We will be starting soon!

Thanks for joining us

Good Electrification for Solar Contractors: New Business Opportunities

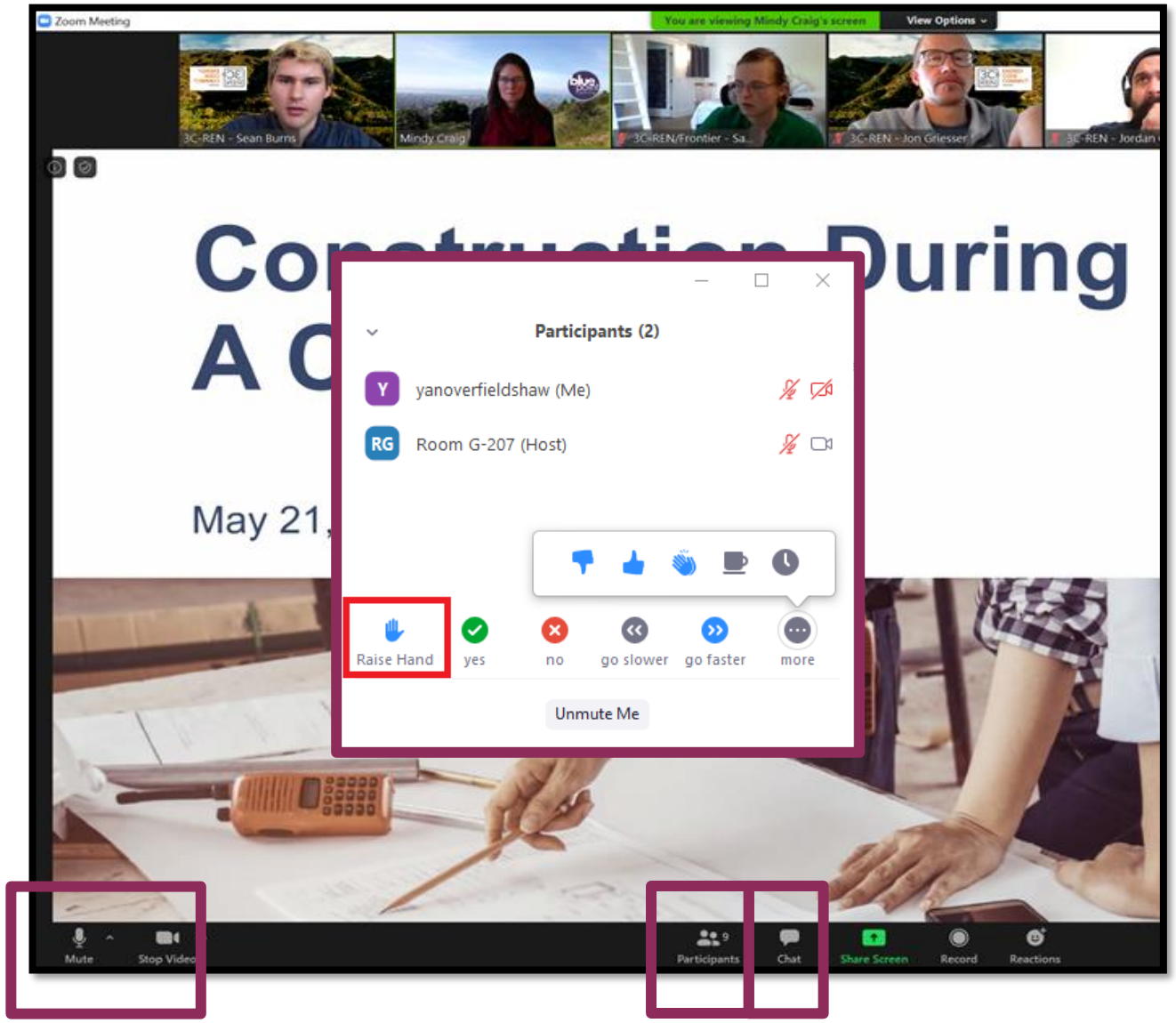
Larry Waters, Electrify My Home

Alex Sloan, Electrify My Home

June 6th, 2023

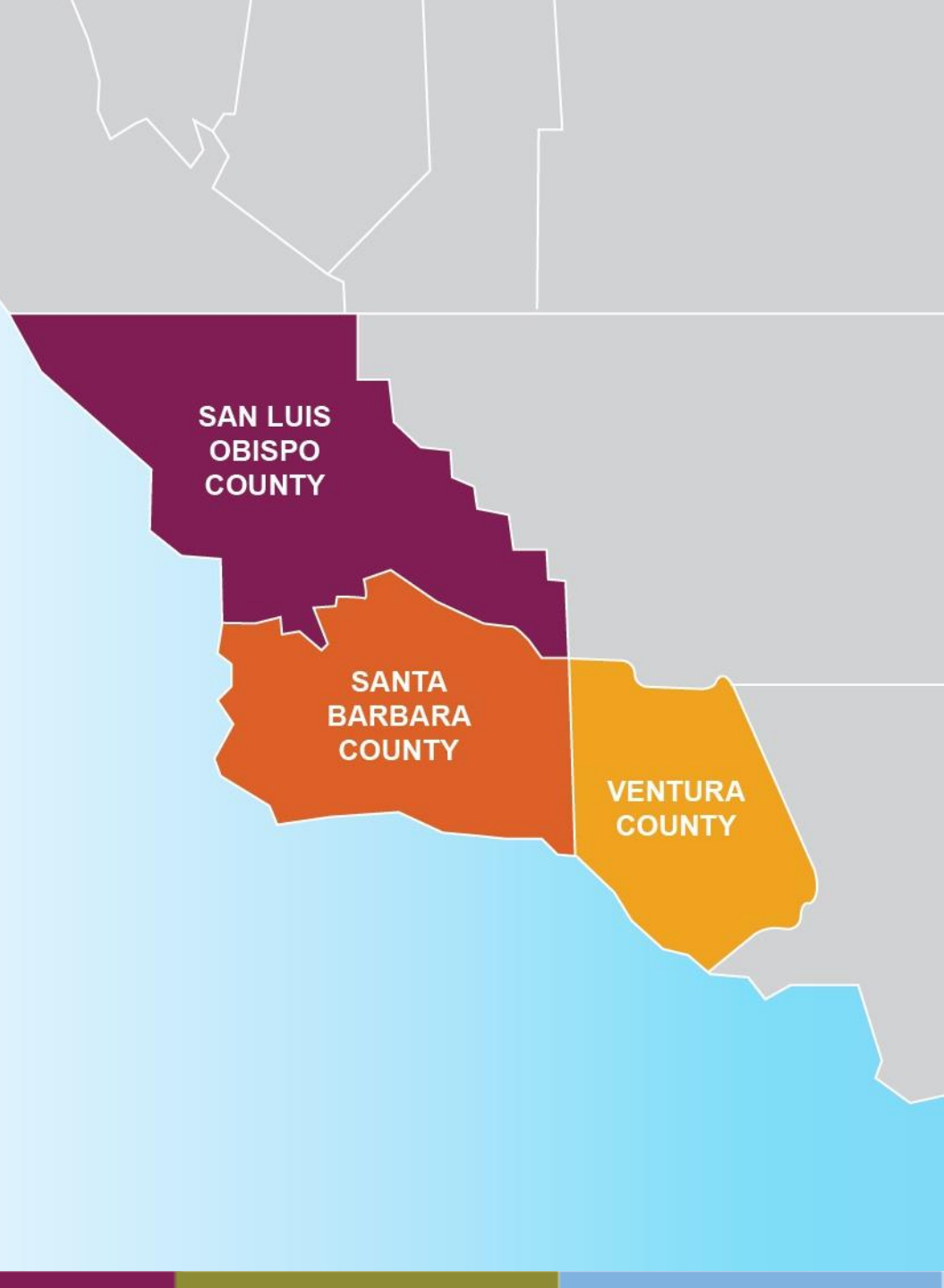
Zoom Orientation

- Please be sure your full name is displayed (for our reporting)
- 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 Programs

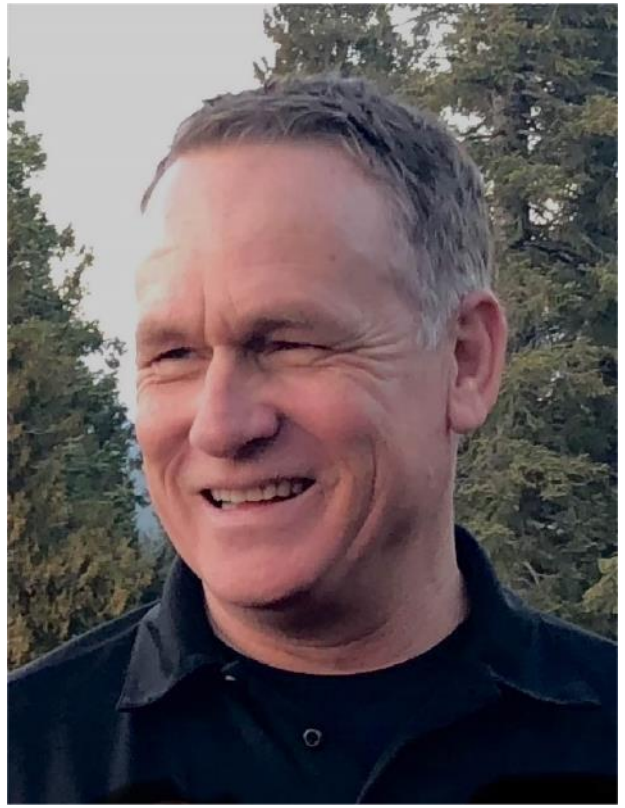
- Energy Code Connect (ECC)
  - Industry Trainings and Regional Forums
  - Energy Code Coach: Title 24 Compliance Support Hotline (805) 220-9991
- Building Performance Training (BPT)
  - Industry Trainings & Certification for current and perspective building professionals
  - Helps workers thrive in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

About Larry Waters

- HVAC trade from UTI in 1982
- In the trade before the first cordless drill

- Nate certified
- 2009/ 2010 BPI certification
- Installing only heat pumps since 2015

- Founded Electrify My Home in 2020



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

Agenda

- Introductions
- Electrification Backdrop
- The Business Case for Solar Contractors
- Introduction to Good Electrification

Electrification Backdrop


TOTAL ELECTRIC
GOLD MEDALLION HOME
LIVE BETTER ELECTRICALLY
AWARD
LIVE BETTER ELECTRICALLY
GOLD MEDALLION HOME
LIVE BETTER ELECTRICALLY
TOTAL ELECTRIC
GOLD MEDALLION HOME
LIVE BETTER ELECTRICALLY
AWARD
MEDALLION HOME
LIVE BETTER ELECTRICALLY
MEDALLION HOME
LIVE BETTER ELECTRICALLY
LIVE BETTER ELECTRICALLY
LIVE BETTER ELECTRICALLY
OPEN HOUSE
EQUIPPED BY GENERAL ELECTRIC
PARADE OF HOMES
BETTER LIVING BEGINS WHEN YOU OWN A NEW HOME
PARADE OF HOMES
BETTER LIVING BEGINS WHEN YOU OWN A NEW HOME
LIVE BETTER ELECTRICALLY
GET FULL HOUSEPOWER
LIVE BETTER ELECTRICALLY
GOLD MEDALLION HOME
LIVE BETTER ELECTRICALLY
PUSH POWER
Live Better, Electrically – 1956
LIVE BETTER ELECTRICALLY
LIVE BETTER ELECTRICALLY
There's No Match for Total Electric Living!
You can't beat FLAMELESS ELECTRIC HEAT
GOLD MEDALLION HOME
LIVE BETTER ELECTRICALLY
Olympic DOOR KNOCKER
Featuring FAMILY NAME OR APARTMENT NUMBER
SECURITY VIEWER can be Added
IMPORTANT
LIGHTED
LONG-LIFE BULB
TRINE
LIVE THE CAREFREE · ELECTRIC WAY ·
MEDALLION HOME
LIVE BETTER ELECTRICALLY

