Project FINAL Report

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1. Introduction

The City of London was the coordinating municipality for a multi-municipality research study, which also included the City of Kingston, City of Kitchener, and the City of Waterloo, of the municipal tools available to catalyse net-zero energy development. The research study was carried out by s2e Technologies.

Derek Satnik, Vice President of Technology from s2e Technologies Inc. (s2e) has been instrumental in guiding the project research activities in all four participating municipalities. The Implementation Team at s2e:

- Demetri Makrakos, Research & Economic Development Intern
- Gary Stevens, Chief Scientist

The Project 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:

- Brandon Sloan, Manager, Long Range & Policy Planning, City of Kitchener Anna-Marie Cipriani, Sustainability Coordinator, City of Waterloo
- Mark Henderson, Director of Business Liaison, City of London
- Paul McLatchy, Director of Environment & Sustainable Initiatives, City of Kingston
- Maureen Zunti, Senior Planner, Sifton Properties Ltd.

2. The Feasibility Study

a. Describe the process that you undertook to make this feasibility study a reality, from concept, to council approval, to RFP, to final deliverable.

The idea for this feasibility study originated from a discussion between staff from FCM, City of London, Sifton Properties, and s2e in February 2015 during the FCM's Sustainable Communities Conference in London to discuss opportunities to help fund studies that would support the development of the net-zero energy community being planned by Sifton for what was then called Riverbend Village (now West 5). This discussion touched on topics such as existing monetary and non-monetary incentives, as well as the policy and regulatory barriers associated with managing "business-as-usual" development and building.

It was recognized that these were issues common across Canada, and particularly in mid-sized cities where lower property values are unable to cover the upfront higher capital costs associated

with net-zero energy development. Therefore, solutions that were designed to be implementable in Canada's mid-sized cities would have greater applicability across all Canada.

The cities of London, Kingston, Kitchener, and Waterloo, together with private developers on two sites per city (eight sites in total), collaborated on a feasibility study that has potential to transform the development industry in Canada.

The initial application to the FCM GMF program was submitted in November 2015, with the subsequent GMF proposal submitted in June 30, 2016. The proposal was accepted by the FCM, and Council approval to enter into an agreement with FCM to use the GMF funding was approved on June 26, 2017.

b. What were the objectives of the Feasibility Study (what was it seeking to determine)?

This feasibility study's objective was to look at ways that a municipality can enable net-zero energy development at the community scale, in a wide variety of communities. Eight sites – two from each municipality - were selected because gave a comprehensive set of examples of all the technology needed to build communities that provide their own energy.

Kingston	**Davis Tannery Lands**: 15 hectare brownfield waterfront site, adjacent to provincially significant wetland, district energy opportunity **Block 4 Lands**: 0.8 hectare downtown infill brownfield (parking lot) site, planned for high density residential
Kitchener	**Bramm Yards**: 3.4 hectare brownfield site, near railway and downtown, ideal for intensification **Woolner Flats**: 42 hectare greenfield site adjacent to conservation lands / wetlands, multiple owners
London	**West 5**: 28 hectare greenfield suburban site near urban boundary: master planned mixed-use **McCormick Candy Factory**: 5.3 hectare central urban brownfield site revitalization opportunity
Waterloo	**Frobisher Drive**: vacant industrial brownfield lands **Father David Bauer Drive**: 0.6 hectare, city owned infill site in flood plain

c. What approach (or methodology) was used in the Feasibility Study to meet these objectives?

The feasibility study looked at different financing and incentive models, particularly those that have minimal or no cost to municipal governments, and at different challenges with the existing permitting and approvals processes and ways to proactively address those challenges.

The pool of case studies for the eight sites represented typical municipal development experiences. This was done to help ensure transferable results for municipalities across the country.

This feasibility study 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; and

4. Consolidate the above findings into a template policy, likely 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, 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.

The feasibility study is intended to provide the development industry with municipal support that is effective. It will help site owners understand how to effectively and affordably make their developments more sustainable.

d. Please describe any public consultations conducted as part of the Feasibility Study and their impact on the Study.

