

Costs of Home Electrification

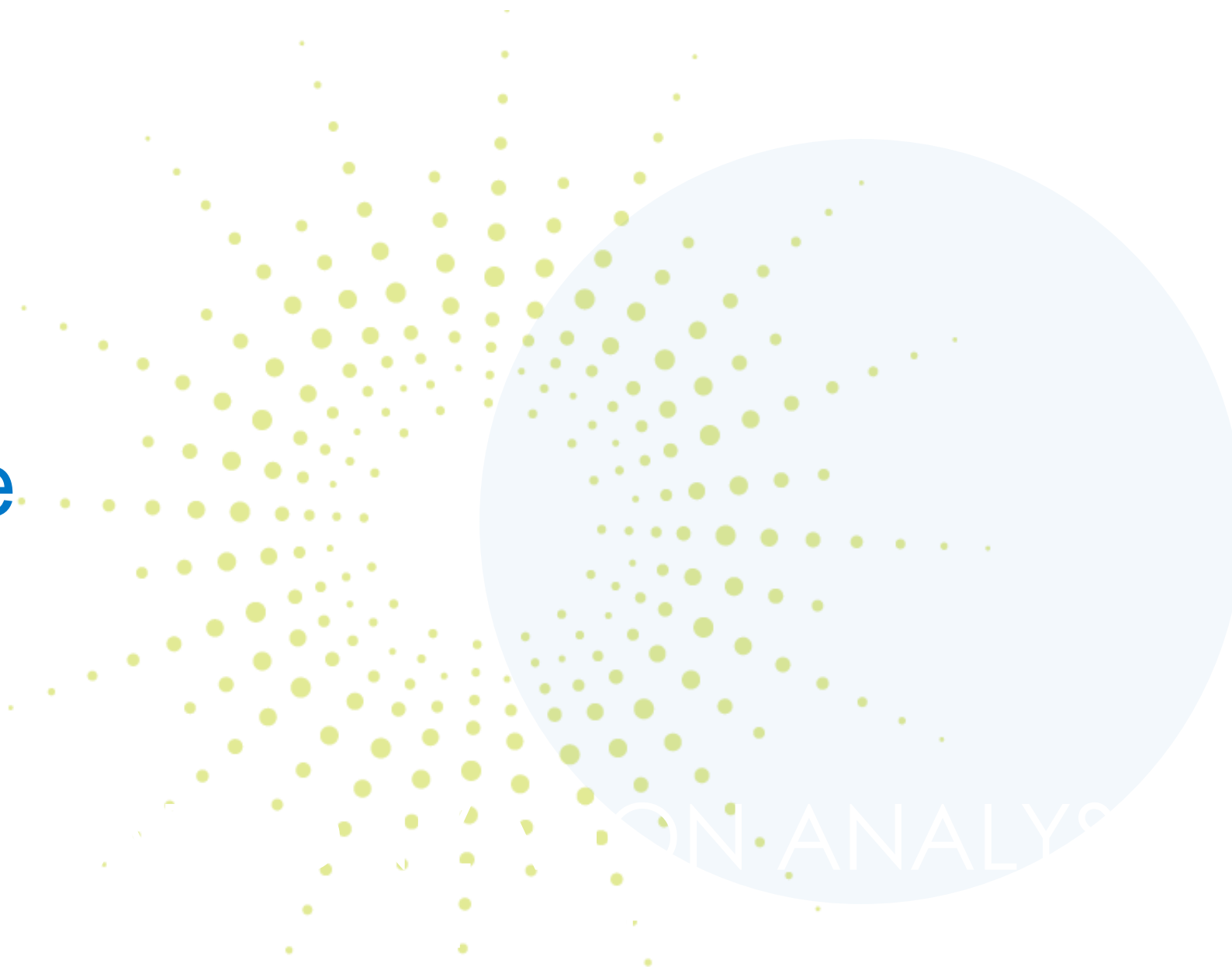
September 27, 2024



Agenda

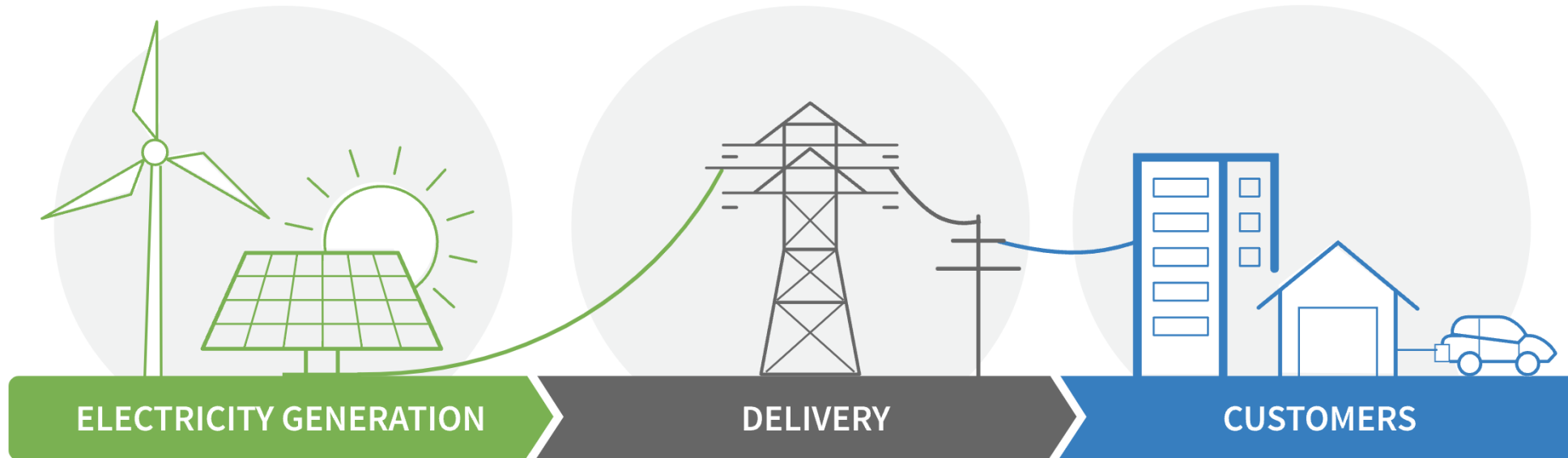
1. Background & Policy Timeline
2. The Research (2018-2023)
 - a. Costs of electrification
 - b. Do we really need to upgrade electrical panels?
3. Proof of Concept (2023-2024)
 - a. Pilot home takeaways
4. Scaling Our Programs (2023-2030)

Background & Policy Timeline



ON ANALYS

Background



Peninsula Clean Energy provides electricity from clean energy sources at lower rates than PG&E.

PG&E owns the power lines and delivers the power we generate. They send a consolidated bill.

As a **customer** of Peninsula Clean Energy, you are helping the environment and saving money.

