

Systems Mapping for Decarbonizing Existing Single-Family Homes

Summary of Workshop 1 – October 28, 2020

The Purpose

Create a common understanding or picture of the system that impacts carbon emissions from existing single-family homes. Identify overlaps, dependencies, and gaps, and ultimately determine where and how to best intervene to make the system work better. The intended outcome is to identify how to coordinate efforts across the many organizations working in this area to remove barriers and identify opportunities to reducing emissions from existing single-family homes and help accelerate our efforts moving forward.

The Plan

Host two stakeholder workshops and two focus groups, to examine the current state of affairs, and generate a high-level, move-forward plan that identifies the highest value initiatives and opportunities for coordination with key stakeholders.

Stakeholder Workshop 1: October 28

Focus Group with Contractors: First week in December

Focus Group with Homeowners: First week in December

Stakeholder Workshop 2: Mid-December

Stakeholder Workshop 1

Our purpose was to convene a small group of people with perspectives on the various parts of the system and from around the Bay Area. This first workshop focused on two tasks:

- A. Creating a “map” of the critical aspects of home electrification
- B. Identifying the key players/stakeholders that influence those aspects

Participants focused on six factors critical to home carbon emissions reduction:

1. Home energy appliances and mechanical systems (HVAC, water heating, kitchen appliances, electrical panels, etc.)
2. Funding and finance (e.g., access to capital, rebates, tax credits, etc.)
3. Home energy generation and storage (solar, battery, resilience during power shut-offs, etc.)
4. Market forces (e.g., building trends, contractor and supplier behavior, price signals, real estate trends)
5. Policy and regulations (permitting, building codes, restrictions, state law, ordinances, etc.)

The interconnections

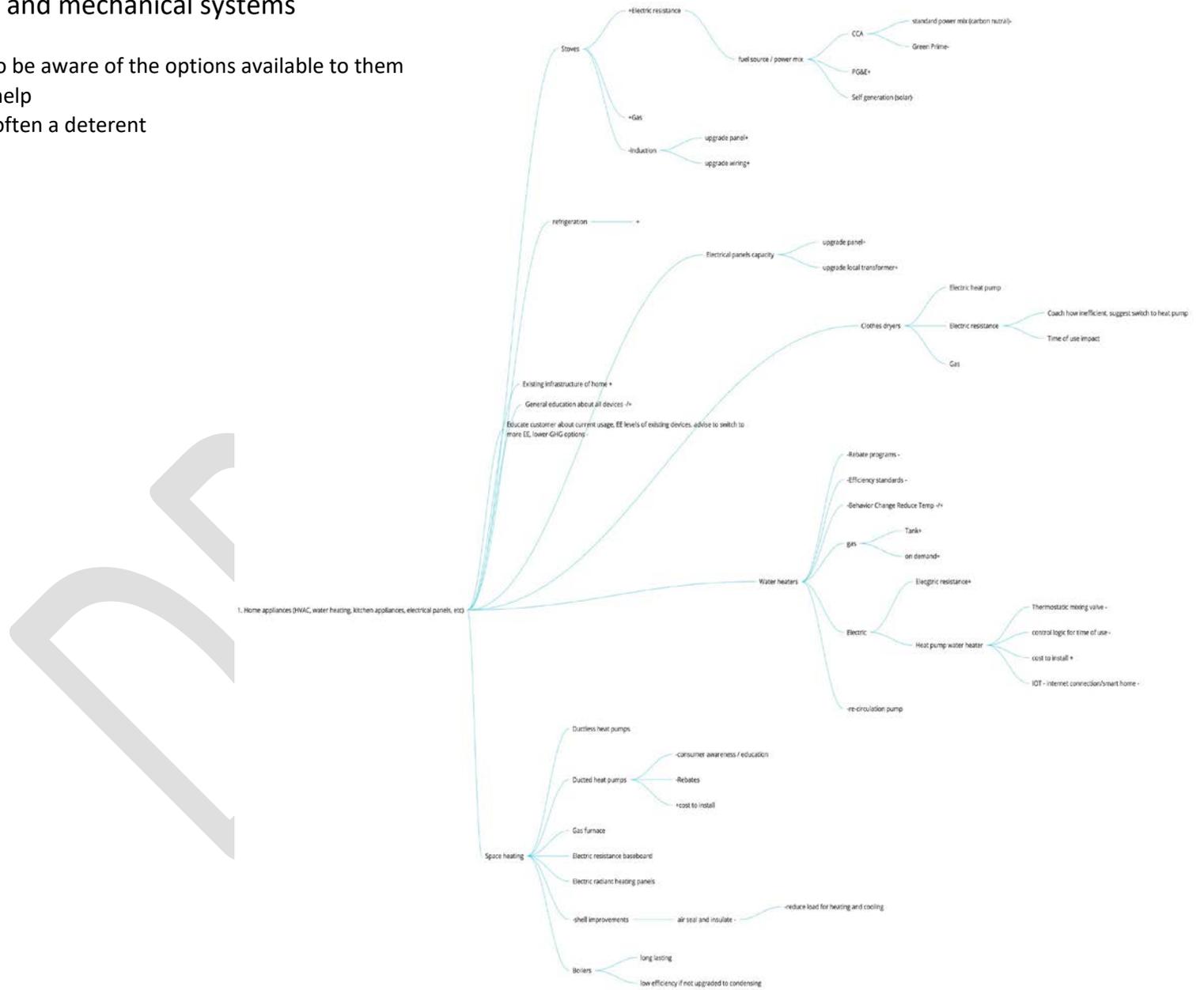
A high level look at the system shows where these six elements are interconnected. The most notable interdependencies occur with funding and finance suggesting it is key to any strategy.



A1. Home appliances and mechanical systems

Key takeaways:

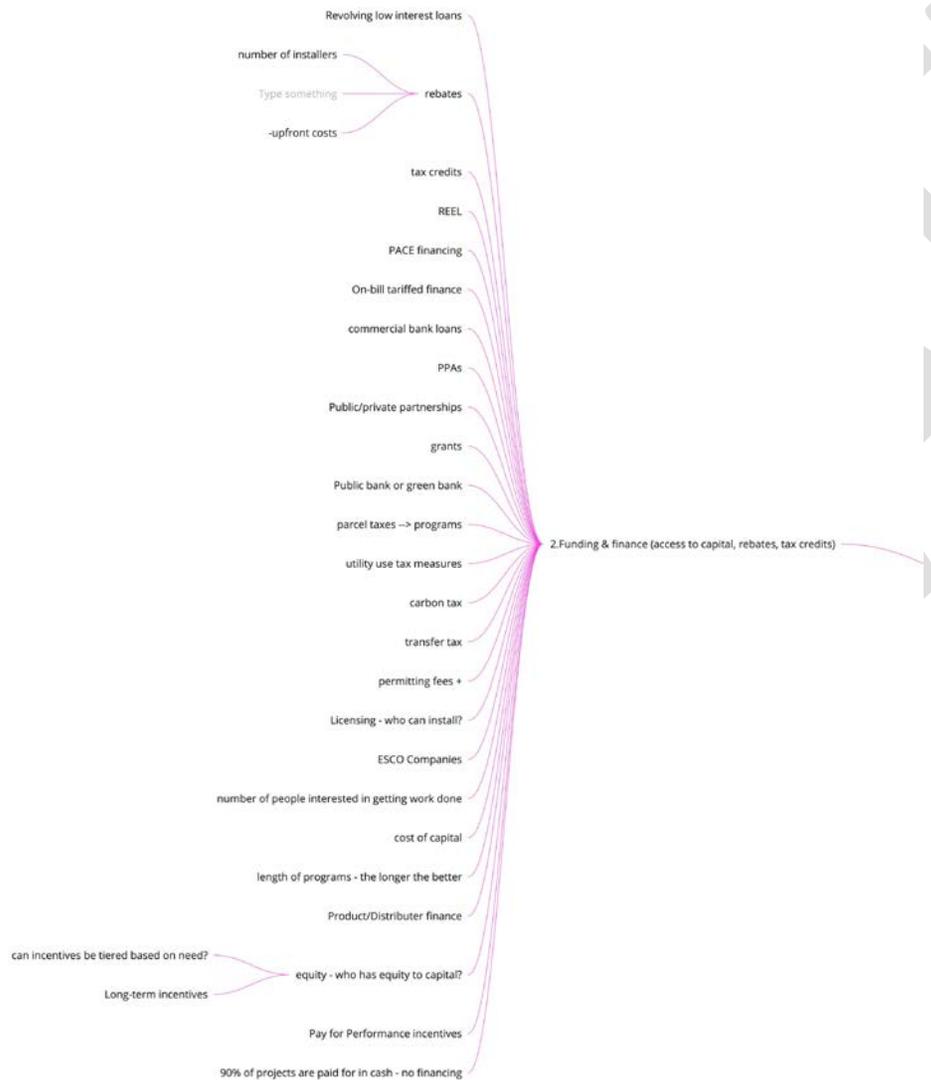
- Consumers need to be aware of the options available to them
- Rebate programs help
- Upfront costs are often a deterrent



A2. Funding and finance

Key takeaways:

