

Beyond Emissions

The Full Case for High Performance Buildings in Canadian Municipalities

The evidence municipal practitioners need across emissions, costs, public health, and markets.

BUILDING TO NET-ZERO

ICLEI Local Governments for Sustainability
Les gouvernements locaux pour le développement durable
CANADA

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Executive Summary

Canadian municipalities are at a pivotal moment in shaping how new buildings are designed and constructed. Not only will the decisions made today lock in energy use and emissions for decades, but the case for building better is stronger than many communities may realize. This report assembles the case across four dimensions—energy and emissions, financial, public health, and market readiness. It draws findings from the Building to Net-Zero project (BNZ), including lifecycle cost modelling, building energy data, public health research, and a supplier availability assessment across municipalities spanning seven provinces. Together, the findings show that these priorities can often complement each other rather than compete.



The Energy and Emissions Dimension

Climate stakes are substantial and growing.

Buildings are generally among the largest sources of greenhouse gas (GHG) emissions in Canadian communities, and because buildings are long-term assets, today's construction decisions will shape community emissions for decades. That risk is not uniform: a building's emissions impact depends heavily on local context, from the dominant heating fuel in the community to the carbon intensity of the regional electricity grid. This means the building decisions that matter most differ from province to province and community to community. Business-as-usual growth would lead to increased building-sector emissions in many communities, by as much as 40% by 2040 in the fastest-growing municipalities in our study, underscoring the long-term consequences of building to today's standards rather than tomorrow's.



The Financial Dimension

The financial case is strong in most contexts, though who benefits is not always who pays.

Across all studied provinces and archetypes, the capital cost premium for higher-performance construction is modest, typically 1–6% for small buildings (somewhat higher for townhomes) and 0–8% for large buildings. Meanwhile, operating cost savings over a 20-year lifecycle are generally significant, with **savings for residents ranging from several hundred to several thousand dollars per year.** Large buildings see operating cost savings in every province modelled. Small buildings see savings in most contexts, though where natural gas is the main heating fuel, partial upgrades can raise operating costs slightly, while deeper upgrades reduce them in nearly every case. Savings generally grow with higher performance, by an amount that depends on local energy prices, climate zone, and building type. This case can also be limited in practice by a split incentive: the party who pays the higher upfront cost, often a developer, is not always the party who benefits from lower energy bills, often a tenant or future owner. This is a structural barrier municipalities can help address through their policy tools.

The Public Health Dimension

Higher-performance buildings offer real public health benefits.

The fuels that heat Canadian homes and buildings carry health costs that are often overlooked, such as combustion byproducts in indoor air and community-scale impacts of particulate pollution. Higher-performance buildings can address these risks through better ventilation, reduced indoor combustion, and lower Volatile Organic Compounds (VOCs) in materials. High performance buildings can offer occupants a healthier, more comfortable home.

The Market Dimension

Local supply chains can largely support this shift.

A supplier availability assessment across participating municipalities found strong local availability for heat pumps and high performance windows across most regions. Geothermal and solar PV show more uneven availability and may require targeted market development—though suppliers for all technologies exist across all the municipalities in our study. The gap between where the financial case is strongest and where local supply chains are most developed is an important finding for municipalities sequencing their policy work, so they are encouraged to assess their own local conditions directly.



The Wellington, a mixed-income high performance building in Saint John, New Brunswick. Photo: Provided by and used with permission from the Wellington project team.

Authors and Acknowledgements

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ICLEI Canada's work happens across Turtle Island which has traditionally been and is home to many diverse First Nations, Inuit, and Métis peoples since time immemorial. We are committed to building relationships with Indigenous groups and knowledge keepers, knowing that Truth and Reconciliation requires ongoing learning, unlearning, reflection, and action. We endeavour to listen to and learn from Indigenous Peoples on an ongoing basis in the process of our work.

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1. Introduction

Advancing high performance buildings is a significant opportunity for Canadian municipalities to create better homes and buildings for their residents.

The decisions made about how new buildings are designed and constructed today will shape community energy use and emissions, affordability, public health, and economic development for decades to come. Making that case to Councils, developers, and residents requires credible, Canadian data grounded in the real conditions of communities of different sizes, climate zones, and energy contexts. This report aims to support that need.

Drawing on cross-Canada research as well as an ICLEI Canada project involving a cohort of 16 municipalities across seven provinces, *Beyond Emissions: The full case for high performance buildings in Canadian municipalities* examines the evidence for building to higher performance tiers under the National Building Code of Canada (NBC) 2020 and the National Energy Code for Buildings (NECB) 2020. It is intended as a practical resource for municipal staff working in this space, sourced from Canadian evidence grounded in the real-world conditions of communities from British Columbia to Newfoundland and Labrador. The report organizes that evidence across four dimensions:



The Energy and Emissions Dimension, which establishes the scale of building-sector energy use and emissions across Canadian communities today, and what business-as-usual growth means for climate trajectories over the coming decades;



The Financial Dimension, which presents a 20-year lifecycle business case, weighing capital and operating costs, to examine who bears the costs and benefits of building to higher standards;



The Public Health Dimension, which surfaces the risks that current building practices impose on occupants and communities; and



The Market Dimension, which shows where the industry is already heading.

This report is a component of ICLEI Canada's Building to Net-Zero (BNZ) project, a four-year initiative launched in 2024 to assist small to mid-sized municipalities across Canada in adopting building energy performance frameworks aligned with national model building and energy codes. Funded by Natural Resources Canada's Codes Acceleration Fund, the program aims to build local capacity and overcome barriers to achieving net-zero building energy performance.



Aqualina at Bayside Toronto, part of Toronto's first LEED-ND Platinum neighbourhood, Ontario. Photo: ICLEI Canada, 2026.

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About the Building to Net-Zero Project

With ongoing growth in the building sector, ensuring that new buildings are sustainable and energy efficient presents a key opportunity—not only to reduce greenhouse gas emissions but also to enhance long-term community resilience, lower energy costs, and support healthier communities. Local governments across Canada are adopting ambitious high performance and net-zero-ready building energy frameworks. This is a crucial component of local climate action as the building sector is a substantial contributor to national greenhouse gas emissions.

While adopting building energy performance frameworks presents challenges for any municipality, smaller, rural, and Northern municipalities face heightened barriers and constraints. ICLEI Canada's BNZ project aims to support small to mid-sized municipalities by building local capacity and helping to overcome barriers along these municipalities' journey to a net-zero future.

About ICLEI Canada

ICLEI Canada is part of a global network working to achieve tangible sustainability results through cumulative local actions. We support local governments by providing expertise and resources. To do this, ICLEI Canada brings together a wide variety of stakeholders across government, industry, academia, and the non-profit community to build more sustainable, low-carbon, biodiverse, and climate-ready communities.

Learn More

Visit ICLEICanada.org/project/bnz/ to learn more about the BNZ project, access more resources, and connect with us online.

2. Background

The push toward high performance buildings in Canada is gaining momentum, driven by a growing body of evidence on lifecycle costs and benefits, evolving industry norms, resilience considerations, and increasing recognition of what building better delivers. This section provides context for the findings that follow: what municipalities and their community partners typically want to understand about higher-performance buildings, what the regulatory landscape looks like, and where municipalities fit within it.

2.1 What Municipalities Are Being Asked to Weigh

Although municipalities across Canada experience unique local realities, opportunities, and barriers, they often face a similar challenge regarding how to engage credibly with questions about high performance buildings. How do higher building standards affect housing affordability? Do local contractors and suppliers have the capacity and expertise to deliver? What are the real health and quality-of-life implications for residents? And what does the emissions trajectory look like in the context of local climate goals? Such questions illustrate how the construction of high performance buildings is a cross-cutting issue, spanning energy costs and affordability, community health, local economic development, and long-term resilience. Each of these dimensions carries weight with different audiences, and each requires its own evidence.

As municipal practitioners explore potential co-benefits, they must also wrestle with trade-offs. High performance buildings can increase upfront capital costs for developers, which is a real consideration in a tight housing market. Implementation needs to be paced in ways that do not overwhelm local building professionals, inspectors, or municipal staff who are already stretched. These tensions are acknowledged throughout this report, and the evidence presented is intended to help municipalities weigh these trade-offs in their own local context.

2.2 Municipal Legislative and Regulatory Context

Federal Framework

In Canada, building codes are developed at the national level and serve as model templates that provinces and territories may choose to adopt, adapt, or supplement with their own requirements. The two most relevant codes for energy performance in new construction are the National Building Code (NBC), which governs low-rise (part 9) residential buildings, and the National Energy Code for Buildings (NECB), which applies to large and commercial (part 3) buildings.

The 2020 versions of both codes introduced a tiered performance system, which marked a significant shift in how building energy performance is regulated.[1] Under this system, Tier 1 represents the baseline, broadly equivalent to previous code minimums, while the highest tier (Tier 5 in the NBC and Tier 4 in the NECB) represents net-zero energy ready performance. The tiers provide a structured pathway for progressive improvement, allowing jurisdictions to signal future requirements and give the development industry time to adapt. The 2025 editions of both codes build directly on this framework. The tier structure is preserved, but several important additions are introduced:[2]

- For the first time both the NBC and the NECB introduce explicit requirements to limit operational greenhouse gas emissions, thereby moving climate considerations from the margins into the core of regulatory practice.
- Alongside this, the 2025 codes introduce an optional Energy Use Intensity (EUI) compliance pathway, providing project teams a flexible, performance-based alternative to demonstrating tier compliance.
- The prescriptive options for energy performance tiers are also expanded, giving industry clearer and more predictable compliance pathways.
- Finally, a new Part 10 introduces an optional framework for alterations to existing buildings, signalling a broader move toward lifecycle-based regulation.

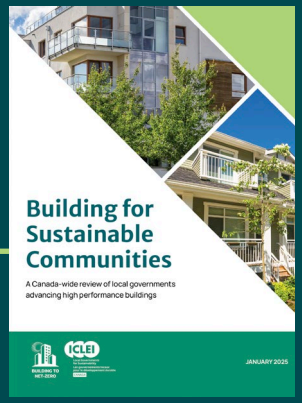
Adoption of the 2025 codes is expected to occur over the coming years. As of time of writing, the 2020 tiered framework remains the operative regulatory reference across many jurisdictions across Canada.

Provincial Variation and Local Government Authority

Because code adoption is a provincial responsibility, the regulatory landscape municipalities are operating in varies considerably across Canada. Several provinces have adopted the 2020 model codes, but where they have landed within the tiered framework differs significantly. Some jurisdictions have adopted Tier 1 as their mandatory minimum, while others have committed to staggered schedules for advancing through higher tiers. The arrival of the 2025 national codes adds a further layer of complexity: provinces with existing 2020 tier schedules will eventually decide whether to continue on that track or migrate to the updated 2025 framework, a choice with direct implications for what a given tier number means in practice for buildings permitted in their jurisdiction.

Separate from where a province sits on code adoption is the question of whether municipalities have the legal authority to require or incentivize performance above the provincial baseline. This is a distinct issue, and the answer varies significantly across the country. Some provinces provide clear pathways for local governments to adopt higher tiers of the code or supplement provincial requirements with their own frameworks and standards; in others, only voluntary high performance development standards are possible.

Building for Sustainable Communities
ICLEI Canada, January 2025



ICLEI Canada published *Building for Sustainable Communities: A Canada-wide review of local governments advancing high performance buildings* in 2025. This report includes a review of the diverse provincial and territorial adoption approaches of national model codes; the extent of local legislative authority across Canada to adopt higher code tiers or supplement code requirements; and various types of local government-led initiatives.

Visit icleicanada.org/project/bnz-jurisdictional-scan/ to learn more and download the report.

Learn More

Understanding Net-Zero Concepts

A **Net-Zero Energy** building produces as much energy as it consumes over the course of a year, while a **Net-Zero Energy Ready** building is constructed to that same high-efficiency standard, but without yet incorporating on-site renewable energy generation; it is capable of achieving net-zero with the future addition of technologies such as rooftop solar. In this report, **High Performance** is used as a general term for any building that delivers meaningfully better energy efficiency and emissions performance that what most building codes require.

It should also be noted that the path toward net-zero is best understood as a spectrum rather than a binary. Buildings progress from baseline code requirements toward net zero in steps, with each tier delivering greater energy efficiency, lower operating costs, and reduced emissions. This incremental framing matters practically: it means municipalities do not face a choice between the status quo and full net-zero, but rather a question of how far along the spectrum to move, and how quickly.

The Uneven Playing Field: Gas and electricity infrastructure costs

A structural barrier worth stating is the unequal treatment of gas and electricity infrastructure costs in new development. In jurisdictions with significant gas distribution networks, natural gas utilities have historically been permitted to recover much of the cost of new customer connections through the rate base (i.e., spreading costs across existing and future customers), while electricity distributors have generally required larger upfront capital contributions from new customers based on shorter revenue horizons.[3,4] This has created a built-in financial incentive to connect new buildings to gas because the near-zero upfront cost makes gas the path of least resistance at the point of construction. This locks buildings and their future owners into long-term fossil fuel dependence, creating additional barriers to electrification that subsequent owners are unlikely to take on.

The issue has been most thoroughly documented in Ontario, where electricity distributors have typically applied shorter connection and revenue horizons than natural gas distributors, resulting in higher upfront capital contributions from new customers connecting to the grid, a disparity that has been the subject of active regulatory and legislative debate.[5] Ontario's own regulatory process has acknowledged that natural gas expansion often requires public subsidy to be viable, illustrating that the current asymmetry reflects policy choices rather than market neutrality.[6] While the specific regulatory mechanisms vary by province, the same asymmetry has been documented elsewhere—for example, in British Columbia, the gas utility's line extension allowance covers nearly the full cost of new gas connections through the rate base, a cost borne by existing ratepayers.[7] Addressing this asymmetry does not require restricting consumer choice or banning gas outright, but consistent treatment of infrastructure costs across fuels.

For municipal staff, this context matters because it illustrates that the barriers to higher-performance buildings are not only technical or financial. Rather, they are also structural, embedded in regulatory frameworks that have historically favoured fossil fuel infrastructure, even where this may not align with long-term cost or emissions objectives.

3. The Energy and Emissions Dimension

Buildings represent 18% of national emissions[8] and are among the largest sources of greenhouse gas emissions in Canadian communities. Nationally, buildings are the third largest emitting sector after the oil and gas sector and the transportation sector, and because they are long-lived assets, the construction decisions made today shape community emissions for decades—a home or office building permitted today will likely still be in use in 50 years, if not significantly longer. Canada has committed to reaching net-zero by 2050 through the Canadian Net-Zero Emissions Accountability Act,[9] and decarbonizing buildings is vital to reaching that goal. Getting the design right the first time will save communities and residents across the country the significant costs of having to perform retrofits on their future outdated technology.

Understanding those stakes, however, requires more than national averages. The emissions implications of building performance decisions depend heavily on local context: what fuel heats the buildings in a community, how carbon-intensive the local electricity grid is, and how fast the community is growing. This section traces that context at two scales: the provincial energy landscape, and what community-specific data reveals when you look closer.



Watercolour Westport, a sustainable residential development in Westport, Ontario.
Photo: Land Ark Developments.

3.1 The Provincial Energy Context

Understanding the emissions implications of building performance decisions requires an understanding of how Canadian provinces heat their homes and how the electricity that powers them is generated. The following figures illustrate this variation across the country, reflecting provincial energy systems.

