10th Quarterly Stakeholder Meeting

February 29, 2024

TECH CLEAN CALIFORNIA

Welcome!

Goal: Review the goals and structure of TECH Clean California, provide key progress updates, and identify how you can get involved

Today's Theme: TECH Clean California's Equity Efforts

Presentation Guidelines:

- This is a webinar format, so please direct your questions to the Q&A feature. We will do our best to answer your questions
- Today's slides and a recording of the presentation will be accessible at techcleanca.com/about/reporting/

Get Involved:

Submit your questions on **incentive layering, data sharing, and coordination** to TECH.info@energy-solution.com

Agenda

1	TECH Clean California Overview
2	Program Design and Incentives
3	Strategic Early Retirement Equity Implementation Plan
4	Multifamily Program Overview
5	Intermission
6	Marketing
7	Evaluation
8	Pilots and Quick Start Grants
9	Q&A, Next Steps

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1 TECH Clean California Overview

TECH Clean California Overview

What is TECH Clean California?

- California's flagship heat pump market transformation initiative for space and water heating is designed to help put California on a path towards carbon-free homes by 2045
  - Shape guiding principles of scale, equity, regulatory simplicity, and market transformation
  - Incentives offered statewide
  - $95 million in new funding from the Greenhouse Gas Reduction Fund (AB 209 & AB 102)

For a more complete overview of TECH Clean California, check out the slides and recordings from our previous quarterly Stakeholder Meetings at techcleanca.com/about/reporting.

California Heat Pump Goals

Heat Pump Water Heating

Heat Pump HVAC

6 million heat pumps installed by 2030

Climate ready / friendly homes:
- 3 million by 2030
- 7 million by 2035

50% of funding delivered to low-income households or disadvantaged communities

Source: California Office of Governor website. July 2022.
"Governor Newsom Calls for Bold Actions to Move Faster Towards Climate Goals"

Our Team: Energy Solutions; Association for Energy Affordability; Building Decarbonization Coalition; Recurve; The Ortiz Group; veic; Ardenna Energy; Frontier Energy; Electrify My Home; NCI National Comfort Institute, Inc.; Tre'Laine

The TECH Clean California initiative is funded by California ratepayers and taxpayers under the auspices of the California Public Utilities Commission.

The Long-Term Plan for TECH Clean California

The "Refine and Scale" Phase

2021-2023
Initial Deployment
Near-term market development and data collection

- Incentives and financing options lower upfront costs to make heat pumps cost competitive
- Wraparound activities including contractor training, consumer awareness, workforce development, etc.
- Pilots and Quick Start Grants address key adoption barriers
- Establish rigorous data collection infrastructure to quantify impacts

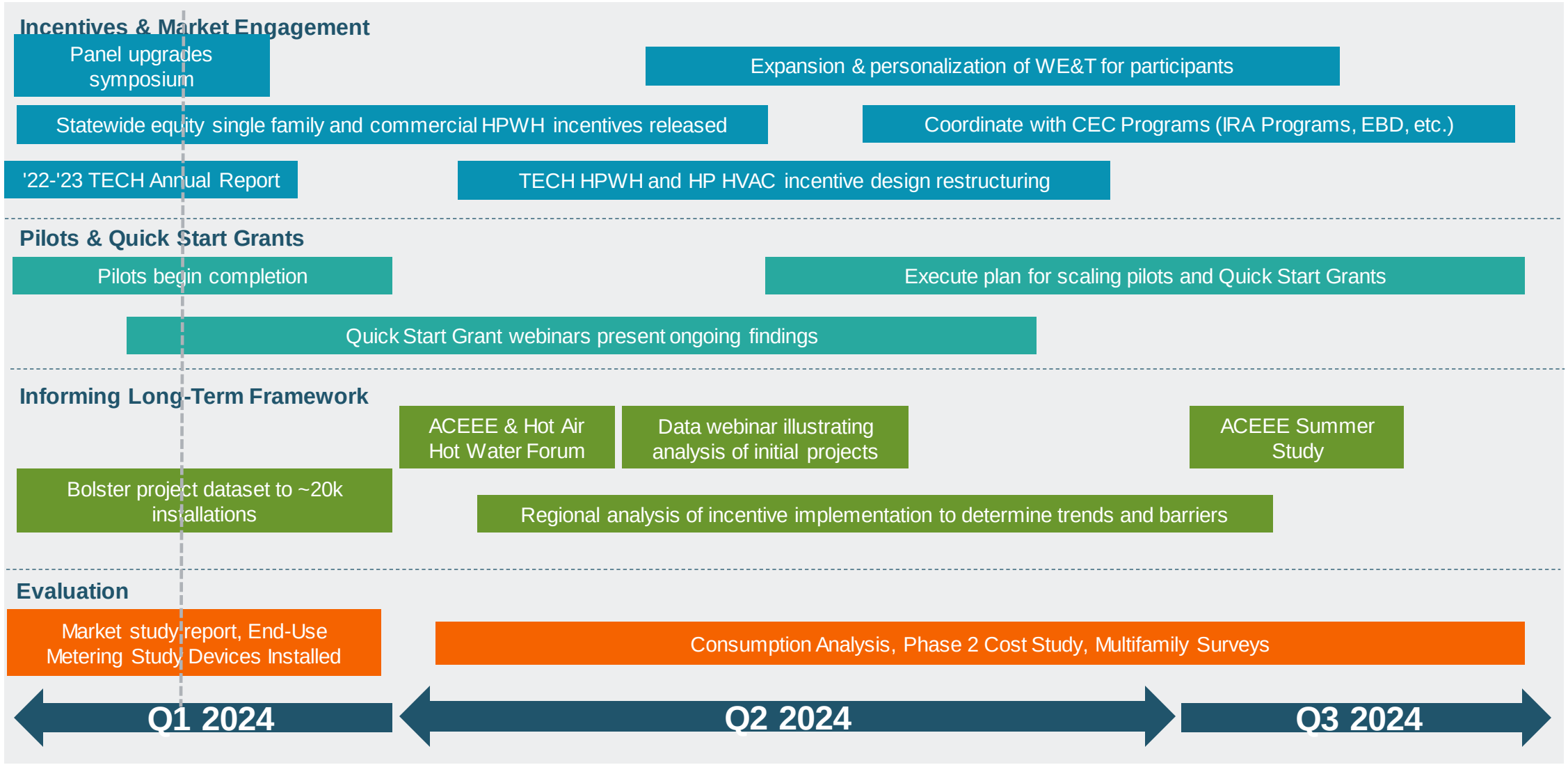
2023-2025
Refine and Scale
Refine and scale activities, inform long-term market structures

- Analyze completed project data and outcomes
- Refine and scale successful phase one activities
- Inform wide range of electrification related policy and stakeholder decisions
- Inform creation of long-term, sustained market structure based on rigorously quantified impacts

2026
Establish Long-Term Framework
Deploy long-term market structures to complement policy

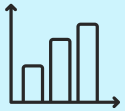
- **Clear Policy direction:** State policy, deployment goals provide stakeholders with long-term strategic direction
- **Long-Term Incentives:** Similar to solar, EVs, and storage, establish long-term program to create market certainty
- **Complementary market development activities:** Continued activities and data reporting that support soft cost reduction and inform investment

TECH Clean California Quarterly Timeline



2 Program Design and Incentives

TECH Clean California Activities



Spur the clean heating market through statewide strategies

Activate the supply chain

- Contractor incentives
- Streamlined incentive clearinghouse
- Technical and sales training

Drive consumer demand

- Statewide marketing campaign and website

Create scalable models through regional pilots

Improve targeting and project finance

- Target customers using meter-based analysis
- Deploy a Tariffed-On Bill Financing Pilot

Expand benefits to HTR customers

- Support low-income programs
- Multifamily pilots targeting property owners

Streamline installation

- Streamline permitting and installation costs
- Enable load-shifting

Innovation through Quick Start Grants

Inform long-term building decarbonization framework

Develop public reporting site

- Inform policymakers and market actors on progress and impacts

Quantify decarbonization impacts

- Avoided costs, grid benefits, and customer bill impacts

Inform policy development

- State, regional, and local regulatory policy

TECH Clean California Incentive Summary

Single Family

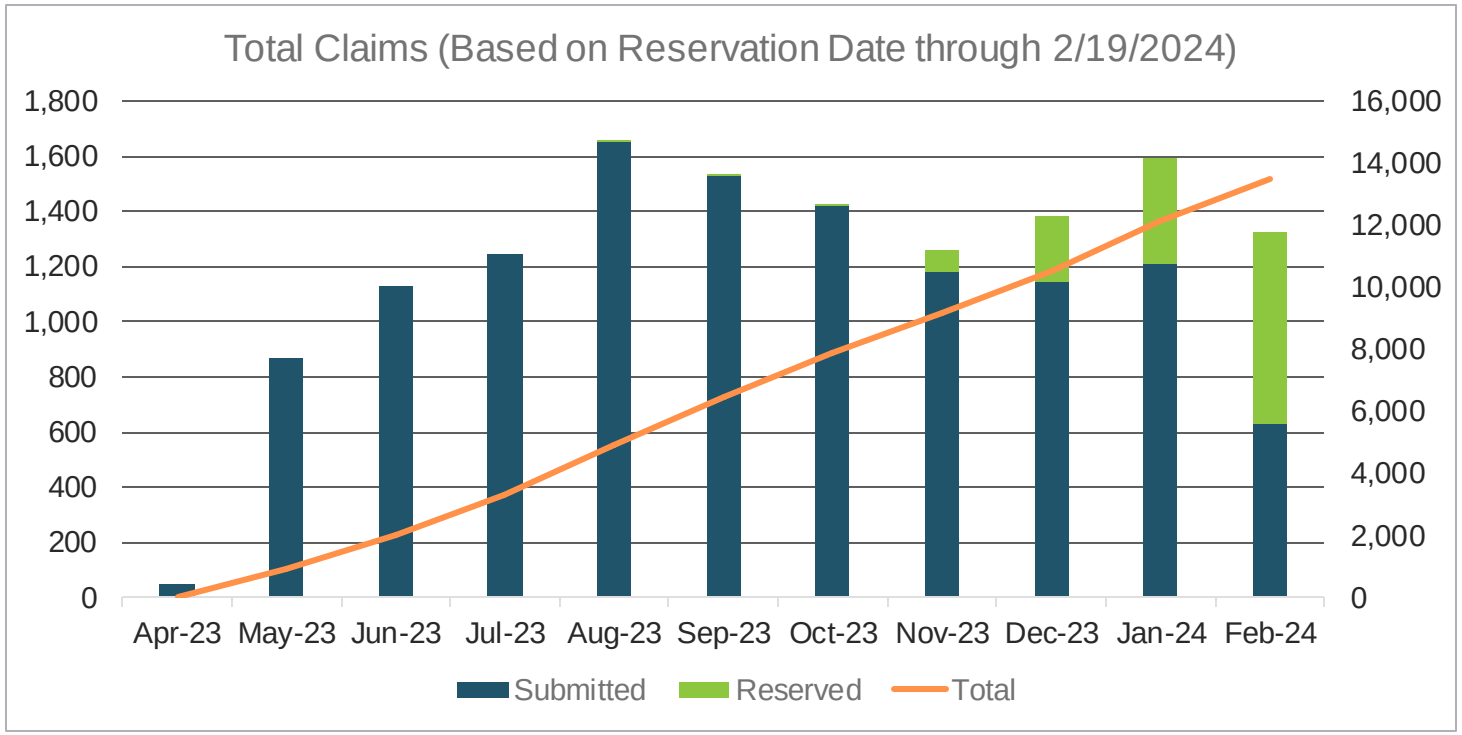
- Heat pump water heater incentive restructuring underway due to high rate of adoption
  - Market rate incentives available in SoCal Gas, SDG&E and regions served by public owned utilities (besides SMUD)
  - Market rate incentives paused in PG&E Gas and SMUD Territories
  - Equity incentives available Statewide
- Current Single Family HVAC incentive stable
  - Single family HVAC redesign underway to switch to a program focused on optimizing impacts through variable capacity systems and high impact users
  - Expected to transition to new structure and add more budget Summer 2024

Multifamily

- Multifamily unitary heat pump water heater incentives launched on 12/12 and multifamily central launching 3/12
- TECH Clean California multifamily incentives proposed to continue testing out new structures/outreach mechanisms to support smaller portfolio owners

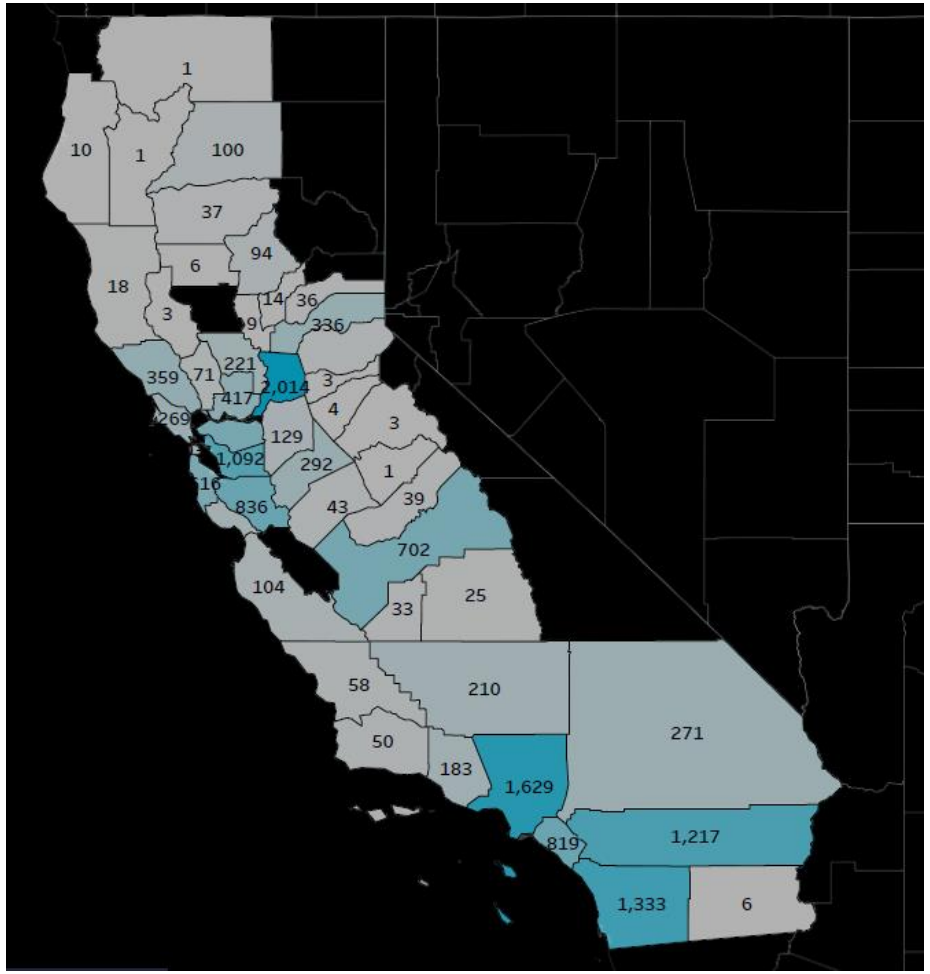
Single Family HVAC: Stats to Date

13,478 Reservations and Submissions from 456 Separate Participants!

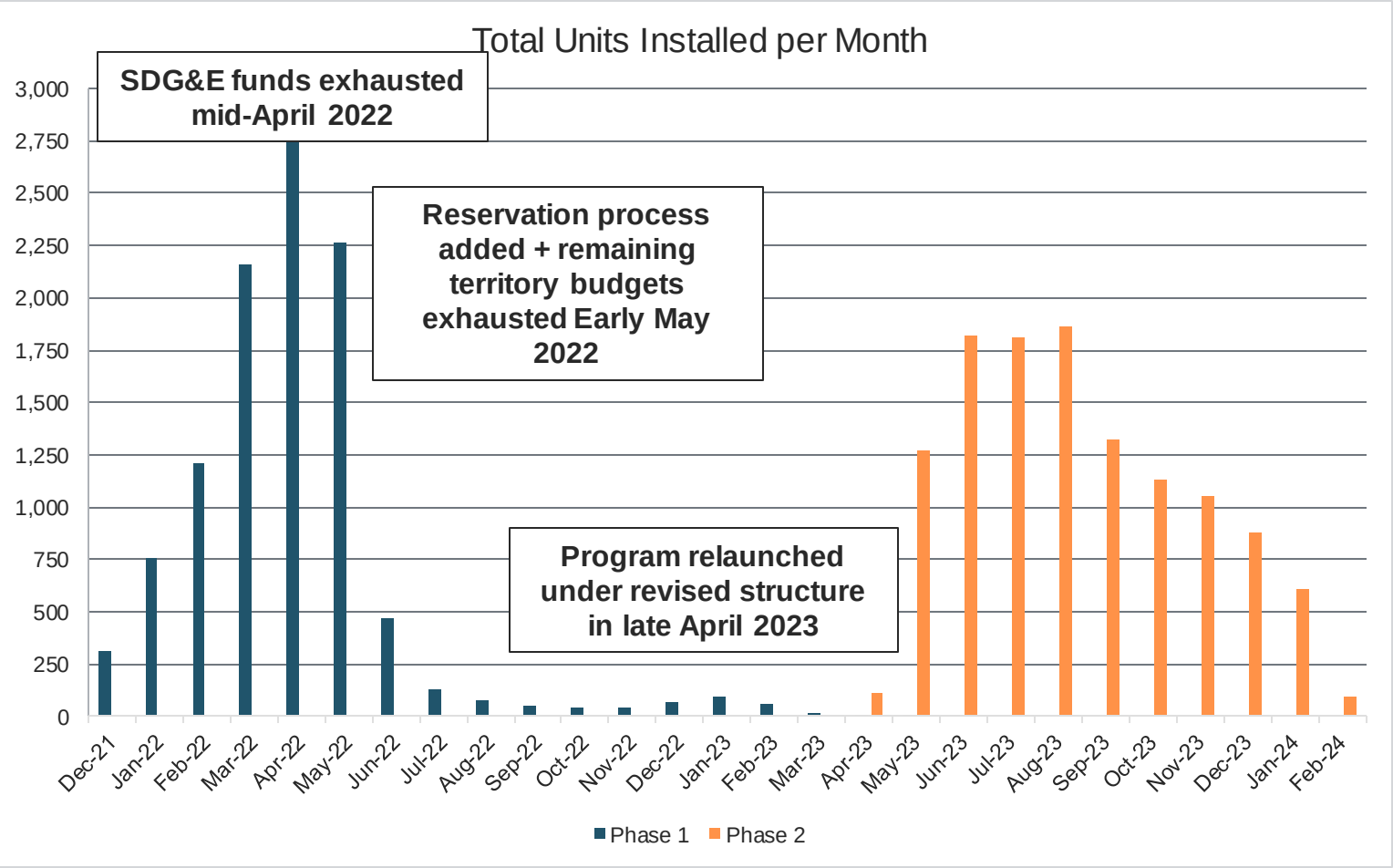


Furnace Left in As Backup?	Total Paid Claims
Yes	1,323 (14%)
No	8,453 (86%)

