



Building Reach Codes

Advancing safer, healthier and more affordable buildings

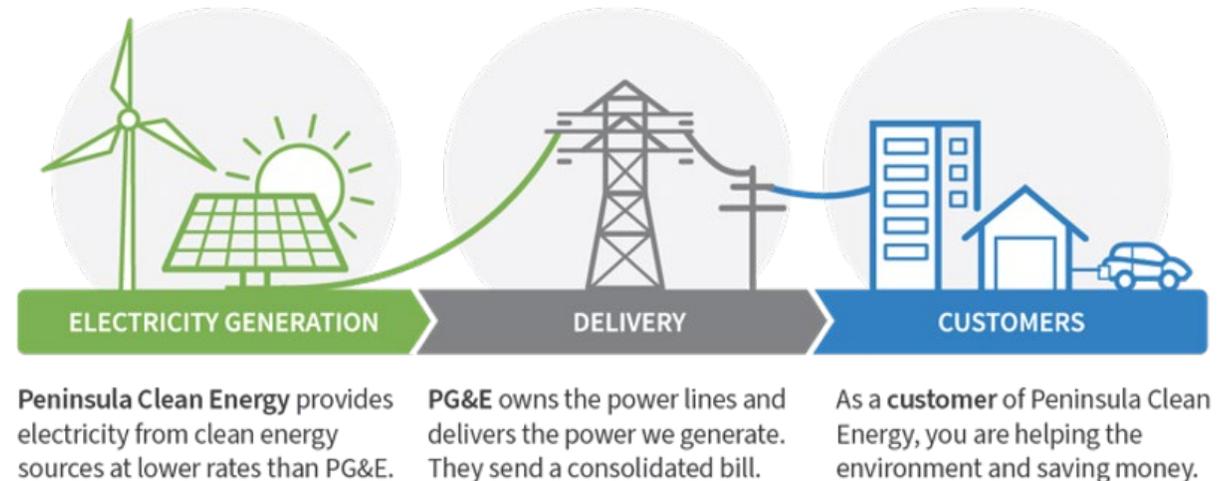
Peninsula Clean Energy



Peninsula Clean Energy is San Mateo County's not for profit locally-led electricity provider

Mission: To reduce greenhouse gas emissions by expanding access to sustainable and affordable energy solutions

How it works



What are Reach Codes?

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

Summary of Benefits



- Major economic value for residents
- Safer and healthier homes
- Advance climate goals
- Enable much greater EV adoption
- Fiscal prudence – more cost effective to address at new construction
- **This Reach Code effort applies only to NEW construction**

Over \$50M/yr

San Mateo Co “fuel” savings by reaching 45,000 EVs in 2025

1-2 tons CO₂

avoided per year for every home

Health Benefits

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



- Gas stoves in homes increase children’s asthma risk by 42%
- Total electric living eliminates risk of carbon monoxide poisoning
- Induction ranges automatically turn off when not in-use, eliminating a leading cause of house fires

Gas Stoves Can Emit Elevated Indoor Nitrogen Dioxide (NO₂) Levels Often Exceeding Indoor Guidelines and Outdoor Standards. *Source: Health Effects from Gas Stove Pollution, Rocky Mountain Institute, 2020, <https://rmi.org/insight/gasstoves-pollution-health>.*

Reach Code Initiative



Model codes and technical assistance
23 adopters out of 42 statewide
Innovation in codes & strategy

