



Igor Tregub
Councilmember, District 4

REVISED AGENDA MATERIAL FOR FITES MEETING

Meeting Date: November 5, 2025

Item Number: 4

Item Description: Referral: Amendments to the Berkeley Green Code for Newly Constructed Buildings and Existing Construction

Submitted by: Councilmember Tregub

Revisions were made to reflect engagement with the Berkeley City Manager and designee, City Attorney Office, and community stakeholders, as well as to reflect updates to the current situation and its effects since the item was first submitted.

Notable updates include:

- Removal of a date by which the City Manager is directed to return with an ordinance;
- Additional report language to reflect ongoing City of Berkeley staff work on a green building ordinance;
- Additional report language limiting the types of building construction that are being contemplated as potentially impacted by a green building code update;
- Updates to the types of green building reach codes adopted or being contemplated for adoption in other California jurisdictions; and
- Report language clarifying, without stating a specific direction to the City Manager, that the preferred green building code pathway for certain types of new construction is a single margin code local amendment and that the preferred pathway for certain types of existing construction is an air conditioning-to-heat pump (AC2HP) conversion. Other potential pathways were moved to the "Alternatives Considered" section of the report.



Igor Tregub Councilmember,
District 4

CONSENT CALENDAR
September 16, 2025

To: Honorable Mayor and Members of the City Council From:

Councilmember Igor Tregub (Author)

Subject: Referral: Amendments to the Berkeley Green Code for Newly
Constructed Buildings and Existing Construction

RECOMMENDATION

1. Refer to the City Manager to ~~return to the Berkeley City Council by December 1, 2025, to adopt the first reading of an Ordinance amending amendments to~~ the Berkeley Green Code, BMC Chapter 19.37, to require AC/Heater to Heat Pump conversions for certain existing residential buildings; and
2. Refer to the City Manager ~~Manager to return to the Berkeley City Council by December 1, 2025, with further recommendations to the adoption of~~ adopt a Zero NOx, Ultra-Low NOx, or Single Margin Energy Reach Code or another Green Building standard for certain residential and mixed-use new construction; ~~and~~

SUMMARY

~~The referral will direct the~~ This item refers to the City Manager the following: to return to the Berkeley City Council by December 1, 2025, to require Air Conditioner (AC) to Heat Pump conversions at end of useful life for existing buildings and that all newly constructed buildings be either Zero Nitrous Oxide (NOx) Emission Buildings, Ultra-Low NOx Emission Buildings, or be subject to a single margin energy reach code.
-Amendments to the Berkeley Green Code, BMC Chapter 19.37, to require AC/Heater to Heat Pump conversions for certain existing residential buildings; and
-The adoption of a Single Margin Energy Reach Code or another Green Building standard for certain residential and mixed-use new construction.

FISCAL IMPACTS OF RECOMMENDATION

The proposed Ordinance, depending on the option adopted by City Council, will modestly or moderately increase the plan check and inspection workload. Costs would be covered by existing fees paid by permit applicants. There are no net fiscal impacts from the ~~eseis~~ amendments of the Berkeley Green Code.

CURRENT SITUATION AND ITS EFFECTS

The Berkeley City Council adopted the California Green Building Standards Code with local amendments on November 29, 2022, and readopted this code on June 4, 2024, with State Mid-Cycle Supplements and further local amendments (effective July 1, 2024).¹

¹ On October 28, 2025, the Berkeley City Council adopted the first reading of an Ordinance repealing and
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Proposed amendments to the Berkeley Green Code were discussed by the Environment and Climate Commission (ECC) at its April and May 2024 meetings. ECC considered options including a Zero NOx CALGreen reach code and a Single Margin Energy reach code. Several commissioners indicated support for a Zero NOx CALGreen reach code, without an exception for cooking equipment used in commercial kitchens, citing potential benefits including alignment with BAAD's Zero NOx appliance rules, appreciation of future preparedness that a reach code brings, and facilitation of neighborhood decarbonization efforts tied to seismic safety and other health and safety benefits.

On May 7, 2024, City Council referred to the Health, Life Enrichment, Equity & Community (HLEEC) Policy Committee to consider local amendments to CALGreen to require all newly constructed buildings to be Zero NOx Emission Buildings. On July 29, 2024, the HLEEC Policy Committee unanimously voted to send Council a qualified, positive recommendation for the Zero NOx CALGreen reach code, noting also that Council should consider a commercial kitchen exemption, or as an alternative, consider a single margin energy reach code.

On June 26, 2024, staff hosted a virtual roundtable for design professionals, property owners, and developers who have recently built new buildings in Berkeley. This group of stakeholders, who had experience with designing and/or building a variety of building types, voiced support for a healthy environment and healthy buildings. Discussion topics included future code requirements, the housing crisis, recommendations for grid resilient design and battery storage, economic and technical challenges, and PG&E's interconnection timelines. The opinions in this group varied, but a Zero NOx reach code with an exception for commercial kitchens had the most interest. However, several developers voiced that having natural gas available in commercial spaces can help them attract a wider range of restaurant and cafe tenants.

The item was removed from the October 15, 2024, Council agenda in order to evaluate recommendations submitted by several environmental organizations to adopt an Ultra Low NOx or a single margin energy reach code.

RECENT STATE LAW DEVELOPMENTS

On June 30, 2025, Governor Newsom signed AB 130 (Committee on Budget, 2025), which enacted into statute the following provisions, effective immediately:

SEC. 29.

Section 17958 of the Health and Safety Code is amended to read:

17958.

(a) Except as provided in subdivision (b), and in Sections 17958.8 and 17958.9, any city or county may make changes in the provisions adopted pursuant to Section 17922 and published in the California Building Standards Code or the other regulations thereafter adopted pursuant to Section 17922 to amend, add, or repeal ordinances or regulations which impose the same requirements as are contained in the provisions adopted pursuant to Section 17922 and published in the California Building Standards Code or the other

[reenacting the Berkeley Building, Residential, Electrical, Mechanical, Plumbing, Energy, and Green Building Standards Codes in BMC Chapters 19.28, 19.29, 19.30, 19.32, 19.34, 19.36 and 19.37, and adopting related procedural and stricter provisions and scheduled a Public Hearing, pursuant to state law, for the second reading on November 18, 2025. While the adoption of these codes constitutes an update from the 2022 to the 2025 Building Standards Code, with certain local amendments, the Green Building reach codes under discussion were not included in the ordinance. Staff anticipates advancing those codes for City Council review in early 2026.](#)

regulations adopted pursuant to Section 17922 or make changes or modifications in those requirements upon express findings pursuant to Sections 17958.5 and 17958.7. If any city or county does not amend, add, or repeal ordinances or regulations to impose those requirements or make changes or modifications in those requirements upon express findings, the provisions published in the California Building Standards Code or the other regulations promulgated pursuant to Section 17922 shall be applicable to it and shall become effective 180 days after publication by the California Building Standards Commission. Amendments, additions, and deletions to the California Building Standards Code adopted by a city or county pursuant to Section 17958.7, together with all applicable portions of the California Building Standards Code, shall become effective 180 days after publication of the California Building Standards Code by the California Building Standards Commission.