The Big Picture

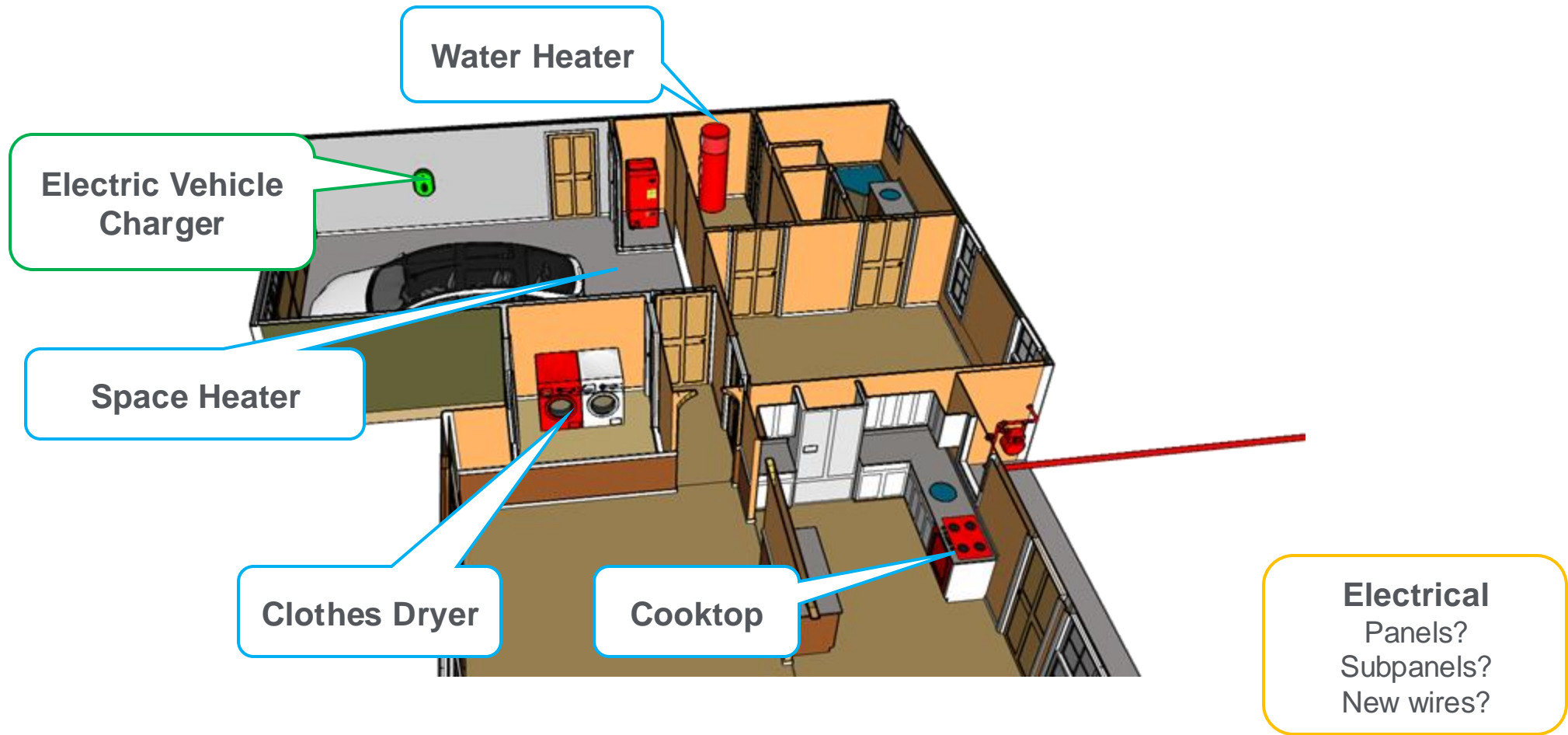
Programs

to enable

Policy

to enable

Massive Decarb



Current Offerings and Uptake



Rebates for heat pump water heaters & heat pump HVAC



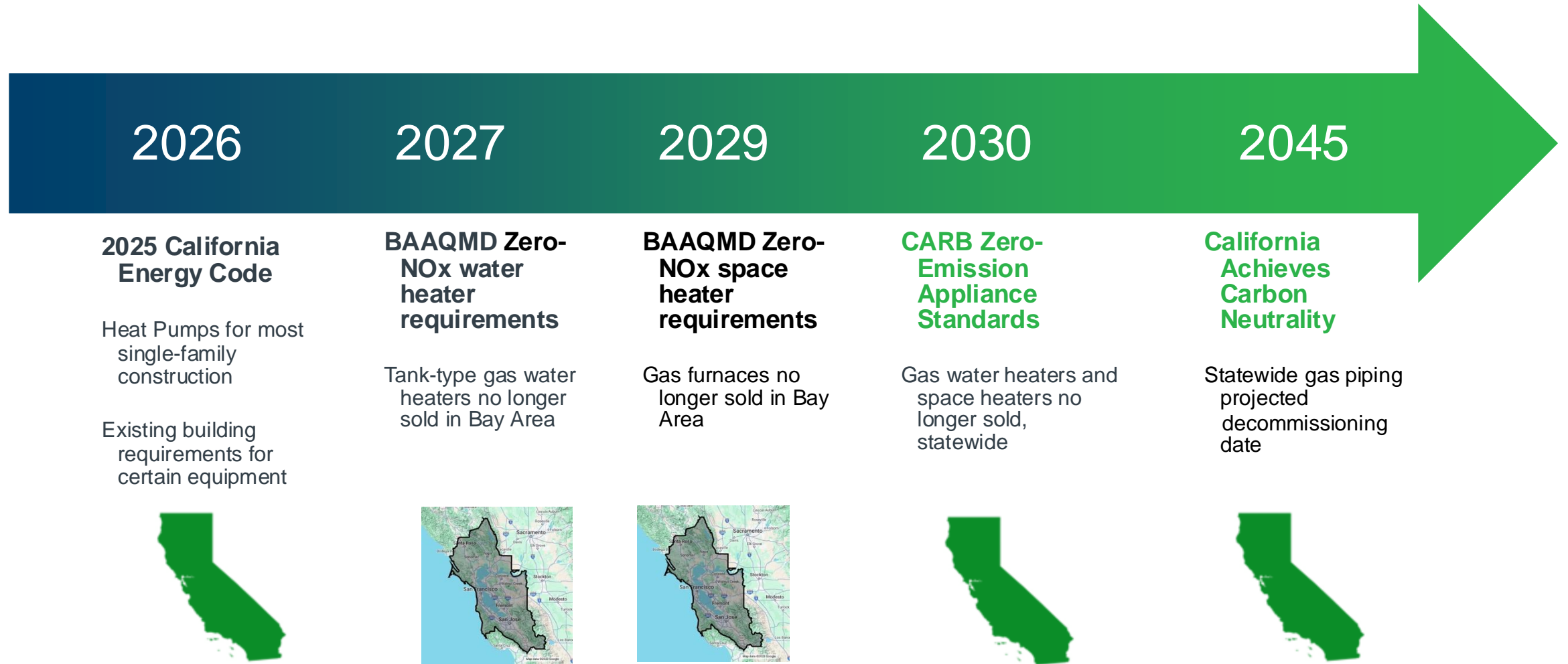
0% loans up to \$10k for heat pump water heaters & heat pump HVAC



Home Upgrade program: no-cost electrification & minor home repairs for income-qualified homeowners

Participants	Count
Rebates	2,761
Loans	618
Home Upgrade program	305
Appliances installed (all programs)	Count
Heat pump water heater	1,442
Heat pump HVAC	1,707
Induction cooktop/range	89
Electric dryer	80

