LOCAL IMPROVEMENT CHARGE (LIC) FINANCING PILOT PROGRAM DESIGN FOR RESIDENTIAL BUILDINGS IN ONTARIO

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Dunsky Energy Consulting is a Montreal-based firm specialized in the design, analysis and implementation of energy efficiency and renewable energy programs and policies. Our clients include leading utilities, government agencies, private firms and non-profit organizations throughout Canada and the U.S. To learn more, please visit us at www.dunsky.ca.

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TABLE OF CONTENTS

GLOSSARY

PACE - Property Assessed Clean Energy

LIC – Local Improvement Charge

GSHP - Ground Source Heat Pump

ERS - EnerGuide Rating System

OPA - Ontario Power Authority

IO - Infrastructure Ontario

FCM - Federation of Canadian Municipalities

SIR – Savings to Investment Ratio

SPP – Simple Payback Period

NG – Natural Gas

HVAC – Heating Ventilation and Air Conditioning

EUL – Estimated Useful Life

DWHR – Drain Water Heat Recovery

CEA – Certified Energy Advisor

DIY – Do-it-yourself

NEB - Non-energy benefits

PDA - Program Delivery Agent

LOC - Line of Credit

LICO - Low-Income Cut-Off

RFD – Request for Disbursement

FHFA - Federal Housing Finance Authority

DI – Direct Install

EE – Energy Efficiency

HELP - Home Energy Loan Program

ACH - Air Changes per Hour

IPMVP – International Performance Measurement and Verification Protocol

NRCan – Natural Resources Canada

NEB - Non-Energy Benefit

ACH50- Air changes per hour at 50 Pascals of depressurisation

EXECUTIVE SUMMARY

Local Improvement Charges (LIC) give municipalities the ability to recover the costs of capital improvements made on public or privately owned land from property owners who will benefit from the improvement. In 2012 Ontario amended the LIC regulations to allow municipalities to enter into voluntary LIC financing agreements with individual property owners in order to finance them to undertake improvements on their own properties. This creates an opportunity for municipalities to establish LIC financing programs that offer an innovative mechanism for property owners to invest in energy and water saving improvements.

LIC financing represents a low-risk tool that encourages investment in measures with long term paybacks by giving homeowners access to capital to complete improvements that lead to utility bill savings, then recuperating payments through property taxes, Moreover, due to their status as a special charge on the tax role, LIC assessments stay with the property when it is sold, rather than with the former owner, thus helping to overcome another of the barriers homeowners face when considering investments in energy efficiency.

This document outlines an LIC financing pilot program design for small residential properties, as well as a study into the potential for using this financing mechanism for larger multi-unit residential buildings (MURBs). It is intended for Ontario municipalities seeking to implement internally administered LIC financing programs for energy and water saving improvements.

Lessons Learned

The pilot program design is based on an in-depth review and gathering of the lessons learned from LIC financing programs from across North America. We reviewed many of the currently operating Property Assessed Clean Energy (PACE) programs in the US, as well as Halifax Nova Scotia's new SolarCity program, and Vancouver's Home Energy Loan Program (which is not strictly an LIC financing program, with the minor difference that the repayments are collected through the municipal utility bill, rather than the tax roll). From the research we distilled six key messages that guided our program design:

- **Know Your Audience:** The more your target market is defined and their needs understood, the better the program can respond to the local market and the greater the chances for success.
- **Sell Hard**: Successful programs will need to devote sufficient marketing resources and form partnerships with respected players in the community (not-for-profits as well as businesses) to effectively promote and communicate the program benefits to property owners.
- **Keep it Simple:** For participants, the program must have a clear and simple application process, and for contractors and trades-people the program must be easy to access, and allow them to introduce their clients to the LIC financing as a sales and marketing tool.

- **Be Attractive - Beauty is in the eye of the beholder:** The program must be attractive to the participants, offering them flexible terms and conditions, an easy to follow processes, clear value-added and an appealing scope of eligible measures and projects.
- **Require energy audits when it is sensible:** Certified energy auditors can play a valuable role in the program as advisors to the property owners. However, the additional cost and procedures associated with the energy audits can create a barrier to participating in the program.
- **LIC financing can work, but it isn't always easy**: Evidence shows that LIC financing works best when it is designed as part of a larger energy efficiency strategy that includes incentives, community-based retrofits and marketing, and strong partnerships with the construction, financial and building management industries.

LIC Financing Pilot Program Design for Single Family Homes and Low Density Residential Buildings

The Residential LIC Financing Pilot Program design presented in Chapter 2 is aimed at small and single-family residential properties (containing up to four residential units), encouraging them to undertake energy saving improvements in their homes.

The central program goal is to:

- Focus on property-owners already doing or planning renovations, and;
- Encourage them to include more and deeper energy saving improvements.

This helps to increase the cost-effectiveness for the participants, and allows access to existing renovation channels to market the program. Municipalities may also choose to expand the pool of eligible measures under the program to include non-energy improvements, deferred maintenance projects or water bill savings opportunities. These may provide additional benefits to the participant and help generate further interest in the program.

While there is clear potential for LIC financing programs to succeed in Ontario, they do face many challenges. The greatest challenges include the current historically low natural gas prices, which reduce the cost-effectiveness of energy saving measures, and the need to engage in successful marketing to achieve high participant uptake rates.

Table E1 below provides a summary of the Residential Pilot Program Design settings. It includes a series of fixed and flexible conditions for each program parameter (Target Audience Eligibility Criteria, LIC Financing Terms, Eligible Measures and Program Funding). The fixed conditions are those that should be maintained in all small and low-density residential property LIC financing programs regardless of the municipality. The flexible conditions indicate those settings that can be adjusted to the local context.

Chapter 2 contains detailed rationale for each program setting, and goes on to provide program delivery models and procedures. The final section of Chapter 2 includes a risk identification and response strategy for a number of the most common risks faced by LIC financing programs. This is designed to aid program administrators to respond to challenges that may arise during program implementation.

Table E1: Residential LIC Financing Pilot Program Design Summary

Target Audience The target audience should define the focus of marketing efforts, with the residential property classification as the only mandatory condition.	**Fixed**	➢ Residential Properties with 1-4 units
	Flexible	➢ Older homes (pre-1980) in need of repairs and renovations ➢ Low to moderate income homeowners (with limited access to affordable long-term credit) ➢ Homeowners not wanting to add to their personal debt load ➢ Homeowners who are already planning or undertaking renovations
Eligibility Criteria Aim to keep eligibility criteria light and broad, with a streamlined application process and quick response times.	**Fixed**	➢ Property fits residential mortgage classification ➢ Participant is the property title holder ➢ No arrears currently on property taxes or mortgage ➢ No involuntary liens on the property
	Flexible	➢ Ensure sufficient homeowners equity to cover the LIC financing capital ➢ Credit score check and recent bankruptcy check.
LIC Financing Terms Long term, low interest, transferable financing is a core selling point for the program.	**Fixed**	➢ Offer the minimum interest rate possible ➢ Set a project financing minimum that is high enough to justify administration expenses ($5,000) ➢ Offer 15-20 year fixed term financing, this will likely be the biggest selling point during periods of historically low interest rates
	Flexible	➢ Maximum financing amount can be a % of property, fixed maximum, or capped at the value of equity the owner has in the property
Eligible Projects and Measures Program should steer homeowners toward deep energy saving measures, but offer the flexibility to fit within broader renovation or repair projects.	**Fixed**	➢ Do not require a savings (%) threshold – it is too high a barrier ➢ Include significant portion of deep savings measures recommended by ERS evaluation: insulation, draft proofing, furnace upgrades ➢ Include "light" energy saving measures such as windows and doors ➢ Include required energy saving improvement-related home repairs ➢ Includes Do-It-Yourselfers and contractor-installed projects
	Flexible	➢ Novel technologies such as electric vehicle plug-ins, and solar energy ➢ Water savings, wells and septic tanks ➢ Deferred maintenance ➢ Direct Install through a delivery agent is an option in some cases
Sources of LIC funds Access the lowest-cost source of program funds, with fixed terms over long durations that match the LIC financing terms offered to participants.	**Fixed**	➢ Municipal debt offers the best source of low interest program funding ➢ Infrastructure Ontario loans are currently the ideal option ➢ Municipal bonds offer a back-up option that can be used for rolling over longer term loans
	Flexible	➢ Program administration costs can be recuperated from: o Interest rate rider on financing terms o Administration charge added to initial financing capital o Grant or other discretionary funding sources ➢ Where available, other government grants, municipal surpluses, or private donations could be used to establish a revolving fund.

LIC Financing for Multi-Unit Residential Buildings (MURBs)

A review of specific LIC financing issues related to MURBs is presented in Chapter 3. MURBs with greater than four housing units fall under the commercial mortgage classification, which carry a range of underwriting criteria that are typically more stringent than those for smaller residential properties. Moreover, there are a range of specific property ownership and management conditions that impact MURBs. Thus we recommend developing a separate LIC financing program, or program stream, to cover MURBs with eligibility criteria, application processes, and financing conditions that are suited to the sector. This will help target the program to the MURB sector, and increase the chances for success.

MURBs make up a significant portion of residential dwellings in many of Ontario's larger municipalities. It is recommended that a municipality assess the size of the MURB sector locally, and create a program that responds to the local needs. Chapter 3 offers key insights into commercial LIC financing mechanisms, and particularly how they may differ from those suited to smaller and low-density residential properties. It is intended to complement the program design in Chapter 2, by adding details specific to the MURB sector.

The MURB LIC financing study includes a review of lessons learned from US commercial PACE programs, outlining the range of financing and program administration models currently in use. This is followed by a cost effectiveness analysis for a range of energy and water saving improvements applied to four Toronto, Ontario MURB archetypes. We also performed a market potential scan to identify the market for LIC financing in the MURB sector, and highlight current market trends.

These studies are gathered into the following programming recommendations for MURB LIC financing:

- **Targeted participants and eligibility requirements within the MURB sector:** Programs typically target buildings with higher energy savings potentials that have sufficient equity to carry the LIC financing commitments.
- **Eligible measures should balance positive cash flow with whole-building retrofits that go farther than existing programs may facilitate:** Among the key benefits of LIC financing is its ability to support major capital investments at fixed interest rates over long durations.
- **Program requirements for contractor qualification and selection:** Most US commercial PACE programs have a level of quality assurance or pre-qualification for the contractors involved in carrying out the energy saving measures. A few basic requirements can help ensure that the projects meet the predicted savings targets and that the LIC financing carries lower risks.
- **Sources of funds accessed by the municipality to finance the programs:** The sources of funds available to a MURB LIC program follow closely available to small and low density residential programs, with a few key additions, most notably private financing negotiated and provided directly to the property owners.
- **Program administration and financing terms:** While small residential property owners need programs with a strong focus on simplicity (from application through implementation and collection of LIC taxes) MURB owners are more conditioned to management practices, financing

arrangements and incentive programs. MURB LIC financing programs may include additional application requirements such as mortgage lender consent and a detailed energy audit.

Monitoring and Evaluation Framework

The Monitoring and Evaluation (M&E) of LIC financing pilot programs is an essential step in gathering the results and benefits of the programs and communicating these to the relevant stakeholders. The interim monitoring results and evaluation reports can be used to improve program implementation practices while the pilots are underway. Final program evaluations are essential to argue the business case for expanding the pilot program models more broadly across the province.

An M&E framework is presented in Chapter 4 primarily for small and low density residential LIC financing pilot programs. However, the overall strategy and approach can also be applied to MURB LIC financing pilot programs, with some important differences noted in the final section of this chapter.

Given that the pilot programs' M&E budgets will be limited, we recommend an M&E framework that focuses on evaluating the program process, to tune the LIC financing program model and address the greatest risk to the pilot program success (i.e. less-than-anticipated uptake rates). By focussing evaluation efforts on the program processes, the M&E budgets will be used most effectively.

Monitoring program indicators and evaluating the program impacts can be largely achieved by recording information available through the participant applications, contract documentation and the participant Request for Disbursement forms. Moreover, the ERS evaluation results available to program administrators through the ERS database provide a valuable source of program performance information, and it is recommended that programs rely on this data to collect the majority of their performance indicators.

Monitoring efforts should collect data on program performance metrics, such as financing delivered, estimated energy and water savings achieved, and number of measures installed. These will provide valuable indicators of the program performance and can be used to meet the programs' reporting needs before council and funding partners. The evaluation reports will interpret the significance of gathered program performance data, and dig deeper into various program processes and impact indicators.

It is recommended that the municipalities coordinate through the CHEERIO Working Group to establish a common list of core program data, and develop a database to record it in a consistent manner. A deeper pilot study that compares the results and gathers best practices from all the pilot programs should be performed through the CHEERIO Working Group to build the case for applying LIC financing for energy and water savings improvements more broadly.

Finally, LIC financing programs directed at MURBs will encompass an additional set of M&E challenges, chief among these is the lack of a consistent energy and water saving evaluation tool like ERS. Program administrators will likely have to develop more comprehensive data gathering tools to meet their M&E needs for MURB programs.

Table E2: Summary of M&E Reports, Objectives and Collected Data

Reports and Studies	Objective	Data Collected
Quarterly Monitoring Reports Contains a tabulation of program performance data.	Tracks program performance indicators and assesses data quality during implementation	The monitored data should include the full set of participant data, along with other collected data, including: • ERS database results • Estimated energy savings • Measures installed • Participation rates, financing awarded, etc.
Process Study Determines program implementation effectiveness, at an interim and final stage.	Indicates if the program is being delivered as intended and recommends adjustments to improve effectiveness.	• Surveys and interviews with applicants, participants, program drop-outs • Interviews with program administrator(s) • Interviews with marketing partners, CEA and contractors • Review of program design and marketing materials
Impact Study Performed at the end of the pilot program to provide insights on program performance to all stakeholders. Ideally, it should be released publicly.	Energy and water savings	• Estimated savings from ERS modeling software • Calculated or deemed energy savings (for measures not included in ERS and renewable energy systems) • Deemed water savings
	Environmental protection	• GHG emissions calculated from energy savings • Qualitative evaluation of well and septic tank improvements
	Increased local economic activity	• Total LIC financing disbursed to property owners • Value of associated self-financed improvements by participating property owners, and program drop-outs • Administration expenses invested • Purchase of goods and services / job creation • Energy bill savings for participants
	Improved building stock	• Number of renovations and specific improvements • Statistical analysis of overall property value • Estimate value of non-energy benefits to participants
Province-Wide Pilot Study This would capture the collective results of the various pilot programs, and provide a validation for broader program implementation.	Collective process and impacts study	• A standardized database for all pilot program datasets, allows for easy aggregation of province-wide results • Comparing process studies, or pooling funds into a multi program process study reveals best practices
	Financial Impacts and Risk Evaluation	• Tax, LIC repayment and mortgage default rates • Program budgets and actual costs to municipalities
	Market Study	• Focus groups and demographic studies of target markets • Update on market status of energy and water saving improvements

1. INTRODUCTION

Local Improvement Charges (LIC) give municipalities the ability to recover the costs of capital improvements made on public or privately owned land from property owners who will benefit from the improvement. In 2012 Ontario amended the LIC regulations to allow municipalities to enter into voluntary LIC financing agreements with individual property owners in order to finance them to undertake improvements on their own properties. This creates an opportunity for municipalities to establish LIC financing programs that offer an innovative mechanism for property owners to invest in energy and water saving improvements.

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The following document outlines an LIC financing pilot program design for small residential properties (containing up to four housing units), as well as a study into the potential for using this financing mechanism for larger multi-unit residential buildings (MURBs). It is intended as a template for Ontario municipalities seeking to implement local, internally administered LIC financing programs for energy and water saving improvements.

1.1 LIC FINANCING IN ONTARIO

In October 2012 Ontario amended its LIC financing regulations to allow municipalities to undertake works on private properties and to enter into a voluntary contract with the property owner to recuperate the capital costs through the imposition of a special charge added to the property's tax assessment. This amendment allows municipalities to create innovative LIC financing programs that cover the capital costs of energy and water savings improvements on private properties. There is an opportunity now for municipalities to establish local LIC financing programs under the amended regulations.

ONTARIO'S LIC REGULATION AMENDMENTS (O. REG 322/12)

Local improvement charges were included in Ontario's 2001 Municipal Act, and had been used by Ontario Municipalities for many years prior. Municipalities are permitted to pass a by-law to undertake works as a local improvement, and to raise all or any part of the cost of the work by imposing special charges on lots that abut on the work and/or will be directly benefited by it. In the past, LIC charges were mostly imposed for upgrading local infrastructure such as sewers and sidewalks.

The Ministry of Municipal Affairs and Housing (MMAH) proposed an amendment to the Local Improvement Charges regulations under the Ontario Municipal Act, 2001 (O.Reg. 586/06) and the City of Toronto Act, 2006 (Government of Ontario, 2012). Under the amendment (O.Reg. 322/12), as approved in October 2012, the municipality is permitted to raise funds to undertake works on a private property by agreement with the owner and to impose a special charge on the lots of the consenting property owners.

The amendment was created with the intention of supporting energy and water saving measures, renewable energy systems, and potentially other differed maintenance projects such as well upgrades and septic tank replacements. An important clause in the amendment states that the annual payments with respect to a work shall not extend beyond its service lifetime. Thus, it is important to estimate the useful life of the proposed energy and water saving improvements to be able to set maximum term limits for the corresponding LIC payments.

Another aspect of note is that the LIC assessments imposed do not constitute an encumbrance on the land unless they are unpaid and in arrears. In the event of a default, the municipality can establish a priority lien, as with unpaid taxes, and seize the property to recuperate the portion of the LIC financing repayments that are in arrears through the sale of the property.

BENEFITS OF LIC FINANCING IN ONTARIO

LIC financing programs for energy and water saving improvements offer a range of benefits for Ontario municipalities and their constituents.

Benefits to Homeowners

- Access to capital to make energy and water savings improvements
- Long term, low fixed-rate financing (up to 15 years and longer)
- LIC payments stay attached to the property and can be transferred to a new owner upon sale
- LIC financing does not impact personal debt load
- Improvements may increase property value
- Lower electric, gas and water utility bills
- Increased thermal comfort and improved indoor air quality in the home
- Reduced greenhouse gas (GHG) emissions
- Access to energy efficiency expertise and a home energy performance label through the EnerGuide Rating System (ERS)

Benefits to MURB Property Owners

- Most of the same benefits for homeowners listed above
- The LIC assessment is kept off balance sheet, maintaining the property owner's debt to equity ratio
- Allows investments in projects with long-term paybacks (up to 20 years)
- May reduce tenant turnover as a result of more comfortable and healthier indoor environment
- Owners of market rate rental properties may be able to avoid the split-incentive barrier in buildings where tenants pay their utility bills by incorporating along LIC assessments into rent increases.

Benefits to Rental Apartment Residents

- Potential for lower electric, gas and water utility bills
- Increased thermal comfort and improved indoor air quality
- Reduced greenhouse gas (GHG) emissions

Benefits to Municipalities

- Encourages residents to decrease water and energy consumption, reducing the strain on local utility infrastructure
- The priority lien placed on defaulting properties offers extremely secure LIC repayment protection
- An important tool to achieve local GHG reduction goals, both through participant energy savings, and by promoting the GHG goals throughout the community

- LIC programs can be designed to be cost-neutral to the municipality by recovering administration fees from program participants
- Encourages investments to improve the quality of the local building stock
- Invests in local job creation and business opportunities
- Potentially increases to local purchasing power through the reduction of residents' utility bills

Benefits to the Building Industry

- Increased demand for contractor and tradespersons' services and equipment
- Increased expertise and experience with energy saving measures
- LIC financing can act as a new tool for contractors to market to customers
- An energy efficiency advisory component, through ERS, that can ensure contractors and clients are making the best decisions

1.2 CURRENT ENERGY EFFICIENCY LIC FINANCING PROGRAMS IN THE US AND CANADA

The first LIC-based pilot program was launched only five years ago in Berkeley, California as a means to eliminate significant financial barriers homeowners experienced with regard to undertaking energy retrofits. Several states rapidly followed by adopting legislation to enable LIC financing (known as Property Assessed Clean Energy (PACE) programs in the US) and launching programs in 2008 and 2009. Currently nearly half the local state governments across the US have PACE-enabling legislation in place. California remains the continent's leader in PACE development, as it is home to several PACE models and some of the longest-running programs in the country.

Due to the recent housing crisis in the US, the Federal Housing Finance Authority (FHFA) has put a hold on many first generation PACE programs to limit the rise of property debt levels. In response to the FHFA concerns, a new crop of PACE programs is emerging that restrict the amount of LIC financing in relation to the property's existing debt to equity ratio.

We have chosen to examine all seven residential North-American programs that were running in 2012 and two programs that were about to roll out in 2013, as detailed in Table 1 and Figure 1 below. This includes two Canadian pilot programs that were launched in 2012; Halifax's Solar City program, and Vancouver's Home Energy Loan Program (HELP)[1]. Several more commercial programs that provide funding to MURBs are currently active, some of which will be discussed in this report.

Table 1: LIC Financing Programs in the US and Canada

US	Canada

• Figtree Financing (2012)
• Efficiency Vermont (2013)
• Efficiency Maine PACE (2010)
• Four Energy Independence programs in California
  ○ Western Riverside Council (2011)
  ○ Palm Desert EI Program (2010)
  ○ Yucaipa EI Program (2013)
  ○ Sonoma County EI Program (2009)
	• Halifax Solar City (2012)
	• City of Vancouver Home Energy Loan Program (closed in 2012)[1]

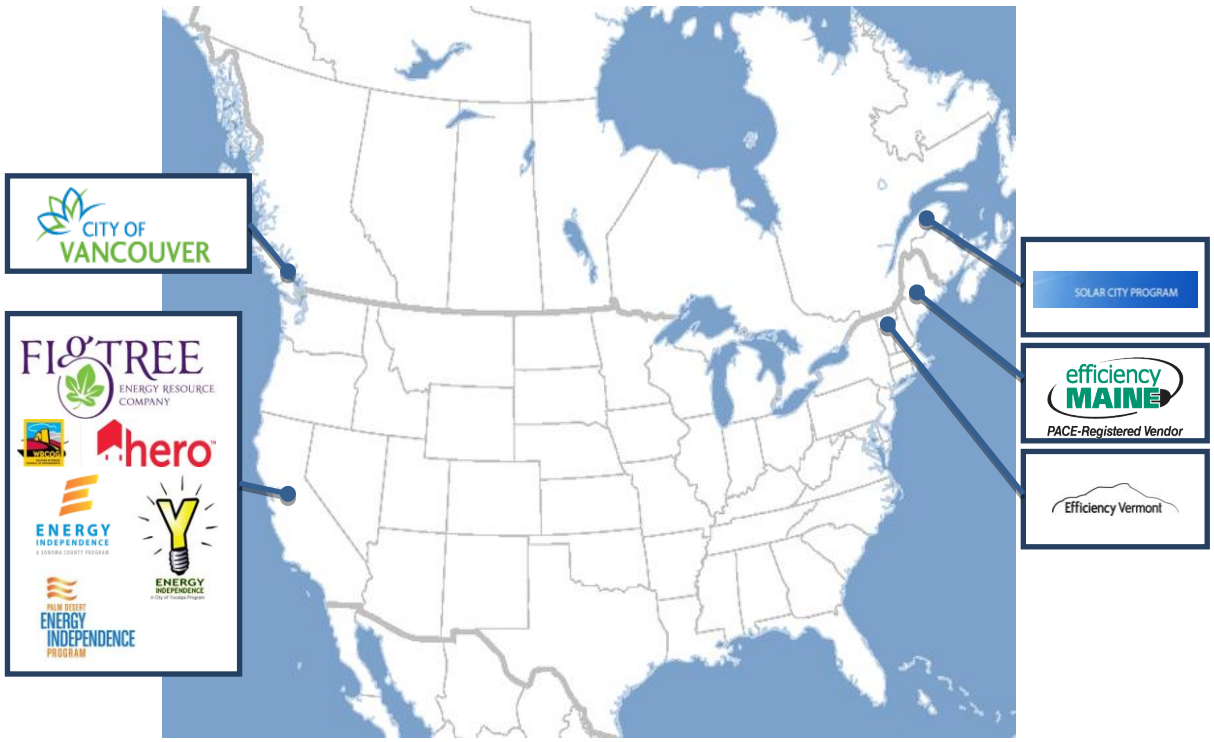
[1] Not strictly an LIC financing program, the Vancouver Home Energy Loan Program offered low interest, non-collateralised loans through Vancity credit union. The loans were then collected through repayments attached to City of Vancouver utility bills, rather than through a special charge added to the property taxes.

Program Administration

Residential LIC financing programs employ three typical program administration models:

1. **State- or county-level programs available to all municipalities in the territory willing to adopt the legislation (Efficiency Vermont, Efficiency Maine, Sonoma County, Riverside County)**
   These programs (especially Sonoma County and Riverside County programs) have a centralised approach h to service delivery and application processing and require minimal participation on behalf of the individual municipalities.
2. **Municipality-level programs (Palm Desert, Yucaipa, Halifax, Vancouver)**
   These programs are administered entirely by the municipalities, and, with the exception of Palm Desert, are all in very early stages of development.
3. **Programs delivered by a private-sector PACE service provider (Figtree)**
   Figtree is a private entity that offers a turnkey PACE program that includes financing, program administration, marketing and application processing to municipalities that are able to adopt PACE-enabling legislation.

Figure 1: North American Residential LIC Programs in 2012



Eligibility criteria

Eligibility criteria in most PACE programs in the US are very light and straightforward. In all cases they require proof of ownership (through a title search) and that the homeowner be current on their property taxes and mortgage payments. In some cases the programs also evaluate applicants based on the properties' debt to equity ratio, and the applicants credit score, bankruptcy history, and debt to income ratio. Overall, programs that work with a financial industry financing delivery partner such as a bank or credit union, tend to apply the most stringent financial eligibility criteria.

Funding sources

A variety of public and private funding sources (pooled bonds, private capital, or a revolving fund seeded by a public grant) is used to support the studied LIC financing programs. Several PACE programs were established with funds invested under the American Recovery and Reinvestment Act stimulus package released in 2009.

Financing conditions

Although financing conditions vary from one program to another, all financing is available over a long term (up to 20 years with the exception of Vancouver, Maine and Halifax), are transferable through the tax system upon the sale of the home and carry rates that vary from 3.5% to 9%.

Eligible measures

The pool of eligible measures for most US programs includes a wide array of measures, such as renewable energy and water saving measures and improvements that are not guaranteed to be cost-effective. Notably, the programs in Vancouver and Maine exclude windows and doors from eligible measures and are the only programs to require mandatory home energy evaluations. Halifax's Solar City program is a direct install program that installs solar water heating exclusively, and uses only contractors who have an established relationship with the program.

Table 2: Studies LIC Program Conditions and Outcomes

Program Name	Figtree	Sonoma County	PACE Maine	Vancouver HELP	HRM Solar City
Jurisdiction	CA	CA	ME	Vancouver, BC	Halifax, NS
Financing Terms and Conditions					
Minimum Project Value	$5,000	$2,500	$6,500	$4,000	$6,400
Maximum Project Value	$200,000	$200,000	$15,000	$16,000	$8,000
Source of Program funds	Private Capital Markets	American Recovery and Reinvestment Act (ARRA) and local funds	ARRA and other Federal Government sources	Vancity Credit Union	$5.5M FCM loan
Admin. Fees included in financing terms	3% of annual PACE repayments + $40	Interest rate rider	$0 – covered by program funding	n/a	Covered by $550K FCM grant
Application Fees	$495 up front administration fee	Recording fee $66 Valuation $12 Title search $125	0	0	0
Results					
Average Financing	n/a	$30,000	$13,000	n/a	$8,000
No of Participants up to end of 2012	n/a	1750	195	4	Maximum of 1000
Financing Rates Offered	8.50%	7%	5%	4.5%	3.5%
Overall Program Budget	n/a	$60M	$5M	n/a	$8.2M

Table 2 Continued

Program Name	Figtree	Sonoma County	PACE Maine	Vancouver HELP	HRM Solar City
Eligibility Conditions					
Property value eligibility criteria	Assessment + mortgage cannot exceed property value	Assessment + mortgage cannot exceed property value	Assessment + mortgage cannot exceed property value	None	None
Bankruptcy history	X	X			
Income assessment			X		
Current on taxes	X	X	X	X	X
Credit check required			X	X	
Energy audit			X	X	
Requires Pre-qualified Contractors	X	X	X	Direct install or suggested contractor list	Direct install
Eligible Measures					
Audit costs		X	X		
Insulation	X	X	X	X	
Draft-proofing	X	X	X	X	
Reflective Roofs	X	X			
Hot water	X	X	X	X	
HVAC	X	X	X	X	
Doors and windows	X	X			
Lighting	X	X			
Pool equipment	X	X			
Solar/Renewables	X	X			X
Water saving	X	X			

SUMMARY OF LESSONS LEARNED FROM LIC PROGRAMS ACROSS NORTH AMERICA

From a review of current and past US PACE programs and two Canadian LIC financing programs, we compiled a series of key lessons and messages that can help in the development of an effective LIC financing program for Ontario municipalities. A slide deck of these is appended to this report.

From these experiences we distilled the five key messages presented below to guide the design of an LIC financing program for Ontario municipalities.

Know Your Audience

Although all property owners can benefit from LIC financing of energy saving improvements, program efficiency can be maximized through effectively targeting the specific segment of properties that have a significant energy saving potential and whose owners have a need for alternative financing mechanisms. Residential programs typically focus on older, less efficient homes occupied by lower to moderate income homeowners with restricted access to affordable long-term credit. Clearly defining the target audience will, in turn, drive the development of appropriate marketing strategies, application processes, eligible measures and financing terms that meet their specific needs.

Sell the Program

It is a common fallacy that if you build the program the participants will come. Program administrators need to understand the conduits through which their target audience gathers information, who they trust in helping them to make decisions, and which messages are most influential in convincing them to join the program and improve their property's energy efficiency. Moreover, in areas where LIC financing is a new concept, its benefits and function need to be explained in a transparent and simple manner. Therefore, programs need to devote sufficient marketing resources and form partnerships with respected players in the community (not-for-profits as well as businesses) to effectively promote and communicate the program benefits to property owners.

Keep it Simple

Simplicity is critical to the success of LIC financing programs on many levels. For participants, the program must have a clear and simple application process, ideally one that can be completed in a single 20 minute session and is integrated with other incentive program applications. For contractors and trades-people the program must be easy to access, and allow them to introduce their clients to the LIC financing as a sales and marketing tool. For program administrators, the process must be straightforward and light to keep management costs down and to ensure quick processing time that keep the participants' projects on track. To achieve these multiple objectives, it is recommended to set the eligibility criteria at the minimum level necessary and to develop effective and user-friendly data collection and management tools to assist application processing.

Be Attractive: Beauty is in the eye of the beholder

The program must be attractive to the participants, offering them competitive financing terms and conditions, an engaging access process, clear added-value and an appealing scope of eligible measures and projects. It is best to offer a wide range of eligible measures (e.g. windows and doors, renewables, water), despite concerns that some measures may not provide significant energy savings. Where possible, it is better to encourage deep savings through links to incentive programs rather than place restrictions on shallow savings measures.

Require energy audits when it is sensible

Certified energy auditors can play a valuable role in the program as advisors to the property owners, giving them direction and peace of mind that the improvements they select will be effective. However, the additional cost and procedures associated with the energy audits can create a barrier to participating in the program. By leveraging the relationship with auditors, training them thoroughly on the program so they can support the property owners, and leveraging the data they collect for program tracking and quality control, LIC financing program administrators can assure that the auditor delivers a value to the property owner that exceeds the costs.

LIC financing can work, but it isn't always easy

LIC financing offers attractive benefits to property owners, but it is not always easy to sell the program to potential participants. Evidence shows that LIC financing works best when it is designed as part of a larger energy efficiency strategy that includes incentives, community-based retrofits, marketing, and strong partnerships with the construction, financing and building management industries.

1.3 MATCHING LIC FINANCING PROGRAMS WITH PROPERTY CLASSIFICATIONS

LIC financing program delivery models typically separate single family (or low density) residential properties from commercial buildings, which includes multi-unit residential buildings (MURBs). There are a number of fundamental differences between the two property types that affect how they interact with the LIC financing mechanisms, including:

- The handling of residential mortgages and commercial mortgages in the secondary financial markets;
- Building construction and energy savings opportunities;
- Energy saving project size and duration;
- Building management and decision-making priorities, and;
- Optimal marketing channels and messages.

In response, some LIC programs deliver financing to residential and commercial properties along two parallel streams, but access the program funds from the same source. In other examples, completely separate programs are established with different sources of program funds for each program. In a few rare cases both residential and commercial properties are eligible under a single program stream, but at the cost of more complex program administrative structures and less than optimal delivery of services to one or the other property types.

DEFINITIONS OF SINGLE FAMILY RESIDENTIAL AND MURB PROPERTY CLASSIFICATIONS

The proposed residential pilot program design presented below in Chapter 2 is focussed on single family and low density residential properties. It is recommended that a separate program, or program stream, be created to handle MURBs. This model follows similar programs in the US where commercial programs (that include multi-unit buildings) are usually delivered separately from residential programs.

From a program design perspective, the key distinction between the two programs is the type of mortgage. In Ontario, single-family homes and residential properties with up to four residential units are covered by residential mortgages. Properties with five or more units, or those that contain a commercial unit such as a storefront, are covered by commercial mortgages. There are significant differences in the underwriting criteria applied to commercial and residential mortgages, which makes it challenging to offer a single LIC financing product to both. Beyond the type of mortgage, there are a number of other important differences between commercial and residential properties that impact LIC financing program design and delivery.

Whether a municipality chooses to administer MURB and residential LIC financing programs jointly, or as separate programs, depends on local conditions and preferences. However, in either case the program delivery on the front end will need to follow two separate processes to respond to the different financial obligations attached to each property type.

Table 3: Relevant Characteristics of Residential and Commercial Properties

Residential Properties	Commercial Properties and MURBs
Typically owner occupied. Can contain up to three additional rental units	Rental units or condominiums
A high portion of residential mortgages are insured[2]	Commercial property financing require higher down payments (typically 25% for uninsured mortgages) and the associated mortgages are rarely insured.
Restrictions on second mortgages and other assessments on the property are typically lighter than for commercial mortgages.	Often carry a *Due on Encumbrance* clause that gives the mortgage-holder the right to call the loan due if additional debt is placed on the property without the lender's consent.
Mortgages on smaller residential properties are typically repackaged and sold by mortgage lender as mortgage-backed securities.	Commercial mortgages are commonly held by the local mortgage lender for their duration
Cost-effectiveness is somewhat important to owners, but is balanced with other qualitative benefits and considerations, such as home comfort	Cost-effectiveness plays a central role in decision-making. Owners are typically adept in cash flow analyses for building improvements
Participants will have a lower tolerance to complicated administrative requirements	Property owners have some familiarity and a somewhat higher comfort with program administrative requirements and would not necessarily be deterred when the business case appears positive from the onset

[2] Mortgage loan insurance is typically required by lenders when homebuyers make a down payment of less than 20% of the purchase price. Mortgage loan insurance helps protect lenders against mortgage default.

RESIDENTIAL LIC FINANCING PILOT PROGRAM DESIGN

2. RESIDENTIAL LIC FINANCING PILOT PROGRAM DESIGN

The residential LIC financing pilot program design is aimed at small and single family residential property owners, encouraging them to undertake energy saving improvements in their homes.

The central program goal is to:

- Focus on property-owners already doing or planning renovations, and;
- Encourage them to include more and deeper energy saving improvements.

This helps to increase the cost-effectiveness for the participants, and allows access to existing renovation channels to market the program.

Municipalities may also choose to expand the pool of eligible measures under the program to include non-energy improvements, deferred maintenance projects or water bill savings opportunities. These may provide additional benefits to the participant and help generate further interest in the program.

While there is clear potential for LIC financing programs to succeed in Ontario, they do face many challenges.

- It is difficult to achieve cash-flow positive energy savings improvements in Ontario's residential sector.
- A whole-home approach is required to achieve energy savings that exceed 20%.
- Marketing and outreach can fall flat if not properly designed and the right partners are not engaged.
- Many small projects and lower than anticipated program uptake can result in high per household administration costs.
- Homeowners are not always convinced of the benefits of investing in energy efficiency.

LIC Financing Offer to Property-owners

Encourages **deep energy retrofits** through an innovative financing program that:

- *Delivers HIGH VALUE retrofit bundles*
- *Encourages property-owners already considering renovations to include further energy saving measures*
- *Offers attractive financing terms, competitive with property backed lines of credit (3%-5% interest rates)*
- *Offers long term fixed rates: 5, 10 or 15 years terms – with no-penalty early payback options*
- *Is automatically transferable to next owner if the property is sold*

Despite the challenges, LIC financing programs can achieve success if they are designed and implemented with careful consideration of the opportunities and challenges faced. LIC financing functions best when it is part of an overall energy efficiency strategy that includes incentives, effective outreach and community engagement, a strong guiding policy and local political will.

The following residential pilot program design template seeks to identify important programming elements and strategies to capture the LIC financing opportunities, while avoiding the pitfalls along the way. It is built taking into consideration the experiences of other innovative financing programs across the US and Canada, some of which have achieved and surpassed their goals, and others of which have fallen significantly short.

LIC financing for energy and water saving improvements on private properties is still a relatively new concept, with the longest-running programs demonstrating just five years of history. New approaches are emerging in the sector that can be integrated into the design or implementation of new and existing programs. Establishing the first pilot programs in Ontario municipalities will lead to new insights and opportunities specific to the province that can reinforce local and province-wide efforts moving forward.

