



DATE: September 17, 2019

TO: Council Sustainability Committee

FROM: Director of Public Works

SUBJECT: Draft Electrification Reach Codes for 2019 California Energy Code and California Green Building Standards Code

RECOMMENDATION

That the Committee reviews and comments on this report and recommends to Council adoption of the draft Reach Code.

SUMMARY

This report presents draft ordinances to address the electrification of buildings and vehicles related to new construction. Every three years, the California Building Code undergoes a full update and the 2019 Code will be in effect on January 1, 2020. Local jurisdictions can implement codes that are more stringent than the State Code. These “Reach Codes” can address the electrification of buildings and vehicles at the time of construction of new buildings.

The proposed Reach Codes would modify Part 6 (California Energy Code) and Part 11 (California Green Building Standards Code, aka CALGreen) of the California Building Code (Title 24 of the California Code of Regulations). This report includes an overview of the Statewide cost-effectiveness study, details findings, and provides language recommended for the associated reach codes for the 2019 building cycle. The draft ordinances would require that new buildings be either: constructed as all-electric (with no natural gas plumbing); or constructed as mixed fuel with extra energy efficiency, solar, and battery storage. As discussed in this report, the Committee may recommend that mixed fuel be removed from the reach code as an option for low-rise residential (single-family and multi-family up to three stories).

BACKGROUND

All-electric buildings are one of the key strategies to decarbonizing the state’s building stock. The state’s electric system is rapidly becoming cleaner, driven by escalating renewable portfolio standards and cleaner product offerings by the utilities and community choice energy programs including East Bay Community Energy (EBCE).

In addition, advances in electric heat pumps and other electrical equipment are yielding much higher overall efficiencies than their natural gas counterparts. Electric heat pumps, unlike traditional electric resistance heaters, do not generate heat, but concentrate and transfer it for end uses such as space conditioning/heating and water heating. This process uses less primary energy and emits much less carbon, particularly when it is powered by renewable energy. In addition, induction cooktops are gaining popularity and are significantly more efficient than gas stoves. According to EBCE, on a BTU basis, electricity is approximately three times more expensive than natural gas. However, some heat pump equipment is approximately three times more efficient than similar natural gas-powered equipment. The more significant cost savings associated with building electrification come from the avoided infrastructure and plumbing needed to serve a building with natural gas.

Reach Code Adoption Process

Every three years, the State of California adopts new building standards that are organized in Title 24 of the California Code of Regulations, referred to as the California Building Standards Code. This regular update is referred to as a “code cycle.” The last code cycle was adopted in 2016 and was effective as of January 1, 2017. The next code cycle was adopted in 2019 and will be effective January 1, 2020. Cities and counties can adopt reach codes that require items that are above minimum state code requirements. However, these reach codes must be filed with the State.

In addition, the California Energy Commission (CEC) requires that a cost-effectiveness study be conducted and filed in the case of local amendments to the Energy Code (Title 24, Part 6). It is required that the City demonstrate to the CEC, using a cost-effectiveness study, that the amendments to the code are financially responsible and do not represent an unreasonable burden to the non-residential and residential applicants. A cost-effectiveness study is not required for amendments to the Green Building Code (Title 24, Part 11).

Funded by the California investor-owned utilities, the California Statewide Codes and Standards Program led the development of a cost-effectiveness study¹ for Energy Code reach codes that examined different performance-based approaches for new construction of low-rise residential (single-family and multi-family up to 3 stories) and non-residential building types. A study for high-rise multi-family has yet to be completed. The results of the study are summarized in the Economic Impacts section of this report and in Attachment II.

Sustainability Committee Meetings

On July 16, 2018, the Committee considered a report titled *Building Electrification & Reducing Natural Gas Use*². The Committee recommended supporting and encouraging East Bay Community Energy (EBCE) to address electrification of existing buildings. The Committee also expressed support for phasing out the use of natural gas in new construction and,

¹ <https://localenergycodes.com/content/2019-local-energy-ordinances/>

² Report is available at <https://hayward.legistar.com/LegislationDetail.aspx?ID=3551018&GUID=718DCC1C-13F6-41D0-8833-C72B0B86DCE5&Options=&Search=>

eventually, no longer permitting new natural gas lines for new construction. The Committee noted that heat pump water heaters in new construction may be a good place to start and that any new regulations should come with sufficient advance notice to developers and builders.

