EXECUTIVE SUMMARY

Cities across Canada are looking for developers and builders to design and construct in “greener” and more “sustainable” ways, yet the processes needed to achieve this are not well understood for municipalities and developers alike. It is easier today than ever before to build communities which provide all of their own energy needs and which leverage smart and sustainable design principles. Most current planning and development processes within municipalities do not fully support the implementation of such initiatives, which often involve technical and financial complexities that can cause delays with the municipal approvals processes, and which thus become dis-incentives against pursuing more sustainable construction.

To address this and related challenges, this study will look at eight different development projects as case studies at diverse stages across four mid-sized growing cities in Ontario (two projects per city), evaluating what would be necessary in order to enable the project to provide all of its own energy on-site, by assessing three complementary and interdependent focusses (ie: like the three legs of a stool):

Technical Feasibility: This study will look at different technologies used in advanced energy-efficient buildings and communities and will assess which are feasible for widespread use today, what types of projects each technology is best suited for, and what technologies can be used to achieve net-zero energy performance in each of the eight chosen cases.

Financial Feasibility: This study will evaluate funding and incentive models which can be used to offset the costs of including advanced technologies that help attain net-zero energy on the neighbourhood / community scale.

Policy / Process Feasibility: This study will involve shadow-permitting discussions, where each partner municipality will participate in a mock-trial approval process. Each project will be conceptually redesigned to achieve net-zero energy, and the cities will be asked to assess and contribute their understanding of what would be required for them to issue construction approvals for the design concepts being studied. This will help to identify policy and process challenges and proactive means by which those challenges may be resolved.

Interestingly, much of the challenge with building better is based on the assumption that this must cost more. In reality, the technology markets (like solar PV and LED lighting) and the best-in-class building programs (like ENERGY STAR, LEED, and others) have enjoyed tremendous success over the past ten years, and costs are much more reasonable than they were previously. This is likely to become even more true with the implementation of new climate action strategies at the Federal and Provincial levels. However, these technologies and programs are still new to city officials and developers, and it can be challenging to get a building permit for a building that is innovative.

The eight project sites included in this study together represent a sufficiently diverse pool of cases that they are generally representative of most of the development scenarios that
municipalities typically experience, and will therefore provide a highly transferrable and repeatable set of results for use not only by the participating partners (who will of course benefit the most), but also for all other Canadian municipalities.

**Results:**

This report includes a series of case studies and appendices which:

1. **Summarize the technologies** that enable net-zero energy at the community or neighbourhood level for various types of project sites, with some guidance about where those technologies are best used and where they are not;
2. **Summarize the financial and incentive models** that have been used across Canada, with comments on their relative strengths and weaknesses, and with comments about how municipalities can provide cost effective incentives that maximize returns for the tax base, while also maximizing effectiveness for the development industry;
3. **Analyze the challenges encountered** during the permit and approvals process for advanced construction designs, and offer comment on proactive ways which municipalities can reduce and eliminate as many barriers as possible, streamlining administrative processes;
4. **Consolidate the above findings into a template policy** in the form of a Community Improvement Plan (CIP) with accompanying enablement programs, which could be adapted and adopted in part or in whole by any Canadian municipality, particularly those in Ontario, and which would serve as a consolidated best-practice reference guide of incentive programs that may be used to catalyze the development of net-zero energy smart communities across Canada.

This study is intended to provide the development industry with municipal support that is effective. It will help site owners to understand how to effectively and affordably make their developments more sustainable, and will provide them with examples they may adapt to their own use. The eight participating sites will be provided with practical support from s2e Technologies in identifying which technologies and strategies will best enable their projects to pursue net-zero energy performance, and the development industry in general will benefit from the generalized results of the case studies. The eight participating projects will further benefit from process / policy support from the participating municipalities, which should enable proactive resolution to challenges that might otherwise be encountered during the permitting and approvals process.

**Recommendations for Municipalities**

The report will offer several conclusions across technical / financial / process topics, and will culminate with a set of seven recommendations for municipalities to consider:

1. **Benchmark:** Assess the capabilities of your local industry. Identify key stakeholders among builders, suppliers, non-profits and others who are respected local leaders, innovators, and potential advisors to the municipality.
2. **Training:** After reviewing this report, especially chapters 3 and 4, consider what training might be necessary for your municipal staff, and what topics might be most helpful for them to understand better.

3. **Continuous Learning:** Adopt a formalized continuous learning program for municipal staff. Capture lessons and experiences as they occur: consider scheduling periodic meetings (perhaps quarterly) to discuss lessons and experiences from recent projects or activities. Document them formally and adapt municipal process (as appropriate) in response. Consider scheduling regular “lunch and learn” sessions as part of these meetings, based first on these learnings and then perhaps on review of various technologies from chapter 3 of this report.

4. Consider implementing a **Solar Right-To-Light bylaw** to help reduce risk for developers who are considering investing in solar systems on properties affected by potential nearby redevelopment / intensification.

5. **District Energy:** Consider implementing any of the solutions in Appendix C: Enabling Policy for District Energy, to proactively define a method by which district energy proponents can participate in local energy markets.

6. **CIP:** Review the draft Community Improvement Plan included in Appendix D, including all of the proposed programs attached to that plan. Adapt it for your local context and implement the portions thereof which are most appropriate to your municipality’s need. Be mindful of the observations and recommendations of section 4.7 starting on page 114 (eg: about program stability, simplicity, target audience, setting reasonable expectations, etc.), and of the strengths of your local industry (refer to recommendation 1 above on benchmarking). Refine this draft CIP into something for use in your local municipality, and then review with local stakeholders. Programs in this CIP do not need to be funded immediately, and discussions of funding method should not delay a discussion on what programs will be most helpful for your local municipality: separate those discussions into two efforts and focus on getting the CIP adapted and adopted as quickly as possible. Then follow up with budget discussions separately for the following fiscal year, to bring the CIP into full force.

7. **Celebrate:** Establish a local marketing plan. Work with local stakeholders to determine what level of publicity is appropriate for your local green building programs, and to identify appropriate methods for recognition. Consider section 4.7.4 item 7 on page 120 as a place to start.

Municipalities who implement the recommendations of this study will be well positioned to help the development industry transition towards net-zero energy construction, increasing local energy independence, catalyzing local economic development, reducing environmental impact and emissions, supporting environmental conservation, and enhancing quality of life.
QUESTIONS AND ANSWERS FOR MUNICIPAL COUNCILLORS

Q1: Why did FCM undertake this initiative?

A1: FCM understands that the building industry and net-zero construction offers one of the most powerful opportunities to create environmental and economic benefit at the same time, and that municipalities can play a leadership role in helping the development community to adapt to net-zero energy construction.

Q2: Has the development/building industry been consulted in this study?

A2: Yes. Developers/builders participated in advisory teams throughout this study.

Q3: Is there demand from the industry / public for net-zero energy developments?

A3: The Canadian Home Builder’s Association (CHBA) performs periodic market research, and in their recent 2018 Home Buyer Preference Survey (available online at https://www.chba.ca/CHBA/Publications/Home_Buyer_Preference_Survey.aspx) they concluded that 5 of the top 10 interests among new home buyers relate to energy. Interest has been so strong that in 2017 CHBA launched a new certification program for Net-Zero Energy Homes (discussed further in this report) and is presently expanding that program to accommodate mid-rise and renovated homes.

Q4: Overall is it feasible to construct neighbourhoods which truly provide all their own energy needs?

A4: Yes, especially with support from local industry.

Q5: What is preventing the development / building industry from constructing net-zero energy homes and neighbourhoods?

A5: This report thoroughly explores barriers which are technical, financial, or process/policy related, and offers lessons and possible solutions for each.

Q6: Are there existing policies or practices that hinder net-zero development?

A6: Yes. Refer to the eight case studies enclosed herein for examples.

Q7: What roles could energy utilities and private sector financing play in enabling these kinds of developments?

A7: It varies by region and policy context, but local energy utilities can play an instrumental role in enabling net-zero neighbourhoods by offering programs like net-metering and by supporting district energy: either by owning and offering local district energy services, by participating in public-private partnerships, by providing funding support, or by simply providing enabling policies which empower privately owned district energy systems. Each of these is explored further in this report.
Q8: Are there immediate budget implications for the suggested municipal tools?

A8: Yes, but each item affecting budget includes a discussion of financial and other returns to the municipality.

Q9: Does this study affect our existing incentive programs or other municipal tools?

A9: Perhaps. This study proposes a new Community Improvement Plan (CIP) which could replace existing programs, could be adapted into existing programs, or could be adopted alongside existing programs.

Q10: Is this a template for other Canadian communities?

A10: Yes. The report has been broken down into self contained sections which may be extracted and implemented in whole or in part to suit the local context of the reader.

Q11: Is this study useful to Canadian communities outside of Ontario?

A11: Yes. The four participating communities are all from Ontario, and the legal instrument of a Community Improvement Plan (CIP) is an idea native to Ontario, but all of the concepts and lessons / experiences contained in this report will translate easily to other communities outside of Ontario, and this report has been written for all Canadian municipalities, not just those in Ontario.

Q12: Are there any quick wins for Council?

A12: Yes. The proposed CIP includes explanations of how it has potential to recover cost sufficient to fund itself, and it could replace existing incentive programs.

Q13: Does this study affect new builds only?

A13: Primarily, but program recommendations comment on existing buildings as well.

Q14: Does this study support other municipal and provincial policies?

A14: Yes. It will depend on what policies affect each local context, but this study will enable local municipalities to pursue actions which deliver environmental and economical results in the building industry. These actions and their results can then help to fulfil policies at many levels: local, regional, Provincial, and even Federal. Municipal staff can translate the conclusions of this report into their local context for further discussion or can contact FCM and/or the authors of this report for further support.
TABLE OF CONTENTS

EXECUTIVE SUMMARY ........................................................................................................... II

QUESTIONS AND ANSWERS FOR MUNICIPAL COUNCILLORS........................................... V

TABLE OF CONTENTS .............................................................................................................. VII

ACKNOWLEDGEMENTS ........................................................................................................... X

GLOSSARY OF TERMS ............................................................................................................. XIV

IMPORTANT ACRONYMS AND ABBREVIATIONS ................................................................ XVI

LIST OF FIGURES .................................................................................................................. XX

LIST OF TABLES ..................................................................................................................... XXI

1. BACKGROUND .................................................................................................................... 1
   1.1 UNDERSTANDING THE PROBLEM .............................................................................. 2

2. METHOD ............................................................................................................................... 3
   2.1 PROJECT MANAGEMENT STRUCTURE .................................................................. 3
   2.2 METHODS IN DETERMINING TOOLS THAT PROMOTE FEASIBILITY .................... 5
   2.3 WORK PLAN & TIMELINES ..................................................................................... 8

3. DESIGN STRATEGIES FOR ACHIEVING NET-ZERO ENERGY ....................................... 9
   3.1 CONSERVATION ...................................................................................................... 14
   3.2 ENERGY STORAGE .................................................................................................... 36
   3.3 GENERATION .......................................................................................................... 40
   3.4 PERFORMANCE VERIFICATION ............................................................................. 47
   3.5 VEHICLE INTEGRATION .......................................................................................... 50

4. POLICIES AND PROGRAMS THAT SUPPORT NET-ZERO ENERGY ............................... 52
   4.1 MUNICIPAL PROGRAMS AND INCENTIVES .......................................................... 52
   4.2 PROVINCIAL PROGRAMS AND INCENTIVES ......................................................... 71
   4.3 UTILITY INCENTIVES .............................................................................................. 82
   4.4 FEDERAL PROGRAMS, INCENTIVES, & CLIMATE INITIATIVES ............................. 91
   4.5 PROGRAMS AND INCENTIVES USED OUTSIDE OF CANADA .............................. 97
   4.6 INDUSTRY PROGRAMS ............................................................................................ 98
   4.7 OBSERVATIONS ....................................................................................................... 114

5. FINANCIAL STRATEGIES FOR ACHIEVING NET-ZERO ENERGY ............................... 125
   5.1 REDUCE EXPENSES .............................................................................................. 125
   5.2 OFFSET EXPENSES .............................................................................................. 128
   5.3 EXTERNALIZING EXPENSES .................................................................................. 130
   5.4 NON-TRADITIONAL METHODS OF FINANCING ..................................................... 135

6. PROJECT CASE STUDIES .................................................................................................. 137
6.1 WEST 5 (LONDON SITE ONE) ................................................................. 137
6.2 McCORMICK CANDY FACTORY SITE (LONDON SITE TWO) ....................... 150
6.3 BLOCK 4 (KINGSTON: SITE ONE) ............................................................. 159
6.4 DAVIS TANNERY (KINGSTON SITE TWO) ............................................... 168
6.5 BRAMM YARDS (KITCHENER SITE ONE) ................................................. 178
6.6 GREENFIELD DEMONSTRATION SITE (KITCHENER SITE TWO) .................... 190
6.7 388 PHILIP STREET (WATERLOO SITE ONE) ........................................... 195
6.8 305 FROBISHER DRIVE (WATERLOO SITE TWO) ...................................... 204
6.9 TRENDS AND KEY FINDINGS .................................................................... 208

7. CONCLUSIONS .......................................................................................... 215
7.1 TECHNICAL ................................................................................................ 215
7.2 FINANCIAL .................................................................................................. 216
7.3 ENABLING POLICIES ................................................................................ 217
7.4 RECOMMENDATIONS ................................................................................. 220

8. OTHER RECOMMENDED READING ......................................................... 222

APPENDICES:

APPENDIX A: EXAMPLES OF MUNICIPAL INCENTIVE PROGRAMS
A.1 MUNICIPAL INCENTIVES: LAND USE
A.2 MUNICIPAL INCENTIVES: ENERGY
A.3 MUNICIPAL INCENTIVES: WATER
A.4 PROVINCIAL INCENTIVES
A.5 UTILITY INCENTIVES
A.6 FEDERAL INCENTIVES

APPENDIX B: ENABLING POLICIES FOR SOLAR ENERGY
B.1 HALIFAX “SOLAR CITY” SOLAR LOANS PROGRAM
B.2 SAMPLE SOLAR “RIGHT-TO-LIGHT” BY-LAW

APPENDIX C: ENABLING POLICY FOR DISTRICT ENERGY
C.1 COMMUNITY CHARTER
C.2 SAMPLE EASEMENT FOR DISTRICT ENERGY (DE) IN PUBLIC RIGHTS-OF-WAY
C.3 SAMPLE MUNICIPAL ACCESS AGREEMENT FOR PUBLIC RIGHTS-OF-WAY

APPENDIX D: SAMPLE COMMUNITY IMPROVEMENT PLAN AND PROGRAMS
D.1 GREEN HOUSING INCENTIVE PROGRAM
D.2 GREEN BUILDING INCENTIVE PROGRAM
D.3 PROPERTY TAX REDUCTION INCENTIVE PROGRAM
D.4 ADVANCED QUEUING INCENTIVE PROGRAM
D.5 PROPERTY ASSESSED PAYMENTS FOR ENERGY REDUCTIONS (PAPER) PROGRAM
D.6 DEVELOPMENT CHARGE REBATE INCENTIVE PROGRAM
D.7 BUILDING PERMIT FEE REDUCTION PROGRAM
D.8 CIP STAFF REPORT TO COUNCIL
D.9 SAMPLE BY-LAW TO DESIGNATE CIP PROJECT AREA (FOR ONTARIO)
D.10 SAMPLE BY-LAW TO ENACT CIP (FOR ONTARIO)
ACKNOWLEDGEMENTS

This study represents the culmination of efforts invested by many parties, listed below by their role in the various teams and committees that managed the efforts associated herewith:

The Implementation Team at S2E Technologies:

S2E Technologies Inc. was hired to serve as the project manager, supervising and coordinating the efforts of all other participants in this project. The following personnel were involved:

Conor MacAdam, Research & Design Associate
Demetri Makrakos, former Research & Economic Development Intern
Derek Satnik, Vice President of Technology (Project Leader)
Gary Stevens, Chief Scientist

Subcontracted urban design support from The Planning Partnership (TPP): Dan Leeming, Evan Truong, Rick Merrill and Stacey MacCulloch

Subcontracted building energy modelling support from Dr. Scott Bucking, Carlton University

The Management Team

The Management Team provided accountability and oversight for the project, reporting back to the four funding City partners and to the FCM, liaising with other City departments to ensure that the project had appropriate information and resources as and when needed, and ensuring that the project met all intended deliverables. The following personnel were involved:

Sarah Brown, Senior Sustainability Planner, City of Kitchener (year 1)
Anna Marie Cipriani, Executive Officer to the Chief Administrative Officer (former Sustainability Coordinator), City of Waterloo (year 1)
Tanja Curic, Policy Planner, City of Waterloo (year 2)
Mark Henderson, Director of Business Liaison, City of London
Demetri Makrakos, former Research & EcDev Intern, S2E Technologies Inc.
Paul McLatchy, Environment Director, City of Kingston
Derek Satnik, VP of Technology, S2E Technologies Inc. (Chair)
Brandon Sloan, Manager, Long Range & Policy Planning, City of Kitchener (year 2)
Maureen Zunti, Project Manager – Planning, Sifton Properties Limited

The London Support Team

The London Team focussed on technical elements of the two feasibility studies in London, ON.

Jennifer Gaudet, former Planner, Sierra Construction
Steve Cornwell, Planner, Sierra Construction
**Mark Henderson**, Director of Business Liaison, City of London (Team Coordinator)
Derek Satnik, VP of Technology, S2E Technologies Inc.
Jamie Skimming, Manager of Air Quality, City of London
Maureen Zunti, Project Manager – Planning, Sifton Properties Ltd.

With additional / occasional support as needed from:

Gregg Barrett, Manager of Policy Planning and Programs, City of London
Amanda Lockwood, Urban Designer, City Planning, City of London
Heather McNeely, Manager Development Services, Site Plan, City of London
Larry Mottram, Senior Planner, Development Services, Subdivisions, City of London
Michael Pease, Manager of Development Planning, Development Services, Site Plans, City of London
Lou Pompilii Manager of Development Planning, Development Services, Subdivisions, City of London
Jerzy Smolarek, Urban Designer, Development Services, Site Plans, City of London
Adam Thomson, Manager of Government and External Relations, City of London
Stephanie Wilson, Landscape Planner, City of London

**The Kingston Support Team**

The Kingston Team focussed on technical elements of the two feasibility studies in Kingston, ON.

Lynn Harding, Kincore Holdings Ltd.
**Paul McLatchy**, Environment Director, City of Kingston (Team Coordinator)
Caitlin Newey, Services Advisor, Utilities Kingston
Derek Satnik, VP of Technology, S2E Technologies Inc.
Stephen Sottile, former Manager of Customer Service & Conservation, Utilities Kingston
David Trousdale, Manager of Acquisitions & Corporate Development, Homestead

With additional / occasional support as needed from:

Mike Lynch, VP of Construction, Homestead
Jay Patry, President, Patry Inc. Developments

**The Kitchener Support Team**

The Kitchener Team focussed on technical elements of the two feasibility studies in Kitchener, ON.

**Brandon Sloan**, Manager, Long Range & Policy Planning, City of Kitchener (Team Coordinator, year 2)
Derek Satnik, VP of Technology, S2E Technologies Inc.
With additional / occasional support as needed from:

Brian Bennett, Manager of Business Development, City of Kitchener
Sarah Brown, Sr. Sustainability Planner, City of Kitchener (Team Coordinator, year 1)
Linda Cooper, Manager, Development Engineering, City of Kitchener
Nick Gollan, Manager, Stormwater Utility, City of Kitchener
Michelle Kamphius, Business Development & Conservation Strategist, City of Kitchener - Kitchener Utilities
Janine Oosterveld, Manager, Site Development & Customer Service, City of Kitchener
Della Ross, Manager, Development Review, City of Kitchener
Robert Schipper, Manager of Building, City of Kitchener
Parmi Takk, Utilities Engineer, City of Kitchener - Kitchener Utilities
Shaun Wang, System Planning & Projects Engineer, Kitchener-Wilmot Hydro
Jeff Willmer, former Chief Administrative Officer, City of Kitchener

The Waterloo Support Team

The Waterloo Team focussed on technical elements of the two feasibility studies in Waterloo, ON.

Anna Marie Cipriani, Executive Officer to the Chief Administrative Officer (former Sustainability Coordinator), City of Waterloo (Team Coordinator, year 1)
Tanja Curic, Policy Planner, City of Waterloo (Team Coordinator, year 2)
Zeljko Prica, President, Prica Global Enterprises
Derek Satnik, VP of Technology, S2E Technologies Inc.

With additional / occasional support as needed from:

Tim Anderson, Chief Administrative Officer, City of Waterloo
Cameron Rapp, Commissioner of Integrated Planning & Public Works and Deputy Chief Administrative Officer, City of Waterloo
Bebe Khan, Site Plan Coordinator and Site Plan Chair, City of Waterloo
Rhonda Werner, Engineering Technologist, City of Waterloo
Adam ischbach, Manager of Inspections, City of Waterloo
Laura Dewar, Development Planner, City of Waterloo

Additional Advisors

Though not directly involved in any of the above teams, there were many other individuals who offered time and expertise to the research compiled here in this report, and we are grateful for their support:

Karen Farbridge, Principal, Karen Farbridge and Associates (expertise in municipal policy and process)
Kelton Friedrich, Researcher at McMaster University (specializing in CHP)
David Roewade, Sustainability Planner - Environmental Planning, Region of Waterloo
Andrew Wilcox, Principal, Filament Energy (specializing in district energy & CHP)
Various planning and building department staff at each of the municipalities referenced in chapter 4 and Appendix A of this report: too many to list here, but we are sincerely thankful for their patience in answering our many questions, and for the anonymous perspectives and advice which they provided on the effectiveness of their programs.

The Funding Team

This report has benefited from financial and in-kind support from the Corporations of the Cities of Kingston, Kitchener, London and Waterloo, and would not have been possible without them or the matching financial contributions given by the Federation of Canadian Municipalities’ (FCM’s) Green Municipal Fund (GMF).

This report is considered by all four contributing cities to be public property, and is freely available for distribution and use by any interested parties who agree to respect and uphold this copyright and to protect its intent as a document for broad public use.

If this document is helpful to you, then please use it with our thanks, and please encourage others to do the same. If you have any questions about the contents or case studies within this document then please feel encouraged to contact either the Cities referenced herein or the report authors at s2e Technologies Inc.

© 2019, The Corporation of the City of London. All Rights Reserved.

The preparation of this feasibility study was carried out with assistance from the Green Municipal Fund, a Fund financed by the Government of Canada and administered by the Federation of Canadian Municipalities. Notwithstanding this support, the views expressed are the personal views of the authors, and the Federation of Canadian Municipalities and the Government of Canada accept no responsibility for them.
GLOSSARY OF TERMS

Conservation: Much like the three R’s (Reduce-Reuse-Recycle), the first step in energy efficient design is to simply not use energy that is not needed. “Conservation” refers to intentional efforts to reduce energy demand by design. This does not include purchasing efficient appliances – it instead focuses on not purchasing appliances that are not needed. For example, purchasing ENERGY STAR® rated refrigerators and printers for the office would be an appropriate measure of Efficiency (below), but Conservation would be consolidating print areas so that fewer printers are needed. Typical conservation efforts will include things like thicker and tighter building envelopes (ie: more insulation, better windows, etc), use of daylight and motion sensors, attention to passive solar gains, technologies which recover waste heat or “free” heat, calculated efforts to “right-size” equipment and not just follow code tables or rules of thumb, changing building designs to minimize the amount of energy that is lost in transmission (eg: by stacking hot-water uses and insulating pipe), and much more.

Efficiency: If we need a box, then get a better box. Fridges, heating/cooling systems, fans/ventilators, and anything else that uses energy, should use it efficiently. Preference should be given to equipment that is rated for efficiency (eg: ENERGY STAR rated), and any large energy users (eg: heating/cooling equipment) should be evaluated based on efficiency ratings (eg: AFUE / COP / HSPF / SHGC) as a primary consideration.

Generation: Once the building/project has been designed to use as little energy as possible, the remaining energy that is needed may be generated from renewable sources on site.

Heat Island Effect: Developed areas (ie: typically urban or suburban) which have significant amounts of land covered with dark colours (eg: asphalt roads, lanes, parking areas, and roofs) will retain more heat from the sun and will literally be warmer than the surrounding countryside or other more natural areas like parks.

Net-Zero Energy: A building or project that is deemed to be “Net-Zero Energy” is one that produces all the energy it consumes on an annual basis, from on-site resources which are renewable. The building / project may or may not be connected to a utility grid or energy storage system. It will have means to generate energy on site, and it will have means to access and use that energy over time – not necessarily exactly when it was generated.

Net-Zero Energy Building: A building which produces as much energy (including both electrical power and heat) as it consumes on a yearly basis.

Net-Zero Energy Community: A community which produces as much energy as it consumes on a yearly basis. Some buildings will likely generate more energy than others, but as a community, they will together offset their combined annual energy demand.

Renewable: “Renewable” and “Clean” energy are closely related, but different, and are often confused. “Clean” refers to emissions, and most energy sources can be artificially made to be “clean” with sufficient effort. For example, emissions stacks from coal or natural gas plants can be scrubbed (ie: “clean coal”). Nuclear waste is one of the only examples of emissions
that are simply not possible to make clean, so they are instead contained in specialized containment facilities. Energy that is truly renewable is not only clean but is available whenever it is needed. For example, biomass is renewable if used at a pace that permits the source fuel to regrow (renew) itself before it is needed again, but if we consume wood so fast that the forest does not have time to regrow, then wood ceases to be renewable as a resource. Geothermal energy (earth heat), is usually renewable, but care must be exercised during design to ensure that the ground will be balanced thermally. Drawing heat from the ground and putting heat back during cooling season will balance the ground, but doing only one or the other can slowly diminish the local ground’s ability to continue in an imbalanced way, progressively drying out the local earth until it no longer exchanges heat efficiently. Biomass and geothermal energy are usually renewable, when designed and implemented with appropriate care. Energy from the sun, wind, tides, or rivers/waterfalls, are always available when needed, and are thus always renewable.
IMPORTANT ACRONYMS AND ABBREVIATIONS

The following abbreviations and acronyms are used in various ways and places throughout the remainder of this document. The definitions included herein are offered as a convenient reference for professionals in the municipal public service, and as such, the explanations included herein may at times be cursory or high-level. This list is neither intended to be exhaustive nor technically rigorous, but as a reference, is intended to help public servants understand what terms apply to what types of technology (as explained in the body of this report), and to understand the general intent and utility of these terms.

AEE: Association of Energy Engineers: an international non-profit organization focussed on training, certifying and supporting energy and sustainability professionals, primarily through offering professional designations such as CEA, CEM, and CMVP, described below.

AFUE: Annual Fuel Utilization Efficiency: a measure of efficiency for mechanical heating equipment. Larger AFUE numbers indicate better efficiency.

AV: Autonomous Vehicle: a vehicle capable of driving itself autonomously.

CEA: (1) Certified Energy Advisor: a qualified residential energy professional, trained and licensed by Natural Resources Canada, to deliver energy models and inspections for low-rise residential housing, and to provide advice on how to improve home energy efficiency, using the EnerGuide Rating System.
(2) Certified Energy Auditor: a qualified commercial energy professional, trained and credentialed by the Association of Energy Engineers (AEE) to provide energy audits and related consulting services for larger buildings (commercial / institutional / industrial).

CEM: Certified Energy Manager: a qualified professional trained by the Association of Energy Engineers (AEE) to optimize the energy performance of commercial or industrial buildings and/or processes. Where the CEA tends to be an outsourced expert bringing in external perspectives, and CEM tends to be an internal resource.

CHBA: The Canadian Home Builders’ Association, representing over 8,500 companies as the primary voice of Canada’s residential construction industry, including home builders, renovators, land developers, trade contractors, product and material manufacturers, building product suppliers, lending institutions, insurance providers, and service professionals: the largest employment sector in Canada.

CHP: Combined Heat and Power: a compact form of energy generation which uses fuel (typically natural gas) to create both heat and electricity (power) at the same time. Refer to Table 3-78 on page 45 in the main report for more detail.

CMVP: Certified Measurement and Verification Professional: The Association of Energy Engineers (AEE), in cooperation with the Efficiency Valuation Organization (EVO), has established the Certified Measurement and Verification Professional program to train and qualify professionals to measure and verify the performance of building and energy systems.
**COP:** Coefficient of Performance: a measure of efficiency for heat pumps – a comparison between the amount of energy used to power the pump, and the amount of heating or cooling the pump can produce. Larger COP numbers indicate better performance.

**CxA:** Commissioning Agent: trained and qualified by the Building Commissioning Association (BCA), whose mission is to guide the building commissioning industry by advancing best practices and education, promoting the benefits of building commissioning, and offering events and programs that set a high bar for the commissioning professionals who manage the total building commissioning process.

**DC:** Development Charge: fees levied by municipalities upon developers prior to permitting development to proceed. DCs are notionally intended to compensate the municipality (up front) for the increase in municipal services that will be required once development has been completed (e.g., garbage collection, snow removal, road maintenance, etc), and are often used by the Municipality to fund capital works projects such as stormwater management features which are required in order to support the development.

**DE:** District Energy systems are networks of hot and cold water pipes used to heat and cool buildings as a network, such as a hospital or academic campus of buildings that share a heating/cooling plant. These systems are often much more efficient than heating/cooling each building separately. Refer to Table 3-79 on page 46 in the main report for more detail.

**EA / ESA:** Environmental Assessment / Environmental Site Assessment: an examination done on properties suspected for soil contamination to clearly identify the nature and extent of contamination, and to determine whether remediation is required (and to what extent) before development can proceed.

**ESA:** Energy Service Agreement (or sometimes Energy Savings Agreements): not to be confused with Environmental Site Assessments (above), Energy Service Agreements are effectively a turn-key energy procurement contract, where a building owner agrees to purchase energy as a service, not just a product, from a third party. That third party might provide renewable energy assets, conservation/efficiency upgrades, or other related projects, and may also procure energy from typical utility sources, but will bundle that energy with the energy they provide before delivering to the building owner, and the building owner will deal only with the ESA holder (i.e., as a replacement for their otherwise typical utility companies).

**ESCO:** Energy Service Company: a company that funds energy performance improvement projects on third party buildings and contracts with the building operators to collect repayment through realized energy savings in any of a number of related business models.

**ESPC:** Energy Service Performance Contracts: see Energy Service Agreements (ESA) above.

**EV:** Electric Vehicle: any vehicle (typically automotive) which is 100% powered by electricity.
FCM: Federation of Canadian Municipalities: a national non-profit whose members are municipalities. FCM is the national voice of municipal government representing 90 per cent of Canada's municipal population.

GMF: Green Municipal Fund: a unique FCM program that provides funding and knowledge services to support sustainable community development in Canada. GMF-supported initiatives aim to improve air, water, and soil, and mitigate the impacts of climate change.

GMM: Green Municipal Mortgage: loans issued by the municipality, offered to property owners for specific purposes such as the financing of energy retrofits, secured against the property, and repaid over time through the property tax bill.

HSPF: Heating Seasonal Performance Factor: A factor used by the heating/cooling industry to compare the performance of heat pumps. The higher the HSPF, the more efficient the pump is. The “Seasonal” part of the HSPF accounts for the fact that COP will vary across the seasons, and HSPF focuses on the heating season more than the overall annual average COP.

IRR: Internal Rate of Return: a metric used for calculating the amount of interest gained on an investment. IRR is the percentage rate earned on each dollar invested for each period it is invested (i.e., the interest). Ultimately, IRR gives an investor the means to compare alternative investments to each other based on their relative yields.

LDC: Local Distribution Company: a local electrical utility that manages the final delivery of electrical power to a local building or use-site. LDCs are typically owned by a local municipality and are sometimes owned by territorial/regional operators (public or private) which are highly regulated, often by multiple levels of government (especially if that operator spans multiple regions/jurisdictions). The term “LDC” is sometimes used to refer to thermal (heating/cooling) delivery utilities as well, but is a term born of the electricity sector.

LEED: Leadership in Energy and Environmental Design: A checklist based family of green building certification programs managed by the US Green Building Council (USGBC) with domestic support by the Canada Green Building Council (CaGBC). LEED programs focus on everything from hospitals to homes, from new construction to maintenance and operations, from energy to durability to smart locations and linkages with the broader community. LEED is one of the most established and globally recognized programs for green buildings.

LIC: Local Improvement Charge: Municipalities in Ontario have the legal right to recover the costs of capital improvements made on public and privately owned land from the property owners who will benefit from the improvement. These cost recoveries may be added to the property tax bill as a “Local Improvement Charge.”

PACE: Property Assessed Clean Energy: PACE loans are typically for clean energy projects, implemented like a GMM (see above).

PAPER: Property Assessed Payments for Energy Retrofits: see PACE/GMM above.
PPA: Power Purchase Agreement: a legal agreement for the purchase and sale of electrical power from an entity owning assets which generate electricity (such as PV, CHP, or any other power generation technology) to a utility operator who wishes to purchase that energy.

PV: Photovoltaic: “photo” = light and “voltaic” = electricity: solar panels which convert sunlight into electrical power.

NRCan: Natural Resources Canada: the Canadian Government’s research arm, which houses departments for many topics related to and including energy efficiency for buildings.

R-Value: Thermal Resistance Value: A measure of the ability of a material or product to resist the transmission of heat. Higher R-Value’s indicate better performance as an insulator. Lower R-Values indicate better performance as a conductor, and poor performance as an insulator.

SHGC: Solar Heat Gain Coefficient: a measure of the amount of heat that a window gains from sunlight incident on the window. Larger numbers indicate more heat passing through the window.

SIP: Structurally Insulated Panel / Sandwich Panel: made from steel, timber, or concrete, and used for all structural elements including interior and exterior walls, floors, and ceilings/roofs. There are many forms of SIPs, but all generally include insulation encased with or supported by structural elements. The most common example would be a “foam sandwich” with wood on the top and bottom, and rigid or expanded foam between. The same can be made with steel or concrete in place of the wood, and can be made to be load bearing or not.

TAP: Tax Assistance Plan: a partial or complete waiver of the municipal property tax applicable to a site, for a fixed period of time.

TIG: Tax Increment Grant: a partial or complete waiver of the incremental portion of the municipal property tax applicable to the site, for a fixed period of time, associated with development that improves the value of the site. Ie: the grant will only apply to the increase in property tax for the site, not to the base value of the property prior to the increase.

U-Value: The overall heat transfer coefficient, expressed in W/(m²·K), or the inverse of R-Value. [ie: U-Value = 1 / R-Value]

V2G: Vehicle-To-Grid: technology solutions that use electric vehicle batteries for grid energy storage, having control capability to identify when it is appropriate to draw energy from the battery (ie: so as to not draw down the battery fully or leave the vehicle owner unable to get home), and when the vehicle needs to be recharged (eg: with off-peak energy).

VNM: Virtual Net-Metering: Net-Metering simply enables a building to supply energy at some times and consume energy other times, and to be billed for the net amount consumed. Virtual Net-Metering extends this same concept to cover multiple buildings owned by the same entity, such that one building’s surplus energy could be used to supply the need in another.
LIST OF FIGURES

Figure 2-1: Project Management & Delivery Team ................................................................. 3
Figure 4-1: Overview of Canadian Green Housing Programs .................................................. 100
Figure 4-2: Overview of Canadian Green Building Programs .............................................. 101
Figure 6-1: Aerial View of West 5 Surroundings, London, ON ............................................. 137
Figure 6-2: West 5 Master Plan .............................................................................................. 139
Figure 6-3: Sifton Centre at West 5 ......................................................................................... 139
Figure 6-4: West 5 Townhomes ............................................................................................. 139
Figure 6-5: Solar Canopy / Gazebo ....................................................................................... 146
Figure 6-6: Solar PV Tunnel ................................................................................................. 146
Figure 6-7: PV @ West 5 Stormwater Management (SWM) Trench .................................... 147
Figure 6-8: Former McCormick Candy Factory .................................................................... 150
Figure 6-9: Aerial View of McCormick and surrounding Area, London, ON ...................... 151
Figure 6-10: Proposed McCormick Redevelopment ............................................................. 153
Figure 6-11: Aerial View of North Block, Kingston, ON ....................................................... 159
Figure 6-12: Most recent concept plans for Block 4, Kingston, ON. A) Low-rise 4-6 storey, B) Mid-rise 7-9 storey, C) High-rise 10-18 storey ................................................................. 163
Figure 6-13: Aerial schematic of the proposed Block 4 design ............................................ 163
Figure 6-14: Latest (2017) Net-Zero Energy Concept Plan .................................................... 164
Figure 6-15: Aerial View of the Davis Tannery Site .............................................................. 168
Figure 6-16: Tannery Land Use Options from 2013 Public Visioning Exercise ..................... 170
Figure 6-17: Tannery Concept Plans A (left) and B (right) from Kincore and Conestoga-Rovers & Associates, 2004 ............................................................. 171
Figure 6-18: Tannery Concept Plan by Jay Patry Enterprises Inc., 2014 ............................... 171
Figure 6-19: Conceptual Net-Zero Energy Community Site-Plan .......................................... 173
Figure 6-20: Aerial View of Bramm Yards, Kitchener, ON .................................................. 178
Figure 6-21: Bramm Yards Conceptual Neighbourhood Design ......................................... 178
Figure 6-22: Bramm Yards District Thermal Energy Concept Plan ....................................... 184
Figure 6-23: Conceptual Site Plan for Green Acres, Kitchener (left: plan view; right: perspective) ............................................................. 190
Figure 6-24: Conceptual Site Plan for 388 Philip St., Waterloo ........................................... 195
Figure 6-25: District Energy Sample Piping Layout #1 for 388 Philip St., Waterloo .......... 201
Figure 6-26: District Energy Sample Piping Layout #2 for 388 Philip St., Waterloo .......... 202
Figure 6-27: Location/Context for 305 Frobisher Dr., Waterloo ......................................... 204
Figure 6-28: Conceptual Site Plan for 305 Frobisher Dr., Waterloo ..................................... 205
LIST OF TABLES

Table 3-1: Sample Tech/Design Table .......................................................... 9
Table 3-2: Summary Overview of Design Strategies ..................................... 10
Table 3-3: Batts - Fibreglass / Fibre Wool .................................................. 15
Table 3-4: Batts - Stone Wool / Mineral Fibre ............................................. 15
Table 3-5: Batts - Cotton / Denim ............................................................... 15
Table 3-6: Blown Cellulose ........................................................................... 16
Table 3-7: Exterior Insulated Finishing System (EIFS) .................................. 16
Table 3-8: Rigid Foam Board (EPS / XPS) ................................................... 16
Table 3-9: Insulated Concrete Forms (ICF) .................................................... 17
Table 3-10: Phase-Change Materials (PCM) ................................................ 17
Table 3-11: Polyisocyanurate ...................................................................... 18
Table 3-12: Structurally Insulated Panels (SIPs) ............................................ 18
Table 3-13: Solid Pre-Fab Panels ................................................................. 18
Table 3-14: Spray Foam ................................................................................ 19
Table 3-15: Straw Bale Insulation ................................................................. 19
Table 3-16: Thermal Foil .............................................................................. 19
Table 3-17: Vacuum Sealed / Insulated Panels ............................................. 20
Table 3-18: Thermally Broken Balconies ..................................................... 20
Table 3-19: Window Flashing Systems ......................................................... 21
Table 3-20: Air Sealing Tapes ..................................................................... 21
Table 3-21: Gaskets ..................................................................................... 22
Table 3-22: Building Paper ......................................................................... 22
Table 3-23: Vapour Barrier Strategies ......................................................... 23
Table 3-24: Window Glazing ....................................................................... 23
Table 3-25: Spandrels .................................................................................. 24
Table 3-26: Clerestory Windows ................................................................. 24
Table 3-27: Passive Solar Design ................................................................. 24
Table 3-28: Earth Tubes .............................................................................. 25
Table 3-29: Geothermal Heat Pump ............................................................ 25
Table 3-30: High Performance HVAC ......................................................... 26
Table 3-31: Low Velocity, Constant Flow Ventilation ................................ 26
Table 3-32: Natural Ventilation .................................................................. 26
Table 3-33: Green Walls / Living Walls ....................................................... 27
Table 3-34: Solar Air Heating (SAH) / Solar Pre-Heating ............................. 27
Table 3-35: Variable Refrigerant Flow (VRF) .............................................. 27
Table 3-36: Condensing Water Heaters ....................................................... 28
Table 3-37: Solar Water Heating (SWH) ...................................................... 28
Table 3-38: Geothermal Water Heating ...................................................... 28
Table 3-39: Instantaneous Boilers ............................................................... 29
Table 3-40: District Energy Water Heating .................................................. 29
Table 3-41: Drain Water Heat Recovery (DWHR) ....................................... 30
Table 3-42: Econoizers ............................................................................... 30
Table 3-43: Heat Recovery Ventilators (HRVs) ........................................... 30
Table 4-4: Provincial Incentive Programs .......................................................... 71
Table 4-3: Electric Vehicle Incentives .................................................................. 81
Table 4-5: Federal Incentive Programs ............................................................... 91
Table 4-6: List of Environmentally Preferable Product Resources .................... 109
Table 4-7: Canadian Municipal Program Trends .................................................. 115
FCM/GMF FEASIBILITY STUDY:
MUNICIPAL TOOLS FOR CATALYZING NET-ZERO ENERGY DEVELOPMENT
FINAL REPORT

Prepared By:
Derek Satnik
VP of Technology
s2e Technologies Inc.
10 Front St., St. Jacobs, ON,
www.s2etech.com
1. BACKGROUND

Cities across Canada are looking for developers and builders to design and construct in “greener” and more “sustainable” ways, yet the processes needed to achieve this are not well understood for municipalities and developers alike. It is easier today than ever before to build communities which provide all their own energy needs and which leverage smart and sustainable design principles. Most current planning and development processes within municipalities do not fully support the implementation of such initiatives, which often involve technical and financial complexities that can cause delays with the municipal approvals processes, and which thus become dis-incentives against pursuing more sustainable construction.

This unfortunate reality exists across most mid-size growing municipalities in Canada and indeed around much of the developed and developing world, many of whom are quite eager to share in any lessons that can be learned across these topics.

The Green Municipal Fund (GMF) was created by the Federation of Canadian Municipalities (FCM) to provide funding support for various initiatives that help Canadian municipalities to improve air, water, and soil quality, and to mitigate the impacts of climate change. GMF programs are organized around topics such as brownfield remediation or green building construction, and GMF has an interest in enabling cities to build more net-zero buildings.

This project began in 2015 as a brainstorming discussion at the City of London, which was then being approached by Sifton Properties Limited (Sifton), to provide various approvals for the West 5 project: one of the eight principal case studies later in this report. The City of London began an internal discussion to ask what else could be done to enable and incite other builders, besides Sifton, to pursue net-zero construction. The discussion quickly turned to wondering whether other municipalities were asking similar questions. S2E Technologies had been working closely with the City of London because of their involvement with the West 5 project, and so S2E suggested that a conversation should be had with each of Kingston, Kitchener, and Waterloo. These four cities (London, Kingston, Kitchener and Waterloo) have each independently enjoyed past success working with the GMF programs to research challenging questions like this, and so it was decided that they would partner together and with GMF to perform a focussed study on what a municipality can reasonably do to help motivate and enable builders to construct net-zero energy developments, be those buildings or whole neighbourhoods.

To make this research question meaningful, the project team decided to focus on case studies: two in each of their respective cities. The quantity of two was chosen to balance the tension between not taking on too many cases and of avoiding myopic thinking. Taking on too many cases would bog down the research with more work than would optimally be needed in order to learn the lessons which were being sought. Doing too little (ie: only one case study per City) would inadvertently set up the investigation team in a context that would struggle to think high level about processes, and not just sink myopically into the details of one specific project’s needs. Having at least two projects per City would help each City not to lose sight of the overall processes which each project is being subjected to, and of how those processes might affect other
dis-similar projects. Three projects offered little tangible benefit that couldn’t be achieved more easily with two projects (ie: at less effort), so two per City was deemed to be the right balance.

S2E then worked with the four city partners to maximize the diversity among their collective eight case studies, in an attempt to ensure that the eight studies would represent as many different scenarios as possible from among those which they might typically see in the development approvals process.

1.1 Understanding the Problem

The core challenge which the project team sought to explore was that of how a municipality can encourage builders / developers to construct to net-zero standards when those standards are clearly above and beyond the building code. This makes it difficult for a City to impose requirements to build beyond code, since the code is the law and is not only acceptable, but is truly the only standard which is strictly enforceable. It is also difficult for a City to offer incentives to builders to build above code, because incentives ultimately cost the City money that could be spent on other things, and they are accountable back to tax paying community members for the use of that money. And even if the City does find an effective way to incent a builder to construct to higher standards, the builder must still undergo the normal approvals process, and the City’s own staff often present numerous concerns and challenges that are more technical: from implementations of planning policy through to what hardware a building inspector will be asked to approve on site, and any number of other items that are simply not what they are accustomed to expecting.

The headache of dealing with these challenges often gives way to inertia, and builders go back to delivering the same old “tried and true” designs which they know they can get approved with limited difficulty. This inertia is further compounded by the inability of municipalities to require any green or sustainable design elements above and beyond the applicable Building Code: because the code is law, requiring anyone to build beyond the code is effectively above and beyond, and is thus not strictly enforceable (and can be challenged and repealed at higher authorities such as Appeal Boards).

It is interesting to note that much of the challenge with building better is based on the assumption that this must cost more. In reality, the technology markets (like solar PV and LED lighting) and the best-in-class building programs (like ENERGY STAR®, LEED®, Passive House, the CHBA’s emerging Net-Zero programs, and others) have enjoyed tremendous success over the past ten years, and costs are much more reasonable than they were previously. This is likely to become even more true with the implementation of Ontario and Canada’s new climate action strategies. However, these technologies and programs are still new to city officials, and it can be challenging to get a building permit for a building that is innovative.

There are many challenges related to improving an entire industry such as the construction industry, but for the sake of clarity, the central problem which this report is studying is that of what a municipality can reasonably do to help motivate and enable builders to construct net-zero energy developments, be those buildings or whole neighbourhoods.
2. METHOD

This research project ultimately breaks down into several parts which are explored in greater detail below (technical, financial, and policy/process), but before that, it is helpful to understand how the work flows were managed. Because this project was delivered by a partnership among four cities, each of those cities participated in the oversight of the project as a whole, and each of them was actively involved in the case studies within their own municipal boundaries.

2.1 PROJECT MANAGEMENT STRUCTURE

The team that managed and provided oversight for this project was divided into several sub-teams with complementary but distinct purposes. There were teams focussed on activities within each participating City (ie: Kingston, Kitchener, London and Waterloo), and an overall Management Team to provide oversight and coordination between them.

![Figure 2-1: Project Management & Delivery Team]

2.1.1 MANAGEMENT TEAM RESPONSIBILITIES

The Management Team was comprised of one representative from each of the participating City partners, plus S2E Technologies as the Project Manager (Derek Satnik), plus one representative from the private development industry to bring a practical perspective to the discussion (Maureen Zunti from Sifton Properties Limited). The Management Team was accountable for the following duties/responsibilities:

- ~4 hours/month, plus periodic reviews of deliverables.
- Participate in monthly meetings (typically by teleconference) to help supervise the project as follows:
  - Support the Project Manager (S2E) by providing advice on various topics as discussed at the monthly meetings;
  - Liaise back and forth between the home organization and this team in order to help keep the organization apprised of the project’s progress;
- **Provide timely feedback** on draft deliverables, to help ensure that they are meeting the commitments made to all funding partners per the proposal, and to help maximize their benefit to the home organization (while respecting the overall project objectives);

- **Provide resources and reference data** as appropriate to support the various objectives of the project. For example, provide examples of relevant resources from the home organization (municipal planning documents, standards, guidance documents produced for local industry, etc), case studies encountered in their experience, industry contacts, or even just information encountered in personal reading that might be of benefit to the project, etc.

- Help **monitor** the project’s progress against the proposed timeline, budget and deliverables, and hold the Project Manager accountable to meet the proposed commitments.

### 2.1.2 City Assessment Teams

The City Assessment Teams were focused more practically on the issues that arose within each project as the feasibility study matured:

- ~4 hours/month, plus periodic reviews of deliverables.
- **Participate** in monthly meetings (typically by teleconference) to help supervise the project as follows:
- **Support** the Project Manager (Derek Satnik, s2e) by providing advice on various topics as discussed at the monthly meetings;
- **Liaise and coordinate** back and forth between the home organization and this team in order to help keep the organization apprised of the project’s progress, and in order to seek assistance from competent voices on relevant topics as they arise (eg: site history, heritage implications, brownfield/flood plain constraints, zoning considerations, process concerns when navigating municipal approvals, etc), and particularly in efforts related to the “shadow approvals” discussions that occurred in later stages of the development of each case study.

- **Provide timely feedback** on draft deliverables to help ensure that the concepts/pre-designs being evaluated have merit, are actionable/implementable, and to help maximize their benefit to the home organization (while respecting the overall project objectives) and to the neighbourhood development process in general;

- **Provide resources and reference data** as appropriate to support the various objectives of the case studies within the City. For example, municipal planning documents, records of past historical uses of the two case study sites, past applications received by the City which relate to the sites, Secondary Plans or other planning or zoning related documents or other relevant local bylaws (including existing or proposed Community Improvement Plans, energy/sustainability plans, incentives, guidelines, or other related draft efforts presently being undertaken at the City), related examples or other guidance documents from the broader industry which seem valuable for use on the case study sites, etc.
2.1.3 **PROJECT MANAGER’S RESPONSIBILITIES**

The Project Manager was responsible to take direction from the partner Cities and to assemble the work of this study with the contributions of the assessment teams into a consolidated report, minimizing the draw upon municipal staff time, while maximizing their engagement opportunities and keeping an open door for feedback:

- **Coordinate** all meetings: prepare agendas and minutes for timely distribution, arrange venues / technology (ie: web/teleconferencing), and food for in-person meetings.
- **Solicit** feedback and stakeholder input on all work-in-progress documents.
- **Lead** all technical research efforts and solicit and respond to input / feedback from all project partners.
- **Report** on all learnings, document case studies, solicit feedback, and prepare final deliverables, including consolidation of related input from all stakeholders.
- **Manage** the budget and timelines, including invoicing to all partners and delivery of all required documentation to FCM/GMF, and provide timely / meaningful interactions with all team members to ensure that their time is respected and appropriately leveraged.

2.2 **METHODS IN DETERMINING TOOLS THAT PROMOTE FEASIBILITY**

As explained above, this team was assembled to assess the challenge of what a municipality can reasonably do to help motivate and enable builders to construct net-zero energy developments, and to address the challenges that a municipality typically faces when attempting to do so (eg: industry inertia, etc). To address these and related challenges, this study looks at eight different development projects at diverse stages across four mid-sized growing cities in Ontario (two projects per city), evaluating what would be necessary in order to enable the project to provide all of its own energy on-site, by assessing three complementary and interdependent focusses (ie: like the three legs of a stool):

**Technical Feasibility:** This study will look at different technologies used in advanced energy-efficient buildings and communities, and will assess which are feasible for widespread use today, what types of projects each technology is best suited for, and what technologies can be used to achieve net-zero energy performance in each case.

**Financial Feasibility:** This study will evaluate funding and incentive models which can be used to offset the costs of including advanced technologies that help attain net-zero energy on the neighbourhood/community scale.

**Policy/Process Feasibility:** This project will involve shadow-permitting discussions, where each partner municipality will participate in mock-trial approval processes, where each project will be conceptually redesigned to achieve net-zero energy, and the cities will be asked to assess and contribute their understanding of what would be required for them to issue construction approvals for the design concepts which we are studying. This will help to
identify policy and process challenges and proactive means by which those challenges may be resolved.

The headache of dealing with these challenges often gives way to inertia, and builders go back to delivering the same old “tried and true” designs which they know they can get approved with limited difficulty. This inertia is further compounded by the inability of municipalities to require any green or sustainable design elements above and beyond the applicable Building Code: the code is law, and requiring anyone to build beyond the code is effectively above and beyond the law, and is thus not strictly enforceable (and can be challenged and repealed at higher authorities such as appeal boards). It is widely expected that future versions of Canadian building codes will have higher standards, ultimately pursuing net-zero energy by 2030, but this only increases the need to address these challenges in the short-term before they become codified. With all of this in mind, there is a valuable opportunity for municipalities to demonstrate leadership in encouraging builders to construct to levels that are presently beyond code, but which likely will not be by 2030.

Interestingly, much of the challenge with building better is based on the assumption that this must cost more. In reality, the technology markets (like solar PV and LED lighting) and the best-in-class building programs (like ENERGY STAR, LEED, and others) have enjoyed tremendous success over the past ten years, and costs are much more reasonable than they were previously. This is likely to become even more true with the implementation of new climate action strategies at the Federal and Provincial levels. However, these technologies and programs are still new to city officials and developers, and it can be challenging to get a building permit for a building that is innovative.

The eight project sites included in this study together represent a sufficiently diverse pool of case studies that are generally representative of most of the development scenarios that municipalities typically experience, and will therefore provide a highly transferrable and repeatable set of results for use not only by the participating partners (who will of course benefit the most), but also for all other Canadian municipalities.

2.2.1 Technologies & Design Strategies

The current generation has seen more technological change than any other generation in history, and the rate of change seems to be forever accelerating. Homes and buildings may be built today using methods and materials that are different than they were only a few short decades ago, yet most of the industry continues to use methods and materials that have been in use for centuries. Skeptics of net-zero energy construction will often cite technology costs as a primary barrier, and will refer to costs that were true over a decade ago. LED lighting and PV solar panels are two examples of technology that have reduced in cost drastically over the last decade (nearly tenfold), and many other technologies are experiencing similar reductions now (eg: storage). It is true that the development process takes time, and buildings being constructed today are often the fruit of plans and permits that were initiated years earlier, sometimes more than a decade earlier. It is easy to see that this could lead to developers thinking about technology from an expired perspective with obsolete data. Technology is no longer a barrier to net-zero construction in and
of itself, but it can be confusing to know what technology may best be applied to what building/construction context.

Chapter 3 will present a detailed comparison of many of the technologies that may be used today to help a modern building pursue net-zero energy construction, including a discussion of where those technologies are best employed, where they are not, and what some of their relative strengths and weaknesses are. Through the course of this study, the research team performed a survey across the industry to identify many different technologies useful for enabling advanced net-zero energy construction, and these have been categorized and presented to enable other projects to leverage those technologies which are best suited to their context.

2.2.2 **Financial Strategies**

Once a building / development team has determined how best to design and construct a net-zero energy building, there are usually questions about who pays and how the financial models will be made successful. The up-front cost to build a better building will always pay back over time, but the people who absorb the up-front cost are not always the same people as those who will benefit over time, and there is not always an intuitive means for the constructor to charge the benefactor. The fact that the construction industry in general does not understand how to leverage technology affordably to build net-zero energy projects is one challenge, but the fact that the industry does not generally understand how to create strong financial returns is perhaps a much larger barrier.

Chapters 4 and 5 will explore funding and incentive models which can be used to avoid, reduce, or offset the costs of including advanced technologies that help attain net-zero energy at the neighbourhood/community scale, and will present some alternative financial models to help enable net-zero construction. The methods assessed were collected from various municipalities across Canada and beyond, and were considered both on the basis of their ability to effectively catalyze net-zero energy projects, and on the basis of their ability to create financial returns for the municipality.

2.2.3 **Policies/Process**

Assuming that a project team can identify technologies that are useful and helpful within their context, and then apply appropriate financial models to help them enable construction to happen, they will still need a permit before they can build. This study included eight site-specific case studies, two from each of the partner cities. Each case study involved shadow-permitting discussions where the partner municipality participated in a mock-trial approval process. Each project was conceptually redesigned to achieve net-zero energy, and the cities were asked to assess and contribute their understanding of what would be required for them to issue construction approvals for the design concepts. Many lessons were learned during the case studies and have been summarized in Chapter 6 of this report.
2.3 **WORK PLAN & TIMELINES**

This feasibility study began conceptualizing in June of 2016, formalized through 2017 and then matured into 2018. In total, there were monthly meetings by the various support teams for most of the two year project, and the final report includes content which we expect will need to be updated on an ongoing basis, especially any comments about technology or technical design approaches.
3. DESIGN STRATEGIES FOR ACHIEVING NET-ZERO ENERGY

The purpose of this chapter is to introduce the reader to the many technologies that may be used to help construct a building / community that provides all of its own energy. It will be useful in this section to review the working definitions for the terms Conservation, Efficiency, and Generation from the Glossary at the beginning of this document, and to refer when necessary to the list of abbreviations and acronyms included in the front matter of this report.

There are many technologies and design approaches that enable the construction of net-zero energy communities. Some of these technologies are nearly universal in their application, and others are more context sensitive. This section will explore technologies and design approaches in grouped themes, and will offer introductory-level guidance on where each of those technologies or design approaches is most applicable and how best to use them successfully. This document is not intended to be used for technical training and should not be used for formal design. Any of the thoughts / opinions offered below are purely those of the authors and should in no way be construed as design recommendations for construction: all design activities should be conducted with the aid of qualified professionals who are appropriately experienced in their discipline. This report offers a technical overview for the purpose of orienting municipal public servants and policy makers in the hopes that it will empower them to better support developers who wish to construct to net-zero energy standards.

Each concept will be summarized in the following tabular format for convenience of reference:

<table>
<thead>
<tr>
<th>Table 3-1: Sample Tech/Design Table</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Technology / Design Type</strong></td>
</tr>
<tr>
<td><strong>Description:</strong> A concise explanation of what exactly this technology is and how it works.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> A brief exploration of where this technology or design approach is ideally intended to be used, and/or where it performs best.</td>
</tr>
<tr>
<td><strong>Limitations:</strong> A summary of some of the limitations of this technology or design approach, or of where it should not be applied.</td>
</tr>
<tr>
<td><strong>Availability:</strong> Is the technology Established, and readily available in industry or Emerging?</td>
</tr>
<tr>
<td><strong>Impact (★ to ★★★★★):</strong> A relative comparison of the degree to which this technology, properly applied, will reduce the impact or improve the performance of the building project. These impacts should always be verified by a local energy modeller.</td>
</tr>
<tr>
<td><strong>Cost ($ to $$$$$):</strong> A relative comparison of the cost of this design strategy against standard building code, on a (loose) lifecycle basis without incentives. $ = low cost and/or high IRR, $$$$$ = high cost / low IRR. These costs should always be verified by a local project team.</td>
</tr>
<tr>
<td><strong>Scope:</strong> Building / Neighbourhood Development (ND) / City</td>
</tr>
</tbody>
</table>

© 2019, The Corporation of the City of London
www.s2etech.com/fcm-gmf
As a further convenience, all of these technologies and design approaches have been summarized into Table 3-2 below, with expanded tables following in subsections thereafter.

Table 3-2: Summary Overview of Design Strategies

<table>
<thead>
<tr>
<th>Technology/Design Strategy</th>
<th>Established</th>
<th>Emerging</th>
<th>Impact (1 to 5)</th>
<th>Price (1 to 5)</th>
<th>Context</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Conservation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insulation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Batts - Fibreglass / Fibre Wool</td>
<td>x</td>
<td></td>
<td>★★★★★</td>
<td>$</td>
<td>x</td>
</tr>
<tr>
<td>Batts - Stone Wool / Mineral Fibre</td>
<td>x</td>
<td></td>
<td>★★★★★</td>
<td>$</td>
<td>x</td>
</tr>
<tr>
<td>Batts - Cotton / Denim</td>
<td>x</td>
<td></td>
<td>★★★★★</td>
<td>$-$$$$</td>
<td>x</td>
</tr>
<tr>
<td>Blown Cellulose</td>
<td>x</td>
<td></td>
<td>★★★★★</td>
<td>$</td>
<td>x</td>
</tr>
<tr>
<td>Exterior Insulated Finishing System (EIFS)</td>
<td>x</td>
<td></td>
<td>★★★★★</td>
<td>$$$$</td>
<td>x</td>
</tr>
<tr>
<td>Rigid Foam Board (EPS / XPS)</td>
<td>x</td>
<td></td>
<td>★★★★★</td>
<td>$</td>
<td>x</td>
</tr>
<tr>
<td>Insulated Concrete Forms (ICF)</td>
<td>x</td>
<td></td>
<td>★★★★★</td>
<td>$$$$-$$$$$$$</td>
<td>x</td>
</tr>
<tr>
<td>Phase-Change Materials (PCM)</td>
<td>x</td>
<td></td>
<td>★★</td>
<td>$$$$-$$$$$$$</td>
<td>x</td>
</tr>
<tr>
<td>Polyisocyanurate</td>
<td>x</td>
<td></td>
<td>★★</td>
<td>$-$$</td>
<td>x</td>
</tr>
<tr>
<td>Structurally Insulated Panels (SIPs)</td>
<td>x</td>
<td>x</td>
<td>★★★★</td>
<td>$$$$-$$$$$$$</td>
<td>x</td>
</tr>
<tr>
<td>Solid Pre-Fab Panels (see Structurally Insulated Panels (SIPs) above)</td>
<td>(see Structurally Insulated Panels (SIPs) above)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spray Foam</td>
<td>x</td>
<td></td>
<td>★★★★</td>
<td>$$$$-$$$$$$$</td>
<td>x</td>
</tr>
<tr>
<td>Straw Bale Insulation</td>
<td>x</td>
<td></td>
<td>★★★★</td>
<td>$-$$$</td>
<td>x</td>
</tr>
<tr>
<td>Thermal Foil</td>
<td>x</td>
<td></td>
<td>★★</td>
<td>$$</td>
<td>x</td>
</tr>
<tr>
<td>Vacuum Sealed / Insulated Panels</td>
<td>x</td>
<td></td>
<td>★★★★★★</td>
<td>$$$$$</td>
<td>x</td>
</tr>
<tr>
<td><strong>Building Structure</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermally Broken Balconies</td>
<td>x</td>
<td></td>
<td>★★</td>
<td>$$$$-$$$$$$$</td>
<td>x</td>
</tr>
<tr>
<td><strong>Air Barrier / Air Sealing</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Window Flashing Systems</td>
<td>x</td>
<td></td>
<td>★★★★</td>
<td>$-$$$</td>
<td>x</td>
</tr>
<tr>
<td>Technology/Design Strategy</td>
<td>Established</td>
<td>Emerging</td>
<td>Impact (1 to 5)</td>
<td>Price (1 to 5)</td>
<td>Context</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>-------------</td>
<td>----------</td>
<td>----------------</td>
<td>---------------</td>
<td>---------</td>
</tr>
<tr>
<td>Air Sealing Tapes</td>
<td>x</td>
<td></td>
<td>★★★★★</td>
<td>$</td>
<td>x</td>
</tr>
<tr>
<td>Gaskets</td>
<td>x</td>
<td></td>
<td>★★★★</td>
<td>$-$-$</td>
<td>x</td>
</tr>
<tr>
<td>Building Paper</td>
<td>x</td>
<td></td>
<td>★★★★★</td>
<td>$-$-$</td>
<td>x</td>
</tr>
<tr>
<td>Vapour Barrier Strategies</td>
<td>x</td>
<td></td>
<td>★★★★★</td>
<td>$</td>
<td>x</td>
</tr>
<tr>
<td>Windows</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Window Glazing</td>
<td>x</td>
<td></td>
<td>★★★★★</td>
<td>$-$-$-$-$</td>
<td>x</td>
</tr>
<tr>
<td>Spandrels</td>
<td>x</td>
<td></td>
<td>★★</td>
<td>$-$-$-$-$</td>
<td>x</td>
</tr>
<tr>
<td>Clerestory Windows</td>
<td>x</td>
<td></td>
<td>★★</td>
<td>$-$-$-$-$</td>
<td>x</td>
</tr>
<tr>
<td>Passive Solar Design</td>
<td>x</td>
<td></td>
<td>★★★★★</td>
<td>$-$-$-$-$</td>
<td>x</td>
</tr>
<tr>
<td>Ventilation, Heating &amp; Cooling</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Earth Tubes</td>
<td>x</td>
<td></td>
<td>★★★★</td>
<td>$$$</td>
<td>x</td>
</tr>
<tr>
<td>Geothermal Heat Pump</td>
<td>x</td>
<td></td>
<td>★★★★</td>
<td>$$$</td>
<td>x</td>
</tr>
<tr>
<td>High Performance HVAC</td>
<td>x</td>
<td></td>
<td>★★★★</td>
<td>$-$-$-$-$</td>
<td>x</td>
</tr>
<tr>
<td>Low Velocity, Constant Flow Ventilation</td>
<td>x</td>
<td></td>
<td>★★★★★</td>
<td>$$</td>
<td>x</td>
</tr>
<tr>
<td>Natural Ventilation</td>
<td>x</td>
<td></td>
<td>★★★★★</td>
<td>$</td>
<td>x</td>
</tr>
<tr>
<td>Green Walls / Living Walls</td>
<td>x</td>
<td></td>
<td>★</td>
<td>$$$</td>
<td>x</td>
</tr>
<tr>
<td>Solar Air Heating (SAH) / Solar Pre-Heating</td>
<td>x</td>
<td></td>
<td>★★★★</td>
<td>$$$</td>
<td>x</td>
</tr>
<tr>
<td>Variable Refrigerant Flow (VRF)</td>
<td>x</td>
<td></td>
<td>★★★★★</td>
<td>$$$</td>
<td>x</td>
</tr>
<tr>
<td>Domestic Hot Water (DHW)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Condensing Water Heaters</td>
<td>x</td>
<td></td>
<td>★★★</td>
<td>$$</td>
<td>x</td>
</tr>
<tr>
<td>Solar Water Heating (SWH)</td>
<td>x</td>
<td></td>
<td>★★★★★</td>
<td>$$$</td>
<td>x</td>
</tr>
<tr>
<td>Geothermal Water Heating</td>
<td>x</td>
<td></td>
<td>★★★★★</td>
<td>$$$</td>
<td>x</td>
</tr>
<tr>
<td>Instantaneous Boilers</td>
<td>x</td>
<td></td>
<td>★★★</td>
<td>$$</td>
<td>x</td>
</tr>
<tr>
<td>Technology/Design Strategy</td>
<td>Established</td>
<td>Emerging</td>
<td>Impact (1 to 5)</td>
<td>Price (1 to 5)</td>
<td>Context</td>
</tr>
<tr>
<td>-------------------------------------------------</td>
<td>-------------</td>
<td>----------</td>
<td>----------------</td>
<td>----------------</td>
<td>---------</td>
</tr>
<tr>
<td>District Energy Water Heating</td>
<td>x</td>
<td>x</td>
<td>★★★★★</td>
<td>$$$</td>
<td>x</td>
</tr>
<tr>
<td>Heat Recovery</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drain Water Heat Recovery (DWRHR)</td>
<td>x</td>
<td></td>
<td>★★★★</td>
<td>$$</td>
<td>x</td>
</tr>
<tr>
<td>Economizers</td>
<td>x</td>
<td></td>
<td>★★★</td>
<td>$$$</td>
<td>x</td>
</tr>
<tr>
<td>Heat Recovery Ventilators (HRVs)</td>
<td>x</td>
<td></td>
<td>★★★★</td>
<td>$$</td>
<td>x</td>
</tr>
<tr>
<td>Enthalpy Recovery Ventilators (ERVs)</td>
<td>x</td>
<td></td>
<td>★★★★★</td>
<td>$$</td>
<td>x</td>
</tr>
<tr>
<td>Sewage Heat Recovery</td>
<td>x</td>
<td></td>
<td>★★★★</td>
<td>$$$$</td>
<td>x</td>
</tr>
<tr>
<td>Run-Off-River Heat Recovery</td>
<td>x</td>
<td></td>
<td>★★★★</td>
<td>$$$$</td>
<td>x</td>
</tr>
<tr>
<td>Lighting &amp; Control</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daylighting</td>
<td>x</td>
<td></td>
<td>★★</td>
<td>$</td>
<td>x</td>
</tr>
<tr>
<td>Sun Control and Shading Devices</td>
<td>x</td>
<td></td>
<td>★★★★</td>
<td>$$$</td>
<td>x</td>
</tr>
<tr>
<td>Outdoor Lighting Control</td>
<td>x</td>
<td></td>
<td>★★★</td>
<td>$</td>
<td>x</td>
</tr>
<tr>
<td>Building Automation Systems (BAS)</td>
<td>x</td>
<td>x</td>
<td>★★★★</td>
<td>-$$$$</td>
<td>x</td>
</tr>
<tr>
<td>Water</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water Conservation - Indoor</td>
<td>x</td>
<td></td>
<td>★★★★</td>
<td>$</td>
<td>x</td>
</tr>
<tr>
<td>Water Conservation - Outdoor</td>
<td>x</td>
<td></td>
<td>★★★★</td>
<td>$</td>
<td>x</td>
</tr>
<tr>
<td>Green Roofs / Living Roofs</td>
<td>x</td>
<td></td>
<td>★</td>
<td>$$$</td>
<td>x</td>
</tr>
<tr>
<td>Greywater Recycling</td>
<td>x</td>
<td></td>
<td>★★★</td>
<td>$$$</td>
<td>x</td>
</tr>
<tr>
<td>Closed - Loop Showers</td>
<td>x</td>
<td></td>
<td>★★★</td>
<td>$</td>
<td>x</td>
</tr>
<tr>
<td>Rainwater Recycling</td>
<td>x</td>
<td></td>
<td>★★★</td>
<td>$$$</td>
<td>x</td>
</tr>
<tr>
<td>On-Site Blackwater Treatment</td>
<td>x</td>
<td></td>
<td>★★★★</td>
<td>$$$$</td>
<td>x</td>
</tr>
<tr>
<td>Composting Toilets</td>
<td>x</td>
<td></td>
<td>★★★</td>
<td>$$$</td>
<td>x</td>
</tr>
<tr>
<td>Living Machine</td>
<td>x</td>
<td></td>
<td>★★★★</td>
<td>$$$$</td>
<td>x</td>
</tr>
<tr>
<td>Energy Storage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technology/Design Strategy</td>
<td>Established</td>
<td>Emerging</td>
<td>Impact (1 to 5)</td>
<td>Price (1 to 5)</td>
<td>Context</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>-------------</td>
<td>----------</td>
<td>----------------</td>
<td>----------------</td>
<td>---------</td>
</tr>
<tr>
<td><strong>Thermal</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ice</td>
<td>x</td>
<td></td>
<td>★★★</td>
<td>$$$</td>
<td>x x</td>
</tr>
<tr>
<td>Passive Thermal Mass</td>
<td>x</td>
<td></td>
<td>★★★</td>
<td>$</td>
<td>x</td>
</tr>
<tr>
<td>Masonry</td>
<td>x</td>
<td></td>
<td>★★</td>
<td>$$$$</td>
<td>x</td>
</tr>
<tr>
<td><strong>Electrical</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flywheel</td>
<td>x</td>
<td></td>
<td>★★★★</td>
<td>$$$</td>
<td>x x</td>
</tr>
<tr>
<td>Batteries</td>
<td>x</td>
<td></td>
<td>★★★★</td>
<td>$</td>
<td>x x x x</td>
</tr>
<tr>
<td>Compressed Air Energy Storage</td>
<td>x</td>
<td></td>
<td>★★★</td>
<td>$</td>
<td>x</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>x</td>
<td></td>
<td>★★★★</td>
<td>$$$$</td>
<td>x x</td>
</tr>
<tr>
<td>Pumped Hydro</td>
<td>x</td>
<td></td>
<td>★★★★</td>
<td>$$$$</td>
<td>x</td>
</tr>
<tr>
<td><strong>Generation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Photovoltaic</td>
<td>x</td>
<td></td>
<td>★★★★★</td>
<td>$$$</td>
<td>x x</td>
</tr>
<tr>
<td>Solar Air Heating (SAH)</td>
<td>x</td>
<td></td>
<td>★★★★</td>
<td>$</td>
<td>x</td>
</tr>
<tr>
<td>Solar Water Heating (SWH)</td>
<td>x</td>
<td></td>
<td>★★★★</td>
<td>$$$$</td>
<td>x x</td>
</tr>
<tr>
<td>Wind – Horizontal Axis</td>
<td>x</td>
<td></td>
<td>★★★★</td>
<td>$$$</td>
<td>x x x x</td>
</tr>
<tr>
<td>Wind - Vertical Axis</td>
<td>x</td>
<td></td>
<td>★★★★</td>
<td>$$$$</td>
<td>x</td>
</tr>
<tr>
<td>Geothermal</td>
<td>x</td>
<td></td>
<td>★★★★</td>
<td>$$$$-$$$$$</td>
<td>x x</td>
</tr>
<tr>
<td>Tidal</td>
<td>x</td>
<td></td>
<td>★★★★</td>
<td>$$$$$</td>
<td>x x</td>
</tr>
<tr>
<td>Biomass</td>
<td>x</td>
<td></td>
<td>★★★★</td>
<td>$$$</td>
<td>x x</td>
</tr>
<tr>
<td>Biogas</td>
<td>x</td>
<td></td>
<td>★★★★</td>
<td>$$$</td>
<td>x x</td>
</tr>
<tr>
<td>Fuel Cells</td>
<td>x</td>
<td></td>
<td>★★★★</td>
<td>$$$$$</td>
<td>x x</td>
</tr>
<tr>
<td>Combined Heat &amp; Power (CHP)</td>
<td>x</td>
<td></td>
<td>★★★★</td>
<td>$$$</td>
<td>x x x x</td>
</tr>
<tr>
<td>District (Thermal) Energy</td>
<td>x</td>
<td></td>
<td>★★★★</td>
<td>$$$</td>
<td>x x x x</td>
</tr>
<tr>
<td>Energy from Waste</td>
<td>x</td>
<td></td>
<td>★★★★</td>
<td>$$$</td>
<td>x x</td>
</tr>
<tr>
<td><strong>Performance Verification</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Building Commissioning</td>
<td>x</td>
<td></td>
<td>★★★★</td>
<td>-$$-$$$</td>
<td>x</td>
</tr>
</tbody>
</table>
### Technology/Design Strategy

<table>
<thead>
<tr>
<th>Technology/Design Strategy</th>
<th>Established</th>
<th>Emerging</th>
<th>Impact (1 to 5)</th>
<th>Price (1 to 5)</th>
<th>Context</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metering &amp; Monitoring Systems</td>
<td>x</td>
<td></td>
<td>★★★★★</td>
<td>$-$$$$$$</td>
<td>x</td>
</tr>
<tr>
<td>Post-Occupancy Performance Verification</td>
<td>x</td>
<td></td>
<td>★★★★★</td>
<td>$-$-$</td>
<td>x</td>
</tr>
<tr>
<td>Recommissioning / Ongoing Reporting</td>
<td>x</td>
<td></td>
<td>★★★★★</td>
<td>$-$$$</td>
<td>x</td>
</tr>
<tr>
<td><strong>Vehicle Integration</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electric Vehicle (EV) Integration</td>
<td>x</td>
<td>x</td>
<td>★★★★★</td>
<td>$</td>
<td>x</td>
</tr>
<tr>
<td>Vehicle-to-Grid (V2G) Controls</td>
<td>x</td>
<td></td>
<td>★★★★★</td>
<td>$</td>
<td>x</td>
</tr>
<tr>
<td>Autonomous Vehicles (AVs)</td>
<td>x</td>
<td></td>
<td>★★★★★</td>
<td>$$$</td>
<td>x</td>
</tr>
</tbody>
</table>

### 3.1 CONSERVATION

The following sub-sections focus on technologies which aim to reduce the overall amount of energy used first, before applying efficient equipment, and well before generating or harvesting any energy on site.

#### 3.1.1 INSULATION

Insulation is one of the most established areas in the discussion of energy conservation, and not surprisingly, there are many different forms of insulation, each with their own respective strengths and limitations and areas of applicability. Equally unsurprising, there are many research papers from reputable government, academic, and industry agencies who have evaluated and compared different forms of insulation. One of the more concise and useful which we have found is on the internet at:

http://www.ecohome.net/guide/choosing-right-insulation-pros-cons-applications

The following tables explore different forms of insulation one at a time. Each of these is included in the master table (Table 3-2) above, and are expanded further here:
### Table 3-3: Batts - Fibreglass / Fibre Wool

<table>
<thead>
<tr>
<th>Insulation Batts - Fibreglass / Fibre Wool</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> One of the most commonly used insulation products in Canada: made of glass that is spun out into fibres (fibreglass) and woven into thick woolly sheets, sold in rectangular batts of various thicknesses, or sometimes in rolls.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> Widely available and widely applicable: well understood by industry, affordable, and a good default option for any design. Available in various thicknesses (R-values) and in various dimensions (to suit most wall designs).</td>
</tr>
<tr>
<td><strong>Limitations:</strong> Batts, by their physical nature, do not stop air from moving: they only limit heat from moving. If not complemented with a solid strategy for air tight design, then circulating currents can steal heat through these batts with relative ease, thus reducing their performance.</td>
</tr>
<tr>
<td>Established</td>
</tr>
</tbody>
</table>

### Table 3-4: Batts - Stone Wool / Mineral Fibre

<table>
<thead>
<tr>
<th>Insulation Batts – Stone Wool / Mineral Fibre</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> Same as fibreglass batts but made of crushed rock that has been spun out into a candyfloss-like fibre, and then assembled into rectangular batt shapes for use as insulation.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> Same as fibreglass batts but with increased resistance to mold and greatly increased resistance to fire.</td>
</tr>
<tr>
<td><strong>Limitations:</strong> Same as fibreglass batts but to a lesser degree (because these are more dense).</td>
</tr>
<tr>
<td>Established</td>
</tr>
</tbody>
</table>

### Table 3-5: Batts - Cotton / Denim

<table>
<thead>
<tr>
<th>Insulation Batts – Cotton / Denim</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> Comes in batt form like fiberglass and stone wool but is made from recycled clothing or waste products that are cotton/denim based.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> Much like fibreglass or mineral wool in most practical respects. Typically has high recycled content and other environmental benefits (resistant to fungus, mold, and pests). Performs better than fibreglass at low temperatures and during high winds, and is exceptionally good at absorbing sound.</td>
</tr>
<tr>
<td><strong>Limitations:</strong> Not widely available in Canada and can thus be expensive.</td>
</tr>
<tr>
<td>Emerging</td>
</tr>
</tbody>
</table>
**Table 3-6: Blown Cellulose**

<table>
<thead>
<tr>
<th>Blown Cellulose / Dense-Packed Cellulose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> Shredded newsprint (or other similar recycled materials), blown to whatever shape/depth is required.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> Has a high recycled content. Fire and insect resistant.</td>
</tr>
<tr>
<td><strong>Limitations:</strong> Not recommended for basements due to its sensitivity to moisture.</td>
</tr>
<tr>
<td>Established</td>
</tr>
</tbody>
</table>

**Table 3-7: Exterior Insulated Finishing System (EIFS)**

<table>
<thead>
<tr>
<th>Exterior Insulated Finishing System (EIFS)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> Typically applied to retrofit scenarios. EIFS are non-load bearing wall cladding systems that include insulation board, backed by a reinforced substrate, and coated with a textured protective finish. These are typically very similar to a rigid foam board, sometimes include water-resistant barriers and/or drainage cavities, and are integrated into a coated/finished panel that is ready to be installed on the exterior of a building.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> Modular assembly, integrated weather barriers, cost competitiveness and compatibility for applications on diverse existing buildings.</td>
</tr>
<tr>
<td><strong>Limitations:</strong> Consult building science first: some existing buildings (particularly &gt;50 yrs. old) were built with wall architectures that require moisture to be able to move through the wall in certain ways, and EIFS can interrupt this flow by sealing it, sometimes causing failure in existing building systems by trapping moisture where it does not belong. Generally prohibitively expensive for application on new buildings.</td>
</tr>
<tr>
<td>Established</td>
</tr>
</tbody>
</table>

**Table 3-8: Rigid Foam Board (EPS / XPS)**

<table>
<thead>
<tr>
<th>Rigid Board / Foam Board (EPS / XPS)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> Rigid physical sheets of foam insulation: made from extruded (EPS) or expanded (XPS) polystyrene foam. Comes in panels of various dimensions and thicknesses.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> Both EPS and XPS are unharmed by moisture and are effective for applications below grade. EPS is vapour permeable. Commonly used for exterior air barriers on residential and commercial buildings, and sometimes under roads to help prevent frost heave.</td>
</tr>
<tr>
<td><strong>Limitations:</strong> Contains a small amount of recycled content. XPS is not vapour permeable.</td>
</tr>
<tr>
<td>Established</td>
</tr>
</tbody>
</table>
### Table 3-9: Insulated Concrete Forms (ICF)

<table>
<thead>
<tr>
<th>Description: Foam lego bricks: foam on the inside and outside, separated by plastic spacers (to hold the foam in place). Concrete is poured in the middle to provide structural strength.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strengths:</strong> Durable, air-tight, and can incorporate a large amount of recycled material. Can withstand extreme winds, is water-resistant, insect resistant, noise reducing, more fire resistant than wood-framed buildings, faster construction time, and has a long life span.</td>
</tr>
<tr>
<td><strong>Limitations:</strong> Common misconception: the concrete between the foam layers is often promoted as offering thermal-mass benefit, but this is confirmed to be negligibly small by energy modelling: the insulation on both sides of the concrete effectively negates any thermal mass benefit.</td>
</tr>
</tbody>
</table>

| Established | Impact: ★★★★ | Cost: $$ - $$$ | Building |

### Table 3-10: Phase-Change Materials (PCM)

<table>
<thead>
<tr>
<th>Description: Most materials will change phase with heat (eg: from solid to liquid), but a select few have more subtle behaviours that may be used for interesting building applications such as drywall, where they can absorb heat through the day while remaining solid (but changing their crystalline structure from one lattice to another), and then release that heat at night, without visibly changing.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strengths:</strong> No noticeable difference to the building occupant, but increased performance from the PCM products. For example, a PCM wall will look like any other wall, but will provide a thermal-mass benefit that helps to maintain comfortable temperatures in the interior space. PCMs provide passive energy benefit with effectively zero maintenance.</td>
</tr>
<tr>
<td><strong>Limitations:</strong> Cost and availability. PCMs are relatively new to the building industry and are not yet widely available.</td>
</tr>
</tbody>
</table>

| Emerging | Impact: ★★★ | Cost: $$$$ - $$$$$ | Building |
### Table 3-11: Polyisocyanurate

<table>
<thead>
<tr>
<th><strong>Polyisocyanurate</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> Rigid foam backed with foil on both sides</td>
</tr>
<tr>
<td><strong>Strengths:</strong> The foil backing acts like a vapour barrier, and helps reflect radiative heat loss back into the building in the winter, or out of the building in the summer.</td>
</tr>
<tr>
<td><strong>Limitations:</strong> Foil offers limited benefit against conductive or convective heat loss, and R-value performance of this specific chemical mix of foam diminishes when exposed to cold, so this should never be used on the exterior side of the building envelope in a Canadian context. Typically not cost-competitive against other forms of insulation.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Established Impact:</th>
<th>Cost: $ - $$</th>
<th>Building</th>
</tr>
</thead>
</table>

### Table 3-12: Structurally Insulated Panels (SIPs)

<table>
<thead>
<tr>
<th><strong>Structurally Insulated Panels (SIPs)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> Made from steel, timber, or concrete (eg: ICF is a form of this). There are many forms of SIPs, but all generally include insulation encased with or supported by structural elements: sometimes wood on the inside and out of rigid foam insulation, sometimes concrete in the middle (ICF), etc. SIPs may be used for all structural elements including interior and exterior walls, floors, and ceilings/roofs.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> SIPs are manufactured structural assemblies that are produced off-site in factory environments, and thus have potentially to drastically reduce construction time and site labour costs, while increasing the quality and performance of the installed structural systems. SIPs are an excellent response to trade-labour shortages, can be produced all year long with minimal weather dependence, and are cost-competitive with traditional construction methods. R-values proportional to thickness.</td>
</tr>
<tr>
<td><strong>Limitations:</strong> Optimizing the cost of constructing with SIPs will require evaluating the building's design for opportunities to minimize custom dimensions, ideally redesigning around mostly standard dimensions and standard module sizes wherever possible.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Established/Emerging Impact:</th>
<th>Cost: $$$ - $$$$$</th>
<th>Building</th>
</tr>
</thead>
</table>

### Table 3-13: Solid Pre-Fab Panels

<table>
<thead>
<tr>
<th><strong>Solid Pre-Fab Panels</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> This is essentially another reference to SIPs (above). &quot;Pre-fab&quot; or &quot;Prefabricated&quot; refers to construction/preparation of these structural panels off-site.</td>
</tr>
<tr>
<td><strong>Strengths/Limitations et al:</strong> Refer to table Table 3-12 above.</td>
</tr>
</tbody>
</table>
### Table 3-14: Spray Foam

<table>
<thead>
<tr>
<th>Spray Foam</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> Urethane is sprayed on, taking only about 20 minutes to become structurally sound.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> Acts as a vapour and air barrier.</td>
</tr>
<tr>
<td><strong>Limitations:</strong> Minimal recycled content. Typically highly flammable, and requires flame retarder additives or other components in the wall assembly in order to meet code requirements for flame resistance.</td>
</tr>
<tr>
<td>Established</td>
</tr>
</tbody>
</table>

### Table 3-15: Straw Bale Insulation

<table>
<thead>
<tr>
<th>Straw Bale Insulation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> 100% natural straw, typically mixed with clay.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> All natural content. Excellent air-tightness and soundproofing. R-value proportional to thickness. Performs like a concrete wall (including moisture permeance and fire resistance).</td>
</tr>
<tr>
<td><strong>Limitations:</strong> Sealing with mud/clay is extremely labour intensive. Highly susceptible to moisture damage, so straw needs to be kept very dry during construction period.</td>
</tr>
<tr>
<td>Emerging</td>
</tr>
</tbody>
</table>

### Table 3-16: Thermal Foil

<table>
<thead>
<tr>
<th>Thermal Foil</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> Bubble wrap encased in foil.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> It is an effective vapour barrier. Adding a second barrier layer can reduce infrared heat loss.</td>
</tr>
<tr>
<td><strong>Limitations:</strong> For this insulation to work properly, an air space on the warm side is needed.</td>
</tr>
<tr>
<td>Established</td>
</tr>
</tbody>
</table>
Table 3-17: Vacuum Sealed / Insulated Panels

**Vacuum Sealed / Insulated Panels**

**Description:** Modular wall panels that have been vacuum sealed (ie: that contain a void space with no air, and the void is used as a proxy for insulation)

**Strengths:** Virtually infinite R-value. Very thin products (<1") can achieve the same effective R-value performance as much thicker walls (12"+).

**Limitations:** Cost, durability, and access: limited success in industry. Easily punctured (after which their R-value goes to zero), and must be treated with extreme care. Great for things like grocery store coolers/freezers, but difficult to use in a building envelope.

| Emerging | Impact: ★★★★★ | Cost: $$$$$ | Building |

3.1.2 **BUILDING STRUCTURE**

Building energy specialists will routinely specify wall designs that are thick and full of high performing insulation strategies, and significant effort will be invested to minimize thermal bridging. There are many strategies to reduce thermal bridging through a wall, and they all boil down to designing the wall in layers, optimizing the synergistic performance of the wall as a whole, and ensuring that none of those layers touches both the inside and outside of the wall. This sometimes means covering the outside of the wall with exterior insulation, sometimes it means staggering studs within the wall, or a number of other creative approaches, all of which have more to do with assembling the wall well than they do with the technology used in the wall.

One technology solution that affects overall structural design is thermally isolated balconies.

Table 3-18: Thermally Broken Balconies

**Thermally Broken Balconies**

**Description:** Heat will leave the building envelope by the shortest and simplest path possible, which in most buildings will include balconies. Whether concrete or steel, balconies protrude through otherwise insulated walls and they act as a thermal bridge: a hole in the insulation. Different forms of gaskets and fasteners are available to act as a physical and thermal break for concrete to concrete cantilevers or for steel to steel canopy connections. Typically these fasteners are made of a rigid insulating material (eg: neoprene) that provides stability while also breaking the thermal bridge.

**Strengths:** Reduces the risk of condensation, mold, and energy loss for both concrete to concrete and steel to steel connections. Increases thermal performance of the building envelope.

**Limitations:** Can be costly. Relatively few contractors with good experience.

| Emerging | Impact: ★★★ | Cost: $$$$ - $$$$$ | Building |
3.1.3 **AIR BARRIER / AIR SEALING**

“Build tight, and ventilate right”. This quote is often heard in building science courses offered by Natural Resources Canada (NRCan) and other reputable agencies or programs promoting energy efficiency. The Canada Mortgage and Housing Corporation (CMHC) has now issued a plethora of related reports that demonstrate the beneficial impact of air-tight building construction. Mechanical equipment is important, but no amount of good ventilation design can make up for a leaky building envelope. NRCan’s home energy retrofits have learned repeatedly that the best way to improve the efficiency of old buildings is to fix the leaks. The same is true for new buildings, and this section will take a brief look at some of the best understood methods of sealing up a building envelope.

*Table 3-19: Window Flashing Systems*

**Windows Flashing Systems**

**Description:** Window flashing and sealing systems are diverse, but generally address at least two dominant problems: air leaking around the window, and moisture (especially rain) getting in where it doesn't belong.

**Strengths:** Good flashing systems will ensure that water always drains out of the building assembly (if it manages to get in), while keeping the building air and moisture sealed. Done right, flashing systems can cost a premium up front, but will always offer significant long-term savings for maintenance and energy.

**Limitations:** Flashing is not a substitute for properly insulating around windows/doors. Flashing is not a thermal barrier, only a weather/moisture barrier.

<table>
<thead>
<tr>
<th>Established</th>
<th>Impact: ★★★★★</th>
<th>Cost: $ - $$$</th>
<th>Building</th>
</tr>
</thead>
</table>

*Table 3-20: Air Sealing Tapes*

**Air Sealing Tapes**

**Description:** Tape limits air leakage by sealing building seams, duct seams, leaks around air barriers, plumbing vents, etc.

**Strengths:** There are specific tapes used for specific seams and the material the tape is adhering to (SIP, Plywood, Rigid foam, Polyethylene), allowing for optimal sealing. Some tapes are moisture permeable and some are not, which means some can be used in air barriers, others can be part of a vapour barrier.

**Limitations:** Because different tapes are intended for different applications, care must be taken to ensure that appropriate tapes / seals are used where intended, not just haphazardly or universally.

<table>
<thead>
<tr>
<th>Established</th>
<th>Impact: ★★★★★</th>
<th>Cost: $</th>
<th>Building</th>
</tr>
</thead>
</table>
Table 3-21: Gaskets

<table>
<thead>
<tr>
<th>Gaskets</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> Used to establish an interior air barrier, gaskets are specialty products typically made of rubber, foam, or compressible plastic, and designed to fit into gaps in mechanical or structural assemblies in such a way as to seal them against air and water flow.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> Inexpensive, widely available in diverse and yet specialized formats for essentially every application.</td>
</tr>
<tr>
<td><strong>Limitations:</strong> Very specialized: there are products for every application, and they must be used in their intended applications, or else are likely to fail.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Established Impact: ★★★★★</th>
<th>Cost: $ - $$</th>
<th>Building</th>
</tr>
</thead>
</table>

Table 3-22: Building Paper

<table>
<thead>
<tr>
<th>Building Paper</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> Most residential builders are now accustomed to working with building paper as a weather barrier and wrap for the wall system, used to help seal the inner layers of the wall and to separate them from the drainage plane. This helps ensure that any unwanted water (rain) that penetrates the exterior facade (brick/vinyl/etc) has a way to drain out of the wall, not work its way into the building.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> Building paper is an inexpensive way to provide a continuous single wrap layer over the entire exterior of the building, providing overall air tightness to the building assembly, and helping keep energy in.</td>
</tr>
<tr>
<td><strong>Limitations:</strong> Not all building papers are created equal: some stick better than others, are more durable than others, or are easier to work with than others. Most are not intended to be used as vapour barriers. Some are vapour permeable in order to enable them to be used as air barriers but not as vapour barriers, helping with air tightness, but not trapping vapour inside the wall between the exterior house-wrap paper and the indoor vapour barrier.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Established</th>
<th>Impact: ★★★★</th>
<th>Cost: $-$$$</th>
<th>Building</th>
</tr>
</thead>
</table>
Table 3-23: Vapour Barrier Strategies

<table>
<thead>
<tr>
<th>Vapour Barrier Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> From 6mm polyethylene to spray foam, &quot;blue skin&quot; to tuck tape, many products can serve as vapour barriers. The important thing to note on this item is that vapour barriers are a code requirement, but that code does not ensure that they are efficient or even effective, just that they are compliant. There are wide ranges in quality for installation of vapour barriers, and many diverse product options. Builders should ensure that their local trades are trained in building science and have a proper appreciation for the impact of proper and improper vapour barrier installation.</td>
</tr>
</tbody>
</table>

3.1.4 WINDOWS

Even the very best windows are still a hole in the wall, and the wall will always keep more energy in the building than a window can, but the following tables will summarize some of the ways that carefully designed windows can contribute to net-zero energy performance.

Table 3-24: Window Glazing

<table>
<thead>
<tr>
<th>Window Glazing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> Refers to the panes of glass in windows. Double-glazed offer two panes with one interior cavity between them: triple-glazed offer three panes with two cavities. These cavities are usually filled with argon or krypton. Going from double to triple can bring the R-value up from &lt;5 to 12 or more.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> Double and triple glazed windows reduce energy costs by decreasing heat loss. Windows are always less insulative than walls, so heat escapes through the window and causes condensation on the interior. Good windows help limit/eliminate this condensation, improve sound insulation, and increase safety (harder to break compared to single pane).</td>
</tr>
<tr>
<td><strong>Limitations:</strong> Failed windows cannot be repaired unfortunately, and need to be replaced (condensation will form in between panes). Watch the relationship between SHGC and U-Value: sometimes it is not best to have high SHGC, which can cause overheating if exposed to too much sunlight, even in the winter. Tinting can be added to reduce this effect.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Established</th>
<th>Impact: ★★★★★</th>
<th>Cost: $ - $$$</th>
<th>Building</th>
</tr>
</thead>
</table>

© 2019, The Corporation of the City of London
www.s2etech.com/fcm-gmf
### Table 3-25: Spandrels

<table>
<thead>
<tr>
<th>Description</th>
<th>Insulated exterior façade panels with glass faces, meant to look like windows but be insulated, to maintain an &quot;all glass&quot; exterior look with improved energy performance.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strengths</td>
<td>Aesthetically pleasing, and should in theory provide more insulation that the surrounding windows.</td>
</tr>
<tr>
<td>Limitations</td>
<td>Spandrels are not typically as well insulated as walls. Too much glass is also a problem for birds (and for maintenance/cleaning from bird strikes): switching to other façade treatments helps birds to see the building and avoid it, and also increases energy performance.</td>
</tr>
<tr>
<td>Established Impact</td>
<td>★★★</td>
</tr>
<tr>
<td>Cost</td>
<td>$$ - $$$</td>
</tr>
</tbody>
</table>

### Table 3-26: Clerestory Windows

<table>
<thead>
<tr>
<th>Description</th>
<th>Windows that are installed at greater heights above the floor than traditional designs, drawing natural light deeper into the building.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strengths</td>
<td>Allows light to enter for a longer portion of the day, and deeper into the building. This reduces energy use by reducing the amount of artificial light used/needed on a daily basis. Can also contribute to warming the building during colder months, and to increased employee comfort and performance (benefitted by natural light).</td>
</tr>
<tr>
<td>Limitations</td>
<td>The window is replacing an area of wall that would be higher R-value, so this design compromises insulation for additional natural light. This is not a net gain for energy, but offers other benefits.</td>
</tr>
<tr>
<td>Established Impact</td>
<td>★★★</td>
</tr>
<tr>
<td>Cost</td>
<td>$$ - $$$</td>
</tr>
</tbody>
</table>

### Table 3-27: Passive Solar Design

<table>
<thead>
<tr>
<th>Description</th>
<th>Uses a combination of the local climate, building orientation and building materials to reduce heating and cooling energy usage and related costs. Leverage free heating from the sun, free cooling from the shade, and natural ventilation through stack effect and cross breezes.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strengths</td>
<td>Low cost, low tech, low maintenance, intuitive approach. Wide experience in industry for certain approaches (eg: passive solar), less so for others (eg: natural ventilation). Much can be made possible or impossible by designing at the neighbourhood level. Passive energy designs are typically dependent upon lot alignment.</td>
</tr>
<tr>
<td>Limitations</td>
<td>Surrounding structures and local climate can reduce the availability of passive design strategies for a specific building.</td>
</tr>
<tr>
<td>Established/Emerging Impact</td>
<td>★★★★★</td>
</tr>
<tr>
<td>Cost</td>
<td>$ - $$$$$</td>
</tr>
</tbody>
</table>
3.1.5 **VENTILATION, HEATING & COOLING**

The preceding sections (3.1.1 through 3.1.4) focus on various components within the building envelope: all passive elements that do not use energy themselves, but by their design will have impact on how much energy is required in order to make the building functional and comfortable. Now we shift our attention to the energy systems operating within the building, the first of which will be ventilation, and heating / cooling systems. Most Canadian buildings will provide fresh air into the building and heat/cool that air with the same system, but strictly speaking, these are different functions that can be provided by different systems. The tables below offer a summary of emerging technologies that are used in net-zero energy buildings.

*Table 3-28: Earth Tubes*

<table>
<thead>
<tr>
<th>Earth Tubes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> The physical earth is always ~10 degrees C at shallow depths. Pipes buried in the earth will be approximately the same temperature, and air blown through those pipes can be inexpensively heated/cooled from outdoor temperatures. Earth Tubes are large ventilation ducts buried at shallow depths, which use the relatively constant temperature of the ground to pre-heat/pre-cool outdoor air.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> Materials are inexpensive, and operational expense is negligible to zero. Effectively free pre-conditioning of ventilation air.</td>
</tr>
<tr>
<td><strong>Limitations:</strong> Excavation premium can be expensive. Operations requires consideration of humidity control. Earth Tubes should have gravel bases or other drainage strategies to ensure removal of condensation.</td>
</tr>
</tbody>
</table>

| Emerging | Impact: ★★★★ | Cost: $$$ | Building |

*Table 3-29: Geothermal Heat Pump*

<table>
<thead>
<tr>
<th>Geothermal Heat Pump</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> A central heating or cooling system that uses the earth as a heat source during cold months and as a heat sink (cooling source) during warm months.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> Saves space because it is underground, requires less maintenance than combustion based heating systems, and is safer due to zero fuel being needed for the system to operate.</td>
</tr>
<tr>
<td><strong>Limitations:</strong> The local geology might not be optimal for geothermal. If the system is not balanced to draw a consistent amount of heating and cooling, then the natural temperature of the ground may change over time, making it harder to produce energy from the system.</td>
</tr>
</tbody>
</table>

| Established | Impact: ★★★★ | Cost: $$$$$ | Building/ND/City |
Table 3-30: High Performance HVAC

| Description: | This could be any number of pieces of equipment (boilers, chillers, ventilators, etc), but the point of this line item is to say that whatever equipment you get, make sure it's the "high performance" model. |
| Strengths: | Widely available, cost competitive, good warranties, good industry support, mature technologies, continuous improvement. |
| Limitations: | HVAC can and will change over time, and is much easier to change than the building envelope. Paybacks may seem better here, but should be balanced with upgrades to the building envelope. |

| Established | Impact: ★★★★★ | Cost: $ - $$$ | Building |

Table 3-31: Low Velocity, Constant Flow Ventilation

| Description: | Traditional systems wait for a thermostat to activate heating, then they blast heat until the thermostat says it is warm enough, then they stop. Low velocity, constant flow systems instead spread that heating over time, reducing the instantaneous amount of heat delivered, and keeping it running (at lower speeds) for much longer. |
| Strengths: | Eliminates short-cycling of heating systems (which typically otherwise leads to uneven heat in the house: cool rooms farthest from the thermostat). Maximizes ventilation effectiveness and mixing / stirring of air throughout the conditioned space: healthier for occupants. Very cost effective - often cheaper than more traditional systems. Reduces bulkheads and physical size of ventilation ducting. |
| Limitations: | Best applied to residential settings. |

| Emerging | Impact: ★★★★★ | Cost: $$ | Building |

Table 3-32: Natural Ventilation

| Description: | The process of supplying and removing air through an indoor space without using mechanical systems, but instead by using natural differences in air pressure: cross and stack ventilation. |
| Strengths: | Natural ventilation can eliminate the need for mechanical ventilation during shoulder seasons: as much as 30-50% of the year. |
| Limitations: | Humidity control is difficult when the windows are open: natural air flows can be used to achieve a comfortable indoor environment despite other humidity challenges. |

| Established | Impact: ★★★★★ | Cost: $ | Building/ND |
### Table 3-33: Green Walls / Living Walls

<table>
<thead>
<tr>
<th>Description</th>
<th>Strengths</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specialized vertical planting systems designed to grow vegetation indoors.</td>
<td>Widely available, commercially established in larger urban markets, contributes amenity space and fresh air into that space (enhancing health and quality of life).</td>
<td>Structural implications, requires significant maintenance, consumes significant energy and water in exchange for providing fresh air indoors (ie: not just filtered air, but truly fresh air). Should be chosen for fresh air / health benefit, not for energy performance.</td>
</tr>
<tr>
<td>Cost: $$$</td>
<td>Building</td>
<td></td>
</tr>
</tbody>
</table>

### Table 3-34: Solar Air Heating (SAH) / Solar Pre-Heating

<table>
<thead>
<tr>
<th>Description</th>
<th>Strengths</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Various technologies used to capture heat from sunlight, and transfer that heat into indoor air or water. Typically involves flat-plate solar collectors, transfer fluids such as glycol, and heat exchangers.</td>
<td>SAH can be very simple (perforated metal duct outside of building, pre-heating incoming fresh air), very cost effective, and very easy to maintain. Sunlight is free, abundant and hot - a great source of energy.</td>
<td>Use of fluids other than air for exchanging heat will introduce maintenance requirements with fluid seals, fluid degradation / acidification, and more. Have maintenance schedule/contract in place.</td>
</tr>
<tr>
<td>Cost: $$$</td>
<td>Building</td>
<td></td>
</tr>
</tbody>
</table>

### Table 3-35: Variable Refrigerant Flow (VRF)

<table>
<thead>
<tr>
<th>Description</th>
<th>Strengths</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>VRF uses established heat pump technology to move heat from one area to the next, and then using variable refrigerant to ramp up or down the heating/cooling only adding the space conditioning that is needed, zone by zone.</td>
<td>Very efficient. When one side of the building is hot and sunny, and the other is cool and shaded, heat can be moved from one zone to another, benefitting both.</td>
<td>Best applied in commercial settings, especially in buildings that are cooling dominated.</td>
</tr>
<tr>
<td>Cost: $$$</td>
<td>Building</td>
<td></td>
</tr>
</tbody>
</table>
### 3.1.6 Domestic Hot Water (DHW)

**Table 3-36: Condensing Water Heaters**

<table>
<thead>
<tr>
<th>Description:</th>
<th>Condensing water heaters are much the same as traditional water heaters, except that they add extra efficiency features which capture waste heat from condensing moisture in the flue gas, enabling better performance than non-condensing water heaters.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strengths:</td>
<td>Widely available, similar to traditional water heaters and thus familiar to most service contractors.</td>
</tr>
<tr>
<td>Limitations:</td>
<td>Marginal efficiency gains over traditional water heating technologies.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Established</th>
<th>Impact: ★★★</th>
<th>Cost: $$</th>
<th>Building</th>
</tr>
</thead>
</table>

**Table 3-37: Solar Water Heating (SWH)**

<table>
<thead>
<tr>
<th>Description:</th>
<th>Various technologies used to capture heat from sunlight, and transfer that heat into indoor water storage tank(s). Typically involves flat-plate solar collectors, transfer fluids such as glycol, and heat exchangers.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strengths:</td>
<td>Free and abundant source of energy. Mature technology. Highly compatible with district energy.</td>
</tr>
<tr>
<td>Limitations:</td>
<td>SWH can have maintenance challenges with fluid seals, fluid degradation / acidification, and more. Have maintenance schedule/contract in place.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Established</th>
<th>Impact: ★★★★☆</th>
<th>Cost: $$$</th>
<th>Building / ND</th>
</tr>
</thead>
</table>

**Table 3-38: Geothermal Water Heating**

<table>
<thead>
<tr>
<th>Description:</th>
<th>Using the ground as a heat source: glycol is pumped through long buried pipes to a heat exchanger, which takes heat from the fluid (ie: from the ground) to heat the building.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strengths:</td>
<td>Free and abundant source of energy. Mature technology. Highly compatible with district energy.</td>
</tr>
<tr>
<td>Limitations:</td>
<td>Many geothermal installers encourage cost savings by reducing loop size: this reduces efficiency of the heat exchange process and will compromise the effectiveness/payback of the system. Longer loops are better! Manage ongoing maintenance with care, watching fluid seals and degradation.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Established</th>
<th>Impact: ★★★★☆</th>
<th>Cost: $$$$</th>
<th>Building / ND</th>
</tr>
</thead>
</table>
Table 3-39: Instantaneous Boilers

<table>
<thead>
<tr>
<th>Instantaneous Boilers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> In lieu of a hot water tank, an instantaneous boiler applies heat to a pipe: fresh cold water coming in one end will be shock-heated before it leaves the boiler, thus supplying hot water in real-time only when needed.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> Saves energy by eliminating standing losses from hot water stored in tanks. Relatively cost competitive with more traditional heating strategies.</td>
</tr>
<tr>
<td><strong>Limitations:</strong> Typically use more water and less energy: if water savings is also important, then this may not be desirable. Vulnerable to hard-water: watch for scaling/fouling of pipes.</td>
</tr>
</tbody>
</table>

| Established | Impact: ★★★ | Cost: $$ | Building / ND |

Table 3-40: District Energy Water Heating

<table>
<thead>
<tr>
<th>District Energy Water Heating</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> District energy systems leverage the benefit of combining multiple buildings / systems together for shared efficiencies.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> The strengths of one building may be used to offset the weaknesses of others. Especially when they have different usage profiles, they may be combined into a larger &quot;district&quot; load that is more easily serviced in aggregate. Peaks from dissimilar loads will not typically occur at the same time, so the overall system will be smaller than a straight sum of the parts, thus introducing opportunities to optimize equipment size, centralize and share maintenance resources, and reduce overall usage, cost, and environmental impact.</td>
</tr>
<tr>
<td><strong>Limitations:</strong> Requires consideration of complementarity of network loads. Works best with balanced loads that do not all ramp up at the same time.</td>
</tr>
</tbody>
</table>

| Established/Emerging | Impact: ★★★★★ | Cost: $$$ | Building / ND / City |

3.1.7 **HEAT RECOVERY**

Heating of air and water accounts for a significant portion of the energy load in most new buildings, and even more in older buildings… and then much of that heat is exhausted with fans or literally dumped down the drain in sinks / showers / laundry. There are several technologies emerging that can harvest heat from waste water or from exhausted air.
### Table 3-41: Drain Water Heat Recovery (DWRH)

<table>
<thead>
<tr>
<th>Description</th>
<th>Strengths</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recovering thermal energy as it goes down the drain, usually from showers.</td>
<td>Increases the output of the hot water heater and reduces the cost of heating water by about half. Simple to install and maintenance free.</td>
<td>Works best with real-time flows: taking heat from shower drains and putting back into the shower.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Established</th>
<th>Impact: ★★★★</th>
<th>Cost: $$</th>
<th>Building</th>
</tr>
</thead>
</table>

### Table 3-42: Economizers

<table>
<thead>
<tr>
<th>Description</th>
<th>Strengths</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>During the shoulder seasons (spring and fall), the ambient outdoor air is often at a sufficiently comfortable temperature that it could be used indoors. At these times, an Economizer can be used to bring fresh outdoor air directly into the building with minimal filtration, without needing to spend energy to heat or cool that air.</td>
<td>Reduce energy costs by removing the heating/cooling requirement for incoming air.</td>
<td>Only helps for part of the year (shoulder seasons).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Established</th>
<th>Impact: ★★</th>
<th>Cost: $$$</th>
<th>Building</th>
</tr>
</thead>
</table>

### Table 3-43: Heat Recovery Ventilators (HRVs)

<table>
<thead>
<tr>
<th>Description</th>
<th>Strengths</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplies continuous fresh air to the building, and captures/uses heat from the stale air leaving the building to warm incoming fresh air.</td>
<td>Reduces common building moisture problems. Reduces interior contaminants that cause respiratory illnesses. Reduces heating/cooling costs.</td>
<td>HRV systems do not contribute to moisture control. For tight buildings in warmer climates, separate dehumidification control may be necessary.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Established</th>
<th>Impact: ★★★★</th>
<th>Cost: $$</th>
<th>Building</th>
</tr>
</thead>
</table>

© 2019, The Corporation of the City of London

www.s2etech.com/fcm-gmf
Table 3-44: Enthalpy Recovery Ventilators (ERVs)

<table>
<thead>
<tr>
<th>Description</th>
<th>Enthalpy Recovery Ventilators (ERVs)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> See HRV's first: ERV's are the same as HRV’s, but with a different core which can transfer moisture from one side to the other, depending on which side contains greater moisture (ie: in the summer it can get rid of more moisture, in the winter it can help recapture moisture from exhaust air).</td>
<td></td>
</tr>
<tr>
<td><strong>Strengths:</strong> Reduces heating costs, and helps to control humidity: it can either keep moisture from escaping indoor air in the winter, or can help minimize the amount of summer humidity that enters the building. Acts as the lungs for the house: brings in only the amount of fresh air that is needed, filters that air, and helps to control its RH level. Filtration helps to reduces interior air contaminants, minimizing negative effects of allergens or asthma.</td>
<td></td>
</tr>
<tr>
<td><strong>Limitations:</strong> ERVs are not moisture control systems. They are better than HRVs, but in warmer climates, may still require separate dehumidification control. In most situations an ERV will out-perform an HRV, except in small, tight homes in cold climates (especially with large families), where an HRV will help reduce the amount of humidity build-up in the home.</td>
<td></td>
</tr>
</tbody>
</table>

| Established Impact: ★★★★★ | Cost: $$ | Building |

Table 3-45: Sewage Heat Recovery

<table>
<thead>
<tr>
<th>Description</th>
<th>Sewage Heat Recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> Recaptures waste heat from sewage (particularly hot water from showers) using essentially the same technology as geothermal systems.</td>
<td></td>
</tr>
<tr>
<td><strong>Strengths:</strong> Essentially free energy source (sewage heat), long-term price model stability, leverages the existing industry skill base around pipe / drilling / sewer.</td>
<td></td>
</tr>
<tr>
<td><strong>Limitations:</strong> Only available in urban areas. Costly first installation. Limited industry experience, and very messy work to retrofit into existing areas.</td>
<td></td>
</tr>
</tbody>
</table>

| Emerging Impact: ★★★★ | Cost: $$$$$ | Building / ND / City |

Table 3-46: Run-Off-River Heat Recovery

<table>
<thead>
<tr>
<th>Description</th>
<th>Run-Off-River Heat Recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> This is the same as geothermal heating, but the pipe is laid along the bed of a flowing waterway rather than buried underground.</td>
<td></td>
</tr>
<tr>
<td><strong>Strengths:</strong> Relatively less expensive than geothermal (due to avoidance of drilling costs).</td>
<td></td>
</tr>
<tr>
<td><strong>Limitations:</strong> Despite avoidance of drilling costs, can be more complicated than geothermal due to installation in running waterways. Often involves Conservation Authorities and is sometimes not feasible simply for policy reasons (ie: disallowed outright, regardless of merit).</td>
<td></td>
</tr>
</tbody>
</table>

| Emerging Impact: ★★★★ | Cost: $$ | Building / ND |
### 3.1.8 Lighting & Control

Few industries have advanced as quickly over the last decade in energy efficiency as lighting. This section summarizes some of the key opportunities in lighting, lighting automation, and building energy control systems.

<table>
<thead>
<tr>
<th>Table 3-47: Daylighting</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Daylighting</strong></td>
</tr>
<tr>
<td><strong>Description:</strong> Using windows and skylights to bring sunlight into the home. Can be used in conjunction with passive solar building design to make the most out of incoming sunlight.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> If done properly, can reduce energy costs needed for heating and artificial lighting.</td>
</tr>
<tr>
<td><strong>Limitations:</strong> Surrounding structures and local climate can reduce the availability of natural ventilation strategies for the specific building.</td>
</tr>
<tr>
<td>Established</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 3-48: Sun Control and Shading Devices</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sun Control and Shading Devices</strong></td>
</tr>
<tr>
<td><strong>Description:</strong> Employ the use of awnings, overhangs, trellises, natural landscaping, light shelves (reflect natural light deep into building), high performance glazing, and other design strategies to control light and solar heat entering the building.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> Reduce energy usage for cooling costs by reducing unwanted solar heat in the summer.</td>
</tr>
<tr>
<td><strong>Limitations:</strong> Surrounding structures and local climate can reduce the availability of natural ventilation strategies for the specific building.</td>
</tr>
<tr>
<td>Established</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 3-49: Outdoor Lighting Control</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Outdoor Lighting Control</strong></td>
</tr>
<tr>
<td><strong>Description:</strong> Different types of outdoor lighting benefit from different controls, typically timers, solar sensors, or motion sensors. Smarter controls will adjust brightness levels to relate to outdoor lighting conditions (eg: brightest at dusk/dawn, dimmed through the night, off during the day, unless dark/cloudy).</td>
</tr>
<tr>
<td><strong>Strengths:</strong> Widely available, commercially established, cost competitive and diverse technologies for diverse applications.</td>
</tr>
<tr>
<td><strong>Limitations:</strong> Control technology must be matched to lighting technology: not all sensors/strategies are compatible with all lighting methods.</td>
</tr>
<tr>
<td>Established</td>
</tr>
</tbody>
</table>
Table 3-50: Building Automation Systems (BAS)

<table>
<thead>
<tr>
<th>Building Automation Systems (BAS)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> Every commercial building will now have a BAS system of some manner (ie: this is industry standard) to control the HVAC systems. Residential systems are still considered a premium upgrade, but are increasingly common (eg: programmable thermostats compatible with Smart Phones)</td>
</tr>
<tr>
<td><strong>Strengths:</strong> Reduce operating and maintenance costs, optimize building systems to operate when and how they should, provide alerts to impending problems to avoid expensive repairs, and reduces energy costs from improper/inefficient use of system.</td>
</tr>
<tr>
<td><strong>Limitations:</strong> BAS systems are only as good as those who design/program them, and must be commissioned and periodically recommissioned. If installed even only just modestly incorrectly, BAS systems can cause significant energy waste and operation/maintenance confusion. Good commissioning is extremely important!</td>
</tr>
</tbody>
</table>

| Established/Emerging | Impact: ★★★★★ | Cost: $ - $$$$$ | Building / ND |

3.1.9 WATER

Saving water is an indirect means to saving energy. Water utilities are among the highest energy users in most municipalities: as much as 1/3 of municipal energy can be used to pump water back and forth and treat it. Any reduction in water use will reduce overall community energy use.

