Navigating Building Decarbonization: Assessing Compliance Pathways and Legal Complexities

Mohammad Dabbagh, NORESCO
Rahul Athalye, NORESCO
Nikhil Kapur, NORESCO

ABSTRACT

To address climate change, a fundamental shift is imperative in building design and construction. Given the substantial energy consumption and greenhouse gas emissions of the buildings sector, reducing energy use in buildings is paramount for global climate objectives. This paper focuses on evaluating challenges and proposing solutions within energy code compliance pathways for both residential and commercial building decarbonization. Specifically, it scrutinizes the two main code compliance pathways: prescriptive and performance. The prescriptive pathway provides explicit requirements for building systems, materials, and equipment, offering a straightforward compliance approach but limiting design flexibility. Conversely, the performance pathway evaluates compliance through energy modeling simulations, fostering innovation but demanding a nuanced understanding of energy and decarbonization metrics. Both pathways confront multifaceted challenges, including federal preemption, cost-effectiveness, and market feasibility. This study analyzes these challenges and provides strategic approaches for effective mitigation.

Furthermore, the paper explores federal challenges, providing scrutiny of federal regulations that establish appliance energy efficiency standards and their implications for building decarbonization. Addressing these complexities furnishes valuable insights for effectively navigating federal legal challenges. This paper contributes to an enhanced understanding of energy code compliance pathways from the perspective of decarbonization and it equips policymakers, designers, and builders with knowledge of the current decarbonization policy landscape.

Simultaneously, this paper delves into the intricate legal landscapes of energy codes and standards at the state level, featuring illustrative case studies from diverse jurisdictions such as California, Washington, and Massachusetts. The exploration of these complexities aims to yield valuable lessons transferrable to other states, with a proactive approach to averting potential legal disputes.

Introduction and Literature Review

Introduction

Climate change necessitates a transformative shift in how we design, construct, and operate buildings. Buildings account for a staggering 39% of global energy use and 36% of associated CO2 emissions.[1] Decarbonizing the building sector is therefore crucial for achieving climate goals. Building energy codes have been shown to be incredibly effective at reducing

[1] https://www.iea.org/reports/global-status-report-for-buildings-and-construction-2019

energy consumption in new buildings and they are being used to achieve decarbonization and electrification objectives for new buildings by several jurisdictions. This paper delves into two key energy code compliance pathways for building decarbonization – prescriptive and performance-based – analyzing their strengths and limitations. The energy generation mix of a region significantly impacts the effectiveness of building decarbonization efforts. Studies have shown that as the share of renewable energy in the grid increases, the carbon intensity of electricity decreases, making electrification of buildings a more viable and effective strategy for reducing overall emissions. For instance, NREL's Electrification Futures Study found that widespread electrification, coupled with a high share of renewable energy, could drastically lower carbon emissions in the power sector by 2050.[2]

A successful transition to a low-carbon economy hinges on navigating the legal complexities surrounding decarbonization efforts. Bellantuono (Bellantuono 2019) emphasizes the importance of identifying and understanding legal pathways that support decarbonization. That study explored the impacts of institutional factors on implementing decarbonization strategies, highlighting the need for collaboration between federal, state, and local governments. Fisher provides a comprehensive overview of legal pathways for achieving deep decarbonization in the United States, with a specific focus on federal preemption and its potential to hinder state and local decarbonization initiatives (Fisher 2020). Oyewunmi et al. delve into legal and policy issues related to energy sector decarbonization, focusing on the reliability and security of sustainable energy systems, which is particularly important as building electrification increases (Oyewunmi 2020). Similarly, Drummond highlights the need for cost-effective decarbonization policies in the EU's power generation and industrial sectors, underscoring the importance of considering economic feasibility alongside legal frameworks (Drummond 2017). A recent report by the International Energy Agency (IEA) titled "Net Zero by 2050: A Roadmap for the Global Energy Sector" emphasizes the need for a clear and stable regulatory framework to incentivize building decarbonization efforts.[3] The report highlights the importance of aligning building codes with decarbonization goals and ensuring enforcement mechanisms are in place.

