CITY OF SAN MATEO

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Agenda Report

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TO: Sustainability and Infrastructure Commission

FROM: Kathy Kleinbaum

PREPARED BY: City Manager's Office

MEETING DATE: July 13, 2022

SUBJECT:
Sustainability-Related Amendments to the 2022 Building Code

RECOMMENDATION:
Provide feedback on potential amendments to the 2022 Building Code for new construction and existing buildings related to building electrification.

BACKGROUND:
Transportation accounts for 50% of greenhouse gas emissions in San Mateo, followed by electricity and natural gas use in buildings that accounts for 34% of emissions. The City's Climate Action Plan identifies encouraging adoption of electric vehicles (EV) and electrification of new and existing buildings as key focus areas to meet greenhouse gas emission reduction goals. Furthermore, the City Council directed staff to establish policies to decarbonize and electrify existing buildings and eliminate fossil gas (also known as natural gas) use by 2030.

Building electrification refers to buildings with no fossil gas service that uses electric equipment for water heating, space heating, clothes drying and cooking. Peninsula Clean Energy (PCE) is a joint powers agency established in 2016 to provide clean electricity in San Mateo County. Currently, PCE provides electricity that is 50% renewable and virtually 100% carbon free and PCE is committed to delivering 100% renewable and carbon free electricity by 2025. While electricity has become cleaner, fossil gas is a fossil fuel producing significant emissions. The primary component of fossil gas is methane, which contributes emissions with a very high global warming potential. Leakage from fossil gas infrastructure adds to emissions as gas leakage occurs during production, transmission, and even at the building level. There are also health and safety concerns associated with the transmission and use of fossil gas in homes.

The development and adoption of amendments to the building code, also known as "reach codes" can help reduce emissions by requiring more sustainable development. Reach codes are typically evaluated every three years in line with the State's triennial building code cycle. The last building code was adopted in 2019 and went into effect on January 1, 2020. The 2022 building code will be adopted this fall and be effective January 1, 2023 through December 31, 2025.

In the previous code cycle, PCE supported jurisdictions in the adoption of reach codes to advance renewable energy, building electrification and EV readiness. PCE provided cost-effectiveness studies, model ordinances and technical support to city staff. This year, PCE is leading the newly formed Bay Area Reach Codes group that includes East Bay Clean Energy (EBCE) and Silicon Valley Clean Energy (SVCE) and providing this same type of support to local governments. The Bay Area Reach Codes team is focusing on building electrification and EV readiness in new construction and existing buildings. It is important to note that reach codes for solar and battery storage are no longer necessary since the 2022 State Energy Code now requires solar and battery storage for all types of new construction.

FEEDBACK FROM APRIL SIC MEETING

At the April 13, 2022 Sustainability and Infrastructure Commission (SIC) meeting, staff presented reach code options for new construction and existing buildings related to building electrification and EV readiness. Commissioners provided feedback on the different options presented. Staff recommended the Bay Area Reach Codes model ordinance that requires the new construction of all building types be all-electric. All commissioners generally supported this approach. Two commissioners emphasized the importance of a fair and reasonable process to allow exceptions to the all-electric requirement for commercial buildings and requested that the exception language be brought back to the SIC for review.

Staff also recommended the Bay Area Reach Codes model ordinance that increases EV readiness requirements beyond the State code. Commissioners voiced mixed support for the Bay Area Reach Codes approach. Two commissioners voiced concern for requiring Level 1 charging and suggested staff consider further enhancing the reach code to require a minimum of Level 2 charging. The remaining two commissioners emphasized the importance of regional consistency with reach code adoption across jurisdictions and therefore supported the adoption of the Bay Area Reach Codes model ordinance. Staff will share this feedback with the City Council when bringing forward the draft EV readiness reach code.

At the April SIC meeting, staff did not have a recommendation for electrification of existing buildings and provided five preliminary electrification measures for the SIC to consider. At that time, the Bay Area Reach Codes team was still developing recommendations and a model ordinance for jurisdictions. Commissioners requested that staff return to the Commission with additional information, the Bay Area Reach Codes team recommendations for existing buildings, and the cost impacts of the proposed measures.

