Building for Tomorrow

Making Canada’s new housing supply high performance and climate ready

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Efficiency Canada

Carleton University

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Acknowledgements

This report was submitted to the Task Force for Housing & Climate. It is part of a package of GHG emissions modelling submitted to the Task Force for the purpose of better understanding the three biggest sources of GHG emissions associated building 5.8 million new homes by 2030: building energy performance; embodied emissions from construction materials and supportive infrastructure; and land use planning decisions. For the full package of research, visit: housingandclimate.ca/ghgs

Task Force for Housing & Climate

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About the authors

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About Efficiency Canada

Efficiency Canada is the national voice for an energy-efficient economy. Our mission is to create a sustainable environment and better life for all Canadians by making our country a global leader in energy efficiency policy, technology, and jobs. Efficiency Canada is housed at Carleton University's Sustainable Energy Research Centre, which is located on the traditional unceded territories of the Algonquin nation.

The views expressed, as well as any errors or omissions, are the sole responsibility of the authors.

Summary of findings

We need to build 5.8 million new homes in Canada by 2030 to restore housing affordability. How we build those 5.8 million homes matters.

We can build them to today's standard, locking in approximately 12.9 Mt of greenhouse gas emissions each year those buildings are in operation.

Or, we can move upward through the tiers of the 2020 National Building Code and National Energy Code for Buildings to reach the net zero energy ready standard by 2030, and produce approximately 3 Mt fewer emissions than today's standards each year. This could also reduce household spending by just over $3 billion per year.

Going a step further, we can realize even deeper reductions if we build those homes to a net zero energy ready standard by 2030 and implement full electrification of all new housing units starting in 2025, which could reduce emissions by 2/3rds from today's standards. This could also reduce household spending by approximately $5 billion per year.

Scenario	**Annual emissions in 2030 (Mt)**	**Annual emissions avoided in 2030 (Mt)**	**Annual energy costs saved**
Business as usual	12.9	-	–
Gradual tier adoption (NZER)	10.4	2.8	$3.2 MM
Gradual tier adoption plus electrification post 2024 (NZER + electrification)	4.2	8.7	$5.1 MM

Building 5.8 million homes right the first time

In a June 2022 report and reiterated in September 2023, the Canada Mortgage and Housing Corporation (CMHC) estimated that to restore housing affordability, Canada needs to build 5.8 million housing units by the end of 2030. This means 3.5 million more units than the current pace of new home construction (see Figure 1). Scaling up new construction activity to meet this goal presents a unique opportunity to tackle the twin challenges of affordability and climate change, and ensure that those homes are climate-ready.

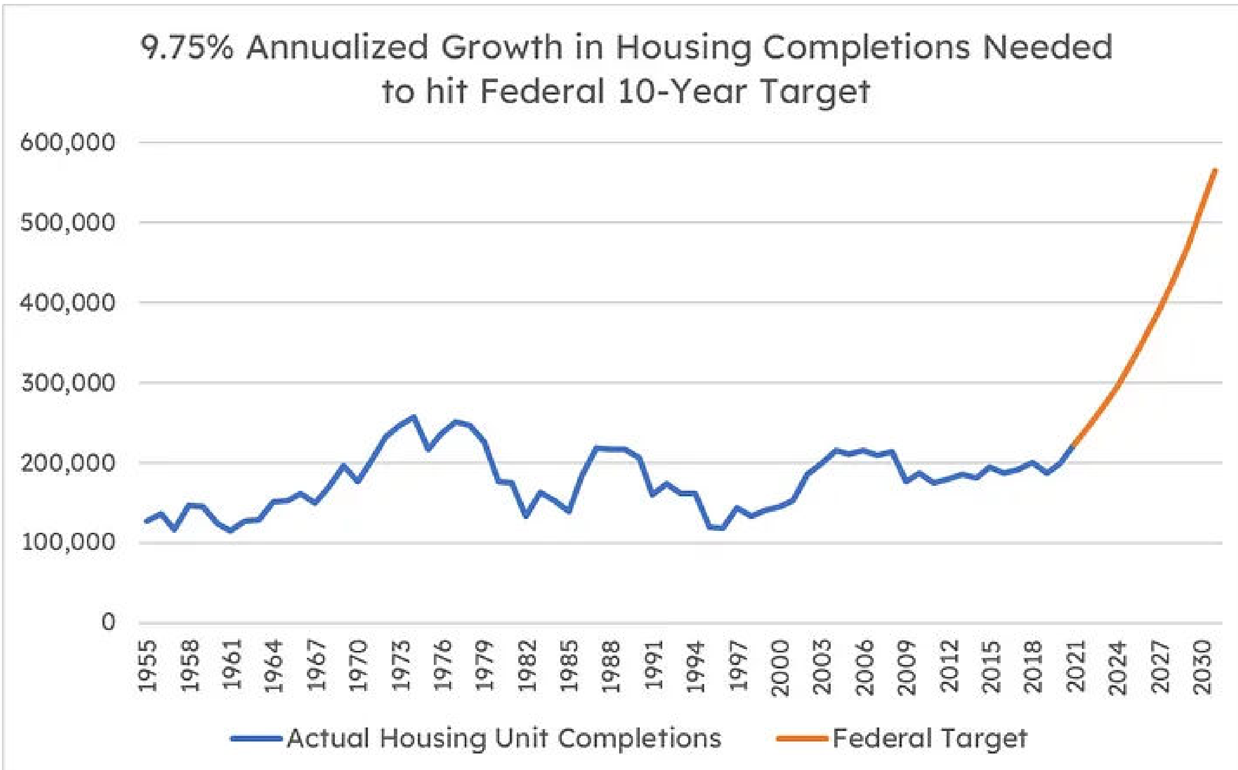

Figure 1: Additional Units Per Year, 2022-2030. Source: Moffat, Mike. The Federal Government's Big Hairy Audacious Goal (BHAG) to Double the Number of New Homes Built, April 10, 2022.