Table 3-51: Water Conservation - Indoor

<table>
<thead>
<tr>
<th>Water Conservation - Indoor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> Low-flow toilets, faucets/aerators, and showers, and ultra-efficient dishwashers and laundry appliances.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> Widely available, commercially established, cost competitive and diverse technologies for diverse applications.</td>
</tr>
<tr>
<td><strong>Limitations:</strong> Low-flow toilets have often resulted in multiple-flushes, and in net increased water use. Ensure toilets are specified based on ability to move sediment, not just reduce water use. Also note that hands-free faucets have been shown to not save water: they are good for health reasons (no contact), but not for efficiency.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Emerging</th>
<th>Impact: ★★★★</th>
<th>Cost: $</th>
<th>Building</th>
</tr>
</thead>
</table>
### Table 3.52: Water Conservation – Outdoor

<table>
<thead>
<tr>
<th>Description</th>
<th>Strengths</th>
<th>Limitations</th>
<th>Established</th>
<th>Impact: ★★★★</th>
<th>Cost: $</th>
<th>Building / ND / City</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficient irrigation systems such as drip irrigators, high-efficiency nozzles, moisture sensors / rain delay controller, timers, separate zones by plant type, etc.</td>
<td>Widely available, commercially established, cost competitive and diverse technologies for diverse applications.</td>
<td>Irrigation systems should ideally be designed to complement the types of plant species present in the landscape design. This will make them less flexible for change in the future though, so design should balance short-term water use optimization with long-term flexibility for changes in plantings.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 3.53: Green Roofs / Living Roofs

<table>
<thead>
<tr>
<th>Description</th>
<th>Strengths</th>
<th>Limitations</th>
<th>Established</th>
<th>Impact: ★</th>
<th>Cost: $$</th>
<th>Building / ND / City</th>
</tr>
</thead>
<tbody>
<tr>
<td>Covering underutilized roof space with vegetation.</td>
<td>Widely available, commercially established in larger urban markets, expands urban canopy and biodiversity, reduces urban heat island, helps retain rainwater and reduce strain on municipal stormwater systems, contributes amenity space (enhancing quality of life).</td>
<td>Structural implications (reinforced roof), requires careful design (no deep roots, be mindful of which insects / wildlife will inhabit chosen plantings), does not contribute meaningfully to energy savings for affected buildings (ie: should be chosen for other benefits, not energy), requires significant maintenance.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 3.54: Greywater Recycling

<table>
<thead>
<tr>
<th>Description</th>
<th>Strengths</th>
<th>Limitations</th>
<th>Established</th>
<th>Impact: ★★★</th>
<th>Cost: $$$</th>
<th>Building / ND / City</th>
</tr>
</thead>
<tbody>
<tr>
<td>Re-uses non-sewage waste water, including sink, bath, and shower, by filtering to standards appropriate for flushing toilets (ie: not to potable standards).</td>
<td>Helps reduce water usage by using water twice: once before grey (at sinks / showers / etc), and then again to flush toilets.</td>
<td>Requires dedicated plumbing which must be clearly labelled (ie: so that home owners / contractors do not accidentally mix greywater plumbing with potable plumbing). Water appears slightly grey in toilets, and thus can cause social concern if users are not educated properly. Maintenance can be challenging in some products.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 3-55: Closed-Loop Showers

<table>
<thead>
<tr>
<th>Closed – Loop Showers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> Showers which recycle and treat their own waste water: purifying water from the drain for re-use in that same shower.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> 80% reductions in shower-water used. Simple design concept, suitable to all shower environments.</td>
</tr>
<tr>
<td><strong>Limitations:</strong> Perception based: there are marketing challenges regarding the optic of showering in recycled water.</td>
</tr>
</tbody>
</table>

| Emerging | Impact: ★★★ | Cost: $$ | Building |

### Table 3-56: Rainwater Recycling

<table>
<thead>
<tr>
<th>Rainwater Recycling</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> Rain water is collected from various roof surfaces (not the ground) and stored in tank(s) for re-use indoors or outdoors.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> Many options for storage tanks, and supply trades are abundantly able to plumb rain water into any number of uses.</td>
</tr>
<tr>
<td><strong>Limitations:</strong> Treatment may be required for indoor uses. Regardless of use, rainwater is not to be confused with storm water: once the water lands on the ground, it picks up sediments and oils not generally present when collected from roof surfaces.</td>
</tr>
</tbody>
</table>

| Emerging | Impact: ★★★ | Cost: $$$ | Building / ND / City |

### Table 3-57: On-Site Blackwater Treatment

<table>
<thead>
<tr>
<th>On-Site Blackwater Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> Showers which recycle and treat their own waste water: purifying water from the drain for re-use in that same shower.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> 80% reductions in shower-water used. Simple design concept, suitable to all shower environments.</td>
</tr>
<tr>
<td><strong>Limitations:</strong> Perception based: there are marketing challenges regarding the optic of showering in recycled water.</td>
</tr>
</tbody>
</table>

| Established | Impact: ★★★★ | Cost: $$$$$ | Building |
Table 3-58: Composting Toilets

<table>
<thead>
<tr>
<th>Composting Toilets</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> Toilets with enlarged storage containers, sealed for odour control, where sewage decays into compost and may be re-used for landscaping.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> Very small scale, adaptable to many user environments.</td>
</tr>
<tr>
<td><strong>Limitations:</strong> Limited supply base, relatively few competing products, fairly sophisticated maintenance requirements, and social challenges around appropriate uses for resultant compost.</td>
</tr>
<tr>
<td>Emerging</td>
</tr>
</tbody>
</table>

Table 3-59: Living Machine

<table>
<thead>
<tr>
<th>Living Machine</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> Mother nature's toilet: landscaping designed to leverage tiered ponds and plantings which filter water naturally, such that sewage may enter the first tier untreated, and be cleaned from pond to successive pond until the final stage is drinkable, and the sediments have been absorbed by the ponds/plants.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> The most natural approach possible, using very little energy and a net of zero water, and often quite beautiful.</td>
</tr>
<tr>
<td><strong>Limitations:</strong> Requires dedicated land that can be substantial in size. Limited industry experience, involved maintenance requirements, and local approving authorities may require periodic testing of effluents to ensure potability.</td>
</tr>
<tr>
<td>Emerging</td>
</tr>
</tbody>
</table>

3.2 Energy Storage

Renewable energy generation technologies are improving at an accelerating pace, providing greater energy density, enhanced performance, reduced costs, and so much more, yet all are limited by the mismatch of generation and loads: that renewable energy is not always available at the same time as it is needed. Storing energy has not always been economical, but market innovations are maturing, and there are now options for storing both heat and electricity.

3.2.1 Thermal

Heating and cooling systems are both examples of thermal energy systems: systems which move heat. Storing heating or cooling enhances the opportunity to use renewable energy at times when it is not otherwise available. The following tables summarize different options for storing and releasing thermal energy, in the form of cooling and/or heating.
### Table 3-60: Ice

<table>
<thead>
<tr>
<th>Ice</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> Using cheap electricity late at night to chill ice into a slurry or even a block, and then blowing air over that ice during the day to provide inexpensive air conditioning.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> Has been used successfully in commercial / office applications.</td>
</tr>
<tr>
<td><strong>Limitations:</strong> Difficult to do on small scales (eg: residential) or on very large scales (eg: industrial).</td>
</tr>
<tr>
<td>Emerging</td>
</tr>
</tbody>
</table>

### Table 3-61: Passive Thermal Mass

<table>
<thead>
<tr>
<th>Passive Thermal Mass</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> Designing the building to absorb and release heat slowly by having concrete or masonry surfaces indoors (ie: interior to the insulated building envelope) which are exposed to sunlight and/or to building heating systems. This helps balance the interior temperature more over time and passively keep the interior space more comfortable: in winter, the thermal mass absorbs heat during the day and releases it slowly at night, helping keep the interior space warm. In summer the opposite happens: the mass cools down at night and absorbs heat during the day, helping to keep the interior space cool.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> Low to no maintenance required. Easy to integrate into most building designs. Very accommodating of partial approaches (ie: many other design approaches require you to adopt a whole system or not: this is easy to integrate to whatever extent is convenient, and does not require &quot;all or nothing&quot;). Masonry in general introduces opportunities for architectural design / customization / beauty, from parliamentary stonework to acid-etched exposed concrete flooring to residential Kachelofens.</td>
</tr>
<tr>
<td><strong>Limitations:</strong> Thermally massive surfaces tend to be physically hard and reflective of sound, contributing negatively to the acoustical environment (ie: echo). This can be compensated by careful interior design, but is not well suited to some interior environments.</td>
</tr>
<tr>
<td>Established</td>
</tr>
</tbody>
</table>

### Table 3-62: Masonry

| Masonry | Description: Various configurations of brick and rock have been used, within insulated containers, to store heat from one time of day (eg: heating with surplus solar thermal energy during the day) for use in another (eg: at night). | Strengths: Very low-tech storage medium (literally rock or masonry), and flexible with many heat inputs. Can be artistic (eg: kachelofen's) or simple. | Limitations: Often expensive up-front with slow payback on energy savings: typically purchased for reasons other than return on investment (eg: beauty, comfort, preference). | Established | Impact: ★★ | Cost: $$$$ | Building |

#### 3.2.2 Electrical

Electrical energy (power) has been stored in batteries for years for household use, and most people are familiar with this form of power storage. Fewer people realize that the power sector also stores power by pumping water into elevated reservoirs at night, and then draining that reservoir over turbines to produce electricity again during the day. The following tables summarize several leading examples of electrical energy storage, and offer examples on the application of each of these storage technologies.

### Table 3-63: Flywheel

| Flywheel | Description: Based on the principles of inertia and kinetic energy: surplus electricity is used to accelerate a spinning wheel up to very high speeds, and when electricity increases in cost momentarily, the inertia of the wheel is sufficient to drive a motor/generator to create electricity. | Strengths: Fairly simple technology. Good at buffering energy pricing in spot markets with real-time volatility. | Limitations: Best employed in industrial environments with trained personnel who understand the safety and maintenance concerns associated with flywheels. | Emerging | Impact: ★★★★ | Cost: $$ | Building / ND |
Table 3-64: Batteries

<table>
<thead>
<tr>
<th>Batteries</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> Electricity is used to charge a battery (of any of several forms of chemical composition), which can hold and store that charge for extended periods of time until the energy is needed again.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> Most diversely applicable, available and broadly affordable form of electrical energy storage, with strong and growing industry support.</td>
</tr>
<tr>
<td><strong>Limitations:</strong> Different battery technologies are suited to different applications: some are better at storing energy over longer periods, and some are better at quick-cycle applications. Batteries must be selected to match their intended use, otherwise they may fail prematurely.</td>
</tr>
<tr>
<td>Established</td>
</tr>
</tbody>
</table>

Table 3-65: Compressed Air Energy Storage (CAES)

<table>
<thead>
<tr>
<th>Compressed Air Energy Storage (CAES)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> Off-hours inexpensive electricity is used to compress air into tanks, which may be used later to run air-powered generators to create electricity when needed.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> Mature industry, widely available equipment that is cost competitive.</td>
</tr>
<tr>
<td><strong>Limitations:</strong> Really only appropriate for industrial environments where there are trained maintenance technicians familiar with compressed air systems.</td>
</tr>
<tr>
<td>Established</td>
</tr>
</tbody>
</table>

Table 3-66: Hydrogen

<table>
<thead>
<tr>
<th>Hydrogen</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> Using electrolysis, off-peak or surplus electricity is used to break water down into hydrogen and oxygen which can then be stored in tanks and burned later to create heat or electricity when needed.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> Leverages existing expertise in pressurized gas systems from natural gas and propane industries. Abundantly available source fuel (water, globally applicable), though filtration may be required. Hydrogen is energy-dense and presents encouraging storage potential within limited physical size units which are easily scalable, with opportunities to integrate/store in the natural gas pipeline systems as well (up to a certain % mix).</td>
</tr>
<tr>
<td><strong>Limitations:</strong> Limited supply base. Relatively few service contractors. Storage vessels operate at higher pressures than industry is accustomed to with propane or natural gas, so some training is required for existing industry professionals. Today’s technology has limited efficiencies compared to other storage technologies.</td>
</tr>
<tr>
<td>Emerging</td>
</tr>
</tbody>
</table>
Table 3-67: Pumped Hydro

| Description: | Off-hours inexpensive electricity is used to pump water into elevated reservoirs, which can later be released to flow over turbines (like an artificial waterfall) to create electricity when needed. |
| Strengths: | Hydro-power generation is one of the most dispatchable forms of electricity, and pumps can be run whenever surplus energy is available, making pumped-hydro one of the most useful forms of electrical energy storage. |
| Limitations: | Sophisticated permitting involved, and really only works well at utility scale. |

Established | Impact: ★★★★★ | Cost: $$$$$ | City

3.3 GENERATION

Net-zero energy always starts with minimizing the energy demand, but at some point even a passive building will need some energy, and in net-zero energy buildings, that energy is ideally to be generated on site. The following tables summarize some of the most mature and broadly available forms of renewable energy systems.

Table 3-68: Photovoltaic

| Description: | Various technologies which convert solar energy to electricity. Most are in the form of panels that can be mounted on or to a building (typically on the roof) or ground mounted support structure. Alternative products are emerging which replace another component of a building (eg: roof tile or façade panel) with a PV product of similar shape. |
| Strengths: | Solar energy is the most accessible form of renewable energy: it works everywhere that there is access to sunlight. Solar energy technology is the most modular and flexible of all renewable energy technologies, and is easily installed in small or large quantities and in many diverse formats. |
| Limitations: | Solutions to replace existing building components (such as roof tiles or façade panels) with PV integrated products are yet very costly. Costs are continually improving at a remarkable pace, but still need improvement. |

Established | Impact: ★★★★★ | Cost: $$$$ | Building / ND
### Table 3-69: Solar Air Heating (SAH)

<table>
<thead>
<tr>
<th>Description</th>
<th>Strengths</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Various technologies used to harness heat energy from sunlight, and input that heat into air circulation systems within the building.</td>
<td>The least costly of all solar energy harvesting technologies: SAH uses simple materials that heat up when exposed to sunlight (direct or indirect), e.g., black sheet metal, which is inexpensive, abundantly available, easily serviced, and strongly supported by local industry.</td>
<td>SAH requires the building's mechanical system to be designed in such a way as to be able to integrate exterior air chaseways, such as solar walls. Integration challenges vary by building type, but are generally best suited to industrial environments.</td>
</tr>
</tbody>
</table>

| Established Impact: ★★★★★ | Cost: $$ | Building / ND |

### Table 3-70: Solar Water Heating (SWH)

<table>
<thead>
<tr>
<th>Description</th>
<th>Strengths</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Various technologies used to harness heat energy from sunlight, and input that heat into water circulation systems within the building.</td>
<td>Well established technology, broad industry competence. Ideally suited to heating pools, commercial laundries, commercial kitchen cleaning water, or other stable non-seasonal heating demand loads. Note the theme of hot water among all these, and the availability of maintenance personnel for most of these environments.</td>
<td>Maintenance requirements are significant, and the consequences of poor maintenance are often severe. Residential SWH products have commonly suffered neglect, which all but eliminates their financial payback/viability. In recent years, SWH has often been replaced with PV powered heat pumps.</td>
</tr>
</tbody>
</table>

| Established Impact: ★★★★★ | Cost: $$$$ | Building / ND |
### Table 3-71: Wind – Horizontal Axis

<table>
<thead>
<tr>
<th>Wind – Horizontal Axis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> Turbines of all forms harvest mechanical energy from a moving fluid (such as water or wind) to turn a generator, which in turn creates power. A horizontal axis turbine is the typical three-blade turbine style seen commonly in open fields, where the blades rotate around a horizontal nacelle.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> Mature global industry, extremely cost competitive when installed at scale, locally available parts/service, very strong performance/uptime, relatively simple maintenance, highly compatible with energy storage and microgrid/distributed energy, and despite political and media debate in Ontario, no substantiated evidence of negative health impacts in over 100 countries and &gt;50 years worth of installations.</td>
</tr>
<tr>
<td><strong>Limitations:</strong> Horizontal axis turbines, by their physical nature, perform best in laminar wind flows that have consistent direction. This means that they are heavily impacted by turbulence, and need to be designed appropriately to stand above any local trees/structures that can cause turbulence and diminished performance. Strongest limitation is unfortunately political/social, often related to visual intrusion.</td>
</tr>
</tbody>
</table>

| Established | Impact: ★★★★★ | Cost: $$$ | Building / ND / City |

### Table 3-72: Wind - Vertical Axis

<table>
<thead>
<tr>
<th>Wind – Vertical Axis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> Vertical axis turbines typically have helical or cylindrical blades rotating around a vertical nacelle. They serve the same purpose as horizontal axis turbines but are better suited to turbulent wind environments: they produce less power overall than a horizontal machine, but they produce it from non-ideal winds coming from random or uncoordinated directions.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> Similar in most respects to horizontal axis turbines, except that the nacelle / rotor system rotates vertically. Some have been referred to as having egg-beater designs, some are helical. Vertical axis machines tend to perform much better in turbulent wind environments than horizontal axis units, such as in urban areas, including along highways, on roof parapets, free-standing in a park, etc.</td>
</tr>
<tr>
<td><strong>Limitations:</strong> The amount of energy generated by a wind turbine is a direct multiple of the cross-sectional area swept by the blades. Horizontal machines always sweep a larger area, and will always perform better if used in non-turbulent wind areas. Vertical axis machines are generally more costly, with more challenging maintenance, and really no more political/social acceptance than horizontal machines. Horizontal should be used wherever possible.</td>
</tr>
</tbody>
</table>

| Emerging | Impact: ★★★★★ | Cost: $$$$ | Building / ND |
### Table 3-73: Geothermal

<table>
<thead>
<tr>
<th><strong>Geothermal</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> Geothermal heating systems use heat exchangers to move heat energy from the physical earth into a building’s interior, or to cool a space by doing the opposite (moving heat from a building's interior space out into the physical earth). Geothermal systems include two core elements: heat pumps / exchangers, and a long loop of pipe that may be buried in the ground, or run along a river or lake bed.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> Geothermal energy is accessible everywhere, and the ground has stable temperatures around 10 degrees C at accessible depths, which makes design predictable and repeatable. The industry is mature, and equipment and service contractors are readily available in most municipal centres across Canada. Open loop systems, where appropriate, are exceedingly cost effective.</td>
</tr>
<tr>
<td><strong>Limitations:</strong> Drilling costs can be prohibitive and will vary by project. Open loop systems will require less drilling and will typically be more efficient, but are really only viable with running water (under or above ground) and may require sensitive environmental approvals from local authorities in order to determine the degree of impact the system will have on that running water source over time. Thermal balancing is significantly important in closed-loop systems (and sometimes in open loop systems) and is often overlooked: the geothermal system needs to pull roughly the same amount of heat from the ground as it injects back into the ground (i.e. when pulling cooling) over time, thus creating a balance in the amount of heating and cooling the system delivers. If this balance is not achieved, the performance of the heat transfer with the ground can change over time, compromising the local earth’s ability to act as a thermal storage buffer and diminishing the performance of the geothermal exchange process. Projects wishing to include geothermal energy should exercise due care in ensuring that their design teams include sufficient experience / expertise to achieve thermal balancing, or to achieve a design that will work long-term on the site in question.</td>
</tr>
</tbody>
</table>

| Established | Impact: ★★★★★ | Cost: $$$ - $$$$ | Building / ND / City |

### Table 3-74: Tidal

<table>
<thead>
<tr>
<th><strong>Tidal</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> Tidal generators are designed to harness power from the kinetic energy in ocean tides.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> Tides are highly predictable, and well suited to providing reliable base-load energy.</td>
</tr>
<tr>
<td><strong>Limitations:</strong> Relatively few opportunities for this technology means that it is likely to stay &quot;emerging&quot; and uncommon. Immature industry means limited access to qualified maintenance support, and marine environment makes physical access difficult.</td>
</tr>
</tbody>
</table>

| Emerging | Impact: ★★★★★ | Cost: $$$$$ | ND / City |
### Table 3-75: Biomass

<table>
<thead>
<tr>
<th>Description</th>
<th>Strengths</th>
<th>Limitations</th>
<th>Established/Emerging</th>
<th>Impact: ★★★★★</th>
<th>Cost: $$$</th>
<th>ND / City</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomass literally includes all biological mass: plant waste, compost, purpose-grown crops, and even sewage contains energy that may be harvested for heating or for power generation. Some is dried, pelletized and used for heating directly, some is transformed into biogas (see below).</td>
<td>Biomass includes waste products from other industries (e.g.: corn silage) and complements other existing processes in the agricultural sector. The technology involved is very comfortable for agricultural sector workers, and though emerging in Canada, the biomass industry is mature elsewhere.</td>
<td>Biomass relies upon various feedstocks to be available when needed, and takes significant resource planning. Biomass systems work best when designed to work at scale, which requires a certain critical mass of participation in order to achieve business viability.</td>
<td></td>
<td>★★★★★</td>
<td>$$$</td>
<td>ND / City</td>
</tr>
</tbody>
</table>

### Table 3-76: Biogas

<table>
<thead>
<tr>
<th>Description</th>
<th>Strengths</th>
<th>Limitations</th>
<th>Established/Emerging</th>
<th>Impact: ★★★★★</th>
<th>Cost: $$$</th>
<th>ND / City</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biogas is nearly the same as commercial natural gas (i.e.: both are methane, refined to different degrees), but is harvested from renewable or natural sources. It may be burned to create heat, to run a gas powered generator and create electricity, or a combination of both (see CHP below).</td>
<td>Biogas can be injected into the Natural Gas pipe-line system present across much of urban Canada, and can be used in place of (or in concert with) natural gas almost everywhere that natural gas is used.</td>
<td>Biogas often contains impurities that require careful management or sometimes treatment in order to be compatible with various uses. E.g.: it can be corrosive depending on the feedstock mix, in which case it is not appropriate for use in as many applications as if it were treated.</td>
<td></td>
<td>★★★★★</td>
<td>$$$</td>
<td>ND / City</td>
</tr>
</tbody>
</table>
Table 3-77: Fuel Cells

**Fuel Cells**

**Description:** Fuel cells employ hydrogen energy storage (see Table 3-66) to generate electricity: stored hydrogen is combined with oxygen from air to produce electricity and water.

**Strengths:** Universal availability of oxygen, and harmlessness of the by-product of generation (water). Whereas batteries run out of the energy stored in their chemistry, fuel cells will run until their fuel is exhausted, and may then be refuelled and will continue working.

**Limitations:** Overall system efficiencies are not compelling.

| Emerging | Impact: ★★★★★ | Cost: $$$$$ | Building / ND / City |

Table 3-78: Combined Heat & Power (CHP)

**Combined Heat & Power (CHP)**

**Description:** All presently known energy generation technologies are less than 100% efficient (thanks to the Law of Conservation of Energy), and traditional fossil fuel plants actually convert most of their energy into heat, not usable electricity. CHP uses natural gas to create electricity, and captures the waste heat as usable heat, thus combining a heating system with a power generation system (hence the name CHP), for much greater overall efficiency.

**Strengths:** The natural gas industry is mature in Canada and is generally available in all major urban centres (where power is most needed). CHP is based upon mature technology that is well understood, available, and serviced, across Canada. CHP is also available at various scales from portable residential backup units up to regional power centres that can supply cities or the shared utility grid. Similarly, gas pipeline infrastructure (including regional storage at salt mines) is mature and accessible across urban Canada as well, and is ready to complement District Energy initiatives (see below). Lastly, CHP can be used to replace emergency generators, which offers several advantages over more typical practices there: avoiding material handling challenges associated with diesel fuel, exercising the generator more regularly ensures greater likelihood of successful performance when needed for true emergency situations, and CHP creates opportunities for sustained occupancy during emergencies, aiding both the occupants and municipal emergency management agencies.

**Limitations:** CHP plants create environmental emissions which must be managed to comply with local authority requirements. If used in dense developments, attention must be given to the locations of exhaust / flue venting. Sizing can be difficult: if prioritizing electrical generation then makeup or surplus heat may need to be managed (eg: exhausted), and if prioritizing thermal generation then same for electricity (eg: dump to grid). Lastly, CHP is based upon natural gas, a fossil fuel, and therefore is subject to all the political discussions surrounding GHG / climate objectives, all the pricing volatility of the fossil fuel sectors, and all the environmental challenges related to pipelines and resource extraction. Renewable Natural Gas (RNG), or biogas, is creating new opportunities to renew the gas sector.

| Established | Impact: ★★★★★ | Cost: $$ | Building / ND / City |
Table 3-79: District (Thermal) Energy

<table>
<thead>
<tr>
<th>District (Thermal) Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> Power and heating systems work best when the loads they serve are consistent, but this is often difficult for any given occupancy (e.g., offices are heavy during the day, but quiet at night, homes are heavy in the evenings, etc). Connecting multiple diverse buildings in a network that is designed to share energy will provide the opportunity for their combined loads to achieve combined / optimised efficiencies together.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> Diversity and flexibility of various heat sources (anything from geothermal and solar to CHP to traditional heating sources) and loads (any building can be connected to the district system).</td>
</tr>
<tr>
<td><strong>Limitations:</strong> District energy systems work best with compact districts where diverse building occupancies are all close together. If density or diversity is lacking, either could compromise the effectiveness of the system.</td>
</tr>
<tr>
<td>Established</td>
</tr>
</tbody>
</table>

Table 3-80: Energy from Waste

<table>
<thead>
<tr>
<th>Energy from Waste (EFW)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> There are many technologies which recover value from waste, including energy, materials and/or fuels. The term “energy from waste” (EFW) typically refers to the combustion of municipal solid waste. Some EFW technologies burn cleaner than others, and the best available technology will produce minimal emissions: emissions represent lost energy, and therefore lost potential revenue. Sweden is one of several countries that has been recovering energy from waste for decades using highly efficient technology that emits less harmful fumes to the environment than most other fossil fuel based energy plants. EFW treats “waste” as a fossil fuel and puts it to good use.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> Many municipalities are increasingly struggling to find land for their municipal solid waste disposal needs. Waste is an underused resource and untapped opportunity. Converting waste into energy reduces the physical space it consumes, scrubs and cleans the emissions that would otherwise escape slowly over time through natural decomposition, and upcycles the waste into a commodity that has significant value to our culture (i.e., energy). There is renewed interest across Canada in EFW and other waste conversion / chemical recycling technologies which enable the circular economy, targeting zero waste to landfill.</td>
</tr>
<tr>
<td><strong>Limitations:</strong> Waste is effectively a fossil fuel: energy systems dependant upon waste as their primary feedstock are in fact hoping for an endless supply of waste. The waste is put to good use, but it is ideologically unfortunate that they need waste in order to produce clean energy, and it does raise the question of just how clean that energy actually is. EFW facilities must meet stringent emissions guidelines but may still struggle to obtain permits in areas where legacy policy opposes older forms of EFW solutions that do not meet current standards.</td>
</tr>
<tr>
<td>Emerging</td>
</tr>
</tbody>
</table>
3.4 Performance Verification

Industry Best Practice requires commissioning of a building after construction in order to confirm that the building performs as it was designed. In fact, commission of some form or other is pre-requisite in all of the third party verification programs prominent in industry (reviewed later in this report: see sect. 4.6.1). In the ideal case, buildings would be commissioned periodically thereafter, perhaps bi-annually depending upon the complexity of the building’s design, to ensure they continue to perform as intended.

Tests which occur after occupancy (post-occupancy performance verification) are typically different than commissioning, and verifying utility bills after occupancy does little to inform us of how the actual building is performing: it reveals only how the occupants are using the building. For example, two families living side by side in identical town homes could live differently: consider one family that likes to leave their lights on vs. one that religiously turns lights off when not in use. Or consider a married couple with three children and two dogs living next to a bachelor who spends most of his time out with friends. The two homes might perform identically, but are being used very differently, or one home might have a serious mechanical problem, but the utility bills alone would not be enough to make this clear. Their utility bills do not tell a useful story about the home’s performance: they reflect the lifestyle of the occupant. If utility bills are higher than expected, then testing and recommissioning activities are required in order to determine whether the occupant is responsible for the additional energy use, or whether there is in fact something amiss with the building itself.

Testing the unoccupied building has value for policy programs, but testing the occupants or checking the bills after occupancy has value only for the occupants or for research purposes.
Table 3-81: Building Commissioning

| Description: | Building Commissioning | After construction is complete, qualified independent professionals may be brought in to test the constructed building and compare it to the design plans, to ensure that all is as it should be. Anecdotal experience has shown that the vast majority of buildings are constructed with minor deficiencies, and a surprising number would have significant deficiencies if not inspected properly. Certified Energy Advisors (CEA’s), Commissioning Agents (CxA’s), Certified Measurement and Verification Professionals (CMVP’s), and Professional Engineers (PEng’s) with commissioning experience can all be important allies when commissioning a building. They will apply their expertise and industry tools to inspect and test various elements of the building’s construction, from wall details to mechanical equipment, and will help to identify deficiencies while they may still be easily corrected. |
| Strengths: | Commissioning is an inexpensive way to identify and correct construction defects before they become problematic or expensive. Common defects include things like flashing being installed incorrectly around windows, air-sealing details being missed (eg: gaskets / acoustical sealant / etc), mechanical systems not being balanced properly, building automation systems not being sequenced properly, and much more. Some of these are easy to correct afterward, some can be quite difficult. All are less expensive to correct during construction than later. The vast majority of commissioning exercises will save more money than they cost. |
| Limitations: | Because building commissioning helps to proactively avoid costs and complications, it can be difficult to determine what those avoided costs in fact are, and can therefore be difficult to determine payback on the investment made in commissioning. There are various perspectives on how to overcome this challenge, but all best-practice green building programs (eg: ENERGY STAR, LEED, etc.) universally pre-require some form of building commissioning, and at the time this report was being authored, there were over 33,000,000 search hits found by Google on “why building commissioning is important”.

| Established | Impact: ★★★★★ | Cost: $-$$ | Building |

Table 3-82: Metering & Monitoring Systems

| Description: | Metering / monitoring technology has matured now to the point that effectively anything can be monitored by technology (energy use, heat, water, etc), at any level (building, sub-system, panel, circuit, device, or large scale like neighbourhood / city / region), integrated back into automation / control systems, and made available for assessment. |
| Strengths: | Supremely customizable; options for low or high tech and touch. |
| Limitations: | Usage: metering / monitoring systems collect vast amounts of data that only has value when used. Systems can be designed to any price point and data depth, and used well, will always produce savings. Avoid overdesign and ensure there is a plan for using the data. |

| Established | Impact: ★★★★★ | Cost: $-$$$$ | Building / ND / City |
### Table 3-83: Post-Occupancy Performance Verification

<table>
<thead>
<tr>
<th><strong>Post-Occupancy Performance Verification</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> Across the Canadian building industry, energy models are commonly performed prior to construction as part of the design process. After the building is completed and occupied, utility bills can be tracked year-over-year and compared to the original energy model. After even just one year, occupants can often glean valuable lessons from their utility data and use those lessons to optimize the performance of their use of the building.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> Occupants can optimize their usage of their buildings with little effort and cost.</td>
</tr>
<tr>
<td><strong>Limitations:</strong> Post-Occupancy verifications of any kind are highly dependent upon occupant behaviour. Different occupants will vary widely in their use of the same building and are NOT a true indicator of the actual performance of the building. If significant concerns are noted, then other (re)commissioning activities will be required in order to identify whether the concern is rooted in occupant behaviour or is actually a physical problem with one of the building’s systems. Post-Occupancy Performance Verification is most useful for teaching occupants how to use their building optimally, after the building has already been properly commissioned.</td>
</tr>
<tr>
<td>Established</td>
</tr>
</tbody>
</table>

### Table 3-84: Recommissioning / Ongoing Reporting

<table>
<thead>
<tr>
<th><strong>Recommissioning / Ongoing Reporting</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> Buildings change over time, whether by natural wear or by the deliberate actions of their owners / occupants. Buildings which experience tenant turnover can change rapidly. Commissioning done at the time of construction may therefore become invalid over time, and it may be necessary to recommission the building in order to ensure that it continues to operate as intended. Even for buildings which do not experience significant change over time, periodic recommissioning can help to identify slow degradations in performance over time and correct them. Recommissioning is essentially the same as commissioning but done later. Depending upon the occupancy and the frequency of turnover, annual recommissioning may be appropriate, or once every five years may suffice. Regardless, recommissioning is most successful when the building operators have been monitoring building performance over time, and can easily access data on their utility consumption, maintenance logs, any inspections / servicing / upgrades done to significant equipment, and any significant renovation projects.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> Recommissioning is an inexpensive way to optimize the performance of a building ongoing over time, and to ultimately extend the service life of the building’s systems (ie: by optimizing operations and maintenance routines). Anecdotally, the better you care for your buildings, the better they will care for you!</td>
</tr>
<tr>
<td><strong>Limitations:</strong> Recommissioning requires some level of investment in items for which it can be difficult to demonstrate payback (the same as with Commissioning, per Table 3-81 above).</td>
</tr>
<tr>
<td>Established</td>
</tr>
</tbody>
</table>
3.5 **Vehicle Integration**

Leaders in the automotive and automation sectors are rapidly blending their efforts into new transportation solutions that have potential to significantly change how we move between work, home, and play. The tables below will look at topics related to transportation, and how these contribute to net-zero energy communities.

Table 3-85: Electric Vehicle (EV) Integration

<table>
<thead>
<tr>
<th>Electrical Vehicle (EV) Integration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> EVs are increasingly common, and making buildings “EV ready” is increasingly easy to do. Chargers are available in several formats and ranges of output, and the EV industry has normalized around common receptacle formats. Building and construction codes in several jurisdictions are now referencing EV charging of different capacities, and EVs represent one of the highest growth areas in the automotive market.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> EVs are increasingly cost competitive and often cost less than combustion vehicles on a lifecycle basis. They are easy to integrate and offer many benefits to the driver: they use the same transportation infrastructure as all other automotive vehicles, are simpler to maintain, can refuel at work or home, are quieter, and more. EV charging stations present new business models and marketing opportunities, monetizing the value of the convenience of charging. EVs also carry batteries, enabling vehicle-to-grid storage opportunities (see below).</td>
</tr>
<tr>
<td><strong>Limitations:</strong> Some EV suppliers have custom charger requirements that should be considered when designing charging infrastructure. High penetration of EVs can lead to rapidly increasing utility interconnection fees: controls should be used to optimize charging patterns, and to share charging times across multiple vehicles / charging stations that do not all need to charge actively at the same time, thus reducing overall charging loads to the utility.</td>
</tr>
</tbody>
</table>

| Established | Impact: ★★★★★ | Cost: $$ | Building / ND / City |

Table 3-86: Vehicle-to-Grid (V2G) Controls

<table>
<thead>
<tr>
<th>Vehicle-to-Grid (V2G) Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong> EVs all contain batteries, and those batteries often carry a charge that exceeds what the EV / driver will need. V2G controls enable the local grid operator to use the surplus charge in the EV battery as a local storage system for the broader grid.</td>
</tr>
<tr>
<td><strong>Strengths:</strong> Highly localized (wherever EVs are, which is where people are and where they need energy) and configurable: drivers may specify how much charge they wish to retain on their batteries (eg: no less than 40%) in order to give them margin to get to work / shopping / entertainment.</td>
</tr>
<tr>
<td><strong>Limitations:</strong> V2G is an emerging concept that is as diverse in its application as the programmers enabling it. It will take time for this field to harmonize.</td>
</tr>
</tbody>
</table>

| Emerging | Impact: ★★★★★ | Cost: $$ | Building / ND / City |
### Table 3-87: Autonomous Vehicles (AVs)

<table>
<thead>
<tr>
<th>Description: AVs are self-guided vehicles which can monitor their surroundings and communicate with GPS / travel guidance systems to deliver a rider from their point of origin to any accessible destination without human intervention. There are several levels of autonomy, from traditional “cruise control” up to fully self-operating.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strengths:</strong> AVs are rich in technology, are typically network-connected at all times, and have access not only to the best sensors for safe navigation, but also the latest software updates / algorithms for safe and efficient transportation. AVs are often safer than human drivers, especially in designated guideways, and they can have their drive patterns optimized for fuel efficiency, most expedient routing, avoiding toll highways, and more. AVs are well suited to car-share applications, and can drive themselves to refueling or maintenance locations when needed. Especially if also an EV, AVs can optimize their environmental performance to minimize transportation emissions.</td>
</tr>
<tr>
<td><strong>Limitations:</strong> AVs are vehicles, and experience the same risks as other vehicles, including fatal risks. Accidents have already been reported in several jurisdictions across North America (though far fewer than non AV vehicle related accidents in the same areas), and most jurisdictions are yet unsure how to appropriately permit and regulate the use of AVs. Several pilot zones are presently being studied at the time of writing of this report.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Emerging</th>
<th>Impact: ★★★★★</th>
<th>Cost: $$$$$</th>
<th>Building / ND / City</th>
</tr>
</thead>
</table>

© 2019, The Corporation of the City of London

www.s2etech.com/fcm-gmf
4. POLICIES AND PROGRAMS THAT SUPPORT NET-ZERO ENERGY

Once a design team has determined which technologies will be most appropriate for their project, there is often an iterative process wherein that team will go back and forth with local approval authorities and utilities to optimize their technology choices for (1) leveraging any relevant incentives, and (2) pursuing the easiest approval they are able to earn without compromising their project’s intent. Optimizing the project’s design around local policies and programs can take multiple iterations, but often results in conversations that are advantageous both to the approval authorities and to the developer.

This section will explore some of the policies and programs that are available across Canada which relate to encouraging sustainable development, energy efficiency, renewable energy, and other related topics, starting with Municipal programs, then Provincial, Federal, and various voices from industry (NGOs, etc).

4.1 MUNICIPAL PROGRAMS AND INCENTIVES

Provincial and Federal policies have significant impact on the development industry, but not as much as Municipalities do. Municipalities review building permits, subdivision plans, and regional plans for topics ranging from transportation to energy to climate resilience. Municipal official plans often affect policy setting out what the municipality seeks to see in new development, or where they seek to empower gentrification or redevelopment. Those policies in turn affect what topics the municipality is willing to invest in, whether with incentives, concessions, innovative approaches to meeting typical approval requirements, or otherwise.

This section summarizes the tools and programs that are presently being offered in Canadian municipalities and assesses the relative successes that are worthy of greater attention. Table 4-1 (below) separates the methods of incenting from the topics which are being incented and is followed by sections that explain each in turn.

Items in Table 4-1 which are highlighted are those which are explained in greater detail below. Those not highlighted are included in Appendix A, and all are referenced appropriately for follow-up if interested readers wish to learn more about any particular program mentioned below.

Please note that a total of 40 municipalities were studied which together offered over 180 programs that were evaluated in this report. The study team believes that this is just scratching the surface of the available pool of literature that could have been reviewed, but that clear themes emerged, and that this review is sufficient to provide an accurate representative look into the entire breadth of discussion around municipal incentives across the Canadian development industry.

Please also note that many of these programs were in various stages of being updated at the time of this study, so this report represents the best knowledge of the authors at the time it was written. Individual municipalities may have changed their programs and/or their websites since.
### Table 4-1: Canadian Municipal Incentive Programs

<table>
<thead>
<tr>
<th>Methods of Incenting</th>
<th>INCENTIVE TOPICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program, Incentives, Rebates</td>
<td>Land Use</td>
</tr>
<tr>
<td>Environmental Site Assessments</td>
<td>Property Tax Exemption</td>
</tr>
<tr>
<td>Development Charge Rebate</td>
<td>Building Permit Rebate</td>
</tr>
<tr>
<td>Property Tax Exemption</td>
<td>Remediation Loan</td>
</tr>
<tr>
<td>Density Bonus</td>
<td>Cash Rebate</td>
</tr>
<tr>
<td>Brownfield</td>
<td>Mixed Use Development</td>
</tr>
<tr>
<td>Mixed Use Development</td>
<td>Non-Brownfield Development</td>
</tr>
<tr>
<td>Non-Brownfield Development</td>
<td>Greenfield</td>
</tr>
<tr>
<td>Electric Vehicle</td>
<td>On-Site Renewables</td>
</tr>
<tr>
<td>On-Site Renewables</td>
<td>Cool Roof</td>
</tr>
<tr>
<td>Cool Roof</td>
<td>Storm Water</td>
</tr>
<tr>
<td>Storm Water</td>
<td>Rainwater</td>
</tr>
<tr>
<td>Rainwater</td>
<td>Greywater</td>
</tr>
<tr>
<td>Greywater</td>
<td>Indoor Conservation</td>
</tr>
</tbody>
</table>

**Table Notes:**
- "x" indicates the presence of an incentive program.
- "A" through "I" indicate the specific incentive topics.
- The table values are indicative of the Municipal Tools for Catalyzing Green Development project.
### METHODS OF INCENTING

<table>
<thead>
<tr>
<th>Programs, Incentives, Rebates</th>
<th>Land Use</th>
<th>INCENTIVE TOPICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feasibility Study Grant</td>
<td>Brownfield</td>
<td>Energy</td>
</tr>
<tr>
<td>Assessments</td>
<td>Mixed Use Development</td>
<td>Net Zero Building</td>
</tr>
<tr>
<td>Tax Assistance Plan</td>
<td>Non-Brownfield Development</td>
<td>Electric Vehicle</td>
</tr>
<tr>
<td>Environmental Site</td>
<td>Greenfield</td>
<td>On-Site Renewables</td>
</tr>
<tr>
<td>Development Charge</td>
<td>Green Roof</td>
<td>Cool Roof</td>
</tr>
<tr>
<td>Property Tax Exemption</td>
<td>Urban Agriculture Provisions</td>
<td>Indoor Conservation</td>
</tr>
<tr>
<td>Building Permit Rebate</td>
<td>Cool Roof</td>
<td>Storm Water</td>
</tr>
<tr>
<td>Remediation Loan</td>
<td>Remediation Loan</td>
<td>Rainwater</td>
</tr>
<tr>
<td>Density Bonus</td>
<td>Remediation Loan</td>
<td>Greywater</td>
</tr>
<tr>
<td>Cash Rebate</td>
<td>Remediation Loan</td>
<td>Medicine Hat, AB</td>
</tr>
<tr>
<td></td>
<td>Remediation Loan</td>
<td>Moncton, NB</td>
</tr>
<tr>
<td></td>
<td>Remediation Loan</td>
<td>Niagara Falls, ON</td>
</tr>
<tr>
<td></td>
<td>Remediation Loan</td>
<td>Niagara Region, ON</td>
</tr>
<tr>
<td></td>
<td>Remediation Loan</td>
<td>North Vancouver, BC</td>
</tr>
<tr>
<td></td>
<td>Remediation Loan</td>
<td>Oakville, ON</td>
</tr>
<tr>
<td></td>
<td>Remediation Loan</td>
<td>Okotoks, AB</td>
</tr>
<tr>
<td></td>
<td>Remediation Loan</td>
<td>Oshawa, ON</td>
</tr>
<tr>
<td></td>
<td>Remediation Loan</td>
<td>Ottawa, ON</td>
</tr>
<tr>
<td></td>
<td>Remediation Loan</td>
<td>Owen Sound, ON</td>
</tr>
<tr>
<td></td>
<td>Remediation Loan</td>
<td>Peterborough, ON</td>
</tr>
<tr>
<td></td>
<td>Remediation Loan</td>
<td>Port Colborne, ON</td>
</tr>
<tr>
<td></td>
<td>Remediation Loan</td>
<td>Quesnel, BC</td>
</tr>
<tr>
<td></td>
<td>Remediation Loan</td>
<td>Saskatoon, SK</td>
</tr>
<tr>
<td></td>
<td>Remediation Loan</td>
<td>Selwyn, ON</td>
</tr>
<tr>
<td></td>
<td>Remediation Loan</td>
<td>St. Catharines, ON</td>
</tr>
<tr>
<td></td>
<td>Remediation Loan</td>
<td>St. John’s</td>
</tr>
</tbody>
</table>

### A B C D E F G H I

- **A**: Medicine Hat, AB
  - x
  - x
  - x
  - B,I
  - I
  - B,I
  - I
  - I

- **B**: Moncton, NB
  - x
  - x
  - x
  - F,I
  - F,I
  - F,I

- **C**: Niagara Falls, ON
  - x
  - x
  - x
  - x
  - B-E,I
  - I

- **D**: Niagara Region, ON
  - x
  - x
  - x
  - D
  - D

- **E**: North Vancouver, BC
  - x
  - x
  - x
  - D
  - H

- **F**: Oakville, ON
  - x
  - x
  - x
  - x
  - B,C,E
  - D,I
  - I
  - I

- **G**: Okotoks, AB
  - x
  - x
  - x
  - x
  - A-C,E,I
  - I
  - I

- **H**: Oshawa, ON
  - x
  - x
  - x
  - x
  - A-C,E,I
  - I
  - I

- **I**: Ottawa, ON
  - x
  - x
  - x
  - x
  - x
  - A-E,I
  - F

- **J**: Owen Sound, ON
  - x
  - x
  - x
  - B,D,E

- **K**: Peterborough, ON
  - x
  - x
  - x
  - x
  - B,C,E,I
  - I

- **L**: Port Colborne, ON
  - x
  - x
  - x
  - x
  - x
  - B,F
  - I
  - C,I

- **M**: Quesnel, BC
  - x
  - x
  - x
  - x
  - x
  - B,I
  - C
  - D
  - F
  - I

- **N**: Saskatoon, SK
  - x
  - x
  - x
  - x
  - x
  - B,I
  - C
  - D
  - F
  - I

- **O**: Selwyn, ON
  - x
  - x
  - x
  - x
  - x
  - C,I

- **P**: St. Catharines, ON
  - x
  - x
  - x
  - B,C,I
  - C

- **Q**: St. John’s
  - x
  - x
  - x
  - I
  - A,
  - H
  - J

© 2019, The Corporation of the City of London
www.s2etech.com/fcm-gmf
## METHODS OF INCENTING

| Programs, Incentives, Rebates |  
|-------------------------------|-----------------------------|
| **Feasibility Study Grant**   | A                           |
| **Assessments**               | B                           |
| **Environmental Site**        | C                           |
| **Tax Assistance Plan**       | D                           |
| **Development Charge**        | E                           |
| **Property Tax Exemption**    | F                           |
| **Building Permit Rebate**    | G                           |
| **Remediation Loan**          | H                           |
| **Density Bonus**             | I                           |
| **Cash Rebate**               |                             |
| **Brownfield**                |                             |
| **Mixed Use Development**     |                             |
| **Non-Brownfield Development**|                             |
| **Greenfield**                |                             |
| **Green Roof**                |                             |
| **Urban Agriculture Provisions** |                         |
| **Net Zero Building**         |                             |
| **Electric Vehicle**          |                             |
| **On-Site Renewables**        |                             |
| **Cool Roof**                 |                             |
| **Indoor Conservation**       |                             |
| **Storm Water**               |                             |
| **Rainwater**                 |                             |
| **Greywater**                 |                             |

### INCENTIVE TOPICS

**Land Use**

- I
- C, I

**Energy**

- D, I
- G, I
- I

**Water**

- A, E

### Case Studies

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>St. Thomas, ON</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>I</td>
<td>C, I</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stratford, ON</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>B, C, I</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sudbury, ON</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>C, E, I</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toronto, ON</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>E</td>
<td>I</td>
<td>I</td>
<td>I</td>
<td>D, G, I</td>
<td>G</td>
<td>I</td>
<td>I</td>
<td>I</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Welland, ON</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>B, D, E-G, I</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Windsor, ON</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>A-E</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winnipeg, MB</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* The Cities of Kitchener and Waterloo are within the Region of Waterloo (higher order regional municipality), so the incentives available at the regional level have been included in this table under the City of Waterloo and City of Kitchener, because they are available to constructors active in those cities.
4.1.1 METHODS OF INCENTING

Not all program approaches are well suited to all desired outcomes. It is thus unsurprising that there are many different methods which municipalities use in order to entice builders/developers to invest effort in various topics of value to the municipality. These various methods have been grouped under lettered headings (A) through (I) in Table 4-1 above and are explained more fully in Table 4-2 below.

**Table 4-2: Methods of Incenting**

<table>
<thead>
<tr>
<th>A</th>
<th>Feasibility Study Grants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feasibility studies could focus on any number of topics. If the municipality wishes to motivate developers to consider connecting to a District Energy system, then the municipality could cover the costs for a feasibility study to determine whether it would be appropriate to connect. Ontario’s largest utilities have had many programs over the years to pay for feasibility studies for things like CHP plants, or even to cover the cost of energy modelling for high performance building designs. Grants in general are low / no conditions attached cash contributions made by the municipality to the developer, to cover the cost of a specific scope of study (such as CHP or high performance energy efficiency).</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B</th>
<th>Environmental Site Assessments (ESAs, or EAs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>An examination done on properties suspected for soil contamination to clearly identify the nature and extent of contamination, and to determine whether remediation is required (and to what extent) before development can proceed. These examinations are done to varying degrees of rigour, commonly referred to in industry as “Phase I” and “Phase II” Environmental Site Assessments (abbreviated to ESA’s or sometimes just EA’s). The exact nature of the inclusions in such an assessment is defined by provincial environmental legislation, but Phase I assessments usually consist of:</td>
<td></td>
</tr>
<tr>
<td>• Gathering information about past usage of the site;</td>
<td></td>
</tr>
<tr>
<td>• Inspection of the site by a qualified environmental professional;</td>
<td></td>
</tr>
<tr>
<td>• Reviewing environmental files maintained by the site owner;</td>
<td></td>
</tr>
<tr>
<td>• Preparing a report identifying existing and potential sources of contamination on the site.</td>
<td></td>
</tr>
<tr>
<td>Phase II EAs usually focus on more specific site information such as:</td>
<td></td>
</tr>
<tr>
<td>• Sampling of surface/subsurface soil, surface water/groundwater, soil vapour, sediment, plant/aquatic species;</td>
<td></td>
</tr>
<tr>
<td>• Testing of above/below ground storage tank content and seal tightness, sampling of asbestos and polychlorinated biphenyls, and geomagnetic/geophysical surveys;</td>
<td></td>
</tr>
<tr>
<td>• Measuring noise and radiation levels;</td>
<td></td>
</tr>
<tr>
<td>• Measuring potential migration of known contaminants on site.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C</th>
<th>Tax Assistance Plans (TAPs) / Tax Increment Grant (TIG)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tax Assistance Plans (TAPs) and Tax Increment Grants (TIGs) are two terms used to describe the same concept. When a property is developed or improved, the taxable revenues to the City</td>
<td></td>
</tr>
</tbody>
</table>
for that site will increase, and the City can waive all or part of that uplift in advance to motivate certain choices on the part of the developer. The “incentive” in this case is a partial or complete waiver of the municipal property tax applicable to the site, for a fixed period of time. Eligibility for the waiver can be made specific to certain scope commitments which the municipality desires of the developer (eg: committing to energy improvements, to connect to a district energy system, etc).

TAPs/TIGs often have no net cost impact on the municipality, because the site being incented will typically have been generating little or no tax revenue prior to development, and any revenue from the site afterward is positive. Waiving the increase in expected levies means that the municipality will still be collecting tax income from the site, only at a lesser amount, and only until the incentive is “paid out” (ie: until the cumulative amount of tax waived / not collected is equal to the amount of the incentive offered). Once the terms of the incentive offer are fulfilled, the tax assistance ends and the site reverts to being fully taxed as normal, based on the improved property value.

The primary difference between TAPs and TIGs is that TIGs apply only to the increase in levies expected after development has successfully been completed, not to any municipal taxes associated with the value of the land prior to development, whereas TAPs could apply to the entire municipal tax levy on the site.

<table>
<thead>
<tr>
<th>D</th>
<th>Development Charge (DC) Rebate</th>
</tr>
</thead>
</table>
| Development Charges are fees collected from developers to offset the cost of infrastructure required to provide municipal services for the new development: road maintenance, transit, water and sewer, fire and police facilities, etc. DC fees may be fully or partially rebated in exchange for certain features or benefits desired by the municipality. For example, rebates are commonly used to attract industry and jobs or to incent brownfield redevelopment (ie: since the cost to provide all infrastructure renewal around brownfields is commonly far less than for new developments, most already being in place from prior usages of the site).

In theory, net-zero energy developments should provide less strain on municipal infrastructure than traditional buildings, so fees such as DCs which are tied to that reduced strain could also be reduced. The municipality would need to ensure that any DC credits or exemptions offered are in fact attributable back to savings on municipal infrastructure costs (as opposed to savings on energy grid costs, which should be reflected in utility incentives not in municipal ones), so the municipality may be wise to define a DC benefit to reduced use of sewers, reduced waste generated on-site, etc. The development industry often requests and is easily excited by the opportunity to reduce DCs, but strictly speaking, the municipality needs to be mindful that DC credits or exemptions are an investment made by the municipality which has an associated cost, and if the cost is not recoverable through meaningful savings or reductions to real municipal costs, then it must be funded ultimately by the tax base with appropriate justification.

<table>
<thead>
<tr>
<th>E</th>
<th>Property Tax Exemption / Rebate</th>
</tr>
</thead>
</table>
| Much the same as a TAG (see method C above), this exemption/rebate reimburses the developer for all or part of the municipal property tax for a fixed period of time. Unlike the TAG, which is a grant paid to the developer after they have paid their tax, a Property Tax
Exemption would proactively waive the requirement for payment. A rebate would be credited from the property tax assessed, whereas a TAG would be funded from a different budget. Because they are different, all can be used independently or in combination with each other.

<table>
<thead>
<tr>
<th></th>
<th>Building Permit Rebate</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>This is perhaps the simplest incentive method to implement, in that it is literally a total or partial refund to the developer for the cost of the building and development permits. This rebate is usually based upon including certain design elements in the building permit application which demonstrate that the building will meet objectives set by the municipality (e.g. sustainability related or energy performance objectives).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Remediation Loan Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>Municipalities often have very strong credit ratings, and can access inexpensive financing with low interest rates. The municipality can then re-loan money out to private industry at the same low rate for specific purposes, such as remediating challenged properties or funding energy projects (e.g. solar panels).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Density Bonus</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>Allows the developers to build greater density than would normally be permitted under the specific zoning regulation for that property/development. For example, if the developer can demonstrate that their plans will have reduced impact on municipal infrastructure on a per unit basis, then they could be permitted to earn additional density that stays beneath the same limits of service capacity. In other words, if the municipality has enough water/electrical capacity for 10 residential units on a property, but the developer can show that their design will achieve 50% reduced energy and water use, then they could be permitted to build up to twice as many units, staying under the same overall limits for energy and water use for the site.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Cash Rebate</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Cash rebates are typically implemented as a partial or full refund to a building owner/developer for capital purchases of pre-qualified equipment or activities which achieve municipal objectives on the owner/developer’s property. For example, Guelph ON is currently providing cash rebates for rainwater and greywater systems, whereas Toronto ON is doing the same for indoor water conservation, green roofs and cool roofs.</td>
</tr>
</tbody>
</table>

### 4.1.2 Incentive Topics: Land Use

Table 4-2 (above) summarized the general methods of incenting that are in use across Canada. The following sub-sections will look more specifically at examples of how those methods are used to promote specific land related initiatives, such as remediating brownfields, installing green roofs, or promoting urban agriculture. Sections 2 and 4.1.4 (below) will respectively explore the various examples of incentives used for energy and water efficiency initiatives. Refer to Appendix A for a comprehensive list of the various Municipal incentives explored in this research effort.
4.1.2.1 Brownfield Remediation – Example Programs

Brownfields are typically vacant or underutilized properties where past industrial or commercial uses have left contamination behind. As contamination standards have become increasingly stringent over the years, more and more lands are being designated brownfields, and it has become increasingly important for municipalities to have tools to support their remediation. Below are some examples of how different municipalities are presently using the incentive methods from Table 4-2 (above) to incent efforts to remediate brownfield lands. Further examples are included in Appendix A.

1. **Windsor, ON: Feasibility Study Grant Program**\(^1\) (see Table 4-2 item A): Grant equivalent to 50% of the cost of an eligible feasibility study. Maximum grant of $7,500 with maximum one study per property.

2. **Waterloo, ON: Phase Two Environmental Site Assessment Grant**\(^2\) (see Table 4-2 items B, I): The Region of Waterloo Provides funding for completion of Phase II Environmental Site Assessments that address environmental impacts on groundwater. Funding covers 50% of Phase Two ESA per site, to a maximum of $40,000, issued in the form of a cash rebate on proof of performance.

3. **Medicine Hat, AB: Environmental Site Assessment and Remedial/Risk Management**\(^3\) (see Table 4-2 item B, I): The region will provide property owners with up to $20,000 to help offset the costs associated with the ESA, and the required actions to remediate and redevelop a Brownfield site.

4. **Grimsby, ON: Property Revitalization (Tax Increment Grant)**\(^4\) (see Table 4-2 item C): For projects that are classified as Brownfield sites that have already had a Phase II Environmental Site Assessment, the program provides a tax increment-based grant that is equivalent to 100% of the municipal property tax increase for up to 10 years following project completion.

5. **Cambridge, ON: City of Cambridge & Region of Waterloo Brownfields Financial Incentive Program: Joint Tax Increment Grant**\(^5\) (TIG, see Table 4-2 item B, C): The City of Cambridge is working in collaboration with the Region of Waterloo to provide grants to property owners to remediate and redevelop Brownfield sites. Although the program has been developed in partnership with the Region of Waterloo, the joint tax increment grant only applies to Brownfield sites located within the city of Cambridge. The remediation and redevelopment must increase the value of the property by at least $100,000 and Phase I and Phase II Environmental Site Assessments are a prerequisite to obtaining the TIG. The

---

\(^1\) [http://www.citywindsor.ca/residents/planning/Land-Development/Planning-Policy/Documents/BRS%20City%20of%20Windsor%20Brownfield%20Redevelopment%20Community%20Improvement%20Plan%20(CIP).pdf](http://www.citywindsor.ca/residents/planning/Land-Development/Planning-Policy/Documents/BRS%20City%20of%20Windsor%20Brownfield%20Redevelopment%20Community%20Improvement%20Plan%20(CIP).pdf)


\(^3\) [https://www.medicinehat.ca/home/showdocument?id=3252](https://www.medicinehat.ca/home/showdocument?id=3252)

\(^4\) [https://www.niagararegion.ca/business/property/pdf/program-guide.pdf](https://www.niagararegion.ca/business/property/pdf/program-guide.pdf)

provisions of the TIG will not exceed the total remediation costs of the Brownfield site. The amount of the provided TIG equals up to 100% of Cambridge’s and the Region of Waterloo’s property taxes per year up to 10 years or the total cost of remediating the land and buildings, or the total of all grants, loans and other tax assistance that is provided (whichever occurs first). The calculation of the TIG will only occur following site assessment and post-remediation.

6. **Region of Niagara, ON: Brownfields Development Charge Exemption Program**⁶ (see Table 4-2 item D): The Region of Niagara will exempt a development from 75% of the Regional development charge for the remediation and rehabilitation of brownfield sites and an additional 25% development charge exemption depending on the inclusion of Smart Growth principles into the proposed development. Eligibility for the regional development charge exemption is determined by a Regional Development Charges Task Force.

7. **Toronto, ON: Brownfield Remediation Tax Assistance (BRTA)**⁷ (see Table 4-2 item E): The BRTA allows the City of Toronto to cancel all or a portion of the tax increase directly attributed to the increase in assessed value related to the remediation and development to help brownfield property owners offset the remediation costs incurred. BRTA may be provided for either:

   a. up to 2 years or until all eligible remediation costs have been compensated through the program (whichever occurs first); or

   b. up to 3 years or until all eligible remediation costs have been compensated through the program (whichever occurs first), if the property is also receiving Development Grants (tax increment equivalent grants for new or expanded employment lands). In this case the property will be eligible for combined BRTA and Development Grants for a combined maximum of 12 years.

8. **Owen Sound, ON: Brownfields Financial Tax Incentive Program**⁸ (see Table 4-2 item E): After a Phase II ESA has been conducted, the city may cancel up to 100% of the municipal property tax until the total cost of rehabilitating the site has been met. The City also reserves the option to cancel or defer any future property taxes on the redeveloped property.

9. **Welland, ON: Brownfields Planning and Building Fees Refund Program**⁹ (see Table 4-2 item F, I): Welland will provide a refund for planning and building permit application fees:

   a. 100% of fees for all planning applications;

---

⁹ [https://www.welland.ca/Planning/BrownfieldIncentive/Brownfield_Community_Improvement-Plan.pdf](https://www.welland.ca/Planning/BrownfieldIncentive/Brownfield_Community_Improvement-Plan.pdf)
b. 100% of demolition permit fee;

c. Building permit fees
   i. 50% if no LEED certification
   ii. 65% if LEED certified
   iii. 75% if LEED Silver
   iv. 90% if LEED Gold
   v. 100% if LEED Platinum

10. Saskatoon, SK: **Enterprise Zone Screening** (see Table 4-2 item B, I): Saskatoon will provide developers with rebates of up to 100% of the costs associated with screening a potential Brownfield to determine the levels of contamination such as Phase I and II ESAs.

11. St John’s, NB: **Residential Construction Challenges Grant** (see Table 4-2 item I): The City of St. John’s will cover 20% of the cost of remediating contaminated soils on Brownfield sites up to a maximum of $30,000.

12. Sudbury, ON: **Landfill Tipping Fee Rebate Program** (see Table 4-2 item I): Sudbury is encouraging the remediation and redevelopment of Brownfield sites by reducing the tipping fees by $36 per metric tonne for contaminated soil material deposited at the City’s landfills (provided the soil can be re-used to cover the landfill). The City offers $200,000 annually through the program, and the maximum incentive amount provided to each property will not exceed $40,000.

Many more examples are included in Appendix A: Examples of Municipal Incentive Programs.

### 4.1.2.2 Mixed Use Development

Some municipalities are incenting mixed use developments, where “mixed” uses can include any blend of residential, commercial, cultural, institutional or industrial uses as defined by the municipality, and are typically intended to be pedestrian friendly, encouraging people to live, work and play in a single neighbourhood. The rationale behind incenting mixed-use varies by region but tends to focus on reducing demand for transportation infrastructure by encouraging mixed uses near to each other (e.g: work / home / play), thus reducing the need to commute.

1. **Kelowna, BC: Tax Exemption program for mixed use development** (see report Table 4-2 item E): The city of Kelowna will provide developers with tax exemption incentives for mixed-use development in the urban core of the city. The incentives and amounts vary

---


according to the city’s three tax regions and are valued according to the cost of the revitalization. To be eligible for the incentive the project must be valued at or above $300,000.

   a. Tax Area 1: Offers a 100% municipal tax exemption on the cost of revitalizing a residential or commercial project;

   b. Tax Area 2: Aims to encourage larger developments. A project that has a minimum floor area of 3761m$^2$ is entitled to a 100% tax exemption for the revitalization costs. Residential and commercial developments smaller than 3716m$^2$ can respectively obtain 75% or 50% of the revitalization amount;

   c. Tax area 3: A 100% municipal tax exemption was formerly available for the revitalization amount for any project in the area. There are now no further exemptions for development in tax area 3 because development capacity has been saturated.

2. **Edmonton, AB:** Development Incentive Program for Mixed Use Development$^{14}$ (see Table 4-2 item I): Eligible projects include the building of residential units above commercial businesses. The development is eligible for $12,000 per residential unit, up to a maximum of 36 units.

3. **Medicine Hat, AB:** Live/Work Residential Development$^{15}$ (see report Table 4-2 item I): Offers property owners up to $5000 to develop residential living spaces with a minimum unit size of 93 square meters that is connected to their commercial building.

4. **St. Thomas, ON:** Residential Conversion, Rehabilitation and Intensification Program$^{16}$ (see report Table 4-2 item I): St. Thomas is providing grants to convert vacant space in downtown buildings into residential units. Eligible property owners may receive grants up to $5000 per residential unit up to $40,000 per application.

**4.1.2.3 Non-Brownfield Redevelopment**

Some municipalities have targeted certain lands within their municipal boundary for redevelopment and have used incentive programs to help attract local developers:

---


$^{15}$ https://www.medicinehat.ca/home/showdocument?id=3252

1. **Ajax, ON: Redevelopment Tax Rebate Program**\(^{17}\) (see Table 4-2 item C): Ajax offers a Redevelopment Tax Rebate Program refunding 80% of the annual property tax over 10 years on the increased portion of the property tax resultant from the redevelopment.

2. **Winnipeg, MB: Heritage Conservation Grant Program**\(^{18}\) (see Table 4-2 item C): The City of Winnipeg is providing incremental tax grants to facilitate the restoration and rehabilitation of vacant and underutilized heritage properties. A minimum of $10,000 in work or 20% of the assessed value prior to the renovation is required to qualify for the grant. The grant will last 12 years and is worth 80% of the incremental municipal taxes issued in the year after the occupancy permit has been issued.

3. **Grimsby, ON: Development Charge Exemption Program**\(^{4}\) (see Table 4-2 item D): Offering an exemption of 50% of the town’s development charge that is payable on commercial, residential, or mixed-use projects creating new residential units or commercial space. Residents can obtain an additional grant to cover the remaining 50% of the development charge if the development project is LEED certified, or includes 3 out of 5 of the region’s Smart Growth Principles. The program will be available for 5 years.

4. **Kelowna, BC: Rental Housing Tax Exemption Program**\(^{19}\) (see Table 4-2 item E): The program will provide a 100% municipal tax exemption on the costs associated with the revitalization, calculated according to the increase in the assessed value of improvements on the property resulting from the construction or alterations. Tax exemptions last for a maximum of 10 years. Eligible units must:
   a. have construction that adds floor space to an existing building, or a new building that costs $50,000 or greater;
   b. Total construction value must be $300,000 or greater.

5. **Ottawa, ON: Building Permit Fee Grant Program**\(^{20}\) (see Table 4-2 item F): Priority Areas: Grant equivalent to 30% of the building permit fee.

6. **Hamilton, ON: Downtown or Harbourfront Remediation Loan Program**\(^{21}\) (see Table 4-2 item G): A low interest loan equal to 80% of the cost of remediating a property, with a maximum of $400,000 per property or project.

---


\(^{19}\) https://www.kelowna.ca/homes-building/development-fees-cost-charges/developer-incentives


\(^{21}\) https://www.hamilton.ca/municipal-incentive-programs/brownfields/erase-programs/erase-community-improvement-plan
7. **Quesnel, BC: Official Community Plan – Density Bonus**\(^{22}\) (see Table 4-2 item H): Rezoning may be considered to allow increased densities of up to 120 dwelling units per net hectare (300 units per net acre) if:

a. Within a 5 min walk of downtown core or West Quesnel commercial area;

b. Amenities such as public gardens, plazas, playground, art, pedestrian and bicycle facilities are provided;

c. Primary vehicular access to development is from a major road that does not require travel through adjacent Low Density residential areas;

d. Max 3 stories of residential use.

8. **St. John’s, NB: Feasibility Study Grant**\(^{23}\) (see Table 4-2 item A): Intended to provide support for either a technical study or an engineering assessment for the feasibility of upper floor rehabilitation or redevelopment (ie: promoting intensification). The grant amount will cover 50% of the study to a maximum of $10,000.

9. **St. John’s, NB: Residential Density Rebate**\(^{23}\) (see Table 4-2 item H): Multi-year grant offers a 5.25% refund on the construction costs for eligible development projects, capped to a maximum grant amount of $35,000 in the first year, issued over 5 years as follows:

<table>
<thead>
<tr>
<th>Year Following Project Completion</th>
<th>Percentage of Construction Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>1.5%</td>
</tr>
<tr>
<td>Year 2</td>
<td>1.5%</td>
</tr>
<tr>
<td>Year 3</td>
<td>1.125%</td>
</tr>
<tr>
<td>Year 4</td>
<td>0.75%</td>
</tr>
<tr>
<td>Year 5</td>
<td>0.375%</td>
</tr>
<tr>
<td>Total Grant</td>
<td>5.25%</td>
</tr>
</tbody>
</table>

NOTE: St. John’s: offers a similar **Social Housing Density Rebate**\(^{23}\) (see Appendix A for detail).

10. **Edmonton, AB: Rehabilitation Incentive**\(^{24}\) (see Table 4-2 item I): The City of Edmonton will cover 50% of the project costs to a maximum of $75,000 for the rehabilitation of residential buildings and offer 50% of the project costs for commercial buildings.

11. **Langley, BC: Heritage Building Incentive Program**\(^{25}\) (see Table 4-2 item I): The City provides grants up to $10,000 to assist with the costs of restoring, repairing, or performing

---


\(^{24}\) [https://www.edmonton.ca/city_government/urban_planning_and_design/financial-rehabilitation-incentives.aspx](https://www.edmonton.ca/city_government/urban_planning_and_design/financial-rehabilitation-incentives.aspx)

required maintenance of heritage buildings to preserve the region’s heritage sites while encouraging further investment in their preservation.

4.1.2.4 Green Roof

Also referred to as living roofs (see Table 3-53 on page 34), these partially or completely covered roofs feature carefully selected vegetation, designed to change the underused roof space into an amenity while also providing technical benefit: holding rainwater to reduce strain on stormwater infrastructure, improving the urban canopy (ie: by expanding it over buildings), reducing urban heat island effect and supporting urban biodiversity. This tends to be a greater concern in larger urban centres and is less relevant for rural areas.

1. **Toronto, ON: Eco-Roof Incentive Program**\(^{26}\) (*see Table 4-2 item I)*: The City of Toronto Eco-Roof Incentive Program provides a potential $75/m\(^2\) up to a max of $100,000 for green roof projects. Existing buildings, and new buildings not subject to the Green Roof By-Law, are eligible for project funding.

   Eligible Green Roof Projects:

   a. New residential, industrial, commercial, and institutional buildings with a gross floor area of less than of 2,000 square metres;

   b. New and existing Toronto Public and Separate School Board buildings of any size.

4.1.2.5 Urban Agriculture Provisions

As urban regions continue to densify, they continue to increase their needs for food and the corresponding strain on local transportation and delivery systems and infrastructure. Many densifying regions are very interested in ways to increase food security and independence as they grow and densify, and are actively promoting various forms of urban agriculture.

1. **Cambridge, ON: Development Charge Rebate**\(^{27}\) (*see Table 4-2 item D)*: Cambridge may exempt the development charges on the construction of a new building for the purposes of farming.

2. **Toronto, ON: Green Roof Program**\(^{28}\) (*see Table 4-2 item I)*: The City of Toronto will fund the development of rooftop gardens as a component of the Green Roof Program.

---

\(^{26}\) Toronto Eco-roof Incentive Program. Retrieved from [http://www1.toronto.ca/wps/portal/contentonly?vgnextoid=3a0b506ec20f7410VgnVCM10000071d60f89RCRD](http://www1.toronto.ca/wps/portal/contentonly?vgnextoid=3a0b506ec20f7410VgnVCM10000071d60f89RCRD)


4.1.3 **Incentive Topics: Energy**

Of particular interest to this study are incentives that support energy related efforts. The following subsections summarize examples of energy and green building related incentive programs from various municipalities across Canada:

4.1.3.1 **Green Building Standards**

This section shows a sample of incentive programs which encourage green building design and construction, including the use of third party Green Building Standards (which are described in greater detail in section 4.6.1 below).

1. **Hamilton, ON: LEED Grant Program**\(^{29}\) *(see Table 4-2 item I)*: The city of Hamilton is supporting the use of the LEED rating system by offering grants to subsidize the cost of LEED certified construction for most building types, calculated based on the rating of official certification under the LEED rating system, and lasting for a period of five years. The grant amount will not exceed 75% of the property tax increases during the first 5 years after the building obtains LEED certification. The grant ends following the five-year period or when the city’s share of the incremental construction cost has been granted in full.

<table>
<thead>
<tr>
<th>LEED Rating level:</th>
<th>Certified</th>
<th>Silver</th>
<th>Gold</th>
<th>Platinum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assumed Incremental Construction Cost:</td>
<td>1%</td>
<td>3%</td>
<td>5%</td>
<td>8%</td>
</tr>
<tr>
<td>Applicant Share:</td>
<td>0.5%</td>
<td>1.5%</td>
<td>2.5%</td>
<td>4%</td>
</tr>
<tr>
<td>City Grant Contribution:</td>
<td>0.5%</td>
<td>1.5%</td>
<td>2.5%</td>
<td>4%</td>
</tr>
</tbody>
</table>

2. **Edmonton, AB: Energy Audit Rebate Program**\(^{30}\) *(see Table 4-2 item A)*: The City of Edmonton will provide a one-time rebate of up to $5000 per eligible building to cover the cost of an energy audit. For owners or ownership groups that complete the submission process by November 30, 2018, an additional $5000 can be obtained. An owner or ownership group can obtain a maximum of three rebates. To be eligible, the building must:

   a. Be a member of Edmonton’s Building Energy Benchmarking pilot program and be willing to participate in the program in future years;

   b. Complete an American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Level 2 commercial energy audit since January 1st, 2018;

   c. Share the energy audit report with the City with proof of payment for the audit service.


\(^{30}\) [http://ace.edmonton.ca/energuide/energuide-rebate-program/](http://ace.edmonton.ca/energuide/energuide-rebate-program/)
3. **Langley, BC: Langley Green Building Permit Program**\(^{31}\) *(see Table 4-2 item 1)*: Incentivizes new construction to maximize the energy efficiency of new homes. The total rebate provided ranges according to the home’s performance:

*For single family detached homes:*

- Level 1: $500 for achieving 10% lower than ERS reference house or Built Green Silver certification;
- Level 2: $750 for achieving 15% lower than ERS reference house;
- Level 3: $1000 for achieving 20% lower than ERS reference house, Built Green Gold or Built Green Platinum;
- Level 4: $1500 for achieving 40% lower than ERS reference house, or certified to R-2000, Passive House, or Net-Zero.

*For Row home units, townhouse units or duplex’s:*

- Level 1: $100 per unit for achieving 10% lower than ERS reference house or Built Green Silver;
- Level 2: $200 per unit for achieving 15% lower than ERS house;
- Level 3: $300 per unit for achieving 20% lower than TS reference house, Built Green Gold or Built Green Platinum;
- Level 4: $500 per unit for achieving 40% lower than ERS reference house, R-2000 Standard, Passive House Certification, or Net-Zero.

4.1.3.2 **Electric Vehicles (EVs)**

Government agencies at every level are keenly watching the emerging Electric Vehicle market. Some governments are implementing programs targeted at purchasers, encouraging the purchase of EVs. Others are offering programs subsidizing the installation of charging infrastructure. Others are changing the building codes to require various levels of charging infrastructure be implemented in new construction. Municipal governments are presently leaving EV programs to the provinces, so there were no municipal incentive programs supporting EVs identified by the research team at the time of this report.

4.1.3.3 **On-Site Renewables: Solar / Wind / Geo**

Renewable energy tends to be a utility issue rather than a municipal one, and accordingly the support programs and incentives available for renewable energy tend to be managed at the

---

\(^{31}\) [https://efficiencybc.ca/incentives/township-of-langley-green-building-permit-program/](https://efficiencybc.ca/incentives/township-of-langley-green-building-permit-program/)
Provincial or even Federal levels. Refer to sections 4.2 and 4.4 below. What follows below is a sample of available municipal programs:

1. Toronto, ON: **Home Energy Loan Program (HELP)**\(^{32}\) (see Table 4-2 item G): The HELP program provides homeowners with loans that are paid back at interest rates of 2 percent over terms ranging up to 15 years on the resident’s property tax bill. Loans are provided to cover the initial capital costs of energy and water efficient retrofits including solar hot water heaters and solar PV panels.

2. Edmonton, AB: **Solar PV Rebate Program**\(^{33}\) (see Table 4-2 item I): Edmonton has partnered with Energy Efficiency Alberta to expand the provincial solar energy incentives with their own municipal incentive that offers residential property owners an additional $0.15 per Watt on top of the provincial incentive of $0.75 per Watt.

3. Medicine Hat, AB: **Hat Smart Program – Solar Electric Panels Rebate**\(^{34}\) (see Table 4-2 item I): The municipality of Medicine Hat will provide rebates to homeowners installing Solar PV systems on their home. The solar PV system must be installed by a qualified service provider. The rebated amount is determined by the size of the system that the resident installs, beginning at $0.75 per installed watt to a maximum of $5000.

**4.1.3.4 Cool Roof**

This is a roof designed to reflect more sunlight and absorb less heat than standard roofs. Cool roofs can be made of highly reflective paint, a sheet covering, reflective tiles or shingles.

1. Toronto: **Eco-Roof Incentive Program**\(^{32}\) (see Table 4-2 item I): Provides $2-$5/m\(^2\) up to a max of $50,000 for cool roof projects. Eligible Cool Roof Projects must cover 100% of the roof area of the building, excluding mechanical equipment or other environmental technologies.

**4.1.4 INCENTIVE TOPICS: WATER**

Many urban regions across Canada are increasingly struggling with the security and quality of their water supply. The following are a sampling of programs that have emerged around themes related to water:

**4.1.4.1 Indoor Conservation**

1. Guelph, ON: **Blue Built Home Water Efficiency Standards and Rebate Program**\(^{35}\) (see Table 4-2 item I): Guelph has devised their own metrics for water efficiency, and is providing

---

\(^{32}\) [https://www.toronto.ca/services-payments/grants-incentives-rebates/](https://www.toronto.ca/services-payments/grants-incentives-rebates/)


\(^{35}\) [https://guelph.ca/living/environment/rebates/](https://guelph.ca/living/environment/rebates/)
a cash rebate of up to $2465 for specific water savings equipment recognized in their program (particularly greywater related equipment). A lesser amount is available to incent the retrofit of existing homes. Details are in Appendix A.

2. **Kingston, ON: Water Efficiency Retrofit Incentive Program**\(^36\) (WERIP) (see Table 4-2 item I): The WERIP program provides $5 per m\(^3\) of combined water and sewer savings up to a cap of 20% of eligible project costs. The project must save more than 80 m\(^3\) annually to be eligible. Social housing providers receive incentives up to 50% of qualifying project costs. Eligible projects include:
   
   a. Toilet replacement;
   
   b. Retrofits to commercial laundry equipment;
   
   c. Retrofits to commercial kitchen equipment;
   
   d. Other projects that can display that they permanently reduce both water consumption and sewer discharge.

3. **Okotoks, AB: Xeriscaping Pilot Program**\(^37\) (see Table 4-2 item I): A 50% rebate for the total cost of the project up to a maximum of $1000 is provided for a pre-approved xeriscaping project (water efficient landscape design) that converts a minimum of 500 square feet into xeriscape land and 50% of the new xeriscape area is drought tolerant plants. The rebate includes associated costs such as; soil amendment, turf removal, drought tolerant plants (see rebate above), and mulch/ground cover.

4. **Toronto, ON: Capacity Buy Back Program**\(^38\) (see Table 4-2 item I): The City has a Capacity Buy Back Program where they will compensate a commercial or institutional organization that has reduced their water usage, giving them a cheque for up to $0.30/L of water saved.

4.1.4.2 **Stormwater**

1. **Kitchener, ON: Storm Water Credit Policy**\(^39\) (see Table 4-2 item I): The City of Kitchener Stormwater Credit Program offers a 45% credit on their stormwater fee portion of the water utility invoice to both residential and non-residential properties for things like rain barrels and certain landscaping features which reduce stormwater runoff.

---


\(^{38}\) [https://www.toronto.ca/services-payments/grants-incentives-rebates/](https://www.toronto.ca/services-payments/grants-incentives-rebates/)

\(^{39}\) [https://www.kitchener.ca/en/resourcesGeneral/Documents/DSD_ENG_Stormwater_Policy_Memo1_BackgroundAndPurpose.pdf](https://www.kitchener.ca/en/resourcesGeneral/Documents/DSD_ENG_Stormwater_Policy_Memo1_BackgroundAndPurpose.pdf)
4.1.4.3 Rainwater

1. **Guelph, ON: Rainwater Harvesting System Rebate**\(^\text{40}\) (see Table 4-2 item I): The Rainwater Harvesting System Rebate provides $0.10/L of tank storage for a seasonal outdoor system and a $2,000 rebate on an all-season indoor/outdoor system.

2. **Kitchener, ON: Rain Water Program Rebate Programs**\(^\text{41, 42}\) (see Table 4-2 item I): The City of Kitchener offers two Rain Water Incentive programs:
   a. **Soak it up!**: Part of Kitchener’s RAIN Smart Neighbourhoods project, this program provides incentives for landscaping solutions that implement rain gardens, infiltration galleries, and permeable paving. The incentives are provided for water saved:
   
<table>
<thead>
<tr>
<th>Water Saved</th>
<th>Incentive Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>2500 L or more</td>
<td>$1500</td>
</tr>
<tr>
<td>1500 L to 2499 L</td>
<td>$1250</td>
</tr>
<tr>
<td>800 L to 1499 L</td>
<td>$750</td>
</tr>
<tr>
<td>799 L or less</td>
<td>$100</td>
</tr>
</tbody>
</table>

   b. **Slow it down!**: As part of the RAIN Smart Neighbourhoods project, incentives are provided for projects that capture rain water such as cisterns and rain barrels. The incentive amount is determined by the amount of water saved:

<table>
<thead>
<tr>
<th>Water Saved</th>
<th>Incentive Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1500 L or more</td>
<td>$500</td>
</tr>
<tr>
<td>800 L to 1499 L</td>
<td>$150</td>
</tr>
<tr>
<td>799 L or less</td>
<td>$25</td>
</tr>
</tbody>
</table>

3. **Okotoks, AB: Residential Rainwater Harvesting System**\(^\text{43}\) (see Table 4-2 item I): The City of Okotoks will provide a 50% rebate for the total cost of a rainwater harvesting system to a maximum of $750 per household for residential scaled tank systems/cisterns that collect a minimum of 4546 litres of rainwater. The city also will rebate the costs of system expenses, including transport piping, debris traps, filters, pumps, and the costs associated with the installation of the system and its components.

4.1.4.4 Greywater

1. **Guelph, ON: Greywater Rebate Program**\(^\text{44}\) (see Table 4-2 item I): The City of Guelph offers a Greywater Rebate Program that provides a $1,000 rebate on the purchase of a greywater

---

\(^{40}\)\url{http://guelph.ca/living/environment/rebates/rainwater-harvesting-system-rebate/}

\(^{41}\)\url{https://www.kitchener.ca/en/resourcesGeneral/Documents/DSD_ENG_Stormwater_Policy_Memo1_BackgroundAndPurpose.pdf}

\(^{42}\)\url{https://reepgreen.ca/what_we_offer/community-action/rain/rain-smart-neighbourhoods/incentives-homes-involved-rain-smart-neighbourhoods-project/}

\(^{43}\)\url{https://www.okotoks.ca/sustainability/rebate-programs/water-conservation-rebate-program}

\(^{44}\)\url{http://guelph.ca/living/environment/rebates/greywater/}
system with minimum storage capacity of 150L and minimum levels of integrated water quality control (ie: can maintain chlorine residual and remove particulate and debris).

4.2 PROVINCIAL PROGRAMS AND INCENTIVES

This study focuses primarily on incentives and programs that municipal bodies can most appropriately and effectively employ. By extension, it is worth being mindful of what incentives are offered at the provincial and federal levels in order to better coordinate with and leverage (not compete) with those programs.

Note that provinces and municipalities have different legislative powers and responsibilities, and therefore have different tools available to them for the purposes of incenting more sustainable construction. As shown in Table 4-3 below, many municipal incentive models simply do not apply at the Provincial level and have thus been shown in faded grey. The columns in Table 4-3 have otherwise been kept the same as those in Table 4-2 for the purposes of comparison.

Table 4-3: Provincial Incentive Programs

<table>
<thead>
<tr>
<th>METHODS OF INCENTING</th>
<th>INCENTIVE TOPICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programs, Incentives, Rebates</td>
<td>Energy</td>
</tr>
<tr>
<td>Feasibility Study Grant</td>
<td>Green Buildings</td>
</tr>
<tr>
<td>Tax Assistance Plan*</td>
<td>Net Zero Building</td>
</tr>
<tr>
<td>Property Tax Exemption</td>
<td>Electric Vehicle</td>
</tr>
<tr>
<td>Development Charge Rebate</td>
<td>Appliances / Equipment</td>
</tr>
<tr>
<td>Building Permits Rebate</td>
<td>On-Site Renewables</td>
</tr>
<tr>
<td>Remediation Loan</td>
<td>Cool Roof</td>
</tr>
<tr>
<td>Density Bonus</td>
<td>Indoor Conservation</td>
</tr>
<tr>
<td>Cash Rebate**</td>
<td>On-Site Conservation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alberta</td>
<td>x</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>British Columbia</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manitoba</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Brunswick</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Newfoundland</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northwest Territory</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nova Scotia</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nunavut</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ontario</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prince Edward Island</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quebec</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saskatchewan</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yukon Territory</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

© 2019, The Corporation of the City of London
www.s2etech.com/fcm-gmf
* Tax Assistance Plans may only be invoked on provincial tax instruments like PST (Provincial Sales Tax) or the provincial portions of HST (Harmonized Sales Tax).

** Cash Rebates for provincial incentive programs are often enabled through provincially owned utility corporations, provincial regulatory bodies, or similar agencies which have been grouped together in section 4.3 below.

Note that the ‘u’ subscript denotes that the Method of Incenting referenced (by letter ‘X’) is delivered through a provincially owned utility.

It should be mentioned that most provincial energy incentives are delivered through partnerships with, or through provincially owned, utility companies. Refer to section 4.4 and Appendix A, section A.5 for a comprehensive list of energy related incentives.

For a comprehensive list of Provincial Incentives, refer to Appendix A, section A.4.

4.2.1 ALBERTA

1. Climate Leadership Adjustment Rebate\(^{45}\) (see Table 4-3 item C): The Alberta Climate Leadership Adjustment Rebate (ACLAR) is a non-taxable amount paid to low and middle-income individuals and families. It is intended to help households adjust to the new provincial carbon price. From July 2018 to June 2019 residents may be eligible to receive:

   a. $300 for a single individual with no children;

   b. $450 if you have a spouse or common-law partner;

   c. $450 if you do not have a spouse or common-law partner, but have full custody of an eligible child;

   d. An additional $45.00 for each child under the age of 18 (to a maximum of 4 children).

For single individuals with no children, the rebate is reduced by 2.67% of adjusted family net income over $47,500. For families, the credit is reduced by 4.0% of adjusted family net income over $95,000. Payments are made in July, October, January, and April separately from the GST/HST credit payments. The program is fully funded by the Alberta provincial government.

Strictly speaking, this tax rebate does not incent any behaviour noted as desirable in Table 4-3. This item has been included for reference purposes only, because it relates to the Alberta

Carbon Tax which otherwise is used to incent several of the items noted in Table 4-3, but delivered through the provincially administered utility system (refer to section 4.3 below).

2. **Farm Energy and Agri-Processing Program (FEAP)**\(^{46}\) (Table 4-4 item I): The Farm Energy and Agri-Processing Program shares costs with the agriculture and agri-processing sector on energy efficient investments. The program is designed to encourage energy management, which will result in cost savings, energy conservation, and ultimately, reduced greenhouse gas emissions. The Program offers financial support under certain conditions to applicants who incorporate high efficiency equipment that is identified in the applicable funding list in their construction and/or retrofit project. Eligible incentive topics include:

   a. Submetering;
   b. Variable Speed Drive for Irrigation Pivots;
   c. Energy Efficiency on Dairy Farms;
   d. Lighting in Dairy, Poultry, and Swine Production;
   e. Space Heating in Poultry and Swine Production;

3. **Custom Energy Solutions Program**\(^{47}\) (see Table 4-3 item I): This program helps large facilities improve productivity, save energy and money by upgrading old, inefficient equipment and making other energy improvements. Account managers work directly with industrial customers to identify their specific needs. The program offers end-to-end support and incentives to implement the most cost-effective enhancements in participants’ facilities. Individual facilities with over 10,000 tonnes of annual GHG emissions are eligible for incentives up to $1 million per year and parent facilities implementing Customer Energy Solutions projects in multiple facilities are eligible for incentives up to $2 million per year. Facilities with less than 10,000 tonnes are eligible for incentives up to $250,000 per year for individual facilities and $500,000 per year for parent facilities. Eligible upgrades include:

   a. Process improvements;
   b. Heat recovery systems;
   c. Boiler controls and boiler systems;
   d. Building controls;

---

\(^{46}\) Alberta Agriculture and Forestry Farm Energy and Agri-Processing Program (FEAP) (2018). [https://www1.agric.gov.ab.ca/general/progserv.nsf/All/pgmsrv462](https://www1.agric.gov.ab.ca/general/progserv.nsf/All/pgmsrv462)

\(^{47}\) [https://www.efficiencyalberta.ca/customsolutions/](https://www.efficiencyalberta.ca/customsolutions/)
e. Insulation;
f. Gas compression;
g. Gas pumping;
h. Variable frequency drives (VFDs);
i. Compressed air;
j. Refrigeration;
k. Water/wastewater.

4. **Residential and Commercial Solar Program** (see Table 4-4 item 1): This program offers rebates to homeowners, businesses and non-profits that install Solar PV systems. The Province provides $0.75/W from Energy Efficiency Alberta, which can be supplemented by the local municipality (eg: Edmonton adds $0.15/W). The maximum residential payment will be the lesser of $10,000 or 30% of eligible system costs. The maximum commercial payment will be the lesser of $500,000 or 25% of eligible system costs.

5. **Municipal Climate Change Action Center** (see Table 4-4 item 1): The MCCAC provides technical assistance, expertise, and limited funding programs to support Alberta municipalities in reducing their greenhouse gas emissions and improving energy efficiency.

### 4.2.2 British Columbia

1. **Climate Action Tax Credit** (see Table 4-3 item C): The BC climate action tax credit (BCCATC) is a non-taxable payment made to low-income individuals and families to help offset the carbon taxes they pay. The program provides a credit of up to $35.00 for an individual, $135.00 for a spouse or common-law partner and $40.00 per child ($135.00 for the first child in a single parent family). The maximum quarterly amounts are $33.75 for an individual and a spouse or common law partner (or first child in a single parent family) and $10.00 per child. For single individuals with no children, the credit is reduced by 2% of his or her adjusted net income over $33,993. For families, the credit is reduced by 2% of their adjusted family net income over $39,658. The payment is combined with the quarterly

---

48 http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/policy_e/results.cfm?searchType=default&sectoranditems=all%7C0&max=10&categoryID=all&regionalDeliveryId=10&programTypes=4&keywords=&pageId=2

49 Natural Resources Canada (2018).

http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/policy_e/results.cfm?searchType=default&sectoranditems=all%7C0&max=10&categoryID=all&regionalDeliveryId=10&programTypes=4&keywords=&pageId=2

payment of the federal GST/HST credit. The BC low income climate action tax credit is fully funded by the BC provincial government.

Strictly speaking, this tax rebate does not incent any behaviour noted as desirable in Table 4-3. This item has been included for reference purposes only, because it relates to the Alberta Carbon Tax which otherwise is used to incent several of the items noted in Table 4-3, but delivered through the provincially administered utility system (refer to section 4.3 below).

2. **Clean Energy Vehicle Program**\(^{51}\) *(see Table 4-4 item I)*: Incentives for battery electric and hydrogen fuel cell vehicles, investments in charging infrastructure and hydrogen fuelling infrastructure, additional support for fleets to adopt CEVs, and investments in research, training and outreach. To make clean energy vehicles more affordable and reduce greenhouse gas emissions, the Province will offer incentives of up to $5,000 for the purchase or lease of a new battery electric or plug-in hybrid electric vehicle, and up to $6,000 for a hydrogen fuel cell vehicle.

3. **BC Scrap-It Program**\(^{52}\) *(see Table 4-4 item I)*: Scrap-It is a voluntary early retirement vehicle program providing incentives to help British Columbians replace higher polluting vehicles with cleaner forms of transportation. Owners of Model Year 2000 or older vehicles are able to choose from a list of incentives, including transit passes, bicycles, car sharing memberships, new or used cars, or $200 cash.

4. **Speciality Use Vehicle Incentive**\(^{52}\) *(see Table 4-4 item I)*: The SUVI Program provides the purchaser or lessee of an eligible vehicle an incentive depending on the vehicle type purchased. The vehicle incentive will be limited to a maximum of 35% of the vehicle MSRP regardless of the total available incentive amount indicated in a vehicle category. The amounts are subject to change and may be adjusted during the program period.

### 4.2.3 MANITOBA

1. **Net Metering Program**\(^{53}\) *(see Table 4-4 item I)*: This program allows users to first offset their hydro bill on a 1:1 basis and the excess energy that is produced is sold to the grid at a reduced rate of $0.03/kWh. Unlike most Provinces, Manitoba will pay net-metered customers for their surplus energy.

### 4.2.4 NEW BRUNSWICK

1. **Energy Audit Program**\(^{54}\) *(see report Table 4-4 item A)*: This program provides rebates for the costs of an energy audit to determine the potential for energy efficiency upgrades in a commercial building. The provided incentives are as follows:

---


a. 50% of energy audit cost up to $1,110 for a building that is up to 15,000 square feet;

b. 50% of energy audit cost up to $2200 for a building that is 15,000 to 75,000 square feet;

c. 50% of energy audit cost up to $3300 for a building that is 75,000 square feet or larger.

2. Commercial Solar Rebate Program\textsuperscript{55} (see report Table 4-4 item 1): This program will provide commercial customers with a rebate of $30/GJ of electricity saved up to a maximum of $75,000.

4.2.5 Newfoundland and Labrador

1. Home Energy Savings Program\textsuperscript{56} (HESP) (see Table 4-4 item 1): Households with low income (under $32,000) who use more than 15,000 kWh of electricity annually are eligible for incentives to reduce their energy consumption by up to $5000.

4.2.6 Northwest Territories

All the programs offered in the Northwest Territories seemed, at the time of this report, to be offered through the utility system. Refer to section 4.3.6 below.

4.2.7 Nova Scotia

1. Heat Pump Incentives\textsuperscript{57} (see Table 4-4 item 1): Efficiency Nova Scotia is offering numerous rebates to encourage residents to install both air source heat pumps and geothermal heat pumps. Refer to Appendix A for further detail (section A.5.7).

2. Commercial and Industrial New Construction Program\textsuperscript{57} (see Table 4-4 item 1): Efficiency Nova Scotia is working with developers of commercial buildings who are planning construction, expansion, or a significant renovation to design an energy efficient plan that will lower energy costs while helping to track the buildings performance. Incentives of up to $500,000 and built year financing plans are offered to lower the upfront equipment and labour costs.

3. Custom Solutions Incentive Program\textsuperscript{57} (see Table 4-4 item 1): Offers medium and large businesses help with implementing electrical and energy-saving projects by offering technical assistance, financial incentives, and financing to offset the costs of engineering studies, energy efficiency equipment and installation. Incentive amounts are determined on a project-by-project basis and vary depending on the size, energy saving effectiveness of the


\textsuperscript{56} Newfoundland and Labrador Housing (nd). \url{http://www.nlhc.nf.ca/programs/programsHesp.html}
measure, the equipment involved, and the financial need of the company. The maximum available incentive for each project is:

   a. 50% of the cost of a preliminary energy audit/scoping study to a maximum of $1000;

   b. 50% of eligible project costs to a maximum of $500,000;

   c. On bill financing for up to 2 years;

   d. Feasibility studies are now eligible for incentives: Efficiency Nova Scotia will contribute up to 100% of the cost to a maximum of $15,000 in which Efficiency Nova Scotia pays 50% of the incentive amount for feasibility and scoping studies, and the remaining half of the incentive is paid when the project begins.

4. **Nova Scotia Solar Homes**\(^57\) (see Table 4-4 item 1): Efficiency Nova Scotia will provide a rebate of $1.00/watt for eligible Solar PV systems. For most systems, the rebate will equate to approximately 30% of the total system cost. The average rebate is approximately $7000. The maximum rebate is $10,000 or 40% of the eligible system costs.

5. **Nova Scotia- Your Energy Rebate Program**\(^57\): designed to help Nova Scotians with the rising cost of home energy. For most participants, the rebate will be automatically taken off the bill by the power company and fuel distributors (oil, propane (home-delivered), natural gas). For other energy sources, such as firewood and wood pellets, Nova Scotians will be able to apply for the rebate. The rebate amount is determined according to the total eligible cost of residential energy use and is equivalent to the provincial portion of the HST.

6. **Solar Thermal Equipment Rebates**\(^57\) (see Table 4-4 item 1): Residents can receive the following rebates for Solar Thermal Equipment:

   a. Solar Thermal: Air to Air: Residents can receive $400/System for a CSA Class 2831-06, 2831-07, 2831-30, 2831-37 or Class 8854 model. The system must be designed for heating season operation and installed according to best practice and manufacturer instructions.

   b. Solar Thermal: Domestic Hot Water: Residents can receive $1000/System for a CSA Class 2831-06, 2831-07, 2831-30, 2831-37 or Class 8854 models. The system must be designed for year-round operation and installed according to industry best practice and manufacturer instructions, with minimum R3 insulation on piping connecting the water storage tank to the solar collector(s) and existing water heater.

4.2.8 Nunavut

1. **Home Renovation Program** (see Table 4-4 item I): This Program provides financial, program and technical assistance to homeowners who wish to carry out major repairs, renovations and additions to their home. Where an applicant has already received assistance to renovate their home, they may apply for an additional $15,000 to improve the energy efficiency of their dwelling.

4.2.9 Ontario

1. **The Ontario energy and property tax credit** (OEPTC): a modest tax credit designed to help low to moderate income Ontario residents with the sales tax on energy and with property taxes.

2. **The Northern Ontario energy credit (NOEC)**: designed to help low to moderate income Northern Ontario residents with the higher energy costs they face living in the north.

3. **SMART Green Program** (see Table 4-4 item I): The Canadian Manufacturers and Exporters (CME) has partnered with the Government of Ontario to launch a $25 million SMART Green fund to help small and medium sized manufacturers reduce their GHG emissions and improve their energy efficiency. Payments are provided in non-repayable grants of 50% of eligible project costs up to $500,000.

4.2.10 Prince Edward Island

1. **Home Energy Low-Income Program (HELP)** (see Table 4-4 item I): Low income clients who applied for the PEI Energy Efficiency Loan or Grant Program are eligible to have a HELP tradesperson complete a comprehensive air-sealing (caulking and weather-stripping on windows and doors) free of charge. Other free features of the HELP program include: installation of a programmable thermostat, a low flow shower head, a voucher for a free furnace cleaning (up to $80 in value), and compact fluorescent light bulbs (ENERGY STAR® CFL and LED).

2. **New Home Construction Program** (see Table 4-4 item I): This program helps residents make their homes more energy efficient. A Certified Energy Advisor must review the

---

58 Natural Resources Canada (2018). [http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/policy_e/details.cfm?searchType=default&sectoranditems=all%7C0&max=10&pageId=6&categoryID=3&regionalDeliveryId=all&programTypes=4,6,9,11,12&keywords=&ID=48](http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/policy_e/details.cfm?searchType=default&sectoranditems=all%7C0&max=10&pageId=6&categoryID=3&regionalDeliveryId=all&programTypes=4,6,9,11,12&keywords=&ID=48)


building plans before construction begins and provides customized recommendations to improve the energy efficiency of the design. Two tiers of rebates are available:

a. ENERGY STAR® for new Homes or EnerGuide rating of 20% better than code will receive a rebate of $2000;

b. R2000 or EnerGuide rating 50% better than code will receive a rebate of $5000.

3. **Commercial Energy Audit Program**\(^6^3\) (see Table 4-4 item A): This Program provides financial incentives of up to $1,000 towards an evaluation to determine the potential for energy efficiency upgrades in commercial buildings.

**4.2.11 QueBec**

1. **Charging Station Rebate**\(^6^4\) (see Table 4-4 item I): Financial assistance is available under the program upon the purchase or lease of an all-electric vehicle, a plug-in hybrid vehicle, a low-speed electric vehicle or an electric motorcycle, up to a maximum of $600. More specifically, assistance is granted as two amounts:

   a. $350 for the purchase of an eligible charging station;

   b. $250 for the installation of the charging station and its power supply infrastructure.

2. **Drive Green Program**\(^6^4\) (see Table 4-4 item I): This Program offers individuals, businesses, organizations and Québec municipalities a rebate of up to $8000 on the purchase or lease of eligible new electric vehicles, depending on vehicle type and certain conditions (selling price, electric battery capacity, model year, year of purchase).

3. **RenoVert Tax Credit**\(^6^4\) (see Table 4-4 item C): This refundable tax credit has been introduced on a temporary basis to encourage individuals to invest in recognized eco-friendly home renovation work that has a positive environmental impact or improves their dwelling’s energy efficiency. The list of recognized eco-friendly renovation work includes:

   a. Replacement or addition of doors, windows and skylights with ENERGY STAR® certified models for the climate zone where the dwelling is located;

   b. Installation of an ENERGY STAR® certified central split or ductless mini-split air-source heat pump;

   c. Replacement of a window air-conditioning unit or central air-conditioning system with an ENERGY STAR® certified central split or ductless mini-split air-conditioning system;

---


d. Replacement of an oil-fired water heater with an ENERGY STAR® certified instantaneous water heater that has an energy factor (EF) of at least 0.90.

4.2.12 SASKATCHEWAN

1. **25 Acts of Energy Conservation**[^65]: 25 Acts of Energy Conservation is a K - 12, province-wide action campaign that promotes energy conservation all school year, culminating in a month of daily activities between Earth Hour and Earth Day. Schools learn about and take action to conserve energy or water, or reduce waste. Schools register in the fall, and begin inquiry and action projects, create videos or presentations, and submit their campaigns to be entered to win up to $1000 for their school. The Program offers campaign ideas, lessons, and daily announcements.

2. **Solar Power Rebate Program**[^66] (see Table 4-4 item 1): Residents who install a system under SaskPower’s Net Metering Program are eligible for a rebate worth 20% of the total system costs, including installation (to a maximum of $20,000).

4.2.13 YUKON

1. **Super Insulated New Homes**[^67] (see Table 4-4 item 1): A rebate of $10,000 is available when a super-insulated home is built to an EnerGuide rating of >50% improvement over the building code (2015 NBC).

2. **Renewable Energy Systems**[^68] (see Table 4-4 item 1): A rebate of up to $5000 is available for renewable energy systems including:
   a. $800 per kW rebate to a maximum of $5000 per system per year;
   b. Includes solar PV, wind, hydro, biomass, and geothermal systems;
   c. 20% of eligible solar water heating systems (CSA F379 rated, with CSA-approved solar heat storage) up to $1200.

3. **Feed-in-Tariff Program**[^69] (see Table 4-4 item 1): For grid-tied systems, members of the Micro-Generation Program are able to sell their surplus energy back to the grid.

4.2.14 ELECTRIC VEHICLE (EV) PROGRAMS

Because the topic of EV’s has been of such significant interest to all levels of government over the past decade, the above referenced programs related to EV’s have been consolidated and

[^65]: [http://environmentalsociety.ca/programs/k-12-school-programs/25-acts/](http://environmentalsociety.ca/programs/k-12-school-programs/25-acts/)
[^67]: [http://goodenergyyukon.ca/renovations](http://goodenergyyukon.ca/renovations)
[^69]: [http://goodenergyyukon.ca/energy-systems](http://goodenergyyukon.ca/energy-systems)
Table 4-4: Electric Vehicle Incentives

<table>
<thead>
<tr>
<th>Province</th>
<th>Program Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>QC</td>
<td>Electric Vehicle Incentive Program</td>
</tr>
<tr>
<td></td>
<td>The Province of Quebec offers up to $8,000 off the purchase of an electric vehicle. This includes fully electric cars, plug-in hybrid electric cars, hybrid cars, hydrogen fuel cell cars and electric motorcycles. In Quebec, you also qualify for up to $4,000 off the purchase of a used electric vehicle. For more information: <a href="http://vehiculeselectriques.gouv.qc.ca/english/particuliers/vehicules-electriques.asp">http://vehiculeselectriques.gouv.qc.ca/english/particuliers/vehicules-electriques.asp</a></td>
</tr>
<tr>
<td>QC</td>
<td>Electric Vehicle Charging Incentive Program</td>
</tr>
<tr>
<td></td>
<td>The Province of Quebec offers $350 for the purchase of a home charger and $250 for the installation for a combined incentive of $600 off your home charger. For more information and to apply, visit: <a href="http://www.vvehiculeselectriques.gouv.qc.ca/">Vehicules Electriques</a></td>
</tr>
<tr>
<td>QC</td>
<td>The Electric Circuit/Le Circuit Électrique</td>
</tr>
<tr>
<td></td>
<td>Through Hydro Québec, the Province of Québec builds and maintains the Electric Circuit, Canada’s first and largest network of public charging stations. For more information, visit: <a href="https://lecircuitelectrique.com/welcome">https://lecircuitelectrique.com/welcome</a></td>
</tr>
<tr>
<td>BC</td>
<td>Clean Energy Vehicle Program (CEV for BC)</td>
</tr>
<tr>
<td></td>
<td>The Province of British Columbia offers up to $5,000 off the purchase of a battery electric, fuel cell electric or plug-in hybrid electric vehicle and up to $6,000 for a hydrogen fuel cell vehicle. For more information, visit: <a href="https://www.cevforbc.ca/">https://www.cevforbc.ca/</a></td>
</tr>
<tr>
<td>BC</td>
<td>SCRAP-IT</td>
</tr>
<tr>
<td></td>
<td>Trade in your old gas car for an electric car and receive up to $6,000 to buy a brand new electric car and up to $3,000 to buy a used electric car. For more information, visit <a href="https://scrapit.ca/">https://scrapit.ca/</a></td>
</tr>
<tr>
<td>BC</td>
<td>Specialty Use Electric Vehicle Program</td>
</tr>
<tr>
<td></td>
<td>The Province of British Columbia offers between $20,000-$50,000 for specialty use electric vehicles such as heavy duty trucks and buses. For more information, visit <a href="https://pluginbc.ca/specialty-use-electric-vehicle-program/">https://pluginbc.ca/specialty-use-electric-vehicle-program/</a></td>
</tr>
<tr>
<td>BC</td>
<td>Home Charging Incentive</td>
</tr>
</tbody>
</table>

---

70 [https://www.plugndrive.ca/discover-electric-vehicles/electric-vehicle-incentives/](https://www.plugndrive.ca/discover-electric-vehicles/electric-vehicle-incentives/)
Receive 75% of the purchase and installation of a Level 2 home charging station to a maximum of $750. For more information, visit https://pluginbc.ca/charging-program/charging-solutions-incentives/  

<table>
<thead>
<tr>
<th>BC</th>
<th>Multi-Residential Building Charging Incentive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receive 75% of the purchase and installation of Level 2 charging stations to a maximum of $4,000 per station and a maximum of two stations per property. For more information, visit <a href="https://pluginbc.ca/charging-program/charging-solutions-incentives/">https://pluginbc.ca/charging-program/charging-solutions-incentives/</a></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BC</th>
<th>Employee Workplace Charging Incentive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receive 50% of the purchase and installation of employee charging stations to a maximum of $4,000 per Level 2 station and $2,000 per Level 1 station. For more information, visit <a href="https://pluginbc.ca/charging-program/charging-solutions-incentives/">https://pluginbc.ca/charging-program/charging-solutions-incentives/</a></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BC</th>
<th>Fleet Champions Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fleet managers are eligible to receive EV suitability assessments on less than 10 vehicles. For more information, visit <a href="http://pluginbc.ca/charging-program/incentives-for-fleets/">http://pluginbc.ca/charging-program/incentives-for-fleets/</a></td>
<td></td>
</tr>
</tbody>
</table>

## 4.3 Utility Incentives

The following incentive programs are provided through Provincially owned Utilities. Because these utilities are provincially regulated and administered, the programs in this section have been included in Table 4-3 alongside programs run by the provinces directly, and denoted with a subscripted u (as explained in the notes beneath the table). It will become evident that utility programs tend to dominantly employ one of two incentive methods: funding studies such as energy audits (method A in the incentive tables above), or cash rebates for various forms of energy improvements (method I). Many even offer programs directed at the municipal corporation, not the development industry, so those have been left to Appendix A. The following subsections have been organized by province for convenience and have been substantially culled for readability. Many further programs are included in Appendix A: this list is intended to highlight those most complementary to the municipal role.

### 4.3.1 Alberta

The following 3 programs have been excerpted from total 5 programs listed in Appendix A:

1. **Business Energy Savings Program**⁷¹ (see Table 4-3 item Iₜ): This program offers incentives to encourage organizations to choose high-efficiency products. Once an organization has installed an approved high-efficiency heating or lighting product, it can apply for the rebate to help cover the cost of the equipment. Eligible products include efficient lighting products, [https://www.efficiencyalberta.ca/home-improvement/](https://www.efficiencyalberta.ca/home-improvement/)

---

⁷¹ [https://www.efficiencyalberta.ca/home-improvement/](https://www.efficiencyalberta.ca/home-improvement/)
efficient heating systems, and efficient water heating equipment. Industrial businesses are now eligible to receive rebates on mechanical component products.

2. **Custom Energy Solutions Program**\(^\text{71}\) (*see Table 4-4 item I_0*): This Program helps large facilities improve productivity, save energy and save money by upgrading old, inefficient equipment and making other energy improvements. Account managers will work directly with industrial customers to identify their specific goals and needs. The Program offers end-to-end support and incentives to implement the most cost-effective enhancements in participants' facilities. Individual facilities with over 10,000 tonnes of annual GHG emissions are eligible for incentives up to $1 million per year and parent facilities implementing Custom Energy Solutions projects in multiple facilities are eligible for incentives up to $2 million per year. Facilities with less than 10,000 tonnes are eligible for incentives up to $250,000 per year for individual facilities and $500,000 per year for parent facilities.

3. **Government of AB – Business, Non-Profit and Institutional Rebate**\(^\text{72}\) (*see Table 4-4 item I_0*): Incentives for high-efficiency retrofits of lighting, heating, cooling and hot water systems, and variable frequency drives for businesses, non-profits and institutions. All businesses serviced by an Alberta electric utility in existing buildings are eligible. Federal and provincially owned buildings and large final emitters are not eligible.

### 4.3.2 **BRITISH COLUMBIA**

The following 4 programs have been excerpted from total 27 programs listed in Appendix A:

1. **Oil to Heat Pump Program**\(^\text{73}\) (*see Table 4-4 item I_0*): This Program is an initiative of the Province of BC to accelerate the adoption of heat pumps as a means of replacing less efficient oil heating systems in order to achieve greenhouse gas reductions, reduce incidents of oil tank leaks, and improve home energy efficiency in BC. Participants can access rebates of up to $1700 when upgrading from oil heating to an air source heat pump.

2. **Energy Studies & Audits – Energy Efficiency Feasibility Study**\(^\text{74}\) (*see Table 4-4 item A_0*): BC Hydro offers several forms of energy audit / study subsidies all detailed in Appendix A. Each program targets a specific building type and has requirements and funding amounts appropriate to that type. Funded studies are intended to subsidize the cost of expert consultants who may perform audits on the energy consumption of individual buildings and provide recommendations on how to retrofit / improve the performance of those buildings.

---

\(^{72}\) Natural Resources Canada (2018).
[http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/policy_e/results.cfm?searchtype=default&programtypes=4,12&regionaldeliveryid=10&sectoranditems=all%7C0&categoryid=all](http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/policy_e/results.cfm?searchtype=default&programtypes=4,12&regionaldeliveryid=10&sectoranditems=all%7C0&categoryid=all)

\(^{73}\) [http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/policy_e/results.cfm?searchtype=default&programtypes=4,12&regionaldeliveryid=11&sectoranditems=all%7C0&categoryid=all](http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/policy_e/results.cfm?searchtype=default&programtypes=4,12&regionaldeliveryid=11&sectoranditems=all%7C0&categoryid=all)
3. **Strategic Energy Management – Energy Monitoring & Targeting**\(^74\) (see Table 4-4 item I\(_a\)): An energy manager will work with one of BC Hydro's service providers to develop targets for a facility's energy use and a proposal for a system to help it meet those targets. Once the proposal is approved, BC Hydro will provide up to $80,000 in funding to implement real time monitoring, system monitoring and/or advanced modelling to gain a better understanding of the facility's day-to-day energy usage.

4. **Strategic Energy Management – Industrial Energy Manager**\(^74\) (see report Table 4-4 item I\(_a\)): This Program provides advanced funding to hire an energy manager to develop and implement a Strategic Energy Management Plan. The Program includes:
   
   a) up to 75% salary funding for 2 years;
   b) 100% of the cost for management coaching;
   c) 100% funding for required training for energy managers;
   d) 100% funding for the full cost of an on-site Energy Management Assessment;
   e) a fully-funded workshop to facilitate creation of a customized plan;
   f) 100% funding for an Employee Awareness Planning workshop and funding of employee engagement activities including training and awareness events.

### 4.3.3 Manitoba

The following 3 programs have been excerpted from total 19 programs listed in Appendix A:

1. **Power Smart New Buildings Program**\(^75\) (see Table 4-4 item I\(_a\)): This Program provides technical guidance and financial incentives for designing, constructing, and operating new, energy-efficient buildings in Manitoba. Financial incentives are based on projected energy savings and proven building performance.

2. **Power Smart Bioenergy Optimization Program**\(^75\) (see Table 4-4 item I\(_a\)): This Program helps industrial customers convert their company's waste streams and by-products into fuel that produces useful heat and power. It offers technical and financial support to help approved customers install, operate, and maintain equipment that can deliver consistent and reliable savings and environmental benefits. Incentives will not exceed 50 percent of the eligible project costs or a maximum incentive of $1,000,000 on electrical load reductions and $250,000 on natural gas load reductions.

3. **Residential Earth Power Loan – for Ground Source Heat Pumps**\(^75\) (see Table 4-4 item I\(_a\)): This Program assists homeowners with the cost of installing a geothermal heat pump, which reduces a home's annual heating energy use by 50 to 70 percent, space cooling costs up to 40

---

\(^74\) [http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/policy_e/results.cfm?searchtype=default&programtypes=4,12&regionaldeliveryid=11&sectoranditems=all%7C0&categoryid=all](http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/policy_e/results.cfm?searchtype=default&programtypes=4,12&regionaldeliveryid=11&sectoranditems=all%7C0&categoryid=all)

\(^75\) [http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/policy_e/results.cfm?searchtype=default&programtypes=4,12&regionaldeliveryid=8&sectoranditems=all%7C0&categoryid=all](http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/policy_e/results.cfm?searchtype=default&programtypes=4,12&regionaldeliveryid=8&sectoranditems=all%7C0&categoryid=all)
percent and domestic water heating costs up to 25 percent. Financial assistance up to $20,000 is available for new installations and retrofits.