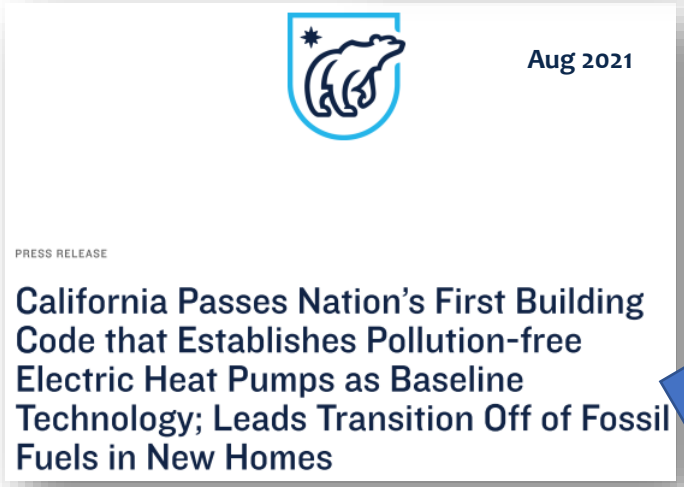
Policies & Decisions Leading to This Point
Primary Drivers = Health, Air Quality, Climate Change

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



Code Prioritizing Heat Pumps

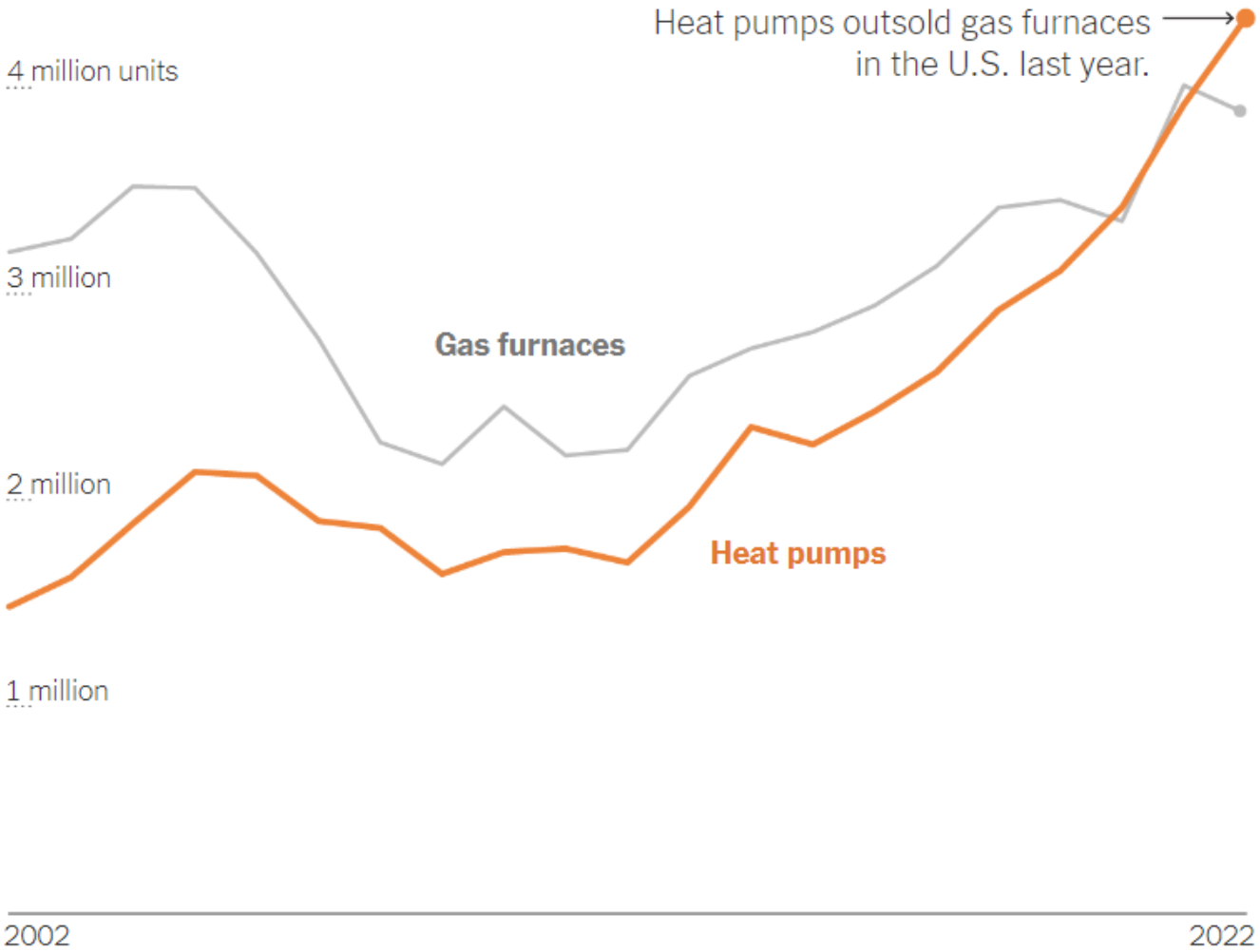
Plans Signaling Demise of Furnaces

77 CA Cities Have Adopted Building Codes to Phase-Out Gas in Buildings

Image Source: Sierra Club

Confidential – do not duplicate or distribute without written pe

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

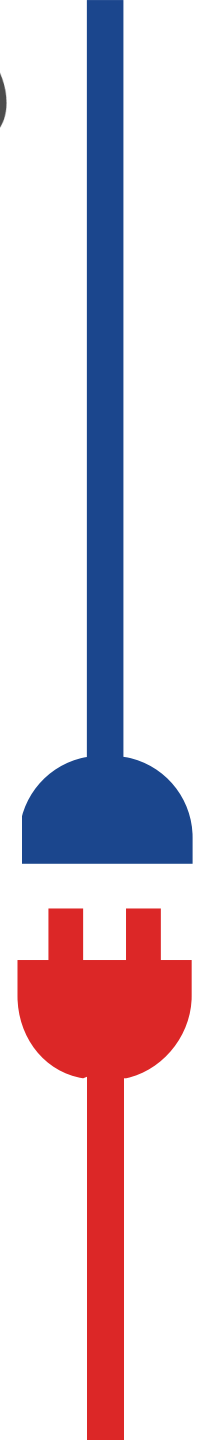
– Jon Wellinghoff, Former FERC Chairman

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 Solar Contractors

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]

12 Million

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

93% of single-family homes have gas DHW [4]

11.7 Million

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

85% of single-family use gas [4]

3.4 Million

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

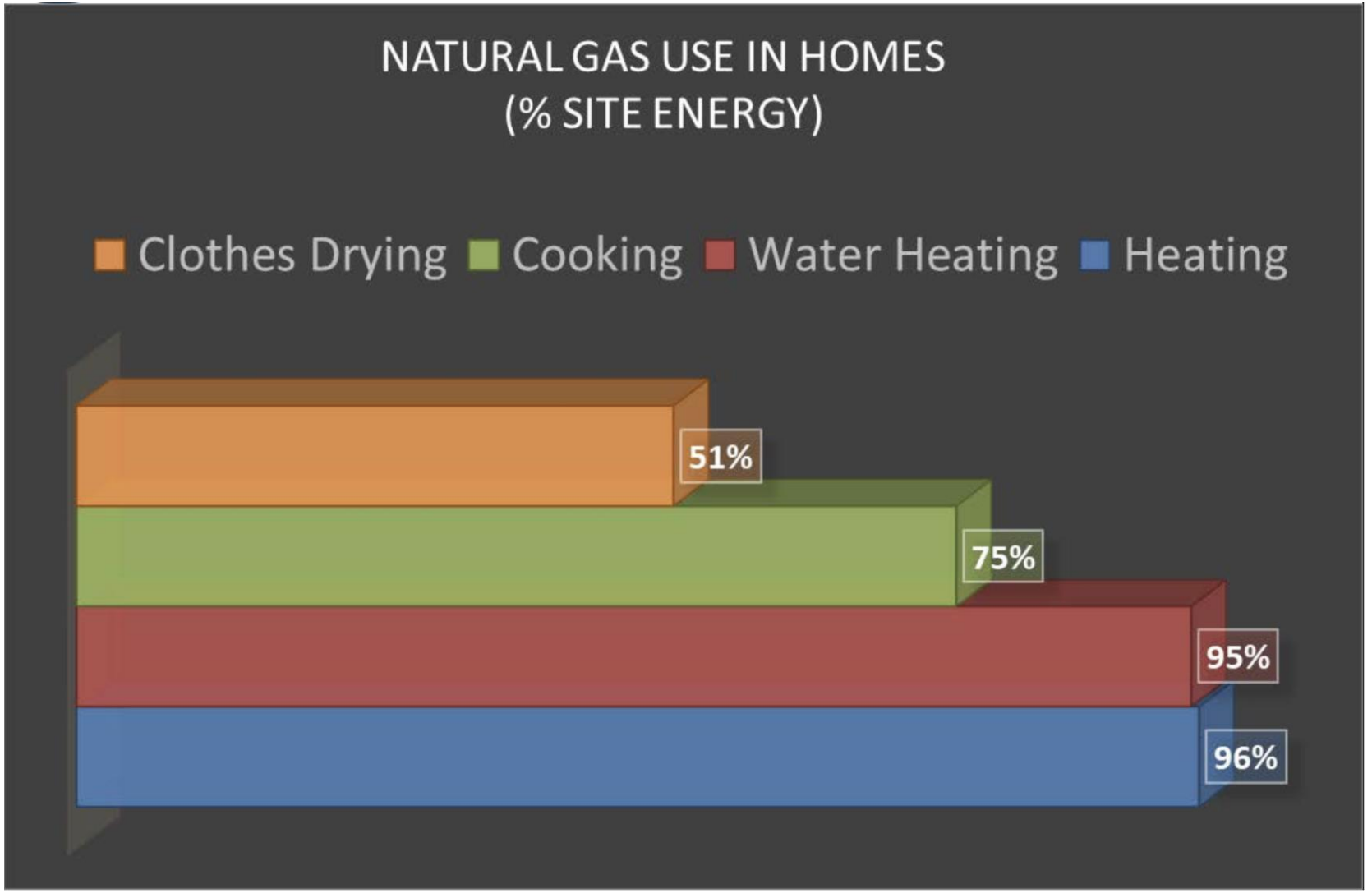
[1] Decarbonization of Heating Energy Use in California Buildings. Synapse Energy Economics, Inc. 2018.