The Bay Area Reach Codes team released a policy framework and model ordinance that provides options to address electrification in existing buildings. Unlike the proposed model ordinances for new construction, PCE is not recommending a unified approach for existing buildings because there are a variety of complex considerations when designing existing building decarbonization policies and there is currently no “one-size-fits-all” approach. PCE expects jurisdictions to evaluate and consider the cost burdens and impacts with the different electrification opportunities and individually determine which measures to include in their ordinance for local adoption. The model ordinance includes measures to mandate all gas-fired equipment be replaced with electric equipment during appliance upgrades, require electric-readiness during alterations and additions, require fossil fuel equipment disclosures at the time of sale, and establish a termination of fuel gas usage (also known as “end of flow” date).

Staff have worked closely with PCE to further evaluate the five reach code options for existing buildings introduced at the April SIC meeting, review the Bay Area Reach Codes team existing building policy framework, and explore other electrification reach code measures. PCE staff provided cost estimates and technical support to understand the benefits and implications of requiring electrification through reach codes. This report reviews electrification reach code options for new construction and existing buildings at the time of permit. This report also highlights outreach and policy approaches to decarbonize buildings beyond reach codes.

NEW CONSTRUCTION – ALL-ELECTRIC REACH CODE

Currently, the City of San Mateo’s building electrification reach code requires the new construction of all residential buildings and office buildings be all-electric. The reach code established an infeasibility exemption process that allows an applicant to apply for an exemption from this reach code if there are circumstances that makes it infeasible to build all-electric. To date, this infeasibility exemption has not been used. The City’s building electrification reach codes resulted in the issuance of permits for 449 all-electric dwelling units.

The Bay Area Reach Code team developed a model ordinance to require the new construction of all building types be all-electric. The model ordinance allows for commercial kitchens and hotels/motels laundry machines to use fossil gas and includes pre-wiring requirements if combustion equipment is installed to enable future electrification, see Attachment 1. These specific end uses are allowed to use fossil gas because of the potential increase in utility bills compared to gas equipment and challenges with electric industrial laundry technology.

In addition, if a project applicant finds they are not able to achieve the Energy Code performance standards and build all-

electric, project applicants can apply for an exception, regardless of the building type or use. Staff anticipate that it would be a rare occurrence that project applicants would not be able to comply with the all-electric requirement and need to apply for an exception because of the availability of electric technology and the cost-effectiveness of all-electric new construction.

PCE engaged with representatives from various biotechnology companies to understand the challenges of new all-electric construction of buildings with biotech use. PCE concluded that it is feasible to require all-electric new construction of nonresidential buildings with biotech use, thus there is no exception language for biotech in the model ordinance. The City could consider revising the model ordinance to include language similar to the City of San Carlos's reach code that allows fossil gas for space conditioning in laboratory areas if there is a third-party verification to demonstrate infeasibility or lack of cost-effectiveness.

EXISTING BUILDINGS – ELECTRIFICATION REACH CODE OPTIONS

The City of San Mateo has a strong history of applying reach codes to new construction, but new construction represents a small fraction of the built environment in San Mateo. Decarbonizing the existing building stock is key to reach the City's ambitious climate goals but addressing the existing building stock can be challenging. When developing reach codes for existing buildings, the City must consider the costs to the property owner and the equity impacts of the policy. Requiring electric equipment may increase upfront project costs and may also have a long-term impact on operational/utility costs. Upfront costs to convert to new technology and electric equipment is often the primary barrier for electrification in underserved communities. Someone who faces energy insecurity (the inability to pay for energy bills without a significant trade-off) is not able to prioritize electrification. The City will need to be thoughtful about reach code requirements to prevent negative impacts to underserved communities.

It is also important to consider the impact of potential requirements and challenges with enforcement. The reach code options outlined below are enforced when a permit is issued from the City. Staff are mindful of the importance of the building permit issuance and building inspection process to ensure the health and safety of the community. The City relies on the permitting process to ensure gas and electric equipment are installed safely. If reach codes impose restrictions that community members or contractors find too challenging or costly to comply with, this might result in improvements being done without permits.

1) Electric-readiness (panel capacity) at time of electrical panel upgrade – Residential

This measure requires the reservation of breaker space in the existing or new electrical panel to accommodate anticipated future electrification of the buildings' electrical load at the time of electrical panel upgrade or replacement. The measure would require dedicated breaker spaces for future electric appliances, including a heat pump water heater, heat pump space heater, EV charger and other end uses. Electrical capacity is key to future electrification of a building's systems. By requiring the reservation of breaker space when a building owner is already making changes to their electrical panel, gas equipment can more easily be converted to electric at the end of equipment life.

