

Municipal Building Sector Natural Gas Limitations in the United States



**The George Washington University
Trachtenberg School of Public Policy and Public Administration**



Dylan Cronin, Kelsey Hopkins, Valerie Porto, Michael Weiner

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Acknowledgments

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We are also compelled to acknowledge the ongoing situation related to the COVID-19 pandemic. It was our intention to conduct a series of wide-ranging interviews with a diverse set stakeholders and municipal policymakers to supplement our analysis. Unfortunately, but understandably, the pandemic limited these opportunities as both their time and their resources were required elsewhere. The report below includes as broad a cross-section as possible given these constraints, but we regret that additional organizations and policymakers were unable to provide input.

Our best wishes go to all of those directly and indirectly impacted by this crisis.

Executive Summary

Since the mid-2000s, the availability of low-cost, abundant natural gas made possible through hydraulic fracturing has led to increased use of the fuel across sectors. In the building sector, natural gas is used in both residential and commercial buildings to power appliances with a wide variety of uses including space and water heating, residential and commercial cooking, and clothes drying. The carbon dioxide emissions resulting from natural gas combustion and methane emissions from transmission and distribution are also major contributors to global climate change.

Beginning in 2019, a wave of cities began pursuing policies that would limit the construction of natural gas infrastructure for new building construction, with over thirty having proposed or adopted such a policy at the time of this writing. This report seeks to evaluate the landscape surrounding these municipal policies by identifying the universe of stakeholders supporting or opposing these policies as well as the most prevalent contextual factors and policy designs that have emerged to date.

The report identifies five cities representing a broad set of policy objectives and political circumstances to serve as “case study” cities. It then provides an in-depth analysis of how those cities’ legislative proposals developed and how external stakeholders participated in and impacted the legislative and regulatory processes.

The analysis of existing municipal natural gas limitation policies revealed that cities are pursuing three separate policy designs to limit natural gas in buildings:

1. Incentivizing building electrification but not entirely prohibiting natural gas;
2. Incremental prohibition of natural gas in new buildings by building type, or;
3. Immediate prohibition of natural gas in new building construction.

The report also identifies key contextual factors that impacted the development of municipal natural gas limitation policies in the case study cities, including the following:

1. Climate change-related concerns typically superseded other considerations during the policy development process, which drew criticism from stakeholders directly impacted by the policy.
2. A rapid legislative process may have contributed to a lack of organized opposition in certain cities. Where organized opposition movements have emerged, they were able to influence both policy and stakeholder engagement processes.
3. Limiting options for future residential construction was a primary concern raised by opponents of natural gas limitations. In cities where housing affordability is already a concern, the impact is heavily scrutinized in policy discussions, with particular attention to low income residents.

4. The organization of local utilities (all-electric, all-natural gas, or dual fuel) had an impact on the composition of stakeholder support in certain jurisdictions. In particular, utilities that own potential stranded natural gas infrastructure assets and have limited alternative revenue sources are likely to strongly oppose natural gas limitations.
5. Particularly in California, neighboring municipalities engaged in cooperative regional efforts to mitigate potential market disadvantages among cities pursuing a natural gas limitation.
6. State regulatory structures and legal restrictions can have an impact on the development of municipal policy. For example, state regulatory authorities in California encourage municipalities to exceed state building standards while Massachusetts state law may preempt municipalities from doing so.

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Section 1: Introduction

In the early 2000s, the advent of hydraulic fracturing technologies fundamentally transformed the U.S. natural gas market. The ability to extract abundant shale natural gas with this technology at a low cost has led to dramatically increased production and lower prices, with natural gas constituting 39% of energy consumption in the United States in 2019 (U. S. Energy Information Administration, 2020). Increased low-cost natural gas production and consumption have reduced U.S. reliance on foreign energy resources and had a direct impact on the market share of more emissive domestic coal consumption. This overall decrease in the price of natural gas over the last two decades can be viewed in Figure 1.

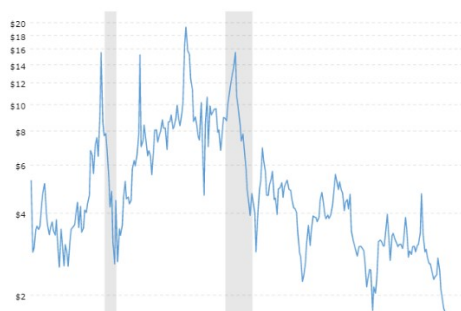


Figure 1: Henry Hub Natural Gas Prices: Historical Chart 2000-2020; U.S. Dollars per million Btu by Year (Macrotrends, n.d.).

Natural gas consumption is prevalent in the U.S. residential sector, where it is an important fuel for space and water heating, cooking, clothes drying, and other applications. It represents nearly a quarter of residential energy consumption, which itself accounts 17% of the nation's energy consumption (Macrotrends, n.d.). This consumption has direct environmental impacts. The extraction and transportation of natural gas results in methane

leakage, releasing a potent greenhouse gas (GHG) into the atmosphere that contributes to climate change. Moreover, end use natural gas consumption results in direct emissions of carbon dioxide (CO₂). Along with oil, combustion of natural gas in residential and commercial buildings accounts directly for 11.6% of U.S. GHG emissions (United States Environmental Protection Agency, 2020).

To mitigate building sector emissions, state and local governments are implementing programs to promote energy efficiency. For cities, these programs are fundamental to any broader emissions reduction goals. Buildings can account for anywhere between 40% to 80% of GHG emissions in cities (Ivanova, 2019), and cities with aggressive climate targets have identified electrification as an effective way to reduce those emissions. Electrification means that buildings use electricity rather than fossil fuels for applications such as water heating, cooking, space heating, and clothes drying.

In 2019, U.S. municipalities moved for the first time to ban the use of natural gas and natural gas infrastructure in residential and commercial buildings entirely. The momentum behind these policies has grown rapidly. Berkeley, California became the first city to prohibit natural gas in new construction in June 2019 and, by the end of 2019, over 30 municipalities had enacted or began pursuing policies that would prohibit natural gas in some fashion. Many of these cities are in California, but others including Seattle and several Boston-area cities that are now pursuing all-electric new construction.¹ The elimination of new natural gas infrastructure, including both pipelines and natural gas piping systems for buildings, is an important aspect of the rationale for a ban. Proponents argue that natural gas must be phased out to meet climate change goals, so new infrastructure should be avoided in order to avoid locking in decades of use and the resulting emissions (Hennen, 2020).

Section 1.1: Background and Methodology

The Public Service Commission of the District of Columbia (DCPSC) agreed to work with our group on this report to better understand the landscape of municipal natural gas infrastructure limitations in the U.S. To do so, this report assesses in detail the development of municipal policies throughout their legislative and regulatory processes, the differences in structure and scope between policies, and the engagement of external stakeholders both in favor of and opposed to these municipal actions.

This analysis will give DCPSC a better understanding of the structure and scope of the aforementioned legislative and regulatory actions, identifying common policy designs and political strategies that have emerged in these municipalities.

The project's methodology was informed by the following primary research question and two secondary research questions:

Primary Research Question: What municipal limitations on residential and commercial natural gas have been enacted or proposed in the U.S. and what similarities or differences exist between the proposals that have been pursued?

Secondary Research Questions:

- ***What is the current landscape of natural gas distribution infrastructure limitation policies in the United States?*** In addition to reviewing the policies themselves, we evaluated existing arguments made by relevant national advocacy groups as well as broader news coverage to understand the contextual elements impacting active and proposed limitations and bans on natural gas. Preliminary legislative and regulatory analysis led to a narrowed down list of case study cities for evaluation.

¹ A matrix comparing every existing enacted or proposed municipal natural gas limitation is included in Appendix A.

- *For policies of interest for the case studies, what impacted legislative and regulatory proceedings of the proposals?* The five selected case studies allow us to compare the policies and political context impacting each case's proposal and describe the nuances of each proposal and interviews of relevant stakeholders. We selected policies that involve different policy models based on initial research from a literature review and legislative and regulatory research.

In order to answer each of these research questions, this report includes both policy analyses and stakeholder interviews. The following sections will explain these methodologies and how they relate to the report's case studies.

Section 1.1.1: Policy Analysis

Each natural gas limitation policy was evaluated by analyzing the public record, information from municipal websites, and media coverage. This analysis includes a review of each municipality's legislative process, including amendments to the proposal, municipal climate goals, and the development of arguments related to costs or affordability.

Section 1.1.2: Stakeholder Interviews

We supplement our policy analysis findings with information from stakeholder and policymaker interviews. We interviewed both national and local stakeholders who support and oppose limitations. These interviews shed light on the contextual attributes of each case, including population breakdown, political climate, governmental structure, projected economic impact of the proposal in terms of cost and affordability, and relevant historical context regarding energy consumption and generation. We incorporated findings from these interviews in our analysis throughout the case studies.

Section 1.2: Case Study Introduction

We selected five case studies to evaluate, at a granular level, how municipal natural gas infrastructure limitations have been developed. Several factors influenced these selections, most evidently the availability of a robust public record and legislative text as well as varying stakeholder engagement processes. This naturally lent itself towards selecting a majority of municipalities where a natural gas limitation is already in force, as opposed to those in which the public record is still developing. We also sought to include geographically diverse cities with non-analogous energy needs, governmental structures, and environmental concerns. However, it is worth noting that a majority of the policies that have been proposed and adopted are located in California and, as such, a majority of our case studies include California cities. Importantly, we sought to include cities in our case studies that pursued a variety of policy designs in their proposals to limit natural gas infrastructure.

Based on these criteria, we selected five cities to review for our case study:

- Berkley, CA
- San Jose, CA
- Davis, CA
- Brookline, MA
- Seattle, WA

Each of the five cities in our case study offered similar justifications for incentivizing building electrification or explicitly prohibiting natural gas. Overarching arguments made by those developing the policies in the case studies can be summarized by the following:

Natural gas is a public safety hazard. Cities raised issues about poor indoor air quality stemming from residential and commercial natural gas consumption. In particular, multiple cities cited statistics suggesting that homes with natural gas stoves can exhibit indoor air quality that would be impermissible under the Clean Air Act if measured outdoors (Smith, 2013). Moreover, activists and stakeholders cited the potential dangers posed by possible explosions from natural gas infrastructure and, where relevant, included examples of nearby accidents. This is particularly a concern in California where wildfires and earthquakes can threaten gas infrastructure.

Building electrification can lead to substantial emissions reduction benefits. Each of the cities included in our case studies source an increasing share of their electricity from clean or renewable resources and each has long-term goals to achieve net-zero total emissions required by either the state or the city itself. Buildings powered by an emissions-free power source would contribute greatly to achieving those goals and those emissions reductions would in turn contribute to climate-related equity and public health goals.

All-electric building construction is arguably cost-effective. Several cities pursuing a natural gas limitation promoted the increasing cost-competitiveness of all-electric building construction relative to mixed fuel construction, often citing the existence and continued development of all-electric buildings in their municipalities. In particular, the state of California put forward modeling suggesting that increasing natural gas rates and aging infrastructure make mixed fuel development more expensive in certain situations. The U.S. Energy Information Administration estimates that one in four American homes are already powered by electricity alone, thus displaying the feasibility of a transition to all-electric homes.

Alternatives to natural gas appliances & technologies are increasingly available. Multiple cities, and stakeholders cited electric-alternative technologies as being readily available and oftentimes more favorable than natural gas, mostly because of increased safety and convenience. One example of a technology alternative is the induction stove, which operates using electricity to cook without a flame. Induction stoves use an electromagnetic field to heat up pans, without heating up the cooking surface and the kitchen. This technology can serve as a replacement to gas

stoves in both residential and commercial kitchens. Other technologies include heat pumps, which transfer heat from inside to outside on hotter days and from outside to the inside on colder days. Even when it is cold outside, there is some heat still in the air that heat pumps are able to extract for heating buildings. Heat pumps are even capable of replacing natural gas heating in areas that experience colder winters.

Prevent natural gas infrastructure “lock-in”. Construction of natural gas pipeline infrastructure and piping systems for buildings are both capital-intensive propositions. Continuing to build out that infrastructure would either “lock in” a role for natural gas in the system that is contrary to municipal climate objectives or, conversely, lead to stranded assets as natural gas usage is phased down.

Preempt expensive building retrofits. Policies requiring retrofits of existing buildings have not yet gained traction, but cities were acutely interested in preempting costly future building retrofits through the development of policies for new construction. Policymakers are anticipating significant new development and a future landscape in which all-electric construction is not only cost-effective compared to mixed fuel but potentially mandated by state law in a carbon-constrained world. Some municipalities discussed and incorporated requirements for natural gas bans in significant home renovations but stopped short of adopting requirements for existing buildings to undergo retrofits to remove natural gas and prepare for electrification. Enacted requirements were careful to specify that renovation requirements would only apply if significant reworking of the building was already being done.

Section 2: Stakeholder Review

A substantial amount of information for our report was gathered through interviews with stakeholders at the national and local level. These interviews provided us a better understanding of the rationale behind and the implications of natural gas limitations and bans. Each stakeholder presented unique reasons for either supporting or opposing proposals. Specific information from stakeholder interviews is discussed in each case study and a brief overview is presented below.

Section 2.1: National Stakeholders

There are a number of national groups on each side of the issue to ban or limit natural gas in buildings. We engaged in conversations with two national groups who have voiced support for proposals around the country. Both groups had a vested interest in supporting all proposals around the country, including the five we included in our case studies.

The Sierra Club is the most vocal national supporter of natural gas bans and limitations. It maintains a directory of all such proposals across the country and its local affiliates have advocated in support of each one. Sierra Club advocates for the ability of clean electricity to power

everything, including vehicles and buildings, which is central to its organizational goal to eliminate the use of fossil fuels.

The Sierra Club is focused on the most cost-effective and equitable ways to phase out natural gas infrastructure. Achieving this goal requires two primary actions. First, the organization argues that investments in natural gas infrastructure should not be continued. These investments have the potential to create stranded assets in a world moving away from fossil fuels. Second, the organization believes in a targeted approach that emphasizes action on immediate, cost-effective abatement opportunities wherever possible. In areas with robust and affordable renewable energy generation, electrifying buildings is one of those opportunities.

The Natural Resources Defense Council (NRDC) echoed similar arguments as the Sierra Club but added that they found the most effective strategy to limit natural gas is through municipal codes that incentivize building electrification rather than prohibit natural gas entirely. The NRDC also believes that introducing an incentive program will attract less public opposition than a mandate. This strategy allows the majority of buildings to transition while allowing those with significant barriers to electrification to explore other options, such as increasing efficiency.

National groups opposing proposed limitations on natural gas include the American Public Gas Association, American Gas Association, National Propane Gas Association, and the Natural Gas Supply Association. These are all trade groups that represent their respective industries. Unfortunately, we were unable to secure interviews with or receive comment from any of these national groups, though a number of these groups have gone on the record against these proposals. For example, the American Public Gas Association has called policies that limit natural gas “a heavy-handed approach [that] eliminates consumer choice, stifles innovation, and diminishes the flexibility to respond to GHG emissions goals...” (American Public Gas Association, n.d.). The American Gas Association also argues that natural gas bans eliminate consumer choice, which can have broader economic repercussions. They argue that supporters of these policies do not fully consider the economic and environmental benefits to natural gas (D’Angelo, 2019).