Lead Agencies



Consulting Partners



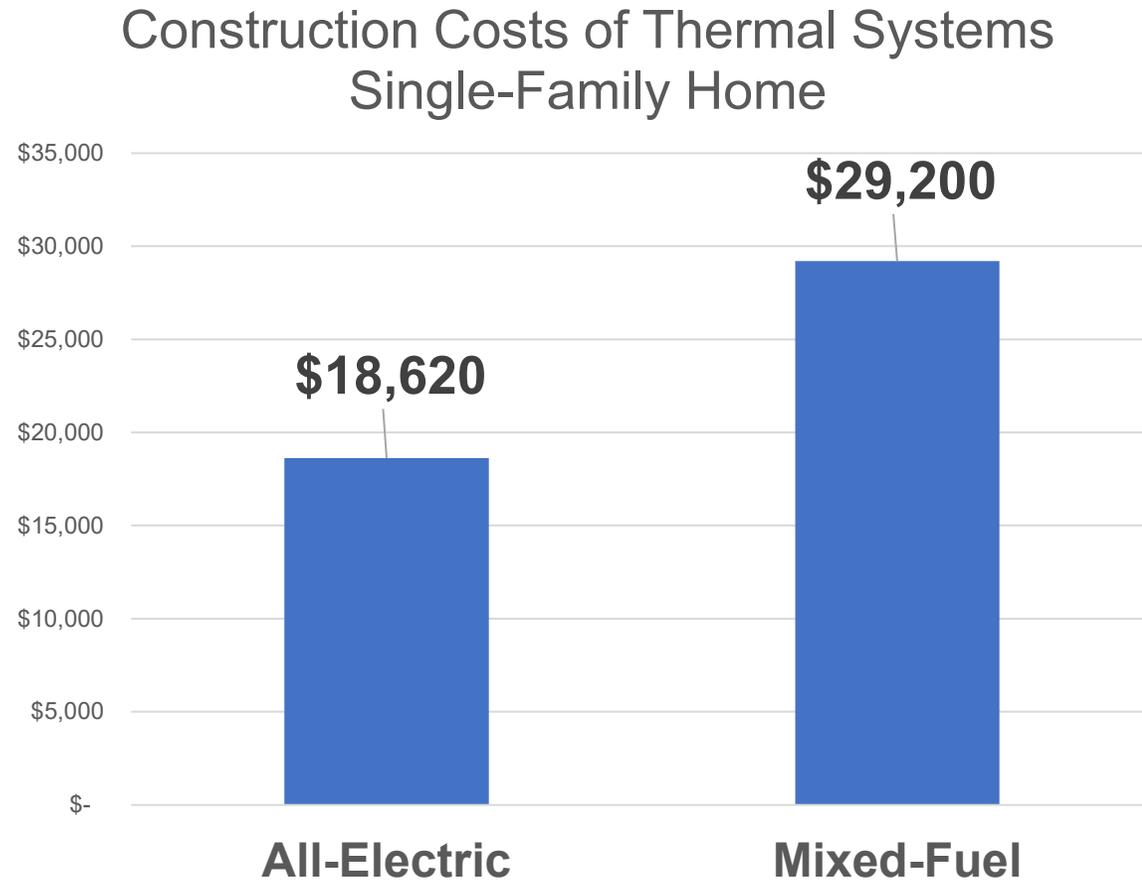
www.peninsulareachcodes.org



II. Building Electrification



Electric New Construction Costs Less Than With Gas



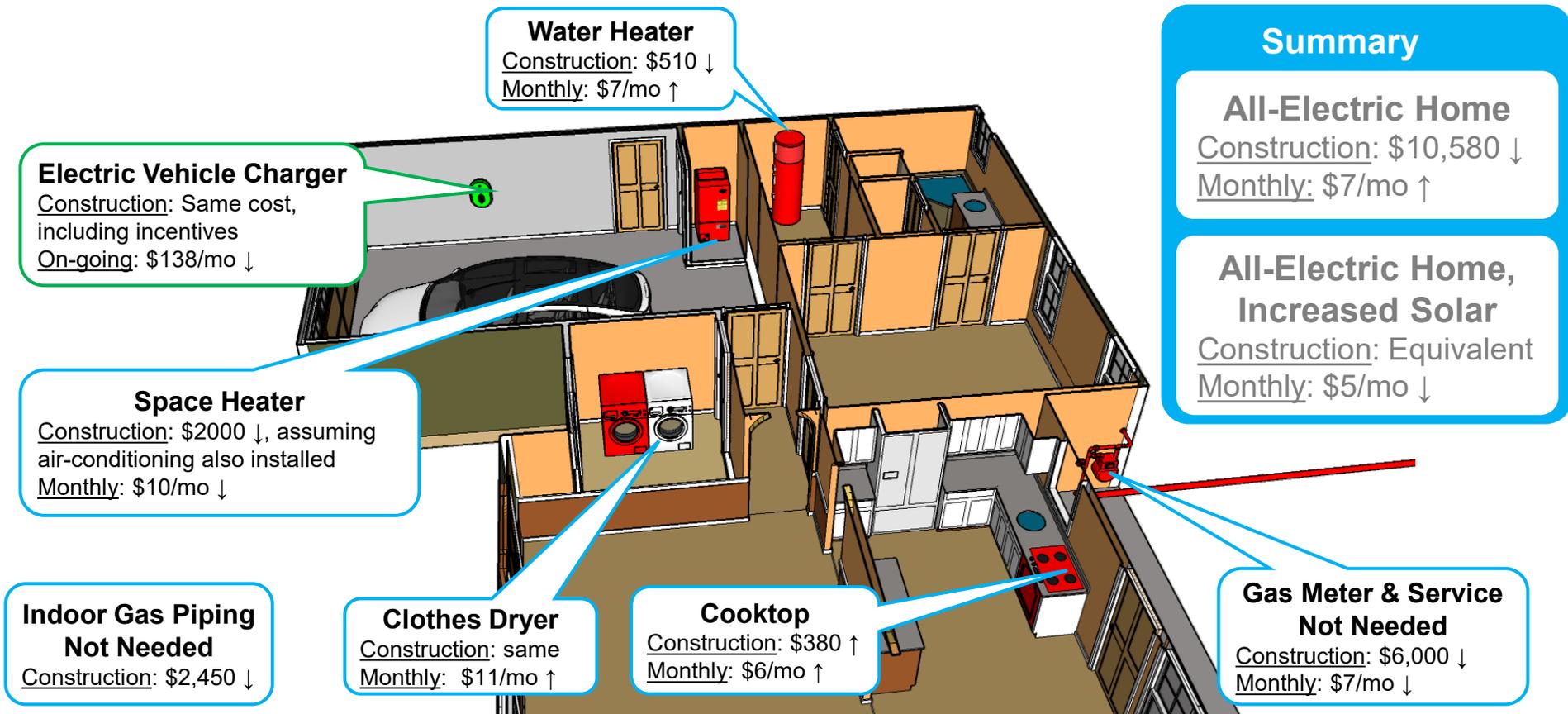
- All-electric homes are less expensive to build
- No gas plumbing, metering or venting needed
- Multiple independent analysis including California Energy Commission and University of California
- University of California commits to all-electric construction for all new buildings

Building Reach Code Options



Reach Code Type	How it Works
Natural Gas Ban	No gas hookup allowed (via municipal ordinance). Limited exceptions.
All-Electric Required	Appliances must be electric (via Energy Code), EXCEPT: <ol style="list-style-type: none">1. Multifamily DHW with entitlement / land use permit2. No compliance pathway in the energy code3. Restaurants, with business reason for flame Conduits or conductors for exempted appliances
All-Electric Preferred	Allows mixed-fuel buildings with high energy performance: <ul style="list-style-type: none">• additional energy efficiency measures• battery storage• Conduits or conductors for fossil-fueled appliances

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



Capital Cost of Thermal Systems



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

Annual Energy Use & Generation



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

Construction and monthly energy costs of thermal systems are based on Residential Building Electrification in California by E3 (April 2019); electricity costs specific to PCE/SVCE territory. 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

