We will be starting soon!

Thanks for joining us

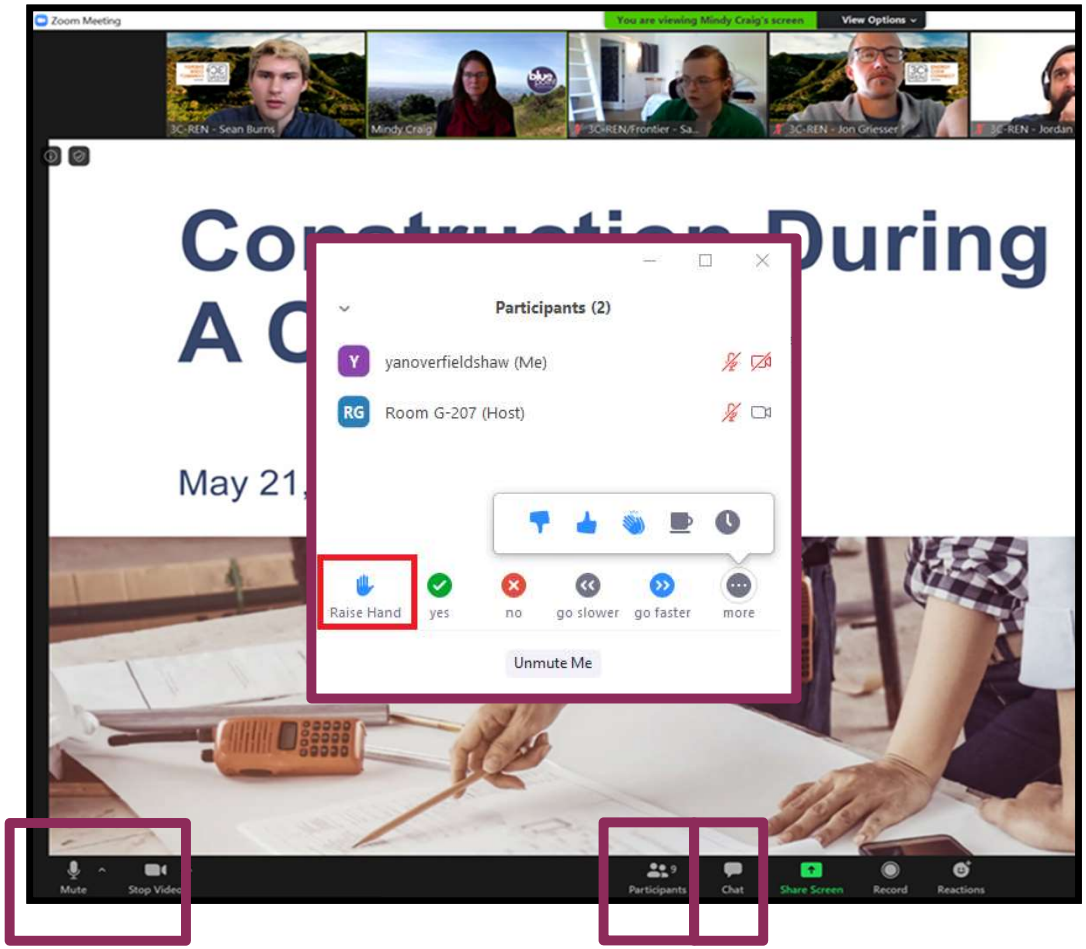
Building the Future: Electrification Strategies for Plumbers

Larry Waters – Electrify My Home

September 6, 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)

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 and Welcome
- Overview of the Electrify My Home
- Electrification market in California
- Gas water heater phase out
- Business and growth opportunities

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

First HPWH? 1940's Robert C Webber

- In the late 1940's, **Robert C. Webber**, a cellar inventor, was experimenting with his **deep freezer**. He dropped the temperature in the freezer and touched the outlet pipe and **almost burned his hand**. He realized **heat was being thrown away**, so he ran outlets from his freezer to his boilers and provided his family with **more hot water than they could use**! There was still wasted heat, so he piped hot water through a coil and used a small fan to distribute heat through the house to save coal. Mr. Webber was so pleased with the results that he decided to build a **full size heat pump** to generate heat for the entire home.

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 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

Aug 2021

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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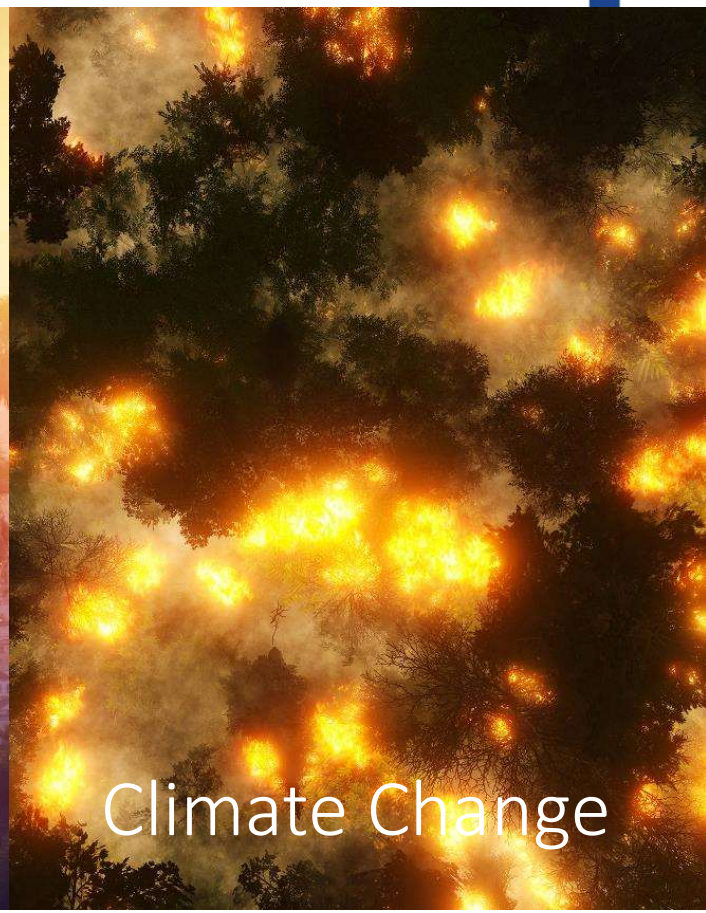
Why The All-Electric Resurgence



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

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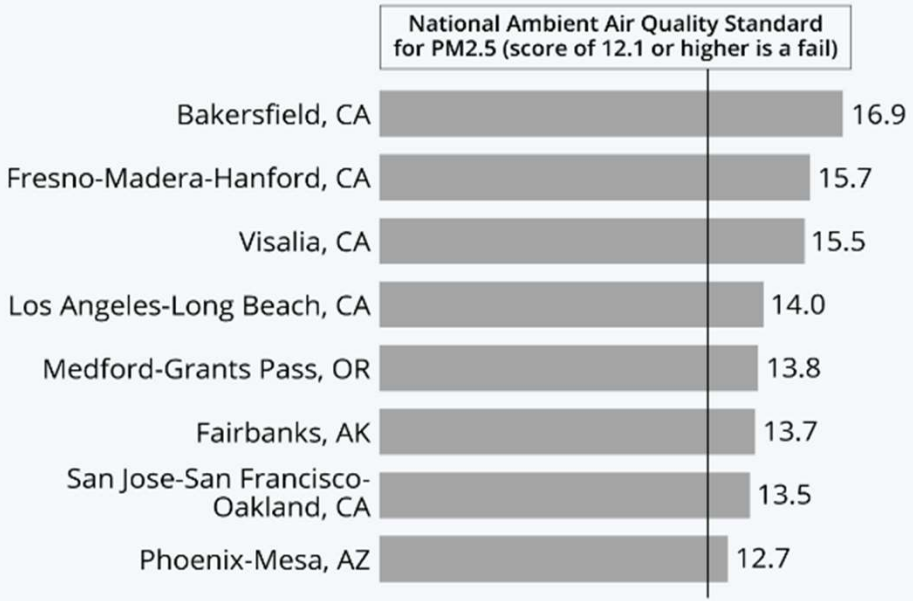
The Most Polluted Cities In America

Cities with the highest year-round levels of particle pollution in the U.S. (2017-2019)*



* Values based on ALA's design value - calculated concentration of a pollutant based on the National Ambient Air Quality standard for PM2.5.

Source: American Lung Association's State of the Air 2021

statista

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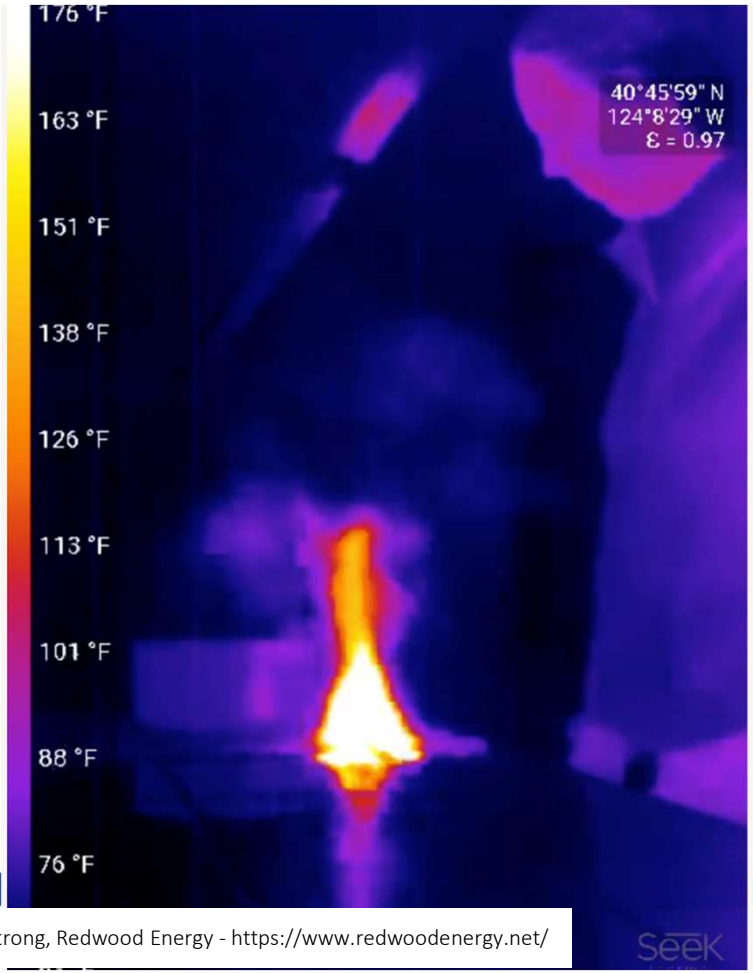
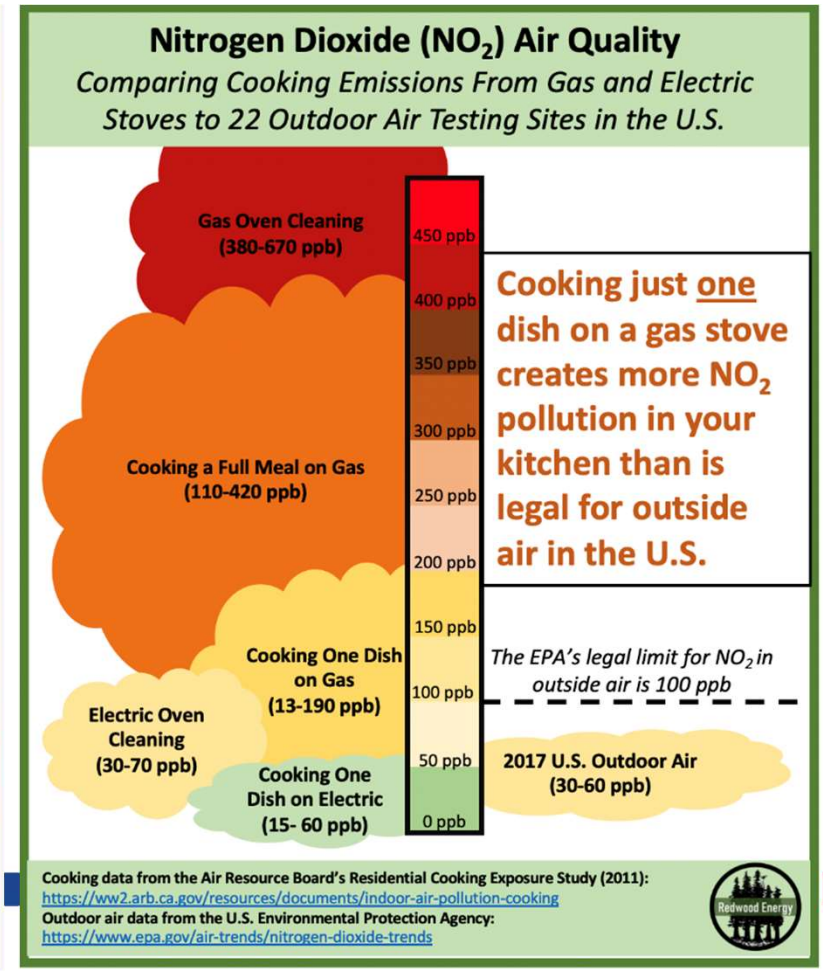
Local Pollution Source: Our Buildings

NOx, CO, CO2,
CH4, N2O, VOCs,
SO2, PM

Burning Gas Indoors
Can Be Similar to A Pack of Cigarettes





Slide citation: Sean Armstrong, Redwood Energy - https://www.redwoodenergy.net/

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Solar Folks – Consumer Protection Guide

Will we see one for gas in the future?

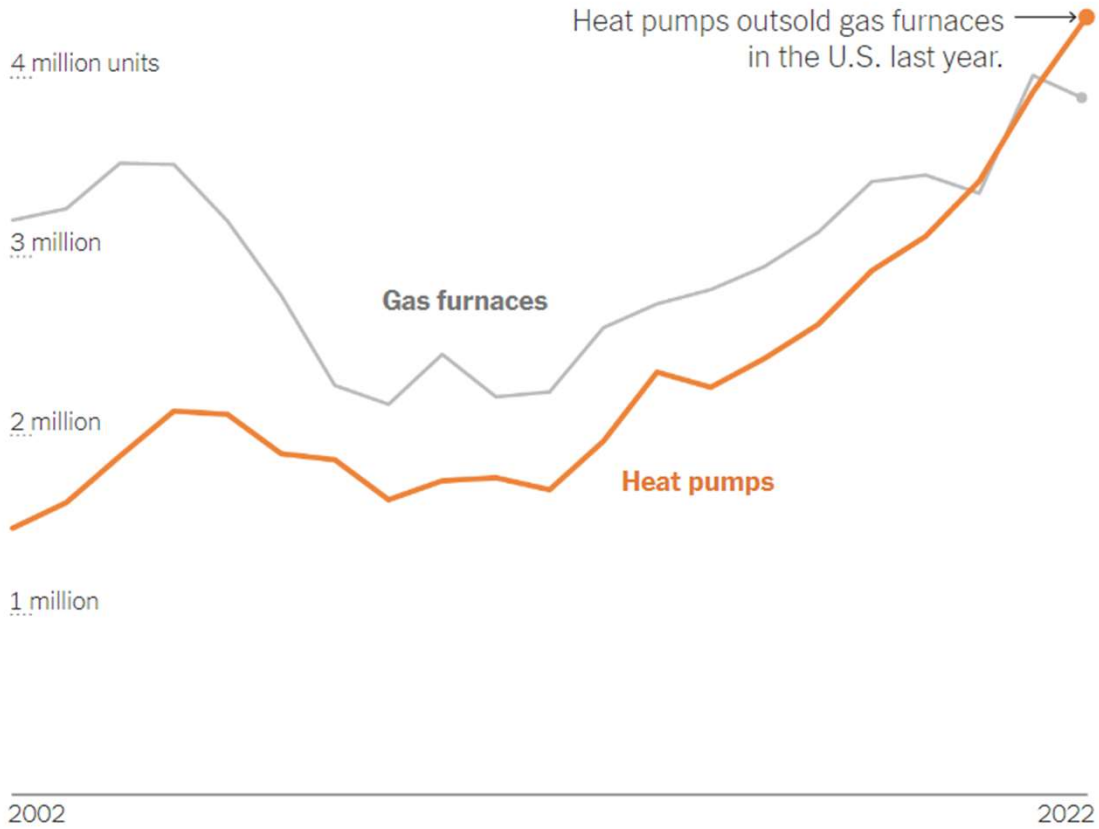
This guide provides important information to homeowners thinking of going solar.