Emergency Replacement?	Total Paid Claims
Yes	255 (3%)
No	9,521 (97%)



Single Family HVAC: Program Lifetime Based on Unit Install Date



- Program participation still strong overall, despite lower incentives, supporting need to focus on specific regions and optimizing overall results
- Reservation process and budget stability helps smooth participation profile, which supports program forecasting and reduces claim processing timelines

TECH Phase 1: 10,500 units, primarily over ~7 months
TECH Phase 2: 12,000 units over ~10 months (~9,500 after 7 months)

TECH Single Family HVAC Redesign

Goals of the redesign include:

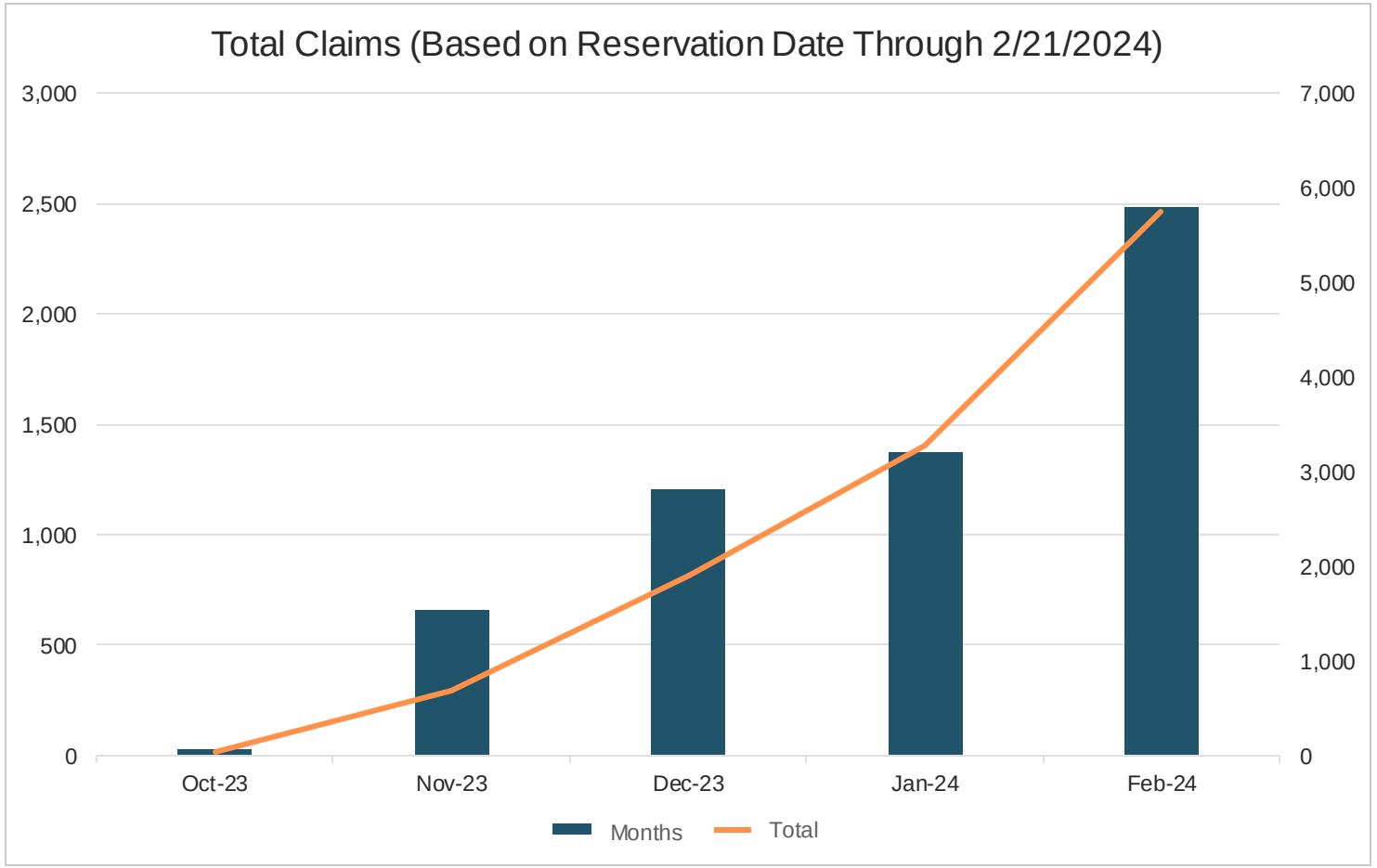
- Establish final set of learnings to inform ideal HVAC design for next phase of decarb proceeding
- Testing new structure with aim to optimize impacts through the adoption of variable capacity heat pumps
- Test structure of layering statewide consistent incentives with customer specific kickers

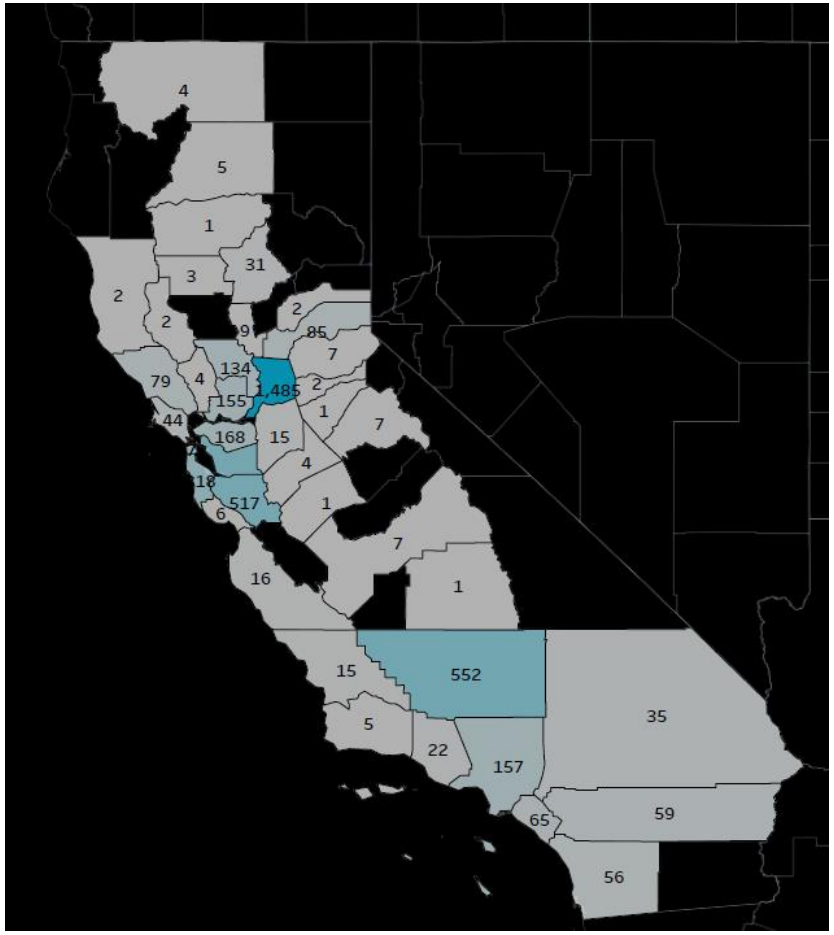
Potential features included in redesign:

- Multi-tier structure with higher incentives for variable capacity heat pumps
- Kickers for customers with high savings potential
- Stepped down structure to increase program run time

Single Family Heat Pump Water Heaters: Stats to Date

5,755 Reservations and Submissions from >190 Participants!

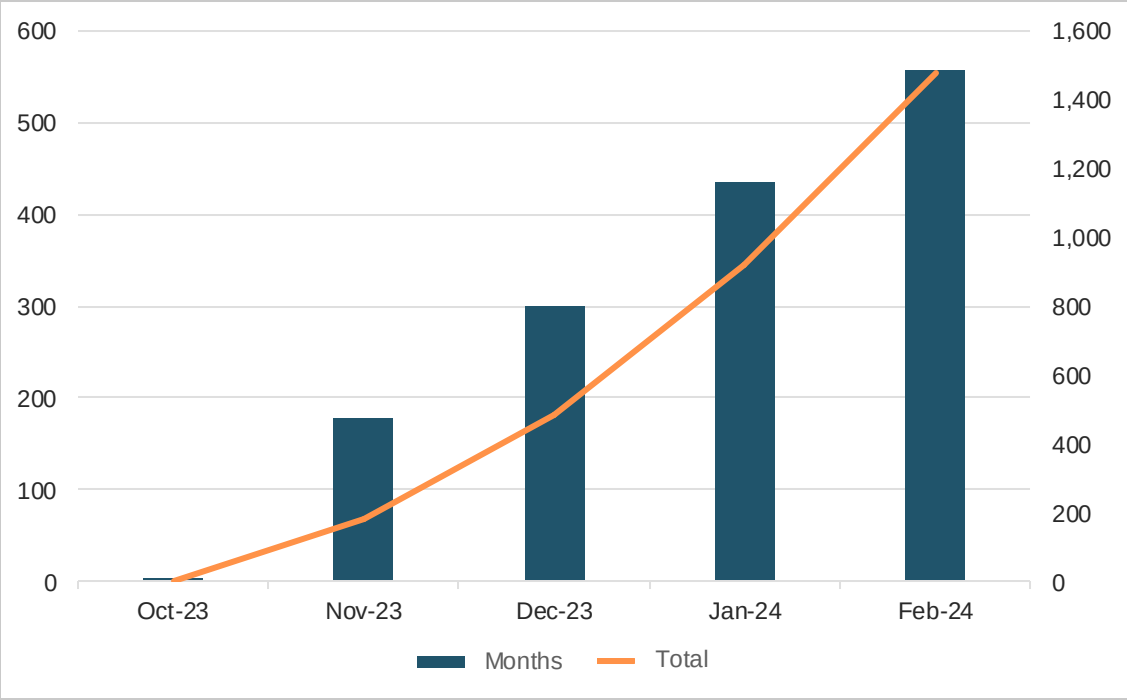




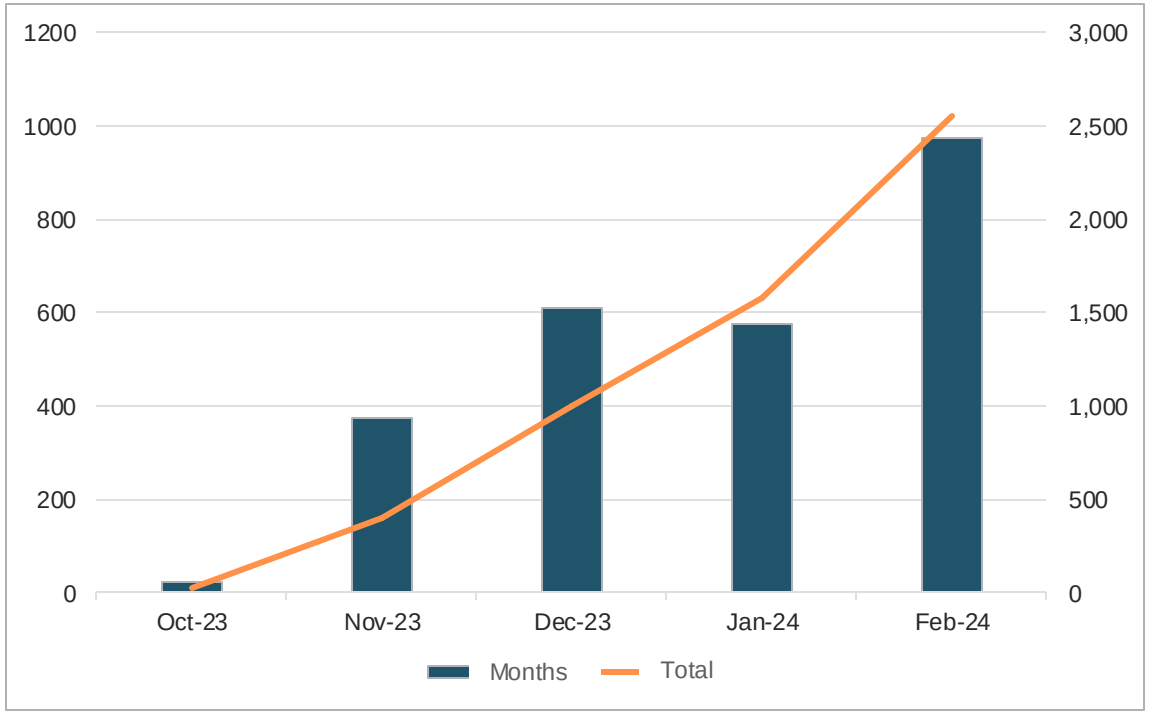
Single Family Heat Pump Water Heaters: Stats to Date

SMUD Service Area and the Bay Area Represent 70% of Total Reservations

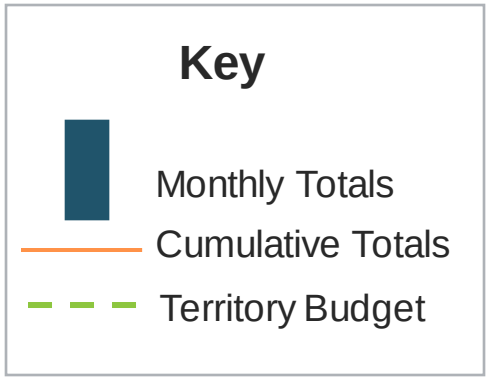
SMUD Service Area
1,474 Total Reservations Through 2/21/2024

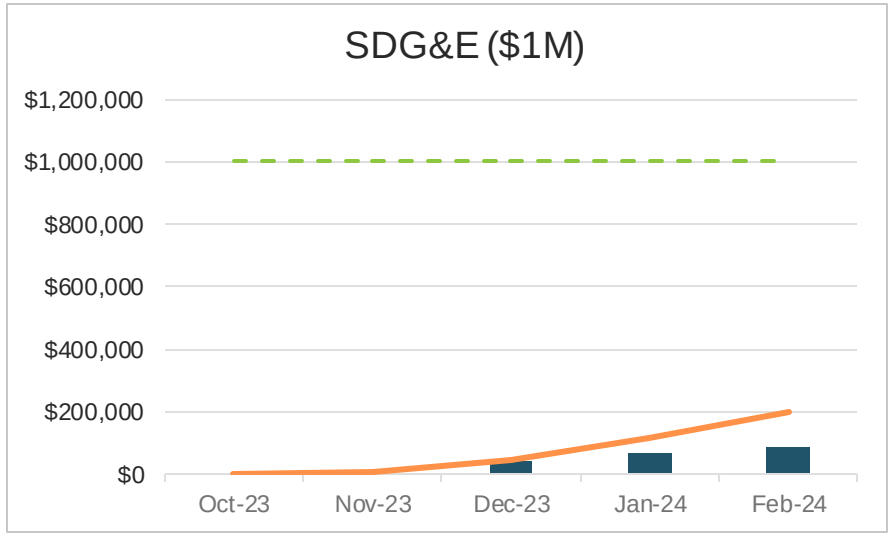


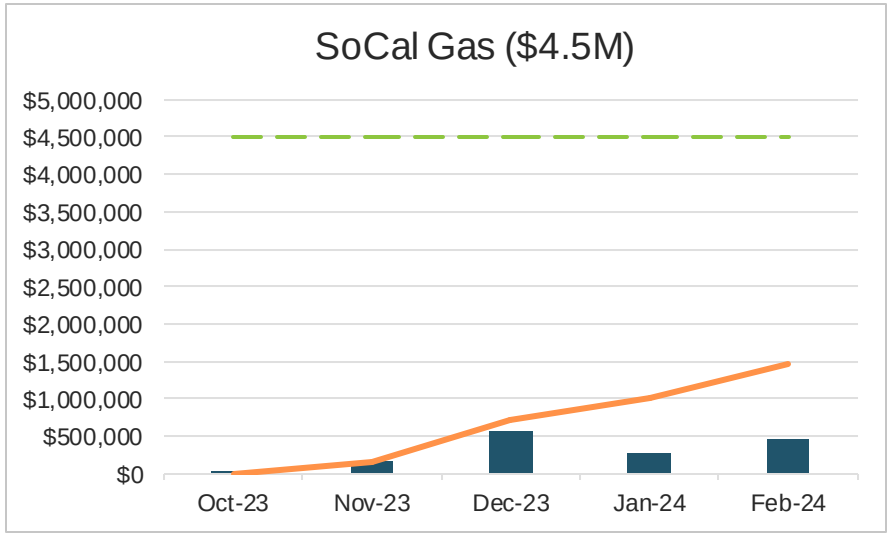
Bay Area
2,553 Total Reservations Through 2/21/2024

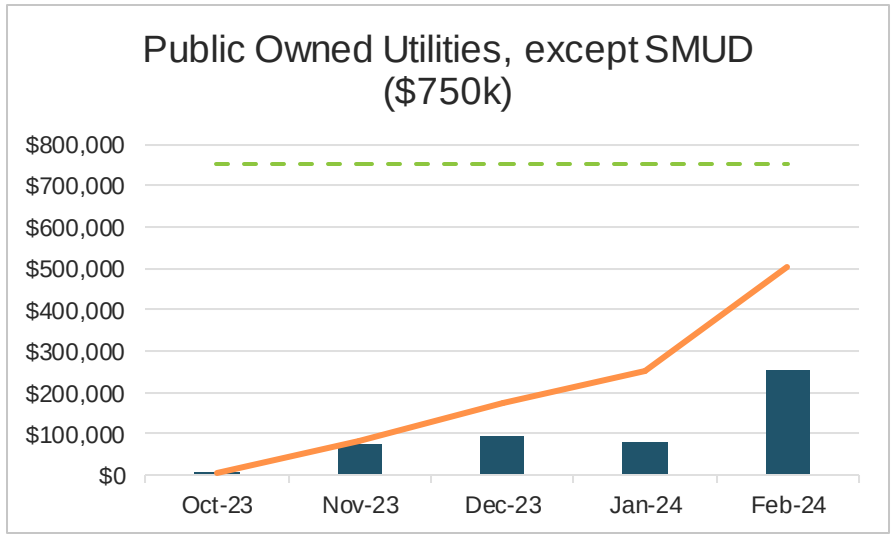


Single Family HPWH Incentives: Stats to Date









Stay up to date on the available budget at https://techcleanca.com/incentives/

TECH Heat Pump Water Heater Update

Increased uptake in following counties:

- Sacramento
- Contra Costa
- Marin
- Alameda

What do these all have in common?

