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ACCELERATING ENERGY RETROFITS

Reducing Barriers in Canada's Private Rental Housing

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Glossary of Terms

- **Deep Energy Retrofit:** An energy retrofit project that includes multiple energy efficiency measures that are comprehensive and extensive within an existing building. The goal of these deeper projects is typically to achieve significant energy savings and greenhouse gas emissions.
- **Energy Audit:** A detailed assessment of a building's energy consumption and efficiency, including identification of areas for improvement and recommendations for retrofit measures. This process may be conducted by a professional auditor or by individuals who own or live in a building.
- **Energy Performance Certificate:** A certification for a building that rates its energy efficiency, energy consumption, and/or environmental impact.
- **Energy Retrofit:** An energy retrofit refers to the process of making modifications or upgrades to an existing residential property with the aim of improving its energy efficiency and reducing energy consumption. This typically involves implementing various measures such as insulation, sealing air leaks, upgrading heating and cooling systems, and installing energy-efficient appliances to enhance the overall energy performance of the home.
- **ESCO (Energy Service Company):** An organization that specializes in providing energy efficiency services, retrofits, and performance contracting to improve energy performance and reduce energy costs for clients. Some ESCOs may utilize financing methods that use energy cost savings to fund the capital investment of an energy efficiency project, with potential returns reinvested or used to pay for the services.
- **Green Building Certification:** A building rating system that is typically voluntary such as LEED (Leadership in Energy and Environmental Design), that evaluates and certifies the sustainability and energy efficiency of buildings based on specific criteria.
- **HVAC:** Heating, ventilation, and air conditioning systems in a building. These systems provide thermal comfort and indoor air quality control within a building.
- **Leadership in Energy and Environmental Design (LEED):** A globally recognized green building certification program that evaluates the sustainability and environmental performance of buildings and communities. It assesses various aspects such as energy efficiency, water conservation, materials usage, indoor environmental quality, and site sustainability to promote environmentally responsible and resource-efficient design and construction practices.
- **Low Hanging Fruit:** For the purposes of this report, this term refers to any measures that are implemented within the scope of an energy retrofit that are relatively easy to implement for relatively low costs. These measures may have relatively short payback periods and may be associated with relatively lower energy efficiency outcomes compared to more comprehensive measures.
- **MURBs:** Multi-unit residential buildings. This term refers to a type of building that contains multiple individual dwelling units, typically in the form of apartments or condominiums, within a single structure or complex.
- **Secondary Suite:** Refers to a private and self-contained living unit that is part of, or has been added to, an existing residential property.
- **Shallow Retrofit:** Refers to a limited or surface-level renovation of an existing building aimed at improving its energy efficiency. It typically involves one or few energy efficiency measures that are implemented in isolation and may be simple in scope, such as weatherstripping or lighting.

List of Acronyms

AHIF - Affordable Housing Innovation Fund

BPD - Building Performance Database

CGAH - Canada Greener Affordable Housing

CMHC - Canada Mortgage and Housing Corporation

CMA - Census Metropolitan Areas

DOE - Department of Energy

DRAI - Deep Retrofit Accelerator Initiative

EC - European Commission

EIB - European Infrastructure Bank

EPA - Environmental Protection Agency

ESDC - Employment and Social Development Canada

FCM - Federation of Canadian Municipalities

GNPP - Greener Neighbourhoods Pilot Program

IBEW - International Brotherhood of Electrical Workers

JATC - Joint Apprenticeship and Training Committees

LED - Light Emitting Diode

LEED - Leadership in Energy and Environmental Design

LEEP - Local Energy Efficiency Partnerships

MLI - Mortgage Loan Insurance

NHS - National Housing Strategy

NRCan - Natural Resources Canada

OSS - One-Stop Shop

Executive Summary

Affordable housing and climate change present two of the most pressing and complicated policy issues facing Canada today. As Canada's population increases and the demand for rental housing surges, rent increases are creating significant challenges for those seeking affordable housing. At the same time, rental housing is deeply intertwined with Canada's commitment to reach net-zero emissions by 2050, given that buildings account for a significant source of emissions in the country. Yet efforts to make rental housing more energy efficient can create additional price pressures in the housing market, which can exacerbate the risks already posed to Canada's existing affordable housing stock. To reconcile these two interrelated challenges, the Canada Mortgage and Housing Corporation (CMHC) asked the following question:

> ***What non-financial tools can the federal government implement to de-risk energy and resiliency retrofits while maintaining the affordability of Canada's private rental housing stock?***

This report provides three policy recommendations that take a whole-of-government approach to answer this question with a focus on energy retrofits due their greater capacity for emissions reductions. The term "retrofit" throughout this report thus refers to energy retrofits. All three recommendations seek to reduce and remove barriers to enable the owners of Canada's private rental housing stock to install retrofits more easily, cheaply, and quickly than currently possible. When paired with existing market incentives, such as the national price on carbon and the various financial incentives to promote retrofits offered by CMHC and other government entities, these policy recommendations are designed to spur the growth of the retrofit industry in Canada while lowering costs for building owners and facilitating long-term housing affordability in the country. Outlined in this executive summary are three policy recommendations, the key issues they address, and some considerations for the future as these policies are implemented.

Policy Recommendation #1: Establish a National Database

This report recommends that Natural Resources Canada (NRCan), with the support of CMHC, create a national database that collects, consolidates, and makes publicly available data on building energy use, characteristics, operations, and equipment. By aggregating data from across the country in an accessible format, a national database will create opportunities for leveraging building data to reduce emissions by enabling low-cost statistical modeling that can predict energy savings more cheaply, quickly, and accurately for actors across the retrofit industry. This national database would also integrate information and resources on energy policies, government programs, and retrofit coordination services that are crafted to meet the needs of individual users based on their zip codes and building profiles. In turn, this national database will reduce barriers to retrofits that would make the installation of retrofits easier, cheaper, and faster across the building industry and thereby increase the uptake of retrofits in private rental housing.

Key Issues Addressed

Absence of National Building Performance Data: Canada lacks a national database for building energy performance. Consequently, although retrofit costs may be clear upfront, potential energy savings are not, creating a major barrier to retrofits since building owners are often unable to fully gauge the costs and benefits of investing in them. A national database mitigates this by making energy savings predictable and accessible to actors across the retrofit industry through cheaper, quicker, and more accurate modeling.

Lack of Information: Landlords of all sizes have many competing priorities and often lack the time and/or resources to learn about government initiatives or to hire staff to do so. Consequently, there is a general lack of knowledge about retrofit programs among many landlords and especially smaller landlords who often maintain full-time jobs. The national database addresses this by compiling all retrofit information in one location and channeling relevant information directly to users, thereby increasing accessibility for all.

Distrust and Disproportionate Effort: Landlords generally distrust government, and this is compounded by the assumption that government programs require significant effort for little gain. A national database that creates a standardized process for landlords to upload information and directs them to relevant policies, programs, and resources mitigates this by making applying for government subsidies and accessing information easier. This will also foster a culture of transparency and support to build the trust between government and landlords that is needed for efforts to reduce building emissions to succeed.

Lack of Support for Green Initiatives: A lack of national building performance data obstructs green initiatives at all levels of government by hindering access to information for actors across the retrofit industry. By aggregating national building performance information, a national database supports the development and implementation of green initiatives such as energy labels, retrofit codes, and minimum efficiency thresholds at the federal, provincial, and municipal levels by making the required data accessible and enabling monitoring of the nation's progress toward reaching its net-zero goals.

Considerations

Data Ownership: Data ownership is a challenge that is further complicated by Canadian federalism since provinces and municipalities often have data ownership regulations in place. Contributing to a national database in Canada would therefore need to be voluntary for public and private entities alike. This would alleviate data ownership concerns by granting provinces, municipalities, and the companies that are based within them the option of choosing to participate in the national database, with promotions to encourage contributions by embedding the use of the national database into government programs and initiatives.

Digital Privacy: Digital privacy is another major hurdle that can be addressed by anonymizing data and embedding options within already existing databases that allow users to provide their informed consent prior to providing their data. There is also an opportunity to update the terms and conditions of other databases such as Energy Star Portfolio Manager to include an option for users to consent to sharing the information they submit to a national database. Additionally, CMHC can use and update the housing agreements it has with provinces and territories to encourage them to contribute to the national database.

Technology Development and Maintenance: This database will need to be developed as well as maintained to ensure its continued relevance and utility. NRCan already has in-house expertise with developing and maintaining online tools that it can leverage, and CMHC can provide support through its research teams, funding channels, policy experts, and network of connections to contribute to this process.

Policy Recommendation #2: Develop a National Training Curriculum

This report recommends that Employment and Social Development Canada (ESDC), with the support of CMHC and NRCan, develop a training curriculum that can be adopted nationwide through Canada's trade schools. The training would be developed in consultation with the government, trade schools, and retrofit industry leaders with a focus on educating workers on how to install retrofit technologies. Participating schools would receive funding packages to incentivize and facilitate the adoption of the curriculum. To promote the curriculum's success, the government should coordinate with construction firms to ensure workers have a channel from schools into the workforce. Through this training curriculum, the training of workers and the adoption of new retrofit technologies will be de-risked and the pool of trained workers will be increased so that firms can better meet the demand for retrofits. In turn, this would reduce costs for retrofit projects by increasing the supply of workers and firms capable of conducting these projects.

Key Issues Addressed

Skilled Workforce Attrition: Workers in construction are leaving the industry faster than they are being replaced. This labor shortage is fueled by the absence of pathways from school to trades, causing fewer Canadians to choose trades careers. Moreover, workers are not being replaced by immigrants since the immigration system targets white-collar workers, and those immigrants trained in trades who are able to

enter Canada often struggle to have their credentials recognized. The training curriculum mitigates this by providing an accessible pathway for workers to obtain the training and recognition to enter the workforce.

Barriers to Market Entry: Landlords generally prefer to do business with a few trusted firms. For landlords, this increases the time it takes to complete an energy retrofit, and for contractors this makes it difficult to break into the market. The training curriculum would increase the overall training level of the workforce and signal that workers have the necessary skills to install retrofits according to industry and government standards. This, in turn, will raise the general trust level of contractors and allow more firms to enter the retrofit market. This will further raise the supply of trained workers and thereby reduce costs.

Rise in Raw Material Prices: The shortage of labor is compounded by a shortage of raw materials that is further exacerbating the costs of all types of construction work, including property maintenance and retrofit installation. As costs increase, so does the risk that landlords assume when installing retrofits. The training curriculum offsets these rising costs by increasing both the number of workers available as well as the pool of workers who can install retrofits as efficiently as possible, thereby reducing overall costs.

Technological Adoption: Construction firms often hesitate to train their workers on the installation of a new technology or invest in obtaining the required raw materials until it is proven that the new technology works, will not be made obsolete, and will be widely adopted well into the future. This further restricts the number of workers qualified to install certain retrofits and hinders the development of the green labor market. The training curriculum would de-risk new technologies among firms by distributing information on the latest trends, teaching efficient and proper installation techniques, and reducing worker error.

Considerations

Maintaining Relevance: ESDC will need to regularly review and update the training curriculum to ensure it is up to date with the latest developments in the retrofit industry. These reviews can be informed by feedback from industry stakeholders, changes in regulations or codes, advances in technology, new installation and safety practices, and emerging industry-specific needs, and continued partnerships between the federal government, trade schools, and retrofit industry leaders will support this maintenance.

Long-term Funding: Long-term funding is needed for the funding packages that incentivize and facilitate adoption of the curriculum. ESDC can do this by establishing a dedicated funding mechanism specifically for the training curriculum. Fostering partnerships between trade schools and industry leaders for the development and maintenance of the curriculum will support this by allowing for collaboration that may increase funding opportunities. Throughout, promoting public awareness about the benefits of the training curriculum will help secure political and public backing that can contribute to sustained funding.

Recommendation #3: Support Community-Led Coordination Services

CMHC should coordinate with NRCan to establish a multidisciplinary Retrofit Commission that will provide national support for retrofit coordination services. By tapping into their existing partnerships and convening capacities, CMHC and NRCan can bring together representatives from all provinces and territories as well as retrofit industry leaders, housing specialists, municipal housing groups, and landlord and tenant associations across both the public and private sectors. In turn, this Commission should develop a toolkit to provide standards and guidance for carrying out coordinated retrofit projects. Key components of the toolkit would include methods for conducting community outreach, guiding principles on housing affordability, networks for sharing information about energy efficiency opportunities, best practices for engaging with and between landlords and tenants, and processes for accessing financial solutions. In turn, empowering actors across the retrofit industry and especially community groups who most need support to pursue retrofit projects can encourage a greater number and diversity of building owners to pursue retrofits while developing public awareness about energy efficiency to increase retrofit uptake over time.

Key Issues Addressed

Complex Retrofit Landscape: The retrofit market is highly complex, creating significant barriers for landlords and especially small landlords. Consequently, even those who are interested in retrofits may only get as far as completing an energy audit before realizing that they are unable to move further in the process. This makes a centralized coordinator who can serve as a streamlined source of information an essential support mechanism to enable landlords to move forward in the retrofit process, and a coordinator that is based in a local community can add an additional layer of trust and credibility to the process.

Limited Coordination Services: Retrofit coordination services lack access to funding and support. Existing programs for coordination services exclude many building owners who do not fall into targeted groups and especially small landlords who rent secondary suites and single-detached homes, and who most need support to pursue retrofits. Rather than starting from scratch, local communities through the toolkit can implement localized coordination initiatives with confidence, with the support of the federal government as well as the network of other community groups across the country who are also using the toolkit.

Lack of Government Coordination: Although there are various partnership networks and communication channels between different federal departments, and between the federal government and provincial and municipal governments, more coordination is needed among the entities most responsible for promoting housing energy efficiency. This includes CMHC for its role in housing, NRCan for its role in energy efficiency, and provincial and municipal governments for their jurisdiction over housing regulations, and the Retrofit Commission would mitigate this by serving as a regular forum for government coordination.

Considerations

Local Variations: This toolkit can work hand-in-hand with the Canada Green Buildings Strategy that the federal government is currently developing to establish high-level direction for on-the-ground community retrofits. Local variations across the country make flexibility and adaptability vital for retrofit coordination services, and this toolkit provides high-level cohesiveness that supports these variations while providing national leadership and creating the space for information sharing and collaboration across the country.

Capacity of Local Communities: Community-led retrofit coordination models have great potential to accelerate retrofits, but local communities must have the capacity to carry out retrofit projects. This makes it imperative that the coordination of the retrofit market is accelerated and access to financial solutions is streamlined. The toolkit supports this by providing guidance that facilitates access to the information that actors across the retrofit industry and especially community groups need to coordinate retrofit projects.

Maintaining Relevance: The toolkit must be regularly updated to reflect developments across the retrofit industry. Accompanying the toolkit with systems and forums for information sharing that bring together local groups and other stakeholders would serve as a forum to solicit feedback from community groups that could feed into reviews and updates to the toolkit to ensure it is well-attuned to the needs of diverse communities and maintains its utility while enhancing coordination among public and private actors alike.

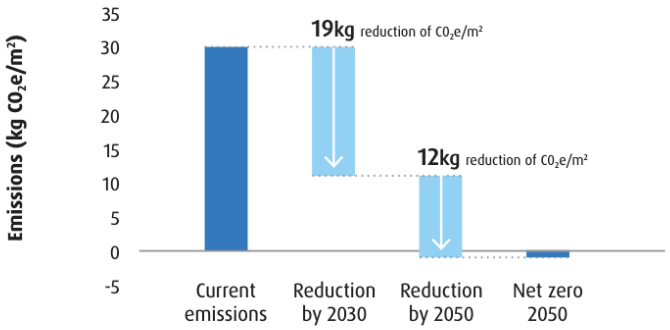
Policy Package

Policy interventions are most effective when they are multifaceted, complimentary, and well-integrated. As such, the policy recommendations in this report are not siloed but, rather, represent a holistic and cohesive package that works together to create synergies in Canada's retrofit market. For example, the national database will identify areas of need to be reflected in the training curriculum. In turn, the training curriculum will increase the pool of trained workers, who will be connected to coordination service providers through the toolkit to aggregate projects. The new data streams produced through the increased uptake of retrofits will then be channeled into the national database to further facilitate resource access and forecast industry trends. Together, these integrated policy recommendations feed into and off of each other in an ongoing feedback loop that positively impacts diverse actors across the retrofit industry by reducing barriers to retrofits and thereby making retrofits easier, cheaper, and faster to install while supporting the whole-of-government approach that is needed for Canada to reach its net-zero goals.

