CITY OF SANTA BARBARA

COUNCIL AGENDA REPORT

AGENDA DATE: January 12, 2021

TO: Mayor and Councilmembers

FROM: Energy and Climate Division, Sustainability & Resilience Department

SUBJECT: Energy Code Amendments For New Buildings

RECOMMENDATION:

That Council receive a presentation from staff on supporting the City's Clean Energy goals by implementing enhancements to State building codes, otherwise known as Reach Codes, or other regulatory means to establish all-electric requirements for new construction, and provide direction to staff regarding possible pathways for implementation.

EXECUTIVE SUMMARY:

Scientific evidence demonstrates that we are at a crossroads with regard to climate change and that limiting global warming to under 1.5 degrees Celsius is imperative for avoiding the disastrous and irreparable effects of a warming planet. In order to minimize these impacts, action must be taken at all levels of government to swiftly and aggressively reduce greenhouse gas (GHG) emissions.

In light of growing climate data, Council adopted an aspirational goal of carbon neutrality by 2035, underscoring its commitment to addressing the climate crisis at a local level. In order to make meaningful progress toward this goal, the City will need to take decisive and immediate action to reduce GHG emissions. Emissions in Santa Barbara primarily come from three sources: transportation, energy (mostly from buildings), and solid waste. In fact, approximately 37 percent of emissions in Santa Barbara are estimated to come from buildings, largely due to space and water heating demands.

The electric grid is becoming progressively less carbon-intensive through the integration of renewable sources and innovative technologies such as battery storage. In October 2021, Santa Barbara Clean Energy (SBCE), the City's Community Choice Energy entity, will begin procuring 100 percent renewable energy for the community, accelerating the pace of renewable energy adoption locally and essentially eliminating emissions related to electricity. This, coupled with advances in appliance technologies, make a transition to

an all-electric building not only viable, but in most cases cost effective, particularly for new construction.

New-construction buildings offer an enormous opportunity to mitigate future emissions, given the long-term nature of a building as an asset. By "building it right" from the start, the City has an opportunity to shape carbon emissions of the future and essentially "lock in" zero emissions throughout the life cycle of these buildings.

There are numerous co-benefits to transitioning away from natural gas use in buildings, including mitigating methane leakage along the natural gas system, improving indoor air quality and health and even potentially generating significant new jobs in California. Additionally, coupling this transition with the thoughtful rollout of local energy generation and storage systems can dramatically improve energy reliability and resilience.

It is important to note that there are promising advancements in the decarbonization of the natural gas system, primarily through renewable natural gas (RNG). However, supplies are insufficient to meet state or local demand and would only partially decarbonize the system. In the near term, RNG is an excellent decarbonization tool for existing buildings, heavy industry, and the transportation sector.

Throughout the State, there is a growing consensus that building electrification is the most viable and reliable path to zero-emission buildings.[1] There are two code enhancement options to decarbonizing new construction: reach codes or a natural gas infrastructure prohibition. Both leverage a local jurisdiction's ability to develop more stringent building code requirements based on local needs. To date, over 40 California jurisdictions have adopted code enhancements that encourage or require all-electric buildings.

DISCUSSION:

BACKGROUND

In 2018, the Intergovernmental Panel on Climate Change issued a special report concluding that irreparable and persistent changes to the global climate will occur if global temperatures continue to rise by greater than 1.5 degrees Celsius. The report further points out that "human activities are estimated to have caused approximately 1.0°C of global warming above pre-industrial levels [and] global warming is likely to reach 1.5°C between 2030 and 2052 if it continues to increase at the current rate" and that "subnational jurisdictions and entities, including urban and rural municipalities, are key to developing and reinforcing measures for reducing weather and climate-related risks."[2] It is therefore incumbent upon us, as a local government entity, to take decisive action to

[1] CEC, 2018 Integrated Energy Policy Report, March 21, 2019. Chapter 1, pg. 28 https://www.energy.ca.gov/data-reports/reports/integrated-energy-policy-report/2018-integrated-energy-policy-report-update
[2] https://www.ipcc.ch/sr15/

reduce greenhouse gas (GHG) emissions and thereby reduce the impacts of climate change.

