West End Library Electrification Project

- Built in 1936
- Designed by Carl Werner
- Funded by a WPA grant
- City of Alameda Historical Register

Goals of Electrification Project:

Create a Cooling Center for community use during heat waves.

Address air quality issues resulting from fire and provide a Clean Air Center when needed.

Convert energy usage from gas to electric.

Cooling Center Creation

- Mitsubishi Electric HVAC
- Two five-ton units with variable speed motors
- Provides continuous air circulation and filtration
- Removal of allergens, bacteria, and pollutants

Clean Air Center Creation	13 MERV system installed
	Filters smoke out of the air as it enters the library filtration center
	Process: outside air to filter to ionizer to MERV system

Gas to Electric Conversion

- Gas furnace replaced with an electric plenum
- No fossil fuel is used to heat or cool the building
- AMP uses only non-hydrocarbonation fuel sources

Final Steps

Window sealing

Weather stripping of main entrance doors

Estimated completion March 18

Electrification 101

City of Alameda

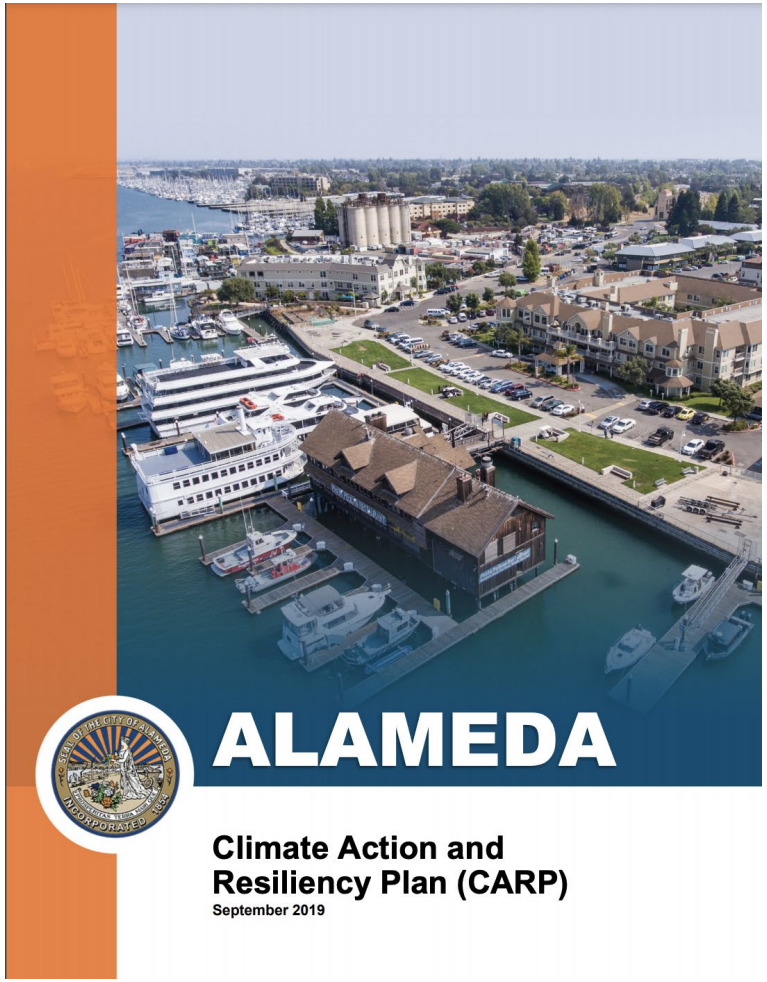
March 16, 2022

Workshop Objectives

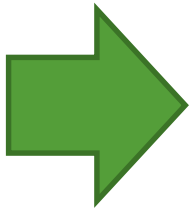
- What is the city doing and where are we going?
- What is building electrification?
- What technologies are available?
- What are the costs and available incentives?
- Real world examples

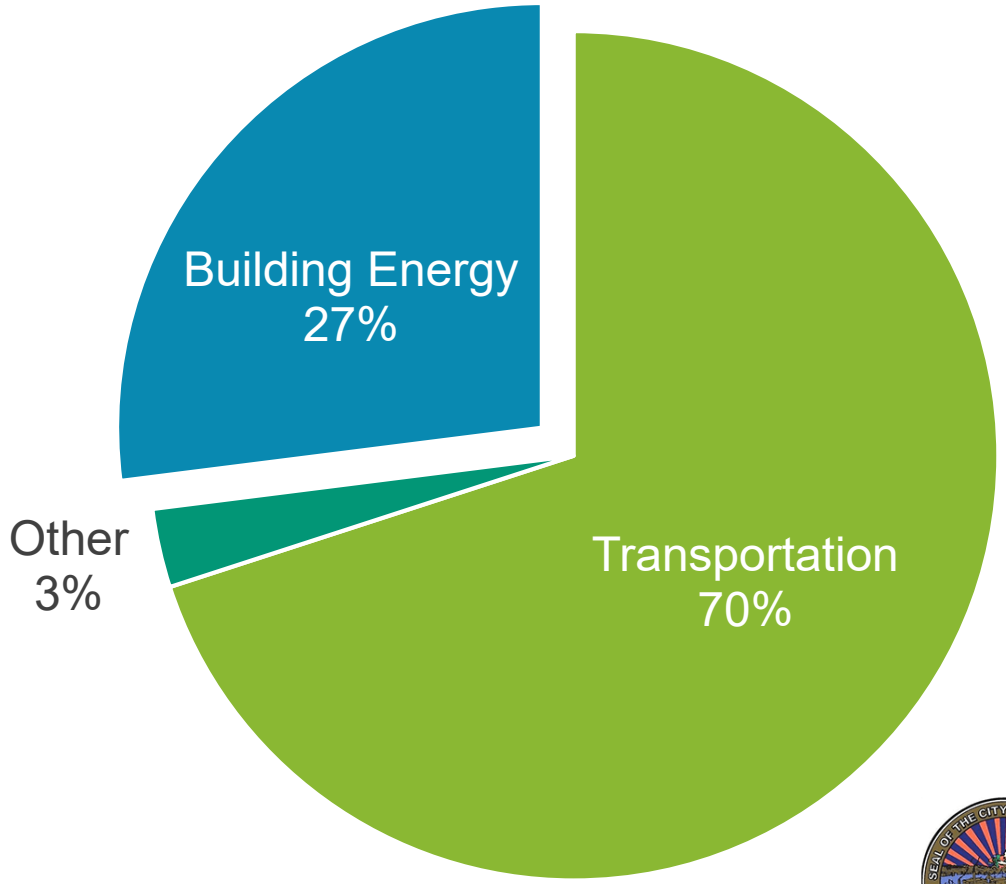
Alameda Climate Action and Resiliency Plan (CARP)

- Reduce emissions by 50% below 2005 levels by 2030
- Achieve net zero emissions as soon as possible, no late than 2030.
- Climate adaptation
  - flooding, sea level and groundwater rise, drought, extreme heat, hazardous air quality, and earthquakes/ liquefaction.