RESIDENTIAL LIC FINANCING PILOT PROGRAM SUMMARY

Table 4: Residential LIC Financing Pilot Program Design Summary below provides a summary of the Residential Pilot Program design settings. A series of fixed and flexible conditions are presented for each program parameter (Target Audience Eligibility Criteria, LIC Financing Terms, Eligible Measures and Program Funding).

The fixed conditions were developed in careful consideration of the current context faced by Ontario municipalities and are designed to strike a balance across the range of programming considerations. We consider these settings to be essential to the program success, and it is not recommended that a municipality alter these in their local program implementation without considering the impact of the change on the overall program design.

The flexible, or discretionary, conditions are the program parameters that should be tuned to the specific goals and context in each municipality. For example, these may be impacted by the local housing stock, the size of the municipality or on the local council's tolerance to risk. We have provided a range of options, and a rationale to be applied when deciding how to fix, or tune, these conditions in the local pilot programs.

Table 4: Residential LIC Financing Pilot Program Design Summary

Target Audience The target audience should define the focus of marketing efforts, with the residential property classification as the only mandatory condition.	**Fixed**	➢ Residential Properties with 1-4 units
	Flexible	➢ Older homes (pre-1980) in need of repairs and renovations ➢ Low to moderate income homeowners (with limited access to affordable long-term credit) ➢ Homeowners not wanting to add to their personal debt load ➢ Homeowners who are already planning or undertaking renovations
Eligibility Criteria Aim to keep eligibility criteria light and broad, with a streamlined application process and quick response times.	**Fixed**	➢ Property fits residential mortgage classification ➢ Participant is the property title holder ➢ No arrears currently on property taxes or mortgage ➢ No involuntary liens on the property
	Flexible	➢ Ensure sufficient homeowners equity to cover the LIC financing capital ➢ Credit score check and recent bankruptcy check.
LIC Financing Terms Long term, low interest, transferable financing is a core selling point for the program.	**Fixed**	➢ Offer the minimum interest rate possible ➢ Set a project financing minimum that is high enough to justify administration expenses ($5,000) ➢ Offer 15-20 year fixed term financing, this will likely be the biggest selling point during periods of historically low interest rates
	Flexible	➢ Maximum financing amount can be a % of property, fixed maximum, or capped at the value of equity the owner has in the property
Eligible Projects and Measures Program should steer homeowners toward deep energy saving measures, but offer the flexibility to fit within broader renovation or repair projects.	**Fixed**	➢ Do not require a savings (%) threshold – it is too high a barrier ➢ Include significant portion of deep savings measures recommended by ERS evaluation: insulation, draft proofing, furnace upgrades ➢ Include "light" energy saving measures such as windows and doors ➢ Include required energy saving improvement-related home repairs ➢ Includes Do-It-Yourselfers and contractor-installed projects
	Flexible	➢ Novel technologies such as electric vehicle plug-ins, and solar energy ➢ Water savings, wells and septic tanks ➢ Deferred maintenance ➢ Direct Install through a delivery agent is an option in some cases
Sources of LIC funds Access the lowest-cost source of program funds, with fixed terms over long durations that match the LIC financing terms offered to participants.	**Fixed**	➢ Municipal debt offers the best source of low interest program funding ➢ Infrastructure Ontario loans are currently the ideal option ➢ Municipal bonds offer a back-up option that can be used for rolling over longer term loans
	Flexible	➢ Program administration costs can be recuperated from: o Interest rate rider on financing terms o Administration charge added to initial financing capital o Grant or other discretionary funding sources ➢ Where available, other government grants, municipal surpluses, or private donations could be used to establish a revolving fund.

2.1 TARGET AUDIENCE

The residential LIC financing pilot program is designed to reach owners of single family homes that have high energy savings potential and may find it difficult to access loans for home renovations at affordable rates. Moreover, given the difficultly of achieving cash flow positive returns from energy and water saving improvements in Ontario's natural gas heated homes, the programs should target property-owners who are considering or planning renovations, and encourage them to include deep energy savings that may otherwise be overlooked.

Program Goal:

- Encourage **deep energy retrofits** through an innovative financing program that:
    - *Delivers HIGH VALUE energy saving bundles*
    - *Targets homeowners already considering renovations to include further energy saving measures*
- Eligible properties include buildings with **residential classified mortgages:**
    - *Single family homes*
    - *Town houses*
    - *Detached, semi-detached*
    - *Small rental properties with 1-4 units*
- A typical participant is defined as:
    - *Lower to moderate income*
    - *Has some challenges to access capital for home improvements*
    - *Is considering doing other renovations, such as updating kitchen and bathrooms or finishing basement*

A **HIGH VALUE** program for participants includes:

- Deep energy savings;
- Focus on older buildings that need renovations
- Beneficial cash-flow:
  A high SIR is good, but requiring SIR > 1 for all projects may be too strict
- Non-energy benefits (NEB)
  Comfort, curb appeal, design, quality, water safety/efficiency
- A broad range of measures
- Attractive loan conditions, with flexible terms.

Targeting homes by vintage

Overall the program is aimed primarily at unimproved older homes (pre 1980 and older) that have little or no insulation, inefficient heating systems and leaky envelopes. These offer the greatest potential for energy savings, and are also regular candidates for major renovations, particularly in neighbourhoods that are undergoing a transformation. Moreover, these homes offer an enhanced marketing

Cut-off Criteria for Residential Properties in Ontario

We identified three potential criteria to differentiate between residential and multi-unit residential properties:

1. Residential Class Mortgage
   - *Buildings with 1-4 residential units*
2. ERS can be applied to any building covered under Part 9 or the Model National Building Code (MNBC)
   - *Buildings with up to 30 units, 3 stories*
3. The Ontario Assessment Act definition of a residential properties
   - *Buildings with fewer than 7 residential units, located on a lot zoned as residential*
     (Government of Ontario, 2007)

We recommend using the residential mortgage classification as the eligibility criterion as it demarks a threshold for a variety of program elements:

- Marketing to single family homes
- Mortgage insurance and financing requirements
- Building form and construction

opportunity as their energy performance is slipping further behind modern homes as newly built construction standards improve. However, there may also be energy efficiency opportunities in some newer homes, particularly if they have electric baseboard or oil heating.

Therefore, we do not recommend that a specific home-vintage cut-off criterion be imposed in the program. Instead the program participation should require an EnerGuide Rating System (ERS) audit that can identify cost-effective and high value efficiency improvements appropriate for each home. Moreover, program marketing and outreach can focus on neighbourhoods with high portions of older homes with substantial energy savings opportunities.

Condominiums

Condominium projects pose a particular challenge for LIC financing programs. The taxes are assessed to the individual units, while the envelope is owned collectively by the condominium corporation. Municipalities may choose to include condominiums provided that the participants obtain the required approval from the condominium corporation to pursue any measures that impact the commonly held building elements. It may be necessary to develop a more detailed application process for condominium projects.

Communities with a significant portion of electrically heated homes

The program design is based on the assumption that natural gas is the dominant heating fuel in most Ontario municipalities. In communities where electric baseboard heating is significant, programs may put less emphasis on homeowners currently planning renovations, and encourage stand-alone efficiency improvement projects.

Neighbourhood Selection Criteria

It is recommended that municipalities offer an LIC financing program across their entire jurisdiction in order to maximise uptake rates. However, there may be some neighbourhoods that offer a particularly

high potential to attract participants, and marketing outreach can be focused in these areas. Neighbourhood selection criteria for focused program outreach include:

- Constructed prior to 1960, or ideally prior to WWII
- Increasing real-estate values, neighbourhoods undergoing a transformation
- Significant portion of electrically heated homes (if they exist)
- The presence of a community-based retrofit initiative, or local community groups involved with urban ecological issues
- A high rate of renovation permit applications
- A high concentration of home-improvement contractors and suppliers with storefronts in the neighbourhood.

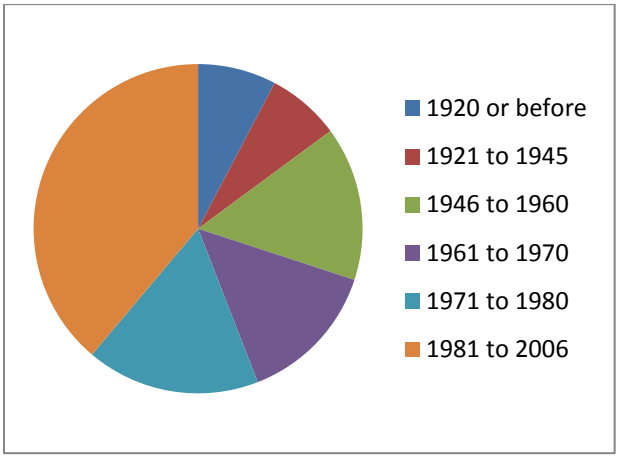
MARKET POTENTIAL

The market for a residential LIC financing program in Ontario is defined predominantly as pre-1980s homes that are likely to undergo renovations. This can include buildings with up to four rental units, and possibly small condominium buildings or horizontal condominium developments depending on the municipality's tolerance to including more complicated property ownership models.

A high-level market scan was performed to evaluate the size of the LIC financing target market. This is compiled mostly from census data and energy end-use statistics. It is expected that municipalities that implement LIC financing programs would have more detailed and up-to-date information on housing types, values, ownership type, and state of repair within their own community. Accessing municipality-specific data would help to define the local target market more precisely.

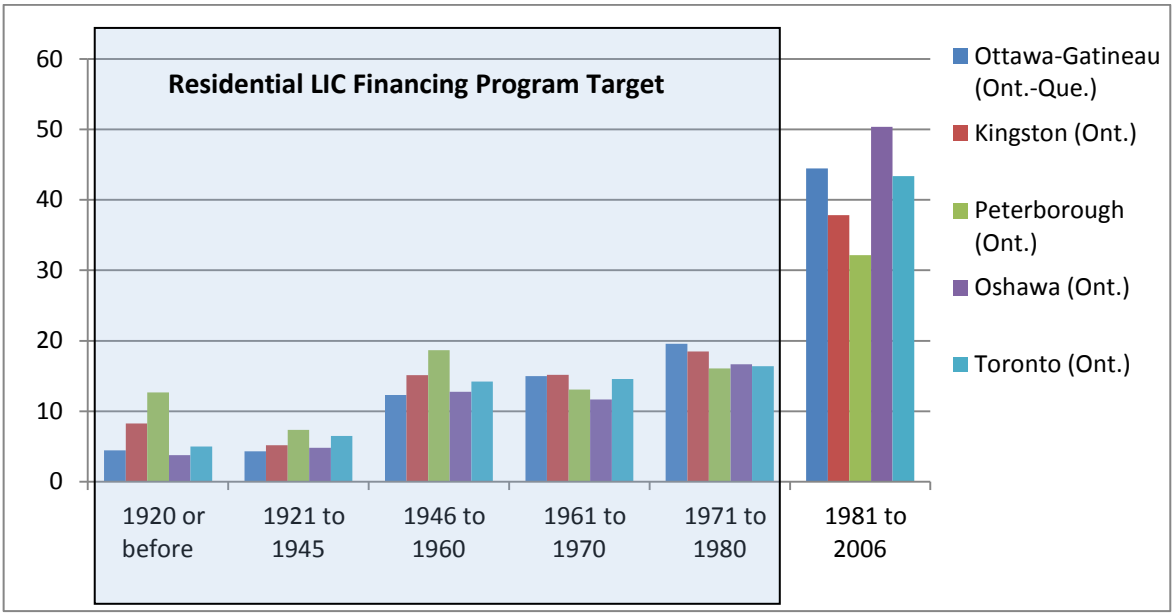
Of Ontario's 4,555,000 dwellings in 2006, over 60% were constructed prior to 1980, with the majority of those being constructed post World War II (WW II).

Figure 2: Ontario dwellings by year constructed (Statistics Canada, 2006)



By the 2011 census, the total number of dwellings in Ontario had expanded by 7% to 4,887,000. These were largely evenly split in numbers between single-family detached homes, apartments in buildings of five or more storeys, and dwellings classified as "others," which includes row houses and smaller apartment buildings. The potential market for the residential LIC financing program includes the single-family detached homes as well as some portion of the dwelling classified as "other" in the figure below.

Figure 3: Portion (%) of occupied private dwellings by period of construction and by census metropolitan area (Statistics Canada, 2006)



The portion of homes constructed in the pre-WW II and post WW II but before 1980 in each of the metropolitan areas shown in Figure 3 shows a generally consistent trend. It can be seen that in the Ontario the majority of homes in most metropolitan areas were constructed before 1980, and a substantial portion (greater than 20% of homes) were constructed prior to 1960.

Figure 4 below demonstrates that there is still a significant portion of homes constructed before 1980 that have not undergone major repairs or renovations in their lifetimes, thus there is likely an underlying foundation of demand for energy retrofits coupled with major home renovations.

Figure 4: Portion (%) of Ontario dwellings that have undergone major repairs by year of construction (Statistics Canada, 2006)

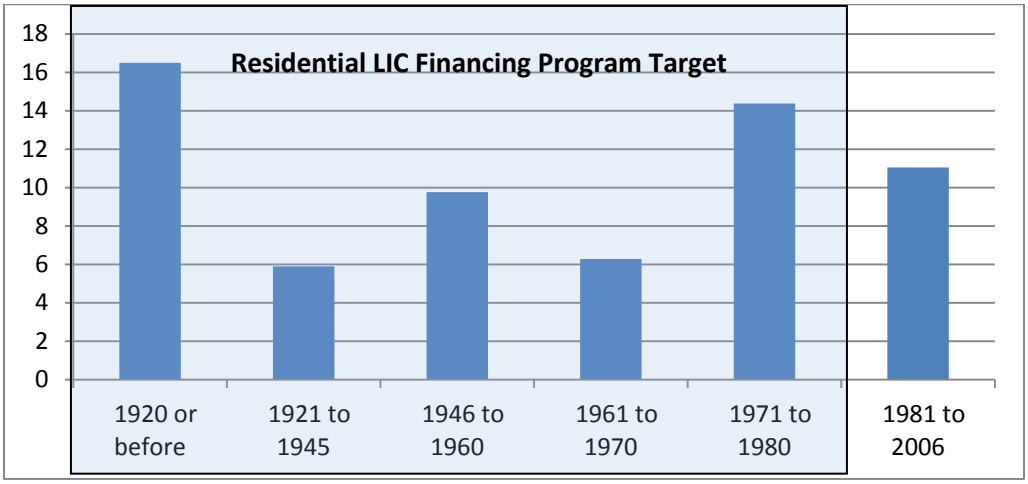


Figure 5: Private households by structural type of dwelling, by census metropolitan area (Statistics Canada, 2011)

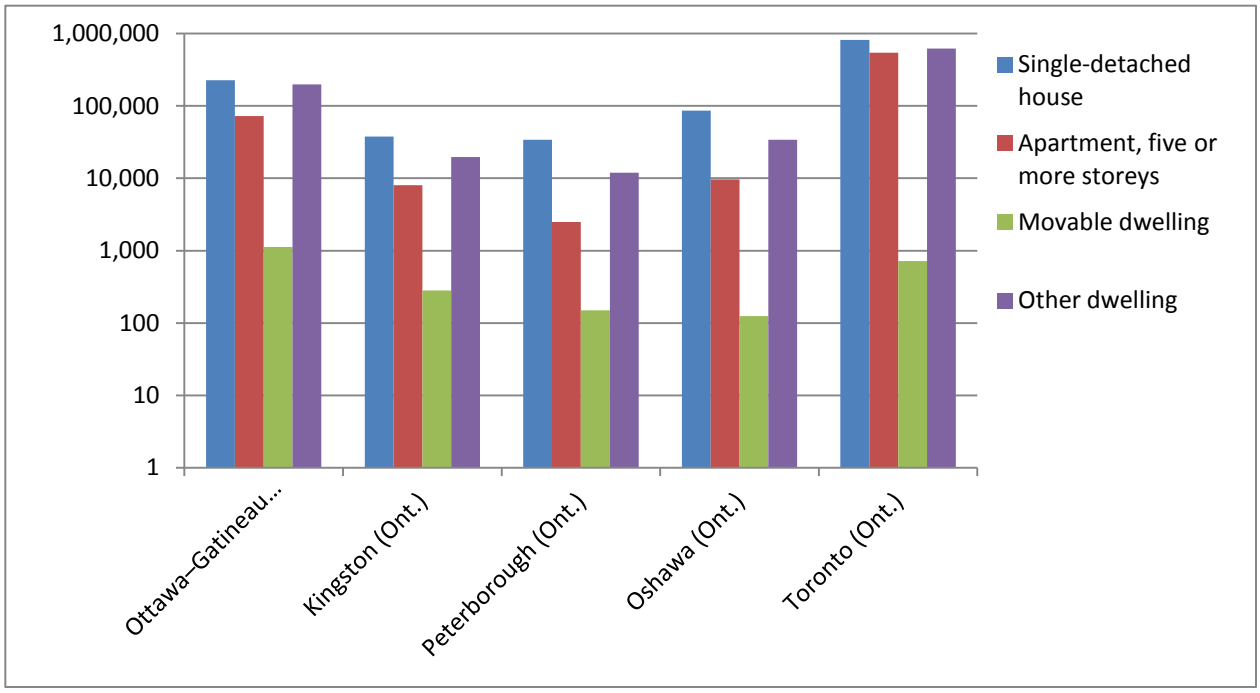
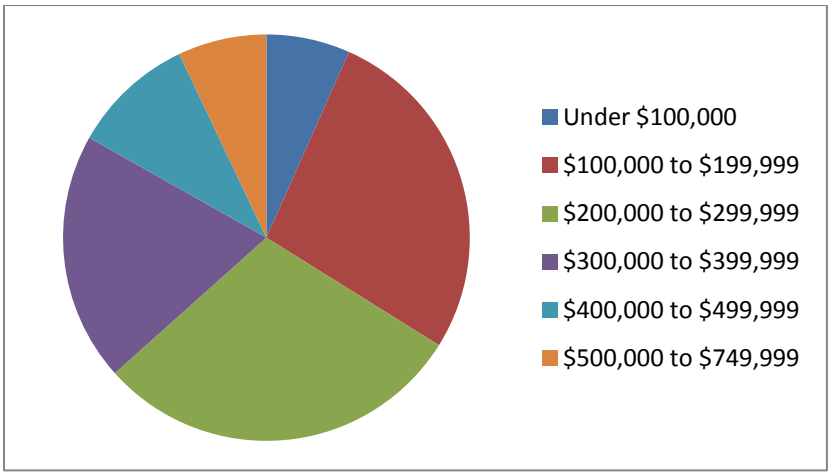


Figure 6: Owner-occupied private dwellings by value of dwelling (Statistics Canada, 2006)

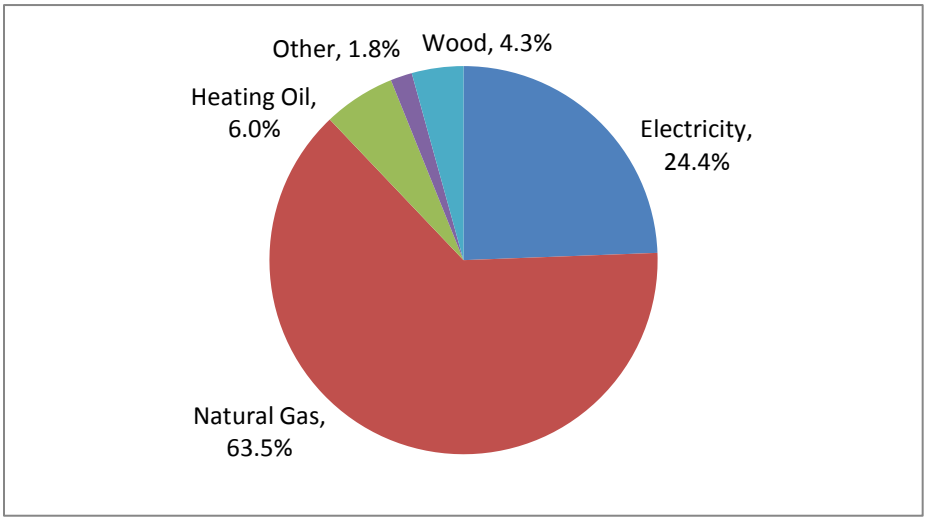


The average dwelling value in 2006 was $263,000 (estimated at $285,000 in 2011 by adjusting to Ontario average new home price index from 2007-2011). An LIC financing maximum financing envelope value of $25,000 would represent less than 10% of the average Ontario home value.

Natural gas is by far the most common fuel for home heating making up 63% of Ontario's total household energy consumption in 2010. While oil and electric heated homes are less common, they may represent a market segment with a particularly appealing potential for cost-effective energy efficiency retrofits.

Of the 4.5 million households in Ontario, Enbridge Gas services 2.7 million (Lontoc E. , 2011). Union Gas services an additional 1.4 million residential, commercial and industrial clients.

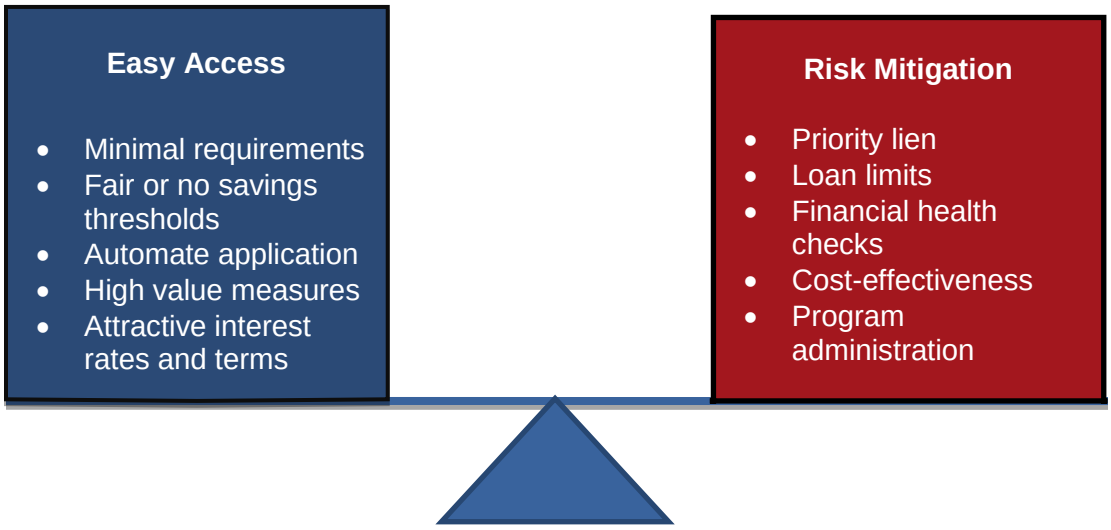
Figure 7: Ontario Residential Sector Secondary Energy Use by Energy Source (Natural Resources Canada, 2010)



PARTICIPANT ELIGIBILITY CRITERIA

Selecting appropriate participant eligibility criteria can have a major impact on the program uptake rates. If the criteria are too onerous or strict, they could become a barrier to participants who may be intimidated by the process, or may not be able to access the information required. Application processes with too many steps may also cause participants to lose focus and move on to other priorities. Moreover, it is important to turn around applications quickly so that participants can get started on their home improvements. Application processes that require the collection and analysis of many conditions will take longer to process, which can further hinder program uptake rates.

The selection of eligibility criteria relies heavily on the definition of the target audience for the program. By requiring particular financial conditions, such as debt-to-equity thresholds on the property, or debt-to-income ratios for the participants, the eligibility criteria can focus on a particular segment of the housing market. However, again it is important to note that collecting the financial documents for these types of requirements may prove to be a barrier even to potential participants who would be eligible.



Given that complicated application procedures may dissuade participants, we recommend keeping the application requirements as simple and straightforward as possible. On the other hand, if the eligibility requirements are too light, they may fail to screen out high risk applicants. Thus there is a careful balance to achieve between creating a simple application process, with easy to pass eligibility criteria, and protecting the municipality from risk. Overall, the proposed pilot program design is based on a few simple financial health criteria, which for the most part can be verified by the program administrators directly.

Table 5: Recommended Participant Eligibility Requirements

Information verified by the municipality (through MPAC and title search)	Information provided by the applicant or other sources
➢ Participant is the property title holder: *All other owners listed on the title must provide signatures to the application* ➢ Property taxes are not in arrears ➢ No involuntary liens present on property: *e.g. no outstanding construction liens from past renovations on the property* ➢ Property Assessed Value: *To determine financing limits as a percentage of total house value or owners equity*	➢ Recent bankruptcy: *No bankruptcy in the past three years* ➢ Mortgage in good standing: *no recent history of payment defaults (3-5years)* ***Optional Requirements*** ➢ Credit Check: *Consider doing it, but don't set the bar too high.* ➢ Household Income: *It is not recommended to request participants to divulge their annual income; however, strategies are needed to avoid overlap with low income home energy efficiency programs.*

Participant income verification

Asking applicants for information about their income can create discomfort, and may possibly contradict the Ontario Municipal Act[3]. However, OPA, Enbridge Gas and Union Gas offer programs to low-income homeowners that provide insulation, weatherization and equipment upgrades free of charge to participants who fall below certain household income thresholds.[4] Strategies are therefore needed to direct low-income applicants to these much more beneficial programs.

We recommend that the program not request information on participant income, but instead actively inform participants of their potential eligibility for the low-income programs. This should be explained clearly and repeated at various points in the process, so that participants can themselves determine if they qualify for the no-cost energy efficiency improvements under low-income programs.

[3] From section 394 of the Ontario Municipal Act, 2001: *(1) No fee or charge by-law shall impose a fee or charge that is based on, is in respect of or is computed by reference to, (a) the income of a person, however it is earned or received, except that a municipality or local board may exempt, in whole or in part, any class of persons from all or part of a fee or charge on the basis of inability to pay;*

[4] Household income eligibility cut-offs for these programs range from 125-135% of Statistics Canada's pre-tax, post-transfer Low-Income Cut-Off (LICO)

LIC Financing Benefits to Mortgage Lenders

- Increased investments in improving properties, especially older homes, resulting in increased resale value and sell-ability.
- Reduced utility bills can improve homeowner's financial health, and decrease mortgage default rates.
- For rental properties, LIC financed improvements increase net operating income, and therefore can increase the property value.
- In the event of LIC default, only delinquent amount on assessment is due.

Points in the application process to inform participants of the low-income programs include:

- On the LIC financing program website
- On the application forms
- At the time the energy audit is performed
- Prior to signing a contract to approve the LIC financing and proceed with the home improvements.

Mortgage lender sign off

In the past few years, residential US PACE programs have come under criticism from the FHFA which has instructed the two largest residential mortgage insurers not to insure properties currently enrolled in PACE programs. This has put many of the early residential PACE programs on hold across the country (Lillian, 2013). The FHFA's objections were a result of the recent housing crash in the US market, wherein many homeowners carried mortgages that exceeded their home's value. The FHFA will now allow mortgage insurance of PACE program participants provided they obtain an up-to-date property value assessment and the total debt on the property (including the LIC financing) not exceed the current property value. As a result, there has been a number of new PACE financing programs established since the FHFA ruling that take into account the FHFA's recommended debt to equity considerations.

While the housing market in Canada has remained relatively stable, there may arise some discomfort within the banking sector to see voluntary tax charges take precedence over existing mortgages through the LIC's priority lien status. However, we do not recommend including a requirement for mortgage lender sign-off in the residential LIC financing program, or to apply strict debt to equity eligibility thresholds to the properties, though in the future it may become necessary to revisit these requirements.

MATCHING THE FINANCING TO THE TARGET AUDIENCE

In order to generate interest in the program, it must offer attractive financing terms to the target audience. This largely falls on three factors: the interest rate offered, the length of the financing term, and the flexibility of options.

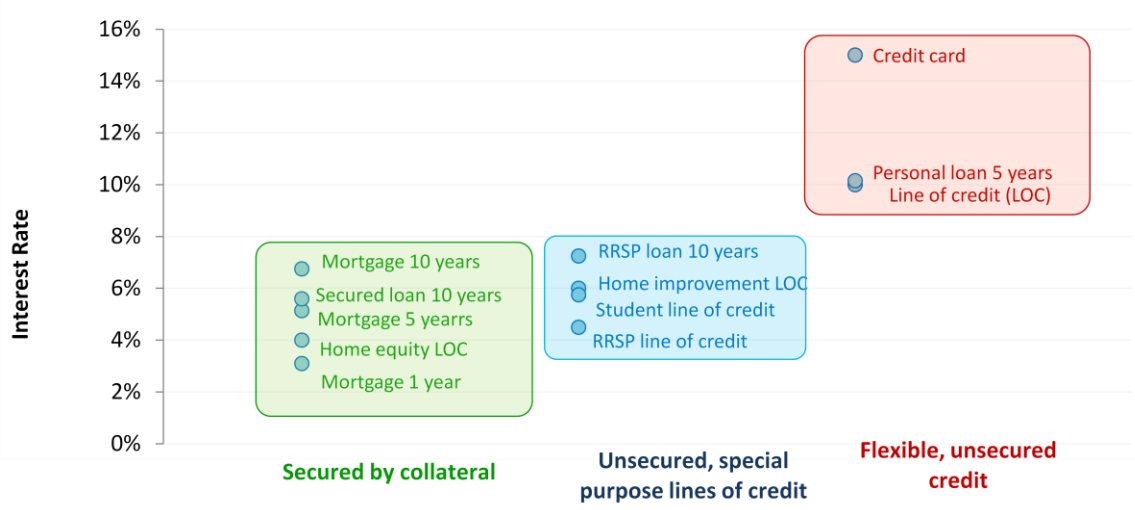
Competing with existing financial products requires offering a low rate, but LIC financing carries the additional advantage of offering long-term fixed rates and not adding to the participant's existing debt load. Collateral-secured loans offer the lowest rates in the market, but are not always available to homeowners, especially those with low to moderate incomes who have little excess equity in their

homes. High income homeowners may be less likely to participate in LIC financing programs as they have other sources of capital available to them.

Table 6: Participant financing characteristics by income level

Participant	Access to financial products
Low-to-moderate income	• May or may not have collateral assets • Less likely to have access to home equity line of credit. • Unlikely to have access to an unsecured credit line if they have a poor credit score • Often left to resort to flexible unsecured credit at high interest rates
Middle Income	• Likely to have collateral assets and thus access to secured loans • Likely to be eligible for lines of credit
High Income	• Able to negotiate preferential rates for mortgage and lines of credit

Figure 8: Published National Bank of Canada lending rates for financial products (April 2013)



Low interest rates: In order for an LIC to offer attractive rates to the homeowner, the municipality must access program funds at an affordable rate, and keep its program administrative costs to a minimum. Many US PACE programs fold the administration into the financing, expressed as a rider added to the interest rates.

Long term: Offering fixed interest rates, over 10, 15 or 20-year terms, can make the financial offer more attractive to potential participants than alternative sources of financing that may offer fixed rates for 5 years or less, after which the loan may be refinanced at a higher interest rate.

Flexible terms: Once a maximum financing term is established and the interest rates set, participants should be offered financing options such as selecting a term length to fit their payback schedule.

Early Assessment Payoff: Participants should be offered the chance to pay off the remaining balance on their LIC assessment at any time without penalty.

SETTING LIC FINANCING ENVELOPE LIMITS

It is recommended to establish a minimum financing amount and to make this clear to potential program participants from the outset in the promotional materials and application process. This ensures that the size of the project warrants the administrative costs associated with processing the application, energy assessment and establishing the tax lien. Second, it helps to encourage participants to make larger investments in energy saving measures. Setting minimum project financing limits too high may make it difficult for property owners to create projects of sufficient cost to be eligible for the program. Minimum financing envelope limits are recommended to be no lower than $5,000.

A maximum financing envelope limit can be set in one of three ways:

1. As a percentage of the property's Current Value Assessment
2. As a standard maximum amount for all participants
3. As a function of the participant's ability to carry more debt on the property (such as the debt-to-property-value ratio)

This may be decided based on availability of program funds, or based on identified needs within the target community. Project financing limits from US PACE programs have been noted in the order of $25,000, or 10% of the property's assessed value. We recommend that each municipality set the maximum loan limits according to the availability of funds and local housing stock characteristics.

Setting the project financing maximum based on the property's debt-to-value ratio may create a barrier for participants with less equity in their homes, especially in cases where the property's assessed value falls below its current market value. This may greatly undermine participant uptake in a program aimed at lower to moderate income participants, and is not recommended for the Ontario LIC financing program.

Where feasible, project financing maximums should be sufficient to allow homeowners to cover the entire project under the LIC financing to avoid requiring them to seek out multiple sources of financing. This however may not be possible for projects that include high-cost items, such as ground source heat pumps (GSHP), or those being carried out as part of a major home renovation.

ELIGIBLE MEASURES

The key considerations influencing the selection of eligible measures for a successful LIC financing program are:

1) To offer participants a broad range of options, and;
2) To steer participants toward energy savings measures that they may not otherwise pursue.

In order to achieve this, we recommend that all projects be required to include one or some measures that result in significant energy savings (insulation, draft-proofing or heating/cooling equipment upgrades). Once this is secured, the remaining financing (up to the pre-approved maximum LIC financing value) can be used for a range of lower priority items that provide some degree of energy or water savings and are attractive to homeowners (e.g. high performance windows).

Table 7: Eligible measures for the LIC financing program

Step 1: Achieve Target Primary Measures	Step 2: Secondary Measures
Must undertake ERS evaluation pre- and post-retrofit ($500 approximate cost) *Must complete at least one of these measures,* ***as recommended in the ERS report.*** *Primary measure(s) costs must represent a minimum of $2,500 of the project costs.*	*Can include any of these up to the maximum approved LIC financing value.*
• Attic insulation to R50 • Basement insulation to R12 or higher • Wall insulation to R5 or higher • Air-sealing (weatherization) • Install a high efficiency space heating system (gas furnace/boiler) (Eff. > 95%) • Install a high efficiency water heater (condensing) • Install drain water heat recovery • Install a Central Air Conditioning (CAC) system or electric furnace that satisfies saveONenergy incentive requirements.	• Home repairs needed to ensure viability of energy saving measures (e.g. correct moisture problems in walls or basement before adding insulation) • Dry-wall, framing, paint finishing (Part of overall renovation) • High performance windows and doors • Drain water heat recovery • Water heater replacement (tankless) • Heat recovery ventilators • Pool equipment (high efficiency pumps) • Ground-Source Heat Pumps (GSHP)

The list of primary eligible measures in Table 7 is designed to match the Enbridge Community Energy Conservation program requirements, wherein participants must carry out two of the listed primary measures (excluding the CAC) and achieve a minimum energy savings of 25%. This program is available in a handful of communities, and only homes with Enbridge Gas Distribution accounts (natural gas heated) are eligible. The LIC program would only require a single measure, but is designed to match Enbridge's Community Energy Conservation program's list of eligible measures to allow participants to easily qualify for both programs in municipalities where they are available.

At the time of writing, Union Gas also offers an incentive for DWHR installation and programmable thermostats, as well as a free energy saving kit. In municipalities serviced by Union Gas, program administrators should check with the incentive currently offered, as well as the eligibility criteria, and ensure that the LIC financing program eligible measures overlap with all incentivised measures.

No required energy savings threshold for eligible projects

For the LIC financing program we recommend that there be no energy savings threshold requirement. Our analysis of various measures and bundles of measures show that this requirement could severely limit the program uptake rates. In neighbourhoods with a large potential for deep savings in gas heated homes, it is likely that Enbridge incentives will give homeowners a nudge toward deeper energy savings that will help achieve higher savings from LIC financed projects.

Water saving measures and infrastructure

Water bill savings can increase the return on investment in municipalities where residential properties are metered and billed for water use. In rural communities, it may be advantageous to include septic tank replacement and well upgrades to ensure safe water supply and disposal.

- Storm water management – backflow preventers
- Water efficiency measures: low flow fixtures and equipment
- Well upgrades
- Septic tank replacement

Novel Technologies and Renewable Energy Systems

Items such as solar panels or electric vehicle plug-ins offer an attractive avenue to engage homeowners in discussions over energy. Including these in the eligible measures may aid in marketing efforts.

- Electric Vehicle Recharge Hook-up
- Other Renewables: Solar PV[5], Solar Thermal or Small Wind

[5] A range of financing options currently exist for homeowners to install solar PV systems, so it may not be beneficial to include these in an LIC financing program.

Table 8: Specifications of LIC financed eligible measures

Measure	Specification	Notes
Draft-proofing / Weatherization	5-6 ACH_{50} attainable in most cases	Best opportunities in leaky (older) homes, but all home types can be good candidates. ERS evaluation will indicate potential.
Attic insulation	Bring to R-50 (or up to available space)	Flat roofs and cathedral roofs are more difficult and costly to insulate, unless done at the time of roofing job. Available space often limits attainable R value.
Basement insulation	Add R-12 to the walls	Finished basements more difficult and costlier to insulate. Ideal during basement finishing.
Wall insulation	Aim to fill wall cavities (add R-5 as a minimum)	For solid walls, and framed walls with already filled cavities, insulation is difficult and costly, unless done during an already planned retrofit.
Furnace Replacements	AFUE 95% or higher	Aims to encourage early replacement of a formerly inefficient unit.
Central AC	SEER 14.5 or higher as per OPA's incentive requirements.[6]	Old units efficiency can be as low as SEER 9
DWHR	Install longest model available at main drain, according to available space	Significant hot water savings can be achieved in homes with larger families. Correct installation critical to realising energy savings.
Water heater	Condensing gas	Program should encourage replacement rented equipment with high efficiency units owned by property owner.
Windows	Energy Star certified	Not cost effective or particularly good for energy savings, but are desirable and can encourage participation.
Low Flow Fixtures	Showerheads: 1.5 gpm, Faucets: 2.0 gpm	Ontario building code requires low flow fixtures for new construction: shower 2.5 gpm, faucets 2.2 gpm

[6] Install or replace an existing CAC System with an ENERGY STAR® CAC System that satisfies at least a 14.5 seasonal energy efficiency ratio ("SEER") and a 12 energy efficiency ratio ("EER") confirmed by an Air-Conditioning, Heating and Refrigeration Institute ("AHRI") reference number.