- Layered incentives
- Continued, focused effort on heat pump water heaters through the contractor channel. That seems to have been making the most impact
- Multiple high-volume contractors (50 or more claims)
  - 23 contractors in Northern California vs 3 contractors in Southern California

Statewide Heat Pump Water Heater Equity Incentives

Category	General Market or Equity	Heat Pump Water Heater Incentive	Low-GWP Kicker Incentive**	≥ 55 Gallon Capacity Incentive	Electrical Upgrade & Pre-electrification Incentive	Max Incentive
Residential Unitary	Equity	$4,185	$1,500	$700	$4,000*	**$10,385**
Residential Central	Equity	$1,000/kWh	$200/kWh	N/A	N/A	**$300,000** per project

*For Equity customers, the $4,000 incentive may cover a variety of other “pre-electrification” costs associated with a HPWH installation
**Low GWP kicker incentive is for heat pump water heaters with a refrigerant with GWP of 150 or less. Other ratings, such as OPD rating, cannot be used in place of GWP

TECH HPWH Equity Customer Requirements

Single Family

- Live in single family, low-income residences
- Have household income which is ≤80% of the area median income (AMI) or ≤250% of federal poverty level (FPL), whichever is less stringent
- Participated in/are eligible for other specific programs that verify income

Multifamily

- Deed-restricted, low-income residential housing and is either:
  - Located in a disadvantaged community
  - Have at least 80% of the building's household incomes at or below 60% of the area median income
- Participated in/are eligible for the MASH or SOMAH

See if you qualify by using the income verification portal found here: switchison.org/techcleanca/hpwh-equity

Incentives Paid in Equity Communities

$42.9 million of TECH Clean California incentives will be paid via initiatives serving primarily equity communities:

Initiative	Incentive Budget	Portion of Total TECH Incentive budget	Portion of Incentives for Equity Communities	Partner Organizations Offering Layered Incentives	Region Prioritized
General Statewide Single Family Incentives	$64.5M	59%	12%	BayREN, CCCE, SMUD, PG&E	Statewide
Statewide Multifamily Incentives	$18.2M	17%	84%	SMUD, BAMBE, CLEANair, BayREN, LIWP	Statewide
Low-Income Single Family Direct Install Incentives	$6.1M	6%	100%	Energy Savings Assistance Program	Statewide
Multifamily Pilot	$4.0M	4%	75%	--	SCG, Southwest Gas service territories
Low-Income Integration Pilot	$5.6M	5%	100%	SJV DAC Pilot, ESA Program	PG&E, SCG service territories
2021 Quick Start Grants	$3.3M	3%	75%	--	Statewide
2022 Quick Start Grants	$2.0M	2%	100%	--	Statewide
Total	**$103.7M**	**96%**	**41%**	**N/A**	**N/A**

**Some incentives delivered via initiatives other than those listed above also go to equity communities*

Workforce Education and Training in Equity Communities

The TECH Clean California team ensures WE&T initiatives serve equity communities by:

- Preferentially choosing training locations in high unemployment areas
- Tracking participation in trainings by contractors residing in high unemployment areas
  - 57% reside in high unemployment areas
  - 63% of companies that employ users are in high unemployment area zip codes
- Providing no-cost equipment and curriculum development to organizations focused on training incoming workforce in marginalized communities
- Planning for translation of trainings and more collaborations in low-income/disadvantaged community zip codes

50% of trainings led by TECH Clean California team member National Comfort Institute occurred in high unemployment areas, and 60% of attendees reside in high unemployment areas

TECH Clean California incentive spending in Equity Communities is now reported on techcleanca.com/public-data/equity-budget-and-spending

3 Strategic Early Retirement (SER) Implementation Plan

Low Income Strategy

Current: ~50,000 gas for gas replacements in income qualified programs

Objective: Demonstrate the case to support replacing gas appliances with heat pump equivalents in all income qualified programs

Strategy:

- Integrate and leverage other low-income energy efficiency and building electrification programs to comprehensively address comfort and cost concerns rather than setting up own program
- Measure and analyze bill impact of electrification measures over usage, climate and occupancy variables
- Quantify costs of remediation necessary to address existing housing conditions
- Provide data to inform cost-effectiveness calculations for income qualified programs

Strategic Early Retirement Program Design

Goal: Electrify as many end uses for 320 low-income households and reduce energy bills

Process:

- Utilize Recurve data to determine households with higher propensity for savings
- Engage with households receiving weatherization from PG&E Energy Savings Assistance Program (ESA)
- Fund measures
  - No cost direct install for heat pumps
  - Remediation, if necessary (non-feasible ESA measures)
  - Include heat pump water heaters if bill analysis is favorable
  - Induction ranges and heat pump dryers if desired through other sources
- Bill protection with analysis from Home Energy Analytics

Transcend program boundaries to put client first

Project Team

Collaboration between PG&E ESA/The Ortiz Group

Installations conducted by five ESA contractors

Contractors trained by Electrify My Home and Barnett Plumbing

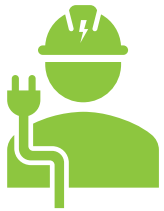
Braiding funding from several sources (ESA, TECH, SGIP, QHVAC, CA Energy Smart Homes) for full electrification

Data analysis: Recurve, Home Energy Analytics

Data and analysis to share in 2025-2026

4 Multifamily Program Overview

Program Components



Incentives

Statewide incentives for central and in-unit heat pump HVAC, heat pump water heaters, and panel upgrades

Reservation system

Training

Webinar, on-demand, and live/field options

Contractor and property owner trainings

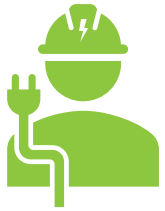
Pilot

Portfolio Level Electrification Roadmap

Central Heat Pump Water Heater Technical Support

Property Electrification Readiness Plan

Market Transformation End State



Affordable Installations

Equipment and installation costs have decreased, and incentives are available in a streamlined manner such that heat pump installations are affordable relative to like-for-like replacements

Experienced Workforce

Contractors are well versed in multifamily heat pump system design and installation as well as how to effectively pitch projects to owners

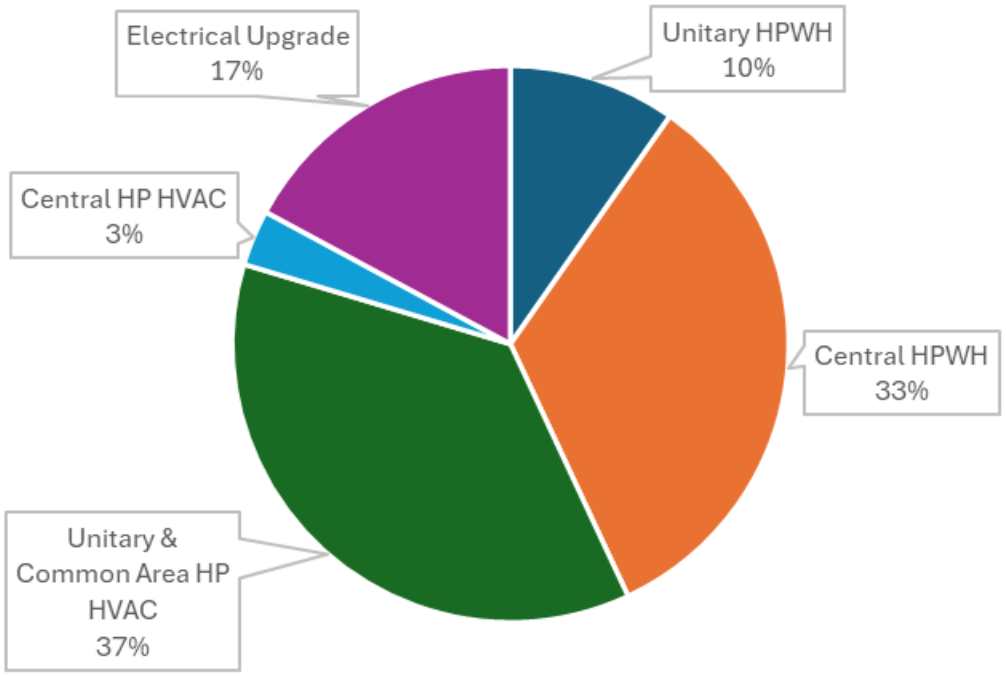
Capacity and Pipeline

Owners receive expert upfront assistance in designing heat pump systems and are able to act on electrification readiness plans and portfolio roadmaps

Multifamily Findings

- Total Funding: $19M -- $12M round one and $7M round two
- 37% of submitted reservations could be served with available budget - more interest and need to close gap for multifamily properties
- Over 10,000 apts being served – 117 properties
- Participating properties from 4 units to 647 units (average 72 units
- Diversity of project types:
  - Shelters, market rate, mixed occupancy, fully subsidized
  - Garden style, midrise, low rise
- Approximately over 80% of participating property owners have large portfolios
- 77% of all multifamily projects are in disadvantaged communities and/or low income
- 71% of all projects layered funding to achieve deeper retrofits

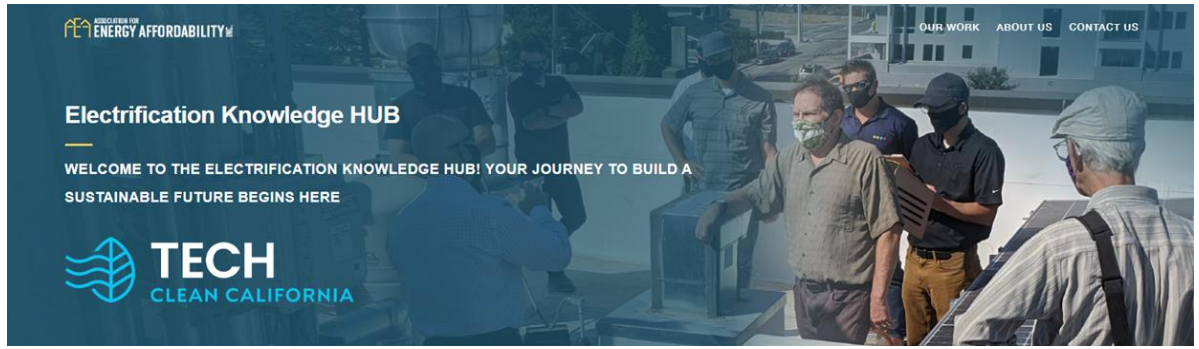
Percent of Total Multifamily Properties Served by Measure Type



- Slightly greater heat pump water heater incentives as water heating is typically the largest load in multifamily
- 51% of projects leverage more than one measure
- Estimated $1,900 per unit

TECH Multifamily Training

- **Over 260 attendees**
- **Foundational to advanced trainings**
- **Range of training types and audiences**
- **Skillsets:**
  - How to talk explain electrification
  - Technical sizing for individual and central heat pump water heaters
  - Approach and technical strategies for retrofits
- **Training schedules and signups at** switchison.org/contractors/training-hub
  - Upcoming courses cover full section with multiple course a month



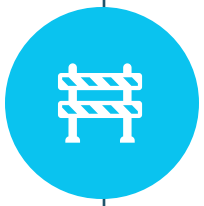
Attendee Testimonials

Multifamily Electrification 101:
"Thank you, this presentation helped me be able to better explain to developers and builders why they should consider all-electric developments."

Installing Individual Heat Pump Water Heaters:
"Sizing would be useful to single-family homes, too! The sizing stuff was very useful. Thanks!"

Multifamily Retrofit and Electrical Assessments:
"The class last Friday was one of the best MF courses I have been a part of…The Load Monitoring Study example was where I could definitely learn by watching it again. I was totally humbled by the pre-training quiz but did pass it after the training, so you did a good job informing me."

Multifamily Pilot Overview



Multifamily Heat Pump Adoption Barriers

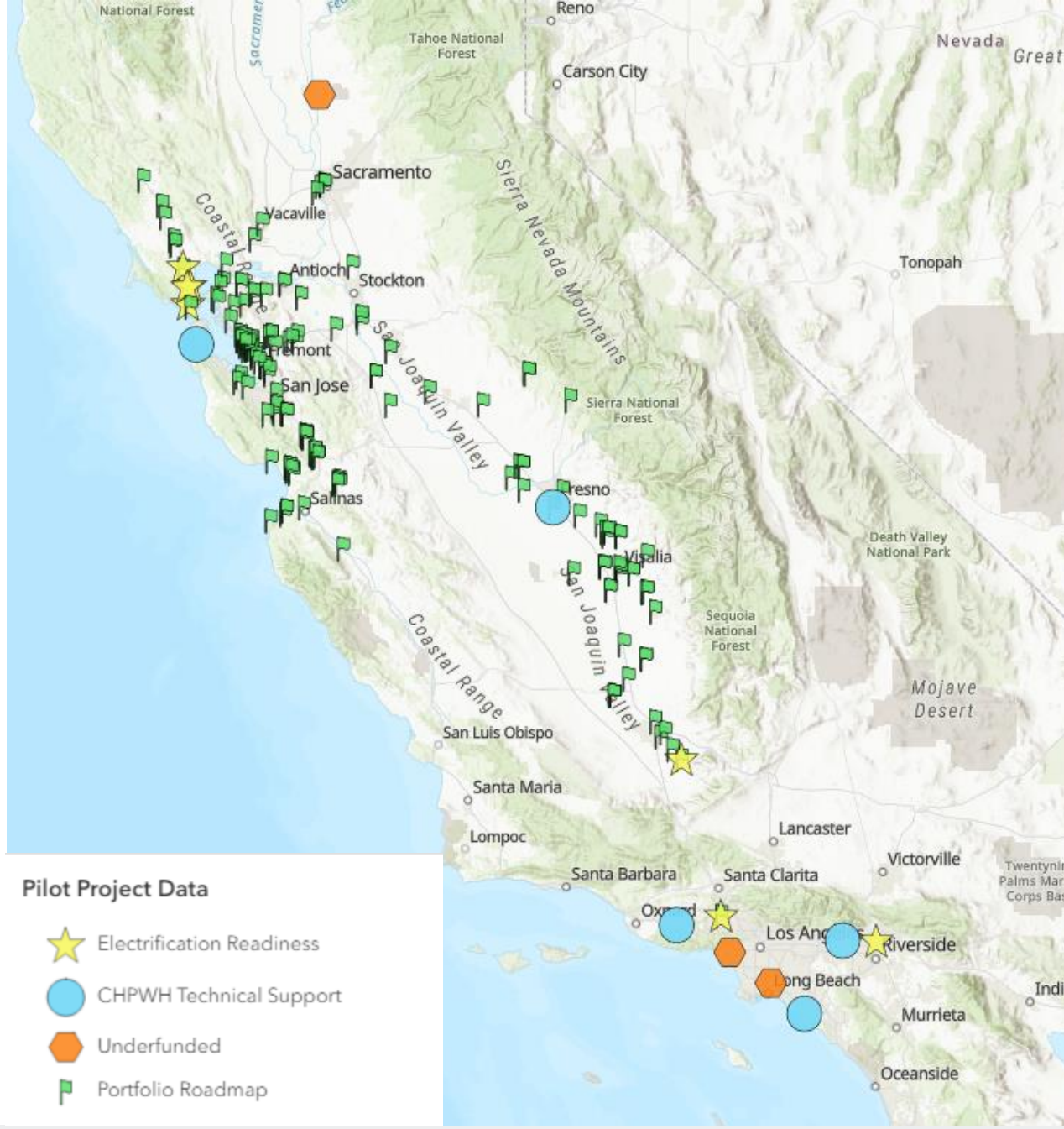
- Electrification retrofits are more complex than like-for-like replacement
- Capital constraints and misaligned timing
- Different types of retrofits to respond to for multifamily

Pilot Solutions

- Provide **central heat pump water heater** pre-install design support and post-install monitoring and technical support
- Develop property-level **electrification readiness plans** that lay out an incremental approach to electrification over time
- Create **portfolio-level electrification roadmaps** for affordable housing portfolio owners
- Identify gaps in funding for **full electrification** projects

Pilot Accomplishments

- **Initial Pilot Initiatives:**
  - Projects are throughout the State (i.e. different regions, climate zones)
  - Diversity of owners and project types and equipment/system types
  - Increased awareness
  - Addressed and refined distinct multifamily barriers
- **Electrification Readiness**
  - Serving 335 units
- **Central Heat Pump Water Heater Technical Support**
  - Serving 661 units
- **Enabling All-Electric Retrofits**
  - Serving 101 units
- **Portfolio Roadmap**
  - Serving 11,989
  - With an additional 1,118 in pipeline
  - Providing owners with goals and prioritized pipeline for electrification



What is the Issue?

- **Problem:** Full electrification may be not be possible due to any of the following reasons: (1) utility timelines are pushing project timeline way out (2) owners does not have capital to undertake all upgrades
- **Solution:** Provide a strategy (incentives and technical assistance) to support electrification readiness enabling owners to plan for replacement over time to align with critical factors

Electrification Readiness: Expanding pilot

- **Four projects:** One in Central Valley, one in North California, and two in Southern California
- **Status:** in scoping/bidding/ permitting stage to complete in 2024
- **Understand definition of electrification readiness and what is needed to ensure future installs**
  - Form factor and space for future equipment (i.e closet size)
  - Venting requirements
- **Anticipated Accomplishments:**
  - Preventing locking in emissions
  - Navigating utility upgrade timelines
  - Preparing for low-income housing tax credit application
  - Completing retrofits with some measures today and future upgrades are either planned or will be completed upon failure
  - Navigating funding availability – reserves, incentives, etc.
  - Addressing limited electrical infrastructure in apartments

Risk: Not addressing this critical aspect of the market will result in locking in emissions from like-for-like replacements, emergency replacement, greater capital costs in the future when trying to achieve full electrification reduced preparedness for air quality district rule sets

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Multifamily Pilot: Central Heat Pump Water Heater Monitoring

Part 1: Issues That Affect Performance and Sizing

What is the issue?

