Municipal Reach Code Initiative -

Frequently Asked Questions

Updated: March 2023

1 Benefits of Electrification

1. What are the safety and health benefits of building electrification?

Research indicates that methane gas is a major fire risk in the event of earthquake. The link between earthquakes and methane gas-triggered fires is documented in California's 2002 study.

Methane gas use in the home is linked with asthma and other health risks. Here are a few examples among many:

- In a 2008 study, John Hopkins reported worsening asthma symptoms in young children due to gas stoves.
- Lawrence Berkeley National Laboratory, the California Energy Commission, and others produced a similar study.
- RMI, Albert Einstein College of Medicine and the University of Sydney found that 20% of childhood asthma cases in California can be attributed to pollution from gas stoves.
- A study from Stanford suggests families that don't use range hoods or have poor ventilation while cooking with a gas stove can surpass the 1-hour national standard NO_2 (100 ppb) within a few minutes.
- Carbon monoxide from fuel use has been long deemed a risk, enough that California requires carbon dioxide sensors in homes that burn fossil fuels.

2. What are the benefits of electric vehicles (EVs)?

Drivers of EVs generally describe them as more fun to drive because they are quicker, smoother, and quieter than gas cars. EV drivers typically save $1,000 to $1,500 per year, as electricity is a more cost-effective way to power a vehicle than gasoline. In addition, owners can expect reduced

maintenance costs, as motors are simpler machines that require less maintenance (such as oil changes). And of course, they dramatically reduce pollution.

2 Municipal Staff, Public Process, Affordable Housing

3. What is the impact to staff? Do electrification reach codes add staffing burden?

A reach code for an all-electric requirement is very easy to permit and inspect. If the code includes exceptions, the level of effort is likely to be a minor increase. For EV charging, the level of effort is likely equivalent to California state code.

4. Should code requirements be consistent across jurisdictions in the same geographic area?

Uniformity across jurisdictions is desirable because it reduces burden on designers and contractors working regionally across jurisdictions. For this reason, Peninsula Clean Energy (PCE), Silicon Valley Clean Energy (SVCE), East Bay Community Energy (EBCE), and regional partners are encouraging consistency. However, to accommodate differences in new and existing buildings across jurisdictions (e.g. a city with heavy industry versus a jurisdiction that is primarily residential) may result in some variation across jurisdictions. Generally, minor variation is preferable to inaction, which locks in future cost for retrofit projects.

5. What kind of public process was held to develop the model codes?

The reach code initiative team has engaged the public since 2018, and highly encourages community participation. The team held over 10 events with the full spectrum of stakeholders (city employees, building officials and developers, public and advocates) with over 350 attendees in total (non-unique). In addition, the team held many meetings with building officials, developers, and affordable housing organizations. For the current initiative, the reach code team is organizing further stakeholder events and will adjust the model code based on stakeholder feedback. As of Q1 2022, the reach code initiative team held 3 events focused on model code updates to new construction and electric vehicle charging infrastructure with over 148 unique attendees. We also held an Existing Building Policy Options forum for city staff in April 2022.

6. What are the impacts to affordable housing projects? Has the reach code process included developers?

In most cases, all-electric buildings cost less to build. To assist with ensuring optimal design and cost effectiveness, PCE is providing technical assistance (visit AllElectricDesign.org).

Proposed reach codes for EV infrastructure for affordable housing are cost neutral relative to California code minimum. Market-rate EV infrastructure reach codes require more EV charging stations and 100% EV access, which do result in a marginal extra cost compared to the state code . To address this issue, PCE and SVCE's EV infrastructure incentive program, which will launch in 2022, will include an explicit element for new construction of affordable housing. The intention of those incentives is to address most or all the cost of EV infrastructure in affordable housing.

The reach code initiative team held multiple discussions with affordable housing providers, including a workshop held by the Housing Leadership Council, and an in-depth meeting with MidPeninsula Housing (Mid Pen) and Mercy senior staff. The team and MidPen exchanged multiple technical emails following the meeting to address and clarify concerns. The two major points of concern related to a lack of familiarity on the part of contractors, which the reach code initiative team is addressing by offering training and technical support via AllElectricDesign.Org.

SVCE has recognized MidPen for their 66-unit all-electric affordable housing project, Edwina Benner Plaza in Sunnyvale.