Efficiency Canada's research isolates the potential impact building codes can have during this anticipated increase in new housing construction. While previous building codes have established a minimum standard for building construction in a given jurisdiction, newer tiered codes, such as Canada's 2020 National Building Code (NBC), 2020 National Energy Code for Buildings (NECB), and the BC Step Code, offer performance-based steps. Each step or tier introduces progressively stringent energy efficiency requirements in a tiered framework.

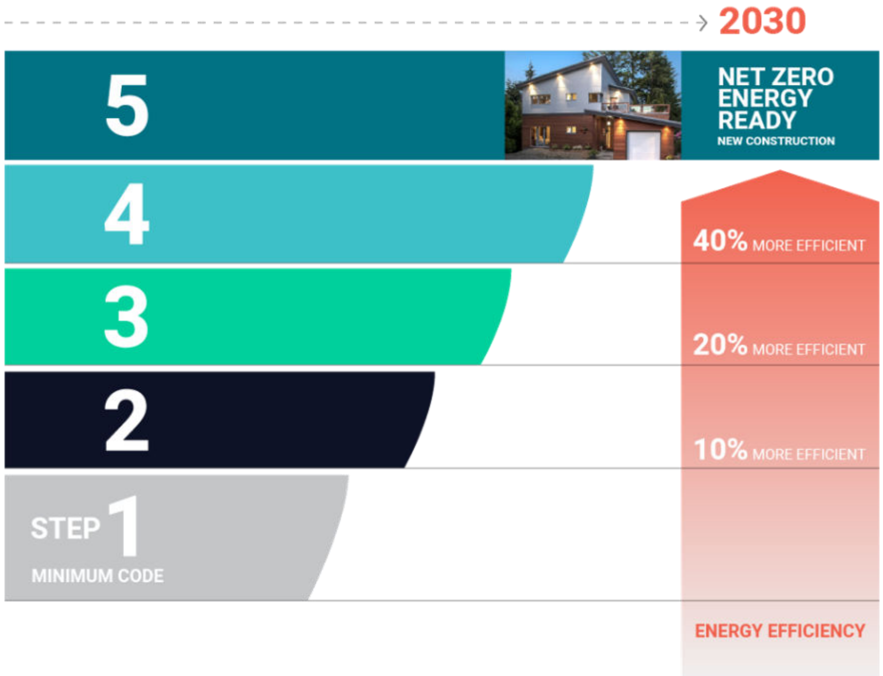

Figure 2: Tiered code framework. Adapted: The BC Step Code, How it works.

The tiered framework for each of these codes culminates in the net zero energy ready standard. A building that meets this standard is energy efficient enough to meet its annual energy needs with the addition of on-site renewables or off-site clean energy.

As per the 2017 Pan-Canadian Framework on Clean Growth and Climate Change, provinces/territories have agreed to reach this standard by 2030. However, provincial/territorial adoption of the tiered codes has been limited, with only select provinces fully committed to adopting all tiers. While several provinces have signalled their preferred tier, only British Columbia has adopted and implemented what would be considered an upper tier, Tier 3, without restrictions. Meanwhile, Ontario has proposed but not yet implemented, a plan to adopt Tier 3 of the NBC, to the exclusion of the tiered framework.

To explore the role of tiered codes in the construction of 5.8 million new housing units, three scenarios are presented:

- Business as usual (BAU): a baseline scenario that assumes limited implementation of the 2020 model codes is established.
- Net zero energy ready (NZER): a scenario is presented that sees all provinces move to Tier 3 of the NBC and Tier 2 of the NECB in 2025, and progress toward the upper tiers' net zero energy ready standard in 2030.

- Net zero energy ready + electrification (NZER + electrification): building on the accelerated adoption of the upper tiers, a building electrification scenario is presented that assumes accelerated adoption of the upper tiers plus full electrification of new construction begins in 2025.

Building electrification, typically implemented by using electricity or other zero-carbon fuels for space heat and water heating equipment, and for use in cooking equipment, offers an emissions-neutral path for newly built residential housing. Additional benefits can also be captured through building electrification, such as improved comfort and resiliency for building occupants, and improved air quality and health for both occupants and their communities.[1]

Canada's buildings — the places we live, work, and play — contribute massive amounts of GHG emissions. 18% of Canada's emissions come from buildings when accounting for emissions associated with electricity use for cooling, lighting, and appliance usage.[2] Given that new buildings constructed today will last for half a century or more, building codes are a primary tool by which to reduce energy demand and lock in immediate and long-term reductions in building emissions.

By implementing the upper tiers of the 2020 NBC and 2020 NECB in each province and territory, and embracing building electrification, we can ensure energy-efficient and climate-resilient features are integrated into all newly constructed housing units. In doing so, building owners and occupants can achieve long-term affordability through lower energy and maintenance costs, while also benefiting from well-designed, insulated and air-sealed homes that offer resilience from extreme heat, forest fire smoke and other serious weather events associated with climate change.

About the Land Use Impact Calculator

This research project uses the Sustainability Solutions Group (SSG) Land Use Impact Calculator (LUIC) to determine the differences in energy and operational emissions if 5.8 million homes were built to current standards (BAU scenario) versus both a more aggressive energy-efficient standard (NZER scenario), and a more aggressive energy-efficient standard (NZER + electrification scenario) with full electrification beginning in 2025.