Section 2.2: Local Stakeholders

Our review discovered a diverse set of local stakeholder groups on both sides of these proposals. Many were very involved in the process in their respective municipalities, providing either vocal or written comments at multiple local meetings. We have classified our local stakeholders into four broad groups: utility companies (electric, natural gas, and combined utilities), environmental groups, trade associations, and labor.

The specific impacts of these policies on utility companies vary by the organization of the utility (i.e., electric-only, natural gas-only, or combined). An electric-only utility company will see increased demand due to the shift from combined fuel buildings to all-electric buildings. This is accompanied by increased strain on the electric grid and increased pressure on the utility to meet

this demand. A natural gas-only utility company is likely to be most impacted by a natural gas ban or limitation because it is substantially invested in natural gas pipelines and piping systems that could be stranded under these policies and have limited alternative opportunities to generate revenue. A shift away from natural gas infrastructure will inevitably result in a lower consumer base for these entities.

Labor is also heavily affected by natural gas bans and limitations. A number of labor unions, specifically pipefitters and other related groups, voiced strong opposition to proposals in cities we analyzed, with particular focus on potential job losses. Less demand for natural gas infrastructure necessarily means fewer employment opportunities in the trades associated with that infrastructure. These groups also expressed concern that rhetoric about a “just transition” does not adequately recognize the loss of pride, culture, and stability the people who are impacted by the transition will experience. The labor industry does not feel that attempts to ensure such a transition address those concerns.

Trade associations representing non-utility industries were also active in legislative proceedings in some municipalities. Industries represented included real estate development associations, building owners and managers, and others, most of whom opposed the local ordinances through written or vocal public comment opportunities. The main concerns these groups expressed included potential job losses, increased building costs, elimination of consumer energy choice, and the potential expansion of policies to require retrofits of existing buildings.

Lastly, a number of local environmental groups advocated for natural gas bans and limitations in buildings, which contribute towards their organizational decarbonization goals for both municipalities and states. Local environmental groups also cited concerns about creating stranded assets through sustained buildout of natural gas infrastructure, echoing national environmental groups. These groups argue that action is needed now to prevent stranded assets and costly future retrofits to replace natural gas with all-electric infrastructure.

Section 3: California

Municipalities in California have been at the forefront of the movement to implement natural gas limitation policies in buildings. Thirty cities in California have already enacted such a policy, buoyed by ambitious climate objectives and a supportive regulatory environment at the state level.

The following section summarizes those climate objectives and the role of California’s regulatory agencies in supporting these municipalities. It also identifies and reviews three California cities that have adopted a natural gas limitation policy as a part of the report’s case study analysis.

Section 3.1: California State Climate Objectives

Overview of California's Statutory Emissions Reduction and Electric Generation Targets

California is one of the most ambitious states in the country with respect to policies that combat climate change. Since 2006, it has taken aggressive action taken at the state level with policies including:

- **2006:** The California Global Warming Solutions Act (AB 32) required California to reduce its GHG emissions to 1990 levels by 2020, approximately a 15% reduction from 2006 levels.
- **2016:** SB 32 built on AB 32 to mandate a 40% reduction in GHG emissions from 1990 levels by 2030.
- **2018:** SB 100 requires California to obtain 100% of its electricity from clean energy sources by 2045. The bill also requires the state to obtain 50% of its electricity from renewable sources by 2026 and 60% by 2030.

The state has indeed achieved significant emissions reductions since 2006 and met the 2020 emissions reduction requirement under AB 32 in 2016 (Plumer, 2016). However, state regulatory authorities project that the rates of reduction needed to meet the 2030 emissions targets under SB 32 will need to be much more significant. The majority of emissions reductions that contributed to meeting the 2020 requirement were driven by the electricity sector, while emissions from other sectors of the economy remained mostly flat or have increased since 2006 (CA LAO, 2019).

Both the state and municipal governments have identified the building sector as an area through which meaningful GHG reductions can be achieved. As of 2017, residential and nonresidential buildings had eclipsed the electricity sector as an emitter, and together account for 12% of the state's GHG emissions relative to just 9% from electricity produced within California (CARB, 2019), which can be seen in Figure 2. They also represent over a quarter of California's end use GHG emissions (Figure 3). Nearly all of those building sector emissions are a function of the combustion of natural gas for home heating and cooling, water heating, and other end uses (Figure 4).

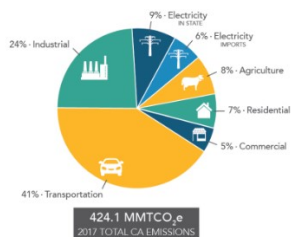


Figure 2: California Emissions by Sector
(California Air Resources Board)

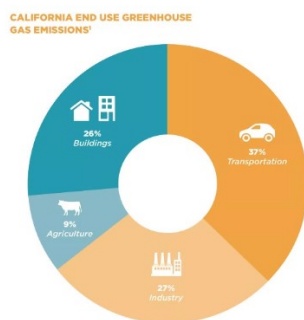


Figure 3: California End Use Greenhouse Gas Emissions

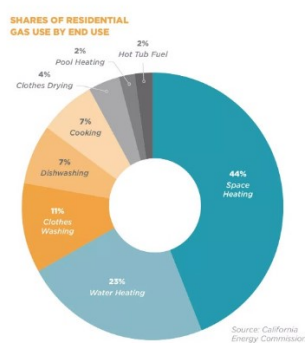


Figure 4: Shares of Residential Gas Use by End Use

Seeking to make progress on building sector-specific emissions, Governor Brown signed two pieces of legislation into law in 2018 targeting the residential and commercial buildings:

- AB 3232, which directed the California Energy Commission (CEC) to assess how to reduce GHG emissions from buildings in the state by 40% from 1990 levels by 2030.
- SB 1477, which redirects \$50 million per year through 2023 in revenues from California's cap-and-trade program toward the Building Initiative for Low-Emissions Development (BUILD) program and the Technology and Equipment for Clean Heating (TECH) program (Delforge, 2018).

California Governor Gavin Newsom and the state legislature have proposed building 3.5 million new homes by 2025 to address the state's housing crisis, including investing \$1.75 billion to incentivize housing construction (Salam, 2019). Such substantial new construction represents an opportunity for the state to mandate energy efficiency measures and promote clean and distributed energy to reduce emissions in accordance with broader state law.

Section 3.2: State Regulatory Overview

California's state regulatory agencies are responsible for implementing the ambitious measures laid out in the previous section. These agencies are empowered to set state regulatory standards in support of legislative goals and have supported municipal goals to achieve building energy efficiency above and beyond what is required by the state.

Section 3.2.1: California Building Energy Efficiency Standards and Green Buildings Standards

The California Energy Commission (CEC) is the primary regulatory agency in the state with jurisdiction over building energy efficiency. The CEC acts with the direction to lead California to a “100% clean energy future.” Every three years, the CEC revises the California Building Energy Efficiency Standards for Residential and Nonresidential Buildings under Title 24, Part 6 of the California Code of Regulations. “Residential” buildings are defined under the regulations as residential buildings with three or fewer habitable stories and “nonresidential” buildings are defined as all non-residential buildings along with residential buildings with more than three habitable stories (CA Buildings Commission, 2019).

The most recent iteration of the Title 24, Part 6 Building Energy Efficiency Standards under the 2019 building code cycle (the “2019 Building Standards” or the “base code”) was adopted on July 1, 2019 and went into effect on January 1, 2020. The 2019 Standards include requirements for the manufacturing, construction, and installation of all systems, equipment, and building components across all new building applications and new construction within existing buildings, including significant additions, alterations, and repairs. Natural gas-powered heating, ventilation, and air conditioning (HVAC) appliances are allowed under the 2019 Standards, so long as they achieve certain levels of energy efficiency. Natural gas systems or equipment including central furnaces, residential and commercial cooking appliances, pool heaters, spa heaters, and indoor and outdoor fireplaces are also allowed under the Standards, so long as they do not have a continuously burning pilot light (CEC, 2018). Notable additions to the 2019 Standards relative to previous cycles are a requirement for electrification-ready water heating appliances and a requirement for all new residential buildings to achieve net-zero electricity through a combination of energy efficiency and mandated solar installation, which would offset all other electricity use.

The California Building Standards Commission (CBSC) also regulates the energy efficiency and performance of new buildings through Title 24, Part 11 of the California Code of Regulations, commonly known as CALGreen. An important component of the CALGreen Standards is a requirement that certain building types meet a particular Energy Design Rating (EDR), an energy use index that quantifies a building’s net energy consumption on a scale from 0-100. An EDR of zero represents a building with zero energy consumption.

Section 3.2.2: Municipal Reach Codes

As noted, California’s 2019 Building Standards went into effect on January 1, 2020. Local governments in the state are required to enforce the regulations under state law whether or not the regulations have been formally approved at the municipal level. However, state law does provide an opportunity for municipalities to amend Title 24 building standards through local ordinances known as “reach codes.” Reach codes extend beyond the base code to require more stringent

energy efficiency measures, electrification of buildings or particular appliances, or electric vehicle infrastructure (EVSI) installation, among other potential requirements.

Reach codes must be submitted to the CEC and approved after a required 60-day comment period before they can be enforced at the municipal level. The CEC must also determine that the reach codes are cost-effective, a standard defined by the state's 2019 Residential and Nonresidential New Construction Reach Code Cost-Effectiveness studies. Those studies modeled different building types and the costs associated with different efficiency requirements, PV requirements, and electrification requirements, among others, beyond the base code. Cost-effectiveness is measured by quantifying the estimated incremental costs and energy savings associated with energy efficiency measures based on utility bill impacts and the "societal value or cost" of energy use, including long-term projected costs such as the cost of providing energy during peak periods of demand and other societal costs such as projected costs for carbon emissions as well as grid transmission and distribution impacts. Both the Residential and Nonresidential studies concluded that all-electric construction is cost-effective relative to mixed fuel construction in most building applications when avoided natural gas infrastructure costs, including natural gas rate increases stemming from future infrastructure replacement, are accounted for (Frontier Energy, 2019).

Nineteen cities in California adopted reach codes during the previous Building Code cycle in 2016. In the 2019 cycle, over 50 municipalities have considered a building reach code and 30 cities have adopted electrification preferences in new construction or an outright natural gas ban to date. These cities represent 10% of California's population. The processes to develop these reach codes were not identical, as each municipality put forward measures best suited to its needs and most achievable under its political circumstances. At the time of this writing, the CEC has unanimously approved reach codes promoting energy efficiency improvements or prohibiting natural gas for the following cities (CEC, 2020):

- Santa Monica, CA (December 2019)
- Menlo Park, CA (December 2019)
- San Jose, CA (December 2019) *
- San Mateo, CA (December 2019)
- Marin County, CA (December 2019)
- Davis, CA (January 2020) *
- Santa Rosa, CA (February 2020)
- Berkeley, CA (February 2020) *
- Mountain View, CA (February 2020)
- Windsor, CA (February 2020)
- Milpitas, CA (February 2020)
- Healdsburg, CA (February 2020)
- Palo Alto, CA (February 2020)
- Los Gatos, CA (February 2020)

- Brisbane, CA (February 2020)
- Pacifica, CA (April 2020)
- San Rafael, CA (April 2020)
- Mill Valley, CA (April 2020)
- Saratoga, CA (April 2020)
- San Francisco, CA (April 2020)
- Cupertino, CA (April 2020)
- Los Angeles, CA (April 2020)

*Case study cities

A map including each of the cities in California to pass a reach code is included in Appendix B.

The following in-depth analyses of Berkeley, San Jose, and Davis best illustrate how California municipal policy strategy and stakeholder engagement differed by city in the development of their reach codes. These case studies ultimately illustrate that there are a broad set of political and policy drivers resulting in reach codes that vary in ambition and short-, medium- and long-term objectives, including regional competition between neighboring cities, all within the overarching goal of reducing emissions from the building sector.

Section 3.3: Berkeley, California

Berkeley, California was the first city to enact a natural gas limitation policy, and many of the subsequent natural gas limitations that have been passed were influenced by Berkeley's policy. This includes both policies modeled after the Berkeley ban as well as cities choosing different paths to limit natural gas. This section provides an overview of the context, process of, and response to limiting new natural gas infrastructure in Berkeley.

Section 3.3.1: Political Landscape

In June 2019, Berkeley, California became the first city in the nation to ban the use of natural gas in buildings at the municipal level by passing Ordinance No. 7,672-N.S. While the state of California has been moving towards building decarbonization, Berkeley argued that taking early action to ban natural gas entirely will encourage the development of electrification expertise and resources in the construction industry, thereby bringing down electrification costs.

Berkeley has a history of enacting policies to combat climate change. Berkeley's 2009 Climate Action Plan calls for a 33% reduction in CO₂ emissions below 2000 levels by 2020 and an 80% reduction by 2050 (City of Berkeley, 2019). The Berkeley Climate Action Plan prioritizes net zero energy, sustainable transportation through electric vehicles and public transit, and zero waste initiatives. The city is approximately 18% behind its 2020 goal, and its anticipated trajectory shows that it will fall short of its 2050 goal. The city estimates that in order to reach the 2050 goal, a 75% reduction in natural gas and petroleum consumption is needed. On June 12, 2018, the city issued

Resolution No. 68,486-N.S., which declared a climate emergency and a commitment to becoming fossil fuel-free. The city argues that their climate goals have a chance of being met if they reduce fossil fuels, including natural gas. The city estimates that natural gas is responsible for 27% of Berkeley's GHG emissions and 73% of building sector emissions (City of Berkeley, 2019). Berkeley projects substantial new construction (5,000 new residential units by 2025) and does not want to lock in new natural gas infrastructure for these new buildings while awaiting a state measure (Berkeley Office of Energy and Sustainability, 2019).

Section 3.3.2: Summary of Policy

Berkeley's natural gas prohibition was passed under city authority as a local building code. In effort to meet its climate goals, the city ordinance bans natural gas hook-ups in new multi-family construction, with some allowances for first-floor retail and certain types of large structures. The legislation will prohibit builders from applying for land use permits that include gas infrastructure. The new law applies only to building types that have been reviewed and analyzed by the CEC.

The ordinance focuses only on new construction because of cost-effectiveness concerns. A key aspect of this concern is that buildings not yet modeled for electrification may prove too costly to electrify. Each time the CEC expands its electrification models and analyses to new building types, the ordinance allows Berkeley to update requirements without returning to council for a new vote. If CEC analysis shows a building type is cost-effective when all-electric and it is not disruptive to the building's function, it will be incorporated under the ban. In order to execute the ordinance, the City hired a staffer that will (City of Berkeley, 2019):

1. Guide developers through the electrification process;
2. Develop codes for future green building standards;
3. Assist property owners with green incentives, and;
4. Support education and outreach efforts, including the All-Electric Multifamily and Commercial Construction Guides and the Induction Cooking Factsheet

In addition to the ordinance, the Berkeley City Council adopted a reach code for new mixed fuel construction in December 2019. The reach code applies to new buildings that apply for building permits after January 1, 2020. It includes pathways for either all-electric construction or mixed fuel construction that exceeds the efficiency requirements of the Energy Code. For new mixed fuel construction, it requires pre-wiring for electrification. The reach code also extends solar photovoltaic system requirements for single-family and low-rise residential buildings to nonresidential buildings, high-rise residential and hotels and motels. The reach code will allow designers and builders to gain experience with all-electric building design before projects subject to the natural gas prohibition begin construction. Reach code requirements are enforced through the building permit review, issuance, and inspection process.

