TORONTO

REPORT FOR ACTION

Net Zero Existing Buildings Strategy

Date: June 18, 2021
To: Infrastructure and Environment Committee
From: Deputy City Manager, Corporate Services
Wards: All

SUMMARY

In 2017 City Council unanimously adopted TransformTO, the City of Toronto's (City) comprehensive climate action strategy for achieving dramatic city-wide greenhouse gas (GHG) emissions reductions of 80% by 2050 and associated co-benefits of health, local economic impact, social equity, and resilience. In 2019, in recognition of the increasing need for accelerated climate action, City Council declared a climate emergency and increased Toronto's city-wide GHG emissions reduction goal to net zero emissions by 2050 or sooner.

According to the latest inventory of city-wide emissions released in 2018, significant results have already been achieved, with overall emissions having been reduced by 37 per cent from 1990 levels, all while Toronto’s population and economy continued to grow over the same time period. However, despite this achievement, accelerated action and transformational initiatives will be needed to achieve the City’s long-term goal of net zero emissions by 2050, or sooner. Existing buildings are Toronto's largest source of emissions, accounting for about 55% of total community-wide emissions. Additionally, natural gas represents 91% of all emissions from Toronto's buildings, and almost 97% of emissions from residential buildings in particular, making the reduction of natural gas use a critical focus of emissions reduction efforts.

This report presents the findings of the Net Zero Existing Buildings Strategy (ExB Strategy), developed by the City's Environment & Energy Division, to specifically address the challenge of achieving net zero emissions by 2050 in existing buildings city-wide. The ExB Strategy has been developed in coordination with the TransformTO acceleration report for achieving net zero emissions city-wide by 2050 or sooner and Corporate Real Estate Management's *Zero Carbon Plan* for City-owned buildings, which is being presented to City Council this cycle. Engagement with City Planning also supported ExB Strategy alignment with The Toronto Green Standard, which sets out the pathway to net zero emissions for new construction by 2030.

The ExB Strategy is the result of extensive technical modelling and analysis, stakeholder engagement, and best practices research. The ExB Strategy presents nine recommended actions for the City to undertake, identifies key design and implementation considerations for each action, and presents the potential impacts on emissions, costs, and co-benefits of resilience, social equity, health, and local economic development, if the ExB Strategy were to be implemented as recommended.

This report presents staff recommendations to City Council that are informed by the modelling and recommended actions in the ExB Strategy, feedback received through stakeholder consultations, and input from partner City Divisions. The nine key actions recommended in the ExB Strategy are presented in Table 1 below, outlined further in the Comments section of this report, and discussed in detail in the ExB Strategy report (Appendix A):

Table 1: Overview of Nine Recommended Actions in the ExB Strategy

Purpose	Actions
Set requirements to assess building performance and create a path to net zero	**1. Require annual emissions performance reporting and public disclosure for all existing buildings** **2. Establish emissions performance targets** **3. Require energy and emissions audits and tune-ups**
Provide support and resources to make retrofits easier and more affordable	**4. Provide integrated retrofit support** **5. Expand and enhance retrofit financing** **6. Support permitting and approvals processes for deep retrofits**
Lay the groundwork for market transformation	**7. Build awareness and capacity of home and building owners for emissions reduction strategies and supports** **8. Support workforce development and training** **9. Advocate and partner with other levels of government**

The modelled impacts of adopting the ExB Strategy as recommended are presented in Table 2 and Table 3 below and discussed in detail in the Comments section of this report.

Table 2. ExB Strategy Recommended Scenario Emissions Impacts 2020-2050

Annual Emissions 2016	Annual Emissions 2050	Change in Annual Emissions	Cumulative Emissions Reductions
7.8 Mt	1.4 Mt	-82%	149 Mt

Mt = Metric Tonne

Table 3. ExB Strategy Recommended Scenario Economic Impacts 2020-2050

Total Economic Activity	Total Job Hours Created	Total Full Time Jobs Created
$302 Billion	1.1 Billion Hours	18,100

To achieve net zero emissions across Toronto's existing building stock, ExB Strategy modelling indicates that over $300 Billion will need to be co-invested in building retrofits between 2020 and 2050 by all levels of government and the private sector, which is $140 Billion more than business-as-usual investment in buildings city-wide.

Without support these costs would be borne solely by building owners and would likely be passed down to tenants in many cases. The City should seek out opportunities to coordinate investment from other levels of government to provide targeted funding for a portion of deep retrofit actions, and to co-deliver recommended actions in the ExB Strategy, to support building owners in addressing the costs of deep retrofits and to stimulate transformative action across the existing buildings sector.

Resourcing and financial implications associated with the implementation of near-term actions in the ExB Strategy will be included as part of the 2022 budget process and will also be included in the TransformTO acceleration report which will be presented to Council in Q3 2021.

Key Insights from the ExB Strategy:

- Emissions reductions of over 80% across Toronto's existing buildings are possible by 2050 through deep retrofits.
- Offsets, renewable energy credits, and other means for achieving emissions reductions will be necessary to some extent as modelling shows that reaching net zero emissions is not technically nor financially feasible from building retrofits alone.
- Voluntary measures are not enough to catalyze transformative action toward net zero emissions, mandatory requirements are necessary.
- Fuel switching and a clean electricity grid are the two most significant technical requirements for achieving net zero emissions.
- Building envelope upgrades, while more expensive to implement than fuel switching and heating, ventilation and air conditioning (HVAC) upgrades, deliver by far the highest co-benefits of resilience, social equity, health and local economic benefit .
- Multi-unit residential buildings (e.g. apartment buildings, condos) and single-family homes (e.g. detached/semi-detached houses, townhouses, row houses, etc.) offer the greatest emissions reduction potential, the greatest co-benefit opportunities, while also requiring considerable financial and capacity support, making them a clear priority sector to target.
- The cost of the needed retrofit actions represent a significant net investment for building owners and these measures do not pay back on their own.
- Financial supports will be needed to enable market transformation.
- The City does not have all of the authorities needed to unilaterally implement the ExB Strategy in full. Dialogue with the province will be necessary.

The ExB Strategy takes the approach of first introducing voluntary programs and policies in the near-term, followed by a transition to mandatory requirements in the medium to long-term. Lessons learned from the operation of voluntary programs, along

with detailed discussions with partner City Divisions and further stakeholder engagement, will be conducted to inform the specific design details and implementation plans for any mandatory requirements. Key aspects of this work will include, but are not limited to:

- Investigation of the necessary authorities, and appropriate regulatory avenues, to enable the implementation of mandatory requirements;
- Investigation of approaches to compliance and enforcement of mandatory requirements;
- Investigation of resourcing and cost implications for affected City divisions;
- Analysis of equity and housing affordability impacts and development of implementation strategies that mitigate negative impacts and enable positive impacts for equity-deserving groups.

RECOMMENDATIONS

The Deputy City Manager, Corporate Services recommends that:

Action #1: Require annual energy and emissions performance reporting and public disclosure for Toronto's homes and buildings

1. City Council request the Government of Ontario to amend the province's Reporting of Energy Consumption and Water Use (O.Reg. 506/18) regulation to mandate commercial, institutional and multi-unit residential buildings smaller than 50,000 ft^2 and single family homes and other building types (e.g. industrial) to report their energy consumption and water use, and to expand the scope of the regulation to include energy, water and greenhouse gas emissions reporting and labelling.

2. City Council direct the Director, Environment & Energy Division to report back to Council by Q2 2023 on the development of a proposed by-law and implementation plan to require mandatory annual energy, water, and greenhouse gas emission reporting, and mandatory emissions benchmarking and labelling, for commercial, institutional and multi-unit residential buildings that are smaller than 50,000 ft^2, to further advance energy and emissions data reporting in Toronto should the Government of Ontario not amend its Reporting of Energy Consumption and Water Use regulation as per recommendation 1.

3. City Council direct the Director, Environment & Energy Division to report back to Council in Q3 2021 with the development of a voluntary EnerGuide-based energy reporting, disclosure and labelling program for Toronto single-family homes to commence in the latter half of 2022.

4. City Council direct the Director, Environment & Energy, in consultation with the Chief Building Official and Executive Director, Toronto Building to report back to Council by Q2 2023 with the development of a proposed by-law and implementation plan to require all Toronto single family homes to participate in an EnerGuide-based energy reporting, disclosure, and labelling program to commence in 2025.

5. City Council authorize the Director, Environment & Energy Division to negotiate, enter into, and execute agreements and any ancillary documents, as required, with Toronto Hydro, Enbridge Gas, and Enwave for the provision of utility data to home and building owners wishing to voluntarily report to the City on terms and conditions satisfactory to the Director, Environment & Energy Division and in a form satisfactory to the City Solicitor.

Action #2: Establish sector specific mandatory emissions performance standards

6. City Council direct the Director, Environment & Energy Division to report back to Council in Q3 2021 with an implementation plan to encourage existing buildings to voluntarily work towards meeting emission performance targets established by the City, to commence in the latter half of 2022.

7. City Council direct the Director, Environment & Energy Division, in consultation with the Chief Building Official and Executive Director, Toronto Building, the Chief Planner & Executive Director, City Planning and the Executive Director Social Development, Finance and Administration to report back to Council:
    a) In Q4 2022, on the regulatory and legislative changes that may be required for the implementation of mandatory emissions performance targets for existing buildings in the city of Toronto; and
    b) In Q2 2023 with a program design and implementation plan for phased-in mandatory emissions performance targets starting with large buildings, that will require improved emissions performance over time, and which will also take into consideration the enabling regulatory changes identified through recommendation 7.a) and leverage the experience, knowledge and data collected through the implementation of recommendations 2. through 6.

Action #3: Require energy and emissions audits and recommissioning to inform net zero retrofit roadmaps

8. City Council direct the Director, Environment & Energy Division to report back to Council in Q3 2021 with an implementation plan for a voluntary program that supports commercial, institutional, and multi-unit residential buildings in undertaking energy and emissions audits, re-commissioning, and the development of retrofit roadmaps aligned with capital plans and the net zero emissions by 2050 target, to commence in the latter half of 2022.

9. City Council direct the Director, Environment & Energy Division to report back to Council in Q2 2023 with a proposed by-law and an implementation plan to require buildings 50,000 ft^2 and larger to undertake energy and emissions audits, recommissioning, and develop retrofit roadmaps aligned with capital plans and the net zero emissions by 2050 target on a regular basis, to commence in 2025.

Action #6: Support efficient navigation of permitting and approvals process for deep retrofits

10. City Council request that the Chief Building Official and Executive Director, Toronto Building and the Director, Environment & Energy Division collaborate to identify and implement opportunities in the permitting process for education and engagement of property owners, designers, builders and other stakeholders on the implementation of the City's Net Zero Existing Buildings Strategy, including emissions performance targets, retrofit support resources, and navigation of the permitting process.

Action #9: Advocate and partner with other orders of government

11. City Council request the Government of Ontario:
    a) Make a commitment to ensure the provincial electricity supply and other infrastructure is climate change resilient;
    b) Mandate implementation of the “Green Button” standard by electricity and natural gas utilities to provide customers with electronic access to utility data;
    c) Create and ease access to grant and/or rebate programs to improve the business case for deep retrofits with longer paybacks for all building types; and
    d) Demonstrate leadership through deep carbon retrofits in provincially owned or leased buildings.

12. City Council request the Government of Ontario direct the Ontario Energy Board (OEB) and Independent Electricity System Operator (IESO) to:
    a) Integrate greenhouse gas emissions reductions into their decision-making framework and mandate;
    b) Implement rate structure changes that favour electrification and fuel switching away from natural gas;
    c) Strengthen the capacity of the electrical grid to accommodate the existing building sector switch away from natural gas;
    d) Develop utility mechanisms to help support and invest in deep emissions retrofits while also providing electricity price relief for both renters and owners in low-income households;
    e) Continue retrofit cost reduction measures, such as performance-based rebates for improved energy and emission performance; and
    f) Introduce Enhanced Demand-Side Management (DSM) programs under the Independent Electricity System Operator (IESO) Conservation and Demand Management (CDM) that focus on temporal emissions intensity as well as peak energy consumption.