PUTTING SOLAR ON YOUR HOME IS AN IMPORTANT FINANCIAL DECISION.

Don't sign a contract until you read this document!

What's Inside

The Tide ~~is Turning~~ has turned



Source: Rewiring America, using data from Air-Conditioning, Heating, and Refrigeration Institute • Note: Data shows units shipped to customers in the United States. There may be a lag between shipments and sales, but shipments are generally an approximation of sales.

Why Electrify?

Building and transportation electrification are critical steps toward a **low-carbon future** that benefits both people and the planet

– Dan Sperling, UC Davis

Electrification is not just a technological shift, it's a societal shift towards a **cleaner**, more **sustainable** future

– Jon Wellinghoff, Former FERC Chairman

Building and transportation electrification will help to reduce our reliance on fossil fuels, **protect public health**, and create a more **resilient** energy system

– Gina McCarthy, Environmentalist

Electrification is the future of energy. It's not just about replacing fossil fuels with renewables; it's about creating **new business models, new products, and new markets**.

– Jigar Shah, Director of Loan Programs Office, US DOE

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 Plumbers

Big Opportunity, Big Risk (If Done Poorly)

We'll come back to this later

90%

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

11.7 Million

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

12 Million

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

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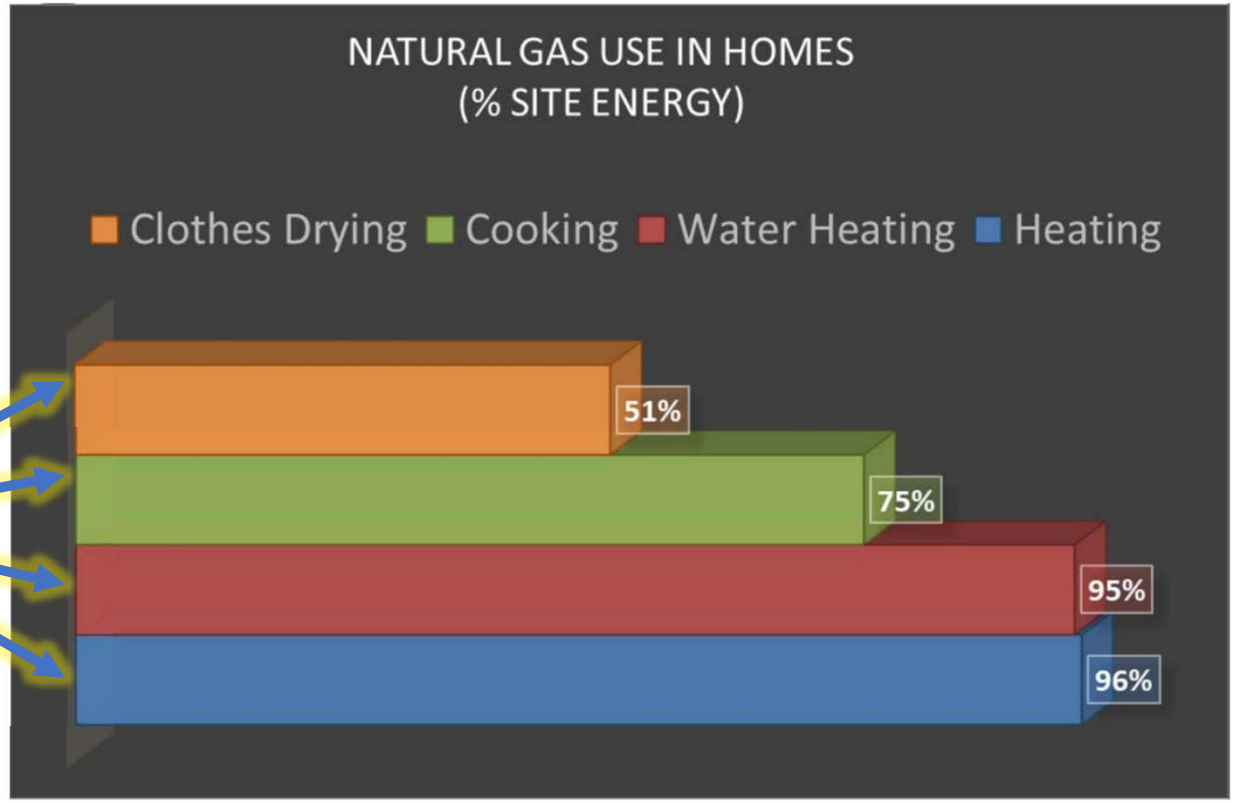
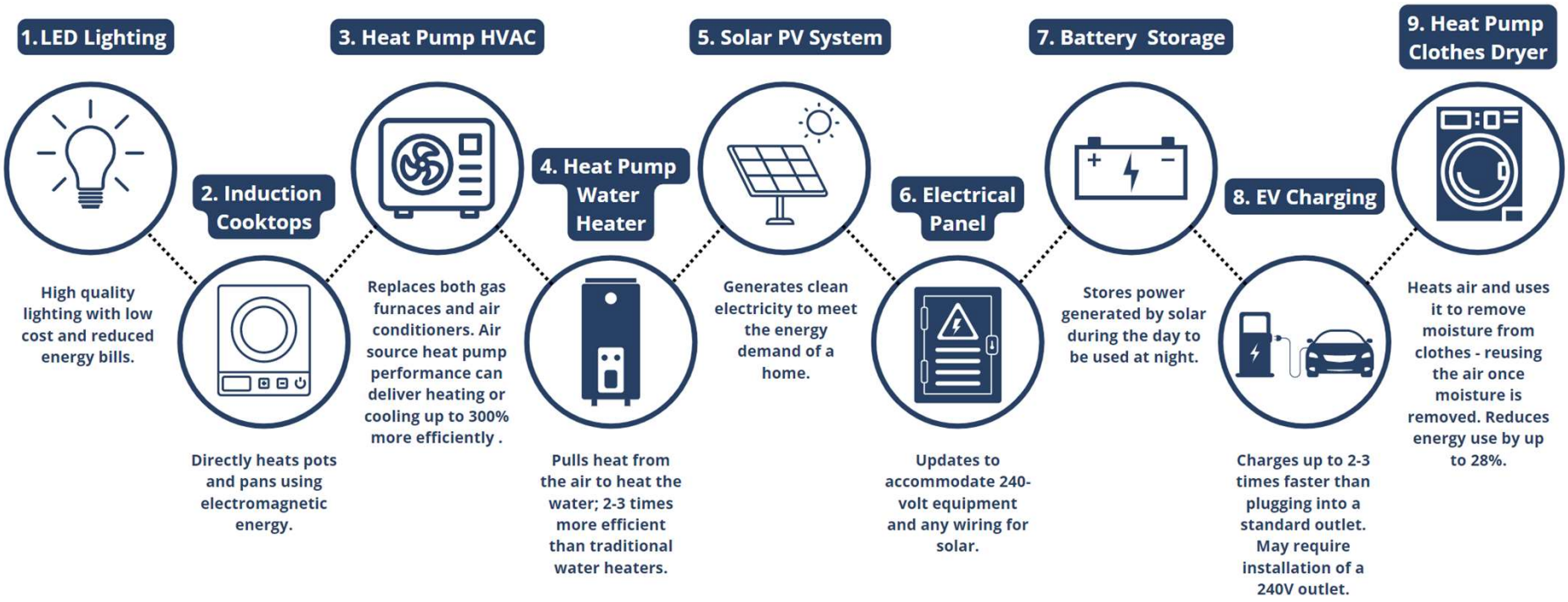
Natural Gas Breakdown in California

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!

"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?

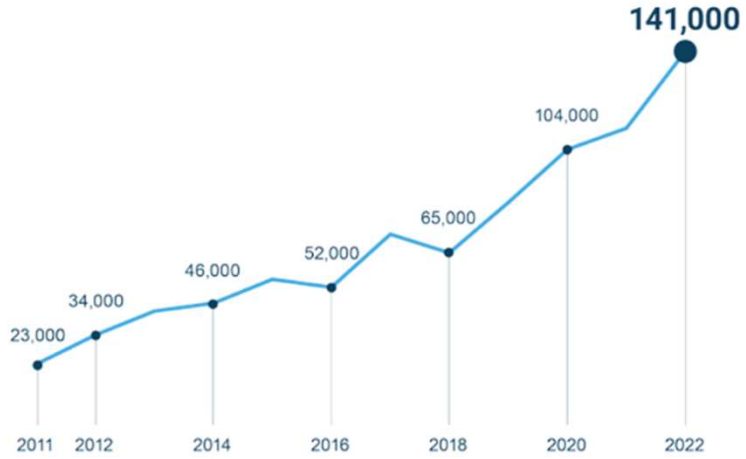
- Timing the Electrification movement to your business
- Many forces are aligning to bring this mainstream
- Market entry has never been easier
- Incentive programs to ease investment including rebates tax credits and financing
- Position yourself as a pioneer and corner a market in its infancy

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

The Tide Will Turn

Growth of Heat Pump Water Heaters



2022 – 26% increase in HPWH penetration. 2% of total market.

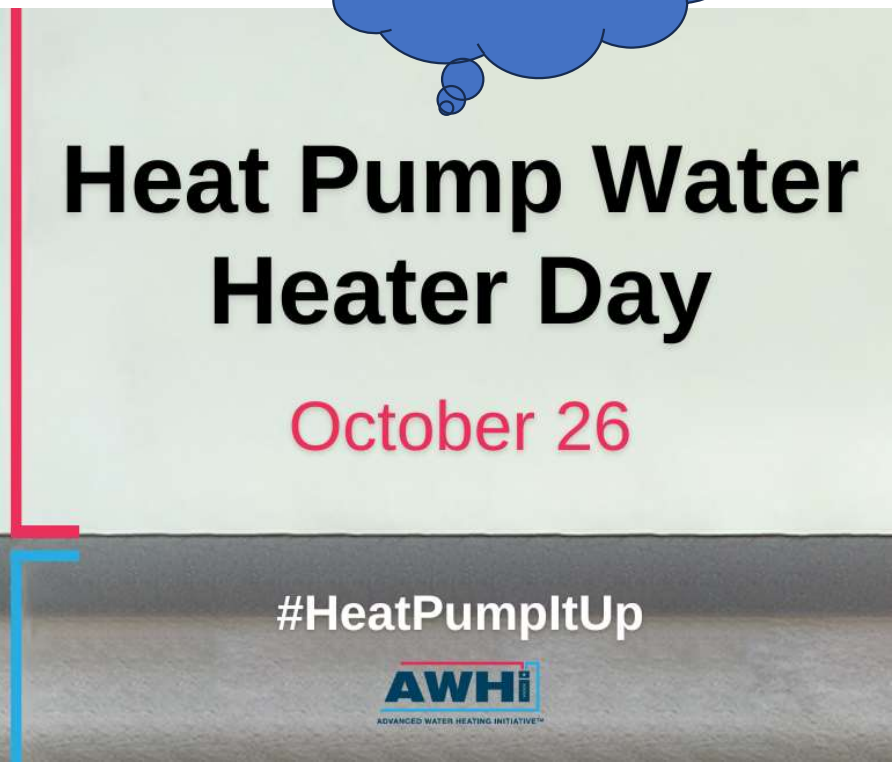
Restart Customer Relationships

- 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

THE SWITCH IS ON

October 23rd this year!



Best Electrification Opportunity For Plumbers: Heat Pump Water Heaters (HPWHs)

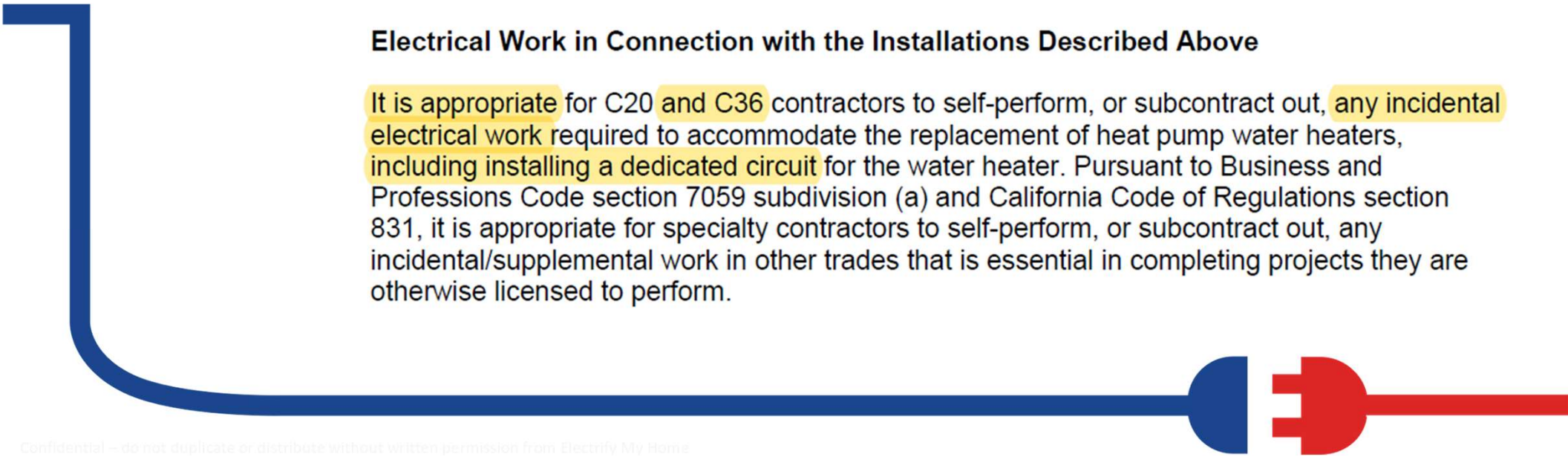
Yes, You CAN Do It!
From CSLB Guidance:

Appropriate Classifications for heat pump water heaters:

The most appropriate CSLB license classifications for stand-alone installation/repair of heat pump water heaters are C20-Warm Air Heating, Ventilating and Air-Conditioning or C36-Plumbing regardless of the system, or purpose, of the heated water.

Electrical Work in Connection with the Installations Described Above

It is appropriate for C20 and C36 contractors to self-perform, or subcontract out, any incidental electrical work required to accommodate the replacement of heat pump water heaters, including installing a dedicated circuit for the water heater. Pursuant to Business and Professions Code section 7059 subdivision (a) and California Code of Regulations section 831, it is appropriate for specialty contractors to self-perform, or subcontract out, any incidental/supplemental work in other trades that is essential in completing projects they are otherwise licensed to perform.