The natural gas prohibition ordinance and the reach code provide multiple compliance pathways that, arguably, accelerate the transition to a decarbonized building sector in Berkeley. The types of buildings that can follow the reach code as opposed to the full ban include:

- Building types that have not been modeled by the California Energy Commission for electrification;
- Buildings that gain public interest exemptions from the ban

Taken together, all new buildings in Berkeley are required to either be all-electric or able to achieve the performance compliance standards under the ordinance and reach code. Figure 5 provides a side by side comparison of the ordinance and reach code.

	Natural Gas Prohibition Ordinance	Reach Code for Electrification
Requirements	Prohibits natural gas infrastructure in new buildings.	Provides two compliance pathways: All-electric or more efficient mixed-fuel.
Covered Buildings	Applies to newly constructed buildings* that submit a Use Permit or Zoning Certificate after January 1, 2020.	Applies to newly constructed buildings* that submit a Building Permit application after January 1, 2020.
Exceptions and Qualifications	Determined on a case-by-case basis when all-electric not feasible or project determined to be in public interest. Requirements for future electrification when natural gas is used.	Efficiency requirements beyond the Energy Code for mixed-fuel vary by building type based on cost-effectiveness. All-electric buildings are cost-effective. Requirements for future electrification when natural gas is used.
Status	Adopted by City Council on July 23, 2019 as Ordinance No. 7,672-N.S. to add a new Chapter 12.80 to the Berkeley Municipal Code	Adopted by City Council on December 3, 2019 as Ordinance No. 7,678-N.S. to reenact Chapter 19.36 of the Berkeley Municipal Code

* Newly constructed building refers to a building that has never been used or occupied for another purpose, and excludes remodels and converted buildings. This applies to both residential and nonresidential buildings.

Figure 5: Berkeley Natural Gas Limitations Compliance Pathways (Berkeley Office of Energy and Sustainability, 2019)

Section 3.3.3: Review of Proposal Process

Ordinance - July 16th, 2019

Berkeley's original proposal was an outright ban on all new natural gas hookups, but was modified to a phased, systems-based approach based on stakeholder engagement. The original proposal also originally included exceptions for gas tanks used as backup energy sources on site, but these were removed at the recommendation of the Berkeley fire department who argued that battery backups are safer than gas tanks and come back on faster in emergencies (Berkeley City Council Meeting, July 16th, 2019). As the ordinance evolved, exemptions were added for facilities that serve the public interest and cannot operate using alternatives to natural gas. An exemption was also added

for buildings that the CEC has not modeled for electrification, though it includes a simple amendment process to allow for these buildings to be brought under the ordinance when modeling is extended. Relying on the CEC's modeling of building types allows Berkeley to pursue electrification without burdening developers or spending city resources to develop such models.

Reach Code - December 3rd, 2019

The supplementary reach code was passed on December 3, 2019 in an effort to capture buildings not incorporated under the original ordinance and to provide flexibility for approved building types through an alternate compliance path. The original ordinance did not include electrification readiness, but it was added to the supplementary reach code. The public comments received during the December 3 hearing reflect the community's support of the additional reach code, as well as some of the concerns with the original ordinance including affordability, flexibility, and the desire to take greater action. Figure 6 below reflects these comments received.

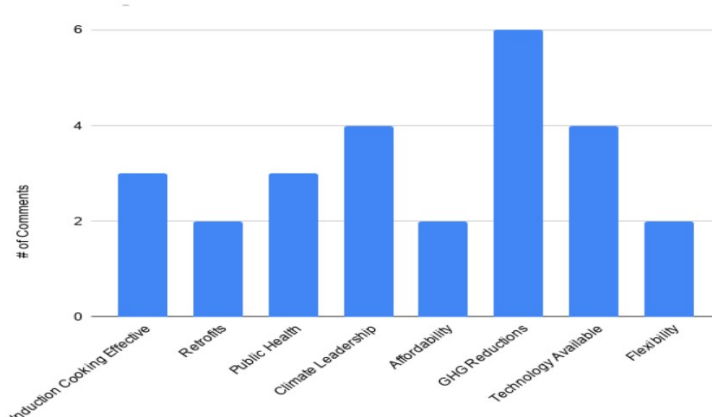


Figure 6: Public Comments in Support of Supplemental Reach Code December 3rd, 2019 (Berkeley City Council Meeting, December 3rd, 2019)

Section 3.3.4: Stakeholder Involvement & Impact

Government Offices

The Berkeley Energy Commission, which advises the Council on climate protection, energy conservation and alternative energy development in Berkeley, held two special meetings on the ordinance and reach code. The Commission unanimously endorsed the ordinance and reach code.

The Berkeley Community Environmental Advisory Commission and Berkeley Community Health Commission also unanimously endorsed the proposal.

Public Response

The response to the proposal from the community was generally favorable, with many residents speaking in favor of the policy at public hearings. The public comments presented in the hearings on the proposal reflect the value the community places on climate leadership as well as the strong activist community in Berkeley. Berkeley's politically engaged community is likely a factor in why it pursued the nation's first natural gas ban policy. There were no dissenting opinions at the public hearing for the ordinance in Berkeley. The lack of negative comments received by the city may be attributed to a lack of political engagement from the opposition and the speed with which the ordinance was passed.

Some community members expressed concern about the policy's impact on housing affordability. Like many other cities in California, Berkeley is already facing an affordable housing crisis. Stakeholders brought up the contradiction between the city's affordable housing goals and the natural gas infrastructure ban. They argued that the policy could disincentivize needed development projects or increase costs that would be passed along to Berkeley's poorer communities through increased rents. These concerns were ultimately addressed with the addition of cost-effectiveness and public interest exemptions in later iterations of the policy as well as the alternative compliance path under the supplemental reach code.

Business/Non-Governmental Organization Response

The city also engaged with stakeholders in business, labor, and other non-governmental organizations in the policy development process. This included the Berkeley Downtown Business Association, developers, activists, engineers, and local union representatives in these industries. These stakeholders were concerned that a full ban without exceptions would require electrification in building types where it was not shown to be cost-effective. The city addressed these concerns by incorporating the CEC electrification cost-effectiveness models for different building types and adding an exemption for buildings not yet modeled for electrification.

The support of Pacific Gas & Electric (PG&E), the major utility servicing Berkeley, for natural gas limitation policies may have also lessened the potential opposition. PG&E supported the policy as "it recognizes the limited lifespan and high costs of gas as California moves toward a carbon neutral economy by 2045 (Long, 2020)." Because PG&E is a dual-fuel utility that provides both electricity and natural gas services to Berkeley, it is not severely impacted by and may indeed benefit from a transition away from natural gas to electricity as it is also the entity supplying the increased electric load to power all-electric buildings.

Californians for Balanced Energy Solutions, a local California association of natural gas businesses, end users, and other interested parties, was active in opposing natural gas limitations

in the state. In an interview with the group, the issue of housing affordability played a key role in their opposition to the natural gas limitation policies across California. According to Californians for Balanced Energy Solutions, Berkeley policymakers did not properly consider the impact of these policies on low income residents as acutely as other jurisdictions. Berkeley's low rates of homelessness and high median income prevent the local population from feeling the impact of discouraged development and higher electricity prices. It also raised the potential impact of these policies on jobs in the natural gas and construction industries.

Restaurant Association Lawsuit

Despite minimal opposition, the reaction to the policy was not wholly favorable as the California Restaurant Association is in active litigation with the city over the ban (California Restaurant Association v. City of Berkeley, 2020). The association contends that restaurants will suffer because the ban will disrupt common restaurant practices that require open flames and will make restaurants more expensive to build and operate. The city of Berkeley defends their ban citing the exceptions that exist to the ban. The city also contends that restaurants and chefs that support induction electric cooking and argues that electric buildings are cost-effective to build. In January 2020, the city filed a motion to dismiss the lawsuit. This is the most recent action at the time of this report.

Section 3.4: San Jose, California

With a population of over 1 million, San Jose is the third-largest city in California and the tenth-largest city in the United States. It is also, to date, the largest city in the country to enforce a municipal policy prohibiting the use of natural gas in certain buildings. The following section analyzes the legislative process and political context that informed the development of San Jose's reach code ordinance.

Section 3.4.1: Political Landscape

Like many populous cities in California, San Jose has a climate-conscious population that expects the city to be a leader on climate issues - especially relative to other major cities in California.

In February 2018, the San Jose City Council adopted Climate Smart San Jose, a city-wide plan to remain compliant with the Paris Climate Agreement. The plan sets aggressive targets to promote EV adoption, solar installation, and zero net energy/carbon (ZNE/ZNC) buildings. San Jose's building stock is a primary target to reduce emissions through energy efficiency, having accounted for 27.5% of the city's energy consumption (City of San Jose Staff, 2018, 211) and one-third of its overall emissions profile (City of San Jose Staff, 2018, 63) in 2018.

Later in the year, San Jose was selected by the Bloomberg American Cities Climate Challenge (ACCC) as one of 25 cities to receive grant funding under the program. ACCC provided a package

of services including personnel, technical assistance, and other resources valued at \$2.5 million through the end of 2020. One condition of the city's agreement with the ACCC was a commitment to pursue the adoption of a reach code in line with Climate Smart San Jose goals. By 2030, those goals for building electrification included 47% all-electric homes in San Jose, 37,975 ZNC homes, and 70 million square feet of ZNC commercial buildings (Climate Smart San Jose & New Buildings Institute, 2019).

San Jose is anticipating a need to reduce carbon emissions from their growing building stock in order to achieve these progressive climate goals. City leaders projected significant new development as new jobs and residents from a burgeoning technology sector flow into the city. Six large-scale building projects are already in development, for example, that could create 68,000 new technology sector jobs in the downtown, more than doubling the current number of workers. San Jose Mayor Sam Liccardo said these projects would be the "first of many" to revitalize the downtown area (Avalos, 2020). Moreover, San Jose projects new development on the order of 350 new single-family units, 2,400 multi-family units, and 2.4 million square feet of new commercial or industrial facilities per year over the next three years alone. Such development would result in 897,000 tons of total CO₂ emissions over the expected 50-year service life of those buildings if built with natural gas infrastructure, equal to 1.7 trillion car miles (City of San Jose, 2019). Moreover, most San Jose residents and businesses already use electricity derived from an electric grid made up of 80% clean electricity, a number that is projected to increase under state and local policies to 100% by 2021 (Liccardo, 2019, 3) Combined with expected new development, putting forward a reach code represented a substantial opportunity to avoid further emissions from the building sector.

Section 3.4.2: Summary of Policy

The San Jose City Council approved its reach code for new residential and nonresidential building construction (Ordinance No. 30311) on September 17, 2019. The reach code applies to any newly constructed building or structure for which a building permit application is made on or after January 1, 2020. It was approved by the CEC on December 11, 2019 and went into effect on January 1, 2020.

The ordinance requires all new residential and nonresidential mixed fuel buildings² to achieve higher levels of energy efficiency than the base code and requires "electrification-readiness" in all new mixed fuel buildings. The reach code also includes provisions requiring certain levels of electric vehicle charging infrastructure (EVCI), electric vehicle (EV) readiness, and solar readiness

² The ordinance defines mixed fuel buildings as any building or building design that uses natural gas or propane as fuel for space heating, water heating (including pools and spas), cooking appliances or clothes drying appliances or is plumbed for such equipment.

for all residential and nonresidential buildings. For the purposes of this report, the EV and solar readiness provisions included in the reach code are not discussed in further detail.

The reach code was initially recommended to the full City Council for adoption by the Transportation and Environment (T&E) Committee during a September 9, 2019 meeting before being formally adopted by the full City Council. During the September 17 meeting, the Council also adopted recommendations from Mayor Liccardo to direct staff to return to the Council by October 2019 with new draft ordinances prohibiting natural gas infrastructure in most residential buildings and in all municipal buildings (Liccardo, 2019, 1). Those ordinances were ultimately adopted by the Council on October 29, 2019 as supplements to the enacted reach code.

San Jose's reach code (Figure 7) is less restrictive when compared to some in California as it allows for at least some new mixed fuel development in the near term. However, the reach code ultimately adopted by the City Council reflects San Jose's climate-forward ambitions while incorporating the results of a months-long stakeholder engagement process facilitated by City Council staff.





	Natural Gas Infrastructure Prohibition Requirements	Reach Code Requirements ¹	
Occupancy Type	Requirements Supplementing Reach Code ²	All-Electric Building Requirements ²	Mixed Fuel Building Requirements ²
Single-family, Detached Accessory Dwelling Unit (ADU), and Low-rise Multi-family (Up to 3 stories) 	Requires all-electric building.	Efficiency: To Code Electric Vehicle Charging Infrastructure (EVCI): Single-family: 1 EV Ready; Detached ADU: 1 EV Ready (if space is required by Code); Low-rise Multi-family: 10% EVSE, 20% EV Ready, 70% EV Capable	<i>Not applicable per Natural Gas Infrastructure Prohibition.</i>
Hotel/Motel (Any number of stories) 	<i>Not applicable.</i>	Efficiency: To Code EVCI: 10% EVSE, 0% EV Ready, 50% EV Capable	Efficiency: ³ 6%; electrification-ready EVCI: Same as All-Electric Building Requirements
High-rise Multi-family (4 stories +) 	<i>Not applicable.</i>	Efficiency: To Code EVCI: High-rise Multi-family: 10% EVSE, 20% EV Ready, 70% EV Capable	Efficiency: ³ 6%; electrification-ready EVCI: Same as All-Electric Building Requirements
Other Non-residential (Any number of stories) 	<i>Not applicable.</i>	Efficiency: To Code EVCI: 10% EVSE, 0% EV Ready, 40% EV Capable	Efficiency: ³ Office & Retail: 14%; Industrial/ Manufacturing: 0%; All other non-residential occupancies: 6%; all electrification-ready EVCI: Same as All-Electric Building Requirements

Figure 7: San Jose Adopted Reach Code Requirements (San Jose City Council)

Section 3.4.3: Review of Reach Code Process

As a function of its agreement with the ACCC, San Jose City Council staff partnered with the New Buildings Institute (NBI) to craft its reach code. NBI specializes in the development of building codes and has expertise on ZNE building construction. Similarly, City Council staff and NBI engaged with other municipalities across Silicon Valley in the development of their reach codes, which had the twin effect of encouraging building electrification throughout the area and reducing the risk of potential market disadvantages between each city (Romanow & Hughey, 2019, 9).

Time was a major factor in the development of the reach code. Staff intended for the reach code to go into effect at the same time as California's 2019 Standards in order to provide certainty to developers and maximize the impact of the reach code. To align with the effective date of the 2019 Standards, this necessitated the city ordinance being approved and submitted to the CEC for review with enough time to accommodate a mandatory 60-day comment period before the last CEC meeting of 2019.

The city received the ACCC grant at the end of 2018, necessitating a rapid stakeholder engagement process. The City Council approved the scope of work to pursue a reach code during a February 26, 2019 meeting. Following the adoption of the scope of work, City Council staff and NBI developed the reach code between May and September 2019.

In that time, staff was able to develop a list including over 65 stakeholder groups and 200 neighborhood associations, utilizing existing stakeholder engagement lists from the city's 2018 ordinance related to energy efficiency in existing buildings. Staff also held four stakeholder engagement workshops which provided an introduction to the reach code development process, reviewed residential and nonresidential issues, and solicited final input on the reach code before releasing its initial draft at a July 10 meeting.