[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

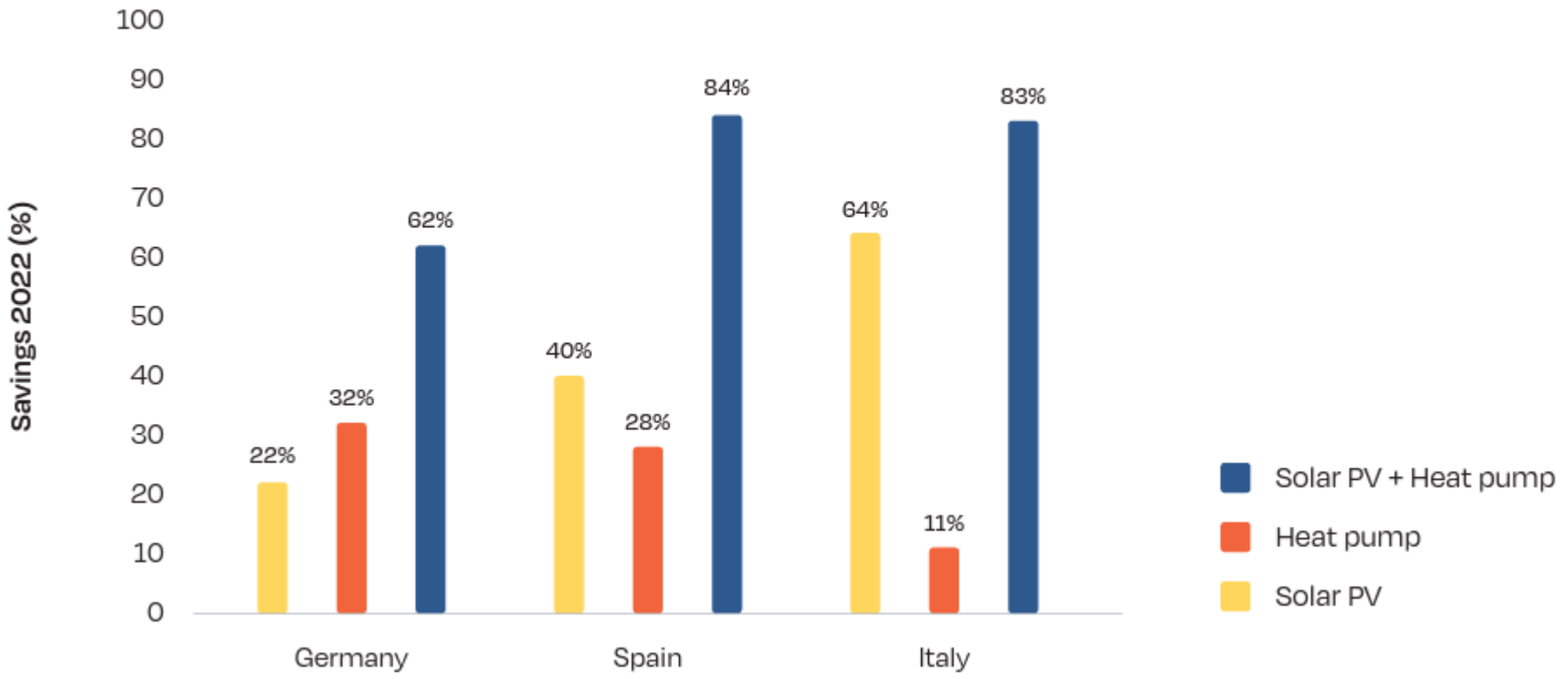
[4] 2019 California Residential Appliance Saturation Study (RASS) . DNV-GL/CEC. 2021

Natural Gas Breakdown in California



Solar & Electrification = Match Made in Heaven

FIGURE 5 ANNUAL ENERGY BILL SAVINGS IN % FOR HOUSEHOLDS WITH DIFFERENT POWER & HEATING TECHNOLOGIES IN GERMANY, SPAIN, ITALY IN 2022



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

ELECTRIFY MY HOME

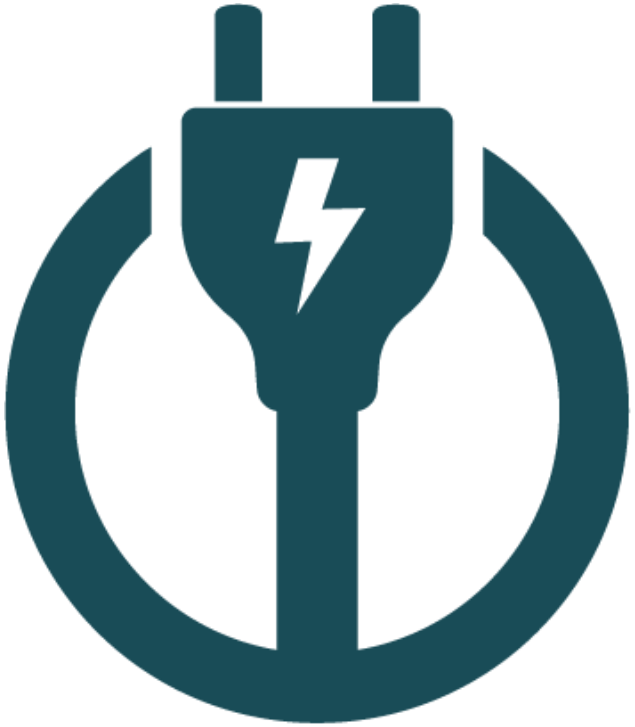
Restart Customer Relationships

- Solar contractors have spent $$$ on marketing. 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

Electric Appliances Can Be Offset By Solar

I am awesome!

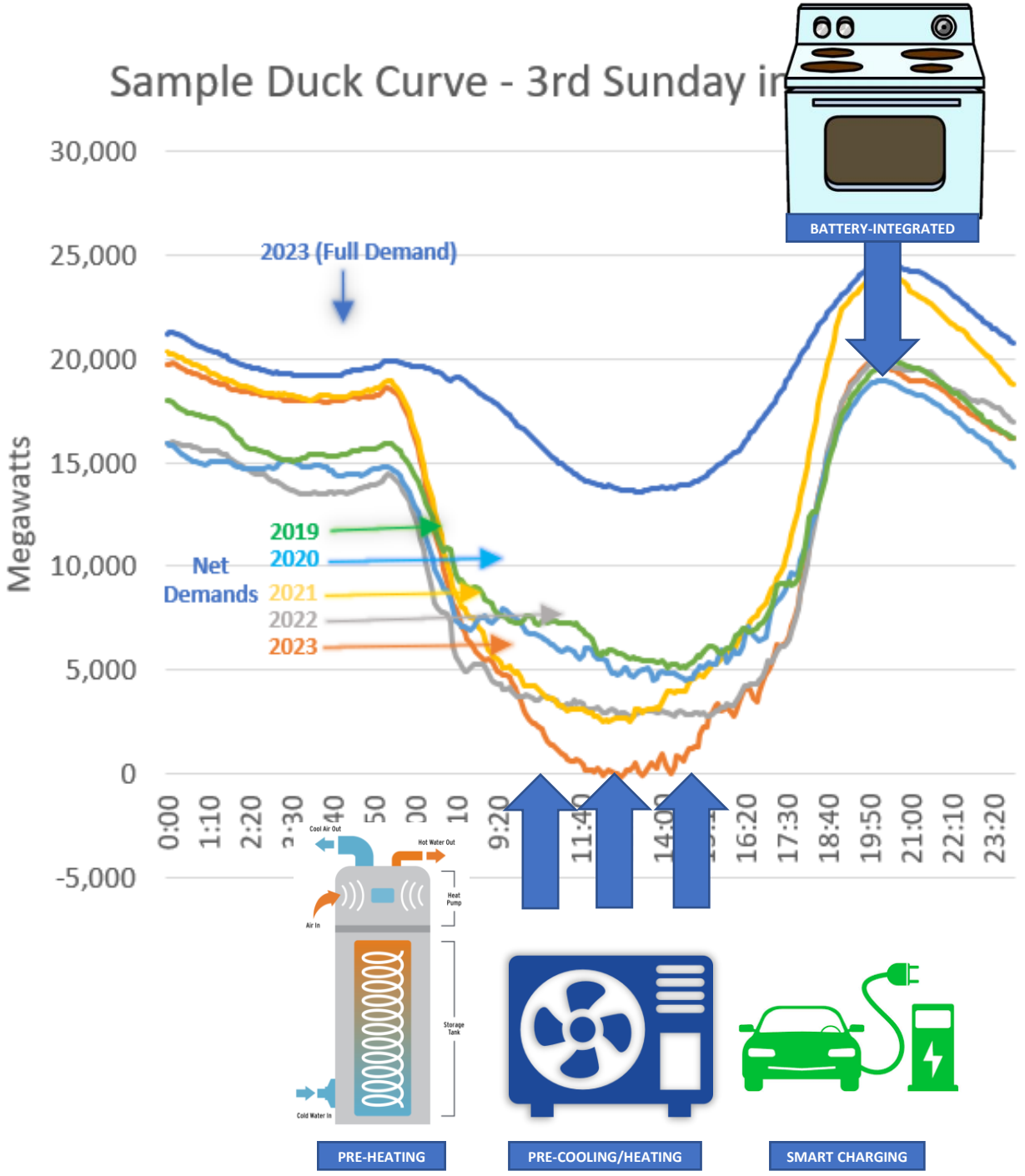
...so are we!