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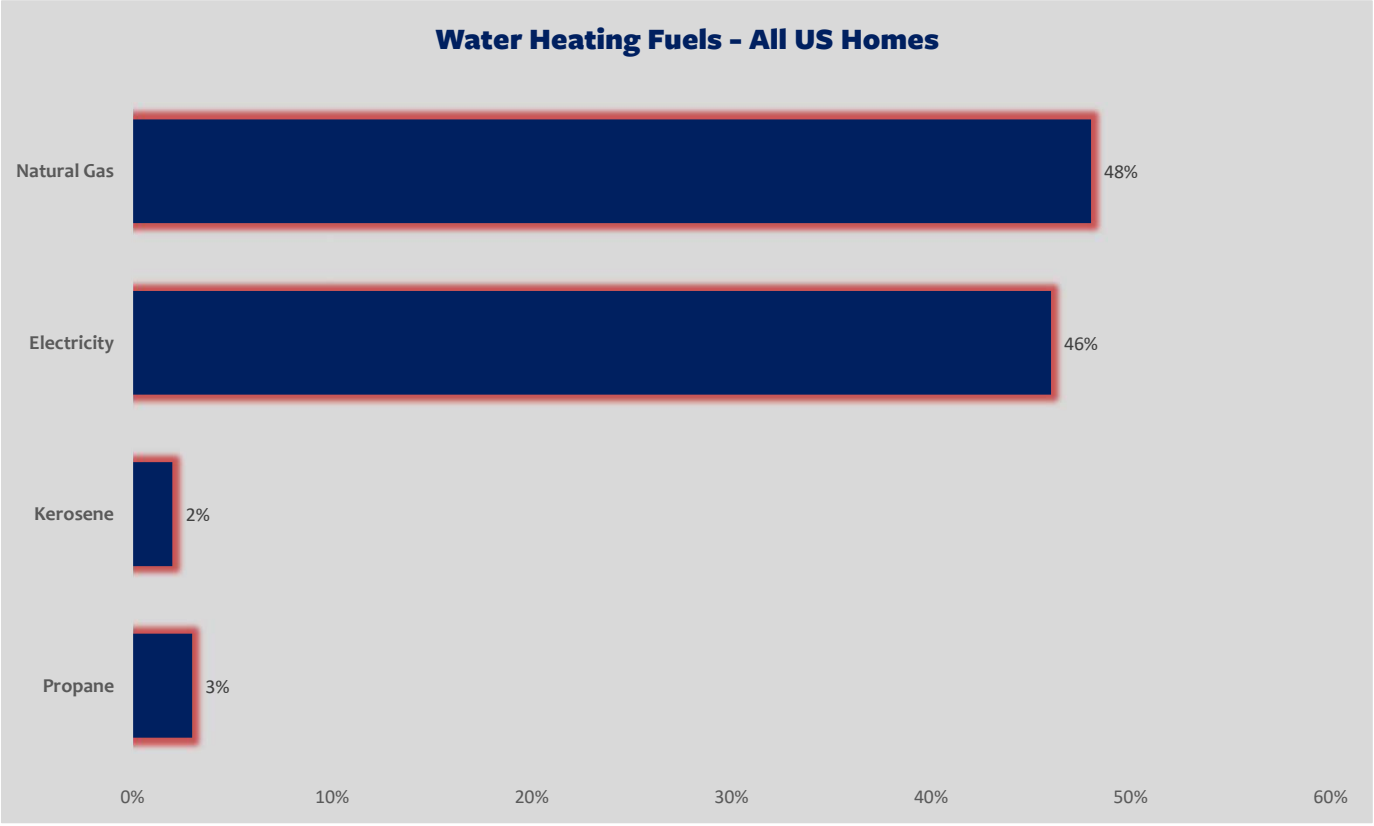
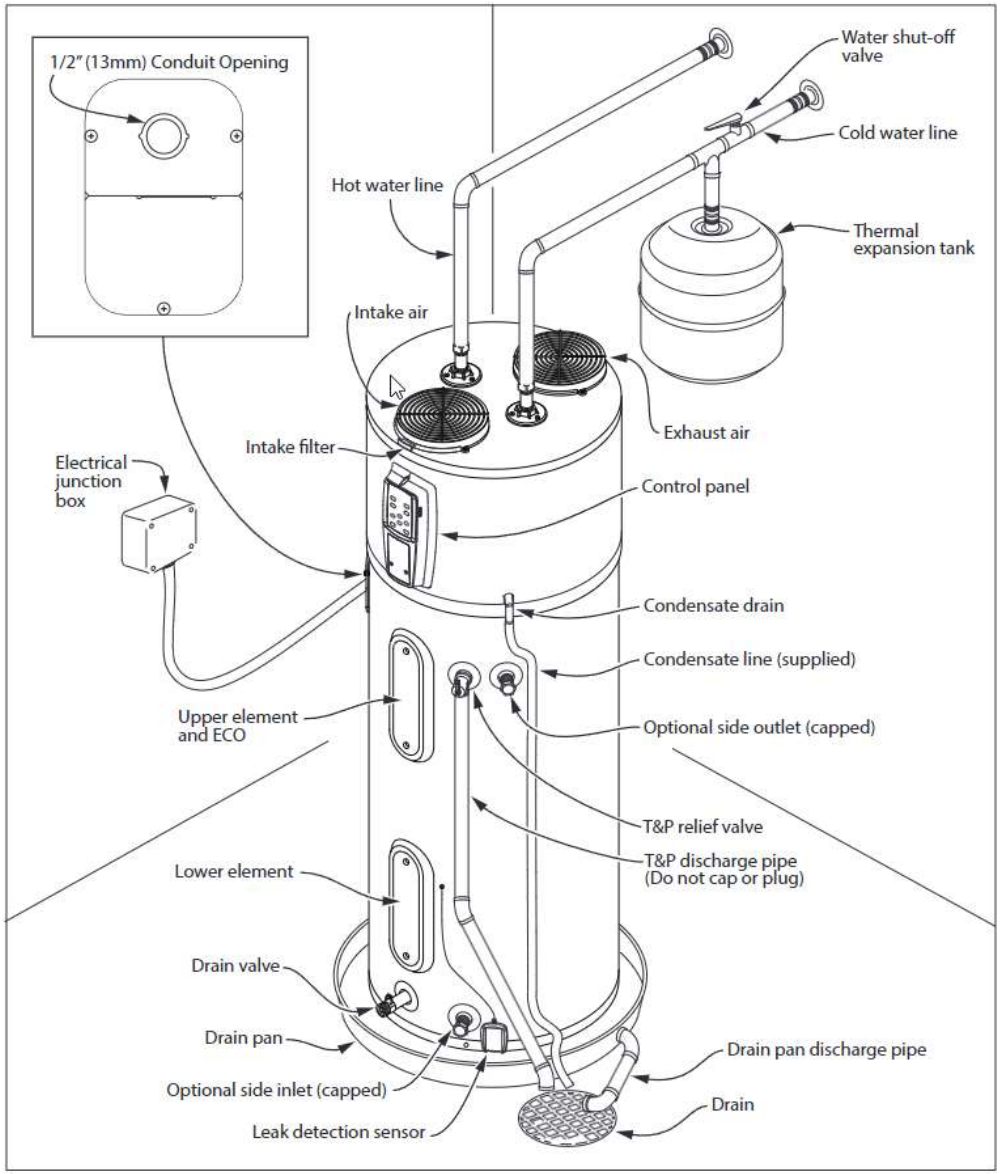
Electric Water Heating: More Common Than You Think!



Source: Energy Information Administration RECS survey, 2020.

Quick Technology Recap

- Heat pumps move heat; 5kbtu vs 40kbtu on gas, size carefully
- 120v shared & dedicated circuit
- 240v 30A and 15A options
- 240v & one 120v option have resistance backup
- Condensate
- Noise/vibration
- Ventilation considerations
- Mixing valves important



120V Heat Pump Water Heaters

- Easy way to get started.
- 120v electrical outlet often already there.
  - If not, dedicated circuit models available
- Sizing is critical – follow FHR plumbing code.
- Mixing valves built in.
- Be careful based on climate zone & temps <37°F

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WHICH ONE DO YOU WANT?

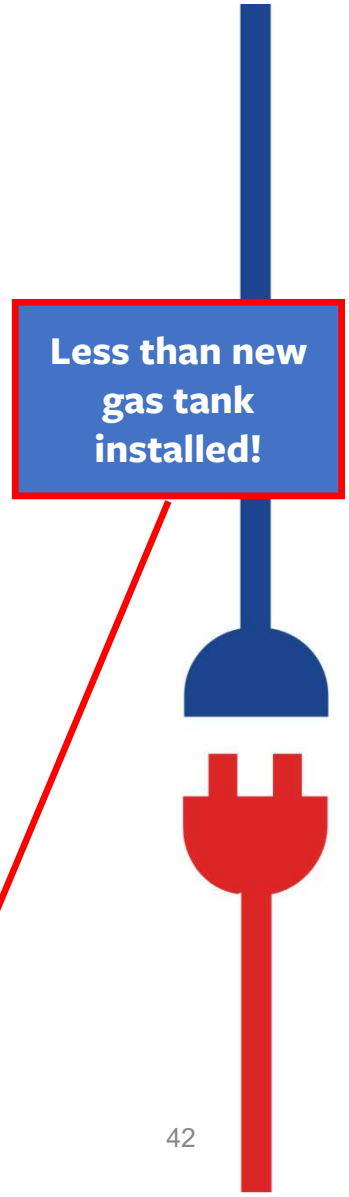
Gas Tank Sale

Item	Amount
Sales Price	**$2,450**
Appliance	$950
Miscellaneous	$150
Permits	$150
Other	$0
Direct Fixed Costs	**$1,250**
Labor (5 hrs @ $95)	$475
Overhead (@25%)	$613
Variable Costs	**$1,088**
Total Cost	**$2,338**
Net Profit $	$113
Net Profit %	4.6%

HPWH Sale

Item	Amount
Sales Price	**$6,850**
Appliance	$1,665
Miscellaneous	$265
Permits	$300
Other Electrical	$1,000
Direct Fixed Costs	**$3,230**
Labor (12 hrs @ $95)	$1,140
Overhead (@25%)	$1,713
Variable Costs	**$2,853**
Total Cost	**$6,083**
Net Profit $	$768
Net Profit %	11.2%
TECH Clean CA & GSR	($3,800)
Federal Tax Credit	($1,125)
Net Price for Customer	**$1,925**

Less than new gas tank installed!



Recirculation Pumps

- Important note – do not install heat pump water heaters on continuous recirculation.
- Remember, recovery rates are different.
- On-demand, learning algorithm, or timer-based is preferable.

Electric Appliances Can Be Offset By Solar

I am awesome!

...so are we!

The estimated annual energy cost of the HPWH is easily offset with less than two 350-watt solar panels

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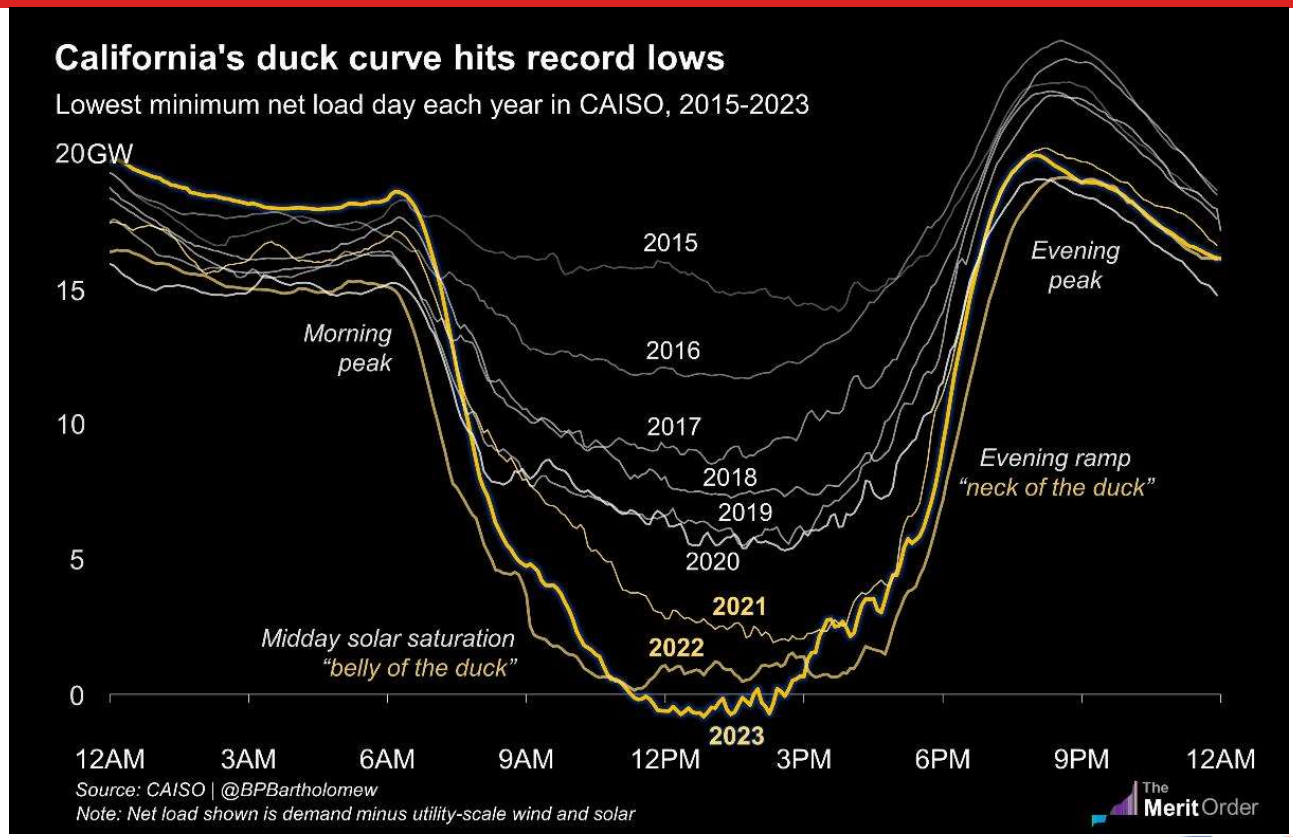
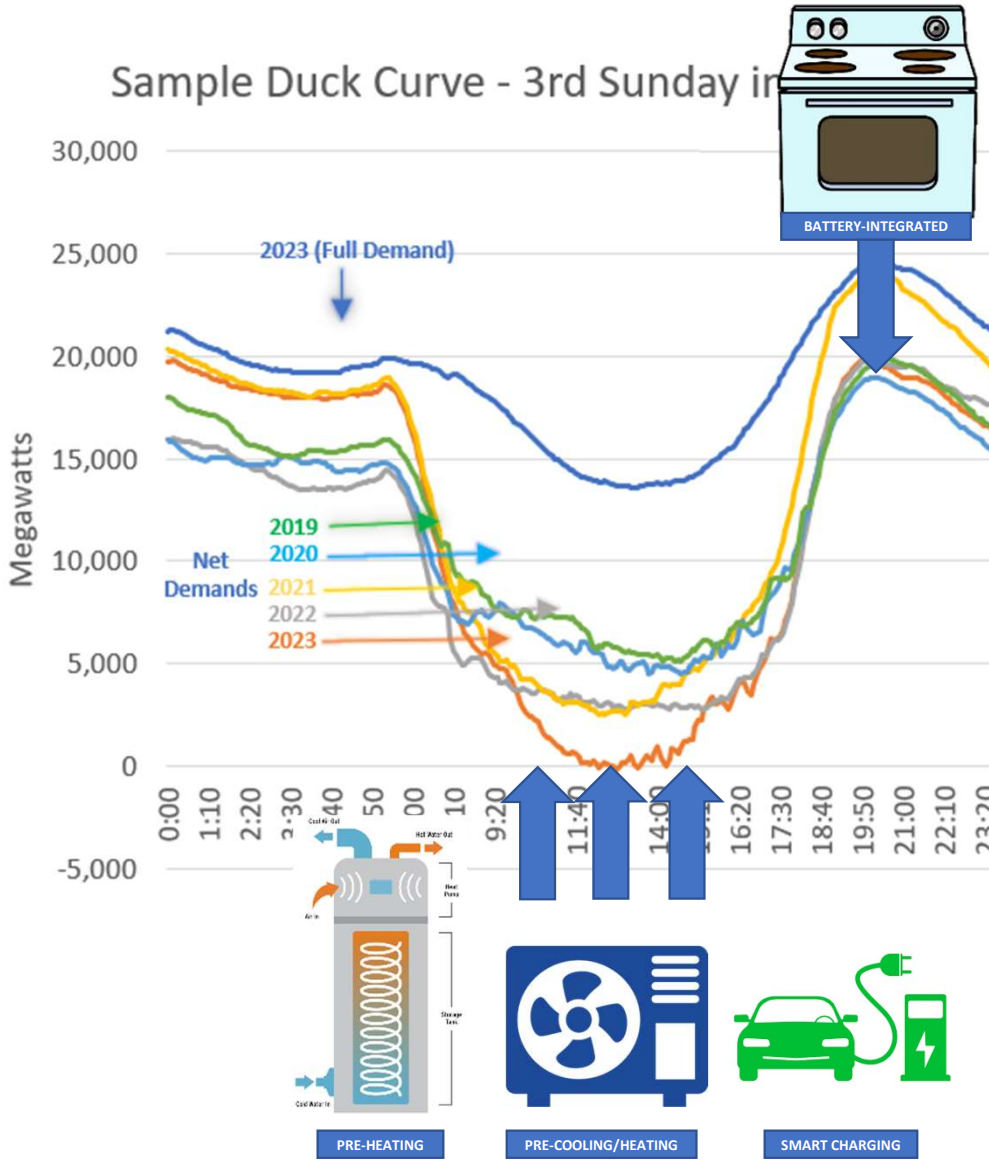
2023 Duck Curve



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



Wind, Water & Solar Is Starting To Work!