13. City Council request the Government of Canada:
    a) Continue their commitment to carbon pricing via the Greenhouse Gas Pollution Pricing Act;
    b) Create/expand grant programs and tax incentives to improve the business case for deep retrofits with longer payback periods;
    c) Continue their commitment to work with municipalities to ensure rebates and financing for deep emissions retrofits flows effectively and directly to recipients;
    d) Continue their enhancement of deep retrofit financing through the Canadian Infrastructure Bank;
    e) Highlight emissions more explicitly through the EnerGuide rating system; and

f) Support regenerative forestry and agricultural practices that contribute to the widespread availability of low embodied carbon, biogenic materials for the building industry.

14. City Council authorize the Deputy City Manager, Corporate Services to negotiate, enter into, and execute agreements, as may be required, with non-profit, public, and private sector organizations to:
    a) collaborate on projects or initiatives,
    b) provide in-kind and/or financial support from the approved Environment & Energy Division budget on projects or initiatives, and/or
    c) receive funding that will support the implementation of the Net Zero Existing Buildings Strategy, on such terms and conditions satisfactory to the Chief Financial Officer and Treasurer and in a form satisfactory to the City Solicitor.

FINANCIAL IMPACT

There are no immediate financial impacts to the current Budget Year arising from the recommendations contained in this report. Any financial impacts related to specific recommended near-term (2022-2024) actions will be included in future budget submissions, beginning in 2022. Financial impacts beginning in 2022 will also be included in the TransformTO acceleration report of the Deputy City Manager, Corporate Services, which will be presented to Council in Q3 2021. See Table 4 below for planned report back and budget cycle timing. The Environment and Energy Division is also exploring funding opportunities provided by other levels of government and associated programs to support the implementation of the ExB Strategy.

Table 4: Estimated Timing of Financial Impacts Summary

Action	Report Back Date	Proposed Implementation Timeline	Budget Year	Divisions with potential budget/resource impacts
1. Require annual energy and emissions performance reporting and public disclosure for Toronto's homes and buildings				
Expand support for voluntary energy and emissions data reporting for buildings in Toronto for buildings >25,000 ft2	Q3 2021	latter half of 2022	2022	EED
Development of a voluntary EnerGuide-based energy reporting, disclosure and labelling program for Toronto single-family homes to commence in the latter half of 2022.	Q3 2021	latter half of 2022	2022	EED
Development of a proposed by-law and implementation plan to require mandatory annual energy, water, and greenhouse gas emission reporting, and mandatory emissions benchmarking and labelling, for commercial, institutional and multi-unit residential buildings that are smaller than 50,000 ft2, to further advance energy and emissions data reporting in Toronto should the Government of Ontario not amend its Reporting of Energy	Q2 2023	2025	2024	TBD - likely just EED

Consumption and Water Use regulation as per recommendation 1.				
Development of a proposed by-law and implementation plan to require all Toronto single family homes to participate in an EnerGuide-based energy reporting, disclosure, and labelling program to commence in 2025	Q2 2023	2025	2024	EED MLS TO Building
2. Establish sector specific mandatory emissions performance targets				
Implementation plan for voluntary emissions performance targets for all existing buildings to commence in the latter half of 2022	Q3 2021	latter half of 2022	2022	EED
Report back to Council in Q4 2022, on the regulatory and legislative changes that may be required for the implementation of mandatory emissions performance targets for existing buildings in the city of Toronto, and a framework for requesting the Government of Ontario to enact those changes	Q4 2022	N/A	no budget implications	EED MLS TO Building City Planning
Report back to Council in Q2 2023 with a program design and implementation plan for phased-in mandatory emissions performance targets starting with large buildings, that will require improved emissions performance over time, and which will also take into consideration the enabling regulatory changes identified through recommendation 7.a) and leverage the experience, knowledge and data collected through the implementation of recommendations 2. through 6	Q2 2023	2025	2024	EED MLS TO Building
3. Require energy and emissions audits and recommissioning to inform net zero retrofit roadmaps				
Implementation plan for a voluntary program that supports commercial, institutional, and multi-unit residential buildings in undertaking energy and emissions audits, re-commissioning, and the development of retrofit roadmaps aligned with capital plans and the net zero emissions by 2050 target, to commence in the latter half of 2022	Q3 2021	Latter half of 2022	2022	EED
Proposed by-law and an implementation plan to require buildings 50,000 ft2 and larger to undertake energy and emissions audits, recommissioning, and develop retrofit roadmaps aligned with capital plans and the net zero emissions by 2050 target on a regular basis, to commence in 2025	Q2 2023	2025	2024	TO Building EED
6. Support efficient navigation of permitting and approvals process for deep retrofits				
Identify and implement opportunities in the permitting process for education and engagement of property owners, designers, builders and other stakeholders on the implementation of the City's Net Zero Existing Buildings Strategy, including emissions performance targets, retrofit support resources, and navigation of the permitting process.	N/A	TBD	TBD	TO Building EED

The Chief Financial Officer and Treasurer has reviewed this report and agrees with the financial implication as identified in the Financial Impact section.

EQUITY IMPACT

The ExB Strategy envisions that all buildings in Toronto are retrofitted and upgraded to dramatically reduce greenhouse gas emissions and support Toronto's efforts to mitigate the harmful impacts of climate change on our city, which disproportionately affect our most vulnerable communities. The retrofits and upgrades that reduce emissions in our buildings also improve the quality, safety, and longevity of the places we live, work, and play. The ExB Strategy has the potential to dramatically improve equitable access to safe, healthy and high quality buildings if affordability challenges are adequately addressed in its implementation. As individual policies and programs recommended in the ExB Strategy undergo detailed design a more thorough equity analysis will be conducted to ensure emissions reductions support equity-deserving groups as buildings are transitioned to net zero.

In particular, the anticipated equity impacts of the ExB Strategy are most likely to affect home owners and renters. However, there are important opportunities for alignment with City initiatives in the residential space such as RentSafeTO, and HousingTO, which strive to protect vulnerable and equity-deserving groups from housing affordability challenges.

Nearly half of Toronto residents are renters. Over 500,000 of them live in high-rise apartment towers, which make up a large part of the city's rental stock. The ExB Strategy modelling identifies the residential sector, and apartment buildings in particular, as providing the greatest opportunity for emissions reductions impacts as well as positive impacts on local economic development, improvements to housing quality, better health, and improved resilience overall, showing that there is alignment between positive emissions outcomes and positive equity outcomes.

The ExB Strategy recognizes that the considerable costs of the building improvements needed to achieve our ambitious emissions reduction targets are most directly borne by building and home owners. The main challenge in the residential sector is to prevent or minimize these costs being passed down to tenants, which could exacerbate housing affordability challenges in Toronto. These affordability challenges are often felt most by Toronto's equity-deserving groups. Consideration should also be given to affordability concerns in the commercial buildings sector, where local business owners may face increased costs of building upgrades that will impact their bottom line.

The ExB Strategy as presented in this report identifies specific instances where affordability impacts and any other unintended consequences will need special attention, and identifies some high-level mitigation approaches. Efforts have been made to analyze and quantify, where possible, the potential co-benefits that can be achieved, identify where potential negative impacts may arise, and provide recommendations for limiting them.

All actions proposed as part of the ExB Strategy have been recommended with equitable access to equity-deserving groups in mind. As individual ExB Strategy actions move forward into the detailed design and implementation phase of development, it will

be essential to conduct thorough equity and affordability analysis as part of this work. With the right approach and involvement of the right stakeholder groups, the implementation of the ExB Strategy can achieve numerous co-benefits and result in improvements to equity.

DECISION HISTORY

At its meeting of October 2 and 3, 2019, the City Council declared a Climate Emergency and endorsed a net zero greenhouse gas emissions target that is in line with keeping global average temperature rise below 1.5 degrees Celsius by adopting MM10.3 entitled "Declaring a Climate Emergency and Accelerating Toronto's Climate Action Plan". The declaration of the Climate Emergency immediately strengthened the goal of making Toronto net zero before 2050. At the meeting City Council committed to looking for opportunities to invest in and accelerate timelines for high priority greenhouse gas emission reduction areas outlined in TransformTO, including the building sector.

The City Council Decision document can be viewed at:
http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2019.MM10.3

City Council at its meeting of July 4, 5, 6 and 7, 2017, endorsed item PE19.4 entitled "TransformTO: Climate Action for a Healthy, Equitable and Prosperous Toronto – Report 2 – The Pathway to a Low Carbon Future" (TransformTO). TransformTO identified a pathway for Toronto to reduce city-wide greenhouse gas emissions by 80% by 2050. At the meeting City Council adopted three acceleration campaigns for reaching the City's greenhouse gas reduction targets, including the 'Building Energy Performance and Comfort' campaign which focuses on increasing the energy performance of existing buildings and ensuring new ones are built to high energy performance targets.

The City Council Decision document can be viewed at:
http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2017.PE19.4

At its meeting of December 13, 14, and 15, 2016, City Council endorsed item PE15.1 entitled "TransformTO: Climate Action for a Healthy Equitable, and Prosperous Toronto" which identified improving energy efficiency in buildings as a key priority in the City's greenhouse gas emissions reduction strategy.

The City Council Decision document can be viewed at:
http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2016.PE15.1

At its July 7, 8, and 9, 2015 meeting, City Council reiterated its commitment to an energy reporting and benchmarking requirement for large commercial and multi-residential buildings, as a strategy for achieving the City's energy conservation and greenhouse gas emission reduction goals and directed the City to support the implementation of a Provincial energy reporting and benchmarking regulation, or alternatively, on the City's own energy reporting and benchmarking by-law and implementation plan, should the Province not proceed with a regulation by December by adopting item PE4.2 entitled "Update on Energy Reporting and Benchmarking By-law for Large Buildings".

The City Council Decision document can be viewed at:

http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2015.PE4.2

City Council at its meeting of November 30, December 1, 2, 4 and 7, 2009, endorsed item EX36.9 entitled "The Power to Live Green: Toronto's Sustainable Energy Strategy" (Live Green Strategy) to further advance Toronto's efforts towards a low-carbon future. The Live Green Strategy identified improving energy efficiency in existing buildings as an important area of focus to achieve the City of Toronto's GHG emissions reduction target of 80% by 2050. At the meeting City Council adopted a recommendation to establish an energy efficiency standard for both new construction and existing retrofit buildings within the city of Toronto to help achieve the GHG emission reduction targets outlined in the Live Green Strategy.

The City Council Decision document can be viewed at:
https://www.toronto.ca/legdocs/mmis/2009/cc/decisions/2009-11-30-cc42-dd.htm

At its meeting of July 16, 17, 18, and 19, 2007, City Council unanimously endorsed item EX10.3 entitled "Climate Change, Clean Air and Sustainable Action Plan" which included the adoption of 64 recommended actions to reduce GHG emissions and included a commitment to reduce Toronto-wide GHG emissions by: 6% from 1990 levels by 2012; 30% from 1990 levels by 2020; and 80% from levels by 2050.

The City Council Decision document can be viewed at:
http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2007.EX10.3

COMMENTS

INTRODUCTION

In the summer of 2019 the Environment & Energy Division retained, through competitive procurement, a consultant team to lead the development of the Net Zero Existing Buildings Strategy (ExB Strategy) in collaboration with City staff. The ExB Strategy was developed over the course of 2020 with the input of City Divisions, an Advisory Committee of key stakeholders, and broad community and sector engagement.

The ExB Strategy provides a comprehensive action plan for the specific policies, programs, and actions for the City of Toronto to undertake to achieve net zero emissions by 2050 across the existing building stock, the City's single largest source of emissions. The ExB Strategy embodies the TransformTO objectives of leveraging emissions reduction efforts to achieve the critical co-benefits of public health, social equity, local economic development, and resilience, which have all been incorporated into the analysis and action plan for decarbonizing Toronto existing buildings.