- Contractors are primary conduit for homeowners to access financing
- Need to create market demand for funding and incentives
- Need banks to offer financial products to make it easy to fund energy upgrades



A3. Home energy generation

Key takeaways:

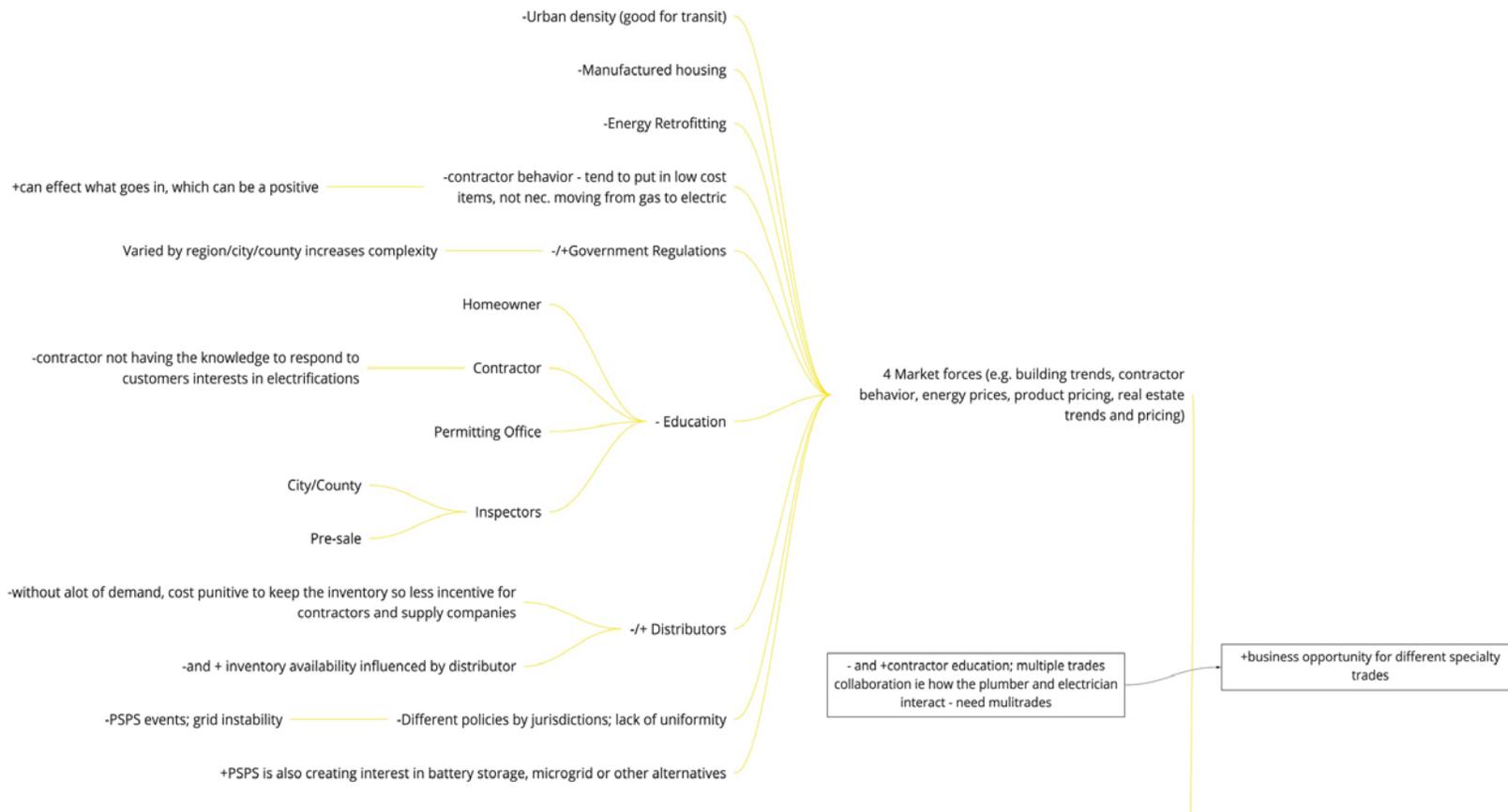
- Need understanding of how wind, solar and hydrogen all fit together in the community
- Right now the financial benefits (home equity and tax incentives) accrue only to the wealthy



A4. Market forces

Key takeaways:

- Different jurisdictions have different rules which confuse the market and key players
- All stakeholders need more information/education about electrification
- Missing from consideration is the impact of transportation



A5. Policy and regulation

Key takeaways:

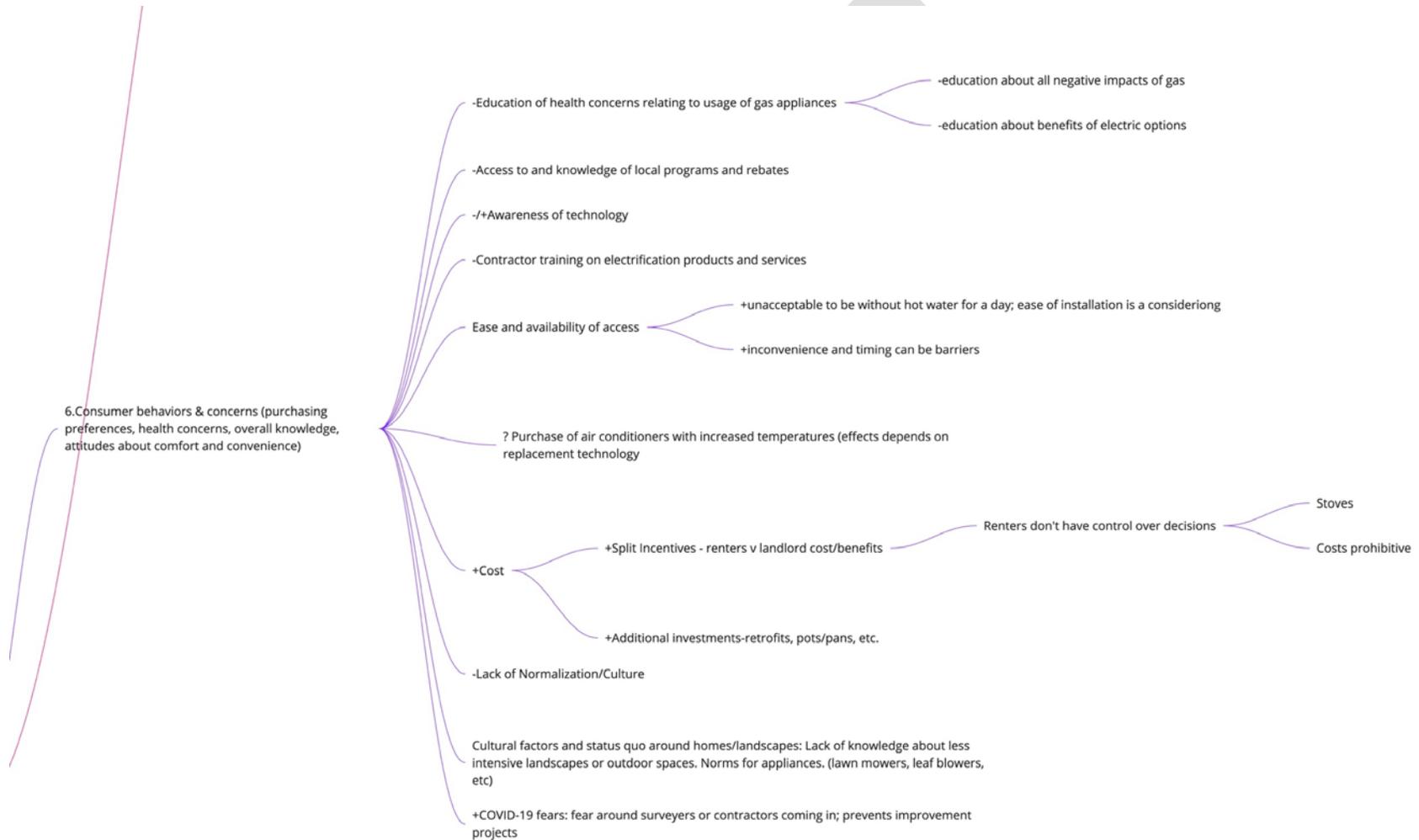
- There are a number of innovative policies already implemented and still emerging
- Wonder if all the efforts to reduce carbon sources is offset by population growth and growing demand for energy



A6. Consumer behavior

Key takeaways:

- Rebate programs have an impact
- Contractors need training to better support the effort



Task B: Stakeholder Analysis

In the second step of the process, the groups identified key players in their segment of the system using Miro. The purpose was to amass a list of who would likely need to play a role in any action, as well as identify information needs about any of the stakeholders to help fill in knowledge gaps and reveal high impact actions.

