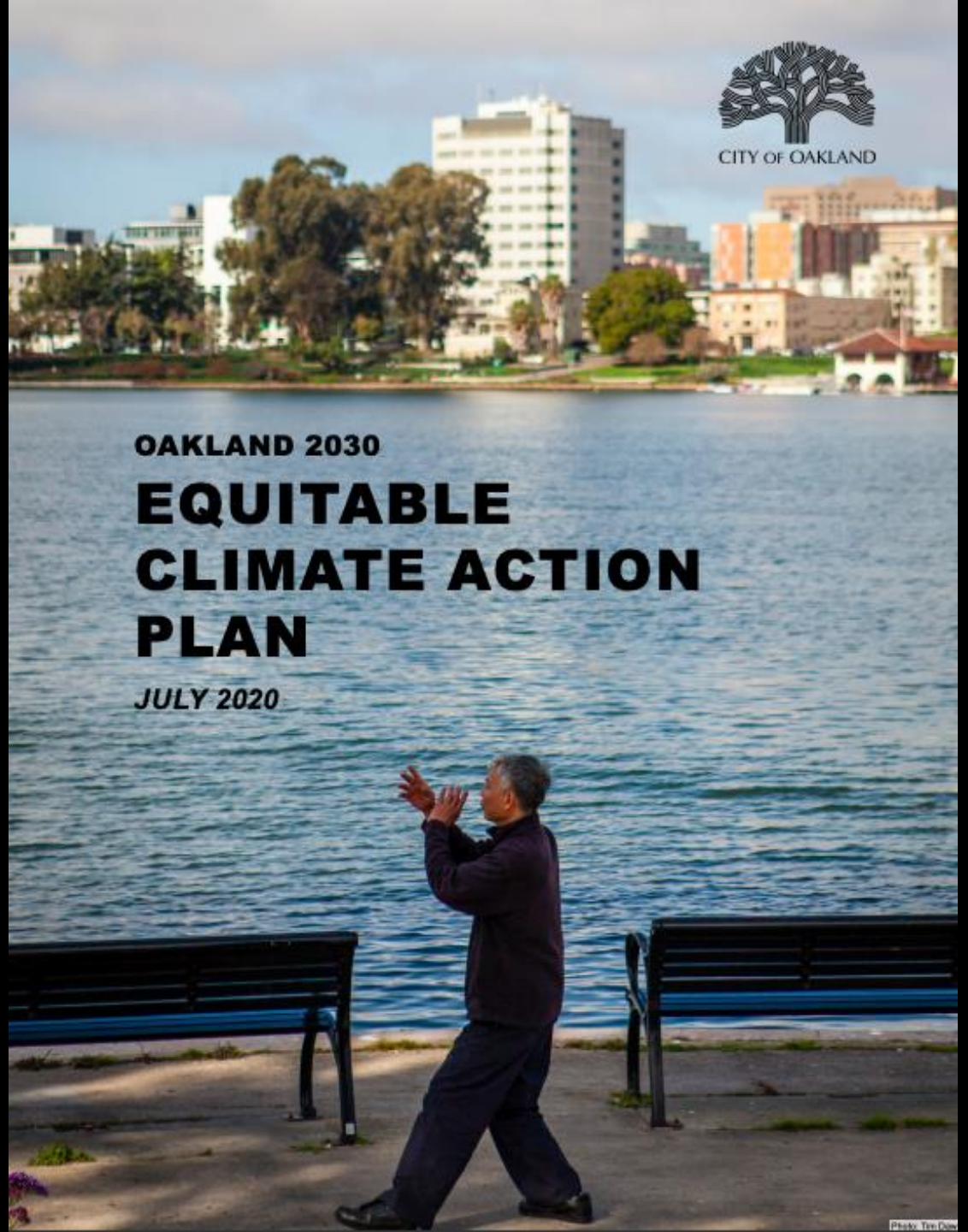
Electric Service Upgrades for Multifamily and Commercial Building Decarbonization

September 28, 2022

Electrifying Existing Buildings for Health & Equity

Shayna Hirshfield-Gold
Climate Program Manager, City of Oakland



Equitable Electrification

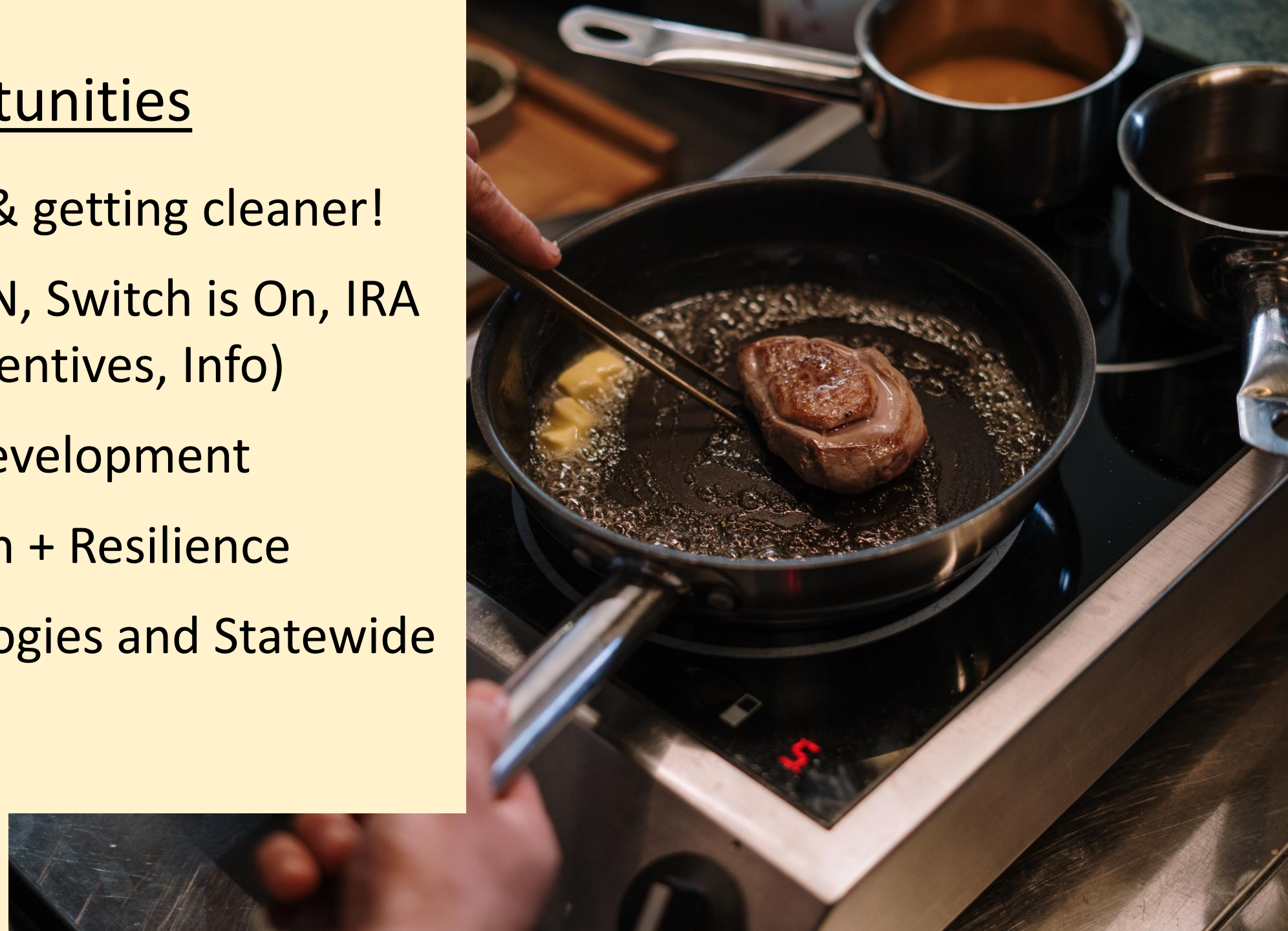
- ***Replacing gas appliances with efficient electric alternatives = health + safety + justice***
- Gas = toxic, flammable, explosive
- Justice = Affordability, energy reliability (solar + storage), related upgrades, JOBS
- Efficiency reduces energy bills, upgrade costs, & grid stress

Key Challenges

- Housing costs
- Utility costs
- Education & awareness
- Old infrastructure
- Ensuring access
- Added complexity:
    - Restaurants
    - Affordable housing

Major Opportunities

- Clean grid… & getting cleaner!
- EBCE, BayREN, Switch is On, IRA (Rebates, Incentives, Info)
- Workforce development
- Electrification + Resilience
- Ripe technologies and Statewide momentum



Oakland Timeline

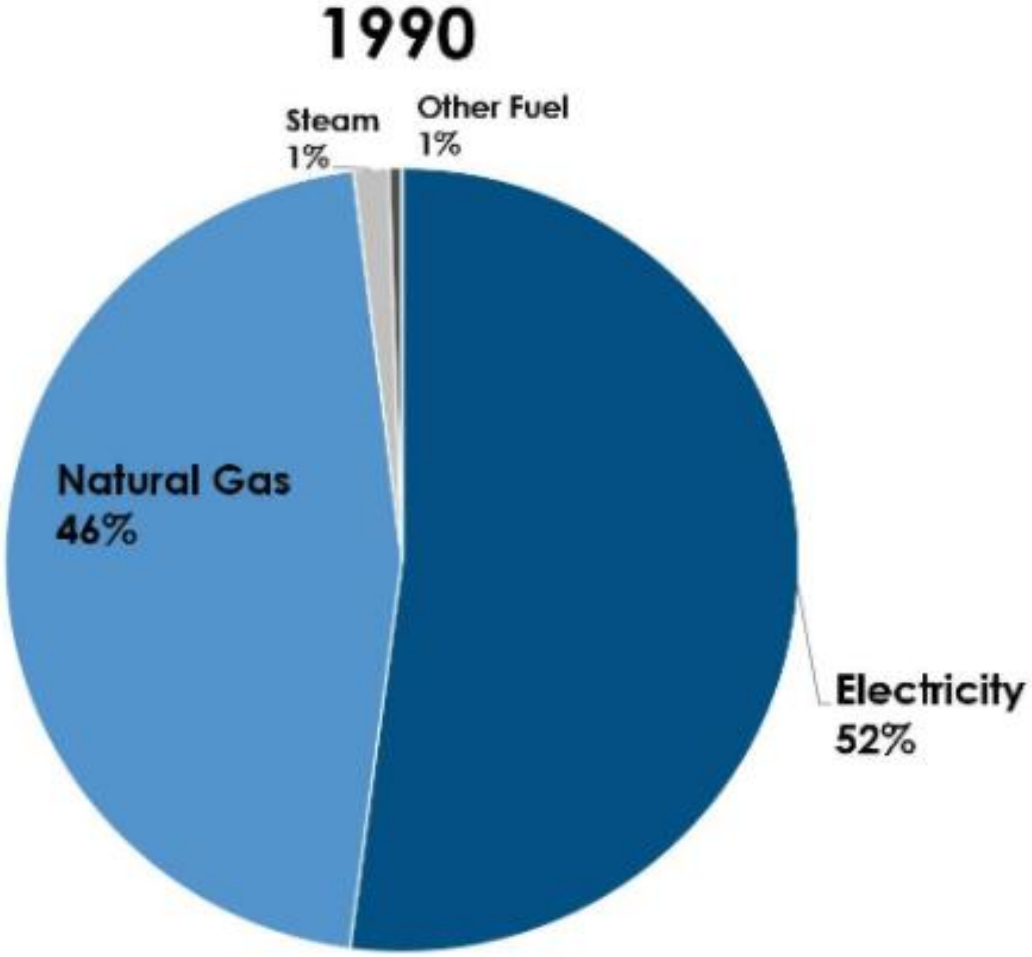
- All-electric new construction (Dec. 2020… the first step)
- Workforce Focus (2021-23)
- Continued Engagement (ongoing)
- Existing Building Electrification Roadmap (Summer 2023)
- Major Renovations (2023?)
- **All buildings all electric: 2040**