DEVELOPING THE STRATEGY

The ExB Strategy was developed over the course of 2020 with the input of City Divisions, an Advisory Committee of key stakeholders, and broad community and sector engagement. Due to the COVID-19 pandemic, most engagement was conducted virtually.

Advisory Committee
An Advisory Committee of over 30 stakeholders was convened to provide feedback and strategic guidance on the development of the ExB Strategy, through four half-day workshops held quarterly, and to provide formal review of key ExB Strategy deliverables and recommendations. Advisory Committee members included building owners and operators, engineers and architects, builders and trades, energy service companies, environmental and community organizations, government, academia, and utilities. Three Sub Committees were also formed to tackle specific issues in detail, including a technical subcommittee, financing subcommittee, and single-family home subcommittee. The ongoing and expert input from committee members throughout ExB Strategy development ensured the research, analysis, and recommended actions were vetted by sector experts.

Community and Stakeholder Engagement
In addition to input of the Advisory Committee and Sub Committee, a series of four broad stakeholder engagement workshops were held online in October 2020. Over 200 individuals from industry and local communities participated in the engagement workshops to review the draft ExB Strategy and provide comments and feedback. These efforts built on TransformTO public consultations that were held in the second half of 2019, which engaged Torontonians and stakeholder organizations on the TransformTO implementation plan, including feedback on actions for existing buildings.[1]

Technical Modelling Methodology
Detailed technical modelling and analysis was conducted to assess the emissions performance, business case (i.e. cost) performance, and co-benefit performance of retrofit measures at the individual building scale as well as city-wide. This analysis provides insights into the impact of individual technologies and retrofit measures as well as the impacts of broad city-wide programs and policies. A detailed description of the modelling methodology used in the ExB Strategy analysis can be found in Appendix B.

This staff report has been structured into two sections. The first section presents the nine core recommended actions that form the complete ExB Strategy, with attention given to key design considerations for each. The second section presents and discusses the results of the emissions, costs, and co-benefits impact modelling and analysis, with key points highlighted.

THE NET ZERO EXISTING BUILDINGS STRATEGY

Retrofitting the thousands of homes and buildings across the city to be more energy efficient, and shifting them to cleaner, renewable sources of energy will take a concerted and coordinated effort involving multiple actors, including federal, provincial and municipal governments, as well as industry associations, financial institutions, trade unions, the real estate sector, and of course – home and building owners.

[1] TransformTO Implementation Plan 2021-2023 Consultation Summary Report https://www.toronto.ca/wp-content/uploads/2020/10/8e41-TransformTO-Implementation-Plan-Consultation-Summary-Final-AODA.pdf

This section provides an overview of the **nine core recommended actions**, i.e. any action, policy, program or undertaking that forms part of the ExB Strategy Recommended Scenario (See Table 5 below and Appendix A for greater detail). The modelled impacts of the Recommended Scenario discussed in the second section of the report assume all nine recommended actions are implemented.

Table 5: Overview of Nine Recommended Actions in the ExB Strategy

Purpose	Actions
Set requirements to assess building emissions performance and create a path to net zero	**1. Require annual emissions performance reporting and public disclosure** **2. Establish emissions performance targets** **3. Require energy and emissions audits and tune-ups**
Provide support and resources to make building retrofits easier and more affordable	**4. Provide integrated retrofit support** **5. Expand and enhance retrofit financing** **6. Support permitting and approvals processes for deep retrofits**
Lay the groundwork for market transformation	**7. Build awareness and capacity of home and building owners for emissions reduction strategies and supports** **8. Support workforce development and training** **9. Advocate and partner with other levels of government**

Design considerations for each recommended action, and initial design recommendations for each, are presented below and are meant to act as starting points for the investigation and development of specific implementation plans that should be developed in the near future.

In most cases the actions outlined below are recommended to be implemented on a voluntary basis in the **near-term (i.e. 2022-2024)**, followed by a transition to mandatory requirements in the **medium-term (i.e.2025-2029)** to **long-term (i.e. 2030+)**. The design of mandatory requirements should leverage lessons learned from voluntary actions and will require additional design analysis, coordination with partner City Divisions, and stakeholder engagement.

Note that there are several actions recommended below that go beyond the City's existing authorities and jurisdiction to implement. Wherever possible it is noted where further investigation of the City's authority to implement the recommended actions is necessary.

Nine Recommended Actions

Action	Description
1. Require annual emissions performance reporting and public disclosure	• Introduce energy and emissions reporting, rating and labelling for all buildings in Toronto. • For large buildings, expand on Ontario's Reg. 506/18: Reporting of Energy Consumption and Water Use requirements by; o Encouraging voluntary reporting for buildings >50,000 ft^2 in 2021 and buildings >25,000 ft^2 in 2022 and introduce a mandatory reporting requirement for buildings >25,000 ft^2 in the medium-term (e.g. 2025) and smaller sizes thereafter. o Encouraging voluntary rating and labelling for buildings >50,000 ft^2 in 2022 and introduce a mandatory rating and labelling program for buildings >50,000 ft^2 in the medium-term (e.g. 2025), and to buildings >25,000 ft^2 thereafter. • For single-family homes, encourage voluntary home energy and emissions reporting, rating, and labelling disclosure through EnerGuide in 2022 with the introduction of a mandatory home energy rating and labelling program by 2025.

The Opportunity

Energy and emissions performance reporting, ratings and labels are critical data management tools that can be used to inform better decision making in many areas. For home and building owners, energy and emissions ratings provide the information they need to understand how their building is performing in comparison to others, as well as the impact any renovations or changes to operations and maintenance have on the performance of their buildings.

When requirements to benchmark and report energy and emissions data are coupled with a requirement to disclose that information to the public at key decision-making points, tenants and future buyers are able to make a more informed choice when deciding to lease, rent, or purchase a space. Disclosure of energy and emissions data, and rating and labelling energy and emissions performance also helps new homeowners to plan for and prioritize future retrofit measures. Further, experience from the European Union has shown that displaying energy ratings of efficient buildings generally has a positive impact on property sale prices.

For governments and regulators, energy and emissions ratings and labels allow for the collection of actual building performance data to be used in the design of effective and targeted programs to the building sectors or areas of the city most in need of improvement.

Design Recommendations

The City's Environment & Energy Division currently has staff that support building owner compliance with Ontario's Energy and Water Reporting and Benchmarking (EWRB) regulation for large buildings (O.Reg. 506/18)). These staff are currently engaging with over 1,200 buildings across Toronto that are between 50,000 ft^2 and 100,000 ft^2 to encourage and support reporting their energy data voluntarily in 2021, ahead of the provincial requirement for these buildings to report by 2023. These City staff should be

leveraged to expand support for **voluntary energy and emissions data reporting** for buildings in Toronto >25,000 ft^2 in 2022. In the medium-term (e.g. 2025), transition to the development of a **mandatory energy and emissions data reporting** program is recommended for buildings in Toronto >25,000 ft^2 and potentially to all building sizes thereafter. The Province should be engaged to determine if voluntary data reporting for buildings smaller than 50,000 ft^2 can be accepted through the existing EWRB intake system, or if a City-operated data reporting system would be required.

A **voluntary energy and emissions rating and labelling** program should be developed to support voluntary participation for large buildings (e.g. buildings >50,000 ft^2) in 2022. Energy and emissions labels could be required to be made visible within each building in a common space, through an online platform, and at time of listing for sale or lease, to increase transparency and access to information in the real estate markets.

Transition to a **mandatory energy and emissions rating and labelling** program is recommended for large buildings >50,000 ft^2 in the medium-term (e.g. 2025), with the potential to apply to smaller building sizes over time and refine program details based on learnings from the voluntary program.

The City's Environment & Energy Division has staff dedicated to delivering programming that supports retrofits of single-family homes through programs such as the Home Energy Loan Program (HELP) and BetterHomesTO. Staff are developing a **voluntary home energy rating and disclosure** program to be introduced in the latter half of 2022 and are currently conducting stakeholder engagement and program design work with the intent to report to Council with a program design in Q3 2021. A voluntary home rating and labelling program will leverage Natural Resources Canada's (NRCan) EnerGuide home energy rating system and participation in the program will be required to access any City-led incentive or financing programs. By 2025, Toronto should transition to **mandatory home energy rating and disclosure** based on the findings from the implementation plan that will be finalized and presented to Council in Q2 2023.

Authority

Currently, Ontario Reg. 506/18: Reporting of Energy Consumption and Water Use requires buildings >100,000 ft^2 to report energy use annually, with buildings >50,000 ft^2 required to report energy use starting in 2023. In the absence of further provincial requirements, the City could review the possibility of developing a bylaw to phase in mandatory reporting, rating and labelling as described above.

Action	Description
2. Establish emissions performance requirements	• Introduce voluntary emissions performance targets for all major building types in Toronto in 2022, progressing over time to net zero by 2050. • Investigate a transition from voluntary compliance in the near-term to mandatory compliance in the medium-term (e.g. 2025).

The Opportunity

Establishing emissions performance targets is an increasingly common way of driving deep emissions reductions in buildings. They use verifiable building energy data to

determine actual building emissions performance rather than relying on modelled performance. Emissions performance targets with firm requirements for compliance offer expanded clarity as to the necessary levels of emissions performance for a particular building sector and directly motivate deep retrofit action where voluntary measures do not. Emissions performance targets allow building owners the flexibility to determine the most cost-effective and appropriate means of improving emissions performance in their buildings.

The City of Toronto has advanced performance standards for new construction through the Toronto Green Standard (TGS), which uses a targets-based approach to drive low emissions building performance in new construction. The TGS is implemented using planning authorities that apply to new development but not to renovations. The City does not have authority to implement advanced performance standards for renovations leaving a gap in Toronto's ability to affect change in homes and buildings across the city.

In keeping with other North American jurisdictions, the City looks to advance energy retrofits in existing buildings through regulation and standards to meet our TransformTO emissions targets. Vancouver, New York City, St Louis, Washington DC, and Washington State have exemplary programs that have successfully transitioned performance targets from voluntary to mandatory compliance to drive the deep retrofits at scale.

It is important to note that cities such as New York and Vancouver have the legal authority to regulate emissions performance in the buildings sector, enabling them to directly implement mandatory emissions performance requirements. **Toronto does not currently have the authority needed to implement mandatory emissions performance targets and will need to engage with the Government of Ontario to be able to pursue this approach.**

The implementation of mandatory building emissions performance targets is essential to meeting the net zero by 2050 goal adopted by the City. As such, the ExB Strategy identifies a number of recommendations for designing emissions performance targets for Toronto's existing buildings, outlined further below. **These recommendations should serve as a starting point for further program design, data analysis, and stakeholder engagement work that will be needed to inform potential mandatory emissions performance targets for Toronto's existing buildings.**

<u>Design Recommendations</u>

Develop **voluntary performance targets** for all building types in Toronto, including single family homes, beginning in 2022. Compliance with voluntary emissions targets should be linked to eligibility for City run incentive and support programs. This will allow the industry and the City to formulate the details of mandatory emissions performance targets and provides lead time for industry to prepare for future, more stringent requirements and mandatory compliance.

In the medium-term (e.g. 2025), transition to **mandatory emissions performance targets** for all buildings >50,000 ft^2, with the potential to apply to smaller building sizes over time. Mandatory emissions performance targets for single family homes and low-

income housing should be carefully considered, in particular as it relates to the potential to impose considerable costs on homeowners and renters, and negatively impact housing affordability. For these types of buildings alternative compliance pathways, such as prescriptive retrofit measures instead of strict emissions performance requirements, and affordability mitigation strategies, such as above guidelines rent increase limits, should be investigated thoroughly.

One approach that has been used to encourage compliance with mandatory performance targets is to impose a fine for non-compliance. For example, New York City levies a fine of $268/tonne (USD) for every tonne a building emits over its targeted emission performance. Other mechanisms to incentivize compliance with mandatory emission performance targets should be investigated, which either could take the form of a reward (e.g. a rebate through a City program for complying with performance targets), or a penalty (e.g. a fine as a result of a non-compliance with performance targets). It is important to note that compliance and enforcement of mandatory performance targets is a considerable undertaking and would create new responsibilities and costs for City administrators. Resourcing and cost implications for the City would be evaluated as part of future detailed program design of mandatory emissions performance targets.