The City of Piedmont adopted this measure and their reach code went into effect on June 1, 2021. Piedmont staff noted that project applicants are typically able to reserve breaker space without upgrading the panel beyond their project scope. Staff estimates that reservation of breaker space for additional electrification would not add to the project cost given Piedmont's implementation experience. This requirement would not directly result in emissions reductions but prepares the property owner for future electrification of systems that would result in emissions reductions.

At the April SIC meeting, there was general support for recommending this measure to City Council for adoption. Over the past five years, there was an average of 192 permits per year for electrical panel upgrades. Electrical service upgrades can occur in combination with solar panel installation, electric vehicle charger installation and major renovation or as a standalone permit.

2) Electric-readiness (outlets installed) at time of kitchen or laundry room renovations – Single Family Residential

This measure requires the installation of electrical outlets at the time of kitchen or laundry room renovation if a gas appliance is installed. This means at least one outlet capable of serving electric equipment is located within six feet of the

kitchen stove during a kitchen renovation and clothes dryer during a laundry room renovation. This requirement enables electric equipment to be easily installed at a later date.

The City of Piedmont adopted this measure and their reach code went into effect on June 1, 2021. This measure aligns with the 2022 State Code update that will require pre-wiring in new construction when gas appliances are installed. PCE estimates that installation of an outlet for future electrification would add $500 - $2000 to the project cost. The costs are highly varied depending on the location of the panel relative to the location of the renovation in the home. Cost estimates are highly sensitive to material availability and inflation. This requirement would not directly result in emissions reductions but prepares the property owner for future electrification of systems that would result in emissions reductions.

At the April SIC meeting, there was general support for recommending this measure to City Council for adoption. Over the past five years, there was an average of 98 permits for kitchen renovations and 49 permits for laundry room renovations per year.

3) Heat pump air conditioning – Single Family Residential and Duplexes

This measure requires the installation of a heat pump air conditioning (AC) unit at the time of installation of a new AC system or replacement of an existing AC unit at single family homes and duplexes. AC condensing units are electric but the requirement to install of heat pump technology would electrify both the home's space heating and cooling.

PCE estimates that the installation of an AC condenser unit would cost $17,500 and the installation of a heat pump unit would cost $19,000. TECH Clean California incentives provide a $3,000 rebate for residential heat pump units, making the heat pump option slightly less expensive when the rebate is layered in. Currently TECH Clean California incentives have all been reserved and incentive funding is anticipated to be fully funded by late 2022. Without incentives, the heat pump unit would cost $1,500 more than the AC condenser unit.

If the homeowner is adding a new AC unit, their electricity costs would increase regardless of the equipment type (heat pump versus condenser unit). When examining the utility bill impacts of a gas furnace and AC condenser unit compared to heat pump HVAC, staff found varied results. One study estimated that homeowners would save $10 per month[1] while another study estimated homeowners would pay $11 more per month[2] with a heat pump unit.

This measure was introduced at the April SIC meeting and commissioners provided mixed feedback. Two commissioners voiced concern regarding heat pump technology, specifically, the market readiness and availability of heat pump equipment and the financial burden to the property owner if there are increased costs. Two commissioners were interested to learn more about requiring heat pump air conditioning and liked the potential of this requirement to lead to the decommissioning of gas furnaces.

Over the past five years, there was an average of 299 permits for new and replacement AC units at single family homes and duplexes per year. Staff does not have specific data regarding the type of HVAC equipment (gas versus electric) installed in San Mateo. Generally, staff observed the majority of HVAC projects include the installation of gas furnaces and AC condenser units. Staff have observed an increase in the installation of ductless heat pump mini split systems in Accessory Dwelling Units.

Space heating accounts for 36% of fossil gas use in a typical household in San Mateo's climate zone, representing a significant greenhouse gas emissions savings opportunity. If adopted, the City of San Mateo would be the first city in California to adopt a requirement for heat pump air conditioning. The City of Vancouver (British Columbia) has a such a requirement that is slated to go into effect January 1, 2023.

