# Overcoming State-Level Preemption to Electrify New Buildings: a Philadelphia Case Study

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**Executive Summary:** The use of natural gas in heating and cooking negatively impacts environmental and human health. As government investments in clean energy production continue to increase, replacing natural gas appliances with electric alternatives is imperative to both reduce greenhouse gas emissions and protect public health. As a large US city with robust emissions reduction goals, Philadelphia, PA must significantly reduce natural gas use in buildings. However, many states, including PA, have advanced legislation that preemptively restricts municipalities from banning natural gas use. Using Philadelphia as a case study, we propose policy options, including electric appliance rebates, electrification incentives, and building efficiency standards, that US municipalities can pursue to circumvent state preemption laws in electrifying new construction, significantly reducing natural gas demand, and advancing their net-zero emissions goals.

## I. Limitations of natural gas and benefits of electrification

Natural gas (NG) was once considered a "bridge fuel" towards a net-zero emissions future because it produces less greenhouse gas (GHG) emissions than oil or coal (US EPA 2022). However, we now know that NG use has significant negative impacts on the environment and human health. About 2.3% of US-produced NG, which is composed of about 75% methane, leaks from oil and gas wells (Storrow 2020; Raimi et al. 2021). These leaks are at least as polluting as coal combustion because methane is 25x more potent than carbon dioxide at trapping heat in the atmosphere (US EPA 2022; Storrow 2020). Gas appliances, such as stoves, water heaters, and furnaces, release dangerously high levels of pollutants even when turned off (Seals and Krasner 2020; Lebel et al. 2022). Children in homes with gas stoves are 42% more likely to have asthma than those with electric stoves (Zhang et al. 2010; Lin et al. 2013). Gas stoves also release benzene, a known carcinogen that can cause leukemia (Michanowicz 2022). In the US, fossil fuels are used in around 70 million residential and commercial buildings for cooking and heating (Billimoria et al. 2018) and are responsible for 13% of national GHG emissions. Currently, 43% of U.S. households and 85% of Philadelphia households rely on natural gas heating (US EIA 2021; PGW 2022). A shift toward electric appliances would mitigate the negative effects of NG use on the environment and on human health.

Building electrification would improve the safety of households and businesses by mitigating the many risks of NG infrastructure, including leaks and occasional explosions (about 280 annually) that result in severe damages, injuries, and over a dozen annual deaths (Kawa 2015, Mall 2019).

A move away from NG can also be quite economical. Multiple studies have shown that electric alternatives to fossil fuel appliances have lower lifetime costs (Billimoria et al. 2018), especially when replacing an HVAC unit or a propane/heating oil system (Billimoria et al. 2018). Heat pumps can both heat and cool buildings by using the refrigeration cycle to transfer thermal heat, and are able to achieve efficiencies of 300%, compared to 80% efficient gas furnaces. We estimate that a typical heat pump has comparable or lower operating costs than a typical gas furnace (US EIA 2021). The wide adoption of highly efficient electric appliances (e.g., heat pumps, induction stovetops, electric water heaters) could reduce overall energy consumption by ~20% in commercial buildings and ~45% in residential buildings by 2050 (Larson et al. 2021). While electrification may increase demand for electricity, ongoing and future grid modernization and decarbonization investments will accommodate increased demand while maintaining reliability and stable rates (US DOE 2022).

For cities like Philadelphia, whose publicly owned gas utility manages gas distribution within city limits, decreasing NG use via planned electrification could save millions of dollars by reducing maintenance liabilities and stranded asset risks (Semieniuk 2022). While 61% of US electricity is still produced by burning fossil fuels (US EIA 2021), government investments in clean energy production continue to increase (US DOI 2022). The Biden administration aims to achieve net-zero emissions for electricity generation nationwide by 2035 (US DOS 2021), and the deployment of carbon-free electricity generation is accelerating rapidly (Sommer 2022; Barbose 2019). Combined with net-zero emissions electricity, building electrification will lead to considerable reductions in GHG emissions.