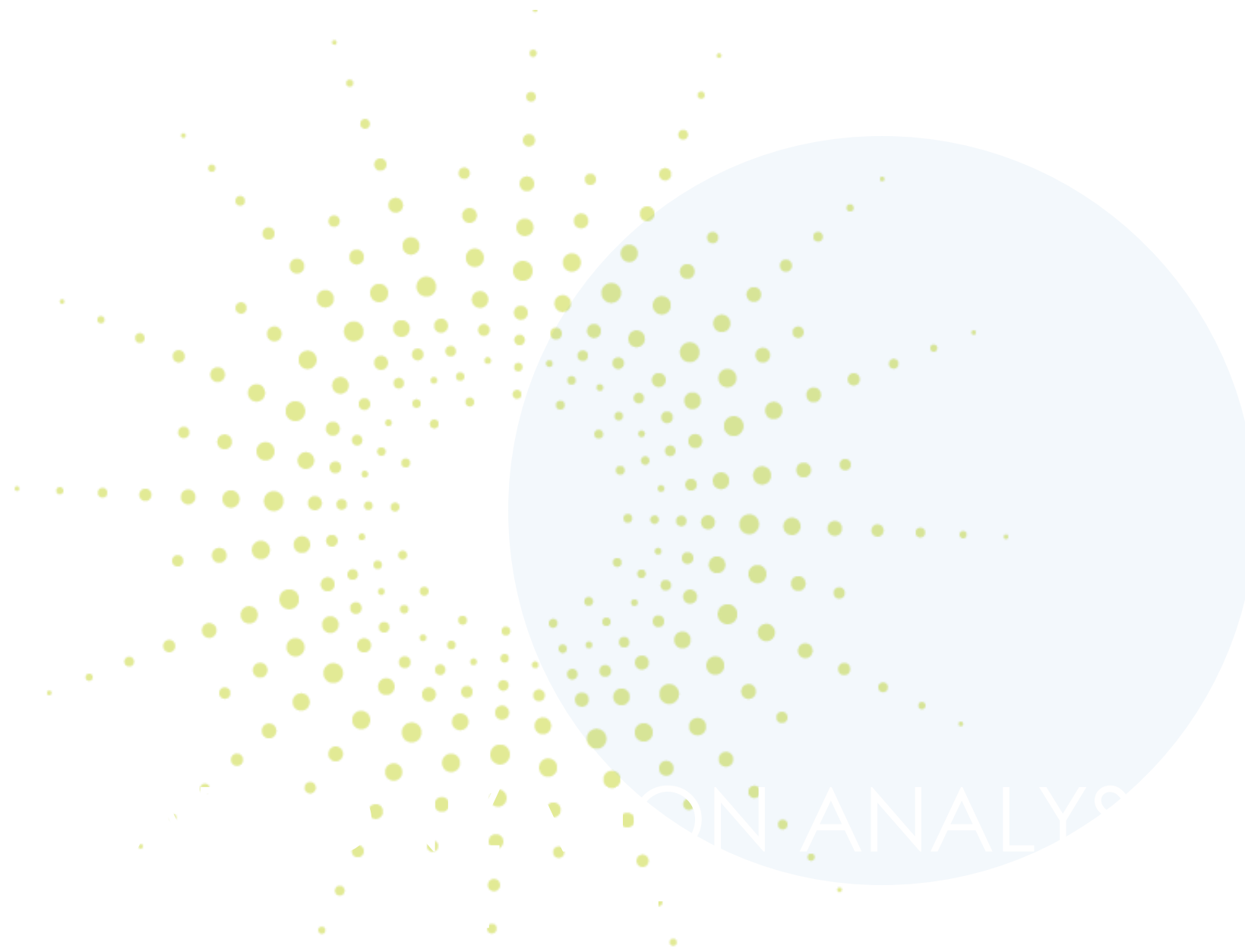
Upcoming Policy Changes



In 2021, We Had No Idea What Local Prices Were

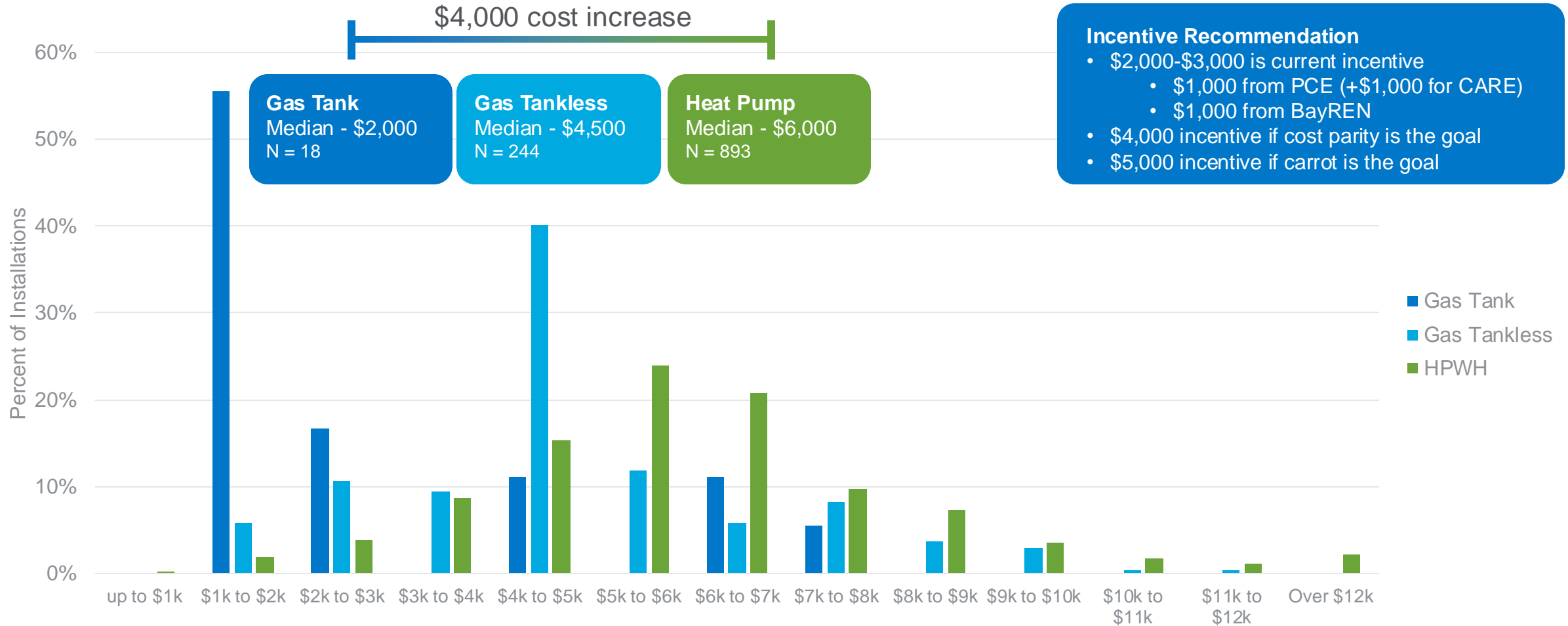
The Research

2018-2022





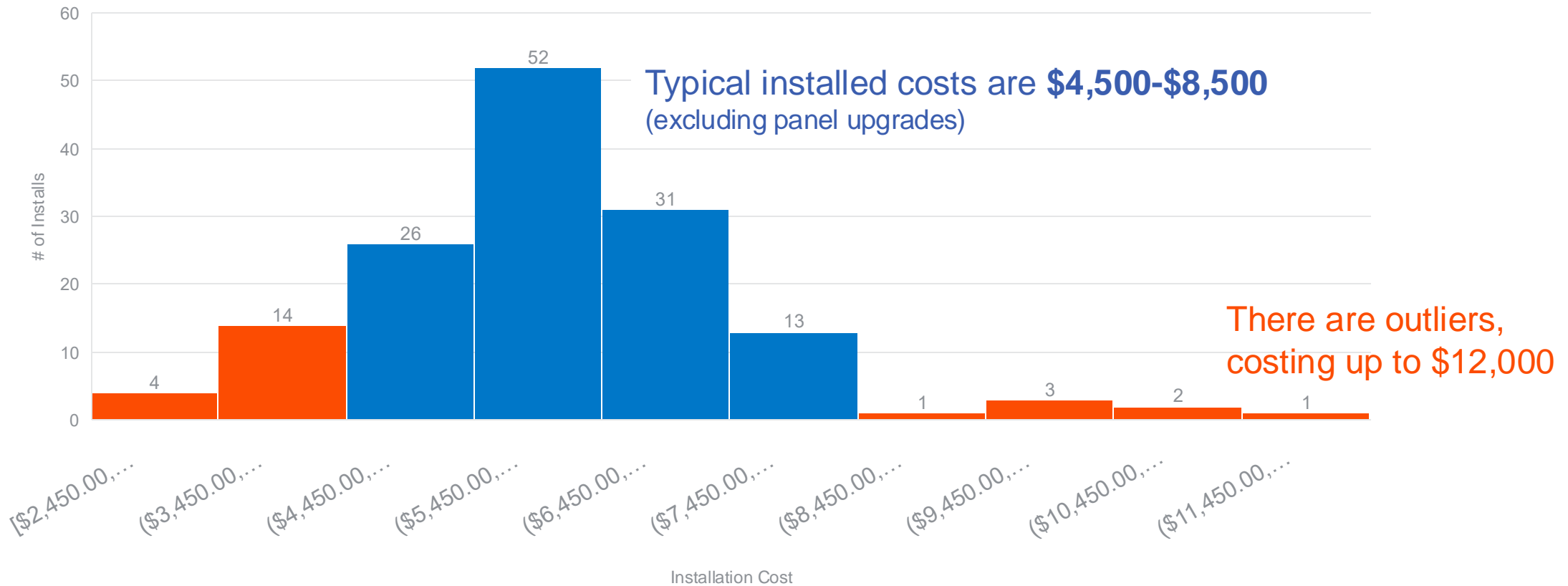
Single Family Water Heater Installation Costs





Heat Pump Water Heater Costs

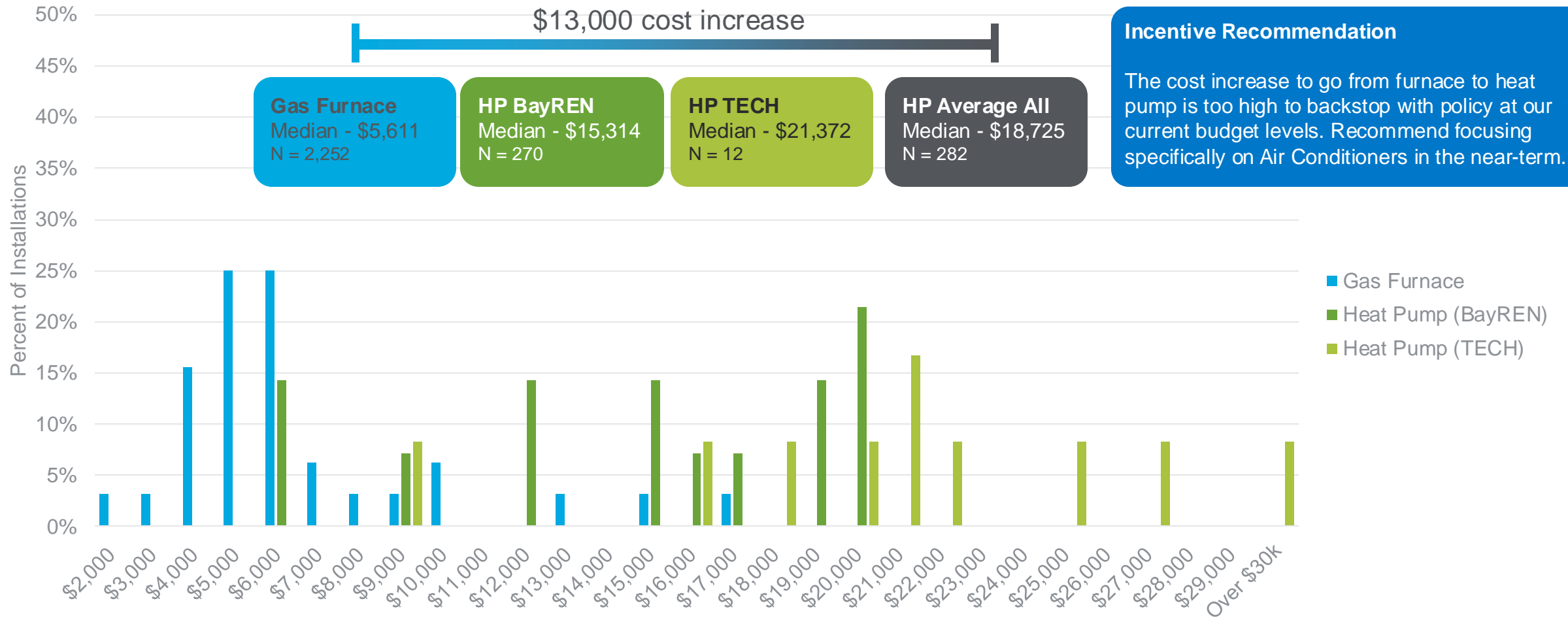
PCE HPHW Installation Costs (Excluding Panel Upgrades and Split Systems)



