Economic Impact Statement

Office of Legislative Oversight

Bill 13-22 Buildings – Comprehensive Building Decarbonization

SUMMARY

The Office of Legislative Oversight (OLO) anticipates that enacting Bill 13-22 likely would have a net negative impact on economic conditions in the County in terms of the Council's priority indicators. By expediting the establishment of an all-electric building code for new construction and major renovations in the commercial and residential building sectors, the Bill would have short- and long-term impacts on *many* County-based private organizations and residents across *numerous* economic indicators. In general, the commercial building sector likely would be negatively impacted due to higher up-front costs and various risks (e.g., uncertain relative energy prices and lower than anticipated energy savings), which would increase the likelihood of certain market actors receiving a net negative return on their investment in building electrification. In contrast, the residential building sector likely would experience lower up-front costs, thereby increasing the likelihood of net positive returns to certain market actors. Ultimately, however, OLO believes the Bill's overall impact on economic conditions in the County would be negative. The primary reasons being that the change in building code has the potential to reduce, both, private sector capital investment and the County's competitiveness in the commercial building sector.

BACKGROUND

In response to the climate emergency, the County has committed to an 80% reduction in greenhouse gas (GHG) emissions by 2027 and 100% elimination by 2035.[1] Commercial and residential buildings are a primary source of GHG emissions in the County. In fact, commercial and residential energy consumption accounted for 50% of emissions in 2018.[2]

Consistent with the County's climate goals, Bill 13-22 aims to accelerate the electrification of buildings in the County's commercial and residential sectors to reduce their GHG emissions.[3] The Bill would attempt to do so by changing the County's building code. Specifically, it would require the County Executive to issue Method 2 regulations[4] establishing all-electric building standards for new construction, major renovations, and additions no later than January 1, 2024.[5] All-electric building standards would prohibit combustion equipment reliant on fossil fuels and plumbing for combustion

[1] Montgomery County Council, Resolution 18-974; and Montgomerycountymd.gov, Montgomery County Climate Action Plan.
[2] Montgomerycountymd.gov, Montgomery County Community Wide Greenhouse Gas Emissions Inventory.
[3] Elrich and Riemer to Albornoz, Memorandum.
[4] Montgomery County Code, Sec. 2A-15.
[5] Bill 13-22.

equipment within a building and building site and require non-combustion technologies, such as air-to-air, water source, and geothermal heat pumps.[6]

Bill 13-22 would cover a significant portion of residential and commercial buildings in the County. Exempted from the all-electric building standards would be emergency systems, buildings used for electric or steam power generation by a utility regulated by the Maryland Public Service Commission, and buildings used for manufacturing, crematories, life sciences, and commercial kitchens. Income-restricted housing projects and public or private schools would not be subject to the standards until January 1, 2026.

INFORMATION SOURCES, METHODOLOGIES, AND ASSUMPTIONS

Per Section 2-81B of the Montgomery County Code, this Economic Impact Statement offers OLO's assessment of Bill 13-22's impacts on County-based private organizations and residents in terms of the Council's priority economic indicators.[7] This statement also discusses whether the Bill would likely result in a net positive or negative impact on overall economic conditions in the County.

Specifying the Impact

By establishing all-electric building standards for new construction and major renovations, Bill 13-22 primarily would impact economic conditions through two effects:

(1) Electrification of new or existing buildings that otherwise would have been constructed or retrofitted as a mixed-fuel buildings in the absence of the change in building code.
(2) Construction or retrofitting of buildings that only would (or would not) occur in the absence of the change in building code.

It is important to note these effects likely would not occur indefinitely, as enacting Bill 13-22 likely would "accelerate," or expedite, the establishment of all-electric building standards in the County.[8]

Bryan Bomer, the Sustainability, Energy, and Mechanical Manager with DPS, anticipates the International Code Council and the state will adopt all-electric building codes by the decade's end. State law requires each jurisdiction in Maryland to comply with the International Code Council's building energy framework, the International Energy Conservation Code (IECC).[9] The latest IECC provides "optional requirements aimed at achieving net zero energy buildings presently and by 2030."[10] Future frameworks could require net zero energy buildings. Moreover, Maryland lawmakers have put forth

[6] Energy.gov, Heat Pump Systems.
[7] Montgomery County Code, Sec. 2-81B.
[8] Elrich and Riemer to Albornoz, Memorandum.
[9] Maryland.gov, "International Energy Conservation Code."
[10] Iccsafe.org, "A New Day in Advancing Energy Efficiency."

legislation that would require new residential and commercial construction to use all-electric power, as recommended by the Maryland Commission on Climate.[11] In anticipation of changes to the IECC and State building codes, Bomer and his team have outlined a process through which the County could transition to all-electric building standards by 2029 across upcoming building code cycles.