Clean Electricity + Electric Appliances = Success

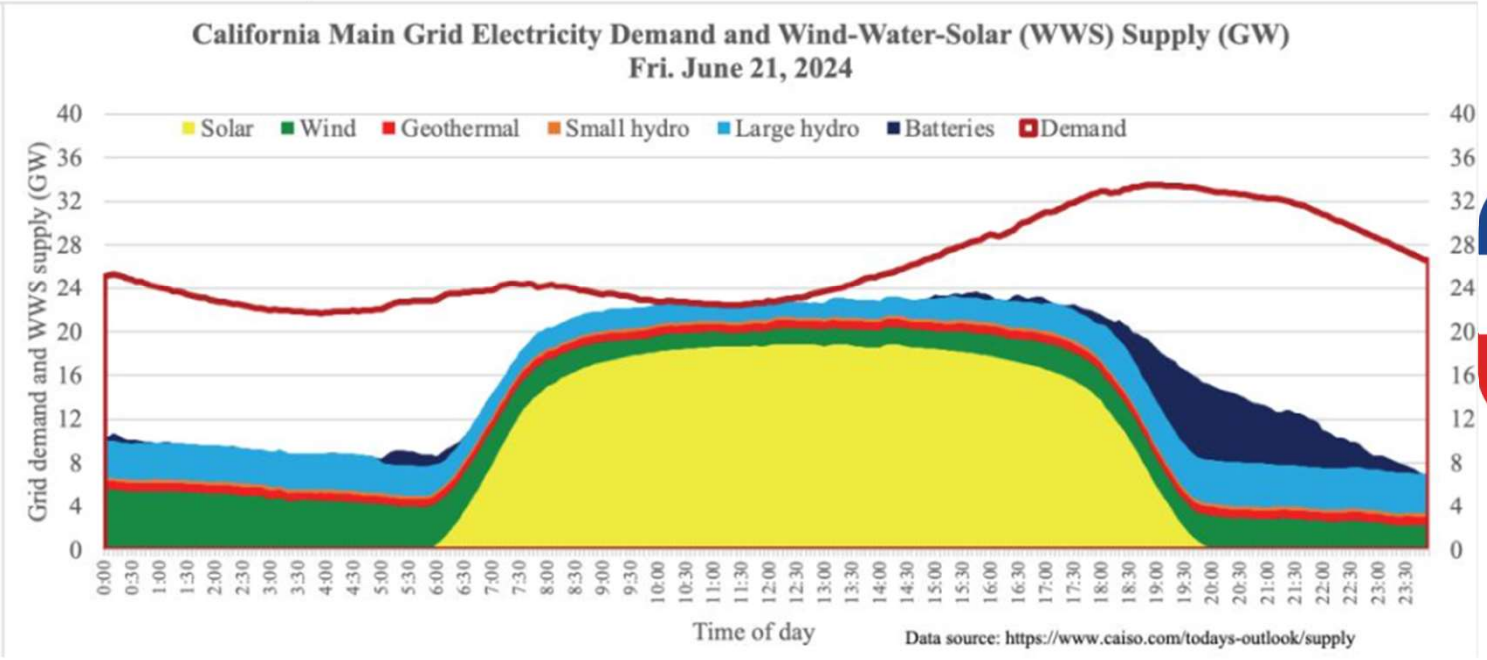
Mark Z. Jacobson
@mzjacobson · **Follow**

It has happened

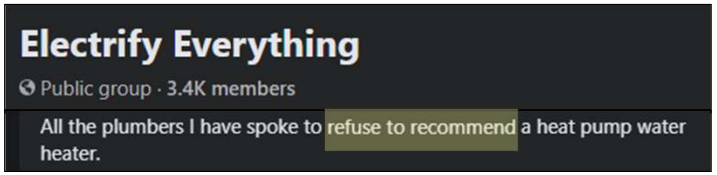
100 days of 100% #WindWaterSolar

Sun, July 28, California reached a milestone. The world's 5th-largest economy met 100% of @California_ISO demand with >100% WWS for the 100th day since March 7. July 27 was day 99 (for 4.9 h)

Strong summer winds helped



Stop Talking Customers Out of HPWHs!
Some Snippets From The Internet…



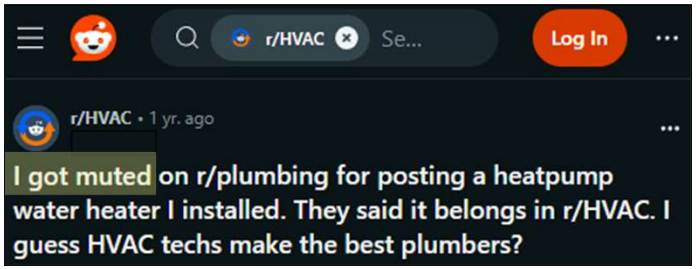
Electrify Everything Facebook Group

3. Contractors don't know heat pump water heaters. Plumbers and HVAC technicians have spent years learning how to install and maintain gas appliances, and they naturally prefer what they are familiar with. They may not trust heat pumps, or understand the electrical requirements, or be confident about answering questions and maintaining them.

Mountain View Voice Article

The trades are unfamiliar with HPWHs and prefer business as usual, which has largely been gas tankless water heaters. Contractors have deep experience selling tankless water heaters, understand them to be less costly, and perceive them as more efficient than HPWH. Three single-family home builders reported that the HPWH they installed was the first one for the plumber they hired. And three respondents described stories where they had to call four plumbers before they could find one who would agree to install a HPWH.

CA Heat Pump Residential Market Characterization Baseline Study, Opinion Dynamics



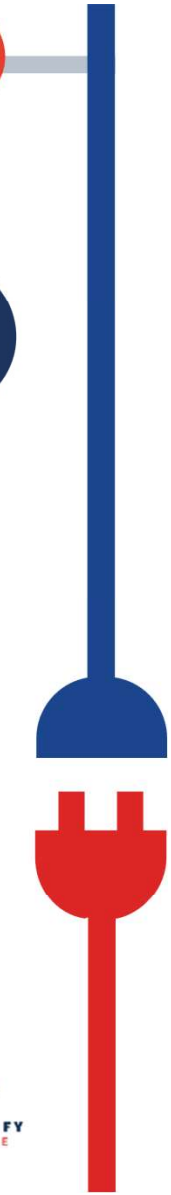
Reddit

Berkeley Parents Network

We installed a heat pump water heater about two years ago and used a local HVAC company since at the time our go-to plumber was not installing them given the electrical work required

Berkeley Parents Network

Potential New Business Pathways



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New Electrification-Driven Opportunities (Worth At Least The Price of Admission)

- 1) Safety Inspections
- 2) Electrification Roadmapping
- 3) Emergency Replacements
- 4) Entry Into Re-pipe Jobs
- 5) Cross-selling & Referring to Others
- 6) Air-to Water Heat Pumps
- 7) Maintenance Agreements

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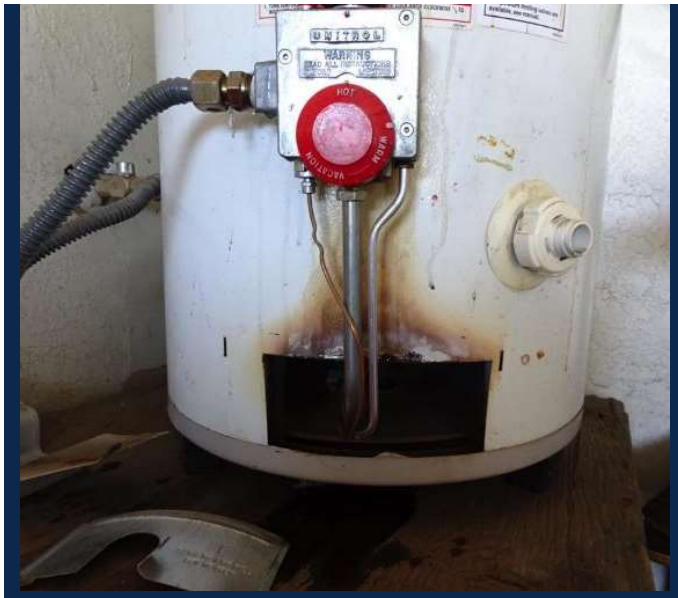
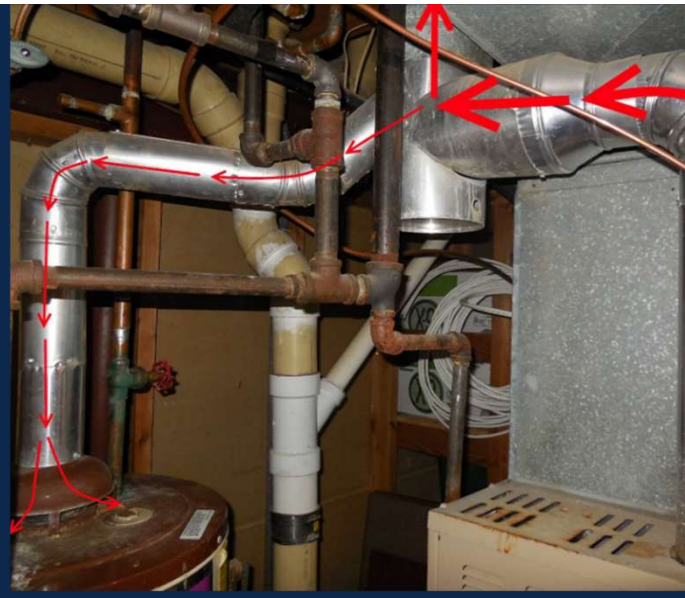
ID Safety Issues First (gas related)

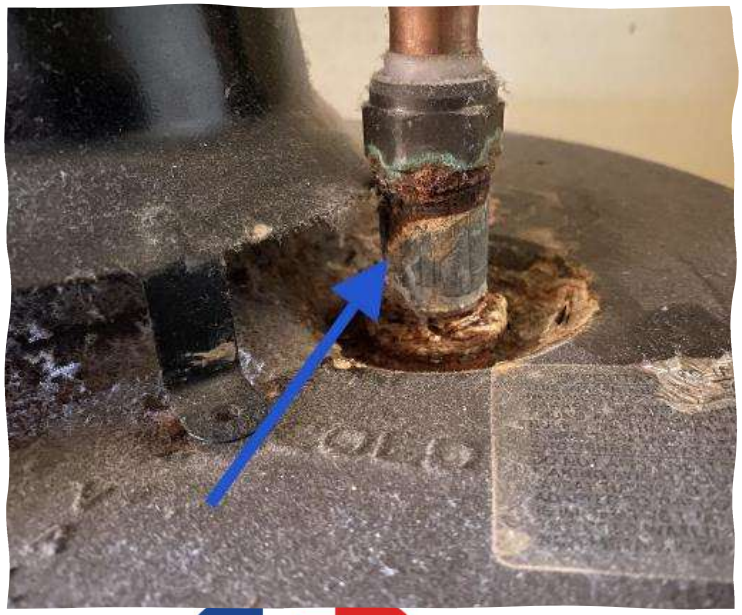
- Carbon Monoxide, Gas Leaks, Pressure Problems
- May impact the electrification plan
- Not only sale opportunity, but lifesaver opportunity – be a HERO





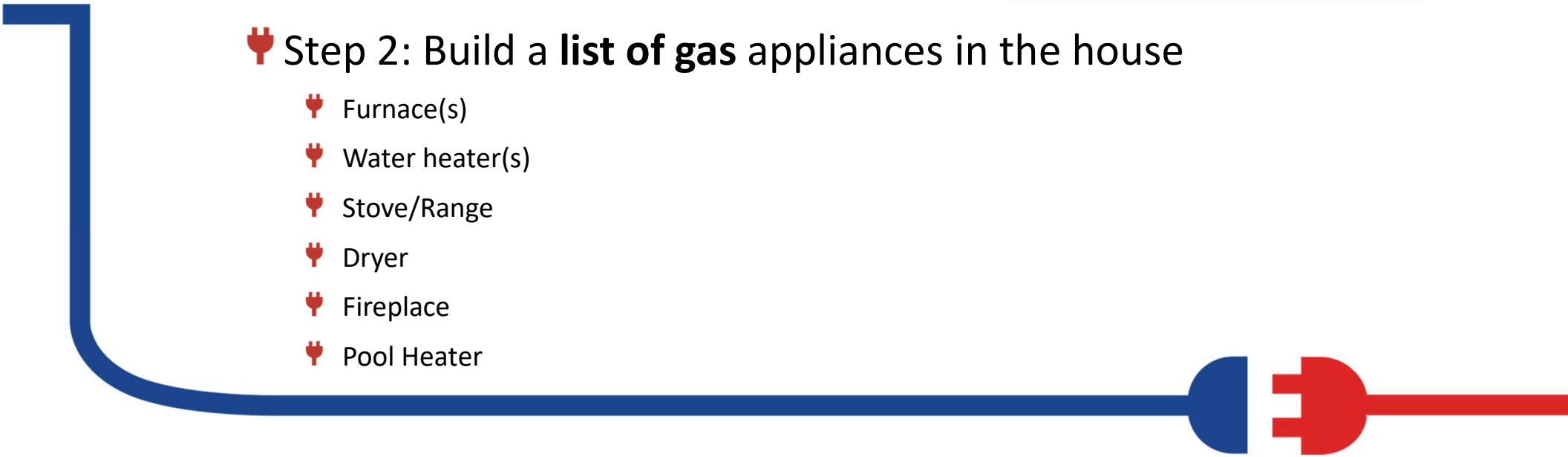
#1 Safety Inspections
Check EVERY Water Heater at EVERY Job

- Many are spilling exhaust into the occupied space
- Ceiling interstitial wall cavities can make this worse
- Ensure you have enough combustion air