Cities that have set specific emissions targets for buildings and associated fines for non-compliance, such as New York City, have done so using years of actual building data and have committed to updating targets at regular intervals to reflect the latest data available. The equivalent actual building performance data is not yet available for Toronto.

Appendix A however includes preliminary emissions performance targets that have been modelled for each major building type in Toronto using the best data and analysis available at this time, and are the best starting point for voluntary emissions performance targets. **Before transitioning to mandatory emissions performance targets, actual energy and emissions data reported from buildings in Toronto should be used to review and update the modelled targets. Once established, mandatory emissions performance targets should continue to be reviewed and updated at regular intervals, using the latest available data.**

Finally, the modelling conducted for the ExB Strategy indicates that while deep energy and emissions reductions can be achieved on-site, even best in class retrofits cannot eliminate all on-site emissions entirely - buildings will still have some residual energy demand and emissions. Ontario's electricity is not 100% emissions free and most buildings cannot produce enough of their own renewable energy (e.g. solar photovoltaics) to fully offset their remaining energy demand. **Additional measures to achieve net zero emissions should be allowed to count toward compliance with emissions performance targets, including the use of embodied emissions reductions from material selection, and the use of carbon offsets and renewable energy credits.**

Authority

The City continues to explore available authorities and potential changes that may be required from the Government of Ontario for the implementation of mandatory

emissions performance targets. Hence, dialogue with the Province will be required to request necessary changes.

Action	Description
3. Require energy and emissions audits and tune-ups	• Introduce a voluntary program in 2022 to encourage large buildings (>50,000 ft^2) to undertake energy audits or recommissioning exercises, at regular intervals (e.g. every 5 years) or at points of major renovation, and support development of retrofit roadmaps that are aligned with capital plans, and transition to a mandatory program in 2025. • In the near-term, enhance energy audit requirements to include a focus on emissions and resilience measures.

The Opportunity

Energy audits and recommissioning exercises help to pinpoint specific areas of improvement in building systems and operations and encourage a planned approach to retrofits. They identify inefficient equipment and systems and recommend upgrades or operational improvements that can help achieve energy savings, reduce emissions, and improve occupant comfort. Resultant actions from energy audits and recommissioning can yield significant energy savings, as high as 30% where significant measures are adopted, but with an average savings of around 5%.

The actions identified in energy audits and recommissioning reports can be developed into a retrofit roadmap, which creates a long-term plan for the types and sequencing of retrofit actions needed to improve building performance.

When coupled with a requisite to align retrofit roadmaps with long-term capital plans, such a requirement helps to confirm that building owners are aware of what they need to do to meet upcoming emissions performance targets, and have integrated the necessary considerations into capital planning processes to ensure deeper retrofit measures can be properly anticipated and accounted for.

Design Recommendations

Develop a **voluntary energy audit and recommissioning** program, beginning in 2022, that encourages building owners to undertake an American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Level II or equivalent energy audit and report findings to the City. Audit and recommissioning exercises should be made a prerequisite for participation in City-run incentive and support programs. In the near-term, enhanced audit and recommissioning requirements to include a focus on emissions and building resilience, including criteria such as air quality, air tightness testing, thermal resilience, backup power generation, and access to water during power outages, are recommended. Building owners should be encouraged to integrate audit and recommissioning recommendations into a **retrofit roadmap** that outlines the specific pathway to retrofit a building to achieve emissions performance targets over time and integrate into their **long-term capital plans**.

By 2025, the City should transition to a **mandatory energy audit or recommissioning** requirement for large buildings (e.g. >50,000 ft^2) and require integration of energy audit and recommissioning recommended actions into a **retrofit roadmap**, and demonstrate

integration into **long-term capital plans**. Roll-out to smaller building sizes should be considered in the medium-term following evaluation of lessons learned from application to larger buildings.

The City-run retrofit Navigation & Support Services program, Green Will Initiative, and Energy Retrofit Loan program should be leveraged to support building owners in creating retrofit roadmaps, integrating them into capital plans, and supporting implementation of retrofit actions resulting from energy audits and recommissioning.

The detailed data acquired through building energy audits and recommissioning reporting could be leveraged by the City to refine emissions performance targets and improve support program offerings.

Authority

In the absence of existing equivalent mandatory requirements at other levels of government, the City could review the possibility of developing a bylaw to phase-in mandatory building energy and emissions audits and recommissioning, and require building owners to develop retrofit roadmaps that align with capital plans and the net zero emissions by 2050 target.

Action	Description
4. Provide integrated deep retrofit support	• Create a series of City-run programs to support building owners in achieving deep emissions reductions in alignment with newly developed emissions performance targets. • Focus on priority building sectors and owners with limited capacity and greatest need of support.

The Opportunity

Support services from the City can provide building owners with much needed assistance in planning, funding and undertaking deep retrofits. Such services can also help to increase the pace of retrofits and help ensure that retrofits are carried out correctly along with realizing the multiple co-benefits that home and building retrofits can provide.

Incentives (e.g. rebates, grants) help reduce the up-front capital costs of retrofit measures by covering a portion of the total cost of a specific service (e.g. audits) or measure (e.g. equipment). When offered consistently and coupled with competitive financing, incentives can significantly lower the cost barrier associated with deep emissions retrofits. To be effective, incentives often need to cover a substantial portion of retrofit costs. However, the City does not need to fund such incentives on their own since the Government of Canada, for example, has committed to providing incentives for retrofits which the City can leverage to support retrofits in Toronto's buildings.

In addition to funding support, building and home owners often need assistance in managing the complexity of deep retrofit projects. The creation of an integrated **online support platform** where building owners can find the information and services they need to implement deep emissions retrofits can help to centralize information and resources in one easy to navigate place. Such online support platform would provide

home and building owners with access to a knowledgeable customer service agent that can answer the owners' questions and provide a clear starting point for retrofits.

Such online support platforms should in turn be connected to a **retrofit coordination service**, which can help owners to identify their retrofit needs and options, select retrofit packages and contractors, streamline the retrofit process, and verify improvements in performance. Often referred to as "one-stop-shops", these retrofit coordination services remove the burden from owners of managing every step of the building retrofit decision-making process, greatly reducing complexity and even costs.

Design Recommendations

New incentive and support programs should be developed to focus on the single-family home (SFH) and multi-unit residential building (MURB) sectors in the near-term. These sectors represent 60% of all emissions from buildings in Toronto due to their sheer number and their heavy dependence on natural gas for space and hot water heating. Generally speaking, deep emissions reductions are possible in these building sectors through a combination of high performance envelope improvements to reduce energy demand and fuel switching from natural gas to efficient electric equipment, such as heat pumps, for heating and cooling needs.

The single-family home and multi-unit residential building sectors also offer the greatest opportunity for achieving co-benefits of economic development, social equity, health, and resilience. The envelope heavy nature of SFH and MURB retrofits means that these building sectors face some of the highest capital costs and most challenging retrofit businesses cases overall, which can raise housing affordability concerns. Focusing incentives on the SFH and MURB sectors can help offset these high costs, limit the pass through of costs to tenants, and ultimately support making homes and living conditions better for Toronto citizens. At the same time, enclosure upgrades of SFH and MURB provides significant local economic activity, including localized job creation and generating a potentially significant economic return for the investment in these building sectors.

Health co-benefits are also most greatly felt in single family home and multi-unit residential building sectors, as better insulated and airtight walls and windows, improvements to ventilation, and upgraded heating and cooling systems can improve comfort, air quality, and overall living conditions for residents. Benefits to social equity can be additionally realized by focusing support programs on social housing, low-income neighbourhoods, and rental apartment buildings that provide foundational housing for thousands of Torontonians and are in most need of repair and upgrade.

Improved resilience to more extreme weather events can be achieved in the residential sectors, where enhanced envelope performance can increase the time residences are habitable in the event of power outages (e.g. homes stay cooler or warmer for longer even without power). Fuel switching to heat pumps can provide active cooling in homes where before there may have been none, and onsite solar PV generation coupled with battery storage can be configured to provide back-up power, all contributing to more resilient homes for Torontonians.

For these reasons, **an incentive program specifically for the low-income single family home (SFH) and multi-unit residential building (MURB) sectors should be developed leveraging Federal funding sources**. Incentives should be offered to building owners for key equipment replacements (e.g. heat pumps to replace natural gas heating, or new high performance windows) and should be provided in alignment with actual performance improvements realized. Building performance incentives should be tied to the proposed voluntary emissions performance targets, with incentive values increasing as actual emissions performance requirements increase. Participation in City-run incentive programs should be tied to a building owner's participation in the proposed energy and emissions data reporting and disclosure programs outlined in Action #1 above.

In the near-term, incentives to building owners should be delivered by leveraging existing City programs like the *High-Rise Retrofit Improvement Support Program* (Hi-RIS) and the *Home Energy Loan Program* (HELP). **The City should aim to act as an aggregator of available building retrofit incentives from utilities and funding from other levels of government to flow into a one-window incentive program for Toronto**, simplifying the process for homeowners and leveraging external sources of investments.

Building retrofit incentive programs should also encourage no net increases in peak electricity demand to minimize grid impact and improve resilience. A final condition for participation in City-run incentive programs should be the continued commitment from participating building owners to no above guideline rent increases to preserve affordability for residents, which is already conditions in City financing programs such as the High-rise Retrofit Improvement Support program and the Energy Retrofit Loan program.

A **retrofit coordination service** program should build on City service delivery programs that already exist and function in this space, including the City's Green Will Initiative and Navigation & Support Services for institutional, commercial, industrial (ICI) and MURB portfolios, the HELP and BetterHomesTO programs for SFHs, and the High-Rise Retrofit Improvement Support Program (HiRIS) for rental apartment buildings. These existing programs can be enhanced and expanded in the near-term with additional technical staff and marketing presence to provide a greater number of building owners, operators, and property managers' with hands-on professional support to facilitate the complete building retrofit process. In the near-term, a retrofit coordination service program should particularly focus on low-income and priority populations in the SFH and MURB sectors and expand in the medium-term to the small commercial building sector. In the long-term, the retrofit coordination service program could transition from a City run program with broad incentives and subsidized services to a market based pay-for-service program with the potential for the private sector, not for profits, and community-based organizations to take over the primary role of service provider.

A **one-stop online retrofit portal** should be developed where building owners can receive support on basic retrofit information, permitting processes, connection to available programs and incentives, information on reporting and performance requirements, and connection with a Retrofit Coordinator as part of a retrofit coordination service program. The City's existing BetterHomesTO platform will be

leveraged for the SFH sector, while the City's Navigation Support Services program will be leveraged to serve this function for larger buildings including the MURB and small commercial sectors.

Action	Description
5. Expand and enhance retrofit financing	• Expand and enhance the City's existing energy and emissions retrofit financing programs and explore the creation of new mechanisms that support greater access to low-cost financing for a greater number of retrofit projects.

Opportunity

In addition to incentives, financing is one of the most common and important tools with which governments can encourage the accelerated uptake of energy and emissions retrofits. Financing can provide building owners with the up-front funding needed to make significant investment in more complex and costly deep retrofit projects.

There are several **City-run retrofit financing** programs already operating. The *Energy Retrofit Loan (ERL) Program* offers low-interest loans to help owners of buildings in Toronto to improve the energy efficiency of their buildings. The *High-Rise Retrofit Improvement Support Program (Hi-RIS)* provides up to $2 Million in financing with up to 20-year terms at competitive fixed rates to residential apartment buildings. The *Home Energy Loan Program (HELP)* provides homeowners with financing of up to $75,000 and flexible terms to cover the cost of energy and water efficiency upgrades, fuel switching, and renewables.

