



2022 Reach Codes Initiative

Advancing safer, healthier and more
affordable buildings and vehicles

Community Forum – February 16, 2022

BayAreaReachCodes.Org



Team Introductions



LEADERSHIP

Peninsula Clean Energy



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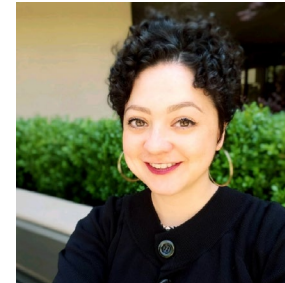
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CONSULTANTS

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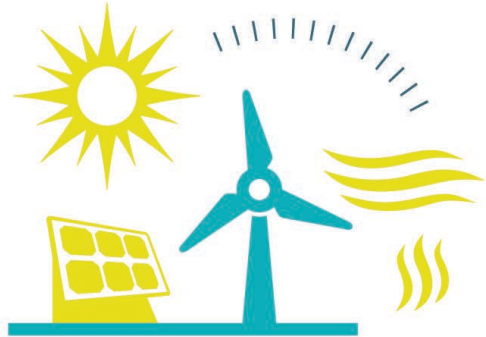
Mayra Vega

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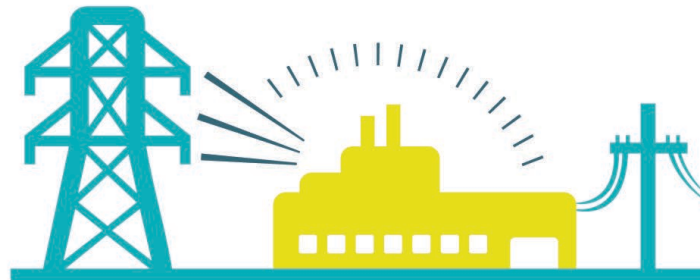
Non-profit, locally-led electricity providers



Source

EBCE, PCE, SVCE

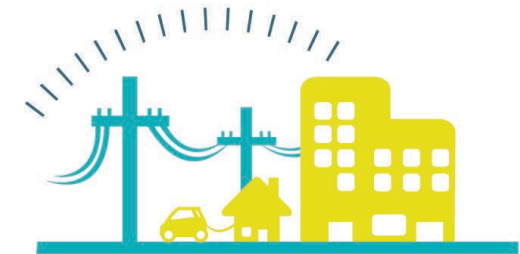
buy and build cleaner
energy



Delivery

PG&E

deliver energy, repair lines,
handle billing



Customer

YOU

benefiting from cleaner energy,
local control

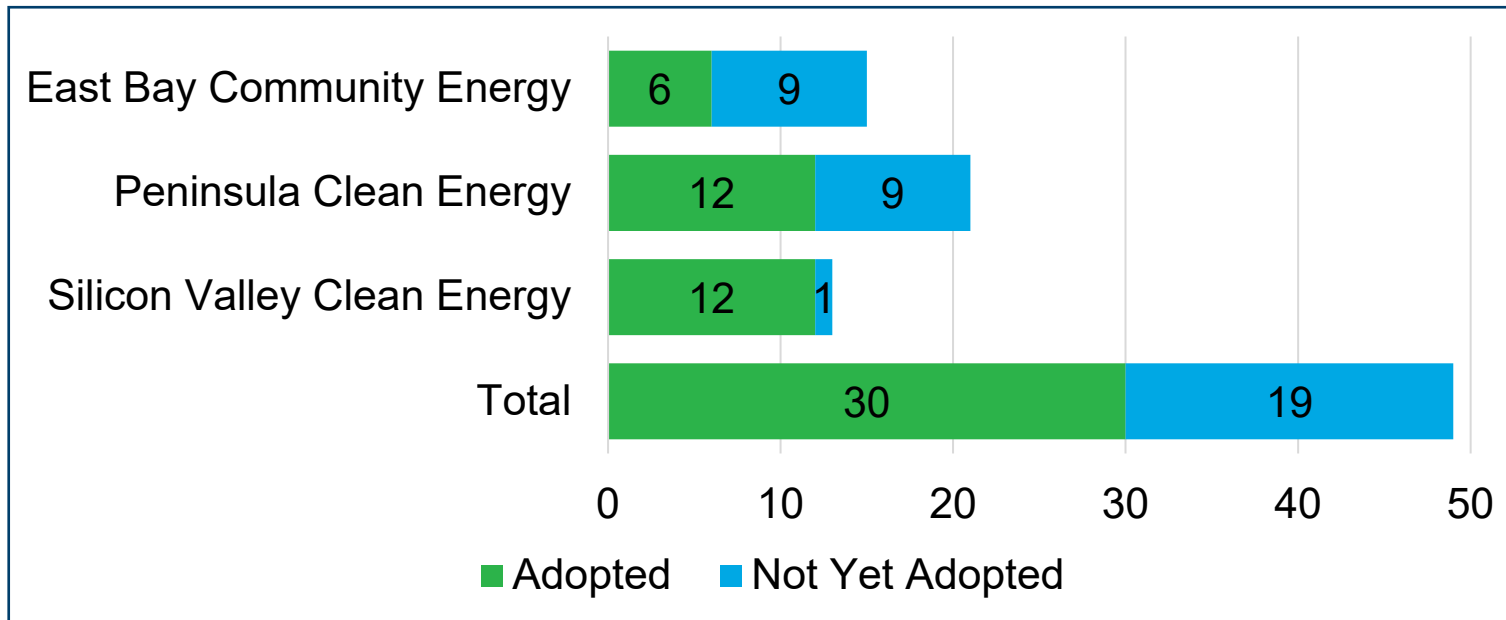
What are Reach Codes?



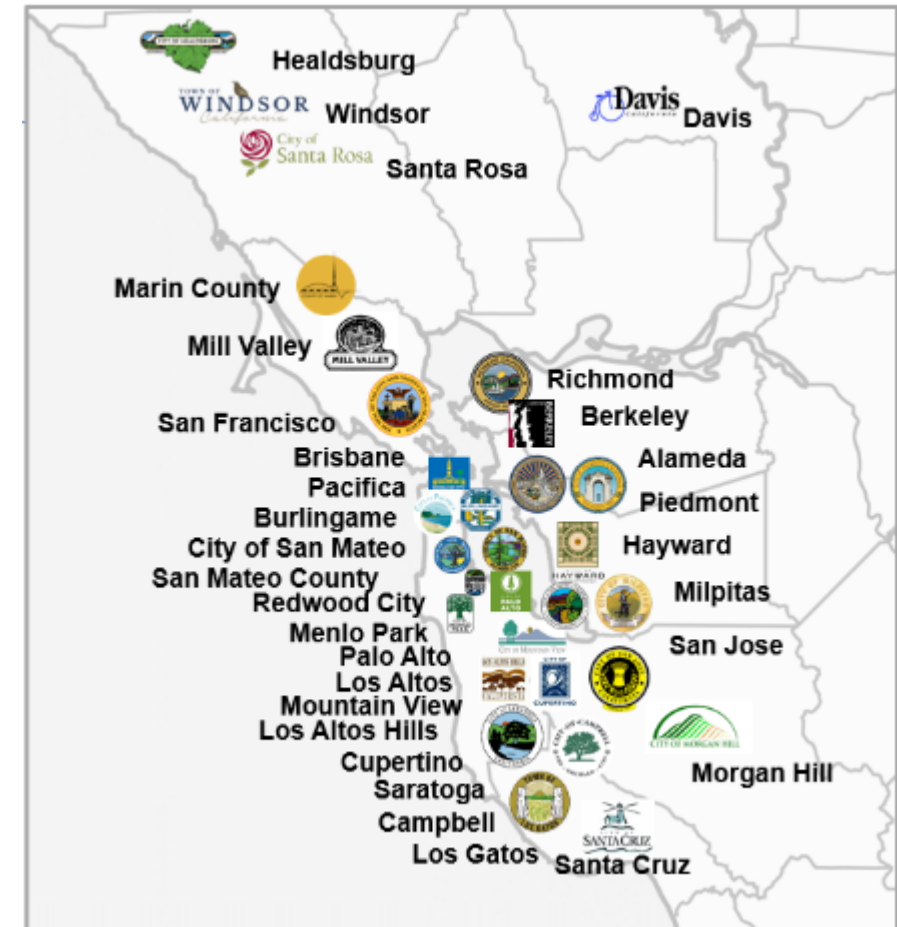
- Local enhancements to state code
- Can be adopted at any time
- Addresses:
 1. Building electrification – reduced use of methane gas
 2. Electric vehicle (EV) charging infrastructure – increased readiness
- Improves economic and energy performance of buildings

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

March-May
Cost
effective
studies

**September-
October**
Local
adoption

February
Begin on-
going
outreach

June
2nd draft
reach
codes,
outreach

**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

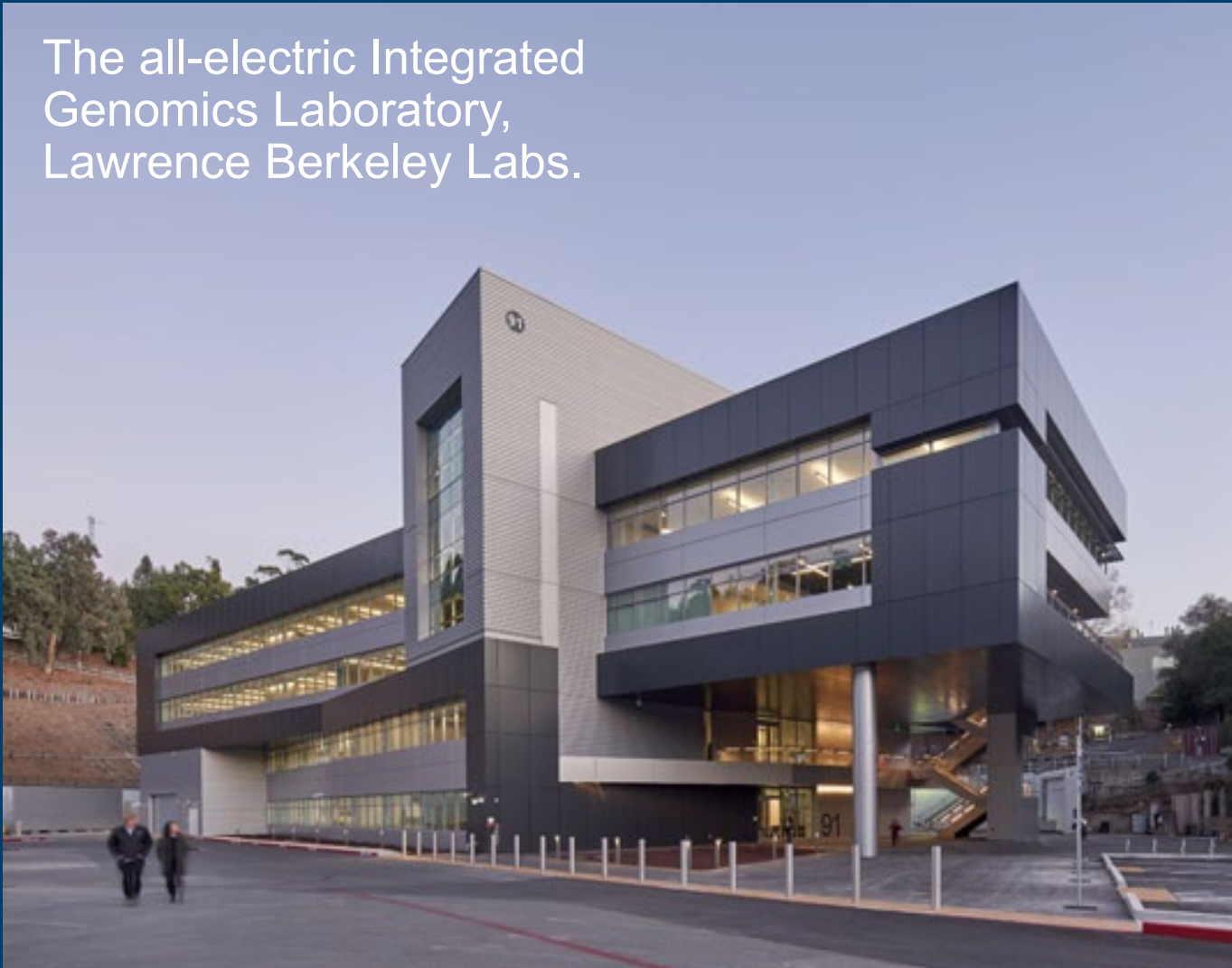


Discussion

What are your hopes and concerns for a Reach Code in your community?