(b) Commencing October 1, 2025, to June 1, 2031, inclusive, a city or county shall not make changes that are applicable to residential units in the provisions adopted pursuant to Section 17922 and published in the California Building Standards Code or the other regulations thereafter adopted pursuant to Section 17922 to amend, add, or repeal ordinances or regulations which impose the same requirements as are contained in the provisions adopted pursuant to Section 17922 and published in the California Building Standards Code or the other regulations adopted pursuant to Section 17922 or make changes or modifications in those requirements upon express findings pursuant to Sections 17958.5 and 17958.7, unless one of the following conditions is met:

(1) The changes or modifications are substantially equivalent to changes or modifications that were previously filed by the governing body of the city or county and were in effect as of September 30, 2025.

(2) The commission deems those changes or modifications necessary as emergency standards to protect health and safety.

(3) The changes or modifications relate to home hardening.

(4) The building standards relate to home hardening and are proposed for adoption by a fire protection district pursuant to Section 13869.7.

(5) The changes or modifications are necessary to implement a local code amendment that is adopted to align with a general plan approved on or before June 10, 2025, and that permits mixed-fuel residential construction consistent with federal law while also incentivizing all-electric construction as part of an adopted greenhouse gas emissions reduction strategy.

(6) The changes or modifications are related to administrative practices, are proposed for adoption during the intervening period pursuant to Section 18942, and exclusively result in any of the following:

(A) Reductions in time for a local agency to issue a postentitlement permit.

(B) Alterations to a local agency's postentitlement fee schedule.

(C) Modernization of, or adoption of, new permitting platforms and software utilized by the local agency.

(D) Reductions in cost of internal operation for a local agency.

(E) Establishment, alteration, or removal of local programs related to enforcement of building code violations or complaints alleging building code violations.

Several other California jurisdictions (e.g., Mill Valley², Glendale³, Oakland⁴, Menlo Park⁵, San Jose⁶, Sunnyvale⁷, Los Altos Hills⁸, Saratoga⁹, Campbell¹⁰, ~~et al^{11,12}~~) ~~are on track or have passed or are on track to planning to pass an AC2HP measure by the end of September early 2026~~, and the City and County of San Francisco¹³ is set to pass recently approved a sweeping all-electric requirement for major renovations ~~in the same timeframe~~.

City of Berkeley staff continues to work on the development of reach codes per a currently active Council referral¹⁴. The summary of its upcoming work plan includes:

- ~~Surveying the latest best practices and model ordinances.~~
- ~~Engaging with stakeholders, including climate action experts, design professionals, and development project sponsors.~~
- ~~Engaging the Environment and Climate Commission.~~
- ~~Advancing recommended reach codes to City Council for consideration.~~

CODE AMENDMENTS

The California Building Standards Code (Title 24 of the State of California Code of Regulations) is updated and published on a three-year cycle. After the California Building Standards Commission publishes the triennial codes, they become effective statewide. The current (2022) cycle of State building codes became effective on January 1, 2023. Local jurisdictions may amend the published codes to address local climatic, geological, or topographical conditions.

The current three-year building code cycle and any effective amendments thereto are effective through December 31, 2025. The local amendments proposed with a green building reach code ordinance would not negate or otherwise affect previously adopted amendments; they introduce new amendments to the 2022 and California Green Building Standards Code. Under state law local jurisdictions may adopt stricter building code provisions if justified by findings of local climatic, geological or topographical conditions.

On October 28, 2025, the Berkeley City Council adopted the first reading of an Ordinance repealing and reenacting the Berkeley Building, Residential, Electrical, Mechanical,

² https://cityofmillvalley.granicus.com/MetaViewer.php?view_id=2&clip_id=2073&meta_id=100851

³

<https://glendaleca.primegov.com/api/compilemeetingattachmenthistory/historyattachment/?historyId=db909199-b056-4790-90ff-994bc0f6b172>

⁴ Draft not publicly available as of the date of this report's publication.

⁵ <https://menlopark.gov/files/sharedassets/public/v/1/agendas-and-minutes/city-council/2025-meetings/20250812/h1-ordinance-amend-chapter-12-muni-code.pdf>

⁶ <https://sanjose.legistar.com/View.ashx?M=F&ID=14574069&GUID=051302E5-52A2-4958-9CEB-6AEDF6C0CAF8>

⁷ <https://sunnyvaleca.legistar.com/View.ashx?M=AO&ID=164851&GUID=16d2e642-ad7e-485a-ac75-599a0d0b0f19&N=Q291bmNpbCBBZ2VuZGEgSXRlbnSB1cGRhdGVkIGZvbGxvZ2luZyBwdWJsaWNhdGlvbiAocG9zdGVkIDlwMjUwODEyKQ%3d%3d>

⁸ <https://losaltoshills.ca.gov/571/Reach-Codes>

⁹ Draft not publicly available as of the date of this report's publication.

¹⁰ Draft not publicly available as of the date of this report's publication.

¹¹ <https://bayareareachcodes.org>

¹² <https://bayareareachcodes.org>

¹³ <https://sfgov.legistar.com/LegislationDetail.aspx?ID=7449406&GUID=B139B7FF-FB8D-4D12-A7B0-9C7C1DFEDBD6&Options=&Search=Draft not publicly available as of the date of this report's publication.>

¹⁴ <https://berkeleyca.gov/sites/default/files/documents/2025-05-20%20Item%202025%20Authorization%20for%20City%20Manager%20to%20evaluate%20policies.pdf>

Plumbing, Energy, and Green Building Standards Codes in BMC Chapters 19.28, 19.29, 19.30, 19.32, 19.34, 19.36 and 19.37, and adopting related procedural and stricter provisions and scheduled a Public Hearing, pursuant to state law, for the second reading on November 18, 2025. While the adoption of these codes constitutes an update from the 2022 to the 2025 Building Standards Code, with certain local amendments, the Green Building reach codes under discussion were not included in the ordinance. Staff anticipates advancing those codes for City Council review in early 2026.¹⁵

A green building reach code ordinance supports the City's Strategic Plan Goals to create a resilient, safe, connected, and prepared city, and to be a global leader in addressing climate change, advancing environmental justice, and protecting the environment. The ordinance also supports City Council directives and policies related to fire and life safety, resilience, and climate protection, and is supported by the resolution adopting findings of local conditions.