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

ELECTRIFY MY HOME

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

ELECTRIFY
MY HOME

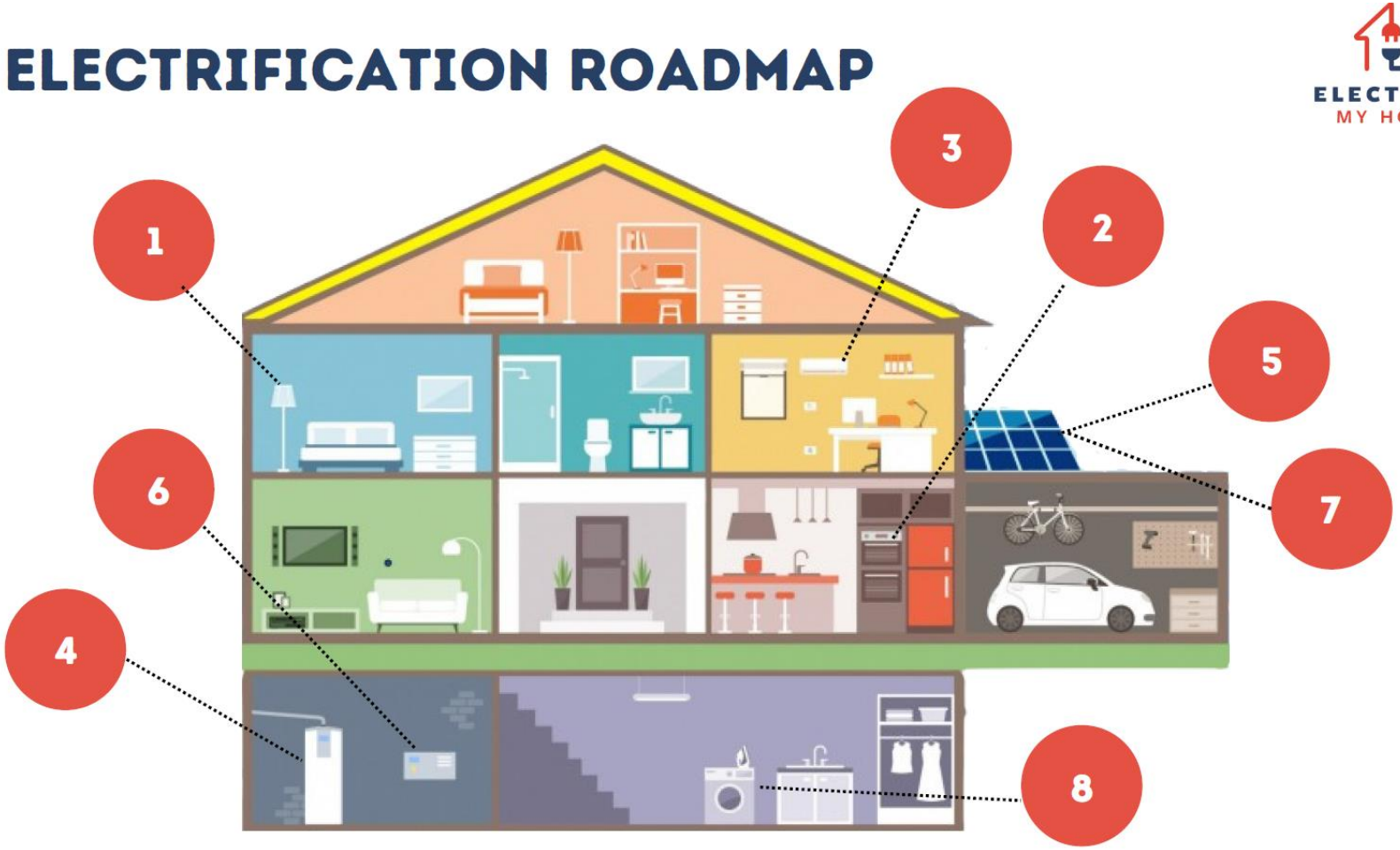
New Electrification Service Ideas
(Worth At Least The Price of Admission)

- 1) Electrification Roadmapping
- 2) Safety Assessments
- 3) Panel Assessments
- 4) Pre-wiring
- 5) Cross-selling & referring to a C-20
- 6) 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

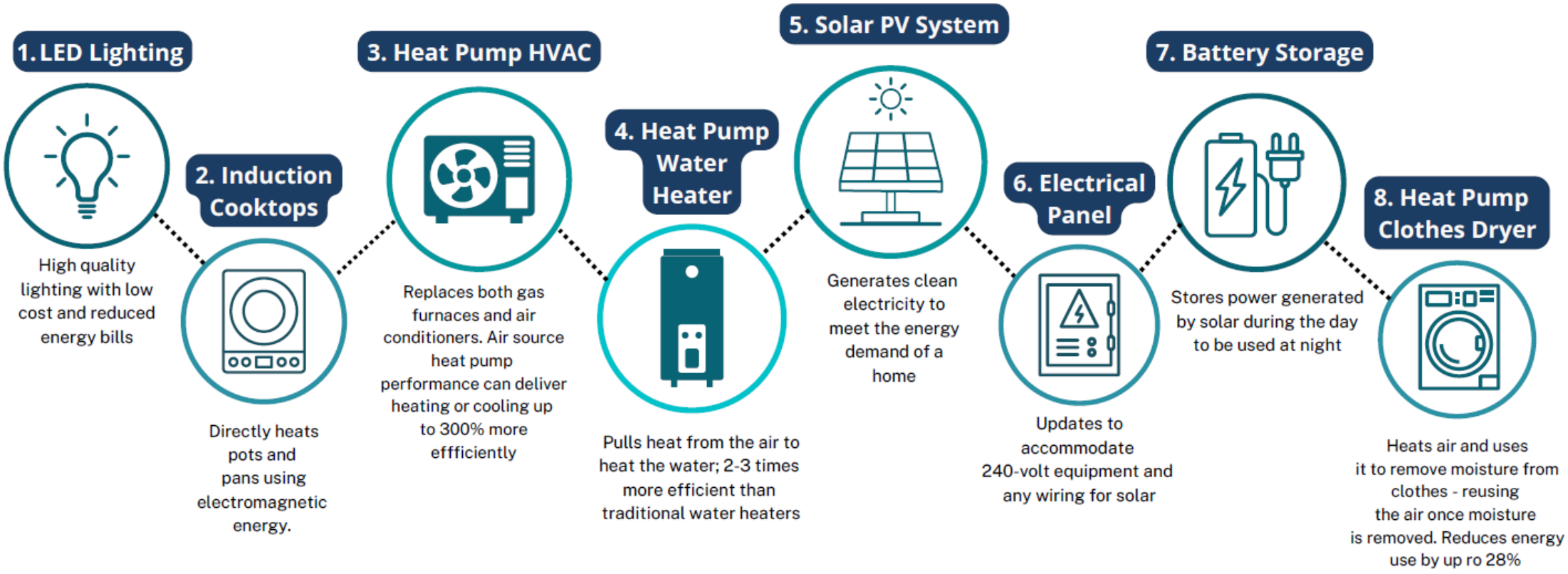
#1 (Roadmap): Graphic Representation



Graphic prepared for Electrify My Home by UC Davis Zero Net Energy students

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

Hint: Incentives Help!



TIMELINE:	Mar. 2023	Jun. 2023	Oct. 2023	Oct. 2023	Oct. 2024	Oct. 2024	Oct. 2024	Jan. 2025
COST:	$250	$2,800	$19,500	$7,800	$19,150	$5,300	$18,300	$850

ELECTRIFY MY HOME

#2 – Safety Assessments

- Get BPI or NGAT Certified
- Assess for:
  - Carbon Monoxide
  - Gas Leaks
  - Pressure Problems
- May impact the electrification plan

ELECTRIFY
MY HOME

#2 – Safety Assessments

- Asbestos
- Mold/Organic Growth
- Rodents
- Wiring Hazards
- Ventilation Issues

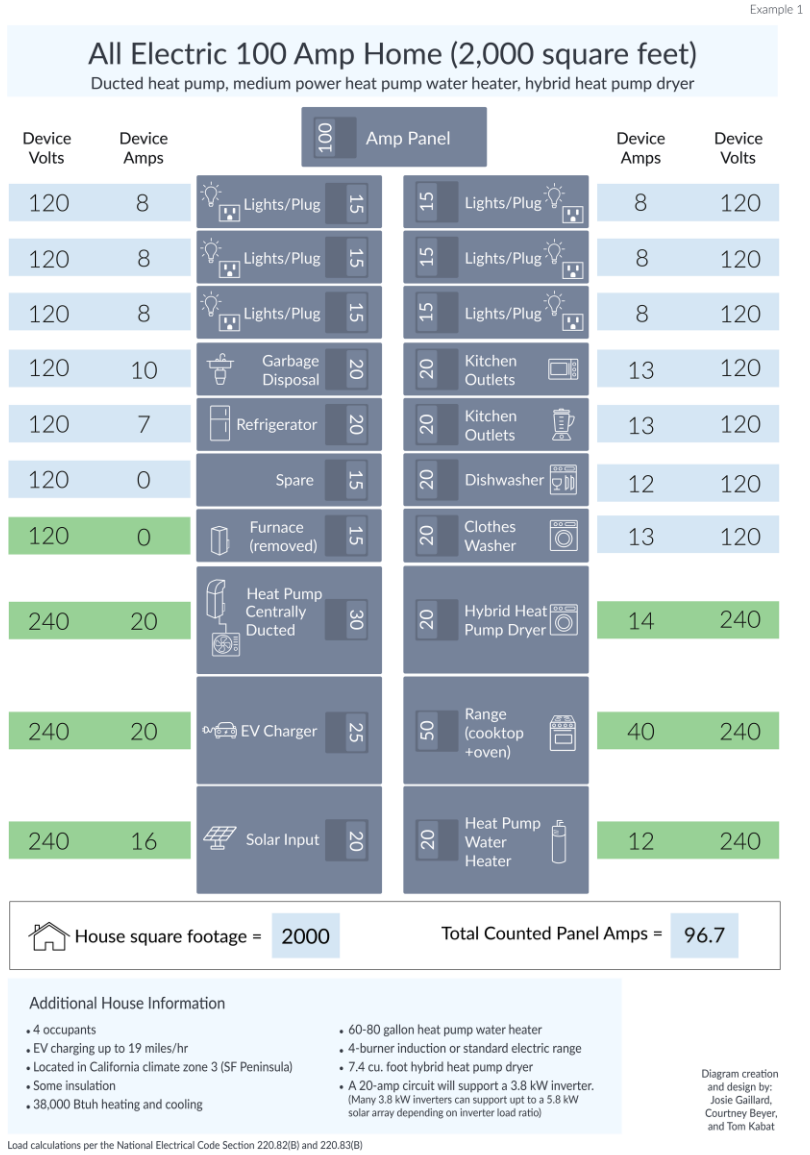
#3 – Electrical Panel Assessments

Checklist Items:

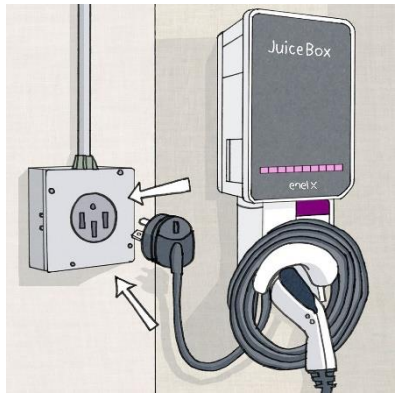
- What additional electrification is left
- Incoming Service Level
- Main panel rated amps
- Panel age
- Evidence of burning/arcing?
- Is there space (physical & capacity)?
  - Perform an NEC load calculation

Outcomes of This Exercise:

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



ELECTRIFY MY HOME



#4 – 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

#5 – Referral or In-House HVAC

- 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

#6 – 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

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

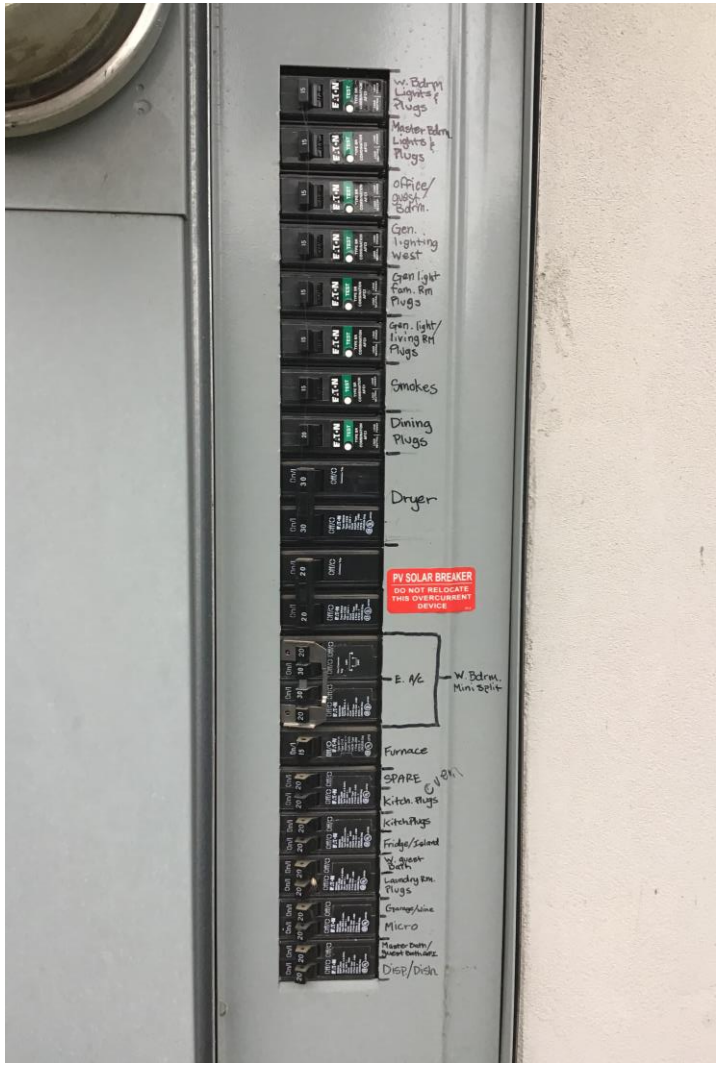
“Good Electrification”
Starts with Being a Good Steward Of the Electrical Panel

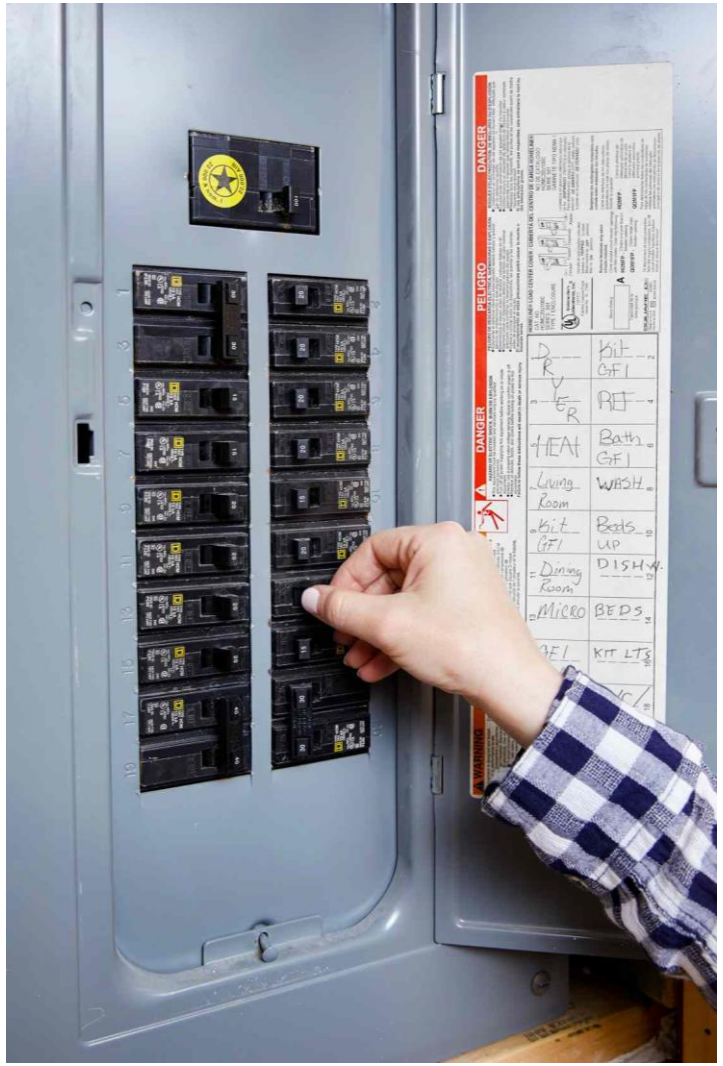
- Steward is: One who directs the affairs in best way possible
- Always most efficient solution!
- Each homeowner’s journey is unique
- Avoid panel changes until necessary
- Take all future loads in a consideration

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



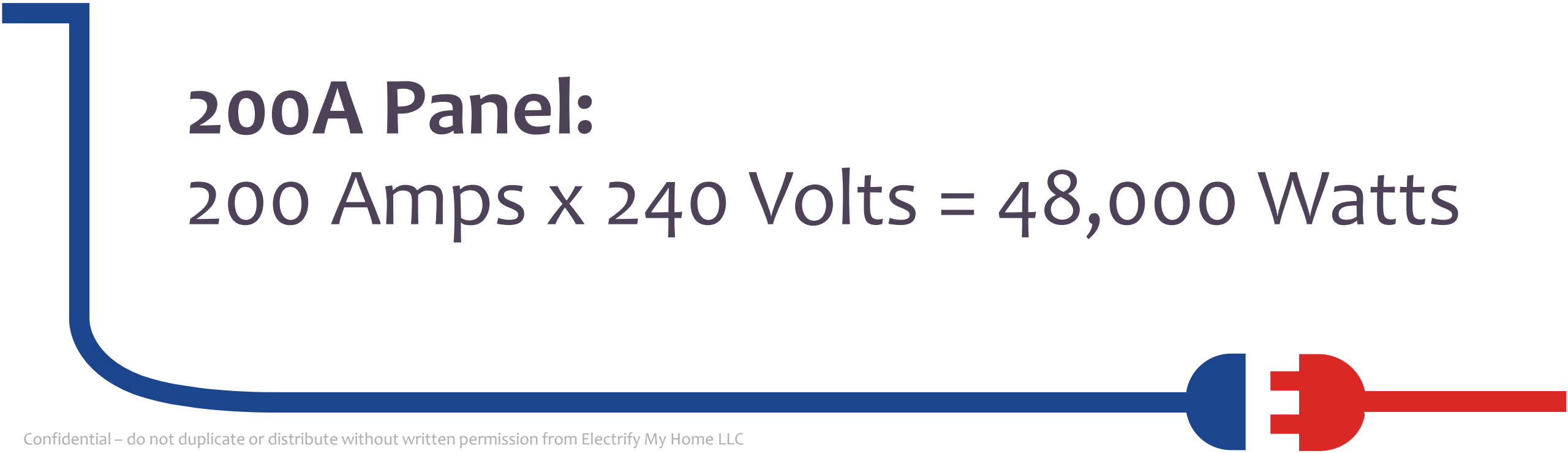


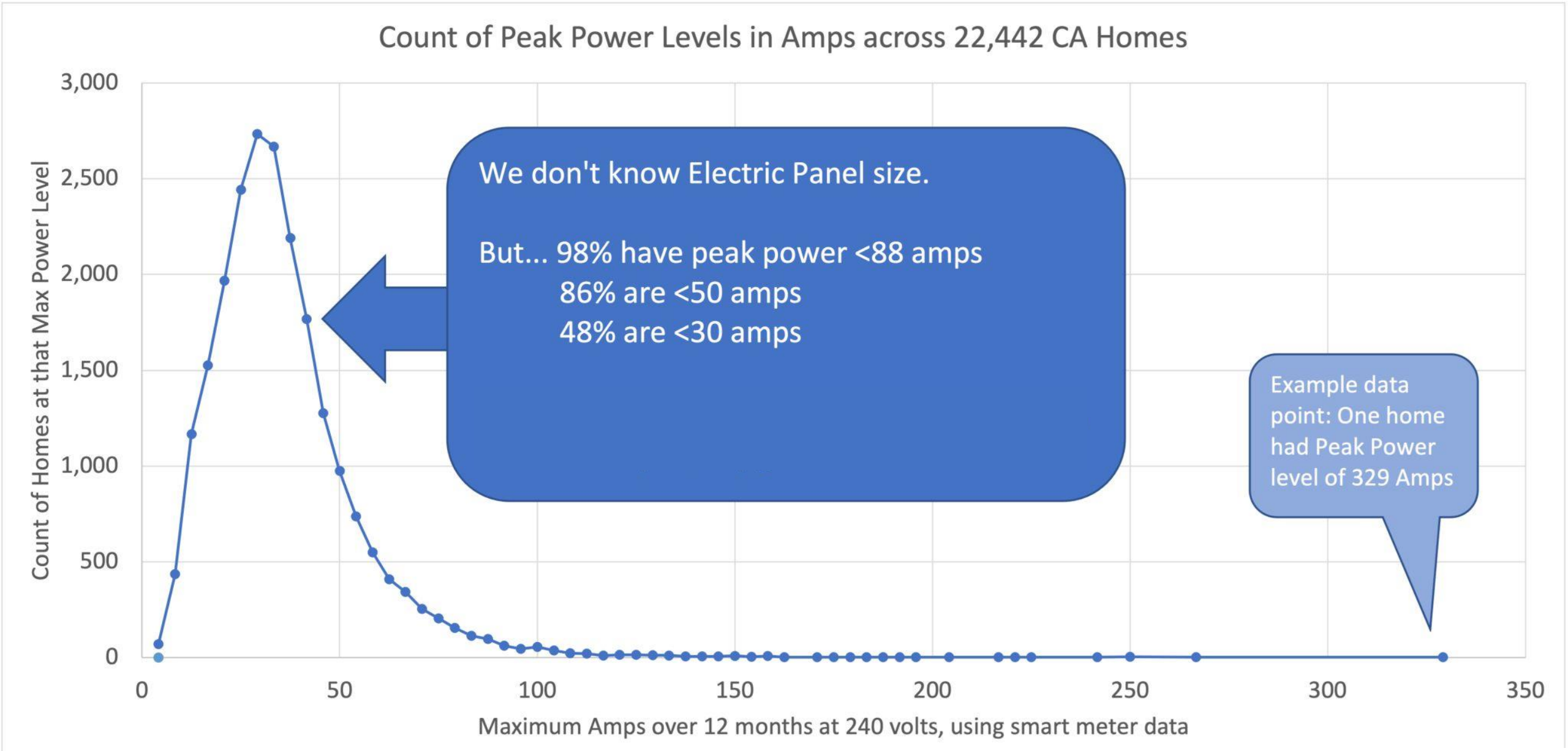
Are these panels full?

