

# The Grid: What is it and Should it Shape Policy for All-Electric Buildings?

## Local Government Panel

Avana Andrade, Senior Sustainability Coordinator  
Office of Sustainability, County of San Mateo  
June 21, 2023



OFFICE OF  
SUSTAINABILITY  
COUNTY OF SAN MATEO



PENINSULA  
CLEAN ENERGY



SAN MATEO COUNTY  
ENERGY WATCH

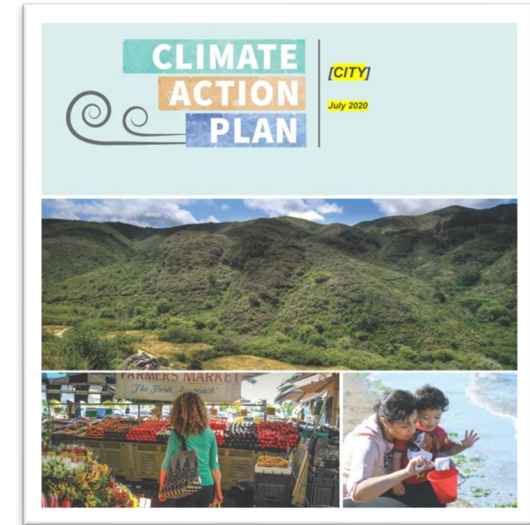
# Countywide Support for Climate Action Planning

**RICAPS**  
Regionally Integrated Climate Action Planning Support

Launched  
in 2011



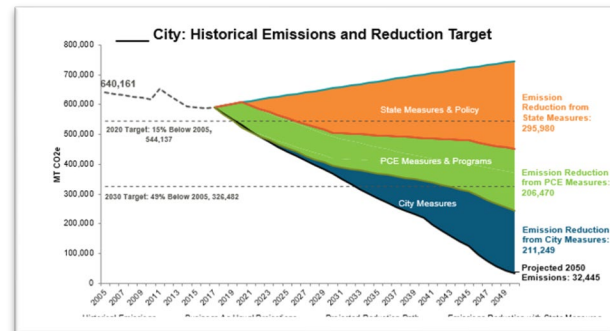
Monthly Working Group



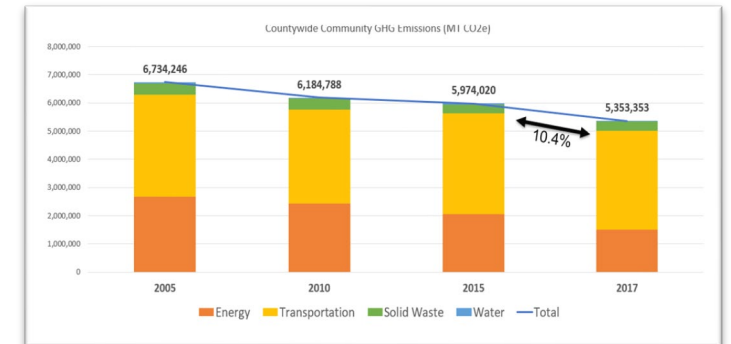
Blueprint Climate  
Action Framework

Approach	Selected	Emissions Impact		Activity Data Impact				Prioritization		Identification Measures			
		2018 Emissions Impact (MTCO2e)	2018 Net Emissions Impact (MTCO2e)	2018 Annual Gas Impact (MWh)	2018 Water Use Impact (MG)	2018 Wastewater Impact (MG)	2018 Disposal Impact (MG)	2018 Measure Prioritization Score (1-5)	2018 Measure Feasibility (1-5)	2018 Measure Cost (\$)	2018 Measure Benefit (\$)	2018 Measure Risk (\$)	2018 Measure Benefit (\$)
Capital Investment	Yes	186	89,202	20,000				10	Yes	Low	Low	High	High
Development Policy	Yes	142		4,382,274				10	No	Low	Low	Low	Low
Development Policy	Yes	3,880		8,796,275				10	No	Low	Low	Low	Low
Development Policy	Yes	781		2,327,543				10	No	Low	Low	Low	Low
Development Policy	Yes	4,378		10,876,400				10	No	Low	Low	Low	Low
Development Policy	Yes	16		44,889				10	No	Low	Low	Low	Low
Development Program	Yes	493		2,795,959				10	No	Low	Low	Low	Low
Development Program	Yes	7		20,898				10	No	Low	Low	Low	Low
Development Policy	Yes	22,939	10,307,311					10	NA				