Based on these indications, OLO makes the following assumption in this analysis:

> By 2029, County building code otherwise would include all-electric building standards for new construction and major renovations in the absence of enacting Bill 13-22.

Analytical Challenges

Assessing the economic impacts of all-electric building codes is challenging due to data limitations at the County-level and the complexity of the issue. A critical data limitation concerns the unknown status of building electrification in the County. However, there are two analyses currently underway that may provide insight:

- **DPS Analysis** – Staff from the Department of Permitting Services (DPS) are collecting data to provide estimates on how many new commercial and residential buildings within the last five years use natural gas, electricity, or both. By estimating the amount of all-electric commercial and residential buildings that have been recently built, the DPS analysis may give insight into *the extent to which current market and regulatory conditions support or hinder electrification in the commercial and residential building sectors in the absence of an all-electric building code*.
- **NBI Analysis** – The County has a contract with New Buildings Institute (NBI), an energy consulting firm. NBI is reviewing the County's "current range of adopted and proposed codes and policies to identify potential areas of conflict in terms of metrics used, timing, adoption, and other factors."[12] The analysis is expected to estimate variation in code compliant buildings across building types (commercial, office, multifamily housing, etc.), current energy use by fuel type for more recently built projects, and site Energy Use Intensity (EUI)[13] likely to result from buildings built to code. By estimating current energy use from recently built buildings and anticipated EUI from code-compliant buildings, the NBI analysis may indicate *the potential magnitude of energy savings achieved through building electrification in the County*.

Data limitations are compounded by the complexity of building electrification. As discussed in subsequent sections, requiring all-electric building standards likely would have conflicting and uncertain short- and long-term economic impacts on many actors across numerous economic indicators prioritized by the Council.

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[11] HB0831; Building Energy Transition Plan.
[12] Contract No. 1143327.
[13] EUI is a measure of energy efficiency of a building design and operations.

Methodology

These analytical challenges rule out a quantitative analysis of the economic impacts of Bill 13-22. Instead, OLO draws on peer reviewed and non-reviewed studies on the economics of building electrification to assess certain short- and long-term economic impacts on key stakeholder groups.

Note: "Short-term" is defined as the period from the procurement/acquisition of all-electric equipment to its installation in buildings. "Long-term" is defined as the operational "life" of the equipment.

Key Market Actors: This analysis focuses on two stakeholder groups:

- "investors," i.e., real estate developers and building owners who develop new all-electric buildings or retrofit existing buildings to be all-electric; and
- "occupants," i.e., buyers and tenants (business and residential) of new or retrofitted all-electric buildings.

These stakeholder groups are the focus of this analysis because they are the primary drivers and the supply and demand of all-electric buildings.[14]

This analysis also briefly discusses the economic impacts to certain "supporting organizations," i.e., businesses and non-profits involved in the financing, design, construction, retrofitting, and servicing of buildings, particularly those in the financial, architectural, construction, energy efficiency, and engineering sectors.

Information Sources: Many studies on the economics of building electrification present "life-cycle" cost models. A life cycle cost model estimates the costs and benefits of all-electric buildings over the "life" of specific equipment (e.g., heat pumps) or the building itself, relative to mixed-fuel buildings. These models provide valuable insight into the long-term economic impacts of building electrification. However, they have two common limitations:

1) they tend to rely on assumptions that do not entirely capture the real-world challenges of electrifying buildings, and

2) they exclude the *distribution* of the costs and benefits of building electrification across market actors.

Here, OLO relies on the following cost model studies:

- E3. "Maryland Building Decarbonization Study." Final Report. October 20, 2021.
- Newbuildings.org, "Cost Study of the Building Decarbonization." April 2022. New Building Institute.