Introduction

Rental Housing Emissions

In 2022, the Government of Canada released its 2030 Emissions Reduction Plan that sets out the roadmap by which Canada will reduce national emissions by 40% from 2005 levels by 2030 and reach net-zero emissions by 2050.[1] Decarbonizing the building sector is critical to this transition as buildings in Canada account for 18% of national emissions,[2] representing the third largest source of emissions in the country.[3] This situation is even more severe in Toronto, where buildings emit 58% of emissions and represent the largest source of emissions in the city.[4] Of these emissions, residential buildings across the country account for 59%.[5] Contributing to this is the old age and consequent energy inefficiency of Canada's housing supply, with multi-residential properties built before 2005 consuming 50% more energy than those built today.[6] This is even more pronounced in rental housing, with 76% of Canada's rental units having been built more than 36 years ago.[7] In the Greater Toronto Area, for example, almost 224,000 rental units were built between 1960 and 1979 compared to just 24,000 rental units between 2000 and today.[8] Although there has been a slight uptick in the construction of purpose-built rental housing in recent years, it is estimated that the current rental housing supply will still account for about two-thirds of rental housing by 2030 and about half by 2050.[9] The significant emissions emitted by rental housing and its importance in continuing to meet the housing needs of the nation well into the future make it essential that emission-reducing efforts are targeted at rental housing to meet Canada's goal of reaching net zero.

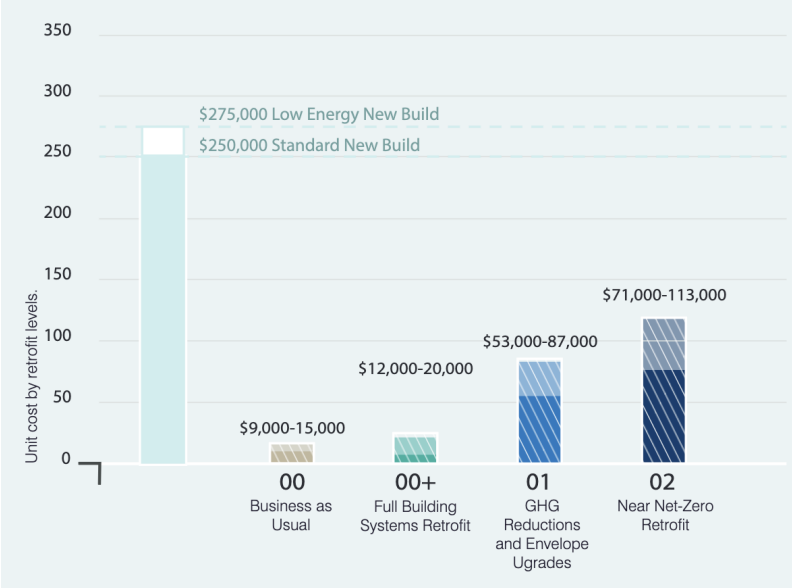


The chart above shows how much emissions will need to be reduced in Canada's housing sector by 2030 and 2050 to meet the country's emissions targets. Source: BMO Climate Institute.[10]

Retrofit Costs & Benefits

Today, there is a wide spectrum of retrofits to reduce building emissions, from minor retrofits that require minimal renovations to deep retrofits that overhaul existing building systems.[11] However, retrofits can be expensive, with the C.D. Howe Institute estimating retrofits cost $18,000 in a typical, detached, single-family home.[12] The deep retrofits needed for net zero are even more costly, with estimates ranging from $60,000 to $100,000 per home.[13] In turn, retrofits can both reduce emissions and generate energy savings, with one study finding emission reductions of 33% and energy savings of 34% in a retrofitted building.[14] Indeed, various studies demonstrate that retrofits can save between 22% and 40% on utilities annually,[15] with savings rising up to 60% for deeper retrofits.[16] In a pilot program that retrofitted 100 homes in Nova Scotia in 2019, for example, the Mi'kmaw Home Energy Efficiency Project found that the average cost of retrofits for each home was between $6,000 and $7,000, and the resulting energy savings averaged $750 per home annually.[17] Emissions have since been reduced by 3,850 tons, or the equivalent of 855 passenger vehicles.[18] Although upfront capital is typically needed to finance retrofits, the energy savings generated thus allow costs to be recouped over time.[19] As the federal price on carbon rises, retrofit energy savings will increase in tandem. Additional benefits from retrofits include improved air quality, comfort,

and safety for residents.[20] In rental housing, this translates into higher tenant satisfaction that can have long-term positive effects not only on the health and well-being of tenants but also on landlords in the form of reduced tenant turnover and vacancy rates.[21] In this way, retrofits benefit landlords by not only increasing rental property values, reducing maintenance and operating costs, and reducing insurance premiums but also increasing rent due to longer uninterrupted tenancies.[22] Moreover, retrofitting existing buildings is far less costly than constructing new buildings or replacing old ones and requires less government support, making retrofits the best path forward for reducing building emissions.[23]



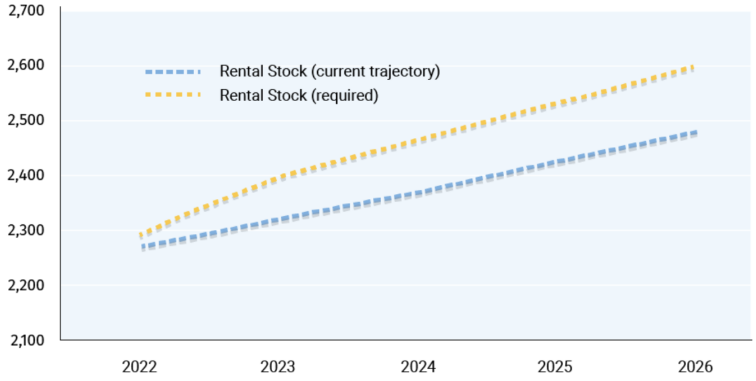
The chart above shows the average cost of various types of retrofits by unit, in comparison to new builds. Source: Tower Renewal Partnership[24]

The Split Incentive

Although retrofits may have many benefits for landlords and tenants alike, conflicting incentives between landlords and tenants produce a "split incentive" that uniquely obstructs retrofits in private rental housing. The split incentive is a market failure in which the benefits of a transaction pass to someone other than the party that pays for the transaction, and private rental housing exemplifies this phenomenon.[25] On the one hand, landlords are not incentivized to install retrofits since tenants usually pay for utilities and thus the cost-saving benefits of retrofits accrue to the tenants rather than the landlords who paid for them. On the other hand, tenants are not incentivized to install retrofits since that would be an investment in a property that they do not own and may vacate or be evicted from any time, and thus the return on such investments would accrue to the landlords rather than the tenants who paid for them. In this way, neither party is willing to incur the costs of retrofitting since the financial benefits of retrofits are seen as accruing to the non-paying party. Shifting the cost of utilities to landlords is not a tenable solution to this since landlords predict and studies confirm that tenants use more energy when landlords pay for utilities.[26] Overall, the result is that retrofits tend to not be pursued in private rental housing, and rental buildings consequently consume approximately 20% more energy per square foot on average than owner-occupied buildings.[27] Moreover, when landlords do opt to pay for retrofits in their rental units, they often pass on retrofit costs to tenants in the form of above-guideline increases in rent.[28] This reduces the affordability of rental units for both current and new tenants and can enable 'renovictions' by which landlords use renovations as a premise for vacating rental units so that rent can be raised beyond what is otherwise legally allowed.[29]

Housing Crisis

The split incentive is exacerbated by Canada's housing shortage. In 2022, Canada experienced record-high population growth as the population rose by over one million people for the first time in national history.[30] Accordingly, the number of renters has been steadily rising among all age groups, with rental households growing by 22% between 2011 and 2021 compared to just 8% for homeowner households.[31] These trends are expected to continue as projections estimate that rental households will increase by over 40% between 2021 and 2031 while homeowner households will decrease by 7%.[32] However, Canada's rental housing supply is not keeping pace: in 2016, there were 437 housing units for every 1,000 Canadians, but in 2020, there were only 424. There is an estimated deficit in rental housing of approximately 30,000 units, and it is predicted that this deficit will exceed 120,000 units by 2026 if current trends continue.[33] Moreover, the Government of Canada's plan to bring in over 1.5 million immigrants over the next three years will only accelerate this trend.[34] Rental vacancies are already at historic lows, with the national apartment vacancy rate dropping from 3.1% in 2021 to just 1.9% in 2022, representing the steepest single-year decrease in over three decades.[35] Retrofits can raise rental income for landlords without raising rents for tenants by reducing turnover and vacancy rates. Yet because of the tight housing market, rental units are likely to be filled regardless of their energy efficiency levels, eliminating any incentive for landlords to retrofit to attract tenants.[36] This has dire implications for affordability as average rental rates in Canada have increased by 18.2%—and by 30% in Toronto—when an apartment is turned over to a new tenant.[37] Importantly, these steep rent increases that are shrinking the amount of affordable housing in Canada are occurring even in the absence of retrofits, making installing the retrofits that Canada's aging rental housing stock desperately needs while maintaining affordability deeply challenging.



The chart above shows how much the rental shortage in Canada is projected to increase between 2022 and 2026 based on current trends. Source: Royal Bank of Canada[38]

Landlord Retrofit Hesitations

Landlords of all sizes are generally interested in retrofits but have often installed few retrofits, if any. According to one stakeholder, small landlords typically intend to pass on rental properties to families, and this encourages upkeeping, upgrading, and potentially retrofitting of rental properties. However, it seems from stakeholder interviews that small landlords focus on property maintenance as opposed to energy efficiency due to their generally more modest financial means compared to large landlords, making the incentive to install costly retrofits with distant payback periods low. This is a major issue since most of the growing demand for rental housing is being met not by purpose-built rentals due to low supply but by secondary market rentals that small landlords often own.[39] In the Greater Toronto Area, for example, the number of renters has grown by 25.6% in the last decade, and over 90% of that demand is being met by the secondary market.[40] A stakeholder representing landlords of various sizes stated an interest in retrofits to save on energy costs and protect the environment, but fast 'payback' whereby landlords recoup costs within a short time frame was cited as necessary for retrofits to be pursued. In contrast, another

stakeholder representing large landlords who tend to be highly business-oriented stated an interest in retrofits as a long-term investment to increase the longevity and value of rental properties. While large landlords often have more capital to finance retrofits, however, there remains concern about installing the 'right' retrofit to avoid making the 'wrong' investment. Landlords of all sizes are generally risk averse, making them concerned about being "guinea pigs" for new technology such that they will typically only install retrofits that have been tested, tried, and true.[41] What this means is different for different types of landlords, with large landlords and property management companies having more resources to invest in early retrofit technologies and manage higher levels of risk. One stakeholder, for example, cautioned against "paralysis by analysis" in retrofit decisions, but this may not be feasible for small landlords.

Tense Landlord-Tenant Relationships

Tension between landlords and tenants further obstructs retrofit progress. Tenants seem to be viewed as either business prospects that earn money or potential liabilities that cost money. For example, stakeholders expressed concerns about "professional" tenants that exploit tenant protections to live in rental housing without paying for extended periods, tenants that damage rental property, and an alleged increase in mental health issues among tenants, all of which makes maintaining a positive landlord-tenant relationship challenging. The split incentive is, in part, fueled by this tense relationship as neither party is willing to incur costs that benefit the other. There was also concern from stakeholders about potentially loud and disruptive retrofit installation processes that may disturb tenants and thereby adversely impact landlord reputations. Today, landlords and especially large landlords have typically already installed the 'low-hanging fruit' of retrofits, such as LED lighting.[42] The retrofits that remain to be done consist of deeper retrofits that may cause noise, dust, and other disruptions during installation. This is especially so in Canada's rental housing stock, most of which is decades old with concrete envelopes that require laborious drilling to modify. Indeed, one stakeholder cited an instance in which tenants were so frustrated by the noise from a renovation that they threw canned foods at the construction crew from their balconies until construction had to cease for the day due to safety concerns. Because of the tight housing market, moreover, there is no alternative housing for tenants to turn to when retrofits are being installed. In this way, current tensions between landlords and tenants produce no incentive to retrofit, and the prospect of further straining landlord-tenant relations discourages the deep retrofits required to reach net zero.

Methodology

Due to the aforementioned barriers to retrofits in private rental housing, CMHC originally posed the following question: *What can the federal government do to incentivize emissions reductions and energy retrofits while maintaining the affordability of Canada's private rental housing stock?* After further discussion with CMHC, the challenge question was officially revised to the following: ***What non-financial tools can the federal government implement to de-risk energy and resiliency retrofits while maintaining the affordability of Canada's private rental housing stock?***

This question stems from the Government of Canada's commitment to reach net-zero emissions by 2050 and the importance of decarbonizing the housing industry to achieve that goal. This report's focus on non-financial tools was selected due to the extensive research that CMHC has already conducted on financial tools in the retrofit industry as well as the wide variety of initiatives that are already underway at all levels of government to provide financial support for residential retrofits. The result is a glaring gap on non-financial tools in both current research and current initiatives that requires attention and is thus the subject of this report. It should be noted that "non-financial" does not exclude the use of funds to design and implement programs. Rather, it emphasizes an approach that leverages tools that go beyond providing financing directly to landlords as has already been done through various federal, provincial, and municipal programs in the form of grants, loans, and subsidies.

Many current retrofit programs target private homeowners and public housing providers to the exclusion of private rental housing. This report emphasizes private rental housing to address this gap. In addition, private rental housing has several key characteristics that make it an important target for public policy. Specifically, private rental housing considerably contributes to national emissions due to the old age and consequent energy inefficiency of many rental units, and this aging private rental housing stock will continue to be essential in meeting the housing needs of Canada's growing population well into the future. Retrofits can significantly reduce building emissions, but private rental housing faces the unique challenge of the split incentive that obstructs retrofits in this sector. The combination of these factors makes public policy that targets retrofits in private rental housing vital if the nation is to reach net zero by 2050. While resiliency retrofits aim to protect homes from environmental damage, energy retrofits aim to improve energy efficiency. Consequently, energy retrofits can contribute more directly to emission reductions and are the focus of this report.[43] Throughout this report, the term "retrofit" refers to energy retrofits.

This report explores insights that were gathered through desk research, literature reviews, and stakeholder interviews conducted over the course of six months. This included a review of scholarly literature and reports from think tanks, government agencies, non-governmental organizations, and academic journals on the challenges, motivations, and opportunities for retrofits in the housing sector generally and in the private rental housing sector specifically. This research was supplemented by an analysis of recent news articles from credible publications, a review of documents provided by CMHC and various stakeholders, and attendance at the two-day Retrofit Canada Conference in June 2023. Stakeholder interviews were conducted with representatives from various levels of government, think tanks, researchers, landlord associations, property management companies, contractors, and coordination service providers. Stakeholders were selected based on their relevance, knowledge, and experience with retrofits and/or private rental housing. Recognizing that retrofits involve many sectors of the economy, this research adopted a whole systems approach with special care taken to speak to stakeholders who represented the perspectives of the various actors across the private rental housing and retrofit landscapes. These stakeholders provided invaluable insight into the complexities embedded in this industry.

Together, this research informed both this report's understanding of the barriers to retrofits in private rental housing and this report's recommendations that aim to reduce these barriers through an integrated policy framework. The Government of Canada is taking a coordinated whole-of-government approach to reach net zero, and this report's recommendations likewise take a whole-of-government approach that leverages the strengths, resources, and expertise of different federal agencies and levels of government to create collaborative and interactive pathways toward encouraging retrofits in private rental housing.

Public Policy Landscape

The Role of the Canada Mortgage and Housing Corporation (CMHC)

CMHC has an essential role to play in advancing Canada's climate goals by working to improve the energy efficiency of the country's housing stock while preserving and promoting the affordability of housing across the country. As Canada's national housing agency, CMHC is dedicated to actively facilitating access to a diverse range of affordable yet high-quality homes for Canadians and contributing to the creation of vibrant and healthy communities nationwide. CMHC focuses on providing housing finance options, supporting individuals who face housing affordability challenges in the private market, enhancing overall building quality and housing construction, and furnishing policymakers with the critical information, reporting, and analysis required to uphold a thriving housing market in Canada.[44]

As a Crown Corporation, CMHC is governed by a Board of Directors and underlying committees that sets the strategic direction of the organization in ways that support government policies and priorities. CMHC is responsible to Parliament through the Minister of Housing and Diversity and Inclusion. The legislative

framework that governs the operations and scope of CMHC's work is primarily composed of the *Canada Mortgage and Housing Act*, the *National Housing Act*, and the *Financial Administration Act.* As set forth in the *National Housing Act*, CMHC's mandate is to "promote housing affordability and choice, to facilitate access to, and competition and efficiency in the provision of, housing finance, to protect the availability of adequate funding for housing at low cost, and generally contribute to the well-being of the housing sector in the national economy."[45]

Furthermore, CMHC is charged with leading and delivering Canada's National Housing Strategy (NHS) and the federal initiatives that stem from it. This includes partnering with federal departments and agencies to design and deliver programming and services to meet the objectives of the strategy. This includes building new affordable housing as well as renewing and renovating the existing affordable housing stock in the country while providing the resources to increase the capacity of local housing sectors and supporting innovations in housing research and information.[46] The NHS is designed as a platform to address the pressing challenges of Canada's housing sector by promoting partnership and integrated, aligned efforts that work together to achieve the strategy's goals and outcomes. Partnerships and coordination are an essential aspect of CMHC's work, and CMHC has the legal grounds to cooperate with and enter agreements with individuals, groups, organizations, municipalities, provinces, and government agencies and departments, as set forth in the *Canada Mortgage and Housing Corporation Act.*[47] These partnerships help develop and disseminate best practices, provide training and education, and support the implementation of housing initiatives at all levels of government.