7. **What are the deadlines for filing for CEC approval for each of the electrification adoption approaches?**

CEC approval is necessary if there are any energy conservation requirements in local code, such as efficiency, photovoltaics (PV), or storage. All of these may be good measures depending on cost effectiveness and jurisdiction-specific factors. In this case, the reach code initiative team recommends reach code adoption by September or October of 2022 to leave ample time for CEC approval processes so that reach codes can become effective Jan 1, 2023, in alignment with the new statewide code cycle.

If your city is not adopting any conservation requirements and only going all-electric, jurisdictions should adopt the reach code by October/November 2022 to allow time for unanticipated challenges and to give the industry advanced notice.

8. **Where is the 2022 CALGreen code available?**

The California Green Building Standards Code, also known as CALGreen, was the first green building code in the United States, first adopted in 2009, It covers a range of requirements including water conservation, materials conservation, and environmental air quality, in addition to Electric Vehicle infrastructure. The Code also contains both mandatory and voluntary provisions.

The 2022 version of California Title 24, Part 11, known as CALGreen is now available.

9. **If my city has already passed an all-electric ordinance with EV charging requirements, is there a need to move forward with a new round of local adoption for the January 1, 2023 new codes effective date?**

If your city's EV charging reach code was adopted through a building code amendment, and you wish to maintain higher levels than 2022 CALGreen, yes. If your city has an EV reach code in your zoning code, then all that is needed is a review to ensure it is still more stringent in comparison to the CALGreen requirements.

10. **Can cities that are interested in reach codes but are not a member agency of PCE, SVCE, or EBCE participate?**

    All cities are welcome to use resources and tools available on the Bay Area Reach Codes website. Customized support services, such as stakeholder engagement and staff report review, are only available for member agencies.

3 Resilience, Grid Readiness, and Pacific Gas and Electric Company (PG&E)

11. **Do gas appliances offer more resilience?**

    Methane gas appliances in general do not support resilience, as most modern gas equipment depend on electric pilot light ignition to operate. In emergencies, gas is also shut-off to prevent accidental combustion.

12. **Does the model code prohibit propane, diesel generators or methane gas pipe fed generators?**

    The proposed code does not prohibit propane or diesel generators. Methane gas pipe fed generators are disallowed if adopting the municipal code amendment. Battery storage is recommended as backup power, but not required by the code.

13. **How reliable is the electric grid as compared to methane gas?**

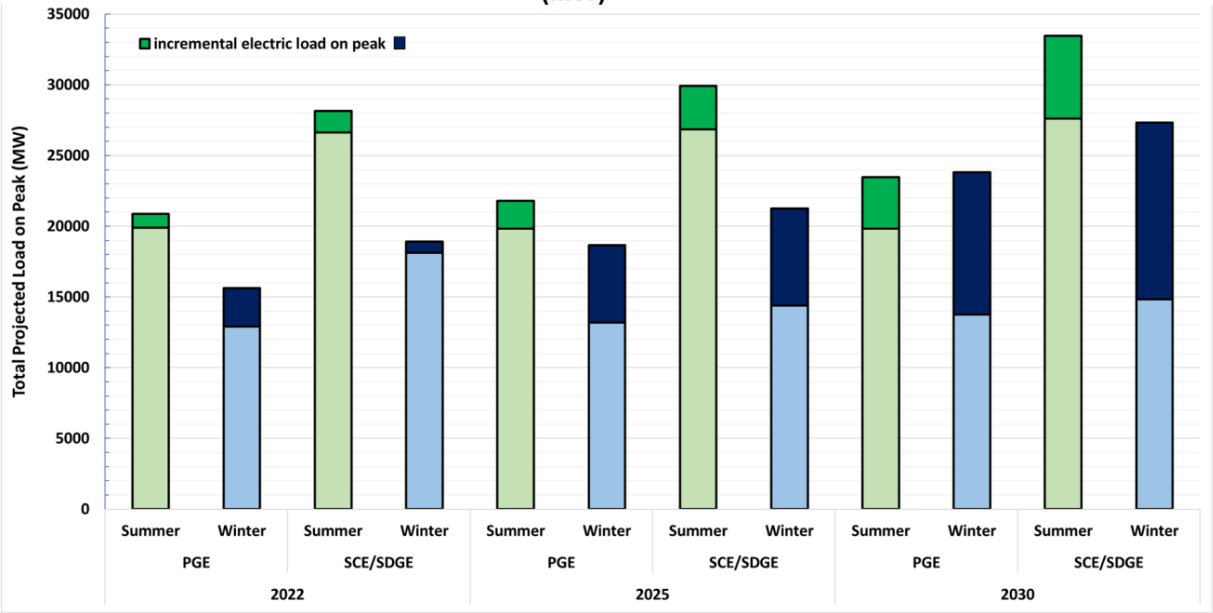
    The methane gas grid and electric grid both go offline on occasion. In fact, during California's primary natural disaster events, wildfires and earthquakes, utilities are required to temporarily suspend gas service. In the 2019 Kincade fire, homes in Sonoma County went without gas service for four days, whereas the electric service was restored after two days (Link to article). The reach code initiative team encourages solar and battery backup via microgrids for 100% reliability.

