2022 Reach Codes Initiative

Advancing safer, healthier and more affordable buildings and vehicles

Industry Forum – February 15, 2022

BayAreaReachCodes.Org

Team Introductions

LEADERSHIP

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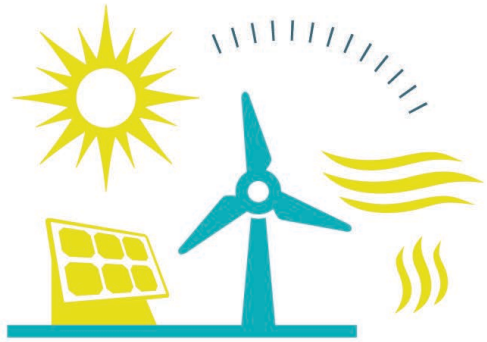
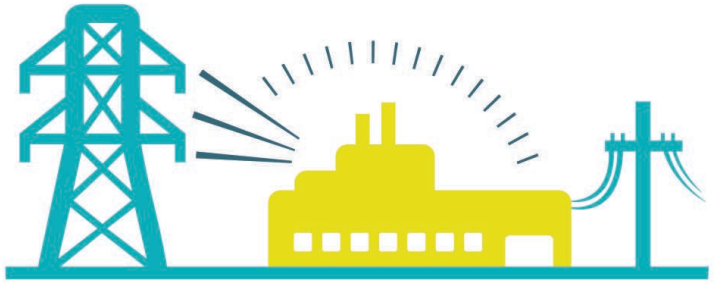
Non-profit, locally-led electricity providers



Source

EBCE, PCE, SVCE

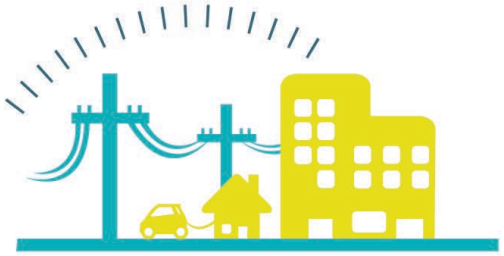
buy and build cleaner energy



Delivery

PG&E

deliver energy, repair lines, handle billing



Customer

YOU

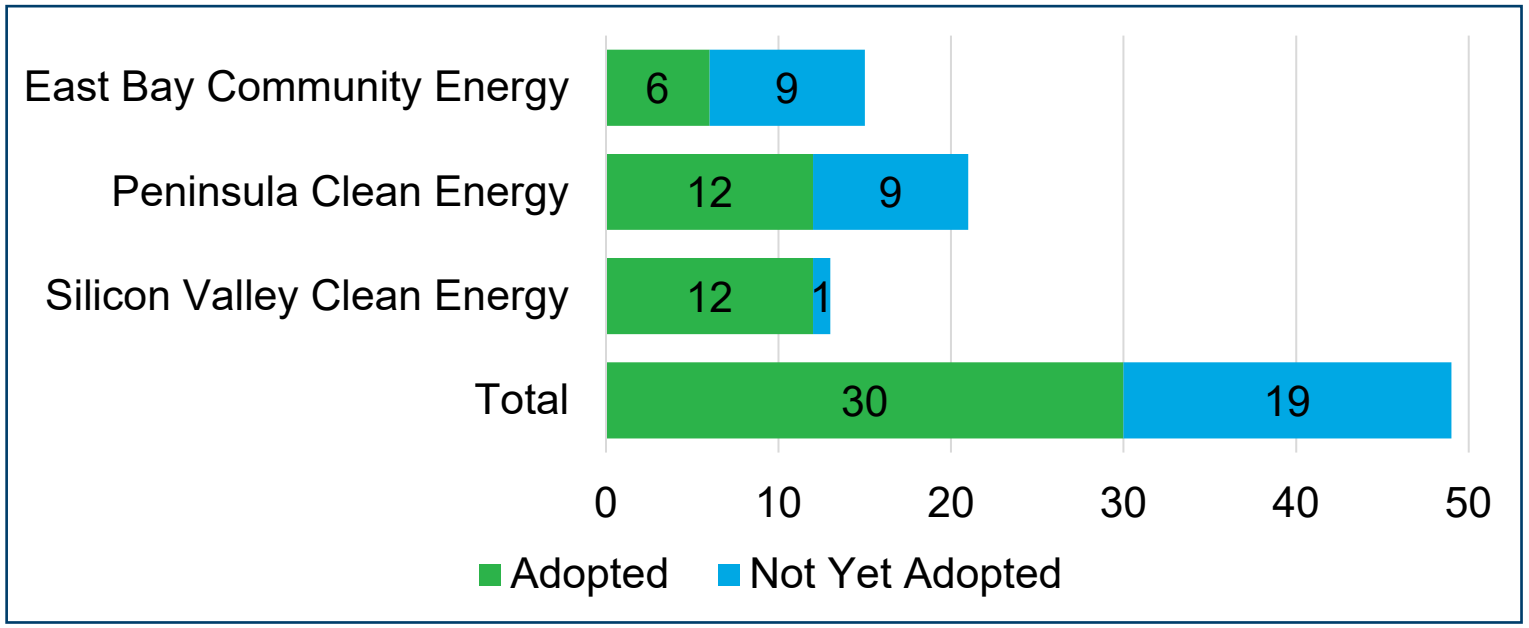
benefiting from cleaner energy, local control

What are Reach Codes?

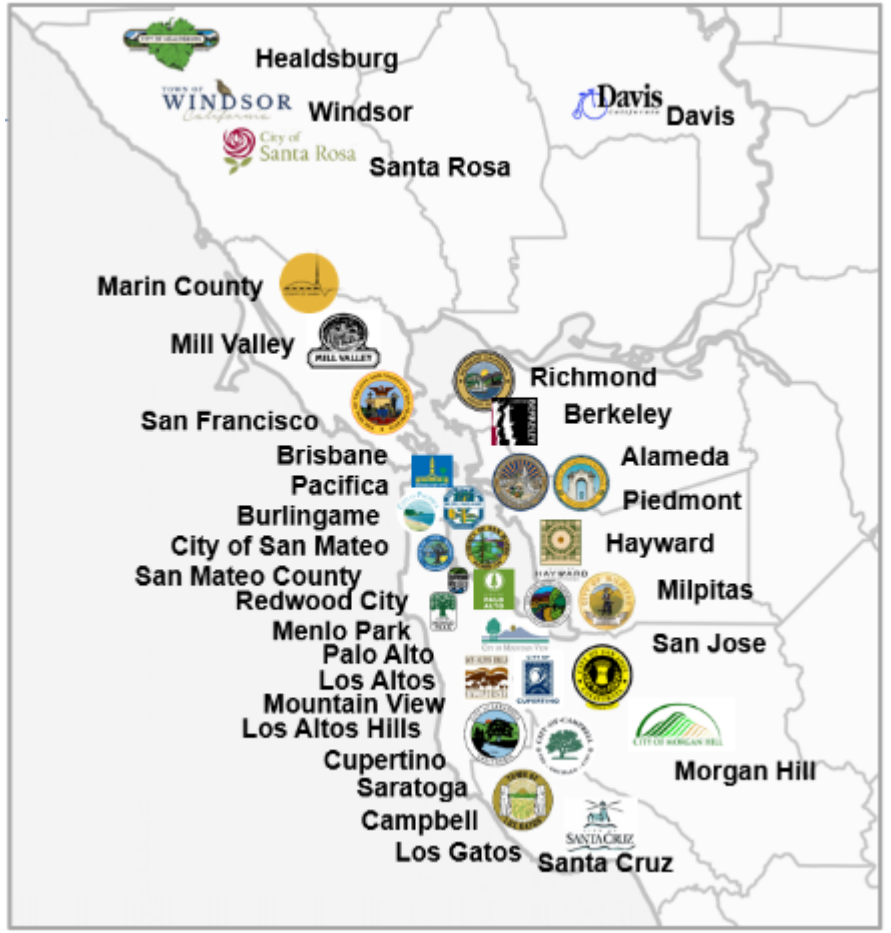
- Local enhancements to state code
- Can be adopted at any time
- Addresses:
  1. Building electrification – reduced use of methane gas
  2. Electric vehicle (EV) charging infrastructure – increased readiness
- Improves economic and energy performance of buildings

Codes are enhanced by stakeholder engagement, why we are here

Adoption of Electrification Reach Codes



- 61% of member agencies
- 57% of electrification Reach Codes statewide
- 21 of 30 also had EV infrastructure codes



Credit: Redwood Energy

2022-23 Initiative

January
Kickoff

February
Begin on-going outreach

March-May
Cost effective studies

June
2nd draft reach codes, outreach

September-October
Local adoption

January 1, 2023
Codes take effect

Presentation Overview

Topics

- Building electrification
- Electric vehicle (EV) charging infrastructure
- New construction
- Alterations

Agenda

1. Technology and feasibility
2. Costs
3. Policy models
4. Tools and Resources

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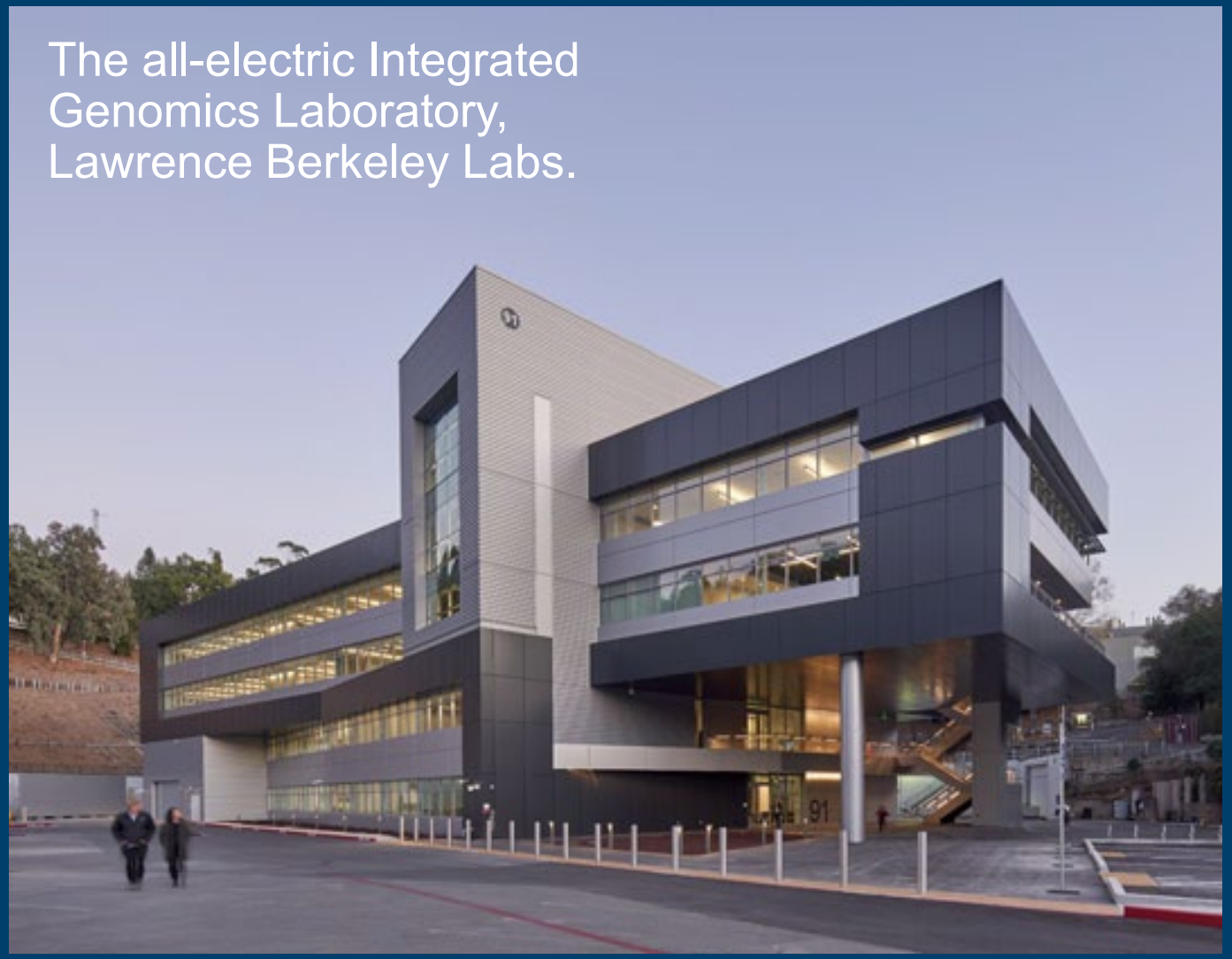
SILICON VALLEY CLEAN ENERGY

Poll Questions

Discussion

What are the benefits of going all-electric for our buildings and vehicles?

