Appendix F: Project Overviews

A total of 20 projects have been identified over the next five years (2020-2025) to accelerate action and investment towards achieving the 100% scenario. They are:

Table 1: List of Energy Evolution Projects

Sector	Project
Land Use and Growth Management	• Integration of energy and climate mitigation policies into the new Official Plan and supporting master plans (pg. 7)
Buildings (New and Existing)	• Residential Building Retrofit Accelerator Program (pg. 12) • Commercial Building Retrofit Accelerator Program (pg. 16) • Building Retrofits through Local Improvement Charge Program (pg. 21) • Energy Community Improvement Plans (pg. 25) • Community Building Heating Strategy (pg. 28) • Municipal Building Renewal and Retrofit Program (pg. 32) • Update Municipal Green Building Policy (pg. 37) • High-Performance Development Standard (pg. 40)
Transportation	• Personal Vehicles Electrification Strategy (pg. 45) • Zero Emissions Commercial Vehicles Strategy (pg. 49) • Municipal Green Fleet Plan Update (pg. 53) • Alternative Energy Sources for Transit Project (pg. 56) • Transportation Mode Shift (pg. 59)
Waste and Renewable Natural Gas	• Organics Resource Recovery Strategy (pg. 65) • Renewable Natural Gas Strategy (pg. 72)
Electricity	• Electricity Resource Strategy (pg. 78)
Enablers	• Climate Ambassadors Network (pg. 85) • Climate Change Education and Outreach Program (pg. 88) • Fund the Evolution (pg. 91)

All proposed projects require further development and will be contingent on future Standing Committee and Council approval as well as future staff and budget (capital and operating). To achieve the GHG reductions required in the 100% scenario, some projects may evaluate a range of options beyond what's been identified in the strategy prior to going to Standing Committee and Council. Where applicable, projects will go through the

standard City project management process. Additionally, realizing this action and investment is not without risks. These risks may include:

- Insufficient financial support from different levels of government and the private sector to meet the budgetary and staffing needs of the Action and Investment Plan and beyond;
- Higher capital and operating costs, as well as lower than expected saving and revenues, beyond what's currently estimated for project implementation and municipal operations;
- Regulatory barriers and compliance issues that impede the municipality from action and innovation, either by impeding the municipality directly through its own operations or impeding how the municipality can enact change in the community;
- Lack of uptake or buy-in from residents, businesses, industry or the municipality that impacts the viability of a new program or new standard;
- Diverging interpretations between stakeholders on how best to achieve the 100% scenario;
- Competing Council priorities or processes associated with other projects across the corporation;
- Competing departmental priorities including current operational mandates of impacted services, and how their mandates will need to change in order to work to achieve the emissions reductions in Energy Evolution;
- Lack of alignment between what the Energy Evolution model calls for and recommendations that come forward for plans and strategies that directly relate to Energy Evolution. Note that although it is expected that the range of options evaluated will include one or more scenarios that achieve the GHG reductions required in the 100% scenario, those scenario(s) may not ultimately be recommended;
- Aggressive implementation timelines which may not account for typical City processes including capital budget approval, Long-Range Financial Plan, planning, consultation, approvals, design, construction, and commissioning or account for provincial or federal approval processes that are out of the City's control;
- Changes in behavior, policy, and best practices related to COVID-19.

Additionally, at the time of the writing of the strategy, multiple City plans and strategies were in the process of being developed that directly relate to Energy Evolution including the new Official Plan, the Transportation Master Plan, the Solid Waste Master Plan, the

Alternative Energy Transit Program, and the Municipal Green Fleet Plan. It is understood that these plans will complete their own options analysis to achieve each respective plan's goals and targets and that the outcomes may differ than what has been identified in the strategy. It is expected that the range of options evaluated will include one or more scenarios that achieve the GHG reductions required in the 100% scenario, although those scenario(s) may not ultimately be recommended.

Appendix G: Summary of Energy Evolution Projects (2020-2025) provides a high-level summary of these projects; this document provides further details as to what each project could entail. Twenty project overviews were created to provide further guidance on each project (refer to Table 1 for the location of each project overview within this document). Specifically, each project overview includes the following:

Section	Description
Project:	The title of the project
Standing Committee:	Which Standing Committee the project is anticipated to report to. Standing Committees include: • Agricultural and Rural Affairs Committee (ARAC) • Finance and Economic Development Committee (FEDCO) • Planning Committee (PC) • Standing Committee on Environmental Protection, Water, and Waste Management (SCEPWWM) • Transit Commission (Transit) • Transportation Committee (TC)
Description:	A brief description of what the scope of the project will include.
Co-Benefits:	Identifies anticipated benefits of the project other than energy and emission reductions.
Risks:	Identifies anticipated challenges and barriers to the project that may impede the success of the project.
Advocacy[1]:	Identifies preliminary advocacy topics to be explored and further topics may be identified as the project is developed. The process, details, and timing for each topic will be determined on a case by case basis, as well as the lead as the municipality is not always best positioned to do so.

[1] In January 2020, Council delegated authority to the Climate Change Council Sponsors Group to provide the Mayor with a list of priority areas and activities to advocate with the provincial and federal governments on program funding, co-delivery opportunities and related policy and regulatory supports necessary to implement the Climate Change Master Plan priority projects, as appropriate.

Section	Description
	A summary of preliminary advocacy topics to be explored within Energy Evolution projects has been provided at the end of this document.
Minimum results required to meet the 100% scenario:	Identifies what the energy and emissions model projects is required to achieve the long-term target to reduce emissions 100% by 2050 in Ottawa. Further options may be evaluated under the project to meet the scale and scope of action required.
Key City Department(s):	Identifies the anticipated City project lead and supporting City departments. City departments include: • Finance Services (FS) • Innovative Client Services (ICS) • Planning, Infrastructure and Economic Development (PIED) • Public Works and Environmental Services (PWES) • Recreation, Cultural, and Facility Services (RCFS) • Transportation Services (TS)
Key Community Partners:	Identifies the anticipated key community partners that may lead, collaborate and/or provide subject matter expertise on the project. Community partners include, but are not limited to: • Federal and provincial governments • Utilities • Developers • Businesses • Non-profit organizations • Advocacy groups
Estimated Project Milestones:	Identifies the key project milestones to be achieved over the next five years (2020-2025). Note: Dates associated with the project milestones are estimates based on the best information available at the time. Milestones and associated dates are subject to change as projects evolve and in relation to other corporate priorities.
Resources:	Identifies whether any budget or staffing resources are required for this project to be successful, either for the municipality or for the community.
Delivery Mechanism:	Identifies the financial tools available to deliver the project.

Section	Description
Projected Financial Profile:	Identifies the following to create an estimated financial investment profile until 2094: • *Principal and Interest*: Cumulative capital contributions required to cover the capital needs of the fund plus interest • *Savings:* Annual operational cost reductions resulting from the selected actions • *Net Return:* The difference between the costs (capital repayment plus interest and operational costs) and revenues generated plus operational savings
Projected GHG Emissions Reductions:	Identifies the estimated annual reductions in greenhouse gas emissions to 2050.

Sector: Land Use

Project: Integration of energy and climate mitigation policies in the new Official Plan and supporting master plans	**Standing Committee**: Joint PC and ARAC
Description:	A new Official Plan for Ottawa is currently underway, to be completed in 2021. Changes to the Planning Act exempt new Official Plans from review for 10 years, which will provide the City with a stable monitoring period to evaluate the effectiveness of new land use policies. The planning horizon for the new Official Plan is to 2046, which is a 25-year horizon. Energy consumption plays an important role in many city building priorities, including the supply of roads and sewers, new development and the conservation and protection of the natural environment. Complete and compact communities consume less energy per capita for housing and transportation. The new Official Plan will focus the majority of growth through intensification with a gradual increase in the intensification targets over the 25-year planning horizon. Using land and energy more efficiently will enable the city to become environmentally, socially and economically sustainable. Expansion areas will make the most efficient use of existing infrastructure and public services, consistent with Provincial Policy Statements. The Official Plan provides a vision for the future growth of the city and a policy framework to guide its physical development, with an aim for Ottawa to grow to be the most liveable mid-sized city in North America. The two largest contributors to GHG emissions are buildings and transportation in Ottawa. The City must implement a model of urbanization that minimizes the need to travel, lessens the reliance on personal vehicles and advances built forms that are energy efficient. The preferred growth management strategy for the new Official Plan has been entered into the Energy Evolution model. Model actions will be used to guide a policy framework that addresses climate and energy resiliency priorities. Using the authority granted to the municipality under the *Planning Act*, the following implementation measures can be carried out to achieve targets: • Higher rates of intensification and a compact built form with mixed land uses • Applying a 15-minute neighbourhood concept to support intensification • Energy and greenhouse gas (GHG) emission considerations as part of the approval of new communities within expansion areas • Urban design requirements that include energy performance as part of Site Plan Control approvals

	• Safe and connected pedestrian and cycling networks • Ongoing improvements to transit service • Community Improvement Plans to support deep energy retrofits for existing buildings The Official Plan will also inform the supporting master plans including Transportation, Infrastructure, and Solid Waste. 1. Transportation Master Plan (TMP) The TMP update is expected to be completed in the fall of 2023. Growth through intensification supports the goal that the majority of mode share targets be achieved through sustainable modes by 2046. Transportation networks will include measures that reflect impacts on emissions. Ongoing improvements to transit service will underpin the significant mode share required by the Official Plan and Climate Change Master Plan. 2. Infrastructure Master Plan The Infrastructure Master Plan will focus primarily on climate vulnerability assessment and adaptation. However, greater intensification is likely to reduce energy requirements as a result of reduced wastewater and/or water pumping requirements and limiting the expansion of infrastructure networks. 3. Solid Waste Master Plan Baseline GHG emissions from the City's current waste management system will be undertaken, including GHG emissions associated with collection, processing and disposal. A review of progressive practices in solid waste management across Canada will be carried out, including emerging and innovative trends in waste management (reduce, reuse, recycle, recover, residuals management), fleet technologies and fuels to achieve emission targets.
Co-Benefits:	• Cost savings associated with intensification, through capital cost savings (road construction, transit costs, water and wastewater infrastructure) and operating costs savings (provision of fire stations, recreation centres, and schools, as well as shorter distances to commute for services). • Achieves synergy with other community goals and aspirations including public health, fiscal efficiency, economic prosperity, resilience, inclusiveness, employment, and housing affordability.

	• Influences the planning processes of energy utilities. • Enhances the quality of the natural environment by reducing energy consumption, improving air quality and minimizing the demand for land and resources. • Influences the uptake of energy saving technologies. • Educates and engages citizens towards a long-term sustainable energy future.
Risks:	• Lack of, or delay in, industry or community support
Advocacy[2]:	Support from other levels of government is required for the success of this project, including: • Development charge system review to explore ways to fund energy efficient capital works that can sustain clean energy initiatives such as district energy in new communities. • Property tax system review to explore charging higher tax to cover building retrofit programs such as through occupancy taxes, carbon-based taxes or land transfer taxes, or authorize tax credits for lower emission buildings.
Minimum Results Required to Meet the 100% Scenario[3]:	• Land use is embedded within most other model actions.
Key City Department(s):	• Lead: Planning, Infrastructure and Economic Development Department • Support: Transportation Services, Ottawa Public Health
Key Community Partners:	• Development industry • Utilities • Housing authorities • Conservation authorities • Federal government (and its departments and agencies) • Provincial government • City of Gatineau • Private sector • Non-Government Organizations
Estimated Project Milestones:	• Q4 2020: Draft Official Plan released • Q4 2021: Council adoption • Q1 2022: Ministry approval

[2] *The list of advocacy topics is preliminary and further topics may be identified as the project is developed. The process, details, and timing for each topic will be determined on a case by case basis, as well as the lead as the municipality is not always best positioned to do so.*

[3] *The minimum results required to meet the 100% scenario are based off the energy and emissions model outputs. Further options may be evaluated under this project to meet the scale of action required.*

Resources:	• This project can be completed with existing staff resources
Delivery Mechanism:	• Official Plan and Secondary Plans
Projected Financial Profile:	• Land use is embedded within other buildings, transportation, waste, and electricity projects.
Project GHG Emissions Reductions:	• Land use is embedded within other buildings, transportation, waste, and electricity projects.

Sector: Buildings (New and Existing)

Project: Residential Building Retrofit Accelerator Program	**Standing Committee**: SCEPWWM
Description:	This project will encourage, educate, and remove barriers to deep energy and greenhouse gas (GHG) emission reduction retrofits of small residential buildings (defined as Part 9 in the Ontario Building Code). Existing buildings are a large source of GHG emissions in Ottawa, with residential buildings contributing 22% of the GHG emissions in 2018. Most of these emissions are from heating. Fuel switching to low carbon heat is not cost effective without a significant reduction in heat demand. The success of this project depends on collective action between many property owners and community partners. It also involves a coordinated approach with the Community Building Heating Strategy, the Electricity Resource Strategy, and the Personal Vehicle Electrification Strategy projects. The main components of this program include: **1. Benchmarking and transparency:** • Develop tools to track energy use and emissions in residential buildings, which then informs building owners and prospective buyers of improvement opportunities. Adjust incentive programs accordingly. **2. Marketing and Education**: • Publish a visual comparison of energy performance of all residential buildings along with a tool for informing retrofit decisions that are specific to each neighbourhood and building vintage. • Work with utilities, industry associations, and energy educators to increase knowledge of emissions reductions strategies and opportunities amongst contractors and service providers. • Build on the tools available from Natural Resources Canada, Canada Green Building Council, etc. by widely sharing and training service providers on deep retrofits and embodied carbon. • Work with building permit office, retailers, community associations and networks, libraries, and social marketing experts to provide tools and information for homeowners on how to reduce GHGs in the home through retrofits and intensification. Leverage equipment replacement or renovations. • Connect homeowners with those who have undergone deep energy retrofits with those considering action. Develop bulk

	retrofit groups in neighborhoods supported by energy advisors. • Implement solutions to resolve the split incentive challenge between landlords and tenants for energy retrofit costs and benefits. • Work with existing rental unit marketing programs such as Certified Rental Building to increase energy performance requirements for participation. **3. Coordinating for Accelerated Reductions:** • Develop financing options for deep energy retrofits through the Building Retrofits through Local Improvement Charge Program and Energy Community Improvement Plans projects. • Pursue programs to upgrade high-GHG equipment. Approach this with an affordability lens. • Review permitting and inspection process to remove barriers that enable innovative energy solutions (ex. exterior prefabricated panels for exterior insulation) that allow for deep retrofits without occupant relocation. It is important to note that solutions that improve efficiency while buildings remain occupied will be critical as there is not sufficient housing supply to temporarily relocate occupants during renovations. **4. Explore Legislative Tools:** • Mandatory energy disclosure at time of listing (rental or sale) • Requiring improvements in carbon and energy performance at the time of building renovations • Updates to Property Standards Bylaw to mandate energy and carbon performance • Landlord licensing requirements tied to building energy performance
Co-Benefits	• Reduced spending on energy • More energy dollars retained in local economy • Healthier and more resilient homes • Job creation from renovation work
Risks	• Limited financial capacity to perform deep energy retrofits • Availability of buildings to undergo deep retrofits • Trade or technical capacity to undertake retrofit work

Advocacy[4]:	Support from other levels of government is required for the success of this project, including: • Strengthen incentives for emission-reducing building retrofits, ex. reinstating the federal home retrofit tax credit • The Province requires energy labeling • The Province to adjust the Land Transfer Tax such that it varies reflects energy performance of buildings. Rebate taxes if timely energy performance improvements made. • The Province establish a Retrofit Code and energy performance requirements by 2030 that align with net zero targets. • All levels of government support a retrofit loan fund and incentives be provided for heat pumps.
Minimum Results Required to Meet the 100% scenario[5]:	• 27% of dwellings are retrofit by 2030 and 98% of buildings are retrofit by 2040. Thermal (heating) savings average 70% and electrical savings are at least 30%. Conservation efforts precede fuel switching to devices such as heat pumps or zero emission district energy. • 117,209 heat pumps installed by 2030 (72%/28% air/ground) • 331,660 on-demand electric water heaters by 2030
Key City Departments:	• Lead: Planning, Infrastructure and Economic Development • Support: Innovative Client Services
Key Community Partners:	• Natural Resources Canada • Canadian Urban Sustainability Practitioners • EnviroCentre • Contractors, including design build companies • Community and industry associations • Low Carbon Cities Canada • Non-profit housing providers • Utility Providers and regulating agencies • Appliance manufacturers and lessors • Real estate professionals

[4] *The list of advocacy topics is preliminary and further topics may be identified as the project is developed. The process, details, and timing for each topic will be determined on a case by case basis, as well as the lead as the municipality is not always best positioned to do so.*

[5] *The minimum results required to meet the 100% scenario are based off the energy and emissions model outputs. Further options may be evaluated under this project to meet the scale of action required.*

Estimated Project Milestones:	• Q4 2020: Decision on Federation of Canadian Municipalities funding for the Better Homes Loan Program. • 2021: If successful, launch the Better Homes Loan Program and retrofit education campaign • 2021: Explore an efficiency utility. Develop a bulk heat pump program. Advocate for authorities necessary for this project • 2022: Develop a retrofit portal and energy labeling tool. • 2023: Develop renovation standard, as municipal authority allows
Resources:	Municipal resources: • 2021-2023: Funding for the local improvement charge program are outlined in the Better Retrofits through the Local Improvement Charge project. • 2021: $50,000 to develop a heat pump pathway • 2022: Funds to develop a bulk heat pump program Community resources: • Significant investment in energy saving retrofits
Delivery Mechanism:	• Local improvement charge program • Private action education and outreach • ESCo or Efficiency Utility • Mechanisms involve bulk buys, PEER, and community-scale retrofits

Projected Financial Profile:

- Assumes 100% financed at 4% interest for 20-year amortization term.
- Incremental investment for deep energy retrofits on Part 9 residential buildings.

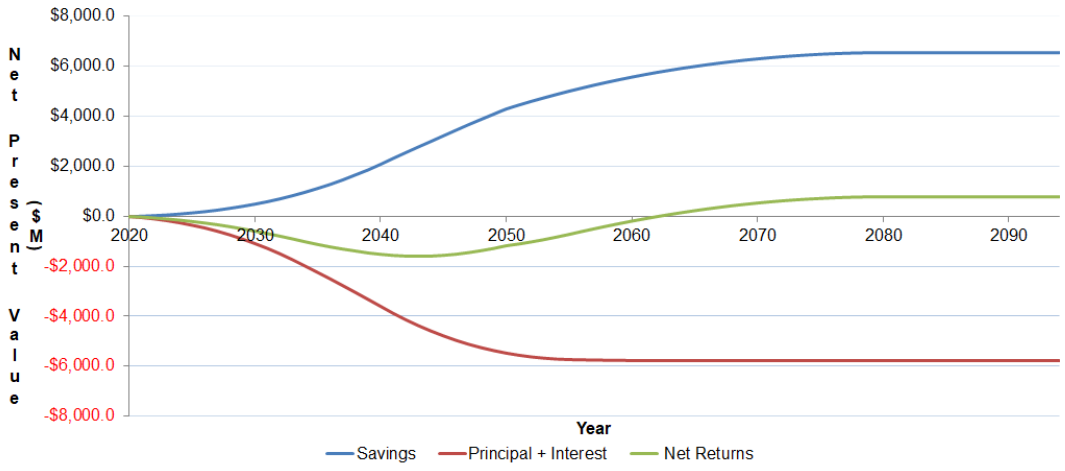

Figure 1: Projected financial profile for residential building retrofits, 2020-2094

Project: Commercial Building Retrofit Accelerator Program	**Standing Committee**: SCEPWWM
Description:	Existing buildings are a large source of greenhouse gas (GHG) emissions, with industrial, commercial and institutional (ICI) buildings emitting close to 14% of Ottawa's GHGs in 2018. Most of these emissions are from heating. This project will identify, encourage, and explore regulating deep GHG reduction retrofits in commercial, institutional, and industrial buildings as well as large multi-unit residential buildings. It will focus on both reducing heating demand as well as fuel switching, to maximize the carbon and financial returns. The City is well positioned to play a coordinating role for collective action. To date, energy reporting of all public buildings and private buildings over 50,000ft^2 is required by the Province. The Province also mandates utility conservation programs. The Federal government offers various funding programs for retrofits. The Federal government has a significant influence on market trends of commercial buildings in Ottawa as one of the largest employers, landowners, tenants, and energy consumers. This project will involve five components plus advocacy and will be aligned with the Community Heating Strategy, Electrification Strategy, and Vehicle Electrification Strategy for success. **1. Strategy** - 2020-2021 • Map a critical path to leverage asset and equipment renewal for deep retrofits. With partners, determine the delivery model to expedite deep retrofits. Archetyping and target setting for each building type. • **2. Benchmarking and Transparency** - 2021-2023 • Encourage building owners to disclose GHG emissions and reduction plans possibly facilitated by virtual energy audits. Make this data available to tenants and investors. • Create a process for certifying service providers and a directory for enabling access to certified service providers. • Use the city procurement process to encourage benchmarking and disclosure where possible. **3. Marketing and Education** - 2021 • With partners, encourage training for property owners/managers, real estate agents, and contractors on green leases, management contracts, asset renewal strategies, real-time energy management techniques, retrofits for emissions reductions, and embodied carbon impacts.

	• Develop thermal imaging of all buildings to inspire upgrades. **4. Accelerating Retrofits** - 2022 • Develop financing options for deep energy retrofits through the Building Retrofits through Local Improvement Charge Program and Energy Community Improvement Plans projects. • An initial focus for incentive programs will be apartments, to support the City's goal of affordable housing, and additional building types will be added after that. • Explore measure-specific programs for GHG reductions. • Consider actions to encourage procurement of efficient building equipment by reducing barriers to access such as cost or time. • Identify ways to encourage energy audits of buildings through licensing, permitting, and price signals. Align with other opportunities like the Community Building Heating Strategy and the Climate Ambassadors Network projects. **5. Energy Retrofit Standard** - 2025 • Explore a means to require improvements in energy performance at the time of building renovations. Partner with other municipalities with similar goals.
Co-Benefits:	• Energy savings for buildings • Decreased vacancy for rental units • Improved health and indoor environment • New green jobs in renovation sector
Risks:	• Limited financial capacity and qualified trades people • Missing equipment renewal opportunities • Low vacancy rates limiting opportunities for deep retrofits • Limited capacity in skilled labour market • Access to necessary equipment • City is prohibited from providing bonuses to private businesses
Advocacy[6]:	Support from other levels of government is required for the success of this project, including: • Energy performance benchmarking requirements for all buildings; • Retrofit Codes and mandatory upgrade requirements in place by 2025 and aligning with net zero targets; • Comprehensive, GHG-focused energy conservation programs; • Property taxes and land transfer taxes that reflect emissions performance; • Regular re-commissioning of buildings;

[6] *The list of advocacy topics is preliminary and further topics may be identified as the project is developed. The process, details, and timing for each topic will be determined on a case by case basis, as well as the lead as the municipality is not always best positioned to do so.*

	• Authority to reflect emissions in building permit fees; • Condo Act amendments for reducing emissions.
Minimum Results Required to Meet the 100% Scenario[7]:	• 27% of buildings are retrofit by 2030 and 95-98% of buildings are retrofit by 2040. Thermal (heating) savings range from 50-70% and electrical savings are at least 30%. Conservation efforts precede fuel switching to devices such as heat pumps or zero emission district energy.
Key City Department(s):	• Lead: Planning, Infrastructure and Economic Development • Support: Recreation, Cultural and Facility Services
Key Community Partners:	• Building owners and tenants • Property managers • Contractors including design build suppliers • Business associations • Utilities • Natural Resources Canada • Low Carbon Cities Canada
Estimated Project Milestones:	• 2020-2021: Develop a strategy for commercial retrofits with stakeholder consultation • 2021-2023: Increase uptake of benchmarking and transparency • 2021: Launch marketing and education programs • 2022: Launch programs for accelerating retrofits • 2025: Launch energy retrofit standard
Resources:	Municipal resources: • Strategy: 0.25 full time employee • Benchmarking and disclosure program: $170,000 • Marketing and Education and recognition: refer to Climate Ambassadors Network project • Financing for local improvement charges: refer to Building Retrofits through Local Improvement Charge Program • Program costs for CIP: refer to Energy Community Improvement Plan project • Advocacy costs: $20,000 Community resources: • Significant investment in energy saving retrofits
Delivery Mechanisms:	• Heat pump leasing, possibly through Envari. • Private energy service contracts and/or equipment leases. • Community Improvement Plan for retrofits and increased density. • Local Improvement Charge financing program. • Climate Ambassadors Network.

[7] *The minimum results required to meet the 100% scenario are based off the energy and emissions model outputs. Further options may be evaluated under this project to meet the scale of action required.*

Projected Financial Profile:

- Assumes 100% financed at 4% interest for 20-year amortization term.
- Figure 1 includes institutional, commercial, and industrial building retrofits with associated heat pumps and water heaters.
- Figure 2 includes large residential (multi-unit) building retrofits with associated heat pumps and water heaters.