Menu of Measures



Forecasting Tool



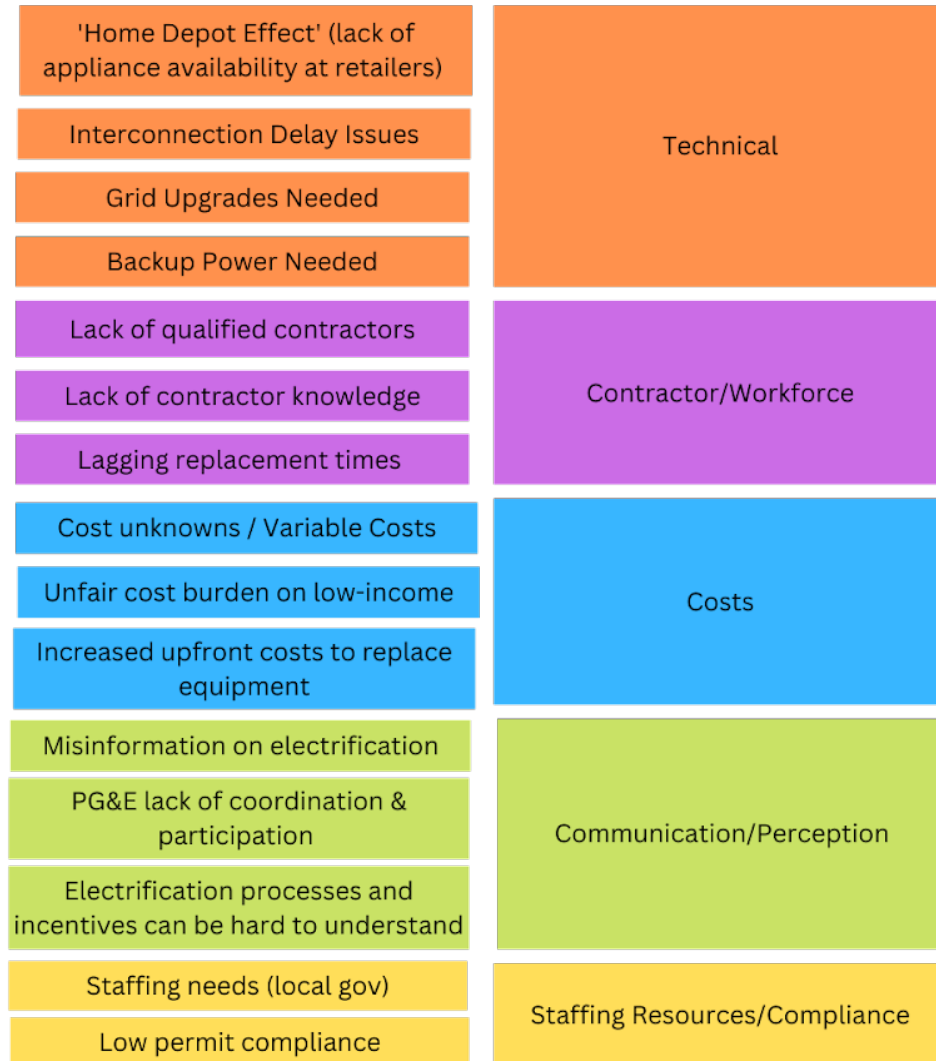
Community GHG Inventories

# Electrification Workshops: Surfacing Concern and Misinformation about the Grid

- **January:** identified hurdles and solutions
- **February:** visualized feedback, mapped out PCE plans, clarified scope of RICAPS action
- **March:** further voting and refinement to produce top 3 ideas
- **April:** distilled program concepts further, began to add detail