In alignment with its mandate and the energy efficiency commitments made by the Government of Canada, CMHC has been actively involved in advancing energy efficiency and sustainability in the housing sector through various initiatives that promote residential building retrofits. Because of the complexity of the retrofit landscape and the many actors involved, accelerating retrofits in Canada's private rental housing market will require CMHC to harness its full toolkit of skills and expertise and develop innovative solutions to the pressing challenges that face the country's housing stock and emissions profile. In recognition of the importance of reducing energy consumption and greenhouse gas emissions, CMHC has developed partnerships with such organizations as Natural Resources Canada (NRCan) to design and implement several initiatives to support retrofits. These programs, as well as additional initiatives that are underway throughout the government, are identified in the following section.

The Government's Approach to Retrofits

The Government of Canada is taking a whole-of-government approach to meeting its climate goals. Accordingly, departments and agencies across the federal government are collaborating on efforts to reduce emissions, transform markets, and work toward the country's legislated net-zero commitments.[48] The Government's plan to reach net-zero emissions by 2050 is backed by the *Canadian Net-Zero Emissions Accountability Act*, which was signed into law in 2021 and requires that the government work toward its emission-reduction goals with transparency, accountability, and public participation.[49]

Green Buildings Strategy (NRCan)

The Government's holistic approach to its climate goals is embodied in its upcoming Green Buildings Strategy. Spearheaded by NRCan, this strategy will provide national leadership and direction for the country to retrofit existing buildings, reduce emissions, and increase climate resiliency in communities in a way that maintains affordability for average Canadians. This strategy is still under development, with NRCan currently in the stage of soliciting public feedback from stakeholders across the retrofit and building sectors. This report's recommendations are well aligned with the goals and intent of the Green Buildings Strategy, and there is potential for each recommendation to be integrated into the design, development, and implementation of the strategy to advance the country's net-zero goals.

Mortgage Loan Insurance (MLI) Select (CMHC)

MLI Select is a multi-unit mortgage insurance product that was designed by CMHC to emphasize affordability, accessibility, and climate compatibility. Through this program, applicants can receive reduced premiums and extended amortization periods based on their commitment to one or more of these emphases. MLI Select utilizes a point system that offers incentives for greater affordability, energy efficiency, and accessibility in new and existing properties, and applicants can combine commitments for higher points and incentives in alignment with social and environmental objectives.[50]

Deep Retrofit Accelerator Initiative (NRCan)

The Deep Retrofit Accelerator Initiative (DRAI) provides funding to "retrofit accelerators," also known as Market Development Teams, to support their establishment, their growth, and their activities across Canada. The work of these retrofit accelerators assists building owners in developing deep retrofits in various building types across Canada by streamlining the retrofit process. These retrofit accelerators are designed to drive market transformation within specific regions or market segments, and this initiative aims to address key barriers while building capacity for deep retrofit project development. By supporting coordination, expertise, and project implementation, DRAI aims to increase the depth and rate of building retrofits, contributing to the nation's emission reduction targets and transition towards net zero by 2050.

Greener Neighbourhoods Pilot Program (NRCan)

The Canadian government has allocated $35.5 million for a period of five years beginning in 2022-23 to implement the Greener Neighbourhoods Pilot Program (GNPP), delivered by NRCan. The GNPP's primary objective is to assess the advantages and economic viability of aggregated deep retrofit models in Canada, with a focus on the Energiesprong retrofit model from the Netherlands. Funding will be awarded to up to six community housing neighborhoods across the country. The GNPP will undertake a number of demonstration projects to validate technical feasibility, facilitate market acceleration, and support research and stakeholder engagement through separate calls for proposals to accelerate retrofit uptake.[51]

Canada Greener Homes Initiative (NRCan and CMHC)

The Canada Greener Homes Initiative consists of both the Canada Greener Homes Grant that is run by NRCan and the Canada Greener Homes Loan that is run by CMHC, making this program exemplary of the coordination that is increasingly taking place between public entities to promote retrofits. While the grant portion of this program offers up to $5,000 to cover the cost of eligible retrofits, the loan portion of this program provides interest-free financing for energy efficiency retrofits that are recommended by an energy advisor. It is possible to combine this loan product with the grant program to further support homeowners in making energy efficiency upgrades to their homes. Also falling within this initiative is the Oil to Heat Pump Affordability Program, which provides financial support to households who are medium income or less to transition from oil-based home heating systems to more efficient heat pumps.

Canada Greener Affordable Housing Program (CMHC)

CMHC launched the Canada Greener Affordable Housing (CGAH) Program just last month, making this program the latest federal initiative to incentivize retrofits. This program offers funding opportunities for affordable housing organizations to undertake deep retrofits with the support of two separate funding streams. The first stream provides financial support for pre-retrofit activities while the second provides financial support for the retrofits themselves. This program is available for community housing providers, Indigenous governments and organizations, and provincial, territorial, and municipal governments. Projects must take place on buildings with at least five beds or individual units and achieve a 70% reduction in energy consumption relative to pre-retrofit building performance to qualify for this program.

Codes Acceleration Fund (NRCan)

Through this fund, NRCan provides financial resources to organizations who are working to expedite the adoption and application of the most ambitious energy performance levels in national model energy codes or other high-performance building codes, including those targeting net-zero emissions. Advancing such building codes helps to establish energy efficiency requirements for construction projects, which results in a greater number of retrofits. Additionally, the program funds focus on increasing compliance rates with these codes while also enhancing capacity and facilitating market readiness for their implementation.[52]

Green Municipal Fund (FCM)

This fund is financed by the Government of Canada and administered by the Federation of Canadian Municipalities. With this support, the fund provides the financial resources for affordable housing projects as well as energy efficiency retrofits, pilots, planning, and feasibility studies across the country to support green efforts across the country.[53]

Challenges with Existing Programs

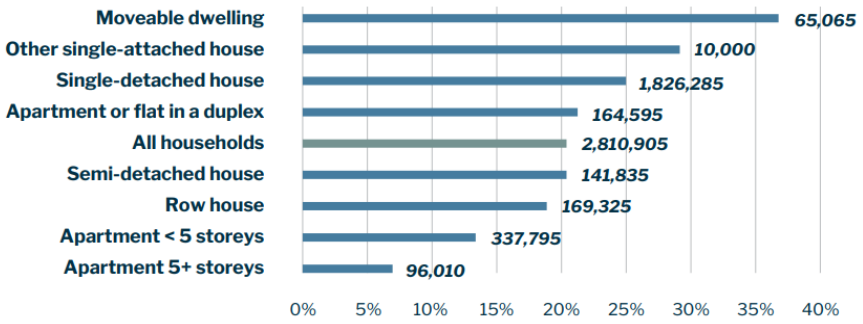
Homeowner and New Build Bias

Government retrofit programs tend to be inapplicable to landlords. To qualify for the Canada Greener Homes Initiative, for example, retrofitted residences must be the homeowner's primary residence, making most rental housing ineligible.[54] The result is that landlords feel excluded from government initiatives, which, in turn, disincentivizes landlords from seeking government initiatives in the future. How to apply for these programs can be unclear, especially for landlords who do not have experience with government programs. According to stakeholders, this further discourages landlords from applying for government programs due to concerns about wasting their time or placing their units under governmental scrutiny and thereby risk fines or forced closure of rental units that may not be up to code. The exclusion of private rental housing also exists at the provincial and municipal levels, where initiatives focus on homeowners and new developments to the exclusion of landlords. For example, the eligibility requirements of both Toronto's Energy Loan Program and Edmonton's Home Energy Retrofit Accelerator exclude most rental housing.[55] Similarly, Toronto has also created the Toronto Green Standard to promote net-zero buildings, but this only applies to new construction—not to current housing stock. Moreover, stakeholders stated the emphasis on homeownership is not limited to specific programs but extends to the government at large in its long-running promotion of homeownership despite the rental industry's importance in meeting the housing needs of a growing Canadian population. Today, average home prices are more than 7x average household incomes,[56] and this gap is accelerating as home prices are growing 10x faster than incomes.[57] Consequently, home ownership is increasingly delayed or even ruled out for many Canadians.[58] Although rental housing is often the more affordable and realistic housing option, government programs continue to focus on homeownership, leaving few programs for which landlords can qualify even if they wanted to.

Lack of Targeted Support for Renters with High Energy Cost Burdens

Inefficient homes lead to high energy costs that further obstruct housing affordability, yet government programs lack support for households struggling with this challenge.[59] Cost savings are critical for low-income families, but energy inefficiency in homes results in high energy bills that significantly eat away at these households' incomes.[60] Today, 20% of Canadian households face energy costs that amount to more than 6% of their incomes, representing an energy cost burden that is double the national median.[61] This places these households in 'energy poverty,' forcing them to choose between essential energy-related services such as heat and light and other essentials such as groceries, rent, and transportation.[62] Moreover, higher rates of energy poverty are more likely to be experienced by marginalized groups, thereby compounding housing affordability with structural and systemic barriers.[63] Although renters and low-income households face disproportionately high energy cost burdens, and thus stand to benefit the

most from retrofits, current federal programs do not provide targeted support and outreach to these households.[64] For example, the Canada Greener Homes Initiative provides loans and grants for retrofits, but neither landlords nor tenants are eligible for this funding. [65] Likewise, the Canada Greener Affordable Housing program offers financial support for affordable housing organizations to undertake deep retrofits in low-income housing, but this funding is not available to landlords in the private rental housing market. Meanwhile, other programs such as the Deep Retrofit Accelerator Initiative target larger, multi-unit buildings, leaving the single detached homes that face the highest energy cost burden rates unaddressed. These programs also typically have barriers to access, such as upfront capital requirements that landlords and tenants experiencing high energy cost burdens are often unable to meet.[66] The result is that funding cannot reach the landlords, tenants, and buildings that most need it, obstructing the retrofitting of energy inefficient properties and perpetuating energy poverty for private rental housing residents.[67]



The chart above shows the percentage and number of Canadian households experiencing high energy cost burdens. Source: Canadian Urban Sustainability Practitioners[68]

Complications of Federalism

The intricacies of Canadian federalism require that any initiative to promote retrofits is filtered through the different levels of the Canadian government. As a federal department, for example, NRCan cannot change zoning laws, which fall under the authority of provinces and municipalities. Instead, NRCan's primary power is federal spending allocations, which NRCan uses to create federal grants such as the Canada Greener Homes Grant to incentivize retrofits. As a Crown Corporation, CMHC has similar limitations, making funding through grants and loans such as the Canada Greener Homes Loan the primary power of CMHC in the retrofit space. NRCan also provides coaching and auditing services to help building owners navigate the retrofit industry and grants financial rewards to provinces and cities that adopt stricter energy efficiency mandates. All these activities indirectly facilitate retrofits among private and public actors alike. In contrast, provinces and cities have a more direct role in retrofits, as zoning laws and building codes fall under their jurisdiction, but coordination is needed to ensure initiatives filter through all levels of government. In 2019, for example, the federal government provided funding to the Federation of Canadian Municipalities to launch the Community Efficiency Financing initiative to encourage municipalities to promote retrofits by allowing building owners to repay retrofit costs through utility or property tax bills. However, provinces first need to pass legislation that enables municipalities to make this change, which only six provinces have done as of 2022.[69] This highlights a key tension: the federal government has greater fiscal capacity to promote retrofits through retrofit incentive programs, but it is provinces and municipalities that hold the power to directly drive change. Yet even then there must be coordination at all levels of government for initiatives to be able to have a meaningful impact.

Recommendations

The following recommendations are presented separately, but each complements one another and offers opportunities for integration that amplifies the impact of each to ultimately create a cohesive policy package. As such, this section will follow with a discussion on the integration of this policy package.

1. Data - Policy Recommendation: Establish a National Building Energy Performance Database

NRCan, with the support of CMHC, should create a national database for building energy performance. The aggregation of large-scale data will enable retrofit project estimates to be conducted more easily, cheaply, and accurately than currently possible. In turn, this will de-risk retrofits for landlords while having important trickle-down effects by supporting green initiatives, easing access to government programs, building trust, and enabling monitoring of the nation's progress toward reaching net zero.

1a. Data - Case Studies

Canada

Energy Star Portfolio Manager is a free online building energy benchmarking platform into which users input building energy usage information. The tool was designed by the Environmental Protection Agency (EPA) in the United States, and in recognition of the utility of the data collection capacity of this tool, NRCan has been collaborating with the EPA since 2011 to allow use of the tool in Canada. Since then, federal, provincial, and municipal governments across Canada have promoted the use of Energy Star Portfolio Manager by embedding the tool into energy efficiency laws and programs. For CMHC's Canada Greener Affordable Housing and Edmonton's Home Energy Retrofit Accelerator programs, for example, building owners must benchmark retrofitted properties in the tool, and Ontario's energy disclosure law requires owners of buildings that are 50,000 square feet or larger to report energy usage in the tool.[70] In turn, this tool allows building owners to track the energy performance of their buildings over time and compare it to similar buildings across the U.S. and Canada. However, only select government agencies and building owners are able to view this data. Moreover, the tool collects only high-level data that cannot be used to estimate energy savings for retrofit projects, limiting its utility in retrofit investment decisions.[71] As a result, programs that require pre- and post-retrofit estimates such as the Toronto Deep Retrofit Challenge use third-party software such as EnergyPlus that may be inaccessible to landlords. While NRCan has been working with the EPA to reflect Canadian metrics in the tool, moreover, it remains limited in its relevance to Canada since it is still designed and maintained by a U.S. government agency, providing Canadian government officials with only limited power to conduct oversight and make modifications to the tool to reflect changing national circumstances.[72] The result is a glaring gap in the very data that building owners, managers, and investors need to pursue costly retrofit initiatives.

The United States

The U.S. Department of Energy (DOE) established the Building Performance Database (BPD) to serve as a publicly accessible national database. As of 2016, the BPD contains data for over 870,000 buildings, 742,5000 of which are residential.[73] Various public and private entities across the U.S. maintain smaller-scale building performance databases due to local energy disclosure laws or ESG initiatives,[74] and the BPD leverages these databases. The BPD does this by partnering with the states, cities, and private companies involved in these local databases to obtain their voluntary disclosure of the data they collect, thereby funneling these local databases into the BPD. Contributors to the BPD, for example, include New York City, San Francisco, Virginia Beach City School District, Prudential, and Kohl's.[75] Although there are many regional, local, and market-specific building databases in the U.S., the BPD thus serves as a locus to consolidate data from all. This includes Energy Star Portfolio Manager, which contributes its engineer-verified building data to the BPD. Indeed, the DOE describes Energy Star Portfolio Manager

and the BPD as "complementary": while the former is a benchmarking tool that generates building energy efficiency scores, the latter allows users to analyze the impact of the physical and operational features of similar buildings across the nation on energy efficiency to identify, assess, and implement opportunities to improve building energy performance.[76] Importantly, the BPD protects digital privacy by displaying only aggregated data that has been stripped of all personally identifiable information, and privacy is protected even before entering the BPD as contributors typically anonymize data before submission.[77] The BPD also hides the energy usage data for peer groups of fewer than ten buildings to minimize the likelihood that users can identify particular buildings, with additional stringent use and privacy rules in place for all data in the BPD as protected by law under the Freedom of Information Act.[78]

The European Union

The European Union (EU) launched the Odyssee-Mure project to serve as a publicly available energy efficiency database for EU countries, Switzerland, and Serbia as part of the LIFE Clean Energy Transition and other EU climate mitigation efforts. The project consists of two complementary and user-friendly online databases: Odyssee and Mure. The Odyssee database consists of detailed energy usage data, underlying factors, and energy emissions based on over 180 energy efficiency indicators.[79] With this information, the Odyssee database enables tracking, monitoring, and evaluating of building energy performance so users can compare the energy efficiency of their buildings in both their own country and elsewhere over time. In contrast, the Mure database consists of energy efficiency policies and their impact in EU member states, Switzerland, Serbia, and the EU as a whole. Data is collected by national energy agencies or their representatives and is reviewed, verified, and harmonized by Enerdata, an independent research company that was contracted by the European Commission to maintain the database. In 2022, the European Commission renewed the Odyssee-Mure project, agreeing to expand the database to eight more countries and to create an integrative tool for assessing energy efficiency policies, quantifying their contribution to long-term energy efficiency targets, and recommending additional policies.[80] By using the same indicators to consolidate data from all affiliated countries, the Odyssee-Mure project represents a "homogenous and harmonized approach" for understanding energy trends not only in individual countries but throughout the region as well as the impact of regional and local policies and the potential path forward for future policymaking to reach energy efficiency and climate change mitigation targets.