Average cost is \$6,100



Single Family Space Heater Installation Costs

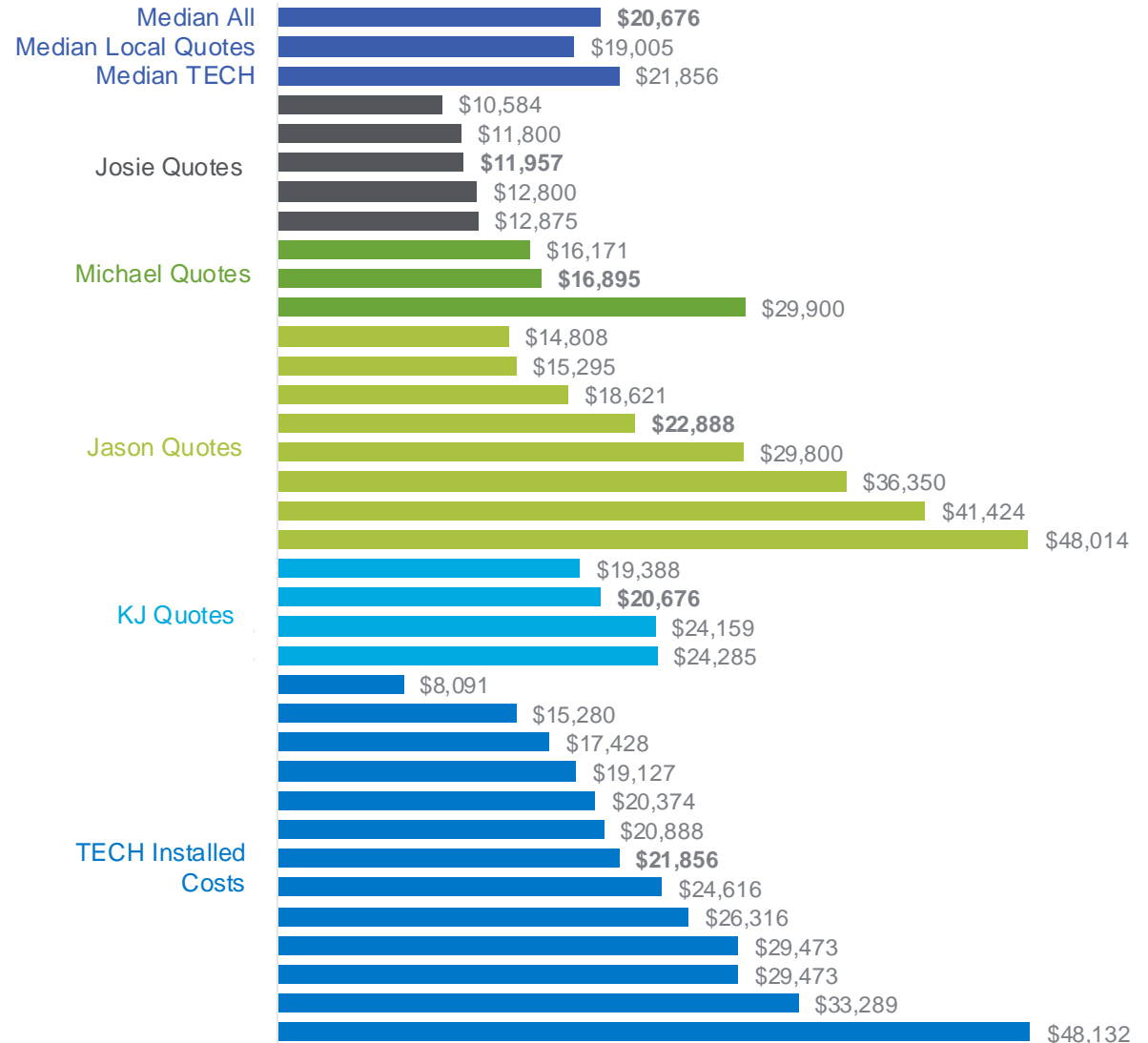




Heat Pump Space Heater Costs

We reviewed quotes and installation cost data from 15 projects in San Mateo County as well as the quotes from KJ on our team, who lives in Santa Clara County. We found the following results:

- **The median cost of a heat pump space heater is \$20,700**
- Quotes at an individual home can range by \$15,000 or more.
- TECH installations appear to be slightly more expensive than non-TECH installations. This could be because:
 - Contractors are keeping some of the incentive
 - Contractors are charging more for early adopters
 - Later installation data reflects recent inflation



2-Way AC Incentives



Default Intent



Default Intent



Default Intent



Default Intent



	Adding A/C only (keep furnace)	Adding HP (keep furnace)	Adding HP (remove furnace)	Replacing A/C + Furnace	Replacing A/C & Furnace w/HP	Replace A/C (keep furnace)	Replace A/C with HP (keep furnace)	Replace A/C (keep furnace)	Replace A/C with HP (remove furnace)
Add circuit	Yes	Yes	Yes	N/A	N/A	N/A	N/A	N/A	N/A
Indoor unit equipment			+\$1,000-\$2,000						+\$1,000-\$2,000
Indoor unit labor				+\$500-\$1,000					
Refrigerant pipe									
Duct test + seal									
Cap gas line			\$100		\$100		\$100		\$100
Flue work	\$100	\$100		\$100	N/A	\$100		\$100	
Outdoor unit equipment		+\$500-\$1,000	+\$500-\$1,000		+\$500-\$1,000		+\$500-\$1,000		+\$500-\$1,000
Outdoor Unit labor									
Heat pump alt.		+\$500-\$1,000	+\$1,500-3,000	Neutral			+\$500-\$1,000		+\$1,500-3,000




Dryers and Ranges

Dryers cost around **\$925** delivered and installed, old one removed








Your Appliance

Earliest Delivery: **January 15**
Based on Zip Code **94061**
You can choose another date during checkout.

	LG Electronics 7.3 cu. ft. Ultra Large White Smart Electric Vented Dryer with EasyLoad Door and Sensor Dry, ENERGY STAR Qty: 1	\$848.00
Parts & Services		
Installation		FREE
Standard Installation Kit (required)		\$52.97
Haul Away Your Old Appliance		\$25.00
Manufacturers Standard Warranty		FREE
Total		\$925⁹⁷ <small>Taxes calculated in checkout.</small>

Ranges cost around **\$1,150** delivered and installed, old one removed

This item is non-returnable.

	FRIGIDAIRE GALLERY 30 in. 5.4 cu. ft. Induction Electric Range with Self-Cleaning Oven in Smudge-Proof Stainless Steel with Air Fry Model #GCR3058AF	\$1,098.00 \$1,999.00 Save 22%						
<table border="1"> <tr> <td></td> <td></td> </tr> <tr> <td>Home Delivery</td> <td>Store Pickup</td> </tr> <tr> <td>FREE</td> <td></td> </tr> </table>					Home Delivery	Store Pickup	FREE	
								
Home Delivery	Store Pickup							
FREE								
Parts & Services Edit								
Range Power Cord		\$32.85						
Manufacturer's Standard Warranty		Included in the actual price						
Haul Away Your Old Appliance		\$25.00						
Save for Later Save to Favorites Remove								

Subtotal	\$1,456.85
Savings	-\$301.00
Appliance Delivery	FREE
Sales Tax (determined in later step)	---
Total	\$1,155⁸⁵
You Saved 21% Off Your Item	
Have a promo code?	
Checkout	
PayPal Checkout	

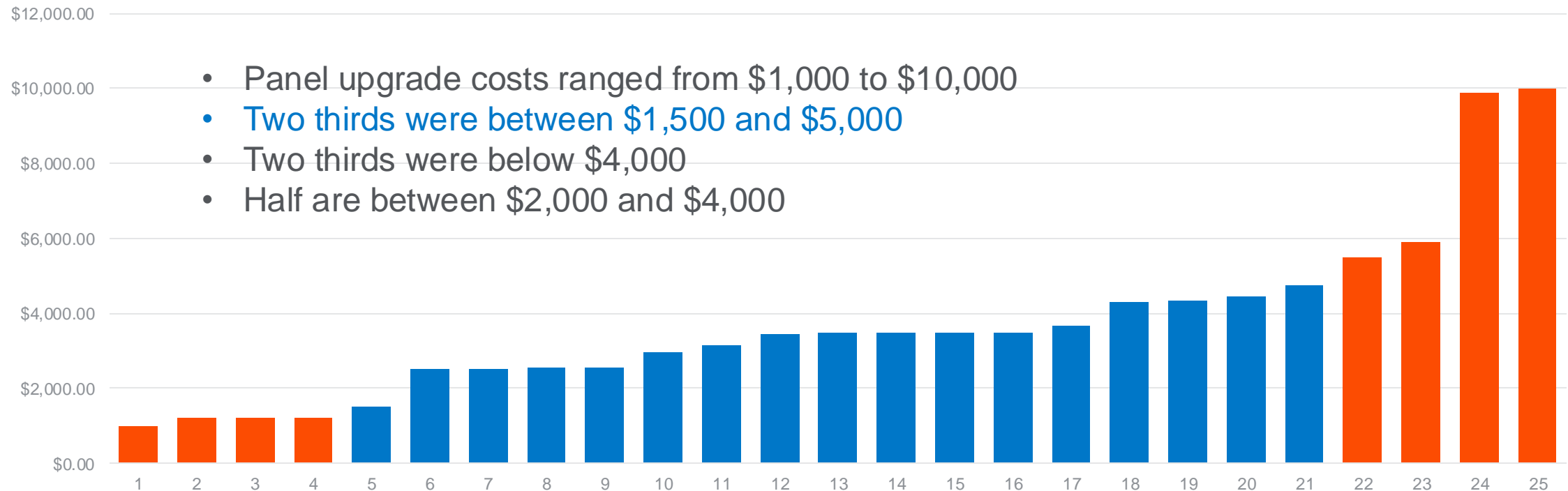


Blake estimates **wiring runs** to cost **\$500 - \$2,000** (excluding panel or sub-panels)



Panel Upgrade Program Costs (n = 25)

Panel Upgrade Costs from Our Program



- Panel upgrade costs ranged from \$1,000 to \$10,000
- Two thirds were between \$1,500 and \$5,000
- Two thirds were below \$4,000
- Half are between \$2,000 and \$4,000

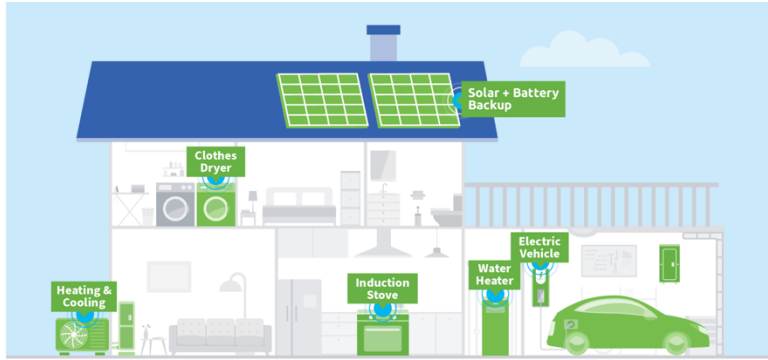
Average cost is \$3,700



Single-Family Home Average Cost

The most common single-family home in SM County has:

- Gas water heating, tank-type
- Gas space heating, without air conditioning
- Gas cooktop
- Electric drying