Technology and Feasibility



Source: Rutherford + Chekene

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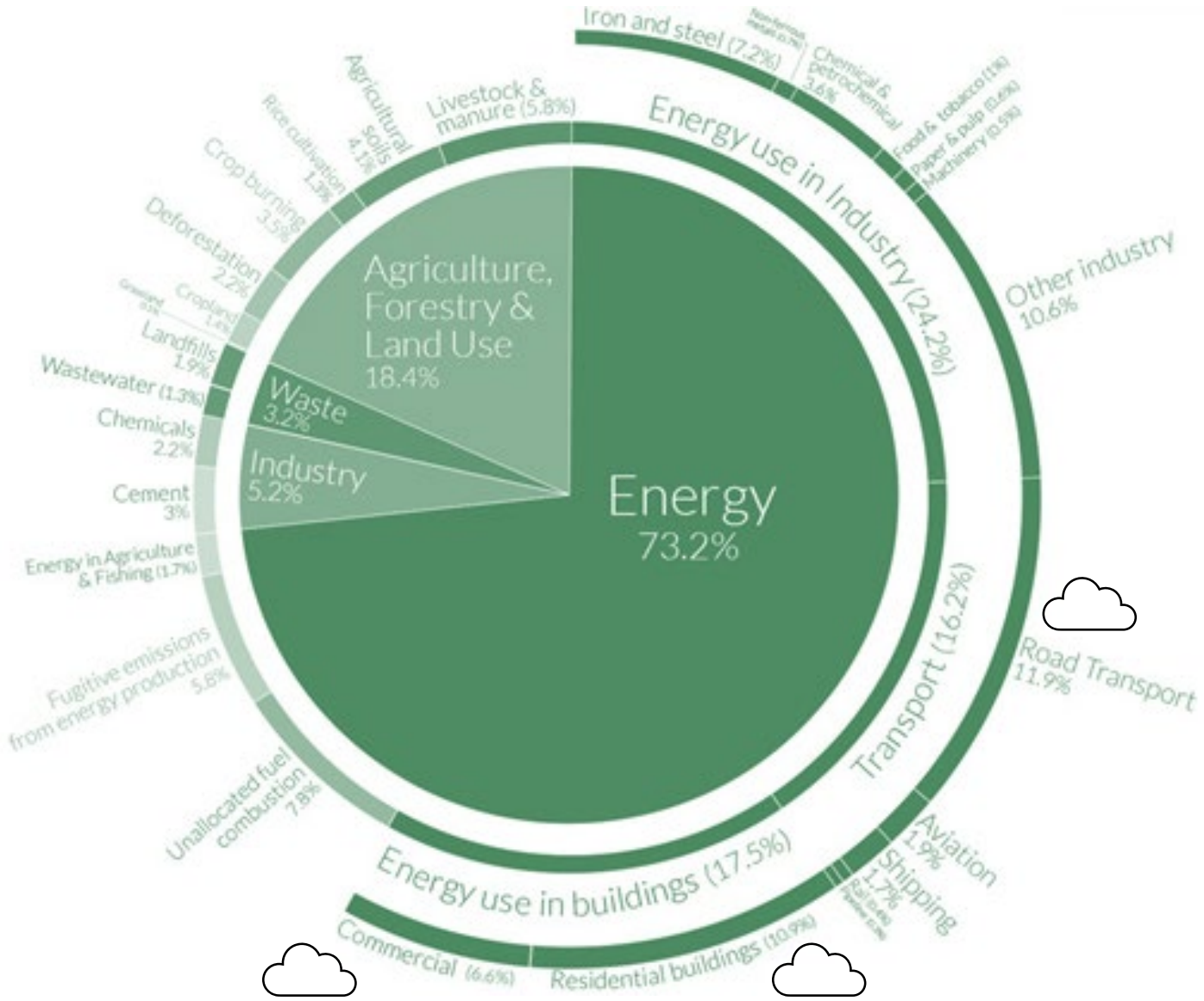
Global Carbon Emissions Sources



18% Commercial & Residential Buildings

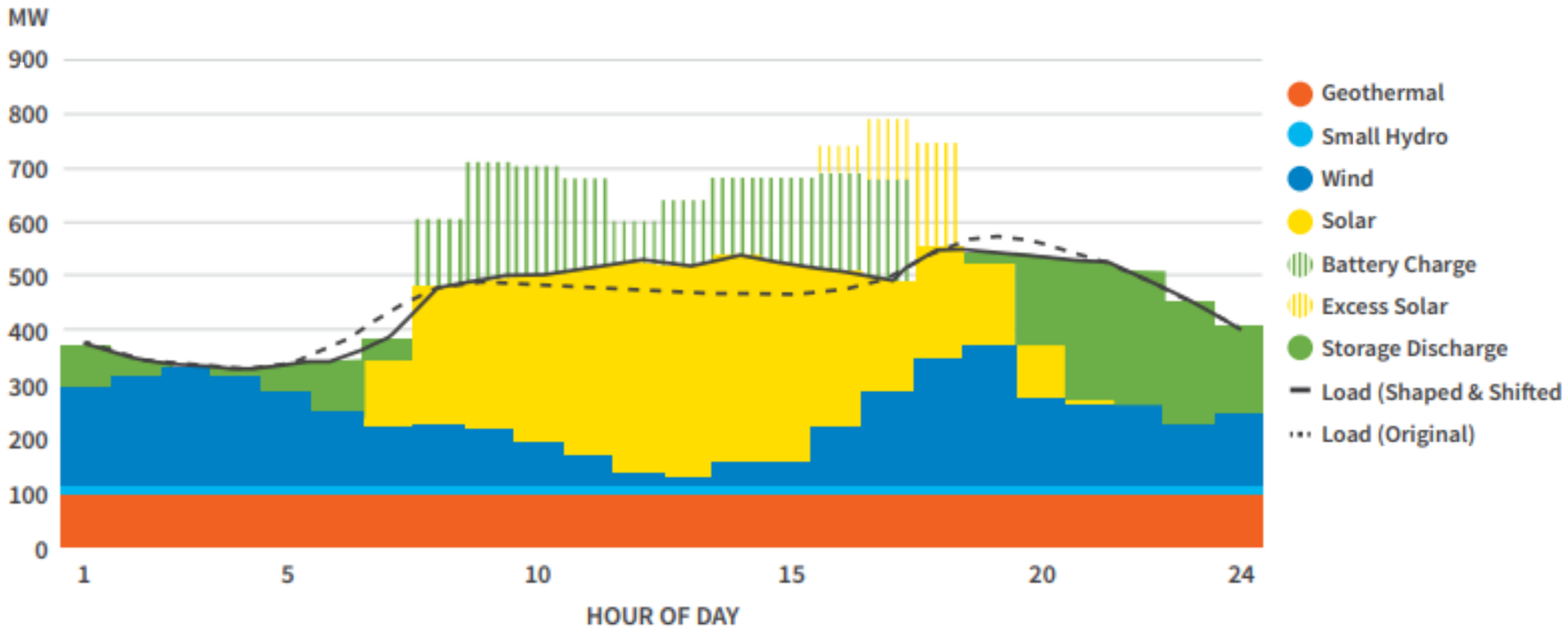
12% Road transport

Source: [Shayle Kann, Climate Tech VC]

In CA, building emissions are overwhelmingly from methane gas uses that can be electrified

Electrification, Compared to Fossil Fuels

- Carbon-free

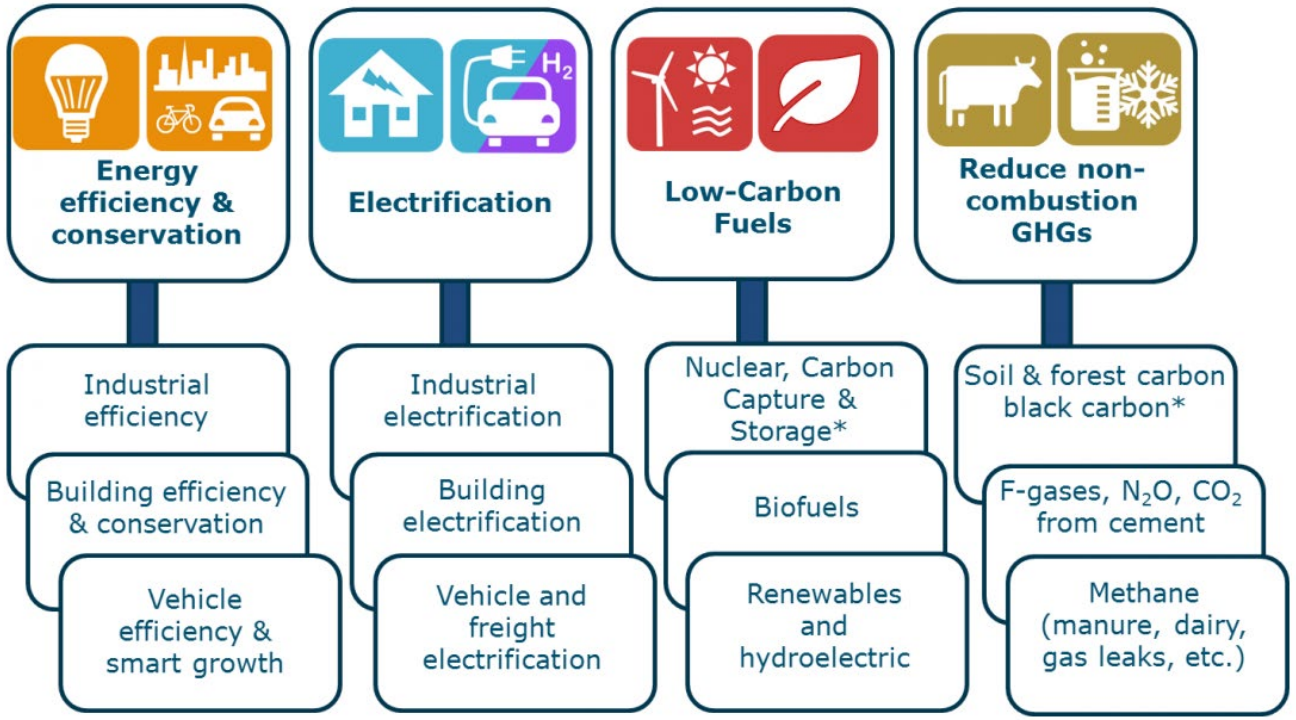


Source: [Peninsula Clean Energy 2021]