SF Environment
Our home. Our city. Our planet.
A Department of the City and County of San Francisco

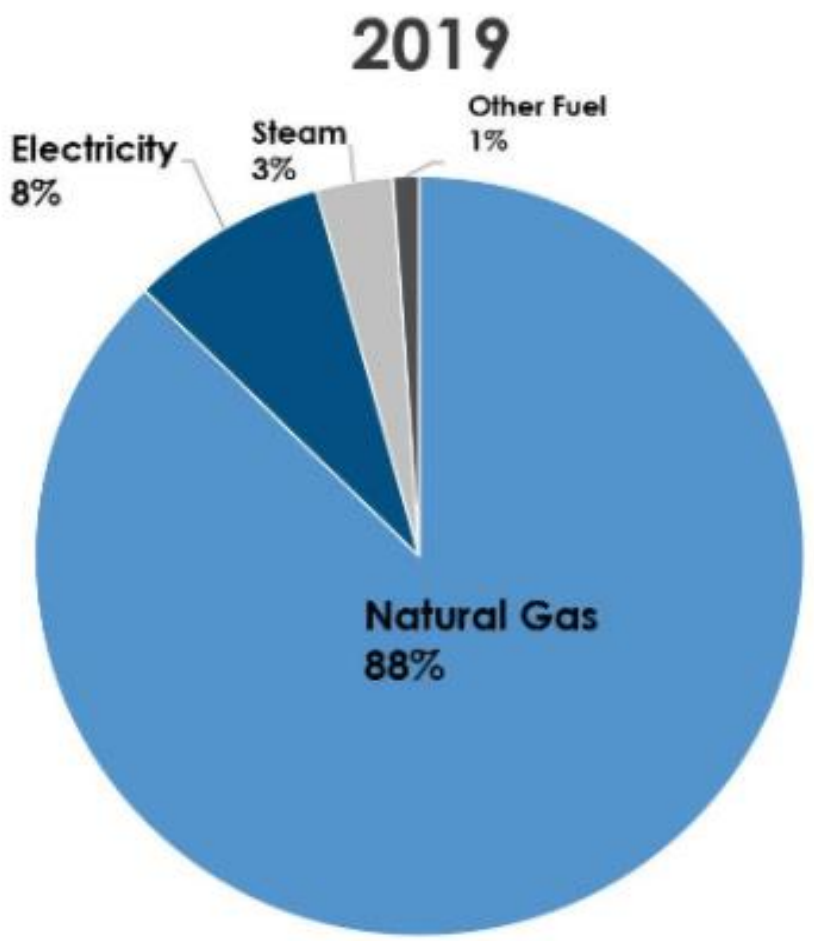
Electrification in San Francisco

Barry Hooper | September 28, 2022

Emissions from San Francisco Buildings

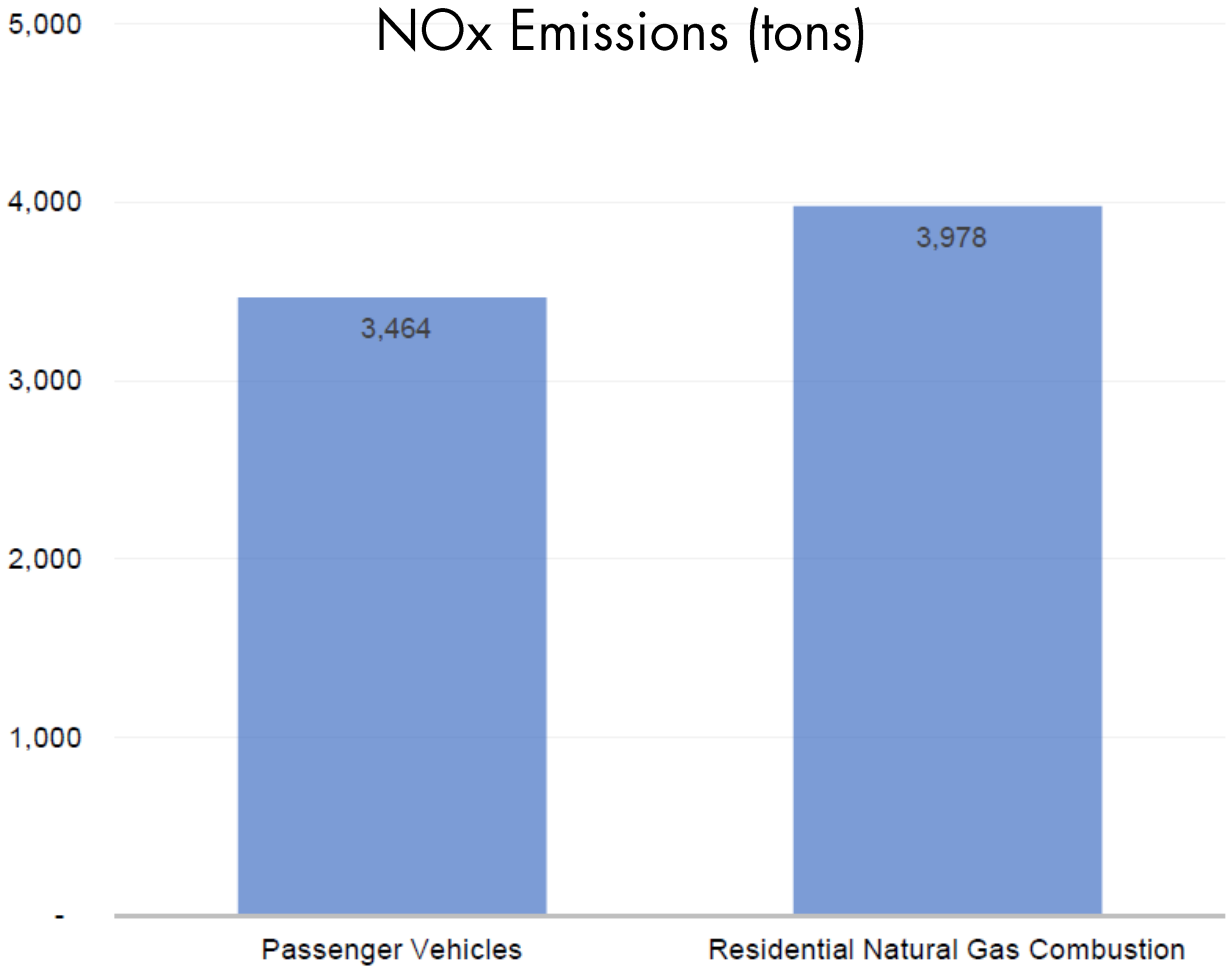


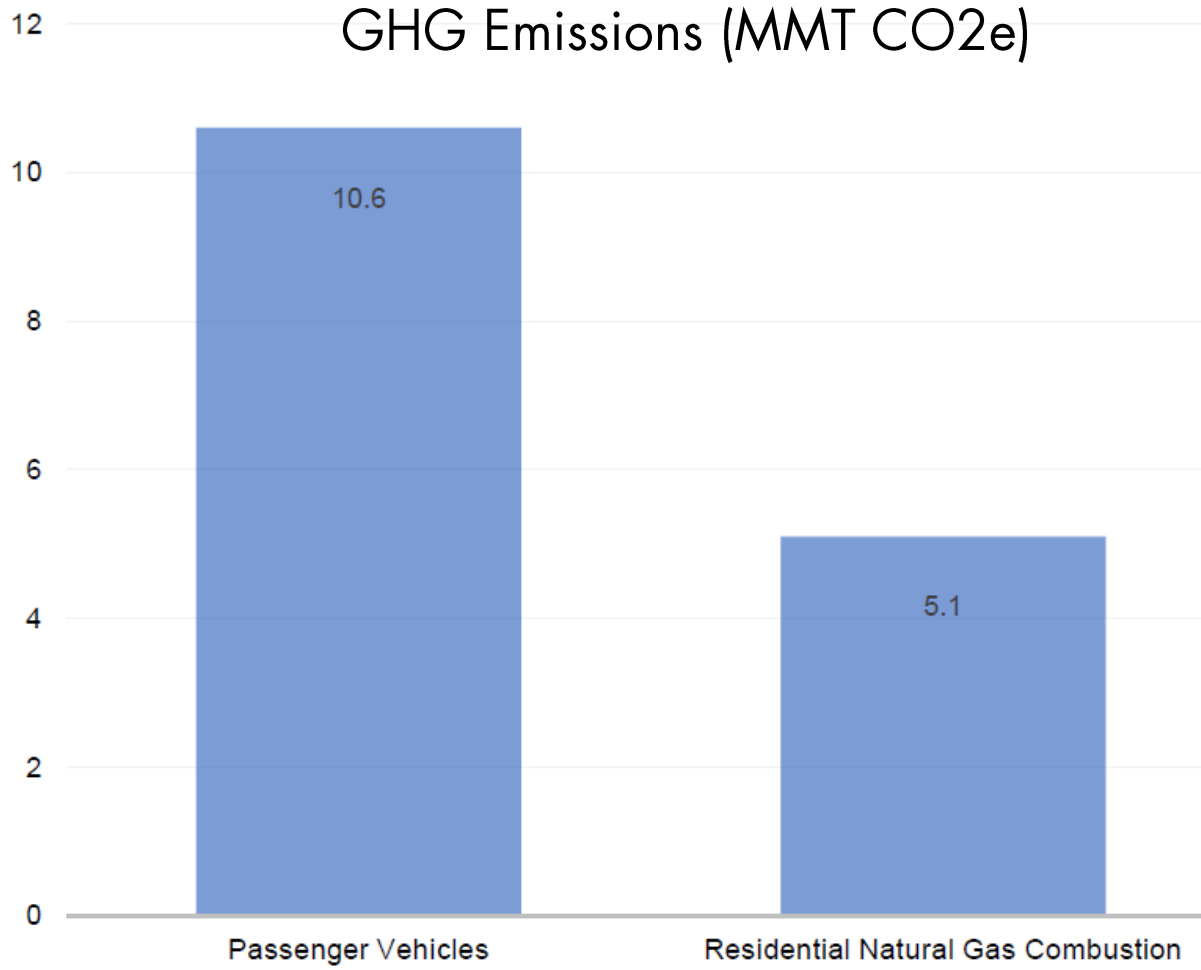
Total Building Emissions:
4.4 Million mtCO2e



Total Building Emissions:
1.9 Million mtCO2e

Gas in the Bay Area





Source: Bay Area Air Quality Management District

Natural gas impacts . . .