Direct Emissions: What heats the building

Figure 1a: Residential energy use by fuel type, energy shares (%) [10]

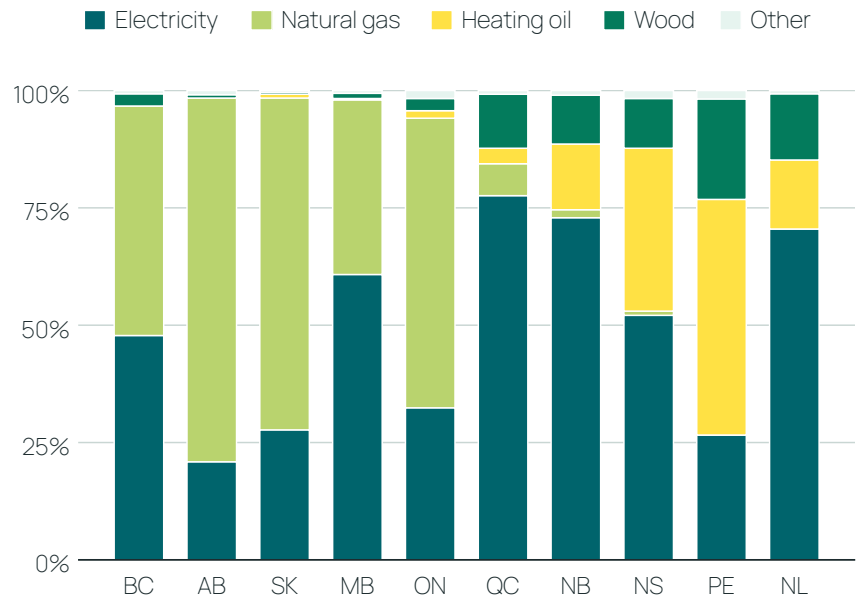
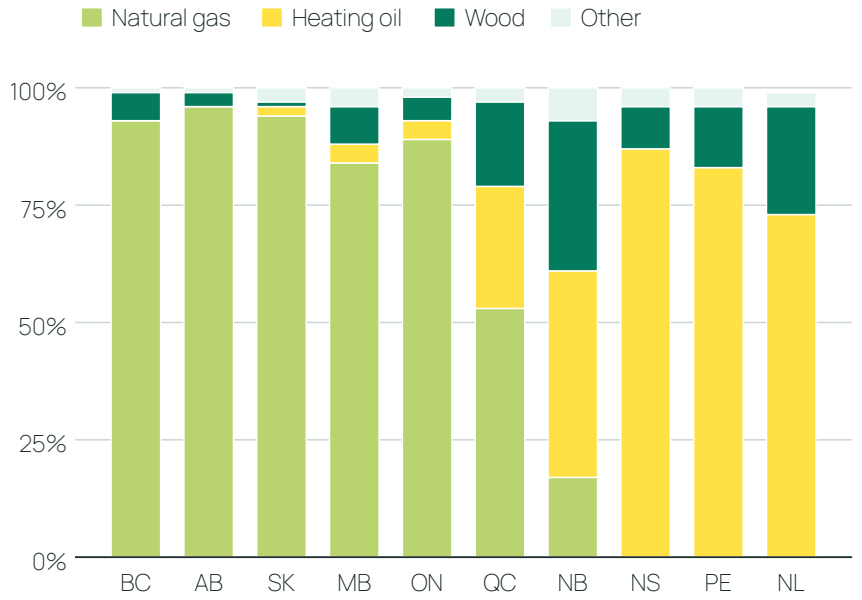


Figure 1b: Direct residential GHG emissions by fuel type, emissions shares (%) [11]



Figures 1a and 1b illustrate how Canadian provinces heat their homes, and what that means for building-related emissions. Figure 1b reflects direct (Scope 1) emissions only, which is why electricity is not included—those emissions depend on how electricity is generated and are addressed separately in Figures 2a and 2b.

Almost all buildings' direct operating emissions (>96%)[12] come from space and water heating from the use of equipment that runs on fossil fuels (e.g., natural gas furnaces and boilers), making heating fuel the single biggest driver of a building's emissions footprint. That fuel mix varies sharply by province: natural gas dominates in Alberta, Saskatchewan, and Ontario; Manitoba and Quebec rely primarily on hydro-generated electricity; British Columbia splits roughly evenly between gas and

electricity; and Atlantic Canada is the most varied region, with electricity leading in New Brunswick, heating oil still significant in Prince Edward Island and Nova Scotia, and Newfoundland and Labrador powered mostly by hydro. For those with natural gas heating or fuel oil, the emissions reduction path for higher-performance buildings is primarily through electrification. For those with electricity, particularly where the local grid is already low-carbon, the emissions benefit of further efficiency gains is smaller—the stronger case there is affordability, grid resilience, and the avoidance of expensive new energy infrastructure.

Indirect Emissions: What powers the grid

Figure 2a: Electricity generation by source, by province (2023) - Share of total electricity generated (%)[13]

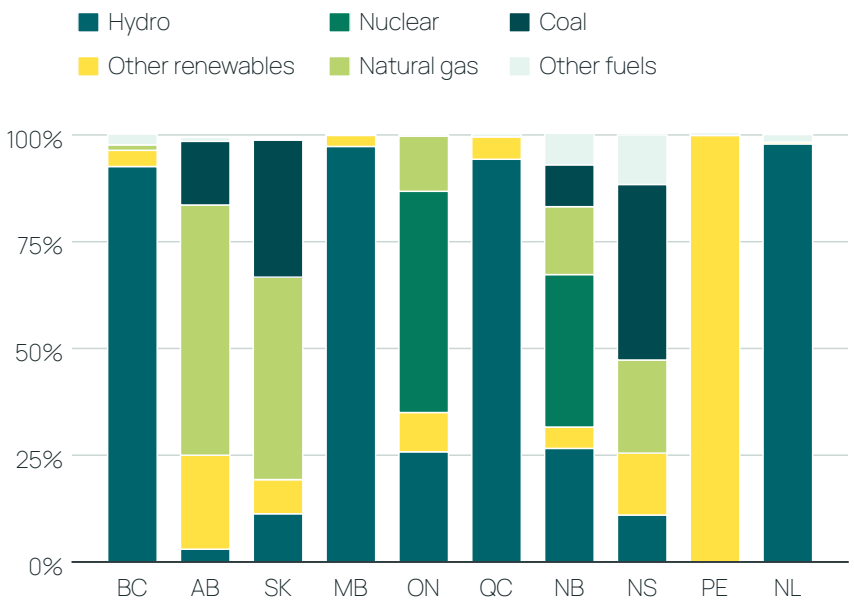
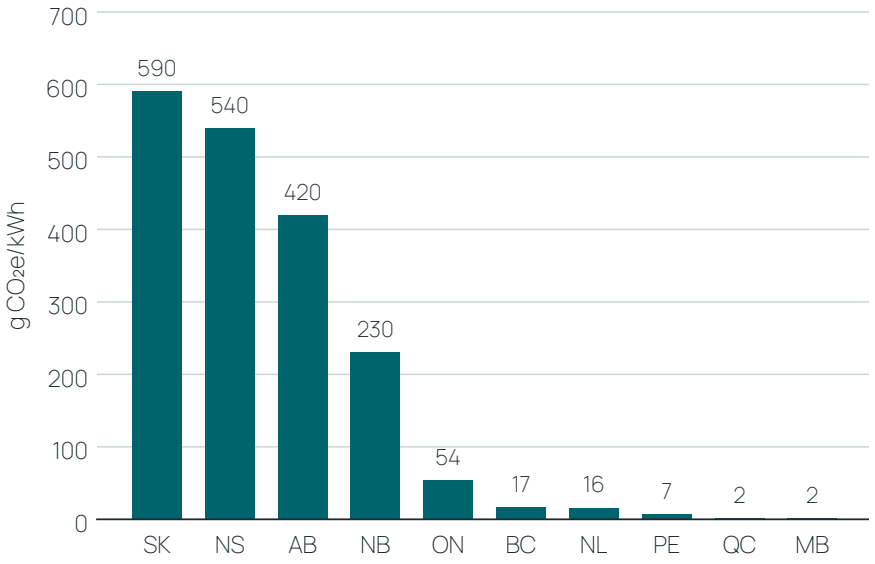


Figure 2b: Grid carbon intensity, by province (2023) - Generation intensity (g CO_2eq / kWh electricity generated) [14]



Notably, while GHG emissions from direct combustion are relatively low in provinces where electricity dominates, the emissions story is not complete without also considering the indirect emissions embedded in the carbon makeup and intensity of the electricity itself. Figures 2a and 2b illustrate how electricity is not the same fuel everywhere, and grid carbon intensity varies dramatically across the country.[†] Quebec, Manitoba, and Newfoundland and Labrador generate electricity from predominantly hydroelectric sources, resulting in near-zero grid carbon intensity. British Columbia is similarly low, with hydro accounting for the large majority of generation.

Ontario's grid is anchored by nuclear power and hydro, producing relatively low emissions, though its intensity has risen in recent years as natural gas has filled gaps during nuclear refurbishment. At the other end of the spectrum, Saskatchewan and Nova Scotia remain heavily reliant on coal and natural gas, with grid intensities among the highest in the country. Alberta's grid has been transitioning away from coal toward natural gas and renewables, but its intensity remains substantial.

Provincial variation has a direct implication for how municipalities make the environmental case locally. There is no single pathway to net-zero buildings that works equally well across Canada. The argument for higher-performance buildings in a natural-gas-dominated Alberta city is fundamentally about reducing combustion, while in a hydro-powered Atlantic community it is as much about reducing dependence on heating oil and wood. Local data is therefore not just nice to have; it is essential to making the case credibly.

[†] Figures 2a and 2b reflect in-province generation only. PEI illustrates why this matters: its electricity is ~99% wind-generated, but most of what it actually consumes is imported from New Brunswick's more carbon-intensive grid, so true consumption emissions are higher than shown here.



An electric vehicle charges at home in Watercolour Westport, Ontario.
Photo: Land Ark Developments.

3.2 The Local Building Sector

Section 3.1 draws on national and provincial data to describe the broader energy and emissions landscape, but provincial averages can obscure what's actually happening in any one community. As part of the BNZ project, cohort members completed community building inventories—detailed, community-specific analyses of current building energy use and emissions, along with projections of how those figures will change as the community grows. The findings below illustrate the kind of insight a community building inventory can surface, and the practical case for municipalities to consider commissioning their own.

Growth compounds the emissions consequences of today's building decisions.

In the BNZ project, each inventory included a business-as-usual emissions projection to 2040, based on the community's own population and employment growth forecasts. Across the inventories, projected emissions increases ranged from roughly 14% in slower-growing communities to 40% in communities anticipating rapid expansion. This range illustrates a point that applies broadly, even though it draws on a small number of communities: growth compounds the emissions consequences of today's building decisions, and the scale of that compounding is different in every community depending on its own growth trajectory.

Energy use alone doesn't tell the full story.

Across the completed inventories, building energy use and emissions do not always move together. A community can rank high on one measure and low on the other, depending on factors like fuel mix and the carbon intensity of the local electricity grid.

> **For municipal staff, this has a direct practical implication: the strongest case for high performance buildings is not the same in every community.**

Where fossil-fuel heating still dominates (whether through direct emissions or indirectly through the grid), emissions reduction is the clearest argument. Where the grid is already clean and buildings are largely electrified, the more compelling case often lies elsewhere, e.g., in affordability, energy security, and grid resilience, since the emissions upside is limited when there's little carbon left to remove. This is why it is important to understand the specific inputs in your municipality to build a clearer picture of the energy use and emissions that local residents are using.

Provincial averages tend to flatten exactly this kind of variation, masking what's actually driving a given community's emissions profile. The contrast between two of the inventoried communities makes the point concretely: a Newfoundland and Labrador community sits among the higher end of the range for building energy use per capita, yet has the lowest per-capita emissions of any community studied, a result of the province's near-carbon-free hydroelectric grid; a Nova Scotia community shows the opposite pattern, with relatively modest energy use but the highest per-capita emissions of any community studied, at over 7 tCO_2e per person, reflecting the heavier carbon burden of the province's coal-and-oil-dependent electricity grid. Neither figure would be visible from provincial averages alone. The takeaway for municipal practitioners is direct: a community's grid context matters as much as its energy use in determining the emissions stakes of its building decisions, and that context can only be confirmed locally.

Part of the case for high performance buildings rests on energy security and grid resilience.

As noted above, where the local grid is already low-carbon, part of the case for high performance buildings rests on energy security and grid resilience rather than emissions reduction. Resilience is an increasingly important driver across the country regardless of grid composition, as extreme weather, wildfire smoke, and supply disruptions place growing stress on energy systems and occupants alike. Well-insulated, airtight buildings retain heat longer during outages and supply disruptions, which matters more as extreme weather and grid constraints place growing stress on energy systems. In cold-climate municipalities, this passive survivability has direct implications for occupant safety.

Learn More

Using an inventory

A community building inventory is typically a foundational step within broader climate action planning, generally serving as the building-sector component of a baseline GHG inventory. ICLEI Canada has supported municipal climate planning for over three decades, including through its long-standing partnership with the Federation of Canadian Municipalities on the Partners for Climate Protection program.

Municipalities considering a community building inventory as part of their own climate planning process can contact ICLEI Canada to learn more by emailing iclei-canada@iclei.org.



A supportive housing development and high performance building in Windsor, Ontario. Photo: Congregate Living Model Building project team.

4. The Financial Dimension

Choosing how to build, whether to minimum code or to a higher performance standard, is a significant financial decision. This section presents the results of lifecycle cost modelling across eight building archetypes in seven provinces, comparing capital costs, 20-year operating costs, and total lifecycle costs at three performance tiers: Baseline, Mid-Range, and Net-Zero Ready.

> **The full methodology, including the key assumptions, modelling approach, and limitations that should be considered when interpreting and applying the results, is documented in Appendix C; energy rate assumptions are provided in Appendix F.**

Two findings hold consistently across the full cohort:

- The capital cost premium for higher-performance construction is modest: typically 1–6% for small residential archetypes (townhomes run higher, up to 12%) and 0–8% for large buildings depending on tier and climate zone.
- Operating cost reductions are substantial in many cases, particularly for large buildings, and for these cases the capital premium is often more than offset over a 20-year horizon. The strength of that offset depends heavily on local energy prices, climate zone, and building type.

The sections below trace these differences in detail across large and residential building archetypes.

4.1 Residential Building Sector

Residential archetypes modelled in this analysis include detached homes, townhome middle units, townhome end units, and quadplexes. The three performance tiers differ primarily in their mechanical systems and envelope:

- Baseline (NBC 2020 Tier 1): Fossil fuel heating and electric resistance domestic hot water. Code level performance.
- Mid-Range (20% Better - NBC 2020 Tier 3): Hybrid heating system with electric heat pumps and fossil fuel backup. Electric resistance for domestic hot water. 10% reduction in heating load.
- Net-Zero Ready (70% Better - NBC 2020 Tier 5): Cold climate heat pumps, heat pump domestic hot water heaters. 40% reduction in heating load.

Full details on the archetypes are available in Appendix C.

Clear patterns emerge from the costing analysis. Overall, results for many provinces (e.g., in Atlantic Canada) show that Mid-Range homes deliver meaningful reductions in operating costs over time. For gas-served regions, however, the results tell a more nuanced story at the Mid-Range tier. For many provinces and archetypes, operating costs do not decrease at this level, and in some cases increase slightly. This reflects the limits of partial upgrades: the Mid-Range tier improves efficiency incrementally but does not go far enough to consistently offset energy costs under current prices. The Net-Zero Ready tier is where the financial case becomes clear and consistent. By going further—combining electrification with meaningful envelope improvements—Net-Zero Ready construction reduces operating costs across nearly all archetypes and provinces.

> **The takeaway for municipal practitioners in regions with natural gas access is that the strongest and most reliable financial case comes from building to the highest tier, not stopping partway.**

Residential Detached

The detached home is modelled as a standalone two-storey home with a basement, the only residential archetype with no shared walls, giving it the largest exposed envelope relative to its floor area.

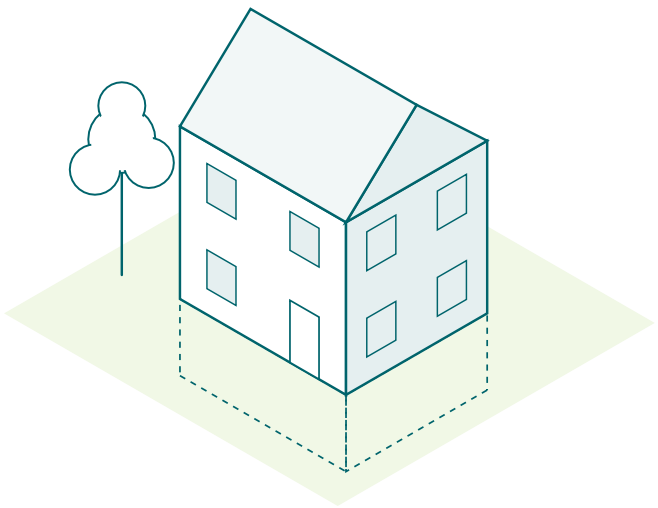


Table 1: *Residential detached*
* Fuel oil modelled as heating source. Row 1 = dollar values; row 2 = % change vs. minimum performance.
Op = lifetime operating cost (20 yr); Cap = capital cost; Tot = total cost.