Public consultation was not part of the scope of work for this project.

3. Feasibility Study Findings and Recommendations

a. What were the environmental findings related to the options explored in the Feasibility Study? Please provide quantitative results and summary tables of these results (or the page numbers from the Feasibility Study report).

The environmental beneficial impacts are discussed in Section 3. DESIGN STRATEGIES FOR ACHIEVING NET-ZERO ENERGY of the report (pages 9 – 51), with a high-level summary of the 82 technology/design options presented in Table 3-2: Summary Overview of Design Strategies (pages 10-14). Note that the environmental benefits are presented in a qualitative, relativistic 1-5 scale, a relative comparison of the degree to which this technology, properly applied, will reduce the impact or improve the performance of the building project.

b. What were the financial findings related to the options explored in the Feasibility Study (for example, results of a cost-benefit analysis, financial savings identified, and so on)? Please provide quantitative results and summary tables of these results (or the page numbers from the Feasibility Study report).

The cost impacts are discussed in Section 3. DESIGN STRATEGIES FOR ACHIEVING NET-ZERO ENERGY of the report (pages 9 – 51), with a high-level summary of the 82 technology/design

options presented in Table 3-2: Summary Overview of Design Strategies (pages 10-14). Note that the costs for the design strategies are presented in a qualitative, relativistic 1-5 scale, a relative comparison of the cost of this design strategy against the building code and on a lifecycle cost basis without incentives, e.g., $ = low cost and/or high internal rate-of-return, $$$$$ = high cost / low internal rate-of-return.

Section 4.7.3 SUMMARY OF THE MOST EFFECTIVE MUNICIPAL MODELS (pages 116-118) 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. 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. Feedback 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. The experience to date has been focussed on brownfield redevelopment. There is strong opportunity 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. There were therefore 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.

3. **Tax Assistance Plans / Tax Increment Grants**: especially when used to support projects that increase property value, this seems to be the most profitable form of incentive overall. These tools target properties which are underutilized and are therefore yielding reduced, if any, tax revenue to the municipality.

4. **Cash grants** (and instant rebates): after the items explained above, the next most common incentive was the use of cash grants. These were typically for smaller amounts and were very specific in nature (e.g., for devices that saved water or energy), but were sometimes for more sophisticated concepts like green roofs or even brownfield remediation.

5. **Property-Assed Clean Energy 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. Although 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.

Most of the incentive methods presently used and most of the topics which they are used for do not create direct financial returns for the municipality, but will offer indirect returns and other community benefits. For example, brownfield incentives restore underused land and move that land towards producing tax revenue along with higher property values. If the incentives are structured carefully (e.g., with Tax Assistance Plans or Tax Increment Grants), then they can be designed to minimize cost to the municipality by partially waiving a portion of property tax revenue which they would not have been able to collect while the property remained underutilized and undervalued. Any model of incentive will be a cost to the municipality, which shows that municipalities have historically been willing to invest in these programs to some degree for primarily non-financial returns.

Section 4.7.4 PROGRAM EVALUATION & FEEDBACK FROM MUNICIPALITIES (pages 118-122) identifies which incentive models seemed most promising or attractive, based on municipal staff perspective on what worked, and on what didn't work. In aggregate, here are some considerations they offered:

1. **Program Stability**: Programs must have stability (i.e., some reasonable assurance that these programs will remain in place for the duration of the project) if they are to be attractive to the development industry given the long time frame for development projects.

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.

3. **Target the Right Client**: Some incentives are well suited to the builder (e.g., development charge or permit fee reductions), and some are better suited to the buyer or end owner of the site (e.g., tax increment grants). The incentive method should be chosen for the intended beneficiary.

4. **Avoid Mandating**: The use of rules and mandated compliance to change their practice without first understanding development business realities is to misunderstand the world they operate in, and will likely result in significant resistance, including legal resistance. It is 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.