III. EV Code



Electric Vehicle Code Options

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

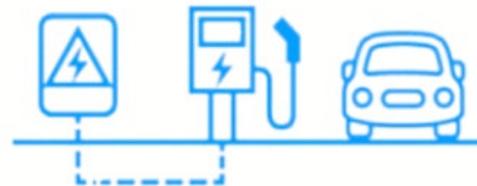
EV Capable



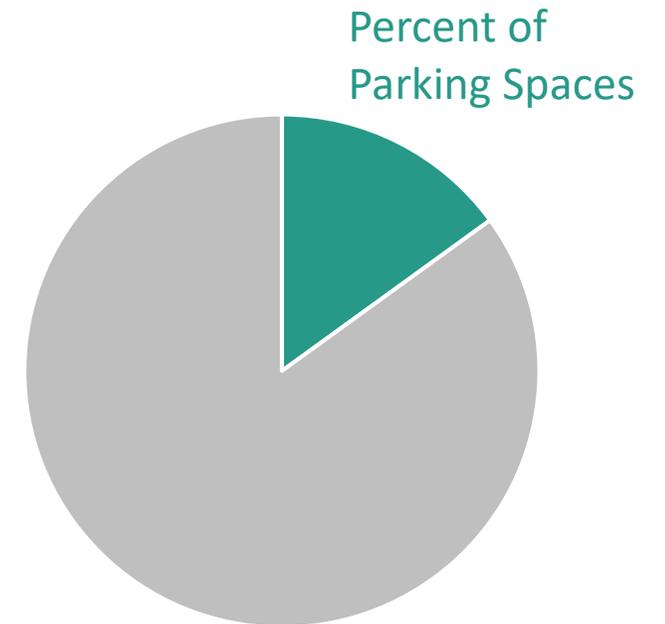
EV Ready



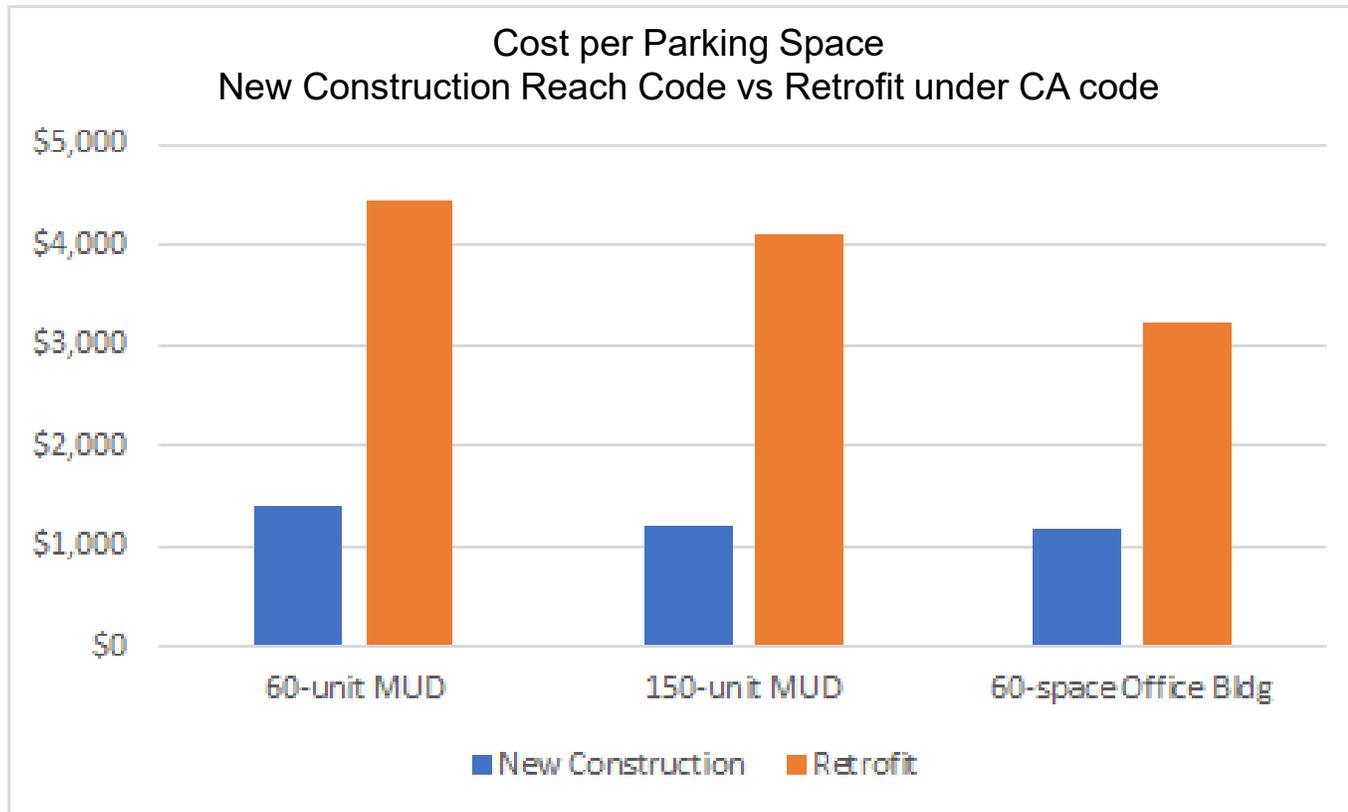
EV Charger Installed



Number



EV Cost of New vs. Retrofit



- 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

EV Charging Reach Code



Building Type	2019 CALGreen	“Plug & Play” Reach Code
Single Family	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
Multi-Family	10% spaces Level 2 EV Capable	One Level 2 EV Ready for first 20 <u>dwelling</u> s, then: <ul style="list-style-type: none"> • 25% <u>dwelling</u>s Level 2 EV Ready (10% in affordable) • 75% are Level 1 EV Ready (90% in affordable) (load management encouraged)
Commercial	~ 6% spaces Level 2 EV Capable (for buildings with at least 10 parking spaces)	Office: some level of EV readiness in 50% of spaces Other commercial: some level of EV readiness in 11% (load management encouraged)

