



We will be starting soon!

Thanks for joining us



Home Electrification Planning Class 3: Developing an Electrification Plan



Josie Gaillard & Tom Kabat

September 5, 2023





HOME ELECTRIFICATION PLANNING SERIES

Learn how to develop customized home electrification plans for customers or your own home!

Home Electrification Planning Classes

Aug 22 Class 1: Electrification Planning: Soup to Nuts

- What is an electrification plan
- Importance of electrification planning
- Methods for calculating heating load

Aug 29 Class 2: Electrical Panel Optimization

- How to calculate existing electrical load
- Incorporate planned electrification upgrades
- Optimize existing electrical panel capacity

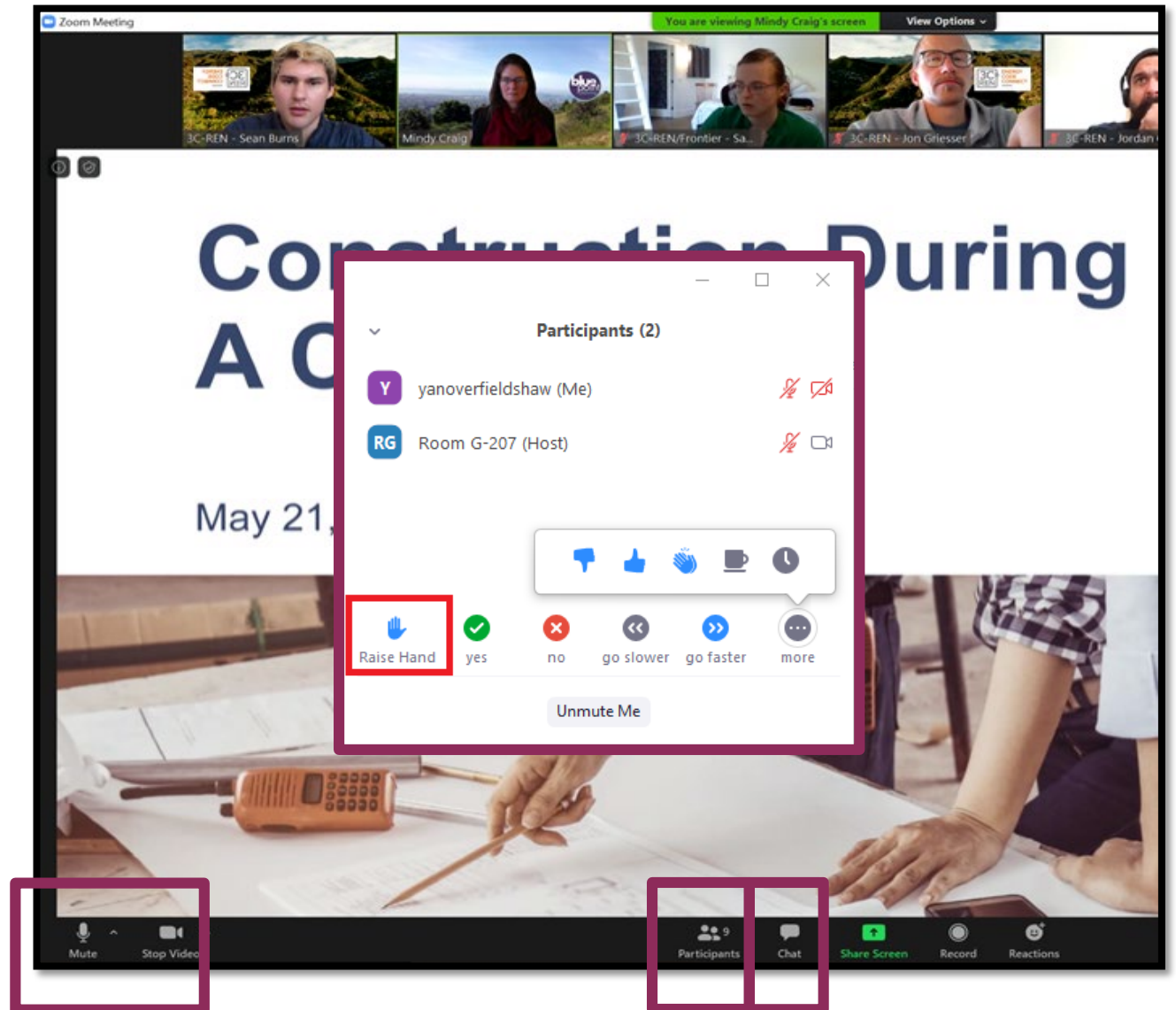
Today Class 3: Developing an Electrification Plan

- Selecting proper type, sizing, and location for new equipment
- Essential components of an electrification plan
- Setting the homeowner and contractors up for success



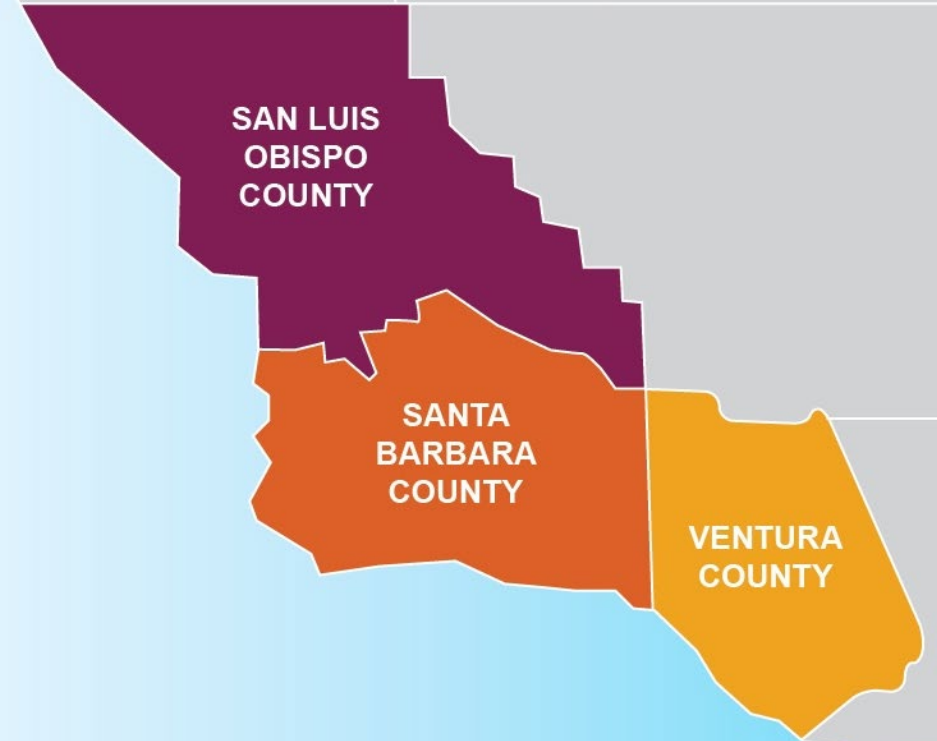
Zoom Orientation

- 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





ENERGY
CODE
CONNECT



BUILDING
PERFORMANCE
TRAINING



HOME
ENERGY
SAVINGS



Topics Already Covered

- ✓ Importance of an Electrification Plan
- ✓ Data gathering
- ✓ HVAC load calculations
- ✓ Electrical load calculations
- ✓ Electrical panel optimization (to avoid service line upsizing)



