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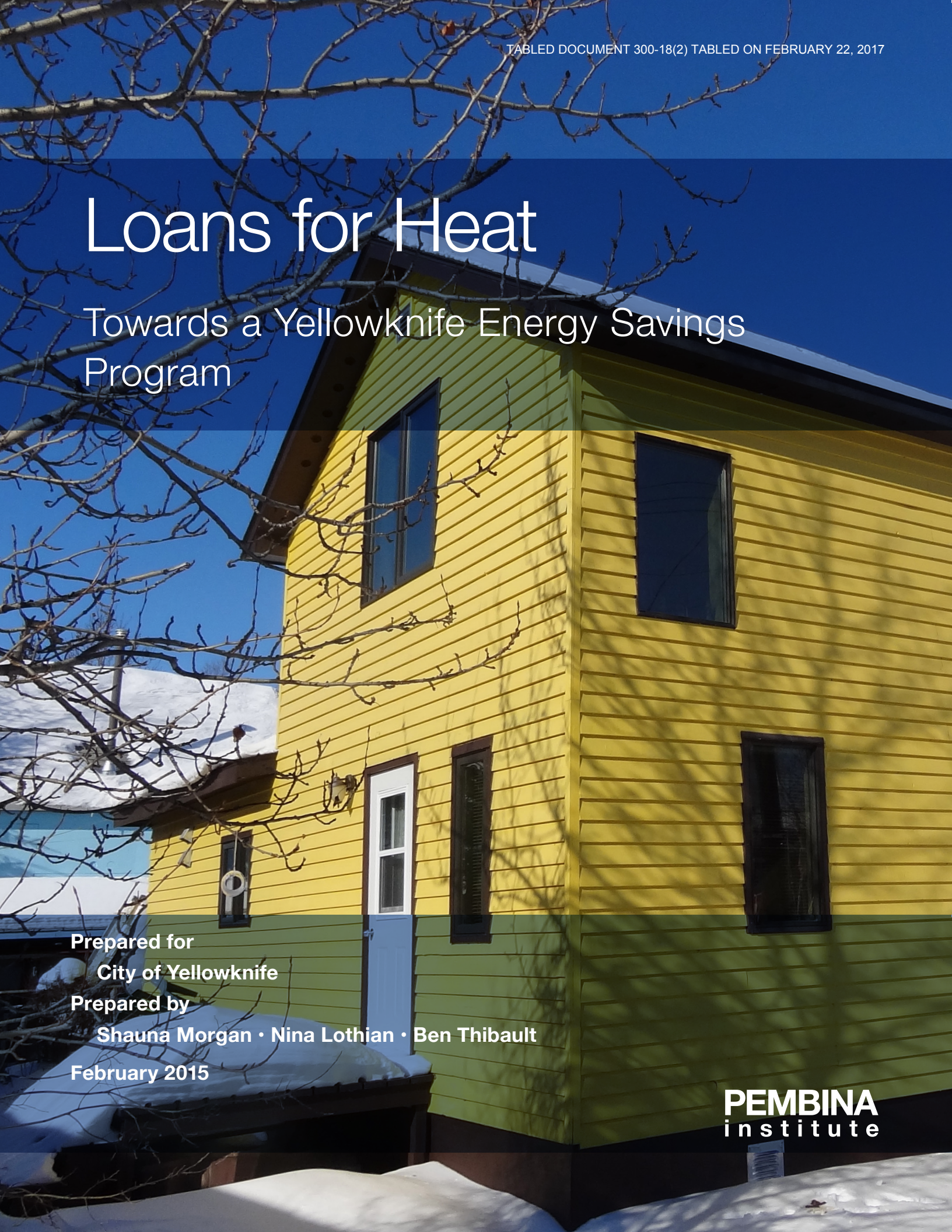
Loans for Heat

Towards a Yellowknife Energy Savings Program



Prepared for
City of Yellowknife

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PEMBINA institute

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The Pembina Institute is a national non-partisan think tank that advances clean energy solutions through research, education, consulting and advocacy. We have spent close to three decades working to reduce the environmental impacts of Canada's energy production and use in several key areas:

- driving down energy demand by encouraging energy efficiency and transportation powered with cleaner energy sources;
- promoting pragmatic policy approaches for governments to avoid dangerous climate change, such as increasing the amount of renewable energy plugged into our electricity grids;
- and — recognizing that the transition to clean energy will include fossil fuels for some time — advocating for responsible development of Canada's oilsands and shale gas resources.

For more information about the Pembina Institute, visit www.pembina.org.

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Cover photo: Binnu Jeyakumar, Pembina Institute

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Acronyms

AEA	Arctic Energy Alliance
AFUE	annual fuel utilization efficiency
CMHC	Canada Mortgage and Housing Corporation
CO_2e per GJ	carbon dioxide equivalent per gigajoule
CTV Act	Cities, Towns and Villages Act (Northwest Territories legislation)
DHW	domestic hot water
ESCO	Energy Service Company
ESPA	Energy Service Performance Agreement
FCM	Federation of Canadian Municipalities
FIRST	Financing Initiative for Renewable and Solar Technology (LIC program in Berkeley, California)
GEERS	Guelph Energy Efficiency Retrofit Strategy (LIC program in Guelph)
GHG	greenhouse gas
GNWT	Government of the Northwest Territories
HELP	Home Energy Loan Program (LIC program in Toronto)
HVAC	heating, ventilation, and air conditioning
LIC	local improvement charge
NRCan	Natural Resources Canada (federal government agency)
NWT	Northwest Territories
PACE	Property Assessed Clean Energy Investments (name for LIC programs in the United States)
PAPER	Property Assessed Payments for Energy Retrofits (name for LIC programs in the United States)
PV	photovoltaic
ROI	return on investment
TAF	Toronto Atmospheric Fund


Photo: City of Yellowknife

Introduction

Background

The City of Yellowknife ("the City") has been working with the Pembina Institute to explore innovative ways to finance energy efficiency and renewable energy retrofits for residential, commercial and municipal buildings. This work supports the City's renewed Community Energy Plan (2015–2025), approved in May 2014, and its ongoing efforts to reduce greenhouse gas (GHG) emissions.[1] The focus is on heat energy savings, given that Yellowknife's electricity is primarily supplied by hydro power which has minimal GHG emissions.

Energy retrofits are an important way for Yellowknife residents, businesses and municipal facilities to save money, reduce environmental and climate change impacts, and support the local economy. Popular heat-related retrofits in Yellowknife include installing wood or pellet stoves, improving insulation and air sealing, and switching to more efficient furnaces and boilers. Retrofits also give residents and businesses more security, since imported fossil fuels are costly, subject to sudden price increases, and potentially vulnerable to interrupted supply due to long transportation routes.

Many people do not have enough savings to pay for energy retrofits up front. They may also have difficulty getting a loan from a bank. Those who own energy-inefficient buildings may be trapped in a cycle of 'fuel poverty' since they must use a large portion of their incomes for monthly energy (utility bill) payments, leaving less savings available for making their buildings more energy efficient or switching to lower-cost sources of renewable energy. Effective financing programs can help residents break out of this fuel poverty cycle.

After initial research on various possible financing mechanisms, a decision was made in consultation with City staff and Yellowknife's Community Energy Planning Committee to focus on local improvement charges (LICs) as the most important financing program for the City to pursue in the short term. The main body of this report is about a Yellowknife LIC program for energy retrofits (named a "Yellowknife Energy Savings Program") that could be implemented to assist homeowners. Other potential financing and delivery mechanisms for municipal and commercial energy retrofit projects are outlined in Appendix D. These options were discussed with City staff and the Community Energy Planning Committee but viewed as less feasible and lower priority for now.

The territorial Cities, Towns and Villages Act (CTV Act) already allows municipalities such as Yellowknife to use LICs to help cover the costs of infrastructure investments that benefit a specific neighborhood, such as improvements to sewers and sidewalks. With their permission, the City charges residents in those neighbourhoods extra fees to cover the cost of the local improvements and collects the payments via their

property tax bills. However, LICs are not currently used to enable loans for projects that benefit individual homes or properties. While the CTV Act does not explicitly prevent the use of the local improvement section for energy retrofits, as it is currently written it would create impossible complications for an effective energy efficiency financing program. Appendix A contains a description of the legislative changes that would be required to launch an LIC program for energy retrofits in Yellowknife, as well as a suggested draft amendment to the CTV Act.

The use of LICs to support residents and small business owners in implementing energy efficiency and renewable energy retrofits was the subject of a 2013 resolution passed by the NWT Association of Communities,[2] which urged the Government of the Northwest Territories (GNWT) to review the CTV Act to enable LICs for this purpose. In its December 2013 Energy Action Plan, the GNWT committed to do just that.[3]

Structure of this report

This report has five main sections, plus Appendices containing more detailed information:

Why an LIC program? —The purpose of an LIC-based Yellowknife Energy Savings Program and evidence for why there may be a need in Yellowknife.

Experience from other Canadian cities — Lessons learned from similar programs underway in Halifax, Toronto, Yukon, Guelph, Vancouver and Edmonton.

What a Yellowknife LIC program could look like — Recommended overall design for a Yellowknife Energy Savings Program (including eligible retrofits), and aspects of program delivery such as outreach, contractor engagement, and the energy audit/assessment.

Benefits, costs, and funding sources — Benefits and savings enjoyed by the City and residents from a Yellowknife Energy Savings Program (Phase 1), what the program would likely cost the City and residents, and sources of initial funding to get the program off the ground.

Conclusion — Key factors for success.

Appendices — Appendix A contains a description of the legislative changes that would be required for Yellowknife to launch an LIC program for energy retrofits, as well as a suggested draft amendment to the CTV Act. Appendix B is a detailed explanation of how predicted cost and energy savings have been calculated for Phase 1 of a Yellowknife Energy Savings Program. Appendix C includes further details on possible funding sources to help Yellowknife get its LIC program off the ground. Appendix D lists potential financing and delivery mechanisms (other than an LIC program) for municipal and commercial energy retrofit projects, including examples and lessons learned from Toronto, as well as historical examples from Yellowknife. Appendix E lists references plus a sample list of further resources and existing research on the topic.

How the research was done

This report is based on a review of literature and publicly available material, interviews with experts in Yellowknife and in other Canadian cities, and consultation with members of Yellowknife's Community Energy Planning Committee.

Types of materials reviewed:

- data about the Yellowknife context, including housing and population statistics
- data from previous energy retrofit subsidy programs carried out in Yellowknife
- relevant legislation from the NWT as well as other Canadian provinces
- studies analyzing the Local Improvement Charge program model in North America
- case studies and online materials about LIC programs implemented in other Canadian cities

Experts interviewed:

- several current and former staff with Arctic Energy Alliance
- members of the Community Energy Planning Committee, including representatives from federal and territorial government, City Council, and non-profit organizations
- staff running LIC programs in other Canadian cities
- representatives from non-profit organizations promoting innovative financing for energy retrofits in municipalities across Canada

A complete list of references is found in Appendix E.

Photo: Binnu Jeyakumar, Pembina Institute

Why an LIC program?

Purpose of an LIC program for energy retrofits

Through an LIC Program, the municipality would help homeowners access low-interest loans for energy retrofits and allow them to pay back the loans on their property tax bills. The loan would be tied to the property rather than to the property owner, so if an owner sells his or her home the responsibility for paying back the loan would pass to the new owner.

A municipality has an advantage over individuals in being able to access low-interest, long-term financing from an institution such as a bank. Through an LIC program, the municipality can pass on these lower rates to residents. The municipality can also help homeowners realize further savings by linking the LIC program with government rebate and incentive programs.

According to the GNWT Energy Action Plan (December 2013):

> Research indicates that individuals often need upfront financing to conduct energy improvements on their homes. However, many homeowners do not have access to these funds and have competing priorities with their money. Additionally, many homeowners resist making energy retrofits if they plan to move before they can recoup their costs through energy savings. A number of jurisdictions have amended their 'Local Improvement Charge' legislation to allow for the development of energy financing programs designed to address the above constraints.[4]

If property owners are strapped for cash, they are more likely to choose the lowest-cost retrofit options, making small improvements but missing out on opportunities to realize the greatest energy and cost savings in the long term. Retrofits can be a hassle, so property owners are not likely to keep going back and making more improvements; they need to get it right the first time. If an LIC loan is available, property owners will have the financial flexibility to opt for higher-cost, higher-

efficiency investments that will allow them to realize maximum savings right from the start. For example, someone planning a renovation may see an opportunity to improve insulation in the walls at the same time, but with more cash on hand the property owner could do a more complete building envelope upgrade and perhaps install much higher quality windows and doors to keep the heat in for many years to come.

The risk of participants defaulting on their loans is low because the liability is tied to the property owner's tax bill and transfers with the property if it is sold. Property owners should be able to afford the loan repayments because they are realizing energy savings, which are ensured as part of the program's design, screening and assessment process. A well-designed LIC program provides a great deal of security for the municipality.

It is important to recognize that an LIC program based on property taxes is not designed to help renters who pay their own utility bills to save on energy costs. A landlord who does not pay for utilities may have little motivation to undertake energy efficiency upgrades. According to the 2006 census, approximately 46% of dwellings in Yellowknife are occupied by renters rather than owners. Alternative types of LIC programs have been successfully implemented in Canada whereby utility companies have helped residents (including renters) obtain loans for energy upgrades, and the loans are paid back via utility bills.[5] This type of LIC program was outside the scope of this report given that the City of Yellowknife does not control any utilities.

An LIC program is likely to benefit the local economy by generating business in the building contracting/retrofit sector in particular. Another side benefit from the existence of a local LIC program for energy retrofits is increasing resident awareness of the benefits of energy efficiency in general, as a result both of program marketing and word-of-mouth success stories. Ultimately, energy retrofits support a municipality's overall security and make the community a more affordable place to live by reducing dependence on expensive imported fuel and reducing exposure to volatile global fossil fuel prices.

Is there a need in Yellowknife for an LIC program?

There are several possible barriers to homeowners undertaking energy efficiency or renewable energy retrofits on their own:

- lack of funds / capital up front
- high rate of turnover in home ownership; uncertainty about whether energy retrofits will improve resale value of home
- hassle factor; lack of motivation
- lack of awareness of technologies / opportunities

An LIC program could address each of these barriers. The latter two points (hassle factor, lack of awareness) should be considered in the design and delivery of a program, as discussed later in this report.