The reach code underwent several revisions between the time it was first introduced and when it was ultimately adopted by the City Council. The following subsections will summarize how the ordinance developed over time and review how stakeholder engagement impacted the process.

Initial Reach Code Introduction - July 10, 2019

In addition to the EVCI and solar readiness requirements, the initial draft of San Jose's reach code required that mixed fuel buildings achieve higher levels of energy efficiency than the base code by demonstrating a compliance margin set at a particular percentage above the base code.

Buildings were required to achieve particular compliance margins based on building type, as detailed below in Figure 8:

	2019 Base Code	Draft San Jose Reach Code
Low-Rise Residential	<ul style="list-style-type: none"> Electrification-Ready water heating 	<ul style="list-style-type: none"> 25% greater efficiency for mixed fuel projects 0% for all-electric
High Rise MF / Hotel / Motel	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> 7% greater efficiency for mixed fuel projects 0% for all-electric
Office	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> 14% greater efficiency for mixed fuel projects 0% for all-electric
Retail	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> 15% greater efficiency for mixed fuel projects 0% for all-electric

Figure 8: July 10, 2019 San Jose Initial Proposal (San Jose City Council)

There were several factors contributing to the decision to limit the reach code to mandating energy efficiency measures in mixed fuel buildings rather than prohibiting natural gas in those buildings entirely. Primarily, staff cited already-high development costs in San Jose, expressing concern about making those costs even more prohibitive through the development of the reach code. There were also concerns about the market-readiness of all-electric buildings across all building types.

Revised Reach Code - September 9, 2019 Meeting

Staff presented a revised reach code for consideration by the T&E Committee during its September 9 meeting. Changes to the proposed reach code in Figure 6 are highlighted in red in Figure 9:




	Reach Code Compliance Pathways*		
Occupancy Type	All-Electric (Draft/Proposed)	Mixed Fuel (Draft)	Mixed Fuel (Proposed)
Single-family & Low-rise Multi-family 	Efficiency: To code EVCI: Same as mixed fuel	Efficiency: Energy Design Rating (EDR) ≤10 EVCI: 1 EV Ready (Single-family); 0% EVSE, 50% EV Ready, 50% EV Capable (Low-rise Multi-family)	Efficiency: EDR ≤10, electrification-ready EVCI: 1 EV Ready (Single-family); 10% EVSE; 0% EV Ready, 50% EV Capable (Low-rise Multi-family)
High-rise Multi-family & Hotel 	Efficiency**: To code EVCI: Same as mixed fuel	Efficiency**: 7% EVCI: 0% EVSE, 50% EV Ready, 50% EV Capable	Efficiency**: 5%; electrification-ready EVCI: 10% EVSE; 0% EV Ready, 50% EV Capable
Non-residential 	Efficiency**: To code EVCI: Same as mixed fuel	Efficiency**: Office 14%, Retail: 15%, All other occupancies: 7% EVCI: 10% EVSE, 40% EV Capable	Efficiency**: Office & Retail: 10%, electrification-ready ; Industrial/Warehouse: 0%; All other occupancies: 5%; electrification-ready EVCI: 10% EVSE, 40% EV Capable

Figure 9: San Jose Reach Code Recommended for Adoption on September 9, 2019 (San Jose City Council)

The September 9 version of the reach code included a requirement for all mixed fuel buildings to be pre-wired for all-electric appliances or “electrification-ready.” The inclusion of this provision in the reach code aligned it with reach codes being developed throughout the region, which were in turn influenced by model base code language developed for the region by Peninsula Clean Energy, Silicon Valley Clean Energy, and the San Mateo County Office of Sustainability (PCE, 2019). In its memorandum to the Committee, staff cited the benefits of regional collaboration to reduce the risk of competitive disadvantage as a reason to adopt provisions from the model reach codes. Staff also indicated that they had received significant stakeholder input supporting the incorporation of the electrification readiness provisions included in the regional model reach codes (Romanow & Hughey, 2019, 9).

The reduced compliance margins included in the revised ordinance were largely a function of internal staff concern over the ability of electric grid infrastructure to handle the increased load resulting from building electrification, the cost of all-electric building, and the use of the highest possible EDRs and compliance margins for mixed fuel buildings (Romanow, Davies, & Son, 2019). Despite the reduction, staff indicated that the energy efficiency requirements included in the proposed reach code were still higher than the base code and would incentivize all-electric construction by necessarily raising the cost of mixed fuel construction.

Staff also noted in its memorandum that it considered two policy alternatives to the proposal presented to the Committee. The first alternative would require all-electric buildings in all new construction, which staff did not recommend as it offered less flexibility for development in an emerging marketplace. The second alternative would have increased energy efficiency requirements for non-residential mixed fuel buildings to the maximum allowable under the 2019 Standards. Staff did not recommend this option due to concerns about raising construction costs for those mixed fuel buildings.

Staff indicated that public feedback leading up to the September 9 meeting suggested public opposition to the less stringent compliance margins in the proposed reach code relative to the initial draft. Most comments indicated that the strength of the market signal towards electrification would be increased if compliance margins were reverted to those in the initial draft. However, there was strong support for the inclusion of the electrification-readiness provisions. During the meeting itself, public comments were unanimously opposed to the compliance margin reduction in the new proposed reach code. Moreover, most commenters urged the Committee to recommend the policy alternative that would require all new building construction to be all-electric.

Adopted Reach Code - September 17, 2019

There was significant criticism of the reach code recommended by the T&E Committee for adoption following the September 9 meeting. The Committee received 15 letters representing stakeholder groups and 16 citizen letters, which nearly unanimously supported reverting the

efficiency compliance margins to the initial reach code draft. Many of those letters also supported the mandating all-electric construction in all new buildings.

Importantly, on September 13, Mayor Liccardo and four City Council members submitted a memorandum to the full City Council urging it to adjust the energy efficiency margins to those included in the original draft reach code and recommending that the Council direct staff to return the following month with ordinances prohibiting natural gas infrastructure in new low-rise residential construction and in municipal buildings. The Mayor's intervention added significant weight to the momentum that had already been building towards prohibiting natural gas infrastructure entirely.

Accordingly, the Council adopted the Mayor's recommendations when it initially passed the reach code and directed staff to return with the natural gas prohibition ordinances in October 2019. The adopted reach code also increased the energy efficiency compliance margins for other building types, though to levels still slightly below the initial draft.

Supplement to Reach Code - October 29, 2019

On October 29, 2019 the Council then adopted an ordinance as a supplement to the reach code prohibiting natural gas infrastructure in new single family, low-rise residential buildings and detached accessory dwelling units, as well as an ordinance prohibiting natural gas infrastructure in all new municipal buildings (with limited exceptions). It also directed staff to return to Council in 2020 with an analysis on the feasibility of prohibiting natural gas infrastructure in all wood-frame buildings up to seven stories.

Section 3.4.4: Stakeholder Involvement & Impact

City Council staff undertook an abbreviated stakeholder engagement process that informed the development of the reach code. There was substantial public support for a stringent reach code throughout the development process, and the public record indicates a stated desire for San Jose to lead on climate issues, even relative to other climate-conscious cities in California.

However, an interview conducted with staff that assisted with the drafting of the ordinance revealed that the abbreviated nature of the process may have prevented a substantial opposition movement from emerging. The public record includes limited opposition from local or national organizations that support the production or distribution of natural gas. It is possible that those entities were not aware of the developing reach code or were unable to coalesce in time to oppose it as they would in other municipalities.

An additional factor that may have contributed to a lack of opposition was PG&E's support of the San Jose reach code process. Similar to Berkeley, PG&E provides both electricity and natural gas services to San Jose and expressed support for local government policies that promote all-new electric construction when it is cost-effective. Staff acknowledged that dual fuel utilities are not

common to all jurisdictions that might pursue building electrification policies, where opposition from separate electric and natural gas utilities may be more pronounced. In particular, natural gas utilities solely reliant on their distribution infrastructure are inclined to vigorously oppose policies incentivizing electrification, particularly any that propose to ban natural gas entirely.

From the onset, local and national climate organizations were engaged in the reach code development process. These organizations pressed the Council to adopt the most stringent energy efficiency requirements possible and indicated a strong desire to require all-electric construction. The initial July 2019 reach code draft that did not include a natural gas prohibition represented a middle-of-the-road approach (see Figure 10) relative to other California cities pursuing a building electrification reach code in terms of its restrictiveness, a position that was untenable for the environmental organizations engaged on the issue in San Jose.

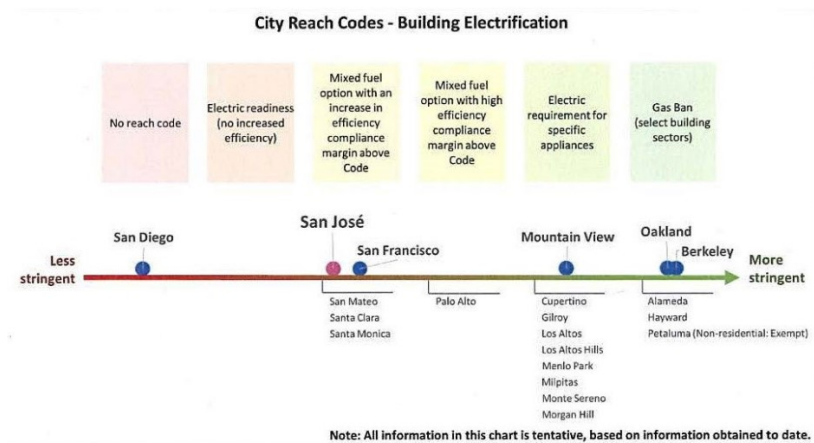


Figure 10: Comparison of California Reach Codes from July 10, 2019 Reach Code Meeting (San Jose City Council)

Advocacy and pressure on the City Council from environmental interests made an impact in the ultimate strengthening of the reach code and the pursuit of a natural gas prohibition for most residential construction. An overwhelming majority of public letters to the City Council after the September 9 T&E Committee meeting urged them to adopt more stringent reach code. Those letters were almost exclusively submitted on behalf of local and national environmental interest groups while utilities, labor, real estate, and other interest groups were largely absent, indicating how thoroughly the environmental community dominated the public record on this issue.

Combined with Mayor Liccardo’s memorandum to the City Council and an emerging consensus developing throughout the state on the cost-effectiveness of all-electric construction, the input of environmental stakeholders played a critical role in shaping the reach code that was ultimately adopted.

Section 3.4.5: Next Steps

San Jose is taking an incremental approach to its limitations on natural gas infrastructure. With the current reach code in effect prohibiting natural gas in single-family, low-rise residential, and detached accessory dwelling units, City Council staff is now exploring the feasibility of prohibiting natural gas infrastructure in other building applications. Staff was directed to examine the feasibility of extending the natural gas ban to mid- and high-rise buildings by the Council and had intended to make a recommendation to the city manager in late April 2020. However, the ongoing COVID-19 pandemic will likely delay the development of further municipal ordinances as city resources are focused elsewhere.

Section 3.5: Davis, California

The city of Davis, California represents a less restrictive policy relative to those developing across the state. Their policy has many of the same goals as the other municipalities studied in this report but uses incentive-based mechanisms to achieve them. The remainder of this section will provide a deep dive on the context and process that led to the limitation on new natural gas infrastructure as well as summarizing the reasons the city chose an incentive-based policy over a broad natural gas ban.

Section 3.5.1: Political Landscape

The city of Davis is located in Yolo County, California near Sacramento. Davis’ population is near 70,000 people with an annual growth rate of 2.2% (City of Davis, 2019). The city has not seen significant new development in the last decade and has limited land for new construction, leading to an affordable housing crisis in the community similar to other California cities. As such, affordable housing is a major priority of the City Council.

Like many other cities in California, climate change is a high priority for Davis. The city passed a climate emergency resolution on March 5, 2019 that set a goal of carbon neutrality for the city by 2040 (City of Davis, 2019). Climate concerns have also led the Davis City Council to consider ways to reduce building sector emissions, including multiple updated energy efficiency reach codes since 2008 (Feeney, Sept. 24th, 2019). These reach codes have set the Davis local building codes equal to the optional “green” standards in each cycle of the California Building Standards. The reach code discussed in this case study follows in this tradition by further increasing efficiency requirements and adding requirements for electrification readiness. This means that buildings

using natural gas must also be pre-wired for electric water heating, cooking, space heating, and clothes drying.

Section 3.4.2: Summary of Policy

Davis introduced its electrification reach code on September 24, 2019. It was enacted two weeks later on October 8, 2019 and went into effect on January 1, 2020 after being approved by the CEC.

The reach code passed the city council unanimously with the goal of incentivizing, rather than requiring, electrification readiness. All new construction will be required to meet higher efficiency standards than the California base code and be electrification-ready.

Under the Davis reach code, new residential mixed fuel buildings meet a total Energy Design Rating (EDR) (EDR) of less than or equal to 9.5 while new low-rise mixed fuel residential buildings less than or equal to 10. This equates to approximately a 15% increase in efficiency over the base code and is the maximum efficiency requirement shown to be cost-effective in the California Energy Commission cost-effectiveness study (Feeney, Sept. 24th, 2019). Figure 11 shows how these requirements apply to different building types.

	Reach Code Requirements	
Occupancy Type	All-Electric	Mixed fuel
Single-family detached accessory dwelling unit, and low-rise multi-family (up to 3 stories)	No additional requirements	Efficiency: EDR 9.5 Electrification-ready
Hotel/Motel	Not applicable	Not applicable
High-rise multi-family	No additional requirements	Efficiency: EDR 10 Electrification-ready
Other non-residential	Not applicable	Not applicable

Figure 11: Davis Natural Gas Reach Code Requirements

This policy acts to incentivize all-electric construction by increasing the cost of building new gas infrastructure. The city estimates that mixed fuel buildings could cost more to construct than all-electric buildings under the efficiency and pre-wiring requirements (City of Davis, 2019). The city council sought to incentivize electrification now and lay the groundwork for future policies aimed

at retrofits. By requiring pre-wiring, the city can avoid locking in new natural gas infrastructure and decrease retrofit costs later while still preserving energy choice in the present.

Section 3.4.3: Review of Proposal Process

Davis considered several options prior to introducing a formal proposal. However, the proposal introduced in September did not change substantially before the final version was passed by the city council.

One consideration discussed was an outright ban on natural gas infrastructure in all new natural building construction, similar to the Berkeley ban. City staff analyzed this option and determined there was significant opposition within the local building community to the full ban and there was potential for litigation under such a ban (Feeney, April 9th, 2019). It is unclear if the concern over litigation was influenced by the lawsuit against the city of Berkeley. These political concerns led city staff to recommend the less restrictive incentive-based policy.

One unique challenge faced by the City of Davis that influenced the structure of this reach code is the complexity of the certification of green buildings. Projects seeking discretionary entitlements must meet green building requirements that are negotiated with the city's Natural Resources Commission on an individual basis (Feeney, Sept. 24th, 2019). The Natural Resources Commission reviewed the proposal three separate times and unanimously supported the final policy. Their support was attributed in part to the simplification of the green building standards. The reach code implementing greater efficiency requirements alleviated the need for individual review on many buildings, lessening the burden on the Commission. The city predicted a significant decrease in the number of projects that will need individual negotiations.