Electrification, Compared to Fossil Fuels

- Carbon-free

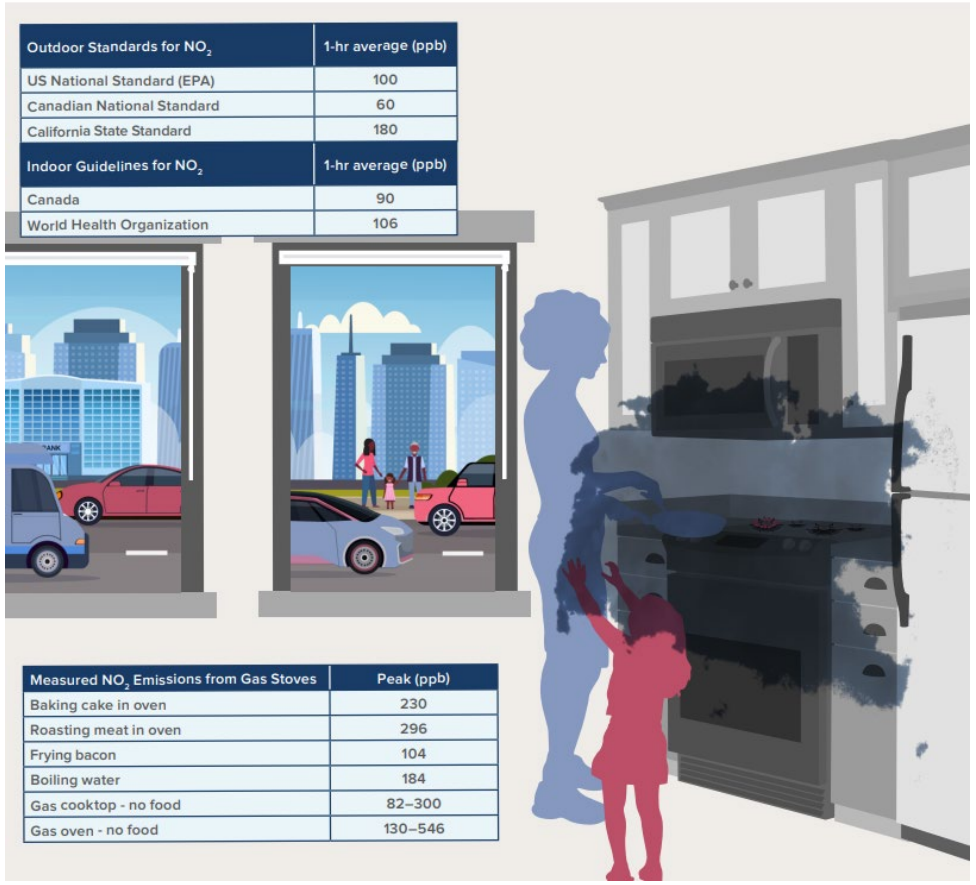
- Lowest-cost, lowest-risk pathway



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

Electrification, Compared to Fossil Fuels

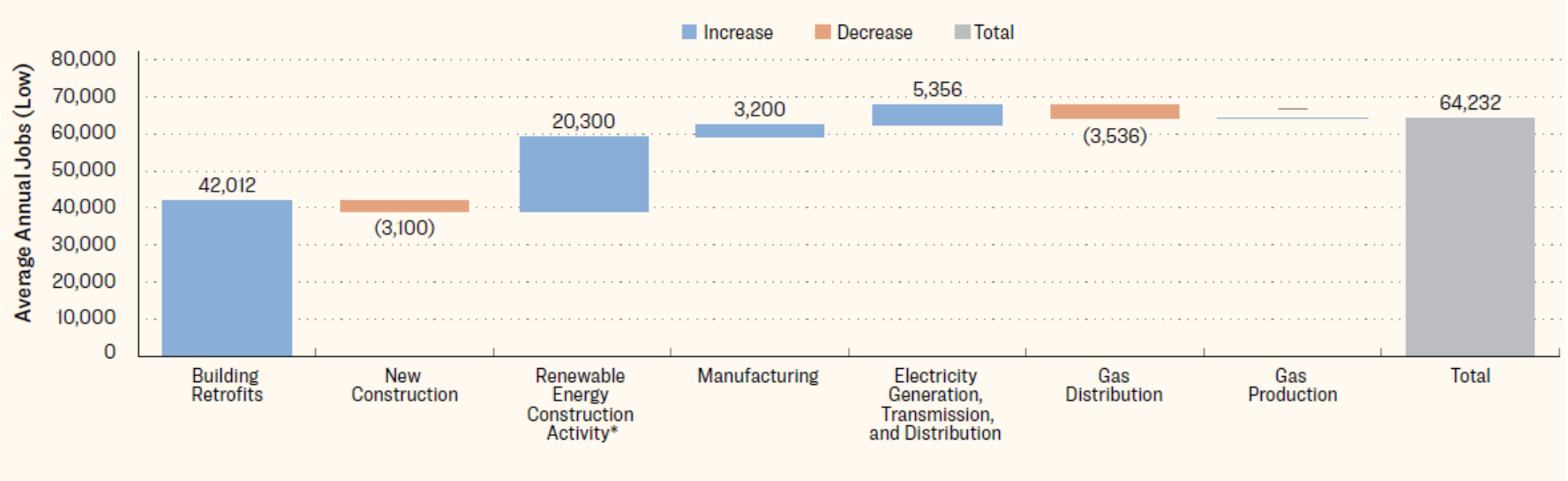
- Carbon-free
- Lowest-cost, lowest-risk pathway
- Healthier indoor air



Sources: RMI 2020, CEC 2019

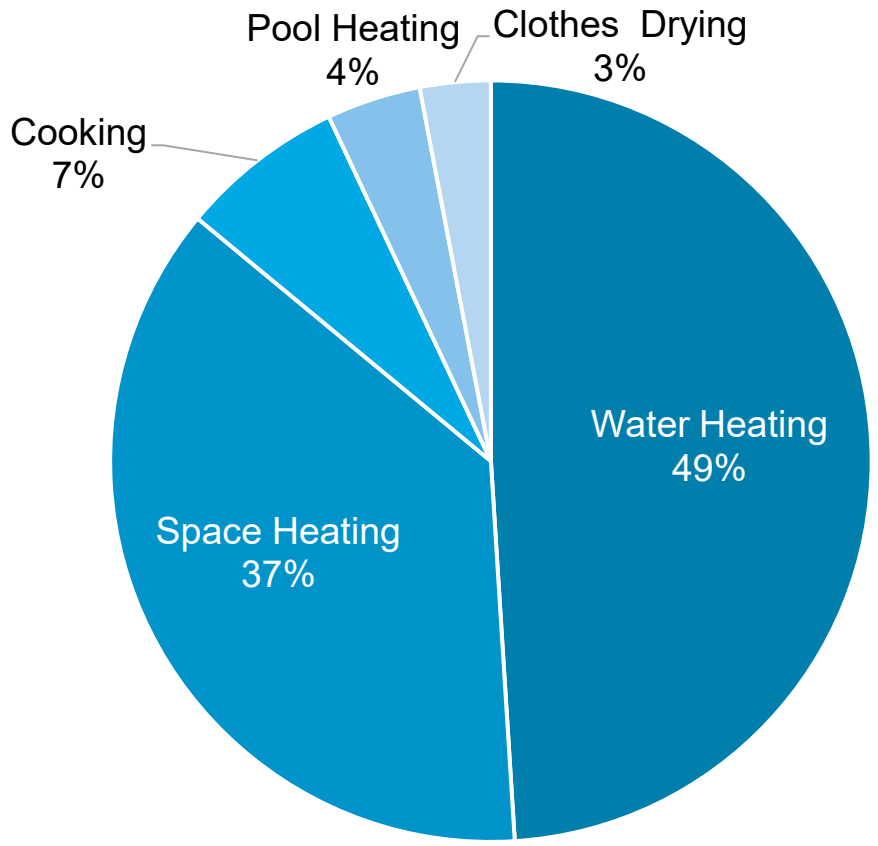
Electrification, Compared to Fossil Fuels

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

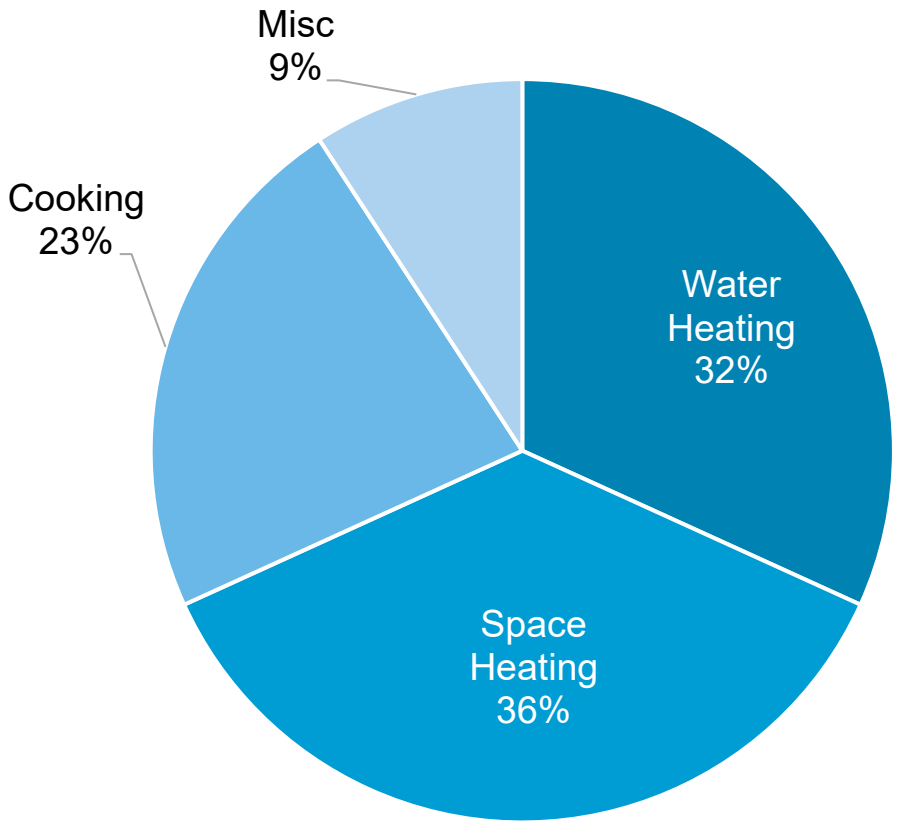


Sources: UCLA 2019, UMass 2021

California Buildings Gas Usage



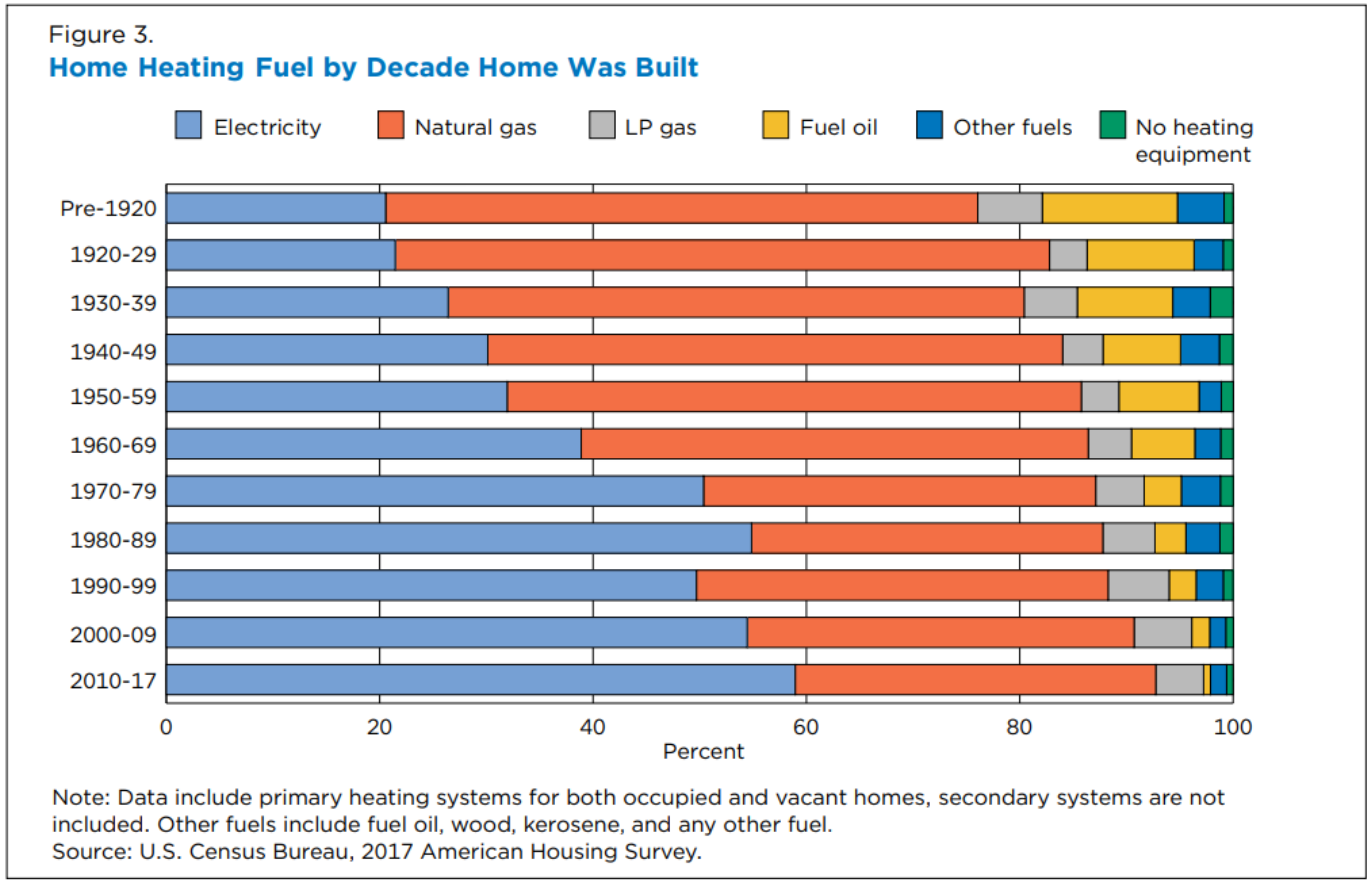
Residential



Non-Residential

2009 Residential Appliance Saturation Survey
2006 California Commercial End Use Survey

Electric is already the majority



Of national new construction homes:[1]

60% use electric space heating (40% of which are heat pumps[2])