1b. Data - Recommendation Details

NRCan, with the support of CMHC, should develop a national and publicly available database for building energy performance. Like the BPD, this national database should go beyond the high-level information currently collected by Energy Star Portfolio Manager by collecting and consolidating data on building energy performance as well as building characteristics, operations, equipment, and resulting energy costs. Using this database, building owners will be able to not only benchmark and track building energy performance and compare their buildings to other similar buildings across the nation but also identify, evaluate, and implement opportunities to make energy efficiency improvements. As the database progresses over the years, building owners will input changes to building energy performance and resulting energy costs and how those changes were achieved into the database. In turn, this will enable building owners to learn more about the factors underlying their building energy performance, search for retrofits that similar buildings installed to improve building energy performance, and view the impact of those retrofits on building emissions, energy usage, and energy costs. Like the BPD, this database should be able to create graphs to make data visualization accessible for all building owners and include an interactive map feature that indicates benchmarking information in a visual format that is easy to navigate. Throughout, this database must be made publicly and freely available so that it is accessible to all actors across the retrofit industry, including landlords of all sizes regardless of their backgrounds, resources, or incomes as well as government agencies, contractors, and coordination service providers.

This database should emulate Oydyssee-Mure in also incorporating information on federal, provincial, and municipal energy policies. Yet this database must go further than both the BPD and Odyssee-Mure by also providing users with information on current and upcoming retrofit initiatives at all levels of government that is crafted toward individual users based on their zip codes and building profiles. This will provide users with information that applies to their unique situations, channeling relevant information directly to users and making information accessible to landlords and building owners generally of all sizes. Based on this same user-specific information, this database should also direct users to local resources that support retrofits in their communities, such as coordination services that can assist building owners in pursuing retrofit projects by helping them to hire contractors, apply for government subsidies, identify retrofits to install, and scale retrofit projects. Installing retrofits can be challenging even for building owners who are committed to doing so due to the complexity of the retrofit landscape, so connecting users to local resources such as certified auditors, contractors, and coordination services providers in this way will streamline the retrofit process. Altogether, these features will make this database an all-around resource for retrofits by plugging building owners into a network of information that not only enables users to benchmark, track, and compare building energy performance to similar buildings, conduct retrofit cost-benefit analyses, and access information about relevant energy policies and programs but also connects users with the support to pursue—and, importantly, complete—retrofit projects.

A national database is only as useful as the data it represents, making it important that the database gather building energy performance data as quickly as possible. Accordingly, NRCan should coordinate with its partners in both the public and private sectors to promote the database across the country. To do this, NRCan should develop promotional materials in a variety of formats including newsletters, websites, email and mailing lists, informational webinars, and digital and physical advertisements to reach a wide audience. CMHC can support these efforts by using its extensive network of contacts to assist with both the development and distribution of promotional materials. These efforts should be supplemented by a public engagement strategy whereby representatives of NRCan, CMHC, and their partners organize and/or attend 'green' events to promote the database. Phone and online chat 'help' lines would also be beneficial, especially in the early stages of the database to ensure it is accessible to those who may not have the technical know-how to utilize the database without guidance. Additionally, NRCan with the support of its partners should create incentives to encourage building owners to contribute to the database. Leadership in Energy and Efficient Design (LEED), for example, is a global green building certification program that uses various incentives, such as tax credits, density zoning bonuses, priority permitting, free or reduced-cost technical assistance, and low-interest loans.[81] Some of these incentives, especially low-interest loans, are well suited to the tools and expertise of CMHC to encourage building owners as well as public and private entities that maintain local databases to contribute to the national database. Just as they promote Energy Star Portfolio Manager by requiring its use in government retrofit programs, NRCan and CMHC should likewise further encourage contributions by requiring building owners to upload building performance data into the national database to receive funding as part of government retrofit programs.

1c. Data - Key Issues Addressed

Absence of National Building Energy Performance Data

Canada lacks national data on building energy performance. Current benchmarking tools in Canada are limited to local, high-level data, thereby obstructing government agencies, building owners, and contractors from identifying where the most need is.[82] This limited data also fails to support energy saving estimates. Consequently, while retrofit costs are clear upfront, potential energy savings are not, creating a major barrier to retrofits since building owners often can only fully gauge the costs of retrofits but not the benefits.[83] To estimate energy savings, landlords currently must rely on applications such as EnergyPlus to create engineering models.[84] These applications are designed for engineers, making them inaccessible for landlords who lack the resources to hire engineering staff and necessitating substantial time, cost, and

expertise that many landlords may lack. Additionally, these models tend to be inaccurate due to their inability to quantify uncertainties or to account for complex factors such as occupant behavior. One study, for example, found actual energy usage deviated from simulated energy usage by at least 25% in over half of the buildings surveyed, while another found energy savings were 30-50% lower than what engineering models predicted.[85] In contrast, the aggregation of large-scale data enables the development of statistical models that are easier, cheaper, and more accurate due to their ability to capture probabilistic uncertainty at low cost.[86] In turn, this will enable building owners to weigh the costs and benefits of different retrofits, thereby de-risking retrofits and empowering building owners to make the business case for retrofits for themselves and their investors.[87] As more information is uploaded into this database, moreover, the statistical modeling it enables will become increasingly accurate. This will provide a built-in incentive for individuals and organizations across the building industry to contribute to this database.

Lack of Information

There is a general lack of knowledge about retrofit programs among landlords. Small landlords typically maintain full-time jobs, making landlordship a side job. Consequently, small landlords are often not aware of government initiatives nor have the time to search for government initiatives or the resources to hire staff to search for them. A stakeholder noted this is especially pronounced in Ontario, where small landlords comprise almost half of the rental housing stock and often are first-generation Canadians who may have less familiarity with government programs.[88] Moreover, stakeholders indicated that this issue extends to landlords of all sizes and backgrounds. Landlord associations serve as a source of information for landlords by hosting educational webinars, providing online resources for landlords to understand tenancy laws and find professional assistance, and convening meetings and conferences where landlords and professionals in the private rental housing industry can learn from and connect with each other. However, information about and representatives of government programs have been largely absent from these informational and networking forums, relegating information on retrofits to corners of government websites. These government websites were cited by stakeholders as often being outdated and lacking user-friendly interfaces, making these online resources that are often the only source of information on retrofit programs challenging to navigate and limiting their utility for average citizens. Even if government programs are updated to better target and support landlords, they will have no impact if landlords are not aware of them. The national database rectifies this by providing users with information about government programs that are crafted to fit their unique circumstances based on their zip codes and building profiles, making learning about relevant programs as easy and straightforward as possible.

Distrust & Disproportionate Effort

Stakeholders indicated that landlords are generally distrustful toward the government as many have heard from fellow landlords about negative experiences with government programs. Landlord experiences with the government beyond retrofit programs have further contributed to distrust, with municipal code cited as strict and municipal employees as heavy handed in shutting rental units that are not up to code even slightly instead of working with landlords to fix the issue. For example, one stakeholder cited a landlord who could not afford mortgage payments due to lost rental income after the secondary suite in the home he had purchased was found to not be up to code. The lack of information about government initiatives is thus compounded by distrust that not only disincentivizes landlords from seeking government programs but even encourages landlords to avoid them. A further challenge is the assumption that government programs require significant effort for little gain, with one stakeholder stating they did not have time to deal with the paperwork involved despite not being familiar with any government programs. Another stakeholder pursued retrofits in the past but stated that the requirements to obtain the government rebate were overly stringent, making the process more difficult and costly to the point that the rebate effort was abandoned. Adding to this is a general feeling of being unsupported by the government, with landlords protesting delays at the Landlord and Tenant Board in Ontario and fighting against potential rent controls in Alberta. All landlords manage many competing priorities, so hurdles that make programs difficult to

access or require disproportionate effort compared to the benefits reaped will not be pursued. By creating a standardized process for landlords to upload information and directing landlords to relevant policies, programs, and resources, the national database will make understanding government policies and applying for government programs easier. This will also create a culture of transparency and support that will build trust between government and landlords for efforts to reduce emissions in rental housing to succeed.

Lack of Support for Green Initiatives

The lack of national building performance data obstructs green initiatives at all levels of government. In New York City, for example, large buildings must display an energy efficiency letter score generated based on annual benchmarking data, and the city saw a 14% reduction in building energy usage just four years after the program was launched.[89] Similarly, in the United Kingdom and European Union, building owners must obtain an Energy Performance Certificate when a building is sold or leased, and buildings with higher ratings command a higher value across the region.[90] In this way, energy labels can drive energy efficiency improvements, but the lack of national building performance data limits energy labeling initiatives in Canada. Although some municipalities such as Toronto have begun creating energy labels,[91] these initiatives are limited in both scope and scale, and isolated local energy label programs are less effective than provincial, regional, and national programs.[92] Other promising green initiatives include retrofit codes and minimum energy performance requirements.[93] By aggregating building performance data from across the country, a national database would support the development and implementation of such green initiatives at the federal, provincial, and municipal levels. Moreover, monitoring is essential to track the impact of green initiatives, and a national database will support that by providing a standardized reporting and monitoring process that all actors in the retrofit industry can access, utilize, and understand.[94] In turn, governments can use this data to target retrofit and other green programs and make adjustments as needed, while other actors such as lenders, contractors, and coordination service providers can likewise use this data to finance, scale, and support green initiatives.[95] In this way, a national database would not only promote retrofits itself but also support green initiatives and enable tracking of the nation's progress toward reaching net zero. Moreover, data generated from these green initiatives would then feed back into the database that will, in turn, inform future green initiatives in a mutually beneficial cycle.

1d. Data - Feasibility

Utilizing Existing Tools

Governments at the federal, provincial, and municipal levels are already gathering an unprecedented volume of building performance data through Energy Star Portfolio Manager. Jurisdictions such as British Columbia, Edmonton, and Toronto that have retrofit initiatives may additionally maintain their own databases with more granular data. For example, Better Homes is British Columbia's online hub for building owners to access information on energy usage and retrofit policies.[96] Beyond the government, there are also initiatives underway in the private sector to collect information on energy usage and energy policies. These include the GRID benchmarking tool that was developed by OPEN Technologies with the support of NRCan to aggregate building performance data and incorporates a map-based visualization interface, auto-generated energy efficiency scorecards, and modeled retrofit recommendations crafted for users, while Efficiency Canada's Energy Scorecard tracks the progress and impact of energy efficiency policies and programs in every province.[97] Within the government, meanwhile, Edmonton has an interactive map for building benchmarks, while Prince Edward Island's Net Zero Navigator connects users with retrofit programs relevant to them based on a brief survey. NRCan already has a relationship with OPEN Technologies that it can leverage to establish a government-run national database or to adapt the already existing GRID database. Likewise, NRCan has relationships with various provinces and cities as well as with Energy Star Portfolio Manager that it can work through to follow the model set by the BPD by having already existing databases across the country feed into this national database and to

incorporate features such as Edmonton's interactive map and Prince Edward Island's Net Zero Navigator into this national database to ensure that it serves as an all-around retrofit resource for building owners.

Leveraging the NRCan-CMHC Partnership

NRCan and CMHC already have a long-standing partnership. For example, the two organizations worked together to establish the Canada Greener Homes Initiative and have regular meetings to foster further collaboration. NRCan is the ideal public entity to develop and maintain the national database due to its federal mandate to preserve the environment and advance energy efficiency.[98] Because its mandate is not specific to housing, NRCan can promote the national database among both residential and commercial building owners so that emissions can be reduced across the building sector. Moreover, NRCan already has experience with building performance databases through its work on Energy Star Portfolio Manager and with establishing online tools, such as when NRCan developed and maintained CAN-QUEST energy modeling software.[99] This shows that NRCan has the experience, skills, and expertise as well as in-house computer scientists to create a national database, and can apply lessons learned from CAN-QUEST to ensure success. Meanwhile, CMHC is ideal for supporting the database due to its role in facilitating the development and implementation of housing policy across Canada, making CMHC well suited to support the residential side of the database. Specifically, the housing surveys CMHC routinely conducts can feed into the database, and CMHC's extensive knowledge of energy and housing policies and retrofit programs are invaluable to ensure the database's continued utility and relevance. CMHC can also use its funding power to design incentive schemes by, for example, providing low-interest loans to building owners who contribute to the database. Together, the two organizations can also combine their substantial convening powers to gather public and private partners to support and promote the database. In this way, NRCan and CMHC can build upon their partnership, expertise, and resources to implement this recommendation.

1e. Data - Affordability

This national database is expected to decrease retrofit costs, thereby promoting retrofits while maintaining or even improving the affordability of private rental housing. By aggregating large-scale data from across the nation, this database will enable statistical modeling for retrofits throughout the building industry. Currently, the building industry must rely on engineering models that require substantial time, cost, and expertise. In contrast, the statistical modeling that this database will enable allows for pre- and post-retrofit energy savings to be conducted more easily, cheaply, and accurately than currently possible.[100] Statistical modeling is also far more accessible than engineering modeling due to its relative ease of use, allowing the utility of the database to be enjoyed by landlords of all sizes. In turn, this modeling combined with the data available in the database will enable landlords to identify appropriate retrofits to install and locate coordination service providers who can assist them in finding trusted auditors, hiring skilled contractors, and applying for government programs, if applicable. In these ways, the database will make retrofits easier, cheaper, and faster to install. In turn, this will encourage landlords to pursue retrofits without having to increase rent to cover their costs, thereby maintaining affordability. Moreover, because this database will be publicly available, it is not only landlords and other building owners who will be able to utilize the easier, cheaper, and more accurate estimates it enables. Other actors across the building retrofit industry, including governments and contractors, will also have access to it, which will allow for better targeted programs and better scaled retrofit projects that will also contribute to cost reductions.

1f. Data - Considerations

Data Ownership

Data ownership may present an obstacle to developing a national database. This is a challenge in any country, and Canadian federalism, by which provinces are reserved considerable authority beyond the federal government, further complicates this. The U.S. has a similar federal system, yet Energy Star

Portfolio Manager shares data with the federal government for the BPD. The BPD addresses this issue by having the regional, local, and market databases maintained by both public and private entities including Energy Star Portfolio Manager voluntarily share data with the BPD. Contributing to a national database in Canada could follow this model and likewise be voluntary for public and private entities alike, thereby alleviating data ownership concerns by granting the choice of participation. Moreover, it seems likely that many public and private entities will be motivated to voluntarily contribute: since the federal government committed to reaching net zero by 2050, many provinces and municipalities have followed suit. Even Alberta, which long resisted adopting a net-zero statement, finally did so in April, while some jurisdictions have gone even further by committing to more ambitious targets, such as Toronto's goal to achieve net zero by 2040.[101] As these deadlines grow nearer, the incentive for provinces and municipalities to contribute to this national database will only grow. Meanwhile, various companies will be subjected to mandatory ESG disclosures beginning in 2024, which is expected to pressure private entities to take emission-reducing action on their business portfolios. This national database will facilitate this and will only become more useful to private and public actors alike as more data is uploaded, creating an inherent incentive for provinces, municipalities, and the companies based in them to contribute to the database.[102]

Digital Privacy

Digital privacy is another major hurdle that must be addressed to successfully establish a national database. As already discussed, the BPD anonymizes data, hides data for peer groups below a certain threshold, and has strict privacy rules. These factors protect the digital privacy of users while still allowing data to be accessible to the public in a helpful yet secure format. Contributors further build upon this by anonymizing their data before submitting it to the BPD. Accordingly, the BPD may again be a model for Canada for mitigating digital privacy concerns by helping to make users comfortable with submitting their data to a national database. Additionally, perhaps the terms and conditions for using other databases throughout the country and especially Energy Star Portfolio Manager can be updated to include an option for users to consent to automatically share their information with the national database. This consent feature can be incorporated into the account sign-up process, with periodic reminders that the national database is an option for those who opt out. Moreover, CMHC can harness the bilateral housing agreements it has with every province and territory to encourage them to contribute to the national database. For example, the bilateral agreement between CMHC and Ontario enshrines a "partnership" based on "collaboration, cooperation, and sharing of data and information," and leveraging these agreements can be a pathway to ameliorating not only data privacy but also data ownership challenges.[103]

Technology Development and Maintenance

Another consideration concerns the development and maintenance of this national database. As already stated, NRCan has prior experience with developing and maintaining online tools that it can apply to likewise building and maintaining the national database. Alternatively, NRCan could use its partnership with CMHC to access CMHC's National Housing Strategy Solutions Lab, which can provide funding and expertise to a third-party organization to develop the national database with government oversight. As another alternative, NRCan, in coordination with CMHC could leverage the convening power of the two organizations to gather relevant public and private entities to collaborate on developing the national database. Any database must be updated regularly to maintain its utility and relevance, as demonstrated by the EU's requirement that Odyssee-Mure is updated at least twice a year. The same options for developing the national database are available to NRCan for maintaining the database, and maintenance should happen regularly to reflect developments in benchmarking, energy policies, and retrofit programs in as close to real time as possible. In maintaining the database, both NRCan and CMHC can provide their expertise on energy and housing policies, retrofit programs, and government initiatives to incorporate into the database. Throughout this process, NRCan can choose to have a major role in developing the database and a minor role in maintaining it, or vice versa, depending on the organization's current capacity, resources, and preferences. This is the model that the BPD followed, as it was developed

by the DOE but is maintained by a federally funded research and development center, and NRCan can likewise do this while using the different options discussed to supplement its work.