Agenda for Today

1. Equipment selection
2. Assembling the plan
3. Tool for creating plans
4. Sample costs
5. Working with contractors





Equipment Selection



Where to Find Equipment Specifications

- More reliable
 - Web search for data sheet from manufacturer
 - Independent product lists like this one for heat pumps: <https://ashp.neep.org/#/>
 - Energy star database: <https://www.energystar.gov/products>

Less reliable

- Retailer websites, e.g. Home Depot
- Installer websites




Reading Data Sheets - HVAC

Indoor Unit				SVZ-KP12NA	SVZ-KP18NA	SVZ-KP24NA	SVZ-KP30NA	SVZ-KP36NA
Outdoor Unit				SUZ-KA12NA2	SUZ-KA18NA2	SUZ-KA24NA2	SUZ-KA30NA2	SUZ-KA36NA2
Cooling	Capacity	Rated ¹	BTU/H	12,000	18,000	24,000	27,000	33,400
	Capacity Range	Min-Max	BTU/H	4,300–12,000	6,200–18,000	12,400–24,000	13,500–27,000	11,600–33,400
	Power Input	Rated ¹	W	940	1,360	1,920	2,160	3,711
	Moisture Removal	Pints/h		1.2	2.4	4.1	2.4	4.7
	Sensible Heat Factor			0.890	0.850	0.810	0.900	0.840
Heating	Capacity at 47°F	Rated ²	BTU/H	15,000	21,600	25,000	30,000	33,400
	Capacity Range	Min-Max	BTU/H	4,700–16,700	8,300–26,000	14,600–28,000	12,640–33,000	13,260–36,000
	Power Input at 47°F	Rated ²	W	1,210	1,600	1,910	2,060	3,030
	Capacity at 17°F	Rated ³	BTU/H	9,900	14,000	14,600	21,400	23,200
		Max	BTU/H	9,900	14,000	14,600	21,400	23,200
	Capacity at 5°F	Max ⁴	BTU/H	7,800	12,200	—	—	—
Capacity at -5°F	Max ⁵	BTU/H	—	—	—	—	—	
Efficiency	SEER			18.0	18.0	18.0	18.0	16.0
	EER			12.7	13.2	12.5	12.5	9.0
	HSPF			12.1	12.6	10.4	13.6	11.7
	COP			3.6	3.9	3.8	4.2	3.2
	ENERGY STAR® Certified			Yes	Yes	Yes	Yes	No
Indoor Unit	Air Flow Rate - Cooling (Quiet-Lo-Med-Hi-SHi)	Dry	CFM	278–381–448	471–573–675	515–625–735	613–744–875	767–910–910
	Air Flow Rate - Cooling (Quiet-Lo-Med-Hi-SHi)	Wet	CFM	—	—	—	—	—
	Air Flow Rate - Heating (Quiet-Lo-Med-Hi-SHi)	Dry	CFM	278–381–448	471–573–675	515–625–735	613–744–875	767–910–910
	Sound Pressure Level (Quiet-Lo-Med-Hi-SHi)	Cooling	dB(A)	29–36–39	33–36–41	33–36–41	32–37–41	35–40–42
	Sound Pressure Level (Quiet-Lo-Med-Hi-SHi)	Heating	dB(A)	29–36–39	33–36–41	33–36–41	32–37–41	35–40–42
	External Static Pressure	In. W.G.		0.30–0.5–0.8	0.30–0.5–0.8	0.30–0.5–0.8	0.30–0.5–0.8	0.30–0.5–0.8
	Condensate Lift Mechanism	Max Distance	In. [mm]	—	—	—	—	—
		H	In. [mm]	34-5/8 [880]	39-13/16 [1011]	39-13/16 [1011]	43-3/4 [1111]	43-3/4 [1111]
	Dimensions	W	In. [mm]	33-1/16 [840]	17 [432]	17 [432]	21 [533]	21 [533]
		D	In. [mm]	13 [330]	21-5/8 [549]	21-5/8 [549]	21-5/8 [549]	21-5/8 [549]
	Weight	lbs [kg]		93 [42]	93 [42]	93 [42]	119 [54]	119 [54]
Outdoor Unit	MCA	A		9.0	14.0	17.0	17.0	17.0
	MOCP	A		16	24	31	31	31
	Dimensions	H	In. [mm]	21-5/8 [550]	34-5/8 [880]	34-5/8 [880]	34-5/8 [880]	34-5/8 [880]
		W	In. [mm]	31-1/2 [800]	33-1/16 [840]	33-1/16 [840]	33-1/16 [840]	33-1/16 [840]
		D	In. [mm]	11-1/4 [285]	13 [330]	13 [330]	13 [330]	13 [330]
	Weight	lbs [kg]		81 [37]	127 [58]	129 [59]	129 [59]	129 [59]
	Air Flow Rate (Cooling/Heating)	CFM		1228/1172	1691/1691	2020/1930	2020/1930	2020/1930
	Sound Pressure Level	Cooling	dB(A)	49	54	55	55	55
Heating		dB(A)	51	55	55	55	55	



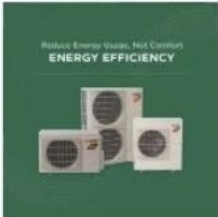
HVAC Info from NEEA: <https://ashp.neep.org/#/>



NEEP'S COLD CLIMATE AIR SOURCE
Heat Pump List

Search Products
Consumer and Installer Resources
About ASHP Initiative
About NEEP

[Back to List](#)
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MITSUBISHI ELECTRIC M-Series

Central Air Conditioning Heat Pump (HP)
Singlezone Ducted, Centrally Ducted
AHRI Cert #: **211273652**
Outdoor Unit Model #: **SUZ-KA30NAHZ**
Indoor Model #: **SVZ-KP30NA***

- Maximum Heating Capacity (Btu/h) @5°F: **32,000**
- Rated Heating Capacity (Btu/h) @47°F: **34,000**
- Rated Cooling Capacity (Btu/h) @95°F: **27,000**

[Basic View i](#)

[Advanced Data - Sizing for Heating](#)

Information Tables

Brand	MITSUBISHI ELECTRIC
Series	M-Series
Ducting Configuration	Singlezone Ducted, Centrally Ducted
AHRI Certificate #	211273652
Outdoor Unit Model #	SUZ-KA30NAHZ
Indoor Model #	SVZ-KP30NA*
Indoor Unit Type	Mini-Splits
Furnace Model #	
EER	12.5

Performance Specs

Heating / Cooling	Outdoor Dry Bulb	Indoor Dry Bulb	Unit	Min	Rated	Max
Cooling	95°F	80°F	Btu/h	13,400	27,000	27,000
			kW	0.89	2.1	2.1
			COP	4.41	3.77	3.77
Cooling	82°F	80°F	Btu/h	15,100	-	29,800
			kW	0.71	-	1.77
			COP	6.23	-	4.93
Heating	47°F	70°F	Btu/h	13,000	34,000	32,000
			kW	0.81	2.4	2.88
			COP	4.7	4.15	3.26