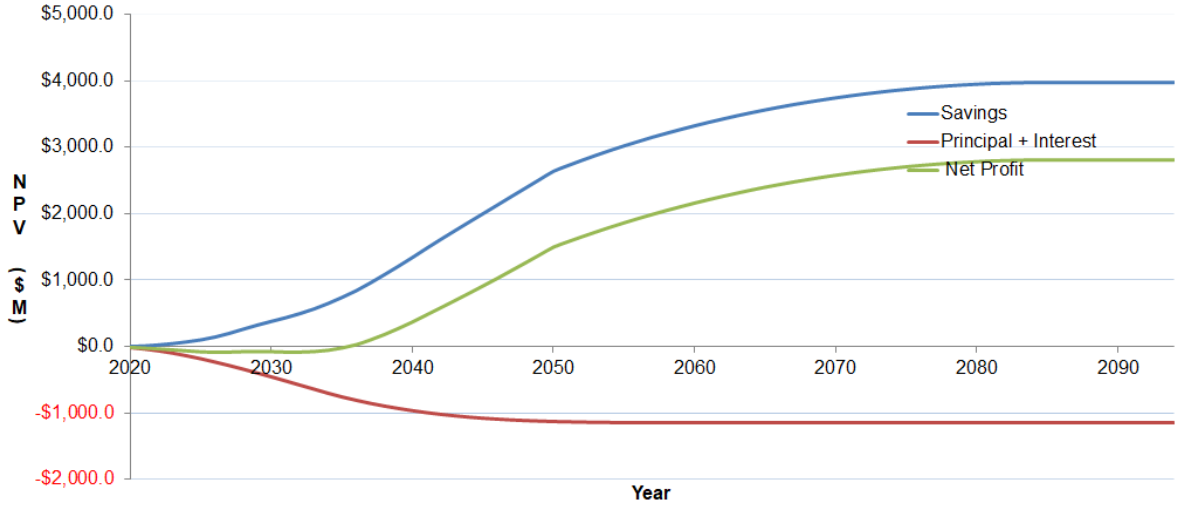

Figure 2: Projected financial profile for ICI building retrofits, 2020-2094

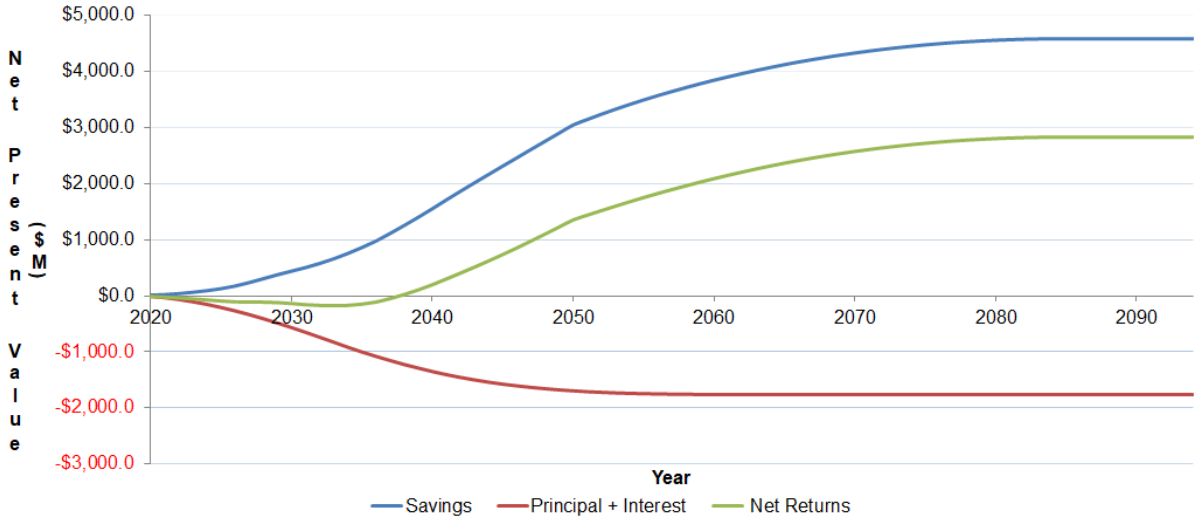

Figure 3: Projected financial profile for large residential building retrofits, 2020-2094

Projected Emissions Profile:

- Figure 3 includes all institutional, commercial, and industrial building upgrades, water heaters, and heat pumps.
- Figure 4 includes all large residential buildings (multi-unit) and associated heat pumps.

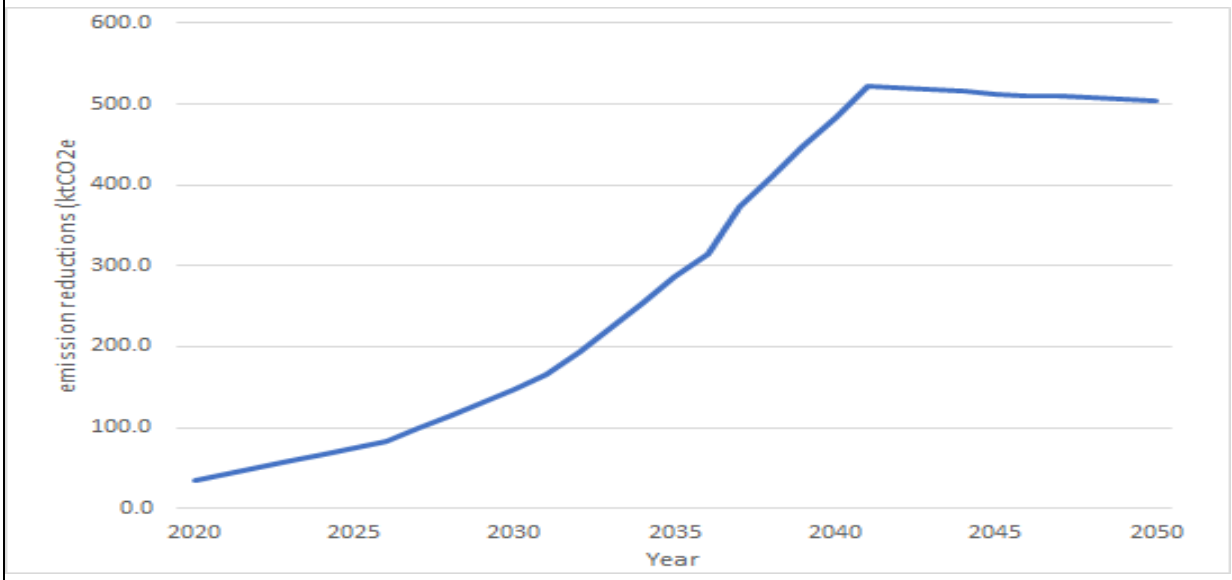

Figure 4: Projected GHG emission reductions for ICI building retrofits, 2020-2050

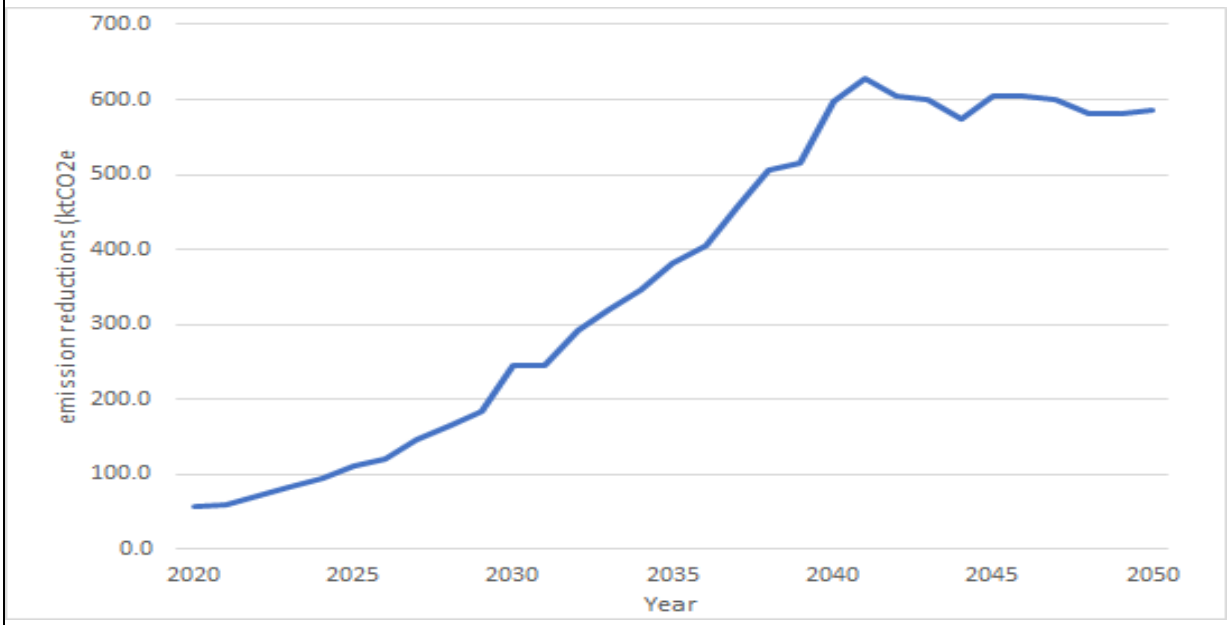

Figure 5: Projected GHG emission reductions for large residential building retrofits, 2020-2050

Project: Building Retrofits through Local Improvement Charge Program	**Standing Committee**: FEDCO
Description:	This project proposes the development of a municipal program to leverage the Local Improvement Charge (LIC) mechanism under Ontario Regulation 322/12 to accelerate deep energy retrofits of buildings (defined as 70% space heating savings and 30% electricity savings per the Energy Evolution strategy). Its main objective is to overcome the motivation barrier to deep energy retrofits by tying, through a priority lien, the obligation for repayment to the property, not the property owner. Through the program, property owners will be able to opt into the LIC program and access long term financing for energy retrofits of their buildings. This is one of the best tools available to municipal governments to influence private buildings. It will facilitate the leveraging of other City, provincial and federal programs for home retrofits through common marketing and participant engagement tools. Through an LIC program, municipalities can: • Enable property owners to improve the comfort and environmental performance of their buildings; • Target areas in transition or in need of repair, rehabilitation and redevelopment; • Support appropriate building upgrades through expert advice and oversight; • Stimulate private investment in property upgrades that reduce energy cost exposure to residents and businesses; • Stimulate local job creation in the renovation sector. The Energy Evolution model finds that 98% of existing buildings (residential and non-residential) in Ottawa will need to have major renovations to achieve Ottawa's climate goals. This will require action from all members of the community. The City has limited control over private property but the LIC mechanism is one of the few municipal tools available to influence changes to private buildings. Municipalities with mature retrofit sectors, including Vancouver, Toronto, and Halifax, have used LICs to stimulate the activity. Key aspects of the LIC program to be explored include: • A municipal council resolution that instructs municipal staff to evaluate the opportunity for a community efficiency financing program;

	• Setting energy efficiency targets based on building type and age to achieve the targets set in Energy Evolution in the most time and cost-effective way; • Involving major Canadian banks and local credit unions as key partners in marketing and take-out financing to enable refinancing of the program; • Engaging qualified energy experts and retrofit service providers to ensure retrofits result in more efficient and healthier buildings in such a way that protects the City from liability; • Working with utility partners to include standardized bulk pricing and project management support to overcome barriers of knowledge and capacity; • Separating streams for Ontario Building Code's Part 9 residential buildings from Part 3 multi-unit residential buildings and commercial buildings because of their significant differences and needs; • Eligibility across all of Ottawa, but outreach will initially focus on regions with more energy upgrade; opportunities. Other eligibility criteria may include credit scores, tax payment history, and mortgage holder consent, among others; • Incorporating credit enhancement support to enable lower interest rates and access for those with less credit; • Identifying opportunities to support related City objectives such as the housing affordability crisis. Federal funding has recently been announced for municipalities to launch an LIC program. A number of municipalities in Ontario are planning to collaborate in bulk program delivery to achieve economies of scale on the program administration. To take advantage of these opportunities, Ottawa needs the following: • A municipal council resolution that instructs municipal staff to evaluate the opportunity for a community efficiency financing program; • A list of eligible measures and financial verification requirements; • A program bylaw that specifies LIC financing mechanism; • An attestation from the City Manager to capitalize the LIC program.
Co-Benefits:	• Reduced GHG emissions • Improved energy efficiency • Reduced energy cost exposure and energy poverty

	• Local job creation • Increased building health and comfort • Increased rental demand from higher performing buildings
Risks:	• Difficulty for homeowners to access expert service providers and delivery agents • Difficulty receiving mortgage holders' collaboration, consent, and investment • Lack of uptake from private building owners • Lower interest rates through financial institutions • Default, bankruptcy, receivership
Advocacy[8]:	Support from other levels of government is required for the success of this project, including: • Funds from senior governments, as well as private investors, to build a sufficient capital pool to fund the retrofits through the LIC mechanism.
Minimum Results Require to Meet the 100% Scenario[9]:	• Supports targets in the Residential and Commercial Building Retrofit Accelerator Programs specify deep retrofits for 27% of existing buildings by 2030 and 95-98% of buildings by 2040. • Also supports the Community Building Heating Strategy
Key City Departments:	• Lead: Planning, Infrastructure and Economic Development • Support: Finance Services; Innovative Client Services
Key Community Partners:	• Retrofit industry (contractors, suppliers, energy advisors, design consultants, building owners and operators, project developers and amalgamators) • Energy auditors and advisors • Banks and mortgage holders • Community associations and social networks • Green building associations • Institutions and academia • Natural Resources Canada / CanmetENERGY • Federation of Canadian Municipalities (FCM) • Canadian Mortgage and Housing Corporation

[8] *The list of advocacy topics is preliminary and further topics may be identified as the project is developed. The process, details, and timing for each topic will be determined on a case by case basis, as well as the lead as the municipality is not always best positioned to do so.*

[9] *The minimum results required to meet the 100% scenario are based off the energy and emissions model outputs. Further options may be evaluated under this project to meet the scale of action required.*

	• Enbridge, Hydro Ottawa/One • Other levels of government with similar programming
Estimated Project Milestones:	• 2020: Program designed, capitalized, and partners confirmed • 2021: Pilot handful of neighbourhoods while leaving the program open to all residents. Recoup admin costs through financing and admin fee. • 2022: Develop and Launch commercial building LIC program. • 2022: Recapitalize. Scale up to retrofit 15,000 homes and 900,000m^2 of commercial space retrofitted per year (not all expected to use the LIC program but will be encouraged to use the online retrofit portal for tracking).
Resources:	• 2020: Apply to a grant from FCM to launch a Better Homes Loan Program (using the LIC mechanism) for homes. If successful, staff will be hired in late 2020. • 2021-2023: Launch Better Homes Loan Program with at least $15M debt facility for residential retrofits. • 2022: Apply for match funding (approx. $100,000) to launch a commercial LIC program. • 2023: Capital partner(s) provide at least $25M debt facility for commercial retrofits. Start with 1.5 FTEs to develop and launch the program. More full-time staff required for both residential and commercial LIC programs for scale up. Programs will be structured to be self-funding from administrative cost recovery and from membership fees from program beneficiaries.
Delivery Mechanism:	• City run LIC program(s)
Projected Financial Profile:	• Included under Residential and Commercial Building Retrofit Accelerator Programs.
Projected GHG Emission Reductions	• Included under Residential and Commercial Building Retrofit Accelerator Programs.

Project: Energy Community Improvement Plans	**Standing Committee**: Joint PC and ARAC
Description:	This project proposes the development of a Community Improvement Plan (CIP), which incentivizes superior energy performance and deep energy retrofits using grants. CIPs provide a flexible, comprehensive, and strategic framework for municipalities in Ontario to provide incentives to property owners to improve their lands and buildings. Through CIPs, municipalities can: • Focus public attention on local priorities and municipal initiatives; • Target areas in transition or in need of repair, rehabilitation and redevelopment; • Facilitate and encourage community change in a coordinated manner; • Stimulate private sector investment through municipal incentive-based programs. The City of Ottawa has several existing CIPs including one related to Brownfield Redevelopment. The Brownfield CIP is expected to be updated in Fall 2020. This update will include proposals around energy targets which align with Energy Evolution. When the energy CIP is brought forward it will provide clear guidance on relationship to existing CIP to ensure programs do not overlap. The Energy Evolution model finds that most buildings in Ottawa will need to have major retrofits or renovations to achieve Ottawa's greenhouse gas (GHG) targets. This will require action from all members of our community. The City has limited control over private property, but the CIP is one of the few municipal tools available to influence changes to private properties and associated buildings. Key aspects of the program to be explored include: • A boundary area applying to the entire geographic area of Ottawa. The program may name added criteria for specific zones. For example, this could include district energy connection requirements; • GHG emission targets based on, building type, and other factors determined during program development • Support for changes to number of units and reduced overall dwelling size; • A focus on existing commercial and multi-unit residential buildings;

	• Identification of opportunities to support projects which address related City objectives such as addition of affordable housing units; • Where possible this program will seek to align with utility incentives and the High-Performance Development Standard to streamline administrative review and associated costs. Strategies to advance residential retrofits are captured in the Building Retrofits through Local Improvement Charge and the Residential and Commercial Building Retrofit Accelerator Program projects. The CIP program is not planned to cover residential retrofits in the near term due to a number of barriers outlined below. • Tax increments aren't a possible funding source for low rise residential buildings because Municipal Property Assessment Corporation (MPAC) property assessments place little value on energy efficiency and energy improvements • The high cost of deep energy retrofits in homes relative to home value make it difficult to address through tax grants. • The administrative cost in residential programs is more for homes due to the lower potential GHG reduction per building compared to commercial projects. Despite these barriers, the market context will continue to be evaluated to determine feasibility of residential energy CIPs in the future.
Co-Benefits:	• Energy savings for buildings • Decreased vacancy for rental units • Improved health and indoor environment • New green jobs in renovation sector • New construction job multipliers would result in additional economic benefits realized through "direct," "indirect," and "induced" impacts
Risks:	• Limited financial capacity • Low vacancy rates limiting opportunities for deep retrofits • Limited capacity in skilled labour market • Property owners not wanting to invest in buildings that are already successful (i.e. "If it isn't broken why fix it?") • Appeals at the Local Planning Appeal Tribunal (LPAT)
Advocacy[10]:	• Included in the Commercial Building Retrofit Accelerator Program

[10] *The list of advocacy topics is preliminary and further topics may be identified as the project is developed. The process, details, and timing for each topic will be determined on a case by case basis, as well as the lead as the municipality is not always best positioned to do so.*

Minimum Results Required to Meet the 100% Scenario[11]:	• 27% of the community's building stock undergoes a deep retrofit by 2030 and 98 % of the building stock by 2040. • 60-70% thermal (heating) savings are achieved as well as 30-40% electrical savings. • Retrofits enable installation of zero emission heating or are installed during the retrofit.
Key City Department(s):	• Lead: Planning, Infrastructure and Economic Development • Support: Finance Services; Innovative Client Services
Key Community Partners:	• Development industry (developers, contractors, suppliers, energy advisors, design consultants, building owners and operators) • Ministry of Municipal Affairs and Housing • Federation of Canadian Municipalities • Utilities • Green building associations • Institutions and academia
Estimated Project Milestones:	• 2021: Retrofit accelerator roadmap • 2022: Draft policy and program • 2023: Policy reviewed and approved by council • 2023: Enabling by-laws enacted by Council
Resources:	• $50,000 consultant and public engagement • Start with 0.5 full time employee to develop and run the program. More staff required as scale builds. The program may look at cost recovery options similar to Brownfield Redevelopment Program and St. Joseph Blvd CIP • Estimated cost of incentives if not recouped through tax increments to be determined.
Delivery Mechanism:	• City run CIP program
Projected Financial Profile	• Included under Commercial Building Retrofit Accelerator Program
Project GHG Emissions Reductions	• Included under Commercial Building Retrofit Accelerator Program

[11] *The minimum results required to meet the 100% scenario are based off the energy and emissions model outputs. Further options may be evaluated under this project to meet the scale of action required.*

Project: Community Building Heating Strategy	**Standing Committee**: SCEPWWM
Description:	The energy and emissions model projects that just over 50% of required greenhouse gas (GHG) emissions reductions required by 2050 will need to come from the way new and existing buildings are heated. Heating infrastructure speaks to energy supply options (fossil fuel, biomass or electricity), and heating supply/storage systems (district energy and geothermal). Anticipated changes in buildings, urban form, utility rate structures and heating systems all have the potential to affect how buildings are heated. Additionally, the impacts to utility infrastructure are important considerations as this infrastructure is typically an expensive long-term investment and careful planning has the potential to save very large costs. The Community Building Heating Strategy will address infrastructure and utility changes that will be required to react to mass changes in the way the city heats buildings. Ottawa is starting to see changes that Energy Evolution seeks to drive. The federal district energy system is being improved to be low carbon and very low heating demand buildings are being constructed, often as infill. Also, a few downtown buildings have moved to geothermal heating and cooling systems. These developments have raised some key questions for what type of heating infrastructure is required in Ottawa: • Can the existing district energy systems be improved to the point that they can easily accept more efficient, low grade heat? Are the legacy systems best employed as back-up for new, more efficient systems? • New high-performance buildings require small amounts of heat for an entire winter season. Do they need a thermal supply or is upsizing of the electrical supply possible and enough? • How can new developments be built with zero emission heating systems? • As buildings are given deep retrofits, there will be neighboring buildings with very large differences in thermal demand. How will thermal infrastructure cope or even take advantage of these advances? • In existing buildings, how can life cycle turn-over become a point to transition to zero-emission heating? The strategy will aim to answer these questions in collaboration with community partners. It will consider:

	• Solar-thermal and geothermal infrastructure, thermal buffering in buildings (i.e., small-scale thermal storage), waste heat, and supplemental electricity to heat systems; • Where district energy systems are required in the long run and where electricity will become the only energy utility required; • Guidelines for how potential proximity issues with geothermal systems being in close quarters may need to be resolved. This include use of space which is not part of a building's land parcel as a source for geothermal (examples could include parks and rights of way); • Barriers and opportunities to implementing the strategy including legislative changes, investments and advocacy.
Co-Benefits:	• Disruption to the city from changes to infrastructure is minimized by having a forward-thinking plan • Capital costs savings for the community • The city's heating infrastructure is more resilient
Risks:	• Significant changes to new buildings take place after the roadmap is set rendering the roadmap out of date • Slow community uptake
Advocacy[12]:	Support from other levels of government is required for the success of this project, including: • Reduce regulatory barriers for sale of renewable electricity and heat across property lines; • Phase out non-condensing combustion equipment; • Add wasted heat to national pollution inventory reporting; • Map geothermal and earth energy resources in and around urban areas Implement a levy on natural gas to fund conservation; • Increase municipal authority to charge utilities access agreement payments to cross municipal land; • Discourage or disallow expansion of the natural gas network.
Minimum Results Required to Meet the 100% Scenario[13]:	• Zero emission heating for new buildings starts now and is completely phased in by 2030 • District energy systems are zero emissions by 2030 • Deep retrofits precede conversion to zero emissions heating systems

[12] *The list of advocacy topics is preliminary and further topics may be identified as the project is developed. The process, details, and timing for each topic will be determined on a case by case basis, as well as the lead as the municipality is not always best positioned to do so.*

[13] *The minimum results required to meet the 100% scenario are based off the energy and emissions model outputs. Further options may be evaluated under this project to meet the scale of action required.*

Key City Department(s)	• Lead: Planning, Infrastructure and Economic Development • Support: Public Works and Environmental Services
Key Community Partners:	• District energy companies • Utilities • Developers • Infrastructure consultants
Estimated Project Milestones:	• 2021: Engage with industry and consultant to develop roadmap for Community Building Heating Strategy • 2022 and beyond: Implementation of the strategy
Resources:	• No new staff required to develop the strategy; budget will be required for consultant support. • Financial resources as listed below will be required by the community at large to implement the district heating and waste heat capture technologies. • The City's role as a catalyst in that is expected to cost 5% of capital costs.
Delivery Mechanism:	• Public and private (P3) district energy systems in dense zones as identified by Energy Evolution Model. • Waste heat policy and public or private investment in heat capture and associated equipment.

Projected Financial Profile:

- Assumes 100% financing at 4% interest rate and 30-year amortization term.
- Includes district energy systems and waste heat capture infrastructure.