55% use electric water heating

62% use electric cooking

75% use electric clothes drying

Sources:
1 - 2017 American Community Survey

2 - 2017 IEA Heat Pump Conference Proceedings

Equipment

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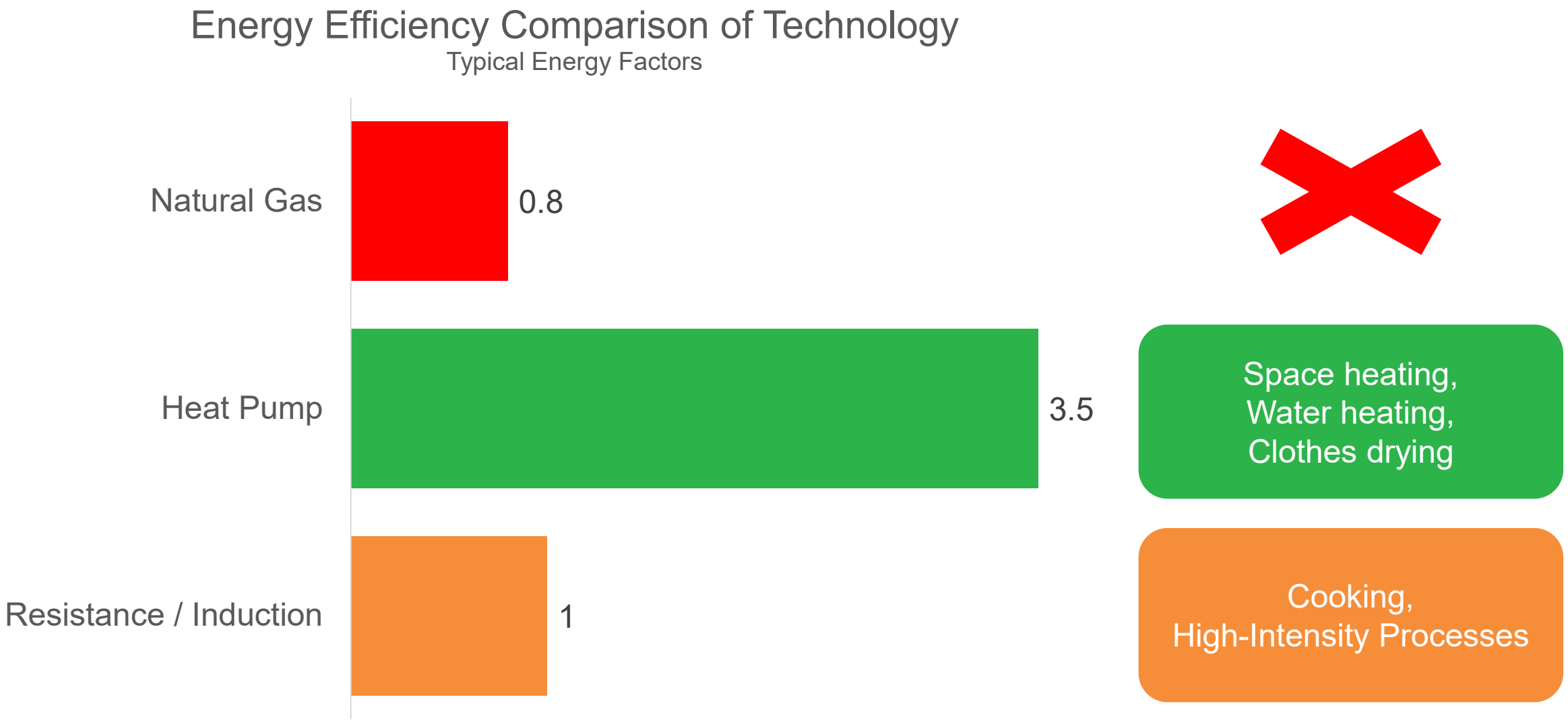
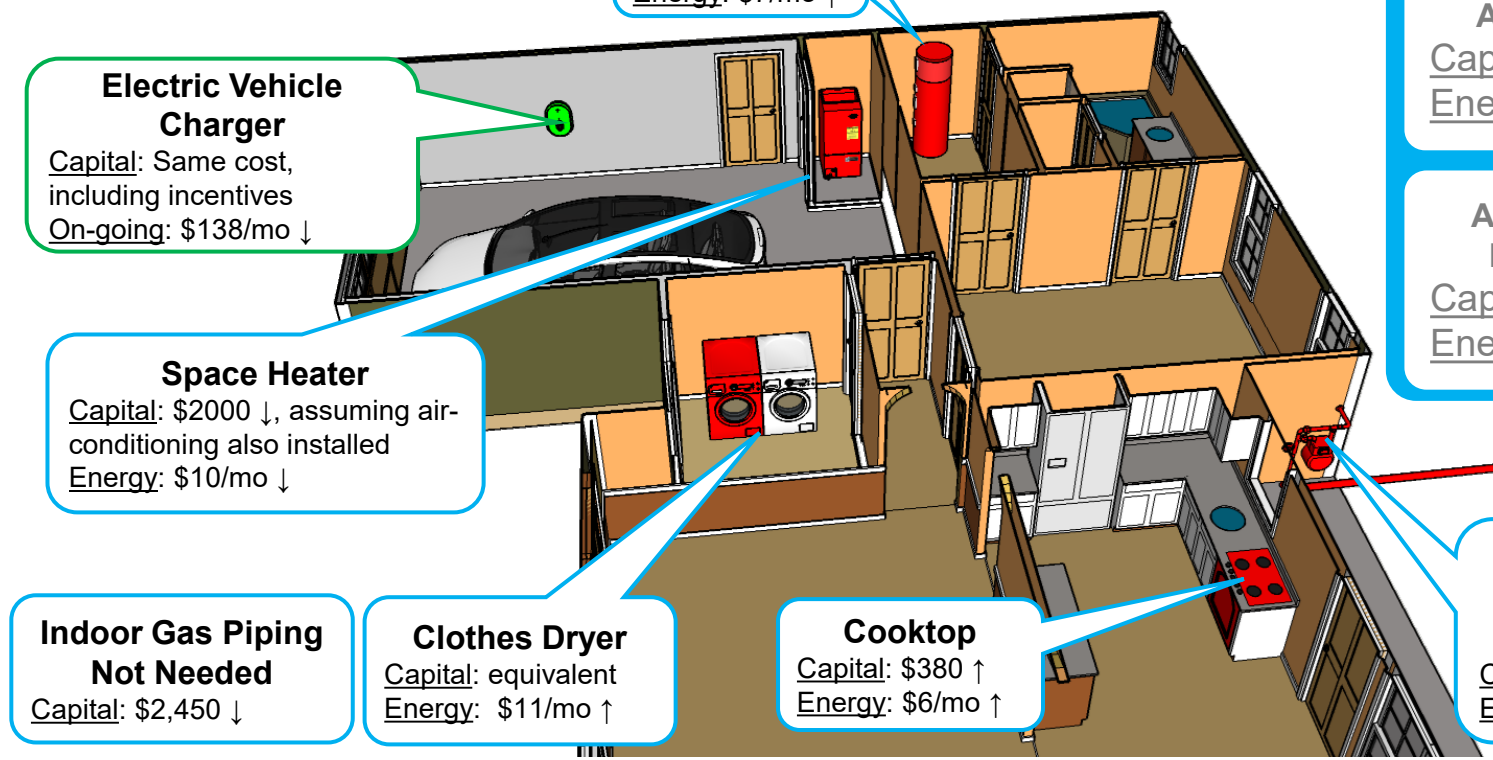
	Space Heating	Water Heating	Cooking	Clothes Drying
Residential				
Commercial				

Equipment Efficiency



Electrifying New Single Family Homes in the Bay Area – The Cost Story



Water Heater
Capital: $510 ↓
Energy: $7/mo ↑

Electric Vehicle Charger
Capital: Same cost, including incentives
On-going: $138/mo ↓

Space Heater
Capital: $2000 ↓, assuming air-conditioning also installed
Energy: $10/mo ↓

Indoor Gas Piping Not Needed
Capital: $2,450 ↓

Clothes Dryer
Capital: equivalent
Energy: $11/mo ↑

Cooktop
Capital: $380 ↑
Energy: $6/mo ↑

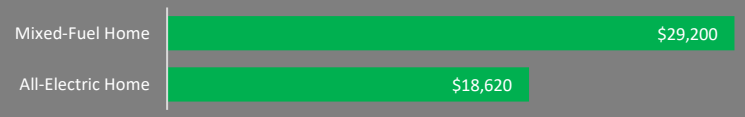
Gas Meter & Service Not Needed
Capital: $6,000 ↓
Energy: $7/mo ↓

Summary

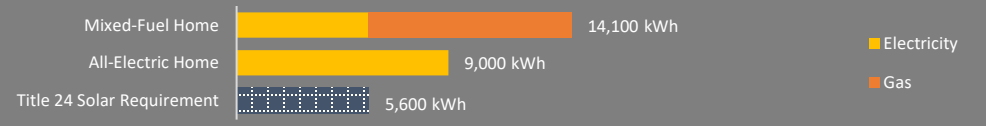
All-Electric Home
Capital: $10,580 ↓
Energy: $7/mo ↑

All-Electric Home, Increased Solar
Capital: Equivalent
Energy: $5/mo ↓

Capital Cost of Thermal Systems



Annual Energy Use & Generation



$191 Net Lifecycle Cost Savings per year for an all-electric home versus the mixed-fuel equivalent

3 MT CO2e Carbon Emissions Savings per home, per year based on 2030 grid mix

Capital and energy costs of thermal systems are based on Residential Building Electrification in California by E3 (April 2019); electricity costs assume CCA generation discount
All-Electric Home, Increased Solar bill impacts are based on Low-Rise Residential New Construction 2019 Cost Effectiveness Study by Frontier Energy (August 2019)
Version 8 10/21/2019

EV Charging Need and Technology

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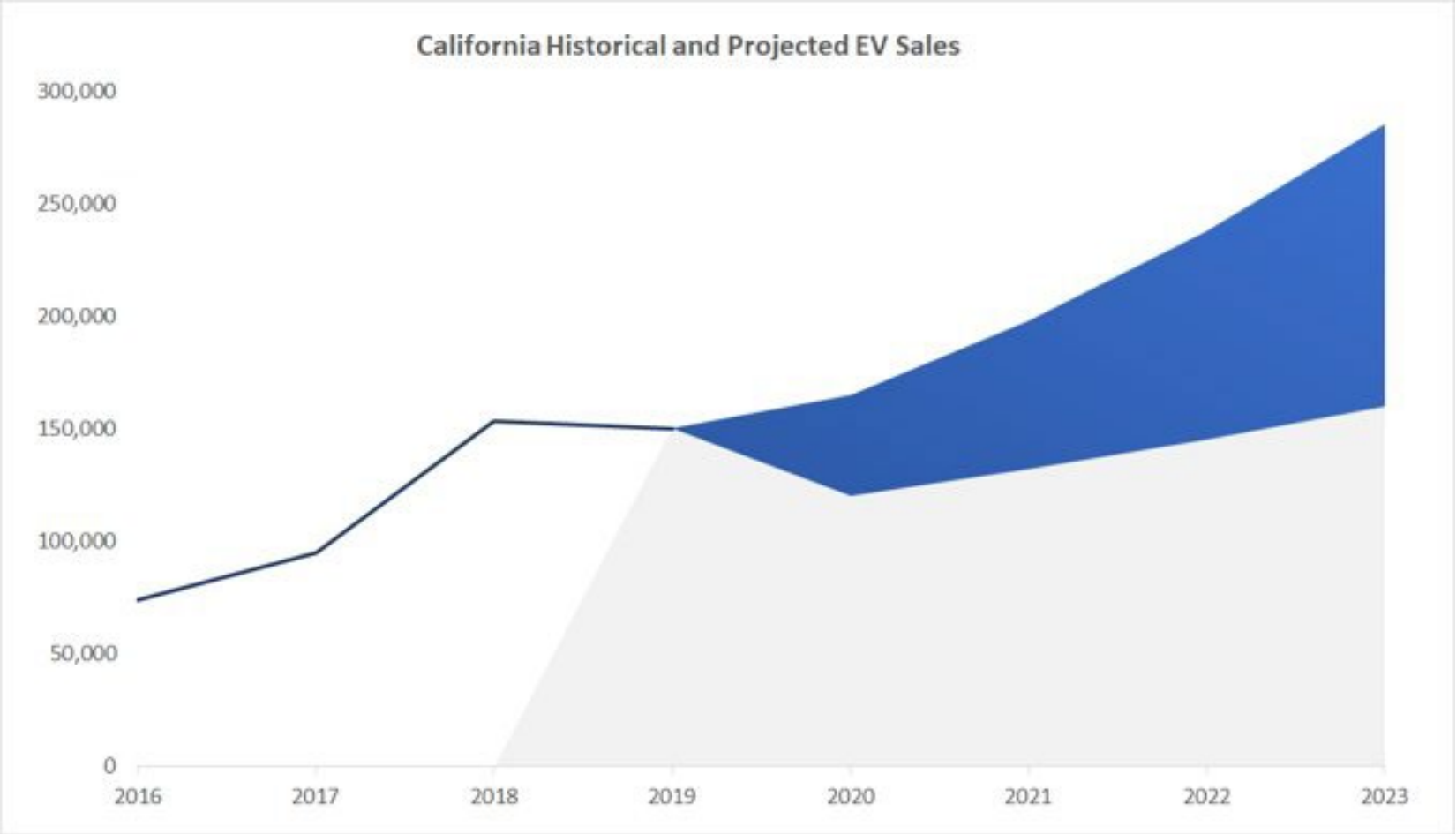
EV Charging Demand

