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NEW YORK CITY'S BUILDING EMISSIONS LAW SHOWS THE IMPORTANCE OF ECONOMYWIDE CLIMATE POLICY

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Introduction

Regulations of greenhouse gas emissions, which are global pollutants, should ideally be coordinated across broad geographic and economic scopes. That way, climate policies can capture important interactions across sectors and borders. However, the United States has repeatedly failed to implement national and economywide climate legislation. That failure has led to an increasing focus on climate actions that are much narrower in scope: sector-specific regulations from subnational governments.

A prominent recent example is New York City's Local Law 97, which limits carbon dioxide (CO_2) emissions from a large segment of the city's residential and commercial buildings. This law is among the most ambitious building emissions regulations in the world, but this commentary focuses on a concern with the design of Local Law 97. The law does not account for the planned decarbonization of the local electricity grid over the next decade, and thus fails to sufficiently encourage a shift from fossil fuels to electricity (or "electrification"), a critically important strategy for achieving a low-carbon building sector. Such a narrow focus is common for sector-specific climate regulations.

The following sections explain the importance of electrification to deep decarbonization and the failure of building regulations to encourage it, focusing on New York City's Local Law 97. Fortunately, solutions to the overly narrow focus of the New York City buildings law are readily available, including via New York State's comprehensive climate strategy, which can align climate action across economic sectors within the state.

Fuel Switching in Buildings Is Critical to Deep Decarbonization Plans

Residential and commercial buildings consume significant amounts of energy for heating, cooling, lighting, and other needs. Buildings are the source of nearly 40 percent of CO_2 emissions from the US energy system,[1] and well over half of New York City's emissions,[2] accounting for both electricity and the direct use of fossil fuels.

The following three major strategies are key to achieving deep emissions cuts in the buildings sector:[3]

1. Cutting energy waste, through greater efficiency and conservation, so the same services can be provided with fewer resources and emissions.
2. Decarbonizing the electricity system, which is responsible for over 70 percent of building sector emissions in the United States.
3. Switching to cleaner fuels, like clean electricity, to reduce emissions associated with the direct burning of fossil fuels (e.g., for space and water heating).

All three strategies are critical. With deep decarbonization as the end goal, fuel switching is perhaps the most important strategy for building regulations to pursue. After all, decarbonizing the electricity system is outside the scope of building regulations because buildings receive whatever power is available from the electricity grid. And cutting energy waste is valuable but limited, because only so much energy is "wasted." A carbon-free building sector cannot be achieved without a massive switch away from the direct usage of fossil fuels in buildings.

While opinions differ about the degree to which a carbon-free building sector should or will be *electrified*—as opposed to a shift to other potentially clean fuels like renewable natural gas and hydrogen—prominent studies on the decarbonization of the US energy system typically show electrification as a primary approach to shifting away from fossil fuels, including a wide-scale shift to electric heat pumps to satisfy heating needs.[4]

Achieving the rapid decarbonization of buildings is difficult for numerous reasons. Take space heating, which is responsible for about one-tenth of CO_2 emissions from the US energy system. About half of US floor space is currently heated with systems that directly burn fossil fuels like natural gas and oil.[5] The market shares of electric heat pumps are quite low in many parts of the country—under 5 percent in the northeastern United States, for example[6]—so consumers often do not even consider heat pumps when their furnace breaks. Moreover, furnaces can last 20 years, so only a small percentage of people buy new equipment every year. So, unless widespread fuel switching begins *soon*, the prospects for a decarbonized buildings sector by mid-century are slim.

NYC Buildings Law Does Not Directly Encourage Fuel Switching

In 2019, the New York City Council passed the Climate Mobilization Act, landmark legislation with the goal of reducing greenhouse gas emissions from residential and commercial buildings by over 80 percent by 2050.[7] The most significant piece is Local Law 97, which places increasingly stringent limits on carbon dioxide emissions per square foot in buildings greater than 25,000 square feet (60 percent of the city's building area).

