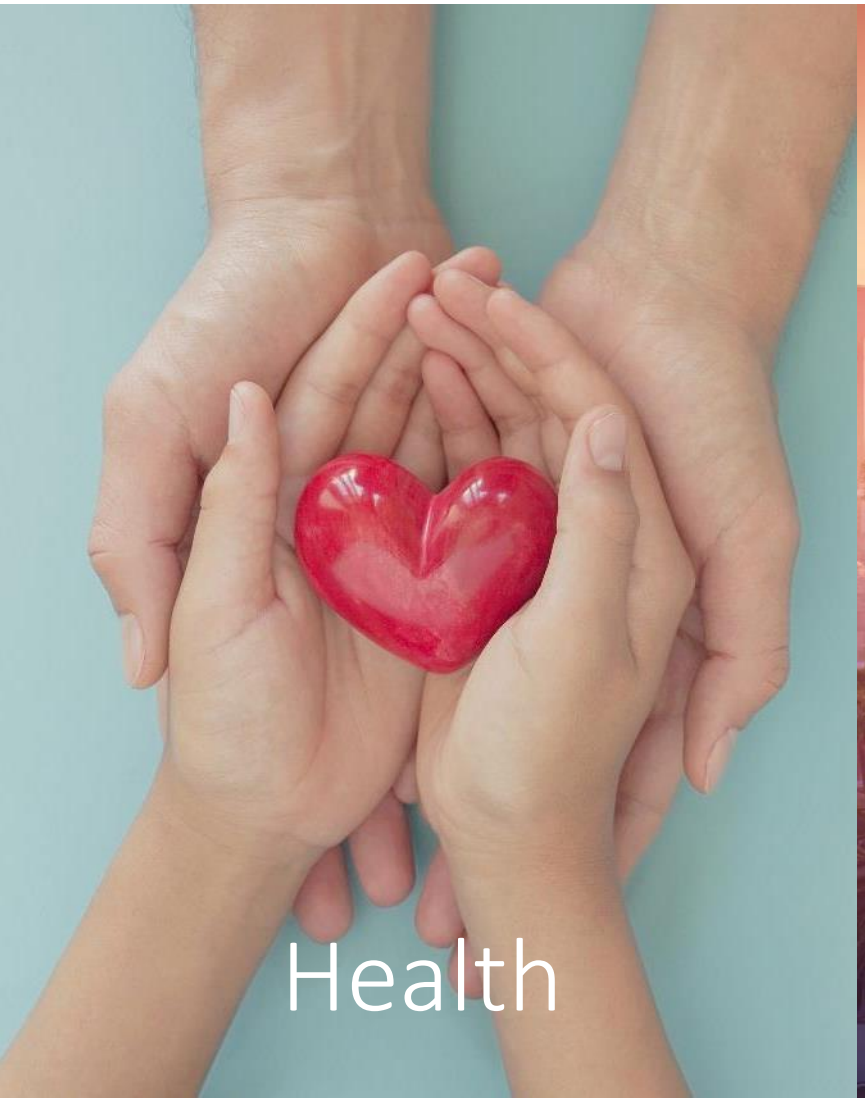
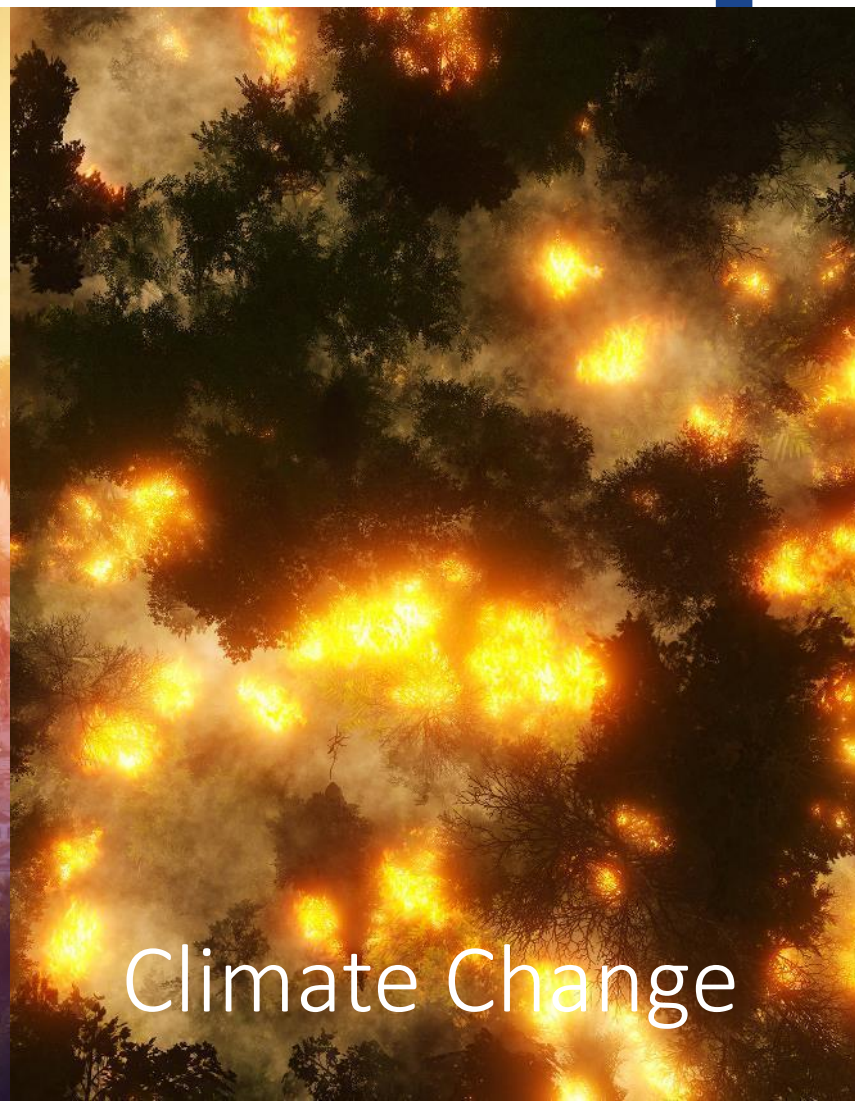
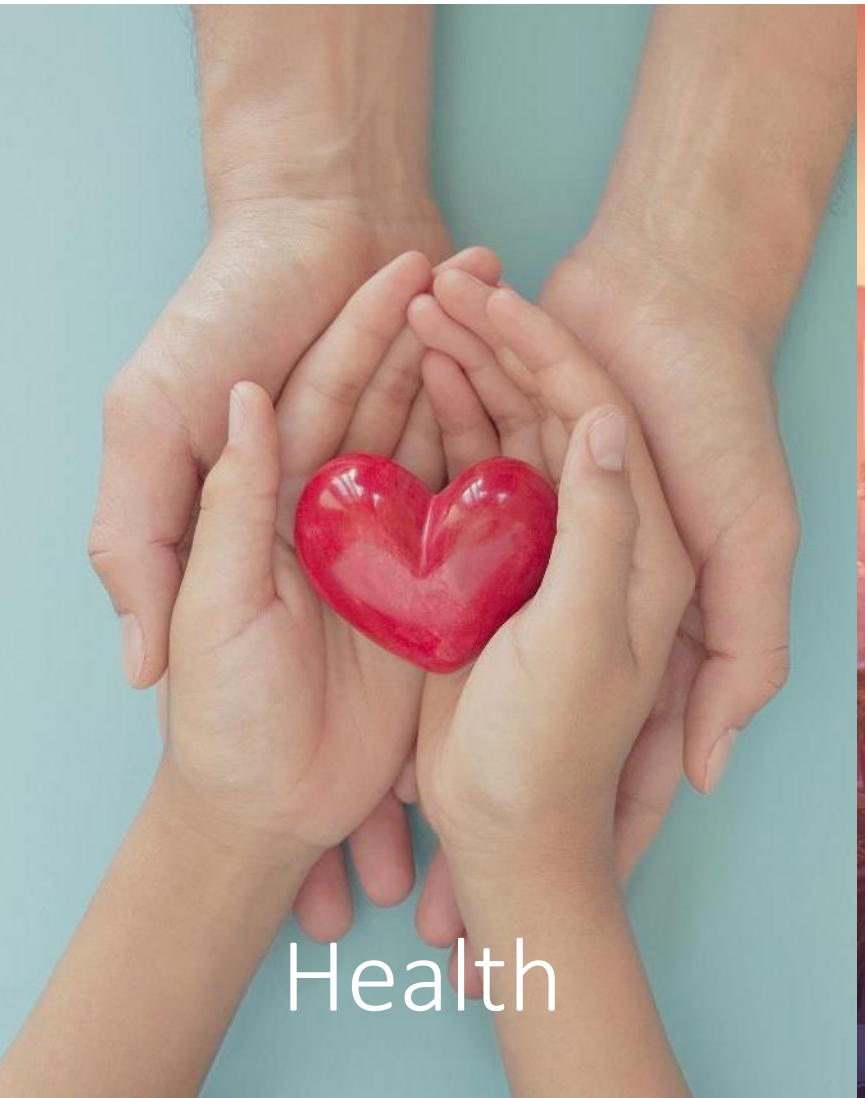
# Why The All-Electric Resurgence





