



California Public
Utilities Commission

Building Decarbonization Best Practices and Future

Pathways Workshop – Day 1

Building Decarbonization Proceeding (R.19-01-011)

January 21, 2026



Welcome

- Safety Information
- Opening Remarks
- Agenda Overview
- Next Steps (post-Workshop)
- Webex Logistics
- Workshop Framework

Emergency Exit Procedures

505 Van Ness Ave

- Exit to Van Ness Avenue
- Go right on Van Ness Avenue
- Meet at outside courtyard across from City Hall
- Automated External Defibrillator is located in auditorium lobby



Opening Remarks

Commissioner Darcie Houck: *CPUC Lead Commissioner Building Decarbonization Proceeding*

Commissioner Karen Douglas: *CPUC Lead Commissioner Long-term Gas Planning Proceeding, Support Commissioner Building Decarbonization Proceeding*

Commissioner Andrew McAllister: *CEC Lead Commissioner Building Decarbonization*



California Public
Utilities Commission

Agenda Overview Day 1

Title	Start	Entity
Sign-In	8:40 AM	-
Welcome	9:00 AM	Commissioner Houck's Office
Opening Remarks	9:10 AM	Commissioners Houck (CPUC), Douglas (CPUC), and McAllister (California Energy Commission)
Workshop Overview	9:25 AM	CPUC Staff
Tribal Government Panel	9:50 AM	Blue Lake Rancheria, Hoopa Valley Tribal Utility District
Break	10:30 AM	
Local and Regional Government Panel	10:45 AM	Central California Rural Regional Energy Network, Local Government Sustainable Energy Coalition, City of Albany
Lunch	11:35 AM	
Local Programs Panel	12:50 PM	The Energy Coalition, UC Berkeley California Institute for Energy and Environment (Oakland EcoBlock), Peninsula Clean Energy, Resource Innovations
Building Industry & Implementer Panel	1:50 PM	Verdani Partners, Association for Energy Affordability, Opinion Dynamics Corporation
Data and Right-Sizing Panel	2:35 PM	Energy Solutions, Recurve, POWER Working Group, SPAN
Break	3:20 PM	
Workforce Panel	3:35 PM	California Coalition of Utility Employees & California State Pipe Trades Council, Contra Costa Building and Construction Trades Council, Opinion Dynamics Corporation
Open Forum	4:25 PM	-
End	4:40 PM	-

Agenda Overview Day 2

Title	Start	Speaker
Welcome	9:00 AM	Commissioner Houck's Office
Opening Remarks	9:10 AM	Commissioner Houck
UN Sustainability Collaboration Panel	9:15 AM	Commissioner McAllister, The Energy Coalition, Enniscorthy International Forum, Center for Energy Efficiency EnEffect, Dynamic Grid
Break	10:20 AM	
State Agency Panel	10:35 AM	California Energy Commission, California Air Resources Board
Publicly Owned Utility and Community Choice Aggregator Panel	11:15 AM	Sacramento Municipal Utility District, City of Palo Alto, Silicon Valley Clean Energy
Lunch	12:00 PM	
Community Based Organization & Ratepayer Advocate Panel	1:30 PM	Public Advocates Office; Building Energy, Equity & Power Coalition
Investor-Owned Utility Panel: Vision for Zonal Decarbonization	2:025 PM	Pacific Gas and Electric Company, Southern California Edison Company, San Diego Gas & Electric Company
Break	3:10 PM	
Gas Utility & Networked Geothermal Panel	3:25 PM	Southern California Gas Company, HEET
Open forum	4:15 PM	-
Closing remarks	4:30 PM	Commissioners Houck and Douglas
End	4:40 PM	

Next Steps (post-Workshop)

- Workshop Report *(approximately late February to early March)*
- Stakeholder Feedback on Workshop Report and Ruling with additional questions for parties *(2-week comment period)*
- Best Practices and Future Pathways Proposed Decision *(anticipated in Quarter 2 or 3 of 2026)*

Building Decarbonization Best Practices and Future Pathways

CPUC Building Decarbonization Proceeding R.19-01-011 Workshop

Presenter: Abhilasha (Abhi) Wadhwa; she
Building Decarbonization Section, Energy Division

Jan 21, 2026



California Public
Utilities Commission

Workshop Goals and Best Practices Framework*

- **Program Design Best Practices**

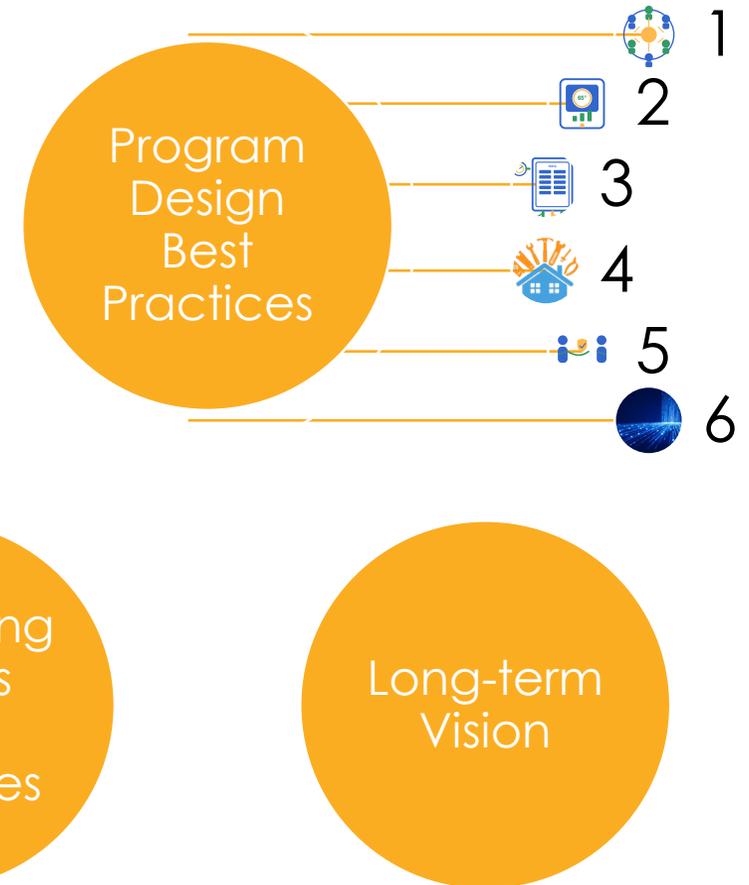
Share Best Practices and Lessons Learned from implementation of programs

- **Supporting Sectors and Strategies**

Recognize synergistic needs and partnerships

- **Achieving Scale: Long-term Vision**

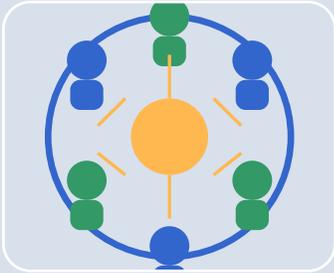
Collect ideas for future strategies that enable scaling



* To be further developed and revised from stakeholder feedback to this workshop

Program Design Best Practices

1



Integrated
Program
Offerings

2



Measure-
specific
Best
Practices

3



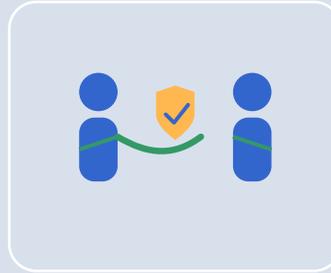
Right-sizing
Electric
Service

4



Recognizing
Remediation
Needs

5



Excelling in
Customer
Buy-in

6



Role of
Data and
Analytics

Program Design Best Practice #1: Integrated Program Offerings

Building decarbonization: an umbrella of strategies to reduce building emissions.*

Building Decarbonization = Building Electrification + Energy Efficiency + Demand Flexibility + Renewable Generation + Energy Storage + Refrigerant Impact Reduction

- This workshop primarily focuses on onsite building decarbonization measures
- Transportation electrification (charging infrastructure) can impact building electrification
- Embodied energy is noted, but not actively explored at this time

When delivered together:

- Maximizes bill savings
- Improves grid benefit / cost-effectiveness
- Avoids decision and information overload to customer

Presenters: CEC, PCE, AEA, HEET, Resource Innovations

*California Air Resources Board 2022 Scoping Plan, Appendix F, p.1.



Program Design Best Practices and Challenges #2: Measure-specific successes

- Measures that amplify benefits for customer bills and the electric + gas grid
- Climate-adaptive strategies and resiliency measures
- Low-Global Warming Potential: equipment uptake, market status and policy update

Presenters: CEC, Opinion Dynamics, PCE, AEA, Energy Solutions/ Recurve, CARB

Program Design Best Practice #3: Right-sizing Electric Service

- An oversized electric panel discourages power efficiency, can trigger upstream electric grid upgrades, which increases rates.
- Leverage the growing era of power-efficient technologies: Meter Socket Adapters, smart panels, circuit sharing and load management devices. Reduce electrification costs and energization timelines.
- Counter-factual: when panel and service upgrades cannot be avoided.
- Unique challenges in multi-family.

Presenters: POWER Working Group, Verdani, AEA, SPAN

Program Design Best Practice #4: Recognizing Remediation Needs

- Non-energy challenges to Electrification:

Examples (non-exhaustive):

- Asbestos presence
- Degraded wiring
- Restricted installation spaces



- Opposing pressures: Limited program funds but desire to benefit under-resourced customers (often higher remediation needs)

Presenters: CEC, Opinion Dynamics, Local Programs Panel, BEEP Coalition, Resource Innovations

Program Design Best Practice #5: Excelling in Customer buy-in



Image Source: environmentalhealth.org



Image Source: environmentalhealth.org



Image Source: environmentalhealth.org

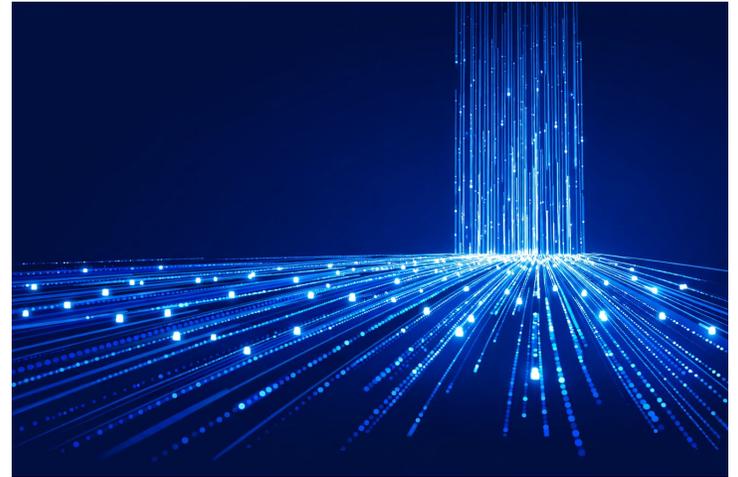
- **Customer/ Community Perspective:** Lessons learned from programs, and statewide listening sessions
 - Effective consumer protection + messaging
 - Barriers that may delay Building Decarbonization and incentives that may expand Building Decarbonization
 - Reducing time investment and stacking incentives required to meet community decarbonization goals
- **Challenges faced by Local Champions** (involved in program design and/or outreach)
- **Renter Inclusion**

Presenters: Cal Advocates, Tribal Governments, LGSEC, BEEP Coalition, Resource Innovations

California Public Utilities Commission

Program Design Best Practice #6: Leveraging Data and Analytics

- Statewide Program Data Framework: Creating a Feedback Loop
- Data-driven decisions
 - Technology and Equipment for Clean Heating (TECH) Initiative
 - CEC's Equitable Building Decarbonization (EBD) program
 - High Efficiency Electric Home Rebate Act (HEEHRA) program
- Data access barriers for single fuel utilities



Presenters: Energy Solutions / Recurve, CEC, SMUD, Dynamic Grid (UN Sustainability Panel)

Supporting Sectors and Strategies

- **Workforce Support and Development:**
 - Achieving economies of scale via zonal decarbonization
- **New Construction / Codes & Standards**
- **Decarbonization Co-benefits**
 - Resilience
 - Health
 - Jobs

Presenters: CCUE, CCBCTC, AEA, BEEP Coalition, SPAN, HEET

Achieving Scale: Long-term Vision

Successes and Challenges

- Electric, Dual-fuel, and Gas Utility Perspective
- Networked Geothermal: what, how, when, where
- International Perspective

Presenters: UN Sustainability Collaboration Panel, Verdani, PG&E, SCE, SDG&E, SMUD, Palo Alto, SoCalGas, HEET

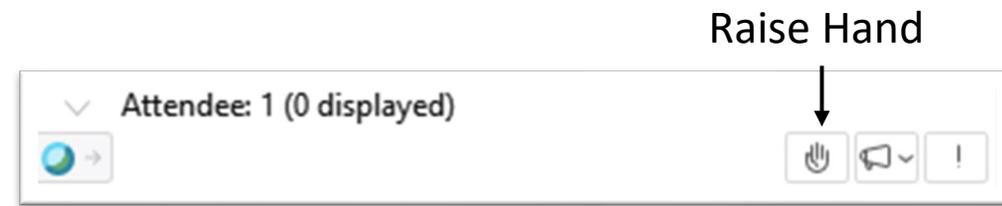
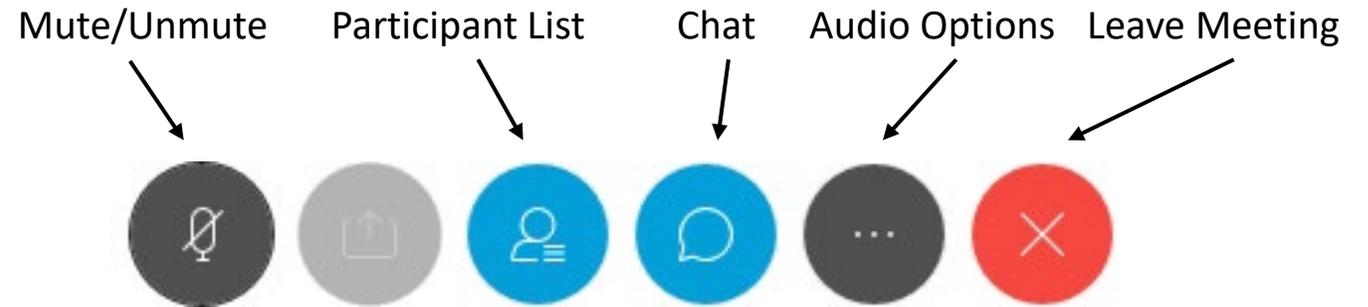
Webex Logistics

- Today's presentations and agenda are available at:
 1. the WebEx link under “Event Material”, and
 2. the CPUC Building Decarbonization Workshops page: <https://www.cpuc.ca.gov/about-cpuc/divisions/energy-division/building-decarbonization/building-decarbonization-workshops>
- **This workshop is being video-recorded and will be posted on the CPUC website.**
- There will be a short discussion period at the end of each day, if time permits.
- The slides, workshop recording, Q&A, and chat will be summarized in a workshop report and may be brought into the record of the Building Decarbonization proceeding.
- Additional written feedback may be submitted in response to the Workshop report; which will be emailed to the service list in approximately one month

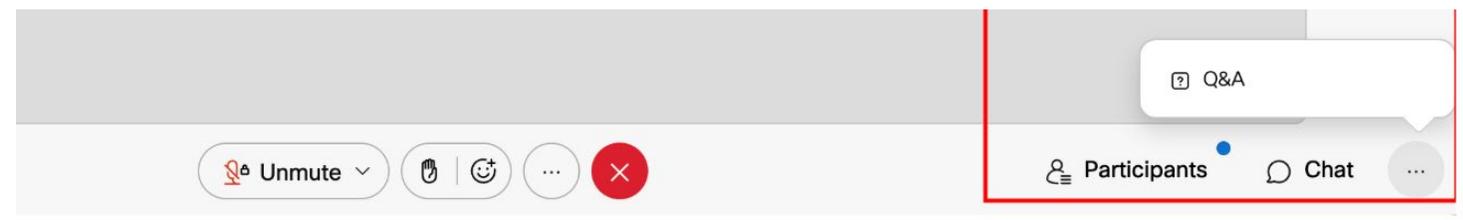
Webex Logistics

- Q&A is opened after each panel (not each presentation).
- Webex attendees may type questions in the **Q&A** box during or after presentations. These will be answered in the Q&A box or read aloud by staff.
- Do not enter questions for panelists into the **chat** box.

Reminder: Mute yourself back!



- You may raise your hand to be called on by staff.
 - *3 to raise hand and *6 to unmute/mute over the phone



Thank you!

buildingdecarb@cpuc.ca.gov

Tribal Government and Utility Panel



BLUE LAKE RANCHERIA

Clean Energy
Innovators



6 Hours North of San Francisco-13 miles East of Humboldt Bay



Blue Lake Rancheria is located in rural Northern California



Well known as a clean energy innovator and leader.
Commissioned first-of-its-kind behind the meter microgrid.

Provides resilient energy resources when access to the grid is compromised.

2016 Obama Clean Energy
Champion Award



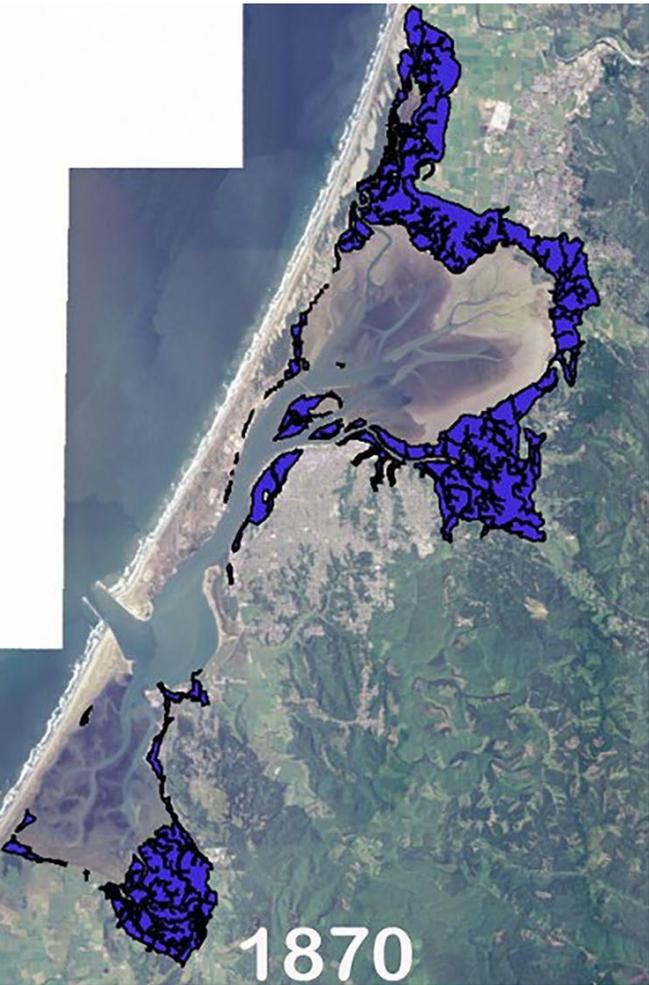
BLUE LAKE RANCHERIA

BLR's Diverse Approach Towards Decarbonization

- Microgrids
- Morbug (portable solar generator)
- Hotel Remodel (updated HVAC, reclaimed wood, LEED standards, etc.)
- Land Acquisitions (400 acres of forested land and 250 acres of SLR-vulnerable coastal lands)
- EV purchases
- Equipment Upgrades
- Sea Level Rise Mitigation
- Restoration Practices (Native Nursery)
- Cultural Burns
- Air and Water Quality Monitoring
- Data Dashboard



Historic Extent of Salt Marsh Habitat



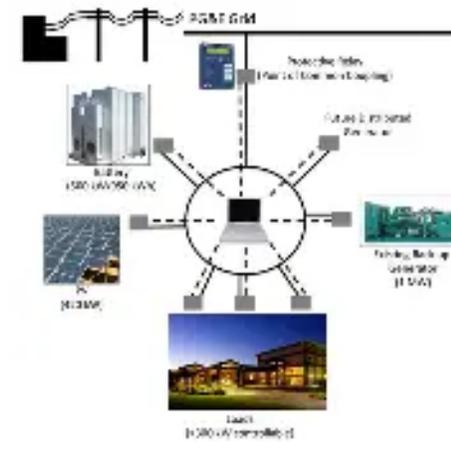
Laird, 2010



What is a Microgrid?

A microgrid is a section of the larger electrical grid that can be disconnected and function autonomously. A microgrid consists of:

- Generation sources (often renewable) eg; solar
- Energy storage (Usually batteries)
- Smart controls that allow autonomous operation in grid connected or islanded states



Current Microgrids at BLR share common features...

- Solar array
- Batteries
- Control Systems
- Back-up Tier 4 Generator



Why Does this Matter?

The Blue Lake Rancheria has a microgrid system that allows the Tribe to become an "island of electrical activity" during power outages, including public safety power shutoffs. This has enabled the Tribe to provide critical support to the community during these events, such as providing power for medical devices and acting as a command center for emergency responders.

- December 20, 2022.
- PPS Events
- Office of Emergency Services.
- MOU's with multi-county agencies.
- Hotel, Restaurant, Gas Station, Ta'm, Health Clinic



Tribal Energy Resilience and Sovereignty (TERAS) Project

Collaboration between three Tribes

BLR will serve as the demonstration site for design and commissioning a nested (networked) microgrid

Hoopa 1101- 142 circuit miles of poorest performing circuit in California

Partnership with Schatz Energy Research Center and the Redwood Coast Energy Authority

\$200 million project (\$88 million from DOE)



TERAS Impacts and Benefits...

- Reliable Electrification
- Cost Savings/Revenue Generation
- Reduced Emissions in culturally sensitive areas
- Emergency Response Opportunities
- Maximum Flexibility with electricity



What We Want You to Know...



- We have an over 50 year old natural power plant situated on an active fault line causing a single source of failure.
- Statewide Adoption of Wildfire and Natural Disaster Resiliency Program is IMPORTANT to regions such as ours.
- Government to Government Consultation is required (Tribal Consultation.)
- The TECH Initiative and related funding (\$50 mill) can assist Tribal Communities to implement technologies that are green and have potential of improving health and safety and energy affordability for Tribal members.
- There needs to be protections from increased rates as a result of switching from gas water heaters to electric heat pump water heaters.
- By having more community microgrids, you can a more diverse footprint (tie in housing, water systems, commercial, etc to microgrid)
- By having campus/community microgrids, you are able to decarbonize with more flexibilities and economy of scale (especially when you can roll residential customers into it)
- Job training and workforce development (eg; low-voltage electrician) is essential in Indian Country



BLR as a Demonstration Site

California Energy Commission

California Public Utilities Commission

Japanese Public Utilities

Informed 9 Tribal microgrids

Europe

Tribes across America

Political Leaders

Scholars

Cal Poly Humboldt Engineering students

CR students

TK-12 students

Workshops/Conferences

Etc...





TA'M
RESILIENCE CAMPUS

Ta'm Resilience Campus: A Strategic Investment for Economic Development

The Ta'm Resilience Campus, spearheaded by the Blue Lake Rancheria Tribe (Blue Lake, CA), presents a transformative opportunity for economic development and resilience-building within the Tribe and across the region. The summary below examines the strategic significance of the Ta'm and its potential to drive sustainable growth, innovation, and prosperity in the region—and serve as a model for the nation.





Thank you!

hguynup@bluelakerancheria-nsn.gov



Hoopla Valley Tribe-Steps to Building Decarbonization

Linnea Jackson, HVPUD General Manager





Hoopa Valley Indian Reservation



The Hoopa Valley Public Utilities District (HVPUD) was chartered in 1982 and for the past 44 years we have provided critical utility services such as water, broadband and energy initiatives.

Hoopa Valley Tribal Utility Goals and Objectives; A Tribal Vision for a Sustainable and Resilient Future

- The **Hoopa Valley Tribe**—located in remote Humboldt County, California—has long embraced its role as a *steward of ancestral lands, natural resources, and community well-being*. In recent years, that stewardship has expanded to include:
 - **Active decarbonization**
 - **Climate change adaptation planning**
 - **Clean energy strategies**

Tribal Decarbonization Goals and Efforts



Building Electrification



Forest Management-
Wildfire Prevention
Air Quality Impacts
Carbon Sequestration



Clean Energy Projects-
Microgrids
Battery Storage
Micro-hydro



Advocate for clean
energy and adaptative
funding sources



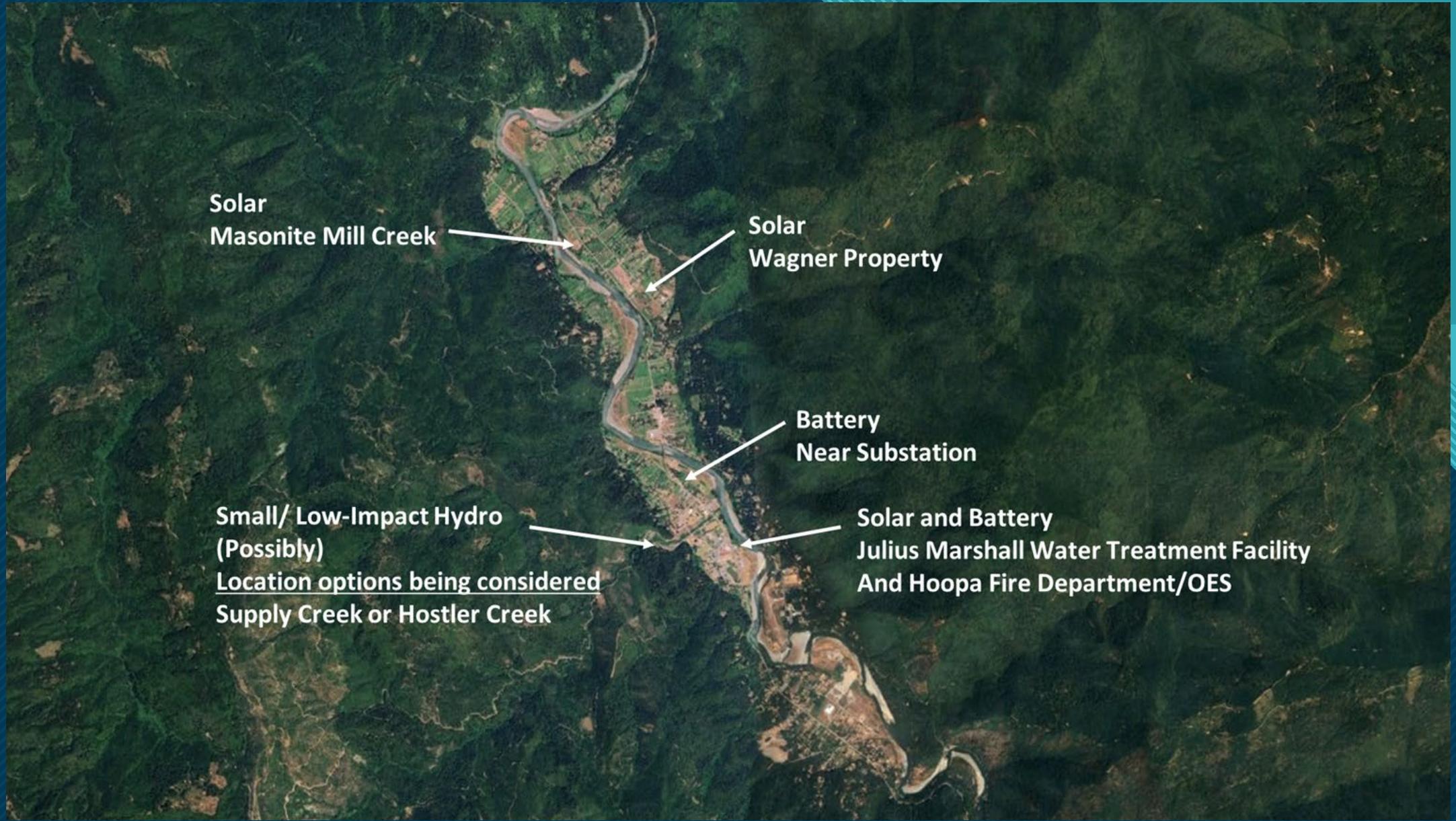
Increase Residential
Solar and Battery
Projects

Tribal Energy Resilience and Sovereignty



Cal Poly Humboldt
Schatz Energy
Research Center

<p>Hoopa Valley</p>	<p>All customers on Hoopa substation; water treatment facility, core zone of Hoopa Valley, with 1,200 residences and many Tribal and non-Tribal critical facilities, extended zone: entire Hoopa 1101 circuit</p>	<p>Solar: 4 MW FTM, 375 kW BTM Battery: 7.8 MW / 15 MWh Micro-hydro: 475 kW</p>	<p>Construction: \$37 M Engr., Design, Permitting: \$6.5 M Tribal staff, WFD, IDC, etc: \$2.6 M</p> <p>Total: \$46 M</p>
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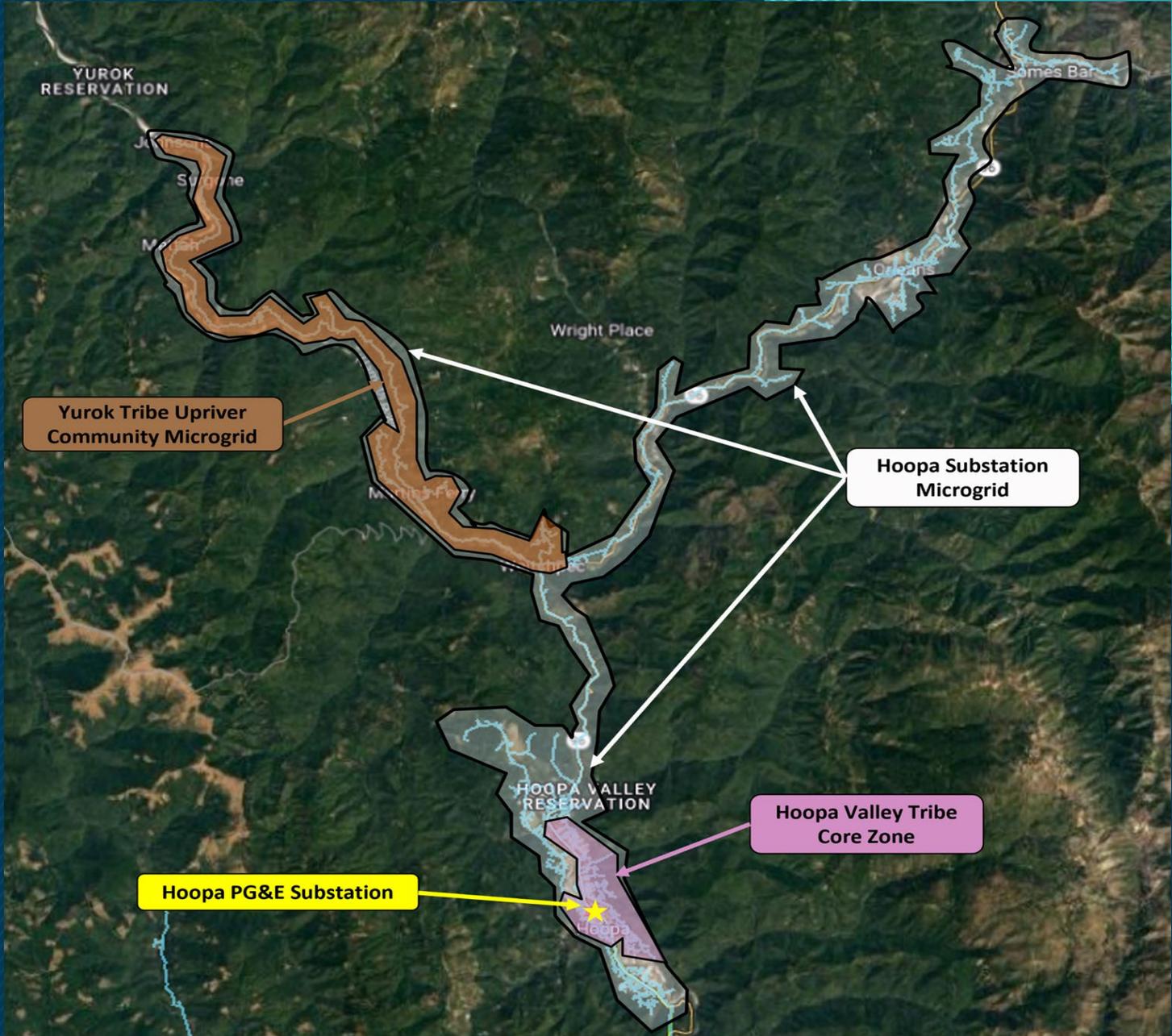
Solar
Masonite Mill Creek

Solar
Wagner Property

Battery
Near Substation

Small/ Low-Impact Hydro
(Possibly)
Location options being considered
Supply Creek or Hostler Creek

Solar and Battery
Julius Marshall Water Treatment Facility
And Hoopa Fire Department/OES



HVPUD GOALS



Nested Microgrids

CEC LDES

PG&E MIP

Communications Infrastructure

Fiber

Solar and Battery Solutions

Tribal solutions to minimize fossil fuels

State and Federal Collaboration

Regional Partnerships

Maximize Funding

Philanthropic Partners



Tse'diya
(Thank you)

Break – 15 Minutes

Local and Regional Government Panel



A Regional Perspective On Zonal Decarbonization

Amaury Berteaud

Director of Sustainability Programs, AMBAG



UNDERSTANDING Regional Energy Networks

RENs are an innovative framework for local governments to design and administer **CPUC energy efficiency programs.**



RENs are allowed to design innovative programs which focus on **servicing communities** in ways traditional energy efficiency programs do not.



This has led RENs to focus on serving **hard-to-reach customers** as well as disadvantaged and underserved communities.

Together, California's RENs serve...



37+ Million People

94% of CA's population

48 Counties

450 Cities



Northern Rural
Energy Network



CENTRAL CALIFORNIA RURAL REN

Leadership and Territory



Association of Monterey Bay Area Governments



San Joaquin Valley Clean Energy Organization



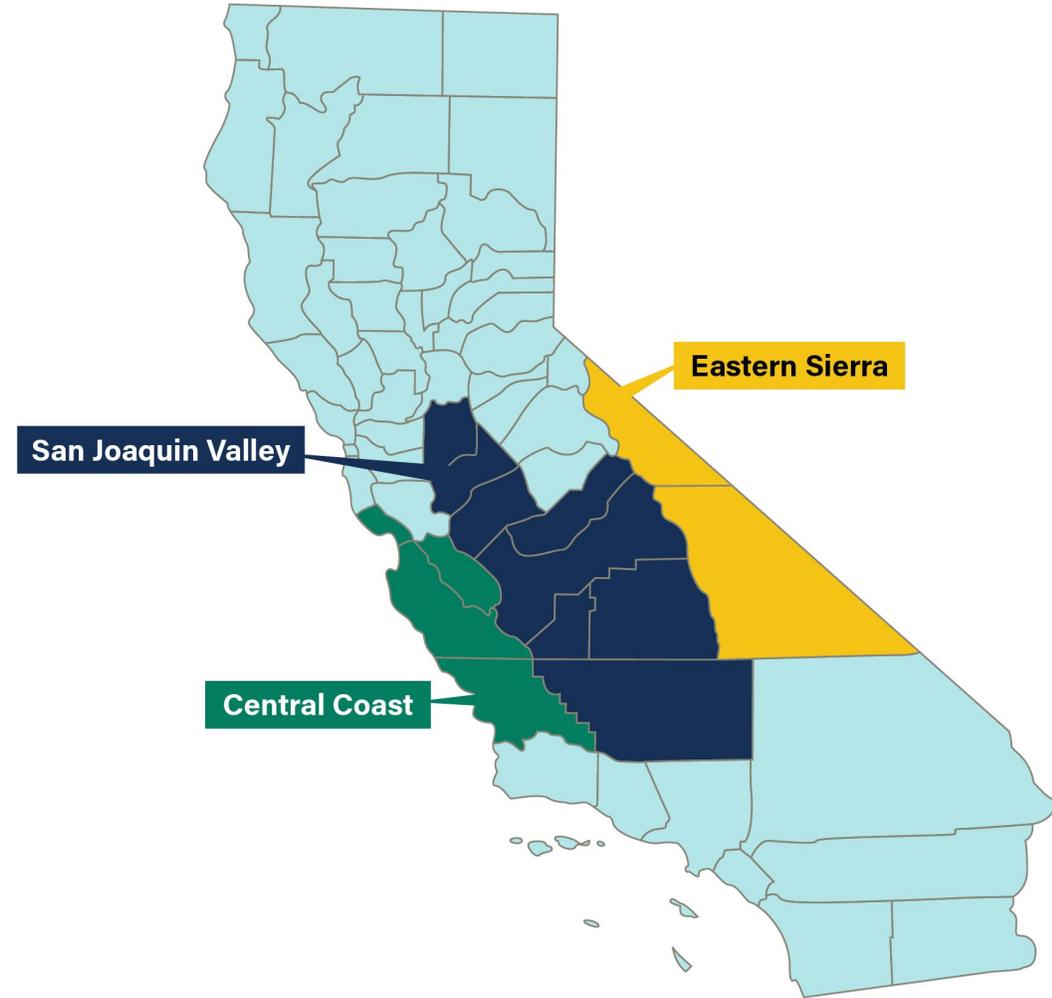
High Sierra Energy Foundation



County of San Luis Obispo



County of Ventura





CENTRAL CALIFORNIA
RURAL REN

Central California Rural REN serves 5.4 million customers across 14 Counties, and almost 50,000 square miles.