Alameda's Emissions





Alameda Building Electrification Efforts

- In 2019, City Council passed an ordinance limiting natural gas infrastructure in residential projects on city-owned land
- In 2020, City Council passed an ordinance requiring new development citywide to be all electric, with certain exceptions
- Published "Electrifying Existing Residential Buildings in Alameda" report in 2021
- In 2022, developing a roadmap to equitably electrify all existing buildings in Alameda

Electrification Technology

Heat pump water heaters

Heat pump heating/cooling

Electric dryer

Induction Stove

Other Steps for a Green Healthy Home

Solar and/or batteries

Great opportunity to plan for electrification and increase resiliency

Seismic retrofit

Protect your investments and reduce damage to your home or business during an earthquake

Electric vehicle and charging

Reduce pollution from transportation & lifetime cost of driving

Mold, asbestos, and lead paint removal

Promote health and safety in the home

Four Elements of Electrification Roadmap

- Alameda Municipal Power
- Policymaking
- Financing
- Education & Outreach

Roadmap Principles

- Everyone, especially low to moderate income households, should be able to affordably switch to modern electric equipment
- Electrification policy should also support housing and anti-displacement policy
- The electrification process should be as simple and seamless and possible
- Our timelines should be fast but be realistic about challenges and other priorities

Existing Building Electrification Workshop

Safer, healthier and more affordable buildings

Technology and Policy Considerations

SUPPORTING [DOING] LEADING

March 16, 2022

Presentation Overview

Agenda

1. Technology and feasibility
2. Costs

Technology and Feasibility

The all-electric Integrated Genomics Laboratory, Lawrence Berkeley Labs.

Source: Rutherford + Chekene

Let's define existing building electrification (a.k.a. electrofits)

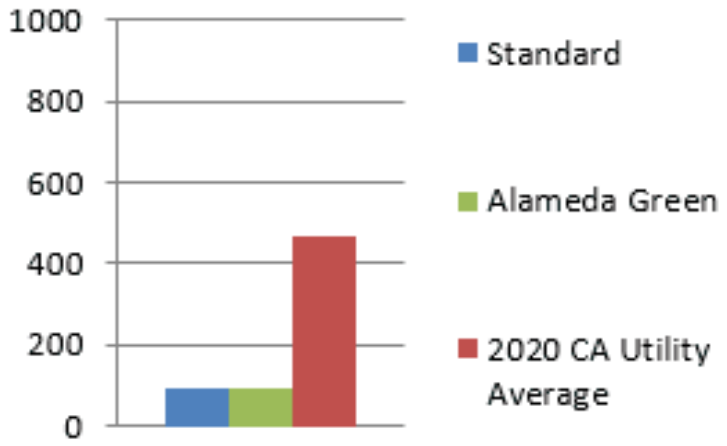
What	Why	How	Who
• Use electricity instead of fossil fuel • For all end uses • In residential, commercial, and some industrial	• Solar and wind power are GHG-free • Converting solar or wind power to other fuel types is inefficient • Lower-cost, lower risk decarbonization pathway	• Electric appliances • Complimentary measures (e.g. efficiency, load management, low-GWP refrigerants) • Minimizing electrical upgrades	• Local, state, federal government • Utilities • Air Quality management districts

Electrification, Compared to Fossil Fuels

- Carbon-free

2020 POWER CONTENT LABEL
Alameda Municipal Power
https://www.alamedamp.com

Greenhouse Gas Emissions Intensity (lbs CO_2e/MWh)		
Standard	Alameda Green	2020 CA Utility Average
95	95	466



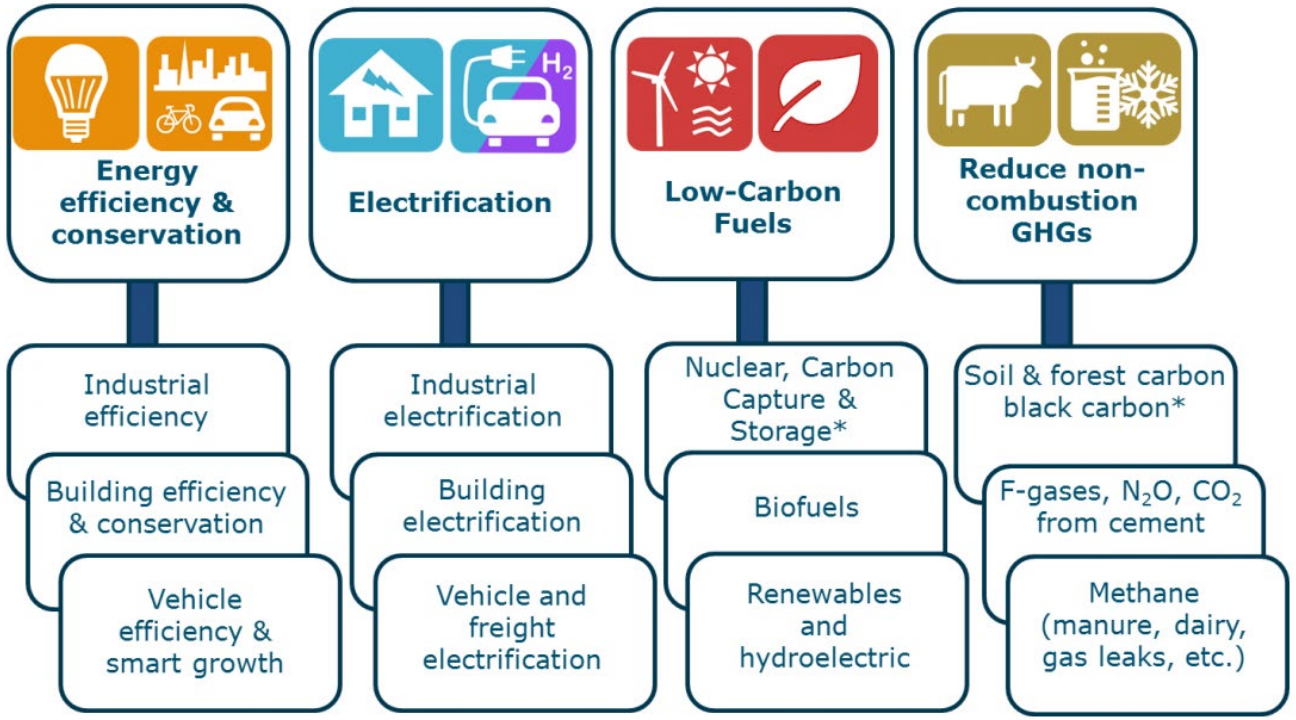
Energy Resources	Standard	Alameda Green	2020 CA Power Mix
Eligible Renewable[1]	73.1%	73.1%	33.1%
Biomass & Biowaste	21.5%	21.5%	2.5%
Geothermal	42.9%	42.9%	4.9%
Eligible Hydroelectric	3.4%	3.4%	1.4%
Solar	0.1%	0.1%	13.2%
Wind	5.3%	5.3%	11.1%
Coal	0.0%	0.0%	2.7%
Large Hydroelectric	26.9%	26.9%	12.2%
Natural Gas	0.0%	0.0%	37.1%
Nuclear	0.0%	0.0%	9.3%
Other	0.0%	0.0%	0.2%
Unspecified Power[2]	0.0%	0.0%	5.4%
TOTAL	100.0%	100.0%	100.0%
Percentage of Retail Sales Covered by Retired Unbundled RECs[3]:	0%	100%	