4.3.4 NEW BRUNSWICK

The following 4 programs have been excerpted from total 14 programs listed in Appendix A:

1. **Low-Income Energy Savings Program**\(^{76}\) (see Table 4-4 item I.a): This Program targets homes in need of major energy efficiency upgrades, which help low-income homeowners in New Brunswick reduce their energy use and costs. Upgrades could include a mix of:
   
   a. Compact fluorescent lighting;
   
   b. Domestic hot water pipe insulation;
   
   c. Low-flow showerheads;
   
   d. Insulation (basement/crawlspace, attic, main wall);
   
   e. Faucet aerators;
   
   f. Ductless heat pumps;
   
   g. Air Sealing.

2. **Total Home Energy Savings Program**\(^{76}\) (see Table 4-4 item I.a): This Program offers money back on efficiency upgrades on everything from insulation and air-sealing to high efficiency central heating systems to windows, doors, and more (including ENERGY STAR certified products). A certified energy advisor will evaluate the home to find out where it needs upgrades and will give customized recommendations to improve space and water heating energy efficiency.

3. **Energy Smart Commercial Buildings Retrofit Program**\(^{76}\) (see Table 4-4 item I.a): This Program provides financial incentives of up to $3000 towards an evaluation to determine the potential for energy efficiency upgrades in a commercial building and a maximum of $75,000 towards the energy retrofitting project costs.

4. **Energy Management Information System (EMIS) Incentives**\(^{76}\) (see report Table 4-4 item I): Large industry customers can get up to $20,000 to assess energy efficiency upgrades, up to $300,000 in incentives for implemented measures, and, if eligible, up to $150,000 in incentives for EMIS.

---

\(^{76}\) [http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/policy_e/results.cfm?searchtype=default&programtypes=4,12&regionaldeliveryid=5&sectoranditems=all%7C0&categoryid=all](http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/policy_e/results.cfm?searchtype=default&programtypes=4,12&regionaldeliveryid=5&sectoranditems=all%7C0&categoryid=all)
4.3.5 NEWFOUNDLAND AND LABRADOR

The following 3 programs have been excerpted from total 9 programs listed in Appendix A:

1. **Newfoundland and Labrador Housing**\(^{77}\) (see Table 4-4 item I\(_a\)): Home Energy Savings Program (HESP): HESP is a provincial initiative designed to assist households with low income who consume 15,000 kWh of electricity annually in making energy-efficient retrofits to their homes. The program assists clients with retrofits that will make their homes more affordable and reduce greenhouse gas emissions that contribute to climate change. All repairs will be identified through an energy evaluation, which will determine the best possible solutions for energy efficiency.

2. **takeCHARGE Insulation Rebate Program**\(^{77}\) (see Table 4-4 item I\(_a\)): This Program offers residents a rebate for 75% of basement wall (min R18 to max R25) or basement ceiling (min R30 to max R35) insulation costs up to $1,000 and 50% of attic insulation (min R50 to max R55) costs up to $1,000.

3. **Isolated System Business Efficiency Program**\(^{78}\) (see Table 4-4 item I\(_a\)): This program targets Newfoundland and Labrador Hydro’s commercial customers in isolated systems, providing support and financing incentives for a wide range of energy efficient products from LED lighting to energy efficient appliances.

4.3.6 NORTHWEST TERRITORIES

The following 3 programs have been excerpted from total 6 programs listed in Appendix A:

1. **Alternative Energy Technologies Program – Business Renewable Energy Fund (BREF)**\(^{79}\) (see Table 4-4 item I\(_a\)): The Business Renewable Energy Fund (BREF) is available to assist NWT commercial businesses including off-grid lodges and camps to integrate commercially available, clean energy technologies into their operations. The fund is intended to reduce fuel use and lower the cost of operations in remote locations where fuel prices and carbon footprints are high. BREF provides funding of up to one-third of the cost of qualified renewable energy systems, up to $15,000 per applicant per year.

2. **Commercial Energy Conservation and Efficiency Program**\(^{79}\) (see Table 4-4 item I\(_a\)): This Program assists businesses in achieving the efficient use of energy and water to help businesses reduce their heat, power and water bills and become more energy efficient while saving money. It is available to support commercial upgrades, which will reduce the use of

---

\(^{77}\) [http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/policy_e/results.cfm?searchtype=default&programtypes=4,12&regionaldeliveryid=2&sectoranditems=all%7C0&categoryid=all](http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/policy_e/results.cfm?searchtype=default&programtypes=4,12&regionaldeliveryid=2&sectoranditems=all%7C0&categoryid=all)

\(^{78}\) [https://takechargenl.ca/business/isolated-system-business-efficiency-program/](https://takechargenl.ca/business/isolated-system-business-efficiency-program/)

\(^{79}\) Natural Resources Canada (2018).
electrical/heat energy and water. Energy conservation and financial savings are achieved by professionally analyzing and improving heating and heating controls, air sealing, lighting and lighting controls, ventilation and ventilation controls, hot water and low flow devices and other building components. The rebate amount will be the lower of $15,000, 1/3 of the total eligible costs, or five times the annual estimated money saved in fuel, water and electricity.

3. **Community Government Building Energy Retrofit Program** (see Table 4-4 item Ia): This Program supports upgrades to Community Government-owned buildings, which will reduce their use of electrical/heat energy and water. The total rebate provided is the lower of $25,000, 50% of the total eligible costs, or five times the annual estimated money saved in fuel, water, and electricity.

4.3.7 **NOVA SCOTIA**

The following 3 programs have been excerpted from total 19 programs listed in Appendix A:

1. **Nova Scotia Solar Homes** (see Table 4-4 item Ia): Efficiency Nova Scotia will provide a rebate of $1.00/watt for eligible Solar PV systems. For most systems, the rebate will equate to approximately 30% of the total system cost. The average rebate is approximately $7000. The maximum rebate is $10,000 or 40% of the eligible system costs.

2. **Custom Solutions Program** (see Table 4-4 item Au, Ia): This Program helps medium and large sized businesses implement electrical energy-saving projects by offering technical assistance, financial incentives and financing to offset the cost of engineering studies, energy efficiency equipment and installation. Incentive amounts are determined on a project-by-project basis and vary depending on the size of the project, energy-saving effectiveness of the measure, equipment involved and the financial need of the company. The maximum incentive available for each project is:

   a. 50% of the cost of a preliminary energy audit/scoping study to a maximum of $1,000;
   b. 50% of eligible project costs to a maximum of $500,000;
   c. on-bill financing for up to 2 years.

Feasibility studies are eligible for incentives and are included in the total maximum eligible project amount. Efficiency Nova Scotia will contribute up to 100% of the cost to a maximum of $15,000, in which Efficiency Nova Scotia pays 50% of the incentive amount for feasibility and scoping studies upon receiving the study, and the remaining half of the incentive amount is paid when the project begins.

---

80 [https://www.efficiencyns.ca/service/solarhomes/#tab-get-started](https://www.efficiencyns.ca/service/solarhomes/#tab-get-started)
81 [Natural Resources Canada (2018).](http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/policy_e/results.cfm?searchtype=default&programtypes=4,6,9,11,12&regionaldeliveryid=all&sectoranditems=all%7C0&categoryid=3)
3. **Low Income Homeowner Service**\(^{81}\) (*see report Table 4-4 item I*) For qualifying low-income homeowners, Efficiency Nova Scotia will make upgrades to insulation, seal holes and cracks, all at no-charge. To determine which energy efficiency upgrades the low-income homeowner needs, one of the Efficiency Partners will conduct a no-charge energy assessment of the home. If upgrades, like draft proofing and insulation, are recommended and approved, the homeowner will receive those upgrades at no cost.

**4.3.8 Nunavut**

1. **Home Renovation Program**\(^{82}\) (*see Table 4-4 item Ia*): This Program provides financial, program and technical assistance to homeowners who wish to carry out major repairs, renovations and additions to their home. Where an applicant has already received assistance to renovate their home, they may apply for an additional $15,000 to improve the energy efficiency of their dwelling.

**4.3.9 Ontario**

The following 3 programs have been excerpted from total 20 programs listed in Appendix A:

1. **Engineering Energy Efficiency Feasibility Study**\(^{83}\) (*see Table 4-4 item Au*): This Program helps fund studies to identify and quantify potential energy saving measures on natural gas consuming equipment, gas-related heating systems or facilities. Studies analyze an existing building or process to determine the changes that will increase its overall energy efficiency. Typical projects include thermal surveys, facility air-balances, HVAC audits, energy audits, benchmarking activities and equipment upgrade studies. Incentives include:

   a. Commercial customers: 30% up to $4,000;

   b. Industrial customers: 50% up to $10,000;

   c. One study per site per year;

   d. $10,000 cap applies to multi-site industrial customers, one study per year.

2. **Enbridge RunItRight Program**\(^{83}\) (*see Table 4-4 item Ib*): This Program enhances an existing building's systems to find energy efficiencies. It analyzes the building's energy performance to identify, implement and monitor low and no cost operational improvements that can lead to 5% energy savings. Once the consultant has identified areas for operational improvements, Enbridge will provide a financial incentive of up to $10,000 for the implementation of

---

\(^{81}\) Natural Resources Canada (2018).
http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/policy_e/results.cfm?searchtype=default&programtypes=4,12&regionaldeliveryid=18&sectoranditems=all\%7C0&categoryid=all

\(^{82}\) http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/policy_e/results.cfm?searchtype=default&programtypes=4&regionaldeliveryid=7&sectoranditems=all\%7C0&categoryid=all
multiple measures. In addition to the financial incentive, Enbridge will provide training for operation managers.

3. **IESO Save ON Energy – Multi-Site Customer Energy Manager Program**\(^{83}\) (see Table 4-4 item I\(_6\)): This Program provides up to $150,000 to businesses to hire an energy manager to help reach energy-saving targets in their facilities. For industrial, commercial or institutional customers with facilities in locations across multiple local hydro company territories, the streamlined application process eliminates the need for multiple applications while providing dedicated support throughout the process.

### 4.3.10 PRINCE EDWARD ISLAND

The following 3 programs have been excerpted from total 10 programs listed in Appendix A:

1. **New Home Construction Program**\(^{84}\) (see Table 4-4 item I\(_6\)): This Program helps residents make their new home more energy efficient.
   a. A certified Energy Advisor will review the building plans before construction begins;
   b. Customized recommendations are provided to improve the energy efficiency of design;
   c. Two tiers of rebates are available;
   d. $2000 rebate if the home is certified to ENERGY STAR® for New Homes or earns an EnerGuide rating of 20% better than code;
   e. $5000 rebate if the home is certified to R2000 or earns an EnerGuide rating of 50% better than code.

2. **Business Energy Rebates Program**\(^{85}\) (see Table 4-4 item I\(_6\)): EfficiencyPEI is offering rebates to support business, non-profits, and institutional organizations, as well as industrial/agricultural facilities for choosing high-efficiency products of $5-$100 for efficient lighting and dimmer technologies, and $600 for Air source heart pumps (ENERGY STAR® Most Efficient 2018 model is required to qualify for the rebate).

3. **Home Energy Low-Income Program (HELP)**\(^{86}\) (see report Table 4-4 item I\(_6\)): Low income clients who have applied for the PEI Energy Efficiency Loan or Grant Programs are eligible to have a HELP tradesperson complete comprehensive air-sealing (caulking and weather

---


stripping on windows and doors) free of charge. Other free features of the HELP program include: installation of a programmable thermostat; a low-flow shower head; a voucher for a free furnace cleaning (up to $80 value); and compact fluorescent light bulbs (ENERGY STAR® CFL and LED).

### 4.3.11 QUEBEC

The following 3 programs have been excerpted from total 17 programs listed in Appendix A:

1. **Gazifere: Feasibility Study**\(^{87}\) (see report Table 4-4 item A\(_0\)): This Program offers financial assistance of $2,000 to cover a portion of the cost of having a feasibility study carried out to define measures that will improve the energy efficiency of an existing or new building.

2. **Hydro-Québec – Building Retrofit Incentives**\(^{88}\) (see Table 4-4 item I\(_0\)): Financial assistance to implement energy efficiency measures while carrying out projects in commercial or institutional buildings. The catered component offers assistance tailored to a business owner’s project, in order to improve the building’s overall energy efficiency. The prescriptive component provides simple solutions tailored to buildings under 10,000 m\(^2\) to assist in implementing predefined measures. This program focusses specifically on commercial buildings >10,000 m\(^2\) consuming >50,000 kWh for the catered component. Commercial buildings <10,000 m\(^2\) are eligible for the prescriptive program.

3. **Technology and Business Demonstration**\(^{89}\) (see report Table 4-4 item I\(_0\)): Hydro-Québec offers support to test the technical and commercial viability of innovative energy-saving or power-demand optimization measures. It will pay 50% of the total cost of an approved project, up to $300,000.

### 4.3.12 SASKATCHEWAN

The following 3 programs have been excerpted from total 9 programs listed in Appendix A:

1. **Commercial Lighting Incentive**\(^{90}\) (see report Table 4-4 item I\(_0\)): The Commercial Lighting Incentive provides non-residential customers in Saskatchewan with access to selected premium energy efficient lighting equipment (including ENERGY STAR® certified light

---

\(^{87}\) [http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/policy_e/results.cfm?searchtype=default&programtypes=4,12&regionaldeliveryid=6&sectoranditems=all%7C0&categoryid=all](http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/policy_e/results.cfm?searchtype=default&programtypes=4,12&regionaldeliveryid=6&sectoranditems=all%7C0&categoryid=all)


\(^{89}\) [http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/policy_e/results.cfm?searchtype=default&programtypes=4,12&regionaldeliveryid=6&sectoranditems=all%7C0&categoryid=all](http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/policy_e/results.cfm?searchtype=default&programtypes=4,12&regionaldeliveryid=6&sectoranditems=all%7C0&categoryid=all)

\(^{90}\) [http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/policy_e/results.cfm?searchtype=default&programtypes=4,12&regionaldeliveryid=9&sectoranditems=all%7C0&categoryid=all](http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/policy_e/results.cfm?searchtype=default&programtypes=4,12&regionaldeliveryid=9&sectoranditems=all%7C0&categoryid=all)
fixtures) at a discounted price. The program is hassle-free and can help to significantly lower a business’s electricity costs.

2. **Industrial Energy Optimization Program**\(^{90}\) *(see report Table 4-4 item I):* This Program is designed to help industrial facilities systematically identify energy waste and reduce the cost associated with electrical energy use during the production process. It offers personalized support geared at improving the efficiency of process operations, leading to reduced costs, emissions and impact on the environment. In addition to providing customized high-quality technical assistance, the program offers financial incentives for the identification, development and implementation of energy management and capital projects.

3. **Commercial HVAC Program**\(^{90}\) *(see Table 4-4 item I):* This Program is designed to encourage the use of high-efficiency natural gas furnaces (ENERGY STAR® certified), boilers, rooftop units, unit heaters, and infrared radiant heaters in both commercial new construction and retrofit applications. It is targeted towards small to medium sized commercial buildings and provides incentives based on the incremental price of the energy-efficient products. Incentives are based on the type, size, and number of units installed and range from $300-$2,000.

### 4.4 Federal Programs, Incentives, & Climate Initiatives

The Federal government has literally hundreds of funding programs for various initiatives. Those shown in Table 4-5 (below) were chosen because they were felt to be relevant to the topics of this study, and demonstrate the complementary role which the Federal government can play in supporting municipal incentives for sustainable development.

*Table 4-5: Federal Incentive Programs*

<table>
<thead>
<tr>
<th>METHODS OF INCENTING</th>
<th>Land</th>
<th>Energy</th>
<th>Water</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Species and Habitat</td>
<td>Energy / Mining / Agriculture</td>
<td>Transportation</td>
</tr>
<tr>
<td>Research / Development / Feasibility Study Grant</td>
<td>A</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Federal Tax Credit</td>
<td>B</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Employment Wage Subsidy</td>
<td>C</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Cash Rebate</td>
<td>D</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Priority Projects</td>
<td>E</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Investment Projects</td>
<td>F</td>
<td>x</td>
<td></td>
</tr>
</tbody>
</table>

© 2019, The Corporation of the City of London

www.s2etech.com/fcm-gmf
Table 4-5 (above) shows the topical themes for which the Federal government provides incentive support. In general, Federal incentives tend to focus on creating employment, promoting new research and entrepreneurship, or investing in political priority projects such as infrastructure (eg: highways / bridges / hospitals). These topics can sometimes complement municipal priority areas, but may not, and typically cannot be expected to remain stable longer than 4 years at a time.

4.4.1 RESEARCH AND DEVELOPMENT GRANTS

The Federal government has several crown corporations focussed on research and development (R&D), and on offering programs which support private industry efforts to perform research as well. Some of the more popular programs include IRAP\(^\text{91}\), SR&ED\(^\text{92}\), SDTC\(^\text{93}\), or public-private partnerships with any number of research teams at Natural Resources Canada (NRCan) or the CANMET Energy Centre. All of these programs support various stages of taking a research idea, refining it into an implementable technology, maturing that technology until it is ready for pilot testing, graduating through pilot testing until ready for commercialization, and then various degrees of commercialization support. Different programs target different stages of the product development cycle, but the programs each have advisors to help project proponents understand when / where they can get funding support.

Some of these research funds are implemented as cash grants or contribution agreements, others are implemented as tax credits. All can be used across almost any field, so long as the proposed project can demonstrate that it is truly innovative. With this in mind, most projects will only get funding once, and thereafter are no longer considered innovative: securing additional funding will require some new innovation or improvement upon the previous project in order to continue to be considered “research” or “development”.

Here are a sampling of other programs supporting various stages of R&D efforts:

1. **Applied Research and Development Grants**\(^\text{94}\) (see report Table 4-5 item A, E): Up to $150,000 in funding may be provided to a business that partners with an eligible Canadian college to develop clean technologies. The grant could total $150,000 when the business covers 50% or more of the costs or $75,000 when the business covers 50% or less of the project cost. The business must be Canadian-based and the research must be used. Canada Small Business Financing Program: This program could help you secure up to $1 million from a financial institution by sharing the risk with your lender.

---

\(^{91}\) [https://www.nrc-cnrc.gc.ca/eng/irap/](https://www.nrc-cnrc.gc.ca/eng/irap/)


\(^{93}\) [https://www.sdtc.ca/en/](https://www.sdtc.ca/en/)

\(^{94}\) [https://canadabusiness.ca/programs/canada-small-business-financing-program-1/](https://canadabusiness.ca/programs/canada-small-business-financing-program-1/)
2. **Sustainable Development Technology Fund**\(^{95}\) (see report Table 4-5 item E): Up to 33% R&D costs covered for those creating technology that addresses climate change issues, clean air, clean water or soil quality, or that may be used to produce and distribute energy, or remove pollutants in certain industry sectors.

### 4.4.2 Tax Credits

1. **Tax Incentives for Clean Energy Equipment**\(^{96}\) (see Table 4-5 item C): The *Income Tax Act* and *Income Tax Regulations* include the following measures to encourage Canadian taxpayers to make investments in qualifying clean energy generation and energy conservation projects:

   a. an accelerated capital cost allowance (CCA) for investments in clean energy generation and energy conservation equipment;

   b. Canadian renewable and conservation expense (CRCE), which is a category of expenditures relating to the development of eligible clean energy generation and energy conservation projects that may be deducted in full in the year incurred, carried forward indefinitely for use in future tax years or renounced under a flow-through share agreement; and

   c. Atlantic investment tax credit of 10% of the cost of prescribed energy generation and conservation properties.

Under Classes 43.1 and 43.2 in Schedule II of the *Income Tax Regulations*, certain capital costs of systems that produce energy by using renewable energy sources or fuels from waste, or conserve energy by using fuel more efficiently are eligible for accelerated capital cost allowance. Under Class 43.1, eligible equipment may be written-off at 30 percent per year on a declining balance basis. In general, equipment that is eligible for Class 43.1 but is acquired after February 22, 2005 and before year 2025 may be written-off at 50 percent per year on a declining balance basis under Class 43.2. Without these accelerated write-offs, many of these assets would be depreciated for income tax purposes at annual rates between 4 and 20 percent.

### 4.4.3 Employment Wage Subsidies

Employment and Social Development Canada (ESDC)\(^{97}\), formerly known as Human Resources and Skills Development Canada (HRSDC), provides a number of direct and indirect training and reskilling programs to help improve and expand the Canadian workforce. This sometimes includes partnering with organizations like ECO Canada\(^{98}\) to provide specific niche programming or training around environmentally oriented career options. NSERC\(^{99}\) (The Natural

---

95 [https://canadabusiness.ca/programs/sustainable-development-technology-fund-1/](https://canadabusiness.ca/programs/sustainable-development-technology-fund-1/)


98 [http://www.eco.ca/](http://www.eco.ca/)

Sciences and Engineering Research Council of Canada) offers a number of partnership programs geared around creating employment for researchers, while also helping private businesses to do more research. Other organizations at the provincial level will provide education related wage subsidies, such as for coop students. In total, there seem to be wage subsidy programs for essentially every industry and every stage of the innovation process.

### 4.4.4 Cash Rebates

1. **EcoAction Community Funding Program**\(^{100}\) *(see Table 4-5 item D):* Cash grants for projects that contribute to water quality or climate change mitigation.

2. **CMHC Green Home Program**\(^{101}\) *(see Table 4-5 item D):* Offers a refund of up to 25% of the mortgage insurance premium paid by mortgagees who use their mortgage to fund the purchase, construction or renovation of energy efficient buildings using CMHC-insured financing. A 15% premium refund is available for a home built to ENERGY STAR® building standards and a 25% premium refund is available for a home built to R-2000 building standards.

3. **Agricultural Clean Technology Program**\(^{102}\) *(see Table 4-5 item A):* aims to support the research, development and adoption of clean energy technologies through investments in, and promotion of precision agriculture and agri-based bioproduct industries. These technologies will help to reduce greenhouse gas emissions, generate a wide range of positive impacts, and promote sustainable and clean growth. Support is available in the form of non-repayable contributions from Agriculture and Agri-Food Canada through projects delivered by provincial and territorial governments.

### 4.4.5 Priority Projects

Apart from research and development, the Federal government often has funding available to support projects which are deemed desirable, even if not innovative, because they stimulate the economy, create jobs, preserve the environment, or provide other social value which is difficult to fund without support. Priority project areas are often defined by federal policy objectives and can change frequently depending on which government is in power and what their policy objectives are. Here is a sampling of programs currently available:

1. **Clean Growth Program**\(^{103}\) *(see Table 4-5 item E):* You may be eligible for funding if you operate a natural resources or clean technology business and are working on cleantech projects in the areas of energy, mining and forestry. Eligible activities in natural resource operations include:

---

\(^{100}\) [https://canadabusiness.ca/programs/ecoaction-community-funding-program/](https://canadabusiness.ca/programs/ecoaction-community-funding-program/)

\(^{101}\) [http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/policy_e/details.cfm?searchType=default&sectoranditems=all%7C0&max=10&pageId=1&categoryID=1&regionalDeliveryId=all&programTypes=4,9,11,12&keywords=&ID=1561](http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/policy_e/details.cfm?searchType=default&sectoranditems=all%7C0&max=10&pageId=1&categoryID=1&regionalDeliveryId=all&programTypes=4,9,11,12&keywords=&ID=1561)

\(^{102}\) [http://www.ic.gc.ca/eic/site/099.nsf/eng/home/p1](http://www.ic.gc.ca/eic/site/099.nsf/eng/home/p1)

\(^{103}\) [https://canadabusiness.ca/programs/clean-growth-program/](https://canadabusiness.ca/programs/clean-growth-program/)
a. Reducing greenhouse gas and air emissions;
b. Minimizing landscape disturbances and improving waste management;
c. The production and use of advanced materials and bioproducts;
d. Efficient energy use and productivity;
e. Reducing water use and impacts on aquatic ecosystems.

2. **Green Freight Assessment Program**\(^{104}\) (see Table 4-5 item E): Successful applicants may receive grants of up to $10,000 to review the state of their fleets to help make informed decisions to reduce fuel costs and transportation emissions, including consideration of EVs.

3. **Green Infrastructure Fund (GIF)**\(^{105}\) (see Table 4-5 item E): The Green Infrastructure fund supports environmental infrastructure projects that promote reduced greenhouse gas emissions, cleaner air, cleaner water and cleaner land. There are five eligible categories of investment: wastewater infrastructure, green energy generation infrastructure, green energy transmission infrastructure, solid waste infrastructure, and carbon transmission and storage infrastructure. By providing up to 50 percent federal funding on a cost-shared basis, the fund leverages additional investments from other partners. The program has $5 billion available over five-years for infrastructure projects designed to protect communities and support Canada’s transition to a clean growth economy. Of this, $2 billion is reserved for Canada’s Clean Water and Wastewater fund (see CWWF) which is designed to provide communities with reliable water and wastewater systems. The Government of Canada made an additional $21.9 billion available for green infrastructure and supports the initiatives outlined in the Pan-Canadian Framework on Clean Growth and Climate Change.

4. **New Building Canada Fund Provincial-Territorial Infrastructure Component – Small Communities Fund (PTIC-SCF)**\(^{106}\) (see Table 4-5 item E): The PTIC-SCF provides contribution funding for infrastructure projects in small communities with populations of 100,000 or less. The PTIC-SCF supports projects of national, regional, and local significance that contribute to economic growth, a clean environment, and stronger communities. Projects will allow people and goods to move more freely, increase the potential for innovation and economic development, and improve the environment while supporting stronger, and safer communities.

5. **Emerging Renewable Power Program**\(^{107}\) (see report Table 4-5 item E): The Emerging Renewable Power Program (ERPP) provides up to $200 million to expand the portfolio of commercially viable renewable energy sources available to provinces and territories as they work to reduce GHG emissions from their electricity sectors. Eligible projects are large size, utility-scale electricity generation projects from renewable energy resources that have not yet been commercially deployed in Canada. Eligible technologies include:

   a. offshore wind;

---

\(^{104}\) [https://canadabusiness.ca/programs/green-freight-assessment-program/](https://canadabusiness.ca/programs/green-freight-assessment-program/)


\(^{107}\) [https://www.nrcan.gc.ca/energy/funding/20502](https://www.nrcan.gc.ca/energy/funding/20502)
b. geothermal power;

c. concentrated photovoltaic;

d. instream tidal;

e. other (must explain how it meets the definition of an emerging renewable power technology).

4.4.6 Federal Climate Initiatives

Incentives are one of the later stages of policy development at the Federal level, and there are often higher priority initiatives which guide the development of specific funding programs such as those listed in the sections above. For example, there is presently a strong international discussion around atmospheric carbon and the need to reduce greenhouse gas emissions at the national and local levels, and the Federal government is deeply invested in discussions about how to reduce Canada’s national carbon footprint. The following initiatives have been summarized and included here because of their potential to impact the future of Federal level incentives which relate to the scope of this study, and which might be useful in local municipal efforts to encourage more sustainable building practices.

1. Pricing Carbon Pollution for Clean Growth: Canada is acting to reduce carbon emissions, spark innovation and create jobs. Pricing carbon is broadly recognized as one of the most effective, transparent, and efficient policy approaches to reduce emissions. Carbon pricing amounts range according to the province. The Pan-Canadian Framework on Clean Growth and Climate Change outlined a benchmark for pricing carbon pollution by 2018, which will be phased into action in the coming months. The goal of this benchmarking effort is to ensure that carbon pricing applies to a broad set of emission sources throughout Canada (with increasing stringency over time) to reduce GHG emissions at lowest cost to business and consumers and to support innovation and clean growth.

Once revenues have been collected from carbon pricing systems, those revenues will be disbursed through a variety of programs intended to help address and reduce carbon emissions. This will create discussions which local municipalities may find beneficial towards supporting transformation of the local construction / development industry.

2. Climate and Clean Air Coalition: The Climate and Clean Air Coalition (CCAC) is a voluntary partnership of governments, the private sector, and civil society stakeholders committed to concrete and substantial action to accelerate efforts to reduce short-lived climate pollutants (SLCPs). Since 2012, the Coalition has become the preeminent forum for international fast action on SLCPs with over 110 partners contributing to protection of the

---

environment and public health, the promotion of food and energy security, and addressing climate change. The Coalition is reducing SLCPs through the following CCAC initiatives:

a. Reducing black carbon emissions from heavy duty diesel vehicles and engines;

b. Reducing SLCPs and other pollutants from brick production;

c. Reducing SLCPs from the waste management sector;

d. Promoting HFC alternative technology and standards;

e. Accelerating methane and black carbon reductions from oil and gas production;

f. Reducing SLCPs from agriculture;

g. Supporting national planning for action on SLCPs;

h. Financing SLCP mitigation;

i. Promoting Urban Health;

j. Reducing SLCPs from household energy; and,

k. Conducting regional SLCP assessments.

The fact that this organization exists and is making an impact is noteworthy, and it is likely that the programs emerging from the efforts around SLCPs will at some point become interesting / beneficial to the municipal sphere of influence.

4.5 PROGRAMS AND INCENTIVES USED OUTSIDE OF CANADA

There are now national councils focussed on sustainable constructing in at least 68 countries who have joined the World Green Building Council (World GBC). These organizations share resources and information in their joint effort to help decarbonize the global building industry, and they have ongoing discussions around various incentive models. There was not time within the scope of this study to fully explore the resources that the World GBC has to offer, but there is certainly a further wealth of information there for the motivated reader.

Many of the stakeholders who participated in this research were familiar with the PACE loan model from the USA, where PACE refers to “Property Assessed Clean Energy”. The same model is sometimes referred to in Canada as a Green Municipal Mortgage (GMM), or as Property Assessed Payments for Energy Retrofits (PAPER). The essential concept is that municipalities tend to have strong credit ratings and good access to inexpensive financing, which they could opt to make available for local energy retrofit loans to qualified applicants. The

109 https://www.worldgbc.org/search/node/incentives
110 http://www.mi-group.ca/GMM
municipality could essentially finance its own energy retrofit program, lending funds to property owners to pay for energy retrofits, and then collecting repayment through the property tax bill or through a municipally owned utility. The idea would be that the municipality, by funding energy conservation projects, could create savings which the benefitting property owner could then use to repay the municipality. A carefully designed program could net out at zero cost (or potentially even negative cost) to a property owner, while achieving environmental objectives for the municipality and creating local economic stimulus at the same time: a true win-win-win.

There are examples of programs like this emerging in Ontario, particularly in Toronto (the Home Energy Loan Program, HELP)\(^{111}\) and Guelph (the Guelph Energy Efficiency Retrofit Strategy, GEERS)\(^{112}\). Several municipalities in Ontario are participating in a network\(^{113}\) specifically launched to monitor these programs, with hopes to expand them once shown successful. Refer to section 5.3.3 on page 133 below for more detail. These programs tend however to be focussed on retrofitting existing buildings rather than on new construction, where incentives for new construction tend to vary as widely as those listed in section 4.1 above.

4.6 **INDUSTRY PROGRAMS**

The following programs are not necessarily incentive related, but are often referenced by public agencies during discussions about incentives. Whether as measures of quality / due-diligence, as systems of third party testing / auditing, or as acceptable alternatives to internal quality assurance audits, there is a place for industry programs in the discussion of how a municipal agency can encourage the industry to pursue net-zero construction. This section will attempt to concisely explore the benefits / strengths / weaknesses of these programs and where they may best be employed.

4.6.1 **INDUSTRY BEST PRACTICE PROGRAMS**

Many municipal policy makers have become very familiar with the leading industry programs in green building certification. BUILT GREEN®, ENERGY STAR®, LEED®, R-2000, Net Zero and Passive House are particularly well known brands that deal with energy efficient buildings, and which are increasingly being considered for incentives, or in some cases for being made mandatory.

First, consider the leaky building era in BC (1980’s-2000’s), when new building construction practices were mandated before their consequences were fully understood. New legislation in BC created an unforeseen problem when noble intentions among policy leaders resulted in requiring all new buildings to use practices which promised to be more energy efficient, but which turned out to trap moisture in the wall. That moisture condensed and “leaked” back into the “leaky


\(^{112}\) [https://guelph.ca/plans-and-strategies/community-energy-initiative/geers/](https://guelph.ca/plans-and-strategies/community-energy-initiative/geers/)

buildings”, resulting in a nightmare of insurance claims, a reversal of the new wall assembly requirements, and a healthy dose of caution about being too hasty to change building code.

Then recall the evolution of home inspections in the resale market, from what was once a niche service (opposed fiercely by the Real Estate sales profession) to what has now become an expected prerequisite for the vast majority of home re-sales.

Several municipalities in Ontario have had lively discussions about requiring all new housing in their jurisdiction to be built to Passive House standards. This introduces a significant liability that has ultimately contributed to the abandonment of these efforts, in that the municipality cannot legally require compliance to one program from private industry above other programs without treading into risks around anti-trust legislation. Further, even if that liability could be resolved, the municipality does not typically have the expertise to evaluate all the various programs and their merits / weaknesses / technical nuances in-house to determine which program they would mandate.

Perhaps the greatest challenge with any effort toward mandating green labelling programs is human resource limitations. Green building programs represent only a modest percentage of all new construction and mandating their use would require an urgent multiplication of the capacity of the sector to service these programs. Considering the present degree of access to competent energy professionals who have not just experience, but expertise in passive and net-zero design, it seems apparent that the industry is simply not ready for ubiquitous mandatory green building programs, and that it will likely take an extended period before it could be. If best practice programs were to be mandated, and industry were required to wait on the availability of qualified support professionals, this would inadvertently impose a slow-down to the industry. It must then be noted that CHBA regularly reports their builders and their projects (directly and indirectly) represent ~30% of the Canadian economy. Slowing the construction sector therefore results in either or both of two undesirable outcomes: either (1) fewer buildings would get built until more professionals could be trained and deployed to service the chosen best practice program, and/or (2) more “professionals” would suddenly flood the local market but would prove to have insufficient experience, and the quality of delivery of the programs would suffer. If fewer buildings are built, then the construction industry would slow locally, which would directly affect economic activity and employment in the local construction sector: the largest single employer in most jurisdictions across Canada. If unqualified people rushed in to help keep up with the pace of construction, then quality would suffer and the entire intent of mandating performance programs would be missed and lost. Again, the industry is simply not ready for best practice programs to become mandatory.

For these and other reasons, it seems clear that municipalities should not require the local construction sector to align with any single best-practice industry program over any other worthy

---

program, and industry across Canada is not ready for mandates like this in any event: there are simply not enough capable service professionals to keep up with the pace of construction.

But with that said, each of these programs has had tremendous positive impact on the housing industry in Canada by being voluntary, and builders/developers across Canada should continue to be encouraged to join these programs actively. These programs have offered the building science training that has made it possible to advance the energy requirements in the National Building Code, and successfully educate industry to grow and improve at the same pace. Builders who have voluntarily complied with best practice programs have provided the model homes and award winners that have taught the rest of the industry how to advance, and have paved the way to progress. Today perhaps more than ever, municipalities can play a vital role in continuing to offer support and healthy pressure to builders and developers to watch these standards, learn from them while they are voluntary, and prepare for net-zero energy as something that many agencies across the country are targeting for code by 2030.

Figure 4-1 and Figure 4-2 (below) offer visual comparisons of each of these best practice programs, particularly in how they relate to energy and environmental performance, and the subsections below offer brief reviews of each program. The list of programs included here is far from exhaustive, but was included because these programs in particular are either already present in municipal policy in various Canadian jurisdictions, or because they are presently being considered for use in various municipal policies / programs.
Note that Figure 4-1 and Figure 4-2 are entirely anecdotal and are offered for discussion purposes only: there is really no apples-to-apples evaluation available that could adequately compare this group of programs on the two-dimensional axes provided, and a proper study of their similarities and differences would fill a report at least equal in length to this report. These figures are offered for the purpose of helping the reader to orient themselves between the various programs included, with the hopes that this will facilitate increased understanding and stimulate further learning for the reader.

Some of the themes and overlaps shown in Figure 4-1 and Figure 4-2 are deliberate. For example, energy systems have an environmental impact, so as energy performance increases, environmental performance tends to increase as well. This is why the Built Green / BOMA / LEED boxes are angled up to the right. This is also why the R-2000 box in Figure 4-1 is somewhat above and to the right of the ENERGY STAR box, and why Passive House extends right of both, and why CHBA’s Net-Zero program extends right of Passive House. That said, these two figures are still anecdotal, and the axes are not to any scale: they are simply for discussion with the hopes that they will facilitate improved understanding. A proper understanding of each of these green building best-practice programs would require a great deal of further study. The sections below will offer a concise exploration of each of the programs shown in Figure 4-1 and Figure 4-2 above, with an emphasis on the most pertinent concerns for a municipality.
4.6.1.1 BUILT GREEN®

BUILT GREEN (or Green Seal® in Ontario) emerged from Western Canada and has enjoyed incentive and program support in several municipalities from AB or BC. Managed by Built Green Canada, BUILT GREEN now has programs for new homes, multi-unit residential buildings (MURBs), and home renovations. BUILT GREEN is a checklist based program where builders are required to select a minimum number of measures to meet in each of several categories, energy being one, and building certifications are awarded for various levels of performance: the more measures met by the builder, the higher the certification level, from Bronze, Silver, Gold or ultimately Platinum. The lowest level is only very slightly better than building code, and is designed to help builders start tracking their environmental performance with an easy-to-use checklist. The program is designed to help builders progress to higher levels, where environmental performance improves significantly.

For municipal purposes, the Certified and Silver levels of BUILT GREEN are more suitable for training builders to adapt and improve their practices, and any programs encouraging participation in environmental best-practice programs should consider referencing the Gold and Platinum levels of BUILT GREEN.

For more information: [http://builtgreencanada.ca/](http://builtgreencanada.ca/)

4.6.1.2 BOMA BEST

The Building Operations and Management Association of Canada (BOMA Canada) has a long established portfolio of programs to help commercial building managers to increase energy efficiency and reduce operating expenses for portfolios of buildings. BOMA Canada is affiliated with BOMA International, which has been providing building management programs and standards to the broader industry for over 100 years. Their present suite of programs target sustainable buildings, portfolio management, and sustainable workplaces (ie: tenant spaces within broader buildings), including specific standards for a variety of buildings that are primarily commercial, but also including multi-unit residential, and they have recently launched a Net-Zero Challenge to encourage their patrons to pursue net-zero energy. BOMA’s most popular program is BOMA BEST: a third-party certification program with a suite of support services to help building operators assess the performance of their buildings on several fronts, and to make measured improvements.

The BOMA programs are the most established in the industry and are designed to facilitate very easy entry for portfolio managers, which means that lower levels of achievement in the BOMA BEST program are focussed on building a culture of monitoring and reporting, helping their clients to orient themselves toward tracking energy/environmental performance, thus their actual benefit is mostly administrative at first. BOMA BEST is designed to encourage and enable their participants to move buildings up from lower to higher levels, where the higher levels align better with the requirements of other best practice programs such as ENERGY STAR or LEED.
BOMA’s programs have demonstrated tremendous impact in the commercial building sector and should be respected and encouraged for the impact which they have had.

Many municipalities across Canada are using BOMA’s programs to manage and improve their buildings already, and this should be encouraged. For municipalities wanting to encourage improvement in the private sector, the BOMA BESt program is worth referencing, but incentives (if offered) should only be tied to the Gold and Platinum levels of the BOMA BESt program, or perhaps to the BOMA Net Zero Challenge. Keep in mind that BOMA’s programs are most effective with existing buildings, so any incentive which would reference BOMA’s programs would typically be aimed at reducing existing strain on municipal energy systems.


### 4.6.1.3 ENERGY STAR®, R-2000

ENERGY STAR is managed in Canada by Natural Resources Canada (NRCan) on license from the US Department of Energy (DOE), and is one of the most reputable brands in the world. ENERGY STAR programs exist for most commercial products, for homes, and for portfolios of commercial buildings. Builders/developers using ENERGY STAR may have any of a number of reasons, but often quality is near the top of the list: ENERGY STAR is known by the public as “better quality than whatever else is out there”, and the process of building to ENERGY STAR standards will make the builder a better builder.

ENERGY STAR products of any kind, from fridges to homes, are typically 15-20% more efficient than their competitors.

For the purposes of this municipally-minded study, ENERGY STAR is an established program that has had and continues to have significant pull in the market. It should be respected as proof of quality, and of diligent third party verification, but should not be given incentive support. Market penetration for ENERGY STAR has been healthy for some time now, and incentive support should focus on more aggressive energy / environmental performance achievements.

R-2000 was launched by NRCan in the 1980’s as the housing standard of the future and was exported internationally as a building science program that (in the USA) became the ENERGY STAR for New Homes program and (in Germany) the Passivehaus program. ENERGY STAR has been updated periodically over the past decade in Canada until it offered very similar performance results to R-2000. R-2000 has recently been updated to more of a “Near Net Zero” level of performance, approaching 50% more efficient than building code compliant homes. NRCan and CHBA have been in ongoing talks over the last 3-5 years about how the R-2000 program might possibly merge into the Net-Zero program as a “Net-Zero Ready” performance level, and it is yet unclear whether R-2000 will continue to exist as an independent brand beyond 2020. If it does, then it is worth recognizing as “Net-Zero Ready” and should be respected by any incentive programs favouring that performance level.

### 4.6.1.4 LEED®

Several jurisdictions already have incentives and programs built around obtaining LEED certifications. Managed in Canada by the Canada Green Building Council (CaGBC), LEED has many protagonists and antagonists, and has had a significant impact on the green building sector. Incentive programs supporting LEED have often relied upon its third-party validation processes, much like those behind ENERGY STAR and others. LEED has recently launched an updated set of requirements across its portfolio of programs (now version 4), and is tending towards increased focus on carbon, increased collaboration with other programs like EcoDistricts, Living Building Challenge, and Passive House, and overall increased impact on measurable objectives. LEED has a number of focussed streams or sub-programs which relate to particular building types: Figure 4-1 shows the logos of the LEED-Canada for Homes and LEED-ND programs, and Figure 4-2 shows the LEED Canada logo (for all other commercial LEED programs: New Construction, Commercial Interiors, etc).

With respect to Net-Zero energy, LEED has always had strong consideration of energy topics, but as one of several strong topics within LEED, and LEED certification does not specifically ensure a focus on energy performance. The LEED systems include both mandatory and optional measures, and the most cost-effective way to be successful in the LEED program is typically through the energy credits, but there are very few mandatory measures related to energy, and once they are achieved there is no significant means by which to ensure that LEED projects will prioritize energy over any other topic in the LEED program. LEED recognizes and awards environmental performance with tiered certification achievements, from LEED Certified up to Silver, Gold, and ultimately Platinum. LEED Platinum buildings are typically very energy efficient, but not net-zero energy, and LEED Certified is much more like ENERGY STAR: all good achievements, but not net-zero.

Incentive support for LEED should carefully consider what the objectives are which the municipality is attempting to achieve. If Net-Zero energy is the priority, then supporting LEED will not ensure meaningful pursuit of net-zero energy. Consider supporting only the higher levels of LEED (ie: Gold and Platinum), and also supporting other programs which are more focussed on energy (eg: Net-Zero below).

For more information: [https://www.cagbc.org/CAGBC/LEED/CAGBC/Programs/LEED/_LEED.aspx](https://www.cagbc.org/CAGBC/LEED/CAGBC/Programs/LEED/_LEED.aspx)
4.6.1.5 **Net-Zero**

The Canadian Home Builders Association (CHBA) launched a Net-Zero Energy Housing Council in 2015 to determine how best to help Canada’s builders transition towards building self-powered and self-heated homes. CHBA has since launched a program to label Net-Zero Energy and Net-Zero Ready homes for part 9 construction and is working on programs for renovated homes and for communities. NRCan and other Federal Government agencies are involved and are actively supporting the development and deployment of CHBAs programs.

CHBA is the leading voice for Canada’s housing industry, one of the largest employers and economic stimulants in nearly every regional economy in Canada, and any program promoted by CHBA is worth respecting at the municipal policy level. If a municipality is considering incenting or supporting building programs, then CHBA’s Net Zero program should be at the top of the list.

For more information:  

4.6.1.6 **Passive House / Passive Haus**

Passive House programs have been gaining attention in several municipalities across Canada in recent years and are beginning to be listed specifically in municipal policy or incentive programs in some jurisdictions.

Like ENERGY STAR, R-2000, or Net-Zero, Passive House is focussed exclusively on energy performance. Unlike the others, Passive House is not particularly interested in energy generation or renewables and is focused solely on conservation. This results in building designs which should perform better than in the other programs, but which can cost much more to build. In many markets across Canada it would be more cost effective to build somewhere between ENERGY STAR / R-2000 and Net Zero, not bothering to pursue Passive House: after achieving 60-70% more efficient than building code, investing not in further conservation but instead in renewable energy generation systems like solar panels (PV). Passive House pursues performance levels that approach 90% better than building code, where the law of diminishing returns is often at play.

Passive House advocates have been actively promoting the idea that performance verification of the occupied house is the only way to confirm the building’s true performance. This is not strictly true and has confused many policy makers across Canada. As discussed in section 3.4 above, particularly in Table 3-81 and Table 3-83 about Building Commissioning and Post-Occupancy Performance Verification respectively, performance verification after occupancy will provide a distorted view of the building’s performance, and a more accurate view only of the ways that the occupant is using the building. Commissioning at the time of construction is a
valuable assessment of the building’s performance irrespective of occupant behaviours, and is pre-requisite in various forms across all best practice programs for green building. Performance verification after occupancy is truly only valuable for the occupant, because it verifies that they are using the building optimally, but it does not truly assess the building independent of the occupant. If the building was commissioned earlier then further verification will not change the building’s performance, it will only change the occupant’s behaviour. All this to say that advocates who promote post-occupancy performance verification as the only true method of verification will be wise to remember that they are, in fact, testing the occupant, and are not actually verifying the performance of the building at all. Municipal programs should be based upon commissioning of the building, independent of the occupants inside.

The Passive House program also has an affinity for requiring Passive House certified products, which typically come from Europe and are not built to Canadian standards. Many Passive House products have in fact struggled to achieve certification in Canada due to the specific requirements that CSA and similar agencies have included to respect our climate zones, and some Passive House products actually consistently underperform their Canadian made alternates. For example, Passive House certified windows have actually cracked and failed in several Canadian provinces. CSA certified windows are tested to perform in Canadian winters.

Lastly, “Passive House” is unfortunately not the same as “passive house”. There is a turf war at play in North America, where the original program standards from the Passive House Institute in Germany have been imported and updated differently by three separate organizations in North America: the Canadian Passive House Institute (CanPHI), Passive House Canada (PHC) and the Passive House Institute US (PHIUS), all of which have subtle technical differences in their programs, and all of which have active projects across Canada. Policy makers should beware of this subtlety when evaluating passive house programs (ie: they are not all the same) and should exercise due caution if referencing any one over any other.

For these reasons it is advisable to exercise caution when considering Passive House for Canadian policy efforts. If a municipality wishes to provide incentives for green building performance then Passive House (any and every version) should be welcome so long as the project team uses Canadian (eg: CSA) approved products, and Passive House buildings should be considered comparable to R-2000 or Net-Zero Ready, better than ENERGY STAR, but not as good as Net-Zero.

For more information:
- [https://passivehouse.com/](https://passivehouse.com/)
- [http://www.passivehouse.ca/](http://www.passivehouse.ca/)
- [http://www.phius.org/home-page](http://www.phius.org/home-page)
4.6.1.7  WELL Building Standard

The WELL Building Standard, administered by the International Well Building Institute (IWBI), is focused exclusively on human health and well-being in interior built environments. Understandably, the program tends to be used primarily for commercial office buildings and has been gaining traction across the MASH sectors (Municipal / Academic institutions / grade Schools / Healthcare facilities). It has been included in this listing and in Figure 4-2 above because of the interest it has earned among municipalities, but strictly speaking, it does little to help with energy efficiency. The overall environmental benefit of WELL is also limited by its lack of inclusion of energy related and other topics that do not specifically address occupant health. It is a useful comparator though, and serves to illustrate that there are many best practice programs active in industry which have specific purposes, not all of which are helpful in moving builders towards net-zero energy.

For more information: https://www.wellcertified.com/

4.6.1.8  Living Buildings

Simply put, the Living Building Challenge is the most rigorous building program in the industry. The Living Building Challenge is one of several programs administered by the International Living Futures Institute (ILFI). All of their programs have a number of prescriptive and optional measures, but their prescriptive measures tend to align with the top tiers of all other programs in the industry. For example, net-zero energy and net-zero water are pre-requisite. Living Buildings are required to meet all their own needs in perpetuity, and to contribute more back to the natural environment than they take away, over time. They feature healthy finishes, abundant fresh air, natural materials, significant effort to integrate into the surrounding neighbourhood, significant educational efforts, and so much more.

If a municipality is intending to offer any incentives for building design at all, then Living Buildings should unquestionably be eligible as an equivalent. If a project can earn the Living Building certification, then it can earn top-tier performance in any other program listed in this report, certainly including net-zero energy.

For more information: https://living-future.org/lbc/
4.6.1.9 EnerGuide Rating System (ERS)

The EnerGuide Rating System is, strictly speaking, not a best-practice program, but a system that enables most of the other programs active in Canada, including most of those listed above. Natural Resources Canada (NRCan) designed and maintains ERS, which has been used by banks, insurance companies, utilities and multiple levels of government across Canada to offer incentives and to measure housing energy performance for a variety of purposes. ERS is a scale that simply measures the number of GJ (gigajoules) of energy that a home uses. Zero on this scale means that the home uses a net of zero energy over the course of the year. A typical home in Ontario built to building code in 2018 might use 80-100 GJ. A Net-Zero Ready home certified in the CHBA program might use 40-45 GJ. A 1970’s side split might use 120-150 GJ. A century home might use 200+ GJ. EnerGuide and the ERS are nothing more than a measurement tool. The strength and credibility of this tool rests in the department that supports it: NRCan’s Office of Energy Efficiency. Because of their support, the ERS has been used to underpin programs like ENERGY STAR, LEED, BUILT GREEN, R-2000, and now Net-Zero. These other programs require their projects to measure energy performance using the ERS, and to label each participating home with their EnerGuide score. These programs then add requirements that may require a certain minimum score in EnerGuide, or may offer guidance on how to achieve a lower EnerGuide score (and therefore a better energy performance). EnerGuide has been considered sufficiently reliable that banks and the insurance industry have used it for various programs, and utilities across Canada have issued incentives based on EnerGuide numbers. Municipalities can be confident that EnerGuide, and NRCan who supports it, is a key reason why many of these best practice programs are reliable.

For more information: https://www.nrcan.gc.ca/energy/efficiency/homes/20578

4.6.1.10 Other Programs

There are MANY other industry best practice programs, including some that are supported by utilities, some from reputable suppliers, and many private programs owned by builders or regional non-profits. The programs listed above are reputable and national in scope. All other programs have been discounted here for simplicity, but may be worthy of further consideration depending upon the region any given project is happening in.

4.6.2 Programs for Materials and/or Products

Section 4.6.1 discussed Canada’s leading green building programs, but each of those programs references other programs which discuss products and materials that can be used in green buildings. Not to be confused with all the technologies and design strategies listed in Table 3-2,
these products / materials programs focus on things like natural or recycled content, VOCs and off-gassing, and environmentally preferable raw material sources.

This section has been included for reference purposes in the likely event that municipal public servants would be asked to comment on any of the following “environmentally preferable” material supply options referenced in other best practice environmental building programs whose scopes extend beyond energy topics. This list is by no means exhaustive, but is generally inclusive of environmentally preferable product sources which municipal public servants should treat as simply that: environmentally preferable, not particularly beneficial for energy savings.

These products should still have appropriate certifications (such as CSA) for use in Canada, but they will generally contribute positively to any project prioritizing energy / environmental performance.

*Table 4-6: List of Environmentally Preferable Product Resources*

<table>
<thead>
<tr>
<th>Resource Description</th>
<th>Website URL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The International EPD System:</strong></td>
<td><a href="http://www.environdec.com">www.environdec.com</a></td>
</tr>
<tr>
<td>An online directory of Environmental Product Declarations, where products are assessed under a number of criteria and their performance is reported publicly.</td>
<td></td>
</tr>
<tr>
<td><strong>UL Environment’s Product Guide:</strong></td>
<td>spot.ul.com</td>
</tr>
<tr>
<td>A product search engine and database maintained by UL, recognized by the US Green Building Council for use with LEED</td>
<td></td>
</tr>
<tr>
<td><strong>CHPS High Performance Products Database:</strong></td>
<td>chps.net/products</td>
</tr>
<tr>
<td>A green product database maintained by the Collaborate for High Performance Schools (CHPS)</td>
<td></td>
</tr>
<tr>
<td><strong>Forest Stewardship Council (FSC):</strong></td>
<td>ca.fsc.org/en-ca</td>
</tr>
<tr>
<td>FSC has a rigorous program for managing and certifying wood, and their website has substantive documentation and educational information to help the user understand the benefits of sustainably certified wood products.</td>
<td></td>
</tr>
<tr>
<td><strong>Health Product Declaration® (HPD):</strong></td>
<td>hpd-collaborative.org</td>
</tr>
<tr>
<td>Managed by the HPD Collaborative, reporting of health information for products used in the built environment.</td>
<td></td>
</tr>
<tr>
<td><strong>Cradle to Cradle Certified Project Registry:</strong></td>
<td>c2ccertified.org/products/registry</td>
</tr>
<tr>
<td>Provides designers and manufacturers with criteria and requirements for continually improving what products are made of and how they are made.</td>
<td></td>
</tr>
</tbody>
</table>
**Red List – Information and Guide:**
Born out of the Living Building Challenge, the Red List contains the worst materials prevalent in the building industry and bans them from use in the Living Building program specifically. The commonly-used chemicals on the Red List are: (1) polluting the environment, (2) bio-accumulating up the food chain until they reach toxic concentrations, and/or (3) harming construction and factory workers.

<table>
<thead>
<tr>
<th>Declare Label – Product Database:</th>
<th>living-future.org/declare/declare-about/red-list/</th>
</tr>
</thead>
<tbody>
<tr>
<td>Managed by the International Living Futures Institute (ILFI), this database is the antonym to their Red List and includes all the preferable materials which are recommended for use in Living Buildings. This database requires a paid membership for access &amp; use.</td>
<td>access.living-future.org/declare-products</td>
</tr>
</tbody>
</table>

### 4.6.3 NGO Programs

The following subsections summarize various programs offered by non-profit organizations which help municipalities to pursue net-zero energy related projects and initiatives. Some of these are focussed on climate, some on energy, some on general sustainability, but all have been included because they have potential to help enable municipalities to encourage net-zero construction among the local development industry.

#### 4.6.3.1 Partners for Climate Protection (PCP) Program

The Partners for Climate Protection (PCP) program\(^{115}\) is a network of Canadian municipal governments that have committed to reducing greenhouse gases and to acting on climate change. Since the program's inception in 1994, over 350 municipalities have joined PCP, making a public commitment to reduce GHG emissions. PCP membership covers all provinces and territories and accounts for more than 65 per cent of the Canadian population.

The PCP program is managed and delivered by FCM and ICLEI Canada, with financial support from the Government of Canada and ICLEI Canada. FCM and ICLEI Canada form the PCP Secretariat, which provides administrative and technical support, develops tools and resources, and delivers capacity building activities to support members in reducing local GHG emissions. The Secretariat also provides national recognition for member achievements.

The program empowers municipalities to take action against climate change through a five-milestone process that guides members in creating GHG inventories, setting GHG reduction

---

\(^{115}\) [https://fcm.ca/home/programs/partners-for-climate-protection.htm](https://fcm.ca/home/programs/partners-for-climate-protection.htm)
targets, developing local action plans, implementing actions to reduce emissions, and monitoring and reporting on results.

The PCP network represents a wealth of experience and capable peers for municipalities wishing to learn how to reduce their community footprint, and this includes experience with various incentive models, public-private partnerships, a host of pilot projects, and many creative ideas about how to engage local industry.

**4.6.3.2 Delphi ES3**

The Delphi Group has conducted extensive benchmarking in the areas of corporate sustainability and carbon management, analyzing over 100 companies across many sectors. As a result, they have thousands of data and information points that help identify trends, best practices, and business opportunities, as well as provide comparable performance data.

Delphi created the ES3 in 2010 and runs it every two years. The ES3 has emerged as a benchmarking tool for sustainability performance in both the Oil and Gas and Utility sectors. It looks at over 60 companies and 75 indicators across 7 issue categories. Clients get a personalized confidential report showing where they lead and lag, plus a review of broad industry trends. Dozens of energy sector companies rely on the bi-annual ES3 to provide the competitive intelligence they need to lead on sustainability.

Although not strictly focussed on the needs or roles of municipalities, there are many interesting initiatives and lessons-learned which can be extracted from the ES3 reports, and these may prove to be useful as reference resources.

**4.6.3.3 Global Reporting Institute (GRI)**

GRI helps businesses and governments worldwide to understand and communicate their impact on critical sustainability issues such as climate change, human rights, governance and social well-being. This enables real action to create social, environmental and economic benefits for everyone. The GRI Sustainability Reporting Standards are developed with extensive stakeholder contributions and are rooted in the public interest.

According to their website, the GRI Sustainability Reporting Standards (GRI Standards) are the first and most widely adopted global standards for sustainability reporting. Since GRI's inception in 1997, they have grown from a niche practice to being adopted by 93% of the world’s largest 250 corporations who now use GRI standards to report on their sustainability performance.

The practice of disclosing sustainability information inspires accountability, helps identify and manage risks, and enables organizations to seize new opportunities. Reporting with the GRI Standards supports companies, public and private, large and small, protect the environment and

---

improve society, while at the same time thriving economically by improving governance and stakeholder relations, enhancing reputations and building trust.

Again, from their website, GRI says “We work with the largest companies in the world as a force for positive change – companies with revenues larger than the GDPs of entire countries and supply chains that stretch the globe. As a result, the impact of our work on social well-being, through better jobs, less environmental damage, access to clean water, less child and forced labor, and gender equality has enormous scale.”

As a reference resource, the GRI standards and the corporations who use them are often comparable to municipal challenges (i.e., many of these corporations are so large that they are like cities unto themselves), and the internal programs and incentives which they use to improve themselves are potential areas of learning for municipalities as well, especially those municipalities who are otherwise required (e.g., by the Province) to report on their emissions and emissions reduction activities.

4.6.3.4 International Institute for Sustainable Development (IISD) – Community Indicator Systems

Community Indicator Systems (CIS) are online platforms that local actors can use to track issues of importance to their community, within the global context of the Sustainable Development Goals (SDGs) defined by the United Nations. This “localization” of the SDGs empowers communities to take local actions, observe the impact of those actions, share experiences with other communities and build new partnerships for implementation.

The SDGs rely on the collection of data for each of the 17 goals to assess how much progress has been made and what remains to be done before the 2030 deadline. Collecting and communicating data at the local level can help communities identify strengths and areas of improvement to achieve the SDGs locally.

IISD has developed an open source platform that communities can customize to collect and visualize indicator data on key issues of community wellbeing using maps, graphs and charts.

CIS platforms also enable communities to share experiences and learn from each other. Communities with similar challenges can draw on the lessons to engage in new collaborative efforts. Comparisons with other communities in the same country or internationally can provide outside validation of progress and stimulate a competitive spirit between communities. Donors and development partners can use the data to track the impact of their work and identify new partners.

The first CIS platform using IISD’s open source tool was launched in Winnipeg in June 2018. Four additional CIS platforms are under development in Canadian communities in three

---

117 [https://www.globalreporting.org/information/about-gri/Pages/default.aspx](https://www.globalreporting.org/information/about-gri/Pages/default.aspx)
118 [https://www.iisd.org/project/community-indicator-systems](https://www.iisd.org/project/community-indicator-systems)
provinces and more are planned to launch in Canada and internationally in the near future. These platforms will prove useful for local benchmarking, for prioritizing areas of need and for identifying opportunities for municipal programming (incentives or otherwise) which can help address those needs directly.

4.6.3.5 Carbon Disclosure Project (CDP)

CDP is a not-for-profit charity that runs a global disclosure system for investors, companies, cities\textsuperscript{120}, states and regions to manage their environmental impacts. CDP provides a global platform for cities to measure, manage and disclose their environmental data, to manage emissions, build resilience, protect themselves from climate impacts and create better places for people to live and work. Over 500 cities are already using CDP to disclose over 8,000 urban sustainability actions, demonstrating their commitment to building a sustainable economy and tackling climate change. Many of those actions are inspiring and informative examples which could serve as reference examples for local Canadian municipalities.

4.6.3.6 Municipal Climate Change Action Centre (MCCAC)

MCCAC provides funding, technical assistance and education for municipalities in Alberta to help them address climate change locally. This includes some level of support for creating programs to help mobilize local private industry.

4.6.3.7 Alberta Municipal Solar Program (AMSP)

This program provides rebates to municipalities in Alberta that install solar photovoltaics on municipal facilities or land and complete public engagement for the project, for solar PV systems greater than or equal to 2kW and less than or equal to 1 MW in installation capacity.

Participants receive a rebate per watt of total installed capacity ($/W), as shown in the table below.

<table>
<thead>
<tr>
<th>Total Installed Capacity (DC)</th>
<th>Rebate</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;10 kilowatts</td>
<td>$0.75/Watt</td>
</tr>
<tr>
<td>10 kilowatts to &lt;150 kilowatts</td>
<td>$0.60/Watt</td>
</tr>
<tr>
<td>150 kilowatts to 1 Megawatt</td>
<td>$0.45/Watt</td>
</tr>
</tbody>
</table>

4.6.3.8 Taking Action to Manage Energy (TAME+)

This program provides tools and funding to help municipalities understand building energy use, identify key savings opportunities, and implement retrofits. This is an Alberta based program for which only Albertan municipalities are eligible. Participants are eligible for energy audit and

\textsuperscript{120} https://www.cdp.net/en/cities
implementation incentives to offset building retrofit costs. Funding is based on the total gross floor area of the building being retrofit:

<table>
<thead>
<tr>
<th>Building Area</th>
<th>Incentive Maximum</th>
<th>Energy Audit Incentive</th>
<th>Implementation Incentive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 2,000 m²</td>
<td>50% of audit costs up to $500</td>
<td></td>
<td>Under 2,000 m²</td>
</tr>
<tr>
<td>2,000 to 5,000 m²</td>
<td>50% of audit costs up to $1,000</td>
<td></td>
<td>2,000 to 5,000 m²</td>
</tr>
<tr>
<td>5,000 to 10,000 m²</td>
<td>50% of audit costs up to $1,500</td>
<td></td>
<td>5,000 to 10,000 m²</td>
</tr>
<tr>
<td>10,000 m² or greater</td>
<td>50% of audit costs up to $2,000</td>
<td></td>
<td>10,000 m² or greater</td>
</tr>
</tbody>
</table>

Projects must meet a greenhouse gas reduction performance requirement of $40 per tonne.

4.7 Observations

The length of this chapter (ie: Chapter 4) and of all the supporting material in Appendix A make clear that there are many things to consider when discussing the policies and programs that support net-zero energy. It is interesting to compare the trends noted across Canada, and to compare the roles that are typically assumed by different levels of government. The previous sub-sections about municipal, provincial, federal, utility and other incentives and programs offer many themes and lessons which can be extracted, including a minimum of the following:

4.7.1 Choice Incentive Models

Not surprisingly, different levels of government have different tools with which to affect industry behaviour. The Provincial and Federal governments tend to focus on grants or tax instruments (credits or rebates), whereas municipalities have more tools at their disposal: subsidizing or outright funding of different studies (feasibility or EAs), waiving or rebating portions of various municipal fees (property tax, DC’s, permits), advanced queueing, or density bonuses on zoning.

Table 4-7 (below) reorganizes and regroups all the municipal programs assessed in Table 4-1 and shows how many different incentive models are presently being used across the topics studied.
### Table 4-7: Canadian Municipal Program Trends

<table>
<thead>
<tr>
<th>METHODS OF INCENTING</th>
<th>Land Use</th>
<th>Energy</th>
<th>Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summarized from all ~40 municipalities studied in Table 4-1 above.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feasibility Study Grant</td>
<td>A 5</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Environmental Site Assessments</td>
<td>B 26</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Tax Assistance Plan</td>
<td>C 19</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Development Charge Rebate</td>
<td>D 13</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Property Tax Exemption/ Rebate</td>
<td>E 18</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Building Permit Rebate</td>
<td>F 3</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Remediation Loan</td>
<td>G 2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Density Bonus</td>
<td>H 1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Cash Rebate</td>
<td>I 14</td>
<td>7</td>
<td>15</td>
</tr>
<tr>
<td>Totals Assessed</td>
<td>100</td>
<td>9</td>
<td>37</td>
</tr>
</tbody>
</table>

There are some immediate observations that seem to jump out: significant effort has been invested in resolving brownfields and in catalyzing re-development of underused sites, but all other topics pale in comparison. This is unsurprising, given that municipalities spend much of their time planning and coordinating various uses of land, and brownfields (as unusable land) naturally represent a hindrance to the work most municipal staff would otherwise seek to do. It is interesting to note though that brownfields have given many municipalities exposure to funding studies for things they care about (EAs) and to rebating taxes and fees (methods C, D, E and F) to address things they care about (underused land). The same tools which have become familiar to municipalities could be extended to serve other topic areas.

#### 4.7.2 Choice Incentive Topics

As noted with incentive models above, different levels of government tend to be motivated towards different incentive topics. Brownfields were by far the most popular municipal incentive topic (almost ubiquitous), whereas the provinces tended to focus more on providing cash rebates (typically through their utilities) for appliances/equipment and buildings, and federal incentives tended not to focus on any topic in particular, but more on broad concepts like economic development, job creation, or market innovation.

Each province has a government ministry responsible for energy, and some manner of provincial energy grid, so it is unsurprising that the provinces would have more attention invested in
improving buildings and their appliance/equipment loads (see Table 4-3). The territories are similar, despite having less of a shared grid and more of a set of regional micro-grids.

Federally (refer to Table 4-5), funds are available for research and development, reskilling / training of human resources, introducing new product into various markets, supporting pilot projects in different ways, … but nothing specifically targeted towards net-zero energy construction. Many existing federal programs have broad mandates around economic development or other such things which could be leveraged in support of net-zero energy, particularly to support manufacturers who are creating new product, or to support pilot projects testing new products and/or design approaches. “First” projects are often eligible for Federal funding support through a variety of funding mechanisms and programs, but after the “First” projects are completed, Federal support will typically dry up and run out. Federal programs are well suited to helping introduce new products or ideas into the market, but municipal programs are much better suited towards long-term market change, driving adoption in the local industry. Municipal programs should be developed with this in mind, and should aim less at supporting initial pilot-stage projects and instead should focus on market-transformation and up-take of available ideas which are now ready for the broader industry.

It is interesting to note that no level of government has yet introduced incentives specifically targeting net-zero energy construction, but that there are several discussions around green buildings and equipment which would naturally progress towards supporting net-zero energy as well.

Municipalities are the closest to local industry, even if just by virtue of the fact that they are local. Municipalities thus have the greatest opportunity to affect real projects, and to help impact the directions of local business. Although past efforts and programs have typically focussed mostly on brownfields, there is significant experience in most municipalities with program models that could support net-zero energy.

4.7.3 SUMMARY OF THE MOST EFFECTIVE MUNICIPAL MODELS

Table 4-7 (above) offered a summary of which incentive models have been used for which types of activities, and a tabular summary of how popular each model has been in the past, at least among the municipalities studied. This section will comment briefly on which models seem to have been most successful, roughly in priority order, and will offer some thoughts on what has most meaningfully contributed to that success.

1. Fee exemptions / rebates: including Development Charge rebates, Property Tax exemptions or rebates, and Building Permit rebates, (incentive types D, E, and F in Table 4-7), almost one third of the programs assessed in this study relate in some way to municipalities waiving or reducing their fees for actions and projects which they deem worthy of incenting. Feedback obtained from municipalities was also supportive of this, and it seems that this is one of the most intuitive sets of tools for most municipalities to employ. It is advantageous that most municipalities seem to have experience with at least one form of reducing / exempting their various fees, even if that experience is focussed presently on an unrelated topic such as brownfields. There is therefore a strong
opportunity for most municipalities to extend their expertise from brownfield fee related incentives to apply to other topic areas around net-zero construction.

2. **Feasibility Study Grants**: feasibility studies can apply to many topics, and are typically required for any detailed technical project, including Environmental Site Assessments (which were included separately in the tables above for reasons explained in Table 4-2, but which are nonetheless a specific form of Feasibility Study). There were over 30 feasibility study related programs summarized in Table 4-7 and in the sections above and in Appendix A, making the funding of these studies the single most common incentive tool employed. Of the many examples explored, most were only a partial funding contribution that leveraged private sector funds. All are risk funding, meaning that there is no guarantee these funds will ever generate a benefit to the municipality. Because it is funding for studies, it is entirely possible that the study will conclude in failure and so would end a potential project, rather than starting one. Still, projects don’t happen without plans, and many municipalities have been successful at incenting these plans / studies, which suggests that many of these plans / studies are succeeding in catalyzing further development.

3. **Tax Assistance Plans / Tax Increment Grants**: especially when used to incent projects that increase property value, this seems to be the most financially profitable form of incentive overall. TAPs/TIGs target properties which are underutilized and are therefore yielding reduced, if any, tax revenue to the municipality. This means that the municipality has nothing to lose by waiving part of a fee (property tax) which it was struggling to collect anyway, and TAPs/TIGs do not need to fully waive the fee: by waiving a portion of the fee, the city increases its revenue while also helping the development industry to improve the site, so everybody wins.

4. **Cash grants** (and instant rebates): after the items explained above, the next most common method of incenting was the use of cash grants. These were typically for smaller amounts and were very specific in nature (eg: for devices that saved water or energy), but were sometimes for more sophisticated concepts like green roofs or brownfield remediation.

5. **PACE / GMM / PAPER** loans: many municipalities spoke highly of various forms of targeted lending, where the municipality would front the cost of a retrofit project and would be repaid over time through an extra fee added to the property tax bill. This concept will be explored further in section 5.3.3 below, and though not strictly an incentive, this is one way that municipalities can remove one of the most common barriers to projects moving forward: initial purchase cost.

It is also interesting to note that most of the incentive methods presently used and most of the topics which they are used for will not create direct returns for the municipality, but will offer indirect returns. For example, brownfield incentives restore underused land and move that land towards producing tax revenue. If the incentives are structured carefully (eg: with a TAP / TIG), then they can be designed to minimize cost to the municipality (ie: by partially waiving a portion of property tax revenue which they would not have been able to collect anyway while the
property remains underutilized) and still have the desired impact on industry. Any model of incentive other than the TAP/TIG will tend to just be a cost, which shows that municipalities have historically been willing to invest in these programs to some degree, with primarily non-financial returns.

4.7.4 PROGRAM EVALUATION & FEEDBACK FROM MUNICIPALITIES

The research team identified which incentive models seemed most promising or attractive, and then contacted several municipalities to ask their perspectives both on what worked, and on what didn’t work. Specific feedback from specific municipalities will be kept confidential to the research team, but in aggregate, here are some considerations they offered:

1. **Program Stability:** Programs must have stability if they are to be attractive to local industry. If a municipality offers a building incentive that is too short-lived to be compatible with the development approvals process, then it will be ignored. Or if a builder has concerns whether they will be able to access an incentive for a later stage in their development, then they are unlikely to wish to use the incentive in an earlier stage as well: they will typically want to keep a predictable set of rules available to their project, and will shy away from incentives that will not last as long as their project will. For example, a 2-3 year incentive plan is not compatible with a 10-15 year build-out plan for a new neighbourhood.

2. **Simplicity:** The construction industry is the most highly regulated of all industries, and builders/developers are naturally wary of any new or additional bureaucracy. Programs must be designed to be as simple as possible and must impose only the minimum administrative burden necessary.
   a. For example, one responding municipality advised that they redesigned one of their incentive programs (offering partial refunds for certain water efficiency equipment) into an instant rebate offered through local suppliers. Rather than asking home owners to apply to a program or fill in forms anywhere, they let the companies handle the paperwork, and local home owners simply got an instant rebate. This was much more successful.

3. **Target the Right Client:** Some incentives are well suited to the builder (eg: DC or permit fee reductions), and some are better suited to the buyer or end owner of the site (eg: tax increment grants). The incentive method should be chosen for the intended beneficiary.

4. **Avoid Mandating:** Municipalities are essentially legal and regulatory bodies of a local nature and scale, so their culture and natural penchant is to want to write rules and mandate compliance, without necessarily understanding the industry factors that are driving non-compliance. This calls for a degree of humility: although there are some actors in industry who simply resist compliance, the vast majority are not inherently deviant, but are driven by business realities that largely dictate their options. To simply require them to change their practice without first understanding their business realities
is to misunderstand the world they operate in, and will likely result in significant resistance, including legal resistance (eg: appeal board / LPAT hearings in Ontario). It is far more constructive to work with industry, to ask questions about why they operate as they do or why they have yet to adopt the measure which is desirable to the municipality, and to identify ways the municipality can help them to be more interested to change. Incentive programs are powerful motivators and can lead to rapid and widespread change with far less difficulty.

a. There is room to be more prescriptive (ie: to mandate new requirements) when the real estate sector is booming and land demand is high (eg: Toronto), but overly aggressive mandating has potential to push projects away from slower markets (eg: rural areas: business will simply go elsewhere and build where they have no extra rules restricting them).

b. Again, where land is a premium, there is opportunity to use a carrot and stick approach: Edmonton and Toronto require green roofs under certain conditions, and Edmonton issues fines for noncompliance. The fine revenues can then fund an incentive for those who exceed the city’s requirements. There is a risk in this practice though, that the City has made public commitments to fund the “carrot”, and there may not be any fine revenue if industry responds well to the green roof requirement. The municipality could then end up liable to pay the incentive without having any new revenue to fund it.

5. Partner: this was an often repeated and emphasized lesson. Work with local utilities, non-profits, and any other local industry actors with similar interests. The more partners the better: they will each add strength to local programs in their own way, and will together help to maximize success.

   a. Stakeholder engagements: clearly identify the audience for whom any proposed incentive is intended, and the stakeholders in that audience. Then meet with them to ensure understanding of their needs and motivations and of what will make the proposed program attractive to them. This maximizes program value during implementation, builds partnerships and engagement, and builds a sense of ownership and commitment by others to help build program success. Done well, a successful stakeholder engagement effort will bring free marketing support in-kind that will help promote your programs. Have advisor committees, have consultants helping with public outreach, and engage local industry and non-profits wherever possible.

   b. Stacking rebates: if there are other incentives available from other agencies (eg: the provinces, utilities, NGOs, even the Federal government) and which complement or support an objective the municipality wishes to pursue, then it is strongly advisable to work with other industry partners to leverage the incentives they offer before investing additional funds from the municipality, or even to stack on those other programs and simply top-up the amount offered by those programs. For example, let those other programs provide the administrative
support and quality assurance / tracking / management work, and use compliance with that program as the only eligibility requirement or auditable activity in your program. This can significantly simplify the effort to implement and manage a new municipal program.

c. **Know your scope:** utilities, non-profits, the Provinces and even the Federal government all offer different forms of incentives. Municipalities have specific rights and responsibilities that are distinct from each of these, and should focus on incenting items that will specifically help achieve municipal objectives. If the province or local utility is already funding those objectives, then the municipality should take the opportunity to question whether further support is needed. It may be well advised to step out and let the province or utility take the lead in that area.

6. **Lead by example.** Use your programs on municipal buildings (affordable housing, offices / fire halls, etc). If the programs are good for private industry, then they should be good for the municipality as well, and using your programs on your own buildings will build good faith with local industry.

7. **Celebrate the wins:**

   a. **Tell your story!** In the age of viral online story telling, it is important to share your successes and promote your programs with positive messaging. Encourage participants to issue media releases, to post on social media, and to get interviews with trade publications or online content providers. This will promote the proponent, the municipality offering the program, and the program itself.

   b. **Events:** have recognition / celebration events to mark milestones and to celebrate local leaders. Everything from formal galas to simple public announcements will help. Consider including annual updates in special political events such as the annual “state of the city” or similar mayoral address. Host ground breaking ceremonies at significant projects such as the first project incented, the smallest, the largest, or any which will encourage the public to participate and/or to support the programs being offered.

   c. **Social media** is now the least expensive form of marketing by a wide margin. Mix up the marketing strategy to leverage low cost resources, to maximize the value of partnerships and stakeholder participation, and any paid advertising should be optimally targeted to appear in front of the right audiences. This is easier and easier with online advertising.

   d. **Physical signage:** consider using signage to advertise municipal programs on the same physical project sites which are benefitting from those programs.

8. **Clarity:** make sure that programs are explicitly clear.
a. **Process matters**: program launch process is important: educate the public, set expectations, engage local stakeholders from industry or non-profit groups and leverage their existing interests and momentum, simplify & clarify, and leverage personal interaction to create buy-in.

b. **Training**: offer free workshops and public information sessions to help local trades/companies/public become familiar with the intent and operation of local municipal programs, and to connect patrons with resources that will provide them with further information for review on their own time.

c. **Ongoing communication**: be prepared to have frequent contact with key stakeholders: hold their hands on the way through the program(s).

d. **Flexibility**: without compromising clarity, avoid being overly prescriptive about which equipment needs to be used in order to comply with the intent of a program.

9. **Set reasonable expectations**: incentives are not intended to cover 100% of the expenses related to any particular project, so it is important to make clear to project proponents that there will be other costs which they alone will be responsible to cover. Especially for programs targeting homeowners, make sure communications are clear.

   a. **Be modest**: many projects which are relatively smaller will have a greater impact than fewer projects which are relatively larger: they engage more people, leverage more private equity, and create more buzz, which leads to greater social impact and overall change.

   b. **Don’t let the budget run out**: plan ahead to ensure program longevity. Market at a pace which is (as much as is reasonably possible) fully compatible with the budget. A well funded incentive program should be marketed heavily to ensure the funding is used. A lightly funded program or pilot program should have very targeted marketing to ensure that it does not create more demand than it can sustain. Programs that run out of money will inevitably disappoint applicants who are left unfunded, which breeds distrust of the municipality offering the program. That distrust will tarnish and sabotage future efforts by the same municipality to offer further programs, and future uptake may be limited even if programs are deeply funded, simply because of industry or public distrust of the authority.

   c. **Match strengths to needs**: Prioritize local community needs that relate to local community strengths. If the municipality has three actions which are deemed worthy of incentive support, but local industry is really only able to fulfil two of those three areas, then those two areas should be prioritized over the third, and the municipality should either reconsider whether the third is worth incenting, or should explore how to get help building local capacity to serve the third area while prioritizing the first two.
10. **Retrofits are challenging**: Although this report is primarily focussed on new housing, many incentive models are targeting the larger problem of how to improve existing housing. The most successful programs seem to actually be portfolio programs which have different levels of incentives for different levels of ambition. It is advisable to incent appliance replacements and similarly simpler projects first, with ties into larger programs thereafter (eg: PACE/GMM/PAPER loans).

   a. PACE (GMM/PAPER) loans are highly regarded across Canada, though they do not appear to be in wide use. Refer to section 5.3.3 on page 133 below for more detail.

11. **Track lessons learned**: Monitor your programs and track stats on things like participation rates, costs, and yields. Have periodic meetings to discuss lessons learned, and make adjustments. Eg: one municipality interviewed for this report had budget allocated to incent LEED certification of buildings constructed on remediated brownfields. Once the brownfield remediations were complete, local constructors were not interested in LEED for the buildings on those specific sites, so uptake in this niche program was limited. The incentive program was terminated and budget reallocated into other areas that were more effectively promoting local action (eg: LEED on other sites, and other supports for brownfield remediation).

It is interesting to note that none of the above feedback comments on the costs of the programs being incented. Cost seemed to be a secondary concern in all cases where the research team was able to solicit personal feedback, and it seemed that most municipalities were far more interested in finding effective ways to increase industry participation and program effectiveness, but were less concerned with the cost of the programs. This may be because of the deemed necessity of the programs by the nature of what they are supporting (ie: turning brownfields into useful land, or reducing water consumption to help preserve a depleting municipal water supply), in which case cost may have been treated as a necessary investment for the public good, whereas energy efficiency programs tend to invite greater scrutiny. Still, it seems that most municipalities are happy to bear the cost of these programs when the vision of the program is deemed as important.

Municipalities wanting to encourage net-zero construction will do well to consider the outcomes noted in section 4.7.3 above, and to qualify those outcomes by the feedback noted in this section.

### 4.7.5 INEFFECTIVE MUNICIPAL INCENTIVE MODELS

In contrast with the positive trends and constructive municipal feedback noted above, below are some summary comments intended to capture some of the lessons to avoid.

1. **Advanced Queuing of Building Permits**: though not specifically mentioned in Table 4-7 (above), many municipalities in western Canada have experience with various forms of “fast track” programs that can prioritize developments by expediting site plan or building permit approvals. Proposals which meet certain criteria as outlined by the municipality can receive approvals ahead of other applications. For example,
applications for affordable housing or for green buildings can be prioritized and expedited up to 50% faster than normal applications.

a. The effectiveness of an advanced queuing program is dependent on how long it usually takes for the application to be processed. In jurisdictions where municipalities are required (by provincial law) to process building permits within 10 business days of receiving a complete application, there is little benefit or incentive to going faster. Building permits tend to be processed quickly (if all documents are submitted satisfactorily) and may not be worth expediting. Site plan approval can take months to secure and would be more meaningful to expedite. Regardless, expediting requires and assumes that good documents be submitted, and any time spent working with applicants to clarify or complete their documents would not count towards proper review time.

b. Most municipalities in western Canada which had a fast-track or advanced queuing process seem to have cancelled or abandoned these. It seems that these were related only to the issuance of building permits, and that the benefit of fast-tracking has become questionable, making it difficult to justify the administrative complications of managing the fast-tracking process. No examples were found of programs which offer advanced queuing for Site Plan Approval or for any other approvals than building permits.

c. It has been suggested anecdotally to this research team that fast-tracking or advanced queuing might be illegal in at least Ontario, and that it would be essentially bonusing, or providing advantages unfairly to some applicants over others. The research team could find no legal basis for concern, including after consultation with the Ontario Ministry of Municipal Affairs and Housing. We have therefore concluded that fast-tracking of Site Plan Approval would be highly desirable to builders/developers, and that there is no legal basis why this may not be done.

d. Some municipalities offered a premium permit fee, with no requirements for special construction (eg: sustainability features or affordability inclusions), which they marked “special” internally and then processed as urgent. This resulted in most applicants being attracted to the expedited processing time, which diluted the value of investing any extra effort in the application (eg: why bother with extra green measures etc: just pay the premium and get the same expedited approval), and which increased the stress level for staff at the City (because nearly every application sought expedited approval). Again, this diminished the benefit of offering an expediting program for approvals, and in fact became one of several reasons why the fast-track programs have been discontinued.

2. **DC rebates:** Development Charges are calculated carefully and are needed in order to fund the ongoing effort a municipality has in maintaining and servicing property after it is developed (eg: providing snow removal, garbage pickup, etc). Reducing or waiving DCs does nothing to reduce the real costs which these fees are intended to support, and
costs must therefore be covered under other budgets. Where green building projects are designed to reduce municipal infrastructure maintenance, for example by reducing the amount of waste water or storm water effluent from a site, then there could be appropriate consideration for DC credits or reductions. DC rebates have been used in the past to attract employment successfully in many municipalities, or to steer development towards underutilized lands which the municipality has prioritized for development. If considering incentive methods which support net-zero energy construction and which could minimally recover their cost for the municipality, then it seems that DC rebates should typically be avoided (unless they reduce infrastructure strain as discussed above – not necessarily energy related).

3. **Fee rebates in general:** If a municipality is seeking to invest money in incentive models which successfully attract the attention of the development industry, then fee rebates have been shown to be successful. If the municipality is seeking to recover the costs invested in such incentive models, then there is no opportunity to recover costs associated with fee rebates, and other incentive models should be explored instead.
5. FINANCIAL STRATEGIES FOR ACHIEVING NET-ZERO ENERGY

Once a building / development team has determined how best to design and construct a net-zero energy building and has given due consideration to their local policy context and the requirements / preferences of the municipality they are building in, there are usually questions about who will pay for the project and how the financial models will be made successful.

When it comes to financing development projects, there are essentially three ways to reduce project costs, which have been broadly categorized below as:

1. **Reduce Expenses**: Often referred to as “value engineering”, this is the brute force exercise of finding cost efficiencies, replacing expensive design options with smarter and less expensive options, or increasing the efficiency / output of the design so that less investment is required. This typically happens entirely within the builder / developer’s internal team.

2. **Offset Expenses**: For the purposes of this study, “offsetting” of expenses is intended to capture all financial concepts that reduce the costs borne directly by the builder / developer, but do not truly reduce costs. For example, this includes incentives, tax rebate vehicles, and any other external sources of funding that can assist builders / developers. This typically requires municipal or other government involvement and can help offset the expense of construction by supplementing it with public funding of various forms.

3. **Externalize Expenses**: Distinct from Offset Expenses, there are often additional funding resources that are simply external to the builder / developer, but which also do not actually reduce costs. For example, connecting to district energy systems, leveraging municipal or other government or utility loan instruments, energy service contracts, or micro-utility business models, are all methods to make additional energy systems and assets available to a builder (with specific terms and conditions, and for specific purposes). Many of these business models create opportunities for public-private partnerships. In these cases, the costs associated with constructing a net-zero energy system might not be paid for by the builder / developer directly, but might be paid by unit of energy later (eg: by kWh or GJ, in some manner of utility bill, rather than in a mortgage).

Offset and Externalized expenses are often similar, but for the purposes of this study, “offset” expenses are those reduced through external funding support of one form or another (typically public sector based), and “externalized” expenses are those externalized to another entity in private industry (including public-private partnerships, but not including public subsidy). This is explained in much greater detail below.

5.1 **Reduce Expenses**

This section is more focussed on technology than on financials, but like so many idioms we cherish (“Conservation is the first form of Generation”, “Reduce, Reuse, Recycle”, etc), it is prudent always to start by making sure we are spending money on the right things, and by not spending money that does not need to be spent. With this in mind, the first financial strategy
which any builder / developer should leverage when building to net-zero energy is to look for savings.

At this point we need to be mindful that looking for savings is different than being cheap, and that there is a stark difference between reducing first-costs and optimizing lifecycle costs. Net-zero energy performance requires investment up front, and if done right, those investments should avoid ongoing costs that will yield significant lifecycle savings, but over time. The net present value of these savings will almost always exceed other options for up-front savings, often by a wide margin. Not surprisingly, there is effort required to properly quantify these savings, and the industry is still realizing the value in this effort.

5.1.1 Funded Design Charrettes

Natural Resources Canada once funded a program called “Building Canada”, wherein builders were offered subsidized training that helped them to focus on identifying the reasons for their service related expenses (ie: their “call-backs” after selling and closing a house). The program leveraged industry experts to dig deep into the history and trends of call-backs, and to eliminate them by design. The goal was to enable builders to spend less money servicing mistakes and complaints, and freeing up that same money for investment in improvements, such as improvements in insulation or other energy related items. The Building Canada training program was used to train and launch the first ENERGY STAR® builders.

For example, one of the builders who participated in the Building Canada program had a persistent problem with cracking in the main floor of one of their home designs. The program helped them learn that the crack occurred consistently in an open span of floor that was directly over a major structural support in the basement, where the original house design had better aligned the load-bearing walls in the upper floor with the load bearing walls in the lower floor. In an effort to please one customer, the builder had moved the upper floor wall off of the lower floor wall to make a customization to the design, and had later adopted the customization into their standard design without properly understanding the impact this seemingly minor change had on the rest of the structure. The result was that this model of home regularly had cracking in the floor in that one predictable location: the open span that crossed over a major structural support. The builder had been tracking their call-backs and had a budget set aside for every house, built into the cost of every sale, to give them funds to pay for the fix whenever they got called back in for this floor problem. By re-aligning the walls and solving the root cause problem, the builder was able to remove a cost of several hundred dollars per house, and they were able to re-invest that money into energy items (insulation, etc.). Their upgrade budget began by finding savings in other areas.

Building Canada leveraged the support of training and outside expertise through design charrettes. Their program was built upon a model of having builders bring real design problems into a room of experts paid for by the government, and those experts helped the builders to solve real problems, with a catch: once the problem was solved and the builder saved money, they were required to spend that money on initiatives supported by the government program that helped them create the savings.
Builders and developers could do the same again for net-zero energy: host special design meetings (charrettes or otherwise), look for ways to optimize their costs, and leverage those savings towards creating room in their budgets for other things. These design meetings could be funded by the builder, or by any level of outside government, and if funded by the government, could readily come with strings attached.

As described above, like in the “Building Canada” program formerly offered by Natural Resources Canada, government could provide funding to interested builders/developers to join a voluntary program where they would provide design details on their buildings / neighbourhoods, and the experts (chosen from suitable disciplines) would help identify opportunities for savings.

For the purposes of this report, funding for training such as this may be difficult for municipalities to justify, but would be something appropriate for the Federal Government through NRCan to consider reinstating and/or expanding in the future. Various regional utilities have their own similar programs (eg: Enbridge’s “Savings by Design” in Ontario), and CMHC continues to offer their LEEP (Local Energy Efficiency Partnership) workshops nationally, with great effect.

5.1.2 Eliminate Redundancy

Simply stated, it costs money to own land but do nothing with it. When municipal processes / approvals take months or years to conclude, the builder / developer is carrying the costs of the land while waiting for those approvals. The truth is that the builder / developer is often responsible for those delays (evaluating different development concepts etc), but delays are equally often caused by municipal process (eg: heritage approvals). If approvals could be expedited in appropriate ways, by eliminating administrative redundancies, reducing the number of steps / processes required for approval, or any other means of expediting the municipal process, then this creates a very real and monetizable value for the builder. This value could potentially be made conditional, and enhanced performance commitments like net-zero energy developments could be given accelerated treatment.

Further, there are many instances where municipalities will require builders / developers to prepare formal design documents or reports that are signed and sealed by licensed professionals (ie: Engineers), but then the municipality will require the builder / developer to pay for the municipality to hire their own or an independent third-party Engineer to review the first Engineer’s work. This obviously increases costs and imposes delays upon project approval, but it also raises awkward questions about liability. For example, the engineering profession is governed by legislation in Ontario through the Professional Engineer’s Act (RSO 1990 and O.Reg. 941), and by other corresponding pieces of law in the other Provinces. By law in Ontario, if an Engineer signs and seals a design document, then they have declared it accurate in and of the authority vested in them by the Act. If their work is deemed to be of concern by anyone, then the concerned party may report the Engineer to the Association of Professional Engineers Ontario (PEO) who will investigate and who has authority to discipline the questioned Engineer. If two Engineers disagree about a matter, they may file complaints with PEO against each other and will be investigated. Ultimately, delinquent Engineers may have their license rescinded and they may face substantial fines or other career ending consequences. If the Engineer’s work is in
any way deficient, then their Professional Liability Insurance will fund its correction. If a Municipality reviews the work done by a builder / developer’s Engineer, then the municipality is assuming responsibility for work that it should leave under the responsibility of the Engineer. The municipality can save time, expense, and liability for itself, and save time and expense for the builder / developer by not requiring redundant reviews. Instead, the municipality could simply require that the builder / developer’s Engineer be in good standing with the Engineering association and be duly insured to a reasonable amount (in accordance with industry best practice and the nature / scale of the project), and can then eliminate the redundant review.

Other municipalities will require developers to create Development Guidelines for their projects, and to include content in those guidelines that will proactively set out all the municipality’s expectations on the project, but will then continue to have every step of the project reviewed by Urban Design Councils or other similar groups who were involved in approving the Development Guidelines. Instead, staff could be given the authority to review and ensure that developers stay compliant to the guidelines they submitted, and no further councils or review panels should be involved after their initial role in approving the guidelines. Otherwise it begs the question of why the Development Guidelines were needed in the first place.

Municipal approvals practices commonly have redundancies like this, all of which cost time and money, many of which create additional liability, and all of which could be optimized or removed.

### 5.2 Offset Expenses

When expenses have been reduced as much as is reasonably possible, there are often opportunities to offset those expenses by finding other ways or other partners to fund them, effectively offsetting expenses to others. The following subsections will explore financing tools which do not reduce costs materially, but which do reduce the costs borne by the builder / developer by introducing other parties or programs to fund those costs.

#### 5.2.1 Incentives / Grants

The most popular method of offsetting expenses is that of using incentive or research funds from other parties, typically governments or government agencies (eg: utilities or crown corporations) of all three levels: Municipal, Provincial, and Federal. Chapter 4 of this report has already explored many options for incentives, so those will not be repeated here, but please refer back to them as valid examples of ways to offset project expenses.

Beyond the incentives and models listed in Chapter 4 of this report, many proactive projects or new ideas have been brought to market with help from research grants or incentives which are tied back to charitable foundations or academic institutions. For example, there are pilot studies across North America for the first generation of solar buildings, many of which benefitted from research dollars managed by several levels of government, funneled through Universities and Colleges across the continent, and into pilot projects that appeared on public and private buildings alike. Natural Resources Canada continues to support academic research partnerships on similar themes today, focussing now on things like building integrated solar panels (eg: solar
shingles or solar walls) or on highly advanced energy efficiency measures that support net-zero energy and/or low carbon buildings. Canada’s Federation of Canadian Municipalities has a grant program that has helped many municipalities across Canada to offset the cost of various research projects in the building sector, and that has a declared intent to support projects (such as this study) which will help municipalities to enable the transition of the construction industry towards net-zero energy and carbon. And the Forest Stewardship Council (FSC) has several active research partnerships promoting the adoption of cross-laminated timber (CLT) and other wood products in lieu of steel and concrete across several building typologies.

Research funds come from a variety of actors, but are often instrumental in offsetting the cost of advanced new construction projects.

5.2.2 Carbon Markets

Carbon markets are further introducing new opportunities for environmental benefits to be monetized and assigned a tradeable value, where real energy savings may be quantified in avoided carbon emissions, and the costs of achieving those savings may be offset by selling the resulting carbon emissions benefit into appropriate carbon markets.

In markets that employ carbon taxation (eg: BC, Alberta), the benefits realized by the project can often be defined in such a way as to be eligible for the incentives funded by the carbon tax. In markets that employ carbon trading (eg: Quebec, formerly Ontario), the carbon benefit can be monetized and traded. Ontario’s Carbon Trading net a revenue to the province of over $4 billion before the provincial election in 2018, which was used to fund the beginnings of several related programs that promised to reinvest those funds into Ontario’s growing clean economy.

5.2.3 Net-Metering

Some technologies and some purchasing schemes enable offsetting of expenses by shifting them to periods where they have reduced financial value. For example, Net-Metering, as a policy concept, enables a building operator to generate their own energy during peak periods when it would be expensive to purchase, and even to export energy at that time (for a valuable credit), and then purchase energy back at less expensive periods (ie: when it is less valuable). Alternatively, some buildings have successfully used energy storage to store cheap energy at night and then consume it later during the day (eg: see section 3.2, Energy Storage, on page 36). Financial returns will vary according to the gap between on-peak and off-peak energy pricing, and according to the cost and benefit of the technology used (whether generation technologies or energy storage technologies).

Ontario is presently exploring whether and how to enable virtual net-metering (VNM), which would extend the net-metering model to apply to multiple buildings that are owned by the same stakeholders and who wish to employ surpluses in energy from one of their buildings to meet the

Refer to the Western Climate Initiative for more information: http://www.wci-inc.org/
needs of another. This could include multiple buildings not necessarily physically close to one another.

5.3 **EXTERNALIZING EXPENSES**

Distinct from offsetting expenses, there are often additional funding resources that are simply external to the builder / developer, but that do not actually reduce costs. Traditionally, there are two ways that construction expenses are most commonly externalized: (1) by requiring suppliers and service providers to take on or share more of the project costs (such as managing their own waste), or (2) to simply transfer costs to the customer and include them in the sale/lease price of the property.

Transferring costs to the customer is fairly intuitive in that they directly impact purchase/rental price for the property, and therefore directly limit the potential success of the design to whatever price the market will bear. Net-zero energy designs are rapidly becoming more affordable, but clever methods of sharing cost are perhaps more interesting than simply transferring costs to the buyer/renter, and also offer greater opportunity for widespread transformation of the construction market.

For example, connecting to district energy systems, leveraging municipal or other government or utility loan instruments, energy service contracts, or micro-utility business models, are all methods to make additional energy systems and assets available to a builder (with specific terms and conditions, and for specific purposes). Many of these business models create opportunities for public-private partnerships. In these cases, the costs associated with constructing a net-zero energy system might not be paid for by the builder / developer directly, but might be paid by unit of energy later (eg: by kWh or GJ, in some manner of utility bill, rather than in a mortgage).

The following sub-sections will break out and explore several of these opportunities to externalize expenses that enable net-zero energy construction.

5.3.1 **DISTRICT ENERGY SYSTEMS**

Most Canadians have experienced district energy, and most do not know it. Hospitals and academic campuses (colleges and universities) across Canada have always used district energy: they have central heating and power plants that service multiple buildings, and most / all of their buildings are interconnected mechanically and electrically. Some regions in Europe are almost entirely connected to district energy systems (eg: almost 90% of homes and 80% of all non-residential buildings in Sweden\(^{122}\)). In industry, the term “district energy” is usually used to refer to heating/cooling systems and may or may not include electrical energy.

The idea behind district energy is simple to describe, though potentially complicated to implement. Essentially, district energy systems enable buildings to be provided energy as a district, or as a group. It means that they share energy supply infrastructure in a more local way

\(^{122}\) [https://www.euroheat.org/knowledge-centre/district-energy-sweden/]
than just through the provincial electrical and thermal utility networks. Like in Markham, ON or Calgary, AB, there might be a CHP plant in the basement of one building, owned by “the district” operator, selling heating and power to that building and also to the two buildings beside it. Or like in Toronto, ON, there might be a heating/cooling exchange loop in a lake that ties into simplified heating plants inside a string of buildings through the downtown near the waterfront. However implemented, district energy reduces the size of the mechanical plant inside each building, freeing up that space for other uses, and replaces much of the equipment there with a smaller heating/cooling exchange system that pulls energy from the district, which is usually manifest as a loop of insulated pipes in the ground that runs between the participating buildings. Those pipes run back to one or more energy plants owned and operated by the district utility, and participating buildings will have energy procurement contracts with that operator.

The key strengths of district energy systems are resilience and efficiency. By virtue of the fact that heating/cooling/power are generated locally, the community served by the system is more independent than it would be with remote services, and is more resilient against natural disasters or broader frailties in larger (eg: provincial) energy networks. Further, the fact that district systems are, by their nature, servicing groups of buildings and not just individual buildings, means that the systems can be optimized to leverage the synergies in the diverse energy uses across the building set, and can capture efficiencies not available to any particular building left to its own. These efficiencies result in savings on costs and on environmental emissions, all on top of the fact that the district system replaces space needed for a heating/cooling plant in the buildings served (which can thus be leased out and turned into more useable/profitable space), so district energy systems provide a portfolio of benefits to their users.

The key limitation to district energy systems is that they typically require a critical mass in order to be cost competitive with traditional approaches. The ideal district energy system will have at least one large and stable base load, such as a hospital or commercial laundry, or will capture waste heat from a large sink such as a local power plant, and will expand to add other buildings as a network built around that base load. Further, district systems work best when the loads on the network are complementary and diverse. For example, a network of all the same occupancy (eg: all residential towers) will experience peak loads in all of those buildings at roughly the same time, whereas a network of mixed buildings (half offices, half homes) will experience a levelling of loads, with some buildings peaking while others are more dormant, and then they trade. As a whole, the district uses less energy because the buildings are taking turns using more, and the overall loads are more stable, which makes it easier on the district operator to run the shared energy plant(s) at relatively more constant output levels. Anecdotally, some industry operators have suggested that district energy starts to make sense at roughly 500,000 ft² of combined uses served (over however many buildings that might be), and that density always increases the likelihood that district energy will be feasible… but that each project needs to be studied independently for feasibility.

District energy systems can be financed with diverse business models and can present an attractive opportunity for public-private partnerships, where a municipally owned utility can co-invest financially and operationally with private sector partners. Properly designed district energy systems can present returns in the range of 5% to 15% or better, yielding attractive
investment opportunities for the municipality, especially when risk may be shared with a capable private sector partner(s).

When successful, district energy means that developers will:

a. free up space in their buildings by reducing the space allocated for mechanical rooms;

b. reduce the cost of their mechanical equipment by replacing that equipment with exchangers which tie into the district system;

c. increase resilience by having local energy supply, rather than being exposed to service interruption risks associated with broader utility networks (extreme weather, etc.);

d. contribute to reducing overall network energy use by reducing transmission losses (using local energy rather than remote) and optimizing load mix to reduce the overall amount of generation needed, thus reducing environmental emissions;

e. potentially saving money: using less, and less expensive, energy.

…and the municipality will:

a. increase resilience of the local energy network (which can be used to attract employers who need assurances of a stable energy supply, such as IBM in Markham, ON);

b. reduce overall energy use across that network, creating emissions reductions benefits;

c. create new investment opportunities (ie: in the district energy system) for themselves and for local industry.

5.3.2 Micro-Utilities

Micro-utilities are much the same concept as District Energy (above), but this term is typically used in industry to refer to electrical power utilities, where “District Energy” is typically used to refer to thermal energy (for heating and cooling). Theoretically a micro-utility could be described as a district energy system for electrical energy, and a district energy system (as commonly understood in industry) could be called a thermal micro-utility, so the two terms can be used interchangeably in some contexts, but convention is to see “micro-utilities” as primarily electrical and “district energy” as primarily thermal.

Electrical micro-utilities experience many of the same technical complications that thermal district energy systems do, except that industry is already well adjusted to running wires between buildings, and is less accustomed to installing insulated underground piping for shared heating systems between buildings. The chief difference between an electrical micro-utility and “business as usual” is that every building constructed would usually be connected directly to the municipal electrical utility grid, whereas in a micro-utility environment each building would be
connected to the local network (ie: a micro-grid embedded within the broader grid) administered by the micro-utility, and that network may or may not have backup connections to the broader municipal utility grid. The municipal grid would see the micro-utility as a single campus-sized customer (whether a small campus of only a few buildings, or a large campus of many), and the micro-utility would manage its customers independently.

Micro-grids are still required to comply with the local electrical safety codes and all related health and safety regulations, but are otherwise able to design and manage their systems with some level of independence from broader municipal or provincial utility networks.

Any municipality interested in District Energy should also be interested in micro-utilities for the same reasons, and can expect similar opportunities and returns for both.

5.3.3 **ON-BILL FINANCING**

On-bill financing has many other names: Property Assessed Clean Energy (PACE) loans, Property Assessed Payments for Energy Retrofits (PAPER), Green Municipal Mortgages (GMM), and more. Each of these names hints at the same root concept. On-bill financing leverages the fact that property owners all pay property tax and utility bills, and identifies the bills associated with taxes and utilities as vehicles that could potentially cover additional fees, such as fees associated with energy retrofits.

In one scenario, a municipally owned utility could help home owners retrofit their homes to be more energy efficient by paying for the retrofit, and then recovering that cost through the utility bill. The utility could register a lien on the property for the value of the retrofit, could perform energy audits using qualified energy advisors, pre-qualify competent contractors, and project manage the retrofit. The utility could then engineer the fees to ensure that they collect their returns over time, but at a pace where the property owner sees no net increase in fees: that the repayment of their loan would cost the same or less than the savings created by the retrofit. The utility could even leverage its internally confidential data to target specific end users that are most likely to present financially viable retrofits to the utility, and/or to target a specific desired benefit to the utility or to the municipality (eg: heritage homes, small businesses of a certain profile, buildings in a certain neighbourhood of the city where the local grid is strained, etc).

Alternatively, the municipality could do the same thing directly through the property tax bill, rather than indirectly through the municipally owned utility. A network of Ontario municipalities has been collaborating on defining support structures for this and several of them are

---

123 [https://energy.gov/eere/slsc/bill-financing-and-repayment-programs](https://energy.gov/eere/slsc/bill-financing-and-repayment-programs)
implementing their own pilot programs presently, including the cities of Guelph\textsuperscript{125} and Toronto\textsuperscript{126}.

Whether through the utility or direct through the municipal property tax bill, both agencies (utility and municipality) have administrative structures and processes in place that provide all the expertise required to build and deploy an on-bill financing system, and this would enable widespread uptake among stakeholders who would not otherwise be capable to pursue energy retrofit projects on their own, whether because of financial limitations, lack of knowledge or confidence in their ability to manage a retrofit project, or for any other reason.

On-bill financing is, by its nature, best suited to retrofit of existing buildings, particularly homes, and is less well suited to new construction.

5.3.4 **Local Improvement Charges (LICs)**

When improvement of municipal infrastructure projects will benefit nearby properties, the costs of the project can be imposed on those nearby properties which benefit, and then be recollected through the property tax bill as a separate and additional levy\textsuperscript{127}. These additional levies, tied to a local infrastructure improvement that particularly benefits the lots being charged, are called Local Improvement Charges (LICs). Ontario recently expanded the legally permissible scope of LICs to include energy retrofit projects. This effectively means that LICs are perhaps an implementation tool for On-Bill Financing methods as described above.

5.3.5 **Energy Service Companies (ESCOs)**

Energy Service Companies (ESCOs) are a private sector equivalent to On-Bill Financing as described above. ESCOs are Companies who offer upgraded energy consumption assets (eg: heating / cooling plants) and financing based on energy savings. The typical ESCO business model includes a long-term contract where the ESCO agrees to fund certain energy retrofits for a particular building owner who would agree in exchange to pay the ESCO a certain monthly amount from their realized energy savings. These payments would be intended to repay the ESCO for the assets and retrofit work which was funded by the ESCO, and ideally these payments should be designed to be less than the amount saved due to the energy retrofit project. In the ideal case this would mean that the building owner’s utility related expenses neither increase nor decrease for the first period of years while repaying the ESCO: they would pay less to their utility (because they are using less energy), but any savings they would have seen would be paid instead to the ESCO until the retrofit system is repaid, whereafter the building owner would own the improved energy systems and would benefit exclusively from the savings. In the end, the ESCO will have helped the building to achieve higher levels of energy performance, and everyone will have benefitted financially along the way.

\textsuperscript{125} [https://guelph.ca/plans-and-strategies/community-energy-initiative/geers/](https://guelph.ca/plans-and-strategies/community-energy-initiative/geers/)
\textsuperscript{127}[http://www.mah.gov.on.ca/Page10226.aspx](http://www.mah.gov.on.ca/Page10226.aspx)
There are many forms of ESCO business models, but they all generally vary on this theme. Some will choose to create immediate savings by extending the repayment period and charging less than the full amount of energy usage money saved, others will forego short-term savings in order to repay the ESCO as quickly as possible. Some ESCOs will actually replace the local utility, will purchase the energy from the utility and then bundle that energy fee with their ESCO service fees and rebill the building operator (ie: with the intent of simplifying the building operator’s utility experience by consolidating all energy fees onto one bill, including the ESCO’s fees).

ESCOs are most successful with long-term stable building occupants, primarily public sector offices, hospitals, schools, recreational facilities, etc. ESCOs have tended to struggle with industrial clients, which are inherently less stable than public sector clients because they compete in global markets, are sometimes subject to unforeseen mergers/acquisitions or the opposite: market shifts and foreclosures. In short, Industry tends to need shorter-term returns, and ESCOs working with industry need to be very careful about over-exposing themselves to risks inherent in the industry they are working with, which makes it difficult for the ESCOs to be confident that they will make their full returns with their long-term business model, or difficult to have assurance that their client will continue to be able to pay into a long-term contract. This in turn puts pressure on the ESCO to collect their returns in a shorter period in order to manage their investment risk, which increases the cash flows required during the payment period, which compromises their project cash flows: rather than maintaining client monthly energy expenditures at the same or slightly reduced amounts after the energy retrofit project is complete, those monthly billings may actually be increased, sometimes significantly, in order for the ESCO to make its minimally required returns while managing all associated risks. This typically ends up making ESCOs uncompetitive with conventional methods, except when working with lower risk buildings in the public sector.

5.4 **NON-TRADITIONAL METHODS OF FINANCING**

Once all reasonable efforts have been made to reduce and offset expenses, and reasonable consideration has been given to whether externalized expense models are appropriate for a given project, the project team will then be back to normal questions of how to finance the outstanding expenses that remain unfunded. The following sub-sections summarize some creative options for non-traditional funding models.

5.4.1 **GREEN BONDS AND DEBENTURES**

There is a growing appetite in the investment market for “green” investments. Some Toronto area developers have been successful in leveraging unsecured “green bond” debenture products to fund green improvements for LEED rated condo tower projects there. The bond was treated as a loan from the bond holder and was repaid over time through the condo fees, offset by the energy savings which resulted from the funded upgrades. This unsecured bond debenture was only possible because of the general creditworthiness of the developers involved in each case, but the model set an interesting precedent.
5.4.2 **Energy Service Agreements (ESA)**

Sometimes also called Energy Savings Agreements or Energy Services Performance Contracts (ESPCs), Energy Service Agreements are effectively a turn-key energy procurement contract, where a building owner agrees to purchase energy as a service, not just a product, from a third party.

ESAs commonly work closely with ESCOs\(^{128}\) (see 5.3.5 above), and typically involve hiring the ESA provider to oversee and manage the customer’s energy systems and related expenses. The ESA provider will then manage the operation and use of energy systems provided by the ESCO (which may be another department in the same company as the ESA provider), they will often guarantee the performance of the energy system, and will take responsibility for ensuring that it achieves the energy savings and investment returns required by all parties.

Physically, the ESA may include the provision of renewable energy assets, conservation / efficiency upgrades, or other related projects, and may also procure energy from typical utility sources, and may bundle that energy with the energy they provide on-site before delivering to the building owner, and the building owner will deal only with the ESA holder (ie: as a replacement for their otherwise typical utility companies).

The primary difference between an ESA and an ESCO is that the ESCO will provide physical assets and the financing to support them, whereas the ESA will concern itself with performance guarantees and with ensuring that the ESCO funded projects are successful. In short, the ESCO is about the bits, and the ESA is about the operation.

The reason this is important is that it affects the financing models. Having a performance guarantee behind the energy systems in the building will reduce the funding risk behind the energy system upgrades and help avail the building owner to different funding solutions, such as green bonds (above).

---

\(^{128}\) [https://betterbuildingssolutioncenter.energy.gov/financing-navigator/option/esamesa](https://betterbuildingssolutioncenter.energy.gov/financing-navigator/option/esamesa)
6. PROJECT CASE STUDIES

Previous sections of this report have addressed what technologies are best suited to which applications and have explored different financial tools that enable projects to proceed. Presuming the project design is successful, and that the project is funded and headed toward construction, there are still a myriad of government approvals that most projects will need to obtain. For the purposes of this study two “real” projects were chosen as case studies from each of the four participating cities: eight case studies in total. These cases were a mix of actual projects with development partners and hypothetical projects chosen for their merit as study cases, and each were then treated as real projects and were subjected to a mock-trial shadow-approval process: conceptual designs were documented and submitted for review by the cities, and discussions were had surrounding what the City in each case would need to see or review in order to approve the projects for construction.

The eight project sites included in this study were intended to represent a sufficiently diverse pool of case studies that they would be generally representative of most of the development scenarios that municipalities typically experience and would therefore provide a highly transferrable and repeatable set of results for use not only by the participating partners, but also for all other Canadian municipalities.

This chapter of this report will summarize the eight case studies and document the lessons we learned in their evaluation.

6.1 WEST 5 (LONDON SITE ONE)

Figure 6-1: Aerial View of West 5 Surroundings, London, ON
6.1.1 **PROJECT SUMMARY**

Figure 6-1 (above) shows the context of the West 5 project site within its immediate surroundings in northwest London, ON. North is up. The coloured shading indicates existing and future uses: yellow is low-density residential, red is commercial, green is park, and blue is civic (a school in the upper middle, a retirement home on the right, and a storm water pond in the lower left). The grey parcel in the middle (surrounded by the red dashed line) is the privately held 70 acre West 5 site, bordered on the south by Oxford Street W., on the right (east) by Kains Rd. (which becomes Commissioners after it crosses Oxford heading south), on the north by Shore Rd., and on the west by Westdel Bourne. The purple lines are bike trails that connect to the rest of the city. The park shown at the top of this image (just north of Shore Rd.) is ~50 acres and is fully serviced, including play structures, soccer and baseball fields, public restrooms and water fountains, and open green space. There is a gated golf community immediately north of the uppermost yellow shading on this image. There are many high-value properties west (left) and north (up) of this image, and the nearest restaurants or entertainment are approximately 2.5 kilometers away. There is little commercial retail within 5 km of this site. In short, there are relatively affluent families living all around West 5, with few local retail, entertainment or recreational opportunities available, thus presenting a prime opportunity for more restaurants and retail here.

“West 5” is the name for Sifton’s master-planned community being built on this site. Sifton Properties Ltd. (Sifton) has owned this land for over 40 years, and has built adjacent communities in the past. Sifton has been family owned for over 95 years, and has built much of the City of London in that time (~25% of the city). See [www.west5.ca](http://www.west5.ca) for more information on the project and on the Sifton group of companies. The Master Plan for West 5 is shown in Figure 6-2 below.
This Master Plan is conceptual and is intended to be built out over approximately 15 years from 2016-2031. It includes nearly 2,000 homes (~300 townhomes and the rest in multi-storey buildings ranging from 4 to 18 storeys in height), approximately 300,000 ft\(^2\) of commercial and retail space and 100,000 ft\(^2\) of office space. The final design for each group of buildings will be refined through detailed architectural design and construction. Several buildings are labelled “NOW OPEN”, and indeed are complete. The townhomes (labelled “NOW LEASING”) have already been constructed and are >90% rented. Since opening the first townhomes in Mar. 2017, Sifton has collected a waiting list of over 650 people interested in renting / purchasing residential units in West 5. Other buildings are presently under design, and the pace of construction is expected to accelerate in the coming years.

### 6.1.2 Social Context

This site is a greenfield on the edge of town, surrounded by other urban expansion (mostly low density residential). Because this site is master-planned, and because of the distance to the...
downtown core and the lack of other local restaurants / entertainment / shopping / amenities, West 5 will be contributing a significant new hub to the north-west area of London. This will help to centralize the residents in the Riverbend area neighbourhoods (approximately 8,000 people), provide that portion of the City with much needed diversity of land uses, reduce the need for residents to travel for work / shopping / play, and bring a new sense of community to what was otherwise formerly a suburban bedroom community. In all, this will help to reduce travel related fuel emissions, it will densify and diversify that portion of the City, it will enhance the immediately local economy, and it will bring all the benefits that come with densification and local diversity of land uses.