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[1] https://www.ethree.com/wp-content/uploads/2019/04/E3_Residential_Building_Electrification_in_California_April_2019.pdf

[2] https://frontierenergy.com/wp-content/uploads/2019-Cost-Effectiveness-Study-Existing-Single-Family-Residential-Building-Upgrades-report.pdf

4) *Electric/solar pool heating or prohibition of extension of fuel gas infrastructure in backyard – Residential*

A) Electric/solar pool heating - Residential

This measure would require installation of electric or solar pool heating equipment when a new heated pool is installed at an existing residential building. If a pool is installed as part of the construction of a new residential building, the pool is already required to use electric equipment according to the City's current building electrification reach code.

In 2019, the City of Santa Monica commissioned a cost-effectiveness study[3] to analyze electric pool heating for Santa Monica's climate zone. The study found the heat pump pool heater option could cost $800 - $1,300 more than the traditional gas pool heater at the time of installation. Over 10 years, the estimated annual utility savings of the electric option would be greater than the upfront cost of the initial investment in electric equipment. Since the lifecycle utility savings exceeded the upfront costs, the report concludes that there is a cost-effective option for solar and electric pool heating equipment. It should be noted that the analysis assumes an avoided cost of $200 per gas appliance. Since pool heaters are located outside and sometimes further away from the house, running a gas line extension to the backyard could be more costly than this conservative estimate, resulting in additional cost savings for the property owner with the electric option. The City of Santa Monica's electric and solar pool heating reach code has been in effect since January 1, 2020.

If adopted, this measure would apply to a small number of projects each year. Over the past five years, there was an average of five permits per year for the installation of new pools at existing residences. However, this measure has a significant greenhouse gas emissions reduction opportunity. Electric pool heating would avoid 83% of emissions compared to the gas pool heating option. Though heat pump pool heaters are not a new technology, they represent a small market share in California. Currently, most pools use natural gas pool heaters. Heat pump pool heaters are more popular in other markets, including Florida.

The cost-effectiveness study for Santa Monica's climate zone indicates that this measure could be potentially adopted in San Mateo. A cost-effectiveness study is underway and estimated to be completed August 2022. At the April SIC meeting, there was general support for this measure.

B) Prohibition of fuel gas infrastructure in backyard - Residential

This measure would prohibit the extension of existing fuel gas infrastructure in the backyard of an existing residence. Fossil gas infrastructure could not be used for pools, grills, and fire pits. In effect, this measure would require the use of electric or solar equipment for pool heating and would allow property owners to use other fuels for grills and fire pits such as propane or electricity. This requirement would prevent investment in the extension fossil gas infrastructure, a costly project compared to propane and electric options for grills and fire pits. It could also potentially save property owners money as explained in the previous section regarding pools.

Over the past five years, there was an average of 10 permits per year for new gas fire pits or grills at residential buildings. This is a new reach code option that was not introduced at the April SIC meeting. The City of Palo Alto is considering adoption of this reach code option.

5) *Heat pump water heating – Single Family Residential*

A) Heat pump water heater at time of replacement – Single Family Residential

This measure would require the installation of a heat pump water heater at time of replacement in a single family home. At the April SIC meeting, commissioners voiced concern about this reach code option because requiring heat pump water heaters poses several challenges and is more expensive than the gas option. Converting gas equipment to electric requires electrical wiring. This process can take time and coordination between a plumber and electrician, which might be specifically challenging at the time of equipment failure. Additionally, a heat pump water heater may require more space than a gas water heater. If a property owner is replacing a tankless gas water heater, it could be challenging to site the new heat pump water heater. It should also be noted that two commissioners voiced general concern regarding heat pump technology, specifically, the market readiness and availability of heat pump equipment and the financial burden to

[3] https://localenergycodes.com/download/481/file_path/fieldList/2019%20Electric%20Pool%20Heat-Santa%20Monica.pdf

the property owner if there are increased costs.

The increased initial cost of a heat pump water heater was also a concern. PCE estimates a gas water heater costs $2,500, an instantaneous gas water heater costs $5,500, and a heat pump water heater costs $7,000. There are rebates available for $2,000 for a heat pump unit. Even with incentives, a heat pump water heater would cost $2,500 more than the gas unit. Ongoing operational/utility costs are estimated to be the same as the gas water heater option or even save you money depending on the efficiency of the heat pump equipment installed. PCE estimates that the heat pump option could save $1/month in utility savings compared to the gas water heater.