2.2 LIC PROGRAM FUNDING SOURCES

Municipalities have a range of options open to them from which they can access the capital needed to establish LIC financing programs. In general, program financial needs can be categorised into:

1) Program funds: a large pool of funds used to issue LIC financing to participants
2) Administrative funds: a smaller funding envelope used to establish and maintain the program administration.

The ideal model is for a municipality to obtain some seed money to cover the program administration set-up costs, and then to establish access to a guaranteed low-interest source of program funds. On-going administration fees can then be recuperated through participant fees to the extent necessary.

Table 9: Potential sources of LIC financing pilot program funds

	One-time access (Set-up Funds)		Recurring access financing				
	FCM grant	Utility or government grants	Municipal revolving funds[7]	Application and administration charges	Municipal Bonds	Private capital (banks)	Infrastructure Ontario Loan
Administrative Funds (depend somewhat on program volume)	•	•	•	•	•		•
Program Funds (directly dependent on program volume)	•		•		•	•	•

Maintaining the expected participation level is vital for a municipality to cover the fixed portion of the program's administration costs. Program administrators should note that increasing program's borrowing and administration costs will most probably result in higher interest rates and fees for participants, which can pose a significant threat to program uptake. Thus securing the appropriate funding sources is a critical step in setting up any LIC financing program.

We evaluated a number of sources of capital assuming that Ontario municipalities will have to seek external funding to support the LIC financing programs. It is also assumed that each municipality will have to set up its own program fund and seek out its own support for administrative funds, since no province-wide body has been established to meet this need. While we indicate below the ideal source of funds in general, individual municipalities may have preferential relationships or access that could render certain funding sources more attractive.

[7] This can be derived from available cash on hand for municipalities that operate with budget surpluses, or through mechanisms such as rate payer charges on municipally owned utility customer.

MUNICIPAL DEBT FOR LIC FINANCING

Ontario municipalities are somewhat limited in the types and amount of debt that they can incur. It is, however, common for municipalities to use long-term debt to finance capital projects. There are also restrictions on the conditions under which municipalities can incur debt. Research on the legal implications of LIC financing was completed simultaneously with the development of the program's design; it was found that there are no specific legal barriers to using municipal debt to support LIC financing programs.

However, some restrictions do apply and should be kept in mind by municipalities implementing LIC financing programs. The Ministry of Municipal Affairs and Housing regulates the level of debt that may be incurred by municipalities, such that no more than 25% of the total Own Source Revenue can be used to service debt and other long term obligations without receiving Ontario Municipal Board approval. Moreover, Ontario municipalities are not permitted to take on debt to cover operational deficits; municipal debt is permitted largely to enable municipalities to invest in major improvement and infrastructure projects. It is important to note however that funds issued for LIC financed programs and projects are subtracted from the municipal debt.

POTENTIAL SOURCES OF PROGRAM FUNDS

The ideal sources of Program Funds for an LIC financing program have a number of key characteristics. These are listed below in order of their priority, with the first being the most important to the program success.

Low interest rates: Because the LIC financing program is designed to be cost-neutral to the municipality, it must pass along all of its borrowing costs to the participant. Thus the higher the rate paid by the municipality, the higher the rate charged to participants.

Long-term fixed rates: LIC financing to participants typically follows a 10, 15 or 20 year repayment schedule with a fixed interest rate throughout. Thus it is ideal for a municipality to access funds that have a fixed rate for terms of the same duration as the LIC financing offered to participants. For programs with larger volumes of participants, it may be possible to pool participants by their LIC financing repayment terms and establish a matching bond or loan ladder (10, 15 and 20 years).

Access according to need: Accessing funds as needed can greatly reduce the costs and risk to the municipality. If for instance it is necessary to issue a $20M bond to initiate the program, then the municipality will incur borrowing costs from the day the bond is issued but will not be able to start to collect interest payment from participants until the LIC financed projects are completed and registered under the LIC financing role. This lag can lead to significant additional costs to the program. Moreover, participant uptake rates can be very difficult to predict, thus there is a significant risk that a municipality will be left holding a bond that it could take time to cover through LIC payments.

The ideal scenario is to find a source of funds that is released according to the program need, or to establish a large enough floating fund to cover the first pool of projects before repackaging them as a long term loan or bond.

Simple to access: The administrative procedures for accessing the program funds should not be too onerous, and there should be the option to return to the source of funds to cover program needs. In order to facilitate this, many US based programs employ third-party bond agents or engage professional financing arrangement services to repackage the LIC assessments into asset-backed securities. Overall, it is important that accessing funds does not hold-up project implementation as this will become a barrier to participants.

Flexible repayment options: LIC financing programs typically allow participants to repay the remaining balance on their LIC assessment at any time during the LIC repayment term. Thus, if a large portion of participants chose early repayment, it would desirable for the municipality to have the same option before its lender. This will help avoid the risk of the municipality holding long term loans with insufficient LIC payments remaining to cover the interest.

Infrastructure Ontario Loans

Infrastructure Ontario (IO) has been identified as offering the most suitable source for program funds to support LIC financing programs.[8]

Infrastructure Ontario is a crown corporation wholly owned by the Province of Ontario (established by the Ontario Infrastructure and Lands Corporation Act, 2011). Infrastructure Ontario's Loan Program provides long-term financing to eligible public sector clients including municipalities to help renew infrastructure and deliver value to customers and residents. They offer a straight-forward application process with no additional fees.

Key advantages of the IO loans for LIC financing programs include:

- Affordable rates
- Access to capital market financing without any fees or commissions
- Longer terms at fixed interest rates designed to match the life of the asset
- Loans that can be tailored to meet the needs and challenges of municipalities
- Flexible conditions that allow access to the loans as needed
- Significant pre-approved amounts are available for most municipalities

While IO publishes their rates and conditions on their website, it would be up to each municipality to agree with IO to the precise conditions of any loan that may be needed.

[8] At the time of writing a decision by IO is pending on whether LIC program financing is eligible for IO loans.

Access to IO loans entails the following steps:

1. The municipality applies for the loan, and if accepted the total loan envelope, interest rate and terms are fixed for two years.
2. The municipality can then access the IO loan funds as needed during the two-year period, paying a lower "construction" interest rate in the interim. These funds would be disbursed by the municipality to LIC financed projects as they are completed.
3. At the end of the two-year period, the loan is converted to a long term debenture at the agreed terms and rates set upon initiation.

Table 10: Infrastructure Ontario Loan Terms (Infrastructure Ontario, 2013)

Term	Interest Rate
1 Month	1.59% (Construction)
5 Year	2.12%
10 Year	2.72%
15 Year	3.13%
20 Year	3.43%
25 Year	3.64%
30 Year	3.76%
35 Year	3.83%
40 Year	3.88%

IO terms and rates vary with the cost of borrowing in capital market. For current terms, visit: http://www.infrastructureontario.ca/

Municipal Bonds

Municipal bonds are another potential source of capital for LIC financing programs. However, they typically entail bond administration fees and higher borrowing costs than those offered by IO, and are less flexible than IO loans. For a program where the municipality can access a float fund to cover projects over the short term, intermittently issuing municipal bonds to replenish the float fund may be an attractive option. In the absence of sufficient liquidity, aggregating enough projects to create a pooled municipal bond may require time during which work will be delayed. Overall, given the availability of IO loans it is not likely many municipalities will pursue the municipal bond path for LIC financing. However, if IO refuses to accept LIC financing programs under its eligibility criteria, municipal bonds would likely offer the next best option.

Table 11: Current Select Ontario Municipal Bond Rates and Terms

Issuer	Coupon Rate	Maturity
Niagara Region	2.65%	2019
Ottawa City	3.35%	2022
Waterloo	3.55%	2027
York Region	4.37%	2025
Ottawa City	4.46%	2025
Peel Region	4.5%	2020
Durham Region	4.59%	2028
York Region	4.76%	2026
Waterloo	4.95%	2021
York Region	4.98%	2036
Ottawa City	5.3%	2030
Metro Toronto	5.34%	2027
Halton Region	5.4%	2023
Waterloo	5.49%	2023
Norfolk	5.79%	2025
Waterloo	6.05%	2021

Private Capital: The Efficiency Maine PACE Program Experience

When Efficiency Maine established a state-wide PACE program in 2010, they issued a call for proposals from financial institutions interested in providing application processing and financing for the PACE loans.

The call resulted in just a single offer received from AFC who eventually became the program's loan provider. Even after Efficiency Maine buys-down on the interest rates and covers all the administration costs, AFC still offers PACE financing at the somewhat high interest rates of 4.99%. Moreover, their sensitivity to risk led AFC to require a 45% debt-to-income ratio for eligible participants, which eliminated many low to moderate income homeowners from the program.

Private Capital

Many PACE programs in the US access private capital, particularly under the turn-key programs available through PACE providers that combine program administration services with pre-arranged capital sources. Private lenders, who provide third-party financing and administration, typically bundle the LIC financing obligations into asset-backed securities for sale on the capital markets.

An alternative option is for a municipality to partner with a financial institution, such as a bank, as is the case with Efficiency Maine and AFC. In this model the bank processes the applications and provides financing, and the municipality collects the LIC payments and transfers them to the bank.

Private capital models mostly charge higher interest rates to participants, and can be much more risk-averse in their application evaluations. These two significant barriers to widespread participation indicate that private capital may not be a viable source of financing for Ontario's residential LIC programs.

For smaller municipalities, or for municipalities lacking the administrative capacity to establish their own LIC financing program, turn-key private LIC financing program providers may offer a low-risk, low involvement option. However, the potential role of these turn-key providers has not yet been established in the Ontario context, and further legal interpretation of the LIC amendment may be necessary. Moreover, private capital sources may require the municipality to establish a loan-loss reserve to cover their risk, which can add further administrative weight to the program.

Other Government Funds

There are some examples where local governments establish revolving funds to provide LIC financing. These can be sourced though ratepayer fees on utility bills[9], carbon taxes and markets or private donations and other government sources such as grants. The revolving fund can either provide the full LIC financing (if it is large enough), or can act as an intermediary lender, providing the upfront financing, then repackaging the LIC assessments as municipal bonds or asset-backed securities.

[9] Ontario municipalities are limited in their ability to establish new ratepayer fees, even for municipally owned utilities. A ruling from the Ontario Energy Board would be required to approve such a mechanism.

POTENTIAL SOURCES OF ADMINISTRATION FUNDS

Program set up and administration entail a range of costs from establishing the legal structure to start issuing LIC financing and registering the LIC roll, to setting up the application process and store-front operations. While much of these costs can be passed along to participants once the program is running, there is a need for a significant injection of funds to get the program off the ground.

The ideal model is to access a significant start-up grant ($200,000 and up) and then to cover the on-going administration costs through participant fees to the degree necessary. Alternatively, municipalities can avoid the upfront costs and administration cost risks by working with a turn-key LIC financing program provider, if they become available in Ontario.

Utility or Government Grants

Provincial or Federal Government ministries, electric or natural gas utilities, and the Federation of Canadian Municipalities (FCM) are all potential sources of administration funds. To the degree that government ministries or agencies have funds or funding programs available and view the local LIC financing program as being a high-impact tool to further their priorities, it may be possible to solicit start-up or administration grants. Utilities active in the municipality may see LIC financing as being beneficial to their demand-side reduction plans.

The FCM, through the Green Municipal Funds, offers 50% financing for feasibility studies (up to $175,000) and low interest loans for implementation of municipal environmental initiatives. It may be possible to perform the program set-up under a feasibility study funded by the FCM, and the loan program may offer the initial bridge loan to get the program moving. In the case of Halifax's Solar City program, the FCM provided a $544,000 grant and $5.4M loan fund to support the program (Halifax Regional Municipality, 2012). However the turn-around time to access FCM funds may be long and it is not clear if the FCM will fund multiple LIC financing initiatives.

Administration Charges and Participant Fees

Another important source of funds for program administration is participant fees, which can be structured in many forms. We recommend either folding the on-going administration fees into an interest rider, or adding an administration charge to the LIC financing principal. The end result of either method is an increase in the annual LIC repayments made by participants.

Participants are already being asked to cover the upfront costs of the pre-retrofit ERS evaluation ($250)[10], and adding an upfront program application fee may deter many potential participants.

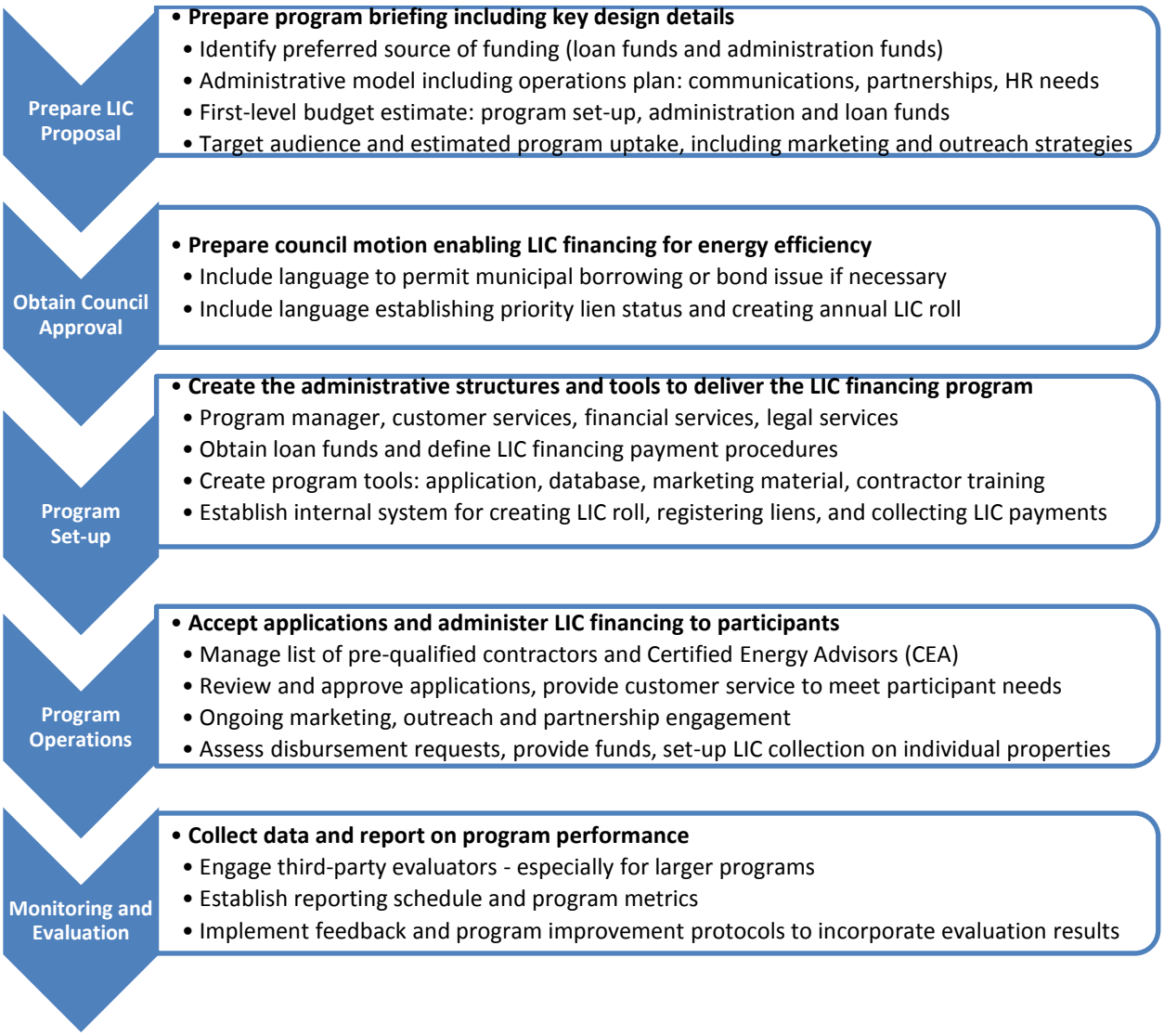
[10] While ERS evaluation costs should be eligible for inclusion in the LIC financing, applicants will be required to cover this cost up front, and will only be able to roll this into the LIC financing if they are accepted as a participant.

2.3 PROGRAM SET UP AND ADMINISTRATION

The pilot program design outlined in this report provides a tool that Ontario municipalities can use to establish locally administered LIC financing programs. The design presents an internally administered model that highlights the key strategies to be employed and the needed program structures. Each municipality has its own internal operating culture, priorities, competencies and configurations that will impact how they put their program into action. Municipal administrators should view the following sections as a strategic guide for establishing their own program plans and procedures.

Even with a program design in hand, there are hurdles to cross and decisions to be made before the first participants will receive their LIC financing and undertake their energy and water savings improvements. Figure 9 below provides an outline of key steps from program set up to implementation.

Figure 9: LIC financing program initiation and management workflow



ADMINISTRATIVE ROLES AND REQUIREMENTS

The LIC financing program administrative roles can be broken down into three main categories: program set-up and initiation, internal LIC registration and collection of repayments, and on-going program operations. This program design presents a breakdown of these roles and responsibilities assuming that the program is administered internally by the municipality. However, certain of the set-up and operations tasks can, and most likely should be considered for outsourcing to external consultants or partners. In a following section a brief description of a province-wide administered program, or a private-sector turn-key program, is also included as options that may become viable as LIC financing programs spread across Ontario.

Table 12: Program set-up roles and tasks

PROGRAM SET UP	Internal	Outsource
One-time investment, transferable to several programs, low sensitivity to program volume		
Application framework		
Develop application process	●	●
Develop application forms	●	●
Database and website		
Set up content management system (web)		●
Establish data collection processes	●	●
Title search		
Property liens information		
Building information		
Set up database		●
Create evaluation and measurement tools		●
Develop reporting tools		●
Legal		
Manage all legal documents and contracts	●	●
Financial		
Set up tax recordation system for LIC financing	●	
Develop process to determine financing terms		●
Marketing		
Create marketing materials		●
Develop marketing strategies		●
Contractors		
Create process for contractor qualification		●
Design a training program for contractors		●

This document is intended to equip municipal administrators to prepare a proposal to council to establish a local LIC financing program, which covers the first two tasks in the workflow presented above. Once that is accomplished, there are a number of important tasks and roles that need to be filled to set up the program. For an internally managed program, these need to be coordinated internally, but certain tasks can be outsourced to reduce the burden on the municipal staff, and to engage qualified expertise where needed. Table 12 outlines the program set up tasks, and indicates which are ideally handled internally, and which are recommended for outsourcing.

Once the program is up and running there will be ongoing management and operations tasks to fulfill, as listed in the tables below. A municipality that establishes an internally administered program may still wish to outsource a good deal of the day-to-day tasks to a Program Delivery Agent (PDA), who may offer a coordinated service including application assistance and processing, energy audits, project coordination assistance to participants (perhaps including turn-key energy and water savings project implementation), and requests for disbursement. This model offers two benefits, first by reducing the municipality's exposure to risks associated with incurring major new internal administrative requirements, and second by streamlining and simplifying the participation process for the homeowner.

Table 13: Internal operations roles for the municipality

TASKS ESSENTIAL FOR MUNICIPALITY	Internal	Outsource
Recurring adjustments over the long term, specific to each program, medium sensitivity to program volume		
Access Program Funds		
Establish new loan with IO or Municipal Bond	●	
Pass loan by-law	●	
Register Liens - Collect Taxes		
Record tax lien on property	●	
Adjust financing terms if necessary	●	
Collect LIC payments	●	

Alternatively individual tasks may be outsourced as needed while the rest is handled by internal staff. Regardless of the specific model applied, there is a minimum set of essential tasks that must be carried out by the municipality itself, these are mostly related to setting up the LIC roll, collecting LIC payments, and approving any municipal debts or bonds for the program funds. These are presented in Table 13 above.

Outsourcing Opportunities: Marketing and Monitoring & Evaluation

For the remainder of the operations, the municipality may choose to handle them largely internally, or to outsource, as described above. However, there are two key roles that should be outsourced - if not entirely, then to the greatest degree possible. The first is marketing and outreach and the other is

program evaluation. For marketing activities, there are many specialists available to develop marketing campaigns and materials. Other key opportunities arise to co-market the program with local contractors, community groups, energy auditors, architects and building professionals, banks and credit unions, and home improvement centres. Programs that leverage these resources will have a greater chance of achieving high uptake rates, than those marketed directly by the municipal administration. More details on marketing strategies and messaging are presented below.

For program evaluation (see Chapter 4 for more details on the Monitoring and Evaluation framework), it is generally considered best practice to hire an independent third party to evaluate program performance data. This will provide the municipality with an unbiased perspective on the effectiveness of various program activities.

Table 14: Ongoing program operations roles and tasks

OPERATIONS	Internal	Outsource
Resources necessary for processing program applications and financing, highly dependent on program volume		
Customer service		
Welcome and inform customers	●	●
Follow-up with participants	●	●
Application processing		
Receive and process applications	●	●
Data management		
Collect and input necessary data	●	●
Produce reports	●	●
Contractor management		
Update participating contractor database	●	●
Create evaluation and measurement tools		●
Marketing		
Distribute marketing materials		●
Maintain social networks		●
Host outreach events		●
Financial		
Approve financing	●	●
Adjust financing terms if necessary	●	●
Create LIC collection schedule	●	●
Evaluate program cost-effectiveness		●

PROGRAM ADMINISTRATION BUDGET

Establishing an accurate program budget can have a major impact on the program's success, both through supporting high uptake rates and by reducing the risk to the municipality. A sample program set up and administration budget is presented in Table 15 below. The budget is derived from a review of published values found in US PACE program reports and guides. Three budget scenarios are presented, corresponding to targeted annual program volumes (100, 250 or 500 participants per year) for a three-year pilot program. This is intended to show the breakdown of program administration costs between the set up and operations phases, and the relative impact that the anticipated program volume may have on each program cost category.

Program costs presented in Table 15 below fall into four categories, and vary in their sensitivity to the program volume.

Program Initiation Fixed Cost: These include the set up legal, planning and reporting costs associated with creating a program model and obtaining council approval. The size of the eventual program has little or no impact on these costs, but the availability of a standard or province-wide program model would help to reduce them significantly.

Program Set Up Costs: After the program is approved by the municipal council, there are various program tools and processes that need to be established before operations can begin. The complexity of these tools and the investment required to create them is somewhat dependent on the eventual program volume. In this case, higher volume programs can offer some economies of scale, and reduce the program set up costs on a per participant basis.

Annual Fixed Costs (Operating Costs): Once the program is up and running, there are annual recurring costs associated with administering the program (management costs, human resources costs etc.). In this case, higher volume programs can offer some economies of scale.

Per Participant Costs (Operating Costs): Finally, there are some costs that are incurred only for each actual participant admitted into the program (or for each applicant). These include costs associated with credit checks, title searches, registering liens and establishing the LIC roll and LIC collection on a specific property.

Table 15: Sample Program set up and Administration Budget based on Anticipated Program Volume

Expense Category	Expenses	100 Participants per year	250 Participants per year	500 Participants per year
Program Initiation Fixed Costs (A)	Program Plan and Initiation Legal and Financing	$ 80,000	$ 80,000	$ 80,000
Program set up Costs (B)	Program Tools Application Database Marketing Materials Documentation ($500-$700 per participant)	$ 70,000	$ 150,000	$ 250,000
Annual Fixed Costs (C)	Human Resources Debt Servicing Marketing Overhead LIC Collection ($140-$400 per participant)	$ 40,000	$ 80,000	$ 140,000
Per Participant Costs (D)	Register Liens Title Searches Application Reviews Documentation ($400 per participant)	$ 40,000	$ 100,000	$ 200,000
Total Program Set Up Costs (A+B)		**$ 150,000**	**$ 230,000**	**$ 330,000**
Total Annual Operating Costs (C+D)		**$ 80,000**	**$ 180,000**	**$ 340,000**
Total Admin. Costs (Per Participant)[11]		**$ 1,300**	**$ 1,050**	**$ 900**

PROGRAM ADMINISTRATION BUDGET RISKS AND SENSITIVITY ANALYSIS

The sample budget shows estimated expenditures both for the program initiation and for ongoing annual operations costs for a three-year program. It is likely that LIC financing programs will need to recover some or all of the program administration fees in order to maintain cost-neutrality to the municipality. This can be done either through an interest rate rider added to the LIC payments, or as an additional charge added to the initial LIC financing total. Some programs may obtain external support

[11] Based on a three-year program duration after which the program will require re-approval and design modifications.

for the program set up and some portion of the ongoing costs through grants or other municipal funds, but most will likely pass along some administration fees to the participants.

Assuming an average financing of $10,000 - 15,000 per project, administration fees will represent about 10% of the total LIC financing on a project. This has a significant impact on the annual LIC repayment made by the participants either by increasing the overall financing costs, or through an additional interest rider charged on top of the municipality's borrowing costs. For example, as seen in Table 16 below, if a municipality is able to negotiate a 3.2% interest rate on a 15-year loan, then it will need to charge 4%-5% to the participants to recover its costs, which is competitive with current 5-10 year fixed mortgages rates (see Figure 8 on page 32).

Table 16: Estimated Interest Rate Rider Based on Program Administration Fees

Average Project Costs (LIC Financing Capital)	Participant Administration Fees	Estimated Equivalent Interest-Rate Rider	Resulting Interest Rate Charged to Participant[12]
$ 10,000	$ 1,300	1.7%	4.9%
	$ 1,050	1.4%	4.6%
	$ 900	1.2%	4.4%
$ 15,000	$ 1,300	1.2%	4.4%
	$ 1,050	1.0%	4.2%
	$ 900	0.8%	4.0%

Budgeting for the Planned Program Volume

In Table 15 it is demonstrated that some costs are highly dependent on the number of participants, such as title search fees and lien registration, while others are only somewhat dependent, such as customer service costs and program fund set-up costs. Some costs, such as those associated with the preparatory work to establish the initial LIC financing by-law and funding approvals, are not dependent on program volume at all. As a result, larger programs benefit from an economy of scale that significantly reduces the administrative costs per participant.

Budget Risks and Impacts

While there is a benefit to setting high program volume targets and ambitious program schedules, there are considerable risks resulting from over-estimating uptake rates. Since participant administration charges will likely be adjusted to cover the overall program administration costs (after grants or set-up funds are exhausted) program administrators will rely on participants to shoulder the program

[12] Based on municipality borrowing costs of 3.2% interest on a 15 year fixed term loan.

operations costs. Thus, a less than anticipated program uptake rate could leave the municipality with program administration budget shortfalls. These shortfalls can become significant if uptake rates fall far short of the planned values, as is demonstrated in Table 17 below.

Some strategies to reduce the risks associated with program administration costs include outsourcing program tasks (such as applications processing and database management) on a per-participant fee basis, and investing sufficient funds in marketing efforts.

Moreover, municipalities may be wise to plan for low program participation volumes initially, with the flexibility to grow if the uptake rates exceed the planned volumes. For instance, establishing a financing fund to cover the first 50-100 participants, with the option to enlarge it if uptake rates grow, could reduce the municipality's administration and debt servicing charges.

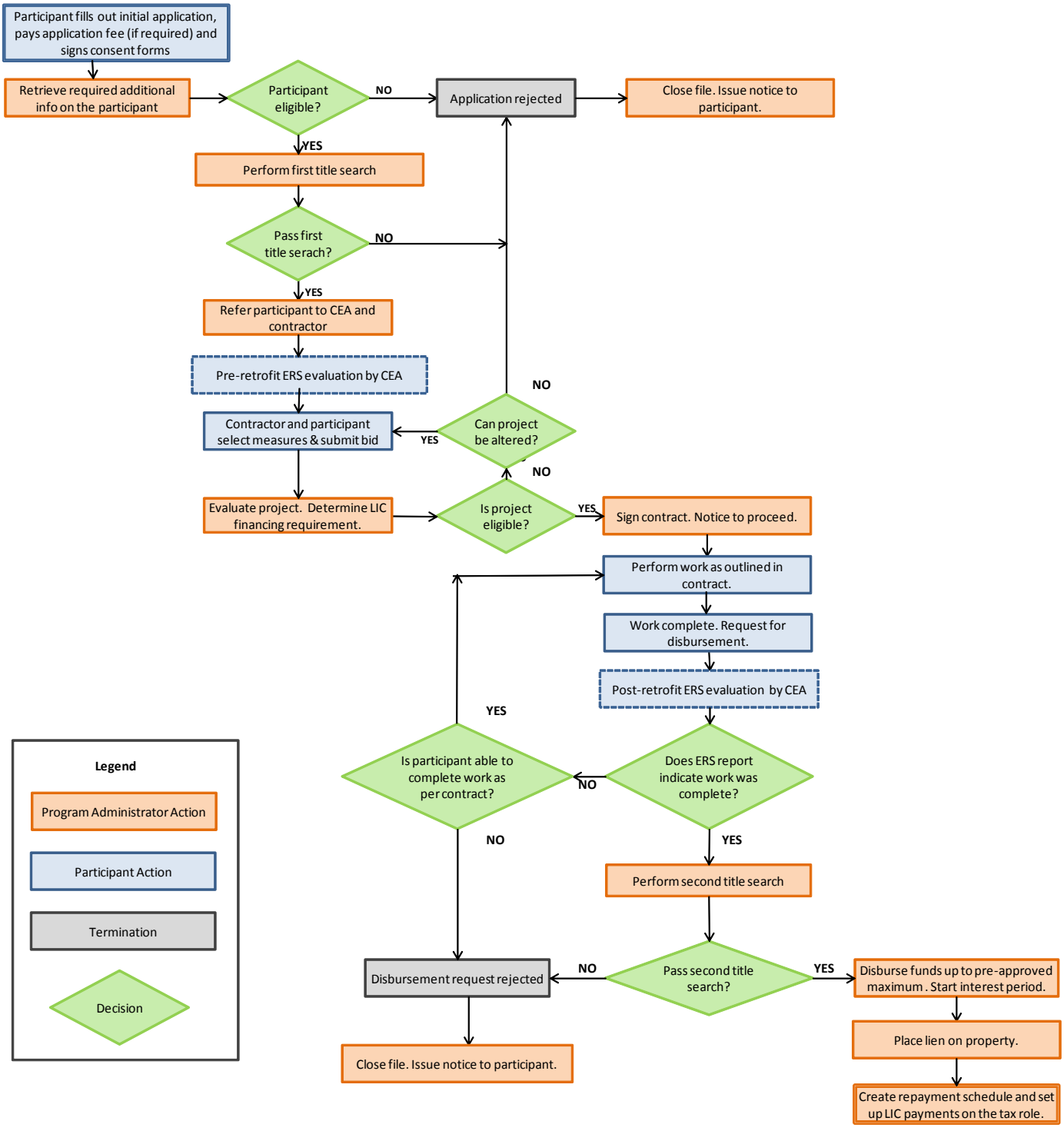
Table 17: Estimated program administration fee short-falls resulting from less than anticipated program uptake rates

Uptake Rate (% of Planned)	100 Participants per year (Planned)	250 Participants per year (Planned)	500 Participants per year (Planned)
75%	$ 66,000	$ 120,000	$ 190,000
50%	$ 130,000	$ 240,000	$ 370,000
25%	$ 200,000	$ 350,000	$ 560,000
10%	$ 240,000	$ 420,000	$ 670,000

PROGRAM PROCESS FLOW

A process diagram is provided in Figure 10 below to assist municipalities in setting up program administration operations and tools. The red boxes in the diagram represent tasks that the program administrator (in most cases the municipality itself) needs to perform to carry a participant from the application stage to project completion.

Figure 10: Program Process Flow Diagram



MANAGEMENT OF ON-GOING LIC REPAYMENTS

Central to the LIC financing program is the registration of the LIC repayments on the tax roll and the collection of the payments to recover the initial financing provided and associated administration costs. Some of these tasks may extend well beyond the life of the program itself.

For example, consider a situation where a municipality creates a three-year pilot program and enters into LIC financing agreements with 100 homeowners, for terms of 10, 15 and 20 years. During the three years of the program life, the municipality will need to:

- Pass the initial by-law creating the LIC financing program
- Pass a by-law to approve the municipal loan or issue a municipal bond
- Register the liens on each of the participating properties as they are approved for financing
- At the end of each year, record the new participants on the LIC roll and pass a by-law creating the special tax charge on each property

Over the 20 years following, the municipality will continue to perform the following actions:

- Collect the special charge from each LIC financed property
- Pool the funds and make annual or semi-annual payments on the municipal loan or municipal bond (or establish a repayment fund to cover a lump sum payment at the end)
- Transfer LIC repayment assessments to the new owners when properties are sold
- Process voluntary early repayments made by owners of LIC financed properties and amend or close the LIC payment terms and conditions
- Reset tax payment schedules and close contracts at the end of the LIC repayment period for each property
- Seize and liquidate through a tax sale any property that defaults on its taxes and special LIC

While many of these actions are well integrated within ongoing municipal tasks, such as tax collection and tax sales for delinquent properties, others are relatively unique to the program and will require the municipality to incorporate these into its ongoing operations and management structures, such as the creation of an LIC early repayment procedure and point of service.

The additional volume placed on existing roles as well as the new roles and tasks will result in some additional administration costs to the municipality. Some PACE programs in the US charge an annual LIC payment administration fee to cover this, however this would further reduce the cost-effectiveness of the program to the participants and may reduce uptake rates.

Collection of special LICs on tax bills

The 2001 Ontario Municipal Act includes provisions for LICs to fund a variety of projects and many municipalities have invoked these special charges to pay for local infrastructure improvements. Thus, the structures to place LIC payments on properties, collect the special LIC on the tax bills and exercise

the priority lien to seize the property for a tax sale to recover defaulted taxes are well established and understood across the province.

One issue that may arise in planning these processes is the interaction between local and regional municipalities where a region-wide LIC financing program is in place. Tax collection is a local responsibility while loans or bonds are managed at the regional level. Provisions to transfer the LIC taxes collected locally to the regional program administration or municipal financial manager would need to be included in the long-term operational planning.

ALTERNATIVE STRUCTURES – EXTERNAL PROGRAM ADMINISTRATION MODELS

At the time of writing, most LIC financing initiatives being considered across Ontario are looking to an internally administered model, as is presented in this pilot program design. However, once LIC financing for energy and water saving improvements becomes established and its potential for Ontario Municipalities becomes well understood, it may be desirable to establish a centralized LIC financing program provider. This could be accomplished through a province-wide program offered by a government agency, a not-for-profit organization, or a privately funded turn-key program administrator and financing provider.

Potential Ontario-Wide Program Administrators

A province-wide program, that is administered centrally, could eventually create and deliver all the program tools (such as automated application and database, contractor training, municipal LIC registration procedures etc.), as is the case for the Efficiency Maine PACE Program and the PACE program being developed in Vermont. This would allow significant economies of scale (eliminating most of the program initiation and start-up costs for the municipalities) and would reduce the administrative burden placed on municipalities to plan and build their own LIC financing programs. The province-wide model would also substantially mitigate or eliminate much of the risk borne by the municipalities by:

- Shouldering the upfront administrative costs,
- Ensuring that municipalities do incur municipal bond obligations before attracting participants,
- Aggregating program loans and bonds from across the province to build larger asset-backed securities that can get better rates in the private markets,
- Developing high-quality and effective marketing tools,
- Automating program processes and establishing a central management body (such as an on-line application and database maintenance) and,
- Developing effective contractor training and partnership courses, and quality assurance protocols.

A province-wide program could operate with a single aggregated pool financing funds, provided to each participant by the provincial program administrator, and collected by the municipal tax collector for

repayment. Alternatively, the municipalities could continue to provide the program funds, acting on the program administrator's instructions to provide LIC financing, and collect LIC payments from the program participants.