    The California Independent System Operator (CAISO) has performed a 20-year study and has recommended over $30B in transmission investments to account for increased demand, increased renewables and decommissioned gas power plants.

14. **Can the grid handle the load increase?**

    In most of California, grid reliability is primarily a concern during summer peak cooling months as our cooling equipment is already electric. Increases in cooling demand are primarily due to climate change increasing summer temperatures. Building electrification to heat our water and spaces will not be in high demand or add strain to the grid during these peak cooling periods. Analysis by the California Energy Commission under AB3232 indicates that the winter heating load will effectively match the summer peak cooling load by 2030 in PG&E territory under a highly aggressive existing building electrification scenario (see figure below). It is important to note that this study does not include EV charging.

Figure 25: Aggressive Electrification Scenario Winter and Summer Peak Load Impacts (MW)



Source: CEC staff

Also, all-electric technologies can draw power flexibly. Electric vehicles can charge during off-peak periods, water heating tanks can increase temperature ahead of peak periods, thermostat setbacks can reduce space conditioning demand, and several other demand flexibility approaches will avoid power outages.

During heatwaves from August 2022, load flexibility approaches helped to prevent blackouts and brownouts. In addition, utility-scale battery power output increased 27-fold between August 2020 and August 2022, further reducing reliance on generator capacity. The grid is evolving rapidly and many state agencies are collaborating on a future of electrification and climate resiliency.

Finally, electricity suppliers have a service obligation to meet demand. California Community Choice Aggregators (CCAs) are continuously acquiring long -term clean energy resources demonstrating their commitment to providing clean, affordable and reliability energy.

15. Is the electricity on the grid clean?

PCE, SVCE, and EBCE provide 100% greenhouse (GHG) free electricity today, and much of the rest of the United States have long-term goals for 100% renewable portfolios.

16. Will electrification require expensive transformers and distribution grid upgrades?

Depending on the building size and the amount of EV charging, additional transformers may be necessary. Even when considering the cost of this additional electrical infrastructure, all-electric building design is still cost-effective. EV charging infrastructure also represents an added cost, but

those costs are small relative to the overall construction costs (we estimate less than 0.5% in the Bay Area depending on the level of charging provided), and they are approximately 4x less costly compared to retrofit scenario. For affordable housing applications, the proposed reach code is cost neutral to code minimum.

Additional distribution grid transformers are rare, and costs are typically the responsibility of PG&E. If there are costs to the customer, these are costs are usually more than offset by the savings of all-electric construction.

The model code for EVs allows for significant use of Level 1 and low-power Level 2 charging and load management to minimize service size requirements and transformer costs.

17. **Do PG&E load calculations for EVs require assuming concurrent charging at all spaces?**

The model EV code gives precedence to the National Electrical Code (NEC), which has also been adopted by the state of California. The NEC allows for load management (NEC 625.42) to reduce the actual load. PG&E has confirmed that they will use specific load design in their calculations (not a fixed calculation based on number of spaces):

> Per PG&E: *We calculate loads based on the information provided by the applicant on the improvement plans, single line diagram and charger equipment specifications. Load balancing equipment can be considered and when it's used, we'll use the current limiting amperage to determine the load for L1, L2 and L3 (DCFC). Please note, for non-residential installations the applicant will be required to provide the charger equipment specifications/cut sheets.*

18. **Will PG&E cause project delays due to updating the distribution grid?**

The reach code initiative team does not expect turnaround times associated with PG&E and new construction to be materially different between all-electric or mixed fuel construction. Also, upgrades to the distribution grid due to EV charging installations (more load than electric buildings) is rare at this point—about 3% according to CPUC data. This may rise somewhat with reach codes, and PG&E response times have clearly been adversely impacted by bankruptcy. This is likely affecting both electrical and methane gas service response times. PG&E has committed to support electrification and is openly supporting all-electric reach codes due to concern about stranded methane gas assets and the rising costs of maintaining the methane gas system.