76 percent of CCR REN customers live in Census tracts that qualify as geographically hard to reach.

40 percent of CCR REN customers live in disadvantaged communities.

50 percent of CCR REN customers live in underserved communities.

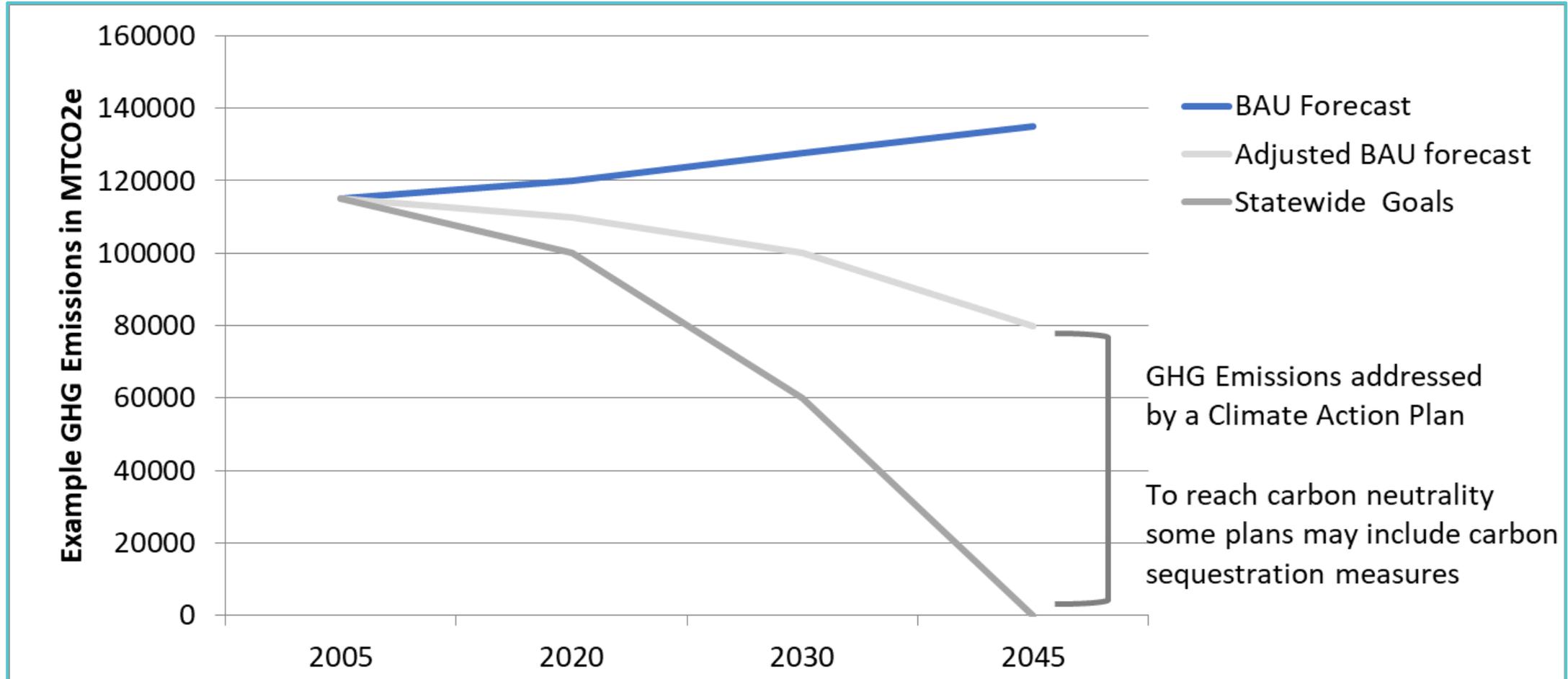


CCRRREN

Climate Action Planning,
a regional perspective



Climate Action Plan Process



Measures, Actions, Funding

- CAPs rely on measures to achieve GHG reduction targets in specific sectors.
- For example, “Decrease natural gas use by 12% by 2030 and 76% by 2045.”
- Measures rely on a set of implementation actions.
- For example, “Support commercial battery storage installations and business district scale microgrid opportunities.”
- For most actions included in a CAP there is no funding identified for implementation.

Zonal Electrification in CAPs

- Zonal electrification would typically be an action included under a measure.
- Many CAPs do not include Zonal Electrification because it is a fairly new concept.
- Some CAPs use other names such as Neighborhood Decarbonization/electrification, natural gas line removal.
- Most CAPs do not quantify the specific GHG impact of Zonal Electrification or the potential cost.

CCR REN

**What do local governments need
to support zonal electrification?**



Supporting Education and Outreach

- The terms around zonal Electrification, neighborhood decarbonization, gas line removal, etc. need to be standardized.
- Broad, interactive, education and outreach material needs to be created, and used to engage with the public.
- Policy briefs, simple CAP language, and technical assistance needs to be provided to assist staff in explaining these concepts to senior and elected leadership of cities and counties.
- Education and outreach needs to begin before a project is identified or fully scoped, so the community can engage once a project is proposed.

Stakeholder Recommendations

- There are number of public agencies and non-profits already engaging communities on energy efficiency and electrification.
- Local governments, REN's, CCAs, and CBO implementers have already built trust with communities and are perfectly positioned to collaborate on and even lead zonal electrification outreach.
- These engagement activities should be pursued through a variety of funding streams (e.g., ratepayer dollars, federal and state grants, philanthropic funding).
- Utilities should partner with local governments and existing program implementers to leverage existing funding commitments.

CENTRAL CALIFORNIA RURAL REGIONAL ENERGY NETWORK

For rural, by rural.



www.ccrren.org

Engaging Local Governments in Gas Line Removal



LOCAL GOVERNMENT
SUSTAINABLE
ENERGY COALITION

January 21, 2026

Jody London, Sustainability Coordinator, Contra Costa County
Representing the **Local Government Sustainable Energy Coalition**

California Public Utilities Commission Workshop on Best Practices and Future Pathways

Who is the Local Government Sustainable Energy Coalition?



- Statewide membership network representing local government interests related to clean energy and climate resilience to state regulatory agencies.
- Represent nearly two-thirds of the state's electricity demand

Local Government in California 101

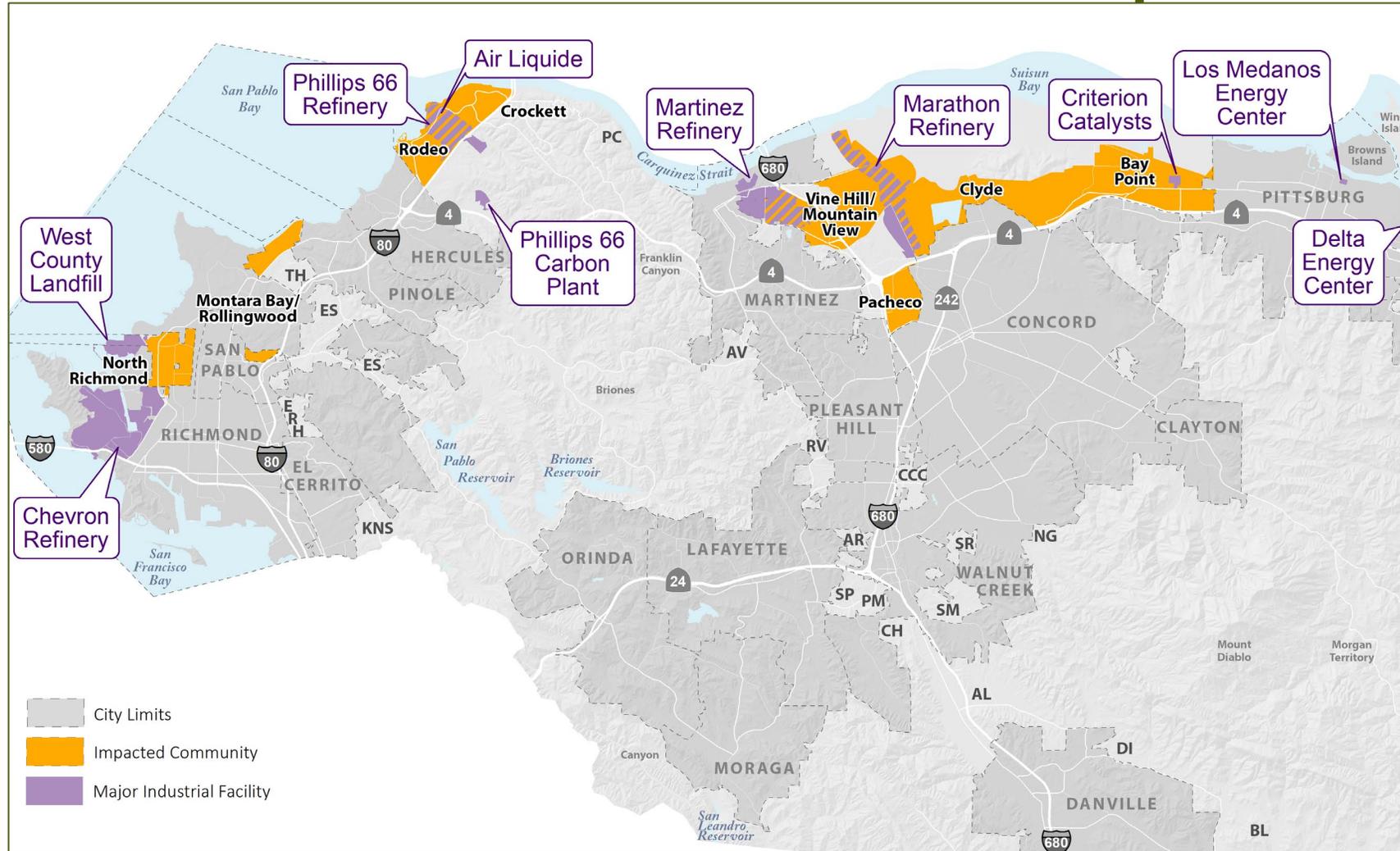
58 counties – governed by Boards of Supervisors. Day-to-day management is with County Administrator.

According to the California State Association of Counties, *counties differ from cities in their scope of authority and governance structure. Unlike cities, which have broad self-governing powers – including significant revenue-generating authority – counties operate under greater legislative oversight.*

Counties are the primary service provider of many state services such as public health, foster care, rehabilitation, elections and more.

- 482 cities – governed by city councils. Day-to-day management is with City Manager.
- Most cities are lucky if they have 1 or 2 people who work on energy and sustainability.
- San Francisco is both a city and a county.
- Local governments can better support the current proceedings on gas line removal if there is more certainty about inclusion of our neighborhoods.

Most Counties Include Communities in Unincorporated Areas



Contra Costa County.

January 2026 Note total County population is 1.15 million people; 175,000 people live in unincorporated areas.

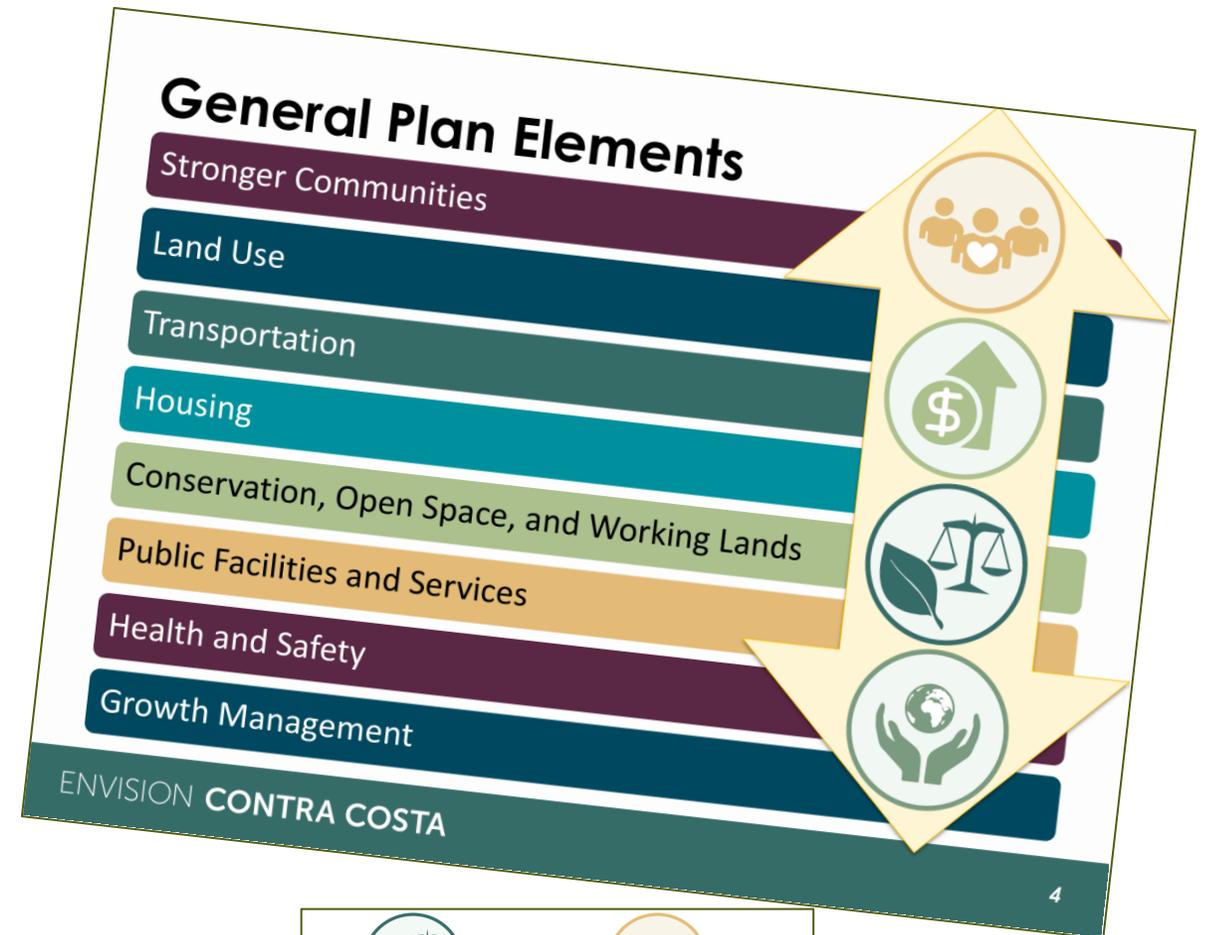
Guiding Policy Documents for Local Governments Related to Energy and Sustainability

General Plan (land use)

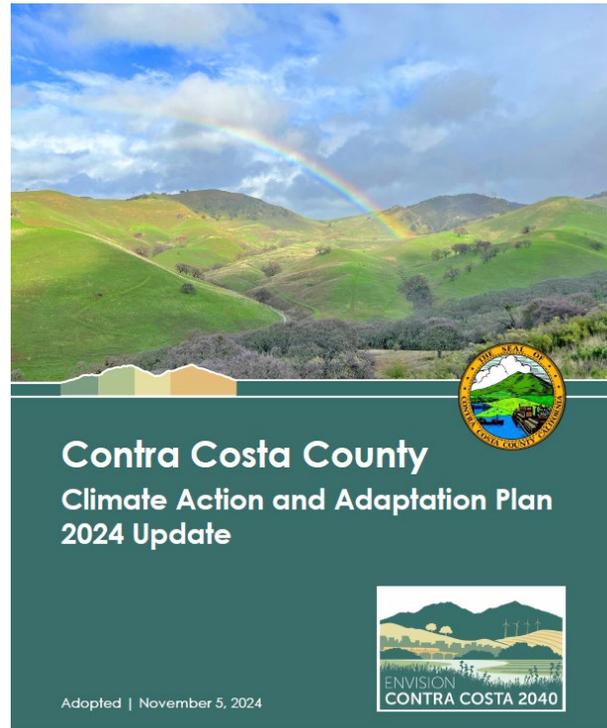
- General Plans are required by State to consider impacts of climate change
- If a jurisdiction is home to “disadvantaged communities,” the General Plan must address environmental justice

Local Hazard Mitigation Plan

- Required by Federal Emergency Management Agency
- Counties develop, in partnership with cities and special districts
- Identifies potential hazards to government operations and strategies for addressing them



Role of Climate Action Plans



- Climate action plans are voluntary. Local governments can develop policies and programs that address energy use without an adopted climate action plan. There is no established schedule to update a CAP.
- Some climate action plans are used to mitigate climate impacts of a General Plan.
- Some climate action plans include language that is aligned with goals of the CPUC gas-removal proceedings.
- Center for Law and Environment (UC Berkeley) 2023 study on climate action plans found that co-benefits can be important for local governing board action, particularly in smaller and/or more conservative communities.

Local governments are testing what is possible in terms of gas line removal.

San Francisco Climate Equity Hub

- One-stop shop for education and technical and financial support for residents.
- Since June 2024 has installed 55 heat pump water heaters at no cost to residents and referred participants to other programs like BayREN.
- SF was able to get 100% project completion by being creative. This is a great opportunity to help large numbers of homes at once.
- Key learning: removing gas is about good project management.

Contra Costa County

- Using federal block grant funds to retrofit family-based day care facilities in impacted communities to be all-electric

- Cities and counties can identify those communities that best lend themselves to all-electric neighborhoods.

Example: Recently closed horse race track in **Berkeley** will be redeveloped and it aligns with PG&E gas infrastructure needs ... so redevelop it to be all-electric?

- Utilities should be directed to partner with local governments to identify neighborhoods where gas line removal makes sense.

Funding Is a Challenge for Implementation

- Local Governments Should Not Have to Compete Against Each Other for Funds.
- And local governments need funding to:
 - engage with and educate community members
 - implement.



Challenge: Most local governments do not have the staff resources or budget for grant writers to develop complex grant applications. Most grants are oversubscribed, so a city or county must decide how much time it is able to put toward a complicated application for a grant it is unlikely to win.



Solution: The State should expand the use of **flexible block grants**, rather than a competitive grant process, for local governments that demonstrate how funds will be used to meet State-identified criteria.

This model has been successfully implemented in the past:

- * grants for Proposition 39 school energy efficiency projects
- * Ocean Protection Council's Senate Bill 1 Grant Program.

Hallmarks of these programs include **rolling quarterly submissions** and **intergovernmental collaboration**, which enable jurisdictions to **apply when they are ready** and able to implement these priorities.

Additional Funding Innovations

- Create a **revenue carveout** for local governments from the utilities to support gas line removal and conversion to all-electric. To the extent local governments can reduce stranded gas assets and contribute to electricity demand they should be paid by the IOUs.
- Use **revenue from data centers** to pay for this transition.
- **Leverage** existing relationships and programs, i.e., RENS, community choice energy, other opportunities.
 - *Example:* Contra Costa Asthma Initiative pilot program (2021-2023) provided weatherization and energy efficiency upgrades to homes of patients with high admittance to emergency room for asthma. Improving residential indoor air quality reduced costs on health care system.

Language Matters! A Lot!

- Talk about gas line removal in language that is accessible to the average person. Pretend you're talking with your intelligent grandmother/neighbor/father-in-law.
- See [Talk Like a Human](#)

Contra Costa County recently adopted a Clean Energy Roadmap, and we are looking for opportunities to remove gas lines from neighborhoods.

Glossary of terms

Say **less** of this... and **more** of this...

Climate change	Extreme weather
Sustainable	Safe and healthy
Warming	Over heating
Emissions	Carbon pollution
Renewable energy	Clean energy
Ban	Upgrade
Transition or transformation	Progress
Carbon tax	Pollution fine
Greener	Cleaner, quieter, faster
Sacrifice	Enjoy
Big Oil	Dirty fossil energy
Decarbonize	Eliminate pollution

Source: Potential Energy, Talk Like a Human

- Rebates are difficult for low- and moderate-income customers
- Need to provide a variety of zero-emission alternatives.
 - Each household should have an opportunity to offset the costs of using more electricity with solar and battery backup, either rooftop solar on participating households or a larger community solar installation.
 - Example: Richmond Rising’s Resilient Homes for Healthy Communities program, which installs solar panels and energy efficiency upgrades at no-cost to income-qualifying homes in the project area.
- Be open to new technologies. For example, balcony solar may be a good solution for renters.
- CPUC should consider joining ongoing meetings of California Collaborative on Energy and Climate (CCEC) and the Statewide Local Energy and Climate Coordination group (SLECC)

Suggestions and Lessons Learned

Questions for CPUC



- What is CPUC proposed process for selecting pilot locations for zonal decarb and how will cities/counties and community members get to participate in and influence that process?
- What funding will be available for residents that participate in the pilots? What will be covered vs. what will be out-of-pocket?
- How do we ensure that these pilot projects are not used as a way to increase rates to all ratepayers? We absolutely want pilots and we don't want the utilities to be able to capitalize on these capital infrastructure projects and give profits to shareholders.

Thank You!

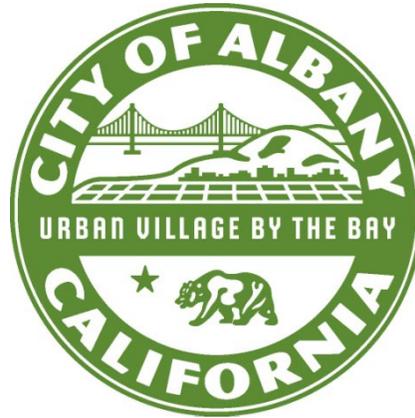
Jody London, Sustainability Coordinator

Contra Costa County

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925-655-2815

contact@lgsec.org



Gas Line Decommissioning in Albany

A local government perspective on decarbonization

Michelle Plouse
Community Development Analyst

About Albany

- Nestled northwest of Berkeley
- 1.5 square miles
- Population of 20,000
- Small, innovative City that prioritizes climate action

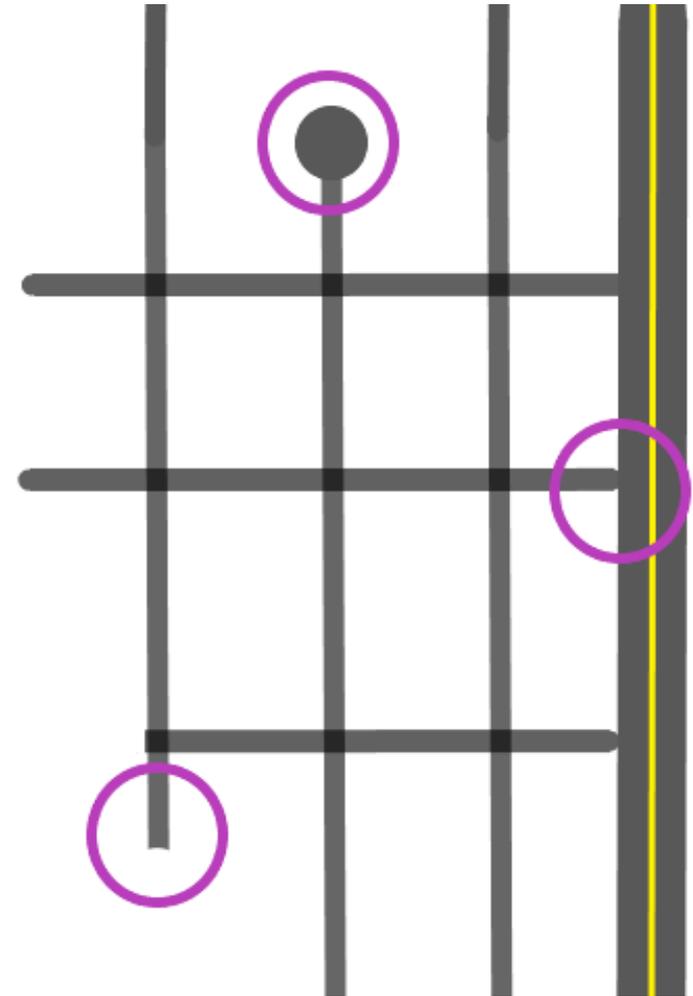
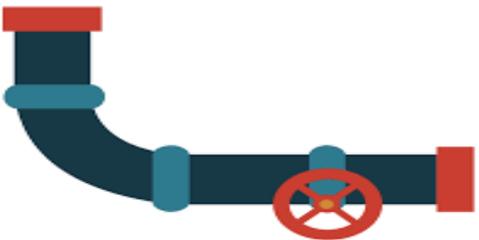


City Plans and Goals

- Climate Action and Adaptation Plan
 - Adopted in 2019
 - Goal: fully electrify 90% of residential buildings by 2045
 - Action 2.2.13 identify a pathway for converting existing buildings to all-electric energy.
- Council strategic plan
 - Adopted 2025
 - Goal: Reduce greenhouse gas pollution and adapt to climate change
 - Action: Continue work to establish a pilot program for electrification of existing buildings

Pilot Site Selection

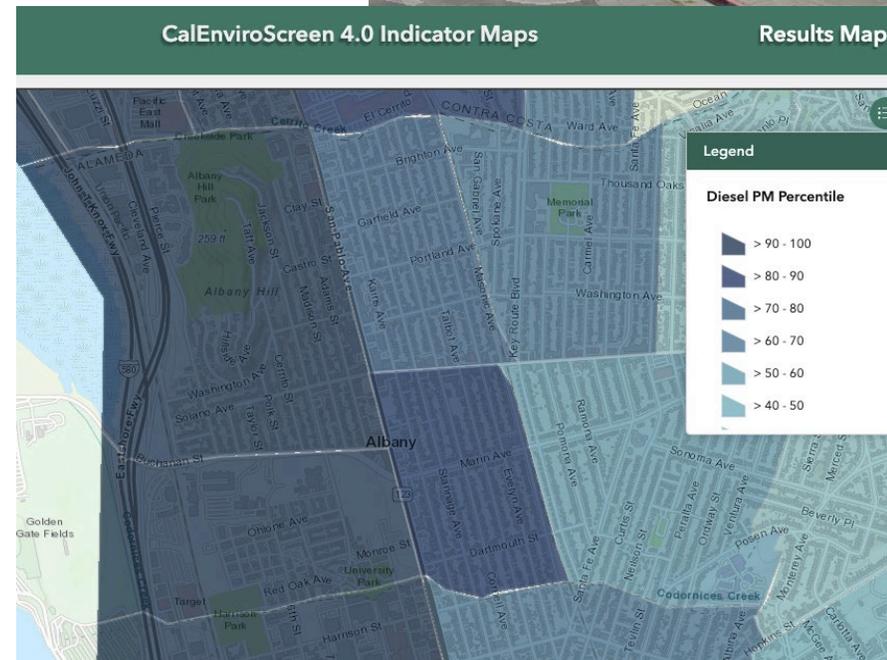
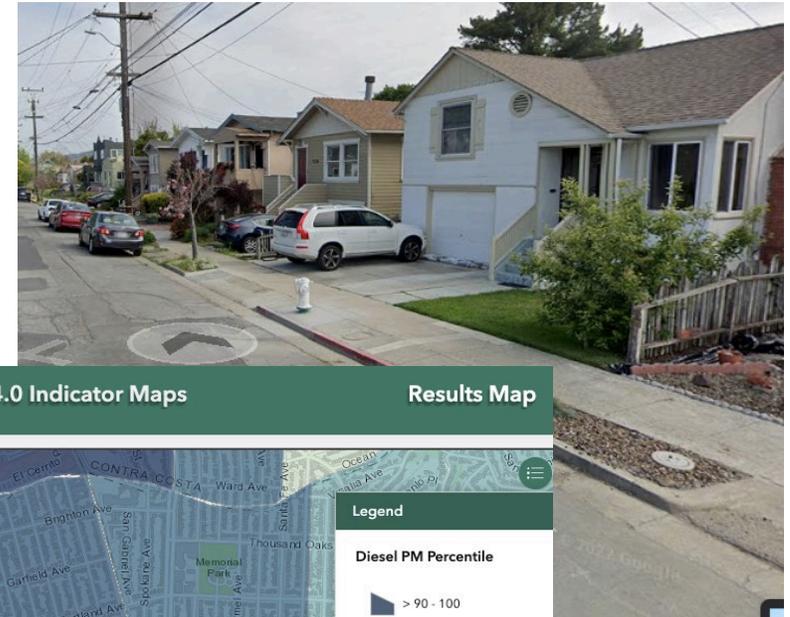
- PG&E Collaboration Tool
- Information
 - Location
 - Section Length
 - Age
 - Material
- Narrowed to about a dozen sites



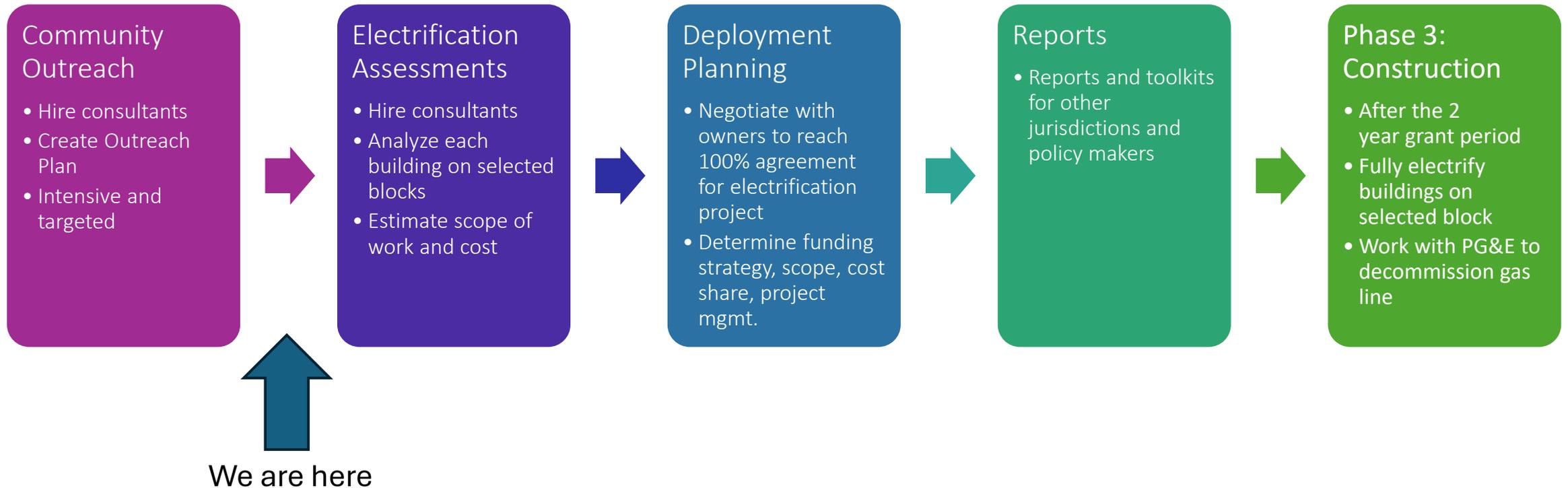
Pilot Site Selection

Assessor data and City permit data

- Building types (SF, MF, commercial, etc)
- Rental vs. Owner-occupied
- Age/renovations
- Equity and environmental data
 - Census data
 - Redlining maps
 - Calenviro screen



Pilot Process



Pilot Outreach



Community Leaders and Champions

- Effective engagement requires local, trusted, on the ground leadership
- Take advantage of geographic specificity
- Bring people outside
- Focus on locations with trusted and enthusiastic champions



Funding

- Funding is the biggest concern for residents and cities
- Local governments can't commit much time to competitive applications
- Much easier to get owners on board with guaranteed funding
- Balance of flexibility and security



Timing

- Give yourself enough time to electrify
 - Don't choose pipelines with looming deadlines
- Consider diverse timelines and approaches
 - In the long term how do we decommission at scale?
 - Different strategies depending on repair timelines?

Lunch

Local Program Panel



Direct-to-Renter™

A Clean Energy Solution Meeting the Urgent Needs of Low-Income Tenants

CPUC Decarbonization Workshop Local Programs Panel

Outline

1. Direct-to-Renter Program Design
2. 2024 Pilot and Implementation
3. Program Expansion Statewide
4. Gap Analysis and Differentiation
5. Workshop Themes and Future Directions

Quick Renter Stats

California:

- Renters make up 44% of households*
- Renters make up 66% of low-income population**

*Public Policy Institute of California, 2024 - <https://www.ppic.org/blog/californias-renters/>

**Low Income Needs Assessment Report, 2022, Evergreen Economics - https://liob.cpuc.ca.gov/wp-content/uploads/sites/14/2023/07/2022_LINA_Report_120922_FINAL.pdf

Direct-to-Renter Program

- Designed by The Energy Coalition
- Brings no-cost portable appliances directly to low-income renter households for their ownership and use
- Bypasses the need to work with landlords



Direct-to-Renter

Does NOT:

- ✗ Replace long term investments in buildings
- ✗ Solve other health and safety challenges faced by tenants (e.g., mold, lead)

DOES:

- ✓ Address immediate and profound *energy-related* health and safety needs
- ✓ Fill an equity gap in current energy programs

Direct-to-Renter - Technical Design

Benefits to renters:

1. Efficient, affordable cooling and heating
2. Resilience in the event of power outages
3. Indoor air quality improvements
4. Ability to manage energy use / bills
5. GHG reductions



Direct-to-Renter - Technical Design

Appliance criteria:

- Portable
- 120V
- No new circuits or panel upsizing
- No permission or involvement from landlords required



Appliance Categories and Benefits

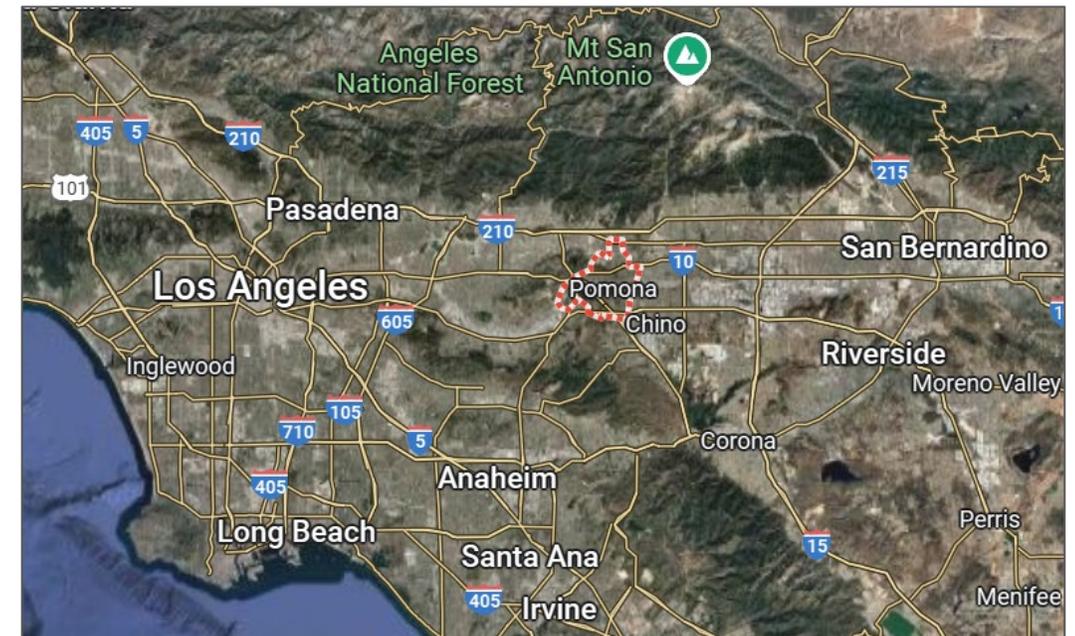
Appliance Category	Benefits				
	Resilience / Safety	High Heat Management	Indoor Air Quality	Utility Cost Savings	GHG Reductions
Portable heat pump air conditioners/ heaters		✓	✓		✓ (When used in place of inefficient units)
Electric cooking appliances		✓	✓		✓
Air purifiers			✓		
Portable batteries	✓			✓	✓
Fans		✓			✓ (If used to reduce need for existing A/C)
Energy management plugs and apps				✓	✓

2024 Appliance List for City of Pomona Pilot

Category	Appliance	Sample Images
Air Quality	Air purifier (\$110)	
Cooking	Electric kettle (\$41), slow cooker (\$99), induction cook plate (\$110), optional cookware (\$88)	
Cooling / Heating	Tower fan (\$77), portable heat pump A/C / heater (\$769)	
Power Storage	Portable plug-in battery (\$2,089)	
Smart Home	Smart plugs (\$48) / power strip (\$73), smart speaker (\$55, optional add-on)	

2024: Design and Pilot Implementation

- Funded by a DOE Community Energy Innovation Prize
- **CBOs were integral partners** in the design and implementation
- Programmatic design: eligibility, outreach strategy and materials, enrollment, ordering, staging, delivery
- Pilot Implementation:
 - 10 households in Pomona, CA
 - Collected surveys and testimonials



Pilot Program Participant Feedback Demonstrated the Need for Affordable Cooling



“The window one doesn’t help [to cool] the whole house.”