To balance the limitations of these studies, OLO also reviews sources that offer insight into the economics of building electrification from the perspectives of primary market actors. These studies sources include

- Deason and Borgeson, "Electrification of Buildings: Potential, Challenges, and Outlook." *Current Sustainable/Renewable Energy Reports* 6 (2019).

[14] Li Zhang and Liu, "Turning green into gold."

- Li Zhang and Liu, "Turning green into gold: A review on the economics of green buildings." *Journal of Cleaner Production*. 172 (2018).
- Deason, et al, "Electrification of buildings and industry in the United States." March 2018. Lawrence Berkeley National Laboratory.
- Outcault, et al, "Building lower-carbon affordable housing: case studies from California." *Building Research & Information* 50:6 (2022).

OLO analyzes findings from these sources to infer the short- and long-term economic impacts of expediting the establishment of an all-electric building code on the previously identified stakeholder groups.

Scope Limitation: Given data limitations, issue complexity, as well as time constraints, this analysis does not account for the potential impacts of Bill 13-22 on utility customers and companies, affordable housing, social cost of carbon, or other important aspects of the economics of building electrification.

VARIABLES

The primary variables that would affect the economic impacts of enacting Bill 13-22 are the following:

- Long-term gas and electricity rates;
- Building vintage (new construction or retrofit);
- Building sector (commercial or residential);
- Building size;
- Annualized capital expenses;
- Annualized consume expenses; and
- Building sale or rental rate.

IMPACTS

WORKFORCE ▪ TAXATION POLICY ▪ PROPERTY VALUES ▪ INCOMES ▪ OPERATING COSTS ▪ PRIVATE SECTOR CAPITAL INVESTMENT ▪ ECONOMIC DEVELOPMENT ▪ COMPETITIVENESS

Building Electrification: Potential and Obstacles

Technical and Economic Potential

In the United States, electricity's share of total energy use in residential and commercial buildings has gradually increased since 1960.[15] The residential and commercial electricity shares of site energy use went from 9% and 17% in 1960 to 43%

[15] Deason, et al, "Electrification of buildings and industry in the United States."

and 50% in 2021, respectively.[16] The U.S. Energy Information Administration forecasts that it will continue to increase, but at an even more gradual rate in the future based on current laws and regulations.[17]

From a technological perspective, increasing building electrification in the United States is possible. Indeed, existing technologies available on the market today can replace virtually all fuel-powered end uses in commercial and residential buildings, according to a study conducted by the U.S. Department of Energy's Lawrence Berkeley National Laboratory.[18] As stated in the study,

> the technical potential for electrification in residential and commercial buildings is nearly 100% of all energy use in buildings. Space heating, water heating, and cooking account for the vast majority of direct fuel usage in residential and commercial buildings. Electric technologies exist, and are in use today, that can deliver similar services to direct fuel technologies for all of these end uses. Some other direct-fueled end uses – such as backup generators – may not have existing electrical substitutes, but these end uses represent a very small fraction of energy use in buildings.[19]

In addition to the technical potential, there are economic factors that support building electrification. Studies on the long-term economics of building electrification – which are largely model-based analyses – conclude that electric appliances can be cost-effective over their operational life. In their review of the literature on building electrification, Deason and Borgeson conclude "electric heat pump technologies are already economically competitive with other space and water heating technologies in some cases – specifically, the South and other mild climates (e.g., California)." They find that building electrification is "most likely cost-competitive:

- where incumbent technologies are more expensive (e.g., fuel oil-fired systems in the Northeast);
- where winter temperatures are mild, though technological progress on cold-climate heat pumps is making this less important;
- where electricity prices are low;
- when replacing both heating and cooling units (e.g., replacing both a furnace and air conditioning unit with a heat pump);
- in residential rather than commercial buildings; and
- in new buildings rather than renovations of existing buildings – and especially where local natural gas infrastructure could be entirely avoided (e.g., an all-electric new housing development)."[20]

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[16] Eia.gov, Table 2.1a Energy Consumption: Residential, Commercial, and Industrial Sectors.
[17] Eia.gov, Annual Energy Outlook 2022.
[18] Deason, et al. "Electrification of buildings and industry in the United States." See also Nadel, "Electrification in the Transportation, Buildings, and Industrial Sectors."
[19] Ibid.
[20] Deason, et al. "Electrification of buildings and industry in the United States." See also Deason and Borgeson, "Electrification of Buildings."