Full Panel ≠ No Remaining Capacity

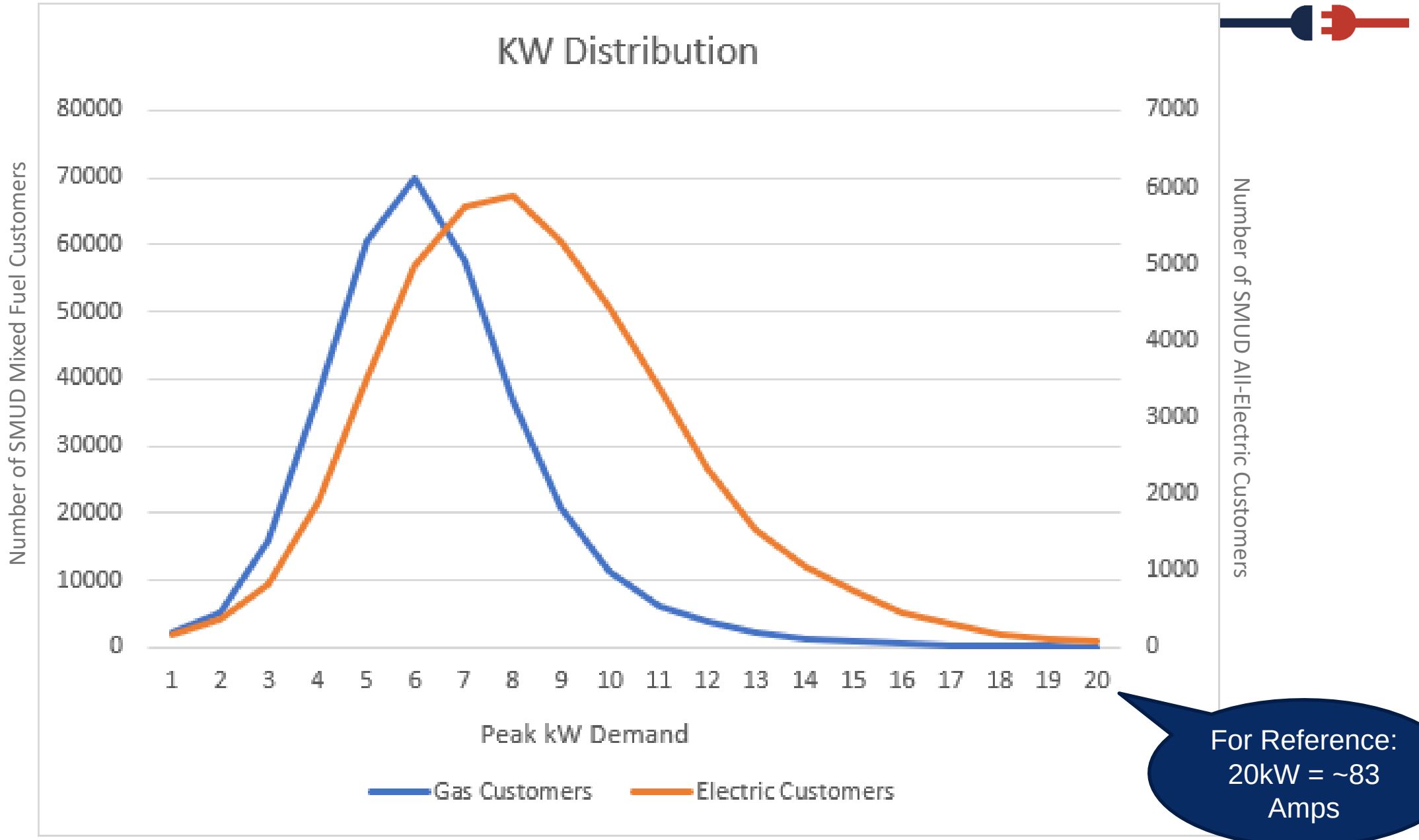
100A Panel:
100 Amps x 240 Volts = 24,000 Watts

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





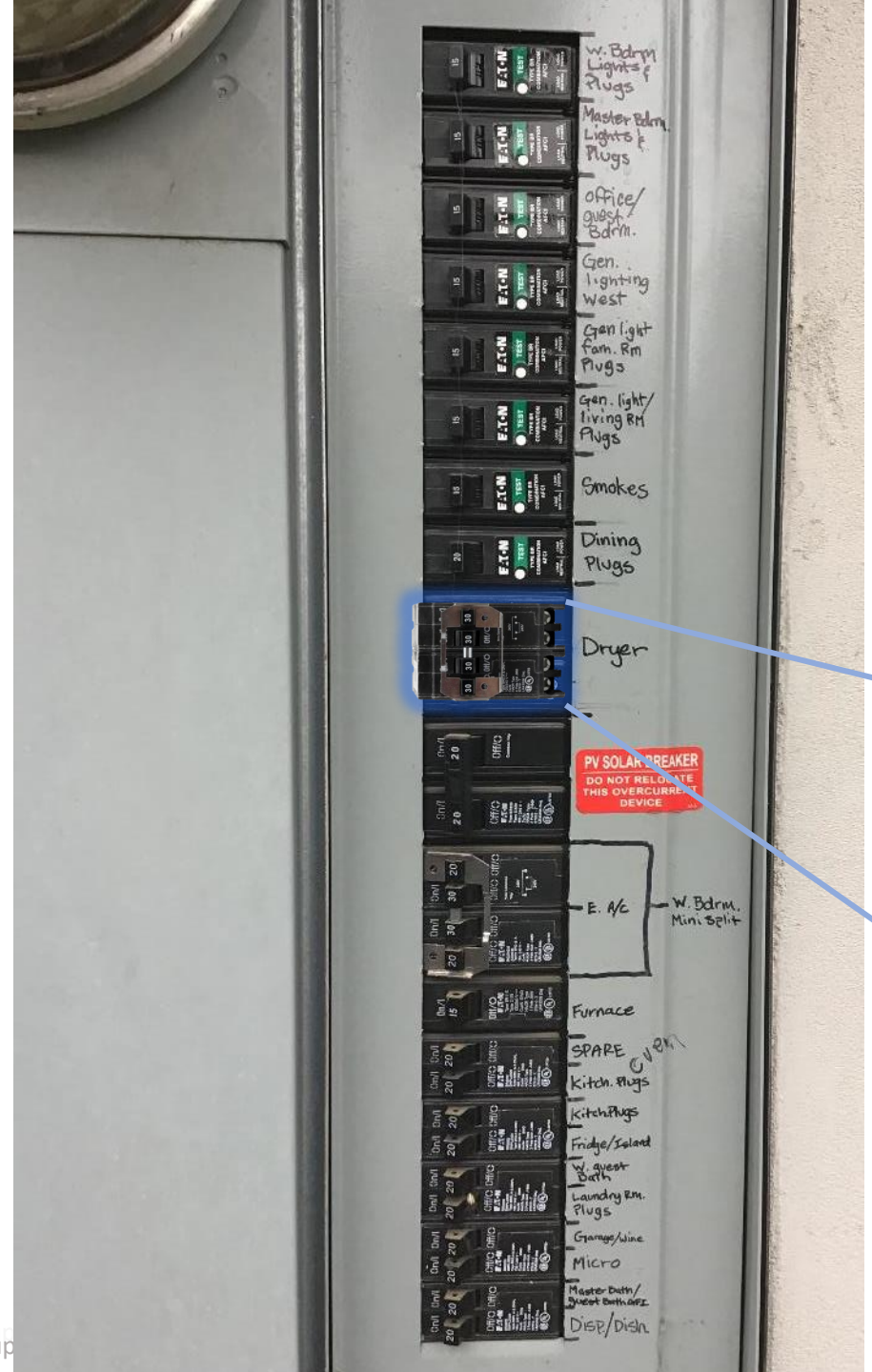
Source: Home Energy Analytics (HEA), PG&E HomeIntel service single family user data



For Reference: 20kW = ~83 Amps

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

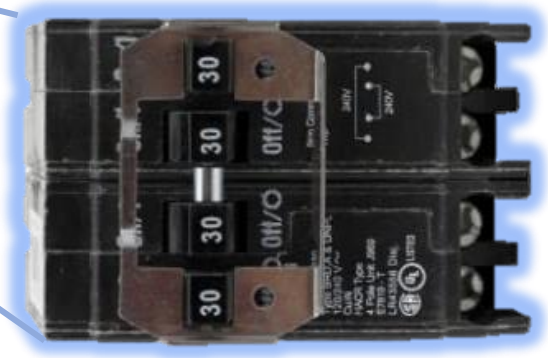
ELECTRIFY MY HOME



Solutions to "Full" Panels

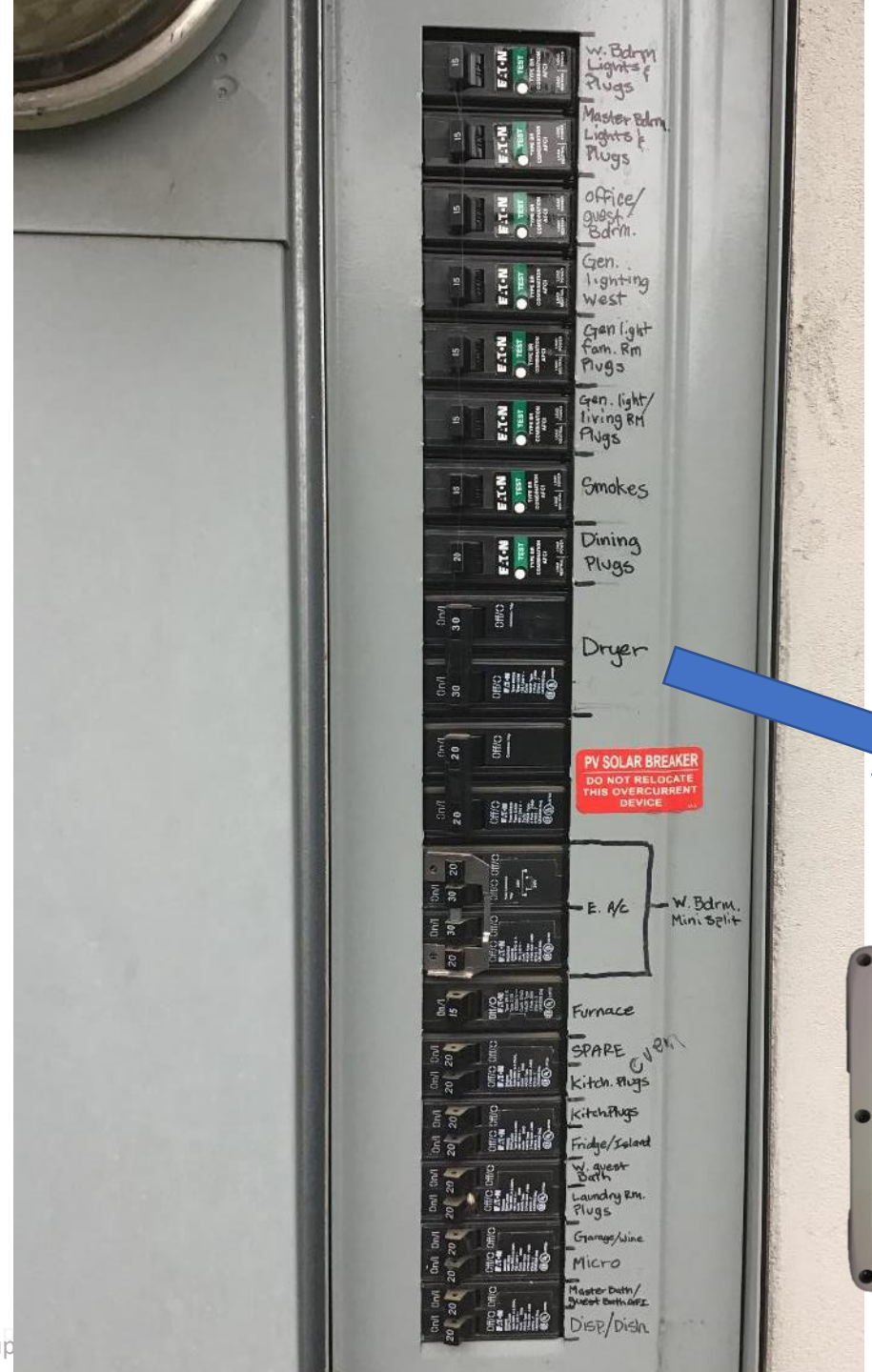
Task: Add a HPWH Circuit

- Option 1: Quad it out!