4 Cost Effectiveness Studies

19. **Are the state-wide cost-effectiveness studies based on investor-owned utility (IOU) rates or PCE/SVCE/EBCE's rates?**

Currently, the study is based on specific IOU utility rates.

20. **For tenants and landlords, who is paying for the measures and who receives the benefits?**

It depends on the metering arrangement and rental agreement between the tenant and landlord.

21. **Are the models adjusted for upstream fugitive emissions? Do they account for Renewable Portfolio Standard requirements? Is there a consideration for hydrofluorocarbons (HFCs) in GHG emission saving analysis?**

    The GHG emission factors do account for future Renewable Portfolio Standard requirements. However, the GHG emissions factors do not reflect current emissions rates, which may be ahead of the renewable portfolio standards requirements. They do attempt to account for gas system fugitive emissions as well as emissions associated with HFCs.

22. **What geographical regions do the cost effectiveness results apply to?**

    The statewide IOU study covers all geographical regions in California. This initiative focuses on San Mateo County (CEC Climate Zone 3), Santa Clara County (CEC Climate Zone 4), and Alameda County (CEC Climate Zones 3 & 12). Click here to see the most up-to-date draft of the cost effectiveness studies.

23. **Does the PV sizing in analysis result in over production?**

    For most scenarios, no. The residential code allows for a slight over generation for all-electric homes with battery storage, but there are no code requirements to do so.

24. **Was there a sensitivity analysis performed on cost benefit?**

    The reach code initiative team performed studies with a set of assumptions that they assumed would be most realistic. Comprehensive descriptions of these assumptions can be found in the methodology section in each relevant report. The team has not yet performed sensitivity analysis.

25. **Why are different compliance margins found to be cost effective between residential and nonresidential buildings?**

    The variance in compliance margins depends on occupancy type of the building and location (climate zone). These two determinants impact the energy consumption of the building, the state building code requirements, and subsequently, the extent that additional energy efficiency measures are cost effective.

26. **Is it truly cheaper to build all-electric? How reliable is electric equipment compared to methane gas?**

    Several studies found that for the major building end-uses, all-electric appliances have a negligible impact on installation costs as compared to gas appliances. Building all-electric has substantial cost savings for avoided methane gas infrastructure. The reach code initiative team will post these studies on their website. The studies examine the upfront costs, maintenance costs, and operational costs of all-electric designs, which support these conclusions:
    a. Residential Building Electrification in California
    b. 2022 PCE/SVCE Single Family New Construction Cost-effectiveness Study

c. 2022 Multifamily New Construction Cost-effectiveness Study
d. 2022 Nonresidential New Construction Cost-effectiveness Study

27. What are the baseline PV sizing requirements for low-rise residential buildings as per 2022 Title 24 code?

The PV system offsets the electricity usage of a mixed-fuel home. Code requires an all-electric home to have a baseline PV system size equivalent to a similar mixed-fuel home.

5 Building Technologies

28. Do people prefer gas stoves?

Yes, many people prefer gas stoves. However, most people are unfamiliar with induction stoves, which offer superior heating speed, cool and safe surfaces while cooking, precise temperature control, and better indoor air quality from avoided GHG and particulate emissions. Consumer Reports' top cooktops are regularly electric. Induction is also more efficient, as demonstrated by this study on Residential Cooktop Performance and Energy Comparison.

29. Does all-electric heating use a lot of energy and can it work in our cool climate?

All-electric heat pumps are highly efficient and effective in weather far colder than California's. U.S. Department of Energy studies show heat pump space heaters as highly efficient at as little as 5°F. The CEC's cost-effectiveness studies also show high efficiency.