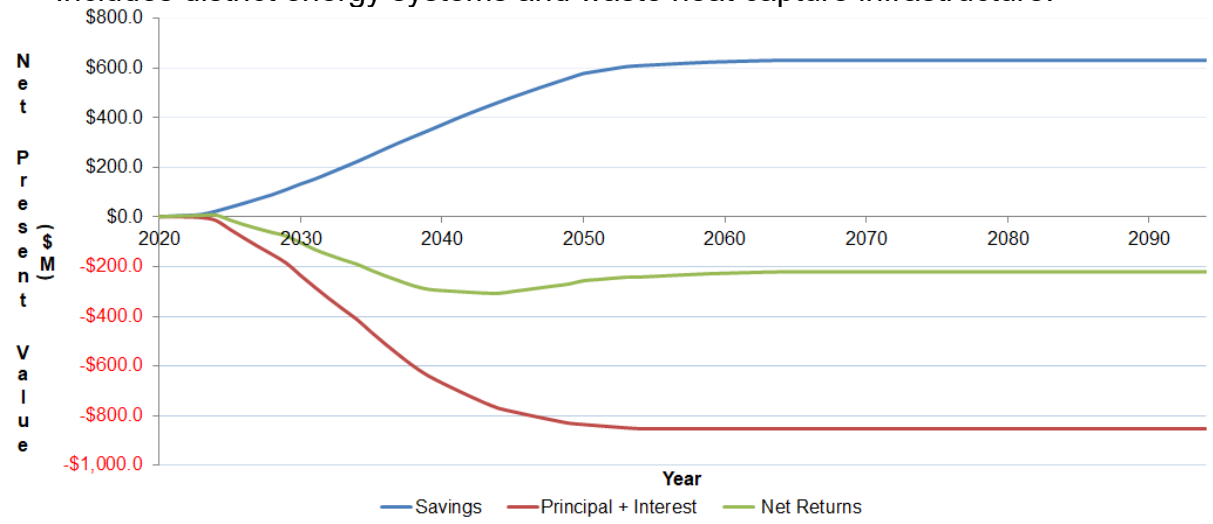

Figure 6: Projected investment profile for district energy systems and waste heat capture infrastructure, 2020-2094

Projected GHG Emissions Reductions:

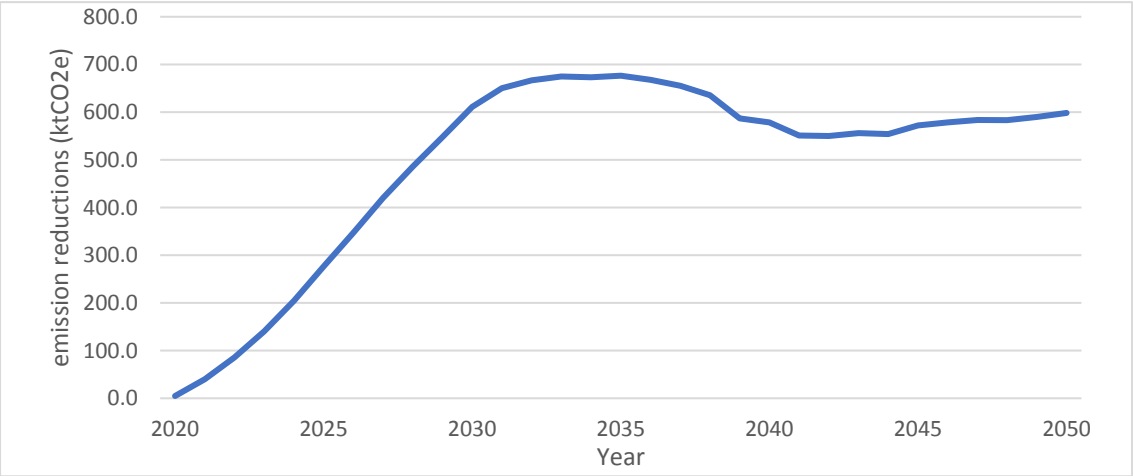

Figure 7: Projected emissions reductions for district energy systems and waste heat capture infrastructure, 2020-2050

Project: Municipal Buildings Renewal and Retrofit Program	**Standing Committee**: SCEPWWM
Description:	These activities propose to expand, improve and coordinate existing building asset renewal and energy retrofit programs. The motivation for doing so is to achieve the higher building energy performance required by Energy Evolution. The City cannot achieve these targets with existing programs. This program would expand the Asset Life Cycle Management Strategy of the corporation's buildings, to include energy and emission performance criteria and ease of deep retrofitting. City staff will use these assessments to inform decisions on building retirements and to develop a schedule of deep building deep retrofits for the balance of the corporate building stock. Deep energy retrofits are defined as a whole building analysis and upgrade that targets a minimum 60-70% reduction in thermal (space heating) requirements and a 30-40% reduction in electricity demand prior to fuel away switching to electricity for uses such as building heating or domestic hot water production. This requires a focus on a building's exterior (airtightness, windows, insulation, and form) and major mechanical systems. As each building is unique, the retrofit plans will often have to be tailored to each building based on existing performance and ease and expense of retrofit actions. The City has yet to undertake deep retrofits of buildings at this scale, but there are examples in the community. After a successful deep energy retrofit, a building will have a heating requirement that is up to tenfold lower than the average building in the Ottawa and typically a zero net energy demand. Using energy and emissions data that is currently tracked improvement in building performance from the deep retrofit would be documented Deep energy retrofits have longer payback periods than the work the City has undertaken to date. The Building Engineering and Energy Management (BEEM) section is currently directed to execute projects with a maximum eight-year payback. This has been of excellent value, but it will not generate the amount of conservation needed to help Energy Evolution achieve its emission reduction goals. Deep retrofits projects will have significantly longer payback than current policy directs the BEEM section to undertake.

	The building deep retrofit schedule will support the planning of related building renewal and lighter energy retrofit work. The benefit of taking this approach is that a proper ordering of work on City buildings will optimize emission reductions and help to ensure that the municipality is employing capital dollars efficiently. A parallel action under this initiative will be to set energy and emission standards for building emergency replacement and life-cycle renewal work. The primary focus of this part of the program will be to ensure that equipment which is being replaced because of a critical failure or because it's at end of life, is replaced with zero or low emission and cost-effective options. This will sometimes mean that replacement equipment will be significantly different (technically or in terms of cost) from the existing equipment. This effort during renewal projects will give returns in reduced emissions, reduced future retrofit work, and life cycle costs. A final aspect of work under this strategy concerns requirements for infrastructure to support electrification of the City's fleets that are served by fleet services. This will include electric vehicles chargers and any upgrades to supporting electrical infrastructure. CCR will support this work with a budget and part of a proposed transportation electrification specialist's time. Part of the specialist work will be to consider long term planning of charging infrastructure to minimize capital, operating and electrical costs and align work with the Asset Life Cycle Management Strategy. This work is generally associated with City buildings but may occasionally be stand alone (for example in a lot without a building)
Co-Benefits:	• More resilient buildings, able to hold heat, keeping safe temperature for longer periods in the event of a loss of energy supply • More comfortable buildings • Build experience in deep retrofit work that can be employed across the community
Risks:	• Capacity, in terms of expertise and financing across the community, to get retrofits done at the rate and quality required by Energy Evolution. A ramp up strategy may be needed • Changes to the long-term plans for some buildings

Advocacy[14]:	Support from other levels of government is required for the success of this project, including: • Strengthen incentives for emissions-reducing building retrofits • Support a retrofit revolving loan fund • Convert the Ottawa federal building district energy loop into a zero carbon, cost effective loop • Reduce regulatory barriers for sale of renewable electricity and heat across property lines
Minimum Results Required to Meet the 100% Scenario[15]:	• 100% of city building achieve zero emissions by 2040 • Deep retrofits precede major renewal of building equipment
Key City Department(s):	• Lead: Planning, Infrastructure and Economic Development; Recreation, Cultural and Facility Services • Support : Finance Services; Public Works and Environmental Services; Transportation Services
Key Community Partners:	• Consultant and trade partners • Canada Green Building Council • Passive House Canada • Natural Resources Canada • Algonquin College • Federation of Canadian Municipalities • Ontario Regional Facilities Management Association • Envari
Estimated Project Milestones:	• 2020: Establish a working group, develop criteria to prioritize deep building retrofits and apply it to the asset list of buildings and establish a preliminary schedule to direct deep building retrofits • 2021: Set standards and guidelines for deep building retrofit and complete first City building deep retrofit • 2022 As funding permits, conduct deep retrofits on up to two more City buildings • 2023: Complete a performance review of the first buildings retrofitted and adjust actions as required

[14] *The list of advocacy topics is preliminary and further topics may be identified as the project is developed. The process, details, and timing for each topic will be determined on a case by case basis, as well as the lead as the municipality is not always best positioned to do so.*

[15] *The minimum results required to meet the 100% scenario are based off the energy and emissions model outputs. Further options may be evaluated under this project to meet the scale of action required.*

Resources:	• In the period from now until 2025 two subject matter expert / project manager will be required to set up assessments and standards and do initial projects. These proposed new resources will be aligned with existing ones, likely in infrastructure services, to leverage the value of existing workflow and expertise • In the period from 2024 to 2040, the deep retrofit program will require on average eight high level project leaders (who direct multiple project managers) on average. Before 2024 a few deep retrofit starter projects could be managed with existing resources • Incremental costs: for renewals, retrofits and related expenses: roughly $1.2 Billion up to 2040, costing work is ongoing. These costs could be reduced with a higher rate of assumption about building retirements [16]. • $1.25 million has been specifically budgeted or forecast in the CCR budget to support electric vehicle charging and associated infrastructure in the period from 2021 to 2025. A CCR resource designated to all aspects of transportation electrification will support this work.
Delivery Mechanism:	• City policy and investment.

Projected Financial Profile:

- Assumes 100% financed at 4% interest rate over 20-year amortization term.

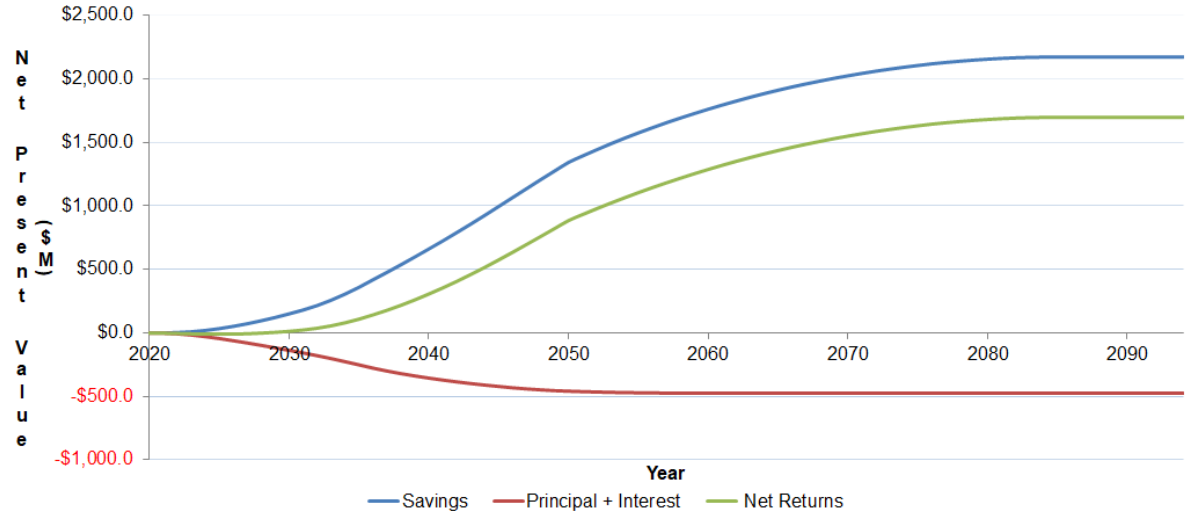

Figure 8: Projected financial profile for municipal buildings retrofit and renewal program, 2020-2094

[16] *Note that the existing estimate has most of the project coordination and project management outsourced and costed with the projects themselves. Should the City choose to in source a significant proportion of this work, this cost would fall but there would be a commensurate increase in City staff requirements. Ultimately, a contract strategy will have to be decided based on results and value for money spent.*

Projected Emissions Reduction:

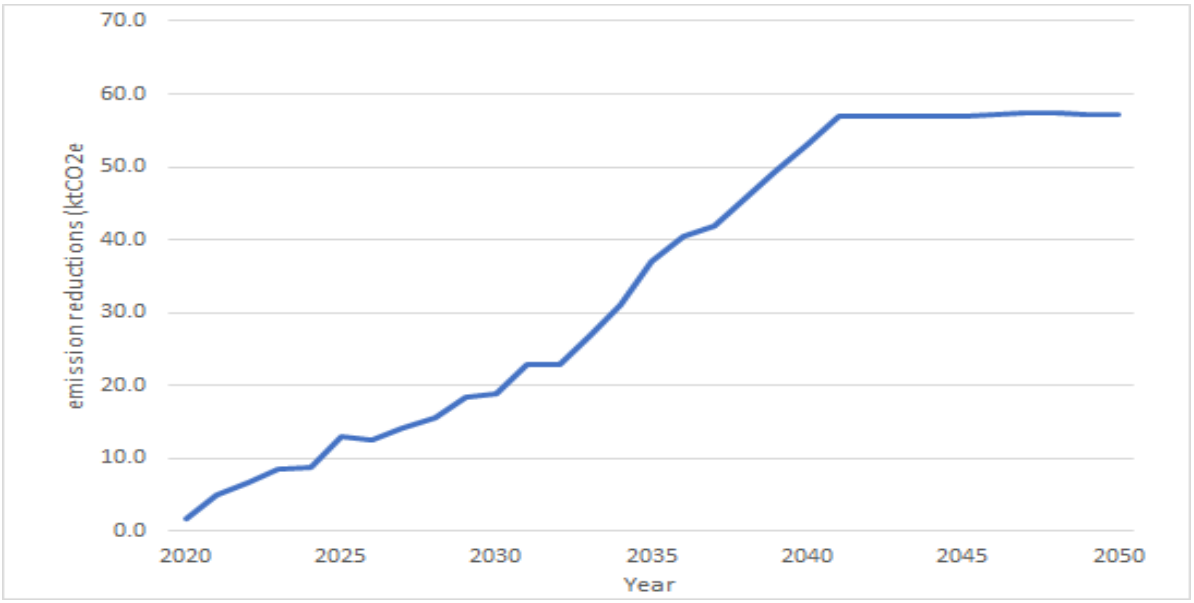

Figure 9: Projected GHG emission reductions for municipal building retrofit and renewal program, 2020-2050

Project: Update Municipal Green Building Policy		**Standing Committee**: SCEPWWM
Description:	The municipal Green Building Policy directs staff on sustainability requirements for newly built City buildings. This project proposes a major update to this policy to better align with corporate objectives and industry best practices. Facilities account for 19% of the municipality's greenhouse gas (GHG) emissions. The proposed municipal carbon emission reduction target is 100% by 2040. To achieve this target, all new buildings will need to be built to net zero emissions ready, to enable zero emissions within 20 years. In addition, work on all existing buildings to achieve zero emissions by 2040 will be required. This is addressed through the Municipal Buildings Renewal and Retrofit Program. The current Corporate Green Building Policy, approved by council in 2005 and amended in 2007, requires that all newly constructed municipal buildings with a footprint greater than 500 m^2 be Leadership in Energy and Environmental Design™ (LEED®) Certified at minimum. Although improving some sustainable criteria for the buildings, these requirements alone are insufficient to meet the City's corporate emissions targets and no longer align with leading design standards. An overhaul to this policy is recommended to better align with municipal targets. The policy revisions will provide unambiguous requirements for design and construction teams to follow to align projects with mitigation and resiliency goals. The revisions will direct projects to be built to zero carbon or, incorporate a path to zero carbon by 2040 in design and construction documents. The policy is expected to include: • Maximum total energy use intensity (EUI), thermal energy demand intensity (TEDI) (building heat loss), and GHG intensities (GHGI) will be set for all facility types including specialty use (arenas, pools, etc.); • Third party commissioning and verification requirements during and after construction, including air tightness testing, and insulation inspections; • Integrative design approach with contracts set up to support this such as Integrated Project Delivery or Performance Based Contracts; • Strategy to address how ongoing and planned projects (for example, infrastructure for electrification of transportation) will be addressed and impacted by the new policy.	

	Project management and procurement teams will undergo training on the policy requirements and underlying building science practices. This will help minimize risks associated with the policy change. As an industry leader, the City will leverage its own buildings and construction projects to educate the industry, post-secondary students and community on best in class practices. Ongoing projects will be influenced by these proposed changes wherever possible.
Co-Benefits:	• Building quality is improved to make buildings more comfortable, resilient and efficient • Improved occupant health and experience • New jobs as a result of enhanced energy model work, airtightness testing, increase skilled labour and new product supply and manufacturing needs. • Lower operating costs • Avoid future retrofits
Risks:	• Procurement policies pose a potential barrier in sourcing innovative technologies and materials • Insufficient budget to achieve energy targets and other competing priorities • Limited industry capacity and expertise available
Advocacy[17]:	• Policy sits within municipal authority • Support from other levels of government may be required for the success of this project, including: ○ Supplementary funding from senior governments
Minimum Results Required to Meet the 100% Scenario[18]:	• All City facilities to be net zero emissions by 2040. Given the lifespan of buildings, to reach this target new construction needs to be designed to net zero carbon as early as possible.
Key City Department(s):	• Lead: Planning, Infrastructure and Economic Development • Support: Finance Services; Innovative Client Services; Public Works and Environmental Services; Transportation Services
Key Community Partners:	• Federal and provincial governments

[17] *The list of advocacy topics is preliminary and further topics may be identified as the project is developed. The process, details, and timing for each topic will be determined on a case by case basis, as well as the lead as the municipality is not always best positioned to do so.*

[18] *The minimum results required to meet the 100% scenario are based off the energy and emissions model outputs. Further options may be evaluated under this project to meet the scale of action required.*

	• Design and construction teams (developers, contractors, suppliers, energy advisors, design consultants) • Green building associations
Estimated Project Milestones:	• 2020: Where possible influence upcoming and ongoing projects with these new criteria, complete policy impact analysis • 2021: Propose new policy and if approved, new green building policy would begin to transition into effect • 2025 Net zero emissions required for all new city facilities
Resources:	• No new staff pressures are expected for this project. • An estimated 15% additional project cost is anticipated for new projects • Costs will vary based on facility type, and other project specifics. Funding opportunities may be available, and future funding may be contingent on project targeting minimum levels of energy performance for funding eligibility (federal, provincial)
Delivery Mechanism:	• City policy and investment
Projected Financial Profile:	• Included in the Municipal Buildings Renewal and Retrofit Program
Projected GHG Emissions Reductions	• Included in the Municipal Buildings Renewal and Retrofit Program

Project: High-Performance Development Standard	**Standing Committee**: Joint PC and ARAC
Description:	A High-Performance Development Standard (HPDS) for Ottawa will enable the adoption of building best practices that support Ottawa's Climate Change Master Plan and Energy Evolution. It will support significant reductions in greenhouse gas emissions and enable new developments to adapt to a changing climate. HPDS is expected to account for about 8% of Ottawa's community-wide GHG reductions to achieve the 100% by 2050 target. A HPDS will align with the "5 Big Moves", which set the stage for the New Official Plan, and associated master plans (Transportation, Infrastructure and Solid Waste) where they relate to new private buildings. Municipalities have direct legislative authority over new construction projects through the Ontario Building Code, Planning Act (S41) and Municipal Act (S97.1). The standard will look to consolidate many of the existing requirements included in the development review process and will expand to address energy concerns where required. This will be a collaborative effort across applicable departments. As it relates to Energy Evolution the following areas will be addressed; • Energy and carbon: energy consumption, generation, and life cycle energy use (including construction materials). For example: energy, thermal energy, and carbon intensities, solar ready, orientation, and material embodied carbon. • Waste: supportive infrastructure for landfill diversion, and construction requirements • Transportation and parking: charging for electric vehicles, bike storage requirements • District specific criteria: consideration toward district energy connections Additional related areas to be included in the consolidation are resiliency, health impacts, ecology, and stormwater. The program will take a phased in tiered approach, enabling industry to build capacity in advance of incremental increases to performance requirements. Financial levers will be explored to encourage faster adoption and will be corelated to estimated incremental costs. In addition, mechanisms to discourage poor energy performance of new buildings will be assessed.

	Building Code Services and Planning Services teams will be involved in developing, reviewing and enforcing new high-performance buildings within their respective legislative frameworks. An internal working group has been established to develop draft metrics incorporated in the standard. Training on a new high-performance building and a review of existing practices will be part of HPDS development. The program will engage with industry throughout and an external working group has been established. Demonstration projects will be encouraged including City projects. Collaboration with utilities to help enable the program will be completed, such as avenues to leverage conservation programs where possible.
Co-Benefits:	• HPDS will consolidate some of the requirements of development review • Prepare the local industry for building code changes • Improve occupant health impacts, and climate resiliency • Building quality is improved to maintain comfort and increase efficiency, including during extreme weather events • Household energy costs to decline
Risks:	• Limitations of incentives • Industry opposition and insufficient capacity • Limitations on legislative authority • Costs and affordability impacts
Advocacy[19]:	Action by other levels of government is required for successful transition of all new buildings to net zero energy including: • Accelerate the Provincial Building Code to net zero by 2030 • Accelerate National Building Code to net zero by 2025
Minimum Results Required to Meet the 100% Scenario[20]:	• New building development must ramp to near zero energy or Passive House standards by 2030 and hold to this standard thereafter.
Key City Department(s)	• Lead: Planning, Infrastructure and Economic Development • Support: Finance Services; Innovative Client Serives; Ottawa Public Health; Public Works and Environmental Services; Transportation Services

[19] *The list of advocacy topics is preliminary and further topics may be identified as the project is developed. The process, details, and timing for each topic will be determined on a case by case basis, as well as the lead as the municipality is not always best positioned to do so.*

[20] *The minimum results required to meet the 100% scenario are based off the energy and emissions model outputs. Further options may be evaluated under this project to meet the scale of action required.*

Key Community Partners:	• Development industry (developers, contractors, suppliers, energy advisors, design consultants, building owners and operators) • Federal and provincial governments • Utilities • Green building associations • Institutions and academia
Estimated Project Milestones:	• Q3 2020: Draft HPDS Metrics consult with Industry • Q4 2021: Program comes into effect in line with the new Official Plan • 2025: Adopt 2nd Tier performance • 2030: Adopt 3rd Tier performance (Near Zero Emissions Buildings)
Resources:	• 2021: $50,000 start-up cost identified in the Hydro Ottawa dividend surplus spending plan. • Additional budget to be identified for subsequent years
Delivery Mechanism:	• City High-Performance Development Standard • Private loans for green construction

Projected Financial Profile:

- Assumes 100% financed at 4% interest rate for 25-year amortization term
- Incremental investment for all new commercial and residential buildings

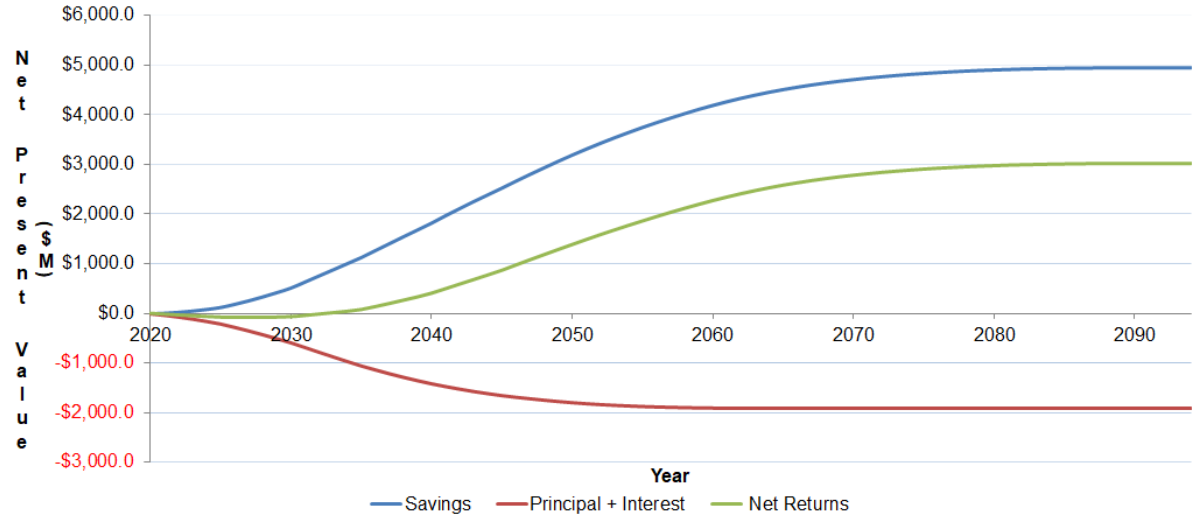

Figure 10: Projected financial profile for new residential and commercial buildings, 2020-2094

Projected GHG Emissions Reductions:

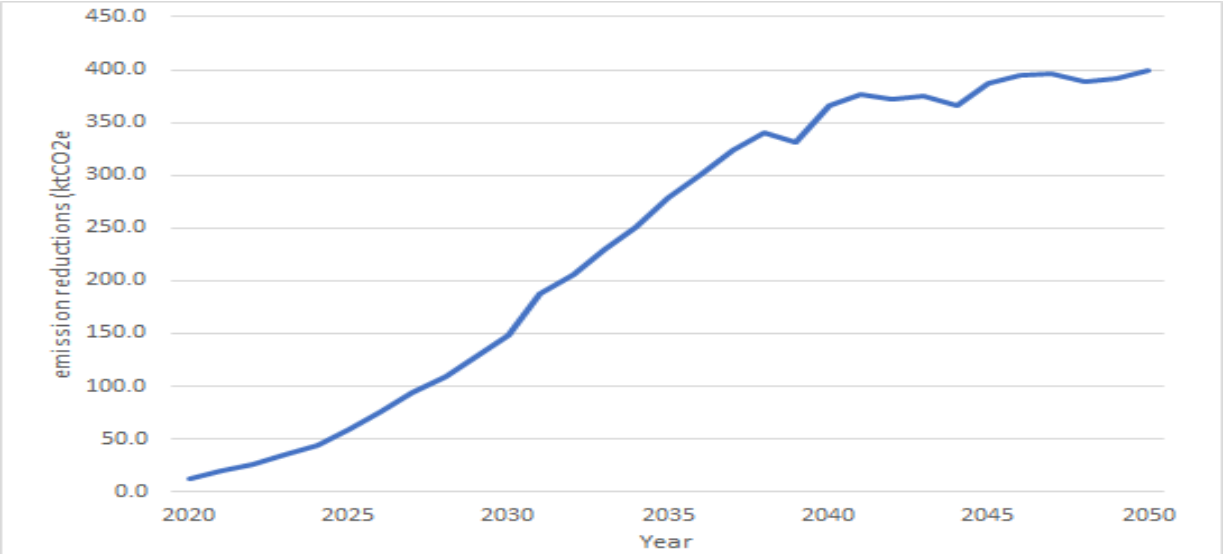

Figure 11: Projected GHG emissions reductions for new residential and commercial buildings, 2020-2050

Sector: Transportation

Project: Personal Vehicles Electrification Strategy	**Standing Committee**: SCEPWWM
Description:	The Energy Evolution model projects that the electrification of personal vehicles has the greatest potential to reduce greenhouse gas emissions across the community. The City of Ottawa does not have the regulatory tools to control electric vehicle availability nor purchasing trends but can take actions to encourage and remove barriers to electric vehicles (EVs). The purpose of the Personal Vehicle Electrification Strategy is to support the transition to personal EV adoption in Ottawa through increasing charging infrastructure, education and outreach, and advocacy. The City has direct roles to play in this sector with respect to charging infrastructure ownership and enabling policies, right of way legislative tools, education, and advocacy work. <u>Charging Infrastructure</u> Studies find few people will buy an EV if they are unable to charge it at home. Tenants and condo owners are the most likely residents to face this challenge, while some older homes or electrically constrained areas may also have difficulties. To address this, the City will explore: • Investigating programs to financially and technically support installation of residential charging. • Working with community partners to encourage the installation of demonstration EV charging projects in existing multi-unit residential buildings. • Monitoring the usage and results of the initial charger installation in rights-of-way. Determine if, in areas where people have no access to home charging, can such charging become an acceptable substitute. • Updating the existing Corporate Electric Vehicle Charging Station Policy to include existing municipal facilities and public right-of-way infrastructure • Investigating regulations and promotion to enable and encourage residential EV owners to publicly make available their household charging infrastructure to other residential EV owners. • Support measures which support charger installation such as sub-metering, charging as an unmetered service and installing charging at lower rate class electricity accounts Electrical grid constraint issues will be addressed in the Electricity Resource Strategy. • Monitor EV charging use and assist in ensuring that there does not become a shortage of EV charging or line-ups at charging area.