2. Training - Policy Recommendation: Develop a National Training Curriculum

Employment and Social Development Canada (ESDC), with the support of CMHC, should coordinate with trade schools and leaders across the retrofit industry in Canada to develop a retrofit training curriculum that can be adopted nationwide. This will increase the pool of trained workers available to install retrofits, thereby making it easier, cheaper, and faster for landlords to find contractors, for firms to obtain training for their workers, and for new and more energy efficient technologies to be adopted across the building retrofit industry.

2a. Training - Case Studies

The International Brotherhood of Electrical Workers

The International Brotherhood of Electrical Workers (IBEW) is a labor union that represents electrical workers, including electricians, lineworkers, and other skilled tradespeople in wiring and circuitry. It has chapters in most major metropolitan areas in both Canada and the U.S. and offers comprehensive apprenticeship programs that combine on-the-job training with classroom instruction to support career development. These programs typically last four to five years and provide apprentices with a structured learning environment to gain hands-on experience under the guidance of experienced journeypersons.[104] To oversee and administer the programs, the IBEW in partnership with the National Electrical Contractors Association establishes Joint Apprenticeship and Training Committees (JATCs) that provide a wide range of training resources, including curriculum development, instructor training, and access to state-of-the-art training facilities.[105] The IBEW also encourages lifelong learning by offering various continuing education and skill-specific training opportunities that enable electricians to stay up-to-date with new technologies, electrical codes, safety practices, and other developments in the industry and to specialize in areas such as renewable energy, industrial automation, and more.[106] These programs are buttressed by IBEW leadership programs that build leadership skills, support professional growth, and empower members to advance within the union and industry as a whole. In turn, these programs help standardize skills and knowledge to ensure quality workmanship across the nation while producing a skilled workforce, promoting safety and compliance, and encouraging collaboration, dynamism, and growth in the industry. In this way, these programs benefit not only workers and the industry but also their customers and communities.

The Red Seal Program

The Red Seal Program is a nationally recognized certification program that allows qualified tradespeople to obtain Red Seal endorsement of their provincial or territorial trade certificates.[107] The program is administered by the Canadian Council of Directors of Apprenticeship in collaboration with provincial and territorial apprenticeship and certification authorities and covers a wide range of trades, including but not limited to carpentry, plumbing, welding, and many more.[108] To qualify for a Red Seal endorsement, tradespeople must complete apprenticeship training and pass the Red Seal exam, which assesses their theoretical and practical knowledge of their trade.[109] Obtaining a Red Seal endorsement demonstrates that a tradesperson has met the national occupational standards for their respective trade by signifying that they have acquired the knowledge, skills, and abilities required to work in their trade across Canada.[110] This enables tradespeople with Red Seal endorsements to effectively work anywhere in the country without undergoing further training or exams. As a result, tradespeople with Red Seal endorsements have significantly more flexibility in choosing where to work, enabling them to relocate to ‘hot’ job markets and increasing their likelihood of securing employment.[111] By granting industrial recognition to skilled workers, the program also raises the overall quality of skilled trades in the country by promoting a culture of excellence that encourages tradespeople to pursue ongoing professional development opportunities to

stay up-to-date with industry standards, demonstrating the value of a national certification system that is recognized across different jurisdictions.[112]

2b. Training - Recommendation Details

ESDC, with the support of CMHC, should develop a standardized training curriculum that can be adopted nationwide. As the ministry responsible for the maintenance of a highly skilled Canadian workforce, ESDC is the ideal entity for developing and implementing this training curriculum. This training curriculum should focus on educating workers about the latest retrofit technologies and how to install them, thereby increasing the supply of workers with the knowledge, skill, and expertise to conduct retrofit projects as efficiently as possible. While developing the curriculum, ESDC should conduct surveys in consultation with leaders in the retrofit industry to gather their insights on retrofit technologies and associated training needs, skill gaps, and emerging trends in the retrofit space. These consultations can take the form of focus groups, roundtable discussions, one-on-one interviews, or some combination of these formats to reach a wide audience. NRCan should be engaged as a key partner in this process due to their Local Energy Efficiency Partnerships (LEEP) program, which already works with industry partners to develop technology guides.[113] CMHC can further assist with this process by working with NRCan to organize conferences, forums, and industry-specific events where industry leaders can share their expertise, present innovative practices, and discuss training needs. By working with industry leaders in this way, ESDC can ensure the curriculum aligns with industry requirements and reflects the latest and most energy efficient technologies at various price points to accommodate the needs, budgets, and preferences of different types of landlords.

Trade schools should also be key partners in the development of this national curriculum. Partnerships with trade schools can take the form of advisory committees composed of representatives from trade schools and other educational institutions that offer construction and contracting programs. These representatives can then guide the development of the curriculum by providing expert insight to better understand the needs of students, identify relevant training methodologies, and align the curriculum with industry expectations. Workshops and consultations with trade schools should also be organized to serve as forums for trade school faculty and staff who may not be able to participate in the advisory committees to provide input on the curriculum development process. Once the curriculum is developed, collaboration with trade schools should continue by piloting the entire curriculum or specific modules in the curriculum before rolling it out nationwide. Trade school instructors and students can then provide feedback based on their experiences to help refine and improve the curriculum. The updated training curriculum can then be sent to industry partners to obtain their feedback as well. In this way, this approach allows for real-world testing of the curriculum's efficacy and enables identification, incorporation, and implementation of potential improvements in real time to ensure the curriculum is relevant, effective, and useful. In turn, this training curriculum facilitates the development of the green labor market for the retrofit economy.[114]

Once the curriculum has been developed and tested, ESDC will need to encourage trade schools to adopt the curriculum and encourage the retrofit industry to hire the newly trained workforce. To do so, ESDC should communicate the benefits of the curriculum to trade schools through promotional materials that highlight how the curriculum aligns with industry needs, addresses skills gaps, improves student outcomes, and enhances employability, with evidence drawn from the pilot programs. By emphasizing the advantages of the curriculum, this promotion will, in turn, generate interest and buy-in from trade schools. To reach a wide audience, promotional activities should encompass a variety of formats, including a dedicated website, informational webinars, emails, newsletters, and attendance by ESDC representatives at events about green initiatives. CMHC can utilize its extensive network to further support these efforts by sending promotional materials to its distributive lists and highlighting the program to its contacts in both the public and private sectors. To further ease adoption of the curriculum, ESDC should also provide trade schools with curriculum materials such as lesson plans, training modules, and assessment templates.

The training curriculum should be supplemented by incentive schemes to encourage trade schools to adopt the training curriculum. For example, ESDC can pool funds from throughout the government to create annual funding packages for trade schools that adopt the curriculum. CMHC can play a major supportive role in this by providing funds for these packages as well as utilizing its convening power and its extensive network of connections to gather additional funds from both the public and private sectors. In turn, this financial support will encourage trade schools to adopt the curriculum by helping them to overcome implementation costs and provide support for curriculum delivery, instructor training, and program improvements. These funding packages will also make the training curriculum accessible to institutions that may not otherwise have the resources to implement it, making the curriculum available to a wider range of institutions that will, in turn, further increase the pool of trained workers available to install retrofits. Additionally, ESDC should establish a recognition program for trade schools that adopt the curriculum. This recognition will serve as another incentive for trade schools by signaling their commitment to delivering high-quality training aligned with industry and government standards. ESDC's endorsement can also enhance the reputation and credibility of trade schools among students and industry stakeholders alike, much like the Red Seal Program, by establishing a widely recognized signal about workers' skills. In turn, this will increase the number of students applying to trade schools that adopt this curriculum, thereby creating a built-in incentive for trade schools to participate.

2c. Training - Key Issues Addressed

Skilled Workforce Attrition

Workers in construction are leaving the industry faster than they are being replaced, and the COVID-19 pandemic has exacerbated this by pushing many contractors to retire earlier than they otherwise would have.[115] With construction job vacancies at over 6% in Ontario, for example, it is estimated that 100,000 more workers are needed to achieve the province's goal of building 1.5 million more homes over the next decade to ease the current housing shortage.[116] Firms are already unable to meet current demand, with many turning down millions of dollars' worth of jobs due to lack of labor. This situation is expected to only worsen as workers age out of the industry, with over 257,000 workers expected to retire by 2029.[117] If the increase in retrofit demand that Canada needs to reach net zero occurs, the incompatibility between demand and supply will deepen further. This labor shortage is fueled by the absence of pathways from schools to trades, causing fewer and fewer Canadians to choose trades careers.[118] Moreover, workers are not being replaced by immigrants since the immigration system targets white-collar workers, and even those immigrants trained in trades who are able to enter Canada often struggle to have their credentials recognized in the country.[119] Consequently, the carpenter and steamfitter professions are projected to have labor shortages for the next three years, and mechanical engineers and technicians are projected to be in short supply until at least 2028.[120] All these occupations tie directly to retrofits, so shortages in these professions will slow increases in retrofit demand even if those increases are the result of well-designed government programs. The training curriculum mitigates this by providing a standardized curriculum that incorporates retrofit skill building while offering financial support that bolsters the capacity of trade schools to teach their students in accordance with industry and government standards.

Barriers to Market Entry

Due to negative experiences with poorly trained or exploitative contractors, stakeholders indicated that landlords mostly deal with contractors through word of mouth, only doing business with a few trusted firms. Once a positive relationship with a contractor is established, landlords tend to consistently use that same contractor. One stakeholder noted that the result of this is that "good" contractors are often booked months in advance. Conversely, this same stakeholder noted that contractors who have wide availability or who actively advertise their services are assumed to be low quality. For landlords, this makes it difficult to install retrofits in a timely manner. For contractors, this makes it difficult for new entrants to

break into the rental housing market. According to stakeholders, most contractors also prioritize working on large buildings due to the size of the contracts, leaving smaller projects in the lurch. All these factors limit the availability of contractors, especially for smaller landlords. This is a serious issue since smaller landlords play an important role in the rental housing industry, with small landlords in Ontario, for example, comprising 49% of the rental housing market.[121] By enabling workers to obtain recognition of their skills, the training curriculum facilitates the entry of workers into the market by indicating to landlords that workers have the training necessary to install retrofits, further adding to the pool of trained workers available. In this way, the training curriculum benefits workers, landlords, and the environment simultaneously by allowing landlords to easily identify skilled workers to install retrofits and helping workers find work that reduces emissions and progresses net-zero goals.

Technological Adoption

According to stakeholders, construction firms often do not invest in training their workers on the installation of a new technology or invest in obtaining the required raw materials until it is proven that the new technology works, will not soon be made obsolete, and will be widely adopted well into the future. This not only further restricts the number of workers available to install newer retrofits but also indicates that innovations in energy efficient technology will not be adopted in a timely manner unless early adoption can be de-risked. An example of this risk is fluorescent light bulbs, which are more energy efficient than traditional incandescent light bulbs and were widely adopted across North America until they were quickly made obsolete when LED lights entered the market soon thereafter. Just as landlords are unwilling to be "guinea pigs" for new technologies, so, too, are construction firms, making it imperative that new technologies can become tested, tried, and true as quickly and efficiently as possible to encourage their adoption. The adoption of new technology as well as the training required to properly operate and install it therefore needs to be de-risked. Through its development in consultation with retrofit industry leaders, the training curriculum contributes to this de-risking by incorporating the technologies and associated skills that are already being pursued or that already show immense potential according to experts across the retrofit space. Additionally, by increasing the pool of workers available to install retrofits, retrofits themselves can become literally tried, tested, and true as quickly as possible. Moreover, the training curriculum ensures that workers have the skills necessary to install retrofits, thereby eliminating the risk associated with worker error. Altogether, this will increase confidence among contractors and landlords alike to invest in new—and better—retrofit technologies.

Rise in Raw Material Prices

The challenge is not only a shortage of workers but also a shortage of raw materials. One stakeholder noted that, although workers may be available for some projects, the price of construction work has increased dramatically due to a shortage in raw materials that is driving prices up. For example, the price of lumber in Canada has increased by 27% since 2020.[122] Likewise, the cost of construction materials has increased by approximately 17%, asphalt by over 34%, and fabricated metals by almost 19%—and all in the span of just one year from 2021 to 2022.[123] The shortage of labor is thus compounded by a shortage of raw materials that further limits the ability of the retrofit economy to meet current demand for retrofits, and this will only worsen if the demand for retrofits increases. This also has significant consequences for affordability: labor shortages are driving up the costs of all types of construction and renovation work, including property maintenance and retrofit installation, and the spike in raw material prices is further exacerbating costs. As costs increase, so does the risk that landlords assume when installing retrofits. If current pricing trends continue, retrofits may become prohibitively expensive for all but the wealthiest landlords and property management companies. Eventually, smaller landlords may be priced out of the market entirely as the cost of not only retrofit installation but also necessary property maintenance rises. In such an event, their rental units may be purchased by property management companies that will likely raise rents and thereby further shrink the amount of affordable housing in Canada. The training

curriculum helps to offset these rising costs in raw material prices by increasing the pool of workers who can install retrofits as efficiently as possible, which should, in turn, reduce installation costs.

2d. Training - Feasibility

Utilizing Pre-Existing Infrastructure

Trade schools are among the nation's main methods of training and certifying tradespeople across the country. This represents an already existing infrastructure for sharing information and teaching skills to workers that ESDC can leverage to distribute the training curriculum. By utilizing trade schools to teach the training curriculum in this way, ESDC will effectively filter the training curriculum from the federal government that designs it to the individual workers that need it. Importantly, this allows ESDC to avoid the expensive and logistically challenging task of investing in creating new training facilities or adapting old ones, identifying and hiring teachers, and developing school administrative apparatuses, and the resulting time, cost, and resource savings can be redirected toward the development, maintenance, and promotion of the training curriculum itself. This also presents an opportunity to cultivate partnerships between trade schools and the federal government. In turn, this will set the stage for both the endorsement of trade schools by the federal government and collaboration between the two that will augment the reputation and credibility of trade schools, making them more attractive to prospective students and industry stakeholders. These partnerships between the federal government and trade schools can then be leveraged to channel feedback from schools, teachers, and students into the training curriculum, which will improve the curriculum and thereby attract more students and enhance student outcomes. The result is a mutually beneficial cycle for all participants.

Leveraging Funding and Convening Support from CMHC

While ESDC is best suited to develop the training curriculum, CMHC is well positioned to support this effort. This is because CMHC has an extensive network of contacts across the retrofit space, including its connections with NRCan, that it can utilize to support the development of this training curriculum. Through its networks, CMHC can facilitate the cultivation and maintenance of partnerships between the federal government, trade schools, and retrofit leaders to ensure that the training curriculum aligns with industry needs, incorporates the latest retrofit technologies and developments, and benefits from the expertise and resources of actors across the retrofit industry. Additionally, among CMHC's core strengths is its ability to convene stakeholder groups and facilitate collaboration. Accordingly, CMHC should help facilitate the development of partnerships between trade schools and the federal government to the benefit of both: the trade schools can use the government's brand and networks to enhance and promote their training curriculum, while CMHC can utilize the trade school's teaching expertise to keep the training curriculum up to date. Moreover, through its mandate to "generally contribute to the well-being of the housing sector in the national economy," CMHC works to promote best practices and ensure quality in the housing sector.[124] Thus, the development of a training curriculum falls within this mandate due to the role workers play in constructing and maintaining quality housing that Canadians rely upon. CMHC can further support the adoption of this curriculum by leveraging its extensive network to help to facilitate the hiring of newly trained workers in the retrofit industry, as well as to establish new partnerships between the construction industry and trade schools to support the channeling of workers from schools into jobs. These partnerships can involve mentorship programs, apprenticeships, and internships and, importantly, can be beneficial in both directions by not only helping students obtain employment in the retrofit industry but also enabling firms to hire reliable workers from these schools as demand for retrofits increases.

