Zoom Functions

Please use the Q&A feature to share thoughts, concerns and your questions with the panelist.

Having tech issues? Email Kamille Lang: klang1@smcgov.org
San Mateo County's Office of Sustainability

Building sustainable communities that fulfill the needs of the present and future
Solving for Today and Tomorrow

- Climate Change
- Energy and Water
- Waste Reduction
- Livable Communities
Overview

什么都是Reach Codes?
- 定义
- 为什么要Reach Codes
- 2022年建筑代码更新
- 成本
- 地区背景
- EV定义

- 旧金山湾县2019年Reach代码
  - 2019建筑Reach代码
  - 2019 EV充电Reach代码

- 2022年模型Reach代码
  - 2022年建筑Reach代码
  - 2022年EV充电Reach代码
  - 2019年和2022年亮点

- 开放提问
What are “Reach Codes?”

- Local Enhancements to State Building Codes and Standards
- Adopted by Individual Jurisdictions to Meet Local Climate and Building Goals
- Next Code Cycle Starts January 1, 2023
- Reach Codes Must be Filed with the California Building Standards Commission and the California Energy Commission
In CA, these emissions are overwhelmingly associated with methane gas equipment that can be electrified.
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
Electrifying New Single-Family Homes in the Bay Area - The Cost Story

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

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

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

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

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

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

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

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

  - **All-Electric Home, Increased Solar**
    - Capital: Equivalent
    - Energy: $5/mo ↓
Regional Context
2019 Adoption of Electrification Reach Codes

<table>
<thead>
<tr>
<th>Region</th>
<th>Adopted</th>
<th>Not Yet Adopted</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Bay Community Energy</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Peninsula Clean Energy</td>
<td>12</td>
<td>9</td>
</tr>
<tr>
<td>Silicon Valley Clean Energy</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
<td><strong>19</strong></td>
</tr>
</tbody>
</table>

- 61% of member agencies
- 57% of electrification Reach Codes statewide
- 21 of 30 also had EV infrastructure codes
## 2022 San Mateo County Reach Code Tracker

<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>New Construction</th>
<th>Existing Building</th>
<th>EV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atherton</td>
<td>All electric except cooking</td>
<td></td>
<td>Model Code</td>
</tr>
<tr>
<td>Brisbane</td>
<td></td>
<td>Considering</td>
<td></td>
</tr>
<tr>
<td>Burlingame</td>
<td>Re-adoption of 2019</td>
<td></td>
<td>Model Code</td>
</tr>
<tr>
<td>Colma</td>
<td>All Electric with less exemptions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daly City</td>
<td>Re-adoption of 2019</td>
<td></td>
<td>Minor Changes</td>
</tr>
<tr>
<td>Menlo Park</td>
<td>Re-adoption of 2019 with less exemptions</td>
<td></td>
<td>Model Code</td>
</tr>
<tr>
<td>Pacifica</td>
<td>All Electric</td>
<td></td>
<td>Model Code</td>
</tr>
<tr>
<td>Portola Valley</td>
<td>All Electric</td>
<td></td>
<td>Considering</td>
</tr>
<tr>
<td>Redwood City</td>
<td>Re-adoption of 2019 with less exemptions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>San Bruno</td>
<td>All Electric</td>
<td></td>
<td>Model Code</td>
</tr>
<tr>
<td>San Carlos</td>
<td>Re-adoption of 2019</td>
<td></td>
<td>Exploring</td>
</tr>
<tr>
<td>San Mateo</td>
<td>Re-adoption of 2019</td>
<td></td>
<td>Exploring</td>
</tr>
</tbody>
</table>
### Electric Vehicle Definitions

#### Charging Speed

<table>
<thead>
<tr>
<th>Level</th>
<th>Definition</th>
</tr>
</thead>
</table>
| Level 1 | - 110/120V outlet  
- 4 miles for every hour of charging |
| Level 2 | - 208/240V outlet or charging station  
- 25 miles for every hour of charging |
| Level 3 | - 480V outlet  
- 170 miles in 30 minutes of charging |

