

# 2035 Decarbonization Feasibility Analysis & Plan

Complete Analysis and Draft Plan

September 22, 2022

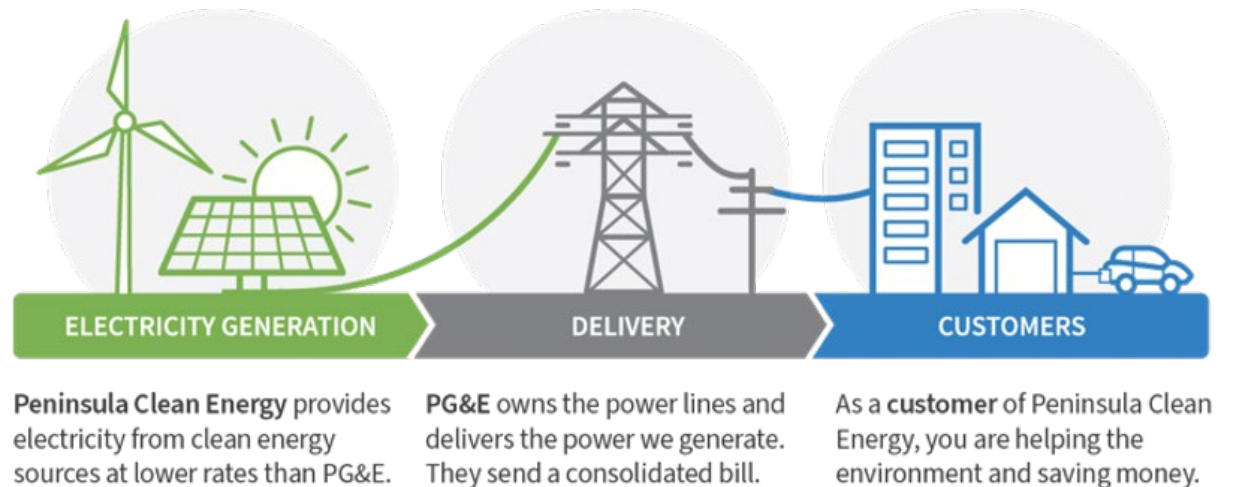


# Peninsula Clean Energy

The not for profit locally-led electricity provider for San Mateo County and Los Banos.

**Mission:** To reduce greenhouse gas emissions by expanding access to sustainable and affordable energy solutions

## How it works



# Strategic Plan

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ACHIEVING  
OUR MISSION

## ORGANIZATIONAL PRIORITIES:

By 2025, deliver 100% renewable energy each and every hour of day.

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Contribute to our community reaching a goal of 100% greenhouse gas-free in buildings and transportation by 2035

# 2021 Board Directive

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*Direct Peninsula Clean Energy to adopt a goal of 100% greenhouse gas free [in buildings and transportation] by 2035 and direct staff to return with a plan for achieving that goal.*

# Plan Must Address Critical Challenges

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1. Building public awareness and motivating adoption

2. Making it easy to take action

3. Accessing the capital to enable action

# Considerations for Feasibility

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1. PCE targets are ones PCE is positioned to affect in energy
2. Solutions exist or are expected to in timeframe
3. State/Fed, local govs and market play material roles
4. A pathway to capital and PCE budget support

# 2035 Plan Objectives

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1. Define **Market Conditions** projected in the timeframe
2. Determine **costs** of decarbonization within target segments
3. Specify **investment strategy** – PCE, non-PCE, and finance
4. Specify **marketing and policy** needs
5. Produce concrete program **roadmap to implement** and achieve maximum decarbonization

# Board and Advisory Committees

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## Board Sub-committee

Rick DeGolia (chair)

Jeff Aalfs

Dave Pine

Laura Parmer-Lohan

## Advisory Committee

Jeff Aalfs

Diane Bailey

Jeff Byron

Andrea Chow

Pierre Del Forge

Cisco Devries

Adrienne Etherton

Laura Feinstein

Zach Franklin

Matt Golden

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Loren McDonald

Joshua Pierce

Mary Anne Piette

James Russell

Nancy Ryan

Justin Zuganis

Board of Directors, Peninsula Clean Energy

Executive Director, Menlo Spark

Former CEC Commissioner

Sustainability Analyst, City of San Mateo

Clean Buildings Director, NRDC

CEO, OhmConnect

Sustainability Manager, City of Brisbane

Sustainability Policy Director, SPUR

Chief Strategy Officer, GRID Alternatives

CEO, Recurve

Executive Director, El Concilio

EV Industry Analyst, EVAdoption.com

EVP, Richard Heath and Associates

Division Director, Lawrence Berkeley National Lab

Energy Transition Director, CLEAResult

Former CPUC Commissioner

Director of Decarbonization, SVCE



# Project Schedule

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- Dec. '21: Scheduling and Scope



- Q1/Q2: Market Conditions



- Q2: Segments, Costs and Financing Options



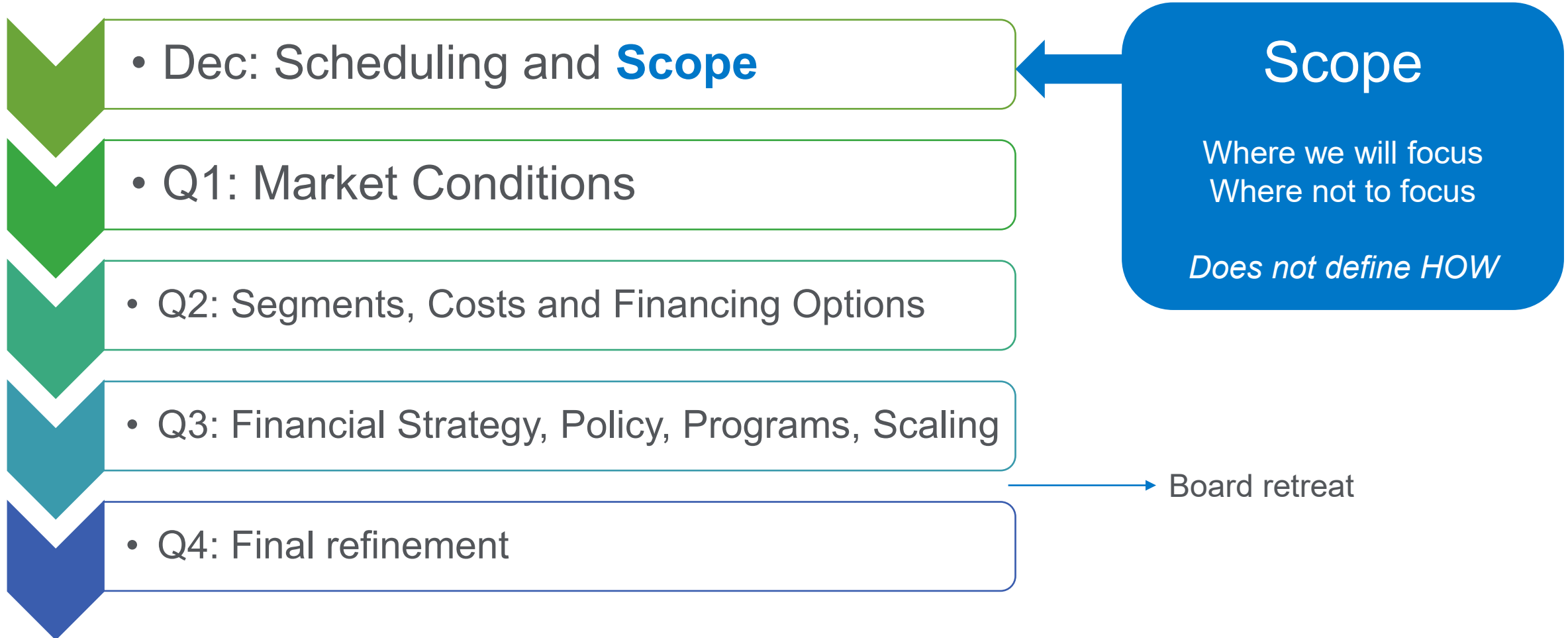
- Q3: Financial Strategy, Policy, Programs, Scaling



- Q4: Final refinements (& Marketing, Metrics, Roadmap)

# Scope

# We Are Here



# 2035 Scoping Table of Contents

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1. Scoping Approach
  - a. Rationale for out-of-scope emissions
  - b. Focusing on Transportation and Buildings
  - c. Scope Overview
  - d. Scope Implications & Catalyst/Enabler Role
2. Transportation Detail
  - a. Transportation Scope
  - b. Ecosystem
  - c. Impact
3. Buildings Detail
  - a. Buildings Scope
  - b. Ecosystem
  - c. Impact
4. Impact Summary

# Rationale for Out of Scope

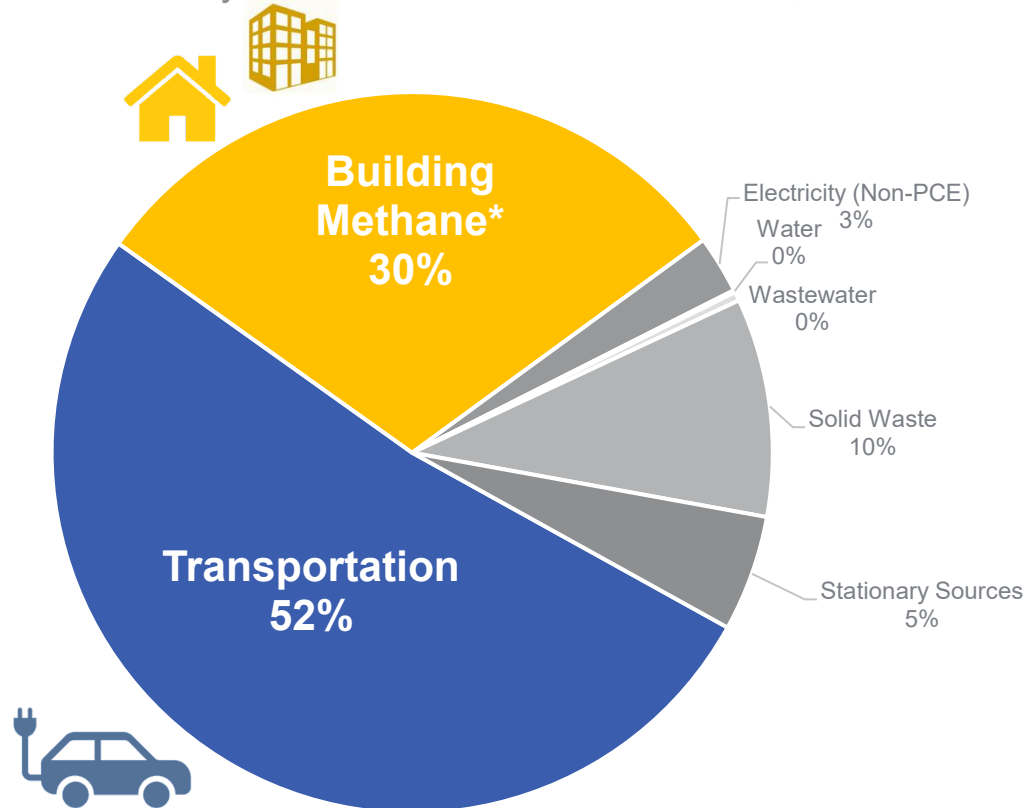
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Rationale for Exclusion	Example
Out of territory	Maritime emissions, regional transportation
Market momentum exists	LED lighting
Other actors are leading	CARB heavy duty investment
No direct line of influence	Direct Access power
No PCE path to accelerate	Industrial
Scope 3 emissions	Embodied emissions
Adaption, mitigation, climate restoration	Wildfire fuels reduction

# PCE Area of Influence

## Focusing on Transportation and Buildings

San Mateo Countywide Greenhouse Gas Emissions, 2021



*\*Methane estimate excludes fugitive emissions and near-term warming potential*

### Rational for exclusion:

- **Electricity (Non-PCE)** - Direct Access and PG&E electricity supplies are not within our control. In addition, our team forecasts these will be near-zero by 2030.
- **Water** – Negligible emissions, and under purview of water district.
- **Wastewater** – Negligible emissions, and other actors are working in the space.
- **Solid Waste** – Negligible emissions, and other actors are working in the space.
- **Stationary Sources** – Not within our control

# Scope Overview

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- PCE Primary Scope
  - Transportation: private passenger, local gov & small commercial fleets, ride-hailing, alternative mobility
  - Buildings: residential (single family & small multifamily), office, small commercial
- Not in PCE scope, or limited\* (others lead)
  - Transportation: heavy-duty vehicles, off-road
  - Buildings: industrial, large commercial\*, large multifamily\*
  - Non-energy: land-use, compost, stationary sources, landfills
  - Out of territory: SF airport
  - Embedded carbon, Climate Adaptation, Sequestration/restoration

# Scope Implications & Catalyst/Enabler Role

## Out of Scope

- Others lead (State, Regional, Fed)
- PCE may highlight in communications

## Support Scope

- Limited complementary program
- Ex: Fleet tech assist
  - CARB regs, CEC incentives
  - Modest GHGs
- Ex: Building electrification in large multi-family buildings
  - Only 27% of SMC housing
  - Existing BayREN program

## Primary Scope







# Transportation Scope

- a. Transportation Scope
- b. Ecosystem
- c. Out-of-Scope
- d. Impact



# Proposed Transportation Scope

Primary Scope	Out of Scope
<ul style="list-style-type: none"><li>• Personal vehicles</li><li>• Government vehicles</li><li>• Local commercial fleets (light and medium duty)</li><li>• Ride-hailing (for now)</li><li>• Alt. Mobility</li></ul>	<ul style="list-style-type: none"><li>• Heavy-duty trucks</li><li>• Non-local fleets</li><li>• Rental vehicle fleet</li><li>• Aviation</li><li>• Maritime</li><li>• Off-road</li></ul>
Support Scope	
<ul style="list-style-type: none"><li>• Other mobile sources (Ag., outdoor equip.)</li><li>• Transit buses</li></ul>	

# We're Not Alone

## Proposed Transportation Scope & Ecosystem



### Personal Vehicles



clean vehicle  
assistance program



CALIFORNIA  
CLEAN FUEL  
REWARD<sup>SM</sup>



### Fleet Vehicles, LD + MD



### Ride-Hailing



### Alt. Mobility (E-Bikes)



BAY AREA  
AIR QUALITY  
MANAGEMENT  
DISTRICT



### Other Mobile Sources



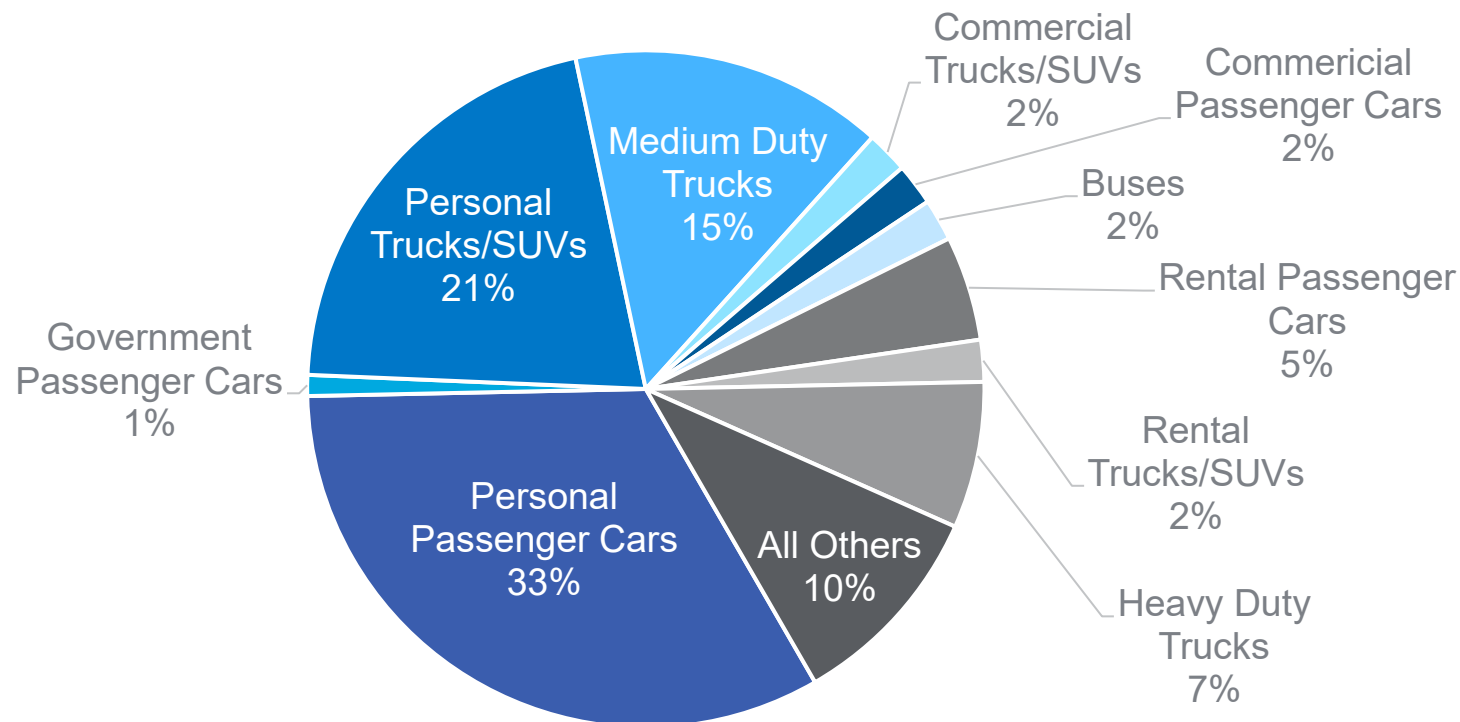
Primary Scope

Support Scope

# Primary Scope Emissions, Transportation



San Mateo Countywide Transportation Emissions



76%

of transportation emissions  
considered primary scope



# Buildings Scope

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- A diagram illustrating the 'Buildings Scope'. It features a large, light blue circle on the right side of the slide. To the left of this circle, a large number of small, yellow-green dots are scattered across the white background. Some of these dots are contained within the blue circle, while many others are outside it. The dots are of varying sizes, with some being significantly larger than others. The list of items is positioned inside the blue circle, to the right of the main cluster of dots.
- a. Buildings Scope
  - b. Out-of-Scope
  - c. Impact
  - d. Ecosystem



# Proposed Buildings Scope

Primary Scope – We lead and mobilize capital	Out of Scope
<ul style="list-style-type: none"><li>• Single-family homes<ul style="list-style-type: none"><li>• 1-4 unit homes</li><li>• Manufactured homes</li></ul></li><li>• Small office/retail</li><li>• Municipal buildings</li></ul>	<ul style="list-style-type: none"><li>• Industrial</li><li>• Greenhouses</li><li>• Fixing leaking transmission and distribution lines</li><li>• Existing gas/diesel standby and portable generators (assumed to be replaced on their own)</li></ul>
<b>Support Scope – Others lead, we provide technical support and pilots</b> <ul style="list-style-type: none"><li>• Multi-Family</li><li>• Lab</li><li>• Large hotel</li><li>• Large Commercial</li><li>• Restaurant cooking equipment</li></ul>	

# We're Not Alone

## Buildings Co-Funding & Ecosystem



Primary Scope

### Single-Family



California  
Public Utilities  
Commission

CALIFORNIA  
ENERGY  
COMMISSION



### Small Commercial, Non-Cooking



California  
Public Utilities  
Commission

CALIFORNIA  
ENERGY  
COMMISSION

### Multi-Family



California  
Public Utilities  
Commission

CALIFORNIA  
ENERGY  
COMMISSION



### Large Commercial



California  
Public Utilities  
Commission

CALIFORNIA  
ENERGY  
COMMISSION



### Commercial Cooking



BAY AREA  
AIR QUALITY  
MANAGEMENT  
DISTRICT

Support Scope

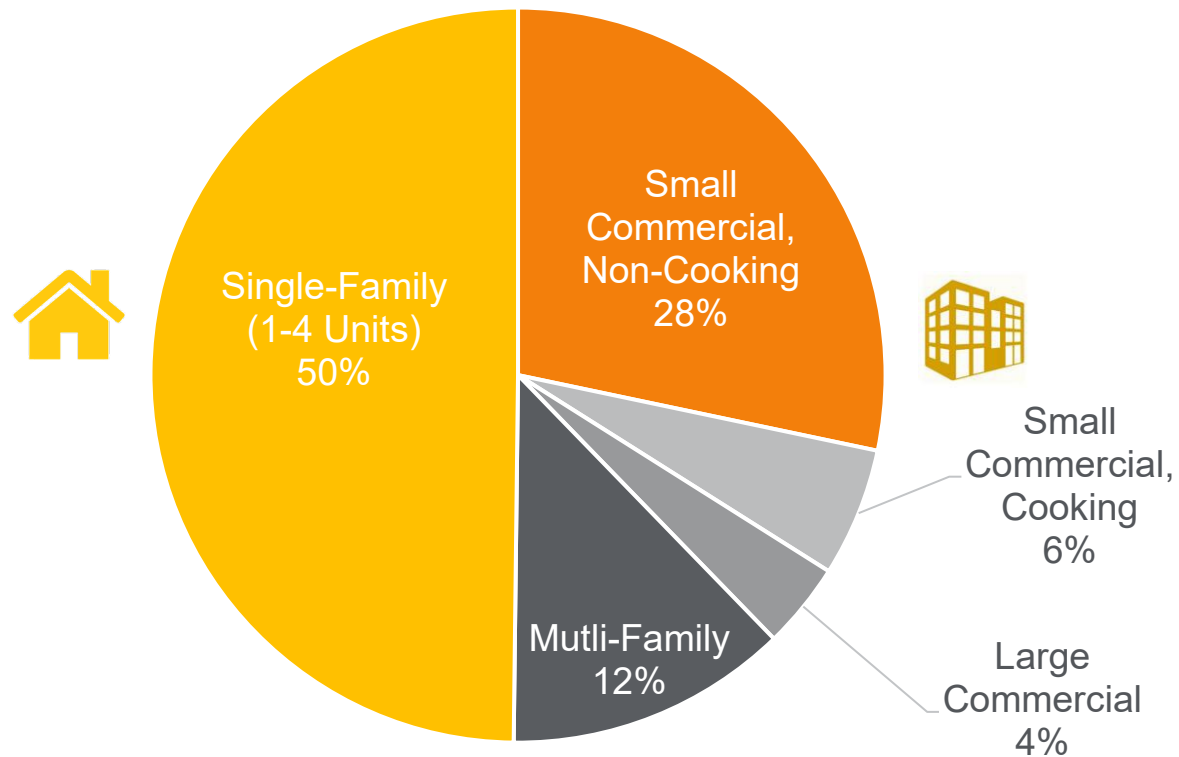
# Primary Scope Emissions, Buildings



## San Mateo Countywide Building Methane Emissions

78%

of building emissions  
considered in scope

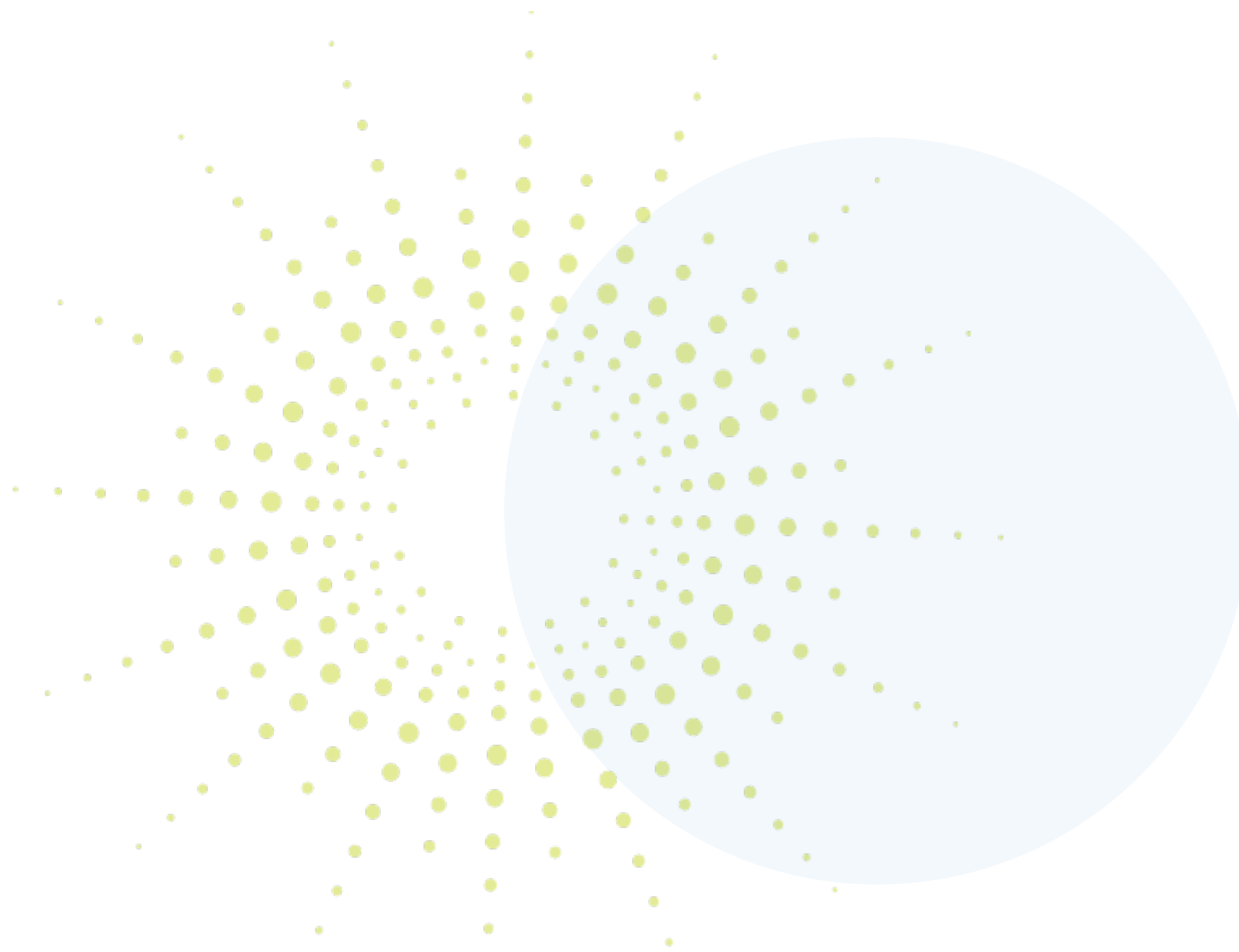


### Rationale for exclusion:

- **Large Multi-Family** – Represents less than 25% of building stock and associated emissions.
- **Large Commercial** – Represents less than 5% of building emissions. Each project will be unique and may require high effort, approaches.
- **Restaurant Cooking** – Market readiness.

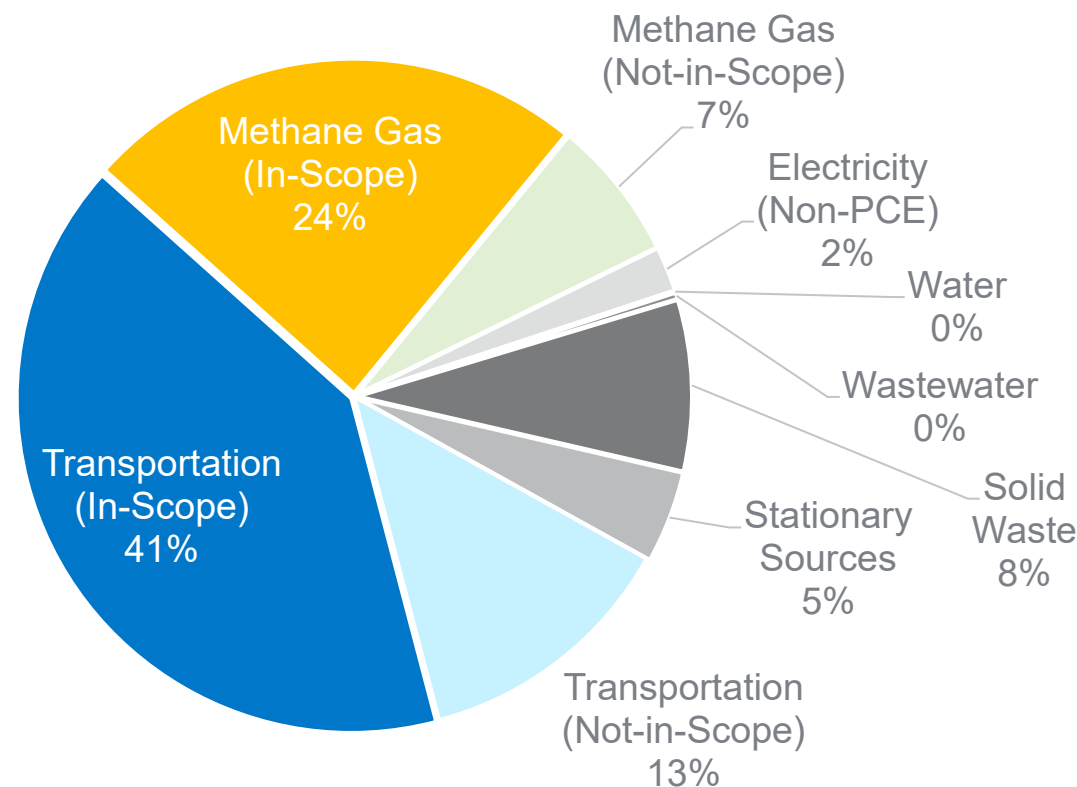


# Impact Recap



# In-Scope Emissions Impact Summary

San Mateo Countywide Greenhouse Gas Emissions,



65%

of Countywide emissions  
considered in scope

*\*Methane estimate excludes fugitive emissions  
and near-term warming potential*

# PCE Scope

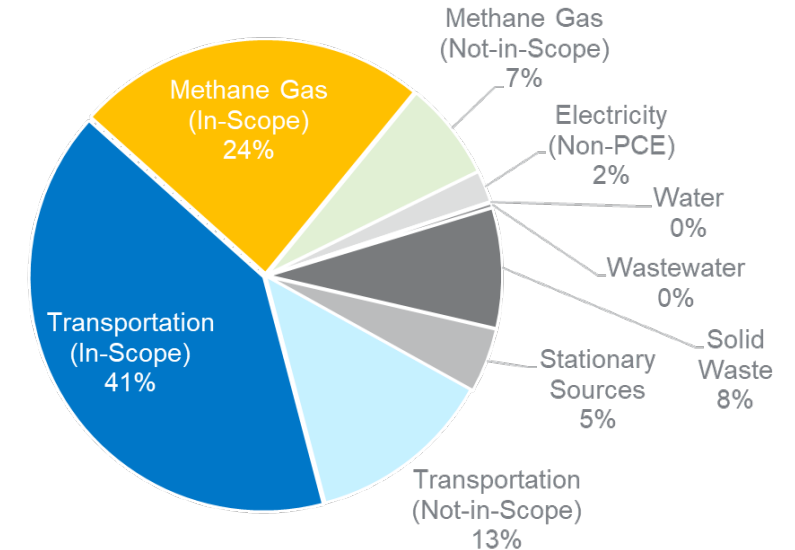
- **Primary Scope**

- Transportation
  - private passenger, local gov & small commercial fleets,
  - ride-hailing, alternative mobility
- Buildings
  - residential (single family & small multifamily),
  - office, small commercial

- **Not in scope, or limited\* (others lead)**

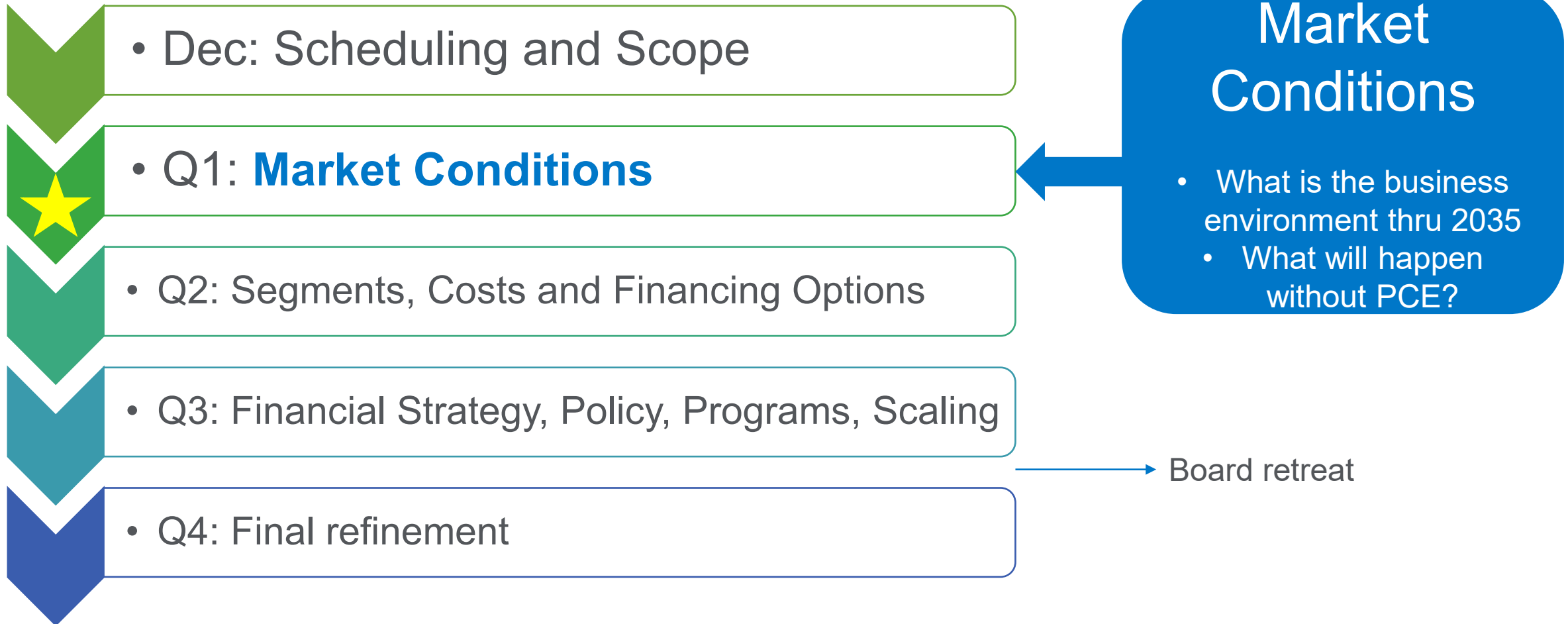
- Transportation: heavy-duty vehicles, off-road
- Buildings: industrial, large commercial\*, large multifamily\*
- Non-energy: land-use, compost, stationary sources, landfills
- Out of territory: SF airport
- Embedded carbon, Climate Adaptation, Sequestration/restoration

San Mateo Countywide Greenhouse Gas Emissions,



# Market Conditions

# We Are Here



# Market Conditions: How the analysis is done

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## Market Conditions

- Macroeconomic conditions
- Technology developments
- Cost changes (products, methods, rates)
- Available or expected policy support  
(no PCE action)



“Business-as-usual”  
adoption forecasts

# Table of Contents

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The Market Conditions document outlines assumptions for current and trending market conditions through 2035, including: technology availability, technology pricing, known or expected policies, state and federal funding, consumer preferences, utility rate forecasts, and population growth projections. The corresponding Market Conditions excel file will be utilized in 2035 planning analytics.