SSG developed the LUIC to explore the potential impacts of proposed residential developments in terms of energy consumed, GHG emissions produced, infrastructure capital costs incurred, and municipal revenues collected. The LUIC allows comparisons of these elements between different residential development scenarios using various user-defined inputs (Table 1). The LUIC is available to all users, and we encourage those interested in how policy inputs, like tiered buildings codes, may impact development scenarios to consider this helpful tool.

Inputs	**Description**
Province	Only provinces, not territories, are included in potential selections.
Year of full build-out	The period when all housing completions will be achieved. For this project, all scenarios are built out within the year they are constructed.
Neighbourhood type	Options include low-density, transit-oriented, and urban infill development types. This project uses a medium-high density, mixed housing type neighbourhood development type across all scenarios.
Number of buildings and types	The total number of buildings to be constructed during the build-out years. For this project, 5.8 million buildings are to be constructed between 2022 and 2030 in a non-linear growth model, scaled beyond current production levels. 2022-2030 housing types include single-detached, row/semi-detached, and apartment housing.
Building codes	Options include the National Energy Code for Buildings (i.e., apartments and multi-unit residential buildings greater than 300 square metres), the Toronto Green Standard, and the BC Step Code. For this project, the BC Step Code will be applied for new low-rise residential housing, as it is the most closely aligned and implemented code compared to the NBC 2020.[3]
Energy use intensity	This variable is pre-populated according to the building code and tier selected. While it can be adjusted by the user, this exercise did not modify this user input.
Building energy sources	Options include electricity, natural gas, and heating oil. For each scenario, these fields were populated according to provincial household fuel mixes (i.e., the share of fuels used by households).

Table 1: Land Use Impact Calculator data inputs

Fixed assumptions

The LUIC applies a number of fixed input assumptions including building size, global warming potential, and energy source emissions factors, that cannot be replaced with user assumption (see Table 2).

Variable	Description
Building size	Building size is assumed to be 72 metres per capita (Based on Shrink That Footprint).
Global Warming Potential	GWP values are taken from Environment and Climate Change Canada: National Inventory Report (NIR) 1990-2018. Simplified.
Energy source emissions factors	The Calculator applies a Canadian Energy Systems Simulator model (CanESS 7), a stocks-and-flows accounting-framework class of model which represents the physical state of Canada's energy system over time – for the observed past and alternative future scenarios. This model also takes into account building and building equipment and appliance characteristics.

Table 2: LUIC fixed assumptions

Project scope

According to CMHC projections, Canada needs a total of 5.8 million homes to be built between 2022 and 2030. To understand the impact of these homes in terms of the energy and emissions produced, and the role building codes and electrification play in reducing energy and emissions from newly constructed buildings, three scenarios were developed:

- BAU
- NZER
- NZER + electrification

Each scenario uses recent Canadian housing completions data to establish a baseline of average housing completions in each province, as well as the provincial share of housing (i.e., the percentage of new housing constructed in each province on an annual basis). This growth is then assumed to scale up in an S-Curve pattern from 2022 to 2030 as new housing construction activity ramps up from current levels in the years leading to 2030.

To isolate the effect of building codes during the construction and operation of those housing units, the provincial share of new construction housing types (i.e., single-detached, row/semi-detached, and apartment housing) remains constant within the build-out phase. The provincial household fuel mix[4] remains constant (i.e., based on 2022 values) between the years 2022 and 2030 in the BAU and NZER scenarios, while the NZER + electrification scenario sees a shift to full electrification from the baseline in 2025. SSG's LUIC calculator is then used to develop each of these scenarios.

GHG emissions associated with electricity use in buildings are a component of each scenario and are assumed to reduce in GHG intensity over the period 2022-2030. However, this assumption does not account for the full implementation of the Clean Electricity Regulations. This results in a conservative assumption in terms of grid emissions, particularly in the years leading to 2030, as GHG emissions reductions can be expected to fall further with lower electricity intensity.

The LUIC requires several user inputs, including neighbourhood typology. For this exercise, Transit Oriented Design V1 (medium housing density at a transit node, low-density away from the node, and a mix of grid and closed street network) is applied. For each scenario, the annual housing completions are set for each year between 2022 and 2030, and the annual and cumulative annual energy and emissions are defined. The variations in each scenario are defined below (Table 3).

Scenario	Description of variance
BAU	Most provinces remain at the Calculator's 'baseline' unless adoption plans specify otherwise. The baseline is defined by the SSG LUIC as a 25% energy efficiency improvement over the average Canadian household energy use as defined by Natural Resources Canada's Comprehensive Energy Use Database. BC follows its legislated adoption plan. To account for the increased energy efficiency performance of the current Ontario Building Code, the province remains at Tier 3 for single-detached, semi-detached and row, and apartments fall under Tier 1 of the NECB.
NZER	The NZER scenario assumes all provinces follow the BAU scenario for the years 2022-2-24, then progress towards NZER standards beginning in 2025 as new housing construction activity ramps upwards towards 2030.
NZER + electrification	Building on the NZER scenario, all variables remain unchanged from the NZER scenario between 2022 and 2024, at which point no more natural gas or heating oil is used in newly constructed buildings in favour of full electrification.