An LIC program would be particularly helpful for those who own relatively inefficient (often older) homes and who do not have the personal savings or access to low-interest financing that would allow them to make energy improvements.

In this section, we consider:

- How old are Yellowknife homes, and what kind of shape are they in?
- What kind of take-up has there been by Yellowknife homeowners to previous energy retrofit incentive programs, and how much energy and cost savings were they able to realize?
- What financial capacity might Yellowknifers have to pay for energy retrofits on their own, without an LIC program?
- Is there high turnover in Yellowknife home ownership, and could this prevent Yellowknifers from wanting to invest in home energy efficiency upgrades?

Age and condition of Yellowknife homes

According to the 2006 census (the most recent data available), about 40% of dwellings in Yellowknife were built before 1980. Most of these pre-1980 homes were built in the 1960s and 70s.

The census also shows that 10% of owner-occupied homes in Yellowknife are in need of major repair (340 dwellings), and 32% of owner-occupied homes are in need of minor repairs (another 1150 dwellings). This may signal opportunities for homeowners to conduct energy efficiency upgrades while they are undertaking their necessary repairs. According to an Ipsos Reid survey of Toronto residents, timing was usually the main driver of energy retrofits; if a homeowner already needs to replace an item such as a furnace, she or he is more likely to choose an upgrade that improves energy efficiency or uses renewable energy.[6]

EnerGuide is a rating system that scores Canadian homes on a scale of 1 to 100, with a rating of 100 representing a house that is airtight, well insulated, sufficiently ventilated and requiring no purchased energy. A home rated as 0 has major air leakage, no insulation and extremely high energy consumption. New homes built to minimum Canadian building code standards generally rate between 65 and 72. Homes rated 80 or higher are considered 'energy efficient'.[7] As of January 2008, the City of Yellowknife requires new homes to meet the EnerGuide 80 standard.[8] An upgrade from an EnerGuide rating of 72 to 80 represents a 40% reduction in energy use.[9]

Out of 1069 Yellowknife homes that have been audited within the past decade, only 8% met or exceeded EnerGuide 80 standard, while 40% met or exceeded EnerGuide 70 standard. EnerGuide ratings were generally related to the age of the house, with older homes receiving lower ratings. The average NWT home built around 1960 is rated about 60; a 1980 home is rated about 65; and an NWT home built in 2000 is generally rated about 70.[10]

Older homes in Yellowknife are more likely to contain renters than newer homes. Only 48% of pre-1980 dwellings in Yellowknife are occupied by owners (as opposed to renters), while 58% of post-1980 homes

Photo: Matthew Levesque, Pembina Institute

are occupied by owners. Given that renters cannot participate in a property tax-based LIC program, yet older homes may benefit the most from energy retrofits, this moderately limits the potential uptake of a Yellowknife LIC program.

Previous energy retrofit incentive programs in Yellowknife

The federal EcoEnergy Retrofit Program ran from April 2007 to March 2012 and provided homeowners with grants of up to $5,000 for eligible energy efficiency measures, which included space heating, insulation (basement, attic, walls), draftproofing, and new windows and doors. The program required an energy assessment using the EnerGuide Rating System before and after work was completed. While 961 homeowners in the NWT had initial EnerGuide assessments done, only 211 followed through with energy efficiency upgrades.

The results of this program provide useful lessons for any future LIC program in Yellowknife. Unfortunately, the data available from the EcoEnergy program covers the NWT as a whole (with no breakdown specifically for Yellowknife); however, it can be assumed that a large portion of participating homeowners may have been in Yellowknife, given that Yellowknife contains about half the population of the territory.

About 47% of the houses that had assessments done were built before 1980. This roughly matches the housing profile in Yellowknife, where about 40% of the dwellings were built before 1980. However, owners of houses built before 1980 were much more likely to follow through with the upgrades: 28% vs. only 17% follow-through by

owners of houses built after 1980. While houses built in the 1970s were subject to the largest number of upgrades compared to any other decade of construction, the highest rate of follow-through was with houses built in the 1960s (32%). For houses built before 1980, the three most popular upgrades were draftproofing, windows/doors and then walls. For houses built after 1980, the three most popular upgrades were draftproofing, windows/doors, and then space heating.

The 124 homes built before 1980 that went through with upgrades saved on average about 49 GJ of energy per house per year. This would correspond to about $3,949 per year in savings (2014 equivalent) if the house is heated with electricity, or $1,634 per year in savings if the house is heated with oil.[11] Upgraded NWT homes built before 1980 improved their EnerGuide rating score by 8 to 9 points. Another 87 homes built after 1980 improved their EnerGuide ratings by up to 6 points and saved between 8 and 34 GJ of energy per house per year.[12]

It is interesting to note that the NWT had the lowest follow-through rate in the country (percentage of those who had initial assessments done who actually followed through with upgrades), with only 20% compared to the Canadian average of 80% follow-through. This may in part be due to difficulty securing qualified contractors and/or access to financing beyond the partial grant amount.

Arctic Energy Alliance (AEA) has been administering rebates to NWT residents on behalf of the the territorial government to support energy efficiency upgrades in residential homes and businesses. The rebates awarded in Yellowknife over the past five years consistently number in the several hundreds, and the dollar amount distributed per year has exceeded $200,000 for the past four years. The heat-related retrofits (wood or pellet stoves, insulation/air sealing, and efficient furnaces and boilers) represent somewhere between 20-30% of the total number of rebates Yellowknifers have accessed. In terms of dollars they represent closer to 40-50% of the rebates. This indicates that these types of energy improvements are the more expensive of those that Yellowknife residents wish to pursue and may warrant additional financing mechanisms.

Financial capacity of Yellowknife residents

Yellowknife households on average have nearly the highest income of any municipality in Canada.[13] While home prices in Yellowknife are relatively expensive, the average household annual income covers 28% of the average home value, which is significantly higher than some other cities such as Whitehorse and Toronto (23% and 16% respectively) (see Table 1 below).

Despite the apparent wealth of Yellowknife residents, there are also many first-time homeowners, who tend to be cash-poor and highly leveraged. According to a 2014 trends report by the Canada Mortgage and Housing Corporation (CMHC), more people in Yellowknife are moving into first-time home ownership — especially lower priced condominiums and mobile homes — given low interest rates and an 18% drop in the prices of Yellowknife condos between 2012 and 2013. First-time homeowners are notorious for maxing out their mortgage limits, so they may have limited savings and limited ability to access further loans through conventional means.

The size of loan required for an energy efficiency retrofit, often less than $10,000, is typically offered by banks only as high interest unsecured loans.[15]

Turnover in home ownership

It is possible that turnover rates in Yellowknife home ownership could prevent Yellowknifers from wanting to invest in home energy efficiency upgrades.

Table 1. Comparison of Yellowknife income to home value ratio[14]

	Average annual household income	Average home price	Avg household income as % of avg home value
Yellowknife	$138,278	$493,544	28%
Whitehorse	$96,112	$417,779	23%
Toronto	$93,288	$594,112	16%

According to research by the Ontario Clean Air Alliance, homeowners generally demand a payback on energy efficiency investments in the range of one to five years, given uncertainty about future savings from the investment, difficulty accessing funds, and uncertainty about how long they will own the home.[16] This is why many LIC programs have been designed to make loans transferable, meaning they stay with the property, and homeowners can recoup their investment when they sell their house.

In fact, Yellowknife home turnover rates are not excessively high, and new studies show that LIC loan transferability is not as important to the success of a program as once thought.

According to calculations based on CMHC data, the ratio of Yellowknife housing transactions to housing stock was about 6.8% in 2012, and about 6.0% in 2013.[17] A similar estimate of the ratio of Whitehorse housing transactions to housing stock in 2006 was 5.5%,[18] and in Toronto the ratio in 2006 was 4.6%.[19]

While Yellowknife has a reputation for being a very transient city (with many residents arriving and leaving within short periods of time), it could be that many transient people are renters rather than homeowners, which would not affect participants in a property-tax-based LIC program.

Several other LIC programs in North America have been successful even when they do not tie loans to the property or to the utility bill, but rather to the individual resident, meaning the loan is not transferable. For example, Manitoba Hydro's Power Smart program and Clean Energy Works Oregon have both had substantial uptake (89,000 and 3,000 households respectively).[20] Analysis suggests that when participants are deciding whether or not to undertake energy retrofits, they are much more concerned with the interest rate being offered, rather than how long they will be staying in the house.[21]


Photo: Binnu Jeyakumar, Pembina Institute

Conclusion

The evidence above suggests that there may indeed be a need and a significant demand for an LIC program in Yellowknife, particularly amongst owners of houses built in the 1960s and 70s. This segment of the population realized the greatest energy and cost savings from retrofits conducted under the EcoEnergy program. Poor overall follow-through in the NWT with the EcoEnergy program could potentially be improved with better access to financing (beyond the $5,000 grant that was offered).

An estimated 60% of Yellowknife homes are rated below EnerGuide 70, leaving substantial room for improvement. Moreover, the significant number of owner-occupied homes in Yellowknife that are in need of major or minor repairs may signal opportunities for homeowners to conduct energy efficiency upgrades while they are undertaking their necessary repairs. It is interesting to note that amongst those who did follow through with the EcoEnergy program, building envelope improvements were most popular—not only relatively cheap upgrades such as draftproofing but also more expensive projects such as windows and doors. This indicates an appetite for energy improvements that would require financing for most people.

While Yellowknife residents have relatively high household incomes, many are first-time homeowners who are likely to have low savings and high debts, and who may find it difficult to access low-interest financing for energy retrofits.

Photo: David Dodge, Green Energy Futures

Experience from other Canadian cities

Jurisdictions across Canada, including Nova Scotia and Ontario, have begun to amend legislation to accommodate the use of local improvement charges to fund home energy upgrades. In Ontario alone, there are 22 municipalities collaborating in the design of their own local improvement energy retrofit programs.

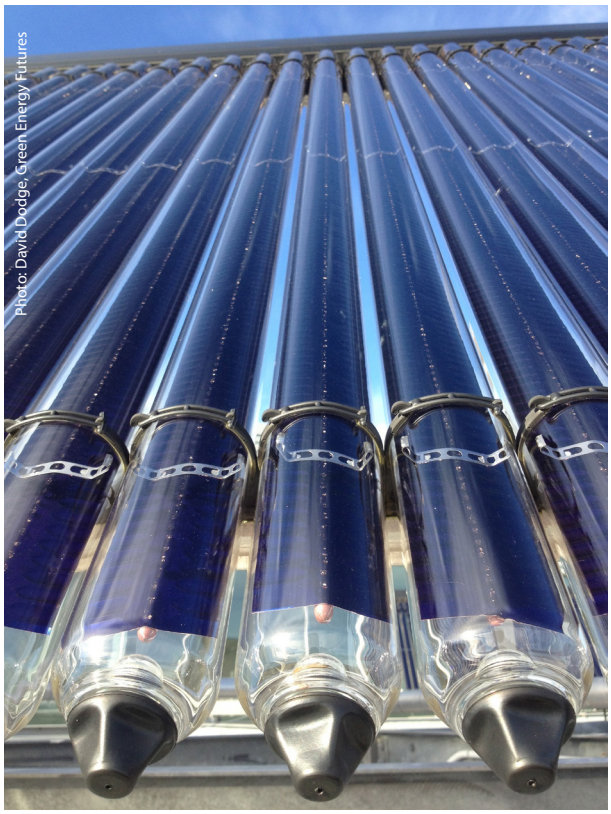
Some jurisdictions such as the Yukon are relatively hands-off in the delivery of their LIC programs — while the program provides the loan, it is up to the homeowner to figure out which retrofit to undertake, how much the energy and cost savings will be, whether the savings will be worth the expense, and which contractor to choose. Other jurisdictions such as Halifax have taken more of a 'turnkey' approach, retaining more control over which retrofits are eligible but providing a more complete package of services along with the loan itself. For example, a turnkey-style program could provide an energy audit and perhaps even manage the relationship with the contractor on behalf of the homeowner. Many LIC programs fall somewhere on this spectrum between 'hands-off' and 'turnkey'.

Halifax

Following a provincial legislative amendment in 2010, the City of Halifax[22] launched an LIC program called Solar City in March 2013. The program offers financing for only one eligible retrofit — solar water heating. It is a direct install program that uses only contractors who have an established relationship with the program. This makes it straightforward for homeowners by having the program oversee the contract management as well as rigorous screening, assessment and third party audit of contract work. Halifax also collects all available retrofit rebate incentives on behalf of the homeowner, putting the funds towards repayment.

The program has been popular, with over 1,600 applicants for 1,000 spots. In just over a year (2013–2014), Halifax installed over 325 residential solar heating systems — more than the rest of Canada combined within that period.[23] It is worth noting that only 25% of applicants have immediately followed through with installing the solar hot water heater. Another 25% have withdrawn their applications and the remaining half find it difficult to make a decision. Of those participants who follow through with installation, about 10% choose to finance the retrofit themselves rather than getting financing through the City.[24] This indicates that while low-interest financing is important to some participants,

others are attracted simply by the package of services offered by the City, such as contract management and auditing. Thus, a turnkey-style program addresses more than one barrier to homeowners undertaking energy retrofits — both the financial aspect and the hassle factor.



Solar water heating system

The total cost per home, including materials, installation, taxes and rebates, is about $6,500 to $7,900, according to the Solar City website. Each homeowner is expected to receive a 7 to 9% return on investment, with typical savings expected to be more than $20,000 over the lifespan of the retrofit, which is estimated at 25 years or more (see below for a discussion of payback periods and return on investment). Average annual greenhouse gas emission savings are estimated at 1,700 kg per participant.

Table 2 below offers more details comparing the Halifax Solar City program to Toronto's LIC program.