The City of Santa Barbara continues to be a leader in climate action efforts, as underscored by Council's recently adopted carbon neutrality goal and 2017 renewable electricity goal. The City currently has numerous efforts underway that focus on the reduction of GHG emissions. These include a transition to Community Choice Energy (CCE), which will offer a default 100 percent renewable and carbon-free product to electricity customers, as well as numerous energy efficiency-related projects.

However, energy use in buildings is the second-largest source of greenhouse gas emissions in California, accounting for approximately 25 percent of statewide emissions[3] and approximately 37 percent of emissions in Santa Barbara. Most emissions from buildings come from two sources: purchased electricity and direct combustion of natural gas for space and water heating and cooking.

The state's electric system is rapidly becoming cleaner, driven by an escalating renewable portfolio standard, cleaner product offerings from utilities, and community choice aggregators such as the City's new CCE program, Santa Barbara Clean Energy. Meanwhile, natural gas remains a potent greenhouse gas, making the transition to all-electric buildings a key component of decarbonizing the state's building stock. In fact, "when packaged with deep energy efficiency measures, building electrification presents the most cost-effective path to decarbonization after the direct greening of sources of electricity"[4] and is a "key strategy for the state's residential and commercial building stock to meet new [state] requirements calling for GHG reductions from buildings to 40 percent below 1990 levels by January 1, 2030."[5] [6]

Further supporting these findings, a study funded by the California Energy Commission (CEC) titled "Residential Building Electrification in California" found that all-electric homes "are estimated to reduce annual GHG emissions by 33–56 percent in 2020 and by 76–88 percent in 2050 compared to a natural gas-fueled home" and that "the largest driver of greenhouse gas emissions savings in all-electric buildings comes from eliminating carbon dioxide emissions from natural gas combustion."[7]

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[3] CEC, 2019 Integrated Energy Policy Report, February, 2020. Pg. 3
https://www.energy.ca.gov/data-reports/reports/integrated-energy-policy-report/2019-integrated-energy-policy-report
[4] CEC, 2019 Integrated Energy Policy Report, February, 2020. Pg.58
https://www.energy.ca.gov/data-reports/reports/integrated-energy-policy-report/2019-integrated-energy-policy-report
[5] CEC, 2019 Integrated Energy Policy Report, February, 2020. Pg.247
https://www.energy.ca.gov/data-reports/reports/integrated-energy-policy-report/2019-integrated-energy-policy-report.
[6] Senate Bill 32 (Pavley, Chapter 249, Statutes of 2016)
[7] Residential Building Electrification in California: Consumer Economics, Greenhouse Gases and Grid Impacts. Energy and Environmental Economics, Inc. Funded by the California Energy Commission. Pg. 47-48
https://www.ethree.com/wp-content/uploads/2019/04/E3_Residential_Building_Electrification_in_California_April_2019.pdf

NEGATIVE EXTERNALITIES OF NATURAL GAS USE

Methane Leakage

The primary component of Natural Gas is methane. According to the EPA, "[p]ound for pound, the comparative impact of CH_4 [methane] is more than 25 times greater than CO_2 [carbon dioxide] over a 100-year period."[8] Methane is even more potent in the first two decades of its lifespan with a near-term global warming potential of 84 times that of carbon dioxide. The Environmental Defense Fund estimates that "[a]bout 25% of the man-made global warming we're experiencing is caused by methane emissions."[9]

Natural gas emissions result from both intentional and unintentional sources. Unintentional sources of methane releases, also known as fugitive emissions, come from various sources along the natural gas production and distribution system, such as pipeline leaks, leaking storage facilities, abandoned wells, and inefficient combustion. A recent report funded by the CEC estimates that the total leakage rate across the natural gas system is approximately 2.8 percent of total natural gas volume.[10] Methane's significant potency, particularly in the short term, results in more immediate warming and should be prioritized in addressing climate change.

While governments can and should try to regulate leaks in the short term, there does not appear to be a cost-effective technical solution to end system-wide leakage from the natural gas system. Eliminating methane leaks from buildings and the oil and gas supply chain necessitates the consideration of a transition away from distributed natural gas as a source of energy.

