Last Updated: August 18, 2021

The Sacramento City Council adopted the Electric Vehicle (EV) Charging Infrastructure Ordinance on April 20, 2021, and the New Building Electrification Ordinance on June 1, 2021. The following Q&A is intended to provide key information about these ordinances, which began as a single ordinance but were split into two separate ordinances during the process.

1. What is building electrification?

- Building electrification is the substitution of gas appliances (furnaces, water heaters, cooking ranges and stoves, dryers, etc.) with clean, safe, and highly efficient all-electric alternatives.

2. What are the benefits of building electrification?

- **Smaller carbon footprint:** As electricity from the grid gets cleaner, all-electric buildings will eventually stop producing greenhouse gas emissions. The electricity provided today by the Sacramento Municipal Utilities District (SMUD) is already approximately 72% carbon free and SMUD has a goal to provide 100% carbon-neutral electricity by 2030.[1] All-electric buildings that purchase 100% renewable electricity are already zero-emission. Electric buildings are a key strategy to attain the City's goal of carbon neutrality by 2045.

- **Better indoor air quality:** All-electric buildings improve indoor air quality and promote better public health by eliminating natural gas combustion inside homes. Burning gas in household appliances produces harmful indoor air pollution, which has been tied to increased risk of respiratory disease and greater impacts on those with existing conditions.[2] Studies have also shown that gas stoves may increase children's risk of asthma by 42%.[3]

- **Better outdoor air quality:** The gas and propane burned in buildings causes six times higher nitrogen oxides (NO_x) emissions than all in-state power plants combined.[4] Reducing combustion of

[1] SMUD's carbon-free energy resources include large hydroelectric. Currently, SMUD's power is approximately 30% eligible renewable for purposes of California reporting, which excludes large hydroelectric. On April 28, 2021, SMUD's Board of Directors is scheduled to consider the 2030 Clean Energy Vision which would establish the commitment to zero carbon for SMUD's energy resources by 2030: https://www.smud.org/en/Corporate/Environmental-Leadership/2030-Clean-Energy-Vision.

[2] Logue, J., et al. (2014, January 1). Pollutant exposures from natural gas cooking burners: A simulation-based assessment for Southern California. *Environmental Health Perspectives*.

[3] Gas Stoves Can Emit Elevated Indoor Nitrogen Dioxide (NO2) Levels Often Exceeding Indoor Guidelines and Outdoor Standards. *Source: Health Effects from Gas Stove Pollution, Rocky Mountain Institute, 2020, https://rmi.org/insight/gasstoves-pollution-health.*

[4] California Air Resources Board: https://www.arb.ca.gov/ei/emissiondata.htm

gas and propane in buildings leads to the reduction of nitrogen oxides, a main contributor to ozone. Ground-level ozone aggravates respiratory health; reducing ozone is a key step to improve the poor air quality that disproportionately impacts many low-income neighborhoods in Sacramento. Sacramento is currently a non-attainment area for federal 8-hour ozone standards.[5] Additionally, in 2021 the American Lung Association ranked the Sacramento metropolitan region as the sixth most polluted in the nation for ozone, with an F rating.[6]

- **Fire Safety:** All-electric buildings are safer since buildings with gas appliances have higher risk of explosions. A gas explosion can occur when there is a gas leak in the presence of a spark or flame. Leaks from gas pipelines are common, with more than 2.3% or more of gas leaking while in transport between extraction to the gas meters at the point of the end user.[7] Examples of significant gas leaks include those in Aliso Canyon (2015 – 2016), and explosions like those in San Bruno, CA, in 2010, Merrimack Valley, MA, in 2018, and San Francisco in 2019. A ruptured gas pipeline in San Bruno was responsible for the 2010 explosion and resultant fire that killed 8 people and destroyed more than 38 homes. This disaster led to $1.6 billion in damages to PG&E.[8] Although an extreme example, San Bruno depicts the embedded risk with the extensive natural gas infrastructure that supplies gas to homes and buildings.

- **Cost Savings:** All-electric new buildings do not require the installation of gas infrastructure, reducing capital costs. New, and existing all-electric buildings can benefit from reduced operating costs[9]. Studies have shown that cost savings for all electric construction can range, with potential savings upwards of tens of thousands of dollars, depending on the type of construction (See questions 15-16 below).

- **Equity:** All-electric new construction can reduce construction costs and make housing more affordable. For low-income households that spend a disproportionate amount of their income on utilities and are more likely to live in substandard housing or neighborhoods with worse air quality

[5] Sacramento Metropolitan Air Quality Management District (2021). Air quality pollution and standards. http://www.airquality.org/air-quality-health/air-quality-pollutants-and-standards

[6] American Lung Association (2021). *State of the Air 2021.* https://www.lung.org/research/sota

[7] Alvarez, R., et al. (2018, July 13). Assessment of methane emissions from the U.S. oil and gas supply chain. *Science, Vol. 361,* pp. 186-188. Environmental Defense Fund (2018, June). Synthesis of U.S. methane measurements. https://www.edf.org/climate/methane-studies

[8] CPUC (2021). *Information on natural gas pipeline safety*. https://www.cpuc.ca.gov/sanbruno/
Ariaratnam, S. (2014). Overview of the explosion of a 30-in. steel natural gas pipeline in San Bruno, California. *Pipelines*. https://doi.org/10.1061/9780784413692.006

[9] Cost effectiveness studies:

- Reach Code, New Construction, Low Rise Residential: https://www.smud.org/-/media/Documents/Corporate/About-Us/Energy-Research-and-Development/2019-Low-Rise-Reach-Code-Analysis_SMUD_Final.ashx
- Reach Code, New Construction, Mid Rise Residential: https://www.smud.org/-/media/Documents/Corporate/About-Us/Energy-Research-and-Development/2019-Mid-rise-NC-Cost-Eff-Report-1.ashx
- Reach Code, New Construction, Low Rise Commercial: https://www.smud.org/-/media/Documents/Corporate/About-Us/Energy-Research-and-Development/2019-NR-NC-Cost-Effectiveness-Study-2019-07-25.ashx
- Low rise, single family and multifamily new and existing building electrification analysis: https://www.smud.org/-/media/Documents/Corporate/About-Us/Energy-Research-and-Development/E3-Residential-Building-Electrification-in-California-April-2019.ashx
- 2020 Reach Code Cost-Effectiveness Analysis: Detached Accessory Dwelling Units: https://www.smud.org/-/media/Documents/Corporate/About-Us/Energy-Research-and-Development/2019-Low-Rise-Reach-Code-Analysis_SMUD_Final.ashx
- 2019 Cost-Effectiveness Study: 2020 Analysis of High-Rise Residential New Construction: https://frontierenergy.com/wp-content/uploads/2019-Cost-Effectiveness-Study-2020-Analysis-of-High-Rise-Residential-New-Construction-report.pdf
- 2019 Cost-Effectiveness Study: 2020 Reach Code Cost-Effectiveness Analysis: Detached Accessory Dwelling Units https://localenergycodes.com/download/760/file_path/fieldList/2019%20New%20Detached%20ADUs%20Cost-effectiveness%20Report.pdf
- Website on the reach code analysis: https://explorer.localenergycodes.com/studies/city-sacramento/

that further increases risk of asthma, zero emission homes are an important opportunity to deliver social equity benefits.

3. Why did the City adopt the New Building Electrification Ordinance?

a. This ordinance is a key strategy to achieve carbon neutrality by 2045 and implements direction of the City Council and the recommendation of the Mayors' Commission on Climate Change. In June 2019, the Mayors' Commission on Climate Change unanimously approved a final report, with the electrification of new buildings as a key strategy. Representatives on the Commission consisted of a range of stakeholders including business and environmental leaders, real estate and development professionals, governmental agencies, and nonprofits. Specifically, this broad range of Commissioners advised that the City mandate all-electric construction to eliminate fossil-fuel use in new buildings under 4 stories by 2023 and all new buildings by 2026, with caveats for cost-effectiveness and technical feasibility.[10] Following this recommendation, City Council passed Motion No. 2020-0226 on August 25, 2020,[11] directing the City Manager to take a number of actions including drafting an ordinance to require electrification of new construction. Responding to this direction, staff prepared this ordinance and incorporated the provisions advised by the Commission, with the recommended timelines and accommodation of situations of technical infeasibility.

4. What type of construction will be subject to the New Building Electrification Ordinance?

a. This ordinance applies only to new construction and will not apply to tenant improvements, remodels or permits for existing buildings.

5. Will the proposed ordinance apply to additions and remodels, or tenant improvements?

a. No, this ordinance will not apply to additions and remodels, or tenant improvements, only new construction.

6. Will the City take my gas stove away?

- No. This ordinance will apply only to newly constructed buildings and will not affect buildings that already have gas. However, the City is beginning a technical analysis and engagement process to develop a strategy for decarbonizing existing buildings by 2045. Staff will seek input and evaluate how to phase future efforts to electrify existing construction. City staff will work closely with local stakeholders to develop and recommend a process. Staff anticipate a multi-year effort in close coordination with SMUD and with extensive input from the community and stakeholders.

7. What other jurisdictions have enacted an electrification ordinance?

a. A growing number of cities in California (48 as of August 14, 2021) already have approved all-electric new construction ordinances of some kind[12].

[10] Mayors' Commission on Climate Change final report and background information available online: https://www.lgc.org/climatecommission/.
[11] Recorded presentation and Council materials available online: https://sacramento.granicus.com/MediaPlayer.php?view_id=22&clip_id=4693&meta_id=596110.

[12] Local government decarbonization ordinances: https://www.buildingdecarb.org/active-code-efforts.html

8. What is included in the Electric Vehicle Charging Infrastructure Ordinance?

- The EV Charging Infrastructure Ordinance approved by City Council on April 20, 2021, includes:

    - Local amendments to the California Building Standards Code that will amend Title 15 of the Sacramento City Code to require new nonresidential, multifamily dwellings, and hotels and motels to provide 20% EV capable charging spaces and at least one installed, operational Level 2 EV charger, effective January 1, 2023, for new construction of three stories or less, and effective January 1, 2026, for new construction of four stories or more.

    - Amendments to Title 17 of the Sacramento City Code effective May 20, 2021, to:

        - Incentivize EV charging stations by allowing the substitution of one EV parking space with a Level 2 charger or a direct current fast charger to be substituted for two parking spaces.
        - Incentivize zero emission carsharing by allowing the substitution of one zero emission carsharing space for four required on-site vehicle parking spaces up to a maximum of 20% of the required on-site vehicle parking spaces.

- The New Building Electrification Ordinance approved by Council on June 1, 2021, includes:

    i. Local amendments to the California Building Standards Code that will amend Title 15 of the Sacramento City Code to require:

        1. Building permit applications filed on or after January 1, 2023, for all newly constructed buildings that are three stories or less to be all-electric buildings.
        2. Building permit applications filed on or after January 1, 2026, for all newly constructed buildings that are four stories or more to be all-electric buildings.
        3. Limited exemptions that would allow the use of mixed-fuel technologies for specific use cases will be available to permits filed through December 31, 2025, unless the exemption timeline is extended by the City Council due to feasibility and availability of technology.

            a. A limited exemption for food establishments for cooking equipment only.
            b. A limited exemption for manufacturing process loads within a manufacturing or industrial facility.
            c. A limited exemption (for water heaters only) in regulated affordable housing when virtual net energy metering (VNEM) is not available.