Table 3: Variations in scenarios

Findings from the business as usual, net zero energy ready, and net zero energy ready plus electrification scenarios

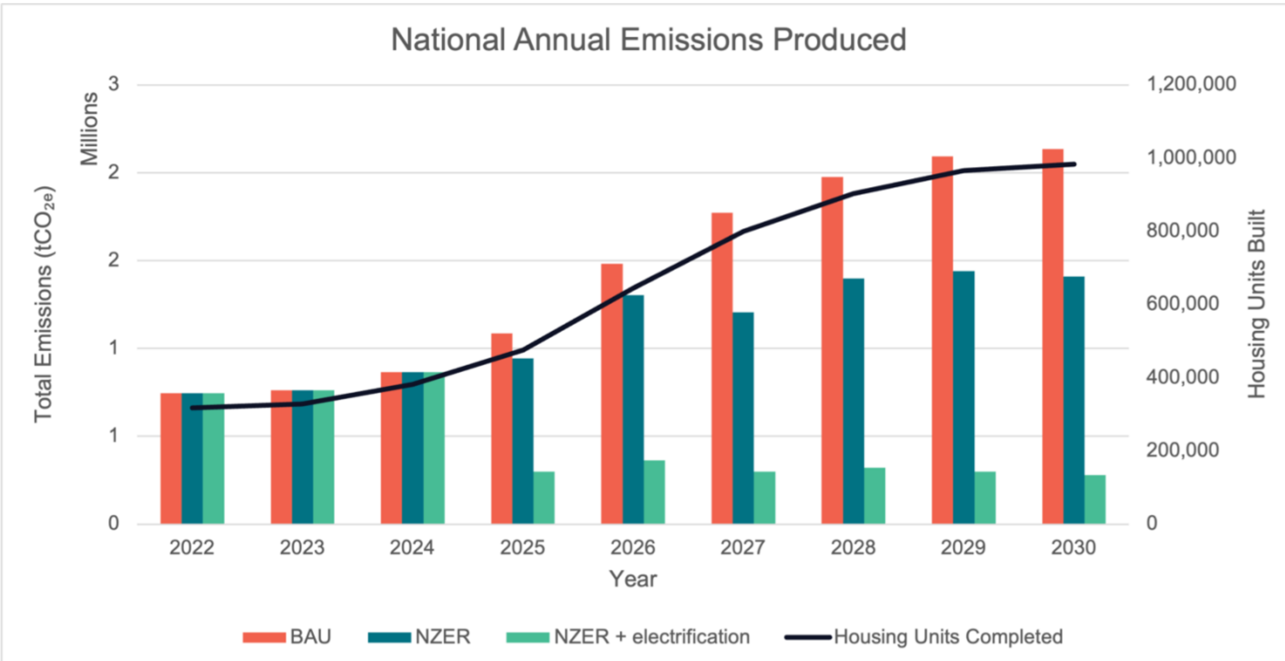

Figure 3: Building emissions, all scenarios, 2022-2030

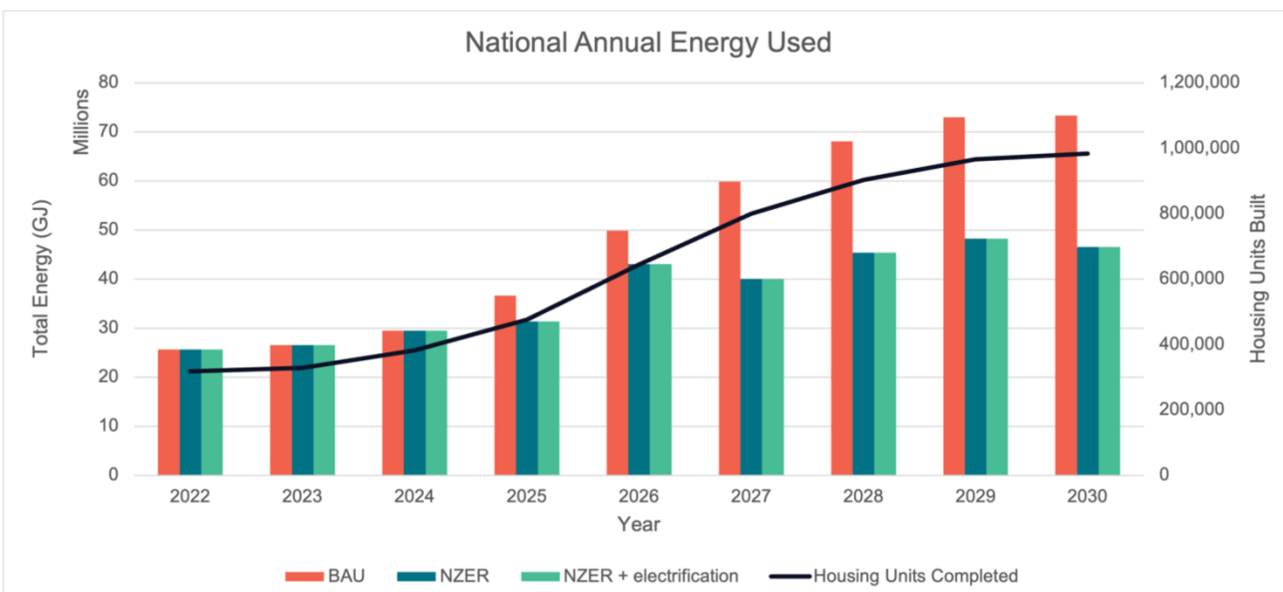

Figure 4: Building energy use, all scenarios, 2022-2030

Scenarios	Total energy (GJ)	Total emissions (tCO_{2e})
BAU	442,179,240	12,898,111
NZER	336,208,422	10,074,295
NZER + electrification	336,203,088	4,234,373

Business as usual (BAU)

The BAU scenario assumes that in most provinces, adoption of the 2020 NBC and NECB remains static, aside from BC. The province is currently at Step 3 of the BC Step Code for residential buildings and has legislated the adoption of Step 4 of the BC Step Code for residential buildings, and the equivalent of Step 3 for large buildings, both in early 2024.