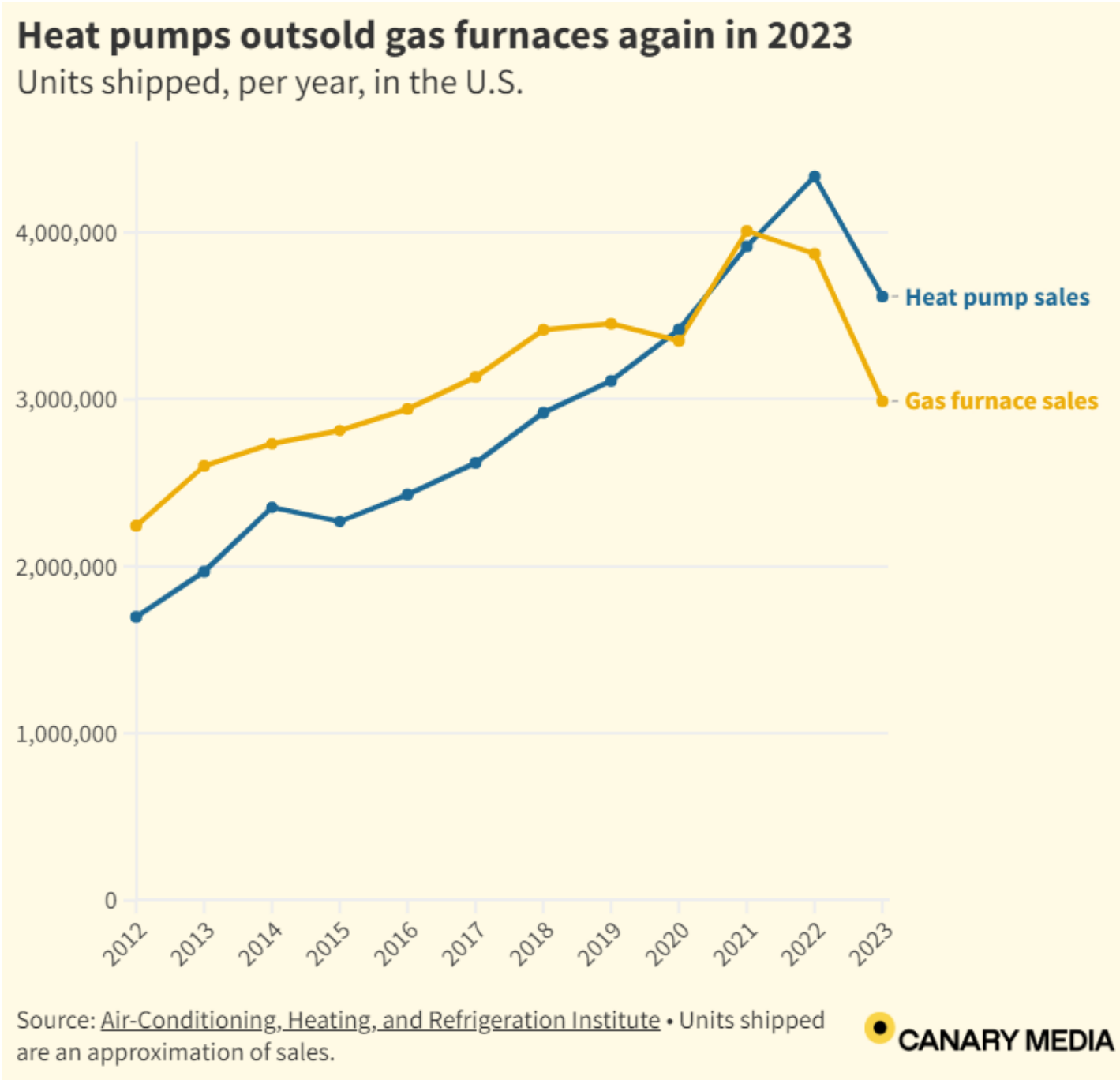


# Climate Change Isn't #1 Policy Driver for Recently Announced Gas 'Bans'





# The Tide ~~is Turning~~ has turned



# Our Favorite Benefits of Correctly Designed Electrification Upgrades (HVAC Focused)

1) Better Comfort
2) Quiet
3) Enviro. Friendly
4) Safer
5) Indoor Air Quality

# The Business Case for Electricians

# Big Opportunity, Big Risk (If Done Poorly)

**90%**

90% of CA homes rely on gas for **space or water heating** [1]

**12 Million**

CA homes (99%) with gas or elec resistance **water heaters** [2]

**11.7 Million**

CA homes (96%) with gas or elec resistance **heating** [2]

**3.4 Million**

CA homes with **no AC** [3]

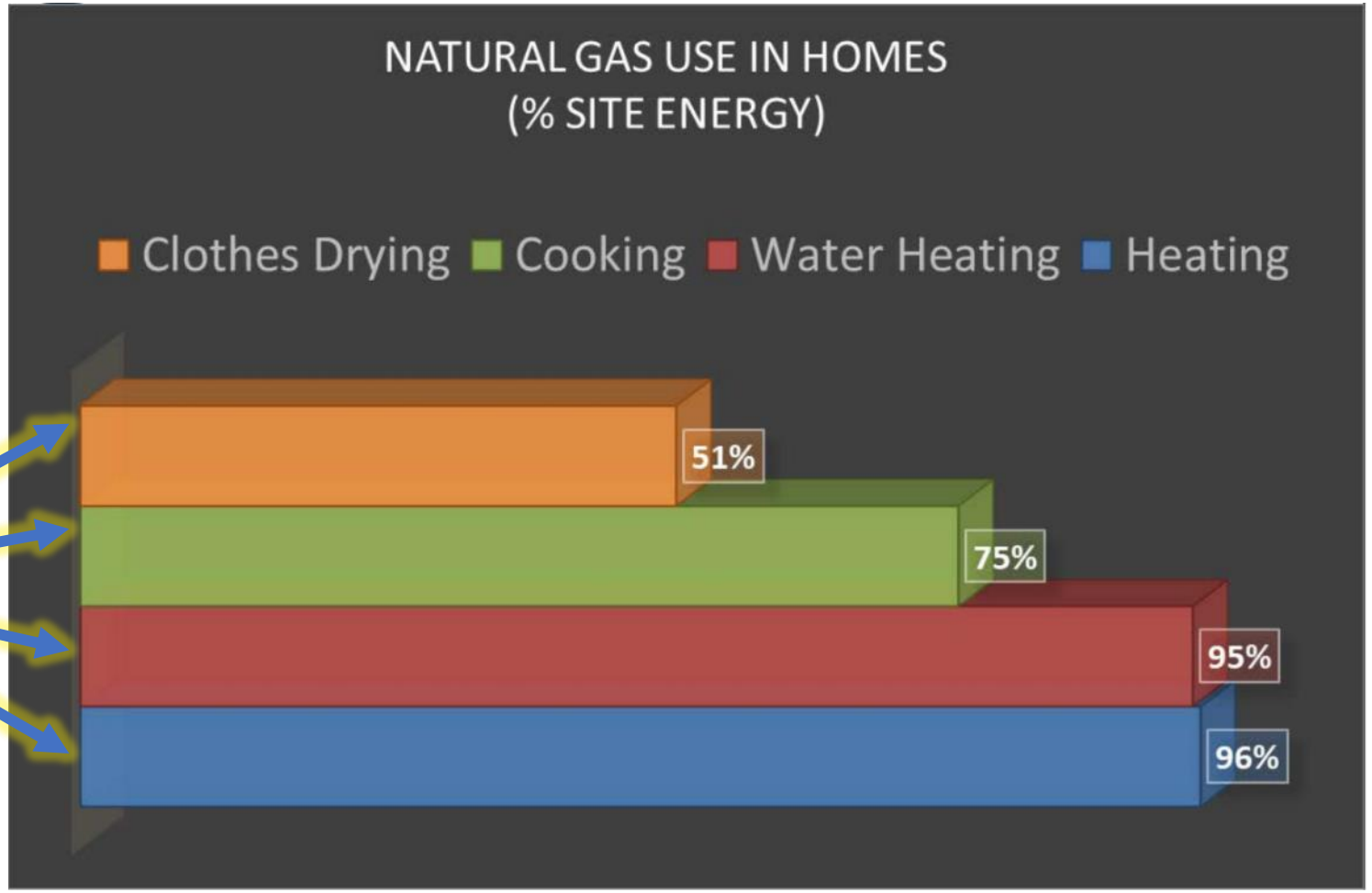
[1] Decarbonization of Heating Energy Use in California Buildings. Synapse Energy Economics, Inc. 2018.

[2] CA Heat Pump Residential Market Characterization & Baseline Study. Opinion Dynamics. 2022.

[3] Canary Media. "California could ban new gas heaters after 2030. The goal: healthier air." 2022

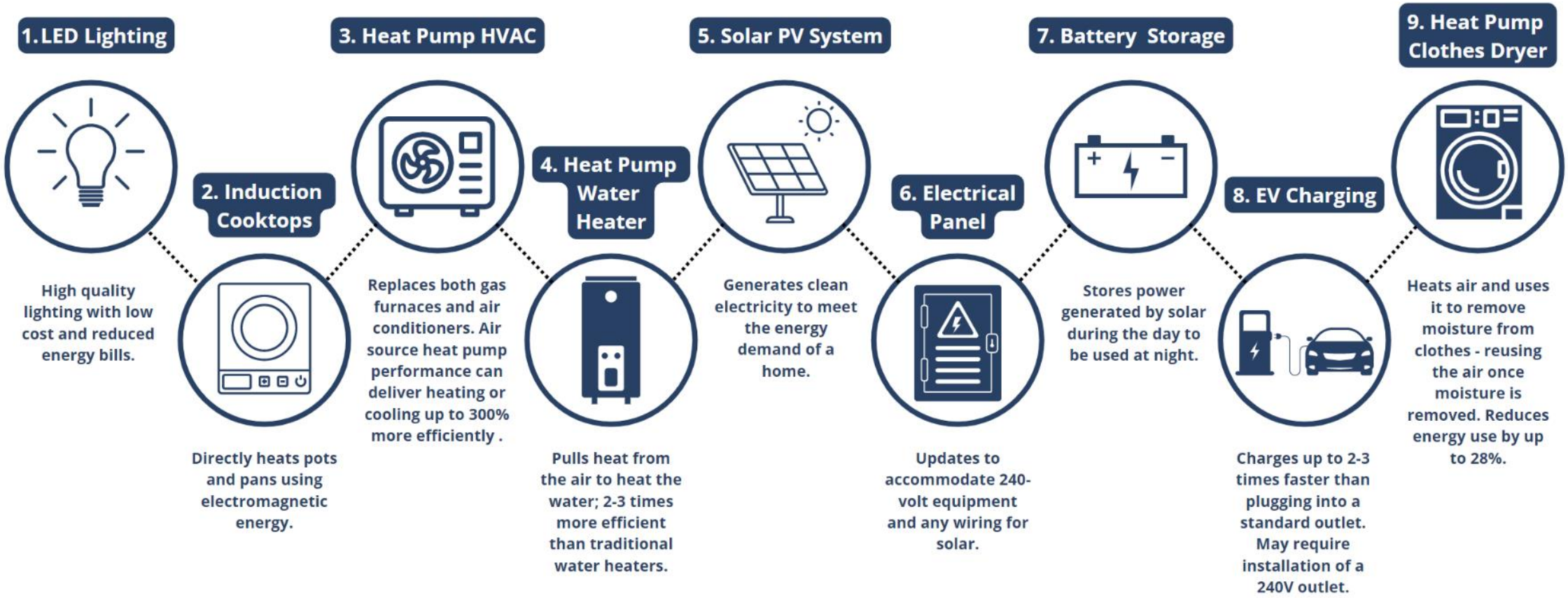
# Natural Gas Breakdown in California

**New Circuits, New Business Opportunities!**



# Eventually Almost All CA Homes Will Be Electrified

*Plus EV Charging! What Does This Mean – LOTS of Circuits and Panels!*



# Job Security Is Looking Good!

Grist

Donate

## To get off fossil fuels, America is going to need a lot more electricians

A shortage of skilled labor could derail efforts to "electrify everything."