Health

Safety

Resilience

Equity

For info: sfenvironment.org/ZEBTaskForce

SAN FRANCISCO

CLIMATE ACTION PLAN 2021

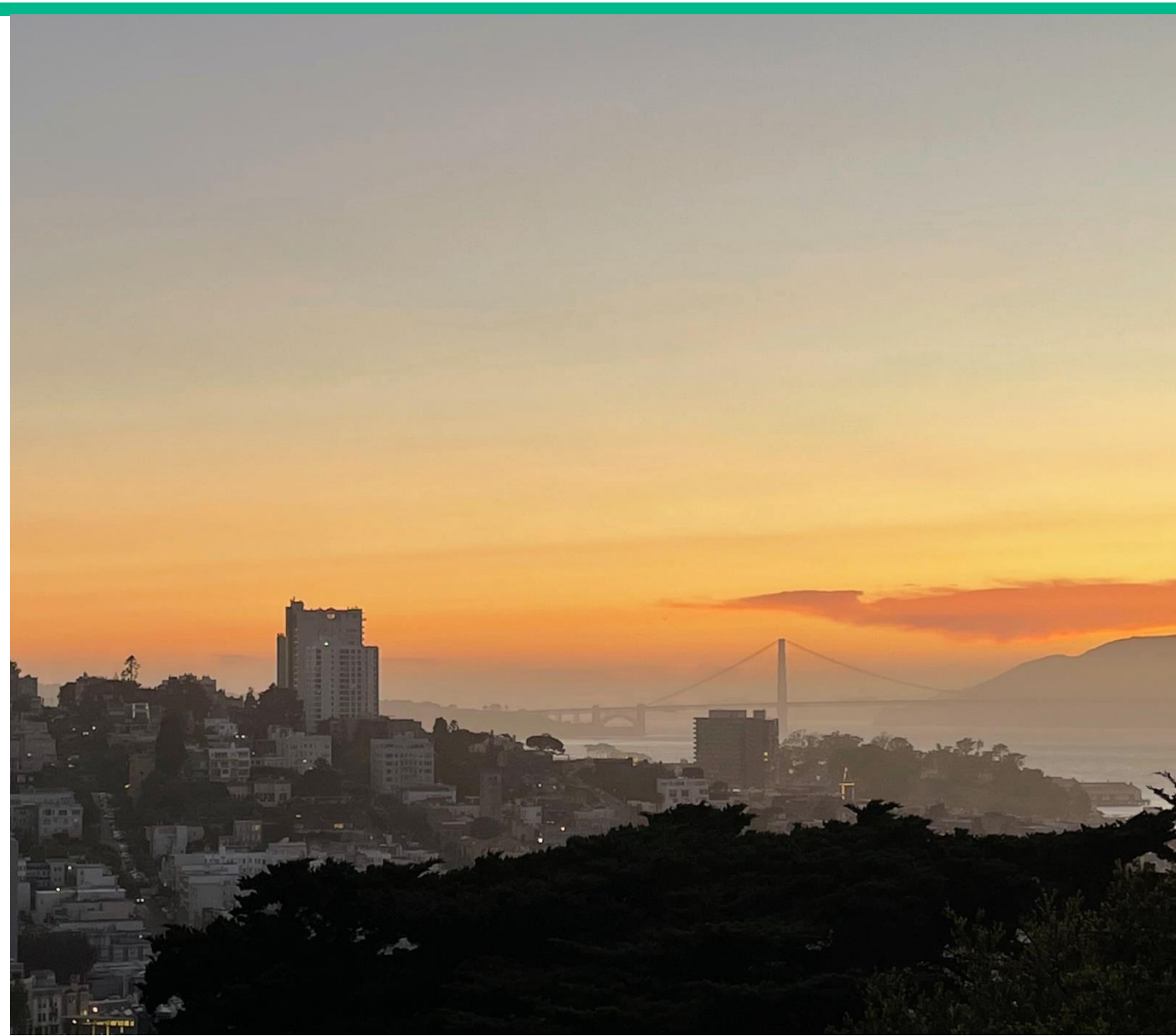
sfenvironment.org/climateplan

Today's Focus: Existing Multifamily and Commercial

- Electrification = opportunity

- Smart use of existing electric service can mean
  - Faster, Simpler Projects
  - Lower Cost
  - Comfort and Performance

- When upgrading electric service
  - Process
  - Timing
  - Cost



Inflation Reduction Act - Commercial

Commercial Building Energy Efficiency Tax Deduction (179D)

Site EUI Reduction	*Without Prevailing Wage*	*With Prevailing Wage & Apprenticeship*
Minimum 25%	$0.50 / square foot	$2.50 / square foot
Each added 1%	$0.02 / square foot	$0.10 / square foot
Cap: 50%	$1.00 / square foot	$5.00 / square foot

AND

- Solar Investment Tax Credit (25D): 30% on PV and battery storage
  or
- new Production Tax Credit (PTC): $0.026/kWh for 10 years

Secondary Network Limitations

- Commercial and fleet electric vehicle tax credit: $7,500/vehicle

Big Impacts

Simplified. Consult your tax professional for details.

Inflation Reduction Act - Multifamily

Program	Key Features	When Available
Energy Efficient Home Credit	30% tax credit Does not affect LIHTC basis Available to multifamily owners	*Starts 2023*
HOMES Rebates	Rebate program based on projected energy savings Rebate amount is increased for measured energy savings and for low- and moderate-income Range: $2,000 to $8,000 – capped at 50% of project cost	*Expected mid-2023*
High-Efficiency Electric Home Rebate Program (HEERA)	Up front rebates (point of sale) Income-qualified: • Up to 100% of project cost for <80% AMI • Up to 50% for households 80% to 150% AMI	*Expected mid-2023*
Solar Investment Tax Credit	30% on PV and battery storage	Now

Simplified. Consult your tax professional for details.

ASSOCIATION FOR ENERGY AFFORDABILITY INC.

Navigating Multifamily Electrical Constraints

Bringing the benefits of clean energy & energy efficiency to underserved & communities

John Neal
Director of Technical Services,
AEA West
jneal@aeacleanenergy.org
September, 2022

MF Electrification Hurdles

- Electrical capacity is often limited
- Electrical upgrades can be expensive, time consuming, or invasive
- How difficult is it to electrify these electric loads*?
  - DHW (easier)
  - Heating (moderate)
  - Dryers (moderate)
  - Cooking (difficult)

**Newer buildings, buildings with cooling, and buildings with existing electric cooking are much easier to electrify*

Working with Existing Capacity

Right size

- Contractor or engineer must size equipment*
- Do not match existing
- Factor in envelope and distribution improvements

Not enough electrical capacity?

- Increase equipment efficiency, further reduce loads
- Eliminate or reduce electric resistance (DHW)
- Reduce or eliminate redundancy
- **Require conversation between electrical, mechanical engineers and contractor to understand impacts and opportunities.**

**HVAC - Using load calculation tools such as Wrightsoft, CBECC, EnergyPro, Manual J, IES*
DHW – Use Ecosizer, manufacturer tools, and/or monitored existing load.

Example Electric Load Impacts

Space Heating	Electric Load Sizing Impact
Mini split single zone (1 ton)	1200 W
Mini split multi zone (3 ton)	4,000 W
Central (3 ton)	5,500 W
Central (3 ton) with electric resistance	10,300 W

Water Heating	Electric Load Sizing Impact
Low Power 120V model	900W
240V 15 Amp Hybrid	2300W
Split Heat Pump	3120W
Standard 240V 30Amp Hybrid	4500W

ASSOCIATION FOR ENERGY AFFORDABILITY INC.

Cooking

Electrification usually triggers electrical upgrades

- First, engage aggressive electrical engineer to look at all pathways
- Plan for electrical upgrades

If stuck, alternate solutions:

- (Future) low amp induction stove
- Induction cooktop only with countertop plug in oven or combination microwave/convection oven: **turkey dilemma.**

Ensuring success:

- We must deliver an **excellent** cooking experience! **USE INDUCTION.**
- Provide training, pot/pan/gift card to help with transition.

Cooking	Electric Load (Sizing Impact)
2 burner induction	1800W
Cooktop	3000W
Wall Oven	3400W
Induction Range	9600W

Navigating Electrical Load Calcs

- **NEC Deemed Calc: Default approach, Conservative**
  - Uses combination of actual and deemed values, and demand factors to calculate capacity
  - Various exceptions and “levers” can be adjusted by engineer
- **NEC Load Monitoring Study: Generous**
  - Uses actual peak energy use to calculate whether new loads can be added
  - 30-day study using power meter or 1-year of monthly peak-demand recordings
    - 30-day study must include time period of highest usage
    - Meter where potential infrastructure limitations exists (pinch points)
    - If limitation is at unit level, confirm if monitoring a sample of units is acceptable by (CBO and Electrical engineer)
- **Above are used for AHJ permitting and discussions with utility (when service upgrades are required). Utility engineers may perform their own internal calculation.**

Electrical Capacity Results

Still not possible to go all electric with existing service?

- Checked all reasonable pathways to make project feasible such as:
  - Combining low amperage equipment, efficiency measures, and electric load monitoring
  - Move from central heating to in unit or vice versa?
- Are default values being used in calculations? Validate.