Toronto

The City of Toronto launched an LIC program[25] called the Home Energy Loan Program (HELP) in January 2014, following an amendment to Ontario legislation in October 2012. HELP falls somewhere in the middle of the spectrum between a hands-off and turnkey delivery style. While the City requires an energy audit to verify expected savings, homeowners are free to choose from a wide variety of retrofits, select their own contractor and manage the contractor themselves. Eligible retrofits include:

- thermal envelope (insulation for attic, exterior wall or basement; window or door replacement; air sealing)
- heat recovery/efficiency systems (furnace and boiler replacement, heat recovery ventilator, high efficiency water heater, drain water heat recovery system)
- water efficiency (toilet replacement)

The average loan is expected to be $10,000 per homeowner. The maximum loan amount is capped at 5% of property value, which means about $25,000 for the average home in the target neighbourhoods.

The City has partnered with Enbridge, which offers added incentives to participants. Enbridge will rebate the cost of the initial home energy audit if a participant chooses a retrofit designed to reduce home energy use by 25%. Enbridge also helps reduce hassle by sharing a shortlist of energy auditors accredited with NRCan that participants can use. The program helps participants access up to $2,650 in grants and incentives offered by Enbridge and Toronto Hydro.

Similar to Halifax Solar City, the first phase of Toronto's HELP program allows for 1,000 participants. During this first three-year phase, only four specific neighbourhoods are eligible. These areas contain pre-1980s (many are pre-1940s), two- to three-story semi-detached townhouses. During Phase 2, the program will expand to 15 to 20 neighbourhoods (based on a market demand survey), and Phase 3 may include a city-wide roll-out. These initial neighbourhood-based limitations on eligibility may make the program marketing and administration more manageable for a mega-city like Toronto.

Unlike the Halifax program, Toronto HELP requires participants to obtain the consent of any mortgage lender as a condition of eligibility (given that the loan will be a priority lien on the property, meaning the LIC loan must be paid back before the mortgage). It will be interesting to see if this proves to be a barrier to participation.

While results of Phase 1 are not yet available, the goals

Table 2. Comparison of Halifax and Toronto LIC programs

	Halifax Solar City	Toronto HELP
Delivery style	Turnkey One eligible retrofit City chooses and manages contractor	More hands-off Wide range of eligible retrofits Participant chooses and manages contractor
Eligible retrofits	Solar water heater	Building envelope / insulation Heat recovery / efficiency Water efficiency
Loan amount per home	$8,000	Average $10,000 Capped at 5% of property value
Number of participants	1,000	1,000
Grants/rebates/incentives available for each participant	$1,500	Up to $2,650 from Enbridge and Toronto Hydro
Average savings per participant	$200-750/yr (average $400/yr)	Varies; for a suite of retrofits that includes attic/wall/basement insulation, new furnace: $1,080/yr
Average payment per participant	$750/yr (including tax)	Varies; for a suite of retrofits that includes attic/wall/basement insulation, new furnace: $1,760/yr (15 yr term)
Interest rate(s) offered	10 year - 3.5%	5 year – 2.5% 10 year – 3.75% 15 year – 4.25%
Energy/GHG emission savings	1,700 kg per participant	Above suite of retrofits could reduce natural gas consumption by 56%
Total program budget	$8.3 million	$10 million
Administrative costs	$600,000	

of Toronto's program include reducing energy use by 25% overall, maintaining housing affordability, creating high-quality jobs, achieving established greenhouse gas reduction targets, and enhancing the quality of life for Torontonians.

Yukon

LICs have been used to finance renewable energy systems for off-grid residents in the rural Yukon since 1998.[26] It is an expansion of an LIC program set up in 1984 to help rural residents finance basic telecommunications infrastructure for their homes. The Yukon program is an example of a hands-off program. Neither an energy audit nor any evidence of energy or cost savings are required, there does not appear to be a list of eligible technologies, and homeowners manage the contractors themselves. The loan can be up to 25% of the property's assessed value, less all existing LICs.

Once a property owner obtains a quote for the cost of the energy improvement, the applicant and the Yukon Government agree upon a certain level of funding. A payback term of five, 10, or 15 years is chosen by the applicant, with interest calculated at the Bank of Canada daily rate at the time the LIC agreement is signed. The contractor submits invoices directly to the Yukon Government, which are paid upon final inspection and a statement of satisfaction from the property owner. The applicant pays back the loan on their property tax bill.

Between 1984 and 2006, the program financed about 600 grid connections in total; approximately 30 of those included a renewable electricity installation (mostly solar). Each project must be approved by a separate Order-in-Council. While this approval process would be too unwieldy for any larger-scale program, it shows how an LIC program could potentially operate with minimal rules and restrictions.

Guelph

The City of Guelph, Ontario, is working on developing an LIC program called the Guelph Energy Efficiency Retrofit Strategy (GEERS).[27] The program will be turnkey style and aims to keep the process as simple as possible for participating homeowners.

Homeowners will be offered a standard package of retrofit items that includes insulation, weather-stripping, windows, furnace, water heater, and comfort controls (i.e. a programmable thermostat). If an applicant has already completed one of these retrofits, he or she will receive credit for that. Pricing for this standard package will be based on the type of home and the square footage. The applicant will then get to choose from a selection of 'extras' such as rooftop solar (PV, thermal, or both), an electric vehicle charger, a rainwater harvesting system, re-roofing, a ground-source heat pump, and a micro combined-heat-and-power system. The City will manage all of the contracting.

GEERS emphasizes customer-friendliness. For example, each applicant will have a single point of contact at the City who is tasked with explaining the program, handling registration, and following up with the applicant throughout the process.

GEERS aims to achieve a 20-40% reduction in residential energy use, retrofitting between 2,000 and 3,000 homes per year between 2015 and 2031. Once the residential program is underway, the City of Guelph plans to tackle the industrial, commercial, and institutional sector.

Vancouver

The City of Vancouver[28] ran a pilot program in 2011–2012 that was discontinued due to disappointing uptake, offering some important lessons. While it was not technically an LIC program, since Vancouver does not yet have the legal authority to offer LIC loans, the City was helping homeowners to access financing for home energy efficiency upgrades and allowing them to pay back the loans on their municipal utility bills. The program was a partnership with VanCity Credit Union, which was the institution offering the financing. In addition, local utility companies (FortisBC and BC Hydro) offered rebate incentives for participants.

Feedback from City residents to program outreach staff indicated that the interest rate offered—4.5%—was too high. Some felt that the maximum loan amount ($10,000) was too low and not worth extending over a 10-year period. Flexibility was not being offered on the term (length) of the loan period.

The City of Vancouver is now seeking to amend its charter to allow repayments of the loans to be made directly through property taxes. This may allow the City to access lower interest rates that could be more attractive to local homeowners.

Edmonton

While the City of Edmonton[29] does not have an LIC program, it has provided start-up funding for a non-profit company (social enterprise) called C Returns, which provides a turnkey program that manages all the aspects of a home energy retrofit, short of actually providing financing. This model is based on the assumption that the major barriers to home energy upgrades are the hassle factor and lack of awareness about available or appropriate technologies, rather than lack of access to low-interest financing.

Photo: David Dodge, Green Energy Futures

C Returns home energy audit

C Returns provides a package of services to coordinate a home energy retrofit from start to finish, including an energy audit, payback information on potential retrofits, project recommendations, management of a competitive bid process, completion of grant and rebate applications, and project management. C Returns can also help

homeowners to secure financing, if necessary. The cost of a comprehensive assessment, in-home consultation and customized report is $295 plus tax. Many of the services can be accessed and managed on-line.

C Returns can evaluate a wide range of home energy improvement options, including building envelope improvements, solar power systems (PV and thermal), drain water and heat recovery ventilation systems, super-efficient heating and cooling systems, electricity reduction options and smart home items such as thermostats.

From 2013–2014, C Returns assessed nearly 100 homes. The first 12 homes were retrofitted at an average incremental cost of $7,220 each, with an expected average lifetime savings of $20,515 per home.[30] The program goal is to complete over 3,000 home audits and 1,500 green retrofits over the next three years.

Further references

The concept of using local improvement charges to support renewable energy and energy efficiency investments has been studied extensively the United States. LIC programs in the U.S. are also known as Property Assessed Payments for Energy Retrofits (PAPER) or Property Assessed Clean Energy Investments (PACE). Appendix E contains a sample list of resources and existing research on the topic.

After the housing crisis swept across the United States, the U.S. Federal Housing Finance Authority put a hold on many first generation PACE programs to limit the rise of property debt levels. Nevertheless, a new set of PACE programs has been emerging with added restrictions on the amount of LIC financing in relation to the property's existing debt to equity ratio.

Photo: Binnu Jeyakumar, Pembina Institute

What a Yellowknife LIC program could look like

Based on lessons learned from the literature and case studies described above, as well as interviews with Yellowknife experts, suggestions for a potential Yellowknife LIC program are outlined here.

Overview

Suggestions for a potential Yellowknife LIC program (named a 'Yellowknife Energy Savings Program') are outlined below, including:

- Eligible retrofits
- Aspects of program delivery
- Resident survey, outreach, and contractor engagement
- Energy audit / assessment
- Other conditions of participation

This report does not aim to put forward a comprehensive program design that is ready to implement. Many decisions still need to be made at the City and territorial government levels before this idea can move forward into the design phase. This report merely puts forward suggestions based on advice from key experts and stakeholders.

Our suggestion is for the Yellowknife Energy Savings Program to be more turnkey than hands-off in its approach. It could offer homeowners financing for a relatively limited suite of energy efficiency and renewable energy technologies, which have already proven to be cost-effective in the north. The focus would be on achieving savings from heating (rather than electricity), given that heating is a much bigger source of GHG emissions in Yellowknife. The eligible technologies would include wood/pellet stoves, high performance furnaces and boilers, and building envelope improvements.

Phase 1 of the program, estimated to last two to three years, would target 100 homes. This seems like a reasonable program size, given that Halifax and Toronto each targeted 1,000 homes in the first phase of their programs, and those cities are more than ten times the size of Yellowknife. Moreover, the federal EcoEnergy program completed 211 retrofits within the entire NWT over five years (2007–2012), so 100 retrofits in Yellowknife over two to three years seems realistic.

It may be wise to allow more applicants than the total target number of 100 participants, given the low follow-through rate experienced by other programs (about 25–50% for the City of Halifax). Therefore, approximately 200 applications could potentially be processed.

Given the nature of the eligible retrofits, the average loan size is expected to be around $10,000. Similar to Toronto,

Yellowknife could cap loan size at 5% of property value. Therefore, the total program budget would be $1 million, plus administrative costs (see the next section below on costs, benefits and funding sources).

Recommended eligible energy retrofits

The program would offer a small bundle of options to help homeowners save in heating costs:

- Wood/pellet stoves (renewable energy option)
- High performance furnaces and boilers (energy efficiency option)
- Building envelope improvements (energy conservation option).

In consultation with Yellowknife experts, these options were identified as priorities for a potential LIC program in Yellowknife, for the following reasons:

- the technologies have been proven effective and durable in Yellowknife
- they are cost-effective over a reasonable payback period
- they have moderate to high GHG savings potential
- the cost falls within a range ($5,000 to $20,000) that could be difficult for homeowners to afford without a low-interest loan
- they could work well for most Yellowknife homes (widely applicable)
- many local contractors and suppliers are familiar with these technologies

Moreover, each of the options above is eligible for a rebate under the GNWT's Energy Efficiency Incentive Program, administered by Arctic Energy Alliance. The Yellowknife Energy Savings Program could help participants to access those rebates to lower the loan amounts needed. Since 2009, the Energy Efficiency Incentive Program has issued rebates each year for an average of 85 wood or pellet stoves, 57 furnaces or boilers and 14 insulation or air sealing projects (across the entire NWT).

Participating homeowners could potentially choose more than one of the above three options; they are not mutually exclusive.

See Table 3 below for a summary of estimated energy, cost and GHG savings from the three eligible retrofit options.

Wood / pellet stoves

Renewable energy option

A 2011 analysis by the Arctic Energy Alliance evaluated a wide variety of potential renewable energy and energy efficiency measures in terms of both the GHG savings per home as well as the likelihood that a high percentage of NWT homeowners would install the technology (due to such factors as affordability and payback period). They found pellet stoves were the top priority measure that should be promoted, with wood stoves in second place, since they had relatively high potential take-up and the highest overall GHG impact (insulation improvements came third).[31]

Wood pellet stove

A wood or pellet stove, including installation, costs about $5,000. Rebates are available for up to a maximum of $700 per stove. Depending on the type and amount of fuel currently being used and the efficiency of the current system, a homeowner could expect to save between $1,700–2,300 per year; therefore the payback is 2 to 2.5 years. Stoves are expected to last 12 to 15 years.[32]

Participants interested in this option must understand and be prepared to deal with regular stove maintenance, which is somewhat more labour-intensive than a furnace.

High performance furnaces and boilers

Energy efficiency option

Photo: David Dodge, Green Energy Futures

Efficient natural gas furnace

Given that Yellowknife homeowners are not allowed to use a wood or pellet stove as a primary heat source, every home in Yellowknife has a furnace or boiler. In many cases these could be replaced with models that conserve significant amounts of energy and reduce GHG emissions. More efficient furnaces and boilers could also be a good solution for those who feel they cannot manage the maintenance of a wood or pellet stove.

The 2014 price of propane in Yellowknife was $0.80/L, versus $1.28/L for oil. The expected savings of switching from an oil furnace to a high efficiency (95% DHW) propane condensing furnace for a home using 5,000 litres of oil per year is about $1,300 annually, which means a payback of approximately 5.7 years.[33]

Rebates of $600 are available for a gas or propane furnace with a 95% AFUE or higher, or a gas or propane boiler with 92% AFUE or higher.[34]

Building envelope improvements

Energy conservation option

"Building envelope" means the parts of the building that separate the indoors from the outdoors and need to be well insulated, properly sealed, and well ventilated. It is widely recognized that the first step in improving energy use is to find opportunities to conserve energy, or to avoid needing to burn so much fuel of any kind in the first place. Advantages of building envelope improvements include durability (no need to replace within the lifespan of the building) and guaranteed savings regardless of fuel price fluctuations.

These types of retrofits would require careful assessment on a case-by-case basis to ensure cost-effectiveness and a reasonable payback period. Window and door replacement are among the most costly items in this category (windows cost approximately $1,400 each). Without including windows, a full building re-insulation might cost $30,000 to $40,000, which would likely go over the suggested cap on loans (5% of property value). However, partial building envelope improvements could also be possible and beneficial. Given that building renovations often have multiple purposes — improved look/style as well as energy efficiency — a cap on loan size could alternatively be set according to a multiplier of expected energy savings.