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1. Home appliances

Key Players (who operates in this area)	What they do (core services; target market)	Opportunities & Barriers (What do we wish they would do, e.g. promote energy efficient options)	Info we want to have (What do we want to know from or about them? or why they do what they do?)	Optional Notes Use this cell for additional thoughts or resources
Energy Program Administrators	Develop and deliver incentive programs, Develop and deliver education/coaching programs. May analyze home energy usage either via questions or analyzing data. Targets: homeowners and/or renters of single-family homes and/or apartments/condos	level playing field between all PAs for decarb efforts and associated TRC Contractor training and education QA/QC Coordination/confusion		Elephant in room: Can we please stop giving rebates for new fossil gas devices? We must stop digging our climate crisis hole deeper.
Retail	Serve customers, stock and display inventory	customer-facing, easy to target warm leads	How can we place information about rebates and educational material on shelves	
Home owners	Own, Purchase and operate			If we include homeowners, we likely also should consider renters
Plumbers	Install and replace water heaters	Heat pumps require electric permits, may not stock heat pumps	How can we get mass adoption of HPWH installation	Q
BAAQMD	regulate emissions of appliances - NOx	Educate public on air quality impacts of appliances		
Utilities - PG&E, CPAU, SVP		Provide rebates, incentives, education		
Community Energy Groups (ex. EBCE, MCE, SVCE)				
City/county sustainability and building and safety staff		Educate residents about programs and resources	Type something	
Electricians	upgrades panels and wiring		Pair with contractors that are installing electrification measures	
Landlords - Single Family homes			Cost driven - capital investments, smaller capital for investments	
Landlord - multi family homes			capital driven, view property as investment	
HVAC contractors	Provide installation services	Vast majority are not educated about electrification options	Get trained to install electrification measures	Do they understand
City and county permit departments	Permit and inspect appliances	Many are not aware of electrification technologies and may steer people away from the carbon reducing options	How familiar they are with electrification measures	
Water companies				
Sewer and water management				
Remodeling contractors / general contractor				

2. Funding and Finance				
Key Players (who operates in this area)	What they do (core services; target market)	Opportunities & Barriers (What do we wish they would do, e.g. promote energy efficient options)	Info we want to have (What do we want to know from or about them? or why they do what they do?)	Optional Notes Use this cell for additional thoughts or resources
Treasurer - County, State				
Legislation and Policies that are aligned				
Regional organizations: MTC, ABAG, BAAQMD, BayREN				
CCAs				
Banks: Public and Private - Climate Focused		Have better products		
Utilities				
Contractors				
Equipment distributors				
City Council	UUT, Transfer Tax			
Homeowners	Fund most projects			
California Public Utilities Commission/ California Energy Commission				
Tax system Property				

Banks -
mortgage

Legislature,
supervisors.
Start at the State to
create financing
mechanisms
Regional: MTC, ABAG,
CCAs

HOW to handle renters?

On-bill tariff financing - overcomes split incentives. Have to have a reasonable rate.

Loans - need to be a reasonable rate...not 7% PACE.

Utilities - would like 0% financing for residential. HOW to coordinate with them if they could prune the gas line, save on maintaining certain lines. Contribute the savings to electrifying homes.

Property owners - incentivized to spend certain amount on property to receive tax credit. Would like more information about tax policy that drives decision-making

Banks - need better products - everyone knows about them. Tied in with the contractors. Don't have to pay upfront, so you would do a bigger project, pay it off over time.

Home equity loans tend to be more expensive. They're higher interest rates because they're a consumer-financed-based rate, not commercial. Don't know why.

Contractors - one-stop shopping. Awareness. Connect people with financing. Selling comfort; also saving energy. Want to know what sorts of financing options contractors would like. What are they currently using that works well?

PACE - cuts contractors a check. Makes it an easier step.

Switching from natural gas to electricity. Question: how would on-bill financing work? Not actually saving electricity.

Bundle EE with solar/battery, all-electric

Residents: What would make financing simple - turnkey, easy



3. Home energy generation and storage

Key Players (who operates in this area)	What they do (core services; target market)	Opportunities & Barriers (What do we wish they would do, e.g. promote energy efficient options)	Info we want to have (What do we want to know from or about them? or why they do what they do?)	Optional Notes Use this cell for additional thoughts or resources
Installers		Promote home electrification and EVs	Do installers promote home electrification to increase system size which would reduce emissions	Install solar systems and batteries as well as educate home owners on options for reducing carbon footprint
Electricians <i>Type something</i>	EV chargers, MSP upgrade	Educate them on future proofing their home and MSP to enable easier upgrade to electrify	Are there Unions that would be supportive of electrification and transition	
Lenders	Loan, PACE, Lease, PPA	Educate them on a comprehensive plan to electrify and offer a package that is a win-win. Barrier: They typically have a network of installers such as solar and they are focussed on closing the deal vs. trying to educate them on other options as they are worried that such discussions would delay the sale		
Roofers	Co-ordinate with solar installer	Awareness about available technologies	This and others, are the local? Do they	
Utilities	develop programs maintain infrastructure	Interconnection issues Refer between programs		
General Contractors		Perhaps contractors aren't as educated about installation options.	How can we set them up to take this type of work on? What education do they need? What's the price point for interest?	
Equipment distributors		Access to large enough inventory - pricing, diversity, etc		
Banks	Provide Capital, Tax equity, Financing	Credit, non-homeowner	How they are financing different technologies,	
Regulators, CEC, CPUC, CARB, CAISO	Set Policies, set rates and priorities		Will they give up past goals to focus on KPIs that tie to climate?	
Property Managers and Realtors	Interact with multifamily homeowners	Education, Incentives, engage contractors	Does this provide and do they promote electrification to buyers	
Funders	Create \$ for support	support for renters, individual homes	Is there is discount or a premium to home buyers if they are buying a more self sufficient home?	
Municipalities	Establish policies	Home inspection issues, not in code, etc. flexibility needed. Fear of enforcement	IS there an effort to streamline permits for electrification	



Home Inspectors, Appraisers, Realtors	(from right) See that info and incorporate it into valuation.	Clarify a Roadmap to Net Zero Energy as a template for the typical home inspection. Realtors—Get more to do "Green" certification from NAR or Eco Broker (they promote integrated thinking). Presentations at office meetings (very typical in the biz) Add "green" elements to MLS descriptions (done in some regions) so that appraisers will see +electrification provides for better indoor air quality	
Healthcare			
Manufacturers		Market is immature in US for established foreign brands, costs too high?	
Utilities/CCA's		Can more solar/battery take pressure off re: PSPS? Sell more electricity (vs. gas)	
Natural Gas Producers		What will they do to save their business? (Compare to coal, etc.)	
NIMBY?		How silent can you make this. For example, bad heat pumps make too much noise.	
Car Dealers		Advice on at-home chargers and net costs per mile in the standard sales process, etc.	

Policy & Regulations

Key Players (who operates in this area)	What they do (core services; target market)	Opportunities & Barriers (What do we wish they would do, e.g. promote energy efficient options)	Info we want to have (What do we want to know from or about them? or why they do what they do?)	Optional Notes Use this cell for additional thoughts or resources
CPUC	Regulate IOUs	Set standards for incentives	Can we change cost-effectiveness standards?	
Planning Consultants	Write planning docs for cities (CAP, GP, EIR)	Use standard templates customized per city (hopefully)	Push them to be more innovative	
CCE Boards	Adopt electrification programs.			
Air Districts	Set NOx Limits	Set NOx limits to zero (near-zero)		
Building Inspectors	Review plans, enforce energy code	Used to old way of doing things, money, staff time	Support for code enforcement, training, openness to new ideas/tech	
City Council	Adopt local ordinances	Political will of CC and residents, sometimes listen to squeakiest wheels when many residents are likely neutral or supportive	Better data, more incentives	
Building Trades				
Utilities (IOUs, munis, CCAs)	provide electricity, gas, and related infrastructure. Provide incentives. Collect and use net revenues from electrification	Commit to removing gas infrastructure. Promote electrification.	Share data on where gas lines are in need of retrofits.	Big equity issues, low-income can't be left behind to pay for electrification of others
CEC				
CBOs				
Legislature	Obligation to serve State laws	State laws can help push boundaries, but if not done carefully, burden for implementation can be high for cities		
Sustainability managers	Run program, pass reach codes, maintain CAP	Planned/phased electrification is needed to realize all benefits		



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Unions			How can we support any workforce transition? How much time do they need?
Environmental Justice Organizations	Inform conversations and communicate them to their communities		What policies/programs can best support these efforts? Are there synergies with other efforts?
Affordable housing organizations	Inform conversations and communicate them to their communities	Support sustainable/energy efficient. Weave in affordable housing/tenant protections into policies.	How can we support developments that are both affordable and energy efficient?
Advocates for health impacts	Important in changing consumer behavior		
Healthcare providers	Impacts - high rates of asthma. Impacts of poor indoor air quality can be communicated to healthcare providers. Include information from doctors and healthcare providers about impacts of gas		
Architects			
Developers			
Community organizations	Understand community concerns to incorporate into policy proposals; build community and equity		

Summary of Key Research Questions

These are questions that warrant further discovery:

- What would make financing for homeowners simple?
- What kinds of financing could banks or utilities offer?
- Right now utilities have deals only for commercial users. Can that be extended to residential users?
- Could we create better rates for people switching from gas to electricity?
- How do we achieve coordination among all the available programs to create synergies and reduce confusion?
- How can we get retailers and contractors to help sell the idea of electrification?
- Would unions support the move to transition to electricity?
- What can be done to support contractors to promote and conduct this work? What training or education do they need?
- What is the price point that makes it worthwhile for contractors to sell this idea?
- What role can realtors play? What can we tell them to help sell homes?
- What motivates landlords to upgrade or retrofit a property?
- How do we encourage and/or coordinate with federal agencies and regulations?
- Municipal structures make for a complicated web of players and actions and confusions about roles and responsibilities. What can be done about that?
- What about groups that advocate for social justice, housing equity and environmental justice? What policies might also support their goals?