If a service upgrade is needed

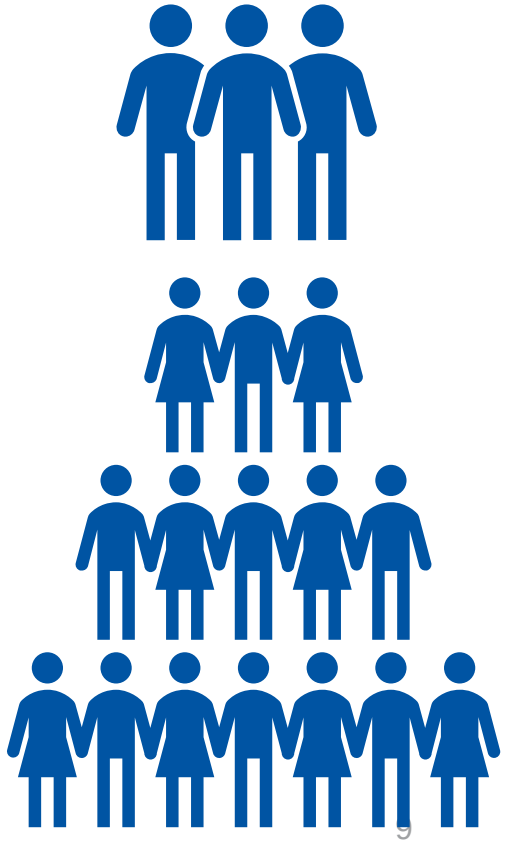
- Utility cost, timelines, and scope are often assumed to be the worst case by project team before having a conversation. Don’t let this kill the project.
- Talk to utility early and plan on submitting an all-electric design for their review to understand implications.
- Do partial electrification now

Project Development Approach

1. Define initial goals for project
2. Identity potential funding
3. Recruit the right team, with experience appropriate to the scale and complexity of project
4. **Have team work together to identify critical decision points and dependencies**
5. **Engage with utility early to discuss project**
6. **Refine project scope and specifications within bounds of goals**
7. Initiate project with flexibility!
8. Complete project
9. Monitor performance

Recruit the right team

- Contractor and other design professionals should be interested
- **Problem solvers, collaborators, and creative thinkers are necessary**
- Prior experience and references encouraged
- Bring on engineers for larger or more complicated projects
- Understand each person’s role and level of expertise
- Team must work together at each step



Full Electrification Example

- Corona, CA | Built 1960s
- (40) Four-plexes (each apt is two bed)
- Central gas DHW
- In unit gas furnaces and ranges
- Each building has pole drop, units and common meter each have a 40 amp service
- Goal of full electrification during rehab, could upgrading existing 40 amp apt services be avoided?

Full Electrification

			2 Ton Ductless HP Central DHW *Basis of Design*			
General Loads						
	receptacle and lights		3120			
	kitchen appliance circuits		1500			
	1st 3KVA @100%		3000			
	Remainder at 35%		567			
	Total		**3567**			
HVAC + DHW Load						
	HVAC		6630			
	HPWH		0			
	1st 8KVA at 100%		**6630**			
	Remainder at 40%		**0**			
Appliances						
	garbage disposal		1200			
	dishwasher		1200			
	microwave		1000			
	total w/ 75% demand factor		**2550**			
Cooking						
	electric range/induction cooktop		5000			
	80% demand factor		**4000**			
Total	VA	17,622	**16,747**	12,322	10,057	8,422
	Total Amps		**70**			

ASSOCIATION FOR ENERGY AFFORDABILITY INC.

Full Electrification

		2 Ton Ductless HP In Unit HPWH	*2 Ton Ductless HP Central DHW* *Basis of Design*			
General Loads						
	receptacle and lights	3120	3120			
	kitchen appliance circuits	1500	1500			
	1st 3KVA @100%	3000	3000			
	Remainder at 35%	567	567			
	Total	**3567**	**3567**			
HVAC + DHW Load						
	HVAC	6630	6630			
	HPWH	1980	0			
	1st 8KVA at 100%	**8000**	**6630**			
	Remainder at 40%	**610**	**0**			
Appliances						
	garbage disposal	540	1200			
	dishwasher	1200	1200			
	microwave	1000	1000			
	total w/ 75% demand factor	**2550**	**2550**			
Cooking						
	electric range/induction cooktop	5000	5000			
	80% demand factor	**4000**	**4000**			
Total	VA	**17,622**	**16,747**	12,322	10,057	8,422
	Total Amps	**73**	**70**			

ASSOCIATION FOR ENERGY AFFORDABILITY INC.

Full Electrification

		2 Ton Ductless HP In Unit HPWH	*2 Ton Ductless HP Central DHW* *Basis of Design*	*1 Ton Ducted HP Central DHW*		
General Loads						
	receptacle and lights	3120	3120	3120		
	kitchen appliance circuits	1500	1500	1500		
	1st 3KVA @100%	3000	3000	3000		
	Remainder at 35%	567	567	567		
	Total	**3567**	**3567**	**3567**		
HVAC + DHW Load						
	HVAC	6630	6630	2700		
	HPWH	1980	0			
	1st 8KVA at 100%	**8000**	**6630**	**2700**		
	Remainder at 40%	**610**	**0**	**0**		
Appliances						
	garbage disposal	540	1200	540		
	dishwasher	1200	1200	1200		
	microwave	1000	1000	1000		
	total w/ 75% demand factor	**2550**	**2550**	**2055**		
Cooking						
	electric range/induction cooktop	5000	5000	5000		
	80% demand factor	**4000**	**4000**	**4000**		
Total	VA	**17,622**	**16,747**	**12,322**	10,057	8,422
	Total Amps	**73**	**70**	**51**		

ASSOCIATION FOR ENERGY AFFORDABILITY INC.

Full Electrification

		2 Ton Ductless HP In Unit HPWH	*2 Ton Ductless HP Central DHW* *Basis of Design*	*1 Ton Ducted HP Central DHW*	*Low Load HP Central DHW + Aggressive Cooking*	
General Loads						
	receptacle and lights	3120	3120	3120	3120	
	kitchen appliance circuits	1500	1500	1500	1500	
	1st 3KVA @100%	3000	3000	3000	3000	
	Remainder at 35%	567	567	567	567	
	Total	**3567**	**3567**	**3567**	**3567**	
HVAC + DHW Load						
	HVAC	6630	6630	2700	1635	
	HPWH	1980	0		0	
	1st 8KVA at 100%	**8000**	**6630**	**2700**	**1635**	
	Remainder at 40%	**610**	**0**	**0**	**0**	
Appliances						
	garbage disposal	540	1200	540	540	
	dishwasher	1200	1200	1200	1200	
	microwave	1000	1000	1000	1000	
	total w/ 75% demand factor	**2550**	**2550**	**2055**	**2055**	
Cooking						
	electric range/induction cooktop	5000	5000	5000	3500	
	80% demand factor	**4000**	**4000**	**4000**	**2800**	
Total	VA	**17,622**	**16,747**	**12,322**	**10,057**	8,422
	Total Amps	**73**	**70**	**51**	**42**	

ASSOCIATION FOR ENERGY AFFORDABILITY INC.

Full Electrification

		2 Ton Ductless HP In Unit HPWH	*2 Ton Ductless HP Central DHW Basis of Design*	*1 Ton Ducted HP Central DHW*	*Low Load HP Central DHW + Aggressive Cooking*	*Central Heat Central DHW + Aggressive Cooking*
General Loads						
	receptacle and lights	3120	3120	3120	3120	3120
	kitchen appliance circuits	1500	1500	1500	1500	1500
	1st 3KVA @100%	3000	3000	3000	3000	3000
	Remainder at 35%	567	567	567	567	567
	Total	**3567**	**3567**	**3567**	**3567**	**3567**
HVAC + DHW Load						
	HVAC	6630	6630	2700	1635	0
	HPWH	1980	0		0	0
	1st 8KVA at 100%	**8000**	**6630**	**2700**	**1635**	**0**
	Remainder at 40%	**610**	**0**	**0**	**0**	**0**
Appliances						
	garbage disposal	540	1200	540	540	540
	dishwasher	1200	1200	1200	1200	1200
	microwave	1000	1000	1000	1000	1000
	total w/ 75% demand factor	**2550**	**2550**	**2055**	**2055**	**2055**
Cooking						
	electric range/induction cooktop	5000	5000	5000	3500	3500
	80% demand factor	**4000**	**4000**	**4000**	**2800**	**2800**
Total	VA	**17,622**	**16,747**	**12,322**	**10,057**	**8,422**
	Total Amps	**73**	**70**	**51**	**42**	**35**

- No scenarios triggered utility *service* upgrades
- Last two scenarios were viable but not desirable
- Final scope will require upgrading unit feeder and sub panel to accommodate electric cooking

Incentives for Multifamily Electrification

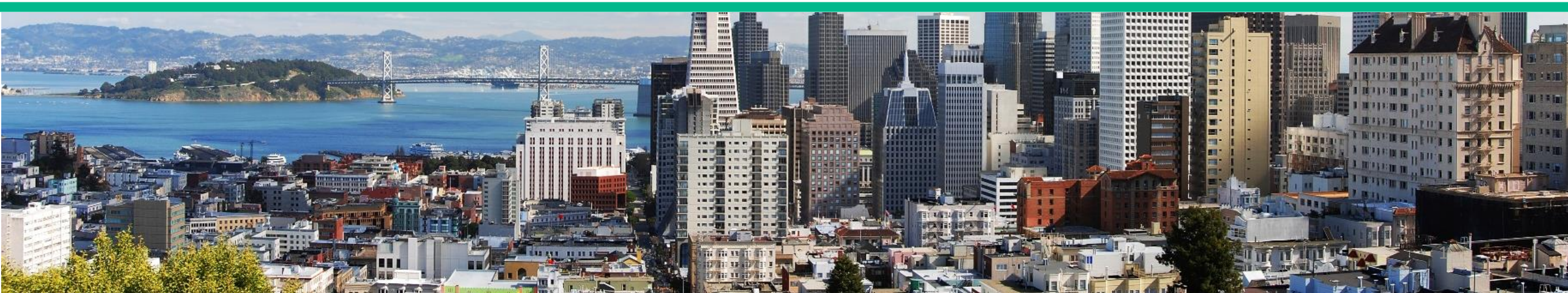
NOW/SOON

??