Literature Review

Legal considerations. Beyond legal considerations, a multidisciplinary approach is essential for effective building decarbonization (Ye 2023). Walker identifies barriers and potential solutions for home decarbonization, such as lack of homeowner awareness and financing limitations (Walker, Brennan and Casquero-Modrego 2022). Leibowicz presents an optimization model highlighting the importance of building electrification and appliance efficiency, alongside considerations for renewable energy integration (Leibowicz 2018). Additionally, the issue of non-compliance with low-carbon building regulations is calling for further research in areas like enforcement mechanisms and occupant behavior change strategies (Lu 2022). These studies emphasize the need for a holistic approach to energy codes and standards that considers technological advancements (e.g., renewable energy integration, energy-efficient materials), economic feasibility (e.g., cost-effectiveness of retrofits, financial incentives), and legal considerations (e.g., compliance pathways, federal preemption challenges).

Market feasibility. When it goes back to market feasibility, decarbonizing buildings presents substantial practical challenges due to both the vast number of existing structures and the

[2] https://www.nrel.gov/analysis/electrification-futures.html
[3] https://www.iea.org/reports/net-zero-by-2050

continuous construction of new ones. For existing buildings, significant upfront costs for retrofits, fragmented markets for clean technologies, and a lack of financial incentives create major roadblocks. Overcoming these hurdles requires financial assistance, streamlined access to qualified contractors, and innovative solutions with shorter payback periods. New construction faces the challenge of avoiding long-term emissions from inefficient designs, necessitating stricter building codes that emphasize energy efficiency and net-zero designs. Regulatory inconsistencies, outdated building codes, and cumbersome permitting processes further complicate efforts. Addressing these barriers through financial incentives, public-private partnerships, investment in research, regulatory alignment, and green financing can create a supportive market environment for decarbonization. Market feasibility could also be enhanced by support from utility companies; for instance, PG&E's new "Code Readiness" program invests in activities that increase market feasibility and accelerate the commercialization of necessary technology improvements to meet statewide goals.[4] Building design and construction practices hold significant potential for reducing carbon emissions (Bisset 2007). Integrating cleaner grid systems with a higher share of renewable energy generation is crucial in this regard, and compliance pathways like prescriptive and performance-based approaches play a key role. However, challenges such as federal preemption, cost-effectiveness, and market feasibility need to be addressed.

Prescriptive pathways. The prescriptive pathway in energy codes establishes clear requirements for building systems, materials, and equipment, offering a straightforward approach to achieving decarbonization goals (Lent 2008). This method streamlines compliance by providing developers and construction teams with a well-defined set of requirements. Building inspectors can readily assess adherence to these regulations, facilitating enforcement and ensuring a minimum level of performance.

However, inherent limitations exist with prescriptive pathways. Firstly, the prescriptive path does not always keep up with the recognition of rapidly developing advancements in building technologies leaving it outdated. Prescriptive requirements may inadvertently stifle innovation by locking stakeholders into existing technologies and levels of performance instead of encouraging exploration of potentially more efficient options. Secondly, achieving optimal energy efficiency for all building types and climates can be difficult with a one-size-fits-all approach. Building characteristics, local conditions, and occupant behavior all play a role in energy use, and prescriptive requirements may not adequately account for these complexities.

These limitations have spurred discussions around alternative approaches, such as goal-oriented (outcome-based) standards that prioritize achieving specific decarbonization targets while allowing flexibility in how those targets are met (C. L. Walker 2022). Finding the optimal balance between prescriptive and goal-oriented approaches will be crucial in crafting effective building decarbonization strategies for the future.

Performance-Based pathways. These approaches prioritize achieving specific energy cost savings targets (e.g., energy cost savings of the designed building vs. the set minimum baseline) but allow flexibility in how these targets are met. This fosters innovation and adaptation to evolving technologies but necessitates robust modeling and verification procedures. One key component of performance pathways is the use of energy modeling simulations. Advancements

[4] https://www.aceee.org/files/proceedings/2016/data/papers/5_615.pdf

in these simulations, particularly the integration of machine learning algorithms in performance-based building design, have significantly enhanced the assessment of compliance with decarbonization metrics (Wilde 2023). These simulations can dynamically evaluate building designs, allowing for optimization and more accurate predictions of energy use.

However, challenges remain in utilizing this approach effectively. Standardizing simulation methodologies across the industry is crucial to ensure consistent and reliable results. Additionally, concerns exist regarding the accuracy of predictions and the industry's adaptation to these techniques (Raslan 2010). Inconsistent implementation and enforcement strategies for performance-based codes and standards can create uncertainty and hinder their effectiveness.