Province	Baseline			Mid-Range			Net-Zero Ready		
	Op	Cap	Tot	Op	Cap	Tot	Op	Cap	Tot
NL*	$117k	$373k	$490k	$94k	$380k	$474k	$61k	$396k	$457k
				−20%	+2%	−3%	−48%	+6%	−7%
NS*	$130k	$373k	$503k	$107k	$380k	$487k	$71k	$396k	$467k
				−18%	+2%	−3%	−45%	+6%	−7%
ON (north)	$92k	$383k	$475k	$94k	$391k	$485k	$71k	$406k	$477k
				+2%	+2%	+2%	−23%	+6%	0%
ON (south)	$91k	$499k	$590k	$96k	$506k	$602k	$70k	$523k	$593k
				+5%	+1%	+2%	−23%	+5%	+1%
MB *†	$118k	$457k	$575k	$91k	$464k	$555k	$46k	$480k	$525k
				−23%	+2%	−3%	−61%	+5%	−9%
SK	$97k	$457k	$554k	$99k	$464k	$563k	$81k	$480k	$560k
				+2%	+2%	+2%	−16%	+5%	+1%
AB	$112k	$457k	$569k	$116k	$464k	$580k	$94k	$480k	$573k
				+4%	+2%	+2%	−16%	+5%	+1%
BC	$88k	$462k	$550k	$87k	$469k	$557k	$65k	$486k	$551k
				−1%	+2%	+1%	−26%	+5%	0%

† The representative community for Manitoba relies predominantly on fuel oil for heating. Elsewhere in Manitoba, natural gas is more widely available, and as such baseline heating costs and the operating cost savings shown would be lower. This applies to all Manitoba results in sections 4.1 and 4.2.

Townhome Middle Unit

The townhome middle unit is modelled as a two-storey home sharing walls on both sides, which reduces its exposed envelope more than any other residential archetype.

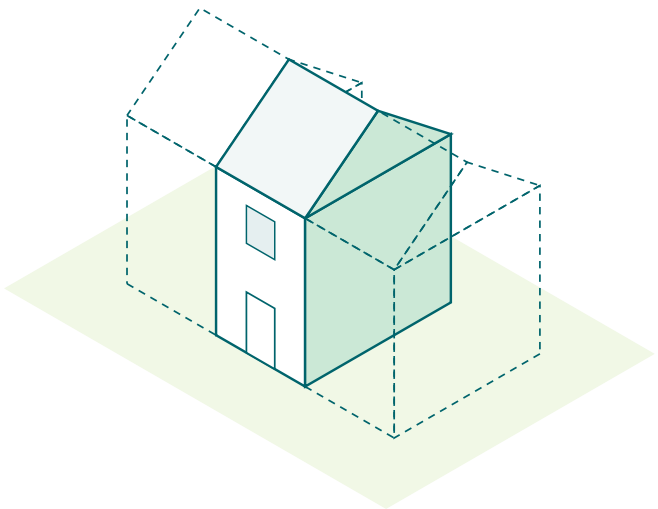


Table 2: Townhome middle unit
* Fuel oil modelled as heating source. Row 1 = dollar values; row 2 = % change vs. minimum performance.
Op = lifetime operating cost (20 yr); Cap = capital cost; Tot = total cost.

Province	Baseline			Mid-Range			Net-Zero Ready		
	Op	Cap	Tot	Op	Cap	Tot	Op	Cap	Tot
NL*	$88k	$255k	$343k	$77k	$260k	$337k	$54k	$283k	$337k
				−13%	+2%	−2%	−39%	+11%	−2%
NS*	$99k	$255k	$354k	$88k	$260k	$348k	$62k	$283k	$345k
				−11%	+2%	−2%	−37%	+11%	−3%
ON (north)	$84k	$240k	$324k	$87k	$245k	$332k	$62k	$268k	$329k
				+4%	+2%	+2%	−26%	+12%	+2%
ON (south)	$84k	$353k	$437k	$88k	$357k	$446k	$61k	$383k	$445k
				+5%	+1%	+2%	−27%	+8%	+2%
MB	$81k	$315k	$396k	$67k	$320k	$386k	$37k	$343k	$380k
				−17%	+2%	−3%	−54%	+9%	−4%
SK	$89k	$315k	$404k	$92k	$320k	$411k	$67k	$343k	$410k
				+3%	+2%	+2%	−25%	+9%	+1%
AB	$104k	$315k	$419k	$108k	$320k	$428k	$77k	$343k	$420k
				+4%	+2%	+2%	−26%	+9%	0%
BC	$77k	$323k	$400k	$79k	$327k	$406k	$56k	$353k	$409k
				+3%	+1%	+1%	−27%	+9%	+2%

Townhome End Unit

The townhome end unit is modelled as a two-storey home sharing a wall on only one side, giving it more exposed envelope than the middle unit but less than the detached home.

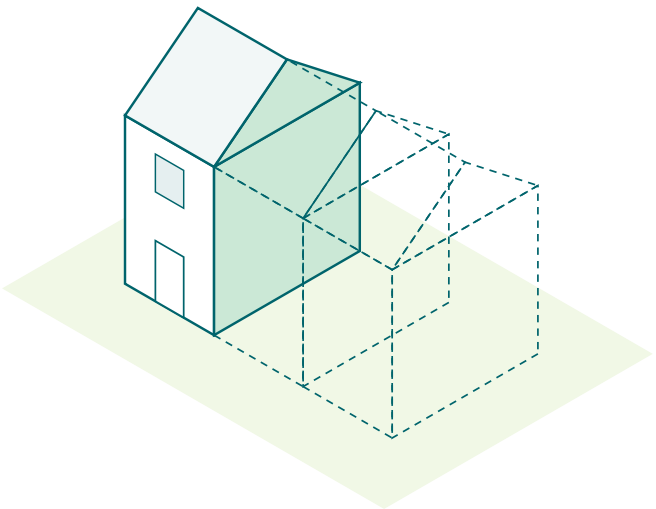


Table 3: Townhome end unit
* Fuel oil modelled as heating source. Row 1 = dollar values; row 2 = % change vs. minimum performance.
Op = lifetime operating cost (20 yr); Cap = capital cost; Tot = total cost.

Province	Baseline			Mid-Range			Net-Zero Ready		
	Op	Cap	Tot	Op	Cap	Tot	Op	Cap	Tot
NL*	$98k	$255k	$353k	$83k	$261k	$344k	$57k	$279k	$336k
				−15%	+2%	−3%	−42%	+9%	−5%
NS*	$109k	$255k	$364k	$95k	$261k	$356k	$66k	$279k	$344k
				−13%	+2%	−2%	−39%	+9%	−5%
ON (north)	$86k	$240k	$326k	$90k	$246k	$336k	$65k	$265k	$330k
				+5%	+2%	+3%	−24%	+10%	+1%
ON (south)	$86k	$353k	$439k	$91k	$359k	$450k	$65k	$379k	$444k
				+6%	+2%	+3%	−24%	+7%	+1%
MB	$94k	$315k	$409k	$75k	$321k	$396k	$41k	$339k	$380k
				−20%	+2%	−3%	−56%	+8%	−7%
SK	$91k	$315k	$406k	$94k	$321k	$416k	$73k	$339k	$412k
				+3%	+2%	+2%	−20%	+8%	+1%
AB	$106k	$315k	$421k	$111k	$321k	$432k	$84k	$339k	$423k
				+5%	+2%	+3%	−21%	+8%	0%
BC	$81k	$323k	$403k	$82k	$329k	$410k	$60k	$349k	$408k
				+1%	+2%	+2%	−26%	+8%	+1%

Quadplex

The quadplex is modelled as a narrow building with a high window-to-wall ratio and a flat roof, which is a configuration that increases baseline heating demand relative to the other residential archetypes.

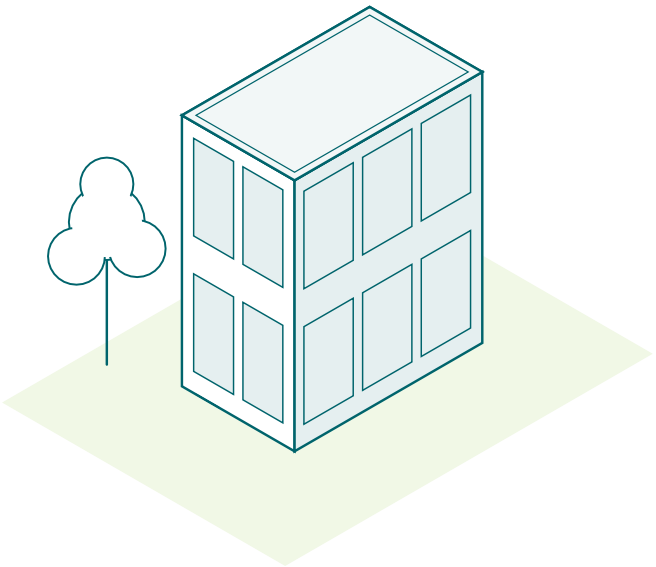


Table 4: Quadplex

* Fuel oil modelled as heating source. Row 1 = dollar values; row 2 = % change vs. minimum performance.
Op = lifetime operating cost (20 yr); Cap = capital cost; Tot = total cost.

Province	Baseline			Mid-Range			Net-Zero Ready		
	Op	Cap	Tot	Op	Cap	Tot	Op	Cap	Tot
NL*	$229k	$1,031k	$1,261k	$164k	$1,044k	$1,208k	$87k	$1,090k	$1,176k
				−28%	+1%	−4%	−62%	+6%	−7%
NS*	$248k	$1,031k	$1,279k	$183k	$1,044k	$1,227k	$101k	$1,090k	$1,191k
				−26%	+1%	−4%	−59%	+6%	−7%
ON (north)	$118k	$1,031k	$1,149k	$123k	$1,044k	$1,166k	$97k	$1,090k	$1,187k
				+4%	+1%	+1%	−18%	+6%	+3%
ON (south)	$117k	$1,581k	$1,699k	$126k	$1,594k	$1,720k	$95k	$1,642k	$1,737k
				+8%	+1%	+1%	−19%	+4%	+2%
MB	$263k	$1,224k	$1,487k	$185k	$1,236k	$1,422k	$74k	$1,282k	$1,355k
				−30%	+1%	−4%	−72%	+5%	−9%
SK	$125k	$1,224k	$1,349k	$130k	$1,236k	$1,367k	$127k	$1,282k	$1,408k
				+4%	+1%	+1%	+1%	+5%	+4%
AB	$138k	$1,224k	$1,362k	$149k	$1,236k	$1,385k	$149k	$1,282k	$1,430k
				+8%	+1%	+2%	+8%	+5%	+5%
BC	$128k	$1,238k	$1,366k	$123k	$1,250k	$1,374k	$89k	$1,298k	$1,387k
				−4%	+1%	+1%	−30%	+5%	+2%

Across all four residential archetypes, operating cost reductions at the Net-Zero Ready tier are largest in Newfoundland and Labrador, Nova Scotia, and Manitoba—where the Baseline is modelled with fuel oil rather than natural gas. These regions see savings between 37–72% and moderate capital costs for developers, of 5–11%, translating into total lifecycle cost savings of 2–9% once both are combined. The driver is heat pump efficiency rather than cheap electricity. The savings come from replacing expensive fuel oil or baseboard electric heating with a heat pump, which delivers the same heat using a fraction of the energy.

Savings are moderate in the natural-gas-baseline provinces of Ontario, Saskatchewan, and Alberta, ranging from 16% (Saskatchewan and Alberta, detached) to 27% (Ontario, townhome middle). The quadplex is the exception: although it shows the strongest reductions of any archetype in provinces without natural gas access (59–72%), there is a cost increase in Saskatchewan and Alberta (+1% and +8%).

Large buildings, covered next, show a more consistent financial case across all provinces.



The deCoste Centre, a high performance performing arts centre in the Town of Pictou, Nova Scotia. Photo: deCoste Cultural Hub.



A high performance commercial facility in Edmonton, Alberta. Photo: Hi-Tech Seals project team.

4.2 Large Building Sector

Large building archetypes include low-rise multi-unit residential, high-rise multi-unit residential, commercial office, and municipal (institutional) office. Performance tiers for large buildings differ from residential in both mechanical system and envelope strategy:

- Baseline (NECB Tier 1): Fossil fuel space heating and domestic hot water. Electric chillers. Code level performance.
- Mid-Range (25% Better – NECB 2020 Tier 2): Electric heat pumps for heating and cooling. Fossil fuel for back-up heating and domestic hot water. Improved ventilation efficiency.
- Net-Zero Ready (60% Better – NECB 2020 Tier 4): Geo-exchange heat pumps for heating and cooling. Efficient equipment and appliances.

Full archetype specifications are in Appendix C.

The large building results present a clearer and more consistent financial case than the residential results. Across all four archetypes, operating costs decrease at both performance tiers in the large majority of provincial contexts, meaning the business case is positive at both Mid-Range and Net-Zero Ready levels. For municipalities and developers considering new large building construction, the data consistently supports investment in higher-performance design at either tier.

Low-Rise Multi-Unit Residential

The low-rise multi-unit residential archetype is modelled as a compact three-storey, 19,000-square-foot building, with more exposed roof and ground-floor area per square foot than the taller high-rise archetype.

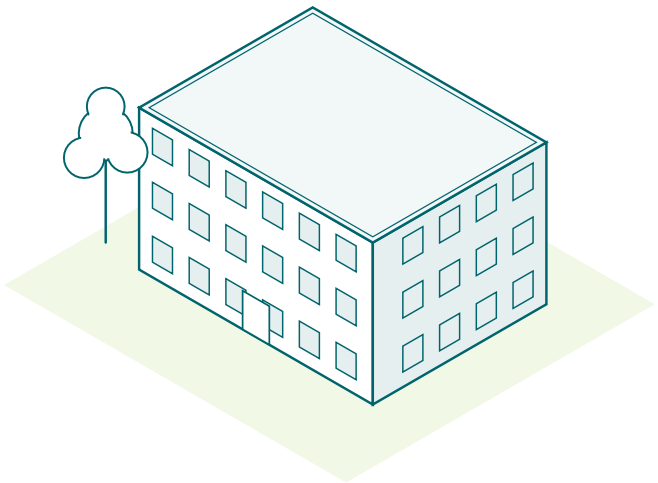


Table 5: Low-rise multi-unit residential
* Fuel oil modelled as heating source. Row 1 = dollar values; row 2 = % change vs. minimum performance.
Op = lifetime operating cost (20 yr); Cap = capital cost; Tot = total cost.

Province	Baseline			Mid-Range			Net-Zero Ready		
	Op	Cap	Tot	Op	Cap	Tot	Op	Cap	Tot
NL*	$1,506k	$5,694k	$7,200k	$1,051k	$5,741k	$6,792k	$620k	$5,997k	$6,617k
				−30%	+1%	−6%	−59%	+5%	−8%
NS*	$1,691k	$5,504k	$7,195k	$1,181k	$5,553k	$6,734k	$738k	$5,808k	$6,546k
				−30%	+1%	−6%	−56%	+6%	−9%
ON (north)	$924k	$5,836k	$6,761k	$715k	$5,863k	$6,578k	$621k	$6,134k	$6,756k
				−23%	0%	−3%	−33%	+5%	0%
ON (south)	$1,025k	$6,453k	$7,478k	$758k	$6,489k	$7,247k	$681k	$6,704k	$7,385k
				−26%	+1%	−3%	−34%	+4%	−1%
MB	$1,328k	$6,121k	$7,449k	$793k	$6,169k	$6,962k	$418k	$6,409k	$6,827k
				−40%	+1%	−7%	−69%	+5%	−8%
SK	$920k	$6,121k	$7,041k	$645k	$6,167k	$6,812k	$693k	$6,409k	$7,101k
				−30%	+1%	−3%	−25%	+5%	+1%
AB	$1,059k	$6,121k	$7,180k	$750k	$6,166k	$6,916k	$827k	$6,408k	$7,235k
				−29%	+1%	−4%	−22%	+5%	+1%
BC	$1,107k	$6,975k	$8,082k	$792k	$7,012k	$7,804k	$666k	$7,229k	$7,895k
				−28%	+1%	−3%	−40%	+4%	−2%

High-Rise Multi-Unit Residential

The high-rise multi-unit residential archetype is modelled as a ten-storey, 84,000-square-foot building—more than four times the floor area of the low-rise archetype—spreading the cost of mechanical upgrades across a much larger building.