SF Environment
Our home. Our city. Our planet.
A Department of the City and County of San Francisco

Existing Commercial Buildings

Barry Hooper
September 28, 2022



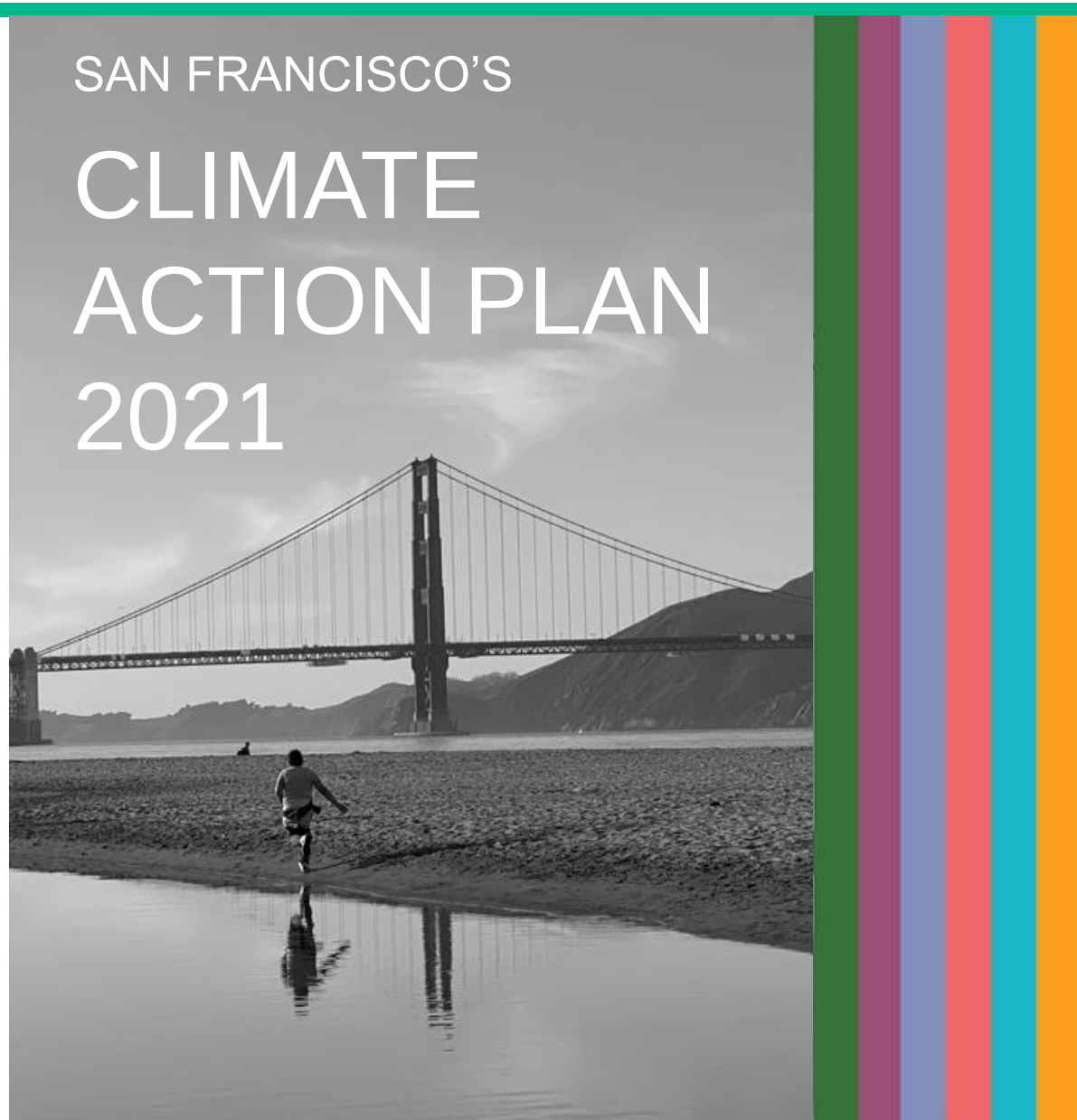
Decarbonization framework for Existing Buildings

LEVERAGE EXISTING POLICIES

- **Energy benchmarking**
- **100% Renewable Electricity**

NEW

- **Require a Plan for Decarbonization**
- **Require decarbonization by 2035 and regular progress reports**
- **Flexibility:** Invest fees in decarbonization of low-income and affordable housing



Energy Code

California's codes are evolving to better support efficient electrification

and

Cities cannot waive Title 24.

Efficiency requirements apply.

Electric resistance boilers are not the solution.

Image: Dicklyon

Efficient Electrification

SPUR Urban Center
14,500 sq ft building

188 Embarcadero
99,625 sq ft building

Levi's Plaza
867,000 sq ft, 6 buildings

Empire Building Challenge
131 Buildings, 10 Owners, 52M sq ft

SFO Central Plant
3.3M sq ft, 4 terminals

More Examples: electrifiedbuildings.org

Small Office

SPUR Urban Center

14,500 sq ft office, 4 stories

- Existing conditions
  - Efficient, and room to improve
  - Space conditioning: rooftop AC units with gas burners (only use of gas)
- Decarbonization plan
  - Specify heat pumps when rooftop HVAC units are replaced.
- Implications
  - No change to electric peak: no change to electric service
  - Can qualify for over-the-counter building permits
  - Similar cost to like-for-like

More Info: spur.org/news/2022-08-31/spurs-plan-decarbonize-urban-center

Medium Office

188 The Embarcadero

99,625 sq ft office, 7 stories

- Existing conditions
  - Efficient, regularly ENERGY STAR
  - Gas uses: Hydronic boiler (reheat) and SHW/DHW
- Piloted Strategic Decarbonization Assessment
  - Defined the cost of inaction
  - Owner set decarbonization goal; communication was key
- Outcomes
  - Upgraded HW and heating to heat pumps
  - No change to electric service
  - Having a plan facilitated action

Thanks: Google

Office Campus

Levi's Plaza / **867,000 sq ft office**

- Existing conditions
  - Built 1981, purchased 2019, zero by 2025
  - Typical office: chillers, cooling towers, AHUs, gas fired boilers with VAC reheat at zone/floor
- Challenges in first 2 buildings
  - Space: An air-source heat pump is larger than a boiler
  - Supply water temp: VAVs required adjustment
  - Electric capacity: Efficiency allowed re-distribution of existing power to meet changes in load
- Outcomes
  - Transition required integrated design
  - No change to electric service
  - Phased installation completed while occupied

Thanks: Jamestown Properties

More Info: casestudies.uli.org/all-case-studies/

Very Large Office

345 Hudson St / 100 Ave of the Americas, NYC

978,277 sq ft / 376,965 sq ft

- Existing conditions
  - Built in 1930s; hot summers and cold winters
  - Fully occupied
  - Steam heating, PTAC cooling

- Challenges: Space for heat pumps, Electric service
- Solutions:
  - Floor-by-floor water-source heat pump
  - Dedicated outside air energy recovery ventilation
  - Dynamic thermal storage

- Outcomes: Reduced heating, cooling and electric use by recycling heat from space to space in the building.

Thanks to: NYSERDA Empire Building Challenge

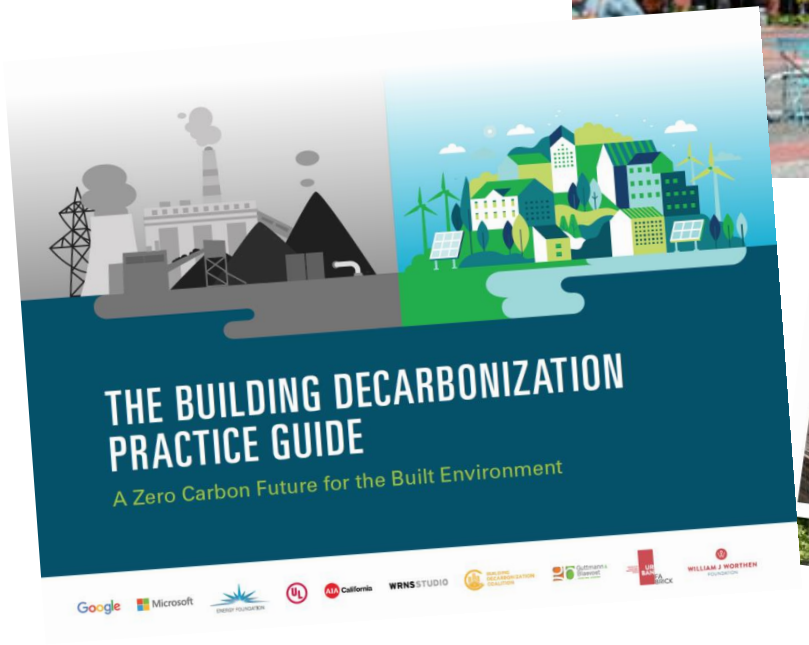
Empire Building Playbook: knowledge.nyserda.ny.gov/display/EBP

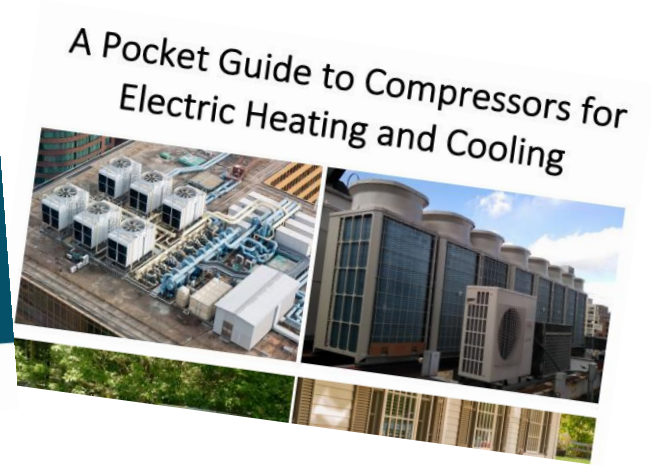
Image: Vladimir Kudinov

Emerging Practice for Heating Hot Water

Evaluate “How low can it go?”

1. **Best Case Scenario**
   - 120F to 110F supply
   - Single stage air source heat pump
2. **Minimum operational change**
   - 175F supply
   - 2-stage ASHP and WSHP
3. **Happy Medium**
   - 160F supply
   - Single stage ASHP low-GWP
4. **Major System Replacement**
   - Highest efficiency
   - 100 to 110F supply