2e. Training - Affordability

The training curriculum is expected to improve affordability by facilitating reductions in the time, cost, and difficulty of installing retrofits. Specifically, a widely adopted training curriculum that establishes

standardized retrofit practices facilitates information sharing, consistency, and quality control. This combined with the skills that the training curriculum teaches will allow for more efficient and effective retrofit processes as workers who are trained to perform tasks correctly, thoroughly, and quickly the first time minimize time and material waste. Together, this reduces overall project costs and will allow firms to lower prices. Meanwhile, the rise in retrofit demand that the increased availability of skilled workers is expected to create with the support of national data, coordination services, and government programs will boost business for firms, thereby balancing the decline in costs. By providing training for workers that firms otherwise would have had to provide, the training curriculum will also allow firms to reduce their overhead costs and redirect resources to invest in retrofit technologies. As the training curriculum allows more workers to enter the retrofit industry with lower overhead costs, more firms will be able to enter the market, enabling healthy competition that will further drive down prices. Consequently, more firms will be available to building owners, reducing wait times and allowing retrofits to be installed more easily and quickly. Workers and leaders in the retrofit space can also be kept updated on new developments in the retrofit industry through the private-public partnerships established by ESDC and CMHC in the development of the curriculum, thereby enabling them to learn about and implement cost-saving opportunities and strategies, such as more efficient equipment, improved monitoring and control systems, and optimized installation methods to maximize energy efficiency and cost effectiveness simultaneously.

2f. Training - Considerations

Maintaining Relevance

The retrofit industry is a constantly changing and dynamic landscape as new technologies and trends can emerge at any time. Accordingly, ESDC will need to conduct regular reviews of the training curriculum in partnership with trade schools and leaders across the retrofit industry to ensure it is updated to reflect the latest developments in the field and can continue to meet the needs of the retrofit market. These reviews can be informed by feedback from industry stakeholders as well as by changes in regulations or codes, advances in technology, new installation or safety practices, and emerging industry-specific needs. In this, ESDC can also utilize the national database to identify what and where retrofits are most needed to ensure the curriculum reflects this. This database will also enable ESDC to see the results of its training curriculum and to predict future trends in the market, allowing ESDC to adjust the curriculum as needed to reflect changing national, regional, and local circumstances. By creating opportunities for feedback and information sharing, the connections established between trade schools, industry leaders, and the federal government during the development of the training curriculum will likewise help to ensure that it is updated to reflect evolutions in the market. Altogether, these efforts will enable the training curriculum to maintain its relevance, utility, and impact well into the future and thereby support both public and private actors across the country in pursuing their climate mitigation goals.

Overcoming Federalism

Under Canada's federal system, education and training curriculum fall outside federal responsibilities and are reserved for provincial governments. Consequently, federal agencies are unable to impose education and training requirements on provinces, but they are able to establish training curriculum that provinces and the schools located within them can voluntarily adopt. This highlights the benefits of working through trade schools to disseminate the training curriculum; creating a curriculum and funding trade schools that adopt it does not infringe upon provincial jurisdiction, as this curriculum would not be enforced by law. However, provinces will have the option of making this curriculum enforceable by provincial law if they so choose, but that would be done on a province-by-province basis. Additionally, each province and territory in Canada has its own policies, regulations, and standards related to education and training. This federally sponsored training curriculum must consider and accommodate these variations to ensure its relevance and applicability across the country. To support this effort, collaboration with provincial governments, industry stakeholders, and trade schools within each jurisdiction are essential for tailoring

the curriculum to meet regional and local needs and facilitating its adoption. The federal government recently established new Workforce Development Agreements to support provinces in the development and delivery of programs and services to aid Canadians in obtaining work-related training, and ESDC can leverage these agreements to establish partnerships with provincial governments and trade schools to promote the training curriculum and ensure it meets the needs of the Canadian people.[125]

Long-term Funding

The training curriculum will need to maintain long-term funding to support its funding packages and its ongoing maintenance operations. To do this, the government can establish a dedicated funding mechanism specifically designed for the training curriculum. This can involve allocating a certain portion of the national budget, creating a separate fund that focuses on vocational training, or a mix of the two. This can be another area where CMHC can provide support as it has the financial capability to significantly support these funds, and CMHC can also use its extensive network of connections to secure funding from other sources in the public and private sectors. To build upon these efforts, the partnerships that were developed between trade schools and industry stakeholders during the curriculum development can be leveraged to foster collaboration with businesses, unions, and professional associations. These, in turn, can contribute to increased funding opportunities through sponsorships, grants, and donations. Moreover, implementing a cost-sharing model can help sustain the program's funding. By involving students, employers, and the government in sharing the financial burden in this way, the long-term viability of the program can be enhanced. For instance, students can be required to contribute a portion of their tuition fees to the fund, while employers may provide financial support for training their workforce in exchange for accessing skilled labor at reduced cost to themselves. Cultivating public support for the curriculum by demonstrating its positive impact on individuals, communities, and the economy will also be helpful in securing political and public backing to support sustained funding. While these efforts will contribute to the long-term financial sustainability of the program and in particular its maintenance operations, this program should become cheaper over time as the curriculum gains a national reputation that attracts trade schools and workers such that financial incentives can increasingly be reduced or even stopped altogether.

3. Coordination - Policy Recommendation: Support Community-Led Coordination Services

CMHC should coordinate with NRCan to establish a multidisciplinary Retrofit Commission that can provide national support for community-led retrofit coordination services. This Commission can then develop a toolkit that will provide best practices, standards, and guidance for community groups to carry out coordinated retrofit projects. In turn, supporting local communities to carry out such projects can encourage a greater number and diversity of building owners to conduct retrofits while developing public awareness about energy efficiency benefits and opportunities to increase the uptake of retrofits over time.

3a. Coordination - Case Studies

Canada

The government need not search far for examples of successful community-level coordination initiatives. Pocket Change in Toronto is one such example of a retrofit coordination model that has tailored its approach to the local community and is able to meet individuals where they are at. Because it operates on a neighborhood level, the organization has strong knowledge of individual community members and can drive more targeted retrofit interventions that are geared toward specific communities. Another successful community-led coordination initiative is the Green Bloc Neighborhoods program in Vancouver, which activated local neighborhood groups to carry out projects that reduced their ecological footprints.[126] This initiative provided coordination to facilitate dialogue between neighbors and enable access to funding for projects that had environmental impacts in their communities. While this program was not specifically geared toward retrofits, it provides a promising example of how community-led coordination can connect

neighbors and facilitate local sustainability initiatives. On the federal level, the Deep Retrofit Accelerator Initiative (DRAI) supports retrofit coordination teams, but the initiative is more focused on scaling large projects that develop the retrofit market. As such, it does not directly support community-centered coordination efforts that focus on neighbor-to-neighbor collaboration. Initiatives such as Pocket Change and the Green Bloc Neighborhoods program fill this gap. This type of community-level coordination may result in more incremental change than the DRAI, but it nonetheless provides critical services to individuals while also promoting awareness, education, and community buy-in for retrofits that is, importantly, informed by and crafted for local contexts. Coordination models of all types and sizes have a critical role to play in accelerating retrofits and addressing the individual barriers for property owners, and these community-led initiatives may offer a model for advancing retrofits at the root.

United Kingdom

The United Kingdom's PAS 2035 and PAS 2030 frameworks present a case study for national retrofit coordination standards and best practices. Specifically, PAS 2035 centers the retrofit process on individual customers by establishing a coordinated set of roles that are involved in the oversight of each retrofit installation. The Retrofit Advisor advises the client and provides instructions in plain and non-technical language; the Retrofit Assessor conducts the assessment of the property by collecting data from surveys and site visits; the Retrofit Coordinator takes on the end-to-end responsibility for ensuring the project aligns with the PAS 2035 framework by overseeing the installation and handover phases of the project; the Retrofit Designer provides the design of the retrofit; the Retrofit Installer is the contractor who installs the retrofit according to national standards as set by PAS 2030; and the Retrofit Evaluator monitors the retrofit after completion, including data collection and analysis. The individuals in each of these roles must obtain an official "quality mark" to show they have been certified by an approved certification body, and that they meet the requirements of each of the three key elements that compose the quality mark: a Code of Conduct, defined Codes of Practice and standards, and a Consumer Charter.[127] To ensure the uptake and scaling of this framework, moreover, PAS 2035 standards are mandatory for all publicly- funded retrofit projects in the UK. Ultimately, both PAS 2035 and PAS 2030 take an integrated, whole- house approach to retrofit management and installation that, together, ensure there is a coordinated point of contact for building owners before, during, and after retrofit projects.[128]

The Netherlands

Energiesprong in the Netherlands presents a different model for retrofit coordination. In 2010, the Dutch government launched this centralized and streamlined approach to delivering retrofits to accelerate retrofit projects in the country's social housing. Since the Energiesprong model relies on a high volume of operations to scale projects, groups of social houses were pooled together through their associations to undergo simultaneous retrofits.[129] Through the Energiesprong model, buildings can be quickly retrofitted with prefabricated external panels that create an air seal and an extra layer of insulation on buildings that reduce heat loss, and this model has worked well in the Netherlands in part because of the uniformity of the country's housing stock.[130] The coordinated and centralized model of Energiesprong presents a compelling case to building owners, who benefit from the ease of having all retrofit services including initial consultation, financing options, installation, and monitoring provided by a single actor. Moreover, the model includes market development teams that operate both domestically and globally to promote their coordination services, present their business case, and create public awareness about retrofits. Although the Energiesprong model has since expanded beyond social housing to operate widely in private markets, it continues to target primarily single-family homes with a focus on those built between 1946 and 1975 with low energy performance and high energy bills to direct retrofits to areas of highest need.

The European Union

The One-Stop Shop (OSS) model of the European Union presents a unique approach to retrofit coordination standards that accounts for local variations across diverse member states. In 2020, the EU's

Renovation Wave Initiative encouraged and streamlined the development of OSSs by establishing that the European Commission (EC) and the European Infrastructure Bank (EIB) would work together to support the standardization of an OSS model that could be quickly set up and deployed at national, regional, and local levels across the EU.[131] Since then, OSSs have been established throughout the region to serve as "integrated management entities" that are designed to remove complexity barriers for retrofits and facilitate access to financing for building owners.[132] Though the EC and EIB set the high-level direction and design of the OSS model, each OSS can be adapted to local contexts and vary in their service offerings to best meet local needs.[133] Accordingly, ownership models of OSSs differ widely across the EU, with some run by single entrepreneurs, others by multidisciplinary teams of industry leaders, and others still by public-private partnerships.[134] While these different business models and ownership structures may address the needs of different customer populations, many OSSs throughout the EU primarily target single-family homes that are medium to high-income in urban and suburban areas.[135] As of 2021, there were 63 OSSs operating in 22 EU member states, up from 57 the previous year, and together these shops carry out approximately 100,000 projects across Europe annually.[136] The high-level structural support in place through the EC and EIB ensures a basic level of consistency across the shops and provides a forum for OSSs from different member states to collaborate and share best practices.

3b. Coordination - Recommendation Details

CMHC should leverage its convening power as well as its partnership with NRCan to establish a national Retrofit Commission. By tapping into the existing partnerships and the convening capacity across the two organizations, CMHC and NRCan can bring together representatives from all provinces and territories, as well as retrofit industry leaders, housing specialists, municipal housing organizations, and landlord and tenant associations across both the public and private sectors. This diverse and multidisciplinary Commission could, in turn, utilize their perspectives and insights to develop a toolkit that can be adopted by coordination service providers across the country. With this toolkit, CMHC can provide national leadership to inspire action on retrofits as well as the support needed to enable provinces, municipalities, and communities to build the capacities necessary to take on coordinated retrofit projects and promote public awareness of energy efficiency opportunities. Given the scale and scope of retrofits that are required for Canada to meet its net-zero emissions targets combined with the different needs that exist in different communities across the country, it is vital that a diversity of retrofit coordination services are promoted and empowered throughout the nation. This toolkit does this by providing coordination service providers with information and guidance on how to best support, expand, and conduct their operations and connecting them with a variety of resources and best practices that should include:

- Methods for conducting community outreach and sharing information about the benefits and opportunities of energy efficiency;
- Guiding principles relating to housing affordability and tenant protections, including best practices for engaging with and between landlords and tenants;
- Processes for coordinating access to financial solutions such as grants, loans, and subsidies for customers at all levels of government;
- Guidelines and best practices for engaging with contractors and aggregating both demand and supply of retrofits;
- An emphasis on information sharing and collaboration across communities; and
- Procedures for independent post-renovation inspections and energy monitoring.

Similar to the UK framework, this toolkit would promote national best practices that serve as a model "code of conduct" for retrofit coordination services. Yet, like the EU model, the toolkit would remain high level, making it highly adaptable to local areas, contexts, and the service and operating needs of different types of communities and coordination service providers. This is essential because different models for coordination services may meet different market needs as well as the needs of different building owners.

For example, an Energy Service Company (ESCO)[137] coordination model may be better suited to provide larger landlords with financing options that allow them to take on multi-year, multi-unit retrofits for their building portfolios. In contrast, community-led coordination models may better serve small landlords who want to identify their "first-step" retrofit project and develop a roadmap for future projects, rather than take on a deep retrofit right away. While this toolkit can be leveraged to support coordination service models of various types and sizes nationally, it will be especially valuable for supporting community-led coordination services that often do not have the resources of larger models such as those funded through the DRAI. Furthermore, community-led coordination models are able to harness local networks, social pressures, and neighbor-to-neighbor collaboration to foster greater buy-in from building owners to pursue retrofits. In this regard, a localized approach to retrofit coordination may be better positioned to reach building owners and especially small landlords who face barriers to participating in larger retrofit projects and may require a more targeted and tailored outreach strategy to reach. Accordingly, this toolkit should target community-level initiatives while maintaining applicability for models at all levels.

While developing this toolkit, CMHC and NRCan should work together with the Commission to develop a pilot to test the toolkit's viability in different communities across the country. In this endeavor, the Retrofit Commission that is composed of actors from both the public and private spheres throughout Canada will be critical in providing insight on the unique needs, circumstances, and contexts of different communities. In turn, this insight will inform the development, deployment, and evaluation of the toolkit pilot. The Retrofit Commission with CMHC and NRCan can then update the toolkit to reflect the results of the pilot by blending different learning elements and adding improvements as needed.

For the toolkit to have an impact, it must be adopted by community groups. As such, to encourage community groups to adopt the toolkit, CMHC and NRCan should develop a public engagement strategy that effectively communicates the benefits of retrofits and promotes the toolkit as a means of carrying out retrofit projects on a community level. This strategy should include the development and distribution of promotional materials in a wide variety of formats as has already been described in this report to reach a wide audience. Both organizations can likewise use their extensive network of connections to further disseminate information about the toolkit throughout both the public and private sectors. Developing buy-in from local communities may also take place by highlighting the toolkit's ability to foster benefits of localized collaboration, the development of social relationships, and the power of individual contributions to climate goals. Additionally, CMHC can use its brand, its ability to craft powerful narratives, and its existing communications team to promote the stories and journeys of community groups who have experienced success in using the toolkit. This type of messaging can showcase to other communities what is possible and inspire them to take action through their own projects.

3c. Coordination - Key Issues Addressed

Complex Retrofit Landscape

Retrofit projects can be highly technical in nature and are further complicated by multiple layers of government regulations, requirements, and programs. The result is that the retrofit market is highly complex, creating significant barriers to participation. This is especially pronounced for small landlords who often lack the time, capacity, and resources to invest in understanding this retrofit landscape. Further compounding this is the distrust that landlords often feel toward existing institutions, and additional hurdles include language barriers and lack of knowledge of retrofit financing options. Without trusted and streamlined sources of information, it can be easy for building owners of all sizes and especially small landlords to lose the motivation to pursue deep retrofits. Consequently, as one stakeholder noted, even those who are interested in retrofits may only get as far as an energy audit before realizing that they are unable to move further in the process. This makes a centralized coordinator who can serve as a source of streamlined information an essential support mechanism to enable building owners to move forward in

the retrofit process, and a coordinator that is based in a local community can add an additional layer of trust and credibility to the process. Rather than expecting individual landlords to maintain relationships with several points of contact in the retrofit supply chain, a community coordinator could provide streamlined and simplified points of access and contact for both suppliers and consumers. This could include connecting landlords with energy auditors and retrofit contractors in local areas, as well as assisting neighbors with applications for financial incentive programs. By enabling and supporting community-led coordination models through an accessible and adaptable toolkit, more landlords can be brought into the fold through initiatives that are localized and tailored to the needs of each community.

Limited Coordination Services

Despite an acknowledgement by NRCan that more work is needed to maximize the coordinated outcomes of retrofit projects, there remains a lack of accessible funding and support for a wide range of professional coordination services.[138] As previously mentioned, the DRAI is designed to remedy this by addressing the need for retrofit coordination services in Canada, but it does so by providing funding for organizations to develop market development teams that target commercial, institutional, and mid- or high-rise multi-unit residential buildings for deep retrofits. While this program has the potential to advance the scale of deep retrofits through coordination of projects that involve larger buildings, it may exclude a significant portion of building owners who don't fall into the targeted groups. In particular, it may leave behind many small landlords who rent out a single-detached home, which comprise more than half of all residential buildings in Canada overall and 25% of all rental housing in Toronto, and many landlords who rent secondary suites will likewise be excluded.[139] Importantly, in many Census Metropolitan Areas (CMAs) across Canada, the number of secondary and garden suites is often unknown and underestimated, making it difficult to include these types of rental units in aggregated retrofit demand models, let alone target these landlords to participate in large-scale retrofit projects.[140] Accordingly, small-scale community-led coordination services may be better positioned to conduct localized and well-targeted outreach to small landlords, making these types of coordination services an important component in advancing energy retrofits in Canada. Providing a toolkit to local communities to launch such coordination services will be critical. In this way, rather than starting from scratch, local communities can implement localized coordination initiatives with confidence and know that they have the support of the federal government as well as the network of other community groups who are also using the toolkit.