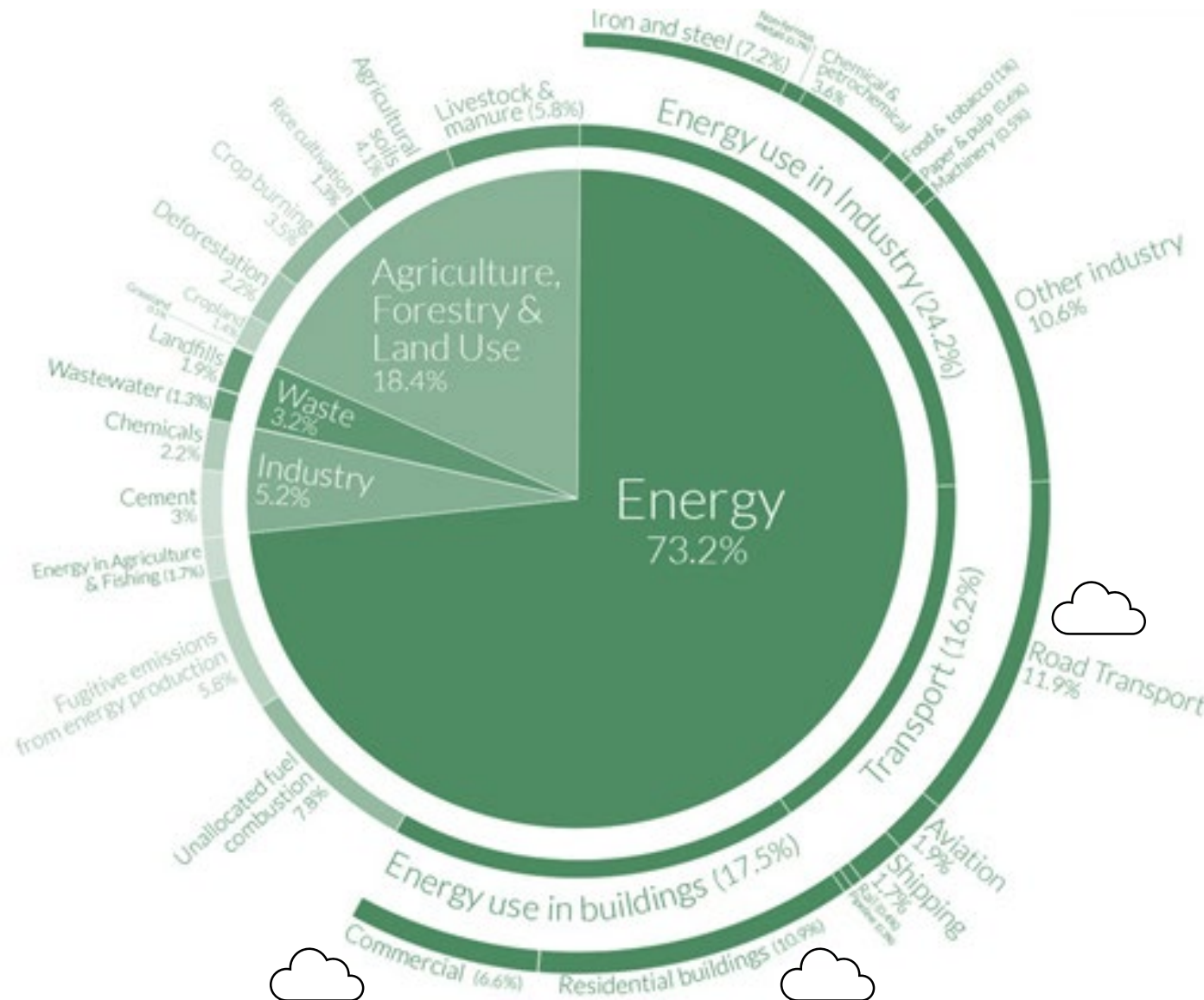
Technology and Feasibility

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



Source: [Rutherford + Chekene](#)

Global Carbon Emissions Sources



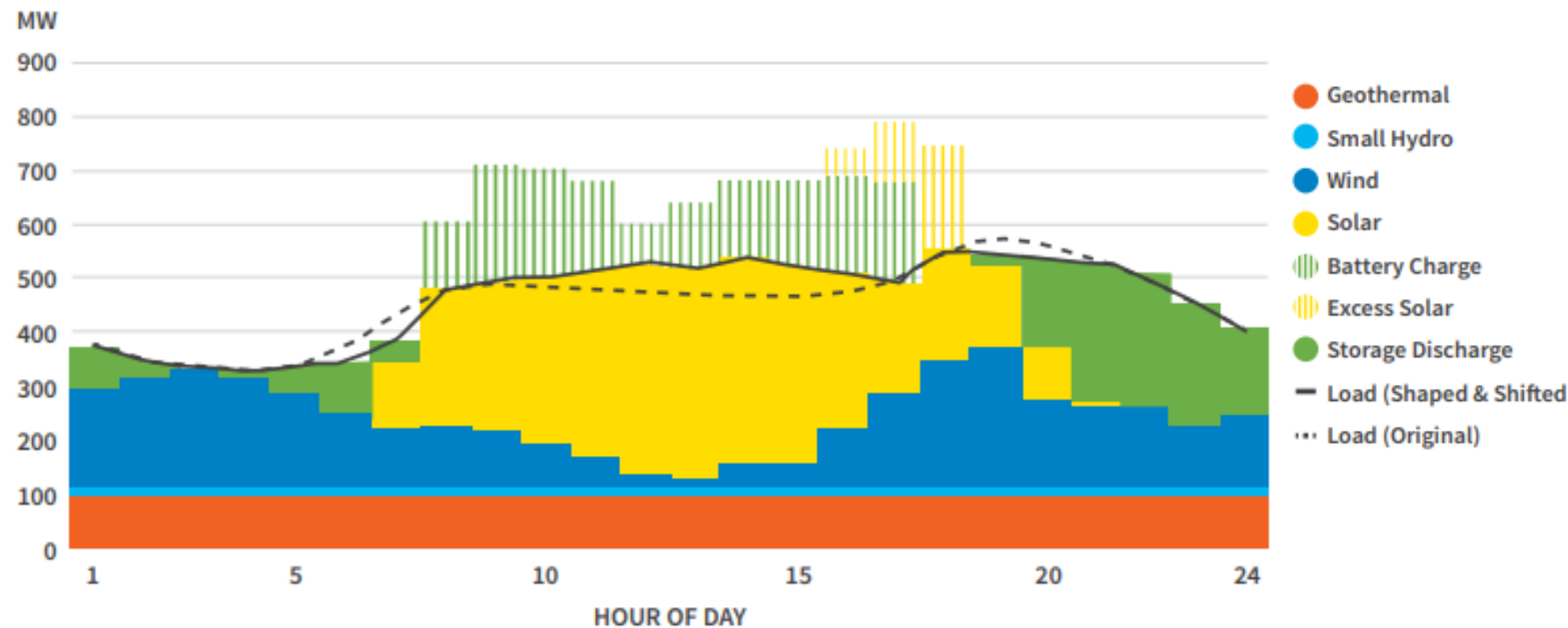
18% Commercial & Residential Buildings
12% Road transport

Source: [Shayle Kann, Climate Tech VC](#)

In CA, these emissions are overwhelmingly associated with methane gas equipment that can be electrified

Electrification, Compared to Fossil Fuels

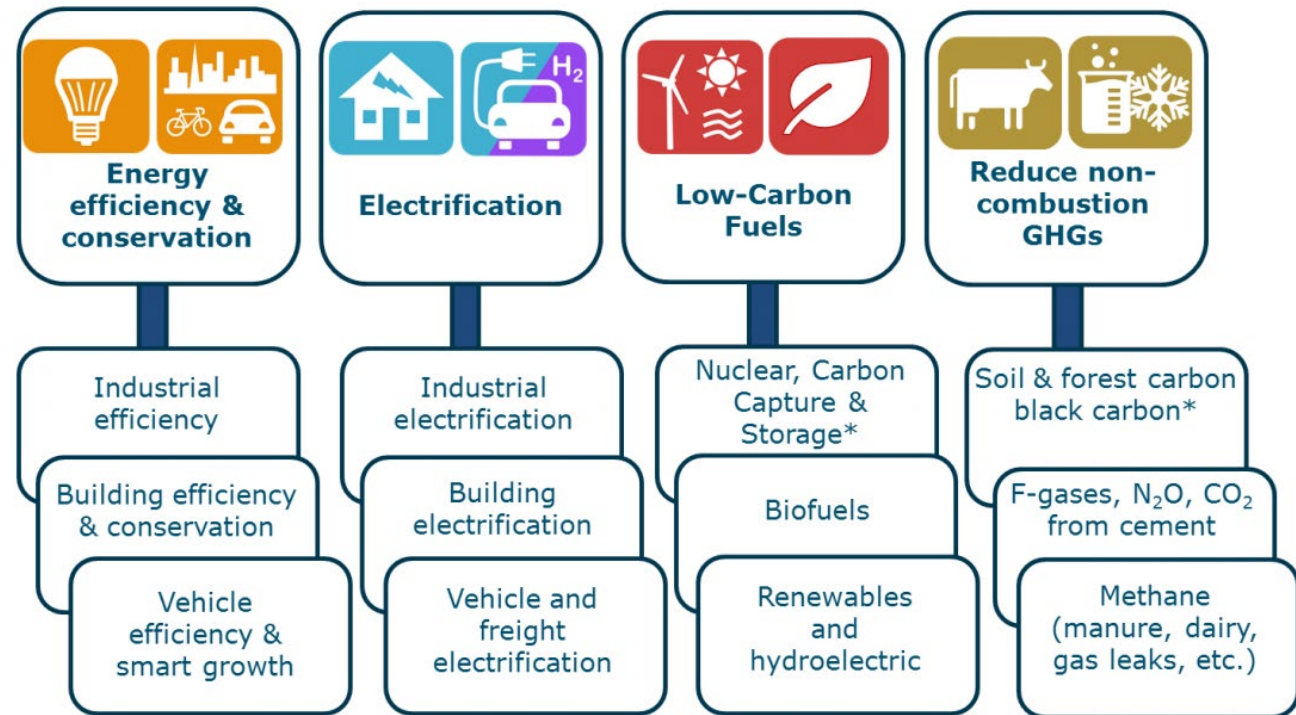
- Carbon-free



Source: [Peninsula Clean Energy 2021](#)