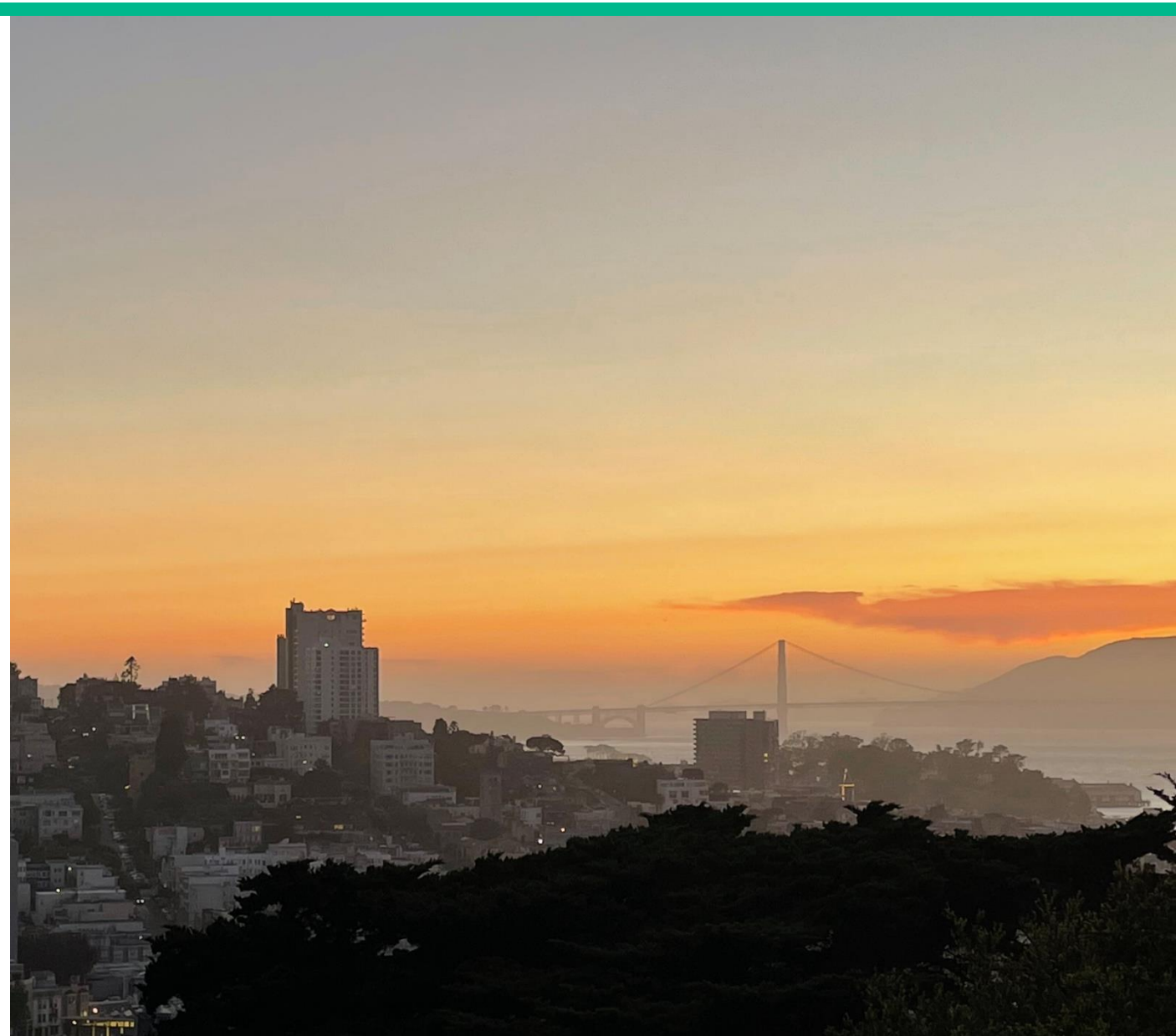
Thanks: SmithGroup

More Info: collaborativedesign.org; redwoodenergy.net/research/

Images: Redwood Energy, WJW Foundation, Jamestown

Summary

- Electrification = opportunity
- Assess and plan
- Efficient optimization of existing electric service can mean
  - Faster, less complex projects
  - Lower cost
  - Improved performance
- Electric service must sometimes be upgraded



Thank You

Barry Hooper, Senior Green Building Coordinator
barry.hooper@sfgov.org

Previously: September 7 –
Electric Service Optimization for Existing Single Family:
https://www.youtube.com/watch?v=Tv_bccFGT2Q
– Or visit City of Oakland's YouTube channel

SF Environment
Our home. Our city. Our planet.
A Department of the City and County of San Francisco

Meeting Agenda

Date/Time:	**September 28th , 2022 at 10 am-12 pm**		
Location:	Teams (Virtual)	Recorder	Hannah Kaye
Desired Outcomes:	1. Webinar attendees are informed of PG&E's Added Load process.		

Number	Agenda Item(s)
1	Introductions
2	Building and transportation electrification
3	Impacts of electrification on primary and secondary distribution
4	Primary trigger of electric service upgrades
5	Added Load process and timeline
6	Helpful resources
7	Wrap up

Building and Transportation Electrification

Transportation Electrification

100% zero emission passenger vehicle sales by 2035

100% zero emission drayage truck operations by 2035

100% zero emission from on-road medium and heavy-duty vehicles by 2045

Building Electrification

California Air Resources Board approved a plan to ban sale of gas water and space heating appliances by 2030

25+ cities in PG&E's territory are considering electrification retrofit targets

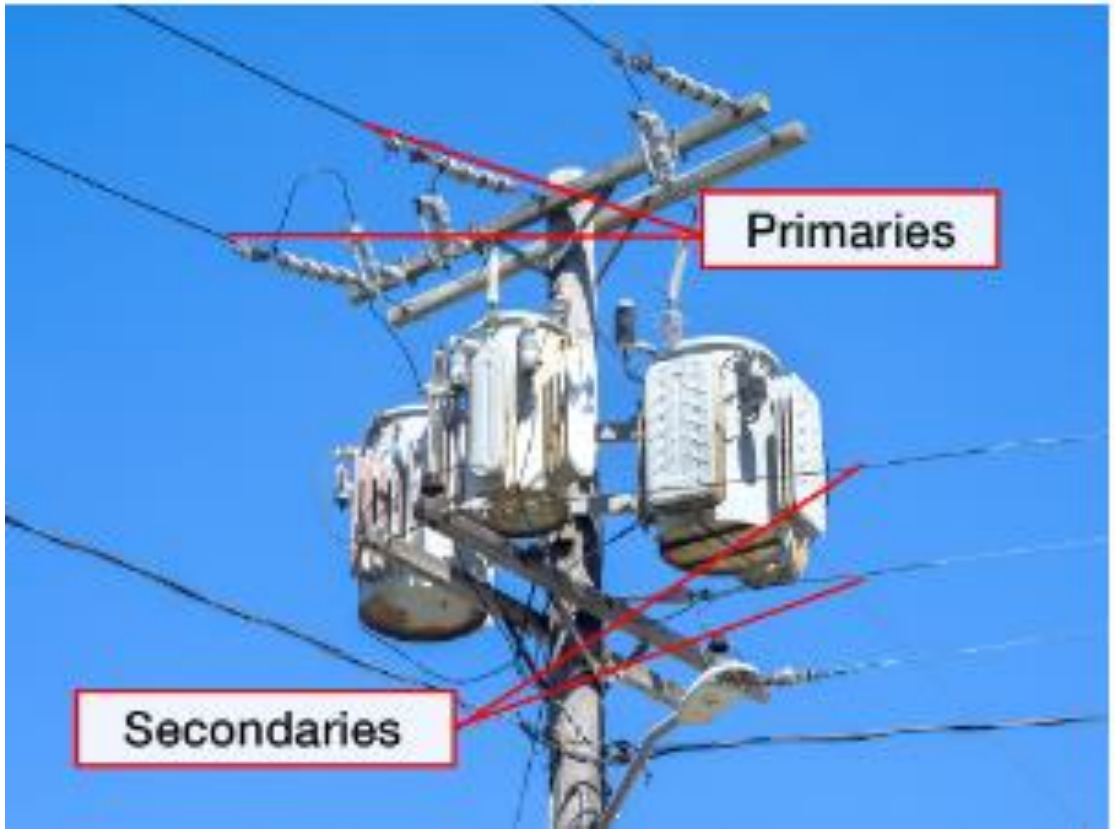
California Energy Commission recommended a goal of 6 million heat pumps by 2030

Impacts of Electrification on Primary and Secondary Distribution

Commercial and large multifamily building electrification projects can trigger primary and secondary system upgrades, particularly when installing EV charging. PG&E is preparing for the anticipated impacts of electrification on the electric grid by improving grid planning.

Primary lines: higher-voltage lines located at the top of utility poles, above transformers. Voltages range from 4,12,21,34kV (in select areas).

Secondary lines: lower voltage lines are below transformers. Typical secondary voltages range between 120, to 480 volts.

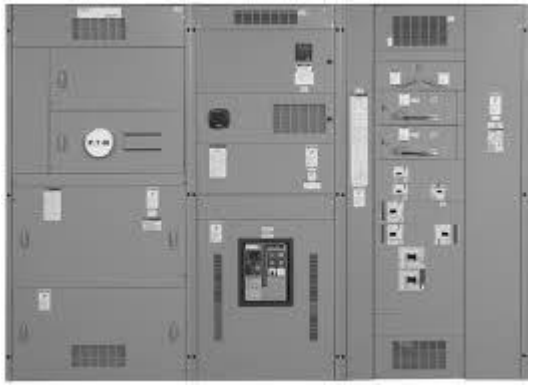


Primary Triggers of Electric Service Upgrades

Customers upsizing their main switch gear (i.e., electric panel) or termination section is the primary cause of service upgrades.

Multi-family Switchgear Equipment

Commercial Switchgear Equipment

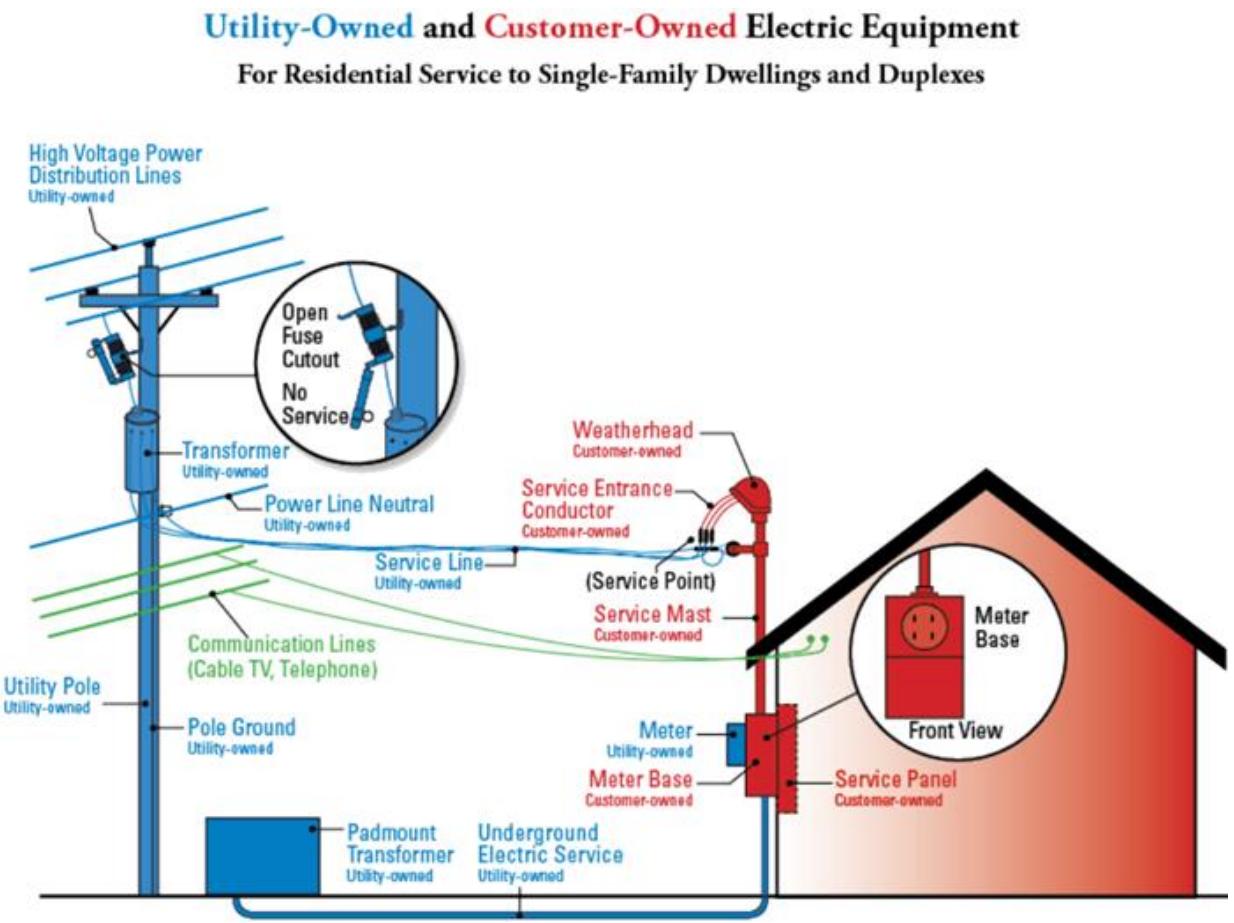


Stages of Added Load Process

1. Customer planning and application
2. Load assessment and/or service design
3. Contract and payment
4. Construction and energization