SURVEY RESPONDENT



“The appliances are needed for cooling [our] baby.”

SURVEY RESPONDENT



“The central A/C is too expensive [to use].”

SURVEY RESPONDENT

Pilot Program Participant Feedback Demonstrated the Program's Immediate, Powerful Impact on People's Lives



My electricity bill increased this summer, but it was less of an increase than last summer when I was using a \$100 portable A/C unit.

Liz G., Resident, City of Pomona



Pilot Program Participant Feedback Demonstrated the Program's Immediate, Powerful Impact on People's Lives



Estoy muy agradecida por el aire acondicionado portátil. Me siento fresca y me ha ayudado con las altas temperaturas. ¡Gracias Pomona ACTS!

I am so thankful for the portable air conditioner. I feel cool and it has helped me with the high temperatures. Thanks Pomona ACTS!

Fatima B., Resident, City of Pomona



Expanding Throughout the State

- **“Pomona ACTS” - Transformative Climate Community grant**
 - Funding from Strategic Growth Council
 - Direct-To-Renter is one of a suite of projects
 - >100 renter participants
- **Santa Monica**
 - Funding from the Clean Power Alliance
 - ~75-80 renter participants
 - Program is underway, started in 2024
- **Alhambra**
 - Funding just awarded from the Clean Power Alliance
 - ~100-150 renter participants
- **Orange County Power Authority (OCPA)**
 - Self-funded roll out starting Spring 2026
- **Peninsula Clean Energy (PCE)**
 - A proposed program within their business plan portfolio

Cities, CCAs, and State agencies are recognizing the need and embracing the benefits of a Direct-to-Renter program.

Each DTR program is tailored to local priorities and funding constraints.

Gap Analysis: Comparison to ESA Rules and Offerings

1	Feature	Direct to Renter	SCE ESA	Multifamily ESA	Notes / Takeaways
2	Eligibility criteria	Focus on low-income renters in priority/disadvantaged communities; program can also target residents of high-pollution areas or disaster-impacted communities.	SCE serves income-qualified homeowners (≤250% of Federal Poverty Guideline) and renters with active SCE service through a residential meter. Residences with four (4) or fewer units are considered single-family homes. Households qualify either by income (same income limits as PG&E) or by participation in specific public-assistance programs (see below). SCE	Property: Multifamily (≥5 units; shared walls/floors/ceilings) in a PG&E, SCE, SDG&E, or SoCalGas territory (or affiliated CCA) Resident (in-unit) path: even if a property doesn't qualify, income-eligible residents can still receive in-unit upgrades. Eligibility	Similar eligibility requirements
3	Method for verifying eligibility	Programs can streamline by prioritizing households already enrolled in utility income-qualified programs (e.g., CARE/FERA); Complex verification (e.g., tax docs) reduces sign-ups.	ESA Program eligibility can be met if 1 person in the household participates in one of the following programs: Bureau of Indian Affairs General Assistance CalFresh/SNAP (food stamps) CalWorks (TANF)/Tribal TANF Head Start Income Eligible (tribal only) Low Income Home Energy Assistance Program (LIHEAP) Medi-Cal/Medicaid Medi-Cal for Families (Healthy Families A&B) National School Lunch Program (NSLP) Supplemental Security Income (SSI) Women, Infants, and Children (WIC)	Verification . Two options for residents: 1) Categorical eligibility via listed public-assistance programs Medicaid/Medi-Cal for Families A & B CalFresh (food stamps) SNAP Head Start Income Eligible (Tribal Only) Bureau of Indian Affairs General Assistance Women, Infants and Children (WIC) National School Lunch Program (NSLP) Low-Income Home Energy Assistance Program (LIHEAP) Supplemental Security Income (SSI) CalWORKs (TANF) or Tribal TANF 2) Income by household size using CPUC ESA limits (250% FPG).	While neither program lists CARE / FERA enrollment as an option for proof of eligibility, the CPUC ESA website explicitly says: "Providing no-cost weatherization services to consumers who meet the CARE or FERA income limits".
4	Appliances/measures & benefits for SF homes	Portable heat-pump A/C+heater, portable battery, induction cooktop + cookware, air purifier (with extra filters), electric cooking appliances (induction cookplate, electric kettle, air fryer, etc.), fan. Targets resilience, high-heat management, IAQ, electrification, and bill affordability without landlord approvals.	Program Flyer Lighting Smart Power Strip Refrigerator Replacement Smart Thermostat Thermostatic Shower Valve/Showerhead Clothes Washer Replacement Dishwasher Replacement Freezer Replacement Heat Pump Water Heater Replacement Pool Pump Replacement Cooling: Evaporative Cooler Evaporative Cooler Maintenance Window or Wall AC Replacement Central AC or Central Heat Pump Replacement Portable AC HVAC Filter Weatherization Services <i>These services may not be available in all areas. Certain restrictions may apply for all products and services.</i>	See list here . Lighting (LED lamps & fixtures; retrofit kits; occupancy sensors) Smart Power Strip Refrigerator Replacement Clothes Washer Replacement Smart Thermostat Thermostatic Shower Valve / Showerhead (incl. low-flow showerhead; kitchen & lavatory aerators) Heat Pump Water Heater Replacement (in-unit, plus central HPWH option) Water Heater Pipe Insulation & Repair/Replacement (includes storage/tankless options) Pool Equipment (variable-speed pool pump; pool/spa heater) Cooling / HVAC (Central AC or Central Heat Pump, Split AC/HP, Ductless Mini-Split Heat Pump, PTAC (packaged terminal AC), Portable AC , Duct Leakage Sealing, Central Gas Furnace) Health & Safety: Air purifier , CO alarm, smoke alarm Weatherization Services: Air sealing, attic insulation, wall insulation	Overlapping appliances with the DTR program include the portable AC unit and air purifier. Does not include portable battery or electric cooking appliances.
5	Level of cost coverage	Appliances provided at no cost to participants	Appliances and installations are provided at no cost. Co-pay may be required for some services (noted on SCE flyer fine print)	Residents: in-unit upgrades at no charge if income-qualified. MF ESA .	No difference in level of cost coverage.
6	Home entry / assessment required?	No requirement for home assessment or entry.	Yes. After qualifying, an SCE-approved contractor does a walk-through assessment; SCE may also perform a post-installation inspection. SCE	Yes. On-site energy assessment are required and conducted by "Energy Advisors". Program flyer also describes the assessment process and post-audit guidance.)	This is a critical differentiator, especially in underserved communities.
7	Landlord involvement required?	Designed to avoid landlord approvals: portfolio prioritizes 120V, portable technologies that don't require landlord consent.	Yes. As noted on the flyer , "renters may be required to obtain the property owner's written permission before services are delivered"	In-unit upgrades are installed by an ESA contractor network; Property coordination is typically needed for access/scheduling but no specific mention of formal landlord-permission	This is a critical differentiator, especially in underserved communities.
8	Use of CBOs for outreach/enrollment	Core feature. DTR is CBO-led for outreach, trust-building, enrollment, and logistics; emphasizes multilingual materials and partner logos.	No specific mention of CBOs	Emphasis on delivery via the ESA contractor network, program Energy Advisors, and utility Single Point of Contact (SPOC) channels; no explicit mention of CBO-led outreach	This is a critical differentiator, especially in underserved communities.

Findings: Existing statewide programs fall short in serving renters

	ESA	DTR
Offerings	Portable AC Air purifier	Portable HP AC/Heater Air purifier Battery Electric cooking appliances
Program Design	Requires home entry Requires landlord involvement	No home entry No landlord involvement CBOs are integral to outreach and education
<p>Per 2024 filings with the Low Income Oversight Board:</p> <ul style="list-style-type: none"> • SCE* ESA provided only 24 portable AC units to SF homes and 0 to MF homes • PG&E** ESA provided only 10 portable AC units to SF homes and 3 to MF homes 		

Direct-to-Renter addresses the barriers to serving low-income renters and under-resourced communities.

CBOs are essential to program design, outreach, education, and relationship building.

*https://liob.cpuc.ca.gov/wp-content/uploads/sites/14/2025/10/SCE-Low-Income-Annual-Report-2024_Revised.xlsx

**https://liob.cpuc.ca.gov/wp-content/uploads/sites/14/2025/10/PGE-ESA_CARE_FERA_AR_Tables.xlsx

Workshop Themes and Future Directions (1 of 2)

Best practices:

- **Serve renters directly**
 - Recognize the need for non-permanent interventions
 - Recognize the energy-health nexus and urgency of unmet needs
- **Integrate CBOs in program design, outreach, and education**

- Program implementers **tailor offerings** to local priorities and conditions, e.g.
 - Marketplace innovation for ordering and delivery
 - Portable solar panels may be a feasible offering in some areas
- Ensure that the growing need for rental unit cooling is **met with heat pumps**
 - Otherwise people will buy cheap / second-hand units
 - Less efficient and more costly to operate
 - New LA County cooling ordinance (Aug 2025) requires landlord action by 2027

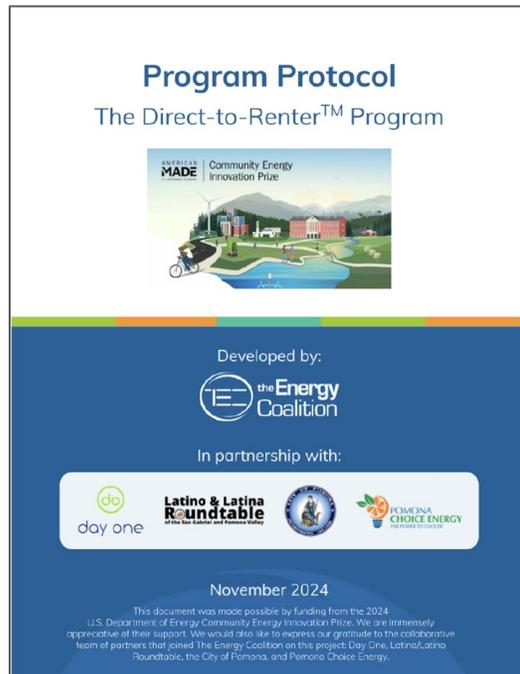


Workshop Themes and Future Directions (2 of 2)

- Goal: enable use of **portable battery in conjunction with heat pump**
 - Reduce electricity bills and support the grid by shifting load to non-peak hours
- Assess extent to which portable heat pump **heating feature** can replace use of gas furnaces / wall heaters
 - Will provide immediate GHG and pollution reduction
- Expand **data analytics** - quantify energy reduction and indoor AQ benefits
 - Renters also need help to understand their bills and manage energy use
- Program learnings support **CaIMTA**
 - **Room Heat Pumps MTI, Induction Cooking MTI**
 - Increased engagement provides insights into rental building stock (e.g. SM slat windows)
- Potential to help overcome a **major barrier to zonal decarbonization**
 - Induction cook plates can provide a stepping stone to full stove replacement
 - CBOs can provide education around indoor AQ benefits

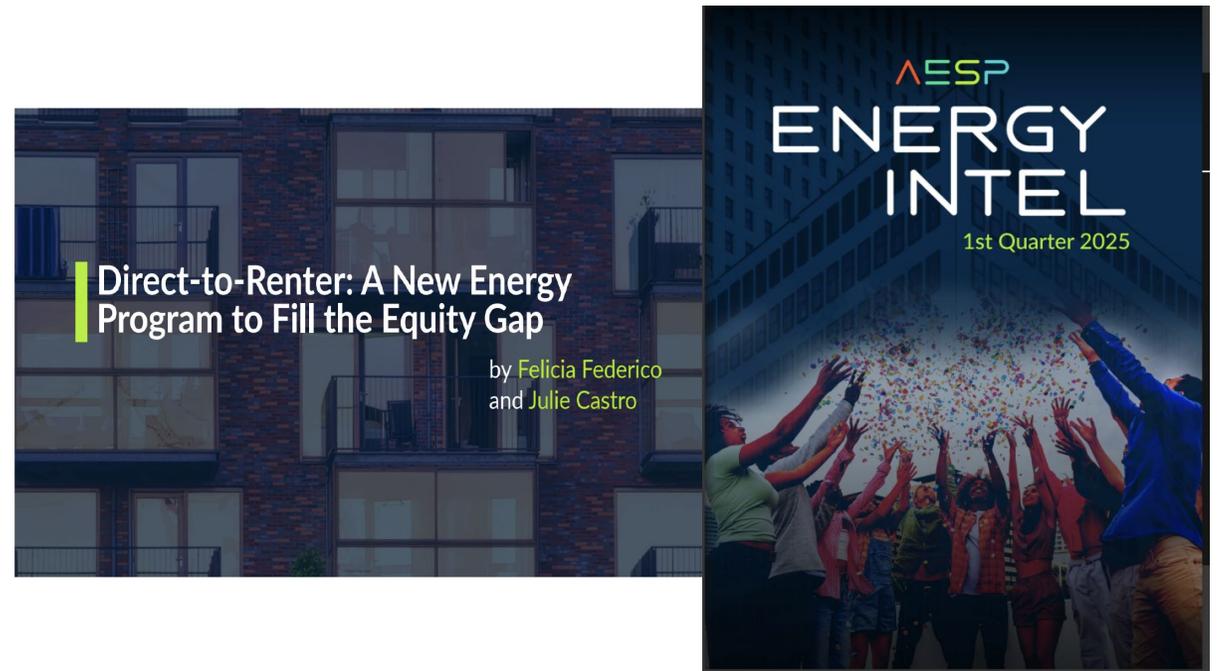
Resources

Direct-to-Renter Program Protocol A roadmap for scaling



https://energycoalition.org/wp-content/uploads/2025/02/Pomona-DTR_Protocol.pdf

AESP Q1 2025 Energy Intel Article A deeper dive into the pilot program motivation and implementation



<https://online.pubhtml5.com/sicr/pyev/>



Thank You!

Questions?

Felicia Federico, D.Env.
Director, Funding and Research
ffederico@energycoalition.org

Extra Slides

Motivation

Programs designed for rental property owners have barriers that limit uptake.

- The “split incentive”
- Renters have no control and very little influence over a landlord’s decision to participate.
- Policies related to rental property upgrades may increase the likelihood of tenant displacement.

Motivation (cont'd)

Energy program incentives build wealth for owners, but not for renters.

- Programs designed for homeowners (such as solar, battery storage, and appliance electrification) build wealth for participants by increasing the value of their home.
 - Incentives and/or direct install for low-income households can be worth ~\$5K-\$20K
 - Most of these improvements also reduce energy bills
- Renters benefit from reduced energy bills when they participate in community solar or CARE/FERA rates, or when improvements are made to landlords' property, but none of these programs build wealth for renter households.

From SAJE 2025 Report: A Renter's Right to Cooling



Living through dangerous levels of indoor heat is common, especially in the summer. Most tenants described their apartments as hotter than the outdoors during heat waves.



The monthly electricity costs associated with A/C are often unaffordable, making tenants hesitant to run A/C units.



Indoor heat makes people sick. Tenants reported physical- and mental-health impacts from extreme heat, including headaches, dizziness, asthma attacks, nosebleeds, anxiety, and heat rashes.



Leaving home to cool down is expensive. Tenants who have tried escaping the heat in their homes by going to cafes, gyms, or the beach said the cost of food, gas, and parking quickly add up.



Many landlords disallow window A/C units, citing electrical or aesthetic concerns.



Tenants overwhelmingly want A/C. Despite the costs associated with running it, nearly everyone said they would use A/C if it were provided and believe it should be a legal requirement.

Oakland EcoBlock



A Neighborhood Energy Retrofit

Therese Peffer, PhD
California Institute for Energy and Environment (CIEE)
University of California, Berkeley

21 January 2026



Oakland EcoBlock: A Zero Net Energy Neighborhood Retrofit

California Energy Commission Advanced Energy Community

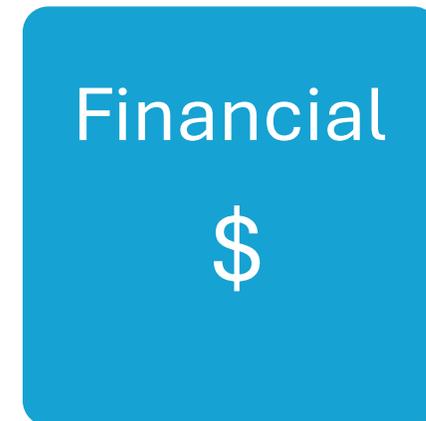
Phase I (2016-2018), \$1.5M: Feasibility study

Phase II (2019-2026), \$5M + \$3M donors: Build

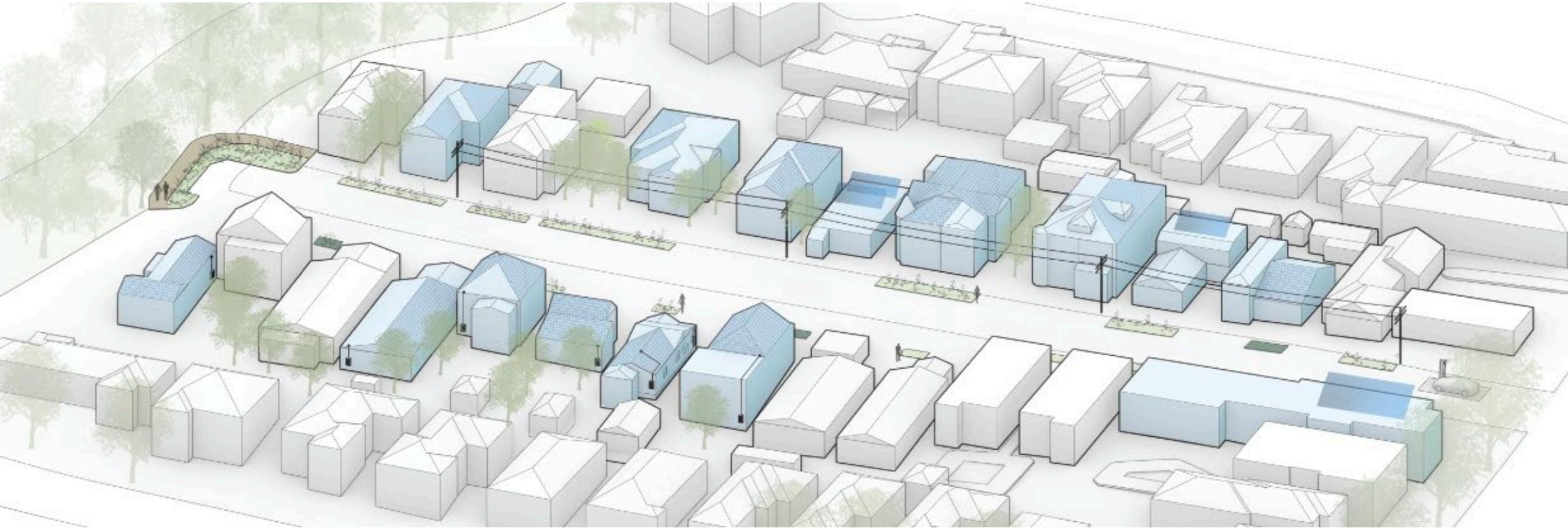


Goals:

- provide **affordable** solar/energy upgrades,
- reduce greenhouse gases,
- improve electrical grid **reliability**,
- strengthen **community**, and
- **scale**



Oakland EcoBlock Overview



Oakland EcoBlock: Affordable, Clean, Resilient Energy

Energy efficiency
(insulation/air sealing) in
older urban housing stock

Electrification of space
conditioning, water heating,
cooking, and clothes drying

Shared rooftop **solar** (some
roof replacement)

Kitchen/bathroom **fans**

Upgraded electric **service
panel**

Design: Microgrid & Curbside
EV charger and **EV car share**

Stormwater biodetention &
sidewalk planting/mulch

Innovative legal & financial
structures for **community
ownership & governance**

Provide templates and best
practices for a **path to scale**

0 100' 200' 400'





We are exploring how EcoBlock leverages Economies of Scale to:

- Reduce energy transmission losses
 - Save construction time
 - Decommission natural gas lines
 - Rapidly increase adopters through neighbor/peer effect
- * Reduce capacity for solar/storage by sharing
- * Fewer vehicles/equipment through car/EVCS share

Lessons Learned

Engage the Community!



Connecting Neighbors

- Created a Home Owners' Association to co-own solar
- Work with block to address quality of life and affordability:
 - uncomfortable homes
 - broken windows
 - security
- Tangible benefits:
 - street tree planting/mulch
 - bulky trash/recycling pickup
 - bioretention swale
- Education
- Language





Laundry to landscape irrigation workshop



Education



AUGUST 2023 | ISSUE NO. 27

AROUND THE BLOCK

ECOBLOCK'S COMMUNITY NEWSLETTER

From the team

Dear Neighbors,
Happy summer! We apologize for the long silence, and hope you are well. Things have been busy with EcoBlock behind the scenes, and we're excited to share the latest project updates with you:

- **Construction** is starting this month, **PG&E service upgrades** are delayed, and **permitting for the block-level upgrades** is underway. (pg. 2-3)
- Blossom Street residents: Interested in being part of the EcoBlock recycling group? **Nick Corlett** shares his experience using **Ridwell**, an innovative community recycling service, with fellow neighbors on the block. (pg. 4)
- The **San Francisco-Oakland Bay Bridge** is a remarkable feat of engineering with a secret guardian: the Bay Bridge troll. Learn about this mysterious figure who has added intrigue and bit of magic to the Bay Bridge for decades. (pg. 5)

With appreciation,

Therese Peffer
Principal Investigator
tpeffer@berkeley.edu

Cathy Leonard
Community Liaison*
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(510) 927-1574
**Primary contact*



CREDIT: HAIKIN GUO

A greener future: The Oakland EcoBlock is paving the way for more sustainable and climate-resilient communities.

General announcements

- | | |
|---|---|
| <p>All participants: Homeowners & Renters</p> <ul style="list-style-type: none"> • Recently, PG&E notified the team that given the current electrical load issues on the block, the service upgrades will require them to replace the existing overhead distribution lines. This will reduce the cost of the microgrid but will delay the project by about six months. The first step in the process is to submit the service upgrade contracts—the team is working with all participating PG&E customers to sign the contracts, which the project will pay for. | <p>All Homeowners</p> <ul style="list-style-type: none"> • The Blossom Street Association (BSA) Board of Directors has hired a Homeowners Association (HOA) manager to oversee the day-to-day legal, budgeting, administration, and maintenance issues for the Oakland EcoBlock. |
|---|---|

Upcoming events

- **Try induction cooking—for free!**
East Bay Community Energy (EBCE) and Acterra are offering all East Bay residents—both EBCE and non-EBCE customers—the chance to "test drive" induction cooking in their home for free! Apply to reserve your Induction Lending Kit today: ebce.org/induction-cooking.
- Given PG&E's new policy, Eco Performance Builders is planning to **conduct construction in phases**, and is **starting work on the block this month**. They will be in touch with this new schedule.

APPLIANCES 101: KNOW YOUR HEAT PUMP WATER HEATERS

01 WHAT ARE HEAT PUMP WATER HEATERS?

Heat pump water heaters (HPWHs) work like refrigerators in reverse: they use electricity to capture heat from the surrounding air and transfer it into an **internal water tank**. Water heating accounts for roughly **20 percent** of home energy use and makes up the **largest residential natural gas load**. However, recent technological advances have made HPWHs more effective for efficient electrification.

02 TYPES OF HEAT PUMP WATER HEATERS

- **Integrated:** Integrated HPWHs have an **internal compressor** on top of the hot water tank. They typically include **1-2 electric resistance elements** that provide backup hot water during periods of high demand (e.g. during the colder winter months).
- **Split:** Split systems have an **external compressor** that is connected to a hot water tank inside the house. They typically do not include an electric resistance heater.

03 INSTALLATION CONSIDERATIONS

- **Size & first hour rating:** To properly size a HPWH, consider how many gallons of hot water it can supply per hour.
- **Sound & filtration:** HPWHs produce **ambient noise** during operation and require regular **air filter cleaning**.
- **Condensate:** HPWHs produce **distilled water** that should be drained outside or to a sewer.
- **Location:** HPWHs should be placed **indoors**, where temperatures stay between **40°-90°F** year-round.
- **Air space:** About **750-1,000 cu. ft.** of air space is needed. The HPWH can be vented to bring in air for intake.

04 WHY HEAT PUMP WATER HEATERS?

<p>Pros</p> <ul style="list-style-type: none"> + Can program mode and set point controls to optimize operation + Premium costs can be offset with long-term energy savings, federal tax credits & local rebates 	<p>Cons</p> <ul style="list-style-type: none"> + Higher initial costs + Have unique space & installation requirements + May take longer to heat larger volumes of water to the preset temperature when demand is high
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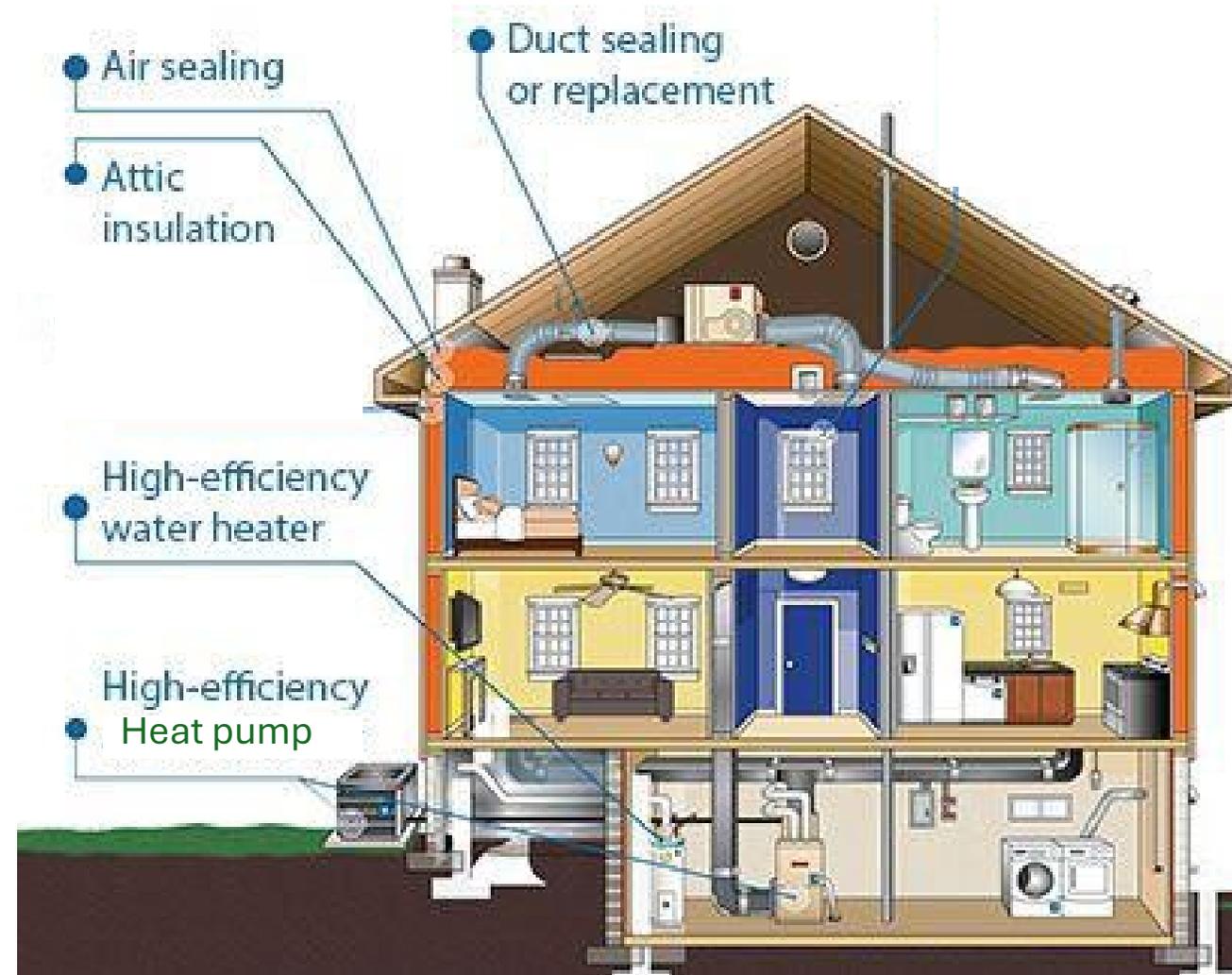
Design by Eunice Chung | Sources: Amy Dryden & Therese Peffer, EcoBlock • Bob Vila • Build with Rise • ENERGY STAR • This Old House • U.S. Department of Energy • U.S. Energy Information Administration

UTILITIES 101: KNOW YOUR UTILITY POLES

Home Performance + Electrification in Existing Homes!

Reduce loads to **make equipment smaller & cheaper** and provide **improved comfort and indoor air quality**

Next time: **Low power electrification:** smart switching/panels to **alleviate need to upgrade service**



Why focus on Existing Single-Family Homes?

- 50-60% of CA homes were built before energy code
 - 70% of Bay Area homes!
 - 100% of Oakland EcoBlock!
- 72% of CA homes are 1-4 unit
- Embodied carbon savings by preserving housing stock



Economies of scale: in construction

- Reduce soft costs of customer acquisition: lower bid for multiple projects (roofing)
- Fewer truck rolls (delivering appliances, trips to the dump)
- Potential for bulk purchase of appliances and heat pumps
- Alleviate “half-day” labor issue when a project finishes midday



Economies of scale: neighbor or peer effect

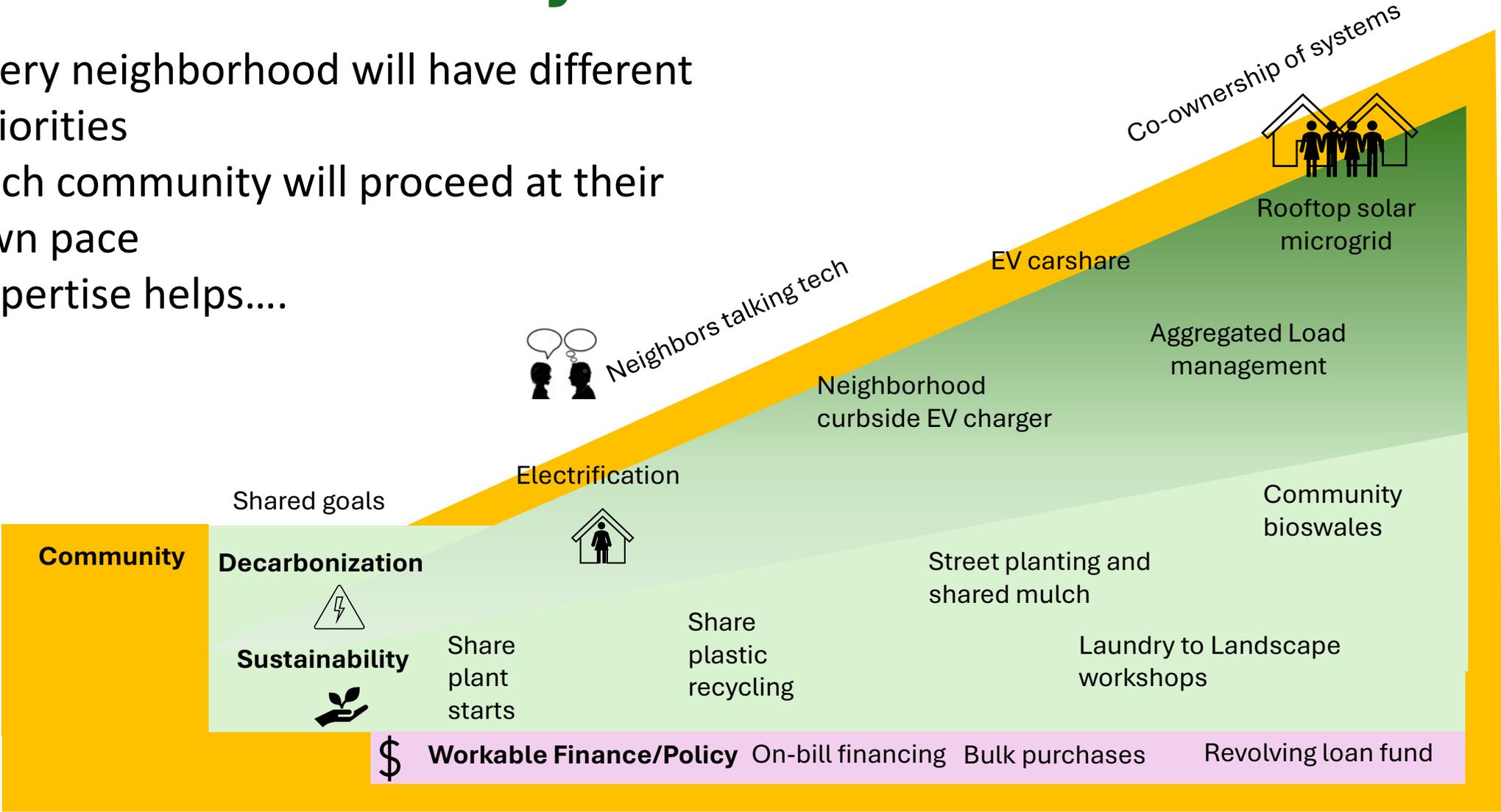
- Solar adoption is contagious in neighborhoods regardless of income.
- These new technologies—heat pumps, induction stoves—are hard to understand
- Trusted source of information: Neighbors talk to each other about new technologies and can reduce the burden



Illustration: Thoka Maer

The EcoBlock Journey

- Every neighborhood will have different priorities
- Each community will proceed at their own pace
- Expertise helps....



Oakland EcoBlock Stakeholders

Partners



Technical
Advisory
Committee



ZNE/Alliance

EcoBlock Community Association



ecoblock™

Research



Renewable & Appropriate Energy Laboratory
RAEL



Berkeley Law
Center for Law, Energy, & the Environment



BERKELEY LAB

Implementation



Morgan Lewis



Sponsors



Anonymous Donor

Utilities



Next steps

- Finish construction (Feb 2026)
 - Main load centers, rooftop solar, electric cooking and clothes drying
- Look for funding
 - Interactive website, look for next site
- Test equitable distribution of solar credits and Association fees
- Interview residents
- Document lessons learned in a Guidebook
- Brainstorm how to scale, how to transfer this knowledge effectively

Questions?



www.ecoblock.berkeley.edu

Therese Peffer
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Berkeley
UNIVERSITY OF CALIFORNIA



Residential Electrification – Local Learnings

Rafael Reyes

Senior Director of Energy Programs

CPUC Workshop Jan. 2026





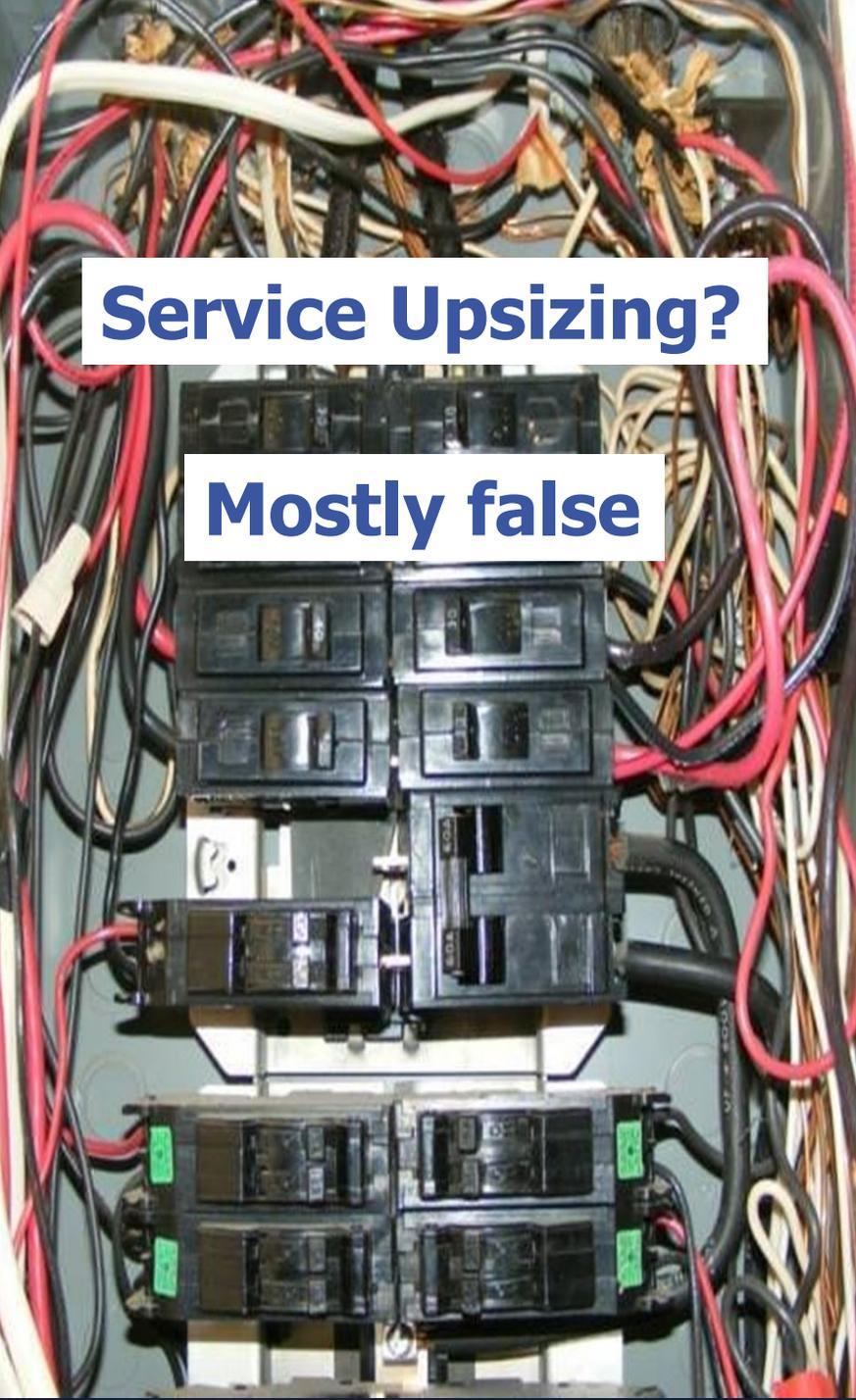
NO MORE GAS
GO ALL-ELECTRIC!