Source: Alameda Municipal Power

Electrification, Compared to Fossil Fuels

- Carbon-free

- Lowest-cost, lowest-risk pathway

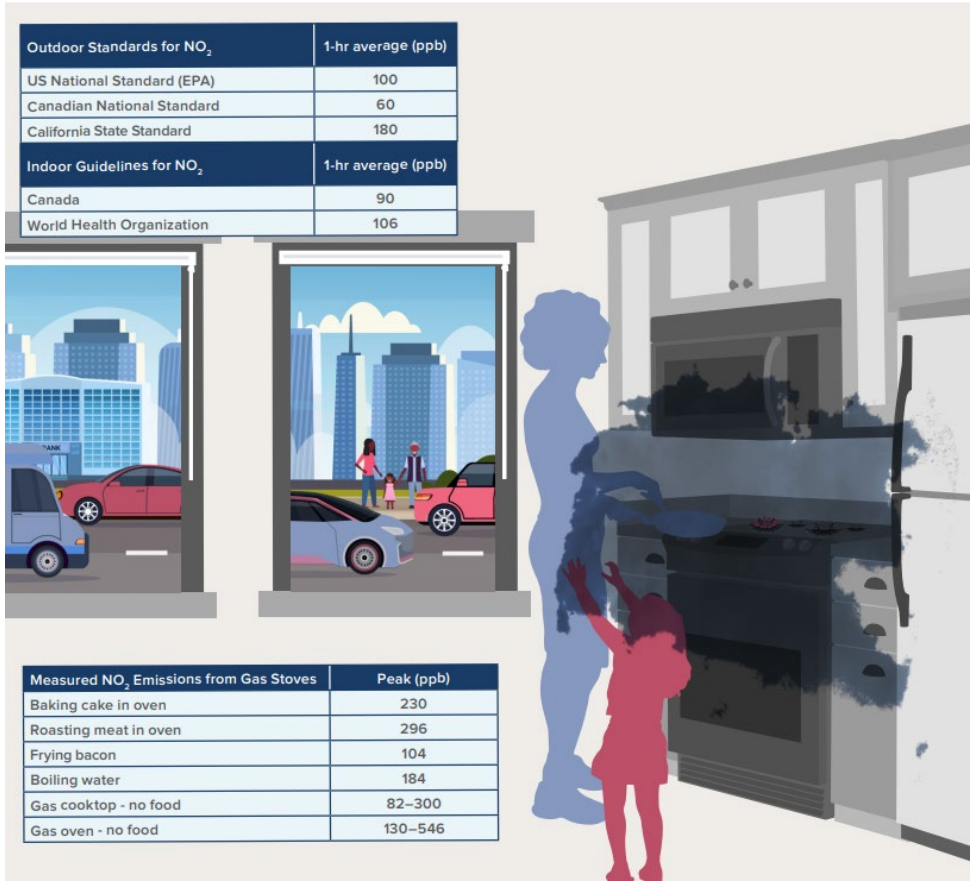


Sources: 1) AB3232 Decarbonization Assessment 2021 2) CA Energy Commission 2018 3) CPUC 2021

Electrification, Compared to Fossil Fuels

- Carbon-free
- Lowest-cost, lowest-risk pathway
- Healthier indoor air

Outdoor Standards for NO_2	1-hr average (ppb)
US National Standard (EPA)	100
Canadian National Standard	60
California State Standard	180
Indoor Guidelines for NO_2	**1-hr average (ppb)**
Canada	90
World Health Organization	106

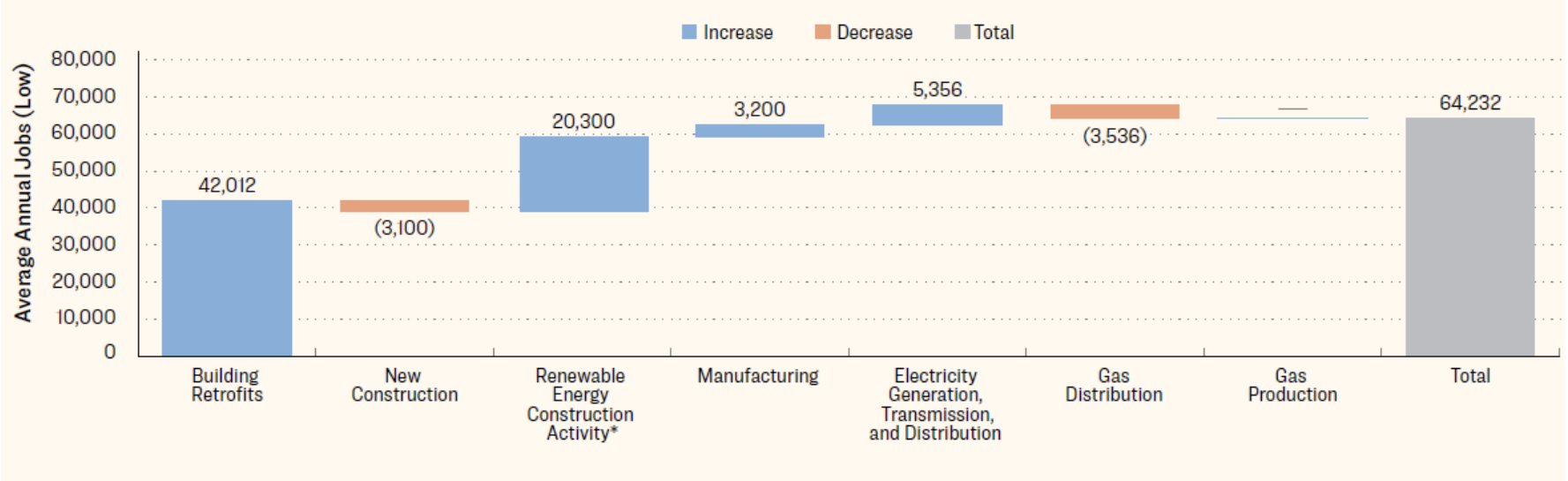


Measured NO_2 Emissions from Gas Stoves	Peak (ppb)
Baking cake in oven	230
Roasting meat in oven	296
Frying bacon	104
Boiling water	184
Gas cooktop - no food	82–300
Gas oven - no food	130–546

Sources: RMI 2020, CEC 2019

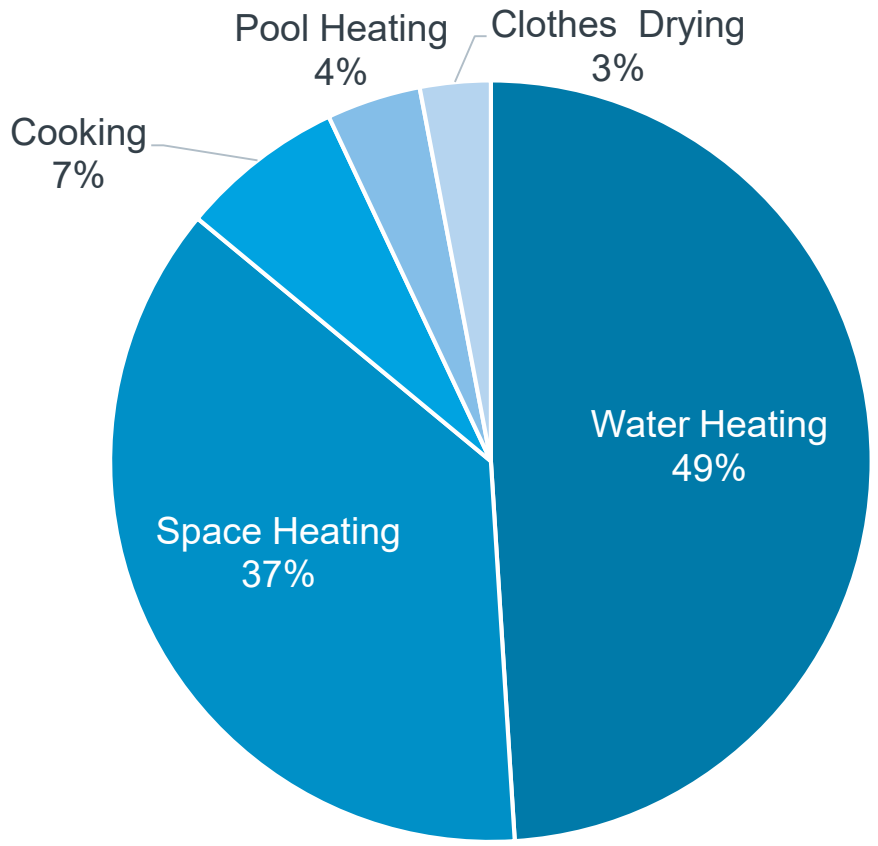
Electrification, Compared to Fossil Fuels