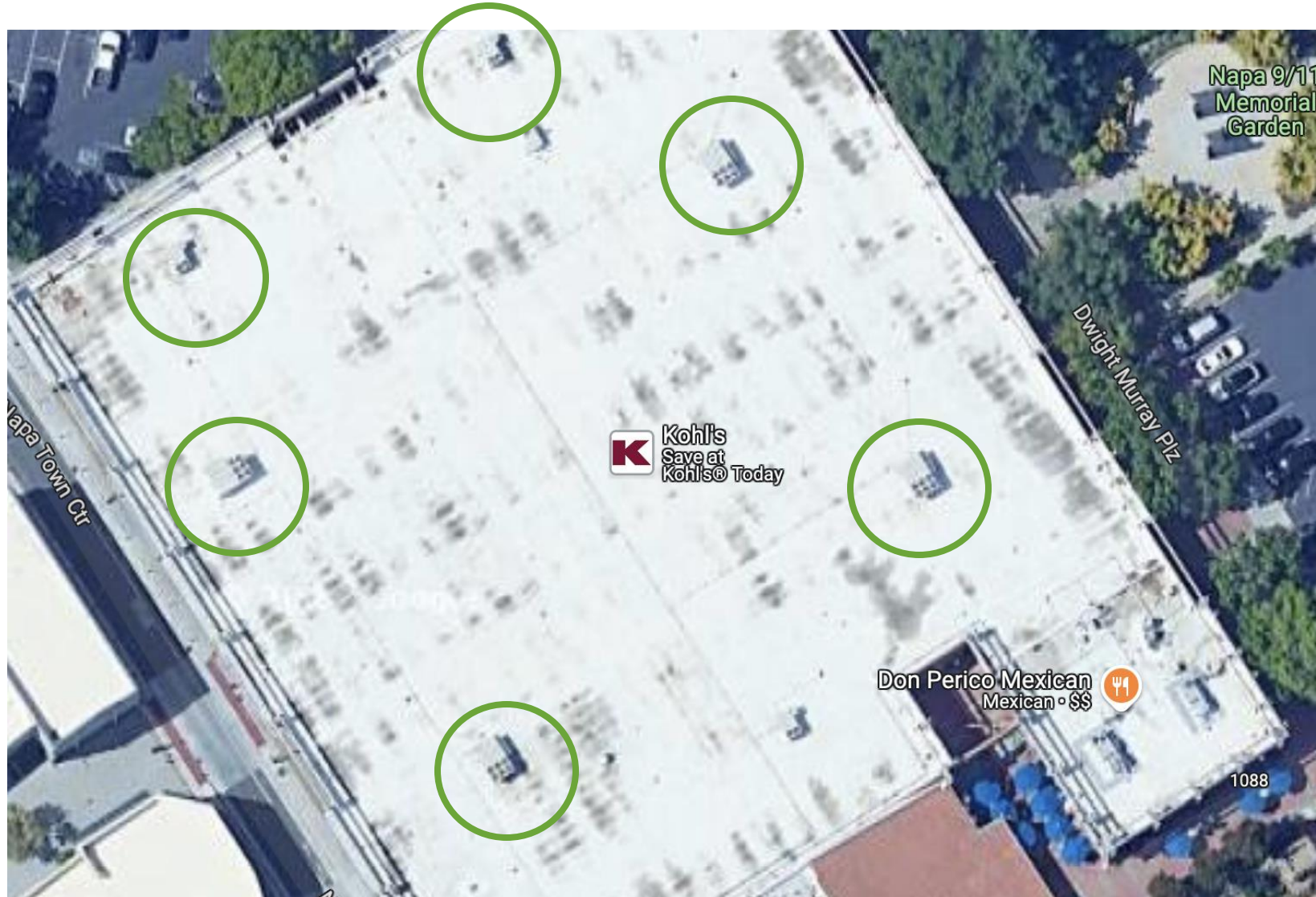
The cost to electrify will be \$28,000, an increased cost to the homeowner of \$18,600 versus typical replacement costs.

	Electrification Cost	Replace In-Kind Cost	Incremental Cost
Water Heating (includes 240V circuit)	\$6,100	\$2,000	\$4,100
Space Heating	\$20,700	\$6,132	\$14,568
Cooking	\$1,098	\$1,155	-57
Clothes Drying	\$925	\$925	\$0
Total	\$28,823	\$9,057	\$18,611
Panel, if required	\$3,700		
Total non-optimized cost	\$32,523		

Up to 2,500 sqft home with one central heating system. In most cases panel upgrades are not required if 100 A service is available.



Commercial: Rooftop Packaged Unit Costs

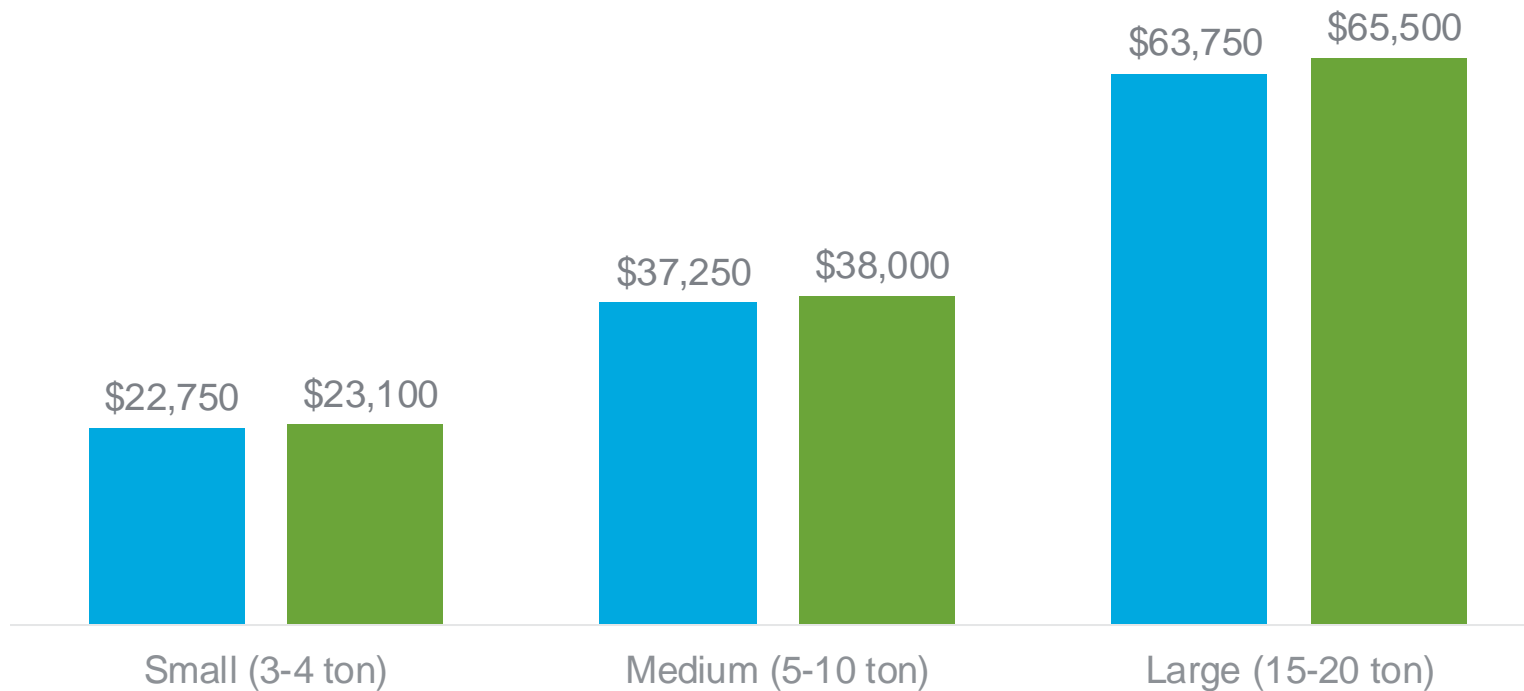




Commercial: Rooftop Packaged Unit Costs

Median Rooftop Packaged Heat Pump Installation Costs

■ Gas ■ Heat Pump



Reach Code Opportunity

Costs of rooftop heat pumps are nearly identical to gas-fired rooftop packaged unit costs. While an incentive of \$100/ton would provide cost parity, it may not be required for commercial existing building policies for this technology.

Do We Really Need to Upgrade Electrical Panels?



Three Reasons Panels are Replaced

Capacity Constrained

Capacity, measured in Amps, is too low to add equipment



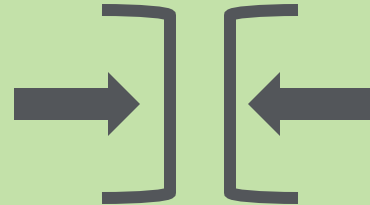
Max. 100A

Solutions to avoid upgrade:

- Circuit splitters
- Circuit pausers
- Smart panel
- Low-amp equipment

Space Constrained

There are no longer spare breaker spaces in the panel



Solutions to avoid upgrade:

- Subpanels
- Circuit splitters
- Smaller breakers
- Breaker re-use

Unsafe to Use

The panel is unsafe to work on, sometimes found on panels from the 1970s or earlier