"To achieve our climate goals, the U.S. will need at least **a million** more electricians over the next decade"
- Rewiring America

# Why is Electrification Important Now?

- Timing the Electrification movement to your business
- Many forces are aligning to bring this mainstream
- Market entry has never been easier
- Incentive programs to ease investment including rebates tax credits and financing
- Position yourself as a pioneer and corner a market in its infancy

# Gas is No Longer a Good Investment

- Gas cost is going up
- Experts agree could quadruple in next decade
- Can’t offset a gas bill with solar
- Remaining gas customers will share the cost of the pipeline maintenance
- Gas heating systems in homes will be a liability when selling
- EPA announced they will no longer label any gas appliances ENERGY STAR Most Efficient

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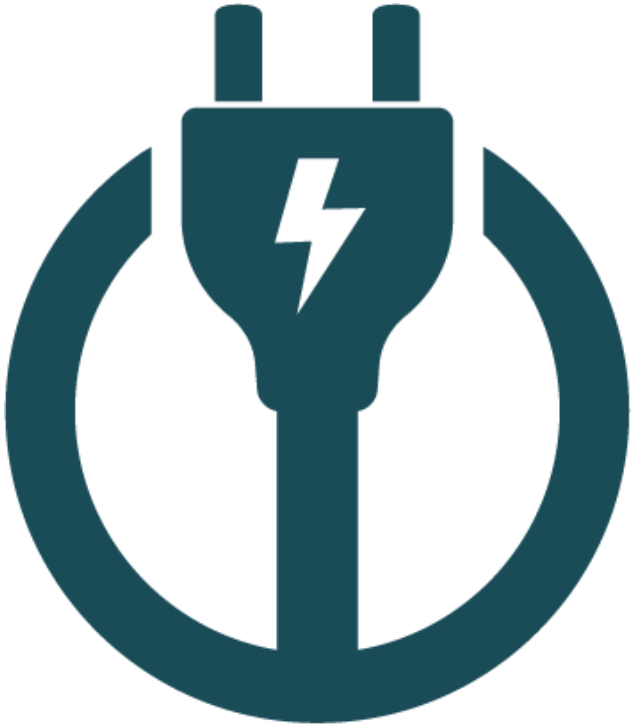
# Restart Customer Relationships

- You have an existing customer base. Recoup those efforts.
- New type of projects, new opportunity for life-long customers
- Electrification opens doors for new measures (EV charging, panel upgrades, appliance wiring, heat pumps, etc.)
- Adds a new product category for those customers that were “sold out”

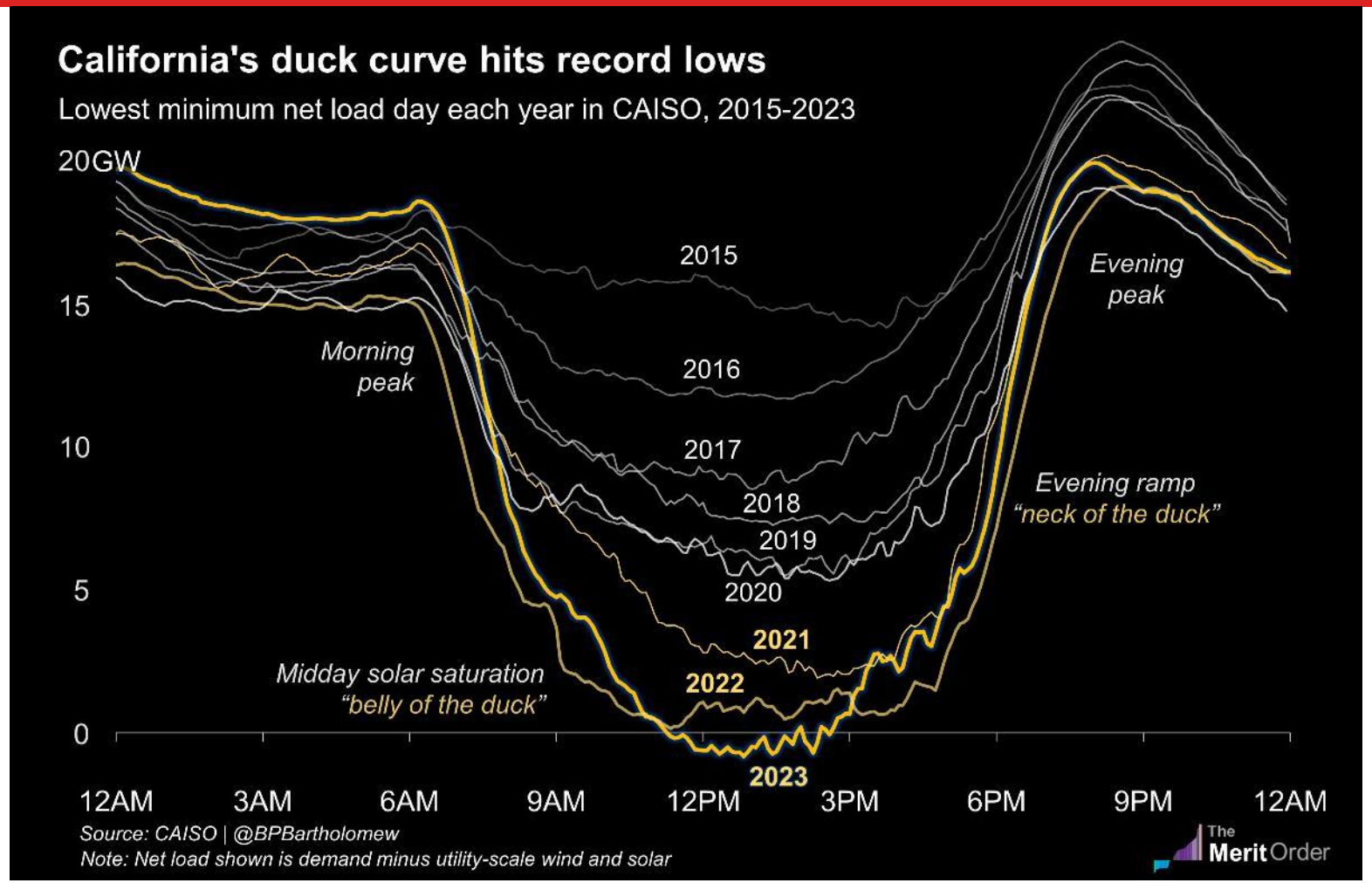
# Public Sector Investment is Shifting Consumer Perception
## Public awareness is shifting more every day

https://www.switchison.org/



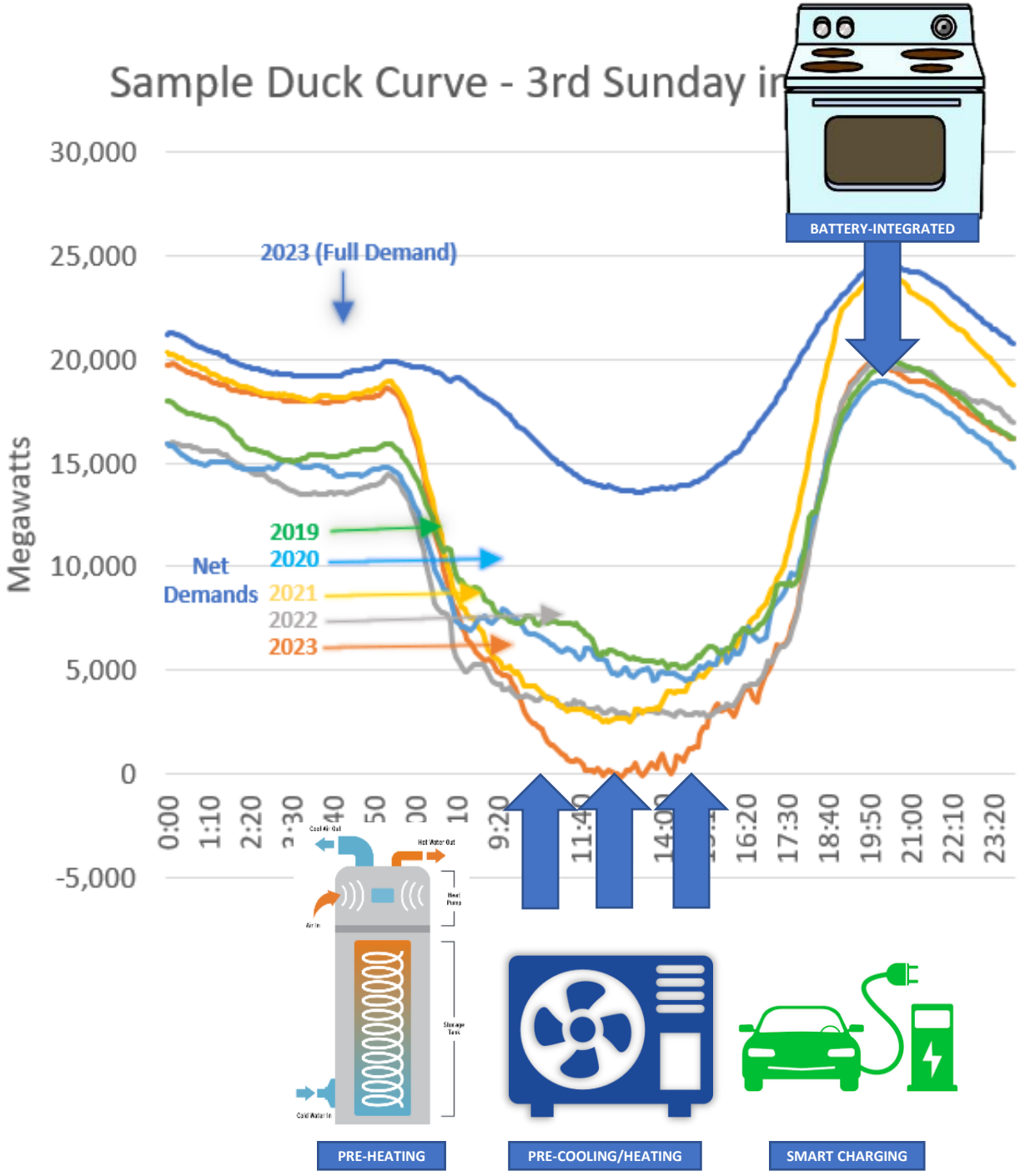
THE SWITCH IS ON

# 2023 Duck Curve



# The Duck Curve

- California's Clean Energy Challenge
- A big part of NEM 3.0 justification
- Opportunity for innovation
- Smart electrification can help with Virtual Power Plants



# Potential New Business Pathways

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# New Electrification Service Ideas (Worth At Least The Price of Admission)

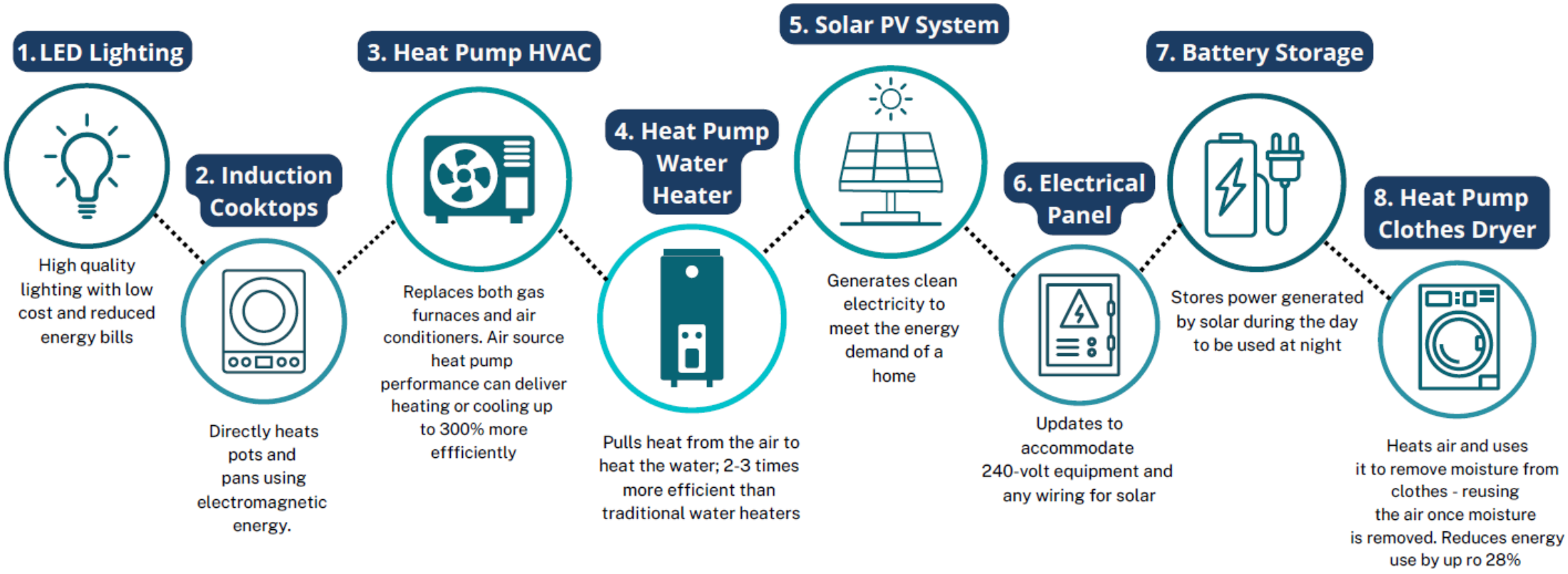
- 1) Electrification Roadmapping
- 2) Panel Assessments
- 3) Pre-wiring
- 4) Cross-selling & referring to a C-20
- 5) Resilience Planning