The Davis City Council strongly emphasized affordable housing during the reach code process. According to city officials, the design of this reach code makes it an effective way to achieve GHG reductions while limiting the negative consequences for the housing stock (Feeney, Sept. 24th, 2019). The reach code allows developers to choose between compliance paths of all-electric or electrification-ready buildings, allowing them the flexibility to achieve the desired abatement at the lowest cost for their project. Since all-electric are only required to meet base code standards but not exceed them, developers can determine whether a project will have lower compliance costs as an all-electric building or as an electrification-ready mixed fuel building. The city sees this as limiting the impacts of the reach code on housing development.

Section 3.4.4: Stakeholder Involvement & Impact

The city of Davis engaged with many local stakeholders while crafting the reach code including the local Chamber of Commerce and Cool Davis, a community-based environmental nonprofit. Cool Davis supported the reach code and was active in the public meetings on the policy. The Chamber of Commerce was consulted directly by the city on two separate occasions and provided

feedback on the proposal. This included meetings with the Chamber's executive staff and its membership. The Chamber did not endorse or oppose the reach code. The city attempted to engage with contractors and developers by inviting them to public meetings on the reach code but there were no individuals from these groups present at the public hearings. The citizens who spoke on the proposal during public hearings before the city council were supportive of the reach code.

Section 4: Massachusetts

Brookline, Massachusetts is the only municipality outside of California that has adopted a limitation on natural gas, though its legality is currently pending review from the Attorney General of the Commonwealth of Massachusetts. The Brookline proposal process demonstrates how municipalities in some states must consider the legality of local policies if they go beyond state requirements. As other cities in Massachusetts have expressed interest in passing a natural gas limitation policy, the decision on the Brookline policy's legality will affect how policy options progress in the state. The background on Massachusetts, below, provides important context for the following case study on Brookline. This section will provide a deep dive on the state's climate goals and then expand on the political context and policy development in Brookline.

Section 4.1: Massachusetts' Climate Objectives

Both the state and local governments in the Commonwealth of Massachusetts have taken action to address climate change. At the state level, Massachusetts has implemented a variety of plans to combat GHG emissions and combat climate change. In 2008, it enacted the Global Warming Solutions Act (GWSA), which set economy wide GHG emission reductions goals for Massachusetts that will achieve reductions of between 10 and 25% below statewide 1990 GHG emission levels by 2020 and at least 80% below statewide 1990 GHG emission levels by 2050 (Mass.gov, n.d.). It also enacted the Green Communities Act (GCA) to reform the energy marketplace. The GCA promotes the reduction of emissions by supporting the development of renewable energy, creating a new greener state building code, and dramatically expanding Massachusetts' Renewable Portfolio Standard, which sets a mandate for increasing requirements for renewable energy sources (Mass.gov, n.d.).

The state's emphasis on combating climate change with clean energy solutions is also reflected in its Clean Energy and Climate Action Plan of 2020. While the plan's primary objective is to combat climate change, it acknowledges that there are other important intersectional issues involved. The three other challenges that the State focuses on include reducing reliance on fossil fuels from other regions, protecting customers from energy price volatility, and taking advantage of the economic growth opportunities associated with expanding clean energy (Mass.gov, n.d.).

Section 4.2: Brookline, Massachusetts

Many cities and towns in the Commonwealth also strive to impact climate change by rethinking their energy sources. The remainder of this section will provide a deep dive on the context and process that lead to a ban on natural gas infrastructure in new buildings and in significant renovation projects in Brookline.

Section 4.2.1: Political Landscape

Brookline is a small town just outside of Boston. Less than seven square miles across, the town has a population of under 60,000 people. It has a moderately dense urban environment with a wide socioeconomic spread, though the population in Brookline can be described as middle and upper class (DATAUSA, 2020). It is highly residential and many of those who live in Brookline work in Boston.

Political Structure

Brookline's citizens tend to be well educated, hold progressive ideals, and be highly involved in local politics, as the governmental structure in Brookline is conducive to high citizen engagement. The town has a unique system of government referred to as a representative "Town Meeting," which leads to strong citizen engagement on local boards and committees.

Brookline does not have a mayor and its affairs are entirely conducted through the Town Meeting. The Town Meeting is the Brookline's legislative branch of government and is highly participatory. Brookline residents select 240 Town Meeting members across 16 precincts to make up the voting body at two Town Meetings each year. One Town Meeting is held in the Spring to enact the following year's budget and discuss matters on the warrant, which can be proposed by citizen petition or the Select Board. The other Town Meeting is held each Summer or Fall to discuss budgetary changes and any new items on the warrant.

Any Brookline citizen is allowed to bring items into consideration at the Town Meetings through its warrant process. It is relatively easy for citizens who want to bring items into consideration of the local government. At the two annual Town Meetings, members of the Select Board, and citizens that meet necessary petition requirements, can submit a warrant for discussion. The Select Board can add items to the agenda as they see fit. For a citizen to bring a warrant, they need only ten registered voters from Brookline to sign a petition. Then, the petitioner can submit the proposal to the annual Town Meeting for consideration (Brookline, Massachusetts Government, 2018). This is a particularly low bar to require a municipal body to consider an issue and can allow issues of varying importance to be brought before the town Meeting at the will of a small number of citizens. Once under consideration, a petition is discussed as an Article of the Warrant and is typically referred to as a Warrant Article.

Brookline Climate Policy

Brookline passed an updated Climate Action Plan in 2018 that focuses on mitigation and adaptation through six strategies for both reducing climate-changing GHG emissions (mitigation) and preparing for climate-change impacts (adaptation) (Brookline, Massachusetts Government, 2018). The Climate Action Plan has a main goal of achieving zero emissions by 2050. One of the Climate Action Plan's strategies to achieve this goal is to increase renewable energy consumption in the town. To that end, Brookline implemented a program in 2017 that allows citizens to choose various ways to purchase renewable energy at stable, competitive prices to be their source of electricity. This program, called Brookline Green Energy, is aimed at reducing the town's dependency on fossil fuels (Brookline, Massachusetts Government, n.d.). The program allows participants to select the percentage of renewable energy they want to purchase to contribute towards their electricity.

Energy sourcing and consumption are a large part of the conversation around how to reduce their environmental impact in Brookline. However, the town still sought additional ways to press forward to meet its climate goals, eventually turning its attention to end-use energy consumption in buildings. As buildings account for 60-70% of the town's emissions, they received much attention as Brookline considered additional pathways towards meeting its aggressive climate goals.

Section 4.2.2: Summary of Policy

In November 2019, the Town Council passed Sustainable Buildings Warrant Article 21 during a Special Town Meeting by a 211-3 vote and the town's Select Board voted unanimously to support it (Special Town Meeting, 2019). The Warrant Article prohibits natural gas infrastructure in all new construction and major renovation projects for commercial and residential buildings in Brookline, effective no earlier than January 1, 2021.

For situations in which going electric is not practical or cost-efficient, this by-law has several exemptions. These exemptions include:

- Repairs to existing systems deemed unsafe or dangerous by the Plumbing & Gas Fitting Inspector
- Piping required to fuel backup electrical generators
- Piping required for cooking appliances and related appliances
- Portable propane appliances for outdoor cooking and heating
- Centralized hot water systems in buildings with at least 10,000 square feet that can certify that no commercially available electric hot water heater exists for the required hot water demand for less than 150% of installation or operational costs

- Any building subject to a Waldo-Durgin Overlay District Special Permit³
- Research labs for scientific or medical research
- Medical offices regulated by the Massachusetts Department of Public Health as a health care facility
- Utility service piping connecting the grid to a meter, or to a gas meter itself
- Extension or modification of existing heating systems so long as new fossil fuel piping is not installed

The Warrant Article also includes a waiver process that would allow natural gas infrastructure if an all-electric alternative is financially infeasible or impractical to implement. Those seeking to get an exemption must seek a permit from the Sustainability Review Board, a new entity created as part of this warrant. This new board will review permit requests and appeals, paying specific attention to the impact of the warrant on the all-electric construction costs. The Board is required to solicit and review a detailed cost comparison based on a developer's conceptual plans before issuing a waiver and permit for any new natural gas construction (Special Town Meeting, 2019).

The legality of Brookline's limitation on natural gas is currently pending review from the Attorney General of the Commonwealth of Massachusetts. This is because the state regulates building codes and gas utilities, and this is the first attempt by a municipality to exceed the state requirements. If the Attorney General ultimately rules in favor of the legality of the Brookline Warrant Article, other cities and towns in Massachusetts are expected to enact similar natural gas limitations. A decision on the policy is expected in Spring 2020, though there has not been any sign that a decision is imminent at the time of this writing.

Section 4.2.3: Review of Proposal Process

Original Proposal

A group of Brookline citizens initially proposed an outright ban on fossil fuel in any new construction or renovation for heating, hot water, and cooking with gas in July 2019. Upon its proposal, two Community Feedback Sessions were scheduled with The Town of Brookline's Economic Development Advisory Board and Sustainability Office for late September and early October (Town of Brookline, Massachusetts, 2019). The town circulated an invitation for community participation, including real estate developers, property owners, building trade professionals, restaurants, and other businesses.

The initial proposal suggested the prohibition of the installation of fossil fuel infrastructure in new buildings and gut renovation projects, with no exceptions, in order to prevent the installation of

³ The Waldo-Durgin development project has already entered a Memorandum of Understanding with the town which specifically addresses energy efficiency and included input during the development's design process. This discussion informed the project's design. For this reason, it was exempted from this bylaw.

new major appliances that require on-site combustion of fossil fuels, including natural gas. It was also originally proposed for implementation on January 1, 2020, but was ultimately moved to 2021 to allow more time for the state Attorney General to respond.

The original Warrant Article language strongly emphasized the importance of protecting the environment, categorizing its current state as a global climate crisis. It also referenced nearby natural gas explosions that demonstrated the safety issues due to natural gas, the emissions concerns, the effect on the ecosystem due to climate change impact, and indoor air quality leading to negative health effects that are associated with continued use of natural gas (Grey, 2019). An interview with Town Meeting staff indicated that the language included in the initial Warrant Article arguably exceeded what was required to combat climate change and reduce emissions in Brookline. Some of these details were ultimately removed in the final version of the Warrant Article.

Section 4.2.4: Stakeholder Involvement & Impact

Community Feedback Sessions

Community Feedback Sessions in August 2019 included discussion on how effective the policy would be at lowering emissions. Brookline is an old city with an aging building stock that currently constitutes 60-70% of the town's total GHG emissions (Grey, 2019). Town data indicates that 0.5% of the city's building stock is significantly renovated each year. If this trend continued under the proposed Warrant Article, the petitioners argued that it would result in 15% of buildings in the town becoming fossil free by 2050 and an accompanying 10% reduction in municipal fossil fuel consumption (Grey et. al., 2019).

Given Brookline's progressive political leanings, the Warrant Article was a favorable political issue and was seen as certain to pass in some form because it was seen as a "green" measure. All members of the Town Meeting and general public were already in agreement that something needed to be done to address building emissions, so the discussion shifted instead to how to best ensure a pragmatic and measured natural gas limitation as this is where the disagreements mainly arose.

Developers, property owners, building trade professionals, and members of the public raised various arguments during the feedback sessions. A consistent argument raised against the proposed Warrant Article was the viability of all-electric alternatives to incumbent natural gas appliances. Specifically, commercial cooking was an issue as the town's original proposal banned fossil fuel infrastructure for cooking as well as heating. Despite advocacy from local chefs in favor of electric induction cooking (Patkin, 2019), proponents modified the measure to permit gas cooking stoves in new buildings and house rehabs to increase support (Gellerman, 2019).

A second issue that emerged during the Community Feedback Sessions was the use of natural gas in Brookline's many research facilities and educational hospitals, which have substantially different energy requirements than traditional residential or commercial buildings. The Town Meeting heard from internationally recognized architects with expertise in green building design to help them understand the feasibility of eliminating natural gas infrastructure in those buildings. The experts determined that the technology is not yet available to meet air handling requirements for medical buildings in a cost-efficient way without natural gas. The town used this guidance to modify the article to exclude these facilities and other buildings that need to be licensed by the Massachusetts Department of Public Health.

In addition to concerns over the viability of all-electric alternatives for commercial cooking appliances and medical facilities, stakeholder opposition also emerged against the feasibility of all-electric residential construction. The Massachusetts Coalition for Sustainable Energy, a stakeholder group representing mostly business organizations and homebuilders, contested the assumption made by policymakers that electric heat pumps are viable technology alternatives to natural gas construction in residential applications. They argued that development will suffer after the ban because electric heat pumps are both impractical and become exponentially more expensive over time, which will slow housing production, increase housing prices, and make many projects non-viable.

Development Costs

Another fear expressed in the August Community Feedback Sessions were potential costs to developers. Chestnut Hill Realty expressed concerns about the Warrant Article's impact on property owners and leasing companies. They said that an in-depth cost-benefit analysis should have been conducted and argued that the Town Meeting did not understand the full costs, economic impacts, or other heavy consequences associated with the Warrant Article (Patkin, 2019).

Other concerns regarding development costs were with respect to a potential loss of tax revenue. As much of the taxes collected by the town come from development projects underway, there were concerns that a natural gas limitation may encourage developers to build elsewhere, leading to reduced tax revenue collected for the town.

One attempt to deal with this concern was the addition of an exemption for the Waldo-Durgin project in Brookline. The Waldo-Durgin project is a mixed-use development project that had already received a permit for construction referred to as a "Waldo-Durgin Overlay District Special Permit." The project would utilize natural gas infrastructure. This development was exempted because it was already subject to a Memorandum of Understanding with the town that specifically addressed energy efficiency requirements during its design phase (Special Town Meeting, 2019). Since the designs had already been completed and approved by the town, the exemption allows the development to move towards construction without further delay. Were it subject to Warrant

Article requirements, it would have required a complete redesign of the project that may have potentially made it non-viable.

Affordability

Housing affordability was only a minor part of the discussion in Brookline, though opponents argued that affordability was not discussed enough before the Warrant Article was adopted. According to the Warrant article proponents, the ban would be cost neutral to homeowners and, over time, the operating costs would be lower with an electric building system (Gellerman, 2019). In order to comment on this claim, a group of Massachusetts' natural gas, electric utilities and energy efficiency service providers (MassSave) conducted a cost comparison that was included in the proposal. This cost comparison found that a brand new all-electric home would be more expensive than a new home with natural gas by \$41 per month, less than 1% of the costs estimated for a new Brookline home, and could actually be cheaper if utilizing certain technologies (Jesse Grey, 2019). They found that using an electric ground source heat pump in single family homes would be cheaper than using an air source heat pump. Finally, the study also found that a new all-electric home would be cheaper than an existing natural gas home. However, it is worth mentioning that natural gas heat remains the overwhelming choice of consumers when purchasing a home in Massachusetts despite this price difference.

Since affordability affects homeowners, restaurants, and developers, there were several exceptions made to the policy that were added to the proposal in hopes of appeasing groups that expressed concern. To further understand these concerns and public opinion, Community Feedback Sessions in September and October were held by the Town's Sustainability Office and the Economic Development Advisory Board (Town of Brookline, Massachusetts, 2019). The October session featured a presentation that added clarity on how the proposal was edited to include exemptions for restaurants and buildings with large central hot water heaters (Grey et. al., 2019). They also clarified what sorts of renovations would be counted. However, additional clarification was requested as it was certain whether all renovations would be exempted. Similarly, it was made clear that there was no desire to completely exempt cooking appliances from the Warrant Article.