Both the Hi-RIS and HELP programs leverage the Provincial Local Improvement Charge (LIC) regulation (O.Reg. 596/06) under the City of Toronto Act, whereby the payment obligation of both these loan programs is tied to the property and not the owner, and secured by the City’s statutory priority lien. All of these City-run retrofit financing programs have already received good uptake and have supported a significant number of retrofits across the city. However, to achieve the scale of building retrofits necessary to meet the City’s emissions reduction goals, enhancement and expansion of financing tools will be necessary.

In addition to improving the existing City-run retrofit financing programs above, the City could support the establishment of, or participation in, a Green Bank that is developed by other levels of government to provide financing for emissions reducing retrofit projects.

Green Banks are public-purpose finance institutions designed to facilitate private investment in energy and emissions reduction projects. Green Banks can help raise capital for deep retrofit projects and demonstrate project viability in what is a relatively new market for traditional financiers. In Canada, the Federal Government has leveraged the Canadian Infrastructure Bank (CIB) to provide financing to the building retrofit sector. The CIB could be further built upon to serve many of the functions of a Green Bank and enhance financing tools that support deep emissions reductions across all existing building sectors.

Green Banks can also support retrofit project aggregation, where multiple projects that are too small, scattered or perceived as too high-risk to attract the attention of traditional financial institutions can be aggregated together to create a larger, more consolidated, and more attractive investment, enabling lending at lower rates and more attractive terms.

Credit enhancements (such as loan guarantees, loan loss reserves, or interest rate buy downs) could be used by financing tools offered by other levels of government to help mobilize private capital investment in retrofits by encouraging lenders to provide long-term financing or lower interest rates, lowering the overall cost of capital for retrofit financing, and making financing available to customers who would otherwise not qualify for credit.

Design Recommendations

In the near-term, **enhance existing City financing programs** to support deep retrofit projects that focus on significant emissions reductions and service the broad range of different building types across the city (e.g. commercial, institutional and residential). The City should build on the existing recoverable debt financing mechanism to better support projects that achieve performance thresholds in alignment with the ExB Strategy. The City could also explore opportunities to develop new retrofit financing mechanisms that encourage private sector co-investment and access to third-party financing and also leverages its ability to utilize the Local Improvement Charge mechanism for certain project types where additional security is required.

Any loan program should mitigate risk to lenders and be safeguarded using external underwriting and third-party project verification for larger projects. This loan program should offer streamlined prescriptive pathways for smaller projects, flexibility for larger projects, as well as various options to provide loan security.

Further, the City should also engage the Government of Canada to discuss continued enhancements to retrofit financing through the Canadian Investment Bank (CIB). While the Government of Canada has made significant commitments to providing retrofit financing through the CIB, the City should advocate for further improvements, such as the potential inclusion of credit enhancement tools (e.g. loan guarantees, loan loss reserves, or interest rate buy downs) to make financing terms even more favourable, and to develop specific financing supports for deep retrofit projects that achieve greater than 50% emissions reductions, in alignment with the level of emissions performance needed to achieve net zero emissions by 2050.

Action	Description
6. Support permitting and approvals processes for deep retrofits	• Support efficient navigation of the permitting and approvals process for deep retrofit projects • Leverage permitting as a key intervention point to engage and educate building owners on emissions performance targets and retrofit support resources.

The Opportunity

The permitting structure for renovations is an important component of a sound construction and building sector in Toronto. However, as the complexity of buildings and deep retrofits increase the process can become more challenging for building owners to navigate efficiently, particularly for homeowners. As the number and complexity of retrofit projects are expected to dramatically increase in the future in response to the City's climate change policies, providing greater clarity and support for building owners' in **navigating the permitting process** can help enable higher volumes of projects with greater efficiency.

Building permits can also act as important touchpoints with the building sector to inform designers, contractors, trades, and owners of upcoming requirements, and provide them with the resources necessary to understand how they can achieve them.

Design Recommendations

In the near-term, the creation of an **enhanced permit navigation service** should be investigated to support permit applicants of deep retrofit projects as they become more complex and involve technologies that are less familiar to the building industry. A permit navigation service could be initially introduced for projects accessing City-run retrofit programs or incentives and act as an additional support to building owners. An enhanced permit navigation service should also link this to the City's centralized one-stop online retrofit portal and retrofit coordination service discussed above in Action 4.

Also, existing permitting related to retrofit and renovation should be identified and leveraged as **key education intervention points** for providing home and building owners with information relevant emissions performance requirements and available retrofit support programs.

Action	Description
7. Build awareness and capacity of home and building owners for emissions reduction strategies and supports	• Work with industry actors to increase access to existing education materials and support development of new education materials specific to emerging deep retrofit topics. • Leverage data and leading industry stakeholders and community groups to identify target markets, develop, and disseminate marketing materials on deep retrofit information, tools, and support services.

The Opportunity

Providing home and building owners with the information they need to make wise retrofit investments is key to market transformation. **Consumer education** and **targeted marketing** represent two relatively low-cost pathways to support more and deeper building retrofits. Consumer education refers to providing building owners, managers, occupants, and tenants with the resources and skills they need to make informed decisions and take action on energy efficiency and emissions reductions. Targeted marketing refers to the process of identifying individuals responsible for making decisions affecting building performance (e.g. owners, managers, tenants) and provide them with useful information, products and tools to help them make informed decisions.

Consumer education and targeted marketing can take the form of sharing local case studies and lessons learned amongst peers, encouraging action through friendly competition, and disseminating messages through respected industry actors and trades. Key content includes information on potential strategies to employ in order to reduce emissions, practical experience with new technologies, where to find help or qualified contractors, as well as ways to reduce retrofit costs.

Toronto is home to an innovative and active green building sector whose industry associations and community leaders can be leveraged to develop and disseminate educational and marketing resources to home and building owners.

Design Recommendations

In the near-term, **leverage data resources**, such as existing EnerGuide data for homes and Energy and Water Reporting and Benchmarking (EWRB) building performance data for larger buildings, to identify target markets (e.g. poor performing sectors or neighbourhoods) and to support development of targeted materials that address the particular needs and interests of different audiences.

Collaborate with key industry content creators (e.g. green building advocates, social enterprise partnerships, real estate associations, trades groups) on the development and dissemination of consumer education and targeted marketing materials.

In the near-term, **collaborate with industry stakeholders and content creators** to increase access to existing education materials relevant to key target markets. Collaborations should focus on developing new educational programs and leverage multiple channels for delivery. Over time, education materials should be refined based on updated home and building performance data and stakeholder feedback on needs.

Consumer education and targeted marketing materials should directly connect owners and tenants to available programs and incentives, such as the one-stop online retrofit portal and retrofit Customer Service Agents described in Action #4, at key touchpoints (e.g. seasonally prior to anticipated equipment replacements such as furnaces in the fall and air conditioners in the spring, and at time of home or building renovation or permitting). Education materials should make use of multiple formats (e.g. online, in-person, hard copy) and be targeted at different demographics and for different resident and ownership types (e.g. single family home, condo, tenant, real-estate investment trust).

The City should work with industry and community organizations to profile buildings and homes that have made deep retrofits, via testimonials, green building tours, and workshops. Owners, trades, and tenants should be encouraged to share their first hand experiences directly with their peers.

Action	Description

8. Support workforce development and training	• Support workforce development and training to ensure a strong and sufficiently numbered workforce is ready to meet the new demand for deep emissions retrofits. • Partner with trades unions, training organizations, industry associations to enhance existing trainings and support development of new ones.

The Opportunity

The ability to dramatically improve the energy and emissions performance of existing buildings depends on a workforce that is well-informed and comfortable with new approaches, designs, technologies, and construction methods. While many aspects of deep emissions retrofits can be undertaken using conventional materials and technologies, others will require new and more advanced tools and techniques, which may in turn require specialized skills.

This **need for widespread education and training** extends beyond architects, engineers, contractors and skilled trades, to also include the many individuals and professions involved in selling, designing, constructing, supporting, and maintaining zero emissions buildings, including City staff.

Industry associations are already identifying the **skillsets, resources, training and certification programs** necessary to educate the workforce in deep emissions retrofits and ensure high quality work. For example, the Canada Green Building Council's Workforce 2030 represents a cross-sectoral coalition of employers, educators, and practitioners across the construction ecosystem working to build a low-carbon building workforce via the skills development, talent recruitment, and workplace innovation.

The City can support this work through **collaborating on enhanced and new training programs** and clearly indicating **standardized requirements for certain levels of training** for participation in City retrofit programs. The City can also help facilitate access to these education and training programs for individuals and communities that often experience barriers to these kinds of opportunities.

Design Recommendations

In the near-term, support training delivery agents (e.g. trades unions, trades colleges, industry associations) to **enhance education, training, and certification programs** that support workforce development specifically for deep emissions retrofits.

Work with industry partners to **co-develop and support the launch of standardized training materials and micro-certification programs** based on identified knowledge or performance gaps. New training topics to investigate include:

- Fuel switching, heat pump installation, and energy/heat recovery
- On-site renewable energy systems and battery storage
- High performance envelopes, including airtightness and thermal bridging
- Co-benefits of retrofits to resilience, health, safety, and comfort
- How to reduce embodied emissions and the benefits of natural materials

The City should work with training delivery agents to increase opportunities for on-the-job retrofit training and promote retrofit training programs directly to trades, contractors,

and industry professionals. Retrofit training programs should aim to remove barriers to the participation in training (e.g. geographic location, financial barriers), and identify means of improving access, funding, and other support for marginalized and underrepresented communities.

In the medium-term, micro-certification and certain hours of training could be required for trades to participate in City retrofit programs and incentives, with the potential to transition to requiring building owners to use certified trades for completion of retrofit work as part of compliance with performance targets, in the longer-term.

In the medium-term, the City should work with industry partners to support the development of a **contractor database**, linked to the one-stop retrofit online platform, with a search tool for owners to better connect with qualified, trained, licensed and insured contractors locally.

Action	Description
9. Advocate and partner with other levels of government	• Engage the Government of Ontario and the Government of Canada, government agencies, and relevant regulatory bodies to gain the appropriate support and authorities necessary to implement all recommended actions in the ExB Strategy and to affect change at higher levels of government that will enable net zero emissions by 2050 in Toronto.

<u>The Opportunity</u>

Toronto is an international leader in municipal climate action and the ExB Strategy represents a truly ambitious approach to achieving net zero emissions in Toronto's existing buildings sector. The need to affect change in the comprehensive and far-reaching manner that the City's goal of net zero emissions by 2050 or sooner requires is not matched by the authorities and resources the City currently has at its disposal.

While the City has many avenues to directly support and even require the decarbonization of the existing building sector, the actions identified in the ExB Strategy will require constructive dialogue with the Government of Ontario, Government of Canada, regulatory bodies such as the Ontario Energy Board, and key government agencies such as the Independent Electricity System Operator.

Engagement activities present the opportunity for the City to not only implement change locally to achieve its net zero emissions goal, but an opportunity to bring the most progressive, innovative and data driven strategies to Ontario and Canada more broadly. The City's advocacy is focussed on driving greenhouse gas emission reductions. These efforts have the potential to secure the tools needed to achieve the City's own goals, as well as to help contribute to climate change reduction in other municipalities, regions and businesses and organizations across the province and country. The City can leverage its position as the capital of Ontario while working with other municipalities to galvanize the necessary actions at the federal and provincial levels. Other levels of government should be recognized for their respective climate plans and emissions reduction actions and the City's advocacy should build on the good work already being done across the country.