# #1 (Roadmap): Gas Assessment & Inventory

- Step 1: Look at your existing **gas usage/bills**
  - PG&E's online portal makes it easy.
  - Home Energy Checkup: pge.com/homecheckup
  - Home Intel (w/ disaggregation & electrification report): electrifymyhome.hea.com
- Step 2: Build a **list of gas** appliances in the house
  - Furnace(s)
  - Water heater(s)
  - Stove/Range
  - Dryer
  - Fireplace
  - Pool Heater

# #1 (Roadmap): Chart a Course & Plan Your Budget

***Hint: Incentives Help!***




| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **TIMELINE**: | Mar. 2025 | Jun. 2025 | Oct. 2025 | Oct. 2025 | Mar. 2026 | Mar. 2026 | Mar. 2026 | Aug. 2026 |
| **COST:** | $250 | $2,800 | $19,500 | $7,800 | $19,150 | $6,400 | $18,300 | $850 |

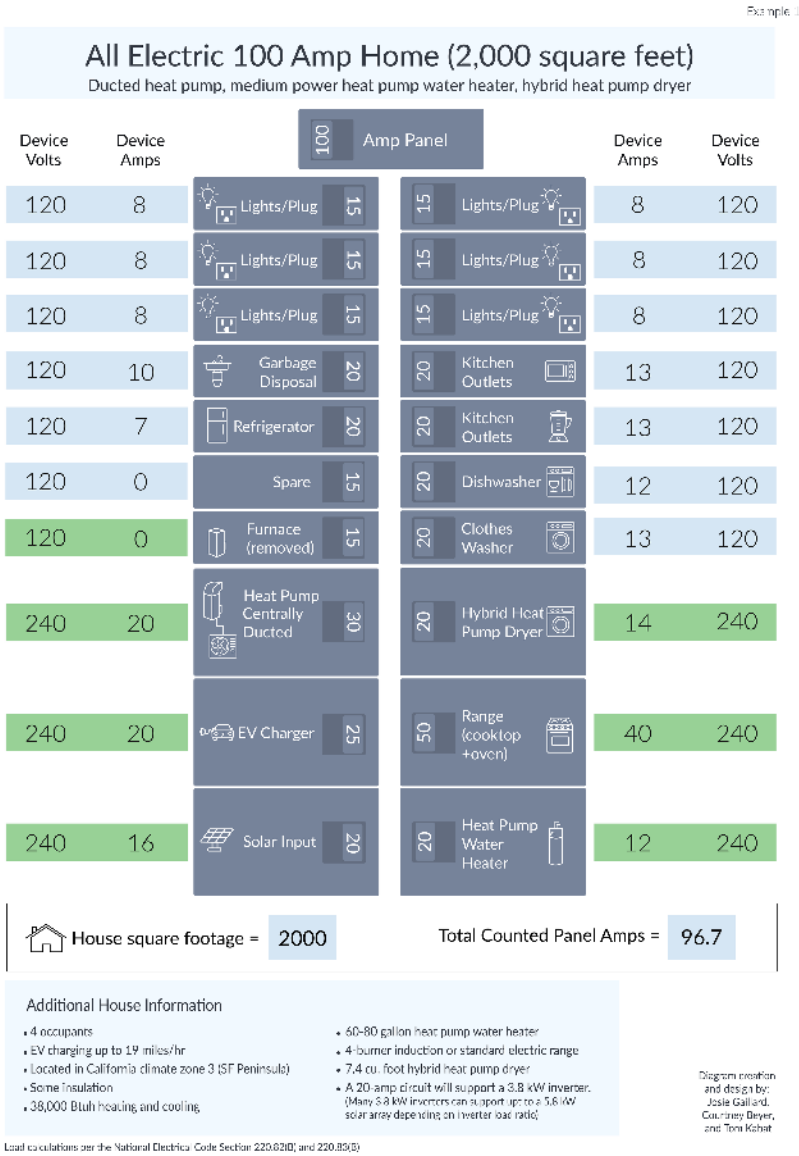
# #2 – Electrical Panel Assessments

## Checklist Items:

- What additional electrification is left
- Incoming Service Level
- Main panel rated amps
- Panel age
- Evidence of burning/arcing?
- Is there space (physical & capacity)?
  - Perform an NEC load calculation

## Outcomes of This Exercise:

- Planned panel upgrade (ideally avoided altogether)
- Additional attention to efficiency to minimize loads



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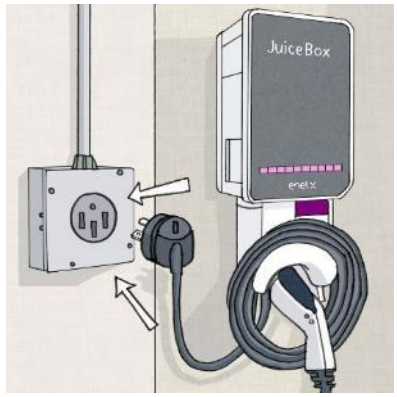


# #3 – Pre-Wiring

Pre-wire to be “electric-ready”

- Most replacements are “replace on burnout”
- Start with your water heater location
- Oven/Stove/Range
- Clothes Dryer
- EV charger

# #4 – Referral on HVAC or Water Heating

- Learn the basics, identify obvious issues
- Ask simple consultative questions
- Build a referral plan (or perform in-house if licensed)
- Work with QUALITY HVAC contractors
  - Remember, it's still your reputation on the line if you refer someone

# #5 – Resilience Planning

- If you're not already installing batteries, get started
- 110v mini splits are a great solution for maintaining heating or cooling during power outages
  - Can be backed up by battery or generator
  - You become the HERO when the power goes out
- New battery-integrated appliances are coming online


| ELECTRICAL SPECIFICATIONS | | | | |
|---|---|---|---|---|
| Voltage/Frequency/Phase | | | | 115 V~ 60 Hz |
| Available Voltage Range | | | | 103.5–126.5 V |
| Current | Cooling | Rated | A | 7.5 |
| | Heating | Rated | | 7 |
| Maximum Operating Current | | Cooling | | 13 |
| | | Heating | | 13.5 |
| Starting Current | | | | 7.5 |
| MCA | | | | 13.5 |
| Maximum Circuit Breaker | | | | 15 |
| Input Power | Cooling | Rated | kW | 0.83 |
| | | Min.–Max. | | 0.24–1.44 |
| | Heating | Rated | | 0.77 |
| | | Min.–Max. | | 0.21–1.49 |

# Introduction to Good Electrification

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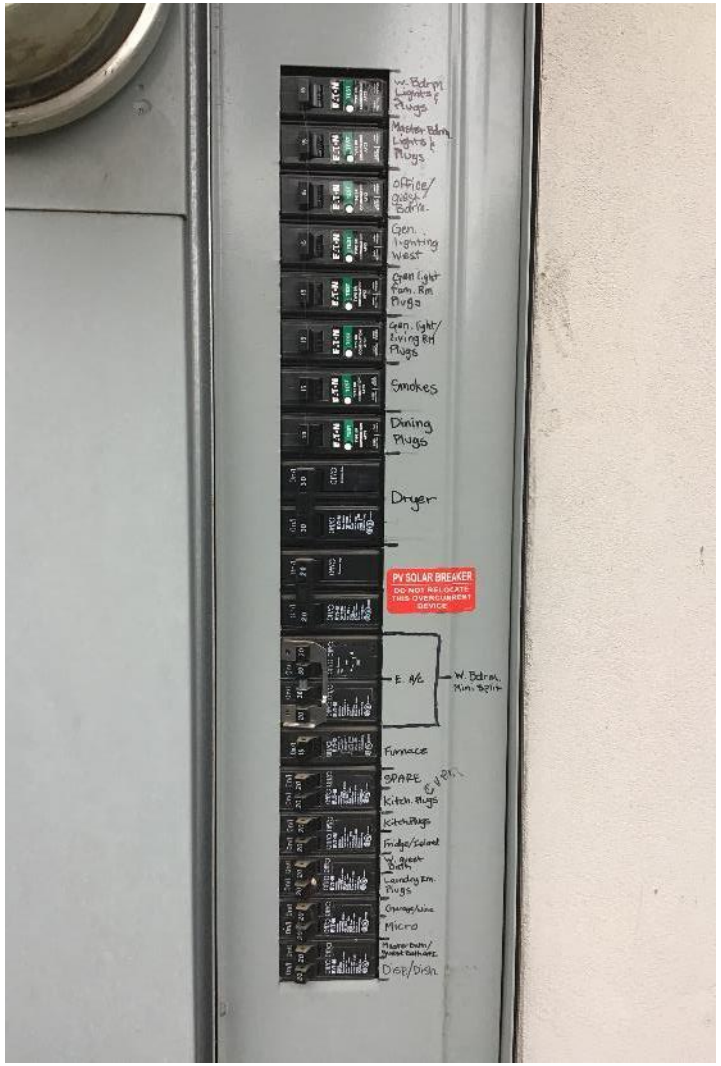
# Good Electrification

# What is Good Electrification?

- Installing the most efficient solutions
- Utilizing existing infrastructure when possible
- Consider all electrification requirements from the start

# “Good Electrification”
## Starts with Being a Good Steward Of the Electrical Panel


- Steward is: One who directs the affairs in best way possible
- Always most efficient solution!
- Each homeowner’s journey is unique
- Avoid panel changes until necessary
- Take all future loads in a consideration