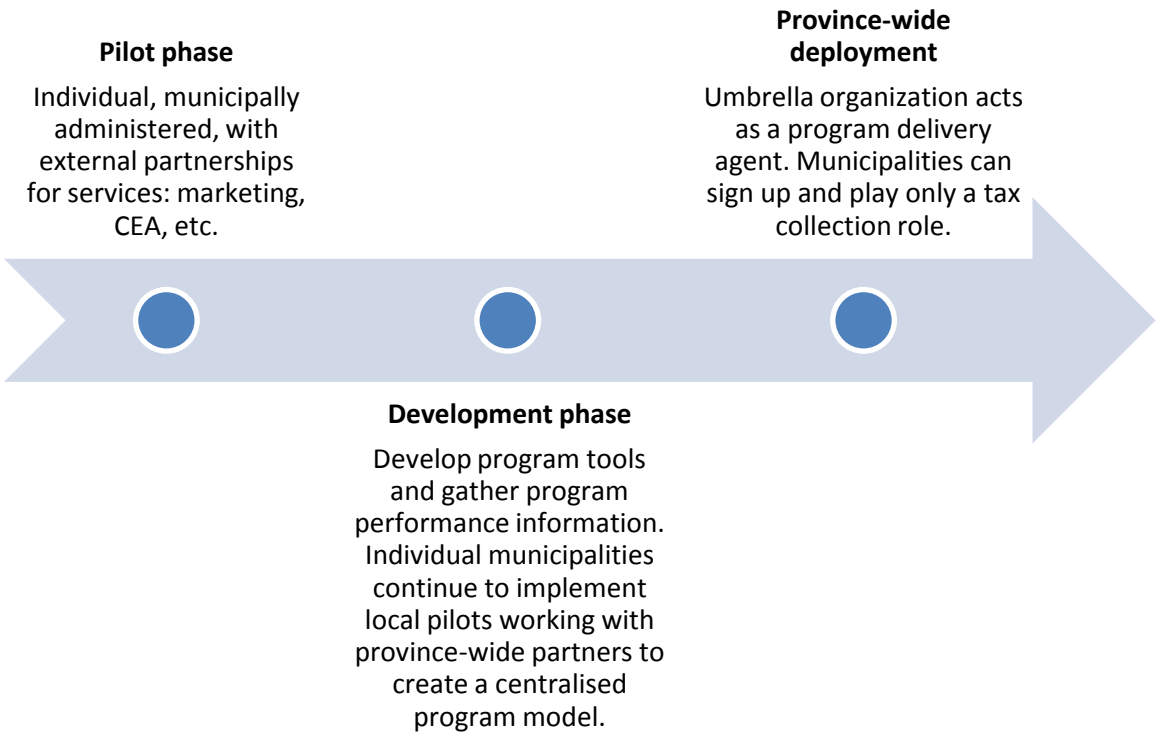
Evolving LIC Financing Program in Ontario

This report outlines a program design for individual municipalities to establish and implement local pilot programs administered by the municipality. As more municipalities implement pilot LIC financing programs, they will build a valuable body of knowledge about LIC financing's potential across the province. Through monitoring and evaluation efforts, information can be gathered concerning key LIC program performance indicators:

- Defining with more precision the target markets for LIC financing programs
- Setting financial thresholds for interest rates, term limits, financing amounts
- Evaluating risks related to LIC payments in arrears, municipal liability over contractor work, and less than anticipated uptake rates
- Quantifying the impact of energy and water saving improvements
- Elaborating effective messaging and marketing channels to reach Ontario homeowners

The results gathered from the pilot programs, along with the program tools and procedures developed by a central body, such as the CHEERIO Working Group, would form the basis upon which to launch a province-wide program that can be delivered to any municipality across the province.

Figure 11: Pathway to a province-wide LIC financing program model



Turn-key program administration by a private sector LIC program provider

There are currently a number of US-based private sector financing groups (Figtree, YGreen etc.) that have developed a turnkey PACE product for municipalities that packages private financing, program administration and implementation. These simply require the municipality to pass an LIC by-law, register the liens and LIC roles, and collect LIC repayments on the tax bills. While these programs are not currently operating in Ontario, they may become active, offering municipalities a ready-to-go solution with little administrative burden or financial risk.

2.4 MARKETING APPROACHES AND STRATEGIES

Effective marketing of LIC financing pilot programs is essential to achieving planned up-take rates. There are many channels by which the program can be brought to the attention of homeowners, and as a general rule, the more of these that can be leveraged, the better. The municipality may want to play a central coordination role in the marketing efforts by creating attractive information materials and establishing customer service or storefront access point. However, it is critically important to engage local partners such as contractors, building supply stores, financial institutions, community groups, and energy advisor service organizations to market the program directly to homeowners.

Marketing the program begins with an effective program design. A straightforward application process, clear selection criteria, and offering attractive and flexible terms, will greatly enhance the marketing efforts. Moreover, the results of focus groups held by the CHEERIO Working Group indicate that homeowners are turned off by vagueness in the LIC financing program messaging. Thus, program materials should explain details such as the sources of program funds, and the structure of the LIC repayments such as the component of the charges that is associated with administration fees. Overall, the program "small print" should be accessible to applicants and easily understood. Further market testing or focus groups may be beneficial to tailor program marketing efforts within municipalities.

MARKETING CHANNELS AND MESSAGING

Three complementary strategies should form the core of a program's marketing strategy:

- **Market push**
  - *Partnership with supply-side market actors*
- **Market pull**
  - *Community-based outreach and mobilization activities*
  - *Education and awareness campaigns through "mass media"*

In the past, many energy efficiency programs have focused largely on bill savings and the financial returns of energy savings improvements. Recent experience with community retrofit programs and other innovative financing initiatives suggests that bills savings are only a part of the motivation for homeowners.

Key messages to homeowners should emphasize:

- **Bring your home up to modern standards:** Close the efficiency gap with newly-built homes and improve the market value of your home. Demonstrate your home's improved efficiency with an ERS label.
- **Save money on your energy bills:** (To the degree possible) Offer clear and straight-forward information about the potential bill savings to applicants through the ERS evaluations, and let them balance this with the other benefits.
- **Solve home performance problems:** Solve problems like ice dams or rooms that are unusable in winter and summer. Improve thermal comfort and indoor air quality.
- **Comprehensiveness matters:** Whole-house retrofits offer more benefits than single-measure or equipment-based solutions.
- **Do your part:** Make your home energy efficiency and contribute to GHG emissions reduction and local job creation.

Market Push

Our recommendation is to target homeowners who are already planning or considering renovations in their homes. It is important to establish partnerships with the supply-side market actors who will be in contact with homeowners as they initiate renovation work. LIC financing may encourage homeowners to expand their projects, thus offering vendors and contractors increased business.

Key supply-side marketing partners include:

- Contractors
- Home improvement retailers
- Windows and doors suppliers
- Furnace and AC equipment vendors and installers
- Insulation installers

LIC financing can become a tool in the contractor's toolbox; an option to help their clients to pay for the renovation projects they are planning together. Many retrofit and innovative financing programs have found that contractors are essential co-marketing partners. Contractors are on the ground, answering homeowners' questions every day: the more information they have about the program, the better they can inform homeowners about the LIC financing options.

Offering a concise training on the program benefits, priorities and procedures, listing participating contractors as marketing partners on the program website, and providing them with program marketing materials, creates an incentive for contractors to increase their knowledge of the program. Some programs have even gone as far as to offer financial sales incentives to contractors who can bring large whole-home retrofit projects to the innovative financing program.

To maximize the tie-in with renovations, marketing can be concentrated in older neighbourhoods in transition where significant renovations are under way. Municipalities can help by tracking neighbourhoods with large volumes of building permit requests, and by promoting participation when homeowners seek building permits.

Market Pull

Municipalities may want to take the lead in promoting the LIC financing retrofit program as a community initiative through branding, special events, endorsements by community leaders, and use of marketing channels such as tax bill stuffers. Municipal sponsorship of the program builds a sense of ownership and credibility.

Natural gas and electric utilities can be marketing partners by linking incentive program websites and applications to the LIC financing program information and application systems, and by providing promotional materials as utility bill inserts. They may also provide energy consumption data by postal code, which can help focus in on neighbourhoods with greater potentials for energy savings.

COMMUNITY-BASED MARKETING

Community-based marketing engages program participants through a variety of strategies that emphasize face-to-face contacts. These can include neighbourhood meetings, events, and door-to-door canvassing. To reach out to participants repeatedly through trusted channels, neighbour-to-neighbour communications and partnerships are mobilized including workplaces, faith communities, unions, clubs and organizations, and schools. Posters, signs at retrofit work sites, information tables, social networking and other similar approaches are combined with localized branding to create visibility and a community buzz for the program, making participation fashionable and a social norm.

Community-based energy improvements in Toronto

PROJECT NEUTRAL is an ambitious initiative to transition neighbourhoods to carbon neutrality. Primarily a volunteer-led, grassroots initiative, Project Neutral works with community leaders to establish a greenhouse gas baseline using a Household Carbon Footprint Survey, creating spaces and tools for knowledge sharing, and galvanize action toward energy saving improvements across the entire neighbourhood.

The Project Neutral approach:

Step 1: Engage neighbourhoods by working with households.

Step 2: Develop a GHG baseline and track progress.

Step 3: Create an Action Plan, set emissions reduction targets and identify priority actions.

Step 4: Build Neighbourhood Capacity and enabling change at the individual, household and neighbourhood level.

Step 5: Champion Ideas, leverage partnerships and innovative practices.

Project Neutral in collaboration with Windfall Ecology Centre recently launched Gettingto80.ca – a community wide retrofit initiative. It offers residents in Toronto's Wards 13 and 30 up to $2000 incentives through Enbridge's Community Energy Conservation. This creates ripe terrain for LIC financing, as the three programs would be highly complementary.

To maximize the impact, marketing can be concentrated at a neighbourhood scale during a time limited period (e.g. two years). Community-based marketing can be a highly effective complement to conventional mass marketing tools, and help to achieve higher uptake rates for cost-effective energy improvements.

When combined with LIC financing and a turnkey delivery model (bundled vs. participant led), community-based approaches may offer some limited economies of scale that reduce costs to the homeowners. For instance, community-based approaches may in some cases offer reduced costs to participants through bulk purchases of commonly installed efficiency equipment, or by contractor efficiencies.

2.5 POSITIONING WITH RESIDENTIAL INCENTIVE PROGRAMS IN ONTARIO

LIC financing programs alone may not be enough to bring about the wide-spread market transformation needed to fully value and encourage energy efficiency improvements in Ontario's residential buildings. However, when coupled with available incentive programs they may prove more successful at encouraging homeowners to engage in energy saving improvements. In some cases, LIC financing may in fact rely on the incentives provided to make the LIC financed projects economically viable to participants, or supporting direct-install programs.

In general, it has been observed that ***LIC financing programs that include incentives or are coordinated with existing incentive programs achieve much higher uptake rates.*** Currently there are few residential incentive programs available in Ontario, but program administrators should make efforts to ensure that their programs easily fit with the available incentive requirements.

ENBRIDGE COMMUNITY ENERGY CONSERVATION PROGRAM

Enbridge Gas has established the Community Energy Conservation Program in the Regional Municipality of York. The program will soon be available in Wards 13 and 30 in the City of Toronto, where it will be delivered in cooperation with Project Neutral, a not-for-profit organization that delivers community energy retrofits.

The program may be available to other municipalities, where there is the potential to achieve significant natural gas savings. Municipalities that would like to establish a Community Energy Conservation program can contact Enbridge Gas who will then perform an assessment to determine which neighbourhoods (if any) in the municipality meet the qualifying criteria (Lontoc E. , 2013).

The program offers incentives of up to $2,000 to qualified homeowners. To qualify, participants must:

- Reside in a participating municipality
- Have a valid Enbridge Gas account number
- Use a program-approved Certified Energy Advisor (CEA)
- Achieve 25% annual gas savings or be pre-approved by Enbridge Gas
- Install at least two of the following upgrades as recommended by the CEA
    - Attic insulation upgrade
    - Basement wall insulation upgrade
    - Wall insulation upgrade
    - Draft-proofing
    - High-efficiency space heating system (gas furnace/boiler)
    - High-efficiency water heating system
    - Drain water heat recovery unit

Incentives are $1,600 for customers saving 25% - 49% annual gas consumption and $2,000 for customers saving over 50% of their annual gas consumption.

Link with LIC financing

LIC financing programs can be greatly enhanced by working in conjunction with the Enbridge Gas incentive programs. First, the incentives increase the attractiveness of engaging in home energy saving improvements by supporting the cost-effectiveness of the measures. Second, the programs can engage in co-marketing efforts that encourage participants to follow both programs together. Finally, Enbridge Gas has information on home energy consumption that can assist LIC financing program administrators to identify high potential neighbourhoods for their programs.

OPA'S SAVEONENERGY INCENTIVES

The OPA, through its partnership with local electrical utilities, offers a range of incentives for electricity saving equipment as part of the saveONenergy program. The program includes:

- Free refrigerator and freezer pickup (for older, less efficient models)
- Discount coupons for efficient light bulbs, fixtures, power bars, low-flow faucets and showerheads, programmable thermostats and hot water pipe and tank insulating wraps
- Heating and cooling equipment

LIC financing is not typically appropriate for plug-load equipment (except in the case of multi-unit rental properties) as it may be easily removed when the property is sold.

Incentives for heating and cooling equipment total up to $650 for replacing a furnace and central air conditioner with high-efficiency units. Available incentives include:

- A $250 incentive for high-efficiency furnace equipped with an Electronically Commutated Motor
- A $250 incentive for an ENERGY STAR certified CAC system[13], or
- A $400 incentive for CEE "Tier 2" level central air conditioning system[14]

Incentives are available for installations of eligible equipment completed between January 1, 2013 and December 31, 2014. It is not clear at this time whether these incentives will be available in future years.

[13] ENERGY STAR certification criteria are a minimum 14.5 SEER and 12 EER

[14] "Tier 2" level qualified criteria are a minimum 15 SEER and 12.5 EER

Link with LIC financing

OPA's incentive program for heating and cooling equipment can make LIC financing programs more attractive, increasing the cost-effectiveness of measures installed. It is noted that electrically heated homes prove particularly attractive in our cost-effectiveness testing. Any neighbourhood with high rates of electrical heating should aim to target these homes and integrate the eligibility criteria with OPA's heating and cooling equipment incentives.

OPA's Peak Saver Program

The Peak Saver program provides homeowners with an electronic display of their energy consumption patterns in return for permission to install and operate load-shedding controls on the home's heating and hot water systems. This may result in some costs savings to participants with the time of day billing rates in effect, and by encouraging behavioral changes. It is not recommended to require this as part of an LIC financing program, but it would be advisable to promote this to participants as a further tool to achieve energy bill savings.

LOW-INCOME ENERGY ASSISTANCE PROGRAM (LEAP)

To assist consumers with limited financial resources, the Ontario Energy Board introduced the Low-income Energy Assistance Program (LEAP), which includes home energy conservation programs that are delivered by the OPA, Union Gas and Enbridge Gas, and are available to both the private and social housing markets.

Households with total annual incomes of less than 135% of Statistics Canada's pre-tax, post-transfer Low-Income Cut-Off (LICO) are eligible for the program **at no cost to the customer**. The program includes:

- Direct installation of energy efficient showerheads, pipe wrap, kitchen/bathroom aerators and a programmable thermostat
- 3rd party contractor services to perform installations by professional technicians
- Free pre- and post home energy evaluations
- Building upgrades such as; attic insulation, basement insulation, wall insulation and draft-proofing measures

Participants can also be eligible if they were a recipient of one or more of the following within the previous 12 months:

- Ontario Works
- Ontario Disability Support Program (ODSP)
- Guaranteed Income Supplement (GIS) Allowance for seniors

- Allowance for the survivor
- National Child Benefit Supplement (NCBS)
- Utility LEAP Emergency Financial Assistance grant

Links to LIC financing

Given that the LEAP home energy conservation programs are delivered at no cost to the resident or homeowner, there is no anticipated overlap with the LIC financing program. Indeed, it should be a priority for LIC financing program administrators to screen applicants to ensure they are not eligible for the LEAP assistance, and direct those that are to that program.

The benefit of the directing low-income applicants toward LEAP is that it can capture the higher risk low-income market segment and keep it out of the pool of LIC financed projects. Conversely, administrators of the LEAP home energy conservation programs may be willing to refer applicants who fall above their eligible income cut-offs to the local LIC financing program.

Ontario Low Income Households Statistics
(Low-Income Energy Network, 2011)

- Over 16% of Ontario households are characterised as “low-Income”, based on pre-tax LICO.
- This represents over 730,000 households in total including over 400,000 multi-family units
- Over 250,000 low-income households live in social housing
- Low income homes tend to be older, less insulated, in need of repair, and use older, less efficient appliances.
- Over 25% of low-income households are electrically heated.
- Over 30% of low-income households have electric hot water heaters.

2.6 PROGRAM DELIVERY APPROACHES

There are two potential program delivery models predominant in home energy saving improvement programs: participant-led and turn-key. Under a participant-led approach the homeowner is responsible for defining the scope of work (within program rules) and managing the project. Under the turn-key approach, a Program Delivery Agent (PDA) is contracted to determine the measures in coordination with the homeowner and to perform or coordinate the installation.

In the Ontario context, where natural gas is the predominant heating fuel, the majority of homes will receive energy saving improvements that are only marginally cost-effective. We recommend the participant-led approach as the preferred model for the following reasons:

1. It allows participants to achieve higher cost-effectiveness by integrating energy and water savings improvements within larger renovations projects.
2. It enables multiple co-marketing opportunities with contractors and vendors.
3. It keeps the program administration light, and reduces the municipality's exposure to construction management risks.

The program design will follow the participant-led approach providing detail on its function, roles and contracting arrangements. Some less detailed information on the turn-key approach is also presented on selected topics to allow comparison between the two models.

Table 18: Comparison of the participant-led and turn-key delivery approaches

Participant-led approach	Turn-key PDA approach
Benefits • Ideal when the participant intends to carry out non-energy renovations; the energy and water savings improvements can be integrated into the larger renovation project. • General contractors, energy auditors, sub trades, window and doors sellers, and efficiency equipment sellers can all be engaged to sell the program. • Can include: DIY, trades-people hired directly by the homeowner, or a general contractor to manage a larger or "gut" renovation project. • Homeowner and contractor are fully responsible for the quality of the work. • Homeowner retains feeling of autonomy and control over work performed on the home.	**Benefits** • No- or low-hassle for participants who are intimidated at the prospect of taking on energy retrofit projects on their own. • Some potential for economies of scale and high-uptake rates when successfully integrated within a community-scale retrofit program. • More appropriate for lower-income residential programs where there may be fewer opportunities to piggy-back on other renovations, less capacity for participant self-management, and greater potential for utility/public financial contributions to program delivery costs based on social objectives. • Municipality can exercise high degree of quality monitoring and control by selecting a limited number of contractors.
Drawbacks • Requires more homeowner initiative, a potential barrier to participation. • Difficult for the municipality to monitor and control quality of work performed. • More installation contractors, and therefore greater requirements for training, screening, monitoring, and quality assurance. • Limited opportunity for coordinated neighbourhood delivery.	**Drawbacks** • The PDA approach would be harder to integrate with existing renovation projects because it would be carried out by a single or limited number of contractors. • Limited avenues for co-marketing within the construction industry as most contractors would not be eligible to deliver energy retrofits. • Municipality may need to determine if it will be exposed to greater risk by taking responsibility to define the work to be performed by the PDA.

PARTICIPANT-LED APPROACH WORKFLOW

Participant completes application

- Provides proof of all eligibility criteria
- Customer service available to assist participant

Application review process

- Program administrator reviews applications
- Performs first title search and approves application if eligibility criteria met
- Indicates maximum eligible loan value to participant
- Contacts CEA service organization and gives homeowner's contact information

Pre-retrofit energy evaluation

- CEA sets up a visit to the home and performs energy evaluation
- Homeowner pays for pre-retrofit audit ($250)
- CEA discusses results with home owner to define work order for the project
- Offers to have three program-registered contractors to contact homeowner (optional)

Contract signing

- Contractor(s) visit(s) home to prepare quote
- Work order added to participant file: program administrator approves eligible measures
- Program administrator and homeowner sign a loan agreement based on approved work order

Perform work

- Homeowner and contractor sign contract based on work order
- Copy of contract provided to the program administrator to be added to participant file
- Contractor performs work
- When complete, contractor informs homeowner AND program administrator

Post-retrofit audit

- CEA performs post project evaluation at program administrator's request
- Results provided to homeowner and program administrator
- Provides homeowner with Request for Disbursement (RFD) forms, including receipts, a copy of any permits required and ERS reports and energy performance lablel

Assessment of work

- Program administrator perforassesses of the extent of work completed
- Second title search (ensure homeowner still owns property)
- If assessment and title search are positive: release cheque in name of homeowner AND contractor (if a general contractor is involved)
- Homeowner endorses the cheque to the contractor, indicating final sign-off on the work

PROJECT PAYMENT SCHEDULES

To keep the administrative requirements light, and avoid payments for incomplete projects, it is recommended that as a standard procedure a single payment is made to the homeowner upon completion, assessment and acceptance of the overall project. This would require the homeowner to pay for the pre-retrofit ERS evaluation out of pocket, but the program should allow homeowners to fold the ERS evaluation fees into the LIC financing.

Table 19: Payment procedures for eligible works undertaken

Project Expense	Payment Procedure
Contractor work: for energy and water saving measures	A single payment is made by the program administrator at the end of the project, through a cheque issued jointly in the names of the contractor and homeowner: • The homeowner signs over the cheque to the contractor indicating their approval and acceptance of the work. • There is little need in most cases to provide an interim payment if the projects are part of larger renovations. • A possible option would be to allow an interim payment for projects of $25,000 and more. Payment issued for 50% of project costs upon written confirmation that 75% of the materials have been delivered to the site. • If no general contractor was involved, the cheque covering all project expenses can be issued directly to homeowner upon approval of the work assessment.
ERS evaluation payments	Homeowner must make two payments of $250 to the CEA (pre and post retrofit): • If the homeowner wishes to roll the ERS costs into the LIC financing, a separate cheque for $500 can be issued to the homeowner. • If the homeowner participant receives the Enbridge Gas incentive, this option is waived as Enbridge will pay for the ERS evaluations.
Miscellaneous	It is not anticipated that architectural or engineering services will be required by the vast majority of projects; however this may be the case in more complicated renovation projects. Moreover, there may be further permitting and evaluation costs (construction permit or structural evaluations) for more complex projects and for installing external equipment such as solar panels.
Turn-key approach	In the case where a turn-key approach is employed all payments are made by the Program Administrator directly to PDA, with homeowner approval, and the LIC is levied based on the sum of the payments.

TURN-KEY RETROFIT DELIVERY WORKFLOW

In a fully integrated turn-key model, a Program Delivery Agent (PDA) is engaged to manage the entire program, and delivery is organized with a view to minimizing barriers for homeowners by making it as easy as possible to participate ("a white glove service").

In this model, the PDA is responsible for: marketing; homeowner eligibility screening and intake; arranging financing (qualification, agreements); retrofit planning (auditing, securing homeowner agreement); facilitating the retrofit (which could include contractor selection and training, as well as providing work orders to contractors for each job, billing and payments); post-retrofit inspection (energy rating, quality assurance); monitoring and reporting. Variants of this advanced turn-key model are currently in wide use in Ontario for delivery of low-income retrofit programs.

Under a turn-key approach with advanced customer service, the PDA:

1. Assists the homeowner in completing program application
2. Processes applications
    a. Determines participant eligibility and maximum financing offered in accordance with program rules and processes (homeownership, credit worthiness)
    b. Performs an ERS energy evaluation and creates a work order in consultation with the homeowner
    c. Completes financing agreement with homeowner and municipality based on approved work order
    d. Provides 'one-window access' to all relevant incentives and related program offerings
3. Facilitates retrofit
    a. Schedules work with the homeowner, contractors
    b. Directs contractors as required (including potential adjustments due to circumstances not identified in the audit)
    c. Performs post-retrofit ERS evaluation, signs off that work has been satisfactorily completed, issues a rating label
    d. Obtains homeowner sign-off
4. Completes financing and payments
    a. Invoices the municipality, which registers the LIC on the property subject to second title search (to confirm that there was no change in the property ownership status)
    b. Makes contractor payments

Specific arrangements would be tailored to each community and municipal preferences. Note that while the PDA model could be designed to minimize the administrative burden for municipalities by contracting most program delivery functions, municipalities would remain responsible for approving financing for each participant, registering the LIC repayments on the property, maintaining records, and paying providers of third-party financing, if applicable.

PROGRAM DELIVERY AGENTS

The PDA could be a suitably qualified non-profit or for-profit corporation. Candidates would include organizations with experience and demonstrated expertise delivering similar low-income residential retrofit programs.

If the PDA is responsible for marketing, skills in this area are crucial. Securing participation, even with an attractive program offering, is **the most challenging aspect of program delivery**. A successful PDA will have experience with these approaches and often pre-existing relations with community partners.

Other key qualifications and expertise include:

- Technical knowledge of residential energy efficiency measures (and other measures that may be included, such as water conservation and home renewables)
- A strong reputation for delivery of the ERS evaluations, including rigorous training, technical support, and quality assurance
- Ability to work with partners (municipalities, utilities, others)
- Knowledge of contracting, including contractor skill requirements and retrofit facilitation
- Knowledge of all relevant conservation programs in order to help ensure efficient co-delivery
- Information management and reporting infrastructure
- Excellent customer service

Municipalities should consider the value of a PDA which does not employ retrofit installers directly, or profit from their work through commissions or other arrangements. The system described above assumes that the PDA makes retrofit recommendations based solely on program rules and the interest of the customer. The retrofit facilitation role, including the post-retrofit evaluation, comprises quality assurance for the work of the contractors. Based on this inspection, contractors may be required to remedy work defects. If warranted, they could be excluded from further program participation and legal action may be initiated. Therefore, independence between the PDA and contractors is essential.

If the PDA does in fact have an interest in the contracting, another layer of independent third party quality assurance may be required.

THE ROLE OF ENERGUIDE RATING SYSTEM ENERGY EVALUATIONS

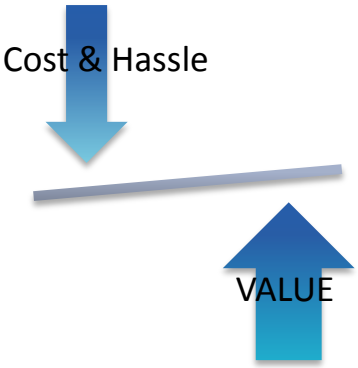
Natural Resources Canada (NRCan) administers the EnerGuide Rating System (ERS) which provides a standard measure of a home's energy performance. It includes a label to demonstrate a home's energy efficiency, a software tool to model residential energy savings improvement projects, and program administration support to reduce program administration costs.

The rating is calculated based on standard operating conditions so that the energy performance of one house can be compared against another. The home's energy efficiency level is rated on a scale of 0 to 100, with 0 indicating a poorly performing home, and 100 indicating a home that requires no net purchase of energy. An ERS evaluation was a requirement of past Federal and Provincial government incentive programs and over 1.1 million Canadian homes have an ERS label. The next generation ERS is currently under development and will be released in 2014.

An ERS evaluation is performed in two steps, a pre-retrofit assessment and a post-retrofit assessment. As part of the pre-retrofit assessment, proposed energy savings improvements are modeled with the HOT2000 software and the homeowner receives a label indicating their home's energy efficiency and a report outlining the potential savings of a range of measures. After the measures have been completed, the home is reassessed and a label indicating the improved level of energy efficiency is provided. The full evaluation (both steps) typically costs $500 for a single family home.

ERS also includes support for energy efficiency program administration by collecting, managing and transferring participant and program data; testing and certifying energy advisors; licensing and monitoring the service organizations that coordinate the energy advisors; developing the software modeling tool and providing technical support.

Evaluation of ERS Evaluations as an LIC financing requirement



A SWOT analysis was performed to evaluate the role of ERS within an LIC financing program. From this analysis we recommend that LIC financing programs require ERS evaluations to identify energy saving opportunities, and communicate the benefits to future home buyers. The CEA who performs the work can also play a role in guiding participants through the LIC financing process, provided they are offered effective information materials and possibly training on the program procedures and requirements. Finally, the ERS database and information gathering systems can offer information to program administrators to support program monitoring and evaluation efforts.

However, ERS evaluations do add costs and program steps that could prove to be barriers to participant uptake rate. The $500 cost may prove to be a barrier to some participants, particularly those who are focused mostly on equipment upgrades, rather than insulation and draft-proofing. The value of the ERS label in quantifying their investment in energy efficiency should be communicated to participants. Program administrators may wish to periodically review the role of ERS evaluations, if this appears to be a significant barrier.

In order to comply with privacy legislation, NRCan requires a formal data sharing agreement with program administrators to send ERS participant data. Program designers are encouraged to contact NRCan early in the design process to discuss how the ERS infrastructure can support their program administration.

Table 20: SWOT Analysis of ERS Evaluations as an LIC Financing Program Requirement

Strengths	Weaknesses
• Based on standardized science-based evaluation of retrofit opportunities by trained and certified assessors, that provides homeowners with energy savings estimates (GJ, kWh and m^3 of NG). • Encourages deep retrofits, and more extensive measures than originally planned by participants, which reinforces the core goal behind LIC financing. • Post-retrofit audit confirms work has been completed according to specifications, which can contribute to program quality control. • CEA can act as advisor to homeowner if provided with program information. • Facilitates DIY option by offering a degree of work validation. • Links with Enbridge's incentive program that pays for ERS evaluations.	• Additional cost to participant ($500), with a $250 initial evaluation cost that can only be recuperated from the program if the applicant succeeds in becoming a participant. • Increased hassle to participants due to additional step in process. • ERS model covers most, but not all measures (notably missing DWHR, lighting and appliances), therefore it misses some savings in evaluation. • Does not account for water savings or water bill savings. • Current ratings and saving based on standard operating conditions: the next generation release, scheduled for early 2014, will have adjustable operating conditions, but to use them will likely cost participants additional fees.
Opportunities	**Threats**
• Municipality can make agreement with NRCan to access and share data. • ERS database allows municipality to trace GHG emissions reductions and overall program energy savings estimates. • Creates conditions for good M&E activities: data tracking and continuous improvement. • NRCan technical support can answer questions that may arise at the design and implementation stage. • Use of nationally recognized label supports long term market transformation. • Provides home energy rating and label to communicate value of energy savings improvements at the time of sale. • Program administrator could sole source one or more service organizations to provide all ERS evaluations, ensuring CEA availability.	• ERS may create a temptation for the program to require an energy savings threshold, which can result in a high barrier to participation. As discussed earlier, this is considered an undesirable program requirement. • ERS tends to guide participants toward measures providing higher energy savings, and away from measures with lighter saving opportunities. Thus, some contractors and vendors (i.e. window installers and sellers) may avoid marketing the program in fear that it will lead away their customers. • Current pool of CEAs in Ontario is shrinking, but could be re-established if the need arises soon.

PROGRAM PARTICIPANT CONTRACT TERMS AND CONDITIONS

A model contractual agreement between a program administrator and a program participant is outlined below. It assumes that the project will apply the participant-led approach, wherein the participant will manage the improvement project, or hire a general contractor. The contract establishes the terms of the LIC financing and remains in effect throughout the duration of the LIC repayment period.

For a PDA-led project, the contract model would need to be altered to include the PDA roles and responsibilities, or another contract signed between the municipality and the PDA and/or the PDA and the participant.

Contract Term

The term of this Contract shall be until the assessment described herein and all accrued interest thereon, together with any applicable penalties, costs, fees, and other charges have been paid in full.

Obligations of the Program Administrator

- Agrees to disburse up to *X* amount to the participant, provided that the extent of the work performed meets that stated in the contracts (based on the agreed work order) and that the participant fulfills all the administrative requirements.
- Agrees to provide a fair and timely assessment of the extent of the work carried out, after the post-retrofit ERS report and request for disbursement are submitted.
- Agrees to allow property owner to pay full amount of outstanding LIC assessment at any time.

Obligations of the Participant

- Agrees to allow the municipality to carry out a credit check, title search, mortgage status check, and property tax payment history evaluation.
    - If any of these reveal new reasons why the participant should not be eligible, the municipality will have the right to close the contract and levy an administrative charge on the property.
- Agrees to allow municipality to place a lien on the property equivalent to the total allowable disbursement amount upon signing of the contract.
- Agrees to carry out the works as outlined in the contract.
- Agrees to undertake pre- and post-retrofit energy evaluations by a Certified Energy Advisor qualified to deliver the EnerGuide Rating System, as per the requirements of the program.
- Agrees to complete request for disbursement forms, only for work eligible under the program (as per eligible measures).
    - The work must be completed and the disbursement must be requested by an agreed-upon date, otherwise the municipality reserves the right to refuse the request for disbursement, close the contract and levy an administrative charge on the property.

- Agrees to accept program administration assessment of the extent of the work carried out, and receive the disbursement according to the extent of work completed.
- Agrees to the repayment terms and interest charges as stated in the contract, which will be collected on the annual property tax bill (as stated in Exhibit B).
- Agrees to notify the program administrator if there is any change to the status of the property title, or additional liens placed on the property before the assessment of the extent of work performed is completed.
- If for any reason the disbursement request is not issued or is refused by the municipality, the municipality reserves the right to place a lien on the property equal to the administrative fees associated with participation in the program (the amount of these fees should be stated).
- Agrees to allow the municipality or its agent to perform an inspection of the property and a verification of the work being performed at any point.

Other conditions and qualifiers

- The municipality is not responsible for the quality of work, or actions, or any damages caused by any contractors, CEAs or other independent agents involved with carrying-out the work outlined in the contract or otherwise performed.
- While the municipality has provided a list of participating contractors, this list is in no way an endorsement of their qualifications, abilities or the quality of their work. The municipality engages the contractors and vendors only in marketing the program by making them aware of the program and its administrative requirements.
- It is the property-owner's responsibility to define the scope of the works to be carried out, to hire the trades-people to carry out the work, verify their qualifications and certification, manage the execution of the work, and approve its completion.

Exhibits

A. Description of the Property
    - Owners, address, building form, etc.
    - Description of the work to be performed, including:
        - The contractor work order if available
        - The estimated cost of the work
        - The estimated useful lifetime of the work
        - The manner by which a cost over-run will be dealt with
    - ERS pre-retrofit report recommended improvement list with primary and secondary elements highlighted
B. LIC Repayment Schedule
    - Estimated maximum disbursement
    - Maximum annual LIC payments and annual administration fees levied
    - Duration of payments, interest rate applied

Changes to the contract before assessment: If the participant wishes to increase the agreed maximum LIC financing amount or term of repayment after the contract has been signed and the lien recorded, a Contract Amendment must be executed following a review of supporting documentation by the program staff. A new lien amending the changes would be required an additional fee charged to the participant.

Expired contracts prior to assessment: Participants have a defined period of time to complete their projects. They may request a time extension if they experience unforeseen delays.

Transfer to future property owners: The contract should contain language requiring the participant to inform a potential buyer of the LIC assessment applied to the property and to obtain their signature indicating that they are aware of the LIC assessment and that it will continue to be levied on the property after the sale is complete.

Early assessment payoff: Participants have the option to make an early repayment on the LIC balance to clear the LIC assessment from the property before selling it. This requires some administration time and adjustments to the tax roll, so it is not recommended to allow partial early repayments (only the option to completely close out the LIC payments in full).

The participant requesting to make the early repayment will contact the municipality or third-party program administrator to receive an LIC balance owing quote, which includes the remaining principal, the interest that has accumulated since the first day of the last tax cycle, and possibly an administration fee for removing the lien.

BUILDER/CONTRACTOR QUALIFICATION

Adopting appropriate contractor standards requires striking a balance between the need to ensure that quality work is performed under the program, while keeping the administrative burden manageable.

Lighter contractor requirements help to reduce the expenses of developing a detailed training program and to protect the program administrator from liability risks stemming from endorsing the work of an independent contractor. It is recommended that the program establish a few basic requirements for contractors to be eligible for registration as co-marketing partners with the program. However, the program should also allow DIY (by the homeowner) and homeowner-managed projects (where there is no general contractor), that would not be required to meet these qualifications.

Once the contractor qualification process is developed, program administrators may wish to have it reviewed by their legal departments to ensure that the municipality is not exposed to liability over the quality of the work performed by program-registered contractors.

Although there are no national or provincial builder qualifications, it would be desirable, if feasible, to develop energy efficiency training for contractors. Program administrators would need to ensure that

the trainings are offered periodically throughout the life of the program to allow additional contractors to become pre-qualified.

Table 21: General Contractor Qualification Requirements

General contractors who wish to be listed on the program website as marketing partners should be required to fulfill the following criteria.	
Essential Qualifications	• Contractor has $1 million in Professional Liability Insurance • Contractor participates in an evening program training (3 hours, free of charge) with an evaluation test at the end focusing on program requirements and co-marketing approaches. • Program administrator posts a list of all program-registered contractors on the program website.[15] • The Program administrator includes disclaimer in the LIC financing contract explaining that it does not endorse or evaluate the quality of the contractor's work.
"Nice to Have" Qualifications	• Contractor is member of Ontario General Contractor Association, or Renomark (or other recognized contractor accreditation) • Background check with the Ministry of Consumer Services and the Better Business Bureau • Provide list of licensed subcontractors to be used– electricians, refrigeration technicians, plumbers etc.

[15] This list would clearly indicate the contractors are marketing partners, and that the municipality does not endorse or evaluate the quality of their work. Moreover, a "three-strike" policy that would require that any contractor to be removed from the list if the Program administrator receives three formal complaints from participants, would help keep the contractors accountable.

2.7 PARTICIPANT COST-EFFECTIVENESS ANALYSIS

Using a cash-flow analysis tool applied to a range of Toronto housing archetypes, the cost effectiveness of a series of energy efficiency measures and bundles was evaluated.

The measures evaluated include:

- Draft-proofing and Ventilation
- Added Insulation: Attic, Basement, Wall
- HVAC: Efficient Furnaces, Central AC
- Hot water: DWHR, Efficient Water Heaters
- High Performance Windows

Table 22: Toronto Housing Archetype Descriptions

Name	Victorian / Edwardian homes	Post War Homes	Split Level	Townhouses
Description	2-3 story, semi-detached, field stone/brick foundation, solid brick walls, pitch roof in front	1.5 storey, solid walls, cement foundations	Concrete foundations, framed wall, brick facade	Particular style townhouse, intricate designs
Years built	Pre 1940's	1940's – 1950's	1960's – 1970's	1970's
Interior area	1000 – 2000 sq-ft	1200 – 1500 sq-ft	2000 sq-ft	1300 sq-ft
Typical location	Downtown	Inner suburbs	Outer suburbs	Outer suburbs
Typical retrofit opportunities	Draft-proofing, insulation (attic, basement), windows, HVAC	Draft-proofing, insulation (attic, basement), HVAC	Draft-proofing, insulation (attic, walls, basement), HVAC	Draft-proofing, insulation (attic, walls, basement), windows, HVAC
Priority measures	Draft-proofing, insulation (attic, basement)	Insulation (attic)	Insulation (attic, basement)	Draft-proofing, insulation (attic)
Comprehensive bundle cost[16]	$19,000	$19,000	$18,000	$11,000

We grouped measures together into whole-home retrofit bundles that aimed to achieve a 25% energy savings, or to provide an optimal energy saving to cost ratio. In each case the housing archetypes and applied measures and bundles were modeled using NRCan's HOT2000 software, to estimate baseline energy consumption and the achievable energy savings.