Added Load Process: Customer Planning and Application

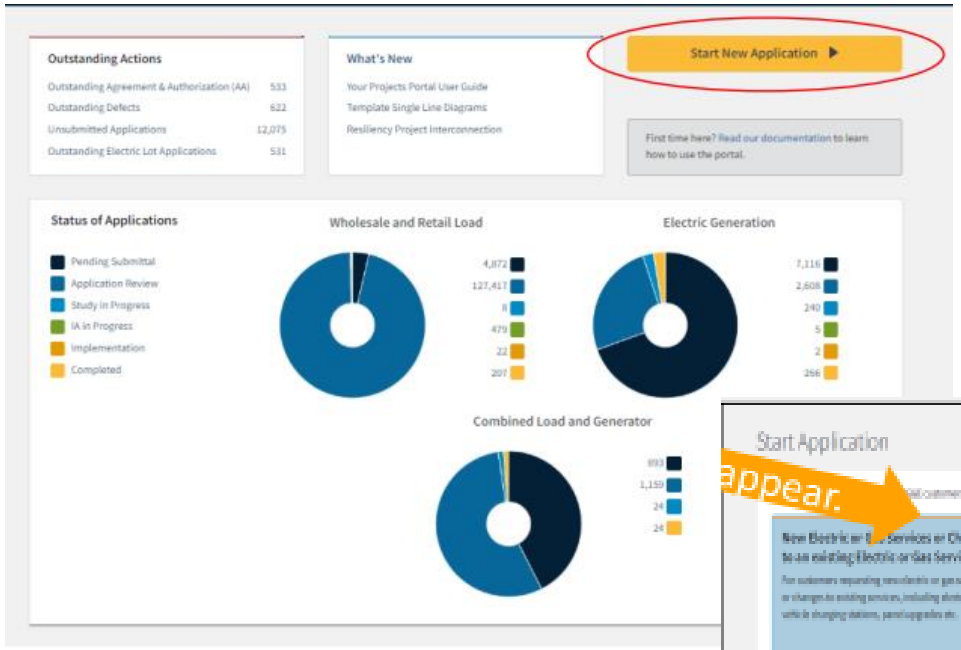
PG&E Responsibility: None
Applicant Responsibility: Acquire contractor and determine electrification needs
Timeline: Dependent on applicant

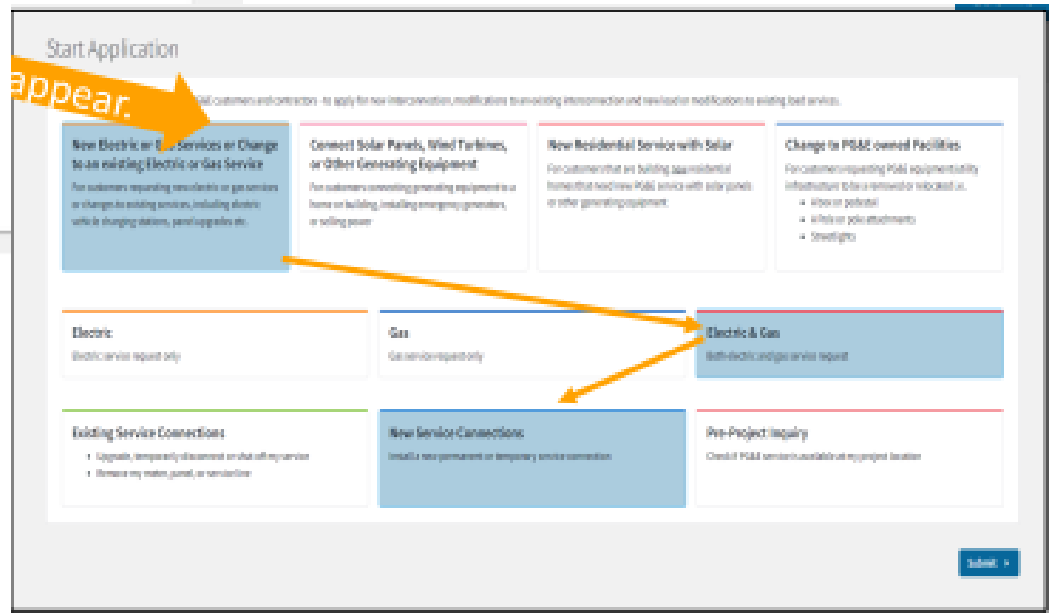


PG&E Infrastructure	Customer Infrastructure
Front-of-the-meter (FTM)	**Behind-the-meter (BTM)**
PG&E owns and is responsible for constructing, maintaining, and upgrading electrical infrastructure to the meter panel	Customer owns and is responsible for constructing, maintaining, and upgrading infrastructure from meter to the customer appliances

Added Load Process: Customer Planning and Application

PG&E Responsibility: Contact applicant within ~ 3 days and confirm application details
Applicant Responsibility: Submit an Added Load application on YourProjects.pge.com
Timeline: Applicant Dependent. PG&E will respond within ~ 3 days of application submission
Helpful Links: Application User Guide





Documentation/Information	Type of Documentation	Required?
Picture of electric panel label	Pictures	**Required**
Picture of the meter number	Pictures	**Required**
Picture of the main breaker	Pictures	**Required**
Picture of the electric panel - 6 feet on both sides - 6 feet in front - Include picture of weatherhead	Pictures	**Required**
Picture of area where new electric panel will be relocated if moving *(mark the location on the picture)*	Pictures	**Required**
Picture of service wire where it runs over the job site / neighboring property	Pictures	**Required**
Picture of where the service wire is attached to the PG&E pole / wire	Pictures	**Required**
List of new electric appliances and associated new loads *(e.g., HVAC tons, wattage, etc.)*	Spreadsheet (see next tab)	**Required**

* Applicable to Overhead Service Only

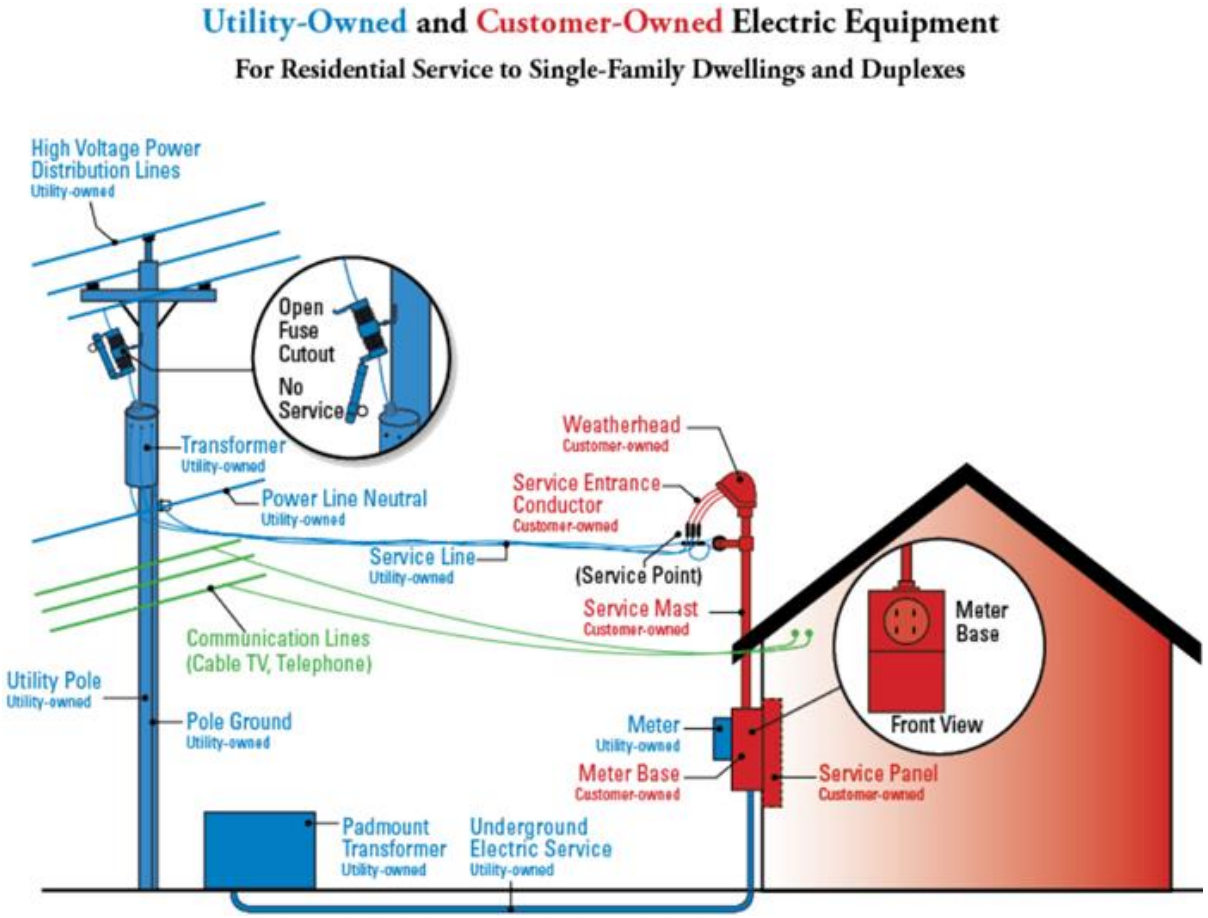
Added Load Process: Load Assessment and/or Service Design

PG&E Responsibility: Perform Load Assessment and inform applicant of findings
Applicant Responsibility: Pay Engineering advance and support PG&E representative with additional project details as needed
Timeline: ~ 90-180 days
Helpful Links: Make Payments Online

Engineering Advance

- Covers the cost for PG&E to perform load assessments
- $2,500 (subject to change)
- May be refunded in like for like panel replacements

Relevant Infrastructure	Capacity
Service wire or cable (if underground)	Your PG&E representative will determine existing capacities for this infrastructure.
Secondary Conductors	
Transformers	
Primary Conductors (depending on size of load)	