## Table of Contents:

1. Macroeconomic Conditions
2. Building Electrification
3. Transportation Electrification

# Macroeconomic Conditions

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1. Population and Housing continues at 10-yr historic rate
  - Population: 0.62%/yr, Housing: 0.94%/yr
2. Worker shortages continue
  - Retirements & demographic changes
3. Supply Chain will catch up slowly; Inflation volatile, may flatten by mid-2023
  - Volatile in the short term; Opinions vary
4. Resident purchasing power continues declining
  - Housing costs rising faster than income
5. Electric Vehicle “hockey stick” is here
  - San Mateo County at nearly 25% of new private vehicle sales in 2021



# Population and Housing

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	Historical annual growth rate (2010-2020)	Forecast annual growth through 2035	2020	2035
Population	0.62%	0.62%	764,442	839,007
Housing Count (DUs)	0.94%	0.94%	283,082	325,659
Personal Vehicles Owned	Linked with population		575,000	629,000



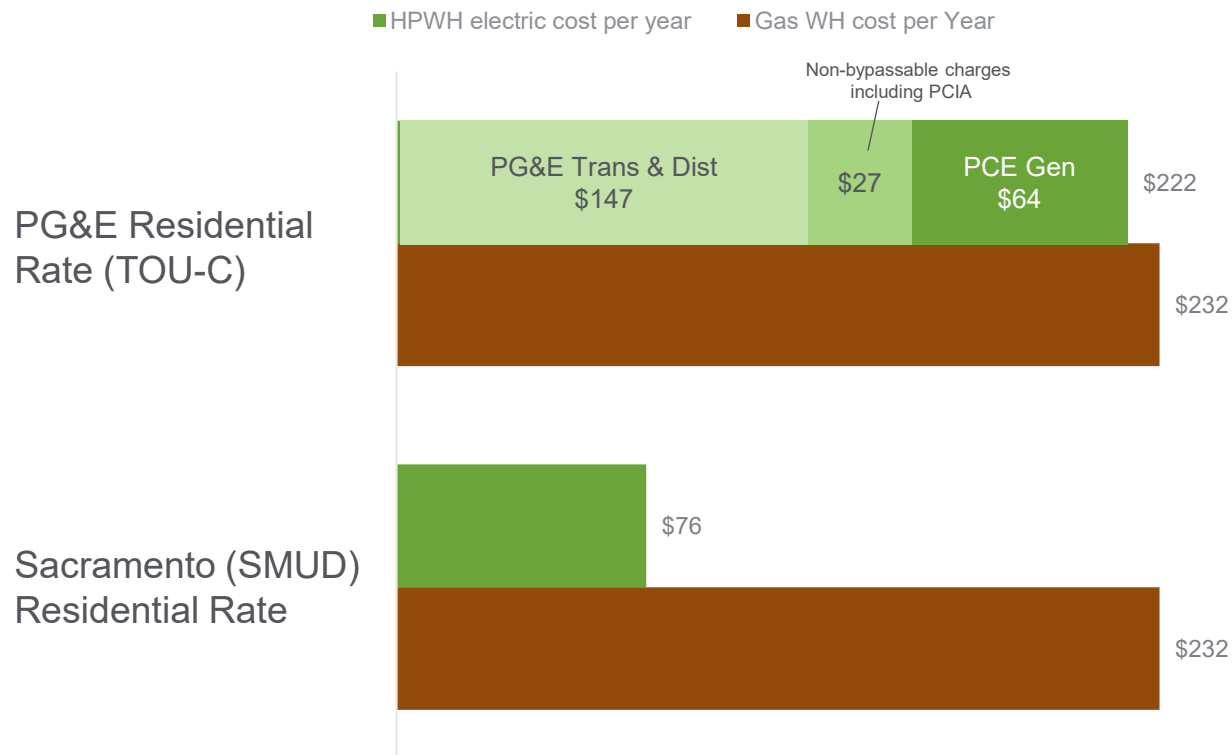
# Building Electrification

Primary Focus: Single-Family and Small Multi-Family Residential



# Impact of Utility Rates

Annual Water Heating Operating Cost by Utility and Rate (2022 rates)



- Residential rates in PG&E territory are very high
- Effectively eliminates economic benefit of electrification
- PCIA is ~\$11/year
- Load shape 3% reduction
- Unless rate structures shift



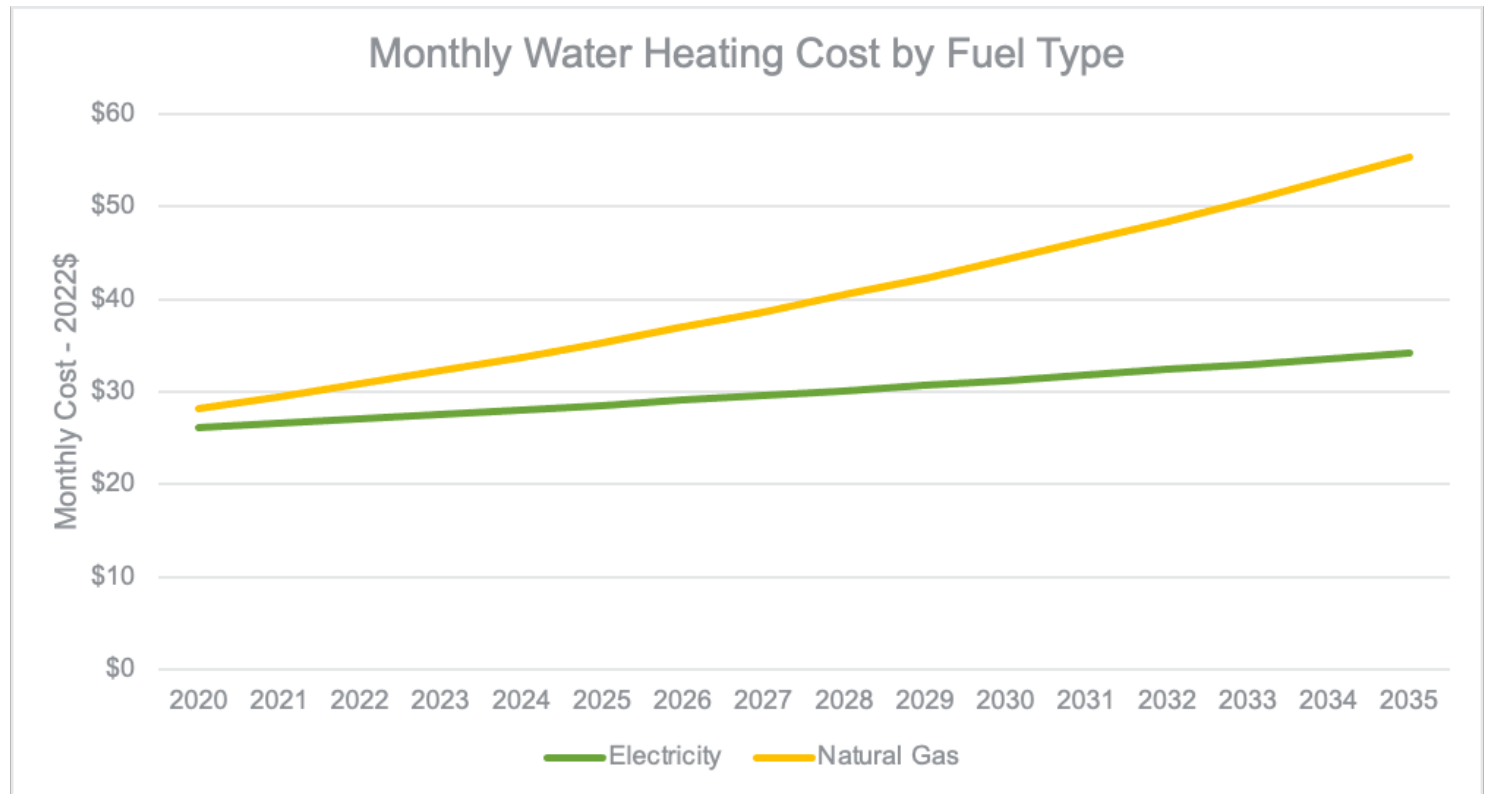
# BE: Residential Rate Forecast

## Summary:

Rate forecasts based on 2021 CPUC En Banc white paper

- Forecasted rate increase:
  - 3.7% annual electricity price increase
  - 4.6% annual gas price increase
  - Assumed CPI of 1.9%
- Inflation adjusted rate forecast appears to be:
  - 1.8% annual electricity price increase
  - 2.7% annual gas price increase

**Impact:** increasing cost effectiveness of electrification



Source: CPUC En Banc Whitepaper

# Building Technology Advancements



## Residential

New twists on proven products



### 120v HPWH Come to Market in 2023

- Reduces costs
- Alleviates contractor constraint issue



### Combo systems become readily available in 2024

- Reduces costs
- Alleviates panel upgrade requirements



### 120V heat pump window and wall units

## Commercial



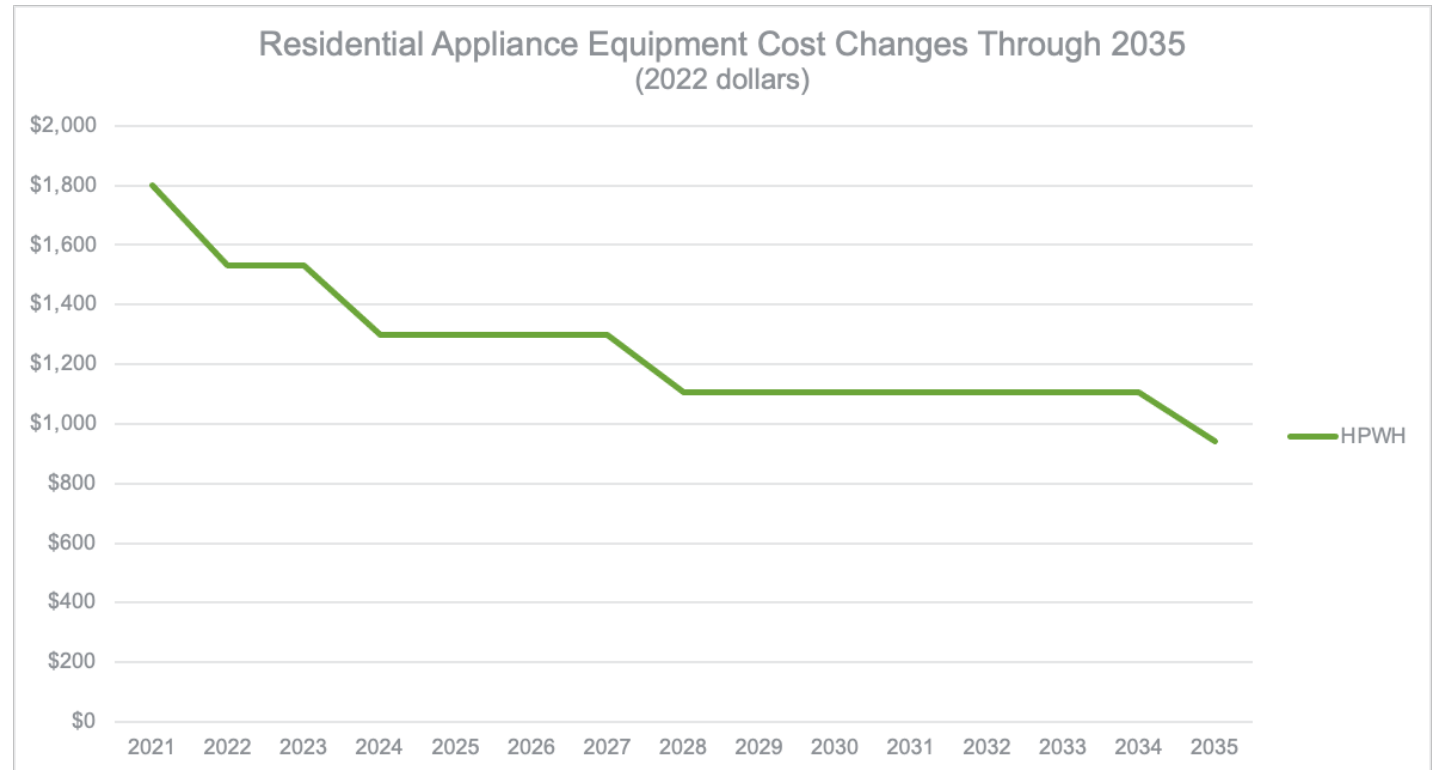
### Rooftop packaged heat pumps increase in efficiency



# Residential Appliance Equipment Costs

As HPWHs becomes more common, costs should reduce

- "15% cost reduction for every doubling of output"
- Increased output based on:
  - NC all-electric reach codes
  - TECH program goals
  - Projected SGIP funding equivalent to TECH annual funding
- Costs reduce by approximately 50% in 2022 dollars versus today's costs





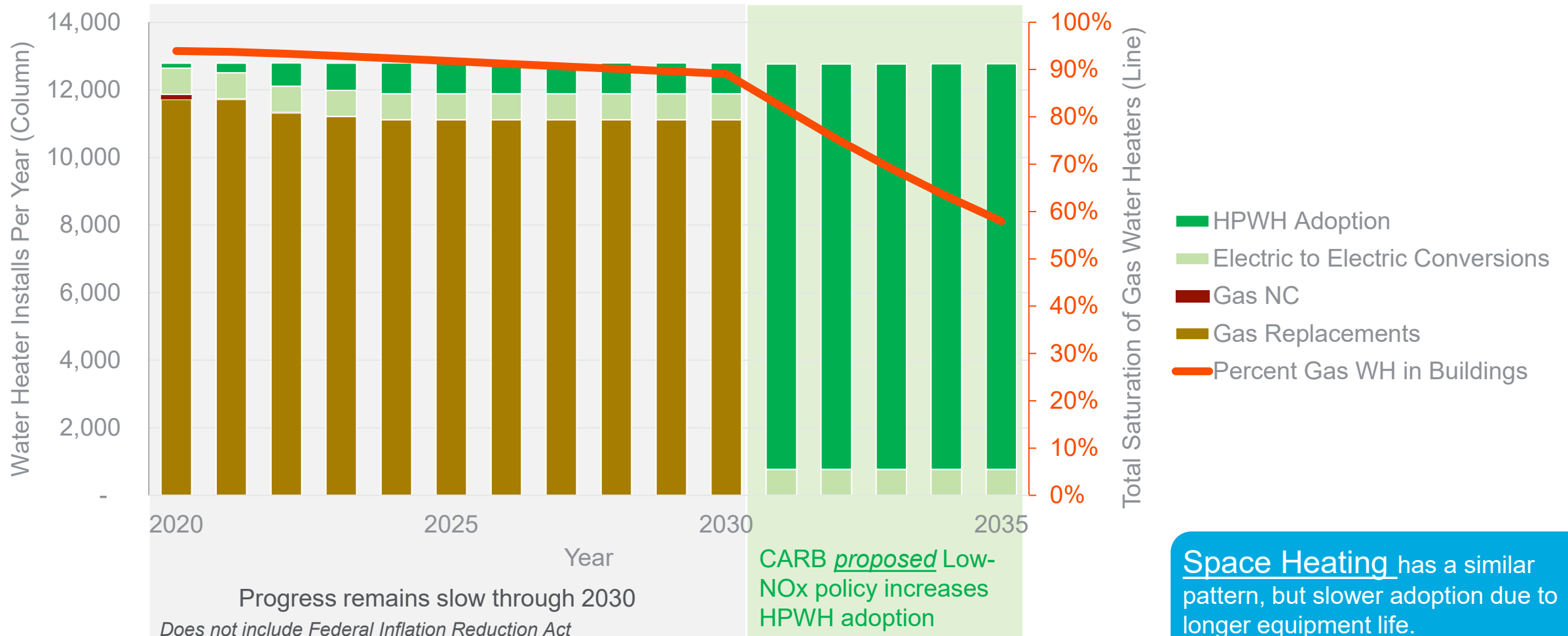
# BE: Policy Expectations

	Item	Agency action	Impact
Regional policy (BAAQMD)	Restrictions on gas-fired equipment	BAAQMD will pass ultra-low-NOx standard by 2025, requiring equipment by 2027	Increases costs of gas equipment and cost effectiveness of electrification
State policy changes	State new construction code	2022 building code requires heat pump space heating and pre-wiring for electrification. Allows heat pump water heating in multi-family.	Drives heat pump space heating in new construction, lowers future costs
	State new construction code	CEC will not pass all-electric mandate in 2026	Little or no new construction improvement driven by state code in later years
	Restrictions on gas-fired equipment	By 2030 CARB bans on the sale of gas-fired equipment	Drives existing building electrification in later years, supply chain aligns earlier
State and federal funding	New state funding	The Governor's \$900m will be available in 2026	Supports electrification in low income, may be limited in PCE territory. \$18m will come to San Mateo County
	Existing state funding	SGIP, TECH and BUILD funding - or equivalent - will be available through 2030	Continuation of ~\$3,400 per HPWH and \$2,800 for panel upgrades
	Federal funding	Inflation Reduction Act: numerous additional incentives for building electrification	Significant added support but <u>not</u> included in BAU



# Adoption Curve – Electric Water Heaters

“Business as Usual” Sm Residential Water Heater Installs by Type and Program  
San Mateo County







# Market Conditions Conclusions: Buildings

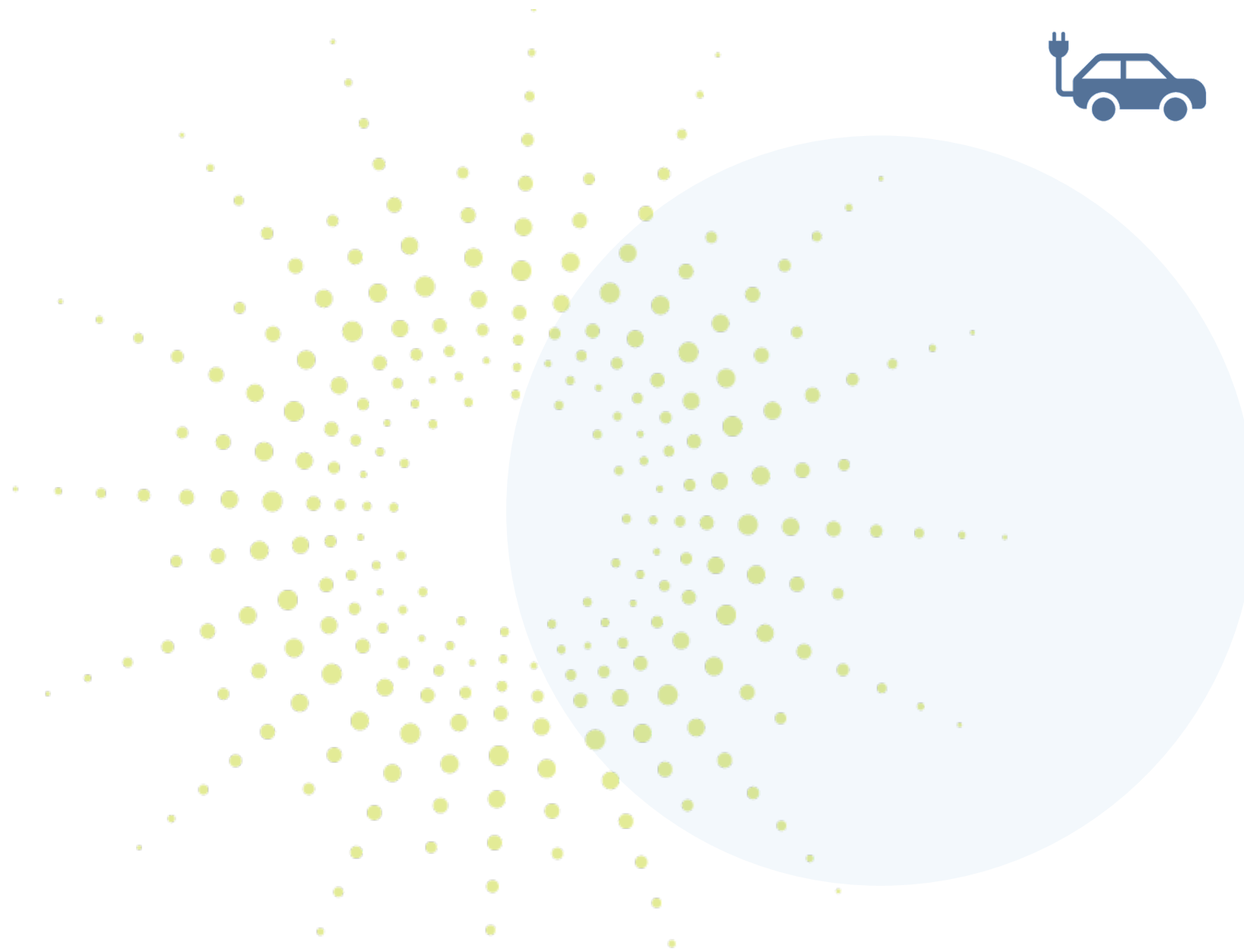
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- High electric rates are major obstacle producing poor economics for electrification
- Economics improve with new technologies, increasing gas rates, manufacturing scale but not enough to drive market
- Statewide funding has arrived, and increases in 2026, but has modest impact. Federal funding to play significant role.
- Potential AQMD and CARB policies 2027-2031, would have enormous impact
- 60+% short of 2035 goals for electrification without intervention



# Transportation Electrification

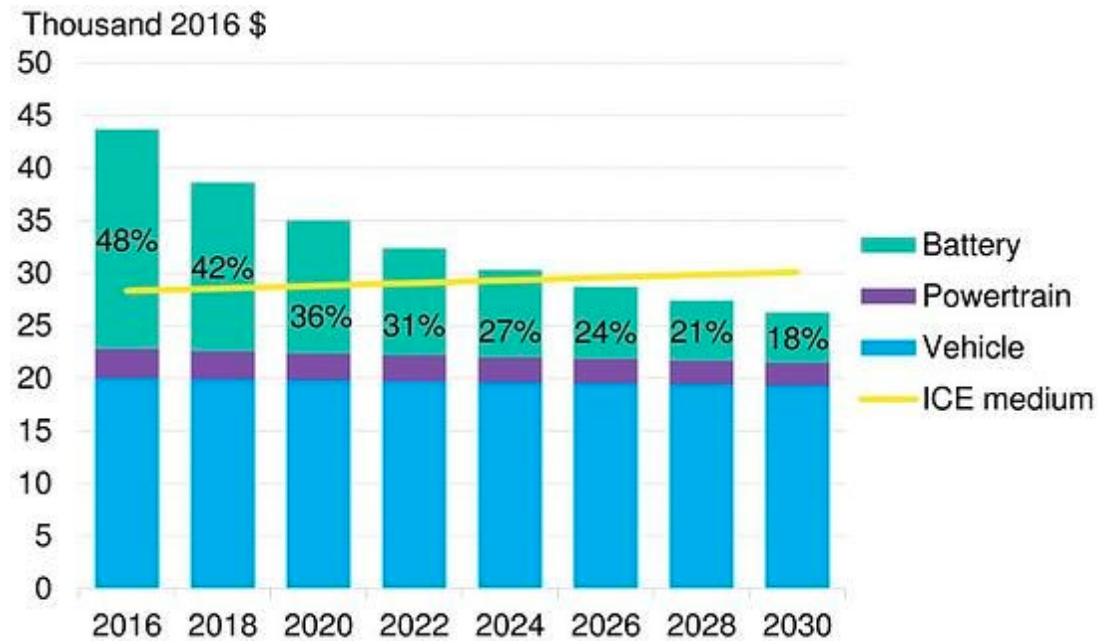
Primary Focus: Personal Vehicles



# EV Cost Forecasts



## New EV prices continue to decline



Source: Bloomberg

## Electricity will remain cheaper than petroleum



Source: EIA + PCE electricity forecast

# EV Technology Advancements



## EVSE



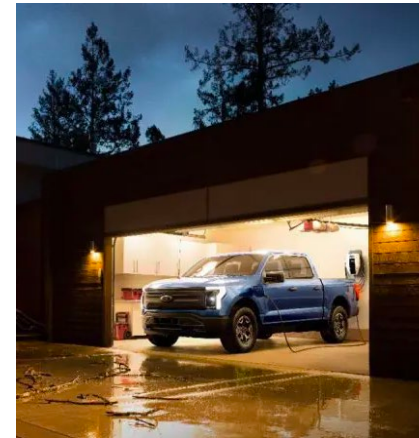
### Smart Level 1 Charging

- Sig. reduces costs
- Provides billing and access controls



### Cheaper Level 2 Charging

- Newer market entrants reducing costs



### Vehicle to Building

- Added resiliency for res. and com. buildings

## EVs



### Most automakers committed, Ex:

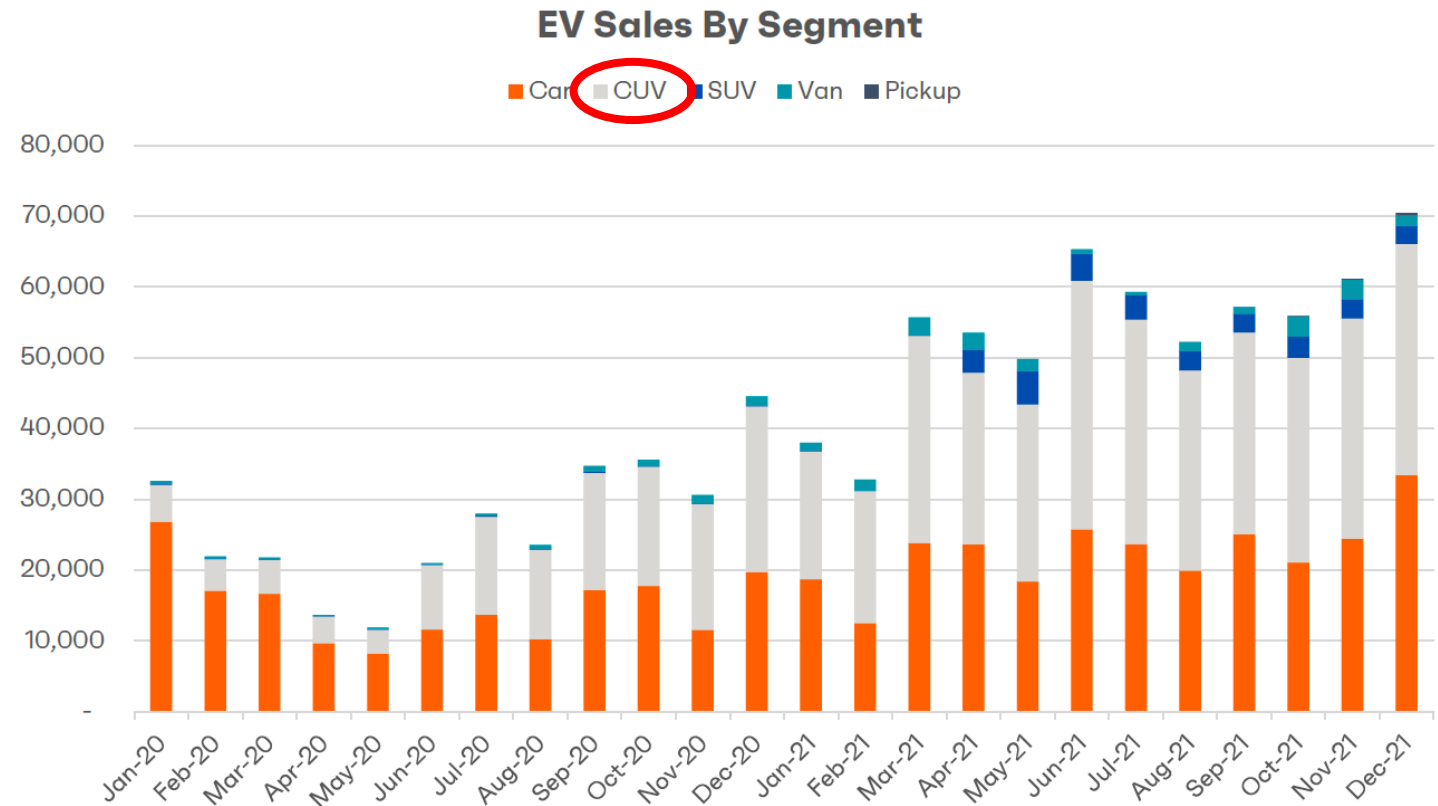
- GM: 30 EVs by 2025
- VW: 70 EVs by 2030



# EV Types Match Consumer Preferences

- Crossovers most popular vehicle type (50% of new sales)
- EV crossovers now available
  - Model Y: Summer 2020
  - ID4: Spring 2021
  - Mach-e: Summer 2021

Impact: faster adoption



Source: Alliance for Automotive Innovation

# TE: Policy Expectations

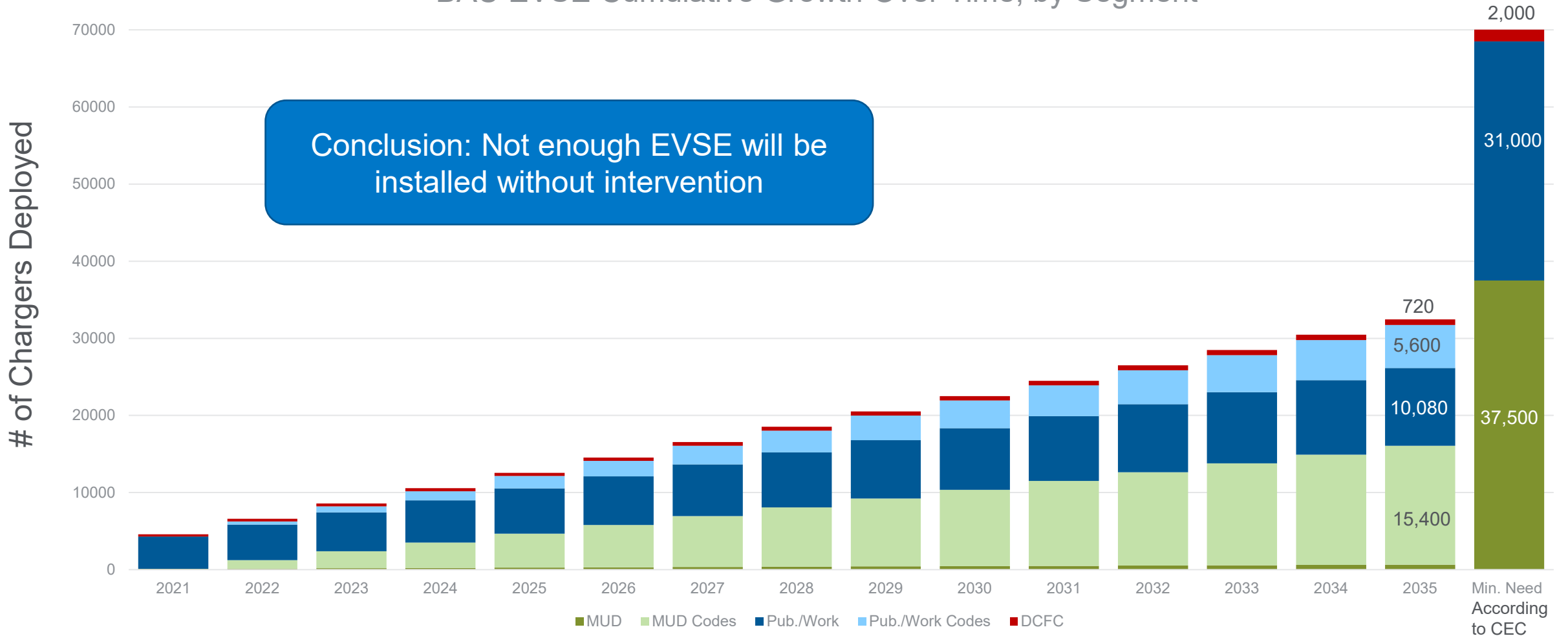


	Item	Agency action	Impact
State policy	Light-duty new gas car ban	Gov. EO bans the sale of new ICE vehicles in 2035	All EV new personal vehicle sales in 2035
	State EV target	5 million EV target by 2030 (equiv. to 100k in SMC)	None, local EV BAU adoption expected to exceed target locally
Local and federal funding	New state funding	No major new funding for personal EV incentives anticipated	No added support
	Existing local/state funding	Current EV incentive programs (e.g. CVRP, CCFA, etc.) continue (~\$1B provided statewide since 2010, \$34.7M to SMC), no major increase in incentives factored in	Historical EV adoption growth continues and accelerates further as other barriers (range, model variety, charging access), reduce
		Current EVSE incentive programs (e.g. BAAQMD, LCFS, etc.) continue unchanged (BAAQMD Charge! FY 22 budget is \$7M, roughly \$700k to SMC)	Historical average EVSE growth continues, mostly supported by BAAQMD, LCFS, EVCN, and tax credits. New state funds would be net new to historical average.
	Federal funding	Inflation Reduction Act: Extension of new EV tax credit (with US content restrictions), Used EV credits	Helpful for new EV market but SMC already very accelerated rate. Used EV credits provide important added support.