Local Law 97 requires emissions reductions of 40 percent below 2005 levels by 2030 (a 26 percent cut from today's levels).[8] Building owners can comply either by reducing their own emissions, by purchasing credits for renewable energy, or by purchasing offsets, and the city is exploring an emissions trading program that could further improve the policy's cost-effectiveness.[9]

Each building's emissions will be calculated by applying a "carbon-intensity factor" to different sources of energy. The carbon-intensity factors that apply to energy use in the 2020s are displayed in Table 1.[10] For example, for natural gas, the carbon-intensity factor is 0.0531 kilograms of CO_2 per thousand British thermal units, reflecting the amount of CO_2 that is released into the atmosphere from the combustion of natural gas.

For electricity, the carbon-intensity factor is inherently more complicated, because electricity is produced with many different fuels. For compliance years during the 2020s, Local Law 97 uses a higher rate for electricity than for any other fuel source—0.0847 kg of CO_2/kbtu—which reflects the carbon intensity of the local electricity grid.

Table 1: Carbon-intensity factors for emissions sources in Local Law 97 in the 2024–29 compliance period

Energy source	Carbon-intensity factors (kg of CO_2e per kbtu)
Electricity (NYC)	0.08469
No. 4 fuel oil	0.07529
No. 2 fuel oil	0.07421
Natural gas	0.05311
District steam	0.04493

Source: Urban Green, https://www.urbangreencouncil.org/content/nyc-building-emissions-law-frequently-asked-questions

One key reason the carbon-intensity factor for electricity is the highest of all fuel sources is that Local Law 97 takes *historical data* on the carbon intensity of the electricity grid—from 2018—and applies that same carbon intensity to emissions from electricity through the end of the 2020s.[11] In other words, buildings will be regulated in 2029 based on the carbon intensity of the New York City-area grid in 2018. Fossil fuels accounted for just over 60 percent of New York City-area electricity generation in 2018, but both New York City and State plan to rapidly decarbonize their electricity systems in the 2020s: state law requires the grid to be at least 70 percent renewable by 2030.[12]

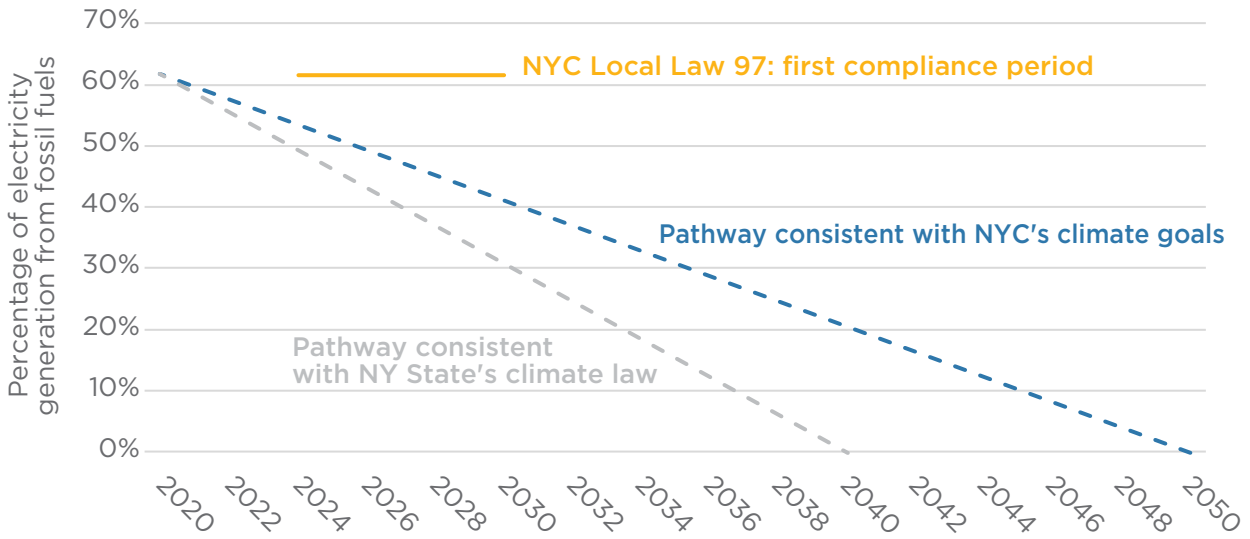
From the perspective of a policymaker narrowly focused on New York City, an urban setting where some the challenges of building electrification mentioned above are heightened, it is easy to understand the logic of relying on historical data. Forecasting is difficult, and it inserts subjectivity into a policy. While the electricity grid has been getting cleaner in recent years, the single largest source of clean electricity for New York City is the Indian Point nuclear power plant, which is scheduled to retire by April 2021.[13] In fact, Local Law 97 could have selected an even *higher* carbon-intensity factor for electricity if it had based the figure on the marginal sources of electricity, which is natural gas most of the time,[14] instead of on the average sources of electricity (which includes the carbon-free generation).