ENVIRONMENTAL SUSTAINABILITY AND CLIMATE IMPACTS

The ordinances contemplated through this referral aligns with Berkeley's health, safety, and climate goals. It supports the Climate Action Plan, Berkeley Resilience Strategy, and Fossil Fuel Free Berkeley goals. Green building reach codes reduce the human health, environmental, and climate impacts of emissions associated with occupying and using the new and existing buildings.

This action is exempt from the California Environmental Quality Act ("CEQA") pursuant to CEQA Guidelines Section 15061(b)(3) because there is no possibility that this action may have a significant effect on the environment; the referral will result in standards that are more protective of the environment than existing state standards, so. Further, the referral will result in standards that are exempt from the requirements of CEQA pursuant to CEQA Guidelines sections 15307 and 15308 as an action by a regulatory agency taken to protect the environment and natural resources.

RATIONALE FOR RECOMMENDATION

Local policies such as a Zero or Ultra-Low NO_x reach code, a Single-Margin Energy Reach Code, or an AC to heat pump conversion reach code provide a higher level of safety than are achieved through the State's Building Codes and Energy Codes. Fire risk, risks to the health of building occupants, the accumulating and compounding risks of climate change to the San Francisco Bay Area, its residents, its coastal and littoral zones, and broader risks of degraded air quality justify adoption of Berkeley code amendments that are stricter than the California Building Standards Code and Energy Code.

Zero-NO_x and Ultra-Low NO_x

A Zero NO_x or Ultra-Low NO_x reach code would regulate nitrogen oxide emissions in buildings. Nitrogen Oxides are defined as the sum of nitrogen oxide (NO) and nitrogen dioxide (NO₂), collectively expressed as NO_x, which is a harmful air pollutant. Short-term exposure can aggravate asthma and other respiratory illnesses and can lead to hospital admissions and emergency room visits. Long-term exposure can cause asthma and potentially increase susceptibility to respiratory infections. Further, NO_x contributes to acid rain and is one of the building-blocks of ozone, an air pollutant, a greenhouse gas, and a

¹⁵ <https://berkeleyca.gov/sites/default/files/documents/2025-10-28%20Item%2017%20Adoption%20of%20Berkeley%20Building%20Codes%2C%20Including%20Local%20Amendments.pdf>

major component of smog.¹⁶ An ordinance setting limits on appliance-generated NO_x emissions, or an equivalent greenhouse gas reduction ordinance, would set a higher standard for health and environmental protection by improving air quality.

A proposed NO_x emission ordinance would also address an immediate health concern of growing importance for Berkeley residents. The Bay Area Air District (BAAD) notes that: “In 2019, emissions from residential natural gas combustion accounted for roughly the same amount of NO_x emissions as passenger vehicles.”⁴ However, shifts in remote work practices since 2019 have likely increased that percentage, both due to increased work from home hours and reduced work commutes. BAAD further notes that, “Through the reduction of NO_x and particulate matter emissions, the proposed [BAAD appliance] amendments are projected annually to prevent up to 85 premature deaths and save up to \$890 million in health impacts.”¹⁷ In summary, the proposed Berkeley amendment for Very-Low NO_x Emission Buildings advances towards a built environment consistent with current understanding of human disease prevention and environmental health.

Cooking equipment, such as ranges, cooktops, and ovens that emit NO_x, exposes users to the NO_x emissions and impacts their health. The use of exhaust fans and vent hoods while cooking limits exposure indoors but does not remove it completely. The highest cited capture efficiency rate of residential kitchen vent hoods in the Energy Code is 85%, meaning cooks will inhale some combustion byproducts when a NO_x emitting appliance is being used. Residential and commercial kitchen vent hoods exhaust the NO_x emissions to the outside.

From a health and safety standpoint, using Zero NO_x Emitting cooking equipment, whether in homes or restaurants, offers the greatest health benefit. Allowing an exception from Zero or Ultra Low NO_x for cooking equipment serving nonresidential occupancies may provide other types of benefits. For example, it may be more economically attractive to restaurant owners due to factors such as equipment availability and familiarity, as well as purchase and operating costs. Restaurant operators in Berkeley have seen increases in expenses in recent years due to leases, costs of food, staff, and increasing regulatory compliance (e.g., utilizing compostable or reusable takeout containers to eliminate single use disposables).

In addition to its direct health impacts, NO_x is one of the building blocks of ozone, a potent greenhouse gas with a Global Warming Potential (GWP) of 520. The Bay Area is currently out of compliance with federal standards for ozone. The provisions for Zero or Ultra Low NO_x Emission Buildings made by Chapter 19.37 would have the effect of reducing the emission of ozone, because NO_x reacts in sunlight with other volatile organic compounds to create ozone.¹⁸ If adopted, the Ordinance will result in a reduction in ozone and a corresponding reduction in greenhouse gas emissions.

Single-Margin Energy Reach Code

Council could consider instead adopting an alternative amendment known as a “Single Margin Energy Reach Code” in lieu of a Zero or Ultra-Low NO_x emissions ordinance for newly constructed buildings. The single margin approach would require the proposed building to meet a higher source energy compliance margin for all occupancies than currently required by the California Energy Code. Although “source energy” is not defined in the state Energy Code, a Code manual explains it generally measures the marginal

¹⁶ <https://www.epa.gov/no2-pollution/basic-information-about-no2>

¹⁷ https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-9-rule-4-nitrogen-oxides-from-fan-type-residential-central-furnaces/2021-amendments/documents/20230522_faq_appliance-rules_final-pdf.pdf?rev=b425fe938f644fa7839f8d938cad41fd&sc_lang=en

¹⁸ <https://www.epa.gov/ground-level-ozone-pollution/ground-level-ozone-basics>

greenhouse gas emissions of energy used to supply electricity (2022 Single Family Residential Compliance Manual at 1.6.4). The metric accounts for the system delivering energy to the building, as well as the time of day the energy is delivered.