	<u>EV Priority Areas</u> The Energy Evolution model calls for an EV only zone within downtown Ottawa by 2028 to motivate the transition to EVs. The area proposed is bounded by Bronson Avenue, Catherine Street, Queen Elizabeth Drive and the Ottawa River. Further studies to evaluate feasibility and implementation strategies will be required. <u>Education and Outreach</u> There are many common misconceptions around EVs that are barriers to increasing EV uptake including range anxiety, lifecycle costs, and charging infrastructure. Overcoming these barriers through education and outreach will be vital in encouraging a transition to EVs. The City will continue to work with community partners to: • Support Ottawa EV Days held by EnviroCentre with support from Plug N Drive and the Electric Vehicle Council of Ottawa • Work towards establishing an EV Discovery Centre in Ottawa. • Support wayfinding systems for EV charging stations across the city.
Co-Benefits:	• A reduction in local air pollution • A quieter city • Energy dollars stay in the city and surrounding region
Risks:	• Availability and cost of EVs • Ability of charging infrastructure to align with demand for charging • Meeting needs of a changing technology[21]
Advocacy[22]:	Support from other levels of government is required for the success of this project, including: • Ensure that highways approaching Ottawa have adequate EV charging to enable trips to and from the city • Strengthening of the clean fuel standard • Public EV charging infrastructure funding and policy support • Require a zero-emission vehicle mandate • Limit or eliminate demand charges for stand-alone EV charging • Increase vehicle registration fees on high emitting vehicles to fund transit

[21] *An example would be charging demand changing as electric vehicles change. For example, a trend to larger battery capacities has changed charging practices towards longer, but less frequent charging.*

[22] *The list of advocacy topics is preliminary and further topics may be identified as the project is developed. The process, details, and timing for each topic will be determined on a case by case basis, as well as the lead as the municipality is not always best positioned to do so.*

	• Reinstate a provincial subsidy for electric vehicle purchases • Advocate for a higher ratio of biodiesel in the retail and commercial diesel supply • Reduce/remove barriers to the installation of EV charging infrastructure such as enabling low cost metering solutions for distributed charging networks
Minimum Results Required to meet the 100% Scenario[23]:	• Personal EVs to be 90% of car and light truck purchases by 2030 and 100% of purchases by 2040. • Challenges with home charging must be largely eliminated by 2028.
Key City Department(s):	• Lead: Planning, Infrastructure and Economic Development • Support: Finance Services; Recreation, Cultural and Facility Services; Transportation Services
Key Community Partners:	• Funders (e.g. Natural Resources Canada) • Charging infrastructure providers (e.g. Envari, Hydro Ottawa, Electric Circuit) • Education and Outreach (e.g. Electric Vehicle Council of Ottawa, Plug 'N Drive, Electric Mobility Canada, EnviroCentre) • Demonstration projects (e.g. Communauto, property managers) • Car dealerships
Estimated Project Milestones:	• 2020 onwards: City participates in advocacy and monitors adequacy of local public charging. • 2020 to 2023: City to apply for expected EV funding programs undertaken by Natural Resources Canada and others • 2021: Update the Corporate Electric Vehicle Charging Station Policy; develop a City public charging infrastructure and building retrofit charging plan
Resources:	Municipal Resources • One full time staff • $300,000 annually for new charging and signage at City facilities or in rights of way, reviewed and adjusted annually according to needs • An expense of $20,000 in 2021 to secure a visit from a mobile EV discovery centre Community Resources • Financial estimates for the community – most capitalization of EV purchases comes from individual consumers buying a personal vehicle

[23] *The minimum results required to meet the 100% scenario are based off the energy and emissions model outputs. Further options may be evaluated under this project to meet the scale of action required.*

Delivery Mechanism:	• Consumer expenditure on personal electric vehicles • Private and public support of the purchase on electric vehicles and supporting infrastructure such as charging.

Projected Financial Profile:

- Assumes 100% financed at 4% interest for 10-year amortization term.

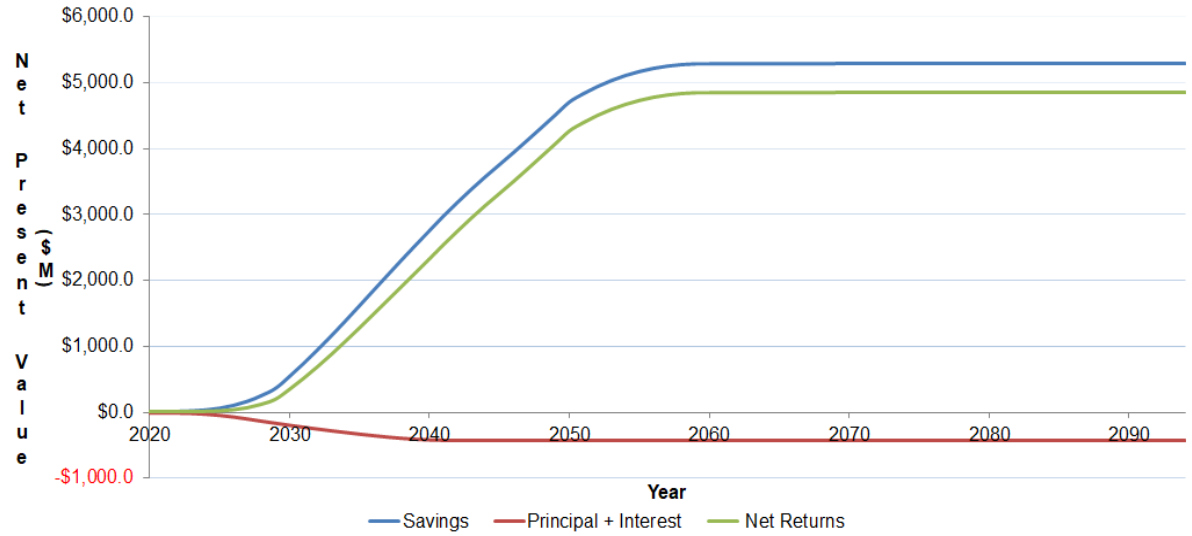

Figure 12: Projected financial profile for personal electric vehicles, 2020-2094

Projected GHG Emissions Reductions:

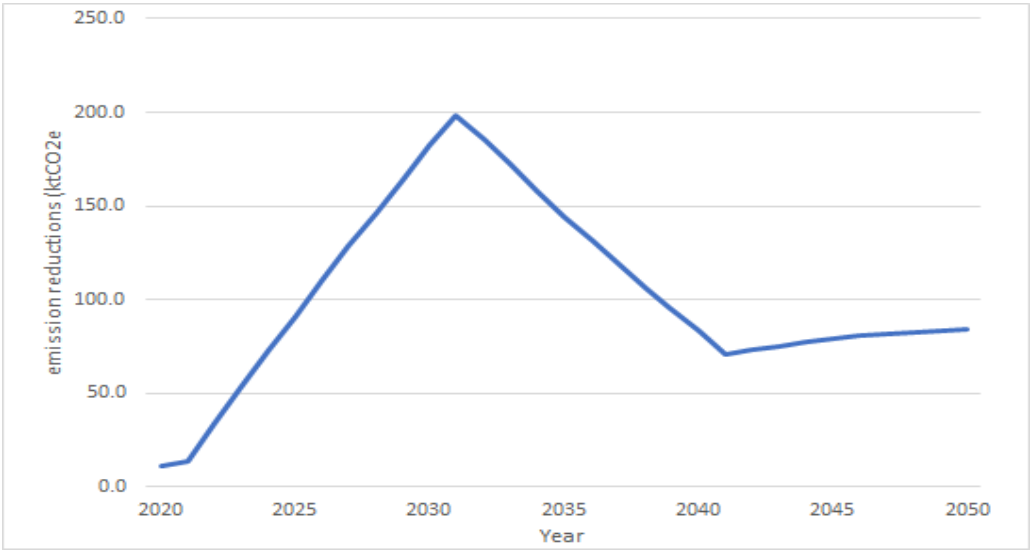

Figure 13: Projected GHG emissions reductions for personal electric vehicles, 2020-2050

Project: Zero Emissions Commercial Vehicles Strategy	**Standing Committee**: SCEPWWM
Description:	A transition to zero emission commercial vehicles is essential to achieving the 100% scenario as the model projects it is one of the top five actions to undertake. The purpose of this project is to explore opportunities to encourage and influence the development and transition to zero emission commercial vehicles in Ottawa. Note that the transition of the municipal and transit fleets to zero emission vehicles are addressed under separate project overviews. Commercial vehicles include light and heavy-duty trucks, vehicles for hire (taxi, car share, ride share, delivery services, car and truck rental), and non-municipal buses. The zero emission commercial vehicle market is currently underdeveloped in respect to available vehicle options due to slow technological advancements and supportive charging infrastructure. Electric commercial vans and heavy class trucks are in early days of development and electric garbage trucks and school buses are starting to find markets in North America. Vehicles for hire are mostly light-duty vehicles with market ready electric options and some taxi companies are currently employing electric models in Ottawa. However, adequate charging infrastructure is often a barrier for these uses. Progress is being made in this sector and is expected to transition rapidly along with other commercial vehicle market disrupters such as autonomous vehicles and increase in door to door goods and services. The City will continue to engage with businesses to better understand charging infrastructure challenges and further explore shared opportunities, information sharing, roadway allowances and regulations, and public charging infrastructure. **1. Shared opportunities** As zero emission commercial vehicles may have similar charging requirements, there may be opportunities to leverage shared investment. For example, school busses and City busses may have potential for shared infrastructure. Now that carbon pricing in Ontario is occurring under the federal back-stop, the City will reach out to community partners such as the Ottawa Student Transportation Authority to see if there are opportunities to support school bus electrification. **2. Information Sharing** City departments have been monitoring technology developments in a wide range of applicable vehicle types. Many businesses have

	much smaller fleets and may not have the staffing to do this equivalent monitoring in a rapidly changing market. The City can support businesses by sharing this information on commercial vehicle options for specialty use vehicles. Going forward, the City can share experiences with its own fleet electrification with other fleet operators in the community. **3. Roadway Allowances** Car share companies have found the requirement for cars to be returned to their point of initial use as an inefficiency barrier and one that makes electrification more difficult. The City will work with its community partners to explore opportunities to overcome the existing barriers and all for roaming parking permits. **4. Regulations** Taxis and related car for hire services include many vehicle types which have market ready options. The City already regulates these services through the Vehicle For Hire By-law. This initiative will look further into opportunities to encourage EV adoption in this market in the short term and ensure that we are not inadvertently working against electrification through things like zoning. This will heighten current actions and still is within the realm of existing City roles. **5. Public Charging Infrastructure** The City will work with its community partners to ensure that public charging infrastructure can help light fleet vehicles make a transition to electric fleets. These businesses may face challenges accessing charging infrastructure on the go. The City may play a role in facilitating easy access or connecting with taxi hubs in public places like the airport or train stations.
Co-Benefits:	• Less local air pollution, including carcinogenic fine particulate • A quieter city • Lower cost transportation as the technology develops
Risks:	• Technical progress to bring heavy-duty zero emission vehicles to market is slower than forecasted • Fleet vehicle turn over period and fuel source lock-in

Advocacy[24]:	Support from other levels of government is required for the success of this project, including: • Support a retrofit revolving loan fund • Ensure that highways approaching Ottawa have adequate EV charging to enable trips to and from the city • Strengthening the clean fuel standard • Support public EV charging infrastructure • Reinstate a provincial subsidy for electric vehicles purchases • Require a zero-emission vehicle mandate • Limit or eliminate demand charges for stand-alone EV charging • Work to ensure that electrical distribution system reinforcements driven by electrification do not trigger economically prohibitive costs to individual customers
Minimum Results Required to meet the 100% Scenario[25]:	• Significant transition to zero emission commercial vehicles starts in 2022, with at least one market segment (perhaps short haul freight) starting to convert by this time • By 2030, 40% of commercial fleets are zero emission • By 2040, all commercial fleets are zero emission
Key City Department(s):	• Lead: Planning, Infrastructure and Economic Development
Key Community Partners:	• Hydro Ottawa and Envari • Ottawa Student Transportation Authority • Taxi Companies, Delivery Services • Car sharing services (e.g., Communauto, Zipcar) • Electric Vehicle Council of Ottawa
Estimated Project Milestones:	• Q1 2021: Consult with commercial fleets and support advocacy • 2022: Report on encouraging electrification of light-duty fleets • 2022: Summary report with recommendations on zero emission commercial vehicles
Resources:	• No additional staff requirement • $1,000,000 per year starting in 2023 to support piloting of heavy fleet vehicles either inside or outside the corporation or through a collaboration between the City and the private sector

[24] *The list of advocacy topics is preliminary and further topics may be identified as the project is developed. The process, details, and timing for each topic will be determined on a case by case basis, as well as the lead as the municipality is not always best positioned to do so.*

[25] *The minimum results required to meet the 100% scenario are based off the energy and emissions model outputs. Further options may be evaluated under this project to meet the scale of action required.*

	• City budget requests may occur in the coming years should opportunities present themselves
Delivery Mechanism:	• Private investments. • Climate Ambassadors Network • EV charging station incentives, coupled with programs to reduce free parking

Projected Financial Profile:

- Assumes 100% financed at 4% interest over 10-year amortization term.

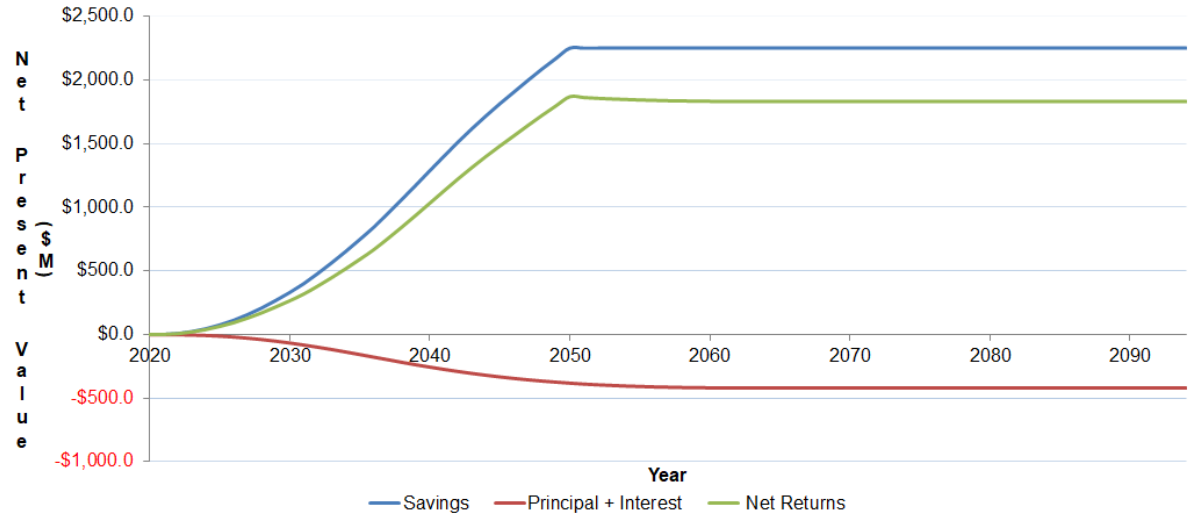

Figure 14: Projected financial profile for transition to zero emission commercial vehicles, 2020-2094

Projected GHG Emissions Reductions:

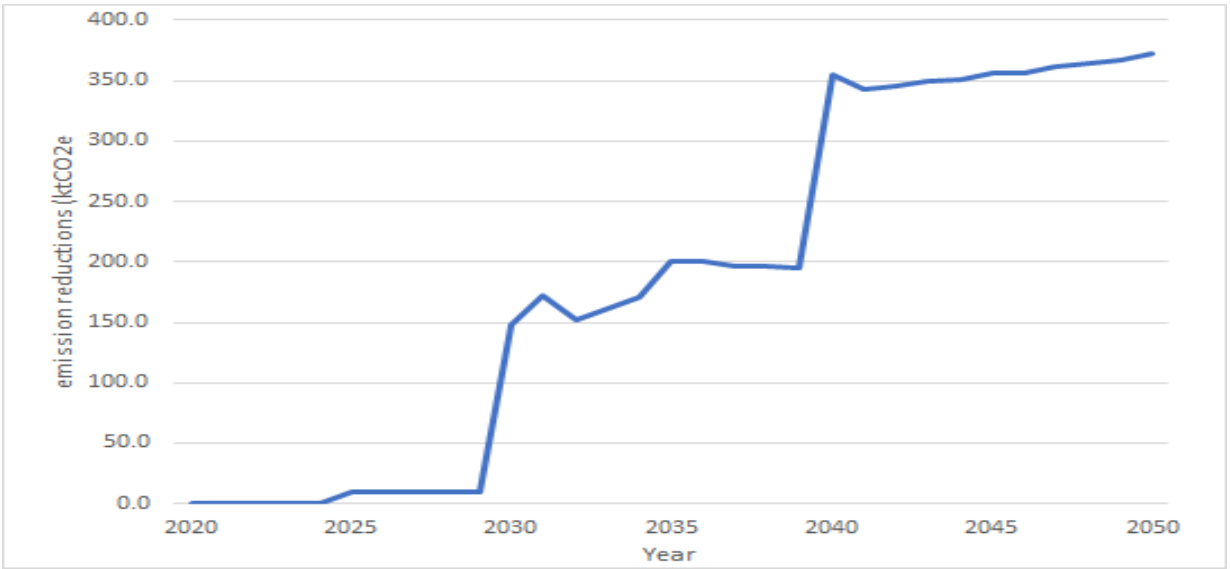

Figure 15: Projected GHG emission reductions for transition to zero emission commercial vehicles, 2020-2050

Project: Municipal Green Fleet Plan Update	**Standing Committee**: TC
Description:	Update Municipal Green Fleet Plan considering corporate greenhouse gas reduction targets. Fleet Services procures, maintains, administers, repairs and replaces the City's diverse fleet of vehicles and equipment in support of all city programs (except transit) including roads, parks, facilities, waste collection, drinking water, wastewater, forestry, paramedic, fire services, and others. Consistent with the 2009 and the 2016 Municipal Green Fleet Plans Fleet Services has kept abreast of developments in the industry, trialed alternate fuels, implemented devices and technologies that reduce greenhouse gas emissions, and purchased low- and no-emission vehicles and equipment where they meet the operational needs of the client department and are available. The funding for purchase of the vehicles comes from two sources: the annual fleet replacement plan first, and then any additional cost to green the unit is paid for from the Municipal Green Fleet fund. An updated Municipal Green Fleet Plan will be brought forward in 2021. In addition to the continued conversion of the light fleet to hybrid and electric vehicles, Fleet Services expects to trial vehicles and technologies that reduce greenhouse gases and implement them where they are effective in our climate and for our operations, at a reasonable cost per tonne of CO2e emissions avoided. Charging infrastructure, related to municipal fleet, is covered under the Municipal Green Building Policy and the Municipal Buildings Renewal and Retrofit Program projects.
Co-Benefits:	• Reduced localized air and noise pollution • Potential reduction in operation and maintenance costs • A healthier city due to the reduced number of micro-particulates released into the air.

Risks:	• Slower than anticipated development of technology that provides alternatives to heavy diesel vehicles and equipment • Availability of low or zero emission vehicle options that meet operational requirements • Higher vehicle replacement capital costs than anticipated
Advocacy[26]:	Support from other levels of government will contribute to the success of this project, including: • Reinstatement of a provincial subsidy for electric vehicles purchases • A strong and effective federal clean fuel standard • A higher low carbon content in liquid fuels, particularly diesel through provincial regulations.
Minimum Results Required to meet the 100% Scenario[27]:	• Municipal fleet is 60% zero emission by 2030 and 100% by 2040
Key City Department(s):	• Lead: Innovative Client Services • Support: Community and Social Services; Emergency and Protective Services; Ottawa Public Health; Planning, Infrastructure, and Economic Development; Public Works and Environmental Services; Recreation, Cultural, and Facility Services; and Transportation Services
Key Community Partners:	• Federal and Provincial Government • Federation of Canadian Municipalities
Estimated Project Milestones:	• 2021: Update of the Municipal Green Fleet Plan • To be determined
Resources:	• Funding to be requested through the Municipal Green Fleet Plan to Transportation Committee
Delivery Mechanism:	• Incremental costs for lower emission vehicles and technologies paid through the Municipal Green Fleet Plan • Funding opportunities from senior levels of government or other agencies will be pursued • Support for charging infrastructure are detailed in Municipal Building Renovation and Retrofit Program

[26] *The list of advocacy topics is preliminary and further topics may be identified as the project is developed. The process, details, and timing for each topic will be determined on a case by case basis, as well as the lead as the municipality is not always best positioned to do so.*

[27] *The minimum results required to meet the 100% scenario are based off the energy and emissions model outputs. Further options may be evaluated under this project to meet the scale of action required.*

Projected Financial Profile:

- Assumes 100% financed at 4% interest rate for 10-year amortization term.