With respect to renovation projects, the proposal bans natural gas only in renovations with "Significant Rehabilitation." The original proposal defined a significant rehabilitation as "a renovation in which the work area, not including any added space, is more than 50% of the building floor area prior to the project" (Grey, 2019). This percentage was shifted to 75% renovation as to not inadvertently trigger the requirement in a smaller renovation project (Special Town Meeting, 2019).

As noted, Brookline is an old town and many of its 1990s homes have been updated recently and transitioned to natural gas heating. As these homeowners might have paid considerably to upgrade to natural gas, the Town Meeting wanted to ensure these homeowners would not be forced to pay for additional upgrades in the near term. To protect those who had just paid for major renovations

from upcoming costs, the Town Meeting decided the natural gas ban should only apply to new single-family homes or gut renovations. The Town Meeting found that decarbonizing in this manner, during new construction or major renovations, is by far the most cost-effective way to decarbonize (Grey, 2019).

Opposition Feedback

At the Community Feedback Sessions, citizens strongly voiced their support and there was not any opposition until days before the vote. Brookline is a small town and its policies are typically not on the radar of the rest of the region or country. The news of its discussion to limit natural gas was not even reported in the Boston Globe until about a week before it passed. Opposition did not emerge until late in the legislative process and, even then, most of the comments received were very generic and had already been discussed within the committees and feedback sessions.

While opposition was late to the discussion, there were interesting perspectives brought into consideration. National Grid, which provides natural gas to the town, says the proposal polarizes the policy conversation. It argued that the need to decarbonize the heating sector should not be viewed as an absolute prohibition on the continued use of natural gas in the short term and that the company's pipeline network has a role to play in a clean energy future, including carrying biogas derived from farms, landfill or human waste (Gellerman, 2019). The American Gas Association (AGA), also commenting later into the process, communicated the fear that prohibiting natural gas eliminates consumer choice, which can have broader economic repercussions. Additionally, AGA argued there are economic and environmental benefits to natural gas that were not adequately considered (D'Angelo, 2019). Stakeholders opposed to the Warrant Article also argued that a natural gas ban could lead to a surge of propane hookups and oil conversion, thus creating the opposite effect of increasing fossil fuel combustion and reducing environmental benefits.

Since the passage of the proposal in Brookline, opponents have expressed their opposition to the Massachusetts Attorney General. On February 27, a joint written objection was submitted by the Home Builders and Remodelers Association of Massachusetts, the American Petroleum Institute, NAIOP Massachusetts, the Massachusetts Energy Marketers Association, the International Council of Shopping Centers, the Greater Boston Real Estate Board, the Retailers Association of Massachusetts, the Massachusetts Association of Realtors, the Massachusetts Restaurant Association, and the Propane Gas Association of New England (Home Builders and Remodelers Association of Massachusetts, 2020). As many other towns and cities in Massachusetts are now considering a ban, this coalition wanted to put forth an argument that the Brookline bylaw conflicts with the State Building Code's purpose of creating a uniform standard of construction across the Commonwealth. While opponents may have been late to the discussion in Brookline, there has been increased organization of the opposition now that the issue has moved to the state level.

Section 5: Washington

The proposal in Seattle, Washington provides a different approach to natural gas legislation coming from a city with its own climate objectives that build off already ambitious state goals. The background on Washington, below, provides important context for the following case study on Seattle. This section will provide a deep dive on Seattle's political context and proposal development.

Section 5.1: Washington State Climate Objectives

The desire for a clean and efficient energy economy exists at all levels of government in the Evergreen State. In May 2019, Washington Governor Jay Inslee signed into law a suite of climate-focused legislation that displays the state's leadership (Energy & Environment, 2013). This legislation package aims to achieve a 25% reduction from 1990 CO₂ pollution levels by 2035. Goals include 100% clean electricity generation, increased EV adoption, reduced building emissions, and limiting hydrofluorocarbons. The Clean Buildings Act seeks to reduce emissions from the state's commercial buildings as they currently account for 27% of the state's carbon pollution.

Section 5.2: Seattle, Washington

Given the ambitious climate goals at the state level, Seattle is well positioned to implement local legislation to achieve ambitious GHG reduction targets. This section provides the background for the proposal of one of the most stringent natural gas bans in the country, the proposal process, and stakeholder reactions.

Section 5.2.1: Political Landscape

Seattle is the largest metropolitan area in Washington. Located in King County, Seattle has a population of roughly 608,000. The City Council consists of nine members, seven representing districts and two at large. The political landscape of Seattle is considered very liberal and progressive (Urbane Development, 2014).

Seattle has a long history of action on climate change-related issues, having first formally recognized global warming in 1992. In the subsequent decades, the city undertook a series of actions to reduce GHG emissions broadly and from buildings in particular. In 2001, the city directed its Office of Sustainability and Environment to inventory Seattle's GHG emissions and begin the process of reducing emission levels. Ten years later, the City Council adopted a resolution that set a goal to achieve net-zero GHG emissions by 2050. In 2013, it adopted the Seattle Climate Action Plan, which set a goal to reduce emissions from residential and commercial buildings by 32% and 45%, respectively, relative to 2008 levels. In 2017, the city reaffirmed its

commitment to GHG reduction by pledging to meet or exceed the goals of GHG reduction set forth by the Paris Agreement.

Compounded with Washington state's 25% CO₂ pollution reduction goal, Seattle's previous actions to mitigate climate change and its progressive population created an environment in which a natural gas prohibition might be considered and enacted. The idea has already gained traction in some form at the highest levels of Seattle's municipal government, with Mayor Jenny Durkan issuing an executive order in January 2020 that would prohibit the use of fossil fuel-fired systems and appliances in all new municipal buildings and require a study on the feasibility of retrofitting existing municipal buildings.

Section 5.2.2 Summary of Policy

The Seattle City Council originally drafted and proposed Council Bill (CB) 119640, which would prohibit natural gas piping systems in new buildings, in September 2019. The proposal prohibits the installation of natural gas piping systems in all new buildings, substantial renovations (where existing mechanical systems are removed and replaced), and any planned extensions to existing natural gas piping systems. The ordinance would apply to all building or mechanical permits for new construction, including for new detached accessory units, effective July 1st, 2020. The proposal includes exceptions for portable propane appliances. Additionally, CB 119640 includes a waiver process that provides up to one year of relief for certain infrastructure, such as commercial cooking appliances if it is determined that alternative electric appliances are unavailable (CB 119640, 2019). The proposal has not been changed since the original introduction. However, a robust set stakeholder of stakeholder opinions has emerged which will likely shape the end result.

Section 5.2.3: Review of Proposal Process

Original Proposal

In drafting the ordinance, the Council found that the use of natural gas in commercial and residential buildings accounts for 71% of the citywide building GHG emissions and 25% of the city's total GHG emissions. Furthermore, the Council cited the city's 2017 Preparing for Climate Change report and the Seattle Public Utilities 2019 Risk and Resiliency Assessment and Framework in creating a list of potential negative effects increased GHG emissions could have to the city and risks that continued natural gas use could pose to the health of Seattle's residents.

The original proposal included input from Seattle City Light, the public electric utility serving the city. The City Council staff reported that 90% of the electricity provided to the city by Seattle City Light, the city's public utility that provides the city's electricity, comes from low-carbon energy resources. They reported that moving the city's building stock from natural gas to electricity would not result in an equivalent increase in natural gas for electric generation to power those buildings. This current generation portfolio is unique to Seattle and allows for an electrification process that

does increase carbon footprint substantially, which may not be able to be replicated in another city with a more fossil fuel-dependent portfolio. Staff added that Seattle City Light expressed confidence it had the generation resources required to meet the increased load from electrified buildings, though there may be near-term constraints on transmission and distribution systems.

City Council staff also considered the potential impacts of the policy on city revenues, cost, and jobs. The Seattle Department of Construction collects approximately \$80,000 per year from the issuance of natural gas piping mechanic's licenses. This revenue would be forfeited if natural gas is eliminated from new construction. City Council staff also worked with the Seattle Office of Economic Development to estimate the number of jobs in the city associated with natural gas plumbing, heating, and other applications that may be lost if the ordinance is enacted. The total number of jobs was estimated to be 5,500 across several industries, though staff noted that more work was needed to assess any potential jobs impact.

Current status of proposal

City Council members in favor of the ordinance intended to see it enacted quickly. The proposal was formally introduced on September 9th, 2019 and was immediately referred to the Sustainability and Transportation Committee for review. The committee held two different meetings to discuss the proposal and hear direct comments from stakeholders on September 10th and 17th, 2019. A vote on CB 119640 was originally planned for the September 17 meeting. However, the Sustainability and Transportation Committee received opposition to the ordinance, with stakeholders citing concern about the arguably rushed legislative process and anon-inclusive stakeholder engagement process, among other concerns. Following these public comments, it was determined that additional work was needed on the ordinance. The ordinance is now pending before the City Council's Sustainability and Renters Rights Committee (which replaced the now-defunct Sustainability and Transportation Committee). Though the Committee continues its work on the ordinance, there have been no formal changes to the introduced legislative text to date.

Section 5.2.4: Stakeholder Involvement and Impact

Stakeholder Engagement and Impact on Policy Development

While local climate advocates expressed support for the ordinance, a significant opposition effort emerged in Seattle that was not evident in the other cities explored in this report. This opposition movement was led by certain local electric and natural gas utilities, natural gas suppliers, and local industries that utilize natural gas in buildings.

Many of the opponents shared similar concerns about the proposal. One of the primary concerns from stakeholders opposed to the ordinance was that the City Council was moving too quickly to enact the ordinance without thoroughly considering the potential impact on building costs, jobs, and electricity supply. We spoke directly with two groups that publicly opposed the ordinance –

the Building Owners & Managers Association of Seattle/King County and the Seattle/King County Realtors Association. Both groups had similar concerns about a rushed process that did not fully consider the long-term effects on housing supply, consumer choice, and building cost. Labor stakeholders also voiced their displeasure, suggesting that their industries were not consulted in the legislative process that might ultimately displace their jobs. Lastly, several of the large utilities in the area have expressed opposition to the ordinance citing a potential loss in revenues that would result from the ban. A group of gas utilities and suppliers are actively forming a coalition called “Partners for Energy Progress,” which also includes unions, businesses, and consumer groups opposed to the ordinance. Puget Sound Energy and Cascade Natural Gas, in particular, are vocal opponents of the proposal (Bernton & Beekman, 2019).

These concerns were made evident during both the September 10 and September 17 meetings. Below are two graphs summarizing the public reasons for supporting or opposing the ordinance.

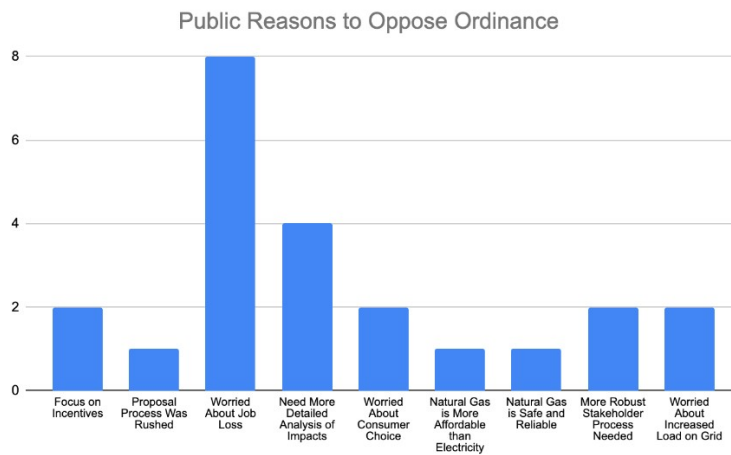


Figure 12: Public Comments Opposed to Seattle Natural Gas Policy (Derived from Seattle Sustainability and Transportation Committee Video)

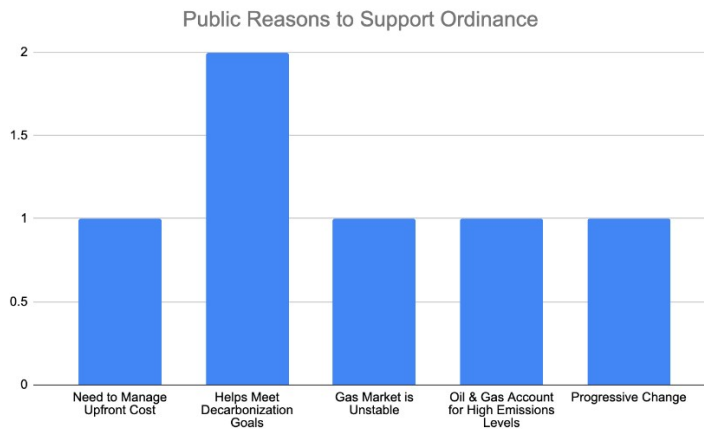


Figure 13: Public Comments Supportive of Seattle Natural Gas Policy (Derived from Seattle Sustainability and Transportation Committee Video)

Figures 12 and 13 show the opponents of the ordinance are in the majority and there is consensus on the reasoning behind their viewpoint. According to the groups that spoke up in opposition to the proposal, the city moved too quickly and did not take the proper time for a study of the full implications of the ban, chief among them job loss. In order to increase public support for the ordinance, the city pledged to take these concerns seriously and ensure the voices of the community are heard.

Section 6: Analysis

In the course of our research and interviews there were common themes that were present across several municipalities which provide insight into how these policies developed and what debates may come up in future policies. These common themes included concerns about energy choice, reliability, cost, climate, public health and safety, housing affordability, and the deployment of alternative technologies. Within these common themes discussed throughout the case studies, there are significant differences in the arguments made by opponents and proponents of these policies which we further explain in the sections below.

Section 6.1: Common Themes During Policy Proposal Discussions

The debates around natural gas use in buildings varied between jurisdictions based on a number of factors including geography, political leaning, socio-economic status, and vulnerability to

climate impacts. However, several themes identified in the course of the case study research and stakeholder interviews serve to highlight the most important issues around these policies. This includes concerns about energy choice, reliability, cost, climate, public health and safety, and affordability.

This analysis is informed by observations from the case studies and comments received by the California Energy Commission. Figure 14 below describes the responses received on the proposed reach codes by the California Energy Commission. These comments apply to the entire range of California natural gas reach codes including full bans and incentive-based policies. They provide insight into the concerns surrounding the principle of limiting natural gas use in buildings rather than specific policy designs. While the comments are specific to California, as much of the policy action on this topic has been taken in this state, the comments can be used to inform other concerns that come up in other parts of the nation. Many of the comments are general, and not specific to California policy so can be used to inform understanding of the policies in general. In the following breakdown, the California comments set the stage, but we utilize findings from our case studies to elaborate on the common themes observed during policy proposal discussions.