Photo: Roberta Franchuk, Pembina Institute

Improved insulation

Table 3. Comparison of savings from eligible retrofit options, compared to an 83% efficient oil furnace burning 4,000 L of oil / year

	Wood / pellet stoves	High efficiency propane condensing furnace	Building envelope improvements
Cost estimate	$5,000	$8,000	$5,000-$20,000
Rebate available	Up to $700	$600	$250 to 350
Expected annual savings*	$1,700 to $2,300	$1,300	Depends
Payback period	2 to 2.5 years	6 years	Depends
How long it lasts**	12-15 years	12-15 years	Often life of house
GHG savings	10.5 tonnes CO_2e per GJ	2.2 tonnes CO_2e per GJ	Depends

* Calculations are based on assumption that the home has been burning 4,000 L of oil per year. Savings will be greater and payback periods will be shorter with greater amounts of oil burned.
**While stoves and furnaces are often marketed as lasting 30 years or more, these appliances often last half as long in Yellowknife as in southern Canada due the wear and tear of harsh winters (pers. comm. Mike Stuhec).

Rebates of $350 are available for building envelope improvements that result in a decreased air leakage of 30% or more ($300 rebates are offered for a 20% decrease; $250 is offered for a 10% decrease).

The results of the EcoEnergy program (2007–2012) show that certain building envelope improvements (draftproofing, windows/doors and walls) were even more popular with NWT participants than space heating improvements. While draftproofing (a relatively cheap and easy upgrade) was the most popular, the second and third most popular improvements undertaken were windows/doors and walls, which indicates that NWT homeowners have an appetite for the more involved and expensive energy conservation projects. One option is for the City of Yellowknife to require draftproofing as a minimum first step before granting a loan for window, door, or wall upgrades. However, it may be wise to keep rules and restrictions to a minimum to lessen administrative costs and make the process simpler for applicants.

Photo: Binnu Jeyakumar, Pembina

Other options

The following heating retrofit technologies were also considered for a Yellowknife Energy Savings Program but deemed impractical at the current time:

Pellet or wood chip boilers

Pellet or wood chip boilers could potentially assume more of the heat load for larger homes. However, these boilers are significantly more expensive ($25,000-$35,000) and the payback periods would be significantly longer. Moreover, homeowners are still required to have a fossil fuel based furnace or boiler as the primary heat source, so there is little incentive to try to cover all of the home's heating energy needs with wood fuel.

Solar hot water system

A solar hot water system could potentially offset about half of the energy needed to heat a home's water over the course of a year in Yellowknife, less than the energy contribution in Halifax which has a lower latitude and milder winters. While the price of a solar hot water system, including installation, is about $8,000 in Halifax, the cost would be significantly higher in Yellowknife ($10,000 to $15,000). If a Yellowknife homeowner is currently heating water with electricity, they might save

about $1,000 a year, resulting in a 10 to 15 year payback, but if they currently use propane to heat water then the payback would be as long as 33 years, which is likely longer than the life of the system. The GNWT already offers $700 rebates for on-demand propane water heaters.

Drain water heat recovery system

A passive drain water heat recovery system could be a great energy-saving option for some Yellowknife homes; however, it is best installed at the construction stage (new homes), and it is not expensive enough to warrant a loan. The technology itself (basically just copper piping) is very simple, effective, and unlikely to break or need replacement during the life of the home. It only costs about $500 to $800, and a $300 rebate is already available. The system takes heat from water running down the drain (usually from a shower) and recycles the heat back to the incoming water. It would not work well for people who primarily take baths. The system can be awkward to install in existing homes, especially if the house is only one story and has no basement, or if there is no room in the wall for the piping.

Air source heat pump

An air source heat pump is an electrically powered device that transfers heat from the outside air into a building. While these devices have been shown to work well in southern parts of Canada, their efficiency decreases with colder temperatures and they must be shut off below minus 15 or 20 degrees Celsius to avoid using excessive electricity.[35] Nevertheless, they can work well in moderately cold temperatures, and the Yukon Government offers rebates of up to $600 for these devices.[36] Given the price of electricity in Yellowknife, it is unlikely air source heat pumps would be economic for homeowners at this time; however, further research may be warranted.

Program delivery

A 'turnkey' approach is recommended for the Yellowknife Energy Savings Program, whereby the program would not only help residents access low-interest financing, it would also:

- include an assessment of energy costs and savings
- assist clients in securing contractors at a fair price
- provide convenient links to existing rebate programs

This type of approach has proven successful in Halifax's Solar City program. While the City of Toronto decided on a somewhat more hands-off approach by putting the onus on the homeowner to choose and manage the contractor in order to reduce its liability, Supervisor Marco Iacampo of the Toronto HELP program recommended that Yellowknife adopt the turnkey model.[37] The contractor market is much smaller and less developed in Yellowknife than in Toronto, so securing a contractor could be a key bottleneck for participants without assistance from the City (see "Contractor engagement" below).

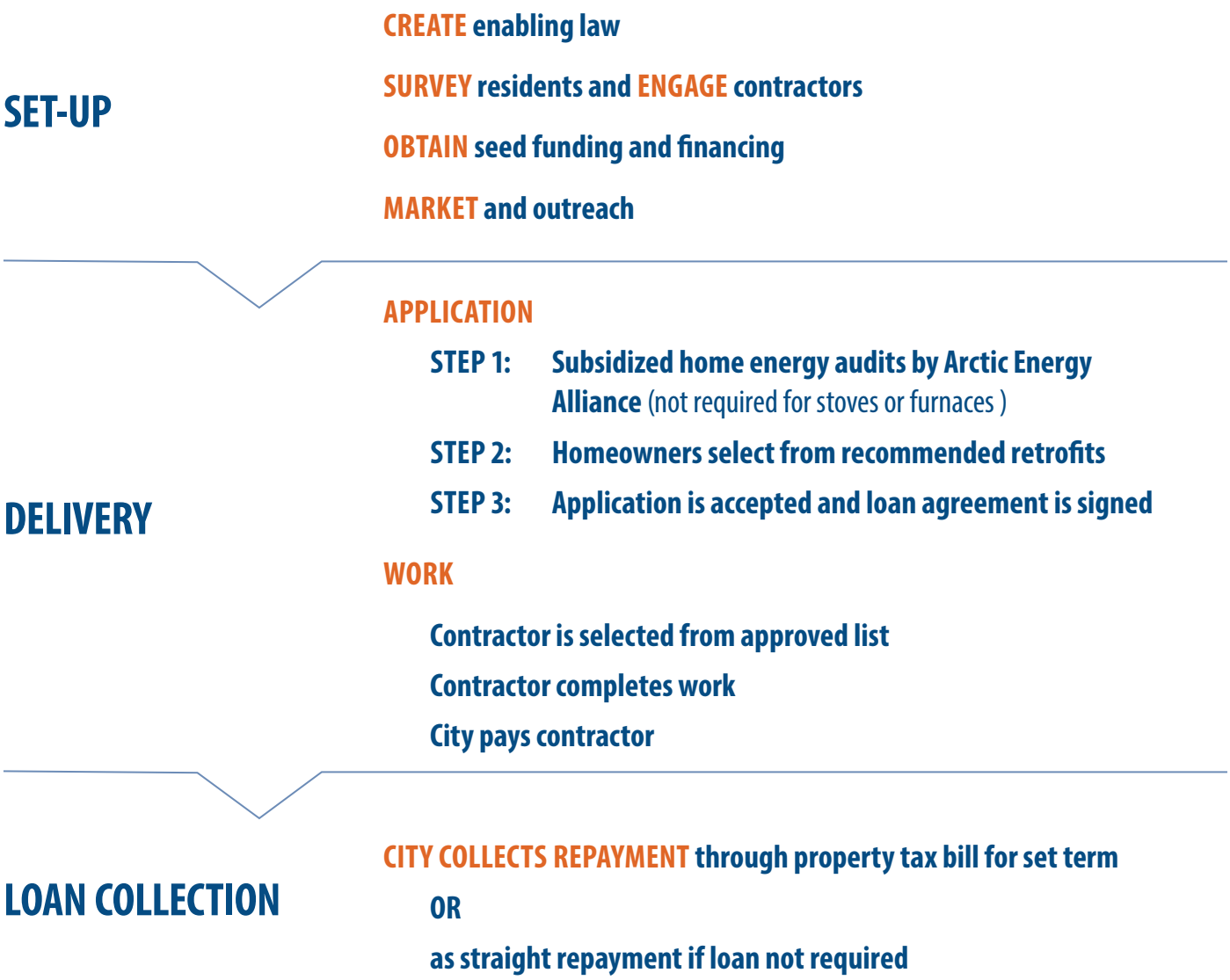
Making the process as simple and straightforward as possible for participants will be key. In this regard it may be useful to learn from the Guelph GEERS program, which plans to emphasize customer-friendliness and have City staff walk applicants through each step of the process. One option Yellowknife might consider is to combine the LIC application process with the building permit application process, if such a permit is required for the desired retrofit, in order to streamline the process for the participant.

Arctic Energy Alliance is a well-established Yellowknife-based organization that is already geared towards helping residents achieve energy and cost savings (including through retrofits). AEA already provides several components that are proposed within the Yellowknife Energy Savings Program, such as offering subsidized energy audits, administering rebate programs, and conducting energy-focused education and outreach. It may make sense for the City of Yellowknife to negotiate a contract agreement with AEA whereby AEA receives a portion of the administration fee and in turn administers several aspects of the LIC program.

Figure 2 below outlines the proposed steps for setting up an LIC program and the broad components of such a program in Yellowknife:

The first step in the setup, creating an enabling law, is addressed in detail in Appendix A, while the third step, obtaining seed funding and financing, is addressed in Appendix C.

Figure 2: Setting up and delivering an LIC program in Yellowknife



Resident survey and outreach

Any LIC program in Yellowknife should be designed according to the specific needs of local residents and take into account the features of the local contractor market. The City is already undertaking an online survey to get residents' feedback on the overall Energy Plan.[38] It would be advisable for the City to conduct further research (either a survey or focus groups) to understand residents' perspectives on an LIC program specifically.

The City of Toronto contracted Ipsos Reid to carry out focus groups with residents about its proposed LIC program, in order to investigate level of interest in retrofits, receptivity to LIC financing methods, and questions or concerns, as well as to identify communications approaches that could maximize resident understanding and appeal.[39]

The results, released in April 2013, found that the main barrier to homeowners undertaking energy retrofits on their own was lack of a guarantee on savings. A professional energy audit/assessment, as well as City assistance in securing reasonable contractor rates and a low fixed-interest loan, may help to address this concern.

While Yellowknifers will likely have different perspectives and priority concerns than Torontonians, the Toronto study nonetheless flags issues that the City of Yellowknife should be prepared to deal with. The top

concerns expressed by Toronto focus group participants included:

- Discomfort with the City acting as a bank, which some saw as not the proper role for the City. (Messaging could emphasize that the City is passing along preferential interest rates to residents rather than acting as a bank per se.)
- Fear that property taxes would be raised if the City knew the value of retrofits and renovations.

Transparency and clarity in an LIC program was key for Toronto focus group participants:

- Residents want clear information on how exactly the charge is transferred upon sale of the home, so it will not be a barrier to sale.
- Any administrative costs or surcharges for participating in the program should be communicated clearly up front.
- Residents want clear information about who will be held accountable and how any conflicts would be resolved between homeowners, government, contractors, etc.
- Residents want a clearly identified contact person who will manage the process and who they can go to with questions and concerns.

In terms of marketing and outreach, Ipsos Reid had the following recommendations:

- Focus group participants rank 'friends, family and neighbours' as their most trusted sources for information on home energy retrofits, as well as certified energy advisors. Word of mouth will be important to program success.
- All communication material and program design elements should emphasize control and decision-making authority being in the hands of the homeowner. While participants may need assistance, they still want options in which contractors to use, the rate of the loan and the length of the term.

With regard to the last point, Torontonians' preference for control was one reason that city went with a more hands-off program style where participants choose and manage the contractors themselves. While a Yellowknife program would likely work better with a turnkey approach, this may create tension given the strong ethos of independence and self-reliance amongst Yellowknifers. The City could consider ways to offer options wherever possible, allowing participants to retain a sense of control.

The importance of marketing and outreach cannot be overemphasized, according to those interviewed for this report who have experience with LIC programs. Inadequate outreach may have been one of the reasons why so few signed up for the Vancouver LIC pilot program.[40] The City of Halifax does regular events and advertising to raise awareness, and program representatives arrange many speaking engagements.

Given the conclusion above that owners of Yellowknife homes built in the 1960s and 70s may be prime candidates for an Energy Savings LIC Program, the City of Yellowknife could consider ways to target outreach towards these neighbourhoods, including by holding local events.

Contractor engagement

Contractors could be key allies for a Yellowknife Energy Savings Program, both in terms of outreach and promotion, and in terms of ensuring retrofits get completed within reasonable timelines and budgets. When a homeowner goes to a contractor to obtain a quote for a retrofit, the contractor should be well equipped to explain what kind of LIC loans are available, and where the homeowner can go to learn more about the program. This could be a win-win-win partnership for the contractor, the homeowner, and the City.

Contractors

Unfortunately, many Yellowknife homeowners currently find it challenging to obtain contractors for energy retrofit work, due to relatively low supply and high cost. The City could improve the situation by bringing

together a group of willing contractors and working out the expected volume, type and timing of needed retrofits over the next several years, to allow contractors to scale up or adjust their services accordingly. The City might play an active role in scheduling retrofits during seasons that are traditionally less busy for contractors.

The City could put a 'basket' of expected retrofits out for bid ahead of time, in order to find contractors who prove they can deliver satisfactory work at reasonable prices. One option is for the City to reach ongoing supply services arrangements with a select group of contractors, choose the best one for each job on a case-by-case basis, and manage contracts directly on behalf of each participating homeowner, as the City of Halifax does. Another option is to create a pre-approved list of contractors (who have agreed upon price ranges) and let homeowners select and manage the contractors themselves from this list. This pre-approved list option was to be used by the City of Vancouver (before the program was cancelled). In either case, rigorous third-party audits of contract work will be necessary.