# Visualizing Feedback



## What we heard: Hurdle >> Outcome Map

Hurdles block the strategy outcome needed for existing building electrification

Even if local policies **are** passed, hurdles remain



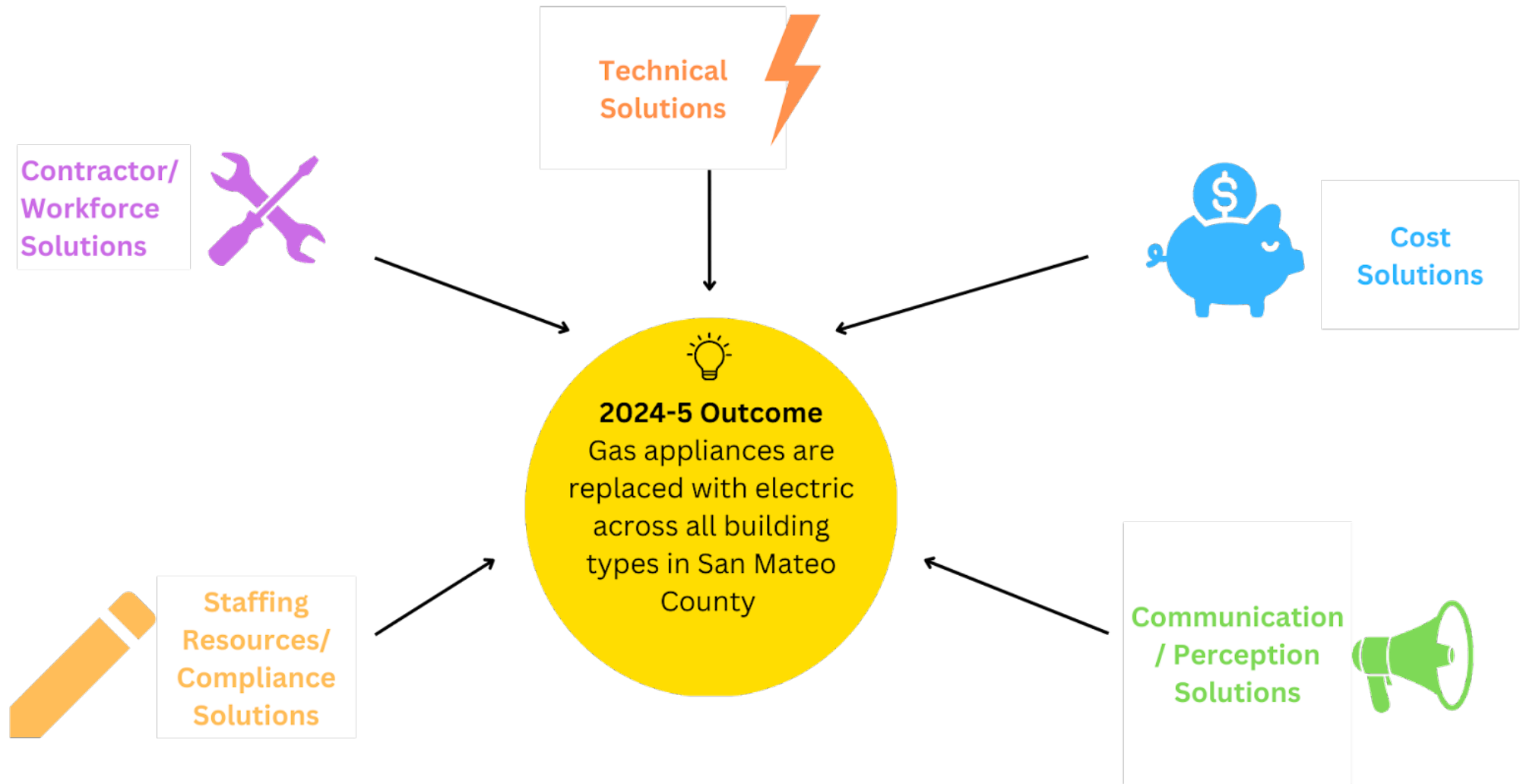
Potentially significant equity impacts: low-income people are left out of the clean energy transition, or are saddled with rising costs.