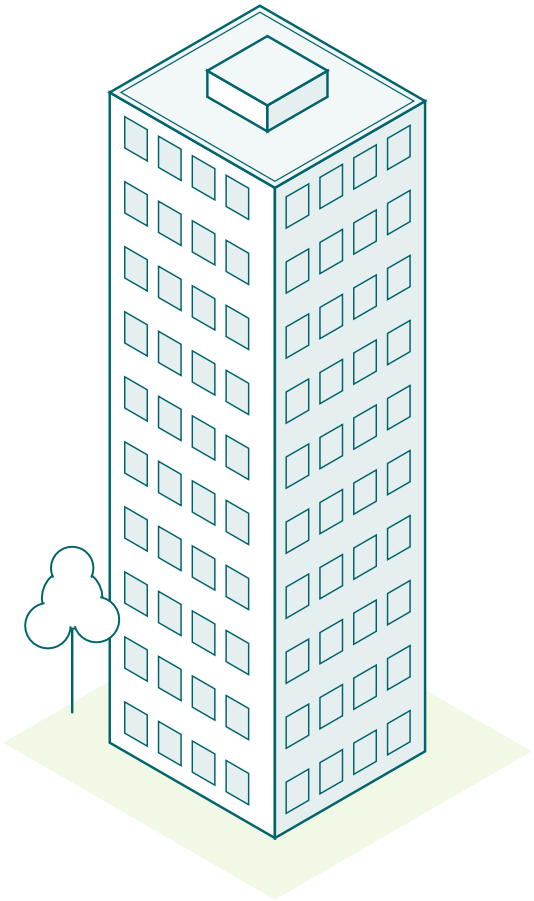


Table 6: High-rise multi-unit residential
* Fuel oil modelled as heating source. Row 1 = dollar values; row 2 = % change vs. minimum performance.
Op = lifetime operating cost (20 yr); Cap = capital cost; Tot = total cost.

Province	Baseline			Mid-Range			Net-Zero Ready		
	Op	Cap	Tot	Op	Cap	Tot	Op	Cap	Tot
NL*	$4,774k	$25,305k	$30,080k	$3,348k	$25,539k	$28,886k	$2,062k	$26,792k	$28,854k
				−30%	+1%	−4%	−57%	+6%	−4%
NS*	$5,371k	$24,462k	$29,832k	$3,803k	$24,694k	$28,497k	$2,463k	$25,953k	$28,416k
				−29%	+1%	−4%	−54%	+6%	−5%
ON (north)	$3,152k	$25,938k	$29,090k	$2,433k	$26,469k	$28,902k	$2,179k	$27,363k	$29,542k
				−23%	+2%	−1%	−31%	+5%	+2%
ON (south)	$3,506k	$28,679k	$32,186k	$2,603k	$28,883k	$31,485k	$2,348k	$29,791k	$32,140k
				−26%	+1%	−2%	−33%	+4%	0%
MB	$4,602k	$27,203k	$31,806k	$3,174k	$27,705k	$30,879k	$1,517k	$28,630k	$30,147k
				−31%	+2%	−3%	−67%	+5%	−5%
SK	$3,198k	$27,203k	$30,401k	$2,503k	$27,701k	$30,204k	$2,497k	$28,628k	$31,125k
				−22%	+2%	−1%	−22%	+5%	+2%
AB	$3,684k	$27,203k	$30,887k	$2,906k	$27,699k	$30,605k	$2,988k	$28,627k	$31,614k
				−21%	+2%	−1%	−19%	+5%	+2%
BC	$3,811k	$30,999k	$34,810k	$2,795k	$31,206k	$34,001k	$2,309k	$32,113k	$34,422k
				−27%	+1%	−2%	−39%	+4%	−1%

Office Building

The office building archetype is modelled as a three-storey, 54,000-square-foot building using geo-exchange heating and cooling at the Net-Zero Ready tier, a system that performs especially well in commercial applications.

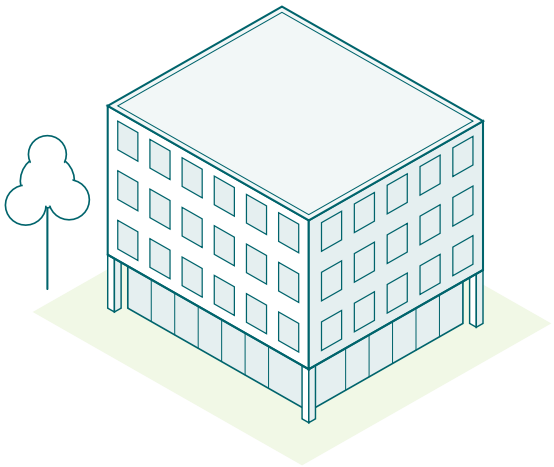


Table 7: Office building
* Fuel oil modelled as heating source. Row 1 = dollar values; row 2 = % change vs. minimum performance.
Op = lifetime operating cost (20 yr); Cap = capital cost; Tot = total cost.

Province	Baseline			Mid-Range			Net-Zero Ready		
	Op	Cap	Tot	Op	Cap	Tot	Op	Cap	Tot
NL*	$2,402k	$12,871k	$15,273k	$1,667k	$13,171k	$14,839k	$992k	$13,902k	$14,894k
				−31%	+2%	−3%	−59%	+8%	−2%
NS*	$2,811k	$12,737k	$15,547k	$1,941k	$13,036k	$14,977k	$1,183k	$13,771k	$14,954k
				−31%	+2%	−4%	−58%	+8%	−4%
ON (north)	$2,179k	$15,820k	$17,999k	$1,448k	$16,142k	$17,589k	$1,066k	$16,871k	$17,936k
				−34%	+2%	−2%	−51%	+7%	0%
ON (south)	$2,459k	$17,429k	$19,888k	$1,849k	$17,731k	$19,580k	$1,142k	$18,433k	$19,576k
				−25%	+2%	−2%	−54%	+6%	−2%
MB	$1,835k	$15,150k	$16,985k	$1,238k	$15,476k	$16,713k	$669k	$16,173k	$16,841k
				−33%	+2%	−2%	−64%	+7%	−1%
SK	$2,218k	$15,150k	$17,368k	$1,725k	$15,479k	$17,204k	$1,104k	$16,169k	$17,273k
				−22%	+2%	−1%	−50%	+7%	−1%
AB	$2,628k	$15,418k	$18,046k	$2,054k	$15,742k	$17,796k	$1,320k	$16,501k	$17,820k
				−22%	+2%	−1%	−50%	+7%	−1%
BC	$2,482k	$18,099k	$20,582k	$1,818k	$18,399k	$20,216k	$1,121k	$19,095k	$20,216k
				−27%	+2%	−2%	−55%	+6%	−2%

Municipal Office Building (Institutional)

The municipal office building archetype shares the same size and systems as the commercial office building, but carries a higher baseline construction cost due to public procurement requirements.

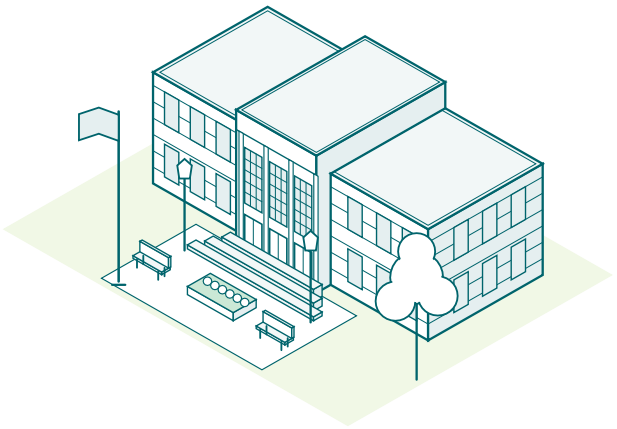


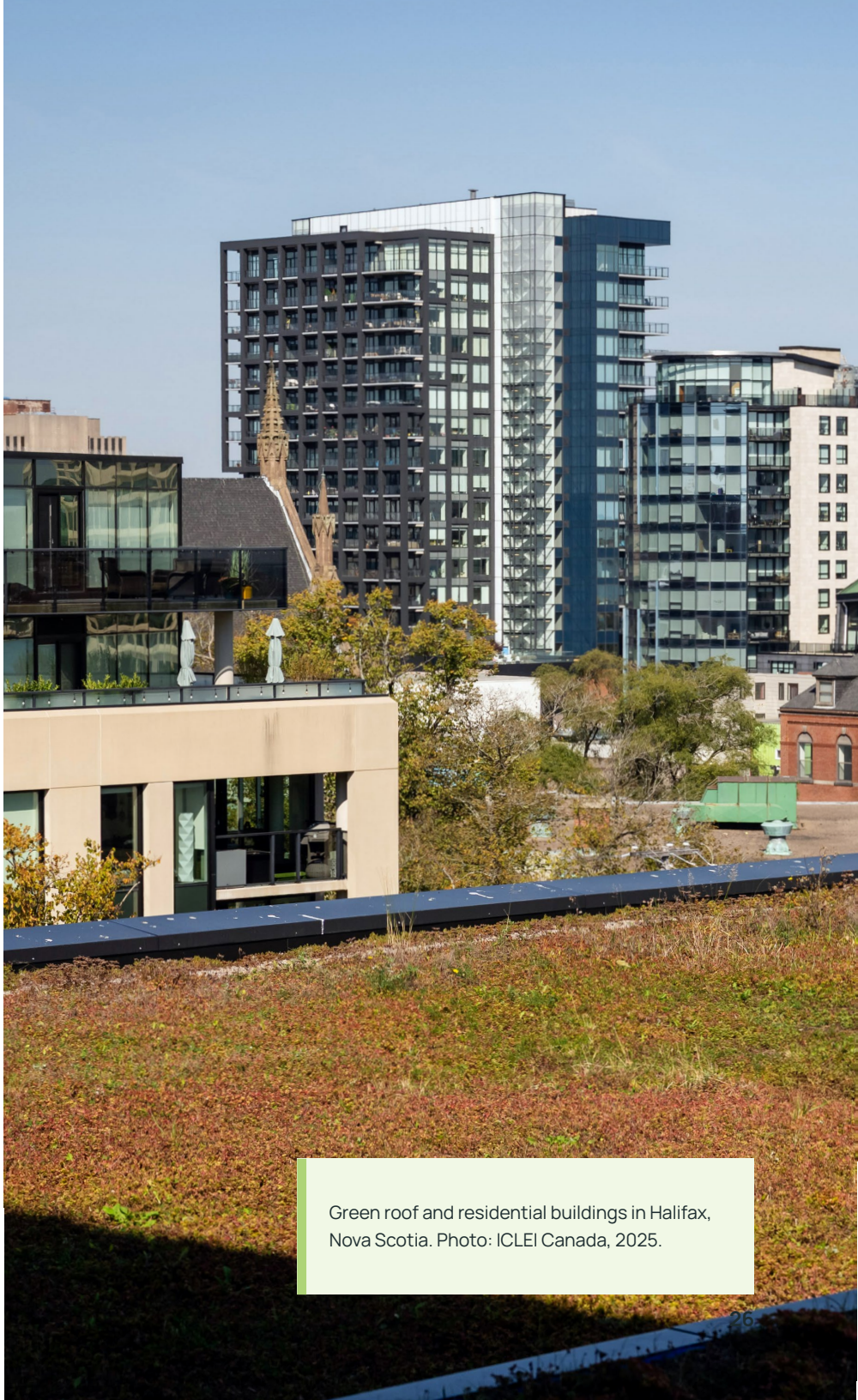
Table 8: Municipal office building (institutional)
* Fuel oil modelled as heating source. Row 1 = dollar values; row 2 = % change vs. minimum performance.
Op = lifetime operating cost (20 yr); Cap = capital cost; Tot = total cost.

Province	Baseline			Mid-Range			Net-Zero Ready		
	Op	Cap	Tot	Op	Cap	Tot	Op	Cap	Tot
NL*	$2,402k	$20,111k	$22,512k	$1,667k	$20,411k	$22,078k	$992k	$21,142k	$22,134k
				−31%	+1%	−2%	−59%	+5%	−2%
NS*	$2,811k	$19,306k	$22,117k	$1,941k	$19,606k	$21,546k	$1,183k	$20,340k	$21,523k
				−31%	+2%	−3%	−58%	+5%	−3%
ON (north)	$2,179k	$22,658k	$24,837k	$1,448k	$22,979k	$24,427k	$1,066k	$23,708k	$24,774k
				−34%	+1%	−2%	−51%	+5%	0%
ON (south)	$2,459k	$27,484k	$29,943k	$1,849k	$27,787k	$29,636k	$1,142k	$28,488k	$29,631k
				−25%	+1%	−1%	−54%	+4%	−1%
MB	$1,835k	$23,730k	$25,565k	$1,238k	$24,060k	$25,297k	$669k	$24,806k	$25,475k
				−33%	+1%	−1%	−64%	+5%	0%
SK	$2,218k	$23,462k	$25,680k	$1,725k	$23,788k	$25,513k	$1,104k	$24,543k	$25,475k
				−22%	+1%	−1%	−50%	+5%	0%
AB	$2,628k	$23,462k	$26,090k	$2,054k	$23,786k	$25,841k	$1,320k	$24,545k	$25,648k
				−22%	+1%	−1%	−50%	+5%	−1%
BC	$2,482k	$26,278k	$28,760k	$1,818k	$26,577k	$28,395k	$1,121k	$27,274k	$28,395k
				−27%	+1%	−1%	−55%	+4%	−1%

The large building sector tells a more uniformly positive story than the residential sector. At the Mid-Range tier, operating costs fall in every province and every archetype, by 21–40%, against a capital cost premium of no more than 0–2%. This produces a total lifecycle cost reduction across the board, from 1–7%.

At the Net-Zero Ready tier, savings deepen further: operating cost reductions of 19–69%, against a capital cost premium of 4–8%. Office and municipal office buildings show the strongest and most consistent results in the report—operating cost reductions of 50–64%, with total lifecycle costs falling by up to 4% and remaining roughly flat in a few provinces. Low-rise and high-rise multi-unit residential follow the geographic pattern established in the residential sector: the largest reductions are in provinces where the Baseline is modelled with fuel oil (Newfoundland and Labrador, Nova Scotia, Manitoba), while Saskatchewan and Alberta see narrower operating savings (19–25%) and a marginal (1–2%) increase in total lifecycle cost.

Section 4.3 discusses these variations further.



Green roof and residential buildings in Halifax, Nova Scotia. Photo: ICLEI Canada, 2025.

4.3 Interpreting the Results

The results in sections 4.1 and 4.2 reflect specific representative communities and energy contexts for each province. Several factors can cause results to vary within a province or climate group, or shift over time, and practitioners should read the results for their region with this in mind.

Heating fuel is the primary driver of variation across the cohort.

Communities where heating oil is modelled—primarily in Atlantic Canada and Manitoba—consistently show the largest operating cost savings from higher performance construction, because the baseline fuel being displaced is expensive relative to electricity. Where natural gas is the dominant heating fuel, savings are real but more moderate. In many communities, for example, gas access is not uniform: some areas have partial gas service while others rely entirely on fuel oil or electricity, which means operating cost savings will vary within the province beyond what the representative results suggest.

While the modelling assumes fossil fuel heating as the Baseline throughout, it should be noted that for parts of Atlantic Canada where electric resistance baseboard heating is common, the results shown here are likely conservative. Operating cost savings from higher performance construction may be even larger in those cases, since electric resistance is a more expensive way to heat in those provinces (see **Appendix F**).

Within-province rate variation can affect results independently of building performance.

In some provinces, results may vary modestly across communities because of differences in local electrical utility rates and connection charges rather than differences in building performance or climate. Connection charges deserve particular attention in smaller and more remote communities, where fixed costs can be proportionally higher and can affect the economics of electrification regardless of the per-unit energy price. Practitioners are encouraged to consult **Appendix F** for the energy rate assumptions underlying each provincial grouping and to consider how their local rates compare.

Energy price volatility is a further source of uncertainty the modelling doesn't capture.