Planning Team

Name	Organization
Denise Lin	County of San Mateo
Emily Alvarez	StopWaste
Jeffery Liang	BayREN
Jenny Berg	BayREN
Kim Springer	County of San Mateo
Laura Hoffacker	Presidio Graduate School
Marsha Willard	Presidio Graduate School
Pam Gordon	Presidio Graduate School
Susan Wright	County of San Mateo



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Attendees

Name	Organization
Abe Talakai	IBEW
Amy Rider	Building Decarb Coalition
Avana Andrade	County of San Mateo
Billi Romain	City of Berkeley
Brett Gentry	Clean Tech Entrepreneur
Chris Cone	RCPA
Dave Mauro	IBEW
David Hamburger	Building Efficiency
Diane Bailey	Menlo Spark
Diane Sweet	emeraldECO
Geneva Gondak	Rescape
Hannah Kaye	PG&E
James Tuleya	Home Intel
Jennifer Green	MCE
Joe Koproski	CLEAResult
JP Ross	EBCE
Juan Bernal	GRID Alternatives
Katie Van Dyke	City of Berkeley

Larry Waters	Electrify My Home
Leslie Alden	Drawdown Bay Area
Lois Smith	MCE
Marc Bigby	CLEAResult
Marc Costa	Energy Coalition
Marcus Griswold	County of San Mateo
Marwa Ali	JobTrain
Mary Sutter	Grounded Research
Maureen Kennedy	Realtor
Mike Balma	SunWork
Mike Beebe	Electrify My Home
Rebecca Milliken	City of Berkeley
Rick Raybin	Financial advisor
Ryan Gardner	Rincon
Shraddha Mutyal	PCE
Sooji Yang	Greenlining Institute
Tom Kabat	EE consultant
Tony Jung	CLEAResult
Vishwas Ganesan	Yellowtin



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Next Steps

- Plan focus groups for contractors and homeowners, with the goal of identifying barriers to implementing decarbonization projects.
- Plan Stakeholder Workshop #2.

Questions and/or Feedback and Insights to Share?

Contact Susan Wright – swright@smcgov.org

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Home Electrification Focus Groups

The Purpose

Discover barriers and opportunities to converting single-family homes from natural gas to electricity. Building on past research, in these focus groups we focused on what makes it easier or harder to actually implement projects.

The Plan

Host two focus groups to hear directly from people interested in implementing electrification projects: contractors and homeowners. Each session was hosted on Zoom and lasted 90 minutes. We were not able to offer any monetary payment for participation.

Contractor Focus Group – December 1

Introductions

Of the 13 contractors who registered for the session, four contractors participated, representing Fast Water Heater Company, emeraldECO, Orion Energy Audits, and Nigel Mulgrew Plumbing. (One additional participant logged in but had to leave shortly afterward.) Participants answered the following questions as an introduction.

What are you hoping to get out of this session today?	What portion of your current business relates to electrification? High, medium or low?
<ul style="list-style-type: none"> ○ Convey the struggles we see with the process and hopefully become a part of BayRen ○ Learn from our contractor friends ○ Interested in sharing what we have seen in the market ○ Learn about the process. Link with contractors ○ Hear from contractors as to what they need to make electrification the default option ○ Learn about barriers for high-volume WH contractors ○ Understand barriers or motivations for contractors to electrify +1 ○ I'm interested to hear new ideas from contractors about how to get rid of problems in our system 	<ul style="list-style-type: none"> ○ High ○ Low ○ Low ○ High ○ Medium

Barriers and Opportunities

Participants independently entered their responses to the prompts below. After completing this task, they were invited to go back and indicate with a dot the three most important items.

Barriers to Profitably Implementing Electrification Projects What are the things in each category that make it hard for you to participate in the electrification market?				
Financial: Cost hurdles, financing, incentives	Contractor resources: Having the products, information and/or programs you need	Customer behavior: Knowledge, foresight, or enthusiasm	Regulation: Permitting, licensing, building codes, inspections	Workforce: Qualified workers, training for them, cross trade connections
<ul style="list-style-type: none"> ○ Rebates are not stackable - BayREN with Regional ones ○ Putting in an induction range may require electrical panel upgrade. 	<ul style="list-style-type: none"> ○ Some many aggregators. Could there be a one stop shop where we could learn everything? Maybe by county? Or a source that will help navigate ○ https://cbbf458e-67d0-4a11-9597-023b97b18cc4.filesusr.com/ugd/cc790b_b5d5f0f5d085484da51e8e58526255bf.pdf 	<ul style="list-style-type: none"> ○ Customers want low-cost solutions & may not be familiar with heat-pumps & requirements for installation. +1 ○ Customers are not proactive when it comes to water heaters. They are reactive to a failure ○ Difficult to find good candidates/home types for HPWH ● 	<ul style="list-style-type: none"> ○ CAS Testing by BPI Rater ● ○ Copy of a finalized permit ● ○ The application process and required items is quite lengthy and time consuming ○ Every town/ municipality has a different process for permitting - no standard process (or standard requirements) +1 	<ul style="list-style-type: none"> ○ Difficulty finding skilled labor to be able to scale+1 ○ As a water heater installer, we do not have licensed electricians on hand. It would be nice to have a list of electricians to partner with

<p align="center">Solutions to Profitably Implementing Electrification Projects</p> <p align="center">If you could wave a magic wand to remove these barriers and/or create more opportunity for you, what would you do?</p>				
<p>Financial: Cost hurdles, financing, incentives</p>	<p>Contractor resources: Having the products, information and/or programs you need</p>	<p>Customer behavior: Knowledge, foresight, or enthusiasm</p>	<p>Regulation: Permitting, licensing, building codes, inspections</p>	<p>Workforce: Qualified workers, training for them, cross trade connections</p>
<ul style="list-style-type: none"> ○ There is a focus on single point implementations (ie HPWH or HVAC, etc) without considering the fact that the electrical panel is the hub and may need to be upgraded to be able to complete an 'all-electric' home plus solar installation (need rebates for panel upgrades) 		<ul style="list-style-type: none"> ○ Provide a learning forum for what's needed before an all electric upgrade can be started. Help them understand all that is involved. Include information along with rebate requirements ○ Produce a white paper and/or a calculator summarizing the requirements, their costs and their savings (e.g. projected energy costs) - NEEA might already have a product <input checked="" type="radio"/> ○ Switch is On Link here ○ More customer education to drive demand! <input checked="" type="radio"/> ○ Highly targeted marketing campaign - targeting home plats based on the age and type of the home and appliances <input checked="" type="radio"/> 	<ul style="list-style-type: none"> ○ Only require a copy of the permit itself, not the finalized, signed off permit ○ Remove the requirement for a CAS test for heat pump water heaters installed in garages or unconditioned spaces (outside of living spaces) (adds cost and expertise requirements. Too many additional steps for homeowner and contractor) ○ File for permit online 	<ul style="list-style-type: none"> ○ <input checked="" type="radio"/> Provide a vetted list of contractors in the BayRen network

Testing New Ideas

The group was asked to comment on these specific ideas.

1. Group purchasing: Would you find those RFPs attractive? Why? would you participate? What would make it more attractive or unattractive?
 - One example: SunShares
 - Big buy approaches don't necessarily work for everyone (i.e. roof types); the program would need more parsing out to make sure people are eligible (average homeowner doesn't know/understand technical aspects about their home)
 - Electrical panel big buy would make more sense
 - Water heaters inside the home (not the right type of house always)
 - Gather data first
 - Heavily discounted is an attractive approach
2. Contractor Network: Would providing some networking amongst you be helpful to problem solve or surface new ideas? Would you join such a group?
 - Yes +3
 - Helpful to have a list of folks who are electricians; taking it a step further, meet periodically to talk about challenges, ideas, opportunities will create synergy. leads for HVACs or water heaters can be shared as well.
 - From Susan Wright: potentially create a LinkedIn group. Would an online platform be helpful?
 1. Virtual face-to-face meetings are much more engaging and helpful
 2. Potentially doesn't exist right now + 1
 - Electrification checklist for contractors to perform (have to wait for calls; hard to be proactive and reach out)
3. Rebates: There are currently a variety of rebates or financial incentives that promote electrification (name some if you can). What is your view of these programs? Do they help you? If you could redo rebate or incentive programs what would be ideal?
 - Easier the better! Instant, simple, customer friendly
 - Happen at the beginning of the process, not the end
 - Barriers have stopped an onboarding process before
 - Experience working with utilities along the west coast, and the most successful relationships have been the ones that have been easy – i.e. Puget Sound Energy, Seattle - pioneered instant rebates (rebates are right off invoice, no application needed)