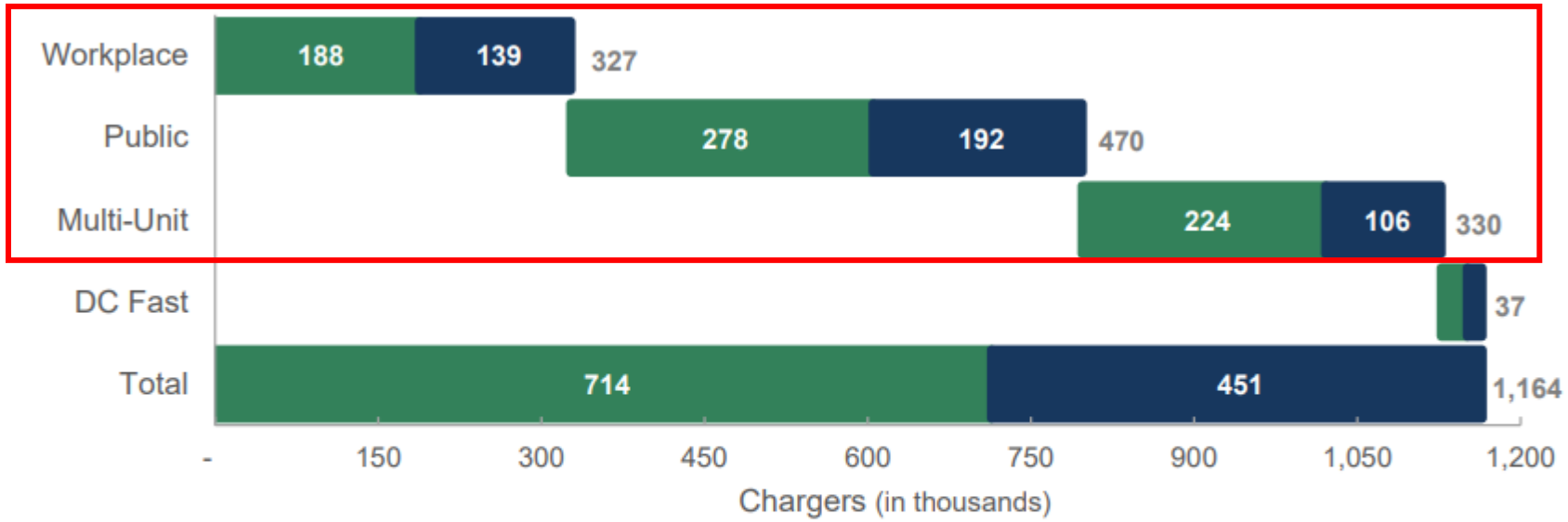
- Increase in light-duty EV ownership
  - 250,000 EVs sold in 2021, 12.5% of all vehicles
- Sale of gas vehicles phased out by 2035
- Pervasive issues
  - Costs of electrical upgrades
  - Underserved multi-family housing occupants



Sources: California Energy Commission, EO N-79-20

EV Charging Demand

Figure 1: Projected 2030 Charger Counts to Support 5 Million and 8 Million Light-Duty Zero-Emission Vehicles



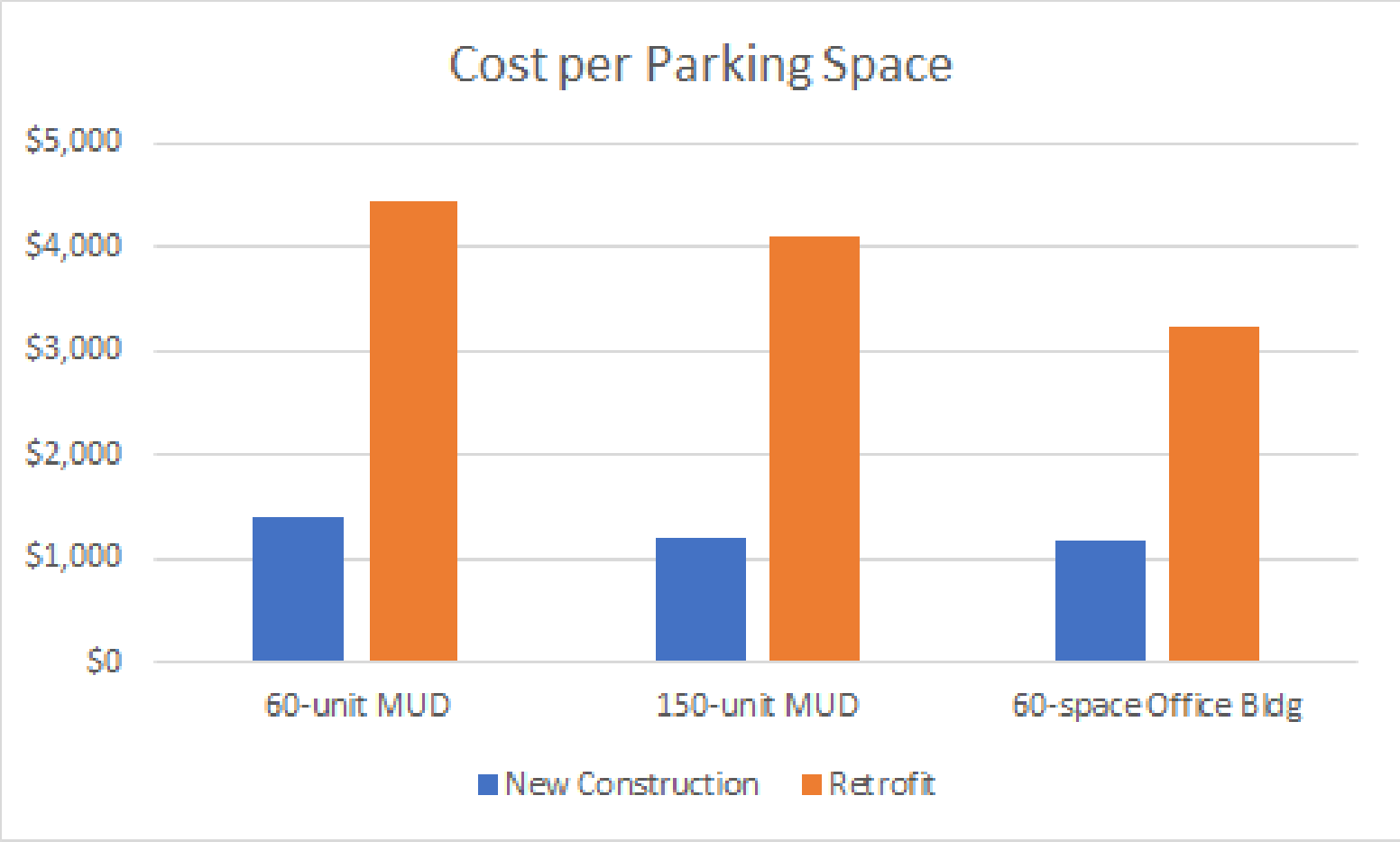
Models project that California will need more than 700,000 shared private and public chargers in 2030 to support 5 million ZEVs as called for in AB 2127 and nearly 1.2 million chargers to support 8 million ZEVs to achieve the goals of the Executive Order N-79-20. Counts for chargers at workplaces, public destinations, and multiunit dwellings generally indicate the number of Level 2 chargers needed. In some cases, Level 1 chargers may be sufficient at select multiunit dwellings. These values do not include chargers at single-family homes.

Source: CEC and NREL, AB2127 (2021)

AB2127 Requirements by 2030

CARB Estimates for 2030

Cost-Benefit - Building



- Retrofit costs shown are “best case”
- Retrofit can be much higher
  - PG&E retrofit 'cost-per-port’ ave. is $18,000
- Costs include wiring, switch gear, conduit, trenching, and secondary transformer

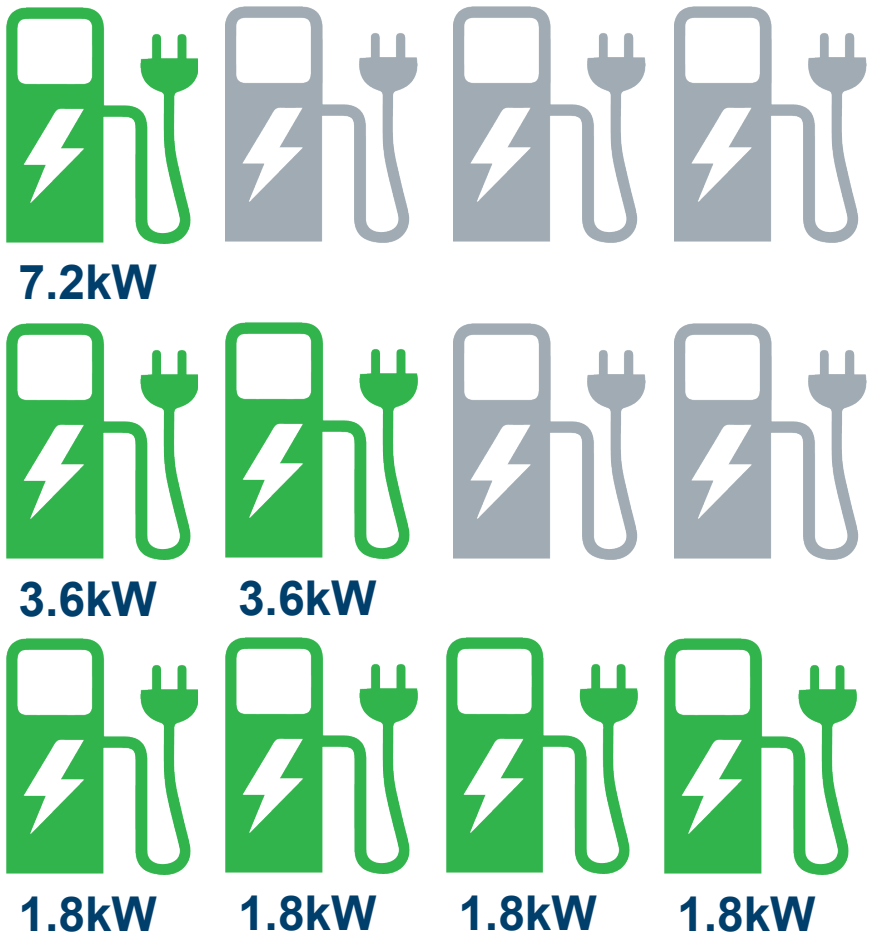
Sources: 1) Electric Vehicle Infrastructure Cost Analysis for PCE and SVCE 2) Pacific Gas and Electric Company EV Charge Network Quarterly Report, Q2 2020

Automatic Load Management

1 car charging

2 cars charging

4 cars charging



Discussion

What are the pros and cons of electrification for your industry?

How will electrification affect your next project?

2022 Reach Code Policy Models

1. 2022 California Energy Code
2. Reach codes
    A. Building electrification
    B. Electric Vehicle infrastructure
3. Discussion

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2022 CA Energy Code

New Construction

- Heat pumps are prescriptive baseline
  - Residential
    - Space heating in climate zone 3, 4
    - Water heating in climate zone 12
  - Nonresidential – water- and/or space-heating for most building types
  - Performance credit for all-electric design
- Residential
  - Pre-wiring required for gas appliances
  - Higher ventilation rate for gas stoves
  - Energy storage readiness
- Nonresidential - Solar PV and Battery Storage prescriptive

Existing Buildings

- Restricts newly installed electric resistance heating
- Simplified language for heat pump retrofits

Building Electrification – New Construction

All-Electric Municipal Ordinance

All-electric construction required

- Also restricts extension of any existing gas infrastructure

New construction definition

- If either of the below are replaced over 3 years for purposes other than repair or reinforcement
  - 50% of above-sill framing, or
  - 50% of foundation

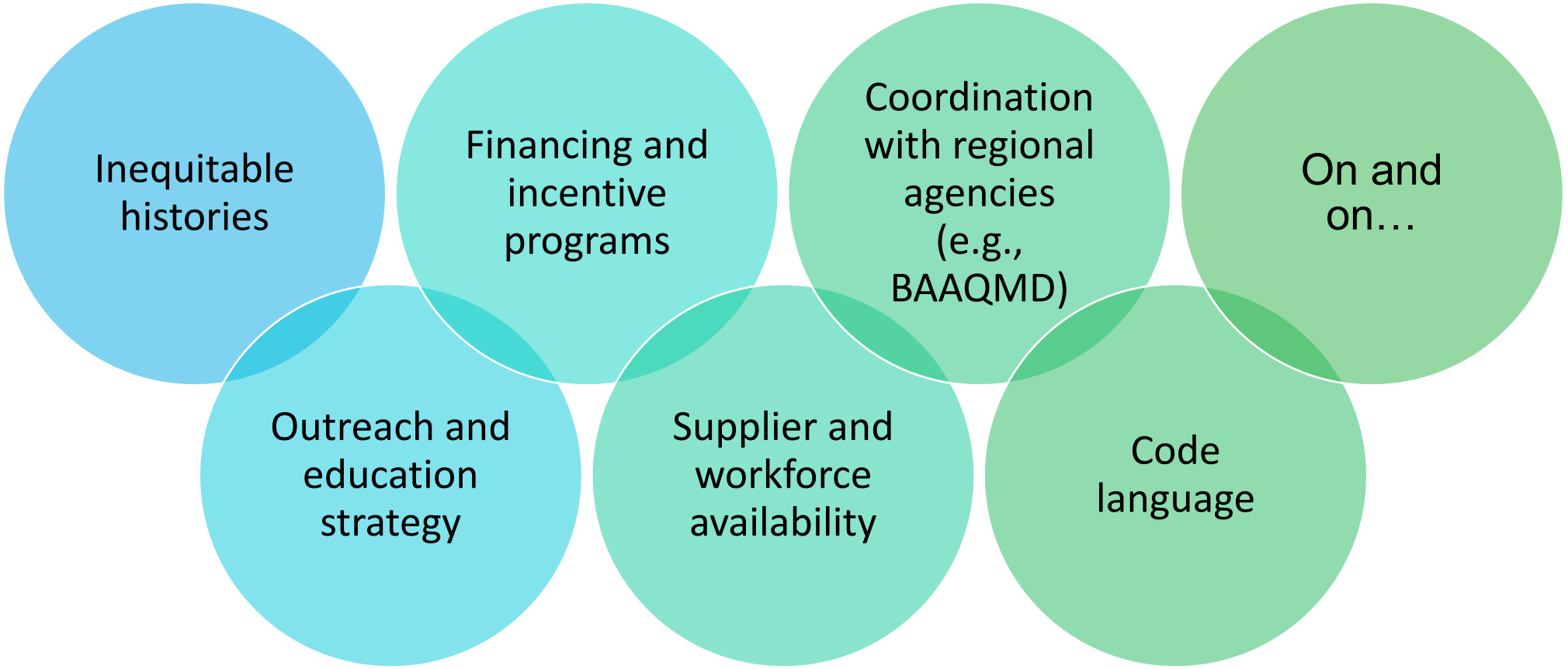
Optional exceptions

- Infeasible to construct according to CA Energy Code
- “Public interest”
- Technology-specific exceptions expiring in 2025 (e.g., cooking, laundry)
- Electric-readiness required
  - Pre-wiring
  - Physical space