30. Is all-electric equipment available?

Yes – heat pumps and induction stoves have a long-established history and are widely adopted in other states. Also, numerous California institutions and agencies have committed to all-electric buildings, which will help drive awareness and adoption of all-electric equipment in California. Training is a need PCE, SVCE, and EBCE will address.

31. Central water heating: Are central heat pump water heaters infeasible/unavailable?

There are several design options for multi-family buildings including central heat-pump water heaters (HPWH) with larger tanks, central HPWHs in parallel, distributed HPWHs within each unit, or distributed HPWHs serving multiple units. Central HPWH it is absolutely an option with dozens of case studies and several practitioners available, particularly in affordable housing. This guide by Redwood Energy provides case studies, design insights, and products.

32. Can a HPHW match the performance of a gas system?

Yes, a heat pump water heater can equal the performance of a gas equivalent. For example, Rheem's 55-gallon HPWH unit can deliver 70 gallons of hot water in the first hour, enough for about four showers. For comparison, Rheem's gas equivalent delivers 79 gallons in the first hour. When selecting any hot water heater, no matter the fuel, make sure it is the right size for your use type. A

home with a big family, or a small home that wants extra insurance to never run out of hot water, might need a larger 80-gallon tank.

33. Will the HPWH need to be supplemented by electric resistance?

Manufacturers design HPHWs with hybrid heating capability, including a backup electric resistance coil. This enables the heat pump to work when it is bitterly cold, and it also helps the heat pump replenish its hot water supply more quickly. In most cases, particularly in mild California climates, the electric resistance coil is idle.

34. Can the central heat pump water heater distribute adequate water supply at high temperature to multiple units simultaneously?

Yes, when designed appropriately. Here are some design guides that will outline typical implementation:

- 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
- Zero Emissions All-Electric Multifamily Construction Guide outlines demonstration projects and common implementation.

35. With the rapid change in technologies, how soon will these all-electric technologies become irrelevant?

Most electrification technologies have been available for over a century. They will likely become slightly more efficient over time, but the current options available will be relevant for the life of the system.

36. How do the costs for electric space heating and water heating compare to that of methane gas-based options?

The answer largely depends on the product chosen, climate, and occupant behavior. Generally, energy costs can be treated as similar. This is because while electricity is more expensive than gas per Btu, heat pumps are more efficient. Capital costs for new construction are lower because a building owner can avoid the high cost of a new gas meter. The cost effectiveness studies listed in this FAQ include estimates of on-bill impacts.

37. Are methane gas systems more efficient than all-electric?

In every case, all-electric systems operate more efficiently than methane gas systems.

38. What if the new building does not have air conditioner? Are there any other requirements to later convert from a gas heater to electric heat pump?

The model code includes requiring electrical capacity minimums ("electric readiness") for any exempted appliances to reduce future retrofitting costs.

39. Are there requirements for buildings to have solar PV or battery storage?

Title 24-2022, which goes into effect on January 1, 2023, requires new nonresidential and multifamily buildings to have onsite solar PV and battery storage.

6 EVs, Charging, and Parking

40. EV demand is perceived to be low. How much EV infrastructure is need?

The model EV reach code intends to ensure that buildings constructed today are ready for EV adoption to occur within the 40+ year life of the building, and builders incorporate that readiness at construction to avoid the substantially greater cost of retrofits. For the Bay Area, EV's will likely be the majority of vehicle sales in the next five to six years, so the EV expansion will be well within the life of the buildings.

Supporting that projection, data shows that at the end of 2021, EV purchases in San Mateo County were approximately 24% of new vehicles sold. According to a PCE county-wide survey in January 2019, 35% of residents reported they are "very likely" to adopt an EV as their next vehicle. Automakers are rapidly moving to address that increase in demand. Every major automaker has announced major expansions of EVs (ex: General Motors: 20 new electric vehicles by 2023; Volkswagen: 50 fully electric models by 2025; Ford: 40 electrified models by the end of 2022). Global purchases of vehicles should be over 50% EV by 2040, but in California it will be much faster.

41. Can you explain different types of EVs?

Plug-in electric vehicles, include both plug-in hybrid EVs (PHEV) and battery EVs (BEV) as subsets. PHEVs include a conventional combustion engine, while BEVs do not.