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 engagement**: clearly identify the audience for whom any proposed incentive is intended, the stakeholders in that audience, and then meet with them to ensure understanding of their needs and motivations and of what will make the proposed program attractive to them. Done well, a successful stakeholder engagement effort will bring free marketing support in-kind that will help promote your programs.

    b. **Stacking rebates**: if there are other incentives available from other agencies (e.g., the senior levels of government, utilities,) which compliment or support an objective the municipality wishes to pursue, 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.

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 online storytelling, 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.

    b. **Events**: have recognition / celebration events to mark milestones and to celebrate local leaders.

    c. **Social media** is now the least expensive form of marketing by a wide margin. Mix up the marketing strategy to leverage low costs 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.

    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, build off stakeholder engagement, simplify & clarify, and leverage personal interaction to create buy-in.

    b. **Training**: offer free workshops and public information sessions to help local trades, companies, and the 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, to hold their hands on the way through the program(s).

    d. **Flexibility**: not compromising clarity, avoid being overly prescriptive about which products or designs need to be used in order to comply with the intent of a program.

9. **Set reasonable expectations**: 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.

    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**: 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.

    c. **Match strengths to needs**: Prioritize local community needs that relate to local community strengths.

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.

11. **Track lessons learned**: Monitor your programs and track statistics on participation rates, costs, and yields. Have periodic meetings to discuss lessons learned, and make adjustments.

It is interesting to note that none of the above feedback comments on the costs of the programs. 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.

c. Based on the environmental and financial findings above, what does the Feasibility Study recommend?

Section 5. FINANCIAL STRATEGIES FOR ACHIEVING NET-ZERO ENERGY pulls together all of the various options from Section 4, 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 typically offsets 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, 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.

Section 6. PROJECT CASE STUDIES provides additional details on the technologies and strategies being used or proposed for the eight project examples.

For Sifton’s West 5 (London), a **bundled internal rate of return** approach to calculating payback was used to hit net-zero energy, where the full package of required upgrades (from building code up) are assessed as a package. 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. The City of London also approved a **Special Policy Area** within the Official Plan and a **Special Provision Business District** zone and **Community Commercial Node** that allowed for

more design flexibility for net-zero related initiatives, where city and Sifton met halfway on the targeted volume of office space and committing to high design and sustainability standards.

For McCormick Villages (London), the site has been approved for $2.5 million in **brownfield remediation incentives** in the form of development charge rebates. The project has also secured **heritage-related incentives** to subsidize or offset the cost of renewing the designated heritage features on the site. Neither of these incentives will benefit any discussion of net-zero energy, sustainability or smart design. As an additional incentive, the City of London sold the brownfield site for $1.

For Block 4 (Kingston), 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 of Kingston's 2014 Block 4 Design Guidelines also provided a sustainability checklist for the North Block, where developers could be rewarded with a **density bonus** for meeting specific checklist criteria.

For the Davis Tannery site (Kingston), the Kingston **CIP for Brownfields** will likely be able to provide rebate of future property taxes sufficient to allow for recovery of environmental remediation costs.

For the Bramm Yards site (Kitchener), a **bundled internal rate of return** approach to calculating payback is being used to hit net-zero energy. The Region of Waterloo (upper tier municipality) **waives all Regional Development Charges for the core area** of Kitchener, and both the City of Kitchener and Region of Waterloo provide **Tax-Increment Grants for brownfield sites**. The City has expressed strong interest in updating the zoning to permit/encourage greater density, diversity of uses, and better integration using the "**Innovation District**" mandate for that region of Kitchener.

For the Green Acres site (Kitchener), a **bundled internal rate of return** approach to calculating payback is being used to hit net-zero energy.

4. Lead Applicant's Next Steps

a. Taking the Feasibility Study's recommendations into account, what next steps do you as the municipality plan to take? What potential benefits or internal municipal improvements would result from these next steps?

The eight participating sites will be provided with practical support from s2e in identifying which technologies will best enable their projects to pursue net-zero energy performance, and the development industry in general will benefit from the generalized results from 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.

5. Lessons Learned

a. What would you recommend to other municipalities interested in doing a similar Feasibility Study? What would you do differently if you were to do this again?