By overcoming these challenges and leveraging advancements in building simulation technology, performance pathways hold significant promise for achieving building decarbonization goals. The flexibility and focus on outcomes can encourage innovation and unlock the potential of emerging technologies to create a more sustainable built environment.

A 2021 publication by the National Conference of State Legislatures (NCSL) titled "Building Energy Codes: A Key Tool for Decarbonization" discusses the benefits and drawbacks of both prescriptive and performance-based pathways. The report highlights the potential for hybrid approaches that combine elements of both methods to leverage their respective strengths.

Policy Landscape for Building Decarbonization in the US

The United States employs a fractured approach to decarbonize buildings, involving federal regulations, state and local initiatives, and economic incentives. Despite the fractured nature of actions taken at the federal, state, and jurisdiction level, the building industry as a whole, is moving towards building decarbonization, though significant challenges remain. For example, most energy codes primarily target new construction, and neglect to address the significant challenge of retrofitting existing buildings, which are major contributors to greenhouse gas emissions. To achieve significant reductions in greenhouse gas emissions, an approach that considers federal regulations, state and local initiatives, economic incentives, and social and political factors is needed. This strategy acknowledges the importance of addressing both new construction and the significant challenge of retrofitting existing buildings.

Federal Regulations

Department of Energy (DOE) sets minimum energy efficiency standards for appliances and promotes energy efficiency by supporting the development of energy-efficient building codes. These regulations indirectly promote building decarbonization by encouraging the use of cleaner energy sources and energy-efficient technologies.[5]

The Environmental Protection Agency (EPA) regulates emissions from the transportation and power plant sector. The EPA regulates refrigerants used in HVAC systems to reduce greenhouse gas emissions and oversees emissions from power plants, which indirectly affect building emissions. Additionally, the EPA's ENERGY STAR program encourages energy efficiency in products, homes, and buildings, contributing to overall emissions reductions. Lastly, the ENERGY STAR Portfolio Manager is a widely-used tool that helps building owners measure and track energy and water consumption, identifying opportunities for improvement.

[5] https://www.energy.gov/eere/buildings/appliance-and-equipment-standards-program

There are federal limits on efficiency for certain 'covered' appliances like chillers, boilers, furnaces, heat pumps, and other HVAC equipment, as well as water heaters, motors, etc. These standards act as both a floor and ceiling because states cannot require efficiencies higher or lower than the federal standard for covered products. As a result, states and local jurisdictions are forced to enact requirements that promote system level efficiency, instead of higher appliance efficiency in their codes. Such policies can promote building decarbonization. For instance, buildings adhering to the federal pre-empted code with a standard gas HVAC system might require significant envelope improvements to achieve energy targets. However, buildings that can install a more efficient heat pump-based HVAC system could achieve similar energy savings at a lower overall cost.

As a whole, however, federal preemption makes it more difficult for adopting jurisdictions to require and specify high-performance buildings because jurisdictions cannot mandate high-efficiency appliances (Edelson 2017) and because the energy code must provide a minimum efficiency gas pathway that severely limits what can be done to push decarbonization. While federal preemption imposes a bottom limit on equipment efficiency, it forces states and adopting jurisdictions to find more complex approaches to requiring higher efficiency and decarbonization measures, which gives rise to a host of new barriers. Some jurisdictions are currently testing the boundaries of federal preemption. If they are prevented from requiring less carbon-intensive equipment and federal standards remain unchanged, decarbonization efforts could face significant obstacles.

State and Local Initiatives

Building on the groundwork laid by federal regulations, many states have adopted stricter regulations than federal standards. California, for example, implements tighter appliance efficiency standards for certain appliances not covered by federal standards. Local initiatives further accelerate decarbonization efforts. New York state enacted All-Electric Buildings Law, which mandates electric heating and appliances in new buildings starting from 2026 to reduce greenhouse gas emission from buildings.[6] Local initiatives such as New York City's Local Law 97 (LL97) that mandates significant emissions reductions from large existing buildings (over 25,000 square feet) by 2030 and 2050 and Local Law 154 (LL154) that mandates a phased elimination of fossil fuel combustion in most new construction by 2027,[7] can be part of the solution towards building decarbonization. These proactive measures position states and localities as leaders in the transition towards a clean built environment, although legal hurdles remain to be addressed.