    The Ordinance also includes provisions for an infeasibility waiver process for those portions of the project where all electric is infeasible. The process would allow an applicant to request an infeasibility exemption when they can demonstrate to the satisfaction of the City building official that it is technically infeasible to meet the requirements of this ordinance.

9. What are the effective dates of the ordinances?

a. Effective Dates:
   i. One-Three Stories and 20% EV capable spaces/EV charging: January 1, 2023.
   ii. Four-stories or more and 20% EV capable spaces/EV charging: January 1, 2026
   iii. EV parking and ZEV carsharing incentives: 30 days from adoption

b. The proposed electrification requirements would not apply to building permit applications submitted and accepted by the City's Building Division with payment of all required fees prior to the effective date of January 1, 2023, or January 1, 2026, respectively.

- These effective dates align with the anticipated effective date of the 2022 California Building Standards Code and the anticipated effective date of the 2025 California Building Standards Code. The state's building code is on a three-year cycle and serves as the basis for any legally enforceable local code. Accordingly, the City's electrification ordinance is not enforceable until California releases the future state building codes, and the City re-adopts the ordinance as amendments to the new statewide building code.

c. During the transition period between the ordinance adoption date and effective date of the Ordinance, the City's Planning and Building Divisions will conduct targeted outreach and educate potential development project applicants about the benefits of all-electric construction and engage stakeholders in the development of the process and criteria for the infeasibility waiver.

10. What about requiring all projects to be "electric-ready" before the all-electric requirements go into effect? How is it different from requiring all-electric?

- An electric-ready building includes both electric and natural gas infrastructure, but the building's electrical systems and designs provide capacity, space, electrical conductors or raceways, and related devices for a future retrofit of building appliances and equipment to be all-electric. In contrast, an all-electric project would not include any natural gas or propane infrastructure.

- The costs to make new development electric ready may be minimal when compared to the cost of retrofitting mixed-fuel buildings. For example, electric-ready adds $300-$400[13] to the cost of constructing a single-family dwelling, while the cost to retrofit a mixed-fuel single-family dwelling to upgrade to all-electric may be 3 - 4 times more than that after construction.

[13] Reach Codes:

Energy & Environmental Economics. 2019. Residential Building Electrification in California. April 2019. https://www.ethree.com/wp-content/uploads/2019/04/E3_Residential_Building_Electrification_in_California_April_2019.pdf

California Energy Codes & Standards. (August 1, 2019). 2019 Cost-effectiveness Study: Low-Rise Residential New Construction. Prepared for Pacific Gas and Electric Company. Prepared by Frontier Energy. https://localenergycodes.com/download/73/file_path/fieldList/2019%20Res%20NC%20Cost-eff%20Report

TRC. 2016. Palo Alto Electrification Final Report. November 2016. https://www.cityofpaloalto.org/civicax/filebank/documents/55069

Additional cost-effectiveness studies available online: https://localenergycodes.com/content/resources.

- Cost-benefits could greatly vary for multi-family and nonresidential development. There may also be a diminishing cost-benefit for upfront inclusion of electric-ready improvements, when compared to future costs for retrofits.

- Due to the range of potential costs, more analysis and outreach would be needed prior to including an electric-ready provision in the ordinance. In order to meet the expedited ordinance timeline, staff have not included this provision in the ordinance.

11. What criteria will be used to determine if all-electric is not feasible for a proposed new building?

a. Following the adoption of the ordinance, staff will work with a technical panel to develop a process and criteria for determining if all-electric construction is not feasible. In response to stakeholder comments and City Council direction, the Technical Panel will include a range of representatives including City staff, technical consultants, utilities, manufacturing, business, development, restaurant, equity/Environmental Justice, and labor. The New Building Electrification Ordinance stipulates that infeasibility guidelines will be adopted by a City Council resolution. The infeasibility guidelines will serve as a resource to provide a clear, transparent process for applicants, identify technologies that may not be market ready, or project-specific conditions that may make all-electric construction infeasible. As proposed in the draft ordinance, the burden will be on the applicant to show infeasibility. City staff anticipate convening the technical panel in Fall, 2021. Following the adoption of infeasibility guidelines, city staff will continue to evaluate the infeasibility waiver process in collaboration with local stakeholders and refine the process for inclusion with amendments to the 2022 California Building Standards Code.

12. What types of new development are hard to electrify, and how does the ordinance respond to these challenges?

a. The following issues were vetted through webinar events and discussions with local stakeholders, developers, chefs, affordable housing advocates, labor representatives, engineers, architects, and more.

i. Gas equipment has broader industry acceptance and understanding by the restaurant community. Some members of the restaurant community have indicated that the ordinance would pose a hardship and have asserted the importance of maintaining flexibility for natural gas equipment in commercial cooking, even though the ordinance would only apply to construction of new buildings.

ii. In certain cooking applications such as big pizza and bakery ovens, the ongoing operating costs for electric cooking equipment may be higher than the cost of operating gas equipment[14]. Certain traditional cooking practices rely on the use of flame, such as grilling and traditional Asian cooking methods with woks.

iii. Manufacturing and special use sectors may also have certain types of equipment that cannot be feasibly electrified while maintaining critical services. For example, some uses may require equipment such as a co-generation plants and emergency generators. The

[14] Richard Young (December 21, 2020). Frontier Energy, the Food Service Technology Center. Personal communication. ryoung@frontierenergy.com, https://fishnick.com/.