- Carbon-free
- Lowest-cost, lowest-risk pathway
- Healthier indoor air
- Job creation

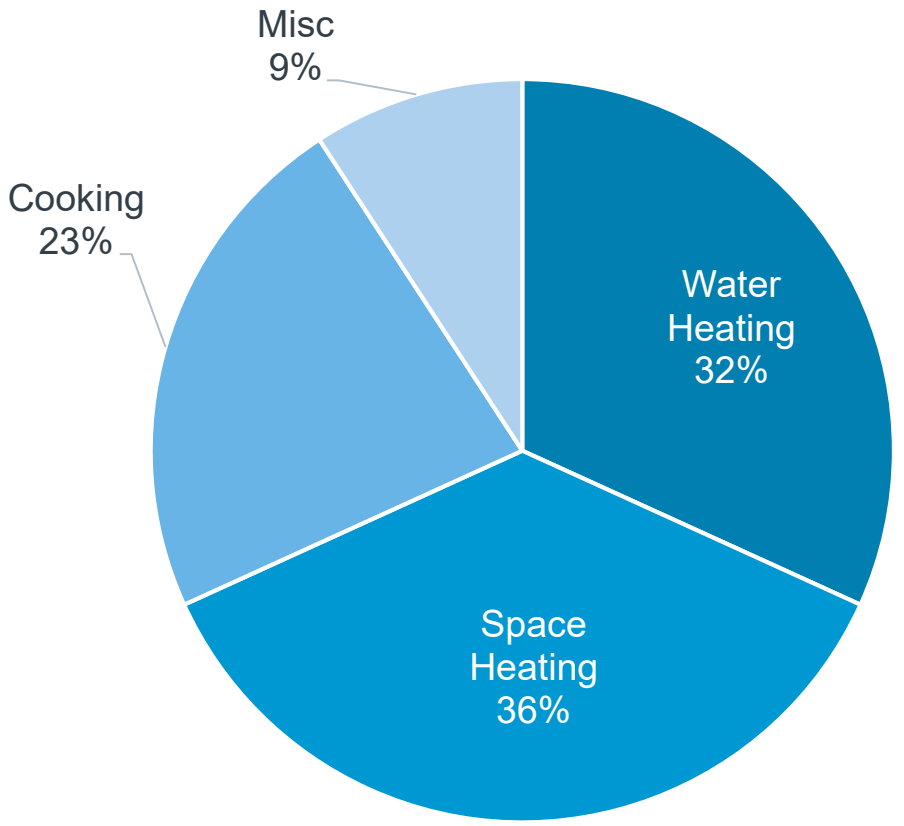


Sources: UCLA 2019, UMass 2021

California Buildings Gas Usage



Residential



Non-Residential

2009 Residential Appliance Saturation Survey
2006 California Commercial End Use Survey

Equipment

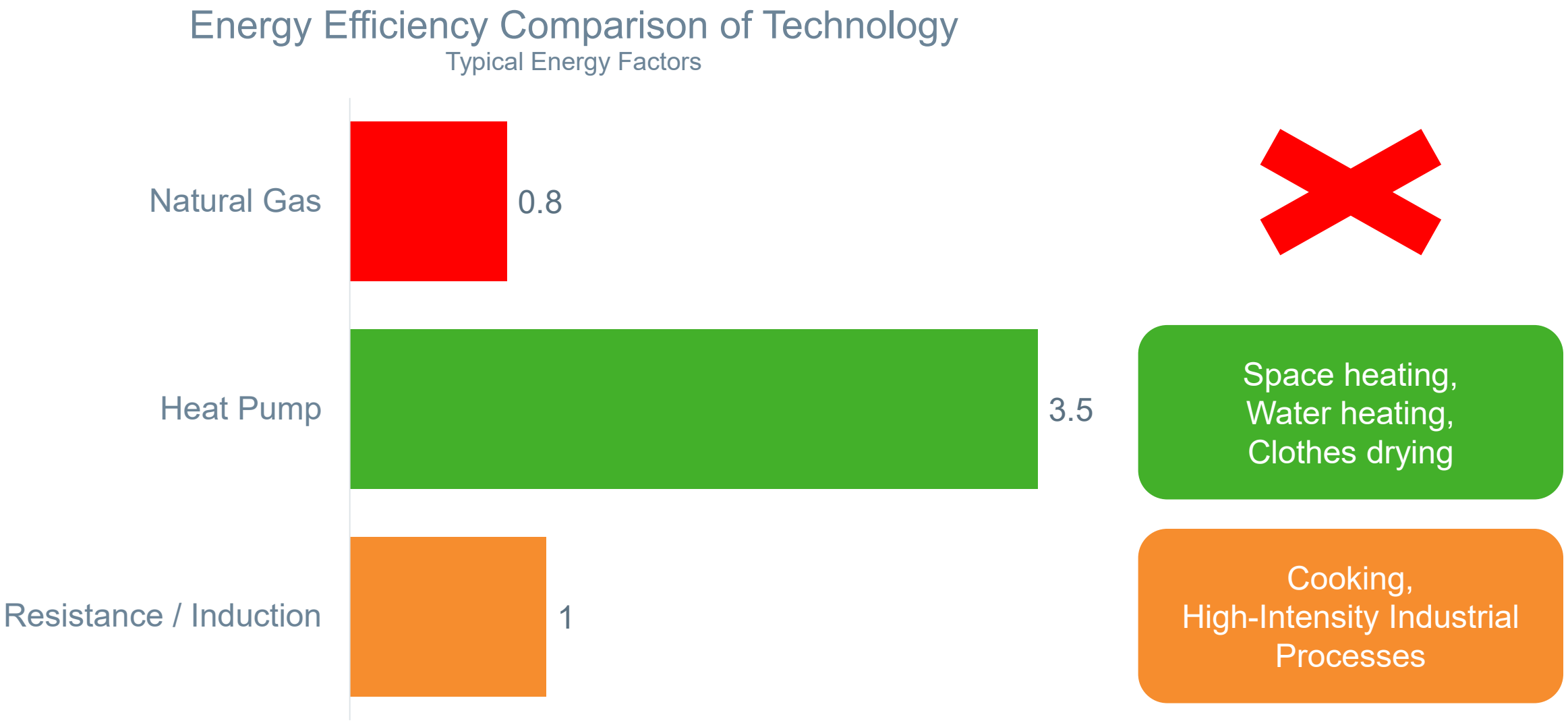
	Space Heating	Water Heating	Cooking	Clothes Drying
Residential				
Commercial				