- 🔥 Maximum Heating Capacity (Btu/h) @5°F: **32,000**
- 🔥 Rated Heating Capacity (Btu/h) @47°F: **34,000**
- ❄️ Rated Cooling Capacity (Btu/h) @95°F: **27,000**

for Heating

Information Tables

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Outdoor Unit Model #	SUZ-KA30NAHZ
Indoor Model #	SVZ-KP30NA*
Indoor Unit Type	Mini-Splits
Furnace Model #	
EER	12.5
SEER	15
HSPF (Region IV)	9
EER2	12.8
SEER2	15.2
HSPF2 (Region IV)	8.5
HSPF2 (Region V)	7.2
ENERGY STAR	✓

Performance Specs

Heating / Cooling	Outdoor Dry Bulb	Indoor Dry Bulb	Unit	Min	Rated	Max
Cooling	95°F	80°F	Btu/h	13,400	27,000	27,000
			kW	0.89	2.1	2.1
			COP	4.41	3.77	3.77
Cooling	82°F	80°F	Btu/h	15,100	-	29,800
			kW	0.71	-	1.77
			COP	6.23	-	4.93
Heating	47°F	70°F	Btu/h	13,000	34,000	32,000
			kW	0.81	2.4	2.88
			COP	4.7	4.15	3.26
Heating	17°F	70°F	Btu/h	7,700	21,400	32,000
			kW	1.24	2.75	3.97
			COP	1.82	2.28	2.36
Heating	5°F	70°F	Btu/h	6,800	-	32,000
			kW	1.33	-	4.14
			COP	1.5	-	2.27

HVAC Info from NEEA, cont.

COP = 3.28

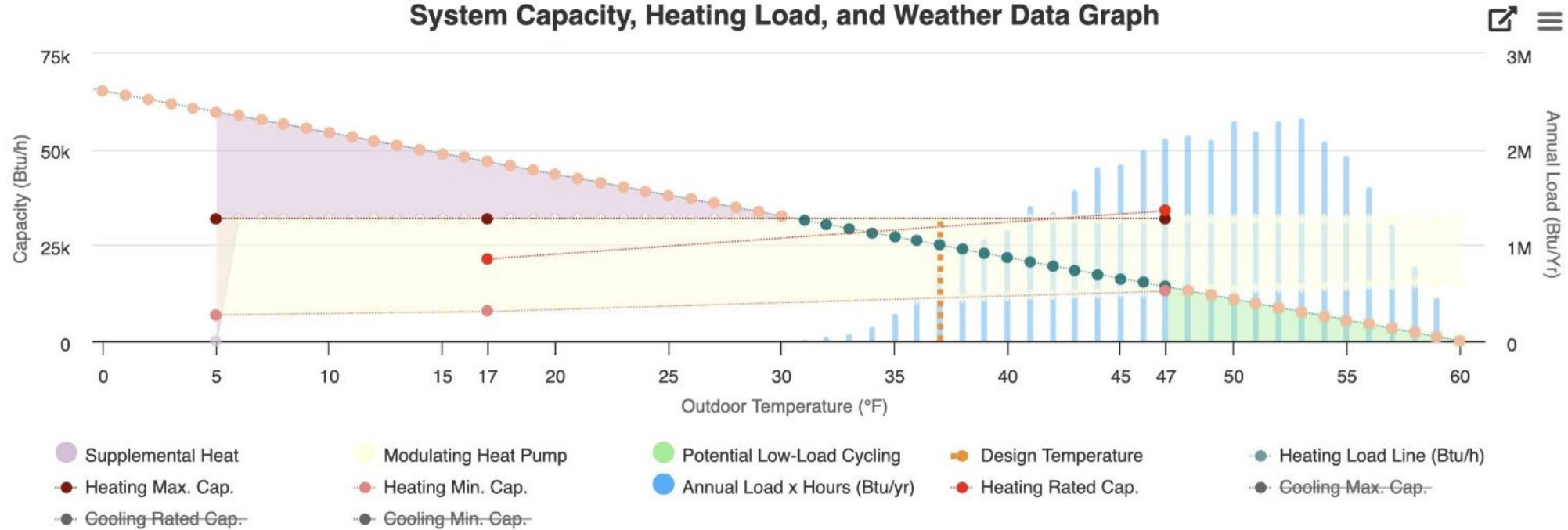
3.97 kW ~ 16.5 A

$3,970 \text{ W} / 240\text{V} = 16.5 \text{ A}$



NEEA performance graph for particular model: Santa Barbara, Moderate Insulation, 3 ton

System Capacity, Heating Load, and Weather Data Graph



Highcharts.com

Product Sizing For Heating

View Oversizing Effects [i](#)

Field Information [i](#)

Capacity Balance Point (°F)	31
Minimum Capacity Threshold (°F)	47
Maximum Capacity at Design Temp (Btu/h)	32,000

Field Information [i](#)

Annual Btu's Covered by Supplemental Heat (MMBtu)	0.0
Hours Requiring Supplemental Heat	0
Percent Hours Requiring Supplemental Heat	0.0%



Reading Data Sheets – Water Heater

Professional *Prestige*® ProTerra Hybrid Specifications

DESCRIPTION					ENERGY INFO	FEATURES						SHIPPING WEIGHTS	
NOMINAL GALLON CAPACITY	RATED GALLON CAPACITY	MODEL NUMBER	MODEL VARIANT	ELECTRIC BREAKER SIZE	UNIFORM ENERGY FACTOR (UEF)	COMPRESSOR BTU/H	UEF FIRST HR. RATING G.P.H.	RECOVERY IN G.P.H 90° F RISE	ELEMENT WATTAGE	TOTAL UNIT WATTAGE	MAX AMPS	UNIT WT. (LBS)	APPROX. SHIP WT. (LBS.)
ProTerra 30 Amp													
40	36	PROPH40 T2 RH375-30	700470	30	3.83	4,200	60	27	4,500	5,000	21	157	174
50	45	PROPH50 T2 RH375-30	700467	30	3.88	4,200	67	27	4,500	5,000	21	178	218
65	59	PROPH65 T2 RH375-30	700468	30	4.05	4,200	75	27	4,500	5,000	21	225	262
80	72	PROPH80 T2 RH375-30	700469	30	4.07	4,200	87	27	4,500	5,000	21	244	281
ProTerra 15 Amp													
40	36	PROPH40 T2 RH375-15	700497	15	3.45	4,200	46	16	2,250	2,750	12	157	174
50	45	PROPH50 T2 RH375-15	700494	15	3.75	4,200	52	16	2,250	2,750	12	178	218
65	59	PROPH65 T2 RH375-15	700495	15	3.55	4,200	54	16	2,250	2,750	12	225	262
80	72	PROPH80 T2 RH375-15	700496	15	3.70	4,200	67	16	2,250	2,750	12	244	281