In addition, E3, an energy consulting firm, conducted the Maryland Building Decarbonization Study on behalf of the Maryland Commission on Climate.[21] In its final report, E3 estimated total annual consumer costs (gas, electricity, and equipment costs) for electrifying new and existing buildings in several scenarios that would achieve net-zero emissions by 2045.[22] As shown in **Table 1**, the study predicts the following all-electric new construction would have lower total annual consumer costs than mixed-fuel new construction for single-family, multi-family, and small and large commercial buildings. All-electric retrofits would have lower total annual consumer costs than mixed-fuel retrofits for single-family, multifamily, and small commercial buildings. However, all-electric retrofits would have higher total annual consumer costs than mixed-fuel retrofits for large commercial buildings.

Table 1. Comparison of Annualized Consumer Costs Between All-Electric and Mixed-Fuel Building Construction/Retrofits[23]

Building Type	Building Vintage	
	All-Electric New Construction	**All-Electric Retrofit**
Single-Family	▪ Lower annualized consumer costs than mixed-fuel new construction	▪ Lower annualized consumer costs than mixed-fuel retrofits
Multi-Family	▪ Lower annualized consumer costs lower than mixed-fuel new construction	▪ Lower annualized consumer costs than mixed-fuel retrofits
Small Commercial	▪ Lower annualized consumer costs higher than mixed-fuel new construction	▪ Lower annualized consumer costs than mixed-fuel retrofits
Large Commercial	▪ Lower annualized consumer costs higher than mixed-fuel new construction	▪ Higher annualized consumer costs than mixed-fuel retrofits

These findings are consistent with the conclusion of a 2018 literature review of the economics of green buildings published in the peer-reviewed journal, *Journal of Cleaner Production*, which finds the adoption of green design and technology in buildings (which includes electrification) can be financially feasible, or even profitable, from the building life cycle perspective.[24]

Moreover, another source of potential for the economics of building electrification is the availability of funding to offset some of the costs. Funding comes in the forms of competitive financing and government grants.

Economic Obstacles

If electrifying residential and commercial buildings is technically possible and can be economically viable from a life perspective, why have experts predicted building electrification to grow at a gradual rate in the future without policy interventions?[25] To understand why, it is important to identify structural and market actor-level barriers to building electrification.

[21] Maryland Commission on Climate Change, Building Energy Transition Plan. See also Appendix A.
[22] "Maryland Building Decarbonization Study."
[23] "Maryland Building Decarbonization Study," 36-37, 127-134.
[24] Li Zhang and Liu, "Turning green into gold."
[25] Eia.gov, Annual Energy Outlook 2022; Deason, et al, "Electrification of buildings and industry in the United States."

At the structural level, the current system of global capitalism produces "externalities" in the form of GHG emissions that cause climate change. Externalities refer to the indirect effects that the production or consumption of a good incurs on third parties. When the price of a good does not account for externalities, the market produces an imbalance between private returns or costs and the returns or costs to society. In the case of GHG emissions, the costs and risks from climate change are born by the world at large.[26] However, there are few pricing mechanisms to compel actors who profit from GHG-emitting activities to internalize these costs and risks. As a result, the market produces an insufficient supply of "green" goods—including all-electric commercial and residential buildings.[27]

At the market-actor level, there are barriers to the growth of building electrification not captured in life cycle analyses. In contrast to the building life cycle perspective, a market actor perspective assesses the distribution of short- and long-term economic costs and benefits of building electrification to affected market actors.[28] Real estate developers, owners, buyers, and tenants are critical actors because they largely determine the supply and demand of building electrification.[29]

From a cost-benefit view, developers can be expected to develop new all-electric buildings when the returns on investment exceed the economic costs. Similarly, building owners can be expected to retrofit existing buildings to become all-electric when the returns exceed the costs.[30] Buyers and tenants, on the other hand, can be expected to buy or rent all-electric buildings when the price premium is offset by the discounted value of lower operating costs and other economic benefits.[31] As we will see, there are numerous factors that can make the costs outweigh the benefits for these market actors.