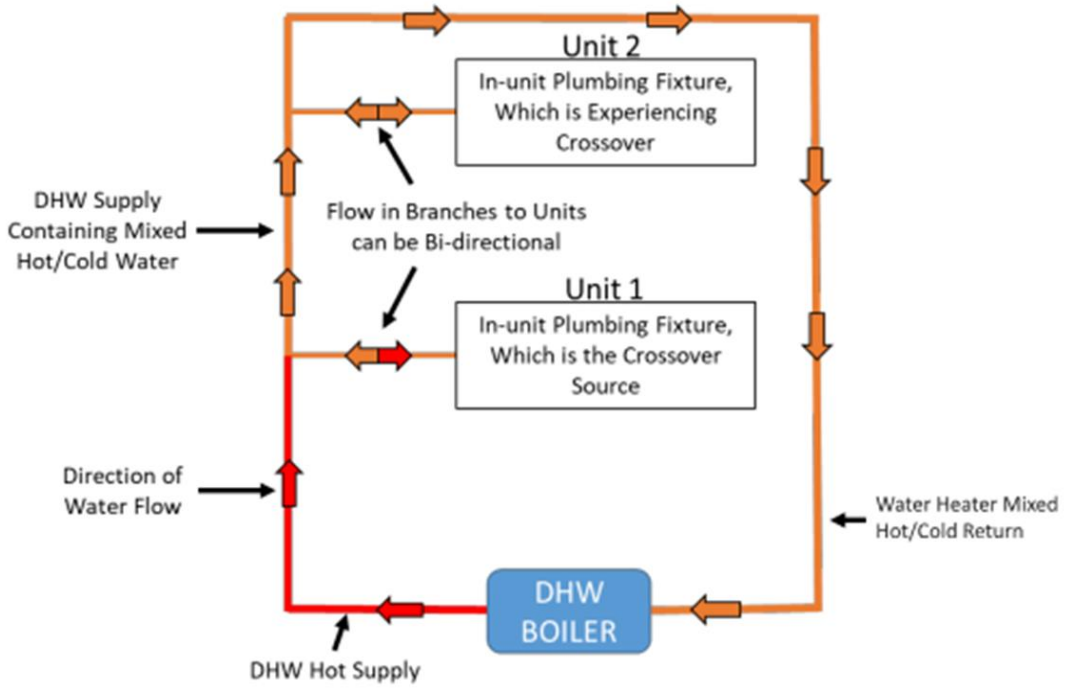
- About 50% of multifamily developments have central domestic hot water systems
- California Energy Commission (CEC) reported 100 multifamily buildings showed 50% had distribution issues
- CHPWH systems are a relatively new retrofit opportunity with ongoing development in terms of system options and design and installation practices
- Heat pump best practices differ from boiler approach

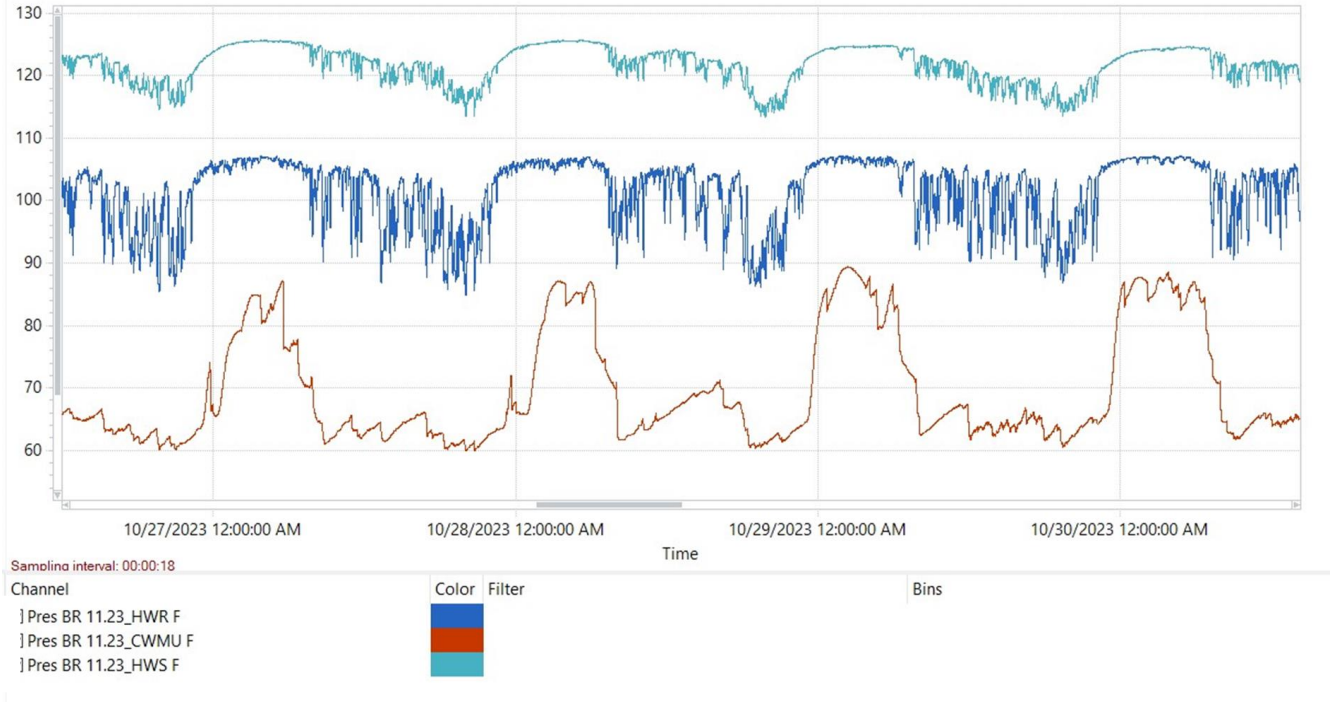
What We Are Doing and Why- Central Heat Pump Water Heater Activities

- TECH Clean California funded a pilot focused on pre- and post-monitoring of central domestic hot water plants to support sizing and optimization of central heat pump water heater retrofits in **six different systems**

Pilot Goal:

- Understand and demonstrate conditions impacting performance of existing systems to contractors and engineers
- Address issues prior to retrofit to ensure systems operate well avoiding costly changes or poor performing systems
- Support shift from boiler approach to heat pump approach
- Support high quality by providing solutions and resources





Moving from Pilot to Program: Central Heat Pump Water Heater Lessons

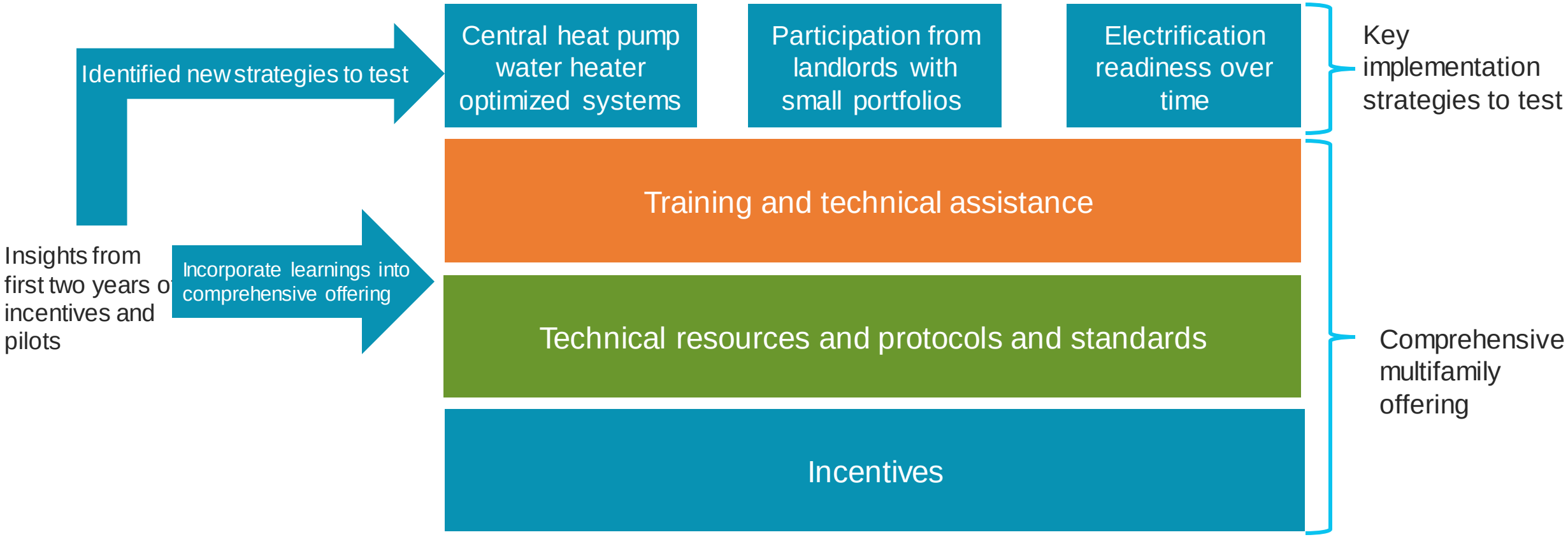
The Risk: Not addressing this critical aspect of the market will result in poorly installed central heat pump water heater systems which represent 40% of load in multifamily buildings – cost savings and energy savings will not be realized and in fact could result in greater load on grid

Solution: Support industry learning through comprehensive approach and provide:

- **Incentives** for design evaluation and fixes prior to design and retrofit
- **Standards** to evaluate and monitor systems
- **Tools, resources and technical assistance** to support optimized central heat pump water heater plant designs and installations

Building on Foundation with Refined Strategies

- Strategic Objective: Incorporate findings from TECH Clean California into comprehensive multifamily strategy leveraged to support new multifamily installations
- Strategic Objective: Target comprehensive offering to test new multifamily strategies



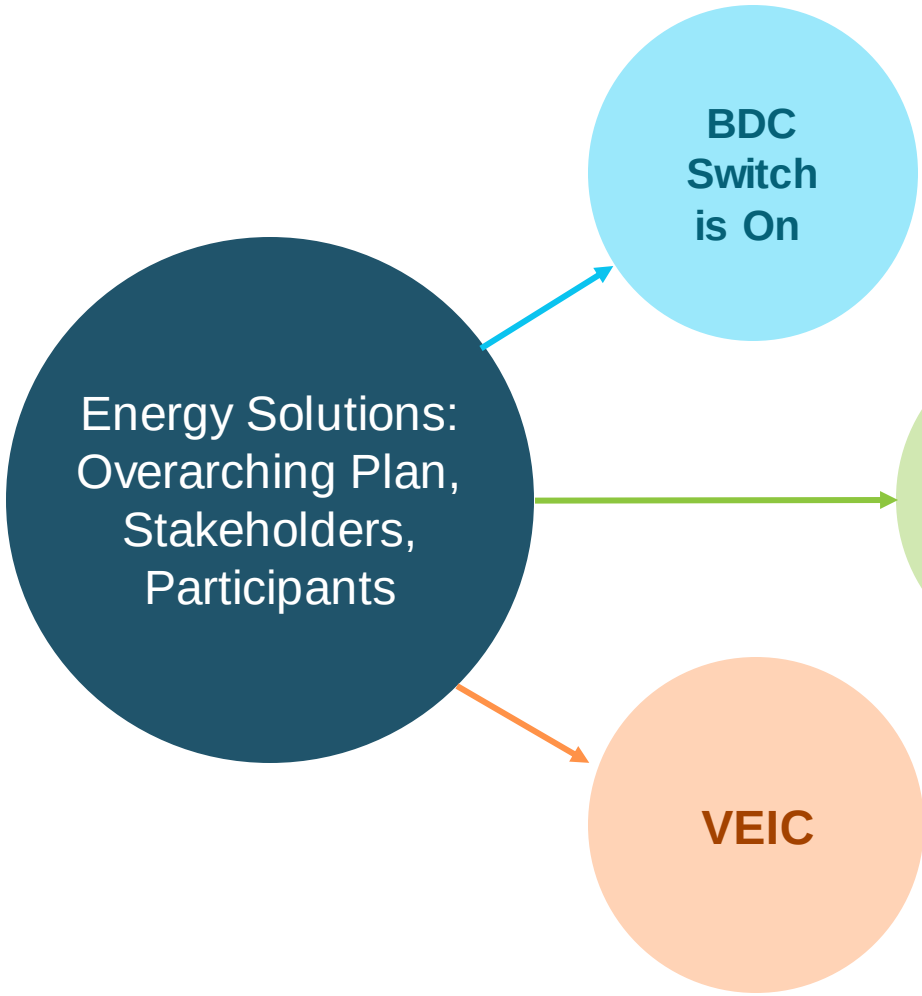
What's Next?

Continue comprehensive offerings of trainings and resources, incentives, and expansion of pilot strategies to support hard-to-reach multifamily sector, building from lessons learned from first pilot initiatives

- **Electrification Readiness**
  - Provide technical assistance on strategies and incentives for readiness
  - Increase awareness on strategies and examples through presentations
- **Central Heat Pump Water Heater**
  - Summarize results of monitoring, fixes and performance – show data!
  - Produce educational materials, recommendations case study, and videos on systems
  - Deliver trainings on monitoring, fixing and sizing
  - Provide incentives to optimized design and installations
- **Continue Portfolio Roadmaps**
  - Support development of pipeline for electrification projects for owners
  - Increase awareness and planning capacity within property owners
- **Engage with Smaller Property Owners**
  - Increase program participation for diverse property ownership structures
  - Increase capacity of owners through technical assistance and education

5 Marketing & Communications

TECH Clean California's Marketing and Communications Team



- Consumers
- New Contractors

- Contractors Certified by TECH Clean California

- Stakeholders: Pilots & Quick Start Grants

Marketing Communications Overview

We are here

Year 1

Preparing the Market:
Establishing and integrating two brands

Year 2

Incentives: Launched consumer media campaign

Year 3

Refine and Scale:
Share the learnings

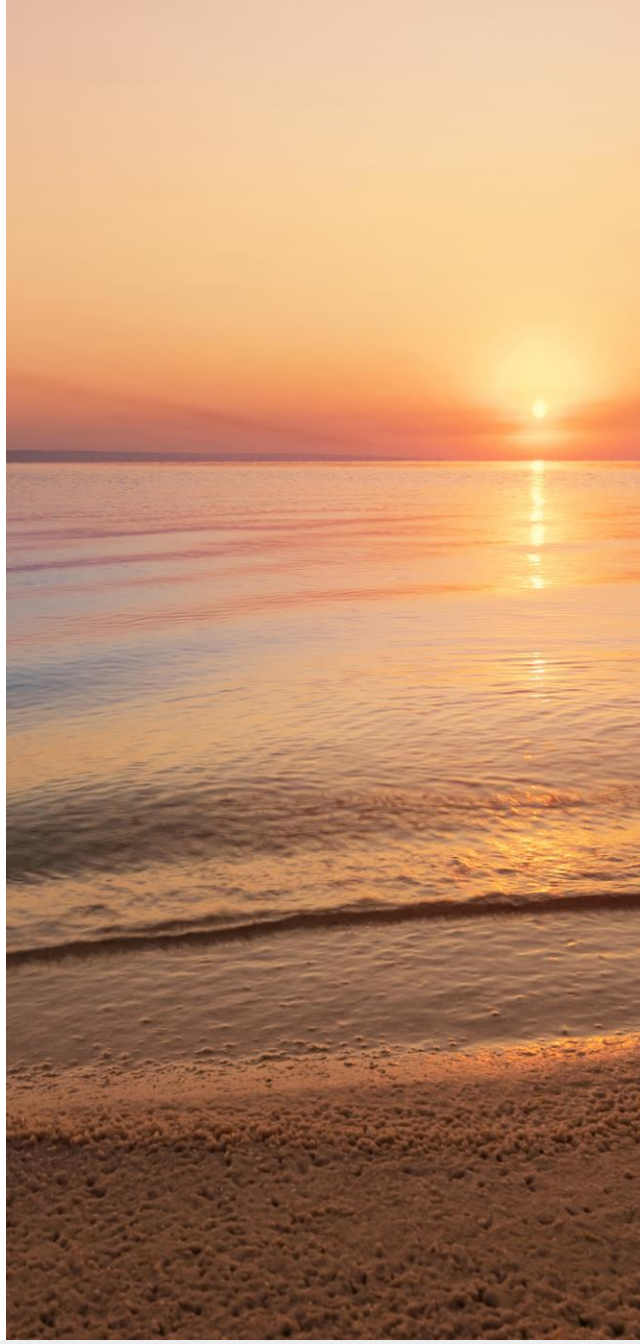
TECH CLEAN CALIFORNIA

THE SWITCH IS ON

Program Objectives and Strategies - 2024

Program objective: Continue to build a path to **6M heat pumps, 7M homes by 2035**

- **Strategic Communications:** Tell the TECH Clean California story through results, data analysis, case studies, and testimonials to inform TECH decision-makers, stakeholders and influencers
- **Optimize Peak Demand Impacts:** Support grid reliability with the implementation of the customer lookup tool to hyper targeted customers
- **Workforce Development:** Contractor engagement & outreach to bi-lingual communities
- **Enable Equity:** Focus outreach on equity communities and support the 40% goal



Consumer Marketing: Switch is On

In 2024 we'll continue to educate, inspire, and guide buyers to make the switch.

- Launch paid media building on 2023 learnings
- Amplify local partners
- Lift up contractors doing quality installs

THE SWITCH IS ON

SIO at National Association of Realtor (with SCE) Nov. 2023

Influencer Marketing: Amplifying Our Trusted Voices

Chefluencer #2 Santa Rosa, Jan. 2024

Telemundo Segment, aired Jan. 16 2024. interview with Andrea Diaz (SIO Spokesperson)

Amplify awareness and favorability:

- Chefs: a gateway from induction cooking to heat pumps
- Engaged contractors
- SIO ambassadors and community events
- Industry leaders

Media coverage (paid and earned)

- Press releases, blog posts on results and updates
- Promote events and well-known
  - Share through email, social media
- Case studies of home installation projects

Switch is On: Stakeholder and Consumer Outreach

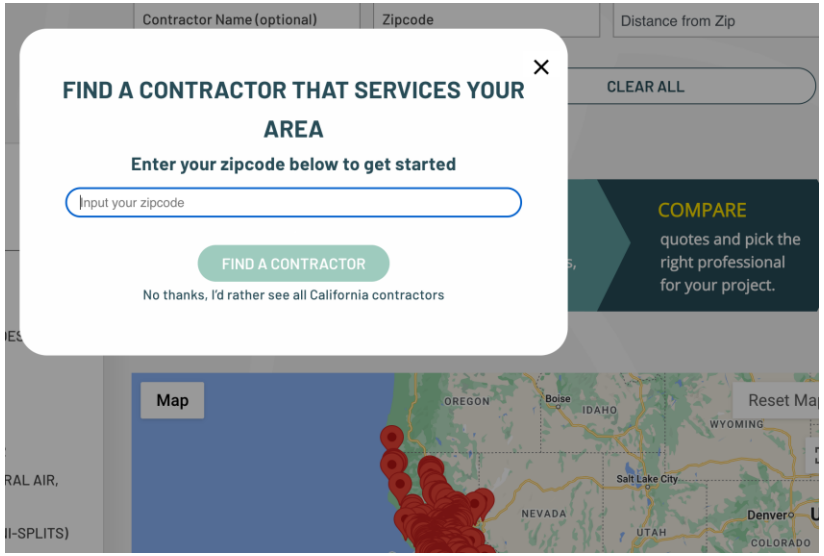
Consumer Marketing

- Paid media & ethnic media
- SEO
- Content Marketing

Stakeholder Engagement

- Partner engagement
- Ambassador Program
- Community events

Digital Finder Tools



- Contractor Finder: adding rankings
- Incentive Finder: layered incentives
- Product Finder: new resource

Switch is On: Contractor Marketing

Goal: Build awareness and favorability for the oncoming market transformation and new opportunities for well-trained contractors.