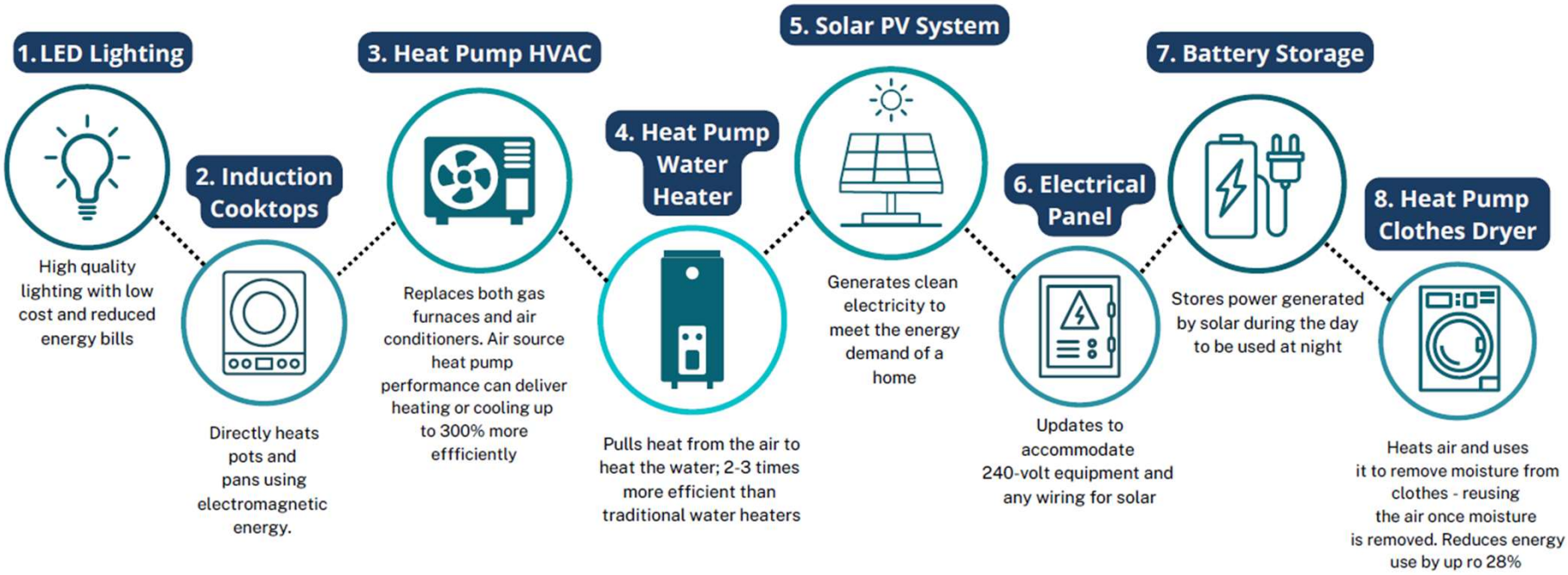
#2 (Roadmap): Gas Assessment & Inventory

- 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



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

Hint: Incentives Help!



TIMELINE:	Mar. 2024	Jun. 2024	Oct. 2024	Oct. 2024	Oct. 2025	Oct. 2025	Oct. 2025	Jan. 2026
COST:	$250	$2,800	$19,500	$7,800	$19,150	$5,300	$18,300	$850

#3 – Emergency Replacements

- Don’t let emergencies drive the decision. There are alternatives!

- 1) Temporary Gas Loaner!

- 2) If outlet avail, 120v Install!

4) Entry Into Re-Pipe Jobs

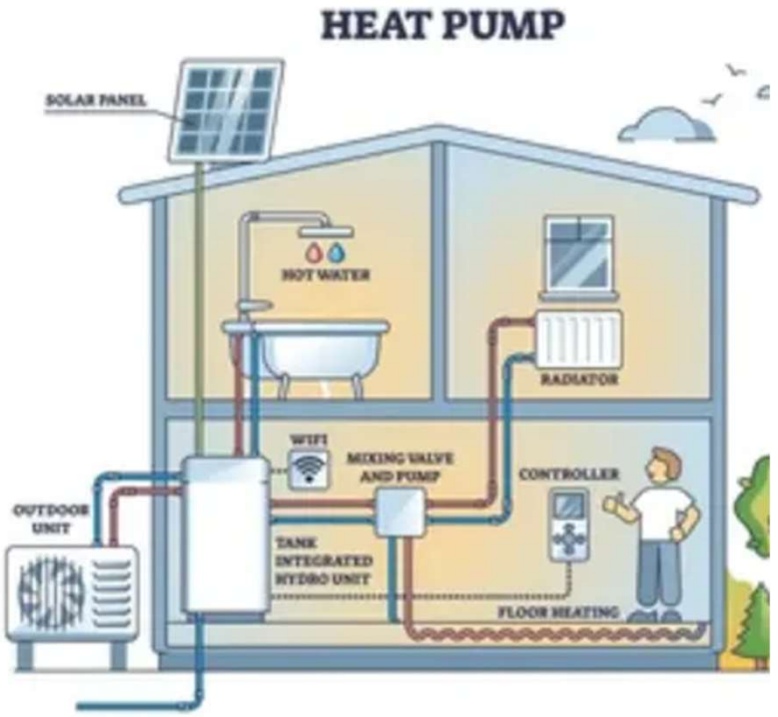
- Any time you have something new to offer, it opens the door for other opportunities.
- In our experience, there's lots of galvanized still out there.
- Doing a repipe at the same time lowers the chance for complications now and in the future.

#5 – Referral to Other Trades

- Primarily: HVAC, Electrical, and Plumbing
- Learn the basics, identify obvious issues/opportunities
- 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

#6 Air-to-Water Heat Pumps

- Technologies are quickly emerging
- Some can provide hot water and space heating
- Some have extensive plumbing
- Few experts or contractors offering hydronic heat pump solutions

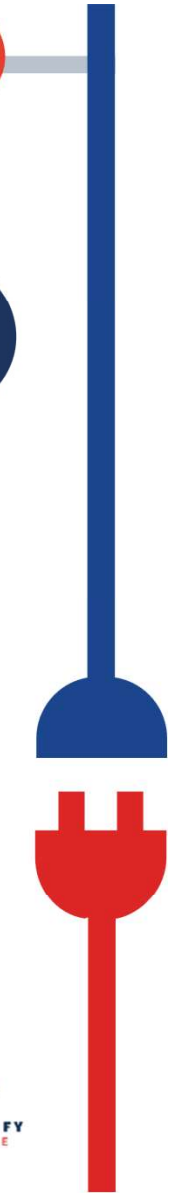


Source: zealux.com

#7 Start A Maintenance Program!

- Heat pump water heaters require maintenance
- New offerings = more $$
- New offerings = more customer touchpoints
- New offerings = long-term allied customers
- Maintenance checklist: leak check, controls, visual inspection & cleaning, filter cleanout, condensate check, drain/flush tank, anode rod check, electrical torque

Introduction to Good Electrification



ELECTRIFY
MY HOME


Good Electrification

What is Good Electrification?

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

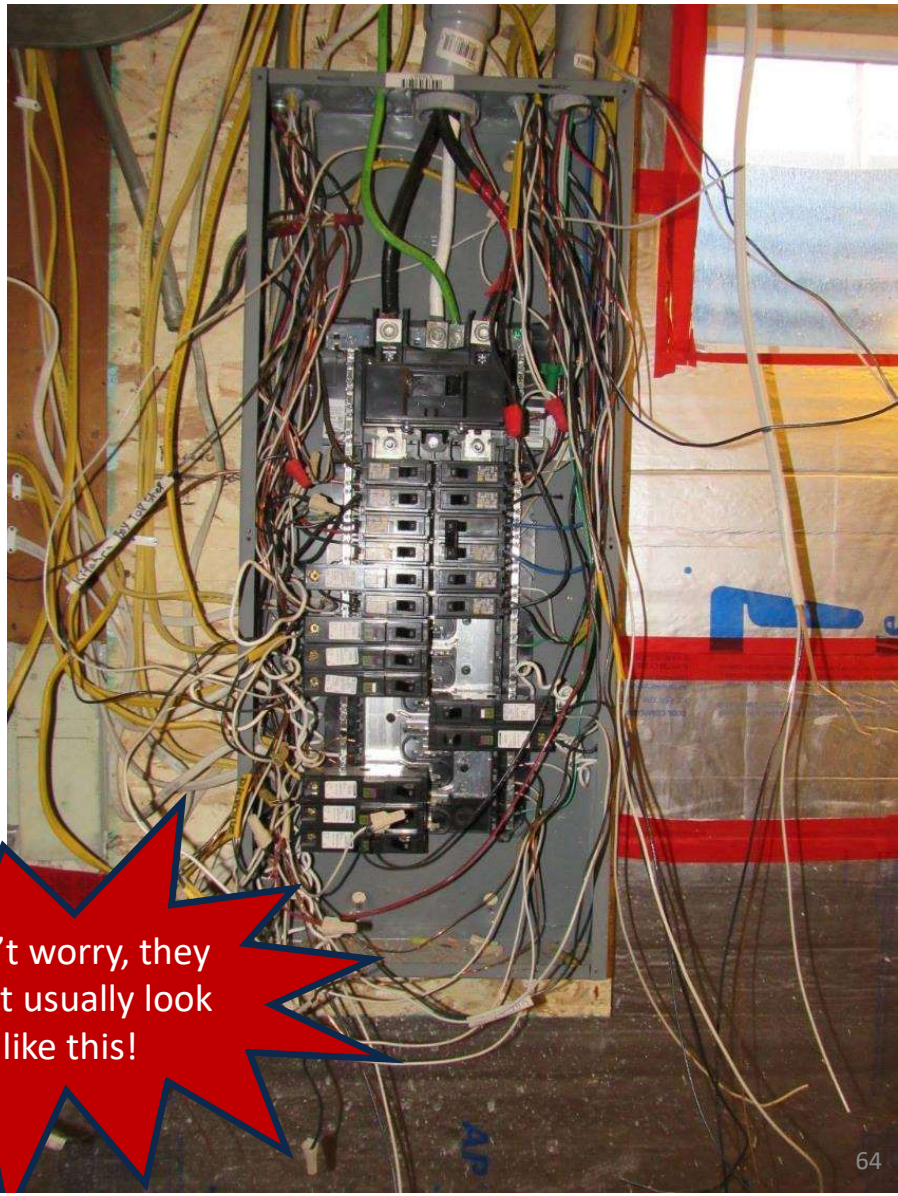
"Good Electrification"
Starts with Being a Good Steward Of the Electrical Panel

- 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

ELECTRIFY MY HOME

Get To Know The Panel

- Goals of the assessment, identify the following:
  - Used capacity
  - Physically available space
  - Path for new wire
  - Safety concerns
  - Opportunities for retrofits to avoid panel change



What Loads to Consider – Breaker Spaces

Most homes converting from gas, will need:

- Heat Pump circuit 2 to 6 spaces
- Dryer 2 spaces 30a amp
- Hot water 2 spaces 15a or 30a
- Range 2 spaces 50a
- EV charger 2 space 30-50a

ELECTRIFY MY HOME

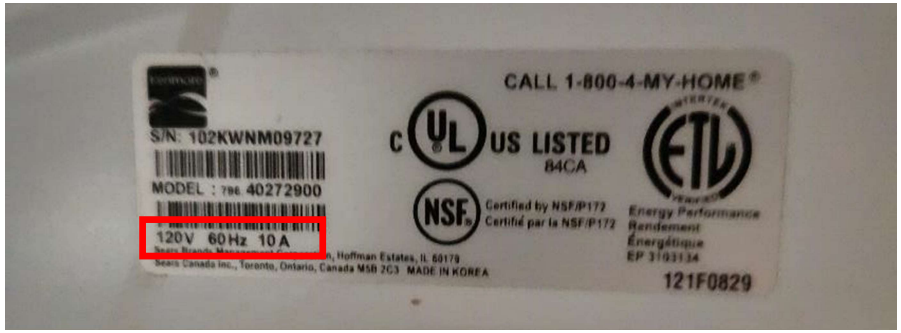
New to Electrical? Step 1: Capacity

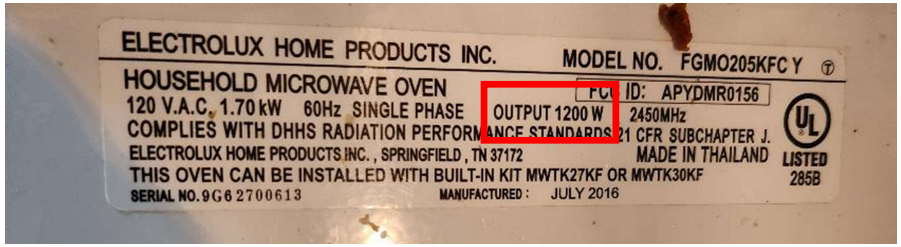
- Find a C10 who can contract with customer for electrical. Learn from them!
- To get started, learn the basics starting with identifying panel size. Look for “service disconnect” and 100, 125, 150, 200A breakers
- Warning – best practice is to also check feed wire size

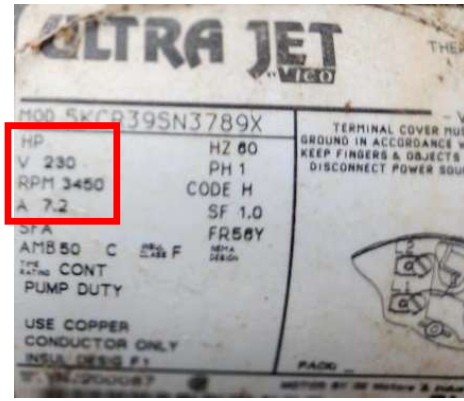
Step 2a: Learn How To Do Electrical Load Calcs Inventory Rated Capacity of Key Appliances

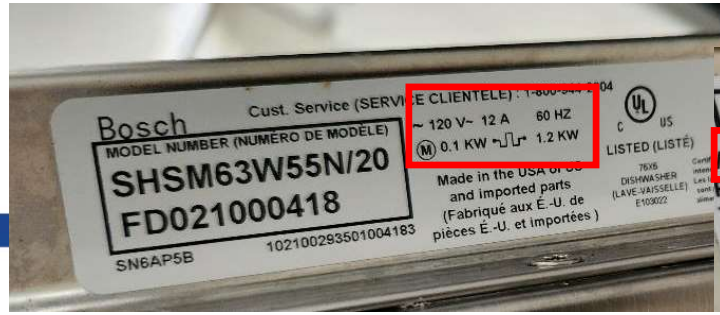
Look for Amps*Volts or W

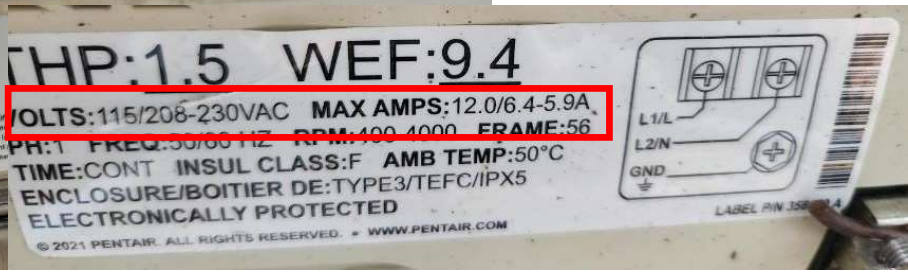
- Microwave
- Trash compactor
- Disposal
- Oven/Stove
- Dryer
- Pool/Spa Pump/Heater
- Hot Tub
- AC
- Water Heater
- EV Charger
- Misc – Kiln









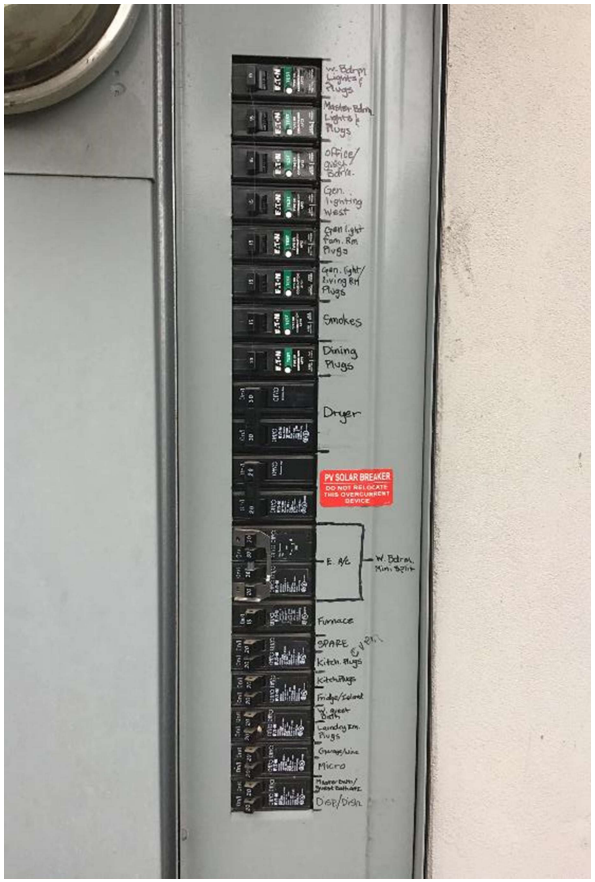


Step 2b: Enter Findings Into NEC-Based Calculator

These Load Calculations are based on California Electrical Code Section 220.82 - Dwelling Unit

- Refer to Instructions.
- User iInputs are only allowed in the orange-shaded cells, and in the blue-shaded cells if nameplate values are different than those listed. Other cells are automatically filled.
- The existing entries in the orange cells are for example purposes only and should be deleted or over-written.