By requiring that a proposed building achieve a certain compliance margin below the source energy requirement for a standard design building, such an ordinance would require that a building improve upon the state code's 1 metric. Each building type would have a respective single margin it would need to comply with. This approach gives builders flexibility in how to meet these standards and allows and applies to both electric and mixed-use fuel designs. Methods to achieve a particular source energy compliance margin include electrifying appliances, or, if a building uses gas appliances, adding efficiency improvements such as insulation, and/or utilizing solar PV or a battery. However, overall, the single margin approach is less effective at reducing greenhouse gas emissions than Zero NOx or Ultra-Low NOx requirements, though it is a feasible option for greenhouse gas reduction and requires more passive design such as increased insulation and/or more efficient windows in a building. The Single Margin Energy Reach Code approach has been adopted by other California cities including San Luis Obispo, Santa Cruz, San Jose, Palo Alto, East Palo Alto, Encinitas, and Brisbane.

This option was discussed at ECC, HLEEC, and at the roundtable with building professionals, and was not voiced as the preferred option by the majority of the participants in any meeting. A Single Margin Energy Reach Code would require additional work for all types of projects, leading to greater difficulty in understanding the requirements, higher impacts on building design teams, and a longer timeline for implementation, as California Energy Commission approval would be required after local adoption. It would also place greater demands on City plan check and field inspection staff. However, the benefits of this option should be reevaluated with the benefit of additional operational experience in a growing number of jurisdictions.

AC to Heat Pump

As the federal government is rolling back climate progress, local governments such as Berkeley must step up to sustain and accelerate emissions reductions. Under an "AC to Heat Pump" (AC2HP) policy, any new installation of an air conditioner would instead be required to use a heat pump, which provides both heating and cooling through a two-way valve, or, alternatively, to install a suite of energy efficiency measures. An AC2HP ordinance was produced in collaboration with the Statewide Reach Codes Program¹⁹, and establishes a "Time of Replacement" policy. The model code language proposes a reach code requiring that any existing single-family home involving replacement or alteration of an existing air conditioning system or installation of a new air conditioning must either include a heat pump space heater as the primary heating system or install other energy conservation measures. This approach targets a natural point of intervention in a building's lifecycle. By focusing on equipment replacement events, this policy minimizes disruption to property owners while ensuring progress toward decarbonization.²⁰

An AC2HP policy could reduce these emissions by displacing gas furnace use in homes and ultimately eliminating the need for them altogether. Replacing all central AC installations statewide with heat pumps could decarbonize more than half of California's residential space heating demand by 2030, while also cutting harmful air pollution responsible for approximately \$890 million annually in health damages across the Bay Area.

¹⁹ <https://localenergycodes.com/>

²⁰ <https://bayareareachcodes.org/model-reach-codes/>

The policy would also align with Berkeley's Building Emissions Savings Ordinance, which provides a compliance pathway for properties with heat pumps. "Time-of-replacement" policies such as AC2HP are considered among the most cost-effective policies for decarbonizing buildings. According to the Berkeley Existing Buildings Electrification Strategy (BEBES), adopted by Council in 2021, "the marginal cost—[the] difference between installing electric equipment and replacing with new gas equipment—at this time is smaller than the full cost of installing electric equipment."

Yet the economics of AC2HP are even more favorable than gas-to-electric conversions. While furnace-to-heat pump conversions typically incur added costs due to electrical work, the electrical and ducting requirements of an air conditioner are typically identical to those of a heat pump. For this reason, BEBES lists AC2HP as a Phase 1 strategy for implementation by 2025.

For new construction, local policies such as the those contemplated under the referral provide a higher level of safety than are achieved through the State's Building Codes. Fire risk, risks to the health of building occupants, the accumulating and compounding risks of climate change to the San Francisco Bay Area, its residents, its coastal and littoral zones, and broader risks of degraded air quality justify adoption of Berkeley code amendments that are stricter than the California Building Standards Code.

In addition, Berkeley does not meet State and Federal ambient outdoor air quality standards (nonattainment) for ozone and is also in an area of nonattainment for State standards for particulate matter (PM_{2.5} and PM₁₀). Per the BAAD²¹, a local government has the authority to regulate air quality. By regulating NO_x emissions from equipment, Berkeley can reduce harm to public health within buildings, improve ambient air quality, and assist in the transition to BAAD's appliance rules which will impact the sale and installation of water heaters and furnaces starting in 2027.

ALTERNATIVES CONSIDERED

Council could choose to adopt either a green building reach code for certain new construction types or an AC2HP conversion code for existing buildings, or could choose not to adopt a reach code. However, not adopting a green building code would effectively cede Berkeley's reputation as a climate leader to a number of neighboring and other California jurisdictions that are actively developing or have already adopted such a reach code.

Other reach code frameworks for certain new construction types can also be considered. These include Zero and Ultra Low nitrous oxide (NO_x) emission regulations and FlexPath.

Zero-NO_x and Ultra-Low NO_x

A Zero NO_x or Ultra-Low NO_x reach code would regulate nitrogen oxide emissions in buildings. Nitrogen Oxides are defined as the sum of nitrogen oxide (NO) and nitrogen dioxide (NO₂), collectively expressed as NO_x, which is a harmful air pollutant. Short-term exposure can aggravate asthma and other respiratory illnesses and can lead to hospital admissions and emergency room visits. Long-term exposure can cause asthma and potentially increase susceptibility to respiratory infections. Further, NO_x contributes to acid rain and is one of the building-blocks of ozone, an air pollutant, a greenhouse gas, and a major component of smog.²² An ordinance setting limits on appliance-generated NO_x emissions, or an equivalent greenhouse gas reduction ordinance, would set a higher

²¹ <https://www.baaqmd.gov/en/plans-and-climate/local-government-support>

²² <https://www.epa.gov/no2-pollution/basic-information-about-no2>

standard for health and environmental protection by improving air quality.

A proposed NO_x emission ordinance would also address an immediate health concern of growing importance for Berkeley residents. The Bay Area Air District (BAAD) notes that: “In 2019, emissions from residential natural gas combustion accounted for roughly the same amount of NO_x emissions as passenger vehicles.”²³ However, shifts in remote work practices since 2019 have likely increased that percentage, both due to increased work from home hours and reduced work commutes. BAAD further notes that, “Through the reduction of NO_x and particulate matter emissions, the proposed [BAAD appliance] amendments are projected annually to prevent up to 85 premature deaths and save up to \$890 million in health impacts.”²³ In summary, the proposed Berkeley amendment for Very-Low NO_x Emission Buildings advances towards a built environment consistent with current understanding of human disease prevention and environmental health.