Another home retrofitted to be

HECO

- **5,000 projects**
- **>500 space & water**
- **Pilots (120v, combos, whole-home)**



Service Upsizing?

Mostly false



Install Cost?

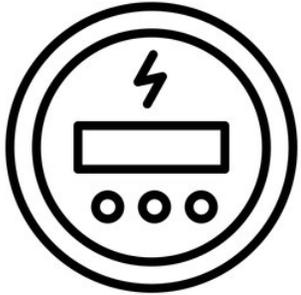
Can improve



Bill Impact?

Mostly better

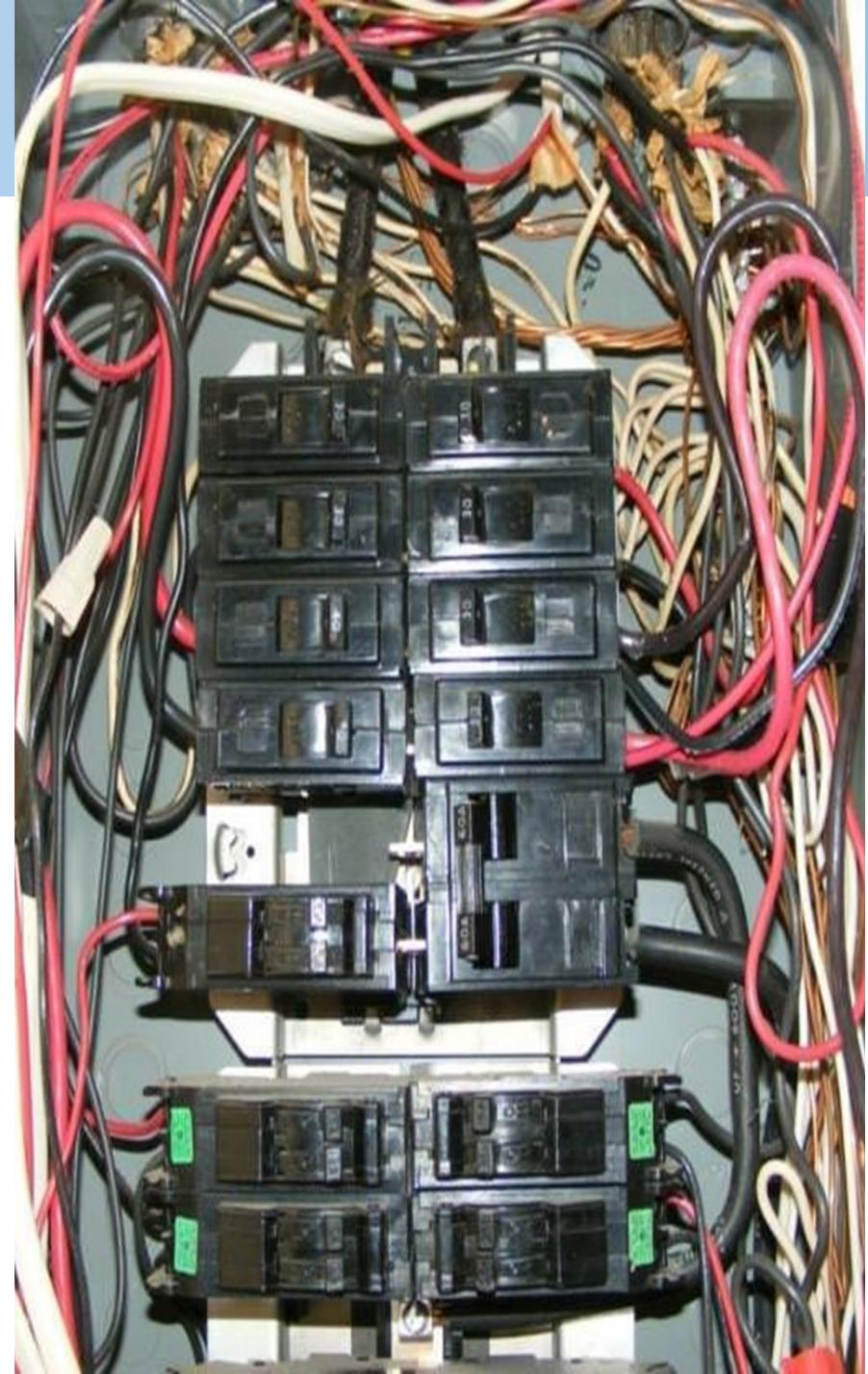
Service Upsizing?



Average max usage 38 amps
(165,000 homes)



9 whole-home electrification pilot:
no service upsizing (5 as 100a)



Install Costs: Whole-Home Pilot



\$35k average, +\$10k incremental



Installer education needed



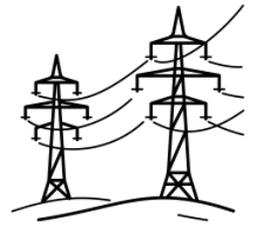
Areas for improvement: permitting, equipment volume, tech innovation



Bill Impacts?

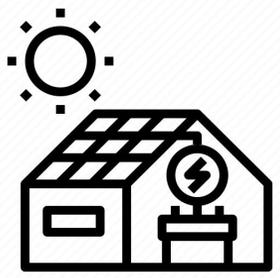


Pilot homes – ave. benefit 20%
(more if on EV-A rate)

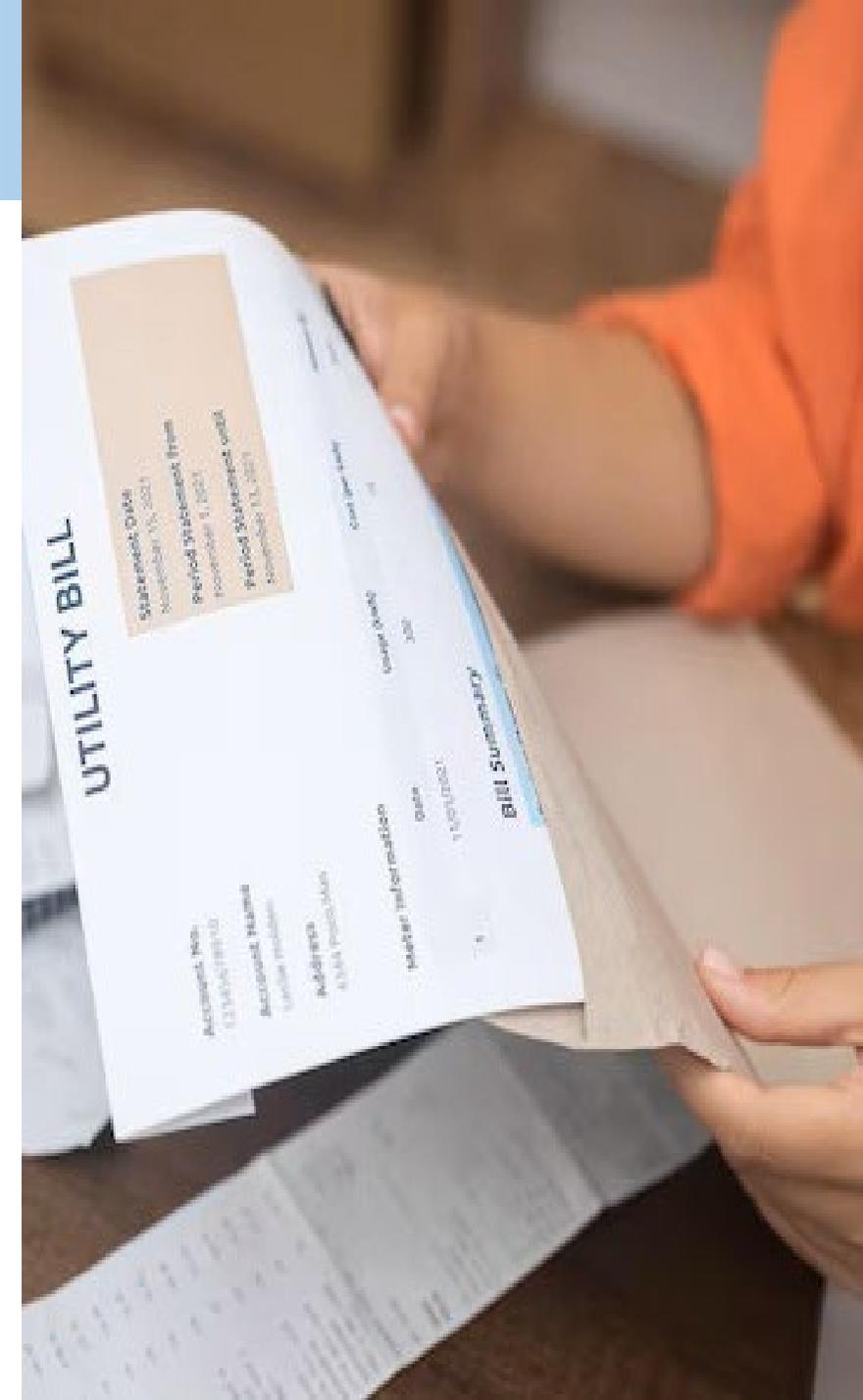


Modeled results – \$30/mo benefit

Controlling T&D rates



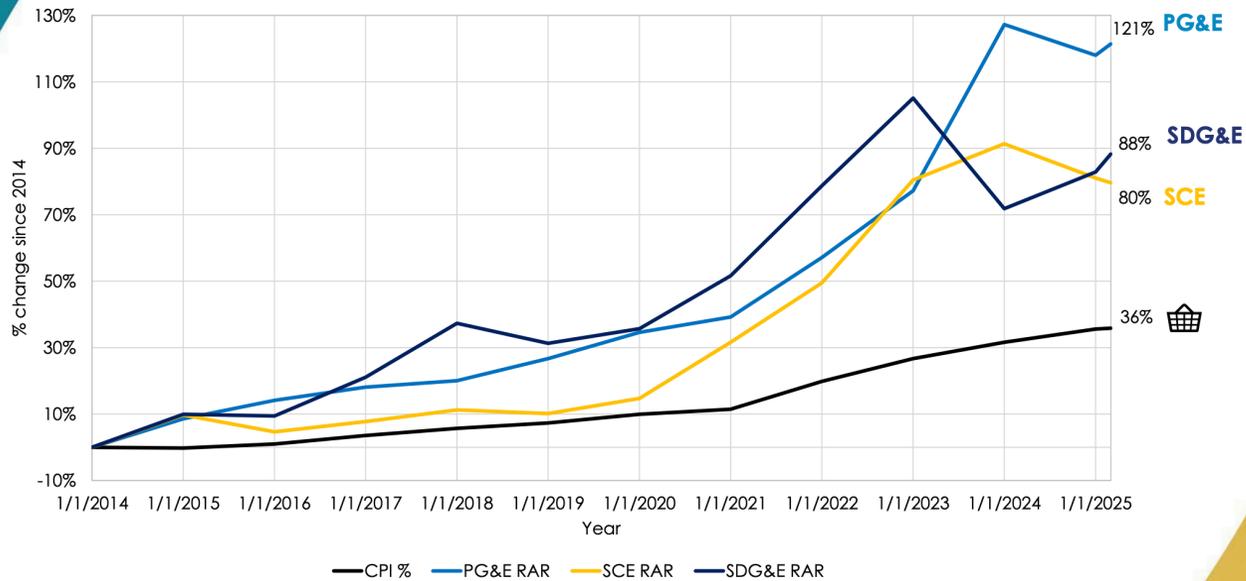
Distributed solar & storage



Increasing Rates Make Electrification Harder

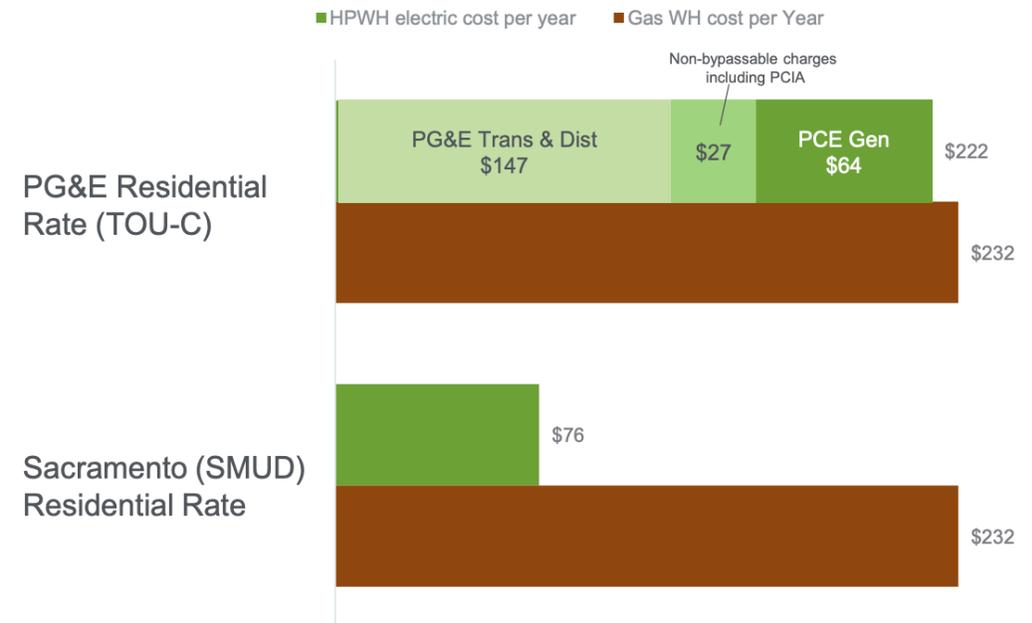


Rates have increased substantially since 2014, surpassing inflation



*Showing latest Bundled Residential Average Rates (RAR) and Consumer Price Index (CPI) for All Urban Consumers (CPI-U) found at <https://data.bls.gov/cgi-bin/dsrv/cu> as of May 15, 2025.
 **For details on primary drivers of rate changes in Q1 2025, see Appendix Slides 18 through 23.

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

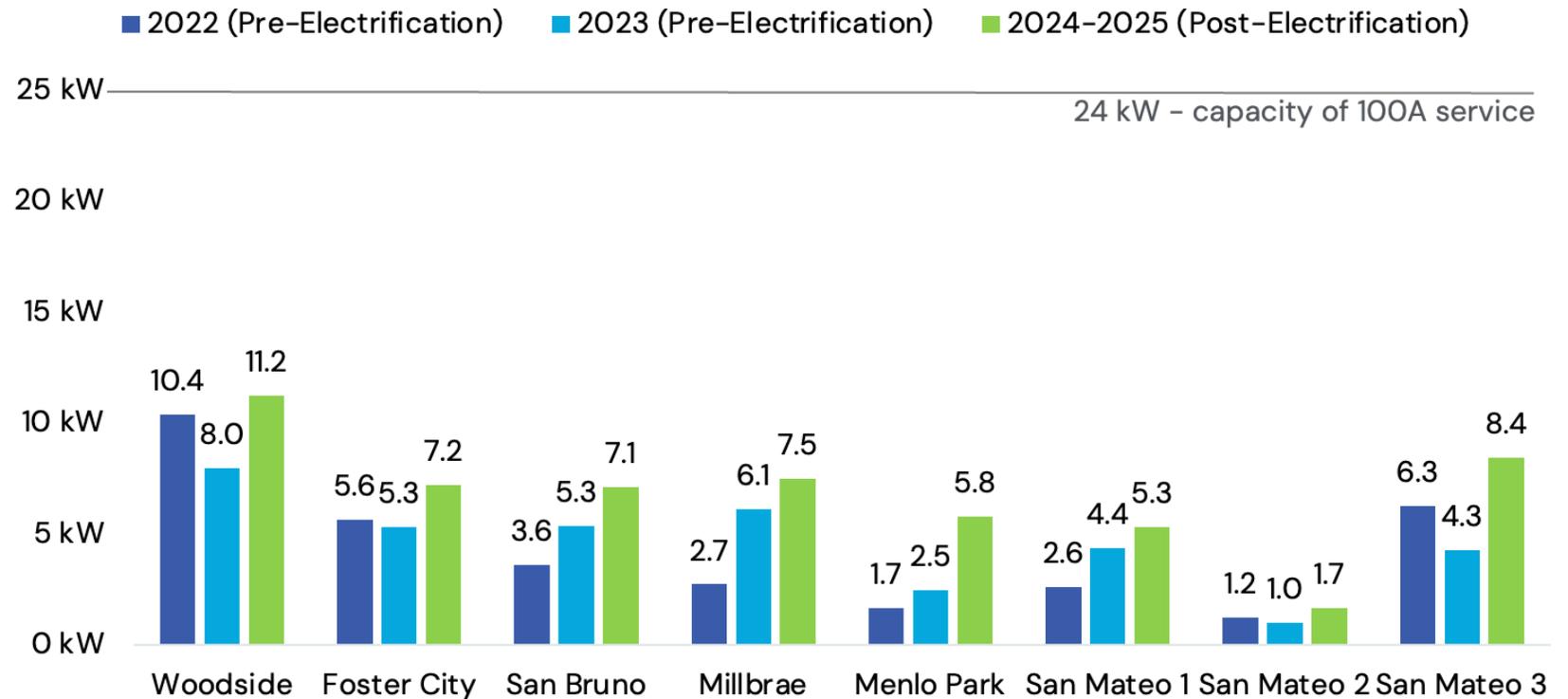


Whole Home Electrification – Minimal Grid Impact

HOME ELECTRIFICATION PILOT



Annual Hourly Peak Load



And 80% of 160,000 homes use less than 40 amps overall

Lessons Learned from Rebate Program

5,200 rebated heat pumps, since 2021

- 1,200 participants for 0% OBF financing
- Over 200 contractors participating, OBF major driver

Self-serve and turnkey options, “concierge” hotline

Streamlined process key

Challenges

Knob & tube, unpermitted spaces

Appliance break/fix

Setback requirements, proper system sizing

Gas data access, formats

Lessons Learned from HP + HPWH Rebated Homes

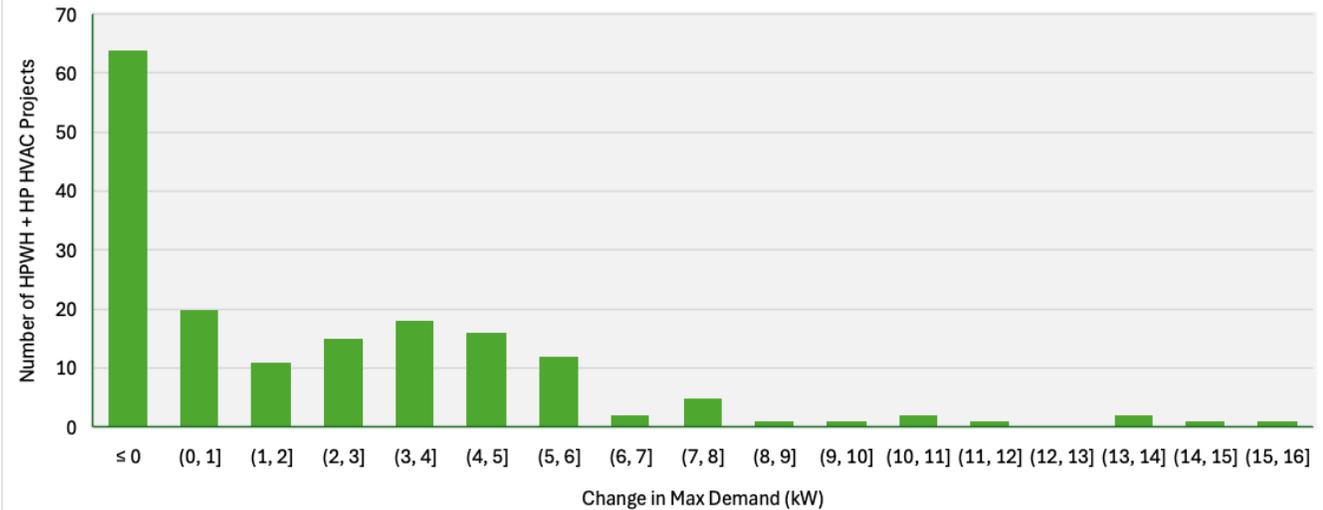
234 customers electrified water and space heating at the same time.

Less than 1/3rd required panel work of any kind

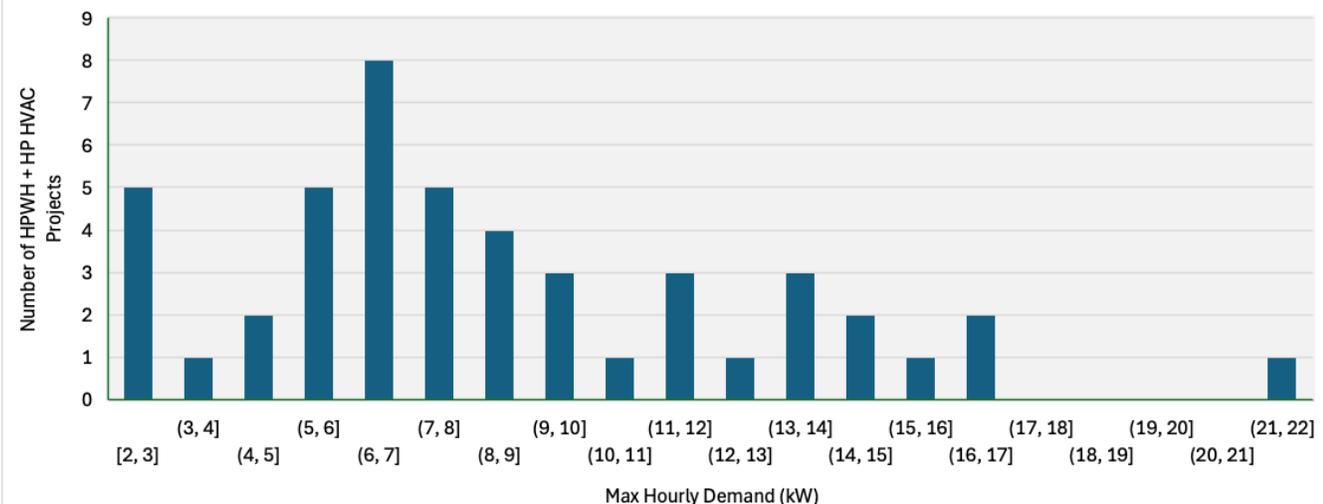
Of the 152 homes that have more than 12 months of post-electrification data.

- About **half saw less than 1 kW increase** in peak hourly demand
- **Median home went from 3.8kW to 4.6kW peak**
- **Zero have a peak demand over 24kW**, indicating they nearly all could have electrified within 100A panel.

Increase in Max Hourly Peak Demand Post-Electrification



Peak Hourly Demand Post-Electrification



Recommendations to Electrify California

Cost Containment

Right-Sizing

Contain project and system costs

Financing

GoGreen/CCA partnership to improve outcomes

Retail Rates and Performance

Resiliency

BTM storage value

Electrification Rates

New pricing to improve economics

Coordinate Efforts

Multiple Agencies and Proceedings

En Banc

Accelerating Electrification

Contain Costs of Electrification

Right-Sizing

Adopt a new Electrification Loading Order with right-sizing as the first step to avoid unnecessary panel, service, and distribution upsizing costs and project delays

Financing

Expand access to GoGreen through CCA partnerships to reduce upfront costs & improve customer & contractor experience

Retail Rates and Performance

Resiliency

Integrate electrification with BTM storage, enabled by Performance-Based Ratemaking and improved distribution grid data sharing, to deliver resiliency and reliability benefits

Rates

Implement new designs that lower electrification costs by pricing incremental electrification load closer to marginal electricity costs rather than full retail rate

Coordinate Agency Efforts

Various Relevant Agencies and Proceedings

Coordinate changes to electrification policy across CPUC and CEC proceedings

E.g., CPUC: Building Decarbonization, Energy Efficiency, High DER, Long-Term Gas System Planning, Transportation Electrification Policy and Infrastructure

CPUC En Banc on Accelerating Electrification

Convene En Banc to discuss electrification policy reforms: right-sizing, new electrification rates, resiliency, and financing

Peninsula Clean Energy: Programs and Reinvestment

As a not-for-profit organization public agency, PCE reinvests its earnings into the community

Since our inception in 2016:

\$70M

Community
investment

\$200M

saved by
PCE customers

<3%

State
funds



Recent initiatives

- \$26 million building electrification assistance (\$40M joint with SVCE)
- Financing solar + storage, public agency electrification, home electrification
- Caltrain first commuter rail service to use 100% clean electricity
- Contracting for 50MW/4hr local FTM storage in Brisbane Baylands

~\$100M

Over next 4 years
in community
reinvestments

Rafael Reyes
Senior Director of Energy Programs
rreyes@pencleanenergy.com

Whole-home pilot
<https://tinyurl.com/PCE-wholeBEpilot>

Bill analysis
<https://tinyurl.com/SVCE-PCEbillanalysis>



SJV DAC Electrification Pilot

Lisa Hernandez

Director – Battery & Energy Resiliency Programs

Resource Innovations



Integrated Program Offerings

- Participants were enrolled in CARE/FERA and Medical Baseline by Self-Help Enterprises (SHE)
- Pilot provided electrification of major appliances
- Utilized Tech Initiative funding for those with excessive remediation
- Energy Saving Assistance (ESA) program leveraged for energy efficiency
 - RI's implementer, Synergy, was also an ESA contractor
- Participants were warm-transferred to:
 - DAC-SASH (GRID Alternatives)
 - WatterSaver Program (Association for Energy Affordability [AEA])
- Participants were served with SGIP

Recognizing Remediation Needs

- In RI's 5 communities:
 - 32%: Zero remediation
 - 58%: Remediation within the \$5K pilot maximum
 - 10%: Remediation above the \$5K pilot maximum
- Tech Initiative provided an additional \$20K in remediation funds
- Remediation was not predictable
- Mobile homes required the most remediation
- Participants with remediation needs that exceeded Pilot and Tech were not interested in zero-percent or low-interest loans, as a means to participate in the Pilot

Excelling in Customer Buy-In

- Outreach and education must be by trusted messengers with roots, or experience operating, in targeted communities
- Some customers chose not to participate until seeing the pilot happen in their community/neighborhood
- Transient nature of rental population can make it difficult to serve, including reaching and obtaining homeowner approval
- Ongoing participant engagement and communication was required for success, as the Pilot was high touch, and often of substantial duration
- Utilize multiple means of contact (i.e. phone, text, Email)
- Contact with participants was frequent with consistent messaging

Best Practices

- Education and outreach must be in-language (i.e. personnel, written material, etc.)
- In-person engagement, like community meetings/workshops, better establishes program legitimacy
 - Alleviates mistrust and “too good to be true” feelings
 - Especially low-income and communities of color
- Training residents of the community to conduct outreach and education, and complete applications, was very effective.
- Set appropriate expectations (i.e. program duration, number of visits, participant commitment)
- Offering a single point of contact, strengthened trust, and was helpful to reduce confusion about who to call for information/questions about the multiple programs leveraged

Building Industry and Owner Panel

Accelerating Decarbonization at Scale

Building Decarbonization Best Practices and Future Pathways Workshop
Building Industry and Implementer | January 21, 2026



Verdani
PARTNERS™

Verdani Partners

Verdani Partners is a **full-service sustainability consulting firm** supporting building efficiency and decarbonization implementation at scale. We work with utilities, building owners, and property managers to translate policy and programs into on-the-ground action, focusing on readiness, execution, and performance across individual assets and complex real estate portfolios.

Verdani team members in the U.S., Brazil, and India. Client portfolios and strategic partners are global.

<p>~2B square feet in 25 national and international real estate portfolios including 7 global firms.</p> <p>\$800B AUM, AUA, or total market capitalization in ongoing ESG programs</p> <p>10,000 Equity and debt properties</p>	<p>322 GRESB funds to date</p> <p>2025 GRESB 20 clients, 73 funds or accounts, 84 submissions</p> <p>20 1st, 2nd, and 3rd rankings in their peer group (6–1st and 5–2nd ranks)</p>	<p>200M+ Green building certified square feet, all time</p> <p>42M+ green building certified square feet in 2024, 110 projects</p> <p>440+ ENERGY STAR certifications since 2018</p>	<p>150+ GRI-aligned sustainability/ESG reports and fund-level reports, all time</p> <p>80+ Sustainability professionals</p> <p>90% retention rate</p> <p><i>As of October 2025</i></p>
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COMMITMENTS



LEADERSHIP



Understanding the Gap Between Policy & Performance

Hands-on implementation across large existing-building portfolios highlights where well-intended policies stall and what helps move projects forward.

What Implementation Experience Reveals

Across markets, climate policy and capital are advancing, but implementation across existing buildings continues to lag. The gap is rarely about ambition; it is about **alignment between policy design, utility programs, financing timelines, and how buildings are actually owned and operated.**

Working at the intersection of portfolios, utilities, and regulators offers a clear view into where well-intended strategies stall and where targeted changes unlock real progress at scale.

Policy Intent Performance Standards Utility Programs

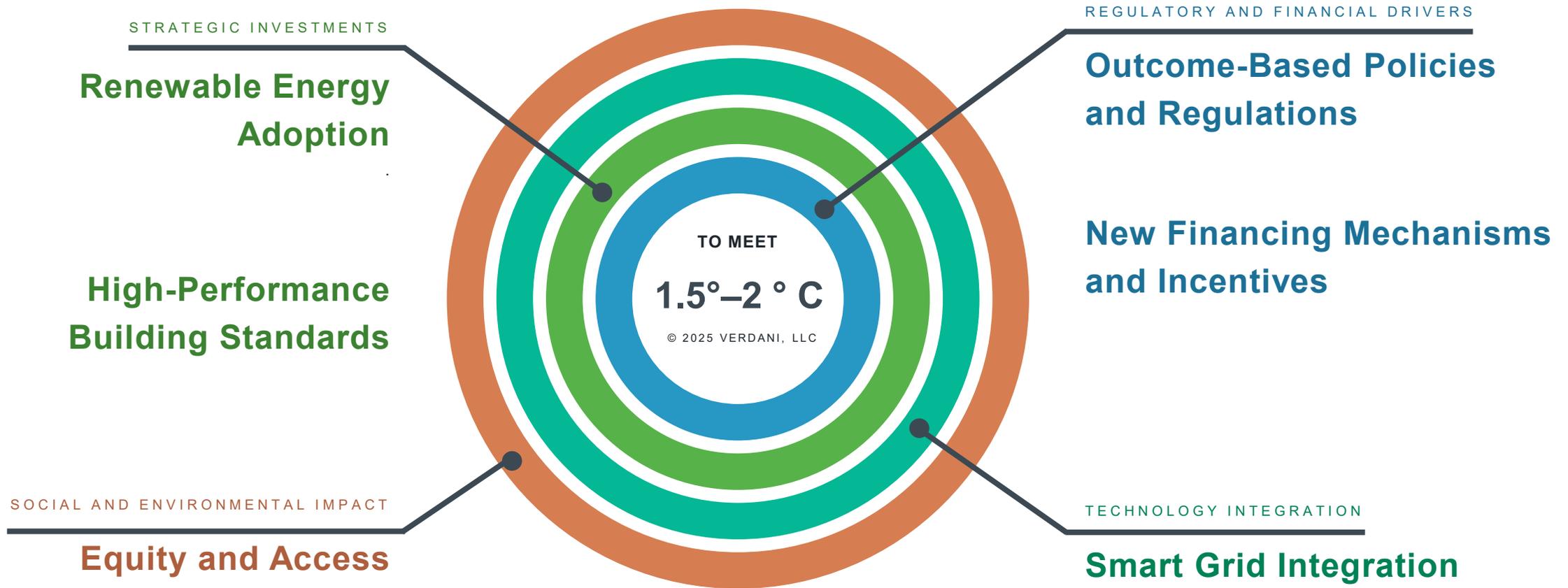
Implementation Gap
(misalignment in timing, incentives, and accountability)

Capital Cycles Ownership & Governance Building Operations

- Firsthand implementation experience surfaces the practical constraints shaping project uptake
- Utility and regulatory engagement shows how targeted adjustments can significantly accelerate adoption

Drivers Reshaping Decarbonization

Top global RE decarbonization policy strategies to address the climate crisis.



Key International ESG Regulations

Regulation		Climate Risk & Governance	GHG Emissions (Scopes 1–3)	Performance & Transition Plans	Harmonization
EU / UK	Corporate Sustainability Reporting Directive (CSRD)	✓	✓	✓	ESRS (aligned with IFRS S2 / TCFD)
	Sustainable Finance Disclosure Regulation (SFDR)	✓		✓	EU Taxonomy
	Energy Performance of Buildings Directive (EPBD)		✓	✓	
	Sustainability Disclosure Requirements (SDR) & UK-ISSB (UK only)	✓	✓	✓	UK-ISSB, IFRS, TCFD
APAC	AASB Climate-Related Disclosures (Australia)	✓	✓	✓	ISSB, IFRS S1/S2
	China National Emissions Trading System (ETS) Scope 1	✓	✓		National ETS, ISSB Alignment
	Singapore ISSB-Aligned Reporting & MAS ERM	✓	✓	✓	ISSB, IFRS, TCFD, MAS ERM
	India BRSR Core	✓	✓	✓	BRSR Core, GRI
Americas	California SB 253 SB 261 (Enforcement currently paused)	✓	✓	✓	GHG Protocol, SASB, TCFD
	U.S. city- and state-level Building Performance Standards		✓	✓	ENERGY STAR / ASHRAE
	Brazil CVM 193	✓	✓	✓	IFRS, ISSB, TCFD

Global Decarbonization Policy: What's Working & What Accelerates Scale



1. Sticks: Performance and Pricing

Work when

- Carbon has a real, rising price
- Existing buildings face clear timelines (i.e., BPS)
- All electric rules prevent lock-in

Fail when

- Low or volatile carbon prices
- Performance mandates without financing

Global signals

- EU ETS
- Boston BERDO
- EU EPBD 2030 mandates
- NY + SF all-electric codes



2. Carrots: Incentives and Capital

Work when

- Upfront costs are reduced
- Capital is stacked (rebates + financing)
- Payback matches hold periods (C-PACE)

Fail when

- Programs are fragmented
- Grid capacity is ignored

Global signals

- EU + Canada reinvesting carbon revenues
- Public green banks (Germany, South Korea)
- C-PACE



3. The Missing Middle: Grid Alignment

Work when

- Load management and efficiency first
- Grid-interactive electrification
- Treating buildings as grid assets, not liabilities

Fail when

- No value for flexibility
- Electrification seen as grid risk

Global signals

- EU integrated grid planning
- Utility-aligned retrofits



What Accelerates Scale: Policy Implications

Bottom line

- The fastest progress happens when sticks set the direction, carrots remove friction, and grid alignment rewards flexibility.