Applicable Equipment	Description of Load	Default Value (measured in Watts)	Nameplate Rating (measured in Watts)	Applicable Rating (measured in Watts)	Units
General Lighting/Power Load					
Required	Insert Total sq. footage of building -> 1,700	Multiply square footage by VA/(ft²)->	3	5,100	Watts
Required	Insert # of Kitchen Circuits -> 2	Mutiply # by volt-amps/circuit ->	1,500	3,000	Watts
Required	Insert # of Laundry Circuits -> 1	Mutiply # by volt-amps/circuit ->	1,500	1,500	Watts
			Subtotal	9,600	Watts
Appliances and Equipment Excluding Air Conditioners and Space Heaters		Default	Nameplate Rating	Applicable Rating	
Instruction below					
Enter Quantity	Appliance Name	Default Value (measured in Watts)	If nameplate rating is diferent than Default Value, replace with nameplate ratiing	Max Default Value or User Inserted Value	Units
1	Microwave	1,400	1,400	1,400	Watts
	Trash Compactor	1,000			Watts
1	Dishwasher	1,500	1,500	1,500	Watts
1	Disposal	1,000	1,000	1,000	Watts
	Electric Wall Oven	2,000			Watts
	Electric/Induction Cooktop	1,800			Watts
1	Electric Range (5 kW for induction, 10 kW for resistance)	10,000	5,000	5,000	Watts
1	Electric Clothes Dryer that is *not* connected to the laundry branch circuit	4,000	4,000	4,000	Watts
	Electric Heat Pump Clothes Dryer	1,800			Watts
	Electric Clothes Washer	500			Watts
	Electric Tankless Water Heater	15,000			Watts
	Electric Water Heater	4,000			Watts
1	Electric Heat Pump Water Heater	550	550	550	Watts
	Level 2 Electric Vehicle Supply Equipment (EVSE) (Required for new homes)	7,000			Watts
	Evaporative Cooler	500			Watts
	Pool or Spa	2,000			Watts
	Other	n/a			Watts
	Other	n/a			Watts
	Other	n/a			Watts
			Subtotal (Appliance and Equipment)	13,450	Watts
			Total (General Lighting/Power Load + Appliance and Equipment)	23,050	Watts
Calculation of General and Appliance Load (load in excess of 10,000 W is counted at 40%)					
			Subtotal (A) = Total Watts - 10,000 VA	13,050	Watts
			Subtotal (B) = Subtotal (A) x .40	5,220	Watts
			Effective General Load = Subtotal (B) + 10,000 VA	15,220	Watts

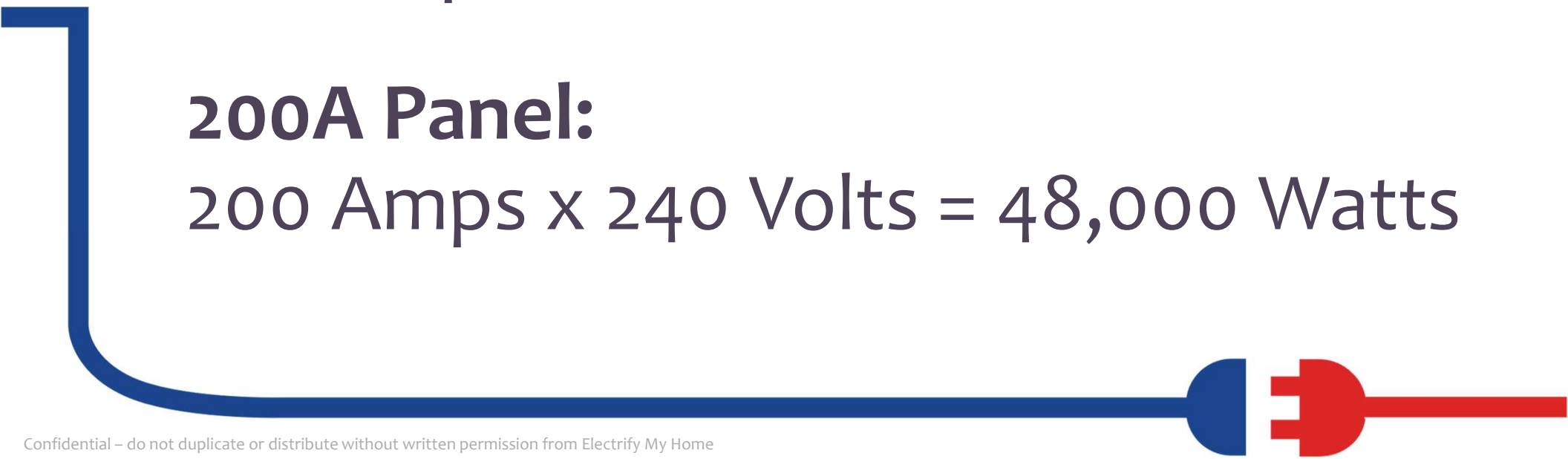


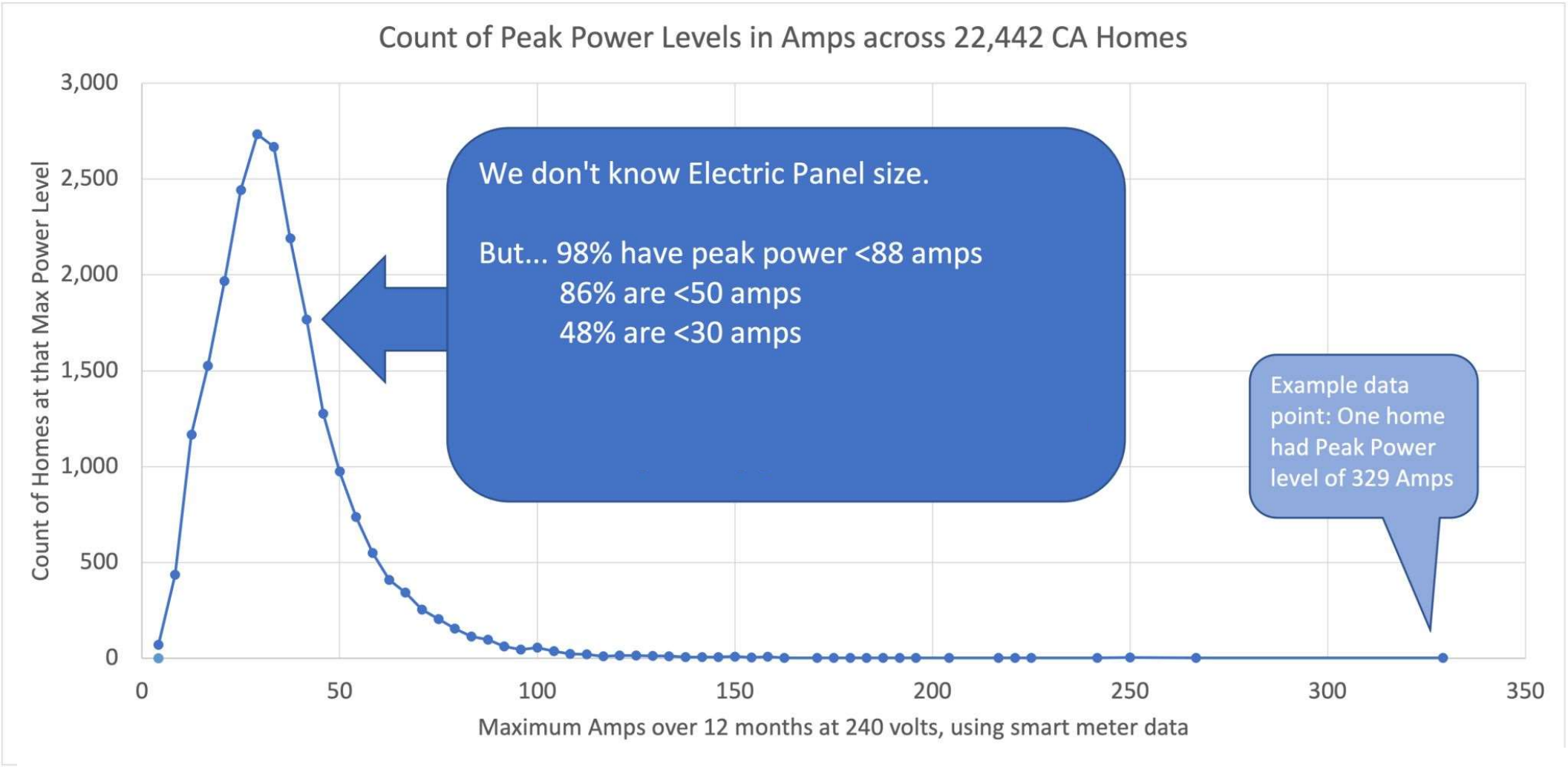
Are these panels full?

Full Panel ≠ No Remaining Capacity

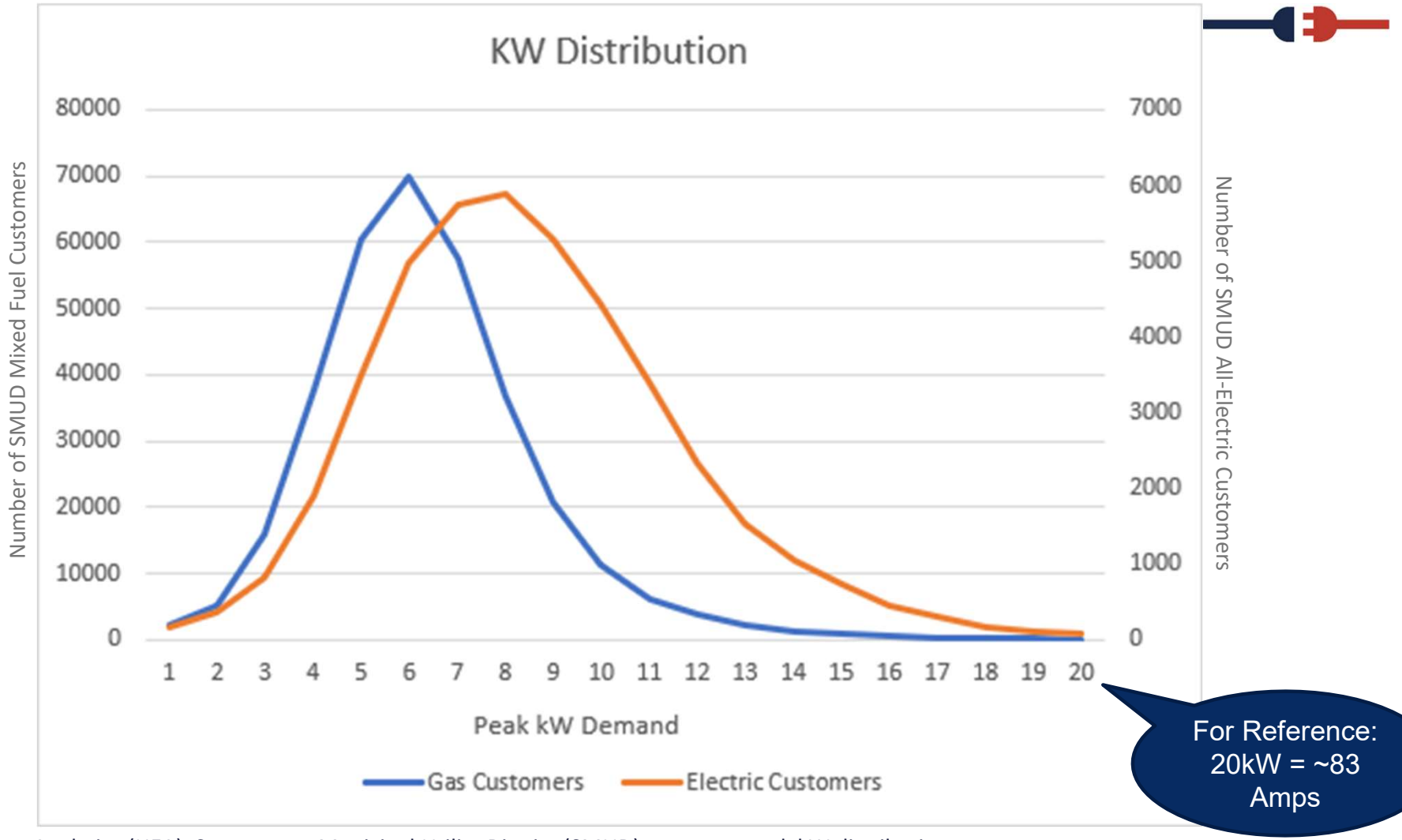
100A Panel:
100 Amps x 240 Volts = 24,000 Watts