42. Why does the EV model code include use of low-power Level 1 charging?

Level 1 charging identifies charging on a standard 110/120 volt plug. This is lower power than Level 2 charging, which is the equivalent of a dryer outlet (or DC fast charging, which is a very high-power charging station, such as a Tesla Supercharger® or EVgo® station). Most installed EV charging stations are Level 2; however, in practice, many (possibly even a majority) EV drivers charge at home using Level 1.

Level 2 charging provides faster charging, which is important for longer range driving, but Level 1 only provides 30-40 miles of charge overnight. This level of charging provides sufficient charging for plug-in hybrids—which make up 40% of the market—and it is also sufficient for average daily

driving, which is under 30 miles a day. It is also substantially less expensive to deploy, and especially at large scales, minimizes the number of transformers and size of service panels to support. Finally, Level 1 outlets provide a practical option for people who may wish to own electric bikes, scooters, or motorcycles.

43. How are the EV charging spaces shared between tenants in multifamily buildings?

The model codes require that each parking space in a multifamily building be provided with EV infrastructure, even parking spaces that are unassigned to specific dwelling units.

44. What are the typical costs of electric vehicle supply equipment?

Residential chargers: $400-$1200 per outlet
Nonresidential chargers: $1000-$5000 per outlet

45. Can a very aggressive deployment of EV readiness put a sudden load to the electric grid?

Utilities are expending a significant effort to plan at the infrastructure level, and smart charging capability at the EV charging station helps ensure this is not an issue. Utilities are planning and preparing for increased levels of EV deployment.

46. Do EV charging stations also count as parking spaces? If not, are cities required to separately meet minimum parking space requirements as well as minimum number of EV charging stations?

This initiative's intent is that an EV charging station would replace a parking space—i.e., the total number of parking spaces would remain the same even with EV reach code requirements. The reach code initiative team's understanding is that the municipalities determine if an EV charging station is equivalent to a parking space. Local ordinance adoption processes should ensure that local planning and zoning interpretations do not inadvertently result in an increase in the total number of parking spaces required as a result of EV reach code adoption.

47. Parking stall size: Will requiring EV spaces make projects unviable?

9' x 18' is common in California municipal codes and so are larger spaces (10'x20'). As an example, the City of Burlingame's space size requirements appear to be 9' x 20' (same width, and longer than CalGreen @ 9' x 18') with an allowance for 8.5' x 18' in special circumstances. However, Burlingame has zones allowing for 8.5' x17'.

To maximize flexibility, the November 2019 update to the EV model code removed references to space sizes so that local jurisdictions can determine space sizing.

48. If my building is required to provide EV charging access to 100% of dwelling units, my building will have a very large electrical service. Considering that EV ownership is still in the minority, will the utility charge me more for underutilized electrical infrastructure?

Utilities have previously charged for underutilized electrical infrastructure, such as over-sized transformers, also known as deficit billing. AB841 required better rates and rules for EV infrastructure, and in support of that mission, PCE was part of an effort to change PG&E rules on deficit billing in late 2021. Rules 15 and 16 are related to single and multifamily buildings, and Rule 29 applies to all properties other than single family. In short, the significant rule changes are:

- The utilities waive deficit billing unless the customer does not install the planned EV chargers.
- Utilities must rate-base costs associated with EV charging electric meters, service and their accompanying infrastructure upgrades. This is also known as the common treatment policy.

Where possible, the reach code initiative team encourages using Rule 29, but if adding an EV-specific meter is infeasible, you may want to consider complying under Rule 15/16.

You can find further information in PG&E Advice Letter 6423-E and 6424-E.

7 Model Code/Ordinance

49. Do the local governments work with public utilities on developing the ordinance?

This initiative supports local governments in developing local ordinances that are most appropriate for the locality. This may require some level of customization, but regional consistency is highly encouraged for the benefit of the building industry. When a local code requires energy conservation or efficiency measures, the ordinance must be approved by the California Energy Commission - this Initiative supports the CEC application process as well, if needed.

50. How will the code be implemented against current standard practices?

The Statewide Utility Study researched design approaches that are market-ready as well as cost effective. The model codes, as part of this initiative, will allow and support flexible all-electric design approaches with multiple compliance pathways.