- Equity Focus on onboarding contractors who are bilingual and can speak to the diverse consumer base in California.
- Create demand for equity incentives.
- On-ramp new contractors into TECH.

New! Contractor Hero Promotion in 2024:
Highlight contractors showcasing success and enthusiasm installing heat pumps in CA. Promote contractor business with high-quality installations

THE SWITCH IS ON

7 Evaluation

Opinion Dynamics

INCREMENTAL COST STUDY

Phase I Findings

Incremental Cost Study – Overview

Increasing Rigor

- Phase I
  - **Rapid turnaround HVAC Contractor Survey**
- Phase II
  - Mystery Shopping
  - Ground Truth Survey Data by Collecting Cost Quotes in the Field
  - Develop Bid Packages
- Phase III
  - Collect Bids from Contractors to Ground Truth Mystery Shopping Data (allowing for greater generalizability & geographic comparisons in price estimates)

Phase I Overview

Research Objective: Develop initial incremental cost estimates for residential single-family space conditioning heat pump and non-heat pump scenarios.

All scenarios assume no equipment relocation, no panel upgrades necessary, and no ductwork needed to be replaced. All heat pumps are code-minimum 14 SEER.

Six Scenarios:

1. Central AC like-for-like replacement
2. Gas Furnace like-for-like replacement
3. Central AC & Gas Furnace like-for-like replacements
4. Central AC to Central, Ducted Heat Pump (Furnace Backup)
5. Central AC & Gas Furnace to Central, Ducted Heat Pump
6. Gas Furnace to Central, Ducted Heat Pump

Phase I Overview

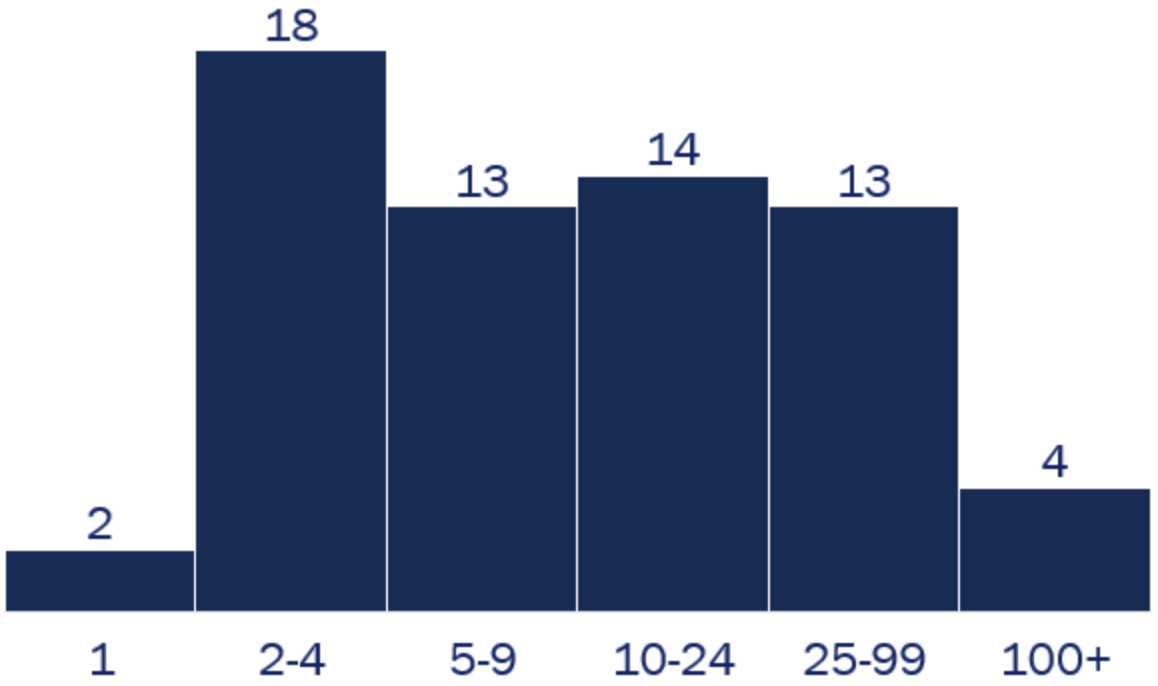
- **Method:** Quick Turnaround Online Survey
- **Sample Frame:** 974 Registered TECH HVAC Contractors
- **Recruitment Approach:** E-mail
- **Incentive:** $150
- **Average Survey Completion Time:** 44 Minutes
- **Survey Dates:** 12/7/2023 – 12/29/2023
- **Survey Completes:** 64
- **Response Rate:** 6.9%

Opinion Dynamics

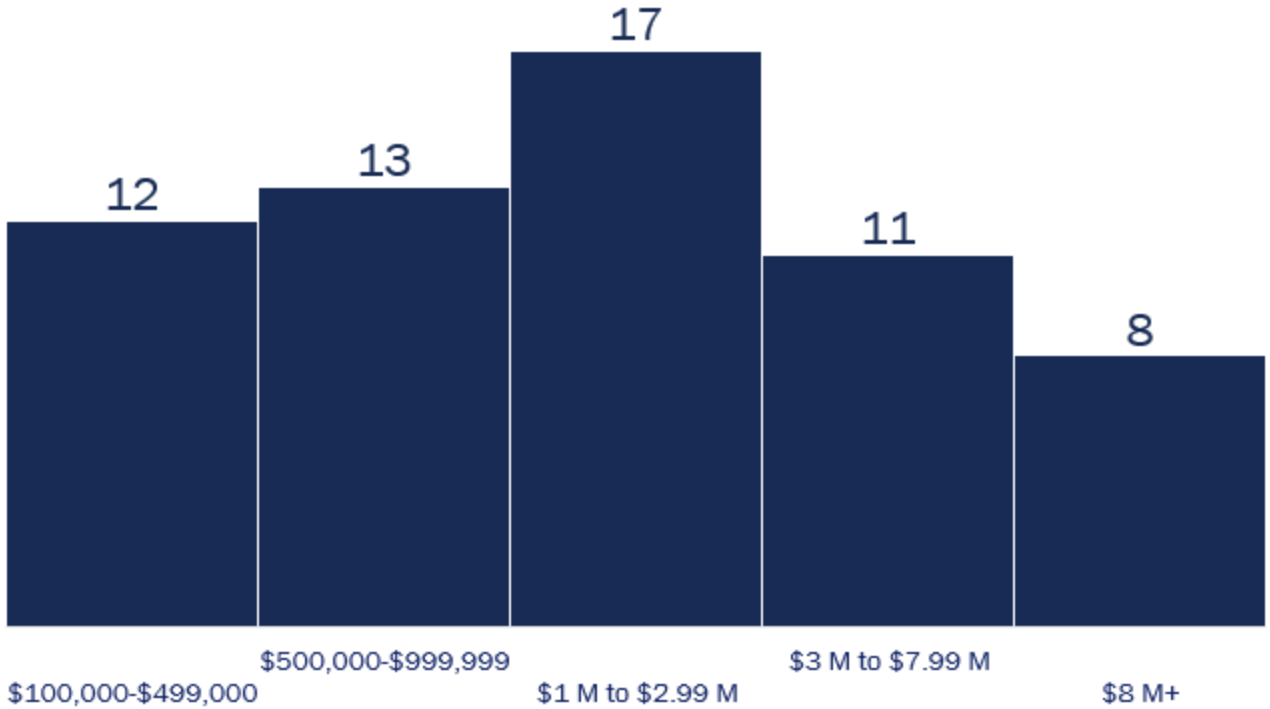
SAMPLE DESCRIPTION

Sample Description

- Number of Respondents: 64
- Firms' staff in a labor union: 2
- Employee Size:



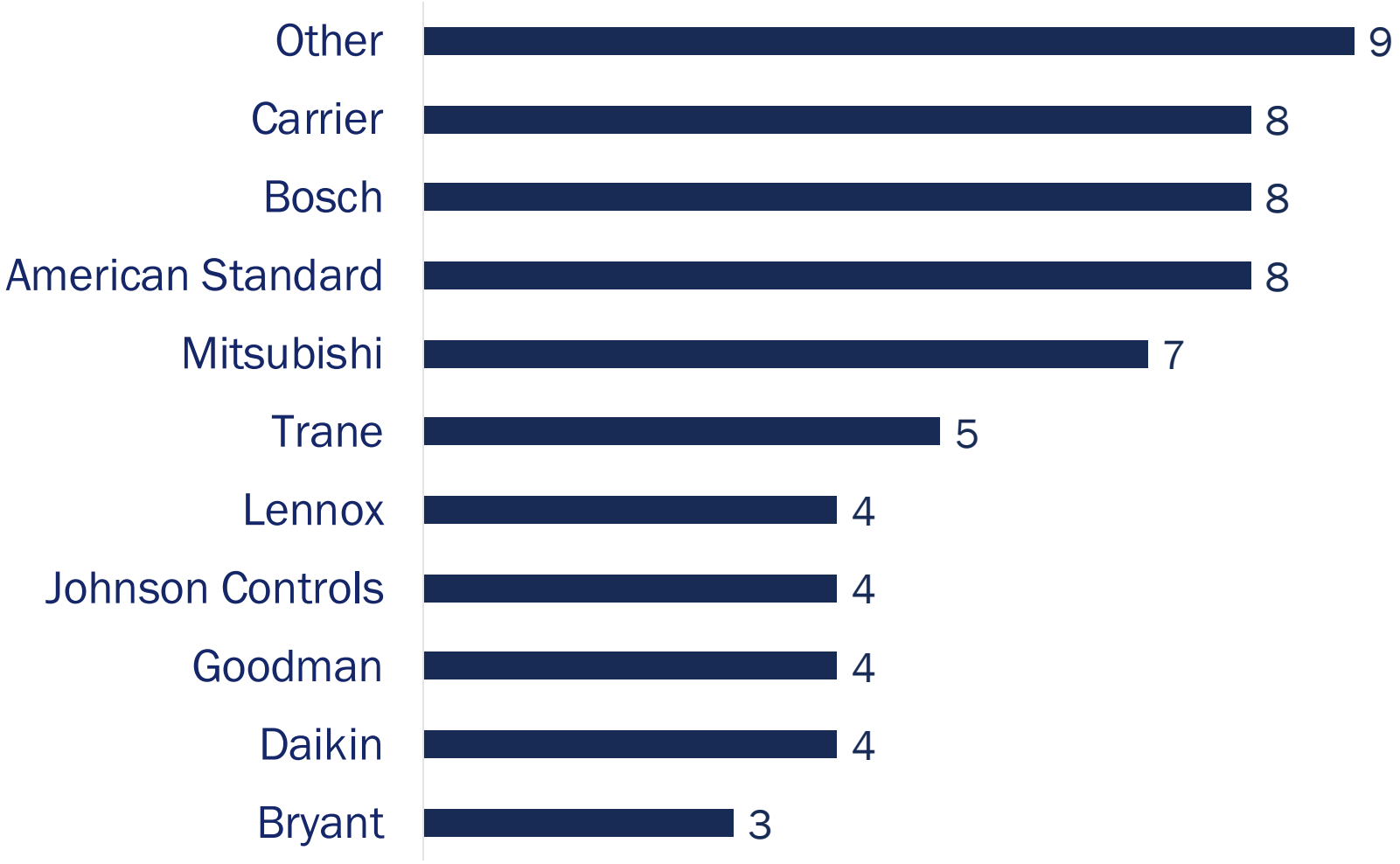
- Revenue Size:



Note: 3 responded, "Don't Know"

Sample Description

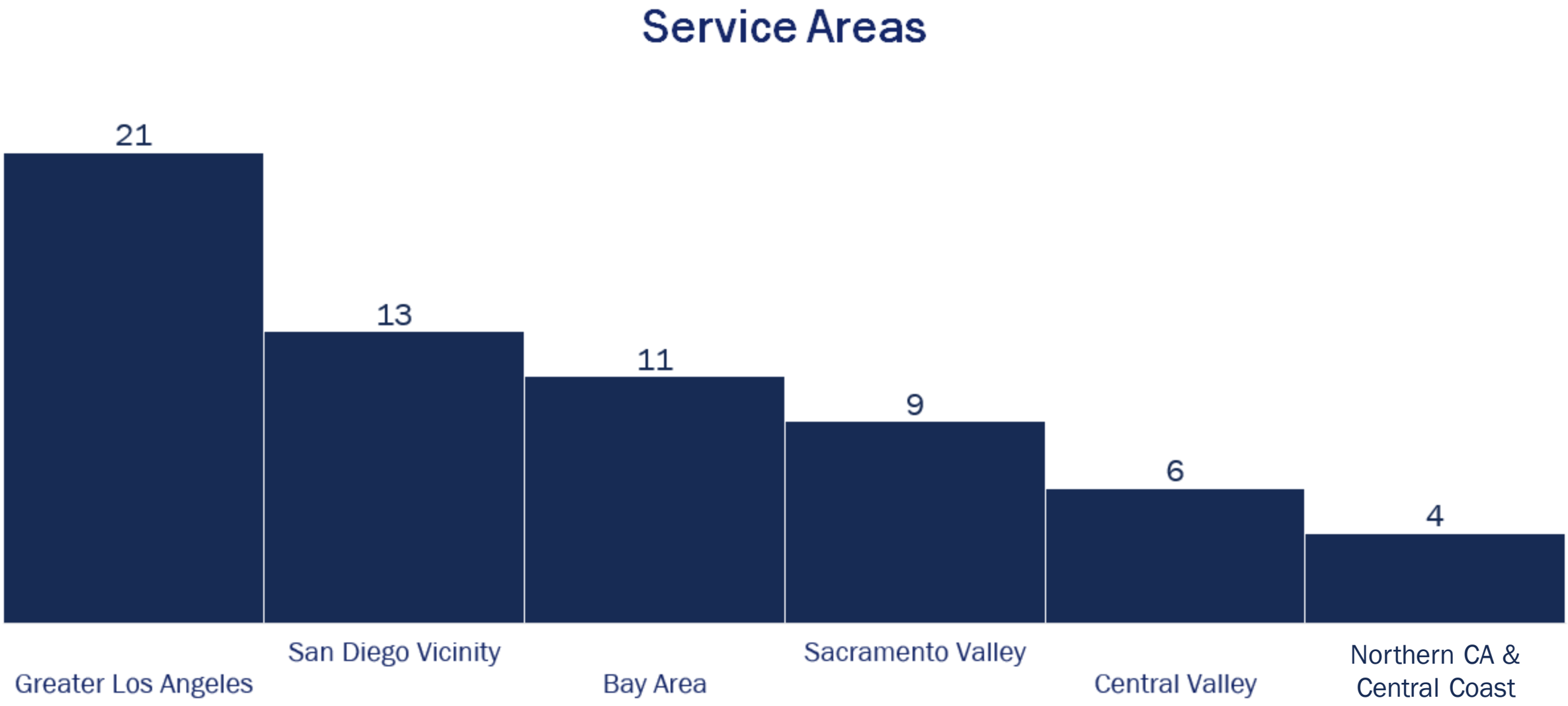
Preferred Line of Equipment



The "Other" Category Includes:

- Allied
- Amana
- Day and Night
- Fujitsu
- Innovair
- "Private Label"
- Ruud
- Rheem

Sample Description



Opinion Dynamics

FINDINGS: AVERAGE COSTS

Average Costs by Project Type: 3-Ton Units

Scenario	Project Type	Total Cost	Equipment Cost	Labor Cost	Misc. Cost
1	Central AC → Central AC	$9,777	$5,880	$3,196	$854
2	Gas Furnace → Gas Furnace (60,000 Btu/h)	$5,951	$3,301	$2,151	$599
3	Central AC & Gas Furnace → Central AC & Gas Furnace	$12,698	$7,856	$4,063	$969
4	Central AC → Central, Ducted Heat Pump	$11,201	$6,767	$3,495	$1,103
5	Central AC & Gas Furnace → Central, Ducted Heat Pump	$13,281	$7,761	$4,284	$1,371
6	Gas Furnace → Central, Ducted Heat Pump	$14,909	$8,185	$5,029	$1,854

Average Total Project Cost by Climate Region: 3-Ton Units

Average project costs for 3-ton units were very similar or slightly lower in the Marine climate region compared to Hot-Dry

Project Type	Hot-Dry	Marine
Central AC → Central AC	$10,081	$8,885
Gas Furnace → Gas Furnace (60,000 Btu/h)	$6,123	$5,434
Central AC & Gas Furnace → Central AC & Gas Furnace	$12,779	$12,455
Central AC → Central, Ducted Heat Pump	$11,323	$10,834
Central AC & Gas Furnace → Central, Ducted Heat Pump	$13,478	$12,702
Gas Furnace → Central, Ducted Heat Pump	$14,891	$14,961

Average Incremental Cost of Heat Pump Installation (3-Ton)

Scenario	Average Incremental Cost of Heat Pump Installation (versus like-for-like replacements)
Central AC Replacement	$1,424
Gas Furnace Replacement	$8,958
Central AC & Gas Furnace Replacement	$583

Opinion Dynamics

SCENARIO-SPECIFIC FINDINGS

Scenario #1: Central AC Like-for-Like Replacement

HVAC Replacement Scenario	Home Type	Square Footage	Home Levels	System Efficiency	Service Needed
Central AC → Central AC	Single-Family	1700 sqft	Single-Story	14 SEER	Disconnect, remove, and discard old CAC and indoor coil. Install and connect new CAC & indoor coil.

