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**

Peninsula Clean Energy provides electricity from clean energy sources at lower rates than PG&E. PG&E owns the power lines and delivers the power we generate. They send a consolidated bill. As a customer of Peninsula Clean Energy, you are helping the environment and saving money.
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

- 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

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

Construction Costs of Thermal Systems
Single-Family Home

<table>
<thead>
<tr>
<th></th>
<th>All-Electric</th>
<th>Mixed-Fuel</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$18,620</td>
<td>$29,200</td>
</tr>
<tr>
<td></td>
<td>$20,000</td>
<td>$29,200</td>
</tr>
<tr>
<td></td>
<td>$25,000</td>
<td>$29,200</td>
</tr>
<tr>
<td></td>
<td>$30,000</td>
<td>$29,200</td>
</tr>
<tr>
<td></td>
<td>$35,000</td>
<td>$29,200</td>
</tr>
</tbody>
</table>
# Building Reach Code Options

<table>
<thead>
<tr>
<th>Reach Code Type</th>
<th>How it Works</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Gas Ban</td>
<td>No gas hookup allowed (via municipal ordinance). Limited exceptions.</td>
</tr>
</tbody>
</table>
| All-Electric Required | Appliances must be electric (via Energy Code), EXCEPT:  
1. Multifamily DHW with entitlement / land use permit  
2. No compliance pathway in the energy code  
3. Restaurants, with business reason for flame Conduits or conductors for exempted appliances |
| All-Electric Preferred| Allows mixed-fuel buildings with high energy performance:  
• 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**

<table>
<thead>
<tr>
<th></th>
<th>Mixed-Fuel Home</th>
<th>All-Electric Home</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clothes Dryer</td>
<td>Construction: $510 ↓</td>
<td>Monthly: $7/mo ↑</td>
</tr>
<tr>
<td>Cooktop</td>
<td>Construction: $380 ↑</td>
<td>Monthly: $6/mo ↑</td>
</tr>
<tr>
<td>Electric Vehicle Charger</td>
<td>Construction: Same cost, including incentives</td>
<td>On-going: $138/mo ↓</td>
</tr>
<tr>
<td>Gas Meter &amp; Service</td>
<td>Not Needed</td>
<td>Construction: $6,000 ↓</td>
</tr>
<tr>
<td>Indoor Gas Piping</td>
<td>Not Needed</td>
<td>Construction: $2,450 ↓</td>
</tr>
<tr>
<td>Space Heater</td>
<td>Construction: $2,000 ↓, assuming air-conditioning also installed</td>
<td>Monthly: $10/mo ↓</td>
</tr>
<tr>
<td>Water Heater</td>
<td>Construction: $510 ↓</td>
<td>Monthly: $7/mo ↑</td>
</tr>
</tbody>
</table>

**Annual Energy Use & Generation**

- **Mixed-Fuel Home**
  - Title 24 Solar Requirement: 5,600 kWh
  - Electricity: 14,100 kWh
  - Gas: 9,000 kWh

- **All-Electric Home**
  - Title 24 Solar Requirement: 9,000 kWh
  - Electricity: 14,100 kWh
  - Gas: 5,600 kWh

**$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**

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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**

Pie chart showing percent of parking spaces.
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

<table>
<thead>
<tr>
<th>Building Type</th>
<th>2019 CALGreen</th>
<th>“Plug &amp; Play” Reach Code</th>
</tr>
</thead>
</table>
| Single Family   | 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 |
| Multi-Family    | 10% spaces Level 2 EV Capable          | One Level 2 EV Ready for first 20 dwellings, then:  
• 25% dwellings 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
<table>
<thead>
<tr>
<th>Concern</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distribution grid upgrades are expensive</td>
<td>Sometimes true. Costs are offset by savings of all-electric construction.</td>
</tr>
<tr>
<td>Resilience, power-shutoffs</td>
<td>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.</td>
</tr>
<tr>
<td>Uniformity</td>
<td>Fair Concern, but all-electric is simpler &amp; 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).</td>
</tr>
<tr>
<td>In multifamily, central heat pump water heating requires more design expertise and space than gas boilers.</td>
<td>True, training needed. There are scores of working systems, but best practice guidance is available.</td>
</tr>
</tbody>
</table>
# Common Concerns (2 of 2)

<table>
<thead>
<tr>
<th>Concern</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>All-Electric heating uses too much energy or can’t work in our cool climate</td>
<td><strong>False.</strong> 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.</td>
</tr>
<tr>
<td>Energy is not clean</td>
<td><strong>False.</strong> PCE base service is 100% GHG free today</td>
</tr>
<tr>
<td>Equipment is not available</td>
<td><strong>Mostly false.</strong> 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.</td>
</tr>
</tbody>
</table>
New Electric Homes Are Majority

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

Trend expected to accelerate:

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

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
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
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
## Adoption in County

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

Santa Clara County

Adopted: 12
In-Progress: 3