[15] Link to Studies: https://www.smud.org/en/Corporate/About-us/Research-and-Development#af4d3e2a-33c7-4612-90ab-3cb869e6da1e-326a400b-d34c-43e8-b0bf-36c07bc1486e

ordinance infeasibility waiver will provide flexibility where all-electric is technically infeasible for new construction.

iv. Affordable housing developers have indicated that additional costs for electric heat pump water heaters can increase construction costs and challenge the ability of project developers to secure competitive financing.

b. Recognizing that there are challenges, the New Building Electrification Ordinance includes limited exemptions and provisions for an infeasibility waiver process to provide additional flexibility for new construction that codified exemptions cannot provide. The limited exemptions that would allow the use of mixed-fuel technologies for specific use cases will be available to permits filed through 12/31/25 unless the exemption timeline is extended by the City Council due to feasibility and availability of technology. The infeasibility waiver does not have a sunset clause. The infeasibility waiver could also accommodate the unique needs of these building types and operators, consistent with the approach of other jurisdictions in California that have already enacted electrification ordinances, such as Oakland, San Francisco, and San Jose. Over the next year, City staff will continue to collaborate with stakeholders to develop the infeasibility exemption guidance for City Council adoption via resolution.

13. How is manufacturing/industrial defined by the building code?

a. Section 306 of the California Building Code describes Occupancy Group F, factory/industrial uses as: "…the use of a building or structure, or a portion thereof, for assembling, disassembling, fabricating, finishing, manufacturing, packaging, repair or processing operations that are not classified as a Group H hazardous or Group S storage occupancy." It goes on to list a number of different typical uses, but these are just examples. The language above is what we would use to determine if a given use was in fact Group F.

14. Why did the City adopt these ordinances now when state building codes are updated every three years?

a. Decarbonization through electrification is one of the City's key strategies for achieving carbon neutrality. The ordinance will reduce greenhouse gas emissions (GHG) and provide many co-benefits including improved indoor and outdoor air quality and improved public health.

It is not certain if or when state building codes will require all-electric construction. Passing the ordinance in 2021 with effective dates that align with the building code cycles signals intent to the development community and provides time for designers and builders to adequately plan for the new mandate.

b. Building code amendments are more effective and cost efficient than other GHG reduction measures available to the City. In addition, most electric appliances have similar or lower operating costs compared to natural gas appliances.

c. Avoiding the cost of gas infrastructure provides significant savings. Studies[15] have shown that all-electric low-rise buildings are already cost effective for new construction and

[15] Link to Studies: https://www.smud.org/en/Corporate/About-us/Research-and-Development#af4d3e2a-33c7-4612-90ab-3cb869e6da1e-326a400b-d34c-43e8-b0bf-36c07bc1486e

adding EV capability requirements is also cost effective for all building types except medium office. When SMUD incentives are factored in, even medium office is cost effective, and other building types come out significantly ahead.

The electrification ordinance is expected to reduce the cost to build new low-rise housing. Delaying will cost more in the long run by creating stranded assets (obsolete gas infrastructure and appliances) that will cost significantly more to retrofit in the future when gas infrastructure is removed to meet state and utility standards for carbon emission reduction.

15. How can all-electric new construction benefit low-income and affordable housing residents?

a. Cost effectiveness studies have shown that all-electric low-rise construction is typically cost effective.[16] The studies showed that the elimination natural gas infrastructure can provide significant cost savings, with ongoing savings to residents. One study estimated that over a 30-year period, residents in new electric construction would pay less in energy bills by approximately $5,349 in single family housing and $2,337 in low-rise multi-family.[17] The upfront costs associated with installing new gas distribution and service lines are paid off over time by the residents of the newly constructed buildings through monthly utility bills. This leads to higher energy rates for residents over the long term.

b. A major portion of natural gas rates are to pay for infrastructure maintenance. The projected decrease in natural gas usage due to improved efficiency and electrification is projected to significantly increase the cost of natural gas over time[18]. Avoiding new natural gas infrastructure will decrease the number of stranded assets and help protect the community as a whole from energy rate increases.

16. How will the ordinance impact the production of affordable multi-family housing?

a. To ensure the ordinance does not limit the construction of affordable multi-family housing, the ordinance provides a limited exemption for water heating systems and related equipment in regulated affordable housing where virtual net energy metering is unavailable (VNEM).

This exemption is based on the feedback from affordable housing developers who report that electric heat pump water-heating systems and related equipment can raise the cost of constructing affordable multi-family housing. This is partly supported by recent cost-effectiveness studies for high-rise new construction which show the costs depend on project design. Cost-effectiveness studies show that central electric heat pump water heaters can increase costs in high-rise housing above eight stories by approximately $557 per multi-family unit, while clustered heat-pump water heaters can save $228 per unit.[19] Costs are anticipated to decrease over time as technologies and market demand advance, but upfront costs would currently challenge affordable housing

[16] Refer to footnote 3 for links to low-rise cost-effectiveness studies.

[17] Low-rise multi-family defined as 8 units. California Energy Codes & Standards. (August 1, 2019). 2019 Cost-effectiveness Study: Low-Rise Residential New Construction. Prepared for Pacific Gas and Electric Company. Prepared by Frontier Energy. https://localenergycodes.com/download/73/file_path/fieldList/2019%20Res%20NC%20Cost-eff%20Report.