Economic Incentives

Passing of the Bipartisan Infrastructure Law (BIL)[8] and the Inflation Reduction Act (IRA)[9] have created a once in a lifetime opportunity for funding building energy codes, performance standards, and energy efficiency and decarbonization efforts across the industry spectrum. The Inflation Reduction Act (IRA) represents a significant development in incentivizing clean energy adoption. The IRA offers substantial tax credits for renewable energy

[6] https://nyassembly.gov/all-electric-buildings/?sec=home
[7] https://www.nyc.gov/assets/buildings/pdf/ll154.pdf
[8] https://www.fhwa.dot.gov/bipartisan-infrastructure-law/
[9] https://www.energy.gov/lpo/inflation-reduction-act-2022

installations (solar, wind, geothermal) and energy-efficient upgrades in buildings. These upgrades can target heating and cooling systems, water heaters, appliances, and building envelope improvements like insulation and windows. Importantly, the IRA prioritizes heat pump technologies - air-source and ground-source heat pumps - which offer significant efficiency gains compared to traditional gas or oil furnaces and water heaters. These tax credits can reach up to 30% of the project cost, making clean energy solutions more financially attractive for building owners and developers. The IRA also includes additional incentives for projects utilizing fair or union wages and those located in environmental justice areas, promoting both decarbonization and social equity.

The Biden administration has established ambitious national goals for emissions reduction, aiming for a 50-52% decrease by 2030 compared to 2005 levels. These goals serve as a guiding force for future federal policies.[10] In addition, significant legislative measures have been enacted to support these goals. The Bipartisan Infrastructure Law (BIL) provides substantial investments in modernizing infrastructure, including initiatives directly related to building decarbonization. This law allocates funds for energy-efficient building retrofits, weatherization projects, and improving the energy performance of public buildings. It also supports the deployment of clean energy technologies and the upgrade of the nation's power grid, which are essential for integrating renewable energy sources into buildings. Together with the IRA, these legislative actions create a comprehensive framework that not only aims to meet the 2030 emissions reduction targets but also paves the way for a sustainable and resilient energy future.

Social and Political Factors

The political landscape influences decarbonization efforts. The IRA is a product of the Biden administration's prioritization of climate action. Shifts in political power can impact future policies in this area. Growing public concern about climate change, particularly among younger generations, is pushing for stricter regulations and increased investment in clean energy solutions. This social pressure complements policy initiatives.

To summarize, the fractured approach that has arisen in the US includes federal regulations, state and local initiatives, and economic incentives to accelerate building decarbonization. Challenges remain, including ensuring the effectiveness of enforcement mechanisms, developing cost-effective retrofitting solutions for existing buildings, and maintaining public and political momentum for continued progress. In the next section, we will delve into the legal challenges and explore how they can be addressed to ensure the continued progress of building decarbonization efforts.

Legal Challenges Towards Decarbonization

This section outlines case studies where challenges to bans on natural gas use have faced legal hurdles. These cases illuminate the complexities of the legal landscape governing energy policy, particularly the interplay between local ordinances and federal regulations.

[10] https://www.whitehouse.gov/briefing-room/statements-releases/2021/04/22/fact-sheet-president-biden-sets-2030-greenhouse-gas-pollution-reduction-target-aimed-at-creating-good-paying-union-jobs-and-securing-u-s-leadership-on-clean-energy-technologies/

California

The 2022 California Energy Code requires heat pumps for space heating and water heating for single family and multifamily buildings in certain climate zones and requires single zone space conditioning systems in commercial buildings to be heat pump-based when they are below a certain size threshold. For the 2025 energy code, the California Energy Commission is proposing to require multizone space heating systems in commercial buildings to be heat pump-based also. In addition, a requirement that heat pumps replace single-zone rooftop air conditioners for end-of-life replacement projects for existing buildings is also being proposed as part of the 2025 energy code. There are 70 jurisdictions in California that have all-electric building ordinances in place.[11]

However, the legal challenges to banning natural gas in buildings in California are complex and multifaceted. For instance, a number of jurisdictions have enacted restrictions banning natural gas in new construction projects, including Cities of Berkeley, San Francisco, and Los Angeles. In the following, a case study is presented for Berkeley.