# Are these panels full?

# Full Panel ≠ No Remaining Capacity

**100A Panel:**

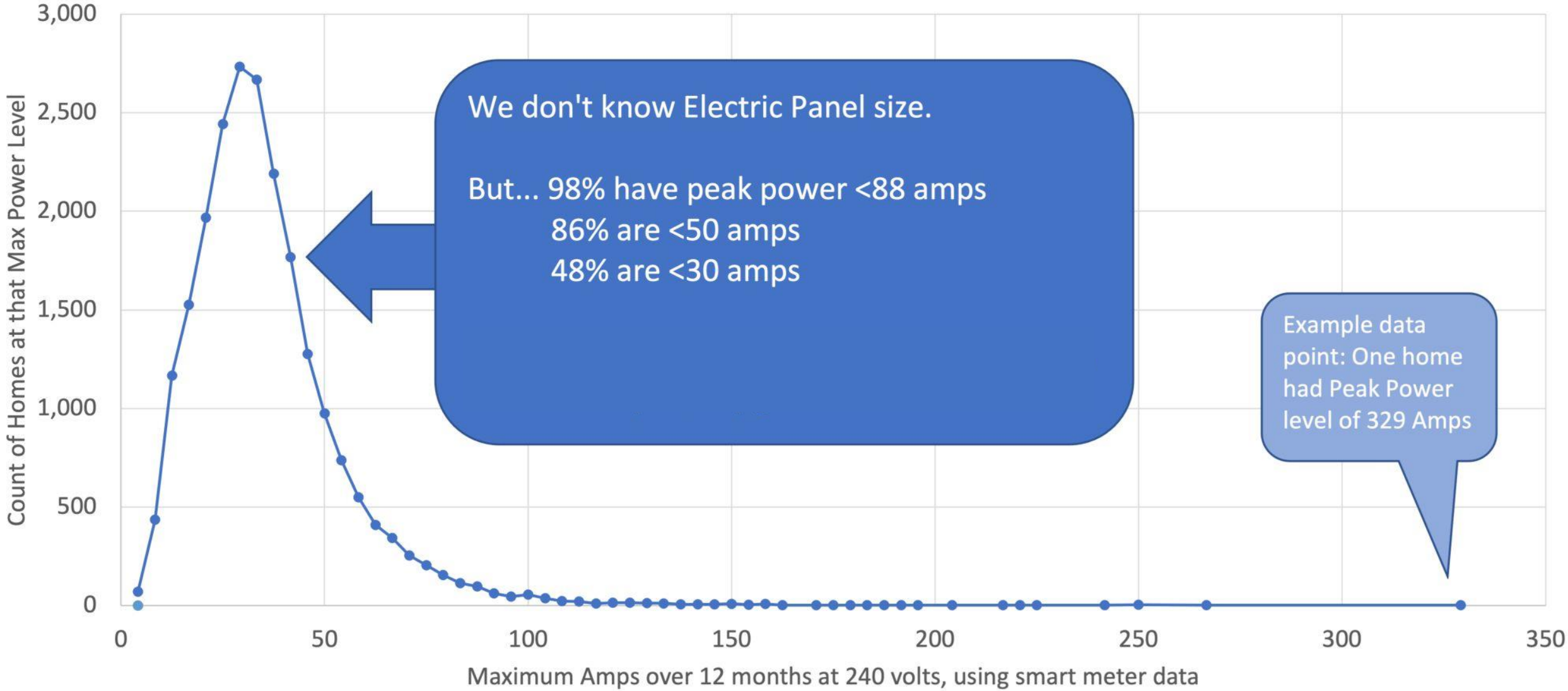
100 Amps x 240 Volts = 24,000 Watts

**200A Panel:**

200 Amps x 240 Volts = 48,000 Watts

That's a LOT of capacity!

# Peak Power (Amps) From 22,442 Homes – Home Energy Analytics




Source: Home Energy Analytics (HEA), PG&E HomeIntel service single family user data

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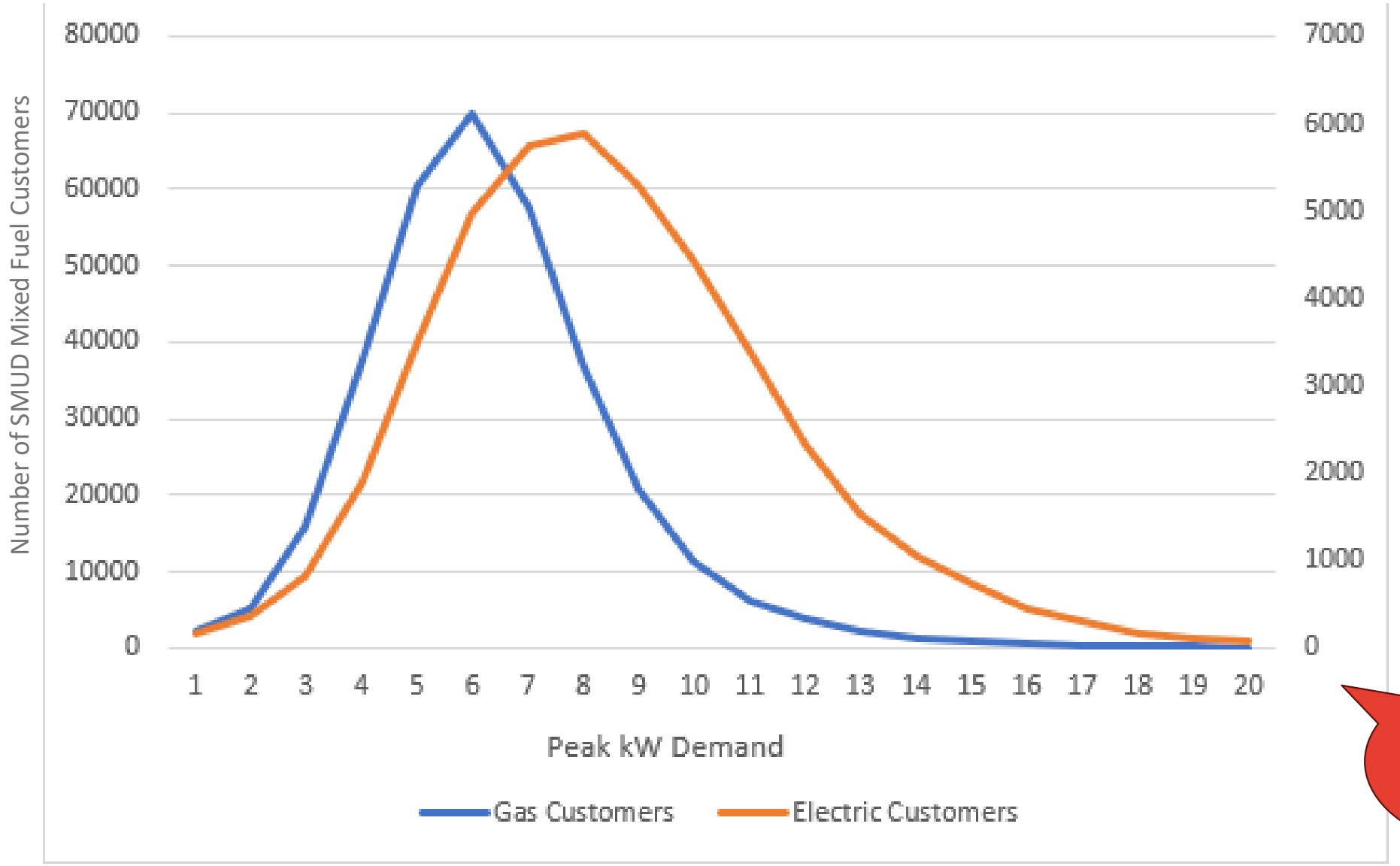
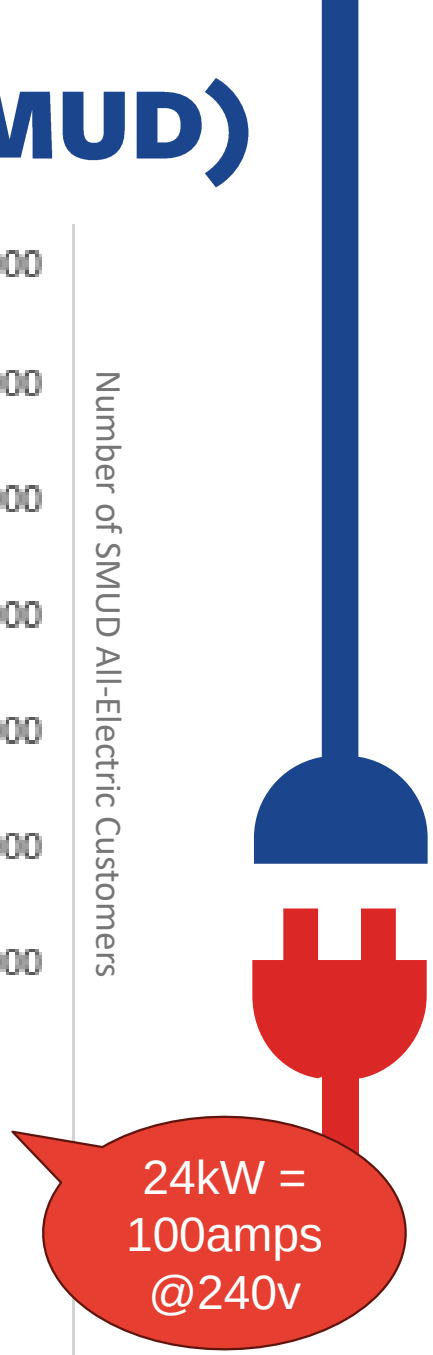
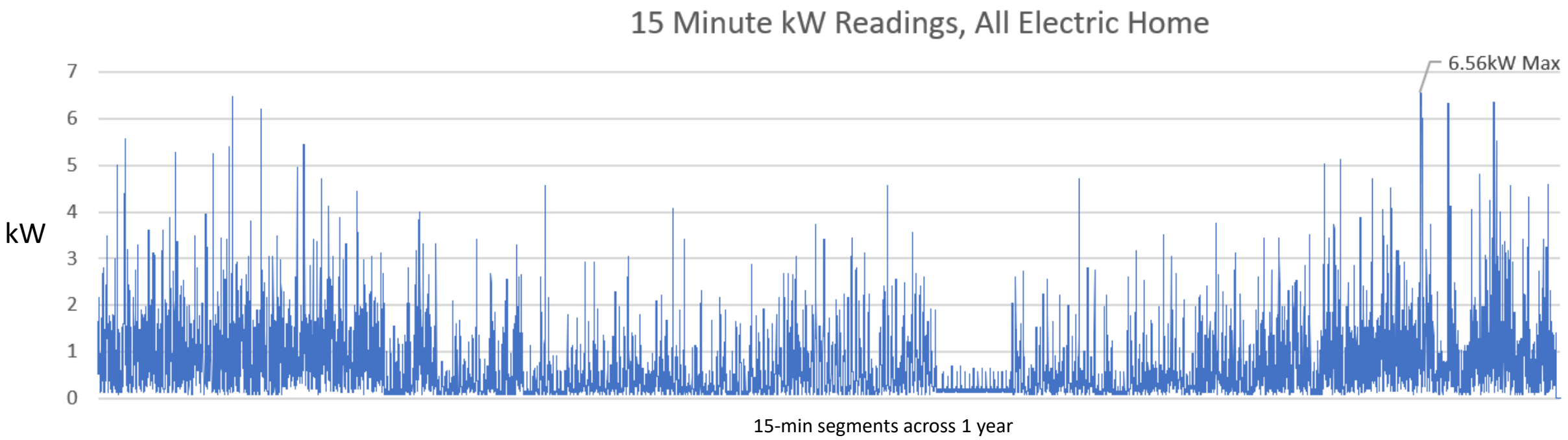
# Peak 15-min kW over 12 Months (SMUD)




Source: Home Energy Analytics (HEA), Sacramento Municipal Utility District (SMUD) customer peak kW distribution

# A Fully Electrified House Example – Max 6.6kW




- Built in 1959
- 1420 sqft
- 2-ton Mitsubishi inverter, 50-gal HPWH, elec range, elec resistance dryer