Health Impacts

Natural gas combustion in buildings has been linked to an increase in respiratory diseases, including increased instances of wheezing and asthma, particularly in children.[11] [12]

A 2013 Lawrence Berkeley National Laboratory study found that "60 percent of homes in the state that cook at least once a week with a gas stove" produce toxic levels of nitrogen dioxide, formaldehyde, and carbon monoxide exceeding federal standards for outdoor air

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[8] "Overview of Greenhouse Gases," U.S. Environmental Protection Agency, https://www.epa.gov/ghgemissions/overview-greenhouse-gases#methane
[9] "Methane: The other important greenhouse gas," Environmental Defense Fund, https://www.edf.org/climate/methane-other-important-greenhouse-gas
[10] Residential Building Electrification in California: Consumer Economics, Greenhouse Gases and Grid Impacts. Energy and Environmental Economics, Inc. Funded by the California Energy Commission. Pg. 43 https://www.ethree.com/wp-content/uploads/2019/04/E3_Residential_Building_Electrification_in_California_April_2019.pdf
[11] Andee Krasner, MPH & T. Stephen Jones, MD, MPH. *Cooking with Gas Can Harm Children: Cooking with Gas is Associated with Increased Risk of Childhood Respiratory Illnesses, Including Asthma.*
[12] Weiwei Lin, Bert Brunekreef, and Ulrike Gehring. *Meta-analysis of the Effects of Indoor Nitrogen Dioxide and Gas Cooking on Asthma and Wheeze in Children*. Internation Journal of Epidemiology 2013;42:1724–1737

quality. Although electric stoves generate some toxins from cooking, researchers found that gas stoves are more detrimental to indoor air quality because they produce significant fossil fuel combustion byproducts not associated with electric stoves.[13] This issue is further compounded by state efficiency standards, which encourage energy efficiency measures that "seal" the building envelope and effectively trap air indoors. This health impact is somewhat mitigated by vent hoods but not completely.

Ultimately, the true cost of natural gas should include consideration of GHG emissions impacts on climate change and of the significant societal and financial costs associated with respiratory illness and unhealthy indoor air.

DECARBONIZING THE NATURAL GAS SYSTEM

Our analysis of decarbonization pathways would be incomplete without consideration of actions the natural gas industry is taking to mitigate carbon emissions from their systems. Promising advancements in renewable natural gas (RNG) offer an additional resource in decarbonizing buildings if mixed into the existing natural gas distribution system.

However, RNG supplies are extremely limited and come predominantly from out of state. A study completed at UC Davis on the potential for RNG to provide a low carbon energy source found that in-state RNG supplies could meet approximately 4.5 percent of the state's current natural gas demand. Furthermore, a CEC-commissioned study titled "Deep Decarbonization in a High Renewables Future" found that there is an insufficient amount of RNG in California to meet long-term demand for low-carbon fuels in buildings and industries without widespread electrification.[14] Ultimately, RNG would be better used in heavy industry settings and hard-to-transition applications, such as existing buildings and freight, rather than in new buildings.

In addition to the problem of limited supply, RNG use poses the potential of pipeline leakage, especially since the vast majority of it travels long distances as it comes from out of state.

In the near term, RNG could provide immediate reductions in statewide GHG emissions in the existing building sector as well as in the transportation sector, especially for freight applications. However, an analysis performed for the CEC suggests that "electrification of buildings is likely to be a lower-cost GHG mitigation strategy over the long-term than a heavy reliance on renewable natural gas, given current trends in the industry."[15]

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[13] "Pollution in the Home: Kitchens Can Produce Hazardous Levels of Indoor Pollutants," Julie Chao, Lawrence Berkeley National Laboratory, July 23, 2013, https://newscenter.lbl.gov/2013/07/23/kitchens-can-produce-hazardous-levels-of-indoor-pollutants/

[14] E3, *Deep Decarbonization in a High Renewables Future*, June 2018. https://www.ethree.com/wp-content/uploads/2018/06/Deep_Decarbonization_in_a_High_Renewables_Future_CEC-500-2018-012-1.pdf