[16] Before tax cost of total retrofit bundle. For incremental costs evaluation we applied a factor of 0.7 to account for economies realised if carrying out the bundle measures simultaneously to undertaking general home renovations.

Table 23: Comprehensive Bundles Modeled for each Toronto House Archetype

House Archetype	Measures in Modeled Bundle	Baseline Annual Heating Energy Consumption	Bundle Savings (all fuels)
Victorian/ Edwardian	**Insulation** Ceiling: R8 upgraded to R28 Exterior Walls: upgrade to R10 Basement: upgrade to R12 **Furnace:** Upgrade from 80% to 94% Eff.[17] **Air tightness:** Upgrade from 13.5 to 6 Air Changes per Hour (ACH)	Natural Gas: 5,390 m^3 Electric: 44,630 kWh	56%
Post War	**Insulation** Ceiling: R12 upgraded to R28 Exterior Walls: upgrade to R10 Basement: upgrade to R12 **Furnace:** Upgrade from 80% to 94% Eff.[17] **Air tightness:** Upgrade from 8.5 to 6 ACH	Natural Gas: 5,179m^3 Electric: 42,882 kWh	56%
Split Level	**Insulation** Ceiling: R20 upgraded to R50 Exterior Walls: R12 upgrade to R22 Basement: upgrade to R12 **Furnace:** Upgrade from 80% to 94% Eff.[17]	Natural Gas: 3,969 m^3 Electric: 32,864 kWh	30%
Townhouse	**Insulation** Ceiling: R16 upgraded to R50 Basement: R8 upgrade to R12 **Furnace:** Upgrade from 80% to 94% Eff. [17] **Air tightness:** Upgrade from 15 to 7 ACH	Natural Gas: 3,198 m^3 Electric: 26,480kWh	40%

The cash-flow analysis tool allows us to vary the program and economic factors to determine their impact on the participant's cost effectiveness. We first developed the standard conditions for the program based on a series of assumptions.

[17] Natural Gas heated houses only

Table 24: Standard Program Conditions for Cost-Effectiveness Analysis

Factor	Value	Rationale
Interest rate	4.5%	From current IO and Municipal Bond rates we assume that a 15 year amortized loan could be possible in the 3.5-4% range. 4.5% was selected to account for up to a 1% rider to cover administrative costs.
Energy prices increase	3.5%	The IEA predicts that over the next 20 years, natural gas prices in the Central North East region will increase by 3%-4% annually, with reference case of 3.5% (US Energy Information Administration, 2013).
Bundle amortization period	15 years	The average useful life of measures in the bundles is 15 years. For the individual measures cost-effectiveness analysis, the actual EUL is used as the amortization period.
Incentives	None	Currently there are few province-wide incentives for home retrofits, other than the low-income programs. OPA's AC and furnace replacement incentives and Enbridge Gas' Community Home Retrofit incentives were assessed as a condition in the sensitivity analysis.

The detailed results for each measure, heating fuel (Natural Gas or Electric) applied to each housing archetype is appended in Table A1. Results include:

- Total monthly energy bill savings (a sum of electricity and natural gas bill savings)
- Simple payback period (SPP)
- Cash-flow (monthly)
- LIC financing repayments (monthly)
- 1st year Savings to Investment Ratio (SIR)
- Lifetime SIR

Both the 1st year SIR values and the lifetime SIR values are included. The lifetime values are more favourable due to the rising fuel costs included, which increase savings as time progresses while LIC payments remain fixed throughout the amortization period.

SENSITIVITY ANALYSIS

A sensitivity analysis was performed by varying the standard program conditions from their most-probable values, to best and worst case values. The conditions tested were:

- Total measure cost versus incremental measures cost
- Utility incentives applied, or no incentives available
- LIC financing interest rates 3% and 6%
- Natural gas price increase 3% per year and 4% per year

The results are presented in Table 26 below. Dark green cells signify program conditions that achieve an SIR of 0.9 or higher. These are considered to be highly cost effective projects, particularly when factoring in the impact of the associated non-energy benefits.

For each column, all other conditions were kept at standard values unless otherwise indicated. Two aggregate cases were tested, an overall best case and an overall worst-case scenario. In all cases the lifetime SIR was used to account for the results over the lifetime of the measures. No attempt was made to discount future savings or financing payments as the program does not require the participant to make an initial up-front investment for the eligible measures.

On a final note, water bill savings were not evaluated in this analysis as no water savings measures were included in the original HOT2000 modeling. Based on current water costs, it is expected that bundles including low-flush toilets, showers and faucets could further increase the SIR values across the board.

Table 25: 2013 City of Toronto Metric Water Rates

General Water Rate		
	Rate if paid on or before Due Date	Rate if paid after Due Date
All consumers, including Industrial consumption of first 6,000 m^3	\$2.7137/m^3	\$2.8567/m^3

Table 26: Lifetime SIRs for Residential Bundles[18]

House Archetype	Heating Fuel	Total Measure Costs		Incremental Measure Costs							
		Standard Conditions	Best Case[19]	Standard Conditions	With Incentive	Interest Rate 3%	Interest Rate 6%	Energy +3%/yr	Energy +4%/yr	Worst Case[20]	Best Case[18]
Victorian/ Edwardian	NG	0.57	0.70	0.81	0.90	0.89	0.74	0.78	0.84	0.71	1.03
	Electricity	2.16	2.48	3.09	3.09	3.41	2.81	2.97	3.21	2.70	3.54
Post War	NG	0.54	0.67	0.77	0.86	0.85	0.70	0.74	0.81	0.68	0.99
	Electricity	2.06	2.37	2.95	2.95	3.26	2.68	2.84	3.07	2.58	3.39
Split Level	NG	0.24	0.29	0.34	0.38	0.37	0.31	0.27	0.35	0.29	0.43
	Electricity	0.90	1.03	1.28	1.28	1.41	1.17	1.23	1.33	1.12	1.47
Town-house	NG	0.42	0.55	0.60	0.72	0.66	0.54	0.57	0.62	0.52	0.83
	Electricity	1.59	1.83	2.28	2.28	2.51	2.07	2.19	2.37	1.99	2.61

[18] The threshold for cost-effectiveness is set at SIR > 0.9, which is denoted by dark green cells. While this is not absolutely cash-flow positive, we suggest it to be a reasonable threshold for cost-effectiveness when considering non-energy benefits such as thermal comfort improvements and GHG savings, which can account for up to 20% of the measure value. Yellow cells indicate SIR = 0.6 and dark red cells indicate SIR < 0.3 - extremely cost-ineffective bundles.

[19] Best case: With Incentive, Interest = 3%, NG price +4%/yr

[20] Worst case: No Incentive, Interest = 6%, NG price +3%/yr

Conclusions from the cost-effectiveness sensitivity analysis

1. Under certain conditions older Victorian, Edwardian, Post-War, urban Townhouses can all achieve near positive cash-flow or significant positive cash flows (SIR > 0.9) for all fuel types. However, bundles applied to modern split level homes are only cost-effective in electrically heated homes, even under the absolute best-case.

2. For natural gas heated homes, the LIC financed bundles can only achieve cost-effectiveness (SIR > 0.9) when the incremental costs are considered, not when the total measure costs are factored in. SIR values remain below 0.8 for all full cost scenarios, which indicates that stand-alone energy efficiency improvements in natural gas heated homes do not achieve positive or near positive cash-flows. This is a clear indication that for natural gas heated homes (the vast majority in Ontario) the LIC financed improvements must be coupled with already planned renovations to be considered cost-effective.

3. For all housing types with electrical heating, the LIC financed bundles are significantly cost-effective, even when considering the total measures costs (except for split level homes which yields a borderline result). This indicates that the energy and water savings bundles can be cost-effectively implemented as stand-alone projects in most pre-1980s homes with electric heating. In communities where there is a substantial portion of the market that fits this profile, there would be a considerable potential to establish a turn-key installation program. This would likely include oil heated homes as well, considering that heating costs for oil heated homes are similar to those of electrically heated homes.

4. The incentives have a clear impact to pull the Victorian/Edwardian and Post-War homes up to a reasonably cost-effective status (SIRs near 0.8) and thus they could prove to be a major motivator if applied widely in connection with LIC financing.

5. Rising natural gas prices would make the cost-effectiveness argument stronger for most housing types, but it would take significantly higher price rises than those currently foreseen to bring SIRs to over 1 for any housing form. Rising gas prices alone will not create the conditions for successful LIC financing programs, and the other marketing and incentive factors are essential over the long term.

2.8 RISK IDENTIFICATION AND MITIGATION STRATEGIES

LIC financing programs face a range of internal and external risks that can impact uptake rates, increase administrative costs, and can expose the municipality to added financial liabilities. Below is an initial survey of some of the risks that may affect any LIC financing program in Ontario, along with suggested mitigation strategies. Program administrators are encouraged to create a register of risks during program set up and establish regular procedures to review, assess and respond to these as they arise.

Table 27: Program Risks and Mitigation Strategies

Identified Risk	Probability	Impact	Mitigation Strategies
Lower than anticipated uptake rate (>50% of planned rate)	High	Medium	Simplify application process. Increase marketing budget and efforts, try new channels. Reduce administrative costs or interest rates.
Lower than anticipated uptake rate (<50% of planned rate)	Medium	High	Likely a fundamental flaw in the program design or delivery. Consider decreasing interest rates, removing stringent application processes, or seeking attractive incentives to drive interest in the program. In this case it is essential that the municipality take steps to reduce its exposure to upfront borrowing cost0073 for program funds.
Collapse in housing values pushing homes under water	Low	Medium	Add a debt-to-property value assessment to the eligibility criteria.
Banks and mortgage lenders try to block LIC financing	Medium	High	Require that the total home equity > total debt on property (including LIC financing). Require bank sign-off on LIC financing approvals.
Rising interest rate environment	Low	Low	Lock interest rates in with a program fund lender prior to establishing LIC financing agreements with

			participants. Ensure program fund loan terms (years) match or exceed participant financing terms.
High default rates on LIC payments	Low	Medium	Lower maximum LIC financing limit and increase participant financial health checks in the application procedures.
Program hindered by lack of available CEAs	Medium	Low	Sole source a service organization to provide ERS reports to all program participants. Offer incentive to local audit professionals to recertify.
Frequent complaints about poor work performed by contractors	Medium	Medium	Perform spot checks on work performed. Increase contractor pre-qualification requirements.
Municipality is pursued for poorly performed work	Low	Medium	Include waiver in the participant contract documents, indicating that the municipality does not endorse the quality of the work performed by the contractors. Improve third-party quality checks and increase their frequency. Increase role of CEA to audit and control contractor quality.
Falling energy prices or slow increases in energy prices	Low	Low	Energy price movements within a reasonable range will have a limited impact on program cost-effectiveness.
Energy efficiency incentive programs disappear	Low	Low	Currently there are a limited number of incentive programs, and they do not have a major impact on the program viability.

LIC FINANCING FOR MURBS

3. MURB PROGRAM RECOMMENDATIONS

As discussed in the introduction, MURBs with greater than four housing units fall under commercial mortgage classifications, which carry a range of underwriting criteria that are typically more stringent than those for smaller residential properties. Moreover, there are a range of property ownership and management conditions that impact MURBs differently. Thus we recommend developing a separate LIC financing program, or program stream, to cover MURBs. MURB-specific eligibility criteria, application processes, and financing conditions will help target the program to the MURB sector, and increase the chances for success.

MURBs make up a significant portion of residential dwellings in many of Ontario's larger municipalities. It is recommended that a municipality assess the size of the MURB sector locally, and create a program that responds to the local needs. This chapter does not present a formal MURB LIC financing program design, but offers key insights into commercial LIC financing mechanisms, and particularly how they may differ from those suited to smaller and low density residential properties. It is intended to complement the program design in Chapter 2, by adding details specific to the MURB sector, and it is recommended that any municipality considering an LIC financing program targeted at MURBs first understand the LIC financing program design rationale presented in Chapter 2.

3.1 LESSONS LEARNED FROM COMMERCIAL PACE PROGRAMS IN THE US

In order to assist the design of an LIC financing product for MURBs, we have compiled the lessons learned and key characteristics from past and currently active commercial PACE programs in the US that include financing for MURBs. This study includes a brief overview of the types of programs currently on the market, three case studies of distinctive program models and a summary table highlighting the design elements of five active programs. The case studies are based on information publicly available about the programs and, where possible, interviews with program administrators.

COMMERCIAL PACE PROGRAM MODELS

PACE financing in general and commercial PACE programs in particular are a relatively new concept in the US. While many residential PACE programs remain on hold, awaiting clarity on the mortgage interaction issues, commercial PACE programs, that include financing for larger MURBs, have continued to expand and are now available in 19 states. Commercial PACE programs typically differ from residential programs in their administrative models, financing and implementation, and these differences have protected them from some of the criticisms directed at small residential property PACE programs in the US. To prevent disputes over lien priority, commercial PACE programs typically require written consent from all mortgage lenders on the property. Moreover, given the larger size of LIC financing envelopes offered for commercial building retrofit projects and the attractive nature of the resulting securities to private capital, commercial PACE programs can apply a wider variety of financing options. These range from local municipal revolving funds or bonds, to issuing aggregated asset-backed securities, or selling individual municipal bonds attached to specific retrofit projects.

Furthermore, commercial programs differ from their residential counterparts in that they have a lower number of participants and involve significantly larger transactions per project. They often involve complex retrofit measures and can invest to a larger degree in professional design and planning services, such as applying the widely recognised ASHRAE procedures for commercial building energy audits. In addition, commercial property owners are arguably more sensitive to the cost-effectiveness of a retrofit project compared to residential homeowners. The business case and marketing strategies for PACE financing can therefore differ significantly between residential and commercial target groups.

Sixteen commercial programs are currently accepting applications in the US. Because these programs are typically very new, there is little performance data available. We have selected six of the longer established programs to highlight key program design and implementation attributes of commercial PACE programs that include MURB financing:

1. Participant eligibility requirements
2. Eligible measures
3. Financing model and source of funds
4. Program administration

5. Program requirements for contractor and lender qualification

The study of the six commercial programs selected for this study revealed various similarities and differences. Although each program features unique characteristics, we have divided the studied programs into three categories, and present particular cases to illustrate each of the most prominent administrative and financial models that have emerged from our analysis.

These models are:

A. Publicly administered municipal (or county) programs based on public funding (see SCEIP case study)
B. Centralised state programs managed by a public or private organization in partnership with private lenders and/or administrators (see Connecticut C-PACE)
C. Fully integrated, turnkey PACE programs designed, administered and delivered by private or public PACE service providers (see Figtree case study)

CASE A: SONOMA COUNTY ENERGY INDEPENDENCE PROGRAM (LOCALLY ADMINISTERED)

Summary

Sonoma County Energy Independence Program (SCEIP) was launched in 2009 and is one of the pioneers of PACE financing in the US and the first countywide PACE program to launch in the state of California. Financing is offered to both residential and commercial sectors including industrial and agricultural properties; 1805 residential and 58 commercial property owners have received financing under the program over the past three years. Sonoma County has also distinguished itself by investing significant resources in outreach and has produced a documentation package that provides valuable guidance for governments considering PACE financing programs.

Political support for SCEIP has been very strong and stems from the local government's clear commitment to reduce GHG emissions and stimulate local economic activity. To date, the program has not been tracking its overall impact on energy savings, but is in the process of establishing measurement and verification tools to do so.

Participant eligibility requirements

Unlike other commercial PACE programs discussed here, SCEIP's eligibility requirements for commercial properties are very similar to those of residential applicants. Standard criteria include verifying the ownership of the property, the good standing of all property liens, taxes and mortgage payments, and the debt-to-value ratio of the property. California's state law also requires that total property taxes do

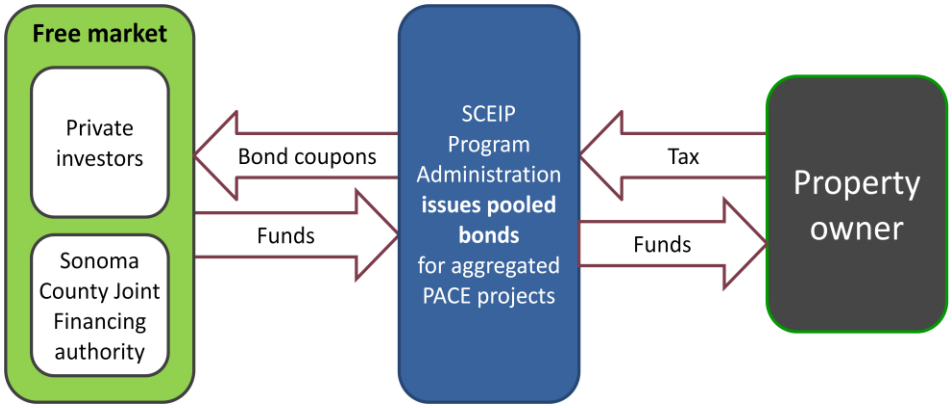
not exceed 5% of the property value (including PACE payments). An ASHRAE level I audit is offered free of charge by the Pacific Gas and Electric, the energy utility active in Sonoma County, and is mandatory for commercial properties to participate in the PACE program. Financing ranges from a minimum of $2,500 up to a maximum of 10% of the total property value (although higher amounts are considered in exceptional cases).

Eligible measures

All six programs reviewed allow owners to finance water saving measures and renewable energy generation as well as a wide array of energy efficiency measures, including doors and windows. SCEIP previously had a loading order requirement obliging property owners to achieve a 10% improvement in energy efficiency prior to installing renewable energy units, but this requirement has been waived due to the sharp decline in uptake it caused. **As a result, the majority of SCEIP PACE applications are driven by solar contractors who typically do not specialize in energy efficiency services**.

Financing model and source of funds

SCEIP is distinct from other programs in providing in-house financing of both commercial and residential projects alike. The program operates its own revolving fund, seeded by the Sonoma County Treasury and the Sonoma County Water Agency, which is fed by proceeds from the sale of PACE bonds on the capital markets. The fund is managed by the Sonoma County Joint Powers Financing Authority created to assist the County with its financing.



Each month, SCEIP issues bonds to cover all the approved PACE financed projects and sells them to the Sonoma County Joint Financing Authority or private investors. SCEIP then disburses the proceeds from the bond sale to the property owners and is repaid through an assessment on the property taxes. The financing terms offered are updated each year and are identical for all incoming participants.

SCEIP also allows third-party financing of commercial projects, which is common practice in most commercial PACE programs. However, only a single $1,600,000 project has been financed through this mechanism so far under SCEIP.

Program administration

SCEIP is administered entirely in-house, outsourcing only specific tasks on a project basis, such as the creation of the website and data management tools. The administration of the program is supported by participant's administrative fees, grants and internships. The program operates its own storefront staffed with ten full-time employees who take care of day-to-day operations such as customer service and application processing. Advising in taxation, energy and sustainability, financial and legal matters as well as program management is provided by a selection of the county's regular staff members.

Program requirements for contractor and lender qualification

SCEIP requires a minimum of two bids for each project, where at least one of the bids is supplied by a local contractor. Moreover, SCEIP only funds projects that are completed by program-approved contractors that are licensed, have undergone SCEIP training and have signed an agreement with the program; a list of participating contractors is available to property owners online.

CASE B: CONNECTICUT C-PACE PROGRAM (STATE-WIDE PROGRAM)

Summary

Connecticut's C-PACE is a new state-wide program, launched in late 2012, that offers financing for commercial, industrial and multi-family property owners.

C-PACE is financed by the Clean Energy Finance and Investment Authority (CEFIA), a quasi-public agency that is the recipient of $32 million per year in electric utility ratepayers' fees and proceeds from the Northeast GHG cap-and-trade system. CEFIA can also issue bonds (acting as the C-PACE bonding agency), secure federal grants, receive philanthropic donations and raise private capital to finance the PACE program, and its other GHG reduction initiatives (Kane, 2012).

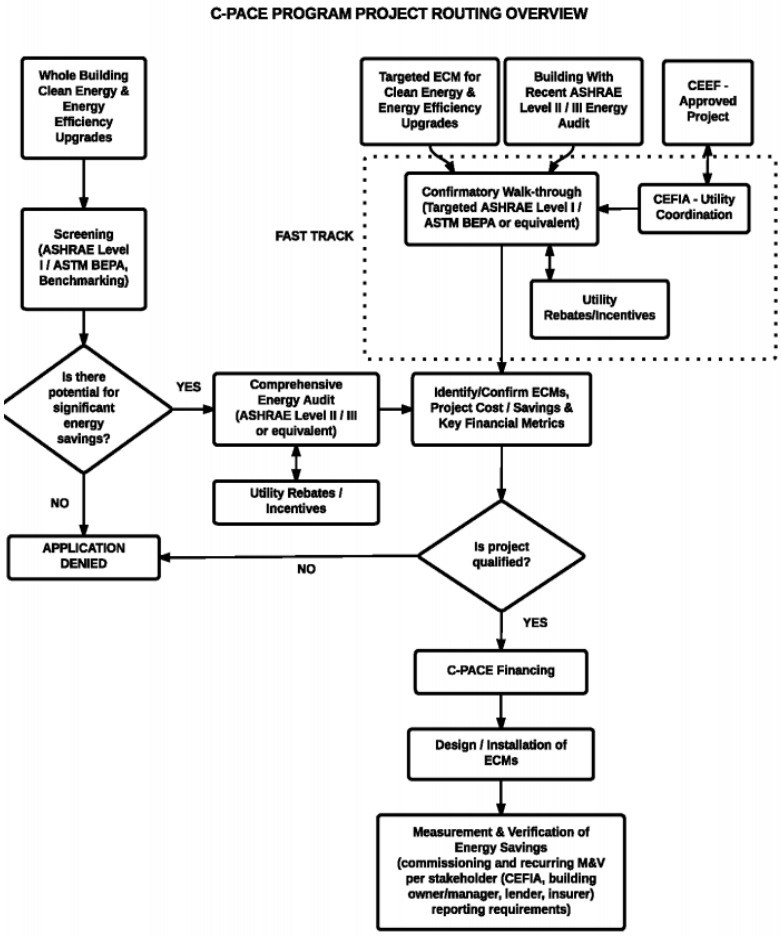
The program relies on third party administration through Buonicorp Partners, LLC. They recommend that C-PACE financed projects have a minimum value of $150,000 in order to cover transaction costs.

Participant eligibility requirements

Eligibility requirements for C-PACE participants include standard criteria such as the verification of the ownership of the property and of the good standing of all property liens, taxes and mortgage payments, as well as proof that a property has loan–to-equity ratio less than one.

Projects are required to have a savings-to-investment ratio (SIR) greater than one; energy savings are evaluated through mandatory ASHRAE audits. Participants are required to develop a performance measurement and verification plan with recurring reporting of energy savings to the program administrator covering the lifetime of the measures.

Figure 12: C-PACE Program Flow Model (Clean Energy Finance and Investment Authority, 2012)



Eligible measures

Because of the cost-effectiveness requirements, several measures often supported by commercial PACE programs (such as windows, doors or plug load devices) are not eligible for financing as stand-alone projects through C-PACE. Eligible measures notably do include Energy Management Systems.

Participants are required to perform a level I ASHRAE audit; the participants are then screened to verify that the desired level of energy savings is indeed likely to be achieved by the proposed improvements. If this is the case, an ASHRAE level II or III audit must be passed by the participant prior to submitting the final application.

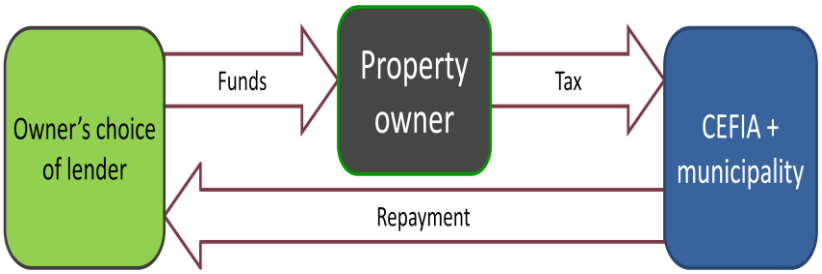
A fast-track application process with a reduced level of screening is offered to properties that have performed an ASHRAE level II or III energy audit in the past three years and that wish to finance a number of targeted measures specifically recommended as a result of these audits.

Financing model and source of funds for state-wide PACE programs

Commercial PACE programs administered state-wide show the widest range of financing models. The overall goal in these financing models is to establish an attractive product to sell in the capital markets in order to achieve favourable terms. For instance, pooling investments into asset-backed securities can offer lower risks than municipal bonds, depending on the municipality's bond rating (Aarvig, 2013). Many financing models are employed by commercial PACE programs, but typically they follow either an owner-arranged financing approach or financing through a bonding agency.

Connecticut C-PACE: Owner-arranged financing

The C-PACE financing model functions through owner-arranged financing, which is a common mechanism for commercial PACE programs.



The owner must find a lender (a list of suggested lenders is available from CEFIA) and agree upon the terms of the PACE financing. CEFIA and the lender will then enter an agreement enabling CEFIA to repay the lender through the collected PACE repayments collected from the property owner.

C-PACE Program administration

Program administration, including application processing, is outsourced entirely to Buonicorp Partners, LLC, a third party administrator.

Program requirements for contractor and lender qualification

CEFIA is planning to develop a list of participating contractors based on a Request for Qualifications opened at the end of 2012. The use of pre-qualified contractors will then become a program requirement.

PACE Financing through a bonding agency

The CaliforniaFIRST program demonstrates an alternative model for financing commercial PACE projects. In this case the program's bonding agency can issue pooled or stand-alone bonds depending on the project transaction size.

For projects that are large enough to warrant a stand-alone bond the bonding agency will try to obtain financing at a given "not to exceed" interest rate. They will then seek to sell a bond at those terms in the private capital markets.

For either aggregated bonds, or stand-alone bonds, the property owner will be required to wait up to 90 days before starting the work, during which time the bonding agency will attempt to sell the associated bond.

Participants may also choose to negotiate financing terms directly with a lender of his/her choice. In this case, a bond will be issued by the agency according to the agreed terms between the lender and the property owner.

CASE C: FIGTREE FINANCING (TURN-KEY, PRIVATELY ADMINISTERED PROGRAM)

Summary

Figtree is a private entity that provides turnkey PACE programs to municipalities across California. Due to the growing popularity of PACE programs in several US states, the market for independent PACE providers is expanding. Figtree is an example of a program that arranges financing, and offers program administration and application processing, ready to use tools for data processing, a web portal and customer service all packaged in a program at no cost to the municipality. Figtree covers its cost from the interest rates and fees charged to the participants. Only limited information is available about the internal decision-making and financing protocols for these privately administered PACE program providers.

Participant eligibility requirements

The basic eligibility requirements for projects financed through Figtree's PACE program are largely based on the criteria set by the state PACE legislation. Figtree applies standard criteria such as the verification of the ownership of the property and of the good standing of all property liens, taxes and mortgage payments.

Eligible measures

Figtree offers a comprehensive array of eligible measures and, unlike several other commercial programs, does not require an energy audit for commercial properties. The program remains open to less cost-effective measures such as windows and doors.

Financing model and source of funds

Figtree is an integrated PACE provider and acts as a lender. Financing terms can be immediately estimated by the property owner through an online tool available on Figtree's website.

Program administration

Figtree takes charge of all aspects of program administration and only requires the participating municipalities to authorize the collection of LIC repayments through the municipal tax system.

Program requirements for contractor and lender qualification

Figtree maintains a list of suggested contractors for each area but does not restrict property owners in the choice of their contractor.

Table 28: Selected Commercial PACE Programs Currently Active in the US

Program Name (Year Established)	CaliforniaFIRST[21] (2012)	Connecticut C-PACE (2012)	GreenFinance SF (2010)	Figtree (2012)	Sonoma County SCEIP (2009)
Jurisdiction	State (CA)	State (CT)	County	Private PACE Provider (Multiple States)	County
Financing Terms and Conditions					
Minimum Value	$50,000	None, but recommended $150,000+	$50,000	$5,000	$2,500
Maximum Value	Loan value < owner's equity in property	Loan value < owner's equity in property	Loan value < owner's equity in property	10%-20% of property value depending on the interest rate	Recommended <10% of property value.
Source of capital	Bond to owner's lender or pooled bonds sold to state	State agency repays owner's lender	Bond to owner's lender	Private funding	Bond to owner's lender or pooled bonds sold to county
Financing of costs covered by incentives			Required participation in solar incentives prior to financing	X[22]	X
Participant fees and administrative cost	0.25% financing amount to cover county administration fees.	Negotiated prior to financing	Negotiated prior to financing	Closing fee of 4% of total financing amount + admin fees of 3% of the annual assessment amount + 40$ annual county admin fee.	Closing fee of 3% of annual assessment amount + 40$ yearly fee + 495$ application fee

[21] In California, municipalities can chose between joining the state-wide program, or establishing a locally administered program in the municipality, as is the case in San Francisco and Sonoma Counties.

[22] X: Denotes Included in Program or Program Requirement

Program Name (Year Established)	CaliforniaFIRST (2012)	Connecticut C-PACE (2012)	GreenFinance SF (2010)	Figtree (2012)	Sonoma County SCEIP (2009)
Eligibility Considerations					
Property tax payment history checked	X	X	5 years	X	X
Bankruptcy history	3 years		3 years	5 years	X
Property value eligibility criteria	Total debt (including PACE assessment) must be less than assessed property value	Pace Assessment must be less than current owner's equity on property	Total debt (including PACE assessment) must be less than assessed property value	Mortgage value must be less than assessed property value	Total debt (including PACE assessment) must be less than assessed property value
Achieve an SIR > 1		X			
Energy audit requirements	ASHRAE II + Utility bill disclosure upon completion	ASHREA II or III + M&V plan + reporting required upon completion	Must do water and energy audits. Must benchmark with Energy Star Portfolio Manager.	No audit required	ASHRAE I required (100% sponsored by PG&E)
Contractors Qualifications	Require licensed and insured contractor	Building a list of authorized contractors	Solar contractors must be pre-qualified by the program, others require insurance and license	Have a list of suggested contractors	Require use of preapproved and trained contractors
Eligible Measures					
Insulation	X	X	X	X	X
Space heating/cooling	X	X	X	X	X
Water heating	X	X	X	X	X
Lighting	X	X	X	X	X
Windows and doors	X		X	X	X
Charging stations	X		X		
Reflective roof	X		X	X	X
Energy management information systems		X			X
Plug loads					X
Motors, fans, pumps		X	X		X
Solar/Renewables	X	X	X	X	X
Water saving	X	X	X	X	X

3.2 COST-EFFECTIVENESS ANALYSIS OF ENERGY SAVING MEASURES IN MURBS

Based on existing studies of energy and water saving improvements and baseline energy consumption in Toronto MURB archetypes, the cost-effectiveness of various LIC financed measures and bundles was evaluated. Using the LIC financing model, we determined the impact that LIC financing terms, up to date energy prices (as well as forward looking energy price projections) and currently available incentive programs have on the cost-effectiveness of LIC financing for Ontario's MURBs.

BUILDING ARCHETYPES

Building archetype models were taken from two recent studies performed for the City of Toronto's Tower Renewal Office:

1. **Community Energy Plan for Pilot Sites** (Arup, 2010)
2. **Tower Renewal Guideline (TRG)** (Saleff, 2008)

The three pilot sites described in the Community Energy Plan, along with the TRG theoretical archetype model, were used to provide a representative sample of the typical energy performance of similar high-rise residential buildings in Ontario. The three pilot sites were modelled using eQUEST, the US Department of Energy-supported building modeling tool (performed by Arup, and Saleff in the original reports). The baseline model was then utilized to incorporate the various energy saving measures and calculate projected energy savings for each.

Table 29: Model Buildings for Energy Measure Cost Effectiveness Screening

	North York Pilot	Etobicoke Pilot	Scarborough Pilot	TRG Archetype
Year of construction	1967	1963	1967	(N/A)
Interior conditioned floor space	22,400 m^2	29,000 m^2	23,300 m^2	23,7000 m^2
Storeys	17	23	17	20
Baseline energy consumption	1.75 GJ/m^2 yr	1.01 GJ/m^2 yr	1.27 GJ/m^2 yr	1.21 GJ/m^2 yr

In the two source reports, the following energy and water saving measures were evaluated for each building. Modelling results provided annual energy and water savings estimates for each measure, as well as a series of bundled measures that represent whole building retrofit packages. The modelled results were used as inputs to our cash flow and cost effectiveness analysis tool and the results are in the following section.

Table 30: Modeled Energy and Water Saving Measures

Apartment-Unit Measures	Building Envelope Measures
1 Incandescent to Compact Fluorescent Lamp Conversion	20 Re-Caulk Around Windows to Reduce Infiltration
2 Occupancy Sensors in Apartments	21 Install Double Pane Windows and Balcony Doors
3 Thermostat & Control Valve Upgrade for Radiators	22 Cladding Exterior Walls (R-18), Non-Enclosed Balconies
4 High Efficiency Refrigerators: Refurbished	23 Re-Clad Exterior Walls (R-18), Enclosed Balconies
5 High Efficiency Refrigerators: New	24 Solar Wall Ventilation Preheat System
6 Low Flow Toilets	**Building Energy Generation Measures**
7 Low Flow Faucets	25 Solar Domestic Hot Water
8 Low Flow Shower Heads	26 Facade-Integrated Photovoltaic Panels (BIPV)
Common Area & Building System Measures	27 Photovoltaic Panels on Roof
9 Occupancy Sensors in Common Areas	**Energy Management & Education Measures**
10 Bi-Level Lighting in Common Spaces & Parking Garages	28 Tenant Orientation and Energy Education Programs
11 Energy Efficient Parkade and Exterior Lighting	29 Apartment-Level Electric Metering
12 High Efficiency Boilers (modulating & condensing)	30 Track & Report Energy/Water Consumption and Expenditure
13 Seasonal Boiler Set-point Temperature Reset	
14 Upgrade/Optimize Boiler Digital Control Systems	
15 Start/Stop Control of Hot Water Circulation Pumps	
16 Variable Frequency Drive on Domestic Cold Water Pumps	
17 CO-Monitoring Based Control of Garage Exhaust Fans	
18 MAU Upgrades & Exhaust Air Heat Recovery for Ventilation Preheat	
19 Eliminate Garage Heating for Sprinkler Freeze Protection	

CURRENT INCENTIVE PROGRAMS AVAILABLE TO ONTARIO MURBS

Incentive programs offered to MURBs for energy and water saving improvements play an important role in increasing their cost-effectiveness. Natural gas and electrical utilities across Ontario offer prescriptive or custom programs that provide incentives based on a combination of equipment performance rating or overall estimated annual energy savings. Additionally, local power utilities, such as Toronto Hydro, offer incentives for energy audits. These incentives were factored into the SIR calculations that follow.

It is important that LIC financed projects access these incentives to decrease upfront costs and improve the overall project viability. To keep the process streamlined for participants, LIC financing programs should apply eligibility criteria that match those of the applicable incentive programs.

Table 31: Current Utility Energy Saving Incentive Program in Ontario

Organization	Program	Resource	Description
Toronto Hydro / OPA	Equipment Replacement Incentive Initiative (ERII)	Electricity	Prescriptive incentives for various lighting, cooling and other measures. Custom incentives.
Toronto Hydro / OPA	Audit Incentive	Electricity	Funding of up to $35,000 for feasibility studies and detailed analysis of capital intensive modifications.
OPA	Feed-in Tariff Program (FIT & microFIT)	Electricity	Guaranteed contracts for on-site renewable electricity generation including solar PV.
Enbridge Gas / Unions Gas	Various multi-unit residential programs	Natural Gas (& water in some cases)	Incentive payments and rebates for steam system improvement, heating system upgrades, water heater replacement, showerhead replacement, appliance replacement. Special programs exist for social housing programs.

CASHFLOW ANALYSIS OF LIC FINANCED ENERGY EFFICIENCY BUNDLES

For the cost effectiveness study, we applied the reported estimated energy savings for each measure installed in each building type to the LIC financing cash flow analysis tool. Construction costs were derived from the original report, and updated by a factor of 3%, representing the increase in average construction costs in the Toronto region in the past five years (Statistics Canada, 2013). The cash-flow tool applied current gas and electrical utility rates, as well as forward-looking gas pricing projections (US Energy Information Administration, 2013) to calculate current and future SIRs. Finally, water savings were also included in the cash flow analysis at current water costs ($ 2.70 /m^3) and all incentives available for each measure were applied.

From the Arup report describing the three pilot sites, a series of four bundles were defined:

- Bundle 1: The combination of measures with a cumulative payback of 5 years
- Bundle 2: All measures with GHG reductions of 30 tonnes/year or greater
- Bundle 3: Bundle 1 + re-cladding with non-enclosed balconies and double pane windows
- Bundle 4: Bundle 3 + apartment radiator control upgrades

Based on construction industry pricing, bundle costs range from $1.5M to $4.5M (averaged for all building types) for the options listed above, with bundle 1 being the lowest cost and bundle 2 being the highest cost.

SIR values are presented below both for the first year of the LIC financing payback, and averaged over the LIC financing repayment period. The cash flow was assessed based on a 20-year fixed financing term at 4.5% annual interest. A 3.5% average increase in energy prices was applied to derive lifetime SIR values, as per the IEA forecasts (US Energy Information Administration, 2013).