51. How do we apply the cost-effectiveness study to develop a prescriptive approach for model ordinance?

The California Energy Codes and Standards cost-effectiveness studies determined the maximum performance level that can be achieved cost effectively through a certain set of measures. The intent was to identify a market-ready performance threshold, while allowing cities to achieve it in a variety of ways. Local jurisdictions can choose to allow for an alternative prescriptive compliance path that requires this set of measures. The 2022 code cost-effectiveness studies will be posted on the Bay Area Reach Codes website when available and the most recent studies from 2019 are already on the website.

52. Can reach codes promote better air quality in addition to energy efficiency?

Indoor air quality impacts are not explicitly studied, though many studies have shown that avoiding indoor methane gas combustion can result in better air quality, such as:

a. Results of the California Healthy Homes Indoor Air Quality Study of 2011-2013: Impact of Natural Gas Appliances on Air Pollutant Concentrations.
b. Air Quality Implications of An Energy Scenario for California Using High Levels of Electrification.
c. A Longitudinal Study of Indoor Nitrogen Dioxide Levels and Respiratory Symptoms in Inner-City Children with Asthma.
d. RMI meta-study on Gas Stoves and public health impacts.

53. How will accessory dwelling unit's (ADUs) be addressed?

Inclusion of ADUs is at the discretion of cities. Many cities are including ADUs in all-electric requirements, while some are not. This 2019 study found that new detached ADUs can be constructed all-electric cost-effectively when combined with efficiency and/or solar PV.

54. How will high-rise multifamily buildings comply?

Cost-effectiveness results and compliance pathways are now available for mid-rise and high-rise multifamily buildings for the 2019 code cycle and will be available in a few months for the 2022 code cycle. Please visit bayareareachcodes.org for the latest information.

55. What building types are covered under the reach code?

The California Energy Codes and Standards team performed cost-effectiveness studies on single family, low-rise multifamily, hotel, office, and retail prototypes. At a minimum, most buildings that fall under these size ranges comply with the reach code buildings. This initiative's model code applies the cost-effectiveness findings to an expanded set of building types.

56. Will implementation of reach codes be affected if my city changes policy to allow different housing types?

Reach codes are specific to individual building types, which means that they will apply to any building of that type, even if the code's adoption predates the policy change that allows for their construction. In other words, if a city votes to allow the construction of multifamily buildings, their reach code will not apply to those buildings unless it specifically addresses that building type.

57. Can you please advise on the energy design rating (EDR) equivalent to compliance margin requirement?

The proposed reach code language refers to EDR reductions from the 2019 code compliant baseline design. It is challenging to develop an exact relationship between an EDR reduction and a compliance margin because EDR includes whole-building energy use, while a compliance margin includes only a limited set of end uses (e.g., not including solar PV or battery). The full range of

compliance margins and associated EDRs are available in the residential cost effectiveness study, but as an example, an efficiency-only EDR reduction of 1 is approximately equivalent to a 5% compliance margin.

58. Please clarify the exclusion for 'heavy industry and process loads' from the nonresidential portion. In other words, does the nonresidential category cover warehouse or any other industrial uses?

The energy code only lightly regulates industrial processes. The reach code does not cover any research into how industry could make these processes all-electric. Common building systems (e.g., space heating, water heating, clothes drying, and cooking) are recommended to comply at a reach level, and they do not affect the industrial processes.

That said, many high-temperature industrial processes do have electric-powered alternatives such as resistance and induction, and we recommend that any exceptions be discussed with developers and treated on a case-by-case basis.

59. Does 2022 Title 24, Part 6 require residential buildings to be all-electric? Will the reach code?

The base code encourages electrification, and the model all-electric municipal ordinance and reach code requires certain building systems to be all-electric construction.

60. Can a reach code still require PV?

The 2022 California Energy Code prescriptively requires some PV on all building types. The Statewide Utility Codes and Standards Program is evaluating the cost-effectiveness of additional PV via reach codes. Results will be final by Summer 2022.

61. Do the model codes prohibit co-generation or district thermal systems?

The all-electric municipal model ordinance recommends that the building not be served by any gas infrastructure, including for the use of energy generation. Backup generation may be provided with other forms of non-plumbed energy storage, preferably batteries but also diesel or propane.