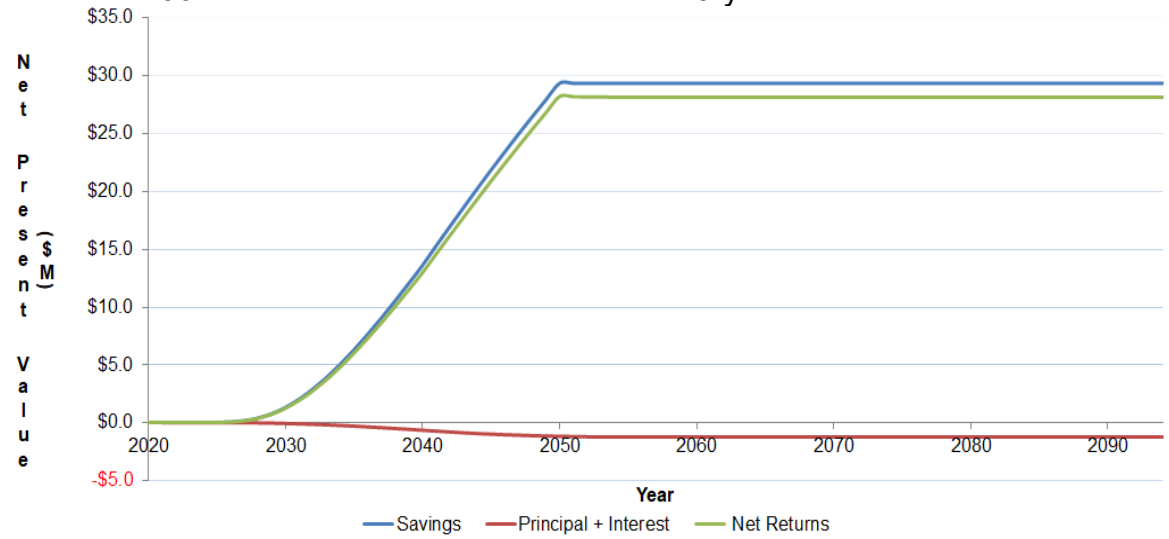

Figure 16: Projected financial profile for transitioning to zero emission municipal fleet, 2020-2094

Projected GHG Emissions Reduction:

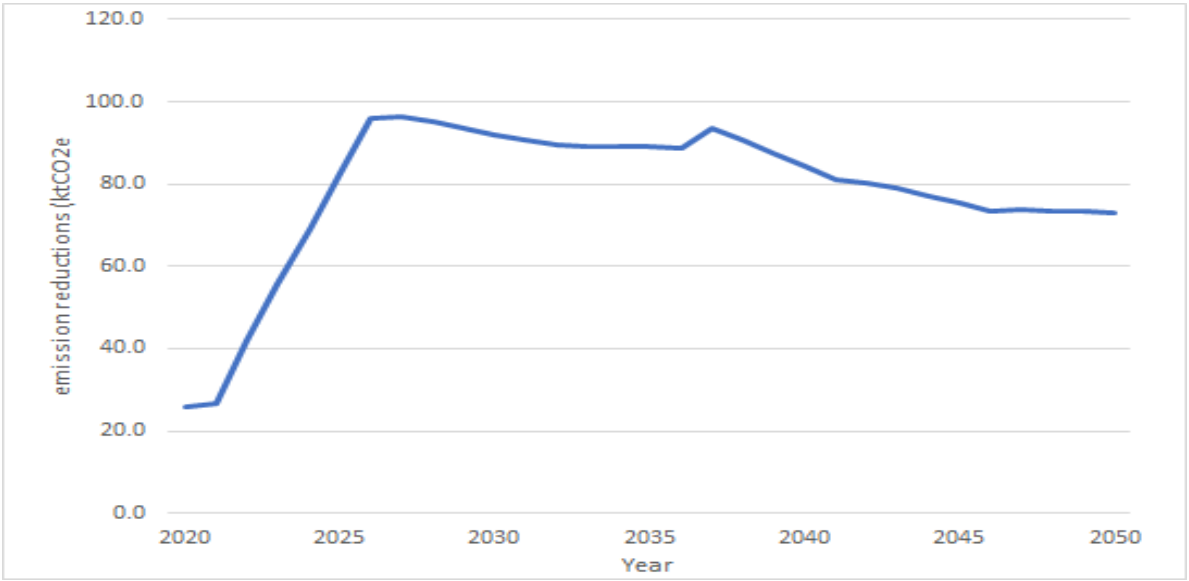

Figure 17: Project GHG emission reductions profile for transitions to zero emission municipal fleet, 2020-2050

Project: Alternative Energy Sources for Transit	**Standing Committee**: Transit
Description:	In 2018, corporate emissions represented roughly 4 per cent of all emissions generated in Ottawa, two-thirds of which were from the City's own fleets, including transit. The City has begun to transition its transit fleet to electric propulsion by converting existing rapid bus routes from diesel buses to zero-emission electric trains. Significant numbers of customer trips are being made on O-Train Line 1, Ottawa's electric light rail line. This Alternative Energy Sources for Transit project will develop recommendations for the Transit Commission and Council on how best to establish a roadmap to change the bus fleet over time to cleaner or non-polluting options. Any transition will require changes to Ottawa's bus operations, including procurement, infrastructure, service planning, maintenance requirements and staff training, among other areas. The project is being carried out in collaboration with other City departments and Hydro Ottawa. Steps in the process will include the review of: • Results of the initial procurement of electric buses Initial results from the operation of these buses as part of the OC Transpo system • Results of similar trials at transit systems in other cities • Technical findings and recommendations from Hydro Ottawa • Long-term conclusions and recommendations from the Transportation Master Plan (TMP) Update and its environmental scan of the existing regulatory framework; relevant Provincial and Federal policies, programs; and other research findings The TMP Update is also exploring potential funding sources for City transportation initiatives such as road pricing/tolls, gas taxes, parking levies, congestion charges, vehicle fees, value capture levies, and other options. The Alternative Energy Sources for Transit project will include: • An industry scan of available lower- and zero emission bus technologies for conventional service and paratransit (as examples, short- or long-range buses, battery-electric, hybrid diesel-electric, compressed natural gas, hydrogen fuel cell,

	renewable biodiesel, trolley bus, diesel bus conversions to electric, etc.); • An examination of the relevant practices and plans of other transit agencies (Canadian and worldwide); • Projecting the impact of lower- and zero emissions buses on City GHG emissions / targets; and • Considerations for a transition strategy (addressing opportunities, timing, infrastructure requirements, operational considerations, and total costs of ownership). The future conversion of the Trillium Line to electric propulsion is not currently included in the TMP scope of work, any planned OC Transpo initiative, or other City plans. Additional resources would be required to address this gap and meet the zero GHG target by 2030. As stated in the Mandate Letter to the Minister of Infrastructure and Communities, the Federal government will no longer fund diesel transit past 2022, so the timing for the transition is motivated by both carbon emissions and access to federal monies. Updating the non-bus OC Transpo fleet can be done in coordination with the City's Municipal Green Fleet Plan.
Co-Benefits:	• Reduced annual operational costs for zero emission buses over diesel buses • Improved air quality (including carcinogenic fine particulate and asthma-inducing NOx) for operators, passengers and the community in general • Noise reduction • Energy dollars remain within the City or region
Risks:	• Operational risks associated with a new technology • Financing options
Advocacy[28]:	The City depends on funding from senior levels of government for transit. Advocacy will be focused on securing funds in the timeframe required for success of this project. Also, more flexibility in how parking and licensing revenues can be used could be helpful as funding sources for transit.

[28] *The list of advocacy topics is preliminary and further topics may be identified as the project is developed. The process, details, and timing for each topic will be determined on a case by case basis, as well as the lead as the municipality is not always best positioned to do so.*

Minimum Results Required to meet the 100% Scenario[29]:	Based on the integrated emissions modeling process that informed the Energy Evolution Strategy, the following outcomes are required for transit. Additional analysis underway by the Transportation Services Department will determine the implementation path: • Half of the currently non-electrified transit fleet (buses, Para Transpo and the Trillium line) are converted to zero emissions by 2025 and all transit fleet is zero emission by 2030.
Key City Department(s):	• Lead: Transportation Services • Support: Finance Services; Innovative Client Services; Planning, Infrastructure and Economic Development
Key Community Partners:	• Hydro Ottawa / Envari • Canadian Urban Transit Research & Innovation Consortium
Estimated Project Milestones:	• 2020: TMP Update environmental scan completed • Q1 2021: TSD study of alternative energy sources for transit fleet options to feed into the Fleet Strategy update; Alternative Energy Transit Project to be completed • Fall 2023: Transportation Master Plan Update completed
Resources:	Municipal Resources - Staff – This Program plan can be developed with existing staff and contracted resources - Finances – Additional funding and financing may be required to implement a fleet transition decided by Council. - Development charges can be used to partially fund the cost of transit for new development. A development charge or tax levy specific to transit is an option that will be reviewed as part of the TMP Update.
Delivery Mechanism:	To be determined based on the outcomes of work outlined above.
Projected Financial Profile:	To be determined based on the outcomes of work outlined above.
Projected GHG Emissions Profile:	To be determined based on the outcomes of work outlined above.

[29] *The minimum results required to meet the 100% scenario are based off the energy and emissions model outputs. Further options may be evaluated under this project to meet the scale of action required.*

Project: Transportation Mode Shift	**Standing Committee**: TC
Description:	As the second largest contributor of community wide emissions in the city (44%), significant action and investment will be required for Ottawa to transform the movement of people and goods to achieve the adopted GHG transportation targets. This will require implementation of ongoing and planned actions as well as new actions not yet approved. This will entail detailed financial analysis to refine costs, savings, revenue and funding options. The 2013 Transportation Master Plan (TMP) target is to reach a 50% sustainable mode share (i.e. walking, cycling, transit or carpool) by 2031. The Official Plan together with the TMP Update will establish the policies to support the vision that the majority of trips will be made by sustainable transportation by 2046. The TMP Update includes support for reducing transportation related emissions through its workplan and recommendations. The TMP Update is expected to be completed by Fall 2023 and will evaluate a number of potential strategies to achieve updated mode share targets to 2046. In 2016, approximately 63% of commuter trips were made by driving with transportation-related emissions from all vehicle trips accounting for 44 per cent of Ottawa's total greenhouse gas (GHG) emissions. Strategies to reduce the share of trips by private vehicles is therefore an important part of meeting the City's GHG reduction targets. The goal of the Transportation Mode Shift is to reduce the reliance on personal vehicles in favour of sustainable modes, all within a mobility network that is affordable, accessible and well connected. While the TMP model outputs on modal share will consider the assumptions used in the Energy Evolution model as well as applying a GHG calculator when running focused network scenarios, the final recommendations from the TMP Update must also consider other objectives and constraints, such as affordability, equity, and technical feasibility. Network planning that accommodates higher non-auto modes shares and aspires to the GHG targets set out as part of the Climate Change Master Plan could be achieved by:

	• Continuing the expansion of the City's Light Rail Transit and Bus Rapid Transit networks guided by the integration of land use and the city-building vision set out by the Official Plan, including areas targeted for intensification. • Focusing new growth around higher-order transit • Requiring the provision of pedestrian and cycling facilities on all new and reconstructed roads in accordance with the TMP and/or the Active Transportation Plan. • Building additional pedestrian and cycling facilities on existing roads (as stand-alone projects and/or as part of resurfacing projects) in accordance with the TMP and Active Transportation Plan. • Reviewing emerging business models and technologies such as shared mobility, e-bikes and e-scooters. • Implementing Transportation Demand Management measures such as parking management, trip planning tools, outreach programs, etc. • Exploring potential new funding sources (e.g. user fees, parking micro-levies, gas taxes, road tolls and congestion charges). The TMP Update also includes the development of a series of discussion papers as follows: 1. New mobility 2. The cost of travel 3. Climate change mitigation and resiliency in transportation 4. Potential funding sources
Co-Benefits:	• Household transportation-related energy costs decline • Decrease in engine noise from combustion engines • Cost of getting around the city declines with enhanced opportunities to walk, cycle and use transit • Reduced congestion • Public health benefits • Road safety benefits • Potential cost savings in some areas (e.g. parking, road maintenance) • Improved mobility options • Increased transit ridership

Risks:	• TMP network modeling scenarios may not align with Energy Evolution model target • Higher costs in some areas (e.g. operations and maintenance costs) • Not enough funding exists to implement actions required to reach GHG emissions reduction targets • Lack of public support for enabling actions (e.g. new funding sources) • Lack of support from senior levels of government (funding, legislation, policy) • Insufficient time and/or construction industry capacity to deliver required infrastructure projects • Dispersed and low-density development results in land use patterns that are not conducive to transit and active transportation, and traffic congestion is maintained
Advocacy[30]:	The City has limited funds to carry out the required transportation infrastructure improvements to support all the transportation model actions. Potential advocacy topics related to transportation mode shifts include: • The Provincial government to enable cities to implement road user fees. • The Provincial government to implement a sales tax specific to private parking revenues. • The Provincial government to increase vehicle registration fees on high GHG-emitting vehicles, in order to fund transit • The Provincial government to shift funding from highway expansions to transit • The Provincial and Federal government to apply levies on gasoline
Minimum Results Required to meet the 100% Scenario[31]:	• The 24-hour mode share for automobiles would have to drop from 74% in 2016 to 58% in 2030 and 55% in 2050. • The transit share would have to increase from 12.2% to 20% and the balance of trips would have to be made by active transportation (cycling and walking).

[30] *The list of advocacy topics is preliminary and further topics may be identified as the project is developed. The process, details, and timing for each topic will be determined on a case by case basis, as well as the lead as the municipality is not always best positioned to do so.*

[31] *The minimum results required to meet the 100% scenario are based off the energy and emissions model outputs. Further options may be evaluated under this project to meet the scale of action required.*

	• The City's mode share targets and how they compare to these results will be determined as part of the Transportation Master Plan Update (currently underway).
Key City Department(s):	• Lead: Transportation Services • Support: Planning, Infrastructure and Economic Development
Key Community Partners:	In addition to engaging with the general public, the TMP Update consultation plan includes engagement with the following stakeholder groups: • Council Sponsors Group • City Advisory Committees • City departments • Community groups • Industry groups • Agencies • Equity-seeking groups
Estimated Project Milestones:	• The TMP Update is scheduled for completion in Fall 2023
Resources:	Municipal Resources • Staff: This project can be completed with existing staff resources who are dedicated to the TMP Update • Finances: The TMP Update will include an affordability analysis based on the City's Long-Range Financial Plan and in consultation with Financial Services. If necessary, budget pressures will be identified through the annual budget process. • Car free zones are out of scope of the TMP and will need additional resources to implement
Delivery Mechanism:	• City policy and investment

Projected Financial Profile:

- Assumes 100% financed at 4% interest rate for 20-year amortization term.
- Figure 1 includes active transportation infrastructure and car free zones.

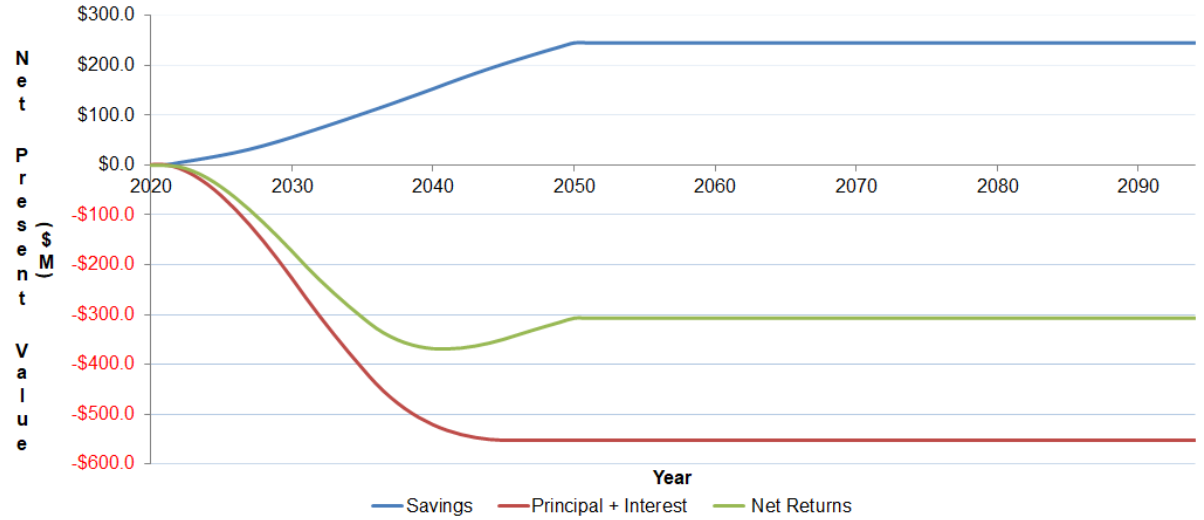

Figure 18: Projected financial profile for transportation mode shift, 2020-2094

Projected GHG Emissions Reduction:

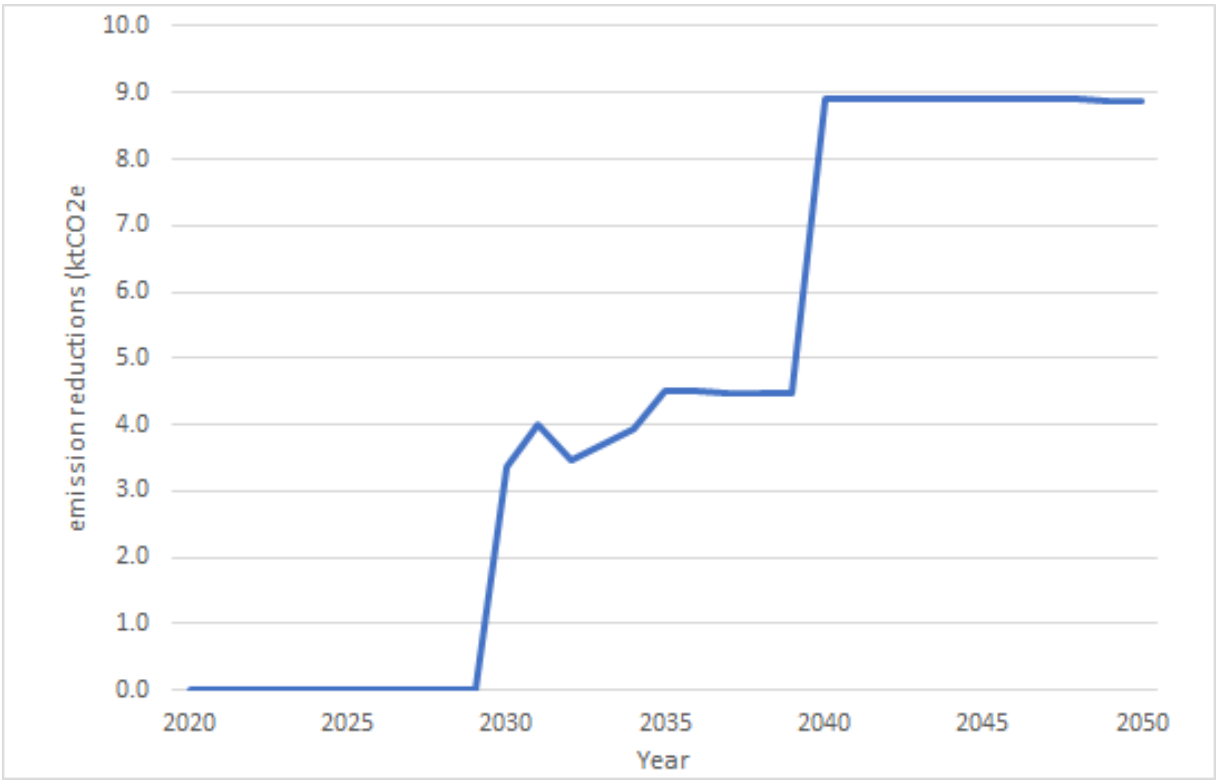

Figure 19: Projected GHG emissions reductions for transportation mode shift, 2020-2050

Sector: Waste and Renewable Natural Gas

Project: **Organics Resource Recovery Strategy**	**Standing Committee**: SCEPWWM
Description:	Some organic waste (i.e. all food, leaf and yard waste, wood, and paper waste) that ends up in a landfill releases methane, a potent GHG. In most modern landfills, including the City's Trail Waste Facility and Waste Management's Carp Landfill (private sector), a portion of that methane, known as landfill gas, is captured and turned into electricity. Source separated organics (SSO) can provide a significant opportunity for carbon reductions as it can be converted into compost and/or renewable natural gas (RNG). Ottawa's residential SSO is collected by the City, with approximately 44% of household organics, 11% of multi-unit residential organic waste, and 97% of leaf and yard waste being diverted from landfill[32]. It is recognized that the magnitude of the complete elimination of organics from landfill is large and complex and will require significant public behavior change and investment from the City and private industry. Without a strong shift in public behaviour, it is unlikely that the magnitude of change required to achieve the short-term objectives called for in solid waste by the Energy Evolution 100% GHG reduction scenario will be possible. However, this strategy will explore the mechanisms within the City's influence and control that will help support increased levels of organics diversion as well as opportunities to generate renewable natural gas from organics. Convertus (formerly Renewi Canada) is under contract with the City until 2030 to process residential SSO into compost using an aerobic tunnel composting technology. The City also owns, operates and maintains the Barnsdale Road Composting Pad. During the Spring and Fall peak leaf and yard waste seasons, leaf and yard waste that is set out for curbside collection outside of the green bin is collected separately and processed at this location using an outdoor windrow composting technique. ICI (Industrial, Commercial, and Institutional) waste is regulated by the Province and mostly collected and processed by private waste management firms. The City currently has no statutory requirement to play in ICI waste collection and processing. Despite not being regulated to do so, as a result of previous Council direction, the City of Ottawa does provide SSO collection

[32] Based on 2018-2019 4 Season Curbside Waste Audit Study

	and processing services for multi-unit residential buildings, small businesses through the City's yellow bag program, as well as City facilities. As of 2019, approximately 36% of multi-residential buildings participated in the City's green bin organics program. The purpose of the Organics Resource Recovery Strategy is to investigate the potential diversion of all residential and ICI organic waste generated in Ottawa from landfills within the city boundary for conversion into RNG (captured under the Renewable Natural Gas Strategy project). waste collection vehicle emissions are captured under the Commercial and Municipal Fleet Zero Emissions Strategies, hence not discussed here. In 2018, GHG emissions from residential and ICI solid waste accounted for roughly 7 per cent of Ottawa's total emissions. To meet Council's target of reducing emissions 100% by 2050, the Energy Evolution model calls for: • 98 per cent of organic materials is diverted from all landfills within the city's boundaries by 2024 • All organic waste generated within the city's boundaries be routed to anerobic digestors or gasification by 2030 • 100 per cent of organic materials generated within the city's boundaries is diverted from landfills by 2040 By mid 2022, the City will have developed a municipal Solid Waste Master Plan for Council consideration, that will provide direction and goals for residential solid waste management, diversion, and reduction over the next 30 years. ICI waste, which accounts for approximately 60-70% of the total solid waste generated in Ottawa is managed by private waste collectors, processors, and landfill owners. Organics diversion, collections and processing for this sector falls outside the scope of the Solid Waste Master Plan as well as the City's statutory responsibility as it is regulated by the Province. A portion of ICI waste is construction and demolition waste, some of which is wood or other organic materials. All three levels of government, as well as all residents and businesses, have a role and responsibility in waste management, and separation and diversion of organic materials from landfills. It is important to note that the Province has indicated their intention to investigate banning the disposal of organics in landfills. If they implement this proposed landfill ban on organics, starting as early as 2022, this ban would apply to both the residential and ICI sectors. At the time of preparing this

	project overview, the Province has not made any notable headway on the proposed ban. It is recognized that the magnitude of the complete elimination of organics from landfill is large and complex and will require significant public behavior change and investment from the City and private industry. Without a strong shift in public behaviour, it is unlikely that the magnitude of change required to achieve the short-term objectives called for in the solid waste sector by the Energy Evolution 100% GHG reduction scenario will be possible. However, this strategy will explore the mechanisms within the City's influence and control that will help support increased levels of organics diversion as well as opportunities to generate renewable natural gas from organics, with initial ideas discussed herein. As part of the Organics Resource Recovery Strategy opportunities to be explored and consulted on through the Solid Waste Mater Plan as well as other component projects supporting the Master Plan include: • Explore the possibility of banning organics from the Trail Road landfill, which the municipality has authority to do for waste disposed of at the Trail Waste Facility through mechanisms to be identified in the SWMP and supporting policy mechanisms required to support a ban (ex. enforcement, fines, education, etc.) • Explore opportunities to improve the diversion of organic waste from multi-residential properties through the development and implementation of the Multi-Residential Waste Diversion Strategy, which is currently scheduled to be presented to Council for consideration in 2021 • Explore at a high-level, alternative technology options that would be required to remove organics from the garbage stream (such as mixed waste processing) for residential waste, as well as alternative organics processing technology options that would support RNG generation (such as anerobic digestion for example) • Explore funding opportunities such as user fees and incentives/disincentives to help further encourage organics diversion of residential waste. • Investigate municipal policies, programs and enforcement options and opportunities such as polluter pays principles, life cycle accounting, reducing food waste, and increased diversion rates for residential waste • Investigate the limited options available to the City as authorized through its powers under the Municipal Act, 2001

	to influence how waste is managed in the IC&I sector, for example, By-laws, fees and fines, business licensing, and the development review process. Opportunities to explore that are not currently included in the SWMP and will need additional resources to plan and implement, include: • Advocacy strategy directed at senior levels of government to, through regulation and enforcement resources, reduce waste generated, in particular in the ICI sector, and provide a fair framework for businesses across jurisdictions. • Consider an immediate opportunity to reduce construction and demolition waste by requiring that a waste reduction and separation plan be submitted with building permit applications above $10,000, to be reviewed by building permit team. This is being considered under the High-Performance Development Standards as part of the City's development of the New Official Plan. • Develop a Waste Organics to Heat Strategy which, in conjunction with the Renewable Natural Gas Strategy, would identify opportunities to use waste streams not applicable to RNG production, for thermal energy generation. This should be considered in conjunction with the Community Heating Strategy and be aligned with the vision and objectives set out in the Solid Waste Master Plan. • Advocate for circular economy regulations and procurement at the federal and provincial levels of government (i.e. convert Provincial Food and Organic Waste Policy Statement to regulation, clearly define waste reduction and resource recovery of food and organic waste)
Co-Benefits:	• New jobs created in waste diversion sector • New investment opportunities in waste diversion and energy recovery from waste, keeping dollars in the local economy • Potential to increase the remaining landfill capacity • Potential to increase nutrient cycling through reapplication of processed organics on land • Potential to earn revenues from energy from waste
Risks:	• Lack of participation from landlords, residents, and ICI sector in actions to separate waste • Provincial legislation banning organics in landfills, in particular for the ICI sector, not passed or implemented or lags behind schedule required for Energy Evolution • Lack of local organics processing facility capacity (including Province-wide) to process ICI sector organic waste or to generate RNG

	• Possible increase in trucking and GHGs resulting from collection of organic material as a separated waste stream which could reduce or negate the benefits of diverting the organics from landfill. • Potentially significant increases in collection and processing costs • Federal and provincial legislation not sufficient to expedite waste reduction and separation and extended producer responsibility
Advocacy[33]	Support from other levels of government is required for the success of this project, including: • Implement circular economy regulations and procurement standards • Balancing concerns related to fugitive methane emissions while ensuring landfill regulatory compliance • Implement an effective ban on organics in all landfills • Implement solid waste polluter pays policies as proposed in the Extended Producer Responsibility legislation • Strong regulatory requirements for source separation of organics in this sector
Minimum Results Required to Meet the 100% Scenario[34]**:**	• Divert organic material at rates and volumes required to satisfy the requirements of the Renewable Natural Gas Strategy • 98% of organics diverted from landfill by 2024 • All leaf and yard waste is gasified after 2030 displacing fossil gas • 100% of organics diverted from municipal landfills by 2040 and from private landfills by 2050
Key City Department(s):	• Led by Planning, Infrastructure and Economic Development • Supported by Public Works and Environmental Services

Key Community Collaborators:	• Federal and Provincial government
	• IC&I sector at large – to implement SSO programs, including:
	  ○ Multi-unit residential building (MURB) landlords and large employers
	  ○ Construction contractors and developers
	• Private waste collectors, processors and landfill operators

[33] *The list of advocacy topics is preliminary and further topics may be identified as the project is developed. The process, details, and timing for each topic will be determined on a case by case basis, as well as the lead as the municipality is not always best positioned to do so.*

[34] *The minimum results required to meet the 100% scenario are based off the energy and emissions model outputs. Further options may be evaluated under this project to meet the scale of action required.*

Estimated Project Milestones:	• 2022: CCR to complete a baseline assessment of the ICI waste in Ottawa with a view to reducing amounts generated and recovering organics from this stream • 2022: Solid Waste Master Plan completed
Resources:	Municipal Resources: • Existing resources to complete the Solid Waste Master Plan • New resources and funding for items that fall outside the SWMP • New budget pressure for any promotion and education requirements • New budget pressures required to support the success of new policies and programs (ex.by-law enforcement) will be identified and quantified in the SWMP Community resources: • Future financial and personnel pressures for the installation and maintenance of waste diversion mechanisms and infrastructure in MURBs and IC&I sector; waste separation plans and methods for construction and demolition projects. • Additional resources for organics processing
Delivery Mechanism:	• City for residential waste. • Private for commercial waste.