On January 14, 2019, the Committee considered a report titled *Natural Gas Use in New Construction*³, which described the current regional effort to develop a reach code that would encourage all-electric construction. The Committee supported the idea of a reach code and asked staff to engage with local builders and developers and noted that a reach code would be most effective if all cities in the area would adopt the same requirements.

On May 13, 2019, the Committee considered a report titled *Update on Possible Reach Code for Building and Vehicle Electrification*⁴ which included a summary of the cost-effectiveness studies prepared by the California Energy Codes and Standards program. The Committee indicated support for not allowing natural gas in new single-family and low-rise (up to three stories) multi-family homes. For non-residential, the Committee prefers that buildings be all-electric, but mixed fuel buildings should be allowed where flexibility is needed for certain building types. The Committee also supported requiring electric vehicle (EV) charging infrastructure in new construction.

DISCUSSION

For multiple reasons including health, safety, economics and environmental benefits, there is growing interest in all-electric new construction, or “building electrification,” which means that the buildings would not have any fossil fuel services. All-electric buildings have electric appliances for space heating, water heating, clothes-drying, and cooking. A major reason to encourage building electrification stems from the fact that East Bay Community Energy is providing carbon-free electricity and eliminating the use of natural gas can greatly reduce greenhouse gas emissions from the building sector.

As noted in previous reports to the Committee, in order to adopt a reach code that will be effective on January 1, 2020, local ordinances must be adopted in September 2019 to allow time for filing with and review by the California Energy Commission and the California Building Standards Commission by the end of 2019. However, in order to allow for stakeholder outreach and accommodate the timelines associated with internal review and approval processes, many cities will not have their reach codes effective January 1, 2020. Many cities expect to have their reach codes in effect by March 2020.

The proposed ordinance is similar to the approach other local governments are considering. It is based on a model ordinance developed through a collaborative effort involving the City staff, California Energy Commission, the State’s major utilities, several

³ Report is available at <https://hayward.legistar.com/LegislationDetail.aspx?ID=3834310&GUID=B84DE7FD-6A5A-43D6-A042-26992FFF031C&Options=&Search=>

⁴ Report is available at <https://hayward.legistar.com/LegislationDetail.aspx?ID=3946057&GUID=61EEA528-55E8-4C6D-BAD3-24211EC64ABA&Options=&Search=>

community choice aggregators including EBCE and representatives from local governments and energy policy agencies.

The cities of San Mateo, Menlo Park and San Luis Obispo have adopted reach codes that, pending approval by the CEC, will be effective January 1, 2020. The cities of Fremont, San Jose, Oakland, Berkeley, and Albany are developing reach codes that could be adopted by the end of 2019 and would be effective in early 2020. Staff is working with EBCE and the other cities in Alameda County to develop similar codes. Also, keeping Hayward's adoption schedule similar to that of surrounding cities will allow for more consistency between codes, which will help to simplify implementation.

The City of Berkeley, on July 16, 2019, adopted a ban on the installation of natural gas infrastructure in new buildings. The ban, effective January 1, 2020, is not amendment of the Energy Code (Title 24, Part 6), but is incorporated into the city's health and safety code and will be implemented as conditions of approval during the planning approval process. Because some development proposals do not require formal planning approval prior to submittal of a building permit application, the City of Berkeley is also preparing to adopt a reach code, which will apply to projects that do not require a planning permit or a zoning certificate.

Staff has worked closely with EBCE's consultants to interpret the study's results and infer what options may or may not be cost-effective for the building types that are prevalent in Hayward. EBCE has also provided consultant support to assist cities in understanding the cost-effectiveness study results and adopting reach codes. The proposed reach codes meet the requirements of the CEC for cost-effectiveness, and are also a cost-effective approach for constituents, contractors, and developers pursuing new construction with the city limits. In addition, the analysis results show that all-electric buildings are typically less expensive to construct. Costs include incremental capital costs, and, in some cases higher energy costs. In general, the first costs of an all-electric building are lower than a mixed fuel building due to the lack of gas plumbing. More detail about the cost-effectiveness of the proposed reach code is included in the Economic Impact section of this report and in Attachment II.