Cooking equipment, such as ranges, cooktops, and ovens that emit NO_x, exposes users to the NO_x emissions and impacts their health. The use of exhaust fans and vent hoods while cooking limits exposure indoors but does not remove it completely. The highest cited capture efficiency rate of residential kitchen vent hoods in the Energy Code is 85%, meaning cooks will inhale some combustion byproducts when a NO_x emitting appliance is being used. Residential and commercial kitchen vent hoods exhaust the NO_x emissions to the outside.

From a health and safety standpoint, using Zero NO_x Emitting cooking equipment, whether in homes or restaurants, offers the greatest health benefit. Allowing an exception from Zero or Ultra Low NO_x for cooking equipment serving nonresidential occupancies may provide other types of benefits. For example, it may be more economically attractive to restaurant owners due to factors such as equipment availability and familiarity, as well as purchase and operating costs. Restaurant operators in Berkeley have seen increases in expenses in recent years due to leases, costs of food, staff, and increasing regulatory compliance (e.g., utilizing compostable or reusable takeout containers to eliminate single use disposables).

In addition to its direct health impacts, NO_x is one of the building blocks of ozone, a potent greenhouse gas with a Global Warming Potential (GWP) of 520. The Bay Area is currently out of compliance with federal standards for ozone. The provisions for Zero or Ultra Low NO_x Emission Buildings made by Chapter 19.37 would have the effect of reducing the emission of ozone, because NO_x reacts in sunlight with other volatile organic compounds to create ozone.²⁴ If adopted, the Ordinance will result in a reduction in ozone and a corresponding reduction in greenhouse gas emissions.

Flex Path and Electric Readiness Reach Codes

Berkeley could also consider adopting a Flex Path and Electric Readiness Reach Code such as one that was recently adopted in Oakland, CA. Oakland’s electric readiness reach code that requires new and some existing buildings to have electrical infrastructure installed for future conversion to electric appliances and electric vehicles. These codes, which often focus on new construction and additions or alterations during remodels, are local amendments to the California Building Code designed to reduce future greenhouse gas emissions at a lower cost by preparing buildings for electrification now. Key requirements typically include running 240V circuits for future heat pumps, cooktops, and

²³ https://www.baaqmd.gov/~/media/dotgov/files/rules/reg-9-rule-4-nitrogen-oxides-from-fan-type-residential-central-furnaces/2021-amendments/documents/20230522_faq_appliance-rules_final-pdf.pdf?rev=b425fe938f644fa7839f8d938cad41fd&sc_lang=en

²⁴ <https://www.epa.gov/ground-level-ozone-pollution/ground-level-ozone-basics>

electric dryers, as well as providing dedicated spaces in the main electrical panel and pre-wiring for electric vehicle (EV) charging.²⁵ It should be noted that Berkeley's recently updated Building Emissions Savings Ordinance already may accomplish these objectives through a similar mechanism for certain types of existing residential construction prior to or shortly following time of sale.²⁶

~~Council could choose to adopt either a code that regulates NOx emissions or an AG2HP conversion code or could choose not to adopt a reach code. However, not adopting a green building code would effectively code Berkeley's reputation as a climate leader to a number of neighboring and other California jurisdictions that are actively developing or have already adopted such a reach code.~~

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²⁵ <https://bayareareachcodes.org/model-reach-codes/#:~:text=Electric%20Readiness%20Reach%20Codes%20outline,reduce%20emissions%20in%20the%20future.>

²⁶ <https://berkeleyca.gov/construction-development/green-building/building-emissions-saving-ordinance-beso>



Igor Tregub Councilmember,
District 4

CONSENT CALENDAR
September 16, 2025

To: Honorable Mayor and Members of the City Council

From: Councilmember Igor Tregub (Author)

Subject: Referral to the City Manager: Amendments to the Berkeley Green Code for Newly Constructed Buildings and Existing Construction

RECOMMENDATION

1. Refer to the City Manager amendments to the Berkeley Green Code, BMC Chapter 19.37, to require AC/Heater to Heat Pump conversions for certain existing residential buildings; and
2. Refer to the City Manager the adoption of a Single Margin Energy Reach Code or another Green Building standard for certain residential and mixed-use new construction.

SUMMARY

This item refers to the City Manager the following:

- Amendments to the Berkeley Green Code, BMC Chapter 19.37, to require AC/Heater to Heat Pump conversions for certain existing residential buildings; and
- The adoption of a Single Margin Energy Reach Code or another Green Building standard for certain residential and mixed-use new construction.

FISCAL IMPACTS OF RECOMMENDATION

The proposed Ordinance, depending on the option adopted by City Council, will modestly or moderately increase the plan check and inspection workload. Costs would be covered by existing fees paid by permit applicants. There are no net fiscal impacts from these amendments of the Berkeley Green Code.

CURRENT SITUATION AND ITS EFFECTS

The Berkeley City Council adopted the California Green Building Standards Code with local amendments on November 29, 2022, and readopted this code on June 4, 2024, with State Mid-Cycle Supplements and further local amendments (effective July 1, 2024).¹

¹ On October 28, 2025, the Berkeley City Council adopted the first reading of an Ordinance repealing and reenacting the Berkeley Building, Residential, Electrical, Mechanical, Plumbing, Energy, and Green Building Standards Codes in BMC Chapters 19.28, 19.29, 19.30, 19.32, 19.34, 19.36 and 19.37, and adopting related procedural and stricter provisions and scheduled a Public Hearing, pursuant to state law, for the second reading on November 18, 2025. While the adoption of these codes constitutes an update from the 2022 to the 2025 Building Standards Code, with certain local amendments, the Green Building reach codes under discussion were not included in the ordinance. Staff anticipates advancing those codes for City Council review in early 2026.

Proposed amendments to the Berkeley Green Code were discussed by the Environment and Climate Commission (ECC) at its April and May 2024 meetings. ECC considered options including a Zero NOx CALGreen reach code and a Single Margin Energy reach code. Several commissioners indicated support for a Zero NOx CALGreen reach code, without an exception for cooking equipment used in commercial kitchens, citing potential benefits including alignment with BAAD's Zero NOx appliance rules, appreciation of future preparedness that a reach code brings, and facilitation of neighborhood decarbonization efforts tied to seismic safety and other health and safety benefits.