High-impact policies

- **Match timelines:** Align utility and performance deadlines
- **Get buildings ready:** Incentivize electrical upgrades first
- **Simplify financing:** One package—rebates + financing + support
- **Pay for results:** Reward flexibility and grid value
- **Recycle funds:** Reinvest penalties into retrofits
- **All-electric by default:** Use electrification as a grid strategy

Source: VIBE — Pathways to Portfolio-Level Decarbonization

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Decarbonization Is Now an Economic Imperative



Why markets are moving now

- Renewables are cheaper and dominant in new capacity
- Stranded asset risk is rising due to building performance standards



Signs of Progress

- **40%** of global electricity from renewables
- **\$2.2T** annual clean energy investment
- **9.5%** decline in building energy intensity since 2015
- Heat pumps now meet **10%** of world heating demand



Demand for low carbon buildings

- Demand for low-carbon buildings expected to 3x supply by 2030 (JLL)



Climate risk is financial risk

Climate risk is now a financial and insurance risk

CA SB 261 mandatory climate risk reporting in 2026
(Enforcement currently paused)

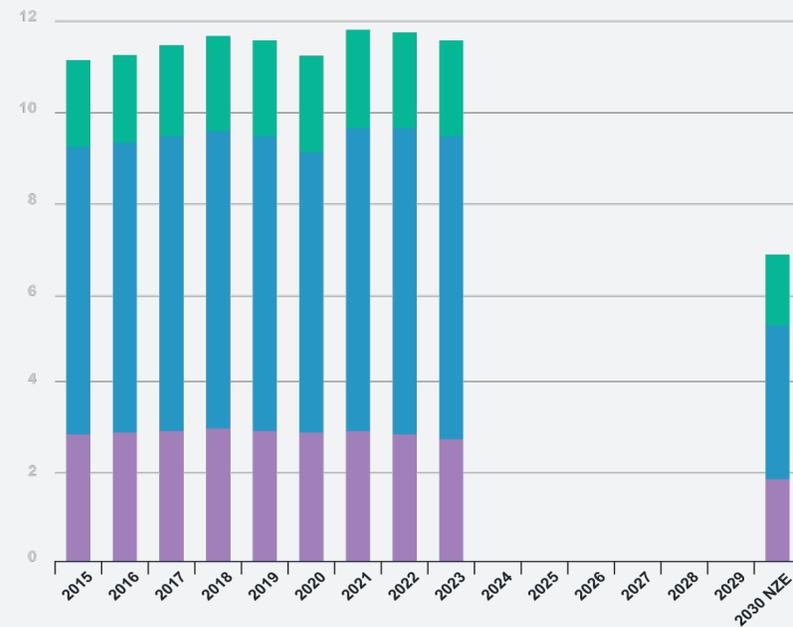
Bridging the Retrofit Gap: From Momentum to Scale



The Global Challenge

- Existing buildings = **34%** of global emissions
- Must increase annual retrofit rate from **1%** to **2.5–5%** and **7x** energy intensity decrease rate
- Capital exists, but timelines and incentives are misaligned

Global building emissions and Paris-aligned 2030 target



Source: International Energy Agency, 2024

Obstacles to Decarbonizing Commercial Real Estate

Despite growing regulatory pressure and economic opportunity, many commercial real estate owners face real-world barriers that delay or derail decarbonization plans. These challenges are particularly acute for smaller portfolios, older buildings, and owners with limited access to capital or technical support.

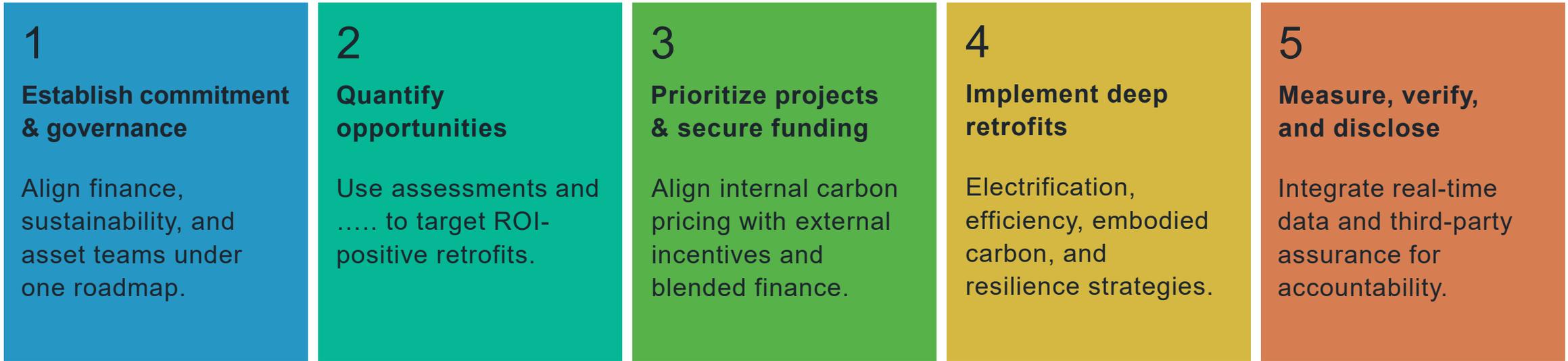


Source: VIBE — Pathways to Portfolio-Level Decarbonization

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From Commitments to Implementation

Verdani's Framework for Implementing Asset Level Projects at a Portfolio Scale



Proof Points

- Client adoption across \$400B+ AUM
- Aligned with UNEP's Buildings Action Coalition, Buildings Breakthrough Target, and Paris Agreement goals

Key Takeaway

- Scaling impact requires three accelerants: capital, collaboration, and credible data

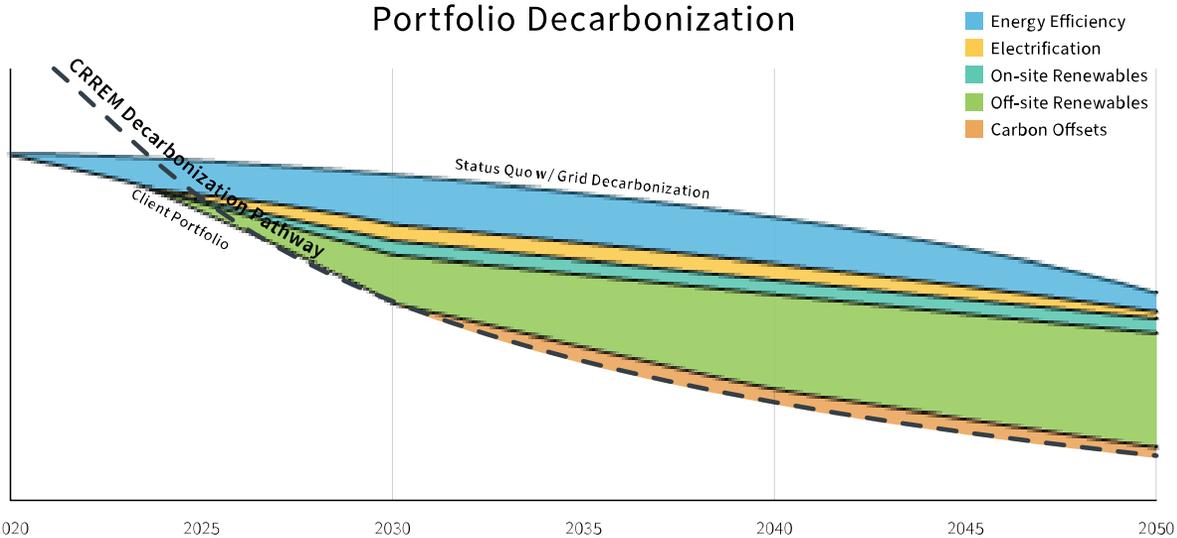
Building Vs Portfolio Decarbonization

Asset-level Strategies



Source: Verdani Partners

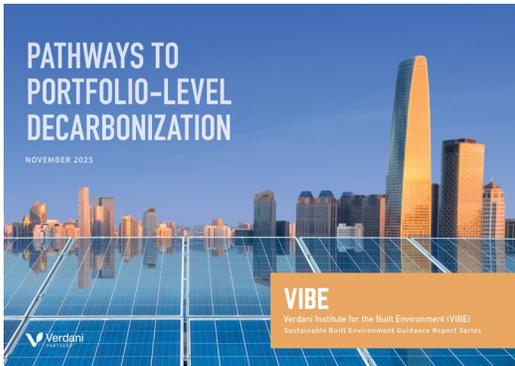
Portfolio-level Strategies



Source: Verdani Partners

How Leading Firms are getting Unstuck

The 5 Levers That Unlock Scale



Our foundational guidance report gives 1) an overview of the decarbonization landscape as it pertains to the built environment and 2) interview research uncovering current implementation strategies in CRE.



Policy as a Catalyst (Not a Penalty)

Building Performance Standards create clear timelines and predictability, especially when compliance payments can be reinvested into retrofits



Efficiency First, Electrification Ready

Owners start with low-cost efficiency and electrical readiness to reduce risk and enable future electrification.



Stacked Capital, Simplified

Leading firms combine rebates, tax credits, alternative financing, & energy-as-a-service into one capital stack.



Pay for Performance & Flexibility

Value comes from peak reduction, load flexibility, and grid services, not just equipment installs.



Human-Centric Engagement & Execution

Progress accelerates when engineers, asset managers, finance, and operators are aligned around a shared roadmap.

Operational Efficiency

Phased Tech Adoption

Leveraging Policy and Financing Tools

Stakeholder Alignment

Case Studies



Industrial

Bagaletos Architectural Glass Systems

Location: Sacramento, CA

Decarbonization Strategies

- Deep efficiency upgrades (envelope, HVAC, lighting, equipment)
- On-site solar sized to offset 100% of energy demand

Financial and Performance Impact

- \$40K–\$50K annual energy savings
- 33% ROI; 3-year payback on solar
- ~55% reduction in upfront PV cost via utility and tax incentives



Multifamily

3-Unit All-Electric Retrofit

Location: San Francisco, CA

Decarbonization Strategies

- Full electrification (induction cooking, heat pumps, electric water heating)
- Envelope upgrades to reduce energy demand

Financial and Performance Impact

- Tenant utility bills reduced >50%
- Before: \$150–\$200/month
- After: \$40–\$90/month
- EUI: 9.75 kBtu/SF, exceeding Architecture 2030 targets (no solar)



Office

Class A Office (236,553 SF)

Location: Phoenix, AZ

Decarbonization Strategies

- Operational efficiency and performance optimization
- On-site solar integrated into ongoing asset operations

Financial & Performance Impact

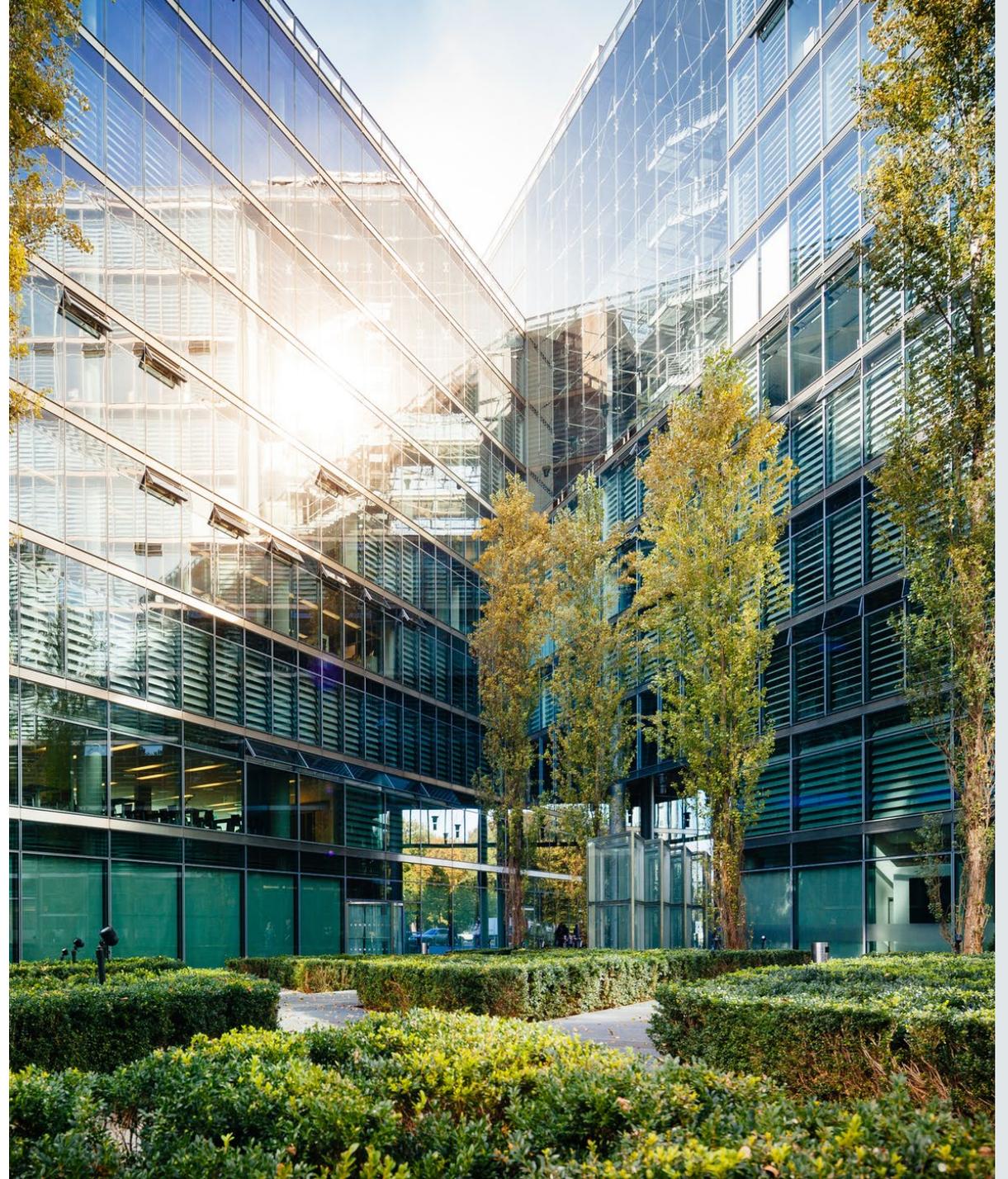
- 15.5% reduction in carbon emissions intensity (2021–2024)
- ENERGY STAR score 76 → 93
- LEED v4 O+M Gold; WELL Core Silver

Source: VIBE — Pathways to Portfolio-Level Decarbonization

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Conclusion

- **Policy is working — but not fast enough**
 - Standards set direction; implementation lags.
- **Owners face a timing mismatch**
 - 3–6 year hold periods vs. 10–20 year paybacks.
- **Bridging the gap is essential**
 - Incentives, utility programs, and financing must align with ownership timelines.
- **Efficiency and flexibility reduce risk**
 - Lower loads and managed demand make electrification feasible.
- **The path forward is proven**
 - When incentives, financing, and utilities match how buildings are owned and operated, decarbonization scales.



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Multifamily Landscape on Electrification Best Practices

CPUC Building Decarbonization Best Practices and Future Pathways Workshop

January 21, 2026

Amy Dryden, Sr. Director

Multifamily Context

Layering

Measure Specific Considerations

Right sizing Electrical Infrastructure

Engagement

Community Scale



California Multifamily Landscape

- About half of low-income households in California live in multifamily properties and 91% are rentals
- 25% low-income households live in subsidized affordable housing and 75% in market-rate properties referred to as “Naturally Occurring Affordable Housing” (NOAH)
- Diverse equipment form factors:
 - Water heating: 50% central systems and 50% in unit systems and majority gas.
 - HVAC nearly 100% in unit and 35% gas
- Diverse metering configurations



Multifamily Challenges

Heat pump retrofits are not yet business as usual, but have strong policy and program support.

Programs serving the multifamily sector face barriers that make it difficult to electrify:



Limited Access to Capital



Increased Electrical Infrastructure Needs



Split Incentives



Lack of Awareness



Leveraging Incentives

- Layering funding for significant electrification enables work to happen
- Flexible funding is necessary to support full electrification in low-income multifamily buildings
 - Electrical infrastructure
 - Remediation and Ventilation
- Low-income housing ideally needs 90% coverage for electrification
- After layering eligible incentives, under TECH pilot provided an average of \$6,600 per unit to cover the funding gap for properties to fully electrify

Examples of Leveraging Multifamily Incentives

Low Income Housing - 49 units 4 buildings

Comprehensive Measures

- In unit HPWH and mini- splits
- LED lighting and Low Flow Fixtures
- Dishwashers
- Common area HPWH and Mini-splits

Incentives

- 4 programs – TECH, LIWP, MAHEP, CAMR
- Approx. \$1.4M incentives
- Covered 90% of costs
- Estimated \$30k/ unit

Low Income Housing – 7 units 1 building

Comprehensive Measures

- CHPWH
- Attic, crawlspace and Wall insulation
- LED lighting and Low Flow Fixtures
- In unit PTHPs
- Windows
- Refrigerators
- Electric Range

Incentives

- 3 programs – BAMBE, LIWP, TECH
- Approx. \$120k incentives
- Covered 88% of costs
- Estimated \$20k/ unit

Measure Specific Best Practices

- Best Practices can take variety of forms
- Additional Products for compatibility: Improve usability and satisfaction
 - Induction with pans **and** education **and** demonstrations
- Installation requirements: Support optimal performance of equipment
 - HPWH venting strategies, TMV, and upsizing
- Pre-retrofit analysis: Upfront analysis to support cost effective and optimized retrofits
 - CHPWH
 - Electrical analysis



Measure Example: CHPWH

Findings and Recommendations



• **Funding for system design, monitoring, analysis, and fixing distribution issues is critical to optimize performance of a future central heat pump water heater plant.**

- Monitoring identified high loads and poor performance at 21 properties from distribution issues
- Distribution issues impact tenant comfort, heat pump water heater performance and efficiency, and system sizing and result in high electricity usage and costs



• **Post-retrofit verification and monitoring required to ensure proper operation after install and future**

- Post installation errors and incorrect system settings or equipment negatively impacted performance. Fixes resulted in energy, utility savings, and/or resident satisfaction with hot water delivery



• **Expanded training and technical support are necessary to build contractor knowledge and capacity.**

- Owners are driven by bottom line. They need data on financial and social impacts to support pre-retrofit work
- Empowering contractors with methods, analysis and strategies to achieve optimized central heat pump water heater retrofits will inherently enable more retrofits that will perform well

This is What CDHW Investments Look Like

Step 1: Installation of monitoring equipment including mapping system and pipes. Evaluation and documentation of existing conditions.



Step 2. Analysis of monitoring data informed fixing crossover and imbalance and sizing of new system and prioritized storage. Complete fixes and confirm effectiveness.

Step 3. Size and install new system.





What is Challenge with Electric Infrastructure?

- **Problem:**

- Full electrification can result in electrical upsizing if not undertaken thoughtfully
- 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

Electrification Readiness Investments: Findings and Recommendations



- **Funding required for electrical infrastructure, readiness and engineering**

- 10 of 13 projects needed engineering support
- Team estimated average of \$9k per unit of avoided future costs for panels/circuits
- Readiness measures should include ventilation and space modifications



- **Easier access to demand and/or monitoring data, coupled with training is critical**

- 11 out of 13 properties upgraded infrastructure
- 7 projects avoided electrical upsizing due to monitoring and/or engineering and analysis
- This analysis can support cost effective full electrification all at once or over time.

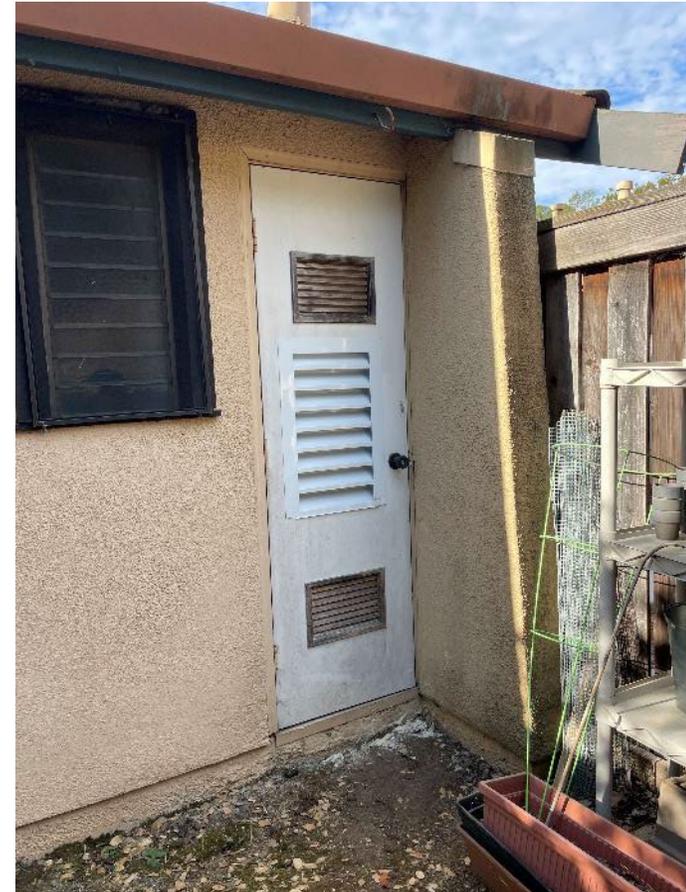


- **Scaling phased approach requires extensive engagement with all stakeholders**

- Contractors and engineers on electrical infrastructure analysis
- Property owners on how to incorporate this strategy into their systems

This is What Electrification Readiness Investments Look Like

Analysis for full electrification resulted in staged work; upgraded feeders, installed HVAC providing cooling, and louvered door for future heat pump water heater



Engagement and Buy In

- Critical for success in a retrofit
- Elements should be built into program design
- Multifamily property owners require technical assistance and support in decision making, product awareness, technical support, specifications and verification, contractor coordination
- Multifamily residents require pre and post retrofit education and engagement to set expectations and maximize benefits

Guide to All-Electric Living



Space Heating and Cooling

Temperature Settings

Feeling too hot?
Set the unit to cooling mode

72-78°F (23-26°C) No **lower** than 72°F for best energy efficiency

During the day, close curtains and blinds to keep out the sun as desired.

At night, turn up the temperature to 78°F (higher if you are comfortable) or set the AC to sleep mode and **open windows** to bring in fresh cool air. Using fans will make you feel more comfortable at higher temperatures, decreasing your bill and energy use.

Feeling too cold?
Set the unit to heating mode

72-65°F (20-22°C) No **higher** than 72°F for best energy efficiency

In the afternoon, turn down the temperature to 65°F, the sun will heat up the building and can allow you to be more comfortable.

At night, turn down the temperature to 65°F (lower if you are comfortable) or set the heater to sleep mode and **keep windows closed** to keep the warm air in

Modes

The temperature setting is the most important setting when it comes to your utility bill. However there are a few controls that could be used to help improve efficiency and lower your utility bill:

ECO mode should be enabled, this improves the efficiency of the unit.

Cooling Mode set the unit to cooling mode when you feel hot

Heating Mode set the unit to heating mode when you feel cold

Timer can be used to turn off the unit after a certain time

Sleep Mode should be enabled at night to reduce the amount of energy your heating and cooling unit consumes

Note: Frequently turning your AC OFF and ON and setting it to extreme temperatures makes it less efficient. Use your thermostat within recommended temperature for best energy efficiency. **Don't forget to turn it off when you leave!**

Community Scale Opportunities

- Opportunity to get larger buy in in priority area with one decision maker
 - Does not require individual buy in
- Identify communities with multiple multifamily properties
 - Result in large volume of gas line decommissioning
- Critical is access to utility information to mitigate transformer upgrades



Summary

- Multifamily is complicated and diverse sector housing priority population that requires strong investment and support
- Layering incentives are necessary to achieve comprehensive all-electric retrofits
- Best practices can take multiple forms and should be included in program requirements to maximize performance and benefits.
- Electrification requires critical evaluation for electrical loads to mitigate electrical upsizing and pathway for achieving electrification overtime.
- Supporting, engaging and educating both property owners and their teams and tenants is critical to advance successful electrification retrofits.
- Large multifamily projects or aggregated multifamily projects can be strategy to achieve significant community scale and grid impacts

Thank You!

Amy Dryden

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Opinion **Dynamics**

an E Source Company

TECH Evaluation Findings

Ellen Steiner, Ph.D

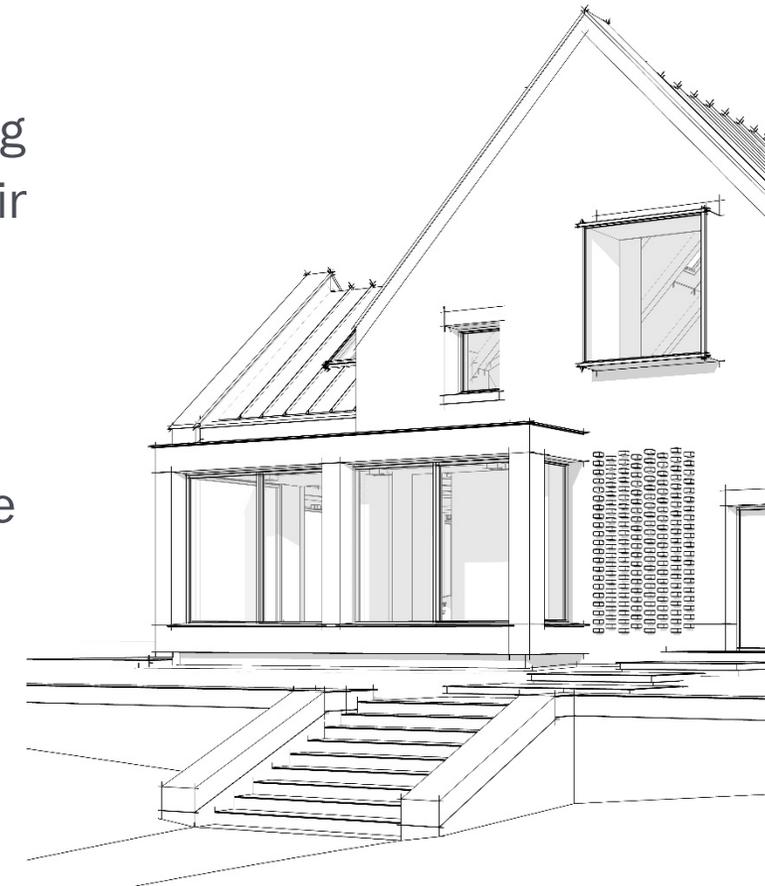
Vice President

January 21, 2026



TECH – Technology and Equipment for Clean Heating

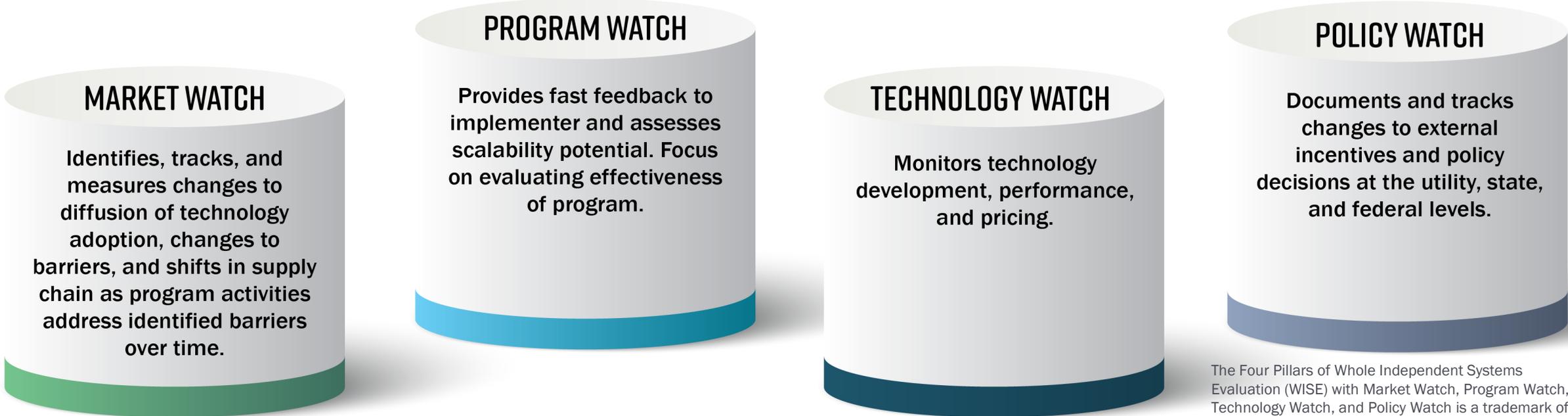
- Established through Senate Bill 1477
- Launched late 2021
- TECH is designed to
 - Spur California’s market for low-emissions space and water heating technologies in new and existing residential buildings by incentivizing distributors and retailers to stock the equipment
 - Must include outreach strategies, job training and employment opportunities for hard-to-reach customers
 - Provide consumer, contractor, and vendor training to support these technologies



Independent, Embedded Evaluation Enables Market Transformation at Scale

Whole Independent Systems Evaluation™ (WISE) is an adaptation of the long-standing developmental evaluation measurement approach, tailored to address the unique needs of the emerging clean energy economy.

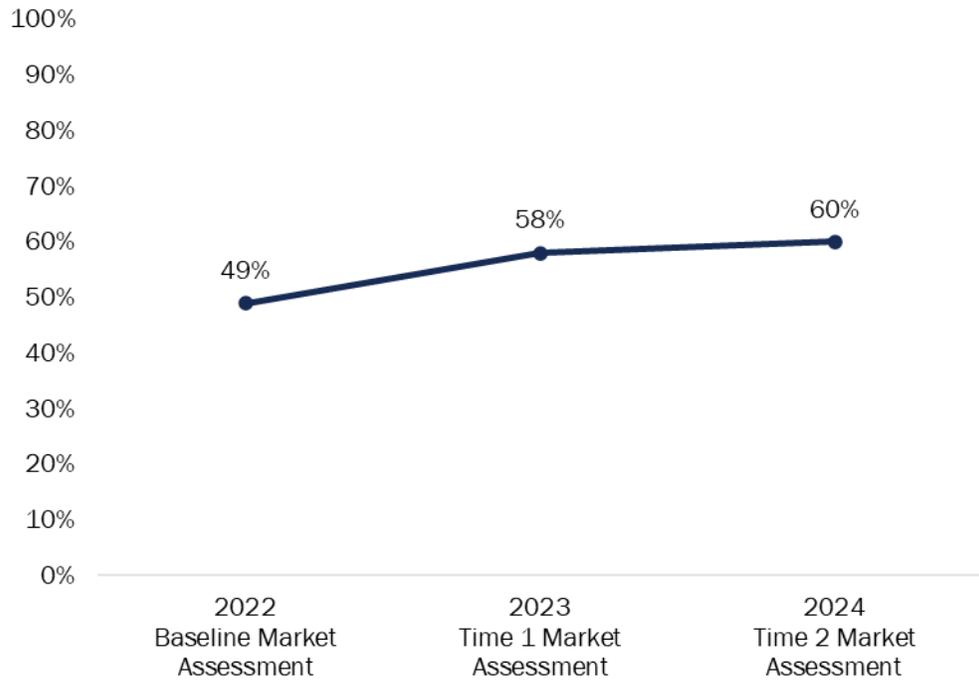
Organizing evaluation activities within the 4 pillars of WISE has proven effective and reflects the fact that everything is interconnected and that any change will likely have ripple effects throughout the system.



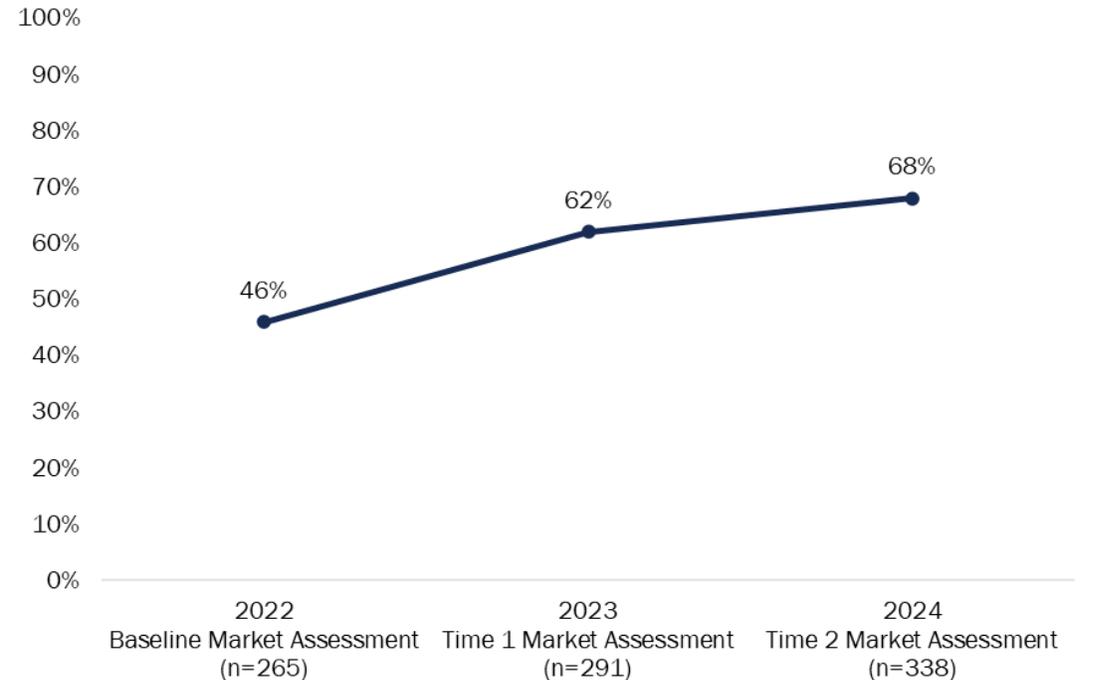
The Four Pillars of Whole Independent Systems Evaluation (WISE) with Market Watch, Program Watch, Technology Watch, and Policy Watch is a trademark of Opinion Dynamics, an E Source Company

Homeowner awareness of HVAC Heat Pumps increased since 2022

Awareness of HVAC Heat Pumps Over Time (n=500)



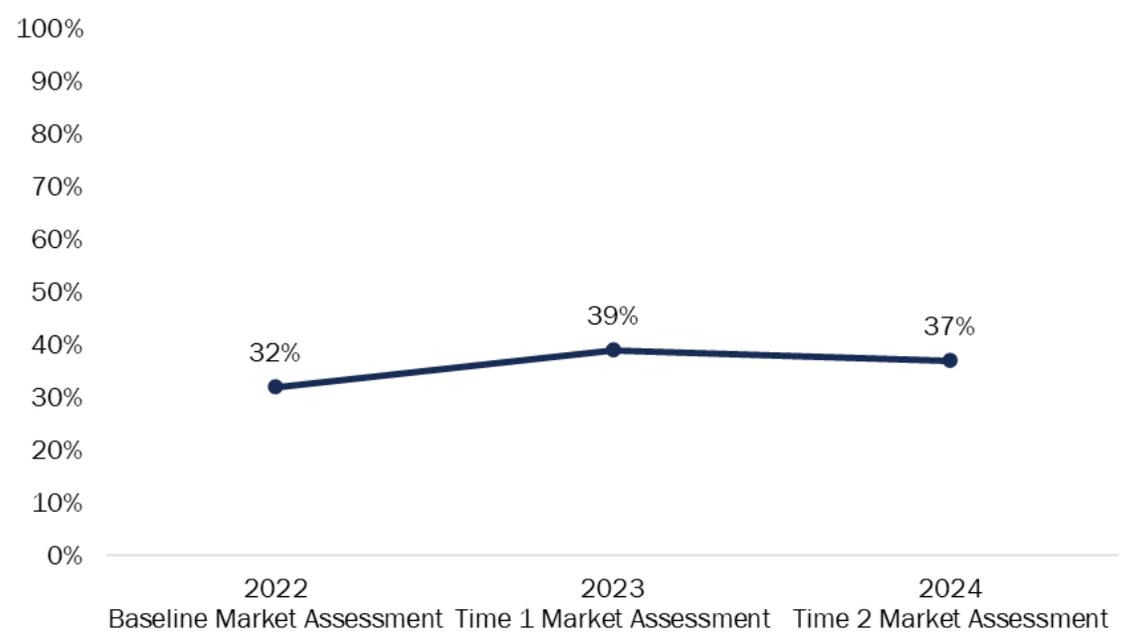
Awareness of Benefits and Drawbacks of HVAC Heat Pumps Over Time



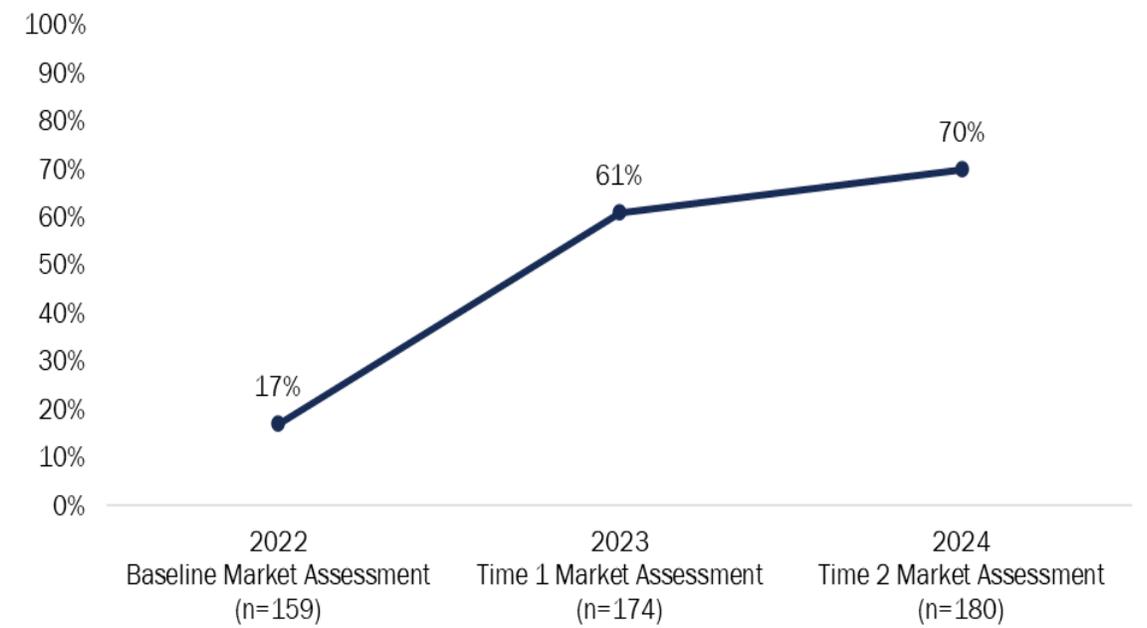
Source: Time 2 Market Assessment (2025)