[15] Residential Building Electrification in California: Consumer Economics, Greenhouse Gases and Grid Impacts. Energy and Environmental Economics, Inc. Funded by the California Energy Commission. Pg. i https://www.ethree.com/wp-content/uploads/2019/04/E3_Residential_Building_Electrification_in_California_April_2019.pdf

Local gas utilities are considering use of hydrogen to help decarbonize their fuels. This might be another promising alternative, but its application would be limited, as the natural gas conveyance infrastructure can only support 5 to 15 percent concentrations of hydrogen without major modifications to existing pipeline systems and end-use appliances.[16]

PATHWAYS TO BUILDING DECARBONIZATION

Decarbonizing buildings will require a multipronged approach, with different strategies applied to existing buildings and new construction.

It is important to consider that buildings are long-term assets that "energy-consuming equipment essentially lock[s] in energy system infrastructure for many years and can be longer-term commitments than even investments in transmission or power plants."[17] Therefore, each new building is an opportunity for investment in a carbon-free future and to enhance the way in which the built environment interacts with the energy sources of the future.

Advances in electric appliances, such as electric heat pumps and other electrical equipment, are yielding much higher overall efficiencies than their natural gas counterparts, allowing for significant emissions reductions in buildings. Electric heat pumps, unlike traditional electric resistance heaters, do not generate heat but instead concentrate and transfer it for end uses such as space conditioning and water heating. This process uses less primary energy and emits much less carbon than natural gas space and water heating, particularly when it is powered by renewable energy.

Ultimately, coupling code enhancements for new buildings with existing and future efforts to undertake energy efficiency measures in existing buildings, develop new funding mechanisms, and building energy resilience systems, such as locally constructed microgrids, will prove an effective strategy in mitigating the climate impact of our local building stock.

NEW BUILDINGS

Reach Code Pathway

The State Building Standards Commission adopts new California Building Standards Codes (CBSC) every three years. The 2019 Building Code went into effect on January 1,

[16] CEC, 2019 Integrated Energy Policy Report, February, 2020. Pg.A-17 https://www.energy.ca.gov/data-reports/reports/integrated-energy-policy-report/2019-integrated-energy-policy-report
[17] CEC, 2018 Integrated Energy Policy Report, March 21, 2019. Pg. 18 https://www.energy.ca.gov/data-reports/reports/integrated-energy-policy-report/2018-integrated-energy-policy-report-update

2020. Provided that required findings are made, the State allows cities to amend the CBSC to make them more restrictive.

In order for local amendments to the CBSC to be accepted by the State Building Standards Commission and enforceable at the local level, every local building standard amendment must provide a greater level of safety, accessibility, or environmental conservation and be deemed locally beneficial based on geological, topographical, and/or climatic conditions.

Additionally, local Reach Codes require California Energy Commission approval and must be:

- **Cost Effective:** Energy cost savings should cover project costs within measure's lifetime;
- **Non-Preemptive:** Appliance requirements cannot be more stringent than efficiency levels of Federal Appliance Standards;
- **Efficiency-Focused:** Buildings can't use more energy than the CBSC allows.

Reach codes are most commonly applied to new construction, as cost savings are often greatest at the time a building is first constructed. Jurisdictions may also include exemptions to reach codes based on needs of specific sectors. For example, the City could choose to exempt commercial kitchens from the all-electric requirement due to current industry preference in such applications.

Reach Codes commonly fall into the following categories:

- Energy efficiency–focused;
- Incentivizing all-electric construction; or
- Requiring all-electric systems in new buildings.

<u>Natural Gas Infrastructure Prohibition Pathway (for New Construction)</u>

Some California cities, such as Berkeley, have pursued an alternative approach to reach codes by adopting prohibitions on gas infrastructure in new construction. This option differs from a reach code in that it does not amend any of the CBSC; rather, it establishes a prohibition of new gas installations on private property. The approach also potentially avoids the necessity for CEC approval. Because the restriction applies only to the construction of gas infrastructure after the point of delivery to property (i.e., after the meter installation), it does not conflict with the California Public Utility Commission's regulatory authority.