## II. Current landscape of electrification legislation

*i. Municipal electrification efforts*

Since Berkley, CA became the first US city to prohibit fossil fuel infrastructure in new buildings in 2019 (Raguso 2019), many cities have followed suit. Over 40 California municipalities and even cities in colder climates, such as New York City (NYC), have banned NG use in new buildings (DiChristopher 2021; City of New York 2021). Starting in 2024 in NYC, new buildings under seven stories must be fully electrified, except where building codes cannot be met without NG, such as in commercial kitchens. However, wiring must be installed for eventual electric appliances in these cases (Starkey 2022; DiChristopher 2021). When cities in Massachusetts passed electric-only building codes, existing state laws automatically preempted those codes (Wasser 2022). To facilitate the adoption of greener energy codes at the local level, the Massachusetts General Court subsequently removed those barriers (Massachusetts DOER 2022).

*ii. Electrification pushback*

As more cities across the US adopt bans on NG infrastructure in new buildings, NG lobbying against these efforts has increased. The American Gas Association (a trade group for gas utilities) leads a national lobbying effort, aided by single party dominance in many state legislatures, to preemptively block municipal electrification efforts (Caruso 2021; Mufson 2021). These state preemption laws preserve the ability of consumers to choose the type of energy used in buildings, effectively barring municipalities from banning NG (Leber 2021).

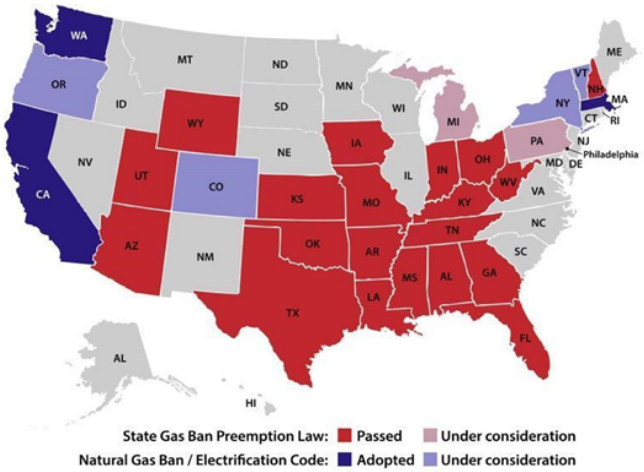


**Figure 1.** U.S map showing (in shades of red) states that passed preemption laws or are considering them in the current legislative session, and (in shades of blue) states where natural gas bans and electrification codes were adopted or are considered at either the state or local level. Source: CNN, S&P Global.

These laws represent a significant roadblock for climate efforts, with some critics arguing that they

impede cities and municipalities from managing their local affairs (DuPuis et al. 2018). Twenty states have already passed such legislation (Caruso 2021) (Figure 1). At the time of writing, there are pending bills in Pennsylvania (SB 275) and Michigan (HB 4575 and SB 820) (Figure 1) aimed at preventing local governments from advancing building decarbonization by prohibiting restrictions on utility services.

Fossil fuel interests have promoted "renewable" natural gas (RNG), methane harvested from landfills, sewers, and farms, over electrification as a more environmentally friendly alternative to conventional NG. Despite lobbying efforts and public relations campaigns to make RNG seem more attractive, RNG still poses significant environmental and health hazards when burnt because RNG and NG are chemically identical. Without large-scale investments in currently unproven technologies to produce RNG from captured carbon dioxide, RNG can meet only 1% of current NG demand (Grubert 2020), and thus, is not an alternative to electrification (Alexander 2020; Roberts 2020).

*iii. Current political landscape in Philadelphia*

Electrifying buildings in Pennsylvania would reduce its carbon emissions by 13.6 million metric tons over the next 30 years (Huxley-Reicher et al. 2021). At the time of writing, preemption legislation (SB 275) has passed both chambers of the General Assembly but has been vetoed by the governor. Were it to become law, SB 275 would ban municipalities in PA from restricting, prohibiting, or discriminating against a utility based on the energy source that powers it, meaning that municipalities would be legally blocked from limiting carbon emissions by mandating fully electric buildings.

## III. Policy options

Prohibiting the installation of fossil fuel infrastructure in all new construction would dramatically reduce fossil fuel use (Meyers 2020), but state preemption laws prohibit this option. While such laws can obstruct local electrification efforts, pathways for action remain open. Using Philadelphia as a case study, we propose actions that a municipality could adopt, regardless of whether state-level preemption laws are a concern. The proposed policies target building codes and incentives for the purchase of new appliances such as stoves, water heaters, and heat pumps.