This project is large in its scope and potential impact, and is highly dependent upon the successful collaboration of a large support team. This in turn is highly dependent upon the project champion

and their experience in managing large teams that operate in both the public and private sectors. This project would not be possible without the team involved. Lesson for other communities: make sure you have a good team behind your project that has the skills (and is willing to commit the resources) which your particular project needs.

Explore opportunities for local universities and colleges to participate in some fashion in the project. In London, we have recently introduced the s2e Technologies project team to academic staff from Fanshawe College who are also working on net-zero energy projects. Fanshawe College academic staff have offered up themselves as a potential third-party reviewer of the report. This expands the already strong network behind this project.

Overall, the report / study is generating the results desired, and the case studies are yielding valuable experiences on what is effective or ineffective in various construction scenarios.

In terms of the lessons learned from each of the eight case study project, the following table provides a high-level summary:

Caste Study Project	**Lessons Learned**	**Reference Page Numbers**
West 5 (London)	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. **Projects are often constrained to work with the best locally available technology**, rather than the best technology, because of importing costs/tariffs, or the lack of local service personnel who can install and maintain systems in a cost-effective way. 3. **Financial considerations** are still the primary determinant in most project decisions. 4. **Municipalities need to proactively identify where they have policies or practices that actively prevent builders/developers from being able to innovate**. In some cases, these was flexibility to try new things (e.g., solar PV canopies over stormwater management swales), but not in all cases (e.g., resistance to reducing stormwater management pond size when net-zero water stormwater utilization concepts were proposed) 5. **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.	149-150

Caste Study Project	Lessons Learned	Reference Page Numbers
McCormick Villages (London)	1. **Renewal Costs**: Old buildings are often VERY expensive to renew. 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. 2. **The Liability of Delay**: Vacant 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. 3. **Balance Complexity with Approval Speed**: 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**: This site has benefitted 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. This opportunity could be considered during the development of targeted municipal incentives.	156-157
Block 4 (Kingston)	1. **Solar Access**: Net-zero energy requires on-site energy generation, which can be affected adversely by shading from adjacent development. A “Right to Light” bylaw should be considered as an important measure to help ensure the long-term viability of net-zero construction. 2. **District energy depends heavily upon the load mix for the sites it supplie**s: 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.	166
Davis Tannery (Kingston)	1. **Net-zero energy in high-density projects requires district energy**. Even after pursuing aggressive energy efficiency, there is simply not enough space for solar panels on the buildings in high-density projects to provide their own energy needs independently. 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. 3. The greatest challenges are associated with **brownfield, heritage, and wetland related approval issues** - more difficult than the technical challenges associated with net-zero energy building.	174-175

Caste Study Project	Lessons Learned	Reference Page Numbers
Bramm Yards (Kitchener)	1. **Dense energy loads are difficult to meet on-site**. Geothermal can provide all the heating/cooling needs of the site, but there is not enough room on this site for solar energy to provide 100% of the site's electrical demand. This site is a good candidate for district energy with combined heat & power. 2. **Substantial energy can be saved by not constructing elements which are not required**. For example, combining and coordinating parking in one shared garage enables the same space to be used for business parking during the day and residential parking during the evening, reducing the overall number of required parking spaces. 3. **District energy systems require buildings to be interconnected with piping that enable them to share energy**. 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. 4. **Underground elements** (shoring, utilities) **in dense developments require planning in advance** to reconcile conflicts. 5. The idea of **combining multiple utility trenches** to achieve savings in trenching costs 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. 6. **Utilities in Garages**: This project presents the opportunity to install district energy piping in the underground parkade that spans between multiple buildings.	186 -188
Greenfield Demonstration Site (Kitchener)	1. **Context Matters**: Land use is as much art as science, and any new project must be designed to appropriately integrate with its surroundings - 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. 2. **Municipal Access Agreements (MAAs)**: District Energy systems require 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.	192-193