Further analysis is required to determine whether a reach code, prohibition of new gas infrastructure, or a combination of regulatory action is most appropriate for Santa Barbara.

EXISTING BUILDINGS

Existing buildings are less cost-effective to convert to all-electric systems. This is primarily due to the fact that most existing buildings already have natural gas infrastructure in place, negating any savings achieved by avoiding the cost of installing the infrastructure in the first place. Additionally, appliances in existing buildings typically reach their end of life at different times, eliminating the cost advantage of dual-purpose systems, such as heat pumps that provide both heating and cooling.

In order to address the existing building sector, the City will need to rely heavily on energy efficiency measures to leverage or create programs that help Santa Barbara building owners transition to all-electric systems. Such programs include utility incentive programs, energy efficiency financing mechanisms, and other innovative programs that encourage the transition through finance, regulatory assistance, and education.

COST ANALYSIS

State law requires any reach code measures to fully offset their costs through energy savings. As a result, cost-effectiveness studies are a necessary precursor to implementing reach codes and will be addressed in the reach code application that must be submitted to the California Energy Commission (CEC). The Statewide Utilities' Codes and Standards Team completed cost-effectiveness studies in July 2019. These cost-effectiveness studies examined options for all-electric and mixed-fuel new construction for single-family residential, low-rise multifamily residential, retail, office, and hotel uses.

The studies revealed that all-electric buildings are generally cheaper to build, due to the elimination of progressing the gas piping systems to and throughout the building(s). These lower initial costs generally make all-electric construction more cost-effective on a life-cycle basis. This is particularly true for low-rise residential buildings, where it is also often more cost-effective for the owner to exceed code requirements by improving efficiency and adding solar photovoltaic (PV) energy systems. In fact, if one invests the savings from the gas infrastructure in PV capacity to offset the electricity load, an all-electric building is often cost-effective for the owner and the community from day one. The solar-powered building is less expensive to build and cheaper to operate.[18]

Additionally, with the adoption of the 2019 code cycle, California became the first state to require the installation of solar generation on all new low-rise homes. This increased on-site energy generation enhances the cost-effectiveness for the all-electric new construction approach.

CALIFORNIA ECONOMY AND GREEN JOBS

[18] Frontier Energy, Misti Bruceri. *2019 Reach Code Cost-Effectiveness Studies* https://www.smgov.net/uploadedFiles/Departments/OSE/Categories/Green_Building/2019_CostEffectivenessStudies_Combined%281%29.pdf

In 2016, the Energy Commission initiated a companion research study with Berkeley Economic Advising and Research, LLC, to assess the implications of accelerating GHG emission reductions. The study estimated the investment in low-carbon energy infrastructure would increase California's real gross state product by two percent by 2030 and nine percent by 2050. Furthermore, it would promote statewide job growth with 500,000 additional full-time jobs, mostly in construction, by 2030 and 3.3 million jobs by 2050.

The average economic benefits would be relatively greater in disadvantaged communities than in non-disadvantaged communities, with job growth in the construction and services sectors. The study showed that jobs from California's climate policies in disadvantaged communities could increase by nearly one million by 2050.[19]

ENERGY RESILIENCE AND RELIABILITY

As more renewable energy sources are brought online, natural gas plays an important role in ensuring energy reliability in today's electric grid, as it provides power generation during periods of the day when renewable sources are not active.