The analysis assumes a steady 3.5% annual increase in energy prices (see **Appendix C4**), but actual energy costs in Canada have been shaped by volatility rather than steady growth, driven by global markets, extreme weather, and geopolitical disruption. That volatility is asymmetric: it scales with fuel consumed, so buildings with higher energy demand face greater cost exposure during price shocks, while Mid-Range and Net-Zero Ready buildings, which use less of the underlying commodity, are more insulated from them. Combined with the conservative baseline assumptions above, the savings shown here are likely a floor rather than a ceiling, and reducing reliance on fossil fuels lowers long-term cost risk.

4.4 Addressing Split Incentives

A split incentive occurs when the party responsible for making capital investment decisions is not the same party that benefits from reduced operating costs. In this case, the developer faces the upfront cost of efficiency improvements, while the building owner or operator later benefits from lower utility bills. This misalignment of incentives can discourage investment in high performance or Net-Zero Ready building systems unless mechanisms are introduced to share costs and benefits more equitably. The mechanisms listed in Table 9 show how that gap between upfront cost and long-term benefit can be bridged through municipal policy tools, market mechanisms, and financing models.



Aqualuna Bayside Toronto, achieved Toronto Green Standard Version 2 Tier 2 requirements, LEED Platinum, Ontario. Photo: ICLEI Canada, 2026.

Table 9: Mechanisms addressing split incentive barrier

Mechanism	Applies to	Description	Addressing Barriers	Example
Tax Increment Equivalent Grant	New Buildings	Municipality refunds a portion of the incremental property tax from a higher-performance building back to the developer over a defined period.	Uses tax revenue the project itself generates to offset the performance premium; low net cost to the municipality.	Penetanguishene Ontario's Tax Increment Equivalent Grant Program
Density Bonusing	New Buildings	Zoning tool permitting additional floor area or uses in exchange for meeting higher energy performance targets.	Expands the developer's revenue base to absorb the capital premium; no direct municipal spending.	Charlottetown, PEI's Zoning and Development Bylaw
Expedited Permitting	New Buildings	Priority processing of building permits for high performance projects.	Reduces carrying costs and shortens timelines; signals municipal commitment to higher performance.	Calgary, Alberta's Green Buildings Priority Stream
Permit Fee Reductions or Rebates	New Buildings	Reduction or rebate of building permit fees for projects meeting defined performance targets.	Modest direct offset to project costs; simple to administer and communicate.	Kelowna, BC's Building Permit Fee Rebate
Performance-Based Cash Grants	New Buildings	One-time municipal grant paid post-construction to developers achieving verified performance tiers.	Directly reimburses the developer for some or all incremental capital cost once performance is verified.	Langley, BC's Incentive for New Homes
Utility Service Agreements	Both New and Existing Buildings	Energy provider owns and operates thermal or electrical systems and charges a service rate.	Shifts capital costs from developer to utility; provider ensures efficient operation.	City of North Vancouver, BC's Lonsdale Energy Corporation
Utility New-Construction Incentive Programs	Both New and Existing Buildings	Utility-funded programs supporting integrated design and higher performance in new construction.	External funding for design and performance measures reduces the developer's capital cost.	Enbridge Gas Savings by Design
Equipment Leasing or Rental Models	Both New and Existing Buildings	Efficient equipment leased rather than purchased outright—energy as a service.	Converts capital cost to operating expense; provider maintains performance.	Enercare Commercial HVAC & Water Heater Rentals
Green or Performance-Based Leasing	Both New and Existing Buildings	Lease terms share energy cost savings and responsibilities between parties.	Aligns incentives through shared savings and clear energy clauses.	BOMA Green Lease with cost-recovery provisions.
Property-Assessed Clean Energy (PACE) Financing	Both New and Existing Buildings	Efficiency measures financed via property tax assessment, repaid over time.	Links repayment to the property rather than the developer/owner; enables long-term investment.	Alberta municipalities' Clean Energy Improvement Programs (CEIP)



Houses in St. John's, Newfoundland.
Photo: Adobe Stock.

5. The Public Health Dimension

The public health dimension in this report centres around the pollution resulting from the fuel types of natural gas, heating oil, wood, and propane typically used to heat Canadian homes.[†] These fuels can carry real health costs that are largely absent from policy conversations about building performance. Research undertaken through the BNZ project examines these costs across indoor air quality, thermal comfort, and occupant wellbeing, and points to higher-performance buildings as a meaningful and underappreciated public health opportunity.

[†] Electricity does not carry localized pollution risks and is excluded from this analysis.

5.1 Indoor Air Quality

Canadians spend approximately 90% of their time indoors.[15] During the long heating season, much of this time is spent at home, where combustion-based heating systems can release pollutants such as carbon monoxide, nitrogen dioxide, and fine particulate matter. This is particularly relevant in communities where heating oil and wood remain common fuels, as is the case across much of Atlantic Canada and in many rural municipalities across the country.

These pollutants can accumulate and contribute to a range of health effects, from headaches and respiratory irritation to more serious risks with prolonged exposure.[16] Table 10 breaks down the pollutants associated with common fuel types and their respective health concerns. As is shown in Section 3 of this report, heating oil and wood remain dominant energy sources in many communities across Canada. As such, the health implications of fuel choice are a live and practical concern for municipal practitioners in those regions—at the population level, symptoms that seem minor at the individual level can add up to a measurable burden, adding to demand on local health institutions and capacity.

Table 10: Health concerns by fuel type

Type of Fuel	What is Emitted	Key Health Concerns
Wood	Fine particulate matter ($PM_{2.5}$), carbon monoxide (CO), volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), nitrogen oxides, trace dioxins.	• Eye, nose and throat irritation, headaches, nausea • Asthma and chronic pulmonary disease flare-ups • Long term exposure linked to cardiovascular disease and lung cancer
Heating Oil	Sulphur dioxide (SO_2), nitrogen oxides (NOx), $PM_{2.5}$, CO (if draft or burner problems), trace VOCs/PAHs	• Short-term respiratory irritation (SO_2, NOx) • Fine particle related heart-attack and stroke risk • Carbon Monoxide poisoning if exhaust spillage or heat-exchanger cracks • Soil-/ground-water contamination from tank leaks (benzene and other aromatic hydrocarbons)
Natural Gas	NO_2, CO (from poor combustion), formaldehyde & other aldehydes, trace benzene, methane leaks	• Higher childhood-asthma risk linked to gas-stove NO_2 [17] • CO poisoning episodes from venting failures • Explosion risk from un-odorized or undetected leaks
Propane	CO (if flame is yellow/ lack of oxygen), NO_2, ultrafine particles; explosive vapor if leaked	• Acute Carbon Monoxide poisoning that includes headache, dizziness, confusion, fatal at high levels • NO_2 aggravates asthma and increases respiratory infections in children • Fire/explosion hazard from leaks or tank damage

5.2 Four Key Interventions for Better Indoor Air Quality

Better ventilation and filtration

High performance buildings typically use Heat Recovery Ventilators (HRVs) or Energy Recovery Ventilators (ERVs) or Dedicated Outdoor Air Systems (DOAS) to ensure continuous, controlled ventilation with high-efficiency filtration. Research shows that building occupants perform better on cognitive tests in buildings with increased ventilation[18] (i.e., exchanging stale indoor air for fresh, filtered outdoor air while recovering heat). Health Canada recognizes HRVs and ERVs as effective means of maintaining good indoor air quality, especially in airtight homes.[19] These systems exchange stale indoor air with fresh, filtered outdoor air while recovering heat, minimizing energy loss and maintaining air quality.

Filtration also matters alongside ventilation. Depending on the outdoor air quality of the building location, the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) recommends filter performance with a Minimum Efficiency Reporting Value (MERV) of at least 8.[20] Furthermore, a MERV 13 may be required for removing smaller particle wildfire pollution from indoor air.[21] To remove other dust, allergens, or mold, a High Efficiency Particulate Air (HEPA) filter would be required.[22]

Reduced indoor combustion

High performance homes minimize or eliminate combustion appliances by using electric heat pumps for space and water heating and induction or electric cooktops in place of gas stoves. This approach avoids emissions of carbon monoxide (CO) leakage into homes. There are significant health benefits from having high performance homes without on-site fuel combustion, eliminating localized pollution sources in the home.

Lower indoor VOCs (Volatile Organic Compounds)

Volatile Organic Compounds encompass a group of chemicals that may be emitted as gases from certain materials, including but not limited to chemicals used in building materials, household cleaning products or composite wood products such as furniture. VOCs are often associated with health impacts that range from headaches and fatigue to more serious lung irritations.[23] The use of low or no VOC products in insulation, flooring, cabinetry, and finishes becomes critical in airtight and high performance buildings due to lower ventilation leakage.

Humidity and thermal comfort

Humidity in the air has a strong influence on the thermal comfort of a space as high water content in interior air can augment sensations of warmth. In the summer, maintaining optimal indoor temperatures through controlled humidity significantly impacts occupant comfort and productivity. The Government of Canada's recommended strategy of increased ventilation effectively manages indoor humidity, promoting both occupant health and productivity.[24]

High performance homes, being well-sealed and insulated, incorporate humidity control through energy recovery ventilators (ERVs) or integrated heat pump systems. These systems not only improve indoor air quality for occupants but also protect building structures from moisture-related damage such as mold and material deterioration.

5.3 Beyond the Building: Community-scale and psychological impacts

The health benefits of high performance buildings extend beyond individual occupants. At a community scale, reducing reliance on combustion-based heating fuels—wood, heating oil, propane, and natural gas—decreases ambient particulate matter levels, lowering population-level risks of cardiovascular and respiratory disease. The ability to filter fine particulate matter is increasingly relevant in Canadian communities affected by wildfire smoke, a growing seasonal risk across much of the country.

In denser urban settings, building design has additional implications. Exhaust heat from HVAC systems and the thermal mass of conventional construction contribute to the urban heat island effect, where built-up areas retain significantly more heat than surrounding areas. High performance buildings reduce this contribution through more efficient mechanical systems, improved building envelopes, and design features such as green and cool roofs. For larger municipalities already experiencing increased cooling demands and heat-related health risks, this is a meaningful co-benefit of higher-performance construction.

High performance buildings not only focus on energy efficiency but also prioritize occupant well-being through thoughtful design strategies. One key area includes **better acoustics and sound insulation**, since high performance buildings incorporate advanced insulation, airtight construction, and careful interior design to minimize unwanted noise.

This directly influences psychological outcomes by:

- **Reducing Stress and Enhancing Relaxation:** Minimizing disruptive noise from both external and internal sources significantly reduces stress, anxiety, and fatigue, promoting a more tranquil and psychologically restful environment.
- **Improving Concentration and Cognitive Performance:** A quieter indoor environment boosts occupants' ability to concentrate, enhances memory retention, and improves overall cognitive performance, beneficial for both academic and professional settings.
- **Better Sleep Quality:** Enhanced acoustic conditions contribute directly to improved sleep quality, leading to better mental health, mood stability, and daily productivity.

5.4 Risks and Considerations

While high performance buildings deliver significant environmental and health benefits, they also present unique health challenges that must be carefully managed. The following items pose environmental challenges to high performance construction. These risks can generally be abated during construction or by the homeowner, so they are important to be aware of.

Overheating risk

High levels of insulation and improved airtightness in high performance buildings can trap indoor heat, worsening overheating risk without adequate ventilation.[25] This risk falls hardest on more vulnerable residents: roughly a quarter of Canadian households have no cooling equipment at all, a gap that skews toward lower-income households and renters.[26]

Design strategies can offset this risk without relying on mechanical cooling, including solar shading (exterior shades, overhangs, low-SHGC glazing), cross-ventilation and operable windows, and ceiling fans to improve air movement when passive cooling alone isn't enough.[27] Many heat pump systems—including the cold-climate and geo-exchange systems already central in this report—provide efficient cooling as well as heating, offering a mechanical complement to passive design where it's needed most.

Over-sealing, poor ventilation maintenance, and radon

Air-tight construction reduces energy losses, but without adequate ventilation it can trap pollutants and worsen indoor air quality, increasing exposure to volatile organic compounds (VOCs), formaldehyde, carbon dioxide, and allergens. Poor circulation can also raise condensation risk, promoting mould growth and material degradation.[28] Airtight construction can also raise indoor radon concentrations, a naturally occurring radioactive gas that enters buildings through cracks in foundations, floor slabs, and construction joints. Radon is a known carcinogen and the leading cause of lung cancer among non-smokers in Canada.[29] **High energy efficiency and effective radon control can be achieved together if enclosure and ventilation are designed as a single system from the outset**, incorporating sub-slab depressurization and post-occupancy radon testing to confirm concentrations meet Health Canada's guideline.[30]

Embodied carbon

High performance buildings frequently require advanced insulation products that could potentially result in higher upfront embodied carbon. Life cycle assessments will need to be conducted to optimize the balance between operational performance and embodied carbon.



Harold Tatler Park South, Saskatoon, Saskatchewan. Photo: Adobe Stock.



Mill's net-zero energy home in Edmonton, Alberta. Photo: Mill's Net Zero Home Retrofit project team.

6. The Market Dimension

Building to higher performance standards, and realizing the financial, health, and emissions benefits described in the preceding sections, requires a functioning local market. This section presents findings from a market assessment conducted as part of the BNZ project across participating municipalities in eight provinces, evaluating supplier availability for five technologies most directly tied to achieving the Net-Zero Ready performance tier modelled in Section 4: heat pumps, geothermal systems (drilling and tubing), high performance insulation, high performance windows, and renewable energy (solar PV).

A few points of context are worth keeping in mind. The data reflects conditions in specific BNZ cohort communities and should not be read as representative of an entire province. Supplier availability can vary considerably within a province, particularly between urban and rural areas. The scores reflect a point-in-time snapshot; markets for many of these technologies are developing rapidly. Lastly, this assessment captures *supplier availability only*. It does not address the availability of trained trades and contractors, which is a distinct and equally important consideration, particularly in smaller and more remote communities. Practitioners are encouraged to verify current local conditions before project planning.

Supplier availability was assessed using a three-tier Supplier Diversity Score—Low (1–2 suppliers), Medium (3–5 suppliers), or High (6+ suppliers)—at both the local and national level. Community sizes and urban/rural designations are included to help contextualize each result.

Table 11: Supplier availability[‡] across BNZ cohort communities
* County, regional municipality, or regional district encompassing multiple communities; figures reflect the broader region rather than a single municipality.

Community	Community Size	Urban/Rural	Heat Pumps	Geothermal	High Perf Insulation	High Perf Windows	Solar PV
NL-1	Small	Mixed	High	Low	Low	Medium	Low
NS-1	Small	Rural	High	High	Medium	Medium	High
NS-2*	Small	Mixed	High	Medium	Medium	Medium	Low
NS-3	Small	Urban	High	Medium	Medium	High	Low
NB-1	Medium	Urban	High	Medium	High	High	Medium
NB-2	Medium	Urban	High	Medium	High	High	Medium
ON-1	Medium	Mixed	High	Medium	High	High	Medium
ON-2	Medium	Urban	High	Medium	Medium	High	Low
ON-3*	Large	Mixed	High	High	High	High	High
ON-4	Large	Urban	High	Medium	Medium	High	High
ON-5	Large	Urban	High	Medium	High	High	Medium
ON-6	Large	Urban	High	Medium	Low	High	Medium
ON-7	Large	Urban	High	Low	High	High	Medium
MB-1	Small	Rural	High	Medium	High	Medium	Medium
SK-1	Large	Urban	High	High	High	High	High
SK-2	Large	Urban	High	Medium	High	High	High
AB-1	Medium	Urban	High	Medium	Medium	High	High
BC-1*	Medium	Mixed	Low‡	Medium	Medium	High	High
National Score	–	–	High	High	Medium	Medium	Medium

[†] A local supplier is defined as one operating within roughly 100 km of a community's central area. A Low score does not necessarily mean no supplier serves the area—only that none is based nearby.
‡ BC-1 is a rural and relatively remote community; the Low heat pump score reflects limited local supplier presence rather than a province-wide pattern.