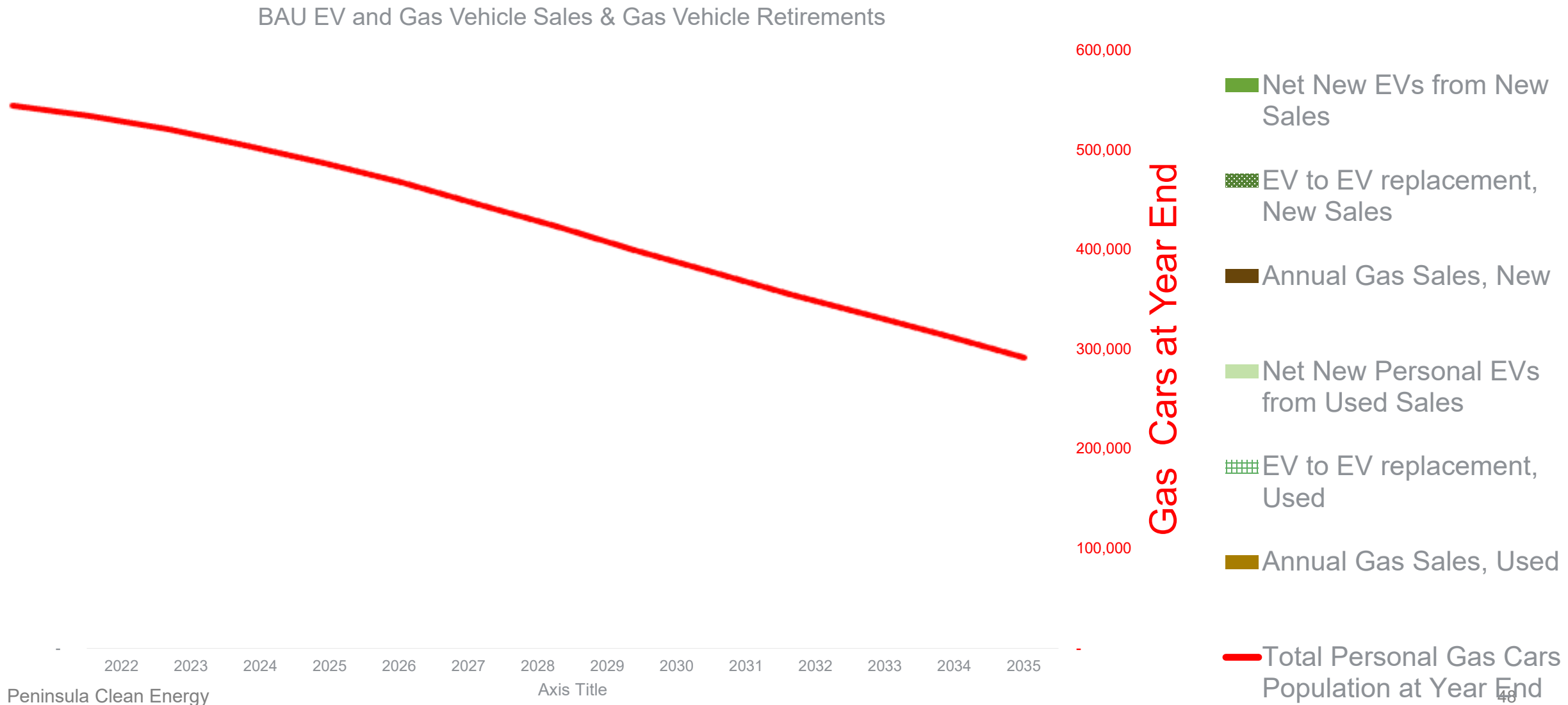


# Adoption Curve – EV Charging

BAU EVSE Cumulative Growth Over Time, by Segment



# Adoption Curve - Personal EVs





# Market Conditions Conclusions: Transportation

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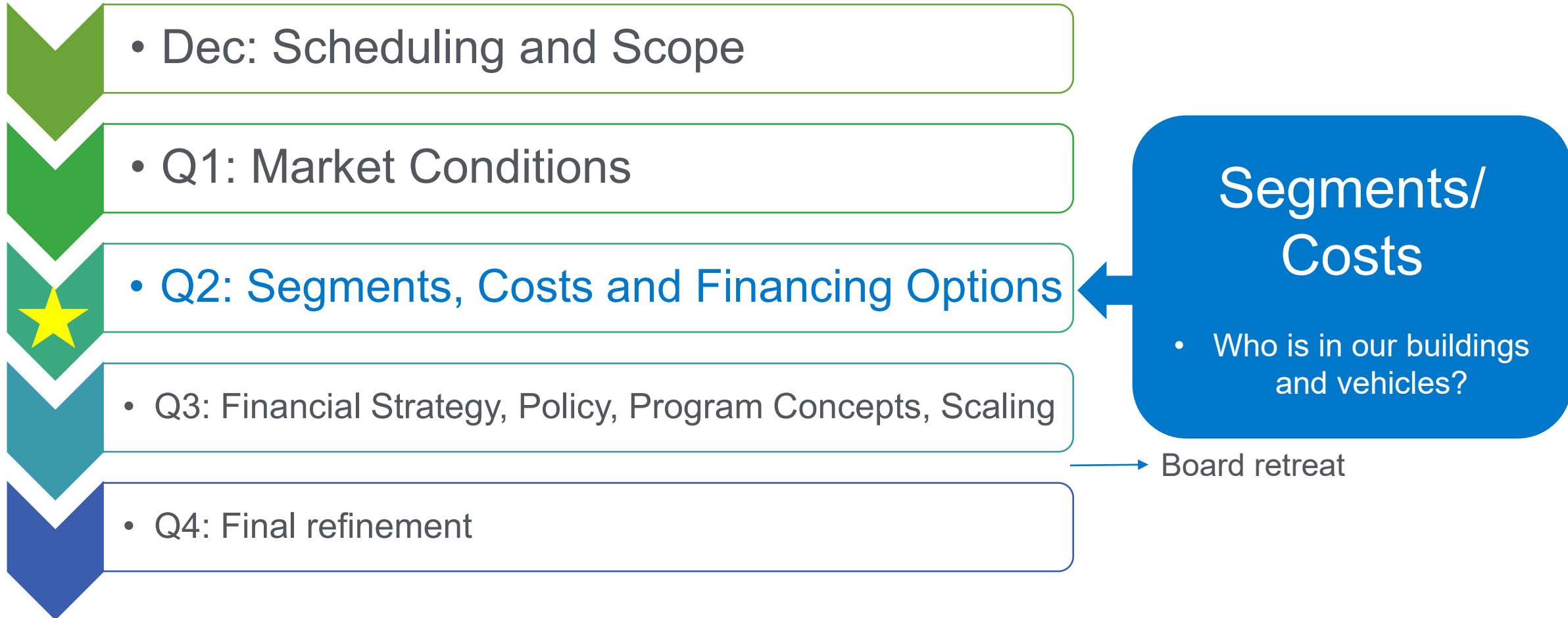


- New EV sales expected to increase significantly in 2025 as new model types, increased ranges, cheaper EVs become available
- Used EV market slower than new EVs, likely supply constrained
- State/Fed policy moderately assists new and used EV markets
- 43% short of 2035 goals for personal EV adoption without intervention
- 54% short of 2035 minimum need for EV charging without intervention

# Segments and Costs

# We Are Here

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## Buildings

### 1. [What buildings do we have?](#)

- Residential
  - [Housing units by type](#)
  - [Housing units by vintage](#)
- Commercial
  - [Commercial building breakdown by size](#)
  - [Commercial building breakdown by type \(pending.\)](#)

### 2. [Who is in our buildings?](#)

- Residential
  - [Housing counts by type and tenure](#)
  - [MUD housing by class and type](#)
  - [Income level definitions in San Mateo County](#)
  - [Overarching income distribution in San Mateo County](#)
  - [Small residential income distribution in San Mateo County](#)
  - [Housing cost burden in SF Bay Area](#)
- Commercial
  - [Types of businesses in San Mateo County](#)

### 3. [What equipment is in our buildings?](#)

- Residential
  - [Water heating](#)
  - [Space heating](#)
  - [Air conditioning](#)
  - [Cooking](#)
  - [Clothes drying](#)
- Commercial
  - Commercial equipment

### 4. [What are the costs to electrify our buildings?](#)

- Residential
  - [Water heating](#)
  - [Space heating](#)
  - [Dryers and Ranges](#)
  - [Panel upgrades](#)
  - [BayREN gas in-kind replacement costs](#)
  - [Summary](#)
- Commercial



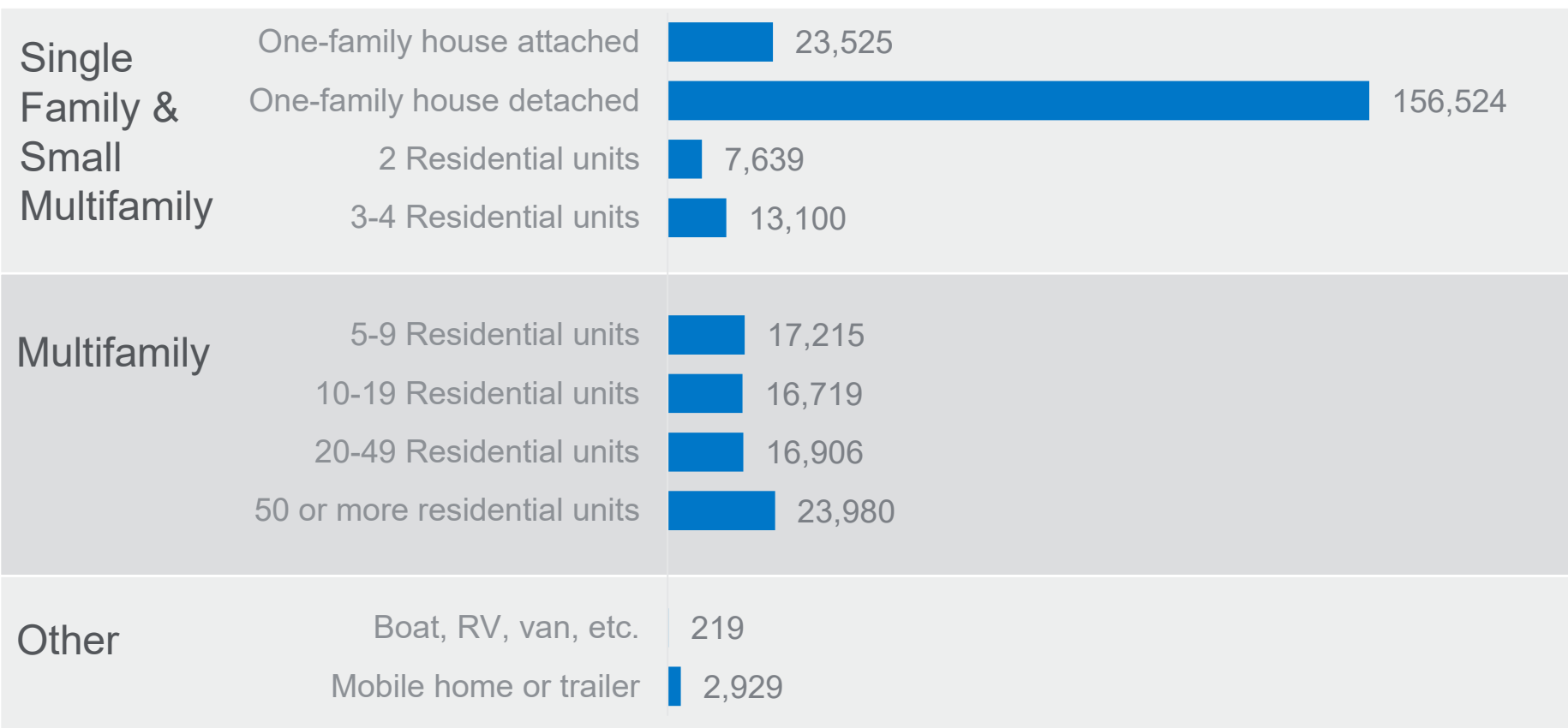
# What buildings do we have?

2035 Building Segmentation Study



# Housing Units by Type

Dwelling Unit by Type in San Mateo County

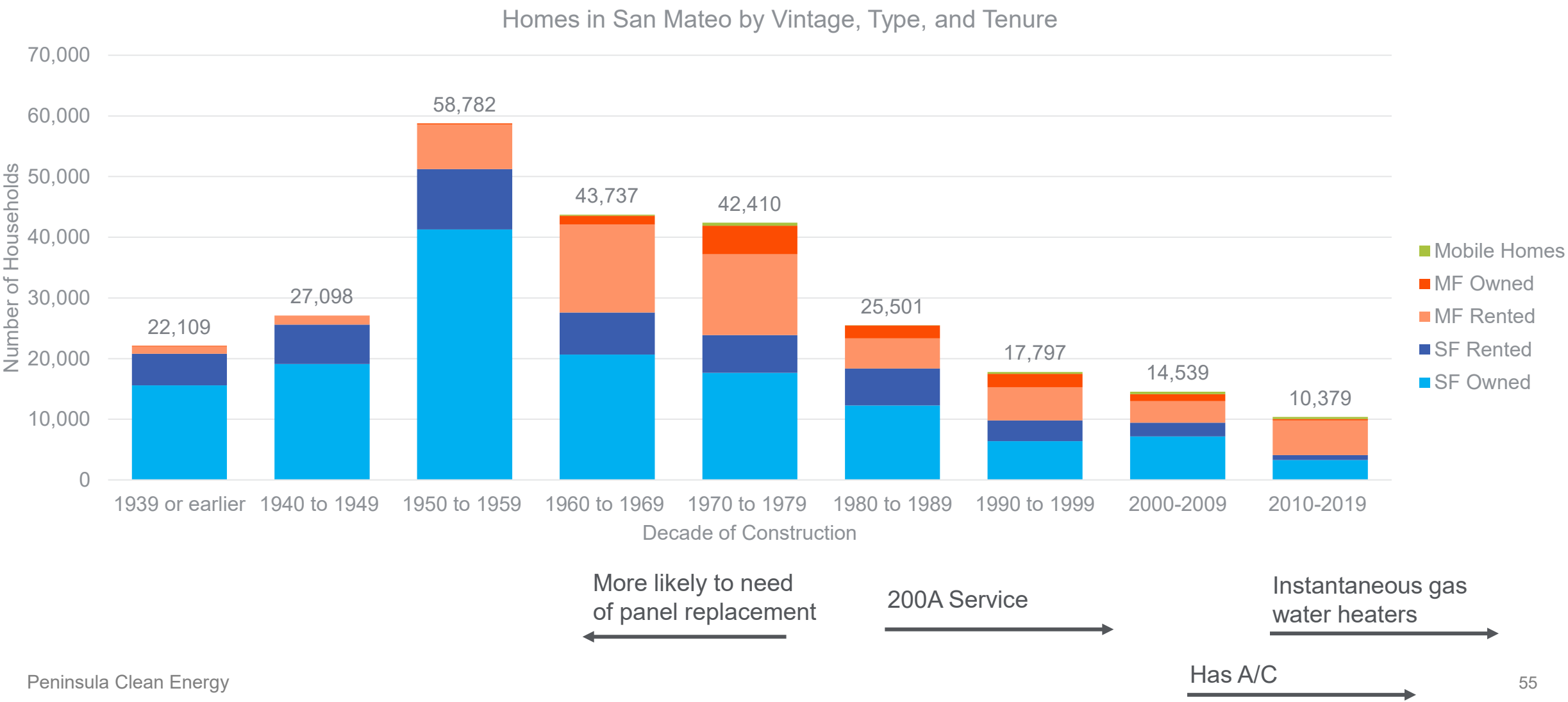


## Small Scale Development

There are 278,700 dwelling units in San Mateo County. The majority are single-family or small multifamily, making up 69% of dwelling units in the County.



# Housing Units by Vintage and Tenure



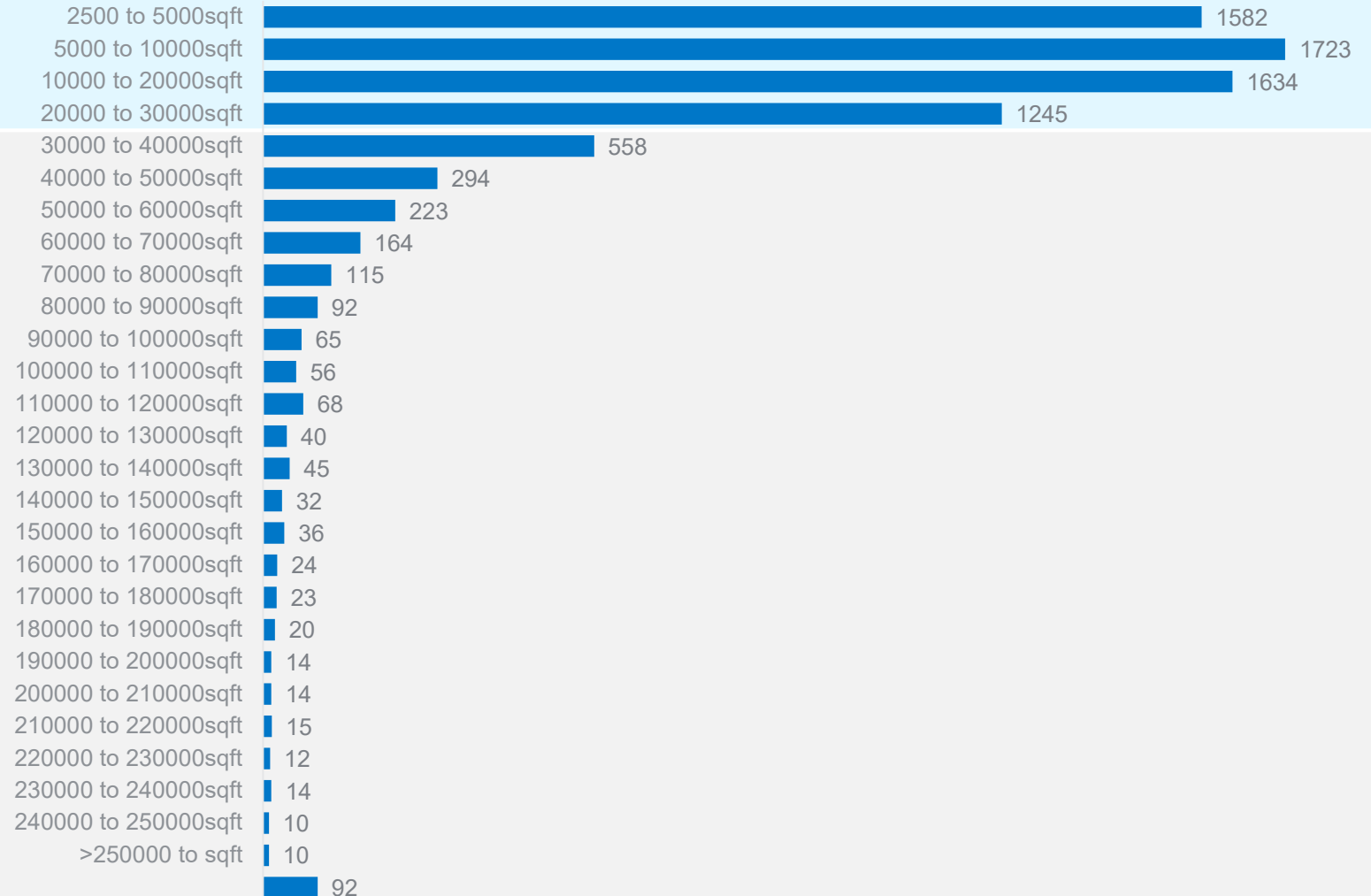


# Commercial Building Breakdown by Size

Number of Buildings by Size

Our focus on **small commercial** includes **6,184 buildings**

**Larger commercial** buildings are likely to require customized electrification strategies, and more likely to have building owners and/or tenants who can afford the cost of electrification. There are **1,862 buildings** over 30,000 sqft in our territory



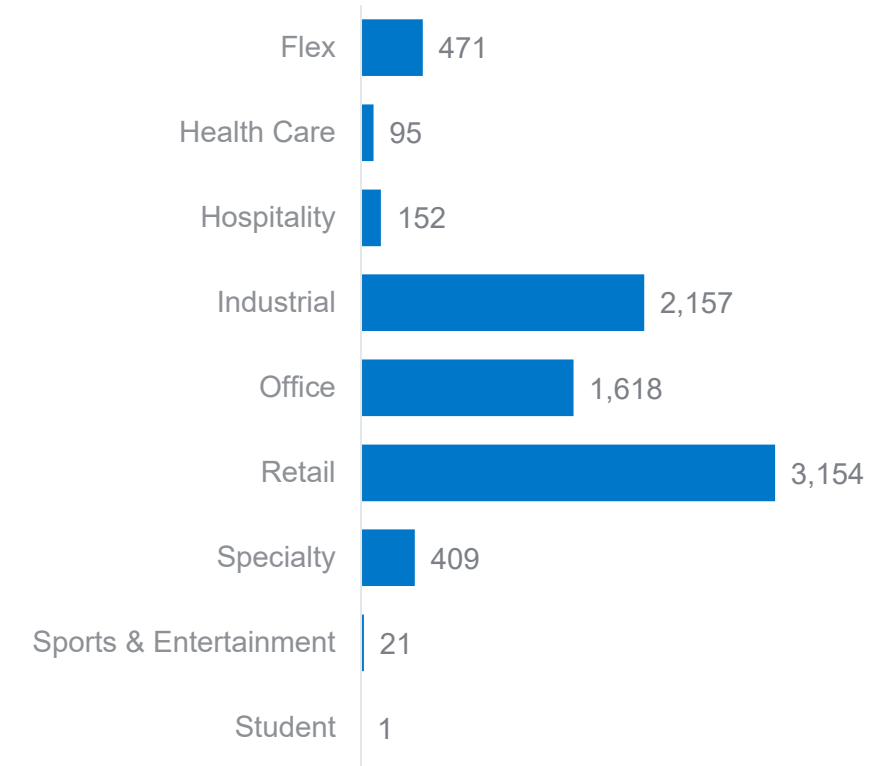




# Commercial Building Breakdown by Type

City	Flex	Health Care	Hospitality	Industrial	Office	Retail	Specialty	Sports & Entertainment	Student	Grand Total
Atherton					5	7	2			14
Belmont	18	6	10	117	40	105	19			315
Brisbane	12		2	86	19	26	5	1		151
Burlingame	46	9	10	177	115	228	19			604
Colma				2	1	25	4	1		33
Daly City	1	9	8	70	68	397	39	5		597
East Palo Alto	2	1	1	27	8	24	9			72
El Granada	1		1	2	3	4				11
Foster City	37	2	2	9	39	34	3			126
Half Moon Bay	5	1	7	67	67	117	22			286
Hillsborough					1					1
La Honda				1		1	3			5
Loma Mar						1	1			2
Menlo Park	66	4	11	81	239	176	32	1		610
Millbrae	2	3	7	10	27	132	2		1	184
Montara		1								1
Moss Beach					1					1
Pacifica		1		2	9	40	5	1		58
Palo Alto	2	2		10	10	29	33			86
Pescadero			1	1	1	13	7			23
Portola Valley		2			16	18	4	2		42
Princeton			1							1
Redwood City	94	23	21	434	341	452	91	3		1459
San Bruno	6	3	13	93	57	259	12	2		445
San Carlos	60	4	8	282	106	264	17			741
San Francisco			1	5		4	2			12
San Gregorio							1			1
San Mateo	22	17	15	208	307	543	34	3		1149
South San Francisco	97	7	32	473	131	248	42			1030
Woodside			1		7	7	1	2		18
<b>Grand Total</b>	<b>471</b>	<b>95</b>	<b>152</b>	<b>2157</b>	<b>1618</b>	<b>3154</b>	<b>409</b>	<b>21</b>	<b>1</b>	<b>8078</b>

Number of Commercial Buildings by Type  
San Mateo County





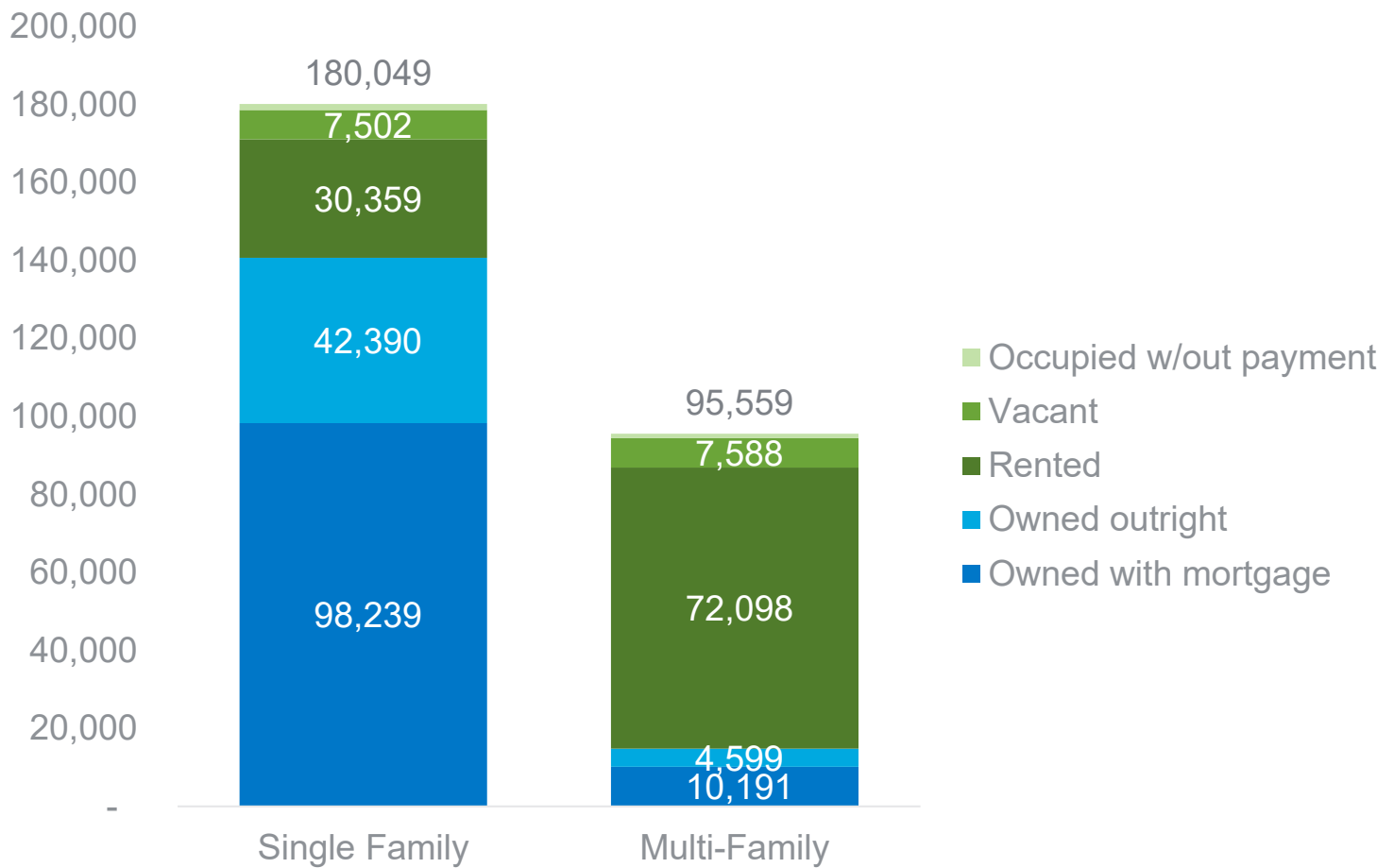
# Who is in our buildings?

2035 Building Segmentation Study



# Housing Counts by Type and Tenure

Tenure by Home Type



San Mateo County has approximately 280,000 housing units, and the majority are single-family or small multi-family homes.

20% of single-family homes are rented

85% of multi-family homes are rented

55% homeownership rate

38% of residents own their homes outright.



# MUD Housing by Class and Type

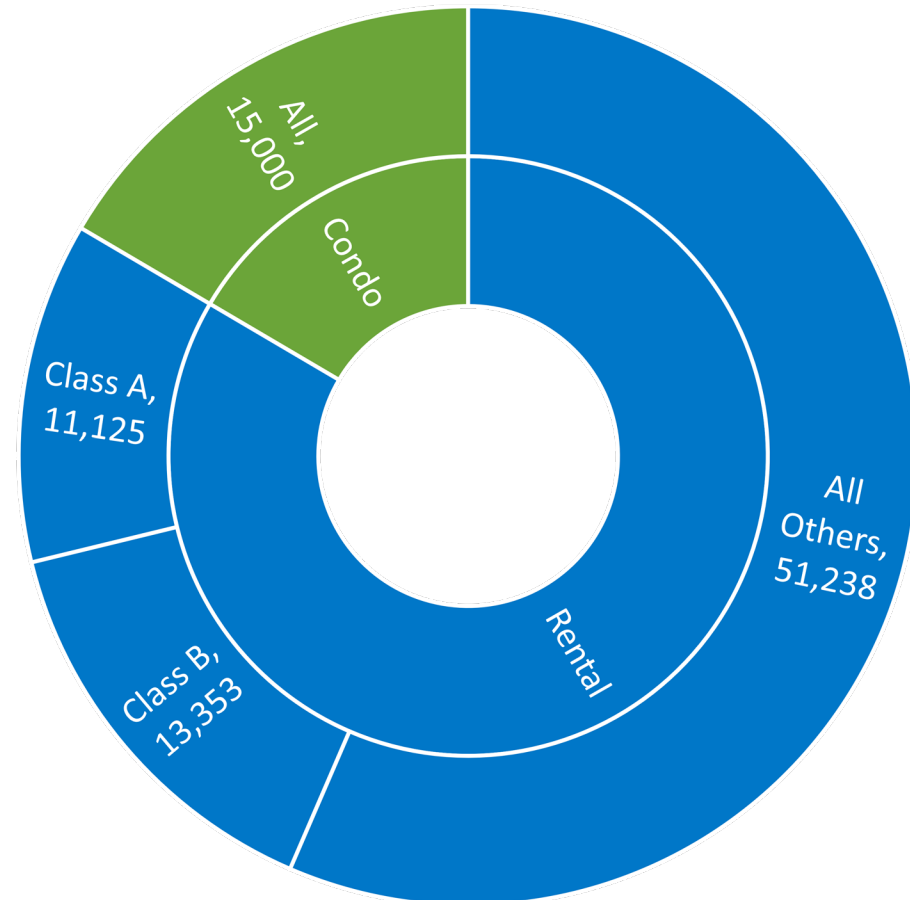
## Real Estate Property Classes

Class A: <15 years old, desirable neighborhoods, low vacancy rates, higher-income tenants

Class B: Average income tenants, more likely to need some maintenance

Class C + D: 20+ years old, likely requires upgrades, lower rental rates, etc.

MUDs, Type and Class, by Unit Count

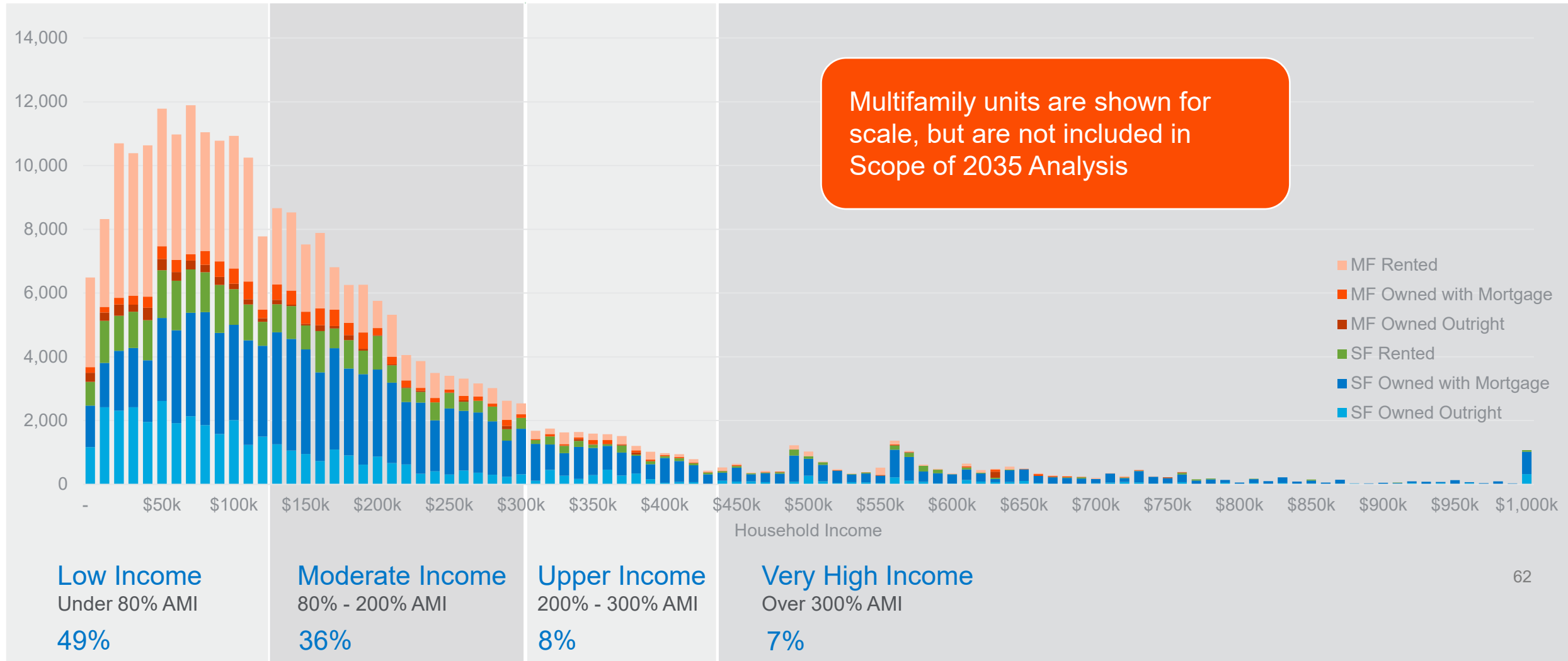




# Income level definitions in SM County

		Number of Persons in House							
		1	2	3	4	5	6	7	8
San Mateo County Area Median Income: \$149,600	Acutely Low	\$15,700	\$17,950	\$20,200	\$22,450	\$24,250	\$26,050	\$27,850	\$29,650
	Extremely Low	\$38,400	\$43,850	\$49,350	\$54,800	\$59,200	\$63,600	\$68,000	\$72,350
	Very Low Income	\$63,950	\$73,100	\$82,250	\$91,350	\$98,700	\$106,000	\$113,300	\$120,600
	Low Income	\$102,450	\$117,100	\$131,750	\$146,350	\$158,100	\$169,800	\$181,500	\$193,200
	Moderate Income	\$125,650	\$143,600	\$161,550	\$179,500	\$193,850	\$208,200	\$222,600	\$236,950

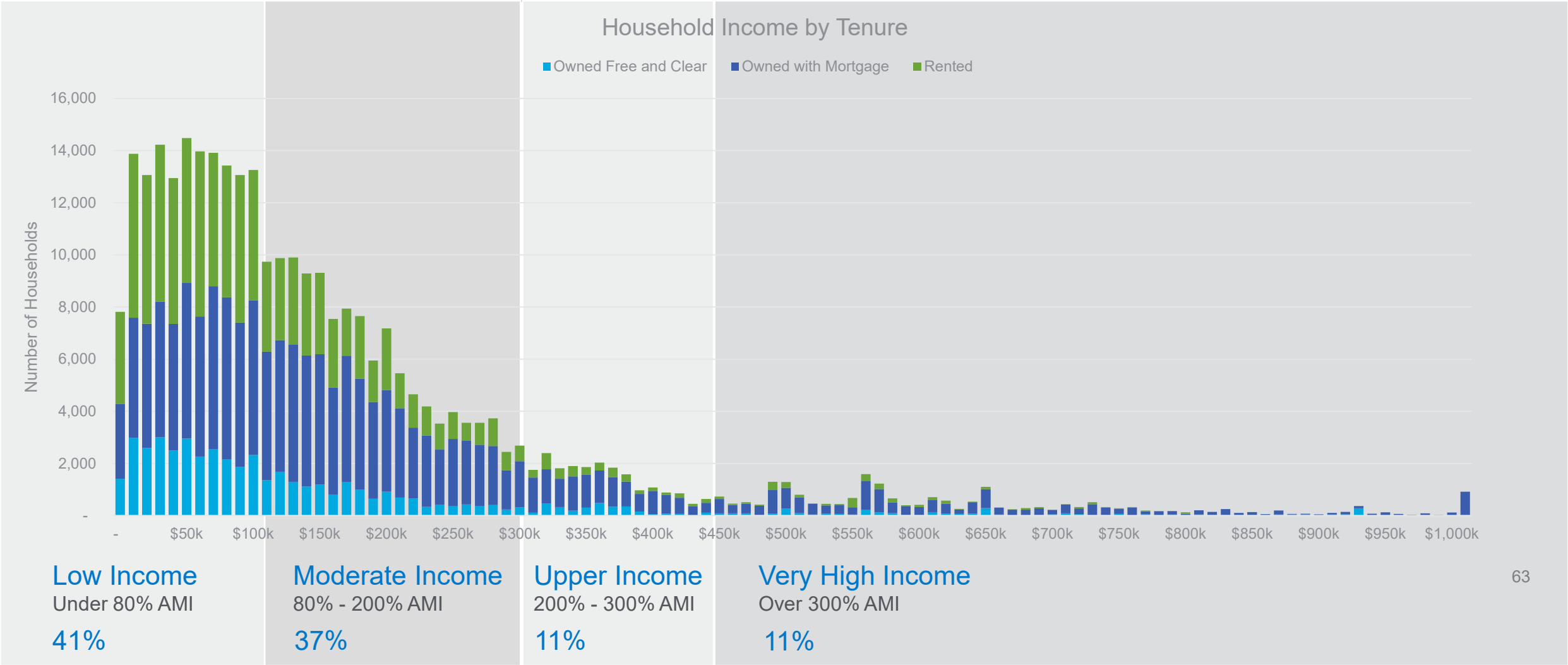
# Overarching income distribution – SM County