Homeowners install gas because of cost unknowns and compliance avoidance

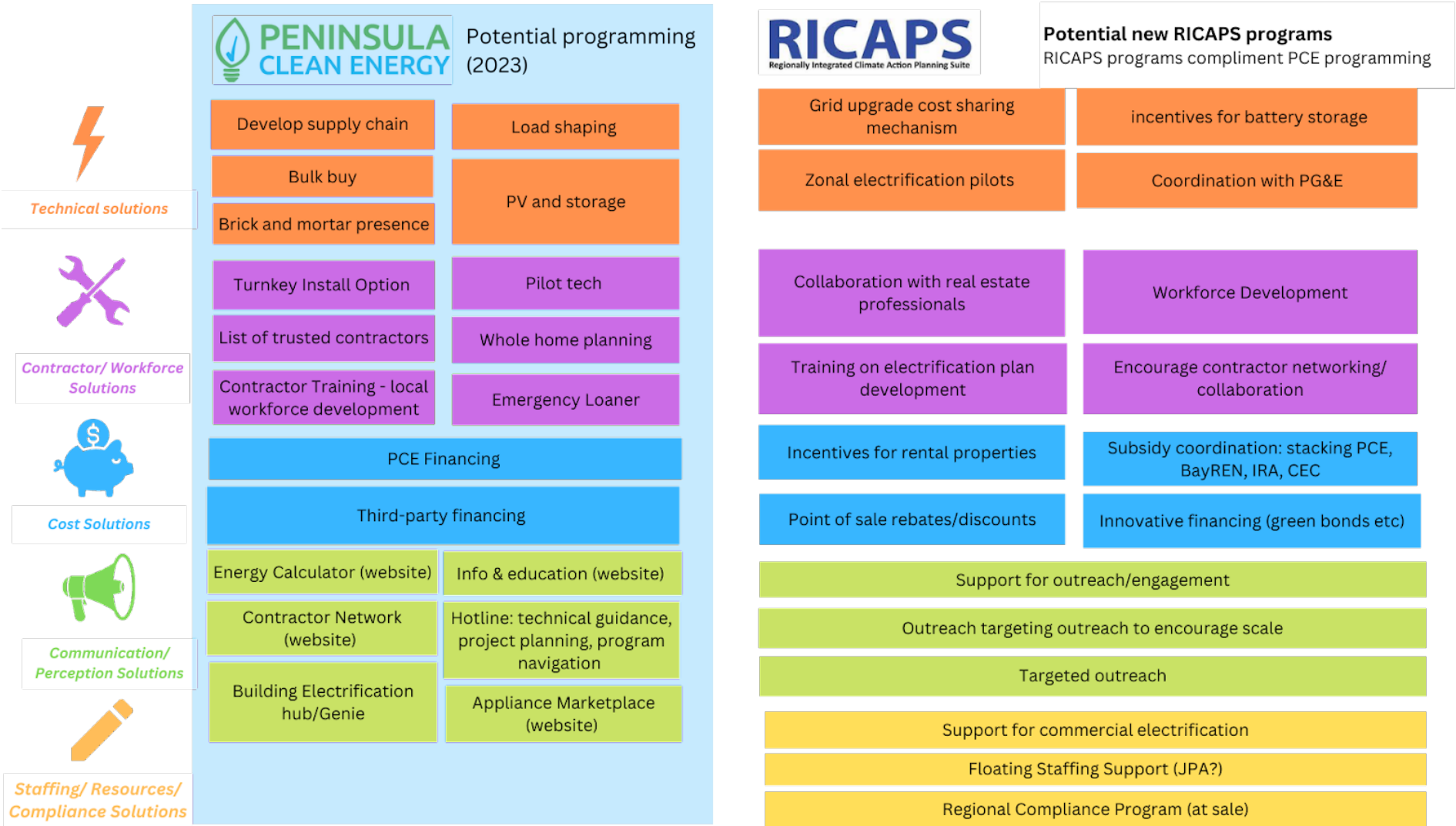
Upset community members

Continued gas install (unpermitted) + low compliance rates

# Clarifying Solutions



# Mapping Appropriate Sphere of Action



# Current Approach

- **Messaging**
- **Policy development**
- **Program development**

**Task 1:** Electrification outreach campaign to small contracting businesses and distributors, those not covered under BayREN contractor outreach.

**Task 2:** Create education materials for electeds, enabling conditions for passage of existing building electrification policies

**Task 3:** Outreach campaign for the general public & local governments, focusing on grid upgrades, reliability, zonal electrification, etc.

# Case Studies: Clarifying Costs for Decarbonizing Single-Family Homes



## Tom Kabat

Since retiring from 30 years as an energy engineer for the City of Palo Alto, Tom has been applying his analytical skills as a board member and consultant for multiple environmental organizations.