[18] Increasing costs of natural gas: https://gridworks.org/wp-content/uploads/2019/09/GW_Calif-Gas-System-report-1.pdf

[19] 2019 Cost-Effectiveness Study: 2020 Analysis of High-Rise Residential New Construction: https://frontierenergy.com/wp-content/uploads/2019-Cost-Effectiveness-Study-2020-Analysis-of-High-Rise-Residential-New-Construction-report.pdf

developers to secure limited and highly competitive funding and project financing. The proposed limited exemption is intended to mitigate this potential added cost.

Some water heating in high-rise housing may still be cost-effective when clustered, and accounting for SMUD rebates. Also, despite the exemption, studies have shown that central water heating in buildings up to eight stories are cost effective.

b. In other regions, affordable housing developers can use Virtual Net Energy Metering (VNEM) as a tool to make solar photovoltaics feasible for multi-family housing. In an increasingly competitive financial environment, VNEM is a tool that affordable housing developers have relied on to compete for and secure limited financing from public housing agencies, the state, and federal tax credits.

c. SMUD has committed to create a new VNEM option for deed-restricted affordable housing development through a rate-making process that kicked off on May 18, 2021[20] at the SMUD Finance and Audit Committee, with anticipated SMUD Board action to approve and establish the new rate in Fall 2021. Once established, VNEM will provide an additional benefit to low-income customers by reducing monthly utility allowances.

17. What other incentives for affordable housing development is the City considering?

- City staff and SMUD are committed to reducing the barriers for affordable housing developers to build all-electric. The City has eliminated city development impact fees for qualifying affordable dwelling units and provides a fee deferral program for other development impact fees that it collects for other agencies. The City is working to further remove barriers to the production of housing with policy and code changes, permit streamlining, and other initiatives. City staff will continue to work through these issues and identify appropriate solutions with key stakeholders to facilitate the construction of affordable housing. SMUD may also consider updates to its rules and programs as described above.

18. Cost-effectiveness studies have shown that all-electric low-rise construction is cost effective, but is the combination of all-electric + EV capable cost-effective for new low-rise construction?

a. For most building types (except medium office), the savings from building all-electric offsets the small added cost of additional EV infrastructure, providing overall cost savings in comparison to mixed-fuel construction. Even medium office was found to be cost-effective when SMUD incentives were considered, which resulted in a savings of $88.[21]

b. Adding EV capacity requirements in new construction is cost effective when compared to the cost of retrofitting to add EV capacity later.

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[20] For more, refer to the May 18, 2021 Finance and Audit Committee presentation: https://www.smud.org/-/media/Documents/Corporate/About-Us/Board-Meetings-and-Agendas/2021/May/2021-05-18-Finance-and-Audit-Exhibit-to-Agenda-Item-1---Jennifer-Davidson-and-Eric-Poff.ashx

[21] Cost estimates for this question were determined using cost-effectiveness studies referenced in footnote #6. Staff calculated the number of EV capable parking spaces for project prototypes assuming average rates of parking provision based on Title 17 requirements and typical projects. Electrical system assumptions were vetted with SMUD. The incremental costs of EV capability and installed Level 2 chargers were calculated for each prototype based on the California Air Resources Board CALGreen Technical Cost and Analysis (2019) (California Green Building Standards Code, Title 24, Part 11, Sections 4.106.4 and 5.106.5.3, https://ww3.arb.ca.gov/cc/greenbuildings/pdf/tcac2018.pdf.).

i. Installing EV capable spaces during construction adds approximately $800 per space. Recent studies have indicated that retrofitting that same space can cost approximately $2,370 - $3,700, depending on the number of spaces. Incorporating the infrastructure with initial construction yields savings between $1,570 - $2,900 per space.[22]

c. By packaging EV capability together with all-electric, the City is taking forward a net-positive cost package for new low-rise construction. Staff's initial review of available cost effectiveness studies indicates that this approach can yield substantial savings, especially for residential buildings:
   i. Accounting for both 20% EV capability and all-electric requirements for low-rise, data suggests that savings ranges from over $6,000 (for a mid-rise, ~88-unit development) to over $60,000 (for a low-rise multi-family project with 8 dwelling units).

19. Are all-electric buildings 4-stories and above cost-effective?

a. Cost effectiveness studies have been completed for mid-rise new construction and high-rise new construction[23]. These studies show that all-electric construction saves an average of $700 per midrise dwelling unit, and also provides $35 savings on energy bills annually. Construction costs for all-electric high-rise multi-family vary depending on project design and how hot water heating is addressed. The cost differences can range from a savings of $228 per unit to a cost increase of $557 per dwelling unit. (Central heat-pump water heating adds $557 per unit in cost, while clustered heat-pump water heating saves $228 per dwelling unit).

SMUD provides rebates to encourage all-electric construction and off-set or exceed costs, as shown in the table below:

New Construction Building Type[24]	SMUD Rebates Per Unit	Construction Costs Savings per unit[25, 26, 27]	Annual Bill Savings per unit
Single-Family	$5,000	$5,000	$400
Low-rise Multifamily	$1,750	$2,000	$120
Mid-rise Multifamily	$1,750	$700	$35
High-rise Multifamily	$1,750	-$557 to +$228	$25 to $75

Source: SMUD summary, from cost-effectiveness summaries linked throughout this report and available at https://explorer.localenergycodes.com/studies/city-sacramento/.

20. Does SMUD have the resources to provide reliable grid capacity?

a. As reliability is a core value, SMUD has the resources and capital investment plans in place to ensure that all customer energy requirements are met and that the grid can continue to deliver as electrification of buildings and transportation becomes more prevalent in the Central City and

[22] Energy Solutions/PG&E study done for San Francisco https://evchargingpros.com/wp-content/uploads/2017/04/City-of-SF-PEV-Infrastructure-Cost-Effectiveness-Report-2016.pdf

[23] Refer to footnote 3 for links to low-rise cost-effectiveness studies.