Low-Cost Options

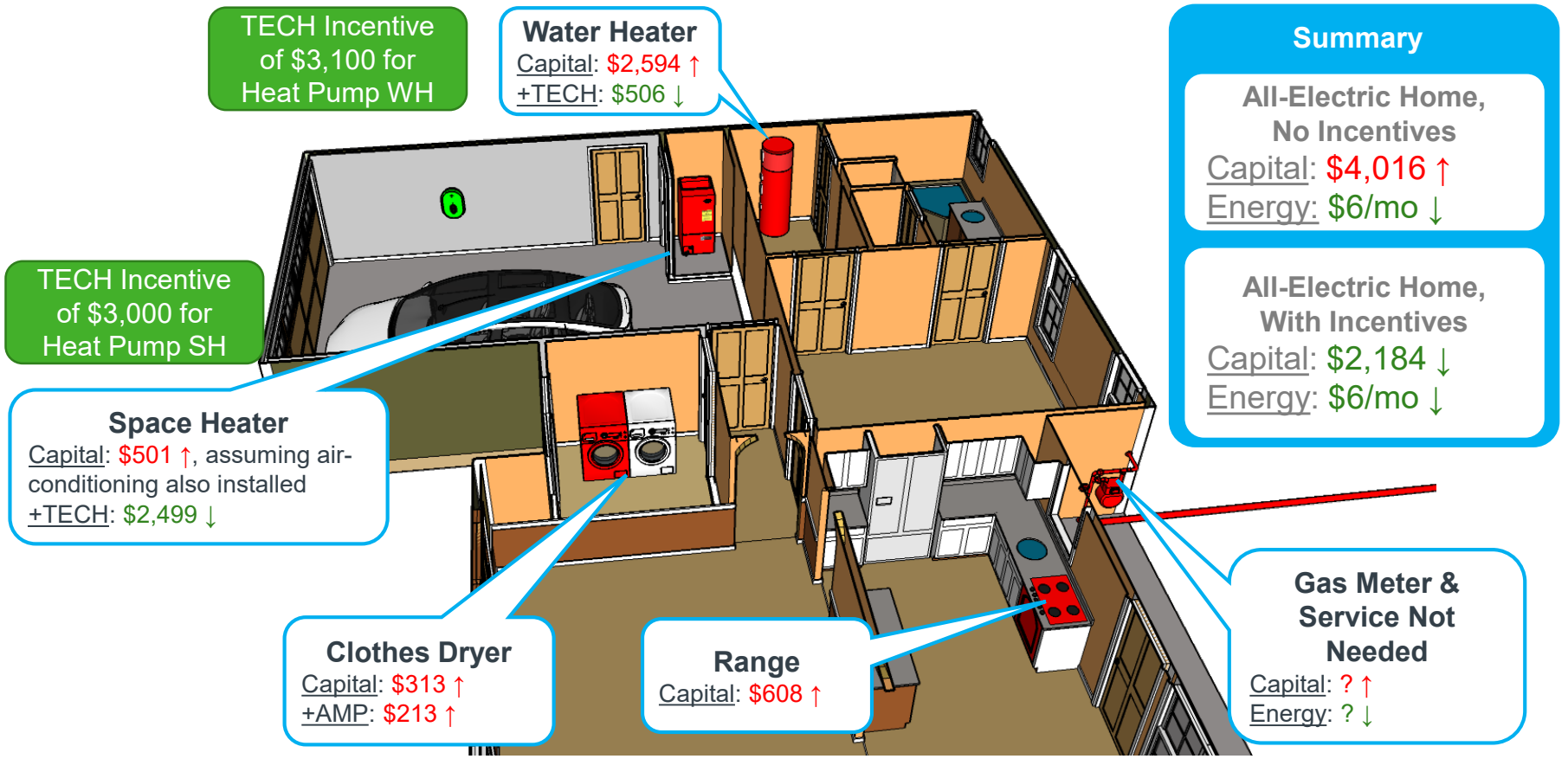
Space Heating

Cooking

Equipment Efficiency



Electrifying Existing Single Family Homes in Alameda – The Cost Story



Capital and whole-building energy costs of thermal systems are based on Statewide Utility Codes and Standards Program report, using AMP D-1 and PG&E G1 rates (March 2022).

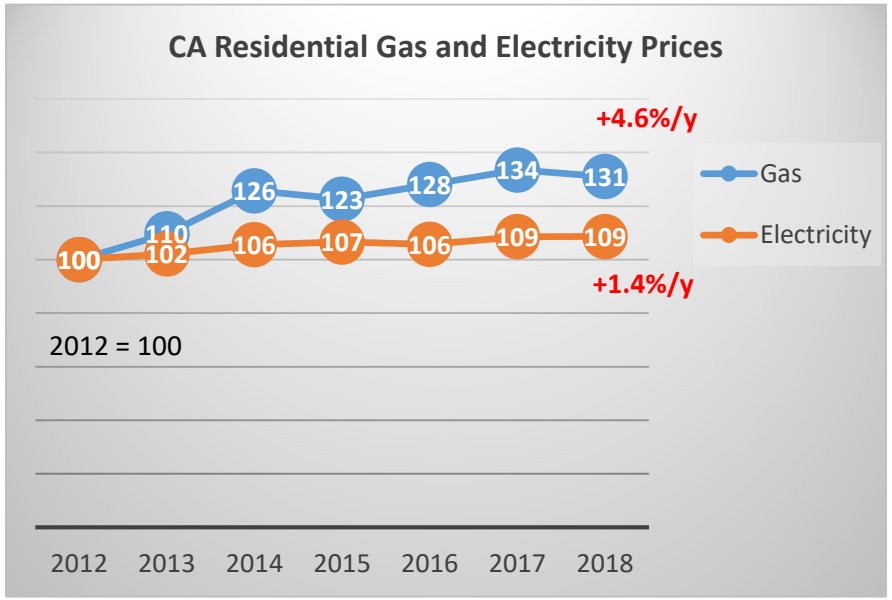
Rate escalation is based on May 2021 CPUC staff En-Banc analysis.

TECH incentives are based on https://energy-solution.com/tech-incentives/ .