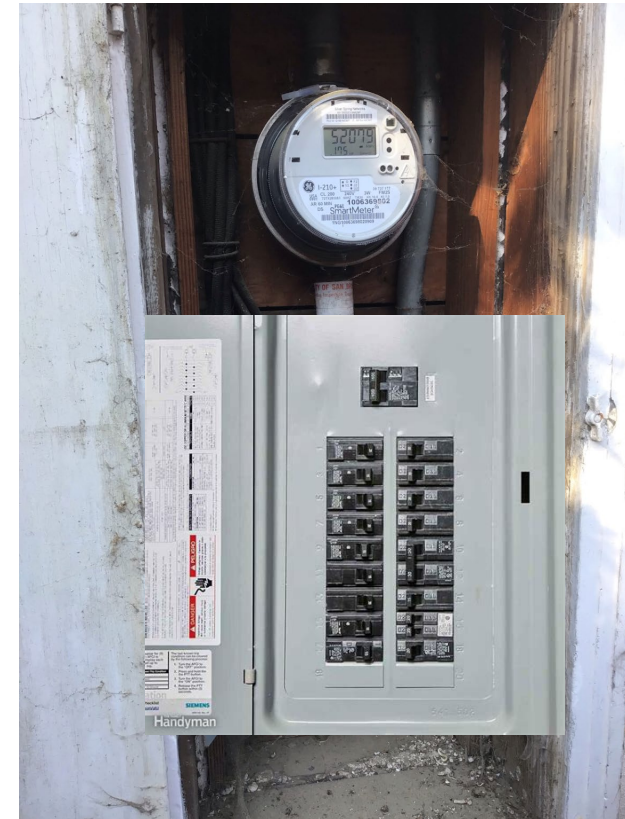
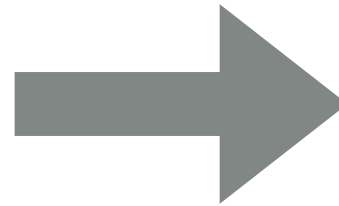
Uniform Energy Factor and rated gallon capacity based on Department of Energy (DOE) requirements.
All units have integrated WiFi control board.



Main Electrical Panel



Today: 100-amp fuse box



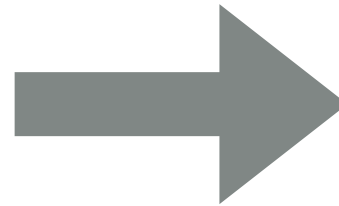
Recommended: 100-amp
breaker panel



Water heating



Today: 50-gallon gas tank WH in garage



Unmatched Savings & So Much More


Get the Rheem Hybrid Electric Water Heater today and enjoy years of energy-saving and worry-free hot water.

- ✓ **Save Money & Energy**
Save up to \$480 per year in energy costs—that's almost \$5,000 over 10 years!
- ✓ Energy Saving Scheduling
- ✓ Set Vacation or Away Mode
- ✓ Demand Response Scheduling
- ✓ LeakGuard™ Auto Water Shut-off Valve
- ✓ Built-in EcoNet WiFi Technology
- ✓ Carbon Footprint Reduction
- ✓ Heat Pump Technology
- ✓ Energy Use Tracking
- ✓ Operation Modes and Scheduling
- ✓ Advanced Diagnostics

UP TO 4.0 UEF

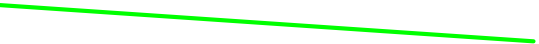
Recommended: 80-gallon, 15-amp heat pump WH (12A / 240V)

Water Heater Observations

Dimensions of space to fit water heater Length X Width X Height to obstacles. 

Can things be easily moved?
e.g. remove water heater stand

Path of a condensate drain line
(all downhill gravity flow?)
Or (needs to be lifted with \$75
condensate pump)



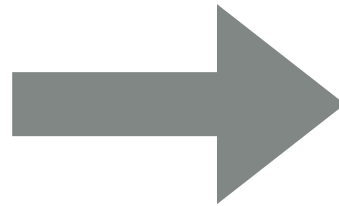
Water Heater: Before and After

Before:
40 Gallon gas WH
On stand
Exposed gas pipe at bumper level.

After:
65 gallon 15 Amp HPWH
On floor
Gas pipe replaced by condensate pipe
Gas flue removed



Space heating/cooling



Today: A/C + Bryant gas furnace

Recommended: Ducted 3-ton inverter-driven heat pump HVAC system (17A / 240V)



Furnace Area Info

Gather Nameplate data

Model #

Btuh input, and output

Efficiency

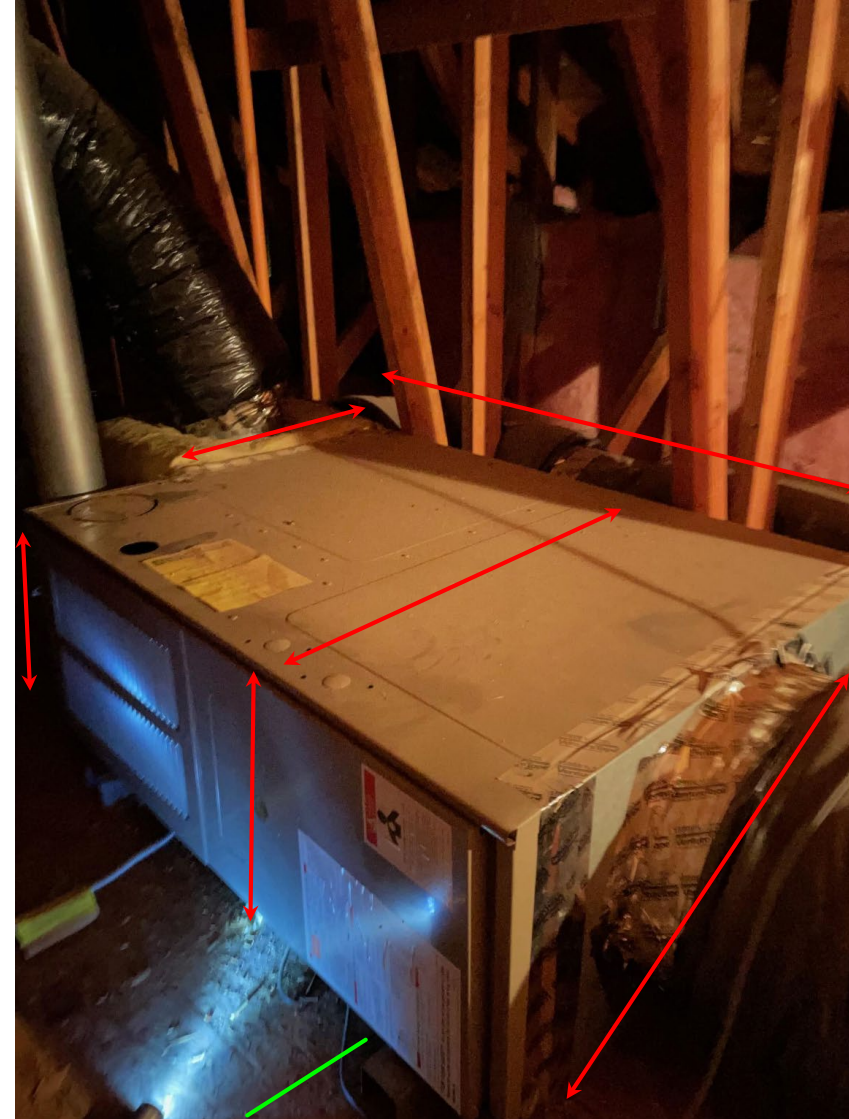
Gather dimensions:

Box: W, L, H

Return Air inlet W x W or diameter

Supply Air outlet W x W or diameter

Scout a route for summer condensate



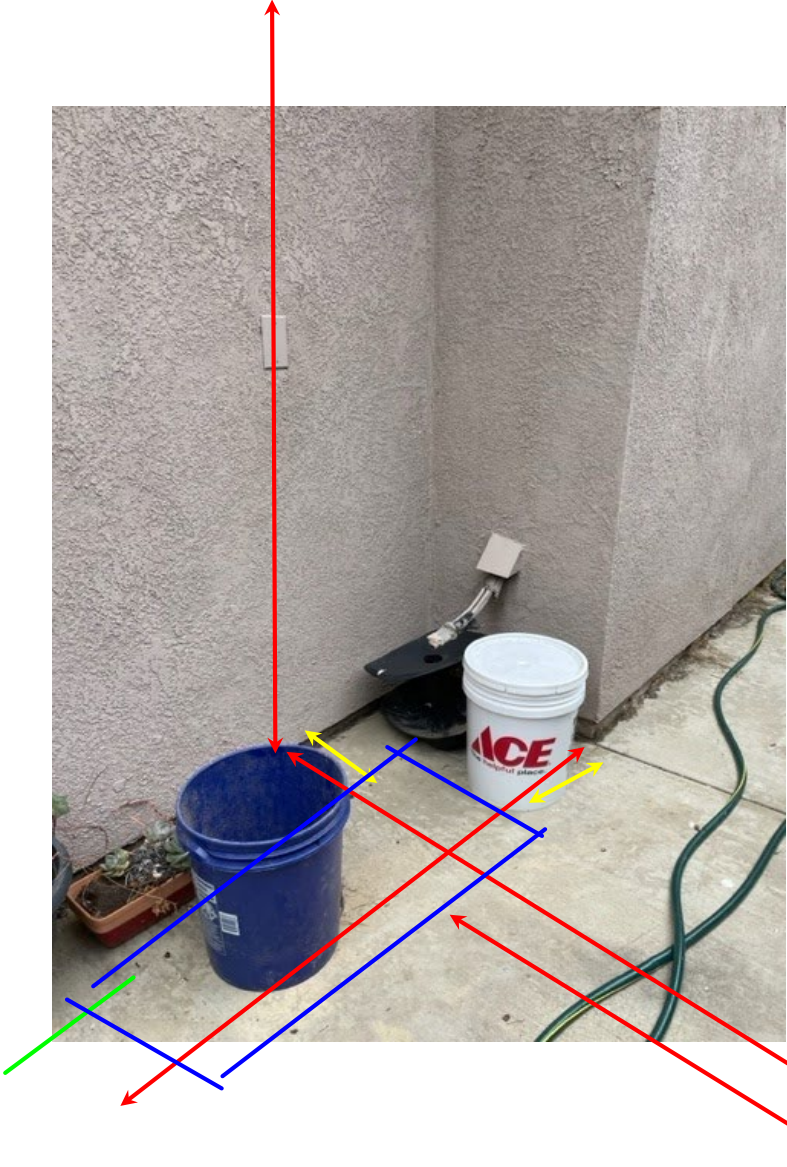
Outdoor Compressor Info

Gather dimensions:

- Back wall to fence
- Side to side space
- Height to constraints
- Wall extension nearby

Unit needs 8" or more clear for easy airflow

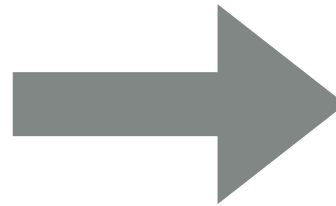
Scout a route for winter condensate
Will it freeze?



Cooking



Today: 48" gas JenAir range



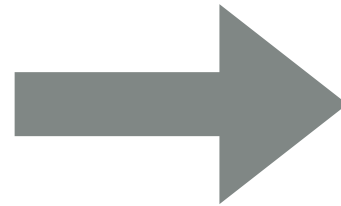
Recommended: 48" AGA induction range
(45A / 240V)



Clothes drying



Today: Samsung 7.5 cu ft resistance
electric dryer (22.5 amps / 240 volts)



Recommended: Whirlpool 7.4 cu ft
hybrid heat pump dryer (14 amps / 240 volts)



EV charging



Recommended: Wallbox Pulsar with adjustable current from 6 to 32 amps (rated 13 amps/240 volts)



Budget Option: NEMA 6-15 outlet with circuit (rated 12amp/240volt)



Exciting NEW products for electrifiers



120V Washer/Dryer:
GE Profile 4.8 cu ft combo unit
w/ heat pump dryer 11 amps /
120 volts



120V HP Water Heater:
AO Smith Voltex 120V Plug
Hybrid Electric Heat Pump 8
amps / 120 volts

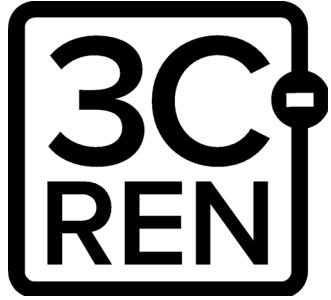


120V HP Water Heater:
Rheem Proterra 120V Plug
Hybrid Electric Heat Pump 4
amps / 120 volts

Equipment silver bullets

1. 120-volt heat pump water heaters or 240-volt 15-amp hybrid water heaters
2. Upsizing water heater and adding a mixing valve to deliver more gallons of hot water
3. 17-amp inverter-driven heat pump HVAC systems that are not just power efficient and energy efficient but also extremely quiet
4. Centrally ducted heat pumps w/ air handlers on same circuit, or multizone ductless
5. Split heat pump water heaters for tight spaces (consider combo washer/dryer to make space)
6. Heat pump dryers or combo washer/dryers (single 120-volt machine that washes and dries)
7. Wallbox Pulsar EV charger with adjustable current (6 to 32 amps)
8. Circuit-sharing devices like Neocharge and SimpleSwitch
9. Circuit pausers like DCC9, SimpleSwitch 240M, EV Duty and Emporia Smart Charger
10. Smart electric panels like Span.io





Assembling the Plan



Plan Components

- Recommended equipment list
- Electrical load calculations per NEC 220.83(B) or 220.87
- Wiring plan (optional but helpful)
- Project list for contractors with photos of existing equipment and locations