#### Infrastructure

<table>
<thead>
<tr>
<th>Definition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EV Capable</td>
<td>- Panel capacity and raceways</td>
</tr>
<tr>
<td>EV Ready</td>
<td>- Complete electric circuit at either Level 1 or 2 including electrical panel capacity, overprotection device and raceway</td>
</tr>
<tr>
<td>EV Charging Station</td>
<td>- Installation of EV supply equipment</td>
</tr>
</tbody>
</table>
2019 SAN MATEO COUNTY REACH CODE
Adoption Process

- BOS Study Session: October 22, 2019
- Outreach: 2 Articles Oct. 2019, 2 Community Councils Oct 2019 & Jan 2020, Email, and Builders Roundtable
- BOS First Reading: February 11, 2020
- BOS Second Reading: February 25, 2020
2019 Reach Code - Buildings

An amendment to Title 24 Part 6
California Energy Code

- **ALL ELECTRIC NEW CONSTRUCTION**
  - Required electric fuel source for indoor appliances
  - Natural gas can be used for outdoor appliances
  - Electric prewiring required where natural gas is used
Exceptions - Buildings

- Labs
- Lack of an all-electric compliance pathway
- Restaurant Kitchens
- Public Emergency Centers
2019 Reach Code - EV Charging

An amendment to Title 24 Part 11 California Green Building Standards

- Residential
  - Single-family
  - Multi-family
- Non-residential
  - Office
  - Other commercial
Residential Exceptions - EV Charging

Where there is no commercial power supply

Accessory Dwelling Units (ADUs) and Junior ADUs
Single-Family EV Charging

- LEVEL 2 EV READY
- LEVEL 1 EV READY

- Exception: For each dwelling unit with only one parking space install a Level 2 EV Ready space
Multi-Family EV Charging

- 10% LEVEL 2 EV READY
- 40% LEVEL 1 EV READY
Non-Residential Exceptions - EV Charging

Where there is no commercial power supply

Spaces accessible only by automated mechanical car parking systems
Office EV Charging

- 10% LEVEL 2 CHARGERS,
- 10% LEVEL 1 CHARGERS,
- 30% EV CAPABLE
Other Commercial EV Charging

- 6% LEVEL 2 Chargers
- 5% LEVEL 1 Chargers

Exception: Installation of each Direct Current Fast Charger with the capacity to provide at least 80 kW output may substitute for 6 Level 2 EVCS and 5 EV Ready spaces after a minimum of 6 Level 2 EVCS and 5 Level 1 EV Ready spaces are installed.
2022 MODEL REACH CODE LANGUAGE
2022 Model Reach Code - Buildings

An amendment to Title 24 Part 11
California Green Building Code

- ALL ELECTRIC NEW CONSTRUCTION
  - Extension of any existing gas infrastructure restricted
  - Definition of new construction: if either 50% of above-sill framing or 50% of foundation are replaced over 3 years for purposes other than repair or reinforcement

Find our codes on: BayAreaReachCodes.org
Exceptions - Buildings

“Public interest”

- Infeasible to construct according to CA Energy Code

- Electric readiness required: pre-wiring, physical space

- Technology-specific exceptions expiring in 2025
<table>
<thead>
<tr>
<th></th>
<th>2019</th>
<th>2022</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Housed</strong></td>
<td>Title 24 Part 6 California Energy Code</td>
<td>Title 24 Part 11 California Green Building Standards (CalGreen)</td>
</tr>
<tr>
<td><strong>Reach Code</strong></td>
<td>ALL ELECTRIC</td>
<td>Required electric fuel source for indoor and outdoor appliances</td>
</tr>
<tr>
<td></td>
<td>▶ Required electric fuel source for indoor appliances</td>
<td>Required electric fuel source for indoor and outdoor appliances</td>
</tr>
<tr>
<td></td>
<td>▶ Natural gas can be used for outdoor appliances</td>
<td>Required electric fuel source for indoor and outdoor appliances</td>
</tr>
<tr>
<td></td>
<td>▶ Electric prewiring required where natural gas is used</td>
<td>Required electric fuel source for indoor and outdoor appliances</td>
</tr>
<tr>
<td><strong>Exceptions</strong></td>
<td>Labs</td>
<td>Prewiring is encouraged for any exempted appliances</td>
</tr>
<tr>
<td></td>
<td>▶ Lack of an all-electric compliance pathway</td>
<td></td>
</tr>
<tr>
<td></td>
<td>▶ Restaurant kitchens</td>
<td></td>
</tr>
<tr>
<td></td>
<td>▶ Public emergency centers</td>
<td></td>
</tr>
</tbody>
</table>
2022 Model Reach Code - EV Charging