This scenario **does not** require:

- Electrical Panel Upgrade
- Equipment Relocation
- Duct Replacement

Scenario #1: Central AC Like-for-Like Replacement

Average Cost	3-Ton CAC Unit	4-Ton CAC Unit
Equipment Cost	$5,886	$6,400
Labor Cost	$3,196	$3,313
Misc. Cost	$854	$875
Total Cost	$9,784	$10,431

- Miscellaneous costs most frequently driven by code compliance requirements:
  - Permits and inspections
  - HERS/Title 24 duct testing
  - Duct sealing
- Contractors also mentioned:
  - Cost of miscellaneous materials, including new registers
  - Labor warranty

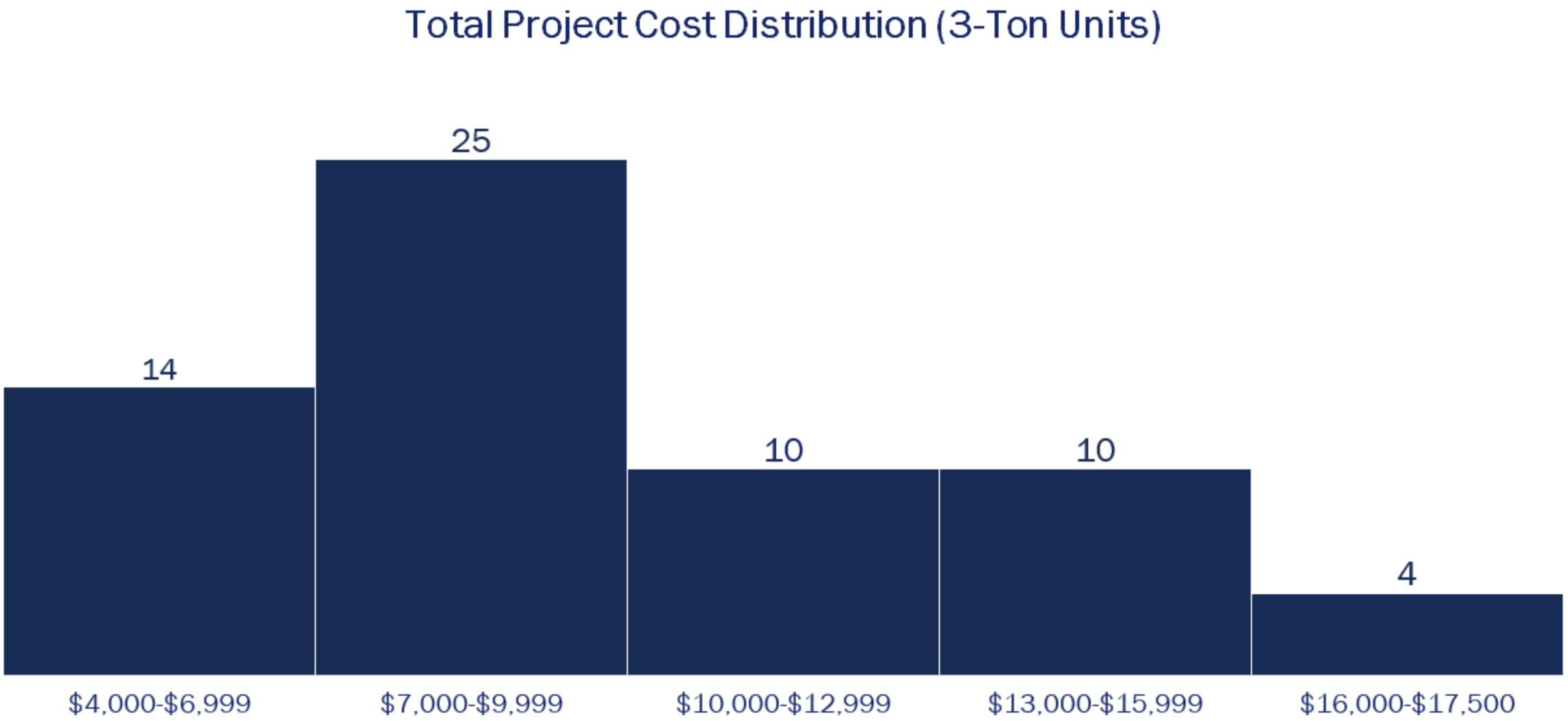
Scenario #1: Central AC Like-for-Like Replacement

Distribution of Respondents Who Mentioned Permit Costs by Service Area

- None in San Diego, few in the Bay Area and Central Valley
- Most common in Los Angeles and Sacramento, plus Central Coast and Northern CA

Service Area	% Mentioned Permit Costs
Northern CA & Central Coast	50% (2 of 4)
Sacramento Valley	44% (4 of 9)
Greater Los Angeles	24% (5 of 21)
Central Valley	17% (1 of 6)
Bay Area	9% (1 of 11)
San Diego Vicinity	0% (0 of 13)

Scenario #1: Central AC Like-for-Like Replacement



Scenario #2: Gas Furnace Like-for-Like Replacement

HVAC Replacement Scenario	Home Type	Square Footage	Home Levels	System Size	System Efficiency	Service Needed
Gas Furnace → Gas Furnace	Single-Family	1700 sqft	Single-Story	60,000 Btu/h	80% AFUE	Disconnect, remove, and discard old furnace; install and connect new furnace

This scenario **does not** require:

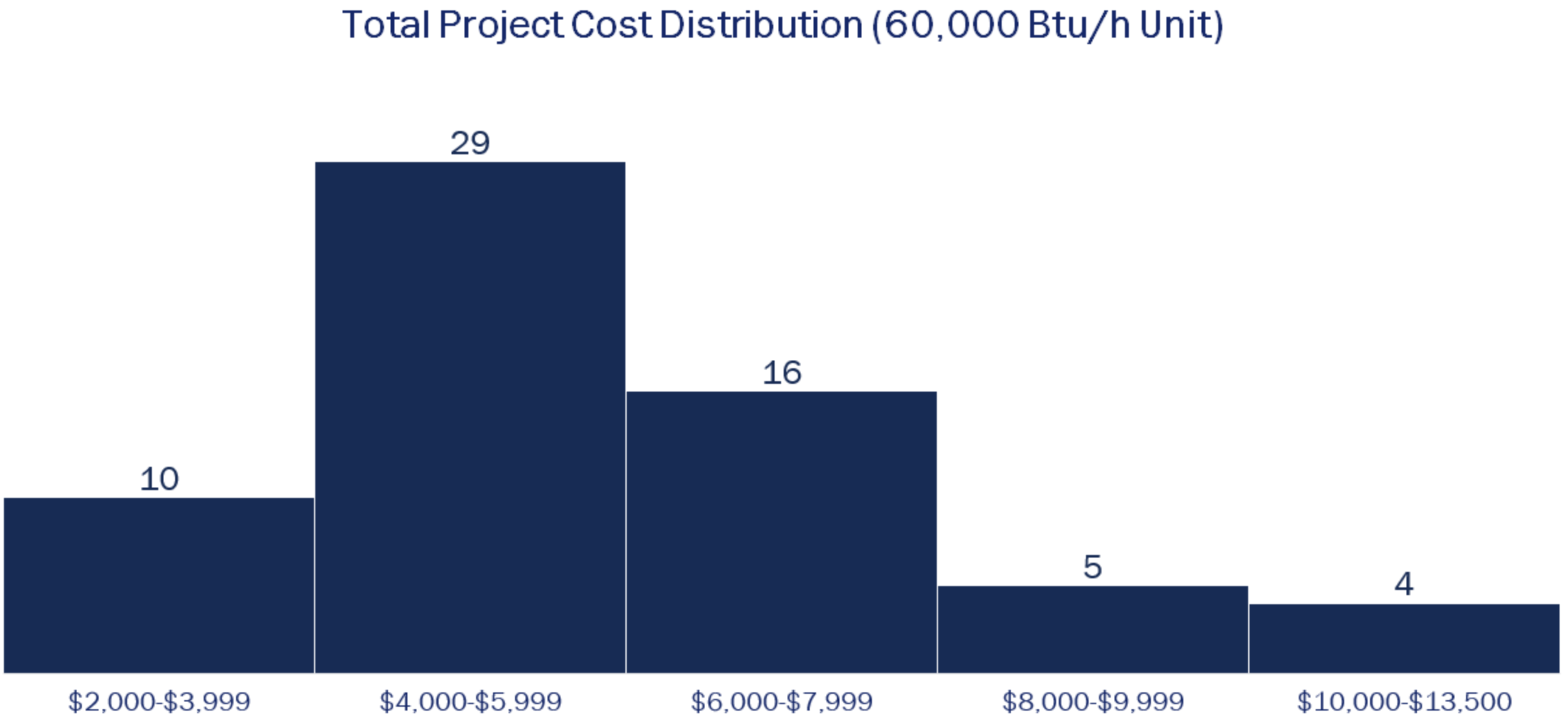
- Electrical Panel Upgrade
- Duct Replacement

Scenario #2: Gas Furnace Like-for-Like Replacement

Average Cost	60,000 Btu/h Unit
Equipment Cost	$3,301
Labor Cost	$2,151
Misc. Cost	$599
Total Cost	$5,951

- Miscellaneous costs driven by code compliance requirements:
  - Permits and inspections
  - HERS/Title 24 Duct Testing
  - Duct sealing
  - Ultra Low NOx requirements (required in LA area)
- Contractors also mentioned:
  - Cost of miscellaneous materials, such as filter rack, drip leg, sediment trap
  - Replacing gas flex with shutoff valve
  - Venting work, return air modifications

Scenario #2: Gas Furnace Like-for-Like Replacement



Scenario #3: Central AC & Gas Furnace Like-for-Like Replacements

HVAC Replacement Scenario	Home Type	Square Footage	Home Levels	System Efficiency	Service Needed
Central AC & Gas Furnace → Central AC & Gas Furnace	Single-Family	1700 sqft	Single-Story	14 SEER 80% AFUE	Disconnect, remove, and discard old CAC, coil, and furnace. Install and connect new CAC, coil, and furnace.

This scenario **does not** require:

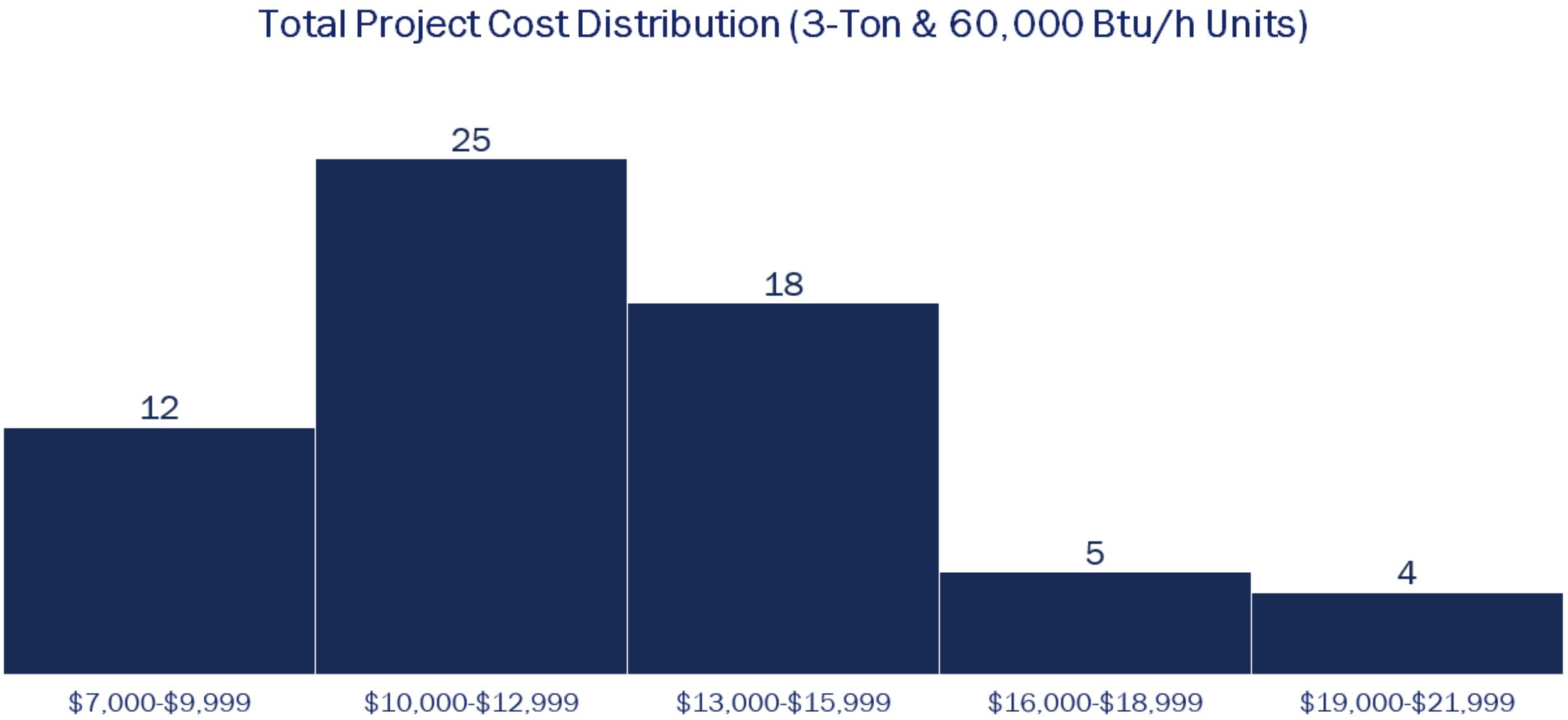
- Electrical Panel Upgrade
- Duct Replacement

Scenario #3: Central AC & Gas Furnace Like-for-Like Replacements

Average Cost	3-Ton CAC Unit	4-Ton CAC Unit
Equipment Cost	$7,856	$8,770
Labor Cost	$4,063	$4,213
Misc. Cost	$969	$1,022
Total Cost	$12,698	$13,808

- Miscellaneous costs driven by code compliance requirements:
  - Permits and inspections
  - HERS/Title 24 Duct Testing
  - Duct sealing
  - Ultra Low NOx Requirements (required in LA area)
- Contractors also mentioned:
  - Cost of miscellaneous materials, including sheet metal, flue pipe, MERV 13 filters
  - Gas line upgrade, gas flex line
  - Venting work, evacuation, startup testing

Scenario #3: Central AC & Gas Furnace Like-for-Like Replacements



Scenario #4: Central AC to Central, Ducted Heat Pump (Furnace Backup)

HVAC Replacement Scenario	Home Type	Square Footage	Home Levels	System Efficiency	Service Needed
Central AC → Central, Ducted Heat Pump (Gas Furnace Backup)	Single-Family	1700 sqft	Single-Story	14 SEER	Disconnect, remove, and discard CAC and coil. Install and connect Heat Pump. Configure thermostat to communicate between Heat Pump & existing Furnace.

This scenario **does not** require:

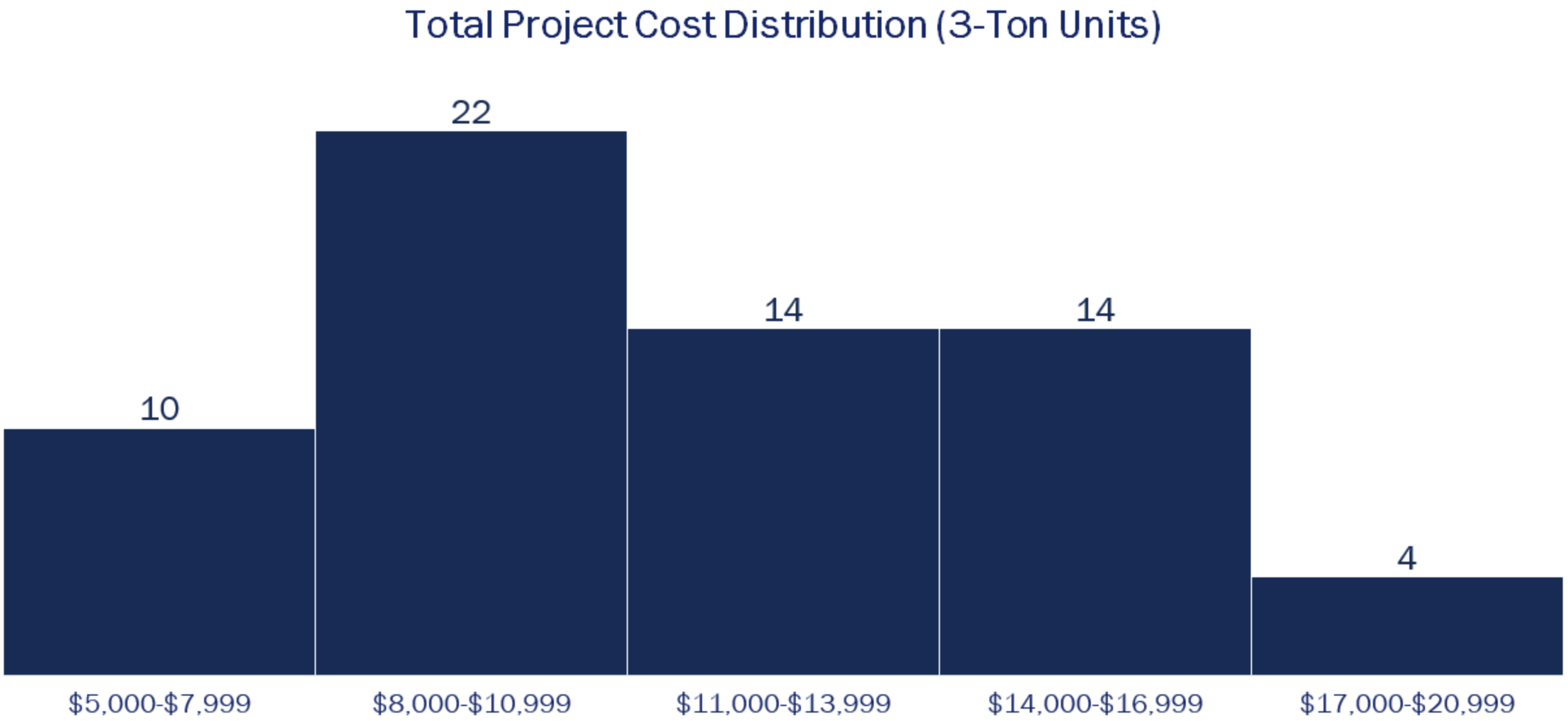
- Electrical Panel Upgrade
- Equipment Relocation
- Duct Replacement

Scenario #4: Central AC to Central, Ducted Heat Pump (Furnace Backup)

Average Cost	3-Ton Heat Pump Unit	4-Ton Heat Pump Unit
Equipment Cost	$6,767	$7,795
Labor Cost	$3,495	$3,611
Misc. Cost	$1,103	$1,110
Total Cost	$11,201	$12,347

- Thermostat costs were the most-often mentioned miscellaneous cost
- Code compliance requirements also frequently mentioned:
  - Permits
  - HERS/Title 24 testing
  - Duct sealing
- Contractors also mentioned:
  - Costs of electrical work, such as new wires for thermostat

Scenario #4: Central AC to Central, Ducted Heat Pump (Furnace Backup)



Scenario #5: Central AC & Gas Furnace to Central, Ducted Heat Pump

HVAC Replacement Scenario	Home Type	Square Footage	Home Levels	System Efficiency	Service Needed
Central AC & Gas Furnace → Central, Ducted Heat Pump	Single-Family	1700 sqft	Single-Story	14 SEER	Disconnect, remove, and discard CAC and furnace. Install and connect Heat Pump and condensate drain.