Investor Risks: Developers and building owners risk receiving an inadequate return on investing in building electrification. Some of the conditions that create this risk are as follows:

First, developers and building owners can face meaningful upfront costs when building electrification. In the short-term, capital and construction costs of electrifying buildings can be higher than the mixed-fuel alternative. In its study of building electrification in Maryland, E3 compared capital costs between all-electric and mixed-fuel new construction and retrofits. Capital costs include building shell upgrades[32] and dryer, cooking, water heater and HVAC equipment.[33] While capital costs can be financed, OLO believes it offers a better indicator of potential short-term costs of electrifying buildings than total annual consumer costs because it excludes savings from lower utility and operation/maintenance expenses.

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[26] The insurance company, Swiss Re, estimates the world could lose around 10 percent of total economic value from climate change by mid-century. Guo et al, "The Economics of Climate Change."
[27] Helbling, "Externalities: Prices Do Not Capture All Costs."
[28] Li Zhang and Liu, "Turning green into gold."
[29] Ibid.
[30] Ibid.
[31] Ibid.
[32] "A building shell upgrade consists of wall insulation, roof insulation, glazing, air-tightness, and heat recovery." "Maryland Building Decarbonization Study," 102.
[33] It is unclear to OLO if capital costs include labor and equipment installation costs.

As shown in **Table 2**, E3 predicts all-electric new construction to have higher annualized capital costs than mixed-fuel new construction for small and large commercial buildings. However, annualized capital costs are predicted to be lower for single- and multi-family buildings. Across all building types, all-electric retrofits are predicted to have higher capital costs than mixed-fuel retrofits.

Table 2. Comparison of Annualized Capital Costs Between All-Electric and Mixed-Fuel Building Construction/Retrofits[34]

Building Type	Building Vintage	
	All-Electric New Construction	**All-Electric Retrofit**
Single-Family	▪ Lower annualized capital costs than mixed-fuel new construction	▪ Higher annualized capital costs than mixed-fuel retrofits
Multi-Family	▪ Lower annualized capital costs lower than mixed-fuel new construction	▪ Higher annualized capital costs than mixed-fuel retrofits
Small Commercial	▪ Higher annualized capital costs higher than mixed-fuel new construction	▪ Higher annualized capital costs than mixed-fuel retrofits
Large Commercial	▪ Higher annualized capital costs higher than mixed-fuel new construction	▪ Higher annualized capital costs than mixed-fuel retrofits

NBI also concluded the short-term costs of constructing all-electric buildings likely would be higher for commercial buildings and lower for residential. NBI assessed the "first incremental cost," or the difference in construction (material and labor) costs between all-electric building prototypes and the baseline code, for constructing all-electric single-family homes and medium-sized office buildings.[35] The study concludes the following:

- The all-electric single-family prototype has an incremental first savings of $2.15 to $2.33 per square foot to construct than the baseline code home due to avoided costs of installing fossil fuel infrastructure.
- An all-electric medium office prototype has an incremental first cost of $0.33-0.50 per square foot, not including the cost of installing EV charging infrastructure.

It is important to emphasize that model-based analyses – such as the E3 and NBI studies – make cost predictions based on assumptions that do not entirely capture the real-world challenges of electrifying buildings.

For example, developers and building owners may experience additional, often unanticipated, costs from adopting emerging technologies. In a 2022 study published in the peer-reviewed journal, *Building Research & Information*, Outcault et al investigate developers' experiences building all-electric and zero net energy affordable housing communities in California.[36] One of the main challenges experienced among the three projects investigated in the study was risk stemming from lack of knowledge and technical experience among developers, general contractors, and subcontractors. Improper

[34] "Maryland Building Decarbonization Study," 36-37, 127-134.
[35] "Cost Study of the Building Decarbonization Code."
[36] "Building Lower-Carbon Affordable Housing."

installation of heat pump systems and other technologies created performance problems. Resolving these problems resulted in unanticipated costs.

Another condition that creates risk for developers and building owners is their reliance on selling or leasing buildings and/or lower operating expenses from energy savings to achieve a profitable return on investing in building electrification.