Recommended reach code requirements for newly constructed buildings are:

Single-family Residential

- An all-electric home must meet the basic requirements of the state's 2019 Code, which includes some solar photovoltaics.
- Mixed-fuel building must either:
 - Meet a minimum EDR⁵ margin of 10 (performance approach); or

⁵ Energy Design Rating – According to the California Energy Commission, the Energy Design Rating (EDR) is a way to express the energy performance of a building using a scoring system where 100 represents the energy performance of a home designed to meet the 2006 Energy Code and 0 represents the energy performance of a home that combines high levels of energy efficiency with renewable generation to “zero out” its time-dependent value (TDV) of energy.

- Comply with a prescriptive list of requirements including extra energy efficiency measures, a solar photovoltaic system meeting 100% of the building's estimated annual electrical usage, and battery energy storage system.
- Free-standing accessory dwelling units less than 400 square feet are exempt, which means they can include natural gas appliances for water heating, space heating, etc.⁶

Multi-family Residential (up to 3 stories)⁷

- An all-electric building must meet the basic requirements of the state's 2019 Code.
- Mixed-fuel building must either:
 - Meet a minimum EDR margin of 10 (performance approach); or
 - Comply with a prescriptive list of requirements including extra energy efficiency measures, a solar photovoltaic system meeting 100% of the building's estimated annual electrical usage, and battery energy storage system.

Non-residential

- An all-electric building must meet the basic requirements of the state's 2019 Code.
- Mixed-fuel building must:
 - Install solar panels on the entire Solar Zone⁸; and
 - Meet a minimum EDR margin of 10% (or 15% for office and retail); or
 - Comply with a prescriptive list of energy efficiency requirements

For non-residential buildings, staff feels it is important to allow the flexibility that the mixed-fuel option provides. There are certain commercial and industrial building types that would be very challenging or infeasible to build as all-electric. For residential construction (single-family and multi-family up to three stories), the mixed-fuel option may not be necessary. **At the direction of the Committee, staff could modify the draft ordinance to simply require all-electric buildings in all new low-rise residential construction.** Other cities, including the City of Oakland, may be considering this requirement in their reach code.

The full text of the recommended amendments to the Energy Code (California Building Code, Title 24, Part 6) is included as Attachment III.

Reach Code for Electric Vehicle Charging Infrastructure

Local residents are showing a significant interest in electric vehicles. It is widely known that availability of EV charging infrastructure is a critical component to EV adoption. Meanwhile, it is significantly more expensive to install charging infrastructure as a retrofit than it is during new construction. As such, ensuring that newly constructed residential and non-residential parking has ample EV charging capability will reduce long-term costs of EV infrastructure installation, while helping to increase EV adoption and decrease transportation-related

⁶ A home of this size may not have the space needed for a heat pump water heater and may be connected to the main panel of the primary dwelling, which may have capacity constraints.

⁷ The cost-effectiveness study for high-rise residential (four stories and higher) has yet to be completed.

⁸ Solar Zone – The Energy Code defines the solar zone as an allocated space that is unshaded, unpenetrated, and free of obstructions. It serves as a suitable place that solar panels can be installed at a future date.

greenhouse gas emissions. While California's new minimum requirements are a step forward, it is unlikely that the requirements for multi-family dwellings and non-residential buildings are enough to keep pace with expected EV growth looking towards 2030. The Statewide Program's team reviewed approaches to increase the amount of EV infrastructure in new construction buildings, while keeping construction costs as low as possible.

Unlike amendments to the Energy Code, a cost-effectiveness study is not required for amendments to Title 24, Part 11, or the Green Building Code "CALGreen" which covers items such as electric vehicle (EV) charging infrastructure. However, to evaluate the financial impact on first costs, PCE/SVCE commissioned an analysis of the total cost of implementing various EV infrastructure measures. Staff worked closely with East Bay Community Energy, and the Statewide Program's team to establish new construction EV requirements which are more in-line with local EV adoption trends, while providing flexibility for the builder and keeping construction costs as low as possible.

Electric Vehicle (EV) charging requirements in California can generally be broken into three categories:

- EV Charging Installed: all supply equipment is installed at a parking space, such that an EV can charge without additional equipment. (Staff does not recommend installation of charging equipment. EVs and EV charger technologies are evolving rapidly and unused installations could become outdated quickly.)
- EV Ready: Parking space is provided with all power supply and associated outlet, such that a charging station can be plugged in and a vehicle can charge.
- EV Capable: Conduit is installed to parking space, and building electrical system has ample capacity to serve future load. An electrician would be required to complete the circuit before charging is possible.