- Tests and verifications – We understand the requirement because we don't want anyone gaming the system - make it have a lot of friction points. But we end up paying for the rebate with all of the complications.
4. Business model: Have you considered reshaping your business model around electrification as a comprehensive service? What is attractive or unattractive about this idea? Under what circumstances would you pursue this?
- Marketing campaign
 - a. partnerships around coop marketing / utilities / manufacturers
 - b. County info is potentially available. Who would be easiest and who should we target? Built-by date? Age of home? (8-12 yrs or 8-15 yrs) | Last major remodel? Contractors don't have easy access to this data for marketing purposes.
 - c. Can we target homeowners that apply through the city that are doing a remodel of any size or new construction project?
 - d. Find people who might already have upgraded panels (it will make it easier to implement)
 - e. Potentially target architects, designers, mechanical engineers
 - This is our business model. Market is responding well (2 month wait time currently). We have needed C10 licenses, contracting out with other experts.
 - Need to be nimble and agile because new challenges are always coming up
 - Proficient at installing natural gas water heaters (50/day; 3 hrs). Heat pumps are more involved and take 4 hrs. + Electrical part is not included in this time estimate (Ranges from 4 hrs to 12 hrs based on infrastructure, what needs to be upgraded, etc.) + it might trigger a (sub)panel upgrade + regulations are complicated
 - Sometimes it is possible to pull one permit for a heat pump water heater, but it is not standard
 - Additional coordination is needed among contractors to take care of the homeowner
 - Difficult to get customers to think ahead and not wait until their water heater breaks. Uphill battle: process is a bit longer, converting from gas to electric is a multi-step process: estimate from contractor, electrician, permitting on all sides.
5. Other ideas that you might have?
- Targeted outreach to potential customers (e.g. age of home 8-15 years)
 - Can we target homeowners that apply through their city that are doing a remodel of any size or new construction project?
 - Hook homeowners up with financing
 - Fyi - it is not difficult for contractors to get product (even with COVID raging)
 - Building departments pass along information when they see permits being pulled for remodeling projects. We could also target architects, designers, mechanical engineers, realtors, county assessor who notice home ownership turn over.

Homeowner focus group conducted on 12/2/20

Introductions

Of the 27 participants that registered for the session, 18 attended. All but two indicated they are “very interested” in converting the equipment in their home from natural gas to electric; the other two said they are “somewhat interested.” Participants were from San Francisco, Santa Clara, San Mateo, and Alameda counties. Participants answered the following questions as an introduction.

What are you hoping to get out of this session today?	What electrification projects have you done, or are you planning to do?
<ul style="list-style-type: none"> • Tools to get residents to decarb and look at solutions for my own home • <input checked="" type="radio"/> Understand the easiest and least expensive way to help people go all-electric • Info on decarbonization programs; opportunity to provide input • information • Steps to help implement electrification • Help inspire comprehensive home electrification programs & troubleshoot • I am in the process of electrifying, looking for strategy both short and long term, strategies that I can share with others • Share electrification journey • Changing my gas water heater • Learn about obstacles and possible solutions for electrifying homes • Help in electrifying my home. Give others help • Info about how others are electrifying • Inspiration and helpful tips • Path to electrifying sooner than later, info, need systemic design for my home not scattershot • Battery storage, heat pump space heating • Improvements in the contractor-homeowner process; would like to see BayREN building analysts provide site visits to help with an overall whole-house solution for energy savings and healthy home environment 	<ul style="list-style-type: none"> • Have an EV and solar panels. In process of getting induction stove and dryer. Heat and hot water are very challenging (radiant floor heating - slab on grade) with very challenging space limitations) • Installed HPWH this year, hope to do electric furnace, solar, battery backup • Have done: replaced WHs with HPWHs, replaced gas stove with induction. Added solar PV and EV charger. Hope to: replace gas furnace/AC with HP. Investigated moving emergency loads to a back-up battery, but wiring would be too extensive/expensive. • EV Charger, Solar, HPWH & electric dryer done; planning to electrify heating & cooking. • Heat pump, want to do heat pump dryer and water heater, have solar panels want induction cooktop • Solar roof with battery. Future: HPWH, heating+cooling • Electric cooking and solar so far, battery. Have an estimate for HPWH and furnace • Heat Pump HVAC, Heat Pump water heater, EV charging and associated electrical work • EV, electrical stove, dryer, upgraded windows and skylights • Air sealing, insulation, Heat pump furnace • Induction cooking, solar panel, EV + charging, heat pump water heater • Done: Efficiency, Solar, EV's. To Do: battery, heat pump water and HVAC, dryer, stove. • • Solar panels, envelope insulation, elect dryer

Barriers and Opportunities

Participants independently entered their responses to the prompts below. After completing this task, they were invited to go back and indicate with a dot the three most important items. We highlighted common themes in gray.

Barriers to Electrification Projects			
What are the things in this category that make it hard for you to electrify your home?			
Financial: This includes cost hurdles, financing, incentives like rebates or credit, etc.	Effort: This includes finding qualified contractors, navigating the options, etc.	Knowledge: This about having the information you need, feeling confident it is accurate and objective, etc.	Other: What haven't we thought of?
<ul style="list-style-type: none"> ○ 1st Quote \$50K for HVAC, battery, water heater... crazy costs & not inclusive +1 ● ○ Knowledgeable contractor, cost estimates are too high so far. May want to do some of it myself ● - behind three of the most important items 	<ul style="list-style-type: none"> ○ a sparse list of qualified contractors; difficulty in arranging on-site visits to discuss project; contractors do not respond to web contact requests; Foster City ○ Impossible. Hard to get response, impossible to get cross plumb/solar/electric design... I have to be general contractor?? 	<ul style="list-style-type: none"> ○ This course for everyone including my spouse who does not have the same knowledge but she has the same passion ○ I get lots of requests from people who want to know how to do this; I would like to know more, +1 ● ○ Upgrading electrical panel expensive, confusing, +1 ○ Very difficult to get deeper information on heat pumps: cost, cost for installation, infrastructure, living with these types of appliances, amount of wattage required from my solar system +1 ● ● 	<ul style="list-style-type: none"> ○ Low hanging fruit first - get rid of non-LED lights. Then roof and wall insulation and new windows = how to deal with that? ○ Incentives are preventative: I have solar so the battery+solar incentive doesn't apply. ○ How about battery+HP? Concern increase in electric appliances will push me into a higher and more expensive electricity tier. ○ I won't have enough solar system wattage to support the additional heat pump appliances. ○ Roof size and roof orientation makes solar more difficult ○ Certain things need to be done to any old house - panels, knob and tube wiring, for example. These costs are not just created by all electric