Projected Financial Profile:

- Assumes 100% financed at 4% interest rate over 20-year amortization term.
- Figure 1 includes residential and commercial waste diversion.
- Biogas generation is separate from this project**.**

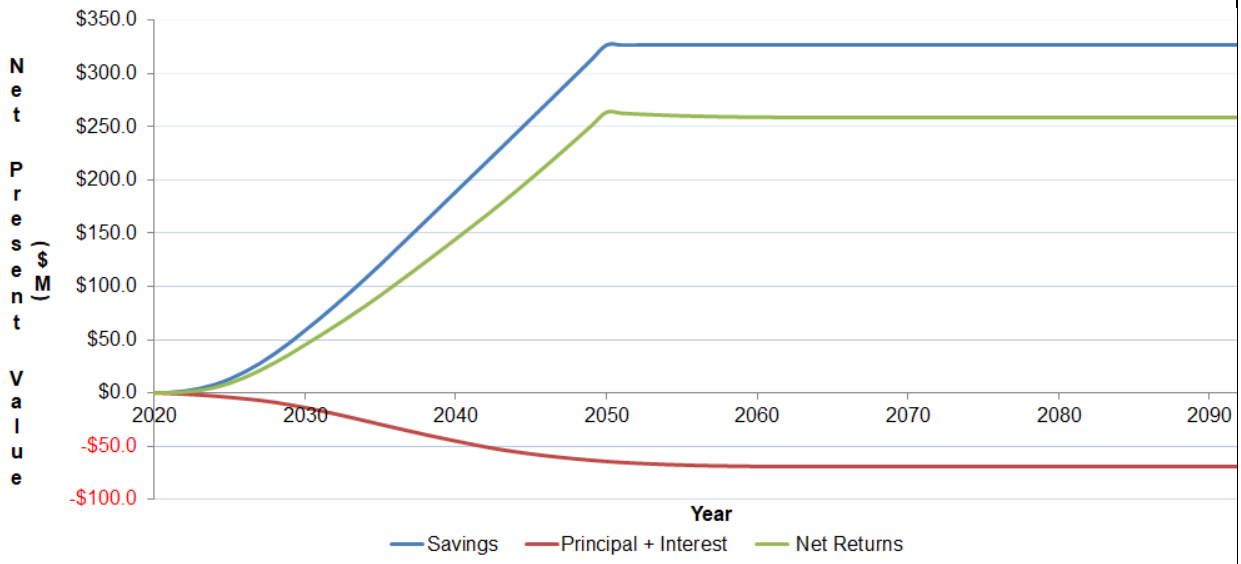

Figure 20: Projected financial profile for residential and commercial waste diversion ,2020-2094

Project GHG Emissions Reductions:

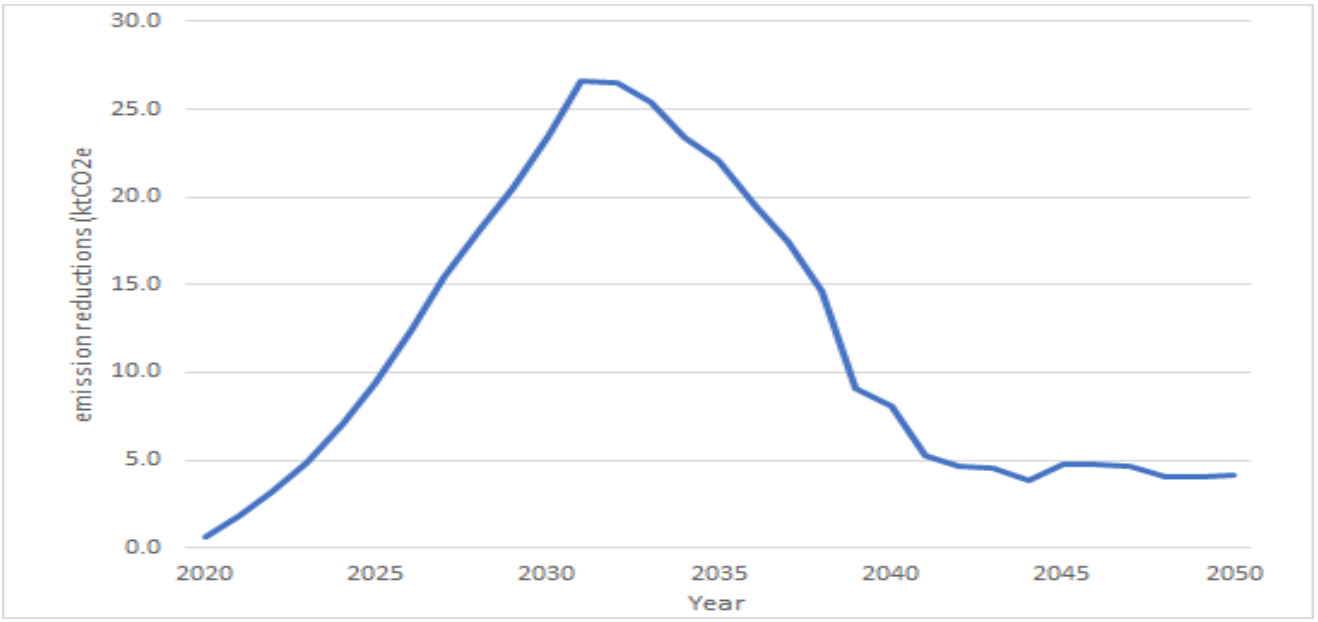

Figure 21: Projected GHG emissions reductions for residential and commercial waste diversion, 2020-2050

Project: Renewable Natural Gas Strategy	**Standing Committee**: SCEPWWM; ARAC
Description:	Energy Evolution calls for significant deviation from the current practices as defined in the Business as Planned report. The Business as Planned scenario foresees most biogas used for electricity generation and some organic material[35] not getting converted to biogas. The 100% GHG reduction model, however, requires virtually all organic material to become biogas and most biogas to become renewable natural gas (RNG). Additionally, the model prescribes some electricity becoming renewable natural gas through power to gas technology. The (RNG) strategy seeks to influence, coordinate and align key corporate and community projects to support the development and optimization of RNG in Ottawa. The scope includes using biogas and power to gas to generate RNG to displace fossil sourced natural gas on the gas grid. Biogas is gas derived from organic biological material such as municipal wastewater, solid waste, and agricultural waste. Most biogas in Ottawa is currently used to generate electricity and sometimes heat. Corporately, biogas is already captured and collected at ROPEC and Trail Road Waste Facility and Waste Management's Carp Rd Landfill. The Trail Road Waste facility's landfill gas to electricity plant has been in production since 2007. At ROPEC, the cogeneration facility has been in operation since 1997 and was approved for expansion as part of the Electrical Reliability and Efficient Use of Digester Gas Project which will make more efficient use of the heat and power produced and greatly contribute to the plant's climate resiliency. Power to gas involves the use of electricity to make gas that can be injected into the gas grid. Power to gas from hydrogen will be considered in the strategy. Power to methane, although promising will not be considered at this time since the technology is not yet at the large demonstration stage. The RNG strategy will progress in two stages. The first phase will consist of several separate corporate projects that have started (ROPEC Biogas Optimization Study, Solid Waste Master Plan), or will soon be underway (ROPEC Site Master Plan). The second stage will build on the information and recommendations generated

[35] For the purpose of the Energy Evolution program, organic material (or organics) is defined as non-fossilized carbon-based compounds ordinally derived from living material and capable of being partial or completely transformed into a renewable energy source.

	in the first stage to develop a community wide RNG strategy, including key corporate opportunities. Opportunities to reduce biogas gas consumption at sites where biogas is produced, through conservation and/or use of heat pumps where feasible will also be considered as a way to increase net RNG production.
Co-Benefits:	• Energy dollars staying in the community • Diversification of energy supply and increased energy security • Potential rural economic development opportunities • Utilization of off-peak electricity
Risks:	• Market changes for inputs and RNG produced • Needing to ensure that regulatory requirements for the landfill operation and wastewater plant operation stay within compliance as new RNG strategies are contemplated and developed • Regulatory changes that could impact biogas production, especially at landfills • New technology risks with power to gas • Emissions regulations and technology risks for gasification
Advocacy[36]:	Support from or implementation by other levels of government is required for the success of this project, including: • Research and development into gasification aligned with the needs of Energy Evolution and the solid waste master plan. • Research and development into power to methane technology ideally at a wastewater treatment plant • Encourage higher levels of government to procure RNG for applications which require gas as their only energy option • Require an RNG mandate similar to Quebec or BC • Reduce barriers for power to gas (increase permitted hydrogen blending ratio) • Balancing concerns related to fugitive methane emissions while ensuring landfill regulatory compliance • More flexibility for energy projects at rate based services (water, wastewater) to have revenues directed towards climate mitigation projects
Minimum Results Required to	• This resource needs to remove 15% of community wide emissions by 2050. To start, one site (City or Private) needs to be producing 80 TJ of gas by 2030. By 2030, almost all organics

[36] *The list of advocacy topics is preliminary and further topics may be identified as the project is developed. The process, details, and timing for each topic will be determined on a case by case basis, as well as the lead as the municipality is not always best positioned to do so.*

Meet the 100% scenario[37]:	need to become RNG and roughly 15% of total RNG production needs to come from power to gas. At the time of modelling it appears that RNG is required to reduce emissions from building heating as opposed to transportation.
Key City Department(s):	• Lead: Planning, Infrastructure, and Economic Development • Support: Innovative Client Services; Public Works and Environmental Services
Key Community Partners:	• Enbridge gas distribution (primary partner) • Canadian and Ontario biogas associations • Comcor (Formally Powertrail) • Convertus (formally Renewi Canada) • Agricultural sector • Waste management industry (Waste Management and Taggart) • District energy system operators • Neighboring municipalities • Commercial building operators
Estimated Project Milestones:	• Stage 1 (2020 – 2022): Identify key issues and opportunities[38]: o Complete Biogas Optimization Study; recommendations to inform Solid Waste Master Plan and Future Organics Processing Capacity (Post-2030) project, and ROPEC Master Plan. Determine if any recommendation from the Biogas Optimization Study can be fast tracked (i.e. assess natural gas infrastructure requirements and other site specific requirements) o Conduct an initial investigation into the potential benefits of sending more organic waste, (such as commercial kitchen waste for example) to ROPEC. The purpose would be to determine if such waste diversion could make an appreciable contribution to biogas production. If it's determined there is an opportunity, a more in depth feasibility study will be considered subject to scope definition and budget availability. o Pending the outcome of the Solid Waste Master Plan, it might be necessary to initiate further investigation for RNG potential at Trail Road. o Identify site specific and natural gas infrastructure needs to accommodate larger RNG volumes

[37] *The minimum results required to meet the 100% scenario are based off the energy and emissions model outputs. Further options may be evaluated under this project to meet the scale of action required.*
[38] Note that renewable electricity generation (solar and recently wind) has been discussed for the ROPEC and Trail road sites and this is discussed in the Electricity Resource Strategy in the Energy Evolution Final Report

	○ Assess interest in RNG from private landfills (ex. Carp Landfill, Capital Resource and Recovery Center and large agricultural sites) ○ Assess interest in the agricultural community in partnering with the City in RNG production ○ Work to explore the possibility and ramifications of capping Trail Road Landfill cells in a timely manner to reduce fugitive landfill emission of methane and enhance methane recovery over the life of methane production at the site. ○ Complete the Solid Waste Master Plan ○ Complete ROPEC Site Master Plan ○ As challenges with GHG emission in the buildings sector look particularly challenging, we will look for opportunities to expedite RNG projects • Stage 2 (2022-2025): Develop an RNG strategy and implement plans ○ Consider the results and recommendations from Phase 1 as well as longer term issues and opportunities associated with the outcome of the Solid Waste Master plan and other key initiatives. ○ Assess further power to gas opportunities including power to methane and production at other sites ○ Assess options which free up biogas produced at ROPEC to increase RNG or electricity production.
Resources:	• Additional resources will be required to implement. • Staffing and budget pressures will be identified through future annual budget processes. • P3 investment and revenue options will be explored.
Delivery Mechanism:	• P3 to the extent possible with some City investment

Projected Financial Profile:

- Assumes 100% financed at 4% interest rate for 20-year amortization term.

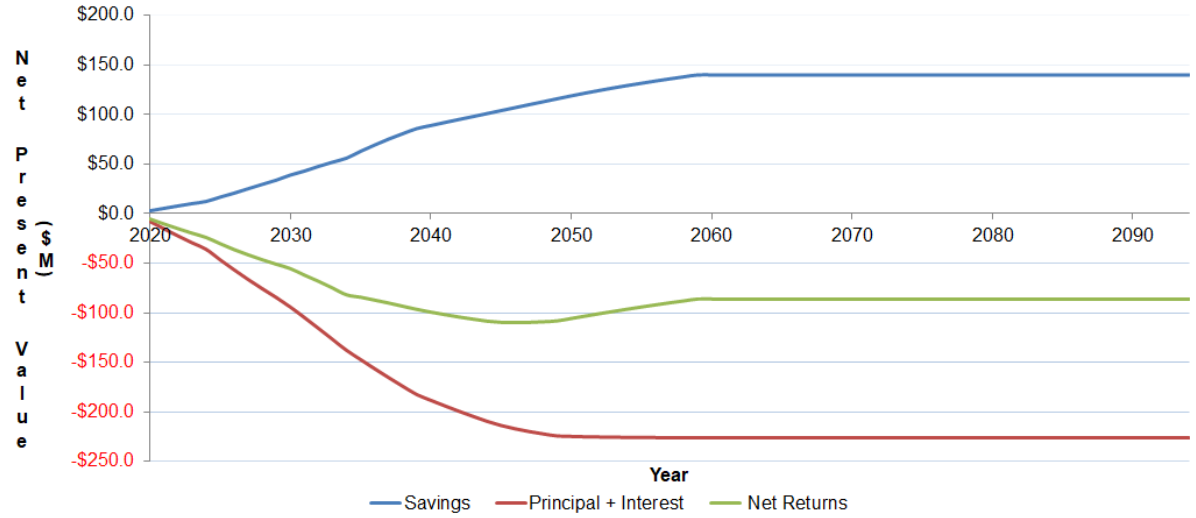

Figure 22: Projected financial profile for the renewable energy strategy, 2020-2094

Projected GHG Emissions Reduction:

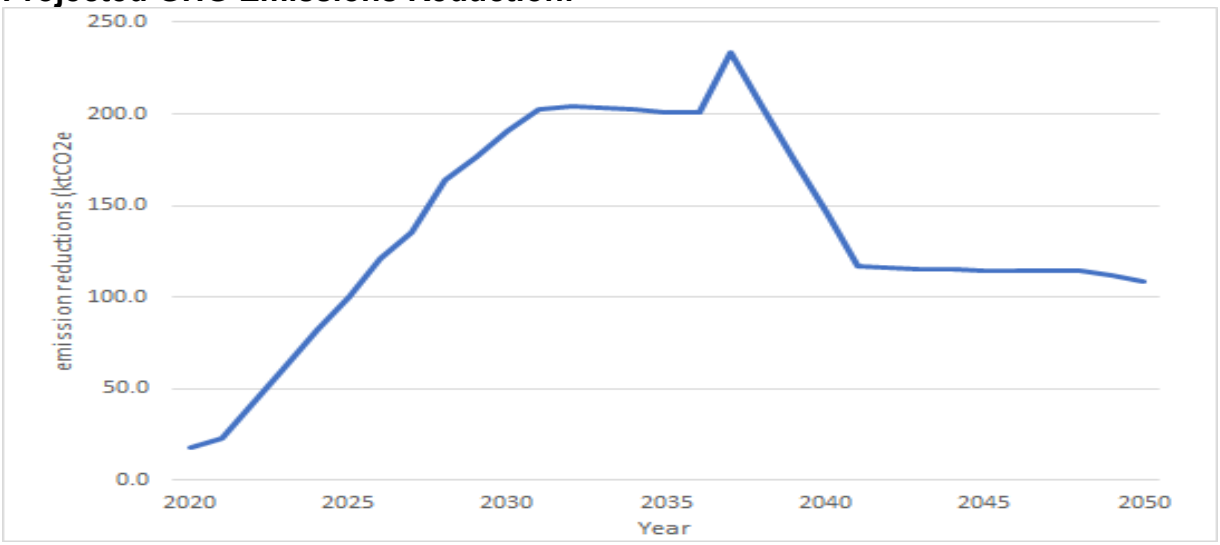

Figure 23: Project GHG emission reductions for the renewable natural gas strategy, 2020-2050

Sector: Electricity

Project: Electricity Resource Strategy	**Standing Committee**: SCEPWWM
Description:	Achieving the 100% scenario will put increasing demands on electricity production and delivery. Renewable electricity projects are required to contribute to 8.5% of the community carbon reductions required to meet the 100% scenario in 2050. The Ontario electricity supply is on average quite low in carbon; however, the Energy Evolution model foresees a doubling of electrical demand as electrification of transportation, heating and population growth drive demand. The additional requirements for renewable electricity generation will reflect both the need to meet new demand and to offset anticipated carbon intensity of the provincial grid as forecasted by the Ontario Ministry of Energy, Mines and Northern Development. The renewable generation addition by 2050 prescribed by the model (3.2GW of wind, 1.2 GW of solar and small amounts of waterpower as opportunities exist) roughly follows an academic study[39] that details the best renewable electricity generation mix for Canada. It is further backed up by electrical system reports for Ontario[40]. However, regional Eastern Ontario specific features and other barriers to wind power may lead to a different mix of renewable sources being optimal. It will therefore be preferable to ramp up solar generation at a faster pace for at least the first five years. This will initially be through a rooftop strategy, as on-site net metering and behind the meter generation are the only available opportunities to connect renewable electricity generation to the grid. Also, because of the relative scarcity of renewable fuels, fuel-based co-generation cannot be installed unless there are rationales for doing so related to redundancy requirements or support of specific electricity system requirements. Existing cogeneration plants that do not meet these criteria should be retired as opportunities exist. In addition to generation, a sizable amount of battery or other power storage capacity (0.6GW) is required to ensure that variable renewable generation can be shifted from periods of

[39] 100% Clean and Renewable Wind, Water and Sunlight All-Sector Energy Roadmaps for 139 Countries of the World. Mark Z Jacobson, Mack A. Delucchi, Zack A.F Bauer, Jingfan Wang, Eric Weiner, Alexander S. Yachanin, Joule. September 6, 2017. http://web.stanford.edu/group/efmh/jacobson/Articles/I/CountriesWWS.pdf

[40] Ontario Reliability Outlook Mach 26, 2020. http://www.ieso.ca/Sector-Participants/IESO-News/2020/03/New-Reliability-Outlook-released

	surplus to periods of high demand and prevent curtailment of renewable generation. **Initial 5 Year Plan** 1. An initial step will involve reducing barriers for private and community investment in new renewable electricity generation and promoting this investment using tools and resources available to the City, Hydro Ottawa/One and the community. 2. Advocating for a long considered virtual net metering framework and third-party ownership of net metering will be important steps. The City will join others in advocating for their quick adoption and rapid implementation. This will open opportunities for the suite of renewable generation identified in Energy Evolution's pathway. An interim opportunity that has been identified is separate-account net-billing implemented directly by the local utilities. Additionally, should the Province not move to a net zero emissions grid, municipalities like Ottawa will need authority to purchase regionally produced renewable electricity to reach their zero-carbon goals. 3. The City is preparing for a renewable energy market. The new Official Plan will include policies related to local renewable electricity generation and electricity storage. Work will be done to identify ideal sites for utility-scale renewable energy and storage projects and to seek opportunities to secure them for such purposes. There will be many outcomes of the increased use of electricity across the community for heating and transportation. Local and Regional Integrated Resource Planning will need to take this into account and ensure that new demands are met with zero carbon options. Power to gas and power to thermal represent opportunities for dispatchable zero carbon loads which could be of interest to the system operator. At the residential level, higher demand for electricity for electric vehicles and heat pumps may spur demand for service upgrades or storage/" smart house" solutions. If needed, these upgrades will need to be available and affordable to consumers and businesses to ensure that Energy Evolution targets are not missed. Finally, local mandates for things like conservation (i.e., a ban on non-LED exterior lighting) and use of zero emission equipment (such as heat pumps), which Energy Evolution will consider, will likely be significant impactors on net electricity demand.