The building code amendment applies to building appliances serving specific end-uses including space and water heating, cooking, and laundry, but not explicitly to energy generation technology. Cogeneration is an energy generation technology that is not an appliance servicing one of the building end-uses covered by the PCE/SVCE/EBCE building code amendment.

The model codes would apply to buildings that connect to the existing district thermal (e.g., central plant) system and install on-site booster appliances to provide supplemental space or water heating (for example), but they would not apply to buildings that only use a heat exchanger and pumps to connect to a district thermal system and do not use any booster systems. Existing district thermal systems are not impacted by the reach code.

62. Do the model codes affect projects that already have been approved for land use permits or have gone through design review?

The reach code initiative team added an exception to the model code for multifamily residential buildings that have been granted entitlements (e.g., a land use permit) within one year of the effective date of the ordinance. Code does not require these buildings to install central HPWH systems. The reach code initiative team added this exception because:

- Multifamily residential buildings, particularly larger ones, often utilize central water heating systems.
- Central HPWH solutions may be more challenging to electrify compared with other building systems because of the physical space necessary for hot water storage tanks.
- Buildings that have received entitlements have performed a significant amount of work designing the building form and calculating pro forma.
    - Thus, changes in central hot water design may lead to substantial changes in physical space planning or pro forma calculations.
- Multifamily residential buildings address statewide housing needs, and the intent of the model code is to support housing development rather than evoke challenging scenarios.

We only recommend this exception be considered for cities that are adopting reach codes for the first time.

8 Existing Building Electrification

Retrofitting existing mixed-fuel buildings to become all-electric presents certain challenges that are different from those of new construction. This section addresses these issues.

63. What does the all-electric municipal code say about gas service connections after an all-electric retrofit is complete?

The all-electric municipal code amendment does not allow any extension of existing gas lines, and it does not allow re-activation or operation of inactive gas lines. The model code does not require capping any gas supply lines.

64. How much does it cost to convert a mixed-fuel building to all-electric?

Costs vary significantly by building type, existing mixed-fuel system types, and existing conditions. For single-family homes with existing air conditioning where the appliances are replaced on burnout, the cost for converting the heating, DHW, kitchen, and laundry appliances—as well as performing required panel/electrical upgrades—will be roughly $12,000 to $26,000 higher than it would have been to keep gas appliances. For multifamily and commercial buildings, costs vary even more widely. These cost considerations underscore the need for adequate financing, equity guardrails, and careful planning to be in place when adopting existing building electrification measures.

65. Will gas appliances have to be retired before the end of their useful life?

In the short term, the existing buildings code focuses on burnout and major alterations. Early retirement of gas appliances is one possible outcome in the long term, as cities scale down fossil fuel usage by 2045 or earlier for gas appliances that remain.

66. What assistance is available for those purchasing electric equipment that is in line with the new model code?

There are multiple organizations providing incentives for purchasing electric equipment. The incentive amounts are constantly getting updated, and incentive programs will provide a summary soon. In the meantime, check the websites of PCE, SVCE, and EBCE to see the incentives they offer their customers. Additionally, check the TECH program website for incentives offered to contractors.

67. How do I know if my building has sufficient electric service capacity for an all-electric retrofit?

This will need to be examined on a case-by-case basis. Technical assistance is available through PCE and SVCE at allelectricdesign.org, and through EBCE at ebce.org/mea/index.html. Calculations show that single-family homes up to 2,400 square feet can be all-electric on an existing 100-A panel with the inclusion of power-efficient appliances and circuit splitters, which are a low-cost alternative to a panel upgrade.

68. What happens if my building has insufficient electrical service capacity, but an electrical service upgrade is not feasible or timely?

Ideally, electric panel and electric service upgrades will not be required for building electrification in retrofit scenarios. Peninsula Clean Energy released design guidelines to outline different options property owners can make based on their current panel size to avoid electric panel and service upgrades. Still, electrification upgrades may require electric panel and electric service upgrades in some instances for retrofit electrification. If this is the case, cities may consider exemptions for technical and financial infeasibility or provide funding.

69. What type of work on existing parking facilities is likely to trigger the EV infrastructure code? Does it include routine maintenance?

When the of existing parking facility's electrical system or lighting is altered and the work requires a building permit, it may trigger the EV infrastructure code. Permit requirements vary from city to city, so check with your local building department to determine if and when you may trigger the EV infrastructure code.