The legal battle over Berkeley's ban on new natural gas hookups traces back to November 2019 when the California Restaurant Association (CRA) filed a lawsuit against the city.[12] The CRA's objection stemmed from concerns about the ban's impact during electrical outages and its perceived ineffectiveness in advancing climate goals. The lawsuit challenged Berkeley's authority, arguing that the ban on natural gas infrastructure in new buildings was an overreach. Initially, in July 2021, a federal district court judge dismissed the lawsuit, affirming Berkeley's right to enact the ban as a measure to combat climate change.[13]

However, the CRA appealed the decision, leading to a pivotal ruling by a three-judge panel on the U.S. Court of Appeals for the Ninth Circuit. In a unanimous decision, the panel reversed the district court's dismissal, siding with the CRA's contention that Berkeley had exceeded its authority. The court's interpretation rested heavily on the Energy Policy and Conservation Act (EPCA), as argued by the three-judge panel, which preempted Berkeley's local regulations concerning natural gas usage. Specifically, the panel highlighted that the EPCA not only governed appliance regulations but also extended its purview to encompass building codes related to natural gas infrastructure. This ruling not only dealt a blow to Berkeley's ambitious climate initiatives but also raised broader implications for similar regulations in other cities facing similar legal challenges.

New York

New York state has passed aggressive laws to reduce building emissions and spur the development of all-electric buildings. However, fossil fuel companies, developers, and other industry groups filed a lawsuit against New York’s All-Electric Building Act. In New York, a coalition comprising construction trade groups has launched a legal challenge against the state's ban on gas stoves and furnaces in new buildings, citing violations of federal regulations governing gas appliances. Filed in federal court, the case contests Governor Kathy Hochul's approval of the ban, which is scheduled to come into effect gradually, starting in 2026 for

[11] https://buildingdecarb.org/zeb-ordinances

[12] https://www.calrest.org/sites/main/files/file-attachments/berkeley_lawsuit_-_press_release_-_final.pdf?1574374597

[13] https://www.jonesday.com/en/insights/2021/07/federal-court-dismisses-nepa-challenge-leaving-trumpera-regulations-in-effect-but-stalled-during-biden-reconsideration

buildings of seven stories or less and in 2029 for larger structures.[14] The ban, part of the state's efforts to reduce greenhouse gas emissions and improve indoor air quality, has sparked partisan debates over climate change, with Republican officials and opponents viewing it as an encroachment on consumer choice.

The legal action underscores broader concerns over the legality and implications of state-level energy policies in the context of federal regulations. The plaintiffs, including the National Association of Home Builders and the National Propane Gas Association, argue that New York lacks the authority to enforce its ban under the Energy Policy and Conservation Act (EPCA), a federal statute regulating energy consumption by appliances.[15] If successful, the lawsuit could set a precedent impacting similar gas bans across the country, including in New York City, with potential ramifications for national energy policy and local regulatory efforts aimed at reducing reliance on fossil fuels. The litigation also reflects tensions between state policies and federal statutes in addressing climate change and underscores the complexities of transitioning to cleaner energy sources while balancing economic considerations and environmental goals.

Washington

In Washington state, a coalition comprising trade associations, union representatives, businesses, and homeowners has renewed its legal challenge against the state's new building codes in Thurston County Superior Court. The coalition, led by the Building Industry Association of Washington (BIAW), has filed a second amended petition for declaratory judgment, contesting provisions of the building codes that effectively prohibit the use of natural gas.[16] Asserting violations of the state Open Public Meetings Act (OPMA) and Administrative Procedures Act (APA) by the Washington State Building Code Council (SBCC), the coalition argues that the SBCC lacked legislative authority to enact measures aligned with Governor Inslee's environmental agenda through building and energy codes.

This legal battle originated in February 2023 when BIAW and its allies filed a lawsuit in Thurston County Superior Court, alleging that the SBCC violated state rulemaking laws by approving costly new codes restricting the use of natural gas and propane in new construction. However, legal proceedings were temporarily halted as the SBCC postponed code implementation until March 15, 2024, to address federal court challenges.[17] These federal challenges were triggered by a precedent-setting decision from the Ninth Circuit Court of Appeals in April 2023, wherein the court ruled that federal law preempted the City of Berkeley's ban on natural gas piping installation in new construction. The court's ruling emphasized that the federal Energy Policy and Conservation Act (EPCA) expressly preempts state and local regulations regarding the energy use of natural gas appliances, including those used in households and restaurants, impacting the legal landscape surrounding energy codes not only in California but also in Washington state. Eventually, in November 2023, SBCC approved revised

[14] https://earthjustice.org/press/2023/new-york-advocates-respond-to-industry-lawsuit-against-all-electric-building-act

[15] https://citylimits.org/2023/11/29/efforts-to-block-gas-bans-across-the-nation-are-growing-will-it-work-in-new-york/