Politically, West 5 has received tremendous support from the City through approved policies for West 5 in the official plan (The London Plan\textsuperscript{129}) that encourage innovation and sustainability initiatives in support of the progression towards sustainable design and net zero energy at the community scale.

The only social constraint that West 5 has experienced thus far is typical for new development: existing residents expressed concern about the increased density of West 5 and corresponding impacts on land values and traffic. Opposition to West 5 has otherwise been minimal.

\subsection*{6.1.3 Design Strategies}

West 5 will include a diverse portfolio of buildings across its 70 acres, which are being designed using a mixed blend of technologies and approaches. First, the community is being master-planned and designed from the macro level to work as a whole, so some buildings are deliberately being designed to include elements that benefit other buildings. Some buildings will generate more energy than they need, and others will not be able to achieve net-zero, but together they will share energy and the surpluses of some will supply the lack of others.

More specifically, the Sifton Centre, a 60,000 ft\textsuperscript{2} commercial office building and the first building constructed on the site, has been designed to achieve net-zero energy using the following technologies:

- Increased insulation beyond building code (R28 walls and R40 roof);
- Advanced windows: triple-pane low-e argon filled (U=0.25) View-Dynamic glass which auto-tints when exposed to sunlight, thus helping to reduce solar heat gain and keep the building cool;
- Cold-Climate Air Source Heat Pumps (ASHPs) as the primary heating system;
- Variable Refrigerant Flow (VRF) heating/cooling distribution, which also allows the building to take heat from the sunny side and move it to the north side, providing cooling and heating simply by moving heat around, before paying to introduce new heat;
- Air-to-air heat recovery;
- Demand control ventilation;

\textsuperscript{129} https://www.thelondonplan.ca/
• Advanced air tightness to minimize air leakage from all spaces (common areas and suites, commercial and residential). Target maximum <2.5 ACH50 for suites <5,000 ft²;
• All buildings will be properly commissioned by professional commissioning agents;
• LED lighting throughout;
• Domestic hot water supplied from the VRF system (and ultimately from the ASHPs);
• 178 kW of net-metered solar PV panels across the roof and various facades, and 280 kW more over the 112 parking spaces shared with the next planned building (a 40,000 ft² office-retail building under construction from fall 2017 through summer 2019), totalling just over 1400 solar panels;
• Orienting the ground floor (retail) to the street, but turning the upper two storeys true to south to maximize solar exposure for the solar PV system;
• A 25,000 US Gallon (~95,000 L) cistern in the basement which holds rainwater collected from the roof for re-use in landscape irrigation and flushing toilets;
• Additional features for tenant enjoyment, including a two-storey living wall and green roof space on lower roofs with balcony access.

The townhomes have been designed to be an average of 25-30% better than net-zero by using:

• Improved insulation: R50 attics, R32 walls, R24 foundation walls, and R10 under the foundation slab;
• Triple pane low-e argon windows with low solar gain (0.2);
• Efficient (R6.5) doors and garage doors;
• Advanced air tightness to ensure maximum 2.0 ACH50 (which is a significant accomplishment on attached row-homes or stacked townhomes which commonly score over 4, and historically have scored >10);
• All buildings will be properly commissioned by professionally credentialed Commissioning Agents and tested for air-tightness;
• Heat Recovery Ventilators (67% efficient) and Drain Water Heat Recovery (43%);
• Cold Climate Air Source Heat Pumps (ASHP) with backup electric resistance heat: base COP of 3.5 and SEER of 21;
• LED lighting throughout;
• ENERGY STAR® rated appliances;
• 700 kW of solar panels shared across all 87 townhomes in the first phase of homes.

Other buildings currently completed, under construction or nearing approval include a 40,000 ft² office-retail building (mentioned above), a 5,000 ft² pet services building by the park (Oak West Animal Clinic - completed), an 11 storey mixed use tower (under construction) with 25,000 ft² of ground floor retail and 115 rental apartments above, and a retirement building (nearing approval) consisting of 115 seniors apartments and a 150 bed retirement residence. Similar approaches are anticipated for all future buildings at West 5: many efficiency measures to get loads down, significant solar for on-site generation, and solar over much of the parking and potentially over an adjacent storm water conveyance trench.

There will be for-sale residential properties in West 5 later, but Sifton wanted to retain the first buildings as rental units because of the number of new innovations that are being included in
each new building. Maintaining ownership allows Sifton to keep control of the buildings so that they can learn any necessary lessons and make appropriate changes as quickly and conveniently as possible before constructing other buildings in West 5. Ongoing lessons are being tracked in a “lessons learned” log which is being shared with each new architectural team as each new building enters design.

Other active projects in West 5 include efforts to design a DC microgrid, to integrate local energy storage at both central and distributed locations, to integrate Electric Vehicles and local charging stations, and to explore Autonomous Vehicles for things like package delivery or shuttling to and from transit stops.

West 5 is presently under construction, but several lessons are being learned that are worth noting:

a. Sifton’s construction team had no prior experience pursuing specific air tightness targets on a multi-unit residential building (MURB), which can be exceptionally challenging around connections for shared walls and floors. Sifton invested significant effort in monitoring contractors on site, and was able to achieve the target of <1.5 ACH (a significant achievement even for detached units).

b. The roof slopes of townhouses were optimized to maximize solar energy generation and limit increase of roof costs. This meant constructing at a low enough slope to optimize solar panel angle, but high enough to avoid low-slope roofing design changes (eg: additional flashing and weather proofing).

c. Tradespeople in London are, in general, not experienced with sustainable building construction. There was / is a need to educate trades to think differently, and to pay extra attention to detailing in the construction drawings. For example, foundation walls had thicker concrete to support additional insulation. Trades would have missed this and would have constructed to standard dimensions if it had not been made very clear.

d. Once construction was complete, building management staff and occupants/tenants were unfamiliar with the smart technologies employed: education was required.

6.1.4 Financial Strategies

Sifton and s2e Technologies explored a variety of financial strategies for West 5, but the objective from the beginning was to construct the community in such a way as to not need any outside incentive money. Sifton has the advantage that they’ve owned the land at West 5 for nearly 40 years, so the land costs have been abnormally low in this project, and this has made it easier for Sifton to invest in things other than land which benefit the vision of the overall project.

The West 5 project began as a research project in 2013 (then named Riverbend Village), wherein s2e Technologies used outside funding to support a team of 90 researchers from 13 academic institutions across Ontario and Quebec, including colleges and Universities from Windsor to
Montreal. The research team focussed on a range of topics including financial, marketing, and a host of technical concepts (energy, water, waste, local agriculture, transportation, and more). The end conclusion from this research effort (more than 2,000 report pages later) was that it was possible to construct a sustainable “smart” community at West 5 and to do so economically, so Sifton and s2e joined forces and Riverbend Village was transformed into West 5.

6.1.4.1 Bundled IRR

The buildings at West 5 are being designed with a slightly nonconventional approach to calculating payback. Most energy efficient building projects calculate payback on each improvement uniquely, and individual items with less attractive paybacks are value-engineered out of the project one by one based on their individual merits, often regardless of whether they offer synergistic benefit with other systems. For West 5, system paybacks have been calculated in aggregate, so rather than comparing the cost benefit of each incremental upgrade in building performance to other proposed benefits and choosing only the most cost effective upgrades, the buildings are simply redesigned to hit net-zero energy, and the full package of required upgrades (from building code up) are then assessed as a package. If the cumulative benefit of the package meets the needed rate of return (measured as an IRR or hurdle rate), then the package is adopted into the design. If the package does not meet the required rate of investment return, then it is modified until it does. This allows swift payback items like insulation to help offset the cost of more expensive items like solar panels, and together, the improved building gets much closer to achieving net-zero energy while still yielding attractive investment returns for the developer. In Sifton’s case, that return needed to be no less than 7%, and preferably over 10%, depending on building type. In all cases this has (so far) been achieved.

The financing of the solar energy systems in West 5 is of particular interest. Most of the solar energy systems in West 5 will be installed using Ontario’s Net Metering program, and much of that after the Feed-in Tariff (FIT) program will have phased out. There will be only two FIT contracts active in all of the West 5 site (at the first phase of townhomes), and the rest of well over 7 MW of solar will be net metered. This means that the utility rates used to calculate the returns on investing in solar are simply the peak rates during the day, so the Province’s political intentions around keeping rates artificially low by subsidizing broad populations of consumers has significantly undermined the returns on the West 5 business model.

6.1.4.2 Micro-Utility

The West 5 team also spent significant time and effort exploring micro-utility business models, and had intentions to launch a micro-utility that would supply all the energy to all of the buildings within the West 5 project. The micro-utility itself was to be owned jointly by Sifton, s2e, and London Hydro, but ongoing political interventions into Ontario’s energy markets have stripped all profitability out of the various business partnership structures that were being considered, so the partnership was ended and the West 5 buildings were connected to the local utility network using traditional methods. The hope had been that the micro-utility could invest in and own the large energy assets in all buildings, including heating/cooling plants, district energy assets, solar systems, heat exchangers and heat recovery systems, and all things electrical or mechanical that might require maintenance, up to and perhaps including kitchen and laundry.
appliances in residential homes/suites. This would have enabled tenants (families and businesses) to leave maintenance concerns to the micro-utility, and it would have made it simpler for Sifton/s2e to choose the systems they most trusted to help them achieve net-zero energy at the community scale, rather than having to worry about whether the building occupants would be able to properly maintain them. The micro-utility may be reintroduced in future West 5 buildings, but is not part of the immediate plan for the present or next few buildings.

6.1.5 POLICY/PROCESS

West 5 was the most advanced of the case studies explored in this research effort, and unsurprisingly, West 5 offered many lessons about the process related challenges which sometimes surface with innovative development projects, particularly net-zero energy projects.

6.1.5.1 Mixed-Use Designation

At the outset of the project, Sifton Properties Ltd. applied to the City of London for Official Plan and zoning by-law amendments, and more specifically, Sifton sought to designate most of West 5 for mixed use. The intent was to maximize flexibility for both the short and long term to allow adaptation to market conditions and tenant demand, and to provide greater opportunities for energy load balancing through the mix of uses.

There was initial resistance by the City to the proposed mixed-use designation (because it would have been an entirely new land use designation in the Official Plan) and to the proportion of office space proposed, but the city ultimately approved a Special Policy Area within the Official Plan and Special Provision Business District and Community Commercial Node zones including most of the requested provisions. These amendments allowed for more design flexibility for net-zero and other sustainability related initiatives, and the net-zero initiatives provided some justification for increased flexibility. The city and Sifton met halfway on the targeted volume of office space, agreeing to 100,000 ft² maximum and committing to high design and sustainability standards. Ultimately, an amendment was added to section 10.1.3 of the Official Plan for the City of London (titled “Policies for Specific Areas”) to guide future development of lands in the Riverbend area referred to as “West Five”.

Lesson: Negotiation and compromise are common during planning approvals processes to address public input, and to balance competing priorities and policies. However, it would seem appropriate to consider more standardized approaches and/or policies in the future that prioritize sustainability, perhaps including incentives such as bonusing for office space, commercial space or density, or providing greater zoning flexibility. Or consider policies that would permit certain concessions from the City when a development applicant pursues specific sustainability objectives (eg: achieving specific performance objectives for energy and water use, integrating green building technologies, etc), and in return the site could be granted a density bonus in the form of additional stories in building height, additional office/commercial space allowances, etc. This could save both the City and the developer time and money, and would also help developers plan ahead to pursue sustainability objectives recognized by the City, knowing they would receive bonusing of some meaningful and clear description. In the end, this would create a way for both the City and the developer to win while pursuing sustainability.
The lesson in this case is that the need for negotiations should be minimized and policies should provide for increased flexibility for development applications that pursue sustainability. Cities should take the opportunity to consider proactively defining benefits that they can offer to builders (such as zoning flexibility or density allowances etc. as discussed above) in order to encourage more sustainable construction.

6.1.5.2 Design Guidelines

The City required a guideline document outlining urban and sustainable design intentions for the site and master plan (in accordance with Section 11.1.3 of the City’s Official Plan). Thereafter it was expected that this Urban Design Guideline would help simplify future approvals. However, challenges have occurred when some urban design guidelines and policies are not conducive to sustainability initiatives (e.g., requirements for street-oriented buildings conflicted with the building orientation required for optimal solar panel arrangements). Sifton has submitted additional building permit applications and has been advised that despite being in general compliance with the Design Guidelines for West 5, review will nonetheless still be required by the Urban Design Peer Review Panel, which seems redundant and adds cost and delay.

**Lesson:** Larger projects are, by their size, more complicated. Innovative projects are similar, because they include unique considerations which deviate from what is otherwise typically expected. If a City department requests or is invited to give proactive feedback to the developer, then it is incumbent upon the City to manage itself in such a way as to not then punish the developer with multiple redundant reviews. In this case, the requirement for a Design Guideline document should either be used to expedite later reviews, or perhaps to avail the builder/developer to some other special advantage that makes the effort and cost of preparing the additional document somehow worthwhile, and not simply redundant. Guideline documents should also be considered just that: guidelines, NOT policies. Flexibility is essential in order to address technical considerations at the detailed architectural/engineering design stage that would not have been known at the initial master plan concept stage.

6.1.5.3 Density Adjustments

Sifton’s design proposed an overall density of 65 units per hectare, or a maximum of 2,000 residential units for the entire West 5 site. The City indicated this was above permitted density on the site, but then allowed this increased density due to the low density developments surrounding the site, with West 5 becoming a hub for the surrounding neighbourhoods. These allowances were contingent upon there being a maximum building height of 12 storeys within West 5, and a mix of housing forms on multi-family high density residential designated lands.

**Lesson:** Sites are always within a broader context, and sometimes that context requires thinking of the site differently. In this case it made sense to revisit density requirements because of the surrounding land uses.
6.1.5.4 Stormwater

The 2013 feasibility studies for West 5 included evaluation of a net-zero water strategy, using Low Impact Development (LID) strategies that are well documented by other research efforts, particularly at the Toronto and Region Conservation Authority (TRCA). The study demonstrated successfully that 100% of the site’s water needs could be met through the collection and appropriate treatment / management / use of rain water, and that this would also eliminate the need for otherwise typical stormwater management systems. Further, it was demonstrated that this entire system would cost less than the traditional stormwater management systems required by the City. In the end, the net-zero water design was abandoned because the City had already approved a more traditional approach, and it was determined that revisiting that approach would require approximately three years’ worth of due process, which would likely conclude with little change. The City was very accommodating of any additional systems which Sifton would desire to install and test on their own, but only if redundant with (and not as replacements for) the system which the City had already approved.

Lesson: In this case, innovation was punished by the choice of either (1) being required to be redundant with traditional systems, and therefore be a fully additional cost with no opportunity for payback, or (2) a three year delay, which was regardless likely to also result in (1). Sifton abandoned their pursuits of net-zero water in West 5.

6.1.5.5 Stormwater PV Canopy

The City of London’s official plan includes proactive language that was specifically intended to enable West 5 to be innovative, as a pilot test site of sorts. Among other things, this language enables the opportunity to install a solar canopy over the stormwater infiltration gallery on the west side of the site (www.londonplan.ca, pg. 230, item 891). The canopy is not yet designed, but Figure 6-5 (from https://www.pinterest.ca/pin/360076932681446585) and Figure 6-6 (from https://www.trendhunter.com/trends/solar-arch) below are some of many sources of design inspiration that could cover the stormwater trench shown circled on the west (left) of Figure 6-7 below. The final design could be a long gazebo-like tunnel covering much of the trench.
Figure 6-7: PV @ West 5 Stormwater Management (SWM) Trench

This stormwater trench has sufficient space for several MW (ie: >2.5MW+) of PV depending on the design of the structure that would support the PV, and could contribute significantly to West 5’s net-zero energy objectives. Over the course of several meetings with city staff and local contractors, it was determined that such a PV canopy would also shade the trench, both enhancing pedestrian enjoyment and also reducing maintenance: the algae and micro-organisms in the trench will be healthier in the shade, and the trench will more effectively filter and infiltrate water into the ground (which will support the cold-water fishery immediately west of the site), less of which will evaporate while shaded.

The mock-trial shadow approval discussions revealed that the City would have no reason to oppose installing PV over the SWM trench, so long as regular maintenance could be performed on the trench and all building code and other related code requirements were met. Local bioswale / SWM contractors were very supportive, suggesting that they only need the PV canopy to be tall enough for a car to get under it, and then they could drive their mini-tractors and bulldozers down into the trench without difficulty.

**Lesson:** SWM trenches can be an ideal place to install solar panels on canopies. This helps provide additional area to generate energy for buildings which struggle to achieve net-zero, while also shading the trench (benefitting the algae and plants that grow there, helping them filter water more effectively and reducing maintenance requirements) and enhancing the pedestrian experience for those who might walk the trails along the trench.
6.1.5.6 Team Experience

Project architects often have exceptional experience in building design but more limited experience with net-zero energy requirements. This lack of experience can cause delays with the approvals process, result in repeated design edits both before and after tendering, and generally complicate projects.

**Lesson:** Experience matters, and it is incumbent upon the developer to ensure that their team has sufficient experience to achieve their design objectives.

6.1.5.7 Incentives

The City of London did not have any specific incentives for which the West 5 project was eligible. 750kW of solar PV installed on the first phase of town homes will benefit from a FIT contract, but the site solar strategy was designed to not need FIT revenue. Various research projects continue on specific buildings as cases arise, but these are side projects and are not core to the West5 business plan.

West 5 does however need the ability to share energy between buildings. The province of Ontario was considering implementing a Virtual Net Metering (VNM) policy which would allow a property owner with generation assets on multiple buildings within a reasonable distance from one another to have net meters installed on each of those buildings and to use generation from any of those buildings to offset consumption in any of those buildings. Essentially the owner would pay the local electrical utility’s grid service fees as normal, and these fees would include the right to send energy from one building across local utility grid infrastructure to another building owned by the same entity. Unfortunately Ontario’s new government cancelled the VNM program before it was launched. In the absence of VNM, Sifton will need to consider bulk metering through the aforementioned micro-utility, and combining as many buildings and systems as possible behind any point of connection to the external grid (ie: London Hydro).

6.1.6 MAJOR LESSONS LEARNED/TAKEAWAYS

1. **Technology is not the issue:** there are many technologies readily available in the industry to help buildings of any shape or size to achieve net-zero energy.

2. **Market realities** can make it difficult to access “best” technologies, and projects are often constrained to work with the best *locally available* technology, rather than the best technology, whether because of importing costs/tariffs, or because of the lack of local service personnel who can install and maintain systems in a cost-effective way. For example, CO2 based air conditioning systems are among the most efficient in the market, and they have much lower environmental impact than other coolants and cooling agents (HFCs etc.), but they require the use of special high-pressure equipment that is not widely available in Ontario, and therefore was not attractive for West 5.

3. **Stormwater Facilities** create opportunities for siting additional PV.
4. Financial considerations are still the primary determinant in most project decisions.

5. Some good ideas are simply not accepted by municipalities. West 5 could have been a net-zero water community at half the cost of the traditional municipal systems that were required, but West 5 would have been required to invest in the traditional system as well (ie: spending tens of millions of dollars on redundant water management strategies) and would have had to wait an expected additional 3 years for related approvals (with noted risk that those approvals were not even assured and could become a wasted effort).

6. Related to item 5 above, Municipalities need to engage in self-review, and make effort to proactively identify where they have policies or practices that actively prevent builders/developers from being able to innovate.

7. Political interventions compromise the stability of the free market. West 5 is utterly dependent upon the ability to share energy between buildings and has thus far been designed around solar PV and the opportunity to build the entire community without the need for natural gas. Because the provincial government has changed, policies have been changing which affect West 5’s ability to share solar energy between buildings that are adjacent to each other. It is very difficult to plan a 15+ year construction project knowing that there will be a minimum of three provincial elections before the project is fully constructed, and that energy (a vitally important topic for net-zero construction in general, and especially for this project because it is primarily solar powered) is a provincial issue which is affected by those elections. The fact that political change can introduce technical considerations into the project puts tremendous pressure on the developer to avoid doing anything that faces political risk, which tends to include anything innovative.

8. Lessons Learned are forgotten and repeated: Sifton is making deliberate efforts to maintain a log of lessons learned from each new building, and to include the latest version of that log in the earliest stages of design for each new building, even before hiring the architecture team.
6.2 **McCormick Candy Factory Site (London Site Two)**

![Figure 6-8: Former McCormick Candy Factory](image)

Owner/Developer: McCormick Villages Inc.

Project Status: Pursuing approvals. Existing buildings in disrepair. Lands are designated brownfield, with cleanup yet to begin.

Site Size: 5.3 hectares (13 acres)

Pre-development Use: Food processing

Proposed Use: Mixed-Use: Ground Floor Commercial, Mid-Rise Apartments, Townhomes

Number of Residential Units: (Planned): 334 Apartments, 130 Seniors Units, 83 Townhouses

Residential Area: 52,600 m² (566,000 ft²)

Commercial Area: 2,700 m² (29,000 ft²)

Building Heights: 3-6 Stories

Key Energy Features: Exceptional energy efficiency, Solar PV

Grants/Incentives/Programs: Brownfield (DC rebate) and Heritage (property tax waiver)
6.2.1 Project Summary

The specific site is now within a broader 35 hectare (87 acre) secondary plan that focusses on the lands surrounding and including the former McCormick food processing facility, active from 1914 through 2007\textsuperscript{130}. Due to the lack of environmental awareness during this period, the site now needs significant environmental remediation before any re-development efforts can take place. McCormick Villages Inc. (MVI) showed interest in the lands shortly after the property was abandoned in 2008, when the city had seized ownership due to accumulated unpaid municipal property taxes. The negotiations between the city and MVI continued until an Agreement of Purchase and Sale (APS) was signed July 10\textsuperscript{th}, 2014, and the site was legally transferred from city ownership to MVI on March 15\textsuperscript{th}, 2016. The intervening time between APS and closing was spent re-zoning and re-designing the site.

\textbf{Figure 6-9: Aerial View of McCormick and surrounding Area, London, ON}

The secondary plan with the current zoning and land designations was approved in November 2015. Figure 6-9 (above) has been slightly modified from the original to provide a visual summary of the different land designations within the McCormick area secondary plan. The secondary plan shows the 5.3 hectare (13 acre) re-development parcel for the McCormick factory.

\textsuperscript{130}McCormick factory glory days are well recorded. 2012. \textit{London Free Press}. Retrieved from http://www.lfpress.com/2012/09/20/mccormick-factory-glory-days-are-well-recorded
within the broader 35 hectare (87 acre) secondary planned area, and emphasizes uses designated by the City: low-rise residential (yellow), mid-rise residential (orange) and transit-oriented buildings (pink). For a more detailed account of what these zoning designations require of future developments, see the City of London’s McCormick Area Secondary Plan – Nov 2015. The translucent white box was added and overlaid to more clearly show the MVI site boundaries. All concept designs for the site, discussed later in this section, have been developed with these land designations in mind. Figure 6-9 shows the context of the MVI project site within its immediate surroundings in east London, ON. North is up.

The site will be developed in stages, starting with the transit-oriented portion. This first phase will commence sometime in 2019 and is estimated to cost ~$40 million. This will include cleaning the site and existing building, remediating the building’s salvageable heritage elements, and renewing/refurbishing the main building into 60,000 ft$^2$ of ground floor commercial with 175 residential units above. This does not include the extension of Gleeson Street at the northern part of the property or the installation of services for the interior of the site. A brownfield grant of $2.5 million has been awarded to MVI to contribute towards site remediation expenses which were underway as of the publishing of this report. A heritage grant has also been awarded to help preserve certain architectural elements of the building. Although this heritage designation provides an opportunity for additional grant money support, it also places restrictions on what types of designs will and will not be accepted. Brownfield remediation and on-site demolition activity are planned to conclude in 2019, and new construction will begin in the fall.

The mid-rise and low-rise residential areas, including 159 apartment units, 130 seniors units and 83 townhouses, are scheduled in the second phase of the project, tentatively 2028.

6.2.2 SOCIAL CONTEXT

The surrounding buildings are good candidates for redevelopment, but still home to some successful businesses. The redevelopment of the McCormick factory and lands will provide additional retail and office space, will catalyze development on adjacent properties, and will encourage revitalization of the surrounding area.

The Old East Area Community Improvement Plan (Old East CIP) has been instrumental in the revitalization of the area it includes, and although McCormick is not included in this CIP boundary, residents of the renewed McCormick site will be within walking distance and will enjoy related employment opportunities. Residents of the McCormick site will be able to fulfill many errands within 2km, which should promote local economic development.

The City of London also has plans to expand rapid bus service throughout London, with a rapid transit station sited at the southwest corner of the McCormick site, thus further benefitting connectivity and economic benefit to this site.

---

6.2.3 Design Strategies

The concept site plan is generally defined and limited by the Secondary Plan land designations. This project will use a blend of technologies and approaches to make NZE on this site feasible, with townhomes that generate more energy than they need, which will then be shared with the apartment buildings (which will not be able to generate net-zero energy without additional help).

A concept plan for the transit-oriented portion of the site has already been submitted and accepted by the City. This original concept site plan that MVI submitted and had approved can be found online at www.london.ca. Figure 6-10 below is a more recent concept site plan that re-orientates the buildings in Phase II and leaves the plot of land north of the Gleeson extension undeveloped for now. The two 6 storey apartments on McCormick Boulevard will be leasable to any individual, whereas the 4 storey apartments on the land bordered by Ashland Avenue and Sparton Street will be designated senior homes.

Development of Phase 1 will result in 60,000 ft² of commercial space for business use, as well as 175 (127,260 ft²) residential apartment units. The conceptual design needed to achieve net zero energy will include the following technologies and strategies:

- Increased insulation beyond building code (R28 walls and R40 roof);
- Advanced windows: triple-pane low-e argon filled (U=0.25); View-Dynamic glass which auto-tints when exposed to sunlight, thus helping to reduce solar heat gain and keep the building cool;
- Cold-Climate Air Source Heat Pumps (ASHPs) as the primary heating system;
- Variable Refrigerant Flow (VRF) heating/cooling distribution, which also allows the building to take heat from the sunny south side and move it to the shaded north side,
providing cooling and heating simply by moving heat around, before paying to introduce new heat;

- Air-to-air heat recovery;
- Demand control ventilation;
- LED lighting and occupancy control throughout;
- Domestic hot water supplied from the VRF system (and ultimately from the ASHPs);
- 650 kW of net-metered solar PV panels across the roof and façades, and 180kW more over the 65 parking spaces, totalling just over 2,100 solar panels (based on 400W 72cell panels);
- Large shared cistern in the basement holds rainwater collected from the roof for re-use irrigating and flushing toilets
- Advanced air tightness to minimize air leakage from all spaces (common areas and suites, commercial and residential). Target maximum <2.5 ACH50 for suites <5,000 ft²;
- All buildings will be properly commissioned by professional Commissioning Agents, and suites <5000 ft² will be tested for air-tightness;

The mid-rise apartments will provide 289 units of varying size, with 130 units specifically for seniors, and concepts will need to include the following technologies to achieve net zero energy:

- Same as above but…
- 644kW of solar PV panels across the roof and various facades, totalling just over 1,600 solar panels (400W 72cell panels);

The 83 proposed townhomes will be designed to be an average of 45-60% better than net-zero (providing adjacent buildings with additional energy) by using:

- Improved insulation: R50 attics, R32 walls, R24 foundation walls, and R10 under slab;
- Triple pane low-e argon windows with low solar gain (0.2);
- Efficient (R6.5) doors and garage doors;
- Advanced air tightness to ensure maximum 2.5 ACH50 (which is a significant accomplishment on attached row-homes or stacked townhomes which commonly score over 4, and historically have scored >10);
- Heat Recovery Ventilators (67% efficient) and Drain Water Heat Recovery (43%);
- Cold Climate Air Source Heat Pumps (ASHP) with backup electric resistance heat: base COP of 3.5 and SEER of 21;
- LED lighting throughout;
- ENERGY STAR® rated appliances;
- 316 kW of solar panels shared across all 83 townhomes, for a total of 790 solar panels (400W 72cell panels).

The combined total solar PV panels of the heritage building, apartments and townhomes on the McCormick site will therefore total to ~1,800kW, for a total of ~4,500 standard 72 cell 400W solar panels. At 2m² per panel, this will require 9,000m² (96,875ft²) of panels, which should reasonably fit on the roof space provided by the proposed buildings. Optimally, the site could hold as much as 2.5MW of solar panels if we assume 45% coverage of all roofs and 30%
coverage of all S/W/E facades, with limited additional PV over surface parking, totalling ~1.8 GWh of energy from solar.

Preliminary energy modelling suggests that the proposed building mix on this site, if built with the above strategy, should consume ~4-5 GWh of energy annually, which could be reduced to ~3.7 GWh annually if district energy is used to heat/cool the buildings as a group, rather than individually. The site is sufficiently compact that it seems well suited to district heating, and this could be explored further.

This would mean that solar panels could provide ~45% of the total energy needed for this site, and thus that other sources of energy would also be needed, either from off-site renewables or by using combined heat and power (CHP) on-site. A 225 kW CHP plant would be the approximate size to provide the outstanding heating / cooling / electricity needs for this conceptual feasibility design. Energy storage of some manner would be needed in order to ensure that heating / cooling / electricity were available in the right amounts when needed, and this would warrant further study. The CHP plant would need to be supplied with natural gas from the local utility in the short term, but could be transitioned to syngas or renewable gas in the future in order to achieve net-zero energy.

6.2.4 **FINANCIAL STRATEGIES**

The renewed McCormick site will leverage incentives wherever possible and will otherwise finance conservation efforts internally and recoup their costs through collected rents.

6.2.4.1 **Incentives**

The McCormick site has been designated Brownfield by the City of London and is thus eligible (and has been approved) for $2.5 million in brownfield remediation incentives in the form of development charge rebates.

MVI was also awarded heritage related incentives to subsidize or offset the cost of renewing the designated heritage features on the site, including specific architectural details on the transit-oriented façade (rod-iron suspended canopies, glass block, etc).

Neither of these incentives will benefit any net-zero energy, sustainability or smart design initiatives: they are solely focussed on brownfield remediation and heritage.

6.2.4.2 **Efficiencies & Cost Recovery**

District energy was considered for this site because of the industrial nature of the buildings and the intended density as development matures to completion. The intended pace of development for the site will unfortunately make it difficult to support a district energy finance model, because the district energy system would need to be designed and deployed largely in advance, but much of the critical mass of the load would not be planned for construction until ~10 years later. This means that the district energy system would bear the infrastructure cost of having to be ready for
this future load expansion, but without any offsetting revenue against that cost, for ~10 years, which is clearly prohibitive.

Efficiency, by contrast, creates immediate savings that will result in reduced utility costs, and because the buildings are intended to be rental in nature, this means that utility costs will be directly born by the tenants, creating a method for immediate recovery. The tension this creates is the ever-present tension between landlord funded efficiencies vs. tenant savings (ie: one party bears the expense, and the other gains the benefit), so MVI will be seeking appropriate means to have rent include an allowance for efficiency upgrades which recover landlord investments that would otherwise only benefit the tenant. This building is in a slightly depressed local economic context within the City, so it remains unclear what threshold of rent will be appropriate for the site, and MVI is presently considering their approach to seeking tenants.

6.2.5 Policy/Process

To reach net zero energy, the buildings in Phase 1 would likely need to have solar panels on their south facing exterior walls, which would conflict with the expectations of the City’s heritage committee. This could potentially be resolved with white solar panels – a custom-order product of premium cost – and could potentially be subsidized with research dollars that target energy efficiency in heritage buildings. This discussion is ongoing.

As a project, the McCormick site has generally experienced significant delays associated with rezoning efforts, and these efforts are also ongoing. Certain holding provisions are imposed during rezoning that will not be lifted until the public consultation process concludes, whereafter MVI will need to complete a traffic impact study, a tree preservation report, a land use compatibility report, a sanitary and storm servicing report, and urban design guidelines.

The City has asked, through the Secondary Plan governing the McCormick area, that any redevelopment of this site provide support for local businesses, that it redefine Dundas St., and that it contribute to both cultural heritage conservation and to environmental sustainability. All this would need to be clearly explained in the aforementioned reports, and potentially in other reports as needed. MVI is waiting to complete most of these reports (traffic, water demand, site plan details, etc.) until they have identified an anchor office/commercial tenant.

Altogether it is likely that the site will not progress significantly until late 2018 / early 2019.

6.2.6 Major Lessons Learned/Takeaways

1. **Renewal Costs:** Old buildings are often VERY expensive to renew, and it is typically (much) more cost effective to simply demolish and rebuild. If heritage and the re-use of old buildings is desirable to the municipality, then the municipality needs to be ready to offer incentives in order to make re-development possible. This project was only possible because the City of London sold the land for $1, and further incented development through DC credits (directed at brownfield and heritage concerns).
2. **The Liability of Delay:** Old buildings present significant process and management challenges while being held as unproductive / inactive assets during the design / rezoning phase and can even pose a significant liability. The McCormick factory has been abandoned for years (since 2008) and has increasingly been used illegally by vandals and the homeless for illicit purposes that pose various security risks from broken glass / debris to abandoned needles and the remains of illegal drugs. The Developer was not intending to invest the effort in security that they have needed to, and they would argue that it is impossible for them to ever invest sufficient effort for such a large site (ie: there is always another way for vagabonds to break in). In situations like this, the only real solution is to mobilize development as quickly as possible, and to that end, the City plays a tremendously significant role in enabling or limiting the speed/progress of the development: through the full approvals process from site plan through various committees (eg: heritage committee) ultimately to building permits. Any one of these steps might actually be very fast (and indeed, the City of London is consistently fast with building permits), but any single other step in the process can easily become complicated. The same holds true for health risks: the McCormick site was once pristine, but has fallen into significant decay, and is now rife with mold, peeling paint, decaying asbestos insulation, leaky roofs/walls, pooling water, … and the illegitimate “occupants” and users of the building could suffer health effects and their associated medical (hospital / emergency) costs, some of which are potentially severe. There is a legitimate cost to the provincial healthcare system, though difficult to quantify, for the illicit activity on the site that unavoidably ensues when development is delayed. Accelerated construction approvals, at least for situations like this vacant industrial heritage property, would help reduce redevelopment costs by reducing costs for security and for remediation, and by moving the building more quickly through the development process (ie: and getting work done before the building falls into increased disrepair, which in turn increases demolition/repair costs).

3. **Balance Complexity with Approval Speed:** By corollary, if the Municipality is, for any reason, unable to expedite the approvals related to the reconstruction or revitalization of properties such as this, then it behoves the Municipality to recognize that delays will significantly increase the costs of redevelopment, and the Municipality should be more lenient about demands placed upon the developer. Specifically for this site, discussions and negotiations around the preservation of various heritage elements were challenging. The more the Municipality wants done on the site, the more quickly they should expedite the approvals: the slower the approvals, the less the Municipality can expect to be a justifiable expense worth investing in the site.

4. **Complementarity:** It is interesting to consider that this site has benefitted somewhat by the gentrification induced through the nearby Old East Area CIP, and that there is a synergistically positive impact to enticing gentrification in Old East while simultaneously pursuing revitalization of the McCormick area lands. It is worth remembering that land can sometimes be made more attractive by investment in areas surrounding that land, and that there may be circumstances where a piece of land (which we’ll call “area A”) is so challenging that the Municipality may accomplish more with less time and effort if they in fact focus elsewhere (“area B”), but in such a way as to create a catalytic benefit that
achieves good both in that other place (B) and, by direct or indirect influence, in the more challenging lands (A). This opportunity of complementarity, that investing in Area B can be an effective way to increase the opportunity for returns to investment in Area A, could be considered during the development of targeted municipal incentives: when municipal funds are limited, this might be an interesting way to extend their impact (ie: benefitting areas A and B by focussing funding on B first over A, then shifting funding support to A in following years).
6.3 **BLOCK 4 (KINGSTON: SITE ONE)**

![Aerial View of North Block, Kingston, ON](image)

**Developer / Land Owner:** City of Kingston  
**Energy Supplier:** Utilities Kingston  
**Project Status:** Pre-design. Block 4 is presently a surface parking lot with no immediate redevelopment planned. Adjacent lands (Blocks 3...
and 5) each have development planned imminently for high density residential.

<table>
<thead>
<tr>
<th>Site Area:</th>
<th>0.82 hectares (2.02 acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-development Use:</td>
<td>Parking lot</td>
</tr>
<tr>
<td>Proposed or Potential Use:</td>
<td>Mixed-Use: Ground Floor Commercial, High-Rise Apartments</td>
</tr>
<tr>
<td>Number of Residential Units:</td>
<td>~ 400 units (200 per building)</td>
</tr>
<tr>
<td>Residential Area:</td>
<td>31,000 m² (334,000 ft²)</td>
</tr>
<tr>
<td>Commercial Area:</td>
<td>3,300 m² (35,500 ft²)</td>
</tr>
<tr>
<td>Building Heights:</td>
<td>6-18 Storeys</td>
</tr>
<tr>
<td>Key Energy Features:</td>
<td>Exceptional energy efficiency, District Energy, Solar PV</td>
</tr>
<tr>
<td>Grants/Incentives/Programs:</td>
<td>Heritage rant/tax refunds, brownfield CIP incentives</td>
</tr>
</tbody>
</table>

### 6.3.1 Project Summary

The Block 4 lands in downtown Kingston are owned by the City of Kingston and were the home of the former Kingston Police Headquarters (until recently), Utilities Kingston’s No. 1 Electrical Substation, several historic buildings along Queen Street, and surface parking. With the demolition of the former Police HQ in 2011 the lands became available for redevelopment. To support this redevelopment, the City completed a *Community and Business Enhancement Study* in 2009, a *Progress Report and Proposed Action Plan* in 2012, and a *North Block Guidelines* report in 2014. These studies and reports compiled significant public and stakeholder input and examined aspects of Official Plan and Zoning Bylaw requirements, utilities servicing, heritage value and environmental constraints to develop potential development models which the City intended to leverage to solicit interest from private sector developers. The redevelopment of Block 4 was delayed by the City when it was surpassed by development interest in other downtown blocks. There is now an opportunity to reconsider how the redevelopment of the Block 4 property may support and complement surrounding development plans.

Block 4 is located in the City of Kingston’s “North Block” secondary planning area, surrounded by a combination of city owned and privately owned parking lots that are also in the process of becoming new residential and commercial buildings. A series of key objectives have been identified for the North Block as a whole, including: (1) heritage protection, (2) public parking, (3) the public realm, (4) site remediation, (5) sustainable development, (6) affordable housing, and (7) transit facilities. Each individual Block is not necessarily expected to satisfy all of these objectives, but the five blocks within the North Block are required to fulfil them collectively.

This means collaboration between the city and these developers is necessary not only to achieve the North Block planning objectives, and to achieve a compatibility of design among the blocks, but also to ensure each individual block design doesn’t impede any others. For example, it would be tragic if the Block 4 buildings were designed to be dependent on 10 floors of face mounted solar generation on its south face, and then after construction for an adjacent building to be built which shades 5 of the 10 sun exposed floors of the Block 4 building. Further examples will be
discussed within the design strategy section of this case study. Whether the other Blocks within the broader North Block will aim for net zero energy is beyond the scope of this assessment, but this case study will present a picture of what would be necessary for Block 4 to achieve net zero energy. For this reason, we have contacted private land owners of the other North Block properties to understand their intentions and to ensure that the designs and assumptions of this case study are as realistic and meaningful as possible. Figure 6-11 (below) shows the five city blocks encompassed by the “North Block” (image A) and significant current and future buildings in each (image B).

Block 1: Consists of a parking lot publicly owned by the city of Kingston and a grocery store privately held by Food Basics Inc.

Block 2: The Leon’s Centre (Ice rink and performance venue) was recently built here in 2008 and is owned by the city of Kingston. The Leon’s Centre was awarded LEED Silver certification by the Canada Green Building Council in 2008. Similar to Block 4, Block 2 was also the site of historic coal gasification operations (1852-1955).

Block 3: There is currently a parking lot owned by Homestead Land Holdings Ltd., a Goodlife Fitness and an LCBO (Liquor Control Board of Ontario) retail store, all private land. The parking lot was recently acquired by Homestead, who plans to build a high-rise (up to 15 storeys) residential apartment within the next 3-5 years.

Block 5: Consists of a parking lot and several smaller commercial buildings. Again, the parking lot was recently acquired by Homestead, who plans to build another high-rise (up to 15 storeys) with ground floor commercial space.

6.3.2 Environmental Constraints

Blocks 2 and 4 were the site of historic coal gasification operations from approximately 1852 through 1955. These operations resulted in significant contamination of the underlying soils, bedrock and groundwater with coal tar and related compounds. In 2000 the City of Kingston undertook a $2.2 million clean-up of the former coal gasification properties (Blocks 2 and 4) that involved removal of buried infrastructure, removal of free coal tar, pumping and removal of groundwater, and removal of contaminated soils. Because of the nature of coal tar (heavier than water), significant contamination remains at inaccessible depths within the fractured limestone bedrock and groundwater. The remaining coal tar was managed through a provincially approved risk assessment and risk management process that sets out physical controls on redevelopment so that exposure to deep contamination is minimized.

Any new development of Block 4 must consider its impact on the contamination which remains (deep coal tar). Any development activities that require significant depth penetration (i.e. multiple levels of underground parking, vertical geothermal systems, earth tubes, etc.) will need to be supported by risk assessment and may not be feasible given the environmental management costs that may be required to support them.
6.3.3 SOCIAL CONTEXT

The Community and Business Enhancement Study conducted by the city of Kingston in 2009 stresses the importance of sense of place. Including ground floor commercial into the building design might not only make the building eligible for a density bonus but will effectively attract the diverse target demographic the city would like to see in the area. This ground floor commercial would also satisfy the “mixed-use” objective the city has for this site (one of the City’s key objectives for North Block as mentioned above). The Kingston Hydro No. 1 substation and the limestone block buildings at 19-23 Queens Street are designated heritage buildings. There is opportunity for a parkette in the northeast corner of the site. The site itself presents opportunity for district energy, especially when designed in synergy with the large energy load requirements on adjacent blocks. This has potential to both improve efficiency and reduce energy costs for the adjacent blocks as well as for Block 4.

Satisfying multiple or even all of the North Block objectives within Block 4 would present an opportunity for the city to lead by example and support incorporation of sustainable outcomes across the whole of the North Block.

A strong and well-coordinated design for Block 4 will catalyze further benefit for each of the adjacent blocks, helping establish the North Block area as a truly special development area within the City, not only achieving the planning objectives sought by the City, but also adding something beneficial environmentally (net-zero energy), socially (providing an exceptional sense of place), and economically (with local economic development at reduced energy costs).

6.3.4 DESIGN STRATEGIES

In 2009, the City of Kingston assembled a document with recommendations and guidelines for the development of the North Block. This document included objectives that these developments are to pursue as well as concept plans which were believed to satisfy these objectives. These concepts include various forms and combinations of commercial and residential high-rise buildings. In 2012, another document outlined some new concepts and approaches to the same objectives. The latest strategy and concepts for the Block 4 site were presented in a document that addressed all North Block plans in 2014. Figure 6-12 (below) illustrates the three most recent potential redevelopment concepts for Block 4, all proposed within the 2014 Design Guidelines city report.
Figure 6-12: Most recent concept plans for Block 4, Kingston, ON. 
A) Low-rise 4-6 storey, B) Mid-rise 7-9 storey, C) High-rise 10-18 storey

Figure 6-13 (below) shows a rough overhead view of the Block 4 design proposed by these latest concepts from the City.

Figure 6-13: Aerial schematic of the proposed Block 4 design
The concept design which we are evaluating for the purposes of this net-zero energy feasibility study is shown in Figure 6-14 below.

![Figure 6-14: Latest (2017) Net-Zero Energy Concept Plan](image)

The decision as to which of the three concepts could or should be used would depend upon several factors that include development plans on adjacent blocks. Homestead Land Holdings Ltd. plans to construct a high-rise apartment building on each of blocks 3 and 5: note the green shaded areas in Figure 6-11(B). Homestead has shared the load and energy usage data from their most recent apartment projects, providing us with an idea of the amount of additional energy their North Block buildings would use. This will be important to consider when designing the district energy system at Block 4. A partnership could be considered between Homestead, the City of Kingston, Utilities Kingston and/or s2e Technologies to jointly develop a district energy system for these sites, sharing costs and benefits derived from the synergies of connecting multiple buildings to a shared heating/cooling system in the future. The financial aspects of this district energy system strategy will be discussed further within the financial strategies section of this case study.

The following is a conceptual design which could be used to pursue net zero energy for an ~13 storey building constructed on Block 4:

- Increased insulation beyond building code (R28 walls and R40 roof);
- Efficient (R6.5) doors.
- Advanced windows: triple-pane low-e argon filled (U=0.25);
- Natural ventilation strategies used throughout (applicable ~3 months/yr): operable windows facing atria, leveraging stack effect and cross ventilation opportunities;
- Cold-Climate Air Source Heat Pumps (ASHPs) as the primary heating system;
- Air-to-air heat recovery;
- Heat Recovery Ventilators (67% efficient) and Drain Water Heat Recovery (43%);
- Demand control ventilation;
- LED lighting and occupancy control throughout;
• All-off switches disabling non-essential electrical loads (appliances and electronics);
• Up to 887 kW of net-metered solar PV panels across the roof and various facades, totalling just over 2,200 solar panels. Note that preliminary models are showing that Block 4’s solar exposure will be unaffected by the buildings which Homestead is expected to construct on blocks 1 and 3 (based on other recent designs they’ve used elsewhere in the City, and after accounting for a density / height bonus which Homestead will be given by the city on both blocks);
• Large shared cistern in the basement to hold rainwater collected from the roof for re-use irrigating and flushing toilets;
• Advanced air tightness to minimize air leakage from all spaces (common areas and suites, commercial and residential). Target maximum <2.5 ACH50 for suites <5,000 ft²;
• Tower air handling systems will be balanced for all common areas (as opposed to industry norm of pressurizing). Note that this may require additional control to enable over-ventilation to pressurize the building in the event of a fire;
• All buildings will be properly commissioned by professionally credentialed Commissioning Agents and tested for air-tightness;
• Block 4 will consume 5-6 GWh of energy annually and can provide up to ~1.8 GWh of that energy from on-site solar. Block 4 cannot achieve net-zero energy without either leveraging off-site renewable energy or partnering through a district energy system with adjacent buildings from other blocks.
• Block 4 could be the hub of a district energy system (perhaps based in the former Kingston Utilities substation on the Queen St. side of the block) designed to provide heat and power to the adjacent buildings in blocks 3 and 5 (from Homestead), with potential to tie into the Leon’s Centre.
  • It may be possible to harvest heat from the 1200mm trunk sewer on Ontario Street.
  • Studies are not yet complete for other technologies and strategies which may help further, including large scale electrical or thermal energy storage, also shared with the district.
  • If using Combined Heat and Power (CHP) as the basis for a district energy system, Block 4 would need a 400 kW CHP plant. This plant could be oversized as much as is helpful for adjacent sites, but 400kW would provide sufficient heating and electricity to meet the needs of Block 4, assuming there is net-metering in place and that the electricity generated could be dumped to the grid for credit when not needed. If there is no storage of electrical energy (in the grid or otherwise), then the CHP plant would need to be sized differently. Regardless, the plant could be expanded modularly to power and heat adjacent blocks (3, 5, and the Leon’s Centre) which, pending further study, could benefit from over 1 MW of additional CHP.

6.3.5 **FINANCIAL STRATEGIES**

6.3.5.1 **Incentives – Brownfield & Density Bonus**

Any private development on the North Block is eligible for financial support from the Kingston Community Improvement Plan (CIP) for Brownfields, which is implemented through a property
tax rebate. The City does not pay tax to itself, so a City owned development would unfortunately not benefit from this support.

The City’s 2014 Block 4 Design Guidelines also provided a sustainability checklist for the North Block, where developers could be rewarded with a height bonus for meeting specific checklist criteria. This means that the Block 4 building will be able to generate more revenue from more floors of leasable/sellable space, and the City will similarly generate increased tax revenues.

Note that this also means that surrounding building projects which meet the City’s sustainability checklist criteria (including Homestead, who indeed plan to on both blocks 1 and 3) will also be eligible for a height bonus, which comes back to the design issue (refer to Sct. 6.3.4 above) of potential shading on Block 4. This was considered in preliminary shading calculations, and we are confident that shading will not be a significant concern for Block 4, even with extra height budgeted on top of the adjacent Homestead developments.

The financial strategies for this particular case study are very typical: the available incentives focus on abating brownfield and heritage related costs that offer no energy benefit for the purposes of our net-zero energy ambitions. Heritage incentives, if available here, would only affect the designated buildings facing Queen St., and would therefore not affect most of the block. The density bonus related to the city’s sustainability checklist is helpful, but is focussed on creating a sense of place, not net-zero energy performance.

This project is otherwise self-financed by focussing on conservation efforts first, to reduce long-term operating costs before investing in local energy generation. District energy may be further leveraged to maximize opportunities for coordinated efficiency across local adjacent buildings.

6.3.5.2 District Energy

The district energy (DE) system presents the most interesting financial elements in this project. Ideally, as part of the energy strategy for the North Block, a district energy system would involve an agreement/partnership between the city of Kingston, Utilities Kingston, and Homestead, as the local land owners in the proposed district. Each partner will benefit from this strategy financially, and at the same time it will result in lower carbon emissions than traditional design strategies. Also, with the pending reconstruction of Queen Street there is an opportunity to coordinate installation of distribution infrastructure that would support a DE system on Block 4 and enable additional customers along Queen Street.

6.3.6 Policy/Process

The Block 4 site was interesting because it contained several historical buildings, including one historical power centre, and Utilities Kingston (UK) has been considering potential futures for this site for some time. This meant that discussions with the City were very positive around items like the inclusion of a district energy (DE) plant of some kind, so long as the heritage elements of the local construction were maintained. In the end, this meant that the site could really only be infilled on its open areas, and that the heritage buildings on-site could be updated in subtle ways (eg: roof redone), but could really not be modified in any significant way. The proximity of a
major Utilities Kingston power distribution asset could enable a natural partnership within a district energy system. The nature of the permitting and approvals process for the DE system was unclear without including UK as a partner, but was implied as effectively assured if UK was a partner.

The undeveloped portions of the Block 4 site are presently used for municipal surface parking and so the City is in a favourable position to facilitate the permits and approvals required for redevelopment of the site. However there has been public concerns voiced over planned increases in building height on adjacent blocks as well as issues of downtown public parking supply that would need to be carefully considered.

6.3.7 MAJOR LESSONS LEARNED/TAKEAWAYS

1. **Solar Access:** Net-zero energy requires on-site energy generation, and that will often include solar energy which requires access to sunlight, and which can therefore be affected adversely by shading from adjacent development. If present planning efforts are to benefit from solar energy, then the solar panels included in the design will need to be effective for decades into the future, during which time we should expect to see many other local developments / gentrification projects, and it is unlikely for the solar exposure of this site to remain unchanged for the full life of any solar system that might be installed here. This specific site (Block 4) ended up successfully demonstrating limited shading impact from adjacent sites, but for other sites like this, especially in areas that are densifying quickly, guaranteeing future solar access can be all but impossible… unless a specific by-law is enacted to make this part of the planning process. For example, the topic of “Right to Light” has emerged in several densifying cities in the United States, which adds a step to the building permit application process that checks whether a proposed development will adversely affect solar access to adjacent properties. Some municipalities are exploring protections for the health benefits of access to natural light, but specifically of interest to this case study would be the access of solar panels to natural sunlight. If a new building application sought to construct a structure which would shade solar panels on an adjacent property (existing or in-progress toward approval / construction), then the new applicant would be advised / warned that their project will impact solar access for an adjacent property / project and would be given options to help mitigate that impact. These options might include paying for the relocation of the impacted solar system, replacing the lost energy revenue for that solar system by paying out the outstanding balance of any power purchase agreement or energy sale contract which that system would otherwise benefit from, or adjusting their building design to eliminate their impact on the adjacent property. Regardless, the pursuit of net-zero energy is often dependent upon unobstructed access to sunlight, and a “Right to Light” bylaw should be considered as an important measure to help ensure the long-term viability of net-zero construction. Refer to Appendix B: section B.2.

2. **District Energy (DE)** depends heavily upon the load mix for the sites it supplies: a balanced load mix, with relatively consistent overall combined loads from day to evening and from one day to the next, is much easier to design and manage with a DE system, but a balanced load mix (ie: with the right balance of residential/commercial and
day/evening/night) is relatively rare. DE systems require many partners in order to maximize success.

6.4 **DAVIS TANNERY (KINGSTON SITE TWO)**

![Figure 6-15: Aerial View of the Davis Tannery Site](image)

<table>
<thead>
<tr>
<th>Owner/Developer:</th>
<th>Jay Patry Enterprises Inc. (formerly Kincore Holdings as of the beginning of this study)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Suppliers:</td>
<td>Utilities Kingston &amp; Kingston Hydro</td>
</tr>
<tr>
<td>Project Status:</td>
<td>Overgrown brownfield; some remediation done, more needed</td>
</tr>
<tr>
<td>Site Size:</td>
<td>15 hectares (37 acres), ~7.3 hectares (18 acres) developable</td>
</tr>
<tr>
<td>Pre-development Use:</td>
<td>Industrial tanning and smelting operations followed by 40yrs vacancy. Currently demolished and overgrown.</td>
</tr>
<tr>
<td>Proposed or Potential Use:</td>
<td>High density residential: ~100 units per hectare (40 per acre)</td>
</tr>
<tr>
<td>Number of Residential Units:</td>
<td>Up to ~1,500 apartments, depending on format mix.</td>
</tr>
</tbody>
</table>
Residential Area: ~130,000 m² (~1,400,000 ft²)
Building Heights: 4 – 12 stories, surrounding a central garden/green space
Key Design Features: Exceptional efficiency, District Heating, Solar PV

6.4.1 PROJECT HISTORY & CONTEXT

Figure 6-15 (above) shows an aerial view of the former Davis Tannery lands, bounded on the north by Belle Park Fairways golf course, on the east by the Great Cataraqui River, on the south by River St. and on the west by Rideau St., abutting industrial and residential land uses, and close to the Kingston downtown.

The site is surrounded by local amenities: 2.5 km to downtown (Wolfe Island Ferry, Market St. or City Hall), 3.5km to the Royal Military College of Canada (RMC), Queens University, or Murney Tower (heritage tourism), and many other tourist attractions are nearby: Fort Henry, 1,000 Island tours, Heart Island, Boldt Castle, and many more. The adjacent Rideau Canal is a designated UNESCO World Heritage attraction.

Belle Park is owned by the City of Kingston and was the former site of golf operations constructed over a historic sanitary landfill site. With the ending of golf operations in 2018 the City is considering how the park can be redeveloped for other public uses. The Great Cataraqui River is the southern terminus of the Rideau Canal, and 2.5 km south on the river is the Kingston harbour on the St. Lawrence River (at the mouth of the Canal): ~300 km by water to Montreal or Toronto, with many sailing attractions along the way, from heritage towns and forts to the thousand islands to the urban skylines of Canada’s two largest centres.

The site presents the opportunity for local employment, but would (by zoning and City plan constraints) be focussed on providing residential density to other nearby zones targeted for employment growth. The site is well connected to downtown and beyond via road, public transit and walking/cycling paths such as the K&P Trail (formerly the Kingston & Pembrooke rail).

The site has previously been used for the industrial production of tanned leather goods, for disposal of contaminated soil, and even for smelting of lead. It is a brownfield of brownfields, and has been through several iterations of ownership and development plans over its history.

The southeast portion of the Site was occupied and operated by North America Smelter Company Limited as a lead smelter until 1915. A tannery was operated on the southwest portion of the site first by Joseph Carrington until 1903 when he sold to A. Davis and Son Limited. The lead smelting operations ceased in 1915 and were annexed by the expanding tannery operations, which continued until 1973 when the site went dormant and industrial operations ceased. The Property owner at that time sought to redevelop the southeastern portion of the site for residential and commercial use and imported significant quantities of fill to that end. Clay berms were constructed along the northeast site boundary and down along the shore of the Great Cataraqui River to contain contaminated soils on-site, which expanded the site to its present shape, more than half of which is fill. In 1984 the site was approved as a waste disposal repository for on-site contaminated soil, and although it is unclear whether on-site disposal actually occurred, the
owner eventually went bankrupt and the site was abandoned. In 2006 the site was acquired by Rideau Renewal Inc. through a failed tax sale from the City of Kingston. No redevelopment has yet occurred, but fill material from off-site sources was imported with MOE approval. The site has been fenced off to improve security but has otherwise remained vacant since that time, and no further redevelopment activities have occurred.

Rideau Renewal has entertained many different concept plans that pursue various versions of renewing the site, and Rideau as an organization cares deeply about its corporate legacy and about improving the lands that it touches. Rideau is actively seeking purchasers for the site and is continually negotiating their designs to ensure that the legacy of developing this site is something they can be proud of.

Currently the site is zoned for mixed uses: 26 acres residential and 4.5 acres for commercial/hotel use. The remaining 6.5 acres are zoned for general recreation and parks.

Figure 6-16 (below) depicts proposed designs for the site that came out of the “Tannery - Public Visioning Report” (2013) prepared by the City. Both proposals were taken as input resources for the purposes of this study, and although neither has been implemented in the final proposed solution, both were valuable for the purposes of creating the design discussed further below, and both were important for establishing our understanding of the City and community’s perspectives on what is desirable on this site.

![Figure 6-16: Tannery Land Use Options from 2013 Public Visioning Exercise](image)

The main differences between these two options are the orientations of land uses and the organization of the different residential density types. The northern part of the property remains
unused both because it is a wetland with mixed fill, and because it would be very complex / expensive to develop properly.

The site designs that arose from the public consultation are both similar to the development site plan Option B which Kincore had proposed in their 2004 report with Conestoga-Rovers and Associates (see Figure 6-17 below, right image), when serious conversations were held about kickstarting development. Option B left the north portion of the property as natural area/open space with a walking path running east–west through the full width of the site. Option A proposed development on the whole site and offered 200 additional residential units. Although Option B is more similar to the public visioning concepts, park costs for this design would require more money than Option A to remediate and obtain a record of site condition.

There was also a proposal made by Jay Patry Enterprises Inc. in 2014 that was similar to the Option A concept, shown in Figure 6-18 below.

![Figure 6-17: Tannery Concept Plans A (left) and B (right) from Kincore and Conestoga-Rovers & Associates, 2004](image1)

![Figure 6-18: Tannery Concept Plan by Jay Patry Enterprises Inc., 2014](image2)
Figure 6-16 through Figure 6-18 show that this site has been the subject of much discussion over the years, and many development options have been explored. The City and Rideau Renewal have benefitted from comparing these various options and have been able to distill a number of lessons from what they have liked or disliked about each.

In 2018 the property was sold by Rideau Renewal Inc. to Jay Patry Enterprises (JPE). At the time of writing this report, JPE was in the process of acquiring approvals for a residential redevelopment and brownfield CIP financial incentives based on their designs put forth in 2014.

6.4.2 DESIGN STRATEGIES

For this feasibility study, the Kincore and JPE concepts were used to create a site plan that is more likely to achieve net zero energy while (as best as possible) respecting the City’s recommendations. Firstly, the public visioning conclusions included space for low-density housing types, which have not been included in the proposed net-zero energy concept design. The site may be sufficiently independent from surrounding sites and adjacent to active transportation infrastructure that a higher density of development could successfully be accommodated if a net-zero goal were being pursued. Although still a work in progress, the City’s North Kingston Secondary Planning Study has identified the Tannery site as a potential “urban village” with compact form and higher densities. Further, the Belle Park Fairways offers a large open green space adjacent to the property, and the trail system is established around this site, making it easy to connect from this site into that system, and making it less interesting to preserve additional green space within the Tannery lands. Green space to be included in the Tannery site will thus be interconnected meaningfully with surrounding green space instead, rather than being emphasized as a major design feature, except where it helps connect residents to the waterfront. Lastly, there will be no emphasis on commercial uses in this proposal, because of the volume of other commercial and employment uses within 5-10km.

With these thoughts and resource concepts in mind, and with help from The Planning Partnership (Dan Leeming, Rick Merrill, and Stacey MacCulloch), the design shown in Figure 6-19 (below) was evaluated for it’s potential to achieve net-zero energy as a combined site.
Key elements of the overall concept design include:

- ~1200 suites (at ~1,000ft²/suite average), totalling ~111,500 m² (1,200,000 ft²).
- Mix of 4 to 12-storey buildings, oriented towards the proposed street network and natural features (river, park, trails, etc).
- 12-storey towers with 6-storey podiums are oriented along the northern and eastern edges of the site (with prominent views of the river). 4 and 8-storey mid-rise buildings line the streets.
- A series of local roads and road extensions make up the street network. A central open space (OS) is located adjacent to the Russell Street Extension, framed by the proposed buildings, while maintaining and enhancing views to the river. Parking is provided in above-grade parking structures lined with grade related units.
- Streets connect well to surrounding neighbourhoods.
- Building orientations generally present opportunities for passive solar energy harvesting and for roof and façade mounted solar panels (for electricity generation).

For the full complement of buildings/units to achieve net zero energy together as an integrated community, the following technologies would be used:

- Increased insulation beyond building code (R28 walls and R40 roof);
- Advanced windows: triple-pane low-e argon filled (U< 0.25);
- Efficient doors (R6.5);
- Advanced air tightness to ensure maximum 2.5 ACH50;
- Cold-Climate Air Source Heat Pumps (ASHPs) as the primary heating system;
- Variable Refrigerant Flow (VRF) heating/cooling distribution, which also allows the building to take heat from the sunny south side and move it to the cooler north side, providing cooling and heating simply by moving heat around, before paying to introduce new heat;
- Domestic hot water supplied from the VRF system (and ultimately from the ASHPs);
- Air-to-air heat recovery;
- Heat Recovery Ventilators (67% efficient) and Drain Water Heat Recovery (43%);
- Demand control ventilation;
- Advanced air tightness to minimize air leakage from all spaces (common areas and suites, commercial and residential). Target maximum <2.5 ACH50 for suites <5,000 ft²;
- Tower air handling systems will be balanced for all common areas (as opposed to industry norm of pressurizing);
- All buildings will be properly commissioned by professionally credentialed Commissioning Agents and tested for air-tightness;
- LED lighting and occupancy control throughout;
- All-off switches disabling non-essential electrical loads (appliances and electronics);
- Up to 2.6 MW of net-metered solar PV panels across the roofs, and up to another ~2 MW of PV on various facades. Assuming 45% of the roof would be covered, and up to 30% of the west and south facing facades, preliminary modelling suggests that the PV on this site could provide ~5.5 GWh of the ~11-13.5 GWh of energy required to heat/cool/power the site (40-55% of all energy required).
- Adjacent to the south-east corner of the site (across River St.) is an underground reservoir owned by Utilities Kingston that is tied into the City’s stormwater management system but is non-active. This reservoir could be used as part of a district energy plant in partnership with Utilities Kingston, particularly to provide the heating/cooling. The exact amount of heating/cooling needed could not be determined without further study of the reservoir, but it would ideally be leveraged to provide significant thermal storage, and to provide a source/sink for geothermal exchange of at least 3 GWh.
- Noting that the timing for generation of energy from PV does not necessarily coincide with the timing when heating/cooling would be needed, there would be perhaps 5-7 GWh of additional thermal energy needed for domestic hot water and space heating. If a Combined Heat & Power plant were used to make up the residual thermal load for this site, then a system of approximately 1 MW in size would likely be required. This system would be able to contribute electricity to the site as well, and would complement well with the other technologies proposed above, except that it would be powered by off-site natural gas and would therefore inhibit the site’s ability to achieve net-zero energy. It would be possible to convert the gas supply to syngas or renewable gas in the future though, and then to achieve net-zero energy.
- The Tannery site cannot achieve net-zero without a district energy system. Such a system could thereafter help other adjacent or nearby properties to also pursue greater energy efficiency, starting with the Tannery site as its anchor. Long-term, a district energy
system on this site could eventually be integrated with other district energy systems at locations such as Block 4, expanding related benefits across the City of Kingston.

- Large cisterns under several buildings which hold rainwater collected from the roofs of all buildings for re-use irrigating and flushing toilets.

6.4.3 **Financial Strategies**

1. **Incentives**: The City’s Brownfield CIP was revised in 2018: the exact amount of environmental remediation cost recoverable is understood to depend upon the amount of property tax uplift created by the new development and will need to be discussed further with the City of Kingston.

2. **Cost Recovery**: Energy improvements made to the buildings will speak for themselves financially and will provide economic and environmental benefit to each building individually.

   The district energy (DE) system presents one of the most interesting financial elements in this project. Ideally, as part of the energy network for the Tannery, a district energy system would involve an agreement/partnership between the city of Kingston, Utilities Kingston, third party equity investors, and the developer(s) behind the Tannery site (ie: Jay Patry Enterprises), as the local land owners in the proposed district. Each partner will benefit from this strategy financially, and at the same time it will result in lower carbon emissions than traditional design strategies. This District Energy system could then be expanded / interconnected with other similar opportunities on nearby sites and could progressively expand in the Kingston downtown over time to become a significant environmental benefit to the City’s downtown energy network and the buildings served by it, and to become a significant asset for Kingston Utilities and other involved partners.

6.4.4 **Policy/Process**

From a policy perspective, to say that “this site is challenging” is a gross understatement. A significant brownfield, now fully overgrown and inactive for over 40 years, including a significant wetland, and affected by the Rideau Canal and UNESCO Word Heritage designations, there is little else that could make this site more challenging.

Fortunately, each of these challenges has little impact on net-zero energy design, so if the site may be developed at all, then the other considerations around energy will be comparatively easy to resolve.

Brownfield challenges are normal, and the City’s CIP program will significantly aid in their resolution. They will simply take time. The overgrown state of the vegetation will bear some cost, but there is little the City can do to simplify the process of preparing the site, and any costs borne out in preparing the land would be implicitly related to the brownfield remediation effort.
The UNESCO World Heritage designations for the adjacent Rideau Canal require consultation with Parks Canada and restrictions on visual impact may pose challenges to higher density and height – especially on the portions of the property closer to the water.

Speaking strictly from an energy view, reducing the density on the site would make it easier to achieve net zero energy, but no other process/policy considerations for this site are expected to.

Given the complications this site already faces, it will be prudent to ensure that new development does not introduce further complications. For example, district energy systems require underground infrastructure which will cross between various lot lines. Private ownership of anything like district energy piping that crosses underground beneath public streets will create additional challenges in obtaining construction approvals, but if Kingston Utilities is a partner / shareholder in that district energy infrastructure, then these challenges will be minimized / eliminated.

6.4.5 **MAJOR LESSONS LEARNED/TAKEAWAYS**

1. **Net-Zero Energy in High Density Projects Requires District Energy.** Even after pursuing aggressive energy efficiency, there is simply not enough space for un-shaded solar panels on the buildings to enable them to provide their own energy needs independently. They need to be designed together, in a district, and there needs to be a single energy plant somewhere in or near to that district in order to provide the energy that the buildings cannot provide themselves.

2. **District Energy Approvals** will typically require some consideration of how to permit a privately owned pipe or service to pass beneath a public right-of-way (eg: street). This could be solved by changing the private ownership to some manner of public ownership, perhaps by having a public utility own the district energy service outright, or perhaps by creating a joint venture with a public utility. Otherwise this could be resolved as a matter of policy, changing or creating by-laws to enable privately owned infrastructure to pass beneath public rights-of-way, or to specifically enable district energy heating pipes and/or electrical conduit to pass beneath public rights-of-way.

3. **Approvals in General:** The greatest challenges associated with approvals required for a net-zero energy construction project are no different than the challenges associated with more typical construction: brownfield, heritage, and wetland related challenges are often much more difficult than the technical challenges associated with net-zero energy buildings and communities, and the approvals related to brownfield / heritage / wetland concerns can take far longer to resolve.

4. **Brownfields** are expensive to remediate in the best of cases. Abandoned / overgrown brownfields introduce additional challenges that are perhaps even more expensive than they would have been if the site had been maintained.
5. **World Heritage** considerations are complex and atypical of most development sites: they involve additional levels of government consultation that can impart additional challenges and additional time for approvals.

6. **Find the opportunity:** This project was a good example of using what opportunities are uniquely available at each site: in this case, a municipal reservoir for district energy.
6.5 **BRAMM YARDS (KITCHENER SITE ONE)**

*Figure 6-20: Aerial View of Bramm Yards within the Innovation District, Kitchener, ON*

Legend:
1. Main St. w/ Separated Cycling Lanes
2. Covered / Underground Parking
3. Courtyard / Fountain / Park Space
4. Education Centre
5. PV/EV Parking
6. Commercial Towers
7. Residential Towers
8. Food Store (not shown)

*Figure 6-21: Bramm Yards Conceptual Neighbourhood Design*
Owner/Developer: City of Kitchener

Project Status: Conceptual Pre-Design

Site Size: 3.44 hectares (8.5 acres)

Pre-development Use: Municipal Operations Facility, Parking

Proposed Use: Mixed-Use: Ground Floor Commercial/Retail, Apartments, Offices, Presentation/Education Centre

Number of Residential Units: (Planned): The present design allows flexibility to allocate up to three of the buildings for residential or commercial uses pending further market research, but the concept includes 500-750 mixed residential units, ~50,000 ft² mixed retail, and the balance in mixed commercial office space (details below).

Residential Area: ~51,100 – 69,700 m² (~550,000 – 750,000 ft²)

Commercial Area: ~18,600 – 37,200 m² (~200,000 – 400,000 ft²), including up to ~4,600 m² (50,000 ft²) of ground-floor retail space.

Building Heights: 2-16 stories plus parking (+2-3 stories)

Key Energy Features: Exceptional energy efficiency, Solar PV, Geothermal / CHP / district energy

Grants/Incentives/Programs: Net-metering contracts for solar, Municipal CIP, development charges and park dedication lower than other areas

6.5.1 PROJECT SUMMARY

Figure 6-20 (above, North is up) shows the location of the Bramm project site within its immediate surroundings in downtown Kitchener, ON. Figure 6-21 (above) shows a possible pre-design concept for a mixed-use neighbourhood which could be built there.

The City of Kitchener recently moved their Operation Centre from this site, vacating ~8.5 acres of prime downtown land bordered on the west by rail tracks, on the north by Joseph St., on the east by other new mixed use developments along Victoria St S., and on the south by Park St. The Bramm site is presently a parking lot that is ready for a brighter future. There is a second, adjacent lot owned by the City of Kitchener which spans the gap between Park St. and the southern edge of this property, and which could be amalgamated into the Bramm St. Yards property (marked 8 in Figure 6-21 above as a potential grocery store, within the area excluded in Figure 6-20).

The concept design being studied on this site includes roughly 1,000,000 ft² of integrated mixed uses plus ample underground parking. The location is within the Urban Growth Centre and is in close proximity to higher order transit: a short walking distance to the LRT system, GO train, regional transit and future multi-modal hub. Key features included are:
• An interior “main street” connecting Park St. through to Joseph St. which includes separated cycling lanes.
• Six towers of varying heights throughout the site: the four closer to the rail tracks would be commercial, the two closer to Victoria Park would be residential. That said, the exact mix of commercial / residential (rental & condo) would need to be determined later as part of the detailed design and pending further market research. The proposed ratio of commercial to residential is loosely based upon Kitchener’s Growth Management and Economic Development Strategies and would need to be refined.
• Multiple courtyards and outdoor sitting spaces designed to create social collisions: opportunities for professional and/or social networking at fountains/courtyards/stairs.
• One small surface parking area with PV canopies for charging of up to 34 electric vehicles (including spots for Community Carshare).
• Indoor and outdoor bike storage.
• Underground parking spread across the back of the site: two storeys on the north (up and right of Bramm St. in Figure 6-20), transitioning to three storeys of parking on the south (toward Park St., left of Bramm St.). The parking provides (1) a buffer along the railroad tracks that helps insulate the building occupants from train noise, (2) a podium on which the rest of the buildings sit, and (3) a place for park space between the buildings and railroad tracks.
• Restaurants / café’s at ground level.
• An education centre between the two central towers, providing signs, handout/tourist materials, videos, and sample products that were used in the various “sustainable” design features in the community. The education centre would double as a bookable event space.
• Behind the education centre, abutting the garage between the two central towers, would be the central power plant housing a hybrid system of geothermal pumps and a Combined Heat & Power (CHP) generator system (for backup power and for district energy heating), with future provision for an energy storage plant.
• Building Integrated Photovoltaic (BIPV) solar panels on all buildings. BIPV would contribute significantly to the community’s energy needs, and the hybrid CHP / geothermal plant would provide the rest. The site as a whole would be designed to achieve net-zero energy.
• Ultra efficient plumbing fixtures with rainwater collection for irrigation & toilet flushing.
• All buildings designed with advanced indoor environments: VOC free finishings, best in class air quality, and maximized access to daylight and views.

Lastly, the proposed design for the Bramm Yards leaves room to expand any developments therein across the railroad tracks to the West, into a gap between spur rail lines west and north of this site, potentially connecting through to the 607 King St. property immediately north of the second set of rail tracks. This leaves many opportunities for future bridges/structures over the tracks to integrate with the adjacent properties West and North. The three properties together (Bramm through 607 King) represent a sizeable area with tremendous potential within a major transit station area in Kitchener that is part of the epicentre of the Waterloo-Toronto Innovation Corridor.
6.5.2 ENVIRONMENTAL CONSTRAINTS

The site itself has experienced former municipal maintenance facility and storage uses. There are no significant natural heritage features on the property. This site is not believed to have any significant environmental constraints.

6.5.3 SOCIAL CONTEXT

Kitchener is growing and intensifying, particularly in the Urban Growth Centre. This site is presently used for parking and storage and is surrounded by other urban intensification: mixed-use, retail, residential and commercial buildings, ranging from single level to ~16 storey buildings. This site is walkable within 400m to many businesses and amenities, including Google, Desire2Learn, the University of Waterloo’s Health Sciences Campus/School of Pharmacy and McMaster’s School of Medicine Campus, The Tannery / Communitech Hub, and many restaurants. The site is close to a major regional park, Victoria Park, and to all forms of transit: two forms of inter-city rail (VIA and GO trains), LRT (light rapid transit, rail based, within the region), Charles St. Bus Terminal (Kitchener’s main downtown terminal) and the coming (regional) Multi-Modal Transit Hub. There is increasing demand for affordable and rental housing among the other growing uses in the area, and the local economy is diverse and growing.

Proximity to the University and the Tannery (home to the Communitech Hub, which houses and supports many startup companies for typically 6-24 months while they establish themselves in the area) means that the Bramm site will likely need to offer a good supply of rental housing. The success of the Tannery / Communitech means that businesses are overflowing the space there and are expanding into adjacent properties, so there will be significant opportunity to collaborate and offer space to new and established businesses emerging from Communitech or seeking to offer services there through nearby facilities of their own. The Bramm St. Yards is sufficiently close to the Tannery to provide an ideal location both for a variety of office spaces for new or growing businesses emerging from the Communitech hub, and also for homes for their employees. Further, the proximity to the University of Waterloo’s Health Sciences Campus and related health/medical presence invites the growth of local biotech and health related businesses. The combination of entrepreneurial supports from the local tech industry and the presence of local health/medical research is expected to create new synergies between both, and the Bramm site is ideally located to provide space for that growth.

Beyond the local business context, that area within the City offers an increasing diversity of uses that enhance quality of life: one of the highest transit modal split targets within the broader Region, and countless festivals, events and ongoing programmed and unprogrammed social interactions.

6.5.4 DESIGN STRATEGIES

Bramm will include a diverse portfolio of buildings across its 8.5 acres and add to Kitchener’s Innovation District, intended to bring in more businesses / job opportunities and housing to support them. Buildings in this project will serve both needs and will be built using appropriate
strategies for each. As with previous case studies in this report, the Bramm neighbourhood is intended to achieve energy performance at the macro level (i.e.: as a whole), so some buildings are deliberately being designed to include elements that benefit other buildings: some buildings will generate more energy than they need, and their surpluses will supply the lack of others.

Commercial buildings will use the following technologies to maximize energy efficiency:

- Increased insulation beyond building code (R28+ walls and R40 roofs);
- Advanced windows: triple-pane low-e argon filled (U=0.25). Occasional uses of View-Dynamic Glass which auto-tints when exposed to sunlight, thus helping to reduce solar heat gain and keep the building cool;
- Cold-Climate Air Source Heat Pumps (ASHPs) as the primary heating system;
- Variable Refrigerant Flow (VRF) heating/cooling distribution, which also allows the building to take heat from the warm/sunny (typically south or west) side and move it to the cool/shaded side (typically north), providing cooling and heating simply by moving heat around, before using energy to introduce new heating/cooling;
- Air-to-air heat recovery;
- Demand control ventilation;
- LED lighting throughout;
- Domestic hot water supplied from the VRF system (and ultimately from the ASHPs);
- Solar PV panels across the roof (685kW), various facades (611kW), and over surface parking spaces (59kW), totalling 1,355kW (~1.4MW) of installed PV, net-metered;
- A district heating/cooling system fed by ~150 geothermal boreholes (600 ft deep);
- A 500kW CHP system could be added for emergency backup power and to make-up remaining on-site generation;
- Provision will be made for a future energy storage plant beside the CHP plant to provide support to the emergency backup power system and to assist with peak-shaving / load leveling, and to facilitate interoperability with future vehicle-to-grid technology (for electric vehicles).
- Efficient (R6.5) doors and garage doors;
- Advanced air tightness to minimize air leakage from all spaces (common areas and suites, commercial and residential). Target maximum <2.5 ACH50 for suites <5,000 ft²;
- Tower air handling systems will be balanced for all common areas (as opposed to industry norm of pressurizing);
- All buildings will be properly commissioned by professionally credentialed Commissioning Agents and tested for air-tightness;
- Cistern collected rainwater (in the parking garage/basement) for irrigating and toilets;
- Shared parking garage coordinating residential and commercial uses (i.e.: for overall reduced parking need).

Residential uses will be designed similarly with shared spaces (e.g.: corridors) powered and conditioned by the district energy systems explained above, but noting the following clarifications for the individual residential suites:

- Heat Recovery Ventilators (67% efficient) and Drain Water Heat Recovery (43%);
- Cold Climate Air Source Heat Pumps (ASHP) with backup electric resistance heat: base COP of 3.5 and SEER of 21;
- LED lighting throughout;
- ENERGY STAR® rated appliances;
- All-off light switches that disable key electrical outlets with passive / parasitic loads (e.g.: entertainment areas).

All combined, this design concept is significantly more efficient than typical building code compliant construction (i.e. 50-60% improved) and will enable the pursuit of net-zero energy performance across the site as a whole (pending detailed design). Preliminary modelling suggests that the site would consume between 7.2 GWh and 9.0 GWh depending on occupancy, and assuming that district energy is used. On-site solar could contribute perhaps 2.1 to 3.8 GWh depending upon how much is installed on facades (assuming 45% coverage of all roofs and an aggressive 20% coverage of all W/S/E facades), leaving ~3.4 to 7 GWh load yet unmet. This site will require some manner of district energy plant in order to achieve net-zero.

The geothermal system included above is intended to supply 100% of the cooling load (and a matching amount of heating). Increasing the size of the geothermal system to meet the full outstanding heating load would imbalance the geothermal system ~4:1 (heating to cooling), enough that it would require an underground river and open-loop design in order to function well long-term, and an environmental study regarding the impact this might have on warming/cooling the underground river, if there is one. Otherwise it can be expected to degrade in performance over time until it is eventually incapable of performing as needed. Refer to Table 3-73 (on page 43) for more information. This site will therefore need to consider external sources of energy, such as a renewable power supplier from off-site, or a larger combined heat and power (CHP) plant supplied by the City’s natural gas utility. A 500kW CHP plant would provide all the remaining heat and electricity required, and would yield some surplus electricity that could potentially be used to support local electric vehicle charging. The local gas utility could be approached for a research partnership to study the potential for use of Renewable Natural Gas (RNG) longer term.

Alternatively, the density of the design on the site could be reduced to the point that net-zero energy becomes possible entirely on-site. This would ultimately require dropping the height of most (if not all) buildings to no more than three storeys. At 3 storeys max, this site would consume 2.8 – 3.5 GWh annually, and could generate 3.3 GWh from on-site PV. This would not reflect the density of adjacent sites though, nor the density targets in the municipal and Regional growth plans, and would not seem to achieve highest and best use of the lands. It seems preferable therefore to consider the first scenario presented in Figure 6-21 above, with geothermal DE and CHP, and to explore future possibilities for RNG.

Figure 6-22 (below) shows a preliminary concept diagram of how a district thermal energy loop could be configured between the buildings with minimal road crossings, locating the shared energy plant in the middle of the neighbourhood and sending branch loops out to the other buildings. Electrical and other services could easily be connected in a similar way, again minimizing the need for crossing the street, and consolidating any required crossings to a single location (which could potentially be installed in/through the underground parking).
Once successful, this District Energy system could also be expanded into adjacent sites in the Innovation District to serve other local tech industry and high-rise residential buildings. In order to meet 100% of the electrical needs for this site, the CHP plant would need to be ~500kW in size to meet both the thermal and electrical loads for this site, and would have reasonably minimal surpluses in both heat and electricity at different times. Optionally, this CHP plant could be expanded and shared with another adjacent building(s), creating a bit of a regional district energy network among the many appropriate candidate buildings near-by.

6.5.5 Financial Strategies

6.5.5.1 Bundled IRR

Refer to section 6.1.4.1 above. This project will use the same approach, leveraging the financial strength of energy efficiency measures to help subsidize the cost of more expensive items such as solar panels.
6.5.5.2 District Energy

By combining the heating/cooling plants from several buildings with diverse occupancy profiles all physically close together in this neighbourhood, this project is able to maximize the efficiency of the combined heating/cooling needs of them all, reducing gross energy use, simplifying expected maintenance, and increasing overall financial returns.

Further, by creating a district energy plant (combining geothermal and CHP technologies), this site is able to serve as a hub from which to expand a local district energy utility, creating legitimate business opportunities for district energy in the surrounding downtown core. Note that this site is on the edge of the rapidly intensifying Innovation District. This district energy utility could be privately held (by the developer or a partner of theirs), or could be a prime opportunity for a public-private partnership or even a new public venture by Kitchener-Wilmot Hydro and/or Kitchener Utilities. In the new economy of changing energy companies, it may prove most valuable to the municipality to partner with a private energy company and to use this partnership to diversify its investment opportunities.

6.5.5.3 DC Exemptions / Incentives

For approximately 20 years, the City of Kitchener had an exemption program for Development Charges (DCs) within the Community Improvement Plan area of the downtown. This exemption, which is replicated by the Region of Waterloo (local 2nd tier municipality)\(^{132}\), expires at the end of February 2019. Pending new DC By-laws, it is expected that future development in the downtown area (including the subject site) would pay DCs, but at a lesser rate than the suburban areas because of Kitchener’s tiered approach to DCs. The LRT system will be operational before the subject site would develop, which is a major publicly-funded incentive.

The City of Kitchener still provides Tax-Increment Grants for brownfield sites, as does the Region of Waterloo (refer to Table 4-2: Methods of Incenting, and Sct. 4.1.2.1), both of which could be applied to this site if necessary.

6.5.5.4 Net Metering

The solar energy systems installed on-site will be eligible for Net-Metering, meaning that surplus electricity may be shared with the local grid for financial credit, which can be carried over to offset future electricity bills for up to 12 months. This site is unlikely to generate surplus electricity on an annual basis, but Net-Metering will be employed in order to ensure that any surplus generation created during times when it is not immediately needed are carried forward for credit against future times of deficit generation (ie: when there is not enough PV generation available to offset real-time electrical consumption). Essentially this will enable the proposed

buildings to use the electrical power grid as a battery until cost effective and appropriate storage technology may be installed on-site.

6.5.6 POLICY/PROCESS

The Bramm site is City-owned and the City is committed to establishing an overall vision and master plan for the lands in order to contribute to the overall plan for growth downtown. This means that discussions about proposed projects on this site were highly proactive, creative, collaborative, and generally easier than most sites have opportunity to be. The following subsections describe some of the practical details or limitations that will need to be addressed as and when development moves forward on this site.

1. **Land Use: Site Conditions:** Because the site is City-owned, this study has treated the site as if it is effectively clean for future uses.

2. **Land Use: Official Plan & Zoning:** The City established a new vision, objectives and policies for the Urban Growth Centre within its Official Plan (2014). The subject lands were re-designated from the former Warehouse District to Innovation District which helped modernize the range of permitted uses, density, policy direction and bonusing opportunities. Sustainability, walkability, economic development and good urban design are hallmarks of this direction. The zoning of this site is being updated by the City to conform to the new designation and policies and will be in place prior to any development of the subject site. This provides a good starting point. Any future vision that exceeds the land use planning framework may have to consider amendments or variances; however, if sustainable development techniques are incorporated (eg: district energy, advanced energy conservation, transportation demand management, green roofs, etc) the framework allows additional density through bonusing.

3. **Land Use: Trails & Trains:** The City has also been investing heavily in trail and cycling infrastructure expansion over the last decade, and a trail connection is planned across this site along the rail tracks from the Iron Horse Trail to the King & Victoria Multimodal Hub (regional transit centre). This would effectively introduce a pedestrian/cyclist trail along the northwest boundary of the site, following the rails for the full length of their contact with this site. Ideally this trail would be moved to the other side of the tracks into a wedge of land that is outside of this project and is difficult to develop otherwise, but that would likely result in at least two additional pedestrian track crossings. The trail may therefore need to be integrated into the detailed design for this site at a later stage. Regardless, the design as proposed will likely need some manner of crash-wall protection against trains on the northwestern edge (along the tracks), and it would likely be preferable to elevate the trail up away from the tracks for enhanced safety as well, onto the proposed development (ie: on top of the parking garage, at the main floor and entry level of the mixed-use towers), where it too will benefit from the protection of the crash wall.

Building on the discussion of crash-wall protection, the proximity to the rail system will require a formal noise and vibration study at a later date as well, which is unlikely to have
any noteworthy impact on the design concept overall but will almost surely affect the minutia of how the parking garage wall details come together. Note that the proposed design has already considered the crash wall and rail proximity and includes extensive structured parking across the whole site, under raised towers, partially in order to simplify the relationship with the rail.

4. **Energy Systems: Optimizing the Underground:** Because the site intends to use District Energy (DE) and will be built out in phases, it is likely that the district energy system will need to be built out before certain buildings are ready for construction. This means that district energy services will likely need to be constructed in-ground before some building foundations which might conflict with in-ground setbacks. For example, the proposed concept design is sufficiently dense that buildings will approach their lot lines on several sides. If foundation shoring is required beyond the lot-line of any particular building, and DE or other utility services exist inside trenches outside the lot lines, then shoring may well extend beyond the lot line and could encroach into utility / DE service trenches. This will require careful planning in advance, including a certain level of planning that will precede the design of some of the affected buildings, and this in turn may necessitate a preliminary design of the foundations of multiple buildings which will otherwise not be fully designed until later.

Regardless of where the DE piping is installed, the City of Kitchener encouraged that extra space be preserved for additional future utilities to be installed in the same place. Experience has shown that utilities in general, and telecom networks especially, have grown substantially over the last decade in the amount of underground pipe / duct space they need, and a future-ready net-zero energy community would do well to budget extra space in advance.

Kitchener Utilities and other utility agencies have often been asked whether their service trenches could be combined with other trenches, either to maximize the effective use of limited real estate, or in an attempt to reduce trenching costs. Experience has shown that this is possible, but complicated: one trench might be physically capable of holding multiple services, but those services typically involve specialized trades (eg: gas fitters for gas piping, communications technicians for fibre-optic wiring, etc.) which cannot be combined, and who will end up spending time waiting on each other on site. Therefore, combined trenches typically do not offer any real financial savings on installation labour, but can still help to optimize use of limited space.

5. **Energy Systems: Requirements for Piping:** The district energy design concept also includes insulated thermal piping between buildings (to deliver heating and cooling). This piping will most easily be installed in parking garages rather than outdoor service tunnels / trenches. The City of Kitchener has numerous local examples of parking garages extending under sidewalks, but none which extend under municipal roadways. If this site wished to install structured parking (and DE piping through parking areas) **under the interior roadways**, then those roadways would need to be privately maintained, through some manner of condominium, but built to required standards (eg: to support fire trucks and waste removal vehicles). The interior roadway proposed in this project was
envisioned to be publicly owned and maintained by the municipality, which would thus require the DE systems underneath to be enclosed in a proper service trench or tunnel (ie: to get from the underground parking garage on one side of the street across to the garage on the other side of the street).

Ultimately the DE plant will include a CHP system that is gas-fed, which will require that there be a utility gas line through the project site into the DE plant. This gas line will run at distribution system pressure, which cannot be installed in parking garages without significant additional design effort and cost. This means that the district energy plant should either be moved to the exterior edge of the site, or else there will need to be a gas main installed through the middle of the site to the proposed location of the district energy plant, and that gas main will not be able to traverse structured parking areas without significant difficulty and cost: it will need to be buried in a traditional utility trench.

The DE system was intended to be privately owned, or at least owned by a joint venture including private interest, so this then introduces the typical challenge of running private utility services under public rights of way. In this case we do not expect any difficulty in earning related approvals, but in other cases (eg: in other municipalities) it may be more difficult. If the private DE utility was partly owned by Kitchener-Wilmot Hydro and/or Kitchener Utilities then it would be treated as effectively public and would obtain permits more easily.

Either way, the cost associated with getting natural gas supply piping across the site to the DE plant will be borne by the developer, whether relocating the DE plant to the exterior of the site, or designing the gas piping to traverse parking, or privatizing interior roads and running private piping under the road. The utilities will default to treating the DE plant as an emergency power system with an unknown demand load upon the gas supply network, which will mean that they cannot predict reliable revenue with which to fund the amortization of the gas supply installation, hence they will either need more information about the ongoing energy demand that will be serviced by gas, and some assurance of a minimum steady usage, or they will simply charge the developer for the gas installation. This means the cost choice will ultimately be defined more clearly in the detailed design phase and will be just that – a choice of which cost the developer prefers to absorb.

6.5.7 MAJOR LESSONS LEARNED/TAKEAWAYS

1. **Net-Zero Energy in High Density Projects Requires District Energy.** Similar to the Davis Tannery site above, this site is simply too dense to accommodate sufficient space for un-shaded solar panels on the buildings in order to enable them to provide their own energy needs independently. They need to be designed together, in a district, and there needs to be a single energy plant somewhere in or near to that district in order to provide the energy which the buildings cannot provide for themselves. This site will achieve most of its energy need through conservation and a combination of geothermal and solar
energy, but would have no hope of achieving net-zero without using district concepts to leverage the ability of adjacent buildings to help each other.

2. **Dense Energy Loads are Difficult to Meet On-Site:** Simply put, there is more load on this site than there is space for generation. Geothermal can provide all the cooling needs of the site, but there is simply not enough room on this site for the solar energy technology that would be needed to provide 100% of the site’s electrical demand, using current technology. This site is a good potential candidate for CHP, and is an example of the importance that renewable natural gas will have in a future where fossil fuels are increasingly replaced with renewable resources.

3. **Silent Wins via Parking:** Substantial energy can be saved by not constructing elements which are not required. For example, by combining and coordinating parking space in one shared garage that is managed with reasonable care, enabling the same space to be used for business parking during the day or residential parking during the evening, the overall number of required parking spaces can be reduced. This reduces the overall size of the parking facility, which in turn reduces the volume of air in that facility which needs to be conditioned, which reduces space conditioning energy.

4. **Public Ownership Simplifies Permit Approval:** District Energy systems will, by their nature, require different buildings to be interconnected with piping and systems that enable them to share energy. This means that piping will need to go back and forth between the buildings, typically under public roads. It can be difficult to obtain permits to run private piping under public roads, and the easiest solution is to either privatize the roads (under a condominium of some manner) or to include public ownership in the piping.

5. **Optimizing the Underground:** Especially for dense developments, buildings can often be constructed right up to the lot line with little to no setback. This means that footings can often require underground elements (shoring etc) which encroach into space beyond the lot line, and this can interfere with utility services. This requires planning in advance in order to reconcile conflicts and ensure the utility services can be installed where they are needed. This planning/coordination effort becomes more complex when multiple buildings are affected but are not planned for simultaneous construction. Care must be exercised when planning the underground routing of services and footings / shorings / supports. Further, future-ready designs may justify the proactive installation of additional underground piping / duct space in order to accommodate unforeseen future infrastructure needs.

6. **Combined Utility Trenches:** Many developers are attracted to the idea that multiple utility trenches can be combined in order to achieve savings in trenching costs. This seems intuitively sensible but ends up saving very little after adding costs for all the specialized trades waiting on each other. Different underground services must be coordinated, but do not necessarily benefit from being combined into the same trench.
7. **Utilities in Garages**: This project presents the opportunity to install district energy piping in the underground parkade that spans between multiple buildings. If the public utility (Kitchener Utilities) owns those pipes then they will have additional requirements for safety because of the pressure they run their system at. Private district energy utilities will be wise to consider those same requirements, or to keep the pipes either underground and outside of the garage.

8. **Land Use & Trails**: In this site particularly, there is a trail along the northern boundary of the site which will need to be adapted into the final design. This may mean raising the trail up onto the roof of the parking garage which runs the length of the site under the buildings, and integrating the elevated trail into grade connections with the existing trail beyond the site.

6.6 **GREENFIELD DEMONSTRATION SITE (KITCHENER SITE TWO)**

![Conceptual Master Plan for a Greenfield Demonstration Site, Kitchener](image)

Owner/Developer: City of Kitchener [on behalf of a confidential land owner]

Project Status: Conceptual Master Planning

Site Size: 2.25 hectares (5.6 acres)

Pre-development Use: Agriculture, vacant
**Proposed Use:** Mixed-Use: Ground Floor Commercial/Retail, Apartments, Offices

**Number of Residential Units:** (Proposed concept): ~460 units in mixed mid/high-rise formats

**Residential Area:** 64,300 m² (692,000 ft²)

**Commercial Area:** 15,600 m² (168,000 ft²): ~11,250 m² (121,100 ft²) retail and ~4,350 m² (46,900 ft²) office.

**Building Heights:** 1-12 stories

**Key Energy Features:** Exceptional energy efficiency, Solar PV, Geothermal

**Grants/Incentives/Programs:** Net-metering contracts for solar

### 6.6.1 Project Summary

The proposed project site is an example location within Kitchener’s Designated Greenfield Area. It is at the intersection of an arterial road and collector street. For the purposes of this study, it is within an area that has a mix of land uses: nearby arterial commercial uses (those that cater to the travelling public), lands in the vicinity that remain for industrial employment, a regional electrical substation and hydro corridor runs close to the site, and there are adjacent significant natural heritage features. Given that it is on an arterial road, it is presumed that there is adequate access to the existing street network and the provincial highway system. The site has potential to be both self-contained and connected to the surrounding area. All greenfield areas are planned to have public transit (bus) available within 450m of most homes and the assumption is that the local express bus service (iXPress) would be extended to run along the arterial road. The nearby highway gives convenient access to much of Ontario’s economy (i.e.: 5 min. drive to Highway 401, less than one hour to four international airports including Waterloo, London, Hamilton and Toronto/Pearson). The significant natural heritage features are part of the Grand River watershed. This site is now in an area that could be serviced in the near future (i.e. receive sanitary, water and storm servicing along with road infrastructure upgrades).

The proposed conceptual pre-design (prepared by Evan Truong of The Planning Partnership) is therefore a mix of uses that will complement and blend the other adjacent uses on nearby sites. Residential mid and high-rise buildings are proposed to the east, adjacent to the significant natural areas. The west of this site is proposed to offer a mix of commercial and retail uses to complement the nearby retail and industrial uses. The middle of this site is proposed to contain mixed use residential buildings with ground floor retail, helping to transition from the proposed retail/commercial zones on the west of this site to the residential zones on the east.

The proposed design would integrate the new buildings and connect the adjacent developments appropriately, featuring a roundabout in the middle that would serve as a natural bisector for the different uses (retail, commercial, and residential), and a focal point to help transition and blend all the uses together.
6.6.2 **ENVIRONMENTAL CONSTRAINTS**

Natural areas adjacent to the site are sensitive and constrained. The boundaries of this project have been established to avoid conflict with sensitive natural areas and should minimize impact to this project as well. The site itself has been historically underutilized and is believed to be clean.

6.6.3 **SOCIAL CONTEXT**

Kitchener has a balance of both intensification and greenfield opportunities. As the city grows, staff have recognized the importance of growing intelligently and more sustainably, starting with a range of land uses that are transit-supportive and designed to be transit-oriented. The site’s context is assumed to be on an arterial road where there is an expected need for more commercial uses. It is also assumed that nearby residential subdivisions will have an interest in the proposed development offering supporting uses to help “complete” the community.

The social context also includes recognition that there is a Community Climate Action Plan that includes a GHG emission reduction target for 2020 and a more aggressive target for 2050. There are other related community expectations for reducing traffic, improving cycling infrastructure and ensuring that there are adequate parks and open spaces.

6.6.4 **DESIGN STRATEGIES**

Commercial buildings on the Greenfield Demonstration site will use the following technologies to maximize energy efficiency:

- Increased insulation beyond building code (R28+ walls and R40 roofs);
- Advanced windows: triple-pane low-e argon filled (U=0.25). Occasional uses of View-Dynamic Glass which auto-tints when exposed to sunlight, thus helping to reduce solar heat gain and keep the building cool;
- Cold-Climate Air Source Heat Pumps (ASHPs) as the primary heating system;
- Variable Refrigerant Flow (VRF) heating/cooling distribution, which also allows the building to take heat from the warm/sunny (typically south or west) side and move it to the cool/shaded side (typically north), providing cooling and heating simply by moving heat around, before using energy to introduce new heating/cooling;
- Air-to-air heat recovery;
- Demand control ventilation;
- LED lighting throughout;
- Domestic hot water supplied from the VRF system (and ultimately from the ASHPs);
- Solar PV: up to 960kW of panels across the roofs, up to 1.85MW across various facades, and up to 1MW over surface parking spaces, for up to 3.8MW total net-metered PV;
- Geothermal district heating using an open source geothermal loop;
- Efficient (R6.5) doors and garage doors;
- Advanced air tightness to minimize air leakage from all spaces (common areas and suites, commercial and residential). Target maximum 2.5 ACH50 for suites <5,000 ft²;
• Tower air handling systems will be balanced for all common areas (as opposed to industry norm of pressurizing);
• All buildings will be properly commissioned by professionally credentialed Commissioning Agents and tested for air-tightness;
• Cistern collected rainwater (in the parking garage/basement) for irrigating and toilets.

Residential suites will be designed similarly but noting the following clarifications:

• Heat Recovery Ventilators (67% efficient) and Drain Water Heat Recovery (43%);
• Cold Climate Air Source Heat Pumps (ASHP) with backup electric resistance heat: base COP of 3.5 and SEER of 21;
• LED lighting throughout;
• ENERGY STAR® rated appliances;
• All-off light switches that disable key electrical outlets with passive / parasitic loads (eg: entertainment areas).

Preliminary energy modelling suggests that the total energy consumption across this site should be between 6.5 GWh and 8.1 GWh annually, depending upon occupant mix, for 100% of all heating/cooling/electricity needs. This assumes that district energy is being used to provide heating/cooling, and that the district is responsible for efficiency gains which save 1.3 – 2.0 GWh (again, depending upon occupant mix). Up to 3.5 GWh could be provided by on-site solar energy, but off-site renewables or combined heat & power (CHP) would be needed in order to bring the site to net-zero. The density of the studied design simply does not allow sufficient surface area for adequate solar to power the site. Net-zero was achievable with solar exclusively if the towers were all reduced to maximum 3 story podiums, but this does not represent the best use of the site.

This site should consider a combined heat and power (CHP) plant, supplied by natural gas. This site could physically accommodate a CHP plant that could be installed centrally and expanded in phases as the site builds out, and the natural gas supply could be replaced with syngas or renewable gas over time. The site would not achieve net-zero energy while using natural gas, but would be net-zero ready, and could achieve net-zero once the natural gas supply is replaced with renewable gas.

6.6.5 FINANCIAL STRATEGIES

6.6.5.1 Bundled IRR

Refer to section 6.1.4.1 above. This project will use the same approach, leveraging the financial strength of energy efficiency measures to help subsidize the cost of more expensive items such as solar panels.

6.6.5.2 Net Metering

The solar energy systems installed on-site will be eligible for Net-Metering, meaning that surplus electricity may be shared with the local grid for financial credit, which can be carried over to
offset future electricity bills for up to 12 months. This site is unlikely to generate surplus electricity (i.e., all solar electricity generated will be consumed on site to run the geothermal cooling system in the summer, and/or the plug and process loads through the rest of the year), but Net-Metering will be employed in order to ensure that any surplus generation created during times when it is not immediately needed are carried forward for credit against future times of deficit generation (i.e., when there is not enough PV generation available to offset real-time electrical consumption). Essentially this will enable the proposed buildings to use the grid as a battery until cost effective and appropriate energy storage technology may be installed.

6.6.6 Policy/Process

Many of the lessons learned on this site mirror those learned in the Bramm Yards case study (section 0 above), particularly because of their similarities in size / mix and because they are both governed by the same jurisdictional authorities, but the major additional learning on this site was related to Municipal Access Agreements (MAA’s).

District Energy (DE) and any other private infrastructure required to be installed underneath public rights-of-way (e.g., streets) are typically confusing to all of the utility and/or municipality and the project proponent, often to the extent that they simply are not permitted or pursued. The City of Kitchener uses Municipal Access Agreements (MAAs, see Appendix B: section C.3) as the preferred legal instrument to grant private access to the public underground, for example by telecommunications companies like Bell, Rogers, Telus and others. These agreements are typically drafted by staff and approved by council, and though there are few of them, they are part of business-as-usual for the City, and they include reasonably rigorous detail about the rights and responsibilities of signing parties who wish to install services under public infrastructure. These MAAs could be adapted for use with DE systems and DE micro-utilities and may in fact be the simplest and best way to enable DE systems on this and other project sites.

6.6.7 Major Lessons Learned/Takeaways

Many of the lessons learned on this site mirror those learned in the Bramm Yards case study (section 0 above), particularly because of their similarities in size / mix and because they are both governed by the same jurisdictional authorities, but the following additional lessons were noted:

1. **Context Matters:** Land use is as much art as science, and any new project must be designed to appropriately integrate with its surroundings. Whether that means respecting environmentally sensitive lands, connecting into a surrounding urban fabric, or just relating well to adjacent uses, the site design must reflect what it is surrounded by. As an added benefit, doing this well will also help to minimize resistance from adjacent property owners and the local public.

2. **Municipal Access Agreements** (MAAs, see Appendix B: section C.3): District Energy systems necessarily invoke a sophisticated policy environment, and they impose a certain amount of confusion when addressing issues of access to space beneath public streets. Municipal Access Agreements are an effective tool that can be used to preserve...
municipal ownership over the road space, while permitting access to licensed agencies (public or private) to install services beneath. Easements and other legal instruments can sometimes bring other encumbrances with them, giving the owning entity more control over the space affected by the easement than the municipality may desire, whereas MAAs seem to offer appropriate rights and protections to all parties involved.

6.7 **388 Philip Street (Waterloo Site One)**

![Conceptual Site Plan for 388 Philip St., Waterloo](image-url)

**Figure 6-24: Conceptual Site Plan for 388 Philip St., Waterloo**

<table>
<thead>
<tr>
<th>Owner/Developer</th>
<th>Prica Global Developments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Status</td>
<td>Conceptual Pre-Design</td>
</tr>
<tr>
<td>Site Size:</td>
<td>9.7 hectares (24 acres)</td>
</tr>
<tr>
<td>Pre-development Use:</td>
<td>Office</td>
</tr>
<tr>
<td>Proposed Use:</td>
<td>Mixed-Use: Offices, Ground Floor Commercial</td>
</tr>
<tr>
<td>Number of Residential Units:</td>
<td>(Proposed concept): n/a</td>
</tr>
<tr>
<td>Residential Area:</td>
<td>n/a</td>
</tr>
</tbody>
</table>
Non-Residential Area: 149,600 m² (1,600,000 ft²)
Building Heights: 2-8 stories
Key Energy Features: Exceptional energy efficiency, Solar PV, Geothermal
Grants/Incentives/Programs: Net-metering contracts for solar

6.7.1 PROJECT SUMMARY

This redevelopment parcel is located between Philip Street and Albert Street in Waterloo, ON and is currently being used as office space. There is extensive surface parking on the site and vacant land. The site is surrounded by other employment uses and some residential uses to the south and east.

The development concept shown in Figure 6-24 illustrates a potential build-out of the site. A series of internal roads/lanes are envisioned through the site to form a grid of streets that connect to existing streets/driveways potentially including a drive/intersection across the north of the site, Lester St. on the south, and potentially Cardill Cres. to the east. Final architectural designs for the buildings would need to conform to the City’s planning regulations such as the Urban Design Manual and requirements for podium/tower proportionality (8 storey mid-rises would need to have some manner of podium to enhance the street wall). These details would be refined at the detailed design stage.

Office uses are proposed along Philip Street and the Cardill Street Extension. The buildings frame the streets and provide a consistent street wall. A majority of the buildings are oriented along Philip Street due to proximity to similar uses, and the new LRT station and accessibility from the existing street network. A small central park is positioned within the site on the south side of the Cardill Extension. This park/open space is framed with buildings on all sides and has street frontage on three sides. The park is envisioned to provide a central focal point for the use of employees from adjacent buildings during their breaks and after work, and to support events for the general public. Parking is provided above-grade and it is anticipated that below-grade parking may also be required for some buildings to meet the City’s parking standards.

By developing a series of new streets and blocks, this concept offers the opportunity for some of the included buildings to be introduced in phases over time. Development could consume surface parking from prior phases and could provide new parking within new development over time.

6.7.2 ENVIRONMENTAL CONSTRAINTS

The west edge of the site, abutting Philip St., has historically been used for industrial research in the telecommunications industry. The eastern portions of the site have historically remained vacant. The site has a “high” threat of contamination according to the city and will likely require remediation. Exact remediation details will not be known until an environmental assessment is completed.
This site is also affected by a municipal by-law, approved in September 2018, prohibiting the use of vertically drilled geothermal wells in the western half of the City of Waterloo, including on this site, in order to protect drinking water sources. This means that horizontal loop geothermal is acceptable, but vertical loop and open-loop would not be. Geothermal would work best on this site if implemented as an open-loop vertical well, due to greater efficiency and reduced cost, but this would contravene the new bylaw. District energy using geothermal on this site would therefore need some manner of variance and/or amendment from this provision in the new bylaw, which is unlikely given how recently the bylaw was established, and noting its intent. This means that district energy on this site would likely require consideration of Combined Heat and Power (CHP) instead.

Lastly, the site will require all the typical approvals expected for a project of this nature in this location, including sun/shadow and wind studies, among others. As part of the William St. Wellhead Protection Area and the Part IV Area under the Clean Water Act and Grand River Source Protection Plan, the site will require a valid Notice of Source Protection Plan Compliance.

6.7.3 SOCIAL CONTEXT

Formerly a research and development facility in the aerospace/telecom industries, this site sits nestled between several other tech sector industrial/research companies in Waterloo, walking distance from the University of Waterloo, Wilfrid Laurier University, and Conestoga College, and from industry leaders such as Blackberry, IBM, Sysco, Sandvine, and many others. This area of the city has experienced growth and is expected to be highly receptive to further development, particularly employment related development.

The conceptual design shown in Figure 6-24 could represent 2-storey buildings similar to nearby 408 through 412 Albert St., or could represent up to 8 storeys. The design calculations below will comment on both. Final design decisions can wait until further marketing research has determined what will be most saleable in the area. It is expected that the local neighbourhood residents will be supportive of any level of employment oriented development that is roughly similar to that contemplated in Figure 6-24.

6.7.4 DESIGN STRATEGIES

388 Philip Street is designated employment lands in the City’s Official Plan and as per provincial and city policy, the proposed design does not include any residential uses. The exact occupant mix cannot be known this early in the design but is likely to include street-fronting ground-floor commercial with a mix of diverse office and/or research uses above.

Buildings would use the following technologies to maximize energy efficiency:

- Increased insulation beyond building code (R28+ walls and R40+ roofs);
- Advanced windows: triple-pane low-e argon filled (U=0.25). Occasional uses of View-Dynamic Glass which auto-tints when exposed to sunlight, thus helping to reduce solar heat gain and keep the building cool;
- Cold-Climate Air Source Heat Pumps (ASHPs) as the primary heating system;
- Variable Refrigerant Flow (VRF) heating/cooling distribution, which also allows the building to take heat from the warm/sunny (typically south or west) side and move it to the cool/shaded side (typically north), providing cooling and heating simply by moving heat around before using energy to introduce new heating/cooling;
- Domestic hot water supplied from the VRF system (and ultimately from the ASHPs);
- Air-to-air heat recovery;
- Demand control ventilation;
- Advanced air tightness to minimize air leakage from all spaces (common areas and suites, commercial and residential). Target maximum 2.5 ACH50 for suites <5,000 ft²;
- Tower air handling systems will be balanced for all common areas (as opposed to industry norm of pressurizing);
- All buildings will be properly commissioned by professionally credentialed Commissioning Agents and tested for air-tightness;
- LED lighting throughout;
- Solar PV panels across the roof, various facades, and over surface parking spaces;
- Geothermal district heating using an open source geothermal loop connecting the largest buildings to the earth, and with district heating/cooling pipes running from those largest buildings to adjacent smaller buildings;
- A Combined Heat and Power (CHP) plant for on-site generation of heat and electricity, supplied in the future by syngas or renewable natural gas;
- Efficient (R6.5) doors and garage doors;
- ENERGY STAR® rated appliances for kitchen / lunch room areas;
- Cistern collected rainwater (in the parking garage/basement) for irrigating and toilets.

Preliminary energy modelling suggests that 2-storey buildings on this site, using this design configuration, should consume between 2.4 GWh and 3.8 GWh of energy annually, depending on occupant mix, for 100% of all heating/cooling/electricity needs. 3.3 GWh could be provided on site using net-metered PV on 45% of all roof surfaces, 30% of S/W/E facades, and most of the surface parking (totalling ~3.15 MW of PV), thus net-zero energy is possible on this site if using 2-storey building designs heated/cooled by a shared geothermal system.

If the buildings are increased to 8 storeys then there will be increased loads and increased surface area for façade PV: loads would increase to 9.7-15.2 GWh, and generation potential would increase to 4.6 GWh (~4.8 MW of PV across all surfaces combined), thus another source of energy would be needed in addition to the PV. The space heating needs for this concept design were modelled at roughly double the cooling needs, and domestic hot water heating was almost as much additional load as space heating. Geothermal energy will therefore be unable to provide both: it could meet 100% of the cooling needs, and ~15-25% of total heating, but sizing geothermal to provide any further heating would lead to thermal imbalance in the ground over time, compromising the effectiveness of the geothermal resource (refer to Table 3-29). If there is running water underground then this problem will be overcome by that water’s ability to renew the thermal resource, but the thermal imbalance would be transferred to the water, which would likely necessitate further environmental study (ie: in order to ensure no negative environmental impact downstream).
A 1MW combined heat and power (CHP) plant could provide all the outstanding heating needs and all of the electricity need remaining beyond what the PV could provide. This system would not necessarily provide electricity when needed, so it would either need electrical energy storage on-site or would be dependent upon the grid and net-metering. If sizing the CHP plant only to serve the electrical load on site, then a smaller CHP plant would likely suffice, thus it is likely that some level of coordination / control will be sufficient to ensure that a 1MW CHP plant can meet the energy needs not already met by the PV and geothermal, after considering the efficiency benefit of combining all buildings on a district energy network. It is difficult to size a CHP plant properly for this site without having specific loads to model (ie: based on real occupancy profiles), but this preliminary concept study is enough to conclude that CHP would be needed if the site wishes to achieve a relative level of energy independence. A CHP plant could be installed centrally and expanded in phases as the site builds out, and the natural gas supply could be replaced with syngas or renewable gas over time. Net-zero energy could be possible with renewable gas, or with off-site renewable electricity.

As the design density increases on this site, so does the gap between the amount of load expected and the amount of generation that can be accommodated, until on-site renewables no longer suffice, and either CHP (with a renewable source of gas) or off-site generation will be needed.

### 6.7.5 Financial Strategies

This site would be a prime candidate for a micro-utility based on district energy. One energy plant could be installed in a central building and designed to provide heating/cooling for multiple adjacent buildings, leveraging the diversity of their occupant profiles to capture and maximize every efficiency in delivering energy to each building. For example, when the south side of one building is sunny and hot, but the north side is cool, then the district energy system can work with VRF technology inside the building to move surplus heat from the south side to the north side, thus “heating” one side and “cooling” the other by moving available heat, using very little new energy. Similarly, if the south side of one building is unoccupied and is still warm (eg: early evening when the office closes, but street fronting uses pick up and get busy), but the north side of another adjacent building is occupied and is cool, the district energy system can move energy between buildings, and can leverage the fact that one space is unoccupied to let that space become slightly uncomfortable, and to wait until a set time before it will be occupied again (eg: 2 hours before the office opens again the next morning) before prioritizing it again and restoring it to comfortable temperatures. District energy systems create opportunity for savings that can be harnessed to reduce energy bills overall across a site.

In this particular case, the district energy system could be owned by the site developer, by the non-regulated side of a publicly owned utility (ie: Grand River Energy, non-regulated partner/subsidiary to Waterloo North Hydro), a private energy developer, or any number of joint ventures between similar parties.
6.7.6 Policy/Process

6.7.6.1 Authorities Having Jurisdiction

One of the most interesting restrictions active on this site is actually provincial. The Province of Ontario’s 2017 Growth Plan for the Greater Golden Horseshoe (GPGGH) requires municipalities to designate all employment areas in official plans and to protect them for appropriate employment uses over the long-term. This includes, among other things, prohibiting residential uses and limiting other sensitive land uses that are not ancillary to the primary employment use. Because the lands in this project site are designated employment in the City’s Official Plan, other uses (eg: commercial, institutional or residential) are not permitted except with the exception of certain ancillary uses specifically defined in the employment designations of the City’s Official Plan. In accordance with the GPGGH and policies in the City’s Official Plan, any conversion of designated employment areas may only be considered through a municipal comprehensive review subject to certain criteria, or a change to provincial law. Both scenarios are clearly out of the reach of this project and are thus well beyond the scope of this study.

The site is envisioned to mature as some manner of technology park, particularly because of its proximity to the University of Waterloo’s main campus, the University of Waterloo’s Research & Technology Park, and many local technology focussed businesses. There are many arguments that could easily be made to promote the inclusion of residential mixed uses on this site, but since they are designated employment lands and are protected under provincial legislation, the scope of study for this case study was clearly confined to “no residential uses”, regardless of the merit of any argument to the contrary.