Recommended Equipment List

Equipment List

Appliance	Image	Model Number	Retail Price		Type	Volts	Nameplate Amps	Breaker Size
Frigidaire gallery 30" front control induction range with air fry		FGIH3047VF	\$1299	Retailer Link	Kitchen	240	42	50
Whirlpool 7.4 cu ft hybrid heat pump dryer		WHD560CHW	\$1400	Retailer Link	Laundry	240	14	30
Mitsubishi 3-ton centrally ducted heat pump HVAC system		SVZ-KP36NA/SUZ-KA36NA2	\$4800	Retailer Link	HVAC Heating	240	17	20
Rheem 15-amp 65-gallon heat pump water heater		PROPH65 T2 RH375-15	\$2215	Retailer Link	Water Heating	240	12	15
Wallbox Pulsar EV charger w/ adjustable current (with circuit pausing)		Pulsar	\$700	Retailer Link	EV Charger	240	16	20



Electrical Load Calculations

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




Wiring Plan

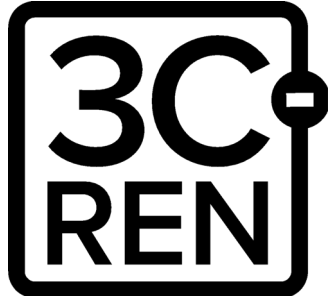
Appliance	Model	Circuit State	Circuit Location	Feeder Panel	Voltage	Appliance Nameplate Amps	Breaker Size	Wire Gauge (AWG)	Wire Type	Conduit Type	Circuit Length	Has Neutral?	Circuit Control
Frigidaire gallery 30" front control induction range with air fry	FGIH3047VF				240	42	50	#6					
Whirlpool 7.4 cu ft hybrid heat pump dryer	WHD560CHW	New	Other	Laundry room Subpanel	240	14	30	#8	THHN/THWN (copper)	1/2" EMT	5 ft	No	
Mitsubishi 3-ton centrally ducted heat pump HVAC system	SVZ-KP36NA/SUZ-KA36NA2	New	Crawlspace/Basement	Laundry room Subpanel	240	17	20	#12	THHN/THWN (copper)	1/2" EMT	25 ft	Yes	
Rheem 15-amp 65-gallon heat pump water heater	PROPH65 T2 RH375-15	New	Other	Laundry room Subpanel	240	12	15	#14	THHN/THWN (copper)	1/2" EMT	15 ft	Yes	
Wallbox Pulsar EV charger w/ adjustable current	Pulsar	New	Crawlspace/Basement	Main Panel	240	16	20	#12	THHN/THWN (copper)	3/4" EMT	55 ft	Yes	Circuit Pausing
Laundry room Subpanel		New	Crawlspace/Basement	Main Panel	240	100	100	#6	THHN/THWN (copper)	1" EMT	60 ft	Yes	



Project List for Contractors

Contractor Type	Description
Electrician	<ol style="list-style-type: none"><li data-bbox="912 389 1294 418">1. Use <i>existing</i> 100A service line.<li data-bbox="912 446 1633 504">2. Modify main electrical panel as specified in Electrical Panels Table.  <p data-bbox="1014 1196 1327 1225">Main 100A electrical panel</p> <ol style="list-style-type: none"><li data-bbox="912 1253 1633 1282">3. Install 1 new subpanel as specified in Electrical Panels Table.





Tool for Creating Plans

WWW.ZEROCARBON-HOME.COM



Quick Tour of www.zerocarbon-home.com

The screenshot shows a mobile browser interface for the website www.zerocarbon-home.com. The status bar at the top indicates the time is 7:28 AM on Monday, September 4, with 100% battery and signal strength icons. The browser address bar shows the URL and standard navigation icons. The website header features the logo "Zero Carbon Home" in green and blue, the tagline "Electrify your Home" in white, and a "My Account" link. There are "Share" and "Save" buttons in the top right. The main content area has a dark background with white text explaining the tool's purpose: "For most Americans, vehicles and homes emit over half the climate warming greenhouse gas emissions they generate in a year. Eliminate those emissions with a plan to convert your home and vehicle from burning fossil fuels (bad) to using clean, abundant renewable energy (good). Let's get started! **Note: this tool is designed for single family residential buildings.**" Below this is a form with input fields for "Your name", "Street address", "City", "State", and "ZIP code". A list of six steps is shown in blue bars with white text and a plus sign on the right: "1. Can my utility service support electrification?", "2. What equipment do I need?", "3. Choose your equipment", "4. What wiring changes do I need?", "5. What will this cost?", and "6. Generate a plan to share with contractors".