Source: US Census – American Community Survey

Note: Low-income categories likely include homeowners with significant assets that are not normally considered “low-income”

# Small residential income distribution – SM County



*Note: Low-income categories likely include homeowners with significant assets that are not normally considered “low-income”*



# Housing Cost Burden, SF Bay Area

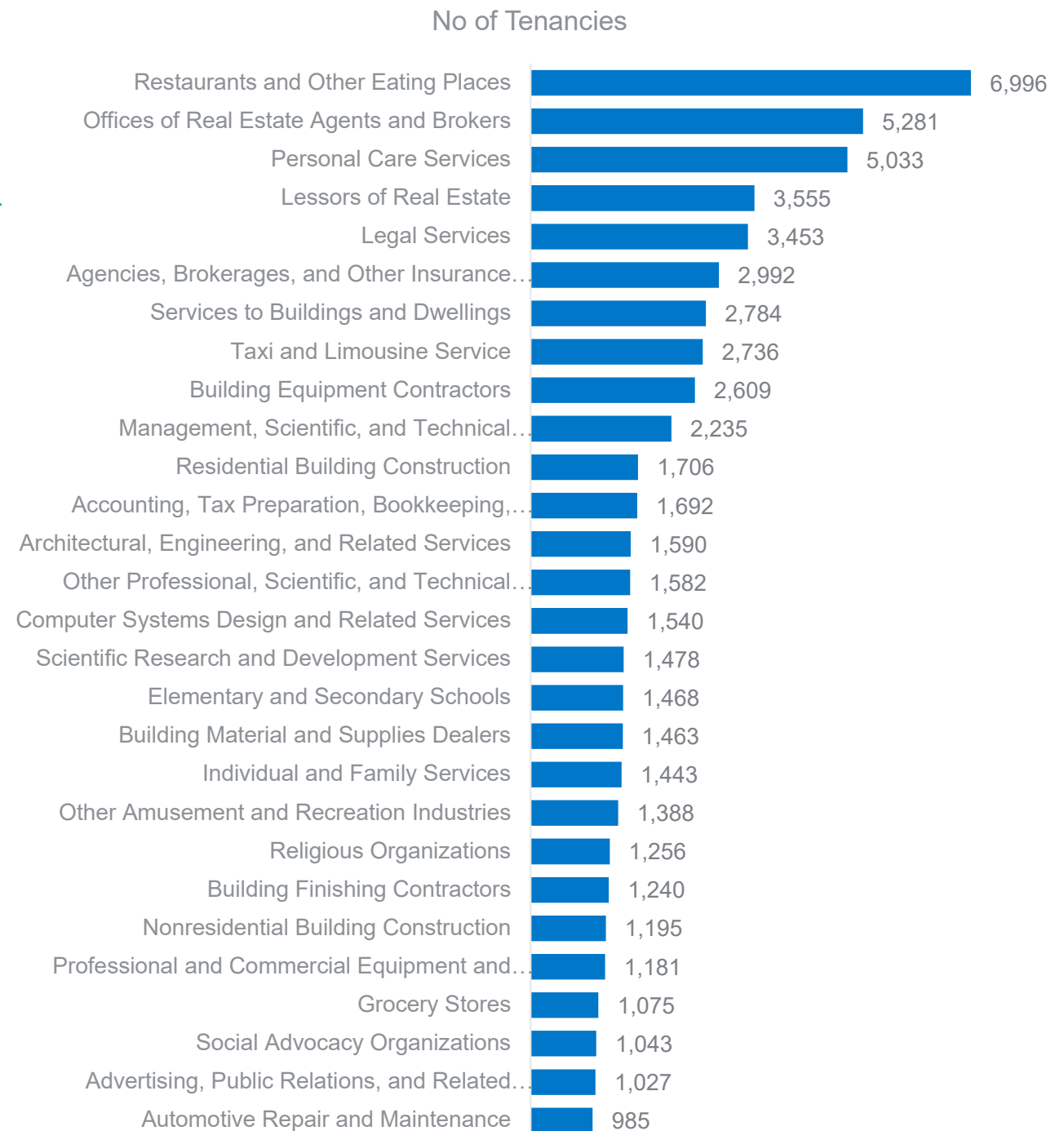
	Housing Cost Burdened (30% of income to housing costs)		Severely Housing Cost Burdened (50% of income to housing costs)	
All Household	35% of homes		16% of homes	
Renters	43% of homes	Cannot easily save to purchase a home or retire	22% of homes	Having trouble meeting basic needs
Owners	28% of homes	Can likely pay for basic maintenance. Might struggle to fund electrification upgrades	12% of homes	Will struggle to pay for basic maintenance, let alone electrification upgrades

<https://www.jchs.harvard.edu/son-2020-cost-burdens-map>. SF Bay Area.



# Types of Businesses

The chart at right displays the top 30 most common tenancy types across San Mateo County based on North American Industry Classification System (NAICS) code designations

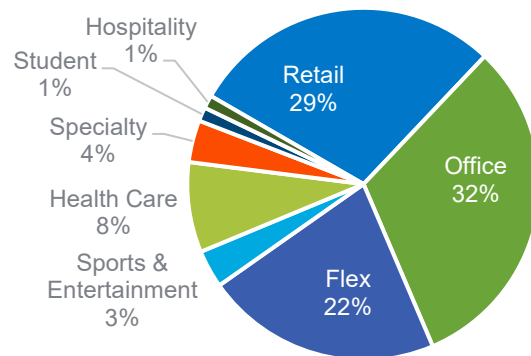




# Small commercial sqft by tenant type

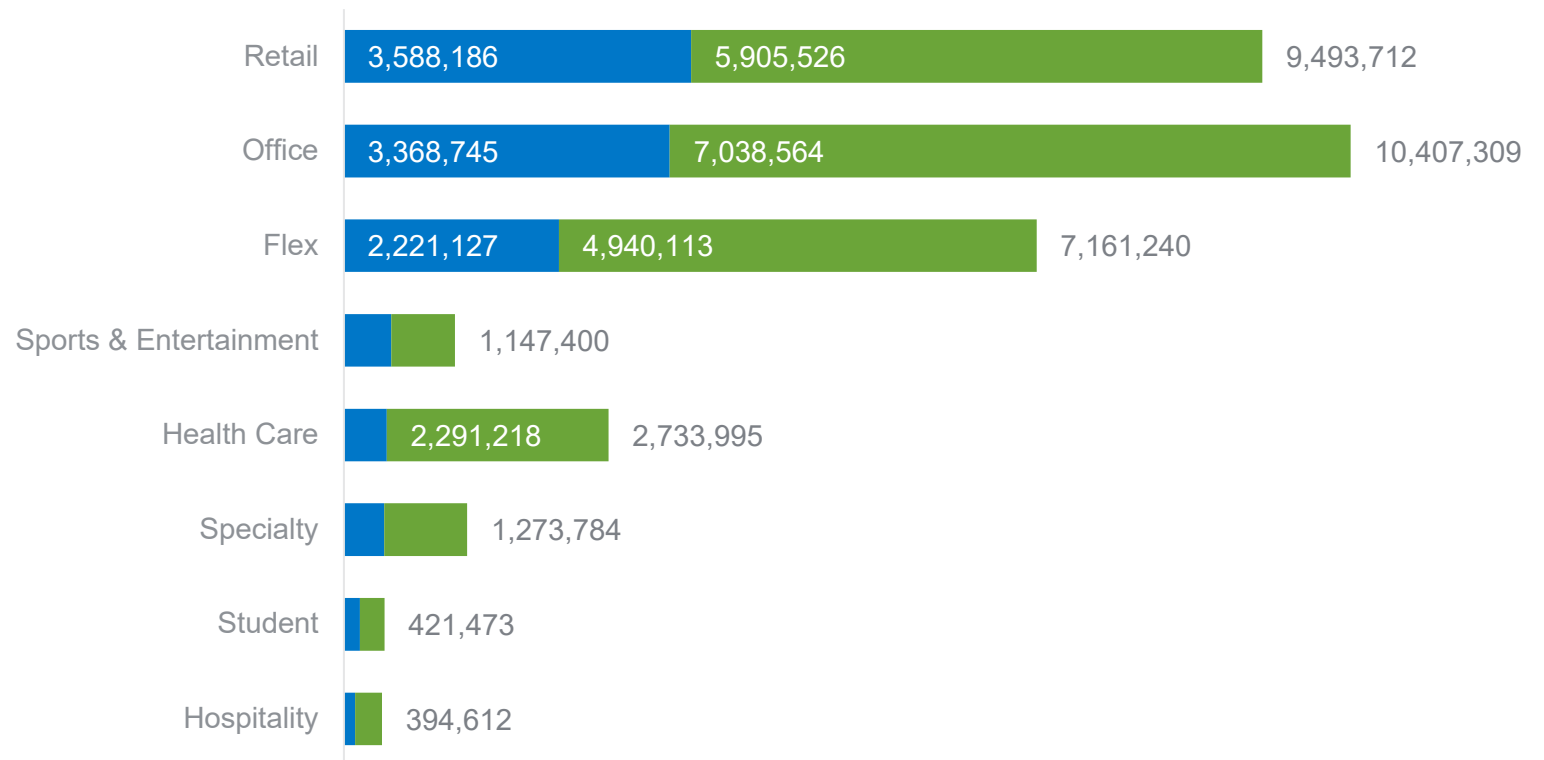
Retail and office buildings make up 61% of small commercial square footage. Systems in these buildings tend to be both easy and cost-effective to electrify during equipment replacement.

Space type by Square Footage



Total square footage of building stock by occupancy type and tenancy type (buildings under 30k sqft)

■ Square footage in single-tenancy ■ Square footage in multi-tenancy





# What is in our buildings?

2035 Building Segmentation Study

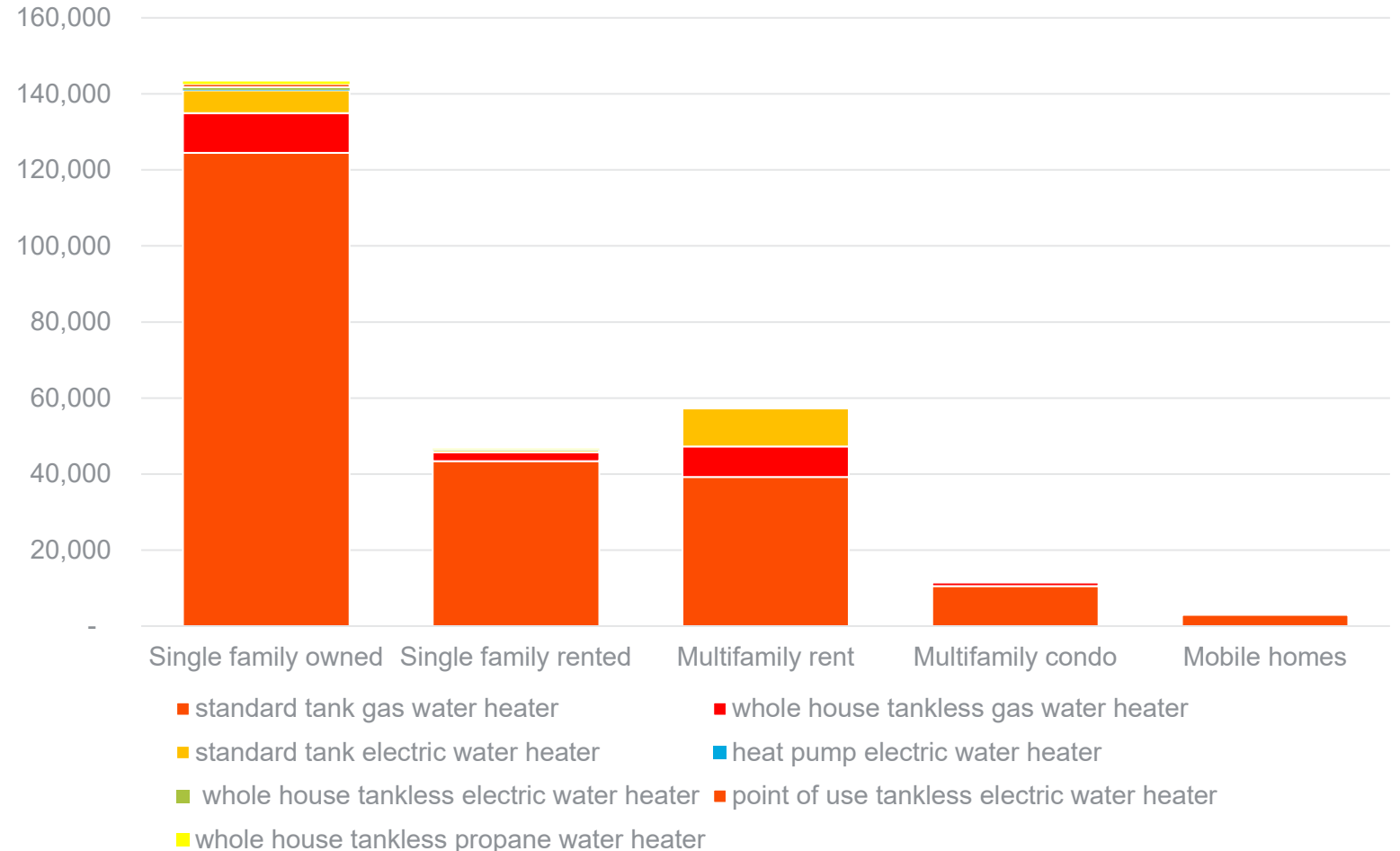


# Water heating by fuel type and building type

**98%** of residential water heating in San Mateo County is fueled by gas.

We estimate there are between 200-300 heat pump water heaters in the County, representing less than 0.1% of dwelling units.

Water Heaters in SM County by Type



# How are San Mateans Heating Their Homes?

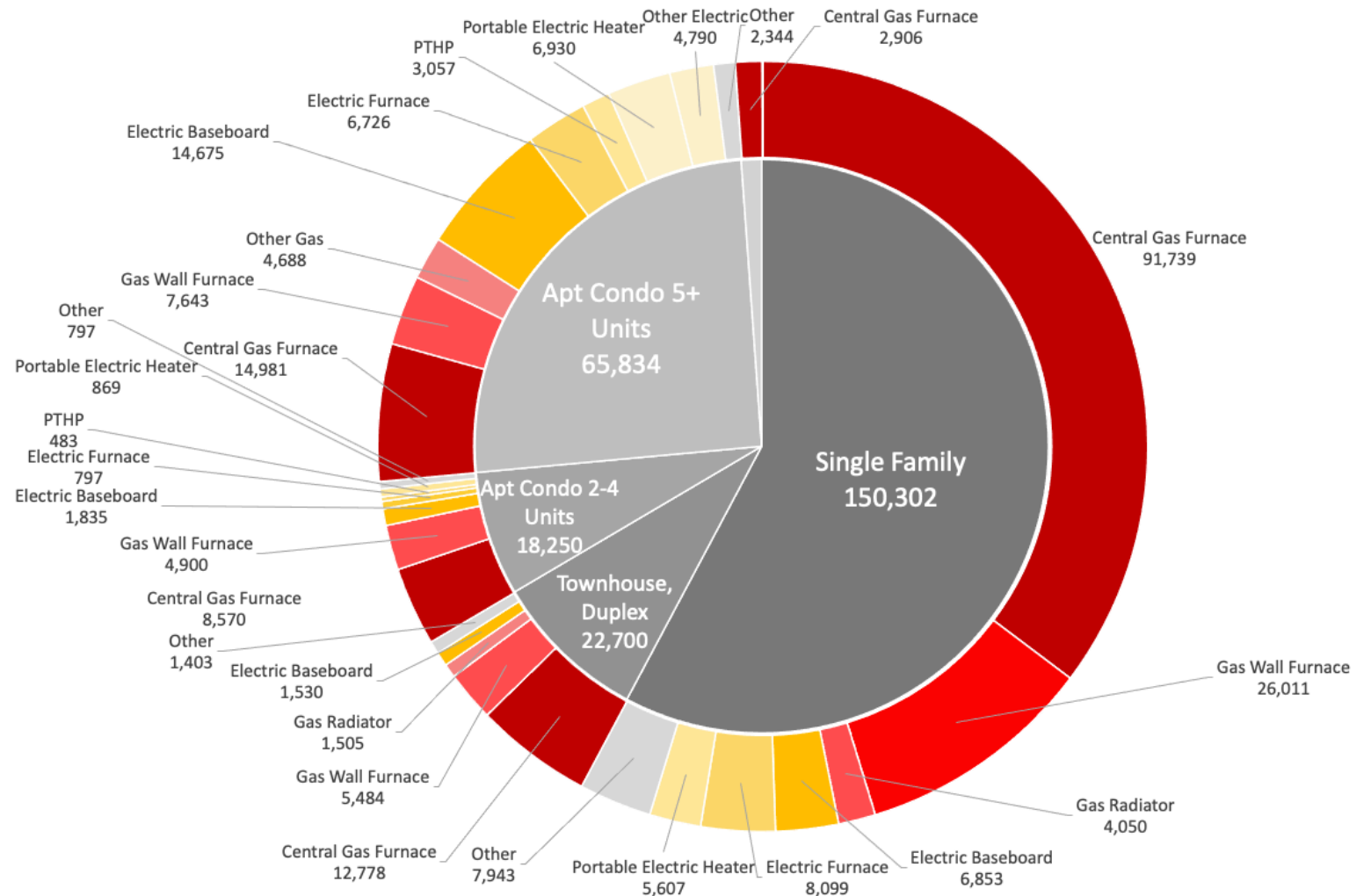


Primary Heating System Type by Home Type - San Mateo County

**68%** of residential space heating in San Mateo County is fueled by gas.

We estimate there are between 6,000-7,000 heat pump space heaters in the County, representing 12.5% of dwelling units.

Central gas furnaces are the most common heating system type in small residential.





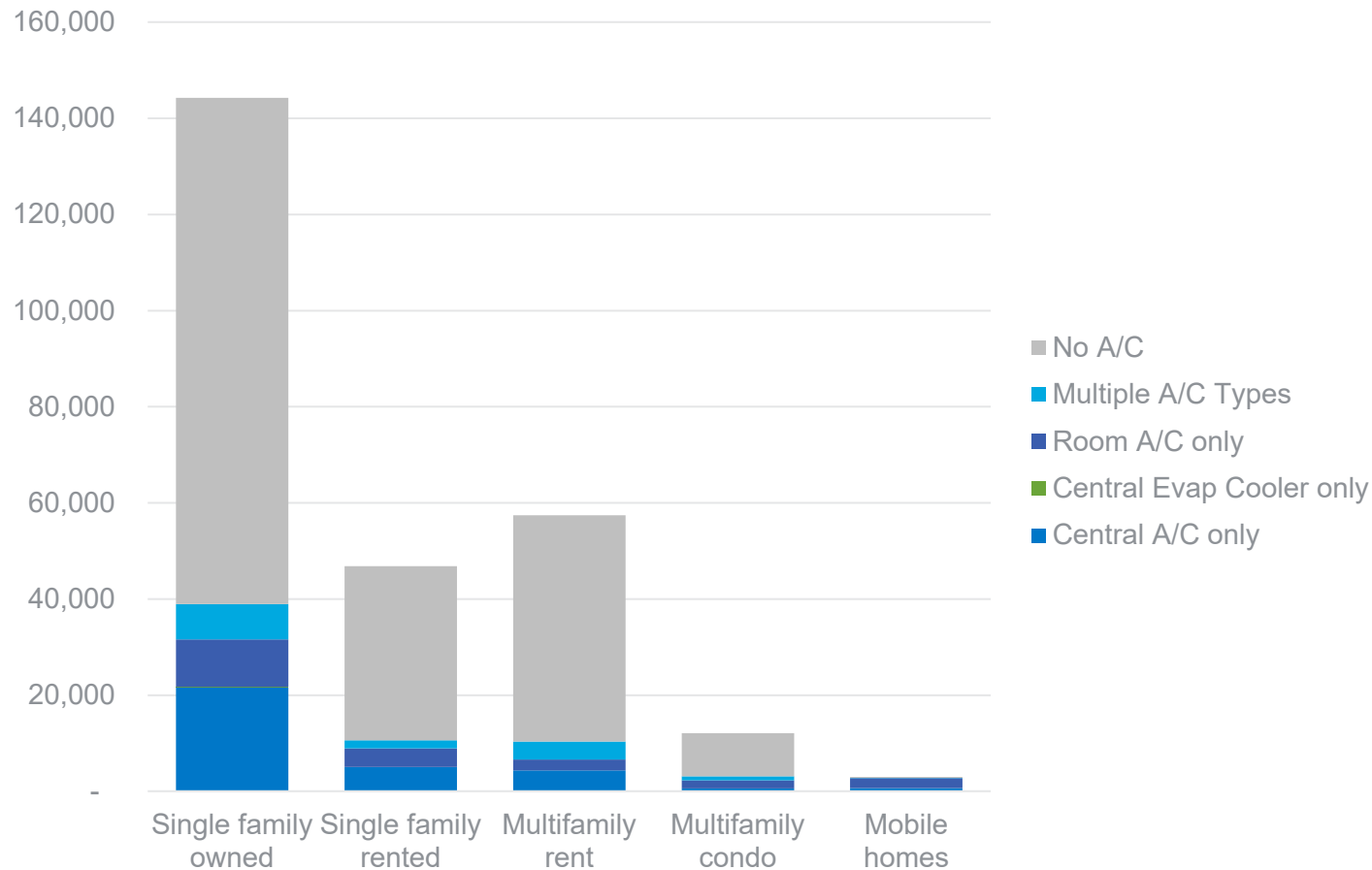
# Which Homes Have Air Conditioning?

25% of homes in San Mateo County have air conditioning.

This is important because the existence of air conditioning in a home makes electrifying the space heating for that home easier.

Central A/C is the most. Common type of air conditioner type.

Air Conditioning by Type in San Mateo County Homes



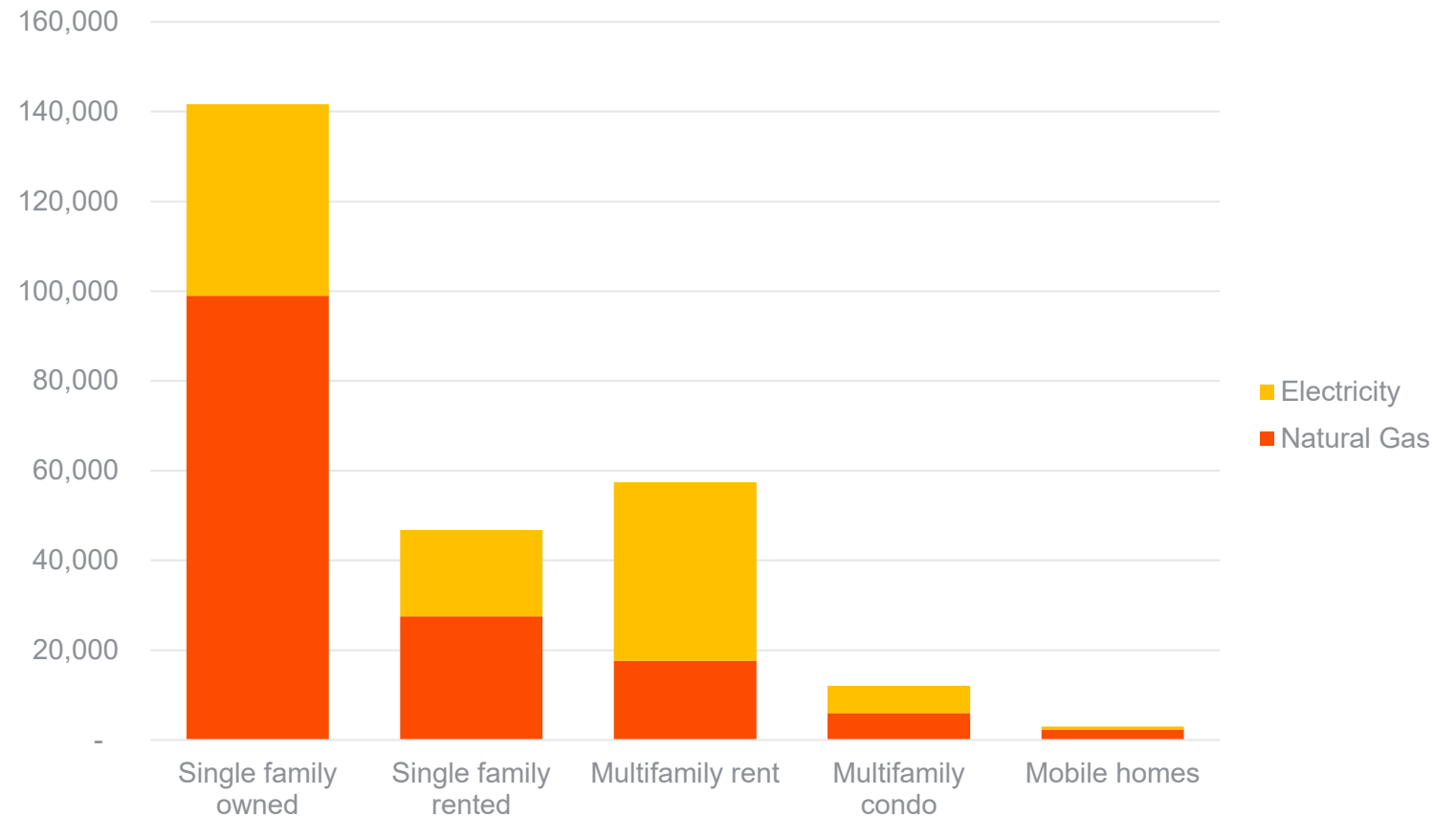


# How are San Mateans Cooking?

42% of homes in San Mateo County use electric cooktops.

58% of homes in San Mateo County use natural gas cooktops.

Fuel for Cooktop by Household Type in San Mateo County



# How are San Mateans Drying their Clothes?

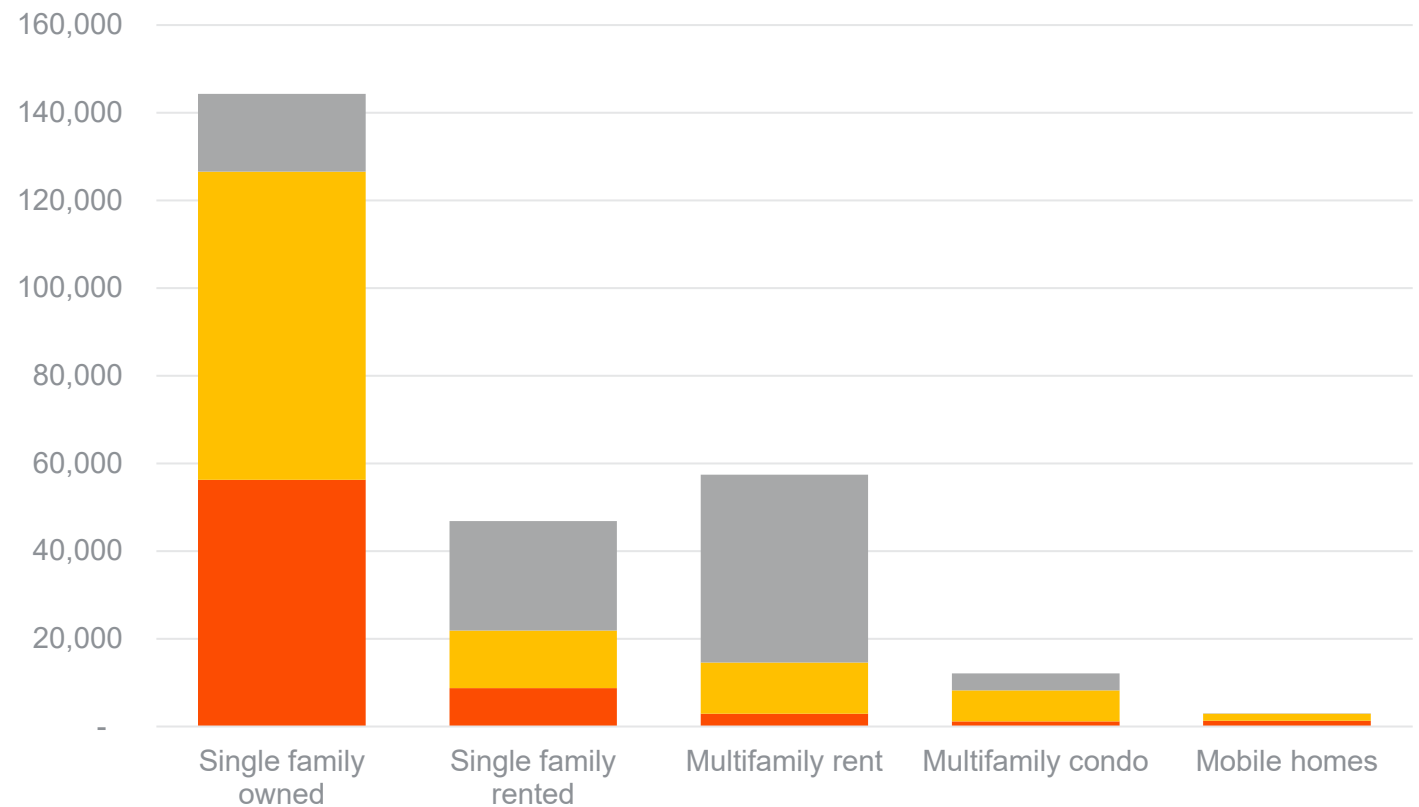


34% of homes in San Mateo County lack in-unit dryers.

39% of homes in San Mateo County use electric dryers.

27% of homes in San Mateo County use natural gas dryers.

Fuel for Clothes Dyer by Household Type in San Mateo County

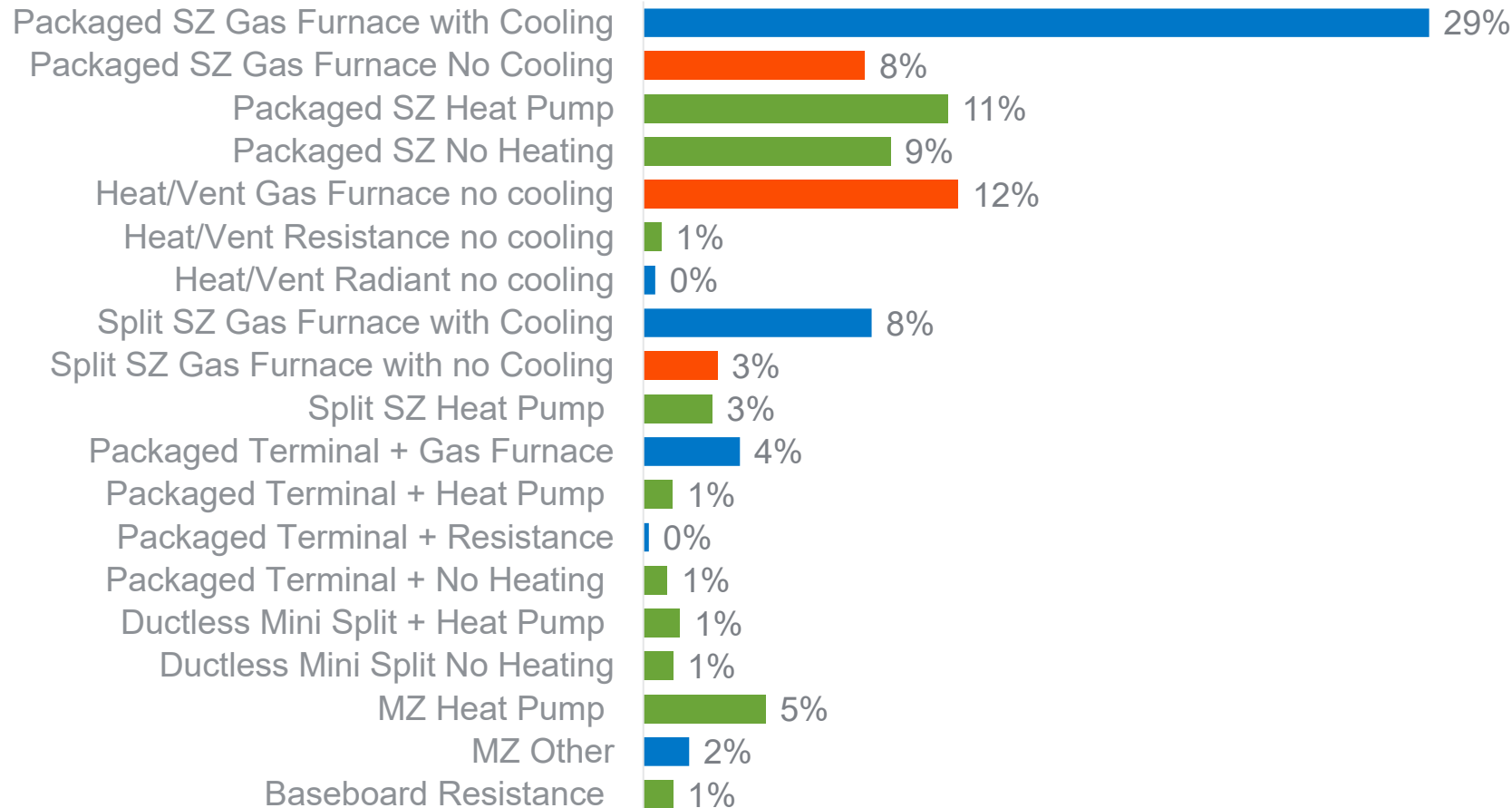






# Commercial HVAC Equipment

Estimated Prevalence based on CSS



## Easy to Electrify – 43%

Blue indicates gas units which have cooling. These are easy to electrify during replacement with minimum incremental costs.

## Already Electric – 33%

Green indicates units which are already electric. No action required except grid enablement.