# Panel Load Calc

## Panel Load Calcs

- With main & subpanel capacities + individual appliance capacities, you can create an electrical load calc.
- This is necessary to determine if panel has sufficient capacity per NEC.
- For proper load calcs, you have 2 options:
  - NEC 220.87 Top-Down
    - Use metered or billing historic peak multiplied by 1.25 (spikey factor)
    - Add FULL nameplate rating of all new proposed appliances
  - NEC 220.83 (B) Bottom-Up
    - Nameplate loads x demand factors (aka coincident factors)
    - 40% coincidence for some devices/circuits, 100% for others, 125% for EV chargers

| General Light and Plug Loads | | | | | Volt-Amps |
|---|---|---|---|---|---|
| Dwelling | 2,350 sq. ft. | × | 3 VA/sf | = | 7,050 |
| Kitchen Small Appliance Circuits | 2 (min. 2) | × | 1,500 VA each | = | 3,000 |
| Laundry (Washing Machine) Circuit | 1 (min. 1) | × | 1,500 VA each | = | 1,500 |
| **Appliance Loads (nameplate value)** | **Volts** | | **Amps** | | **Volt-Amps** |
| Built-in Microwave (not countertop model) | 120 | × | 10 | = | 1,200 |
| Dishwasher | 120 | × | 15 | = | 1,800 |
| Garbage Disposal | 120 | × | 9.5 | = | 1,140 |
| Refrigerator (on dedicated circuit) | 120 | × | 5 | = | 600 |
| Stove hood | 120 | × | 1 | = | 120 |
| NEW: Frigidaire gallery 30" front control induction range with air fry | 240 | × | 42 | = | 10,080 |
| NEW: Whirlpool 7.4 cu ft hybrid heat pump dryer | 240 | × | 14 | = | 3,360 |
| NEW: Rheem 15-amp 65-gallon heat pump water heater | 240 | × | 12 | = | 2,880 |
| **General Loads Subtotal** | | | | | 32,730 |
| **First 8,000 VA @ 100%** | | | | | 8,000 |
| **Remaining VA @ 40%** | | | | | 9,892 |
| **General Loads Total** | | | | | 17,892 |
| **Other Loads (nameplate value)** | **Volts** | | **Amps** | | **Volt-Amps** |
| NEW: Electric Vehicle Charging Load @ 125% (with circuit pausing) | 240 | × | 0 | = | 0 |
| Bathroom Heater #1 @ 100% | 120 | × | 11 | = | 1,320 |
| NEW: Mitsubishi 3-ton centrally ducted heat pump HVAC system @ 100% | 240 | × | 17 | = | 4,080 |
| **Other Loads Total** | | | | | 5,400 |
| | | | | | |
| **Total Load (General + Other)** | | | | | 23,292 VA |
| **Divide Load by 240 Volts** | | | | | 97 A |
| **Rating of Existing Electrical Service** | | | | | 100 A |
| **Panel Upgrade Required?** | | | | | No |

Photo Credit: Tom Kabat

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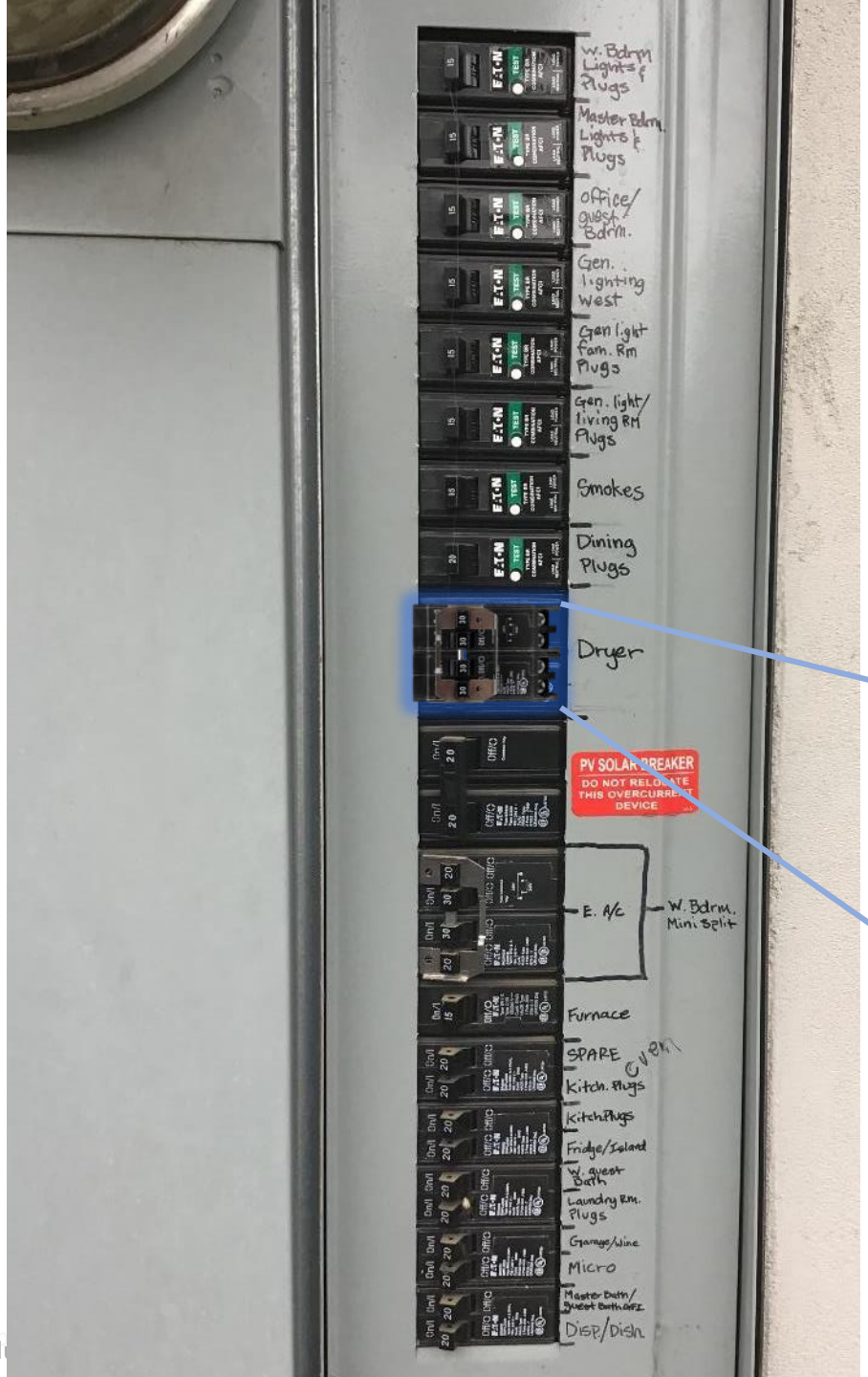
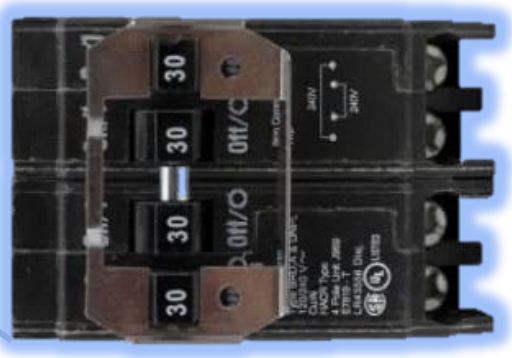



# Solutions to "Full" Panels

## Task: Add a HPWH Circuit

- Option 1: Quad it out!





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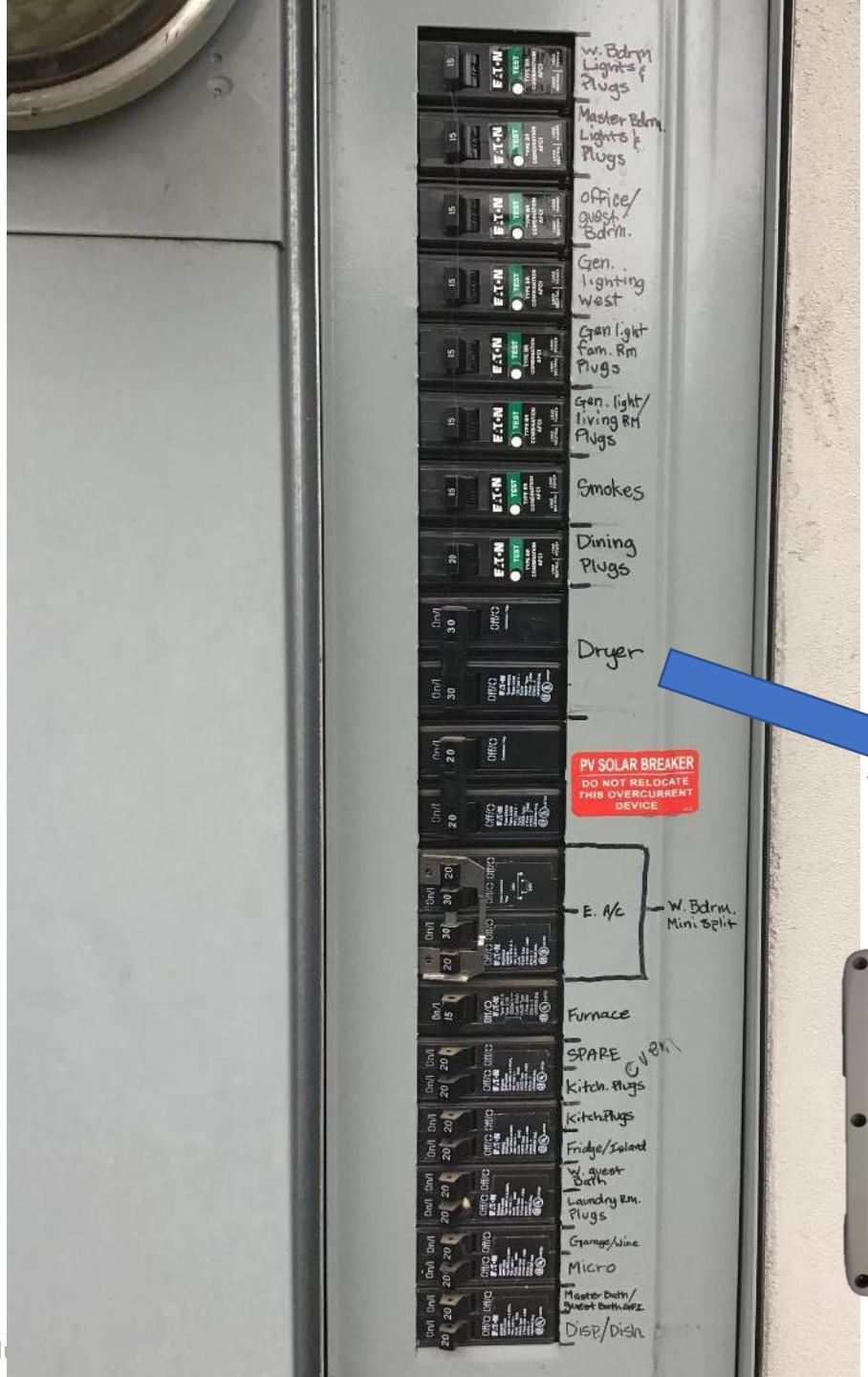


# Solutions to “Full” Panels

## Task: Add a HPWH Circuit

- Option 2: Circuit Splitter!