Added Load Process: Adding New Load through Building Electrification

Type of Building	Pre-Electrification	Post-Electrification
10-unit Multifamily Building w/ gas water and space heating, cooking	5 kVA per living unit	8-10 KVA per living unit
Commercial Kitchen w/ gas cooking	7-10 kVA	25-35 kVA

***Illustrative Example**

Added Load Process: Adding New Load through Transportation Electrification

Details	Multifamily Building	Commercial Building
Location	Oakland	Bay Area
Number of chargers	~100 L2 (7.2 kW) charging ports	~30 L2 (7.2 kW) charging ports
Total Incremental load	720 KW	216 KW
Necessary upgrades	meter, panel, switch gear, transformer upgrade	meter, panel, switch gear, new additional transformer, and upstream 3 phase switch

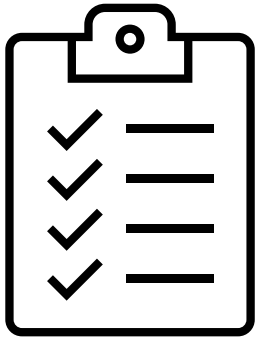
Added Load Process: Contract and Payment

PG&E Responsibility: Complete estimating, design and send final contract
Applicant Responsibility: Sign contract and pay for any necessary customer costs
Timeline: ~180 days
Helpful Tip: A detailed added load application can expedite the process

Site Visit

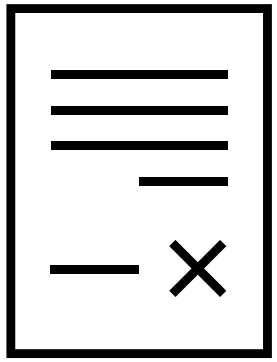
PG&E coordinates a site visit with customer to assess the scope of the project

Job Package



PG&E designs and estimates necessary service work to send to customer

Contract



Customer signs contract with PG&E and pays for any necessary costs

* EA is applied to final contract cost

Added Load Process: Contract and Payment

PG&E Responsibility: None
Applicant Responsibility: Sign contact and complete payment
Timeline: Dependent on applicant payment timeline

Electric Rule 15 and 16 govern the allowance for service upgrades

- Residential applicant is responsible to pay all upfront costs associated with service installation and an allowance of $3,255 per meter will be applied to the refundable portion of costs
- Non-residential applicants receive an allowance based on their expected usage once connected

The top variables that impact cost

- Panel location and its distance from the nearest distribution point
- Transformer (if a single customer is on a transformer)
- If service is underground (trenching costs)

Types of customer costs

- Customer costs include any necessary trenching, substructure/conduit installation new service conductor, and protective structure.

Added Load Process: Construction and Energization

PG&E Responsibility: Complete service installation and any applicable distribution betterment work
Applicant Responsibility: Complete projects and required inspections
Timeline: ~1.5 – 3 months for PG&E work

Preconstruction Meeting

PG&E coordinates meeting to align on customer and utility tasks and coordinate inspections

Customer Construction

Customer completes substructure (if underground) installation and inspections (e.g., Green Tag inspection)

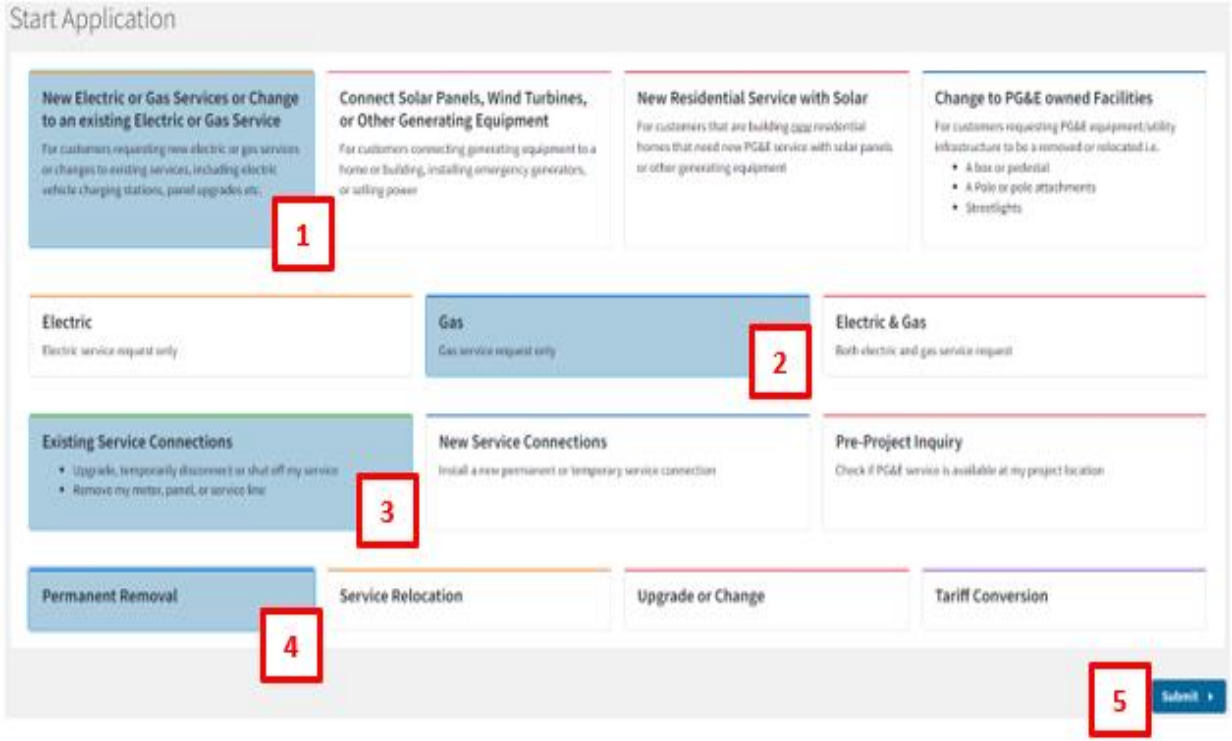
Service Installation and Energization

PG&E installs new service and coordinates disconnect/reconnect while customer completes panel upgrade

Gas Disconnection Process When All-Electric

Once your building has converted from dual fuel to all-electric, you can safely stop gas services and gas interconnection charges by applying to modify your existing services

Log in to the *PG&E Your Projects* portal>Start New Application>Select **New Electric or Gas Services or Change to an existing Electric or Gas Service**



1. Why stop gas services?

- Safety: eliminate safety concerns during an accidental dig-in or other damage.
- Customer cost savings: customers pay a $0.13151/day minimum transportation charge to remain connected to the gas system.

2. Who pays for removing gas system?

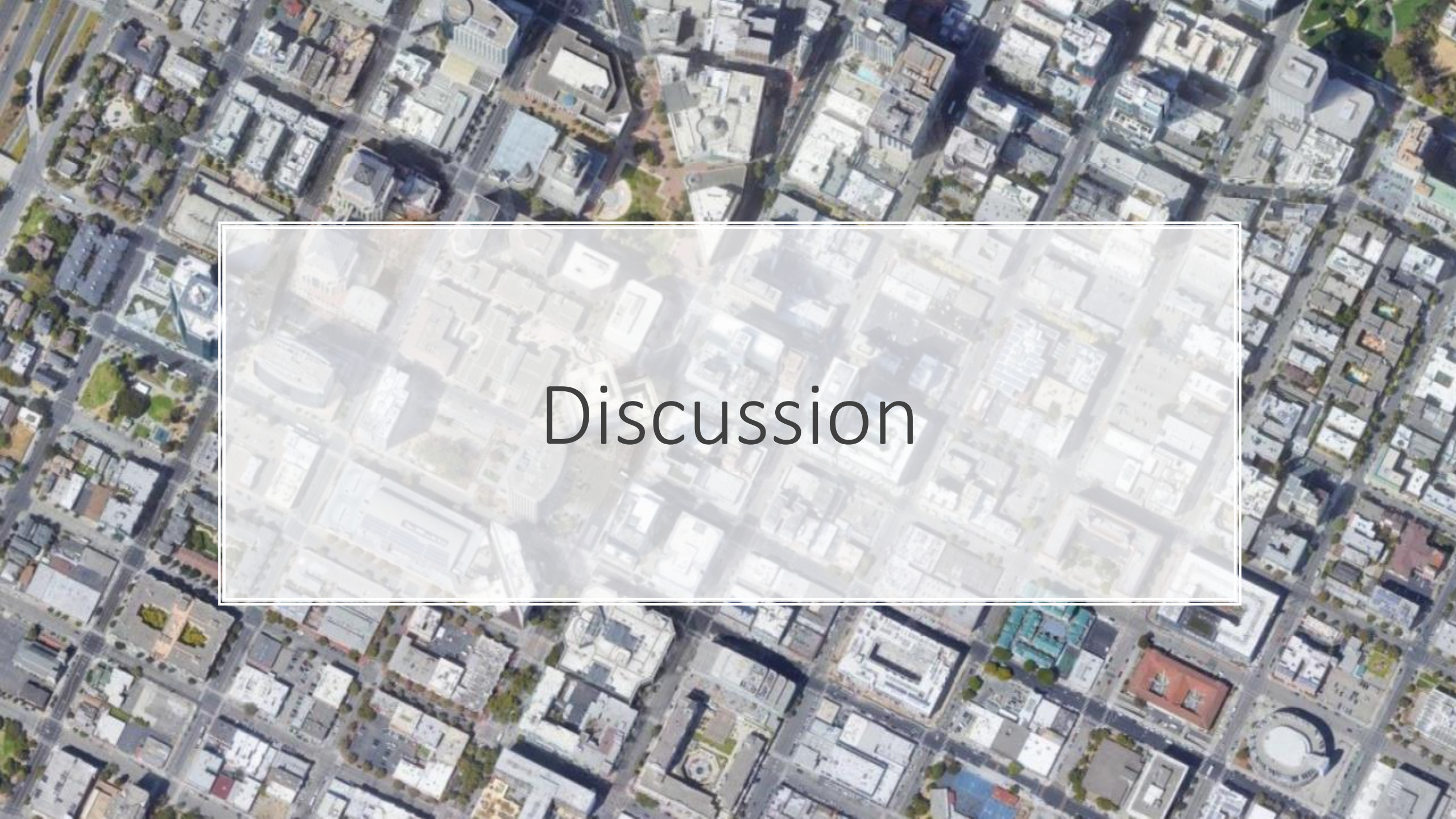
Any gas service greater than 10 years will be removed at PG&E's expense

Helpful Resources & Wrap Up

1. Pacific Energy Center Classes (www.pge.com/energyclasses)
2. Induction Loaner program (www.pge.com/inductionloaner)

Thank you

Khalil Johnson: Khalil.Johnson@pge.com
Nick Souza: Nick.Souza@pge.com



Discussion