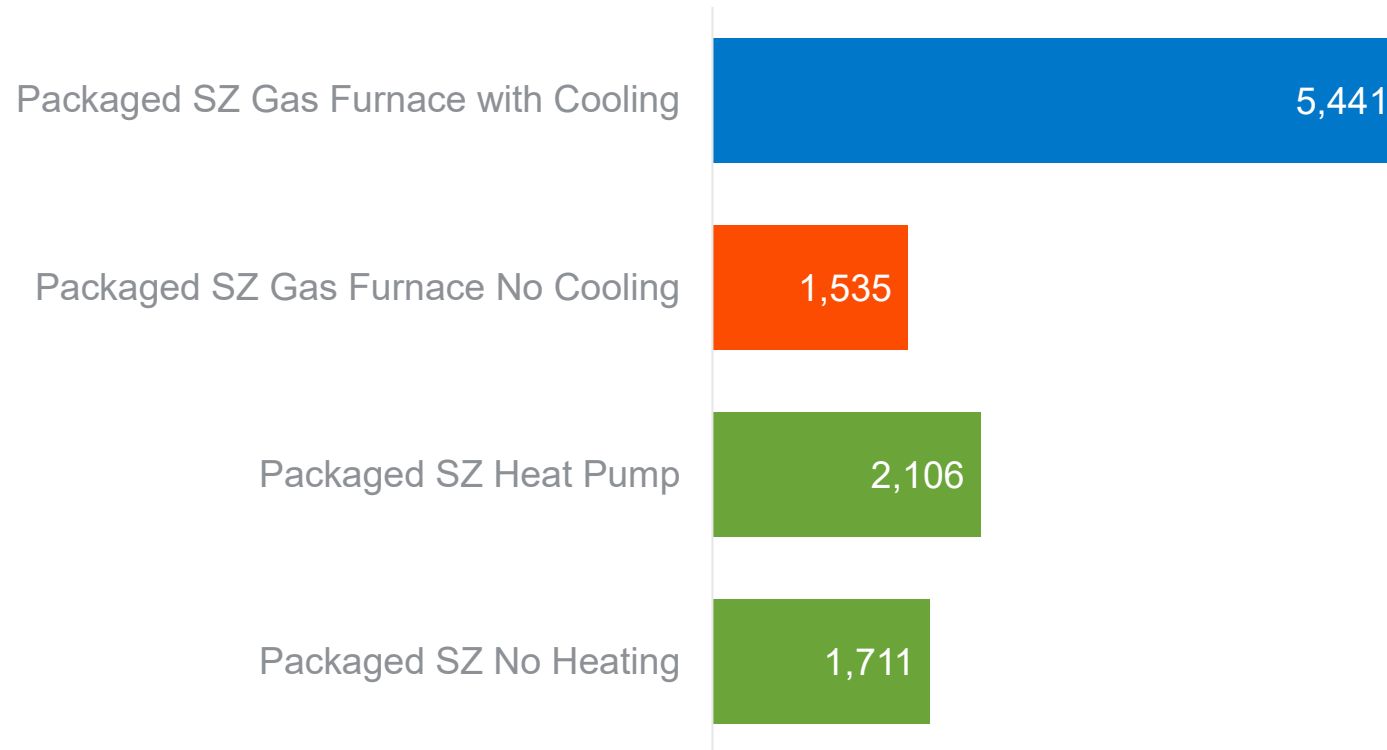
## Gas, No A/C – 34%

Red indicates gas units without air conditioning. These are incrementally expensive to electrify.



# Commercial: Packaged HVAC Equipment Counts

Number of Rooftop Units in Small Commercial Buildings -  
Countywide

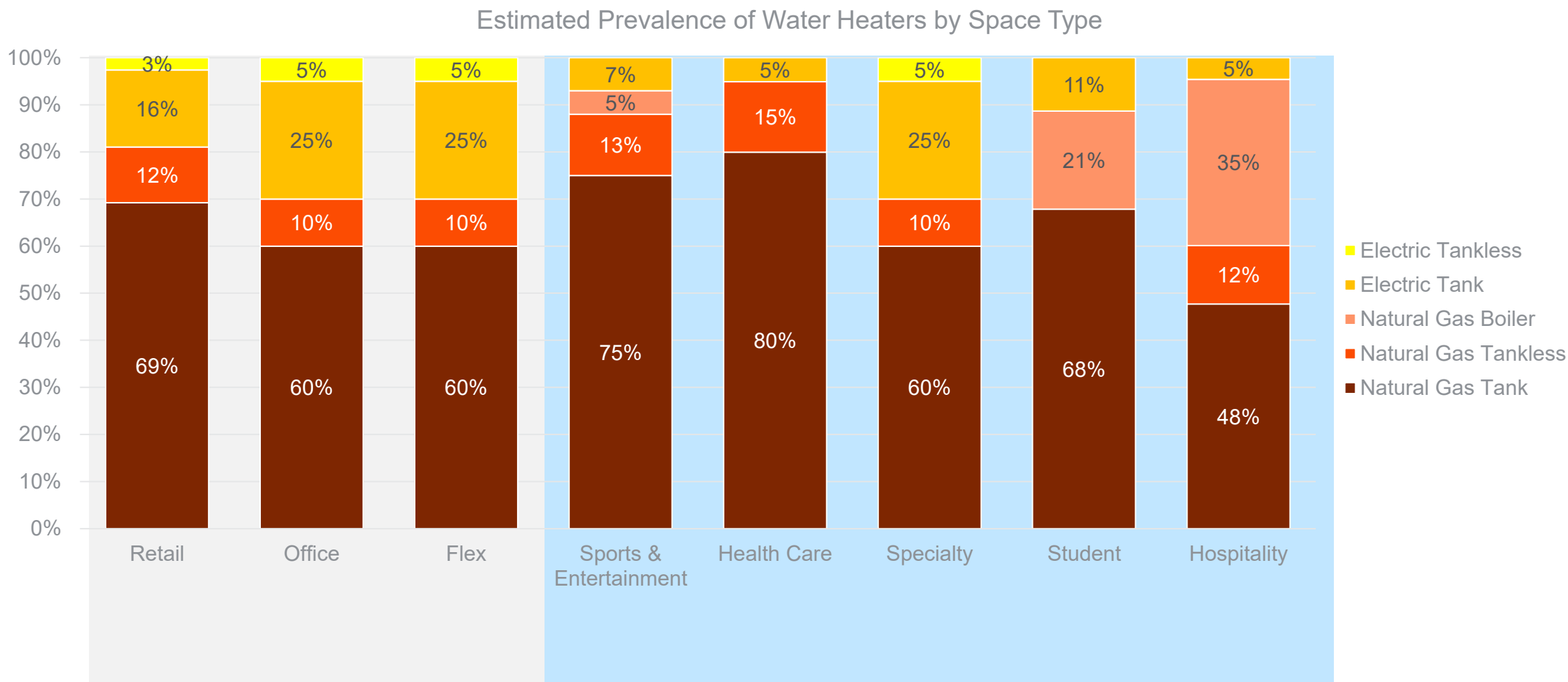


**Easy to Electrify – 5,441**  
Existing building 2-way A/C ordinances can cover most of these units without the requirement for incentives.

**Gas, No A/C – 1,535**  
Incentives may be required to offset the incremental cost increases to electrify. Electric service upgrades may also be required.



# Commercial: Water Heaters by Space Type

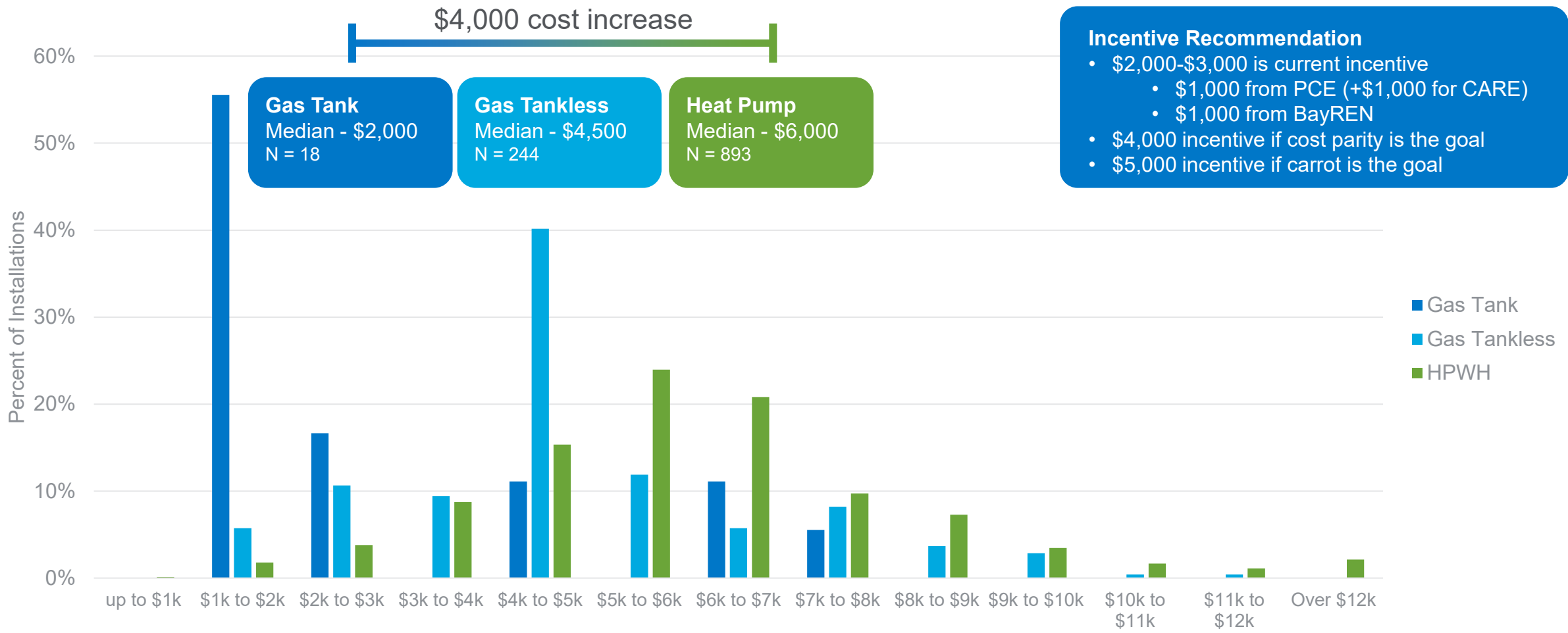




# What are the Costs to Electrify our Buildings?

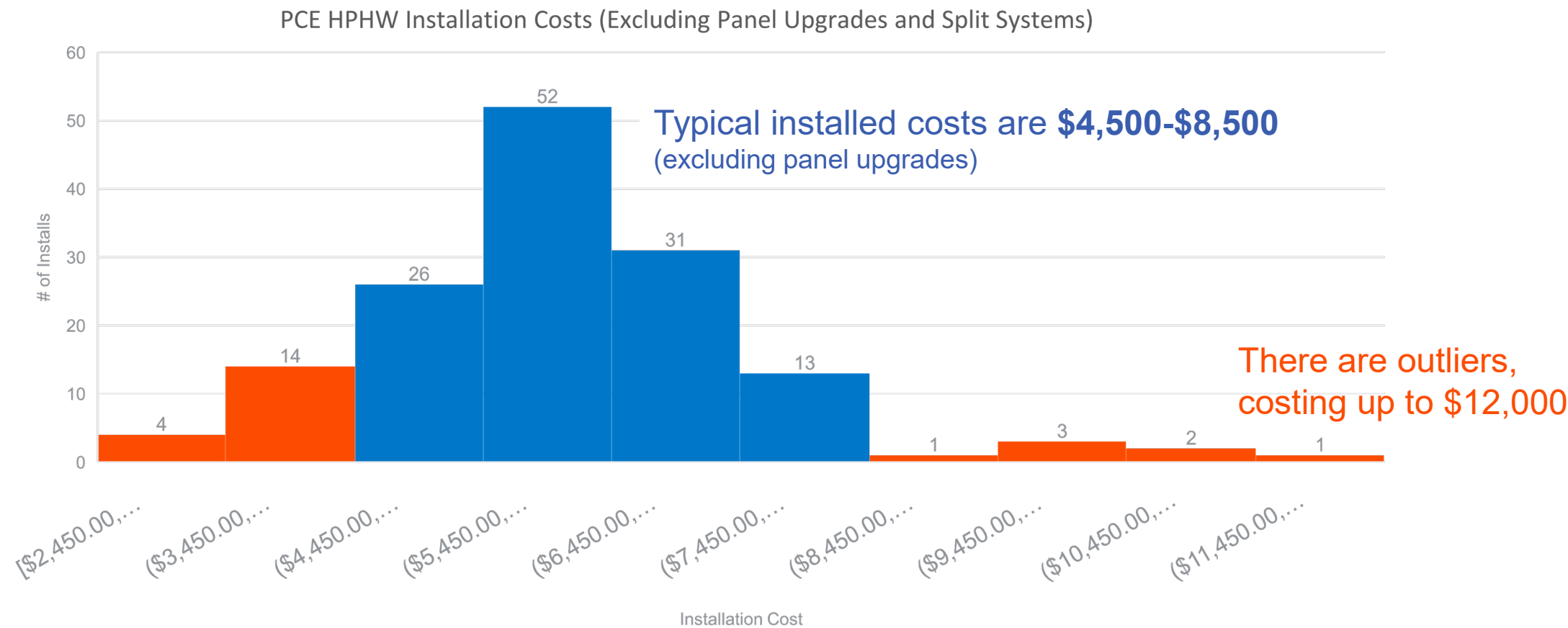
2035 Building Segmentation Study

# Single Family Water Heater Installation Costs



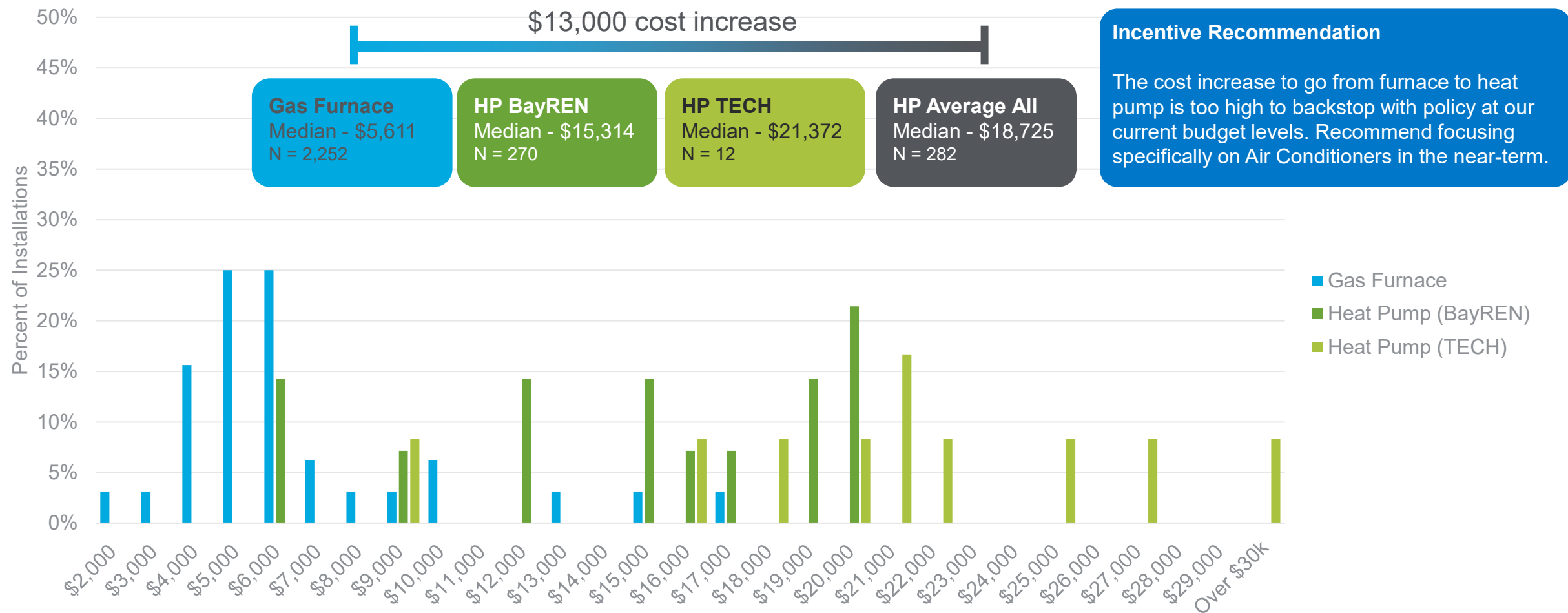


# Heat Pump Water Heater Costs



Average cost is \$6,100

# Single Family Space Heater Installation Costs

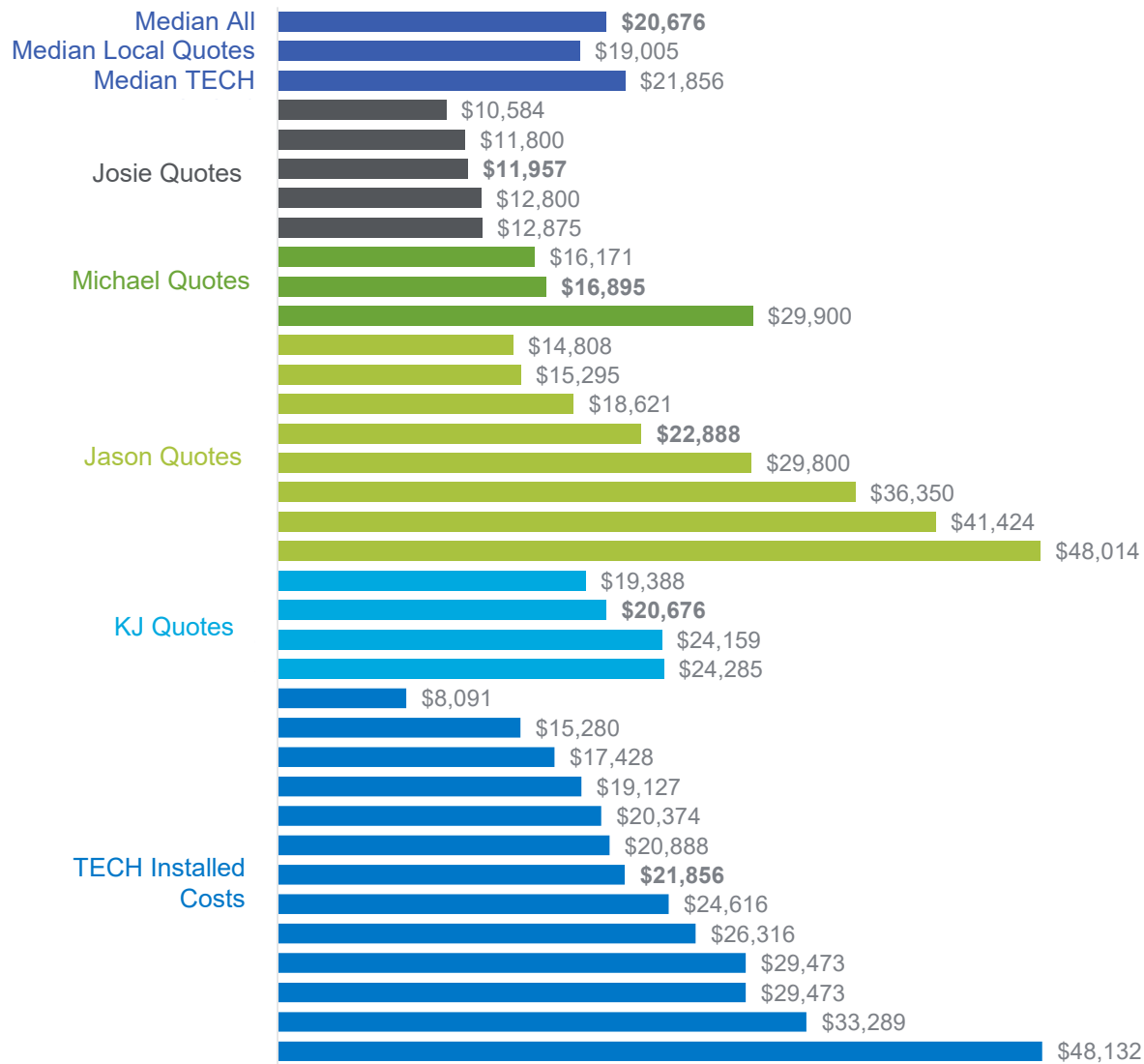




# Heat Pump Space Heater Costs

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




	Adding A/C (keep furnace)	Adding A/C + HP (keep furnace)	Adding A/C + 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									
<b>Total</b>		<b>+\$500-\$1,000</b>	<b>+\$1,500-3,000</b>		<b>Neutral</b>		<b>+\$500 -\$1,000</b>		<b>+\$1,500-3,000</b>


# Dryers and Ranges



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

Your Appliance		
Earliest Delivery: <b>January 15</b>		
Based on Zip Code <b>94061</b> You can choose another date during checkout.		
	<b>LG Electronics</b> 7.3 cu. ft. Ultra Large White Smart Electric Vented Dryer with EasyLoad Door and Sensor Dry, ENERGY STAR Qty: 1	<b>\$848.00</b>
<b>Parts &amp; Services</b>		
Installation		<b>FREE</b>
Standard Installation Kit (required)		\$52.97
Haul Away Your Old Appliance		\$25.00
Manufacturers Standard Warranty		<b>FREE</b>
<b>Total</b>		<b>\$925<sup>97</sup></b>
Taxes calculated in checkout.		

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

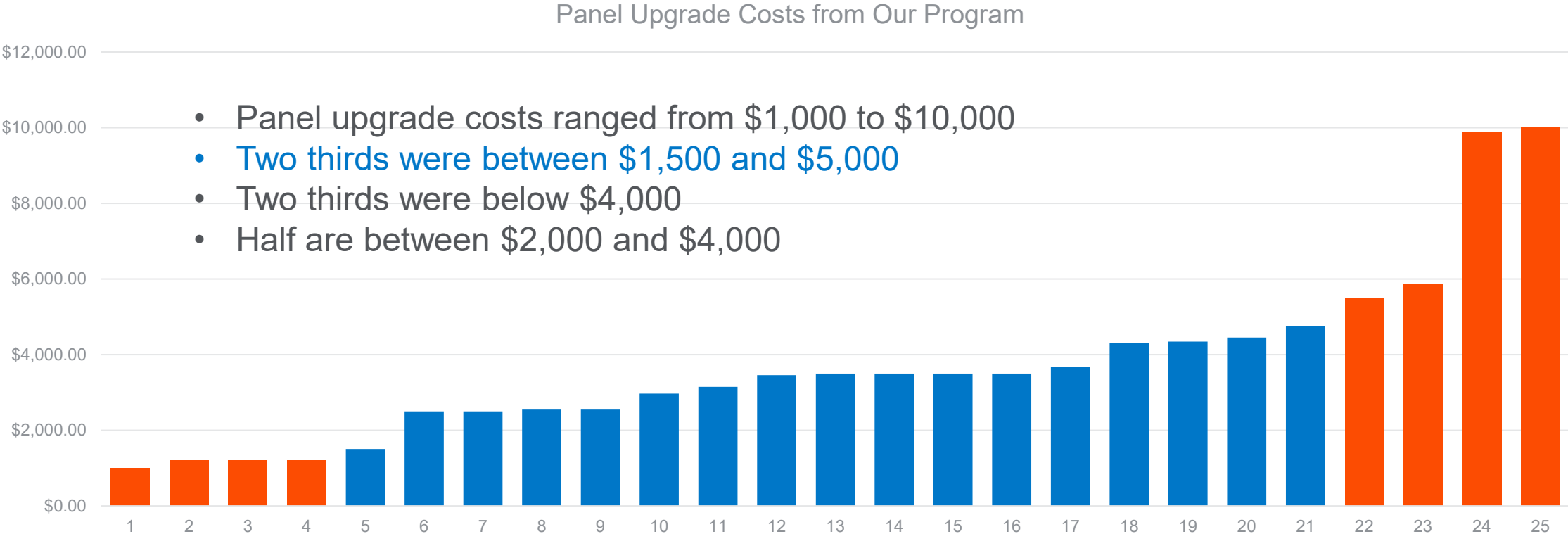
This item is non-returnable.		
	<b>FRIGIDAIRE GALLERY</b> 30 in. 5.4 cu. ft. Induction Electric Range with Self-Cleaning Oven in Smudge-Proof Stainless Steel with Air Fry Model #GCR13058AF	<b>\$1,098.00</b> <del>\$1,999.00</del> Save 22%
<b>Home Delivery</b> <b>FREE</b>		
<b>Parts &amp; Services</b>		
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		
<b>Subtotal</b>		<b>\$1,456.85</b>
Savings		<b>-\$301.00</b>
Appliance Delivery		<b>FREE</b>
Sales Tax (determined in later step)		----
<b>Total</b>		<b>\$1,155<sup>85</sup></b>
You Saved 21% Off Your Item		
Have a promo code?		
<b>Checkout</b>		
PayPal Checkout		



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



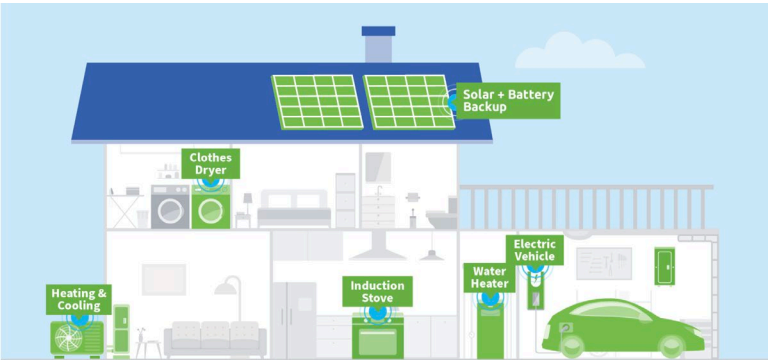
# Panel Upgrade Program Costs (n = 25)



Average cost is \$3,700



# Summary for Financing Analysis



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.

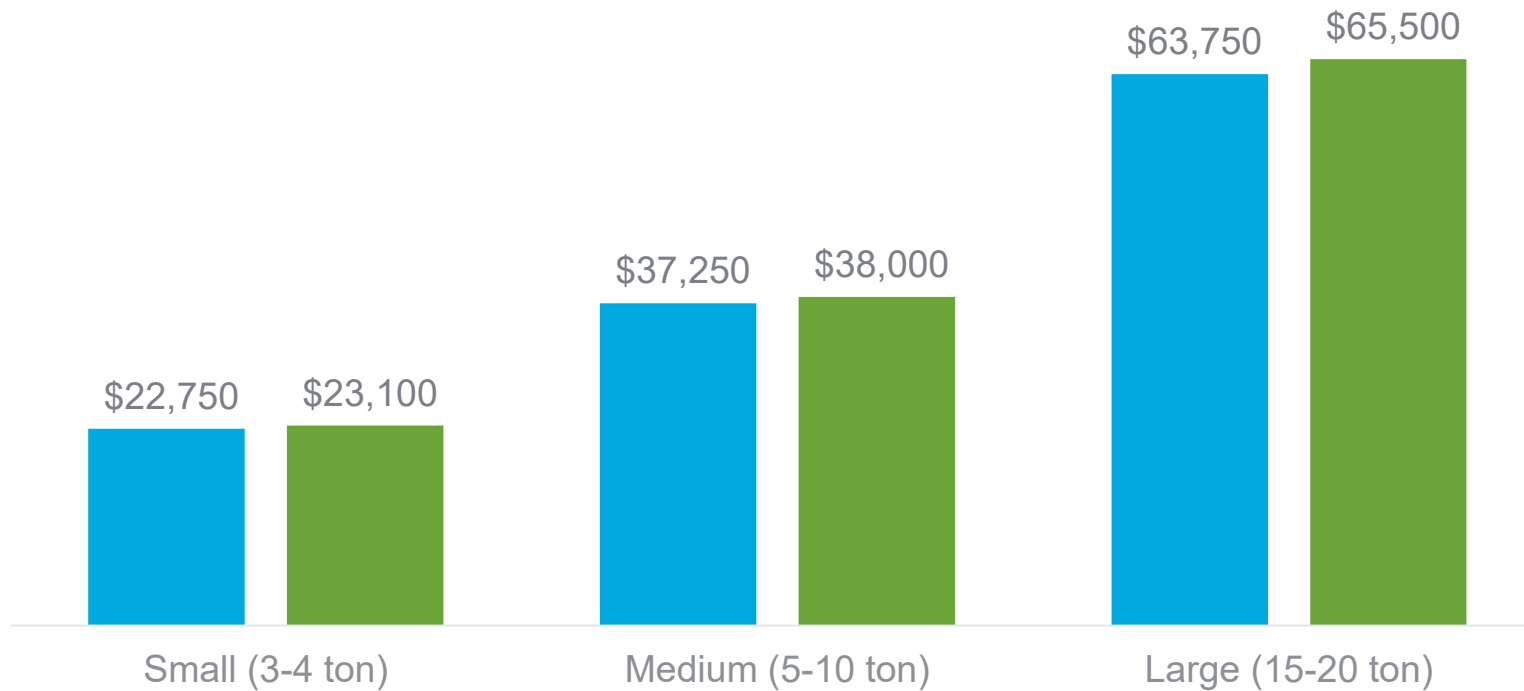
	Electrification Cost	Replace In-Kind Cost	Incremental Cost
Water Heating (includes 240V circuit)	\$6,100	\$2,000	\$4,100
Space Heating	\$20,700	\$6,132	\$14,568
Cooking	\$1,098	\$1,155	-57
Clothes Drying	\$925	\$925	\$0
Total	\$28,823	\$9,057	\$18,611
Panel, if required	\$3,700		
Total non-optimized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



# Commercial: Rooftop Packaged Unit Costs

Median Rooftop Packaged Heat Pump Installation Costs

■ Gas ■ Heat Pump

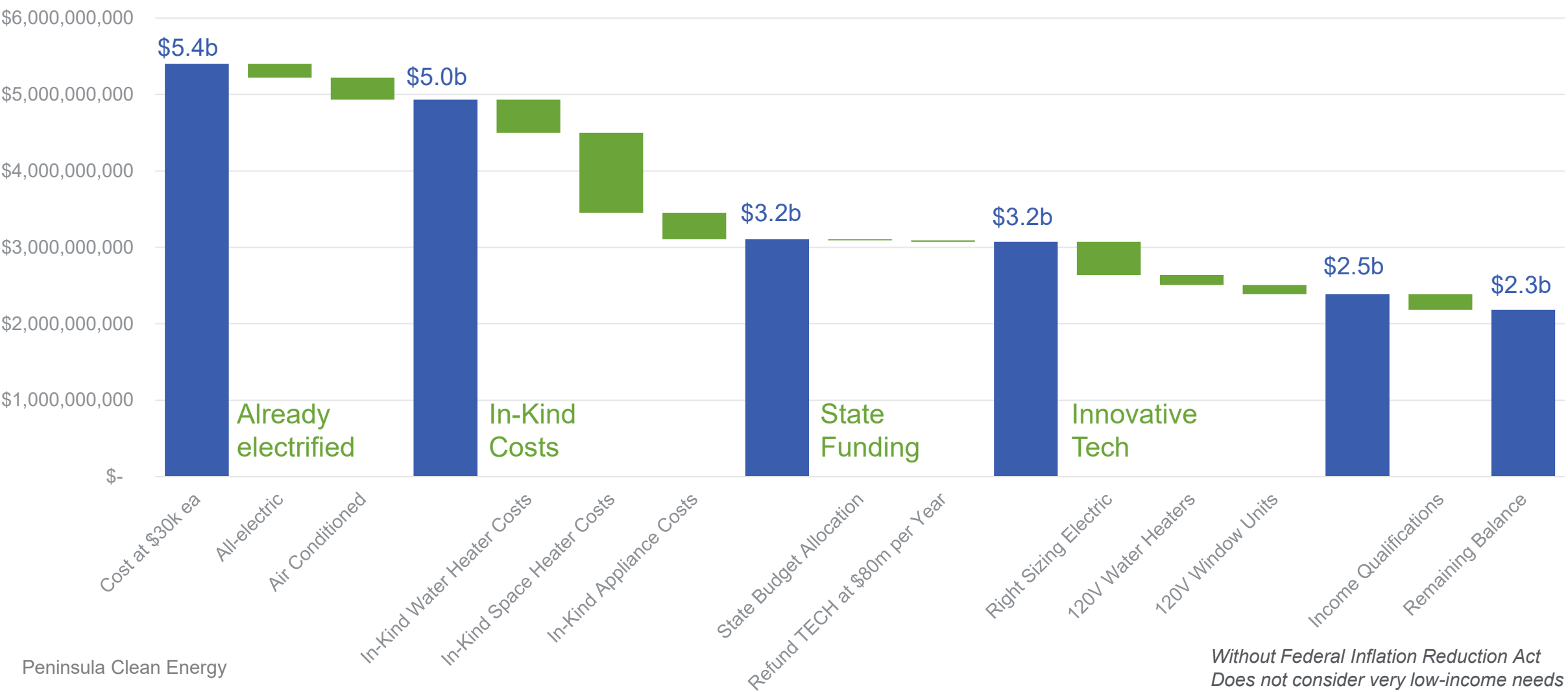


## Reach Code Opportunity

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.



# How Big is the Task? – Sm Res. (DRAFT)





# Segmentation Conclusions: Buildings

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- Older small-residential dominant: Small residential represents most of the building stock (>70%), and these tend to have more gas appliances
- Methane gas equipment predominates: Most homes have methane water heaters (98%) and gas furnaces (68%). Electric dryers and stoves are common.
- Space heating is the biggest installation expense: At \$20k, electrifying space heating is a significant cost.
- Total Capital Required: Estimated ~\$3.6-4B needed to electrify single-family and small multifamily.
- Low-income segment challenge: High percentage of small residential units (~20%) owned by very low-income residents creates a challenge to self-fund electrification.

# Vehicles

(San Mateo County only)





# Table of Contents

---

## Vehicles

What vehicles do we have?

- [Registration Type](#)
- [Fuel Type](#)
- [Vehicle Type](#)
- [Vehicle Age & Fuel Type](#)
- [Ownership Type](#)
- [Used Car Finance Rates](#)
- [Average Monthly Car Payments](#)
- [2021 New EV Sales](#)
- [2021 New/Used EV Purchases by Zip Code](#)
- [2021 New Vehicle Sales Price](#)

Who owns them?

- [Vehicle Age by Zip Code](#)
- [Vehicle Ages by Median Income, Zip Code Level](#)
- [Vehicle Age by Median HH Income](#)
- [EV Adoption by Income](#)

[How Big is the Task?](#)

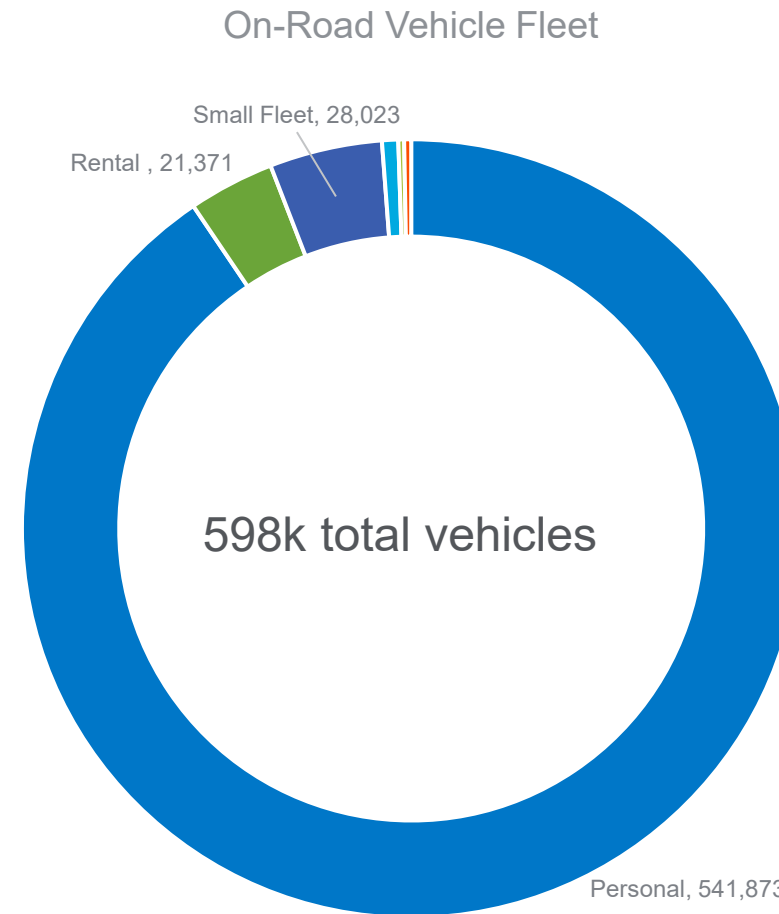
What EV charging do we have?