Design Recommendations

Advocate to the Government of Canada on topics such as:

- Continued commitment to carbon pricing in Ontario via Canada's Greenhouse Gas Pollution Pricing Act
- Continue their commitment to developing Canada's National Model Building Codes, requiring benchmarking and labelling, and to providing additional financial support for retrofits.
- Continued enhancement for deep retrofit financing through the Canadian Infrastructure Bank.
- Creating additional grant programs and tax incentives to improve the business case for deep retrofits with longer paybacks
- Highlight emissions more explicitly through their EnerGuide rating system.
- Support regenerative forestry and agricultural practices that contribute to the widespread availability of low embodied carbon, biogenic materials for the building industry

Advocate to the Government of Ontario on topics such as:

- Amending the City of Toronto Act to provide the City with the regulatory authorities necessary for the City to move forward on some of its ExB Strategy recommendations
- Commitment to the continued decarbonization of the provincial electricity supply
- Continued roll-out of the EWRB to smaller buildings
- Add mandatory disclosure and labelling of EWRB data so that transparent property data is available to the market
- Mandated implementation of the "Green Button" standard by electricity and natural gas utilities to provide customers with electronic access to utility data via the Download My Data (DMD) XML format and the Connect My Data (CMD) Application Programming Interface (API)
- Requirements for utilities to provide direct automated upload of utility data to ENERGY STAR Portfolio Manager using the Portfolio Manager Web Services API
- Create and ease access to grant and/or rebate programs to improve the business case for deep retrofits with longer paybacks for all building types.

Advocate to the Province of Ontario to direct the Ontario Energy Board (OEB) and Independent Electricity System Operator (IESO) and relevant utilities on topics such as:

- Integrating emissions reductions into their decision-making frameworks and mandates
- Rate structure changes that favour electrification and fuel switching away from natural gas (e.g. heat pump rates) that include considerations for low income households (owners and renters).
- Strengthening the capacity of the electrical grid to accommodate the existing buildings sector to fuel switch away from natural gas
- The development of utility mechanisms to support deep retrofits, such as performance-based rebates for improved energy and emission performance

- Enhanced Demand-Side Management (DSM) programs under the IESO Conservation and Demand Management (CDM) that focus on temporal emissions intensity as well as peak energy consumption.

IMPACTS ON EMISSIONS, COSTS AND CO-BENEFITS

This section provides an overview of the results of the emissions, costs, and co-benefit impacts modelling conducted as part of ExB Strategy development.

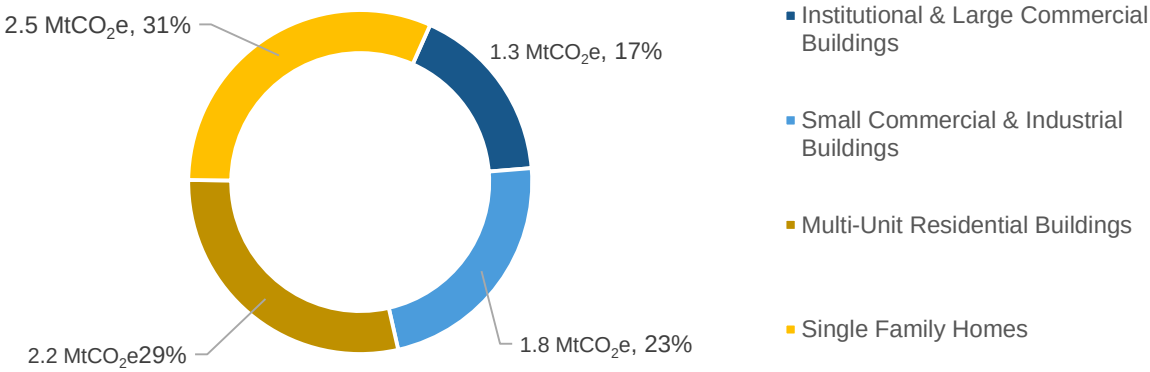
Emissions Impacts

Detailed modelling and analysis was conducted to understand current emissions trends across existing buildings in Toronto, determine the emissions reduction potential of a variety of retrofit packages applied to different building types, and to estimate the total city-wide emissions reduction potential of retrofits across the entirety of Toronto's diverse building stock.

Emissions from Toronto's Buildings

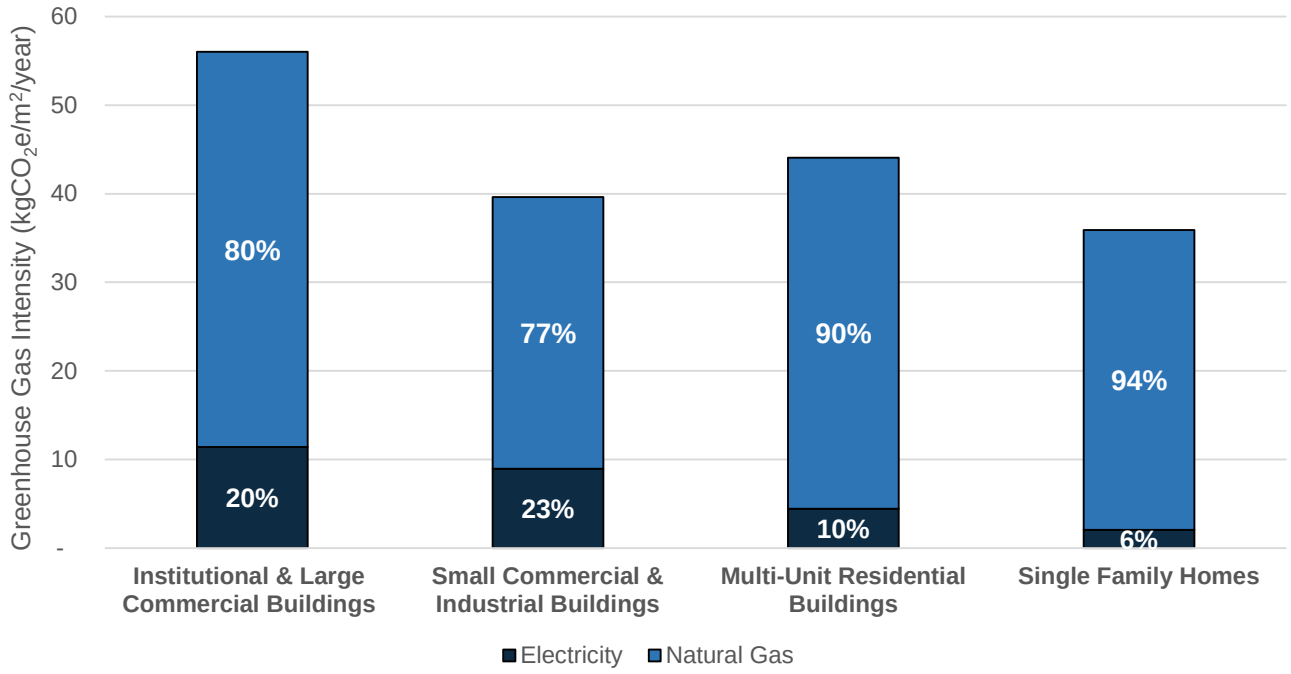
As seen in Figure 1 below, in Toronto 60% of building emissions come from the residential sector, and are roughly equally divided between multi-unit residential buildings (MURBs) (29%) and single family-homes (SFHs) (31%). The remaining 40% of emissions are derived from the institutional, commercial, and industrial (ICI) sector, which is divided into large commercial and institutional buildings (17%) and smaller commercial and industrial buildings (23%).

Figure 1: Greenhouse gas (GHG) emissions breakdown by building sector



The majority of emissions from Toronto's buildings are a result of energy use for heating, cooling, ventilation, and plug loads. For Toronto's buildings these activities make use of two primary sources of energy, electricity and natural gas. In Ontario, the combustion of natural gas produces nearly six times the emissions of electricity from the grid. Figure 2 below shows how building emissions from natural gas use is of primary importance for city-wide emissions reductions. Emissions from electricity play a lesser role, but remain a prominent source of emissions in the ICI sector.

Figure 2: Annual greenhouse gas (GHG) emissions intensity by building sector and energy source



Importantly, emissions analysis of building sectors reveals that **two types of multi-unit residential buildings (i.e. apartment towers c. 1960's and condos c. 1990's) account for 25% of all existing building emissions in Toronto, making this a priority sector to focus on.**

Retrofit Impacts on Emissions

Different retrofit packages (i.e. a number of multiple individual retrofit measures that together serve to improve emissions performance) were modelled to determine the emissions reduction potential of retrofits across Toronto's building stock.

Modelling of different deep retrofit packages across Toronto's buildings reveals that on average city-wide emissions reductions of over 80% are possible from on-site retrofit activities alone. However, it is important to note that **even the best in-class retrofit packages that are technically and financially feasible will still not achieve complete net zero emissions across the entire building stock.** While some buildings may be able to reach net zero emissions on-site most will still have some amount of residual energy use and associated emissions. Therefore, it is recommended that additional measures be investigated to bridge this gap to net zero, namely; allowing demonstrated emissions reductions in embodied emissions (discussed below) to count toward a building's emissions reductions, allowing carbon offsets, renewable energy credits, and long-term power purchase agreements for a portion of overall emissions reductions as well.

Embodied Emissions

Reference to GHG emissions from buildings typically refers to 'operational' emissions, or emissions that result from using energy (e.g. natural gas and electricity) within a

building as part of its regular operation. Another important source of emissions to account for in truly net zero emissions buildings are the 'embodied' emissions associated with the materials used in construction and renovation work. Embodied emissions are generated from creating the building materials or equipment used (i.e. from mining raw materials, materials processing, transportation, manufacturing), from the construction process (i.e. blowing agents in spray foam insulation installation, emissions from equipment used on-site), and during building end of life (i.e. demolition and disposal). Embodied emissions reductions can be achieved by selecting alternative, bio-based materials (e.g. wood siding, cellulose insulation) with carbon storing benefits (i.e. materials that absorb more GHG emissions as they grow than is emitted in their manufacturing, use, and disposal) in place of conventional materials. Details on the embodied emissions analysis conducted as part of the ExB Strategy can be found in Appendix A.

Other key learnings from retrofit package analysis include:

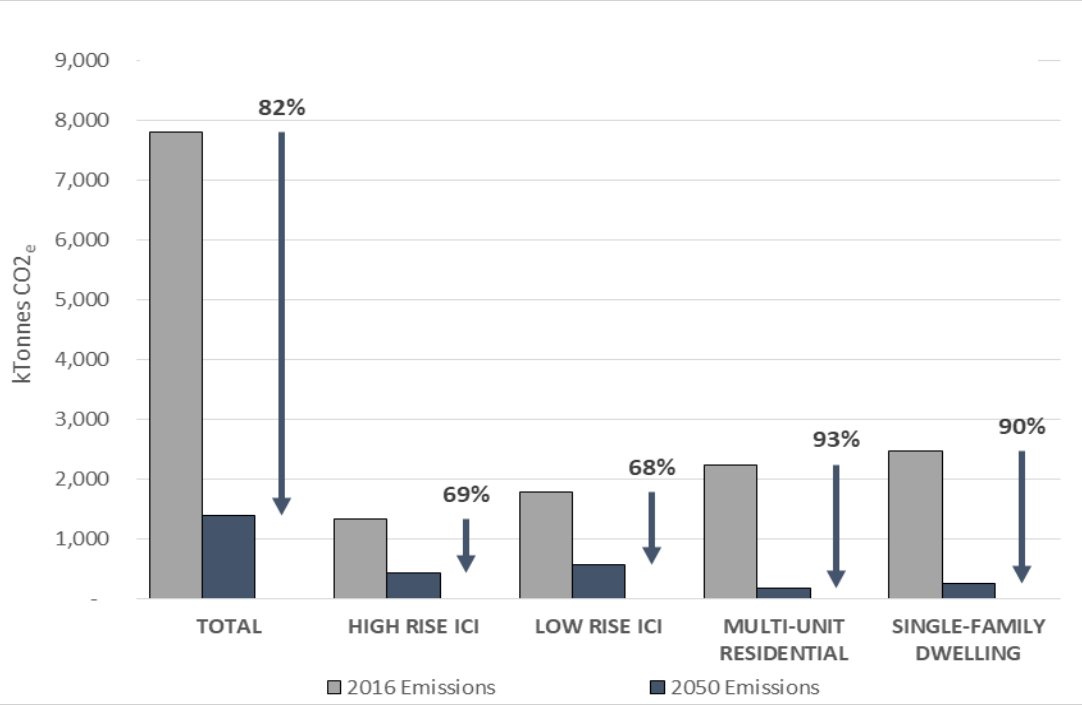
- **Electrification of space and water heating:** High performance envelope retrofits and HVAC systems can provide significant emissions reductions, however, electrification of space and water heating systems is essential to achieve the deepest emissions reductions possible and represents the single most impactful retrofit measure.
- **Emissions-free electricity grid:** An emissions-free electricity grid is critical to achieving net zero buildings. Without a clean grid the benefits of electrification are negated and Toronto's emissions targets are not achievable.
- **Reduce overall demand for energy:** Electrification of heating systems must occur in tandem with retrofit actions that reduce overall demand for energy, specifically in space heating (i.e. envelope upgrades), to mitigate energy cost increases and negative impacts on the distribution grid.
- **Envelope upgrades:** While significant envelope upgrades are critical to achieving the greatest possible emissions reductions even moderate levels of envelope upgrades are sufficient to achieve deep retrofit performance in many cases.
- **Envelope upgrades co-benefits:** There are significant co-benefits of envelope upgrades beyond emissions reductions alone, specifically their impact on occupant health and comfort, their local economic impacts, and resilience improvements.
- **Strong economic return of Solar Photovoltaic (PV):** Solar PV has a material, but not significant, impact on emissions. However, solar PV provides strong economic returns to most retrofit packages modelled and plays an important role in the overall retrofit business case.