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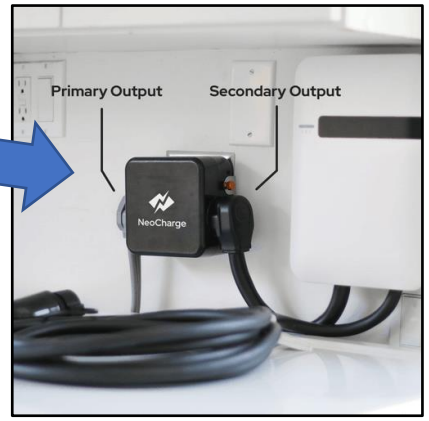





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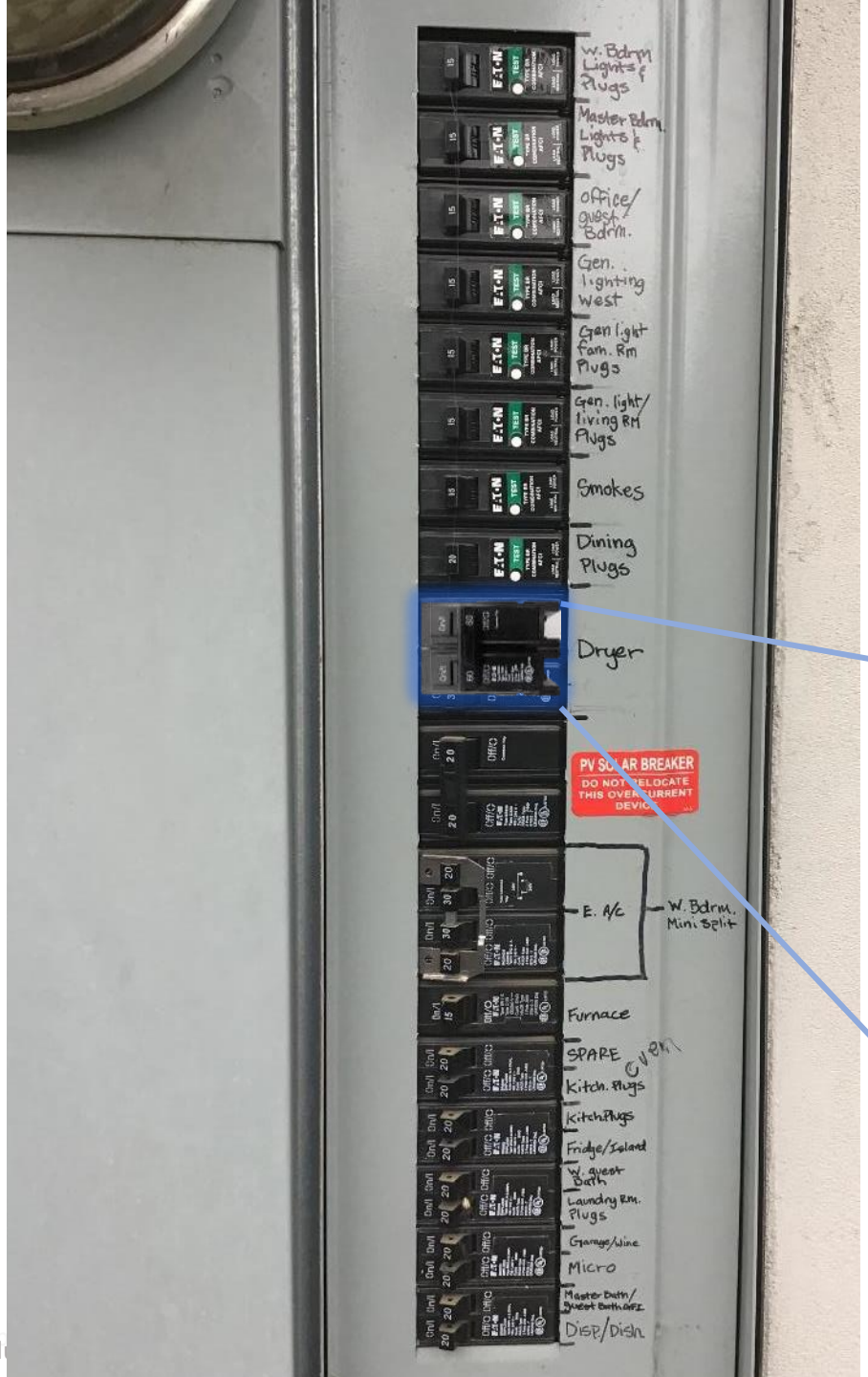


# Solutions to "Full" Panels

## Task: Add a HPWH Circuit & a Couple More

- Option 3: Add a Subpanel

- Tip – add the neutral!


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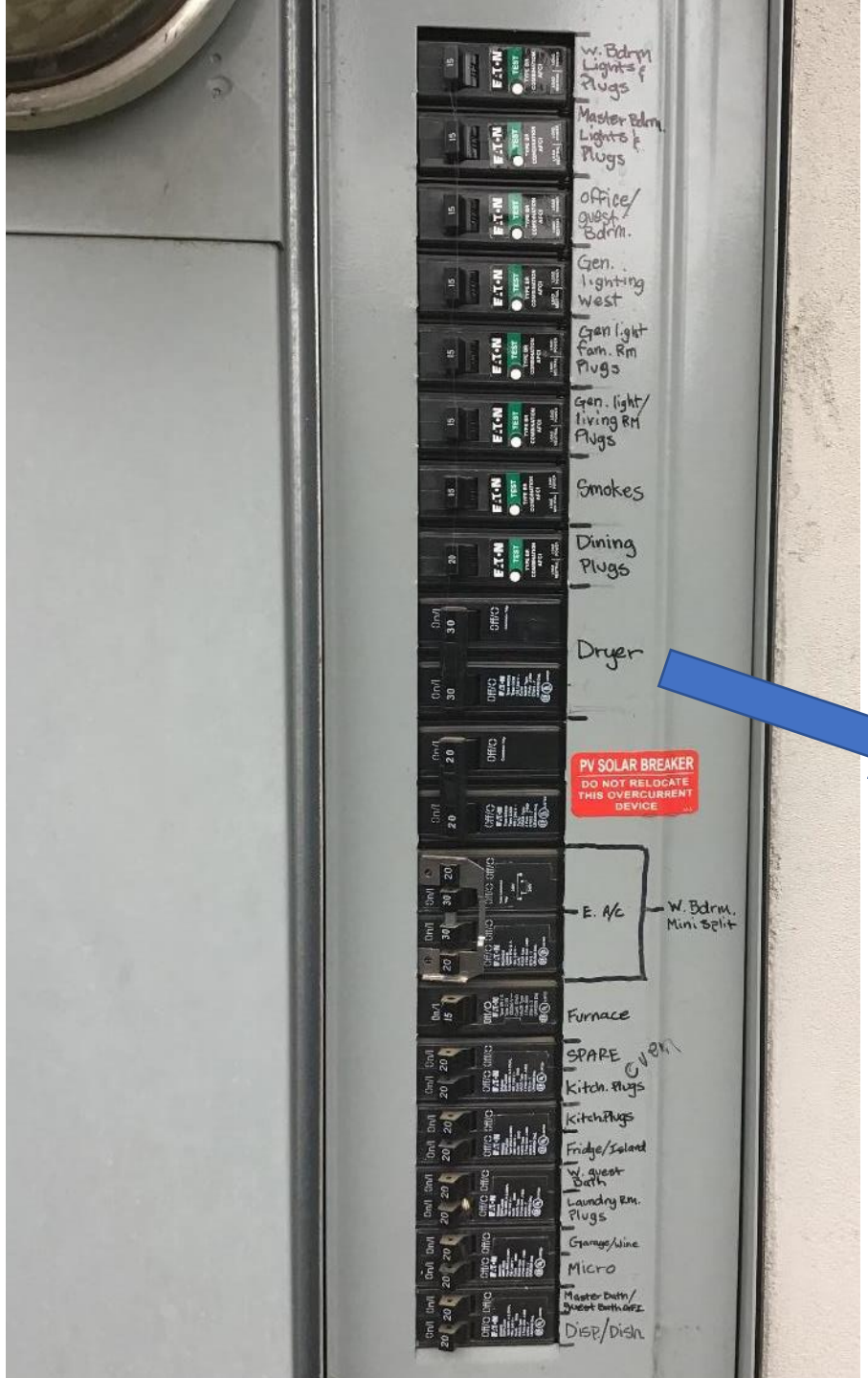
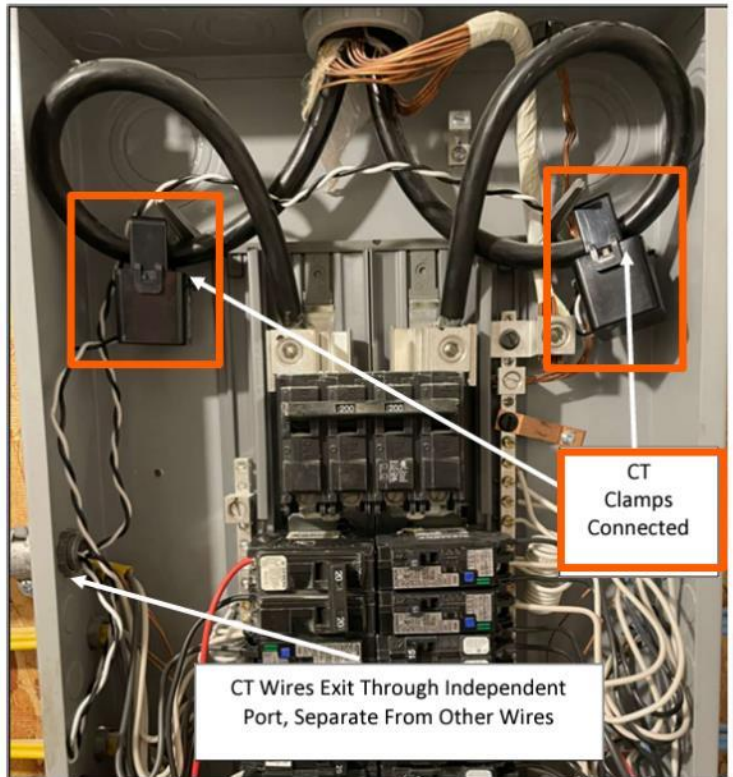



# Solutions to "Full" Panels

## Task: Add a HPWH Circuit

- Option 4: Circuit Pausing!