BC has also committed to a Zero Carbon Step Code that sets a maximum annual amount of greenhouse gas emissions for new buildings to be implemented by local governments. These changes meet commitments in the CleanBC Roadmap to 2030 to make all new buildings zero carbon by 2030 and net zero energy ready by 2032.

However, as the Clean BC goals and Zero Carbon Step Code are commitments rather than mandatory requirements at this time, they have not been included in this modelling exercise. Ontario is held at Step 3 throughout 2030, as this step is the rough equivalent of the current Ontario Building Code's Supplementary Standard, SB-12.

Scenario 1: Business As Usual									
Province	2022	2023	2024	2025	2026	2027	2028	2029	2030
British Columbia	NBC T3/NECB T2		NBC T4/NECB T3						
Ontario	NBC T3/NECB T1								
Manitoba	NBC T1/NECB T1								
New Brunswick	NBC T1/NECB T1								
Newfoundland and Labrador	NBC T1/NECB T1								
Nova Scotia	NBC T1/NECB T1								
Alberta	NBC T1/NECB T1								
Prince Edward Island	NBC T1/NECB T1								
Quebec	NBC T1/NECB T1								
Saskatchewan	NBC T1/NECB T1								

Table 4: Current and proposed/adopted tiers by province

Year	Number of housing units	Incremental energy used from additional housing each year (GJ)	Incremental emissions from additional housing each year (tCO_{2e})
2022	317,829	24,423,198	737,977
2023	328,491	25,325,668	770,524
2024	381,484	28,292,911	856,950
2025	475,677	35,429,816	1,076,813
2026	644,064	49,799,706	1,481,209
2027	800,053	59,853,446	1,771,640
2028	903,288	68,074,094	1,974,788
2029	965,356	72,918,412	2,093,613
2030	983,758	73,300,472	2,134,597
–	5,800,000	–	–

Table 5: BAU, energy and emissions, 2022-2030

Within the BAU scenario, the end-use fuel mix with each household (i.e., electricity, natural gas, and heating oil) are defined according to Statistics Canada's, Household energy consumption, Canada and province.

Net zero energy ready (NZER)

The NZER scenario assumes that all provinces aside from BC, which has committed to and published an accelerated tiered code adoption schedule, scale up the tiers of the adopted model codes to reach the NZER standard by 2030. This scenario uses the 2019 Emission Reduction Plan as a benchmark. This plan included a "net-zero ready building code" assumption that used a 2019 baseline and set reductions in energy use that approximately align with reaching tier 3 of the 2020 model codes by 2025, and tier 4 by 2030.[5] To reach these targets, this scenario follows the BAU scenario between 2022 and 2024 and sees most provinces move directly to tier 3 in 2025, forgoing tier 2.

Scenario 2: Gradual Increase up Tiers									
Province	2022	2023	2024	2025	2026	2027	2028	2029	2030
British Columbia	NBC T3/NECB T2								
Ontario	NBC T3/NECB T1								
Manitoba	NBC T1/NECB T1								
New Brunswick	NBC T1/NECB T1								
Newfoundland and Labrador	NBC T1/NECB T1			NBC T3/NECB T2		NBC T4/NECB T3			NBC T5/NECB T4
Nova Scotia	NBC T1/NECB T1								
Alberta	NBC T1/NECB T1								
Prince Edward Island	NBC T1/NECB T1								
Quebec	NBC T1/NECB T1								
Saskatchewan	NBC T1/NECB T1								

Table 6: Gradual adoption scenario by province

Year	Number of housing units	Incremental energy used from additional housing each year (GJ)	Incremental emissions from additional housing each year (tCO_{2e})
2022	317,829	25,613,493	746,155
2023	328,491	26,515,969	762,161
2024	381,484	29,483,269	856,128
2025	475,677	31,283,892	944,274
2026	644,064	43,082,788	1,302,306
2027	800,053	40,044,886	1,206,564
2028	903,288	45,367,368	1,398,748
2029	965,356	48,215,879	1,439,336
2030	983,758	46,501,878	1,409,621
–	5,800,000	–	–

Table 7: NZER, Energy and emissions, 2022-2030

As illustrated below, the NZER scenario demonstrates the opportunity to twin a rapid increase in new construction activity with tiered code adoption. In this scenario, as tiered code adoption ramps up towards the upper tiers beginning in 2027, and reaches the NZER standard in 2030, the delta between the NZER and the BAU scenario's annual energy use and emissions demonstrates the impact of upper tier code adoption, albeit at a reduced scale due to the delayed uptake of Tier 3 of the NBC and T2 of the NECB in 2025. This conservative assumption is compounded by the use of fixed household fuel mixes through the implementation of the upper tiers. In practice, new homes constructed to the upper tiers are more likely to employ full electrification, leading to further reductions in emissions, rather than relying solely on energy efficiency measures.

As upper tiers are implemented beginning in 2027, energy and associated emissions remain at a consistent level, even as more buildings are completed year over year. Reduced energy use and emissions can be expected to continue throughout the life of these buildings as operational energy and emissions are heavily influenced by building code requirements emphasizing a robust building envelope and reduced energy demands. This is because a well-insulated building envelope, and equipment and appliances that use less energy, reduce the thermal and electrical energy demands of the building and enable a heat pump to meet the vast majority of the heating load. A properly sized heat pump that matches the building's heat load will work more efficiently and improve comfort by operating consistently.