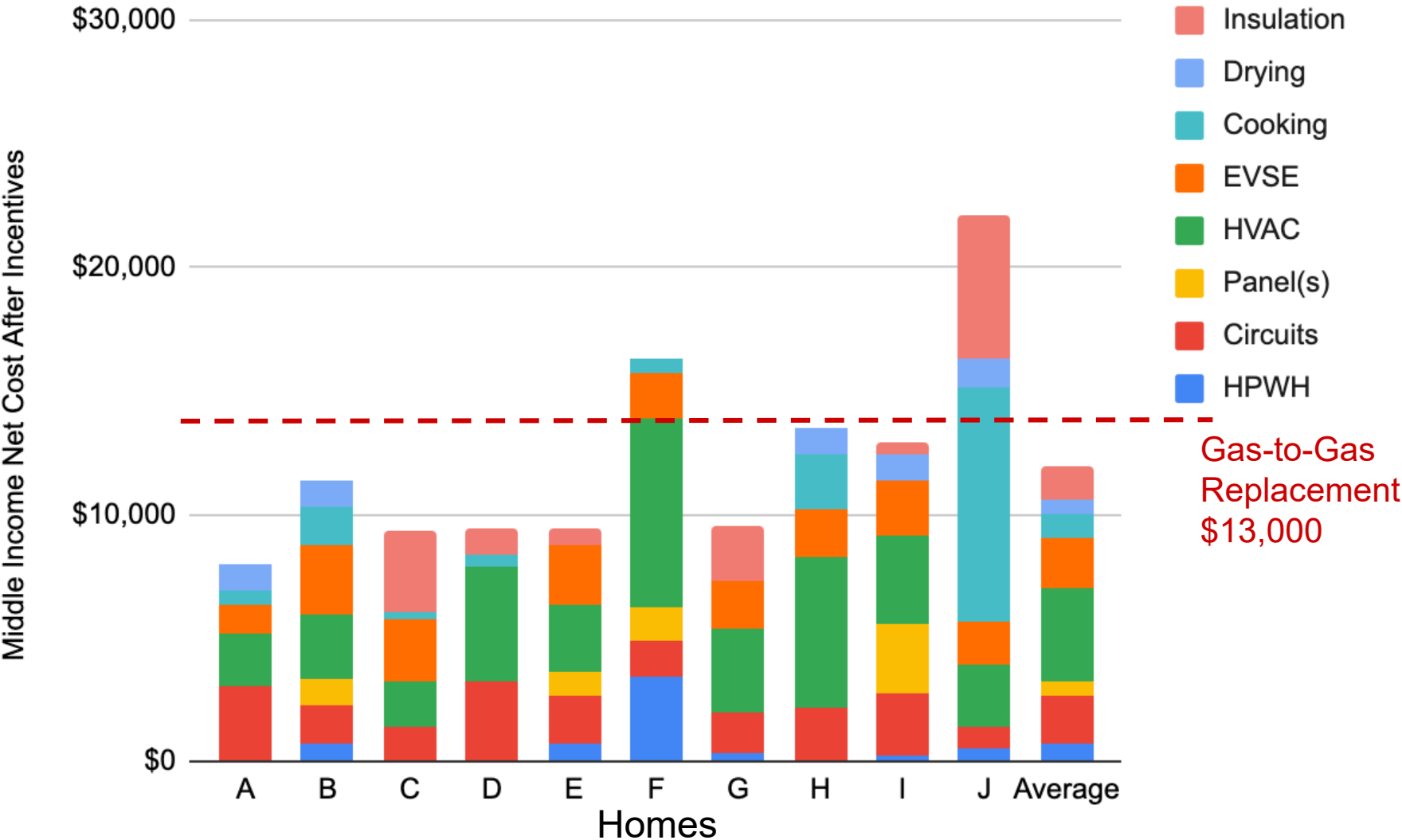


Sample Costs

2022 HOME ELECTRIFICATION CASE STUDIES
SAN MATEO COUNTY & BAYREN

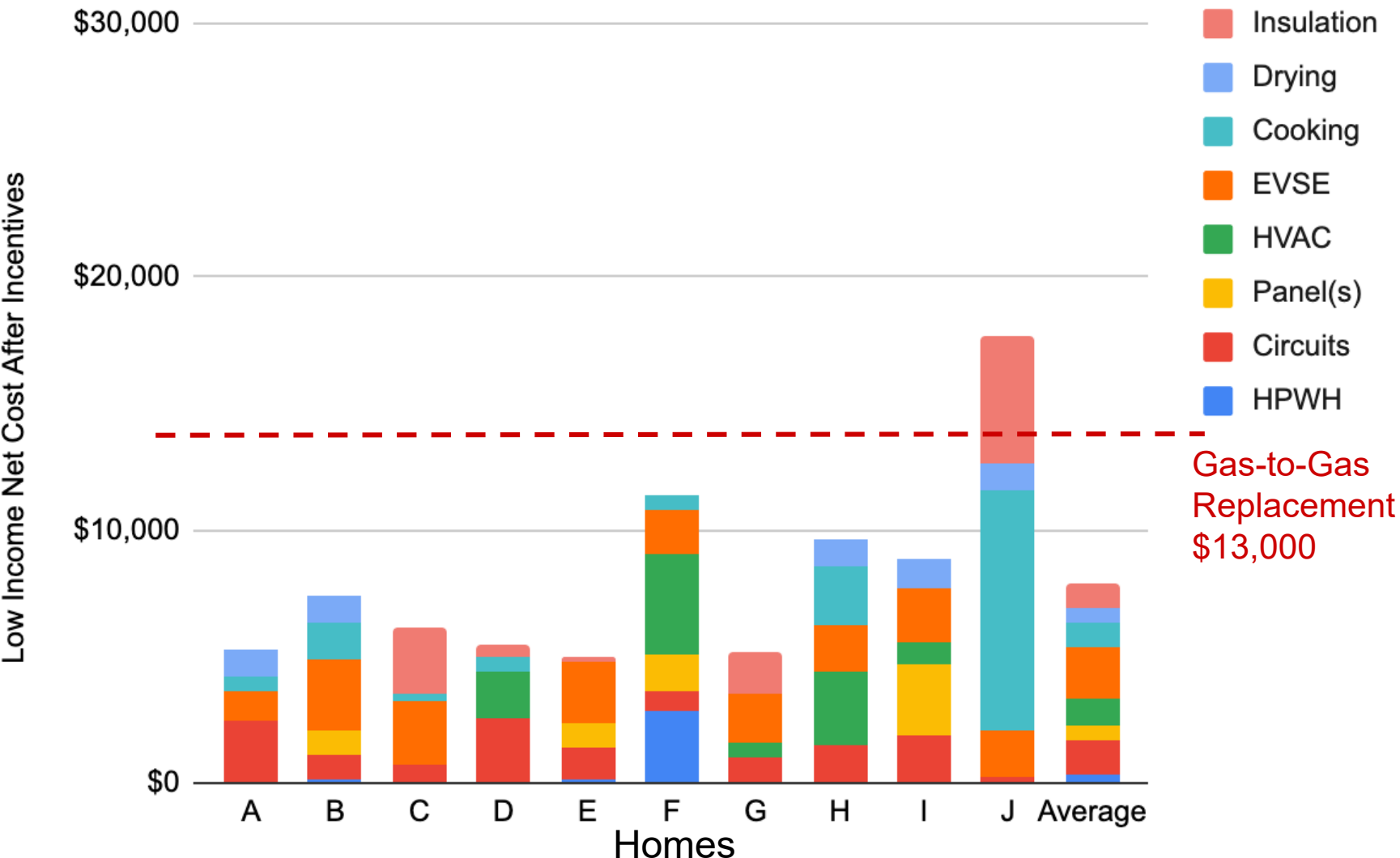


Net Cost to Decarbonize Home in San Mateo County (medium income, no solar, no battery)



Source: San Mateo County Home Electrification Case Studies

Net Cost to Decarbonize Home in San Mateo County (low income, no solar, no battery)



Source: San Mateo County Home Electrification Case Studies

Example: Space Heating and Cooling Cost



Recommended: Mitsubishi 3ton inverter-driven heat pump HVAC system w/ ducted air handler

Cost to Low Income Homeowner:

	SCE Customer	3CE Customer
HVAC Quote	\$17,000	\$17,000
Estimated 3C-REN rebate	(\$5,000)*	(\$5,000)*
3CE rebate	-	(\$3,500-\$4,500)
TECH rebate	(\$1,000)	-
Total Out of Pocket	\$11,000	\$7,500-\$8,500
IRA Tax Credit	(\$2,000)	(\$2,000)
TOTAL COST	\$9,000	\$5,500-\$6,500

*3C-REN rebates are based on actual energy saved. Rebate amounts may be higher or lower than the example provided.

**IRA Rebates are expected to become available in late 2024, and can further reduce costs for low and middle income households.

Compared to:

Gas Furnace Cost: \$4,808

With AC: Add \$4,800 more = \$9,600

Source: San Mateo County Home Electrification Case Studies



Example: Space Heating and Cooling Cost



Recommended: Mitsubishi 3ton inverter-driven heat pump HVAC system w/ ducted air handler

Cost to High Income Homeowner:

	SCE Customer	3CE Customer
HVAC Quote	\$17,000	\$17,000
Estimated 3C-REN rebate	(\$2,000)*	(\$2,000)*
3CE rebate	-	(\$2,500-\$3,500)
TECH rebate	(\$1,000)	-
Total Out of Pocket	\$14,000	\$11,500-\$12,500
IRA Tax Credit	(\$2,000)	(\$2,000)
TOTAL COST	\$12,000	\$9,500-\$10,500

*3C-REN rebates are based on actual energy saved. Rebate amounts may be higher or lower than the example provided.