A few patterns emerge from this data. Heat pump availability is high in nearly every cohort community and matches the National Score, indicating a mature, widely distributed local supplier base for this technology. Geothermal and solar PV show the most variation, with several communities—particularly in Atlantic Canada and parts of rural Ontario—scoring below the National Score for one or both. This is consistent with the pattern noted above: suppliers for these two technologies are more likely to serve a community from outside the 100 km radius rather than maintain a local presence, so a lower local score reflects supplier geography as much as true unavailability. This unevenness doesn't track cleanly with population size: a mid-sized BC community reports Low heat pump availability despite otherwise typical conditions, suggesting local market factors matter more than size or region alone. High performance insulation and windows score High in most cohort communities, close to or above the National Score, indicating comparatively mature local markets even in smaller communities.



Senákw, a First Nation partnership between Nch'ḵay̓ Development Corporation and OPTrust, located in the City of Vancouver, British Columbia. Photo: Nch'ḵay̓ project team.

6.1 What This Means for Municipalities

The findings above point to a practical way of thinking about sequencing: where local supply is strong, a municipality can promote or incentivize a technology with reasonable confidence that the market will respond; where supply is thinner, building local capacity may be necessary before encouraging broader uptake.

Low carbon technologies are widely available across Canada.

The underlying throughline of the analysis is that while there is regional variation, especially in rural areas, there is at least one supplier in each municipality for all five studied technologies. This means they are widely available and exist competitively across most of the country. The results suggest that access to these technologies is generally not a limiting factor to high performance construction in most communities.

Heat pumps, high performance insulation, and windows are the clearest case for moving now.

With the exception of one cohort community, supplier availability for heat pumps is High across every community assessed, regardless of population size, urban or rural character, or province. High performance insulation and windows follow a similar pattern, scoring High in most cohort communities and close to or above the National Score even in smaller communities. Together these three technologies represent a mature, accessible bundle. Municipalities considering incentives, recognition programs, or voluntary green development standards around this combination can generally do so with confidence that local contractors and suppliers will be able to meet demand.

Geothermal and solar PV may warrant a different approach.

Several cohort communities—particularly in Atlantic Canada and parts of rural Ontario—score below the National Score for one or both technologies. Because suppliers for these technologies often serve a wide area without a local base, a lower score signals that confirming actual project-level access is especially important, not necessarily that the technology is unavailable. Municipalities in this position may have more to gain from market-building tools first: aggregated demand commitments, supplier outreach, contractor training partnerships, or recognition programs that reward these technologies without assuming widespread uptake. These tools can help grow local capacity ahead of stronger voluntary or provincial frameworks, rather than promoting adoption before the market is ready to support it.

Apply the same method locally.

The assessment method used in this section is one municipalities can apply directly to their own context, and doing so is often more useful than relying on this report's cohort findings alone. A municipality can identify the technologies most relevant to its own building energy goals, then conduct a simple local count of contractors and suppliers for each. This gives staff a current, locally grounded picture of market readiness, rather than relying on provincial patterns that may not reflect their own community. Repeating this exercise periodically is worthwhile, since supplier markets for these technologies are growing and local conditions can shift faster than any point-in-time assessment can capture.

7. Conclusion and Recommendations

The evidence assembled in this report makes a strong and multidimensional case for higher-performance buildings in Canadian municipalities.

Taken together, the four dimensions examined here tell a story that is more compelling than any one of them alone:

- Higher-performance buildings reduce emissions in ways that are locally specific and quantifiable;
- They deliver lifecycle cost savings that, in many contexts and at the right performance tier, outweigh the upfront premium;
- They protect and improve the health of the people who live and work in them; and
- The market capacity to build high performance buildings is growing, and in many communities is already very strong.

These findings equip municipal staff, Councils, and partners with the evidence needed to make the case for higher-performance buildings to the audiences that matter most—and to act on it credibly in their own communities.



Energy-efficient residential and mixed-use developments in Quebec City, Quebec. Photo: ICLEI Canada, 2025.

7.1 Making the Case to Your Community

Making the case for higher-performance buildings to various groups in your community—including residents, local businesses, municipal Council, developers, and more—requires matching the evidence to the audience. Community members with various interests and perspectives respond to different priorities, and the four dimensions in this report offer a range of entry points.



The **energy and emissions findings** ground the conversation in local energy realities rather than national abstractions. Understanding the source of direct and indirect emissions in your local building sector helps you understand your progress toward local climate commitments. A community energy and emissions inventory provides critical information on your local fuel mix, grid carbon intensity, and growth trajectory to determine emission projections.



The **financial findings** speak directly to community members focused on affordability and fiscal responsibility. Higher performing buildings often see substantial operating cost savings, and large buildings make a strong case almost everywhere. Residential buildings in gas-served communities are the one place the case weakens at the Mid-Range level—fully Net-Zero Ready buildings generally see reduced operating costs even in this context.



The **public health findings** offer an argument that directly connects building performance to the wellbeing of residents. Reduced indoor combustion, better ventilation, and more stable indoor temperatures are health benefits that extend beyond the building itself, and into the everyday lives of residents.



The **market findings** provide practical reassurance that acting is feasible: the suppliers and products needed to build to higher standards are largely already there for the technologies that matter most, and the market is continuing to develop. For community members concerned about whether the local industry can actually deliver, this section provides a simple methodology to help answer that question.

Municipal staff presenting to Council do not need to lead with all four dimensions at once. But having all four available, grounded in Canadian data and tailored where possible to local context can make sure that the discussion is salient to the ever-changing priorities of residents and Canadians.

7.2 Recommendations for Municipalities

To translate these findings into outcomes, municipalities should consider the following strategies.

Encourage uptake of higher code tiers

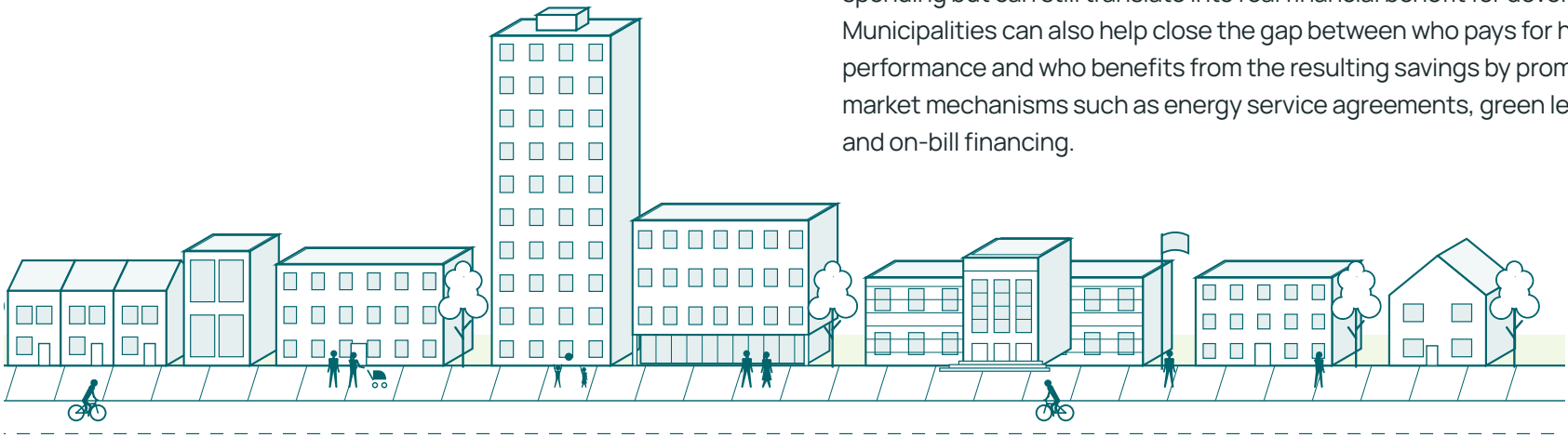
Encourage uptake of advanced tiers of the National Building Code of Canada (NBC) and National Energy Code of Canada for Buildings (NECB), and potentially through frameworks like Green Development Standards (GDS). GDS-style frameworks can be voluntary or mandatory, depending on a municipality's jurisdictional authority. In addition to encouraging uptake of advanced tiers, they can also offer a broader, integrated approach to sustainability. The specific metrics they prioritize signal to the development community what the municipality values most.

Build market capacity and engage the development and builder community

Collaborate with all stakeholders, builders, developers and trades to improve awareness, training and capacity in better building and higher-performance construction. Clear communication around building code, cost benefits, and available supports along with workshops, pilot projects and recognizing and rewarding early adopters can help strengthen market preparedness and foster community level buy-in.

Develop incentives to reduce adoption barriers

Consider the implementation of both financial and non-financial incentives to reduce barriers to adoption and accelerate consideration of higher performance construction. For example, permit fee reductions, property tax incentivization, expedited permit approvals, or lower interest financing for Net-Zero Ready construction can help to offset marginal increases in capital costs. Non-financial incentives, such as recognition programs and density bonusing, don't require direct municipal spending but can still translate into real financial benefit for developers. Municipalities can also help close the gap between who pays for higher performance and who benefits from the resulting savings by promoting market mechanisms such as energy service agreements, green leasing, and on-bill financing.



Measure and share outcomes

Municipalities with limited capacity can request more data from builders—tracking what's actually being built and how it performs. For large buildings specifically, some municipalities are already implementing monitoring and tracking programs that require or encourage reporting of energy use and emissions data. Sharing this information helps residents and communities make informed decisions, and gives municipal and provincial governments a knowledge base to understand local market readiness.

Advocate for provincial leadership and build regional momentum

In many provinces, the financial case for higher-performance construction is strong, yet provincial governments may not be moving to adopt higher tiers of the NBC or NECB. This leaves municipalities, particularly smaller ones without the technical or administrative capacity to advance standards on their own, at risk of falling behind. Municipalities can help close this gap by advocating directly to provincial governments for higher code tiers, backed by local evidence of market readiness and cost-effectiveness. Partnering with neighbouring municipalities to align advocacy, share resources, and demonstrate collective demand for change can build the momentum needed to shift provincial policy, while easing the capacity burden on any one municipality.

Continue looking ahead

The findings in this report reflect current conditions, not fixed ones. The financial case for higher-performance construction will strengthen as grids decarbonize, heat pump technology matures, and local supplier markets develop. The evidence base for acting is already strong in most contexts across Canada, and the trajectory suggests it will only become stronger.



Halifax Central Library, a high performance building in Halifax, Nova Scotia. Photo: ICLEI Canada, 2025.



Limberlost Place, a net-zero, mass timber institutional building designed to achieve LEED Gold and Toronto Green Standard V3 Tier 4 in Toronto, Ontario. Photo: ICLEI Canada, 2026.

Appendices and References

In this section, you will find appendices supporting this report, including Glossary of Terms, List of Acronyms, the Financial Analysis Methodology, and more.

Appendix A: Glossary of Terms

Additive Costing – A costing approach that estimates the incremental change in cost from one performance level to another by adding or removing materials, systems, or equipment relative to a Minimum Performance design.

Air-Source Heat Pump (ASHP) – An electric system that heats and cools by moving heat between indoor and outdoor air; the most common heat pump type, with efficiency that declines as outdoor temperatures fall.

Altus Group Cost Guide – An industry-standard reference that provides construction cost ranges for Canadian markets, used here to establish Baseline construction costs.

BTAP (Building Technology Assessment Platform) – A modelling tool developed by Natural Resources Canada (NRCan) to evaluate the energy performance of large and commercial building archetypes.

Capital Costs – The total upfront expenditures required to construct a building, including materials, labour, and equipment.

Climate Zone – A geographic classification in the NECB that represents local temperature and humidity ranges influencing building design and performance.

Coefficient of Performance (COP) – The ratio of useful heating or cooling output delivered by a heat pump or air conditioner to the energy it consumes at a specific temperature; a higher COP means greater efficiency.

Cold-Climate Heat Pump – An electric heat pump designed to provide efficient heating and cooling at the lower outdoor temperatures typical of Canadian climates.

Domestic Hot Water (DHW) – The heated water supplied for washing, bathing, and other non-space-heating uses in a building.

Electric Chiller – An electrically driven system that produces chilled water for space cooling, typically in larger buildings.

Electric Resistance Heating – Heating that converts electricity directly into heat (e.g., baseboards or standard electric water-heater elements); simple but less efficient than a heat pump.

Envelope (Building Envelope) – The physical separation between the interior and exterior of a building, including walls, windows, roofs, and foundations, which affects energy performance.

Geo-Exchange / Geothermal (Ground-Source Heat Pump) – A heating and cooling system that transfers heat to and from the ground through buried piping loops; the stable year-round ground temperature lets it stay highly efficient even in very cold weather.

Heat Pump Water Heater – A domestic hot water system that heats water with a heat pump instead of electric-resistance elements or a gas burner, using substantially less energy.

HRV / ERV (Heat- or Energy-Recovery Ventilator) – Mechanical ventilation systems that exchange indoor and outdoor air while recovering heat or moisture to improve indoor air quality and efficiency.

HTAP (Housing Technology Assessment Platform) – A modelling tool developed by Natural Resources Canada (NRCan) to evaluate the energy performance of homes constructed to the NBC.

Hybrid (Dual-Fuel) Heating System – A system pairing an electric heat pump with a fossil-fuel backup (furnace or boiler) that takes over below a set outdoor temperature, capturing heat-pump efficiency on mild days while controlling cost on the coldest ones.

Lifecycle Costing – An analysis approach that combines capital and operating costs over a defined period (20 years in this report) to evaluate long-term economic performance.

NBC (National Building Code of Canada) – Canada's model code for residential and small-building construction; the residential archetypes in this study follow its tiered energy performance levels (Tiers 1, 3, and 5).

NECB (National Energy Code for Buildings) – Canada's model energy code specifying minimum energy performance requirements for new large, commercial, and institutional construction.

NRCan (Natural Resources Canada) – The federal department responsible for developing national energy modeling tools and standards referenced in this study.

Solar Photovoltaic (PV) – Roof- or site-mounted panels that convert sunlight into electricity to offset some or all of a building's electricity use.

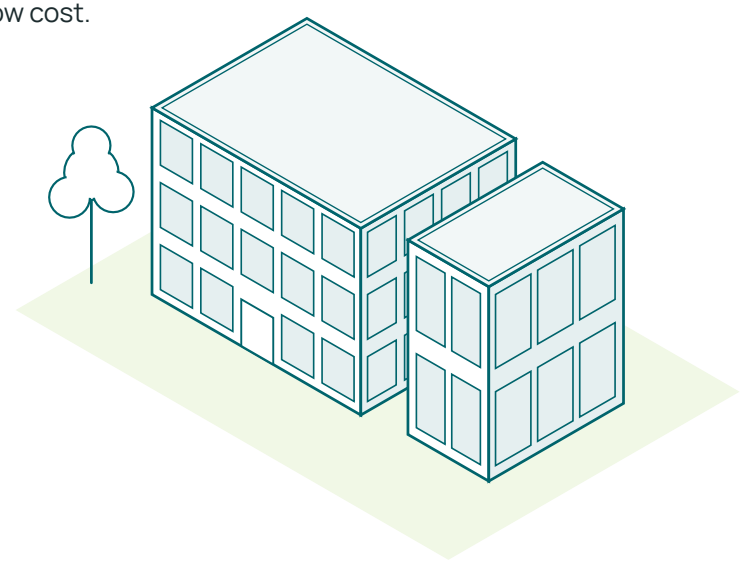
Split Incentive – A market barrier where the entity that pays for energy-efficiency upgrades (e.g., a developer) is not the one who benefits from lower operating costs (e.g., a tenant).

Thermal Energy Demand Intensity (TEDI) – A building energy metric that measures the annual heat required for space heating and ventilation per square metre of floor area.

USI (Window U-Value) – A measure of how readily a window conducts heat; a lower USI means a better-insulating window.

Variable Refrigerant Flow (VRF) – A heat pump system that varies refrigerant flow to deliver efficient, independently controlled heating and cooling across multiple zones of a building.

Window-to-Wall Ratio (WWR) – The share of a building's exterior wall made up of windows; reducing it (to 30–40%) lowers heat loss and window cost.





A residential building in Toronto, Ontario.
Photo: ICLEI Canada, 2024.