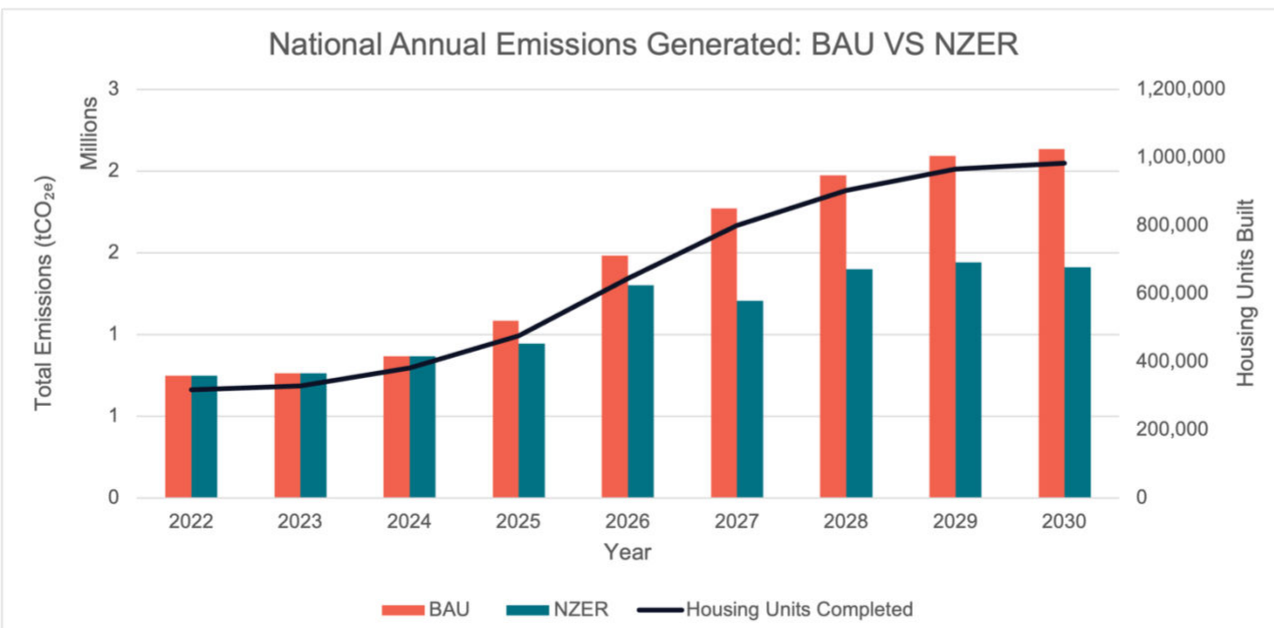

Figure 5: NZER scenario, annual energy and emissions (BAU vs NZER) 2022-2030

Net zero energy ready (NZER) + electrification

Building on the NZER scenario defined above, the NZER + electrification scenario assumes the full tiered code adoption as defined in the NZER scenario, with the addition of full electrification of all new buildings starting in 2025. This scenario holds current provincial electricity, natural gas, and heating oil fuel shares constant between 2022 and 2024. Emissions arising from space heating and water heating account for 77% of building emissions.[6] As such, building electrification can immediately deliver significant emissions reductions. This scenario could be realized with an accelerated adoption and implementation of the net-zero emissions code, anticipated to be released by the end of 2024.

Scenario 3: Electrification post 2025									
Province	2022	2023	2024	2025	2026	2027	2028	2029	2030
British Columbia	NBC T3/NECB T2		NBC T4/NECB T3						
Ontario	NBC T3/NECB T1								
Manitoba	NBC T1/NECB T1								
New Brunswick	NBC T1/NECB T1								
Newfoundland and Labrador	NBC T1/NECB T1			NBC T3/NECB T2		NBC T4/NECB T3			NBC T5/NECB T4
Nova Scotia	NBC T1/NECB T1								
Alberta	NBC T1/NECB T1								
Prince Edward Island	NBC T1/NECB T1								
Quebec	NBC T1/NECB T1								
Saskatchewan	NBC T1/NECB T1								

Table 8: Gradual adoption + full electrification starting in 2025 scenario by province

Year	Number of housing units	Annual incremental energy used from additional housing each year (GJ)	Incremental emissions from additional housing each year (tCO_{2e})
2022	317,829	25,613,493	746,155
2023	328,491	26,515,969	762,161
2024	381,484	29,483,269	856,128
2025	475,677	31,283,892	299,518
2026	644,064	43,087,252	363,351
2027	800,053	40,044,886	299,236
2028	903,288	45,367,341	320,407
2029	965,356	48,215,879	298,447
2030	983,758	46,501,878	279,969
–	5,800,000	–	–

Table 9: NZER + electrification, energy and emissions, 2022-2030

Similar to the NZER scenario, between the years 2022-2030 total annual energy use in the NZER + electrification falls by approximately a quarter below energy use in the BAU scenario. Notably, the switch to building electrification in 2025 will see a significant and immediate reduction in building energy use and operation emissions. The impact of upper-tier code adoption is even more pronounced in 2027 with the adoption of Tier 3 for smaller residential buildings and Tier 2 for large residential buildings, in which both energy use and emissions fall despite an increased amount of new construction activity. Coupled with the energy conservation measures required in the upper tiers of the building code, total annual emissions generated fall by nearly three-quarters of those generated in the BAU scenario, and by over half when compared to the NZER scenario.