Table 32: Bundle SIRs and Project Cost for the Building Models

	North York Pilot		Etobicoke Pilot		Scarborough Pilot	
	1st year	Lifetime	1st year	Lifetime	1st year	Lifetime
Bundle 1	1.68	2.42	2.37	3.41	1.86	2.68
Bundle 2	0.71	1.02	1.30	1.87	0.79	1.13
Bundle 3	1.16	1.67	1.32	1.89	1.12	1.61
Bundle 4	0.94	1.36	1.00	1.44	0.86	1.23

Overall most bundles consistently provided lifetime SIRs greater than 1 except for bundle 2, suggesting positive cash-flow for the property owner based on the ratio of the energy cost savings to the annual LIC payments. Bundles 1, 3 and 4, as defined by the Arup report, are skewed largely toward shorter term payback measures (5 years or less) such as lighting upgrades that may be financed through other means.

A major aspect of LIC financing's appeal is the ability to finance measures with longer payback periods, of up to 20 years or more. Further observation of those measures shows that many offer very low SIRs when applied to some building types, but may offer SIRs approaching 1 in other building types. This highlights the value of grouping longer payback measures with those offering a higher rate of return in order to achieve the overall SIR greater than 1 for the bundles. However, it also points to the importance of including detailed professional energy auditing in the LIC financing requirements in order to identify the buildings where longer payback measures can be carried out as stand-alone projects, or can be included to a greater extent in a project bundle.

Table 33: SIR Values for Select Individual Measures[23]

	North York Pilot		Etobicoke Pilot		Scarborough Pilot		TRG	
	1st year	Lifetime	1st year	Lifetime	1st year	Lifetime	1st year	Lifetime
Track and Report Energy / Water Consumption	4.48	1.22	3.88	5.57	n/a	n/a	n/a	n/a
Occupancy Sensors	3.17	1.89	3.39	2.02	3.01	1.80	n/a	n/a
High Efficiency Boilers	1.44	1.42	0.82	0.81	n/a	n/a	1.02	1.00
Double Pane Windows and Balcony Doors	0.57	0.82	0.59	0.58	0.29	0.41	0.46	0.67
Cladding Exterior Walls, Non-Enclosed Balconies	0.74	1.07	0.38	0.38	0.33	0.47	0.27	0.39
Re-Clad Exterior Walls, Enclosed Balconies	0.48	0.69	0.25	0.19	0.22	0.31	0.21	0.30
Solar Wall	0.23	0.33	0.23	0.33	0.22	0.32	n/a	n/a
Solar Hot Water	0.23	0.33	0.23	0.33	0.23	0.33	n/a	n/a

In all the cost-effectiveness analysis for MURB energy efficiency measures presented above, the full cost of the measures are used. In many cases the energy efficiency measures may be part of required maintenance, repairs, or planned upgrades. In these cases it would be appropriate to use only the incremental difference of the energy efficient measure as compared to the standard option.

Evaluating the incremental costs for specific measures in large MURB projects can vary widely depending on the nature of the planned work, and the configuration of the building, thus no attempt was made to determine the specific incremental costs of the measures evaluated above. This may be an area for further analysis on a project by project basis, carried out within the MURB LIC financing program administration. Methods to carry this out would include setting standard incremental cost portions for specific upgrades, such as adding insulation during the replacement or maintenance of cladding work, or analysis of the work order and contractor quotes to determine the portion of the project associated specifically with efficiency upgrades.

[23]The threshold for cost-effectiveness is set at SIR > 0.9, which is denoted by dark green cells. While this is not absolutely cash-flow positive, we consider it to be a reasonable threshold for cost-effectiveness when considering for non-energy benefits such as thermal comfort improvements and GHG savings, which can account for up to 20% of the total measure value. Yellow cells indicate SIR = 0.6 and dark red cells indicate SRI < 0.3, which indicate measures with extreme negative cash-flows.

3.3 MURB MARKET POTENTIAL SCAN FOR LIC FINANCING

We performed a market potential scan supplementing the findings presented in the *Johnson Controls Energy 2010 Efficiency Indicator North America Survey Results* with the findings presented in the 2012 North American survey update, along with a report specific to the Canadian market in 2011.

The Johnson Controls survey reports target the commercial building sector in general, but contain minimal information regarding MURBs. To supplement the findings therein with MURB-specific information on building-owner intentions, behaviour, and effective practices for energy efficiency programs targeted at MURBs, we reviewed two recent studies from the American Council for an Energy-Efficient Economy (ACEEE).

Overall, the summarised findings aim to provide further insight into building-owners' intentions to perform efficiency upgrades, the challenges faced, and opportunities for LIC financing to impact these.

RELEVANT MARKET TRENDS IN THE MURB SECTOR

1. **A growing interest in energy efficiency:** Energy savings and energy efficiency opportunities are currently broadly recognised across the Canadian and US commercial building sectors, and are receiving increasing attention over the past three years.
    - A larger portion of owners are currently investing in energy saving measures - 74% of respondents in one recent study (Johnson Controls, 2012).
    - Most of the current investment is focussed on accessing the low hanging fruit, including measures with payback periods of 3-years or less. This mainly covers lighting, HVAC and behavioural improvements.
    - Nearly 50% of commercial building owners are engaged in, or are considering, various energy saving efforts including energy audits, data analysis, and accessing external capital to undertake improvements.

2. **Barriers to further energy efficiency investments:** Building managers and owners see insufficient access to capital (internal competition for funds) and long paybacks on investment as significant barriers to energy efficiency investments.
    - Currently, owners typically seek measures with an SPP of three years or less as a threshold for investment decisions, but will in some cases consider projects with SPP approaching ten years (Johnson Controls, 2010).
    - LIC funding offers a potential solution to overcome this barrier as it: a) provides the upfront capital needed, b) includes provisions for measures with longer payback periods, and c) stays off the building's balance sheet, thus maintaining the owner's access to collateralized credit for other repairs and investments.

3. **Motivations for energy efficiency improvements:** Key motivations for energy efficiency investments remain largely unchanged, with the most influential factors being:
    - Reduced energy costs
    - Improved branding
    - Access to incentives

    However, tenant retention appears to remain a poorly recognized benefit. Efforts to communicate this as part of the LIC financing program marketing could prove worthwhile. Other influences driving the uptake of energy efficiency improvements include:
    - An increasing number of building portfolios that include green building certified properties such as LEED and BOMA BESt.
    - A growing interest in the verification and monitoring of building energy consumption patterns.

4. **Potential exists to build on existing sector relationships:** MURB LIC financing programs can leverage transactional relationships within the industry. For example, MURB owners are often closely linked with financial industry representatives and partners. This can support LIC financing initiatives by:
    - Facilitating the mortgage lender acknowledgement that is often required for LIC financing in the MURB sector.
    - Offering access to private capital sources through which self-financed LIC programs can be based.

    Moreover, MURBs may change hands often and have frequent repair and renovation needs. Integrating LIC financed energy saving improvements into these processes can help reduce the cost of deeper energy saving measures (such as exterior-mounted insulation and cladding) and improve SIRs on many projects. Important MURB transactions to leverage in an LIC program could include:
    - Time of sale
    - Renovations and repairs projects

    Marketing the program through financial institutions, general contractors and building professionals will likely be important to the success of a MURB LIC financing program.

5. **The MURB sector has unique marketing needs:** Specific marketing channels may be required to target building portfolio managers and owners. Certain sectors may pose particular challenges that will need to be addressed in the LIC financing products and information materials.
    - Real estate investment trusts, affordable housing providers and other large portfolio owners may each require a specific targeted marketing and outreach strategy.
    - Affordable housing providers and properties may offer a particular challenge in defining the LIC financing arrangement as they are highly impacted by the split incentive barriers and provisions will likely be needed to ensure that LIC repayments are not transferred to tenants in the form of rent increases.

3.4 LIC FINANCNING PROGRAM RECOMMENDATIONS FOR ONTARIO MURBS

Based on the case studies, measures analysis and market potential scan, a series of recommendations that can support the design of a MURB LIC financing program are presented below.

1. Targeted participants and eligibility requirements within the MURB sector

Programs typically target buildings with higher energy savings potential that have sufficient equity to carry the LIC financing commitments. The City of Toronto's Tower Renewal Office has compiled valuable information on the city's current MURB stock. Other Ontario municipalities may benefit from Toronto's MURB studies and augment it with local research to define their own target group definitions.

From the scan of MURB programs and commercial PACE programs across the US, a few general eligibility criteria appear to be essential to a future LIC financing program:

- Consent must be obtained from all property owners and mortgage lenders of record on the property. This is the responsibility of the building owner(s) under the conditions of commercial mortgages (that often carry a *Due on Encumbrance* clause that gives the mortgage-holder the right to call the loan due if additional debt is placed on the property without the lender's consent). US PACE programs often offer standard forms that property owners can use to obtain consent from mortgage lenders, and it is the responsibility of the property owner to ensure that all necessary consent is obtained.
- Property owners have not defaulted on mortgage payments or municipal taxes on the property in question over the past 3-5 years.
- Energy savings potential is sufficient to provide a positive cash flow over the life of the LIC financing.
- The LIC financing investment should not exceed the property owner's equity (although the energy savings should offset the LIC payments, most PACE programs still do not allow an owner's overall debt on the property to exceed the assessed property value). This is an important requirement to put mortgage lenders at ease over the program's potential impact on the buildings' financial health.
- Individual LIC financed projects are of sufficient value to justify the administrative costs, and to fit the program's financing model. For example, a program that relies on reselling the LIC assessments as bonds based on individual projects would require a higher minimum loan value than a program that pools loans and resells them as asset-backed securities.

2. Eligible measures should balance positive cash flow with whole-building retrofits that go further than existing programs may facilitate

Among the key benefits of LIC financing is its ability to support major capital investments at fixed interest rates over long durations. Thus it is a unique tool for enabling building owners to undertake energy efficiency measures with substantial capital expenditure requirements. However, as can be seen in the individual measure cash flow results appended, high cost measures with long payback periods

may not always provide sufficient energy savings to support the LIC payments through positive or neutral cash flows. This is especially relevant if the energy saving measures are undertaken as stand-alone projects, or are not part of an overall upgrade or maintenance project.

Thus LIC financing should focus on a few key elements:

- Emphasize whole-building retrofits that bundle measures together to significantly reduce the buildings' energy and water consumption costs.
- Require detailed audits, including building energy modelling to accurately determine energy savings from bundled measures
- Require SIR > 1 for projects (bundles), with a process for approving projects that yield negative cash flow if the owners can demonstrate:
    - Additional benefits that can be valued in the bundle such as: lower tenant turnover rates, potential for increased rents[24], etc.
    - That the project addresses the building's capital repair back-log
    - Sufficient equity in the building to cover the LIC financing
    - Other sources of income or assets to guarantee the LIC payments
- Consider the incremental costs related to energy efficiency improvements in situations where they are carried out as part of an overall renovation or deferred maintenance (for example, adding insulation to the building exterior as a component of a cladding replacement project). In these cases the MURB LIC financing program can help property owners to realize deferred maintenance and upgrade projects sooner than were otherwise possible given the owners' limited financial resources. Moreover, the LIC financing can encourage the owners to improve the maintenance project scope of work to include energy and water saving measures.

Only energy and water saving measures were evaluated, however the City of Toronto's Tower Renewal Office's Sustainable Tower Engaged People (STEP) program provides a framework for property owners to pursue safety, waste management and community building improvements. There could be potential through the LIC financing program to support these other measures that are more difficult to apply a cost-benefit analysis to. Expanding LIC financing to cover these measures along with cost-effective bundles of water and energy savings could create a mutually reinforcing relationship between the programs.

3. Program requirements for contractor qualification and selection

Most PACE programs have a level of quality assurance or pre-qualification for the contractors involved in carrying out the energy saving improvements. A few basic requirements can be important to ensuring

[24] If maintaining housing affordability is a program priority, increased rents should be limited within the applicable rental increase guidelines.

that the projects meet the predicted savings targets and that the LIC financing carries lower risks. Suggested requirements include:

- Work is designed and supervised by licensed engineer or architect.
- All general contractors and design professionals provide proof of valid professional liability insurance up to $5 million.
- Eligible general contractors participate in half-day program training with an evaluation at the end; this can also be an opportunity to engage contractors in co-marketing training and promotions.
- Include background checks conducted with Ministry of Consumer Services and Better Business Bureau.
- General contractors should provide a list of licensed subcontractors to be used: electricians, refrigeration technicians, plumbers etc. in the application process, similar to the procedures for private construction loans.
- Local power utilities in Ontario offer energy audit incentives that are the entry point for accessing equipment replacement incentives. These generally require that a detailed energy audit be performed by a professional engineer, certified energy technician, certified energy manager, or certified measurement and verification professional with experience in building energy auditing.
- Third-party post-retrofit engineering assessment (on site) of the final project and scope of work performed should be conducted. This can be particularly valuable to provide peace of mind to the capital markets if the LIC assessments are sold as bonds. However, municipalities should be aware of potential liability issues related to inspecting the quality of work performed under LIC financing programs, and design their post-retrofit inspection requirements accordingly.

4. Sources of funds accessed by the municipality to finance the programs

The sources of funds available to a commercial LIC program follow closely those used by residential programs, with a few key additions.

Infrastructure Ontario (IO) Loans

At the time of writing, IO is offering favourable terms and rates for loans that could support LIC financing programs, offering long-term fixed interest rates that can be guaranteed for a period of up to two years ahead.[25]

Key advantages of the IO loans for LIC financing programs include:

- Affordable rates

[25] At the time of writing the eligibility of loans to support LIC financing programs is awaiting IO approval.

- Access to capital market financing without any fees or commissions
- Longer terms at fixed interest rates designed to match the life of the asset
- Loans that can be tailored to meet the needs and challenges of municipalities
- Flexible conditions that allow access to the loans as needed
- Significant pre-approved amounts are available for most municipalities.

While IO publishes their rates and conditions on their website, it would be up to each municipality to agree with IO on the precise conditions of any loan that may be needed.

Access to IO loans entails the following steps:

1. The municipality applies for the loan, and if accepted the total loan envelope, interest rate and terms are fixed for two years.
2. The municipality can then access the IO loan funds as needed during the two-year period, paying a lower "construction" interest rate in the interim. These funds would be disbursed by the municipality to LIC financed projects as they are completed (see Table 10 in Chapter 2 above for details on IO loan terms and rates).
3. At the end of the two-year period, the loan is converted to a long term debenture at the agreed terms and rates set upon initiation.

Municipal Bonds

Municipal bonds are another potential source of capital for an LIC financing program. However they will result in higher borrowing costs and administration fees and they are less flexible than IO loans. For a MURB LIC financing program where individual projects could exceed $1 million, it could be feasible to engage a bond agent to create individual bonds based on each project, or pool a few projects together. Given the potentially large transaction size, municipal bonds may be more attractive for MURB LIC financing than for a residential (single-family, low density) program. However, establishing aggregated bonds may require time to pull together enough projects during which work will be delayed or bridge financing will be needed to maintain project momentum.

Many US programs shy away from municipal bonds as they are less secure in the US than they are in Ontario. As a result, municipal bond interest rates are typically higher and more variable in the US than in Ontario. The secure position of Ontario municipalities suggests that this could be an attractive option for a MURB LIC financing program.

Private Capital

Many commercial programs in the US access private capital, particularly under the turn-key model and owner-arranged financing model. Again, the size of the projects and the involvement of the mortgage lenders create an opening to engage private lenders on a project by project basis, protecting the municipality from taking on a large loan obligation and hoping it can cover the interest payments through high participation rates. The owner-arranged financing option in an Ontario MURB LIC financing program would require a legal interpretation of Ontario's LIC Financing Amendment.

A private-public financed option could also be promising, wherein a private lender would establish the initial LIC financing with the property owner, providing the capital to finance the energy saving improvements. The private lender would then be reimbursed through a bond issued by the municipality in the lenders name. Under this model the private lender would provide the upfront capital, allowing the municipality to avoid issuing a large bond in advance of having a guaranteed source of income to cover it.

Other Government Funds

There are some examples where local governments establish revolving funds to provide LIC financing. These can be sourced though ratepayer fees on utility bills,[26] carbon taxes and markets or private donations and other government sources. The revolving fund can either provide the full LIC financing amount (if it is large enough), or can act as an intermediary lender, providing the upfront financing, then repackaging the LIC assessments as municipal bonds or asset-backed securities.

5. Program administration and financing terms

The program administration models for commercial PACE programs are extremely varied, from programs run wholly within the municipal administration to turn-key programs provided by third-party enterprises. Under a turn-key approach, the municipality has only to register the LIC fees on the tax register, collect the annual fees, and deliver them to third–party program providers or bond holders. This model is popular in the US and the program providers typically compete based on delivering the lowest rates to the participants. In each case a municipality can select a single LIC financing service provider to operate within its jurisdiction based on a competitive selection process.

The turn-key model is potentially available to Ontario municipalities, but to confirm its potential, further discussion would be needed with turn-key service providers, and the legality of the arrangement under Ontario's Municipal Act would have to be confirmed.

Fee structures are as varied as the administrative models. Currently, interest rates offered to LIC financing participants vary from 4%-7% and are largely dependent on the source of capital raised and the procedures for folding program administrative fees into the interest rate.

Program administrative fees in commercial PACE programs tend to be more complex than in residential programs, often involving fees at each step of the process. This is recommended as it avoids accruing large program overhead, and ensures that participants that do not fulfill all the program requirements are not burdened with the overall administration fees. It also ensures that participants will not be required to cover administrative costs associated with properties that drop out of the program. Fees

[26] Ontario municipalities are limited in their ability to establish new ratepayer fees, even for municipally-owned utilities. A ruling from the Ontario Energy Board would be required to approve such a mechanism.

from commercial PACE programs typically range from 5%-7% of the LIC financing provided. This tends to be lower than administrative fees for small residential property programs.

Fees charged by various US commercial PACE program include:

- Project fees: upon acceptance of the project, or project closing
- Servicing fees: often an initial application fee
- Jurisdictional cost recovery fees: a sum of project and closing fees
- Title search fees: often charged separately, as needed
- Annual fees: typically less than $100 to cover tax collection costs

6. Marketing and outreach: The power of simplicity

While residential owners need programs with a strong focus on simplicity (from application through implementation and collection of LIC taxes) MURB owners are more conditioned to complex management practices, financing arrangements and incentive programs. MURB LIC financing programs may include additional application requirements such as mortgage lender consent and a detailed energy audit. Still, there are strong benefits to reducing program complexity. Opportunities include rolling incentive programs into the LIC financing program, facilitating access to qualified energy auditors and contractors, and offering customer service to keep applicants on track from initiation to completion.

As with residential programs, a portion of the program administrative costs are typically borne by the participants. Thus, to keep risks low to the municipality, programs need to achieve the planned participant volumes. While financial viability may prove a reasonable criterion for program participation, onerous, confusing or overly strict application and

Impact of the Energy Saving Performance Agreement (ESPA) Program on LIC Financing Potential

The Toronto Atmospheric Fund is currently offering an energy efficiency funding program aimed at the MURB sector that will fully cover upgrade costs upfront, in return for receiving payback over a 10-year period from the building owners' energy costs savings. Given the programs 10-year payback limit, it will mostly access mechanical equipment upgrades. The target audience of this program has significant overlap with an eventual LIC financing program, which could influence program uptake.

Overall, ESPA participants will have undertaken the higher yielding energy saving improvements. In many cases this would make it difficult for the remaining energy saving measures eligible under the LIC financing program to achieve a positive cash flow. Similarly, properties that access LIC financing will likely bundle high yielding measures with lower yielding measures, which would make it unlikely that they would pursue ESPA financing in the future. Ultimately, building owners would be able to decide on which program better fits their priorities, but there would be little (if any) opportunity to access both programs for the same property.

LIC financing program marketing and communications strategies should make clear the program's benefits and how it can be differentiated from other competing financing products (second mortgages or collateralised loans) available to property owners, including the ESPA.

procedural requirements increase the risk that qualifying participants will avoid the program, thus saddling the municipality with additional administrative cost risks.

Strategies to maintain program simplicity from the participant perspective include:

- One-stop shop for LIC financing and other relevant incentive programs
- Effective customer service, such as accessible hot-line support
- Shared application procedures and requirements with utility incentive programs
- Use of established auditing tools and processes such as Energy Star, ASHREA Audits, BOMA BESt and LEED
- Focus on eligibility criteria that provide the clearest indication of project financial viability

Key marketing channels can help reach potential LIC financing participants at the time of sale or natural maintenance and renovation schedule:

- Banks and lenders
- Real-estate community
- Contractors
- Energy auditors, architects and engineers
- Tenants' associations
- Affordable housing groups

Messaging to MURB property owners is another key consideration. Based on the market scan and commercial PACE programs, a few important considerations were identified for incorporation into marketing:

Cost-effectiveness is a high priority for MURB owners, and projects typically need to offer SIR>1

- It may not be necessary for the program to set the terms of cost effectiveness for the owners, who often have their own financial criteria. The program should however ensure that owners have accurate information upfront about the financing conditions (interest rate, term, and a breakdown of the principal, interest and administration charges, etc.) to allow them to evaluate the return on the investment.
- Quality energy audits are an essential element to give property owners and bond agents confidence in the financial viability of LIC financed projects.
- Third-party engineering evaluations help to ensure the cost-benefit, and also can increase the rating of the asset-backed securities.

LIC financing does not appear as debt on a property's balance sheet, and should not undermine the building owner's access to capital for other projects. This should be clearly communicated as an attractive feature of the LIC financing, and will overcome a key barrier faced by many property owners.

While property owners see energy efficiency and environmental improvements as a tool to reinforce their brand, few recognise the value of energy efficiency measures to attract tenants.

- LIC financed energy efficiency measures often improve comfort for tenants, which in turn can increase tenant retention. This lowers the property owners' costs associated with vacant apartments and seeking new tenants.

EXAMPLE MURB LIC FINANCING PROGRAM PARTICIPANT WORKFLOW

Participants in a MURB LIC financing program would have significantly different needs than those in the small and low density residential program. This would be reflected in the program delivery workflow. To illustrate this impact, a sample workflow for a MURB program is presented below.

1) Participant completes application
    a. Provides proof of all eligibility criteria
    b. Includes instructions on energy auditing and project implementation requirements
2) Municipality reviews applications
    a. Performs first title search and approves application if eligibility criteria is met
3) Participant hires professionals to undertake an energy audit and plan for the project
    a. Energy audit performed by qualified expert (e.g. Professional Engineer)
    b. Energy audit results and proposed scope of work provided to the municipality
4) Municipality reviews energy audit results and proposed scope of work
    a. Indicates maximum eligible financing available to the participant
    b. Scope of work added to participant file: municipality approves work as eligible for program
5) Contractor(s) visit property to prepare quote
    a. Work order for LIC financed project developed from results of energy audit and initial scope of work description
    b. When property owner and contractor agree – they sign contract based on work order
    c. Copy of contract provided to the municipality to be added to participant file
6) Municipality and property owner sign financing agreement based on approved work order
7) Contractor performs work
    a. Property owner or owner's agent supervises the work
    b. When complete, contractor informs property owner
    c. Property owner issues Request For Disbursement (RFD) to the Municipality for work performed according to the contract
8) Third-party auditor produces work verification

   a. Prepares a post-project evaluation report[27]
   b. Results provided to property owner and municipality

9) Municipality receives post project evaluation report and RFD
   a. Second title search (ensure property owner still owns property)
   b. Release cheque in name of property owner corresponding to the verified scope of work performed under the LIC financing contract.

10) Property owner pays the contractor, indicating final sign-off on the work

[27] The verification report can range from a simple verification that the scope of the work performed meets the description in the LIC financing contract, to a detailed quality assurance inspection, depending on the program design.

M&E FRAMEWORK

4. MONITORING AND EVALUATION FRAMEWORK

The Monitoring and Evaluation (M&E) of LIC financing pilot programs is an essential step in gathering the results and benefits of the programs and communicating these to the relevant stakeholders. The interim monitoring results and evaluation reports can be used to improve program implementation practices while the pilots are underway. Final program evaluations are essential to argue the business case for expanding the pilot program models more broadly across the province.

The M&E framework presented below is designed primarily to respond to the needs of small and low density residential property LIC financing pilot programs. However, the overall strategy and approach can also be applied to MURB LIC financing pilot programs, with some important differences noted in the final section of this chapter.

Given that the pilot programs' M&E budgets will be limited, we recommend an M&E framework that focuses on evaluating the program process, to tune the LIC financing program model and address the greatest risk to the pilot program success (i.e. less-than-anticipated uptake rates). By focussing evaluation efforts on the program processes, the M&E budgets will be used most effectively.

Monitoring program indicators and evaluating the program impacts can be largely achieved by recording information available through the participant applications, contract documentation and the participant Request for Disbursement forms. Moreover, the ERS evaluation results available to program administrators through the ERS database provide a valuable source of program performance information, and it is recommended that programs rely on this data to collect the majority of their performance indicators.

Monitoring efforts should collect data on program performance metrics, such as financing delivered, estimated energy and water savings achieved, and number of measures installed. These will provide valuable indicators of the program performance and can be used to meet the programs' reporting needs before council and funding partners. The evaluation reports will interpret the significance of gathered program performance data, and dig deeper into various program processes and impact indicators.

It is recommended that the municipalities coordinate through the CHEERIO Working Group to establish a common list of core program data, and develop a database to record it in a consistent manner. A deeper pilot study that compares the results and gathers best practices from all the pilot programs should be performed through the CHEERIO Working Group to build the case for applying LIC financing for energy and water savings improvements more broadly.

Finally, LIC financing programs directed at MURBs will encompass an additional set of M&E challenges, chief among these is the lack of a consistent energy and water saving evaluation tool like ERS. Program administrators will likely have to develop more comprehensive data gathering tools to meet their M&E needs for MURB programs.

Table 34: Summary of M&E Reports, Objectives and Collected Data

Reports and Studies	Objective	Data Collected
Quarterly Monitoring Reports Contains a tabulation of program performance data.	Tracks program performance indicators and assesses data quality during implementation	The monitored data should include the full set of participant data, along with other collected data, including: • ERS database results • Estimated energy savings • Measures installed • Participation rates, financing awarded, etc.
Process Study Determines program implementation effectiveness, at an interim and final stage.	Indicates if the program is being delivered as intended and recommends adjustments to improve effectiveness.	• Surveys and interviews with applicants, participants, program drop-outs • Interviews with program administrator(s) • Interviews with marketing partners, CEA and contractors • Review of program design and marketing materials
Impact Study Performed at the end of the pilot program to provide insights on program performance to all stakeholders. Ideally, it should be released publicly.	Energy and water savings	• Estimated savings from ERS modeling software • Calculated or deemed energy savings (for measures not included in ERS and renewable energy systems) • Deemed water savings
	Environmental protection	• GHG emissions calculated from energy savings • Qualitative evaluation of well and septic tank improvements
	Increased local economic activity	• Total LIC financing disbursed to property owners • Value of associated self-financed improvements by participating property owners, and program drop-outs • Administration expenses invested • Purchase of goods and services / job creation • Energy bill savings for participants
	Improved building stock	• Number of renovations and specific improvements • Statistical analysis of overall property value • Estimate value of non-energy benefits to participants
Province-Wide Pilot Study This would capture the collective results of the various pilot programs, and provide a validation for broader program implementation.	Collective process and impacts study	• A standardized database for all pilot program datasets, allows for easy aggregation of province-wide results • Comparing process studies, or pooling funds into a multi program process study reveals best practices
	Financial Impacts and Risk Evaluation	• Tax, LIC repayment and mortgage default rates • Program budgets and actual costs to municipalities
	Market Study	• Focus groups and demographic studies of target markets • Update on market status of energy and water saving improvements

4.1 BACKGROUND ON M&E PRACTICES FOR ENERGY EFFICIENCY PROGRAMS

M&E is an essential element of a successful program and should be embedded into the design of every municipal LIC financing program. M&E provides the information to communicate program progress to all stakeholders.

Monitoring is the systematic and routine collection of program data that allows program administrators to track the internal and external accountability of the resources used and the results obtained. Monitoring should be a periodically recurring task that is planned prior to the program initiation, and is carried out throughout the program implementation, and possibly beyond.

Monitoring checks progress against the planned performance, provides the data needed to carry out evaluation studies and informs the decision-making processes. Monitoring results may be reviewed at regular intervals throughout the program implementation (monthly, quarterly or upon completion of program milestones) by the administration team to track the program performance and inform adjustments.

Evaluation is a deeper, objective assessment of the completed program, pilot or phase. Evaluations appraise data and inform strategic decisions, thus improving future programming actions. Evaluations draw conclusions about the program's:

- Relevance
- Effectiveness
- Efficiency
- Impact
- Viability

Evaluation studies are typically performed by an objective third-party that can provide an analysis or interpretation of the collected data that delves deeper into the relationships between the results of the program, the effects produced by the program and the overall impact of the program.

EVALUATION STUDIES

Program evaluations can cover a range of program features and impacts. Specific studies are identified within evaluation plans to capture the program's effectiveness and communicate the results achieved.

Process studies concentrate on assessing how efficiently and effectively the program is delivered. They are a valuable tool for improving program implementation and delivery, as well as identifying strategies to increase participant satisfaction with the program. They can be particularly useful when carried out mid-stream during program implementation, or at the end of a pilot phase. Areas reviewed include incentive and financing conditions; communications and promotional materials; program operations,

administration and accountability; participant awareness and participant satisfaction with energy and water saving improvements; and qualified contractor or service organization awareness and satisfaction.

Impact studies seek to quantify the program results. These typically focus on estimated resource (energy and water) savings generated by the program and associated GHG emission reductions. They can also cover other economic benefits generated by program expenditures such as job creation and increased economic activity. Impact studies usually also include cost-effectiveness assessments that compare the overall investments made in the program activities (by program administrators and participants) with the returned benefits. Depending on the evaluation objectives, gross impacts may be adjusted to account for program spill-over or free-riders and rebound effects.

Market studies evaluate the program's effectiveness in increasing the market penetration of energy and water saving measures. Market studies include assessing market potential and market penetration over time through a review of the availability, accessibility, adoption rates and affordability of energy efficient technologies and measures.

Pilot studies aim to evaluate the effectiveness of a new program before it is unfolded across a region, province or utility service area. A pilot study will determine the potential risks in the energy savings estimates, as well as delivery effectiveness and consumer acceptance. While it may not be as comprehensive as an established program evaluation study, a pilot study may comprise a higher portion of the administration budget as its goal is to gather program design feedback through a limited pool of projects.

LESSONS LEARNED

In designing this M&E framework we reviewed evaluation plans and reports from a range of residential energy efficiency programs to identify best practices and appropriate strategies. The reviewed studies covered four PACE programs in the US (Maine, Berkeley, Boulder and Sonoma County), as well as two Canadian home retrofit programs (RenoClimat and Enbridge Gas Community Home Retrofit Program). A series of other industry reports and state-wide energy efficiency program evaluations were also included in the research.

1. Municipal energy efficiency financing programs typically have limited M&E resources and thus should focus on process studies to improve implementation

- Comprehensive energy efficiency program evaluation budgets typically represent 5%-10% of the overall spending in incentive programs, but comprise less than 2% of total financing program spending (financing expenditures and administration costs).
- Evaluation plans should confirm the program's ability to deliver on the primary objective(s), and should focus on identifying and responding to the greatest risks to the program.

- Falling short of planned participant uptake rates likely poses the greatest risk to LIC financing pilot program sustainability and success. Thus tracking and improving the program implementation must be a high priority for the program M&E framework.

2. Tracking participant uptake and retention are central to LIC Financing Pilot Program Process Studies

- Tracking the numbers of information session attendees, applicants and participants at each stage of the program can help to pinpoint the program barriers or bottlenecks. This is valuable information for a process study.
- Evaluating the program marketing and outreach activities can be difficult as marketing evaluation criteria is largely subjective in nature, and opinions can vary widely. It can also be difficult to separate marketing influences from other program barriers and benefits in the analysis, and thus the program design and process should be considered alongside the marketing activities evaluation. Moreover, program administrators should consider the impact of changing the marketing message and strategies on co-marketing partners (contractors).

3. Assessing increased local economic activity is often the primary impact studied in municipal financing programs

- All of the three municipally delivered US PACE program evaluations put an emphasis on the local economic impacts of the program. This likely indicates that municipalities prioritize the economic impact of energy efficiency financing programs, over the simple energy and water savings.
- There was a wide range of economic impact results depending on the extent of the evaluation performed and the inclusion of indirect and induced economic activities. Results show between three and ten job-years per million dollars in program spending (depending on program type and the specific region) but some studies found estimated impacts of up to 43 job-years per million dollars.
- The programs typically have a multiplier effect in the local economy. For example, the Boulder FIRST program economic impact study estimated that every dollar in program spending produced over $3 in new economic activity, and about 60% of this was taking place within Boulder itself(Marshall Goldberg, 2011).

4. In-depth analysis and verification of energy savings is likely too onerous a process for LIC Financing Pilot Programs

- Utility energy efficiency programs typically require in-depth evaluation and verification of resulting energy savings to respond to energy regulators' requirements. However, municipally run financing programs are more often driven by local economic objectives, and thus invest less of their evaluation budget in energy savings verification, but are more likely to evaluate overall local economic impacts.

- Municipal energy efficiency financing programs that are not delivered by LDCs and are therefore not subject to the Ontario Energy Board's (OEB) regulatory compliance requirements, and are not obligated to verify the energy and water savings achieved.
- Most energy efficiency financing programs still demand the participants' consent to access utility billing information for a full year prior to the project, and for up to five years following. It is noted that a single year of post retrofit bill analysis may not be sufficient to estimate annual savings over the longer term.
- Detailed billing analysis and the establishment of net-to-gross ratios are likely too expensive processes for most municipal financing programs to carry-out in an accurate manner. Moreover, billing analysis results from a limited pilot program will not carry much relevance to future program activities.
- Determining energy savings through recognised software modelling tools (HOT2000, EE4 etc.), deemed savings analysis or engineering algorithms provide an efficient and affordable means to estimate the program's gross energy savings.

5. Participant and administrator interviews are valuable for tools in process studies, but they need to be designed and performed carefully to achieve meaningful results.

- Interviews can be an important tool in process studies and can also support the impact analysis. For instance, surveys and interviews that ask participants to indicate the number and extent of new energy savings improvements they included in their renovation project can be used to assess the net energy savings attributable to the program. Free-ridership and other market effects are also routinely evaluated though surveys, where required for LDCs meeting regulatory reporting obligations.
- Evaluators should recognise that statistical bias can easily appear in interview and survey results which can reduce the accuracy of the findings. Interview data can be subject to many sources of bias including: selection bias, non-response bias, error in measuring variables, sample homogeneity bias, outlier data points; and missing data (KEMA, 2010).
- It can be difficult with limited M&E budgets and small participant sizes to achieve statistical significance from participant interviews and surveys. In designing process studies for the pilot programs, there should be sufficient flexibility in the interview process to gather anecdotal responses pertaining to the program delivery and implementation.

4.2 M&E FRAMEWORK DESIGN

Monitoring and evaluation of LIC financing pilot programs will serve to accomplish three objectives:

1) Tracking program performance and providing feedback to program administrators that enables them to adjust program delivery and implementation to increase program uptake and impact;
2) Measuring indicators of program impact and success for reporting to municipal council, program funders and other program sponsors, and;
3) Collecting data and lessons learned from the various LIC financing pilot programs to allow an overall evaluation of the LIC amendment, and the potential for longer term and province-wide programs.

Programs will likely have limited resources to pursue M&E activities, and thus it is important to select M&E studies that will have the greatest benefit in meeting various stakeholders' needs. Moreover, we recommend that M&E studies focus on the aspects that carry the greatest risk for the program, in particular the participant uptake and retention rates.

M&E activities should be planned carefully at the time of the local program design by applying the following steps:

1. State clearly the primary program objectives (i.e. energy savings, economic development or environmental protection), and identify areas of highest risk for the municipality.
2. Identify internal and external reporting requirements – such as obligations to sponsoring utilities or funding agencies, key stakeholders to be kept informed, Municipal Council requirements.
3. Establish M&E timeframe and reporting milestones – quarterly indicator reports, mid-term evaluations, and final evaluations.
4. Establishing a budget in the context of the overall program administration expenses and match expectations to fit within the M&E budget.
5. Determine M&E technical factors, such as data collection requirements, storage methods and evaluation reporting format.

STEP 1: LINK M&E OBJECTIVES TO PROGRAM GOALS

Unlike utility-administrated energy efficiency programs, municipal LIC financing programs may have primary objectives that go beyond simply reducing energy efficiency within the local community. Identifying the motivations driving the program development will play an essential role in selecting the M&E studies needed to confirm the program's success in achieving these objectives.

Municipal LIC financing programs are typically motivated by the following benefits.

- Energy and water consumption savings

    - Reduced strain on local energy and water infrastructure
- Environmental protection
    - Reduced GHG emissions and pollution from energy consumption
    - Reduced use of fresh water and risk of local water pollution
- Increased local economic activity
    - Encourage new and expanded renovation projects
    - Utility bill savings for participants
    - Improved housing affordability from bill savings
    - Job creation and training
- Improved local building stock
    - Encourage deferred maintenance projects such as roof repairs, upgrades, etc.
    - Improve water access and treatment systems such as well upgrades and septic tank replacement
    - Mitigate risks from weather disasters by installing sewage backflow protectors (any other health & safety items, smoke/CO detectors, removing asbestos etc.)

Establish Costs and Risks to the Municipality

Understanding what program costs the municipality is incurring can help identify potential areas for M&E focus. Even LIC financing programs that are designed to be cost-neutral can carry risks that could lead to the municipality taking on certain program related expenses. The risks include:

- Insufficient program participation rates to fully recover administration costs (through administration fees and/or LIC interest rate riders)
- Overruns in program administration costs
- Failure to meet external funding partner requirements that may threaten sources of administration funding

In other cases the municipality may have chosen to invest some of its own funds to cover administration costs. Given that LIC financing is a new mechanism in Ontario, there is little evidence upon which to build participation rate projections, and thus it is clear that this risk should be monitored closely through M&E activities in all pilot programs.