On May 7, 2024, City Council referred to the Health, Life Enrichment, Equity & Community (HLEEC) Policy Committee to consider local amendments to CALGreen to require all newly constructed buildings to be Zero NOx Emission Buildings. On July 29, 2024, the HLEEC Policy Committee unanimously voted to send Council a qualified, positive recommendation for the Zero NOx CALGreen reach code, noting also that Council should consider a commercial kitchen exemption, or as an alternative, consider a single margin energy reach code.

On June 26, 2024, staff hosted a virtual roundtable for design professionals, property owners, and developers who have recently built new buildings in Berkeley. This group of stakeholders, who had experience with designing and/or building a variety of building types, voiced support for a healthy environment and healthy buildings. Discussion topics included future code requirements, the housing crisis, recommendations for grid resilient design and battery storage, economic and technical challenges, and PG&E's interconnection timelines. The opinions in this group varied, but a Zero NOx reach code with an exception for commercial kitchens had the most interest. However, several developers voiced that having natural gas available in commercial spaces can help them attract a wider range of restaurant and cafe tenants.

The item was removed from the October 15, 2024, Council agenda in order to evaluate recommendations submitted by several environmental organizations to adopt an Ultra Low NOx or a single margin energy reach code.

RECENT STATE LAW DEVELOPMENTS

On June 30, 2025, Governor Newsom signed AB 130 (Committee on Budget, 2025), which enacted into statute the following provisions, effective immediately:

SEC. 29.

Section 17958 of the Health and Safety Code is amended to read:

17958.

(a) Except as provided in subdivision (b), and in Sections 17958.8 and 17958.9, any city or county may make changes in the provisions adopted pursuant to Section 17922 and published in the California Building Standards Code or the other regulations thereafter adopted pursuant to Section 17922 to amend, add, or repeal ordinances or regulations which impose the same requirements as are contained in the provisions adopted pursuant to Section 17922 and published in the California Building Standards Code or the other regulations adopted pursuant to Section 17922 or make changes or modifications in those requirements upon express findings pursuant to Sections 17958.5 and 17958.7. If any city or county does not amend, add, or repeal ordinances or regulations to impose those requirements or make changes or modifications in those requirements upon express findings, the provisions published in the California Building Standards Code or the other regulations promulgated pursuant to Section 17922 shall be applicable to it and shall become effective 180 days after publication by the California Building Standards

Commission. Amendments, additions, and deletions to the California Building Standards Code adopted by a city or county pursuant to Section 17958.7, together with all applicable portions of the California Building Standards Code, shall become effective 180 days after publication of the California Building Standards Code by the California Building Standards Commission.

(b) Commencing October 1, 2025, to June 1, 2031, inclusive, a city or county shall not make changes that are applicable to residential units in the provisions adopted pursuant to Section 17922 and published in the California Building Standards Code or the other regulations thereafter adopted pursuant to Section 17922 to amend, add, or repeal ordinances or regulations which impose the same requirements as are contained in the provisions adopted pursuant to Section 17922 and published in the California Building Standards Code or the other regulations adopted pursuant to Section 17922 or make changes or modifications in those requirements upon express findings pursuant to Sections 17958.5 and 17958.7, unless one of the following conditions is met:

(1) The changes or modifications are substantially equivalent to changes or modifications that were previously filed by the governing body of the city or county and were in effect as of September 30, 2025.

(2) The commission deems those changes or modifications necessary as emergency standards to protect health and safety.

(3) The changes or modifications relate to home hardening.

(4) The building standards relate to home hardening and are proposed for adoption by a fire protection district pursuant to Section 13869.7.

(5) The changes or modifications are necessary to implement a local code amendment that is adopted to align with a general plan approved on or before June 10, 2025, and that permits mixed-fuel residential construction consistent with federal law while also incentivizing all-electric construction as part of an adopted greenhouse gas emissions reduction strategy.

(6) The changes or modifications are related to administrative practices, are proposed for adoption during the intervening period pursuant to Section 18942, and exclusively result in any of the following:

(A) Reductions in time for a local agency to issue a postentitlement permit.

(B) Alterations to a local agency's postentitlement fee schedule.

(C) Modernization of, or adoption of, new permitting platforms and software utilized by the local agency.

(D) Reductions in cost of internal operation for a local agency.

(E) Establishment, alteration, or removal of local programs related to enforcement of building code violations or complaints alleging building code violations.

Several other California jurisdictions (e.g., Mill Valley², Glendale³, Oakland⁴, Menlo Park⁵, San Jose⁶, Sunnyvale⁷, Los Altos Hills⁸, Saratoga⁹, Campbell¹⁰, *et al*¹¹) have passed or are on track to pass an AC2HP measure by early 2026, and the City and County of San Francisco¹² recently approved a sweeping all-electric requirement for major renovations..

City of Berkeley staff continues to work on the development of reach codes per a currently active Council referral¹³. The summary of its upcoming work plan includes:

- Surveying the latest best practices and model ordinances.
- Engaging with stakeholders, including climate action experts, design professionals, and development project sponsors.
- Engaging the Environment and Climate Commission.
- Advancing recommended reach codes to City Council for consideration.

CODE AMENDMENTS

The California Building Standards Code (Title 24 of the State of California Code of Regulations) is updated and published on a three-year cycle. After the California Building Standards Commission publishes the triennial codes, they become effective statewide. The current (2022) cycle of State building codes became effective on January 1, 2023. Local jurisdictions may amend the published codes to address local climatic, geological, or topographical conditions.

The current three-year building code cycle and any effective amendments thereto are effective through December 31, 2025. The local amendments proposed with a green building reach code ordinance would not negate or otherwise affect previously adopted amendments; they introduce new amendments to the 2022 and California Green Building Standards Code. Under state law local jurisdictions may adopt stricter building code provisions if justified by findings of local climatic, geological or topographical conditions.

On October 28, 2025, the Berkeley City Council adopted the first reading of an Ordinance repealing and reenacting the Berkeley Building, Residential, Electrical, Mechanical, Plumbing, Energy, and Green Building Standards Codes in BMC Chapters 19.28, 19.29, 19.30, 19.32, 19.34, 19.36 and 19.37, and adopting related procedural and stricter provisions and scheduled a Public Hearing, pursuant to state law, for the second reading on November 18, 2025. While the adoption of these codes constitutes an update from the 2022 to the 2025 Building Standards Code, with certain local amendments, the Green

² https://cityofmillvalley.granicus.com/MetaViewer.php?view_id=2&clip_id=2073&meta_id=100851

³

<https://glendaleca.primegov.com/api/compilemeetingattachmenthistory/historyattachment/?historyId=db909199-b056-4790-90ff-994bc0f6b172>

⁴ Draft not publicly available as of the date of this report's publication.