For developers and owners to profit from the investment, it is critical that potential buyers and tenants see the value of building electrification at the time of building sale or lease. Buyers and tenants, however, may make improper valuations due to their lack of specialized knowledge on building electrification, awareness of their energy consumption, and other information-asymmetries.[37] There also may be a lack of consumer acceptance for electric buildings, particularly residential, among certain buyers and tenants.[38]

In addition to building sale and lease, decreased operating expenses from energy savings provide another opportunity to achieve returns on building electrification investments. The uncertainty of energy prices however creates risk. Indeed, relative drops in the price of gas has been identified as an important factor in decisions to forego building electrification.[39] Energy pricing mechanisms can also factor in. For instance, energy cost savings can beproportionately lower than energy savings due to fixed demand charges.[40]

Moreover, long-term energy savings may not be as high as predicted in model-based studies, such as the above-cited E3 and NBI studies, due to the "building energy performance gap." This refers to the disparity between predicted and actual energy performance of green buildings. It is well-documented that actual energy consumption can be significantly greater than expected. The causes of the building energy performance gap may result from various changes in occupants' behavior, construction quality, and inaccurate modeling assumptions.[41] Irrespective of its causes, the gap creates additional risk for developers and building owners considering electrifying buildings.

<u>Occupant Risk:</u> If there is a price premium for all-electric buildings, potential buyers and tenants can also face economic obstacles.

For potential buyers, the decrease in operating expenses from energy savings may not be sufficient to offset the price premium due to factors previously discussed—utility price uncertainty, energy pricing mechanisms, higher than predicted energy consumption, discounted value of building electrification from the perspectives of potential tenants, etc.

For commercial and residential tenants facing a rent premium, the economic benefits of building electrification are primarily transmitted through their lease agreements in the form of lower operating expenses from energy savings. The savings, however, may not be sufficient to offset rent premium. Moreover, not all lease agreements pass on savings to

[37] Li Zhang and Liu, "Turning green into gold."
[38] Ibid; Deason, et al. "Electrification of buildings and industry in the United States."
[39] Deason, et al. "Electrification of buildings and industry in the United States."
[40] Li Zhang and Liu, "Turning green into gold."
[41] Ibid; Zou et al, "Review of 10 Years Research on Building Energy Performance Gap."

tenants. This creates a principle-agent problem where the interests of tenants and building owners do not align, which the International Energy Association considers "one of the most pervasive barriers to energy efficiency."[42]

Impacts on Private Organizations

OLO anticipates that enacting Bill 13-22 would have mixed impacts on certain private organizations in the County in terms of several economic indicators prioritized by the Council.

Investor Impacts

Based on the E3 and NBI cost models, the short-term economic impacts of an all-electric building code on real estate developers and building owners who develop or retrofit all-electric buildings would vary by building vintage (new construction or retrofit), sector (commercial or residential), and size. The long-term economic impacts would depend on factors and uncertainties identified in the previous section and perhaps others.

New construction in the commercial sector: In the short-term, developers and/or building owners involved in developing new all-electric commercial buildings likely would have higher capital costs (equipment and building shell upgrade costs) than the mixed-fuel alternative (Table 2). Some of these actors also may experience unanticipated short-term costs due to challenges with adopting emerging all-electric technology, depending on developers or contractors' technical experience with building electrification.

Over time, these actors likely would experience lower operating costs in the form savings from gas, electricity, and equipment costs than the mixed-fuel alternative (Table 1). However, the magnitude of savings would depend on factors like relative energy prices and occupant energy consumption.

For developers and building owners who take on the risks associated with new all-electric commercial development, numerous factors would determine whether the investment yields a net positive or negative return relative to the mixed-fuel alternative. In addition to the magnitude of upfront capital costs and lower operating costs, the sale and/or lease premium would be an important determinant of the return. Given the uncertainties, OLO suspects there would be variation in outcomes, with some projects yielding a higher return and others a lower return than the mixed-fuel alternative.

New construction in the residential sectors: In contrast to the commercial sector, short-term capital costs for new all-electric construction of single- and multi-family buildings likely would be lower than the mixed-fuel alternatives (Table 2). Similar to the commercial sector, over time owners likely would experience lower operating costs in the form of savings from gas, electricity, and equipment costs than the mixed-fuel alternative (Table 1).