Homeowner Awareness of HPWHs Increased since 2022

Awareness of HPWHs Over Time (n=500)



Awareness of Benefits and Drawbacks of HPWHs Over Time

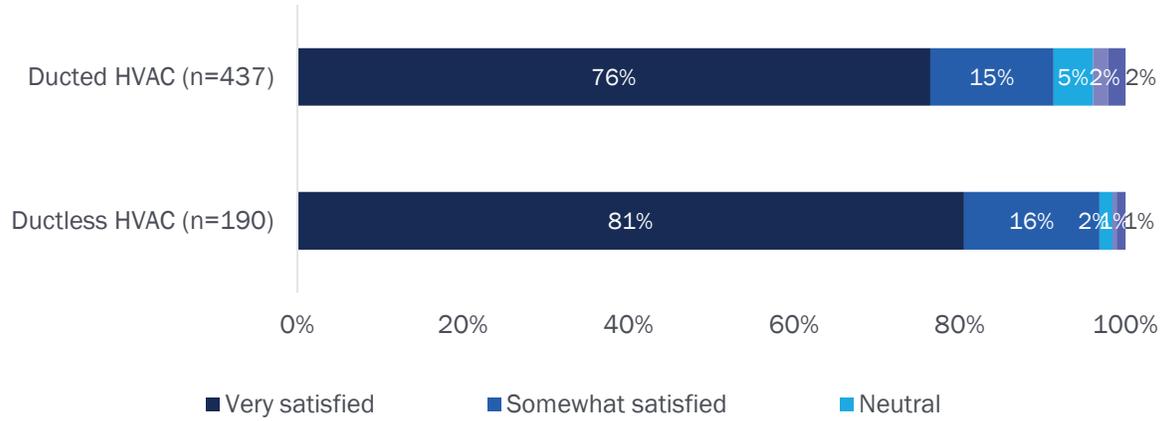


Source: Time 2 Market Assessment (2025)

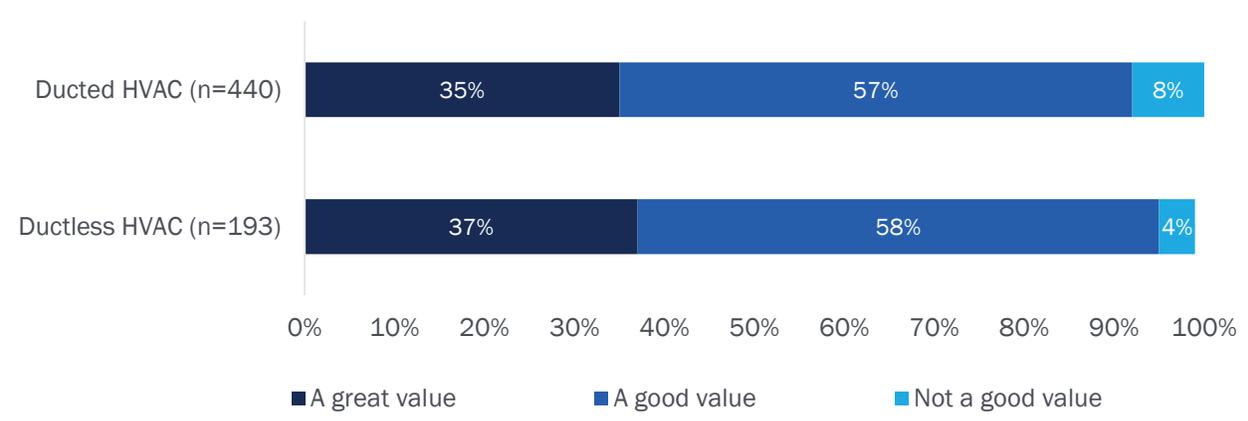
Customer Satisfaction with Heat Pumps

Source: Wave 2 Customer Experience and Satisfaction (2025)

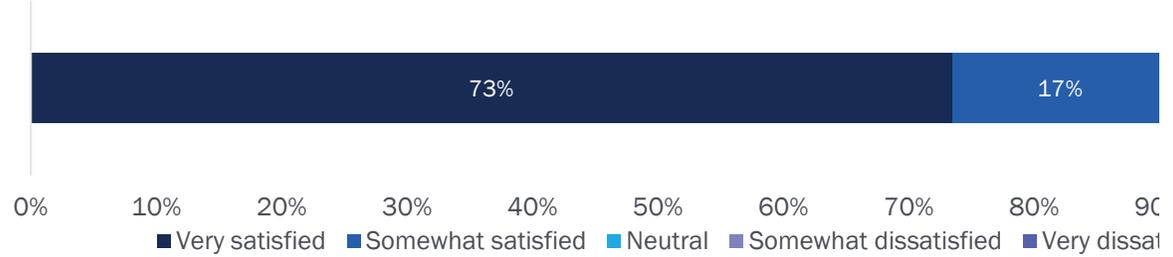
Customer Satisfaction with HVAC Heat Pump



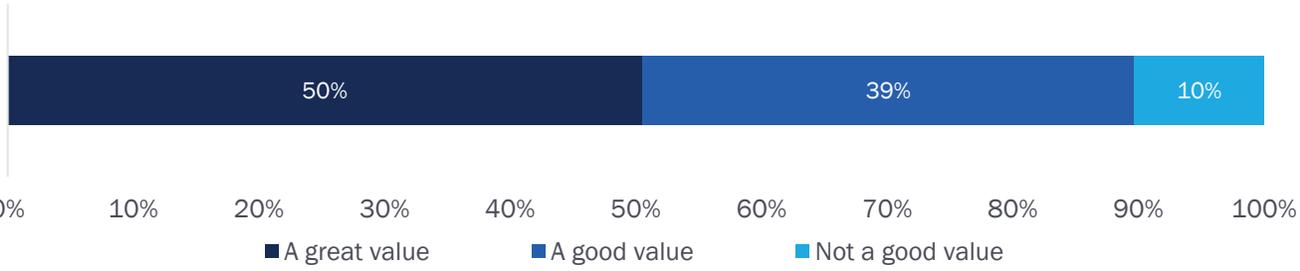
Customer Perceived Value in HVAC Heat Pump Investment



Customer Satisfaction with HPWH (n=301)

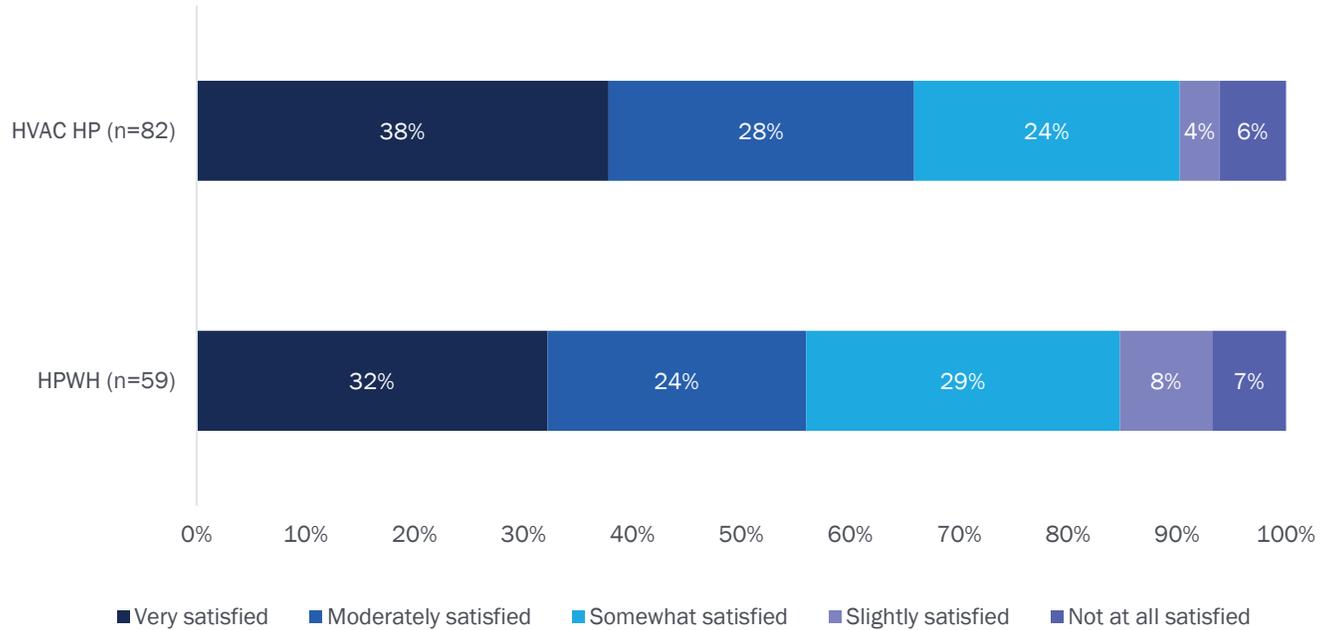


Customer Perceived Value of HPWH (n=301)



Contractor Satisfaction with TECH Clean California

Contractor Overall Satisfaction with TECH Clean California Experience



Source: Process Evaluation (2024)

Energy and GHG Impacts

Program
Watch

TECH Initiative Annual Per-Participant Energy & GHG Emissions Impacts

- On average, participants reduced natural gas consumption by 38% & increased electric consumption by 17%
- This translates to reductions in overall energy use and GHG emissions

Impact Outcome	Units	Baseline	Impact	Lower CI	Upper CI	% Impact
Electric	kWh	8,421	1,451*	1,315	1,587	17.2%
Natural Gas	Therms	432	-165*	-172	-158	-38.2%
Total Energy	mmBTu	71.9	-11.55*	-12.72	-10.39	-16.1%
Total GHG Emissions	tonnes CO2-e	4.26	-0.73*	-0.77	-0.69	-17.2%

Note: Normal weather estimates based on fixed-effects D-in-D panel regression analysis of TECH Initiative participant and matched nonparticipant electric interval data. (*)Results are statistically significant at 95% confidence level.

Seasonal Energy Impacts

Source: Population Pathway
Impact Report (2025)

- Gas consumption decreases in all seasons
- Electric consumption increases in winter & decreases in summer for the average participant

TECH Initiative Energy Impacts by Fuel and Season

Season	Electric Impacts		Gas Impacts		Total Energy Impacts	
	Average Impact (kWh)	% Impact	Average Impact (therms)	% Impact	Average Impact (MMBtu)	% Impact
Summer	-100*	-2.9%	-17*	-25.6%	-2.00*	-11.1%
Winter	1,215*	41.6%	-101*	-41.2%	-5.98*	-17.3%
Shoulder	336*	15.9%	-47*	-39.1%	-3.57*	-18.5%

Note: Normal weather estimates based on fixed-effects D-in-D panel regression analysis of TECH Initiative participant and matched nonparticipant electric interval data. Summer is defined as June through September, winter as December through March, and shoulder as April, May, October, and November. (*) Results are statistically significant at 95% confidence level.

Participant Energy Bill Impacts

The average participant does not experience a statistically significant change in annual energy bills, but there are meaningful seasonal changes

Change in Customer Energy Bills by Fuel & Season

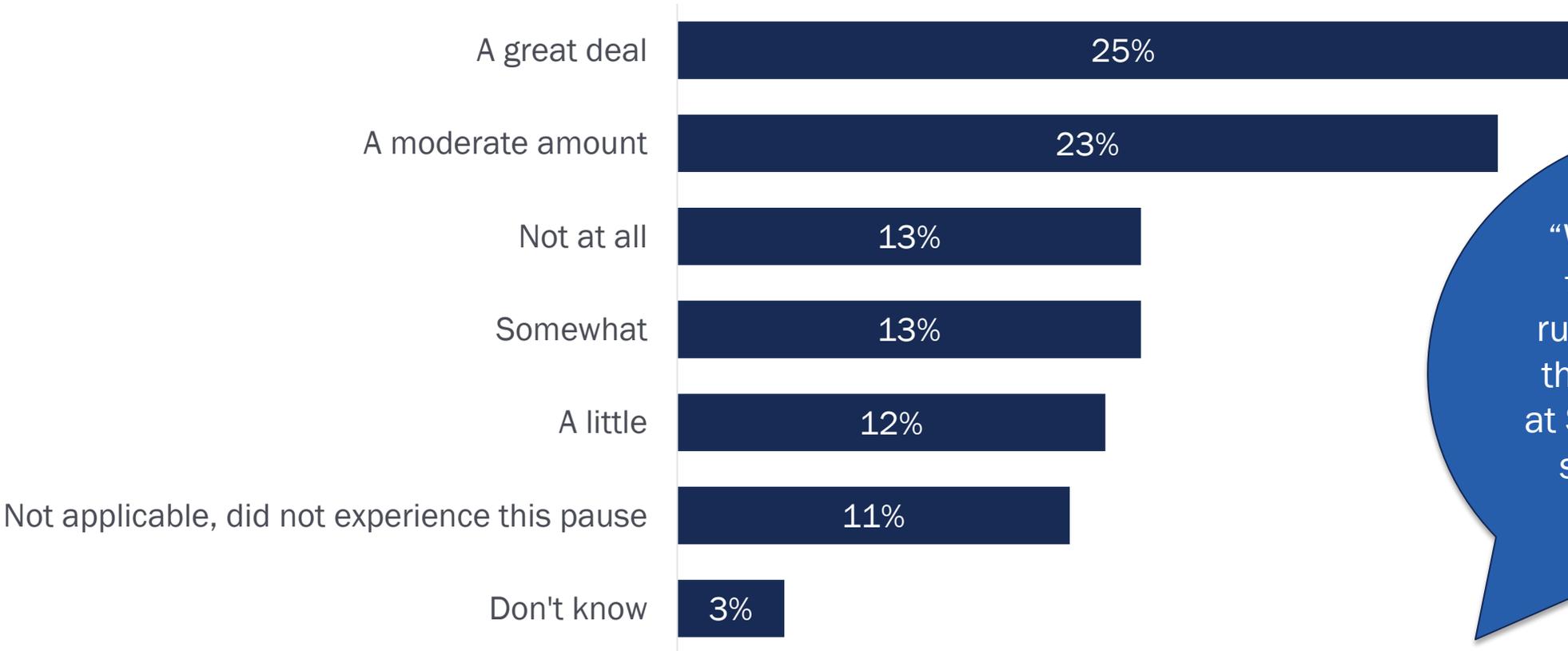
Season	Electric Estimate	Natural Gas Estimate	Annual Change	Net Change	
				Lower CI	Upper CI
Winter	\$316	-\$222	\$94*	\$79	\$108
Summer	-\$33	-\$24	-\$56*	-\$74	-\$39
Shoulder	\$50	-\$99	-\$49*	-\$62	-\$36
Overall	\$333	-\$344	-\$11	-\$37	\$15

Note: Normal weather estimates based on fixed-effects D-in-D panel regression analysis of TECH participant and matched nonparticipant monthly natural gas consumption data and interval electricity consumption data, combined with utility rates. Summer is defined as June through September, winter as December through March, and shoulder as April, May, October, and November. (*) Results are statistically significant at 95% confidence level.

Pauses in TECH incentives had a big effect

Source: Process Evaluation Report (2024)

To what extent have the periodic pauses of many TECH incentives reduced your heat pump sales, if at all? (n=100)



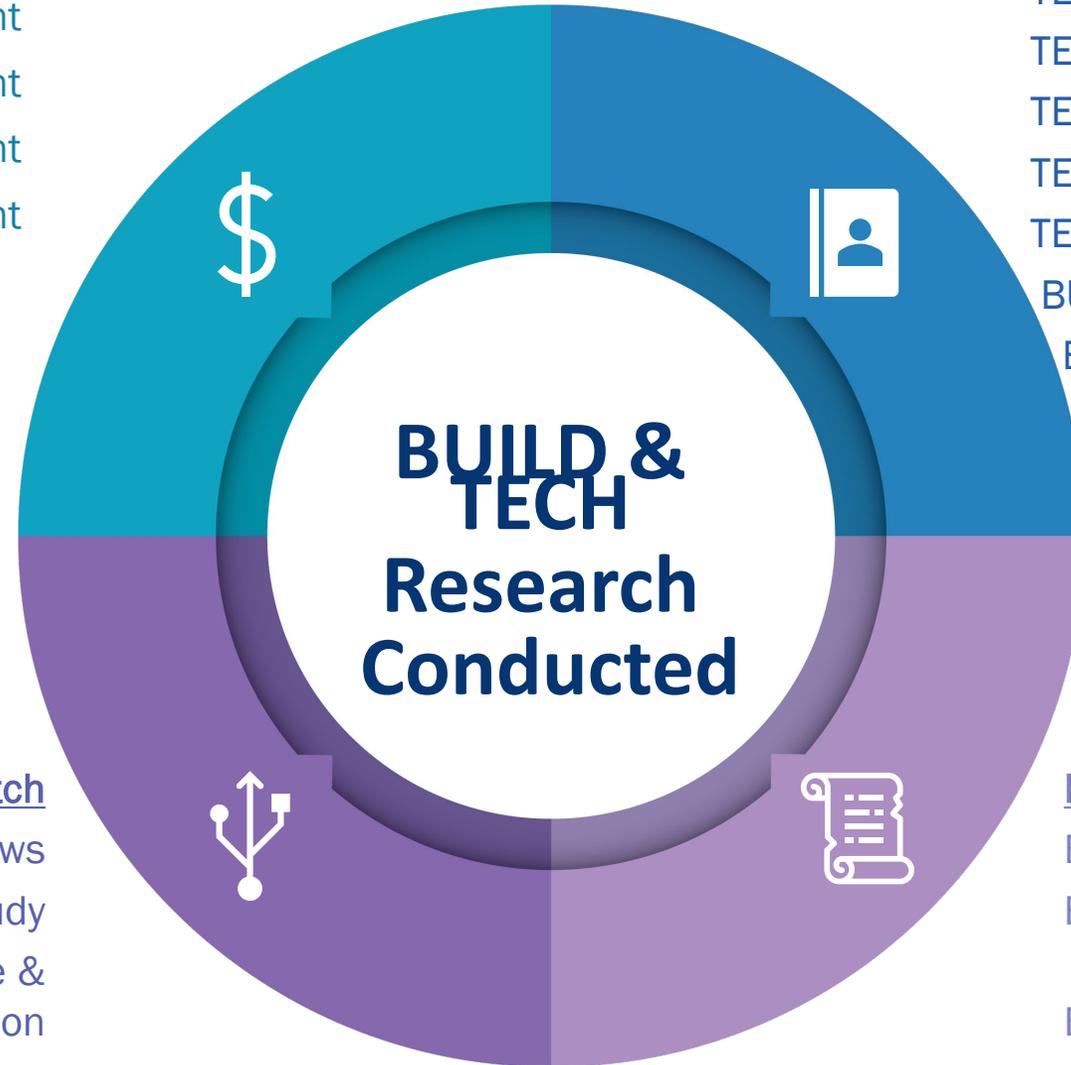
“We found out that the program was running out of funds through our contact at SMUD before TECH sent out an email days later.”

Market Watch

TECH Baseline Market Assessment
TECH Time 1 Market Assessment
TECH Time 2 Market Assessment
BUILD Baseline Market Assessment
BUILD Time 1 Market Assessment

Program Watch

TECH Interim Process Evaluation Report
TECH Process Evaluation Report: Wave 2
TECH Pilots and Quick Start Grant Evaluation
TECH Contractor Training: Behavior Survey
TECH Contractor Training: Cohort Evaluation
TECH Impact Evaluation
BUILD Interim Process Evaluation Report
BUILD Process Evaluation Report
BUILD Impact Evaluation



Technology Watch

TECH Engineering Desk Reviews
TECH End Use Metering Study
TECH Insights Into Customer Experience & Satisfaction
TECH Incremental Cost Study

Policy Watch

BUILD & TECH Technology & Policy Brief
BUILD & TECH Updated Technology & Policy Brief
BUILD & TECH Electrification Benefit-Cost Analysis
TECH Air-to-Water Heat Pump Memo

Select Overall Insights and Considerations

- Recognize that HVAC heat pumps and heat pump water heaters (HPWHs) operate in fundamentally different markets, with distinct customers, decision pathways, supply chains, and adoption barriers. Treating them as interchangeable technologies in program design is fraught with pitfalls and can undermine program effectiveness.
- **Ensure decarbonization program goals are clearly defined, prioritized, and documented.** Programs that attempt to advance too many objectives simultaneously risk diluted focus, implementation challenges, and reduced effectiveness.
- **Building decarbonization is not the same as traditional energy efficiency.** While many energy efficiency (EE) best practices can be leveraged, decarbonization programs operate under fundamentally different objectives, constraints, and market dynamics—and policy and regulatory protocols are still evolving to catch up.

Select Overall Insights and Considerations

- Are incentives padding contractor pockets?
- Especially with the emergence of power-efficient design (PED) strategies, electric panel capacity is no longer the primary barrier to building electrification it was once assumed to be. PED emphasizes intentional, whole-home or whole-building load management.
- Independent, embedded evaluation saves money by identifying issues early, enabling course correction before ineffective strategies scale, and ensuring program outcomes are assessed within evolving market, technology, and policy contexts. By shortening feedback loops between implementation and decision-making, it allows programs to adapt in real time rather than discovering structural problems after substantial resources have already been committed.



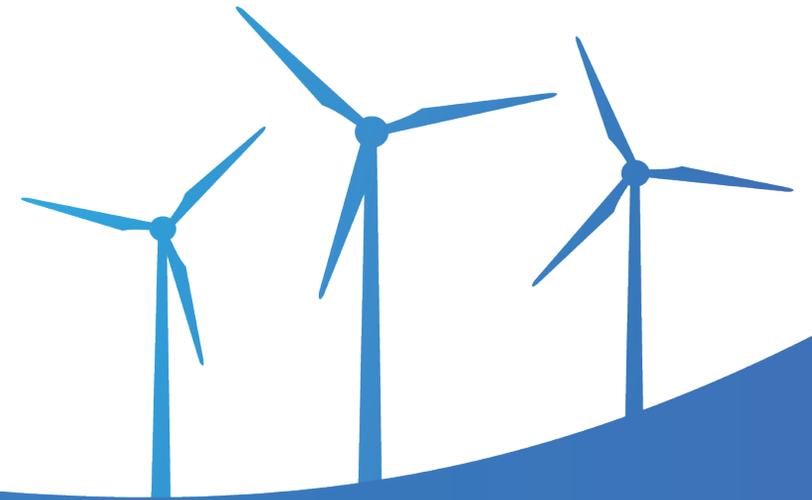
Opinion **Dynamics**

an E Source Company

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Vice President, Opinion Dynamics

esteiner@opiniondynamics.com



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Data and Right-Sizing Panel

Leveraging Data to Inform Building Decarbonization Strategy

CPUC Building Decarbonization Workshop
January 21, 2026

Teddy Kisch
Senior Fellow, Energy Solutions

Carmen Best
Chief Policy Officer, Recurve

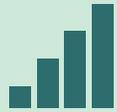


RECURVE



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TECH Clean California's 3 Strategic Pillars



Deploy

Spur the clean heating market through statewide strategies



Innovate

Pilots and Quick Start Grants to address market barriers



Inform

Use data to improve program design and support long-term planning

Focus of today's presentation

Deployment To Date (HP HVAC + Water Heating):

- Over 1,600 contractors participating
- Over 69,700 heat pumps deployed
- 45% of incentives deployed in equity communities
- Over 40,000 visitors using the Switch Is On "Find a contractor" tool
- Over 3,400 downloads of TECH Clean California's anonymized project datasets

TECH Clean California has deployed funding for several programs:

- HEEHRA Phase I
- TECH
- SGIP HPWH

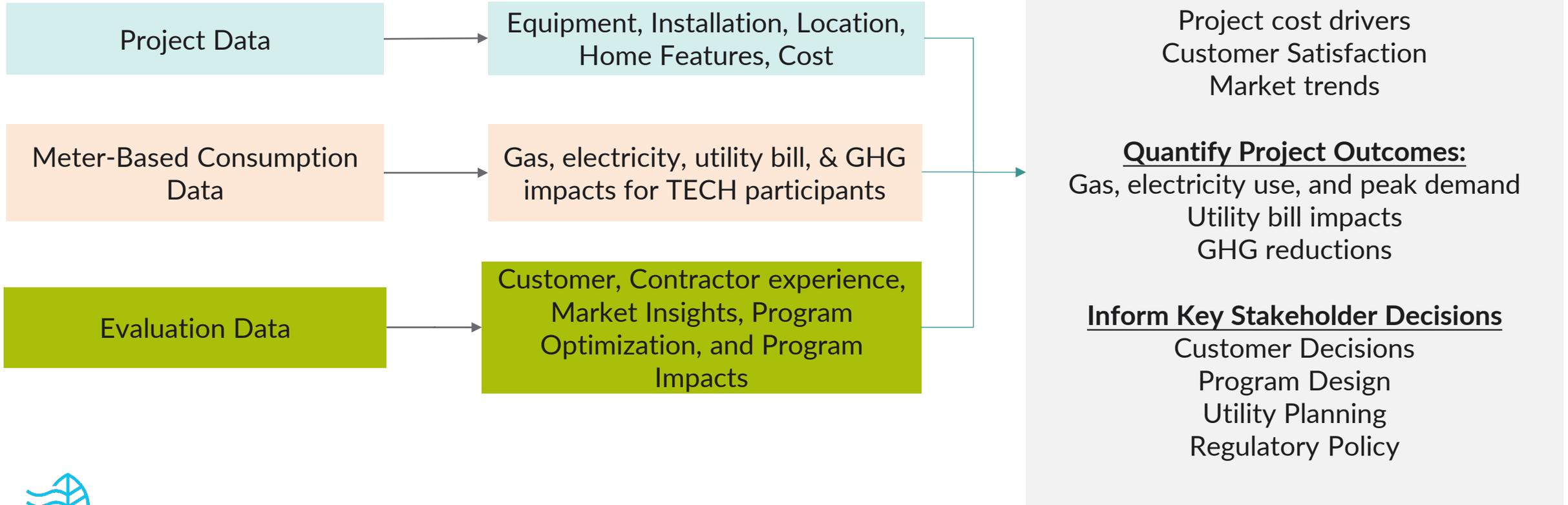


Program Data Analytics Enable Continual Refinement

Program Data Sets

Project Characteristics

Strategic Planning Insights



Incentive Design Changes that Reward Good Investments

Single-Family Incentives

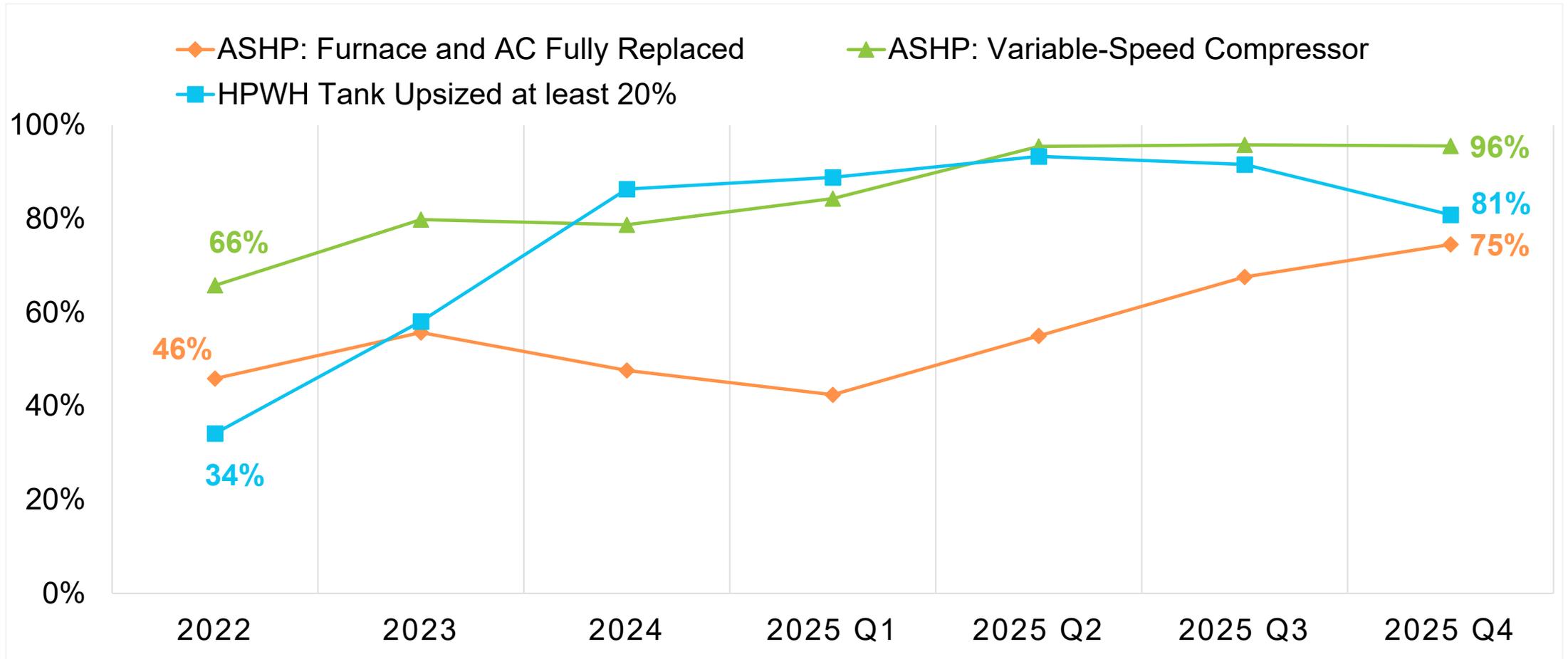
Category	Change	Reason
ASHP	Increase incentive for projects that fully replace furnace and air conditioner	<ul style="list-style-type: none"> • 3x greater utility bill savings² • 25% greater GHG emissions savings² • Peak demand reduction of 20% instead of increase²
ASHP	Require multi- or variable-speed compressors ¹	<ul style="list-style-type: none"> • 9x greater utility bill savings when replacing air conditioner² • 2x greater peak demand reduction when replacing air conditioner²
HPWH	Increase incentive for heat pump water heater with ≥55-gallon tank	Projects that up-sized the water heater tank by at least 20% had ¹ 20% greater GHG savings

¹ Derived from median post-installation energy impacts measured by TECH Clean California Implementation team member Recurve.

² Depending on the refrigerant pair and leakage assumptions. Sources: [California Energy Commission](#), [Cadmus](#)

Effects of Incentive Redesign on Participation

TECH-funded installations in Single-Family homes



Data Infrastructure for Electrification

The Opportunity

Analysis of key drivers and their relationships can help stakeholders, regulators and implementers reconcile multiple policy objectives and align around shared goals and outcomes.

The Partnerships

Recurve provides a unified platform to multiple agencies to:

1. Collaborate to accelerate impacts
2. Design more effective programs;
3. Inform policy and strategies for the future



Design Smarter

Understand electrification rate structures and forecast grid impacts.



Prioritize Outreach

Identify & engage with customers who have the most to gain.



Isolate key Drivers

Measure and analyze real-world performance.

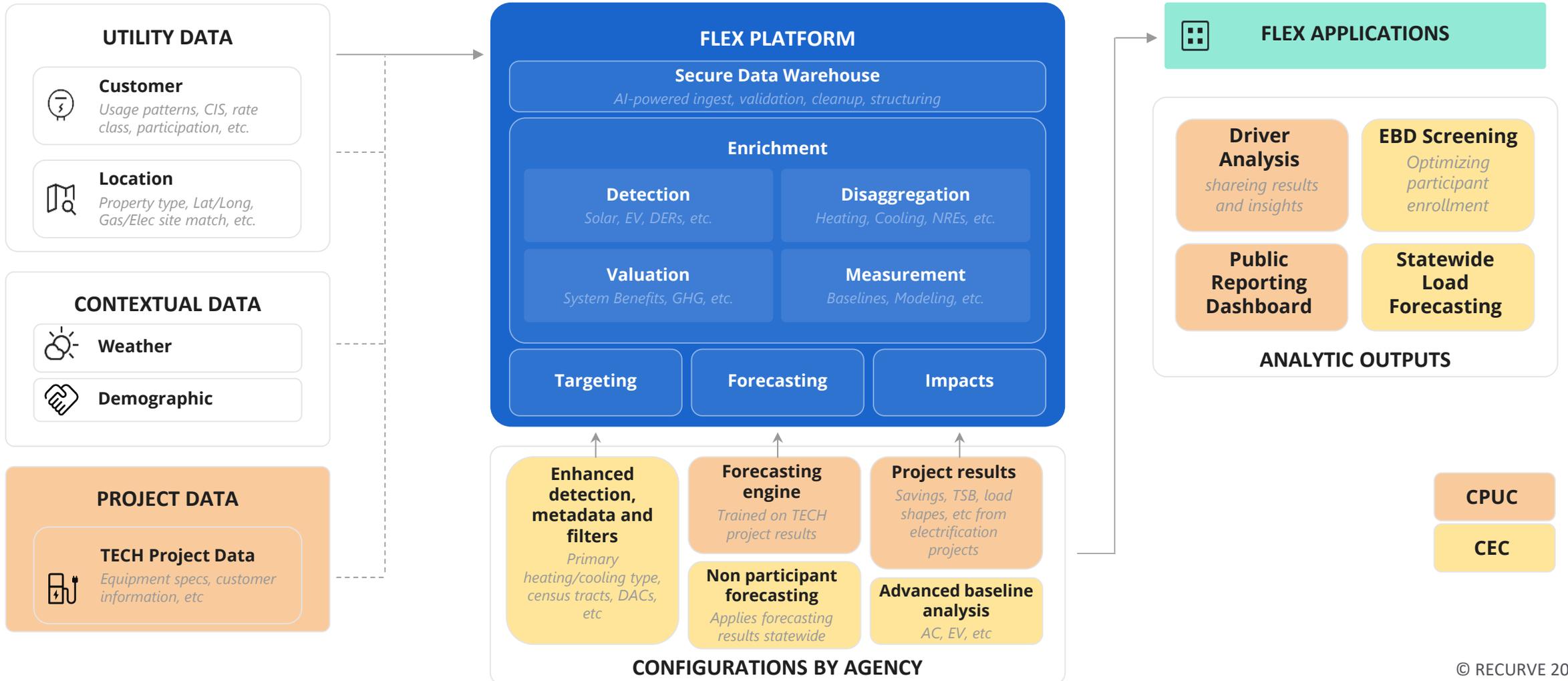


Improve Continuously

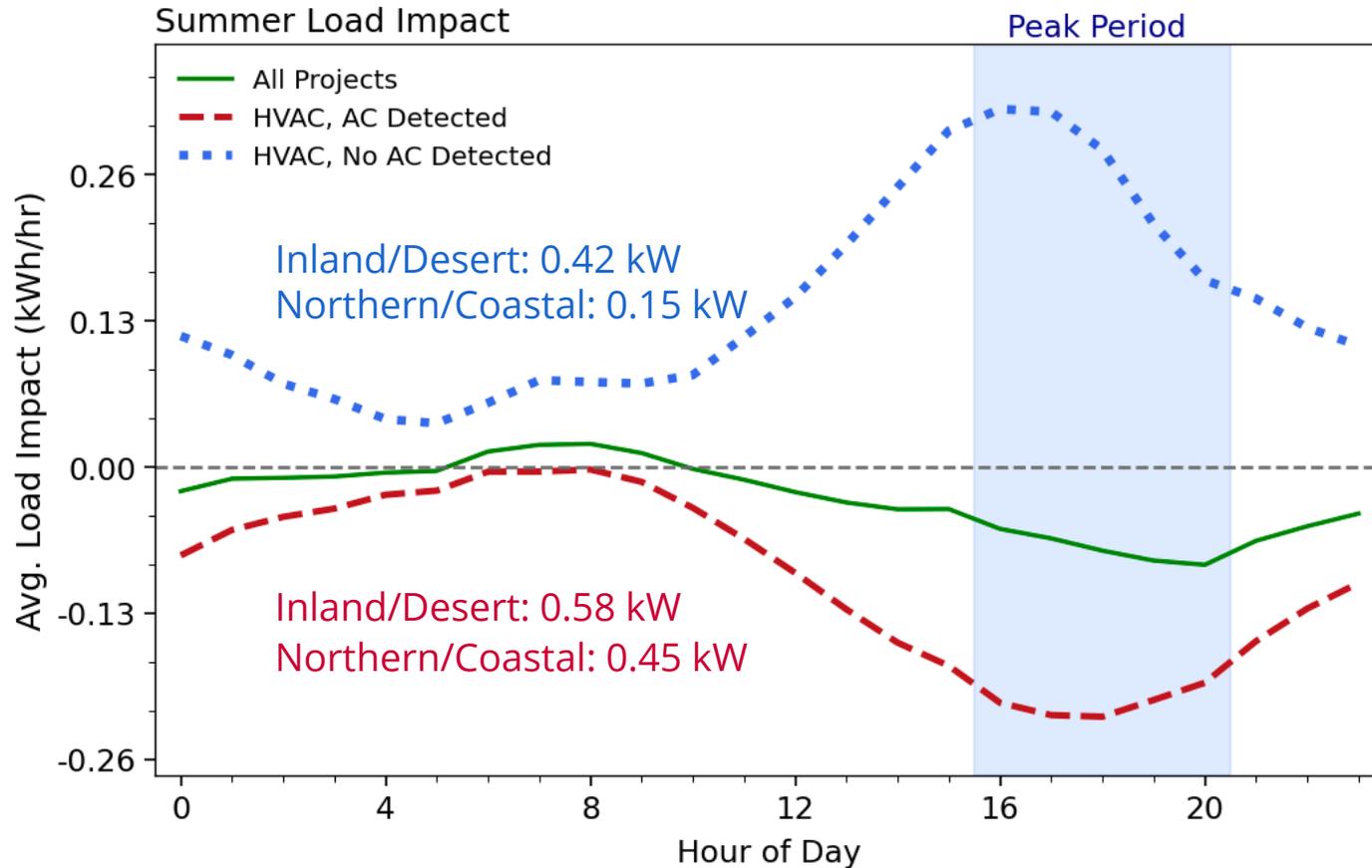
Use results to update program designs, incentives & forecasts

Analytics are Accelerating Decarbonization Across Agencies

The FLEX platform is contributing to both CEC and CPUC decarbonization initiatives by making disparate customer data and granular assessments accessible to drive action.