⁵ <https://menlopark.gov/files/sharedassets/public/v/1/agendas-and-minutes/city-council/2025-meetings/20250812/h1-ordinance-amend-chapter-12-muni-code.pdf>

⁶ <https://sanjose.legistar.com/View.ashx?M=F&ID=14574069&GUID=051302E5-52A2-4958-9CEB-6AEDF6C0CAF8>

⁷ <https://sunnyvaleca.legistar.com/View.ashx?M=AO&ID=164851&GUID=16d2e642-ad7e-485a-ac75-599a0d0b0f19&N=Q291bmNpbCBBZ2VuZGEgSXRlbSB1cGRhdGVkIGZvbGxvd2luZyBwdWJsaWNhdGlvbiAocG9zdGVkIDlwMjUwODEyKQ%3d%3d>

⁸ <https://losaltoshills.ca.gov/571/Reach-Codes>

⁹ Draft not publicly available as of the date of this report's publication.

¹⁰ Draft not publicly available as of the date of this report's publication.

¹¹ <https://bayareareachcodes.org>

¹² <https://sfgov.legistar.com/LegislationDetail.aspx?ID=7449406&GUID=B139B7FF-FB8D-4D12-A7B0-9C7C1DFEDBD6&Options=&Search=>

¹³ <https://berkeleyca.gov/sites/default/files/documents/2025-05-20%20Item%2025%20Authorization%20for%20City%20Manager%20to%20evaluate%20policies.pdf>
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Building reach codes under discussion were not included in the ordinance. Staff anticipates advancing those codes for City Council review in early 2026.¹⁴

A green building reach code ordinance supports the City's Strategic Plan Goals to create a resilient, safe, connected, and prepared city, and to be a global leader in addressing climate change, advancing environmental justice, and protecting the environment. The ordinance also supports City Council directives and policies related to fire and life safety, resilience, and climate protection, and is supported by the resolution adopting findings of local conditions.

ENVIRONMENTAL SUSTAINABILITY AND CLIMATE IMPACTS

The ordinances contemplated through this referral aligns with Berkeley's health, safety, and climate goals. It supports the Climate Action Plan, Berkeley Resilience Strategy, and Fossil Fuel Free Berkeley goals. Green building reach codes reduce the human health, environmental, and climate impacts of emissions associated with occupying and using the new and existing buildings.

This action is exempt from the California Environmental Quality Act ("CEQA") pursuant to CEQA Guidelines Section 15061(b)(3) because there is no possibility that this action may have a significant effect on the environment; the referral will result in standards that are more protective of the environment than existing state standards, so. Further, the referral will result in standards that are exempt from the requirements of CEQA pursuant to CEQA Guidelines sections 15307 and 15308 as an action by a regulatory agency taken to protect the environment and natural resources.

RATIONALE FOR RECOMMENDATION

Local green building reach codes provide a higher level of safety than are achieved through the State's Building Codes and Energy Codes. Fire risk, risks to the health of building occupants, the accumulating and compounding risks of climate change to the San Francisco Bay Area, its residents, its coastal and littoral zones, and broader risks of degraded air quality justify adoption of Berkeley code amendments that are stricter than the California Building Standards Code and Energy Code.

Single-Margin Energy Reach Code

Council could consider instead adopting an alternative amendment known as a "Single Margin Energy Reach Code" in lieu of a Zero or Ultra-Low NOx emissions ordinance for newly constructed buildings. The single margin approach would require the proposed building to meet a higher source energy compliance margin for all occupancies than currently required by the California Energy Code. Although "source energy" is not defined in the state Energy Code, a Code manual explains it generally measures the marginal greenhouse gas emissions of energy used to supply electricity (2022 Single Family Residential Compliance Manual at 1.6.4). The metric accounts for the system delivering energy to the building, as well as the time of day the energy is delivered.

By requiring that a proposed building achieve a certain compliance margin below the source energy requirement for a standard design building, such an ordinance would require that a building improve upon the state code's 1 metric. Each building type would have a respective single margin it would need to comply with. This approach gives builders flexibility in how to meet these standards and allows and applies to both electric and mixed-use fuel designs. Methods to achieve a particular source energy compliance margin

¹⁴ <https://berkeleyca.gov/sites/default/files/documents/2025-10-28%20Item%2017%20Adoption%20of%20Berkeley%20Building%20Codes%2C%20Including%20Local%20Amendments.pdf>

include electrifying appliances, or, if a building uses gas appliances, adding efficiency improvements such as insulation, and/or utilizing solar PV or a battery.

AC to Heat Pump

As the federal government is rolling back climate progress, local governments such as Berkeley must step up to sustain and accelerate emissions reductions. Under an “AC to Heat Pump” (AC2HP) policy, any new installation of an air conditioner would instead be required to use a heat pump, which provides both heating and cooling through a two-way valve, or, alternatively, to install a suite of energy efficiency measures. An AC2HP ordinance was produced in collaboration with the Statewide Reach Codes Program¹⁵, and establishes a “Time of Replacement” policy. The model code language proposes a reach code requiring that any existing single-family home involving replacement or alteration of an existing air conditioning system or installation of a new air conditioning must either include a heat pump space heater as the primary heating system or install other energy conservation measures. This approach targets a natural point of intervention in a building’s lifecycle. By focusing on equipment replacement events, this policy minimizes disruption to property owners while ensuring progress toward decarbonization.¹⁶

An AC2HP policy could reduce these emissions by displacing gas furnace use in homes and ultimately eliminating the need for them altogether. Replacing all central AC installations statewide with heat pumps could decarbonize more than half of California’s residential space heating demand by 2030, while also cutting harmful air pollution responsible for approximately \$890 million annually in health damages across the Bay Area.

The policy would also align with Berkeley’s Building Emissions Savings Ordinance, which provides a compliance pathway for properties with heat pumps. “Time-of-replacement” policies such as AC2HP are considered among the most cost-effective policies for decarbonizing buildings. According to the Berkeley Existing Buildings Electrification Strategy (BEBES), adopted by Council in 2021, “the marginal cost—[the] difference between installing electric equipment and replacing with new gas equipment—at this time is smaller than the full cost of installing electric equipment.”