Electrification, Compared to Fossil Fuels

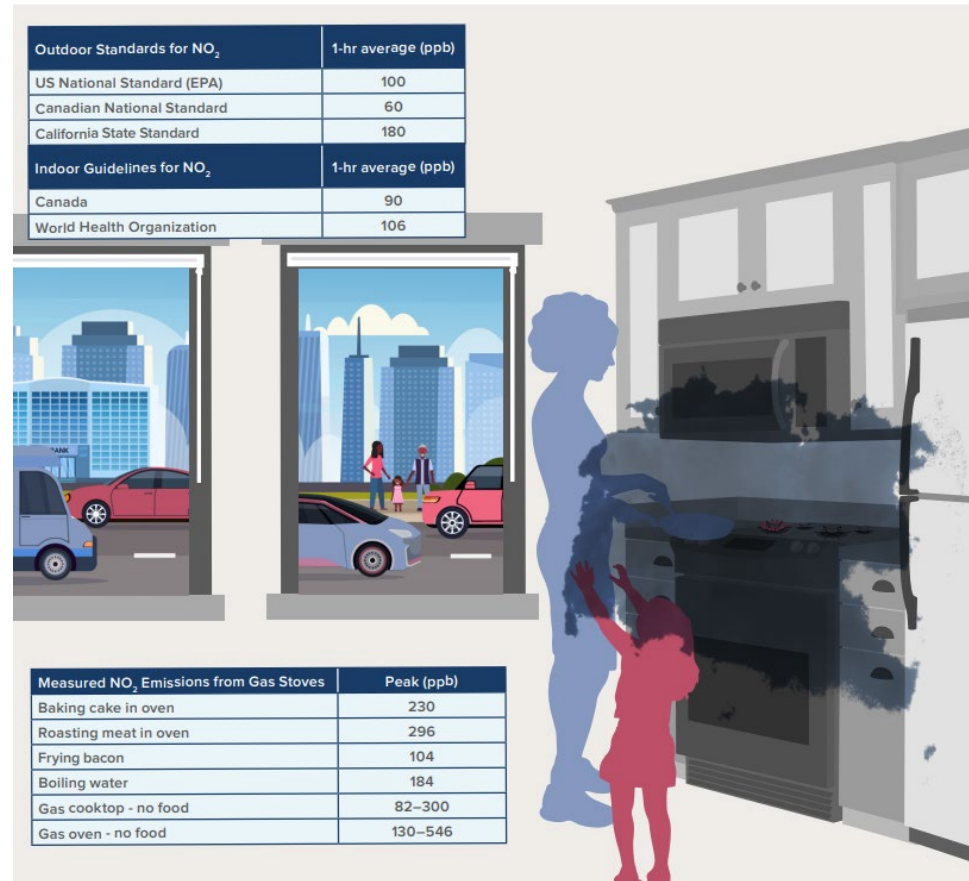
- Carbon-free
- Lowest-cost, lowest-risk pathway



Sources: 1) [AB3232 Decarbonization Assessment 2021](#) 2) [CA Energy Commission 2018](#) 3) [CPUC 2021](#)

Electrification, Compared to Fossil Fuels

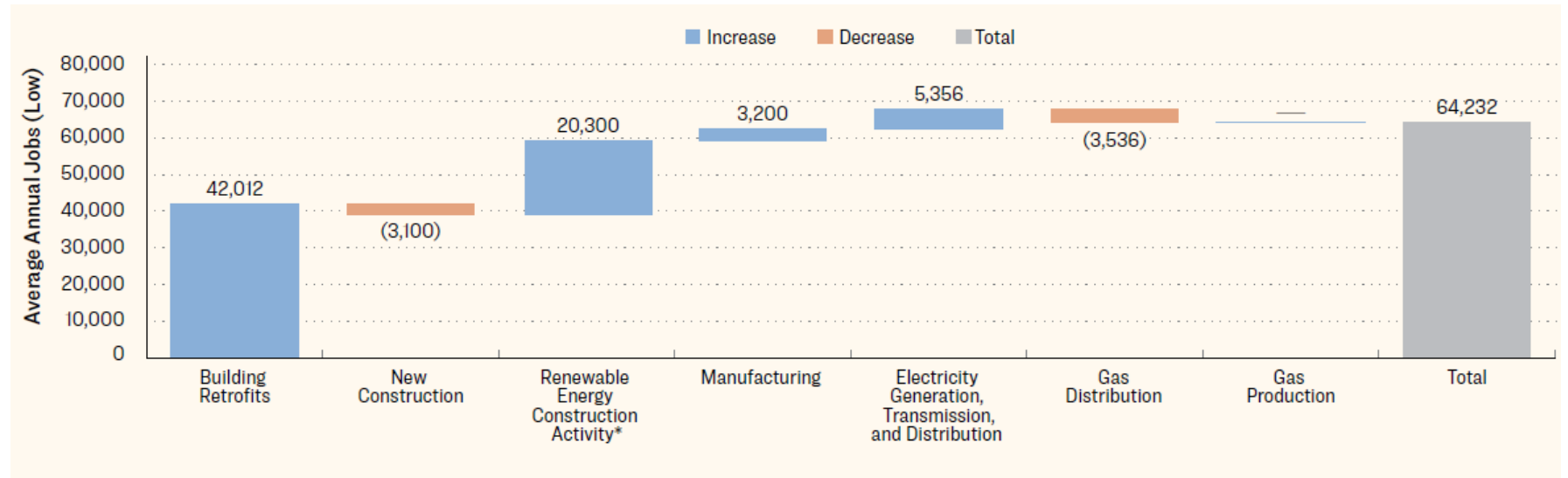
- Carbon-free
- Lowest-cost, lowest-risk pathway
- Healthier indoor air



Sources: [RMI 2020](#), [CEC 2019](#)

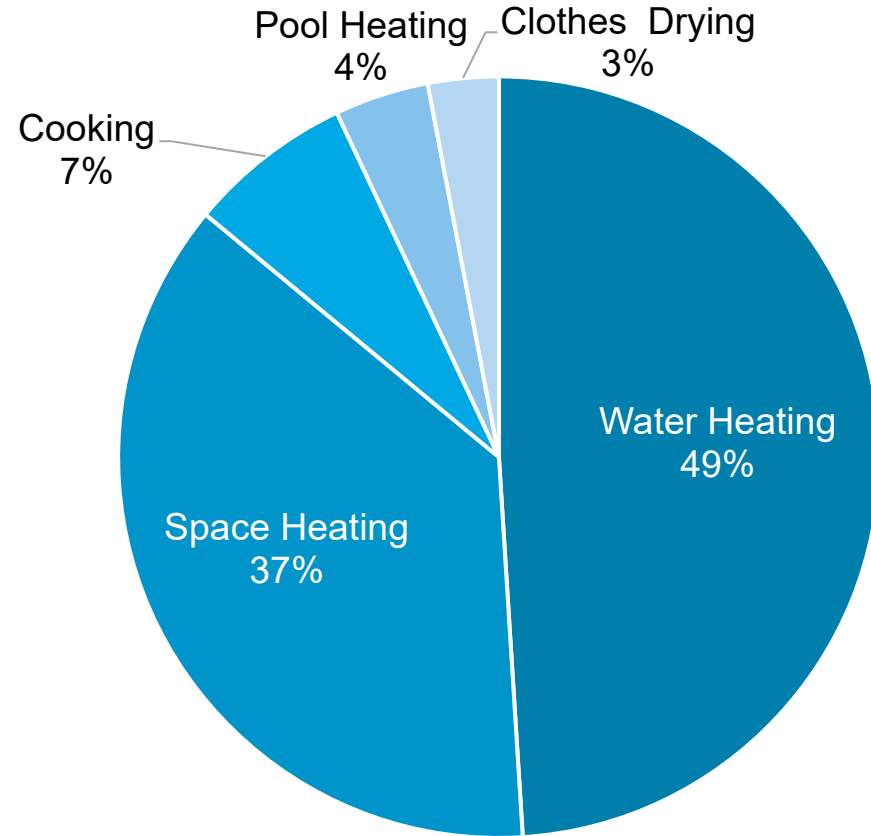
Electrification, Compared to Fossil Fuels

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

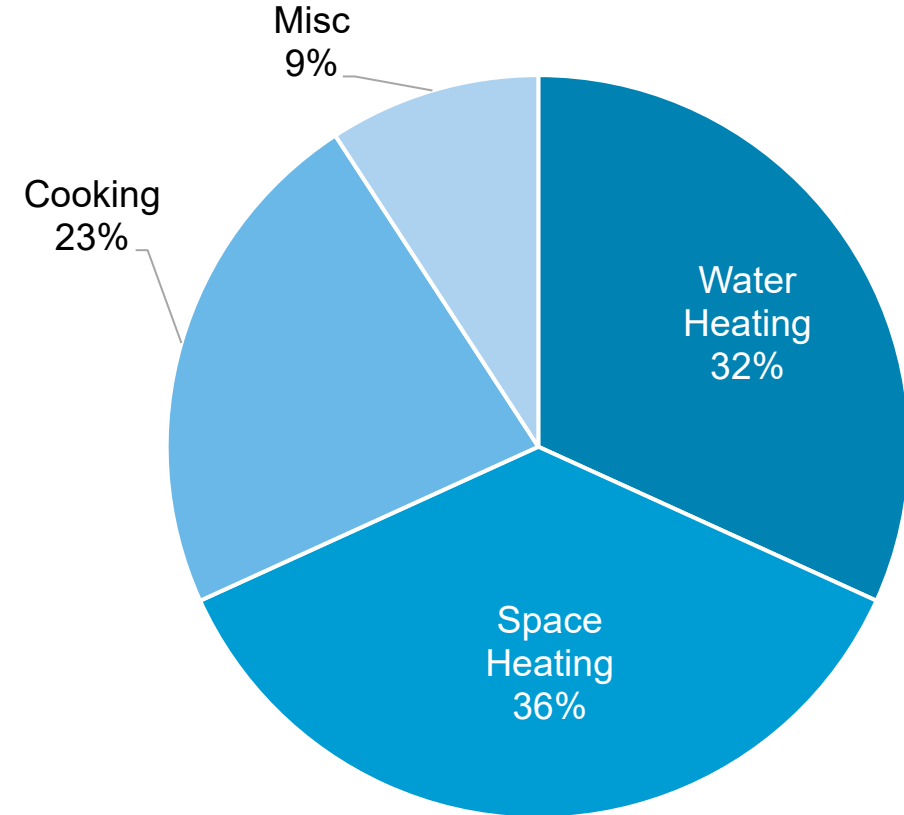


Sources: [UCLA 2019](#), [UMass 2021](#)