Baseline Conditions & Load Impact



AC Detection: Isolating a key driver

- AC Detection methodology sponsored by CEC enabled cohort-level analysis for TECH
- AC replacement drove peak load **reductions** for TECH
- TECH participants with No-AC showed **increases** in peak load.
- Significant variation by climate zone

Use Cases

- Isolate AC base conditions as a key driver for system load impacts
- Segment by high summer peak usage for AC replacement
- Forecast regional electrification impacts

Multiple other drivers are also being analyzed . . .



Bill Impacts



Peak Load



GHG | Carbon



Energy Savings



Equity

- A single driver can be a focal point of an electrification initiative
- Drivers are correlated and influence outcomes in different ways
- Each prospective participant has a unique potential contribution and personal outcome
- When analyzed together, drivers provide predictive power for an individual customer and actionable intelligence for the full initiative.

Multiple other drivers are also being analyzed . . .



Bill Impacts



Peak Load



GHG | Carbon



Energy Savings



Equity

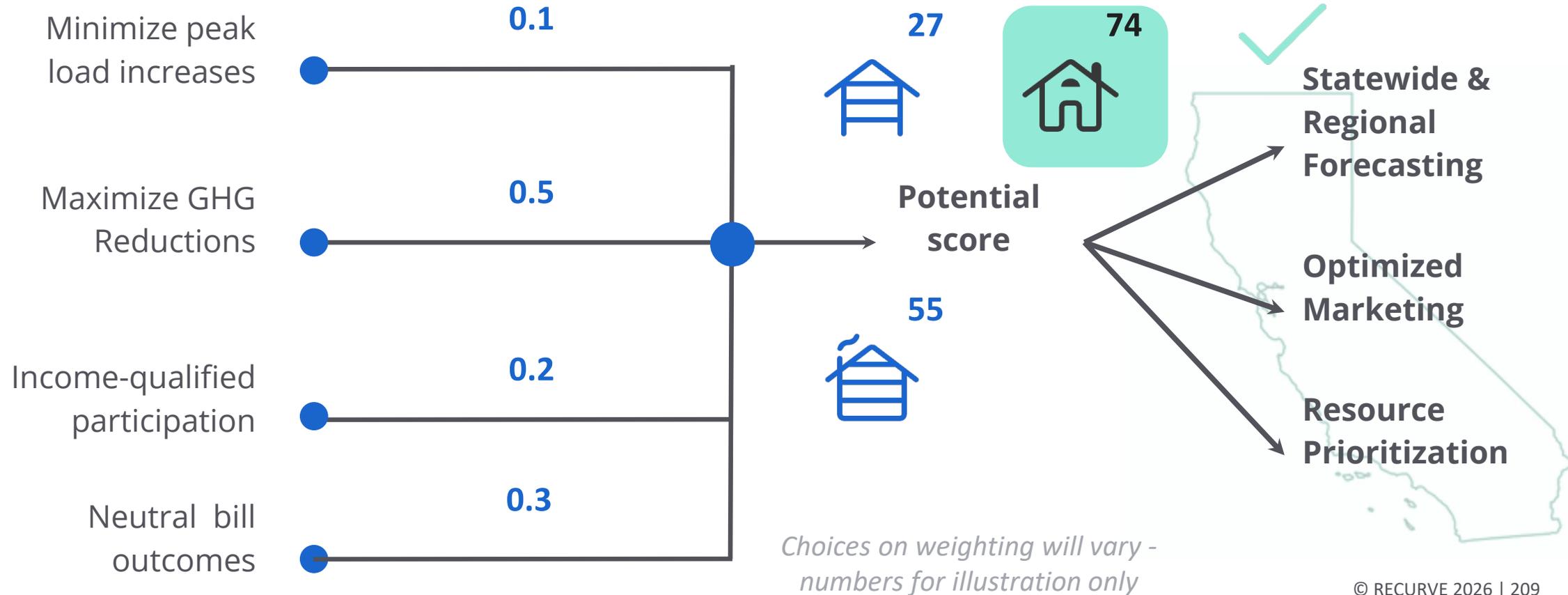
Correlation Matrix	Low Income	HTR County	Disadvant. Comm.	GHG Savings	System Impacts	Annual Bill Savings
Peak MWh Savings	-0.02	0.16	0.02	0.10	0.51	0.54
Annual Bill Savings	-0.02	0.14	0.06	0.39	0.68	
System Impacts	-0.09	0.11	-0.06	0.88		
GHG Savings	-0.12	0.04	-0.11			
Disadvant. Comm.	0.24	0.28				
HTR County	0.13					

Individual customer and actionable intelligence for the full initiative

Content represents implementer-led analysis only and is not reflective of third-party EM&V.

The Electrification Potential Score

Reconciling the many objectives of each electrification initiative into a score enables coordination to systematically drive impacts and predict outcomes.



A Prioritization Framework for Decarbonization Initiatives

When tested with TECH measured field performance, *every* metric is significantly improved among high scoring customers.

Predicted Score Bin	Predicted Score	Measured Score	Peak MWh Savings	Annual Bill Savings (\$)	System Impacts	GHG Savings (Tons CO ₂)	Disadvant. Comm.	HTR County	Low Income
1	31.07	32.53	-0.115	-\$88	\$2,618	18.58	0.0%	0.0%	5.5%
2	36.85	37.76	0.007	\$226	\$4,508	22.91	1.1%	0.0%	12.2%
3	42.73	43.43	0.102	\$266	\$5,733	27.64	15.6%	4.4%	34.4%
4	51.48	54.57	0.244	\$556	\$7,865	32.98	37.4%	50.5%	47.3%

Low Score



High Score

Test Case for hypothetical program reveal that top quartile projects can:

- Yield +\$556 in annual bill savings vs. a \$88 bill increase for bottom quartile
- Offer 3X higher energy system benefits tied to peak load reductions
- Generate 78% higher GHG savings
- Align with high participation among income-qualified and equity populations

Applying Model Findings to Real Data

What would median outcomes look like if we targeted TECH participants based on ML model findings?

Targeting Tier	Heat Pump HVAC Retrofit Customer Targeting Strategy	Sample size (# TECH projects)	On-Peak Electricity Savings (kWh)	Annual Utility Bill Savings ¹ (\$)	Lifecycle ² GHG Savings (MT CO2e)	Lifecycle ² Total System Benefit (\$)	Total Project Cost (2022 \$)	% Projects in DACs ³
0	None - All HP HVAC Retrofits	1,918	32	155	15	5,219	18.0k	12%
1	Reference case - Target only homes with air conditioning	1,270	155	259	17	5,962	17.2k	16%
2	Target homes with A/C and on-peak elec use above the median (1 MWh)	789	311	423	21	7,582	17.7k	16%
3	... and: <ul style="list-style-type: none"> • Home size < 1,750 ft², • Home age < 80 years, • SEER2 > 17 • Variable-Speed Compressor 	103	363 (23% of base case usage)	458 (12% of base case bill)	23	7,504	16.3k	20%

What about HPWH? TECH Clean California HPWH retrofits tracked to-date only add **51 kWh** to on-peak electricity use, on the median. Targeting tiers 1-3 save enough that a HPWH could be added and the home would *still* reduce on-peak usage.

¹ Utility Bill Savings is available for a subset of 1,229 projects. Median results for that subset, filtered the same way for each row, are presented here.

² EUL = 23 years per DEER 2026.

³ Disadvantaged Community, defined by CalEnviroScreen 4.0

Reducing Electrification Barriers: Encouraging Power Efficient Design



Tom Kabat, Co-Chair of POWER Steering Committee

January 21, 2026

POWER GROUP

PANEL OPTIMIZATION WORK AND ELECTRICAL REASSESSMENTS

- **250+ Members**
- **Vision:** Power efficient design becomes the common approach and practice in residential electrification that reduces barriers to electrifying communities.

Power Efficient Design

- **Power Efficient Design (PED)** is the intentional practice of electrification design to fit whole building electrification onto existing electric panels, service lines and distribution transformers without needing expensive upsizing.
- **Power efficient design uses:**
 - Multi-function appliances (e.g. combination washer and dryer)
 - Power efficient appliances (e.g. heat pumps without resistance strip heat)
 - Thoughtful sizing (of HVAC, EV charger, etc.)
 - Load Controls (e.g. circuit sharing or circuit pausing)
 - Strategic use of the National Electrical Code

POWER GROUP

PANEL OPTIMIZATION WORK AND ELECTRICAL REASSESSMENTS

- **Mission:** POWER brings together a multidisciplinary group of experts that advances power efficient design that maximizes resources, increases affordability, and shortens timelines so all homes can embrace the fully electrified future. We develop and share best practices, advise on policy and codes, and explore technological advances to efficiently utilize electrical infrastructure.

120 volt Appliances

- **Is permitting necessary for:**
 - common household appliances that plug into a regular 120 volt outlet?
 - Before: window air conditioner and plug-in space heater
 - After: 120 volt heat pump
- **Are dedicated circuits required for:**
 - 120 volt heat pump water heater where manufacturer allows shared circuit

Utility Electrical Service Requirements

- **Gas Meter & Electrical Panel Clearances**

- *Existing Rules:* There are specified, uniform clearance requirements for gas meter and electrical panel/meter that applies to all existing residential homes – single family, multifamily, retrofits – and new construction.
- **Problem:** For projects in existing residential homes, requiring strict compliance with the gas meter and/or electrical panel clearances regularly leads to **costly workarounds and delays or project cancellations**, including those that would improve safety (e.g. replacement of a known faulty panel equipment like some from Zinsco or Federal Pacific)
- *Solutions:*
 - Have different appropriate rules for retrofits of existing vs. new construction
 - Use of gas vent extension pipes or snorkels
 - 5 year clock for completing electrification if it has space clearance issues
 - Potential mitigation for the non-compliant existing situation (improving general safety)

Utility Electrical Service Requirements

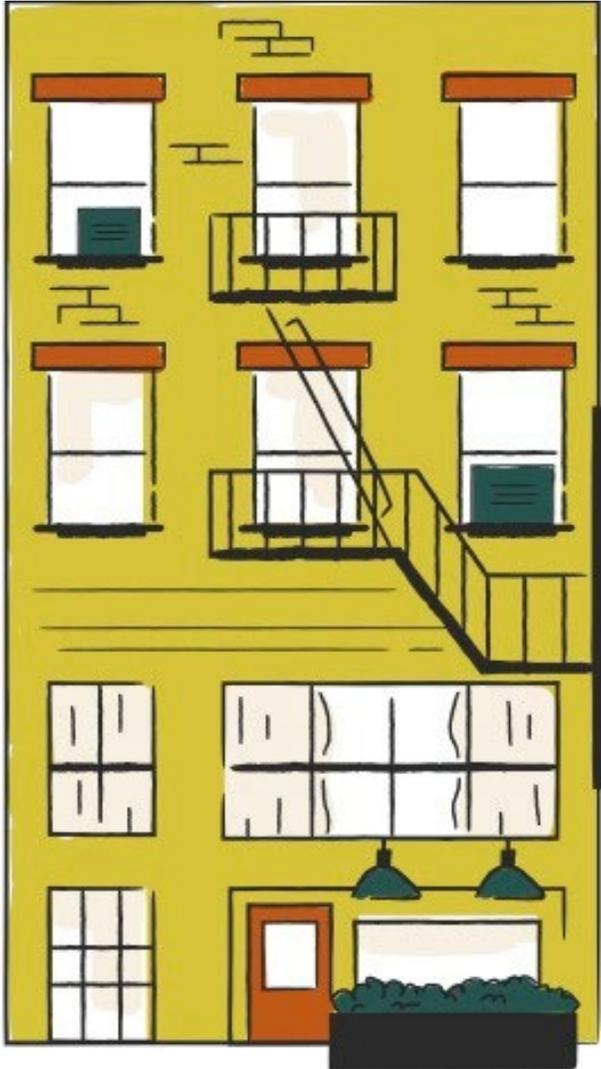
- **Working Space for Retrofits**

- *Existing Rules:* Code requires a specific working space around an electrical panel to ensure safety for service personnel.
- **Problem:** Many existing homes have legacy situations of clearance violations that have existed a long time without creating significant barriers to servicing utility equipment. Because of these pre-existing clearance conditions, new projects in existing homes will trigger compliance to this working space rule.
- *Solutions:*
 - Allow most panels to be replaced in place, provided no identifiable hazard is found.
 - Defer clearance requirements to the local authority.
 - Change the standard for retrofit to match that of the [New Jersey UCC Rehabilitation Subcode](#), which allows retrofits in most cases if the new setup is clearly safer or more compliant than the existing condition.

Multifamily Buildings

- **Distinct issues from single family homes**
- **Transformer**
 - Existing multifamily: Past practice in undersizing of transformers for multifamily buildings as historically no major electrification end-use existed.
 - New construction: Infill development would be connecting to a constrained grid.
- **“Inactivity” leading to project cancellation**
 - For a project, a general application pathway is established for initial contact with the utility. “Inactivity” for a period of time (e.g. 30 days) could lead to project cancellation in their system.
 - Example: As you submit your permits to the city and wait 1-2 months for the city’s review, the utility could cancel the project during this time.
 - Solution: Reach out to property owner/project manager to check-in on project status

Multifamily Buildings



Buildings 1960s and earlier will be more costly to electrify

- lower panel capacities
- the prevalence of original electrical gear
- old spacing practices don't meet new construction specs
- the code implications of relocating and updating equipment
- meter banks closely located near one another

Adding Solar on 100 amp panels

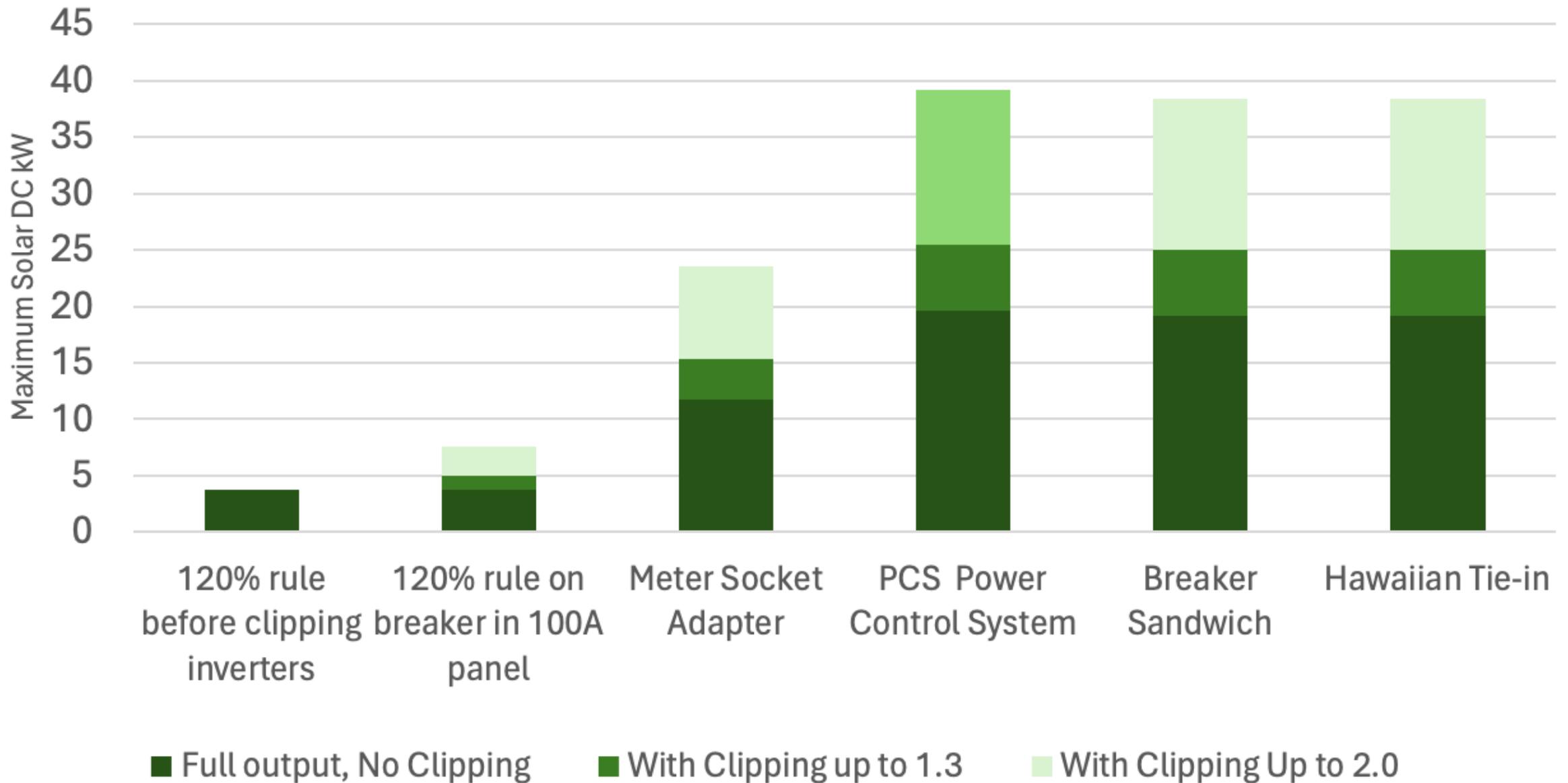
- **120% Rule**
 - Max Solar Breaker = 20A; Max Solar Array Size = 7.6 kW DC with clipping
- **De-rating the Main Breaker (for 125 amp panel)**
 - Max Solar Breaker = 50A; Max Solar Array Size = 19.2 kW DC with clipping
- **Hawaiian Tie-In**
 - Max Solar Breaker = 100A; Max Solar Array Size = 38 kW DC with clipping
- **Breaker Sandwich**
 - Max Solar Breaker = 100A; Max Solar Array Size = 38 kW DC with clipping
- **Meter Socket Adapter**
 - Max Solar Breaker = 60A; Max Solar Array Size = 23 kW DC with clipping

Adding Solar on 100 amp panels

- **Line-side Tie-In**
 - Max Solar Breaker = 100A; Max Solar Array Size = 23 kW DC with clipping
- **Power Control Systems for Solar**
 - Max Solar Breaker = 100A; Max Solar Array Size = 38 kW DC with clipping
- **Emerging: Home DC Nanogrids**
 - Max Solar Breaker = 50A; Max Solar Array Size = 19 kW DC with clipping
- **Emerging: Plug-in solar**

Note: More details on these strategies to add new power sources will be available by end of March 2026 in a Power Efficient Management Report developed under the CEC EPC-24-005 grant project.

Maximum Solar DC sizing kW on a 100A panel home



Program Support for Power Efficient Design

- Include power efficient design products
 - example: make programs for combination washer/dryer machine (1 & Done)
- Not incentivizing unnecessary panel upsizing
- Tom's personal ideas:
 - Offer incentive of \$100/Amp space remaining for full electrification under 100A (recognizes neighborhood benefits of PED) for single-family homes
 - Offer DIY incentives, not just contractor incentives

THANK YOU!

Good Gridizen LLC

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POWER Group

Jenny Low, Senior Program Manager

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SPAN[®]

Richard W. Caperton
VP, Public Policy, SPAN



SPAN: Enabling Electrification for All

Core Product: The SPAN Smart Electrical Panel



SPAN 32

SPAN 48

SPAN 24

SPAN 16

SPAN Panel

efficiently integrates sources, loads, and storage, enhancing functionality and reducing costs of whole home electrification

Additional Products



SPAN Drive

launched in 2022 to fully control any EV charging, including intelligent throttling.



SPAN App

facilitates whole home energy management and creates an intuitive interface to the home.



SPAN Fleet

software services for fleet management and virtual power plants.

Different models for different use cases

SPAN Panel

Customer-owned in home electric service panel



- Comprehensive home energy management for every circuit
- Requires full panel replacement
- Customer can opt-in to programs to share data and controls with a utility

SPAN Edge

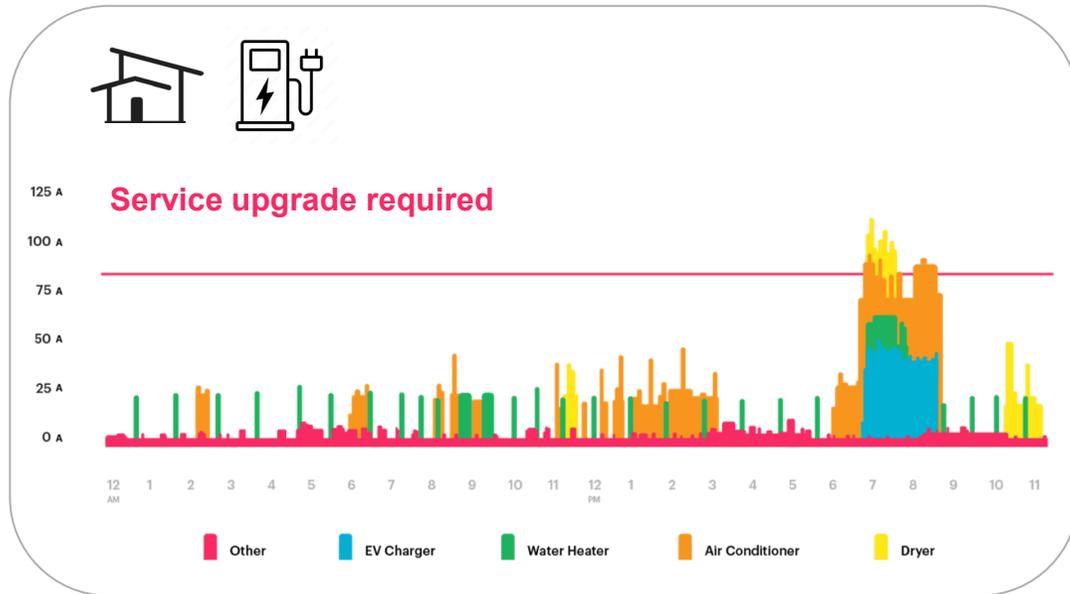
Utility-owned distribution grid asset



- Support for up to 8x 240V loads (EV charger, HVAC, water heater, etc)
- Utility enables electrification and provides customer with EMS value
- Simplified opt-in to utility submetering and tailored programs/incentives

All powered by the same platform to support rapid residential electrification, provide multi-home demand flexibility, defer or avoid costly infrastructure investment, improve end-customer satisfaction, advance beyond VPP and demand response, and integrate seamlessly into utility operations.

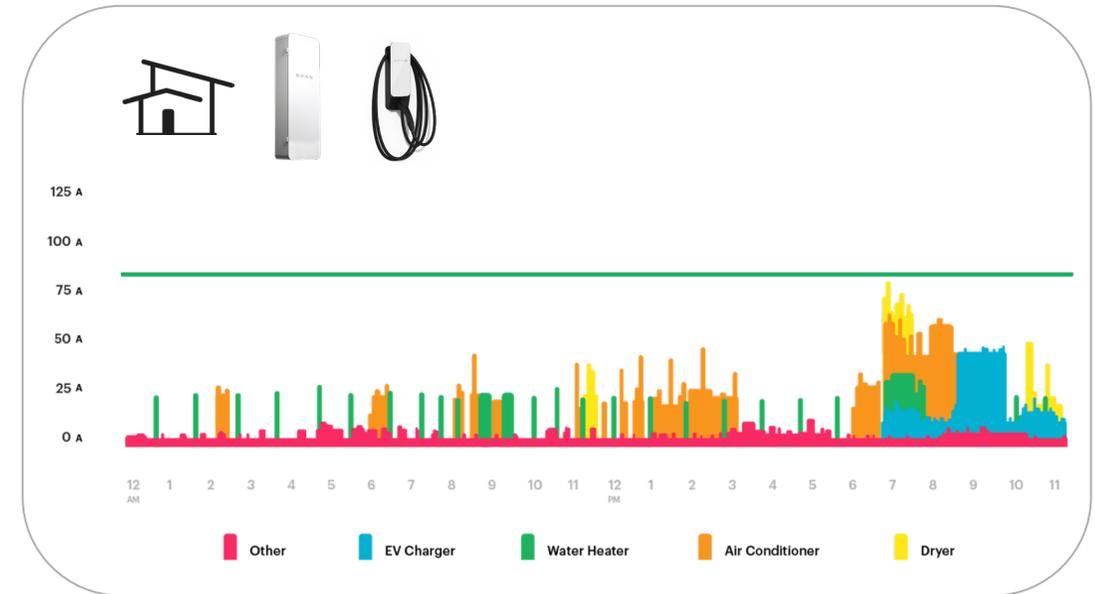
PowerUp is the energy management system (EMS) feature in all SPAN Panels



Increase electrical service required

When building all-electric homes, or meeting code requirements for future electric pre-wires, critical load sub-panels increased and over-built utility-side electrical service is often required, which can cost **\$11k per home** and delay projects by **months, even years**, or at worst, cause the customer to cancel their project.

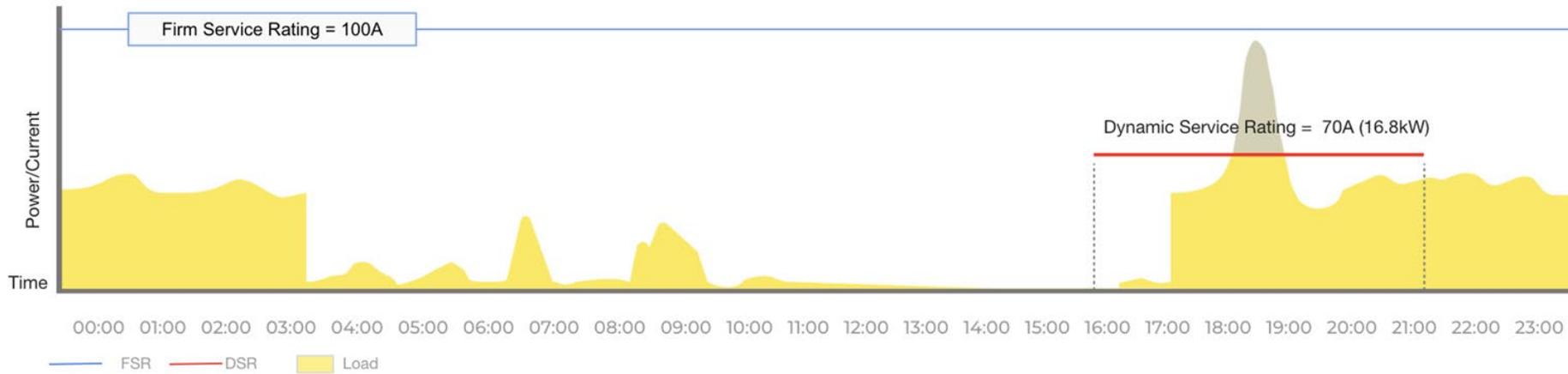
Vs.



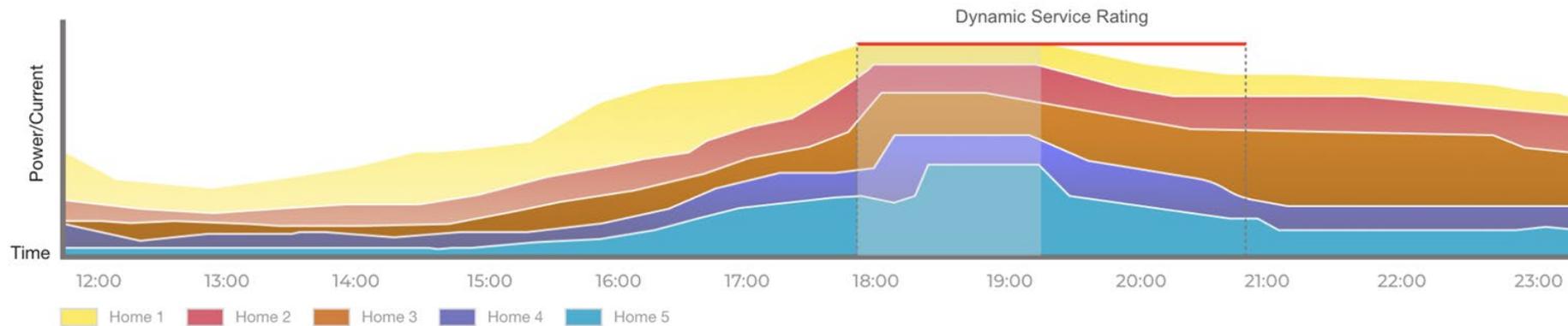
Electrification with SPAN PowerUp

SPAN automatically shifts loads based on homeowner preferences to intelligently control energy consumption in the home behind the scenes, enabling **faster**, often **less expensive installations**.

SPAN Dispatchable Dynamic Service Rating



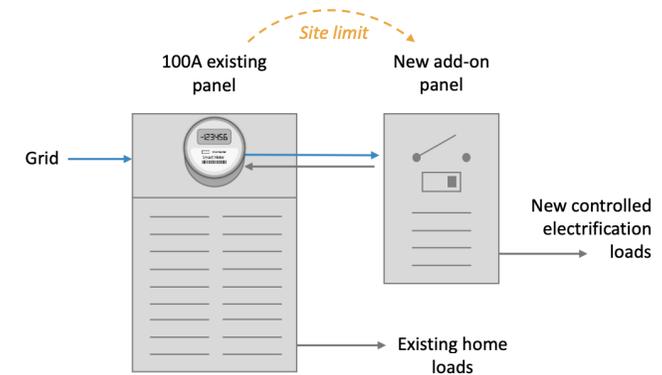
Aggregated DSR for Non-Wires Alternatives



Smart panels and service upgrade avoidance

1. Service Upgrade Avoidance pilot at PG&E (EPIC 4.02B)

- Augmenting “Socket of the Future” initiative to enable electrification without service or panel upgrades
- Starting Q4 2025 to offer SPAN Edge as fully subsidized, fast-install alternative to service upgrades



2. Transportation electrification at Green Mountain Power

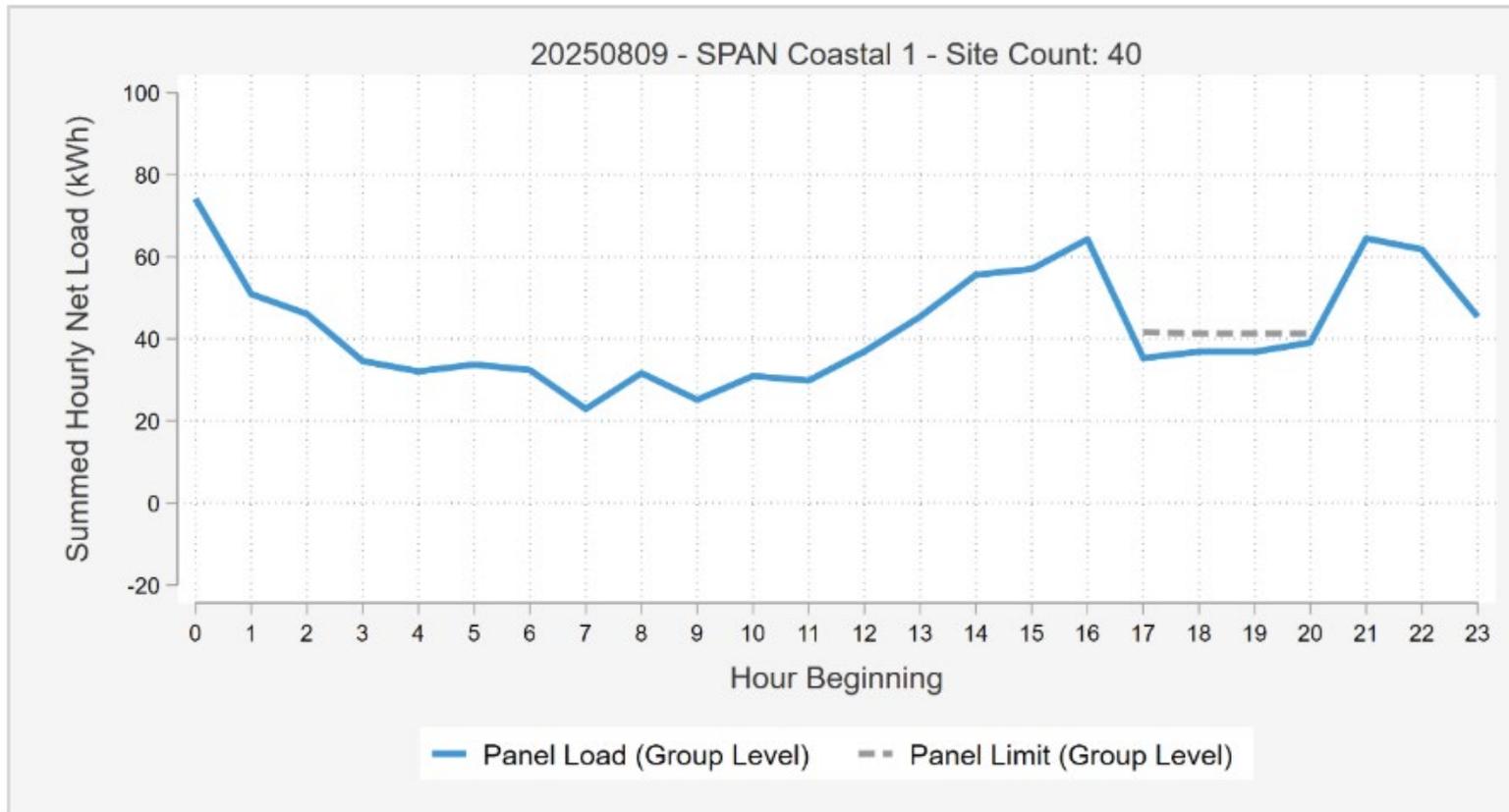
- “In 2021, GMP piloted SPAN smart electric panels, which allow for electrification without the need for service upgrades. This technology was extended to the Resilient Neighborhood Pilot, a community of new, fully electrified homes in South Burlington, each with all electric heating and cooling, induction stoves, and Level 2 EV chargers. These homes demonstrate that 200A service equipment and a home energy management system can meet the needs of a fully electrified house without the need for upgrading to a larger service.”
- [Case No. 24-3023-INV](#) – Public Utility Commission 2024 Investigation into Rates Related to Electric Vehicles, p. 5

3. Targeted electrification at National Grid (Massachusetts)

- “[P]articipating customers will receive temporary, artificial virtual service limit signals to their smart panels to test how their smart panels can automate pausing or shifting loads in line with customer preferences, to remain within those limits with minimal or no customer inconvenience.
- National Grid MA - [Targeted Electrification Demonstration Project Proposal](#), p. 63-64

Smart panels are reducing load on constrained feeders

SPAN is seeing positive field results from PG&E SAVE, funded by EPIC 4.09B



Seasonal Aggregation of Versatile Energy (SAVE)

- Enrolled >100 installed SPAN panels for distribution load shaping
- Dispatched based on local feeder and substation load conditions
- Each premise managed to an individual limit. Load reduction per premise measured against Peak Load Contribution value
- Participating aggregators: Sunrun, Everbright, SPAN

Smart panels can deliver comprehensive system benefits, including upstream infrastructure



Total System Value

Exceeds **\$14,000 per device** —delivering a consistent \$7,900 to \$8,100 customer savings by avoiding costly panel upgrades.

Total Feeder-Level CapEx Deferral

Total utility benefits reach up to **\$1.3 Million per 500-home feeder** with up to \$1.16M in secondary distribution avoidance alone.

Regulatory Proof: High Cost-Effectiveness

SPAN delivers a High ROI (Total Resource Cost Ratio) of **3.8 to 6.5**, with the most scalable scenario achieving a positive Program Administrator Cost ratio of **1.18**.