In general, because the short- and long-term costs are both projected to be lower, new all-electric construction in the single- and multi-family residential sectors likely would yield positive net returns relative to the mixed-fuel alternatives for developers and building owners. However, the magnitude (and perhaps direction in some cases) of the relative net

[42] Li Zhang and Liu, "Turning green into gold." For more on this problem, see IEA, *Mind the Gap*.

returns would be subject to numerous factors and uncertainties which include those identified above—relative energy prices, occupant energy consumption, sale and/or lease premiums, etc.

Retrofits in the commercial and residential sectors: Across all sectors, the short-term capital costs for all-electric retrofits likely would be higher than the mixed-fuel alternatives for building owners (Table 2). For the residential sectors, all-electric retrofits likely would have lower relative operating costs in the long-term. For the commercial sector, the relative operating costs may vary by building size, with lower costs for small commercial buildings and higher costs for large commercial buildings than the mixed-fuel alternatives (Table 1).

Because of the likely contrary short-term capital and long-term operating costs, OLO suspects there would be variation in net returns on investment for owners who pursue all-electric retrofits of residential and small commercial buildings relative to the mixed-fuel alternatives. However, because the capital and operating costs are both negative for all-electric retrofits of large commercial buildings, building owners likely would attain a relative net negative return. Again, relative net returns would be contingent on numerous factors and uncertainties.

Occupant Impacts

Building Buyers: Unlike developers and owners who develop or retrofit all-electric buildings, future buyers of these buildings would not incur the upfront capital costs. However, depending on market conditions, buyers may pay a premium to purchase an all-electric building relative to the sales price had the building been constructed or retrofitted as mixed-fuel. Whether the long-term benefits outweigh the potential premium likely would depend on building vintage, sector, and size as well as the factors and uncertainties previously discussed, such as relative energy prices, occupant energy consumption, future lease and resale premiums, etc. Ultimately, it is likely there would be variation in relative long-term returns on investment, with some buyers attaining a higher return and others a lower return than would have otherwise been the case.

Commercial Tenants: Similar to buyers, commercial tenants of an all-electric building may pay a rent premium relative to what they would have paid had the building been constructed or retrofitted as mixed-fuel. A critical determinant of the long-term economics would be whether the lease agreement passes savings from lower energy costs onto tenants. If so, tenants may attain a net positive outcome due to lower operating costs, depending on occupant energy consumption and other factors. However, if not, the long-term impacts would likely be net negative.

Supporting Organization Impacts

In addition to investors and occupants, Bill 13-22 may have mixed impacts on certain County-based private organizations involved in the financing, design, construction, retrofitting, and servicing of buildings. On the one hand, the change in law likely would increase demand for businesses in these sectors with technical knowledge and experience in building electrification (i.e., local energy efficiency consultants). Increased demand for their services would increase business income for these organizations. On the other hand, there may be businesses lacking in relevant technical knowledge and experience (i.e., small construction companies) that lose out on contracts.

While OLO anticipates that Bill 13-22 would impact other private organizations in terms of the Council's priority indicators, it is beyond the scope of this statement to assess these potential impacts.

Impacts on Residents

OLO anticipates that enacting Bill 13-22 would have mixed impacts on certain residents in the County in terms of several economic indicators prioritized by the Council.

Homebuyers: According to the E3 and NBI cost models, new single- and multi-family construction would have lower up-front costs and operating costs than the mixed-fuel alternative. If buyers do not pay a premium to purchase all-electric homes, the primary risk to their return on investment is eliminated. They would likely experience savings from lower energy expenses. The magnitude of the savings, however, would depend on factors like relative energy prices and occupant energy consumption. Holding all else equal, lower energy costs would result in a net increase in household income.

In the case of retrofitted all-electric single- and multi-family buildings, the E3 cost model predicts higher up-front costs and lower operating costs than the mixed-fuel alternative. For owners who pay the up-front costs and buyers who pay a purchasing premium, they would need to receive enough savings in lower energy costs for the return to be positive.

Residential Tenants: Because all-electric retrofits have higher up-front costs than the mixed-fuel alternative, tenants in retrofitted single- and multi-family buildings may pay a rent premium. If so, tenants may attain net positive outcome in cases where the lease agreement passes savings from lower energy costs onto tenants. In cases where savings are not passed on, tenants may experience higher costs.

While OLO anticipates that Bill 13-22 would impact other residents in terms of the Council's priority indicators, it is beyond the scope of this statement to assess these potential impacts.