Confidential – do not dup

ELECTRIFY MY HOME

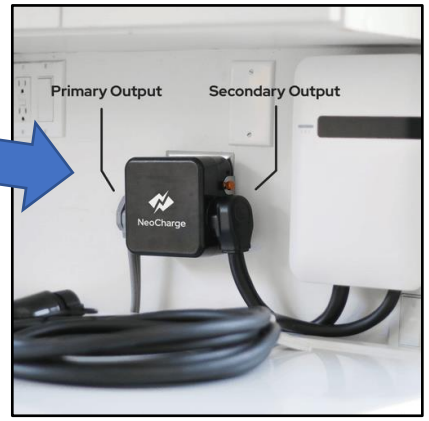


Solutions to “Full” Panels

Task: Add a HPWH Circuit

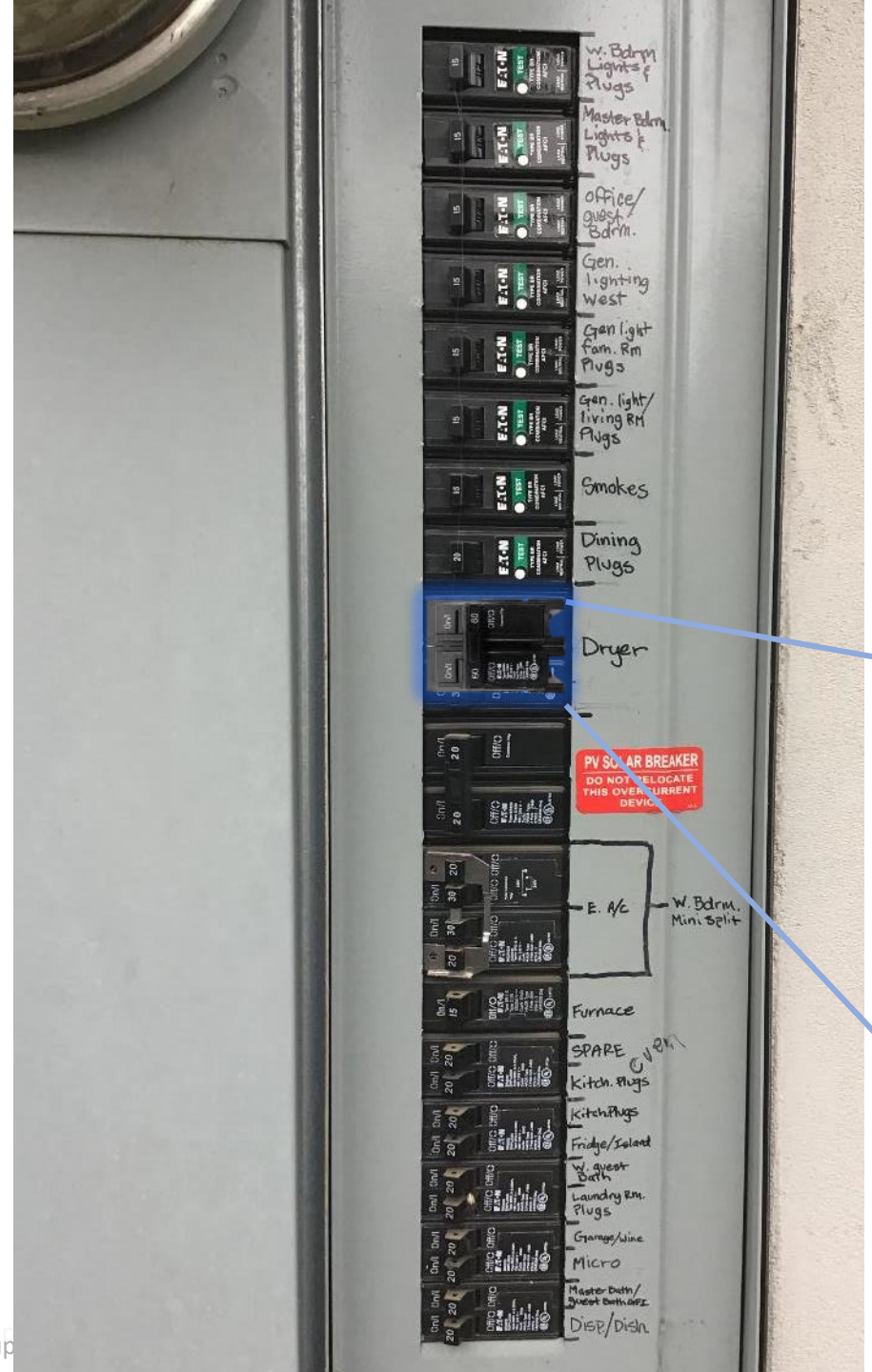
- Option 2: Circuit Splitter!

+



Confidential – do not dup

ELECTRIFY MY HOME



Solutions to "Full" Panels

Task: Add a HPWH Circuit & a Couple More

- Option 3: Add a Subpanel

- Tip – add the neutral!

Confidential – do not dup

ELECTRIFY
MY HOME

Solutions to “Full” Panels

Task: Add a HPWH Circuit

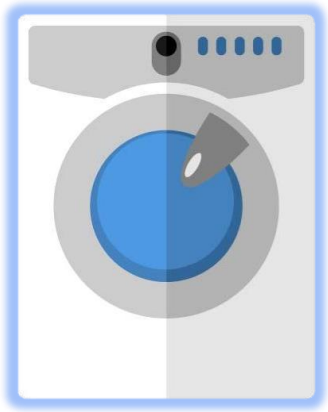
(and much more)

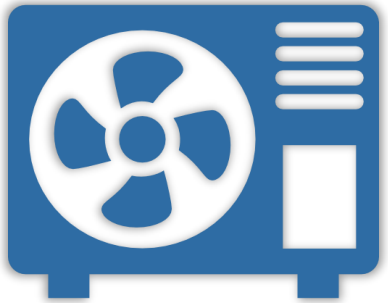
- Option 4: Smart Panel

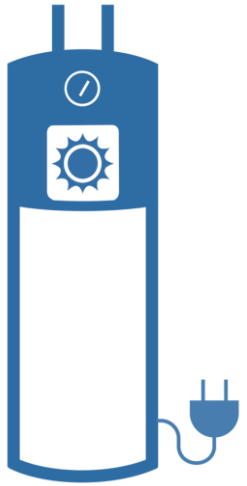
Sub Circuit Energy Monitoring

- Pinpoint energy utilization
- Several options available

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

Common Residential Heat Pump Technologies

Unitary On/Off

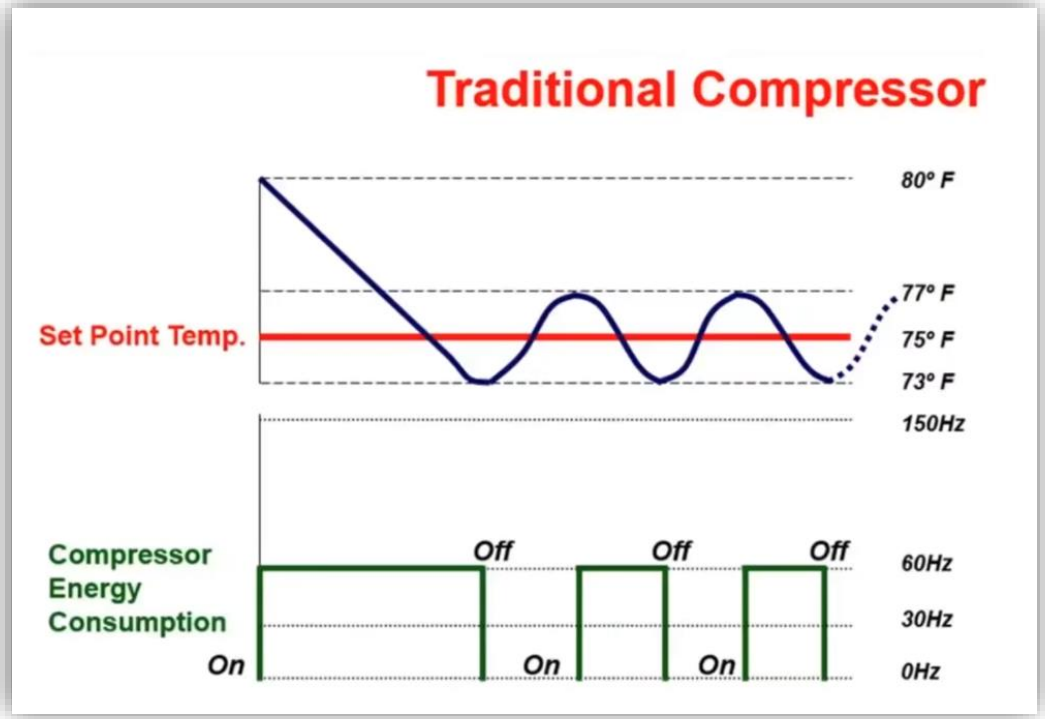
- Traditional heat pump solution
- 1 to 2 stages
- Base efficiencies (up to 6 breakers!)
- Loss of performance at lower temps