<ul style="list-style-type: none"> ○ Space and technical challenges, financing- it's really expensive for HPWH and there isn't one that will work with my limitations. ○ Simple financing and a 3% (or lower) interest rate ●● ○ A special electric rate around \$0.14/kWh for all electric homes...this makes electrification affordable for most according to my modeling +1 ●● ○ Replacing working appliance is not good ROI, +1 ● ○ Extremely high cost for HPWH and HP heating cooling. Need more support from San Mateo. Seeing much more support in other bay areas with financial incentives. +1 ○ Very expensive and knowledgeable contractors not readily available ●●● ○ Cost of wiring for induction stove higher than we would have liked. Same with HPWH. Cost of replacing fully-functioning, efficient HVAC system difficult to justify. 	<ul style="list-style-type: none"> ○ Need a great design, not just what the contractor offers X ○ Permitting is challenging with too many inspections. Slow for city to approve the permit. ○ Hard to find contractor in SMC, inspections cost more XX ○ Had to bring plumber up to speed on Sanden split system HPWH, which they'd never installed before. Higher price to bring them up to speed. ○ Took much time with choosing right contractor, then had problems during initial install and now not willing to go back to same contractor for additional work ! ○ Learned the hard way not to pull insulation and old furnace out of the house in November. We were without heat for an extended period time when installation experienced complications ○ No BayRen contractors in San Mateo. Contractors are expensive, don't want to service San Mateo from South Bay, don't want to participate in BayRen because they don't feel it's a well run program.+1● 	<ul style="list-style-type: none"> ○ Choosing the right product for my home, +1 ○ Hard to get best product info for heat pumps, stoves, dryers... ○ common in europe but dont' trust US options are the best. Trustable reviews? ● ○ Don't want scattershot conversion; how to design battery/solar/heatpump/stove infrastructure TOGETHER. Expertise is silo'ed badly! ○ Knowledge of mini split space heating vs [central] heat pump space heating ○, +1 ○ Cost to run and maintain system ○ Good with info we had. Plumber's representative asked, "Why do you want to go all-electric? You know how they make electricity? They burn coal. ○ I had educated myself pretty easily through programs offered in the community It's really complicated - electrical, plumbing, panel upgrade, availability ○ Many people not familiar with new electric appliances, induction cooktops and fight to keep what they have ○ BayREN wasn't helpful. They corresponded ok, but incentives didnt apply and introductions to contractors were dead ends and there was no "Path" to help me. I was disappointed. Now I'm stuck!● 	<ul style="list-style-type: none"> ○ Can't we have product \$ incentives AND an outcome incentive like \$2k when home is all electrified? Lets get more creative. ● ○ Changing nature of market making previous purchases (PV) outdated. IE panels sharing alternator vs individual panel alternators ○ Renters ○ Need electrical panel upgrade, +1 ● ○ Electrical panel upgrade was also a surprise and nearly derailed project at the last minute when extra costs were suddenly added to project ○ Unable to insulate my attic because of existing knob and tube wiring. It was not recommended. It'd be great if there were other financial incentives for things like electrical panel upgrade and rewiring a house. ○ Without PV+battery, we have no heating at all in house during PSPS events ○ Free advisors, who are electrification experts, and could help you come up with a plan ●● ○ A database of contractors with ratings and quote examples that prospective electrifiers could search ○ Ask/force cities to adopt low (or no) permit *fees* for electrification work (e.g. new circuit to electric appliances, HVAC, HP water heater, electric range ●) ○ Get the knowledge out there that almost no one with a 100amp panel needs to upsize their panel to FULLY electrify their homes. Electricians tell people they need an upgrade when they don't. You just have to pick the
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<ul style="list-style-type: none"> ○ High cost to “do it right” and comprehensively ○ The HPWH was so \$\$\$ & i wish i had known about the PG&E marketplace; the EV charger was surprisingly expensive too. ○ Exclusion from incentives due to fuel switching rules (now changed) ○ Expense. No rebates from BayREN for getting rid of my old furnace and replacing with heat pump. Said I must use one of their contractors but it still wasn’t possible because I didn’t have an AC that I was replacing ○ Natural gas costs are so low that it’s difficult to consider electrification +1 ○ We were (and still are) trading off investment for daughter’s college fund so that we can have a better house. It sure feels like we can’t do both. ○ Eg: \$5,500-\$7,000 for a Heat Pump Water Heater (6 yr warranty) ○ Eg: \$14,700 for a Heat Pump Heating and Cooling (12 yr warranty) ○ Cost to run and maintain system (unknown) 	<ul style="list-style-type: none"> ○ Emergency nature of WH replacement vs time required to install HPWH ●●● ○ Unable to find contractor even with BayRen help. ○ We had a very hard time finding contractors to install the EV Charger and also the HPWH. There were no BayREN contractors for HPWHs in San Mateo County. ○ Cities have different requirements for permits, some quite difficult ○ More info about ways to avoid a difficulty finding solar panel installation very complicated in terms of investing \$4,000 electrical panel upgrade, for example Tom Kabat’s “Amp Diet” ○ Info on how to choose electric appliances, e.g. 15 amp heat pump water heater, that will help someone electrifying without upgrading their electrical service with PG&E down the line ○ A professional (free) advisor to help someone come up with a plan and direct me to good contractors ○ Heat Pump Water Heater: 220 line and gas termination 	<ul style="list-style-type: none"> ○ I would like to see a database of local contractors who have track records on electrification projects and some quotes they have given customers. You could allow people to rate the contractors, after working with them. That would allow good, reasonable, knowledgeable contractors to grow their business and (even more importantly), allow citizens who want to electrify to find good people to do the work, which seems to be the major barrier ● ○ We need to provide a ROADMAP for homeowners so they can navigate through the whole process. ●● ○ Need to help affordable housing projects go all-electric ○ It was hard just to find out from a BayRen advisor how much it costs to run a HPWH per year so I could compare it with the cost of my gas water heater. ○ From a practical POV rather than a manufacturer label, it’d be helpful to know the annual cost and wattage requirement for a HPWH 	<p>right appliances or use circuit sharing devices, like Neocharge. See Tom Kabat’s amp diet approach. ●</p>
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<ul style="list-style-type: none">○ HP HVAC requires replacing all ducting and infrastructure in 100yr old house. Really? Lots of added costs but is there a better way?? ● - behind three of the most important items	<ul style="list-style-type: none">○ Heat Pump Heating and Cooling: partner exterior wall unit, condenser (plant removal)○ Someone to call to tell me if a quote is outrageously high (I've seen quotes for \$15,000 and \$30,000 for the same HVAC job, same house). Lots of price gouging happening, meaning a contractor who looks at the neighborhood and prices accordingly. ●○ Contractors all were familiar with installing heat pumps○ Knowledge of rebates running in the area at any time		
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Solutions to Electrification Projects			
If you could wave a wand to remove these barriers and/or create more opportunity for you, what would you do?			
Financial: This includes cost hurdles, financing, incentives like rebates or credit, etc.	Effort or concerns: This includes finding qualified contractors, navigating the options, etc.	Knowledge: This about having the information you need, feeling confident it is accurate and objective, etc.	Other: What haven't we thought of?
<ul style="list-style-type: none"> ○ Group presentation/ information sessions-- difficulty obtaining comprehensive information ○ BayREN requirements are over the top with CAS tests, etc. making the cost higher. The rebates don't come close to covering these extra costs. +1 ● ○ More rebates ● ○ BatREN rebates for replacing gas furnace with new heatpump Help with financing would be beneficial to people ○ With more rebates, I'd replace my gas water heater and gas furnace. ● ○ On bill financing would be a big help+ +1+1 ● ○ Someone to pay for changes--Bill Gates or Jeff Bezos type (friendly 	<ul style="list-style-type: none"> ○ Standardize installation and inspection process, +1 ● ○ BayRen HPWH program has few contractors. How do we get more contractors educated and publicly identified? Or if BayRen program is onerous, is there a different process for identifying knowledgeable installers? ○ Concierge service which had list of vetted contractors and central rebate processing,+1.+1 ●●●● ○ Availability of "loaner" gas WH to install during gap between outage and HPWH installation +1 ○ Difficulty finding solar panel contractor who had a solution for a very pitched roof installation 	<ul style="list-style-type: none"> ○ More education for consumers, +1 +1 ●●● ○ City council hesitant about establishing regulations for new construction and current residential improvements--sends mixed message to community ○ Educating the public about the problems with gas. I've found most people look at the banning of gas as government dictating to them and not letting them do what makes the most sense. For years gas was pushed instead of electricity. Up until recently I couldn't have an electric tankless water heater, the county wouldn't allow it Maybe still won't, I don't know ○ Many City Councils don't understand the need and process ● ○ Heat pump heating and cooling options ○ Eg: heating cooling--new (mini split) or retrofit (using current air ducts) ○ BayRen just promotes one type of heating and cooling, but I learned there's other options that might be a better fit for cost and existing infrastructure 	<ul style="list-style-type: none"> ○ Would like to see whole home electrification programs (similar to Boulder) that combine technical & financing assistance through one central contractor & no extra charge to customer (e.g. supported by utility or county) - similar to concierge service mentioned in column 2 but comprehensive (incl. Solar, EE, EV, etc) +1+1+1+1 +1 ●●●●●● ○ Would help to have designated contractors who would offer group rates for neighboring communities ○ Availability of "loaner" gas WH to install during gap between outage and HPWH installation ○ ON bill financing, and massive tax incentive bonds with Cal Debt Limit Allocation being increased substantially for homeowners



<p>amendment - full coverage for low-income?). ●</p>	<ul style="list-style-type: none"> ○ Speed of permitting, and complexity of coordinating all the various components (appliances, panels, financing) ○ Need to have system set up so that consumers with dead water heater or furnace can instantly get new ones ●●● ○ Silo'd contractors - separate ○ plumber, electrician, builder, HVAC, and kitchen appliance workers.... Crazy separation rather than systemic "future fit" to make this easier. ●● ○ Improvements in the contractor-homeowner process; would like to see BayREN building analysts provide site visits to help with an overall whole-house solution for energy savings and healthy home environment ○ Pre-wiring at all gas equipment that is being installed. Without Reach Code, state code only requires electric prep at water heater, not furnace, stovetop. ○ ? 	<ul style="list-style-type: none"> ○ Installation process/requirements - simplified ○ What it's like to live with heat pump appliances, +1 ○ Some advisors lack familiarity or experience with appliances ○ Heat pumps (slower) vs existing gas (fast). I later learned heat pumps are slower and should be left on as well as not to expect instant warmth as with my gas furnace. ○ What are the associated costs (monetary and wattage) ○ Specific appliance webinars on selection, costs, installation and usage ○ What should we look for when shopping for these new appliances (brands, avg warranty, etc?) ○ System sizing, as in, we need design help and technical help to properly design a system holistically, not just electrical, but insulation, fenestration, etc., +1 ○ Short info sheets on HPWH, HP HVAC, induction stovetops, battery back-up systems; then longer info packets with product comparisons, installation requirements. ○ Educating public about perniciousness of NG, and that we're proposing ON REPLACEMENT, not to take out existing, working appliances but to PREPARE for when the appliance fails so they can electrify. ●●● ○ It takes so much time to learn bit by bit. Need a county information system 	<ul style="list-style-type: none"> ○ Education program for public about the problems of gas and the benefits of electrification ○ Benefits of air sealing and weatherization to keep wildfire smoke out of house ○ Warning labels on gas products at retailer similar to surgeon general's warning on cigarettes to alert consumer to health & climate impacts of gas use & provide info on clean alternatives at point of sale. ● ○ Residential Design ○ Remodeling & Additions ○ 828 18th Ave. ○ Menlo Park, CA 94025 ○ 650 323-2343 ○ Prohibit new fossil fuel product sales, phasing in over time. ●● ○ Problem of needing to upgrade your electric service is financially prohibitive for many. I've seen suggestions on how to get your amps down but this is a problem for older homes converting to all electric ○ Ability to post electrification contractor reviews like they have for Earthquake (Brace+Bolt) retrofit contractors. ○ Spot incentives \$ come and go (solar here, battery there, stovetop next year). If you want
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		<ul style="list-style-type: none">○ Education about power outages and electricity supply, cost○ SVCE “FutureFit” program was on the right track - comprehensive. What happened to that initiative?○ Dispel misinformation being disseminated by fossil gas industry. They are actively organizing to mislead people and convince policymakers and citizens that this work is too expensive for normal people. If we don’t proactively address this misinformation, we will lose in the realm of perception, which is all that matters in a new movement like this. ●●○ Sponsor panels of homeowners to talk about their electrification experiences: challenges, costs, approach, Q&A. There could be a sponsoring county or city council member present. To seed the panel, have a pilot project with interested homeowners to do complete electrification. These homeowners could help support county and city messaging for electrification as well as provide valuable feedback on going through pilot programs.	<p>to electrify whole home, where’s the incentive program all at once?</p> <ul style="list-style-type: none">○ Electric fireplace inserts○ New construction/major remodels: install EV-ready electric outlet at driveway.○ During heat wave, offer air-conditioning/heating solutions easy to install quickly○ EQUITY (dropped the ball on this earlier - pls accept a late entry)○ Fastest way to get adoption is getting government to mandate new policies ●○ Cash for Clunkers is a great idea. It was mentioned for 10 yr old gas water heaters. But, my water heater has a 9 yr warranty so my concern is that it’ll give out soon. Please consider lowering the age limit. Even at 8-9 yrs, I’d switch it out if there was an incentive.○ Promote solar roofs as an option to solar panels. Homeowners would be able to break even and then come out ahead with the electricity savings. One of the few ways to break even on a home project (roof).
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Testing New Ideas