## Josie Gaillard

Josie's decarbonization journey started in the solar industry. She served on Menlo Park's Environmental Quality Commission and has a special interest in rapid electrification.





# Goals of the Study

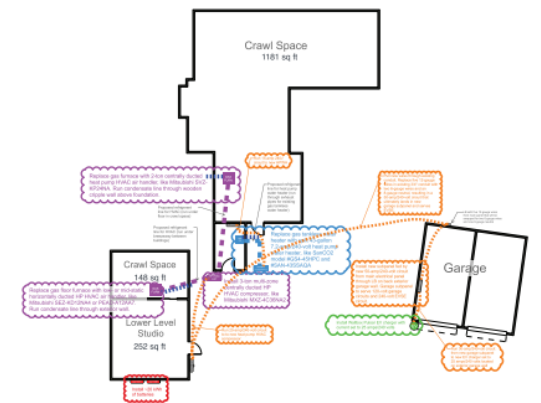
- Learn about costs and strategies for decarbonizing existing homes in San Mateo County
- What does is cost to decarbonize a home?
- Does a plan help homeowners?
- What can we learn from assisting homeowners in electrifying?

## FLOOR PLANS WITH UPGRADES

All Electrification Projects



All Electrification Projects



# The Process

1. On-line survey(s) - 78 homeowners applied, 10 selected
2. Intro calls w/ homeowners
3. Site visits
4. Created drawings and detailed plans
5. Developed contractor quote request packets
6. Recruited contractors
7. Solicited bids from contractors
8. Reviewed bids, requested changes, ran financial projections
9. Presented plans with costs and available incentives to homeowners
10. Summarize findings

# Home Selection Criteria

## Locations:

- Belmont
- Brisbane
- East Palo Alto
- Half Moon Bay
- Pescadero
- Redwood City (2)
- San Bruno
- San Carlos
- San Mateo