While Halifax pays contractors directly, the City of Toronto issues funds to the homeowner — 10% once the initial purchase order agreement is signed, and the remaining amount once the City verifies the work is complete and certified.

Building strong relationships with contractors was cited as a key factor of success in Manitoba Hydro's Power Smart LIC program, which has had 89,000 households participate since 2001 (receiving loans up to $7,500 each).[41] Coordination with contractors also provides convenience for the client; for example, in the case of furnace financing, one contract is used for both furnace purchase and financing.

Inadequate consultation with contractors was cited as a reason for the poor completion rate experienced by the 2008–2009 Berkeley FIRST residential loan program in California — while all 40 application slots were filled, only 13 projects were completed. Poor communication with the City resulted in contractors being concerned about getting paid on time.[42]

Energy audit / assessment

An energy assessment or audit process is a key first step to determine whether a proposed retrofit will save

Photo: David Dodge, Green Energy Futures

Energy assessors

a homeowner energy and money, and to ensure that the payback period will not extend beyond the useful life of the retrofit. However, the assessment or audit process could be more or less in-depth depending on the proposed retrofit. For example, the assessment could be much simpler and less expensive if the proposed retrofit is either a wood or pellet stove or a furnace or boiler replacement, since much is known about energy and cost savings from those technologies. A more in-depth audit would be required for building envelope improvements, which can vary greatly from one building to another.

While scaled-down or targeted audits can help save costs, there is also benefit in encouraging homeowners to use the opportunity to have a full energy audit done on their home, to find out whether additional upgrades or energy efficiency/conservation opportunities exist.

In Halifax, applicants undergo an initial energy assessment and receive a feasibility report detailing their estimated return on investment and the system cost after all rebates and incentives. About 5 to 10% of homes are deemed non-feasible and screened out, but these applicants still receive a report with an explanation. Typically homes are screened out because they will not save enough money on upgrades to justify the cost, or they are deemed structurally unsuitable.[43]

Both Halifax and Toronto require third-party verification that the retrofit was completed as planned, but do not require a full post-retrofit energy audit to determine actual energy and cost savings. While a post-retrofit

energy audit would be ideal in order to determine the GHG and cost savings achieved by the program as a whole, this step may be too expensive and impractical as a requirement for each participant. A smaller selection of participants could receive a post-retrofit energy audit as part of program evaluation.

Other conditions of participation

The Halifax program allows participants to pay off any outstanding balance partially or fully at any time with no penalties. If the home is sold, the participant has the option of repaying the outstanding balance at that time, or transferring the loan to the new homeowner. According to staff with Halifax Solar City, there have been no problems reported so far related to the sale of homes with these LIC loans attached to them.

The customer agreement signed by Halifax Solar City registrants requires participants to notify their insurance provider about the new system being installed (and purchase appropriate insurance coverage), notify potential home buyers about the lien on the house, and to provide any buyer with a copy of the agreement with the City.

The City of Toronto has been more concerned about the risk of LIC loans complicating real estate transactions, and requires homeowners to obtain the consent of their mortgage provider. It will be interesting to learn as the Toronto program unfolds how mortgage lenders are reacting to the program.

Photo: Binnu Jeyakumar, Pembina Institute

Photo: Roberta Franchuk, Pembina Institute

Benefits, costs and funding sources

Benefits of an LIC program

An LIC program for energy efficiency and renewable energy improvements could create significant financial and non-monetary benefits for both the City and individual residents. City-wide benefits include:

- creating a more comfortable and affordable place to live
- stimulation of local economic development, particularly in the construction/retrofit sector and the biomass energy sector
- progress in achieving the City's GHG reduction targets, and demonstration of the City's continued leadership on climate action

Benefits for individual homeowners include:

- immediate savings through lower utility bills
- improved health and comfort for residents
- lower fixed interest rates for longer repayment terms (eg. up to 15 years) than homeowners could obtain on their own
- equal access to financing regardless of homeowner income
- transferability of the loan with the property

The first phase of the Yellowknife Energy Savings Program (targeting 100 homes) is estimated to potentially save each homeowner on average per year:

- about $1,300 in energy costs (not including cost of the investment)
- 40.3 GJ of energy
- 3.75 tonnes of carbon dioxide equivalent (CO_2e)

These calculations are explained fully in Appendix B.

Briefly here, the estimates are derived from the actual experience of the EcoEnergy Retrofit program. Homeowners who undertook space heating and insulation/building envelope improvements between 2007–2012 through this program saved an average of 40.3 GJ of energy and 3.75 tonnes of CO_2 per year. For a Yellowknife homeowner using oil to produce 40.3 GJ (given the 2014 price of oil), this would translate to $1,344 in savings. A homeowner using electric baseboard heating would save a much greater amount ($3,248), but relatively few Yellowknifers use electric heating given the cost, and CO_2e savings would be minimal in this case given that Yellowknife electricity is mostly powered by hydro. This correlates well with the estimate of $1,300 in expected savings per year from replacing an oil furnace with a propane condensing furnace (see Table 3. Comparison of savings from eligible retrofit options, compared to an 83% efficient oil furnace burning 4,000 L of oil / year).

With a total of 100 participants in Phase 1, Yellowknife's Energy Savings Program is expected to save residents about $130,000 per year in total, while reducing CO2 emissions by about 375 tonnes per year.


Photo: Binnu Jeyakumar, Pembina Institute

The Yellowknife Energy Savings Program would not benefit renters, who occupy about half of the dwellings in Yellowknife, although 64% of renters live in apartments. In total, about 15.7% of households in Yellowknife are renters in single detached, semi-detached or row houses, none of whom would likely benefit from a property tax based LIC program.

Payback periods and return on investment

Using a simple payback (total cost divided by annual savings) is common in business decisions. However, this method does not take into account rising fossil fuel costs, the life expectancy of the system, increasing future savings or the likely costs associated with the status quo or alternative options.

A return on investment (ROI) calculation takes into account the lifespan of the system, and would assume at least a 5% escalation rate in energy costs.

For example, the Halifax Solar City program estimates that the average homeowner payment will be $750 per year, and the average savings will be $400 per year, which adds up to a net cost of $350 for 10 years. From an ROI perspective, however, the program offers each homeowner a 7 to 9% return on investment, with typical savings expected to be more than $20,000 over the lifespan of the retrofit (estimated at 25 years or more), with average annual savings of $425. Annual savings are expected to outweigh annual payments after about eight years (creating a positive cash flow starting around year nine).[44]

It would be helpful for the City of Yellowknife to emphasize the return on investment perspective, rather than simple payback calculations, in marketing and outreach for its program.

Costs of an LIC program

The Yellowknife LIC program would ideally be revenue neutral, meaning all costs would be recovered from participants (including administrative fees).

It is envisioned that the legislative amendment enabling LICs in the NWT would require any municipality to recover the full cost of the program from local improvement charges, including the financing costs of short-term debt and long-term debt (see Appendix A for a sample draft legislative amendment). Any risk of municipalities themselves defaulting on loans could be addressed by retaining adequate Ministerial oversight.

A small grant or loan would be required for administrative set-up costs, estimated at approximately $150,000.[45] Ongoing administrative costs for the Yellowknife Energy Savings Program could be as high as $80,000 per year, judging by the cost of programs in other cities.[46] The City of Toronto charges each participant an administrative fee of 2% of the value of the loan; however with only 100 participants in Phase 1 of the Yellowknife Energy Savings Program and an average loan value of $10,000, a 2% administrative fee would only amount to $20,000. The City of Yellowknife may need to charge a higher fee, but this will make the program less attractive to participants. The City will need to work particularly hard to reduce and streamline administrative costs as much as possible. Offering participants a limited range of proven options for eligible retrofits will help. A contract with Arctic Energy Alliance for parts of program delivery might also help to leverage existing resources and reduce potential duplication.

The City would require access to a guaranteed low-interest source of program funds, about $1 million in start-up capital for a Phase 1 program targeting

100 homes. This would likely involve borrowing from a financial institution, with the territorial Minister's approval. However, other options for seed funding and financing mechanisms are outlined below.

Seed funding and financing options

The City of Yellowknife has five main options for obtaining the $150,000 in start-up funding and $1 million in capital needed to finance an LIC program:

- Borrow from a financial institution (requiring a Ministerial exemption or a City-wide referendum)
- Use existing capital reserves
- Land sale or endowment
- Access grants for start-up seed funding (would not address financing issue)
- Establish an internal revolving fund for start-up seed funding (would not address financing issue)

These and other options for consideration are discussed in more detail in Appendix C.

Most municipalities have access to low-interest financing from financial institutions that can be used to support the LIC loan program. For example, the City of Yellowknife is financing its new water treatment plant with a 15-year loan at 3.4% interest. Section 112 of the territorial Cities, Towns, and Villages Act (CTV Act) requires NWT municipalities to obtain voter approval or a Ministerial exemption from voter approval in order to take on long-term debt above certain limits. A simple amendment to the CTV Act or a Ministerial exemption for the City of Yellowknife's LIC program would allow the program to be financed through a bank.

The City of Halifax obtained a $5.5 million loan from the Federation of Canadian Municipalities' (FCM) Water Conservation Fund to partially cover its Solar City program budget which totaled $8.3 million. While reporting requirements are more onerous with FCM loans than with a financial institution, the Fund issues loans at one point below the standard interest rate. According to Halifax's Energy Manager, the program could have gone ahead with a bank loan instead; however the FCM loan provided added comfort.[47] The Solar City program was eligible for this particular fund because of its link to water; it is not clear whether Yellowknife's LIC program would qualify for an FCM loan.[48]

Another option is to set aside capital to form a large enough floating fund to cover the first phase of projects. Toronto was able to finance its HELP program by committing up to $20 million from its existing working capital reserve fund. This may not be practical or possible for a city the size of Yellowknife.

The Toronto Atmospheric Fund (TAF) is an arm's-length organization mandated to reduce greenhouse gas and air pollution emissions in the Toronto area, including by increasing energy efficiency in buildings (see Appendix D). TAF was formed out of a $23-million endowment resulting from the sale of Toronto municipal land. A land sale by the City of Yellowknife would be governed by the Land Administration bylaw, which is prescriptive in terms of what can be done with the money.

While grants would likely not be large enough to cover the full program budget (including financing), they could be accessed for seed funding to cover program design, set-up and initial outreach. A grant for up to $150,000 was offered for 2015–2016 from Natural Resources Canada (NRCan) for purposes such as this; NRCan previously gave a start-up grant to Toronto's HELP program. Halifax's start-up administrative costs were covered by a $550,000 grant from FCM. Toronto received seed funding amounting to about $1 million from TAF, Ontario Power Authority, NRCan, Enbridge and Toronto Hydro.

It is also possible for local governments to establish revolving funds to provide start-up funds for an LIC program. Both the City of Hamilton and the City of Edmonton have established internal revolving funds where they reinvest savings gained from initial municipal energy retrofit projects into other municipal energy efficiency improvements. While setting up a formal revolving fund may be an unnecessary administrative burden for Yellowknife, the City could simply set aside some of its gas tax money or Community Energy Plan funds in order to support an LIC program.

Conclusion: Key factors for success

There appears to be a need and a significant demand for an LIC program in Yellowknife, particularly among owners of houses built in the 1960s and 70s. An estimated 60% of Yellowknife homes are rated below EnerGuide 70, leaving substantial room for improvement.

The Yellowknife Energy Savings Program would ideally follow a 'turnkey' approach, whereby the program would not only help residents access low-interest financing; it would also:

- include an assessment of home energy costs and savings
- assist clients in securing contractors at a fair price
- provide convenient links to existing rebate programs

The program would offer homeowners financing for a relatively limited suite of energy-efficiency and renewable energy technologies, which have already proven to be cost-effective in the north. The eligible technologies (all heating-related) would include wood/pellet stoves, high performance furnaces and boilers, and building envelope improvements.

Given the lessons learned in other jurisdictions with LIC programs, the following are seven key factors that could help a Yellowknife Energy Savings Program be successful:

1. Low interest rates

Interest rates seem to be the biggest single factor in whether or not LIC programs have gotten off the ground and attracted participants.

Manitoba Hydro's Power Smart program and Clean Energy Works Oregon have both had substantial uptake (89,000 and 3,000 households respectively) due to attractive interest rates, despite offering non-transferable loans that are attached to the individual rather than the property.

On the other hand, Vancouver's pilot LIC program attracted very few participants due to a 4.5% interest rate. Feedback on the Berkeley FIRST program also indicated that 27 of 40 participants withdrew in large part because the program's interest rates were higher than expected.[49]

2. Get the loan size right

If the loan amount is too large, there is a risk that the retrofit will not produce the expected payback within a reasonable time period, and the homeowner could be dissatisfied or default on the loan. The City of Toronto caps its loans at 5% of the property value.

On the other hand, there are risks of offering loans that are too small (under about $5,000). The administrative costs of managing loans for many small projects add up, and the City gets less 'bang for the buck' in terms of energy and GHG savings. Small loans may encourage homeowners to choose only the lowest-hanging fruit and miss opportunities for deeper retrofits with greater energy and cost savings in the long run. Finally, the program may attract few participants in the first place, since homeowners are more likely to be able to pay for smaller projects out of their own savings or on credit.

3. Effective marketing and outreach

While inadequate outreach was observed to be a significant factor in the poor uptake of the Vancouver LIC pilot program, staff at Halifax Solar City point to effective marketing and outreach as the biggest key to their success. The City's communications team was involved right from the early stages of program design. The team aims to create 'buzz' by doing regular events, advertising and speaking engagements to raise awareness. The Toronto HELP program organizers contracted Ipsos Reid to identify communications approaches that could maximize resident understanding and program appeal.


News Bulletin #7 June 2014

Solar City

Hello Solar City Community,

With spring now here, the Solar City Program is running full speed again. Scotian Renewables and Thermo Dynamics spent the winter roughing in equipment inside homes and April has seen the completion of a lot of systems. Lots of other solar news to catch up on too!

Solar City Registration Open and Growing

General registration is now open for the Solar City Program at www.halifax.ca/solarcity. Since opening up the registration again in early March, over 1,000 new homeowners have signed up and will be getting a free solar assessment in the next 3 months. Registration is now easier than ever.