Compared to:
 Gas Furnace Cost: \$4,808
 With AC: Add \$4,800 more = \$9,600



Source: San Mateo County Home Electrification Case Studies

Example: Water Heating Cost



Unmatched Savings & So Much More
Get the Rheem Hybrid Electric Water Heater today and enjoy years of energy-saving and worry-free hot water.

- ✓ **Save Money & Energy**
Save up to \$480 per year in energy costs—that's almost \$5,000 over 10 years!
- ✓ Energy Saving Scheduling
- ✓ Set Vacation or Away Mode
- ✓ Demand Response Scheduling
- ✓ LeakGuard™ Auto Water Shut-off Valve
- ✓ Built-in EcoNet WiFi Technology
- ✓ Carbon Footprint Reduction
- ✓ Heat Pump Technology
- ✓ Energy Use Tracking
- ✓ Operation Modes and Scheduling
- ✓ Advanced Diagnostics

UP TO 4.0 UEF

Recommended: 65-gallon heat pump WH

Cost to Low Income Homeowner:

	SCE Customer	3CE Customer
Heat Pump Water Heater Quote	\$8,000	\$8,000
Estimated 3C-REN rebate	(\$2,000)*	(\$2,000)*
3CE rebate	-	(\$4,300-\$4,800)
TECH rebate	(\$3,100)	-
Total Out of Pocket	\$2,900	\$1,200-\$1,700
IRA Tax Credit	(\$870)	(\$360-\$510)
TOTAL COST	\$2,030	\$840-\$1,190

*3C-REN rebates are based on actual energy saved. Rebate amounts may be higher or lower than the example provided.

**IRA Rebates are expected to become available in late 2024, and can further reduce costs for low and middle income households.



Compares to \$2,500 for a gas water heater

Source: San Mateo County Home Electrification Case Studies & Switchison.org

Example: Water Heating Cost



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- ✓ Advanced Diagnostics

UP TO 4.0 UEF

Recommended: 65-gallon heat pump WH

High Income Homeowner:

	SCE Customer	3CE Customer
Heat Pump Water Heater Quote	\$8,000	\$8,000
Estimated 3C-REN rebate	(\$2,000)*	(\$2,000)*
3CE rebate	-	(\$3,300-\$3,800)
TECH rebate	(\$3,100)	-
Total Out of Pocket	\$2,900	\$2,200-\$2,700
IRA Tax Credit	(\$870)	(\$660-\$810)
TOTAL COST	\$2,030	\$1,540-\$1,890

*3C-REN rebates are based on actual energy saved. Rebate amounts may be higher or lower than the example provided.



Compares to \$2,500 for a gas water heater
Source: San Mateo County Home Electrification Case Studies & switchison.org

Net Cost (w/ Incentives)

Existing Condition	Proposed Electrification	Trade	Applicable Project	Replace Existing (Gas)	DIY Electric	Low Bid Electric	Mid Bid Electric	High Bid Electric
100-amp main fuse box	100-amp main electrical panel + new subpanel in garage	Electrician	Panel(s)		\$2,859	\$2,859	\$4,767	\$7,322
No 240-volt circuits to: water heater, HVAC, range, dryer	4 new 240-volt circuits to: water heater, HVAC compressor, cooktop, dryer	Electrician	Circuits		\$625	\$625	\$4,467	\$4,825
40-gallon gas water heater	65-gallon heat pump water heater	Plumber	HP Water Heater	\$2,849	\$0	\$0	\$2,727	\$3,183
80% efficient centrally ducted gas furnace	36,000 BTU centrally ducted heat pump HVAC system w/ MERV 13 filter	HVAC	HVAC	\$7,690	\$0	\$795	\$1,962	\$5,609
4-burner 30" gas cooktop	4-burner 30" induction cooktop	Electrician	Range/Cooktop/Oven	\$598	\$0	\$0	\$0	\$0
7.5 cu ft gas dryer	7.4 cu ft hybrid heat pump dryer	None	Dryer	\$1,079	\$254	\$254	\$254	\$254
Insulation: attic - some	Insulation: attic - R38	Insulation	Attic		\$178	\$0	\$104	\$722
Insulation: walls - none	Insulation: walls - none	Insulation	Walls		\$0	\$0	\$0	\$0
Insulation: floor - none	Insulation: floor - none	Insulation	Floor		\$0	\$0	\$0	\$0
Ductwork: fair condition	Ductwork: sealed and insulated	HVAC	Ducts	\$5,750	\$6,550	\$5,750	\$5,750	\$6,625
No at-home fueling for: 2 gas cars: [15,000 miles/yr]/	At-home fueling for: 2 EVs [15,000 miles/yr]	Electrician	EV Charger		\$1,200	\$1,200	\$2,217	\$3,516
SUBTOTAL				\$17,966	\$11,666	\$11,483	\$22,248	\$32,056
Rooftop solar PV: none	Rooftop solar PV: 5.8 kW	Solar/Battery	Solar		\$8,120	\$8,120	\$9,683	\$12,950
Home battery: none	Home battery: 10 kWh	Solar/Battery	Battery		\$8,680	\$8,680	\$10,272	\$12,950
SUBTOTAL					\$16,800	\$16,800	\$19,956	\$25,900

Source: San Mateo County Home Electrification Case Studies



Working with Contractors



Working with Contractors

- Challenges
- Opportunities
- Recommendations



Challenges with Some Contractors

- Resistance to change
 - Been working w/ gas for decades and may not want to learn heat pumps
- May recommend oversized equipment for the task
- May not know how to do electrical load calcs per NEC 220.83(B) or 220.87
- May take short cuts in electrical load calcs that create unnecessary constraints
- May reject panel optimization and refuse to follow your electrification plan
- May prefer to upsell homeowner on bigger panel and service line
- May prefer equipment or brands that are suboptimal for whole home electrification
- May push back on: load calcs, heat pump sizing



Opportunities

- Contractors love photos, use them to communicate
- Although not all contractors will use plan details and load calcs, some will appreciate them, therefore you could...
- Screen contractors based on whether they value plans
- Best contractors will understand that a good plan helps them streamline their work



Recommendations

- Feel confident that whole home electrification is possible, even on 100 amps
- Identify contractors who are:
 - Eager to learn
 - Comfortable with new technology
 - Good with customers
 - Ready to grow
- Develop networks of contractors that are trained in home electrification
- Know required electrical specs of each appliance so you can flex with contractor recommendations
- Show contractors your electrical load calculations
- Reject power hogs
- Be ready to defend the electrical panel
- If contractor can't follow the plan, find a new contractor



Questions?



Closing

- Coming to Your Inbox Soon!
 - Slides, Recording, & Survey – Please Take It and Help Us Out!
- Upcoming Courses:
 - Getting Past Heat Pump Objections (9/8)
 - Introduction to Passive House Retrofits (9/11)
 - Installing Heat Pumps: Lessons from the Field (9/13)
 - High Performance Fundamentals Series Class 2: Using Building Science to Design and Build High Performance Homes (9/14)
 - Regenerative Design in Practice: Zero Net Carbon Design Series (9/19)





Thank you!

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