California Buildings Gas Usage



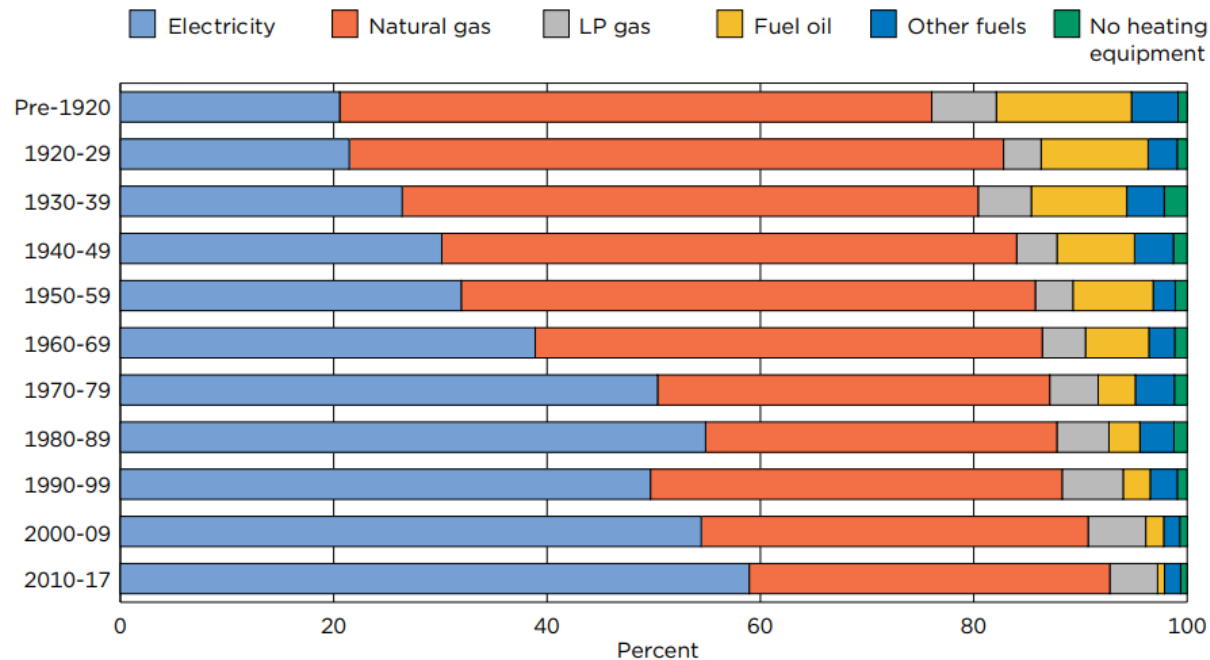
Residential



Non-Residential

Electric is already the majority

Figure 3.
Home Heating Fuel by Decade Home Was Built



Note: Data include primary heating systems for both occupied and vacant homes, secondary systems are not included. Other fuels include fuel oil, wood, kerosene, and any other fuel.
Source: U.S. Census Bureau, 2017 American Housing Survey.

Of national new construction homes:¹

60% use electric space heating (40% of which are heat pumps²)

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



Space Heating

Water Heating

Cooking

Clothes Drying

Residential



Commercial



Equipment Efficiency



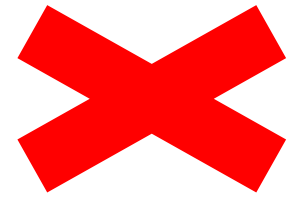
Energy Efficiency Comparison of Technology

Typical Energy Factors

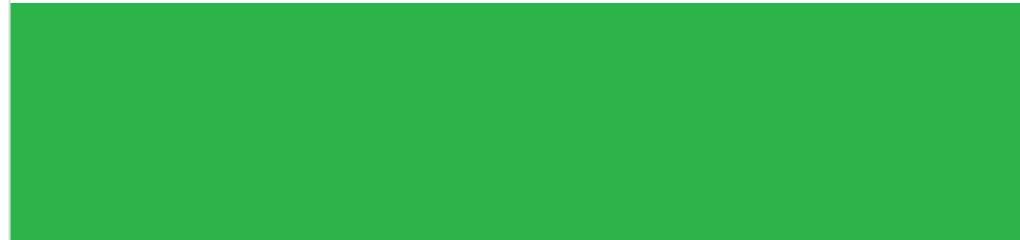
Natural Gas



0.8



Heat Pump



3.5

Space heating,
Water heating,
Clothes drying

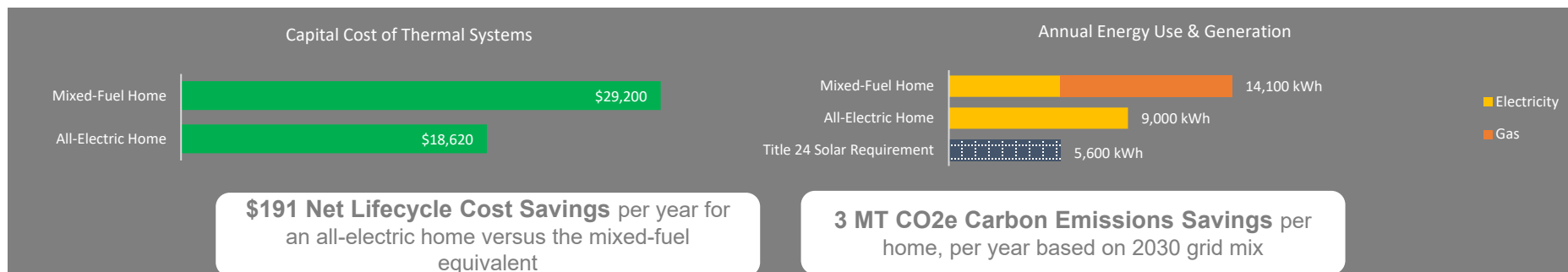
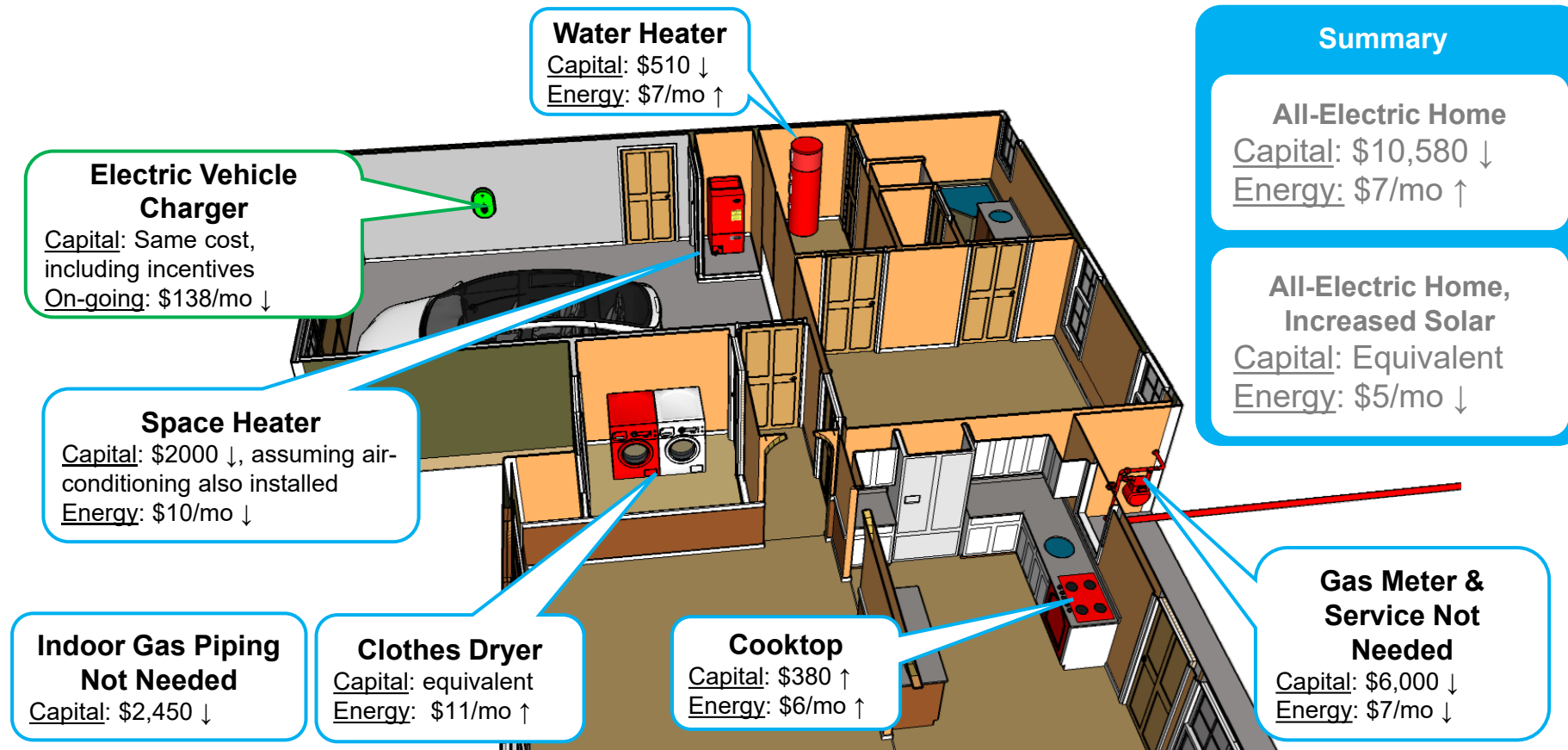
Resistance / Induction