<u>Emissions Reduction Potential by Building Sector</u>

Several building sector specific insights are drawn from the analysis of different retrofit packages. The residential sectors, SFHs and MURBs, show the greatest emissions reductions potential. The most robust retrofit packages have the potential to achieve over 90% emissions reductions in SFHs and over 80% reductions in MURBs. In comparison, modelling results indicate large (i.e. high-rise) and small (i.e. low-rise) ICI buildings can achieve 60-70% emissions reductions with the most robust retrofit packages (See Figure 3 below). **While the potential for emissions reductions in**

residential buildings are considerable, there is risk of increasing costs for the tenants and residents of these buildings if retrofit costs are passed on to them.

Figure 3: Modelled potential GHG emissions reductions by 2050 by building sector



The significant emissions reductions potential in the residential sector largely resides in the space and hot water heating loads that can be reduced with envelope upgrades and then decarbonized through efficient electrification (e.g. heat pump technologies). In contrast, a much larger portion of institutional and commercial emissions derive from electricity demand for plug loads, lighting, and large HVAC systems that are more difficult to reduce. Space heating and hot water demand is much lower in commercial and institutional buildings which somewhat limits the total impact of fuel switching in this sector. **These findings suggest that MURBs and SFHs should be targeted as priority sectors for deep retrofits. As part of this prioritization effort, the impact of retrofit costs on tenants and residents must be further studied and considered in order to ensure undue affordability impacts are mitigated.**

As part of analyzing different approaches to city-wide emissions reductions actions, a **Recommended Scenario** for retrofit action across Toronto was developed based on the nine core recommended actions in the ExB Strategy, which balances the greatest possible emissions reductions in buildings with economic feasibility and the simultaneous achievement of positive co-benefit impacts. The Recommended Scenario for deep retrofit actions was compared against three other scenarios: (i) a **Business-as-Planned (BAP) Scenario** that reflects the actions that are already in place or planned for the City of Toronto, (ii) a **Least Cost (Least-Capital) Scenario** that prioritizes lowest cost approaches to emissions reductions, and (iii) an **Aggressive Scenario** that accelerates the speed of sector transformation (see Figure 4 below).

Figure 4: GHG reductions Recommended Scenario compared to Business-as-Planned, Least Cost, and Aggressive Scenarios from 2020 to 2050

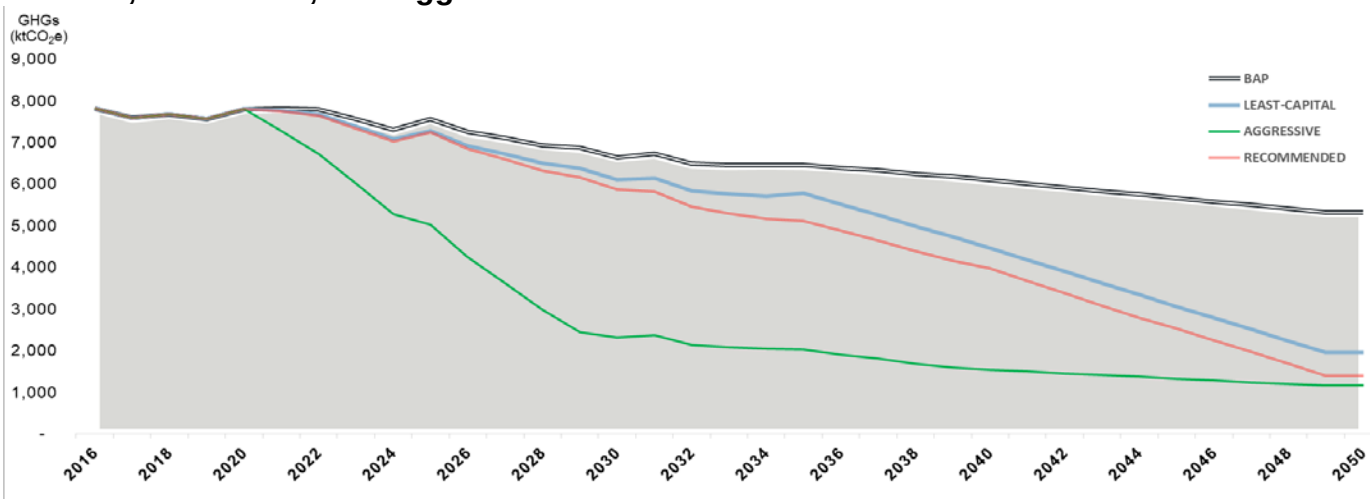


Figure 4 shows that from 2020 to 2050, **the Recommended Scenario achieves a reduction in annual emissions from existing buildings of over 80%, compared to only a 34% reduction achieved by the Business-as-Planned (BAP) Scenario**. The Aggressive Scenario achieves very similar annual emissions reductions as the Recommended Scenario by 2050 but gets there much faster (achieving greater total accumulated emissions reductions over the 30 year period), however this accelerated pace involves significantly increased overall cost. The Least Cost Scenario focuses heavily on the lowest cost emissions reduction interventions (i.e. fuel switching and minimal envelope improvements) but creates considerable challenges for the electricity grid and achieves the least co-benefits impacts of all. More detail on these four scenarios can be found in Appendix A.

Cost Impacts of Recommended Scenario on Building Owners

The incremental **capital cost** increase between the Business-as-Planned and Recommended Scenario is at least 30%, and as high as 270%, depending on the building sector. This is due to the significant investment in enclosure upgrades across most building sectors and retrofit packages. **The Recommended Scenario represents a significant increase in capital costs over the Business-as-Planned Scenario, especially for the large ICI, and residential building sectors.**

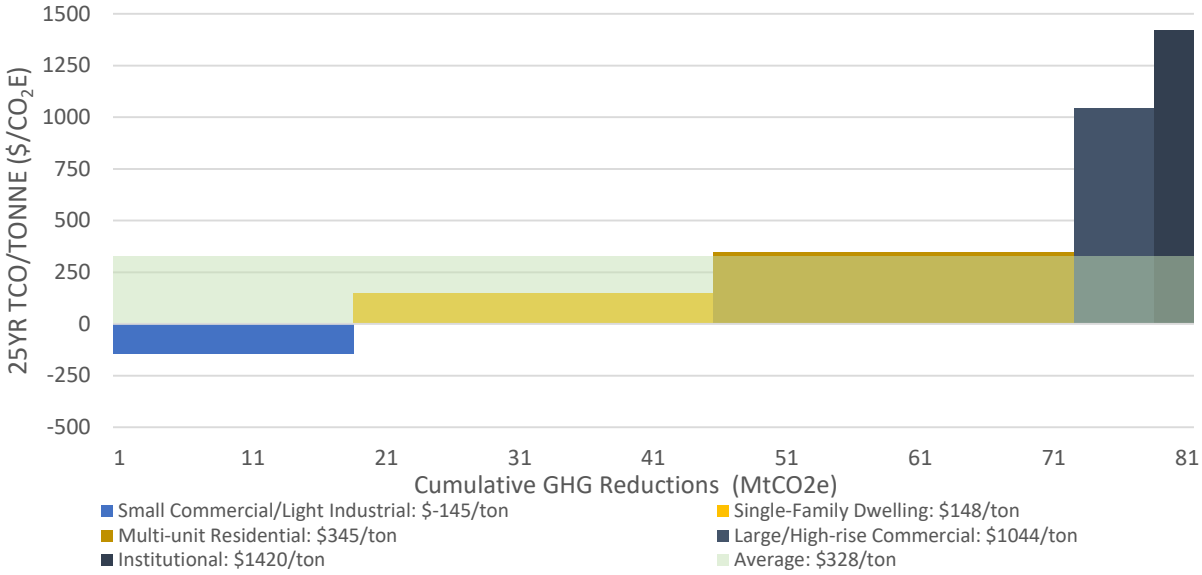
A simple payback analysis shows that the energy and carbon cost savings from implementing the different retrofit scenarios modelled do not offset the incremental capital cost of achieving those savings, even with a carbon tax as high as $150/tonne between now and 2050.

Across all building sectors analyzed, the **net cost of energy does not increase** in the Recommended Scenario, as the retrofit packages modelled all use high efficiency cold climate heat pumps, coupled with at least basic upgrades for other equipment and systems, reducing overall energy demand. While this outcome helps to lower the risk of exacerbating any existing struggles for households or communities to heat and cool their homes, it is possible that landlords and property owners wishing to recoup the cost of capital investments may drive up rents. **Any programs or policies introduced should include measures that specifically mitigate the potential for deep retrofits**

to negatively impact housing affordability. This may include utilizing existing policy tools such as Above Guideline Rent Increase restrictions, which are conditions of City financing programs such as the High-rise Retrofit Improvement Support program and the Energy Retrofit Loan program.

Life cycle cost analysis for different retrofit packages was conducted and can be reflected at the city-scale by a metric called total cost of ownership (TCO) (see Figure 5 below). Total cost of ownership captures the various cash flows paid (or saved) by the owner over a 25-year study period, including regular maintenance and replacement of materials and equipment, and any residual value of capital at the end of the study period.

Figure 5: Recommended Scenario 25 Year Total Cost of Ownership (TCO) by Building Sector



As shown in Figure 5, the average total cost of ownership per tonne of GHG emissions for the Recommended Scenario is $328/tonne, akin to the current Government of Canada's Greening Government Strategy shadow pricing of $300/tonne for federal building retrofits. This suggests that the total cost to building owners of implementing retrofit actions that would achieve deep emissions reductions in the Recommended Scenario are generally in line with federal estimates on the cost of emissions reductions from retrofitting their own federal buildings.

The economic analysis in the ExB Strategy provides certain sector specific insights as well. For example, **the most robust retrofit packages are projected to have the least economic burden on the small commercial buildings sector,** with a projected net positive total cost of ownership over a 25 year building life cycle, the only building sector to achieve a positive business case. Analysis suggest low economic burden for small commercial buildings to implement retrofits is a result of:

- the relatively modest level of enclosure upgrades necessary to achieve deep emissions reductions (enclosure upgrades are modelled to be the most capital cost intensive set of retrofit measures);
- significant impact of comparatively low cost fuel switching; and

- relatively large rooftop surface area available to maximize solar PV and the associated economic benefits.

This suggests that moderate financial support, and support for building owners in navigating the retrofit process, may be sufficient to stimulate retrofit action.

In contrast, **MURBs and SFHs have challenging retrofit business cases** and overall net negative total cost of ownership over a 25 year building life cycle, largely due to the necessity for more significant investment in costly enclosure upgrades to adequately reduce heating demand to a degree that makes fuel switching feasible.

Large ICI buildings face the greatest retrofit business case challenges due to the scale and complexity of their mechanical systems and often energy intensive operations that can be difficult to reduce (e.g. plug loads, equipment, and longer hours of operation).