The proposed conceptual design for this site therefore respects the need for 100% employment focussed uses and presents a new technology park featuring extensive office space above ground-floor commercial uses (such as restaurants and cafés).

6.7.6.2 District Energy

The site is, like several earlier in this study, also a prime opportunity for intensification, and intensification that pursues net-zero energy will absolutely need to consider district energy.

District energy on this site is challenging because of the municipal zoning by-law provision which prohibits vertical geothermal wells in the western half of the city, but with or without geothermal, this site will require a combined heat and power (CHP) plant if the buildings are to exceed ~3 stories in height. Whether based on geothermal energy or CHP or both, district energy will need to include pipes to carry heating and cooling between buildings, and this means pipes that cross the street. Just as with the previous case studies, this site experienced difficulty when proposing private energy infrastructure crossing public streets. According to the City, the appropriateness of public versus private roads on the site would need to be determined through a

---

plan of subdivision process, and the city further clarified that it would not support the installation of private infrastructure in any public right-of-way. The local utilities were unsure whether they would be able to support such a design.

Three possible solutions were evaluated for their conceptual merit, but none of the three have been approved by the City: they are offered here for discussion only.

1. As in Figure 6-25 below, the majority of the streets interior to the site would be maintained privately, thus making it easier to install DE piping under the private streets, and public utilities (eg: water, sewer, gas, communications) could be connected via the public streets at the exterior of the site. This solution would only be acceptable to the City if the developer owns and maintains all interior streets.

![Figure 6-25: District Energy Sample Piping Layout #1 for 388 Philip St., Waterloo](image)

2. As shown in Figure 6-26 below, the middle east-west road (Cardill extension) could also be made public, and private services could be run under the buildings north of that road, reducing the presence of private infrastructure under the street to one (or at most two) crossings. Note that this option reduces the need for the developer to maintain the street infrastructure, but still necessitates a number of privately maintained side streets between the buildings. Changing all streets to public would necessitate that the DE system pass under several street crossings (likely a minimum of 5), which would still be rejected by the City.
3. The DE system could be owned by the public utility (ie: Grand River Energy, non-regulated subsidiary to Waterloo North Hydro) and would be treated as effectively public infrastructure, thus eliminating the permitting challenges faced by private infrastructure under public streets.

Many other conceptual piping layouts could be considered, but all would reach the same conclusion that, at least within the City of Waterloo, either the developer must own and maintain the streets, or they must not own the DE piping that crosses under the streets. The Kitchener case studies leveraged Municipal Access Agreements (see section 6.6.7 item 2), and other such tools may be helpful in other municipalities, but these are not available options in Waterloo.

### 6.7.7 Major Lessons Learned/Takeaways

The key lessons learned in this project case study are similar to those learned in the other more intensified case studies:

1. **Net-Zero Energy in High Density Projects Requires District Energy.** Similar to the Davis Tannery site, this site is simply too dense to accommodate sufficient space for un-shaded solar panels on the buildings in order to enable them to provide their own energy needs independently. They need to be designed together, in a district, and there needs to be a single energy plant somewhere in or near to that district in order to provide the energy that the buildings cannot provide themselves. This site can achieve most of its energy need through a combination of geothermal and solar energy, but would have no hope of achieving net-zero without using district concepts to leverage the ability of adjacent buildings to help each other.

2. **Dense Energy Loads are Difficult to Meet On-Site:** Simply put, there is more load on this site than there is space for generation. Geothermal can provide all the cooling needs...
of the site, but there is simply not enough room on this site for the solar energy technology that would be needed to provide 100% of the site’s electrical demand using current technology, and the heating needs for the site will significantly exceed the cooling needs, which would limit the ability of a geothermal system to meet both and maintain healthy thermal balancing with the earth across the seasons. This site is a potential candidate for CHP depending on the final load mix, and is an example of the importance that renewable natural gas will have in a future where fossil fuels are increasingly replaced with renewable resources. Ultimately this site challenges the idea of net-zero energy on-site, and is an example where it would be beneficial to have a contract with an off-site renewable energy provider to make up the lack in energy that cannot be generated on-site renewably.

3. Policy Jurisdiction: The permitted land uses on this site are restricted by an unusual party this time in the Province (via the Provincial Growth Plan), rather than the City, and the provincial legislation does not allow the conversion of designated employment lands outside of a comprehensive municipal review process which complies with the provincial legislation. This may be unique to those communities in Ontario which are particularly affected by provincial employment growth policy, but it serves as an interesting reminder that some projects will face their greatest difficulties in perhaps unexpected places, and may be required to pursue approval through processes or agencies which are not typical of the development approvals process.

4. Ownership Models Define Applicable Approvals: Particularly with respect to District Energy, the type of approvals process that becomes applicable is often a consequence of the ownership structure. For example, if privately held energy assets are run under public infrastructure, then they may need easements or special permissions, or they may simply be prohibited. If publicly owned utility lines are run to private lots then there is no problem, but if that utility line passes under one private lot to service another, then easements or other approvals may be required. It seems to be much easier to get approvals for public assets under/on/through private lands than it is to get approvals to install private services under/on/through public lands or rights-of-way. For district energy to increase in Ontario, and to bring its many benefits and efficiencies to the grid, legislative change may be required at the provincial level. And if such change is pursued, then it could require privately owned energy assets to follow the same codes and standards of quality and safety as are used for public owned assets.

5. Public vs. Private: There is a persistent theme across all sites studied thus far, that municipalities generally do not wish to permit private infrastructure under public rights-of-way, no matter the merit or the method by which it is implemented. In Ontario, energy law facilitates public utilities installed under public rights-of-way, but does not speak as clearly to similar infrastructure which is privately owned. Legislative change may be required at the provincial level in order to simplify the installation of district energy, and if pursued at that level, could require that private infrastructure underground be required to follow and comply with the same standards of quality and safety as public infrastructure, using the same applicable codes and standards to guide their design and installation.
6. **Local Process:** Development application proposals with net zero are still development proposals. Parties proposing to construct net-zero buildings or communities need to be informed about the applicable local regulations and processes. Not doing so could result in significant delays and additional costs.

6.8 **305 Frobisher Drive (Waterloo Site Two)**

![Figure 6-27: Location/Context for 305 Frobisher Dr., Waterloo](image-url)
6.8.1 Project Summary

The 305 Frobisher Dr. property is owned by the City of Waterloo and is used as a municipal snow storage site. It is located within an existing industrial area. Adjacent to the site are industrial uses and a stormwater management pond. A Grand River Transit Bus Storage and Maintenance Facility was approved to the east of the site.

The development concept shown in Figure 6-27 and Figure 6-28 illustrates a 2,750 square metre (29,600 square foot) industrial/flex-industrial use on the site. The building is oriented along the northern property line of the site, partly to take advantage of the views and overlook of the stormwater management pond, and partly to maximize visibility and prominence from University...
Avenue East. Access is provided off Frobisher Drive. Parking and loading access is depicted on the southern portion of the site and is large enough to accommodate a diverse range of parking/loading configurations. The development concept will need to meet municipal regulations including the City’s Urban Design Manual which includes requirements for high quality appearance from both University Avenue East and Frobisher Drive.

6.8.2 ENVIRONMENTAL CONSTRAINTS

The site is currently used by the City for salt and snow storage. Remediation might be necessary prior to development but is beyond the scope of this study: it has been assumed that any potential remediation would be resolved by the City external to this scope before the site would be developed.

6.8.3 SOCIAL CONTEXT

This site is surrounded by other industrial uses in an employment area on the edge of the City, a short drive from other industrial zones, a commercial zone, and low-density residential zones (ie: single detached and row homes). It is one of relatively few open pieces of land remaining within the city limits. The use proposed for this site is consistent with adjacent sites and is expected to be of little interest to local residents until there is a tenant or industrial occupant on-site who might offer goods or services of interest to them. Any new employment on this site is expected to be received favourably by local residents with little to no opposition or concern.

Regarding public transit, bus route 31 stops twice hourly at the intersection of Bridge St. W. and Frobisher Dr. (~300m walk away), and the new ION express connection bus route 202 will stop at the intersections of Northfield Dr. E. and Bridge St. W. (~400m walk away) every 15 minutes. Both bus stops are less than a 5 minute walk away.

6.8.4 DESIGN STRATEGIES

The base design for this building is intended to target net-zero energy performance. Whether this is achievable will be somewhat dependent upon the type of tenant or eventual use which the building might see, but a building such as this, designed using best available industry knowledge for energy efficiency, will end up having an Energy Usage Intensity (EUI) of between 80 and 150 kWh/m². The range in this estimation is due to occupancy type: a primarily office related occupancy with mostly desks and computers will trend towards the lower end of that range, while industrial machinery and clean-room ventilation systems will trend much higher. The following technologies will be used to maximize energy efficiency:

- Increased insulation beyond building code (R28+ walls and R40 roofs);
- Advanced windows: triple-pane low-e argon filled (U=0.25);
- Cold-Climate Air Source Heat Pumps (ASHPs) as the primary heating system;
- Variable Refrigerant Flow (VRF) heating/cooling distribution;
- Air-to-air heat recovery;
- Demand control ventilation;
• LED lighting throughout;
• Domestic hot water supplied from the VRF system (and ultimately from the ASHPs);
• Solar PV panels across the roof, various facades, and over surface parking spaces (providing multiple tangential benefits such as weather protection for parked cars and simplified drainage / winter snow removal);
• Efficient (R6.5) doors and garage doors;
• Advanced air tightness to minimize air leakage (target maximum 3.5 ACH50 for total facility);
• Stormwater from the adjacent stormwater pond for irrigating.

This design concept will result in a building that uses between 250,000 and 425,000 kWh/yr. Up to 260 kW of high efficiency PV can fit on the roof, and would provide ~312,000 kWh/yr net-metered. If this is insufficient for any reason, then additional PV could be installed on the façades (providing 15-20% additional energy output) and/or over the parking area (providing >100 kW additional PV, up to ~100,000 kWh of additional capacity). The site is capable of achieving net-zero energy on its own, and district energy connections with adjacent properties will potentially reduce the required amount of on-site generation by up to 20%.

6.8.5 Financial Strategies

This site is the smallest of the case studies evaluated in this project, and as such, has the fewest opportunities for creative finance. If combined with adjacent sites, then micro-utility or district energy models could apply. Independently, this site is able to achieve sufficient levels of efficiency and on-site energy generation to reach net-zero energy at a reasonable cost. Like with West 5 (see section 6.1.4.1), the most helpful strategy for the Froebisher site is bundled IRR: by combining the energy efficiency measures into the same budget as the energy generation measures (ie: insulation and PV sharing one joint payback), the overall returns from the total investment to get to net-zero energy will become more respectable, and the design team will be less likely to “value engineer” the PV out of the design.

6.8.6 Policy/Process

This site has relatively self-evident use opportunities, will need to coordinate well with adjacent sites, and so long as that is done, will not encounter any significant challenges during the permitting / approvals process.

6.8.7 Major Lessons Learned/Takeaways

1. Size Defines Opportunities: Smaller sites are simpler in every respect than larger sites, and the consequences of this difference are both positive and negative. In the positive, it is more intuitive to determine the highest and best use of the sight, particularly with respect to its surroundings. Permitting / approvals are proportionately simple as well. In the negative sense, smaller sites offer far fewer opportunities for creativity. But again in the positive, creativity is less necessary, and it is much simpler to achieve advanced
energy performance, including net-zero energy, precisely because the site is small enough to largely meet its own needs.

2. **Low-Density Buildings Can More Easily Achieve Net-Zero Energy**: This is not a strictly new lesson, but was confirmed again on this site. Low rise buildings (one or two storeys in this case) with substantial roof space and open parking areas can most easily accommodate enough solar panels to provide all their own energy on-site. If the building is a more intensive energy user, then the lower density of the site affords further opportunities for local energy generation that can combine with on-site solar, such as geothermal, wind energy, or biomass. And there may yet be opportunities to collaborate with neighbouring properties in a district energy scheme or micro-utility, which could further reduce energy consumption and provide other benefits. In all, this property is well poised to meet its own energy needs.

6.9 **TRENDS AND KEY FINDINGS ACROSS ALL 8 CASE STUDIES**

The case studies above offer a select sampling of archetypal projects which encompass most of the typical development scenarios that Cities encounter: green-field and brown-field, infill and gentrification, heritage and flood plain challenges, and more. This section will summarize some of the trends identified across all eight case studies, and some of the key lessons that emerged.

6.9.1 **PROCESS IS SECONDARY TO VISION**

This observation is sometimes obvious, and sometimes counterintuitive. The mock-trial process with the Cities proved difficult in some cases, precisely because of the gaps between envisioning new projects and the process of realizing those visions. For example, in areas where vision is highly encouraged, creativity flows, new ideas run plentiful, and “the team” is focused on finding ways to make those visions become feasible and ultimately successful. More typically though, permit/approving officials will struggle between the requirements of many existing policies, and the creative process will be limited by time and other pressures: design creativity typically causes delays that indirectly affects the builder/developer (e.g., with additional fees while waiting for approvals, even if only property tax fees accruing during extended permit pursuits), and design teams typically are encouraged to produce designs which are very predictable, similar to the local norm, and easy for permit/approving officials to recognize and understand with little effort. Net-zero energy is yet new enough that it requires a certain level of creativity, and some municipalities (perhaps many) will struggle to embrace the creative process without (intentionally or otherwise) pressuring design teams to conform to status quo.

6.9.2 **CONFLICTING POLICIES**

There are often unintentional conflicts between the policies among different departments within the municipality. For example, when planning documents include high-level ambitions for the City around topics like District Energy, when other policies make it difficult for the Engineering department or local utilities to release permits. Or consider planning policies that drive certain types of development to certain portions of the City (e.g.: more employment downtown to improve transit ridership among other things), while other planning policies talk about growth of
self-contained neighbourhoods that minimize the need for travel: the one pushing commercial/office uses downtown and the other pushing mixed uses all across town. As noted in West 5, Builders/Developers should not have to negotiate in order to pursue sustainability, and a good design for a self-contained neighbourhood with appropriate densities of mixed uses should be encouraged wherever it is pursued, not just where a well-intentioned policy thought it could be pursued.

6.9.3 Death by a Thousand Meetings

Many municipalities struggle with too many people (internal and external) wanting to be informed and involved as much as they are able, sometimes slowing progress, creating unintentionally redundant approvals, and adding complication. For example, having a committee assembled to review an Architectural or Urban Master Plan for a larger project, and then also having the same committee meet to review each and every building design thereafter that is already compliant to the approved master plan. Rather than have the committee involved at both stages, the committee could review and approve the Master Plan, and municipal staff could monitor adherence to that Master Plan without the need to revisit the committee. Alternatively, if the Municipality wishes to prioritize involvement at each building’s design separately, then the Municipality should not waste the Developer’s time (and money) requiring master documents which will not end up being given any authority for use.

6.9.4 Context, Context, Context

Every project exists within a broader neighbourhood context. Each of these case studies struggled with the tension between maximizing/optimizing the use of the project lands vs. respecting and integrating with adjacent lands. The Municipal approvals process typically does well at facilitating this discussion, but it is an ongoing struggle, and it significantly affects design (eg: solar access, district energy, built form, etc).

6.9.5 Experience is King

Especially in any area of innovation, it is incumbent upon the Builder / Developer to have a team that has expertise in the innovations they wish to implement, and upon the Municipality to invest in its own competence at reviewing innovative designs. “Talk early and often” will make it much easier for both to work together toward realizing great projects, proactively identifying challenges and resolving them, and both parties will need to be proactive to that end. Each successful project will facilitate the next, and the collective experience gained will continue to benefit all parties with each new innovation, but it all starts with the foundation under the first project, and both the Builder / Developer and the Municipality will do well to invest in their expertise.

6.9.6 Institutional Inertia

Municipalities across Canada are resource constrained, and this often results in (among other things) municipal approvals officials being understaffed and overworked. This in turn makes it difficult for those staff to budget time away for training, which makes it difficult for them to stay
informed on the evolution of industry best practice and innovation, which makes it difficult for
them to be comfortable with new proposed innovations, which can make it difficult for
innovative builders to obtain permits.

Topics such as heritage or water treatment are particularly sensitive. West 5 showed that a
fantastic looking innovation in water infiltration (which would have performed better than
traditional methods at greatly reduced cost) was rejected because of institutional inertia: the City
was not comfortable with the innovation proposed, and it would have taken a minimum of 3
years to evaluate that innovation further, after which time the City might still not be comfortable.
Innovation in this specific instance was simply abandoned.

The McCormick redevelopment showed that delaying gentrification on vacant industrial sites
can literally invite illegal activity by vagabonds and the homeless (see section 6.2.6.2), and
accelerate decay of the site. The City plays a significant role (through the approvals process) in
enabling or limiting the speed/progress of redevelopment, and that delay can literally cause a site
to fall into such disrepair that its heritage value is compromised. The desire to preserve heritage
features can be the very thing that causes avoidable delays which end up unintentionally eroding
the value of those same features.

By corollary, if the Municipality is, for any reason, simply unable to expedite the approvals
related to the reconstruction or revitalization of properties such as this, then it behooves the
Municipality to recognize that delays can exponentially increase the costs of redevelopment, and
the Municipality should be appropriately more lenient about demands placed upon the developer.
The more the Municipality wants done on the site, the more quickly they should expedite the
approvals. The slower the approvals, the less the Municipality can expect the private sector to
invest in the site, and/or the more the Municipality must be prepared to invest itself (via
incentives).

Municipalities need to engage in self-review and make effort to proactively identify where they
have policies or practices that actively discourage, delay or even prevent builders/developers from
being able to innovate.

6.9.7 INCENTIVES ARE ENABLERS, NOT LESS OR MORE

Most Canadian Municipalities are not able to offer incentives for anything other than carefully
constructed programs which offer returns to the municipality that fund or offset the cost of the
incentive. Chapters 4 and 5 (above) have much more to say about this, but it is interesting that
incentives did not define any of the 8 case studies in this report, and yet incentives did enable
each of the 8: several of these sites were brownfields on which the Municipality helped fund
remediation, and all of these sites were dependent upon the ability to resell electricity, either
through the net-metering or FIT programs (neither of which are actually incentives, as explained
in section 5.2 above, but both of which are important enablers). Each of the four Municipalities
who participated directly in these case studies has used incentives to promote different forms of
development over time, for example, by offering waivers of various fees / taxes to new
employers setting up factories, or to developers who remediate challenged sites, or to
constructors adding iconic buildings to a municipally designated growth zone.
It is worth remembering that land can sometimes be made more attractive by investment in areas surrounding that land, and that there may be circumstances where a piece of land (which we’ll call “area A”) is so challenging that the Municipality may accomplish more with less time and effort if they in fact focus elsewhere (“area B”), but in such a way as to create a catalytic benefit that achieves good both in that other place (B) and, by direct or indirect influence, in the more challenging lands (A). This opportunity of complementarity, that investing in Area B can be an effective way to increase the opportunity for returns to investment in Area A, could be considered during the development of targeted municipal incentives: when municipal funds are limited, this might be an interesting way to extend their impact (ie: benefitting areas A and B by focussing funding on B first over A, then shifting funding support to A in following years).

6.9.8 Money Talks

Financial considerations are still the primary determinant in most project decisions.

Old buildings can be VERY expensive to renew, and it is often (but not always) more cost effective to simply demolish and rebuild. If heritage and the re-use of old buildings are desirable to the municipality, then the municipality needs to be ready to offer incentives in order to make re-development possible (see section 6.9.7 above). And if the Municipality is particularly invested in a piece of land to the extent that the approval of development plans for that land can reasonably be expected to take additional effort (ie: delays, especially on vacant properties which present security risks that grow with time), then as in section 6.9.6 above, the Municipality must be prepared to invest (via incentives) in items which the private sector cannot reasonably be expected to bear. Partial or full waivers of various municipal fees (eg: permit fees, Development Charges, or Tax Increment Grants) may be appropriate.

6.9.9 Technology is Not the Issue

There are many technologies readily available in the industry to help buildings of any shape or size to achieve net-zero energy. Market realities can make it difficult to access “best” technologies for any given application, and projects are often constrained to work with the best locally available technology, rather than the best technology, whether because of importing costs/tariffs, or because of the lack of local service personnel who can install and maintain systems in a cost-effective way.

Some building types will more easily achieve net-zero energy than others, but the mix of technologies available is now sufficiently diverse and mature that any site can be built to provide for itself with enough investment. More often than not, the degree of investment required is what makes net-zero projects succeed or fail.

6.9.10 It’s All About Design

Substantial energy can be saved by not constructing elements which are not required. For example, by combining and coordinating parking space in one shared garage that is managed with reasonable care, enabling the same space to be used for business parking during the day or residential parking during the evening, the overall number of required parking spaces can be
reduced. This reduces the overall size of the parking facility, which in turn reduces the volume of air in that facility which needs to be conditioned, which reduces space conditioning energy. Proper coordinated uses of the space then results not only in energy savings, but also in avoided construction cost.

6.9.11 Solar Access

Net-zero energy requires on-site energy generation, and that will often include solar energy which requires access to sunlight, and which can therefore be affected adversely by shading from adjacent development. If present planning efforts are to benefit from solar energy, then the solar panels included in the design will need to be effective for decades into the future, during which time we should expect to see many other local developments / intensification projects, and it is unlikely for the solar exposure of a site to remain unchanged for the full life of any solar system installed there. The pursuit of net-zero energy is often dependent upon unobstructed access to sunlight, and a “Right to Light” bylaw (see section 6.3.7.1) could be considered as an important measure to help ensure the long-term viability of net-zero construction.

6.9.12 District Energy (DE)

Net-Zero Energy in high density projects requires District Energy (DE). Even after pursuing aggressive energy efficiency, there is often not enough space for un-shaded solar panels on the buildings to provide their own energy needs independently.

There is no hard/fast rule, but anecdotally, buildings greater than three storeys in height will often struggle to achieve net-zero energy, and sites where >40% of the gross floor area is in buildings >3 storeys in height will tend to struggle to provide sufficient surface area to achieve net-zero with on-site renewables: they will need to consider off-site renewables and/or CHP (Combined Heat and Power). Renewable Natural Gas will make this consideration much easier in the future, but today’s projects will need to remember that CHP is typically non-renewable and will compromise the project’s ability to make claims to net-zero energy.

DE depends heavily upon the load mix for the sites it supplies: a balanced load mix, with relatively consistent overall combined loads from day to evening and from one day to the next, is much easier to design and manage with a DE system, but a balanced load mix (ie: with the right balance of residential/commercial and day/evening/night) is relatively rare. DE systems require many partners in order to maximize success.

Once the technical issues surrounding DE are overcome, it is necessary to determine the legal vehicles required in order to establish access to the underground. Appendix C includes three sample policies that enable DE, along with explanatory language on how these three should best be applied, including Community Charters (Appendix C.1), a Sample Easement for District Energy (DE) in Public Rights-of-Way (C.2) and a Sample Municipal Access Agreement for Public Rights-of-Way (C.3). Which approach works best will vary by context. For example, many municipalities have fully separated utility companies, but some like Manitoba Hydro or ATCO Energy in Alberta provide both electricity and heating, and others like Kingston Utilities will provide even more integrated utilities (electricity, heating, water, sewer, and telecom). The
local business landscape varies by region, and the policies included in Appendix C are offered precisely because they provide three different ways to legitimately grant access for DE companies to install and service their infrastructure under public rights of way, giving local municipalities the opportunity to choose the method that best suits their context.

6.9.13 Optimizing the Underground

Especially for dense developments, buildings can often be constructed right up to the lot line with little to no setback. This means that footings can often require underground elements (shoring etc.) which encroach into space beyond the lot line, and this can interfere with utility services. This requires planning in advance in order to reconcile conflicts and ensure the utility services can be installed where they are needed. This planning/coordination effort becomes increasingly more complex when multiple buildings are affected but are not planned for simultaneous construction (e.g., District Energy). Care must be exercised when planning the underground routing of services and footings/shorings/supports.

Similarly, many developers are attracted to the idea that multiple utility trenches can be combined in order to achieve savings in trenching costs. This seems to make sense intuitively, but ends up saving very little by the time you add costs for all the specialized trades waiting on each other to each do their respective work in the same trench. Different underground services must be coordinated, but do not necessarily benefit from being combined into the same trench.

Lastly, future-ready “smart” or net-zero energy designs will do well to build upon key lessons from the past: that utilities in general, and telecom networks especially, have grown disruptively over the last decades in the amount of underground pipe/duct space they need, and future-ready designs may justify the proactive installation of additional underground piping/duct space in order to accommodate unforeseen future infrastructure needs.

6.9.14 Permits and Approvals

When this study was commissioned, and the 8 case studies identified, the research team predicted that the greatest challenges facing these projects would not be technical or financial, but would be that of securing the necessary permits/approvals. Now at the conclusion of all this research, the prediction stands fulfilled, and this sub-section will attempt to summarize a number of lessons related to simply getting permits and approvals:

1. **Policy Jurisdiction**: The permitted land uses on some sites are restricted by entities other than the City, such as the Province or Environmental/Conservation Authority or others: some projects may require approval from agencies which do not commonly participate in the development approvals process and may even require legislative change if the proposed project deviates from their intended use for the site. For example, the 388 Philip St. site in Waterloo was designated as employment lands, and provincial legislation prohibits conversion of those lands outside of a Municipal Comprehensive Review and subject to certain provincially inspired criteria, so conversion of the lands would be far more complicated than a typical zoning bylaw amendment.
2. **Ownership Models Define Applicable Approvals:** District Energy systems will, by their nature, require different buildings to be interconnected with piping and systems that enable them to share energy. This means that piping will need to go back and forth between the buildings, typically under public roads, which will typically require some consideration of how to permit a privately owned pipe or service to pass beneath a public right-of-way (eg: road). This could be solved by changing the private ownership to some manner of public ownership, perhaps by having a public utility own the district energy service outright, or perhaps by creating a joint venture with a public utility. Otherwise this could be resolved as a matter of policy, changing or creating appropriate by-laws or access agreements to enable privately owned infrastructure to pass beneath public rights-of-way, or to specifically permit district energy heating pipes and/or privately held electrical conduit (eg: owned by a micro-utility) to pass beneath public rights-of-way.

If publicly owned utility lines are run to private lots then there is no problem (this is business as usual), but if that utility line passes under one private lot to service another, then easements or other approvals may again be required. It seems to be much easier to get approvals for public assets under/on/through private lands than it is to get approvals to install private services under/on/through public lands or rights-of-way.

Cities wishing to enable net-zero energy will do well to proactively evaluate how to permit private utility uses under public rights-of-way, and to setup bylaws, template easements or access agreements (eg: Appendix C:) that may be used when needed.

It is worth noting that district energy is truly no different than communications or gas utilities in this sense: Bell, Cogeco, Rogers, Telus, Enbridge, Union Gas and others have long been granted permissions to install their privately owned infrastructure underneath public rights-of-way. Most municipalities have some form of process by which to enable these private entities to install their services under public rights-of-way, though they typically only use it for select few cases such as the aforementioned communications and gas companies. This could be through easements, through Municipal Access Agreements (see Appendix C: section C.3), or through a municipal Public Utilities Commission (PUC) which issues licenses to recognized “utility” companies (public and/or private), and provides a venue for them to coordinate their installations to ensure that they respect each other’s setback and clearance requirements etc. With a process defined, the municipality could easily promote DE to the local building industry and would be ready to capitalize on the efficiencies and emissions reductions which this would enable.

3. **Approvals in General:** The greatest challenges associated with approvals required for a net-zero energy construction project are no different than the challenges associated with more typical construction: brownfield, heritage, and ecological challenges are often much more difficult than the technical challenges associated with net-zero energy buildings and communities, and the approvals related to these concerns can take far longer to resolve. Adding net-zero energy considerations does little to affect brownfield / ecological concerns, but heritage concerns can significantly impact a project’s ability to incorporate innovative energy efficient facades, or to use building integrated solar panels.
7. CONCLUSIONS
The lessons learned in this study have been numerous, and the trends emerging from each of the topic areas were already summarized above. This section will extract and summarize the strongest and most fundamental conclusions which were reached in the chapters above, including those from the case studies and those from the broad market research done in prior chapters, both for clarity and for enabling follow-up action by local municipalities.

7.1 TECHNICAL

a) **Technology is no longer the problem.** There are now available products to solve effectively any challenge we face. Access to the right technology can be a problem, and access to qualified service personnel is often more difficult than would be desired, but the greater challenges are in (1) getting permit/approval officials comfortable with new technology, and in (2) getting new technology deployed into market.

b) **Municipalities should avoid choosing favourites.** Some municipalities have adopted official policy documents which list specific technologies or best practice programs in them (eg: referencing the use of specific credits in one program like LEED or Passive House, with no alternatives). This should generally be discouraged, and private industry should be given as much room for creativity / innovation as possible. For example, rather than referencing the use of specific technologies (eg: solar PV, geothermal, etc.), reference the achievement of a minimum overall level of energy efficiency. Municipalities will typically not have the same level of resources as private industry with which to keep current, but they will always be able to tell industry the performance based goals which the municipality has, and to let industry find the best way to meet them.

c) **Best Practice Programs should be encouraged.** Built Green, ENERGY STAR, LEED, Net-Zero, Passive House, R-2000, … are all having a positive impact on the industry in general and should all be encouraged equally. Each program has supporters and antagonists, but in the end, each program is helping the industry to progress toward higher levels of performance, and they are all therefore valuable in their potential to help a municipality encourage better building practices. Incentives are the most effective way that a municipality can increase local participation in such programs, and there are a variety of incentives worth considering (see sect. 7.2 below). Best practice programs are a very effective pre-requisite for determining eligibility for incentives.

d) **Best Practice Programs should never be mandated.** All the best-practice programs presently available in Canada are led by private industry, enabled in various degrees by higher levels of government (eg: Natural Resources Canada, NRCan, and their energy modelling programs). Various provinces are entertaining the idea of requiring that all new or resale homes be labelled in NRCan’s EnerGuide program, which is not a Best Practice Program, but is simply a rating scale that indicates the energy performance of a home. The home could be poor or excellent, and EnerGuide will simply measure and report its performance. Programs such as Built Green, ENERGY STAR, LEED, Net-Zero, Passive House, R-2000, … all have requirements for minimum levels of energy and
environmental performance across a range of discreet measurables, and guidance on how to succeed. These programs all enable the building industry to improve, and they compete to some extent in the free market. Municipalities wishing to encourage local construction quality to improve can confidently leverage these programs, but mandating any one program over another, or mandating any one program at all, will impose two fatal mistakes: (1) it will bias the local industry to the benefit of one program agency over others in a way that is not legally defensible; (2) it will outpace the capacity of local industry to deliver the favoured best practice program with consistent quality and will cause delays that could have negative economic impact for the community at large (refer back to section 4.6.1).

7.2 **FINANCIAL**

a) **Lifecycle Accounting:** Many municipal funding decisions are made based on first cost, comparing the purchase values of different options, and sometimes considering forecasted costs for operations and maintenance. If accounting practices instead assess the entire lifecycle of an expenditure, including design assessments, detailed designs, procurement, associated permitting fees, operations, maintenance, ongoing reporting fees (especially where environmental emissions reporting is required), disposal or remediation fees, and any other fees that can reasonably be understood in advance, then it is often more cost effective and less expensive overall to support net-zero and environmentally minded designs. Municipalities should be encouraged to adapt procurement practices to take a more lifecycle based approach to understanding costs.

b) **Green Building Programs:** There are many best practice programs available in industry which can be leveraged by municipalities to encourage energy / environmental improvements in the building industry. These programs can be trusted to achieve meaningful energy usage reductions that will reduce strain on local utility infrastructure, and result in related environmental benefits which may support municipal objectives:

1) **New Construction:** If the municipality is wishing to encourage new construction to pursue net-zero energy, then incentives could be offered for participation in CHBA’s Net-Zero program, for LEED Platinum, BUILT GREEN Platinum, Passive House, R-2000, and/or for Living Buildings.

2) **Existing Buildings:** If the municipality is wishing to encourage retrofit of existing buildings to reduce strain on existing infrastructure, then incentives could be offered for achieving BOMA BEST Gold, Platinum or Net Zero Challenge certification, for LEED (particularly LEED EB:O&M – Existing Buildings: Operations & Maintenance), or for measured improvements using ENERGY STAR Portfolio Manager.

c) **Incentives:** Funding for incentives supporting either new or existing buildings can be leveraged from the budgets those programs will support. For example, both will reduce the strain on local municipal utility infrastructure and have potential to therefore also reduce expenses related to expanding that infrastructure. Savings realized from those
avoided expenses could be partially re-invested in incentives which enable those savings. Similarly, most incentives will result in some manner of increased value to the properties they affect, and can thus be funded to varying degrees by the future revenues associated with increasing property values.

Appendix D (Sample Community Improvement Plan and Programs) includes a full draft Community Improvement Plan with corresponding enabling by-laws and a selection of proposed draft incentive programs which interested municipalities are encouraged to consider.

d) **Targeting Circular Funding Mechanisms:** As introduced in item (b) above, there are sometimes opportunities to use funding to support projects which create savings to repay the funding. For example, in Ontario most Local [electrical power] Distribution Companies (LDCs) are owned in part or in whole by the municipalities in which they operate. Further, those LDCs all coordinate and interoperate through a system that is administered provincially by the Independent Electrical System Operator (IESO), and the IESO funds several conservation initiatives through the LDCs. This means that the IESO gives funding to the LDCs for certain initiatives, which the LDCs flow through to projects and initiatives in their local areas. If the municipal shareholder behind the LDC wishes to incent certain energy saving projects, then it is often possible for the LDC to claim the environmental and energy related achievements of those projects towards conservation targets which will receive funding from the IESO, and that funding can be used to repay any investment the LDC or the municipality may have invested, in effect closing the funding loop and netting out the direct cost to the municipality to zero.

Similarly, district energy creates a circular funding opportunity for larger buildings: if the local district energy utility is municipally owned and the municipality offers an incentive to connect, the building designers will save mechanical room space (typically from the penthouse) which can be converted back into premium leasable space. This increases the useable square footage of the building, increases the revenue to the builder, and ultimately increases the property tax yield to the municipality, which can be used over time to repay whatever incentive dollars were invested by the municipality.

This circular funding opportunity varies in nature across Canada, but the general principal is applicable in multiple contexts. Municipalities (directly or through a municipally owned utility) can invest in inciting energy related projects which generate savings and/or increased tax revenues which can thus repay the municipal investments over time. Careful program design can help maximize the return on the municipality’s investment, and stakeholders can celebrate the benefit of the accomplished projects with no net financial investment made by the municipality.

### 7.3 ENABLING POLICIES

a) **Voluntary vs. Mandatory:** At the risk of overlapping section 7.1(d) above, mandatory technical requirements above and beyond established codes should not be confused with enabling policies. Many well-intentioned municipalities have instituted requirements
which local industry was not ready to accommodate. This is partly what caused the leaky building crisis in BC in the 1980’s, and many less traumatic trials at the Ontario Municipal Board. Enabling policies should provide and protect new options, not new requirements.

b) **Simplify Permitting for District Energy:** Net-zero energy projects of any size or density will almost always require some manner of micro-utility or district energy system. In general, municipalities seem frequently to struggle to understand and/or accept private infrastructure under public rights-of-way, no matter their merits or the method by which they are implemented. Legislative change may be required at the provincial level in order to define and specifically permit private utility services to be installed under public infrastructure, and to define methods by which to design those private services to meet the same standards of quality and safety as those used by public authorities. Until then, Appendix C offers several models for legal instruments which can provide access to a district energy company to install infrastructure under public rights-of-way, and local municipalities are encouraged to work with these to proactively identify the best method to use in their context. All things being equal, the team behind this report favours Appendix C.3: Municipal Access Agreements.

c) **Net-Metering Laws are Vital:** Net-metering laws have been used in every case study to ensure that PV installed on the buildings is able to provide energy to the buildings when needed, using the local grid for energy storage. Net-Metering laws are administered provincially and are present everywhere in Canada, but are also politically risky and can be changed at any time. Several jurisdictions in the USA have changed their net-metering laws in ways that compromise the viability of the solar industry, and that sabotage local residents’ and companies’ ability to use PV to meet their own energy needs. Net-Metering is a vital component of net-zero energy design and should be protected. The provinces should be encouraged to entrench net-metering laws such that proponents who connect using a net-metering agreement may have long-term confidence that the agreement under which they connect will not be changed on them in the future. For example, rather than having net-metering remain open to change over time, net-metering based connection agreements could be locked in with the terms and conditions extant at the time of connection.

d) **Solar Right-To-Light:** projects which include solar panels and solar energy harvesting technology are dependent upon ongoing access to sunlight which can be difficult to protect, especially in densifying / gentrifying neighbourhoods. Without having some level of legal protection, the rate of gentrification / construction can be a significant risk to the future business viability of a solar system, which makes it difficult for developers to place confidence in the long-term availability of energy from the solar systems they would install. If the business risk of future solar yields cannot be reasonably protected, then many developers in the markets where solar is most needed will simply not invest in solar. Appendix B.2 (section B.2.9) offers a sample solar Right-To-Light bylaw which defines processes by which these risks can be mitigated.
e) **Overstepping Authorities**: This is a particularly challenging topic that was raised quietly at several different interactions throughout this research study. As building and community design advances toward net-zero energy, the designs themselves are trending towards ever increasing complexity. This tends to involve the support of an increasing pool of specialist designers who work in regulated professions, such as Professional Engineers or Architects, who carry professional insurance and are liable to disciplinary processes authorized and defined by provincial law. When these professionals submit designs to a municipality for various permits, it would be normal and expected for the municipality to review those designs against municipal policy to ensure compliance with items like official planning documents and zoning bylaws. Many municipalities take their review a step further though, whether because they lack expertise in these new topics or for various other reasons, and are requiring third-party peer reviews not just of policy compliance, but of technical elements of the proposed design.

The problem this creates is that the technical elements of the design are regulated at a level above the municipality, typically by provincial legislation and regulations governing building codes and the professions. If the design documents have been signed and sealed by qualified professionals from a regulated industry (e.g.: a Professional Engineer) with liability insurance in good standing and who are subject to professional discipline processes appropriate to the licensing bodies behind their respective professions, then the municipality really should not require a peer review.

There is a tension here that is difficult to explain concisely and is easy to miss. The building department at any given municipality exists in order to ensure compliance with the building code. When they perform inspections on a construction site, they are inspecting to code and can be liable if they allow construction which does not meet code. This is necessary in practice because most homes are built by trades, not by regulated professions. If an Engineer or Architect seals a design and says that it meets code, then the building department will still provide site inspections as before, but will not need to review the drawings as closely in their office: they can leverage the legislation supporting those professionals, lean on their liability insurance, and simply accept their seal. The professional is liable for the design, not the municipality. If the municipal review surfaces a concern about their design then the municipality can complain to the professional body holding their license (e.g.: the Engineer’s Association) and that body will investigate the quality of the design and the behaviour of the regulated professional designer, and the permit can simply be held frozen until the investigation is complete. The municipality does not need to perform a full technical review of an already engineered design, and when they do, it adds cost and delay to the project, and liability to the municipality.

It has been said that these third-party reviews are intended to mitigate the municipality’s liability associated with approving the designs and issuing permits, but the opposite is in fact more likely. For example, requiring a peer review for technical items, not just for policy compliance, means that the regulated professional’s seal, which is deemed by law to be sufficient for all technical concerns, is being considered insufficient by the municipality. This in turn means that the municipality is requiring additional reviews which are in contrast with the laws regulating the design profession, and thus that the
municipality is assuming responsibility for good design above the laws regulating that design profession, which introduces risks of liability which are not well understood.

This is not the same as assessing compliance with municipal policy, and this steps outside the authority the municipality has. For example, if the municipality performs a peer review and comments on the lack of conformance to site plan or zoning requirements, then this is clearly appropriate. But if the municipality is requiring an independent engineer to review a technical design of any kind (perhaps energy performance, innovative structural designs, etc) for compliance with technical codes (eg: the Building Code), then they are effectively asserting that the first engineer’s seal is insufficient to determine compliance, which conflicts with the law governing the engineering profession. This means that the municipality is disregarding the rights and responsibility’s accorded to the first Engineer’s seal by requiring a second opinion, and this enters questionable legal territory where the municipality’s requirements contravene provincial legislation.

For greater clarity, it seems questionable and wasteful (of time and money) for municipalities to require independent engineers to peer review technical elements of a design that is already sealed by a Professional Engineer: the independent review could appropriately comment on compliance with municipal policy, but technical concerns should be addressed through the discipline process of the regulated profession, not through a municipal peer review. Otherwise the municipality opens itself to multiple liabilities around the technical elements of the design.

7.4 RECOMMENDATIONS

There is much that a municipality can do to encourage their local building and development industry to “go green”, or to adopt more sustainable construction practices, even net-zero energy. The length of this report hopefully makes it clear that there are many lessons within these pages which are worth learning and acting upon. In order to simplify that learning effort, this section attempts to highlight a list of the top recommendations (in no particular order) which might serve as an effective starting place:

1. **Benchmark:** Assess the capabilities of your local industry. Identify key stakeholders among builders, suppliers, non-profits and others who are respected local leaders, innovators, and potential advisors to the municipality.

2. **Training:** After reviewing this report, especially chapters 3 and 4, consider what training might be necessary for your municipal staff, and what topics might be most helpful for them to understand better.

3. **Continuous Learning:** Adopt a formalized continuous learning program for municipal staff. Capture lessons and experiences as they occur: consider scheduling periodic meetings (perhaps quarterly) to discuss lessons and experiences from recent projects or activities. Document them formally and adapt municipal process (as appropriate) in response. Consider scheduling regular “lunch and learn” sessions as part of these
meetings, based first on these learnings and then perhaps on review of various
technologies from chapter 3 of this report.

4. Consider implementing a **Solar Right-To-Light bylaw** to help reduce risk for developers
who are considering investing in solar systems on properties affected by potential nearby
redevelopment / intensification.

5. **District Energy:** Consider implementing any of the solutions in Appendix C: Enabling
Policy for District Energy, to proactively define a method by which district energy
proponents can participate in local energy markets.

6. **CIP:** Review the draft Community Improvement Plan included in Appendix D, including
all of the proposed programs attached to that plan. Adapt it for your local context and
implement the portions thereof which are most appropriate to your municipality’s need.
Be mindful of the observations and recommendations of section 4.7 starting on page 114
(eg: about program stability, simplicity, target audience, setting reasonable expectations,
etc.), and of the strengths of your local industry (refer to recommendation 1 above on
benchmarking). Refine this draft CIP into something for use in your local municipality,
and then review with local stakeholders. Programs in this CIP do not need to be funded
immediately, and discussions of funding method should not delay a discussion on what
programs will be most helpful for your local municipality: separate those discussions into
two efforts and focus on getting the CIP adapted and adopted as quickly as possible. Then
follow up with budget discussions separately for the following fiscal year, to bring the
CIP into full force.

7. **Celebrate:** Establish a local marketing plan. Work with local stakeholders to determine
what level of publicity is appropriate for your local green building programs, and to
identify appropriate methods for recognition. Consider section 4.7.4 item 7 on page 120
as a place to start.
8. OTHER RECOMMENDED READING

This report has surveyed and reviewed a body of material that could fill several libraries. Although the lessons and recommendations captured herein are grounded in experience and are presented in ways which are intended to be as useful as possible, this report has truly only scratched the surface of some of the concepts referenced herein.

The following is a brief list of additional reference material beyond that already included in the content and footnotes throughout this report which may prove valuable to municipalities interested in ways to improve their environmental impact, and to enable local industry to do the same.

1. FCM / GMF programs: The Green Municipal Fund (GMF) managed by the Federation of Canadian Municipalities (FCM) is an outstanding resource for municipalities wishing to pursue projects related to energy efficiency, environmental protection, climate mitigation and resilience, and much more. The fund offers several programs supporting actions from feasibility study (such as this study) through to capital works projects, and has an archive of interesting projects implemented by other municipalities. The archive alone is a valuable resource. [https://fcm.ca/home/programs/green-municipal-fund.htm](https://fcm.ca/home/programs/green-municipal-fund.htm)

2. The CHBA (Canadian Home Builders’ Association) produces a study of homebuyer preferences every few years. This most recent study demonstrates that Canadian homebuyers are increasingly interested in energy efficiency, so much so that five of the top 10 wants for new buyers are now energy related: [http://www.chba.ca/survey](http://www.chba.ca/survey)

3. BC’s Climate Action Revenue Incentive Program (CARIP): carbon tax revenues used to help municipalities (in BC) to reduce emissions. This doesn’t help developers per se, but is interesting nonetheless as a resource for BC municipalities and for other municipalities interested in climate action. [https://www2.gov.bc.ca/gov/content/governments/local-governments/grants-transfers/climate-action-revenue-incentive-program-carip](https://www2.gov.bc.ca/gov/content/governments/local-governments/grants-transfers/climate-action-revenue-incentive-program-carip)


5. The Ontario government’s webpage explaining Community Improvement Plans: [http://www.mah.gov.on.ca/Page223.aspx](http://www.mah.gov.on.ca/Page223.aspx)

6. Funding programs for agriculture and food processors in Ontario. This website offers some interesting examples on the unique funding models associated with the ag sector. [https://www.mentorworks.ca/blog/government-funding/top-funding-agriculture-food-processors-ontario/](https://www.mentorworks.ca/blog/government-funding/top-funding-agriculture-food-processors-ontario/)

7. The SMART Green Program from Natural Resources Canada, offering support to manufacturers who are innovating their production processes to be more energy efficient: [http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/policy_e/details.cfm?searchType=def](http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/policy_e/details.cfm?searchType=def)
8. The “Affordability Fund” is funded by an independent trust set up by the Government of Ontario. Local electric utility companies and community services are working together to help residents improve their home’s energy efficiency with free energy-saving upgrades, which can lower home energy use and their electricity bill. Residents may qualify for free upgrades, including ENERGY STAR® certified LEDs, ENERGY STAR® certified appliances and insulation and weatherstripping.
   i.  https://www.affordabilityfund.org/
   ii. http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/policy_e/details.cfm?searchType=default&sectoranditems=all%7C0&max=50&pageId=1&categoryID=3&regionalDeliveryId=7&programTypes=4,12&keywords=&ID=5146
APPENDIX A: EXAMPLES OF MUNICIPAL INCENTIVE PROGRAMS

A.1 Municipal Incentives: Land Use

A.1.1 Brownfield Remediation – Example Programs

Brownfields are typically vacant or underutilized properties where past industrial or commercial uses have left contamination behind. As contamination standards have become increasingly stringent over the years, more and more lands are being designated brownfields, and it has become increasingly important for municipalities to have tools to support their remediation. Below are some examples of how different municipalities are presently using the incentive methods from Table 4-2 (in the main report) to incent efforts to remediate brownfield lands.

Belleville, ON: Brownfield Remediation and Rehabilitation Programs134

1. **Tax Increment Equivalent Grant Program** (TIEG) (*see report* Table 4-2 item B, C): A grant equivalent to the increase to property taxes obtained by the municipality is given to the private landowner of a contaminated brownfield for commercial and residential development, reuse, and/or conversion, ESAs, and remediation and rehabilitation. The city will refund the landowner with an annual grant equivalent to 80% of the incremental property tax increase for a maximum of 10 years or when the grant payments are equivalent to the full cost of remediation and rehabilitation. At the end of the program, 100% of the municipal property tax is retained by the city.

2. **Environmental Remediation Tax Cancellation Assistance Program** (*see report* Table 4-2 item C): The increases to a Brownfield’s property value is provided to encourage remediation and development. The amount of tax assistance is either the amount of the remediation work conducted in the calendar year or the amount of property tax canceled by the municipality (the lesser of the two amounts).

3. **Environmental Site Assessment Grant Program** (*see report* Table 4-2 item B): The city of Belleville will reimburse the landowner for the costs associated with eligible studies at a maximum grant of $20,000 or 50% of the Phase II ESA (the lesser of the two amounts). A maximum of 2 studies per property will be funded, with a maximum of $35,000 being provided to each property.

4. **Building Permit Fees Grant Program** (*see report* Table 4-2 item I): Aids the remediation and redevelopment of Brownfield sites by providing a maximum 75% return grant in

---

134 City of Belleville Brownfields Community Improvement Plan (2011).
priority area 1 and a 50% reimbursement in priority area 2 for the completion of the building.

5. **Development Charge (DC) Grant Program** *(see report Table 4-2 item D)*: The property owner pays for 100% of the development charges. The owner can receive a maximum of 50% of the cost of the development charge or the total eligible costs (the lesser of the two amounts). The grant will be received within 6 months of the issuance of the building permit and after the city verifies the eligibility of the associated costs.

Cambridge, ON: Brownfield Remediation and Rehabilitation Programs

6. **City of Cambridge & Region of Waterloo Brownfields Financial Incentive Program: Joint Tax Increment Grant (TIG)** *(see report Table 4-2 item B, C)*: Cambridge is working in collaboration with the Region of Waterloo to provide grants to property owners to remediate and redevelop brownfields. The joint tax increment grant is only available to Brownfield sites within the city of Cambridge. The remediation and redevelopment must increase the value of the property by at least $100,000 and Phase I and Phase II Environmental Site Assessments are a prerequisite to obtaining the TIG. The provisions of the TIG will not exceed the total eligible remediation costs. The amount of the provided TIG equals up to 100% of Cambridge’s and the Region of Waterloo’s property taxes per year up to 10 years or the total cost of remediating the land and buildings, or the total of all grants, loans and other tax assistance that is provided (whichever occurs first). The calculation of the TIG will only occur following site assessment and post-remediation.

Chatham-Kent, ON: Brownfield Remediation and Rehabilitation Programs

7. **Feasibility Study Grant** *(see report Table 4-2 item A)*: Provides 50% of the cost (up to a maximum of $5000 per study with a maximum of one study per property/project) for the feasibility and cost studies required to rehabilitate and reuse Brownfield sites.

8. **Environmental Study Grant** *(see report Table 4-2 item B)*: Provides 50% of the costs (to a maximum of $15,000 per study with a maximum of two studies per property or project and a maximum in $20,000 in study grants per property or project) associated with Phase II Environmental Site Assessments, remedial work plans risk assessments and risk management plans.

9. **Tax Assistance** *(see report Table 4-2 item B, E)*: A property owner is exempt from municipal property taxes for up to 5 year after a Brownfield site has been remediated and rehabilitated to offset the developer’s expenses. Assistance is available for Phase II ESAs, remedial work plans.

---


plans and risk assessments, environmental remediation, placing clean fill and grading, installing environmental and engineering controls, monitoring and maintaining the installed engineering controls, and environmental insurance premiums.

10. **Rehabilitation Tax Increment Based Grant** *(see report Table 4-2 item B, C)*: Provides an annual grant equal to 80% of the municipal property taxes for five years. A property situated Downtown or in the designated Main Street Community Improvement Project Area is eligible to receive 100% of the increase in the municipal property tax for 5 years. Projects that are eligible for the grant include:
   - Phase II ESAs, remedial work plans and risk assessment/management plans, costs of the environmental remediation, placing clean fill and grading, installing environmental and/or engineering controls. Monitoring, maintaining and operating the environmental and engineering controls, environmental insurance premiums, demolishing buildings on site, building rehabilitation/retrofits, upgrading the on-site infrastructure such as sewers, storm water management, water services, electrical and gas utilities.

**Grimsby, ON: Brownfield Remediation and Rehabilitation Programs**

11. **Environmental Site Assessment (ESA) Grant Program** *(see report Table 4-2 item B)*: The city will provide a grant covering 50% of the costs (up to a maximum of $12,000 per environmental study, with a maximum of 2 studies per property/project. The maximum total grant a developer can receive per property/project is $20,000.) to remediate and redevelop Brownfield areas including the costs of the ESA and the remedial action plan and risk assessment. A phase I ESA is necessary to be eligible for the program.

12. **Brownfields Tax Assistance Program** *(see report Table 4-2 item E)*: Cancellation of the municipal property tax for up to 3 years, or when the total tax assistance provided covers the total eligible costs, on a Brownfield site that has had a Phase II ESA.

13. **Property Revitalization (Tax Increment Grant)** *(see Table 4-2 item C)*: For projects that are classified as Brownfield sites that have already had a Phase II Environmental Site Assessment, the program provides a tax increment-based grant that is equivalent to 100% of the municipal property tax increase for up to 10 years following project completion.

**Guelph, ON: Brownfield Redevelopment Community Improvement Plan**

14. **Environmental Study Grant** *(see report Table 4-2 item B)*: This program covers 50% of the cost of Phase II Environmental Site Assessment, designated substances and hazardous

---

materials survey, remedial work plan or risk assessment. Maximum two studies per project and $15,000 per study

15. **Tax Assistance Grant** *(see report Table 4-2 item C)*: Waiving of municipal and education property taxes for maximum three years.

16. **Tax Increment Based Grant** *(see Table 4-2 item C)*: Waiving 80% of the municipal property tax increase (not the base tax) resulting from the project for up to 10 years.

**Hamilton, ON: ERASE Community Improvement Plan**\(^{139}\) includes the following incentives:

17. **Study Grant** *(see report Table 4-2 item B)*: Up to half of Phase II and III Environmental Site Assessment, maximum of $20,000 to a maximum of two studies and $25,000 maximum per property.

18. **Education Tax Assistance** *(see report Table 4-2 item C)*: A financial incentive for the education portion of the property tax that results from remediation, paid out annually for up to three years.

19. **Development Charge Reduction** *(see report Table 4-2 item D)*: Environmental remediation costs can be applied against the development charges for that property. Any environmental remediation costs applied against development charges are deducted from eligible costs under the Redevelopment Grant.

20. **Redevelopment Grant** *(see report Table 4-2 item E)*: If redevelopment causes an increase in assessed value and property tax, a grant for 80% of the increase is awarded on an annual basis.

21. **Downtown or Harbourfront Remediation Loan Program** *(see report Table 4-2 item G)*: A low interest loan equal to 80% of the cost of remediating a property, with a maximum of $400,000 per property or project.

22. **Municipal Acquisition and Partnership**: By purchasing brownfield lands and remediating them as a City, Hamilton has been able to create awareness of brownfield redevelopment opportunities and related funding.

**Kingston, ON: Kingston Brownfield Incentive Programs**\(^{140}\) includes the following incentives:

23. **Initial Study Grant** *(see report Table 4-2 item B)*: The grant covers 50% of Phase II and Phase III Environmental Site Assessments (ESA) and Site Specific Risk Assessments

---


(SSRA) up to a maximum of two studies per property and no more than $20,000 in total grants.

24. **Brownfield Financial Tax Incentive Program** (see report Table 4-2 item E): This program provides tax relief for 100% of the municipal and educational property tax for a maximum of three years. The municipal tax relief is provided by the city and the educational tax relief is provided by the Minister of Finance (provincial level).

25. **Tax Increment-Based Rehabilitation Grant Program** (see report Table 4-2 item C): Eligibility for this program is limited to brownfield redevelopment projects within the CIP project area which result in an increase in assessed value and property taxes. The grant is paid on an annual basis for 10 years, where the payments equate to 80% of the increase in the municipal portion of the taxes.

Region of Waterloo, ON: The Brownfield Financial Incentive Program\(^{141}\) includes the following incentives:

26. **Phase Two Environmental Site Assessment Grant** (see report Table 4-2 item B, I): Provides funding for completion of Phase II Environmental Site Assessments that address environmental impacts on groundwater. Funding covers 50% of on Phase Two ESA per site, to a maximum of $40,000, issued in the form of a cash rebate on proof of performance.

27. **Regional Development Charge Exemptions** (see report Table 4-2 item D): The value of the RDC exemption is based on the total eligible costs of remediation, plus 20% for indirect costs, less any brownfield financial assistance already received. Issued based on a signed commitment letter or on submission of a modelling report by a qualified professional.

28. **Joint Tax-Increment Grant** (see report Table 4-2 item C): The grant is equivalent to the increase in annual property taxes after a brownfield is remediated, redeveloped and reassessed. It is provided annually until the total eligible remediation costs are recovered, or to a maximum of 10 years, whichever comes first.

London, ON: City of London CIP for Brownfield Incentives\(^{142}\) includes the following specific brownfield incentives:

29. **Environmental Site Assessments** (see report Table 4-2 item B): The grant covers 50% of assessment study costs, up to a maximum of $10,000 per property. Below is an example of what those expenses might look like.

---


30. **Tax Assistance Plan** *(see report Table 4-2 item C, E):* This program provides tax relief by cancelling 25% of current property taxes for up to 3 years. The following costs are eligible for the tax relief:

   a. 100% of building demolition costs;
   b. 100% of site remediation costs;
   c. 100% of the cost of rehabilitating existing structures;
   d. 100% of the cost of environmental insurance premiums during the remediation phase to the date the first building permit is issued.

Property tax assistance may be provided in either the rehabilitation period or the development period. Projects may also be eligible for an education tax assistance grant, which would offset the costs of site rehabilitation for a maximum of three years.

31. **Development Charge (DC) Rebate Program** *(see report Table 4-2 item D):* DC rebates are also provided to projects within the CIP designated area for remediation costs on up to 50% of DC amounts. The eligible costs for this rebate are the same as the Tax Assistance Plan eligible costs. Costs cannot be claimed if they have already been claimed under the contamination assessment study grant program.

32. **Tax Increment Equivalent Program** *(see report Table 4-2 item C):* This grant is equal to the amount of municipal property tax increase as a result of rehabilitation and development, and is given out for a maximum of 3 years from the date of increased assessment value.

Mayerthorpe, AB: Brownfield Remediation and Rehabilitation Programs\(^{143}\)

33. **Brownfield Redevelopment Grant Program** *(see report Table 4-2 item B):* Provides funding for land owners to conduct ESAs to determine the levels of contamination and required remediation actions. Up to $1000 dollars will be provided for a Phase I ESA and up to $5000 is available for Phase II ESAs

---

\(^{143}\) Brownfield Case Studies (nd). [https://auma.ca/advocacy-services/programs-initiatives/brownfields/brownfield-case-studies](https://auma.ca/advocacy-services/programs-initiatives/brownfields/brownfield-case-studies)
Medicine Hat, AB: Brownfield Remediation and Rehabilitation Programs\textsuperscript{144}

34. \textit{Environmental Site Assessment and Remedial/Risk Management} (see report Table 4-2 item B, I): The region will provide property owners with up to $20,000 to help offset the costs associated with the ESA, and the required actions to remediate and redevelop a Brownfield site.

Niagara Falls, ON: Brownfield Community Improvement Plan\textsuperscript{145}

35. \textit{Environmental Study Grant Program} (see report Table 4-2 item B, I): Provide a grant for 50\% of the cost of an environmental study, for a maximum of two studies per property/project, $12,500 per study and $20,000 per property/project.

36. \textit{Brownfields Tax Assistance Program} (see report Table 4-2 item C, E): Provides tax assistance to an eligible property in the form of a freeze or cancellation of part or all of the taxes levied on that property for municipal (City and Region) and education purposes during the “rehabilitation period” and the “development period” of the property.

37. \textit{Brownfields Development Charge Exemption Program} (see report Table 4-2 item D): Exempts a development from 75\% of the Regional development charge for brownfield development on brownfield sites and an additional 25\% development charge exemption depending on the inclusion of Smart Growth principles into the proposed development. Eligibility for the regional development charge exemption is determined by a Regional Development Charges Task Force.

38. \textit{Brownfields Rehabilitation Grant Program} (see report Table 4-2 item I): The Rehabilitation Grant Program will provide a financial incentive in the form of an annual grant for up to ten (10) years to help offset the cost of rehabilitating eligible brownfield properties only where that rehabilitation results in an increase in assessment value and property taxes on these properties. The annual grant available under the Rehabilitation Grant Program will begin when the benefits of the Tax Assistance Program end.

Oakville, ON: Brownfield Remediation and Rehabilitation Program\textsuperscript{146}

39. \textit{Environmental Study Grant Program} (see report Table 4-2 item B): A grant up to 50\% of the costs for an eligible environmental study on Brownfield sites are provided including:

a. A grant totalling $3000 for a Phase I ESA;

\textsuperscript{144} Downtown Development and Incentive Program (2018). \url{https://www.medicinehat.ca/home/showdocument?id=3252}


\textsuperscript{146} Oakville Brownfield Community Improvement Plan (2018). \url{https://www.oakville.ca/assets/2011%20planning/Final%20Brownfields%20CIP.pdf}
b. A grant for $20,000 for other eligible studies;

c. Maximum of 2 studies per project capped at $30,000 per project.

40. **Tax Assistance Program** (see report Table 4-2 item E): Property tax increases are canceled for a Brownfield that has received remediation and development to offset the costs of the necessary environmental remediation for up to 3 years after completion.

41. **Tax Increment Grant (TIG) Program** (see report Table 4-2 item C): An annual grant ranging between 60% and 100% of the increases to municipal taxes resulting from a development are provided for up to 12 years after the completion of a remediation or redevelopment project. The amount of the grant is also determined according to the priority area of development (as determined by the City).

Oshawa. ON: Brownfield Rehabilitation and Remediation Program

42. **Brownfields Study Grant Program** (see report Table 4-2 item A, B, I): The Brownfields Study Grant provides 50% of the cost of an eligible study to a maximum sum of $10,000 for an individual study focused on Phase II Environmental Site Assessments and remedial work plans and risk assessments (including studies formerly known as Phase III Environmental Site Assessments). A maximum of 2 environmental study grants will be given to any property.

43. **Property Tax Cancellation Program** (see report Table 4-2 item E): Encourages the revitalization of brownfields by cancelling property taxes to property owners who rehabilitate contaminated brownfield sites that have already had a Phase II Environmental Site Assessment. Taxes may be cancelled either during remediation or during the development period. The property tax cancellation program will be in effect until December 31, 2020.

44. **City of Oshawa Brownfields Redevelopment Grant Program** (see report Table 4-2 item C, I): An annual City grant will be provided to property owners who have begun redevelopment of their properties in the Community Improvement Project Area after the Brownfields Tax Cancellation Program ends. The grant will equal 80% of the increase in City property taxes. The Provided grant expires when the total value of the provided grants equals one third of the costs of eligible works or after 10 years. The grant program will be available until December 31, 2020.

Ottawa, ON: Brownfields Redevelopment Program includes the following incentives:


45. **Project Feasibility Study Grant Program** *(see report Table 4-2 item A)*: Grant equivalent to 50% of eligible projects cost, with a maximum of $5,000 and a maximum of one study per property.

46. **Environmental Site Assessment Grant** *(see report Table 4-2 item B, I)*: Grant equivalent to 50% of eligible environmental assessment, remedial action plan or risk assessment costs. Maximum of $15,000 per study, a maximum of two studies per property/project and a maximum total grant of $25,000 per project.

47. **Property Tax Assistance Program** *(see report Table 4-2 item E)*: Cancellation of the municipal and education property tax increase for up to three years.

48. **Development Charge Reduction Program** *(see report Table 4-2 item D)*: Priority Areas in the Central Area, Mixed Use Centres, along Main streets, and within 600 meters of existing or planned rapid train stations: Up to 50% reduction of development charges. Non-Priority Areas: Up to 25% reduction of development charges.

49. **Rehabilitation Grant Program** *(see report Table 4-2 item C, I)*: Grant equivalent to 85% of the municipal tax increase for up to 5 years, covering up to 50% of demolition costs, rehabilitation costs and on-site infrastructure costs.

Owen Sound, ON: Brownfield Remediation and Rehabilitation Program

50. **Environmental Study Grant** *(see report Table 4-2 item B)*: The City will provide a grant to assist in offsetting the costs of Phase I and II ESAs and the remedial work plans and risk assessments that are required prior to a redevelopment processes. The grant will return 50% of the cost of the environmental study to a maximum of $10,000 per study.

51. **Brownfields Financial Tax Incentive Program** *(see report Table 4-2 item E)*: After a Phase II ESA has been conducted, the city may cancel up to 100% of the municipal property tax until the total costs of rehabilitating the site has been met. The City also reserves the option to cancel or defer and future property taxes on the redeveloped property.

52. **Development Charges Grant Program** *(see report Table 4-2 item D)*: A grant may be provided for residential redevelopments or conversions of existing building. The amount received is determined by the required development charges that are associated with the redevelopment process if there is no net increase in servicing demands after the development is complete.

---

Peterborough, ON: Brownfield Remediation and Rehabilitation Program

53. **Central Area Revitalization (tax increment based) Grant Program** (see report Table 4-2 item C): A grant is provided to property owners to facilitate the remediation and rehabilitation of properties to increase the property value. The amount of the grant is relevant to the incremental increase to the municipal taxes received by the City but will not exceed the value of the work. The grant will be paid in full over 10 years, not exceeding 100% of the increase of the municipal taxes in year one to five, 80% of the increase in year six, 60% in year seven, 40% in year eight, and 20% in year 9. The owner will pay full taxes starting in year ten.

54. **Brownfields Tax Assistance Program** (see report Table 4-2 item E): The City will cancel of all, or part, the property tax increases on a property that requires or has undergone remediation. Only properties that have already have proven need through a Phase II Environmental Site Assessment are eligible to apply for tax assistance. The assistance will be provided during the rehabilitation period and the development period of the property, and expires once the tax assistance equals the eligible costs including:

   a. Phase II ESA, remedial work plan, hazardous materials survey;
   b. Environmental remediation;
   c. Place clean fill and grading;
   d. Installing environmental and/or engineering controls;
   e. Monitoring, maintaining and operating environmental and engineering controls;
   f. Environmental insurance programs.

55. **Municipal Brownfields Rehabilitation Grant Program** (see report Table 4-2 item I): Encourages the remediation, rehabilitation and re-use of Brownfields. The City of Peterborough will grant the developer the equivalent of the tax increase to offset cleanup costs. The grant may renew on an annual basis until remediation is complete. The amount provided is determined by the increase in the municipal taxes due to the increased property value but will not exceed the rehabilitation cost. The grant covers:

   a. Environmental remediation;
   b. Removal of hazardous materials and transferring waste to landfills;

---

c. Fill and grading to replace contaminated soil;

d. Partial demolition.

Saskatoon, SK: Brownfield Remediation and Rehabilitation program\textsuperscript{151} Incentives Include:

56. \textit{Enterprise Zone Screening} (\textit{see report} Table 4-2 \textit{item} B, I): Provides developers with rebates of up to 100\% of the costs associated with screening a potential Brownfield to determine the levels of contamination such as Phase I and II ESAs.

St. Catharines, ON: Brownfield Remediation and Rehabilitation Programs\textsuperscript{152}

57. \textit{Tax Increment Finance Program for Brownfield Remediation} (\textit{see report} Table 4-2 \textit{item} B, C): An annual grant is provided to assist with redevelopment costs. The value of the grant is determined by the increase in property taxes following the completion of the remediation project. The sum of the grant will be up to an 80\% increase in municipal taxes that must be paid on the property. To receive the grant, the project must be completed within 3 years. Eligible costs for remediation of brownfields include:

a. A Phase II Environmental Site Assessment, Site Specific Risk Assessment (SSAR), and Record of Site Condition;

b. Environmental remediation in accordance with the Ministry of Environment regulations and standards;

c. Placing of clean fill and required grading;

d. Interest charges that are associated with the cost of financing the preparation of remediation studies and the undertaking of the remediation;

e. Removal of waste materials.

St. John’s, NB: Brownfield Remediation and Rehabilitation Program\textsuperscript{153} Incentives Include:

\textsuperscript{151} Redeveloping Brownfields in Saskatoon: A guidebook (nd).

\textsuperscript{152} City of St. Catharines Community Improvement Plan (2015).

\textsuperscript{153} Urban Development Incentives: Central Peninsula Re-Investment Program Options (nd).
58. **Residential Construction Challenges Grant** *(see report Table 4-2 item I)*: The city will cover 20% of the cost of contaminated soils up to a maximum of $30,000.

Stratford, ON: Brownfield Remediation and Rehabilitation Program\(^\text{154}\) include the following incentives:

59. **Environmental Site Assessment Grant Program** *(see report Table 4-2 item B)*: Stratford will provide $10,000 or 50% of the cost of conducting a Phase II Environmental Site Assessment (whichever amount is less) to help the City determine the location and level of contamination within Brownfield sites. The amount of the grant will not exceed $50,000.

60. **Tipping Fee Grant Program** *(see report Table 4-2 item I)*: Provided for remediation and redevelopment on Brownfields by assisting with the excavation, removal, and disposal of contaminated soils. The property owner is required to pay the minimum tipping fees for the contaminated soil as recommended by a Phase II ESA and will pay tipping fees for an amount of soil exceeding the stated minimum delivery amount. The city will deposit the amount of all tax increments to the tipping fee reserve until the balance of the owing amount is paid off.

61. **Brownfield Grant Program** *(see report Table 4-2 item I)*: Designed to stimulate investment in project areas by providing a grant to offset the costs associated with site planning and development fees. The provided grant will equal all eligible fees at the expense of the property owner for the planning and development applications.

62. **Brownfield Redevelopment Grant Program** *(see report Table 4-2 item C)*: Provides property tax grants to property owners who remediate and redevelop their properties within the stated community improvement project area provided that the remediation increases the property’s taxation value. The program removes the tax increase associated with property redevelopment. The city reimburses the developer with annual grants determined by the incremental tax increase collected by the municipality to defer the full amount of taxes that would otherwise have been paid. The provided grant will equal the total value of the work done on the eligible program costs, or after 10 years, and is distrusted as follows;

<table>
<thead>
<tr>
<th>Year</th>
<th>Grant Amount</th>
<th>Year</th>
<th>Grant Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100%</td>
<td>6</td>
<td>50%</td>
</tr>
<tr>
<td>2</td>
<td>90%</td>
<td>7</td>
<td>40%</td>
</tr>
<tr>
<td>3</td>
<td>80%</td>
<td>8</td>
<td>30%</td>
</tr>
<tr>
<td>4</td>
<td>70%</td>
<td>9</td>
<td>20%</td>
</tr>
<tr>
<td>5</td>
<td>60%</td>
<td>10</td>
<td>10%</td>
</tr>
</tbody>
</table>

Sudbury, ON: Brownfield Remediation and Rehabilitation Program\textsuperscript{155} includes the following incentives:

63. **Brownfields Tax Assistance Program** (see report Table 4-2 item E): Tax assistance is provided by deferring or a cancellation equivalent up to 100\% of the municipal property tax and will not exceed the eligible costs of remediation and redevelopment.

64. **Landfill Tipping Fee Rebate Program** (see report Table 4-2 item I): Encourages the remediation and redevelopment of Brownfield sites by reducing the tipping fees by $36 per metric tonne for contaminated soil material deposited at the City’s landfills provided it can be re-used to cover the landfill. The total amount of incentives provided will not exceed $200,000 annually and the maximum provided to each property will not exceed $40,000.

65. **Planning and Building Fee Rebate Programs** (see report Table 4-2 item I): Sudbury will rebate the fees associated with the Planning Act and the Ontario Building Code applications for improving eligible property developments on Brownfield sites. The total amount of the incentive associated with planning fees will not exceed $50,000 with a maximum of $10,000 provided to each property. The total amount of incentives for building fees will not exceed $300,000 annually, with a maximum of $60,000 provided to each eligible property.

66. **Tax Increment Equivalent Grant Program** (see report Table 4-2 item C): Grants are provided to assist with the remediation and development costs of the property, provided that the property’s assessment and taxation values increase. The value of the grant will equal the incremental increase to the property’s assessment and increased taxes collected by the municipality. The developer will receive the entirety of the grant amount over five years.

67. **Non-Urban Tax Increment Equivalent Grant Program** (see report Table 4-2 item C): Provided to offset the costs associated with rehabilitating and developing a non-urban Brownfield site provided through a grant that equals the incremental increase in the municipality’s collected property taxes.

Toronto, ON: Brownfield Remediation Program\textsuperscript{156} includes the following incentives:

68. **Brownfield Remediation Tax Assistance (BRTA)** (see report Table 4-2 item E): The BRTA allows the City of Toronto to cancel all or a portion of the tax increase directly attributed to the increase in assessed value related to the remediation and development to help brownfield property owners offset the remediation costs incurred. BRTA may be provided for either:

---

\textsuperscript{155} Downtown Sudbury Community Improvement Plan, and Brownfield Strategy and Community Improvement plan Applications (2017). 

a. up to 2 years or until all eligible remediation costs have been compensated through the program (whichever occurs first) or;

b. up to 3 years or until all eligible remediation costs have been compensated through the program (whichever occurs first), if the property is also receiving Development Grants. In this case the property will be eligible for combined BRTA and Development Grants for a maximum of 12 year.

Welland, ON: Brownfield Community Improvement Plan\(^\text{157}\) includes the following incentives:

69. **Environmental Site Assessment Grant Program** (see report Table 4-2 item B, I): Phase II ESA, remedial work plans, and risk assessment are eligible for a grant for 50% of study costs, with a maximum of two studies per property/project, $15,000 per study and $25,000 per property/project.

70. **Brownfields Tax Assistance Programs** (see report Table 4-2 item E): Cancels part of or all of the property tax increase on a Brownfield property that has undergone or is undergoing development. Tax assistance will cease when either the total amount provided equals the total eligible costs or after five years.

71. **Brownfields Development Charge Exemption Program** (see report Table 4-2 item D): Exempts a development from 75% of the Regional development charge for brownfield development on brownfield sites and an additional 25% development charge exemption depending on the inclusion of Smart Growth principles into the proposed development. Eligibility for the regional development charge exemption is determined by a Regional Development Charges Task Force.

72. **Brownfields Rehabilitation Grant Program** (see report Table 4-2 item I): Provided annually, for up to 10 years, where redevelopment has resulted in an increase in assessment value and property taxes. Below is the structure used to calculate the annual grant amount:

<table>
<thead>
<tr>
<th>Year</th>
<th>No LEED Certification</th>
<th>LEED Certification</th>
<th>LEED Silver</th>
<th>LEED Gold</th>
<th>LEED Platinum</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>70%</td>
<td>80%</td>
<td>80%</td>
<td>80%</td>
<td>90%</td>
</tr>
<tr>
<td>2</td>
<td>60%</td>
<td>80%</td>
<td>80%</td>
<td>80%</td>
<td>90%</td>
</tr>
<tr>
<td>3</td>
<td>60%</td>
<td>70%</td>
<td>70%</td>
<td>80%</td>
<td>90%</td>
</tr>
<tr>
<td>4</td>
<td>50%</td>
<td>70%</td>
<td>70%</td>
<td>80%</td>
<td>90%</td>
</tr>
<tr>
<td>5</td>
<td>50%</td>
<td>60%</td>
<td>70%</td>
<td>80%</td>
<td>90%</td>
</tr>
<tr>
<td>6</td>
<td>50%</td>
<td>60%</td>
<td>70%</td>
<td>80%</td>
<td>90%</td>
</tr>
<tr>
<td>7</td>
<td>40%</td>
<td>50%</td>
<td>60%</td>
<td>80%</td>
<td>90%</td>
</tr>
<tr>
<td>8</td>
<td>30%</td>
<td>50%</td>
<td>60%</td>
<td>80%</td>
<td>90%</td>
</tr>
<tr>
<td>9</td>
<td>20%</td>
<td>40%</td>
<td>60%</td>
<td>80%</td>
<td>90%</td>
</tr>
<tr>
<td>10</td>
<td>20%</td>
<td>30%</td>
<td>60%</td>
<td>80%</td>
<td>90%</td>
</tr>
<tr>
<td>Total</td>
<td>450</td>
<td>590</td>
<td>680</td>
<td>800</td>
<td>900</td>
</tr>
</tbody>
</table>

\(^{157}\)City of Welland Brownfield Community Improvement Plan (2007).
https://www.welland.ca/Planning/BrownfieldIncentive/Brownfield_Community_Improvement-Plan.pdf
73. **Brownfields Planning and Building Fees Refund Program** *(see report Table 4-2 item I):* Provides a refund for planning and building permit application fees:
   a) 100% of fees for all planning applications  
   b) 100% of demolition permit fee  
   c) Building permit fees  
      a. 50% if no LEED certification  
      b. 65% if LEED certified  
      c. 75% if LEED Silver  
      d. 90% if LEED Gold  
      e. 100% if LEED Platinum

Windsor, ON: Brownfield Redevelopment Strategy and Community Improvement Plan\(^{158}\) includes the following incentives:

74. **Feasibility Study Grant Program** *(see report Table 4-2 item A):* Grant equivalent to 50% of the cost of an eligible feasibility study. Maximum grant of $7,500 with maximum one study per property

75. **Environmental Site Assessment (ESA) Grant Program** *(see report Table 4-2 item B, I):* A Grant is provided that is equivalent to 50% of the cost of an eligible environmental site assessment, designated substances and hazardous materials survey, remedial action plan or risk assessment. Maximum grant of $15,000 per environmental study. Maximum of 2 studies per property/project. Maximum total grant of $25,000 per property/project.

76. **Brownfields Property Tax Assistance Program** *(see report Table 4-2 item E):* Cancellation of the municipal property tax increase and the education property tax increase for up to 3 years.

77. **Brownfields Development Charge Exemption Program** *(see report Table 4-2 item D):* Up to 60% reduction of development charge payable on a brownfield site approved under the Brownfields Rehabilitation Grant Program.

78. **Brownfields Rehabilitation Grant Program** *(see report Table 4-2 item C):* Grant equivalent to 70% (no LEED certification) or 100% (any LEED certification) of the municipal property tax increase created by the project for up to 10 years after project completion

### A.1.2 Mixed Use Development Incentives

\(^{158}\)The City of Windsor Brownfield Redevelopment Strategy and Community Improvement Plan (2010).  
http://www.citywindsor.ca/residents/planning/Land-Development/Planning-Policy/Documents/BRS%20City%20of%20Windsor%20Brownfield%20Redevelopment%20Community%20Improvement%20Plan%20(CIP).pdf
Mixed use development is a development practice that incorporates two or more residential, commercial, cultural, institutional, or industrial uses. Mixed use development is characterized by; 1) providing three or more significant revenue-producing users, 2) fosters integration, density and compatibility of uses, and 3) creates a walkable community with uninterrupted pedestrian connections. This planning strategy is focused on community design and development to better serve the community, the economy, public health, and the environment.

Edmonton, AB: Mixed Use Development Programs include the following incentives:

1. **Development Incentive Program for Mixed Use Development**\(^{14}\) (see report Table 4-2 item I): Eligible projects include the building of residential units above commercial businesses. The development is eligible for $12,000 per residential unit, up to a maximum of 36 units.

Kelowna, BC: Mixed Use Development Program\(^{13}\) includes the following incentives:

2. **Tax Exemption program for mixed use development** (see report Table 4-2 item E): The city of Kelowna will provide developers with tax exemption incentives for mixed-use development in the urban core of the city. The incentives and amounts vary according to the city’s three tax regions and are valued according to the cost of the revitalization. To be eligible for the incentive the project must be valued at or above $300,000
   a. Tax Area 1: Offers a 100% municipal tax exemption on the cost of revitalizing a residential or commercial project;
   b. Tax Area 2: Aims to encourage larger developments. A project that has a minimum floor area of 3761m\(^2\) is entitled to a 100% tax exemption for the revitalization costs. Residential land use developments can obtain 75% of the revitalization amount, and commercial developments are entitled to 50% of the revitalization amount, both for projects with floor areas beneath 3716m\(^2\);
   c. Tax area 4: A 100% municipal tax exemption is available for the revitalization amount for any project in the area.
      Note – There is no exemptions for development in tax area 3 because development capacity has been saturated.

Medicine Hat, AB: Mixed Use Development Program\(^{15}\) includes the following incentives:

3. **Live/Work Residential Development** (see report Table 4-2 item I): Offers property owners up to $5000 to develop residential living spaces with a minimum unit size of 93 square meters that is connected to their commercial building.
Port Colborne, ON: Mixed Use Development Program\(^{159}\) includes the following incentives:

4. **Commercial/Mixed Use Building Improvement Grant** *(see report Table 4-2 item I)*: A grant is provided equaling up to 70% of the cost of interior and exterior building improvement works to a maximum of $10,000 per property or project.

5. **Commercial/Mixed Use Building Facade Improvement Grant** *(see report Table 4-2 item I)*: The city will cover up to 50% of the costs associated with storefront improvement or restoration work up to a maximum of $10,000. An additional $5000 can be distributed to Heritage buildings. The City may also choose to provide an additional $5000 for rear facing improvement. The program will last approximately 10 years.

St. Thomas, ON: Mixed Use Development Program\(^{160}\) includes the following incentives:

6. **Residential Conversion, Rehabilitation and Intensification Program** *(see report Table 4-2 item I)*: St. Thomas is providing grants to convert vacant space in downtown buildings into residential units. Eligible property owners may receive grants up to $5000 per residential unit up to $40,000 per application.

### A.1.3 Land Use: Non-Brownfield Development

Non-Brownfield development programs are provided to developers who are constructing, rehabilitating, or remediating properties that are not classified as Brownfield sites. These programs are designed to offset the costs that are required for the development costs, or for maintenance required for beautification or repairs.

Ajax, ON: Non-Brownfield Development Program\(^{17}\) includes the following incentives:

1. **Redevelopment Tax Rebate Program** *(see report Table 4-2 item C)*: Tax rebates are provided that offset the increases in municipal taxes that result from the redevelopment.

2. **Development Charge Exemption/Reduction program** *(see report Table 4-2 item D)*: The development charges are waived or reduced by an amount to be determined by the City for redevelopment projects downtown.

\(^{159}\) Incentive Programs in Port Colborne. (nd). http://portcolborne.ca/fileBin/library/afceee8d60912cdced6cecdae14f222af.pdf

\(^{160}\) City of St. Thomas: Financial Incentive Programs within the Community Improvement Area (nd). https://www.stthomas.ca/UserFiles/Servers/Server_12189721/File/City%20Hall/City%20Manager/Community%20Improvement%20Program/CIP%20Brochure.pdf
Belleville, ON: Non-Brownfield Development Program\(^{161}\) includes the following incentives:

3. **Facade Improvement Program** (see report Table 4-2 item I): The City will provide up to $15,000 for a single wall Façade improvement and $20,000 for two facades to a maximum of 75% of the project costs.

Edmonton, AB: Non-Brownfield Development Program\(^{162}\) includes the following incentives:

4. **Rehabilitation Incentive** (see report Table 4-2 item I): The City of Edmonton will cover 50% of the project costs to a maximum of $75,000 for the rehabilitation of residential buildings and offer 50% of the project costs for commercial buildings.

5. **Maintenance Incentive** (see report Table 4-2 item I): The City of Edmonton will cover 30% of the project costs to a max of $10,000 which is renewable every 5 years to property owners for residential maintenance. The City will provide 30% of the project costs to a maximum of $50,000 which is renewable every 5 years to property owners for commercial building maintenance.

Grimsby, ON: Non-Brownfield Development Program\(^4\) includes the following incentives:

6. **Development Charge Exemption Program** (see report Table 4-2 item D): Offering an exemption of 50% of the town’s development charge that is payable on commercial, residential, or mixed-use projects creating new residential units or commercial space. Residents can obtain an additional grant to cover the remaining 50% of the development charge if the development project is LEED certified, or includes 3 out of 5 of the regions Smart Growth Principles. The program will be available for 5 years.

Hamilton, ON: Non-Brownfield Development Programs\(^{163}\) include the following incentives:

7. **Downtown or Harbourfront Remediation Loan Program** (see report Table 4-2 item G): A low interest loan equal to 80% of the cost of remediating a property, with a maximum of $400,000 per property or project.

Kelowna, BC: Non-Brownfield Development Programs\(^{19}\) include the following incentives

8. **Rental Housing Grants & Tax Exemption Programs** (see report Table 4-2 item E, I): The city of Kelowna is offering both rental housing grants and tax exemption programs to encourage the development of rental housing in Kelowna. Grants are offered to offset the cost of development. Rental housing incentives are only provided for rental buildings

\(^{161}\) City of Belleville: Brownfields Community Improvement Plan (2011).  

\(^{162}\) Financial and Rehabilitation Incentives (2018).  

\(^4\) https://www.hamilton.ca/municipal-incentive-programs/brownfields/ erase-programs/erase-community-improvement-plan
composing at least five units. The amount of funding received is determined by the rate of applicants.

a. Up to $8000 for three or more-bedroom units;

b. $4000 for two-bedroom units;

c. $2000 for bachelor / one-bedroom units.

9. **Rental Housing Grant Program** *(see report Table 4-2 item D, E, I)*: The City of Kelowna will provide annual grants up to $42,000 to offset the development charges for affordable housing developments. Eligible developments will also receive a 10-year tax exemption.

10. **Rental Housing Tax Exemption Program** *(see report Table 4-2 item E)*: Program provides tax exemptions to reduce the cost of municipal property taxes to rental house units. The program will provide a 100% municipal tax exemption on the costs associated with the revitalization, which is the municipality’s portion of property tax calculated according to the increase in the assessed value of improvements on the property resulting from the construction or alterations. Tax exemptions last for a maximum of 10 years. Eligible units must:

a. Project must have construction that adds floor space to an existing building, or a new building that costs $50,000 or greater

b. Total construction value must be $300,000 or greater

Langley, BC: Non-Brownfield Development Program includes the following incentives:

11. **Heritage Building Incentive Program** *(see report Table 4-2 item I)*: The City provides grants up to $10,000 to assist with the costs of restoring, repairing, or performing required maintenance of heritage buildings to preserve the regions heritage sites while encouraging further investment in their preservation.

London, ON: Non-Brownfield Development Incentives include:

12. **Rehabilitation & Redevelopment Tax Grant** *(see report Table 4-2 item C)*: London will rebate a portion of the municipal tax increase associated with the rehabilitation of a building, or construction of a new one. A percentage of the tax increment will be provided back to the property owner over a ten year period.

13. **Residential Development Charge Incentive Grant** *(see report Table 4-2 item D)*: A grant is provided that is equal to the development charges for the construction of new residential units. The grant is provided over a 10 year schedule until the entire cost of the development charges is refunded to the property owner.

14. **Tax Increment Grant Program** *(see report Table 4-2 item C)*: A grant is provided for the restoration of heritage sites that is equal to the increase in the municipal portion of the property taxes that result from the rehabilitation project.
Oakville, ON: Non-Brownfield Development Programs\textsuperscript{164} include the following incentives:

15. \textit{Development Charges} (see report Table 4-2 item D): Oakville provides DC assistance to support the expansion of infrastructure when constructing a new building, increasing the floor area or number of units to an existing building, or redeveloping a property. The charge is based according to the type of dwelling and the number of available units. For non-residential development, the charge is determined according to the floor area of the building (limited to retail and non-retail buildings).

16. \textit{Demolition Credits} (see report Table 4-2 item E): Additional demolition credits are added to development charges after a building has been demolished and permitted for redevelopment. The provided credit is determined according to the number of residential units that are demolished and/or the floor area and the type of non-residential buildings that are demolished.

Ottawa, ON: Non-Brownfield Development Programs\textsuperscript{165} include the following incentive:

17. \textit{Building Permit Fee Grant Program} (see report Table 4-2 item F): Priority Areas: Grant equivalent to 30\% of the building permit fee.

Peterborough, ON: Non-Brownfield Development Programs\textsuperscript{160} include the following incentives:

18. \textit{Municipal Incentive Grant Program} (see report Table 4-2 item I): Provides additional incentive to support redevelopment programs in the Central Area of the city by providing funding for planning application fees, parkland and parking charges, and building permit fees. The provided grants will total 50\% for any project that is not focused on developing a new residential unit, and a 100\% return for new residential projects for the costs associated with planning applications and demolition and building permit application fees (at a maximum of $50,000).

19. \textit{Residential Conversion and Intensification Grant Program} (see report Table 4-2 item I): Designed to promote the conversion of unused commercial space into residential units with the assistance of a municipal grant calculated at up to $10 per square foot of floor space.

\textsuperscript{164} https://www.oakville.ca/assets/2011%20planning/Final%20Brownfields%20CIP.pdf
Port Colborne, ON: Non-Brownfield Development Program\textsuperscript{166, 167} includes the following incentives:

20. \textit{Urban Design Study Grant Program} \textit{(see report Table 4-2 item I)}: The City provides a grant that is equal to 50\% of the costs of an urban design study to a maximum of $1,750 per property or project for 10 years.

21. \textit{Residential Intensification Grant} \textit{(see report Table 4-2 item I)}: A grant up to $10 per square foot is provided to renovate residential buildings up to a maximum of $10,000 per unit with a maximum of 4 units per property.

22. \textit{Residential Rehabilitation Grant} \textit{(see report Table 4-2 item I)}: A grant that is equal to 50\% of the cost of exterior building maintenance and property improvement to either single or multi-unit residential properties. The maximum total grant will be distributed at $12,500 and grants will be provided to a maximum of two properties.

23. \textit{Affordable Housing Grant} \textit{(see report Table 4-2 item I)}: $10 per square foot of developed affordable residential housing is provided up a maximum of $10,000 per unit and a maximum of 4 units per each property.

24. \textit{Revitalization (Tax Increment) Grant Program} \textit{(see report Table 4-2 item C)}: A grant equal to 80\% of the increase in the municipal property taxes is provided for up to 10 years after the completion of the project provided that the restoration work increases the municipal taxes that can be collected by the city.

25. \textit{Planning and Building Fees Grant Program} \textit{(see report Table 4-2 item I)}: An annual grant that is equal to 100\% of the fees that must be paid on planning and development applications and building permits will be provided to a maximum total grant of $5000 per property or project.

Saskatoon, SK: Non-Brownfield Development Program\textsuperscript{168} includes the following incentives:

26. \textit{Building and Plumbing Permit Fee Rebate} \textit{(see report Table 4-2 item F, I)}: Developers will receive a rebate for building in the zone, and for installing appropriate plumbing systems, for both renovations and new construction.

27. **Property Tax Abatement** (see report Table 4-2 item C): A five-year tax abatement is provided to one/two-unit residential buildings that applies to any increase in taxes that results from development or renovation.

28. **Development Charge Rebate** (see report Table 4-2 item D): Any eligible use (excluding one/two-unit dwellings) is able to apply for a rebate that covers off-site and direct DC determined by the infrastructure service department.

Selwyn, ON: Non-Brownfield Development Program\(^{169}\) includes the following incentives:

29. **Urban Design Study Grant Program** (see report Table 4-2 item I): Provides a grant equal to half of the cost for an urban design study or architectural design sketches to a maximum grant amount of $2500 per property.

30. **Landscape improvement Grant** (see report Table 4-2 item I): Provides a grant equal to half of the costs for landscaping and lighting improvements in priority areas as outlined by the municipality. The maximum provided grant is $5000, except in high priority areas where $6000 will be provided.

31. **Façade Improvement Grant Program** (see report Table 4-2 item I): Provides a grant equal to half of the costs of storefront property restoration and improvement to a maximum of $12,500 per property. A separate grant up to 50% (to a maximum of $7500) will be provided to rear facing properties.

32. **Building Improvement Grant** (see report Table 4-2 item I): Provides a grant equal to 50% of the costs for eligible building improvements on a property to a maximum of $10,000 per project.

33. **Residential Grant** (see report Table 4-2 item I): Provides a grant equal to $15 per square foot of residential space to a maximum of $15,000 per unit to a maximum of 4 units.

34. **Tax Increment Based Grant** (see Table 4-2 item C): Provides an annual grant that is equal to 80% of the increase in municipal property taxes up to 10 years after project completion.

St. Catharines, ON: Non-Brownfield Development Program\(^{170}\) includes the following incentives:

35. **Tax Increment Finance Program for Non-Brownfield Development** (see report Table 4-2 item C): An annual grant is provided up to a maximum of 10 years to assist with a portion of redevelopment costs. The value of the grant that is received is according to increase in property tax assessment following the completion of the remediation project. The amount of


the grant may be up to an 45% increase in municipal taxes that must be paid on the property resulting from the new development. The project must be completed within 5 years to receive the grant. Project costs that are available for redevelopment include:

a. Cleaning and removing debris from abandoned infrastructure;

b. Site preparation and construction of services such as water service, sanitary and storm sewers, roads, curbs, gutters, hydro, and gas communication services;

c. Demolition of buildings and removing the resulting debris;

d. Capital costs of renovating existing buildings;

e. Streetscape and landscape improvements;

f. Building sound barriers and gas migration trenches;

g. Municipal Property Assessment Corporation (MPAC) Assessment Estimate;

h. Legal and consulting fees for the application requirements.

St. John’s, NB: Non-Brownfield Development Program\textsuperscript{23} includes the following incentives:

36. **Residential Density Rebate** (see Table 4-2 \textit{item H}): Multi-year grant is offered for a 5.25% refund for the construction costs for eligible development projects over 5 years. Development projects are capped at a maximum grant amount of $35,000 in the first year. The rebate is distributed as follows:

<table>
<thead>
<tr>
<th>Year Following Project Completion</th>
<th>Percentage of Construction Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>1.5%</td>
</tr>
<tr>
<td>Year 2</td>
<td>1.5%</td>
</tr>
<tr>
<td>Year 3</td>
<td>1.125%</td>
</tr>
<tr>
<td>Year 4</td>
<td>0.75%</td>
</tr>
<tr>
<td>Year 5</td>
<td>0.375%</td>
</tr>
<tr>
<td>Total Grant</td>
<td>5.25%</td>
</tr>
</tbody>
</table>

37. **Social Housing Density Rebate** (see Table 4-2 \textit{item H}): Rebates are available for projects on subsidized housing units or those owned by not-for-profit organizations to a maximum grant amount of $35,000 in the first year with a total grant amount of $120,000 over 5 years. The grant will be distributed according to the following payment schedule:

<table>
<thead>
<tr>
<th>Year Following Project Completion</th>
<th>Percentage of Construction Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>0.5%</td>
</tr>
<tr>
<td>Year 2</td>
<td>0.5%</td>
</tr>
<tr>
<td>Year 3</td>
<td>0.5%</td>
</tr>
</tbody>
</table>
38. **Feasibility Study Grant** *(see report Table 4-2 item A)*: Intended to provide support for either a technical study or an engineering assessment for the feasibility of upper floor rehabilitation or redevelopment. The grant amount will cover 50% of the study to a maximum of $10,000.

39. **Building Permit Rebate** *(see report Table 4-2 item I)*: The City will provide up to 80% of the building permit fees up to a maximum of $10,000 for social housing and residential rehabilitation projects.

St. Thomas, ON: Non-Brownfield Development Program\(^\text{171}\) includes the following incentives:

40. **Façade Improvement Program** *(see report Table 4-2 item I)*: Grants are provided for renovations on commercial properties up to $10,000 per application.

41. **Property Tax Increment Equivalent Grant Program** *(see report Table 4-2 item C)*: A grant is provided to redevelopment buildings or redeveloping land for residential conversion that is equal to the incremental increase in the municipal portion of property taxes resulting from the improvement.

42. **Heritage Tax Relief Program** *(see report Table 4-2 item C)*: Grants up to $1500 are provided to assist in the design of a restoration project on a heritage building.

Toronto, ON: Non-Brownfield Development Program\(^\text{172}\) includes the following incentives

Include:

43. **Basement Flooding Protection Subsidy Program** *(see report Table 4-2 item I)*: The City offers single-family, duplex, and triplex residential homes a subsidy of up to $3400 per property to install flood protection devices including
   a. Backwater valve;
   b. Sump pump;
   c. Severance and capping of a home’s storm sewer or external weeping tile connection.

\(^\text{171}\) [https://www.stthomas.ca/UserFiles/Servers/Server_12189721/File/City%20Hall/City%20Manager/Community%20Improvement%20Program/CI P%20Brochure.pdf](https://www.stthomas.ca/UserFiles/Servers/Server_12189721/File/City%20Hall/City%20Manager/Community%20Improvement%20Program/CI P%20Brochure.pdf)

Winnipeg, MB: Non-Brownfield Development Program\(^{18}\) includes the following incentives:

44. **Heritage Conservation Grant Program** \(\text{see report Table 4-2 item C}\): The City of Winnipeg is providing incremental tax grants to facilitate the restoration and rehabilitation of vacant and underutilized heritage properties. A minimum of $10,000 in work or 20% of the assessed value prior to the renovation is required to qualify for the grant. The grant will last 12 years and is worth 80% of the incremental municipal taxes issued in the year after the occupancy permit has been issued.

\[\text{A.1.4 Land Use: Green Roof}\]

A green roof is a design for residential and commercial buildings that partially or completely covers it with vegetation and a growing medium which is placed over a waterproofing membrane. Additional root layers or drainage and irrigation systems also may be included. Green roofs allow for the absorbing of rainwater, providing insulation, creating wildlife habits, treat air in urban spaces, lower urban air temperatures mitigating the heat island effect and creating an aesthetically pleasing landscape. Green roofs are suitable for retrofit and redevelopment projects as well as new construction designs.

Toronto, ON: Green Roof Program\(^{173}\) includes the following incentives:

1. **Eco-Green Roof Program** \(\text{see report Table 4-2 item I}\): The City of Toronto will provide grants to install green roofs on residential and commercial buildings to save energy. The grant program provides $100 per square meter installed and offers up to $1000 for a structural assessment.

\[\text{A.1.5 Land Use: Urban Agriculture Provisions}\]

Urban agriculture is the practice of cultivating, processing and distributing food in or around urban areas. Benefits of urban agriculture are economic vitality and entrepreneurship, individual / community health and well-being, landscape beautification, and environmental restoration and remediation. Urban agriculture also is a way to assist with the provision of fresh food to urban residents.

Cambridge, ON: **Development Charge Rebate**\(^{174}\) \(\text{see Table 4-2 item D}\): Cambridge may exempt the development charges on the construction of a new building with the purposes of farming.


Toronto, ON: Green Roof Program\textsuperscript{175} (see Table 4-2 item I): The City of Toronto will fund the development of rooftop gardens as a component of the Green Roof Program. Incentive Topics: Energy

A.2 Municipal Incentives: Energy

A.2.1 Green Building Standards

Residential and commercial buildings have extensive environmental impacts during construction and their life cycle. Buildings must consume water, use energy, generate various forms of waste, and emit carbon emissions. Green building standards and certification programs are designed to improve the buildings environmental performance by mitigating the environmental footprint associated with the buildings daily operations. This is achieved by a set of guidelines that outline the criteria in which the building can be judged in terms of environmental impacts. These requirements can be prescriptive (indicating methods of achievement) or performance based (stating expectations of end results). For instance, standards can recommend or require water and energy efficiency measures, such as indicating the required efficiency levels for home appliances and building materials including insulation or air barriers that reduce the consumption of resources and their associated carbon emissions.

Banff, AB: Green Building Standards Program\textsuperscript{176} includes the following incentives:

1. Commercial Environmental Rebates (see report Table 4-2 item I):
   
a. Window and Door Retrofit Replacement Rebate: Offering a $50 to install ENERGY Star\textsuperscript{®} certified products that are appropriate for at least climate zone 2. The window rebates are only available if the glass frame and the sash are replaced;

   b. Pre-Project Energy Audit – The city of Banff will provide a third of the costs for an energy audit prior to a retrofit project for qualifying businesses. (does not indicate what is a qualifying business).

2. Residential Environmental Rebates (see report Table 4-2 item I):
   
a. Clothes Washer: $100 rebates for ENERGY STAR\textsuperscript{®} rated clothes washers recommended by Energy Efficiency Alberta;

   b. Dishwasher: $100 rebate for ENERGY STAR\textsuperscript{®} rated dishwashers;

\textsuperscript{175} https://www.toronto.ca/legdocs/mmis/2012/pe/bgrd/backgroundfile-51558.pdf

c. Door Replacement: $50 rebates for ENERGY STAR® certified doors;

d. Energy Audit: $100 rebate for residential energy audits to help identify areas of the home that warrant efficiency improvements;

e. Furnace: $500 rebates for high-efficiency ENERGY STAR® certified furnaces;

f. Refrigerators: Banff will match the provincial refrigerator incentive of $75 for a CEE Tier 2 and $100 for Tier 3 energy efficient refrigerators;

g. Toilets: $100 rebate is available for a high-efficiency toilet that is 4.8L or less, and a $100 rebate is available for the purchase of a dual flush toilet

Brantford, ON: Green Building Standards program\textsuperscript{177} includes the following incentives:

3. \textit{Brantford Retrofit Program} (see report Table 4-2 item I): The city of Brantford will provide financial incentives up to 50\% of the total project costs to encourage the implementation of high-efficiency equipment and for the installation of control systems that will improve the efficiency of operational procedures and processes. Incentives will be provided for:
   a. Lighting and control upgrades;
   b. Unitary air conditioning;
   c. Alternative energy measures;
   d. Motors;
   e. Pumps;
   f. Fans;
   g. Refrigeration.

Edmonton, AB: Green Building Standards Program\textsuperscript{30} includes the following incentives:

4. \textit{Energy Audit Rebate Program} (see report Table 4-2 item A): The City of Edmonton will provide a one-time rebate of up to $5000 per eligible building to cover the cost of an energy audit. For owners or ownership groups that complete the submission process by November 30, 2018, an additional $5000 can be obtained. An owner or ownership group can obtain a maximum of three rebates. To be eligible, the building must be:
   a. A member of Edmonton’s Building Energy Benchmarking pilot program and be willing to participate in the program in future years;
   b. Competed an American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Level 2 commercial energy audit since January 1\textsuperscript{st}, 2018;
   c. Share the energy audit report with the City with proof of payment for the audit service.

5. **Change Homes for Climate – EnerGuide Program** *(see report Table 4-2 item I)*: This incentive program has been designed to help residents understand the energy performance of their home and to provide them with access to expert advice on how they can make it more energy efficient. The City of Edmonton provides homeowners with $400 to offset the costs of the EnergyGuide home evaluation.

Hamilton, ON: Green Building Standards Program\(^29\) includes the following incentives:

6. **LEED Grant Program** *(see report Table 4-2 item I)*: The city of Hamilton is supporting the growth of sustainable industrial, commercial, mixed-use and multi-unit residential buildings. The city will split the incremental construction cost to the maximum amounts as shown in the provided table, consultation costs, energy modeling, and certification fees to assist the applicant in achieving LEED certification. The grants are calculated based on the rating of official certification under the LEED rating system, and last for a period of five years. The grant will not exceed the increase in municipal realty taxes resulting from the development or redevelopment of the building. The grant amount will not exceed 75% of the municipal realty tax increases during the first 5 years after the building obtains LEED certification. The grant ends following the five-year period or when the city’s share of the incremental construction costs has been granted in full.

<table>
<thead>
<tr>
<th>LEED Rating</th>
<th>Certified</th>
<th>Silver</th>
<th>Gold</th>
<th>Platinum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incremental Construction Cost Total</td>
<td>1%</td>
<td>3%</td>
<td>5%</td>
<td>8%</td>
</tr>
<tr>
<td>Applicant Share</td>
<td>0.5%</td>
<td>1.5%</td>
<td>2.5%</td>
<td>4%</td>
</tr>
<tr>
<td>City Share (based on construction costs)</td>
<td>0.5%</td>
<td>1.5%</td>
<td>2.5%</td>
<td>4%</td>
</tr>
</tbody>
</table>

Langley, BC: Green Building Standards Program\(^{178}\) includes the following incentives:

7. **Green Building Rebate Program** *(see report Table 4-2 item I)*: Langley is providing incentives for complete home energy improvements that reduce the home’s annual energy consumption by at least 10 GJ. For every GJ that is reduced annually, the city will rebate $15 off the energy bill to a maximum rebate of $750.

8. **Langley Green Building Permit Program** *(see report Table 4-2 item I)*: Incentivizes new constructions to maximize the energy efficiency of the home. The total rebate provided is $1500 and ranges according to the home’s performance;

   For single homes
   a. Level 1: 10% lower than ERS reference house or achieves a Built Green Silver rating will receive a rebate of $500;
   b. Level 2: 15% lower than ERS reference house will receive a rebate of $750;
   c. Level 3: 20% lower than ERS or achieves a Built Green Gold or Platinum rating will receive $1000 per home;

---

d. Level 4: 40% lower than ERS reference house, achieves a R-2000 Standard, or achieves Passive House Certification or a NZEB Certification will receive $1500 per home.

For Row home units, townhouse units or duplex’s;

a. Level 1: 10% lower than ERS reference house or achieves Built Green Silver will receive $100 per home;

b. Level 2: 15% lower than ERS house will receive $200 per home;

c. Level 3: 20% lower than TS reference house; or achieve Built Green Gold or Platinum will receive $300 per home;

d. Level 4: 40% lower than ERS reference house, or achieves R-2000 Standard, or achieves Passive House Certification, or achieves NZEB Certification will receive $500 per home.

Medicine Hat, AB: Green Building Standards Program\textsuperscript{179} includes the following incentives:

9. \textbf{HAT Smart Program – Air Sealing Incentive Program} \footnote{https://www.medicinehat.ca/government/departments/utility-sustainability/hat-smart} (see report Table 4-2 item I): The program helps to educate and provide consumers with cash rebates to help prevent sources of air leaking into and out of the home to improve the performance of the home’s envelope. Lowering the sources of air leakage reduces the home’s heating and cooling requirements, reducing the energy use and associated emissions associated with residential space heating. The rebated funds are determined by a pre- and post- retrofit blower door test conducted by a certified energy advisor and can total:

a. $500 for a 10\% reduction in air leakage;

b. $600 for a 20\% reduction in air leakage;

c. $700 for a 30\% reduction in air leakage.

10. \textbf{HAT Smart program – ENERGY STAR® Clothes Dryer Incentive Program} \footnote{https://www.medicinehat.ca/government/departments/utility-sustainability/hat-smart} (see report Table 4-2 item I): This program provides homeowner’s that apply prior to January 4, 2019, $75 dollars for a qualityed ENERGY STAR® Clothes Dryer to reduce the homeowner’s energy use.

11. \textbf{HAT Smart Program – Energuide® Ratings for New Homes Incentive Program} \footnote{https://www.medicinehat.ca/government/departments/utility-sustainability/hat-smart} (see report Table 4-2 item I): The focus of this program to provide rebates for the construction of energy efficient homes. To be eligible, an energy advisor is required for consultation. The homeowner is provided with $100 for every gigajoule of energy that is saved relative to the regions existing energy code for a typical new house up to a maximum of $10 000.

12. \textbf{HAT Smart Program – Scratch and Win Rebate} \footnote{https://www.medicinehat.ca/government/departments/utility-sustainability/hat-smart} (see report Table 4-2 item I): The purpose of this program is to promote the use of energy efficient technologies within the home by providing the home owner with a scratch ticket providing a 20-100\% (to a maximum of $100) with the purchase of an energy efficient product (up until December 31, 2018) including:
a. Equipment and power bars – Watt Meters, Power Cost / Energy Monitors, Smart Battery Chargers, Surge Protection / Smart Shutdown, Timer / Compact;
c. Insulation and Sealing: Water Piping Insulation, Outlet Plate Gaskets, Weather Stripping, Expanding Foam, Sealing Tapes, Window Kits, Caulking – Latex / Silicone / Acoustical / Exterior / Interior / Multi-Use;
d. Lighting and timers: Compact Fluorescent Lights (CFLs), Light Emitting Diode (LED) – Lights / Decorative Light Strings, Motion Sensors, Timers – Programmable / Outdoor / Indoor / Photoelectric;
f. Home Servicing: Furnace / Air Conditioner / Heat Pump Servicing, Refrigerator Removal;
g. Vehicle: Block Heater Timers, Bus Passes, Cords – Power Saving / Thermostatically Controlled / Timer Setting;

Okotoks, AB: Green Build Standards Program\textsuperscript{180} includes the following incentives:

13. **LEED Certification Program** (see report Table 4-2 item I): The town of Okotoks is offering a rebate on building permits when specific levels of LEED certification are achieved. The town will provide a 20\% rebate for certified status, a 40\% rebate so Silver status, a 50\% rebate for gold status, and a 60\% rebate for platinum status.

Toronto, ON: Green Building Standards Program\textsuperscript{181} includes the following incentives:

14. High Performance New Construction Program (see report Table 4-2 item I): The High Performance New Construction Program incentivizes building and design decision makers to go beyond Ontario’s building code requirements in terms of energy efficiency standards. Buildings that demonstrate superior energy efficiency can qualify for up to $10,000 in modeling costs. There are different incentive streams offered within the program including:
   a. The ENGINEERED track: Offers savings achieved by reducing peak demand and/or electricity consumption. For lighting, there is $400 offered for every kW saved ($0.05/kWh). For non-lightening, there is up to $800 for every kW saved, or $0.10/kWh of energy saved;
   b. The CUSTOM Track: These incentives are based on modelled energy performance. It provides building owners;

\textsuperscript{180} https://www.okotoks.ca/sustainability/rebate-programs/building-incentive-program
Appendix A: Examples of Municipal Incentive Programs

1. $400 for every kilowatt saved ($0.05/kWh) of energy saved to 25% above code;
2. $600 for every kilowatt saved ($0.075/kWh) of energy saved between 25% - 50% above code;
3. $800 for every verified kilowatt saved ($0.10/kWh) of energy saved for greater than 50% above code.

For design decision makers, the program provides;
   a. $50 for every kilowatt saved ($0.00625/kWh) of energy saved up to 25% above code;
   b. $100 for every kilowatt saved ($0.0125/kWh) of energy saved between 25% to 50% above code and;
   c. $150 for every kilowatt saved ($0.01875/kWh) of energy saved for greater than 50% above code.

Note – a CUSTOM Track project must be valued at a minimum of $5000

Waterloo, ON: Northdale Tax Increment Based Grant\(^\text{182}\) includes the following incentives:

14. LEED Certification Program (see report Table 4-2 item C): The City of Waterloo offers a 40-100% reduction to property tax increases generated by the project if the proponent can demonstrate LEED certification along with compliance to any of 10 city defined Sustainability Strategies.

A.2.2 Net-Zero Building

At the time of this investigation we were unable to identify any municipal incentive programs which offered targeted funding support for the construction of net-zero buildings. Refer to section A.2.1 above for incentives which target the broader topic of “Green Building” in general.

A.2.3 Electric Vehicle

At the time of this investigation we were unable to identify any municipal incentive programs which offered targeted funding support for the integration of electric vehicles. Refer to Chapter 4 of the main report for more detail on the available Municipal, Provincial, Federal, NGO and Industry incentives, noting that EV related support typically comes from the Provinces, not from Municipalities.

A.2.4 On-Site Renewables

On-Site renewable incentive programs are designed to encourage residential and commercial buildings to install renewable energy technologies, such as Solar PV systems, that allow the building to generate a portion to all its energy requirements. Renewable energy systems

generally produce low carbon electricity, which lowers the building’s carbon emissions. On-Site renewables also have financial benefits by lowering the amount of consumed commercial electricity drawn from the power grid.

Banff, AB: On-Site Renewables Program\textsuperscript{183} includes the following incentives:

1. \textit{Solar PV Production Incentive} (\textit{see report} Table 4-2 \textit{item I}): Banff is incentivizing residents to install Solar PV systems with funding determined by the installed system capacity. In 2017, the town provided eligible participants rebates up to $750/kW of solar capacity to a maximum system capacity of 7.5 kW.

2. \textit{Solar Hot Water Heater} (\textit{see report} Table 4-2 \textit{item I}): $650 rebate available for ENERGY Star\textregistered{} certified solar hot water heater

Edmonton, AB: On-Site Renewables Program\textsuperscript{33} includes the following incentives:

3. \textit{Solar PV Rebate Program} (\textit{see report} Table 4-2 \textit{item I}): Edmonton has partnered with Energy Efficiency Alberta to expand the provincial solar energy incentives with their own municipal incentive that offers residential property owners an additional $0.15 per Watt on top of the provincial incentive of $0.75 per Watt.

Medicine Hat, AB: On-Site Renewable Programs\textsuperscript{184} include the following incentives:

4. \textit{HAT Smart Program – Solar Electric Panels Rebate} (\textit{see report} Table 4-2 \textit{item I}): The municipality of Medicine Hat will provide homeowner’s assistance with installing Solar PV systems on their home. The solar PV system must be installed by a qualified service provider. The rebated amount is determined by the size of the system that the resident installs, beginning at $0.75 per installed watt to a maximum of $5000.

Toronto, ON: On-Site Renewable Programs\textsuperscript{32} include the following incentives:

5. \textit{Home Energy Loan Program} (HELP) (\textit{see report} Table 4-2 \textit{item G}): The HELP program provides homeowners with loans that are paid back at interest rates of 2 percent over terms ranging up to 15 years on the resident’s property tax bill. Loans are provided to cover the initial capital costs of energy and water efficient retrofits including:
   a. Solar hot water heaters;
   b. Solar PV panels;
   c. Energy Retrofit Loans: Through the City’s Sustainable Energy Plan Financing Program, building owners have access to low-interest financing focused on energy efficient retrofits at fixed financing rates overing up to 100% of the projects cost with a maximum payback period of 20 years. To be eligible the projects must be focused on;

\textsuperscript{183} https://banff.ca/solar
Appendix A: Examples of Municipal Incentive Programs

- Lighting retrofits;
- Equipment replacement including chillers and HVAC;
- Building envelope improvements;
- Building automation systems and controls;
- Renewable energy projects;
- Energy storage projects;
- Other measures to be reviewed and determined by the City on a case by case basis.

A.2.5 Cool Roof

A Cool Roof is designed to reflect sunlight and absorb less heat than a standard roof. Cool Roofs typically are made of our reflective paints, a sheet covering, or highly reflective shingles or tiles. A Cool Roof can reach temperatures that are on average 100 degrees Fahrenheit cooler than average roofs, which saves the homeowner money by reducing the energy consumption associated with running their air conditioning system.

Toronto: Cool Roof Programs\(^{185}\) include the following incentives:

1. **Cool Roof Incentive Program** (see report Table 4-2 item 1): Toronto offers rebates for the installation of cool roofs ranging from $2 to $5 per installed square meter.

A.3 Municipal Incentives: Water

A.3.1 Indoor Water Conservation

Indoor water conservation programs are designed to reduce residential and commercial water usage through targeting wasteful behaviors and improving the water efficiency of appliances throughout the home.

Banff, AB: Indoor Conservation Programs\(^{\text{Error! Bookmark not defined.}}\) include the following incentives:

1. **Commercial Water Conservation Rebates and Incentives** (see report Table 4-2 item 1):
   - Banff is provided incentives to reduce commercial water use by offering cash rebates on:
     a. Dual-flush toilet replacements: offering 50% rebate on purchase per toilet;
     b. High-efficiency toilet replacement (4.8L or less) – 50% rebate on purchase per toilet.

2. **Residential Water Conservation Rebates and Incentives** (see report Table 4-2 item 1):
   - $100 rebate for energy efficient clothes washers;
   - $100 rebate for energy efficient dishwashers;

\(^{185}\) https://www.toronto.ca/services-payments/water-environment/environmental-grants-incentives-2/green-your-roof/
c. $25 rebate on rain barrels;  
d. $100 rebate available for purchase of high-efficiency (4.8L or less) toilet;  
e. $100 rebate for dual-flush toilet.