Next Open House

June 12, 6-7 pm

Halifax North Memorial Library, 2285 Gottingen Street

New to the Solar City Program? This is a great chance to ask questions and hear how the program runs. Typically a 20 minute presentation is given by the HRM Solar City staff followed by Q&A. Thermo Dynamics also has demo equipment set-up. More than 500 people have attended our Open House nights. Please RSVP to solarcity@halifax.ca to secure a seat at this Open House! More Open Houses will be coming. Of course you can always call or visit the website too.

Contact Us

Website: halifax.ca/solarcity

Email: solarcity@halifax.ca

Phone: (902) 240-8208

In this issue

- Registration Opens
- Solar Fiesta Recap
- Next Open House – June 12
- Halifax's Solar Energy Map
- Solar In the City
- Solar City by the numbers
- Council update
- Solar Fast Fact – cloud cover?
- Looking for volunteers to be mapped
- Shape Your City's Energy Future
- Dalhousie's GEEN
- We want your comments and feedback

HALIFAX REGIONAL MUNICIPALITY

Real estate agents may be another important partner for the City. First, it may be necessary to address their questions and concerns about the program, given that some may view the LIC loan as a complicating factor in house sales and mortgages. On the other hand, energy retrofits represent improvements to home value, and real estate agents need to be aware of the selling points.[50] An important factor that will drive homeowners' interest in energy retrofits is whether potential buyers will pay more for the house as a result; therefore, increased awareness of EnerGuide standards and ratings within the housing market will contribute to success of the LIC program.

4. Phase in gradually

Due to current bottlenecks in local contractor availability for home energy retrofits, it will be particularly important for Yellowknife to phase in its Energy Savings Program. By opening up clear communication channels and establishing formal agreements with contractors, the City can encourage contractors to scale up or adjust their services. The program must allow time for the contractor market to grow and develop.

It is anticipated that Phase 1 of the Yellowknife Energy Savings Program will allow for a maximum of 100 participants over the course of two to three years. This time could be lengthened or the number reduced, depending on feedback from residents and contractors during program set-up and over the first year.

5. Make it simple for participants

Newer programs such as GEERS in Guelph and C Returns in Edmonton are recognizing that the hassle factor may be equally or more important than lack of access to low-interest financing in preventing people from doing home energy retrofits. Therefore, a successful LIC program must be easy for homeowners to understand and involve only a few clear steps. Homeowners should have a clear and consistent point of contact at the City (or Arctic Energy Alliance) to answer their questions and guide them through the process.

The program must be designed to help people overcome the hassles associated with identifying energy-saving opportunities, figuring out the right technology, finding and managing a contractor, and getting a fair deal. These services are incorporated into the turnkey approach. At the same time, the Ipsos Reid survey results from Toronto indicated that homeowners want to retain a sense of control over the process, which means having key choices available to them such as the length of the loan term.

One of the lessons the City of Halifax learned is how difficult it is to make a program simple for participants; Solar City has required extensive teamwork from not only the City's energy team but its legal, finance, and communications departments.[51]

6. Streamline administration

If administrative costs are ultimately to be fully covered by charges on program participants, and there are relatively few participants in a small program, then administrative costs must be kept to a minimum in order to avoid charging unreasonable fees and driving away participants.

Streamlining administration is also necessary to keep the program financially sustainable. An on-bill LIC program run by BC Hydro from 1990 until 2002 was ultimately cancelled because administrative costs took up almost half the program budget.[52]

A small city like Yellowknife has limited administrative capacity, and must make use of all available resources and partnerships. A contract with Arctic Energy Alliance for parts of program delivery might help to leverage existing services and reduce potential duplication.

Streamlining can be enhanced by offering participants a limited range of eligible options for retrofits and by reaching service agreements with contractors ahead of time.

7. Win political support

An LIC program for Yellowknife will be impossible without an amendment to the territorial CTV Act, which will require the support of political leaders and top staff within the GNWT. Other communities in the NWT have shown their support for an LIC amendment through a resolution by the NWT Association of Communities.

Photo: Yellowknife City Hall by Alan Sim via Creative Commons

Appendix A: Required changes to Cities, Towns and Villages Act (CTV Act)

Overview

Changes to the CTV Act could be made along similar lines as recent amendments in other jurisdictions such as Ontario[53] and Nova Scotia[54]. In 2012, Ontario became the first Canadian province to specifically enable LIC-type financing.[55]

The CTV Act could be amended in three simple ways to provide a tax-based municipality such as Yellowknife with the authority to establish LIC-based energy efficiency programs:

- Clarify what kinds of local improvements can be done (i.e., include energy efficiency works and renewable energy works)
- Clarify where the local improvements can be carried out (i.e., private property) and who can access local improvement funding (i.e., individual property owners)
- Allow municipal councils to approve LIC programs as a whole rather than requiring bylaws to be passed for each individual local improvement

Kinds of local improvements

The CTV Act, which is only applicable to tax-based communities, currently defines local improvement to mean "a work that will have a benefit to the real property in a particular geographic area within the municipality". This kind of work may add value to groups of — or individual — property owners in a particular geographical area.

Municipalities typically use LICs to help cover the costs of infrastructure investments that benefit a specific neighborhood, such as improvements to sewers and sidewalks. The neighborhood benefiting from the improvements would then pay for the improvements through their property taxes. Using LICs for energy efficiency and renewable energy improvements is a new application for this financing mechanism, but consistent with the broader intent of LICs. Nevertheless, for greater certainty, it may be prudent to amend the CTV provisions relevant to LICs to include energy efficiency and, if desired, renewable energy investments.

In Ontario the definition of what a local improvement could support was amended to include the following clause:

> (q) constructing energy efficiency works or renewable energy works.

Where and with whom local improvements can be carried out

Both the Nova Scotia and Ontario legislative changes clarified that individual property owners can access funding for local improvements. The Ontario amendment introduces the use of an agreement between the municipality and a property owner, and enables a special charge for local improvement works on particular properties to be placed on the property tax roll and receive priority lien status.

Ontario added the following clause to allow a local improvement on private property:

> Scope of local improvement
>
> (2) The power to undertake a work as a local improvement includes, without limitation, the power to,
>
> (a) undertake the work as a local improvement, including undertaking the work on private property;

The Nova Scotia amendment includes the following:

> 104A (1) The Council may make by-laws imposing, fixing and providing methods of enforcing payment of charges for the installation of energy-efficiency equipment on private property with the consent of the property owner including, without restricting the generality of the foregoing, solar panels.
>
> (2) A by-law passed pursuant to this Section may provide
>
> (a) that the charges fixed by, or determined pursuant to, the bylaw may be chargeable according to a plan or

method set out in the bylaw;

(b) that the charges may be different for different classes of development and may be different in different areas of the Municipality;

(c) when the charges are payable;

(d) that the charges are first liens on the real property and may be collected in the same manner as other taxes;

(e) that the charges be collectable in the same manner as taxes and, at the option of the Treasurer, be collectable at the same time, and by the same proceedings, as taxes

Flexibility for municipalities to pass bylaws for entire LIC programs

The CTV Act currently constrains the development of a local improvement program because of the need to pass a bylaw with three readings, in addition to the need for public consultation for each individual LIC. This section is designed for local improvements with a larger geographical area that encompasses multiple private properties. However, this clause would be overly cumbersome for a local improvement program targeting individual private properties. The Ontario legislation includes the flexibility for allowing a municipality to pass an entire LIC program:

Local improvement charges by-law

36.5 (1) If the municipality has the authority to undertake a work, it may, in accordance with this Part, pass a by-law to undertake the work as a local improvement for the purpose of raising all or any part of the cost of the work by imposing special charges on lots upon which all or some part of the local improvement is or will be located.

(2) A by-law under subsection (1) may be a by-law to authorize the undertaking of a specific work for which the municipality has given notice under clause 36.6 (2) (a) or a by-law to authorize the undertaking of works which satisfy the requirements of a municipal program for which the municipality has given notice under clause 36.6 (2) (b).

Notice of local improvement charges by-law

36.6 (1) Before passing a by-law to undertake a work as a local improvement under section 36.5, the municipality shall give notice to the public of its intention to pass the by-law.

(2) The public notice of the intention to pass the by-law shall include, (a) a description of a specific work the municipality intends to undertake; or (b) a description of a program that the municipality has or intends to establish to undertake the types of works set out in the notice.

In summary, the CTV Act could be simply amended to provide tax-based municipalities with the authority to establish a local improvement program by:

- Clarifying the uses of a local improvement to include energy efficiency works or renewable energy works
- Specifying that a local improvement can be administered on private property
- Allowing for the flexibility of a local improvement program

Proposed legislative changes

AN ACT TO ENABLE MUNICIPALITIES TO USE LOCAL IMPROVEMENT CHARGES FOR ENERGY EFFICIENCY MEASURES

Summary

This Bill amends the Cities, Towns and Villages Act to enable municipalities to use their local improvement charge authority to finance property-assessed pay-as-you-save energy efficiency investments in private local buildings.

The Commissioner of the Northwest Territories, by and with the advice and consent of the Legislative Assembly, enacts as follows:

1. **The Cities, Towns and Villages Act is amended by this Act.**
2. **The definition of "local improvement" in section 1 is amended by adding** "or a work to promote energy efficiency or renewable energy on a particular parcel of real property within the municipality" to the end of the definition.
3. **The definition of "local improvement bylaw" in section 1 is amended by adding** "or a program for a series of local improvements that promote energy efficiency on individual parcels of real property" to the end of the definition.
4. **Section 107 is amended by adding the following after subsection 107(4):**
   (5) For greater certainty, the borrowing of money by a municipal corporation for the purpose of financing a local improvement, as authorized under section 120, shall be considered a municipal purpose.
5. **Subsection 117(1) is amended by striking out** "bylaw" **and substituting** "bylaw authorizing a single local improvement under subsection (2) or a bylaw authorizing a program for local improvements under subsection (3)".
6. **Subsection 117(2) is amended by striking out** "local improvement" **and substituting** "single local improvement benefitting multiple parcels of real property".
7. **Section 117 is amended by adding the following after subsection 117(2):**
   (3) A bylaw authorizing a program for a series of local improvements that promote energy efficiency on individual parcels of real property must
      (a) recover the full cost of the program, including the financing costs of short-term debt and long-term debt, from local improvement charges levied against the parcels of real property that benefit from the local improvements; and
      (b) set out
         (i) the total cost of the series of local improvements authorized as a program;
         (ii) the proportion of the costs that would be financed by
            (1) local improvement charges levied against the parcels of real property that benefit from the local improvements
            (2) general revenue of the municipal corporation; and
            (3) any short-term debt and long-term debt;
         (iii) the period over which the local improvement charges would be payable;
         (iv) the conditions on which the local improvement charges, in respect of a parcel of real property, could be paid in a lump sum;
         (v) the nature of the energy efficiency measures eligible under the program and the nature of eligible costs; and
         (vi) a description of the parcels of real property that are eligible under the program.
8. **Subsection 118(1) is amended by striking** "local improvement bylaw" **and substituting** "bylaw authorizing a single local improvement under subsection 117(2)".
9. **Subsection 119(1) is amended by striking** "local improvement bylaw" **and substituting** "bylaw authorizing a single local improvement under subsection 117(2)".

10. **Paragraph 121(1)(c) is repealed and the following substituted:**

(c) authorize

(i) in the case of a bylaw for a single local improvement under subsection 117(2), the levy of a local improvement charge against the real property that council considers principally benefits from the local improvement; or

(ii) in the case of a bylaw authorizing a program for local improvements under subsection 117(3), the levy of local improvement charges against each individual parcel of real property that benefits from the local improvement.

Photo: Legislative Assembly of Northwest Territories @ Yellowknife by Hideyuki Kamon via Creative Commons

Appendix B: Estimates for energy and cost savings from Phase 1 of a Yellowknife energy savings program

Summary

The first phase of an LIC program in Yellowknife (targeting 100 homes) is estimated to potentially save each homeowner on average per year:

- about $1,300 in energy costs
- 40.3 GJ of energy
- 3.75 tonnes of carbon dioxide equivalent (CO_2e)

The estimates are conservative and derived from the actual experience of the EcoEnergy Retrofit program. Homeowners who undertook space heating and insulation/building envelope improvements between 2007–2012 through this program saved an average of 40.3 GJ of energy and 3.75 tonnes of CO_2 per year. For a Yellowknife homeowner using oil to produce 40.3 GJ (given the 2014 price of oil), this would translate to $1,344 in savings. A homeowner using electric baseboard heating would save a much greater amount ($3,248), but relatively few Yellowknifers use electric heating given the cost. Coincidentally, $1,300 also represents a rough estimate of expected savings per year from replacing an oil furnace with a propane condensing furnace (see Arctic Energy Alliance Savings Calculations below). Note that homeowners who switch from oil furnaces to wood/pellet stoves can potentially save much more than $1,300 per year ($1,700 to $2,300 per year in the hypothetical case outlined below).

With a total of 100 participants in Phase 1, Yellowknife's Energy Savings Program is expected to save residents about $130,000 per year in total, while reducing CO_2 emissions by about 375 tonnes per year. This represents a reduction of about 0.9% of Yellowknife's total residential CO_2e emissions per year (estimated at 43,653 t CO_2e).[56]

The actual energy and cost savings from a Yellowknife Energy Savings Program are impossible to predict exactly, since savings depend on many factors, including:

- how many participants choose each of the three program options (wood stove, furnace upgrade, or insulation improvements)
- the nature of each participant's existing heating system (e.g. electric or oil)
- how much fuel each participant currently uses
- the efficiency of each participant's current furnace
- what other energy efficiency measures residents adopt based on energy audit recommendations

The figures above do not represent net cost savings; they do not subtract the costs of doing the energy retrofits or consider interest payments on loans. Costs of insulation/building envelope improvements in particular would be highly variable and case-specific, and data is not available from the 2007–2012 EcoEnergy Retrofit program on how much homeowners paid in total for their retrofits. It is worth noting that simple payback calculations (cost of the retrofit divided by difference in current energy prices between old system and new energy-efficient system) are not the best way to evaluate the economic benefit of a retrofit or renewable energy installation. Instead, a return on investment calculation may be more appropriate whereby the cost of energy is assumed to increase over time, and thus the homeowner's savings will also increase over time.