[24] Low-rise construction is defined as three stories or less, mid-rise is four stories to seven stories, and high-rise is any building with eight stories or more.

[25] California Energy Codes & Standards. See Tables 2 & 3 in 2019 Cost-effectiveness Study: Low-Rise Residential New Construction Addendum – SMUD Analysis.

[26] California Energy Codes & Standards. 2019 Mid-rise New Construction Reach Code Cost-Effectiveness Study.

[27] California Energy Codes & Standards. 2019 Cost-Effectiveness Study: 2020 Analysis of High-Rise Residential New Construction.

throughout SMUD's service territory. On May 4, 2021, SMUD staff will present on grid capacity to the City's Law and Legislation Committee.

21. Does SMUD provide incentives to support building electrification?

a. Yes, SMUD provides excellent incentives to support electrification. A summary of residential incentives as of January 2021 follows, but more information on SMUD programs follows.

SMUD

SMUD Smart Homes Program Manual
11/20/2019

Table 1 – Single Family, All-Electric Incentives

Incentive	Amount Available
Base Incentive for All-Electric Home	$4,000
Induction Cooktop	$1,000
Battery Bonus	$2,000
Total All-Electric Incentive per home	**Max $7,000**

Table 2 – Single Family, All-Electric Ready/Mixed Fuel Incentives

Incentive	Amount Available
Compliant with All-Electric Ready Definition (Required)	$1,000
Heat Pump HVAC only**	$950
Heat Pump Water Heater only**	$800
Induction Cooktop	$600
Electric Laundry Dryer	$200
Electric Fireplace or Outdoor Grill	$50
Subtotal All-Electric Ready Incentive per home	**Max $3,000**

** Must choose either heat pump HVAC or heat pump water heater, or both

Table 3 – Multifamily, All-Electric Units

Incentive	Amount Available
Base Incentive for All-Electric Unit	$1,250.00
Induction Cooktop	$500.00
Battery Bonus	N/A
Total All-Electric Incentive per home	**$1,750.00**

Table 4 – Multifamily, All-Electric Ready (Mixed Fuel) Units

Incentive	Amount Available
Compliant with All-Electric Ready Definition (Required)	$310
Heat Pump HVAC*	$320
Heat Pump Water Heater*	$450
Induction Cooktop	$300
Electric Laundry Dryer	$110
Subtotal All-Electric Ready Incentive per home	**Max $1,380**

* Must choose either heat pump HVAC or heat pump water heater, or both

b. Residential New Construction:
Smart Homes https://www.smud.org/en/Going-Green/Smart-Homes

- Retrofit:
  Commercial Multifamily: https://www.smud.org/en/Business-Solutions-and-Rebates/Business-Rebates/Multi-Family-go-electric-incentives
  Home Performance Program https://www.smud.org/en/Rebates-and-Savings-Tips/Improve-Home-Efficiency

- Commercial New Construction:
  Integrated Design Solutions: https://www.smud.org/en/Business-Solutions-and-Rebates/Business-Rebates/Integrated-Design-Solutions

22. What impacts will the electrification of new buildings have on the grid?

a. Impacts to the grid for the electrification of new buildings are less than many may imagine because existing peak electrical loads are in the summer; the SMUD system is sized for summer peak loads, while the shift to all-electric space heating (which uses more electricity than other appliances) would occur in the winter. In addition, electric heat pump space heating, electric heat pump water heating, and induction stovetops are all very energy efficient.

b. The potential impact of electric vehicle charging on the grid is more significant. These impacts will not happen overnight, and SMUD has ongoing forecasting in place and is actively planning to address impacts created by electric vehicle charging to meet future grid demand.

23. Will the New Building Electrification Ordinance create or exacerbate a shortage of electrical contractors?

a. No, every gas appliance has to be wired for 120V (for fans, electric starts, etc.) so there is virtually no change in the labor needed by electricians to electrify new construction. However, input from local electricians indicates the need for a larger trained workforce – this represents an important workforce opportunity.

24. How will the New Building Electrification Ordinance impact labor?

a. The City anticipates more work for electrical infrastructure and equipment that can largely be met with the existing workforce in the near-term. However, long-term, as the City works towards carbon neutrality and both local and state targets for zero-emission vehicles, more trained workers will be needed to ensure the construction and installation of zero-emission vehicle infrastructure, including both EV chargers and hydrogen fueling stations. This will create a need for more electrical contractors, and an important workforce opportunity to provide needed high-quality jobs to the community. For example, in 2019, the International Brotherhood of Electrical Workers Local 340 estimated a shortage of approximately 1,500 people in the apprentice program, but apprenticeship has significant barriers to entry.[28] This represents an important jobs opportunity, and the City is committed to bridging this gap. Together with local partners, schools, and stakeholders, the City is working to create a pipeline for the new types of jobs opportunities consistent with the City's electrification goals. The City's recent $10M CARES-funded workforce development investment, 1,942 Sacramento residents have received direct employment services through the City's Workforce Recovery Programs (WRP) to date.[29]

b. State research indicates that building codes can shape the evolution of the market and encourage development of a local pool of contractors ready to meet code requirements and able to support a "high-road" path for local, high-quality jobs.[30] The City also recognizes the

[28] Refer to the *EV Economic Pathways* analysis Frontier Energy conducted for the City's EV Blueprint project (2019): http://www.cityofsacramento.org/-/media/Corporate/Files/Public-Works/Electric-Vehicles/5-2_EV-Blueprint_Final-EV-Economic-Pathways.pdf?la=en

[29] Learn more about the City's CARES investments: https://www.cityofsacramento.org/Economic-Development/CARES-Act.