Lack of Government Coordination

The lack of coordination in the retrofit industry in Canada extends to the government at large. While there are various partnership networks and communication channels between different federal agencies, and between the federal government and provincial and municipal governments, more coordination is needed among the entities responsible for promoting housing energy efficiency. For example, there are a number of retrofit programs underway at the federal, provincial, and municipal levels, yet these programs often exist in silos that limit their effectiveness. Beyond these programs, moreover, there remain untapped opportunities for government coordination. For example, NRCan grants financial rewards to provincial and municipal governments that adopt stricter energy efficiency mandates and provides coaching and auditing support for building owners to pursue retrofits. CMHC can join these efforts while coordinating its own initiatives to support NRCan's services. The two organizations already have communication channels that can be expanded upon to support this effort, and this relationship can lay the foundation for improved collaboration across the federal government as a whole. In this way, improved collaboration that harnesses the networks, capacities, and powers of various federal agencies can support a whole-of-government approach to retrofits while avoiding duplicated efforts and promoting efficiencies of scale and operation by bringing together lessons learned from various initiatives and streamlining information around program development and evaluation. Furthermore, this improved coordination must extend from the federal government to the provinces, territories, and municipalities as well as the private sector so that all contribute to net zero. The Retrofit Commission will promote this collaboration by regularly convening

representatives from all levels of government, creating a forum for them to share, learn, and collaborate. In turn, this high-level government interaction will generate a more conducive environment for retrofits that could have a ripple effect by leading to more robust and more frequent forums for cross-jurisdictional collaboration in the development and implementation of incentives, regulations, and codes for retrofits.

3d. Coordination - Feasibility

Channeling the Capacities of CMHC and NRCan

As a Crown Corporation that straddles the line between the public and private spheres, CMHC is ideal to lead the establishment of the Retrofit Commission due to the wide variety of actors in the retrofit landscape across the country, while NRCan's extensive involvement in retrofit programs also makes it well suited to support this endeavor. The toolkit that the Retrofit Commission develops must be informed by research, insights, and trends across the retrofit industry to ensure that it is effectively designed and well-attuned to the needs of communities across Canada, and CMHC and NRCan are both well suited to support this. CMHC has a housing markets, data, and research arm while NRCan compiles data, research, and information on energy efficiency in Canada,[141] demonstrating that both organizations possess an existing in-house capacity to conduct and coordinate targeted reports to capture developments in the retrofit industry. Their existing relationships with provincial and municipal governments, moreover, will enable CMHC and NRCan to reflect developments at even the local level in their reports. These reports could then inform and support the work of the Retrofit Commission as it develops and maintains the toolkit. This would be well-aligned with CMHC's execution of the National Housing Strategy (NHS), which emphasizes housing research and information to support innovations in the Canadian housing market.[142] It could even be possible for the Retrofit Commission to coordinate with the existing Collaborative Housing Research Network that is a part of the NHS to lay the foundation for ongoing national information sharing on energy retrofit research.[143] Additionally, CMHC and NRCan both have an extensive network of partners across the national retrofit industry in both the public and private sectors that can be leveraged to support development, maintenance, targeting, and dissemination of the toolkit.

Leveraging Local Initiatives and Organizations

While developing this toolkit for community-led retrofit coordination services, CMHC and NRCan can draw upon and leverage the work that local initiatives and organizations are already doing in this space. For example, Pocket Change in Toronto is a neighborhood-based and community-led initiative with extensive local knowledge that can be engaged to provide insights, advice, and lessons learned for developing and distributing the toolkit to local groups across the country. CMHC can also utilize its existing relationships with provinces, municipalities, and local housing organizations to identify active neighborhood associations and other community groups who can contribute to the development of the toolkit. Part of this work could include a partnership with the Federation of Canadian Municipalities, which already has knowledge of and relationships with local sustainability initiatives through the Green Municipal Fund that can inform toolkit development and dissemination. By tapping into the work of these initiatives and organizations, and perhaps including them in the Retrofit Commission, CMHC can enable them to make meaningful contributions to the national toolkit while also amplifying their work and providing them with a platform to support and enhance their ability to make an impact in their communities. In this way, these relationships would be mutually beneficial as local groups would be placed in position to inform the toolkit that will, in turn, empower them to conduct and expand upon their work. Through this positive cycle, these local groups may even become advocates of the toolkit and could serve in key roles to assist in dissemination and ongoing maintenance of the toolkit once it is developed.

Lessons Learned from Current Programs

There are several federal programs currently underway to accelerate retrofits in Canada. For example, such federal programs as the Deep Retrofit Accelerator Initiative (DRAI) will have huge implications for

the development of the retrofit market and the aggregation, scaling, and coordination of projects across the nation. These initiatives will be an invaluable source of information on best practices in the retrofit market, and CMHC and NRCan can utilize their existing partnership and their current communication channels that stem from their work on the Canada Greener Homes Initiative to develop processes for harnessing, consolidating, and reporting on the lessons learned from these initiatives. Developing these high-level systems of information sharing will be important for streamlining information on retrofits and their associated coordination services and creating consistency across government initiatives as well as informing community groups who are carrying out their own projects. The information generated from current government programs such as the DRAI can also be directly incorporated into the work of the Retrofit Commission and the development and updating of the toolkit. Being open and transparent about the lessons learned from current programs can help to ensure that local communities are informed of the government's work and the status of retrofits across the country. This will help to foster a community of practice that is grounded in the trust, transparency, and collaboration necessary to advance emission reduction initiatives in communities across the country and reach net zero by 2050.

3e. Coordination - Affordability

The coordination toolkit is expected to advance housing affordability in Canada by integrating and emphasizing both housing affordability and tenant protections within the toolkit as guiding principles for retrofit coordination. This emphasis on affordability would be in alignment with the NHS and would add to the development of norms and standards at the federal, provincial, and municipal levels through which housing affordability can be advocated for and advanced by a wide range of actors and initiatives across the nation. Additionally, by including guidance for community groups to coordinate access to financial resources for projects, the toolkit can make financial solutions such as grants and affordable loans more accessible to all landlords, especially small landlords who may otherwise not be aware of these funding opportunities. This can reduce pressures for landlords to raise rents to compensate for project costs and contribute to sustained affordability in areas across the country. Furthermore, the toolkit will enable and promote the proliferation of retrofit coordination services themselves, which help to streamline the retrofit process from start to finish and therefore should accelerate the uptake of retrofits. In turn, this can have positive effects on rental housing affordability by making retrofits easier, cheaper, and faster to install while also creating demand aggregation in the market and promoting innovative delivery models that could further bring down costs across the retrofit market. By providing community groups with the tools to coordinate with supply-side actors, the toolkit can also reduce friction in the retrofit market in ways that lower costs for building owners and reduce pressures for price increase in the private rental market.

3f. Coordination - Considerations

Local Variations

The diverse provinces, territories, and municipalities and the communities that live within them across the country have unique variations that must be taken into consideration. Because the energy grids of each province vary widely in their "cleanness," for example, the types of retrofits and accompanying services that are best tailored to each area will differ. In Alberta, where about 89% of electricity produced in the province comes from fossil fuels, there may be a higher need for air sealing and envelope-related retrofits.[144] In Quebec, by contrast, where hydropower generates 94% of the province's electricity, there may be a higher demand for fuel-switching retrofits such as heat pumps.[145] These variations must be factored into the toolkit and by the coordination groups who use it to explore and accommodate how local variations may affect the guidance and practices that work best in different parts of the country. To do this, this toolkit can work hand-in-hand with the Canada Green Buildings Strategy that is currently under development to establish high-level direction for on-the-ground community retrofits. Local variations across the country make embedding flexibility and adaptability into retrofit coordination services essential,

and this toolkit can provide high-level cohesiveness to support retrofits despite these variations by providing guidance that is not specific to individual programming options, service offerings, or delivery models. Emphasis on project affordability, for example, can apply to both envelope-related retrofits as well as fuel-switching projects, while guidance for post-retrofit monitoring and auditing can also apply to all types of interventions. Due to local variations, CMHC should include resources in the toolkit that specifically focus on information sharing, and to accompany this with the systems and processes for doing so. As a Crown Corporation, CMHC is well positioned to partner with NRCan to provide national leadership in creating the space for information sharing across the country.

Capacity of Local Communities

Though there is great potential to accelerate retrofits through community-led coordination models, the success of such efforts will ultimately depend on local communities having the capacity to carry out these projects. Pocket Change and the Green Bloc Neighborhoods program both provide promising case studies of how local groups have harnessed a community-led model to accelerate projects to reduce their ecological footprints. Yet, as has been previously mentioned throughout this report, the current Canadian retrofit market is highly complex, with many factors currently limiting its development that is further compounded by immense variation across the country. This, in turn, affects the ability of local groups to tackle the challenges of coordinating projects within this landscape. Additionally, the capacity of local groups, particularly those in remote and low-income communities, may be further hindered by the high costs of certain retrofit projects. This has the effect of limiting the ability and capacity of coordination service providers to conduct the very work that is most needed to promote retrofits in a complex retrofit environment. The toolkit will assist in mitigating this and have positive outcomes for the ability of community groups to undertake coordinated retrofit projects by providing coordination groups with guidance and advice to support their operations so that they can do their work as efficiently as possible. Additionally, government initiatives to develop local, regional, and especially a national database will hugely support coordination service providers by giving them access to the information they need to direct their services to the areas of greatest need so that they can have as large of an impact as possible.

Maintaining Relevance

The retrofit industry and the coordination service providers that support it are constantly evolving. Consequently, it is essential that this toolkit is informed by a regular process of soliciting feedback and incorporating updates so that the toolkit embeds changing national, regional, and local circumstances. The pilot proposed in this recommendation effectively begins this process by allowing the Retrofit Commission to obtain feedback and make improvements to the toolkit in its early implementation stage. To ensure that this feedback process continues even after the toolkit is launched, the toolkit should be complimented by a system for peer-to-peer learning across community groups and jurisdictions. CMHC, via the Retrofit Commission, could facilitate this system of information sharing by hosting an annual forum on community-led retrofits that brings together the local groups who have or would like to utilize the toolkit. By convening this forum on an annual basis, CMHC, NRCan, and the Retrofit Commission can provide the space for community groups to discuss lessons learned and identify opportunities for collaboration with each other as well as with government officials and industry leaders. This would be an avenue to solicit feedback from community groups that could feed into regular reviews and updates to the toolkit. In turn, this would ensure the toolkit is well-attuned to the needs of diverse communities and maintains relevance, utility, and meaning that reflects changes and trends across the country.

The Policy Package

Integration

Policy interventions are most effective when they are multifaceted, complimentary, and well-integrated. As such, the policy recommendations that have been provided in this report are not siloed but, rather, represent a holistic package that works together to create synergies in Canada's retrofit market. For example, the national database can provide valuable information to support the development of the training curriculum as well as the community retrofit coordination toolkit. By providing insights into the energy performance of different building types, the retrofits that are being pursued by different building owners, and variations across different areas of the country, the database can highlight key trends and areas of need. This information can then inform the development of the training curriculum to reflect specific types of retrofits that are in demand and teach the necessary skills to support installation. By providing accessible modeling tools, accurate cost estimates for projects, and streamlined information relating to financial incentives and resources, the database will also provide critical information for community groups to undertake localized projects by enabling them to update and redirect their activities to best support building owners in pursuing retrofit projects. Once implemented, the database itself could be integrated into the coordination toolkit, with guidance on how to access and utilize its features and information. In turn, the database can provide information about local coordination services that would assist building owners in identifying initiatives and connecting with resources in their communities.

The toolkit itself can also interact with and positively contribute to both the training curriculum and the national database. By providing consistent guidelines for engaging with contractors and for streamlining retrofit projects, the toolkit will promote retrofits that will contribute to enhancing market development. As local retrofit markets develop in accordance with trends that are visualized and forecasted by the national database, suppliers may be more likely to undertake training and scale their operations with confidence. These developments will further highlight the benefits of the training curriculum, bolstering public awareness and support that will support the program's financial longevity. In turn, the training curriculum can be integrated into the toolkit, with the recognition from the training curriculum serving as a clear signal of the quality, competence, and skill of workers that coordination service providers and landlords alike can leverage to overcome their limited capacities to easily identify trusted contractors. Additionally, the coordination toolkit would establish guidance for information collecting, reporting, and sharing, which can support national systems for data compilation as well as promote the use of the national database in general. Greater levels of data and information sharing will help to create a community of practice that spans jurisdictional borders and improves coordination and knowledge transfers for all actors across the retrofit industry that together can accelerate retrofits.

Furthermore, the creation of a national database will provide necessary benchmarks and metrics to know what the full requirements of the retrofit transition are, including how many projects are anticipated, what type of projects those might be, and what project pipelines can be estimated for contractors to undertake training with confidence. These metrics can drive demand as well as supply for retrofits, which will generate opportunities for skilled trades to expand and adopt the curriculum developed by ESDC. There are also opportunities for the multidisciplinary Retrofit Commission overseeing the toolkit's development to collaborate with the teams responsible for the national database as well as those overseeing the development of the training curriculum. This high-level coordination across initiatives would ensure that the toolkit's recommendations align with data collection, reporting, and monitoring standards as well as with the practices set forth by the training curriculum to meet the needs of all actors in the retrofit industry. By collaborating and leveraging the strengths of each recommendation, this policy package seeks to enhance the effectiveness of retrofit projects, improve energy efficiency outcomes, and contribute to Canada's climate goals while maintaining the affordability of the country's rental housing stock.

Public Engagement Strategy

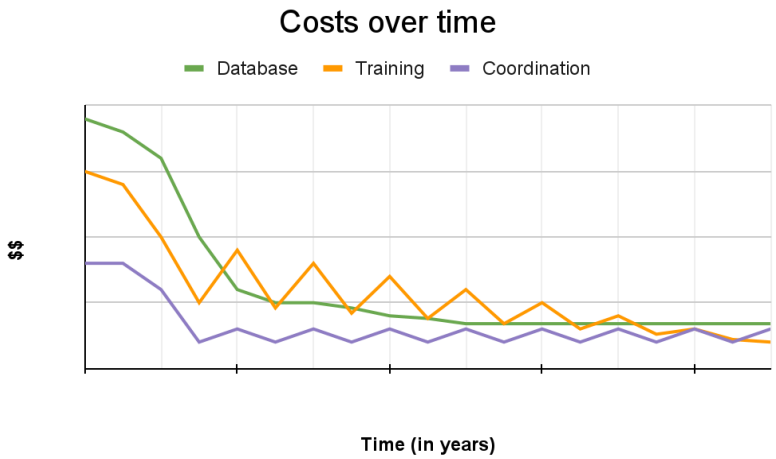
As this policy package is rolled out, it will be essential that each recommendation is accompanied by a comprehensive public engagement plan. This could include coordination with media, communications with public and private partners, regular "info nights," and updates to website content. Media attention will be especially important for ensuring that each component of this policy package and the programs, services, and resources it develops are publicly visible and well-understood by average Canadians across the country. Communications and collaborations with landlord and tenant associations can also improve the use of the national database as well as adoption of the training curriculum and awareness of the value that retrofit coordination services provide. To support both tenants and landlords, CMHC with the support of its partners could set up a phone and online chat "help" lines to answer questions and provide guidance to Canadians who might need additional support. Regular "info nights" paired with outreach at all levels of government and with industry partners will be important complements to this to get the message out about the training curriculum and new career opportunities in the trades. In addition to these outreach and communications efforts, it will be important for CMHC to also consider the ways in which end-users and consumers can be educated about energy efficiency in general. This will be critical for Canada to meet its national emission reduction targets, as the individual actions of households post-retrofit can affect the actual energy consumption outcomes of those projects.[146] End-users must be educated on how to properly use new technologies, and retrofits will need to be accompanied by a shift in consumption habits in order to be most effective. As such, a comprehensive public engagement strategy for these policy changes should include a component of energy-efficiency education for average Canadians.