An amendment to Title 24 Part 11
California Green Building Code

- Residential
  - Single-family
  - Multi-family
- Non-residential
# Single-Family EV Charging

<table>
<thead>
<tr>
<th></th>
<th>2019 CALGreen</th>
<th>2022 CALGreen</th>
<th>Model Code</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mandatory</td>
<td>Mandatory</td>
<td></td>
</tr>
</tbody>
</table>

**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

[Image of electric vehicle outlet]
## Multi-Family EV Charging

<table>
<thead>
<tr>
<th>Multi-family</th>
<th>2019 CALGreen</th>
<th>2022 CALGreen</th>
<th>Model code</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mandatory</td>
<td>Mandatory</td>
<td></td>
</tr>
</tbody>
</table>

### Multi-family

- **10% Level 2 EV Capable**
- **5% Level 2 EVCS**
- **25% Level 2 EV Ready (low-power)**
- **10% Level 2 EV Capable**

### % of Parking Spaces

- **10%**
- **5%**
- **25%**
- **10%**

### % of Dwelling Units with Parking Spaces

- **60%**
- **40%**
- **85%**

**Low Power Option**
- **40%** Level 2 EVCS
- **60%** L1 EV Ready

**High Power Option**
- **15%** Level 2 EVCS
- **85%** L2 EV Ready (low-power)

**AUTOMATIC LOAD MANAGEMENT ENCOURAGED**
## Non-Residential EV Charging

<table>
<thead>
<tr>
<th></th>
<th>2019 CALGreen</th>
<th>2022 CALGreen</th>
<th>Model Code</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mandatory</td>
<td>Mandatory</td>
<td>All other:</td>
</tr>
<tr>
<td>Non-Residential</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6% Level 2 EV Capable</td>
<td>5% Level 2 EV Capable</td>
<td>10% Level 2 EV Capable</td>
</tr>
<tr>
<td></td>
<td>6% Level 2 EV Capable</td>
<td>5% Level 2 EV Capable</td>
<td>10% Level 2 EV Capable</td>
</tr>
<tr>
<td></td>
<td>15% Level 2 EV Capable</td>
<td>15% Level 2 EV Capable</td>
<td>30% Level 2 EV Capable</td>
</tr>
<tr>
<td></td>
<td>30% Level 2 EV Capable</td>
<td>20% Level 2 EV Capable</td>
<td>10% Level 2 EV Capable</td>
</tr>
</tbody>
</table>

### 2019 CALGreen

- Mandatory: 6% Level 2 EV Capable
- Non-Residential: 6% Level 2 EV Capable

### 2022 CALGreen

- Mandatory: 5% Level 2 EV Capable
- Non-Residential: 5% Level 2 EV Capable
- Offices: 20% Level 2 EV Capable
- All other: 10% Level 2 EV Capable
### EV Charging Reach Code Comparison