Find our codes on:

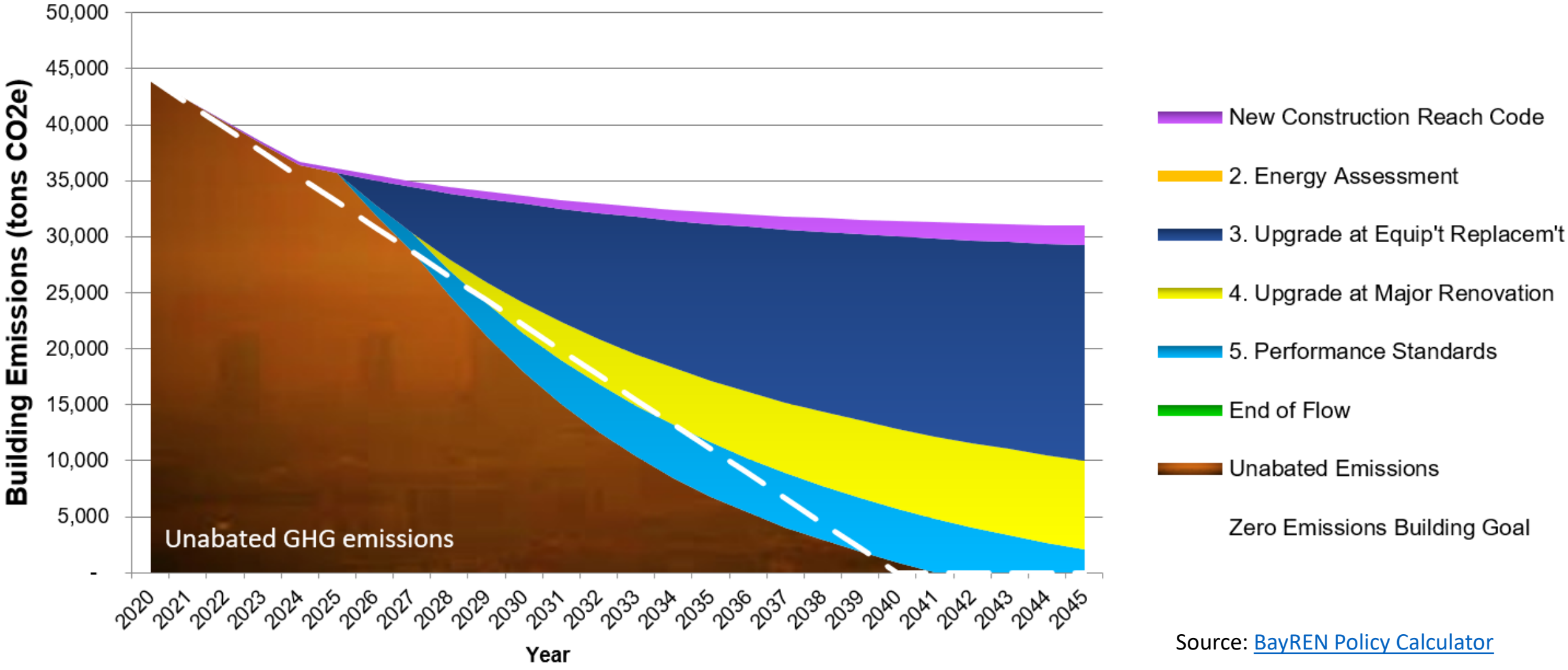
BayAreaReachCodes.Org

Building Electrification – Existing Buildings



We Need Every Tool in the Box

Forecast of Cumulative GHG Emission Impacts from Selected Policy Options



Source: BayREN Policy Calculator

Time of Permit – Electric Required

DRAFT

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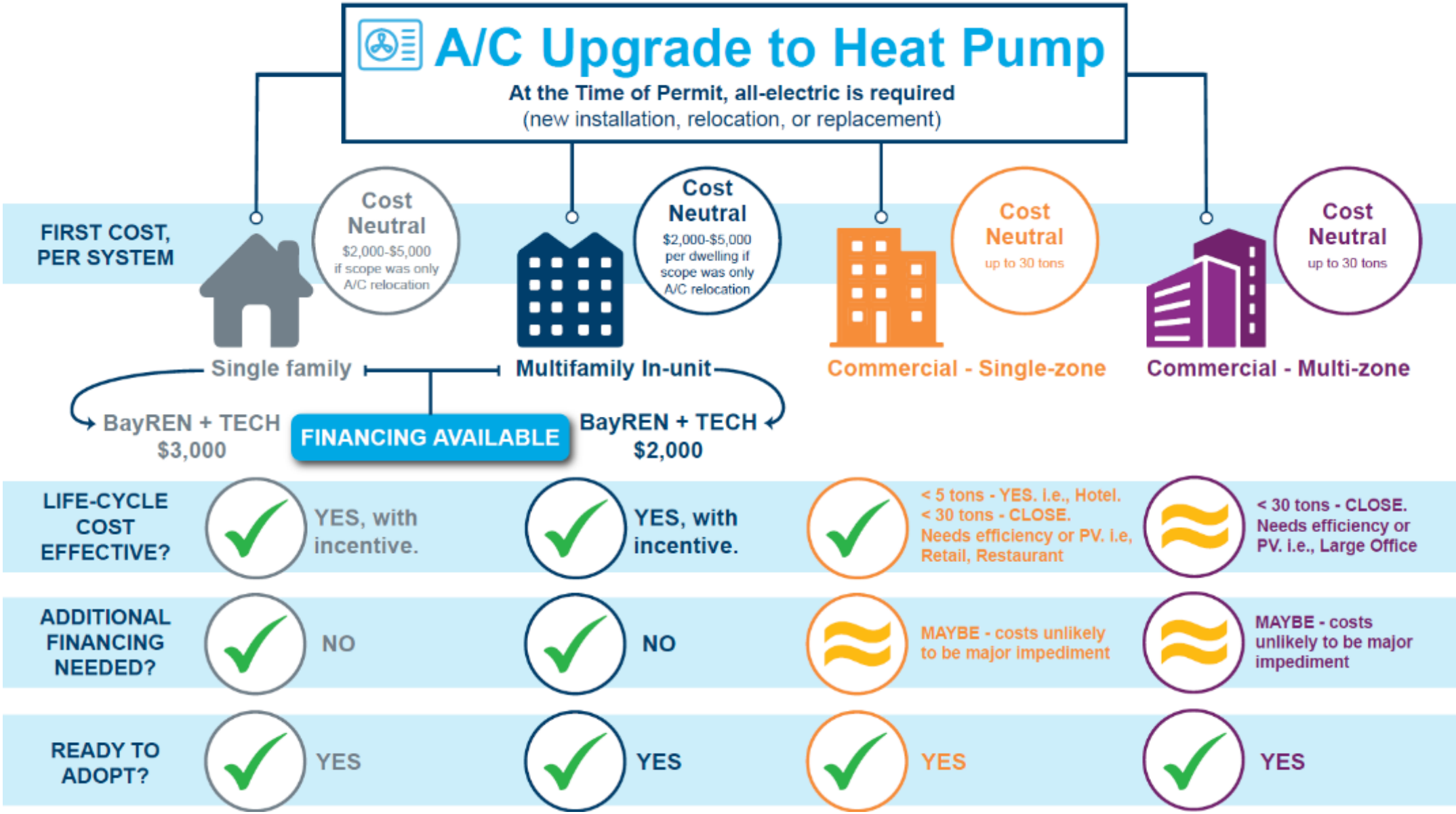


EV Code Terminology

Speed

Level 1
3-4 miles per charging hour

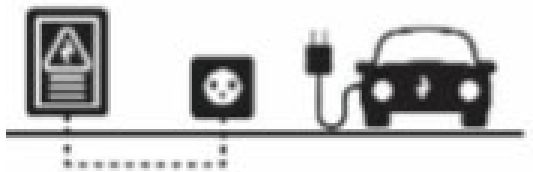
Level 2
10-20 miles per charging hour

Level 3
150+ miles per charging hour

Readiness

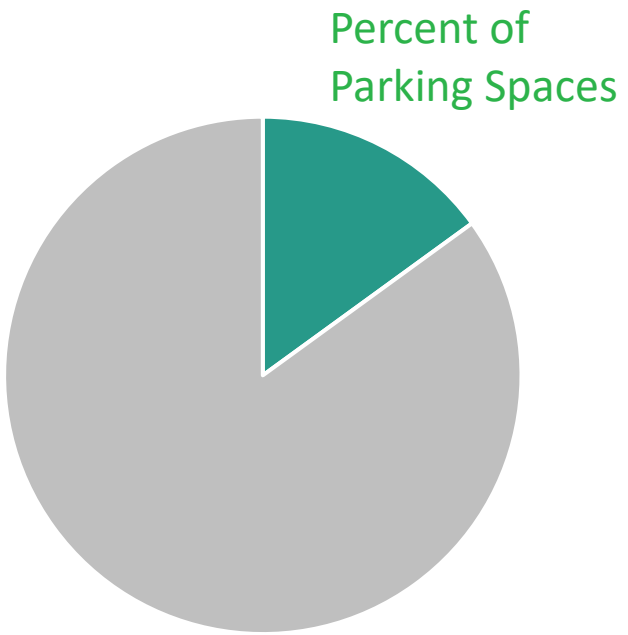
EV **Capable**

EV **Ready**

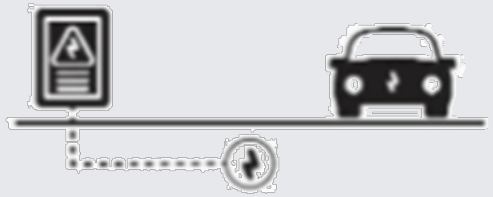


EV **Charging Station**

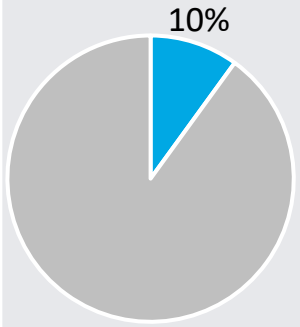
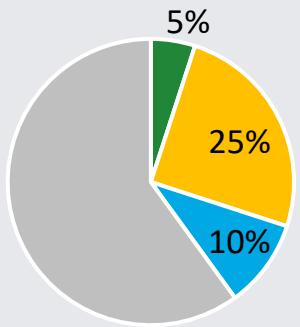
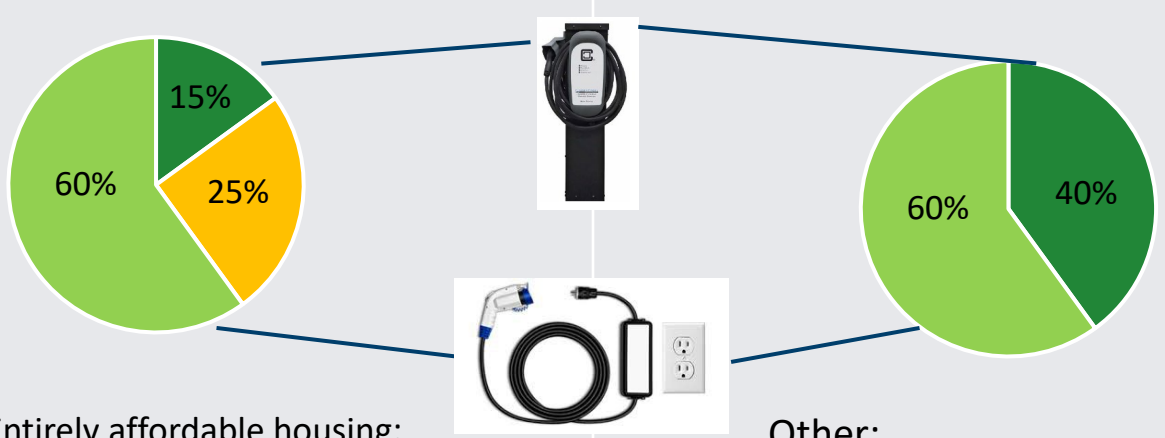
Number