Appendix B: List of Acronyms

Acronym	Meaning
ASHP	Air-Source Heat Pump
BNZ	Building to Net-Zero (ICLEI Canada project)
BTAP	Building Technology Assessment Platform
CoP	Community of Practice
COP	Coefficient of Performance (heat pump / equipment efficiency)
DHW	Domestic Hot Water
EPC	Energy Performance Contract
ERV	Energy Recovery Ventilator
ESA	Energy Service Agreement
GDS	Green Development Standard
HRV	Heat Recovery Ventilator
HTAP	Housing Technology Assessment Platform
HVAC	Heating, Ventilation and Air Conditioning
LEED	Leadership in Energy and Environmental Design
NBC	National Building Code of Canada
NECB	National Energy Code for Buildings
NRCan	Natural Resources Canada
PACE	Property-Assessed Clean Energy Financing
PV	Photovoltaic (solar)
RSMeans	Reed Construction Data's Means database
TEDI	Thermal Energy Demand Intensity
VRF	Variable Refrigerant Flow
WWR	Window-to-Wall Ratio

Appendix C: Financial Analysis Methodology

This appendix describes the methodology underlying the financial analysis presented in Section 4, covering building archetype development, capital and lifecycle costing approaches, regional pricing considerations, and the limitations of the analysis. For a description of the performance tiers and building archetypes modelled, see Section 4 and Appendix D.

C1 Building Archetypes Development

This analysis leveraged software developed by Natural Resources Canada's Canmet ENERGY Ottawa lab including:

- Building Technology Assessment Platform (BTAP): Focused on large buildings and commercial / institutional sectors
- Housing Technology Assessment Platform (HTAP): Focused on residential and low-rise housing

Both software packages allow users to access pre-developed NECB 2020 energy models that were used in developing the NECB 2020 as well as the National Building Code (NBC) 2020.[†] This analysis leveraged these models to access the building archetypes for this study that varied by:

- Energy Performance Tiers and Levels
- Building Archetype
- Climate Zone

The project team extracted models from BTAP and HTAP and reviewed them to ensure that the design choices were the best representation of an approach to Mid-Range and Net-Zero Ready construction in Canada. The High Performance level consisted of partial electrification of the heating system combined with limited improvements to the building envelope. For building types governed by the NBC, the High Performance also had a thermal load reduction of 10%. The Net-Zero Ready performance level included improvements to the building envelope in combination with improved mechanical system efficiency. For NBC projects, a thermal load reduction of 40% was required.

Each performance level in the energy model represents a different combination of materials and technologies needed to reach that efficiency target. These combinations were used to estimate how much the building will cost to construct. The energy use predicted for each level was then used to estimate long-term utility costs and cost savings for the life-cycle analysis.

[†] https://github.com/canmet-energy/btap_batch
https://github.com/NREL/openstudio-standards/tree/nrcan
https://github.com/NRCan-IETS-CE-O-HBC/HTAP

C2 Capital Costing Methodology

The capital costing methodology used in this analysis allowed the project team to develop capital costing estimates for a variety of building types and performance levels across various climate zones and construction markets. Rather than relying on the costing outputs embedded in NRCan's BTAP and HTAP software, the team created a tailored costing strategy that combines market-based construction cost data, real-world development experience, and cost estimating software. This approach was designed to provide results that are more accurate and regionally appropriate.

Step 1: Baseline Costs

Baseline construction costs were established using the Altus Group 2025 Canadian Cost Guide.[†] This guide provides a budget range per square foot for hard construction costs which reflect current market conditions in Canada and include regional variations. This baseline serves as a reference point for additive costing, and the average of the range was chosen as this was the most reflective of the full range of construction costs.

Step 2: Additive Costing

Additive costing was established using RSMeans Construction Cost Data,[‡] a nationally recognized reference database that provides standardized construction cost information for materials, equipment, and labour. RSMeans data is widely used across the building and infrastructure sectors to inform capital planning, cost benchmarking, and policy evaluation. The database includes regional adjustment factors, allowing costs to be accurately represented for over 70 locations across Canada.

For each archetype and climate zone, the building material and technology bundles required to meet modeled performance targets were reviewed. The incremental changes between baseline, high performance, and net-zero–ready tiers were then costed using RSMeans to reflect the additional capital investment associated with higher performance levels. For NBC buildings within the HTAP software, the costing via RSMeans was done directly in the software. Additions of new materials or systems were applied additively to represent increased capital costs, while baseline systems that were replaced or eliminated were deducted accordingly. This approach ensures that cost estimates are both consistent and geographically representative, providing a transparent basis for comparing the incremental costs of advancing energy performance across cohort members.

Step 3: Leveraging Development Experience

For higher cost heating equipment such as air source heat pumps, dual fuel split systems, variable refrigerant flow heat pumps, and geo-exchange heat pump systems this analysis leveraged the development experience of Windmill Developments and Urban Equation in the Canadian marketplace. This led to the analysis increasing several input costs based on Windmill Development's experience in Ontario. For additional locations in Canada, the costs were not adjusted downwards, despite regional price variations in RSMeans generally being lower. This was to ensure that cost premiums for key low-carbon systems such as heat pumps and geo-exchange systems were not underestimated.

[†] https://www.altusgroup.com/featured-insights/_canadian-cost-guide
[‡] https://www.rsmeans.com

C3 Regional Pricing Considerations

While this report contains cost estimates based on the best available data, it is not possible to determine with certainty what the cost will be for a project until it is designed and tendered. Market conditions in rural areas in Canada can be influenced by several variables which are difficult to predict. These include:

- Contractor availability
- Material availability
- Economies of scale

In addition, recent events related to international trade and tariff adjustments have introduced further uncertainty into construction pricing. Canada's close economic relationship with the United States means that fluctuations in tariffs on steel, lumber, and manufactured building components can have direct impacts on material costs and project timelines. Even minor changes in trade policy or cross-border supply chain conditions can influence availability, particularly in regions that rely on imported goods or specialized equipment. As a result, project budgeting and procurement strategies should account for potential cost volatility stemming from trade relations and broader geopolitical factors.

C4 Lifecycle Costing Methodology

The lifecycle costing methodology was used to develop financial models to understand the cost impacts of operating the building over a 20-year period. While a building itself will typically remain in service for several decades, a lifespan period of 20 years was chosen as this represents the average lifetime of a building's heating and cooling equipment.

Step 1: Identify Operational Expenses

Utility rates for each cohort were researched and have been stored in Appendix F. Whereas rates may vary by residential or commercial consumer type, for simplicity the basic residential rate was used for each cohort. Monthly billing or connection fees were included as a fixed annual fee, and utility rates for fuel and electricity were multiplied by the annual consumption of each energy type.

Maintenance costs for fossil fuel burning equipment vs heat pump systems vary, and there isn't a defensible source of information that can be referenced that says one type of equipment costs more to operate than the other. For this reason, maintenance costs were assumed to have a net-neutral impact on the analysis and were excluded.

Step 2: Model Outcomes

The capital costing results, along with the operational expenses in Step 1 were used to develop lifecycle costing models. Operational expenses were escalated each year using an annual increase of 3.5%, as energy prices have historically been higher than general inflation (≈ 2 %) due to factors including energy infrastructure investment and commodity volatility. The resulting nominal operating expenses over 20 years were then added together to give the total nominal operational expenses which were included in the results.

C5 Limitations of the Study

This section outlines the key limitations and assumptions that should be considered when interpreting the study's findings and applying them beyond the modeled scenarios.

Applicability of Results

While this analysis is built on a specific set of building configurations, real buildings vary. Some are heated with wood, others rely on electric resistance, district energy, or heat pumps already in place. As such, the specific dollar figures presented in Section 4 of this report will not transfer directly to every project. The analysis nonetheless demonstrates findings that apply more broadly than the specific configurations modeled. **The findings of this report should therefore be used as a directional foundation for decision-making rather than a project-level forecast. They tell municipalities and developers what to expect, where to focus, and how to design programs, while project-specific analysis remains essential for any individual building.**

To capture a wide range of building types, regions, and climate zones, this analysis relied on existing NRCan energy models developed during the national code development process. These models represent standardized prototypes and are not detailed building designs. Each archetype was optimized for its respective climate zone based on available model parameters rather than project-specific data. Energy consumption and cost estimates reflect national energy code schedules and rate assumptions, which may differ from localized pricing, design practices, and operational patterns. The analysis was conducted directly within NRCan's HTAP and BTAP tools and did not include independent design development. While the principal changes in mechanical systems and envelope performance between archetypes are identified, detailed construction assemblies were not developed. **The modeled configurations should therefore not be interpreted as construction-ready designs; additional design development would be required to confirm the applicability, constructability, and project-specific costs of the measures.**

Modelling and Costing Methodology

NRCan's HTAP tool also has several limitations which were managed as part of this study:

- **NBC 2015/2020 rulesets:** HTAP uses NBC 2015 9.36 rulesets as the baseline. The baseline in NBC 2020 is largely unchanged, but the way performance tiers are evaluated is new in NBC 2020. As a workaround to bring the study into compliance with NBC 2020 our team is using Mechanical Energy Use Intensity (MEUI) as the metric to quantify energy savings, and followed the air tightness requirements in NBC 2020.
- **Cost data:** HTAP costing connection to RSMeans uses the RSMeans 2020 database which is pre-pandemic pricing. For mechanical equipment, pricing was manually updated to reflect current market conditions based on Windmill and Urban Equation's experience. For building envelope materials, costing was adjusted to 2025 dollars using the Building Construction Price Index (BCPI). RSMeans was selected as the primary cost data source because of its integration with HTAP and BTAP, as well as its broad coverage and consistent methodology across the capital items considered in the analysis.

  However, standardized cost database estimates may not fully reflect project-specific or local market conditions. To improve their applicability, location-specific RSMeans cost indices were used to account for regional differences in labour and material costs, and

selected major mechanical costs were benchmarked against actual pricing experienced by Windmill Developments and its construction partners. These measures provide a degree of validation but do not eliminate the uncertainty inherent in using standardized cost data in place of project-specific pricing. Accordingly, the cost estimates should be understood as order-of-magnitude or budgetary estimates rather than precise projections of actual project costs.

Scope of Analysis

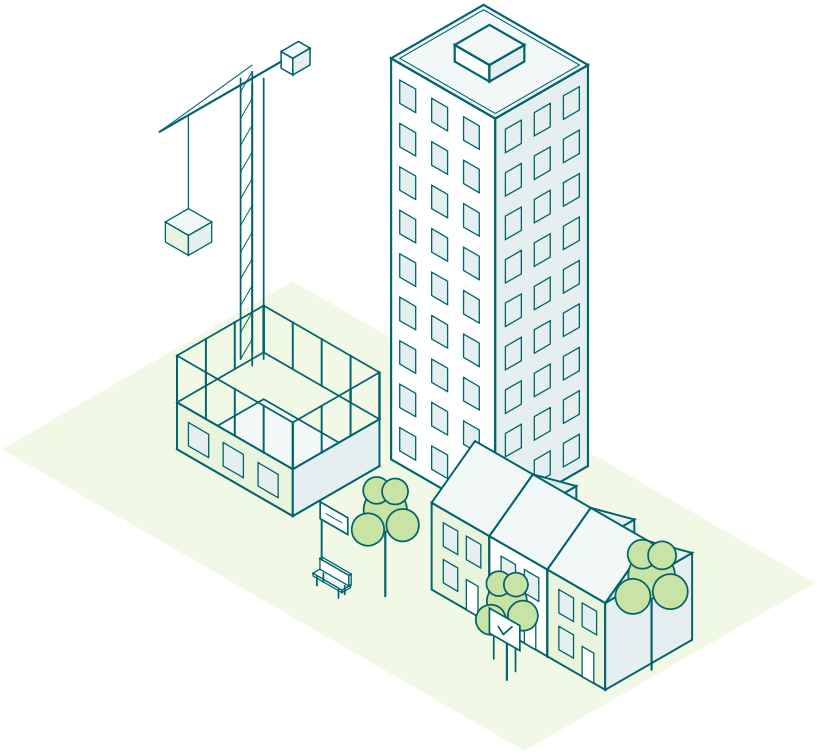
The analysis focuses on new construction only. The question of how to cost-effectively bring existing building stock to higher performance standards is beyond the scope of this report but represents an important area for future work, given that the majority of buildings that will exist in 2050 have already been built.

Financial Assumptions

The financial analysis presents a static snapshot of current energy prices and grid carbon intensity. As grids decarbonize and energy markets evolve, the relative cost advantages of higher-performance construction may shift, including potentially in favour of electrification.

The financial results are also unlevered and therefore exclude project-specific financing costs, funding arrangements, and the effects of ownership structure. Developing a leveraged analysis would require assumptions regarding debt terms, interest rates, financing periods, ownership structures, and other project-specific variables that were beyond the scope and budget of this study. Presenting the results on an unlevered basis provides a consistent framework for comparison across scenarios and allows readers to apply financing assumptions appropriate to their own circumstances.

The exclusion of financing costs should not be interpreted as indicating that financing would necessarily strengthen or weaken the business case for higher-performance construction. Available financing programs may provide preferential terms for projects pursuing higher levels of energy performance, potentially offsetting some of the incremental capital costs. For example, the CMHC Apartment Construction Loan Program provides access to financing at preferred rates for eligible projects meeting specified energy performance criteria. The extent to which such programs may affect the business case will depend on program eligibility, application conditions, competition for available financing, and the specific financing structure of an individual project. **Accordingly, the financial results should be interpreted as unlevered project-level economics, with project-specific financing and funding considerations assessed separately where relevant.**



Appendix D: Building Design

Table D1: Building type design across performance tiers

Building Type	Baseline	Mid-Range	Net-Zero Ready
Residential Archetypes include: Detached – Two Storeys with basement (2,100 sq. ft) Townhome Middle Unit – Two Storeys (1,500 sq. ft) Townhome End Unit – Two Storeys (1,500 sq. ft) Quadplex – 5,500 sq. ft	1. Fossil fuel heating. 2. Electric resistance hot water. 3. No cooling.	1. Hybrid system, electric heat pump (COP 3.66 @ 8.3C) and cooling (COP 4.0 @ 35C) with fossil fuel (i.e., natural gas or fuel oil) backup. 2. Electric resistance hot water. 3. Improved envelope performance (10% reduction in TEDI).	1. Electric heat pumps OR cold climate heat pumps for heating (COP 2.97 @ -6.3C) and cooling (COP 5.3 @ 35C). 2. Electric heat pump hot water. 3. Improved envelope performance (40% reduction in TEDI).
Large Archetypes include: Low-Rise Multi-Unit Residential – Three Storeys above grade (19,000 sq. ft) High-Rise Multi-Unit Residential – Ten Storeys above grade (84,000 sq. ft) Office Building – Three Storeys above grade (54,000 sq. ft) Municipal Office Building (Institutional) – Three Storeys above grade (54,000 sq. ft)	1. Fossil fuel heating. 2. Electric chillers for cooling.	1. Hybrid electric heat pump for heating (COP 3.2) and cooling (COP 3.66) with fossil fuel backup 2. (-8C cut-off) 3. Improved ventilation efficiency (75-80%)	1. Improved windows (USI 1.6) 2. Improved window to wall ratio (reduced to 30-40% of total exterior wall area.) 3. Geo-exchange heating and cooling (seasonal heating COP 3 and cooling COP 6) with electric backup for ~5%. 4. Efficient equipment

Appendix E: Annual Energy Consumption

To ensure consistent comparison across communities, all delivered energy in Appendix E is expressed in kilowatt-hours (kWh). For natural gas and fuel-oil–heated communities, energy volumes were converted to kWh using Higher Heating Values (HHVs).



Mixed-use buildings in Vancouver, British Columbia. Photo: ICLEI Canada, 2024.

E1 Residential Archetypes

Table E1: Residential detached

* Indicates regions where fuel oil is the primary heating source.

Province	Climate Zone	Climate Grouping	Performance Level	Annual Electricity Usage (kWh)	Annual Natural Gas (or Fuel Oil*) Usage (kWh)
NL*	Zone 6	Cold – Atlantic	Baseline	13,226	15,028
			Mid-Range	15,328	5,782
			Net-Zero Ready	12,528	0
NS*	Zone 6	Cold – Atlantic	Baseline	13,226	15,028
			Mid-Range	15,328	5,782
			Net-Zero Ready	12,528	0
ON (S)	Zone 5	Moderate	Baseline	12,915	14,114
			Mid-Range	15,658	4,476
			Net-Zero Ready	12,856	0
ON (N)	Zone 6	Cold – Ontario	Baseline	13,139	15,682
			Mid-Range	15,522	6,785
			Net-Zero Ready	13,462	0
MB*	Zone 7A	Very Cold	Baseline	13,638	21,511
			Mid-Range	15,347	12,402
			Net-Zero Ready	14,992	0
SK	Zone 7A	Very Cold	Baseline	13,638	21,511
			Mid-Range	15,347	12,402
			Net-Zero Ready	14,992	0
AB	Zone 7A	Very Cold	Baseline	13,638	21,511
			Mid-Range	15,347	12,402
			Net-Zero Ready	14,992	0
BC	Zone 5	Moderate	Baseline	12,915	14,114
			Mid-Range	15,658	4,476
			Net-Zero Ready	12,856	0

Table E2: Townhome middle

* Indicates regions where fuel oil is the primary heating source.