Yet maintaining energy reliability remains challenging in Southern California, on both the electric and natural gas sides of the equation. Wildfire risks and Public Safety Power Shutoffs pose a constant threat, and potential breakdowns in the aging natural gas infrastructure in the region remain a critical concern. For example, the massive leak at the Aliso Canyon natural gas storage facility in 2015 resulted in the state limiting the use of the facility, "which has historically helped balance natural gas supply and demand. Further, multiyear outages of natural gas pipelines that serve the region greatly add to the risk of disruptions in energy reliability."[20]

However, advancements in electric technologies such as battery energy storage and demand management, as well as evolving market factors are creating a new pathway to energy reliability and resilience. Additionally, new, modern buildings include technologies that allow for maximizing energy load flexibility. For example, "using heat pump water heaters as thermal batteries can help match the timing of electricity demand to the generation of renewable energy, as well as reduce the severity of the late-afternoon demand ramp as solar output rapidly decreases."[21]

Some industry professionals argue that mixed-fuel buildings offer greater resilience in the face of electric outage, but this is misleading since most gas appliances today rely on electric ignition in order to operate. Although gas cooking stoves could be operated during

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[19] Roland-Holst, David, Samuel Evans, Samuel Heft-Neal, Drew Behnke, and Myung Lucy Shim. 2018. *Exploring Economic Impacts in Long-Term California Energy Scenarios*. California Energy Commission. Publication Number: CEC-500-2018-013.
[20] CEC, 2019 Integrated Energy Policy Report, February, 2020. Pg. 7 https://www.energy.ca.gov/data-reports/reports/integrated-energy-policy-report/2019-integrated-energy-policy-report
[21] CEC, 2019 Integrated Energy Policy Report, February, 2020. Pg. 51 https://www.energy.ca.gov/data-reports/reports/integrated-energy-policy-report/2019-integrated-energy-policy-report

an electricity outage, not using electric-powered ventilation hoods would exacerbate negative indoor air quality impacts. Additionally, natural gas system outages take much longer to repair than those on the electric system, taking months and sometimes years to bring back online. According to the CEC's 2019 Integrated Energy Policy Report, "In recent years, SoCalGas [has] experienced pipeline outages that have worsened the [capacity] constraints, leading to price spikes and gas curtailment of noncore gas customers in 2018."[22] This is of particular concern after natural disasters, like wildfires, earthquakes, or other emergency disruptions in the energy systems.

STAFF RECOMMENDATION:

In light of the carbon intensity of buildings as well as the emergent need to dramatically reduce GHG emissions, staff recommends returning with a proposed approach that best suits the needs of Santa Barbara and is aligned with the City's climate goals.

Staff proposes not applying any code enhancement to existing buildings, additions, or alterations such as tenant improvements**.** Any existing building with natural gas appliances would not be affected, even if that building is sold or renovated or changed use.

On November 30, 2020, Staff presented on this topic to the Sustainability Council Committee, and the committee unanimously voted to recommend that Council consider an all-electric code enhancement for new construction.

To date, over 40 jurisdictions in California have already adopted Reach Codes that encourage or require building electrification, establishing a statewide trend toward building electrification. New technologies and the diminishing carbon intensity of the electric grid make an all-electric reach code an effective tool in reducing future GHG emissions in Santa Barbara.

NEXT STEPS:

Staff has already begun to engage local stakeholders and provide outreach and education regarding potential building code enhancements. Staff has met with a number of community-based groups and industry associations, such as the Santa Barbara Contractor's Association, the Santa Barbara Realtor's Association, and the local chapter of the American Institute of Architects. Staff will continue to engage with key stakeholders during the process of developing potential reach code language.

With Council direction, staff proposes to return with a recommended approach, either reach code or prohibition, that best suits the needs of Santa Barbara and aligns with Council's ambitious climate goals.

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[22] CEC, 2019 Integrated Energy Policy Report, February, 2020. Pg. 176
https://www.energy.ca.gov/data-reports/reports/integrated-energy-policy-report/2019-integrated-energy-policy-report

BUDGET/FINANCIAL INFORMATION:

Some staff time will be necessary to implement the new permit regulations, but it is not anticipated to be substantial.

SUSTAINABILITY IMPACT:

Switching to all electric for new buildings will prevent the release of significant additional natural gas–related greenhouse gasses from delivery to and end-use in new buildings.

ENVIRONMENTAL REVIEW:

No California Environmental Quality Act (CEQA) review is required as only a presentation of information is occurring and no action will be taken by Council. A future Council action would be subject to CEQA review. At that time the likely CEQA review is anticipated to be Categorically Exempt per Section 15308, actions by regulatory agencies for the protection of the environment.

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