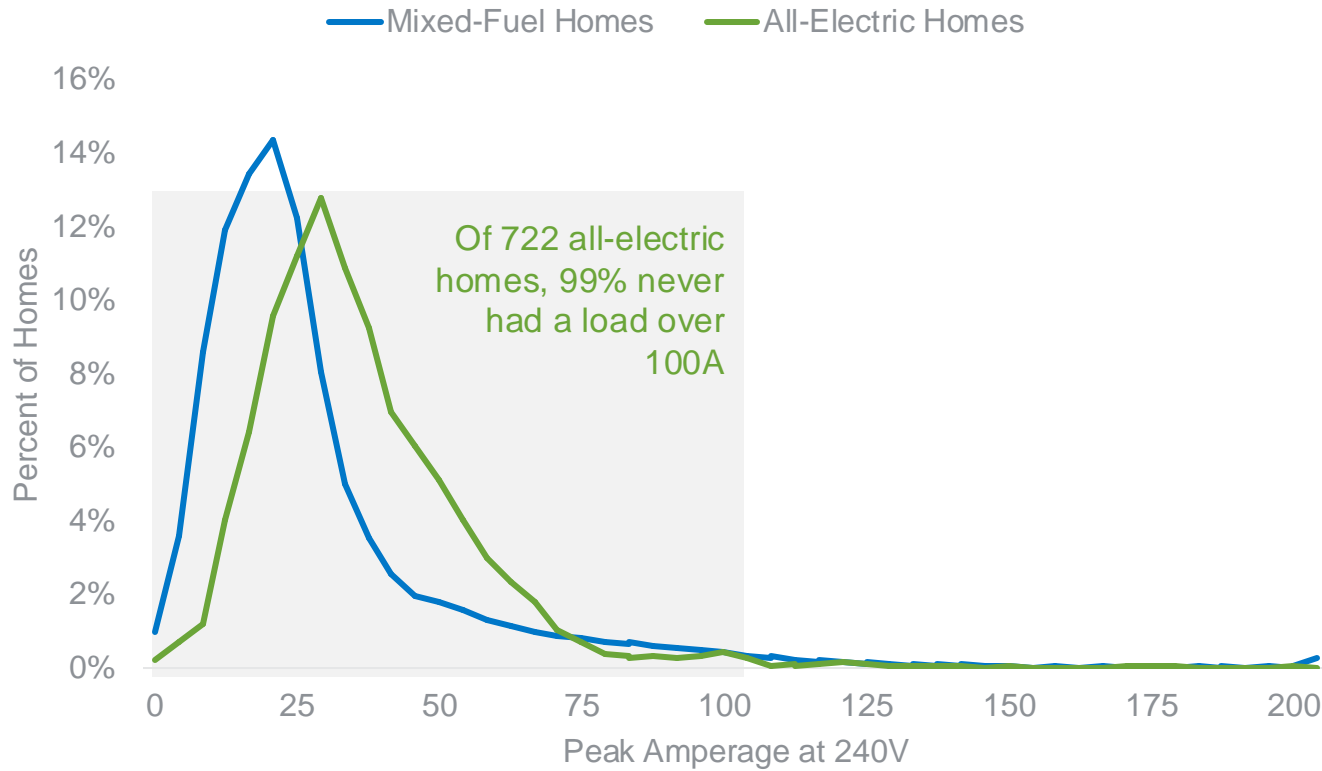


Solutions to avoid update:

The panel must be replaced for your safety. However, it may be worth avoiding a service upgrade using solutions for capacity-constrained panels, and planning ahead by providing breaker space for an all-electric life.

Data shows 100A is enough capacity for most homes

Maximum Annual Peak Demand at Single Family Homes in Peninsula Clean Energy Territory



Peninsula Clean Energy analyzed hourly utility data at hundreds of thousands of customer accounts. The peak demand at customer accounts tended to be well-below the 100A threshold.

99% of all-electric single-family homes use less than 100A of power at all hours of the year.

The most common peak demand is 29 Amps, indicating over 70% of capacity goes unused throughout the year.

Over 99% of mixed-fuel, single-family homes use less than 100A of power at all hours of the year.

The most common peak demand is 21 Amps, indicating nearly 80% of capacity goes unused throughout the year. 80% are 38 Amps or less.

Including Solar When a Panel is At Capacity

For Solar systems under 5kW

The [120% rule](#) in the National Electrical Code allows load to go up to 120% of the rated busbar capacity, allowing 20A on top of the 100A capacity to be reserved for solar installations

To put it simply, the 120% NEC rule for the busbar roughly allows the following in addition to 100A-worth end uses:

- 3.8 kW-AC
- 5.5 kW-DC

Please consult your solar installer or electrician for detailed information when applying the 120% rule.

For Larger Systems and Going Net Zero

There are three alternative installation approaches that could be used to allow up to 20kW of solar in addition to the 100A worth of end uses. While these strategies are being used in some areas, they are not yet common in PG&E territory.



[Renewable meter adapters](#) are connect to the existing main panel and are wired to the utility-side of the panel, allowing for larger, streamlined installations. These are a common in San Diego Gas and Electric (SDG&E) territory



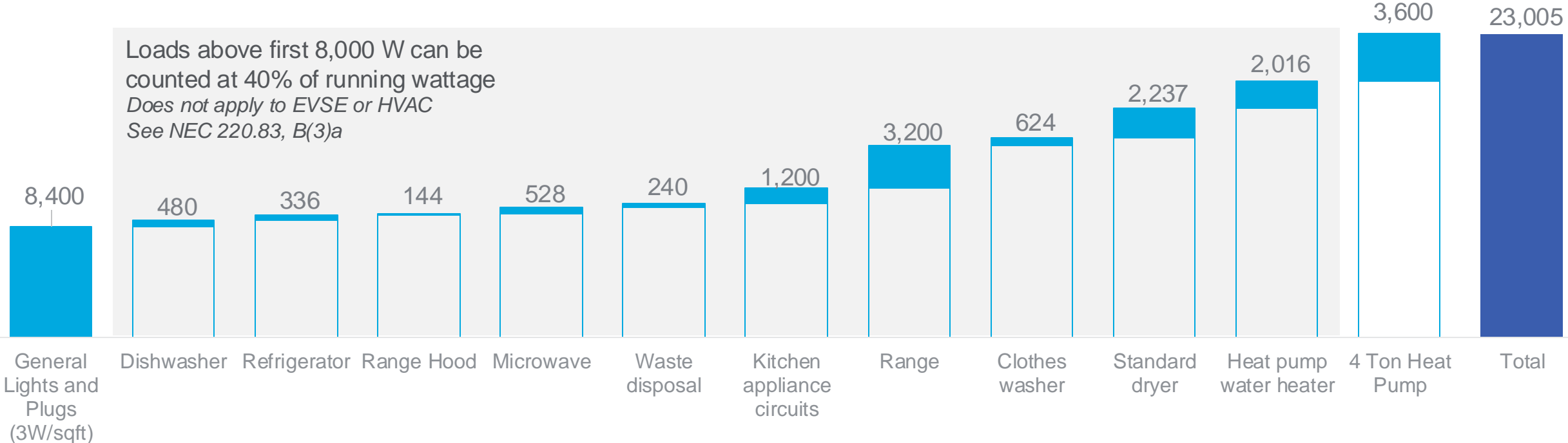
[Meter collars](#) are wired similarly to a renewable meter adapter, and are designed to connect to the existing utility meter. These are not yet available as an option in California.

Line
Side
Tap

A “line-side tap” is a similar approach that installs solar on the line between the bus bar and the meter. This approach is possible with older meter boxes, but not newer ones

Calculation Summary

Panel Size Calculations for Sample 2,800 sqft Single Family Home (Watts at panel)



Typical Pre-1985 Single Family up to 2,800 sqft, up to 4-ton Heat Pump

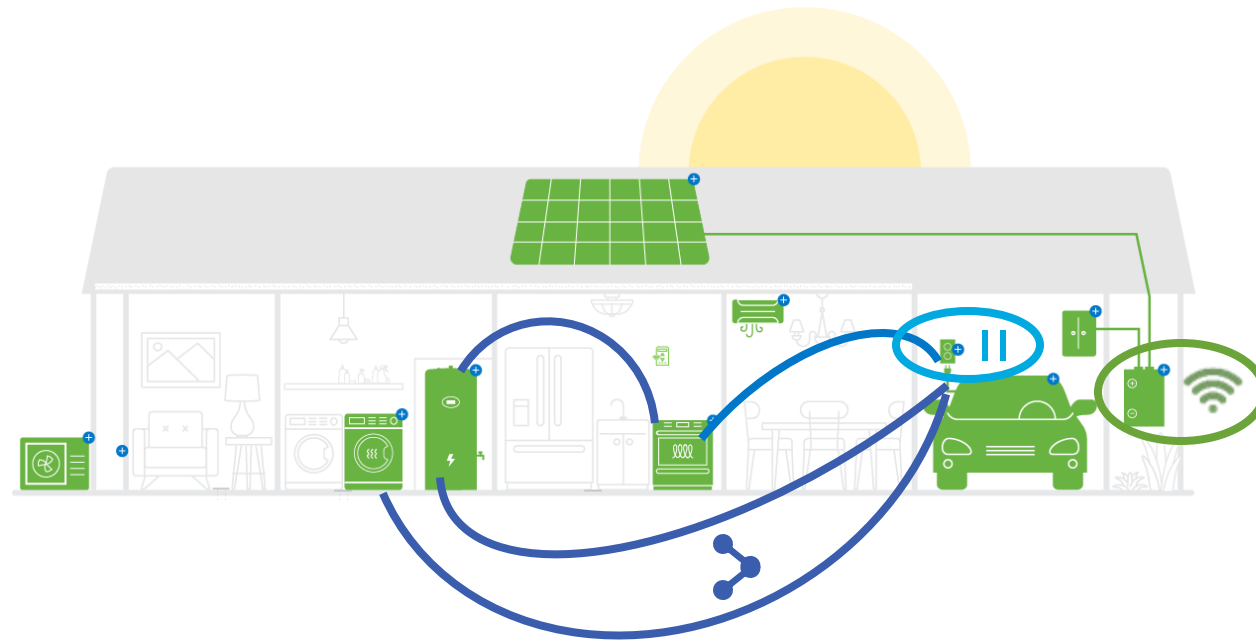
Home description:

- Up to 2,800 sqft
- 100A service and panel
- No pool or spa
- Slide-in range/oven combo
- One (1) 4-ton heat pump space heater

Summary:

It is relatively easy to electrify the typical single-family home up without upgrading above 100A service.

Focusing on circuit controls for EV charging is the easiest path to avoiding an upgrade. See options on the right.