Co-Benefits:	• Boost the local economy by keep energy dollars local and stimulating green jobs • Increases energy security • Local generation, storage, and demand control reduces distribution re-enforcements, thus improving land use • Improve air quality • Reduce energy bills through conservation and demand management and lower cost supply.
Risks:	• The carbon intensity of the provincial bulk transmission system increases more than forecasted • Distribution system enabling policies (i.e. virtual net metering or net metering financing) are not implemented quickly enough to enable renewable electricity expansion. • Renewable projects are not accepted by the community. • Preferred sites for utility scale renewable energy generation are not secured
Advocacy[41]:	Support from other levels of government is required for the success of this project, including: • Align conservation demand management programs with Provincial GHG targets • Remove small scale solar siting restrictions • Allow net metered accounts to stay on time of use billing as an option • Require local distribution companies to have a standardized process to renewable energy connections which standardizes costs, times for studies and times for connections • Ensure ongoing access to low priced, market rate electricity in Class A accounts • Obtain access to low priced electricity during periods of low demand for Class B accounts • Research distribution scale wind systems suitable for urban settings • Encourage movement to a zero emission electricity grid • Guarantee market access to conservation or renewable generation through provincial power purchase agreements if it is lower cost than existing generation • Ensure that initiatives which encourage better utilization of the electrical system can be funded from the electrical rate base at large or from distribution company earnings

[41] *The list of advocacy topics is preliminary and further topics may be identified as the project is developed. The process, details, and timing for each topic will be determined on a case by case basis, as well as the lead as the municipality is not always best positioned to do so.*

	• Work to ensure that electrical distribution system reinforcements driven by electrification do not trigger economically prohibitive costs to individual consumers • Remove the stipulation which limits behind the meter generation to 1% of a distribution system's peak demand • Develop frameworks which allow evaluation of non-wires solutions to be evaluated as capacity and energy resources • Encourage the continued publication of a long-term energy plan • Place a moratorium on combustion-based new electricity generation on either the transmission or distribution systems or behind the meter • Discourage the renewal of contracts with combustion based electricity generators at the transmission and distribution systems or behind the meter • Limit or eliminate demand charges for stand-alone EV charging • Enable virtual net metering and third-party ownership of renewable electricity projects
Minimum Results Required to Meet the 100% Scenario[42]:	• Avenues to meet at least 30% of the required renewable generation are in place by 2022 • The first five-year renewable targets are met to ensure that expertise and capacity are developed to continue renewable installation for the rest of the planning period to 2050
Key City Department(s):	• Lead: Planning, Infrastructure, and Economic Development • Support: Finance Services
Key Community Partners:	• Hydro Ottawa and Hydro One • Portage Power • Universities and Colleges • Solar contractors • Ottawa Renewable Energy Co-operative • Invest Ottawa

[42] *The minimum results required to meet the 100% scenario are based off the energy and emissions model outputs. Further options may be evaluated under this project to meet the scale of action required.*

Estimated Project Milestones:	• Five Year (2020-2025) Targets:[43]
	  ▪ Solar: 150 MW
	  ▪ Wind: 20 MW
	  ▪ Storage: 20 MW
	  ▪ Hydro: 20 MW
	• 2020: Provide input to and comment on the Hydro Ottawa five-year direction plan to align it with Energy Evolution targets
	• 2020 onwards: Remain active in planning at the Independent Electricity System Operator and the Ontario Energy Board
	• 2021: Establish a stakeholder working group to evaluate distributed generation and storage options and encourage private and community investment
	• 2021 onwards: Implement additional smart grid showcases in several parts of the City
	• 2020-22: Install power to thermal at City facilities which have access to low cost wholesale priced power. Showcase this work.

Resources:	• To be undertaken with existing staff resources • Future budget requests may be required for consultants to develop implementation plans and for demonstration projects.
Delivery Mechanism:	• Private ownership, co-operative ownership, Portage Power generation, building standards and policies, corporate (City) procurement. • Net metering, virtual net metering, power purchase agreements with the provincial electricity system operator.

[43] *A starting point for renewable electricity generation will be to return to the projects identified in Phase 1 of Energy Evolution when the regulatory framework appears. As time has passed since Phase 1, there may be scope to improve these projects through expansion and the addition of wind and/or electricity storage. Other possible projects have been discussed since Phase 1 (e.g. generation on hydro corridors). These are potentially promising but require further evaluation.*

Projected Financial Profile:

- Assumes 100% financed at 4% interest rate over 20-year amortization term
- Figure 1 includes solar PV, wind, and hydropower

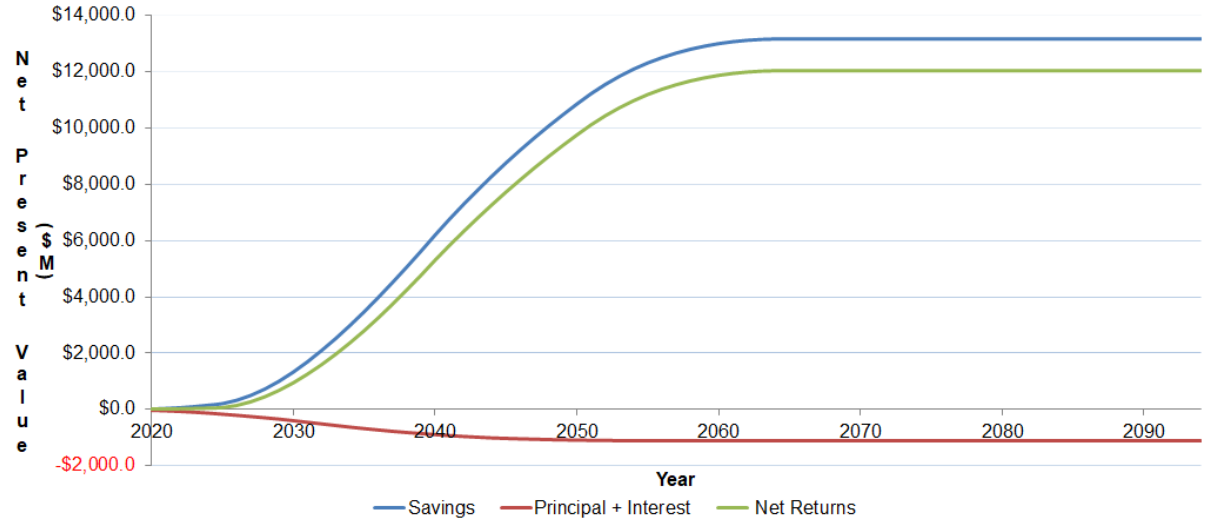

Figure 24: Projected financial profile for solar PV, wind, and hydropower, 2020-2094

Projected GHG Emissions Reduction:

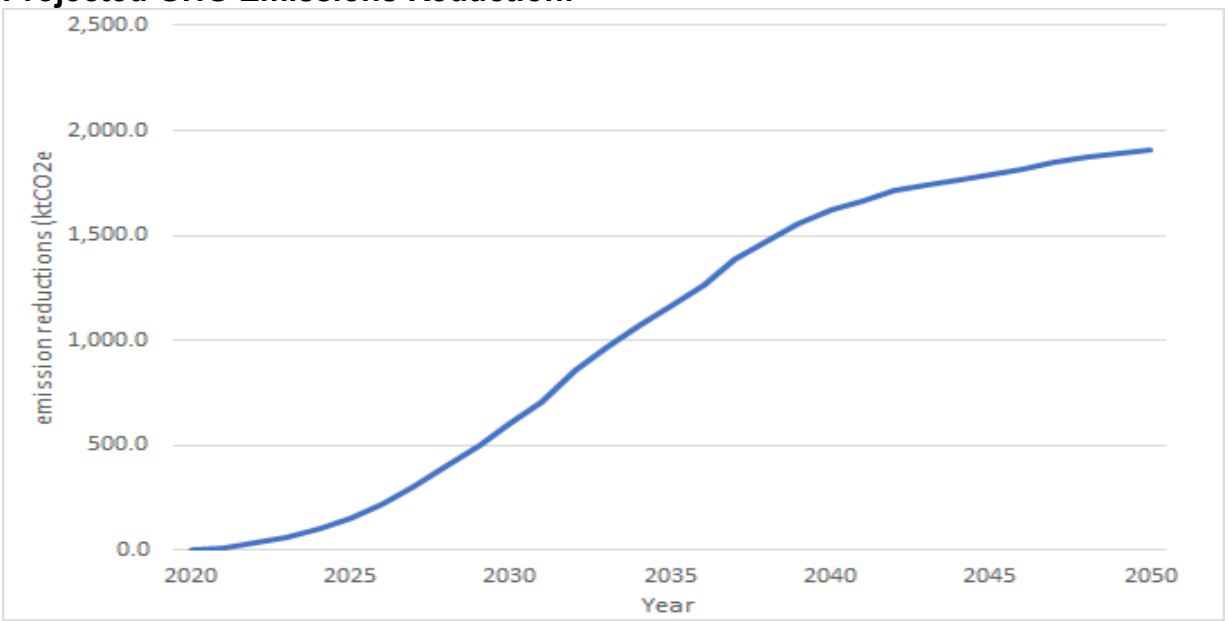

Figure 25: Projected GHG emissions reductions for solar PV, wind, and hydropower, 2020-2050

Sector: Enablers

Project: Climate Ambassadors Network	**Standing Committee**: SCEPWWM
Description:	A Climate Ambassador's Network will be developed in collaboration with the large employers in Ottawa. It will aim to encourage the city's largest businesses and institutions to support the City's efforts in reducing greenhouse gas (GHG) emissions by align their GHG reductions with the City's targets. Network participants will be supported to adjust operational decisions and employee engagement to reduce GHGs. The program will collaborate with similar programs offered in Ottawa to build on previous successes. This program will be designed to encourage and remove barriers to deep carbon reductions within the businesses and employers of Ottawa. Working with large employers, this program will influence a market transformation towards measuring, disclosing, and reducing carbon emissions in all areas of business activity. As significant energy consumers and employers, these organizations have control over substantial emissions at their facilities as well as influence on the commuting choices of their employees and patrons. A large portion of those emission reductions will be from buildings which, in 2018, made up 45% of GHG emissions in Ottawa. One program of focus to drive uptake will be the Commercial Building Retrofit Accelerator Program as many industrial, commercial, and institutional buildings will need to be retrofitted to eliminate their consumption of fossil fuels. This can be achieved by undertaking measures such as upgrading lighting, air sealing, HVAC, smart controls, waste heat capture, windows, doors, insulation, heat pumps, and recommissioning. Transportation emissions are also significant, at 44% of total emissions. A significant portion of these are from daily commuting by employees. By working with employers on sustainable commuting options for employees, this program will reduce those emissions and improve the quality of life for road users in Ottawa. This program will build upon the success of Ottawa's TravelWise program and other transportation demand management programs. It will also encourage urban property owners with parking lots to initiate fees for parking for employees and patrons. The main components of the program are: 1. Benchmarking, Transparency, and Planning 2. Networking, Education, and Training 3. Coordinating and Supporting Accelerated Reductions

	4. Public Recognition
Co-Benefits:	• Reduced operating costs for businesses • Less time wasted in traffic • Improved employee retention • Reduced exposure to carbon price inflation
Risks:	• Lack of meaningful participation in the network • Lack of price signals including carbon pricing • Lack of funding
Advocacy[44]:	• Addressed by the other projects
Minimum Results Require to Meet the 100% Scenario[45]:	• No direct outputs from the model • Enabler of other projects including Residential and Commercial Buildings Retrofit Accelerator Programs and Personal Vehicles Electrification Strategy
Key City Department(s):	• Lead: Planning, Infrastructure, and Economic Development • Support: Ottawa Public Health; Public Works and Environmental Services; Transportation Services
Key Community Partners:	• Utilities • Board of Trade • Business Improvement Areas • Large energy consumers and employers • Federal & Provincial government • Carbon 613 • BOMA Ottawa and other sector associations • Low Carbon Cities Canada (LC3)
Estimated Project Milestones:	• 2021 Q1: Identify and determine level of interest from large energy consumers and employers • 2021 Q1: Review Ethical Purchasing Policy to support network objectives • 2021 Q2: Develop network activities and programs • 2021 Q3: Launch network and initial activities • 2022: Participants publish GHG reduction targets and carbon budgets and implement significant carbon reduction activities • 2023: If successful, expand network to include small medium enterprises

[44] *The list of advocacy topics is preliminary and further topics may be identified as the project is developed. The process, details, and timing for each topic will be determined on a case by case basis, as well as the lead as the municipality is not always best positioned to do so.*

[45] *The minimum results required to meet the 100% scenario are based off the energy and emissions model outputs. Further options may be evaluated under this project to meet the scale of action required.*

Resources:	Municipal Resources: • Staff and program budget Community Resources: • Investments required by the commercial sector total approximately $436M between 2020-2050 which will result in $1.7B in net profit throughout that same period.
Delivery Mechanism:	• Embedded within other projects.
Projected Financial Profile:	• Embedded within other projects.
Project GHG Emissions Reductions:	• Embedded within other projects.

Project: Climate Change Education and Outreach Program	**Standing Committee**: SCEPWWM
Description:	The City has adopted ambitious new targets to reduce GHG emissions from the community by 100 per cent by 2050 and from City operations by 100 per cent by 2040. It is working toward this target and increased climate resiliency in future growth and development through its Climate Change Master Plan, Official Plan policies, its energy transition strategy (Energy Evolution) and a variety of specific energy conservation and environmental initiatives. A Climate Change Education and Outreach Program will support broad communications and outreach to help all residents and stakeholders understand what the City is doing, and what they can do, to reduce greenhouse gas emissions and adapt to Ottawa's changing climate. Communications will aim to inspire a vision of a clean, renewable and resilient Ottawa. The overall objectives of the program are to: 1. Generate interest and awareness of the scale, scope and type of change required to meet Ottawa's greenhouse gas emission targets 2. Generate broad interest and awareness in the actions the City is taking to protect our economy, our ecosystems, and our community from the effects of climate change. 3. Promote and provide information on concrete actions that individuals, businesses and organizations can do to mitigate and adapt to climate change and persuade them to take action. 4. Engage with stakeholders to secure their collaboration on collective efforts to effect change. The approach to the program is outlined below. • Communications and engagement will be ongoing but with key focus points and phases. This will allow the City to address the immediate need to engage and communicate with residents about climate actions while allowing time for planning of more in-depth communications and engagement activities later in the year. • Engagement will focus on helping to create awareness among audiences and encourage behaviour change. To achieve this the messaging will use a mix of awareness raising, persuasion, practical tips and highlighting the benefits to demonstrate why action is necessary and beneficial to residents. • As audiences may be at different stages of understanding climate change issues, willingness to take action, and personal circumstances (home ownership, home type, etc.) further audience segmentation will be needed. Each segment will

	likely need a different communications and engagement approach and messaging. • The City will explore opportunities to work in collaboration with existing networks, Energy Evolution stakeholders and leaders in the community to amplify messaging and reach a wider audience. • This will be a cross-departmental effort; Climate Change staff will collaborate with other city departments (e.g. Solid Waste, Transportation, Ottawa Public Health) where there are synergies to align and amplify messaging. • Outreach and engagement will be proactive and timely to leverage key local / national days and events to promote messaging such as Earth Day.
Co-Benefits:	• Improvement in air quality and population health • Improved local economy and job creation • Energy and gas cost savings • Reduced congestion and less time wasted in traffic • Decreased exposure to engine noise. • Improved building health, comfort, and resiliency. • Avoided stranded costs and burden on future generations.
Risks:	• Complexity and breadth of climate change issues combined with the diversity of audiences make communication and behaviour change difficult. Leads to apathy and feelings of powerlessness causing inaction. • Individuals have competing priorities/interests and a finite capacity for consuming issues and communications. Climate change must compete with these to gain and maintain the attention from individuals and the community that it requires. • Lack of funding
Advocacy[46]:	• Addressed by the other projects
Minimum Results Require to Meet the 100% Scenario[47]:	• Embedded within other projects such as the Residential Building Retrofit Accelerator Program and the Personal Vehicles Electrification Strategy.
Key City Department(s):	• Lead: Planning, Infrastructure and Economic Development • Support: Ottawa Public Health; Public Works and Environmental Services; Transportation Services

[46] *The list of advocacy topics is preliminary and further topics may be identified as the project is developed. The process, details, and timing for each topic will be determined on a case by case basis, as well as the lead as the municipality is not always best positioned to do so.*

[47] *The minimum results required to meet the 100% scenario are based off the energy and emissions model outputs. Further options may be evaluated under this project to meet the scale of action required.*

Key Community Partners:	• Community associations, organizations and leaders • Utilities • Board of Trade and Business Improvement Areas • Employers and office green teams • Property managers • Renovation supply and appliance retailers and contractors • Media
Estimated Project Milestones:	• 2020 Develop program materials and engage community partners, launch campaign • 2021: Expand campaigns; monitor effectiveness • 2021: Presentations to support on-going alignment of priorities, workplans, and budgets to internal and external stakeholders • 2022: Adjust as necessary for effectiveness
Resources:	• The program can be developed with existing municipal staff. Additional resources may be required to implement, depending on the scope and scale of efforts. Budget pressures will be identified through annual budget processes.
Delivery Mechanism:	• Through community organizations and volunteer engagement.
Projected Financial Profile	• Embedded within other projects such as the Residential Building Retrofit Accelerator Program and the Personal Vehicles Electrification Strategy
Project GHG Emissions Reductions:	• Embedded within other projects such as the Residential Building Retrofit Accelerator Program and the Personal Vehicles Electrification Strategy

Project: Fund the Evolution	**Standing Committee**: FEDCO
Description:	Meeting Council's greenhouse gas emission targets will require unprecedented investments from the City, senior levels of government and the community, especially in the next 10 years. Staff were directed in the Climate Emergency motion of April 2019 to report on funding and savings options for the City when implementing emission reductions. These investments will result in considerable savings by 2050 while also reducing carbon risk exposure to local businesses and investors and protecting the public from climate risk. Since municipalities have influence over 50 to 60% of carbon emitting activities, they have a unique opportunity to affect change. The Fund the Evolution project will assess capital and revenue sources available to the City to adequately fund Energy Evolution. The assessment will also include how financial mechanisms can help adjust market forces and accelerate greenhouse gas emissions reductions. For projects that have a positive return on investment, borrowing funds presents an opportunity to take advantage of the currently low interest rates. Municipal debt financing opportunities to be explored include: • Debt limit adjustments • Bonds / Loans (such as green bonds) • Reserve funds Other investments included in the Energy Evolution model will not generate significant returns, thus will require non-repayable sources of funding such as senior government transfers, service fees, or other revenues. Revenue opportunities generally within municipal authority fall into five main categories, with specific opportunities outlined in Table 1 below: • Parking and road-based fees • Property-related taxes • Development-related charges • User/Service fees • Environmental fines

	Of these revenue mechanisms, user/service fees and development charges are commonly used for cost-recovery of the associated services provided. Where possible, revenues should be generated with the flexibility to fund further climate initiatives. Potential sources of municipal revenue identified were selected based on both their revenue generating potential and their climate-related behavioural change opportunities. Leading jurisdictions were identified through a municipal scan, with a preference for Ontario and Canadian examples where possible. The values shown in Table 1 represent the potential gross revenue for Ottawa if the revenue opportunities were implemented at the same level as in the leading jurisdiction. To quantify the potential gross revenues, the leading jurisdiction rates were used and prorated based on relevant Ottawa data such as population, parking spaces, vehicle trips and kilometers travelled, etc. In cases where the revenue stream was assumed in the Energy Evolution model, the modeled rates were assumed for consistency. All potential sources of municipal revenue opportunities require further analysis and Standing Committee and Council approval would be required prior to implementation. Analysis will consider additional factors such as the ability to leverage other public and private sources of funding, public acceptance, ease of implementation, limitations on revenue use, authority to implement, economic impacts, and equality and inclusion. Some of the most influential revenue opportunities fall under Provincial or Federal jurisdiction and advocacy to senior governments would be key to project success if Council directs staff to pursue these revenue streams. Through the relevant projects, the City will explore ways to enable residents and businesses to finance their energy transition. Community financing mechanisms include: • Local improvement charges • Community improvement plans • Tax-increment financing • On-bill financing (through utilities) • Investments into low carbon revolving loan funds • Private and government grants

	Market adjustment mechanisms that will be explored through each of the projects include: • Bulk procurement programs for equipment • Low-carbon-screening on endowment funds • Lifecycle cost decision criteria replacing simple payback • Risk reduction mechanisms such as interest rate buydowns or reserve funds.
Co-Benefits:	• Enable co-benefits from climate action • Keep energy dollars in the local economy • Support and protection for those who are most vulnerable
Risks:	• Insufficient Provincial or Federal support • Lack of public acceptance • Insufficient staff capacity to realize
Advocacy[48]**:**	• Authority to implement the funding sources as identified in Table 1
Measures of Success:	• Adequate funding for implementation • Successful funding applications to enable municipal and community investments • Contributions from senior levels of government • Sufficient funds are allocated annually to fund the Energy Evolution requirements
Key City Department(s):	• Lead: Finance Services • Support: Innovative Client Services; Office of the City Clerk; Planning, Infrastructure and Economic Development
Key Community Partners:	• Provincial and Federal Governments • Ontario Energy Board • Municipal Property Assessment Corporation • Utilities • Board of Trade • Low Carbon Cities Canada • Canada Mortgage Housing Corporation • Federation of Canadian Municipalities and Association of Municipalities of Ontario • Ontario Investment Management Corporation • Canada Infrastructure Bank • Metrolinx

[48] *The list of advocacy topics is preliminary and further topics may be identified as the project is developed. The process, details, and timing for each topic will be determined on a case by case basis, as well as the lead as the municipality is not always best positioned to do so.*

Estimated Project Milestones:	• 2021: Consult on potential revenue sources advocate for mechanisms not in City's control, if required and provide input into Long Range Financial Plan and bylaws as opportunities arise • 2022: Begin to implement revenue and funding mechanisms per council direction • 2023: Measure success and continue to pursue revenue and funding opportunities
Resources:	• Staff time • Professional services, if required
Delivery Mechanism:	• Embedded within other projects.
Projected Financial Profile:	• Embedded within other projects.
Project GHG Emissions Reductions:	• Embedded within other projects.

Table 2: Potential Municipal Revenue Sources to Support Climate Initiatives and Leading Jurisdictions

Title	Municipal Legislative Authority	Key Consideration	Status	Leading Jurisdiction [49]	Potential Gross Revenue/yr in Ottawa in $2020 based on Leading Jurisdiction Rates[50]	Limits on Revenue Use	Key Assumptions
Parking and Road-Based User Fees							
Road Tolls upon entering city limits	Authority to designate a road(s) as a toll road subject to enactment of Provincial regulation	Economic impact; Authority (multi-jurisdictional)	General review of congestions charges in Transportation Master Plan update.	London, UK.	$1,298,821,000	Must be defined prior by the municipality. Transit and other municipal infrastructure are eligible.	Assuming all external inbound trips are charged $20 per entry as assumed for congestion charge in Energy Evolution model.
Congestion/ cordon Charge - inside the greenbelt	Authority to designate a road(s) as a toll road subject to enactment of Provincial regulation	Equity; Economic impact	General review of congestions charges in Transportation Master Plan update.	London, UK.	$204,450,000	Must be defined prior by the municipality. Transit and other municipal infrastructure are eligible.	Inside Greenbelt $20/weekday, aligned with Energy Evolution.[51]

[49] Leading jurisdiction was selected based on a municipal scan of jurisdictions, with a preference for Ontario and Canadian examples where possible.
[50] Leading jurisdiction rates were applied to Ottawa prorated based on relevant data such as population, parking spaces, VKT, external inbound trip, as appropriate
[51] Equivalent to the rate in London to enter the urban area 364 days per year: https://tfl.gov.uk/modes/driving/congestion-charge#:~:text=The%20Congestion%20Charge%20is%20a,and%20discounts%20are%20available%20too.

Title	Municipal Legislative Authority	Key Consideration	Status	Leading Jurisdiction [49]	Potential Gross Revenue/yr in Ottawa in $2020 based on Leading Jurisdiction Rates[50]	Limits on Revenue Use	Key Assumptions
Congestion/ cordon charge - downtown	Authority to designate a road(s) as a toll road subject to enactment of Provincial regulation	Included in the Energy Evolution financial analysis	General review of congestions charges in Transportation Master Plan update. Included in Energy Evolution model.	London, UK.	$188,000,000	Must be defined prior by the municipality. Transit and other municipal infrastructure are eligible.	Downtown area $20/weekday, as per the Energy Evolution.[52]
Road User Fees per km traveled	Yes, but requires Provincial regulation	Privacy; Equity; Enforcement	General review of road user fees in Transportation Master Plan update.	Oregon, US.	$106,198,000	Must be defined prior by the municipality. Transit and other municipal infrastructure are eligible.	Assuming all km traveled in Ottawa cost $0.01.[53]

[52] https://www.transportstyrelsen.se/en/road/Congestion-taxes-in-Stockholm-and-Goteborg/congestion-tax-in-stockholm/hours-and-amounts-in-stockholm/

[53] https://www.myorego.org/

Title	Municipal Legislative Authority	Key Consideration	Status	Leading Jurisdiction [49]	Potential Gross Revenue/yr in Ottawa in $2020 based on Leading Jurisdiction Rates[50]	Limits on Revenue Use	Key Assumptions
Increasing metered street parking fees and areas	Yes, with price increases implemented on $0.50 increments as per the Municipal Parking Management Strategy (MPMS).	Enforcement; Economic impact	Parking Services implements Rate Setting Guidelines as per the Parking Management Strategy. Areas under review by Parking Services. Council's approved thresholds for implementing street parking are currently a limitation to expanding paid street parking.	Vancouver, BC.	$86,308,000	As per the Municipal Act and Municipal Parking Management Strategy, there are restrictions on the use of parking fee revenues under the existing governance structure (reviewed in 2019). Items that can currently be funded include EV chargers. Transit cannot currently be funded through parking revenues.	Increase 3.3%/yr as per Energy Evolution model. Increase 3.3%/yr as per Energy Evolution model. Add meters to additional commercial districts.[54]
Vehicle Registration Tax/Fee	Not currently	Enforcement; Limited behaviour	No review underway.	Chicago, IL. "Wheel Tax"	$64,979,000	Not yet defined.	$118 per privately owned vehicle year.[55]

[54] https://www.cbc.ca/news/canada/british-columbia/vancouver-parking-revenue-doubled-reasons-why-1.5206173#:~:text=more%20and%20more.-,Vancouver%20is%20forecast%20to%20collect%20%2462.9%20million%20in%20%22on%2Dstreet,million%20during%20the%20same%20span.