Inverter/Modulation

- Mini split
- Ductless and ducted
- Multi-zone

ELECTRIFY MY HOME

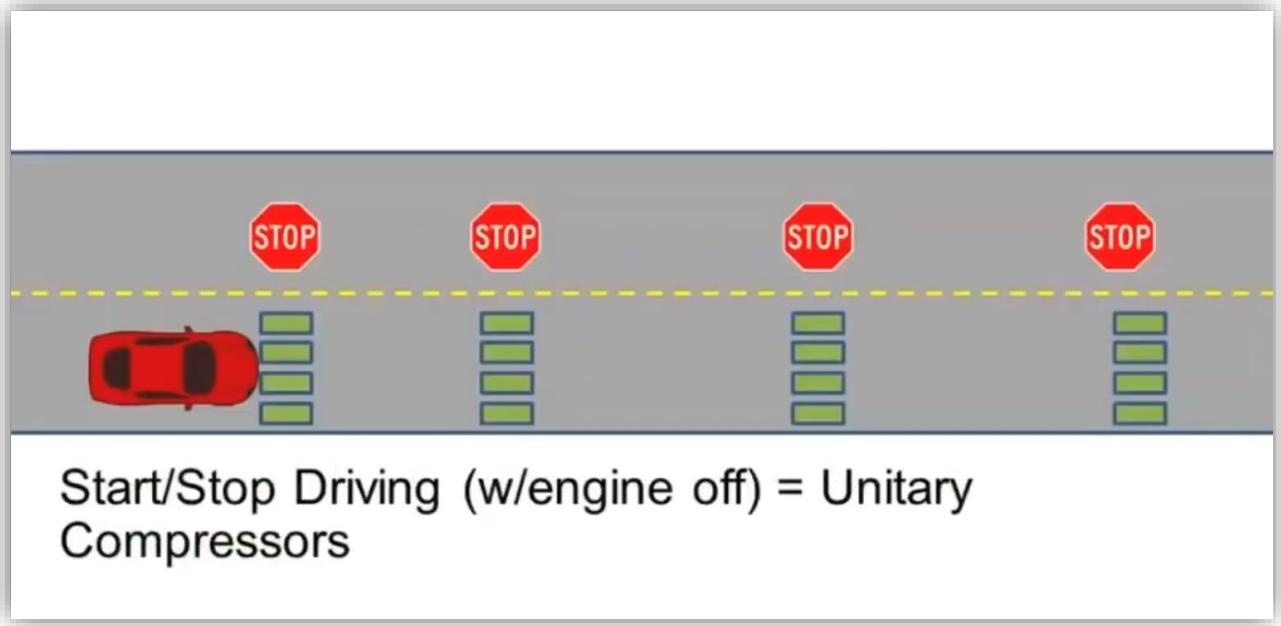
Traditional Heat Pumps



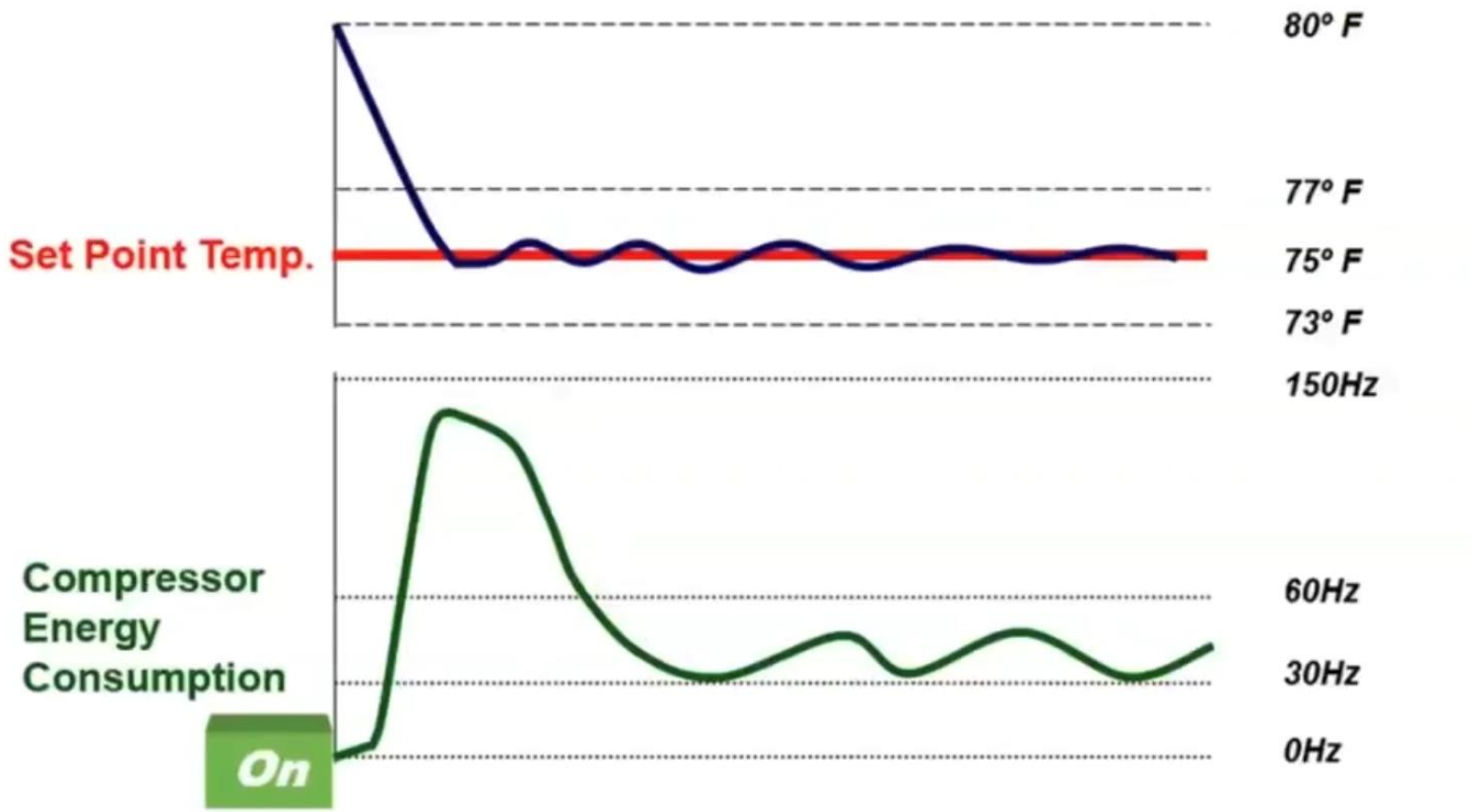
- On/Off nature limits comfort
- Noisy operation

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

Is This Efficient?

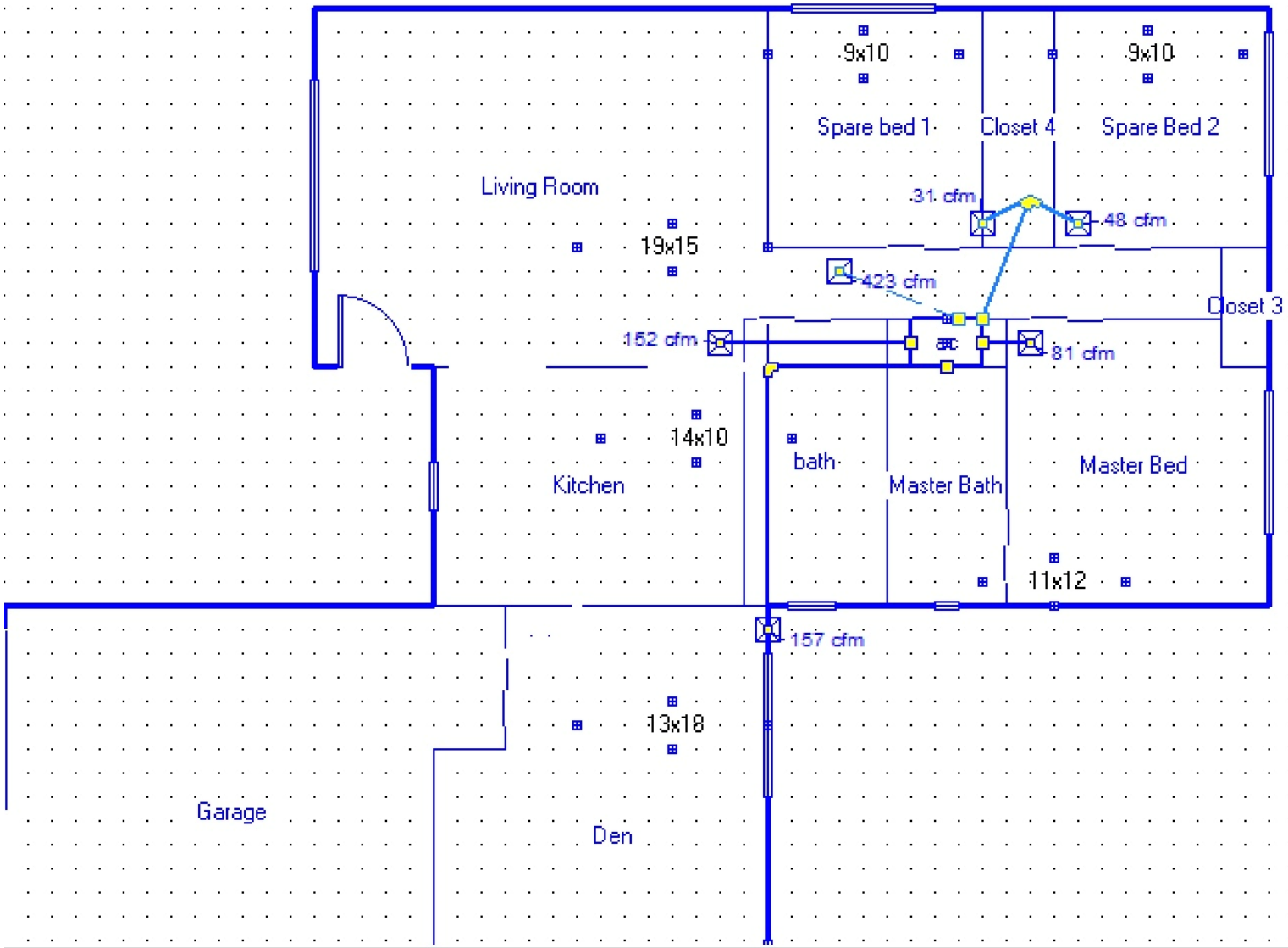


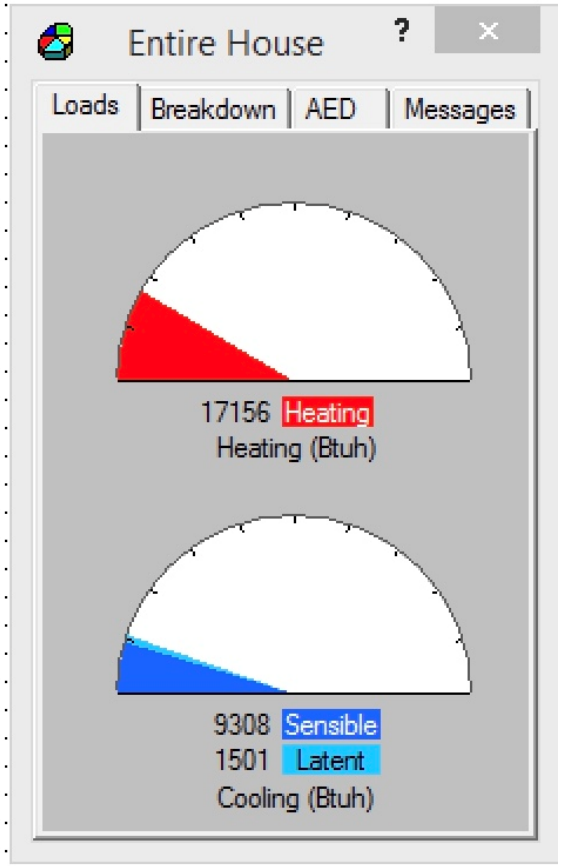
Inverter-Driven Heat Pumps



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

HVAC Load Calculations are Key





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?

ELECTRIFY
MY HOME

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

Closing

- AIA Learning units
  - Contact Ian.logan@ventura.org for AIA LUs
- Coming to Your Inbox Soon!
  - Slides, Recording, & Survey
- Other 3C-REN resources you should be aware of:
  - All other upcoming events: www.3c-ren.org/events
  - Free energy code technical support: www.3c-ren.org/code
  - Incentive program for enrolled contractors: www.3c-ren.org/contractor-participation

Thank you!

For more info:
3c-ren.org

For questions:
info@3c-ren.org
or
Ian.Logan@ventura.org

TRI-COUNTY REGIONAL ENERGY NETWORK
SAN LUIS OBISPO • SANTA BARBARA • VENTURA