Option 1

Control



Use a circuit pauser on the Level 2 EV charger

Option 2

Control



Use a **circuit-sharing** device with

- EV charger + range
- EV charger + water heater
- EV charger + clothes dryer
- Range + water heater

Option 3

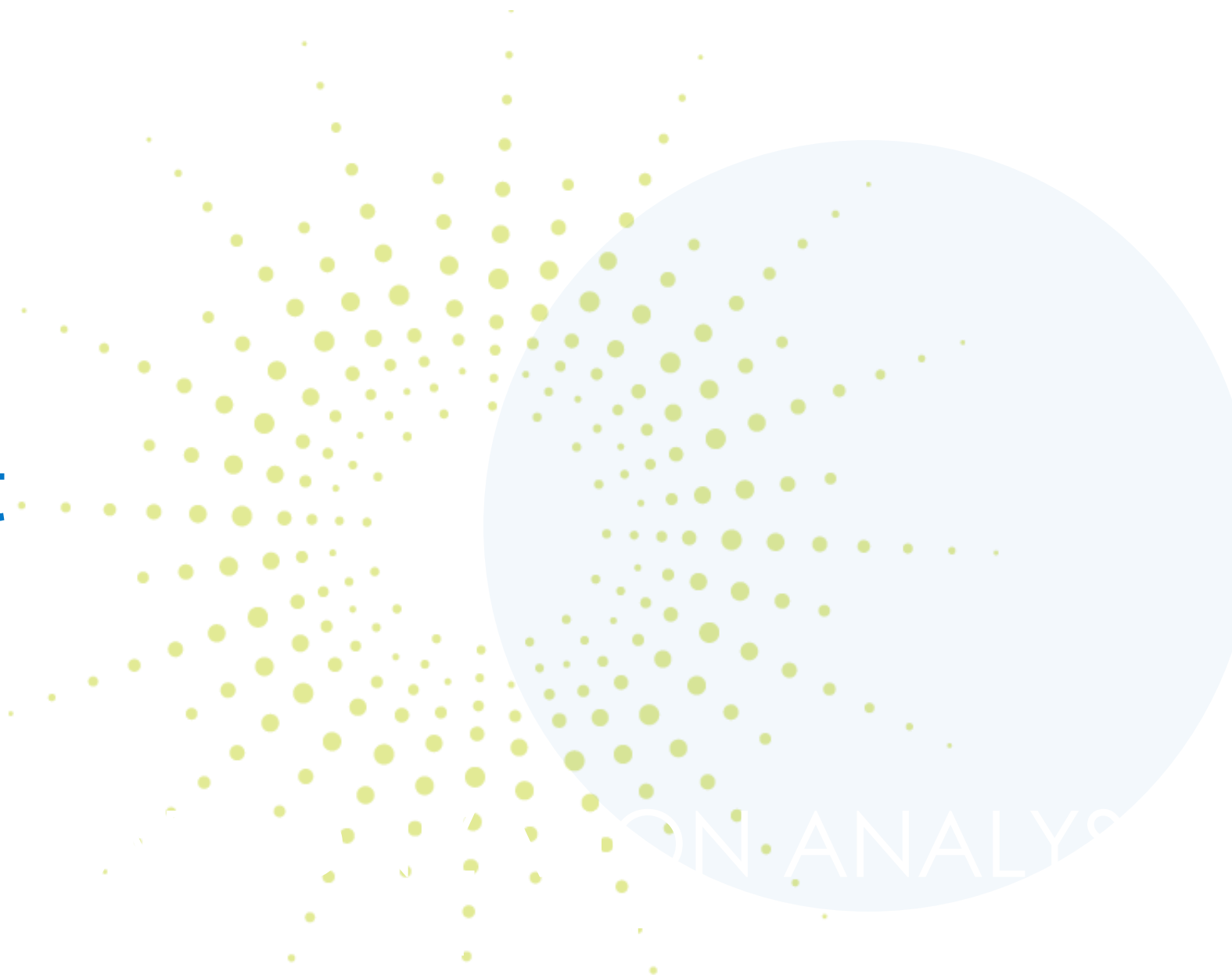
Control



Use a smart panel

Proof of Concept

2023-2024

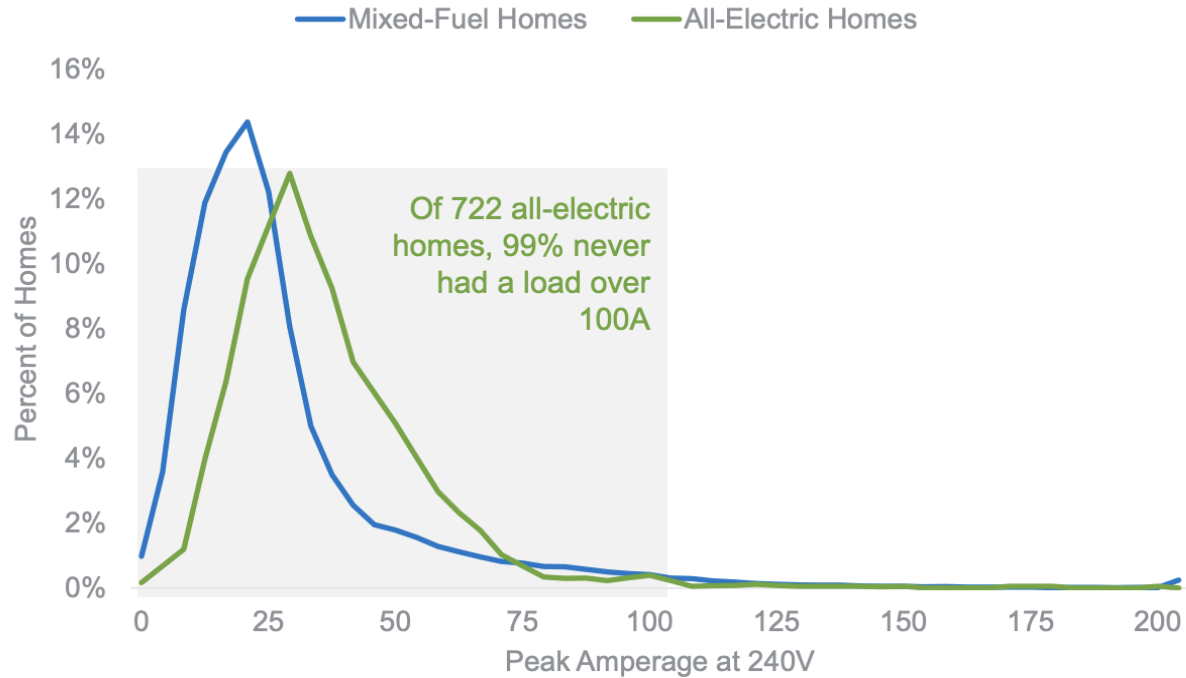


Whole Home Pilot

City	Woodside	Foster City	San Bruno	Millbrae	Menlo Park	San Mateo	San Mateo	San Mateo
Beds/Baths	3/3	3/2	2/2	3/1	3/2	3/2.5	2/1	4/2
Sqft	1,030 – 2,000							
Vintage	1927 - 1983							
Fuel	Propane	Methane Gas						
Panel size	100	100 to 200	125	100	100	100	200	200
Electrification total	Average Price - \$36,000							
Total incl. minor home repair	Average Price - \$36,500							
appliances	<ul style="list-style-type: none"> •Ducted HP •65g HPWH •Induction range •Dryer •Subpanel 	Ducted HP 65g HPWH (120v) •Induction cooktop	<ul style="list-style-type: none"> •2.5 HP •65 HPWH •Electric dryer •Subpanel 	<ul style="list-style-type: none"> •3 ton HP •65 HPWH •Electric range •Panel replacement 	<ul style="list-style-type: none"> •2.5 mini split HP •65g HPWH •Induction range •Electric dryer •Panel replacement 	<ul style="list-style-type: none"> •3 ton HP •Induction range •Electric dryer •New subpanel 	<ul style="list-style-type: none"> •4 zone mini split HP •65g HPWH •Induction Range 	<ul style="list-style-type: none"> •4 zone mini split HP •65g HPWH

Whole Home Pilot

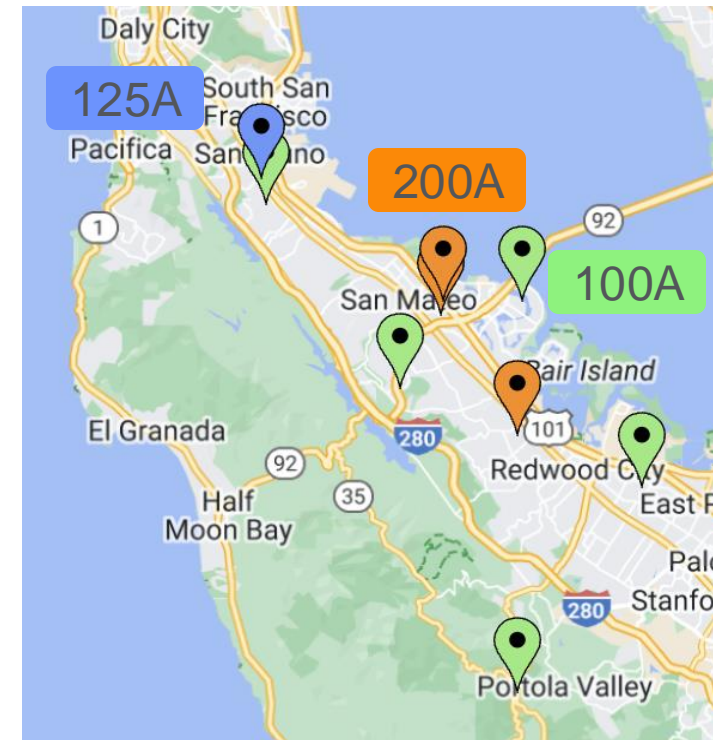
Maximum Annual Peak Demand at Single Family Homes in Peninsula Clean Energy Territory



PCE and SVCE analysis concludes that most homes under 2,800 square feet can electrify within 100A service capacity.