EV Infrastructure – New Construction

	2019 CALGreen	2022 CALGreen	Model Code
	Mandatory	Mandatory	
Single Family Homes and Two-Family Townhomes	(1) Level 2 EV Capable for one parking space per dwelling unit 	2 EV spaces total: • 1 Level 2 EV Ready circuit • 1 Level 1 EV Ready circuit     	

EV Infrastructure – New Construction

	2019 CALGreen	2022 CALGreen	Model code
	Mandatory	Mandatory	
Multi-Family	% of Parking Spaces	% of Parking Spaces	% of *Dwelling Units with* Parking Spaces
			
	10% Level 2 EV Capable	**5%** Level 2 EVCS **25%** Level 2 EV Ready (low-power) **10%** Level 2 EV Capable	Entirely affordable housing: **15%** Level 2 EVCS **25%** L2 EV Ready (low-power) **60%** Level 1 EV Ready Other: **40%** Level 2 EVCS **60%** Level 1 EV Ready

AUTOMATIC LOAD MANAGEMENT ENCOURAGED

100% Access Doesn't Need to Cost More

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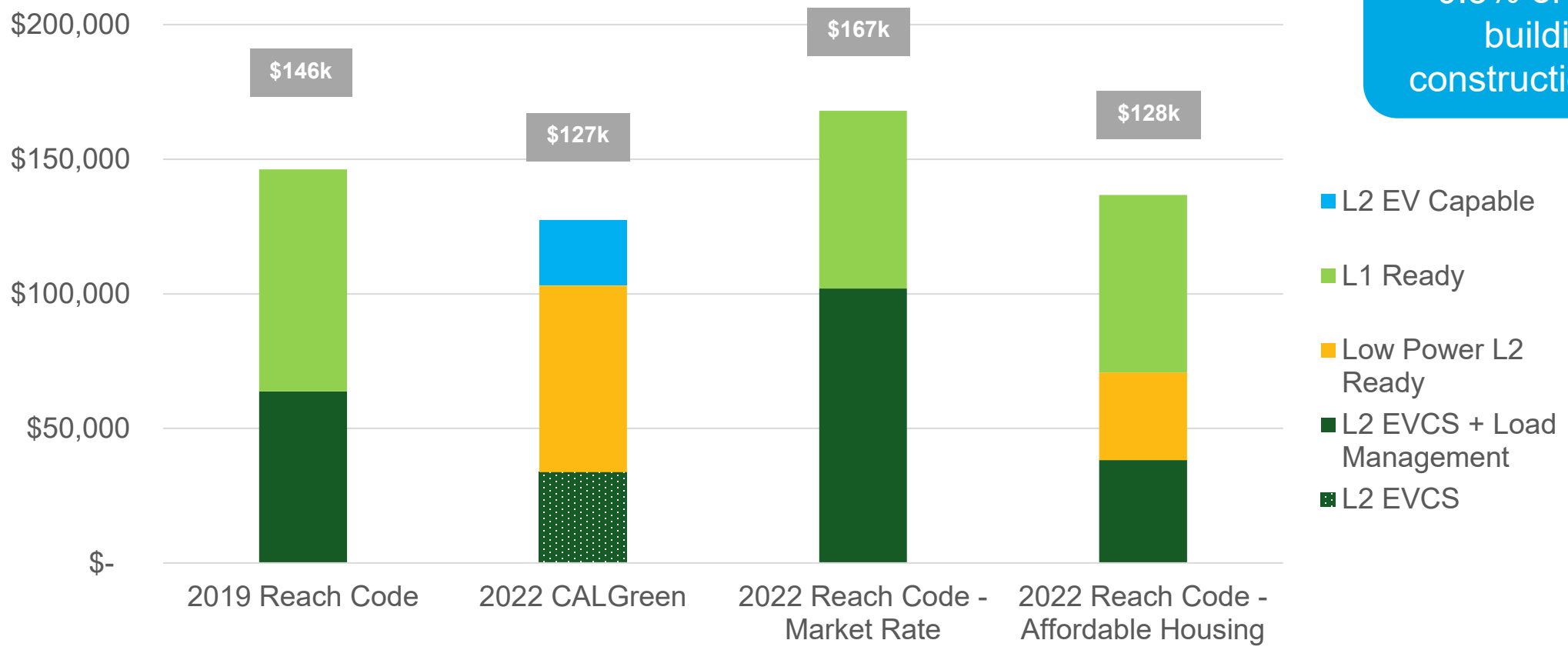
EV Infrastructure Cost for 100-Dwelling Multifamily Building



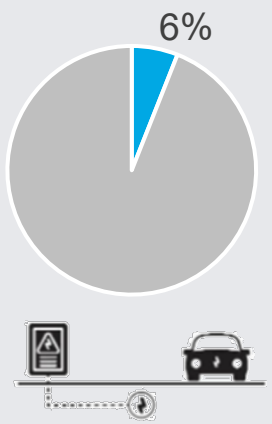
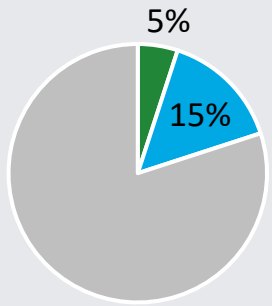
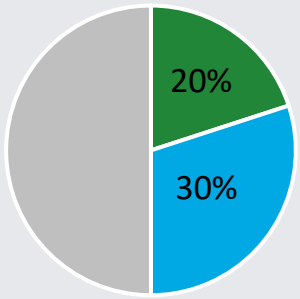
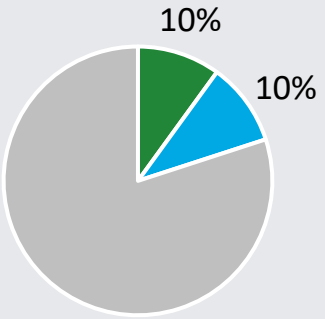
Each scenario is ~0.3% of whole-building construction cost

% of dwellings with access	100%	40-60%	100%	100%

Assumes $392/ft^2

Source: Turner and Townsend, 2021

EV Infrastructure – New Construction

	2019 CALGreen	2022 CALGreen	Model Code	
	Mandatory	Mandatory		
Non-Residential	 **6%** Level 2 EV Capable	 **5%** Level 2 EVCS **15%** Level 2 EV Capable	 Offices: **20%** Level 2 EVCS **30%** Level 2 EV Capable	 All other: **10%** Level 2 EVCS **10%** Level 2 EV Capable

EV Infrastructure – Existing Buildings

Alterations or additions

- **Single Family –** Parking additions or electrical panel upgrades must meet new construction requirements

- **Multifamily** →
- **Nonresidential** →

When new parking facilities are added, or electrical systems or lighting of existing parking facilities are added or altered and the work requires a building permit, ten percent (10%) of the total number of parking spaces added or altered shall be EVCS.

Time certain policy

- By January 1st, 2025, multifamily and nonresidential properties shall upgrade existing EV Capable spaces required by the locally adopted codes at the time the building was permitted to a minimum of Level 1 EV Ready.

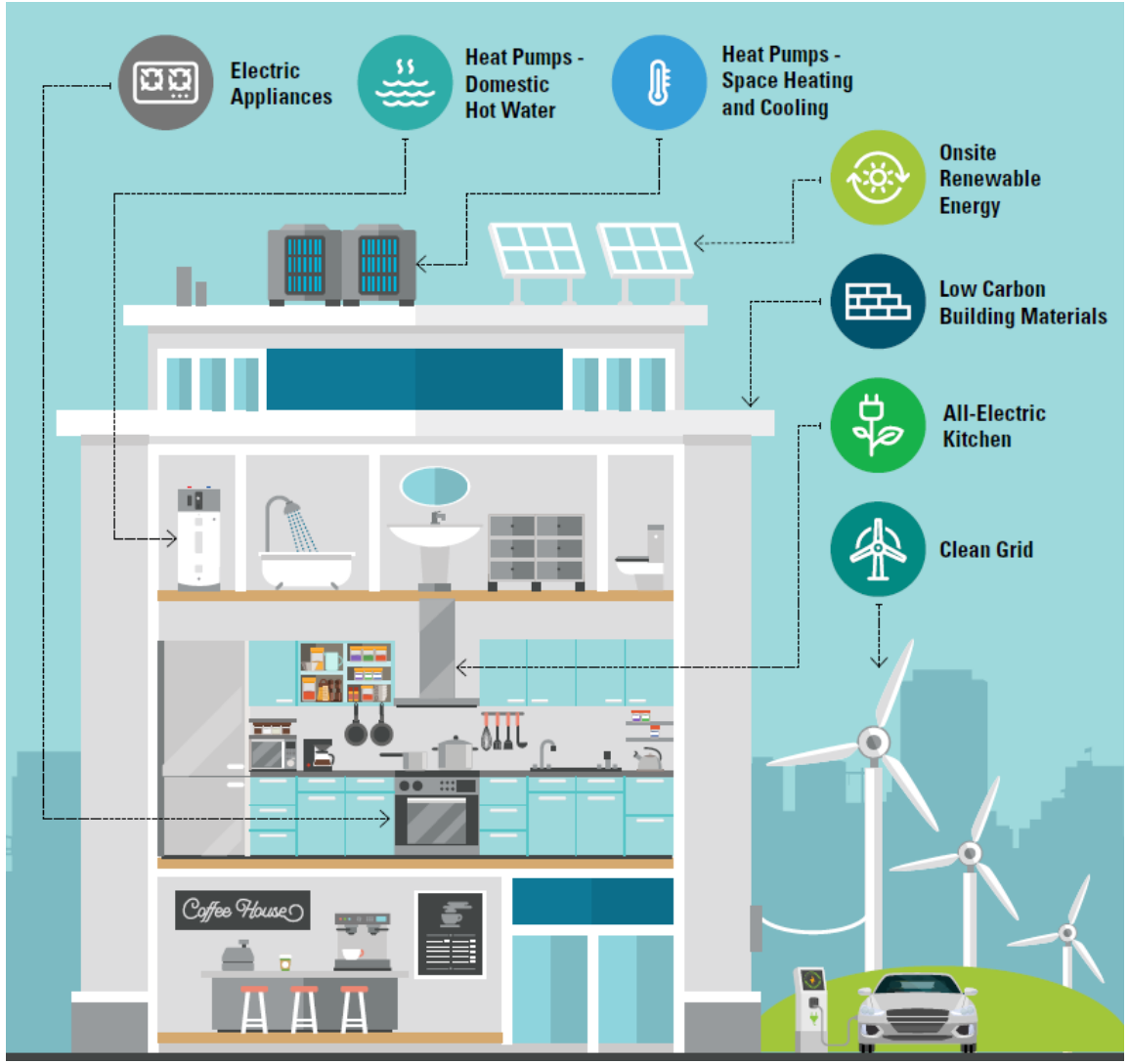
Discussion

How might these codes impact your business practices?

What would you like to see in locally adopted codes?

Industry Resources

- www.AllElectricDesign.Org
  Provides free technical assistance on custom projects for practitioners or residents
- Building Electrification Technology Roadmap -
  Covers the technical capabilities of a variety of end-uses
- Building Decarbonization Practice Guide
  Guides architects and engineers towards best practices during design development
- Ecosizer
  Guides engineers and energy consultants for proper design of central heat pump water heating systems



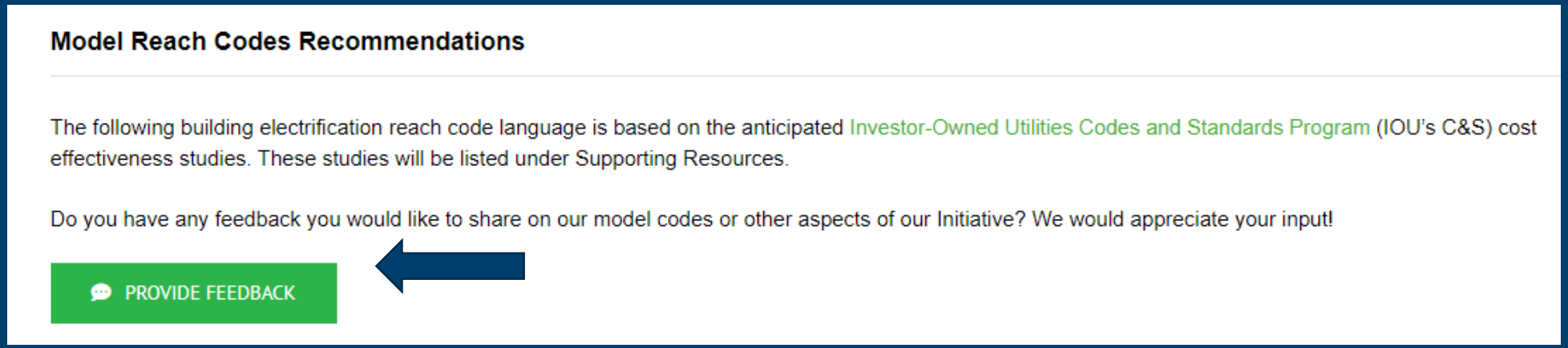
Incentive Programs

Property Category	Property Type	Port Type	Port Incentive	Applicable Cap
Existing	Multi-Unit Dwelling	L1 outlet	**$2,000**	No cap
		L2 EVSE port	**$4,500**	75% of costs, up to $36k
	Affordable Housing Multi-Unit Dwelling	L1 outlet	**$2,500**	No cap
		L2 EVSE port	**$5,500**	Up to $36,000
	Workplace	L1 outlet	**$2,000**	No cap
	Any	Make Ready circuit	**$2,000**	Up to $20,000
New	Market Rate Multi-Unit Dwelling (Above Code)	L1 outlet	**$1,000**	No cap
		L2 EVSE port	**$2,000**	Up to $40,000
	Affordable Housing Multi-Unit Dwelling	L1 outlet	**$1,500**	No cap
		L2 EVSE port	**$2,500**	Up to $100,000
New or Existing	Any	Resilient L2 or DCFC port	**$10,000**	Up to $50,000

Source: Peninsula Clean Energy EV Ready Program

Please share your opinions

Please review the codes posted on BayAreaReachCodes.org and share feedback



- What opportunities and challenges do you expect in 2022-23?
- Are the code concepts appropriate for your City/County?