IV. Common Concerns

Will Electrification Reduce Resilience?

Space Heating



Gas furnaces require electric fans, but fireplaces still work.

Water Heating



Gas water heaters require electronic ignition or pumps

Cooking



Will work without electricity

Clothes Drying



Electric motor runs tumbler

Can the Grid Handle the Load Increase?

- Peninsula Clean Energy assessment indicates building electrification will account for **<1% increase to grid load** through 2025 and marginal afterwards
- “**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
- The electricity suppliers have a **service obligation** to meet your needs

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 <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.

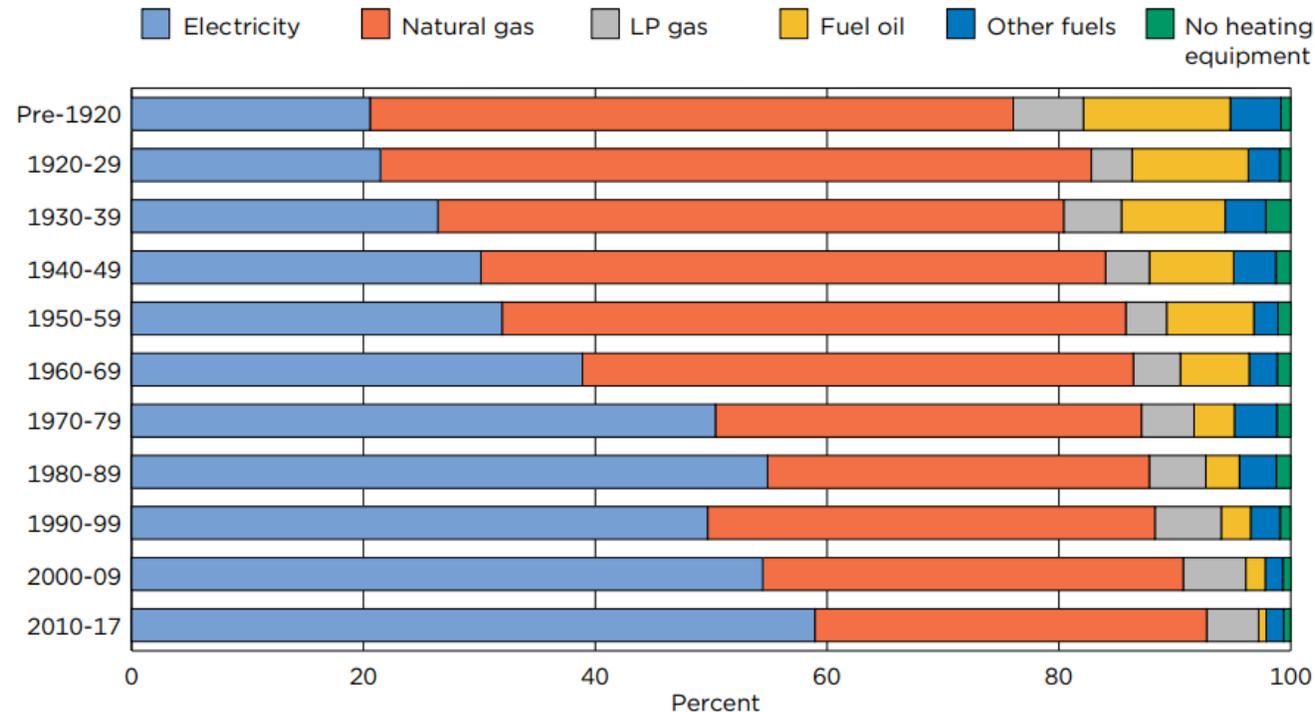
Common Concerns (2 of 2)



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.