## Aimed for variety in:

- Location
- Home vintage
- Home size
- Electrical panel size
- Income level



# Electrification Plan Example

## San Bruno Home

San Bruno, CA 94066  
Main panel size: 100 amps  
Square footage: 1700

### Electrical Panel Information

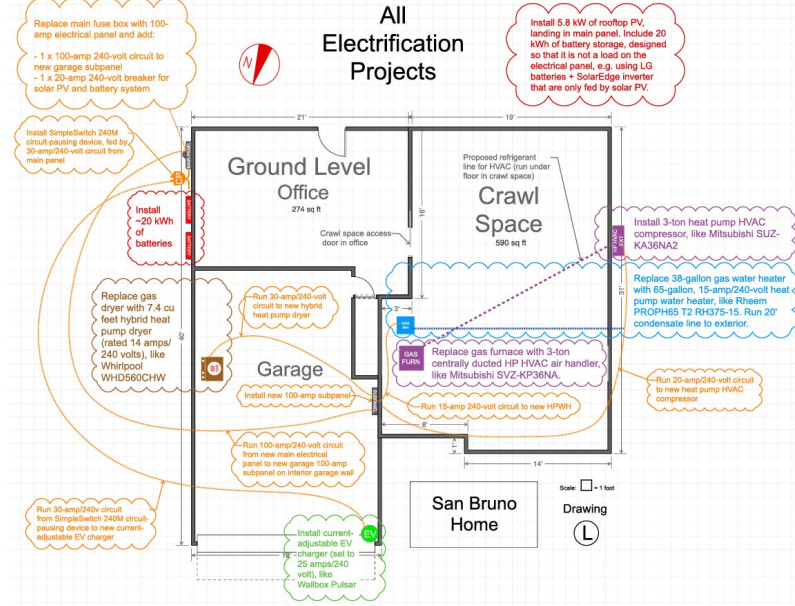
#### Existing Circuits

Main Panel, rated amps: 100

Circuit Number	Voltage	Breaker Amps	Type	Splittable ?	Notes
1	120	25	Lights and Plugs	no	
2	120	20	Lights and Plugs	no	"Track lights Hollis' Office"
3	120	30	Lights and Plugs	no	
4	120	25	Lights and Plugs	no	
5	120	20	Lights and Plugs	no	"Bedroom track lights"
6	120	20	Lights and Plugs	no	
7	120	20	Lights and Plugs	no	
8	120	6	Furnace	no	Fuse with spring, we think for furnace
9	240	25	Unknown	no	"Lights and Appliances"
10	240	50	Oven	no	Labeled "Range" but it's the oven only

### Electrical Load Calculations (Fully Electrified)

Name	Voltage	Nameplate Amps	Panel Number	Circuit Number	Notes
Lights and Plugs	120	6.07	0	1	
Lights and Plugs	120	6.07	0	2	"Track lights Hollis' Office"
Lights and Plugs	120	6.07	0	3	
Lights and Plugs	120	6.07	0	4	
Lights and Plugs	120	6.07	0	5	"Bedroom track lights"
Lights and Plugs	120	6.07	0	6	
Lights and Plugs	120	6.07	0	7	
Furnace	120	0	0	8	Fuse with spring, we think for furnace
Unknown	240	0	0	9	"Lights and Appliances"
Oven	240	14	0	10	Labeled "Range" but it's a single wall oven only



## San Bruno Home Home Quote Request



### Home Info

- 1700 sq ft
- Single-family detached
- 2-story on hill
- 4 BR 2 BA
- Built 1958
- San Bruno, CA

Please provide notional quotes ( $\pm 10\%$  of expected cost) for the relevant projects below, **breaking out equipment cost, labor and permits**. Show discounts for combining projects.

Project #	Contractor Type	Description	Drawing Color
1	Electrician	<p>Replace 100-amp main fuse box with 100-amp main breaker box. No electrical service increase required. If existing service wires allow, right-size main panel to take advantage of larger existing service wire.</p> <p>Install new 100-amp subpanel in garage.</p> <p>Run 5 new 240-volt circuits from new garage subpanel to locations for: circuit pausing device and EV charger, induction cooktop, heat pump water heater, heat pump HVAC compressor and heat pump dryer.</p> <p>Install new induction cooktop, circuit pausing device and EV charger.</p> <p>Equipment:</p> <ul style="list-style-type: none"> <li>- Circuit pauser, like SimpleSwitch 240M, serving EV charger circuit</li> <li>- Current adjustable EV charger, like Wallbox pulse EV charger with adjustable current (set to 25 amps/240 volts)</li> <li>- To be purchased by homeowner: 30" induction cooktop like Frigidaire 30-inch Induction Cooktop, Model #FFIC3026TB (rated 30 amps/240 volts), hybrid heat pump dryer like Whirlpool 7.4 cu ft Hybrid Heat Pump Dryer, Model</li> </ul>	<p>Orange for Electrical</p> <p>Green for EV</p> <p>Brown for Dryer</p>