STEP 2: IDENTIFY INTERNAL AND EXTERNAL REPORTING REQUIREMENTS

The results of M&E studies form the basis of communication to the program stakeholders, and thus the M&E activities should respond to the stakeholders' specific information and reporting needs. This is especially important for the pilot LIC financing programs, where the M&E results will play a major role in determining the future of LIC financing across the province's municipalities for years to come.

Stakeholder M&E Needs

1. Elected Officials (Municipal Councillors) may use the M&E reports to support budgetary decisions, drive strategic priorities, support communications with and presentations to professional associations and the public at large.

The LIC financing program may have a champion on municipal council who spearheaded the effort to approve the program. It may be worthwhile to check back with them to review the key arguments that carried the motion through council and ensure that the M&E studies will capture the relevant program results.

2. Internal Reporting is important to track program performance and follow the program's marketing efforts and financial management. Regular reporting of performance indicators and program status can support an iterative approach to the pilot program implementation and development. Programs may also be subject to internal municipal audits.

3. Program Partners and Sponsors (such as funding agencies or energy utilities) often include reporting requirements in their offers of support for the program. Successful reporting can be critical to continued support for the pilot program. The evaluation obligations attached to the support must be captured and included in the program M&E design from the start, and flagged as essential elements during any M&E plan streamlining activities.

4. Public Reporting can also play a critical role in ensuring the long term continuance of the pilot program activities by generating interest and continued support for the program.

Utility Evaluation Requirements

If utilities sponsor LIC financing programs locally, by providing administration funds or other in-kind staff support, it is reasonable for the municipality to agree to provide information concerning program results to the utility. However municipalities should be cautious about agreeing to provide statistical program evaluation results such as net energy savings, cost-effectiveness tests or statistical billing analyses, or adhering to International Performance Measurement and Verification Protocol (IPMVP) requirements.

These studies offer marginal benefit to the municipality and can be expensive to undertake; they would pull the limited M&E resources away from process and pilot study activities which are more useful to municipal program administrators. Instead we suggest that municipalities agree to collect and share key program performance data with sponsoring utilities, so that the utilities can perform the detailed billing analysis and cost-effectiveness tests required by their regulators.

STEP 3: SET M&E TIMEFRAME AND MILESTONES

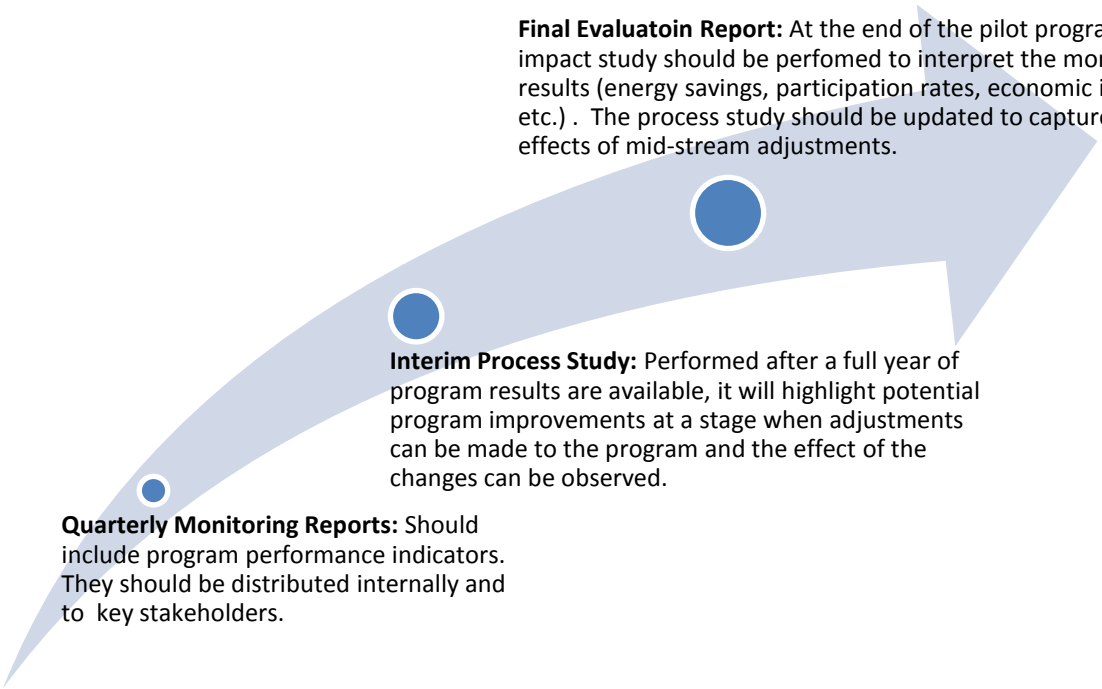
Program administrators will want to ensure that the M&E studies and results are available to meet various program requirements, depending on the pilot program length, activity schedules and uptake rates.

Quarterly Monitoring Results Reports: By compiling performance statistics from the program database on a regular basis, program administrators will have regular feedback about the program performance. Reports should be simple and straightforward, presenting the key performance indicators, such as number of participants, financing totals, average energy savings per project, etc. Tracking this early and often can be accomplished with a minimal time investment, and will allow the program administration team to identify and address implementation challenges as they arise.

Interim Evaluation Study Reports: For pilot programs of reasonable durations (more than two years) it may be advantageous to include an interim evaluation report that provides an analysis of program processes and indicators. These should be scheduled early enough in the program implementation cycle to ensure that the findings can feed into program administration practices. This can be particularly valuable for process studies that may point to adjustments in the marketing, application or program requirements processes.

Final M&E Reporting: Upon completion of the program, the M&E reports should be prepared and published. The work should start prior to program wrap-up to ensure that key members of the program administration team are available to provide input and for interviews, and allow easy access to the program data. The final M&E reports should be available to the relevant stakeholders at a time that meshes well with their review and decision-making schedules, considering reporting deadlines to program sponsors and municipal council to name a couple.

Figure 13: Pilot Program M&E Reporting Timeline



STEP 4: MATCHING M&E BUDGET TO PROGRAM PRIORITIES

Allocating adequate funding to capture the needed information will likely be an important challenge facing LIC financing program administrators. Utility energy efficiency programs typically budget 5%-10% of the total program outlays for evaluation, monitoring and verification. Thus, for an incentive program with a $10 million budget, up to $1.0 million could be available to evaluate and verify the program's performance.

For a municipal LIC financing pilot program it is recommended that the M&E budget be determined as a function of the program administration budget, as opposed to the overall total financing envelope. For a program with a total financing budget in the order of $10 million, the administration fees may represent only $800,000 to $1.0 million. Setting the M&E at 10% of this figure results in an upper limit of $100,000 for M&E activities, about one tenth the M&E budget that would be allocated for a utility DSM incentive program.[28]

Fortunately, municipal LIC financing programs do not have the same reporting obligations to the OEB as utility financed programs, and through access to the ERS database they will have accurate estimates of simulated savings to use in their reporting. The remainder of the resources therefore should be available to track and assess the program processes and non-energy impacts.

Table 35: Recommended M&E Budgets Based on LIC Pilot Program Size

Program size	Administration budget for 3 years	Recommended total M&E budget
100 participants per year	$ 390,000	$ 40,000
250 participants per year	$ 790,000	$ 80,000
500 participants per year	$ 1,350,000	$ 135,000

[28] For example, Efficiency Maine Trust set the budget for evaluation studies at $500,000 for its $30 million PACE financing program which had approximately $5 million allocated to administration and marketing cost. Their evaluation was performed by external consultants Opinion Dynamics with support from Dunsky Energy Consulting, who examined the program delivery processes, evaluated the program impacts and verified the gross and net energy savings achieved. Evaluation activities include: a review of successful practices, a review of program materials, in-depth interview with program staff, energy advisors and vendors, as well as telephone interviews with program participants, drop outs, non-participants.

Setting precise budgets for M&E activities can only be done on a program by program basis, considering the resources available and reporting obligations. As a guideline, it is recommended to capture the greatest portion of the monitoring activities within the general program administration budget lines as possible. For specific evaluation and reporting costs, these would likely breakdown along a 70% to 30% ratio for the allocated M&E budget for the Process Study and Impact Study respectively.

STEP 5: DESIGN M&E TECHNICAL FACTORS

Finally, once the budget, timeline and reporting requirements are well established, the program administrators should select the program performance indicators, and identify the fields to include in the program database. The two primary sources of information to feed into the database will be the ERS database, comprised of ERS report results compiled by NRCan, and the participant applications, contracts and request for disbursements. A database should be established within the program administration office to record and track program and participant data for M&E and other program administration purposes.

We recommend that the municipalities coordinate through the CHEERIO Working Group to establish a common list of core program data, and develop a database to record it in a consistent manner. This would provide a dataset making it possible to carry out a province-wide pilot study of the initial LIC financing program results. Programs should also request access to participant energy and water billing information. While it is likely beyond individual programs to perform billing analysis of their participants, the billing information could feed in to a province-wide evaluation.

4.3 MONITORING PROGRAM PERFORMANCE

Monitoring activities involve the systematic collection and review of program metrics and performance data. It is recommended to invest some time early in the program design to identify the most important metrics and to design the program tools to gather these during implementation. The data collection and storage tools should be simple to use, comprehensive and flexible enough to ensure that the program administration team will keep it updated and will be able to quickly and easily access information when needed.

Systematic: the same full data set is collected for all applicants and participants at set milestones along the project implementation schedule.

Timely: Some information is ONLY available during the project implementation, or may be extremely difficult to access after a participant has completed their project. Data collection should record information at the time it is available for review and evaluation studies performed later.

Sources of Information:

- Application forms, participant contracts and Requests for Disbursements
- pre and post retrofit ERS evaluation reports, ERS database
- Municipal property tax records
- Energy and water utilities
- Contractor pre-qualification applications and reports

Programs that require ERS for small residential properties and detailed audits for MURBs should base a significant amount of their monitoring on the information available from those tools. ERS in particular collects and tracks a significant amount of participant data, including *ex-ante* estimated savings that can streamline data collection.

PARTICPANT DATA

The information gathered from the participant applications and contracts can provide useful program metrics. The participant data should be included in the M&E database to the extent that the Privacy Act permits. It is worth keeping in mind that the application process needs to be kept light to encourage participation, and the M&E activities should not cause program administrators to add a series of new fields to the existing application.

Key parameters may include:

- Participant address: neighbourhoods, postal code, municipality etc.

- Participant financial status: property assessed value, history of tax and mortgage payments, credit scores and household income (if requested)
- Participant demographics information: age of property owner(s), number of residents etc.

PARTICIPANT UPTAKE AND RETENTION

Collecting and storing information about applicants, participants and program drop-out rates provide valuable program metrics for evaluating the program administration and marketing efforts.

Table 36: Program uptake and retention metrics

Program applicants and marketing efforts *An applicant is considered any property owner who initiates an application to the program. A participant is any successful applicant to the program*	• Number of attendees to public information sessions explaining the program • Website hits • Program brochures distributed • Number of marketing partners (i.e. qualified contractor and energy evaluators) • Number of applications initiated and completed • Number of rejected applications: classified by reason application was rejected
Participation rates *Enrolled participants are those who have been accepted to the program, but have not completed their project and received the LIC financing.*	• Number of participants currently enrolled • Number of signed contracts in process • Total dollar value of projects currently under way • Number of projects complete • Total dollar value of completed projects • Number of pre and post retrofit ERS evaluations completed
Program drop-out rates *A drop-out is a participant whose involvement in the program terminates at any time after their application is accepted and before financing is disbursed. Termination can be initiated by the participant, or the program administrator.*	• Number of participants who do not to carryout pre-retrofit ERS evaluation • Number of participants who do not carry-out post-retrofit ERS evaluation • Number of participants who do not submit final RFD • Where possible, program drop-outs should be categorised between those who fail to meet the program requirements, those who chose to self finance the projects, and those who cancel the planned improvement projects.

Information from non-participants, or program drop outs can be particularly valuable to program evaluators, however, it may be difficult to obtain since the program cannot obligate them to provide information. Where possible, assessing the extent to which non-participants and drop outs carryout similar energy and water saving improvements can indicate program spill-over (people influenced by program materials, or who elect to drop out of the program and self-finance their projects) and establish baselines. Typically targeted surveys and interviews are needed to gather these results.

FINANCIAL INDICATORS AND ECONOMIC DATA

Program administrators and tax collection departments may have access to financial and economic data that can be useful in monitoring the program.

Table 37: Financial and economic metrics

Program administration costs	• Annual fixed program administration costs • Annual variable program administration costs • Program marketing costs
LIC financing costs and revenues	• Municipal loan processing costs (to establish new loans or bonds) • Annual municipal loan interest payments • Current outstanding municipal loan value • Total annual LIC repayments collectable

Participant financial data
 	
(It may be desirable to track program participant financial metrics both during program implementation and for the extent of the LIC repayment period.)
	• Status of property taxes accounts and LIC repayments
	• Total LIC financing/assessment
	• Total value of renovation project (if participants are self-financing a portion)
	• Number of participants currently in arrears on LIC repayments or property taxes
	• Participants in arrears during current year
	  ○ Number of participants in arrears
	  ○ Annual participant arrears-months (collective magnitude and duration of outstanding payments)
	  ○ Number of forced tax sales on properties carrying LIC repayment assessments

USING THE ERS DATABASE FOR TRACKING AND RECORDING PROGRAM METRICS

Small and low density residential programs that require participants to undertake pre and post retrofit ERS evaluations will have the opportunity to leverage NRCan's ERS database to gather valuable information about the participants. The data provided to program administrators is a "snapshot" of the home at the time of each evaluation.

Accessing this information from the ERS database adds further value to the investment made by participants as it allows program administrators to streamline their data collection processes, and thus set lower participant administration charges. Moreover, NRCan performs QA/QC evaluations on the CEAs and Service Organizations to ensure that the ERS evaluations are performed correctly and provide accurate results.

The ERS modeling of estimated energy applies a set of standard operating conditions that includes electrical base load (including lighting and appliances) and hot water consumption. Therefore, improvements by homeowners in these areas are not reflected in the estimated energy use and calculation of energy savings.

Program designers are encouraged to contact NRCan early in the program design process to determine how NRCan data can best support program design, delivery and evaluation. With a signed data sharing agreement, program administrators are provided with full homeowner name, address, and contact information for program participants along with data. The ERS database with the forward service area (first three digits of the postal code) is available for research purposes.

Accessing ERS Data from NRCan

NRCan will transfer data, from electronic files, collected from qualifying ERS pre-retrofit "D" evaluations and qualifying ERS post-retrofit "E" evaluations performed on properties participating in the program.

To facilitate the identification of electronic files of participating homeowners licensed Service Organizations/Certified Energy Advisors performing an ERS evaluation on a participating property will be required to indicate that the homeowner is a participant in the Hot2000 file, thereby "tagging" the file for transfer purposes.

The ERS data will be electronically transferred in Microsoft Excel format via File Transfer Protocol. NRCan will provide the data bi-weekly and shall include all file data received in the ERS database since the previous transfer.

Table 38: Program metrics and information available from the ERS database

Participant and property information	• Participant address • Floor area, footprint and number of housing units • Year of construction • Number of above ground storeys • Number of occupants • Type of house: (i.e. row house, duplex etc.)
Building characteristics, and energy and water saving measures *Program administrators can confirm the completion of measures of interest by comparing the pre-retrofit evaluation and the post-retrofit evaluation results.*	• Furnace type, efficiency and fuel type • Supplemental heating system (i.e. Fireplace) • Heat pump systems: ground or air source (or water source) • Domestic hot water heater efficiency and fuel • Draft proofing • AC type and COP • Ventilation systems (HRV) • Insulation values (walls, ceiling, basement, exposed floors) • Windows (Including type and number of windows) • Low flow toilets • Solar PV and solar hot water systems

Energy performance information
 	
Energy savings can be calculated by comparing the energy use in the pre- and post-retrofit evaluations.
	• ERS Scores
	  ○ Pre-retrofit (based on current configuration)
	  ○ Projected potential (based on recommended measures)
	  ○ Post-retrofit (based on completed measures)
	• Air-tightness – Air changes per hour at 50Pa of depressurisation (ACH50)
	  ○ Measured ACH50 pre-retrofit
	  ○ Measured ACH50 post-retrofit
	• Total modelled energy savings (A – C)[29]
	  ○ A= Baseline consumption
	  ○ B= Projected consumption – after proposed improvements
	  ○ C= Estimated consumption – when improvements are complete

[29] In ERS, standard operating conditions assume a fixed amount of energy use for base electrical load (including lighting and appliances). In addition, AC energy use is currently not included in the calculating of energy use, but will be in the next generation ERS due in 2014. Changes to lighting and appliance energy use are also not captured by ERS.

MEASURES NOT INCLUDED IN THE ERS DATABASE

The ERS database is primarily focussed on the energy performance of buildings. LIC financing programs may allow the inclusion of a range of non-energy saving improvements, or equipment not captured in the EnerGuide process. This may include water savings, deferred repairs and general building improvements and the installation of novel equipment such as high-voltage electric hybrid car hook-ups, wind generators, and domestic hot water heat pump systems.

Municipalities that wish to monitor the install rates and impacts of these measures will need to establish additional data collection and recording procedures. It is recommended that measures not captured in the ERS database be described clearly in the participant project description in the initial financing contract. Confirmation of the completed measures should be part of the RFD procedure, including a checklist of planned measures, accompanied by contractor receipts.

Table 39: Project data NOT recorded in the ERS database

Measures and novel equipment	• Non-energy saving improvements (repairs, backflow preventers etc) • Wind generators • Low flow showerheads, aerated sink faucets • Electric vehicle plug-ins • Drain water heat recovery units • Solar PV energy generation in excess of the base lighting and appliance needs of the host building[30]
Project data	• Project and individual measure costs • Estimated energy savings for individual measures • Measure estimated useful life

[30] In the ERS energy savings estimates, electricity generated by solar PV is used to offset the electrical energy load. As a result, in ERS evaluations the maximum estimated energy savings from solar PV is limited to the building's base electrical energy load, even if the actual system output exceeds this amount.

4.4 PROCESS EVALUTAION STUDY

The process evaluation seeks to determine the gaps between program design and program implementation (the extent to which the program is being implemented according to plan). It also serves to provide program administrators valuable feedback on various delivery components, both for accountability to program stakeholders and to help improve and refine the program.

The object of process evaluation can be very broad, as any program component can potentially be studied. Therefore, the evaluation should focus on elements that are most critical to the program's success or that represent a significant risk:

- **Marketing and outreach**: Participation is key to the LIC financing program success, as too few participants will result increased administration costs per project, which may lead to increased costs for the municipality. Low uptake rates will also reduce the overall pilot program impact and justification for future expansion or continuance. Process evaluation will assess the effectiveness of marketing and outreach efforts, help identify the best strategies, and share these strategies across the different programs.
- **Market evaluation**: LIC financing is offered to help realize new retrofit projects that would not have been done without the program or help expand the scope of existing projects. There must be a clear link between market barriers, program components, and outcomes. Financing must be granted to applicants to help them increase the number and/or scope of retrofit jobs that would have occurred without the program.
- **Application process and drop-out rates**: Experience of other financing programs has shown that the application process must be as seamless and straightforward as possible, with few steps and paperwork for the applicant. Process evaluation will help identify areas where the application process might be simplified, and where the program processes or eligibility criteria may be turning successful applicants away from the program.
- **Financing offering**: The financing conditions (interest rate, repayment period, eligibility criteria, etc.) must be competitive compared to the market's other financial offerings, and these conditions must evolve as the market conditions change. A survey of financing interest rates offered on private financing institution websites or published in newspapers may provide insight into current market rates.
- **Internal management/application processing**: The internal management process must be efficient to effectively process the applications at low cost while providing timely information to all concerned parties and ensuring that the funds are properly secured and recollected.

Because of the small scale of the pilot projects, the process study will rely on low-cost, easy-to-implement methods:

- The **program design and logic model will be compared** to the actual implementation.
- **Surveys and interviews** with program applicants, participants, drop-outs, administrators, energy advisors and contractors will help gather information on various program components

- Some **program metrics** will be helpful in informing the process evaluation, including the participation rates, number of file applications that have not been completed, default rates, and average loan amounts.

For applicants, on-line surveys can be used as a convenient way to effectively gather useful insights at low costs. Interviews with a small sample of program participants and drop-outs can garner further information about the program experience.

The program administrators and a small sample of contractors and energy advisors should be interviewed. Semi-structured interviews can be used to this end. While the applicants' survey previously mentioned will be composed of pre-defined questions that do not allow for any diversion, the semi-structured interviews are open, with varying levels of details on the different themes depending on the interviewee's experience with the program, and allowing new ideas to be brought up during the interview. An interview guide to be used by the interviewers will be prepared in advance, providing a list of questions to pose, and prompts for furthers details depending on the responses given.

Interviews with program administrators should be extensive enough to cover all the important program components. Depending on program implementation, they may include third-party vendors (for example, a financial institution in charge of the loan processing).

APPLICANT AND PARTICIPANT SURVEYS AND INTERVIEWS

Method 1: On-Line Survey

Sample: Try to reach all applicants. Maximize cooperation by offering prizes.

Main information gathered

- General level of satisfaction with program and with program components
- Extent to which financing helped expand scope of retrofit work
- Application process (complexity from the applicant's point of view)
- Extent to which financing offering is interesting and competitive with other market offerings

Method 2: Interviews

Sample: Try to reach a sample of participants and drop-outs.

Information gathered

- More detail on the information sought in the surveys
- Primary motivation(s) for leaving/staying in the program

PROGRAM ADMINISTRATOR INTERVIEWS

Method: Semi-structured interviews

Sample: Can include just a single highly relevant administrator, or a number of members of the team. It is important to ensure that every major program component is covered (for example, when some components are delivered by third-party vendors).

Main information gathered

- Detailed information on actual implementation compared to program design. Reasons why implementation has been different from program design (if relevant)
- Efficiency of internal management
- Communication between different administrators (tax collection department, program administrators, third-party vendors).
- Review of marketing and outreach activities, insights on their effectiveness to increase participation and program awareness
- Any general feedback to help improve the program

ENERGY ADVISOR AND CONTRACTOR INTERVIEWS

Method: Semi-structured interviews

Sample: Small sample (10 to 20 advisors and contractors, depending on available budget for evaluation and number of contractors involved in the program).

Main information gathered

- General level of satisfaction with program and with program components
- Extent to which financing helped their clients to expand scope of retrofit work
- Description of co-marketing activities they engaged in, and feedback on marketing material and outreach activities
- Feedback on information and training offered by program to advisors and contractors
- Any general feedback to help improve the program

The process evaluation activities for all the pilot programs could be grouped and performed by a central body such as the CHEERIO Working Group. While this would offer an economy of scale, and consistent methodology, it might be a challenge to coordinate among the varying implementation dates and reporting requirements. For example, a participant survey could be designed and delivered through a single on-line platform, thus reducing the costs of each evaluation. At a minimum, evaluation results and lessons learned should be shared between programs to ensure program improvement.

4.5 PROGRAM IMPACT EVALUATION STUDY

The impact study aims to capture the quantitative program results and evaluate the program's effectiveness in meeting its objectives. It is recommended to spend a smaller portion of the M&E budget on the impact study than on the process study. The impact study should be based largely around interpreting the collected program metrics and monitoring data, with some additional research to gather other relevant program impact data if necessary. It should provide stakeholders with a clear indication of the success the program has had in meeting the program objectives, as expressed through the program indicators identified in the program design.

ESTIMATED ENERGY SAVINGS

It is recommended that the impact study apply a savings analysis to estimate the resulting energy savings. For each property that completes the post-retrofit evaluation an estimate of the total annual energy savings achieved is generated by the CEA using the HOT2000 modeling software and entered into the ERS database.

Savings from software modelling results is chosen because it can be calculated from existing program metrics (ERS database). This is calculated as the total of estimated energy savings in the ERS database as determined in the post-retrofit evaluation. For measures not included in the ERS database, deemed savings, engineering algorithms or software modeling of savings can be used and added to the ERS database totals.

This will yield the gross estimated energy savings attributable to the LIC financing program activities. It does not attempt to indentify the portion of savings that would have happened even in the absence of the program (free-ridership), or the amount of savings that occurred as a result of non-participants being influenced by program information materials and marketing (spill-over). It is expected that these two factors will largely cancel each other out[31], and that reporting the gross estimated savings will satisfy local reporting requirements.

[31] The PACE Maine program Impact evaluation concluded that the program spill over exceeded the free ridership rate, resulting in a net to gross ration of 1.072 (Opinion Dynamics, 2012). It was notable that there was a significant influence from applicants who performed an energy audit under the program, but then withdrew their application for PACE financing, electing instead to undertake the audit recommendations with alternative funding sources.

DEEMED WATER SAVINGS

The ERS database does not include a field for estimated water savings. Municipalities may wish to add this field to their own program monitoring database by applying deemed water savings factors for low flow toilets, showerheads and aerated faucets. Table 40 below provides deemed water savings for each measure.

Table 40: Deemed water savings estimates for residential fixtures

Measure	Key Assumptions	Water Savings (m^3/year)
Low flow toilet (6 liters per flush or less)[32]	• Replace a 16.5 liter per flush model • 5 Flushes/day/person • Average of 2.5 people per household	28
Dual flush toilet (3 or 6 liters per flush)[32]	• Replace a 16.5 liter per flush model • 5 Flushes/day/person • Average of 2.5 people per household	34
Aerated faucets (1.5 GPM or less)[33]	• Replaces 2.2 GPM model	3.3
Low flow showerhead (1.25 GPM or less)[33]	• Replaces 2.0 GPM model	12

AVOIDED EMISSIONS

For evaluating emissions reductions we recommend the emissions factor approach applied to the estimated electrical and combustion fuel savings. These can yield an estimate of the resulting annual GHG emissions reductions attributable to the LIC financing program. Based on the gross energy savings estimates for the LIC financed projects, the following factors can be applied to calculate GHG emissions reductions from estimated electrical and combustion fuel savings in Ontario.

[32] Source: (City of Toronto, 2011)

[33] Source: (Ontario Power Authority, 2011)

Table 41: Attributed GHG emissions factors for energy savings in Ontario (Environment Canada, 2012)

	Electricity (g CO2 eq/kWh)	Natural Gas (g CO2 eq/m^3)	Residential Heating Oil (g CO2 eq/l)
CO_2 Intensity	100	1879	2725
CH_4 Intensity	0.01	0.037	0.026
N_2O Intensity	0.002	0.035	0.006
Overall Intensity[3]	100	1879	2725

These factors can be applied to meet informational and reporting requirements specified by the municipality. However, obtaining GHG credits for sale on the trading markets may require additional verification of the program savings and associated avoided emissions. Municipalities who are engaged in meeting verified GHG reduction targets will likely undertake periodic region-wide GHG emissions verifications that will capture the net GHG reductions from LIC financing programs and account for yearly variations in GHG emissions factors related to electricity generation.

ECONOMIC IMPACTS

Economic impacts can be classified into direct, indirect and induced economic activities. Determining indirect and induced economic impacts requires the use of complex input-output economic modelling tools. In this case we recommend a simplified economic impact study that captures the directly resulting economic activities through an analysis of the program's financial metrics.

Accounting for Non-Energy Benefits (NEBs)

Thermal comfort, curb appeal, and easy-to-operate equipment and windows offer real value to program participants beyond energy and water savings. However, determining a dollar value for these can be challenging given their subjective nature.

A study of federally funded weatherization programs in the US estimated that the lifetime value of rate payer NEBs represented over 15% of the initial project costs, and that if household and societal non-energy benefits were included they would be valued higher than the overall energy savings. (Schweitzer, 2005) Other estimates of the value of ratepayer NEBs in energy efficiency programs range from 12% up to 20%.

Considering that LIC financing will likely include non energy saving measures to some degree, a 20% rate-payer NEB factor applied to the overall project costs provides a conservative estimate that can be used in evaluation of the program's economic impacts.

Table 42: Direct Economic Benefits and Building Stock Improvement Evaluation Criteria

Program-related economic activity	Program-related expenditures create new economic activity within the local community. The three primary program-related expenditures include: • Investment in LIC finance measures; • Program administration expenses (internal vs. 3rd party), and; • Additional investment made by participants through self financing or complimentary financing products (utility incentives, bank loans etc.)
Net-present-value of energy savings	Energy bill savings from LIC financing improvements can carry forward for up to 20 to 30 years, depending on the nature of the projects completed. For projects with lifetime SIR values greater than one (wherein the net bill savings exceed the LIC repayments) there will be on-going energy bill savings that can be used to purchase other local goods and services.
Job creation and net benefits	In general energy efficiency programs have been seen to create more local economic benefits than are lost (Optimal Energy, Inc. and Synapse Energy Economics, Inc., 2011) creating a net positive impact in the local economy. Much of the short-term job creation from energy efficiency programs is derived from payments made to contractors and businesses to purchase and install the efficiency measure. Studies of energy efficiency and PACE programs have consistently found that for each $1 million in program expenditures, between three to ten job-years of new employment is created, with seven job-years providing a reasonable average estimate (Marshall Goldberg, 2011).
Improvements to the local building stock	LIC financing programs can include a range of building improvements that offer wider benefits, such as backflow preventers that reduce the risk of damage caused by large storms, and septic tank replacements or well upgrades that protect water quality and safety. Deferred repairs and comfort improvements can increase the overall quality of the local building stock, which will have spin-off economic benefits. These can be assessed by the following indicators: • Increase in assessed property values for LIC participants • Number of backflow preventers, wells upgrades, septic tanks removed • Effectiveness of weather damage risk prevention measures installed • Value of improvements made and NEBs to property owners

4.6 PROVINCE-WIDE PILOT STUDY AND MARKET EVALUATION

The first pilot programs to apply the LIC financing mechanisms to energy and water saving improvements will generate information and experiences that will be valuable for designing the next generation of programs and establishing best practices for LIC financing across Ontario. A province-wide pilot study that includes a statistical analysis of the impacts and energy savings, a comparative analysis of the process study results, a financial risk analysis, and deeper market potential study would form the basis for building the business case for broader implementation of LIC financing for energy and water saving improvements. The pilot study would ideally be performed by a province–wide body, or coalition such as the CHEERIO Working Group, equipped with the budget to carry out an objective analysis of the M&E results from all the pilot programs.

COLLECTIVE PROCESS AND IMPACT STUDIES

The first step in performing the pilot study would be to gather the results of the process and impact studies performed for each pilot program, as well as their monitoring data sets. It is recommended that the municipalities coordinate through the CHEERIO Working Group to establish a common list of core program data, and develop a shared database format to record it in a consistent manner. This shared database format would allow simple collection and combination of all the programs' data into a single database for the province-wide pilot study.

Comparison of the Process Studies to Establish Best Practices

Each of the process evaluations will reveal strengths and weaknesses in the program implementation approaches. By identifying practices that were successful in multiple programs, and innovative solutions to problems that arose, the analysis of the process studies can be used to update the best practices for LIC financing program implementation and marketing.

Alternatively, if the timing is appropriate, individual programs could pool their process study resources, and perform a single process study of all the programs together through the CHEERIO Working Group. This would create some degree of economy of scale as well as ensure consistency of the evaluation approaches and tools applied, thus improving the outcomes of the evaluation.

Energy and Water Savings Verification through Billing Analysis

Verifying energy and water savings through billing analysis can help to reduce uncertainty around the financial benefits offer and risks faced by the participants. It can also provide further certainty over the ability of the programs to deliver new energy and water savings that can justify utility and municipality investments in LIC financing program administration costs.

While billing analysis holds little value for the small participant numbers in local pilot programs, combining results from a number of pilot programs could provide sufficient data to perform a meaningful analysis of billing data.

Key considerations in planning for billing analysis include:

- Billing analysis requires access to 12 months of billing data prior to the improvement project implementation.
- It also should cover a number of years after the improvements are completed to account for changing user behaviour as a result of the new measures.
- A representative set of non-participants billing data or statistics and weather normalisation of data are also needed to quantify the gross energy savings.
- The individual municipalities with pilot programs should obtain access to the billing data for their participants through an agreement with the local utilities upon starting their programs. This data can be provided to the central evaluation team and combined with baseline billing data.

Billing analysis provides an estimate of net energy savings. Specific free-ridership and spill-over rates can be determined through participant interviews and local renovation market activity analysis.

By verifying energy and water savings, and evaluating the LIC financing program net-to-gross saving ratios, the pilot evaluation will provide valuable analysis to help justify investments in broader LIC financing programs. This information can be combined with the other individual pilot program impact study results to provide a cumulative assessment of the program impacts to date, and project potential impacts moving forward.

FINANCIAL IMPACTS AND RISK EVALUATION

Assessing the financial and risk impacts of LIC financing over the long-term can present challenges to evaluators, but offers a chance to assuage concerns that LIC financed properties may be more susceptible to tax or mortgage payment defaults. Information about a property's financing debt and value are not generally available except at the time of transaction, but other analysis may offer valuable insights into the programs' financial impacts.

Tax and Mortgage Default Rates

Concerns have been raised by mortgage lenders that LIC financing assessment through their priority lien status put other lenders at higher risks.

Verifying energy savings and securing cash-flow positive projects can offer reassurance to some degree that the participants are not being placed under additional financial strain. Improving energy savings certainty can further help to reduce potential risk for all participants (Deason, 2012).

However, LIC financing programs may include expenses other than energy saving improvements and may also include projects that are not cash-flow positive, which could introduce further default risks. Further evaluation of the risk posed by LIC financing to mortgage lenders can be performed by tracking mortgage or tax payment default rates among participants. It is likely that a large population size would be needed to identify a trend with confidence. For example, in Sonoma County's PACE program, out of 1600 PACE-financed home only one default was declared, despite a county-wide default rate of 7% (Deason, 2012). Evaluating tax and mortgage default rates in LIC financed properties against baseline mortgage and tax defaults rates across the pilot program municipalities would be needed to draw meaningful conclusions.

Risks to Program Administrators

The collective experience of the pilot programs may also help to shed further light on the potential risks faced by municipalities who implement LIC financing programs. Concerns over the potential for participants to litigate against municipalities for poor quality work performed under LIC financing programs, or for failure to achieve predicted savings can be addressed by citing examples successful pilot program experiences with litigation-free track records.

The financial risks associated with lower than anticipated uptake rates, and strategies to mitigate these can be further assessed by collecting program administration budgets from across a range of pilot programs.

Impact of Program Participation on a Property's Assessed Value

Investments in the energy and water saving measures, along with other LIC financed improvements may have long term impacts on participant property values. Identifying trends in increased assessed property values would require the larger data set from a collection of pilot programs, along with statistical analysis to separate the effects of LIC financing improvements from background property value trends. Given a large enough dataset, it may also be possible to track the affect that ERS ratings have on property values, but this is likely beyond the reasonable scope of any LIC financing program evaluation.

MARKET STUDY

In building the business case for a broader implementation of LIC financing programs across Ontario, a deeper analysis of the market potential would be beneficial. Building on the results of the first pilots,

the evaluation can seek to more clearly define the target market and assess the strengths and weaknesses of the LIC financing value proposition to property owners.

Focussing the Value Proposition

A key factor to determine is to differentiate among the program elements most attractive to the participants and link them with market segments. These may include:

- The long term fixed financing conditions (up to 15 or 20 years)
- Competitively low interest rates
- Transferability of LIC payments to future property owners

This can be achieved through further focus groups and interviews (with participants and non-participants). Analysis of participant data may also reveal trends in participant behaviour that indicate successful messaging and motivators.

Quantifying the Market Potential

Before rolling out a long term program, or spreading LIC financing to cover the other Ontario municipalities, an evaluation of the market potential will help to support LIC financing's business case. As real estate markets evolve, and markets transform for energy efficiency improvements, quantitative analysis of the market potential can help to:

- Apply pilot participant profile analysis to assess the size of specific market segments
- Identify municipalities with the highest potential for high program uptakes
- Highlight demographic segments and socio-economic groups with the highest program participation rates
- Update the current energy efficiency opportunities and measures to achieve deep energy saving retrofits

Assessment of the pilot program results and quantification of the market segments that hold high potential for LIC financing programs across the province provide a valuable knowledge base to inform further program marketing activities and successful program design.

4.7 ADDITIONAL M&E STRATEGIES FOR MURB LIC FINANCING PROGRAMS

LIC financing pilot programs that include MURBs will carry some additional M&E challenges. Central among these is the collection and storage of performance monitoring information because the ERS evaluations do not apply to buildings that contain over 30 units or are over three storeys tall, and can be difficult to perform in any MURB with more than a few housing units.

Compared to the small and low density residential program, MURB programs have fewer participants and the projects will carry much larger budgets. This creates more room within the M&E budget for monitoring each project, and tracking the results closely. Moreover, MURB programs will likely require a professional building energy audit to be performed, which can provide program administrators with detailed information about the proposed measures.

Finally, MURBs encompass a range of resident comfort and safety issues that are quite different than small and low density residential properties. These may be important motivators for LIC financed projects, and should be monitored and evaluated for their effectiveness.

M&E of MURB programs is likely to be more complex than that of the small and low density residential property LIC financing programs due to the size and range of LIC financed projects and measures. Because M&E budgets may not be any larger for MURB programs than for their counterparts, program administrators should attempt to integrate the collection of monitoring data into the participant auditing and reporting requirements wherever possible, and standardised data collection and analysis tools should be applied as much as is feasible. The use of standardised modelling tools, such as EE4 and the Energy Star portfolio manager can greatly help to ensure consistent energy savings estimates and verification. This will help to offset internal M&E cost and provide benefits similar to those stemming from the ERS database used in the small and low density residential programs.