+

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# Solutions to “Full” Panels

**Task: Add a HPWH Circuit**

**(and much more)**

- Option 5: Smart Panel

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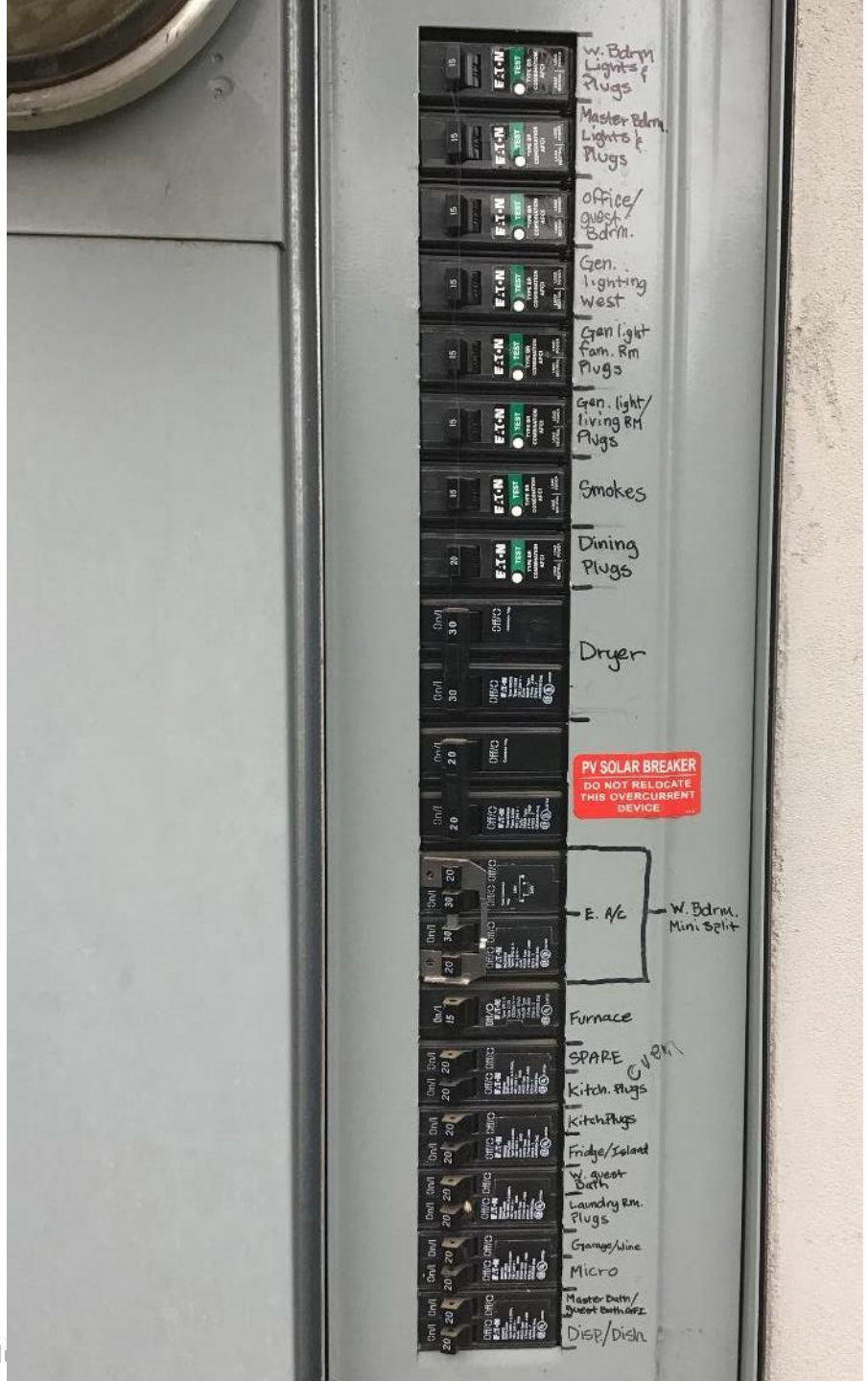


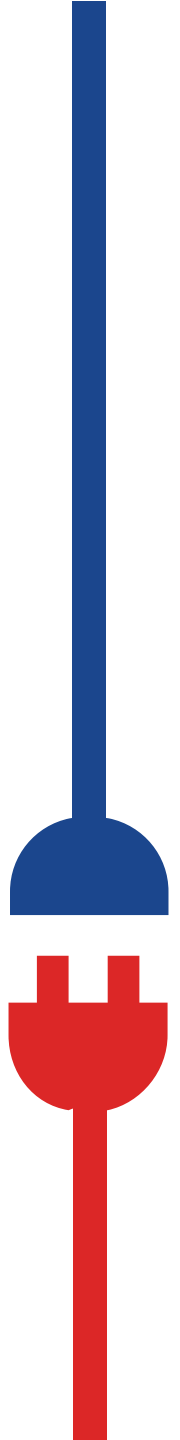

# Solutions to "Full" Panels

## Task: Add a HPWH Circuit

- Option 6: Specify a 120v 4A HPWH!


Confidential – do not d

# Install Small



# What is Install Small?

- Install Small means putting in the **right sized** systems!
- Focus typically on HVAC (experts agree 60%+ systems are oversized)
- But also applies to other home appliances when panel capacity is limited (e.g., water heater, dryer, range, EV charger).

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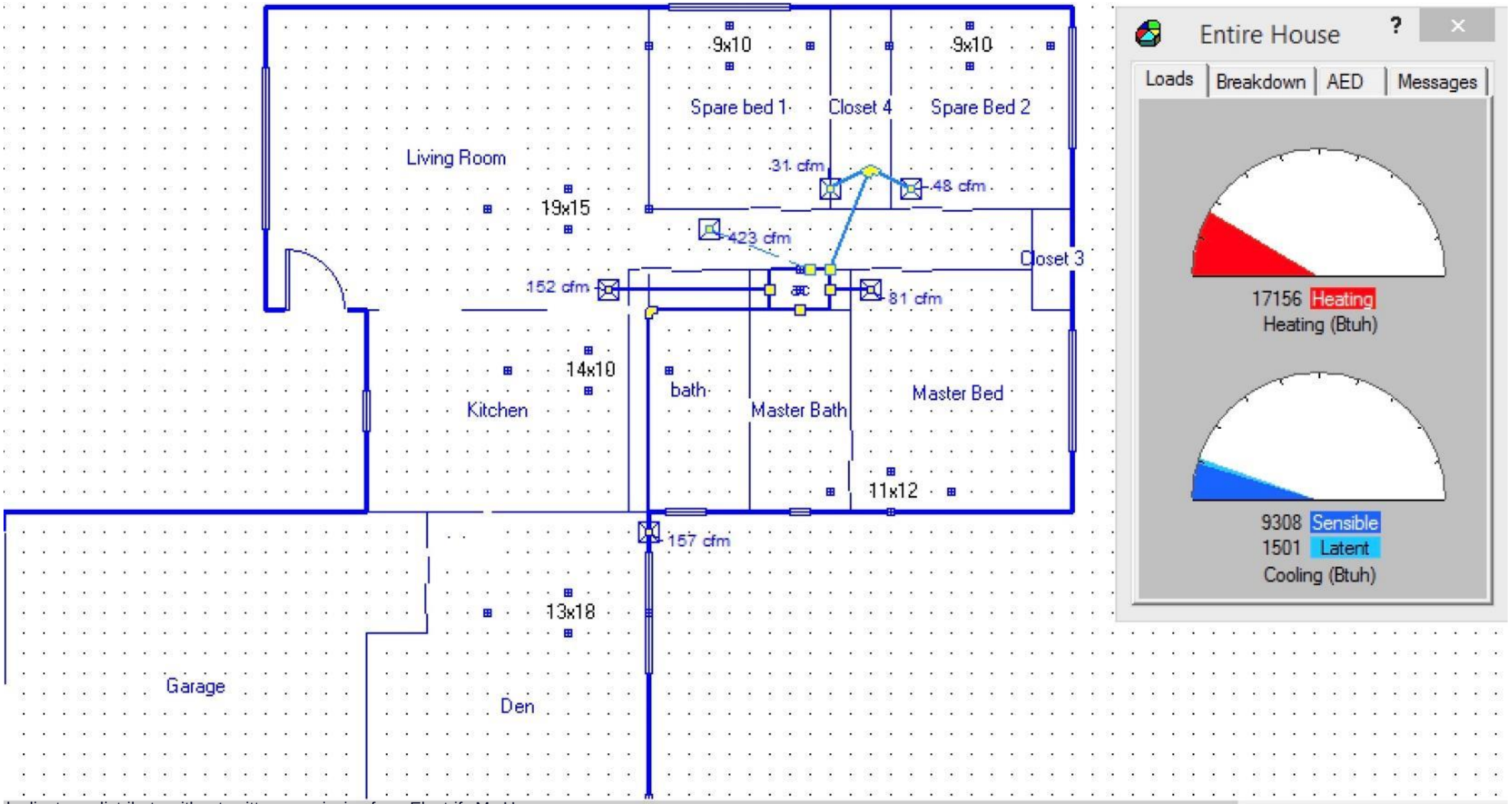
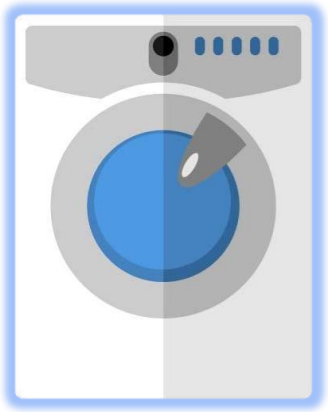
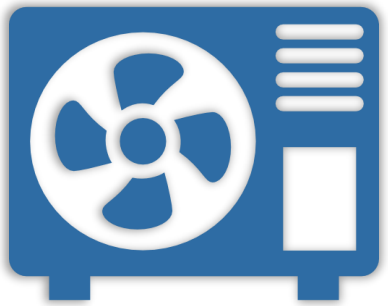
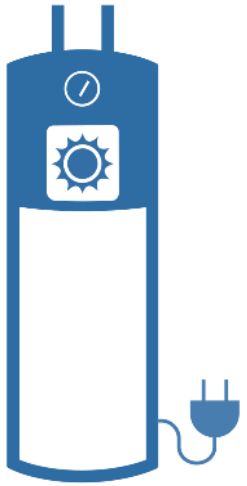
# HVAC Load Calculations are Key



# Watt Dieting Examples







| Category | Dryer | Dishwasher | Heat Pump | HP Water Heater | SUM |
|---|---|---|---|---|---|
| Standard | 5,280 W | 1,400 W | 9,220 W (w/ heat strips) | 4,500 W (30A) | 20,400 W |
| Efficient | 2,200 W | 1,100 W | 3,500 W | 2,200 W (15A) | 9,000 W |

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# Sample Scenario

**EXAMPLE**: Customer wants an EV Charger

- 125A panel, in good condition
- Load calc stands at 73A
- Range, Dryer, and Water Heater still gas
- Install Small means putting in the **right sized** system!


**Option 1** (typical reflexive response): 50A Car Charger

- Puts load calc at 123A, making future electrification hard

**Option 2**: 20A Charger

- Leaves enough room for 2 of 3 remaining devices (or all if one is 120v)

**Option 3**: 50A Charger split with Range or 30A split with Dryer

# Sub Circuit Energy Monitoring – Try On Your Own House!

- Pinpoint energy utilization
- Several options available




# Questions? Stay in Touch!

**Join us February, 13th for Home Electrification Product Overview**

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# Questions about Title 24?

Energy Code Coaches are local experts who can help answer your Title 24 questions. Coaches have decades of experience in green building and energy efficiency improvements. They can provide citations and offer advice for your project to help your plans and forms earn approval the first time.

Online:
**3c-ren.org/codes**

Call:
**805.781.1201**

# Closing

- Continuing Education Units Available
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- For more information about upcoming events please visit: https://www.3c-ren.org/events

## Thank you!

For more info:
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For questions:
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