[30] Refer to *Putting California on the High Road* (June 2020), prepared by the UC Berkeley Labor Center for the California Workforce Development Board: https://laborcenter.berkeley.edu/wp-content/uploads/2020/09/Putting-California-on-the-High-Road.pdf

immense opportunity to create more jobs by attracting the manufacturing industries that are developing clean energy and zero-emission mobility technologies. The California Mobility Center is an important example of the regional commitment and investment in green jobs development.

c. Through ongoing partnership and collaboration, the City is committed to developing a "just transition" to new market opportunities for local jobs in fossil fuel-related industries that may be impacted by the ordinance. The phased timing of the ordinance provides the City with additional time to ensure this smooth transition. Data from local pipefitters indicates that gas piping and appliance work can be an important portion of their workload.[31] However, new opportunities abound in water conservation and reuse, and other aspects of the City's sustainability programs. The 2021 Climate Implementation Work Plan identified funding needs to address opportunities for green jobs and water conservation and reuse. The Midyear Fiscal 2021 Budget recommendation included funding for these efforts that would accelerate green job efforts (pending approval by City Council). Additionally, a City Resolution (June 1, 2021) committed the Community Development Department and Department of Utilities to evaluate opportunities for the expansion of water conservation standards for buildings, with an update to Council prior to July 1, 2022, in advance of the New Building Electrification Ordinance effective date.

25. Will new building electrification make Sacramento less resilient in preparing for the electrical outages that result from winter storms?

a. No, increasing electric buildings and vehicles in Sacramento does not correlate with making the grid less resilient. Modern gas appliances require electricity to operate (for fans, electric starts, etc.), so modern electric appliances are no less resilient. Unforeseen electricity outages can occur resulting from car accidents, falling trees, storms, or even animals interfering with equipment. During an outage, SMUD consistently meets aggressive reliability targets, minimizing frequency and duration of outage events and distribution system disruptions. Also, all-electric appliances can easily be set up to use a backup power source including generators or solar-powered batteries.

b. During California's primary natural disaster events, wildfires and earthquakes, utilities are supposed to turn the gas off. If 100% reliability is a goal for your home or project, electrification with battery and solar backup via microgrid is the way to get there.

c. PG&E is also required to shut down gas service during fires and/or earthquakes. Gas service was shutoff in areas of the state for tens of thousands during Camp and Kincaid Fires, in some cases for over 10 days. For new buildings with gas appliances, having gas service does not improve resiliency, as new gas appliances require electricity for ignition and motors to function. This includes tankless water heaters, furnaces, gas dryers, gas ranges (especially with digital controls). Resilience is best handled with battery storage, propane (long storage life) generators or both.

d. Natural gas pipelines and the electric grid both go down on occasion.

[31] According to the U.A. Local Union 447, the Plumbers and Pipefitters Union, approximately 22% of union member workload in late 2020 was for gas piping.

26. Are there issues related to locating transformers in tight mid-and high-rise infill sites (particularly those with podium parking)? Would projects lose some developable space due to the need to add large transformers for all electric?"

a. Some infill development projects may face challenges to fully electrify. Infill projects with zero-lot line development are already challenged to find space for utility infrastructure, including transformers. Developers have shared concerns that under current SMUD rules regarding transformer size and clearance, going all-electric may require more space for infrastructure than is available. To accommodate challenges such as these, the ordinance includes provisions for an infeasibility exemption process. The City will continue to work with SMUD to address the unique needs of infill development.

b. Project design that considers utility infrastructure from the initial stages, including building design that provides adequate space for utility infrastructure, clustering heat-pump water heaters to reduce electrical loads, and appropriately sizing infrastructure such as transformers, can address many of these issues. Transformer sizes do not necessarily have to increase in size due to building electrification. To learn more about space requirements for mid-rise infill sites, please refer to SMUD's Electrical service in downtown Sacramento (pdf). Applicants should schedule a pre-application meeting with SMUD's Commercial Development team (development@smud.org or 916-732-5448) to discuss their specific project needs.

27. Are there all-electric alternatives to gas stoves?

a. Yes, electric smooth-top ranges and stoves have improved and provide high performance reduce indoor and outdoor air pollution. While they may cost more upfront, induction cooktops perform even better than electric smooth-tops and conventional gas stoves, save on fuel costs, and reduce greenhouse gas emissions. There are also induction woks that can replace conventional woks over a gas stovetop. SMUD incentives are available for electric cooking options.

b. Although the recommended ordinance includes an exemption for commercial cooking equipment, efforts will continue to ensure broad availability of electric commercial cooking equipment over time. SMUD programs will continue to support the advance of market-ready technologies, with new programs to ensure that commercial cooking equipment dealers are offering electric options.

28. What is electric induction cooking?

a. Conventional stovetops use electric resistance to heat metal coils, which heats the air between the cooktop and the pan. Electromagnetic induction cooktops are a new type of electric stovetop that uses electromagnetic coils beneath a ceramic glass surface to transfer energy directly into metal pans. With induction cooking, the air between the cooktop and the pan never gets hot, so there is no residual heat and no need for a warning light. Induction cooktops are faster, more precise, and more energy efficient than conventional electric stovetops. Pots and pans need to have a magnetic (steel or iron) bottom in order to work with the electromagnetic induction cooktop. A quick way to test if pots and pans will work with induction is to see if a magnet sticks to the bottom.