[16] https://www.biaw.com/wp-content/uploads/2024/01/BIAW-2nd-Amended-Petition-for-Declaratory-Judgement.pdf

[17] https://www.sbcc.wa.gov/news/revised-effective-date-2021-codes-march-15-2024

codes that incentivize builders to choose electric heat pumps but erase language mandating heat pumps for heating water and rooms in homes.[18]

Massachusetts

In 2019, Brookline, Massachusetts, marked a significant milestone by becoming the first municipality outside of California to enact a ban on fossil fuels in new construction.[19] This move, part of a broader trend among cities and towns, aimed to address the leading source of emissions from buildings by curbing the use of oil and natural gas through electrification. However, the Attorney General's Municipal Law Unit intervened in 2020, disapproving Brookline's ban on grounds of state law preemption. State law preemption means that state regulations take precedence over local laws, limiting the ability of municipalities to enact regulations that conflict with state policies. This legal framework ensures uniformity but can restrict local initiatives that aim to exceed state standards. Undeterred, Brookline attempted a new approach in 2021 with revised by-laws framed as requirements for building permits. Yet, this effort faced the same fate as the original ban, as the Attorney General once again deemed the by-law amendments preempted by state regulations. This situation highlights how state laws regarding zoning or natural gas use can act similarly to federal appliance efficiency mandates, limiting the ability of local jurisdictions to implement stricter measures.

However, amidst Brookline's legal challenges, interest in fossil fuel bans surged across Massachusetts, particularly considering that natural gas is the heating fuel for 1.4 million, or 51%, of Massachusetts households. This surge in natural gas usage spurred legislative action, with State Representative Tami Gouveia and State Senator Jamie Eldridge introducing a bill granting municipalities authority for all-electric construction without the need for individual home rule petitions. Eventually, a compromise was reached with the passing of An Act Driving Clean Energy and Offshore Wind in August 2022.[20] This legislation authorized a pilot program allowing up to ten municipalities to adopt fossil fuel-free building requirements. However, concerns arose over the lengthy implementation timeline and limited participation, prompting pressure from legislators and municipalities, including Boston, the state's largest city. While the delay may hearten opponents citing concerns about housing affordability, recent initiatives in Brookline and Boston highlight potential pathways toward fossil fuel-free building practices, underscoring the uncertain yet evolving landscape of Massachusetts' transition to cleaner energy solutions.

Summary of Challenges States Face in Decarbonization Efforts

As the case studies above illustrate, states across the US are encountering significant legal hurdles in their efforts to decarbonize buildings. These challenges often stem from conflicts between federal regulations and state/local initiatives aimed at restricting natural gas usage. Here's a breakdown of the key issues:

- **Federal preemption by the Energy Policy and Conservation Act (EPCA):** This federal law regulates appliance energy consumption. Court rulings have interpreted EPCA to extend to building codes that prohibit natural gas connections to buildings,

[18] https://www.sbcc.wa.gov/sites/default/files/2023-11/Johnson_Mod_EPCA_112223.pdf
[19] https://sites.bu.edu/dome/2023/08/11/the-push-and-pull-of-municipal-fossil-fuel-bans-in-massachusetts/
[20] https://www.mass.gov/info-details/municipal-fossil-fuel-free-building-demonstration-program

specifically when these codes prevent the use of otherwise lawful gas appliances. This interpretation led to a legal challenge against a ban on natural gas hookups in Berkeley, California, and may restrict similar regulations at least for states within the Ninth Circuit.

- **State law preemption:** States can also have their own internal legal battles. In Massachusetts, the Attorney General's office blocked a municipality's ban on fossil fuels in new construction due to conflicts with state regulations.
- **Challenges to state building codes:** Industry groups and others are contesting new state building codes that limit natural gas use in Washington state. These challenges hinge on the precedent set by a recent Ninth Circuit decision (CRA v. Berkeley) that raised concerns about federal preemption under the Energy Policy and Conservation Act (EPCA). Additionally, some lawsuits challenging similar local ordinances in California have cited violations of procedural laws, like the California Environmental Quality Act (CEQA),[21] even if they haven't resulted in successful strikes against the codes themselves. These legal maneuvers, however, can financially strain less-resourced jurisdictions, potentially leading them to withdraw their ordinances despite environmental benefits.
- **Concerns regarding affordability and consumer choice:** The bans on natural gas appliances have sparked debates over cost implications and potential limitations on consumer options, particularly for low-income residents. Critics argue that upfront costs for electric appliances and retrofits could disproportionately burden low-income households.[22] Additionally, concerns exist that limitations on natural gas appliances could restrict consumer preferences for cooking styles and functionality.[23]

These legal battles illustrate the complex legal landscape surrounding decarbonization efforts. While some states are exploring pilot programs for all-electric buildings, the path forward remains uncertain. Resolving these challenges will require navigating federal and state regulations while balancing environmental goals with economic considerations and consumer choice.