The group was asked to comment on these specific ideas.

1. Group purchase opportunities: would be willing to participate in a “buying coop”? how do we scale for many people to do this?
 - One example: SunShares for solar. Similar program for heat pump water heaters or panels.
 - Solar, panels, batteries - helpful for products. Group buying might be difficult with various custom appliances are harder to buy as a group. In addition, most of the cost is labor. +3
 - Heat pump water heaters are standard enough for this to work
 - When it’s possible (taking into account above), it can be a win-win
 - Neighbors may not understand the issue
 - Let’s separate electrification into two categories... replace a discrete product like a gas dryer VERSUS systemic labor intensive shifty of solar/battery/HVAC/water which is a very different project and set of needs.
 - Education is key to do before this step
 - I love the idea of bulk purchasing to get the cost down
 - I’d like to see the county or PCE do an RFP for a contractor to perform several hundred electrical upgrades on older homes, so that those home-owners have a guaranteed price (based on the average across a large pool) and subsidized through the utility.
 - I absolutely would participate in a group purchase program. I took advantage of SunShares
 - Link to what Marlene referred to - <https://www.pbs.org/independentlens/films/jonathan-scotts-power-trip/>
 - In Boulder, homes of similar characteristics were grouped and contractors could specialize in those unique needs. This allowed for more specialization and customization.

2. Home advisor service: Would having access to a service like this be helpful? What additionally do you wish it would do?
 - +1 to advisor service. We have solar panel advisory built in before installing panels - not so much for individual appliances (getting a number on size requirement and cost would help)
 - New codes require separate circuits for many things now. It is challenging to get the amps down enough to get by on a 100 amp circuit. And many places still have old knob and tube which aren’t up to the electric stresses required by our electronics, etc.
 - Most people may not need a panel upgrade, but the electricians (and others) tell them they do so that they can make a profit. Whoever is advising people, learn about the amp diet approach from Tom Kabat + 3
 1. Include a site visit and help homeowners; analyze the systems now and compare them to what is place in other areas (like Boulder) + 1

2. Future Fit from SVCE - look at the whole house +1
 - Advisors have cursory knowledge, but not exactly what they need
 - Palo Alto Home Genie program covers the cost for home advisors to come in and help.
 - Whole home incentives (at one time).
 - Would recommend development of standard "home upgrade roadmap" template with standard and optional sections that the homeowner can use to get a comprehensive approach and then chip away in stages over a number of years
 - I love the idea of a holistic approach +1
 - If thinking ahead and understands the whole house, could make recs, help save costs, and remove barriers in the future +1
 - Good point about needing plan for whole house electrification when considering panel upgrade
 - Across discipline approach is key given speciality expertise needed
 - Would recommend development of standard "home upgrade roadmap" template with standard and optional sections that the homeowner can use to get a comprehensive approach and then chip away in stages over a number of years +1
 - I think I need a BayREN "electrification designer" service onsite, not an audit.
 - !!! to BC Capps comment.
 - Honest input about electrification is needed (not relying on someone who stands to make a profit)
 - apart from info on appliance upgrades, knowledge about things like insulation to reduce electricity usage is also helpful
3. Homeowner network: Would it be helpful to connect with other homeowners to share learning or resources?
 - Ambassadors, someone to call who has been through this. Homeowners know a lot about this. People have gone through this the hard way. Call in service through the county or city to connect with other homeowners. +1
 1. Helpful to know the expectations and the process
 2. Contractors, in the past, have avoiding directly answering questions on cost
 3. Polling of people who have been through this before would be helpful. I.e. how much should x cost?
 - Zoom meetings are helpful to share insights and tips - community leaders who have been through this before. Threshold for joining a zoom meeting is much lower than threshold for in-person public/city council meetings.
 - Facebook group to serve as a network. Talk about who the big contractors are. Rate contractors who specifically do electric work. +1
 1. Helps saves time (without having to do all of the research ourselves)
 - It would be good to get recommendations from other homeowners on how to do the process and contractor they used +2

- I'm liking the WeRenew group that SM county is running to share across homeowners. But I'm missing trusted "consumer reports" style reviews of best products for heat pump water, battery, HVAC, stove, dryer etc. Europe, for example, has so many more choices than here it seems.
 - Sharing a video of all electric home owners journey would scale better
 - Homeowners can talk more freely about contractor experiences, costs, problems than either BayREN advisors or other county energy staff who need to be "un-biased"
 - Can there be "recipes" for electrification steps based on age and size of home, types of gas use, etc? That would create patterns of steps and best ROI for each?
 - local homeowners sharing info about financing, contractors, how to, when to, etc., research shows that getting people to participate in changes that may be difficult or expensive, or novel, is much more successful when they see their neighbors doing it. We are a species that, despite our emphasis on individualism, (often)unconsciously) operate from a herd mentality. We are subject to what our neighbors and our community are doing and what they value. From a sociological and psychological perspective, it is very important, not only to inform, but to actively include everyone in the consideration and evolution of these significant and essential changes in energy sources and consumption. It might be helpful, for example, to have energy fairs as someone mentioned, and also have sign up sheets where attendees can indicate their interest or need for information, with various neighborhood individuals would contact people and set up meetings with their neighbors.
4. Bundling: do you see value in doing multiple jobs at once? What would make it more attractive?
- Bundling would be good if it is coupled with a holistic analysis and design. Sending a contractor to do everything could be worse than using individual contractors and suppliers.
 - Cost is biggest barrier but I'd do steps if I had a comprehensive plan to guide me.
 - Strong support for a comprehensive plan, with incremental installation upgrades
 - Bundling.... I can replace a gas dryer or stove on my own. But the biggie is solar/battery/HVAC/Water as one cohesive plan and design. That's the biggest impact and most important to get right. And hardest
 - Great to bundle the plan (cohesive, whole home plan)
 - Especially if pulling a line of credit; more efficient to do it all at once
 - Helpful to include the cost savings over time in the plan, and the energy savings in the plan
 - Barrier: costly to do this all at once; Helpful to have the work done all at once so the home is not disturbed more than necessary
 - Bundling incentives = great idea
 - If I were doing it all at once, it would be in conjunction with a remodel process -- I'd be doing other things as well. So although contractor recommendations would be great, I wouldn't want to rebates to be tied to using specific contractors, as I'd want to be able to use the subs already being utilized on the remodeling project.
 - Resurfacing an "outcome" incentive too... \$\$\$ once electrification is all done as a carrot for the whole project.