200A Panel:
200 Amps x 240 Volts = 48,000 Watts

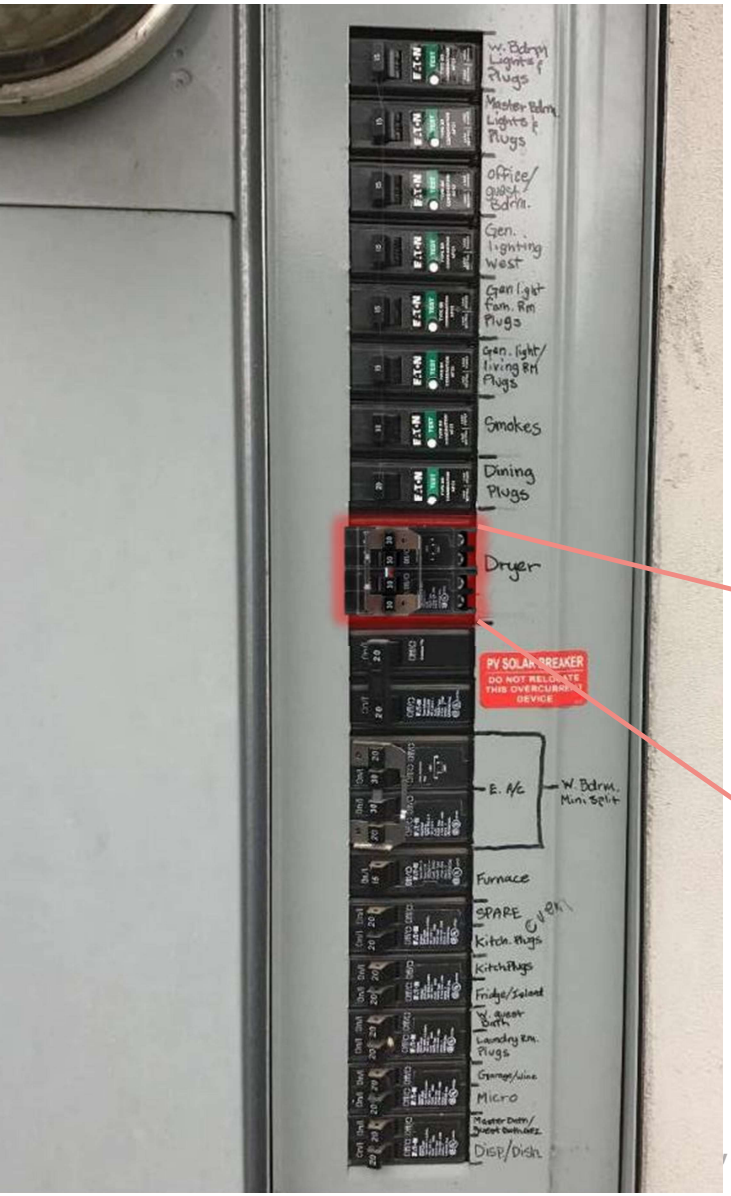




Source: Home Energy Analytics (HEA), PG&E HomeIntel service single family user data



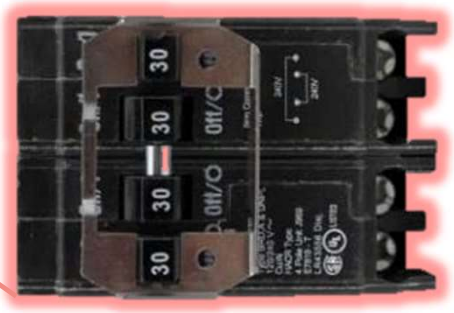
Source: Home Energy Analytics (HEA), Sacramento Municipal Utility District (SMUD) customer peak kW distribution

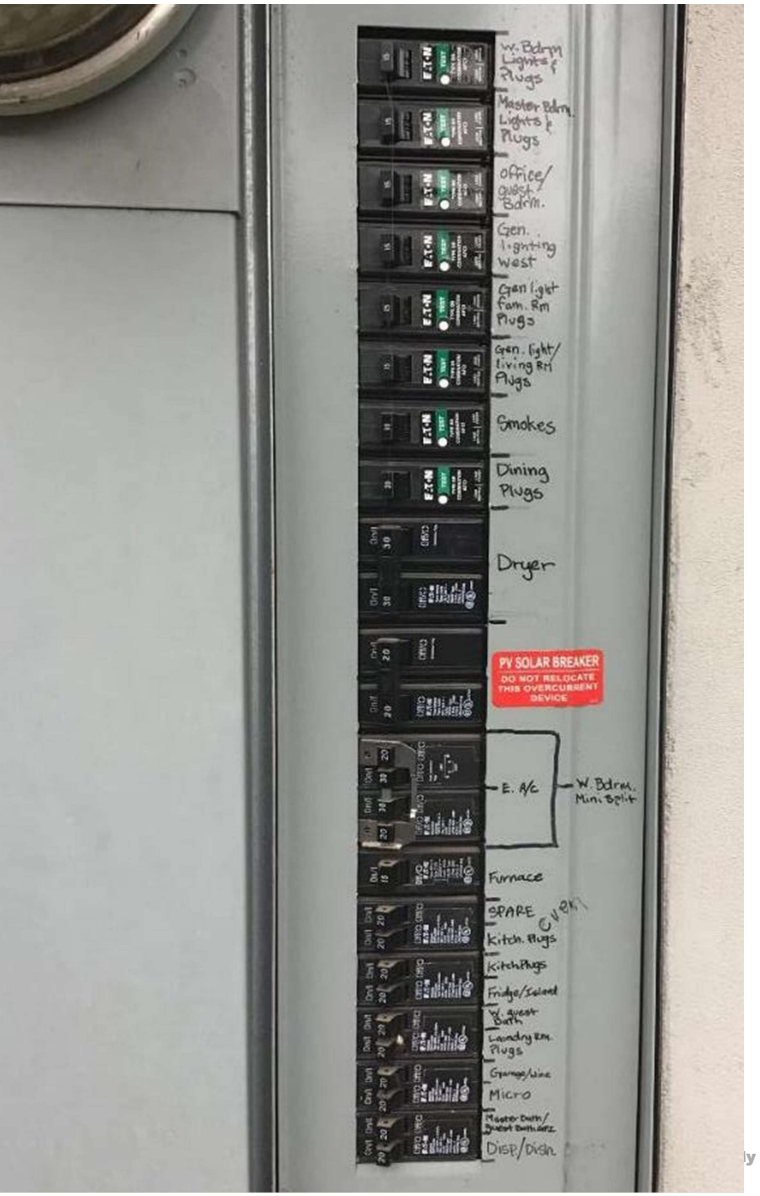


Solutions to "Full" Panels

Task: Add a HPWH Circuit

- Option 1: Quad it out!

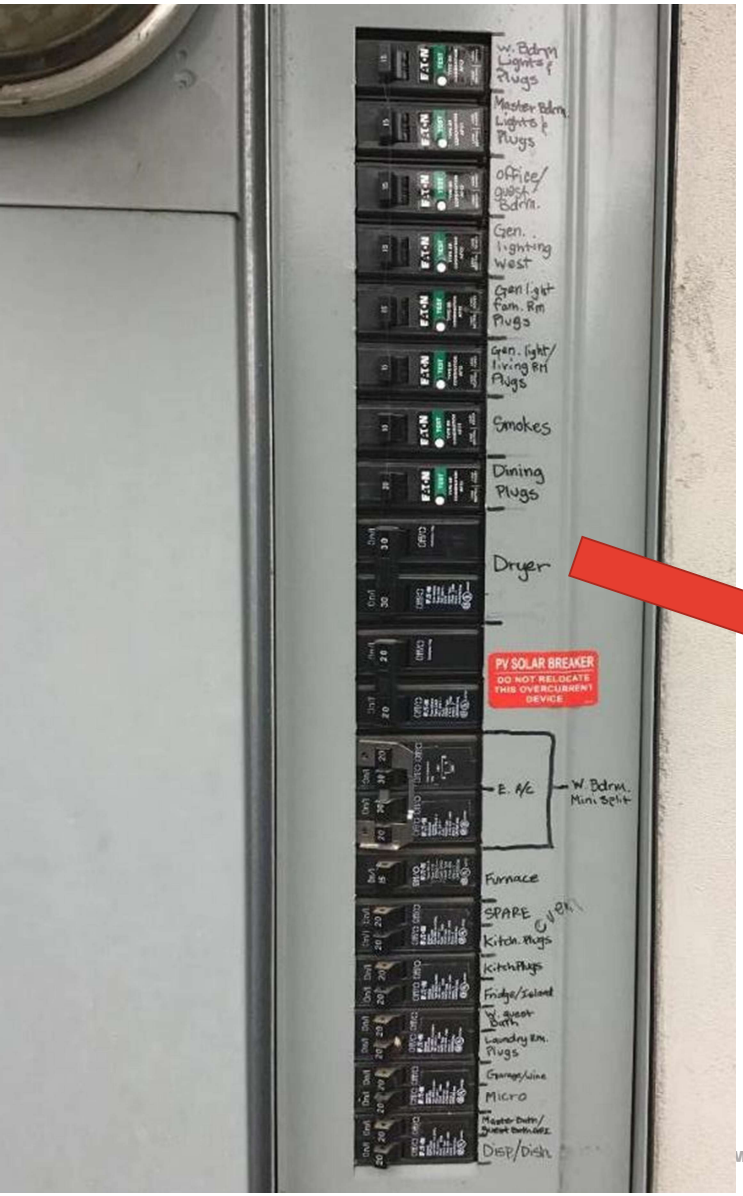




Solutions to "Full" Panels

Task: Add a HPWH Circuit

- Option 2: Circuit Splitter!

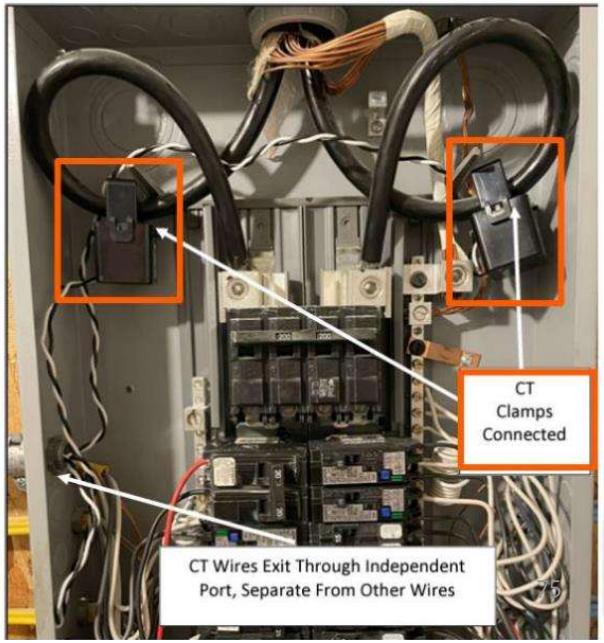


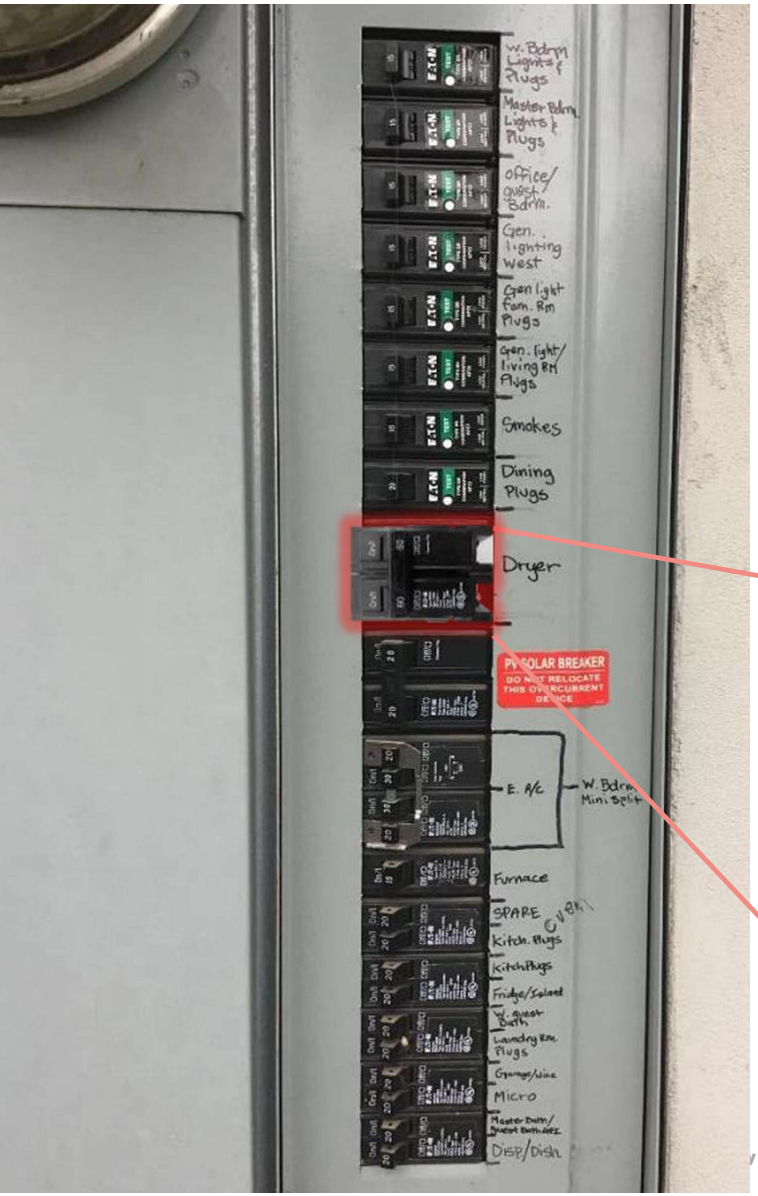
Solutions to "Full" Panels

Task: Add a HPWH Circuit

- Option 3: Circuit Pausing!

+





Solutions to “Full” Panels

Task: Add a HPWH Circuit & a Couple More

- Option 4: Add a Subpanel

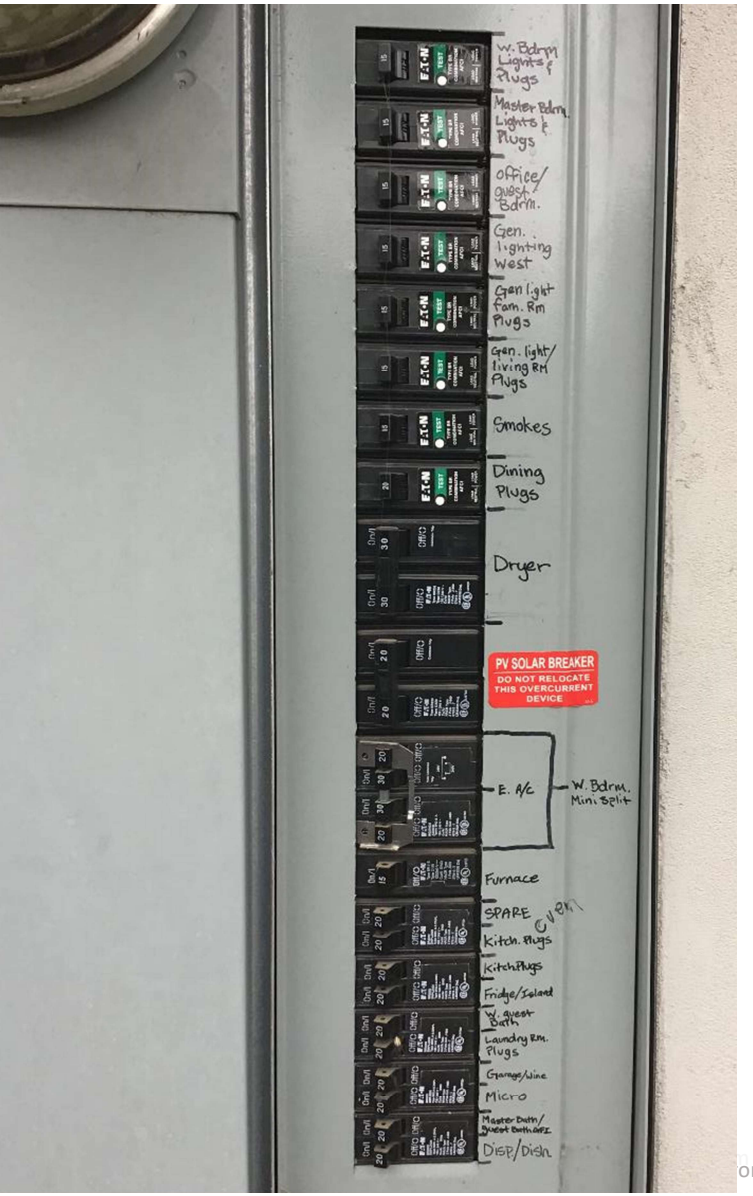
- Tip – add the neutral!