This scenario **does not** require:

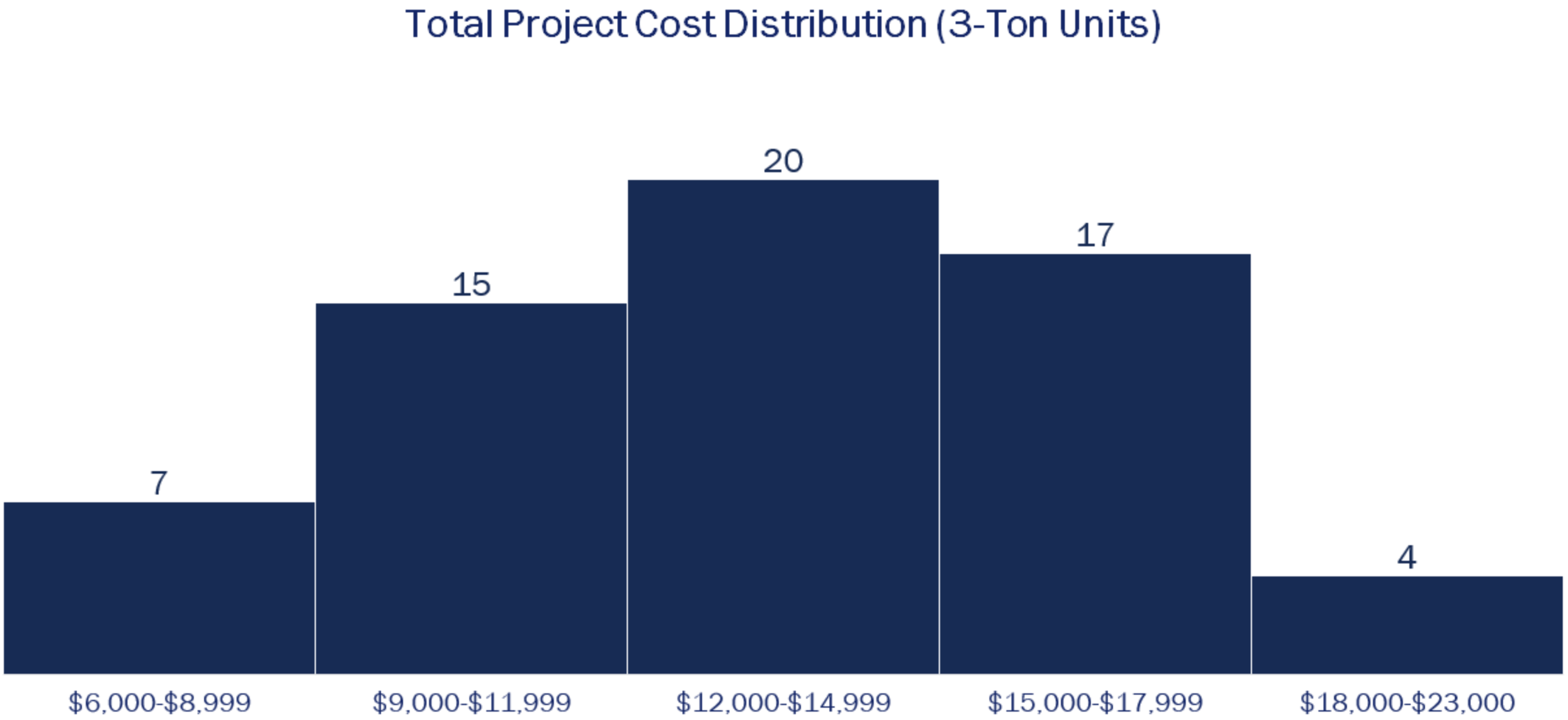
- Electrical Panel Upgrade
- Equipment Relocation
- Duct Replacement

Scenario #5: Central AC & Gas Furnace to Central, Ducted Heat Pump

Average Cost	3-Ton Heat Pump Unit	4-Ton Heat Pump Unit
Equipment Cost	$7,761	$8,797
Labor Cost	$4,284	$4,456
Misc. Cost	$1,371	$1,418
Total Cost	$13,281	$14,529

- Cost of electrical work was the most-often mentioned miscellaneous cost, including changing the power to a 220V to accommodate a 3-ton air handler
- Code compliance requirements also frequently mentioned:
  - Permits
  - HERS/Title 24 testing
  - Duct sealing
- Contractors also mentioned:
  - Thermostat costs

Scenario #5: Central AC & Gas Furnace to Central, Ducted Heat Pump



Scenario #6: Gas Furnace to Central, Ducted Heat Pump

HVAC Replacement Scenario	Home Type	Square Footage	Home Levels	System Efficiency	Service Needed
Gas Furnace → Central, Ducted Heat Pump	Single-Family	1700 sqft	Single-Story	14 SEER	Disconnect, remove, and discard furnace. Install Heat Pump. Install 240V circuit and disconnect for Heat Pump.

In this scenario, **there is a need to install a new 240V circuit and disconnect. This is included in the labor cost.**

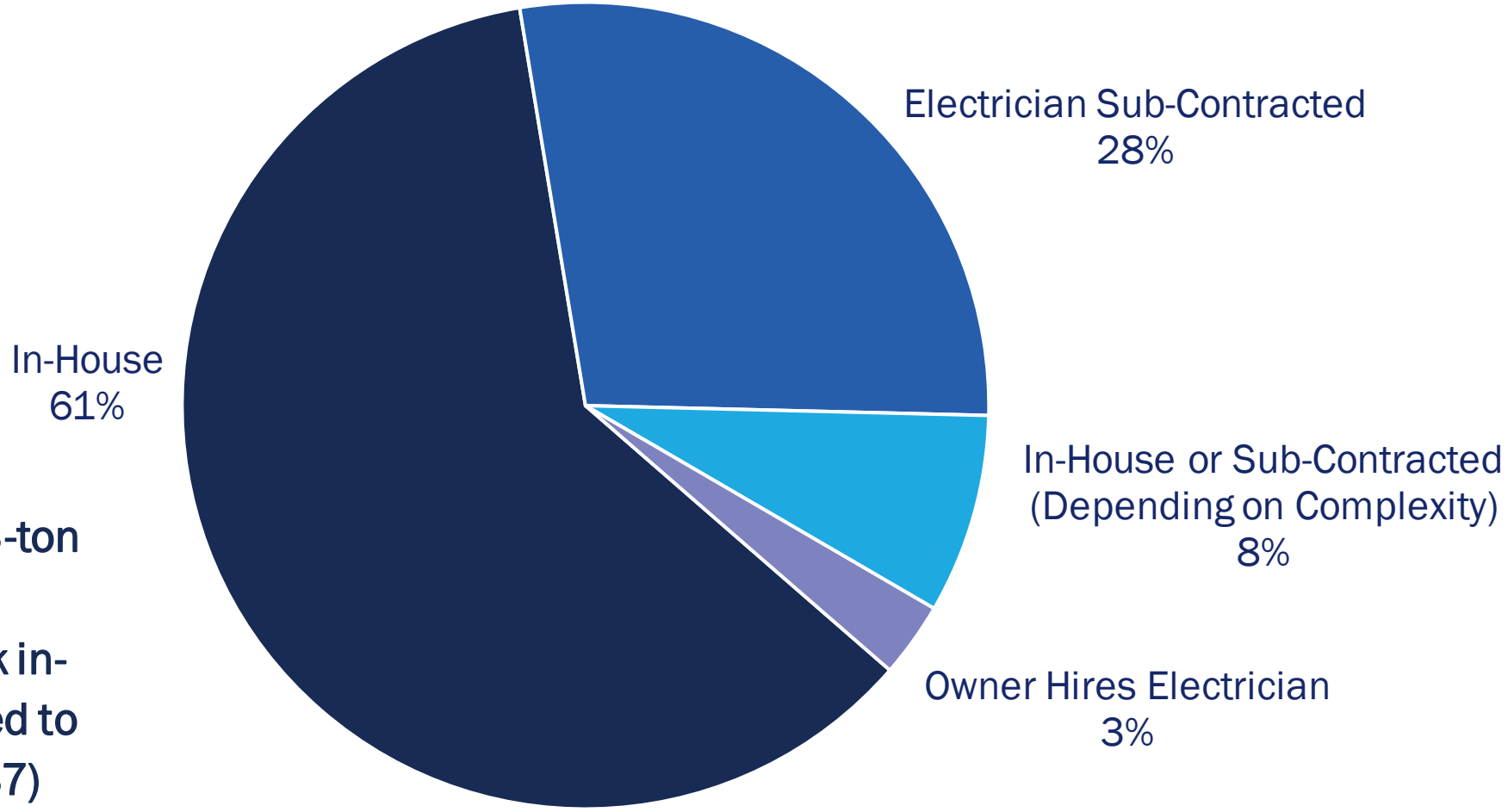
Scenario #6: Gas Furnace to Central, Ducted Heat Pump

Average Cost	3-Ton Heat Pump Unit	4-Ton Heat Pump Unit
Equipment Cost	$8,185	$8,750
Labor Cost	$5,029	$5,176
Misc. Cost	$1,854	$1,793
Total Cost	$14,909	$15,555

- Cost of electrical work was the most-often mentioned miscellaneous cost, including installing 240V circuits and disconnects.
- Code compliance requirements were also frequently mentioned:
  - Permits
  - HERS/Title 24 testing
  - Duct sealing
- Contractors also mentioned:
  - Thermostat costs
  - Costs of miscellaneous materials

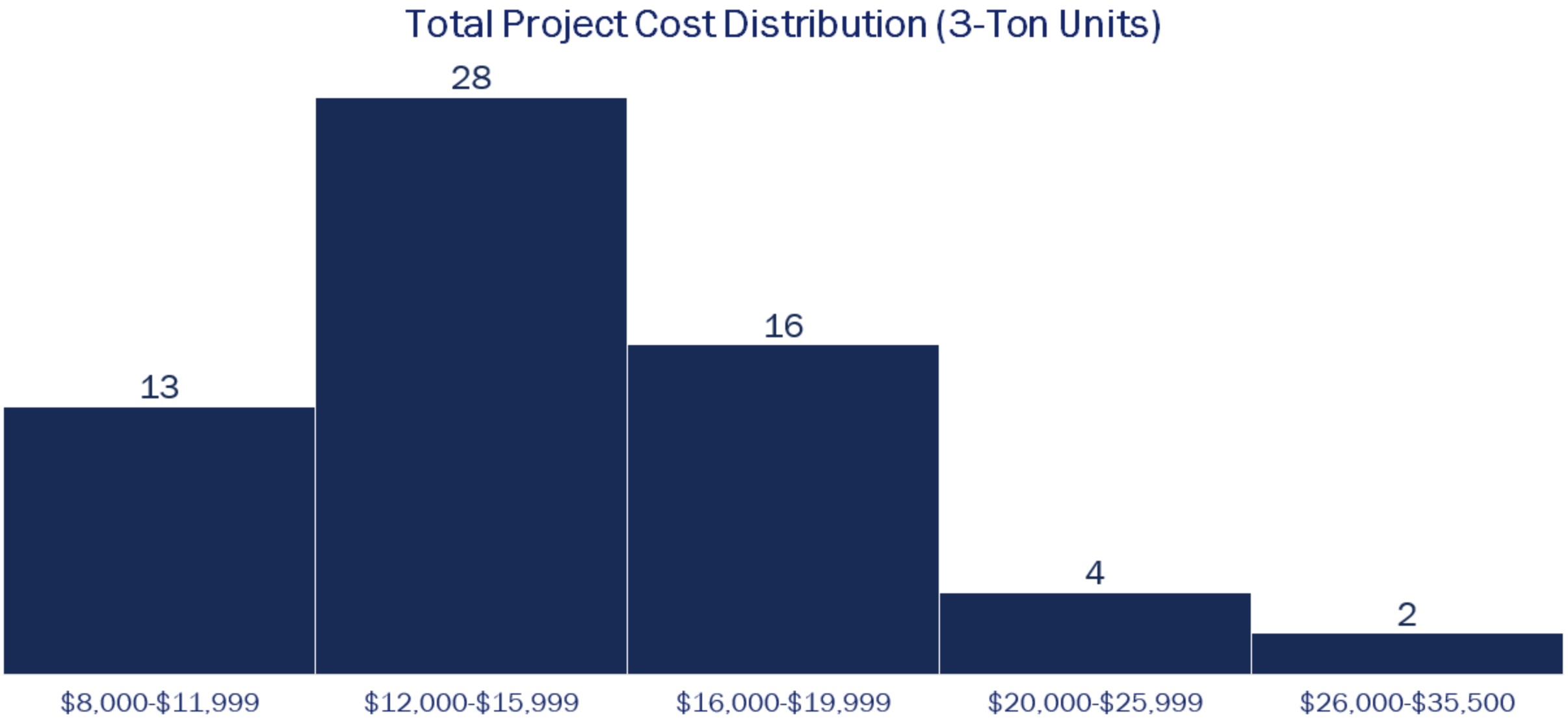
Scenario #6: Gas Furnace to Central, Ducted Heat Pump

Who Performs the Electrical Work?



Average project costs for 3-ton units were lower when performing electrical work in-house ($13,904) compared to sub-contracting ($16,437)

Scenario #6: Gas Furnace to Central, Ducted Heat Pump



Opinion Dynamics

TAKEAWAYS

Key Takeaways

- Costs increase with complexity. Like-for-like replacements were less costly than heat pump replacements. Yet, the incremental cost for replacing a furnace and CAC with a heat pump over its like-for-like counterpart was very small.
  - No significant differences in total costs between Marine and Hot-Dry climate regions
- Code compliance requirements often drove miscellaneous costs.
  - New thermostats and electrical work were additional costs on heat pump projects.
- Project costs were lower when the electrical work was performed in-house.
- A majority of contractors perform Manual J sizing calculations. Many size the units based on home factors.
  - Otherwise, Bay Area contractors size to the heating load and Central Valley contractors size to the cooling load.

Opinion Dynamics

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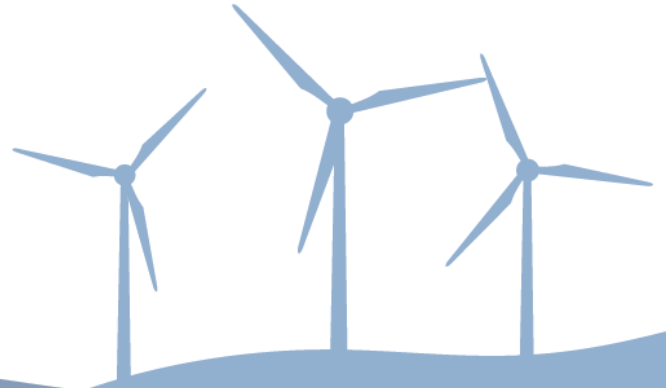
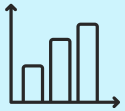


8 Highlights from Pilots and Quick Start Grants

TECH Clean California Activities



Spur the clean heating market through statewide strategies

Activate the supply chain

- Contractor incentives
- Streamlined Incentive Clearinghouse
- Technical and sales training

Drive consumer demand

- Statewide marketing campaign and website

Create scalable models through regional pilots

Improve targeting and project finance

- Target customers using meter-based analysis
- Deploy a Tariffed-On Bill Financing Pilot

Expand benefits to hard-to-reach customers

- Support low-income programs
- Multifamily pilots targeting property owners

Streamline installation

- Streamline permitting and installation costs
- Enable load-shifting

Innovation through Quick Start Grants

Inform long-term building decarbonization framework

Develop public reporting site

- Inform policymakers and market actors on progress and impacts

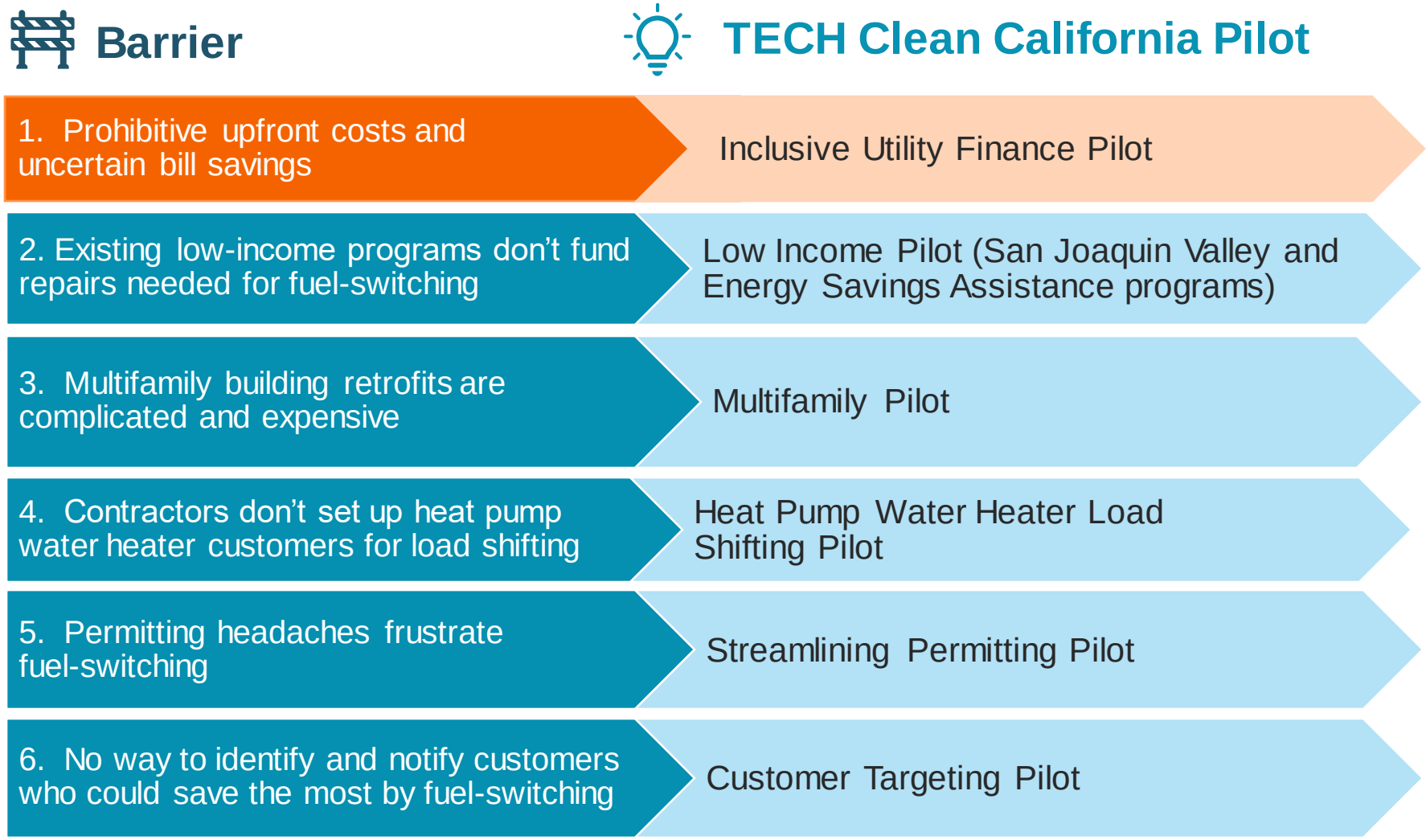
Quantify decarbonization impacts

- Avoided costs, grid benefits, and customer bill impacts

Inform policy development

- State, regional, and local regulatory policy

TECH Clean California Regional Pilots



TECH Clean California Regional Pilot Updates

Pilot	Achievements and Next Steps
Inclusive Utility Investment Pilot	• Published on bill financing program design guidelines and recommended best practices • Defining the parameters of Tariffed On-Bill program design in the CPUC Clean Energy Finance Options proceeding • Launching an on-bill financing pilot with SVCE in 2024
Low Income Pilot	• Provided home repair funding allowing 120 households to participate in the San Joaquin Valley electrification pilots • Providing funding for necessary pre-project repairs in PG&E and SCE ESA programs
Multifamily Pilots	• Completed central heat pump water heater data collection and analysis across different building configurations and system types • Identified knowledge gaps in design, sizing and installation of central heat pump water heater • Currently preparing Electrification Readiness Plans and Portfolio Roadmaps
Heat Pump Water Heater Load Shifting Pilot	• Supporting contractors with SGIP heat pump water heater incentives and demand response enrollment requirements through extensive personalized outreach
Streamlining Permitting Pilot	• Created permitting packet to guide code offices' practices • Final report available at: techcleanca.com/pilots/permitting-pilot/
Customer Targeting Pilot	• Tested four email outreach campaigns with SCE, reaching over 200,000 customers • Final targeted marketing campaign launching spring 2024 • Proposing a scaling plan to extend meter-based customer targeting throughout California

Pilot Profile: Inclusive Utility Investment Pilot

Scaling electrification requires enormous capital.
Many households lack ready capital for these investments.