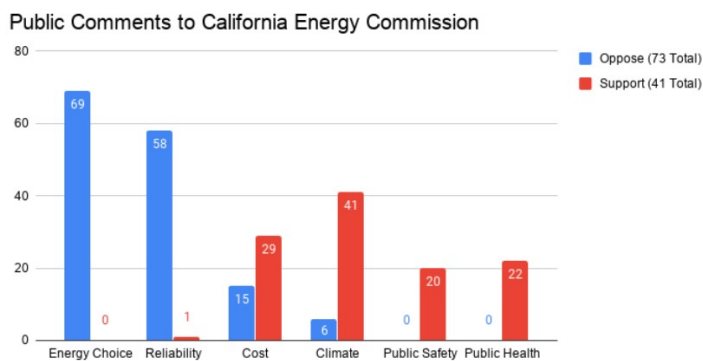


Figure 14: Public Comments to California Energy Commission on Reach Codes (California Energy Commission)

Section 6.1.1: Energy Choice

Concerns about energy choice are prevalent in the criticisms of natural gas limitation policies. These concerns are often connected to the continued use of natural gas stoves which many perceive to be superior to induction stoves. This has been addressed in some jurisdictions with the Berkeley planning divisions fact sheet on induction cooking as the prime example of cities seeking to address this concern. In Brookline, a cost comparison conducted during the proposal process found that monthly costs of a new all-electric home would be cheaper than an existing natural gas home.

Yet, despite this price difference, natural gas remains the overwhelming choice of consumers when purchasing a new home in Massachusetts. At least in Brookline, the market indicates there is a clear preference for natural gas even though its citizens widely approve the natural gas limitation policy.

The language around energy choice in this debate also reflects the value that Americans place on freedom of choice broadly with many disagreeing on principle that the government can mandate a certain energy source regardless of their personal feelings toward natural gas versus electric infrastructure.

Section 6.1.2: Reliability

One of the concerns expressed by interest groups and private citizens opposed to natural gas policies is the concern that overreliance on renewable electricity in the building sector will make the electric grid less reliable⁴ by increasing demand on intermittent energy resources. It would also make building systems more vulnerable to electricity shutoffs, which are particularly prevalent in California, although many modern natural gas appliances also require electricity to operate.

Concerns about reliability, however, can be mitigated by a diverse portfolio of renewable electric generation resources. In cities where grid decarbonization is already in progress, such as the municipalities included in our case studies, this is less of a concern.

Section 6.1.3 Cost

The public view of the costs of the policies are largely in line with their preexisting political leanings and it is difficult to determine which view of costs is more accurate given the limited adoption of electric infrastructure in these areas prior to these policies. Figure 15 shows how cost is reflected in public comments on electrification policies.

Supporters of natural gas limitations cite electrification as a cost-effective policy given the monetized benefits of GHG reductions and air quality improvements. Meanwhile, opponents argue that these policies

Opinions on Cost of Electrification Policies

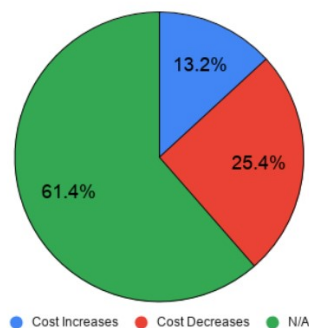


Figure 15: Public Opinion on Cost of Building Electrification (California Energy Commission)

⁴ Reliability is defined here as concern that over reliance on one energy source leading to service disruptions/monopoly price increases

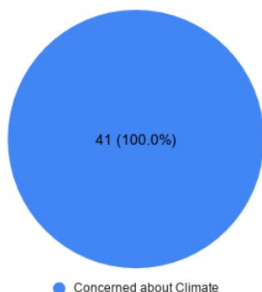
force developers and builders to incur additional costs and that electric buildings are more expensive to build. The positions taken by interest groups such as environmental groups and gas groups regarding cost reflect this divide.

Another important consideration related to costs and affordability of these policies is consumer costs related to electrification. As more consumers are removed from natural gas the cost burden on those remaining will increase. Opponents are also concerned that the increased demand on the electricity grid and the decrease in competition could potentially lead to higher electricity bills in these areas. The jurisdictions pursuing these policies tend to have a liberal political leaning and median income, so these consumer costs are not as high a concern as they may be in other locations.

Section 6.1.4: Climate

The climate arguments around natural gas limitation policies reflect views on the importance of climate mitigation policies and arguments of the effectiveness of building electrification as a mitigation strategy. Many of the opponents of natural gas limitations do not see climate mitigation as a priority while the majority of supporters argue climate mitigation is a top priority. The prevalence of these policies in California, arguably a leader in climate mitigation, reflects their communities' attitudes toward climate change.

Climate Concern among Supporters of Electrification



Climate Concern Among Opponents of Electrification

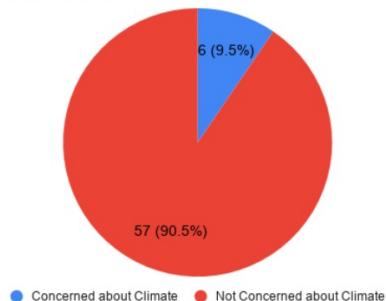


Figure 16: Climate concerns expressed by supporters and opponents of limiting natural gas in California

Figure 16 above shows climate concerns expressed by supporters and opponents of limiting natural gas in California. The supporters unanimously say they are concerned about climate reflecting the importance of climate mitigation to the argument for these policies. The climate concern among opponents of these policies is more nuanced with some expressing climate concern but still opposing limiting natural gas. This reflects the positions of several opposition citizens and interest

groups that recognize the importance of prioritizing climate change but do not see limiting natural gas use in buildings as an effective mitigation strategy. Natural gas is one of the least polluting fossil sources and opponents of these policies argue that the impact will be negligible and is offset by compliance costs and increasing regulatory burdens. Another major point against policies to electrify the building stock is that it shifts emissions from the building to the power sector. In the California jurisdictions pursuing limitations there is ample carbon free generation so this concern is not as pronounced. In other areas where energy production comes from fossil sources these policies may not have a net climate benefit.

In Brookline, Massachusetts, climate mitigation policies are also important. The town had already implemented policies to reduce fossil fuels and move towards building electrification prior to the passage of its natural gas limitation. As buildings account for 60-70% of the town's emissions, the natural gas limitation was rooted in its expected positive climate impact. Because of Brookline's progressive environmental political leanings, the positive climate impacts of the policy were at the foundation of why the natural gas limitation was brought into its consideration. But since most of the community was already in agreement about the climate impact, the policy discussion mainly focused on other areas.

Section 6.1.5: Public Health and Safety

Supporters of limitation policies also tend to see continued use of natural gas in buildings as a threat to public health and safety. Public safety is defined as risks from gas infrastructure (fire hazard). Public health is defined as air quality impacts on health. These issues are largely unaddressed by the opposition.

In Brookline, the issue of safety was brought up by drawing on examples of nearby natural gas related accidents that led to injury or death. The initial proposal also included details on the negative health impacts due to natural gas being used indoors. While these issues were part of the introduction and discussion of the policy, the details were not included in the final by-law that was passed by the Town Meeting. Still, it was a prevalent topic in early policy discussions.

Section 6.1.6: Housing Affordability

Throughout the case studies, the topic of how the transition away from natural gas impacts housing affordability was prevalent. In our research, this topic was part of discussion in several capacities. Specifically, it came up in reference to low- and middle-income housing, renovations costs, energy costs, and housing development costs.

It is important to note that cost analyses often come to various conclusions depending on who is conducting the study and how they are conducting it. Because of this discrepancy, it is difficult to project what the true costs will be to each given community. For example, in the Brookline case study, proponents of the natural gas limitation conducted a cost analysis and found that the

requirements would be cost neutral to homeowners and, over time, the operating costs would even be lower with an electric building system. Opponents, however, claimed that further analysis was necessary to know the full impact.

While exact costs are challenging to quantify, a few takeaways must be considered when discussing natural gas limitations. First, it is certain if there is any financial burden due to rising housing costs, it will be most strongly felt by low- and middle-income homeowners or home seekers. This is especially important to consider if proposed limitations include retrofit or renovation requirements. Additionally, any costs associated with natural gas limitations would also be felt by developers. An argument we observed in our case study is that increases to development costs due to natural gas limitations could disincentivize development. Higher costs may encourage developers to look to build in different cities where restrictions might not otherwise exist.

Section 6.1.7: Alternative Technologies

Alternative technologies are a critical part of the successful transition away from natural gas. This is evident in all case studies both in front of and behind the meter. On the generation side, in order to meet the decarbonization goals cited in the case studies renewables would need to be a larger part of the portfolio. The five case study cities are located in areas with progressive energy policies and favorable renewable portfolios. However, should a proposal come up in an area with a heavy non-renewable generation portfolio, the inclusion of more renewable generation should be a part of the conversation. This is due to the increased demand as a result of electrification. As communities shift away from natural gas, it is important for the electricity that replaces it to come from clean sources.

With the end user, a successful natural gas limitation relies on there being suitable alternatives for popular natural gas appliances in both homes and businesses. The most common place this comes up is in the kitchen. The transition away from gas cooking requires readily available technology as a replacement. The most common alternative is induction cooking. This technology is available and can serve as a replacement to gas cooking in some cities but may be harder to procure in others. Seattle, for example, includes waivers in its proposal such that commercial kitchens without the ability to find suitable alternatives can apply for a one-year waiver. Additionally, heat pumps are able to serve as a replacement for natural gas heating systems and are especially useful in colder climates such as New England. This technology alternative was cited in the Brookline case study as a favorable alternative to natural gas. In Brookline, local chefs argued that induction stoves were a dependable option for cooking. Similarly, architects who specialize in green building projects came in to testify to the viability of alternatives to natural gas heating.

Section 7: Conclusion

After completing our study, there were several clear contextual factors that impact the potential for natural gas limitations to gain traction within municipalities and impact discussion. To conclude our study, we will provide a final list of common contextual factors that impact the political environment throughout the proposal process. We then provide an overview of the various policy designs within our case studies and highlight the key differences between them. We end our conclusion with a brief outlook on the future of natural gas limitation policies.

Section 7.1: Contextual Factors

Our in-depth review of each case study municipality, as well as the broader range of cities that have enacted or are considering municipal natural gas infrastructure limitations, have yielded a set of common contextual factors impacting the political environment for these proposals:

Climate change-related concerns typically superseded other considerations during the policy development process. We found that municipalities considering natural gas limitations each viewed addressing climate change as a major concern and were concurrently pursuing other ambitious municipal actions to address emissions in other sectors. With exceptions, climate change-related justifications tended to outweigh potential concerns including near-term cost-effectiveness, consumer choice, and impact on jobs. Stakeholder groups representing impacted industries and workers in certain municipalities criticized the policy development process for a lack of inclusivity and lack of consideration for those concerns, achieving varying levels of success in terms of gaining substantive changes to policies.

A rapid legislative process may have contributed to a lack of organized opposition in certain cities. Cities moved quickly to propose and adopt these measures. We found that the public record in several of the cities we studied did not include robust or organized opposition to these municipal actions. Our research and outreach indicate that swift legislative processes may have contributed to a lack of significant media scrutiny and may have prevented significant opposition movements from coalescing. In Seattle, the impact of an organized opposition was apparent in the ultimate tabling of the proposal and commitment to revise it with additional input from affected groups, though it is unclear if similar movements would have been successful in other municipalities.

Limiting options for future residential construction was a primary concern for opponents of limiting natural gas. In cities with existing concerns about housing supply, stakeholder groups raised concerns about how a legislation on natural gas infrastructure would only exacerbate the problem. Realtors and builder association groups argued that eliminating natural gas would put strain on the availability of options for new residential housing. There is concern that this strain would drive up construction costs and disincentivize new construction, exacerbating the difficulty of access to affordable housing.

Whether local utilities are organized as single fuel or dual fuel utilities has a major impact on support of or opposition to policy. The utilities that supply electricity and/or natural gas to municipalities are likely to be among the most interested and impactful stakeholders involved in the development of these policies. Our research indicates that the structure of these utilities (all-electric, all-natural gas, or dual fuel) had a discrete impact on utility-sector stakeholder support. In particular, local dual fuel utilities are more likely to support these policies while all-natural gas utilities, in particular, are likely to vigorously oppose them. Those utilities stand to lose the most if natural gas is prohibited, with potentially stranded natural gas infrastructure assets and limited access to alternative revenue sources. Impacted utilities can be hugely influential in the legislative process and spend significant money on advocacy efforts, as was seen in Seattle.

Cooperative regional efforts were undertaken to mitigate potential market disadvantages between cities. Particularly in California, municipalities expressed a desire to be as environmentally ambitious as possible in their natural gas limitations. Regional efforts were undertaken among cities with similar interests to ensure that cities pursuing a natural gas limitation would not be put at a market disadvantage by pursuing more stringent policies than their neighbors and forcing development out of their jurisdictions.

State regulatory structures and legal restrictions can have an impact on the development of municipal policy. Our research indicates the degree to which municipalities are or are not restricted by state law and state regulatory authorities. In California, for example, the state Code of Regulations gives municipalities the flexibility to enact reach code ordinances exceeding the state's building energy efficiency standards under Title 24. Further, the California Energy Commission has encouraged municipalities within the state to exceed the base code and provided an array of resources to help them to do so. The same flexibility is not apparent in other states, even those that might have strong climate ambitions. In Brookline, for example, the legal validity of Warrant Article 21 is in question due to state utility regulation law preempting municipal ordinances. There is also emerging evidence that certain state legislatures are taking proactive action to ensure that state law preempts any municipal effort to disrupt natural gas utility service (DiChristopher, 2020).

Section 7.2: Policy Design

Each case study proposal aims to reduce the use of natural gas in residential and commercial buildings. However, several factors including political climate, governmental structure, and stakeholder input led to substantive differences between the proposed or enacted natural gas limitations in each city.

The primary policy difference between cities is their reach. All cities but Davis proposed a ban on natural gas infrastructure of some sort. Davis' proposal only requires higher efficiency standards for mixed fuel buildings, incentivizing electrification in favor of natural gas. These higher standards drove up construction costs for mixed fuel buildings but stopped short of prohibiting it

entirely. In the four other cities, there was variation on which building types the ban applied to. For example, San Jose's adopted reach code only prohibited natural gas in single family, low-rise residential, attached accessory dwelling units, and municipal buildings. Seattle's proposal is more far reaching and covers all new construction. Another factor differentiating each proposal is the exceptions they allow. Berkeley used CEC electrification modeling to determine which buildings its ordinance and supplemental reach code applied to. Any building not modeled by the CEC is not covered under the ban. In Brookline, the Town Meeting created a number of exceptions including backup generators, repairs deemed unsafe to remove natural gas infrastructure, and propane for outdoor cooking. To the extent to which they limit natural gas, figure 17 below shows the five case studies on a spectrum from least stringent to most stringent.

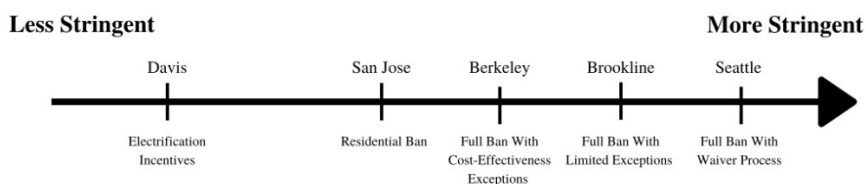


Figure 17: Stringency of Policy Design

Our review found that municipal natural gas limitation policies that have been formally proposed or enacted largely fall into three broad categories:

- Incentivizing building electrification but not entirely prohibiting natural gas;
- Incremental prohibition natural gas in new buildings by building type, or;
- Immediate prohibition of natural gas in all new building construction.