EV charging capacity and speed can be summarized as three categories:

- Level 1: Capable of charging at 120V, 20A. This is equivalent to a standard home outlet. (Staff is not recommending requirements for Level 1 chargers as they are not expected to be useful as technology advances. In the near future, EVs are expected to have larger capacity batteries, which will take a very long time to charge using a Level 1 charger.
- Level 2: Capable of charging at 240V, 30-40A. This is the service capacity typically used for larger appliance loads in homes
- Level 3 (DC Fast Charging): Capable of charging at 20-400kW. This is the type of charger used for Tesla Superchargers and DC Fast Chargers at some shopping centers (and there are two at the City Hall parking structure).

The 2019 California Green Building Code Update (Title 24, Part 11) increases requirements for electric vehicle charging infrastructure in new construction; including:

- New one- and two-family dwellings and townhouses with attached private garages: must be Level 2 EV-capable
- Multi-family dwellings: 10% of parking spaces must be Level 2 EV-capable
- Non-residential: 6% of parking spaces must be Level 2 EV-capable

Recommended reach code requirements for EV infrastructure are:

Residential

- Single Family Dwelling: For each dwelling unit, install two dedicated Level 2 EV Ready circuits.
 - Exception: For each dwelling unit with only one parking space, install one Level 2 EV Ready circuit
- Multi-Unit Dwelling, <20 units: Per unit, a single Level 2 EV Ready circuit
 - Exception: Not required for units without parking
- Multi-Unit Dwelling, >20 units: 75% of the units, a single Level 2 EV Ready circuit per unit; 25% of the units, a single Level 2 EV Capable circuit per unit
 - Exception: Not required for units without parking

Non-Residential Office

- 20% of the parking spaces, Level 2 EV Ready circuit
- 30% of the parking spaces EV Capable at the “pinch points” utilizing at least Level 2-sized conduit with panel capacity for 2kW per EV capable parking space. Pinch points are defined as the areas where conduit should be installed at the time of new construction so that future installations do not require walls to be opened or asphalt dug up.

Non-Residential, Non-Office

- 15% of the parking spaces, Level 2 EV Ready circuit
- For parking lots with more than 100 spaces, first hundred spaces must adhere to Level 2 requirements, with option to install a single DC fast charger (Level 3) for each subsequent set of 100 spaces.

The full text of the recommended amendments to CALGreen (California Building Code, Title 24, Part 11) is included as Attachment IV.

ECONOMIC IMPACT

A reach code may only be adopted if it is determined that the proposed requirements are cost-effective. Cost-effectiveness is measured considering lifecycle costs using a 30-year timeframe. Generally, electric appliances are not more expensive compared to those fueled by natural gas. When considering the avoided cost of installing gas infrastructure (piping), in most cases, all-electric construction is cost-effective. The CEC requires that the cost-effectiveness analysis incorporate the time-dependent valuation (TDV) of energy so that the costs for the construction and operation of the building can be accurately calculated⁹. In addition to TDV, the studies also present cost-effectiveness in terms of the on-bill customer lifecycle benefit-to-

⁹ As defined in the cost-effectiveness studies, the TDV calculation is “intended to capture the “societal value or cost” of energy use including long-term projected costs such as the cost of providing energy during peak periods of demand and other societal costs such as projected costs for carbon emissions, as well as grid transmission and distribution impacts. This metric values energy use differently depending on the fuel source (gas, electricity, and propane), time of day, and season. Electricity used (or saved) during peak periods has a much higher value than electricity used (or saved) during off-peak periods (Horii et al., 2014). This is the methodology used by the Energy Commission in evaluating cost-effectiveness for efficiency measures in Title 24, Part 6.”

cost ratio. The on-bill method shows that a new all-electric single-family home is not cost-effective when meeting the minimum 2019 state code requirements. This is because the study assumed appliances that meet minimum federal efficiency standards. In most cases, more efficient appliances are installed, which would cause the project to be cost-effective.