Caste Study Project	Lessons Learned	Reference Page Numbers
400 Philip St. (Waterloo)	1. **Dense energy loads are difficult to meet on-site**. Geothermal can provide all the heating/cooling needs of the site, but there is not enough room on this site for solar energy to provide 100% of the site's electrical demand. This site is a good candidate for district energy with combined heat & power. 2. **Policy Jurisdiction**: The permitted land uses on this site are restricted by the Province, rather than the City, which serves as an interesting reminder that some projects will face their greatest difficulties in perhaps unexpected places, and in this case includes the government of the Province of Ontario. 3. **District energy systems require buildings to be interconnected** with piping that enable them to share energy. 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. 4. **Public vs. Private**: There is a persistent theme across some sites studied thus far, that some 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. Legislative change may be required at the provincial level in order to simplify the installation of district energy.	159
305 Frobisher Drive (Waterloo)	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 site, and permitting approvals are proportionately simple as well. In the negative sense, smaller sites offer far fewer opportunities for creativity. 2. **Low-Density Buildings Can More Easily Achieve Net-Zero Energy**: Low rise buildings with substantial roof space and open parking areas can most easily accommodate enough solar panels to provide all their own energy on-site.	205 - 206

In terms of overarching lessons learned, these are outlined in Section 7 - Conclusions (pages 213-219) and summarized briefly below:

- TECHNICAL
    - **Technology is no longer the problem** - there are accessible products to solve any challenge we now face.

- **Municipalities should avoid "choosing favourites"**, i.e., mandating specific technologies or best practices.
- **Best Practice programs should be encouraged** (e.g., Built Green, ENERGY STAR, LEED, Net-Zero, Passive House, R-2000, etc.), **but should never be mandated**.

- FINANCIAL
  - **Lifecycle Accounting**: Municipalities should be encouraged to adapt procurement practices to take a more lifecycle based approach to understanding costs.
  - **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.
    - **New Construction**: If the municipality is wishing to encourage new construction to pursue net-zero energy, then incentives could be offered for participation in programs such as CHBA's Net-Zero program, LEED Platinum, BUILT GREEN Platinum, Passive House, R-2000, and/or for Living Buildings.
    - **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.
  - **Targeting Circular Funding Mechanisms**: Funding for incentives supporting either new or existing buildings can be leveraged from the budgets those programs will support. Savings realized from those avoided expenses could be partially re-invested in incentives which enable those savings.
- ENABLING POLICIES
  - **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.
  - **Private Infrastructure Beneath Public Roadways**: Municipal agencies wishing to encourage district energy should proactively create documents and standards which define template easements or franchise agreements permitting a district energy utility to run insulated pipe between buildings under a public roadway.
  - **Net-Metering Laws are Vital**: Although not clearly stated anywhere above, 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.
  - **Solar Right-To-Light**: Projects which are dependent upon ongoing access to solar energy can be difficult to protect, especially in neighbourhoods planned for intensification. Without having some legal protection, intensification in the form of taller buildings can be a significant risk to the future business viability of a development project reliant on solar energy.

b. What barriers or challenges (if any) did you encounter in doing this Feasibility Study? How did you overcome them?

There were no significant barriers encountered when carrying out the study itself. This project was successful collaboration of a large support team from all four participating municipalities.

6. Knowledge Sharing

a. Is there a website where more information about the Feasibility Study can be found? If so, please provide the relevant URL.

The full report is shared online at www.s2etech.com/fcm-gmf, and is in the process of being republished and distributed nationally through the FCM.

b. In addition to the Feasibility Study results, has your Feasibility Study led to other activities that could be of interest to another municipality (for example, a new policy for sustainable community development, a series of model by-laws, the design of a new operating practice, a manual on public consultation or a measurement tool to assess progress in moving toward greater sustainability)? If so, please list these outcomes, and include copies of the relevant documents (or website links).

The four partner municipalities who participated in this study (i.e., London, Kingston, Kitchener and Waterloo) are all presently evaluating how they can implement the conclusions of the study in locally appropriate ways. FCM intends to distribute the study widely, and it is expected that many other municipalities across Canada will also begin to evaluate how they can leverage the lessons learned herein.

FCM and S2E are presently in discussions about next phases for the study which might include training events, public speaking engagements, and/or other methods of sharing and promoting the lessons learned herein.

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