Calgary: Indoor Conservation Programs\textsuperscript{186} \textsuperscript{187} include the following incentives:

3. **Hotel & Motel Toilet Replacement Program** (see report Table 4-2 item I): The City of Calgary is providing a $50 rebate to Hotel & Motel owners to replace inefficient toilets with WaterSense™ labeled toilets.

4. **Multi-Unit Toilet Replacement Program** (see report Table 4-2 item I): Calgary is offering owners of properties with three or more units a $50 rebate to replace inefficient toilets with high-efficiency WaterSense™ toilets.

Guelph, ON: Indoor Conservation Programs\textsuperscript{35} include the following incentives:

5. **Royal Flush Rebate Program** (see report Table 4-2 item I): Guelph will provide $50 in rebates for the replacement of 6-litre or larger toilets with qualifying 4.8litre or smaller WaterSense® models.

6. **Residential Sub-Water Meter Program** (see report Table 4-2 item I): Guelph is providing rebates for the purchase and installation of sub-meters to residential buildings and multi-unit buildings to monitor water usage and identify areas of inefficiency. The City will rebate $125 for each installed sub-water meter. The City will rebate an additional $100 for each add-on sub-water meter that incorporates smart technology.

7. **Multi-Residential Water Audit Program:** Guelph will provide a free water audit to property owners of residential buildings that contain 7 or more units.

8. **Blue Built Home Water Efficiency Standards and Rebate Program** (see report Table 4-2 item I): Guelph is incentivizing the construction of Blue Built Homes (a rating system indicating that the home uses water efficiently) by providing rebates of $2465 if the home is Blue Built certified. Existing multi-unit residential buildings may receive a rebate of $415 per unit it is renovated to meet Blue Built standards.

9. **Water Smart Business Program** (see report Table 4-2 item I): Guelph is incentivizing its commercial sector to improve its water efficiency by splitting the costs of a water audit


worth up to $10,000. For projects with a greater than one-year payback, the city is a capacity buyback incentive of $750 per cubic meter per day of reclaimed municipal water supply saved to a maximum of $100,000 per project.

Kingston, ON: Indoor Conservation Programs include the following incentives:

10. **Multi-Residential Toilet Replacement Rebate** *(see report Table 4-2 item 1)*: Kingston is offering rebate to replace inefficient toilets in multi-residential properties with three or more individual units. The rebate provides $60 to replace a toilet that uses 13 litres per flush or more with dual flush models that use a maximum of 6 litres per flush, or single flush toilets that use 4.8 litres or less. Social Housing providers are eligible to receive up to $125 per toilet.

11. **Water Efficiency Retrofit Incentive Program** *(WERIP)* *(see report Table 4-2 item 1)*: The WERIP program provides $5 per m³ of combined water and sewer savings up to a cap of 20% of eligible project costs. The project must save more than 80 m³ annually to be eligible. Social housing providers receive incentives up to 50% of qualifying project costs. Eligible projects include:
   a) Toilet replacement;
   b) Retrofits to commercial laundry equipment;
   c) Retrofits to commercial kitchen equipment;
   d) Other projects that can display that they permanently reduce both water consumption and sewer discharge.

Niagara Falls, ON: Indoor Conservation Programs include the following incentives:

12. **Toilet Retrofit Program** *(see report Table 4-2 item 1)*: Incentives are offered to residents of single and multi-family residential units who purchase a maximum of two high-efficiency toilets that meet the US EPA WaterSense® guidelines at $60 per replaced toilet.

Oakville, ON: Indoor Conservation Incentives Include:

13. **Halton’s Residential Toilet Rebate Program** *(see report Table 4-2 item 1)*: As a member of the Region of Halton, residents in Oakville qualify for the residential toilet rebate program. Residents can receive a rebate of $75 to replace inefficient toilets with toilets meeting the high-efficiency WaterSense® requirements.

Okotoks, AB: Indoor Conservation Program includes the following incentives:

14. **Water Conservation Rebate Program** *(see report Table 4-2 item 1)*: Okotoks is providing residential water conservation rebates to help manage the Region’s water supply including:
   a. **Drought Tolerant Ground Cover** *(see report Table 4-2 item 1)*: A 50% rebate for the total cost of a purchase up to a maximum rebate of $200 per house is offered.

---

for residents who purchase drought tolerant grass seed, sod, and hydro-seeds (provided they are TWCA-certified);

b. Organic and Inorganic Mulch (see report Table 4-2 item I): All forms of organic and inorganic mulch that is used for landscaping purposes such as ground cover are eligible for a 50% rebate of the total cost per purchase up to a maximum rebate of $200 per household;

c. Drought Tolerant Plants, Shrubs, and Trees (see report Table 4-2 item I): A 50% rebate up to a maximum of $200 per household is provided for drought tolerant plants, shrubs, and trees, provided the user appropriately covers the base of the plants with mulch;

d. Xeriscaping Pilot Program (see report Table 4-2 item I): A 50% rebate for the total cost of the project up to a maximum of $1000 is provided for a pre-approved xeriscaping project (water efficient landscape designs) that converts a minimum of 500 square feet into xeriscape land and 50% of the new xeriscape area is drought tolerant plants. The rebate includes associated costs such as; soil amendment, turf removal, drought tolerant plants (see rebate above), and mulch/ground cover.

Toronto, ON: Indoor Conservation Program includes the following incentives:

15. **Capacity Buyback Program** (see report Table 4-2 item I): Incentives commercial and institutional organizations by providing a free water audit to identify ways to reduce water use, rewards participants that implement permanent water-saving measure with a one-time cash rebate of up to 30 cents per litre of water saved per average day, and helps participants save money over the long-term with reduced water bills. Efficiency upgrades available through the program include

   a. Cooling towers;
   b. Boilers;
   c. Refrigeration and food service equipment;
   d. Process equipment and other site-specific water-saving measure (grey water reuse, rainwater harvesting systems).

16. **Mandatory Downspout Disconnection Financial Assistance Program** (see report Table 4-2 item I): Offers a reimbursement of the labour costs and materials for downspout disconnection work up to a maximum of $500. To qualify for the program residents must;

   a. Own a residential property in Toronto;
   b. Have a combined household income beneath $50,000;
   c. Be 65 years of age;
   d. Have a disability and are receiving disability benefits.

17. **Sewer Surcharge Rebate Program** (see report Table 4-2 item I): Businesses in Toronto may be eligible for a rebate on water that is not discharged into the City’s sanitary sewer system. The rebate is based on the percentage of water not returned to the sanitary sewer system and is applied to the sewer portion of the water rate.
18. **Industrial Water Rate Program** *(see report Table 4-2 item I)*: Toronto offers a discounted rate to manufacturers in Toronto to support economic growth while encouraging water conservation provided the manufacturer;
   a. Uses more than 5000 m³ of water annually;
   b. Falls within the industrial property tax class;
   c. Follow Toronto’s sewers by-law;
   d. Submit a comprehensive water conservation plan to the General Manager or Toronto Water.

19. **Faucet Filter Rebate Program** *(see report Table 4-2 item I)*: Provides a free faucet filter for eligible low-income homes with lead faucets when the City owned portion of a lead water service is replaced. To be eligible residents must;
   a. Have a child under 6 and/or a pregnant woman in the home;
   b. The home is a single family, duplex, or triplex building;
   c. The annual household income is less than $50,000.

### A.3.2 Stormwater

Urban development is associated with an increase to impervious surfaces such as streets or parking lots, which results in increased volumes of storm water runoff. This poses risks to public safety and property from flooding. Municipalities can provide residential and commercial property owners with incentives to reduce the volume of storm water run-off from their property to ensure infrastructure and environmental protection.

**Kitchener, ON: Stormwater Program** includes the following incentives:

1. **Stormwater Credit Policy** *(see report Table 4-2 item I)*: Provides residents with a storm water rate credit policy that incentivizes on site management practices to reduce their contributions to storm water run off. Credits are determined as percent reductions applied to the rate category that is applied to the property in question and can total up to a 45% reduction to the storm water portion of the resident’s monthly utility bill. The credit is applied to the charged monthly fee.

**Waterloo, ON: Storm Water Program** includes the following incentives:

2. **Stormwater Credit Program** *(see report Table 4-2 item I)*: The city of Waterloo offers a credit up to 45% of the stormwater utility fee for properties that manage their stormwater. Residential stormwater management techniques can include rain barrels, trees, cisterns, infiltration measures, and rain gardens. The stormwater credit program is also available for commercial, industrial, institutional and multi-residential properties based on the stormwater quality, quantity and education measures in place.

### A.3.3 Rain Water

Rain Water incentive programs are designed to foster sustainable water usage by encouraging residents to use rain water as a resource. These incentives reduce the homeowner’s water
consumption by replacing water drawn from the City’s reserves with rain water. These programs also help watersheds in urban landscapes to mimic functions of natural ecosystems through programs such as rain gardens, green roofs and bioswales which are designed to help capture water for use within buildings, or to slowly diffuse it back into the region’s water table.

Kitchener, ON: Rain Water Programs\(^{189,190}\) include the following incentives:

4. **Soak it up!** *(see report Table 4-2 item 1)*: Part of Kitchener’s RAIN Smart Neighbourhoods project, this program provides incentives for landscaping solutions that implement rain gardens, infiltration galleries, and permeable paving. The incentives are provided for water saved as follows:

<table>
<thead>
<tr>
<th>Water Saved (L)</th>
<th>Incentive ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2500 or more</td>
<td>1500</td>
</tr>
<tr>
<td>1500 to 2499</td>
<td>1250</td>
</tr>
<tr>
<td>800 to 1499</td>
<td>750</td>
</tr>
<tr>
<td>799 or less</td>
<td>100</td>
</tr>
</tbody>
</table>

5. **Slow it down!** *(see report Table 4-2 item 1)*: As part of the RAIN Smart Neighbourhoods project, incentives are provided for projects that capture rain water such as cisterns and rain barrels. The incentive amount is determined by the amount of water saved, and funding is allocated as follows:

<table>
<thead>
<tr>
<th>Water Saved (L)</th>
<th>Incentive ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1500 L</td>
<td>500</td>
</tr>
<tr>
<td>800 to 1499 L</td>
<td>150</td>
</tr>
<tr>
<td>799 L or less</td>
<td>25</td>
</tr>
</tbody>
</table>

Okotoks, AB: Rain Water Programs\(^{191}\) include the following incentives:

6. **Water Conservation Rebate Program**: Okotoks is providing residential water conservation rebates to help manage the Region’s water supply including:
   a. **Rain barrels** *(see report Table 4-2 item 1)*: Both residential and commercial users will receive a 50% rebate per rain barrel to a maximum of $50 per barrel up to a total maximum rebate of $200;
   b. **Rain sensor and/or WaterSense® labelled irrigation controller** *(see report Table 4-2 item 1)*: A 50% rebate for the total cost of a Rain Sensor or WaterSense® labelled irrigation controller will be provided to a maximum rebate of $200 per household to prevent irrigation during rain.

---


\(^{190}\) Incentives for homes involved in our RAIN Smart Neighbourhoods Project (nd). [https://reepgreen.ca/what_we_offer/community-action/rain/rain-smart-neighbourhoods/incentives-homes-involved-rain-smart-neighbourhoods-project/](https://reepgreen.ca/what_we_offer/community-action/rain/rain-smart-neighbourhoods/incentives-homes-involved-rain-smart-neighbourhoods-project/)

7. **Residential Rainwater Harvesting System** (see report Table 4-2 item I): A 50% rebate for the total cost of a rainwater harvesting system to a maximum of $750 per household will be provided for residential scaled tank systems/cisterns that collect a minimum of 4546 litres of rainwater. The city also will rebate the costs of system expenses, including transport piping, debris traps, filters, pumps, and the costs associated with the installation of the system and its components.

**A.3.4 Grey Water**

Grey Water incentive programs reduce a residential or commercial buildings water consumption by introducing water recycling measures. For example, treated water from a dishwasher or shower can be used to flush toilets.

Guelph, ON: Grey Water Program\textsuperscript{192} includes the following incentives:

1. Greywater Rebate Program (see report Table 4-2 item I): Guelph will provide a $1000 rebate for the installation of residential greywater systems to collect water from showers and baths.

**A.4 Provincial Incentives**

**A.4.1 Alberta**

1. **Farm Energy and Agri-Processing Program (FEAP)**\textsuperscript{46} (see report Table 4-4 item I): The Farm Energy and Agri-Processing Program shares costs with the agriculture and agri-processing sector on energy efficient investments. The program is designed to encourage energy management, which will result in cost savings, energy conservation, and ultimately, reduced greenhouse gas emissions. The Program offers financial support, subject to financial constraint, to applicant who incorporate high efficiency equipment that is identified in the applicable funding list in their construction and/or retrofit project. Eligible incentive topics include:
   a. Submetering;
   b. Variable Speed Drive for Irrigation Pivots;
   c. Energy Efficiency on Dairy Farms;
   d. Lighting in Dairy, Poultry, and Swine Production;
   e. Space Heating in Poultry and Swine Production;

2. **Alberta Indigenous Community Energy Program (AICEP)**\textsuperscript{193} (see report Table 4-4 item I): The AICEP program provides tools and funding to help indigenous communities and

---

\textsuperscript{192} Guelph Greywater Rebate Program (2018). https://guelph.ca/living/environment/rebates/greywater/

\textsuperscript{193} http://indigenous.alberta.ca/AICEP.cfm
organizations understand how energy is used in their buildings and identify opportunities to save energy and financial resources. The AICEP can fund eligible projects up to 100% of project costs, up to a maximum of $200,000. Fundable projects include:

a. Office and Administrative Buildings;
b. Fire Halls and Police Stations;
c. Elders’ Centres;
d. Community Centres;
e. Arenas and Curling Rinks;
f. Aquatic Centres and Swimming Pools;
g. Multiplexes;
h. Dry Sport Centres;
i. Public Works Buildings;
j. Buildings that House Community-Owned Businesses;

3. **Alberta Indigenous Climate Planning Program (AICPP)**[^193] (see report Table 4-4 item I):
The Alberta Indigenous Climate Planning Program (AICPP) is a grant program that supports Indigenous communities to establish an understanding of their energy conservation opportunities, set priorities to improve energy efficiency and reduce greenhouse gas (GHG) emissions, and pursue opportunities related to participating in Alberta’s “green economy.” AICPP can fund up to 100% of eligible costs, to a maximum of $100,000. Projects must be focused on either:

a. **Community Energy Plans**: These projects seek to improve a community’s understanding of their current and future energy needs, to set a path for the community to meet its needs, and to pursue related community, employment, and economic development opportunities
b. **Opportunity Development**: These projects seek to assess or pursue specific opportunities related to renewable energy, reducing GHGs, or otherwise participating in the “green economy”, whether to identify available opportunities, assess feasibility, or business planning.

4. **Alberta Indigenous Energy Efficiency (Retrofit) Program**[^194] (see report Table 4-4 item I):
The Alberta Indigenous Energy Efficiency (Retrofit) Program (AIEERP) is a grant program that provides funding to improve the energy efficiency of Indigenous communities and Indigenous organization-owned buildings. These retrofit projects will reduce greenhouse gas (GHG) emissions and provide energy savings to communities. By completing eligible energy efficiency retrofits to existing buildings and enhancements to new construction, this grant program will:

a. Support Indigenous communities and organizations to increase the energy efficiency in new buildings;
b. Support Indigenous communities and organizations to improve energy efficiency of existing community and organization owned buildings;
c. Contribute to GHG reductions or avoidance; and
d. Provide energy savings to communities.
Existing buildings must have a detailed energy assessment completed to qualify. For new buildings, GHG emissions avoidance must be clearly demonstrated in the proposal submitted in addition to information on what types of upgrades are being planned and the expected cost savings from those upgrades. The Program can provide up to 100% of the required project costs.

5. **Alberta Indigenous Green Employment Program** \(^{194}\) (see report Table 4-4 item I): The Alberta Indigenous Green Employment Program (AIGEP) provides grant money to the Alberta Aboriginal Skills Employment and Training Strategy (ASETS) agreement holders, whose members will train Indigenous people for employment in the green economy. Green employment is employment that focuses on building, maintaining or participating in innovative ways to lower carbon emissions or use alternative energy sources. As Alberta transitions to a lower carbon economy, this type of employment will be increasingly important. The grant program will equally share $1 million worth of funding between ASETS agreement holders. Fundable projects include:
   a. Offer training to Indigenous individuals in a green industry;
   b. Promote green employment opportunities to Indigenous peoples;
   c. Develop strategies to employ and retain Indigenous workers in a green industry; and
   d. Labour market and workforce planning activities related to the green economy.

6. **Alberta Indigenous Solar Program** \(^{Error! Bookmark not defined.}\) (see report Table 4-4 item I): The Alberta Indigenous Solar Program (AISP) is a program that provides grants to Alberta Indigenous communities or Indigenous organizations to install solar photovoltaic (PV) systems on community or organization owned facilities. Eligible projects include:
   a. Are compliant with the Government of Alberta’s Micro-generation Regulation 27/2008 (for grid-connected projects);
   b. Are greater than or equal to two kilowatts (kW DC PV array capacity), and less than or equal to one megawatt (MW DC PV array capacity), in installation capacity;
   c. Have a cost under $3.25 per watt;
   d. Are completed within one (1) year of the signing of the grant application;
   e. Are new installations, where “new” is defined as construction completed or begun after the application was approved by Indigenous Relations.

The AISP provides funding for up to 80% of eligible expenses up to a maximum of $200,000 per project.

7. **Alberta Indigenous Green Energy Development Program** \(^{194}\) (see report Table 4-4 item I): The Alberta Indigenous Green Energy Development Program (AIGEDP) assists Alberta Indigenous communities and organizations acquire an ownership stake in Alberta’s rapidly-expanding renewable energy sector. The AIGEDP focuses on supporting the development of community owned, commercial or community scale, renewable-energy generation projects that will lead to significant reductions in Alberta’s overall greenhouse gas (GHG) emissions.
These projects will support the increase of renewable energy, which aligns with the government’s Climate Leadership Plan. The intent of the AIGEDP is to support Indigenous community-owned renewable energy generation projects with a generation capacity above 1 MW. There are two streams of development offered by the program:

a. **Project Development** stream:
   
   i. feasibility: To support the pre-development stage to identify the opportunity and develop the concept of a potential project through preliminary design and technical, financial, legal, and market assessments
   
   ii. Technical documentation: To support the development stage of the project and perform the required activities including but not limited to technical and financial feasibility studies, front end engineering, permitting, regulatory work, contracts negotiation, financing strategy, to achieve a shovel-ready stage.

b. **Project Implementation** stream:

   i. To support Indigenous communities and organizations to fund capital costs of community-owned, commercial or community scale, renewable energy generation projects that are close to start operations or the engineering, procurement and construction (EPC) stage of the project within the funding year.

8. **Alberta Indigenous Climate Capacity Program**[^194] ([see report Table 4-4 item I]): The Alberta Indigenous Climate Capacity Program (AICCP) is a grant program that builds technical and leadership capacity within Indigenous communities and organizations in order to:

   a. Increase climate leadership knowledge within Indigenous communities and organizations;
   
   b. Prepare Indigenous communities for green-energy and economic development opportunities by increasing awareness of climate leadership and the low-carbon economy;
   
   c. Increase awareness of local actions that can be taken which will decrease community and organization greenhouse gas emissions.

The AICCP can provide 100% of the eligible expenses of an eligible project, up to a maximum of $100,000.

9. **Municipal Climate Change Action Center**[^49] ([see report Table 4-4 item I]): On June 4, 2015, the Government of Alberta announced a $2 million investment in energy efficiency and conservation initiatives for the Municipal Climate Action Centre (MCCAC) led by local governments. The MCCAC provides technical assistance, expertise, and funding programs to support Alberta municipalities in reducing their greenhouse gas emissions and improving energy efficiency.
10. Business Energy Savings\(^{194}\) (see report Table 4-4 item I): This program offers incentives to business, non-profits and institutional organizations to encourage them to choose high-efficiency products. Incentives of up to $25,000 per facility (or $100,000 for parent companies) are available to help cover the cost of the equipment. Eligible products include:

a. Efficient lighting products: LED T8s, ENERGY STAR certified LED bulbs, LED low/medium/high-bay fixtures, LED exterior fixtures, T5HO high-bay fixtures, occupancy controls, etc;

b. Efficient heating, ventilation and air conditioning (HVAC) equipment: commercial warm air furnaces, hot water commercial packaged boilers;

c. Efficient water heating equipment: condensing water heaters, tankless water heaters.

Industrial businesses, including small-to-medium sized oil and gas industries, are also now eligible to receive rebates on products such as:

a. Pump-off controllers for pump jacks;

b. Variable frequency drives for combustion air fans;

c. Steam trap survey and retrofit;

d. Retro-commissioning for economizers and fresh air dampers;

e. Pneumatic to electric instrument conversion;

f. Compressed air leak detection and repair;

g. No-loss drains (compressed air);

h. Chiller tune-up;

i. Loading dock door and pit seals;

j. Valve repair - chilled water / hot water;

k. Process exhaust filtration.

11. Custom Energy Solutions Program\(^{47}\) (see Table 4-4 item I): This program helps large facilities improve productivity, save energy and money by upgrading old, inefficient equipment and making other energy improvements. Account managers will work directly with industrial customers to identify their specific goals and needs. The program offers end-to-end support ad incentives to implement the most cost-effective enhancements in the participant’s facilities. Individual facilities with over 10,000 tonnes of annual GHG emissions are eligible for incentives up to $1 million per year and parent facilities implementing Customer Energy Solutions projects in multiple facilities are eligible for incentives up to $2 million per year. Facilities with less than 10,000 tonnes are eligible for incentives up to $250,000 per year for individual facilities and $500,000 per year for parent facilities. Eligible upgrades include:

a. Process improvements;

b. Heat recovery systems;

c. Boiler controls and boiler systems;

d. Building controls;
e. Insulation;
f. Gas compression;
g. Gas pumping;
h. Variable frequency drives (VFDs);
i. Compressed air;
j. Refrigeration;
k. Water/wastewater.

12. **Drain Water Heat Recovery Rebates**\(^{194}\) (see Table 4-4 item I): This program offers rebates up to $500 for the installation of a new Drain Water Heat Recovery device. Rebates vary based on the energy savings modelled by a participating contractor for the project, the device that is chosen, the flow rate of shower heads, and the number of showers which drain through the plumbing system where the Drain Water Heat Recovery system is installed.

13. **Instant Savings Program**\(^{195}\) (see Table 4-4 item I): This program offers instant rebates of $3 to $15 per item on dozens of energy efficient products at retailers across the Province. Eligible products include motion sensors, smart power bars, programmable thermostats, clotheslines, and many more.

14. **Non-Profit Energy Efficiency Transition (NEET) Program**\(^{195}\) (see Table 4-4 item I): This program provides funding to non-profit and volunteer organizations to provide them with detailed energy audits and energy management plans. NEET covers 10\% of the direct costs for energy efficiency audits and energy management plans up to a maximum of $12,000 per organization.

15. **Climate Leadership Adjustment Rebate**\(^{45}\) (see Table 4-3 item C): The Alberta Climate Leadership Adjustment Rebate (ACLAR) is a non-taxable amount paid to low and middle income individuals and families. It is intended to help households adjust to the new provincial carbon price. From July 2018 to June 2019 residents may be eligible to receive:
   a. $300 for a single individual with no children;
   b. $450 if you have a spouse or common-law partner;
   c. $450 if you do not have a spouse or common-law partner, but have full custody of an eligible child;
   d. An additional $45.00 for each child under the age of 18 (to a maximum of 4 children).

   For single individuals with no children, the rebate is reduced by 2.67\% of adjusted family net income over $47,500. For families, the credit is reduced by 4.0\% of adjusted family net income over $95,000. Payments are made in July, October, January, and April separately from the GST/HST credit payments. The program is fully funded by the Alberta provincial government.

16. **Residential and Commercial Solar Program**\(^{48}\) (see Table 4-4 item I): This program offers rebates to homeowners, businesses and non-profits that install Solar PV systems. The Province provides $0.75/watt from Energy Efficiency Alberta, which can be supplemented
with an additional $0.15/watt for those in the City of Edmonton. The maximum residential payment will be the lesser of $10,000 or 30% of eligible system costs. The maximum commercial payment will be the lesser of $500,000 or 25% of eligible system costs.

### A.4.2 British Columbia

1. **BC Scrap-It Program**\(^2\) (*see report* Table 4-4 *item I*): Scrap-It is a voluntary early retirement vehicle program providing incentives to help British Columbians replace higher polluting vehicles with cleaner forms of transportation. Owners of Model Year 2000 or older vehicles are able to choose from a list of incentives, including transit passes, bicycles, car sharing memberships, new or used cars, or $200 cash.

2. **Speciality Use Vehicle Incentive**\(^2\) (*see report* Table 4-4 *item I*): The SUVI Program provides the purchaser or lessee of an eligible vehicle an incentive depending on the vehicle type purchased. The vehicle incentive will be limited to a maximum of 35% of the vehicle MSRP regardless of the total available incentive amount indicated in a vehicle category. The amounts are subject to change and may be adjusted during the program period.

3. **Climate Action Tax Credit**\(^0\) (*see Table 4-3 *item C*): The BC climate action tax credit (BCCATC) is a non-taxable payment made to low-income individuals and families to help offset the carbon taxes they pay. The program provides a credit of up to $35.00 for an individual, $135.00 for a spouse or common-law partner and $40.00 per child ($135.00 for the first child in a single parent family). The maximum quarterly amounts are $33.75 for an individual and a spouse or common law partner (or first child in a single parent family) and $10.00 per child. For single individuals with no children, the credit is reduced by 2% of his or her adjusted net income over $33,993. For families, the credit is reduced by 2% of their adjusted family net income over $39,658. The payment is combined with the quarterly payment of the federal GST/HST credit. The BC low income climate action tax credit is fully funded by the BC provincial government.

4. **Clean Energy Vehicle Program**\(^1\) (*see report* Table 4-4 *item I*): Incentives for battery electric and hydrogen fuel cell vehicles, investments in charging infrastructure and hydrogen fuelling infrastructure, additional support for fleets to adopt CEVs, and investments in research, training and outreach. To make clean energy vehicles more affordable and reduce greenhouse gas emissions, the Province will offer incentives of up to $5,000 for the purchase or lease of a new battery electric or plug-in hybrid electric vehicle, and up to $6,000 for a hydrogen fuel cell vehicle.

5. **Net Metering Program**\(^\text{Error! Bookmark not defined.}\) (*see report* Table 4-4 *item I*): This program will purchase the excess power that a solar system produces. The power that is produced is purchased at the current retail rate, and the excess power that is returned to the grid is sold at $0.09/kWh.
6. **PST Tax Exemption Program**\(^{195}\) (see report Table 4-4 item I): This program removes the PST tax on the purchase of all Solar PV panels and equipment to slightly decrease the costs associated with installing the solar system.

7. **Regional District of Nanaimo Renewable Energy System Incentive**\(^{196}\) (see report Table 4-4 item I): This program enables homeowners in RDN Electoral Areas and the District of Lantzville to save money while upgrading to energy efficient technology in their home. Homeowners that install a solar PV system are eligible to receive the $250 incentive. In addition, effective April 1, 2015, a $400 rebate is available for renewable energy systems that require and obtain a development variance permit. Please include the development variance permit in your submission.

### A.4.3 Manitoba

1. **Net Metering Program**\(^{53}\) (see Table 4-4 item I): This program allows users to first offset their hydro bill on a 1:1 basis and the excess energy that is produced is sold to the grid at a reduced rate of $0.03/kWh. Unlike most Provinces, Manitoba is the will pay users for their produced energy.

### A.4.4 New Brunswick

1. **Net Metering Program**\(^{197}\) (see report Table 4-4 item I): This program allows homeowners to earn credits for the excess power that they send back to the grid. The earned credits can be carried over month to month to offset future energy consumption.

2. **Commercial Solar Rebate Program**\(^{55}\) (see report Table 4-4 item I): This program will provide commercial customers with a rebate of $30/GJ of electricity saved up to a maximum of $75,000.

3. **Energy Audit Program**\(^{54}\) (see report Table 4-4 item I): This program provides rebates for the costs of an energy audit to determine the potential for energy efficiency upgrades in a commercial building. The provided incentives are as follows:
   a. 50% of energy audit cost up to $1,110 for a building that is up to 15,000 square feet;
   b. 50% of energy audit cost up to $2200 for a building that is 15,000 to 75,000 square feet;
   c. 50% of energy audit cost up to $3300 for a building that is 75,00 square feet or larger.

### A.4.5 Newfoundland and Labrador

---


1. **Home Energy Savings Program**[^1] (HESP) *(see report Table 4-4 item I)*: Households with low income (under $32,000) who consume 15,000 kWh of electricity annually are eligible for incentives to reduce their energy consumption by up to $5000.

### A.4.6 Northwest Territories

1. **Net Metering Program**[^2] *(see report Table 4-4 item I)*: This program allows residents to generate their own electricity and send excess electricity back to the grid for a credit. The earned credits are worth the retail value that they were purchased for and carry over from month to month to offset future electricity bills.

### A.4.7 Nova Scotia

1. **Custom Solutions Incentive Program**[^3] *(see report Table 4-4 item I)*: Offers medium and large sized businesses help with implementing electrical and energy-saving projects by offering technical assistance, financial incentives, and financing to offset the costs of engineering studies, energy efficiency equipment and installation. Incentive amounts are determined on a project-by-project basis and vary depending on the size, energy saving effectiveness of the measure, the equipment involved, and the financial need of the company. The maximum available incentive for each project is:
   a. 50% of the cost of a preliminary energy audit/scoping study to a maximum of $1000;
   b. 50% of eligible project costs to a maximum of $500,000;
   c. On bill financing for up to 2 years;
   d. Feasibility studies are now eligible for incentives: Efficiency Nova Scotia will contribute up to 100% of the cost to a maximum of $15,000 in which Efficiency Nova Scotia pays 50% of the incentive amount for feasibility and scoping studies, and the remaining half of the incentive is paid when the project begins.

2. **Existing Building Commissioning**[^4] *(see report Table 4-4 item I)*: Recommissioning specialists work with the company to ensure that the building is working properly and set for optimal efficiency including reviewing equipment, temperature settings, scheduling, and the original operating documents. The business is then provided with a customized report outlining the enhancements that have been made and other areas for energy savings. Incentives offered are up to 75% of the total project costs (based on electrical energy savings). Additional funding may be provided on a project-by-project basis.

3. **Onsite Energy Management Program**[^5] *(see report Table 4-4 item I)*: This program provides a fully-funded, on-site energy manager to work with a business to help save energy

---

[^1]: https://www.ntpc.com/customer-service/net-billing
and money. Trained experts work with staff to improve energy related activities, identify and obtain funding and financing opportunities, plan, implement, and evaluate energy saving projects.

4. **Solar Thermal Equipment Rebates**

   (see report Table 4-4 item I): Residents can receive the following rebates for Solar Thermal Equipment:
   
   a. Solar Thermal: Air to Air: Residents can receive $400/System for a CSA Class 2831-06, 2831-07, 2831-30, 2831-37 or Class 8854 model. The system must be designed for heating season operation and installed according to best practice and manufacturer instructions;
   
   b. Solar Thermal: Domestic Hot Water: Residents can receive $1000/System for a CSA Class 2831-06, 2831-07, 2831-30, 2831-37 or Class 8854 model. The system must be designed for year-round operation and installed according to best practice and manufacturer instructions. The system must be installed with minimum R3 on all piping connecting to the solar storage tank to the solar collector(s) and existing water heater.

5. **Nova Scotia Enhanced Net Metering Program**

   (see report Table 4-4 item I): The program allows residents to connect a small renewable electricity project (such as a wind turbine or a solar panel) to the distribution grid through a meter that measures electricity flow in two directions. The resident gets a credit for any electricity that they feed into the grid and are paid for it at the retail class rate. The program allows residents to supply electricity to multiple meters under one account within a single distribution zone up to an overall limit of 1 megawatt.

**A.4.8 Nunavut**

1. **Home Renovation Program**

   (see report Table 4-4 item I): This Program provides financial, program and technical assistance to homeowners who wish to carry out major repairs, renovations and additions to their home. Where an applicant has already received assistance to renovate their home, they may apply for an additional $15,000 to improve the energy efficiency of their dwelling.

2. **Net Metering Program**

   (see report Table 4-4 item I): This program allows customers to generate their own electricity and send excess electricity back to the grid for credit. The earned credits are worth the same retail rate that they were purchased for and can be carried forward from month to month to offset future energy consumption.

**A.4.9 Ontario:**

---

1. **AffordAbility Fund**\(^{202}\) (see Table 4-4 item I): The Affordability Fund is funded by an independent trust set up by the Government of Ontario. Local electric utility companies and community services are working together to help residents improve their home's energy efficiency with free energy-saving upgrades, which can lower home energy use and their electricity bill. Residents may qualify for free upgrades, including ENERGY STAR® certified LEDs, ENERGY STAR® certified appliances and insulation and weatherstripping.

2. **Feed-in Tariff (FIT) and microFIT Program**\(^{202}\) (see Table 4-4 item I): This program was launched in 2009 to encourage new renewable energy technology, investments and the creation of new clean energy jobs. The program allows homeowners, communities, business owners and private developers to generate electricity from prescribed renewable sources and sell it back to the government/grid for a guaranteed fixed price for the duration of their contract term. Eligible energy sources include: wind, waterpower, biomass and biogas, solar photovoltaic (PV) power and landfill gas. The FIT program is intended for renewable energy projects from 10 to 500 kW for applicants of almost any nature, private, community, corporate, or public. The microFIT program is intended for roof mount solar PV systems <10kW, usually at a home, farm, institution, school, or place of worship.

3. **SMART Green Program**\(^{203}\) (see report Table 4-4 item I): The Canadian Manufacturers and Exporters (CME) has partnered with the Government of Ontario to launch a $25 million SMART Green fund that assist small and medium sized manufacturers reduce their GHG emissions and improve their energy efficiency. Payments are provided in non-repayable grants of 50% of eligible project costs up to $500,000.

### A.4.10 Prince Edward Island

1. **Commercial Energy Audit Program**\(^{63}\) (see report Table 4-4 item I): This Program provides financial incentives of up to $1,000 towards an evaluation to determine the potential for energy efficiency upgrades in commercial buildings.

2. **Home Energy Low-Income Program**\(^{62}\) (**HELP**) (see report Table 4-4 item I): Low income clients who applied for the PEI Energy Efficiency Loan or Grant Program are eligible to have a HELP tradesperson complete a comprehensive air-sealing (caulking and weather-stripping on windows and doors) free of charge. Other free features of the HELP program include: installation of a programmable thermostat, a low flow shower head, a voucher for a free furnace cleaning (up to $80 in value), and compact fluorescent light bulbs (ENERGY STAR® CFL and LED).

---


3. **New Home Construction Program**\(^{62}\) (see report Table 4-4 item 1): This program helps residents make their home more energy efficient. A certified energy advisor must review the building plans before construction begins and provides customized recommendations to improve the energy efficiency of the design. Two tiers of rebates are available:
   a. ENERGY STAR® for new Homes or EnerGuide rating of 20% better than code will receive a rebate of $2000;
   b. R2000 or EnerGuide rating of 50% better than code will receive a rebate of $5000.

4. **Solar Net Metering Program**\(^{204}\) (see report Table 4-4 item 1): This program allows customers to generate their own electricity ad send excess electricity back to the Provincial grid for credits. The earned credits are worth the same retail rate that it was purchased for and can be carried forward from month to month to offset future energy usage.

### A.4.11 Quebec

1. **Novoclimat Big Multi-Unit buildings**\(^{205}\) (see report Table 4-4 item 1): Novoclimat is an initiative that allows Quebec builders to increase the energy efficiency of their commercial establishments by building to the Novoclimat technical standards. This Program applies to
   - buildings of over 600 m\(^2\) with up to 10 storeys; and
   - duplexes, triplexes and quadruplexes, as well as multiple-unit buildings of three or fewer storeys and 600 m\(^2\) and less, using electricity, natural gas, or residual forest biomass as the main energy source for heating.

The buildings must be newly built or undergoing major renovation in order to obtain financial assistance. The types of buildings eligible are private (condominiums or dwelling units) or social housing. Financial assistance is available to the project's general contractor responsible for all work carried out in respect of the Novoclimat program.

2. **Novoclimat 2.0 Homes**\(^{206}\) (see report Table 4-4 item 1): This program supports the construction of new, high energy performance homes, according to specific construction requirements. The first owner of a new Novoclimat certified home will receive a $2000 rebate to build the home. First time property owners have access a $4000 rebate.

3. **Renoclimat Program**\(^{205}\) (see report Table 4-4 item 1): This energy renovation program for owners of single family, semi-detached or row houses includes an energy audit conducted both before and after retrofit. The program also offers access to financial assistance for carrying out insulation work; carrying out work affecting a home's air tightness; and

---


\(^{204}\) Natural Resources Canada (2018).

installing or replacing mechanical systems (ventilation system, water heater, ENERGY STAR® certified heat pump, geothermal heating system). Financial assistance ranges from $50 for the installation of a central programmable electronic thermostat to $5,365 for the installation of a complete geothermal system in replacement of a main heating system using fuel oil.

4. **Ecoperformance Program** 207 *(see report Table 4-4 item I)*: This program is designed to reduce GHG emissions and energy consumption of businesses by financing projects or measures related to energy consumption and production, as well as process improvement. Rebates of $40/tCO₂e are provided.

5. **Charging Station Rebate** 64 *(see report Table 4-4 item I)*: Financial assistance is available under the program upon the purchase or lease an all-electric vehicle, a plug-in hybrid vehicle, a low-speed electric vehicle or an electric motorcycle, up to a maximum of $600. More specifically, assistance is granted as two amounts:

   a. $350 for the purchase of an eligible charging station;
   b. $250 for the installation of the charging station and its power supply infrastructure.

6. **Drive Green Program** 205 *(see report Table 4-4 item I)*: This Program offers individuals, businesses, organization and Québec municipalities a rebate of up to $8000 on the purchase or lease of a new electric vehicle. The amount of the rebate depends on the type of vehicle and conditions (selling price, electric battery capacity, model year, year of purchase). Moreover, the vehicle must be included in the list of eligible new vehicles.

7. **Net Count Program** 205 *(see report Table 4-4 item I)*: Hydro-Quebec’s net metering program allows residential and agricultural customers to bring their surplus energy they produce to Provincial energy grid. The excess energy is credited to the customer’s account and can be carried forward from one month to the next to offset their future energy consumption.

8. **RenoVert 20% Tax Credit Program** 64 *(see report Table 4-4 item C, I)*: This program encourages residential buildings to install green technologies and includes the costs of installing Solar PV systems or solar thermal systems to heat the house or water. The maximum available rebate is $10,000.

### A.4.12 Saskatchewan

1. **Solar Power Rebate Program** 65 *(see report Table 4-4 item I)*: Residents who install a system under SaskPower’s Net Metering Program is eligible for a rebate worth 20% of the total system costs, including installation (to a maximum of $20,000).

---

A.4.13 Yukon

1. **Commercial Energy Incentive Program**\(^{208}\) (*see report* Table 4-4 *item I*): This Program promotes energy efficiency upgrades in Yukon commercial and institutional buildings. There is up to $10,000 available for LED lighting upgrades, including 20% rebates on LED lamps, fixtures and controls and 40% rebates off dark sky criteria exterior LED Lamps, fixtures, and controls.

2. **Thermal Enclosure Upgrade for Mixed-Use Building Rebate**\(^{208}\) (*see report* Table 4-4 *item I*): This program offers up to $50,000 in rebates for renovations that improve the thermal enclosure and performance of existing multi-use residential buildings and mixed-use buildings.

3. **Refrigerator Retirement Program**\(^{209}\) (*see report* Table 4-4 *item I*): This program provides a $50 rebate to retire a refrigerator that is 10 years and older with pick up and drop off to the recycling facility at no added cost.

4. **ENERGY STAR® Appliance Rebates**\(^{210}\) (*see report* Table 4-4 *item I*): Rebates are available for the purchase and installation of ENERGY STAR® certified washers, refrigerators, freezers, dishwashers and ventless dryers. A $100 rebate per appliance is available in hydro communities and a $300 rebate per appliance is available in diesel communities.

Heating System Rebates:

a. A $1500 rebate is available for Cold Climate Heat Pumps (Air-source heat pumps must be ENERGY STAR or 8.2 HSPF or better and Ground-source heat pumps must be ENERGY STAR);

b. Wood and pellet stove, furnace and boiler rebates:
   i. $800 rebate for wood or pellet furnaces and boilers;
   ii. $600 rebate for pellet stoves;
   iii. $300 rebate for wood stoves;
   iv. All wood and pellet heating systems must be EPA-listed or CSA B415.10.

c. Oil and propane furnace, boiler and combination system rebates;
   i. $500 for oil or propane furnace and boilers;
   ii. Furnaces and boilers must be ≥ 95% AFUE and ENERGY STAR;
   iii. Combination systems must be condensing and CSA P.9 tested.

5. **Heat Recovery Ventilator Rebate**\(^{211}\) (*see report* Table 4-4 *item I*): Homeowners installing a high-performance heat recovery ventilator (HRV) in an existing home can receive a $500

---


rebate. Heat recovery ventilators provide a balanced supply of fresh air to a home while exhausting stale air from kitchens and bathrooms. Heat recovery ventilators are essential for homes that are tightly sealed and have little air leakage.

6. **Window Replacement Rebate**\(^{211}\) (see report Table 4-4 item I): Homeowners replacing existing windows with ENERGY STAR ® Zone 3 windows are eligible for a $100 rebate per window to a maximum rebate of $1,000 per home.

7. **Super Insulated New Homes**\(^{211}\) (see report Table 4-4 item I): A rebate of $10,000 is available when a super-insulated home is built to an EnerGuide rating of >50% improvement over a NBC 2015 code home.

8. **Renewable Energy Systems**\(^{212}\) (see report Table 4-4 item I): A rebate of up to $5000 is available for renewable energy systems including:
   a. $800 per kW rebate to a maximum of $5000 per system per year;
   b. Includes solar PV, wind, hydro, biomass, and geothermal systems.

   Systems collecting solar thermal energy:
   a. 20% of eligible material cost up to $1200;
   b. Must be CSA F379 Rated solar domestic hot water system;
   c. Must be used with CSA-approved solar heat storage.

9. **Feed-in-Tariff Program**\(^{69}\) (see report Table 4-4 item I): For grid-tied systems, members of the Micro-Generation Program are able to sell their surplus energy back to the grid.

10. **Water Efficient Appliance Rebates**\(^{210}\) (see report Table 4-4 item I): Toilets and drain water heat recovery systems that conserve heat and/or water are eligible for rebates. A $65 rebate is available per WaterSense toilet and a $150 rebate is available per NRCAN-listed drain water heat recovery systems.

**A.5 Utility Incentives**

**A.5.1 Alberta**

1. **Government of AB – Business, Non-Profit and Institutional Rebate**\(^{72}\) (see report Table 4-4 item I): Incentives for high-efficiency retrofits of lighting, heating, cooling and hot water systems, and variable frequency drives for businesses, non-profits and institutions. **Eligibility** – All businesses serviced by an Alberta electric utility in existing buildings. Federal and provincially owned buildings, and large final emitters are not eligible.

---

2. **Home Improvement Rebates**\(^{213}\) (see report Table 4-4 item 1): Energy Efficiency Alberta is offering numerous residential rebates for home improvement including:
   a. Up to $500 for a Drain Water Heat Recovery System;
   b. Up to $3500 for increasing the home’s insulation;
   c. Up to $1500 on Windows;
   d. Up to $1000 for a Tankless Water Heater.

3. **Business Energy Savings Program**\(^{71}\) (see report Table 4-4 item 1): This program offers incentives to encourage organizations to choose high-efficiency products. Once an organization has installed an approved high-efficiency heating or lighting product, it can apply for the rebate to help cover the cost of the equipment. Eligible products include efficient lighting products, efficient heating systems, and efficient water heating equipment. Industrial businesses are now eligible to receive rebates on mechanical component products.

4. **Custom Energy Solutions Program**\(^{71}\) (see report Table 4-4 item 1): This Program helps large facilities improve productivity, save energy and save money by upgrading old, inefficient equipment and making other energy improvements. Account managers will work directly with industrial customers to identify their specific goals and needs. The Program offers end-to-end support and incentives to implement the most cost-effective enhancements in participants' facilities. Individual facilities with over 10,000 tonnes of annual GHG emissions are eligible for incentives up to $1 million per year and parent facilities implementing Custom Energy Solutions projects in multiple facilities are eligible for incentives up to $2 million per year. Facilities with less than 10,000 tonnes are eligible for incentives up to $250,000 per year for individual facilities and $500,000 per year for parent facilities.

5. **Drain Water Heat Recovery Rebate**\(^{\text{Error! Bookmark not defined.}}\) (see report Table 4-4 item 1): Rebates of up to $500 are available for the installation of a new Drain Water Heat Recovery (DWHR) device. Rebates will vary based on the energy savings modelled by a Participating Contractor for the project. Factors that impact the rebate are the device chosen, the flow rate of shower heads and the number of showers which drain through the portion of the plumbing system where the DWHR device is installed.

### A.5.2 British Columbia

1. **BC Hydro – Business Energy Saving Incentives**\(^{214}\) (see report Table 4-4 item 1): Financial incentives for businesses that replace inefficient technologies with energy-efficient technologies: T12s with T8s, T12s with LEDs, Incandescent/Halogen with LEDs, Exit signs with LED exit signs, HPS with T8s and more efficient HPS, HVAC fan with Fan w/VFD,

---


\(^{214}\) [https://www.bchydro.com/powersmart/business/programs.html](https://www.bchydro.com/powersmart/business/programs.html)
HVAC pump w/pump w/VFD. **Eligibility** – Small businesses and medium to large commercial.

2. **Fortis BC – Efficient Boiler**\(^{215}\) *(see report Table 4-4 item I)*: Financial incentives to facility owners for the installation of an energy-efficient natural gas boiler. Whether building new or retrofitting, customers may qualify for a rebate of $9 per MBH for high-efficient condensing boilers, to a maximum of $45,000 per boiler. **Eligibility** – Commercial rate class natural gas customers.

3. **Fortis BC – Efficient Commercial Water Heater**\(^{215}\) *(see report Table 4-4 item I)*: Financial incentives to facility owners for the installation of a high-efficiency natural gas water heater. Whether building new or retrofitting, customers may qualify for a rebate of up to $15,000. **Eligibility** – Commercial rate class natural gas customers.

4. **Multi-Unit Residential Building – New Construction Program**\(^{216}\) *(see report Table 4-4 item I)*: This incentive program supports the construction of high-efficiency, multi-unit residential and mixed-use buildings. Incentives include custom performance and individual energy-saving measures (including the installation of ENERGY STAR certified products).

5. **Commercial Buildings Retrofit Program**\(^{74}\) *(see report Table 4-4 item I)*: FortisBC is providing incentives for the installation of high-efficient foodservice equipment, lighting, heating, ventilation & air conditioning and refrigeration. For information about rebate guidelines and values visit.

6. **FortisBC- Electricity – For Homes**\(^{74}\) *(see report Table 4-4 item I)*: FortisBC is providing residential rebates for energy efficient appliances and technologies such as hair source heat pumps and air source heat pump water heaters, and appliances such as dishwashers and dryers. For information about incentive values and guidelines visit.

7. **FortisBC – Natural Gas – For Business & Industry**\(^{74}\) *(see report Table 4-4 item I)*: FortisBC is offering incentives on energy efficient natural gas boilers and water heaters ranging from $1000 to $15000.

8. **FortisBC – Switch ‘n’ Shrink Program**\(^{74}\) *(see report Table 4-4 item I)*: This Program offers financial incentives to homeowners who switch their existing oil or propane heating system to a new ENERGY STAR rated high-efficiency heating system. Eligible applicants could receive up to $1,300 in rebates when they switch to natural gas space heating equipment.

\(^{215}\) [https://www.fortisbc.com/naturalgas/business/naturalgasvehicles/howwecanhelp/incentives/Pages/default.aspx](https://www.fortisbc.com/naturalgas/business/naturalgasvehicles/howwecanhelp/incentives/Pages/default.aspx)

9. **FortisBC – New Home Program**\(^74\) *see report Table 4-4 item I*: This Program, in collaboration with BC Hydro Power Smart, encourages customers to build energy-efficient homes (to ENERGY STAR standards). Incentives are available for the construction of new single family homes, row homes, duplexes and townhouses. Customers who achieve an EnerGuide 82 rating are eligible to receive a whole home rebate.

10. **Home Renovation Rebate**\(^74\) *see report Table 4-4 item I*: Provided in partnership by BC Hydro Power Smart and FortisBC, this Program offers homeowners a wide variety of incentives to help reduce ongoing energy costs. Rebates are provided for both natural gas and electric energy-efficient upgrades, including insulation, draft proofing, ventilation, ENERGY STAR® certified hot water and heating systems.

11. **Non-Profit and Aboriginal Housing Upgrades**\(^74\) *see report Table 4-4 item I*: Non-profit housing providers and aboriginal communities can get free help upgrading their housing units with energy efficient products to help tenants and members save on their electricity costs and improve their overall comfort. Products installed include efficient light bulbs, water-saving showerheads, and weather-stripping to reduce drafts. Some tenants may also qualify for an ENERGY STAR® refrigerator, insulation in their walls, attic, and/or crawlspace, or a high-efficiency gas furnace.

12. **Power Smart for Low-Income Households- Energy Conservation Assistance Program**\(^74\) *see report Table 4-4 item I*: The Program provides qualified low-income residential account holders with free personalized home energy evaluation, installation of energy saving products (e.g. ENERGY STAR certified high-efficiency gas furnace) by a qualified contractor and personalized energy efficiency advice.

13. **Power Smart for Low-Income Households – Energy Savings Kit Program**:\(^74\) BC Hydro and Fortis BC have partnered to provide free Energy Saving Kits (ESK) for low income households. The kit contains a number of simple, easy-to-install energy saving products including: compact fluorescent light bulbs, weather stripping, fridge and freezer thermometers and a high efficiency showerhead.

14. **Sustainable Communities Program**:\(^74\) This Program helps local governments meet the challenges of energy and GHG reductions by providing a range of services, including:

   a. funding to hire an energy manager;
   b. expertise and funding to develop the Community Energy and Emissions Plan;
   c. expertise and funding to facilitate a workshop;
   d. funding for energy experts to participate on the multi-disciplinary planning team and to provide data compilation, analysis and recommendations;
   e. funding to hire internship or student positions to help increase energy literacy, electricity savings and broader benefits to community;
   f. funding to jump start a project that will lead to electricity savings.
15. **Oil to Heat Pump Program**\(^7^3\) *(see report Table 4-4 item I)*: This Program is an initiative of the Province of British Columbia to accelerate the adoption of heat pumps as a means of replacing less efficient oil heating systems in order to achieve greenhouse gas reductions, reduce incidents of oil tank leaks, and improve home energy efficiency in BC. Participants can access rebates of up to $1700 when upgrading from oil heating to an air source heat pump.

16. **Commercial New Construction Program**\(^7^4\) *(see report Table 4-4 item I)*: This Program offers financial incentives
   a. to owners of medium to large buildings to study different energy saving systems;
   b. to owners of small to large buildings (including multi-unit residential buildings) for energy efficient lighting design;
   c. to owners of large buildings in the early stage of the design process that have potential electricity savings with at least 50,000 kWh per year.

17. **Business Energy Savings Incentives**\(^7^4\) *(see report Table 4-4 item I)*: This Program helps B.C. businesses reduce their operating costs through the implementation of energy-efficiency projects (lighting, HVAC, refrigeration (including ENERGY STAR®), ice-making machines) by offering incentives that can help cover up to 75% of the cost of the project.

18. **Leaders in Energy Management Program**\(^7^4\) *(see report Table 4-4 item I)*: Commercial, government or institutional organizations that spend at least $200,000 annually on electricity are eligible for this program. Implementation funding is available to large commercial, government and institutional customers to reduce the capital cost of implementing electrical energy efficiency projects through the Project Implementation Funding program.

19. **Continuous Optimization Program**\(^7^4\) *(see report Table 4-4 item I)*: This Program provides customer assistance to save energy and improve operations in large commercial buildings. The primary focus is on reducing the energy consumption of heating ventilation and air-conditioning (HVAC) systems by making improvements to the Building Automation System. Additional systems of interest include lighting, refrigeration, and other energy intensive systems with complex operating strategies and control systems.

20. **Energy Studies & Audits – End-Use Assessment**\(^7^4\) *(see report Table 4-4 item A)*: Experts are available to visit client sites to conduct a detailed analysis and assess options to improve inefficiencies. Power Smart offers 100 percent funding of the assessment (some limits apply). Funding is available for detailed energy efficiency and feasibility studies to help build a solid business case to upgrade plant and equipment systems.

21. **Energy Studies & Audits – Energy Efficiency Feasibility Study**\(^7^4\) *(see report Table 4-4 item A)*: This Program provides participants with a detailed report concerning everything needed to build a solid business case for efficiency upgrades including:
   a. assessment of options;
   b. estimated savings;
   c. implementation costs.
The Program also offers business support from experts to provide knowledge and information to assist with energy efficiency upgrades. Funding of up to 100 percent, with 75 percent of study costs funded right away. The remaining 25 percent is funded if participants implement a major efficiency upgrade within 18 months. The study report can be used to apply directly for funding to implement a system upgrade under the Project Incentive Program.

22. **Energy Studies & Audits – Plant-Wide Audit**\(^{(74)}\) *(see report Table 4-4 item A):* An energy efficiency expert will review the consumption history of a facility, examine the facility and all of its process systems, and provide a comprehensive report that summarizes the audit results and recommendations. The facility owner can receive up to 100 percent of the assessment cost (some limits apply).

23. **Project Incentives – Distribution**\(^{(74)}\) *(see report Table 4-4 item I):* This Program provides funding, to a maximum of $500,000, for energy efficiency upgrade projects, including design, equipment, installation, disposal and taxes.

24. **Project Incentives – Self Serve Incentive Program**\(^{(74)}\) *(see report Table 4-4 item I):* The Self-Serve Incentive Program online application process allows participants to apply for incentives for eligible compressed air and lighting retrofits. Incentives cover up to 75 percent of project costs.

25. **Project Incentives – Transmission**\(^{(74)}\) *(see report Table 4-4 item C, I):* Program funding covers design, equipment, installation, disposal and taxes. The maximum incentive is calculated based on the amount of electricity that a project will save over its projected lifetime (to a maximum 10 year lifespan), at a base rate of $45/MWh. BC Hydro will pay up to 90 percent of the incentive during the implementation process, with the rest paid after verification of energy savings.

26. **Strategic Energy Management – Energy Monitoring & Targeting**\(^{(74)}\) *(see report Table 4-4 item I):* An energy manager will work with one of BC Hydro's service providers to develop targets for a facility's energy use and a proposal for a system to help it meet those targets. Once the proposal is approved, BC Hydro will provide up to $80,000 in funding to implement real time monitoring, system monitoring and/or advanced modelling to gain a better understanding of the facility's day-to-day energy usage.

27. **Strategic Energy Management – Industrial Energy Manager**\(^{(74)}\) *(see report Table 4-4 item I):* This Program provides advanced funding to hire an energy manager to develop and implement a Strategic Energy Management Plan. The Program includes:
   a. up to 75 percent salary funding for 2 years;
   b. 100 percent of the cost for management coaching;
   c. 100 percent funding for required training for energy managers;
d. 100 percent funding for the full cost of an on-site Energy Management Assessment;

e. a fully-funded workshop to facilitate creation of a customized plan;

f. 100 percent funding for an Employee Awareness Planning workshop and funding of employee engagement activities including training and awareness events.

A.5.3 Manitoba

1. **Community Geothermal Program**\(^{217}\) (see report Table 4-4 item 1): First Nations community members are engaged in being active participants in reducing their energy consumption. This is achieved through training local businesses on how to install and maintain geothermal heat pump systems while providing homeowners with convenient and affordable financing through Pay As You Save (PAYS) Financing.

2. **Energy Finance Plan**\(^{217}\): The Energy Finance Plan is a convenient, on-bill financing for upgrades to gas and electrical systems and is available to Manitoba Hydro residential, commercial, farm, and seasonal customers. All work must be performed by a qualified electrician or a licensed contractor who is a participant in the Plan.

3. **Heat Recovery Ventilator Control Program**\(^{217}\) (see report Table 4-4 item 1): This Program offers a $150 rebate to homeowners who install an advanced heat recovery ventilator (HRV) control, which has options for automatic recirculation and intermittent on or off modes, and provides better control of humidity, comfort and heating costs.

4. **Lighting for Multi-Unit Residential Buildings**\(^{217}\) (see report Table 4-4 item 1): This Program offers financial incentives to owners, property managers, and landlords of apartment complexes, townhouses, and triplexes/fourplexes, or multi-unit residential buildings to upgrade their incandescent and halogen bulbs to energy efficient LED bulbs (ENERGY STAR\(^{®}\) certified) in their residential suites.

5. **Power Smart Affordable Energy Program**\(^{217}\) (see report Table 4-4 item 1): This Program offers financing and free energy-efficient upgrades for qualifying lower income households.

6. **Power Smart Home Insulation Program**\(^{217}\) (see report Table 4-4 item 1): This Program offers rebates to upgrade home insulation to Power Smart levels.

7. **Power Smart Residential Loan**\(^{217}\) (see report Table 4-4 item 1): The Power Smart Residential Loan is a financing option for homeowners wanting to implement energy-efficient measures to their homes. The loan covers upgrades ranging from window and doors,

\(^{217}\) Natural Resources Canada (2018).
http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/policy_e/results.cfm?searchtype=default&programtypes=4,12&regionaldeliveryid=8&sectoranditems=all%7C0&categoryid=all
improving insulation values, and installing energy efficient space and water heating equipment. The maximum allowable loan is $7500 in total, of which up to $5500 can be applied toward the purchase of a high efficiency natural gas furnace.

8. **Power Smart Shops**\(^\text{217}\) *see report Table 4-4 item 1*: This Program helps small, independent businesses reduce their energy and water consumption to save money and energy. Small businesses may qualify for the installation of water and energy efficient appliances from bathroom fixtures to lighting upgrades.

9. **Residential Earth Power Loan – for Cold Climate Air Source Heat Pumps**\(^\text{217}\) *see report Table 4-4 item 1*: This Program assists homeowners with the cost of installing an ENERGY STAR\(^\text{®}\) certified cold climate air source heat pump with a variable capacity compressor, rated to provide heat at temperatures of at least -25°C. The home must be currently heated with electric resistance heat.

10. **Residential Earth Power Loan – for Ground Source Heat Pumps**\(^\text{217}\) *see report Table 4-4 item 1*: This Program assists homeowners with the cost of installing a geothermal heat pump, which reduces a home's annual heating energy use by 50 to 70 percent, space cooling costs up to 40 percent and domestic water heating costs up to 25 percent. Financial assistance up to $20,000 is available for new installations and retrofits.

11. **Residential Earth Power Loan – for Solar Water Heaters**\(^\text{217}\) *see report Table 4-4 item 1*: Homeowners who install an approved solar water heating system may qualify for a Residential Earth Power Loan of up to $7,500 per residence.

12. **Power Smart Bioenergy Optimization Program**\(^\text{217}\) *see report Table 4-4 item 1*: This Program helps industrial customers convert their company's waste streams and by-products into fuel that produces useful heat and power. It offers technical and financial support to help approved customers install, operate, and maintain equipment that can deliver consistent and reliable savings and environmental benefits. Incentives will not exceed 50 percent of the eligible project costs or a maximum incentive of $1,000,000 on electrical load reductions and $250,000 on natural gas load reductions.

13. **Power Smart Commercial Building Envelope Program**\(^\text{217}\) *see report Table 4-4 item 1*: This Program provides financial incentives to encourage building owners to improve the thermal performance of their building by upgrading insulation levels, installing energy-efficient windows, and investing in high performance glazing systems for curtain walls.

14. **Power Smart Commercial Custom Measures Program**\(^\text{217}\) *see report Table 4-4 item 1*: This Program addresses energy-efficient projects that are not part of an existing Power Smart commercial program and provides financial incentives to identify, investigate, and implement system efficiency improvements in a facility. The maximum eligible incentive is $250,000 for all electrical measures, and $100,000 for all natural gas measures included in the project.
15. **Power Smart Commercial Lighting Program**\(^{217}\) (see report Table 4-4 item 1): This Program offers guidance and financial assistance to commercial, industrial and agricultural customers to install energy-efficient lighting in new construction and renovation projects. The maximum eligible incentive is $250,000 for all electrical measures included in the project.

16. **Power Smart Commercial Kitchen Appliance Program**\(^{217}\) (see report Table 4-4 item 1): This Program encourages restaurants and foodservice facilities to install energy-efficient appliances in their kitchens. Rebates are available for ENERGY STAR qualified natural gas deep-fryers and natural gas or electric steamers, and range from $1,000-$1,500. Businesses may also qualify for free pre-rinse spray valves, installed free of charge.

17. **Power Smart New Buildings Program**\(^{75}\) (see report Table 4-4 item 1): This Program provides technical guidance and financial incentives for designing, constructing, and operating new, energy-efficient buildings in Manitoba. Financial incentives are based on projected energy savings and proven building performance.

18. **Power Smart Commercial HVAC Program**\(^{217}\) (see report Table 4-4 item 1): This Program is designed to encourage the use of higher efficiency heating and cooling systems in commercial buildings. Financial incentives are available for boilers, chillers and CO\(_2\) sensors to help offset the added cost of efficiency upgrades and reduce the payback in energy. The maximum eligible incentives are $250,000 for all electrical measures and $100,000 for all natural gas measures included in the project.

19. **Power Smart Performance Optimization Program**\(^{217}\) (see report Table 4-4 item 1): This Program provides industrial and large commercial customers with the technical support and financial incentives that are necessary to identify, investigate and implement system efficiency improvements throughout a facility. The program promotes energy efficiency through the optimization of three phase electrical power end-use systems including compressed air, pumps and fans, industrial refrigeration, process heating, electro-chemical processes and plant-wide energy management systems. The result is lower operating costs and improved system performance.

### A.5.4 New Brunswick

1. **Community Outreach Program**\(^{218}\): Through this program, not-for-profit organizations receive energy-savings kits and training on how to install these products. Energy efficiency kits include LED light bulbs, water-efficient showerheads, faucet aerators, and water heater pipe wrap.

\(^{218}\) Natural Resources Canada (2018). http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/policy_e/results.cfm?searchtype=default&programtypes=4,12&regionaldeliveryid=5&sectoranditems=all%7C0&categoryid=all
2. **Energy Management Information System (EMIS) Incentives**\(^{218}\): Large industry customers can get up to $20,000 to assess energy efficiency upgrades, up to $300,000 in incentives for implemented measures, and, if eligible, up to $150,000 in incentives for EMIS.

3. **Large Industry Retrofit Program**\(^{76}\): Large industries that have a rate schedule of 750 kW or more of contracted demand. If you are a customer with an average of 2,000 kW or more of demand, you may be eligible for Energy Management Information System (EMIS) incentives. Large industry customers can get up to $20,000 to assess energy efficiency upgrades, up to $300,000 in incentives for implemented measures, and, if eligible, up to $150,000 in incentives for EMIS.

4. **Energy Smart Commercial Buildings Retrofit Program**\(^{219}\): This Program provides financial incentives of up to $3000 towards an evaluation to determine the potential for energy efficiency upgrades in a commercial building and a maximum of $75,000 towards the energy retrofitting project costs.

5. **Energy Smart Industrial Program**\(^{218}\): This Program provides financial incentives and advice to make an industrial facility more energy efficient. By studying and implementing energy efficiency measures, facilities can better manage energy costs while improving productivity and competitiveness.

6. **Small industry Program**\(^{76}\): Small industries with a rate schedule lower than 750 kW of contracted demand and consumption of less than 500 MWh per year. If you are small industry, you are eligible for up to $10,000 to help with energy assessments and up to $115,000 in incentives for implementing your upgrades.

7. **Medium industry Program**\(^{76}\): Customers with a rate schedule lower than 750 kW of contracted demand, but with a consumption of 500 MWh or more per year. If you are medium industry, you are eligible for up to $10,000 to help with your energy assessments and can get up to $210,000 in incentives for implemented measures.

8. **Low-Income Energy Savings Program**\(^{76}\): This Program targets homes in need of major energy efficiency upgrades, which help low-income homeowners in New Brunswick reduce their energy use and costs. Upgrades could include a mix of:
   a. Compact fluorescent lighting;
   b. Domestic hot water pipe insulation;
   c. Low-flow showerheads;
   d. Insulation (basement/crawlspace, attic, main wall);
   e. Faucet aerators;
   f. Ductless heat pumps;

---

g. air sealing.

9. **Home Insulation Energy Savings Program**\(^\text{218}\) (*see report Table 4-4 item I*): This Program provides financial incentives to homeowners of electrically heated homes who make eligible energy efficiency upgrades to their homes.

10. **Ductless Mini-Split Heat Pump**\(^\text{218}\) (*Heat Pump*; *see report Table 4-4 item I*): Homeowners who do one major insulation upgrade through the Program will be eligible for a $500 heat pump bonus on eligible ENERGY STAR certified heat pump models purchased from NB Power's list of approved heat pump contractors.

11. **Heat Recovery Ventilation (HRV)**\(^\text{218}\) (*see report Table 4-4 item I*): Homeowners who do one major insulation upgrade through the Program will be eligible for an HRV bonus on eligible ENERGY STAR certified HRV models. Homes with an existing HRV or Air Exchange System will not be eligible for the HRV incentive.

12. **New Home Energy Savings Program: Home Insulation Energy Savings Program**\(^\text{218}\) (*see report Table 4-4 item I*): This Program provides financial incentives to homeowners of electrically heated homes who make eligible energy efficiency upgrades to their homes.

13. **Small Business Lighting Program**\(^\text{218}\) (*see report Table 4-4 item I*): This Program provides financial incentives to small businesses to offset the costs of upgrading their lighting systems and controls with energy-efficient products.

14. **Total Home Energy Savings Program**\(^\text{218}\) (*see report Table 4-4 item I*): This Program offers money back on efficiency upgrades on everything from insulation and air-sealing to high efficiency central heating systems to windows, doors, and more (including ENERGY STAR certified products). A certified energy advisor will evaluate the home to find out where it needs upgrades and will give customized recommendations to improve space and water heating energy efficiency.

### A.5.5 Newfoundland and Labrador

1. **takeCHARGE Commercial Lighting Rebate Program**\(^\text{220}\) (*see report Table 4-4 item I*): This Program helps commercial businesses province-wide make smarter lighting choices by offering rebates on high performance T8 lighting and LED Exit signs at participating lighting retailers ($4 per qualifying ballast, $1 per qualifying lamp and $20 per LED exit sign full fixture or retrofit kit).

---

2. **takeCHARGE Commercial Product Rebates** *(see report Table 4-4 item I)*: This Program offers commercial businesses rebates on the purchase of programmable thermostats, occupancy sensors, LED wall packs, and high-performance showerheads.

3. **takeCHARGE Custom Program** *(see report Table 4-4 item I)*: This Program provides financial incentives to commercial businesses towards the cost of an energy audit, feasibility study and the implementation of energy saving upgrades in heating and cooling, refrigeration, lighting and controls, and more.

4. **takeCHARGE Energy Efficiency Loan Program** *(EELP)* *(see report Table 4-4 item I)*: takeCHARGE is partnering with the Government of Newfoundland and Labrador to subsidize the financing required to purchase and install a qualified heat pump, insulation and/or home energy assessments through monthly payments on a customer’s electricity bill. This subsidy will be in the form of a reduced interest rate (prime plus 1.5%). Each year there will be a cap or maximum amount of subsidy provided. The Program aims to improve the affordability of energy efficiency upgrades so that homeowners can reduce their electricity bills and improve comfort levels in their homes.

5. **takeCHARGE Heat Recovery Ventilator Rebate Program** *(see report Table 4-4 item I)*: This Program offers residents a $175 rebate to reduce the cost of upgrading to a more efficient Heat Recovery Ventilator (HRV), which must be installed by a HRAI certified installer. Unit rebated must be listed on a utility generated list of qualified units.

6. **takeCHARGE Insulation Rebate Program** *(see report Table 4-4 item I)*: This Program offers residents a rebate for 75% of basement wall (min R18 to max R25) or basement ceiling (min R30 to max R35) insulation costs up to $1,000 and 50% of attic insulation (min R50 to max R55) costs up to $1,000.

7. **Isolated System Business Efficiency Program** *(see report Table 4-4 item I)*: This program targets Newfoundland and Labrador Hydro’s commercial customers in isolated systems, providing support and financing incentives for a wide range of energy efficient products from LED lighting to energy efficient appliances.

8. **takeCHARGE Thermostat Rebate Program** *(see report Table 4-4 item I)*: This Program offers residents rebates on the purchase of a programmable thermostat ($10.00 or electronic thermostat ($5.00).

9. **Newfoundland and Labrador Housing** *(see report Table 4-4 item I)*: Home Energy Savings Program (HESP): HESP is a provincial initiative designed to assist households with low income who consume 15,000 kWh of electricity annually in making energy-efficient retrofits to their homes. The program assists clients with retrofits that will make their homes more affordable and reduce greenhouse gas emissions that contribute to climate change. All
repairs will be identified through an energy evaluation, which will determine the best possible solutions for energy efficiency.

### A.5.6 Northwest Territories

1. **Alternative Energy Technologies Program – Business Renewable Energy Fund (BREF)**\(^{79}\) *(see report Table 4-4 item I)*: The Business Renewable Energy Fund (BREF) is available to assist NWT commercial businesses including off-grid lodges and camps to integrate commercially available, clean energy technologies into their operations. The fund is intended to reduce fuel use and lower the cost of operations in remote locations where fuel prices and carbon footprints are high. BREF provides funding of up to one-third of the cost of qualified renewable energy systems. The maximum amount available per applicant is $15,000 per year.

2. **Alternative Energy Technologies Program – Community Renewable Energy Program (CREP)**\(^{79}\) *(see report Table 4-4 item I)*: This Program is available to assist community-based installations of alternative energy systems or the conversion of an existing conventional energy system to alternative energy technology. Renewable energy projects may receive funding of up to one-half (50%) of the project cost, up to $25,000 per year.

3. **Alternative Energy Technologies Program – Residential Renewable Energy Fund (RREF)**\(^{79}\) *(see report Table 4-4 item I)*: The Residential Renewable Energy Fund (RREF) is available to assist NWT residents to integrate commercially available, clean energy technologies on their property, building or other assets for the intent purpose of reducing fuel usage. RREF provides funding of up to one-third of the cost of qualified renewable energy systems. The maximum amount available to any recipient is $5,000 per year.

4. **Commercial Energy Conservation and Efficiency Program**\(^{79}\) *(see report Table 4-4 item I)*: This Program assists businesses in achieving the efficient use of energy and water to help businesses reduce their heat, power and water bills and become more energy efficient while saving money. It is available to support commercial upgrades, which will reduce the use of electrical/heat energy and water. Energy conservation and financial savings are achieved by professionally analyzing and improving heating and heating controls, air sealing, lighting and lighting controls, ventilation and ventilation controls, hot water and low flow devices and other building components. The rebate amount will be the lower of $15,000, 1/3 of the total eligible costs, or five times the annual estimate money saved in fuel, water and electricity.

5. **Community Government Building Energy Retrofit Program**\(^{79}\) *(see report Table 4-4 item I)*: This Program supports upgrades to Community Government-owned buildings, which will reduce their use of electrical/heat energy and water. The total rebate provided is the lower of $25,000, 50% of the total eligible costs, or five times the annual estimated money saved in fuel, water, and electricity.
6. **Energy Efficiency Incentive Program (EEIP)** \(^{79}\) *(see report Table 4-4 item I):* This Program helps homeowners and consumers purchase new, more energy efficient models of products that they use every day (i.e. ENERGY STAR® appliances, heating equipment, LED light bulbs). For a full rebate, qualifying products must be purchased through NWT vendors. Qualifying products purchased outside the NWT, but within Canada, are eligible for 50% of the rebate. Rebates range from $50-$1,500.

**A.5.7 Nova Scotia**

1. **Custom Solutions Program** \(^{81}\) *(see report Table 4-4 item A,1)*: This Program helps medium and large sized businesses implement electrical energy-saving projects by offering technical assistance, financial incentives and financing to offset the cost of engineering studies, energy efficiency equipment and installation. Incentive amounts are determined on a project-by-project basis and vary depending on the size of the project, energy-saving effectiveness of the measure, equipment involved and the financial need of the company. The maximum incentive available for each project is:
   
   a. 50% of the cost of a preliminary energy audit/scoping study to a maximum of $1,000;
   b. 50% of eligible project costs to a maximum of $500,000;
   c. on-bill financing for up to 2 years.

   Feasibility studies are eligible for incentives and are included in the total maximum eligible project amount. Efficiency Nova Scotia will contribute up to 100% of the cost to a maximum of $15,000, in which Efficiency Nova Scotia pays 50% of the incentive amount for feasibility and scoping studies upon receiving the study, and the remaining half of the incentive amount is paid when the project begins.

2. **Energy Efficient Appliance Rebates** \(^{223}\) *(see report Table 4-4 item I):* Efficiency Nova Scotia is offering a $75 rebate for eligible energy efficient models including clothes washers, refrigerators, LED light bulbs (up to 8$ per pack of 3 or more), programmable thermostats, smart thermostats and will install a high efficiency shower head for no cost.

3. **Basement Header Insulation** \(^{221}\) *(see report Table 4-4 item I):* Efficiency Nova Scotia is offering residents a $100 rebate to insulate the basement header after a home energy assessment has been conducted.

4. **Basement Slab Insulation** \(^{221}\) *(see report Table 4-4 item I):* Efficiency Nova Scotia is offering a $100 rebate to residents for insulating the basement slab after a home energy assessment.

5. **Ceiling Insulation** \(^{221}\) *(see report Table 4-4 item I):* Efficiency Nova Scotia is offering residents incentives to insulate their ceilings including:

---

a. Increase 100% attic insulation to R-50 from a starting point of R-12 or less is eligible for a $750 rebate;
b. Increase 100% attic insulation to R-50 from a starting point greater than R-12 and up to R-25 is eligible for a $375 rebate;
c. Increase 100% attic insulation to R-50 from a starting value greater than R-25 and up to R-35 is eligible for a $125 rebate;
d. Increase 100% flat roof or cathedral ceiling insulation to R-10 from a starting point of R-0 is eligible for a $500 rebate;
e. Increase 100% flat roof or cathedral ceiling insulation to R-28 from a starting point of R-12 or less is eligible for a $750 rebate;
f. Increase 100% flat roof or cathedral ceiling insulation to R-28 from a starting point greater than R-12 and up to R-25 is eligible for a $250 rebate.

6. **Foundation Insulation**

   (see report Table 4-4 item I): Efficiency Nova Scotia is offering the following foundation insulation incentives:
   a. Add between R-10 and R-23 to 100% of basement foundation walls is eligible for a $600 rebate;
   b. Add >R-23 to 100% of basement foundation walls is eligible for a $1200 rebate;
   c. Add between R-10 and R-23 to 100% of crawlspace exterior walls is eligible for a rebate of up to $480;
   d. Add >R-23 to 100% of crawlspace exterior wall is eligible for a $960 rebate;
   e. Add >R-23 to 100% of floor above crawlspace is eligible for a $240 rebate.

7. **Exterior Wall Insulation**

   (see report Table 4-4 item I): Efficiency Nova Scotia will provide the following incentives for exterior wall installation:
   a. Add between R-3.8 and R-9 to 100% of exterior walls is eligible for a $900 rebate;
   b. Add >R-9 to 100% of exterior walls is eligible for a $1500 rebate.

8. **Air Sealing Rebate**

   (see report Table 4-4 item I): Efficiency Nova Scotia will provide a $200 Rebate to residents who achieve the air sealing targeted identified in the preliminary Home Energy Assessment

9. **Windows, Doors & Skylights**

   (see report Table 4-4 item I): Efficiency Nova Scotia will provide $30/rough opening for ENERGY STAR ® certified units rated for climate zone 2

10. **Exposed Floor Insulation**

    (see report Table 4-4 item I): Efficiency Nova Scotia will provide a $200 rebate for adding at least R-20 to 150 square feet or more exposed floor space

11. **Drain Water Heat Recovery**

    (see report Table 4-4 item I): Efficiency Nova Scotia will provide a $200 rebate to install a unit with greater than or equal to 42% efficiency

12. **Heat Recovery Ventilation (HRV only)**

    (see report Table 4-4 item I): Efficiency Nova Scotia will provide a $300 rebate to residents who install an HVI certified HRV (may replace a non-HVI certified HRV).
13. **Heat Pump Incentives**\(^{223}\) *(see report Table 4-4 item I)*: Efficiency Nova Scotia is offering numerous rebates to encourage residents to install both air source heat pumps and geothermal heat pumps including:

a. Ductless Mini-Split Heat Pump: Residents receive $300/ton for system models qualified as Cold Climate Heat Pumps (the system must be installed by a certified Refrigeration and Air Conditioning Mechanic);

b. Centrally Ducted Heat Pump: Residents receive $500/ton on ENERGY STAR® V5.0 or newer models (the system must be installed by a certified Refrigeration and Air Conditioning Mechanic);

c. Air-to-Water Heat Pump: Residents will receive $500/ton for CSAC656-05 or ANSI/AHRI210/240-1994 or equivalent models (the system must be installed by a certified Refrigeration and Air Conditioning Mechanic);

d. Heat Pump Water Heater: Residents receive $400 for ENERGY STAR® V.3.0 or Newer models (the system must be installed by a certified Refrigeration and Air Conditioning Mechanic);

e. Geothermal Heat Pump: Residents receive $600/ton for ENERGY STAR® or Newer models (the system must be installed by a certified Refrigeration and Air Conditioning Mechanic).

**NOTE:** 1 refrigeration ton = 12000 BTU

**Wood/Pellet Burning Equipment Rebates**

a. Wood Stove or Fireplace Insert: Residents can receive $500/Unit for a CSA-B415.1-10 or US EPA CRF Part 60 AAA certified model with EPA or CASE emissions of < 4.5 g/hr. or <0.40g/MJ for TPM (must be inspected and approved by a WETT Certified Inspector or installed by a Wood Energy Technology Transfer (WETT) Installer);

b. Pellet Stove or Fireplace Insert: Residents can receive $500/unit for a CSA-B415.1-10 or US EPA CRF Part 60 AAA certified model with EPA or CASE emissions of < 4.5 g/hr. or <0.40g/MJ for TPM (must be inspected and approved by a WETT Certified Inspector or installed by a Wood Energy Technology Transfer (WETT) Installer);

c. Wood Boiler or Centrally Ducted Forced Air Furnace: Residents can receive $1000/Unit for a CSA-B415.1-10 or US EPA CRF Part 60 AAA certified model with EPA or CASE emissions of < 4.5 g/hr. or <0.40g/MJ for TPM (must be inspected and approved by a WETT Certified Inspector or installed by a Wood Energy Technology Transfer (WETT) Installer);

d. Pellet Boiler or Centrally Ducted Forced Air Furnace: Residents can receive $1000/Unit for a CSA-B415.1-10 or US EPA CRF Part 60 AAA certified model with EPA or CASE emissions of < 4.5 g/hr. or <0.40g/MJ for TPM (must be inspected and approved by a WETT Certified Inspector or installed by a Wood Energy Technology Transfer (WETT) Installer).

14. **Business Energy Solutions**\(^{223}\) *(see report Table 4-4 item I)*: Efficiency Nova Scotia will upgrade businesses with energy efficient products and cover up to 60% of the costs. One of Efficiency Nova Scotia’s qualified partners conducts a free initial assessment to determine the ways to improve the energy efficiency within the business.
15. **Commercial and Industrial New Construction Program**\(^{221}\) (*see report* Table 4-4 *item* I): Efficiency Nova Scotia is working with developers of commercial buildings who are planning construction, expansion, or a significant renovation to design an energy efficient plan that will lower energy costs while helping to track the buildings performance. Incentives of up to $500,000 and built year financing plans are offered to lower the upfront equipment and labour costs.

16. **Home Energy Assessment**\(^{223}\) (*see report* Table 4-4 *item* I): One of Efficiency Nova Scotia’s energy advisors will come to the home and perform an EnerGuide evaluation that examines the homes insulation levels, air leakage, and mechanical systems. The provided rebates are relative to the work that needs to be done (move to the above incentives discussing windows doors insulation etc).

17. **Nova Scotia Solar Homes**\(^{80}\) (*see report* Table 4-4 *item* I): Efficiency Nova Scotia will provide a rebate of $1.00/watt for eligible Solar PV systems. For most systems, the rebate will equate to approximately 30% of the total system cost. The average rebate is approximately $7000. The maximum rebate is $10,000 or 40% of the eligible system costs.

18. **Low Income Homeowner Service**\(^{223}\) (*see report* Table 4-4 *item* I): For qualifying low-income homeowners, Efficiency Nova Scotia will make upgrades to insulation, seal holes and cracks, all at no-charge. To determine which energy efficiency upgrades the low-income homeowner needs, one of the Efficiency Partners will conduct a no-charge energy assessment of the home. If upgrades, like draft proofing and insulation, are recommended and approved, the homeowner will receive those upgrades at no cost.

19. **Strategic Energy Management**\(^{223}\): Organizations will be provided with technical advice, financial incentives and other resources needed to successfully implement Strategic Energy Management (SEM) within their organization. Through continuous energy performance improvements, SEM has helped organizations:
   a. reduce energy use by up to 15%;
   b. achieve greater saving from capital projects; and
   c. sustain energy and cost savings over the long term.

A.5.8 **Nunavut**

1. **Home Renovation Program**\(^{82}\) (*see report* Table 4-4 *item* I): This Program provides financial, program and technical assistance to homeowners who wish to carry out major repairs, renovations and additions to their home. Where an applicant has already received assistance to renovate their home, they may apply for an additional $15,000 to improve the energy efficiency of their dwelling.

A.5.9 **Ontario**
NOTE: Ontario’s 2018 provincial election brought about a significant political change that put many of these programs at risk. At the time this report was being compiled, these programs were yet relevant, though compromised.

1. **IESO Save ON Energy – Audit Funding**
   (see report Table 4-4 item I): This Program offers financial incentives to businesses towards the cost of various energy audits, which identify the costs and benefits of implementing energy-efficient measures. The saveONenergy programs are offered through local electric utilities and funded through the Independent Electricity System Operator.

2. **IESO Save On Energy – Energy Performance Program Incentives For Multi-Site Businesses**
   (see report Table 4-4 item I): This Program encourages whole building energy performance improvements through incentives at a four cent per kilowatt-hour ($0.04/kWh) of savings per year for up to 4 years. This pay-for-performance model encourages participants who are able to make behavioural and operational changes alongside capital investment projects to achieve and grow energy savings over multiple years. It provides multi-site customers with a single program point of contact.

3. **IESO Heating and Cooling Incentive**
   (see report Table 4-4 item I): This Program offers homeowners a financial incentive of up to $600 by installing a high-efficiency ENERGY STAR certified central air-conditioning system and $250 by installing a high-efficiency furnace equipped with an electronically commutated motor. The saveONenergy programs are offered through local electric utilities and funded through the Independent Electricity System Operator.

4. **IESO Save ON Energy – Multi-Site Customer Energy Manager Program**
   (see report Table 4-4 item I): This Program provides up to $150,000 to businesses to hire an energy manager to help reach energy-saving targets in their facilities. For industrial, commercial or institutional customers with facilities in locations across multiple local hydro company territories, the streamlined application process eliminates the need for multiple applications while providing dedicated support throughout the process.

5. **IESO Save ON Energy – Small Business Lighting Program**
   (see report Table 4-4 item I): This Program provides financial incentives up to $2,000 worth in energy-efficient lighting upgrades, including a wide range of ENERGY STAR® certified LED lighting products, to qualifying businesses. An authorized electrical contractor is available to complete the retrofit. The program provides licensed electrical contractors, a no-risk assessment and clean-up, which includes recycling and proper disposal. The saveONenergy programs are offered

---

222 Natural Resources Canada (2018).
http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/policy_e/results.cfm?searchtype=default&programtypes=4&regionaldeliveryid=7&sectoranditems=all%7C0&categoryid=all
through local electric utilities and funded through the Independent Electricity System Operator.

6. **Engineering Energy Efficiency Feasibility Study**\(^{222}\) (see report Table 4-4 item A): This Program helps fund studies to identify and quantify potential energy saving measures on natural gas consuming equipment, gas-related heating systems or facilities. Studies analyze an existing building or process to determine the changes that will increase its overall energy efficiency. Typical projects include thermal surveys, facility air-balances, HVAC audits, energy audits, benchmarking activities and equipment upgrade studies. Incentives include
   a. Commercial customers: 30% up to $4,000;
   b. Industrial customers: 50% up to $10,000;
   c. One study /site/ year;
   d. $10,000 cap applies to multi-site industrial customers, one study per year.

7. **Heating and Cooling Program**\(^{222}\) (see report Table 4-4 item I): Receive $250 to replace and old furnace with a high-efficiency furnace equipped with an electronical commutated motor and up to $600 to purchase and install a new ENERGY Star certified central air conditioning system that meets specific efficiency ratings. **Eligibility** – Small businesses with residential-type systems.

8. **Toronto Hydro – Opsave (Energy Management)**\(^{222}\) (see report Table 4-4 item I): Facilities can earn 2.5 cents/kWh for savings over the baseline determined by Toronto Hydro. Encourages facilities to deploy energy efficiency projects. Large ICI buildings are eligible.

9. **Enbridge – Boiler**\(^{222}\) (see report Table 4-4 item I): Rebates to customers who rent or purchase and install non-atmospheric hydronic boilers, which must be used for space heating and/or hot water heating and must have 85 percent to 88 percent thermal efficiencies. Financial incentives are also available for condensing boilers, condensing economizers, direct contact water heaters and direct contact heat exchangers. Intended for commercial spaces, small through large.

10. **Enbridge – Retrofit**\(^{222}\) (see report Table 4-4 item I): Receive up to 50% of the project cost (not to exceed $100,000) in custom retrofit incentives from Enbridge for energy efficiency projects designs to optimize energy usage and save on natural gas costs. Various incentives available through brochure. Intended for commercial spaces, small through large.

11. **Enbridge Custom Solutions and Incentives**\(^{222}\) (see report Table 4-4 item I): This program provides financial incentives to assist customers with costs related to energy assessment, measurement and efficiency implementation initiatives. Customers are eligible for incentives based on consumption savings to a maximum of the greater of 50% of the cost of implementation or $100,000 project.
12. **Enbridge Home Energy Conservation (HEC) Program** (see report Table 4-4 item I): This Program makes it easy and affordable for homeowners to improve the energy efficiency of their home, lower their energy bills and lessen their home's impact on the environment. Qualified homeowners can take advantage of valuable incentives towards the cost of an energy assessment and the installation of recommended energy upgrades (including ENERGY STAR certified products).

13. **Enbridge RunitRight Program** (see report Table 4-4 item I): This Program enhances an existing building’s systems to find energy efficiencies. It analyzes the building's energy performance to identify, implement and monitor low- and no-cost operational improvements that can lead to five per cent energy savings. Once the consultant has identified areas for operation improvements, Enbridge will provide a financial incentive of up to $10,000 for the implementation of multiple measures. In addition to the financial incentive, Enbridge will provide training for operation managers.

14. **Hydro Ottawa – Retrofit** (see report Table 4-4 item I): Receive up to 50% of project costs to replace existing, inefficient equipment with high-efficiency equipment and for installing new control systems that will improve your operational procedures and processes. **Eligibility** – Small businesses and medium to large commercial spaces.

15. **Hydro Ottawa – Lighting Upgrades** (see report Table 4-4 item I): Receive up to $2000 in incentives towards an energy-efficient lighting upgrade. **Eligibility** – Small businesses with an average annual electricity demand of less than 100 kilowatts.

16. **Union Gas Limited – Retrofit** (see report Table 4-4 item I): Eligible measures under the program are those that provide sustainable, measurable and verifiable reductions in peak electricity demand and/or electricity consumption and below are some examples: Lighting retrofits, Lighting controls, HVAC redesign, Chiller replacement, Variable speed drives, Building envelope, BMS, sensors control equipment, and metering equipment. **Eligibility** – Account holder in ICI.

17. **Government of Ontario – Lighting Upgrades** (see report Table 4-4 item I): Receive a free onsite lighting assessment of facility and up to $2000 towards eligible energy-efficiency lighting upgrades. **Eligibility** – Small businesses with an average annual electricity demand of less than 100 kilowatts.

18. **Enbridge Affordable Housing Program** (see report Table 4-4 item I): This program provides affordable housing providers with up to $100,00 in available incentives. It helps to
offset the costs of retrofits and provides ongoing energy efficiency savings that reduce the payback time. Enbridge will guide participants through their energy management projects from start to finish.

A.5.10 Prince Edward Island

1. **Building Envelope Upgrade Rebate Program**\(^{227}\) *(see report Table 4-4 item 1):* EfficiencyPEI offers grants for the installation of insulation, air sealing improvements, and ENERGY STAR® windows and doors including:

   a. Attic Insulation (minimum total R-value R50 for flat ceilings, R28 for sloped ceilings);
      i. Regular rebate: $2.50/100 square feet(SQ)/R-value increase;
      ii. Low income* rebate: $4.00/SQ/R-value increase.

   b. Above Grade walls (minimum R-value increase R6);
      i. Regular rebate: $25/SQ/R-value increase;
      ii. Low-income Rebate: $40.00/SQ/R-value.

   c. Above grade walls (blown in insulation, minimum R-value increase R10);
      i. Regular rebate: $5.00/SQ/R-value increase;
      ii. Low income rebate: $8.00/SQ/R-value.

   d. Exposed floors and headers (Minimum total R-value R20);
      i. Regular Rebate: $12.00/SQ/R-value increase;
      ii. Low income rebate: $20.00/SQ/R-value.

   e. Below grade (Minimum R-value increase R12 for walls, R20 for headers);
      i. Regular Rebate: $12.00/SQ/R-value increase;
      ii. Low income rebate: $20.00/SQ/R-value.

   f. Windows, doors and skylights;
      i. Regular rebate: $100 per window opening to a maximum of $1000/property for ENERGY STAR® zone r products;
      ii. Low-income rebate: $200 per window to a maximum of $2000/property for ENERGY STAR® zone 3 products.

   g. Air Sealing
      a. 10% improvement over initial ACH@50pa rate;
         i. Regular rebate: $100;
         ii. Low income rebate: $175;
      b. 20% improvement over initial ACH@50pa rate;
         i. Regular rebate: $250;
         ii. Low income rebate: $450;
      c. 30% improvement over initial ACH@50pa rate;
         i. Regular rate: $400;
         ii. Low income Rebate: $700.

---

*low income is defined as an annual household income of $35,000 or less.

2. **Business Energy Rebates Program**[^PEI_report] (see report Table 4-4 item I): EfficiencyPEI is offering rebates to support business, non-profits, and institutional organizations, as well as industrial/agricultural facilities for choosing high-efficiency products of $5-$100 for efficient lighting and dimmer technologies, and $600 for Air source heat pumps (ENERGY STAR® Most Efficient 2018 model is required to qualify for the rebate).

3. **Energy Efficient Equipment Upgrades**[^PEI_report]: EfficiencyPEI offers rebates for the installation of ENERGY STAR® certified heating equipment including heat pumps, water saving devices, biomass heating devices, and other energy saving products. Incentive values include:
   a. Mini-split (ductless) Air Source Heat Pump;
      i. Heat Pump Regular Rebate: up to $1,200;
      ii. Heat Pump Low-income Rebate: up to $2,400;
      iii. Must be ENERGY STAR Most Efficient 2018;
   b. Central (ducted or air-to-water) Air Source Heat Pump;
      i. Heat Pump Regular Rebate: up to $2,500;
      ii. Heat Pump Low-income Rebate: up to $4,500;
      iii. Must be ENERGY STAR Most Efficient 2018;
   c. Ground Source (Geothermal) Heat Pump;
      i. Heat Pump Regular Rebate: up to $4,000;
      ii. Heat Pump Low-income Rebate: up to $7,500;
      iii. Must be ENERGY STAR Most Efficient 2018;
   d. Oil Boiler;
      i. Regular Rebate: up to $500;
      ii. Low-income Rebate: up to $900;
      iii. Must have an AFUE of 87.0% or higher;
      iv. Must be ENERGY STAR certified;
   e. Oil Furnace;
      i. Regular Rebate: up to $500;
      ii. Low-income Rebate: up to $900;
      iii. Must have an AFUE of 94.0% or higher;
      iv. Must be ENERGY STAR certified;
   f. Propane Boiler or Propane Furnace;
      i. Regular Rebate: up to $500;
      ii. Low-income Rebate: up to $900;
      iii. Must have an AFUE of 95.0% (boiler) or 97.0% (furnace) or higher;
      iv. Must be ENERGY STAR certified;
   g. Electric Thermal Storage Furnace – Summerside;
      i. Regular Rebate: up to $1500;
      ii. Low-income Rebate: up to $2750;

iii. Must be through City of Summerside Electric Utility “Heat for Less Now!” program;

h. Electric Thermal Storage Heater – Summerside;
   i. Regular Rebate: up to $750;
   ii. Low-income Rebate: up to $1400;
   iii. Must be through City of Summerside Electric Utility “Heat for Less Now!” program;

i. Hot Water Heaters and Recovery;
   i. Electric Thermal Hot Water Heater – Summerside;
   ii. Regular Rebate: up to $500;
   iii. Low-income Rebate: up to $900;
   iv. Must be through City of Summerside Electric Utility “Heat for Less Now!” program;

j. Solar Thermal Hot Water Heater;
   i. Regular Rebate: up to $1500;
   ii. Low-income Rebate: up to $2750;
   iii. Must be CAN/CSA F379 certified or ENERGY STAR certified;

k. Tankless Propane Hot Water Heater;
   i. Regular Rebate: up to $500;
   ii. Low-income Rebate: up to $900;
   iii. Must be ENERGY STAR with energy factor of 0.90 or higher;

l. Air Source Heat Pump (Hybrid) Hot Water Heater;
   i. Regular Rebate: up to $1000;
   ii. Low-income Rebate: up to $1800;
   iii. Must be ENERGY STAR with energy factor of 2.0 or higher (<55 gal.);

m. Indirect Hot Water Heater;
   i. Regular Rebate: up to $500;
   ii. Low-income Rebate: up to $900;

n. Drain Water Heat/Energy Recovery Ventilator;
   i. Regular Rebate: up to $1000;
   ii. Low-income Rebate: up to $1800;
   iii. Must be ENERGY STAR;

o. Biomass Stove;
   i. Regular Rebate: up to $1000;
   ii. Low-income Rebate: up to $1800;
   iii. Must be EPA approved;

p. Biomass Boiler / Furnace;
   i. Regular Rebate: up to $2000;
   ii. Low-income Rebate: up to $3500;
   iii. Must be EPA approved.
8. **Home Energy Audit Program** 229 *(see report Table 4-4 item I): Efficiency PEI will subsidize the cost of an EnerGuide home evaluation by $150. In the event that homeowners choose to proceed with efficiency upgrades after the audit, efficiency PEI will further subsidize those costs by enhancing the corresponding rebates.

9. **Home Energy Low-Income Program (HELP)** 86 *(see report Table 4-4 item I): Low income clients who have applied for the PEI Energy Efficiency Loan or Grant Programs are eligible to have a HELP tradesperson complete comprehensive air-sealing (caulking and weather stripping on windows and doors) free of charge. Other free features of the HELP program include: installation of a programmable thermostat; a low-flow shower head; a voucher for a free furnace cleaning (up to $80 value); and compact fluorescent light bulbs (ENERGY STAR® CFL and LED).

10. **New Home Construction Program** 84 *(see report Table 4-4 item I): This Program helps residents make their new home more energy efficient.
    a. A certified Energy Advisor will review the building plans before construction begins;
    b. Customized recommendations are provided to improve the energy efficiency of design;
    c. Two tiers of rebates are available;
    d. ENERGY STAR® for New Homes or EnerGuide rating of 20% better than code (a rebate of $2000);
    e. R2000 or EnerGuide rating of 50% better than code (a rebate of $5000
       i. The home will be assigned an EnerGuide rating that tells the homeowner that their home is comfortable, efficient and saves money.

A.5.11 Québec

1. **Gaz Métro – Encouragement and implementation of measures** 230 *(see report Table 4-4 item I): $0.10 to $0.25 per cubic metre of natural gas economized, up to a maximum of $100,000. **Eligibility** – Current customers with an annual natural gas consumption of at least 75,000 m3 for ICI.

2. **Gaz Métro – Recommissioning** 230 *(see report Table 4-4 item I): Recommissioning of mechanical systems in commercial and institutional buildings by an accredited recommissioning (RCx) agent. Up to $25,000 for the investigation, $0.25 per cubic metre of natural gas saved, up to a maximum of $25,000 for implementation and $4,000 for

---

229 Natural Resources Canada (2018).
230 http://www.transitionenergetique.gouv.qc.ca/en/programs-and-financial-assistance/page-programmes/1/?tx_nurprogsubv_pi1%5Bcategory%5D=26&tx_nurprogsubv_pi1%5Bagency%5D=9&tx_nurprogsubv_pi1%5Border%5D=energy#.W9oofZNKhPY
monitoring phases. Eligibility – Commercial Gaz Metro customers in existing buildings of at least 5 years old with natural gas consumption of at least 75,000 m3/year.

3. **Gaz Métro – Boiler**\(^{230}\) (see report Table 4-4 item I): Receive up to $25,000 for high efficiency equipment and up to $10,000 for medium efficiency equipment.

4. **Gaz Métro – New Efficient Construction**\(^{230}\) (see report Table 4-4 item I): Receive $1.50/ m3 of natural gas saved with a maximum of $275,000 for the construction of a new efficient building. Eligibility – Current and about-to-be ICI and multi-tenant (4 units or more) Gaz Metro customers.

5. **Gaz Métro – Building Envelope Renovations**\(^{230}\) (see report Table 4-4 item I): The maximum financial assistance is $40,000 for buildings with an annual consumption of natural gas below 150,000 m3, and $100,000 for buildings with an annual consumption of natural gas above 150,000 m3. Eligibility – Current and about-to-be Gaz Metro customers are eligible.

6. **Gazifère: Support for Initiatives – Energy Optimization of Buildings and Implementation Assistance**\(^{231}\) (see report Table 4-4 item I): Divided into two components, this Program provides the opportunity to apply a wide range of energy-saving initiatives including:
   a. The Energy Optimization component supports measures involving the building envelope and mechanical systems: heating, ventilation and air conditioning. For this component, Gazifère offers financial support of 25 cents per cubic metre of natural gas saved to a maximum of 70 percent of the cost of the measure involved, or $20,000;
   b. The Implementation Assistance component supports the application of measures involving the use of natural gas in production processes and high-efficiency equipment not covered by existing programs, such as furnaces and gas dryers. For this component, Gazifère offers financial support of 25 cents per cubic metre of natural gas saved to a maximum of 70 percent of the cost of the measure involved, or $10,000.

7. **Gazifère: Feasibility Study**\(^{87}\) (see report Table 4-4 item A): This Program offers financial assistance of $2,000 to cover a portion of the cost of having a feasibility study carried out to define measures that will improve the energy efficiency of an existing or new building.

8. **Gazifère: Heating system Incentives**\(^{231}\) (see report Table 4-4 item I): Gazifère offers financial incentives for the installation of high efficiency heating systems ranging from

---

\(^{231}\) Natural Resources Canada (2018).
http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/policy_e/results.cfm?searchtype=default&programtypes=4,12&regionaldeliveryid=6&sectoranditems=all%7C0&categoryid=all
condensing boilers to natural gas furnaces. Rebate amounts vary according to the installed system and range from $100-$10,000.

9. **Hydro-Québec – Building Retrofit Incentives** (see report Table 4-4 item I): Financial assistance to implement energy efficiency measures while carrying out projects in commercial or institutional buildings. The catered component offers assistance tailored to a business owner’s project, in order to improve the building’s overall energy efficiency. The prescriptive component provides simple solutions tailored to buildings under 10,000 m² to assist in implementing predefined measures. This program focuses specifically on commercial buildings >10,000 m² consuming >50,000 kWh for the catered component. Commercial buildings <10,000 m² are eligible for the prescriptive program.

10. **Efficient Farming Products Program** (see report Table 4-4 item I): This Program offers rebates on the purchase and installation of lighting products and more efficient farm equipment. The Program has five components, including lighting, heat pads, piglet warmers, fans and plate heat exchangers.

11. **Energy Efficiency Retrofit Program for Low-Income Households** (see report Table 4-4 item I): The objective of this program is to lower the energy bills of community housing complexes through implementation of general energy-saving measures. Rebates are offered on measures such as installation of ENERGY STAR certified windows and patio doors, insulation upgrades, and addition of heat recovery to mechanical ventilation.

12. **Industrial Systems Program** (see report Table 4-4 item I): This Program offers a wide range of measures and financial incentives to make industrial facilities, processes and electromechanical systems more energy-efficient. It includes the following components: electricity consumption analysis, continuous measurement and electricity management, prescriptive measures, retrofit, new plant, expansion or addition of product lines, and technology demonstration.

13. **Technology and Business Demonstration** (see report Table 4-4 item I): Hydro-Québec offers support to test the technical and commercial viability of innovative energy-saving or power-demand optimization measures. It will pay 50 percent of the total cost of an approved project, up to $300,000.

14. **Combo System Grant** (see report Table 4-4 item I): This Program offers a grant of $250 for the purchase and installation of a standard tankless water heater installed in combo mode (water heater is combined with a fan coil unit that heats the air). The Program also offers a grant of $550 to install a condensing tankless water heater in combo mode.

15. **High Efficiency Water Heater grant** (see report Table 4-4 item I): This Program offers grants ranging from $5,750 to $25,000 towards the purchase of a high-efficiency direct contact water heater (which features direct contact between the flame, combustion gases and
the water to be heated). It also offers grants ranging from $750 to $20,000 towards the purchase of a condensing water heater (which reuses part of the available latent heat energy).

16. **Hot Water Boiler Grants**\(^{231}\) (*see report* Table 4-4 *item I*): This Program offers homeowners grants towards the purchase of their heating systems. Grants include:
   a. $1,100 for the purchase and installation of a natural gas boiler, no matter which type of appliance chosen;
   b. $1,275 toward converting an oil-fired system to a new natural gas furnace;
   c. An additional grant of $900 to encourage customers to adopt energy-wise lifestyles. This amount helps reduce the difference between the cost of a high-performance appliance and the cost of a standard boiler.

17. **Thermostat Incentive Programs**\(^{231}\) (*see report* Table 4-4 *item I*): Residents can apply for a Programmable Electric Thermostat and receive a $25 rebate, or a $200 rebate upon the installation of a smart thermostat ($100 to participate in the program and another $100 to take part in the Smart Thermostat pilot program.

**A.5.12 Saskatchewan**

1. **Commercial Boiler Program**\(^{90}\) (*see Table 4-4 *item I*): This Program is designed to encourage the use of high-efficiency natural gas hydronic space-heating systems in commercial new construction and retrofits. It provides incentives to help offset the incremental price of a high-efficiency natural gas condensing boiler over the purchase price of a standard-efficiency boiler. Incentives are based upon space-heating, ventilating, domestic hot water load and type of equipment installed.

2. **ENERGY STAR® Loan Program**\(^{90}\) (*see Table 4-4 *item I*): This Program offered by SaskEnergy in conjunction with SaskPower, and runs from August 1, 2017 to March 31, 2018. It offers customers financing at 6.5% (OAC) on the purchase and installation of eligible ENERGY STAR certified equipment, including furnaces, boilers, air conditioners, natural gas hot water heaters, and ventilation systems.

3. **Residential Lighting Discount Program**\(^{90}\) (*see report* Table 4-4 *item I*): Save instantly on ENERGY STAR lighting products at a participating retailer. SaskPower partners with local retailers to offer discounts on a variety of energy efficient lighting products, including LED bulbs, fixtures, motion sensors, timers and more.

4. **Commercial Lighting Incentive**\(^{90}\) (*see report* Table 4-4 *item I*): The Commercial Lighting Incentive provides non-residential customers in Saskatchewan with access to selected premium energy efficient lighting equipment (including ENERGY STAR certified light fixtures) at a discounted price. The program is hassle-free and can help to significantly lower a business's electricity costs.
5. **Commercial Refrigeration Program**\(^90\) (see report Table 4-4 item I): This Program offers rebates of up to 50 percent on the purchase of qualified energy-efficient refrigeration products (including ENERGY STAR certified products), such as:
   a. self-contained refrigeration units including refrigerators, freezers and display cases;
   b. electronically commutated motors (ECM motors);
   c. evaporator fan controllers;
   d. anti-sweat heater humidistat controls;
   e. night covers;
   f. strip curtains;
   g. auto door closers for walk-in or reach-in freezers or coolers.

6. **Commercial HVAC Program**\(^90\) (see report Table 4-4 item I): This Program is designed to encourage the use of high-efficiency natural gas furnaces (ENERGY STAR certified), boilers, rooftop units, unit heaters, and infrared radiant heaters in both commercial new construction and retrofit applications. It is targeted towards small to medium sized commercial buildings and provides incentives based on the incremental price of the energy-efficient products. Incentives are based on the type, size, and number of units installed and range from $300-$2,000.

7. **Industrial Energy Optimization Program**\(^90\) (see report Table 4-4 item I): This Program is designed to help industrial facilities systematically identify energy waste and reduce the cost associated with electrical energy use during the production process. It offers participants personalized support geared at improving the efficiency of process operations, leading to reduced costs, emissions and impact on the environment. In addition to providing customized high-quality technical assistance, the program offers financial incentives for the identification, development and implementation of energy management and capital projects.

8. **Walk-Through Assessment Program**\(^90\) (see report Table 4-4 item I): This Program offers Alberta businesses an energy efficiency assessment to help identify a variety of ways to save power. SaskPower pays 90% of the cost of the assessment. Businesses receive recommendations to help save money and learn from an expert in commercial power efficiency.

9. **Solar Power Net Metering Program**\(^232\) (see report Table 4-4 item I): SaskPower’s Net Metering Program allows residents to earn credit for the excess energy that they produced which is used to offset a portion of the energy bill. The excess power is credited at the same rate at which it was purchased for.

---

A.6 Federal Incentives

NOTE: Most incentive programs for energy efficient technologies and appliances are handled provincially through partnerships with utility companies. See above for more information on these programs. The following programs are generally related to Tax instruments, credits, or rebates.

A.6.1 Habitat Conservation

1. *EcoAction Community Funding Program*[^100] ([see report Table 4-5 item G](#)): If you’re a business owner, you are encouraged to partner with an eligible applicant on projects that contribute to water quality or climate change.

   Non-profit groups working on projects focused on coastal and fresh water quality and conservation, or reduced emissions or adaptation to current and future climate change impacts may be eligible for funding. Eligible organizations include:
   
   a. Environmental groups;
   b. Community groups;
   c. Youth and seniors groups;
   d. Community-based associations;
   e. Service clubs;
   f. Indigenous organizations.

2. *Environmental Damages Fund*[^233]: [see report Table 4-5 item G](#): You are encouraged to partner with an eligible group to obtain funding that could cover up to 100% of eligible project costs.

   Projects must address one or more of the Fund’s priority areas:
   
   a. Restoration of natural environments;
   b. Environmental quality improvement;
   c. Research of environmental damages and development of solutions;
   d. Education and awareness.

   Eligible costs include:
   
   e. Human resources, including salaries and benefits;
   f. Travel and field costs;
   g. Material and supplies;
   h. Equipment and vehicle rentals as well as operational costs;
   i. Overhead and/or administrative costs.

3. *Fisheries and Aquaculture Clean Technology Adoption Program*[^234]: [see report Table 4-5 item G](#): Do you undertake activities such as wild capture harvesting, or have operations in

[^100]: https://canadabusiness.ca/programs/ecoaction-community-funding-program/
[^233]: https://canadabusiness.ca/programs/environmental-damages-fund/
[^234]: https://canadabusiness.ca/programs/fisheries-and-aquaculture-clean-technology-adoption-program/
aquaculture facilities or processing plants in the fish or seafood sectors? If so, you could be eligible for funding to reduce the environmental impacts of your activities by implementing clean technologies. If you meet the eligibility criteria, you can submit a project proposal, which must include a minimum of 10% provincial or territorial funding (cash or in-kind). The program provides funding for up to 75% of eligible project costs.

A.6.2 Species Conservation

1. Aboriginal Fund for Species at Risk (see report Table 4-5 item G): Funding is provided for the conservation and recovery of at risk species including habitat protection, habitat improvement, program planning and development, and surveys, inventories and monitoring. A minimum of 20% of matching contributions is required. For every $1 that is provided, $0.20 must be raised through financial or in-kind resources.

A.6.3 Energy, Mining, Forestry, and Agriculture

1. Agricultural Clean Technology Program (see report Table 4-5 item A): The Agricultural Clean Technology Program is a $25-million, three-year investment (2018 – 2021) which aims to support the research, development and adoption of clean technologies through investments in, and promotion of precision agriculture and agri-based bioproducts. These technologies will help to reduce greenhouse gas emissions, generate a wide range of positive impacts, and promote sustainable and clean growth. Support is available in the form of non-repayable contributions from Agriculture and Agri-Food Canada through projects delivered by provincial and territorial governments.

2. Clean Growth Program (see report Table 4-5 item G): You may be eligible for funding if you operate a natural resources or clean technology business and are working on cleantech projects in the areas of energy, mining and forestry. Eligible activities in natural resource operations include:
   a. Reducing greenhouse gas and air emissions;
   b. Minimizing landscape disturbances and improving waste management;
   c. The production and use of advanced materials and bioproducts;
   d. Efficient energy use and productivity;
   e. Reducing water use and impacts on aquatic ecosystems.

All projects will be required to secure provincial/territorial support.

A.6.4 Transportation

1. Green Freight Assessment Program (see report Table 4-5 item G): You could receive funding of up to $10,000 to review the state of your fleets to help make informed decisions to reduce your fuel costs, and your greenhouse gas emissions.

---

236 https://canadabusiness.ca/programs/green-freight-assessment-program/
The application form consists of 4 sections:
   a. Company information;
   b. Business operation;
   c. Fleet portrait;
   d. Previous assessment experience and readiness.

2. Impact Canada Initiative – Cleantech Impact Program\(^{237}\) (see report Table 4-5 item A,G): Cleantech Impact, part of Impact Canada, will invest $75 million over four years into various programs. The Sky's the Limit Challenge will stimulate the development of sustainable aviation fuel supply chains so that the Canadian aviation industry can further reduce its greenhouse gas emissions and lower the flying public's environmental footprint. The Challenge consists of two competitions open to a range of innovators:
   a. The Green Aviation Fuels Innovation Competition provides $2 million apiece for four teams who develop the most innovative solutions, which, in turn, will support their next endeavour: an 18-month competition to produce the most economical and environmentally sustainable aviation fuel and win the $5-million grand prize;
   b. The Cross-Canada Flight Competition offers a $1 million prize to the first participant to fuel a Canadian commercial flight using a minimum 10% blend of made-in-Canada biojet fuel.

3. Public Transit Infrastructure Fund (PTIF)\(^{238}\) (see report Table 4-5 item G): The Public Transit Infrastructure Fund provides short-term funding to help accelerate municipal investments that support the rehabilitation of transit systems, new capital projects, and planning and studies for future transit expansion to foster long-term transit plans. These investments work to improve commutes, cut air pollution, strengthen communities and grow Canada’s economy. Investments of $3.4 billion will be made over three years to upgrade and improve public transit systems across the country. An additional $25.3 billion will be provided over the next decade.

A.6.5 Infrastructure

1. Building Canada Fund\(^{105}\) (see report Table 4-5 item G,H): Major Infrastructure Component (MIC): The Building Canada Fund – Major Infrastructure Component targets larger infrastructure projects of national or regional significance. It increases overall investment in public infrastructure and contributes to broad federal objectives: economic growth, a cleaner environment and strong and prosperous communities. At least two-thirds of the funding is targeted to national priorities: water, wastewater, public transit, the core national highway system, and the green energy.

2. Building Canada Fund\(^{238}\) (see report Table 4-5 item G): Communities Component (CC): The Building Canada Fund – Communities Component supports infrastructure needs of

\(^{237}\) http://www.ic.gc.ca/eic/site/009.nsf/eng/home#p1
\(^{238}\) http://www.infrastructure.gc.ca/prog/programs-infc-summary-eng.html#ptif
smaller communities with populations of less than 100,000. The fund supports the construction, renewal, and enhancement of basic infrastructure such as potable water, wastewater treatment, local roads, and other infrastructure needs of small communities. Projects costs are shared with provincial, territorial and municipal governments, with each order of government generally contributing one-third of the eligible costs. The fund promotes a cleaner environment, a competitive economy and liveable small communities.

3. **Clean Water and Wastewater Fund (CWWF)**\(^{238}\) (see report Table 4-5 item G): The Clean Water and Wastewater Fund provides funding to projects that contribute to the rehabilitation of both water treatment and distribution infrastructure and existing wastewater and storm water treatment systems; collection and conveyance infrastructure; and initiatives that improve asset management, system optimization, and planning for future upgrades to water and wastewater systems. The Government has provided $2 billion in funding for the CWWF.

4. **Disaster Mitigation and Adaption Fund (DMAF)**\(^{238}\) (see report Table 4-5 item H): The Disaster Mitigation and Adaptation Fund (DMAF) is a national, competitive, merit-based contribution program. The DMAF is aimed at strengthening the resilience of Canadian communities through investments in large-scale infrastructure projects, including natural infrastructure projects, enabling them to better manage the risk associated with current and future natural hazards, such as floods, wildfires and droughts. The Disaster Mitigation and Adaptation Fund started in 2018 and is scheduled to end in 2028.

5. **Gas Tax Fund (GTF)**\(^{238}\) (see report Table 4-5 item G): The Gas Tax Fund provides municipalities with a permanent, predictable and indexed source of long-term funding, enabling construction and rehabilitation of core public infrastructure. It offers local communities the flexibility to make strategic investments across 18 different project categories, including roads and bridges, public transit, drinking water and wastewater infrastructure, and recreational facilities. The fund promotes investments in increased productivity and economic growth, a clean environment, and strong cities and communities.