New Electric Homes Are 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:

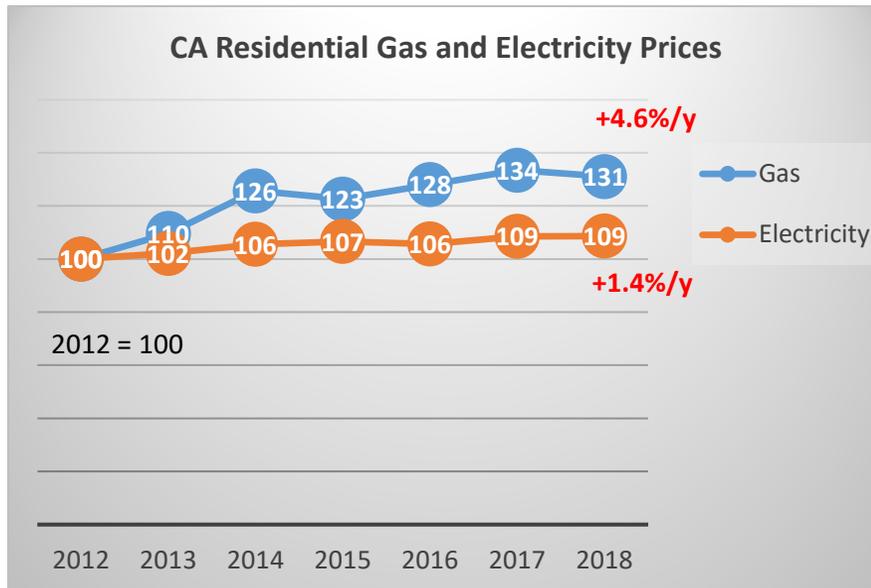
1 - [2017 American Community Survey](#)

2 - [2017 IEA Heat Pump Conference Proceedings](#)

Natural Gas Costs Climbing



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

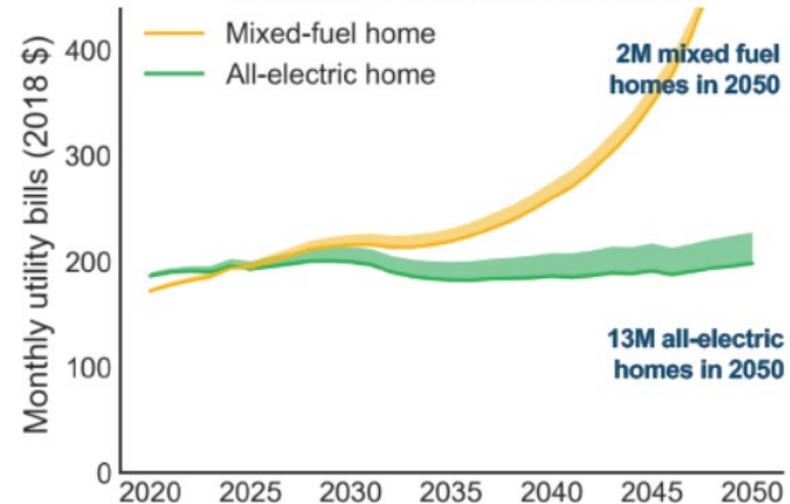


Source: EIA
<https://www.eia.gov/dnav/ng/hist/n3010ca3m.htm>
<https://www.eia.gov/electricity/data/browser/#/topic/7?agg=2.0,1&geo=g&freq=M>

Trend expected to accelerate:

High Building Electrification scenario with no gas transition strategy

Mixed-fuel bills* rise due to delivery costs



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

V. Resources and Adopted Codes

Resources for Cities



1. \$10,000 grant to compensate for City staff time
2. Model codes for customization
3. Consultant time for technical questions
4. Adoption and implementation tools