*i. Option 1: Encourage purchase of electric appliances through market incentives*

Municipalities can end rebates for NG appliances and introduce rebates for electric appliances to encourage consumers to switch. These options would face limited opposition and represent an effective market-based approach for increasing uptake of electric appliances, though it may have limited impacts on overall fossil fuel use.

*a: Eliminate incentives for installing new natural gas appliances*

Philadelphia Gas Works (PGW), a municipally owned utility, currently offers customers up to a $500 account credit for converting from electric to NG water or space heating (PGW 2020). Philadelphia, and other cities offering similar incentives (directly or through a publicly owned utility), could remove them. By ending subsidies for NG appliances, this would reduce installation of NG appliances without requiring additional funds.

*b: Introduce retailer rebates for electric appliances*

Electric appliance rebates can be more cost-effective and impactful when offered to retailers (e.g., Costco, Lowe's) rather than to consumers (e.g., homeowners, contractors). Retailer rebates can be particularly effective when applied to products with limited market share, such as heat pumps and induction stovetops (Daughton 2019). Retailers taking advantage of rebate programs can then reduce prices, include more informative product displays, and increase stock of eligible products, which increases consumer demand for electric appliances. These programs can generate large market impacts, encouraging consumers to switch from NG to electric appliances, without requiring consumers to participate in traditional mail-in-rebate programs (Bickel et al. 2016; Quiad and Geller 2014). While administered differently from conventional rebates, retailer rebates are straightforward to implement due to support from EnergyStar (a government-backed energy efficiency program) (EnergyStar n.d.a).

*ii. Option 2: Encourage electrification through building codes*

Municipalities can apply building codes that promote electrification for new construction. Compared to requiring electrification, which would be prohibited by state preemption legislation, these options may face less stakeholder opposition but would also have smaller impacts on fossil fuel consumption.

*a: Electrification-ready codes*

These require that new construction be designed to readily convert to all-electric. Required installations may include electrical panels and subpanels with capacity to meet future electrical requirements (CA Energy Codes and Standards 2019). Although this regulation may increase some construction-related costs, and thus face opposition from contractors and building owners, it requires minimal deviation from business-as-usual construction practices, while ensuring low-cost switching to fully electric appliances in the future.

*b: Stretch codes*

Stretch codes are building codes which are more stringent than existing minimum building codes and can be either voluntary or mandatory (NBI 2020). When voluntary, stretch codes can be implemented by municipalities to evade prohibition by state preemption laws. These are commonly used to prepare stakeholders, such as building owners and contractors, for future mandatory code implementation (US EERE 2012). At the city level, Santa Monica, CA adopted a stretch code that requires all new single-family homes to use 15% less energy than the state of California mandate (NBI 2020). Voluntary stretch codes often have low compliance rates, but compliance can be increased through utility incentives, training, and education efforts. Adopting a voluntary stretch code could reduce overall building energy use and costs, decrease power system load, and help Philadelphia and similar cities to meet emissions reduction goals (NBI 2017).

*iii. Option 3: Require properties to meet minimum energy performance standards*

Philadelphia can define minimum energy efficiency requirements for all new construction via a benchmark based on the most energy-efficient existing multifamily residential and commercial properties (City of Philadelphia 2021). Philadelphia could define this benchmark through data it has already obtained from mandated disclosures of energy and water use by owners of existing large buildings (50,000 square feet and larger) (City of Philadelphia 2020). This approach has been successfully implemented by cities like Boulder, CO (City of Boulder 2020), which compelled landlords to meet minimum efficiency standards by any means, including improving insulation and installing electric appliances. Although this approach may increase construction costs and therefore face resistance from developers, it would dramatically reduce GHG emissions associated with new buildings in Philadelphia without explicitly banning the use of NG.

## IV. Conclusions

In an effort to decrease GHG emissions and meet climate goals, many municipalities have targeted policies to decrease the impact of new buildings on the climate. While NG appliances are commonplace in many American homes and businesses, their use has significant health and environmental impacts, whereas electrical appliances are more energy efficient, cost effective, and environmentally friendly. Therefore, electrification of new buildings is a powerful option available to municipalities for decreasing overall emissions. In municipalities where state laws preempt their ability to ban new NG hookups, several effective policy options remain, such as market incentives, building codes, and energy performance standards. By implementing these policies, municipalities can decrease the installation of new NG appliances and infrastructure, decrease GHG emissions, and take a critical step towards a carbon free future.

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