1

Cooking,
High-Intensity Industrial
Processes

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



EV Charging Need and Technology



EV Charging Demand

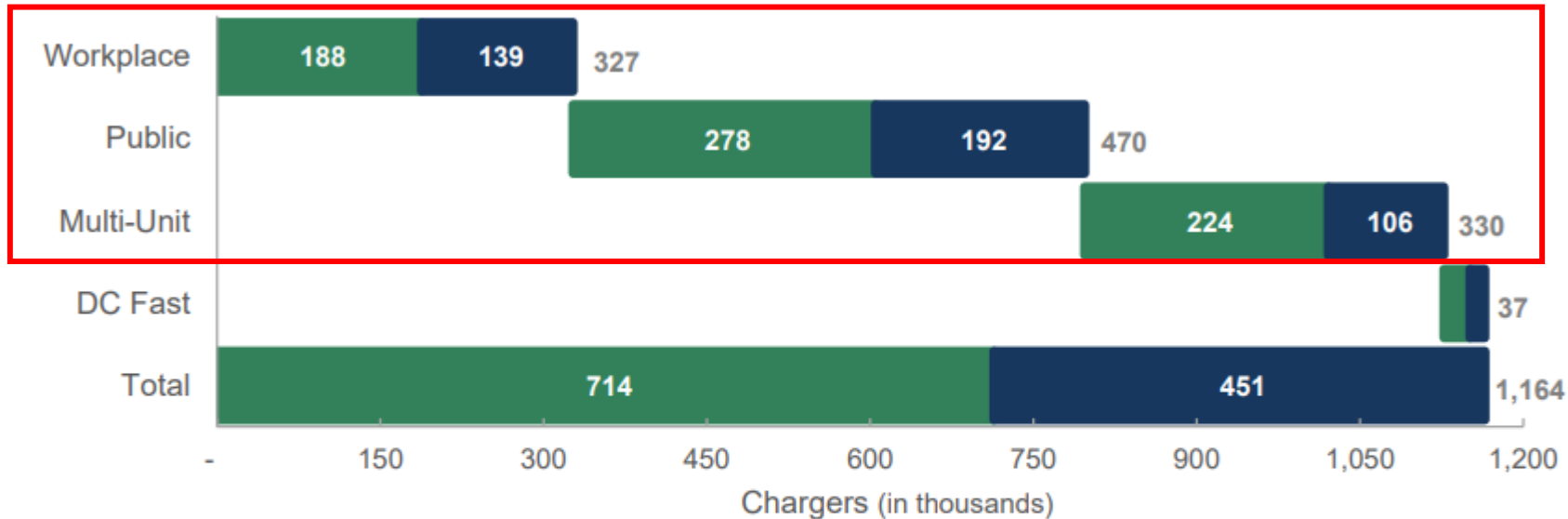


- Sale of gas vehicles phased out by 2035
- 250,000 EVs sold in 2021 in CA, 12.5% of all vehicles
- Pervasive issues
 - Costs of electrical upgrades
 - Underserved multi-family housing occupants



EV Charging Demand

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



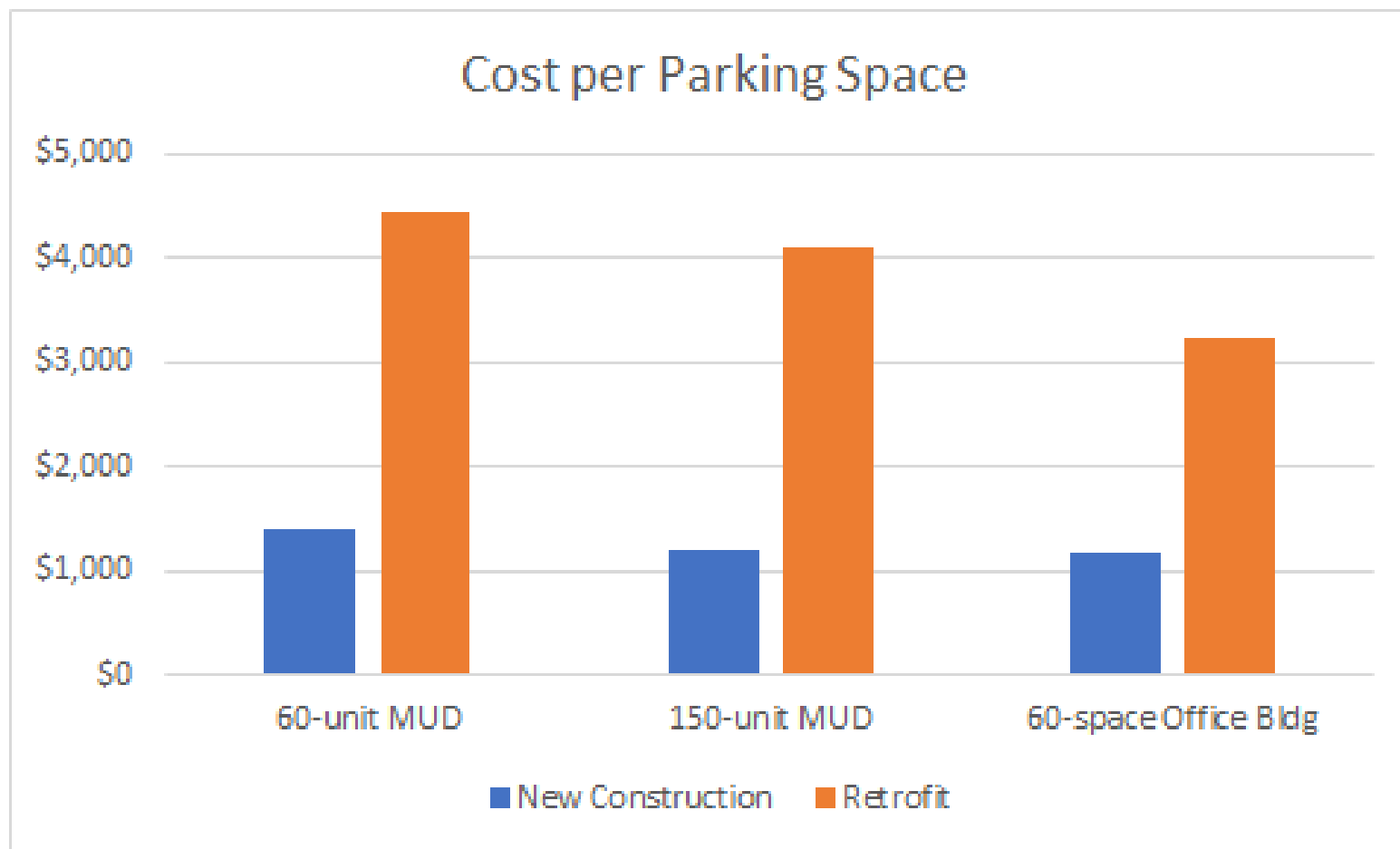
**AB2127
Requirements
by 2030**

**CARB Estimates
for 2030**

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.

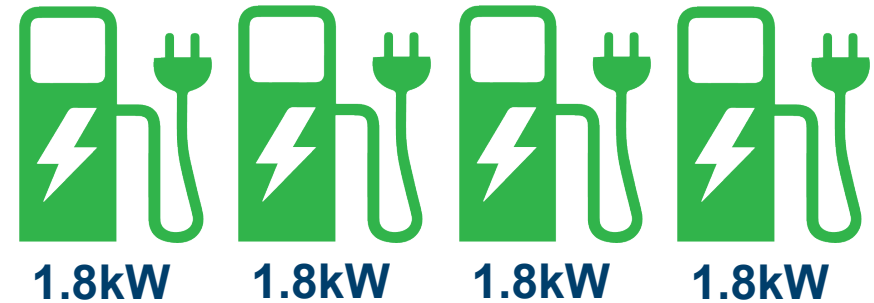
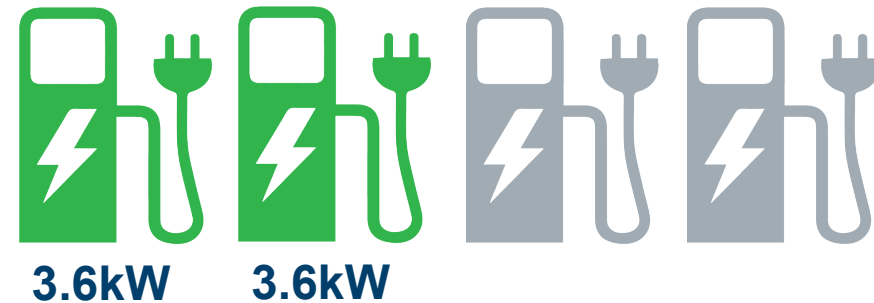
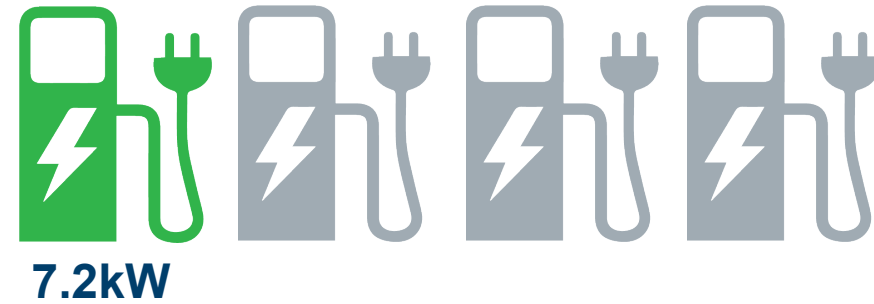
Source: [CEC and NREL, AB2127 \(2021\)](#)

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

Automatic Load Management



Discussion

What all-electric technology is most important to you?

Can you see yourself living and driving all-electric?

2022 Reach Code Policy Models



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



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

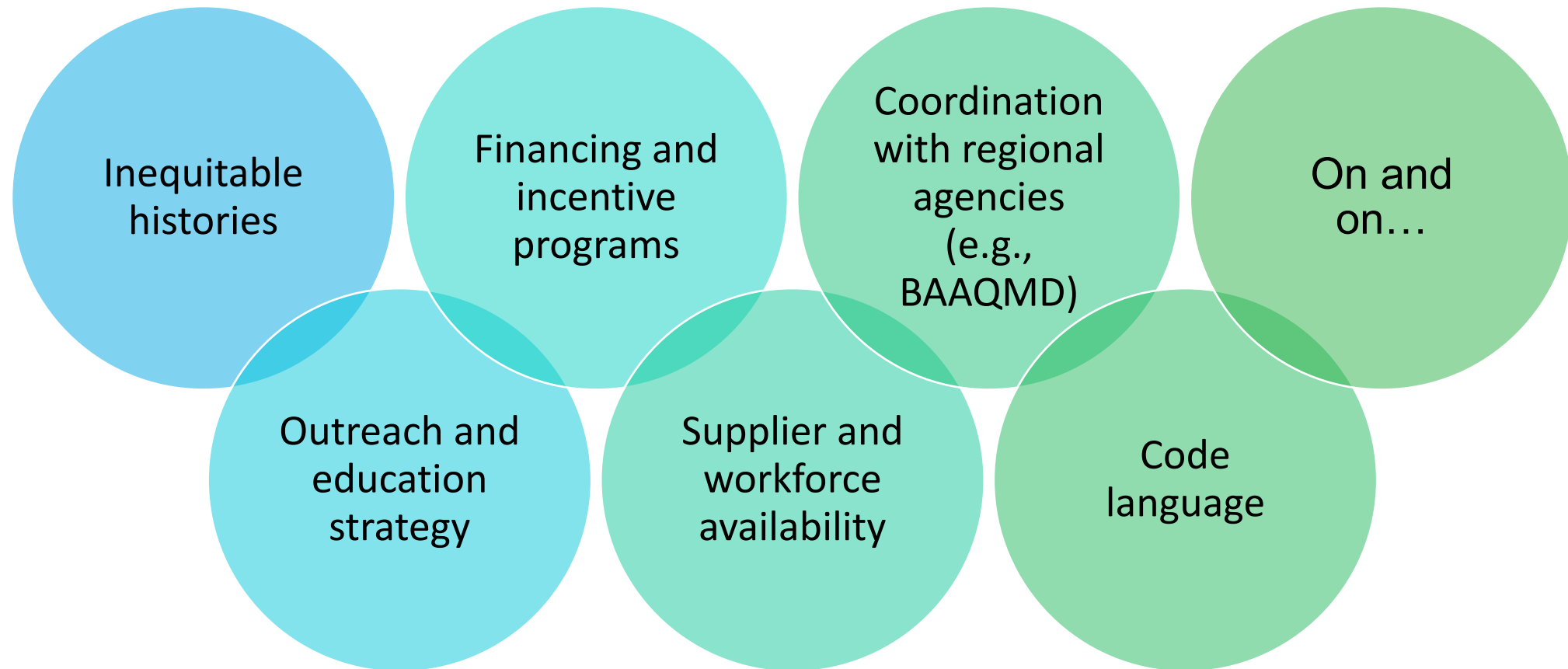
Optional exceptions

- Infeasible to construct according to CA Energy Code
- “Public interest”
- Technology-specific exceptions expiring in 2025
- Electric-readiness required
 - Pre-wiring
 - Physical space