Additionally, PCE and SVCE are providing building industry technical assistance: [AllElectricDesign.Org](https://www.ailelectricdesign.org)



Resources Available



Adoption Resources

- Ordinance Language
- Staff Report & Slides
- Homeowner Flyer
- FAQs
- Cost Effectiveness Infographic

Permitting, enforcement, and inspection resources

- Permit Checklist
- Inspection Checklist
- Trainings for Building Department Staff
- FAQs

2019 Energy Reach Code Amendments Promoting Healthy, Safe Homes & Buildings



What Are Reach Codes?

Reach codes provide an opportunity for homes and commercial buildings to be all-electric new construction or electric vehicles.

Why Reach Codes?

- Incentivize lowest-cost construction
- Encourage development of high-quality construction
- Reflect the sustainability-related benefits of electric vehicles
- Improve indoor air quality and energy efficiency

Single-Family

Builders and developers can choose between an all-electric or mixed-fuel construction option. The code encourages the all-electric option as it is less expensive, provides a healthier, safer residence while significantly reducing pollution.

Compliance with Building Electrification Reach Code – Single Family

Instructions: Fill out form and attach form directly on drawing set for permit review. This form is only required for New Construction projects.

Is the building applying for a permit all-electric, or is it mixed-fuel (using gas or propane for some end uses)?

- All-Electric Mixed-Fuel

If All-Electric:

- Does the building's energy model meet California Energy Code (CEC) Compliance?

If Mixed-Fuel:

- Does the building meet each of the following requirements? *Call-out specifically on electrical and mechanical plans*
 - Is a dedicated 240V, 30A electrical receptacle located within 3 feet of each water heater?
 - Is a dedicated 240V, 30A electrical receptacle located within 3 feet of each clothes dryer?
 - Is a dedicated 240V, 50A electrical receptacle located within 3 feet of each cooktop?
 - Is the air conditioning system capable of operating in heat pump mode?
- Does the building's energy model perform 15% better than CEC requires?
- If prescriptive performance path is selected, does the building meet each of the following requirements in addition to requirements? *Call-out specifically on plans*
 - Verified low leakage ducts in conditioned space
 - R-10 perimeter slab insulation
 - Meets requirements for "basic compact hot water distribution"
 - Fan efficacy of 0.35 Watts/CFM verified by HERS rater
 - If building uses gas or propane for space heating or water heating:
 - Includes 5 kWh battery storage system
 - Includes solar water heating with 0.20 solar fraction or greater



Resources for Developers



AllElectricDesign.org

- Free technical assistance to architects, builders, developers, design engineers, contractors, and energy consultants
- Portfolio of leading experts for every building type
- Technical roundtables
- Design guidelines
- In-depth 1-on-1 assistance



SMITHGROUP



Adoption in County



Member Agency	Reach Code Status	Building (proposed)	EV
Brisbane	Adopted	All-electric w/ exceptions	MUD 1xL2/ unit
Burlingame	Adopted	All-electric w/ exceptions	PCE model code (variant)
East Palo Alto	Adopted	All-electric w/ exceptions	PCE model code (variant)
Millbrae	Adopted	All-electric w/ exceptions	PCE model code (variant)
Menlo Park	Adopted	All-electric w/ exceptions	(existing EV code)
Pacifica	Adopted	All-electric w/ exceptions	(existing EV code)
County of San Mateo	Adopted	All-electric w/ exceptions	PCE model code
Redwood City	Adopted	All-electric w/ exceptions	PCE model code
San Mateo	Adopted	All-electric w/ exceptions	Increase EV capable
San Carlos	Adopted	All-electric w/ exceptions	PCE model code
Colma	Adopted	Prewiring required	Increase EV capable
Portola Valley	1 st reading TBD	(All-electric w/ exceptions)	(existing EV code)
Belmont, Daly City, South SF	Scheduling study session		
Atherton, Foster City, Half Moon Bay, Hillsborough, San Bruno	Letter of Intent, Staff discussions or Council briefing done		
Woodside	Declined		

Santa Clara County
 Adopted: 12
 In-Progress: 3