- [EV charging segmentation](#)
- [Estimated Charging Gap Costs](#)



# What cars do we have? Registration Type

90% of all vehicles registered in San Mateo County are personally owned, relatively small local fleet segment.

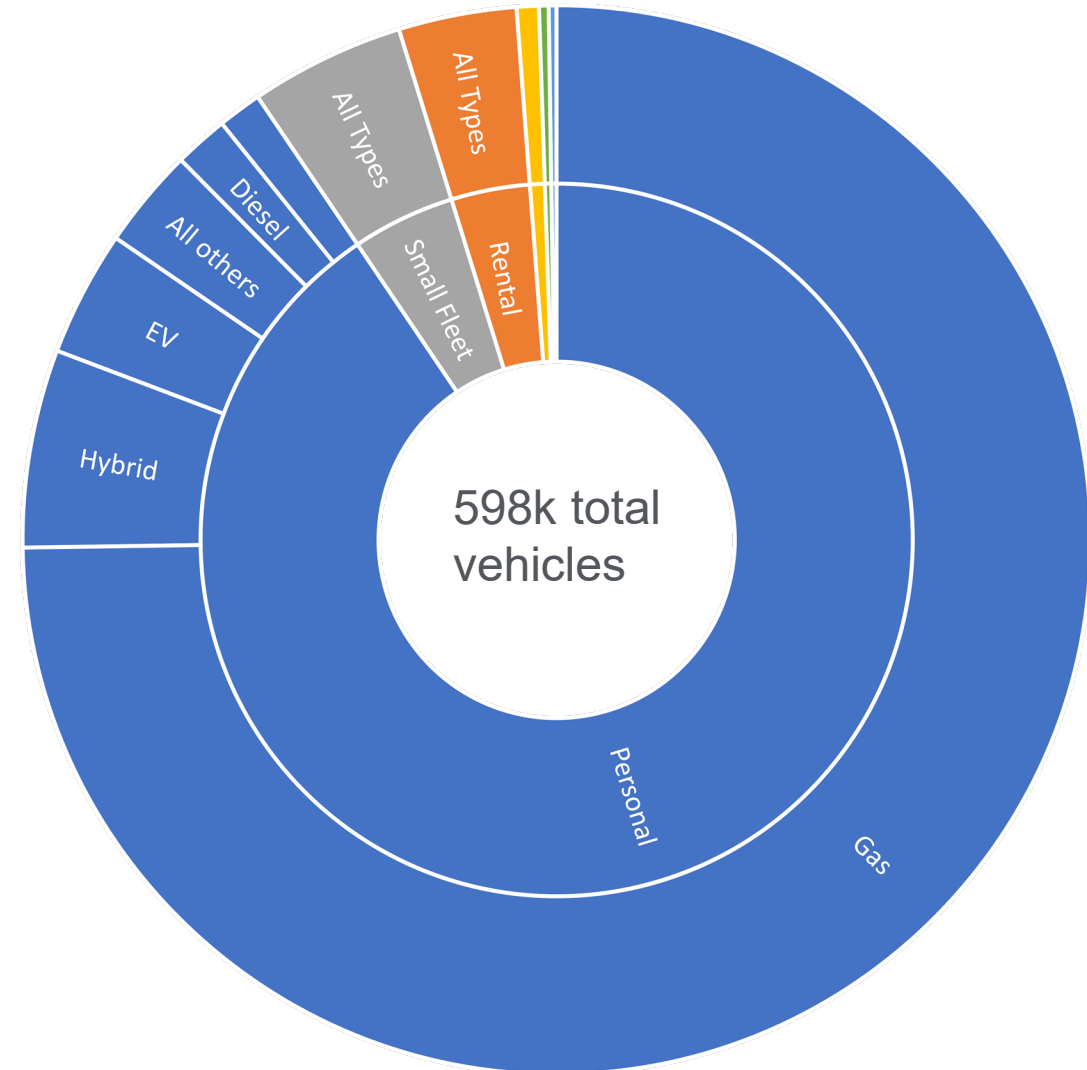




# What cars do we have? Fuel Types

83% of personal vehicles are non-hybrid gas cars

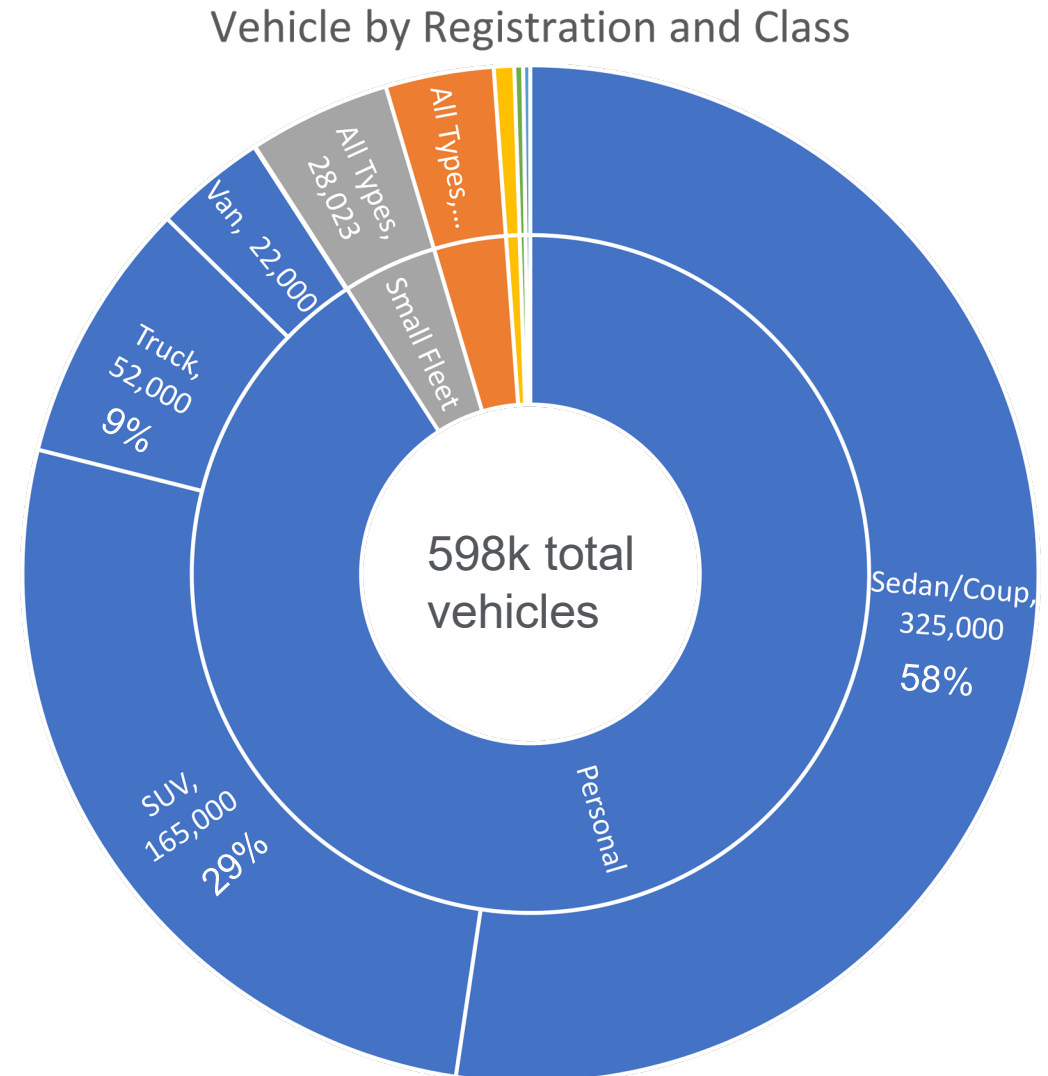
On Road Vehicles by Registration and Fuel Types





# What cars do we have? Vehicle Types

60% of personal vehicles are sedans and coupes

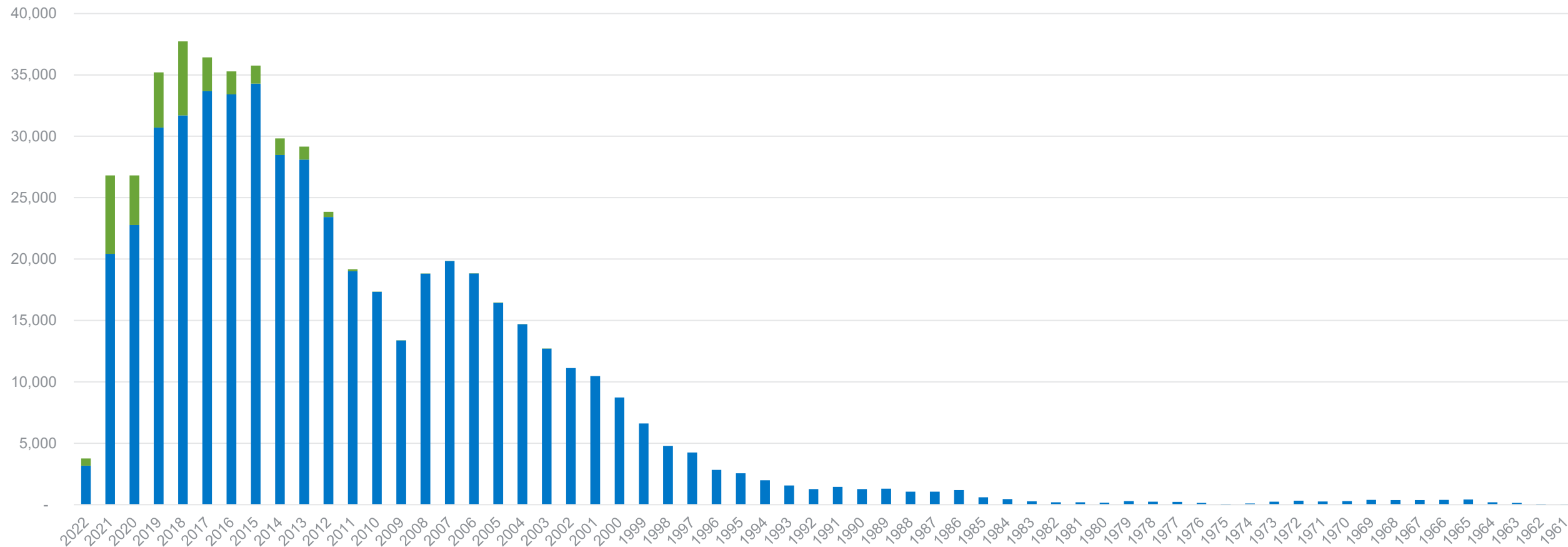


# What cars do we have? Vehicle Age & Fuel Type



Median Age = MY 2015/2016, ~7 years old (National Average = 12 Years Old)

Total Vehicles by Model Year and Fuel Type





# What cars do we have? Ownership Type

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## Purchase vs Lease

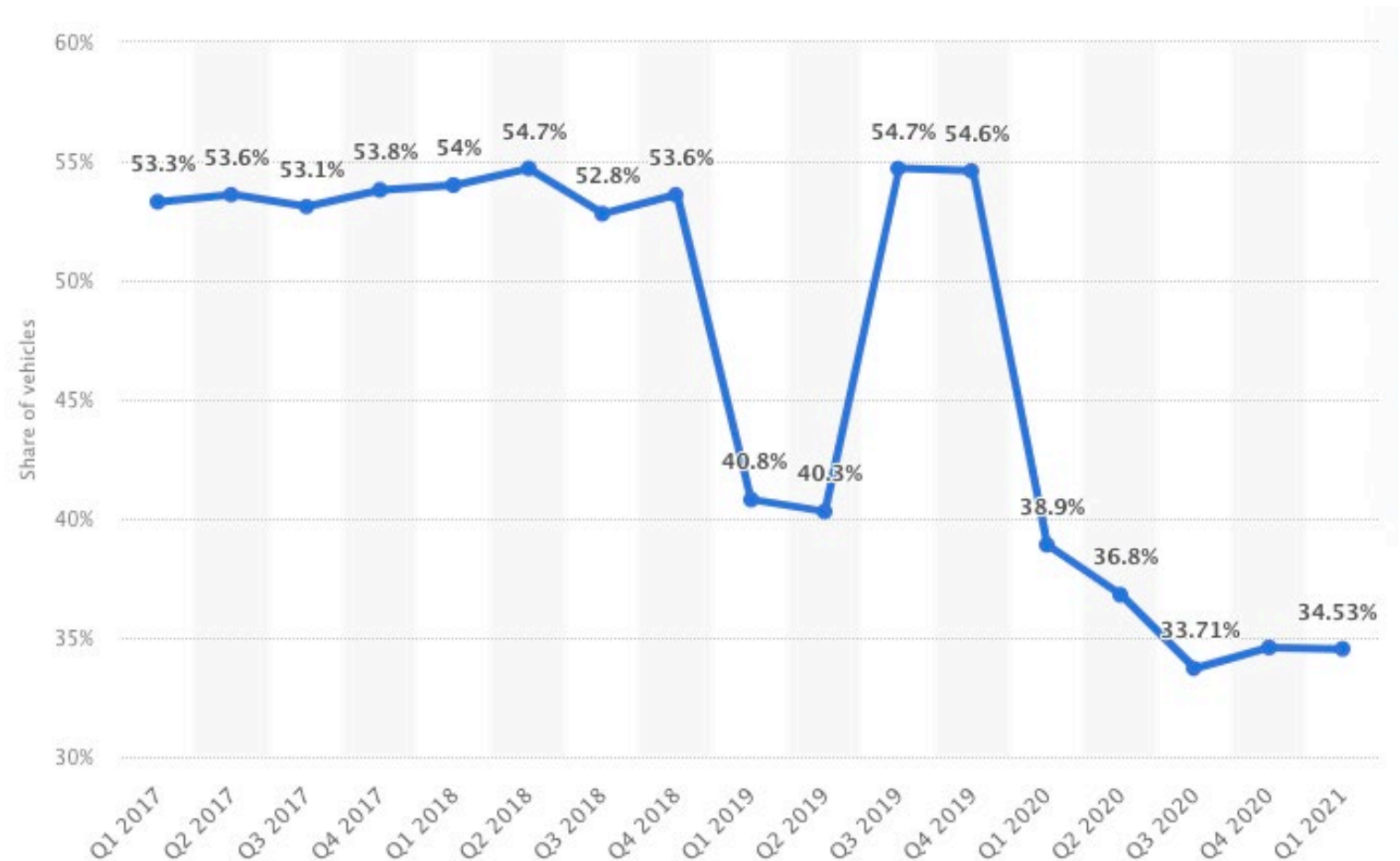
- ~70/30 purchase/lease (nearly identical for EV and non-EVs in San Mateo County)
- Consistent for previous 3 years

# What cars do we have? Used Car Finance Rates



Note: national trend, NOT local

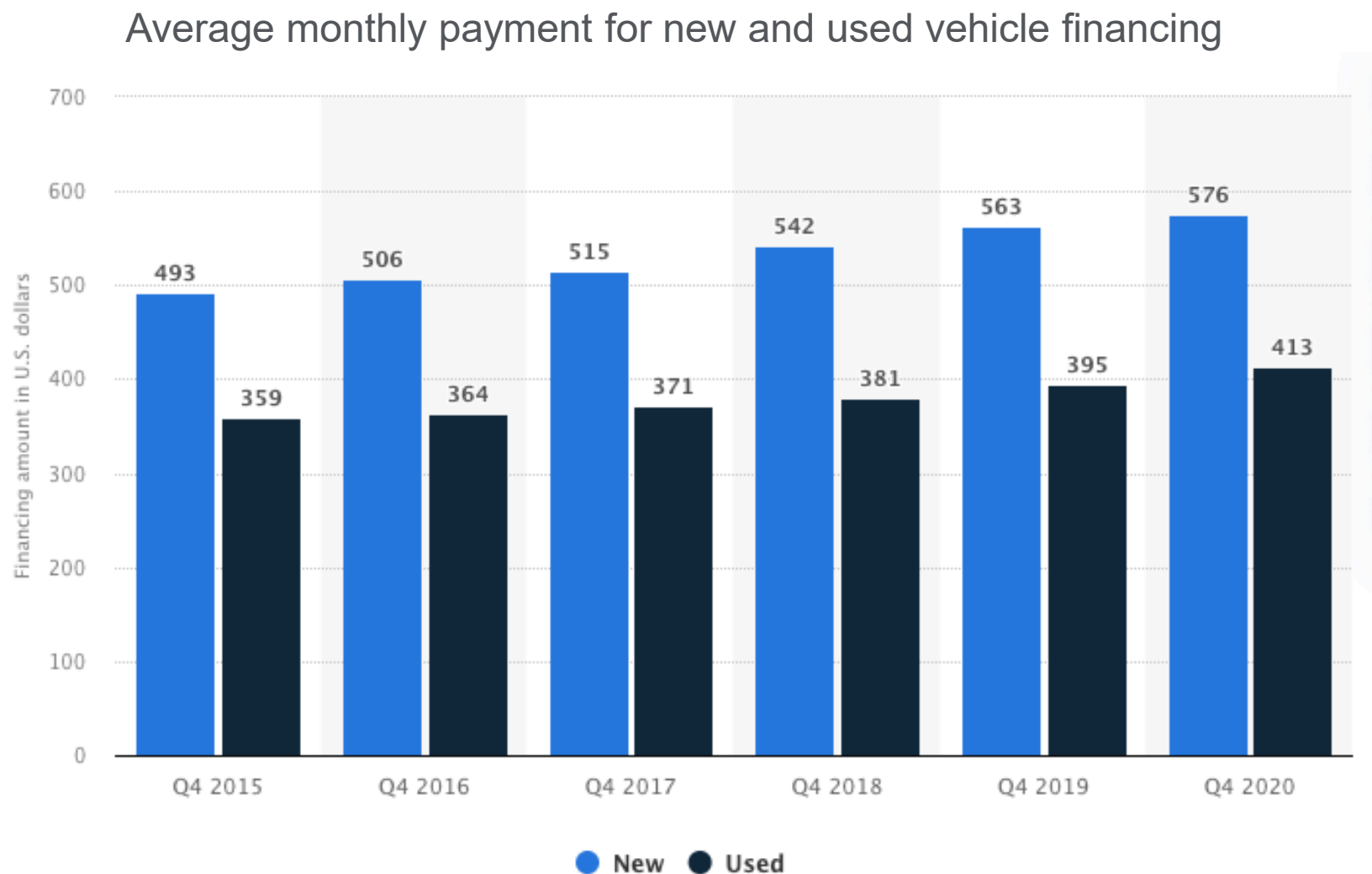
Share of Used Car Purchases with Financing



# What cars do we have? Average Monthly Payments



Note: national trend, NOT local





# What cars do we have? 2021 New EV Sales



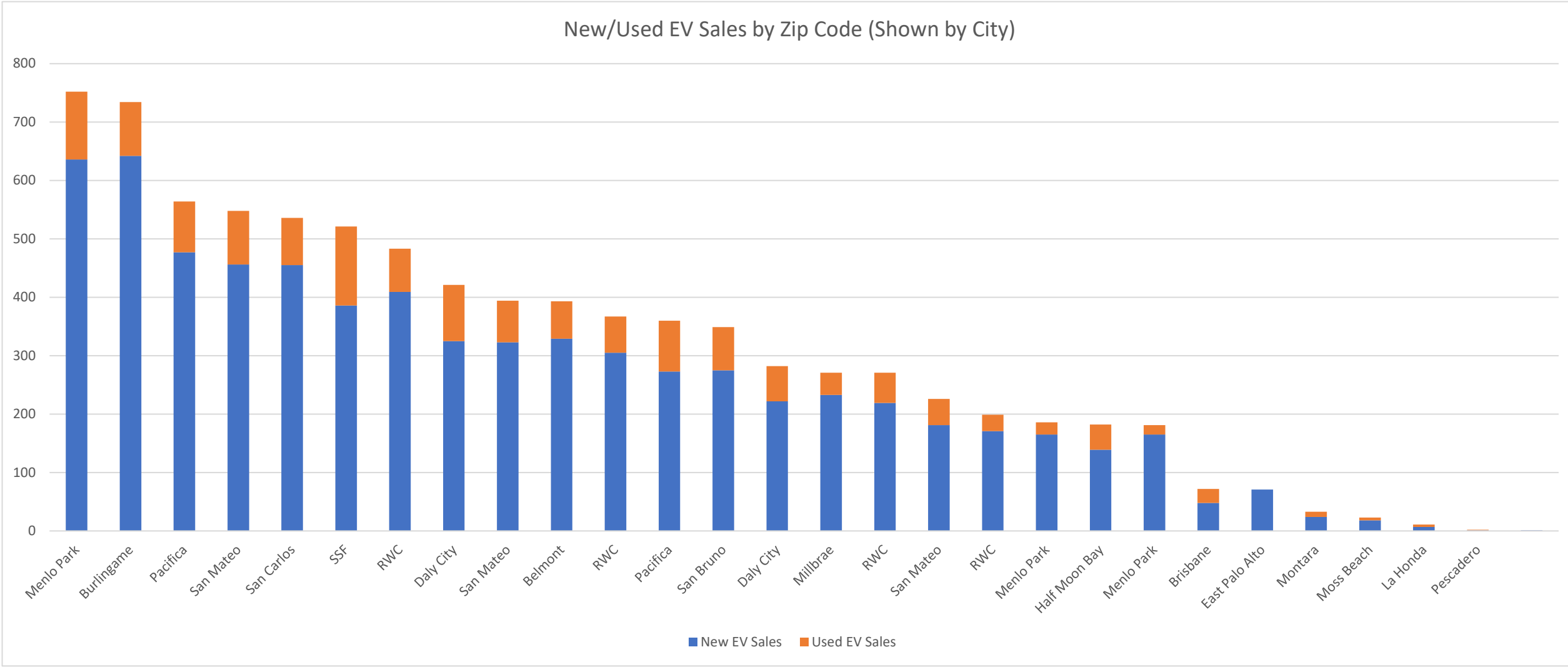
Tesla still over half of all new EV sales

2021 New EV Sales by Type, San Mateo County



# What vehicles do we have?

## 2021 New/Used EV Purchase Volume by Zip Code

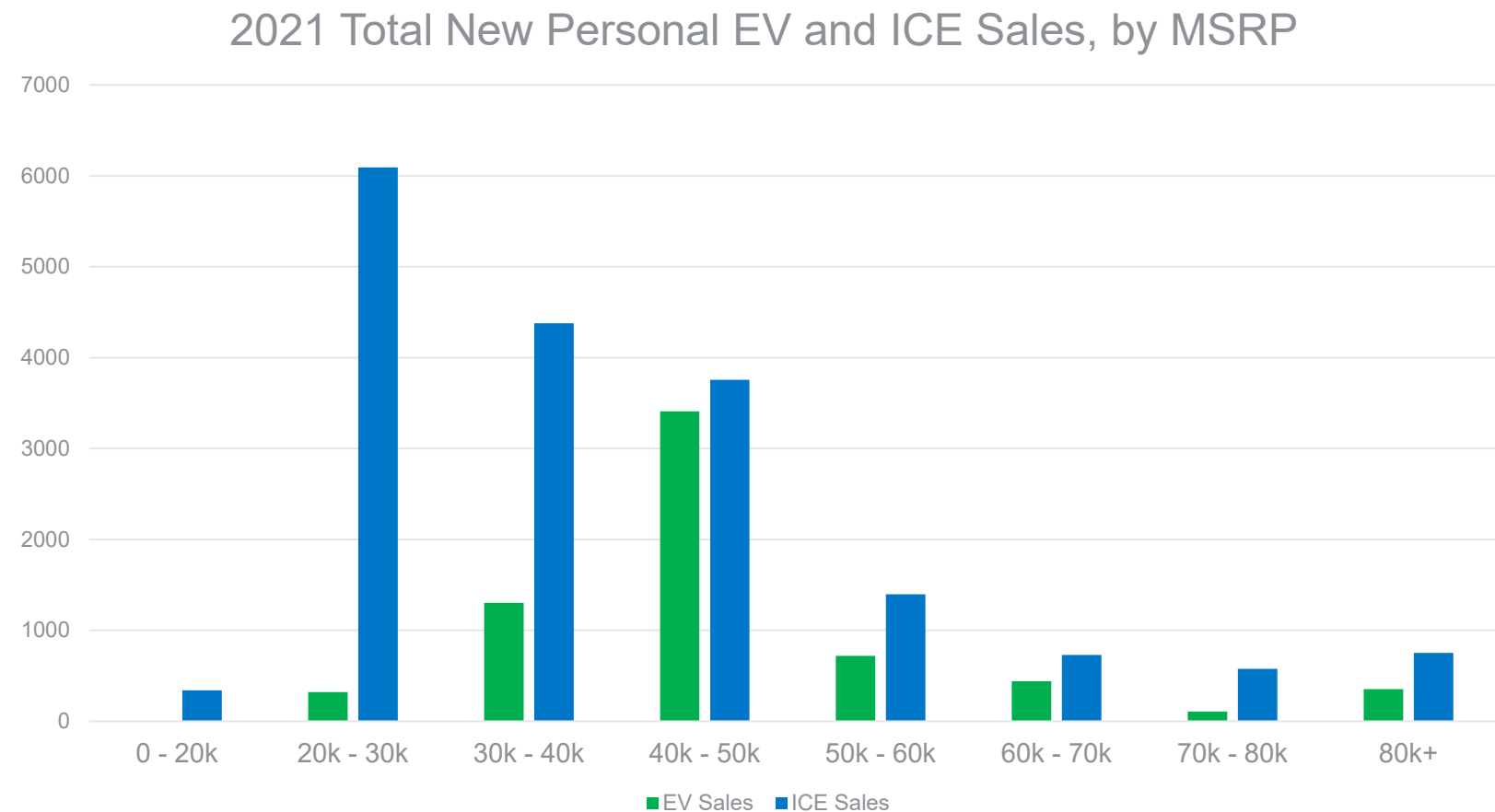


# What cars do we have? 2021 New Sales Prices

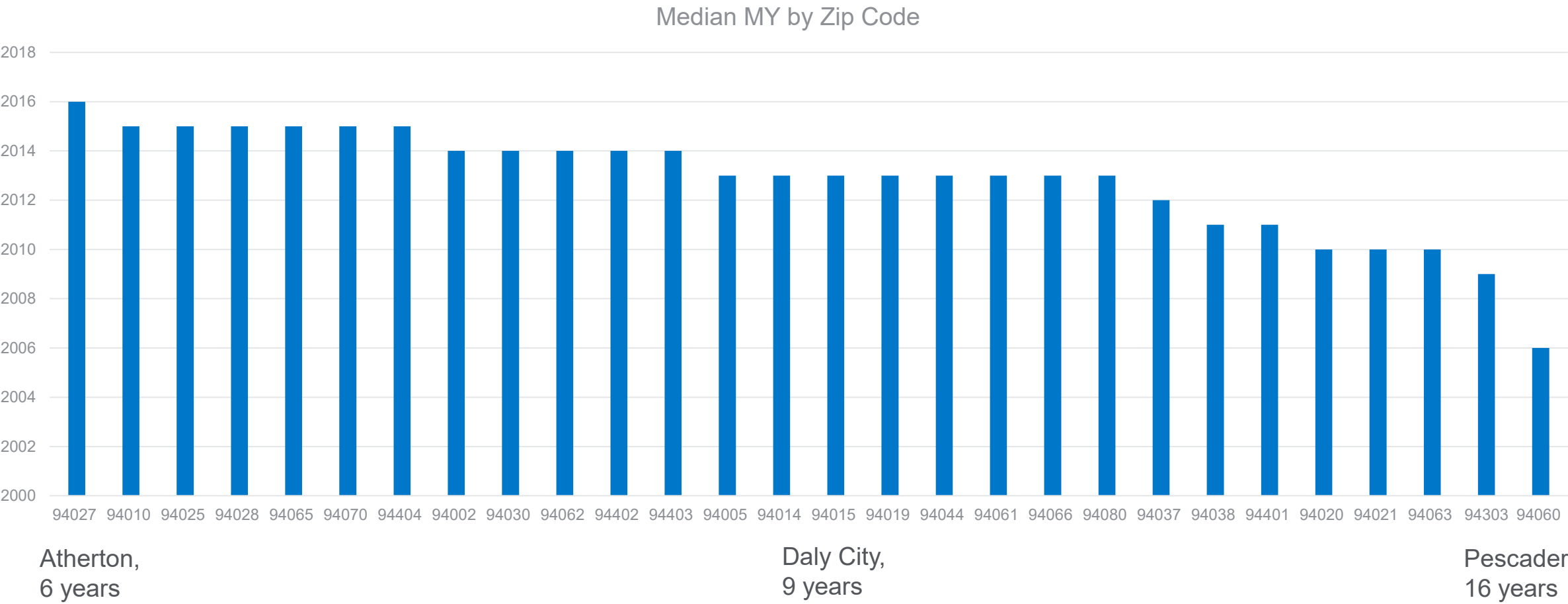


## Average MSRP of SMC New Vehicle Sales, 2021

ICE: \$41,400  
EV: \$52,145  
All: \$41,860

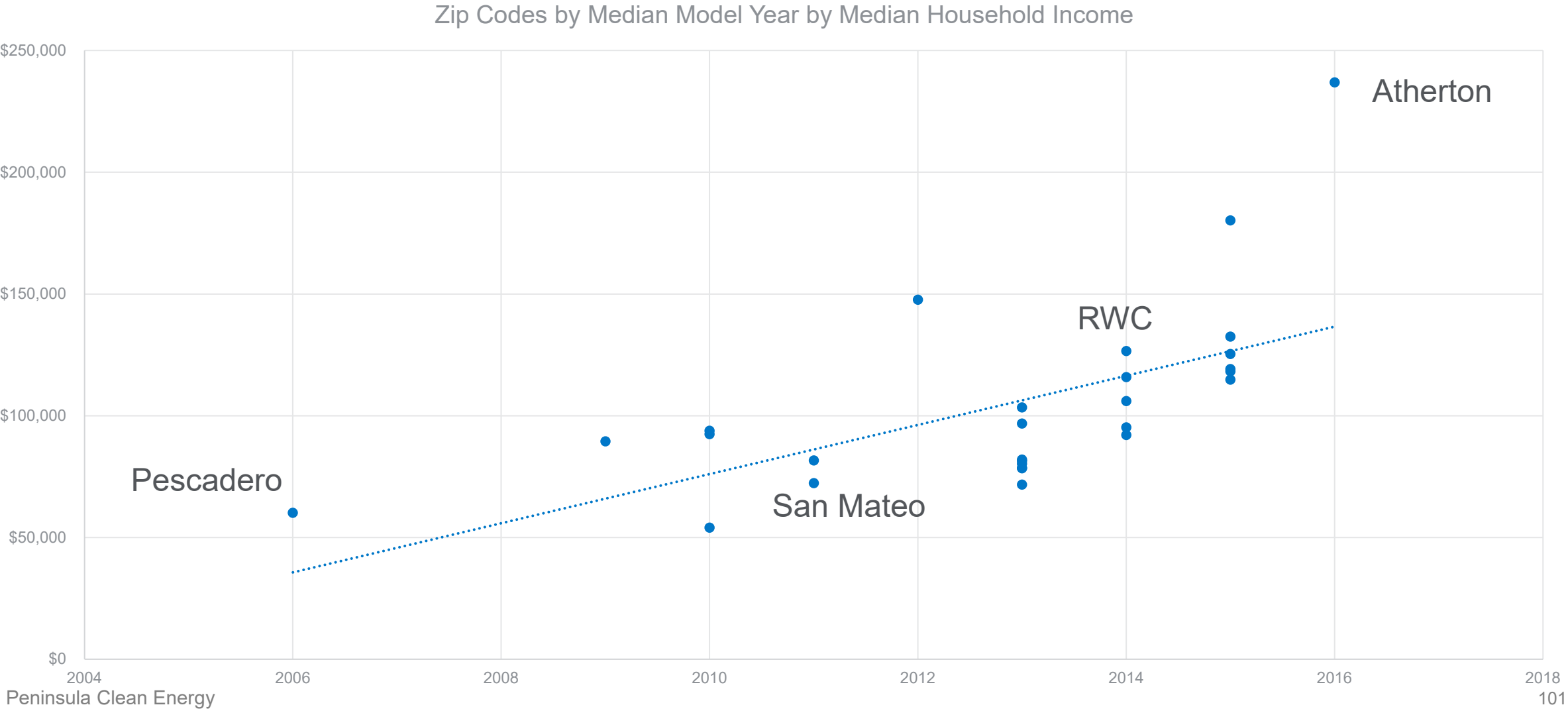


# Who's in our Vehicles? Vehicle Age by Zip Code



# Who's in our Vehicles?

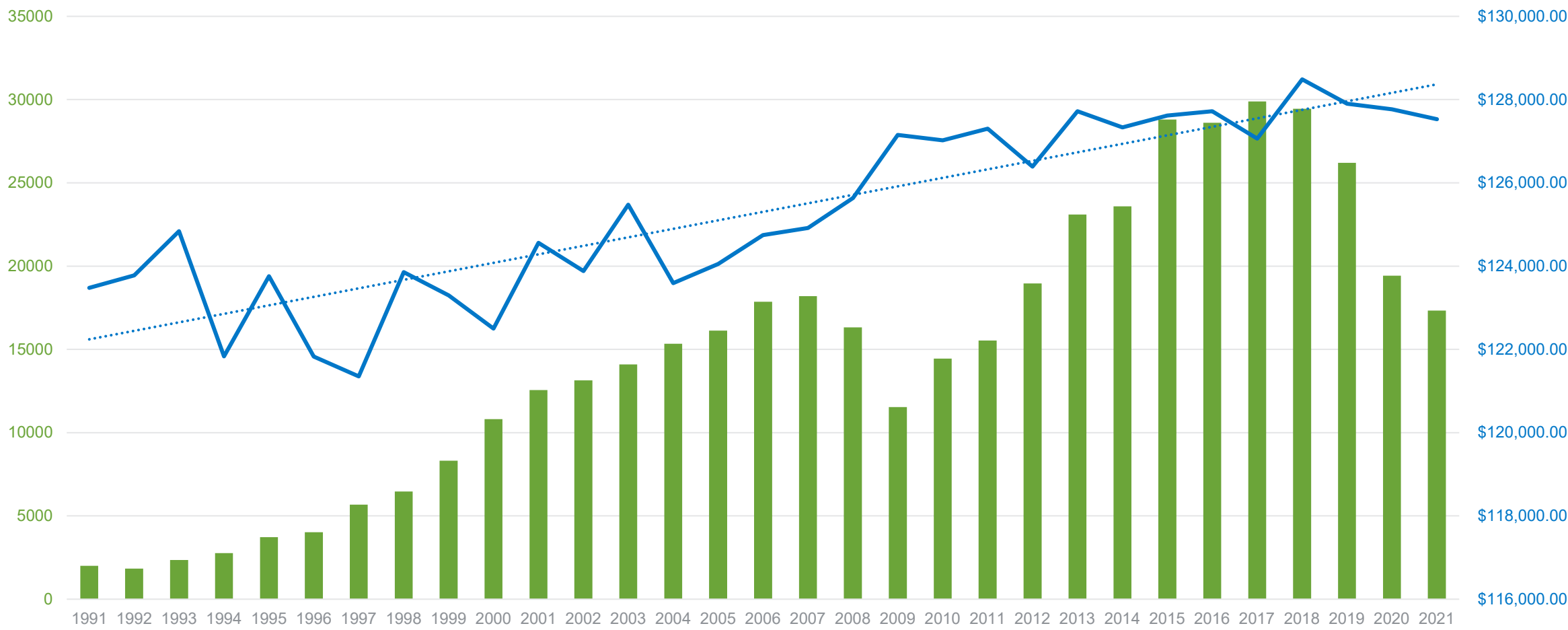
## Vehicle Ages by Median Income, Zip Code Level