AMP incentive is based on https://www.alamedamp.com/407/Rebates-and-Incentives

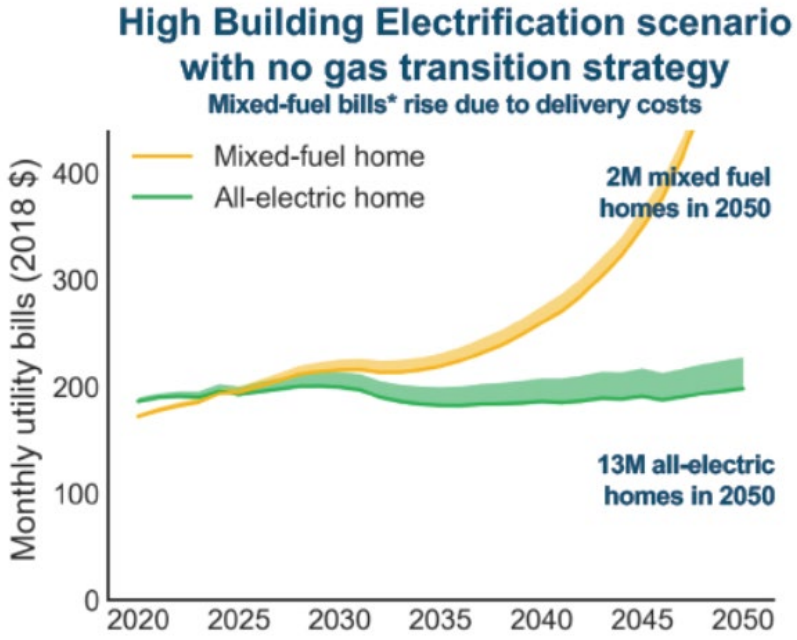
Natural Gas Costs Climbing

CA residential natural gas prices increased 3x faster than electricity prices from 2012 to 2018



Source: EIA
https://www.eia.gov/dnav/ng/hist/n3010ca3m.htm
https://www.eia.gov/electricity/data/browser/#/topic/7?agg=2,0,1&geo=g&freq=M

Trend expected to accelerate:



CEC Workshop June 6, 2019: Draft Results from E3 study on the Future of Natural Gas Distribution in California

The AB3232 Report represents the most current CEC research supporting that *Aggressive Electrification* is the primary pathway to meeting GHG reduction targets.

Will I Need Larger Electrical Service?

What is the minimum panel size would you need to electrofit a 2,500 ft² home, including 240V 30A EV charging?

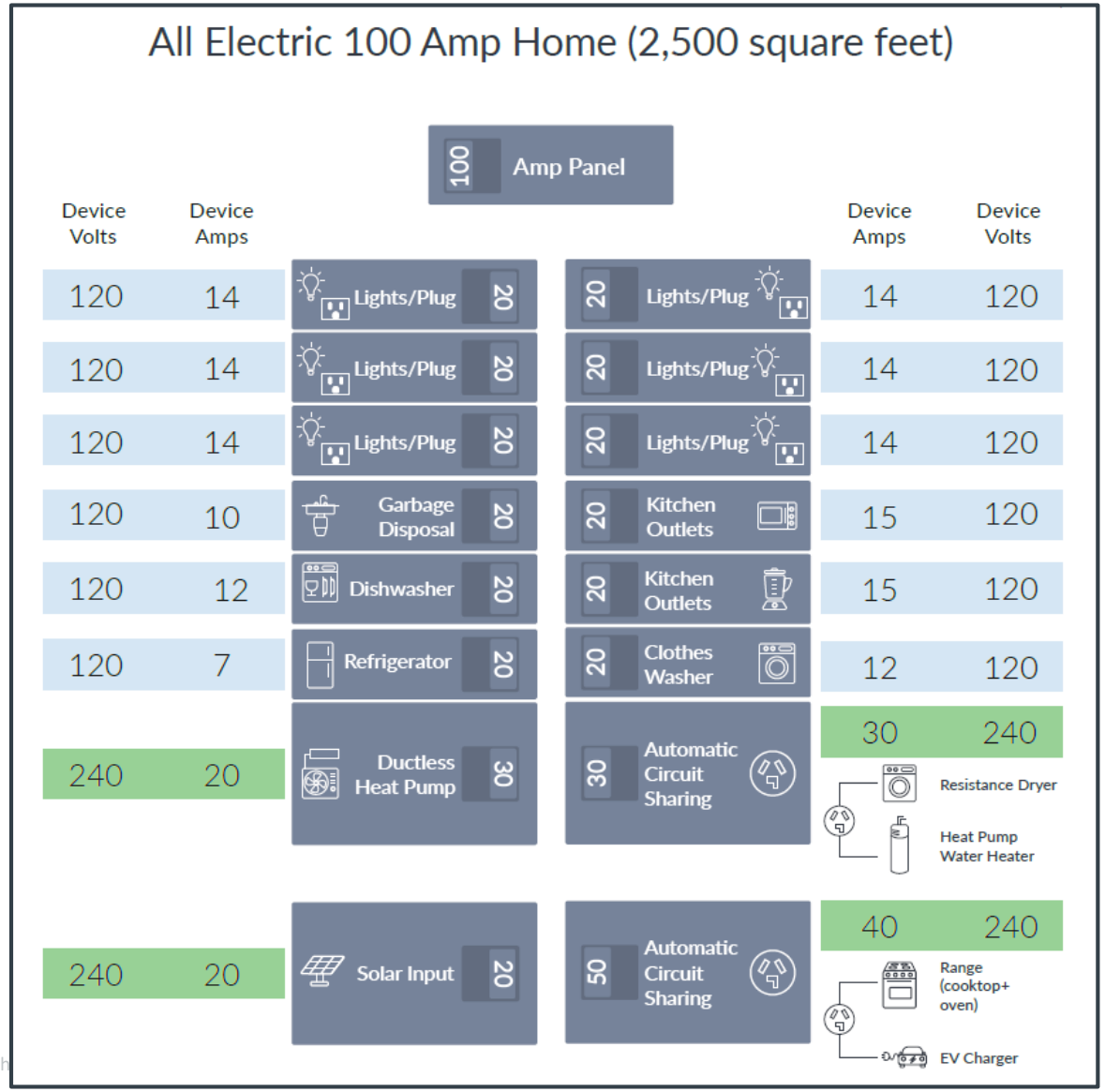
A. 60A

B. 100A

C. 200A

D. 400A

Source: Josie Gaillard, Courtney Beyer



Thank you!

Farhad Farahmand, PE

Senior Project Manager, TRC

Ffarahmand@trccompanies.com

Background- AMP

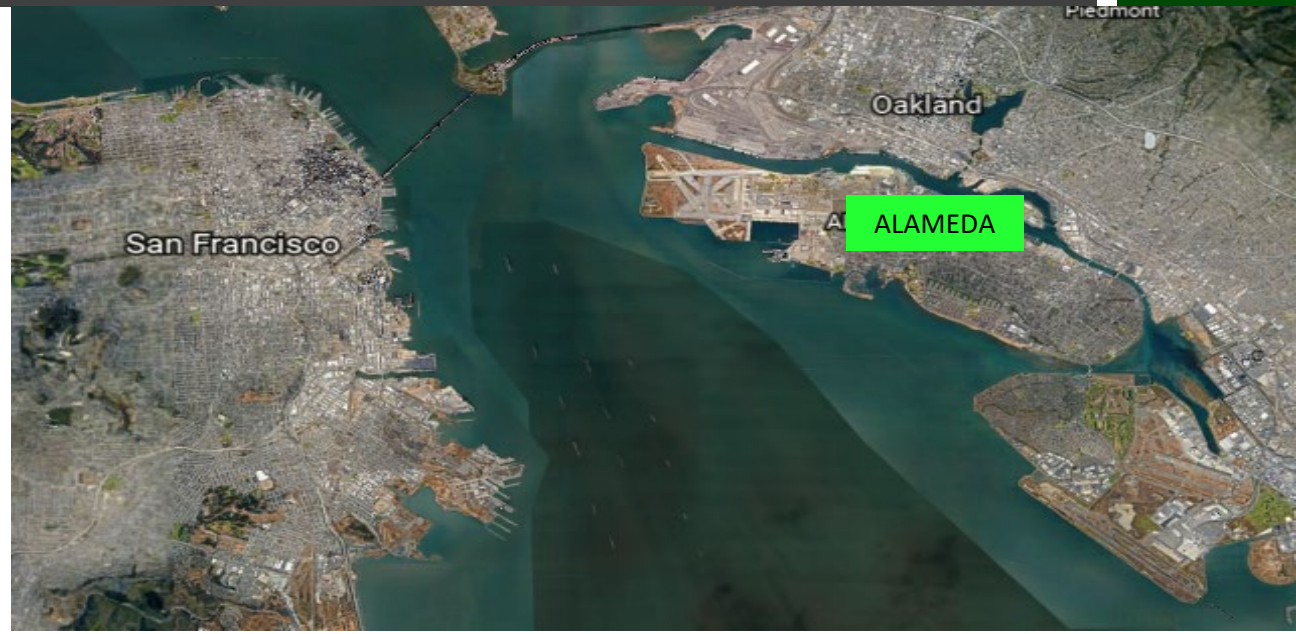
Manage and safely provide reliable, cost effective, and environmentally friendly electric services for a sustainable Alameda