Find our codes on:

BayAreaReachCodes.Org

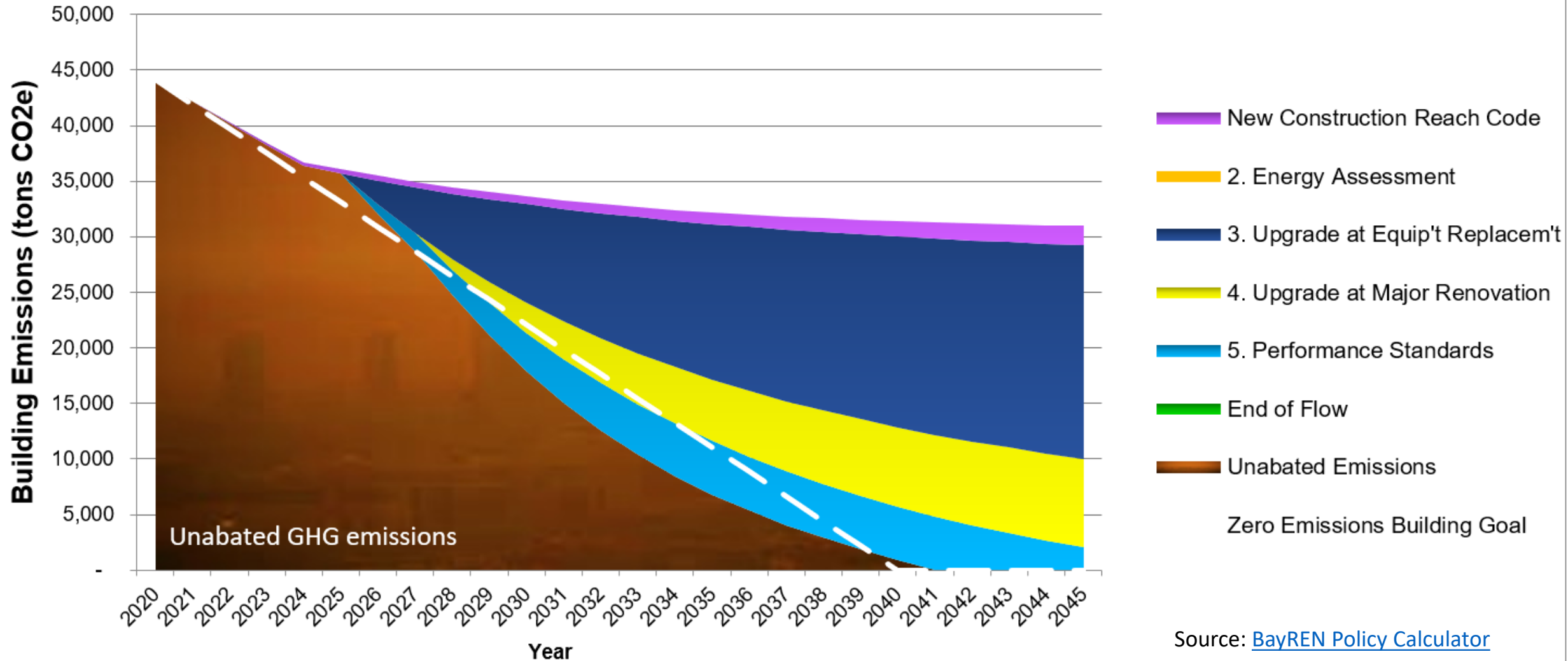
Building Electrification – Existing Buildings