According to the 2011 Census, there are 6,935 residential dwellings in Yellowknife. Analysis has shown that the total energy use by residential dwellings in Yellowknife for 2013 was 600,539 GJ and GHG emissions were 43,653 t CO_2e. This means that the average household energy use was 86.6 GJ and the average household GHG emissions were 6.3 t CO_2e. Thus, the expected average energy savings per home (40.3 GJ) from a Yellowknife Energy Savings Program loan represents about 47% of average household energy use, and the expected average GHG emission savings (3.75 t CO_2e) represents about 60% of average household GHG emissions.

EcoEnergy Retrofit Program data

The federal EcoEnergy Retrofit Program ran from April 2007 to March 2012 and provided homeowners with grants up to $5,000 for eligible energy efficiency measures. The program required an energy assessment

Table 4. Cost savings based on EcoEnergy Program energy savings

	Energy savings	Conversion to heating equivalent*	Price (2014)*	Cost savings
Electricity	40.3 GJ	11,200 Kwh	$0.29/Kwh	$3,248
Oil	40.3 GJ	1,050 L	$1.28/L	$1,344

* Calculated using Arctic Energy Alliance's Space Heating Calculator.

using the EnerGuide Rating System before and after work was completed.

During the life of the program, 1,074 homes in the NWT were evaluated.[57] Based on the data from pre-retrofit assessments, potential savings for those homes ranged between 2.7 and 7.3 tonnes of CO_2/home/year and between 32 and 84 GJ of energy/home/year. This amounts to averages of 5.51 t of CO_2/home/year and 56 GJ/home/year.

However, not all of the energy efficiency potential was utilized. Instead, actual upgrades represented energy savings of between 8 and 51 GJ/home/year. The average NRCan incentive payout for all of NWT was $1,447/home.

The average energy savings were 40.3 GJ/home/year and 3.75 t of CO_2/home/year. Using the average of those energy reductions and equating them to savings in either electricity or oil consumption results in $1,344 to $3,248 per home per year in heating cost savings. See Table 4.

The majority of the ecoEnergy upgrades were focused on space heating, insulation of basement, attics and walls, and draft proofing — which aligns with two of the three proposed focus areas of the Yellowknife Energy Savings Program, namely:

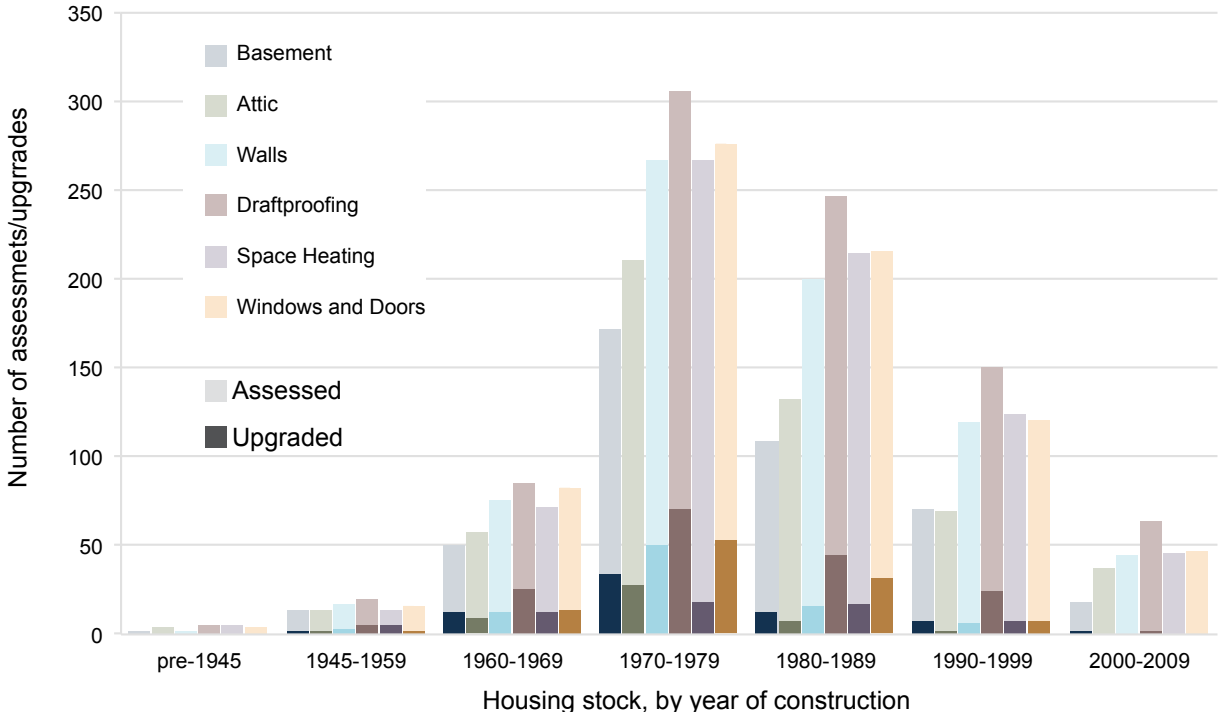
a) 'renewable energy' component – wood/pellet stoves

c) 'energy conservation' component – insulation and air sealing

Figure 1 shows the ecoEnergy upgrades (by type) that were suggested in NWT, by age of house, as well as the actual upgrades completed.

The energy assessments undertaken (1,074) represent about 8% of the housing stock in NWT. Only 20%

Figure 1: EcoEnergy retrofits in NWT



Data source: NRCan[58]

of those who undertook pre-retrofit evaluations implemented upgrades, completed the post-retrofit evaluation and received grants under the EcoEnergy program. It is interesting to note that the NWT had the lowest conversion rate of evaluations to execution in the country, only 20% compared to the Canadian average of 80% conversion. This may in part be due to difficulty securing qualified contractors and/or access to financing beyond the partial grant amount.

About 47% of the houses which had assessments done were built before 1980. This roughly matches the housing profile in Yellowknife, where about 40% of the dwellings were built before 1980.[59] However, owners of houses built before 1980 were much more likely to follow through with the upgrades: 28% vs. only 17% follow-through by owners of houses built after 1980. While houses built in the 1970s were subject to the largest number of upgrades compared to any other decade of construction, the highest rate of follow-through was with houses built in the 1960s (32%). For houses built before 1980, the three most popular upgrades were draftproofing, windows/doors and then walls. For houses built after 1980, the three most popular upgrades were draftproofing, windows/doors, and then space heating.

These results indicate that owners of Yellowknife houses built in the 1960s and 70s may be prime candidates for an Energy Savings LIC Program, and the program should target its marketing and outreach towards these neighbourhoods. Moreover, the popularity of building envelope improvements (not only relatively cheap upgrades such as draftproofing but also more expensive projects such as windows/doors) supports the need to include this as an option in the Yellowknife Energy Savings LIC Program.

Arctic Energy Alliance savings calculations

Arctic Energy Alliance has created a spreadsheet which calculates energy, cost, and GHG savings from space heating improvements. Taking into account the cost of each fuel type in a given year (electricity, oil, propane, wood pellets, cords of wood), the amount of fuel used by a given home, and the efficiency of the furnace/stove/system, the spreadsheet calculates how much energy and how many tonnes of CO_2 equivalent per GJ would be saved by switching from one fuel system to another. The spreadsheet also completes a simple payback calculation by dividing the installed cost by the yearly cost savings.

Savings calculations were made using this spreadsheet, using the following assumptions:

- A homeowner is switching from an 83% efficient oil burning furnace (a fairly common system in Yellowknife) to either a wood or pellet stove or a 95% efficient propane condensing furnace
- 2014 fuel costs are the baseline
- The home initially burns 4,000 litres of oil per year

Savings would be greater and payback periods shorter with greater amounts of oil burned.

Payback periods shown in Table 5 below are lower than those indicated in the spreadsheet, since available rebates have been subtracted from the estimated installed cost.

The lower range of the estimated cost savings for wood/pellet stoves represents the savings from using a wood stove, whereas the upper range represents savings from using a pellet stove. Savings would be greater for a wood stove if the homeowner cut his or her own wood rather than buying cords of wood at market price.

Table 5. Savings based on Arctic Energy Alliance savings calculations

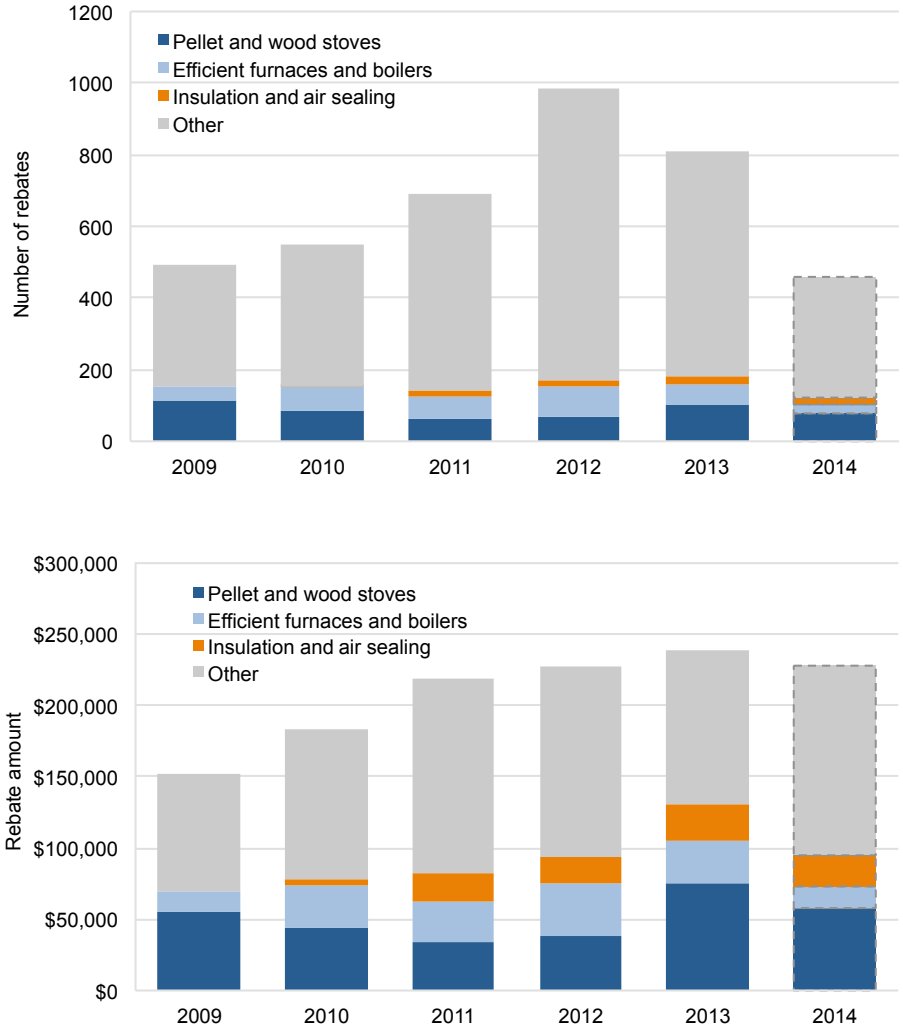
	Estimated cost	Rebate available	Estimated savings per year	Payback period (years)	How long it lasts (years)	GHG savings (t CO_2e / GJ)
Wood / pellet stoves	$5,000	Up to $700	$1,700 to $2,300	2 to 2.5	12-15	10.5
High efficiency propane condensing furnace	$8,000	$600	$1,300	6	12-15	2.2

Energy Efficiency Incentive Program rebate data

Arctic Energy Alliance has been administering rebates to residents of the NWT on behalf of the Government of the Northwest Territories to support energy efficiency upgrades in residential homes and businesses. The program is called the Energy Efficiency Incentive Program. Figure 3 shows data from rebates awarded in the city of Yellowknife within the past five years. Note that 2014 data is not complete.

The rebates awarded in Yellowknife are consistently numbering in the several hundreds and the dollar amount distributed per year has exceeded $200,000 for the past four years. The rebates that align with the types of energy improvements that would be eligible under the proposed Yellowknife Energy Savings Program represent somewhere between 20-30% of the total number of rebates issued; however, in terms of dollars they represent closer to 40-50%. This indicates that these types of energy improvements are the more expensive of those that Yellowknife residents wish to pursue and may warrant additional financing mechanisms.

Figure 3: AEA rebates in Yellowknife, by number and by dollar amount



Appendix C: Seed funding and financing options

The City of Yellowknife has five main options for obtaining the $150,000 in start-up funding and $1 million in capital needed to finance an LIC program:

1. Borrow from a financial institution (requiring a Ministerial exemption or a City-wide referendum)
2. Use existing capital reserves
3. Land sale or endowment
4. Access grants for start-up seed funding (would not address financing issue)
5. Establish an internal revolving fund for start-up seed funding (would not address financing issue)

Table 6 below shows how these sources might be used for administrative or program funding.

The following alternative funding methods used by other Canadian cities are also discussed below:

6. Carbon tax/carbon funds
7. Franchisee fees
8. New fees
9. Sponsorship

1. Loan

The municipality can secure a loan through its usual financial service providers or look to alternative financiers, such as the Federation of Canadian Municipalities. The intent is to secure a low interest rate by leveraging the city's borrowing power. The LIC loan has first lien rights and so is extremely low risk and provides a secure return to the municipality that will cover the city's borrowing costs.

a. From bank

Most municipalities have access to low-interest financing from financial institutions that can be used to support the LIC loan program. For example, the City of Yellowknife is financing its new water treatment plant with a 15-year loan at 3.4% interest. Section 112 of the territorial Cities, Towns, and Villages Act (CTV Act) requires NWT municipalities to obtain voter approval or a Ministerial exemption from voter approval in order to take on long-term debt above certain limits. A simple amendment to the CTV Act or a Ministerial exemption for the City of Yellowknife's LIC program would allow the program to be financed through a bank.

b. From Federation of Canadian Municipalities

The City of Halifax obtained a $5.5 million loan from the Federation of Canadian Municipalities' (FCM) Water Conservation Fund to partially cover its Solar City program budget which totaled $8.3 million. While reporting requirements are more onerous with FCM

Table 6. Funding and financing sources for administrative and program funds

		Administrative Funds (depend somewhat on program volume)	Program Funds (directly dependent on program volume)
Start-up funding (one-time access)	FCM grant	✓	
	Government grant	✓	
Ongoing funding (recurring access)	Bank loan		✓
	FCM loan	✓	✓
	Internal municipal funds (capital reserves, land sale, revolving fund)	✓	✓
	Charges to participants (admin fees)	✓	

Source: Adapted from Persram[60]

loans than with a financial institution, the Fund issues loans at one point below the standard interest rate. According to Halifax program staff, the program could have gone ahead with a bank loan instead; however the FCM loan provided added comfort and political support. The Solar City program was eligible for this particular fund because of its link to water; it is not clear whether Yellowknife's LIC program would qualify for an FCM loan.