Co-Benefit Impacts
The impacts of deep retrofits on health, local economic development, social equity, and resilience were analyzed to understand how these co-benefits could be best supported in the design and implementation of the recommended actions in the ExB Strategy.

Health
Investment in deeper retrofits can yield positive outcomes for the overall quality of space, and indoor environmental quality.

For example, envelope upgrades, as a part of deep retrofit implementation, in residential buildings can lower the amount of energy needed to maintain suitable indoor temperatures and correspond to improved comfort and the ability to maintain liveable indoor temperatures under conditions of power outage. The installation of heat pumps, as part of fuel switching from natural gas to lower emission electricity, overlaps with the goal of heat wave preparedness, since installing heat pumps also provides a cooling system to buildings that do not already have one. As more severe weather events are projected to increase with a warming climate, **the ability to provide livable indoor spaces under conditions of power outage or extreme weather will be of increasing value, especially in residential buildings.**

In addition, **envelope upgrades and properly sized and applied HVAC systems in residential buildings also improve ventilation and indoor air quality for residents.** In general, the deep retrofit of buildings can yield considerable improvement in the function and quality of a person's home.

Resilience
Investment in deeper retrofits can improve resilience to the impacts of climate change within buildings and across city infrastructure.

At a macro scale, energy demand reduction is also an important measure to reduce the strain on the city-wide electricity grid. The use of electrification as the principal means of fuel switching in the buildings sector risks substantially increasing electricity demand, especially at peak periods, if demand reduction is not adequately addressed. High level

analysis of the energy demand impacts of city-wide building retrofits indicates that the Recommended Scenario can substantially mitigate overall energy demand increase through retrofit actions that reduce energy loads (see Figure 6 below). **Energy demand reduction should be a requirement of City-run financing and incentive programs offered to building owners under-going fuel switching to support overall electricity grid resilience.**

Figure 6: Recommended Scenario modelled peak demand from existing buildings city-wide

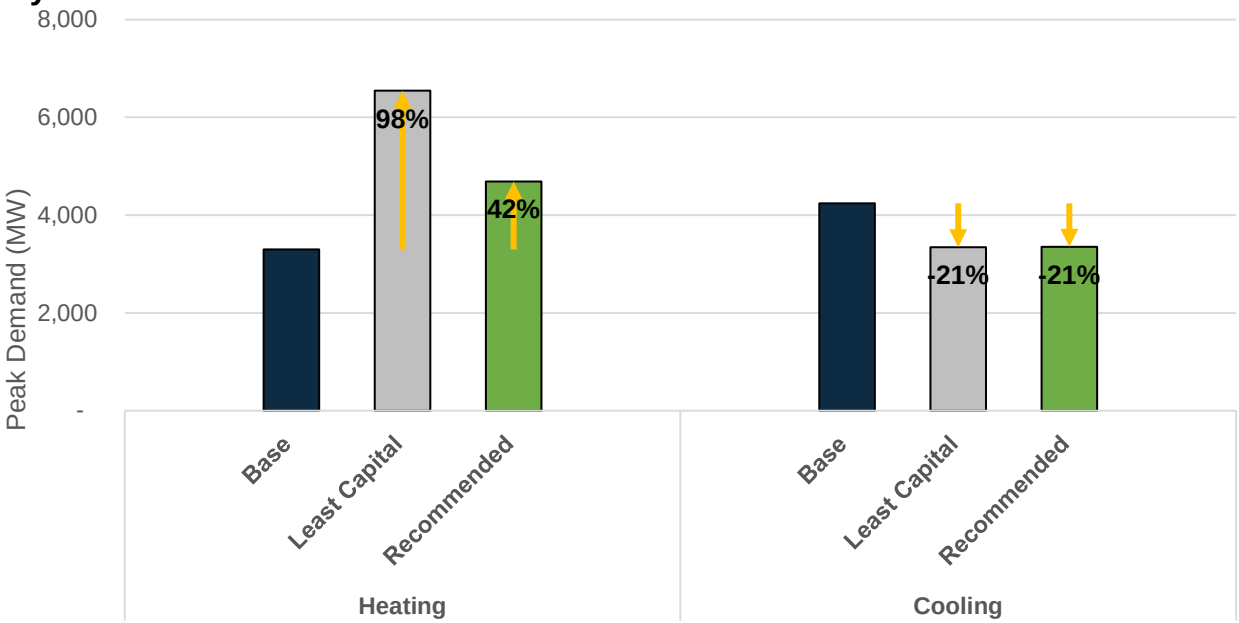


Figure 6 shows only a modest projected increase in overall electricity grid demand when comparing the estimated heating and cooling energy demand in the Recommended Scenario to the Business-as-Planned Scenario (i.e. Base). Of note is the switch from a summer peak to a winter peak for energy demand in buildings, which is a result of the electrification of space heating in the Recommended Scenario and the corresponding increase in electricity demand in the winter months. Figure 6 also shows the dramatic increase in overall electricity grid demand under the Least Cost Scenario (i.e. Least Capital), due to the reliance on fuel switching from natural gas to electricity without corresponding investment in envelope improvements to reduce overall energy demand.

Local Economic Impacts

While the total cost of implementing the recommended retrofit actions across Toronto's buildings is a significant investment, the accumulated macro-economic impacts at the city-wide scale create considerable capital investment and job creation opportunities. **The Recommended Scenario represents an increase of over $140 billion in investment, over 420 million in new job-hours, and 7,000 new full time jobs in local construction, energy services, and supportive work, compared to the Business-as Planned Scenario (see Table 6 below).** These job creation figures indicate a significant training effort will be necessary, since skilled trades are already understood to be in short supply in Toronto, representing further local economic development opportunity.

Table 6: Recommended Scenario modelled economic impacts 2020-2050

Scenario	Business-as-Planned	Recommended
Overall Economic Activity	$161 Billion	$302 Billion
Average Annual Investment	$5.4 Billion	$10 Billion
Direct, retrofit related Job-Hours	665 million job-hours	1,087 million job-hours
Approximate number of direct, full-time jobs created by the work	11,100	18,100

Social Equity

Many of the local economic impacts of building retrofits described above actively support labour opportunities in priority neighbourhoods (such as Neighbourhood Improvement Areas). Furthermore, a focus on retrofitting social housing, residential homes and rental buildings in targeted neighbourhoods can help ensure the benefits of healthier and more comfortable homes are realized by residents most in need. At the same time it is important to recognize the very real potential for the cost of net zero building retrofits to exacerbate housing affordability for owners and renters. Implementation of the ExB Strategy will need to carefully consider the balance between retrofitting residential buildings to the highest standards possible and reducing the financial burden on tenants and residents, especially those in low-income groups.

IMPLEMENTATION PLAN AND NEXT STEPS

The nine key ExB Strategy recommendations outlined earlier are presented as a comprehensive strategy that is to be taken together as a whole with the individual components highly inter-dependent and complimentary. Implementation of multiple actions simultaneously will be necessary with opportunity for prioritization in the near-term. In particular, it will be critical to implement actions that enable access to quality building data at the earliest possibility so other actions heavily reliant on actual data (i.e. emissions performance targets) can be successfully planned and implemented. Enhanced funding and support programs must also be developed and implemented prior to mandatory emissions performance targets so that building owners are motivated and supported in achieving compliance. Actions related to education, awareness and training must also be implemented early on to support informed retrofit decision making and a skilled workforce to meet increased demand for services as performance targets are phased in over time.

The ExB Strategy recommends an implementation approach of first introducing voluntary programs and policies in the near-term, followed by a transition to mandatory requirements in the medium to long-term. Lessons learned from the operation of voluntary programs and policies will be leveraged to inform the detailed design of mandatory programs and policies. Detailed discussions with partner City Divisions and further stakeholder engagement will be conducted to inform the specific design details and implementation plans for voluntary actions in the near-term and subsequent mandatory requirements in the medium-term. Table 7 below presents a potential timeline for phasing-in requirements as recommended in the ExB Strategy.

Table 7: Potential timeline for phased-in requirements

	Near-Term (2022-2024)	Medium-Term (2025-2029)	Long-Term (2030+)
1. Data Reporting, Disclosure, and Labelling			
All Buildings >50,000 f2	Voluntary	Mandatory	
All Buildings >25,000 f2	Voluntary	Mandatory	
All Buildings	Voluntary		
Single Family (HERD)	Voluntary	Mandatory	
2. Performance Targets			
All Buildings >50,000 f2	Voluntary	Mandatory	
All Buildings >25,000 f2	Voluntary		Mandatory
All Buildings	Voluntary		Mandatory
Single Family	Voluntary		
3. Audits, Recommissioning, Retrofit Roadmaps			
All Buildings >50,000 f2	Voluntary	Mandatory	
All Buildings >25,000 f2	Voluntary	Mandatory	
All Buildings	Voluntary		Mandatory

Regarding mandatory requirements, it is particularly important to note the recommendation to introduce mandatory emissions performance targets goes beyond the City's existing authorities and jurisdiction to implement. While all of the actions and policies proposed in the ExB Strategy are important to effect the necessary market transformation to achieve net zero emissions in existing buildings, none of the actions will be successful in meeting the City's targets without clear authority on the part of the City to require performance improvements in existing buildings. On their own, building industry capacity, educating homeowners, or even providing financing and incentives are not enough to shift the market to a state where net zero emissions buildings are the norm. One of the keys to successful implementation of the ExB Strategy relies on the City's ability to clarify its authority regarding the regulation of existing building emissions and to engage the Government of Ontario in the near-term on this topic.

It is also important to note that compliance and enforcement of mandatory requirements, such as mandatory performance targets, is a considerable undertaking and would result in new responsibilities and costs for City administrators. Resourcing and cost implications for the City would be evaluated as part of future detailed program design of mandatory performance requirements.

Resource and financial implications associated with the implementation of the near-term actions outlined in the previous section will be included in future budget submissions, beginning in 2022. Financial impacts beginning in 2022 will also be included in the TransformTO acceleration report of the Deputy City Manager, Corporate Services, which will be presented to Council in Q3 2021.

CONCLUSIONS

Achieving emissions reductions of over 80% across Toronto's existing buildings is possible by 2050 through deep retrofits, and tools such as renewable energy credits,

carbon offsets, and embodied emissions actions can help close the remaining gap to net zero.

To achieve these emissions reductions, ExB Strategy modelling indicates that over $300 Billion will need to be co-invested in building retrofits between 2020 and 2050 **by all levels of government and the private sector**, which is $140 Billion more than business-as-usual levels of investment. Without support these costs would be borne solely by building owners and would likely be passed down to tenants in many cases. The City should seek out opportunities to coordinate investment from other levels of government to provide targeted funding for a portion of deep retrofit actions, and co-deliver recommended actions in the ExB Strategy, to support building owners in addressing the costs of deep retrofits and to stimulate transformative action across the existing buildings sector.

Analysis indicates that fuel switching from natural gas to electric systems and a clean electricity grid are the two most impactful technical requirements toward achieving net zero emissions. However, investment in robust building envelope upgrades are also critical to achieve co-benefits such as improved comfort, health and resilience in residential buildings, minimizing peak demand and strain on the electricity grid, and create significant opportunity for local economic investment and job creation.

The residential buildings sector should be a priority focus as the emissions reductions potential and co-benefit potential from deep retrofits is greatest here. Within the residential sector careful consideration must also be given to the potential for retrofits costs to be passed down from building owners to residents, which can result in negative impacts on housing affordability. The development of strategies that mitigate negative impacts on affordability, and for equity-deserving groups in particular, will be a critical aspect of ExB Strategy implementation.

The recommended actions in the ExB Strategy will require careful consideration and continued dialogue with key industry members and home and business owners as the City moves forward with implementation planning. Successful implementation of the ExB Strategy will put Toronto on track to achieving its building sector and city-wide emissions reduction goals, and to becoming a leader in climate action in Canada.

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SIGNATURE

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ATTACHMENTS

Appendix A – Net Zero Existing Buildings Strategy
Appendix B – Impact Modelling and Assessment Technical