CMHC Branding

CMHC is well known throughout the building, housing, and retrofit industry. Indeed, stakeholders not only widely know of the organization but some even have relationships with the Crown Corporation, with established connections between CMHC and major landlord associations and housing providers across the country. This has cultivated a positive image of CMHC that gives the organization's brand considerable sway in the rental housing market as well as the housing industry overall, making its involvement in the development and maintenance of each policy recommendation invaluable. Government participation is essential to supporting the success of retrofit initiatives,[147] and CMHC through its mandate and reputation can provide this support by placing its brand on these policy recommendations. Yet, there remains a sense of distrust toward the government among landlords that necessitates that government initiatives are bolstered by private support. For example, the coordination toolkit may gain greater traction if CMHC is able to leverage its national brand to partner with local organizations and associations to develop the toolkit and then subsequently rely on these local groups to disseminate the toolkit directly to communities. Likewise, NRCan can utilize its relationship with CMHC and OPEN Technologies to provide both public and private endorsement of the national database. Although large building owners and management companies may choose to hire private data scientists to analyze the national database, the publicly accessible format of the database nonetheless ensures that landlords of all financial means can realize its benefits. Meanwhile, the training curriculum should be spearheaded by the government and will further shore up its reputation through the partnerships that it develops between the federal government, trade schools, and retrofit industry leaders. As a well-known federal organization, CMHC can also harness its brand and its unique ability to craft compelling narratives in all outreach efforts to effectively promote these initiatives, both individually and as an integrated policy package.

Costs

The costs associated with each of these policy recommendations varies, but, due to their integrated nature, their costs may be viewed in relation to one another over time.



The development of the national database would require a significant upfront investment that could be split between CMHC and NRCan. The initial development costs would include database design, software development, and the setting up of national data infrastructure, all of which would require information systems analysts, database administrators, software engineers, and interactive media developers, and web designers, all of which should be supported by private consultants to support the database's credibility to building owners.[148] There would also be ongoing maintenance costs, but these would be significantly less than the upfront costs, and would decline over time due to the establishment of institutional knowledge and capacities for managing the database. Long-term costs would include data storage, updates to the database, and security measures to protect the data. Periodic costs associated with the database might also include national surveys on building characteristics and national energy trends, as well an analysis and validation of the data collected through those surveys. Because NRCan and CMHC both have in-house research teams, and because NRCan has past experience with developing and maintaining CAN-QUEST energy modeling software, the organizations may not need to hire entirely new teams, but rather could reallocate staff from existing departments or their partners in the public and private sectors to work on this project. The two organizations could also choose to contract out the project to a third party, which would result in a different set of costs over time, though the general costing trend line would remain the same.

The training curriculum would also include high initial costs, as the development of the curriculum would require research, content creation, and coordination with instructors, trade schools, and industry partners that would all incur expenses. If ESDC establishes a recognition and certification program to accompany the training curriculum to signal its adoption and completion by trade schools and workers, this would incur additional costs to develop and implement the program as well as ensure its ongoing evaluation and administration. Unlike the database, the training curriculum would continue to incur periodic annual costs in the form of the financial incentive transfers provided to trade schools that adopt the curriculum. To fund these transfers, ESDC and CMHC could work together to assemble annual funding packages that draw in funding from various government departments and other partners in both the private and public sectors. Given the country's whole-of-government approach to the country's energy transition and the importance of a green labor transition in making this possible, it is feasible for a variety of partners to contribute to these funding packages. As the training curriculum gains a reputation over time that draws in trade schools and workers, these funding packages can gradually be reduced or even abandoned altogether. The costs to continue updating the curriculum will remain, though these, too, are expected to decline over time as the government's maintenance capacity gradually grows through firsthand experience.

The primary costs associated with the creation of a retrofit coordination toolkit would be the formation and ongoing convening of the Retrofit Commission as well as the activities that would contribute to the development and distribution of the toolkit itself. Because this recommendation is grounded in a

partnership between CMHC and NRCan, the costs of research and analysis for the development and maintenance of the toolkit and for convening the Retrofit Commission to support these efforts could be split across the two organizations. However, if CMHC takes on the primary role of regularly convening the Commission, then it would be the party most likely to compensate the Commission members for their time. These fees could vary depending on the number of members sitting on the Commission and the frequency of meetings, and there would be higher upfront costs associated with this group as members would have to be vetted and onboarded while initial meetings may be more frequent and may involve additional group cultivation activities. There would also be higher upfront costs to develop the toolkit, but all these costs will decrease over time as internal capacities are developed and maintenance costs decline. However, there will be periodic spending peaks due to the hosting of an annual peer-to-peer learning forum. The costs of these gatherings would vary depending on the size, location, and scope of the events.

Furthermore, each policy recommendation comes with costs associated with marketing and outreach, and the combined public engagement strategy mentioned previously in the report consolidates these activities across the policy package. Since the policies recommended in this report span multiple organizations and agencies in alignment with the whole-of government approach to emissions reductions, the costs of this comprehensive engagement strategy could be shared across actors and budgeted for across multiple years.

Additional Policy Pathways

The retrofit industry spans both public and private actors and touches several sectors of the economy, with spillover effects that influence national, provincial, and municipal progress toward reaching net-zero emission goals. In recognition of the depth and breadth of this complex industry, there are various policy pathways beyond what was recommended in this report that merit future consideration.

Tenant Liaison Groups

A tenant liaison group refers to an organized body or committee that represents the interests and concerns of tenants within a specific residential area or community. The primary purpose of these groups is to act as a bridge between tenants and property management companies or landlords. As such, these liaisons have the potential to be conduits of information for landlords as well as tenants, and to facilitate retrofit implementation. Moreover, these tenant liaison groups can support tenants during retrofit projects, alleviating concerns and coordinating solutions to issues such as noise, dust, and other disruptions that may take place during installation. This will further assist landlords in building the business case for retrofits by mitigating concerns that stakeholders raised about tenant dissatisfaction. In this way, it is worth considering the role that tenant liaison groups could play in the acceleration of retrofits, and how they might affect tenant rights, retrofit uptake, and the scale and scope of retrofits in rental housing.

Carbon Pricing Transparency

The national price on carbon is a government-imposed fee on carbon emissions designed to reduce Canada's greenhouse gas emissions and combat climate change. By putting a price on fossil fuels such as gasoline, diesel, natural gas, and coal, the carbon price aims to incentivize individuals and businesses to reduce their carbon footprint and promote the adoption of cleaner alternatives. Current communications around carbon pricing indicate that the government will steadily increase the price of carbon over the next decade, but there is a lack of information as to what will occur after 2030. Stakeholders cited this lack of transparency and predictability as making it difficult for landlords and management companies to plan out investments, hindering them from making the long-term business case that is needed for landlords, investors, and shareholders alike to pursue retrofits. More transparency from the government regarding the future of carbon pricing can therefore affect the acceleration of retrofits and is worth consideration.

Tenant Subsidies for Low-Income Tenants

An issue that was raised by stakeholders was the possibility of government subsidies to tenants after retrofits had been installed. This would allow tenants to remain in their dwellings at the same price point as before the retrofits, while also allowing landlords to temporarily increase rents above stated guidelines to offset the cost of installing retrofits. This is especially important in light of the lack of government funding available for landlords to pursue retrofits and the high cost of the deep retrofits needed to reach net zero. The government has a stated interest in encouraging mixed income housing, and these subsidies could be an option to encourage retrofits in this type of housing by supporting those most likely to be adversely affected by rent increases that may occur after retrofits are installed. In this way, tenant subsidies for low-income tenants may have a role to play in accelerating retrofits in Canada's private rental housing market that warrants future consideration.

Carve-Out in the Affordable Housing Innovation Fund for Retrofits

CHMC's Affordable Housing Innovation Fund (AHIF) provides financial assistance to various stakeholders, including private sector developers, non-profit organizations, and researchers, among others, to support the development and implementation of innovative strategies, technologies, and practices related to affordable housing.[149] At present, the fund does not include a specific carve-out for housing retrofits, though this could have the potential to stimulate innovation in retrofits that would accelerate their development and adoption across the country that the government should consider.

Conclusion

The Government of Canada has an essential role to play in advancing and accelerating retrofits, and federal programs for demonstration projects and financial incentives have been a key factor in advancing retrofits to date.[150] Given the country's ambitious climate goals, there is a need for an all-hands-on-deck approach to reaching net zero by 2050, and CMHC can and must partner with government departments as well as private industries to accelerate the adoption of retrofits across the country. As has been outlined in this report, Canada's retrofit market is still nascent, with ample room to grow and expand in the years to come. Yet, there will be challenges to accelerating the retrofit market that must be addressed, including a current lack of accessible and comprehensive information relating to building energy performance data, the general sense of distrust that landlords tend to have toward government initiatives, the attrition of skilled workers in the trades, the slow adoption of new retrofit technologies, the sheer complexity of the current retrofit landscape, and the need for better support for and more forms of retrofit coordination services that can meet landlord where they are at. As a Crown Corporation with extensive partnership networks, in-house research and innovation capacities, and a strong and well-known brand, CMHC is well positioned to contribute to a whole-of-government approach to tackling these issues.

Although financial incentives provided by the government have been essential mechanisms for advancing retrofits within Canada to date, the urgency of the impending threat of climate change has precipitated the need for additional avenues by which retrofits can be facilitated, promoted, and accelerated across the country.[151] As such, the policy recommendations set forth in this report seek to address the systemic issues that currently exist in the retrofit market with the goal of making these projects easier, faster, and cheaper for landlords in the private rental housing industry and building owners generally. Each recommendation is geared toward accelerating retrofits in ways that reduce costs, de-risk retrofit processes, and streamline the development, expansion, and completion of projects for all landlords, with a special focus on small landlords and local communities that most need support. While each recommendation individually supports retrofit projects, the impact of these recommendations is multiplied when adopted in tandem, working together as an integrated policy package that aligns with the nation's whole-of-government approach to climate change and that advances retrofits by minimizing and eliminating barriers to comprehensive information, skilled workers, and coordination services across the country. Altogether, these recommendations will ultimately reduce price pressures and contribute to the maintenance of affordability in the country's rental housing stock while progressing net-zero emission goals and protecting the environment for current and future generations.

Going forward, there are areas of research that require further investigation, not least including resiliency retrofits. The challenge question that guided this report included resiliency retrofits, but due to the scope of the issue, this report focused on energy retrofits given their capacity to lower Canada's emission profile and contribute to Canada's transition to net zero. However, as the effects of climate change become more pronounced, the need to also make Canada's aging housing stock more resilient will only grow. In addition to increasing the energy efficiency of homes, the government must also find ways of supporting landlords, renters, and construction industries to renovate buildings in ways that ensure they can withstand significant changes in temperature, increasingly severe weather events, and other changes in the surrounding environment that were not present when the buildings were built. Additionally, it will be imperative to continue studying the effects of current government programs such as the Deep Retrofit Accelerator Initiative. There are high hopes that initiatives such as this will result in accelerated retrofit adoption and coordination across the country, which will have major implications for the implementation of each policy recommendation set forth in this report. At the same time, it will be important to study the variations in retrofit adoption that emerge within each province and territory, and to develop programs and policies that can support local initiatives and target households facing the greatest need.

Appendix

A. Consultations conducted

1. **Alberta Residential Landlord Association** - Donna Munkhouse (Executive Director)
2. **The Atmospheric Fund, The** - Bryan Purcell (Vice-President of Policy and Programs)
3. **Canadian Federation of Apartment Associations** - John Dicke (President)
4. **City of Toronto / BetterHomesTO** - Stewart Dutfield (Senior Project Manager)
5. **Dunsky Energy and Climate Advisors -** Lorenzo Daieff (Consultant, Energy and Climate Transition)
6. **Ecohabitation** - Mathieu Gillet - (Consultant for Neighborhoods and Municipalities Programs)
7. **Efficiency Canada** - Abhilash Kantamneni (Research Associate)
8. **Efficiency Capital** - Matt Zipchen (President)
9. **Federation of Rental-Housing Providers of Ontario -** Asquith Allen (Director, Policy & Regulatory Affairs)
10. **Greater Toronto Apartment Association** - Daryl Chong (Chair)
11. **McGill ReCONstruct** - Michael Jemtrud (Chair in Architecture, Energy, and Environment)
12. **Minto** - Joanna Jackson (Director, Sustainability and Innovation)
13. **Natural Resources Canada** - Jerome Bilodeau (Director, Building Division)
14. **Natural Resources Canada** - John Fee (Manager of Policy and Planning)
15. **The New Hampshire Sustainable Energy Association** - Laura Richardson (President)
16. **People Design Co-operative** - Brandon Riddell (Principal)
17. **Pocket Change** - Eve Wyatt (Project Manager) and David Langille (Chair and Coordinator)
18. **Resilient Buildings Group** - Dana Nupe (President)
19. **SOFIAC** - Stuart Galloway (Executive Vice President)
20. **Skyline -** Jason Ashdown (Co-Founder & Chief Sustainability Officer)
21. **Small Ownership Landlords of Ontario** - Boubacar Bah (Chair)
22. **Smart Prosperity Institute** - Abdullah Khan (Research Associate)

B. Retrofit Classifications

There are three main ways to refer to different types of retrofits, and all entail different levels of commitment, cost, or disruption to building owners and tenants.[152]

1. Minor retrofits

These involve “shallow retrofits” and projects that target the "low-hanging fruit" – simple modifications that are cost-effective, easy to implement, and provide significant value for the invested money and effort without requiring a major renovation. These projects include sealing air cracks around windows and doors with caulk or spray foam, changing light bulbs, and adding aerators to water faucets and shower heads. These measures can typically be carried out by individual building owners and tenants without the need for a contractor or professional installation.

2. Major retrofits

These types of retrofits take a more holistic approach to energy efficiency enhancements on buildings, and may encompass a broader range of modifications such as replacing windows and doors, updating inefficient heating, cooling, and ventilation (HVAC) systems, installing lighting sensors and automatic shut-offs, and implementing sub-metering in residential buildings. Despite the increased complexity of these measures as compared to minor retrofits, these major retrofit projects can still be carried out with minimal disruption to building occupants.

3. Deep retrofits

Deep retrofit renovations often involve an extensive overhaul of a building's energy systems, appliances, and external envelope. Measures may include significant interior reconfigurations, replacing roofs and insulation, installing geothermal heating, and even rearranging windows to optimize natural daylight heating. These types of deeper projects can typically result in potential energy cost savings of up to 60 percent, though some government incentive programs require even higher energy cost savings, sometimes up to 70 or 80 percent. Due to the scale and complexity of the changes involved in these projects, deep retrofits may be disruptive to building occupants and take considerable time and money to carry out.

C. Landlord Sizes

For the purposes of this report, landlord sizes can be defined as the following:

- Small landlords refer to individuals who own 1-2 residential properties
- Mid-sized landlords refer to individuals who own 3-4+ residential properties, and
- Large landlords refer to private equity firms, asset managers, publicly listed companies, and real estate investment trusts (REITs) which own and manage portfolios of residential buildings

Within Canada, the greatest proportion of property owners by demographic volume are those who own only one or two residential properties. In Ontario for example, these small property owners make up 96% of all property owners in the province, while those owning 3 or 4+ make up just 4% of property owners (see data chart below).[153]

Single and multiple residential property owners: Demographic data and value of properties owned 2020			
Statistics Canada Table: 46-10-0038-01			
		Number of property owners	Proportion of owners
Geography	**Number of residential properties owned in 2020**		
		Number	Percent
Nova Scotia	Total, all number of properties owned categories	390,840	100
	Owns one property	301,895	77.2
	Owns two properties	61,780	15.8
	Owns three properties	16,800	4.3
	Owns four or more properties	10,365	2.7
New Brunswick	Total, all number of properties owned categories	345,470	100
	Owns one property	274,275	79.4
	Owns two properties	50,100	14.5
	Owns three properties	13,270	3.8
	Owns four or more properties	7,825	2.3
Ontario	Total, all number of properties owned categories	5,629,715	100
	Owns one property	4,733,530	84.1
	Owns two properties	673,690	12
	Owns three properties	146,740	2.6
	Owns four or more properties	75,755	1.4
Manitoba	Total, all number of properties owned categories	410,935	100
	Owns one property	350,890	85.4
	Owns two properties	46,445	11.3
	Owns three properties	8,880	2.2
	Owns four or more properties	4,720	1.2
British Columbia	Total, all number of properties owned categories	1,885,580	100
	Owns one property	1,592,255	84.4
	Owns two properties	223,465	11.9
	Owns three properties	47,715	2.5
	Owns four or more properties	22,145	1.2
Yukon	Total, all number of properties owned categories	10,360	100
	Owns one property	8,590	82.9
	Owns two properties	1,350	13
	Owns three properties	275	2.7
	Owns four or more properties	145	1.4
Nunavut	Total, all number of properties owned categories	2,900	100
	Owns one property	2,645	91.2
	Owns two properties	205	7.1
	Owns three properties	30	1
	Owns four or more properties	20	0.7

Although the number of property owners who own 4 or more properties is small, they still control a significant amount of the country's rental housing stock. For example, one study found that in 2017 the top 25 biggest landlords in Canada owned 18% of the country's purpose-built rental stock.[154]

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