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Thank you!
Next Meetings:

February 15 – Building Industry: Deep Dive into Model Codes

February 16 – Community: Deep Dive into Model Codes

March 8 – ICC Tri-Chapter briefing

March 9 – CALBIG briefing

Visit us at: BayAreaReachCodes.Org

Common Concerns (1 of 2)

Concern	Response
Distribution grid upgrades are expensive	**Sometimes true**. Costs are offset by savings of all-electric construction.
Resilience, power-shutoffs	**Real problem, but gas does not help**. Gas appliance ignition is electric. In emergencies gas is also shut-off. State policy for grid hardening is key.
Uniformity	**Fair Concern, but all-electric is simpler & not adopting ensures future risk**. PCE and regional partners are encouraging consistency. All-electric is simple and inaction locks in future cost (retrofits, rates) and risk (fire).
In multifamily, central heat pump water heating requires more design expertise and space than gas boilers.	**True, training needed.** There are scores of working systems, but best practice guidance is available.

Common Concerns (2 of 2)

Concern	Response
All-Electric heating uses too much energy or can't work in our cool climate	**False. All-electric heat pumps are highly efficient and effective** in weather far colder than ours. DOE studies show heat pump space heaters as highly efficient at as little as 5 degrees Fahrenheit.
Energy is not clean	**False**. PCE base service is 100% GHG free today
Equipment is not available	**Mostly false**. Some scenarios for high-volume or steam applications are more challenging to address. Heat pumps and induction stoves have a long-established history, are widely adopted in other states, but market awareness needs to grow. PCE is addressing training needs.

Will Electrification Reduce Resilience?

Heat Pump Space Heating

Gas furnaces require electric fans, but fireplaces still work.

Heat Pump Water Heating

Gas water heaters require electronic ignition or pumps

Induction Cooking

Gas stoves will work without electricity, but it's unsafe

Electric Clothes Drying

Gas dryers use electric motors to run tumbler

Can the Grid Handle the Load Increase?

- California Energy Commission's AB3232 analysis indicates that *aggressive* electrification will result in **20 percent additional summer peak load** through 2030. Winter load expected match summer peak load.*

- The electricity suppliers have a **service obligation** to meet your needs. "**PG&E fully expects to meet the needs** that all-electric buildings will require" -Robert S. Kenney, Vice President, PG&E

- CEC has noted **electrification as the lower cost, lower risk approach** to decarbonization

- CA-ISO has performed a 20-year study and has recommended **over $30B in transmission investments** to account for increased renewables and decommissioned gas power plants

Sources: 1) AB3232 Decarbonization Assessment 2021 2) CA Energy Commission 2018 3) CA-ISO 4) CPUC 2021

**Represents PG&E territory. Assumes all-electric for 100% new construction, 90% replace on burnout, and 70% early retirement for remaining existing buildings.*

2019 Reach Code Initiative - Litigation

1. **Berkeley – Municipal all-electric ordinance**: Federal court **rejected** the plaintiff challenge because the ordinance does not directly regulate either energy use or energy efficiency of covered appliances. Plaintiff has appealed.
2. **Windsor – Energy Code (Part 6) amendment**: Agency **repealed** reach code because the Town could not sufficiently fund legal defense of all-electric reach code.
3. **Santa Rosa – Energy Code (Part 6) amendment**: CA court **rejected** plaintiffs claims regarding CEQA analysis for all-electric reach code. Plaintiff has appealed.

Takeaway: Pending appeals, both a municipal code or building code amendment seem legally defensible.

Sources: (1) Climate Case Chart 1 January 2021 (2) CCC 2 January 2021 (3) CCC 3 June 2021)

Building Electrification – Existing Buildings

Our Approach →

Summarize codes and development processes

- Point of permit
- Building performance standards
- Point of sale

Prioritize

- Stakeholder engagement
- Building stock assessment
- Financing strategy
- Policy considerations

Develop code for "low-hanging fruit"

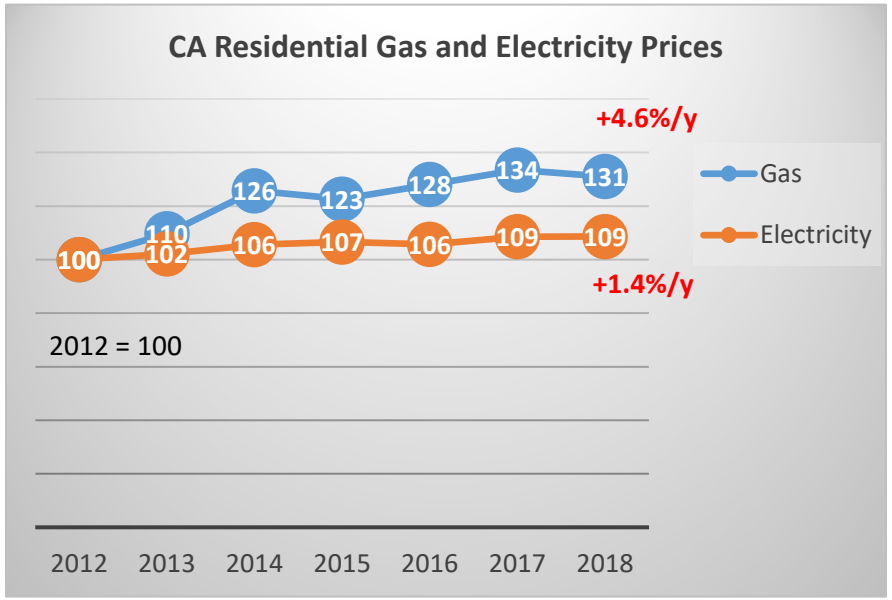
- Air-conditioning installations, new pool permits
- "End of flow" date

Reference useful tools

- Statewide Utility Program
  - Cost-effectiveness studies
  - Electric-preferred retrofit ordinance
- BayREN Policy Calculator

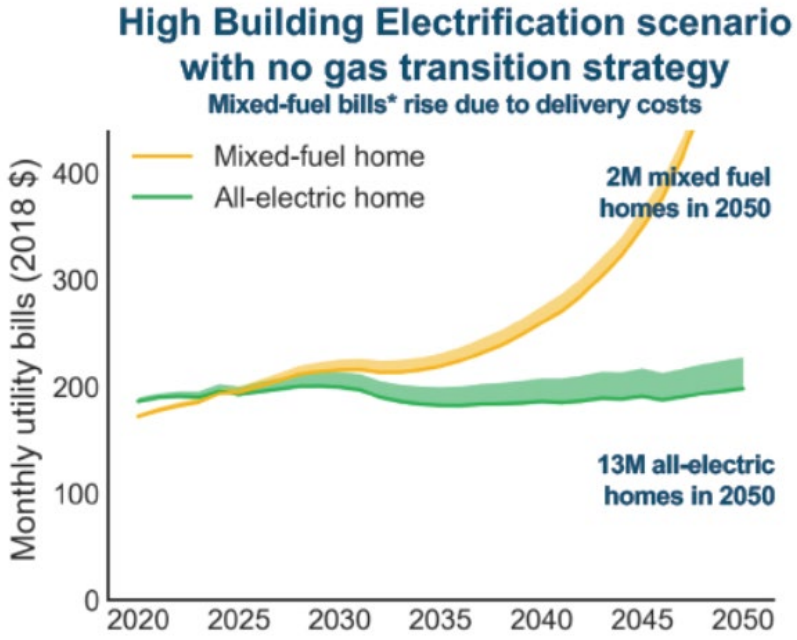
Natural Gas Costs Climbing

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

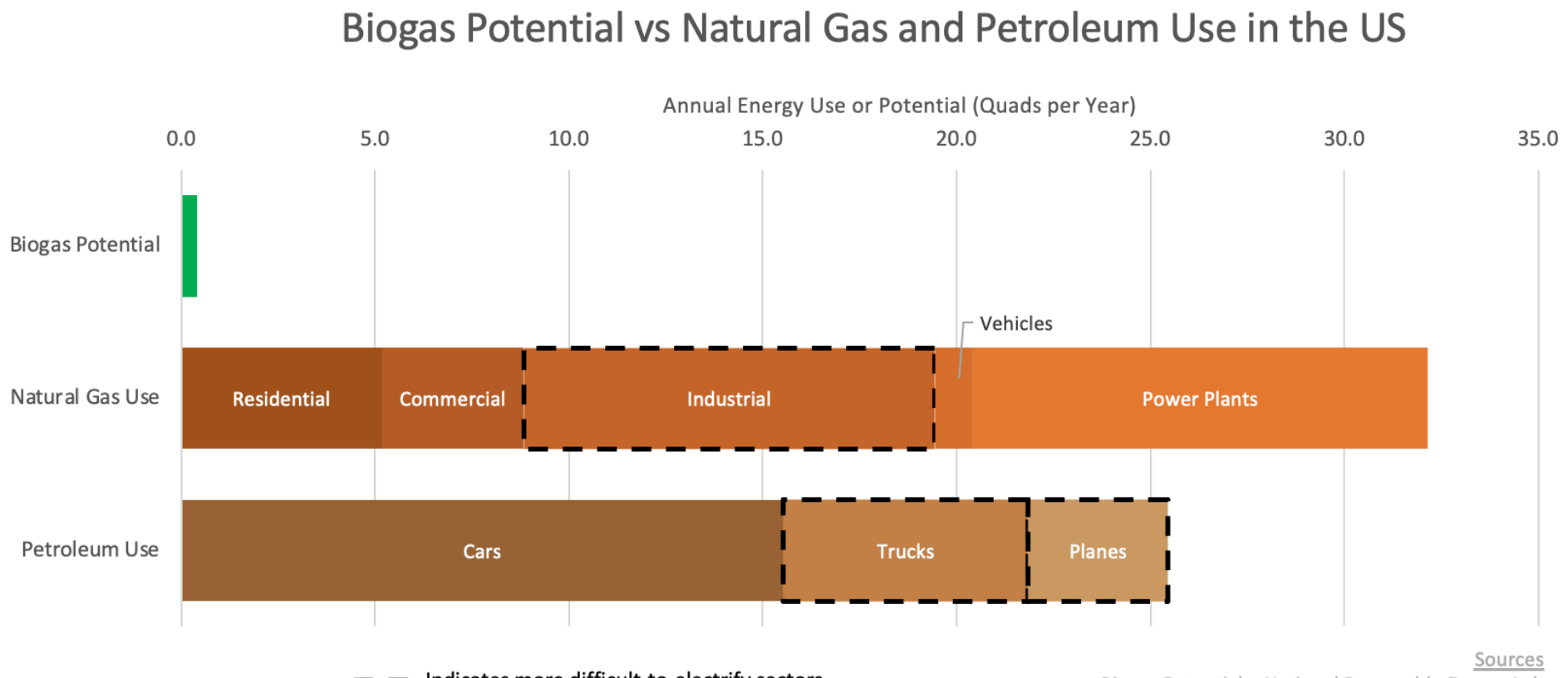
The AB3232 Report represents the most current CEC research supporting that *Aggressive Electrification* is the primary pathway to meeting GHG reduction targets.

Stoves: Consumer Reports Prefers Induction

6 of top 8 Ranges for 2020 were electric, top 2 were Induction

Fuel	Model	Consumer Reports Rating	Cost
Induction	GE Profile PHS930SLSS	86	$2,432
Induction	Kenmore Elite 95073	84	$1,525
Gas	LG Signature LUTD4919SN	84	$3,000
Induction	LG LSE4617ST	82	$2,500
Induction	LG LSE4616ST	82	$1,700
Smoothtop	Whirlpool WGE745c0FS	82	$1,000
Gas	Samsung NY58J9850WS	81	$2,725
Induction	Frigidaire Gallery FGIF3036TF	81	$1,035

Biogas Can’t Get Us There



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LEADING CAUSES OF HOME STRUCTURE FIRES: 2010-2014

by National Fire Protection Agency