<http://www.ethree.com/smart-panels>

Best practices for including smart panels in utility programs



- **Reduce the upfront investment by a homeowner.** Infrastructure benefits are realized by all ratepayers, so the upfront investment shouldn't just be the homeowner's responsibility. Rebates or utility ownership are good options to consider.
- **Use existing budgets to fund smart panels.** California IOUs have service upgrade allowances that should pay for grid edge technology like smart panels.
- **Link smart panel programs to system planning.** Smart panel benefits are system-wide, and utilities should include panels in system planning and operations.



Thank you!

Richard Caperton - VP, Public Policy
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Break – 15 Minutes

Workforce Panel



Why Workforce Planning and Standards Are Crucial for Safe, Effective, and Equitable Building Decarbonization

Tom Enslow

Adams Broadwell Joseph & Cardozo

California Coalition of Utility Employees,
California State Pipe Trades Council, and
Western States Council of Sheet Metal Workers

SAFETY

- ❑ Utility Worker Retention Plan Is Critical to Maintaining the Safety and Reliability of California's Gas Pipelines During the Transition to Decarbonized Buildings and Neighborhoods.**
- ❑ Replacing Gas Appliances with Electric Appliances Increase Electrical Load and Can Pose Significant Safety Issues If Performed by a Low-Skilled Workforce.**

Achieving Expected Energy Efficiency and Performance Outcomes



Installation Errors Impact Efficiency

- ❑ **Studies show that 85% of HVAC retrofits are installed incorrectly.**
- ❑ **This results in up to a 20-30% reduction in energy efficiency outcomes.**
- ❑ **Utility studies found the majority of HVAC installers don't have the technical knowledge, skills, or abilities to properly install systems, resulting in high failure rates on even routine tasks.**

Issue is not lack of available training; Issue is lack of incentive to invest in training.

- ❑ **All union and some non-union contractors use state-approved apprenticeship programs to provide their workers comprehensive hands-on training.**
- ❑ **Fundamental problem is contractors are subsidized by public incentives even when they use installers who have not been provided adequate training – discouraging investment in training.**

Providing a Just Transition to Address Worker Job Loss



Utility Gas Workers

Plan Is Needed To Retain And Transition Gas Utility Workers.

- ❑ Sufficient Workforce Must Be Retained to Ensure Pipeline Safety.
- ❑ Retention Plan Must Include Transition Program for When a Group of Gas Utility Employees Are No Longer Needed.
- ❑ Diablo Canyon Power Plant Retention Plan Provides a model, but Need to Adopt a Plan on a Much Larger Scale.

Plumbers and Pipe Fitters

Plumbers Install Gas Pipelines in Buildings.

- ❑ Electrification Of Buildings Will Eliminate A Substantial Chunk Of Plumbing Work And Will Result In The Loss Of Good Paying, Middle Class Blue-collar Jobs.
- ❑ Unfair For The Burdens Of Decarbonization To Be Borne Primarily By The Men And Women In The Plumbing And Pipefitting Trades Without A Just Transition Plan.

Consistency with State Policies To Create High Road Jobs and an Equitable Green Economy



- ❑ 2018 – CPUC directed the IOUs to evaluate all new energy efficiency incentive programs for opportunities to establish workforce standards to improve efficiency outcomes, to increase contractor investment in worker training, and to provide greater career opportunities for disadvantaged workers.
- ❑ 2020- CPUC MOU with the California Workforce Development Board to ensure that Commission-regulated programs build clean energy career pipelines and establish frameworks for high road economic and workforce policy in areas such as energy efficiency and building electrification.

California Workforce Development Board Jobs and Climate Action Plan identifies three key factors for agencies to consider when implementing climate policies and programs:

- ❑ Labor should be considered an investment rather than a cost. Well trained workers are key to delivering emissions reductions and moving California closer to its climate targets.
- ❑ Programs should pay attention to job quality (i.e., family-supporting wages, employer-provided benefits, worker voice and opportunities for advancement).
- ❑ Deliberate policy interventions are necessary to advance job quality and social equity as California transitions to a carbon neutral economy.

Apprenticeship Programs Meet All State Workforce Goals:

- (1) Creates qualified, highly-trained workers.**
- (2) Provides pathway for disadvantaged workers and local residents to obtain good paying jobs with benefits.**
- (3) Required by law to have equal opportunity and affirmative action plans.**
- (4) Over 65% of registered apprentices are people of color.**



Policies and programs that increase demand for apprentices and apprenticeship graduates are the most effective method to meet high road job creation goals and to ensure safe and quality installations that realize expected energy savings and provide consumers with performance satisfaction.

What Does Not Work

Contractor Training/Contractor licensing

- Contractor licenses are employer business licenses and do not require that employees actually performing installation have any training.

Webinars; Cursory Training

- Retrofits require whole system knowledge, not just cursory training on installing a specific piece of equipment. Existing building conditions vary widely and require expertise.



Workforce Standards Options and Recommendations

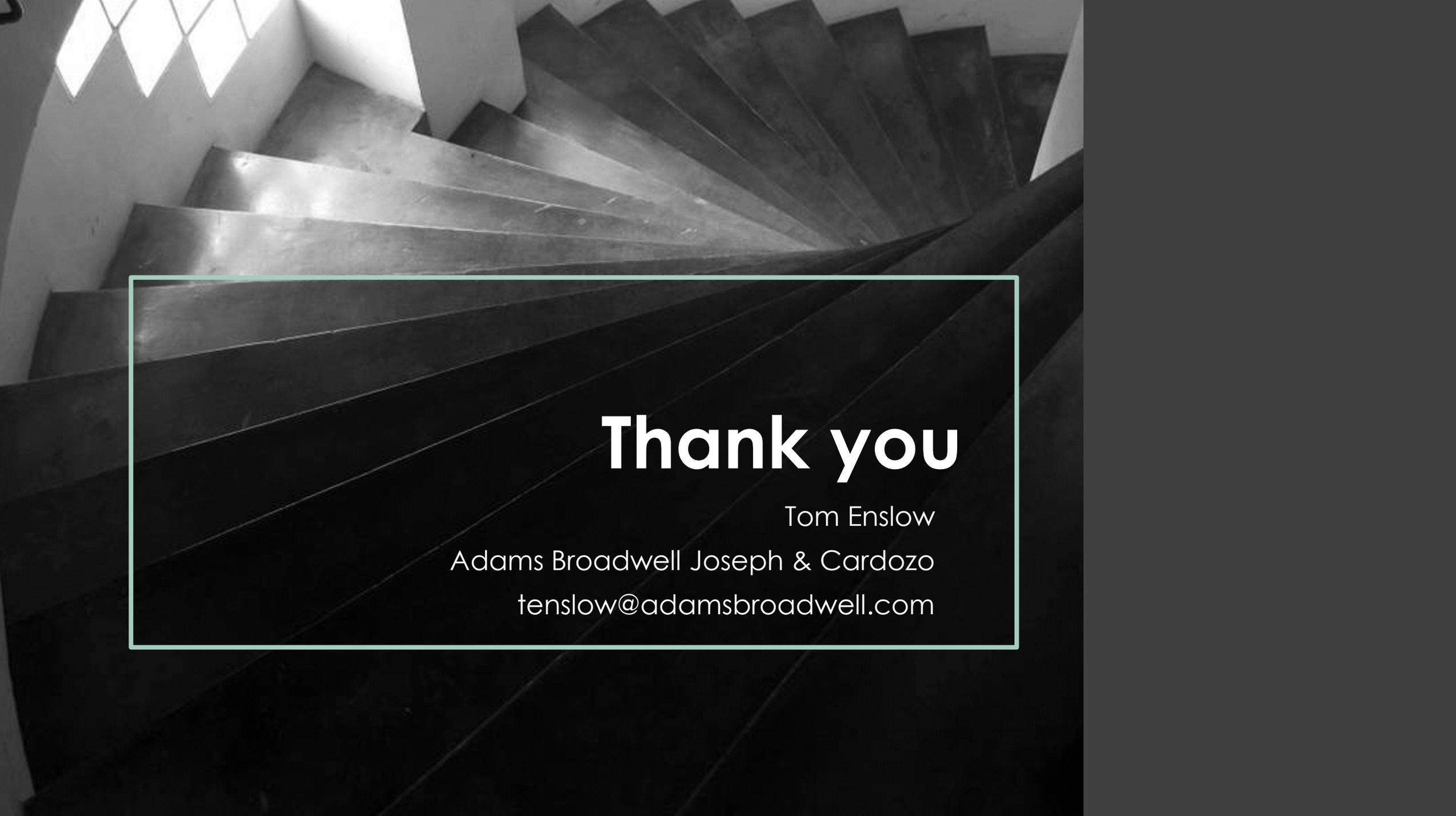


- **Prevailing Wage** – Creates competition based on work quality rather than rewarding contractors for investing the least in their workers.
- **Skilled and Trained Workforce Requirements** - Authorized under Public Contract Code § 2600; generally requires 60% of workers to be union or nonunion apprenticeship graduates.
- **Incentive programs run through Local Building Trades Councils or Local Unions** – Track record of very successful outcomes and inherently supports state's workforce training and high road job creation goals.

Workforce Standards Options and Recommendations



- **Project Labor Agreements** – Ensures skilled workers, use of apprentices and local hire. Best practice for large or bundled projects.
- **Priority Access to Incentives** - Provide first priority to high road contractors for incentive or direct install programs.
- **Require Subcontracting of Specialty Contractors** – For multi craft incentive programs such as whole home upgrades, critical to require that specialty work be subcontracted if the prime contractor does not itself hold the relevant specialty license.
- **Involve Trades in Implementation Plan Process.** Implementers should engage with local building trades councils early on in program development to identify the best ways to ensure that high road contractors will participate in any building decarbonization program.



Thank you

Tom Enslow

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High Road Building Decarbonization



Construction Trades Workforce Initiative

**Contra Costa Building &
Construction Trades Council**

Presentation Outline

- **Zonal Decarbonization High Road Requirements**
- **Leadership Projects demonstrating High Road strategies for other Building Decarbonization Program types.**
- **High Road Energy Benefits**
- **Cost Effectiveness Reforms to Boost High Road Approaches across Portfolio of Rate Payer Programs**

Instructions to IOUs re SB 1221 Implementation

- **Require Prevailing Wage (Berkeley Specific Plan)**
- **Require Paid Health Care (Berkeley HARD HATS)**
- **Require Apprenticeship Utilization. (Berkeley HARD HATS)**
- **Optional Compliance Path: PLA with Local Building Trades**

SB 1221 Implementation Model: Richmond

- **Team: Building Trades, ACCE, Rebuilding Together East Bay, MCE, PG&E, City of Richmond,**
- **Scope: Building Electrification, Rooftop or Community Solar, Home Health Hazards**
- **Funding (prospective): PG&E (avoided costs), MCE (solar), City of Richmond, Bay Area Air District Community Development Fund. CEC Equitable Building Decarbonization**
- **Optional Compliance Path: PLA with Local Building Trades**

High Road Program Examples

- **Rebates: Clean Power Alliance grant to Sheetmetal Workers**
- **Direct install single measure: City of Hayward**
- **Direct install whole home: City of Berkeley**
- **Critical Municipal Facilities: AVA Community Energy**
- **Zonal: None. That is what SB 1221 pilots are for.**

High Road Energy Benefits

- **Prevailing wage, benefits and apprenticeship requirements improve recruitment, training and retention of skilled clean energy workers**
- **Improves installation quality, yielding greater energy efficiency and climate benefits**
- **Addresses skilled labor shortage of decarb workers**

Cost Effectiveness Revisions

- **Needs to consider energy benefits of high road construction strategies**
- **Should incentivize high road strategies for rate payer programs of all types**



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an E Source Company

California Residential Fuel Substitution Workforce Readiness Study – Phase 1

Ellen Steiner, Ph.D.

January 21, 2026



Background of the Study

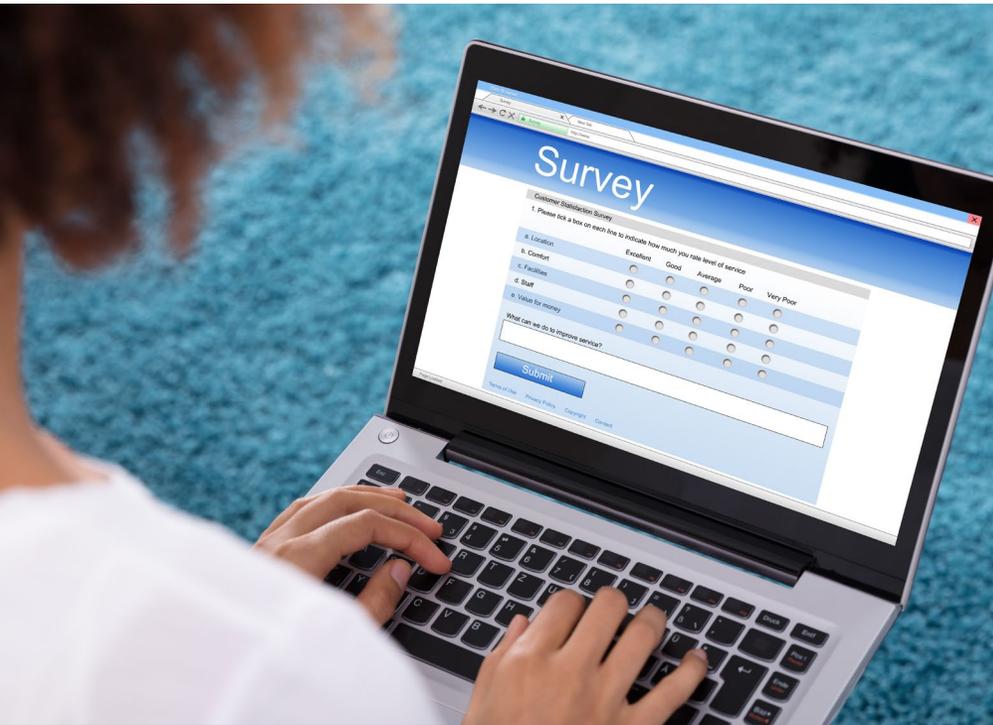
- Ambitious state heat pump goals
 - California must more than triple its current pace of installation and achieve 750,000 installations per year to achieve its goal of installing six million heat pumps by 2030
 - At the current pace, we predict we will only reach 4 million heat pumps by 2030
 - Need for decarbonization contractors also driven by the Viable Electric Alternative policies
- Workforce shortages were already a concern due to retirements, and reduced individuals pursuing these careers will not fill the void left by those retiring
- Growing a diversified workforce is a priority



Objectives of the Study

- Mine existing data to **understand the workforce landscape** for heat pump water heater (HPWH) installers, heating, ventilation, and air conditioning (HVAC) heat pump installers, and electricians.
 - Analyze patterns and trends in workforce data over both space and time to **understand the historical and current workforce** for HVAC, plumbing, and electrical workers.
- **Define the customer journey**, from purchasing an HPWH or an HVAC heat pump to installing the heat pump, with or without electrician involvement.
 - **Ascertain the average time** customers are in each stage of the heat pump journey, and if prolonged delays exist, **determine if those delays are due to workforce shortages**.

METHODS



Three primary methods of investigation:

- Literature review and secondary data review
- Customer journey mapping and survey
- Spatiotemporal analysis

Spatiotemporal Level of Analysis

Number	Short Region Name	Number	Short Region Name
1	Bakersfield	16	Riverside
2	Chico	17	Sacramento
3	Eastern Sierra	18	Salinas
4	El Centro	19	San Diego
5	Fresno	20	San Francisco
6	Hanford-Corcoran	21	San Jose
7	Los Angeles	22	San Luis Obispo
8	Madera	23	San Rafael
9	Merced	24	Santa Cruz
10	Modesto	25	Santa Maria
11	Napa	26	Santa Rosa
12	North Coast	27	Stockton-Lodi
13	North Valley	28	Vallejo-Fairfield
14	Oxnard	29	Visalia-Porterville
15	Redding	30	Yuba City



Spatiotemporal Analysis Typologies

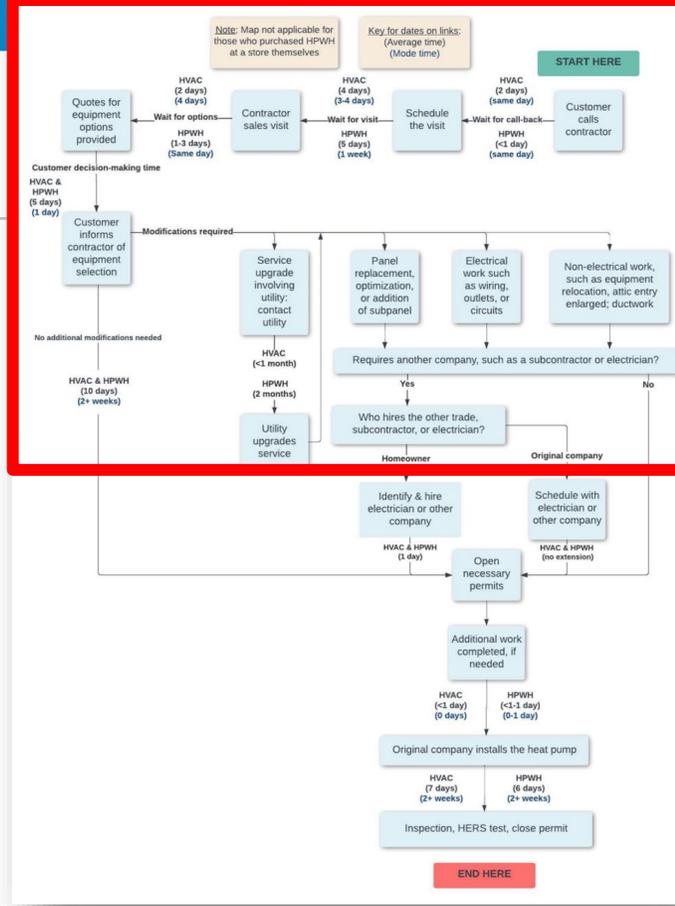
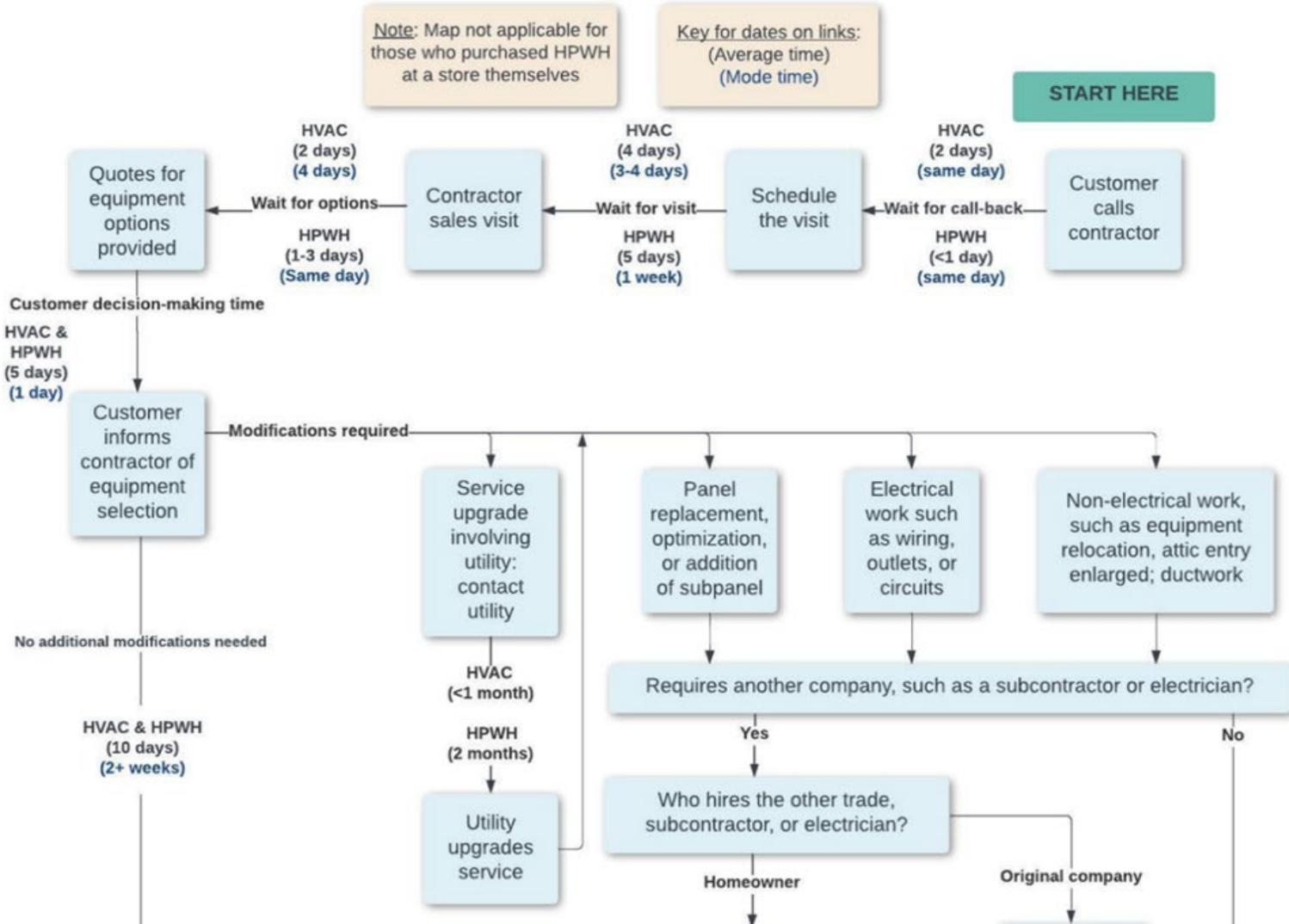
Focus	Factors
<p>Fuel Substitution Demand Drivers: Regions with more demand drivers will likely require a greater workforce in the short term.</p>	<ul style="list-style-type: none"> High median home value Primary heating fuel is fuel oil or propane Age of housing stock: high proportion of homes built between 2000 and 2009 Clean energy investments
<p>Workforce Supports and Enablers: In high-scoring regions, we expect the workforce to be better positioned to meet the demand for fuel substitution services and support the transition than in regions where such enablers are less prevalent.</p>	<ul style="list-style-type: none"> High proportion of population entering the workforce Availability of training and prevalence of certifications Robust union presence High engagement with existing utility energy efficiency programs
<p>Areas of Opportunity: These regions need extra support to achieve sufficient and equitable fuel substitution.</p>	<ul style="list-style-type: none"> High proportion of population exiting the workforce Primary heating fuel is natural gas High proportion of population living in disadvantaged communities



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SELECTED FINDINGS

Findings – Customer Journey Map



Spatiotemporal Findings – Growth Projections

- Between 2020 and 2030, California is projected to grow the electrician workforce by 20%, HVAC by 16% and plumbing by 15%
- Growth needs to be greatest, across trades, primarily in central and southern California
- There is substantial variation between regions, but the trade-level trends are consistent– meaning that the same regions will need to grow their fuel substitution workforce across all trades

Spatiotemporal Findings – Regional Typologies

**20 regions: “Very behind”
employment targets for one trade
or “behind” for two or more:**

Bakersfield, Chico, El Centro, Fresno,
Hanford-Corcoran, Los Angeles,
Modesto, North Valley, Oxnard,
Riverside, Sacramento, Salinas, San
Diego, San Francisco, San Jose, San
Luis Obispo, Santa Cruz, Santa Rosa,
Vallejo-Fairfield, and Visalia-
Porterville

**3 regions: Not “on track” in one or more trades
and demand is expected to be high**

San Luis Obispo, Sacramento,
Riverside

**4 regions: Not “on track” in one or more trades
and supports and enablers are lacking**

San Luis Obispo, Oxnard,
Santa Rosa, Madera

**5 regions: Demand drivers are low and
opportunities high**

Vallejo-Fairfield, Santa Maria, Oxnard,
San Rafael, Modesto

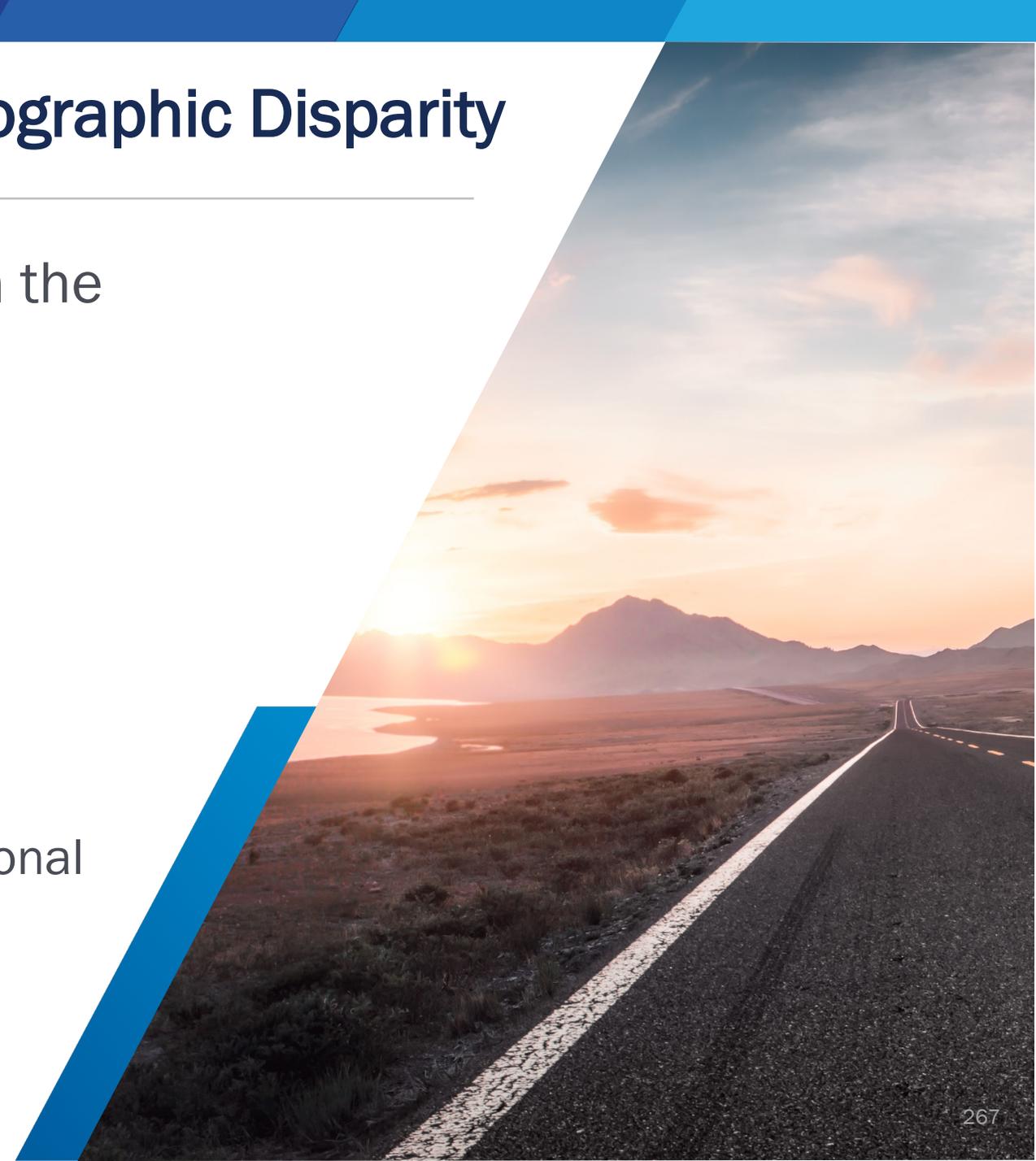


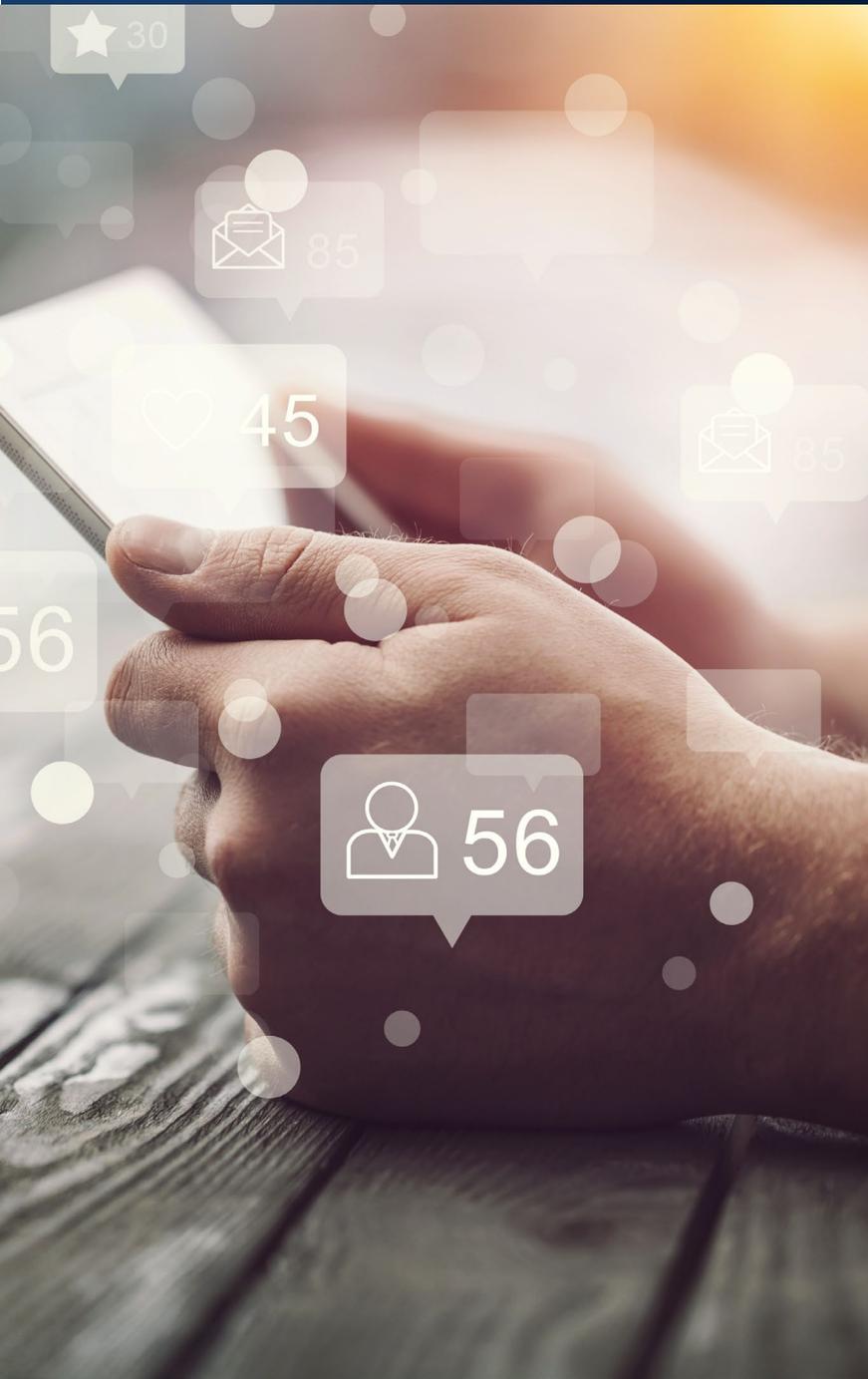
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CONCLUSION & RECOMMENDATIONS

Recommendations – Address Geographic Disparity

- **Conclusion:** A geographic disparity in the number of HVAC employees per contractor and prevalence of sole proprietorships in some regions may create challenges in growing the workforce in areas with smaller contractors
 - **Recommendation:** Encourage interregional travel from areas with robust workforce during slow seasons and pair with apprenticeship / job shadowing opportunities for local workforce





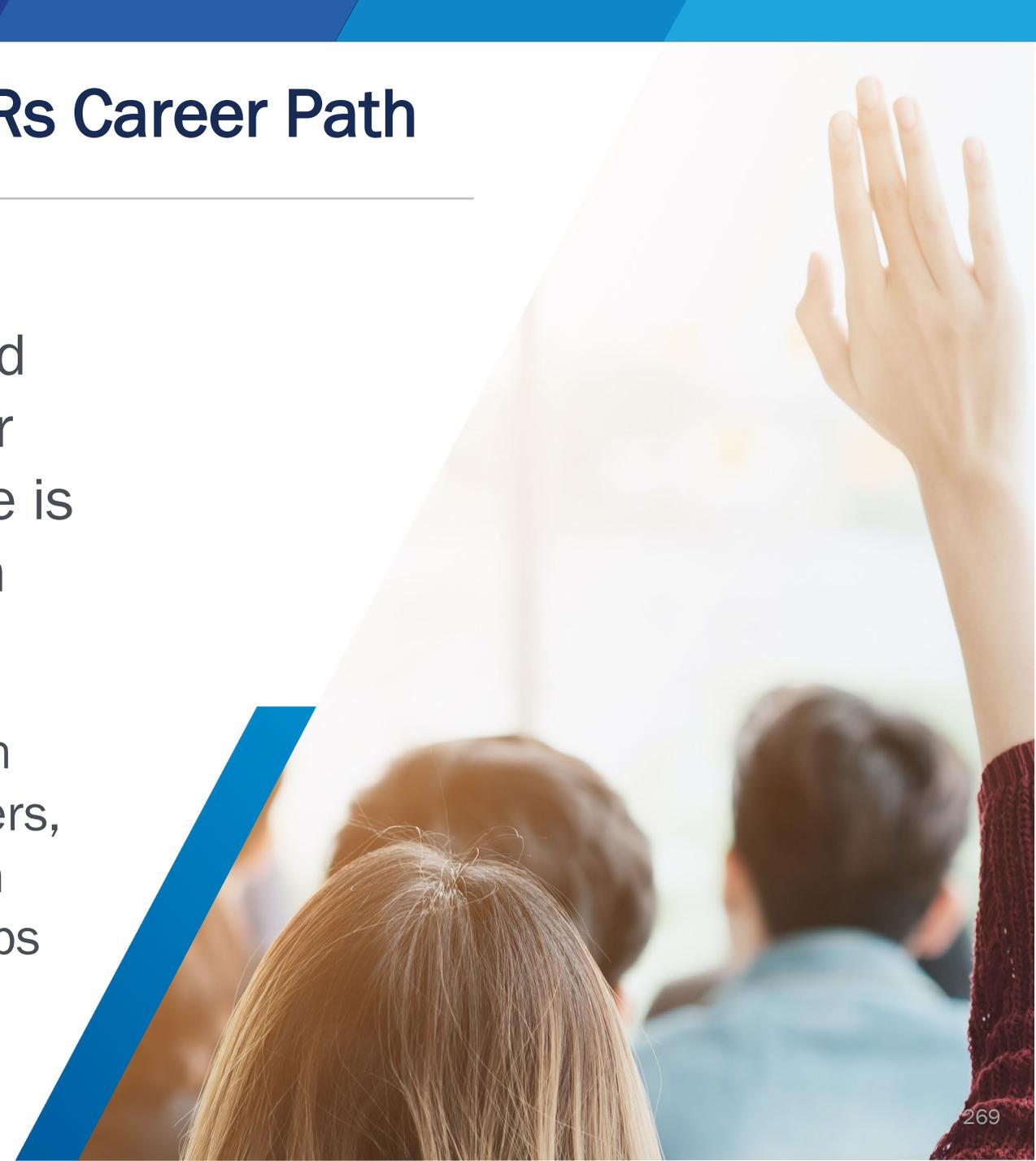
Recommendations – Provide Sales Tools

- **Conclusion:** Delayed decision-making by HPWH customers with malfunctioning equipment may be due to unfamiliarity with heat pump equipment and low levels of workforce experience with HPWH technology may create barriers to adoption

- **Recommendation:** Provide plumbers with the means to more quickly guide customers through the fuel substitution process as the water heating market moves beyond early adopters

Recommendations – Support HERs Career Path

- **Conclusion:** One of the consistently longest steps in HVAC heat pump and HPWH replacements was the wait for an inspector or HERs rater, and there is now only one certification provider in California
 - **Recommendation:** Regions that are “on track” or better for electricians, plumbers, and HVAC contractors and that have an anticipated high demand for heat pumps should increase focus on HERs career path development





Recommendations – Assess Community Targeting Opportunities

- **Conclusion:** Madera features a mix of attributes that make workforce development opportunities compelling but current apprenticeship numbers indicate additional support may be needed
 - **Recommendation:** Support community-level electrification of subdivisions with optimal preconditions and build apprenticeship or training program around community-level targeting. Assess additional county/region fit by cross-referencing study analysis with subdivision approval data.



For additional information, contact:

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Ellen Steiner, Ph.D., Vice President

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Link to Full Report:

[California Residential Fuel Substitution
Workforce Readiness Study Report](#)

Phase 2 Report expected May 2026!

Open Forum

Resources:

- **CPUC Building Decarbonization webpage:** <https://www.cpuc.ca.gov/about-cpuc/divisions/energy-division/building-decarbonization>
- **CPUC Building Decarbonization proceeding:**
https://apps.cpuc.ca.gov/apex/f?p=401:56:0::NO:RP,57,RIR:P5_PROCEEDING_SELECT:R1901011

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California Public Utilities Commission