[55] Ranges from $118 CAD for a car to $625 CAD for a large truck per year. https://www.chicityclerk.com/sticker

Title	Municipal Legislative Authority	Key Consideration	Status	Leading Jurisdiction [49]	Potential Gross Revenue/yr in Ottawa in $2020 based on Leading Jurisdiction Rates[50]	Limits on Revenue Use	Key Assumptions
		change incentive					
Private Parking Levy	Authority through parking lot property tax or bylaw under review.	Enforcement; Economic impacts	Initial review underway in Transportation Master Plan Update.	Montreal, QC.	$7,979,000	A Parking Authority may allow revenues to be used more generally	Montreal Parking Levy: ($/m2) Sector A: 46.50 Sector B: 34.90 Sector C: 17.45[56]
Increase residential parking permits areas to whole city	Yes, by updating On-Street Parking Permit Policy.	Enforcement; Equity and inclusion	No review underway.	Toronto, ON.	$2,624,000	As per the Municipal Act and Municipal Parking Management Strategy, there are restrictions on the use of parking fee revenues under the existing governance structure (reviewed in 2019). Items that can currently be funded include EV chargers. Transit cannot currently be funded through parking revenues.	Increase zones for overnight permits to whole city. Currently covers 20% of city residential areas. Assumes demand increases proportionally to population.[57]

[56] https://www.toronto.ca/legdocs/mmis/2016/ex/bgrd/backgroundfile-94513.pdf

[57] https://www.toronto.ca/legdocs/mmis/2020/bu/bgrd/backgroundfile-145493.pdf

Title	Municipal Legislative Authority	Key Consideration	Status	Leading Jurisdiction [49]	Potential Gross Revenue/yr in Ottawa in $2020 based on Leading Jurisdiction Rates[50]	Limits on Revenue Use	Key Assumptions
Parking Sales Tax	Province has authority to implement as a sales tax.	Distribution of funds to the municipality; Enforcement; Economic impacts	No review underway.	South Coast of BC, implemented by BC and transit authority.	$2,259,000	Revenues owned by Province	24% on all private parking revenues implemented by Province which is directed to funding transit.[58]
Demand based parking fees	Yes.	Behaviour change potential	Was reviewed in 2019 Municipal Parking Management Strategy and semi-annual adjustments will be implemented based on demand. Also, the updated Rate Setting Guidelines will be implemented[59].	Calgary, AB.	$1,928,000	As per the Municipal Act and Municipal Parking Management Strategy, there are restrictions on the use of parking fee revenues under the existing governance structure (reviewed in 2019). Items that can currently be funded include EV chargers. Transit cannot currently be funded through parking revenues.	Parking rates vary by time of day based on demand. In Calgary this generates $500/yr more per parking space.

[58] https://www.translink.ca/About-Us/Taxes/Parking-Tax/About-the-Parking-Tax.aspx
[59] https://documents.ottawa.ca/sites/documents/files/Report%20%28EN%29%20-%20MPMS%20Refresh%20and%20Gov%20Review.pdf

Title	Municipal Legislative Authority	Key Consideration	Status	Leading Jurisdiction [49]	Potential Gross Revenue/yr in Ottawa in $2020 based on Leading Jurisdiction Rates[50]	Limits on Revenue Use	Key Assumptions
Increase parking fees in city lots	Yes.	Enforcement; Economic impact	Parking Services currently implements the Rate Setting Guidelines as per the Municipal Parking Management Strategy. Escalation included in Energy Evolution model.	Toronto, ON.	$1,640,000	As per the Municipal Act and Municipal Parking Management Strategy, there are restrictions on the use of parking fee revenues under the existing governance structure (reviewed in 2019). Items that can currently be funded include EV chargers. Transit cannot currently be funded through parking revenues.	Increase rates in existing metered areas at 3.3%/yr as per EE model. Note the loss of the Byward Market parking lot is not assumed in this calculation but will have a downward impact on revenues.
High Occupancy Toll Lanes - those who pay a toll can use carpool lanes on highways	Province has authority to implement HOT lanes on provincial highways.	Equity; Enforcement	No review underway	QEW from Oakville to Burlington, ON.	$720,000	Revenues owned by Province	4,000 permits issued per year $180/permit, as was done for the initial pilot on the QEW.[60]
Development-Related Charges							

[60] https://www.ontario.ca/page/high-occupancy-toll-hot-lanes

Title	Municipal Legislative Authority	Key Consideration	Status	Leading Jurisdiction [49]	Potential Gross Revenue/yr in Ottawa in $2020 based on Leading Jurisdiction Rates[50]	Limits on Revenue Use	Key Assumptions
Development Charges	Yes, based on standards of service and historical costs.	Economic impact	Current approach in place until 2024 when it will be reviewed.	Vaughan, ON.	$234,267,000	For municipal costs related to growth areas such as new transit infrastructure, new district energy systems, etc.	Used Vaughan's development charge pricing proportional to Ottawa's 2019 developments with a 68/32 split residential/ non-residential buildings.[61]
Utility local access fees	Requires legal review of the authority given to the municipality	Energy poverty; Authority	No review underway.	Edmonton, AB.	$66,172,000	None.	In 2016 Edmonton's local access fee revenue was: $60.3M from natural gas utilities (32.9% of delivery charge revenues).[62]
Property-Related Taxes							

[61] https://www.vaughan.ca/services/business/development_charges/General%20Documents/2020%2007%2001%20rate%20schedule%20with%20increase%20notice.pdf

[62] https://www.edmonton.ca/city_government/documents/TWWF_FranchiseFees_WhitePaper.pdf

Title	Municipal Legislative Authority	Key Consideration	Status	Leading Jurisdiction [49]	Potential Gross Revenue/yr in Ottawa in $2020 based on Leading Jurisdiction Rates[50]	Limits on Revenue Use	Key Assumptions
Property tax climate levy	Yes	Behaviour change	No review underway.	Toronto, ON.	$32,000,000	None.	2% Tax levy (for climate and affordable housing), increases with population.[63]
Empty Buildings Tax (or tax proportional to occupancy)	Yes, but requires Provincial regulation	Enforcement. Behaviour change	To be reviewed in 2021 by Revenue Services.	Vancouver, BC.	$24,374,000	None.	1% of assessed value of the buildings that were vacant in 2017. Assumed an average of 1.61% tax rate in 2017.[64]
Land Transfer Tax to encourage intensification	Currently no municipal authority to implement	Authority	Has been modeled but advocacy for municipal authority is required.	Toronto, ON.	$130,000,000	None.	Land transfer tax as implemented in Toronto.[65]
Voluntary climate surcharge on	Yes	Behaviour change	No review underway.	Minneapolis, Ohio Energy Co-operative	$165,000	None.	1% of property tax bills would opt to round to the nearest $100.[66]

[63] .https://www.toronto.ca/legdocs/mmis/2019/ex/bgrd/backgroundfile-140989.pdf
[64] https://vancouver.ca/home-property-development/empty-homes-tax.aspx
[65] https://www.toronto.ca/services-payments/property-taxes-utilities/municipal-land-transfer-tax-mltt/
[66] https://myenergycoop.com/operation-roundup/

Title	Municipal Legislative Authority	Key Consideration	Status	Leading Jurisdiction [49]	Potential Gross Revenue/yr in Ottawa in $2020 based on Leading Jurisdiction Rates[50]	Limits on Revenue Use	Key Assumptions
property tax bills							
User/Service Fees - typically							
Hydro Ottawa dividends	Yes	Grid upgrades required to enable increased sales may reduce profits.	No review underway.	Ottawa, ON.	$6,293,000	None.	Incremental dividends received by the City based on increased electricity sales as modeled in Energy Evolution.
Add Park and Ride fees to all spaces	Yes.	Impact on transit ridership	Not under review.	Vancouver, BC.	$6,004,000	As per the Municipal Act and Municipal Parking Management Strategy, there are restrictions on the use of parking fee revenues under the existing governance structure (reviewed in 2019). Items that can currently be funded include EV chargers.	Average daily rate per park and ride space in Vancouver is $2.58, assumes 80% occupancy on weekdays, 50 weeks/yr. [67]

[67] https://www.translink.ca/Getting-Around/Driving/Park-and-Ride.aspx

Title	Municipal Legislative Authority	Key Consideration	Status	Leading Jurisdiction [49]	Potential Gross Revenue/yr in Ottawa in $2020 based on Leading Jurisdiction Rates[50]	Limits on Revenue Use	Key Assumptions
Sewer heat sales	Yes, through a utility.	Scalability; Technical and financial feasibility	Initial review in scope for Waste Heat Survey with follow up work to quantify revenues.	Vancouver, BC.	$4,053,000	None if utility provides royalties or dividends to City.	As per Energy Evolution model: 700TJ of heat captured and sold for 50% of the cost of biogas (assuming 50% of value is needed to pay for distribution).
Renewable Natural Gas sales	Yes, through a utility.	Energy poverty; Technical feasibility	Included in Energy Evolution model; Follow up work pending results of Biogas Optimization Study	Vancouver, BC.	$3,934,000	None if utility provides royalties or dividends to City.	As per Energy Evolution model: FortisBC recently signed a 20-year contract with the City of Vancouver to purchase landfill renewable natural gas at $22/GJ.
Gasoline and Natural Gas-Related Fees							
Fines							
Fines: Idling	Yes, with appropriate bylaws and provincial approval of rates	Enforcement	No review underway.	Invermere BC.	$57,000	Revenues owned by the Province.	Fines are $250-$10,000 in Invermere, 2,256 of $100 were issued in Ottawa in 2019.[68]

[68] https://invermere.civicweb.net/document/282

Title	Municipal Legislative Authority	Key Consideration	Status	Leading Jurisdiction [49]	Potential Gross Revenue/yr in Ottawa in $2020 based on Leading Jurisdiction Rates[50]	Limits on Revenue Use	Key Assumptions
Fines: Parking in bike lanes	Yes, with appropriate bylaws and provincial approval of rates	Enforcement	No review underway.	Toronto, ON.	$25,000	Revenues are split between cost recovery and general revenues.	Fines are $150 in Toronto. 169 fines of $125 were issued in Ottawa in 2019. [69]
Fines: Organics in garbage	Yes, with appropriate bylaws and provincial approval of rates	Enforcement; Privacy; Behaviour Change; Equity	To be reviewed in Solid Waste Master Plan.	Halifax, NS.	$0	Revenues are split between cost recovery and general revenues.	Fines are $200-$5000 in Halifax but are rarely issued, rather, the contaminated garbage is not collected.[70]
TOTAL					**$2,473,250,000**		

[69] https://www.toronto.ca/311/knowledgebase/kb/docs/articles/transportation-services/transportation-infrastructure-management/cycling-infrastructure-and-programs/bylaw-enforcement-illegal-bike-lane-parking-driving.html

[70] https://www.halifax.ca/sites/default/files/documents/city-hall/legislation-by-laws/By-lawS-600.pdf

Summary of Preliminary Advocacy Topics

Summary of Preliminary Advocacy Topics to be Explored within Energy Evolution Projects

Significant investment, policy alignment and regulatory changes are needed amongst various levels of government, utilities, stakeholders, and the broader community to meet Ottawa's GHG reduction targets.

In April 2019, Ottawa's climate emergency declaration directed Council and staff to work with senior levels of government to accelerate ambition and action to meet the urgency of climate change and provide additional resources for municipalities and the public to reduce their GHG emissions and build resiliency to climate impacts.

In January 2020, Council delegated authority to the Climate Change Council Sponsors Group to provide the Mayor with a list of priority areas and activities, which are consistent with the Council-approved Climate Change Master Plan, to allow the Mayor to advocate with the provincial and federal governments on program funding, co-delivery opportunities and related policy and regulatory supports necessary to implement the Climate Change Master Plan priority projects, as appropriate.

Table 1 provides a summary of potential advocacy topics to be explored within Energy Evolution projects. Topics that may require advocacy are also included in the project overviews. Although Table 1 provides a summary, it should be considered a preliminary list as more detailed analysis is required on every topic. This analysis will be completed as projects are developed or when opportunities arise.

The Energy Evolution project team will work with relevant departments, utilities, stakeholders, the broader community to identify legislative or policy barriers as projects are developed or when opportunities arise. The City will not necessarily take the lead on advocacy for all topics identified and has not taken a position on topics at this time. The position, process, details, and timing will be determined on a case by case basis with input from the relevant departments, utilities, stakeholders, the broader community, the City Manager's Office, the Climate Change Council Sponsors Group, the Mayor's Office, and political representatives to the Association of Ontario Municipalities and Federation of Canadian Municipalities, where appropriate. Recommendations for advocacy, where appropriate, will be included in future Energy Evolution project reports to the appropriate Committee and Council for consideration.

The Energy Evolution project team will also work with other Ontario and Canadian municipalities through organizations like the Federation of Canadian Municipalities, Big City Mayors Caucus, the Association of Municipalities of Ontario, Canadian Urban Sustainability Practitioners, and the Clean Air Partnership to inform strategic discussion, align positions and coordinate communications with senior levels of government, where appropriate.

Advocacy to senior levels of government, may be required by the City, utilities, stakeholders, or the broader community when:

- Financial investments are required to meet Ottawa's GHG reduction targets;
- Policy alignment, regulatory changes or legislative authority are required to resolve issues or implement solutions;
- Stakeholders identify barriers or opportunities and the City is in a position to advocate for residents, businesses, and institutions;
- Other levels of government (Departments, Ministries, Crown Corporations, etc.) or related organizations (Independent Electrical Systems Operator or Energy Board) are seeking input on proposed policy or regulatory changes.

Table 1: Summary of Preliminary Advocacy Topics to be Explored within Energy Evolution Projects

Land Use and Growth Management

Potential Advocacy Topics	Associated Projects	Jurisdictional Responsibilities	
		Provincial Government	Federal Government
• Development charge system review to explore ways to fund energy efficient capital works that can sustain clean energy initiatives such as district energy in new communities.	• Integration of energy and climate mitigation policies in the new Official Plan and supporting master plans	✓	
• Property tax system review to explore charging higher tax to cover building retrofit programs such as through occupancy taxes, carbon-based taxes or land transfer taxes, or authorize tax credits for lower emission buildings.	• Integration of energy and climate mitigation policies in the new Official Plan and supporting master plans	✓	

Buildings (New and Existing)

Potential Advocacy Topics	Associated Projects	Jurisdictional Responsibilities	
		Provincial Government	Federal Government
• Benchmark energy performance of all existing buildings (at point of sale for residential, through Provincial reporting requirements or otherwise for industrial, commercial, and institutional buildings)	• Residential Building Retrofit Accelerator Program • Commercial Building Retrofit Accelerator Program	✓	✓
• Implement a Retrofit Code in line with federal emissions reduction targets	• Residential Building Retrofit Accelerator Program	✓	✓

Potential Advocacy Topics	Associated Projects	Jurisdictional Responsibilities	
		Provincial Government	Federal Government
	• Commercial Building Retrofit Accelerator Program		
• Strengthen incentives for emission-reducing building retrofits, ex. reinstating the federal home retrofit tax credit, adjusting property taxes and land transfer taxes to reflect energy performance	• Residential Building Retrofit Accelerator Program • Commercial Building Retrofit Accelerator Program • Municipal Buildings Renewal and Retrofit Program	✓	✓
• Allow City fees (for building permits, zoning amendments, etc.) to reflect emissions performance	• Commercial Building Retrofit Accelerator Program	✓	✓
• Update Condominium Act to require energy considerations in reserve fund regulations	• Commercial Building Retrofit Accelerator Program	✓	✓
• Implement regular recommissioning requirements for industrial, commercial and institutional buildings	• Commercial Building Retrofit Accelerator Program	✓	✓
• Support a retrofit revolving loan fund and heat pump incentives	• Municipal Buildings Renewal and Retrofit Program • Zero Emissions Commercial Vehicles Strategy	✓	✓

Potential Advocacy Topics	Associated Projects	Jurisdictional Responsibilities	
		Provincial Government	Federal Government
• Accelerate the Provincial Building Code to net zero by 2030	• High-Performance Development Standard	✓	✓
• Accelerate National Building Code to net zero by 2025	• High-Performance Development Standard		✓
• Funds from senior governments, as well as private investors, to build a sufficient capital pool to fund the retrofits through the LIC mechanism	• Building Retrofits through Local Improvement Charge Program		✓
• Supplementary funding from senior governments to support higher development standards for municipal buildings	• Update Municipal Green Building Policy		✓
• Authority to implement an Empty Buildings Tax	• Fund the Evolution		✓
• Restrict the sale of high global warming refrigerants	• Other		✓

Transportation

Potential Advocacy Topics	Associated Project	Jurisdictional Responsibilities	
		Provincial Government	Federal Government
• Provincial regulations allowing municipalities to implement road user fees, cordon/congestion charges	• Transportation Mode Shift • Fund the Evolution	✓	
• Implement a sales tax on private parking revenues	• Transportation Mode Shift • Fund the Evolution	✓	
• Increase vehicle registration fees on high emitting vehicles to fund transit	• Transportation Mode Shift • Fund the Evolution	✓	

Potential Advocacy Topics	Associated Project	Jurisdictional Responsibilities	
		Provincial Government	Federal Government
• Shift funding from highway expansions to climate action	• Transportation Mode Shift • Fund the Evolution	✓	
• Implement levies on gasoline	• Transportation Mode Shift	✓	
• Implement a high-occupancy toll lane and direct revenues to climate action	• Fund the Evolution	✓	
• Ability to fund transit from parking revenues and licensing fees	• Alternative Energy Sources for Transit	✓	
• Fund a zero emissions Concept Transit Network including zero emissions buses	• Alternative Energy Sources for Transit	✓	
• Ensure that highways approaching Ottawa have adequate EV charging to enable trips to and from the city	• Personal Vehicles Electrification Strategy • Zero Emissions Commercial Vehicles Strategy	✓	
• Reinstate a provincial subsidy for electric vehicles purchases	• Personal Vehicles Electrification Strategy • Zero Emissions Commercial Vehicles Strategy • Municipal Green Fleet Plan Update	✓	
• Public EV charging infrastructure funding and policy support	• Personal Vehicles Electrification Strategy	✓	✓

Potential Advocacy Topics	Associated Project	Jurisdictional Responsibilities	
		Provincial Government	Federal Government
• A higher low carbon content in liquid fuels, particularly diesel through provincial regulations.	• Personal Vehicles Electrification Strategy • Zero Emissions Commercial Vehicles Strategy • Municipal Green Fleet Plan Update	✓	✓
• Reduce barriers to the installation of EV charging infrastructure	• Personal Vehicles Electrification Strategy	✓	✓
• Require a zero-emission vehicle mandate	• Personal Vehicles Electrification Strategy • Zero Emissions Commercial Vehicles Strategy	✓	✓
• Strengthening of the federal clean fuel standard	• Personal Vehicles Electrification Strategy • Zero Emissions Commercial Vehicles Strategy • Municipal Green Fleet Plan Update		✓
• Purchase, operate, and subcontract only zero emissions vehicles within Ottawa's boundary	• Other	✓	✓

Waste, Renewable Natural Gas, District Energy and Community Heating

Potential Advocacy Topics	Associated Project	Jurisdictional Responsibilities	
		Provincial Government	Federal Government
• Implement solid waste polluter pays policies as proposed in the Extended Producer Responsibility legislation	• Organics Resource Recovery Strategy	✓	
• Implement an effective ban on organics in all landfills	• Organics Resource Recovery Strategy	✓	
• Implement circular economy regulations and procurement standards	• Organics Resource Recovery Strategy	✓	✓
• Ensure that rules for landfill leachate re-circulation do not increase fugitive methane emissions or thwart collection of landfill gas which can be employed as an energy source	• Organics Resource Recovery Strategy	✓	
• Strong regulatory requirements for source separation of organics	• Organics Resource Recovery Strategy	✓	
• More flexibility for energy projects to have revenues directed towards climate mitigation projects	• Renewable Natural Gas Strategy	✓	
• Reduce barriers for power to gas (increase permitted hydrogen blending ratio)	• Renewable Natural Gas Strategy	✓	
• Require a renewable natural gas mandate like Quebec or British Columbia	• Renewable Natural Gas Strategy	✓	
• Encourage higher levels of government to procure renewable natural gas for applications which require gas as their only energy option	• Renewable Natural Gas Strategy	✓	✓
• Develop a gasification demonstration and validation project for forestry, leaf and yard waste	• Renewable Natural Gas Strategy	✓	✓

Potential Advocacy Topics	Associated Project	Jurisdictional Responsibilities	
		Provincial Government	Federal Government
• Research and development into power to methane technology	• Renewable Natural Gas Strategy	✓	✓
• In areas served by low-carbon district energy systems, require new construction to either connect to the district system or employ a low carbon heating system for space and water heating	• High-Performance Development Standard	✓	✓
• Implement a levy on natural gas to fund conservation	• Community Building Heating Strategy	✓	✓
• Map geothermal and earth energy resources in and around urban areas	• Community Building Heating Strategy		✓
• Add wasted heat to national pollution inventory reporting	• Community Building Heating Strategy		✓
• Phase out non-condensing combustion equipment	• Community Building Heating Strategy		✓
• Discourage or disallow expansion of the natural gas network	• Community Building Heating Strategy		✓
• Increase municipal authority to charge utilities access agreement payments to cross municipal land	• Community Building Heating Strategy • Fund the Evolution		✓
• Convert the Ottawa federal building district energy loop into a zero carbon, cost effective loop	• Community Building Heating Strategy • Municipal Buildings Renewal and Retrofit Program		✓
• Reduce regulatory barriers for sale of renewable electricity, RNG and heat across property lines	• Community Building Heating Strategy		

Potential Advocacy Topics	Associated Project	Jurisdictional Responsibilities	
		Provincial Government	Federal Government
	• Municipal Buildings Renewal and Retrofit Program		
• Remove subsidies on fossil fuels	• Other		✓
• Require and/or support ammonia recovery and use from municipal wastewater treatment plants	• Other	•	✓

Electricity

Potential Advocacy Topics	Associated Project	Jurisdictional Responsibilities	
		Provincial Government	Federal Government
• Enable virtual net metering and third-party ownership of renewable electricity projects	• Electricity Resource Strategy	✓	
• Limit or eliminate demand charges for stand-alone EV charging	• Personal Vehicles Electrification Strategy • Zero Emissions Commercial Vehicles Strategy • Electricity Resource Strategy	✓	
• Discourage the renewal of contracts with combustion-based electricity generators at the transmission and distribution systems or behind the meter	• Electricity Resource Strategy	✓	
• Place a moratorium on combustion-based new electricity generation on either the transmission or distribution systems or behind the meter	• Electricity Resource Strategy	✓	

Potential Advocacy Topics	Associated Project	Jurisdictional Responsibilities	
		Provincial Government	Federal Government
• Encourage the continued publication of a long-term energy plan	• Electricity Resource Strategy	✓	
• Develop frameworks which allow evaluation of non-wires solutions to be evaluated as capacity and energy resources	• Electricity Resource Strategy	✓	
• Remove the stipulation which limits behind the meter generation to 1% of a distribution system's peak demand	• Electricity Resource Strategy	✓	
• Work to ensure that electrical distribution system reinforcements driven by electrification do not trigger economically prohibitive costs to individual customers	• Electricity Resource Strategy • Zero Emissions Commercial Vehicles Strategy	✓	
• Ensure that initiatives which encourage better utilization of the electrical system can be funded from the electrical rate base at large or from distribution company earnings	• Electricity Resource Strategy	✓	
• Guarantee market access to conservation or renewable generation through provincial power purchase agreements if it is lower cost than existing generation	• Electricity Resource Strategy	✓	
• Encourage movement to a zero-emission electricity grid	• Electricity Resource Strategy	✓	
• Research distribution scale wind systems suitable for urban settings	• Electricity Resource Strategy		✓
• Obtain access to low priced electricity during periods of low demand for Class B accounts	• Electricity Resource Strategy	✓	

Potential Advocacy Topics	Associated Project	Jurisdictional Responsibilities	
		Provincial Government	Federal Government
• Ensure ongoing access to low priced, market rate electricity in Class A accounts	• Electricity Resource Strategy	✓	
• Require local distribution companies to have a standardized process to renewable energy connections which standardizes costs, times for studies and times for connections	• Electricity Resource Strategy	✓	
• Allow local distribution companies to purchase renewable electricity from both within and outside their service areas including outside the province	• Electricity Resource Strategy	✓	
• Allow net metered accounts to stay on time of use billing as an option	• Electricity Resource Strategy	✓	
• Remove small scale solar siting restrictions	• Electricity Resource Strategy	✓	
• Align conservation demand management programs with Provincial GHG targets	• Electricity Resource Strategy	✓	