Net Impact

OLO anticipates Bill 13-22 would result in a net negative impact on economic conditions in the County. As previously stated, the impacts of the change in law would occur through two channels:

(1) Electrification of new or existing buildings that otherwise would have been constructed or retrofitted as a mixed-fuel buildings in the absence of the change in law.
(2) Construction or retrofitting of buildings that would or would not occur in the absence of the change in law.

So far, this statement has the potential impacts of Bill 13-22 on private organizations and residents in terms of the first channel. From this perspective, OLO believes the Bill likely would be economically beneficial for some County stakeholders and costly for others. In general, the commercial building sector likely would be negatively impacted due to higher up-front costs and various risks (e.g., uncertain relative energy prices and lower than anticipated energy savings), which would increase the likelihood of certain market actors receiving a net negative return on their investment in building electrification. In contrast, the residential building sector likely would experience lower up-front costs, thereby increasing the likelihood of net positive returns to certain market actors. Given data limitations and the complexity of building electrification, it is impossible to quantify whether the benefits to some entities would outweigh the costs to others.

Ultimately, OLO anticipates enacting Bill 13-22 would have an overall negative impact on economic conditions in the County when accounting for the second economic channel. Certain buildings that otherwise would be constructed or retrofitted in the absence of the change in law may not occur—or may be scaled back—in cases with higher up-front costs relative to the mixed-fuel alternative. Based on the E3 and NBI cost models' estimates of capital costs, new construction in the commercial sector and retrofits in both sectors may be most vulnerable to the decline in private sector capital investment. Even though cost models predict lower operating expenses in these sectors (except for large commercial retrofits), the risks investors face may be enough to deter investment, thereby decreasing private sector development.

Moreover, investors may prefer to develop in nearby jurisdictions without all-electric building codes. If Bill 13-22 is enacted, the County would join the District of Columbia in having a building code that bans (with exceptions) on-site fuel combustion in new construction and major renovations.[43] The other jurisdictions adjacent to the District (Prince George's and Fairfax Counties and the Cities of Arlington and Alexandria) have not adopted all-electric or net zero building codes. Local governments in Virginia are legally required the Virginia Uniform Statewide Building Code (USBC) and cannot unilaterally change their building codes.

Given the up-front costs and various risks investors can face, certain investors likely would prefer other nearby jurisdictions due to their regulatory flexibility. It is impossible to quantify how many projects would not occur at all or at the same scale because of the building electrification requirement. But for every project that does not occur or is significantly scaled back, certain County-based businesses and residents would experience meaningful opportunity costs in the form of forgone contracts, employment, income, etc.

Finally, in addition to the Bill's potential to decrease private sector capital investment and the County's competitiveness, the change in law likely would likely result in a net outflow from the County. For one, the net outflow would increase from the importing of all-electric equipment that is more costly than the mixed-fuel alternative. Second, certain building owners who are based outside the County likely would retain the economic benefits of building electrification and pass down a portion of the costs to County-based businesses and residents (i.e., higher rents).

DISCUSSION ITEMS

As discussed in this analysis, establishing all-electric building standards would have conflicting and uncertain short- and long-term economic impacts on many County-based private organizations and residents across numerous economic indicators prioritized by the Council. Moreover, the complexity of the issue is exacerbated by significant data limitations at the County-level. For these reasons, Councilmembers may want to consider whether a more thorough investigation of the economic impacts of Bill 13-22 is needed. For instance, a more thorough investigation could consider whether

[43] Washington D.C. Council Bill 24-0420 has been enacted and transmitted to the U.S. Congress.

available financing and grants for building electrification are sufficient to offset the short-term costs and potential impacts on private sector capital development and competitiveness and/or whether the Bill would negatively impact other stakeholder groups, such as certain utility customers and residents in need of affordable housing.

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CAVEATS

Two caveats to the economic analysis performed here should be noted. First, predicting the economic impacts of legislation is a challenging analytical endeavor due to data limitations, the multitude of causes of economic outcomes, economic shocks, uncertainty, and other factors. Second, the analysis performed here is intended to *inform* the legislative process, not determine whether the Council should enact legislation. Thus, any conclusion made in this statement does not represent OLO's endorsement of, or objection to, the Bill under consideration.

CONTRIBUTIONS

Stephen Roblin (OLO) prepared this report.