29. Are there all-electric options for fireplaces?

a. Yes, there are great all-electric alternatives to traditional wood or gas-burning fireplaces, and they do not require any maintenance, wood chopping, chimney cleaning or expensive installation. Electric fireplaces are affordable, clean, safe, and easy to install.

30. Will propane infrastructure be exempt?

a. No, propane is a fossil fuel. The proposed ordinance will require newly constructed buildings to be all-electric and will prohibit the inclusion of natural gas piping or propane plumbing. Outdoor grills, patio heaters, and other appliances that use portable propane tanks will still be allowed as long as the appliance is not permanently plumbed for gas.

31. Isn't the City limiting innovation by requiring buildings to use electricity? Why not allow fuels like renewable natural gas?

a. The ordinance ensures innovation in technologies that create clean power. Electricity can come from a range of creative on-site technologies, or from the grid. The ordinance ensures innovation in energy sectors that are consistent with the City's policy goals. The ordinance does not preclude a range of options for electrical power; it only precludes the use of natural gas or propane.

b. Burning natural gas and other forms of fossil fuels pollutes the air that the community breathes and increases health risk. Natural gas appliances also ensure a reliance on aging and expensive natural gas infrastructure system with safety risks. Continuing a reliance on fossil fuels falls short of the action needed to clean Sacramento's air or achieve carbon resilience.

c. There is very little renewable gas available today (less than 1% of current use versus 34% renewable electricity in 2018), and the potential future supply from sustainable sources is limited. Renewable gas is also much more expensive than fossil fuel gas, while renewable electricity is getting cheaper than electricity from gas power plants. When produced sustainably, renewable gas can play a limited role in reducing emissions, but given its scarcity and high cost, it is unlikely to ever replace a large enough share of the state's fossil gas use. The limited supply may be better used where it is most impactful in harder-to decarbonize sectors, for example, in certain industrial and heavy machinery applications that may be accommodated through the ordinance's proposed infeasibility process. Renewable natural gas will not eliminate impacts on indoor air quality or safety risks outlined in previous questions.[32]

32. Can I listen to recordings of the building electrification webinar series?

- Yes, these can be found on the project webpage: http://www.cityofsacramento.org/SacElectrificationOrdinance

33. The market-penetration of electric heat pump water heaters is currently only at 2%, which seems too low to reasonably consider a mandate.

[32] Building Decarbonization Coalition, Sierra Club, NRDC (2019, October). https://www.buildingdecarb.org/local-government-resources.html

a. Heat pump water heaters, as they exist today, have been made in the United States since 1978 as smaller brands, and have been manufactured by all the major brands since 2009. Furthermore, one in four homes in the United States is currently all-electric.[33]

The State of California does not currently have a threshold for market adoption of water heaters in order to comply with its own laws regarding air pollution, which is the worst in the nation. Yet the market may not change of its own accord. Regulations and mandate help to create the market. In all of the examples below, the regulation came first, and then the product was invented.

- o California's South Coast Air Quality Management Board required low-NOx water heaters to be created by May of 2006. Prior to the mandate, there was no such thing sold anywhere else in the U.S.
- o The SCAQMD later required ultra-low-NOx water heaters to be created for California by Oct 1st, 2019. These also did not exist before the requirement.
- o The CEC banned electric resistance water heaters in the 2016 Code, requiring all new construction to use heat pump water heaters to build all-electric.
- o Another example is High-Global Warming Potential refrigerants. The Air Resources Board announced their 2023 phase-out years ago, when there were no substitute refrigerants in use in the U.S., and the manufacturers have started changing out the refrigerants (e.g., R-134a is switched for R-513 in water heaters; R-410a is switched for R-32 in HVAC heat pumps, etc.).

34. How can the City pass a reach code over a future building code cycle?

a. The current ordinance as drafted will have no legal effect concerning modifications to the California Building Standards Code in the near term. The City will be required to pass a new ordinance for the next building code cycle (after July 1, 2022) that will provide modifications to the 2022 building standards code that will be effective January 1, 2023.

In addition, the City will need to pass a new ordinance after July 1, 2025, that will provide for modifications to the 2025 building standards code that will be effective January 1, 2026. The amendments to Title 17, Planning and Development Code, will be effective in 2021.

- Codifying the phased implementation now provides developers and contractors with time to plan and prepare for the new ordinance.

35. What is the process for approving local amendments to the California Building Standards Code (California Code of Regulations, Title 24) for the proposed electrification ordinance?

a. There are two processes that provide for local amendments to the California Building Standards Code:

1) Local amendments that are more stringent due to climatic, geographic, or topographic conditions. This generally requires a city, through an ordinance, to identify the specific local conditions, specify the local amendments and specify how the local amendment is made necessary because of the local condition. This process requires the City to file the ordinance and findings with the California Building Standards Commission.

[33] One in Four U.S. Homes is All-Electric https://www.eia.gov/todayinenergy/detail.php?id=39293

2) The other process concerns Part 6, the California Energy Code. This process allows a city to adopt local energy standards. The City would be required to determine that the proposed standards are cost effective. In addition, the California Energy Commission is required to find that the standards will require buildings to be designed to consume less energy than permitted by the California Energy Code.

36. How many new buildings are expected to be built between now and 2026 before the ordinance becomes effective?

- Based on building permit data from 2018 and 2019, it is estimated that approximately 2,250 new buildings (total residential and non-residential) and 2,240 new dwelling units will be constructed between now and 2026.

37. What about existing buildings?

- See project webpage for the decarbonization of existing buildings.