We Need Every Tool in the Box

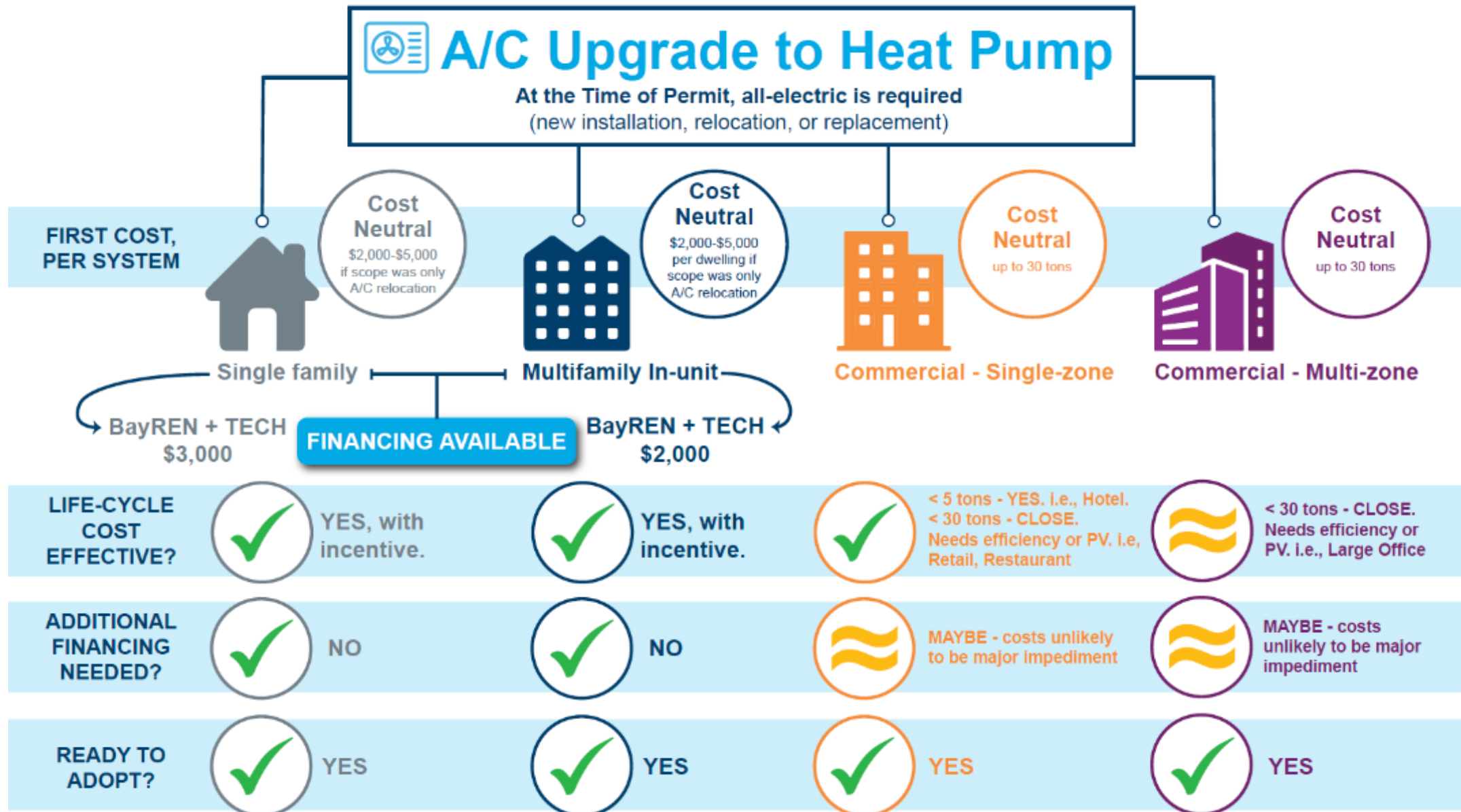


Forecast of Cumulative GHG Emission Impacts from Selected Policy Options



Time of Permit – Electric Required

DRAFT



EV Code Terminology



Speed

Level 1

3-4 miles per charging hour



Level 2

10-20 miles per charging hour



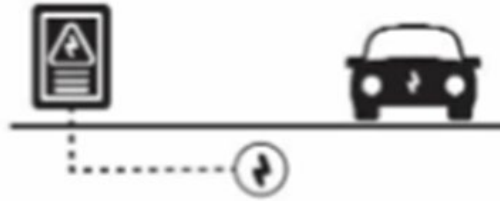
Level 3

150+ miles per charging hour

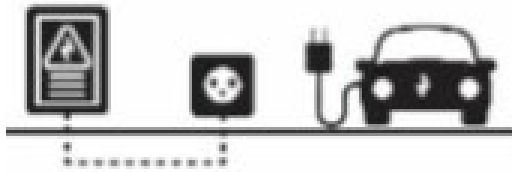


Readiness

EV Capable



EV Ready

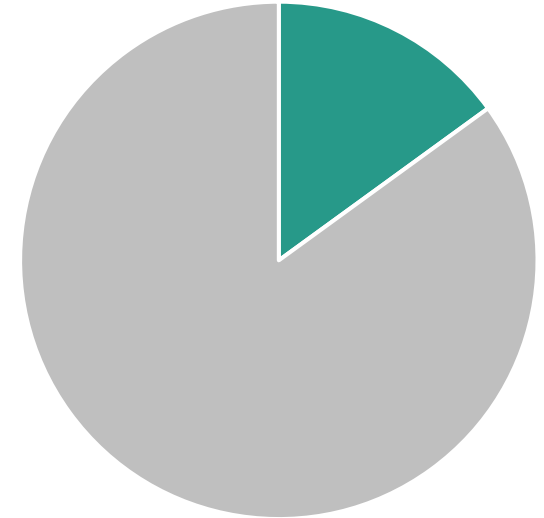


EV Charging Station

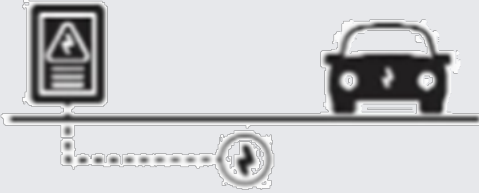






Number

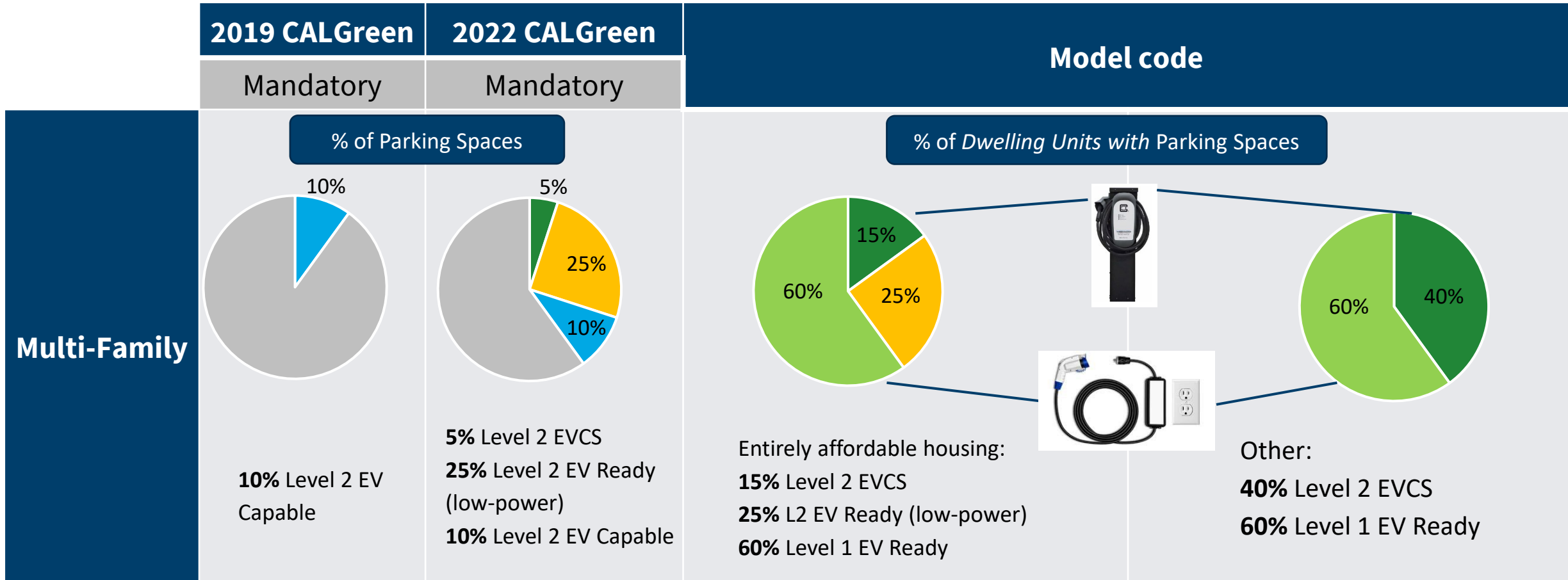
Percent of Parking Spaces



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:
			<ul style="list-style-type: none"> • 1 Level 2 EV Ready circuit • 1 Level 1 EV Ready circuit <div>     </div> <div>ELECTRIC VEHICLE OUTLET</div>

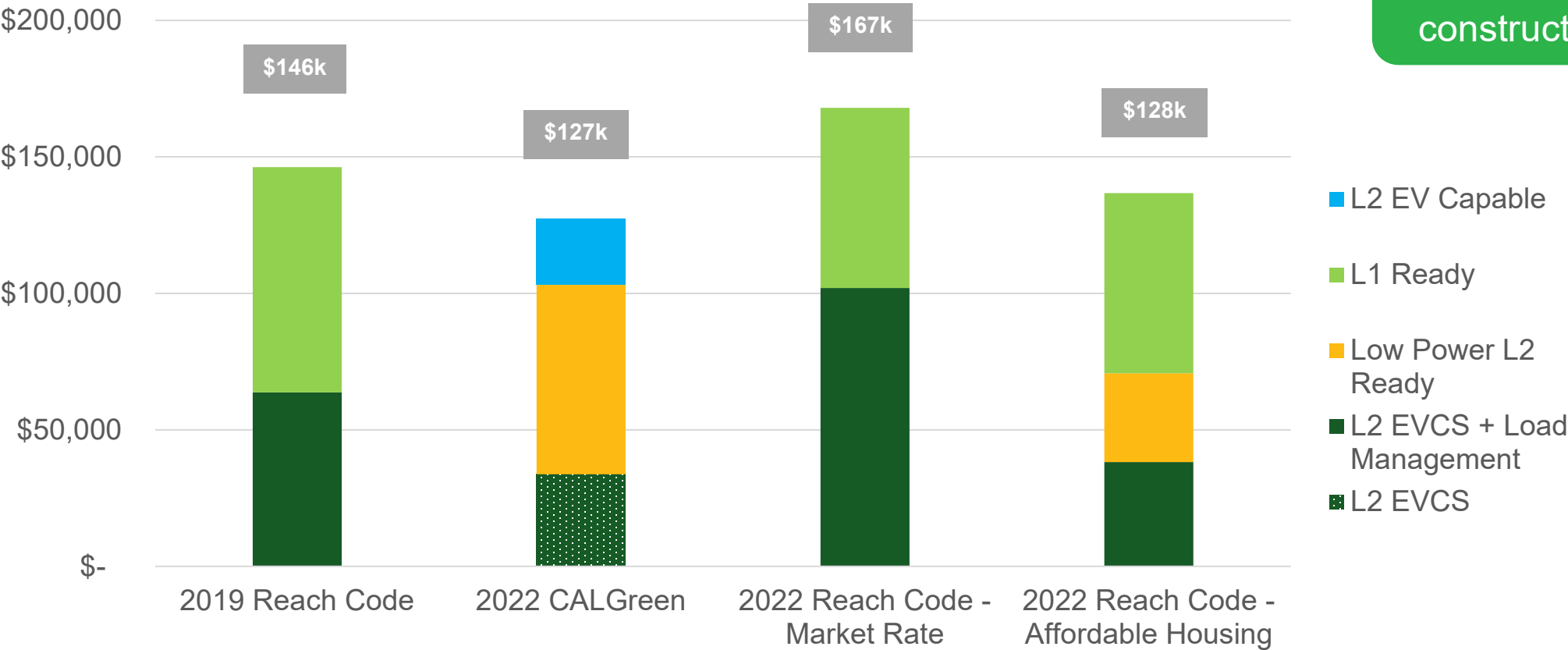
EV Infrastructure – New Construction



AUTOMATIC LOAD MANAGEMENT ENCOURAGED

EV Infrastructure Cost for 100-Dwelling Multifamily Building

Each scenario is
~0.3% of
construction cost



% of dwellings
with access

100%

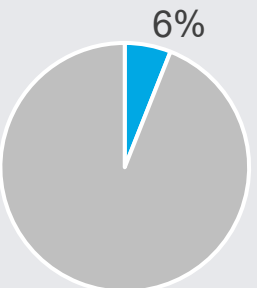

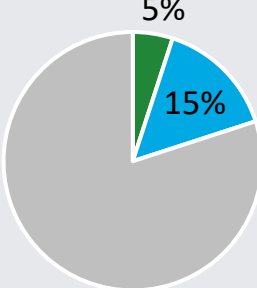
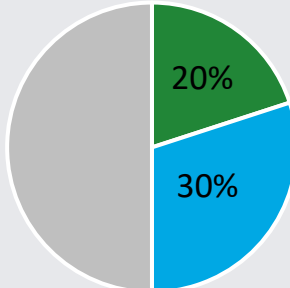
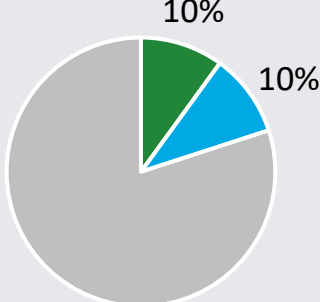
40-60%

100%

100%

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.

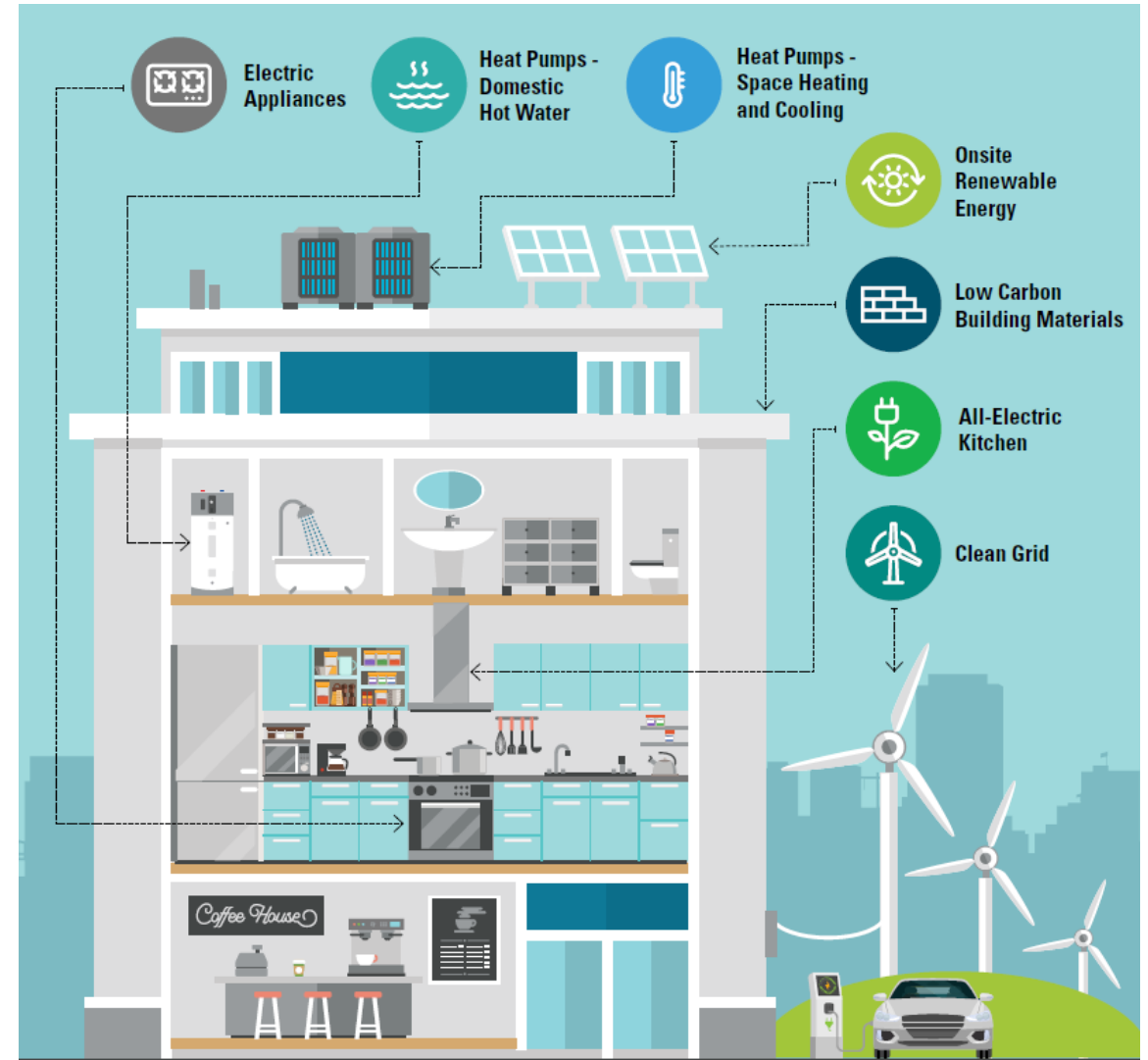
Discussion

How might these codes impact your community?