6. **Green Infrastructure Fund (GIF)**\(^{239}\) (see report Table 4-5 item G): The Green Infrastructure fund supports environmental infrastructure projects that promote reduced greenhouse gas emissions, cleaner air, cleaner water and cleaner land. There are five eligible categories of investment: wastewater infrastructure, green energy generation infrastructure, green energy transmission infrastructure, solid waste infrastructure, and carbon transmission and storage infrastructure. By providing up to 50 percent federal funding on a cost-shared basis, the fund leverages additional investments from other partners. The program has $5 billion available over five-years for infrastructure projects designed to protect communities and support Canada’s transition to a clean growth economy. Of this, $2 billion is reserved for Canada’s Clean Water and Wastewater fund (see CWWF) which is designed to provide communities with reliable water and wastewater systems. The Government of Canada made an additional $21.9 billion

\(^{239}\) https://www.infrastructure.gc.ca/plan/gi-iv-eng.html
available for green infrastructure and supports the initiatives outlined in the Pan-Canadian Framework on Clean Growth and Climate Change.

7. Municipal Asset Management Program\textsuperscript{240} (see report Table 4-5 item G): The Government of Canada is funding the Federation of Canadian Municipalities Municipal Asset Management program which is designed to address the challenges that municipalities are facing in aging infrastructure. The program provides $50 million over five-years to make informed infrastructure investment decisions.

A.6.6 Green Buildings

1. Canadian Industry Program for Energy Conservation\textsuperscript{241} (see report Table 4-5 item G): By attending customized workshops, you can learn how to help your organization increase its energy efficiency and reduce costs. Other tools and services can help you calculate and reduce energy consumption. If you choose to implement the ISO 50001 Standard at your facilities, you may be eligible to receive up to $40,000 to help cover implementation costs and those of related studies. To be eligible, you must:
   a. Register your facility with NRCan as a CIPEC Leader;
   b. Have your proposal approved before work begins.

2. MHC Green Home Program\textsuperscript{101} (see report Table 4-5 item F): Offers a refund of up to 25% of the mortgage insurance premium paid by mortgagees who use their mortgage to fund the purchase, construction or renovation of energy efficient buildings using CMHC-insured financing. A 15% premium refund is available for a home built to ENERGY STAR® building standards and a 25% premium refund is available for a home built to R-2000 building standards.

3. New Building Canada Fund Provincial-Territorial Infrastructure Component – Small Communities Fund (PTIC-SCF)\textsuperscript{238} (see report Table 4-5 item G): The PTIC-SCF provides contribution funding for infrastructure projects in small communities with populations of 100,00 or less. The PTIC-SCF supports projects of national, regional, and local significance that contribute to economic growth, a clean environment, and stronger communities. Projects will allow people and goods to move more freely, increase the potential for innovation and economic development, and improve the environment while supporting stronger, and safer communities.

4. New Building Canada Fund – Provincial-Territorial Infrastructure Component – National and Regional Projects (PTIC-NRP)\textsuperscript{238} (see report Table 4-5 item G): The New Building Canada Fund – Provincial-Territorial Infrastructure Component – National and Regional Projects provides funding to support infrastructure projects of national and regional significance that contribute to economic growth, a clean environment and stronger communities. The PTIC-NRP is an allocation-based program that recognizes and supports the

\textsuperscript{240} https://fcm.ca/home/programs/municipal-asset-management-program/municipal-asset-management-program.htm
\textsuperscript{241} https://canadabusiness.ca/programs/canadian-industry-program-for-energy-conservation-1/
role that provinces, territories, and municipalities play in helping to build Canada's public infrastructure. Projects will allow people and goods to move more freely, increase the potential for innovation and economic development, and help to improve the environment and support stronger, safer communities.

5. **Low Carbon Economy Challenge**\(^{242}\) (see report Table 4-5 item G): Are you working on reducing GHG emissions and generating clean growth? You may be eligible for funding of no less than $1 million and up to $50 million. The Champions stream offers funding for projects based primarily on reducing greenhouse gas emissions and that meet 4 key principles:
   a. Tangible and measurable GHG emissions reductions;
   b. Incrementality;
   c. Contributing towards Canada’s 2030 emission reduction target;
   d. Cost-effectiveness.

Some of the eligible project costs can include salaries, supplies, equipment and other operation costs. The Deadline to apply for the Champions stream has passed, however, the Partnerships stream will be open for applications later in 2018-2019.

### A.6.7 Equipment

1. **Applied Research and Development Grants**\(^{94}\) (see report Table 4-5 item A, G): Up to $150,00 in funding may be provided to a business that partners with an eligible Canadian college to develop clean technologies. The grant could total $150,000 when the business covers 50% or more of the costs or $75,000 when the business covers 50% or less of the project cost. The business must be Canadian-based and the research must be used.

   Canada Small Business Financing Program: This program could help you secure up to $1 million from a financial institution by sharing the risk with your lender. Eligible small businesses should have annual gross revenues of no more than $10 million.

   The loans can be used to:
   a. Purchase or improve land or buildings;
   b. Purchase leasehold improvements or improve leased property;
   c. Purchase new or used equipment.

2. **Sustainable Development Technology Fund**\(^{243}\) (see report Table 4-5 item G): If you create technology that deals with climate change issues, clean air, clean water or soil quality, you could get funding to cover up to 33% of the costs involved in developing and testing your product.

   To qualify, you need to:
   a. Have expertise in sustainable development technology
   b. Be part of a project consortium

   Your product or process must be used to:

---

\(^{242}\) [https://canadabusiness.ca/programs/low-carbon-economy-challenge/](https://canadabusiness.ca/programs/low-carbon-economy-challenge/)

\(^{243}\) [https://canadabusiness.ca/programs/sustainable-development-technology-fund-1/](https://canadabusiness.ca/programs/sustainable-development-technology-fund-1/)
a. Produce and distribute energy
b. Create electricity (for example, solar power)
c. Remove pollutants in certain industry sector

3. **Sustainable Development Technology Canada – SD Tech Fund**\(^{244}\) (see report Table 4-5 item A, G): The SD Tech Fund supports the development and demonstration of pre-commercial clean technologies (renewed with $400 million over five years). Applications are accepted on a continuous basis.

**A.6.8 On-Site Renewables**

1. **Emerging Renewable Power Program**\(^{107}\) (see report Table 4-5 item G): The Emerging Renewable Power Program (ERPP) provides up to $200 million to expand the portfolio of commercially viable renewable energy sources available to provinces and territories as they work to reduce GHG emissions from their electricity sectors.

Eligible projects are large size, utility-scale electricity generation projects from renewable energy resources that have not yet been commercially deployed in Canada. Eligible technologies include:

a. geothermal power;
b. concentrated photovoltaic;
c. instream tidal;
d. off shore wind;
e. other (must explain how it meets the definition of an emerging renewable power technology).

2. **Federal Tax Provision for Clean Energy**\(^{245}\) (see report Table 4-5 item C): Businesses (including farms) are allowed to depreciate the cost of their solar power system at an accelerated capital cost allowance rate of 50% on a declining balance basis.

3. **Solar Panel Power Canada Cash Incentive Program**\(^{246}\) (see report Table 4-5 item F): The Solar Panel Power Canada Cash Incentive program is open to eligible Canadian residents who purchase and install a solar power system, 5 kW or larger, from a qualified installer within 6 months of requesting a free estimate. The incentive value is always equal to the number of years that Canada has been an independent country (this year, the value is $151 for a 5 kW system).

4. **Tax incentives for Clean Energy Equipment**\(^{96}\) (see report Table 4-5 item C): The *Income Tax Act* and *Income Tax Regulations* include the following measures to encourage Canadian taxpayers to make investments in qualifying clean energy generation and energy conservation projects:

\(^{244}\) [http://www.ic.gc.ca/eic/site/099.nsf/eng/home#p1](http://www.ic.gc.ca/eic/site/099.nsf/eng/home#p1)

\(^{245}\) [https://solarpanelpower.ca/rebates-incentives-tax-credits-canada/#federal](https://solarpanelpower.ca/rebates-incentives-tax-credits-canada/#federal)

\(^{246}\) [https://solarpanelpower.ca/cash-incentive-program/](https://solarpanelpower.ca/cash-incentive-program/)
a. an accelerated capital cost allowance (CCA) for investments in clean energy generation and energy conservation equipment;

b. Canadian renewable and conservation expense (CRCE), which is a category of expenditures relating to the development of eligible clean energy generation and energy conservation projects that may be deducted in full in the year incurred, carried forward indefinitely for use in future tax years or renounced under a flow-through share agreement; and

c. Atlantic investment tax credit of 10% of the cost of prescribed energy generation and conservation properties;

d. Under Classes 43.1 and 43.2 in Schedule II of the Income Tax Regulations, certain capital costs of systems that produce energy by using renewable energy sources or fuels from waste, or conserve energy by using fuel more efficiently are eligible for accelerated capital cost allowance. Under Class 43.1, eligible equipment may be written-off at 30 percent per year on a declining balance basis. In general, equipment that is eligible for Class 43.1 but is acquired after February 22, 2005 and before year 2025 may be written-off at 50 percent per year on a declining balance basis under Class 43.2. Without these accelerated write-offs, many of these assets would be depreciated for income tax purposes at annual rates between 4 and 20 percent.

5. **Science Horizons Youth Internship Program**\(^\text{247}\) (see report Table 4-5 item D): Environment and Climate Change Canada's Science Horizons supports green jobs for youth by providing wage subsidies to eligible employers to hire interns in the environmental sector. Interns must be recent college or university graduates in science, technology, engineering or math (STEM). The program is delivered by our two agents, Environmental Careers Organization Canada (ECO Canada) and Colleges and Institute Canada, who deliver the Environmental Youth Corps and the Clean Tech Internship Program, respectively. A maximum of $15,000 is provided per year.

6. **Scientific Research and Experimental Development (SR&ED) Program**\(^\text{248}\) (see report Table 4-5 item A, C): The Scientific Research and Experimental Development (SR&ED) Program is a federal tax incentive program designed to encourage Canadian businesses of all sizes and in all sectors to conduct research and development (R&D) in Canada. The program is administered by the Canada Revenue Agency (CRA), which delivers SR&ED tax incentives in a timely, consistent and predictable manner, while encouraging businesses to prepare their claims in compliance with Canada’s tax laws and the CRA’s policies and procedures. Generally, a Canadian-controlled private corporation (CCPC) can earn a refundable ITC at the enhanced rate of 35% on qualified SR&ED expenditures, up to a maximum threshold of $3 million. This 35% ITC is 100% refundable on qualified SR&ED expenditures and 40% refundable on qualified SR&ED capital expenditures incurred before 2014. A CCPC can also earn a non-refundable ITC at the basic

---

\(^{247}\) https://www.canada.ca/en/environment-climate-change/services/environmental-funding/programs.html

\(^{248}\) https://www.canada.ca/en/revenue-agency/services/scientific-research-experimental-development-tax-incentive-program.html
rate of 15% on an amount over the $3 million threshold. A CCPC that meets the definition of a qualifying corporation can earn a refundable ITC at the basic rate of 15% on an amount over the $3 million threshold, of which 40% can be refunded. Other corporations can earn a non-refundable ITC at the basic rate of 15% on qualified SR&ED expenditures. The ITC can be applied to reduce tax payable. Individuals (proprietorships) and trusts can earn a refundable ITC at the basic rate of 15% on qualified SR&ED expenditures. The ITC must be applied against tax payable and the remaining ITC can be refunded, up to a maximum of 40%.

7. **Climate Action Fund**\(^{249}\) (*see report* [Table 4-5 *item G]*): The Climate Action Fund (CAF) supports climate actions in communities across the country. It seeks to increase the awareness and participation in climate action initiatives among Canadians, especially youth, students, Indigenous populations and organizations, and small and medium businesses. The maximum federal contribution per project is $500,000. The only exception is for for-profit entities, where the maximum is $200,000. Up to $3 million in funding is available. There are no minimum funding levels. The objectives of the project are to ensure that:
   a. Canadians are more aware of the required actions to address climate change;
   b. Youth, students and indigenous Peoples and organizations are engaged on clean growth and climate change initiatives;
   c. Communities are better suited to reduce GHG emissions and are more resilient to the impacts of climate change;

8. **The Municipalities for Climate Innovation Program**\(^{250}\) (*see report* [Table 4-5 *item A, D, G*]: This Program is provided by the Federation of Canadian Municipalities and funded through the Government of Canada and is a five-year $75 million program that provides funding, training and resources to help Canadian municipalities to adapt to the impacts of climate change and to reduce their GHG emissions. MCIP includes grants for plans, feasibility studies and capital projects, and temporary salary offsets for municipal staff who implement climate change initiatives. The type of initiatives the program supports include:
   a. The assessment of the vulnerability to flooding of buildings in a neighbourhood;
   b. Ways to reduce GHG emissions from waste collection trucks by optimizing routes and reducing the frequency of garbage and recycling pick-up;
   c. Plans to encourage residents to use less polluting forms of transportation by encouraging cycling, walking and transit;
   d. The impact of a municipal policy change, such as a no-idling policy.

The MCIP helps municipalities by:
   a. Raising awareness of climate change, its impacts on infrastructure, and how municipalities can manage the associated risks;

---


\(^{250}\) [https://fcm.ca/home/programs/municipalities-for-climate-innovation-program/about-municipalities-for-climate-innovation-program.htm](https://fcm.ca/home/programs/municipalities-for-climate-innovation-program/about-municipalities-for-climate-innovation-program.htm)
b. Providing technical expertise to municipalities through training and workshops;
c. Funding municipal projects, such as hybrid vehicle purchase and solar thermal water heater programs for homes or institutional buildings;
d. Gathering and sharing relevant knowledge and lessons learned about the experiences gained through the program by participating municipalities with the rest of the municipal sector.
APPENDIX B: ENABLING POLICIES FOR SOLAR ENERGY

There are a number of policy approaches and examples available in industry to those municipalities wishing to more actively support solar energy. Pembina Institute undertook a significant research effort on this topic recently and has published their results online at:

http://www.mccac.ca/resources/solar-friendly-municipalities

The sections below will offer highlights of some of the most effective supports referenced specifically in the main body of this net-zero neighbourhood study.

B.1 Halifax “Solar City” Solar Loans Program

The City of Halifax offers a municipal loan program\(^{251}\) to encourage the use of solar energy, making it affordable and more accessible for more residents to switch to solar energy for heating, as opposed to more typical fossil fuel sources available in the area.

The municipality provides loans to homeowners to install solar water-heating equipment. Homeowners repay the loans through their property taxes, and the savings in energy and water costs make repayment easier.

Halifax named this loan program their “Solar City” pilot project and launched it with funding support from the Green Municipal Fund (GMF), administered by the Federation of Canadian Municipalities (FCM). The program was designed to be revenue neutral for the municipality and cost neutral for homeowners. The project has inspired other municipalities to test similar models.

B.2 Sample Solar “Right-To-Light” By-law

This appendix section includes a number of examples of different types of solar protection legislation from across the USA. Most examples seem to focus on protecting a property owner’s right to install solar energy systems, and some have leveraged legal instruments such as easements to protect access to sunlight over time. This section offers a sampling of representative programs, and a recommendation for how such a program might best be implemented in Canadian municipalities.

As noted in the main body of the report, projects which include solar panels and solar energy harvesting technology are dependent upon ongoing access to sunlight which can be difficult to protect, especially in densifying / gentrifying neighbourhoods. Solar by-laws of various natures have been considered in many different locations across North America as a means to help protect access to sunlight, and to ensure that solar projects remain viable over time. Without having some level of legal protection, the rate of gentrification / construction can be a significant risk to the future business viability of a solar system, which makes it difficult for developers to place confidence in the long-term availability of energy from the solar systems they would

\(^{251}\) https://www.halifax.ca/home-property/solar-projects/about-solar-city-halifax
install. For these reasons and more, this report saw value in seeking precedent legislation from as many jurisdictions as were identifiable during the study period.

At the time of this publication, the research team was unable to find any examples of Canadian Solar Right-To-Light By-laws or similar enabling legislation. The following examples of Solar Easements and Solar Protection Rights have been implemented in various municipalities in the United States of America, as listed below.

Solar Easements are agreements made by two or more property owners to ensure that a solar system is not infringed upon to the agreed upon amount. Typically, some form of incentive is provided to ensure an agreement can be reached. Contrarily, a Solar Protection Ordinance legally outlines conditions for vegetation or new developments to protect an installed solar PV system.

B.2.1 The State of California: Solar Easements and the Solar Shade Control Act

California’s Civil Code provides that neighbors may voluntarily sign solar easements to ensure that proper sunlight is available to those operating solar energy systems. California’s government code (65850.5) provides that subdivision may include solar easements applicable to all plot within the subdivision in their plans. California’s Public resources code (25980) contains the Solar Shade Control Act, which encourages the use of trees and other natural shading except in the case where the shading will interfere with the use of active and passive solar systems on adjacent properties. The law provides that a tree or shrub cannot cast a shadow which covers more than 10% of a solar collector’s absorption area at any one time between the hours of 10 am and 2 pm if the tree is planted after the installation of the solar collector.

In general, this legal approach is one of banning and preventing any form of development which might impinge upon the solar access of an already installed and protected solar system.

For more information:

- [http://programs.dsireusa.org/system/program/detail/294](http://programs.dsireusa.org/system/program/detail/294)
- [http://programs.dsireusa.org/system/program/detail/2722](http://programs.dsireusa.org/system/program/detail/2722)

B.2.2 Santa Clara County, CA: Solar Access Easements

In proposed subdivision where a building configuration has been developed, solar access easements will be designed to protect solar access to proposed south roof and south wall areas and any proposed site for a solar energy system. For subdivisions that have not been developed, solar access to the southernmost boundary of the buildable portion of a lot will be protected. In cases where a building configuration is not able to reasonably protect solar access to a proposed south facing element, the advisory agency acting on behalf of the municipality may require the preparation and dedication of solar access easements as a condition of approval for any subdivision application that contains one or more proposed lots under one acre. Solar access easements shall not be required in cases where the lot that would be benefited is equal to or greater than one acre or where solar access is not available.
In general, this legal approach is one of using easements to assign the owner of the solar system (eg: on Property A) with a permanent legal right to have access to the sun over another neighbouring property / properties (eg: Property B). This invokes certain unintended consequences where the property over which the easement protects solar access, for example, making it impossible for the owner of Property B to renovate their home or landscape their yard without first obtaining permission from the owner of Property A. The wording on such easements must be done very carefully, and as will be seen below, easements are not recommended as the preferred legal instrument for protecting solar access.

For more information: http://programs.dsireusa.org/system/program/detail/5911

### B.2.3 Santa Cruz County, CA: Solar Access Protection

The County of Santa Cruz has expressed concern that although the California Solar Rights Act of 1978 requires local governments to plan for future passive or natural heating or cooling opportunities in new residential construction, and the California Shade Control Act protects solar systems from being shaded by vegetation, current state and local laws do not explicitly protect installed solar energy systems from being shaded by structures.

The County of Santa Cruz has developed a process for registering solar energy systems to provide protection to solar energy system owners. Once the owner registers their system, the County’s Building Regulations Code\(^\text{252,253}\) requires that any obstructions of solar access to a registered solar energy system be mitigated to the maximum extent feasible during the review of any permit to construct a building, wall, fence or other structure, or part of structure on a property that could have an adverse impact on the registered solar system. The Code also contains a provision to protect registered systems from shading by vegetation on neighboring properties.

For more information: http://programs.dsireusa.org/system/program/detail/1113

### B.2.4 State of Utah: Solar Rights Act, 2017

Utah’s solar rights law prohibits community association governing documents other than declarations and association rules from prohibiting or restricting owners of detached dwellings from installing solar energy systems. The solar rights law does not apply to dwellings where the association has an ownership interest in the roof or to express prohibitions or restrictions on solar energy systems recorded in declarations of created by official association action before January 1, 2017. Declarations and associations may require that solar energy systems meet safety, building and performance standards.

State law also stipulates that local zoning authorities may adopt regulations that mandate solar access and specifically grants governing bodies the right to refuse a plot of land or subdivision

\(^{252}\) [https://www.codepublishing.com/CA/SantaCruzCounty/#/SantaCruzCounty01/SantaCruzCounty01.html](https://www.codepublishing.com/CA/SantaCruzCounty/#/SantaCruzCounty01/SantaCruzCounty01.html)  
\(^{253}\) [https://www.codepublishing.com/CA/SantaCruzCounty/html/pdfs/SantaCruzCounty12.pdf](https://www.codepublishing.com/CA/SantaCruzCounty/html/pdfs/SantaCruzCounty12.pdf), noting particularly chapter 12.28 on Solar Access Protection
plan if deed restrictions, covenants, or other agreements running with the land prohibit or have the effect of prohibiting reasonably sited and designed solar collectors or other renewable resource devices.

This legislation is less about protecting solar system performance over time, and is more about protecting the rights of property owners to install solar energy systems on their own properties at all (in most, but not all cases). This was the most common style of solar “protection” law, and is a good example of others found in various locations across the US, such as New York State\textsuperscript{254}, Louisiana\textsuperscript{255}, Maine\textsuperscript{256}, and more.

### B.2.5 Boulder, CO: Solar Access Ordinance

**Solar Access:** Solar access is guaranteed on setting limits on the amount of shading that can result from a new development. The degree of solar access protection is defined by either a 12 foot or a 25-foot hypothetical boundary on the property line of the protected building. Under most circumstances, new developments are prohibited from casting a shadow on the adjacent lots that is greater than the 12 or 25-foot established boundary. There are three Solar Access Areas in Boulder based on a property’s zoning district. Depending on the applicable Solar Access Area, the designated lot is protected by either the 12 foot or 25 foot fence, or only through a solar permit process (ie: if protection is not already accorded, then a solar access permit may be sought per below, which will provide solar access protection).

**Solar Access Permitting:** A solar access permit is available to those who have installed (or who are planning to install) a solar PV system and need more protection than what would have been offered from the 12 or 25-foot solar boundary. If the permit is granted then it will last for the life expectancy of the solar PV system.

**Solar Siting Requirements:** All planned unit developments and subdivisions are required to be designed and constructed in a manner that provides reliable access to solar energy:

- a) oriented within 30 degrees of a true east-west direction;
- b) is flat or not sloped towards true north;
- c) is physically and structurally capable of supporting at least 75 square feet of un-shaded solar collectors for each individual dwelling unit in the building; and
- d) has unimpeded solar access through the ordinance or easements, covenants, or other private agreements among affected landowners.

Each non-residential building with an anticipated hot water demand of 1,000 gallons a day or more must have a roof surface meeting the following criteria:

- a) is flat or oriented within 30 degrees of a true east-west direction,
- b) is physically and structurally capable of supporting a solar collector or collectors capable of providing at least 50% of the anticipated hot water needs of the building, and

---

\textsuperscript{254} http://programs.dsireusa.org/system/program/detail/309  
\textsuperscript{255} http://programs.dsireusa.org/system/program/detail/4239  
\textsuperscript{256} http://programs.dsireusa.org/system/program/detail/3455
c) has unimpeded solar access through the solar access ordinance or other private agreements that protect solar access for the roof surface.

For more information: http://programs.dsireusa.org/system/program/detail/438

### B.2.6 Oregon: Solar/Wind Easements, Rights Laws & Local Option Solar Rights Law

Oregon’s solar access laws state that no person conveying or contracting to convey a property title can include provisions that prohibit the use of solar energy systems on the property. Any provisions that prohibit the use of solar energy systems are void and unenforceable.

Oregon’s solar and wind easements allow property owners to create solar (and wind) easements to protect proper access to sunlight (and wind). Easements are negotiated with neighboring property owners.

Oregon state law also allows municipalities and local authorities to establish solar access laws. Access laws are intended to protect solar access to the south face of buildings during solar heating hours, considering existing development, vegetation, and planned uses. The local ordinances may include standards for the orientation of new streets and lots, placement and height of new buildings, and the placement of new trees on public property. City and county laws are generally designed to protect south-facing roof space for active solar energy systems such as solar electric and solar hot water panels, as opposed to daylighting and passive solar heating that require southern exposure to a building’s wall.

### B.2.7 Ashland, OR: Solar Rights Ordinance

The City of Ashland has a solar rights and access protection ordinance containing solar setback provisions designed to ensure that the shadows at the north property line do not exceed a certain height, depending on the property’s location. Property owners can also apply for a Solar Access Permit to provide protection from shading by vegetation.

For more information: http://programs.dsireusa.org/system/program/detail/291

### B.2.8 Marin County: Solar Access Code

Marin County’s Energy Conservation Code requires that new subdivisions are designed so that streets, lots, and building setbacks must be designed so that habitable buildings are oriented with their long axis running east to west to allow for appropriate solar access. The planning director or planning commission may require solar access easements or restrictive covenants to protect solar access.

For more information: http://programs.dsireusa.org/system/program/detail/1114

### B.2.9 Recommendations for Canadian Municipalities
The previous sections above have offered several examples of legislative approaches used across the USA to protect a property owner’s right to install solar energy systems on their own properties. Some of these examples have used easements to protect long-term access to sunlight, but in practice it would be difficult to encourage neighbouring property owners to sign such easements, binding themselves to the exclusive benefit of their neighbours, and limiting the future opportunities on their own properties.

The example from the USA that seems most helpful to Canadian Municipalities is title 12.28 from Santa Cruz, CA. Adapted for use in Canada this document might read something like this:

**SAMPLE BY-LAW: SOLAR RIGHT TO LIGHT**

WHEREAS solar energy has been found to be an inexhaustible, reliable and nonpolluting energy resource that can contribute to the public health, safety and welfare of the citizens of [municipality] by lessening dependence upon non-renewable and imported energy sources;

AND WHEREAS the successful use of solar energy systems for supplying space heating and cooling, water heating or the production of electricity is dependent upon sufficient access to direct sunlight;

AND WHEREAS current Provincial and local laws do not protect installed solar energy systems from shading caused by structures, including unforeseen structures constructed after the solar energy systems were first designed and installed, and this represents a significant deterrent to the use of solar energy systems;

THEREFORE it is the intent of this by-law to protect and encourage the successful use of solar energy in new construction by requiring that solar access to solar energy systems be protected from shading by vegetation, and that protection of solar access to solar energy systems registered with the [municipality] be reviewed when construction on a neighboring property is proposed. It is likewise the intent of this by-law to provide adequate protection for the use of solar energy systems without prohibiting the normal development of property or of a community when such development is found by the [municipality] to be beneficial for the citizens of [the municipality].

**Definitions:**

For the purposes of this By-Law, the following words and phrases shall have the meanings ascribed to them by this section.

“**Approving body**” means the officer or hearing body which makes the determination on applications at each processing level, including the Planning Director, the Zoning Administrator, the Planning Commission and the Board of Supervisors.

“**Feasible**” means capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental and technological factors.

“**North**” means the direction of the terrestrial north pole.
“Registered solar energy system” means any solar energy system registered with the County as requesting solar access protection, and in compliance with the conditions for that registration.

“Solar access” means the ability of sunlight to strike a solar energy system. For the purpose of this chapter, protection of solar access requires locating buildings and trees where their shadows will not obstruct more than 10 percent of the sunlight available to the solar energy system between the hours of 10:00 a.m. and 2:00 p.m., [local] Standard Time, on Dec. 21st.

“Solar energy system” means any solar collector or other solar energy device, or any structural design feature of a building whose primary purpose is to provide for the collection, storage and distribution of solar energy for space heating or cooling, for water heating or for electricity. Glazing facing within 45 degrees of south is protected, under the provisions of this chapter, as a solar energy system when at least 60 percent of the space heating load for the building is supplied by solar energy.

“Solar impacting property” means any property whose buildings, fences, other structures or vegetation interfere with, or are likely in the future to interfere with, the solar access of any registered solar energy system.

“Solar improved property” means any property whose solar access to a registered solar energy system may be adversely affected by construction or vegetation on the parcel for which a development permit is being requested.

“South” means the direction of the terrestrial south pole.

“Unobstructed sunlight” means energy from the sun which is not blocked by any visible matter or structure and which is devoid of shadows.

“Vegetation” means all plant life.

Protection of solar access:

1. Protection from Shading by Structures. Subsequent to the effective date of the ordinance codified in this chapter, any obstructions of solar access to a registered solar energy system shall be mitigated to the maximum extent feasible during the review of any permit to construct a building, wall, fence or other structure, or part of a structure on a solar impacting property.

   a. If a project is proposed which includes Structures that would cause a property to become a solar impacting property and to shade a registered solar energy system, then the person owning or in control of the property proposed to become a solar impacting property shall have, at their option, the ability to negotiate privately with the owner of the registered solar energy system. The [municipality] shall be permitted to introduce the two parties to each other for the purposes of resolving the solar impact on the registered solar energy system. Potential resolutions may include:
i. The person owning or in control of a solar impacting property paying 100% of all expenses required to relocate the registered solar energy system to a property that is unobstructed, and to register the relocated system anew as a registered solar energy system in its new location. This may include relocating the registered solar energy system onto the solar impacting property.

ii. The person owning or in control of a solar impacting property paying the person owning or in control of the registered solar energy system an amount equal to (1) the full original purchase value of the registered solar energy system and any contract material or labour costs required to remove the solar energy system and repair the building to as-new condition, or (2) the value of future energy which would be produced by the registered solar energy system, that being calculated by an independent energy professional such as a Certified Energy Advisor (for homes) or a Professional Engineer (for non-homes) using accepted industry best practice as supported by energy modeling and related software and tools administered by Natural Resources Canada. If the two parties cannot agree on the value of future energy then the [municipality] may be engaged (for a fee to be negotiated on a case by case basis) to calculate this value as a unbiased third party, in which case the municipal opinion on the value of future energy will be deemed to be final and binding upon both parties for a period of 180 days.

iii. Any other private arrangement agreeable to the person owning or in control of the solar impacting property and the person owning or in control of the registered solar energy system.

b. If the person owning or in control of the registered solar energy system is willing to accept an offer negotiated with a solar impacting property as described above in clause 1.a., then the person owning or in control of the registered solar energy system shall send a formal typed letter to the [municipality] including:

i. A copy of the agreement reached with the person owning or in control of the solar impacting property and any relevant supporting information such as an energy model used under clause 1.a.ii., signed and/or sealed by the qualified professional who authored the report.

ii. The following statement:

“I have reached an agreement with a neighbour who wishes to construct a structure that will cause their property to impact my Right-To-Light for my registered solar energy system. I hereby formally request that the protections accorded to me and my registered solar energy system under the Right-To-Light program be temporarily suspended until further notice in order to accommodate that aforementioned agreement, which I have enclosed with this letter, until that agreement has come into full effect,”
and thereafter that my registered solar energy system be deregistered from the program.”

c. The person owning or in control of a solar impacting property shall behave at all times in good faith and shall be fully liable to the owner of the registered solar energy system to restore their property to as good or better condition as it was prior to their negotiations to the satisfaction of the owner of the registered solar energy system and to the satisfaction of the municipality. If the two parties’ agreement should fail for any reason then the municipality will re-register the solar energy system in the Right-To-Light program and restore the protections which were in force prior to their negotiation. The persons owning or in control of both properties, the solar impacting property and the property of the registered solar energy system, acknowledge that their private negotiations are entirely separate from the municipality. Both parties must agree to indemnify and hold harmless the municipality from any and all damages potentially arising from their private negotiations and to sign whatsoever separate documents as may be required by the municipality in order to further solemnize this indemnification.

2. Protection from Shading by Vegetation. No person owning or in control of a solar impacting property shall allow a tree or shrub to be placed, or, if placed, to grow on such property, subsequent to the installation of a solar energy system on solar improved property so as to cast a shadow greater than 10 percent of the solar energy system absorption area at any one time between the hours of 10:00 a.m. and 2:00 p.m., local standard time; provided, that this section shall not apply to specific trees and shrubs which at the time of installation or within 365 days following such installation, cast a shadow upon that solar energy system. A person desiring protection under the provisions of this chapter shall demonstrate to the satisfaction of the Planning Director that the solar energy system was not shaded at the time it was installed and during any 365-day cycle following installation. Evidence may include, but is not limited to, notarized photographs. For the purposes of this chapter, the location of a solar energy system is required to comply with building and setback regulations and to be set back not less than five feet from the property line, and no less than 10 feet above the ground. A solar energy system may be less than 10 feet in height, only if in addition to the five-foot setback, the collector is set back three times the amount lowered.

3. Civil Action. No violation of the terms of this chapter or civil liability based on this chapter shall ensue from a utilities inspection of a solar system or issuance of a solar rebate or other incentive under any other program offered by [the municipality].

4. Exemptions. Nothing in this chapter shall apply to trees planted, grown, or harvested on timberland or on land devoted to the production of commercial agricultural crops. Nothing in this chapter shall apply to the replacement of a tree or shrub which had been growing prior to the installation of a solar collector and which, subsequent to the installation of such solar collector, dies.

Registration of solar energy systems.
5. Application Procedure. Any owner of a solar energy system, or applicant for a building permit for a solar energy system, desiring solar access protection under this chapter must apply to the Planning Department for registration of the solar energy system. The applicant shall provide the following information in addition to the information required for permit applications.

a. Names and addresses of solar impacting property owners; and addressed, stamped, envelopes for all solar impacting property owners;

b. The location and shadow patterns of all buildings, walls, fences, and vegetation on the property and on the adjacent parcels to the west, south and east;

c. Location and height above grade of the existing or proposed solar energy system;

d. Information demonstrating that the applicant has designed and located the solar energy system so as to cause the least restriction of development on solar impacting properties;

e. The percent of energy provided by the solar energy system; and, when protection is requested for glazing, calculations demonstrating the proportion of heating load supplied by solar energy.


a. The Building Official shall review all complete applications for solar energy system registration, requesting protection of solar access, for location of the system, size of the system and other factors.

b. The Building Official shall notify all solar impacting property owners identified in the application, and the parcel record sheets for these parcels will be updated to include the request for solar access protection.

c. The Building Official shall consider the comments submitted by solar impacting property owners, and may condition the application for registration of the solar energy system in order to reduce development restrictions on solar impacting property owners, based on the following standards:

   i. The solar energy system shall be designed and located so as to cause the least restriction of development on solar impacting properties.
   
   ii. The Building Official may require relocation of a solar energy system resulting in a reduction in system efficiency if the Building Official determines that the applicant’s selected site results in undue restriction of development on a solar impacting property.
   
   iii. The request for solar access protection shall be consistent, to the maximum extent feasible, with other design criteria.
iv. Solar access protection for the registered solar energy system shall not prevent construction of a single-story structure, not exceeding 10 feet at the top plate of exterior walls, which could not otherwise be reasonably designed or located to avoid shading the solar energy system.

v. The approving body shall review the registered solar energy systems, and requests for the protection of solar access prior to issuing any building permits or development permits on solar impacting properties. Solar access shall not be deemed to be protected from construction or vegetation occurring on any properties not identified by the applicant as a solar impacting property.

d. Protection of solar access shall be balanced with protection of development potential on solar impacting properties. The level of solar access protection shall be based on the standards set forth in this section.

i. Shading which obstructs 10 percent or less of the sunlight available to the solar energy system between 10:00 a.m. and 2:00 p.m. on December 21st, by construction on solar impacting properties shall be permitted; provided, that the land development or building permit applicant for the solar impacting property demonstrates that shading does not exceed said obstruction level.

ii. Expansion of existing structures which would block solar access to a registered solar energy system shall not be permitted.

iii. Buildings, walls, fences and other structures, and vegetation, which existed, or a building permit had been issued for such structure (or such structure was built prior to the time a permit was required), prior to the registration of the solar energy system shall not be subject to the provisions of this chapter; provided, that such permit is still valid, and the building or structure conforms to the legal requirements of the County Building Code in existence at the time the permit was issued.

7. Invalidation of Registered Solar Energy Systems. The registration of any solar energy system shall be rendered invalid upon: failure to construct a solar energy system within 12 months of registration; permanent removal or change in location of the solar energy system; permanent abandonment of the use of the solar energy system; as determined by the Building Official.

Exceptions.

8. A request for an exception from the provisions of this chapter or the permit conditions may be approved, conditionally approved or denied by the approving body if the exception is necessary to ensure that the provisions of other chapters of the County Code are met, including but not limited to Chapter 16.20 SCCC, Grading Regulations, Chapter 16.22 SCCC, Erosion Control, Chapter 16.30 SCCC, Riparian Corridor and Wetlands Protection, and Chapter 16.34 SCCC, Significant Trees Protection; or if it can be
demonstrated by technical information that the exception is necessary to ensure public health, safety and welfare.

9. A request for an exception must state in writing the provision from which the exception is proposed, the proposed substitute provisions, when the exception would apply and its advantages. In granting an exception, the approving body shall be guided by the following findings:

   a. There are special circumstances or conditions affecting the property;

   b. Adequate measures will be taken to ensure consistency with the purposes of this chapter to the maximum extent feasible;

   c. Relinquishing solar access protection will permit the attainment of other County objectives and contribute a greater public benefit than the continued protection of solar access.

Violations

10. It shall be unlawful for any person to refuse or fail to correct any shading of a solar energy system by vegetation in violation of this by-law.

Nuisance abatement of violation

11. If the responsible party fails to act in response to written notification from the Planning Director, the shading problem may be declared a public nuisance, and be abated according to the standard municipal procedure as detailed in [refer to appropriate local bylaw].

Fees

12. Reasonable fees may be imposed by resolution of the [municipality] to cover the cost of administering this By-law and may be collected along with existing fees for related plans approvals applications.
APPENDIX C: ENABLING POLICY FOR DISTRICT ENERGY

District Energy (DE) is a complex and colourful topic, precisely because there are so many ways to address energy at district scale. As described in the main body of the report (see Table 3-79, pg. 46), the term “District Energy” (or “DE” for short) is typically used to refer to thermal energy networks which provide heating/cooling to multiple buildings, and the term “micro-utility” is typically used to refer to electrical power networks which provide power locally to a group of buildings. The two terms are technically interchangeable, since both are local energy systems, but in practice they are used to refer to thermal energy and electricity respectively. The Canadian public is largely unaware that hospital and academic campuses have been using district energy systems for decades, and so district energy is yet an emerging topic in Canada.

Here are some examples of district energy systems that have recently earned public attention in varying degrees:

1) Consolidated Edison Company of New York:
   - Serves ~18,000 buildings;
   - Avoids about 350 MW of electricity on grid because customers use steam driven chillers for air conditioning;
   - More than 50% of its steam is produced by CoGen (CHP) units.

2) University of Texas at Austin:
   - Its combined heat and power plant has produced 100% of the electricity used on campus since 1929 (at one of the largest universities in the US at 7,000,000 ft²!);
   - Saved $170 million worth of energy between 1996 and 2008;
   - Additional projects started in 2010 will return campus to 1977 fuel consumption and emission levels.

3) District Energy St. Paul:
   - Operates a combined heat and power facility where 70% of annual fuel is supplied by municipal wood residue, avoiding landfill while providing energy;
   - Helped to reduce CO₂ emissions by 280,000 tons/year;
   - Supplies 25 MW of electricity: serves most of the downtown buildings;
   - The district cooling system makes chilled water at night when electricity rates are low and stores in large tanks until needed by customers during the day.

4) Deep Lake Water District Cooling in Toronto:

5) Windsor District Energy System
   - Operates a District cooling plant with a capacity of 5660 tons including thermal energy storage. Cooling is provided with four dual duty, industrial grade screw chillers capable of producing chilled water or ice for thermal energy storage.
   - Ice thermal energy storage. Pea power demand load shifting is provided with 7410 tons-hours of ice-on-coil thermal storage
   - District heating. The heating plant has a capacity of 70 million Btu/hour hot water (120 C) and 20 million Btu/hour (150 psig) and is capable of running on either
fuel or natural gas. Hot water is distributed to multiple buildings in the community.

- Standby/peak shaving power generation. Reliability is enhanced with 6 MW of diesel power generation for standby and peak shaving.

6) Markham District Energy System

- The first District Energy System in North America to combine the use of hot water for heating, chilled water for cooling and combined heat and power (CHP).
- Nearly 6 million square feet of building space has been connected to the District Energy System.
- Hot water is provided by natural gas fired boilers.
- Electric centrifugal chillers are used in combination with a hot water absorption chiller to produce the chilled water for the district energy system.

7) Hamilton District Energy System

- Combined Heat & Power. The CHP plant will utilize a gas fired combined heat and power engine to produce 3.3 MW of electricity and 85% of the district heating system’s annual thermal energy requirements.
- District heating. The heating plant will have a capacity of 61 million Btu/hour. The district heating system will utilize three natural gas fired boilers and a heat recovery boiler to provide 120 °C hot water.
- Services commercial and government buildings

8) And many, many more…

- Solar District Heating in Denmark and Sweden
- Combined Heat and Power fueled by Oat Hulls at the University of Iowa
- Geothermal Based District Heating in Turkey
- Combined Heat and Power fueled by Landfill Gas at UCLA (University of California at Los Angeles)

There are many different legal models used to justify the means by which district energy is enabled, and those means are sometimes enacted at different levels of government from local to regional to Provincial / State level. Some jurisdictions like the City of London, Ontario, simply treat district energy systems like any other public utility and coordinate their installation through a municipal Utilities Coordinating Committee. Other municipalities have more formal policies or agreements in place to enable district energy, such as those detailed in C.1, C.2 and C.3 below.

C.1 Community Charter

North Vancouver is one of several municipalities in BC have successfully implemented Community Charters to provide power to service their citizens. These “Charters” are legal documents whereby the municipality can assign itself certain powers and abilities such as the ability to provide any service that the council considers necessary or desirable, including district energy services, and including through another public authority or another person or organization.
For example, the City of North Vancouver’s Hydronic Heat Energy Service Bylaw 2004 No. 77575\textsuperscript{257} is an example of a district energy bylaw enacted under those conditions. Interestingly, it seems that although this bylaw sets out the legal framework for DE (and seems to define access to public rights of way), it is unclear whether this bylaw has ever been used, and whether there is in fact any district energy system active in North Vancouver.\textsuperscript{258}

\subsection*{C.2 Sample Easement for District Energy (DE) in Public Rights-of-Way}

The previous sections above have offered several examples of legislative approaches used across Canada and the USA to enable a municipality to install a District Energy System through a public right-of-way. The following is a sample Geothermal Easement from the City of Boise, Idaho\textsuperscript{259} designed and intended to grant private companies access under public rights of way for the purposes of installing geothermal services which provide heating/cooling to multiple adjacent buildings. What follows has been adapted slightly, with the intent to make it applicable to district energy systems in general (not just geothermal), and to make it more readily adoptable by other municipalities across Canada.

\textbf{A PERMANENT EASEMENT FOR THE INSTALLATION AND MAINTENANCE OF A DISTRICT ENERGY NETWORK}

This Agreement made the _____ day of ______________, 20____.

B E T W E E N:

THE CORPORATION OF THE MUNICIPALITY OF ___________

(the “City”)

- and -

COMMUNICATIONS

(the “Company”)

WHEREAS, the City owns a Public Right of Way;

AND WHEREAS, the Company seeks a permanent easement and right-of-way through and within a public right-of-way for the purpose of establishing, constructing, maintaining, repairing, and operating a district energy thermal network systems and maintains the right of ingress and egress, from and to said easement for the purpose of inspecting, maintaining, and repairing such district energy networks and related works, lines, and miscellaneous appurtenances;

AND WHEREAS, the perpetual easement and right-of way is hereby sought by Company for the purpose of constructing, installing, maintaining, repairing, and operating a district energy

\textsuperscript{257} \url{http://www.sms.bc.ca/wp-content/uploads/2015/03/District-Energy-Final2.pdf}
\textsuperscript{258} \url{http://bog3.sites.olt.ubc.ca/files/2015/11/3.22_2015.12_NDES-Covenant.pdf}
\textsuperscript{259} \url{https://publicworks.cityofboise.org/media/223419/48503_ITEM%205%20GEO%20ESMT.pdf}
system to provide energy in the form of heating and/or cooling and/or electricity to buildings connected to the system;

**AND WHEREAS,** it is the intent of this Easement to protect and encourage the use of District Energy Systems by allowing the City to give, grant and convey an easement for the purposes of construction and installing said district energy network generally described as a system that provides heating and/or cooling and/or electricity to multiple buildings connected to the DE system;

**NOW THEREFORE** in consideration of the mutual terms, conditions, and covenants herein contained, both the City and Company agree with each other as follows:

**Protection of District Energy Systems in public rights-of-way:**

1) **Grant Reservation:** City hereby expressly reserves and shall have the right to use and enjoy the property for itself, its successors, assigns, and permittees; the right at all times and for any purpose to go across and re-cross and to use the said Easement premises in a manner consistent with the existing nature of the public right of way. It is likewise the intent of this Easement to provide adequate protection for the use of District Energy Systems without prohibiting their development through a public right-of-way when the establishment of the District Energy System is found by the City to be beneficial for the citizens of the City.

2) **Restoration.** Upon completion of the construction, and any future repair or maintenance work contemplated hereunder, Company agrees to promptly restore the above-described property owned by the City to a condition equal or superior to that existing prior to exercising its rights under this easement. If and when Company makes any future repairs to the DE system and its components located on the above described public right of way, or the pipelines connecting buildings to the network, Company shall expediently replace and restore and affected portion of the property to a condition equal or superior to that existing prior to the undertaking of such repairs and maintenance.

3) **Indemnity.** Company hereby agrees to indemnify, defend, save and hold harmless the City from any and all liability, loss, or damage, the City may suffer as a result of any and all actions, claims, damages, costs, and expenses on account of, or in any way arising out of or from this Agreement, including but not limited to indemnify and save and hold harmless the City from any and all losses, claims, actions, or judgements for damages or injuries to persons or property arising out of or from, or caused by, the construction, operation, maintenance and use of the aforesaid easements and right-of-way by the Company or its agents. This indemnity shall continue so long as this Easement Agreement is in effect.

4) **Binding Effect.** The rights and responsibilities set forth in this Agreement shall inure to and bind the parties hereto, their heirs, representatives, successors, and assigns and also constitute covenants running with the land.
5) Attorney Fees. In the event of any action between the City or Company for a breach of or to enforce any provision or right hereunder, the non-prevailing party in such action shall pay to the prevailing party all costs and expenses, expressly including, but not limited to, reasonable attorney fees and costs incurred by the successful party in connection with such action, including without limitation all fees and costs incurred on any appeal from such action or proceeding.

6) Headings. The headings in this Agreement are intended for convenience only and shall not be used to vary or interpret the intent of the text.

7) Recording. Company shall, at its expense, record this Easement Agreement in the records of [the municipality] and shall provide the City with conformed copies of the recorded instruments, as well as executed originals of all documents. Such recording shall take place within five (5) business days of the execution of this Agreement.

Violations

8) It shall be unlawful for any person to refuse or interfere with the installation and maintenance of the installed District Energy System.

IN WITNESS WHEREOF, the parties enter into this Easement Agreement this ______ day of _____________, 20______.

Municipality/Grantor: Easement Grantee:

By: ___________________________  By: ___________________________

By: ___________________________  By: ___________________________

_________________________  ___________________________

(Registered Agent) (DE Company Representative)

Witness: Witness:

By: ___________________________  By: ___________________________

_________________________, Secretary ___________________________

C.3 Sample Municipal Access Agreement for Public Rights-of-Way

The following is a sample Municipal Access Agreement (MAA) used by the City of Kitchener in order to grant private companies access under public rights of way. For example, the City has an agreement like this with each local telecom provider (Bell, Rogers, Telus, others). Kitchener prefers this agreement over easements or other such agreements because there is no ambiguity over the assignment of rights: this agreement includes no assignments, only a granting of access (to specific things under specific terms). See below for details. What follows has been adapted slightly, with the intent to make it more readily adopted by other municipalities.

Such an agreement could be for use in Canada this document might read something like this:

**MUNICIPAL ACCESS AGREEMENT**

**ACCESS TO MUNICIPAL RIGHTS-OF-WAY**

This Agreement made the _____ day of ______________, 20____.

BETWEEN:

THE CORPORATION OF THE MUNICIPALITY OF ____________
(the “City”)

- and -

COMMUNICATIONS
(the “Company”)

WHEREAS the Company is offering utility or comparable services to the public which the City deems to be desirable, including but not limited to services related to the internet, television, communications technology, heating, cooling, electricity, shared or district energy services, charging of electric vehicles, guiding of autonomous vehicles, or waste collection;

AND WHEREAS, in order to offer its services, the Company requires access to, in, on, over, under, across or along the City’s Rights-of-Way to do Work;

AND WHEREAS, the Company requires the City’s consent to construct its works or Plant in, on, over, under, across or along the City’s Rights-of-Way;

AND WHEREAS the City is willing to permit the use of its Rights-of-Way where, in its judgement, such use will not interfere with its own service requirements and the public use of the Rights-of-Way including the consideration of the functionality and safety and any rights or privileges previously conferred or hereafter conferred by the City by contract or otherwise on others not parties to this Agreement to use any of the Rights-of-Way;

AND WHEREAS the City and the Company have agreed that it would be mutually beneficial to outline the terms and conditions pursuant to which said consent shall be obtained;
NOW THEREFORE in consideration of the mutual terms, conditions and covenants herein contained, the City and the Company each agree with each other as follows:

DEFINITIONS

1. In this Agreement, the following words and phrases shall have the following meanings:
   
   (a) “Affiliate” means affiliate as defined in the Canada Business Corporations Act and, in the case of the Company, includes any partnership or other unincorporated association in which the Company or any of its affiliated bodies corporate (as so defined) has a controlling interest;
   
   (b) “Agreement” means this Municipal Access Agreement complete with Schedule “A” attached hereto;
   
   (c) “Director” means the City’s Director of Engineering or designated successor, or the person designated by him or her;
   
   (d) “Emergency” means an unforeseen situation where immediate Work is necessary because of imminent danger to life, health or property including, but not limited to, unscheduled interruption of the Company’s service;
   
   (e) “Hazardous Substance” means any hazardous substance and includes, but is not limited to, electromagnetic or other radiation, petroleum products or bi-products, industrial wastes, contaminants, pollutants, dangerous substances, and toxic substances, as defined in or pursuant to any applicable law, ordinance, rule, regulation, bylaw or code, whether federal, provincial or municipal;
   
   (f) “City Consent” means the written consent of the Director, with or without conditions, for access to and use of the City’s Rights-of-Way, subject to the obtaining of a Work Permit as applicable;
   
   (g) “Plant” means any of the Company’s works or wares as are located or planned as may be identified on a permit application submitted to the City, to be located in the Right-of-Way, including but not limited to wires, fibre optic cables, ducts, manholes, handwells, poles, anchors, cables, pipes, conduits, pedestals, antennas, vaults, support structures or other related facilities or structures;
   
   (h) “Prime Rate” means the prime lending rate of the City’s principal financial institution carrying on business in the City;
   
   (i) “Right-of-Way” or “Rights-of-Way” means, but is not limited to, a road, a common and public highway, street, avenue, parkway, driveway, square, place, bridge, viaduct or trestle, any part of which is intended for or used by the general public for the passage of Vehicles and includes the area between the lateral property lines thereof, under the jurisdiction of the City;
(j) “Service Drop” means a section of Plant that by its design, capacity and relationship to the overall Plant of the Company, can be reasonably considered to be for the sole purpose of connecting the Plant to not more than a single customer or building point but shall not include Plant designed so as to carry multiple customer traffic.

(k) “Subsurface Utility Engineering” means the generic process of locating underground facilities using locating techniques at varying levels of accuracy;

(l) “Third Party” means any individual, corporation, partnership, association, joint venture or organization of any kind and the lawful trustee, successor, assignee, transferee or personal representative thereof that attaches to the Company’s Plant under an agreement with the Company but does not include direct users of the Company’s services;

(m) “Vehicle” includes, but is not limited to, a motor vehicle, trailer, traction engine, farm tractor, road building machine, bicycle, and any vehicle drawn, propelled or driven by any kind of power including muscular power;

(n) “Work” means, but is not limited to, any activities related to the Company’s installation, construction, maintenance, testing, operation, repair, replacement, relocation, removal, adjustment or other alteration of Plant in, on, over, along, under, above or across any Right-of-Way or poles in the Right-of-Way owned by the City (but specifically excluding Plant installed on poles in the Right-of-Way which are the property of utilities or other service providers unless a City Consent is applied for and obtained for Plant installed on such poles), including excavation, repair or restoration of the Right-of-Way; and

(o) “Work Permit” means a permit issued by the City under its applicable policies or by-laws for the purpose of authorizing the commencement and undertaking of any Work in a Right-of-Way.

USE OF RIGHTS-OF-WAY

2. The City hereby consents to the Company utilizing Rights-of-Way for the purpose of the Company completing its Work subject to the terms and conditions set out in this Agreement, the applicable City Consent and/or Work Permit and in accordance with all applicable federal, provincial and local municipal and City statutes, laws and by-laws or other rules, regulations, policies, standards and guidelines pertaining to the application and use of the Right-of-Way or the Plant provided that the laws, by-laws, rules, regulations, policies, standards and guidelines of the City are not in conflict with applicable provincial or federal statutes or regulations.

3. The Company shall not utilize any Rights-of-Way in whole or in part for any purpose other than that permitted under this Agreement, unless otherwise explicitly agreed to by the City and the Company. Upon the written request of the City, the Company shall forthwith
remove any Plant installed without City Consent or such other permission as granted by the City and repair and restore the Right(s)-of-Way in accordance with the requirements and obligations of subsection 8(c) and compensate the City for any reasonable and verifiable costs incurred by the City with respect to the installation and removal of the subject Plant.

APPROVAL OF DIRECTOR

4. Subject to Section 5, the Company shall not enter, excavate, break up or otherwise break the surface of any Right-of-Way for the purpose of its Work without first:

   (a) Obtaining the City Consent of the Director and/or Work Permit as are required for the specific Work activity, identifying the proposed location of the Plant and proposed number of installations of Plant in, on, over, under, across or along any such Right-of-Way, and paying the appropriate fee, all as detailed in Schedule “A”;

   (b) Providing detailed construction design drawings to the Director’s satisfaction when such are required by the Director due to the nature of the Work setting out the proposed location of the Plant within the relevant Rights-of-Way; and

   (c) Obtaining all applicable permits from other regulatory agencies.

5. In the event of an Emergency, the Company shall be permitted to carry out such Work as is reasonably necessary, minimizing impact to the extent possible in the circumstances and, subject to Section 2 of the Telecommunications Act, complying with any applicable City policies or by-laws to the fullest practical extent possible, to restore its service prior to satisfying subsection 4(a). The Company shall take all steps necessary to provide verbal notice to the City within one (1) business day and within five (5) business days of completing its Work to restore its service in response to such Emergency the Company shall satisfy subsection 4(a) and if such Emergency situation was caused by the Company, the Company shall provide details of the cause of the Emergency and the actions taken to resolve such Emergency and to prevent similar such Emergencies from occurring or reoccurring in the future.

6. The Company acknowledges and agrees that the City may refuse to grant City Consent with regard to any proposed application for any reason the City deems critical in nature, public health and safety, conflicts with the City’s infrastructure, lack of space in the Right-of-Way, proposed road reconstruction or the proper functioning of public services identified by the Director.

7. Notwithstanding Section 4, the Company may carry out routine maintenance, field testing, pulling cables through existing ducts, lashing additional cables to the Company’s existing aerial strands and placing Service Drops, without the Consent of the City but with the applicable Road Occupancy Permit. Alternatively, the Company may elect to conduct such activity under a Blanket Work Permit provided the Company has elected to do so in writing and pays the appropriate Fee which may be stipulated by the City. Nevertheless, in no case as part of completing any of these specific Work activities shall the Company
carry out any physical disruption or change to the surface of a Right-of-Way or the use of the Right-of-Way. The Company agrees to work with the City to create an efficient method of notifying the City of its scheduled maintenance Work activities outlined in this Section 7 in advance of commencing them.

MANNER OF WORK

8. The Company agrees that it shall perform its Work in accordance with the following conditions:

(a) All Work shall be conducted and completed to the satisfaction of the Director, at the Director’s sole discretion and in accordance with applicable industry standards, this Agreement and, subject to all applicable Federal, Provincial and Municipal statutes, laws and by-laws or other rules and regulations, policies, standards and guidelines as amended from time to time;

(b) The portions of the Plant which cross beneath streets, or existing buried utility Plant, shall be installed in a manner satisfactory to the Director;

(c) If the Company breaks or disturbs the surface of a Right-of-Way, it shall repair, temporarily restore and pay an applicable fee to the City with respect to the permanent restoration of the surface in the Right-of-Way to substantially the same or better condition it was in before such Work was undertaken by the Company in accordance with, subject to Section 2, without limitation, the City’s policies, standards and by-laws, as amended from time to time, and to the satisfaction of the Director. If the Company fails to repair and restore a Right-of-Way to the satisfaction of the Director within seventy-two (72) hours of being notified in writing by the City, or such longer period as agreed to by the parties, the City may, in addition to any remedy available under applicable by-laws, effect such necessary repairs and restoration and charge all costs related thereto plus an overhead equal to fifteen percent (15%) to the Company. In default of payment thereof, the amount of such cost with interest equal to the Prime Rate shall be due and payable by the Company. Both parties recognize that, weather permitting, final repair and restoration of the Right-of-Way should be completed as soon as practical notwithstanding the fact that in such instances the Company will have completed a temporary repair or restoration to the Right-of-Way.

(d) Notwithstanding subsection 8(c), in the event of an Emergency, the City may take appropriate measures determined necessary, by the Director, acting reasonably, to re-establish a safe environment at the Work site. Where any costs incurred by the City in re-establishing a safe environment are attributable to the Work of the Company or are a result of the presence of the Company’s Plant, these costs plus an overhead equal to fifteen percent (15%) shall be charged back to the Company. In default of payment thereof, the amount of such cost with interest equal to the Prime Rate shall be due and payable by the Company.
(e) If the City requires the Work to be stopped, under the terms of an applicable Work Permit, the Company shall cease all such Work forthwith upon receipt of written notice from the City, which notice shall contain reasons for the Work stoppage, and leave the Work site in a safe and clean condition. Once the reasons for the Work stoppage have been resolved to the Director’s satisfaction, the Director shall lift the stop work order in writing to the Company notifying the Company that it may be allowed to resume its Work;

(f) The Company shall be responsible for all excavation, installation, repair, maintenance, replacement or removal of the Plant including the cost of such Work when such Work is initiated by the Company;

(g) The Company shall use reasonable efforts to coordinate work in the Rights-of-Way and share the use of support structures with other service providers occupying and using or intending to occupy or use the Right-of-Way, with the intent of minimizing the necessity for road cuts, construction and the placement of new support structures in the Right-of-Way and;

(h) All contractors, when working for the Company, shall have proper identification visible on site displaying the name of the Company.

STREET AESTHETICS

9. The City reserves the right to specify the visual appearance of new plant for the purpose of improving street and community aesthetics when fair and equitable terms can be reached and technical and service requirements can be satisfied. Partnerships may take the form of support structure agreements between utilities, developers and/or the City whereby a number of service providers’ equipment can be combined into one specially designed unit or pedestals or cabinets can be clustered together to improve street and landscape aesthetics.

THE COMPANY’S WARRANTIES

10. The Company represents and warrants to, and covenants and agrees with, the City that:

(a) After completion of its Work, the Company shall leave the Right-of-Way in a neat, clean, and safe condition and free from nuisance, all to the reasonable satisfaction of the Director and, subject to Section 2, in accordance with any applicable policies or by-laws of the City;

(b) The Company warranties restoration Work performed by the Company within the Right-of-Way to the reasonable satisfaction of the City, for a period of two (2) years from the date of completion as specified in the Work Permit. This warranty shall not apply to Work performed by the City itself;
(c) If, as per the terms allowed by this Agreement, this Agreement is terminated by the City, all the unfulfilled covenants, indemnities and obligations of the Company herein shall survive such termination.

THE CITY’S NON-WARRANTY

11. The City has made no representations or warranties as to the state of repair of the Rights-of-Way or the suitability of the Rights-of-Way for any business, activity or purpose whatsoever and the Company hereby agrees to accept the Rights-of-Way on an “as is” basis. Without limiting the generality of the foregoing the City shall not be required to undertake any remediation or work for the Company’s proposed work.

AS-CONSTRUCTED DRAWINGS

12. When requested in writing by the City at the time of issuing City Consent, the Company shall at its expense and within three (3) months of completing the installation of its Plant provide “as-constructed” drawings to the satisfaction of the Director, which drawings, when created for engineered Plant, may include appropriate certification requirements. All “as-constructed” drawings shall be submitted in either/or a hard copy format and digital formats as specified by the City, to the satisfaction of the Director.

EMERGENCY CONTACTS

13. The Company and the City shall provide to each other a list of 24 hour emergency contact personnel available at all times and shall ensure that the aforementioned list is kept current.

LOCATES

14. In response to a request from the City for locates for construction purposes, pre-engineering purposes or any other reasonable purpose, or from any utility occupying or intending to occupy the Right-of-Way, or by the Company as required for Work under an approved City Consent, the Company or City, as applicable, or its locate contractor shall, at the expense of the Company or the City as applicable, in all cases subject to best commercial efforts, complete field locates of its Plant within two (2) weeks for construction related locates, two (2) weeks for pre-engineering purposes or any other reasonable purpose, or otherwise within a mutually agreeable time frame, calculated from the day of receiving such request. For greater certainty, the City does not provide locates of its sewers. In the event of a valid Emergency the locates shall be completed within two (2) hours. In the event of an Emergency the party requesting the locate will either have a representative on site or provide a contact number for their representative in order to ensure that the Company or City, as applicable, can complete the required locates in the affected area. In addition to any other rights it may have, the Company may, in the event the Company fails to provide the locates, not including pre-engineering locates, in the timeframe(s) set out herein, demand from the Company any reasonable and direct damages it incurs as a result of the delay in excess of the times stipulated in this paragraph and the Company shall, upon receipt of documentation to confirm such claims, forthwith pay such
amount to the City. The City is not responsible for any damages arising from damages to incorrectly or unlocated plant or resulting interrupted service.

PLANT VERIFICATION AND VALIDATION CITY CAPITAL PROJECTS

15. The Company agrees to verify and validate the location of existing Plant to the City for City capital planned projects using the following steps:

(a) Upon request from the City, meet with the City or its representatives to identify potential design and construction conflicts;

(b) Where, in the design stage for such capital planned projects, the City makes a reasonable determination that, in order to avoid redesign work for such project, pre-engineered field locates of the Company’s Plant are required, the Company shall, at its cost and upon request from the City, complete such pre-engineered locates within two (2) weeks subject to best commercial efforts.

(c) Where, after the Company locating its plant as required in subsection 15(b), the City determines that the Company’s Plant is not located in the approved or marked-up line location and thus the proposed project design may be susceptible to a risk based on the City’s perception of the actual location of the Plant, the Company shall, at the request of the City and the cost of the Company, undertake field investigations using the appropriate daylighting or Subsurface Utility Engineering method as agreed upon by the Company and the City, to verify the horizontal and vertical location of the buried Plant. Field investigations will be undertaken using a non-destructive method, such as vacuum excavation. The actual cost of such investigations shall be borne on a fifty (50) percent each shared basis if the plant is in the correct location.

(d) If the results obtained from the field investigation under subsection 15(c) demonstrate that the Plant is not reasonably in the approved or marked up line location, the Company will bear the associated full cost for the method used in the investigation.

16. If, during City work or Work by the Company, the Company’s Plant or the City’s installations, as applicable, are found not to reasonably be in the approved or marked up location and where the City or Company determines it may or does incur any additional costs as a result of the actual location of the Company’s Plant or City’s installations, as applicable, the City or Company agrees to notify the other party in writing of such within twenty-four (24) hours. If, after notice, the Company or City, as applicable, is unable to rectify the problem in a reasonable time commensurate with the situation, the Company or City, as applicable, will compensate the other for any reasonable and verifiable additional costs which the notifying party incurs resulting from the actual Plant or installation location. The City of Company, as applicable will compensate the other part for any damage to the others Plant, where such Plant’s location is known and correct.
RELOCATION OF PLANT

17. Upon receipt of not less than sixty (60) days written notice from the City, or such additional advance notice as is reasonable, having regard to the nature of the relocation required, the Company shall relocate its Plant within a Right-of-Way, or perform any other Work as may be required as the direct result of the relocation in connection with the Right-of-Way as may be required by the City for municipal purposes.

18. In cases of Emergency, both parties agree to work co-operatively and use their commercially reasonable best efforts to relocate Plant immediately as directed by the Director, provided that in cases of Emergency, the City may take any measures deemed necessary that may be required in the circumstances by the nature of the Emergency to restore public safety with respect to the Plant.

19. The City will make a good faith effort to provide alternative suggestions for re-routing the Plant affected by the relocation to assist the Company in its efforts to ensure uninterrupted service to its customers.

20. The responsibility for the costs incurred in relocating the Company’s Plant or performing such Work referenced above will, for the purposes of this Agreement, be based upon the following:

(a) For Plant installed with City Consent subsequent to the date of the latest Work Permit related to Plant (the “Relocation Costs Effective Date”), the City will be responsible for the percentage of relocation costs as set out in the following chart:

<table>
<thead>
<tr>
<th>Years Following Municipal Consent</th>
<th>Percentage of reasonable costs paid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years 1 to 4</td>
<td>100%</td>
</tr>
<tr>
<td>Year 5</td>
<td>75%</td>
</tr>
<tr>
<td>Year 6</td>
<td>50%</td>
</tr>
<tr>
<td>Year 7</td>
<td>25%</td>
</tr>
<tr>
<td>Year 8 &amp; thereafter</td>
<td>0%</td>
</tr>
</tbody>
</table>

(i) For the purposes of calculating the relocation costs under the foregoing chart, the commencement date to be used will be the date of City Consent for the Plant to be relocated and the date of relocation shall be the date on which notice is given to the Company that the relocation is required by the City. The City Consent date associated with any Plant subsequently installed in or attached to the Company’s support structures, attached to or on poles or other service providers for which City Consent was obtained, shall be deemed to be the original City Consent or installation date for the construction of the
Company’s support structure(s) or the installation date of the City poles, or poles of utilities or other service providers for which City Consent was obtained.

(ii) Where the City requires a relocation of Plant installed prior to the Relocation Costs Effective Date in its capacity as a road authority, such relocation shall be based, as applicable, on the methodology outlined in the Public Services Works on Highways Act (Ontario) provided the said Act is applicable to the relocation and recognizing the right of the City to claim the recovery of relocation costs by the Company does not fall within, or is covered by, the provisions of the said Act.

(b) The Company will provide to the City a written estimate for each relocation in a format clearly identifying the percentages and dates being applied to each part of the Company’s Plant for the purpose of calculating relocation costs;

(c) In the case where the City cannot guarantee an ultimate location for the proposed Plant identified in a City Consent application having regard to projects identified in the first five years of the City’s Capital Program and standard road cross-sections for reasonable long term forecasts, and the Company, despite being made aware of these conditions, requests the City approve the application and proceeds to install its Plant, then the City may issue a conditional City Consent stating that, if necessary and notwithstanding any obligations of the City under this Section 20, the Company may be required to relocate its Plant at any time related to identified projects and, in such circumstances, the Company will be responsible for full relocation costs for its Plant;

(d) Subject to Sections 15 and 16, in the case where the Company’s Plant is found to be in non-compliance with any aspect of the approved location so that the Plant needs to be relocated, the cost for relocating the non-compliant Plant will be paid for by the Company. The City will use reasonable best efforts to avoid unnecessary relocations but reserves the right to request such relocation as required; and

(e) For purposes of clarity, nothing in this section shall apply to Plant installed without City Consent or other permission of the City including, but not limited to, Plant installed on poles not owned by the City, or in ducts or structures not owned by the Company unless the Company has obtained City Consent for such Plant.

21. Both parties agree that special circumstances may arise with respect to specific location approvals whereby it may be appropriate for the parties to mutually agree to waive the above-noted provisions and to negotiate alternative arrangements. These alternative arrangements shall be agreed upon in writing.

22. In no event shall the Company charge the City, or shall the City be responsible for costs incurred by, or charged to Third Parties to relocate their installations and/or infrastructure
located in or attached to the Company’s Plant, unless the City has an agreement with such Third Party permitting the same.

23. The relocation of Plant requested by parties other than the City or those not required for City purposes, shall be at the discretion of the Company and all of the costs of such relocations may be charged directly to the party requesting such relocation. An agreement in writing by each party to assume responsibility for all such relocation costs shall be required prior to commencing any of the associated relocation work. All relocations requested under this section shall be subject to obtaining City Consent and all other applicable permits.

24. If the Company fails to complete the relocation or removal of the Plant in accordance with Section 17 in a timely and expeditious manner to the satisfaction of the Director, the City may, at its option complete such relocation or removal. The Company shall pay the cost of such relocation or removal to the City forthwith plus an overhead equal to fifteen percent (15%) of such cost. In default of payment thereof, the amount of such cost with interest equal to the Prime Rate shall be due and payable by the Company;

INDEMNIFICATION AND LIABILITY

25. The Company shall indemnify and save harmless the City from and against all actions, causes of action, proceedings, claims and demands brought against the City, and from and against all losses, costs, damages or expenses suffered or incurred by the City, by reason of any damage to property, including property of the City, or injury, including injury resulting in death, to persons, including the employees, servants, agents, licensees and invitees of the City, caused by, resulting from or attributable to the negligent act or omission of the Company or any of its employees, servants, agents, licensees or invitees in the performance of this Agreement or any previous agreement, or any Third Party, its employees, servants, agents, licensees or invitees.

26. The City shall indemnify and save harmless the Company from and against all actions, causes of action, proceedings, claims and demands brought against the Company, save and except as to those of any Third Party, and from and against all losses, costs, damages or expenses suffered or incurred by the Company, save and except those in favour of any Third Party, by reason of any damage to property, including property of the Company but not of any Third Party, or injury, including injury resulting in death, to persons, including the employees, servants, agents, licensees and invitees of the Company but not those of any Third Party, caused by, resulting from or attributable to the intentional or negligent act or omission of the City or any of its employees, servants, agents, licensees or invitees in the performance of this Agreement or any previous agreement.

27. Notwithstanding anything contained in this Agreement, the City and the Company shall not be liable to each other in any way for indirect or consequential losses or damages, or damages for pure economic loss, howsoever caused or contributed to, in connection with this Agreement or with any Plant or Right-of-Way governed hereby.
INSURANCE

28. Each of the parties hereto shall maintain insurance, naming the other as an additional insured, in the amount and description as outlined in this Section as will protect the other party from claims for damages, personal injury including death, and for claims from property damage which may arise under this Agreement, including but not limited to the construction, maintenance or operation of the Plant in, on, under, over, along and across the Right-of-Way or any act or omission of the City’s or the Company’s employees, servants, agents, licensees or contractors. In addition to the foregoing, each of the parties covenants and agrees that:

(a) the limits of liability for personal injury, bodily injury and property damage combined shall be for not less than five million dollars ($5,000,000.00) for each occurrence;

(b) the Commercial General Liability Insurance to include blanket contractual liability;

(c) all policies to include cross liability with a severability of interest clause, and all policies shall provide that they cannot be cancelled, intentionally lapsed without at least thirty (30) days notice to the other party by registered mail;

(d) it shall maintain automobile third party liability insurance in the amount of two million dollars ($2,000,000.00) covering all owned, leased and non-owned automobiles used in connection with activities under this Agreement; and

(e) forward to the other a Certificate of Insurance evidencing the insurance required herein, both upon execution of this Agreement and upon each renewal of insurance.

TERM

29. (a) The initial term of this Agreement shall be ten (10) years, commencing on the date of signing and shall automatically renew for two (2) additional consecutive five (5) year periods upon the same terms and conditions contained herein, including payment of the annual fee, unless terminated by either party in writing, at least ninety (90) days prior to the expiry of the term. If the Agreement is terminated either by expiry of the term, without an extension thereof or a replacement agreement, or as a result of default under Sections 36 or 37, then, subject to the Company’s rights under the Telecommunications Act (or any successor legislation), all rights and privileges under this Agreement shall come to an end and despite such termination, the Plant will continue to be the property of the Company and the Company shall be permitted to maintain, test, repair and operate its Plant subject to the right of the City, in the event of termination or Company Default, to obtain an order under the Telecommunications Act (or any successor legislation) to have the Company prohibited from operating its Plant in the City. Notwithstanding termination both the Company and the City shall continue to be liable to the other for all payments due and obligations incurred hereunder prior to the date of such termination, except for termination as a result of Default whereupon the defaulting party only shall continue to be liable to the
non-defaulting party for all payments due and obligations incurred under the Agreement prior to the date of such termination.

(b) Any previous agreement between the Company and the City regarding Work within the City’s Right of Way is hereby terminated effective the effective date of this agreement, save and except that the Company shall continue to be liable to the City for all payments and obligations incurred under that Agreement up to and including the effective date of this agreement [if applicable].

PAYMENT OF FEES

30. The Company covenants and agrees to pay to the City fees calculated in accordance with the City’s schedule of fees and charges as amended from time to time by mutual consent and calculated in accordance with Schedule “A” in this Agreement. Upon sixty (60) days prior notice, either party may request the other party to re-negotiate the annual administrative fee based on verifiable changes to either party’s causal cost including, but not limited to, an increase or decrease in the fees and charges, as applicable, by an amount equal to such fees and charges multiplied by the percentage increase or decrease in the latest available Consumer Price Index published by Statistics Canada.

LEGISLATIVE CHANGE

31. If, at any time subsequent to the entering into of this Agreement, the Provincial or Federal government or a regulatory authority, acting within its jurisdiction, enacts or repeals any legislation or regulation, or orders, directs or mandates anything which pertains to the subject matter of this Agreement, then either party may notify the other of its intention to require the other party to enter into good faith negotiations to amend this Agreement, or to enter into a new agreement reflecting such legislative or regulatory action or court or tribunal decision, as the case may be, within thirty (30) days after written notice (the “Notice”) from the notifying party, and any newly permitted terms and conditions, charges or fees pursuant to such new or amended agreement will take effect from the date upon which the Notice expires.

32. If the parties are unable to re-negotiate the terms and conditions of this Agreement, then the unresolved matters may, within thirty (30) days prior written notice from the requesting party, be referred by the party to either arbitration for resolution, in accordance with the [Ontario] Arbitration Act, as amended or its successor legislation, or to the CRTC. Subject to the right to request arbitration or refer the matter to the CRTC, if an amendment to this Agreement or a new agreement is not reached within ninety (90) days from the date on which the Notice was received, either party may terminate this Agreement without further notice and both parties shall fulfil their respective obligations thereafter in accordance with this Agreement.

SECURITY
33. The City reserves the right to require, and the Company agrees to forthwith provide upon request:

(a) in the situation where the City has not enjoyed a satisfactory relationship with the Company prior to this Agreement, security in the amount of fifteen thousand dollars ($15,000) for the first three (3) years of this Agreement in a form satisfactory to the City’s Deputy CAO of Finance and Corporate Services to secure performance of all of the Company’s obligations under this Agreement. Such security may be drawn on by the City through its Director and the funds applied against any outstanding financial obligations owed by the Company to the City under the terms of this Agreement. Such security shall not be released unless the Company is in good standing with respect to its obligations under this Agreement and shall only be released if the Company has fulfilled all of its obligations under this Agreement to the satisfaction of the Director for a period of at least three (3) consecutive years; and

(b) ‘project specific’ securities in a form satisfactory to the City’s Deputy CAO of Finance and Corporate Services using reasonable discretion, for any major projects, with the amount of such security in an amount equal to any and all restoration costs of a project approved by a City Consent as determined by the Director acting reasonably having regard to the scope of the project. Such security shall be provided prior to City Consent and may be drawn on by the City, through its Director, and the funds applied against any outstanding financial obligation of the Company to the City under this Agreement with respect to the project. The ‘project specific’ letter of credit shall be released once the conditions of the applicable City Consent have been fulfilled to the satisfaction of the Director.

34. If, at any time during the term of this Agreement, the City does not hold security and the Company fails to make any payment as and when required under this Agreement, then at the sole discretion and request of the Director the Company agrees to provide to the City an irrevocable automatically renewing letter of credit in a form satisfactory to the City’s Deputy CAO of Finance and Corporate Services in the minimum amount of five thousand dollars ($5,000), or other form of security acceptable to the City’s Deputy Director of Finance and Corporate Services, within thirty (30) days of a request from the Director and no applications for City Consent shall be processed for approval unless and until such security is provided to the City. Such security may be drawn on by the City through its Director and the funds applied against any outstanding financial obligations owed by the Company to the City under the terms of this Agreement. Such letter of credit shall be posted for a minimum of three (3) years and shall not be released unless the Company has fulfilled all of its obligations under this Agreement to the satisfaction of the Director for a period of at least three (3) consecutive years.

35. Should the City through its Director draw on any security provided pursuant to this Agreement, the Company shall forthwith reinstate the securities to the amount required prior to the drawing.
DEFAULT/TERMINATION

36. The City and the Company mutually agree that, should either party fail to carry out any of the terms, covenants and conditions contained herein or default in any of its obligations under the terms hereof and fail within thirty (30) days after receiving written notice from the non-defaulting party to correct or commence to correct in a fashion acceptable to the non-defaulting party any such failure, then this Agreement may, at the option of the non-defaulting party, be terminated by giving written notice to be effective upon receipt. In addition to any other rights it may have under this Agreement, the non-defaulting party shall have such other remedies as may be available at law.

37. Despite Section 36, this Agreement may be terminated immediately and without prior notice by the City in the event that:

(a) the Company becomes insolvent, makes an assignment for the benefit of its creditors, has a liquidator, receiver or trustee in bankruptcy appointed for it or becomes voluntarily subject as a debtor to the provisions of the Companies’ Creditors Arrangement Act, the Bankruptcy and Insolvency Act, as amended from time to time, or any successor legislation;

(b) Subject to Section 38, the Company transfers, assigns, or sublicenses any part or all of its interest in this Agreement other than in accordance with the provisions of this Agreement, or attempts to do same; or

(c) the Company ceases all operations as a provider of the services which relate to any and all Plant installed or operated by the Company under this agreement, which may include closing down a business unit responsible for district energy services, or ceasing licensed operation as a Canadian carrier or distribution undertaking within the meaning of the Telecommunications Act, or as regulated by the CRTC as amended from time to time, or any successor legislation.

ASSIGNMENT

38. This Agreement may be sublicensed, granted, transferred or assigned:

(a) By the City or the Company in its entirety, to a single sublicensee, grantee, transferee or assignee with the other party’s prior consent in writing, which consent shall not be unreasonably withheld; or

(b) By the Company in whole or in part during the term of this Agreement without the City’s prior consent in writing;

(i) upon having first given notice to the City of the sublicense, grant, transfer or assignment; and
(j) provided the sublicensee, grantee, transferee or assignee is an Affiliate of the Company; and

39. Despite the sublicense, grant, transfer or assignment of this Agreement by the Company, the Company will remain fully responsible to the City for the fulfillment of the obligations or liabilities of the Company hereunder to the date of such sublicense, grant, transfer or assignment.

NO OWNERSHIP RIGHTS

40. No use of a Right-of-Way under this Agreement shall create or vest in the Company any ownership or property rights in a Right-of-Way, and the Company shall be and remain a mere non-exclusive occupant of the Right-of-Way. Placement of the Plant in a Right-of-Way shall not create or vest in the City any ownership or property rights to the Plant, except as provided in this Agreement.

NOTICES

41. Any notice required or permitted to be given hereunder or any tender or delivery of documents may be sufficiently given by personal delivery or, if other than the delivery of an original document, by facsimile transmission to the City at the following address:

[municipality legal name]  
Address  
Attention:  
Tel:  
Fax:

and to the Company at the following address:

Company name  
Address  
Attention:

Any notice may also be given by prepaid registered mail mailed within the Province of Ontario and such notice shall be effective five (5) business days following the date of mailing, except in the event that there shall be a disruption in postal services at the date of mailing, in which case notice shall be effective by personal delivery or a facsimile transmission as stated above.

PRIOR APPROVAL FOR ANY TREE REMOVALS

42. The Company shall consult the City prior to commencing work to determine the risks of damaging City trees.

TREES
43. The Company is responsible for the costs of any remedial work required to rehabilitate any trees damaged in the performance of its Work permitted by this Agreement or, in the event any trees suffer irreparable damage as a result of the Work, the Company shall replace the trees or compensate the City for the value of the trees and the removal costs as determined by the City.

REMOVAL OF GRAFFITI

44. The Company shall take all reasonable measures, to the satisfaction of the City, to clean, remove or conceal graffiti or other unauthorized markings in a timely manner from its Plant. In this regard, the Company will within forty-eight (48) hours written notice from the City remove or conceal all obscene or offensive graffiti from its Plant and in all other instances shall do so within (96) hours written notice. In the event that the Company does not remove or conceal the graffiti in accordance with this section, the City may take such steps as it deems reasonable and necessary to remove or conceal the said graffiti and shall charge the cost of the removal or concealment to the Company.

MAINTENANCE OF ABOVE GROUND CABINETS

45. The Company shall have a maintenance program to clean, straighten, paint and repair above ground cabinets on a regular basis and shall respond within five (5) business days of being notified by a request from the City to complete any of this maintenance at any location identified by the City.

CONDITIONS OF RIGHTS-OF-WAY AND ENVIRONMENTAL LIABILITY

46. The Company accepts all Rights-of-Way being used under this Agreement in “as is” condition and the City is not obligated to undertake any work or remediation on any Right-of-Way to accommodate, or as a result of, any Work. The City is not responsible, either directly or indirectly, for any damage to property, including any nuisance or injury to any person howsoever caused, including death, arising from the condition of the Right-of-Way or the escape, discharge, spill or release or any Hazardous Substance resulting from the Company’s use of the Rights-of-Way. The foregoing release shall not extend to any loss, damage, injury or death caused by the negligence or wilful misconduct of the City, its employees, agents, contractors or those other persons for whom the City is in law responsible.

47. The Company agrees to assume all environmental liabilities relating to its use of the Rights-of-Way including but not limited to any liability for clean-up of any Hazardous Substance on or under the Rights-of-Way which result from:

(a) the operations of the Company in, on, under, over, above, along or across the Rights-of-Way, or
any Plant brought in, on, under, above, over, along, or across the Rights-of-Way by the Company, its contractors, agents or employees or by any person with the express or implied consent of the Company.

48. The Company agrees to immediately notify the City of any environmental issues or contamination with respect to any City Rights-of-Way.

THIRD PARTY ACKNOWLEDGEMENT

49. The Company agrees that it shall provide in agreements with Third Parties, a provision that requires the Third Party to comply with all applicable laws, statues, by-laws (including, but not limited to, obtaining a Work Permit as applicable), codes, ordinances, rules, orders and regulations of all governmental authorities in force, and that the Third Party shall obtain and maintain any and all permits, licenses, official inspections or any other approvals and consents necessary or required for the placement or operation of the Third Party’s equipment. The City shall have no obligation to notify any Third Party under any provision of this Agreement.

JOINT PLANNING

50. Each of the Company and the City agree to joint planning sessions between users of the Rights-of-Way and shall make reasonable efforts to promote and attend the same.

INSTALLATION OF CONDUIT OR FIBRE CABLE FOR CITY PURPOSES

51. At the time of any City Consent application by the Company, the City may request the Company to install conduits or fibre optic cable for the City. The Company, at its sole option, may agree to the installation of such additional facilities if it deems it reasonable and technically feasible and if the Company determines that doing so will not unreasonably delay its Work. The additional conduits and fibre optic cables will become the property of the City for their exclusive use upon payment in full by the City to the Company of the amount equal to the actual proportionate cost, including any additional engineering costs and an overhead cost equal to five (5) percent of the proportionate cost of installation. The Company shall prepare a written quote for such additional work and agrees to install such additional conduit or fibre optic cable upon the City approval in writing of such quote.

WORKERS’ SAFETY AND INSURANCE BOARD COVERAGE

52. The Company shall pay to the appropriate provincial Workers Safety and/or Insurance Board/Commission all assessments and levies owing to the Board/Commission by the Company, its employees and others engaged in providing services under this Agreement and any unpaid assessment or levy shall be the sole responsibility of the Company.

53. Prior to commencing the Work, the Company shall, upon request, provide to the Director evidence of compliance with the requirements of the Province of [Ontario] with respect to Workers’ Compensation Insurance.
54. The Company shall comply with all applicable statutes and regulations that establish health and safety requirements and will reasonably cooperate with the City in the establishment and enforcement of safe working procedures.

55. The Company acknowledges that out-of-province contractors are not exempt from having to register and comply with the requirements of the Workers’ Safety and Insurance Board of [Ontario]. Prior to commencing the Work, out-of-province contractors not required to be registered in [Ontario] shall provide:

(a) written confirmation from the Workers’ Safety and Insurance Board of [Ontario] stating that the contractor is not required to be registered in [Ontario]; and

(b) evidence of compliance with the requirements of the province or territory or place of business with respect to workers’ compensation insurance.

At any time during the term of this Agreement, when requested to do so by the City, the Company shall provide such evidence of compliance by itself and its subcontractors. Failure to provide satisfactory evidence in respect of workers’ compensation insurance shall result in future permits being denied by the City until satisfactory evidence of compliance has been received by the Director.

GENERAL

56. This Agreement is the entire agreement between the City and the Company regarding the subject of this Agreement. This Agreement may only be amended or supplemented by a document executed in writing by both the City and the Company.

57. This Agreement benefits and binds the City and the Company and the successors and permitted assigns of each of them.

58. If any term of this Agreement is found to be invalid, illegal, or unenforceable by a court having the jurisdiction to do so, that term is to be considered to have been severed from this Agreement and this Agreement remains in force unaffected by that finding or by the severance of that term.

59. This Agreement creates contractual rights only between the City and the Company and not an interest in the Rights-of-Way and the Company covenants and agrees with the City that the Company shall cease and desist from any registration of this Agreement or of any right howsoever arising under it.

60. No amendments or waiver of any provision of this Agreement shall be binding on either party unless consented to in writing by such party. No waiver of any provision of this Agreement shall constitute a waiver of any other provision, nor shall any waiver constitute a continuing waiver unless expressly provided.
61. In this Agreement, unless the context otherwise requires, the singular includes the plural and the masculine includes the feminine gender and a corporation.

62. This Agreement shall be governed by and construed and enforced in accordance with the laws of the Province of [Ontario] and the laws of Canada which may be applicable to a party in the Province of [Ontario] and both parties irrevocably attorn to the jurisdiction of the Courts of the Province of [Ontario].

63. In the performance of obligations and the exercising of rights under this Agreement, or whenever the approval, consent or a decision is requested or required from either party under this Agreement each party agrees that it shall at all times act reasonably.

64. Time shall be of the essence in this Agreement.

65. Any obligation of the Company or City to indemnify, and/or to make any payments or satisfy obligations incurred prior to the expiration or termination of this Agreement, shall survive the said expiration or termination of this Agreement.

IN WITNESS WHEREOF the parties hereto have executed this Agreement by their duly authorized representatives.

Dated:

<table>
<thead>
<tr>
<th>[municipality legal name]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Per: _____________________</td>
</tr>
<tr>
<td>Mayor</td>
</tr>
<tr>
<td>Per: _____________________</td>
</tr>
<tr>
<td>Clerk</td>
</tr>
<tr>
<td>[Company]</td>
</tr>
<tr>
<td>Per: _____________________</td>
</tr>
<tr>
<td>Name &amp; Title</td>
</tr>
<tr>
<td>Per: _____________________</td>
</tr>
<tr>
<td>Name &amp; Title</td>
</tr>
</tbody>
</table>

[See SCHEDULE “A” next page for CONSENT AND FEES]
SCHEDULE “A”

CONSENT AND FEES

1. Annual Administration Fee

The Company shall pay to the City an annual administration fee to compensate the City for its causal costs incurred in the administration of this Agreement and the provision of services related to Work including the issuance of Work Permits.

The Annual Administration Fee shall be ____.ZERO____ DOLLARS ($0.00) payable upon the commencement date of this Agreement and on each annual anniversary thereafter, subject to Harmonized Sales Tax and any other applicable tax payable in addition to the Fee. On each anniversary of this Agreement, the amount shall be replenished in full.

[NOTE: There is a real, but limited, amount of administrative effort involved in maintaining contact with any external entities which the City wishes to grant access to perform works in public Rights-of-Way. This admin fee will be most attractive to district energy and other investors if it is kept to a reasonable minimum, and if the Municipality instead focuses on recovering any real costs through charging Consent Fees for real Works as described below.]

2. Municipal Consent Fee / City Consent Fee

The terms “Municipal Consent Fee”, “City Consent Fee” and “Consent Fee” shall be understood to be interchangeable references to the same identical fee.

The Company shall pay to the Municipality the Consent Fee for plan review and approval work, other than that covered by Annual Administration Fee, a City Consent Fee of SIX HUNDRED DOLLARS ($600.00) per application, an application being a request for City Consent for work of a contiguous nature, with no gap in that work exceeding one hundred (100) meters on a Right-of-Way. For clarity, a separate application and Municipal Consent will be required for any work not within one hundred (100) meters of the initial Work being undertaken.

In most instances, a review of second or third submissions of an application will not be charged and only the finalized application will trigger the Municipal Consent Fee.

Consent Fees are Due and payable upon invoice at time of approval and shall be subject to Federal Goods and Services Tax and any other applicable tax payable in addition to the Fee.

3. Annual Administration Fee and Municipal Consent Fee Adjustments

On each anniversary date of this Agreement, the Annual Administration Fee and Municipal Consent Fee may increase or decrease as applicable by an amount equal to such fee multiplied by the latest available Consumer Price Index published as a percentage by Statistics Canada.
APPENDIX D: SAMPLE COMMUNITY IMPROVEMENT PLAN AND PROGRAMS

This appendix includes a sample Community Improvement Plan (CIP) and associated programs for Energy and Water Efficiency (EWE) in Buildings and Communities. It has been adapted and expanded from a similar plan enacted by the City of Kitchener, and is offered here in the hopes that other municipalities will adapt and adopt this CIP and/or its programs for their use locally.

The original plan from the City of Kitchener may be found line at:

https://app2.kitchener.ca/appdocs/ciplan/PublishedCurrentText//Energy_and_Water_Efficiency_for_Land_and_Buildings_CIP.pdf
[MUNICIPALITY]

COMMUNITY IMPROVEMENT PLAN for

*Energy and Water Efficiency for Land and Buildings*

Adopted by the Council of the Corporation of the [municipality] on __{date}__ (By-law ###____).

**SAMPLE REFERENCE TEMPLATE**

NOTE: This document includes template language which is intended to be adapted by the reader to suit their local context. Words in *italics with square parentheses* are intended to be descriptive text, not actual text, that needs to be replaced with (for example) the name of your municipality, a date, a name for a responsible staff person within your agency, etc. This document has been edited to be as useful a reference as was deemed reasonably possible at the time of authoring. Should you need further assistance, please contact the authors.
# TABLE OF CONTENTS

1. INTRODUCTION......................................................................................................................... D-5

1.1 SUMMARY .......................................................................................................................... D-5

1.2 ORGANIZATION OF THE COMMUNITY IMPROVEMENT PLAN (CIP) .................... D-5

1.3 GENERAL INFORMATION ON COMMUNITY IMPROVEMENT PLANNING .......... D-5

2. LEGISLATIVE AUTHORITY AND POLICY DIRECTION .............................................. D-6

2.1 PROVINCIAL ......................................................................................................................... D-6

2.1.1 Ontario Planning Act ...................................................................................................... D-6

2.1.2 Provincial Policy Statement .......................................................................................... D-7

2.1.3 Growth Plan for the Greater Golden Horseshoe ......................................................... D-7

2.2 REGIONAL ............................................................................................................................. D-7

2.2.1 Regional Official Plan ..................................................................................................... D-7

2.2.2 Regional Growth Management Strategy ....................................................................... D-8

2.3 LOCAL .................................................................................................................................. D-8

2.3.1 Kitchener Official Plan .................................................................................................. D-8

2.3.2 A Plan for a Healthy Kitchener .................................................................................... D-8

2.3.3 Strategic Plan for the Environment .............................................................................. D-8

2.3.4 Kitchener Growth Management Strategy .................................................................... D-9

3. COMMUNITY IMPROVEMENT PLAN (CIP) FOR ENERGY AND WATER EFFICIENCY FOR LAND AND BUILDINGS ................................................................. D-9

3.1 COMMUNITY IMPROVEMENT PROJECT AREA ........................................................... D-9

3.2 PURPOSE .............................................................................................................................. D-9

3.3 GOAL .................................................................................................................................. D-9

3.4 PROGRAM PARAMETERS .................................................................................................... D-9

3.5 AMENDMENTS .................................................................................................................... D-10

4. CIP PROGRAMS .................................................................................................................... D-11

4.1 GREEN HOUSING INCENTIVE .......................................................................................... D-11

4.1.1 Background .................................................................................................................... D-11

4.1.2 Program Description ...................................................................................................... D-11

4.1.3 Conformity with the CIP .............................................................................................. D-11

4.2 GREEN BUILDING INCENTIVE ......................................................................................... D-13

4.2.1 Background .................................................................................................................... D-13

4.2.2 Program Description ...................................................................................................... D-13

4.2.3 Conformity with the CIP .............................................................................................. D-13

4.3 PROPERTY TAX REDUCTION PROGRAM ....................................................................... D-14

4.3.1 Background .................................................................................................................... D-14

4.3.2 Program Description ...................................................................................................... D-14

4.3.3 Conformity with the CIP .............................................................................................. D-15

4.4 ADVANCED PERMIT QUEUING PROGRAM ................................................................. D-16

4.4.1 Background .................................................................................................................... D-16

4.4.2 Program Description ...................................................................................................... D-17
4.4.3 Conformity with the CIP ................................................................. D-17
4.5 PROPERTY ASSESSED PAYMENTS FOR ENERGY IMPROVEMENTS PROGRAM ........................................ D-19
  4.5.1 Background ............................................................................. D-19
  4.5.2 Program Description ................................................................. D-19
  4.5.3 Conformity with the CIP ......................................................... D-19
4.6 DEVELOPMENT CHARGE REBATE PROGRAM .................................................. D-20
  4.6.1 Background ............................................................................. D-20
  4.6.2 Program Description ................................................................. D-21
  4.6.3 Conformity with the CIP ......................................................... D-21
4.7 BUILDING PERMIT FEE REDUCTION PROGRAM ............................................. D-23
  4.7.1 Background ............................................................................. D-23
  4.7.2 Program Description ................................................................. D-23
  4.7.3 Conformity with the CIP ......................................................... D-23

APPENDICES: ......................................................................................... D-25

D.1 GREEN HOUSING INCENTIVE PROGRAM ............................................. D-26
D.2 GREEN BUILDING INCENTIVE PROGRAM ............................................ D-32
D.3 PROPERTY TAX REDUCTION INCENTIVE PROGRAM ................................ D-38
D.4 ADVANCED QUEUING INCENTIVE PROGRAM ........................................ D-45
D.5 PROPERTY ASSESSED PAYMENTS FOR ENERGY REDUCTIONS (PAPER) PROGRAM .................. D-50
D.6 DEVELOPMENT CHARGE REBATE INCENTIVE PROGRAM .................. D-57
D.7 BUILDING PERMIT FEE REDUCTION PROGRAM ..................................... D-63
D.8 CIP STAFF REPORT TO COUNCIL ........................................................ D-69
D.9 SAMPLE BY-LAW TO DESIGNATE CIP PROJECT AREA (FOR ONTARIO) ....................... D-74
D.10 SAMPLE BY-LAW TO ENACT CIP (FOR ONTARIO) ................................. D-75
1. INTRODUCTION

1.1 Summary

The fate of the environment, and the crisis associated with declining fossil fuels, increased greenhouse gas emissions and resulting global climate change, can be said to be the greatest challenge faced by this generation. As local economies continue to be shaped by global economic, environmental and social trends; there is a need to build, reinforce and reshape our cities to meet global and local challenges in ways that reduce the impact on our environment.

Municipalities [in Ontario, because of the Planning Act.] can make use of Community Improvement Plans to offer incentives related to the energy efficiency of land and buildings. This Community Improvement Plan for Energy and Water Efficiency for Land and Buildings (hereafter referenced as “this CIP”) will encourage the construction or reconstruction of buildings or the use of land, in a way that achieves measurable improvement or efficiency in energy and/or water conservation. This will be achieved through the provision of programs which could make grants, loans, refunds, exemptions, tax increment-equivalent financing or other incentives and assistance available, in accordance with qualifying programs and available funding.

1.2 Organization of the Community Improvement Plan (CIP)

This CIP includes the following components:

- General information on community improvement planning;
- Review of the legislative authority supporting the establishment of the CIP
- Identification of the CIP project area, purpose, goal, and program policies
- Description of CIP programs
- Appendices relating to the CIP and program details

1.3 General Information on Community Improvement Planning

Common to all municipalities is the need to build, reinforce or reshape themselves to meet global challenges and residents’ future needs in a sustainable way that delivers a high quality of life. Community improvement planning, one of the many community planning tools found in [the Ontario Planning Act], can help municipalities address some of these challenges, as it provides a means of planning and financing activities that relate to the effective use, reuse or restoration of lands, buildings and infrastructure. Through a Community Improvement Plan municipalities can:

- focus public attention on local priorities and specific municipal initiatives;
- target areas in transition or in need of repair, rehabilitation and redevelopment;
- facilitate and encourage community change in a co-ordinated manner; and,
- stimulate private sector investment through municipal incentive-based programs.
Community improvement project areas may range from specific properties and employment areas to streets, neighbourhoods, or as is the case with this CIP, an entire community or City. Program coverage can span a wide spectrum of municipal objectives from municipally driven programs relating to infrastructure works, to incentive based programs providing grants, loans or tax increment-equivalent financing. Cities across Ontario have previously used Community Improvement Plans for residential neighbourhood restoration, commercial area improvements, incentives for enhancing or redeveloping the downtown, adaptive re-use and brownfield remediation. Common to these and all CIP programs is the alteration of the physical landscape of communities so that public benefits can be achieved, resulting in more socially cohesive, environmentally friendly and/or economically sound communities.

2. LEGISLATIVE AUTHORITY AND POLICY DIRECTION

[Note: the text of this section is highly context dependent and has been written with Kitchener, Ontario in mind. It therefore makes reference to documents and policy from the Province of Ontario, Region of Waterloo, and City of Kitchener, all of which will need to be re-evaluated for adaptation to the context of the local municipality using this as a reference.]

2.1 Provincial

2.1.1 Ontario Planning Act

Ontario municipalities are generally prohibited from granting bonuses or incentives, directly or indirectly, through the restrictions of the Municipal Act. An exception to this general rule is provided through Part IV Section 28 of the Planning Act. Section 28 allows municipalities, where there are provisions in its Official Plan relating to community improvement, to designate by Bylaw, a “Community Improvement Project Area”, and subsequently provide for the preparation of a “Community Improvement Plan”.

Through Bill 51, amendments to the Planning Act have been made to expand the scope of CIPs. The most significant of these changes is a new definition for “community improvement.” As of January 1, 2007 community improvement “means the planning or replanning, design or redesign, resubdivision, clearance, development or redevelopment, construction, reconstruction and rehabilitation, improvement of energy efficiency, or any of them, of a community improvement project area, and the provision of such residential, commercial, industrial, public, recreational, institutional, religious, charitable or other uses, buildings, structures, works, improvements or facilities, or spaces therefore, as may be appropriate or necessary” (Planning Act, Part IV Section 28(1)).

Directly related to the focus of this CIP are new changes made to the Planning Act which add the improvement of energy efficiency to the definition of “community improvement”; and the provision of energy efficient uses, buildings, structures, works and improvements or facilities, to the scope of eligible costs for which municipalities can provide community improvement grants or loans.

Specifically, Part IV Section 28 of the Planning Act includes the following:
Grants or loans re eligible costs:

(7) For the purpose of carrying out a municipality’s community improvement plan that has come into effect, the municipality may make grants or loans, in conformity with the community improvement plan, to registered owners, assessed owners and tenants of lands and buildings within the community improvement project area, and to any person to whom such an owner or tenant has assigned the right to receive a grant or loan, to pay for the whole or any part of the eligible costs of the community improvement plan.

Eligible costs

(7.1) For the purposes of subsection (7), the eligible costs of a community improvement plan may include costs related to environmental site assessment, environmental remediation, development, redevelopment, construction and reconstruction of lands and buildings for rehabilitation purposes or for the provision of energy efficient uses, buildings, structures, works, improvements or facilities.

2.1.2 Provincial Policy Statement

Ontario’s Provincial Policy Statement 2005 (PPS) provides policy direction on matters relating to land use planning that are of provincial interest. It is issued under the authority of Section 3 of the Planning Act and applies to all applications, matters or proceedings commenced on or after March 1, 2005.

The 2005 Provincial Policy Statement is based on building strong communities. Specifically, Policy 1.8 of the PPS provides policy direction to planning authorities on how Ontario’s energy goals can be achieved by encouraging energy efficiency, conservation, and a new clean energy supply.

2.1.3 Growth Plan for the Greater Golden Horseshoe

One of the guiding principles of the Growth Plan for the Greater Golden Horseshoe is to “protect, conserve, enhance and wisely use the valuable natural resources of land, air and water for current and future generations”. Specifically, Policy 4.2.4 (A Culture of Conservation) of the Growth Plan for the Greater Golden Horseshoe provides direction to municipalities to develop strategies in support of water and energy conservation, air quality protection and waste management.

2.2 Regional

2.2.1 Regional Official Plan

Both the Regional Official Policies Plan and the Regional Official Plan 2029 (ROP) are based on a vision for a sustainable community. Specific energy conservation policies in the ROP “promote building designs and orientations that incorporate energy conservation features”.
2.2.2 Regional Growth Management Strategy

Goal 1: Enhancing our Natural Environment of the Region of Waterloo’s Growth Management Strategy, identifies the need to reduce energy consumption and minimize the urban footprint. One of the recommended action items of this goal is to “investigate the potential for more environmentally-friendly development in urban areas”.

2.3 Local

2.3.1 Kitchener Official Plan

The City of Kitchener Official Plan (approved May 25, 1995) includes policies regarding ‘Community Improvement’ (Part II - Section 5.4). The objective of the Community Improvement policies in the Official Plan is to maintain, improve and rehabilitate Kitchener’s current and former industrial, commercial, residential and public areas.

Community Improvement Policy 5.4.1 of the Official Plan states that:

"All lands within the City Limits of the City of Kitchener are considered eligible for Community Improvement initiatives, and eligible to be designated as a “Community Improvement Project Area”, pursuant to the provisions of Section 28 of the Ontario Planning Act."

In addition, Part II - Section 5 (Conservation and Community Improvement) of the Official Plan, contains policies to improve the environmental impacts of development and specifically to promote energy and water conservation within the City.

2.3.2 A Plan for a Healthy Kitchener

Kitchener’s healthy community model, A Plan for a Healthy Kitchener (approved by Council in 2006) is directly integrated into the Corporate Strategic Plan. This plan identifies several strategic directions; including Quality of Life, Leadership, Development and Environment, that support a healthy community (which includes an environmentally sustainable community).

2.3.3 Strategic Plan for the Environment

Some of the key guiding principles of the City’s Strategic Plan for the Environment (approved by Council in 1992 and updated in 2008) include being a partner, supporting and collaborating with community participants on initiatives that can have maximum benefit to the environment. The objectives of this plan incorporate the conservation of water resources, emission-reduction and air quality improvement, integrating the principles of environmental conservation with development, and reducing energy usage.
2.3.4 Kitchener Growth Management Strategy

One of the objectives within Goal 1 of the Kitchener Growth Management Strategy (approved by Council in 2009) is to implement energy conservation measures. Another objective is to ensure new development limits its impact on water and wastewater systems.

3. COMMUNITY IMPROVEMENT PLAN (CIP) FOR ENERGY AND WATER EFFICIENCY FOR LAND AND BUILDINGS

3.1 Community Improvement Project Area

This CIP applies to all lands within the municipal boundary.

3.2 Purpose

The purpose of this CIP is to support and implement provincial, regional and local policies and strategies relating to energy and water conservation. This will be achieved through the provision of one or more programs which could make grants, loans, refunds, exemptions, tax increment-equivalent financing or other incentives and assistance available to project proponents, subject to available funding.

All qualifying programs forming part of this CIP shall be identified in Section 4.0 (CIP Programs) and may meet varying aspects of the goal of this CIP.

3.3 Goal

The goal of this CIP is to encourage the construction or reconstruction of buildings or the use of land in a way that achieves measurable improvement in energy performance and water conservation.

3.4 Program Parameters

Programs qualifying under this CIP shall meet the following program parameters:

1) Program(s) may offer grants, loans, refunds, exemptions, tax increment-equivalent financing or other incentives and assistance to registered owners, assessed owners and tenants of lands and buildings within the community improvement project area, and to any person to whom such an owner or tenant has assigned the right to receive such financial incentive to pay for the whole or any part of the eligible costs of the community improvement plan, subject to available funding.

2) Financial assistance shall not be issued for work on buildings located on property in property tax or utility arrears or any municipal financial obligations.

3) The total of grants, loans or other financial assistance provided under a program is limited to the amount of the eligible costs defined in the program.
4) Program(s) shall relate directly to achieving energy or water performance objectives and shall address but not necessarily be limited to one or more of the following:

a) **air quality** through the reduction of emissions harmful to the environment;

b) **water efficiency** by reducing water demand or maximizing the re-use and recycling of water;

c) **energy efficiency and conservation** through energy demand management to reduce energy consumption, and design or product standards that result in more energy efficient green buildings and development;

d) **energy generation** through on-site or remote renewable energy systems;

e) **energy storage and distribution** for thermal or electrical energy systems, including but not limited to district energy, microgrid, smart-grid, vehicle-to-grid, virtual net metering, and micro-utility distribution concepts; and

f) **waste management** by enhancing waste reduction through composting, material re-use, recycling and waste diversion initiatives;

5) Program(s) shall measure improvement in energy and water efficiency by using government or industry accepted benchmarks or certifications including but not limited to BOMA BEnSt, BUILT GREEN, EnerGuide, ENERGY STAR, LEED, Net-Zero, Passive House, R-2000 and Living Buildings.

6) Program(s) contained in the CIP shall not commence until City Council has approved and adopted the CIP or respective amendment to the CIP.

3.5 Amendments

1) An amendment to the CIP is required where there is

a) a change the geographic area to which financial or land programs outlined in the CIP apply;

b) a change in the purpose or goal of the CIP;

c) a change in the eligibility criteria of a program contained in the CIP;

d) an addition of a new program(s) to the CIP;

e) an increase in the financial incentive offered within a program contained in the CIP.

2) If an amendment results in the commitment of additional public dollars or the foregoing of public dollars, public notice should be given.

3) All amendments to the CIP shall require pre-consultation with the [Ministry of Municipal Affairs and Housing], and approval by City Council.
4) An amendment to this CIP is not required where:

   a) a subsidiary program within this CIP is discontinued; or
   b) funding to a CIP program is decreased or discontinued.

4. CIP PROGRAMS

4.1 Green Housing Incentive

4.1.1 Background

It is acknowledged that the building industry, while recognized as a major contributor to the economic vitality of cities, is also a major consumer of energy and supplier of emissions detrimental to our environment. Buildings consume a significant portion of the world’s energy consumption through their construction and operation. As the local community expands, each new building not constructed to higher standards becomes a lost opportunity that will someday need to be retrofitted and improved.

Knowledge and technology exist today to enable enhanced “green” building practices. While changes to the National and regional Building Codes require higher minimum standards of construction and home operating efficiencies over time, there is an opportunity to strive for a greater measure of energy and water efficiency than is minimally required.

4.1.2 Program Description

The intent of the Green Housing Incentive is to use a modest but truly helpful incentive amount to enable and leverage greater investments by the builder/developer, catalyzing greater energy efficiency performance for new homes as they are built, thus offsetting the impacts on energy, water and waste from new home construction. Residential dwellings that are built and certified to advanced building standards will receive a financial incentive in the form of a grant. The amount of the grant is incremental dependent upon the performance level achieved, as measured by several recognized best practice programs. For example, a single detached dwelling built to Net-Zero Energy or to LEED Platinum would receive a larger grant than a single detached dwelling built to Net-Zero Ready or to LEED Silver. As [municipality] continues to grow, the Green Housing Incentive Program will help reduce [municipality]’s future carbon footprint and provide substantial water and landfill savings.

The details of the program’s specific objectives, financial incentives, duration, and administration are contained in Appendix D.1 to this CIP.

4.1.3 Conformity with the CIP

The Green Housing Incentive Program is consistent with the goal and Program parameters for this CIP. The Program will implement strategies in support of water and energy conservation, including air quality protection and improvements in waste management. Further, it aims to
stimulate the construction of buildings that achieve an improvement or efficiency in environmental conservation through the following industry best practice construction programs:

- **BUILT GREEN / Green Seal**, administered by Built Green Canada
- **EnerGuide Rating System (ERS)**, administered by Natural Resources Canada (NRCan)
- **LEED (Leadership in Energy and Environmental Design)**, administered by the Canada Green Building Council (CaGBC)
- **Net-Zero (NZ) and Net-Zero Ready (NZr)**, administered by the Canadian Home Builders’ Association (CHBA)
- **Passive House**, administered by Passive Buildings Canada (PBC), the Canadian Passive House Institute (CanPHI), and/or the Passive House Institute US (PHIUS)

These third party certification programs are rigorously defined and nationally respected, and are supported by nationally respected agencies. Each offers measurable benchmarks for the design, construction and operation of high performance green buildings. By leveraging these third party building certification programs, the Green Housing Incentive Program establishes that it will:

1) Reduce the incremental impact of the built environment on energy and water systems;
2) Reduce greenhouse gas emissions from new home construction;
3) Recognize that the energy and environmental benefits of new construction become inherently part of the new building(s), and will have a compoundingly positive legacy impact for the full life of the building;
4) Contribute to the enhancement of local air quality and indoor air quality improvements that benefit human health;
5) Achieve a net gain in the quality of the local environment resulting in an improved quality of life in the community;
6) Improve local construction knowledge and implementation of more efficient construction techniques;
7) Support the increased use of reputable third party green building certification programs;
8) Increase community awareness of the economic, environmental and social benefits of environmentally efficient use of land and buildings;
9) Provide a boost for local businesses to establish themselves as leaders in the “green” marketplace and to be proactive in preparing for increasingly stringent Building Codes as industry transitions towards requiring net-zero energy by 2030;
10) Educate and promote change at a community level by:
    a) creating a new standard of “green” building in the local building industry that will last after the incentive is gone;
    b) involving builders and their trade partners in green building techniques;
    c) enabling homebuyers and visitors to tangibly experience the benefits of smarter, more energy-efficient homes;
    d) attracting media exposure to “green” certified buildings;
    e) demonstrating municipal leadership as a “green” community.
4.2 Green Building Incentive

4.2.1 Background

Refer to section 4.1 above. This program is the same but for all forms of buildings not eligible for the Green Housing Incentive program.

4.2.2 Program Description

Refer to section 4.1 above. This program is the same but for all forms of buildings not eligible for the Green Housing Incentive program.

The details of the program’s specific objectives, financial incentives, duration, and administration are contained in Appendix D.2 to this CIP.

4.2.3 Conformity with the CIP

The Green Building Incentive Program is consistent with the goal and Program parameters for this CIP. The Program will implement strategies in support of water and energy conservation, including air quality protection and improvements in waste management. Further, it aims to stimulate the construction of buildings that achieve an improvement or efficiency in environmental conservation through the following industry best practice construction programs:

- **BOMA BESt**, administered by the Building Operations and Management Association of Canada (BOMA Canada);
- **BUILT GREEN Mid-Rise / Green Seal Mid-Rise**, administered by Built Green Canada for mid and high-rise residential buildings;
- **LEED (Leadership in Energy and Environmental Design)**, administered by the Canada Green Building Council (CaGBC);
- **Living Building**, administered by the International Living Futures Institute (ILFI);
- Or buildings with Energy Usage Intensity (EUI) calculated by a licensed Professional Engineer and reported in a manner consistent with the program requirements set out below.

These third party certification programs are rigorously defined and nationally respected, and are supported by nationally respected agencies. Each offers measurable benchmarks for the design, construction and operation of high performance green buildings. By leveraging these third party building certification programs, the Green Building Incentive Program establishes that it will:

1) Reduce the incremental impact of the built environment on energy and water systems;
2) Reduce greenhouse gas emissions from new home construction;
3) Recognize that the energy and environmental benefits of new construction become inherently part of the new building(s), and will have a compoundingly positive legacy impact for the full life of the building;
4) Contribute to the enhancement of local air quality and indoor air quality improvements that benefit human health;
5) Achieve a net gain in the quality of the local environment resulting in an improved quality of life in the community;
6) Improve local construction knowledge and implementation of more efficient construction techniques;
7) Support the increased use of reputable third party green building certification programs;
8) Increase community awareness of the economic, environmental and social benefits of environmentally efficient use of land and buildings;
9) Provide a boost for local businesses to establish themselves as leaders in the “green” marketplace and to be proactive in preparing for increasingly stringent Building Codes as industry transitions towards requiring net-zero energy by 2030;
10) Educate and promote change at a community level by:
    a) creating a new standard of “green” building in the local building industry that will last after the incentive is gone;
    b) involving builders and their trade partners in green building techniques;
    c) enabling homebuyers and visitors to tangibly experience the benefits of smarter, more energy-efficient homes;
    d) attracting media exposure to “green” certified buildings;
    e) demonstrating municipal leadership as a “green” community.

4.3 Property Tax Reduction Program

4.3.1 Background

Property taxes are the primary and often sole source of revenue for a municipality. Properties which are vacant, undeveloped, or in need of remediation will yield less (if any) revenue to the municipality than developed and well-maintained properties. Offering temporary relief on property tax is a proven tool that the municipality can use to motivate and incentivize property owners to invest in improvements to their properties, thus increasing the value of the property and of the associated tax revenue potential for the municipality. Many municipalities have successfully offered short-term relief programs waiving part or all of the property tax on eligible properties, particularly the portion of the tax that is new due to actions which increase the value of the property. This is sometimes referred to as a Tax-Increment Grant, because it applies only to the incremental increase in property tax, not to the tax that was assessed prior to the improvement of the property. This helps ensure that the municipality continues to collect tax revenue off of the property (and thus ensures the funding of municipal services such as garbage collection and road maintenance), but also provides a meaningful incentive to the developer.

4.3.2 Program Description

The intent of the Property Tax Reduction Program is to encourage property owners to invest in the development of vacant, undeveloped or poorly maintained sites by offering a reduction to the collected property taxes until the program’s specific criteria have been satisfied. Reducing the property taxes can be leveraged to support development projects that achieve industry best
practiced in environmental building standards. Reducing the municipal property taxes collected on brownfield sites, vacant properties, or buildings needing rehabilitation or renovations that achieve advanced building standards is a way that municipalities can encourage clean developments without having to allocate funding from their annual budgets. While it is true that the city loses a portion of the tax revenue that could be collected on the property, these revenues were often at risk regardless, and the development or remediation process should result in an increased property value which increases the amount of tax collectable from that site for the future. This model is more useful than tax exemption programs because the municipality still collects a portion of the property taxes during the incentive period. The tax reduction should not be provided if the development will not increase the property value, and environmental site assessments should be a requirement on brownfield sites to ensure that priority areas are remediated.