However, when viewed in the context of the city and state's climate plans, the problem with assuming a static electricity grid becomes clear. Building emissions are naturally just one part of a much broader effort to reduce carbon dioxide emissions from New York City. The city also aims to receive electricity from 100 percent clean sources by 2050.[15] Of course, a city does not fully control its electricity sources, so state plans and targets for the electricity grid arguably matter even more. New York State legislation requires the electricity grid to be 70 percent renewable by 2030 and 100 percent emissions-free by 2040.[16] An analysis commissioned by the New York State Energy Research and Development Authority (NYSERDA) shows a pathway to meeting the state's midcentury climate goals with over 80 percent of electricity provided by clean sources by 2030.[17]

Achieving the city and state's broader climate goals therefore requires the rapid decarbonization of the electricity system. That's why, for example, both the city and the state are committed to the 1000 MW Champlain Hudson Project, which will bring electricity generated using hydropower in Quebec to New York City.

Figure 1 displays the discrepancy between Local Law 97 and the (illustrative) pathways to achieving New York's electricity targets. The carbon-intensity factor in Local Law 97 assumes that fossil fuels will continue to contribute roughly 60 percent of NYC's electricity through the 2020s. In contrast, a pathway to a carbon-free electricity system by 2040 or 2050 would require the grid to be more (potentially much more) than 60 percent clean by 2030 if the city achieves a pathway consistent with the state's goals.

Figure 1: Fuel sources for New York City-area electricity system



Source: Authors' compilation

Local Law 97 does not provide building owners with sufficient incentives for fuel switching, even though such incentives are critical to decarbonizing the sector. Carbon-intensity factors that reflect the future decarbonization of the electricity grid would provide a much clearer signal to consumers of the benefits of electrification. Instead, consumers will be penalized for shifting from fossil fuels to electricity in the 2020s, at least for a given unit of energy (this caveat is important because electric appliances often provide energy savings compared to fossil fuel alternatives), which is antithetical to deep decarbonization goals.

If the city and the state successfully decarbonize their electricity systems during the 2020s, cost-effective opportunities to reduce buildings emissions via electrification will arise, but Local Law 97 is not designed to sufficiently encourage consumers to take advantage of those opportunities.

In essence, the carbon-intensity factors of Local Law 97 assume the failure to make progress decarbonizing the electricity system. However, failing to decarbonize the electricity system means the city and state will fail to achieve their climate goals, of which Local Law 97 is intended to be a centerpiece. It would make far more sense to align climate policies across sectors.

The Failure to Encourage Electrification Is Widespread

New York City's buildings emissions law may not be perfect, but neither are other jurisdictions' building regulations. Historically, regulations of residential and commercial buildings have typically focused on energy savings.