Potential Solutions for Decarbonization within Legal Frameworks

Despite the legal challenges discussed in the previous section, there are still pathways for states and localities to pursue building decarbonization efforts within the existing legal framework. This section explores potential solutions that leverage building codes and standards to achieve progress without preempting federal law, with a particular focus on promoting building decarbonization and electrification.

Update or remove NAECA preemption

A potentially significant solution lies in addressing the issue of federal preemption under the National Energy Conservation Act (NAECA). NAECA currently limits the authority of states and localities to regulate appliance standards, potentially hindering their ability to promote

[21] https://opr.ca.gov/ceqa/

[22] https://www.aceee.org/press-release/2024/05/report-electrifying-us-homes-can-save-96-billion-energy-costs-if-done

[23] https://thehill.com/changing-america/sustainability/energy/3702129-natural-gas-ban-threats-spark-fear-for-restaurants/

electrification within their jurisdictions. There are two main approaches to tackling this preemption:

- **Updating appliance standards:** The Department of Energy (DOE) sets minimum appliance efficiency standards under NAECA. Advocates for decarbonization argue that these standards should be strengthened to incentivize the development and adoption of more efficient electric appliances. This would create a national push towards electrification without directly regulating building codes.
- **Removing preemption:** A more ambitious approach would involve removing or weakening the preemption provisions of NAECA. This would allow states and localities to establish their own appliance standards, potentially exceeding federal baselines and accelerating the transition to electric appliances within their jurisdictions. However, achieving this legislative change would likely be a complex and politically charged process.

Electrification Strategies in Building Codes and Standards

Building codes and standards establish minimum performance requirements for new construction and, in some cases, renovations. While there are federal limits on equipment efficiency for certain classes of equipment and on removing products from the market, states and local jurisdictions can enact codes and standards that strongly promote electrification. Here are some specific strategies:

- **Electric-Ready measures:** Building codes can require new construction to be "electric-ready," meaning they have the necessary physical and electrical infrastructure to readily support future installation of heat pumps, heat pump water heaters, and photovoltaic systems (Franconi, et al. 2021). This prepares buildings for seamless future electrification without requiring immediate conversion.[24] One challenge to implementing electric-ready requirements has been demonstrating their cost-effectiveness, particularly when cost-effectiveness must be demonstrated, because readiness measures incur incremental costs but do not generate energy cost savings.
- **Performance-Based approaches with compliance options:** Performance-based codes specify the desired energy efficiency outcomes for a building but allow flexibility in how these outcomes are achieved. These approaches can include compliance options that provide a route for projects to meet or exceed code requirements through innovative approaches like central heat pump water heaters or cold climate heat pumps. This encourages innovation and adaptation to new technologies while ensuring buildings meet efficiency targets using low or zero carbon technologies.
- **Prescriptive requirements and performance baselines:** Building codes can take a hybrid approach, establishing heat pumps as a code requirement in some circumstances (prescriptive) while still allowing natural gas heating systems to be used in the performance approach. This strategy, exemplified by California Title 24, Part 6, allows for flexibility while promoting electrification. Similarly, performance-based approaches can establish heat pumps as a baseline system (California Title 24, WA State Energy Code), pushing projects towards electrification while still allowing alternative solutions to meet performance targets. However, it's important to note a potential limitation

[24] https://neep.org/sites/default/files/media-files/electrification_and_energy_codes.pdf

identified in Conditioning v. City of Albuquerque (2009).[25] This case found that a local building code could not solely rely on a performance pathway for achieving minimum-efficiency appliance standards.