Two studies were completed; one for single-family and low-rise residential and one for non-residential construction. In general, the studies found that all-electric construction is cost effective for new construction for several building prototypes including: single-family home, low-rise multi-family building, medium office and medium retail. The complete cost effectiveness studies are available on the California Energy Codes and Standards program website¹⁰ and are summarized in Attachment II.

FISCAL IMPACT

The proposed energy performance amendments parallel the structure and terms of the State code and as such any incremental plan check and inspection time should be minimal. The electric readiness provisions will require plan checkers and inspectors to apply additional check lists to mixed-fuel buildings. These items are not expected to require very much additional staff time. Any incremental costs of administering these requirements will be covered through existing permit fees.

East Bay Community Energy (EBCE) is assisting its member jurisdictions with community outreach and development of local ordinances. EBCE will provide a grant of \$10,000 to each city that presents an ordinance to its council as compensation for the staff time spent on the effort. Before a reach code is adopted, staff will evaluate the potential impacts that implementation would have on the General Fund.

STRATEGIC INITIATIVES

This agenda item does not directly relate to one of Council's three Strategic Initiatives.

SUSTAINABILITY FEATURES

Meeting the City's long-term GHG reduction goal of 82.5% by 2050 will require that the use of natural gas be significantly curtailed throughout the community. Eliminating the use of natural gas in new construction would be a step toward meeting this goal. Furthermore, a reach code that encourages all-electric construction is consistent with the following General Plan policy:

Natural Resources Policy 2.6: Greenhouse Gas Reduction in New Development

The City shall reduce potential greenhouse gas emissions by discouraging new development that is primarily dependent on the private automobile; promoting infill development and/or new development that is compact, mixed use, pedestrian

¹⁰ <https://localenergycodes.com/content/2019-local-energy-ordinances/>

friendly, and transit oriented; promoting energy-efficient building design and site planning; and improving the regional jobs/housing balance ratio.

ENVIRONMENTAL DETERMINATION

Adoption of the proposed Reach Codes is categorically exempt from the California Environmental Quality Act (CEQA) pursuant to Section 15308 of the CEQA Guidelines, Actions by Regulatory Agencies for the Protection of the Environment.

PUBLIC CONTACT

East Bay Community Energy is coordinating the preparation of draft reach codes and stakeholder engagement for its member agencies. EBCE has developed a website¹¹ with information and resources. On April 23 and 24, EBCE held four meetings in Fremont and Berkeley. Each location had one meeting for city staff and one for community members and stakeholders. In total, more than 100 people attended, including city staff from at least seven EBCE jurisdictions. On May 3, 2019, staff met with the Chamber of Commerce's Government Relations Council where staff from EBCE presented an overview of the need for and the benefits of a reach code. Comments received at the April and May meetings were summarized in the report presented to the Committee on May 13, 2019.

Recent Stakeholder Engagement

On August 26, 2019, staff partnered with BayREN to offer a workshop to local plumbing contractors to provide code compliance information related to heat pump water heaters. During the meeting staff informed attendees that the City is developing a reach code, which could require heat pump water heaters in new construction.

Staff created a webpage dedicated to the reach code effort. It includes links to previous Committee reports as well as links to external resources.

In September, staff mailed and emailed letters to hundreds of developers and contractors with information about the reach code development, including information about the September 17 Committee meeting.

Finally, an article about the Reach code will be published in Leaflet on September 24, 2019.

NEXT STEPS

Upon a recommendation from the Committee, staff may present the draft reach codes to Council in October or November. Additional steps would be as follows:

Sept. – November October 30	Continue Stakeholder Engagement Sustainability Committee Meeting (if needed)
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¹¹ <https://ebce.org/reach/>

November 19
December 3
January 2020

Council Meeting (Public Hearing and First Reading of Ordinance)
Council Meeting (Second Reading and Adoption of Ordinance)
Submit Reach Code to CEC for Approval

The reach codes would become effective upon approval by the CEC. The CEC currently requires a 60-day public review period. Effective January 1, 2020, the review period will be only 15 days. Staff intends to submit the reach codes in January after the shorter review period is in effect.

Prepared by: Erik Pearson, Environmental Services Manager

Recommended by: Alex Ameri, Director of Public Works

Approved by:

A handwritten signature in black ink, appearing to read 'K. McAdoo', is written over a horizontal line.

Kelly McAdoo, City Manager