The details of the program’s specific objectives, financial incentives, duration, and administration are contained in Appendix D.3 to this CIP.

4.3.3 Conformity with the CIP

The Tax Reduction Program is consistent with the goal and Program parameters for this CIP. The Program will encourage development of vacant properties and the rehabilitation of poor performing buildings which contributes to water and energy conservation and improving air quality (within buildings and via reductions in energy related emissions). Further, it aims to stimulate the construction of buildings that achieve an improvement or efficiency in environmental conservation through the following industry best practice construction programs:

- **BOMA BEST**, administered by the Building Operations and Management Association of Canada (BOMA Canada);
- **BUILT GREEN / Green Seal**, administered by Built Green Canada for mid and high-rise residential buildings;
- EnerGuide Rating System (ERS), administered by Natural Resources Canada (NRCan);
- **LEED** (Leadership in Energy and Environmental Design), administered by the Canada Green Building Council (CaGBC);
- **Living Building**, administered by the International Living Futures Institute (ILFI);
- Net-Zero (NZ) and Net-Zero Ready (NZr), administered by the Canadian Home Builders’ Association (CHBA);
- Passive House, administered by Passive Buildings Canada (PBC), the Canadian Passive House Institute (CanPHI), and/or the Passive House Institute US (PHIUS);
- Or buildings with Energy Usage Intensity (EUI) calculated by a licensed Professional Engineer and reported in a manner consistent with the program requirements set out below.

These third party certification programs are rigorously defined and nationally respected, and are supported by nationally respected agencies. Each offers measurable benchmarks for the design, construction and operation of high performance green buildings. By leveraging these third party building certification programs, the Green Building Incentive Program establishes that it will:
1) Reduce the incremental impact of the built environment on energy and water systems;
2) Reduce greenhouse gas emissions from new development and construction;
3) Reduce the greenhouse gas emissions and energy consumption of buildings;
4) Recognize that the energy and environmental benefits of new construction become inherently part of the new building(s), and will have a compoundingly positive legacy impact for the full life of the building;
5) Contribute to the enhancement of local air quality and indoor air quality improvements that benefit human health;
6) Achieve a net gain in the quality of the local environment resulting in an improved quality of life in the community;
7) Improve local construction knowledge and implementation of more efficient construction techniques;
8) Support the increased use of reputable third party green building certification programs;
9) Increase community awareness of the economic, environmental and social benefits of environmentally efficient use of land and buildings;
10) Provide a boost for local businesses to establish themselves as leaders in the “green” marketplace and to be proactive in preparing for increasingly stringent Building Codes as industry transitions towards requiring net-zero energy by 2030;
11) Educate and promote change at a community level by:
   a) creating a new standard of “green” building in the local building industry that will last after the incentive is gone;
   b) involving builders and their trade partners in green building techniques;
   c) enabling homebuyers and visitors to tangibly experience the benefits of smarter, more energy-efficient homes;
   d) attracting media exposure to “green” certified buildings;
   e) demonstrating municipal leadership as a “green” community.

4.4 Advanced Permit Queuing Program

4.4.1 Background

Construction across Canada is highly regulated and cannot proceed without a number of permits and approvals that help to ensure (1) the safety of the projects being proposed and (2) compliance with municipal plans for the affected lands. Potential developers are required to submit detailed development applications containing site-specific drawings and documentation to the municipality’s planning department. Many municipalities experience such volumes of applications that the amount of time required to obtain development / construction permits can become challenging, especially where local industry is in the habit of submitting incomplete applications which require multiple resubmissions before being ready for full review. While waiting for the various permits required prior to construction, developers will continue to pay property taxes on idle properties which are simply waiting to be developed, and many developers are highly motivated to do what they can to accelerate the permitting / approvals process. If there were an option to get their applications processed faster, it would generate significant interest.
Advanced queuing is the process of prioritizing more desirable development projects over less desirable ones, where those projects seeking to add features or considerations which the municipality deems as desirable may be given advanced review. This is achieved by expediting the applications for an additional “advanced review” fee. If the application is accepted by the municipality as complete, and it can demonstrate that environmental standards will be achieved for the development, then the municipality can advance the application’s position in the que to help ensure faster approval.

**4.4.2 Program Description**

The intent of the Advanced Permit Queuing Program is to incentivize future developments to satisfy environmental standards by prioritizing development projects according to industry best practice programs such as those listed in section 4.4.1 above. Expediting development applications is a useful municipal tool to leverage because the municipality does not need to devote any financial resources to encourage developers to satisfy various Green Building Certifications. Rather, offering a reduced permit approval time encourages developers to submit more municipally preferable projects simply in order to be reviewed before other applicants.

Applications leveraging this program will be prioritized according to the level of environmental performance that is achieved. This is a two-tier approval processing system, where applications that meet a minimum threshold of municipally preferred performance will be placed into an advanced queue, and all other applications will be reviewed as normal. For example, an application that can achieve a level of Green Building Certification will be accepted into the advanced queuing program. This program will not distinguish between various levels of Green Building Certification, but developers are encouraged to pursue higher levels of building performance encouraged by other sustainable development programs included in this Community Improvement Plan.

The details of the program’s specific objectives, financial incentives, duration, and administration are contained in Appendix D.4 to this CIP.

**4.4.3 Conformity with the CIP**

The Advanced Queuing Program is consistent with the goal and Program parameters for this CIP. The Program will encourage sustainable community growth by stimulating the development of project sites that achieve high environmental performance standards. This is achieved by prioritizing the applications that can demonstrate that the development will follow industry best practice environmental and construction programs including:

- **BOMA BEST**, administered by the Building Operations and Management Association of Canada (BOMA Canada);
- **BUILT GREEN / Green Seal**, administered by Built Green Canada for mid and high-rise residential buildings;
- **EnerGuide Rating System (ERS)**, administered by Natural Resources Canada (NRCan)
• LEED (Leadership in Energy and Environmental Design), administered by the Canada Green Building Council (CaGBC);
• Living Building, administered by the International Living Futures Institute (ILFI);
• Net-Zero (NZ) and Net-Zero Ready (NZr), administered by the Canadian Home Builders’ Association (CHBA)
• Passive House, administered by Passive Buildings Canada (PBC), the Canadian Passive House Institute (CanPHI), and/or the Passive House Institute US (PHIUS)
• Or buildings with Energy Usage Intensity (EUI) calculated by a licensed Professional Engineer and reported in a manner consistent with the program requirements set out below.

These third-party certification programs are rigorously defined and nationally respected, and are supported by nationally respected agencies. Each offers measurable benchmarks for the design, construction and operation of high performance green buildings. By leveraging these third-party building certification programs, the Advanced Queuing program establishes that it will:

1) Expedite development projects that can provide measurable evidence that they will achieve a certain level of Green Building Standards;
2) Reduce the incremental impact of the built environment on energy and water systems;
3) Reduce greenhouse gas emissions from new site development projects;
4) Recognize that the energy and environmental benefits of new construction become inherently part of the new building(s), and will have a compoundingly positive legacy impact for the full life of the future development;
5) Contribute to the enhancement of local air quality and indoor air quality improvements that benefit human health;
6) Achieve a net gain in the quality of the local environment resulting in an improved quality of life in the community;
7) Improve local construction knowledge and implementation of more efficient construction techniques;
8) Support the increased use of reputable third party green building certification programs;
9) Increase community awareness of the economic, environmental and social benefits of environmentally efficient use of land and buildings;
10) Provide a boost for local businesses to establish themselves as leaders in the “green” marketplace and to be proactive in preparing for increasingly stringent Building Codes as industry transitions towards requiring net-zero energy by 2030;
11) Educate and promote change at a community level by:
   a) creating a new standard of “green” building in the local building industry that will last after the incentive is gone;
   b) involving builders and their trade partners in green building techniques;
   c) enabling homebuyers and visitors to tangibly experience the benefits of smarter, more energy-efficient homes;
   d) attracting media exposure to “green” certified buildings;
   e) demonstrating municipal leadership as a “green” community.
4.5 Property Assessed Payments for Energy Reductions (PAPER) Program

4.5.1 Background

Buildings constitute a significant contribution to National GHG emissions. It is important to encourage energy-efficiency improvements to buildings to assist in achieving municipal, provincial, and federal GHG emission reduction goals. There are barriers to improving residential energy efficiency, including high up-front retrofit costs, lack of knowledge about cost-effective measures that contribute to significant energy savings, challenges with obtaining affordable financing options, awareness gaps about energy savings, uncertainty about workforce capability, intimidation at the complexity of the retrofit process, and more. Offering people up-front financing to support energy improvements can be a useful tool to encourage energy efficiency retrofits. These retrofits should take a comprehensive approach to increasing the home’s energy efficiency, including increasing the amount of insulation in the envelope, upgrading the lighting fixtures and appliances that are used, upgrading inefficient heating and cooling systems, and supporting on-site renewable energy technologies.

4.5.2 Program Description

The intent of the 4.5 Property Assessed Payments for Energy Reductions (PAPER) Program is to encourage energy efficiency upgrades in homes and small businesses by providing property owners with a loan of up to $30,000 to support deep energy retrofits to the property, and a degree of support in hiring reputable contractors. These retrofits encourage increases to the performance of the building’s envelope and energy systems through measures such as increased insulation and air sealing, conservation efforts such as installing more efficient furnaces or heat pumps, and on-site energy production. The up-front capital loan and support from the municipality can enable retrofit projects that would otherwise not overcome the typical barriers to entry.

The PAPER model is built upon the municipality’s ability to lend out money at a low interest rate (because of the municipality’s strong credit rating) and recollect that loan over time through the property tax bill. PAPER is designed to enable property owners to reduce their energy bills by up to 50%, and the funds saved that were previously used to pay those bills can then be used to repay the PAPER loan. Prequalified criteria are established that will help to shortlist eligible homes for retrofit projects. This should be done by partnering with local utilities in the area to conduct energy audits and prioritize retrofit projects in buildings that need the greatest improvements.

The details of the program’s specific objectives, financial incentives, duration, and administration are contained in Appendix D.5 to this CIP.

4.5.3 Conformity with the CIP

The Property Assessed Payment for Energy Reductions Program is consistent with the goal and Program parameters for this CIP. The Program will encourage sustainable community growth by stimulating retrofit projects on residential and business sites that can display the need for energy
efficiency improvements. This is achieved by prioritizing retrofit projects to homes and business buildings that pass basic eligibility assessments and display the opportunity for deep energy efficiency increases through the retrofit process. These deep home retrofit programs will:

1) Reduce the incremental impact of the built environment on energy and water systems;
2) Reduce the purchased energy consumption in residential homes;
3) Reduce greenhouse gas emissions from residential and commercial buildings;
4) Recognize that the energy and environmental benefits of retrofitting energy inefficient homes should become inherently part of the requirements for new building(s), and will have a compoundingly positive legacy impact for the full life of the future development;
5) Contribute to the enhancement of local air quality and indoor air quality improvements that benefit human health;
6) Achieve a net gain in the quality of the local environment resulting in an improved quality of life in the community;
7) Improve local construction knowledge and implementation of more efficient construction techniques;
8) Support the increased use of reputable third party green building certification programs;
9) Increase community awareness of the economic, environmental and social benefits of environmentally efficient use of land and buildings;
10) Provide a boost for local businesses to establish themselves as leaders in the “green” marketplace and to be proactive in preparing for increasingly stringent Building Codes as industry transitions towards requiring net-zero energy by 2030;
11) Educate and promote change at a community level by:
   a) creating a new standard of “green” building in the local building industry that will last after the incentive is gone;
   b) involving builders and their trade partners in green building techniques;
   c) enabling homebuyers and visitors to tangibly experience the benefits of smarter, more energy-efficient homes;
   d) attracting media exposure to “green” certified buildings;
   e) demonstrating municipal leadership as a “green” community.

4.6 Development Charge Rebate Program

4.6.1 Background

Across Canada, there are steadily increasing demands on municipal services with the development of new property, including garbage collection, snow removal, road maintenance, and more. Development Charges (DC) are notionally intended to compensate the municipality (up front) for the increase in municipal services that will be required once development has been completed, and are often used by the municipality to fund capital works projects such as stormwater management upgrades which are required in order to support the development.
Many municipalities across Canada have offered to fully or partially rebate DC fees in order to attract industry and jobs or to incent brownfield redevelopment. This is tricky, because reducing or rebating these fees does not typically reduce the cost born by the municipality which these fees are intended to support, so prudence is required when considering what types of projects should be eligible for DC rebates. The development industry often requests and is easily excited by the opportunity to reduce DCs, but strictly speaking, the municipality needs to be mindful that DC credits or exemptions are an investment made by the municipality which has an associated cost, and if the cost is not recoverable through meaningful savings or reductions to real municipal costs, then it must be funded ultimately by the tax base with appropriate justification.

DC rebates which help to entice (re)development of sites which are underutilized, but are already serviced, represent an opportunity for the municipality to increase property tax yield from specific sites with little to no increase in investment into servicing those sites. This is an easy win-win, where the developer is happy because of DC incentives, and the municipality is happy because it is not really loosing anything by reducing DC fees, but is gaining by having the site increased in value and restored to active use.

4.6.2 Program Description

The intent of the Development Charge Rebate Program is to enable and leverage greater investments by the builder/developer, catalyzing greater energy efficiency performance for new buildings as they are built, thus offsetting the impacts on energy, water, and environmental emissions (GHGs) from new construction. This program reduces DC fees levied against new development or remediation projects on residential, commercial, mixed-use, and brownfield sites that meet Green Building Certification standards. The amount of the development charge rebate is incrementally dependent upon the performance level achieved, as measured by industry best practice in Green Building standards.

In theory, net-zero energy developments should provide less strain on municipal infrastructure than traditional buildings, so fees such as DCs which are tied to that reduced strain could be proportionately reduced. This would also add an additional incentive to achieve the higher Green Building Certification.

The details of the program’s specific objectives, financial incentives, duration, and administration are contained in Appendix D.6 to this CIP.

4.6.3 Conformity with the CIP

The DC Rebate Program is consistent with the goal and Program parameters for this CIP. The Program will implement strategies in support of water, energy, and related environmental emissions (GHG) reductions. It aims to stimulate the construction of buildings that achieve an improvement or efficiency in environmental conservation by exempting or reducing DC fees for developments that meet the following industry best practice programs:
- **BOMA BEST**, administered by the Building Operations and Management Association of Canada (BOMA Canada);
- **BUILT GREEN / Green Seal**, administered by Built Green Canada for mid and high-rise residential buildings;
- EnerGuide Rating System (ERS), administered by Natural Resources Canada (NRCan);
- LEED (Leadership in Energy and Environmental Design), administered by the Canada Green Building Council (CaGBC);
- **Living Building**, administered by the International Living Futures Institute (ILFI);
- Net-Zero (NZ) and Net-Zero Ready (NZr), administered by the Canadian Home Builders’ Association (CHBA);
- Passive House, administered by Passive Buildings Canada (PBC), the Canadian Passive House Institute (CanPHI), and/or the Passive House Institute US (PHIUS);
- Or buildings with Energy Usage Intensity (EUI) calculated by a licensed Professional Engineer and reported in a manner consistent with the program requirements set out below.

These third-party certification programs are rigorously defined and nationally respected, and are supported by nationally respected agencies. Each offers measurable benchmarks for the design, construction and operation of high performance green buildings. By leveraging these third-party building certification programs, the Development Charge Rebate Program establishes that it will:

1) Reduce the incremental impact of the built environment on energy and water systems;
2) Reduce greenhouse gas emissions from new developments;
3) Recognize that the energy and environmental benefits of new developments become inherently part of the new building(s), and will have a compoundingly positive legacy impact for the full life of the building;
4) Contribute to the enhancement of local air quality and indoor air quality improvements that benefit human health;
5) Achieve a net gain in the quality of the local environment resulting in an improved quality of life in the community;
6) Improve local construction knowledge and implementation of more efficient construction techniques;
7) Support the increased use of reputable third party green building certification programs;
8) Increase community awareness of the economic, environmental and social benefits of environmentally efficient use of land and buildings;
9) Provide a boost for local businesses to establish themselves as leaders in the “green” marketplace and to be proactive in preparing for increasingly stringent Building Codes as industry transitions towards requiring net-zero energy by 2030;
10) Educate and promote change at a community level by:
   a) creating a new standard of “green” building in the local building industry that will last after the incentive is gone;
   b) involving builders and their trade partners in green building techniques;
   c) enabling homebuyers and visitors to tangibly experience the benefits of smarter, more energy-efficient homes;
   d) attracting media exposure to “green” certified buildings;
e) demonstrating municipal leadership as a “green” community.

4.7 Building Permit Fee Reduction Program

4.7.1 Background

The building permit process is intended to ensure that proposed project plans comply with applicable safety legislation such as Building Codes, and also with the municipality’s standards for land use, zoning, and local construction. These considerations are important to ensure the safety of current and future owners and occupants of the property and to provide standards for the enforcement of zoning and land use policies. Applicants can be incentivized to develop buildings to achieve Green Building Certification if the municipality reduces the fees associated with the application. A building permit fee reduction is perhaps the simplest incentive method to implement, in that it is literally a total or partial refund to the developer for the cost of the building and development permits. This rebate is usually based upon including certain design elements in the building permit application which demonstrate that the building will meet objectives set by the municipality (eg: sustainability related or energy performance objectives).

4.7.2 Program Description

The intent of the Building Permit Fee Reduction Program is to encourage new developments to meet industry best in practice environmental standards. Residential, commercial, mixed-use, and brownfield sites that can demonstrate that the development will meet advanced environmental standards will receive a financial incentive in the form of reduced building permit fees. Residential, commercial, mixed-use buildings, and brownfield sites that will be built and certified to environmental standards will receive a reduction to their building permit fees that is incrementally dependent upon the level of performance that is achieved. For example, a home that is built to Net-Zero efficiency would receive a larger reduction than a home built to LEED Silver standards. This is a helpful incentive model to leverage environmentally sustainable developments by encouraging developments that will demonstrate savings in terms of consumed energy, GHG emissions, and water use. As the municipality continues to grow, the Building Permit Reduction Fee Program will help to reduce the municipality’s future carbon footprint, while providing reductions to energy and water consumption.

The details of the program’s specific objectives, financial incentives, duration, and administration are contained in Appendix D.7 of this CIP.

4.7.3 Conformity with the CIP

The Building Permit Fee Reduction Program is consistent with the goal and Program parameters for this CIP. The Program will encourage developments that support water and energy conservation, including air quality protection and environmental emissions (GHG) reductions. Further, it aims to stimulate the construction of buildings that achieve an improvement or efficiency in environmental conservation through the following industry best practice construction programs:
BOMA BEST, administered by the Building Operations and Management Association of Canada (BOMA Canada);

BUILT GREEN / Green Seal, administered by Built Green Canada for mid and high-rise residential buildings;

EnerGuide Rating System (ERS), administered by Natural Resources Canada (NRCan);

LEED (Leadership in Energy and Environmental Design), administered by the Canada Green Building Council (CaGBC);

Living Building, administered by the International Living Futures Institute (ILFI);

Net-Zero (NZ) and Net-Zero Ready (NZr), administered by the Canadian Home Builders’ Association (CHBA);

Passive House, administered by Passive Buildings Canada (PBC), the Canadian Passive House Institute (CanPHI), and/or the Passive House Institute US (PHIUS);

Or buildings with Energy Usage Intensity (EUI) calculated by a licensed Professional Engineer and reported in a manner consistent with the program requirements set out below.

These third party certification programs are rigorously defined and nationally respected, and are supported by nationally respected agencies. Each offers measurable benchmarks for the design, construction and operation of high performance green buildings. By leveraging these third party building certification programs, the Green Housing Incentive Program establishes that it will:

1) Reduce the incremental impact of the built environment on energy and water systems;
2) Reduce greenhouse gas emissions from new home construction;
3) Recognize that the energy and environmental benefits of new construction become inherently part of the new building(s), and will have a compoundingly positive legacy impact for the full life of the building;
4) Contribute to the enhancement of local air quality and indoor air quality improvements that benefit human health;
5) Achieve a net gain in the quality of the local environment resulting in an improved quality of life in the community;
6) Improve local construction knowledge and implementation of more efficient construction techniques;
7) Support the increased use of reputable third party green building certification programs;
8) Increase community awareness of the economic, environmental and social benefits of environmentally efficient use of land and buildings;
9) Provide a boost for local businesses to establish themselves as leaders in the “green” marketplace and to be proactive in preparing for increasingly stringent Building Codes as industry transitions towards requiring net-zero energy by 2030;
10) Educate and promote change at a community level by:
   a) creating a new standard of “green” building in the local building industry that will last after the incentive is gone;
   b) involving builders and their trade partners in green building techniques;
   c) enabling homebuyers and visitors to tangibly experience the benefits of smarter, more energy-efficient homes;
   d) attracting media exposure to “green” certified buildings;
APPENDICES:

The following Appendices are attached to and form part of this Community Improvement Plan:

D.1 Green Housing Incentive Program
D.2 Green Building Incentive Program
D.3 Property Tax Reduction Incentive Program
D.4 Advanced Queuing Incentive Program
D.5 Property Assessed Payments for Energy Reductions (PAPER) Program
D.6 Development Charge Rebate Incentive Program
D.7 Building Permit Fee Reduction Program

And the following appendices do not form part of this Community Improvement Plan, but are likely to be required in order to enact this CIP or any other adapted from it in any local municipality in Ontario. Further adaptations may be required in order to use the sample by-laws outside of Ontario.

D.8 CIP Staff Report to Council
   This appendix includes a sample staff report that municipal staff could use to submit the CIP to Council for approval.

D.9 Sample By-law to Designate CIP Project Area (for Ontario)
   This appendix includes a sample by-law which would be used to designate the area within the municipality which is affected by the CIP (ie: the CIP “Project Area”).

D.10 Sample By-law to Enact CIP (for Ontario)
   This appendix includes a sample by-law which would be used to enact the CIP, and to assign it to affect the designated CIP Project Area (as defined by the by-law in D.9 above).
D.1 Green Housing Incentive Program

D.1.1 Program Description

The Green Housing Incentive Program provides financial incentives to encourage potential homebuyers and new home builders to design, build and certify residential dwellings to advanced green building standards including:

- **BUILT GREEN / Green Seal**, administered by Built Green Canada;
- **EnerGuide** Rating System (ERS), administered by Natural Resources Canada (NRCan);
- **LEED** (Leadership in Energy and Environmental Design), administered by the Canada Green Building Council (CaGBC);
- **Net-Zero** (NZ) and **Net-Zero Ready** (NZr), administered by the Canadian Home Builders’ Association (CHBA);
- **Passive House**, administered by Passive Buildings Canada (PBC), the Canadian Passive House Institute (CanPHI), and/or the Passive House Institute US (PHIUS).

Each of these green building standards encourages and accelerates adoption of sustainable green building and development practices through the creation and implementation of universally understood and accepted tools and performance criteria. These standards use third-party certification processes that leverage nationally (and internationally) accepted benchmarks for the design, construction and operation of high performance green buildings. They provide building owners and operators with the tools needed to have an immediate and measurable impact on their buildings’ performance.

Of the standards listed, the EnerGuide Rating System is the only one that does not include a specific performance requirement. Instead, EnerGuide sets out a rigorous method for modelling and determining the amount of energy that a building will use, calculated in gigajoules (GJ). EnerGuide is supported and administered by Natural Resources Canada (NRCan) and is considered accurate by Canada’s banking and insurance industries: it is used for finance and incentive programs across Canada. EnerGuide is also used as the backstop behind all the other green building standards listed above (except Passive House, which uses its own system).

Each of these green building standards has a significant focus on energy performance, which is the primary reason they are beneficial to the Green Housing Incentive Program, but they also include language which benefits topics such as:

- respect for local context within the broader neighbourhood;
- sustainable site development;
- water efficiency;
- materials selection;
- indoor environmental quality;
- building commissioning.
LEED and BUILT GREEN both offer multiple levels of certification from Certified/Bronze up to Silver, Gold and Platinum, where higher levels reflect greater performance within each system respectively. This incentive program will make reference to those different performance levels below. Passive House and Net-Zero / Net-Zero Ready are simpler in that they have firm requirements for fewer performance levels.

**D.1.2 Objective & Strategy**

The objective of the Green Home Incentive Program is to offset enough of the direct building costs of energy related upgrades to new homes to:

1) overcome the learning curve experienced by builders new to these programs and
2) reduce the first-cost barrier to entry.

Secondary objectives that will be achieved indirectly include:

3) Energy and water savings from each participating building;
4) Environmental benefit (GHG reductions) from those energy/water savings;
5) Increased occupant health for those living in better buildings;
6) Reduced utility bills freeing up disposable income, promoting local economic benefit;
7) Increased green building experience / expertise among local builders and trades;
8) Increased public recognition / normalization of green building standards among local property owners, constructors, realtors, finance/insurance professionals, and more;
9) Increased capacity of local trades / constructors to deliver green buildings;
10) Boost local businesses to establish themselves as leaders in the “green” marketplace and to be proactive in preparing for increasingly stringent Building Codes as industry transitions towards requiring net-zero energy by 2030;
11) All of these benefits accrue over time for as long as the buildings endure;
12) Improved quality of life in the community.

**D.1.3 Measurable Outcomes**

Measurable outcomes are benchmarked against new houses built to the National Building Code, and are estimated as follows:

<table>
<thead>
<tr>
<th>Program / Performance Level</th>
<th>~GHGe/yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net-Zero, EnerGuide 0 or less</td>
<td>0 Tonnes</td>
</tr>
<tr>
<td>LEED Platinum, Passive House, EnerGuide 25 or less</td>
<td>1 Tonnes</td>
</tr>
<tr>
<td>LEED Gold, Built Green Platinum, Net-Zero Ready, EnerGuide 50 or less</td>
<td>2 Tonnes</td>
</tr>
<tr>
<td>LEED Silver, Built Green Gold, EnerGuide 65 or less</td>
<td>3 Tonnes</td>
</tr>
<tr>
<td>EnerGuide 80 or less, ENERGY STAR, LEED Certified, or Built Green Silver</td>
<td>4 Tonnes</td>
</tr>
<tr>
<td>National Building Code</td>
<td>5 Tonnes</td>
</tr>
</tbody>
</table>

*NOTE: These estimates could be more accurate by considering climate zone and energy supply mix, but have been simplified to enable consistent measurability for the municipality.*
D.1.4 Program Incentives

This project proposes that a new Green Housing Incentive be defined as follows:

<table>
<thead>
<tr>
<th>Performance Level</th>
<th>Yr. 3+ Incentive Levels</th>
<th>Yr. 1-2 Incentive Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1st dwelling</td>
<td>2nd dwelling</td>
</tr>
<tr>
<td>Net-Zero, EnerGuide 0 or less</td>
<td>$7,500</td>
<td>$6,000</td>
</tr>
<tr>
<td>LEED Platinum, Passive House, EnerGuide 30 or less</td>
<td>$6,000</td>
<td>$4,500</td>
</tr>
<tr>
<td>LEED Gold, Built Green Platinum, Net-Zero Ready, EnerGuide 50 or less</td>
<td>$5,000</td>
<td>$3,500</td>
</tr>
<tr>
<td>LEED Silver, Built Green Gold, EnerGuide 65 or less</td>
<td>$3,000</td>
<td>$2,250</td>
</tr>
<tr>
<td>EnerGuide 80 or less, ENERGY STAR, LEED Certified, or Built Green Silver</td>
<td>Pre-required</td>
<td>Pre-required</td>
</tr>
</tbody>
</table>

*The need for this incentive level should be re-evaluated based upon the success of the program as it progresses.*

Please notice that this incentive is based on a declining balance model, where the incentive level is higher for the first and second dwelling than for every dwelling thereafter. This is intended to respect the fact that builders who begin to construct to advanced building standards will experience unique costs while they go through their own learning process for the first two dwellings, and that these learning costs will be largely passed by the third dwelling. The incentive therefore diminishes until the third dwelling and remains at the third dwelling level for each dwelling thereafter. It is expected that this declining balance model will help spread the incentive money across more builders/buildings and will encourage greater market participation. Further, the incentive amounts offered after year 3 of the program are reduced in general to encourage local industry to join the program with some urgency, and to begin getting experience right away (which will help support the goal to transition much of the industry by 2030).

D.1.5 Eligibility

The Green Housing Incentive Program shall comply with the Community Improvement Plan for Energy and Water Efficiency for Land and Buildings.
For the purposes of this program, residential dwellings are single detached, semi-detached, duplex and street townhouse dwellings. Multiple-unit dwellings as defined in the zoning bylaw are not eligible.

The Green Housing incentive Program is open to all newly constructed residential dwellings (as defined) built within the municipal boundary during the program and that are constructed and certified in any of the green building standards listed in section D.1.1 above.

For the purposes of this program, the “applicant” is defined as the owner of the property at the time of application. Constructors are eligible applicants.

**D.1.6 Program Administration**

The incentive program is proposed to be delivered by the Building Division. The Building Division will design and secure approval for a stream-lined process for management of the incentive program including:

1) Application by eligible applicant, including proof of third-party verification;
2) Review by Building Division, and payment to applicant;
3) Tracking of greenhouse gas and water savings;
4) Semi-annual reports to be approved by council regarding incentives paid, number of homes and builders participating, and of greenhouse gas and water savings gained.

**D.1.7 Monitoring**

The municipality will track the estimated green house gas savings, number of builders participating in the program and the level of participation. Update reports to be approved by City Council will be prepared on an annual basis.

**D.1.8 Municipal Investment**

**Hard Investment:** cash grants issued to home builders/owners. Total value of grants will be proportionate to local industry activity and program participation: $1,000-$7,500/building.

**Soft investment:** staff time to support administrative efforts behind the program.

**Marketing investment:** staff time to liaise with local industry partners (eg: local chapter of the Canadian Home Builders’ Association, CHBA), and to issue local media releases. Further marketing efforts could be pursued to whatever extent is deemed appropriate.

**Financial Returns on Investment:** funds disbursed as grants under this program will be invested in buildings which have increased performance above building code. These buildings will have increased value, and will yield increased property tax revenues to the municipality which will repay the investment over the life of the building (<40 yrs, or sooner for lower incentive amounts). For municipalities who own their local electrical utilities, these improved...
buildings will help reduce utility infrastructure spending and will yield almost immediate returns.

**Environmental Returns on Investment**: 1-5 tonnes GHG/yr per house affected, compounding annually for the full life of each building, plus energy and water savings (avoiding municipal infrastructure growth and related impacts).

**Social Returns on Investment**: refer to indirect goals from D.1.1 above. Benefits to health, local economic development, local industry leadership, community quality of life.

**D.1.9 Program Duration**

The program will come into effect immediately after budget/funding is assigned and will remain active until budget/funding is exhausted. Once budget is exhausted, this program will remain valid as an endorsed program that is dormant until funding is renewed.

**D.1.10 Application Form**

A template application form is included on the next page. One form should be completed for each house seeking the grant amount.
# Green Housing Incentive Program

**Grant Application**

For Use by Principal Authority

<table>
<thead>
<tr>
<th>Grant Application Number:</th>
<th>Permit Number:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date Received:</td>
<td>Roll Number:</td>
</tr>
</tbody>
</table>

## A. Project Information

<table>
<thead>
<tr>
<th>Building number, street name:</th>
<th>Unit Number:</th>
<th>Lot/con.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipality:</td>
<td>Postal Code:</td>
<td>Plan number/other description:</td>
</tr>
<tr>
<td>Project Value est. $</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## B. Performance Level and Incentive Objective

Performance Level (Refer to Program details):

<table>
<thead>
<tr>
<th>Incentive Level:</th>
<th>1st dwelling</th>
<th>2nd dwelling</th>
<th>3rd dwelling +</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incentive Amount $:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## C. Applicant

Applicant is Authorized agent of owner: [ ] Yes / [ ] No

<table>
<thead>
<tr>
<th>Last Name:</th>
<th>First Name:</th>
<th>Corporation or partnership:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Mailing Address:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phone:</td>
<td>Cell:</td>
<td>E-Mail:</td>
</tr>
</tbody>
</table>

## D. Owner (If different from applicant)

<table>
<thead>
<tr>
<th>Last Name:</th>
<th>First Name:</th>
<th>Corporation or partnership:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Mailing Address:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phone:</td>
<td>Cell:</td>
<td>E-Mail:</td>
</tr>
</tbody>
</table>

## E. Builder

<table>
<thead>
<tr>
<th>Last Name:</th>
<th>First Name:</th>
<th>Corporation or partnership:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Mailing Address:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phone:</td>
<td>Cell:</td>
<td>E-Mail:</td>
</tr>
</tbody>
</table>

## F. Energy Advisor / Green Building Consultant

<table>
<thead>
<tr>
<th>Last Name:</th>
<th>First Name:</th>
<th>Corporation or partnership:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Mailing Address:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phone:</td>
<td>Cell:</td>
<td>E-Mail:</td>
</tr>
</tbody>
</table>

## G. Declaration of Applicant – Please Print Name

I certify that:

The information contained in this grant application, and other attached documentation is true to the best of my knowledge and I have authority to bind the corporation or partnership (if applicable).

______________________     ______________________________
Date        Signature of Applicant
D.2 Green Building Incentive Program

D.2.1 Program Description

The Green Building Incentive Program provides financial incentives to encourage potential developers / constructors to build and certify to advanced green building standards including:

- **BOMA BEST**, administered by the Building Operations and Management Association of Canada (BOMA Canada);
- **BUILT GREEN Mid-Rise / Green Seal Mid-Rise**, administered by Built Green Canada for mid and high-rise residential buildings;
- **LEED** (Leadership in Energy and Environmental Design), administered by the Canada Green Building Council (CaGBC);
- **Living Building**, administered by the International Living Futures Institute (ILFI);
- Or buildings with Energy Usage Intensity (EUI) calculated by a licensed Professional Engineer and reported in a manner consistent with the program requirements below.

Each of these standards encourages and accelerates adoption of sustainable green building and development practices through the creation and implementation of universally understood and accepted tools and performance criteria. These standards use third-party certification processes that leverage nationally / internationally accepted benchmarks for the design, construction and operation of high performance green buildings. They provide building owners and operators with the tools needed to have an immediate and measurable impact on their buildings’ performance. Each of these green building standards has a significant focus on energy performance, which is the primary reason they are beneficial to the Green Building Incentive Program, but they also include language which benefits topics such as:

- respect for local context within the broader neighbourhood;
- sustainable site development;
- water efficiency;
- materials selection;
- indoor environmental quality;
- building commissioning.

LEED, BUILT GREEN and BOMA BEST all offer multiple levels of certification from Certified/Bronze up to Silver, Gold and Platinum, where higher levels reflect greater performance within each system respectively. This incentive program will make reference to those different performance levels below. The Living Building certification program is simpler in that it has firm pass/fail requirements, but those requirements require verification post-occupancy, which means that the incentive will not be able to be paid until after the verification has been complete.

For projects submitting EUI calculations, the final EUI results must be submitted as part of an energy model report issued and sealed by (1) a licensed Professional Engineer or (2) a qualified energy professional using government issued energy modelling software (eg: EE4 by Natural Resources Canada).
Resources Canada) and who can provide a copy of a certificate demonstrating that they have been formally trained by the government agency responsible for that software and are qualified to use it to provide energy modelling services.

**D.2.2 Objective & Strategy**

The objective of the Program is:

1) overcome the learning curve experienced by builders new to these programs and  
2) reduce the first-cost barrier to entry.

Secondary objectives that will be achieved indirectly include:

1) Energy and water savings from each participating building;  
2) Environmental benefit (GHG reductions) from those energy/water savings;  
3) Increased occupant health for those living / working in better buildings;  
4) Reduced utility bills freeing up disposable income, promoting local economic benefit;  
5) Increased green building experience / expertise among local builders and trades;  
6) Increased public recognition / normalization of green building standards among local property owners, constructors, finance/insurance professionals, and more;  
7) Increased capacity of local trades / constructors to deliver green buildings;  
8) Boost local businesses to establish themselves as leaders in the “green” marketplace and to be proactive in preparing for increasingly stringent Building Codes as industry transitions towards requiring net-zero energy by 2030;  
9) All of these benefits accrue over time for as long as the buildings endure;  
10) Improved quality of life in the community.

Measurable outcomes are benchmarked against new buildings built to the National Building Code, and are estimated as follows:

<table>
<thead>
<tr>
<th>Program / Performance Level</th>
<th>~GJ/m²/yr</th>
<th>~GHGe: kg/m²/yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Living Building, EUI of 0 (zero) or less</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>LEED Platinum, BOMA Net Zero Challenge, EUI 50%&lt;building code</td>
<td>100</td>
<td>10</td>
</tr>
<tr>
<td>LEED Gold, BUILT GREEN Platinum, BOMA BES! Platinum, EUI 30%&lt;building code</td>
<td>140</td>
<td>14</td>
</tr>
<tr>
<td>LEED Silver, BUILT GREEN Gold, BOMA BES! Gold, EUI 20%&lt;building code</td>
<td>160</td>
<td>16</td>
</tr>
<tr>
<td>LEED Certified, BUILT GREEN Silver, BOMA BES! Silver, EUI 10%&lt;building code</td>
<td>180</td>
<td>18</td>
</tr>
<tr>
<td>Building code</td>
<td>200</td>
<td>20</td>
</tr>
</tbody>
</table>

*NOTE: These estimates could be made more locally accurate by considering climate zone, local energy supply mix and especially building type, but have been generalized and simplified to enable consistent measurability for the municipality.*
D.2.3 Program Incentives

The proposed Green Building Incentive would be defined as follows:

<table>
<thead>
<tr>
<th>Performance Level*</th>
<th>$/m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 Living Building, EUI of 0 (zero) or less</td>
<td>15.00</td>
</tr>
<tr>
<td>4 LEED Platinum, BOMA Net Zero Challenge, EUI 50%&lt;building code</td>
<td>12.50</td>
</tr>
<tr>
<td>3 LEED Gold, BUILT GREEN Platinum, BOMA BESt Platinum, EUI 30%&lt;building code</td>
<td>10.00</td>
</tr>
<tr>
<td>2 LEED Silver, BUILT GREEN Gold, BOMA BESt Gold, EUI 20%&lt;building code</td>
<td>7.50</td>
</tr>
<tr>
<td>1 LEED Certified, BUILT GREEN Silver, BOMA BESt Silver, EUI 10%&lt;building code</td>
<td>5.00</td>
</tr>
</tbody>
</table>

*Jurisdictions with Step Codes should also consider including higher steps / levels from those Codes in this table.

D.2.4 Eligibility

The Green Building Standards Incentive Program shall comply with the Community Improvement Plan for Energy and Water Efficiency for Land and Buildings.

For the purposes of this program, new buildings that do not meet at least LEED Certified, BUILT GREEN Silver, BOMA, BESt Silver, or have an EUI that is 10% less than the national building code are not eligible.

The Green Building Incentive Program is open to all newly constructed residential dwellings (as defined) built within the municipal boundary during the program and that are constructed and certified in any of the green building standards listed in section D.2.1 above.

For the purposes of this program, the “applicant” is defined as the owner of the property at the time of application. Constructors are eligible applicants.

D.2.5 Program Administration

The incentive program is proposed to be delivered by the Building Division. The Building Division will design and secure approval for a stream-lined process for management of the incentive program including:
1) Application by eligible applicant, including proof of third-party verification;  
2) Review by Building Division, and payment to applicant;  
3) Tracking of greenhouse gas and water savings;  
4) Semi-annual reports to be approved by council regarding incentives paid, number of homes and builders participating, and of greenhouse gas and water savings gained.

### D.2.6 Monitoring

The municipality will track the estimated greenhouse gas savings, number of builders participating in the program and the level of participation. Update reports to be approved by City Council will be prepared on an annual basis.

### D.2.7 Municipal Investment

**Hard Investment:** cash grants issued to home builders/owners. Total value of grants will be proportionate to local industry activity and program participation.

**Soft Investment:** staff time to support administrative efforts behind the program.

**Marketing Investment:** staff time to liaise with local industry partners (eg: local chapters of BOMA Canada, CaGBC, etc), and to issue local media releases. Further marketing efforts could be pursued to whatever extent is deemed appropriate.

**Financial Returns on Investment:** funds disbursed as grants under this program will be invested in buildings with increased performance above building code. These buildings will have increased value and will yield increased property tax revenues to the municipality. Municipal tax rates tend to range between 1% and 1.4% of property value, and the incented buildings will tend to have a premium cost between 3% and 10% of gross construction value, thus payback is determined by comparing the tax collected on the marginal increase in property value with the incentive amount offered, which will repay the incentive amount over time. The municipal services offered to this building over time will be covered reasonably by the property taxes collected on the normal cost of construction, and the incremental increase in collected property taxes (due to constructing to a higher standard of building performance) will help repay the incentive amount over time. For municipalities who own their local electrical utilities, these improved buildings will help reduce utility infrastructure spending and can yield almost immediate returns.

**Environmental Returns on Investment:** energy and water savings (avoiding municipal infrastructure growth and related impacts) compounding for the life of the building.

**Social Returns on Investment:** refer to indirect goals from D.2.1 above. Benefits to health, local economic development, local industry leadership, community quality of life.

### D.2.8 Program Duration
The program will come into effect immediately after budget/funding is assigned and will remain active until budget/funding is exhausted. Once budget is exhausted, this program will remain valid as an endorsed program that is dormant until funding is renewed.

D.2.9 Application Form

A template application form is included on the next page. One form should be completed for each building seeking the grant amount.
City of ____
[mailing address for building department]

<table>
<thead>
<tr>
<th>Green Building Incentive Program Grant Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>For Use by Principal Authority</td>
</tr>
<tr>
<td>Grant Application Number:</td>
</tr>
<tr>
<td>Permit Number:</td>
</tr>
<tr>
<td>Date Received:</td>
</tr>
<tr>
<td>Roll Number:</td>
</tr>
<tr>
<td>A. Project Information</td>
</tr>
<tr>
<td>Building number, street name:</td>
</tr>
<tr>
<td>Unit Number:</td>
</tr>
<tr>
<td>Lot/con.</td>
</tr>
<tr>
<td>Municipality:</td>
</tr>
<tr>
<td>Postal Code:</td>
</tr>
<tr>
<td>Plan number/other description:</td>
</tr>
<tr>
<td>Project Value est. $</td>
</tr>
<tr>
<td>B. Performance Level and Incentive Objective</td>
</tr>
<tr>
<td>Performance Level (Refer to Program details):</td>
</tr>
<tr>
<td>Incentive Level:</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>Incentive Amount $:</td>
</tr>
<tr>
<td>C. Applicant</td>
</tr>
<tr>
<td>Applicant is Authorized agent of owner:</td>
</tr>
<tr>
<td>Yes / No</td>
</tr>
<tr>
<td>Last Name:</td>
</tr>
<tr>
<td>First Name:</td>
</tr>
<tr>
<td>Corporation or partnership:</td>
</tr>
<tr>
<td>Full Mailing Address:</td>
</tr>
<tr>
<td>Phone:</td>
</tr>
<tr>
<td>Cell:</td>
</tr>
<tr>
<td>E-Mail:</td>
</tr>
<tr>
<td>D. Owner (If different from applicant)</td>
</tr>
<tr>
<td>Last Name:</td>
</tr>
<tr>
<td>First Name:</td>
</tr>
<tr>
<td>Corporation or partnership:</td>
</tr>
<tr>
<td>Full Mailing Address:</td>
</tr>
<tr>
<td>Phone:</td>
</tr>
<tr>
<td>Cell:</td>
</tr>
<tr>
<td>E-Mail:</td>
</tr>
<tr>
<td>E. Builder / Constructor</td>
</tr>
<tr>
<td>Last Name:</td>
</tr>
<tr>
<td>First Name:</td>
</tr>
<tr>
<td>Corporation or partnership:</td>
</tr>
<tr>
<td>Full Mailing Address:</td>
</tr>
<tr>
<td>Phone:</td>
</tr>
<tr>
<td>Cell:</td>
</tr>
<tr>
<td>E-Mail:</td>
</tr>
<tr>
<td>F. Energy Advisor / Green Building Consultant</td>
</tr>
<tr>
<td>Last Name:</td>
</tr>
<tr>
<td>First Name:</td>
</tr>
<tr>
<td>Corporation or partnership:</td>
</tr>
<tr>
<td>Full Mailing Address:</td>
</tr>
<tr>
<td>Phone:</td>
</tr>
<tr>
<td>Cell:</td>
</tr>
<tr>
<td>E-Mail:</td>
</tr>
<tr>
<td>G. Declaration of Applicant – Please Print Name</td>
</tr>
<tr>
<td>I certify that:</td>
</tr>
<tr>
<td>The information contained in this grant application, and other attached documentation is true to the best of my knowledge and I have authority to bind the corporation or partnership (if applicable).</td>
</tr>
<tr>
<td>Date</td>
</tr>
<tr>
<td>Signature of Applicant</td>
</tr>
</tbody>
</table>
D.3 Property Tax Reduction Incentive Program

D.3.1 Program Description

The Property Tax Reduction Incentive Program provides financial incentives to encourage property owners to develop above and beyond normal building code, using one of the following recognized third-party Green Building Standards:

For buildings compliant to Part 9 of the National Building Code (ie: low-rise residential):
- **BUILT GREEN / Green Seal**, administered by Built Green Canada
- **EnerGuide Rating System (ERS)**, administered by Natural Resources Canada (NRCan)
- **LEED (Leadership in Energy and Environmental Design)**, administered by the Canada Green Building Council (CaGBC)
- **Net-Zero (NZ) and Net-Zero Ready (NZr)**, administered by the Canadian Home Builders’ Association (CHBA)
- **Passive House**, administered by Passive Buildings Canada (PBC), the Canadian Passive House Institute (CanPHI), and/or the Passive House Institute US (PHIUS)

For buildings compliant to Part 3 of the National Building Code:
- **BOMA BEST**, administered by the Building Operations and Management Association of Canada (BOMA Canada);
- **BUILT GREEN Mid-Rise / Green Seal Mid-Rise**, administered by Built Green Canada for mid and high-rise residential buildings;
- **LEED (Leadership in Energy and Environmental Design)**, administered by the Canada Green Building Council (CaGBC);
- **Living Building**, administered by the International Living Futures Institute (ILFI);
- Or buildings with Energy Usage Intensity (EUI) calculated by a licensed Professional Engineer and reported in a manner consistent with the program requirements set out below.

Each of these green building standards encourages and accelerates adoption of sustainable green building and development practices through the creation and implementation of universally understood and accepted tools and performance criteria. These standards use third-party certification processes that leverage nationally (and internationally) accepted benchmarks for the design, construction and operation of high-performance green buildings. They provide building owners and operators with the tools needed to have an immediate and measurable impact on their buildings’ performance.

Property tax reduction programs allow the municipality to encourage developers to incorporate Green Building Standards in their design proposals without having to allocate municipal funding to developers. Rather, the incentive reduces a portion of the collected property taxes for a defined period. This method of tax assistance is less costly to municipalities than tax exemption models because the municipality still collects a portion of the property taxes during the incentive period, and can continue to use those revenues to support municipal services. Thereafter the municipality will collect the full value of the property tax, including the increased property tax.
resulting from the development being implemented to higher standards (ie: resulting in higher value property), following the completion of the incentive program.

Property owners may be eligible for property tax reductions of up to 80% for up to 10 years or until the costs of developing the property to Green Building Standards have been offset, whichever occurs first.

**D.3.2 Objective & Strategy**

The main objectives of the Property Tax Reduction Incentive Program are:

1. To encourage new construction to pursue higher levels of performance under the guidance / support of industry recognized best practice Green Building certification programs;
2. Encourage the rehabilitation / gentrification of poorly performing existing buildings;
3. Reduce the property’s energy consumption and GHG emissions by incentivizing the owner to meet Green Building certifications as outlined in section D.3.1;
4. Increase the amount of property tax that the municipality will be able to collect on the property in the future.

Secondary objectives that will be achieved indirectly include:

1. Energy and water savings from each participating building;
2. Environmental benefit (GHG reductions) from those energy / water savings;
3. Increased occupant health for those living in better buildings;
4. Reduced utility bills freeing up disposable income, promoting local economic benefit;
5. Increased green building experience / expertise among local builders and trades;
6. Increased public recognition / normalization of green building standards among local property owners, constructors, realtors, finance/insurance professionals, and more;
7. Increased capacity of local trades / constructors to deliver green development and remediation projects;
8. Boost local businesses to establish themselves as leaders in the “green” marketplace and to be proactive in preparing for increasingly stringent Building Codes as industry transitions towards requiring net-zero energy by 2030;
9. All of these benefits accrue over time for as long as the buildings endure;
10. Improved quality of life in the community.

**D.3.3 Measurable Outcomes**

Measurable outcomes for the Tax Reduction Incentive Program will be the same as those in sections D.1.3 for homes and D.2.3 for buildings.

**D.3.4 Program Incentives**

This project proposes that a new Tax Reduction Incentive Program be defined as follows:
The amount of municipal taxes on a vacant or unused property, a contaminated Brownfield site, or a building requiring remediation and energy efficiency improvements will be reduced by up to 80% for up to 10 years, or until the costs of developing or remediating the property have been offset (whichever occurs first). The full and final value of municipal property tax offset will be named a Tax Reduction Grant, and the period of time over which this grant is applied will be referred to as the Grant Period. Once the grant is fully applied, the Grant Period will have closed.

The final valuation of the Tax Reduction Grant will be calculated after a site assessment has been conducted following the completion of the development and is incrementally determined based on the level of environmental certification that has been achieved. The developer must submit verification of the level of Green Building Certification that was achieved in the form of a copy of a certificate from one of the Green Building Certification programs listed in the table below. The municipality will accept the quality assurance processes behind these Green Building Certification programs as sufficient for this Tax Reduction Grant. The final value of the Tax Reduction Grant will be calculated using the incremental cost which the developer invested into the project, above and beyond standard construction costs, to achieve the certification level presented. These incremental costs must be reported clearly and in an auditable form for review by municipal staff. Supporting materials may be required such as invoices from suppliers.

A project is only eligible for the incentive if the taxable value of the property increases, thus increasing the municipal tax revenue from the site. The amount of the Tax Reduction Grant will not exceed the increase in deemed municipal tax revenue during the Incentive Period.

<table>
<thead>
<tr>
<th>Tax Reduction</th>
<th>New Homes: Green Building Certification Levels</th>
<th>New Buildings: Green Building Certification Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>20%</td>
<td>EnerGuide 80 or less, ENERGY STAR, LEED Certified, or Built Green Silver</td>
<td>LEED Certified, BUILT GREEN Silver, BOMA BEST Silver, EUI 10%&lt;building code</td>
</tr>
<tr>
<td>40%</td>
<td>LEED Silver, Built Green Gold, Energuide 65 or less</td>
<td>LEED Silver, BUILT GREEN Gold, BOMA BEST Gold, EUI 20%&lt;building code</td>
</tr>
<tr>
<td>60%</td>
<td>LEED Gold, Built Green Platinum, Net-Zero Ready, EnerGuide 50 or less</td>
<td>LEED Gold, BUILT GREEN Platinum, BOMA BEST Platinum, EUI 30%&lt;building code</td>
</tr>
<tr>
<td>70%</td>
<td>LEED Platinum, Passive House, EnerGuide 25 or less</td>
<td>LEED Platinum, BOMA Net Zero Challenge, EUI 50%&lt;building code</td>
</tr>
<tr>
<td>80%</td>
<td>Net-Zero, EnerGuide 0 or less</td>
<td>Living Building, EUI of 0 (zero) or less</td>
</tr>
</tbody>
</table>
For example, if a property is vacant and a Net-Zero Energy home or building is constructed on that vacant property, then the final constructed property will be new, and the increased value of that property will be fully eligible for use when determining the Tax Reduction Grant amount, calculated as follows:

\[
\text{[Total eligible amount for Tax Reduction Grant]} = \text{The lesser of} \\
\text{[Property value after construction] – [Property value before construction]} \\
\text{OR} \\
\text{[Premium cost for Green Building Standard]}
\]

\[
\text{[Amount paid per year]} = \text{The lesser of} \\
\text{[Total property tax payable per year] * [\% from table above]} \\
\text{OR} \\
\text{[Total eligible amount] – [all amounts paid in previous years]}
\]

**D.3.5 Eligibility**

The Property Tax Reduction Incentive Program shall comply with the Community Improvement Plan for Energy and Water Efficiency for Land and Buildings.

For the purposes of this program, the following development projects are not eligible for the Property Tax Reduction program:

a) developments that do not increase the property taxes which can be collected by the city;

b) developments that will not meet any level of Green Building Certifications as outlined in section D.3.1;

c) rehabilitation / renovation projects which do not increase the energy efficiency or decrease the GHG emissions of the building(s) being improved.

To be eligible for the Tax Reduction Incentive Program, the development must:

a) Be in a designated community project area;

b) Earn certification in any of the Green Building Standards referenced in section D.3.1, at the levels referenced in section D.3.4, and produce a copy of a valid earned certificate.

For the purposes of this program, the “applicant” is defined as the owner of the property at the time of application.

**D.3.6 Program Administration**

The incentive program is proposed to be delivered by the Municipal Tax Administration Office in partnership with the Buildings Department. These two Municipal Departments will work
together to design and secure approval for a stream-lined process for management of the incentive program including:

1) Application by eligible applicant, with detailed plans and all relevant documents for the development or rehabilitation proposal, including the level of Green Building Certification that is being pursued;
2) Review by the Buildings Department to ensure application is complete, and to determine which level of Green Building Standards are being pursued;
3) Approval of Application and determination of eligible rebate amount;
4) After certification has been earned (typically near the close of construction), Applicant shall produce a copy of the certificate appropriate to the Green Building Standard used;
   a. If Energy Use Intensity (EUI) calculations were used as the basis for the incentive approval, then the Applicant shall submit a Commissioning Report, signed by a duly qualified Commissioning Agent, including evidence that the building was constructed as modelled and is operating as intended.
5) Annual assessments on the property after the development and remediation is complete to ensure that the property continues to meet the performance criteria for the tax assistance that is being provided. If standards are not being met, the tax reduction will be adjusted to the appropriate amount.
6) Monitoring of the amount of tax relief provided for up to ten years to ensure that the program ends once the costs of the development have been offset.

D.3.7 Monitoring

The municipality will track the estimated green house gas savings, number of builders participating in the program and the level of participation to indicate the success of the program and to identify if program specifics need to be adjusted. Update reports will be prepared on an annual basis to be reviewed by municipal Council.

The municipality will also need to track the economic value of the tax reductions throughout the 10 years of eligibility to ensure that the provided tax relief does not exceed the costs of improving the property. As soon as the cumulative incentive amount has reached and matched the eligible development or rehabilitation costs, the tax reduction will immediately expire and the property owner must pay any outstanding amount of tax owing in the current tax year, and the full normal amount of municipal property taxes owing in any subsequent year.

D.3.8 Municipal Investment

**Hard Investment:** Tax Reductions applied to the collected property tax values. The total reduction amount will be up to 80% of the required costs of improving the property and will not exceed the project expenses.

**Soft investment:** staff time to support administrative efforts behind the program, including processing applications and monitoring the energy consumption and GHG reductions during and after the development or remediation process.
Marketing investment: staff time to liaise with local industry partners (e.g., local chapter of the Canadian Home Builders’ Association, CHBA), and to issue local media releases. Further marketing efforts could be pursued to whatever extent is deemed appropriate.

Financial Returns on Investment: the reduced property taxes under this program will be used to incentivize property owners to invest in unused or undeveloped lands, or the rehabilitation of existing buildings to significantly increase their performance after the project is completed. These projects will increase the property taxes that the municipality can collect, which will pay off the value of the foregone tax revenues through future payments. Where municipal infrastructure and services are already in place, this will result in no negative impact to the municipal budget (i.e., infinite IRR% returns). For properties where improvements result in an increase in required municipal services (e.g., increased snow plowing, garbage collection, etc.), the short-term partial waiver of the tax amount collected could result in a minor loss in municipal revenues that would need to be offset by other revenues. Returns in this case will be difficult to calculate because they vary with costs which could be negligible for properties between other serviced properties (i.e., infinite IRR% return) or could be more noteworthy in greenfield areas (with IRR% returns under 5%). Regardless, the municipality will gain a partial increase in property tax revenues from the site, which will help cover any increase in servicing costs. For municipalities who own their local electrical utilities, these improved buildings will help reduce utility infrastructure spending and will yield almost immediate returns (again, infinite %).

Environmental Returns on Investment: Environmental emissions avoided (measured in GHG/yr) per improved property, compounding annually for the full life of each site, plus energy and water savings (avoiding municipal infrastructure growth and related impacts).

Social Returns on Investment: refer to secondary goals from D.3.2 above for benefits to health, local economic development, local industry leadership, community quality of life, and more.

D.3.9 Program Duration

The program will come into effect immediately after budget/funding is assigned and will remain active until the available municipal funding has been expired. Once budget is exhausted, this program will remain valid as an endorsed program that is dormant until funding is renewed.

Each accepted project under the program will last for 10 years, or until the eligible costs associated with developing or rehabilitating the property have been offset.

D.3.10 Application Form

A template application form is included on the next page. One form should be completed for each house seeking the grant amount.
City of ____  
[mailing address for building department]

**Property Tax Reduction Incentive Program**  
Grant Application

For Use by Principal Authority

<table>
<thead>
<tr>
<th>Grant Application Number:</th>
<th>Permit Number:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date Received:</td>
<td>Roll Number:</td>
</tr>
</tbody>
</table>

**A. Project Information**

<table>
<thead>
<tr>
<th>Building number, street name:</th>
<th>Unit Number:</th>
<th>Lot/con.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipality:</td>
<td>Postal Code:</td>
<td>Plan number/other description:</td>
</tr>
</tbody>
</table>

Project Value est. $

**B. Performance Level and Incentive Objective**

Green Building Program and Performance Level (Refer to Program details):

<table>
<thead>
<tr>
<th>Incentive Level:</th>
<th>20%</th>
<th>40%</th>
<th>60%</th>
<th>70%</th>
<th>80%</th>
</tr>
</thead>
</table>

Incentive Amount $

**C. Applicant**

Applicant is Authorized agent of owner: ☐ Yes / ☐ No

<table>
<thead>
<tr>
<th>Last Name:</th>
<th>First Name:</th>
<th>Corporation or partnership:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Full Mailing Address:

<table>
<thead>
<tr>
<th>Phone:</th>
<th>Cell:</th>
<th>E-Mail:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**D. Owner (If different from applicant)**

<table>
<thead>
<tr>
<th>Last Name:</th>
<th>First Name:</th>
<th>Corporation or partnership:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Full Mailing Address:

<table>
<thead>
<tr>
<th>Phone:</th>
<th>Cell:</th>
<th>E-Mail:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**E. Builder**

<table>
<thead>
<tr>
<th>Last Name:</th>
<th>First Name:</th>
<th>Corporation or partnership:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Full Mailing Address:

<table>
<thead>
<tr>
<th>Phone:</th>
<th>Cell:</th>
<th>E-Mail:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**F. Energy Advisor / Green Building Consultant**

<table>
<thead>
<tr>
<th>Last Name:</th>
<th>First Name:</th>
<th>Corporation or partnership:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Full Mailing Address:

<table>
<thead>
<tr>
<th>Phone:</th>
<th>Cell:</th>
<th>E-Mail:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**G. Declaration of Applicant – Please Print Name**

I ________________________________________________________________________________________

certify that:

The information contained in this grant application, and other attached documentation is true to the best of my knowledge and I have authority to bind the corporation or partnership (if applicable).

______________________     ______________________________
Date        Signature of Applicant
D.4 Advanced Queuing Incentive Program

D.4.1 Program Description

The Advanced Queuing Incentive Program incentivizes developers to incorporate best in practice industry standards and Green Building Certifications to their development plan. This is achieved by prioritizing the distribution of Building Permit applications that commit to exceeding the Building Code by obtaining a certain level of Green Building Certification including:

- **BOMA BESt**, administered by the Building Operations and Management Association of Canada (BOMA Canada);
- **BUILT GREEN / Green Seal**, administered by Built Green Canada for mid and high-rise residential buildings;
- **EnerGuide Rating System (ERS)**, administered by Natural Resources Canada (NRCan);
- **LEED (Leadership in Energy and Environmental Design)**, administered by the Canada Green Building Council (CaGBC);
- **Living Building**, administered by the International Living Futures Institute (ILFI);
- **Net-Zero (NZ) and Net-Zero Ready (NZr)**, administered by the Canadian Home Builders’ Association (CHBA);
- **Passive House**, administered by Passive Buildings Canada (PBC), the Canadian Passive House Institute (CanPHI), and/or the Passive House Institute US (PHIUS);
- Or buildings with Energy Usage Intensity (EUI) calculated by a licensed Professional Engineer and reported in a manner consistent with the program requirements set out below.

Large retrofit applications may also apply to be placed in the advanced queue if their retrofit is sufficiently extensive as to be eligible for certification under any of these same Green Building Certification programs.

Each of these green building standards encourages and accelerates adoption of sustainable green building and development practices through the creation and implementation of universally understood and accepted tools and performance criteria. If a developer can prove that the project will satisfy the criteria for any of the above listed Green Building Standards, then their application will be marked for advanced processing, and will be reviewed in advance of the general stream of applications. This reduces the amount of time a developer must pay property taxes, incentivizing them to satisfy a level of Green Building Certification.

To enter the advanced queue, the applicant must demonstrate that their project is registered in a green building certification program from the list above by producing a confirmation of registration appropriate to the program (e.g. a registration number, a confirmation page from a registration website, a confirmation email from a registrar, etc.), and must pay an additional $100.00 application fee for the advanced queue service. If the project is later found to have abandoned certification efforts without appropriate cause, appropriateness being determined according to the sole discretion of the municipality, then there will be a penalty fee of $2,000 assessed to the applicant for acting in bad faith and failing to fulfil the commitments of the
D.4.2 Objective & Strategy

The objective of the Program is to:

1) Encourage developers to exceed the Building Code and incorporate industry best practice Green Building Standards into their project applications;
2) Give preferential treatment to development applications that employ Green Building Standards to increase sustainable development activity within the Municipality.

Secondary objectives that will be achieved indirectly include:

1) Energy and water savings from each participating building;
2) Environmental benefit (GHG reductions) from those energy/water savings;
3) Increased occupant health for those living in better buildings;
4) Reduced utility bills freeing up disposable income, promoting local economic benefit;
5) Increased green building experience / expertise among local builders and trades;
6) Increased public recognition / normalization of green building standards among local property owners, constructors, realtors, finance/insurance professionals, and more;
7) Increased capacity of local trades / constructors to deliver green buildings;
8) Boost local businesses to establish themselves as leaders in the “green” marketplace and to be proactive in preparing for increasingly stringent Building Codes as industry transitions towards requiring net-zero energy by 2030;
9) All of these benefits accrue over time for as long as the buildings endure;
10) Improved quality of life in the community.

D.4.3 Measurable Outcomes

Measurable outcomes for the Tax Reduction Incentive Program will be the same as those in sections D.1.3 for homes and D.2.3 for buildings.

D.4.4 Program Incentives

This project proposes an Advanced Queuing Incentive Program to prioritize development applications which can demonstrate that the proposed project will be eligible for certification under any of the Green Building Certification programs listed in section D.4.1 above. Successful applicants will have their project applications moved from the normal queue of applicants into a priority queue. The municipality reserves the right to process applications within each queue (priority and normal) according to its sole discretion and to manage its internal human resources accordingly to ensure that the priority advanced queue is given preferential treatment over the normal queue. Builders who commit to Green Building Certification of their projects will enjoy having their applications processed earlier than those who do not, thus moving forward with development of their lands earlier, reducing holding costs and increasing their project yields.
**D.4.5 Eligibility**

The Advanced Queuing Incentive Program shall comply with the Community Improvement Plan for Energy and Water Efficiency for Land and Buildings.

For the purposes of this program, any Building Permit application that does not incorporate any of the Green Building Standards as indicated in section D.4.1 will not be eligible for priority review. Applicants will be eligible to participate in the Advanced Queuing Incentive Program if:

1) Their application is complete in every respect and will not cause delays related to obtaining information which should reasonably have been submitted with a normal application that was not seeking advanced prioritization.

   NOTE that if a project applies for advanced queueing and is incomplete, the advanced prioritization fee will be forfeit, and any subsequent re-reviews of an application to the advanced queue will require a new advanced queue application fee;

2) Proof of registration in any of the green building standards listed in section D.1.1 above.

For the purposes of this program, the “applicant” is defined as the owner of the property at the time of application. Constructors are eligible applicants.

**D.4.6 Program Administration**

The incentive program is proposed to be delivered by the municipality’s Buildings department, who will filter applications based on whether they make real commitments to Green Building Standards or not. Administration of the incentive program will include the following steps:

1) Application submitted by eligible applicant, including proof of third-party program participation and all other typically required documentation;
2) Payment of application fee and of advanced queue fee;
3) Building Department staff screen the application;
   a. If application is rejected due to insufficient / incorrect information, does not meet applicable codes and standards, includes illegible plans, etc, staff will request for design to be revised or for applicant to re-submit with additional information.
4) Application reviewer determines if the project is considered eligible for the advanced queue;
5) Application is expedited and processed earlier than the applications in the regular queue;
6) Staff will contact applicant to retrieve the expedited permit once approved.

**D.4.7 Monitoring**

The Building Department will continue to track internal performance as it has in the past, noting the volume of applications processed and now tracking both the normal and advanced priority queues separately. The municipality will also track the number of builders participating in the program, the nature of their participation in Green Building Standards, and the overall success of
those builders with Green Building Standards. Update reports will be prepared on an annual basis for review by City Council.

More specifically, each applying project and each applicant will be monitored for integrity: applicants who apply in bad faith and do not fulfil the commitments they have made to build to Green Building Standards may face the consequences described in the sections above, including fines, suspension from eligibility to apply to the advanced queue, and potentially even having open Building Permits suspended, freezing any site inspections yet to be completed until all outstanding concerns are resolved to the satisfaction of the municipality.

**D.4.8 Municipal Investment**

**Hard Investment:** no financial commitment: the municipality will be paid for any and all services rendered in this program through related fees charged to program applicants.

**Soft investment:** staff time to support administrative efforts behind the program will be funded through application fees associated with participation in the program.

**Marketing investment:** staff time to liaise with local industry partners (eg: local chapter of the Canadian Home Builders’ Association, CHBA), and to issue local media releases. Further marketing efforts could be pursued to whatever extent is deemed appropriate.

**Financial Returns on Investment:** all hard costs associated with administration of this program will be covered through related permit fees paid by participating applicants. Once complete, buildings constructed to Green Building Standards will typically have higher performance and higher value, reducing strain on municipal energy and water infrastructure and increasing property value. These developments will thus save the municipality on infrastructure costs and make the municipality money on increased property tax revenue. This program is entirely positive for the municipality financially, and still provides meaningful benefit to participants.

**Environmental Returns on Investment:** infinite. Program participants bear 100% of the costs of this program, and all emissions savings and other environmental benefits come at no cost to the municipality.

**Social Returns on Investment:** refer to indirect goals from D.4.1 above for benefits to health, local economic development, local industry leadership, community quality of life, and more.

**D.4.9 Program Duration**

The program will come into effect immediately after budget/funding is assigned and will remain active until available development space is saturated.

**D.4.10 Application Form**

A template application form is included on the next page. One form should be completed for each building permit application seeking advanced queuing.
Advanced Queue Incentive Program
Application

City of ____
[mailing address for building department]

For Use by Principal Authority

<table>
<thead>
<tr>
<th>Grant Application Number:</th>
<th>Permit Number:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date Received:</td>
<td>Roll Number:</td>
</tr>
</tbody>
</table>

A. Project Information

<table>
<thead>
<tr>
<th>Building number, street name:</th>
<th>Unit Number:</th>
<th>Lot/con.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipality:</td>
<td>Postal Code:</td>
<td>Plan number/other description:</td>
</tr>
<tr>
<td>Project Value est. $</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

B. Performance Level and Incentive Objective

<table>
<thead>
<tr>
<th>Performance Level (Refer to Program details):</th>
<th>Incentive Level:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incentive Amount $:</td>
<td></td>
</tr>
</tbody>
</table>

C. Applicant

<table>
<thead>
<tr>
<th>Applicant is Authorized agent of owner:</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Last Name:</td>
<td>First Name:</td>
<td>Corporation or partnership:</td>
</tr>
<tr>
<td>Full Mailing Address:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phone:</td>
<td>Cell:</td>
<td>E-Mail:</td>
</tr>
</tbody>
</table>

D. Owner (If different from applicant)

<table>
<thead>
<tr>
<th>Last Name:</th>
<th>First Name:</th>
<th>Corporation or partnership:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Mailing Address:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phone:</td>
<td>Cell:</td>
<td>E-Mail:</td>
</tr>
</tbody>
</table>

E. Builder

<table>
<thead>
<tr>
<th>Last Name:</th>
<th>First Name:</th>
<th>Corporation or partnership:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Mailing Address:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phone:</td>
<td>Cell:</td>
<td>E-Mail:</td>
</tr>
</tbody>
</table>

F. Energy Advisor / Green Building Consultant

<table>
<thead>
<tr>
<th>Last Name:</th>
<th>First Name:</th>
<th>Corporation or partnership:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Mailing Address:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phone:</td>
<td>Cell:</td>
<td>E-Mail:</td>
</tr>
</tbody>
</table>

G. Declaration of Applicant – Please Print Name

I ____________________________ certify that:

The information contained in this grant application, and other attached documentation is true to the best of my knowledge and I have authority to bind the corporation or partnership (if applicable).

______________________     ______________________________
Date        Signature of Applicant
D.5 Property Assessed Payments for Energy Reductions (PAPER) Program

D.5.1 Program Description

The intent of the Property Assessed Payments for Energy Reductions Program (PAPER) is to encourage energy efficiency upgrades in homes and small businesses by allowing municipalities to assess energy improvement costs to properties where the homeowner voluntarily participates in the program. A PAPER program works similarly to a Property Assessed Clean Energy (PACE) Loan, which are not common in Canada but are frequently used in the United States of America. The purpose of the PAPER financing program is to provide home and small business owners with a loan to support deep energy retrofits to the property that are paid back through an additional fee applied short-term to the Municipal property tax bill. This model is most successful when the deep energy efficiency retrofits are designed to reduce the home’s utility bills by ~50%, freeing up funds formerly spent on monthly energy bills that can then be used to cover the loan repayment fees. In other words, net monthly bills do not increase, but the property owner will spend less on energy and more on their property tax bill. Note that this is not in any way an increase to property taxes or taxable assessed value, but the property tax bill is simply a regular bill that the municipality already issues to the homeowner, and the municipality can use this same bill, with a new PAPER loan repayment line added therein, to facilitate the loan.

The municipal government will establish a revolving loan fund to enable green energy retrofit projects, including increasing the amount of insulation in the home’s envelope, increasing the efficiency of the appliances and heating systems, and supporting on-site renewable energy generation. The strong credit ratings of most municipalities can be leveraged to set up these revolving loans at low cost (i.e.: low interest rates), which the municipality can then re-loan out to eligible applicants, making PAPER loans a useful tool to support deep retrofit projects on buildings which the municipality wishes to target for retrofit.

Prequalification criteria are established by the municipality that will help to shortlist eligible homes for retrofit projects. The criteria for project shortlisting is related to the energy efficiency performance of the building, as determined by an energy audit conducted by a qualified individual: a certified Energy Advisor (EA) licensed to use Natural Resources Canada (NRCan)’s EnerGuide Rating System (ERS) for existing homes. The municipality should establish partnerships with local utilities to support energy audits on homes interested in obtaining the loan, and to target areas within the municipality that are likely to represent the greatest opportunity for successful retrofits.

The public will be invited to apply, and qualified applicants will receive a home inspection to determine if there are structural or mold issues with the home that could prevent the energy retrofit from proceeding. Assuming no such issues are found, a home energy audit will next be performed by a qualified Energy Advisor contracted by the municipality to identify retrofit opportunities that will bring energy savings. It is crucial to determine that the retrofit project will provide sufficient reductions to the energy bills (ideally ~50%) to ensure that they can pay off the loan in a reasonable time through their temporarily increased tax bill. If the retrofits will not
reduce the utility bills to a degree that will allow the homeowner to pay off the loan through an temporary increase to their tax bill, they may be classified as ineligible for PAPER assistance.

The loan is approved if no structural / mold issues are identified and if the energy audit determines that the provided energy savings will make the increase to the property taxes affordable. The home owner receives $30,000, and the municipality registers a $30,000 lien on the property. The lien (effectively a second mortgage on the property) will reduce municipal risk of repayment.

The homeowner will then meet with an approved energy consultant and select a retrofit package from a list of pre-determined options after project eligibility has been confirmed. These packages cover a variety of available improvements, such as increasing insulation amounts, improving the efficiency ratings of furnaces, and supporting on-site energy conservation and generation. The energy audit should indicate the areas where the greatest improvements to energy efficiency can be obtained, and recommendations should be made to homeowners to implement projects which will bring the greatest reductions to their utility bills. This will help ensure that the GHG emissions and energy consumption of the home both decrease, while ensuring that the retrofit project can still be repaid. The contractors then complete the deep retrofit project, providing reductions of up to 50% to the property’s energy bill. This model ensures repayment because the money that was previously allocated to their utility bills is now devoted to repaying the loan. Unused portions of the loan are credited back to the City. A portion of the loan (up to ~$2000) can be used to fund a 7-day vacation for the residents of the home to allow contractors the required time to complete the retrofit process.

**D.5.2 Objective & Strategy**

The objective of the Program is to:

1) Assist home and small business owners with up front capital assistance to support deep energy retrofits (that reduce the building’s energy bills by a targeted 50%) that may not have been attainable without the assistance;

2) Reduce residential and commercial purchased energy use and GHG emissions to support sustainable community development, at zero net cost to the municipality.

Secondary objectives that will be achieved indirectly include:

1) Energy and water savings from each participating building;

2) Environmental benefit (GHG reductions) from those energy/water savings;

3) Increased occupant health for those living in better buildings;

4) Improve the comfort of the home by increasing the insulation and reducing heat loss;

5) Reduced utility bills freeing up disposable income, promoting local economic benefit;

6) Increased green building experience / expertise among local builders and trades;

7) Increased public recognition / normalization of green building standards among local property owners, constructors, realtors, finance/insurance professionals, and more;

8) Increased capacity of local trades / constructors to deliver green buildings;
9) Boost local businesses to establish themselves as leaders in the “green” marketplace and to be proactive in preparing for increasingly stringent Building Codes as industry transitions towards requiring net-zero energy by 2030;

10) All of these benefits accrue over time for as long as the buildings endure;

11) Improved quality of life in the community.

D.5.3 Measurable Outcomes

Program outcomes are measured using the EnerGuide Rating System (ERS) administered by Natural Resources Canada (NRCan). Participating homes will be tested before and after the retrofit projects to establish an initial benchmark and custom retrofit plan, and to verify the success of that plan thereafter. The municipality may collaborate with local utilities to target homes which it believes to represent the greatest opportunity for successful participation in the program.

D.5.4 Program Incentives

The PAPER program incentivizes home owners to take action by removing barriers to entry. The program provides low cost financing and expert advice on how to use that financing. Once the project is complete, the value of the home will immediately improve. Once the loan is repaid, the home’s utility bills will continue to be much less than they were before the project. In the end, the municipality has been repaid for the loan, and the homeowner will enjoy a much more comfortable and affordable house that also has increased resale value.

D.5.5 Eligibility

All homes and small businesses (under 5,000 ft\(^2\)) are eligible to apply to the PAPER program. Applicants will be interviewed by the program manager to ensure that they understand the nature and mechanics of the program, and once they agree, will schedule the first inspections (for structural safety and for mold). Applicants who pass this first inspection will then be declared eligible and will be ushered through the remaining program steps (from Energy Audit to retrofit to setting up of ongoing repayments).

Eligible applicants will then meet with an Energy Advisor contracted by the municipality to perform an Energy Audit of their home and to determine their best retrofit options. Eligible retrofit projects include:

- a) Increasing the performance of the home’s envelope using air sealing, caulking, weather stripping, improving the thermal resistance values of windows and doors, and increasing the quality and amount of insulating materials;
- b) Increasing the energy efficiency of light fixtures and large appliances, including the installation of more efficient furnace systems including High Efficiency Natural Gas Furnaces and Air Source Heat Pumps;
- c) On-Site energy production technologies, such as Solar PV.

D.5.6 Program Administration

{ adapted with permission from the City of Kitchener }
The incentive program is proposed to be delivered by the municipality’s Buildings Division with support from the municipality’s finance departments. Administration of the incentive program will include the following steps (first described with a flow-chart\(^5\), and then with clarifying text):

---

1) Establishing a revolving loan fund to enable green energy retrofit projects;
2) Establishing the prequalification criteria to shortlist applicants;
3) Inviting the public to apply;
4) Application by eligible applicants;
5) Completing inspections: a building inspection (with a certified Home Inspector) to determine if any structural or mold issues will prohibit eligibility, and a home energy audit (with a certified Energy Advisor) to identify appropriate retrofit activities that will maximize energy bill savings while minimizing cost for the retrofit;
6) If the home fails the inspection, the project stops, the inspection report is given to the home owner outlining the actions they need to take prior to reapplying for the program, and the cost of the inspection(s) will be recovered through the property tax bill;
7) When the home passes, the Green Loan is approved up to ~$30,000, and the municipality registers a matching Lien on the property;
8) Homeowner books appointment with an approved Energy Advisor consultant to do an energy audit and help select a retrofit package from a list of predetermined options;
9) Book retrofit: Contractor collects key, and while the homeowners are away, the home is renovated to improve energy performance;
10) Contractor inspects house to ensure it is ready for retrofit, and schedules trades crew for a busy week while the homeowners are away. If the home is not ready then the retrofit work will be rescheduled.
11) Retrofit is performed during homeowners’ absence, and a second energy audit is conducted to confirm success.
12) The homeowners return to enjoy reduced utility bills, and the loan is repaid over time through their property tax bill.

D.5.7 Monitoring

The municipality will track the before and after results from each retrofit, and maintain logs of all energy audit numbers, total number of homes affected, total kWh saved, total tonnes GHG avoided, total energy dollars saved and total dollars leveraged. Loan repayment statistics will also be tracked to ensure that the repayment structure has been designed appropriately. Update reports will be prepared on an annual basis for review by Council.

D.5.8 Municipal Investment

**Hard Investment:** any funds invested by the municipality are fully repayable and secured by registered liens on affected properties, at no net cost to the municipality.

**Soft Investment:** staff time to support administrative efforts behind the program will be covered through interest payments made on the loans offered by the municipality in support of this program, and/or through fees assessed by the municipality and added into the loan amount (on a cost-recovery basis only, with no markup).

**Marketing Investment:** staff time to liaise with local industry partners (eg: local chapter of the Canadian Home Builders’ Association, CHBA), and to issue local media releases. Further marketing efforts could be pursued to whatever extent is deemed appropriate.
**Financial Returns on Investment:** funds disbursed as loans under this program will be secured via liens on the affected properties. These loans will represent minimal income to the municipality, and minimal liability. Financial returns will be limited to neutral. This program is designed to enable local property owners at minimal cost to the municipality and is not intended to create financial returns (other than to cover all costs) for anyone other than the property owners.

**Environmental Returns on Investment:** 1-5 tonnes GHG/yr per house affected, compounding annually for the full life of each building, plus energy and water savings (avoiding municipal infrastructure growth and related impacts).

**Social Returns on Investment:** refer to indirect goals from D.5.2 above. Benefits to health, local economic development, local industry leadership, community quality of life and more.

**D.5.9 Program Duration**

The program will come into effect immediately after budget/funding is assigned and will remain active until budget/funding is exhausted. Once budget is exhausted, this program will remain valid as an endorsed program that is dormant until funding is renewed.

**D.5.10 Application Form**

A template application form is included on the next page. One form should be completed for each house seeking the grant amount.
## Property Assessed Payments for Energy Reductions (PAPER) Program Grant Application

### For Use by Principal Authority

<table>
<thead>
<tr>
<th>Grant Application Number:</th>
<th>☐ Home</th>
<th>☐ Small Business</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date Received:</td>
<td></td>
<td>Roll Number:</td>
</tr>
</tbody>
</table>

### A. Project Information

<table>
<thead>
<tr>
<th>Building number, street name:</th>
<th>Unit Number:</th>
<th>Lot/con.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipality:</td>
<td>Postal Code:</td>
<td>Plan number/other description:</td>
</tr>
</tbody>
</table>

### B. Applicant

<table>
<thead>
<tr>
<th>Applicant is Authorized agent of owner: ☐ Yes / ☐ No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Last Name:</td>
</tr>
<tr>
<td>First Name:</td>
</tr>
<tr>
<td>Corporation or partnership:</td>
</tr>
<tr>
<td>Full Mailing Address:</td>
</tr>
<tr>
<td>Phone:</td>
</tr>
<tr>
<td>Cell:</td>
</tr>
<tr>
<td>E-Mail:</td>
</tr>
</tbody>
</table>

### C. Owner (if different from applicant)

<table>
<thead>
<tr>
<th>Last Name:</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Name:</td>
</tr>
<tr>
<td>Corporation or partnership:</td>
</tr>
<tr>
<td>Full Mailing Address:</td>
</tr>
<tr>
<td>Phone:</td>
</tr>
<tr>
<td>Cell:</td>
</tr>
<tr>
<td>E-Mail:</td>
</tr>
</tbody>
</table>

### D. Declaration of Applicant – Please Print Name

I certify that:

The information contained in this grant application, and other attached documentation is true to the best of my knowledge and I have authority to bind the corporation or partnership (if applicable).

________________________  __________________________
Date                                  Signature of Applicant
D.6 Development Charge Rebate Incentive Program

D.6.1 Program Description

The Development Charge Rebate Program provides financial incentives to encourage developers to design, build and certify buildings to advanced green building standards. The rebate amount depends on the level of effort invested by the builder. Projects that qualify for DC rebates must meet industry best practice Green Building construction standards including:

- **BOMA BEST**, administered by the Building Operations and Management Association of Canada (BOMA Canada);
- **BUILT GREEN / Green Seal**, administered by Built Green Canada for mid and high-rise residential buildings;
- **EnerGuide Rating System (ERS)**, administered by Natural Resources Canada (NRCan);
- **LEED** (Leadership in Energy and Environmental Design), administered by the Canada Green Building Council (CaGBC);
- **Living Building**, administered by the International Living Futures Institute (ILFI);
- **Net-Zero (NZ) and Net-Zero Ready (NZr)**, administered by the Canadian Home Builders’ Association (CHBA);
- **Passive House**, administered by Passive Buildings Canada (PBC), the Canadian Passive House Institute (CanPHI), and/or the Passive House Institute US (PHIUS);
- Or buildings with Energy Usage Intensity (EUI) calculated by a licensed Professional Engineer and reported in a manner consistent with the program requirements set out below.

Each of these green building standards encourages and accelerates the adoption of sustainable green building and development practices through the creation and implementation of universally understood and accepted tools and performance criteria. These standards use third-party certification processes that leverage nationally (and internationally) accepted benchmarks for the design, construction and operation of high performance green buildings. They provide building owners and operators with the tools needed to have an immediate and measurable impact on their buildings’ performance.

The amount of the DC rebate is determined based on the incremental performance levels within the Green Building standards listed above. For instance, a developer who can demonstrate that their development will achieve Net Zero Energy will receive a larger DC rebate than a developer who achieves LEED Silver certification.

The DC fee reduction will be in the form of a rebate that is issued to the applicant after the development has been completed and has been assessed to determine the Green Building Certification level that has been achieved.

D.6.2 Objective & Strategy

The objective of the Program is to:
1) Encourage new construction projects to use best practice Green Building construction standards to enhance the environmental performance of their buildings;
2) To offset the cost of Development Charges (DC) as an incentive to encourage builders to invest in higher levels of building performance.

Secondary objectives that will be achieved indirectly include:

1) Energy and water savings from each participating building;
2) Environmental benefit (GHG reductions) from those energy/water savings;
3) Increased occupant health for those living in better buildings;
4) Reduced utility bills freeing up disposable income, promoting local economic benefit;
5) Increased green building experience/expertise among local builders and trades;
6) Increased public recognition/normalization of green building standards among local property owners, constructors, realtors, finance/insurance professionals, and more;
7) Increased capacity of local trades/constructors to deliver green buildings;
8) Boost local businesses to establish themselves as leaders in the “green” marketplace and to be proactive in preparing for increasingly stringent Building Codes as industry transitions towards requiring net-zero energy by 2030;
9) All of these benefits accrue over time for as long as the buildings endure;
10) Improved qualify of life in the community.

D.6.3 Measurable Outcomes

Measurable outcomes for the Tax Reduction Incentive Program will be the same as those in sections D.1.3 for homes and D.2.3 for buildings.

D.6.4 Program Incentives

This project proposes that a Development Charge (DC) Rebate Program be defined as follows:

Developers can apply for rebates that exempt a portion of the development charges assessed to new properties which are eligible to participate in any of the Green Building standards referenced in D.6.1 above. The rebate amount is determined by the level of achievement earned in the various Green Building standards listed in the table below:

<table>
<thead>
<tr>
<th>DC Rebate</th>
<th>New Homes: Green Building Certification Levels</th>
<th>New Buildings: Green Building Certification Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%</td>
<td>EnerGuide 80 or less, ENERGY STAR, LEED Certified, or Built Green Silver</td>
<td>LEED Certified, BUILT GREEN Silver, BOMA BEST Silver, EUI 10%&lt;building code</td>
</tr>
</tbody>
</table>
### D.6.5 Eligibility

The Development Charge Rebate Program shall comply with the Community Improvement Plan for Energy and Water Efficiency for Land and Buildings.

For the purposes of this program, development projects that do not obtain any Green Building Certification as outlined in section D.6.1 are not eligible for development charge rebates.

The Development Charge Rebate Program is open to all newly constructed residential, commercial, mixed-use, and brownfield rehabilitation and restoration projects (as defined) within the municipal boundary during the program and that are constructed and certified in any of the Green Building Standards listed in section D.1.1 above. Note that eligible buildings wishing to produce Energy Use Intensity (EUI) numbers as evidence for the incentive amount must have those calculations signed and sealed by a Professional Engineer who has experience energy modelling and is appropriately licensed and insured to offer services in the province where the project is taking place. Participants in any of the other programs must produce a certificate from the related program.

For the purposes of this DC rebate program, the “applicant” is defined as the owner of the property at the time of application. Constructors are eligible applicants.

### D.6.6 Program Administration

The incentive program is proposed to be delivered by the Buildings Department with support from the financial departments. Administration of the incentive program will include the following steps:
1) Application by eligible applicant, with detailed plans and all relevant documents for the
development or rehabilitation proposal, including the level of Green Building
Certification that is being pursued;
2) Review by the Buildings Department to ensure application is complete, and to determine
which level of Green Building Standards are being pursued;
3) Approval of Application and determination of eligible rebate amount;
4) After certification has been earned (typically near the close of construction), Applicant
shall produce a copy of the certificate appropriate to the Green Building Standard used;
a. If using Energy Use Intensity (EUI) modelling, then rebate will be issued after the
applicant produces a Commissioning Report, signed by a duly qualified
Commissioning Agent, including evidence that the building was constructed as
modelled and is operating as intended.
5) Rebate of the Development Charges to the Applicant (relative to the Green Building
Standard that they achieved). Note that this is a rebate: DCs will be paid as usual at the
beginning of the project, and will be rebated upon successful fulfilment of the incentive
program’s requirements.

D.6.7 Monitoring

The municipality will track the estimated green house gas savings, number of builders
participating in the program and the level of participation to indicate the success of the program
and to identify if program specifics need to be adjusted. Update reports will be prepared on an
annual basis to be reviewed by municipal Council.

The municipality will also monitor services provided to the incented properties over time, in an
effort to track true municipal costs associated with the DC refund invested. It is hoped that DC
refunds for these advanced projects will represent minimal loss to the municipal operating
budget, and that the cost of municipal services rendered to the affected sites will still be mostly
funded by the DC amounts collected. Any gap left unfunded should be tracked and treated as an
investment. The premium cost associated with constructing the affected properties to higher
standards than normal (as certified through the Green Building Standards which determine
eligibility for this incentive program) will result in the properties having an increased constructed
value, and thus an increased property tax revenue to the municipality. The net amount of DC
funding not collected, seen as invested, can be compared with the returns in increased tax
revenue over time, and these values can be used to calculate financial returns to the municipality
(see below).

D.6.8 Municipal Investment

Hard Investment: cash rebates issued to builders / property owners. Total value of the rebates
will be proportionate to the level of Green Building certification that is achieved.

Soft investment: staff time to support administrative efforts behind the program.
**Marketing investment:** staff time to liaise with local industry partners (eg: local chapter of the Canadian Home Builders’ Association, CHBA), and to issue local media releases. Further marketing efforts could be pursued to whatever extent is deemed appropriate.

**Financial Returns on Investment:** funds disbursed as DC rebates under this program will be invested in developments which have increased performance above building code. These buildings will have increased property value and will yield increased property tax revenues to the municipality which will repay the investment over the life of the building. Investment returns over the life of the building approach 3-5%. Encouraging new development can also bring new jobs and growth to a region.

**Environmental Returns on Investment:** 1-5 tonnes GHG/yr per house affected, compounding annually for the full life of each building, plus energy and water savings (avoiding municipal infrastructure growth and related impacts). Additional benefits for non-housing.

**Social Returns on Investment:** refer to indirect goals from D.6.1 above. Benefits to health, local economic development, local industry leadership, community quality of life.

**D.6.9 Program Duration**

The program will come into effect immediately after budget/funding is assigned and will remain active until budget/funding is exhausted. Once budget is exhausted, this program will remain valid as an endorsed program that is dormant until funding is renewed.

**D.6.10 Application Form**

A template application form is included on the next page. One form should be completed for each building seeking the grant amount.
City of ____
[mailing address for building department]

Development Charge Rebate Incentive Program
Grant Application

For Use by Principal Authority

<table>
<thead>
<tr>
<th>Grant Application Number:</th>
<th>Permit Number:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date Received:</td>
<td>Roll Number:</td>
</tr>
</tbody>
</table>

A. Project Information

<table>
<thead>
<tr>
<th>Building number, street name:</th>
<th>Unit Number:</th>
<th>Lot/con.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipality:</td>
<td>Postal Code:</td>
<td>Plan number/other description:</td>
</tr>
<tr>
<td>Project Value est. $</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

B. Performance Level and Incentive Objective

Green Building Program and Performance Level (Refer to Program details):

<table>
<thead>
<tr>
<th>Incentive Level:</th>
<th>10%</th>
<th>20%</th>
<th>30%</th>
<th>40%</th>
<th>50%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incentive Amount $:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

C. Applicant

Applicant is Authorized agent of owner: [ ] Yes / [ ] No

<table>
<thead>
<tr>
<th>Last Name:</th>
<th>First Name:</th>
<th>Corporation or partnership:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Mailing Address:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phone:</td>
<td>Cell:</td>
<td>E-Mail:</td>
</tr>
</tbody>
</table>

D. Owner (If different from applicant)

<table>
<thead>
<tr>
<th>Last Name:</th>
<th>First Name:</th>
<th>Corporation or partnership:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Mailing Address:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phone:</td>
<td>Cell:</td>
<td>E-Mail:</td>
</tr>
</tbody>
</table>

E. Builder

<table>
<thead>
<tr>
<th>Last Name:</th>
<th>First Name:</th>
<th>Corporation or partnership:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Mailing Address:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phone:</td>
<td>Cell:</td>
<td>E-Mail:</td>
</tr>
</tbody>
</table>

F. Energy Advisor / Green Building Consultant

<table>
<thead>
<tr>
<th>Last Name:</th>
<th>First Name:</th>
<th>Corporation or partnership:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Mailing Address:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phone:</td>
<td>Cell:</td>
<td>E-Mail:</td>
</tr>
</tbody>
</table>

G. Declaration of Applicant – Please Print Name

I ________________________________________________________________________________________ certify that:
The information contained in this grant application, and other attached documentation is true to the best of my knowledge and I have authority to bind the corporation or partnership (if applicable).

______________________     ______________________________
Date        Signature of Applicant
D.7 Building Permit Fee Reduction Program

D.7.1 Program Description

The Building Permit Fee Reduction Program provides financial incentives to encourage developers to design, build and certify buildings to advanced green building standards. The rebate amount depends on the level of effort invested by the builder. Projects that qualify for rebates must meet industry best practice Green Building construction standards including:

- BOMA BEST, administered by the Building Operations and Management Association of Canada (BOMA Canada);
- BUILT GREEN / Green Seal, administered by Built Green Canada for mid and high-rise residential buildings;
- EnerGuide Rating System (ERS), administered by Natural Resources Canada (NRCan);
- LEED (Leadership in Energy and Environmental Design), administered by the Canada Green Building Council (CaGBC);
- Living Building, administered by the International Living Futures Institute (ILFI);
- Net-Zero (NZ) and Net-Zero Ready (NZr), administered by the Canadian Home Builders’ Association (CHBA);
- Passive House, administered by Passive Buildings Canada (PBC), the Canadian Passive House Institute (CanPHI), and/or the Passive House Institute US (PHIUS);
- Or buildings with Energy Usage Intensity (EUI) calculated by a licensed Professional Engineer and reported in a manner consistent with the program requirements set out below.

Each of these green building standards encourages and accelerates adoption of sustainable green building and development practices through the creation and implementation of universally understood and accepted tools and performance criteria. These standards use third-party certification processes that leverage nationally (and internationally) accepted benchmarks for the design, construction and operation of high-performance green buildings. They provide building owners and operators with the tools needed to have an immediate and measurable impact on their buildings’ performance.

The dollar value of the rebate is determined based on the incremental performance levels within the Green Building standards listed above. For instance, a developer who can demonstrate that their development will achieve Net Zero Energy will receive a larger rebate than a developer who achieves LEED Silver certification.

The building permit fee reduction will be in the form of a rebate that is issued to the applicant after the development has been completed and has been assessed to determine the Green Building Certification level that has been achieved.

D.7.2 Objective & Strategy

The objective of the Program is:
1) Encourage developers to exceed the national building code when proposing a new development project;
2) Increase development and municipal growth without contradicting sustainability objectives as indicated in the Municipal CIP.

Secondary objectives that will be achieved indirectly include:

1) Energy and water savings from each participating building;
2) Environmental benefit (GHG reductions) from those energy/water savings;
3) Increased occupant health for those living in better buildings;
4) Reduced utility bills freeing up disposable income, promoting local economic benefit;
5) Increased green building experience / expertise among local builders and trades;
6) Increased public recognition / normalization of green building standards among local property owners, constructors, realtors, finance/insurance professionals, and more;
7) Increased capacity of local trades / constructors to deliver green buildings;
8) Boost local businesses to establish themselves as leaders in the “green” marketplace and to be proactive in preparing for increasingly stringent Building Codes as industry transitions towards requiring net-zero energy by 2030;
9) All of these benefits accrue over time for as long as the buildings endure;
10) Improved quality of life in the community.

D.7.3 Measurable Outcomes

Measurable outcomes for the Tax Reduction Incentive Program will be the same as those in sections D.1.3 for homes and D.2.3 for buildings.

D.7.4 Program Incentives

This Project recommends that a Building Permit Fee Rebate Program be defined as follows:

The applicant is required to pay the full costs of the building permit in advance, as usual, and to attach to that application a copy of the form included in section D.7.10 below. Developers can apply for rebates that exempt a portion of the permit fee for new properties which are eligible to participate in any of the Green Building standards referenced in D.7.1 above. The rebate amount is determined by the level of achievement earned in the various Green Building standards listed in the table below:

<table>
<thead>
<tr>
<th>Permit Fee Rebate</th>
<th>New Homes: Green Building Certification Levels</th>
<th>New Buildings: Green Building Certification Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>20%</td>
<td>EnerGuide 80 or less, ENERGY STAR, LEED Certified, or Built Green Silver</td>
<td>LEED Certified, BUILT GREEN Silver, BOMA BEST Silver, EUI 10%&lt;building code</td>
</tr>
<tr>
<td>Permit Fee Rebate</td>
<td>New Homes: Green Building Certification Levels</td>
<td>New Buildings: Green Building Certification Levels</td>
</tr>
<tr>
<td>-------------------</td>
<td>-----------------------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>30%</td>
<td>LEED Silver, Built Green Gold, EnerGuide 65 or less</td>
<td>LEED Silver, BUILT GREEN Gold, BOMA BEST Gold, EUI 20%&lt;building code</td>
</tr>
<tr>
<td>40%</td>
<td>LEED Gold, Built Green Platinum, Net-Zero Ready, EnerGuide 50 or less</td>
<td>LEED Gold, BUILT GREEN Platinum, BOMA BEST Platinum, EUI 30%&lt;building code</td>
</tr>
<tr>
<td>50%</td>
<td>LEED Platinum, Passive House, EnerGuide 25 or less</td>
<td>LEED Platinum, BOMA Net Zero Challenge, EUI 50%&lt;building code</td>
</tr>
<tr>
<td>60%</td>
<td>Net-Zero, EnerGuide 0 or less</td>
<td>Living Building, EUI of 0 (zero) or less</td>
</tr>
</tbody>
</table>

Once construction is complete and the applicable Green Building Standard has been achieved, the applicant must submit proof of certification to the municipality (in a form appropriate to the green building program chosen and the level of performance achieved in that program) and the permit fee rebate will be issued accordingly.

**D.7.5 Eligibility**

The Building Permit Fee Reduction Program shall comply with the Community Improvement Plan for Energy and Water Efficiency for Land and Buildings.

The Building Permit Fee Reduction Program is open to all new residential, commercial, mixed-use, and brownfield development projects (as defined) built within the municipal boundary and certified in any of the green building standards listed in section D.1.1 above.

For the purposes of this program, the “applicant” is defined as the owner of the property at the time of application. Constructors are eligible applicants.

**D.7.6 Program Administration**

The incentive program is proposed to be delivered by the Buildings Department. Administration of the incentive program will include the following steps:

1) Application by eligible applicant, including proof of third-party verification, with stated intention of the Green Building Certification being pursued;
2) Review by the Planning and Development Department;
3) Payment for permit fees;
4) Administration of building permits after review process has been completed;
5) Detailed energy audit completed post development to confirm the level of Green Building Certification that has been achieved, including tracking of GHG, energy and water consumption;
6) Applicant submits verification of Green Building Certification that was achieved;
7) Rebate for the Building Permit Fees relative to the Green Building Standard that was achieved;
8) Semi-annual reports to be approved by council regarding incentives paid, number of homes and builders participating, and of greenhouse gas and water savings gained.

D.7.7 Monitoring

The Municipality’s Planning and Development Department is responsible to monitor applications, and to determine which applications are also applying to be placed in a fast-tracked stream through the Advanced Queuing Incentive Program.

The Municipality needs to monitor the program with a detailed energy audit after the completion of the development to determine which level of Green Building Certifications were achieved. Repayment of the building permit fees will then be provided.

D.7.8 Municipal Investment

**Hard Investment:** cash rebates issued to home builders/owners. Total value of the rebate will be proportionate to the level of Green Building Standards that are achieved, ranging from 20% to 60% of the permit costs, and will be distributed following a post development energy audit.

**Soft investment:** staff time to support administrative efforts behind the program, including sorting applications into the regular or advanced queuing stream, processing applications and distributing permits, and conducting a post development energy audit to determine the building’s performance.

**Marketing investment:** staff time to liaise with local industry partners (eg: local chapter of the Canadian Home Builders’ Association, CHBA), and to issue local media releases. Further marketing efforts could be pursued to whatever extent is deemed appropriate.

**Financial Returns on Investment:** funds disbursed as rebates under this program will be invested in new developments which have increased performance above building code. These buildings will have increased value and will yield increased property tax revenues to the municipality. The increase to the property tax value will provide a larger source of income then what would have been obtained by the building permit fees, typically paying back in 1-4 years (ie: IRRs >25%).

**Environmental Returns on Investment:** 1-5 tonnes GHG/yr per house affected, compounding annually for the full life of each building, plus energy and water savings (avoiding municipal infrastructure growth and related impacts). Greater savings per non-residential building.
Social Returns on Investment: refer to indirect goals from D.7.1 above. Benefits to health, local economic development, local industry leadership, community quality of life.

D.7.9 Program Duration

The program will come into effect immediately after budget/funding is assigned and will remain active until budget/funding is exhausted. Once budget is exhausted, this program will remain valid as an endorsed program that is dormant until funding is renewed.

D.7.10 Application Form

A template application form is included on the next page. One form should be completed for each house seeking the grant amount.
# Building Permit Fee Reduction Program

Grant Application

<table>
<thead>
<tr>
<th>For Use by Principal Authority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grant Application Number:</td>
</tr>
<tr>
<td>Permit Number:</td>
</tr>
<tr>
<td>Date Received:</td>
</tr>
<tr>
<td>Roll Number:</td>
</tr>
</tbody>
</table>

**A. Project Information**

- Building number, street name:
- Unit Number:
- Municipality:
- Postal Code:
- Plan number/other description:
- Project Value est. $:

**B. Performance Level and Incentive Objective**

- Green Building Program and Performance Level (Refer to Program details):
- Incentive Level: 10% 20% 30% 40% 50%
- Incentive Amount $:

**C. Applicant**

- Applicant is Authorized agent of owner: Yes / No
- Last Name: First Name: Corporation or partnership: Full Mailing Address: Phone: Cell: E-Mail:

**D. Owner (If different from applicant)**

- Last Name: First Name: Corporation or partnership: Full Mailing Address: Phone: Cell: E-Mail:

**E. Builder**

- Last Name: First Name: Corporation or partnership: Full Mailing Address: Phone: Cell: E-Mail:

**F. Energy Advisor / Green Building Consultant**

- Last Name: First Name: Corporation or partnership: Full Mailing Address: Phone: Cell: E-Mail:

**G. Declaration of Applicant – Please Print Name**

I certify that:

The information contained in this grant application, and other attached documentation is true to the best of my knowledge and I have authority to bind the corporation or partnership (if applicable).

Date __________________________ Signature of Applicant __________________________
D.8 CIP Staff Report to Council

REPORT TO: [name appropriate committee of council]
DATE OF MEETING: [date]
SUBMITTED BY: [staff member’s name]
PREPARED BY: [staff member’s name]
WARD INVOLVED: All
DATE OF REPORT: [date]
REPORT NO.: [####]
SUBJECT: COMMUNITY IMPROVEMENT PLAN FOR ENERGY AND WATER EFFICIENCY FOR LAND AND BUILDINGS

RECOMMENDATIONS:

1. That the proposed by-law attached as Appendix D.9 be adopted to designate the Community Improvement Project Area for the [municipality] Community Improvement Plan for Energy and Water Efficiency for Land and Buildings in item 2 below; and,

2. That the proposed by-law attached as Appendix D.10 be adopted to approve the [municipality] Community Improvement Plan for Energy and Water Efficiency for Land and Buildings.

3. That Council direct Staff to assess where funding will best be invested in attached CIP programs, and to report back with recommendations for funding allocations for incorporation into the next municipal budget cycle.

BACKGROUND:

Community improvement planning provides a means of planning and financing activities that relate to the effective use, reuse or restoration of lands, buildings and infrastructure. Municipalities can use Community Improvement Plans for a variety of public goods:

- focus public attention on local priorities and specific municipal initiatives;
- target areas in transition or in need of repair, rehabilitation and redevelopment;
- facilitate and encourage community change in a co-ordinated manner; and,
- stimulate private sector investment through municipal incentive-based programs.

Ontario municipalities are generally prohibited from granting bonuses or incentives to private enterprises, directly or indirectly, through the restrictions of Ontario’s Municipal Act. An exception to this general rule is provided through Part IV Section 28 of Ontario’s Planning Act, which allows municipalities, where there are provisions in their Official Plan relating to
community improvement, to designate by Bylaw, a “Community Improvement Project Area”, and subsequently provide for the preparation of a “Community Improvement Plan”.

Many municipalities across Canada, and especially across Ontario, have previously used various forms of Community Improvement Plans for residential neighbourhood restoration, commercial area improvements, downtown incentives, and adaptive re-use and brownfield remediation. Common to these and all CIP programs is the alteration of the physical landscape so that public benefits can be achieved, resulting in more socially cohesive, environmentally friendly and/or economically sound communities.

REPORT:

As Canada’s economy continues to be shaped by global economic, environmental and social pressures, there is an increasing need to build, reinforce and reshape our cities to meet global and local challenges in ways that reduce local impact on our environment. A Community Improvement Plan is an efficient and effective way to empower the local building and development industry to adopt improvements that will reduce strain on municipal infrastructure, reduce costs to occupants to own and maintain buildings, reduce strain on the environment, support local employment in fields of energy and water efficiency, and enhance local leadership.

City staff have drafted a Community Improvement Plan entitled the **Community Improvement Plan for Energy and Water Efficiency for Land and Buildings** (attached as Appendix ‘C’ to this report). The goal of the Community Improvement Plan (CIP) is to encourage the construction or reconstruction of buildings or the use of land in ways that achieve measurable improvement to energy and water performance. This goal is consistent with policy directives at the local/regional, provincial and federal levels. This includes consideration of specific language in Ontario’s Planning Act which added the improvement of energy efficiency to the definition of “community improvement”; and the provision of energy efficient uses, buildings, structures, works, improvements or facilities to the scope of eligible costs for which municipalities can provide community improvement grants or loans.

This Community Improvement Plan would enable the City to proceed with the implementation of multiple incentive programs, each described in detail below and in the attached appendices, and makes provision for the possibility of adding other qualifying programs to the Community Improvement Plan by future amendment.

Programs qualifying under the Community Improvement Plan for Energy and Water Efficiency for Land and Buildings shall meet the following program parameters:

1) Program(s) may offer grants, loans, refunds, exemptions, tax increment-equivalent financing or other incentives and assistance to registered owners, assessed owners and tenants of lands and buildings within the community improvement project area, and to any person to whom such an owner or tenant has assigned the right to receive such financial incentive to pay for the whole or any part of the eligible costs of the community improvement plan, subject to available funding.
2) Program(s) shall relate directly to achieving energy or water conservation objectives and shall address but not necessarily be limited to one or more of the following:

   a) **air quality** through the reduction of emissions harmful to the environment;

   b) **water efficiency** by reducing water demand or maximizing the re-use and recycling of water;

   c) **energy efficiency and conservation** through energy demand management to reduce energy consumption, and design or product standards that result in more energy efficient green buildings and development;

   d) **energy generation** through on-site or remote renewable energy systems;

   e) **energy storage and distribution** for thermal or electrical energy systems, including but not limited to district energy, microgrid, smart-grid, vehicle-to-grid, virtual net metering, and micro-utility distribution concepts; and

   f) **waste management** by enhancing waste reduction through composting, material re-use, recycling and waste diversion initiatives;

3) Program(s) shall measure improvement in energy and water efficiency by using government or industry accepted benchmarks or certifications (e.g. energy modelling in software supported by Natural Resources Canada, labelling buildings in recognized third party industry programs such as EnerGuide, ENERGY STAR, LEED, etc).

4) Financial assistance shall not be issued for work on buildings located on property in property tax or utility arrears or any municipal financial obligations.

5) The total of grants, loans or other financial assistance provided under a program is limited to the amount of the eligible costs of the program set annually by Council.

6) Program(s) contained in the CIP shall not commence until City Council has approved and adopted the CIP or respective amendment to the CIP.

Council’s consideration of this CIP for Energy and Water Efficiency for Land and Buildings includes consideration of several incentive programs which would form part of the CIP. These programs are consistent with the goal and program parameters for the CIP. The Program will implement strategies in support of water and energy conservation, including air quality protection and improvements in waste management. Further, it aims to stimulate the construction of buildings that achieve improved environmental performance through third party certification programs such as Net-Zero (by the Canadian Home Builders’ Association). Program descriptions are provided in the body of this CIP document, and full program details are included in the appendices.

**FINANCIAL IMPLICATIONS:**
Programs forming part of the Kitchener Energy and Water Efficiency for Land and Buildings Community Improvement Plan may offer grants, loans, refunds, exemptions, tax increment-equivalent financing or other incentives and assistance. Such programs require Council approval and are subject to available funding.

No funding is proposed to be assigned immediately to any of the attached incentive programs. Council is encouraged to direct staff to assess where funding will best be invested in the short-term, and to report back with recommendations for funding allocations prior to next budget cycle. Any additional funding or any increase thereafter in the financial incentive(s) being offered within a municipal CIP program will require an amendment to the CIP, which would require Ministry pre-consultation and approval by Council.

**COMMUNICATIONS**

As a result of changes made to Section 28(8) of the Planning Act and Section 365.1 of the Municipal Act and provided community improvement policies exist in the Official Plan, municipalities are no longer required to submit community improvement plans or amendments to the Ministry of Municipal Affairs and Housing for approval. However, municipalities in Ontario are required to pre-consult with the Ministry of Municipal Affairs and Housing (MAH) prior to adoption of the by-law approving the Community Improvement Plan. Municipalities do not require MAH approval, only pre-consultation. The Ministry can be reasonably expected to reply with comments for the City’s consideration and which should be incorporated into the final Community Improvement Plan.

(include a statement herein about public meeting feedback. Here’s an example from Kitchener:)

Notice of the June 7, 20yy public meeting of the Development and Technical Services Committee will be advertised in The Record [local newspaper] on May 14, 20yy. A copy of the advertisement is attached as Appendix ‘A’ to the Community Improvement Plan.

The incentives included in this CIP were drafted as part of a study undertaken by the Federation of Canadian Municipalities in partnership with the Cities of London, Kingston, Kitchener and Waterloo in Ontario.

City Staff will be providing Committees who may have an interest in the Kitchener Energy and Water Efficiency for Land and Buildings Community Improvement Plan, such as KW Homebuilders and the Environmental Committee, with an information update on the establishment of the CIP.

**CONCLUSION:**

The goal of the Kitchener Energy and Water Efficiency for Land and Buildings Community Improvement Plan is to encourage the construction or reconstruction of buildings or the use of
land, in a way that achieves measurable improvement or efficiency in energy and water conservation. The Plan provides the basis for the City’s ability to implement programs, such as the Kitchener Green Housing Incentive Program, which are consistent with the CIP goal and objectives and which may offer grants, loans or other incentives and assistance to eligible applicants. The CIP and implementing program will help further Kitchener as a healthy community.

List of Attachments

Appendix XX: Proposed By-law to designate the Community Improvement Project Area for the Community Improvement Plan for Energy and Water Efficiency for Land and Buildings

Appendix XX: Proposed By-law to establish a Community Improvement Plan for Energy and Water Efficiency for Land and Buildings

Appendix XX: Community Improvement Plan for Energy and Water Efficiency for Land and Buildings

NOTE: This sample report, if adapted and submitted to your local council, would hereafter need to include attached copies of the actual Community Improvement Plan document included in Appendix D above, as well as copies of the draft by-laws included in Appendices D.9 and D.10.
D.9 Sample By-law to Designate CIP Project Area (for Ontario)

BY-LAW NUMBER

OF THE

CORPORATION OF THE CITY OF ____________

(Being a by-law to designate a Community Improvement Project Area in the City of ______ for the purpose of preparing and implementing a Community Improvement Plan for Energy and Water Efficiency for Land and Buildings)

WHEREAS the Official Plan for the City of ___________ contains provisions relating to community improvement in the City of ____________;

AND WHEREAS Sections 28 and 17 of The Planning Act, R.S.O. 1990, Chapter P.13, as amended, provide for the designation of a Community Improvement Project Area;

NOW THEREFORE the Council of The Corporation of the City of ___________ enacts as follows:

“1. That all the lands within the City limits of the City of ______ be designated as a Community Improvement Project Area for the purposes of preparing and implementing a Community Improvement Plan for Energy and Water Efficiency for Land and Buildings.”

PASSED at the Council Chambers in the City of ___________________ this _____ day of ____________, 20__.  

____________________________
Mayor

____________________________
Clerk
D.10 Sample By-law to Enact CIP (for Ontario)

BY-LAW NUMBER

OF THE

CORPORATION OF THE CITY OF ____________

(Being a by-law to adopt the Community Improvement Plan for Energy and Water Efficiency for Land and Buildings)

WHEREAS By-law No. ________, passed on the ______ day of ________, 20__, designated the Community Improvement Project Area for this Community Improvement Plan for Energy and Water Efficiency for Land and Buildings;

AND WHEREAS Section 28 of the Planning Act states that where a by-law has been passed to designate a community improvement project area, the Council may provide for the preparation of a plan suitable for adoption as a community improvement plan for that community improvement project area;

AND WHEREAS for the purpose of Section 28 the Planning Act states that “community improvement” means “the planning or replanning, design or redesign, resubdivision, clearance, development or redevelopment, construction, reconstruction and rehabilitation, improvement of energy efficiency, or any of them, of a community improvement project area, and the provision of such residential, commercial, industrial, public, recreational, institutional, religious, charitable or other uses, buildings, structures, works, improvements or facilities, or spaces therefore, as may be appropriate or necessary”;

AND WHEREAS the Council of The Corporation of the City of ____________ considers it appropriate to adopt a Community Improvement Plan for Energy and Water Efficiency for Land and Buildings in accordance with the Planning Act, for the purposes of community improvement of the corresponding Community Improvement Project Area, through various municipal initiatives as set out in the community improvement plan;

AND WHEREAS Council, by its [Development and Technical Services Department], held a public meeting on ________________ to discuss and receive public input regarding adoption of the Community Improvement Plan for Energy and Water Efficiency for Land and Buildings, and has taken all of the other required steps prior to the enactment of this by-law to adopt a Community Improvement Plan for Energy and Water Efficiency for Land and Buildings in the Community Improvement Project Area as required by the Planning Act;

AND WHEREAS the City has prepared a plan entitled “Community Improvement Plan for Energy and Water Efficiency for Land and Buildings Community Improvement Plan” attached hereto as Schedule “A” and forming part of this By-law;

NOW THEREFORE the Council of The City of ____________ enacts as follows:

Community Improvement Plan for Energy and Water Efficiency for Land and Buildings annexed hereto as Schedule “A” and forming part of this By-law is hereby adopted as the Community
Improvement Plan for the Community Improvement Project Area designated by By-law No. ____________.

PASSED at the Council Chambers in the City of ______________________ this _____ day of _________________, 20__. 

_____________________________  
Mayor

_____________________________  
Clerk

NOTE: The actual Community Improvement Plan document included in Appendix D should be attached to this draft by-law when submitted to your local council process.