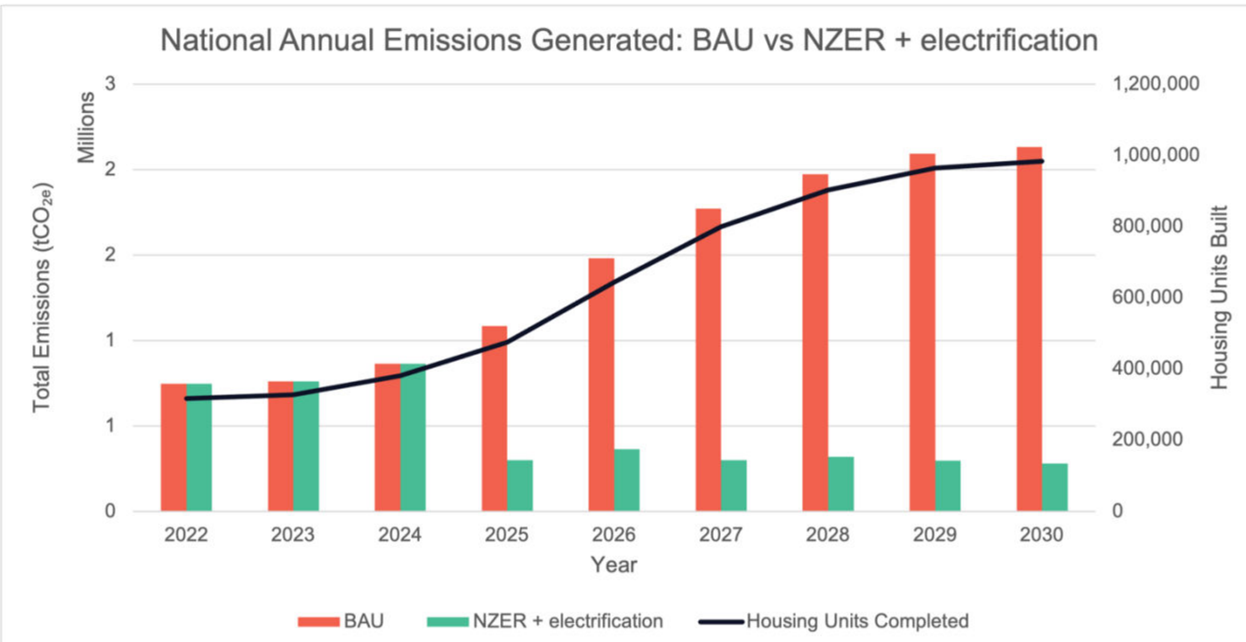

Figure 6: NZER + electrification scenario, annual energy and emissions (BAU vs NZER + electrification) 2022-2030

Household energy costs and savings

Energy costs are not included in the LUIC. Instead, energy costs are calculated using the total provincial energy use, by fuel type for each of the scenarios. For each year, the provincial price/unit of energy[7] is multiplied by the calculated annual provincial energy use, by fuel (electricity, natural gas, heating oil)[8]. This weighted average, pre-tax price, includes all applicable charges and rebates. Energy prices between 2022 and 2030 are based on the Canadian Energy Regulator's 2022, Canada's Energy Future 2023: Energy Supply and Demand Projections to 2050 (end-use prices, conventional scenario, residential) and held at 2022 constant dollars. The provincial fuel mix is based on the latest 2019 values.[9]

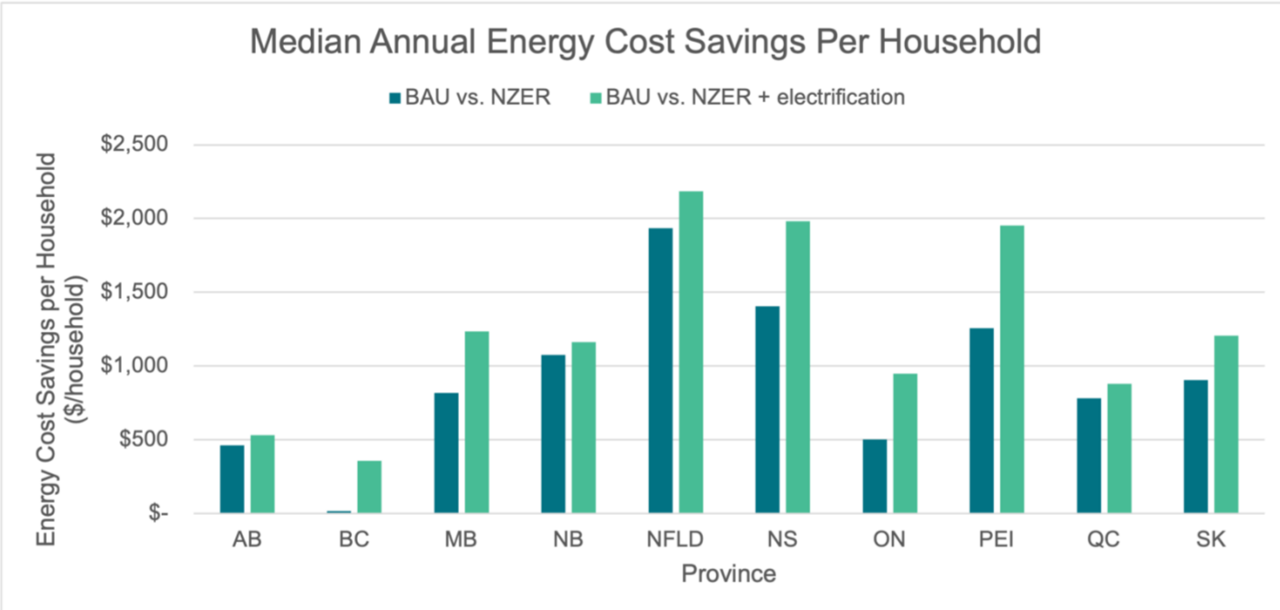

Figure 7: Median annual energy cost savings per household, by province

	Total energy cost savings ($), 2022-2030	**Annual energy cost savings per household ($/household)**
BAU vs NZER	$8,779,715,476.24	$1,530.30
BAU vs NZER + electrification	$19,677,806,164.53	$3,429.84