AMP History:

- AMP was established in 1887
- Oldest municipal electric utility in CA
- Community owned
- Locally controlled

AMP Highlights:

- 100% clean electricity
- 20% lower rates than neighboring utilities
- Demonstrated leader in building and transportation electrification programs

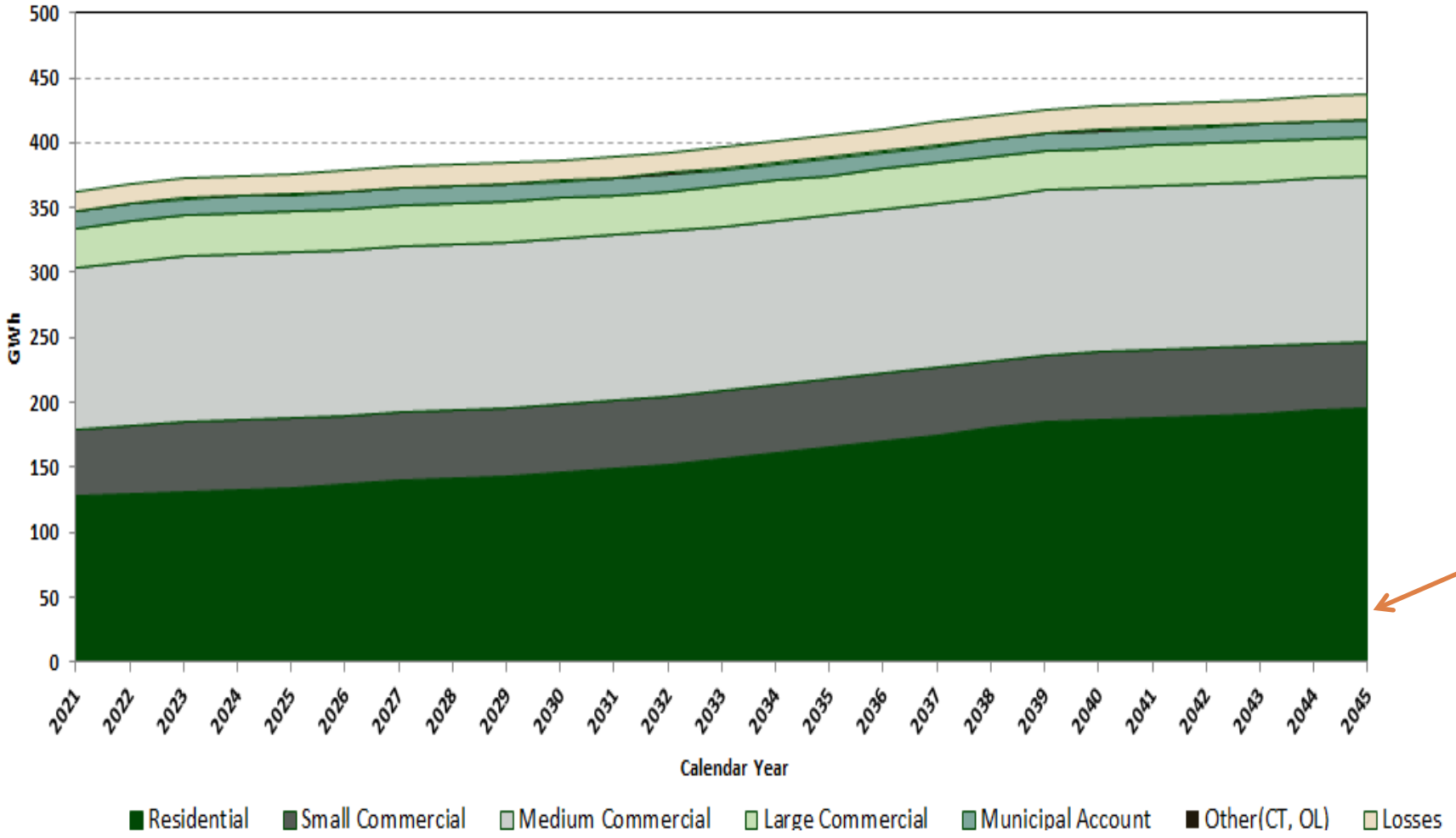


The City of Alameda is a small island community in the heart of the San Francisco Bay Area

- 80,000 residents
- 22.8 square miles
- 36,000 total customer accounts

ALAMEDA MUNICIPAL POWER
A Department of the City of Alameda

How will Building Electrification affect AMP?



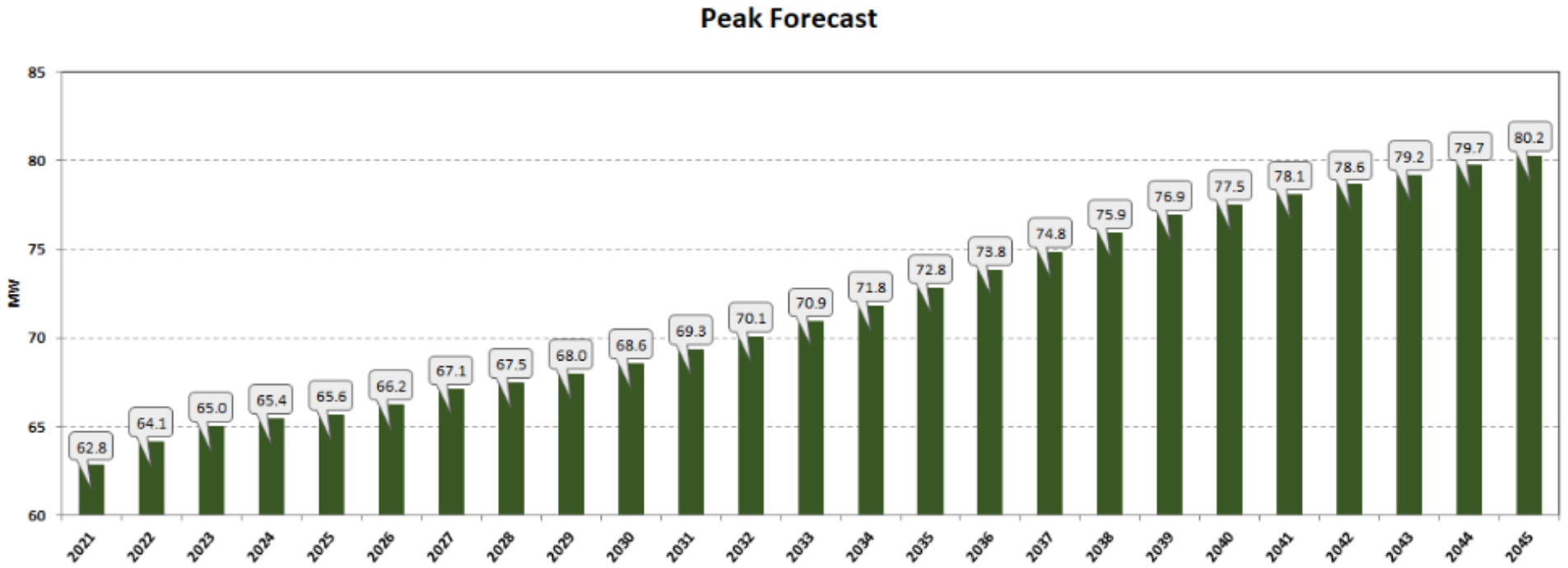
Load Forecast by Customer Class

The customer group that is predicted to have the largest load increase is **Residential**