For example, while California is known as one of the leading US states for both climate and energy efficiency policies,[18] it only recently changed its energy efficiency rules to avoid perverse incentives related to electrification. This change only gives credit for the *energy savings* caused by fuel switching (which would also be implicitly credited under Local Law 97), and it does not explicitly encourage electrification.[19] (California is also in the process of developing legislation to reduce building emissions in response to legislation passed in 2018.[20])

At the city level, Boulder, Colorado implemented a successful performance standard for the efficiency of rental housing within the city in 2010, with over 97% of licensed rental units achieving compliance after a decade.[21] Other cities, including Washington, D.C. and St. Louis, Missouri, have also recently passed building energy performance standards that include ambitious targets for reducing energy use in new and existing buildings. However, none of these programs includes explicit incentives for electrification or other forms of fuel switching.[22]

This historical failure to encourage the electrification of buildings is a major reason why the process of decarbonizing the US buildings sector remains in the starting gates. Even in the South, where relatively moderate climates and low electricity prices create ideal conditions for heating buildings with electric heat pumps, more than three-quarters of the energy for space heating is provided by non-electric sources.[23]

All's Well That Ends Well in New York?

There are ways to fix the insufficient incentives for fuel switching in New York City buildings.

First, New York City may have opportunities to modify Local Law 97 to align with the city and state's power sector climate plans. For example, the Department of Buildings may have the authority to align the carbon-intensity factors with the expected annual decarbonization of the grid in the 2020s.[24] Local Law 97 also requires the creation of an advisory board to present recommendations on improved approaches. However, the advisory board report is not due until January 2023, which may be too late to make changes for the initial compliance periods.

A separate, and perhaps better, solution can come from above. New York State is taking aggressive actions to reduce greenhouse gas emissions across its economy. The Climate Leadership and Community Protection Act, passed in 2019, requires economywide emissions reductions of at least 85 percent below 1990 levels by 2050. The New York State Climate Action Council is currently preparing a strategy to enable the state to achieve its climate goals.

Ideally, that will include a carbon price or other cross-sectoral incentives (e.g., emissions standards) that aligns efforts across the economy. With incentives applied evenly to emissions sources throughout the energy system, fossil fuels would be regulated according to their carbon intensity. That way, when considering the purchase of a space-heating appliance, the building owner would automatically have an incentive to purchase the alternative that produces fewer emissions over the lifetime of the appliance.

To be clear, a cross-sectoral policy like a carbon price is no panacea—sector-specific regulations are critically important complements to cross-sectoral policies. But with a carbon price in place to provide the appropriate incentives for emissions reductions across the economy, sector-specific regulations can focus on overcoming separate barriers to emissions reductions.

In buildings, those additional regulations include targeted support for emerging electric appliances so they can compete on a level playing field with incumbent technologies.[25] New York is moving forward with plans to do just that. For example, earlier this year, New York State's Public Utility Commission authorized nearly half a billion dollars in spending to promote electric heat pump usage through 2025.[26]

Inefficiencies in energy use is another important barrier to emissions reductions—consumers notoriously fail to take advantage of many cost-effective opportunities to reduce energy use. As noted above, overcoming this barrier is the goal on which city building regulations have historically focused, and despite its label as a broader emissions law, reducing energy use is the main avenue by which Local Law 97 will reduce emissions as well. As a strategy to reduce building emissions in isolation, this exclusive focus on reducing energy use is problematic because it fails to encourage electrification and other forms of fuel switching. But, when surrounded by a comprehensive climate policy that both aligns incentives across sectors and provides targeted incentives for the electrification of buildings, the focus of Local Law 97 on reducing energy use is no problem at all.

Unfortunately, New York State is an outlier in terms of the ambition and comprehensiveness of its climate plans. Building emissions in most jurisdictions remain uncovered by a cross-

sectoral policy. These jurisdictions can learn from the failure of Local Law 97 to encourage fuel switching and take actions that align climate policies across economic sectors, which includes accounting for the expected decarbonization of the electricity system.