Table 10: Cost savings, cumulative and annual household savings for NZER and NZER + electrification

Figure 7 depicts the annual household cost savings, and that cost savings are higher in the NZER + electrification scenarios in all provinces. It also highlights the important role energy efficiency measures play in reducing thermal energy demands and operational energy use by appliances and equipment. Those measures, particularly in the NZER scenario, contribute to significant cost savings for consumers in a number of provinces that cannot be achieved by electrification alone. Energy efficiency measures in new construction also play an important role in reducing system-wide electricity demands thereby enabling further electrification of new buildings, existing buildings, and transportation.

Potential bottlenecks and solutions

The goal of this research is to demonstrate the benefits of every new building being energy efficient and low-carbon while creating the capacity to make all new and existing buildings net-zero emissions in 2050. This goal presents a unique set of potential barriers that can be overcome with policy solutions as presented below (see Table 7).

Bottleneck	Solution
Concerns building to net zero will increase construction costs or increase the complexity of projects.	A mission-oriented policy to introduce productivity-enhancing and net-zero emission construction practices in Canada, building on the Construction Sector Digitalization and Productivity Challenge program at the National Research Council, and adoption-oriented initiatives like the local energy efficiency partnerships program. Comprehensive studies and educational materials on how whole-building energy-efficient design reduces costs, and incentives for integrated design principles can further alleviate concerns related to costs and feasibility.
Building officials are concerned with the capacity to monitor and enforce compliance with new building codes.	Expand the 2023 Codes Acceleration Fund and develop partnerships with building officials, municipalities, and energy efficiency organizations to lead energy and climate compliance activities.
Federal and municipal governments are often more concerned with building emissions, yet provinces traditionally adopt building codes.	Require all new buildings to have zero-carbon heating systems (electrification and/or renewable natural gas) by 2025, through the federal Canada Environmental Protection Act (CEPA). Work with the Federation of Canadian Municipalities to demand provinces give municipalities the ability to adopt upper tiers of building code faster than provincial timelines.

Building codes have a narrow definition of energy efficiency, which does not include the benefits of electrification.	Complete development of net-zero emissions code to incorporate standards and guidance on fuel choice and new CEPA rules and embodied emissions from construction materials.
The building code development and adoption process is governed by established interests and is not transparent or democratic.	Increase support and resources for civil society to engage in local advocacy efforts to improve building codes and the performance of new buildings. The federal government encourages the creation of stakeholder councils on high-performance buildings through a codes acceleration fund.

Table 11: Potential bottlenecks and solutions

Conclusion

The policy solutions above, recognize the role building codes, and tiered codes, in particular, play beyond reducing energy use and emissions in newly constructed buildings. Tiered codes are a market transformation tool establishing a long-term goal and a roadmap to reach that goal via timely and transparent tiered code adoption. Establishing this "roadmap' fosters confidence in the market, by offering regulatory certainty and an anchor by which to develop a long-term strategy. From technical leadership and coordination to education, incentives, and enforcement programs, certainty is key. It helps governments at all levels, builders, developers, and manufacturers prepare to meet the market's needs, invest in the buildings sector, and introduce innovative ways to deliver 5.8 million new affordable and climate-neutral homes, by 2030.

Citations

[1] Poirier, M. and Cameron, C. (2023). The Case for Building Electrification in Canada. The Transition Accelerator.
[2] Natural Resources Canada (2019), Comprehensive Energy Use Database; Natural Resources Canada (2014) Survey of Commercial and Institutional Energy Use Database
[3] It is important to note that the BC Step code includes mandatory airtightness requirements. Although this requirement is not mandatory within the national model codes, it is a crucial component to improve building energy and emissions performance. Therefore, it should be made a mandatory requirement within national model/provincial building codes.
[4] Household fuel mix (electricity, natural gas, heating oil) defined as per Statistics Canada's Household energy consumption, Canada and provinces, 2022.
[5] The 2019 Emission Reduction Plan sets out energy reductions of 61% less energy by 2025 and 65% by 2030 for residential buildings; and 47% less energy by 2025 and 59% less by 2030 for commercial buildings. These reductions are approximate to meeting tier 4 by 2025 and tier 5 by 2030, of the NECB and NBC, respectively.
[6] Natural Resources Canada (2019). Comprehensive Energy Use Database, Residential Sector, Canada, Table 2: Secondary Energy Use and GHG Emissions by End-Use.
[7] 2022 data from Canada Energy Regulator. Canada's Energy Future Data Appendices. DOI: https://doi.org/10.35002/zjr8-8x75. Current Policies Scenario - Residential - 2023C$ per GJ.
[8] As per Statistics Canada. Table 25-10-0060-01 Household energy consumption, Canada and provinces. DOI: https://doi.org/10.25318/2510006001-eng .
[9] Household fuel mix (electricity, natural gas, heating oil) defined as per Statistics Canada's Household energy consumption, Canada and provinces, 2022.