Province	Climate Zone	Climate Grouping	Performance Level	Annual Electricity Usage (kWh)	Annual Natural Gas (or Fuel Oil*) Usage (kWh)
NL*	Zone 6	Cold – Atlantic	Baseline	12,900	7,113
			Mid-Range	14,365	2,156
			Net-Zero Ready	10,872	0
NS*	Zone 6	Cold – Atlantic	Baseline	12,900	7,113
			Mid-Range	14,365	2,156
			Net-Zero Ready	10,872	0
ON (S)	Zone 5	Moderate	Baseline	12,605	6,911
			Mid-Range	14,535	1,708
			Net-Zero Ready	10,877	0
ON (N)	Zone 6	Cold – Ontario	Baseline	12,817	7,858
			Mid-Range	14,541	3,169
			Net-Zero Ready	11,327	0
MB*	Zone 7A	Very Cold	Baseline	13,265	11,215
			Mid-Range	14,615	6,213
			Net-Zero Ready	12,018	0
SK	Zone 7A	Very Cold	Baseline	13,265	11,215
			Mid-Range	14,615	6,213
			Net-Zero Ready	12,018	0
AB	Zone 7A	Very Cold	Baseline	13,265	11,215
			Mid-Range	14,615	6,213
			Net-Zero Ready	12,018	0
BC	Zone 5	Moderate	Baseline	12,605	6,911
			Mid-Range	14,535	1,708
			Net-Zero Ready	10,877	0

Table E3: Townhome (end)

* Indicates regions where fuel oil is the primary heating source.

Province	Climate Zone	Climate Grouping	Performance Level	Annual Electricity Usage (kWh)	Annual Natural Gas (or Fuel Oil*) Usage (kWh)
NL*	Zone 6	Cold – Atlantic	Baseline	12,956	9,839
			Mid-Range	14,675	3,445
			Net-Zero Ready	11,497	0
NS*	Zone 6	Cold – Atlantic	Baseline	12,956	9,839
			Mid-Range	14,675	3,445
			Net-Zero Ready	11,497	0
ON (S)	Zone 5	Moderate	Baseline	12,655	9,430
			Mid-Range	14,947	2,609
			Net-Zero Ready	11,715	0
ON (N)	Zone 6	Cold – Ontario	Baseline	12,871	10,534
			Mid-Range	14,829	4,453
			Net-Zero Ready	12,112	0
MB*	Zone 7A	Very Cold	Baseline	13,339	14,797
			Mid-Range	14,908	8,197
			Net-Zero Ready	13,311	0
SK	Zone 7A	Very Cold	Baseline	13,339	14,797
			Mid-Range	14,908	8,197
			Net-Zero Ready	13,311	0
AB	Zone 7A	Very Cold	Baseline	13,339	14,797
			Mid-Range	14,908	8,197
			Net-Zero Ready	13,311	0
BC	Zone 5	Moderate	Baseline	12,655	9,430
			Mid-Range	14,947	2,609
			Net-Zero Ready	11,715	0

Table E4: Quadplex

* Indicates regions where fuel oil is the primary heating source.

Province	Climate Zone	Climate Grouping	Performance Level	Annual Electricity Usage (kWh)	Annual Natural Gas (or Fuel Oil*) Usage (kWh)
NL*	Zone 6	Cold – Atlantic	Baseline	13,597	46,408
			Mid-Range	18,881	21,399
			Net-Zero Ready	18,383	0
NS*	Zone 6	Cold – Atlantic	Baseline	13,597	46,408
			Mid-Range	18,881	21,399
			Net-Zero Ready	18,383	0
ON (S)	Zone 5	Moderate	Baseline	13,253	43,581
			Mid-Range	19,998	17,385
			Net-Zero Ready	18,365	0
ON (N)	Zone 6	Cold – Ontario	Baseline	13,508	47,019
			Mid-Range	19,122	23,460
			Net-Zero Ready	19,915	0
MB*	Zone 7A	Very Cold	Baseline	14,159	61,653
			Mid-Range	18,781	36,228
			Net-Zero Ready	24,912	0
SK	Zone 7A	Very Cold	Baseline	14,159	61,653
			Mid-Range	18,781	36,228
			Net-Zero Ready	24,912	0
AB	Zone 7A	Very Cold	Baseline	14,159	61,653
			Mid-Range	18,781	36,228
			Net-Zero Ready	24,912	0
BC	Zone 5	Moderate	Baseline	13,253	43,581
			Mid-Range	19,998	17,385
			Net-Zero Ready	18,365	0

E2 Large Building Archetypes

Table E5: Low-rise multi-unit residential

* Indicates regions where fuel oil is the primary heating source.

Province	Climate Zone	Climate Grouping	Performance Level	Annual Electricity Usage (kWh)	Annual Natural Gas (or Fuel Oil*) Usage (kWh)
NL*	Zone 6	Cold – Atlantic	Baseline	180,563	204,881
			Mid-Range	127,809	140,210
			Net-Zero Ready	142,280	0
NS*	Zone 6	Cold – Atlantic	Baseline	180,563	204,881
			Mid-Range	127,809	140,210
			Net-Zero Ready	142,280	0
ON (S)	Zone 5	Moderate	Baseline	186,318	210,483
			Mid-Range	145,630	106,576
			Net-Zero Ready	150,048	0
ON (N)	Zone 6	Cold – Ontario	Baseline	173,675	227,627
			Mid-Range	142,624	126,421
			Net-Zero Ready	146,744	0
MB*	Zone 7A	Very Cold	Baseline	160,645	244,507
			Mid-Range	117,280	128,657
			Net-Zero Ready	147,175	0
SK	Zone 7A	Very Cold	Baseline	160,645	244,507
			Mid-Range	117,280	128,657
			Net-Zero Ready	147,175	0
AB	Zone 7A	Very Cold	Baseline	160,645	244,507
			Mid-Range	117,280	128,657
			Net-Zero Ready	147,175	0
BC	Zone 5	Moderate	Baseline	186,318	210,483
			Mid-Range	145,630	106,576
			Net-Zero Ready	150,048	0

Table E6: High-rise multi-unit residential

* Indicates regions where fuel oil is the primary heating source.

Province	Climate Zone	Climate Grouping	Performance Level	Annual Electricity Usage (kWh)	Annual Natural Gas (or Fuel Oil*) Usage (kWh)
NL*	Zone 6	Cold – Atlantic	Baseline	580,648	644,331
			Mid-Range	465,935	379,294
			Net-Zero Ready	477,591	0
NS*	Zone 6	Cold – Atlantic	Baseline	580,648	644,331
			Mid-Range	465,935	379,294
			Net-Zero Ready	477,591	0
ON (S)	Zone 5	Moderate	Baseline	649,448	720,386
			Mid-Range	492,045	473,811
			Net-Zero Ready	524,825	0
ON (N)	Zone 6	Cold – Ontario	Baseline	608,154	768,072
			Mid-Range	490,812	475,619
			Net-Zero Ready	523,822	0
MB*	Zone 7A	Very Cold	Baseline	570,618	838,567
			Mid-Range	464,127	522,183
			Net-Zero Ready	536,725	0
SK	Zone 7A	Very Cold	Baseline	570,618	838,567
			Mid-Range	464,127	522,183
			Net-Zero Ready	536,725	0
AB	Zone 7A	Very Cold	Baseline	570,618	838,567
			Mid-Range	464,127	522,183
			Net-Zero Ready	536,725	0
BC	Zone 5	Moderate	Baseline	649,448	720,386
			Mid-Range	492,045	473,811
			Net-Zero Ready	524,825	0

Table E7: Office building

* Indicates regions where fuel oil is the primary heating source.

Province	Climate Zone	Climate Grouping	Performance Level	Annual Electricity Usage (kWh)	Annual Natural Gas (or Fuel Oil*) Usage (kWh)
NL*	Zone 6	Cold – Atlantic	Baseline	464,731	112,199
			Mid-Range	306,811	96,522
			Net-Zero Ready	228,814	0
NS*	Zone 6	Cold – Atlantic	Baseline	464,731	112,199
			Mid-Range	306,811	96,522
			Net-Zero Ready	228,814	0
ON (S)	Zone 5	Moderate	Baseline	522,526	135,473
			Mid-Range	412,662	0
			Net-Zero Ready	253,824	0
ON (N)	Zone 6	Cold – Ontario	Baseline	491,534	153,840
			Mid-Range	330,965	69,514
			Net-Zero Ready	254,296	0
MB*	Zone 7A	Very Cold	Baseline	453,011	155,465
			Mid-Range	359,535	61,897
			Net-Zero Ready	236,013	0
SK	Zone 7A	Very Cold	Baseline	453,011	155,465
			Mid-Range	359,535	61,897
			Net-Zero Ready	236,013	0
AB	Zone 7A	Very Cold	Baseline	453,011	155,465
			Mid-Range	359,535	61,897
			Net-Zero Ready	236,013	0
BC	Zone 5	Moderate	Baseline	522,526	135,473
			Mid-Range	412,662	0
			Net-Zero Ready	253,824	0

Table E8: Municipal office building (institutional)

* Indicates regions where fuel oil is the primary heating source.

Province	Climate Zone	Climate Grouping	Performance Level	Annual Electricity Usage (kWh)	Annual Natural Gas (or Fuel Oil*) Usage (kWh)
NL*	Zone 6	Cold – Atlantic	Baseline	464,731	112,199
			Mid-Range	306,811	96,522
			Net-Zero Ready	228,814	0
NS*	Zone 6	Cold – Atlantic	Baseline	464,731	112,199
			Mid-Range	306,811	96,522
			Net-Zero Ready	228,814	0
ON (S)	Zone 5	Moderate	Baseline	522,526	135,473
			Mid-Range	412,662	0
			Net-Zero Ready	253,824	0
ON (N)	Zone 6	Cold – Ontario	Baseline	491,534	153,840
			Mid-Range	330,965	69,514
			Net-Zero Ready	254,296	0
MB*	Zone 7A	Very Cold	Baseline	453,011	155,465
			Mid-Range	359,535	61,897
			Net-Zero Ready	236,013	0
SK	Zone 7A	Very Cold	Baseline	453,011	155,465
			Mid-Range	359,535	61,897
			Net-Zero Ready	236,013	0
AB	Zone 7A	Very Cold	Baseline	453,011	155,465
			Mid-Range	359,535	61,897
			Net-Zero Ready	236,013	0
BC	Zone 5	Moderate	Baseline	522,526	135,473
			Mid-Range	412,662	0
			Net-Zero Ready	253,824	0

Appendix F: Energy Rates

Province	Natural Gas ($/m³) or Fuel Oil* ($/L)	Natural Gas or Fuel Oil ($/kWh equivalent)[41]	Natural Gas Connection Rate (Monthly)	Electricity Rate (per kWh)	Electricity Connection Rate (Monthly)
NL*	1.3135	0.1245	–	0.1521	22.38
NS*	1.3766	0.1305	–	0.1819	19.17
ON (south)	0.3078	0.0292	27.69	0.1570	38.29
ON (north)	0.2984	0.0283	28.91	0.1461	44.04
MB*	1.3303	0.1261	–	0.0997	9.84
SK	0.2377	0.0225	26.50	0.1638	32.99
AB	0.2205	0.0209	37.95	0.1961	31.03
BC	0.4923	0.0467	12.65	0.1550	24.79

* The $/kWh equivalent column expresses gas and fuel oil rates on the same per-energy-unit basis as electricity, using a higher heating value of 10.55 kWh per m³ of natural gas (and per L of fuel oil). This conversion does not account for end-use efficiency: a heat pump delivering ~3 kWh of heat per kWh of electricity will reduce the effective per-kWh-of-heat cost of electricity by a factor of approximately three.

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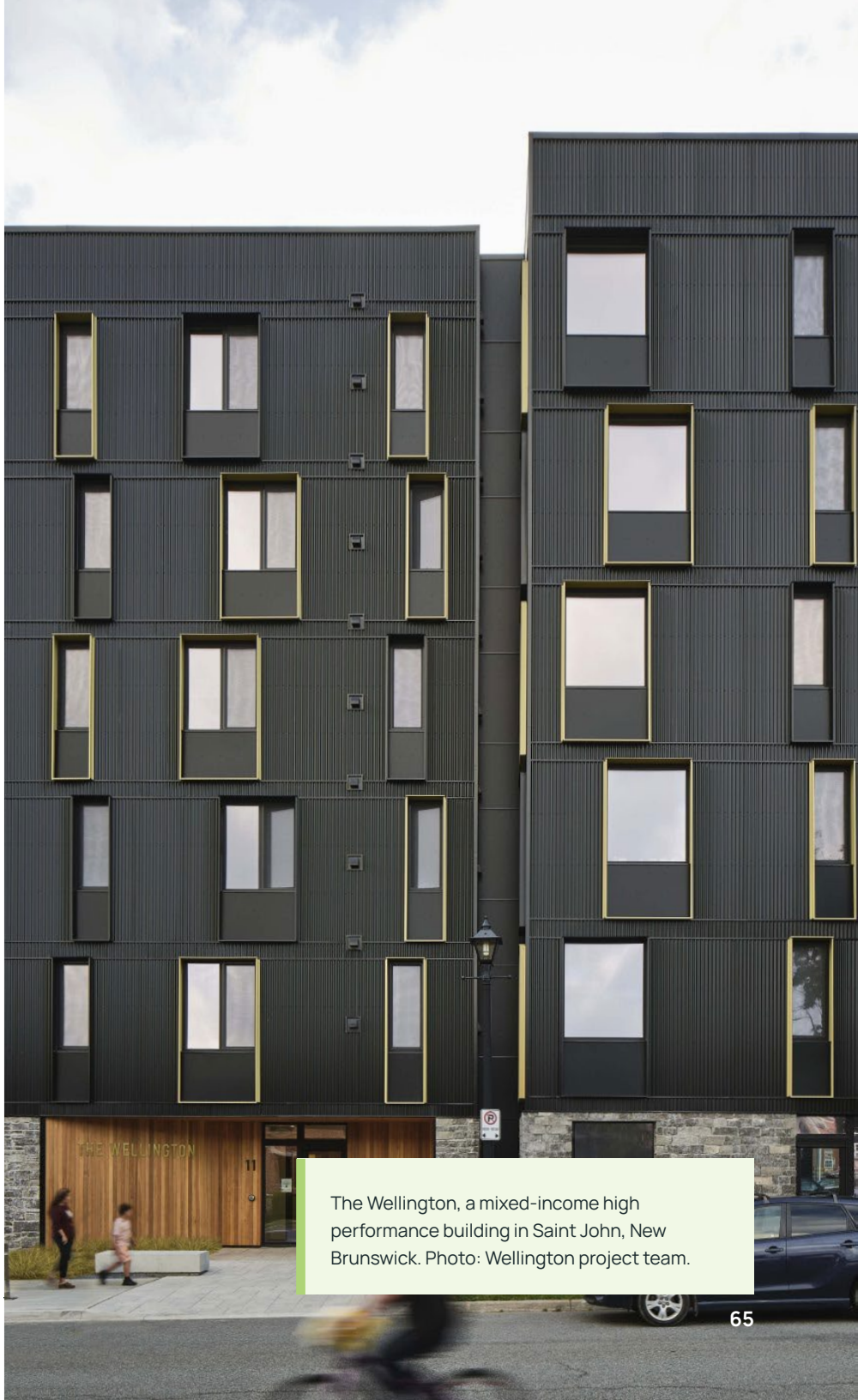
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The Wellington, a mixed-income high performance building in Saint John, New Brunswick. Photo: Wellington project team.

Beyond Emissions

The Full Case for High Performance Buildings in Canadian Municipalities

The evidence municipal practitioners need across emissions, costs, public health, and markets.

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