- Consortium of contractors, plumbers, electricians, other experts are brought together (they need to have these relationships in advance to save the homeowner time and hassle) + 1
 - Efficient
 - Bundle incentives +1
 - Or scaled rebates, so we're still incentivizing projects that might have a sticking point -- a reason they can't electrify everything
 - ADD these thoughts - contractors get used to working with each other, and know how to follow one another. Not all electricians, plumbers, and carpenters are good at this.
 - I've already done efficiency measures as they were easiest. SO next big nut is HVAC and water... and fix any remaining efficiency items as part of that.
 - Sonoma Clean Power is working on a commercial showroom space where homeowners can browse and see new electric appliances in person before purchase. The intent is then to match owner w/ contractors + incentives using a "one stop shop" model.
5. Regarding upgrades or electrification projects, how do you take energy efficiency into account? Are you looking at appliance only?
- There aren't too many programs in place that are demanding the sealing; it is a big project and barrier.
 - Incentives for lowering energy usage is helpful to encourage more optimization
 - Concept can be bundled together with Clean Air days
 - Response dependent on weather conditions (i.e. heat wave, wildfires - having a gas free home is healthier, new systems have heat on demand for rooms which is helpful in cold weather)
 - sharing information about available rebates more widely might convince skeptics
 - Education would be helpful, particularly when starting to look at appliances. Better understand what we additionally, holistically need to do. Specific insight for homeowner's unique home.
 - Affordable housing - overtime, residents will benefit from these upgrades
6. What about a "cash for clunkers" rebate where if you want to replace a working hot water heater with a heat pump water heater, you get an additional incentive (~\$500) on top of the other rebate?
- Cash for Clunkers Idea for water heaters + 4
 - Greater incentives for switching
 - This is helpful for products, but not for labor involved in other categories of this issue
 - + furnaces; could technically work for a longer time and it is expensive to fix, but may not work well and need to be replaced

- Talk about how long water heaters last; educate; think proactively; this will be helpful in the long run and help homeowners plan for the future - financially especially
 - Some only have a 6 year warranty. This could be \$1000/year. Others have 12 yr warranty now.
 - Avoid emergency situation (switch BEFORE) the water heater fails
 - It would help to have an electricity rate schedule that rewarded electric upgrades with lower electricity rate.
7. How are you financing these projects? What financing programs would be attractive to you?
- PACE financing is a great fit for some, especially if they do not know how long they will stay in the home
 - I've been saving up to cover this, but \$50K++ is just a bridge too far. So I need a comprehensive design that is 1/2 or 2/3 less... so the key to cost is in the options and design of affordable electrification overall
 - I'm not interested in paying more in terms of interest rate than what is required for a product. I prefer to try and save for it. If not, I won't do the electrification.
 - On-bill financing would be the easiest from a customer experience standpoint
 - Loans are also good options; interest rates are low; especially for home*owners*
 - Banks helped solar industry grow - Banks made financing solar simple and available. I.e. Silicon Valley Bank came to solar companies to offer this.
 - When homeowners want to electrify their homes progressively by replacing gas appliances with electric, would there be incentives from PG&E because electrical infrastructure is increasingly less expensive to maintain than the aging gas infrastructure? The all electric appliances are often more expensive so incentives are very helpful for these marginal cost increase decisions.
 - Solar industry now has pay-as-you-go (via PCE perhaps?), lease, lease to own, and buy outright options. Need the same for a total electrification project. Buyer decides which.
8. Driving policy change
- County to have a model procedure/ordinance to make electrification easier (cities could cut and paste this. I.e. PCE model helpful in driving change) +1
 - Contractors have discouraged from changes before because city regulations are so complicated (i.e. permitting costs, more inspections, whole house plan needed before they would put in a new heater)
 - Previously mentioned, Sonoma County seemed to make electrified efficient rebuilds much easier with permitting and showroom and incentives after the fire. Can't we do the same and more in SM Co? For retro future fits?
 - How about city/county fast-track for electrification permitting and incentive bundled? Really make this look easy in time and \$\$ as a type of project?

- Time-of-Remodel Electric-Ready: Would be useful to have policy changes to require running conduit to future-electrify appliances in areas of the home that are being remodeled, reducing time-of-replacement costs later.
 - One building official in my city told me earlier this year he thought electric water heaters were illegal
 - workshops for city building officials next!
 - ^Trainings include heat pump water heaters and reach codes. We are continuing to do outreach on these to building departments. Thank you for the feedback!
 - Getting neighbors onboard; city council is not necessarily supporting the need for electrification. Other cities are completely supportive. It would be nice to have a collaborate with the messaging of the importance of electrification. (perspective is from San Mateo currently, experience around Bay Area counties and cities)
 - Plug for building officials - who don't have the knowledge or experience - who implement. Help them on a county or regional level. Educate them on the guidelines for installing these. They could potentially be a stumbling block (for getting permits) if they aren't educated on this. +1, assist on a state-level as well
 - I live in the east bay in a small city (Piedmont). City Council is currently planning to address the electrification building regulations. To that end the city has sent to all residents an online survey presenting various regulation options, which homeowners (in terms of remodel or construction costs) should be required to update or achieve which guidelines, attitudes towards changing energy sources and even attitudes/beliefs re climate change. This seemed like a really good idea to me because it accomplishes conveying info re: state and county projected guidelines as well as possible city regulation options, so it warns people and allows them to feel participatory in pending changes. It also gives the city some sense of the obstacles they are facing, e.g. the %age of those who don't believe in climate change may indicate the necessity of more basic education and possible methods of providing that info.
9. Miscellaneous comments
- Also need to deal with enormous costs of litigation/lawsuits when natural gas prohibitions are challenged by developers (Windsor, Santa Rosa, etc.)
 - Would like to think about equity. There will be a future discussion on equity issues and how to involve lower income populations.

Next Steps

Ideas from these focus groups will be incorporated into the 2nd stakeholder workshop on December 9.

Final Workshop

On December 9, 2020 the second and final project workshop was held. The purpose of the workshop was to:

- Review the outcomes of workshop 1 and the two focus groups. The combined list of ideas from those three events formed the starting point of the discuss for this workshop.
- Working in small groups, participants analyzed a set of ideas the proposed ideas and narrowed them down to the two most promising to pitch to the larger group.
- The whole group discussed the prioritized ideas and agree on the top 4 that merited immediate action. Together participants identified the next steps to take to move the ideas forward. The table below summarizes the results.

Attendees

Name	Organization
Jeffery Liang	BayREN
Billi Romain	City of Berkeley
Jennifer Green	MCE
Tony Jung	CLEAResult
Pam Gordon	Presidio Graduate School
Brett Gentry	Clean Tech Entrepreneur
Jenny Berg	BayREN
Marc Bigby	CLEAResult
Denise Lin	County of San Mateo
Juan Bernal	GRID Alternatives
Corinne Schroll	Frontier Energy
Shraddha Mutyal	PCE
Vishwas Ganesan	Yellowtin

Susan Wright	County of San Mateo
Chris Cone	RCPA
Leslie Alden	Drawdown Bay Area
Chris Bradt	Frontier Energy
Beckie Menten	EBCE
Emily Alvarez	StopWaste
Diane Bailey	Menlo Spark
Hannah Kaye	PG&E
Mary Sutter	Grounded Research
Maureen Kennedy	Realtor
Kim Springer	County of San Mateo
Tanya Narath	RCPA
Tom Kabat	EE consultant

Prioritized actions

Key players for this intervention

First next step

Upstream instant rebates (starting with heat pump water heaters, and additional aspects of electrification)	BayRen (lead), Contractor community, CCA's, Energy Solutions, Energy Star and retail products platforms, SMUD, IOU program, Manufacturers (energy star has mfg council)	BayRen to make connections to the key players. Kick off meeting
"Cash For Clunkers" program so that we can replace water heaters before they go out, including recycle program, Building Decarb coalition	BayREN, CCA's, contractors that are doing the work, Transfer stations for recycling, ask PGE about their refrigerator recycling program. Policy makers	Convening the stakeholders; scope out the regulatory implications. Develop marketing plan to get the awareness of homeowners. Both downstream and mid-stream marketing. High potential for abuse - regulations need to align
Develop an automated roadmap/project planning tool for electrifying a property		
Develop an emergency loaner program for contractors		
Financing instrument that emphasizes leveraging public/private partnerships to make it easier for customers to access, use public capital to make private capital more affordable.	BayRen or regional administrator (lead), EDCE, coalition of CCA's, BAC to move the private sector, building Decarb Coalition (tech team member), financial institutions/banks, BC3 (including community or mission driven banks),	Check out the Clean energy financing mechanism. Tech Opportunity - Energy Solutions working on innovative financing strategies. Map out the likely stakeholders and how to start the conversation. EBCE will be looking at the financials and might have models to use.
"Groupon for Electrification" (building on above automated planning tool) service that allows for group purchasing of electrification plans. entities that have large purchasing power (CCAs, IOUs) can be leveraged.		
Help building dept with permit guidance for various electrification products (addresses knowledge gap and need for speed)		

<p>Help with applying for permits - standardizing and streamline them. Make it easier for people to apply for building permits. This could be done at the state level.</p>	<p>BayRen Codes and Standards program. Tri Chapter Uniform code committee, Calif energy commission, ICC (building departments as inside partners NOT the problem), Climate friendly chief building officials, CEC compliance and enforcement division. Senator Becker</p>	<p>Design charrette with building officials where we emphasize building safety - get their ideas to solve the problem. Target building code officials group. Educating building officials, Look for potential support in building departments. Clarify How much permitting is really needed? Goal = Calif Electrification program statewide (like solar) so that there is a standardized permitting standards state wide.</p>
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Next steps for sharing out this information will be included in the final draft.

DRAFT