As noted previously, every city implementing a natural gas limitation policy also included exemption language tailored to political or other circumstances in that particular municipality. These exemptions were diverse in scope, covering entire building types or specifically exempting particular appliances, like popular natural gas cooking appliances for either residential or commercial use.

Section 7.3: Outlook

The momentum behind prohibiting natural gas infrastructure in cities will grow apace as municipalities continue to consider how to reduce emissions and address global climate change. However, it is important to note that the strategies undertaken by the municipalities included in this report are not necessarily indicative of the way that others may elect to pursue limitations on natural gas in the future. The contextual factors identified in this study, both political and

otherwise, will have an impact on the scope of future natural gas limitations and are likely to vary significantly from city to city. Where these case studies indicated an immediate desire to eliminate natural gas use as soon as possible, other cities may elect to take a longer-term approach to phase out natural gas the cities to give utilities, developers, and other interested parties more time to adjust to a new market signal. Moreover, formal opposition movements are more likely to emerge now that this issue is gaining attention at both the national and regional levels.

Having completed this study, we believe natural gas limitation proposals will continue to emerge and develop across the country. State and local governments are reaching into their toolkits for new and creative ways to mitigate their emissions and limiting natural gas use in buildings is an attractive option for cities with ambitious climate agendas. The five case studies in our report, as well others considered or enacted across the country, each present a unique strategy for limiting natural gas and accommodating the needs of a unique universe of stakeholders. As new proposals emerge, so too will new debates spur by the political circumstances in each city and the voices of stakeholder groups impacted by new policies.

Appendix A: Side-by-Side Comparison of Municipal Natural Gas Limitation Policy

			New Construction (* Indicates Electrification-Readiness Requirement)					Existing Buildings
Municipality	Status	Effective Date	Single-Family Low-Rise Residential	Accessory Dwelling Units	High-Rise Residential Hotels/Motels	Nonresidential Buildings	Public Buildings	Retrofit Requirement
California*								
Berkeley	In Force	1/1/2020	• All-Electric OR Mixed Fuel with EDR above 10*	• All-Electric	• All-Electric OR Mixed Fuel with EDR above 10	• All-Electric OR Mixed Fuel with 10% energy efficiency above base code • <i>Exceptions:</i> Laboratories, industrial and manufacturing occupancies	• All-Electric	No
Brisbane	In Force	2/20/2020	• All-Electric • <i>Exceptions:</i> Cooktops/fireplaces*		• All-Electric	• All-Electric • <i>Exceptions:</i> Life science occupancies, for-profit kitchen appliances		No
Campbell	In Force	2/20/2020	• All-Electric space/water heating					No
Cupertino	In Force	4/8/2020	• All-Electric		• All-Electric	• All-Electric • <i>Exceptions:</i> Fire, High-Hazard, Laboratory, “Essential Facilities”*		No
Davis	In Force	1/22/2020	• All-Electric Single Family OR Mixed Fuel with EDR above 9.5 • All-Electric Multi-Family OR Mixed Fuel with EDR of 10*					No

Municipality	Status	Effective Date	New Construction (* Indicates Electrification-Readiness Requirement)					Existing Buildings
			Single-Family Low-Rise Residential	Accessory Dwelling Units	High-Rise Residential Hotels/Motels	Nonresidential Buildings	Public Buildings	Retrofit Requirement
Hayward	Adopted	TBD	<ul style="list-style-type: none"> All-Electric 	<ul style="list-style-type: none"> All-Electric for ADUs less than 400 sq. ft. 	<ul style="list-style-type: none"> All-Electric OR Mixed Fuel with 10% energy efficiency above base code 	<ul style="list-style-type: none"> All-Electric OR 10% efficiency above base code, 15% for offices/retail 15% efficiency above base code for office/retail 		No
Healdsburg	In Force	2/20/2020	<ul style="list-style-type: none"> All-Electric Exceptions: Cooktops, fireplaces, pool/spa* 			<ul style="list-style-type: none"> All-Electric Exceptions: Cooktops, fireplaces, pool/spa, "Essential Services", technical processes* 		No
Los Gatos	In Force	2/20/2020	<ul style="list-style-type: none"> All-Electric Pre-wire for battery storage 	<ul style="list-style-type: none"> All-Electric Pre-wire for battery storage 				No
Marin County	In Force	1/1/2020	<ul style="list-style-type: none"> All-Electric OR limited mixed fuel pre-wired for induction and EE EDR above 3 OR mixed fuel total EDR above 10 		<ul style="list-style-type: none"> All-Electric or limited mixed fuel pre-wired for induction with 5% energy efficiency above base code OR mixed fuel pre-wired for induction with 10% energy efficiency above base code 	<ul style="list-style-type: none"> All-Electric or limited mixed fuel pre-wired for induction with 5% energy efficiency above base code OR mixed fuel pre-wired for induction with 10% energy efficiency above base code 		No
Menlo Park	Adopted	TBD	<ul style="list-style-type: none"> All-Electric space/water heating, clothes dryers Natural gas OK for cooktops/fireplaces* 		<ul style="list-style-type: none"> All-Electric 	<ul style="list-style-type: none"> All-Electric 		No

Municipality	Status	Effective Date	New Construction (* Indicates Electrification-Readiness Requirement)					Existing Buildings
			Single-Family Low-Rise Residential	Accessory Dwelling Units	High-Rise Residential Hotels/Motels	Nonresidential Buildings	Public Buildings	Retrofit Requirement
Mill Valley	In Force	4/8/2020	<ul style="list-style-type: none"> All-Electric OR limited mixed fuel pre-wired for induction and EE EDR above 3 OR mixed fuel total EDR above 10 		<ul style="list-style-type: none"> All-Electric or limited mixed fuel pre-wired for induction with 5% energy efficiency above base code OR mixed fuel pre-wired for induction with 10% energy efficiency above base code No 	<ul style="list-style-type: none"> Adds CalGreen Tier 1 		No
Milpitas	In Force	2/20/2020	<ul style="list-style-type: none"> All-Electric OR All-Electric space/water heating OR mixed fuel single family* with EDR above 10 and multifamily* with EDR above 11 		<ul style="list-style-type: none"> All-Electric OR mixed fuel with 6% energy efficiency above base code* 	<ul style="list-style-type: none"> All-Electric OR 14% energy efficiency above base code (mixed fuel office/retail) 6% All other mixed fuel nonresidential <i>Exceptions:</i> Industrial/manufacturing 		No
Morgan Hill	Adopted	TBD	<ul style="list-style-type: none"> All-Electric 	<ul style="list-style-type: none"> All-Electric 	<ul style="list-style-type: none"> All-Electric 	<ul style="list-style-type: none"> All-Electric 	<ul style="list-style-type: none"> All-Electric 	No
Mountain View	In Force	2/20/2020	<ul style="list-style-type: none"> All-Electric Single Family/Duplexes <i>Exceptions:</i> Cooktops/fireplace* All-Electric Low-Rise Multifamily <i>Exceptions:</i> For-profit cooking appliances 			<ul style="list-style-type: none"> All-Electric <i>Exceptions:</i> Fire/police occupancies, for-profit cooking appliances 		No

Municipality	Status	Effective Date	New Construction (* Indicates Electrification-Readiness Requirement)					Existing Buildings
			Single-Family Low-Rise Residential	Accessory Dwelling Units	High-Rise Residential Hotels/Motels	Nonresidential Buildings	Public Buildings	Retrofit Requirement
Pacifica	In Force	4/8/2020	<ul style="list-style-type: none"> All-Electric Single Family/Duplexes <i>Exceptions:</i> Cooktops/fireplace* All-Electric Low-Rise Multifamily <i>Exceptions:</i> For-profit cooking appliances 		<ul style="list-style-type: none"> All-Electric <i>Exceptions:</i> F,H, and L occupancies, for-profit kitchen appliances 	<ul style="list-style-type: none"> All-Electric <i>Exceptions:</i> Fire/police occupancies, for-profit cooking appliances 		No
Palo Alto	In Force	2/20/2020	<ul style="list-style-type: none"> All-Electric OR mixed fuel with EDR above 10* 		<ul style="list-style-type: none"> All-Electric OR mixed fuel with 5% energy efficiency above base code* 	<ul style="list-style-type: none"> All-Electric OR mixed fuel with 12% energy efficiency above base code* 		No
Richmond	Adopted	TBD	<ul style="list-style-type: none"> All-Electric space/water heating, clothes dryers Natural gas OK for cooktops/fireplaces* All-Electric equipment upgrades/replacement 		<ul style="list-style-type: none"> All-Electric 	<ul style="list-style-type: none"> All-Electric <i>Exceptions:</i> Fire/Police, Life Sciences, for-profit kitchen appliances* No 		No
San Francisco	In Force	4/8/2020	<ul style="list-style-type: none"> All-Electric or mixed fuel with EDR above 14 		<ul style="list-style-type: none"> All-Electric OR mixed fuel with 10% energy efficiency above base code* 	<ul style="list-style-type: none"> All-Electric OR mixed fuel with 10% energy efficiency above base code* <i>Exception:</i> Laboratories, industrial/manufacturing 		No

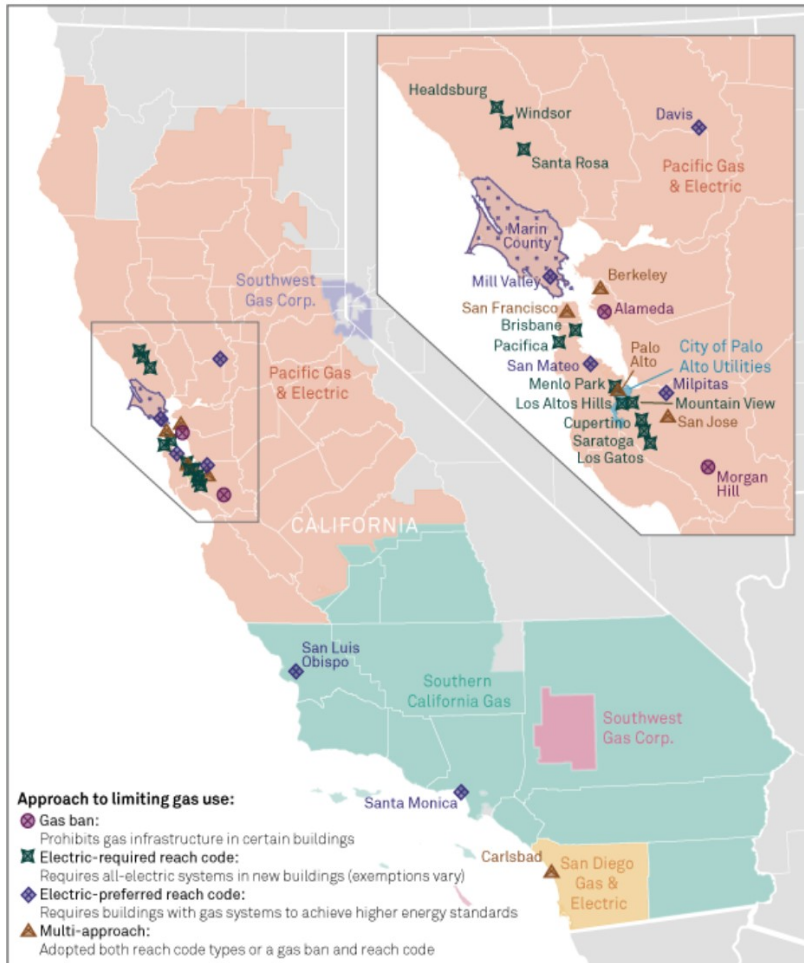
Municipality	Status	Effective Date	New Construction (* Indicates Electrification-Readiness Requirement)					Existing Buildings
			Single-Family Low-Rise Residential	Accessory Dwelling Units	High-Rise Residential Hotels/Motels	Nonresidential Buildings	Public Buildings	Retrofit Requirement
San Jose	In Force	1/1/2020	<ul style="list-style-type: none"> • All-Electric 	<ul style="list-style-type: none"> • All-Electric 	<ul style="list-style-type: none"> • Mixed fuel with 6% energy efficiency above base code* 	<ul style="list-style-type: none"> • Mixed fuel with 14% energy efficiency above base code (Office/Retail)* • Mixed fuel with 6% energy efficiency above base code (All Other) * • <i>Exceptions:</i> Industrial/manufacturing 	<ul style="list-style-type: none"> • All-Electric 	No
San Luis Obispo	Adopted	TBD	<ul style="list-style-type: none"> • All-Electric single-family OR mixed fuel with EDR of 9 • All-Electric low-rise multi-family with EDR of 9.5* 		<ul style="list-style-type: none"> • All-Electric OR mixed fuel with 9% energy efficiency above base code* 	<ul style="list-style-type: none"> • All-Electric OR: Mixed fuel office/retail with 15% energy efficiency above base code* • All other mixed fuel buildings with 5% energy efficiency above base code* 		No
San Mateo County	Adopted	TBD	<ul style="list-style-type: none"> • All-Electric 		<ul style="list-style-type: none"> • All-Electric 	<ul style="list-style-type: none"> • All-Electric • <i>Exceptions:</i> Laboratories, emergency operations, for-profit cooking appliances (approval required) 		No
Santa Monica	In Force	1/1/2020	<ul style="list-style-type: none"> • All-Electric or mixed fuel with CalGreen Tier 1 		<ul style="list-style-type: none"> • All-Electric or mixed fuel with 5% energy efficiency above base code 	<ul style="list-style-type: none"> • All-Electric or mixed fuel with 10% energy efficiency above base code 		No
Santa Rosa	In Force	2/20/2020	<ul style="list-style-type: none"> • All-Electric 					No
Saratoga	In Force	4/8/2020	<ul style="list-style-type: none"> • All-Electric space/water heating 					No

			New Construction (* Indicates Electrification-Readiness Requirement)					Existing Buildings
Municipality	Status	Effective Date	Single-Family Low-Rise Residential	Accessory Dwelling Units	High-Rise Residential Hotels/Motels	Nonresidential Buildings	Public Buildings	Retrofit Requirement
			• Natural gas OK for cooktops, fireplaces, clothes dryers*					
Windsor	In Force	2/20/2020	• All-Electric					No
Massachusetts								
Brookline	In Force	DATE	• All Electric • <i>Exceptions: Cooking appliances, backup generators, outdoor cooking and heating, large central hot water heaters. Waldo Durgin, laboratories and certain medical offices, repair unsafe conditions, waivers for financial infeasibility or impracticality</i>					No
Cambridge	Proposed	TBD	• All-Electric • <i>Exceptions: Physical infeasibility, public interest.</i>					No
Washington								
Bellingham	N/A	N/A	• All-Electric					Yes
Seattle	Proposed	7/1/2020	• All-Electric • <i>Exceptions: Authorizes Seattle Department of Construction and Inspections to promulgate rule for temporary waivers or other relief for up to one year. Waivers only permissible if alternative electric appliances are unavailable.</i>					No

Source: [California 2019 Adopted Reach Codes](#)

Appendix B: Map of California Reach Code

Building gas bans and all-electric reach codes passed in California
Natural gas utility service areas as defined by California Energy Commission



Data as of Feb. 4, 2020.
Map credit: Elizabeth Thomas
Sources: Building Decarbonization Coalition; Sierra Club; California Energy Commission

S&P Global
Market Intelligence

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