Yet the economics of AC2HP are even more favorable than gas-to-electric conversions. While furnace-to-heat pump conversions typically incur added costs due to electrical work, the electrical and ducting requirements of an air conditioner are typically identical to those of a heat pump. For this reason, BEBES lists AC2HP as a Phase 1 strategy for implementation by 2025.

For new construction, local policies such as the those contemplated under the referral provide a higher level of safety than are achieved through the State’s Building Codes. Fire risk, risks to the health of building occupants, the accumulating and compounding risks of climate change to the San Francisco Bay Area, its residents, its coastal and littoral zones, and broader risks of degraded air quality justify adoption of Berkeley code amendments that are stricter than the California Building Standards Code.

ALTERNATIVES CONSIDERED

Council could choose to adopt either a green building reach code for certain new construction types *or* an AC2HP conversion code for existing buildings, or could choose not to adopt a reach code. However, not adopting a green building code would effectively

¹⁵ <https://localenergycodes.com/>

¹⁶ <https://bayareareachcodes.org/model-reach-codes/>

cede Berkeley's reputation as a climate leader to a number of neighboring and other California jurisdictions that are actively developing or have already adopted such a reach code.

Other reach code frameworks for certain new construction types can also be considered. These include Zero and Ultra Low nitrous oxide (NO_x) emission regulations and Flex Path / Electric Readiness Reach Codes.

Zero-NO_x and Ultra-Low NO_x

A Zero NO_x or Ultra-Low NO_x reach code would regulate nitrogen oxide emissions in buildings. Nitrogen Oxides are defined as the sum of nitrogen oxide (NO) and nitrogen dioxide (NO₂), collectively expressed as NO_x, which is a harmful air pollutant. Short-term exposure can aggravate asthma and other respiratory illnesses and can lead to hospital admissions and emergency room visits. Long-term exposure can cause asthma and potentially increase susceptibility to respiratory infections. Further, NO_x contributes to acid rain and is one of the building-blocks of ozone, an air pollutant, a greenhouse gas, and a major component of smog.¹⁷ An ordinance setting limits on appliance-generated NO_x emissions, or an equivalent greenhouse gas reduction ordinance, would set a higher standard for health and environmental protection by improving air quality.

A proposed NO_x emission ordinance would also address an immediate health concern of growing importance for Berkeley residents. The Bay Area Air District (BAAD) notes that: "In 2019, emissions from residential natural gas combustion accounted for roughly the same amount of NO_x emissions as passenger vehicles."¹⁴ However, shifts in remote work practices since 2019 have likely increased that percentage, both due to increased work from home hours and reduced work commutes. BAAD further notes that, "Through the reduction of NO_x and particulate matter emissions, the proposed [BAAD appliance] amendments are projected annually to prevent up to 85 premature deaths and save up to \$890 million in health impacts."¹⁸ In summary, the proposed Berkeley amendment for Very-Low NO_x Emission Buildings advances towards a built environment consistent with current understanding of human disease prevention and environmental health.

Cooking equipment, such as ranges, cooktops, and ovens that emit NO_x, exposes users to the NO_x emissions and impacts their health. The use of exhaust fans and vent hoods while cooking limits exposure indoors but does not remove it completely. The highest cited capture efficiency rate of residential kitchen vent hoods in the Energy Code is 85%, meaning cooks will inhale some combustion byproducts when a NO_x emitting appliance is being used. Residential and commercial kitchen vent hoods exhaust the NO_x emissions to the outside.

From a health and safety standpoint, using Zero NO_x Emitting cooking equipment, whether in homes or restaurants, offers the greatest health benefit. Allowing an exception from Zero or Ultra Low NO_x for cooking equipment serving nonresidential occupancies may provide other types of benefits. For example, it may be more economically attractive to restaurant owners due to factors such as equipment availability and familiarity, as well as purchase and operating costs. Restaurant operators in Berkeley have seen increases in expenses in recent years due to leases, costs of food, staff, and increasing regulatory compliance (e.g., utilizing compostable or reusable takeout containers to eliminate single use disposables).

¹⁷ <https://www.epa.gov/no2-pollution/basic-information-about-no2>

¹⁸ https://www.baaqmd.gov/~/_media/dotgov/files/rules/reg-9-rule-4-nitrogen-oxides-from-fan-type-residential-central-furnaces/2021-amendments/documents/20230522_faq_appliance-rules_final-pdf.pdf?rev=b425fe938f644fa7839f8d938cad41fd&sc_lang=en

In addition to its direct health impacts, NOx is one of the building blocks of ozone, a potent greenhouse gas with a Global Warming Potential (GWP) of 520. The Bay Area is currently out of compliance with federal standards for ozone. The provisions for Zero or Ultra Low NOx Emission Buildings made by Chapter 19.37 would have the effect of reducing the emission of ozone, because NOx reacts in sunlight with other volatile organic compounds to create ozone.¹⁹ If adopted, the Ordinance will result in a reduction in ozone and a corresponding reduction in greenhouse gas emissions.

Flex Path and Electric Readiness Reach Codes

Berkeley could also consider adopting a Flex Path and Electric Readiness Reach Code such as one that was recently adopted in Oakland, CA. Oakland's electric readiness reach code that requires new and some existing buildings to have electrical infrastructure installed for future conversion to electric appliances and electric vehicles. These codes, which often focus on new construction and additions or alterations during remodels, are local amendments to the California Building Code designed to reduce future greenhouse gas emissions at a lower cost by preparing buildings for electrification now. Key requirements typically include running 240V circuits for future heat pumps, cooktops, and electric dryers, as well as providing dedicated spaces in the main electrical panel and pre-wiring for electric vehicle (EV) charging.²⁰ It should be noted that Berkeley's recently updated Building Emissions Savings Ordinance already may accomplish these objectives through a similar mechanism for certain types of existing residential construction prior to or shortly following time of sale.²¹

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¹⁹ <https://www.epa.gov/ground-level-ozone-pollution/ground-level-ozone-basics>

²⁰ <https://bayareareachcodes.org/model-reach-codes/#:~:text=Electric%20Readiness%20Reach%20Codes%20outline,reduce%20emissions%20in%20the%20future.>

²¹ <https://berkeleyca.gov/construction-development/green-building/building-emissions-saving-ordinance-beso>