Solutions to “Full” Panels

Task: Add a HPWH Circuit

(and much more)

- Option 5: Smart Panel



Solutions to “Full” Panels

Task: Add a HPWH Circuit

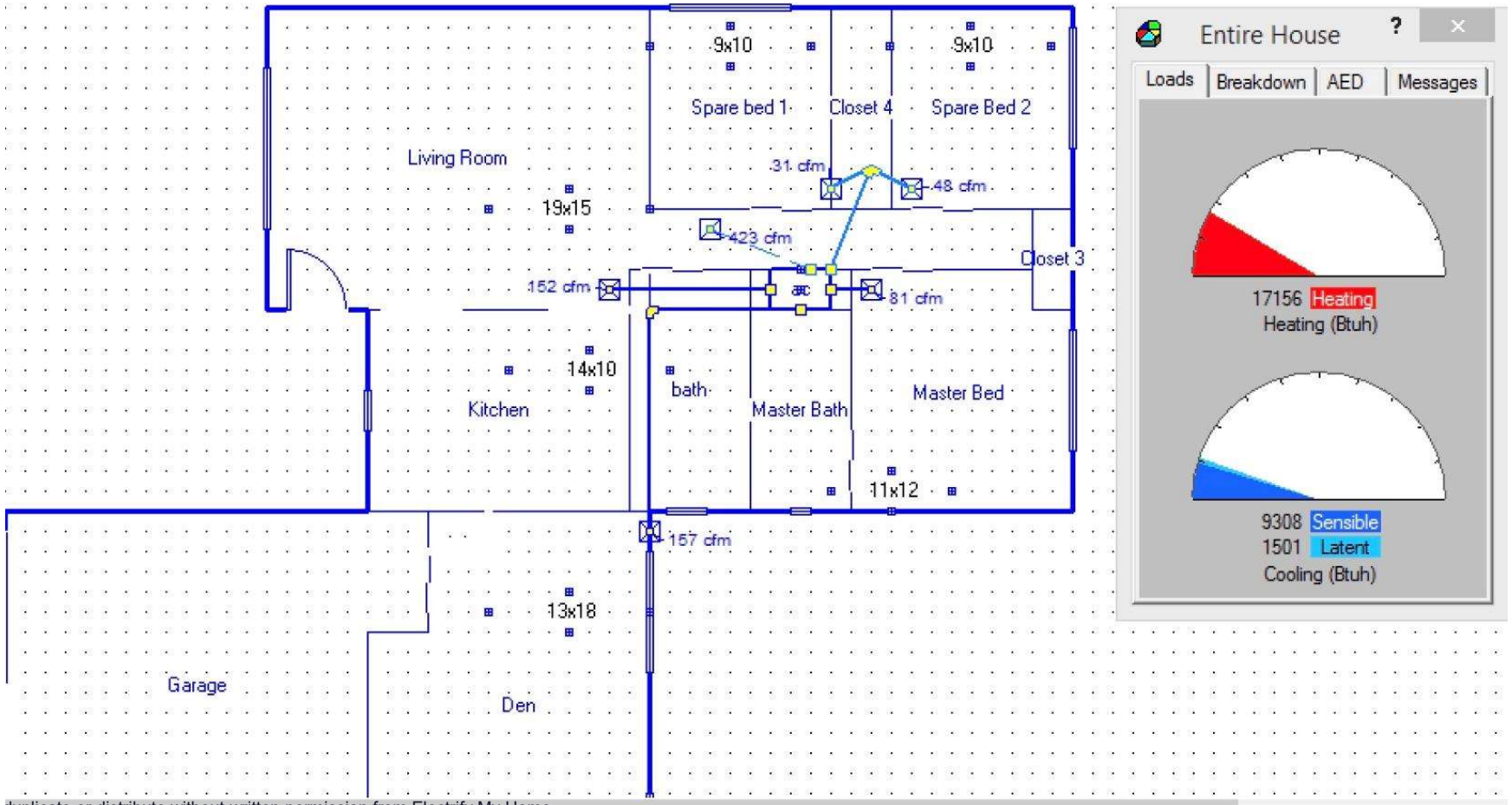
- Option 6: Specify a 120v 4A HPWH!

Install Small

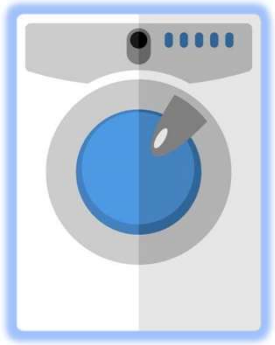
What is Install Small?

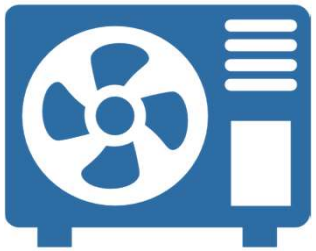
- Install Small means putting in the **right sized** systems!
- Focus typically on HVAC (experts agree 60%+ systems are oversized)
- But also applies to other home appliances when panel capacity is limited (e.g., water heater, dryer, range, EV charger).

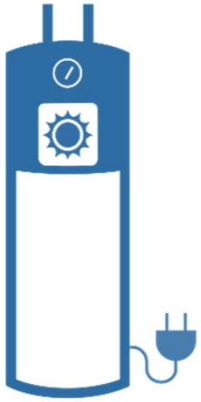
HVAC Load Calculations are Key



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

So…Are You Convinced?

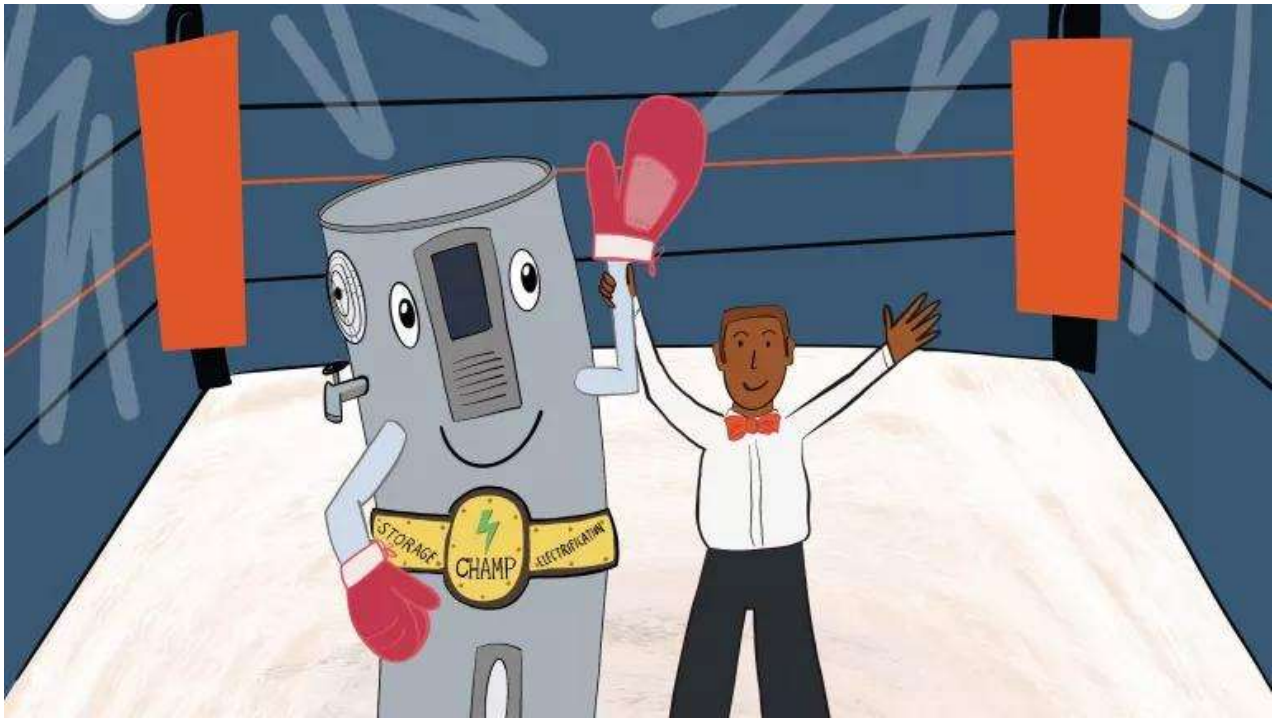


Image Source: Jessica Russo, NRDC

Common Residential Heat Pump Technologies

Unitary On/Off

- Traditional heat pump solution
- 1 to 2 stages
- Base efficiencies (up to 6 breakers!)
- Loss of performance at lower temps

Inverter/Modulation

- Mini split
- Ductless and ducted
- Multi-zone

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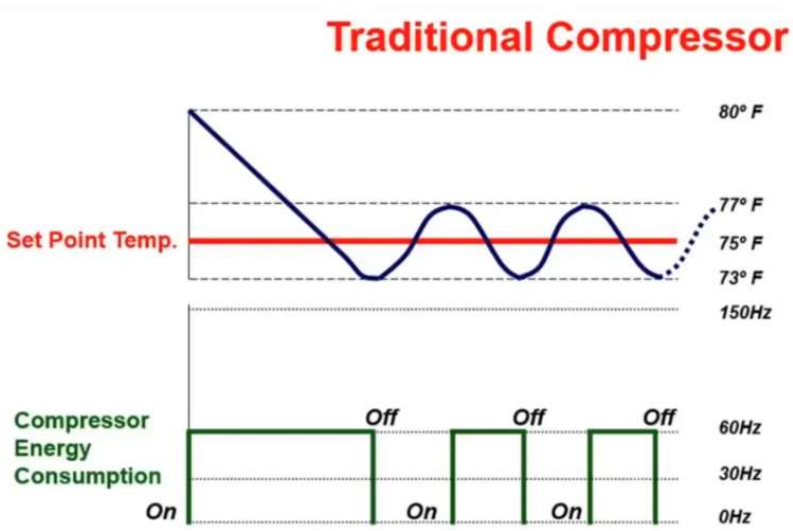
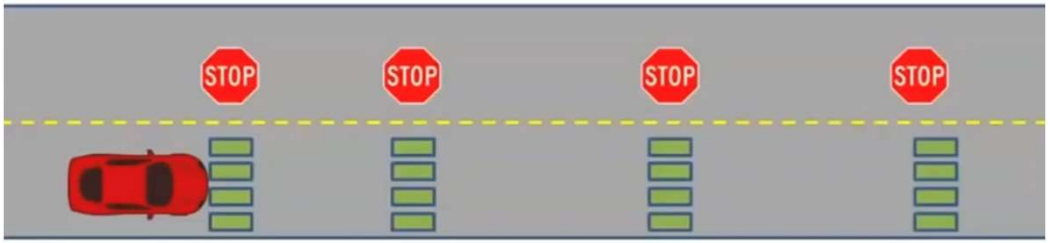
Traditional Heat Pumps



- On/Off nature limits comfort
- Noisy operation

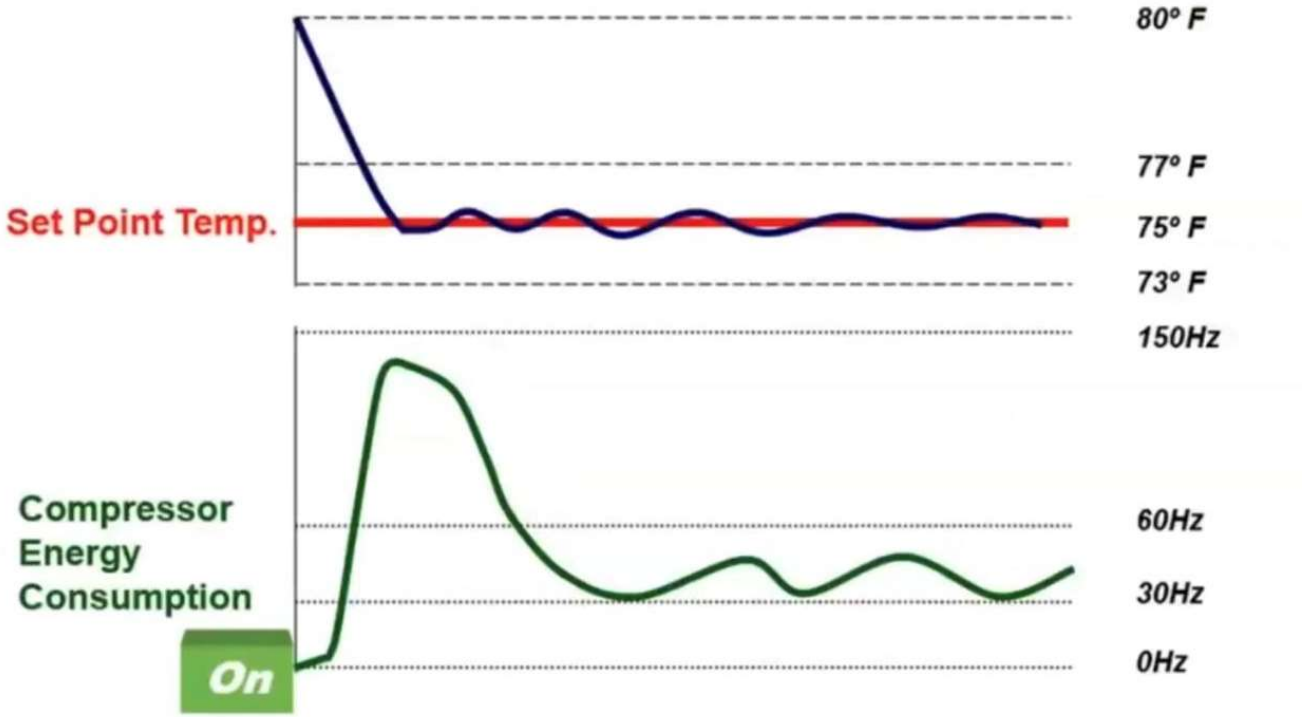
- May require backup heat
- Limited to 1 or 2 stages
- Up to 6 breaker spaces

Is This Efficient?



Start/Stop Driving (w/engine off) = Unitary Compressors

Inverter-Driven Heat Pumps



- Converts Single Phase AC to DC, backconverts to 3-phase AC

Focus on Envelope (Example: Buried Ductwork)

Example: Calculating the Duct Gain

- Square footage of the home X 0.4
- T/D of the attic and the cold air in duct 125-55=70 degrees
- Determine the R-value of the ductwork

$$Duct\ Gain = \frac{square\ feet\ \times 0.4\ \times temp.difference}{R - value\ of\ ductwork}$$

EXAMPLE → 1500 sq ft home, 125 degree attic, 55 degrees supply air, R3 insulation

With R-3 ducts: $\frac{1{,}500\ \times 0.4\ \times (125\ -55)}{3} = \frac{42{,}000}{3} = 14{,}000\ BTU\ (1.2\ TONS)\ lost\ to\ the\ hot\ attic$

Buried ductwork (R-30): $\frac{1{,}500\ \times 0.4\ \times (125\ -55)}{30} = \frac{42{,}000}{30} = 1{,}400\ BTU\ (0.1\ TONS)\ lost\ to\ the\ hot\ attic$

That is over one ton of cooling lost to the attic space!

Questions? Stay in Touch!

Join us October 9-11th in Oxnard – FREE SCE HPWH Training!
Attendees get a FREE Heat Pump Water Heater!

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SCAN ME

Larry Waters | 707-840-3411 | www.electrifymyhome.com | info@electrifymyhome.com

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- Continuing Education Units Available
  - Contact ian.logan@ventura.org for AIA & ICC LUs
- Coming to Your Inbox Soon!
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- Upcoming Courses
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  - 9/12 All-Electric ADU's
  - 9/19 Ventilation and Heat Recovery Ventilators
  - 9/30 Passive Design/Build Boot Camp – San Luis Obispo @ People's Self Help Housing
  - 10/3 Building Tour of Four All-electric Buildings – San Luis Obispo
- For more information about upcoming events please visit: https://www.3c-ren.org/events

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

Thank you!

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