# Who's in our Vehicles? HH Income and Veh. Age



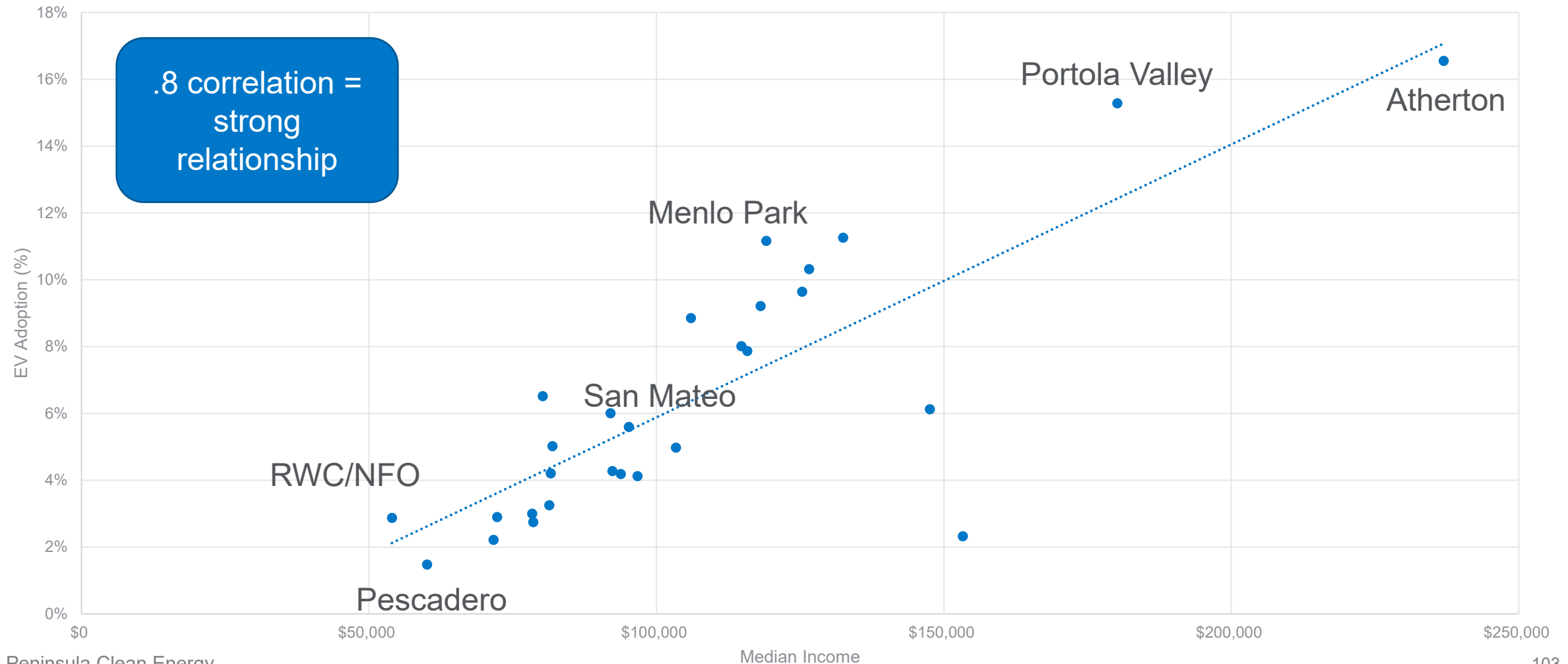
Average HH Income by Vehicle MY and Vehicle Totals by MY



# Who's in our Vehicles? EV Adoption and Income



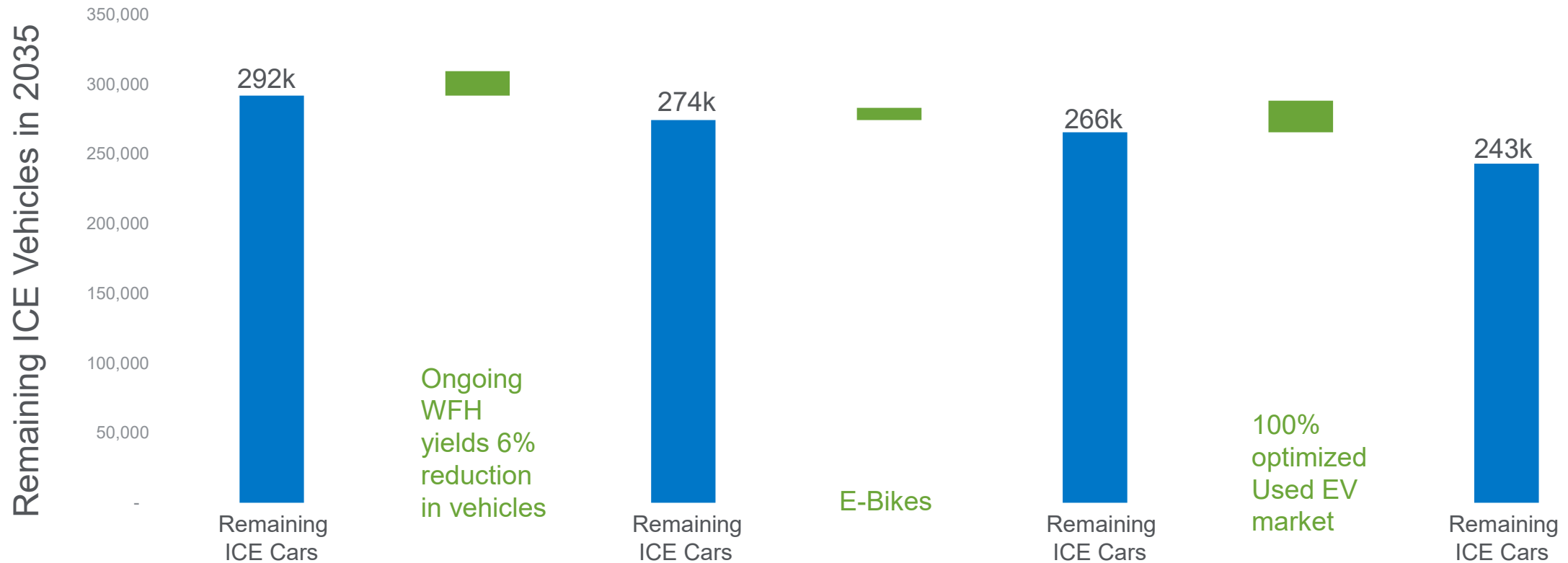
EV Adoption and Median Income, by Zip Code





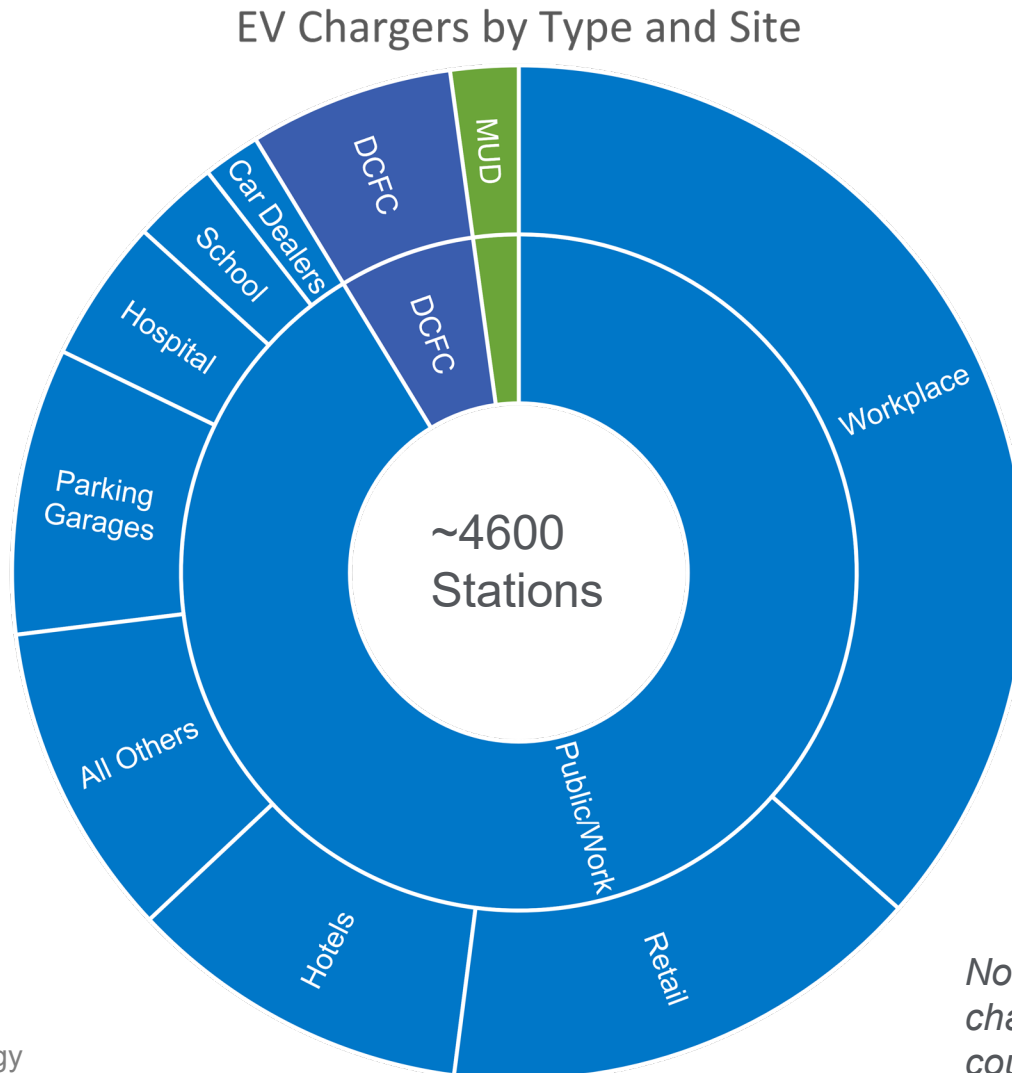
# How Big is the Task? Vehicles

Remaining gas vehicles in BAU scenario and various reductions strategies (without increasing new EV purchases)





# Current EV Charging Distribution



- Min. need to support all-electric fleet, ~70k chargers (CEC)
- Major need in multi-family housing
- 80% of EV charging happens at home

*Note: data quality is poor for workplace charging and multifamily (MUD) so counts may be higher*



# Estimated Charging Gap Costs

EVSE	2035 Min. Charging Need	Expected Chargers by 2035 in BAU	Charging Gap	Cost to Install Charging Gap
MUD	37,500	16,060	21,440	\$71,180,800
Pub/Work	31,000	15,680	15,320	\$137,880,000
DCFC	2,000	720	1,280	\$130,560,000
Total	70,500	32,460	38,040	\$339,620,800



# Segmentation Conclusions: Transportation

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- Young fleet: Our vehicles are younger than national average (our new vehicle segment is 2x national average) and appear to turnover faster
- Vehicle prices: New car prices in SMC track with national average
- Vehicle Age & Income Correlate: Vehicle age and income are highly correlated (areas where average car age is 10+ years old have avg. income of <\$100k, very low income)
- EVs and Income Correlate: EV adoption and income are highly correlated
- Min. Charging at MUDs: Virtually none exist currently, reach codes to be a material contributor but substantial gap remains

# Finance Options

# Overview of Funding & Financing

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## Public & Private Capital

- Debt/Credit instruments
- Project finance
- Bonds

## Federal & State

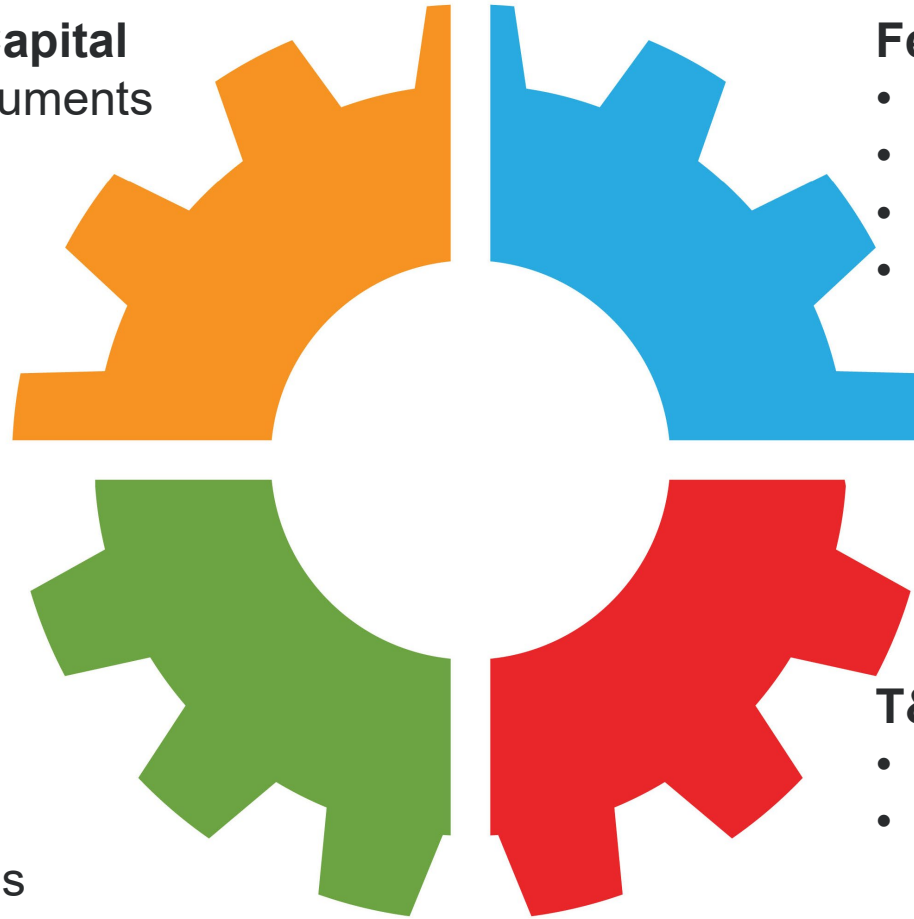
- DOE grants & loans
- CEC, CARB grants
- iBank loans/bonds
- Treasurer loans, credit enhancement

## PCE Leverage

- Budget
- Balance sheet
- Revenue streams
- Credit ratings

## T&D value streams

- CPUC programs
- Wholesale market/DR



# Finance Mechanisms

---



- **Consumer/Business Finance**

- Debt held by individual/company
- Usually dependent on individual/company credit worthiness
- Mature but available to limited population, possibly high cost of capital



- **Credit Enhancement**

- Mechanism to improve consumer or business credit terms or eligibility
- Via added govt funding to “buy down” rates or create loan-loss reserve
- Specialized applications requires policy approval



- **Project Finance**

- Debt and possibly asset ownership held by third-party
- Usually tied to the cashflows of the project to be financed
- Available only in large capital pools

# Examples

Finance Class	Security	Finance Type	Capital Source
Consumer Finance	Unsecured	Revolving credit (ex: credit card) Unsecured loan	Private
		On-bill finance	Rate payer funds
		On-bill repayment loan	Private
	Secured	Home mortgage Home equity line of credit	Private
Business Finance	Unsecured	Line of credit	Private
	Secured	Mortgage Property Assessed Clean Energy (PACE)	Private
Project Finance	Single project	Power Purchase Agreement Energy/Efficiency Service Agreements	Private
		Tariff On-Bill Finance	Private, Rate payer funds, Public
		Public works (bridge, treatment plant)	Public (bond)
	Aggregate	Distributed project	Private, Public

# Access to Finance

Customer capacity	Who	Current Option	Possible Option
Credit worthy	Corporate	PACE, Line of Credit	--
	Residential	Consumer loans, HELOC	--
Limited or None	Med/Small business	Maybe small business loan, but not for many or expensive.	Project finance or Credit enhanced debt
	Residential	None	Project finance or Credit enhanced debt

*Est. 12% of residential customers have especially limited/no access to credit (very low-income property owners bearing mortgages)*



# Low-income Considerations

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- **12-20% Segment:** Very low-income property owners earning 30-50% of Area Median Income
- **Major barrier:** Most unable to bear costs, including debt
- **Total Cost to Electrify:** \$480 M
- **Possible Tools**
  - Very large grant sources
  - Property owner requirements for rented units
  - Loans with credit enhancement for some
  - Incentive + Aggregate Project Finance

# Credit Enhancement



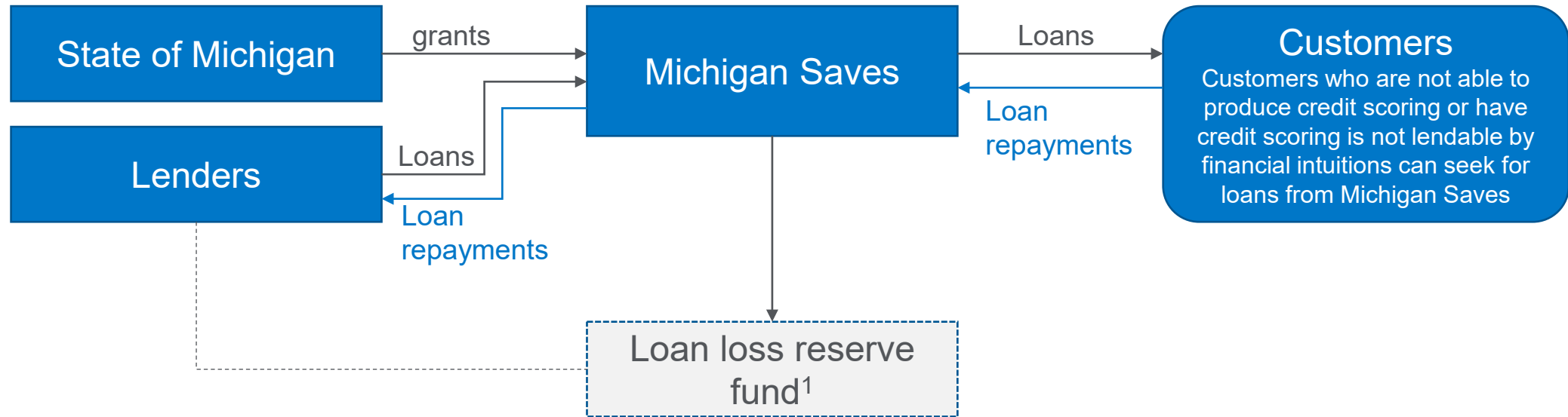
# Financing – Credit Enhancement

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Credit enhancement is a financial instrument to reduce rates or broaden customer creditworthiness eligibility by provide partial risk coverage to lenders.

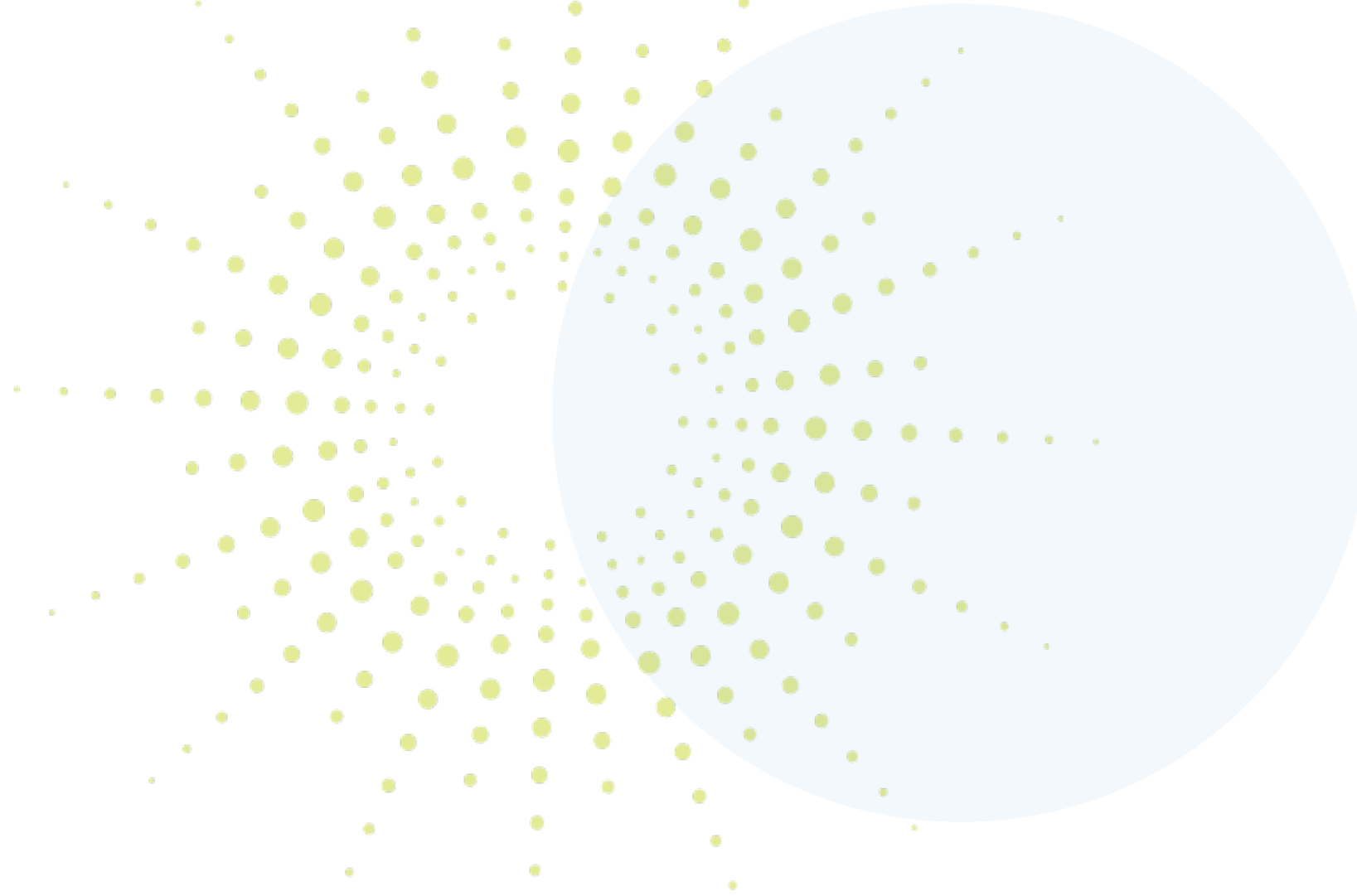
- **Determinants for creditworthiness**
  - Track record of default rates and percentage of loan loss reserve deposit against borrowing
- **Example**
  - Michigan Saves program provide affordable financing for energy improvements
  - California GoGreen Home

# Financing – Credit Enhancement Example



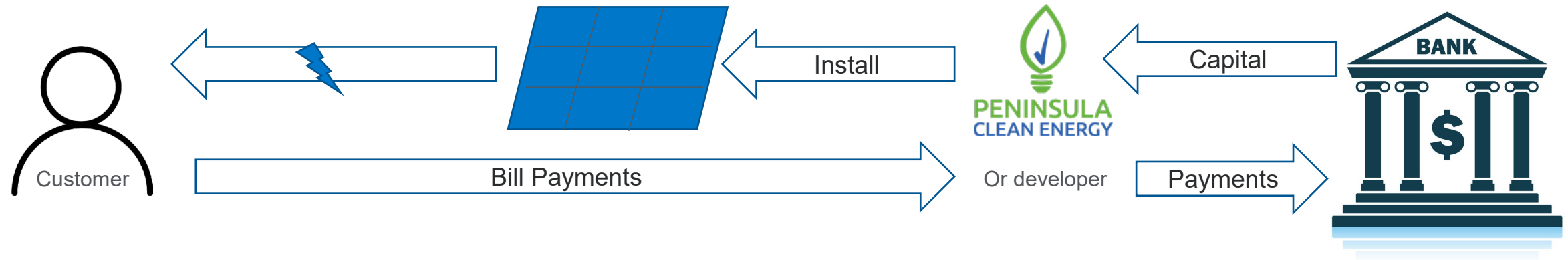
- Program
  - deposits a security based on a percentage of the loan amount into reserve, improving the overall credit quality, attracting more lenders and better terms
  - provides low-interest energy efficiency loans to customers with improved eligibility
  - pays contractors directly and customers payments are on-bill
- Viable for customer if savings delivered are greater than loan payment amount

# Project Finance

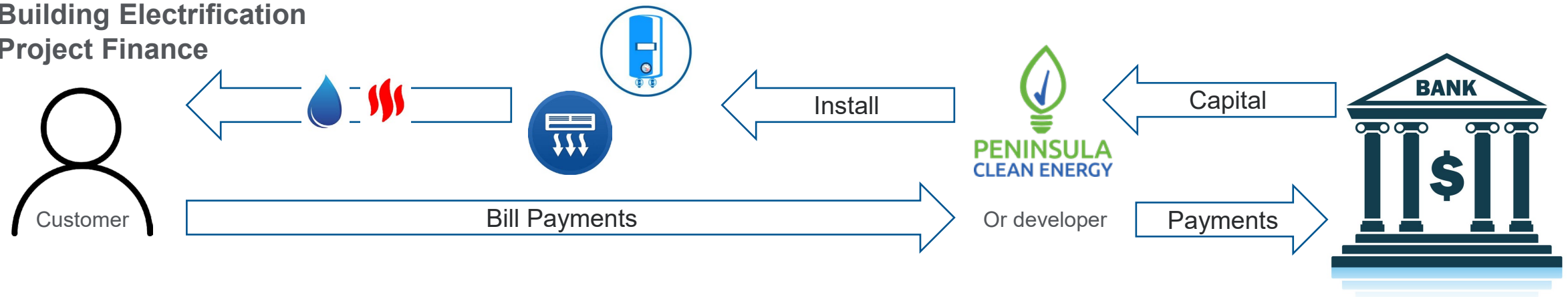


# Project Finance – PV and Building Electrification

## Solar PPA



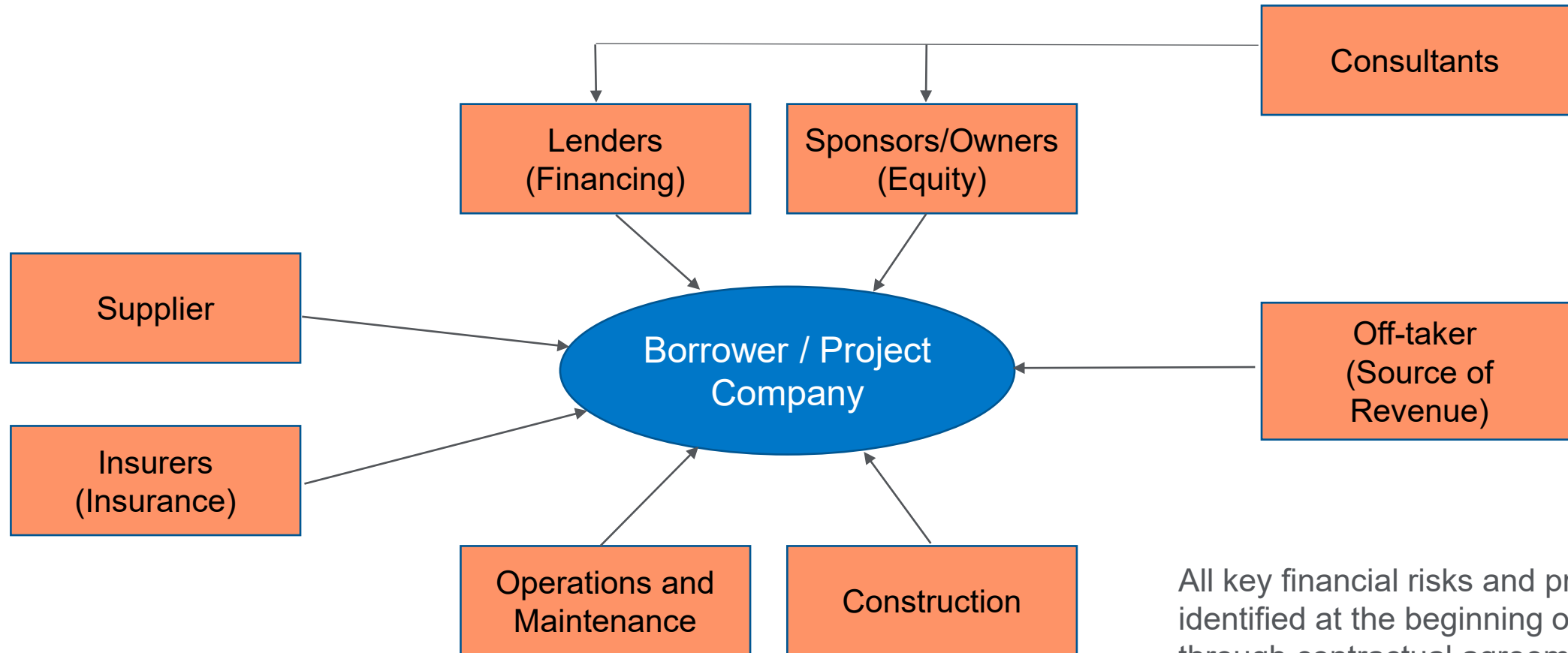
## Building Electrification Project Finance



# Appendix



# Financing – Typical Project Financing Structure



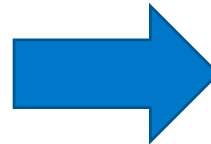
All key financial risks and project risks are identified at the beginning of the financing through contractual agreements with various counterparties. The project cash flow is only for project uses.



# Financing – Typical Project Financing Structure

Example: Cash Flow Waterfall in Project Finance

Project Revenue from PPA
Less: Project Operating Expenses <ul style="list-style-type: none"><li>• O&amp;M expenses</li><li>• Staff costs</li><li>• Tax expenses</li></ul>
Less: Senior Debt Payments <ul style="list-style-type: none"><li>• Interest costs</li><li>• Hedging costs</li></ul>
Less: Senior Debt Service Reserve Less: Capex Reserve Account

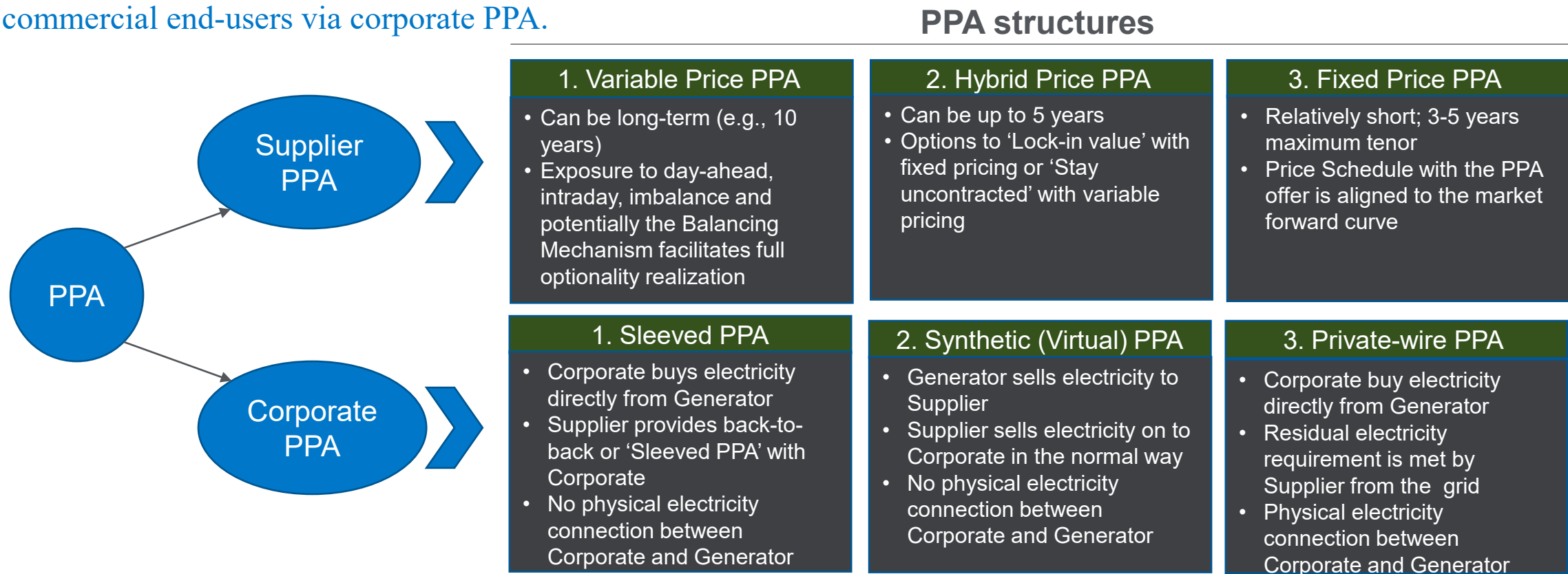


Access cash after all debt obligations are fulfilled will go into distribution account

Distribution Account (Dividend to Project Sponsors)

# Financing – Power Purchase Agreement (PPA, Project Finance)

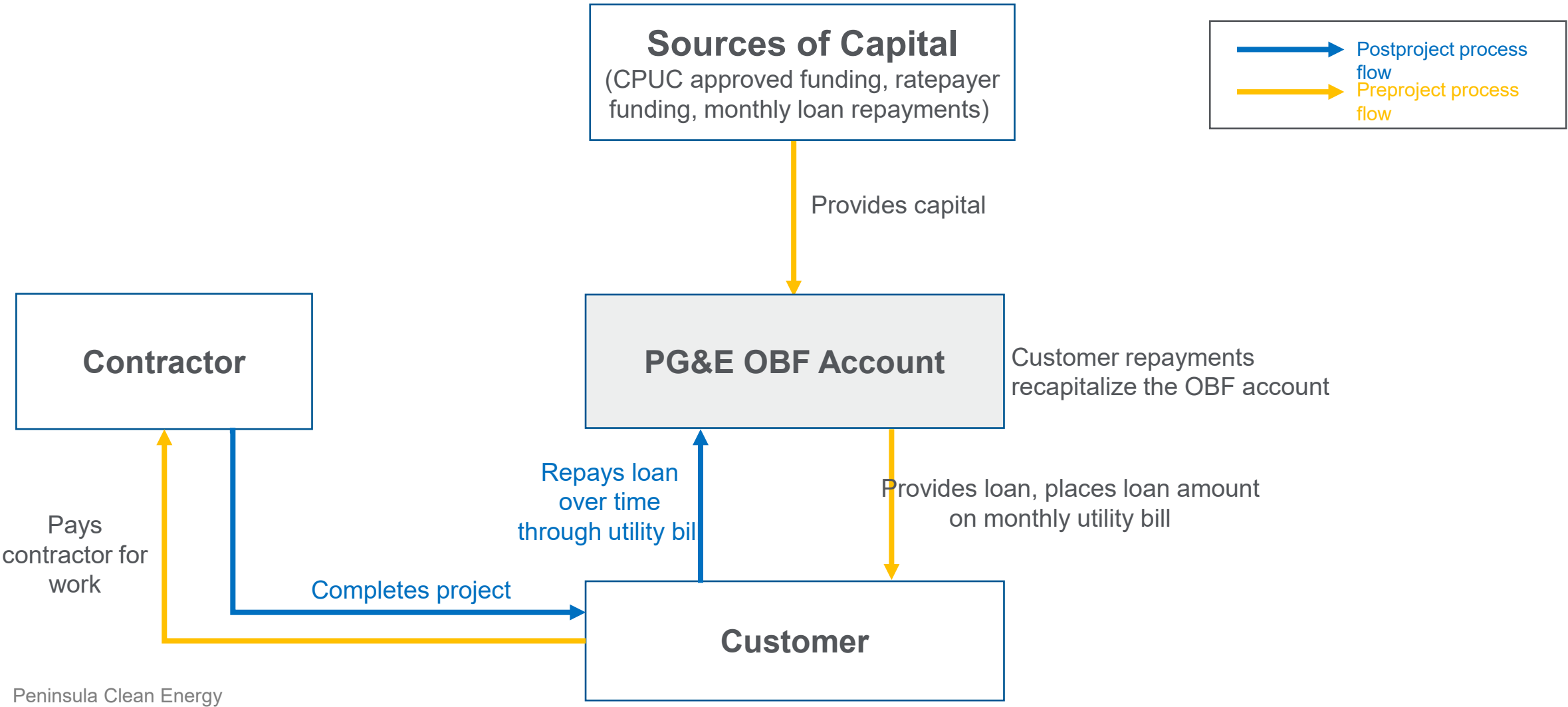
PPA is an agreement between a generator and an electricity supplier to buy and sell the electricity (Supplier PPA) being produced by the generator at a renewable energy project. A generator could sell electricity directly to large industrial or commercial end-users via corporate PPA.