# Value of Electrification Plan

- Saves homeowner money
- Gives homeowner confidence to start
- Provides roadmap for multi-year process
- Provides contractors with critical technical information
- Optimizes existing electrical panel by taking all systems into account
- Helps homeowners avoid unnecessary work and expense

## COST SUMMARY

### ELECTRIFICATION COSTS

Subtotals of Upgrade by Trade	Replace Existing (gas)	DIY	DIY With Incentives	Low Bid	Low Bid With Incentives
Electrical	\$949	\$8,952	\$2,441	\$8,952	<b>\$2,441</b>
Plumbing	\$2,754	\$4,100	\$0	\$5,898	<b>\$104</b>
HVAC	\$4,808	\$5,000	\$0	\$12,586	<b>\$0</b>
Insulation	\$0	\$2,843	\$375	\$2,843	<b>\$375</b>
<b>Total</b>	<b>\$8,511</b>	<b>\$20,895</b>	<b>\$2,816</b>	<b>\$30,279</b>	<b>\$2,920</b>

# Summary of Findings

- Have your electrification plan ready so you know how much panel amperage you are saving for each future need
- Actively participate in appliance selection with contractors
- Think of the EV as the "shock absorber" in the plan
- 120V is common
- Don't oversize your HVAC equipment "just to be safe"
- Don't undersize your heat pump water heater
- Not planning can lead to much greater expense, selecting the wrong equipment, and upsizing panels unnecessarily

# View All Case Studies Online



- 2,000 Sq Ft
- 5 Occupants
- Built in 1965
- 3 Bedrooms
- 2 Baths

[View Cost Plan](#)



- 1,500 Sq Ft
- 2 Occupants
- Built in 1934
- 3 Bedrooms
- 2 Baths

[View Cost Plan](#)



- 1,010 Sq Ft
- 3 Occupants
- Built in 1952
- 3 Bedrooms
- 1 Bath

[View Cost Plan](#)



- 2,244 Sq Ft
- 3 Occupants
- Built in 1979
- 3 Bedrooms
- 3 Baths

[View Cost Plan](#)



- 1,150 Sq Ft
- 2 Occupants
- Built in 1974
- 3 Bedrooms
- 2 Baths

[View Cost Plan](#)



- 1,950 Sq Ft
- 4 Occupants
- Built in 1960s
- 4 Bedrooms
- 2 Baths

[View Cost Plan](#)

# Showing Electrification *Can* Be Done

## Electrification Best Practices Review

*Examples and Cost-Effectiveness for Commercial Kitchens, Labs & Life Science Buildings, Public Emergency Centers, ADUs, and Affordable Housing*

**RICAPS**  
Regionally Integrated Climate Action Planning Support



**C/CAG**  
City/County Association of Governments  
of San Mateo County





# Addressing Difficult Use Cases

## Focus On

- Accessory Dwelling Units
  - Affordable Housing
  - Commercial Kitchens
  - Public Emergency Centers
  - Labs & Life Science
- Sources

## Content

- Cost Effectiveness Results
- Perceived hurdles
- Examples
- Considerations
- Toolkits and Resources

Induction Wok at One Esterra (Source: Microsoft)



Source: Building Decarbonization Practice Guide Volume 7





# THANK YOU!

**Avana Andrade**

Senior Sustainability Specialist

[aandrade@smcgov.org](mailto:aandrade@smcgov.org)

[smcsustainability.org](http://smcsustainability.org)