- **Energy credits:** Building codes can incentivize electrification through achievement of energy credit points towards a required target level by building type (City of Denver,[26] New York,[27] IECC, Standard 90.1, and others). These credits are part of the prescriptive compliance path within these codes; builders must achieve enough credits to meet the overall energy efficiency target. While a performance-based compliance path may or may not utilize credits, the presence of an energy credit system within a prescriptive code allows builders to achieve efficiency levels exceeding National Energy Conservation Act (NAECA) minimums. As long as compliance can be achieved without exceeding NAECA standards in other areas, builders can leverage these credits to embrace electrification strategies.
- **System performance approaches:** Trade-off approaches, such as envelope trade-off in Standard 90.1 (Appendix C) have existed for a while. New system performance approaches for HVAC and service water heating (SWH) systems are being developed and adopted into national model energy codes as well as state and local energy codes. The total system performance ratio (TSPR) provides a convenient method to set the standard using heat pumps while allowing other systems to comply. This approach is being used in the newly developed New York Energy Code (yet to be adopted) and is also likely to be included in the next editions of the national model energy codes.[28] Massachusetts utilizes the Thermal Energy Demand Intensity (TEDI) for Office, School, and Residential use types and other adjacent building use types, which sets a budget for envelope performance.[29]

Incentivizing Electrification Beyond Building Codes

Building codes are just one piece of the puzzle. Here are additional strategies to encourage electrification:

- Financial Incentives and Rebates: States and localities can offer financial incentives and rebates to homeowners and businesses who electrify their buildings. These incentives can help offset the upfront costs of electric appliances and heat pumps, making them more attractive options.
- Standardized Building Energy Audits and Retrofits: Building energy audits identify areas for improvement in a building's energy performance. Standardized protocols for

[25] https://blogs.law.columbia.edu/climatechange/2010/10/12/federal-preemption-issues-for-green-building-ordinances-remain-unresolved-after-recent-ahri-ruling/

[26] https://denvergov.org/Government/Agencies-Departments-Offices/Agencies-Departments-Offices-Directory/Climate-Action-Sustainability-Resiliency/Cutting-Denvers-Carbon-Pollution/High-Performance-Buildings-and-Homes/Energize-Denver-Hub/Buildings-25000-sq-ft-or-Larger/Performance-Requirements/Flexibility-in-Compliance#section-1

[27] https://www.nyc.gov/assets/sustainablebuildings/downloads/pdfs/ll97_ab_report.pdf

[28] https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Programs/Energy-Code-Training/NYStretch-2023-Commmercial.docx

[29] https://www.mass.gov/doc/2023-stretch-code-technical-guidance-document-main-text/download

conducting audits can ensure consistency and reliability. Similarly, standardized approaches to building retrofits that prioritize electrification can streamline the process and reduce costs, incentivizing building owners to invest in upgrades.

- Existing Building Requirements: Building performance standards (BPS) for existing buildings can be established to encourage electricity-based space heating and water heating for alterations or replacements, particularly at the end-of-life of existing systems.[30] Preemption issues under the NAECA must be considered in this strategy, which focuses on electrification opportunities during natural upgrade cycles. This strategy focuses on electrification opportunities during natural upgrade cycles. BPS standards typically set targets for energy consumption or greenhouse gas emissions and requires building owners to demonstrate compliance through measurement and reporting. Additionally, layering energy codes with BPS can drive electrification more effectively. For instance, Energize Denver's ordinance [31] does not require space or water heating electrification to meet BPS targets, but it mandates that space and water heating equipment be replaced with electric-based systems at the end of their life. This dual approach ensures that building owners are held to electrification standards during upgrades for compliance with BPS targets.

Conclusion

This study explored the multifaceted challenges and opportunities inherent in building decarbonization. A critical evaluation of two key compliance pathways – prescriptive and performance-based – revealed their strengths and limitations within the legal landscape currently in place. The analysis reviewed the various challenges to decarbonization policy, including federal preemption, cost-effectiveness, and market feasibility. In-depth case studies from California, New York, Washington, and Massachusetts served to illuminate the legal complexities surrounding decarbonization efforts. These case studies highlighted the challenges posed by federal preemption, particularly the Energy Policy and Conservation Act (EPCA), and state law preemption. Additionally, concerns regarding affordability and consumer choice were identified as significant, non-legal roadblocks.

Despite these legal hurdles, the paper explored potential solutions for decarbonization that could be implemented within existing legal frameworks. Specific strategies focused on building codes and standards, electrification measures, and optimizing existing buildings for electrification were outlined. Additionally, innovative code approaches adopted by some states to navigate federal limitations were presented. By implementing these solutions and addressing affordability and consumer choice concerns, noteworthy progress can be made towards achieving building decarbonization goals.

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