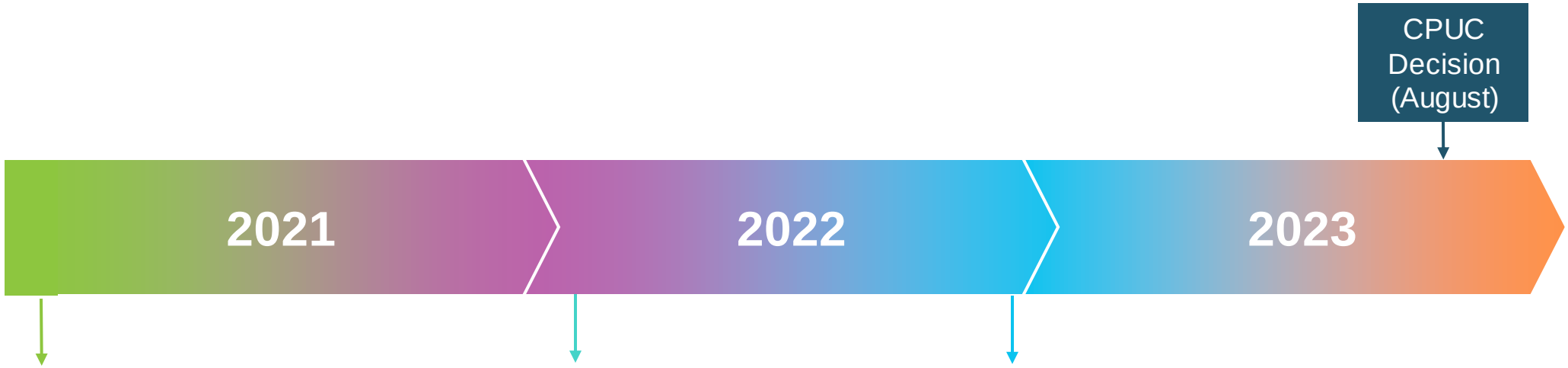
Inclusive Utility Investment (IUI), sometimes called tariff on-bill financing (TOB), allows utilities to finance home energy improvement measures located behind the meter similar to the way they use tariffs to recover costs for traditional grid investments.

IUI participants do need not qualify for or take on consumer debt, which allows more customers to participate (including renters) and longer-lived improvements to be financed. Cost-recovery for the investment stays with the meter (where the benefits are located), not with the customer when they move out.

IUI/TOB is used throughout the country for energy efficiency.

Bill neutrality or savings is a critical design feature.

Pilot Profile: Inclusive Utility Investment Pilot



TECH developed an IUI pilot approach that could be applied to electrification/fuel-switching, as well as energy efficiency and distributed energy generation. The pilot team held a series of workshops with IOUs, CCAs and others, resulting in a pilot template

In early 2022, TECH selected Silicon Valley Clean Energy (SVCE) to develop a specific pilot proposal which was filed with the CPUC in the Clean Energy Finance proceeding in April/June 2022

TECH & SVCE further developed the pilot approach, including through M&V research using meter-data and other sources to assess opportunity for savings, calculate risks around predicting bill savings, and strengthen customer protections

The pilot team also selected a program operator, Franklin Energy, through RFP

Pilot Profile: Inclusive Utility Investment Pilot

August 2023

The CPUC issued a Final Decision which:

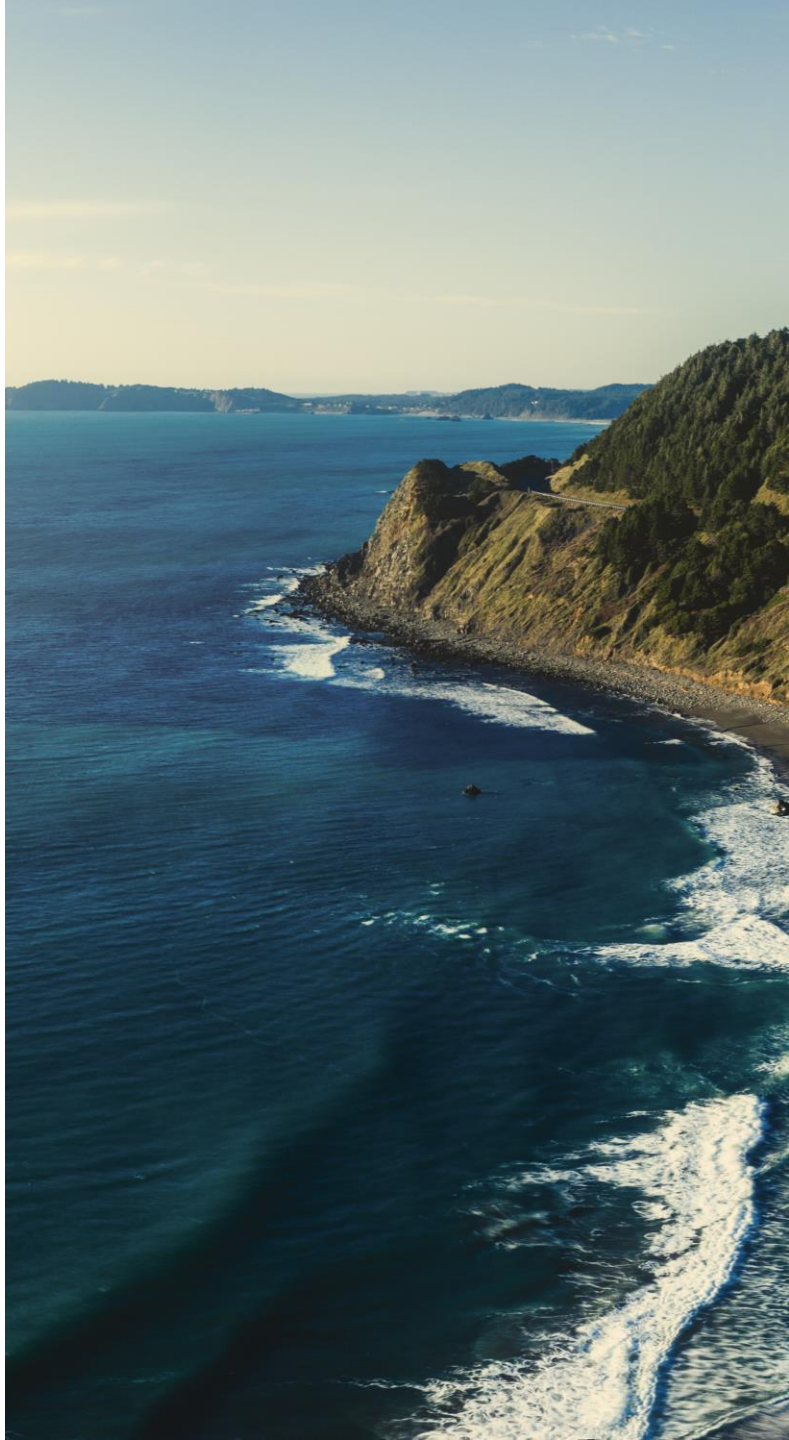
- Withheld approval of all finance proposals, including the TECH Clean California/SVCE IUI pilot, and;
- Directed all IOUs and SVCE/TECH Clean California to prepare a "joint TOB proposal", using the pilot design as a starting point

May 2024

- The joint proposal is due May 2024, after which there will be a new round of party comments and a new decision
- This decision created a pathway for IUI/TOB to be offered across all IOU territories – critical for scaling investment in electrification – however did not create a way to evaluate financial risks (to consumers or capital providers) and the feasibility of offering robust and attractive customer protections

2024 to-date

- For the last several months, TECH Clean California has been actively helping shape the joint TOB proposal and is preparing with SVCE to field test elements of IUI through a modified finance pilot in 202



Pilot Profile: Inclusive Utility Investment Pilot

SVCE Finance Pilot

TECH Clean California & SVCE have developed a revised pilot that can shorten the pathway to scaling IUI, with similar scope:

- Approximately 500 homes with HVAC heat pumps and/or heat pump water heaters + efficiency measures
- Some single family rental housing
- Some moderate-income/underserved populations (but not targeting income-qualified households)
- Franklin Energy as program operator

The pilot can go to market in **mid 2024** using the CCA's authority to capitalize and offer on-bill financing. It will not be tariff-based but allows us to field test and evaluate many of the questions we sought to tackle through the IUI pilot proposal:

- **Customer Risk:** Our ability to offer customers low-risk or no-risk investments that generate cash positive outcomes. We will test our ability to accurately estimate bill savings, provide meaningful measure-level performance guarantees, and manage the financial risks associated with exogenous variation in customer usage
- **Ratepayer Risk:** The cost and financial risk for de-risking the customer's investment
- **Project Financial Viability:** Our ability to stack multiple sources of incentives and other funding to offer customers low-cost / no-cost upgrades despite IUI investments that are constrained by available bill savings
- **Program Simplicity and Customer Acceptance:** The ability to achieve high customer acceptance rates via offers for low-cost / no-cost upgrades with robust customer protections for zero financial risk, easy enrollment process, and ongoing service after the sale
- **Rental Housing Solutions:** Ability to serve rental housing by partitioning financial responsibility for debt repayment between the landlord and tenant, in proportion to the direct benefits they enjoy

Pilot Profile: Inclusive Utility Investment Pilot

TOB Working Group

CPUC ordered IOUs + SVCE/TECH Clean California to work together to file a **Joint TOB Proposal** by **May 2024**

CPUC directed Work Group to use SVCE/TECH Clean California IUI pilot proposal as the starting point for the joint proposal

Work Group chaired by PG&E, meets twice/week

- An Equity Committee meets biweekly and is open to public stakeholders

TECH Clean California's IUI existing planning and analysis is being offered to support development of joint proposal, including:

- Financial model
- Measurement and verification findings and methods
- Customer protections (e.g., savings guarantees)
- Program operations

TOB Work Group

- PG&E
- SCE
- SDG&E
- SoCal Gas
- SVCE & TECH Clean California
- CPUC Energy Division
- CEC finance staff

Equity Committee

- Facilitated by Michelle Vigen Ralston of *Common Spark*
- For information contact Sooji Yang at *sooji@common-spark.com*

Quick Start Grants 2023 Projects

Reaching Renters

Bright Power – Aligning utility allowances in regulated affordable housing to promote electrification

350 Bay Area – Fast-path approach to heat pump deployment for renters with portable heat pumps and air purifiers

Novel Financing and GHG Accounting Approaches

Climate Resolve – GHG accounting as a tool to scale heat pump retrofits in housing with cost barriers

Community-Centered Approaches

City of Sacramento – Layering multiple programs to enable whole-home electrification and prevent displacement

Viridis Consulting – Decarbonizing a multi-owner equity community with HOA governance

Diversity Coalition – Targeted and inclusive marketing, educational materials for equitable electrification

Expanding the Skilled Workforce

RHA – Heat pump water heater best practices and field guide

Quick Start Grant Profile:

Sacramento Energy Equity Pilot

City of Sacramento, SMUD, Habitat for Humanity

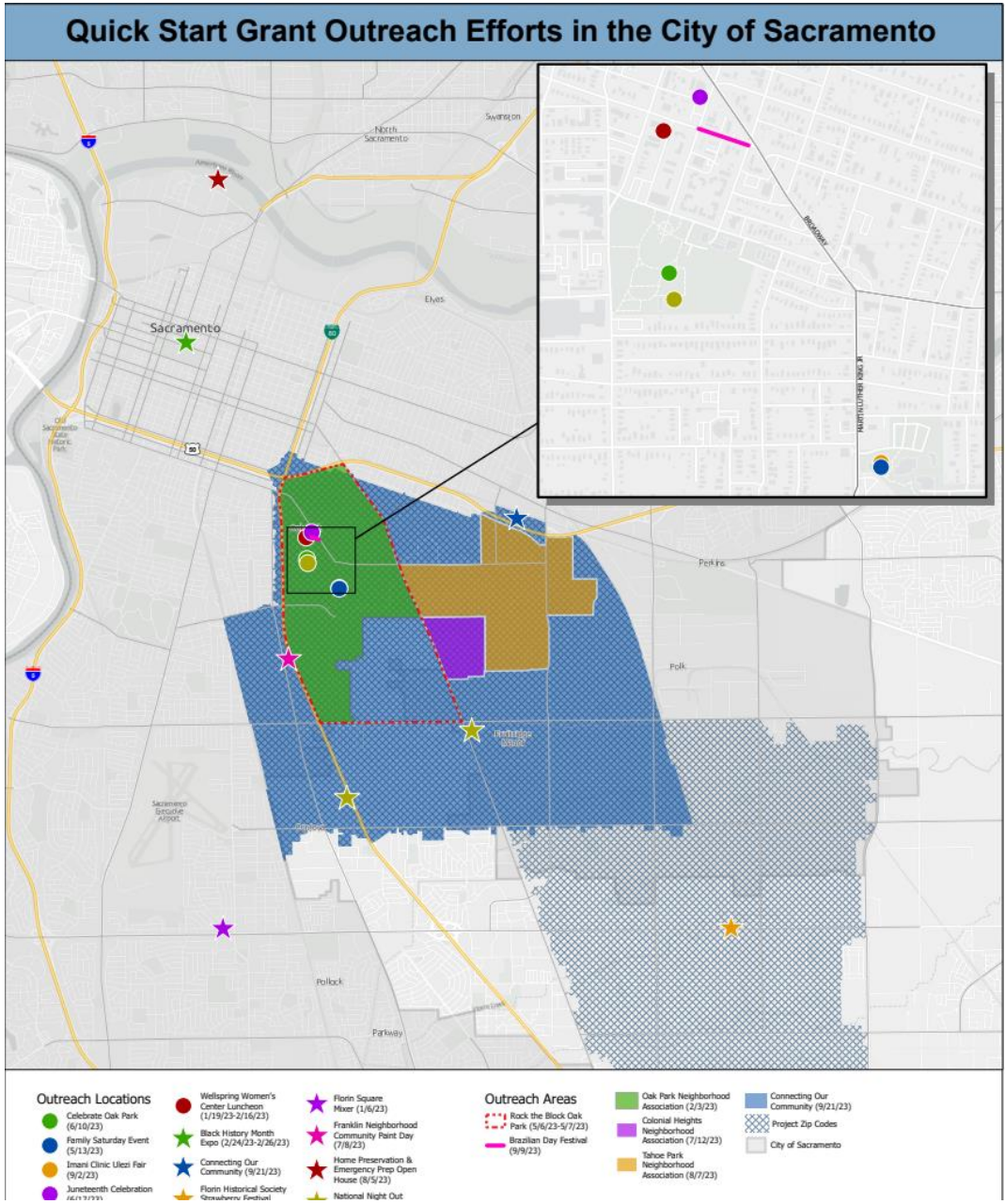
Project Objective: A team from the City of Sacramento, SMUD, and Habitat for Humanity will perform home repairs and install heat pumps for income-qualified, single family homeowners. The project intends to gather insights on how to best layer heat pump incentives with other energy equity programs, and how combining these programs can promote neighborhood stabilization

Eligibility:
Single family homeowners that are eligible for SMUD's Energy Assistance Program rate

Technology:
Heat pump water heaters and heat pump HVAC, plus home efficiency improvements

Location:
Sacramento, CA

Zip codes along Stockton Boulevard



Quick Start Grant Profile:

Sacramento Energy Equity Pilot

City of Sacramento, SMUD, Habitat for Humanity

Accomplishments so far:

- Reached 22 homes out of a goal of 25
- Installed:
  - 22 HVAC systems
  - 12 Heat pump water heaters

What they've learned:

- Low-income homeowners need a full package of home upgrades, implemented through as few entities as possible
- Mapping the customer and contractor journeys is critical
  - Clarifying the procedural steps needed for each coordinated programs is helpful for project team and participants
  - Tracking who from the project team the homeowners are speaking to helps track homeowners' expectations
- Lag time between initial engagement and installations can lead to participant drop-out
- Munis and CCAs are well-suited to take on this type of delivery model, given benefits of operating at a smaller, regional scale

9 Q&A

Summary and Next Steps

TECH Clean California Overview

- Publication of **Annual Report focusing on Year 2** of TECH Clean California
- **New dashboards** of meter-based results (electricity, gas, GHG, utility bill impacts)

Program Design and Incentives

- Analyze learnings to inform ideal HVAC design for next phase of decarb proceeding
- Pursue **HVAC and heat pump water heater incentive restructuring,** and test regional kickers
- Launch Strategic Early Retirement Plan to further promote equity efforts

Multifamily

- Incorporate findings into comprehensive multifamily strategy leveraged to support new installations
- Expand pilots to further analyze implementation efforts

Marketing

- **Reevaluate strategy** to incorporate refine and scale phase objectives
- **Personalize communication** between key market actors

Evaluation

- Results from **incremental cost study**
- Early 2024 - **Market study report, conduct site visits for the end-use metering study, and begin consumption analysis,** pending available utility data

Pilots and Quick Start Grants

- **Webinar** and **final reports** for the second group of completed **Quick Start Grants**
- Publication of **initial Pilot Learnings Report**

Next Stakeholder Meeting: Q2 2024

Thank You

For more information or to get involved, contact:

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Appendix