<table>
<thead>
<tr>
<th></th>
<th>2019</th>
<th>2022</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Housed</strong></td>
<td>Title 24 Part 11 California Green Building Standards (CalGreen)</td>
<td></td>
</tr>
<tr>
<td><strong>RESIDENTIAL</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Exceptions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Where there is no commercial power supply</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ADUs and Junior ADUs</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Single-family</strong></td>
<td>Exception: For each dwelling unit with only one parking space, install a Level 2 EV Ready space</td>
<td>TBD</td>
</tr>
<tr>
<td><strong>Multi-family</strong></td>
<td>10% Level 2 EV Ready and 40% Level 1 EV Ready</td>
<td>15% Level 2 EV Charger and 85% Low Power Level 2 EV Ready</td>
</tr>
<tr>
<td><strong>NON-RESIDENTIAL</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Exceptions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Where there is no commercial power supply</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spaces accessible only by automated mechanical car parking systems</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Office</strong></td>
<td>10% Level 2, 10% Level 1, and 30% EV Capable</td>
<td>20% Level 2, and 30% of spaces to be Level 2 EV Capable</td>
</tr>
<tr>
<td><strong>Other Commercial</strong></td>
<td>6% Level 2 installed and 5% Level 1 installed</td>
<td>10% Level 2 EV installed and 10% of spaces to be Level 2 EV Ready</td>
</tr>
<tr>
<td>Exception: Installation of each Direct Current Fast Charger with the capacity to provide at least 80 kW output may substitute for 6 Level 2 EVCS and 5 EV Ready spaces after a minimum of 6 Level 2 EVCS and 5 Level 1 EV Ready spaces are installed</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Pathway to Reach Code Adoption

Oct. 13
Builders Roundtable

Dec. 6
Board of Supervisors
First Reading

Dec. 13
Board of Supervisors
Second Reading

Jan. 1
California Codes
Take Effect
QUESTIONS?
ADDITIONAL INFORMATION
## Common Concerns (1 of 2)

<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>
100% Access is Cost Comparable

EV Infrastructure Cost for 100-Dwelling Multifamily Building

- **2019 Reach Code**: $170k
- **2022 CALGreen**: $146k
- **2022 Reach Code - with L1 Ready**: $194k
- **2022 Reach Code - with low power L2**: $227k

Each scenario is 0.3 – 0.5% of construction cost.

Assumes $392/ft² to build per Turner and Townsend, 2021.

- **L2 EV Capable**
- **L1 Ready**
- **Low Power L2 Ready**
- **L2 EVCS + Load Management**
- **L2 EVCS**

**Affordable Housing new construction is eligible for PCE incentives**
Electrifying New Single-Family Homes in the Bay Area - The Cost Story

<table>
<thead>
<tr>
<th>Capital Cost of Thermal Systems</th>
<th>Annual Energy Use &amp; Generation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixed-Fuel Home</td>
<td>Mixed-Fuel Home</td>
</tr>
<tr>
<td>All-Electric Home</td>
<td>Electricity</td>
</tr>
<tr>
<td>$18,620</td>
<td>14,100 kWh</td>
</tr>
<tr>
<td>$29,200</td>
<td>Gas</td>
</tr>
<tr>
<td>$191 Net Lifecycle Cost Savings per year for an all-electric home versus the mixed-fuel equivalent</td>
<td></td>
</tr>
</tbody>
</table>

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
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

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

Sources: 1) AB3232 Decarbonization Assessment 2021 2) CA Energy Commission 2018 3) CA-ISO 4) CPUC 2021
2022 New Exemption Language

**Exception 5:** Parcels or sites currently served by the electrical supplying agency, and where at least one building intended for human occupancy and constructed prior to the existence of this ordinance (February 25, 2020) currently exists:

Where, due to local site conditions, an applicant establishes that it is infeasible to construct an all-electric building, the Building Official shall have the authority to grant an exception provided he or she finds that one of the following conditions apply:

1. That for undergrounded utilities, the distance from the point-of-connection at the proposed building to the location of the supplying agency exceeds 150 linear feet, and that any existing underground electrical conduits are not of adequate size or in such condition as to permit the installation of adequately sized conductors for the proposed new construction. Other factors, such as the point-of-connection location specified by the supplying agency being located on the opposite side of a street and trenching across a street would be required to complete the installation, may also be considered by the Building Official for this exception.

2. That for overhead utilities, the cost of installing new or upgraded conductors and equipment required for such conductors would exceed 10% of the total project cost and, thereby, present a financial hardship to the applicant.
Equipment

- Space Heating
- Water Heating
- Cooking
- Clothes Drying