ALAMEDA MUNICIPAL POWER
A Department of the City of Alameda

How will Building Electrification affect AMP?

Building Electrification is also expected to contribute to an increase in Alameda's **peak demand** from 62 MW to over 80 MW in 2045



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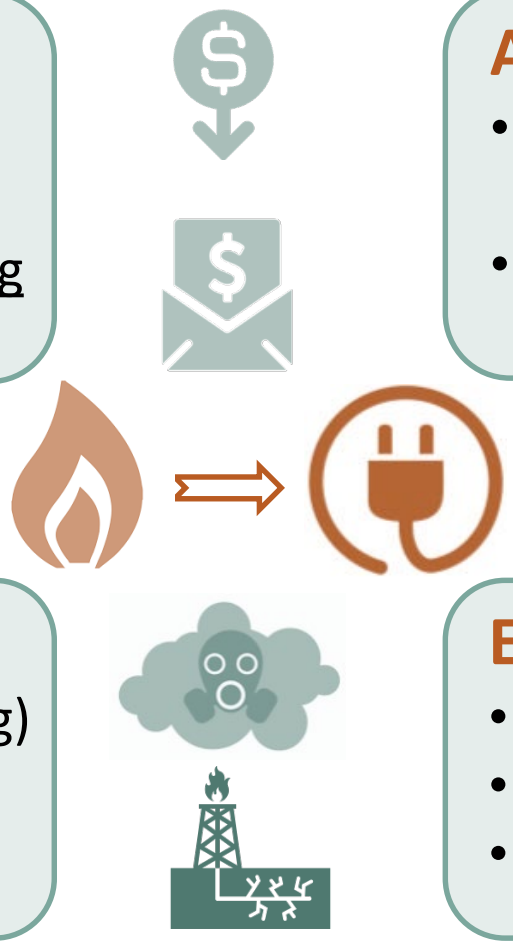
Benefits of Building Electrification

Customer overall utility costs

- Lower net gas and electric bills when switching from gas to electric heat pump for space & water heating



AMP electric bills

- Customers eligible for expanded Tier 1 allowance on D1H rate
- Potential Time-of-Use rate for all-electric homes

Health & safety risks from gas

- NOx indoors (asthma) & outside (smog)
- Carbon monoxide poisoning
- Explosions in pipelines and homes

Environmental impact of gas

- Global warming from CO_2 in exhaust
- Methane (GHG) leaks
- Fracking impacts

AMP’s Rebates and Incentives

Residential Rebates

Building Electrification Rebates

- Electric Clothes Dryer - $100
- Heat Pump Water Heater - $1,500
- Smart Thermostats- $50
- LED Bulbs - $2
- Electric Panel Upgrade- $2500

AMP Marketplace

User-friendly **online shopping** for energy-efficient electric appliances, equipment, and devices

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Panel Upgrade

- Up to $2500
- Covers permit, installation, labor costs
- Must be electrifying at least one appliance in the home (water heater, dryer, or space heating)
- AND installing an additional electrical appliance
  - EV charger can count as the second appliance

- Must be permitted
- Must work with engineering department
- Must be from 100amps to 200amps

- Application: https://www.alamedamp.com/407/Rebates-and-Incentives

Other Incentives

- **TECH Clean California**

- Rebate paid to contractor and then passed to customer
- Gas to HPWH:
  - HPWH < 55 gallons : $1,600
  - HPWH < 55 Gallons: $2,300
  - ERWH to HPWH: $1,500
  - Panel upgrade incentive: $0
- Current TECH contractors: https://switchison.cleanenergyconnection.org/tech-clean-california-contractors

Bay Area Regional Energy Network (BayREN):

https://www.bayren.org/get-started

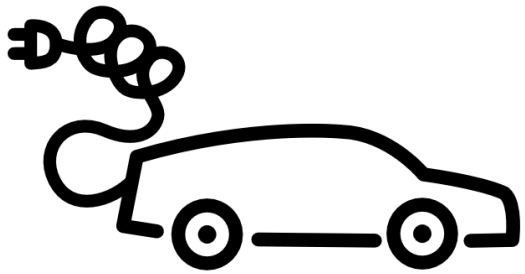
- Energy Efficiency Rebates before you electrify
  - Attic and wall insulation
  - Duct sealing and insulation
  - Air sealing
- Free Consultation With a Home Energy Advisor
  - Call **(866) 878 - 6008**
- BayREN Contractor Database
  - Submit rebate applications for you!
  - includes Tech Clean California Partner Contractors

All about the EVs

- Level 2 EV Charger: $800
  - Permit, installation, cost of the charger
- Used EV: $2000 and $3000 for income qualified
  - Rebate for Used EV's up to $22,000
- State and Federal Incentives: https://www.alamedamp.com/349/Electric-Vehicles

- Interested in learning more about EVs?

  -Upcoming webinar April 19th about EV and EV charging



Abbe-Patterson Project

Electrification of Existing Single-Family Home Built in 1903

Existing home had:

3 bedrooms/2 bath
1,550 square feet

Solar panels
Electric stove/oven
Electric car charger

Gas furnace circa 1950s
Gas dryer
Gas water heater

New Project – ADU + All Electric Conversion

500 square foot accessory dwelling unit

- Induction stove/oven

Chiltrix – Air to Water Heat Pump

- Electric furnace & water heater

Electric dryer

Unfinished Basement

New ADU

Old Furnace + Water Heater

New Furnace + Water Heater

New Dryer


SENSOR DRY
Normal
Delicates
Heavy Duty
Perm. Press
Bedding
MANUAL DRY
Speed Dry
Towels
Air Dry

New Panel, Induction Stove

Project Contractors

Norman Sanchez Architect
Monterey Energy Group
Sunrise Construction
TEC Electric
AT Weber Plumbing

Next Steps

- Visit www.alamedaca.gov/BuildingElectrification
- Take our survey!
- Attend more workshops and give your input to the roadmap

Workshop Series

- Electrification 101
  - April 6 @ Main Library
- Roadmap Brainstorm
  - March 28: For Renter
  - March 30: For Property Owners & Management
  - April 4: For Single Family Home Owners
- Draft Roadmap + Ordinance
  - April 27: Draft Roadmap + Ordinance Review
  - May 4: Draft Roadmap + Ordinance Review @ Main Library
  - April 3-15: Interactive brainstorming poster board @ Library

Thank you! Questions?