What would you like to see in locally adopted codes?

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



Residential Incentives



[BayREN Home+ Program](#) - Starting point

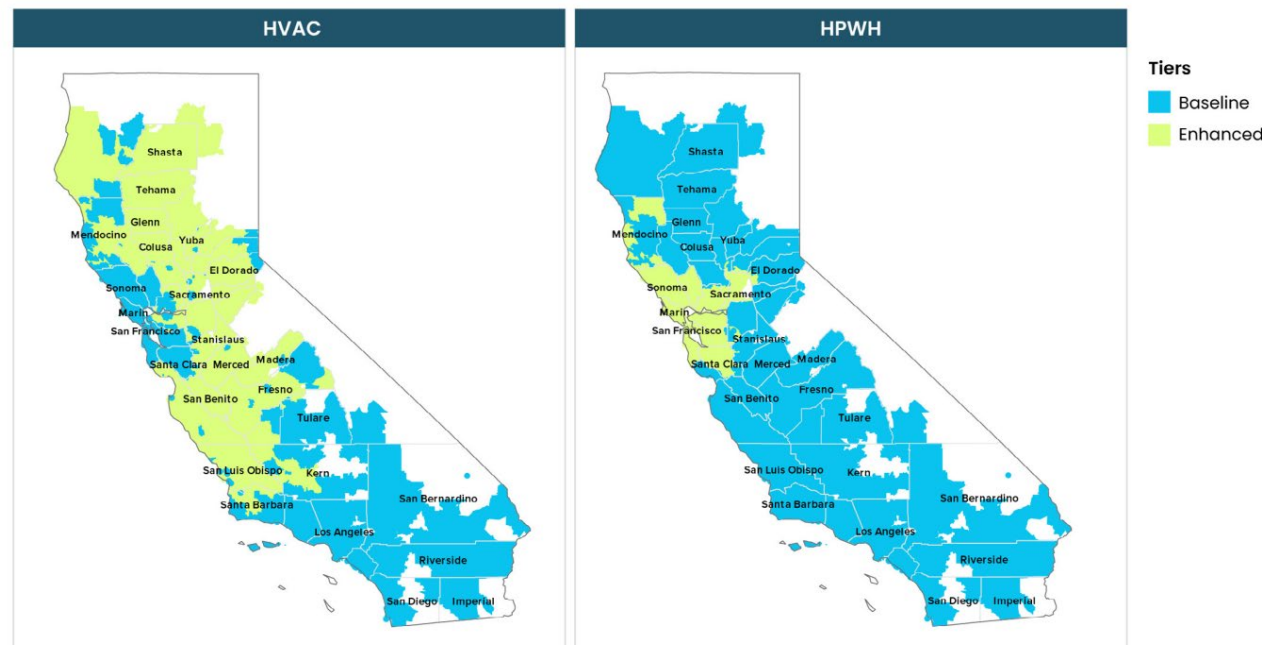
BayREN has the Home Energy Advisor
866-878-6008, advisor@bayren.org

[TECH Clean California](#) - Incentives
compliment other programs

[SVCE FutureFit Heat Pump Water Heater
Rebate](#)

[PCE Heat Pump Water Heater Rebate](#)

TECH Incentive Map



Please share your opinions

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

Model Reach Codes Recommendations

The following building electrification reach code language is based on the anticipated [Investor-Owned Utilities Codes and Standards Program](#) (IOU's C&S) cost effectiveness studies. These studies will be listed under Supporting Resources.

Do you have any feedback you would like to share on our model codes or other aspects of our Initiative? We would appreciate your input!

 PROVIDE FEEDBACK



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





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



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 <u>locks in</u> 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.

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

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.

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

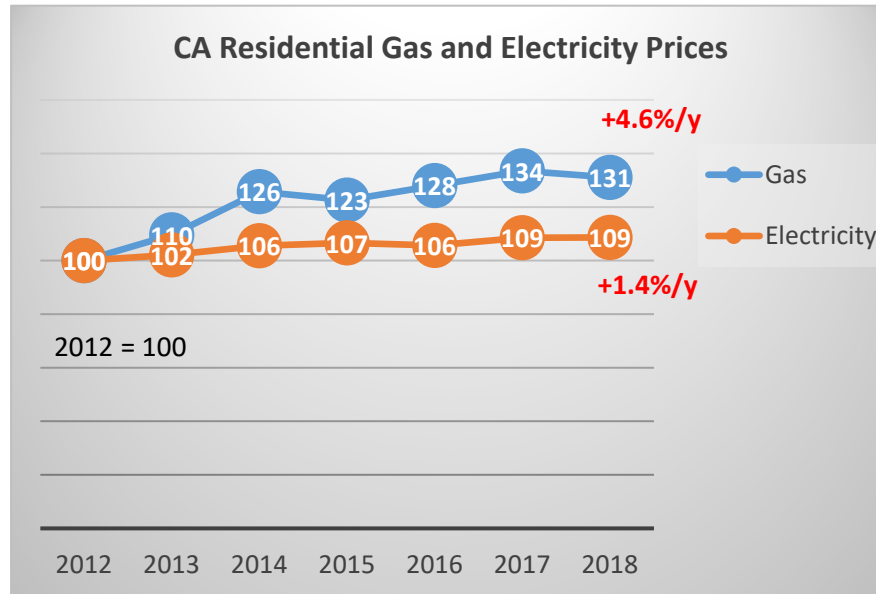
Reference useful tools

- 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

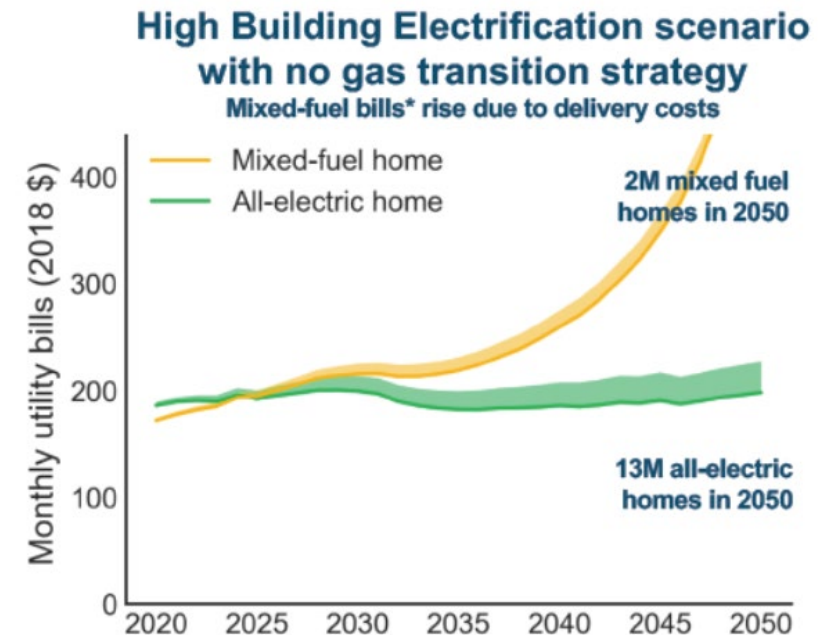


Source: EIA

<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

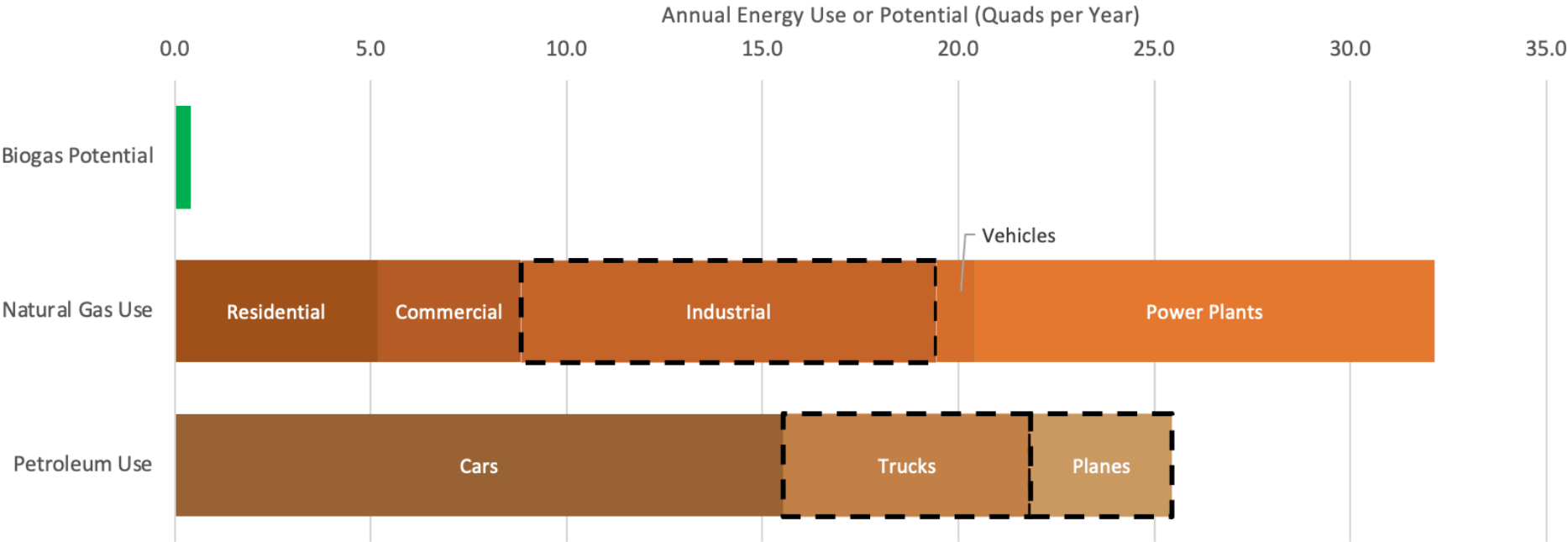
6 of top 8 Ranges for 2020 were electric, top 2 were Induction

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

Biogas Potential vs Natural Gas and Petroleum Use in the US



— — Indicates more difficult-to-electrify sectors which could most benefit from biogas

Sources
Biogas Potential – National Renewable Energy Lab
Annual Natural Gas Use – Energy Information Administration
Annual Petroleum Use – Federal Highway Administration

LEADING CAUSES OF HOME STRUCTURE FIRES: 2010-2014

by National Fire Protection Agency