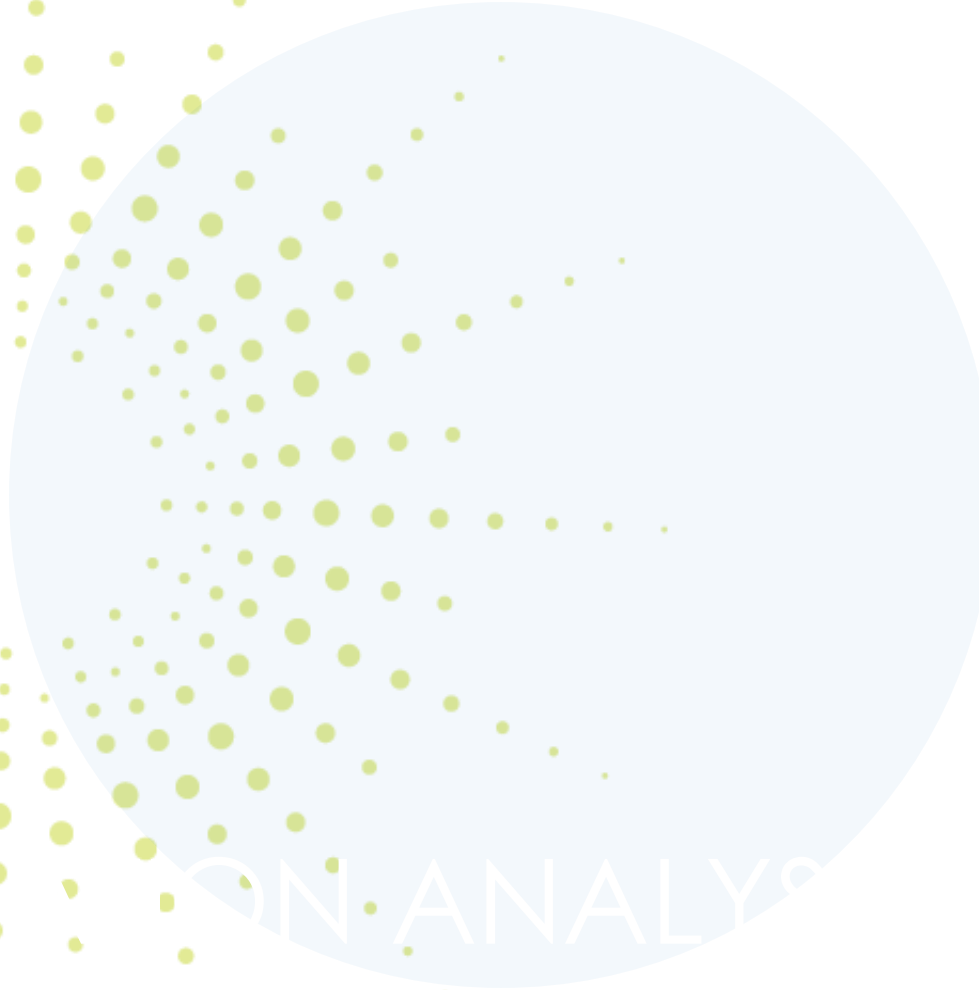
Whole Home Pilot

- 9 electrified homes
- 5 100A homes
- No service upgrades required



Scaling Our Programs

2023-2030



Program Background

Deeper assistance is needed to reach more single-family homes



Rebates
Post-install incentives.



Financing
0% loans up to \$10,000. (PCE only)



Advising & Support
One-on-one assistance for residents to learn how to electrify their homes.

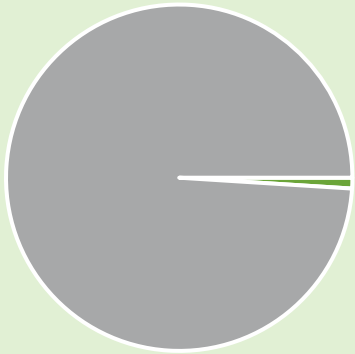


Full-Service Installation
Home assessments and installation services through PCE/SVCE backed partners.

Similar programs being built by:

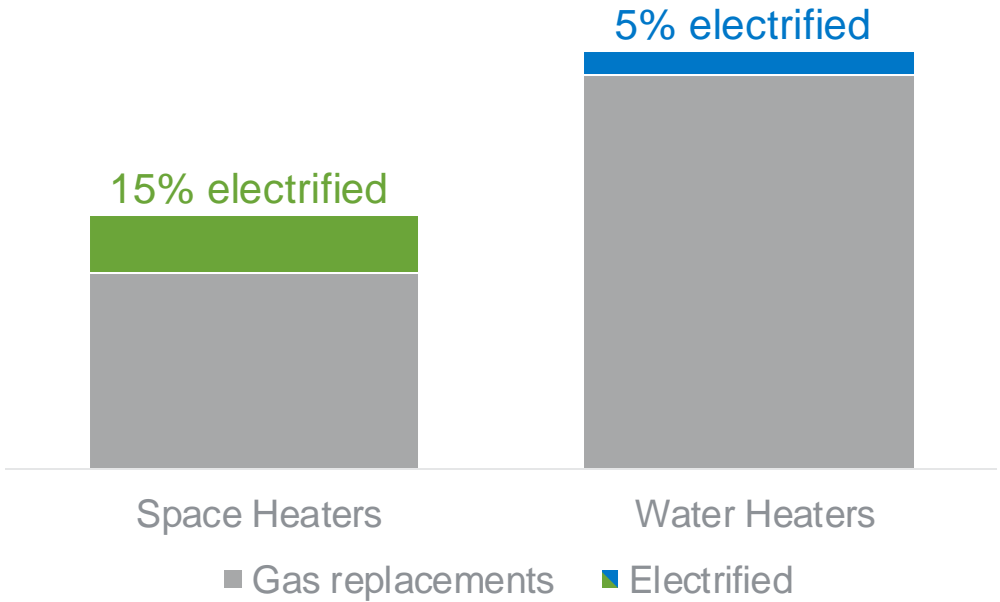
- California Energy Commission
- Palo Alto
- Marin Clean Energy

State of the Building Electrification Market



Only 1% of homes in PCE service territory are estimated to have taken any home electrification step

Electrification rebates as a percentage of replacements in 2023

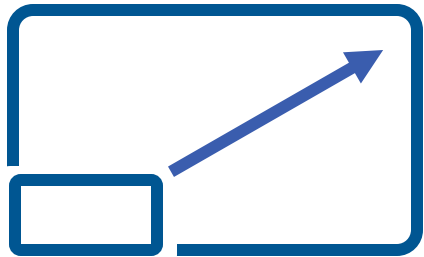


Annual small residential gas replacements

12,000 water heaters

7,000 space heaters

Vision Building Electrification v2 – Home Upgrade Services



Scale to Whole Home



Increase Homes Impacted per Year



One-Stop Shop Services



Concierge Services



Full-Service Installation

Full-Service Installation Offerings

Three components of comprehensive full-service installation services.

**Income-Qualified
No-Cost Electrification**

No-cost whole-home
electrification for low-
income residents

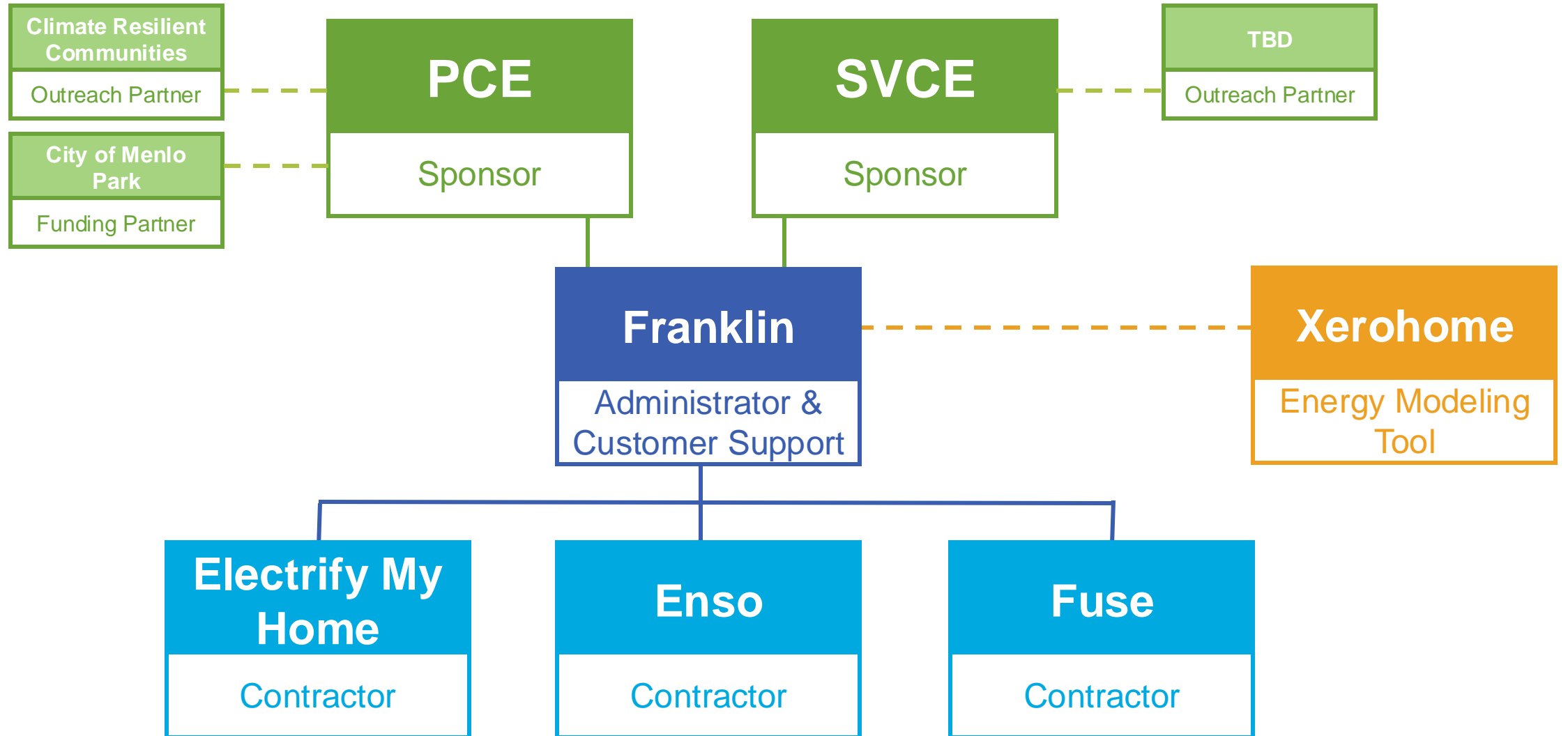
**Market-Rate
Low-Cost Electrification**

Low-cost whole-home
electrification for market-
rate residents

**Emergency
Water Heater Replacements**

Rapid replacement of
failing water heaters
with heat pump water
heaters

Home Upgrade Partners



Building Electrification v2: Timeline