The City of San Mateo does not track whether a water heater permit is for a gas or electric equipment; anecdotally, staff observed that most projects include the installation of gas water heaters and heat pumps are not a common choice. Over the past five years, there was an average of 134 permits per year for water heater replacement. This includes permits for remodels or alterations that include the replacement of a water heater. Requiring the installation of heat pump water heaters represents an important opportunity to reduce carbon emissions as water heating accounts for the majority of natural gas use (55%) in a typical household in San Mateo's climate zone. However, because of the increased costs and challenges summarized above, staff does not recommend moving forward with a reach code requirement that requires all water heaters be replaced with heat pump water heaters at time of replacement.

B) Heat pump water heater replacement as part of major renovation – Single Family Residential

This measure would require the installation of a heat pump water heater if a water heater was replaced as part of a major renovation in a single family home. This measure is distinct from the measure described above since it impacts water heaters that are installed as part of a larger project. The intent would be to impact projects that are not replacing the equipment at time of failure, allowing for the project applicant to have more time to plan for electrification. Staff estimates this requirement would impact less than 134 projects per year in San Mateo based on the number of permits issued for water heater replacement.

As discussed in the previous section, this measure would cost the homeowner $2,500 more than the gas option but operational and ongoing costs would be about the same. The City of Palo Alto is also considering this reach code option.

OTHER ELECTRIFICATION EFFORTS

In addition to reach codes, staff is working on efforts to encourage homeowners to transition to electric equipment. In May, staff launched the Induction Cooktop Loaner Program that allows residents to borrow a portable induction cooktop and induction-ready pot and pan for two weeks. This program allows residents to get hands-on experience with an induction cooktop before potentially converting their gas cooktop to the electric option. There has been great interest in the program and there is a short waitlist of residents waiting to borrow the induction cooktop kit. Staff also hosted an online workshop on June 22 to review the benefits of an electric home. The workshop featured speakers from the Bay Area Regional Energy Network and PCE. The speakers shared information about rebates and resources available for energy efficiency upgrades, electric equipment, and solar; 24 people attended the workshop.

There are also partner agency efforts to encourage electrification. PCE showcases electric construction by hosting an annual All-Electric Leadership Awards program. Property owners apply and share details about their all-electric home projects and PCE evaluates and selects award winners. PCE recently hosted a virtual webinar with the winners of the showcase. The winning property owners talked about the electrification of their homes and the program included the opportunity for audience members to ask questions. In addition, "The Switch is On" is a statewide marketing effort to encourage electrification. "The Switch is On" website (https://www.switchison.org/) is an excellent resource for both homeowners and contractors and provides information on electrifying gas equipment in your home and aggregates electric equipment rebate information.

Exploration of policies that decarbonize existing buildings by 2030 is a City Council priority for FY 2022-23. Staff plan to evaluate other building decarbonization approaches beyond reach codes including home energy assessment requirements or fossil fuel equipment disclosures at time of sale, commercial energy building performance standards and efficiency programs, "end of flow" ordinances, carbon neutrality policies and financing and rebates for electrification.

NEXT STEPS

Staff will host a community meeting to solicit public input on reach code options in August. Staff plan to present new construction reach codes at a City Council Study Session in September and return to City Council for ordinance adoption by November. It is critical that new construction reach codes be adopted by the end of the year to prevent a lapse in the City's current new construction reach code requirements.

Reach codes can be adopted at any time. It is optimal for a reach code to be adopted at the beginning of the code cycle to maximize the amount of time the policy is in place. However, addressing electrification in existing buildings is new for San Mateo and developing thoughtful policies for existing buildings is complex. Reach codes for existing buildings could be adopted separately from the new construction reach codes if more time is needed for analysis and public input. Since the City does not currently have a reach code impacting existing buildings, there is no concern about a lapse in requirements.

BUDGET IMPACT:

There is no budget impact.

ENVIRONMENTAL DETERMINATION:

This informational report is not a project subject to CEQA, because it can be seen with certainty that it will not cause a physical change in the environment. (Public Resources Code Section 21065.)

NOTICE PROVIDED

All meeting noticing requirements were met.

ATTACHMENTS

Att 1 – Draft All-Electric New Construction Exception Language
Att 2 – Public Comment

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