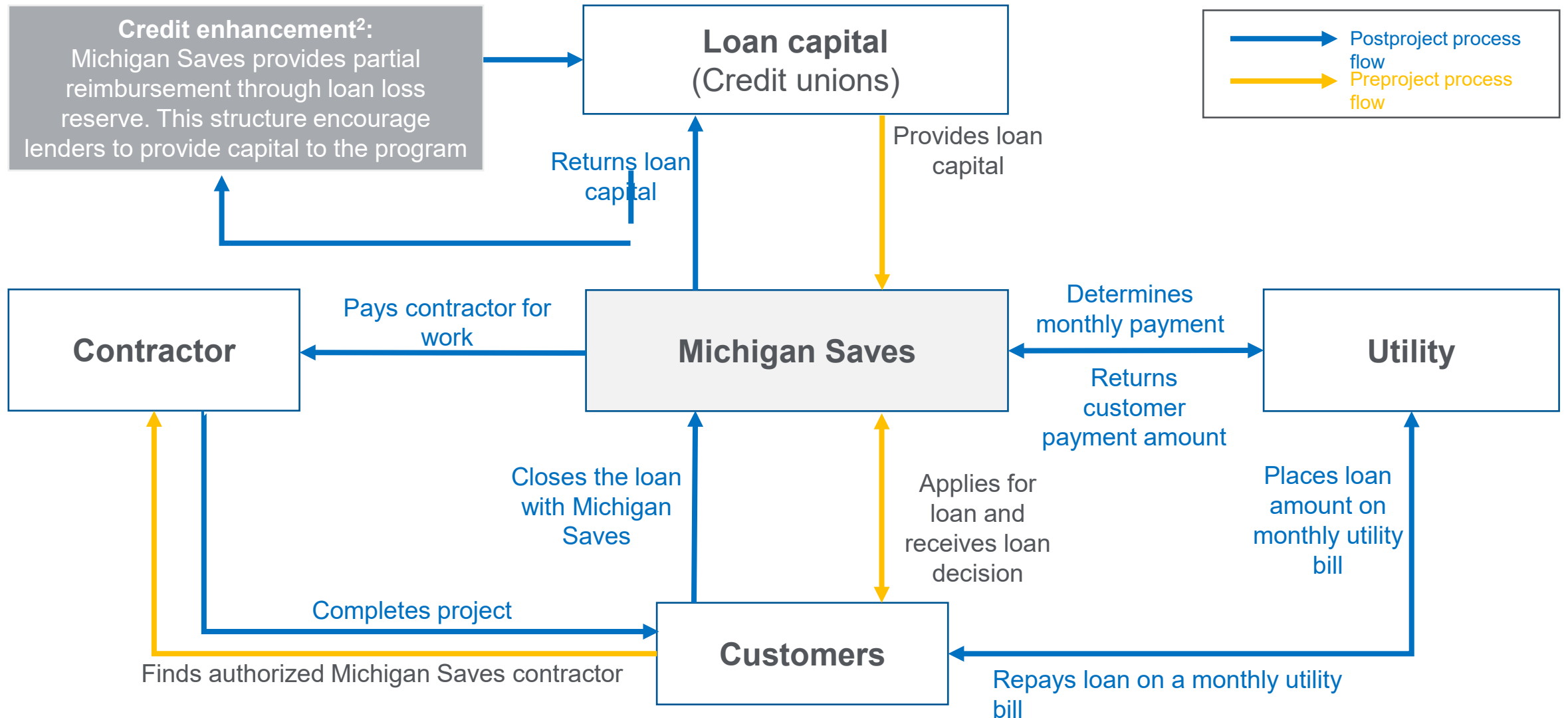
# On-Bill Financing (Project Finance)

	Description	Customers	Eligibility	Loan Capitalization Source
PG&E	0% interest loans for replacing equipment with energy-efficient models. Energy bill cannot increase due to equipment investment.	Commercial; MFH (only for common meters)	Business must have been a PG&E non-residential customer for at least 24 months & has 12 months of consistent payment history	CPUC approved tariff increase, ratepayer funding, monthly loan repayments. PG&E is looking to expand the program in the coming years and involve third-party lenders to secure additional source of capital.
Holland PW	Holland Board of Public Works' On-Bill Loan Program was launched in late 2016. Over the program's first three years, more than \$2 million were invested into 116 homes. HBPW works with Michigan Saves, a green bank, that issues loans by working with third-party investors.	SFH, MFH	Applicant owns a home in the City of Holland, has 12 months of consistent payment history, has no delinquent taxes, unsatisfied money judgements or bankruptcies within the last three years, and works with an authorized contractor	Green bank/lenders.
Michigan Saves	Michigan Saves works with municipalities and utilities to establish OBF programs. Michigan Saves has launched OBF programs Holland Board of Public Works and Traverse City Light & Power. OBF programs offer low interest rates for residential customers.	Residential	Traverse City Light & Power's OBF is only open to single-family (one- to four-unit) homes. Rental/income properties are eligible provided the landlord meets program requirements. 12 months of consistent payment history. If an applicant has no more than one delinquency in the past 12 months, TCL&P may pre-approve the applicant if there is no more than one delinquency in the last 24 months or the applicant has a credit score of 640 or higher. Additionally, Applicants should not have any delinquent taxes, bankruptcies within the last three years (from discharge), foreclosures, repossessions greater than \$1,000, or unsatisfied money judgements.	Michigan Saves provide a portion of the loan amount as a deposit in the loan loss reserves as a credit enhancement to improve its credit quality when borrowing from its participating lenders (credit unions).

# Financing - On-Bill Financing (PG&E Cashflow Diagram)



# Financing - OBF (Michigan Saves - Green Bank Cashflow Diagram)



# Financial Strategy

# Questions Financial Strategy aims to answer

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- How much does the plan do: GHG, # EVs, chargers, buildings
- With what resources: \$ from all sources
- How much we can capture: Other value streams (DR, LCFS, PV)
- What is the role of policy: Local, regional, state
- What are the limits: State/Fed funds, finance, PCE budget
- What is the gap: GHG & financial gap

# PCE Financial Strategy – Key Principles

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1. Leverage **market forces, innovation and policy** support for cost-effective GHG reduction measures
2. Provide **higher incentives early**, better than cost parity where possible, then reduce incentives as market matures and costs decline
3. Offer **more support to those with less** capacity to bear costs
4. Mobilize traditional and innovative **finance solutions for scale**
5. Where practical, leverage other/existing programs and **fill gaps**
6. Target and fund programs to **enable key policy** adoption for required action and market transformation



# Modeling Assumptions (as of Aug. 2022)

Assumption	Basis/Notes
Model is in <b>constant dollars</b> (no inflation)	
Costs are estimated on <b>2021 costs</b>	
Service territory: San Mateo County	Los Banos data will be integrated at later date
Assumed external Building electrification (BE) funding: <b>\$27-33M/year</b>	Assumes TECH and CEC budgets are continually funded at initial/current levels. Assumes IRA and tax credits are renewed once and extend to 2035.
Assumed external Transportation electrification (TE) funding: <b>\$8-10M/year</b>	Approved CEC budget continued, expected CPUC TEF funding, & Federal for EVs & multi-family (MUD)
Existing building reach codes adopted <b>over 10 yrs</b> with increasing efficacy over time	Some cities beginning to consider adoption, increasing stringency over time. Policies drive adoption.
PCE investment grows moderately: <b>3.5 to 5% annual program budget growth</b> beyond FY22-FY26 forecasted baseline; 80% for decarbonization	Current conditions for budget growth are favorable
Additional value streams to be captured (DR): estimated at <b>\$4-5M/year</b>	Majority DR value from res. EV load shaping. Assumes 10% EV participation. Buildings provide modest load shaping potential (excl. storage, TBD)



# Projected Policy Progression

BE Policies	2024-2026	2027-2030	2031-2035
Local Reach Codes – Existing Buildings	Several cities adopt modest requirements	Half cities adopt more stringent requirements	Most cities adopt very stringent requirements
AQMD NOx limit		Resi WHs & Furnaces ban	
CARB gas appl. ban			All gas appliances
State & Federal Funding	Expect to continue at current levels		

**Policy requirements will drive the volume of adoption.** AQMD & CARB NG appliance policies may drive more volume than incentives can support, expectation that AQMD and CARB are not providing additional incentive support

TE Policies	2024-2026	2027-2030	2031-2035
CARB new gas car ban			2035 ban on new gas sales
CARB ride-hailing clean miles	Start 2% to 30% clean miles	50% to 90% clean miles	
State & Federal Funding	Expect to continue at current levels		

# Financial Strategy: Buildings (small resi)



	2024-2035	Notes
Total Small Residential Units	200,000	San Mateo County only (Los Banos to incorporate at later date)
Avg. Cost to Electrify	\$19,000-\$21,000	Per residence; Aggressive optimized cost with declining costs over time. However ~\$10k are costs homeowners would have anyway to install units with “in-kind” equipment at time of replacement
<b>Total Cost</b>	<b>\$3.6 - \$4 billion</b>	Approximately half is an “incremental cost”
PCE Incentive Investment	\$160 - 200 million	Excluding load-shaping, project finance funds
State & Fed Investment	\$320 - 400 million	CA TECH and CEC funding assumed ongoing and federal IRA rebates and tax credits assumed renewed
Customer Investment	\$600 - 700 million	Customer copay & consumer finance
Aggregate Project Finance Cost	\$40 - 50 million	For ~20% of homes that are very low income
Load Shaping Value	\$3 - 5 million	80% participation of HVAC and HPWH
<b>Total Available Capital</b>	<b>\$1 – 1.3 billion</b>	All sources
<b>Total Residential Units Electrified</b>	<b>57,000 – 69,000</b>	Adoption rate is driven by policies at replacement rates. Measured in “home equivalents”, actual electrification may be more distributed with partially electrified homes.
<b>Remaining Units to Electrify</b>	<b>130,000 -140,000</b>	

# Financial Strategy: Transportation (personal vehicles)



	2024-2035		
	EVs	Chargers	Notes
Total New Units Expected by 2035	300k - 375,000	30k - 35,000	Business as usual adoption without PCE support
Total Units Deployed by PCE	55k - 70,000 Used EVs & bikes	20k - 25,000	Used EV equity program (not additive) + e-bikes (~40% EVs), Charging is for primarily MUD, but also workplace and public (not DCFC)
Avg. Cost to Electrify	EV: \$24k - 30,000 Bike: \$1k - 2,000	\$5.5k - 6,800	Per unit costs. Charging costs are blend of L1 and L2 ports
Total Cost of PCE-supported units	\$715 - 875 million	\$130-160 million	
PCE Incentive Investment	\$10-12 million	\$22-28 million	Net of Load Shaping Value, no admin or TA
State & Fed Investment	\$70-90 million	\$27-33 million	Assumes fed & state funding at current levels
Customer Investment	\$600-730 million	\$55-70 million	
Load Shaping Value	\$30-40 million	\$14-17 million	Assumes 10% participation from EVs
Low Carbon Fuel Standard		\$10-12 million	LCFS reinvested to electrification
Total Available Capital	\$715-875 million	\$130-160 million	
Total Units Electrified in 2035	300k - 375,000	50k - 60,000	Used EVs do not add to total but ensure low-income access
Remaining Gap	215k - 270,000	13k - 17,000	Charging based on CEC projected need, excludes DCFC

# Risks/Uncertainties

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1. State and Federal funding is **not renewed** or not fully accessible
2. Programs are **not able to coordinate** to achieve scale
3. Cities and agencies do not adopt **codes/regulations**
4. Programs are unsuccessful in delivering **cost reductions**
5. **Supply chains** do not scale to meet demand
6. Additional **value streams** are not realized (DR, LCFS)
7. **Interest rates** make consumer finance too expensive
8. **Capital** for aggregate project finance cannot be secured

# Policy Needs

Regional and State





# Key Regional and State Policies

Category	Objective	Target
Overall	Influence rates to improve economics	Lowering T&D rates incl. exploring: <ul style="list-style-type: none"><li>• <b>Marginal rates for incremental electrification load</b></li></ul>
Buildings	Phase out gas appliances	<b>Local code requirements (new &amp; existing)</b> <b>State code requirements (new &amp; existing)</b> <b>AQMD NG standard</b> <b>CARB ban on NG appliances</b>
	Ensure availability of scaled finance	<b>Capitalization of statewide low-cost finance facility</b> Tariff On-Bill
	Improve economics	<b>State incentive support (continue &amp; expand)</b>
Transportation	Phase out of gas vehicles	<b>New gas car ban by 2035 CARB (-done-)</b> Model credits - Increased EV model availability, esp. low MSRP (in CARB AC2) Used EV incentive program (done) Used car buybacks, early retirements
	Improve economics	<b>State incentive support (continue &amp; expand)</b>
	Charging access	State/local codes (new & existing) Increased state support (all charging)



# Additional Regional and State Policies

Category	Objective	Target
Workforce	Increase trained workforce	Increase diversity and underserved community training for building and transportation electrification
	Transition legacy sectors	Support retraining programs
Grid	Grid readiness	Resiliency for electric-only homes, V2B Distribution interconnection timelines BTM resources compensation, load shaping, dispatchability
Gas System	Reduce investment in gas infrastructure	Limit expansion and minimize continued investment
	Gas legacy cost management	Shift capital from gas grid to electric grid Oppose gas cost-shift to electric ratepayers Oppose enhancements & requirements, esp ratepayer funding

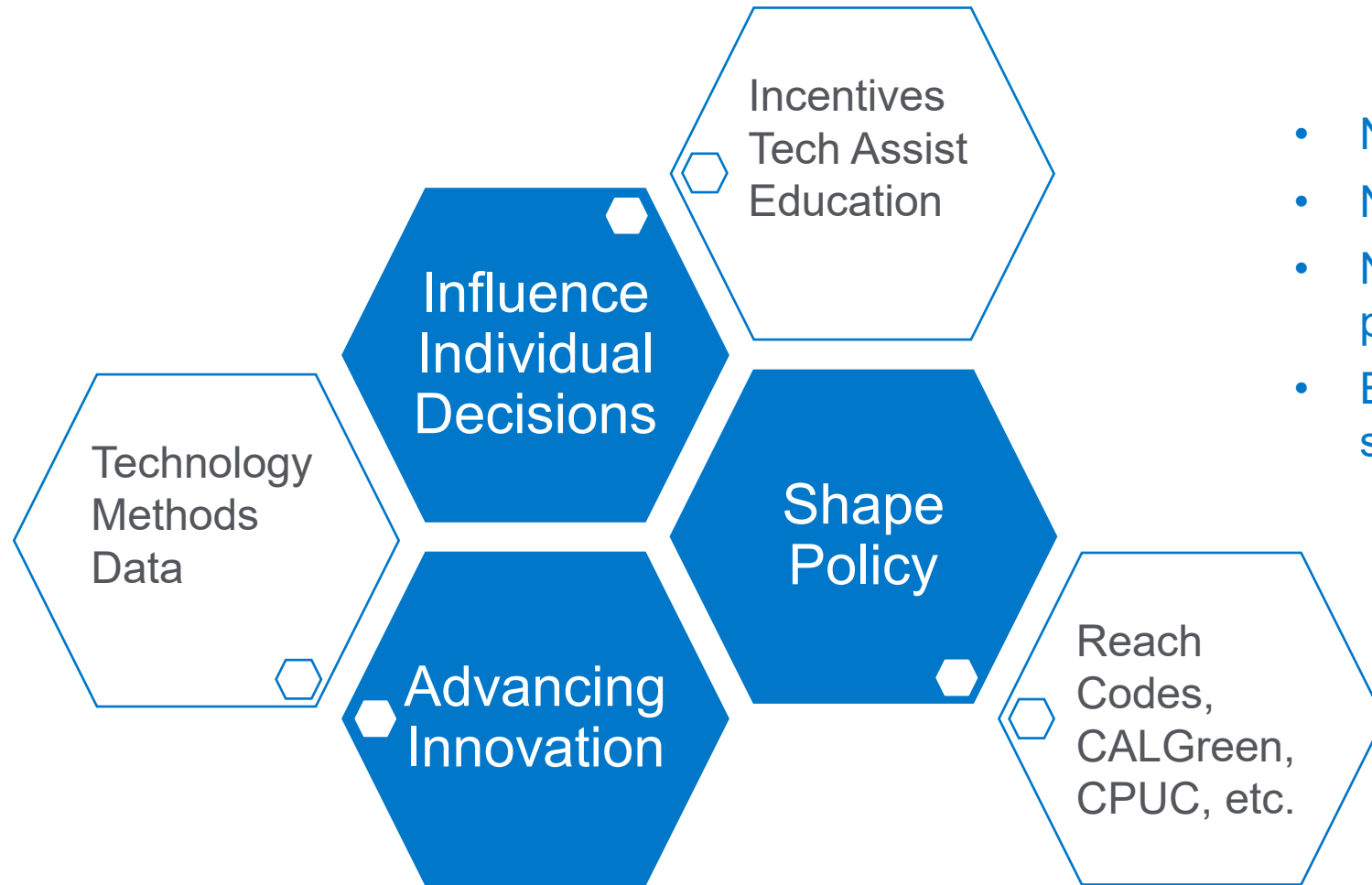


# Program Concepts

Building on PCE's Strong Program  
Foundation

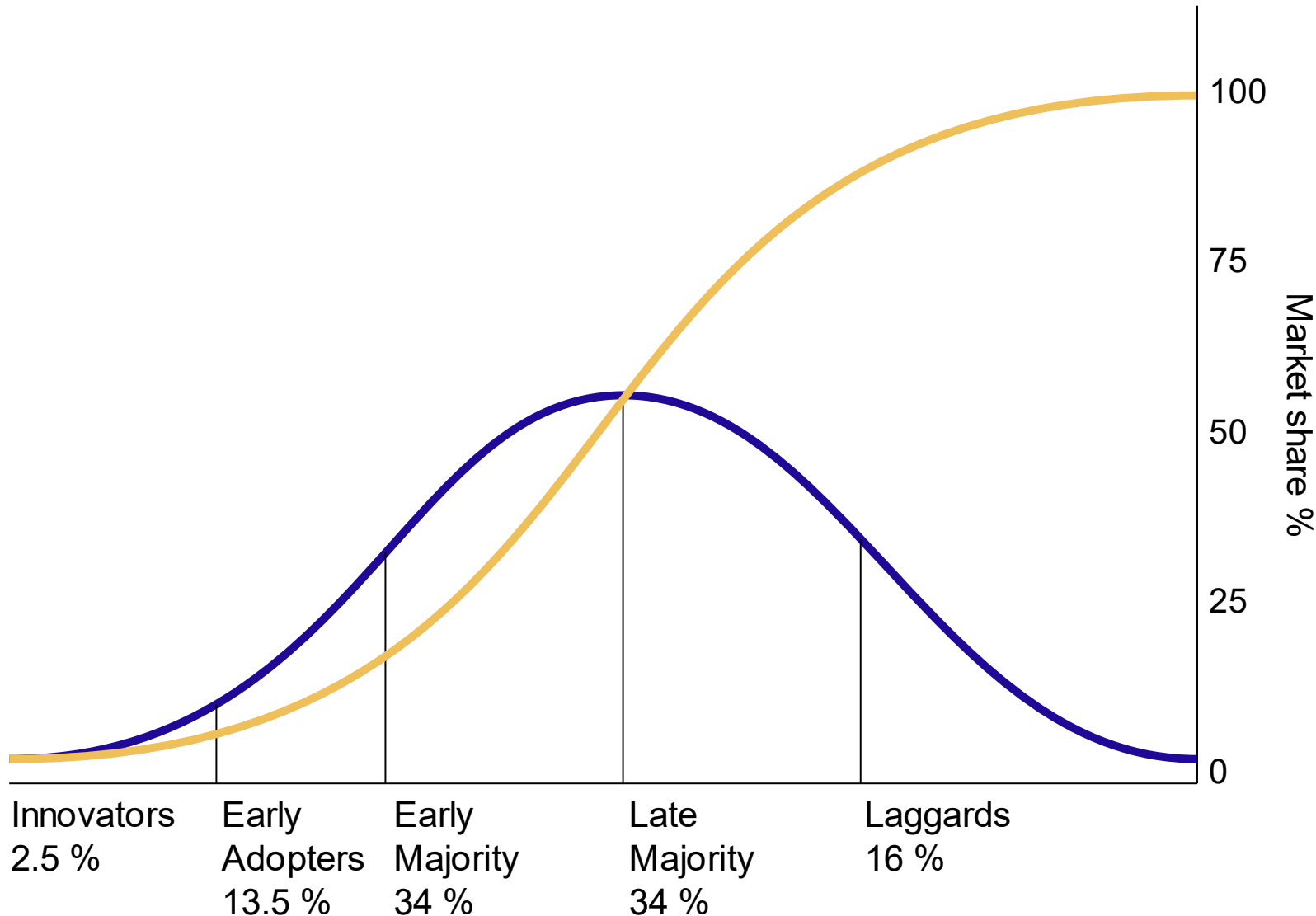
# Impacts & Additionality

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- Not all impacts are measurable
- Not all actions are additional
- No program stands alone, all partner (state, etc.)
- Early action paves way for state and national action

# Market Transformation – Considerations



- Needs change over time as market matures
- Initial emphasis is to build momentum
- Some segments will develop market momentum (EVs) but policy support is key
- Over time increase emphasis on low-income and target barriers
- Areas that are more difficult are typically more “additional” (ex: multi-family EV charging)



# Decarbonization Programs

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## 1. Building Electrification

- Flexible incentives
- High touch support
- Links to finance

## 2. Reach Codes & Other Local Policies

- Continue new construction
- Support existing buildings
- Ensure programs support policies

## 3. Transportation Electrification

- Vehicle Incentives
- EV Charging (esp. MUD)
- Fleets & Alternative Mobility

## 4. PCE as Conduit to Capital

- On-Bill Finance
- Information Conduit & Credit Enhancements
- Project Finance



# Buildings Electrification



## 1. Flexible Incentives

- All measures, incl. prewiring and panels
- Broader building segments
- Integrated load shaping & solar+storage options

## 2. High touch support

- Advanced “right-sizing” design
- One-stop shop, hotline assist, turnkey option
- Procurement aggregation to lower costs
- Greater contractor support

## 3. Links to Finance

- Specific linkages by customer segment

# Reach Codes and Other Local Policies



1. **Continue to Support New Construction**
  - Re-adopt and increase jurisdictions
  - Remove exemptions and expand building types
  - Progressive increase in EV charging capacity as needed
2. **Support Existing Building Policy**
  - Adopt no-cost and low-cost measures first
  - Adopt new measures as programs and funding become available
  - Increase city count over time
3. **Build Programs to Support Policy**
  - To support local reach code adoption
  - To support BAAQMD goals
  - Work with state and federal agencies to leverage funding streams

# Transportation Electrification



## 1. Vehicle Incentives

- Low income used EV incentives with tech. assistance
- Integrated load shaping

## 2. EV Charging

- Technical assistance and incentives for multi-family and public agency parking, “right-sizing” design
- Incentives in other market segments taper over time
- Integration with SFH whole-home solutions (and V2H resiliency as appropriate)
- Contractor training for grid & load mgmt. solutions

## 3. Fleets & Alternative Mobility

- Local government and small commercial fleet incentives and technical assistance
- E-bikes and, until state EV requirements come into effect, ride-hailing





# PCE as Conduit to Capital



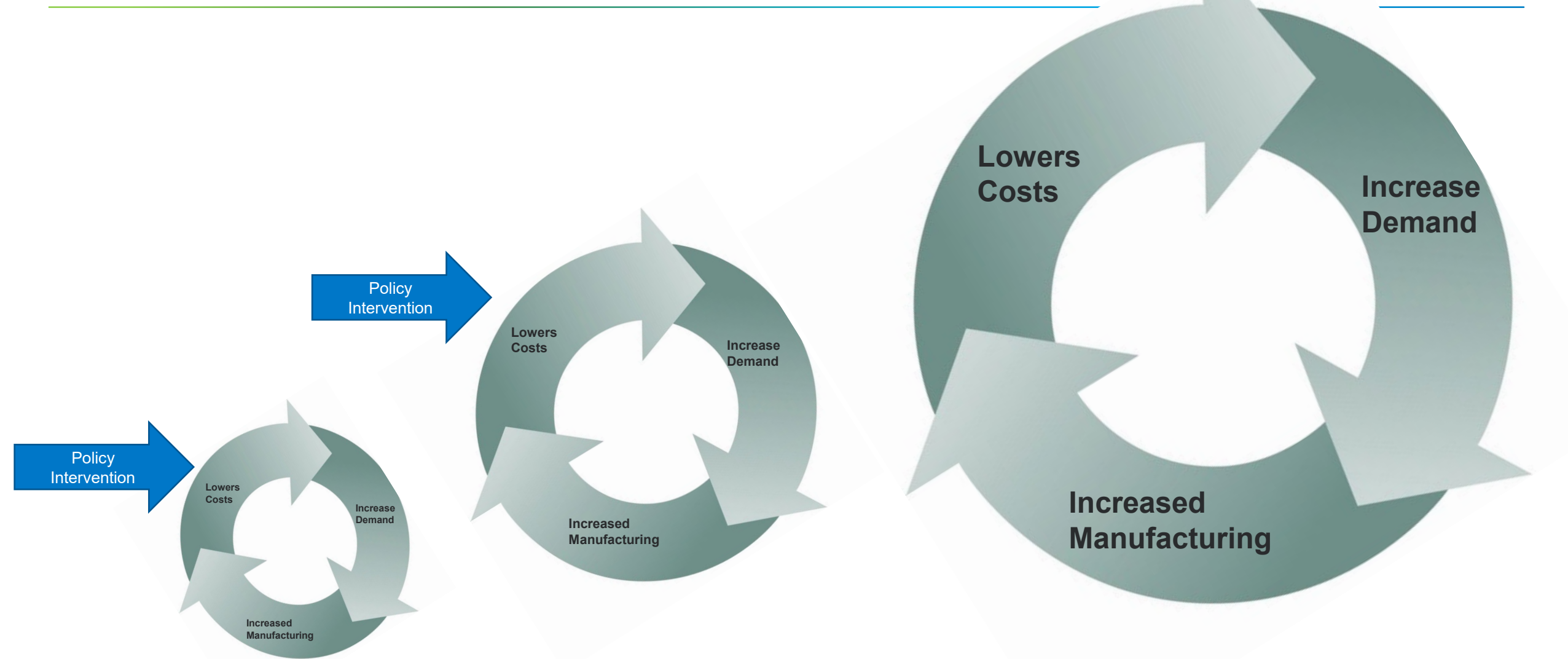
- 1. On-bill finance (OBF) from PCE**
  - Limited scale 0% interest credit for any customer
  - Could expand to include third-party capital
- 2. Provide customer information on third-party finance**
  - Guidance on consumer credit, including point of sale
- 3. Advocate for state credit enhancements**
  - Foster credit enhancements to lower credit cost
- 4. Aggregate residential project finance (under study)**
  - Adapted from Government Solar
  - Target lowest income customers without capacity for debt or added cost
  - PCE fully funds installations using external capital, repays capital under long term plan
  - Customers assume no debt or added expense



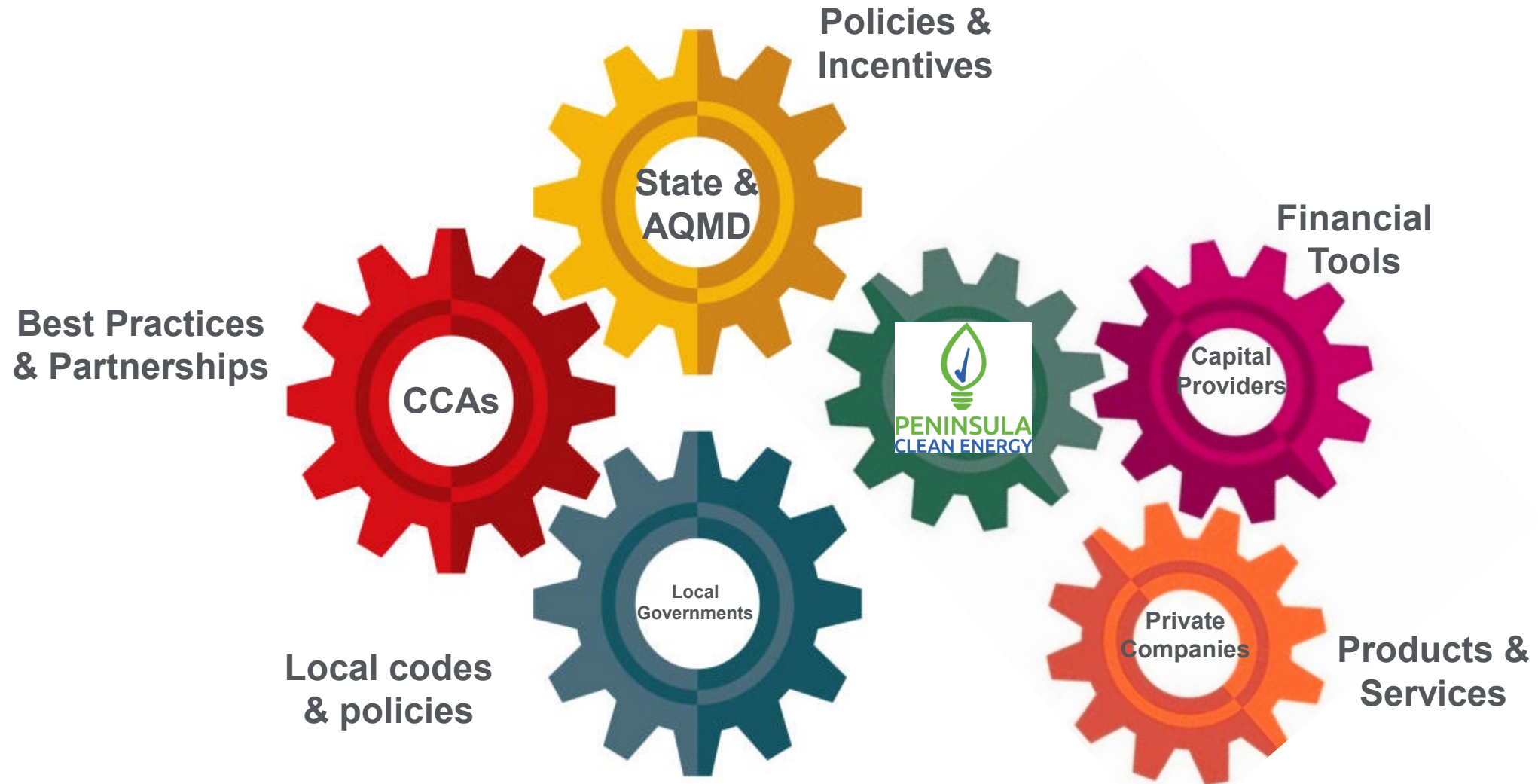
# Scaling & Partnerships

We're Not In This Alone

# Market Transformation: Generating Scale



# Leverage & Replicability



# Acting with Others

## Transportation



## Buildings



Next Up: Capital Providers

# SMC Carbon Neutrality Action Plan

Intentional coalition of three main countywide Board organizations towards carbon neutrality



OFFICE OF  
SUSTAINABILITY  
COUNTY OF SAN MATEO

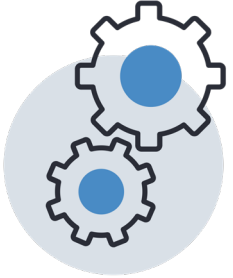


## Objectives

- Policy advocacy
- State and Federal funding
- Communications
- Standardized metrics & timelines
- Sharing analysis and equity strategy
- Coordinated implementation

# Replication

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- **Develop Methods & Partners**

- Technology & Technical method, Financial tools, Program models
- Policies
- Partnerships



- **Foster Early Market**

- Generate early volume to establish initial market
- Foster manufacturer and supply chain pipeline
- Workforce



- **Replicate**

- Push policies and methods to peers, practitioners, and state

# Replication: Initial Successes

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- **Building Codes**

- Local codes: 16 local adopters
- State codes: Single-family electrification, multi-family EV ready with power mgmt., low-power
- Replicated: SVCE, EBCE, Clean Power Alliance, San Luis Obispo

- **EV Charging methods**

- Power Management/Level 1: Adopted by CEC, PG&E, AQMD, SVCE, MCE
- Advance design and technical assistance: CLEAResult with SVCE, EBCE, Palo Alto

- **Other Programs**

- Government Solar: EBCE, CalChoice, Prime
- Portable batteries (MCE)
- Residential solar + storage (SVCE, EBCE)
- Ebikes (SCP)
- Fleets (SVCE, 3CE)
- On-Bill Finance (SCP)
- New EV Dealer Incentive (SCP)
- Low Income Turnkey (EBCE)
- Heat Pump Water Heaters (CPSF, EBCE, MCE, SCP, SVCE)