Notes

1. The White House, "United States Mid-Century Strategy for Deep Decarbonization," (2016), http://unfccc.int/files/focus/long-term_strategies/application/pdf/mid_century_strategy_report-final_red.pdf.
2. New York City Mayor's Office of Sustainability, "Inventory of New York City Greenhouse Gas Emissions," New York City Mayor's Office of Sustainability, https://nyc-ghg-inventory.cusp.nyu.edu/.
3. The White House, "United States Mid-Century Strategy for Deep Decarbonization."
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5. The White House, "United States Mid-Century Strategy for Deep Decarbonization"; Energy and Environmental Economics, "Pathways to Deep Decarbonization in New York State," Energy and Environmental Economics (2020), https://climate.ny.gov/-/media/CLCPA/Files/2020-06-24-NYS-Decarbonization-Pathways-Report.pdf.
6. Kaufman et al., "Decarbonizing Space Heating."
7. "All About NYC's Historic Building Emissions Law," Urban Green Council (2019), https://www.urbangreencouncil.org/content/projects/all-about-nycs-historic-building-emissions-law.
8. "All About NYC's Historic Building Emissions Law."
9. One of the authors of this commentary, Noah Kaufman, is a member of a committee that is providing feedback related to studies of a potential trading program for Local Law 97. See: https://www.urbangreencouncil.org/content/projects/global-climate-efficiency-trading-initiative.
10. "NYC Building Emissions Law: Frequently Asked Questions," Urban Green Council (2020), https://www.urbangreencouncil.org/content/nyc-building-emissions-law-frequently-asked-questions.
11. A second reason the carbon-intensity factors are higher for electricity is the losses associated with generation and distribution of electricity compared to the direct usage of fossil fuels onsite.

12. Jackson Morris and Miles Farmer, "Unpacking New York's Big New Climate Bill: A Primer," NRDC (2019), https://www.nrdc.org/experts/miles-farmer/unpacking-new-yorks-big-new-climate-bill-primer-0.

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14. David B. Patton et al., "2018 State of the Market Report for the New York ISO Markets," Potomac Economics (2019), https://www.nyiso.com/documents/20142/2223763/2018-State-of-the-Market-Report.pdf.

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17. Energy and Environmental Economics, "Pathways to Deep Decarbonization."

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23. Jeff Deason et al., "Electrification of buildings and industry in the United States: Drivers, barriers, prospects, and policy approaches," Energy Analysis and Environmental Impacts Division, Lawrence Berkeley National Laboratory (2018), http://ipu.msu.edu/wp-content/uploads/2018/04/LBNL-Electrification-of-Buildings-2018.pdf.

24. An amendment to Local Law 97, passed in April 2019, empowers the Department of Buildings to develop "time-of-use" carbon-intensity factors for electricity. While this amendment was passed for an entirely different reason—to reflect the changing carbon intensities of electricity throughout the day—it might provide an opportunity to simultaneously align the carbon-intensity factors with the expected annual decarbonization of the grid in the 2020s. Note that time-of-use carbon intensities could

potentially lead to higher carbon-intensity factors for electricity if it causes a shift in methodology from using average emissions rates to using marginal emissions rates. See Urban Green website at: https://www.urbangreencouncil.org/content/projects/all-about-nycs-historic-building-emissions-law.

25. Varun Sivaram and Noah Kaufman, "The Next Generation of Federal Clean Electricity Tax Credits," Center on Global Energy Policy (2019), https://energypolicy.columbia.edu/sites/default/files/file-uploads/NextGenTaxCredits_CGEP_Commentary_Final.pdf.

26. "Governor Cuomo Announces Additional $2 Billion in Utility Energy Efficiency and Building Electrification Initiatives to Combat Climate Change," NYSERDA (2020), https://www.nyserda.ny.gov/About/Newsroom/2020-Announcements/2020-01-16-Governor-Cuomo-Announces-Additional-2-Billion-in-Utility-Energy-Efficiency-and-Building-Electrification-Initiatives.

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