Considering these factors, a few recommendations for M&E activities related to MURB LIC financing pilot programs are described below.

MONITORING DATABASE

In the absence of a third party data collection tool like the ERS database, MURB program administrators will have to develop and manage all the data collection and storage tools for the program. A few recommendations may help to reduce the complexity of these tasks:

- Pre-retrofit energy audit reports for MURBs should include energy modeling for the pre- and post-retrofit building conditions with a breakdown on the estimated energy savings attributed to each measure. This will provide the basis for determining savings resulting from the installed measures.

- The audit reports will likely follow varying formats and involve varying levels of detail which could complicate data collection and monitoring. Two strategies to alleviate this are to:
    1. Require the use of a consistent energy modelling software to be used in all audits, such as NRCans' EE4 software (or RETScreen for renewable energy projects), and for the applicant to provide the modelling software files to the program administrators to be verified.
    2. Establish a sole-source contract with a qualified energy auditing consulting firm to perform all the MURB audits following a consistent format. Developing the building performance information database and recording the results for each applicant could also be included in their scope of work.
- In a MURB program the data set of measures and financial information will likely be broader than for the small and low density residential properties, including options such as waste management improvements and a wider range of water savings. Capturing and quantifying the estimated impacts of these should be included in the applicants' energy audit requirements.

PROCESS STUDY

The process study for a MURB program will also focus on determining the effectiveness of the program implementation and marketing, and identifying areas where improvements can be made. There are a few additional considerations that should be brought into the process study that are unique to MURBs:

- MURB programs will have a far smaller number of participants than the small and low density program. Thus it will likely be feasible to interview them all rather than perform an on-line survey.
- Interviews with the participants will also offer more detailed information about the project implementation (planning, design and project management processes applied), which is likely to be a more complicated process taking place over a longer duration.
- Evaluating the effectiveness of the MURBs program will involve assessing issues related to tenant experience and satisfaction with the results. Interviews and surveys with tenants of participating MURB properties should be added to the process study to capture these.
- Many participating MURBs may have significant deferred maintenance projects related to safety, comfort or code compliance. The LIC financing may have an impact on the properties by facilitating the completion of these works earlier or to a greater extent than was planned. Interviews with participants (building owners and managers) should seek to identify this impact, and assess the program parameters that can provide further motivation to future participants.
- Finally, in the absence of ERS evaluators and reports, the responsibility for QA/QC activities related to MURB auditing and recommendations for building improvements will fall on the program administrators. Standardising the program data collection and reporting procedures can help to limit the risks, but program administrators may need to perform data quality reviews and process audits a selection of the projects.

IMPACT STUDY

The size and complexity of MURB projects, the limited number of participants, and the absence of a standardised tool like the ERS database pose additional challenges when evaluating the impact of MURB LIC financing pilot programs.

Energy savings estimates

Energy savings can be estimated from the modelling results in the pre-retrofit energy audit. However if the set of improvements completed differs from the recommended measures list, then changes to the individual measures and interactive effects may reduce the accuracy of the modelled saving estimates. In cases where billing analysis or benchmarking is not being pursued property owners should be required to update their energy model to include just the completed measures.

Billing analysis and benchmarking may also offer a feasible option to evaluate and verify energy savings estimates. Given the smaller number of participants, and the larger impact per project, gathering and processing participant billing data would be a less onerous activity than for smaller properties. There are a number of additional benefits offered by this approach including:

- It can capture the impacts of resident behaviour and building management practices.
- It can provide longer term tracking of energy savings.
- It can integrate with existing benchmarking initiatives and provide a sector-wide comparison.
- In the absence of a locally developed or applied energy and water benchmarking tool, the new EnergyStar Portfolio Manager tool for Canada could be used.[34]

ENERGY STAR Portfolio Manager

Adapted for Canada by NRCan, Portfolio Manager is a free, online, energy management tool that allows building owners to measure and track energy and water utility bill data to provide an accurate measure of changes in the building's overall consumption over time. Portfolio Manager provides a number of energy performance metrics including weather-normalized energy use intensity and greenhouse gas emissions.

Portfolio Manager may aid in the monitoring and evaluation of MURB LIC financing program results:

- Participants can easily input and track changes in energy and water consumption before and after improvements
- An account sharing feature enables program administrators to access user data and produce aggregate reports
- The tool includes a range of building characteristics including, address, floor space, # of stories and fuel source.
- Weather normalization compares the buildings against past performance regardless of differences in climate
- Includes national GHG reporting protocols
- Customized reporting tools can respond to specific M&E requirements
- Automated data exchange via web services with utility companies

[34] Currently, there is no ENERGY STAR energy performance score for MURBs to compare the performance of a participating building against the performance of all MURBs nation-wide. However, with account sharing, program administrators will be able to compare the performance of all participating buildings.

Water savings estimates

Water savings can be evaluated similarly to energy savings, applying a savings evaluation to modelled data (from pre and or post retrofit audit results), or a billing analysis and benchmarking. In addition, MURB programs may wish to track specific measures including:

- Fire prevention equipment losses (sprinkler systems)
- Irrigation of property
- Swimming pools (in-door or out-door)
- Replacement of out dated municipal water cooled refrigeration unit

Waste reduction

Some programs may chose to include waste reduction measures, such as installing recycling facilities or developing waste management information for building residents. Capturing the results of these can provide a further option to evaluate the program's impact. Waste reduction and diversion from MURBs would can be quantified through:

- On-site recyclable material collection (during?) room upgrades, and;
- Education and outreach activities with residents

These would likely need to be evaluated *ex-post* through analysis of waste collection contractor bills.

Economic impacts

Again, evaluation of the program economic and financial impacts on MURB properties may include additional considerations. Apart from the bill savings, these will likely be determined through the interview process, which can be expanded to gather information regarding:

- Impact on rents and affordability
- Tenant retention and turnover rates
- Impact on building operation and maintenance costs
- Energy, water and waste management bill savings

Building Improvements for comfort and safety

Finally, the impact evaluation may also be expand to capture information regarding building improvements that are more important to MURB properties, such as maintenance and improvement of building safety and fire protection equipment.

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APPENDICES

APPENDIX A: ONTARIO MUNICIPALITIES

There are currently 444 municipalities in the province of Ontario.

In Ontario the term "municipality" refers to various forms of local government (including cities, counties, regional municipalities, towns, townships, villages, and governments called municipalities) that provide services.

Two possible arrangements of local government exist:

- One level of governance: a unitary authority (also referred to as a "single-tier" municipality) is responsible for providing all services.
- Two levels of governance: a county (or regional municipality) shares service responsibilities with constituent towns, cities, townships, and villages. These municipalities may be referred to as "upper-tier" and "lower-tier", respectively.

Sparsely populated Northern Ontario mostly lacks local government, instead using provincially-contracted local services boards to provide services. The exception is larger centres, which have unitary authorities. Although Northern Ontario can be divided into districts, these divisions are used only for census purposes.

REGIONAL MUNICIPALITIES AND CONSTITUENTS

Durham (Whitby)
- Ajax
- Brock
- Clarington
- Oshawa
- Pickering
- Scugog
- Uxbridge
- Whitby

Halton (Milton)
- Burlington
- Halton Hills
- Milton
- Oakville

Muskoka District (Bracebridge)
- Bracebridge
- Georgian Bay
- Gravenhurst
- Huntsville
- Lake of Bays
- Muskoka Lakes

Niagara (Thorold)
- Fort Erie
- Grimsby
- Lincoln
- Niagara-on-the-Lake
- Niagara Falls
- Pelham
- Port Colborne
- St. Catherines
- Thorold
- Wainfleet
- Welland
- West Lincoln

Oxford County (Woodstock)
- Blandford-Blenheim
- East Zorra-Tavistock
- Ingersoll
- Norwich
- South-West Oxford
- Tillsonburg
- Woodstock
- Zorra

Peel (Brampton)
- Brampton
- Caledon
- Mississauga

Waterloo (Kitchener)
- Cambridge
- Kitchener
- North Dumfries
- Waterloo
- Wellesley
- Wilmot
- Woolwich

York (Newmarket)
- Aurora
- East Gwillimbury
- Georgina
- King
- Markham
- Newmarket
- Richmond Hill
- Vaughan
- Whitchurch–Stouffville

APPENDIX B: CHEERIO CONSULTATION MEETING NOTES

Date: Thursday 11 April 2013

Comments on aspects of community retrofit program design and delivery.

Participants:

- **Alex Hill,** Dunsky Energy Consultants: *Facilitator*
- **Clifford Maynes**, Executive Director, Green Communities Canada (notes). Senior manager for Green Communities home energy solutions programs, 1995-.: *Facilitator*
- **Kai Millyard**, Millyard and Associates. Technical manager, residential energy audits and low income program delivery, Green Communities Canada. Kai initiated and designed the retrofit incentive, and managed a successful Green Communities pilot. His incentive system was adopted by Natural Resources Canada and become a highly successful national program.
- **Don Eaton**, former Executive Director, Elora Environment Centre, a Green Communities Canada member organization. Certified energy advisor since 1998, and GCC's first trainer. He oversaw one of the most successful EnerGuide for Houses local delivery programs, serving most of south-west Ontario. The Elora Centre is delivering the Home Assistance Program (electricity-saving low-income program) for several local distribution companies throughout its territories.
- **Shaun Loney**, BUILD (Winnipeg), Aki Energy, Manitoba Green Retrofits, Inc. Shaun is seconded from his position as senior energy policy manager for the Manitoba government. He is executive director of the celebrated BUILD program to train and employ mostly urban aboriginals in energy retrofits. Through Manitoba Green Retrofits, a social enterprise, he is participating in the community retrofit program for Winnipeg's William Whyte neighbourhood. He is also a senior partner in GCC's First Nations Pay as You Save program being delivered in two northern MB communities.
- **Priyanka Lloyd** is business development manager for REEP Green Solutions (Kitchener-Waterloo), a Green Communities Canada member organization. Priyanka is developing a proposed community-scale retrofit program in Kitchener-Waterloo.
- **Jen Atkinson** is operations manager and Brent Kopperson is executive director for Windfall Ecology Centre, a Green Communities Canada member organization serving York Region, Toronto, and Durham. Windfall managed a successful community wide retrofit program for Georgina Island First Nation. Windfall is providing audit and retrofit services for Project Neutral in two Toronto neighbourhoods, and delivering the Enbridge Gas retrofit rebate program in York, Durham, and Toronto.
- **Pete Wobschall** is executive director of Green Venture, Green Communities Canada member organization in Hamilton and Niagara. Green Venture is delivering the Enbridge weatherization program in Niagara Region.
- **Kate Taylor**, Green Communities Canada, manager of the Affordable Energy program. Kate has research community scale/innovative financing programs in the UK and the US, and is managing the First Nations Pay as You Save program, which is installing 100 geothermal energy systems in Peguis and Fisher River First Nations.

- **Dave Chatterton**, Manager Commercial Retrofit and Weatherization Division, Great Northern Insulation … Matt Mulligan, Business Development, GNI.

Key discussion points:

1. The energy efficiency of older homes is slipping further behind as new-build standards improve. This should be the basis of an effective marketing message: retrofit your home - not because it is a good thing to do, but because your house is substandard. It's not up to modern standards. You have to close the gap, catch up. This message would work on a neighbourhood basis as well as program wide. The message: instead of trying to make your home better, let's stop it from being so bad. We need to change the norm of what's acceptable in housing. We know that the biggest motivator for people getting windows is that their neighbour got new windows, so that's got to be our message: make your house acceptable for the 21st century … We have got to get people to feel that the norm for houses is a certain level of energy efficiency.
2. Municipalities shouldn't take a lead role in marketing community energy programs. They aren't good at it, and likely don't want to.
   Water savings need to be captured by the retrofit program to compensate for low natural gas prices; water bill savings will pay for themselves quicker and cheaper than natural gas, and help to make the overall program cost-effective. Targeting electric heat is another strategy.
3. Let's not worry about the Golden Rule, i.e., a SIR greater than 1. If a household can afford PV, for example, then it should be included in financing … The focus of the program should be to go deeper than what would normally be considered cost-effective based on bill savings alone … But cost-effective savings don't get implemented automatically, so care must be taken to capture these as well.
4. A marketing approach is to trigger participation as part of building permit process. If you are spending money on a major reno or addition, then this is a good time to require an EnerGuide audit and offer incentives … You have to piggy back on market activity, it's hard to make a cold call sell.
5. Offering a bundled retrofit service should be a good way to overcome barriers. But the jury is still out: Homeworks tried this under EnerGuide, with a perfect message, but was unsuccessful (could be the quality of their contractors). Enwise tried the same thing, and seemed to do everything right (at peak of incentives). But they didn't make it work. Why? It is difficult to reach a firm conclusion.
6. The neighbourhood retrofit approach is promising. Clean Energy Works ran a successful 100 home pilot in Cully, a Portland, Ore. neighbourhood. The pilot logged 1700 volunteer hours, with door to door canvassing, Tupperware-style parties with contractors, community events, educational campaigns. The program, which had on-bill financing, couldn't promise positive cashflow – home comfort was emphasized. 100 homes were retrofit in 4 months, a much higher uptake than overall. People talking to people sold the program … Also, quick turnaround is important. And the more we can handhold homeowner, make it quick and easy, and celebrate action, the more successful we will be … Cully marketing cost $20-$30K.

APPENDIX C: RESIDENTIAL PROGRAM COST EFFECTIVENESS ANALYSIS RESULTS

Standard Conditions

- Interest rate 4.5%
- Energy price inflation rate: 3.5%
- Financing term: 15 years

Table A1 Cash-flow Analysis Results for Small and Low Density Residential Program Measures and Bundles

Measure	Archetype	Heating Fuel	Monthly savings ($)	Total Measure Costs				Incremental Measure Costs			
				SPP (Yrs)	LIC ($/mo) payment	1st yr SIR	Lifetime SIR	SPP (Yrs)	LIC ($/mo) payment	1st yr SIR	Lifetime SIR
Comprehensive bundle	Victorian / Edwardian	Natural Gas	70.74	25.3	163.06	0.43	0.57	17.68	114.14	0.62	0.81
Comprehensive bundle	Victorian / Edwardian	Electricity	269.46	6.6	163.06	1.65	2.16	4.64	114.14	2.36	3.09
Comprehensive bundle	Post War	Natural Gas	68.36	26.4	164.85	0.41	0.54	18.50	115.39	0.59	0.77
Comprehensive bundle	Post War	Electricity	260.37	6.9	164.85	1.58	2.06	4.86	115.39	2.26	2.95
Comprehensive bundle	Split Level	Natural Gas	28.02	60.9	155.58	0.18	0.24	42.60	108.91	0.26	0.34
Comprehensive bundle	Split Level	Electricity	106.73	16.0	155.58	0.69	0.90	11.18	108.91	0.98	1.28
Comprehensive bundle	Town House	Natural Gas	30.10	34.3	94.10	0.32	0.42	23.98	65.87	0.46	0.60
Comprehensive bundle	Town House	Electricity	114.67	9.0	94.10	1.22	1.59	6.30	65.87	1.74	2.28

Measure	Archetype	Heating Fuel	Monthly savings ($)	Total Measure Costs				Incremental Measure Costs			
				SPP (Yrs)	LIC ($/mo) payment	1st yr SIR	Lifetime SIR	SPP (Yrs)	LIC ($/mo) payment	1st yr SIR	Lifetime SIR
Attic Insulation	Victorian / Edwardian	Natural Gas	6.18	32.0	14.90	0.41	0.60	22.40	10.43	0.59	0.85
Wall Insulation	Victorian / Edwardian	Natural Gas	13.60	43.9	45.02	0.30	0.43	30.75	31.51	0.43	0.62
Basement Insulation	Victorian / Edwardian	Natural Gas	17.88	13.3	17.96	1.00	1.43	9.33	12.57	1.42	2.04
Upgrade furnace	Victorian / Edwardian	Natural Gas	16.28	28.9	42.96	0.38	0.50	20.25	30.07	0.54	0.71
Upgrade AC	Victorian / Edwardian	Electricity	2.35	100.0	21.48	0.11	0.14	70.20	15.04	0.16	0.20
Air tightness	Victorian / Edwardian	Natural Gas	19.85	14.2	30.36	0.65	0.81	9.96	21.25	0.93	1.15
Attic Insulation	Post War	Natural Gas	30.06	15.3	34.69	0.87	1.24	10.72	24.28	1.24	1.78
Wall Insulation	Post War	Natural Gas	10.18	40.8	31.28	0.33	0.47	28.55	21.90	0.46	0.67
Wall Insulation	Post War	Natural Gas	14.07	29.5	31.28	0.45	0.65	20.66	21.90	0.64	0.92
Basement Insulation	Post War	Natural Gas	12.20	25.9	23.84	0.51	0.74	18.16	16.69	0.73	1.05
Upgrade furnace	Post War	Natural Gas	15.47	30.4	42.96	0.36	0.47	21.31	30.07	0.51	0.67
Upgrade AC	Post War	Electricity	2.23	100.0	21.48	0.10	0.14	73.87	15.04	0.15	0.19
Air tightness	Post War	Natural Gas	6.98	20.2	15.18	0.46	0.57	14.17	10.63	0.66	0.81

Measure	Archetype	Heating Fuel	Monthly savings ($)	Total Measure Costs				Incremental Measure Costs			
				SPP (Yrs)	LIC ($/mo) payment	1st yr SIR	Lifetime SIR	SPP (Yrs)	LIC ($/mo) payment	1st yr SIR	Lifetime SIR
Attic Insulation	Split Level	Natural Gas	4.35	79.2	25.96	0.17	0.24	55.41	18.17	0.24	0.34
Wall Insulation	Split Level	Natural Gas	11.03	59.2	49.16	0.22	0.32	41.43	34.41	0.32	0.46
Basement Insulation	Split Level	Natural Gas	3.86	100.0	29.23	0.13	0.19	70.31	20.46	0.19	0.27
Upgrade furnace	Split Level	Natural Gas	11.22	42.0	42.96	0.26	0.34	29.38	30.07	0.37	0.49
Upgrade AC	Split Level	Electricity	1.62	100.0	21.48	0.08	0.10	100.00	15.04	0.11	0.14
Attic Insulation	Town House	Natural Gas	2.20	77.0	12.77	0.17	0.25	53.92	8.94	0.25	0.35
Basement Insulation	Town House	Natural Gas	0.75	100.0	19.86	0.04	0.05	100.00	13.90	0.05	0.08
Upgrade furnace	Town House	Natural Gas	8.26	57.0	42.96	0.19	0.25	39.90	30.07	0.27	0.36
Upgrade AC	Town House	Electricity	1.19	100.0	21.48	0.06	0.07	100.00	15.04	0.08	0.10
Air tightness	Town House	Natural Gas	21.77	13.0	30.36	0.72	0.89	9.08	21.25	1.02	1.27
Attic Insulation	Victorian / Edwardian	Electricity	23.54	8.4	14.90	1.58	2.27	5.88	10.43	2.26	3.24
Wall Insulation	Victorian / Edwardian	Electricity	51.81	11.5	45.02	1.15	1.65	8.07	31.51	1.64	2.36
Basement Insulation	Victorian / Edwardian	Electricity	68.12	3.5	17.96	3.79	5.45	2.45	12.57	5.42	7.78

Measure	Archetype	Heating Fuel	Monthly savings ($)	Total Measure Costs				Incremental Measure Costs			
				SPP (Yrs)	LIC ($/mo) payment	1st yr SIR	Lifetime SIR	SPP (Yrs)	LIC ($/mo) payment	1st yr SIR	Lifetime SIR
Air tightness	Victorian / Edwardian	Electricity	75.61	3.7	30.36	2.49	3.08	2.62	21.25	3.56	4.40
Attic Insulation	Post War	Electricity	114.49	4.0	34.69	3.30	4.74	2.82	24.28	4.71	6.77
Wall Insulation	Post War	Electricity	38.79	10.7	31.28	1.24	1.78	7.49	21.90	1.77	2.54
Wall Insulation	Post War	Electricity	53.59	7.7	31.28	1.71	2.46	5.42	21.90	2.45	3.52
Basement Insulation	Post War	Electricity	46.46	6.8	23.84	1.95	2.80	4.77	16.69	2.78	4.00
Air tightness	Post War	Electricity	26.57	5.3	15.18	1.75	2.16	3.72	10.63	2.50	3.09
Attic Insulation	Split Level	Electricity	16.59	20.8	25.96	0.64	0.92	14.55	18.17	0.91	1.31
Wall Insulation	Split Level	Electricity	42.00	15.5	49.16	0.85	1.23	10.88	34.41	1.22	1.75
Basement Insulation	Split Level	Electricity	14.71	26.4	29.23	0.50	0.72	18.46	20.46	0.72	1.03
Attic Insulation	Town House	Electricity	8.38	20.2	12.77	0.66	0.94	14.16	8.94	0.94	1.35
Basement Insulation	Town House	Electricity	2.85	92.4	19.86	0.14	0.21	64.68	13.90	0.21	0.29
Air tightness	Town House	Electricity	82.93	3.4	30.36	2.73	3.38	2.38	21.25	3.90	4.82
DHP	Victorian / Edwardian	Electricity	124.28	3.8	42.96	2.89	3.78	2.65	30.07	4.13	5.40

Measure	Archetype	Heating Fuel	Monthly savings ($)	Total Measure Costs				Incremental Measure Costs			
				SPP (Yrs)	LIC ($/mo) payment	1st yr SIR	Lifetime SIR	SPP (Yrs)	LIC ($/mo) payment	1st yr SIR	Lifetime SIR
DHP	Post War	Electricity	118.64	4.0	42.96	2.76	3.61	2.78	30.07	3.94	5.16
DHP	Split Level	Electricity	86.27	5.5	42.96	2.01	2.62	3.82	30.07	2.87	3.75
DHP	Town House	Electricity	65.64	7.2	42.96	1.53	2.00	5.02	30.07	2.18	2.85
GSHP	Victorian / Edwardian	Electricity	103.57	13.6	93.35	1.11	1.76	9.55	65.34	1.58	2.51
GSHP	Post War	Electricity	118.64	11.9	93.35	1.27	2.01	8.33	65.34	1.82	2.87
GSHP	Split Level	Electricity	71.89	19.6	93.35	0.77	1.22	13.75	65.34	1.10	1.74
GSHP	Town House	Electricity	54.70	25.8	93.35	0.59	0.93	18.07	65.34	0.84	1.33
GSHP	Victorian / Edwardian	Electricity	(1.77)	100.0	93.35	(0.02)	(0.03)	100.00	65.34	(0.03)	(0.04)
GSHP	Post War	Electricity	(1.69)	100.0	93.35	(0.02)	(0.03)	100.00	65.34	(0.03)	(0.04)
GSHP	Split Level	Electricity	(1.23)	100.0	93.35	(0.01)	(0.02)	100.00	65.34	(0.02)	(0.03)
GSHP	Town House	Electricity	(0.94)	100.0	93.35	(0.01)	(0.02)	100.00	65.34	(0.01)	(0.02)
Solar PV	All	Electricity	50.10	12.2	46.11	1.09	1.56	8.55	32.28	1.55	2.23
Solar Hot water	All	Electricity	18.45	35.7	60.15	0.31	0.40	25.01	42.10	0.44	0.57

APPENDIX D: COST EFFECTIVENESS ANALAYSIS RESULTS FOR MURB PROGRAM MEASURES

Green denotes projects with neutral or positive cash-flows (SIR => 0.9) while yellow and red values represent projects with negative cash flows.

Table A2 Cash-flow Analysis Results for MURB Measures and Bundles

Measure	Archetype	Heating Fuel	SPP (yrs)	1st yr Cash flow ($)	Monthly saving ($)	LIC ($/mo) payment	1st yr SIR	Lifetime SIR
Roof R-20	TRG	Natural Gas	29.8	-1006	945	1952	0.48	0.70
Boilers @93%	TRG	Natural Gas	14.1	74	3599	3524	1.02	1.00
HRV 70% + duct air to suite	TRG	Natural Gas	10.7	903	3446	2542	1.36	1.33
Water conservation 30% redux	TRG	Natural Gas	24.8	-332	461	794	0.58	0.84
Parkade lighting control + occupancy sensor	TRG	Natural Gas	2.9	147	184	37	4.96	7.13
Overclad non-balcony/shear walls with R-12	TRG	Natural Gas	48.5	-4031	1706	5737	0.30	0.43
Overclad non-balcony/shear walls with R-16	TRG	Natural Gas	52.6	-5029	1904	6933	0.27	0.39
Windows R-2.5	TRG	Natural Gas	31.2	-6080	5244	11324	0.46	0.67
Enclose Balconies R2.5 glazing + R-15 guard	TRG	Natural Gas	65.5	-14670	4147	18817	0.22	0.32

Measure	Archetype	Heating Fuel	SPP (yrs)	1st yr Cash flow ($)	Monthly saving ($)	LIC ($/mo) payment	1st yr SIR	Lifetime SIR
Overclad walls RSI 2.8 + overclad balconies R10	TRG	Natural Gas	80.5	-24939	5452	30391	0.18	0.26
Overclad walls R16 + balconies R10 + guards + windows	TRG	Natural Gas	68.2	-32927	8849	41776	0.21	0.30
Enclose Balconies R2.5+ guard+ overclad walls R16 + windows	TRG	Natural Gas	53.2	-22563	8412	30974	0.27	0.39
Boilers @82%	TRG	Natural Gas	14.7	-56	2721	2777	0.98	0.96
RCM 1, 7, 10, 11, 12, 13	TRG	Natural Gas	62.1	-38988	11816	50804	0.23	0.33
RCM 1, 8, 10, 11, 12, 13	TRG	Natural Gas	48.4	-28055	11917	39972	0.30	0.43
Incandescent to CFL	Scarborough	Natural Gas	0.1	83	84	1	108.40	42.84
Occupancy Sensor	Scarborough	Natural Gas	4.8	666	996	330	3.01	1.80
Tstat Ctrl for radiators	Scarborough	Natural Gas	100.0	-5393	453	5846	0.08	0.06
High Eff. Fridges refurbish	Scarborough	Natural Gas	3.9	602	821	219	3.75	1.72
High Eff. Fridges new	Scarborough	Natural Gas	9.8	424	1328	904	1.47	1.09
Low flow faucets	Scarborough	Natural Gas	5.0	1504	2291	787	2.91	4.18
Occupancy Sensor - common	Scarborough	Natural Gas	0.2	145	147	2	65.21	48.37

Measure	Archetype	Heating Fuel	SPP (yrs)	1st yr Cash flow ($)	Monthly saving ($)	LIC ($/mo) payment	1st yr SIR	Lifetime SIR
Bi-lvl lighting in common	Scarborough	Natural Gas	2.1	2080	2438	358	6.81	4.06
Energy Efficient exterior lighting	Scarborough	Natural Gas	8.9	24	63	39	1.62	0.96
Seasonal Boiler Setpoint temp reset	Scarborough	Natural Gas	0.4	460	473	13	35.14	20.94
Upgrade/Optimize Boiler digital ctrl system	Scarborough	Natural Gas	2.0	1022	1187	165	7.18	4.28
Start/Stop ctrl on hot water recirc. pump	Scarborough	Natural Gas	7.7	5	10	6	1.89	1.12
VFD on cold water pumps	Scarborough	Natural Gas	7.9	19	42	23	1.82	1.78
CO monitor ctrl Garage	Scarborough	Natural Gas	2.6	923	1125	202	5.57	3.32
MAU upgrades & exhaust air hrv	Scarborough	Natural Gas	4.3	347	495	148	3.34	3.28
Eliminate garage heating for freeze protect	Scarborough	Natural Gas	4.8	607	909	302	3.01	2.95
Re-Caulk windows	Scarborough	Natural Gas	2.9	832	1037	205	5.06	3.75
Double pane Windows + balcony doors	Scarborough	Natural Gas	50.0	-1482	601	2083	0.29	0.41
Cladding exterior wall R18 non-enclosed balc	Scarborough	Natural Gas	43.9	-4842	2373	7215	0.33	0.47
Cladding exterior wall R18 Enclosed balc	Scarborough	Natural Gas	66.3	-8530	2373	10903	0.22	0.31
Solar Wall	Scarborough	Natural Gas	64.9	-382	109	491	0.22	0.32

Measure	Archetype	Heating Fuel	SPP (yrs)	1st yr Cash flow ($)	Monthly saving ($)	LIC ($/mo) payment	1st yr SIR	Lifetime SIR
Solar hot water	Scarborough	Natural Gas	62.7	-2760	826	3586	0.23	0.33
Roof PV	Scarborough	Natural Gas	50.2	-3145	1270	4415	0.29	0.41
Tenant orientation & education	Scarborough	Natural Gas	1.1	657	708	52	13.70	3.73
Apartment-level metering	Scarborough	Natural Gas	6.7	1192	2226	1034	2.15	0.59
Cumulative payback < 5yrs	Scarborough	Natural Gas	7.8	7021	15164	8143	1.86	2.68
GHG redux 30 T/yr	Scarborough	Natural Gas	18.4	-4887	18016	22904	0.79	1.13
SC1 + recla + double pane windows	Scarborough	Natural Gas	12.9	2140	19574	17434	1.12	1.61
SC3 + Apartment radiator ctrl	Scarborough	Natural Gas	16.9	-3365	19918	23283	0.86	1.23
Incandescent to CFL	NorthYork	Natural Gas	0.7	1426	1499	73	20.50	8.10
Occupancy Sensor	NorthYork	Natural Gas	4.6	813	1189	375	3.17	1.89
Tstat Ctrl for radiators	NorthYork	Natural Gas	17.8	-1285	5504	6789	0.81	0.60
High Eff. Fridges refurbish	NorthYork	Natural Gas	3.9	677	923	246	3.75	1.72
High Eff. Fridges new	NorthYork	Natural Gas	9.8	477	1494	1017	1.47	1.09
Low flow faucets	NorthYork	Natural Gas	6.4	1205	2165	960	2.26	3.24

Measure	Archetype	Heating Fuel	SPP (yrs)	1st yr Cash flow ($)	Monthly saving ($)	LIC ($/mo) payment	1st yr SIR	Lifetime SIR
Low flow showerheads	NorthYork	Natural Gas	1.1	1244	1345	101	13.28	19.07
Occupancy Sensor - common	NorthYork	Natural Gas	0.1	170	172	2	113.90	84.49
Bi-lvl lighting in common	NorthYork	Natural Gas	1.0	7755	8345	590	14.14	8.43
Energy Efficient exterior lighting	NorthYork	Natural Gas	8.9	24	63	39	1.62	0.96
Hi-efficiency boiler	NorthYork	Natural Gas	10.0	721	2345	1624	1.44	1.42
Upgrade/Optimize Boiler digital ctrl system	NorthYork	Natural Gas	8.8	122	314	192	1.63	0.97
Start/Stop ctrl on hot water recirc pump	NorthYork	Natural Gas	4.9	10	16	5	2.96	1.76
VFD on cold water pumps	NorthYork	Natural Gas	0.1	459	461	3	173.92	170.47
CO monitor ctrl Garage	NorthYork	Natural Gas	2.1	1186	1388	202	6.87	4.09
MAU upgrades & exhaust air hrv	NorthYork	Natural Gas	2.1	919	1074	155	6.94	6.80
Eliminate garage heating for freeze protect	NorthYork	Natural Gas	6.2	577	1013	436	2.32	2.28
Re-Caulk windows	NorthYork	Natural Gas	3.7	621	835	215	3.89	2.89
Double pane Windows + balcony doors	NorthYork	Natural Gas	25.4	-943	1241	2184	0.57	0.82
Cladding exterior wall R18 non-enclosed balc	NorthYork	Natural Gas	19.5	-1945	5588	7533	0.74	1.07

Measure	Archetype	Heating Fuel	SPP (yrs)	1st yr Cash flow ($)	Monthly saving ($)	LIC ($/mo) payment	1st yr SIR	Lifetime SIR
Cladding exterior wall R18 Enclosed balc	NorthYork	Natural Gas	29.9	-5969	5588	11557	0.48	0.69
Solar Wall	NorthYork	Natural Gas	63.6	-744	219	962	0.23	0.33
Solar hot water	NorthYork	Natural Gas	62.1	-2723	826	3549	0.23	0.33
Facade PV	NorthYork	Natural Gas	88.2	-9647	1888	11535	0.16	0.24
Roof PV	NorthYork	Natural Gas	50.2	-3113	1258	4371	0.29	0.41
Tenant orientation & education	NorthYork	Natural Gas	0.7	1127	1185	58	20.38	5.55
Apartment-level metering	NorthYork	Natural Gas	6.1	1572	2736	1163	2.35	0.64
Track&Report Energy/Water	NorthYork	Natural Gas	3.2	299	386	86	4.48	1.22
Cumulative payback < 5yrs	NorthYork	Natural Gas	8.6	7417	18297	10880	1.68	2.42
GHG redux 30 T/yr	NorthYork	Natural Gas	20.3	-11292	27922	39214	0.71	1.02
SC1 + recla + double pane windows	NorthYork	Natural Gas	12.4	3318	23810	20491	1.16	1.67
SC3 + Apartment radiator ctrl	NorthYork	Natural Gas	15.3	-1514	25871	27386	0.94	1.36
Incandescent to CFL	Etobicoke	Natural Gas	0.3	889	909	20	45.31	17.91
Occupancy Sensor	Etobicoke	Natural Gas	4.3	970	1376	405	3.39	2.02

Measure	Archetype	Heating Fuel	SPP (yrs)	1st yr Cash flow ($)	Monthly saving ($)	LIC ($/mo) payment	1st yr SIR	Lifetime SIR
Tstat Ctrl for radiators	Etobicoke	Natural Gas	52.6	-5796	2193	7989	0.27	0.20
High Eff. Fridges refurbish	Etobicoke	Natural Gas	3.9	721	983	262	3.75	1.72
High Eff. Fridges new	Etobicoke	Natural Gas	9.8	508	1591	1083	1.47	1.09
Low flow toilets	Etobicoke	Natural Gas	3.1	4153	5278	1125	4.69	6.74
Low flow faucets	Etobicoke	Natural Gas	3.5	3379	4480	1100	4.07	5.85
Low flow showerheads	Etobicoke	Natural Gas	0.5	2690	2782	93	30.04	43.16
Occupancy Sensor - common	Etobicoke	Natural Gas	-	1460	1460	405	3.60	2.67
Bi-lvl lighting in common	Etobicoke	Natural Gas	1.8	3370	3853	483	7.98	4.76
Energy Efficient exterior lighting	Etobicoke	Natural Gas	8.9	24	63	39	1.62	0.96
Hi-efficiency boiler	Etobicoke	Natural Gas	17.6	-288	1327	1615	0.82	0.81
Upgrade/Optimize Boiler digital ctrl system	Etobicoke	Natural Gas	5.0	354	539	185	2.91	1.73
Start/Stop ctrl on hot water recirc pump	Etobicoke	Natural Gas	3.8	29	39	10	3.82	2.28
VFD on cold water pumps	Etobicoke	Natural Gas	-	1537	1537	3	579.74	568.24
MAU upgrades & exhaust air hrv	Etobicoke	Natural Gas	3.7	864	1167	303	3.85	3.78

Measure	Archetype	Heating Fuel	SPP (yrs)	1st yr Cash flow ($)	Monthly saving ($)	LIC ($/mo) payment	1st yr SIR	Lifetime SIR
Re-Caulk windows	Etobicoke	Natural Gas	4.0	643	887	244	3.64	2.70
Double pane Windows + balcony doors	Etobicoke	Natural Gas	24.4	-1007	1453	2460	0.59	0.85
Cladding exterior wall R18 non-enclosed balc	Etobicoke	Natural Gas	37.7	-5296	3290	8586	0.38	0.55
Cladding exterior wall R18 Enclosed balc	Etobicoke	Natural Gas	57.2	-9740	3290	13030	0.25	0.36
Solar Wall	Etobicoke	Natural Gas	63.6	-744	219	962	0.23	0.33
Solar hot water	Etobicoke	Natural Gas	62.9	-2156	643	2799	0.23	0.33
Facade PV	Etobicoke	Natural Gas	88.2	-3567	698	4265	0.16	0.24
Roof PV	Etobicoke	Natural Gas	50.2	-2455	992	3447	0.29	0.41
Tenant orientation & education	Etobicoke	Natural Gas	1.3	603	665	62	10.74	2.93
Apartment-level metering	Etobicoke	Natural Gas	5.8	1821	3059	1239	2.47	0.67
Track&Report Energy/Water	Etobicoke	Natural Gas	3.7	248	334	86	3.88	1.06
Cumulative payback < 5yrs	Etobicoke	Natural Gas	6.1	15506	26793	11288	2.37	3.41
GHG redux 30 T/yr	Etobicoke	Natural Gas	11.1	6510	27962	21452	1.30	1.87
SC1 + recla + double pane windows	Etobicoke	Natural Gas	10.9	7063	29198	22135	1.32	1.89

Measure	Archetype	Heating Fuel	SPP (yrs)	1st yr Cash flow ($)	Monthly saving ($)	LIC ($/mo) payment	1st yr SIR	Lifetime SIR
SC3 + Apartment radiator ctrl	Etobicoke	Natural Gas	14.4	-5	30157	30162	1.00	1.44
Cumulative payback < 5yrs	All	Natural Gas	7.3	9981	20085	10104	1.99	2.86
GHG redux 30 T/yr	All	Natural Gas	16.3	-3223	24633	27857	0.88	1.27
SC1 + recla + double pane windows	All	Natural Gas	11.9	4174	24194	20020	1.21	1.74
SC3 + Apartment radiator ctrl	All	Natural Gas	15.4	-1628	25315	26943	0.94	1.35

APPENDIX E: LESSONS LEARNED SLIDE DECK

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