2. Existing capital reserves

Another option is to set aside capital to form a large enough floating fund to cover the first phase of projects. This option depends on the municipality's capital reserves and the demand on those funds in the near term.

Toronto was able to finance its HELP program by committing up to $20 million from its existing working capital reserve fund. This may not be practical or possible for a city the size of Yellowknife.

3. Land sale or endowment

The Toronto Atmospheric Fund (TAF) is an arm's-length organization mandated to reduce greenhouse gas and air pollution emissions in the Toronto area, including by increasing energy efficiency in buildings (see Appendix D). TAF was formed out of a $23 million endowment resulting from the sale of Toronto municipal land. A land sale by the City of Yellowknife would be governed by the Land Administration bylaw, which is prescriptive in terms of what can be done with the money.

4. Grants

While grants would likely not be large enough to cover the full program budget (including financing), they could be accessed for seed funding to cover program design, set-up and initial outreach. Grants up to $150,000 are available from Natural Resources Canada (NRCan) for this purpose; NRCan has previously supported the LIC program concept. Halifax's start-up administrative costs were covered by a $550,000 grant from FCM. Toronto received seed funding amounting to about $1 million from TAF, Ontario Power Authority, NRC, Enbridge and Toronto Hydro.

These grants may not have been necessary to get the LIC programs in Halifax and Toronto off the ground, but they were helpful in reducing perceived risk and attracting political support.

5. Internal revolving fund

It is also possible for local governments to establish revolving funds to provide start-up funds for an LIC program. The municipality implements energy efficiency upgrades and uses the savings relative to business as usual to support LIC program set-up costs. In some cases, the revolving fund could either provide the full LIC financing (if it is large enough), or act as an intermediary lender, providing the upfront financing, until the LIC loans could be repackaged as municipal bonds or asset-backed securities.

The city of Hamilton, Ontario, completed an energy efficiency project, whereby 50% of the savings were absorbed by the municipality's operating budget but the other 50% were allocated to a retrofit fund.

Edmonton's Energy Management Revolving Fund finances energy retrofits of city facilities. The $30M fund has been used for a variety of energy-efficiency measures including lighting, HVAC and envelope upgrades. The amounts borrowed must be repaid over a period of up to eight years (some exceptions can increase that to 10 years), and the loans are repaid through the utility (energy) savings.

While setting up a formal revolving fund may be an unnecessary administrative burden for Yellowknife, the City could simply set aside some of its gas tax money or Community Energy Plan funds in order to support an LIC program.

6. Carbon tax/carbon funds

The City of Dawson Creek, British Columbia, has imposed a $100/tonne levy on its own greenhouse gas emissions, and the fund supports energy efficiency and renewable energy projects.

7. Franchisee fee

Some municipalities have increased the franchisee fee charged to utility providers. This fee is generally tied to utility consumption so ultimately the cost would be

passed on to consumers. The fee could be increased and/or redirected to a separate fund for retrofits.

The town of Banff used proceeds from this fee to develop a conservation fund. There might be an appetite for increasing Yellowknife's franchisee fee if it has not yet been raised in alignment with property tax increases. In order to raise $150,000 (the estimated amount required for program set-up costs), the City of Yellowknife would have to increase the franchise fee by about 78 cents, or almost 3%.[61]

8. New fees

The City of Langley, British Columbia funded a new home rebate program by collecting an extra fee on new building permits. This concept could be used to collect seed funding to support the Yellowknife Energy Savings Program, whether the fees are from new building permits or a more appropriate municipal program.

9. Sponsorship

Corporate sponsorships allow private companies to get some form of public recognition through advertising, signage or monuments in exchange for significant donations or strategic funding arrangements to cities.

Photo: Binnu Jeyakumar, Pembina Institute

Appendix D: Other financing and delivery mechanisms for municipal and commercial energy retrofit projects

Municipal and commercial projects could be financed through the following mechanisms, discussed below:

1. Internal green financing mechanism
2. Arm's-length organization
3. Energy savings performance agreement (ESPA)
4. Energy service company (ESCO)
5. Crowdfunding

1. Internal green financing mechanism

A report was produced for the City of Yellowknife in 2006 by the Pembina Institute and SENES Consultants, as part of the City's initial energy planning process, which reviewed 12 municipal green financing mechanisms across North America and gave specific recommendations for setting up such a fund in Yellowknife. These recommendations included:

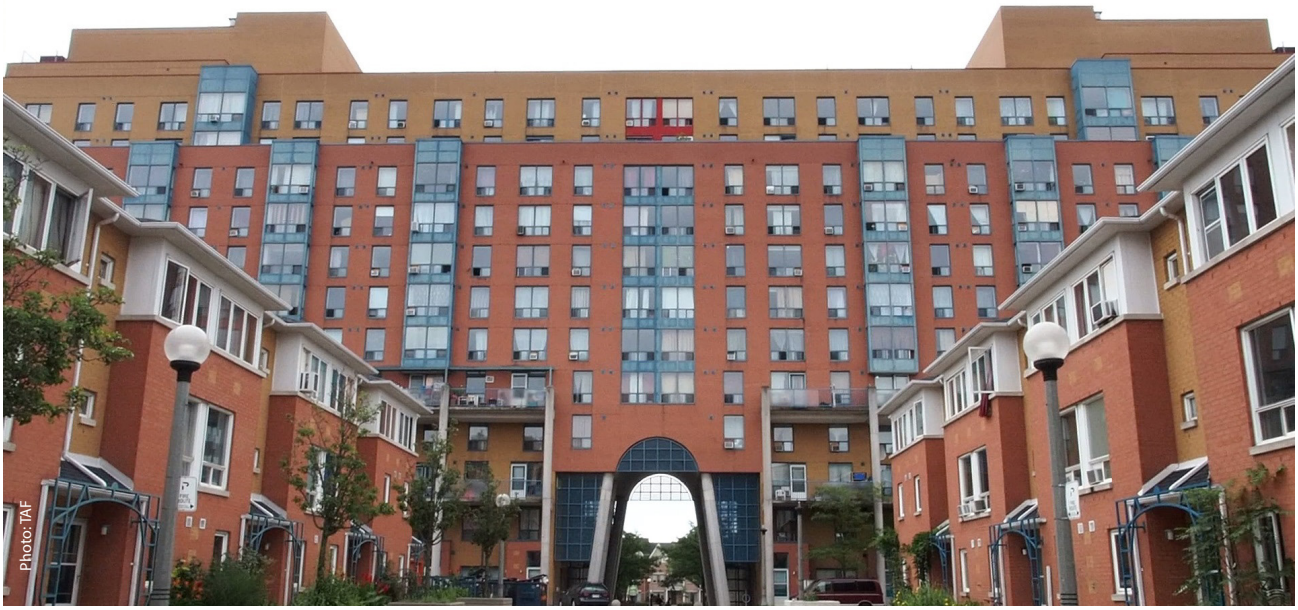
- "Establish a mixed financing mechanism that includes a revolving fund component to finance relatively small-scale regular retrofits and an annual allocation component that would be reserved for larger projects that would require Council approval. The revolving fund component would be sufficient to finance the feasibility and evaluation studies needed to maintain a steady flow of projects.
- "Limit eligibility to projects that produce energy savings capable of paying off the initial investment within eight years at an annual interest rate of 4.7% and ensuring that GHG emissions will not increase. Beyond these minimum requirements, projects will be selected to maximize GHG emission reductions, so that low GHG reduction opportunities are only financed if the available funds for a given year cannot be allocated on better opportunities. For projects that demonstrate a rate of return greater than 4.7%, the amortization period will remain constant at 8 years."[62]

2. Arm's-length organization

The Toronto Atmospheric Fund (TAF) is an arm's-length organization that is mandated to reduce greenhouse gas and air pollution emissions in the Toronto area. It was started in Toronto in 1991 with an endowment of $23 million resulting from the sale of municipal land. TAF is financially independent of the city and innovates, incubates and advocates for financial solutions to increase energy efficiency in buildings. TAF's approach has evolved over the years but it has moved increasingly towards 'impact investing' in energy retrofit savings and partnering with others in the private sector who are interested in realizing profits from energy savings.

Several years ago, TAF teamed up with Tridel Condos to conduct a kind of research/demonstration project. They built two new condominiums side by side — one followed the standard national building code, and the other was designed to outperform the national code by 41% in terms of energy efficiency. TAF provided a loan for the incremental cost of building the second condo to a higher standard. Tridel was able to repay the loan using only about half of the energy savings, and pocket the rest.[63]

In May 2014, TAF announced that it had designed and implemented its first energy services performance agreement (ESPA; see below) with the Robert Cooke apartment complex, a 123-unit apartment co-op. TAF provided the financing for about $460,000 worth of energy retrofits (heating, cooling, lighting and appliances) to be installed, and in return TAF will keep 75% of the savings over the life of the agreement (10 years). To make this agreement possible, TAF was able to secure reinsurance from Energi of Canada. This means that if there is a shortfall in savings, neither TAF nor the building owner are on the hook — the difference is covered by the insurance policy. The insurance costs between 2 and 5% of the total insured energy savings.



The Robert Cooke apartment co-op in Toronto received $460,000 in energy retrofits through an ESPA with the Toronto Atmospheric Fund

3. Energy savings performance agreement (ESPA)

An ESPA involves a company (service provider) that provides capital to build the retrofit and then reaps a portion of the savings. All of the risk is borne by the service provider and the reinsurer under the service agreement, so there is no loan involved.

An ESPA was developed by the Toronto Atmospheric Fund (see above) and piloted at the Robert Cooke apartment co-op in Toronto, where $460K of energy retrofits were fully financed through TAF. The apartment complex was then responsible for paying back that investment from the savings realized by the project.

Efficiency Capital Corporation has taken the TAF ESPA model and is offering it Canada-wide. Efficiency Capital has been working with TAF for the last six years and in mid-2014 started up as a for-profit company, the first of its kind in Canada. The company pays for the upgrade, manages the engineering, procurement and construction and is paid back over time out of the energy savings. If the savings do not materialize, the building owner is not obligated to pay the instalments. Instead, Efficiency Capital is compensated by an energy savings warranty, in this case provided by the reinsurance company Energi. The minimum project value must be equal or greater than $500,000.

This financing and delivery mechanism is appropriate for government bodies or large corporations, rather than individual homeowners.

4. Energy service company (ESCO)

Energy savings or energy service companies (ESCOs) are generally utility or equipment maintenance providers that implement an energy savings measure in the building on behalf of the building owner and then collect repayment from the cost savings of the higher efficiency unit. Honeywell, for example, provides an energy saving performance contract or a utility energy service contract. Similar to an ESPA, these contracts offer a means to implement energy efficiency, renewable energy and water efficiency projects without the building owner having to make any initial investment or take any risk. However, it also means that the building owner reaps less of the reward (savings). The advantage in using an energy service company is their experience and expertise in estimating savings and running projects. The company designs and installs the retrofit, assists in arranging funding to cover capital costs, and then gets repaid over the contract term from the cost savings generated by the energy retrofit. Repayments only begin after commissioning of the new unit. This type of arrangement could be established with any service provider willing to enter into this sort of contract, whether it is a utility provider or a maintenance contractor.

In 2011, TAF helped to broker an ESCO-type agreement between the City of Toronto and private energy management firm Glenbarra Energy Management Corp (GEMCO). GEMCO was to provide solar hot water systems at three city facilities (including the Toronto Zoo). TAF loaned the initial capital to GEMCO at commercial financing rates.

GEMCO would own and operate the systems and provide the facilities with hot water under a long-term energy purchase agreement. However, GEMCO abandoned the project when the Ontario Feed-In Tariff program for renewable energy was established. Due to TAF's financial structure the organization is able to take innovative risks, and lose on some investments, while trying out new business models to effect change.[64]

It is interesting to note that Yellowknife has seen successful ESCO contracts for energy retrofits established in the past. Arctic Green Energy established energy service contracts with the GNWT for the jail, Sir John Franklin school, and Inukshuk Housing Corporation (this last one also leveraged grants). Arctic Green Energy set up wood pellet boilers in those facilities and charged leasing fees based on expected savings. The company was able to finance this arrangement by securing a five-year lease agreement with RBC for 80% of the value of the boilers at low interest rates.[65] At first, facility managers were skeptical that any energy or cost savings would be realized, but they went ahead with the contract because it required them to take no risk. It turned out that the GNWT realized substantial savings from switching to wood pellet boilers. Eventually the GNWT stopped negotiating contracts with an energy service company and became confident enough of the expected savings to install wood pellet boiler systems with its own financing. In this way the GNWT is now able to keep all of the savings for itself.

There may be a role yet for energy service companies in Yellowknife to assist with municipal or commercial energy retrofits, if projects involved less proven technologies (higher risk). Such a company would have the opportunity to leverage existing services and rebates in Yellowknife. Arctic Energy Alliance offers businesses a Targeted Energy Audit at no cost as long as the business owner commits to making energy efficiency upgrades (under GNWT's CECEP program). In addition, the GNWT offers rebates up to $15,000 for energy retrofits in commercial buildings.

5. Crowdfunding

Another increasingly popular way of raising capital is through contributions by private individuals—the "crowd." These are essentially revolving funds that traditionally have been independent of any government body. The potential for crowdfunding clean energy projects is vast. Around the world there are several examples of successful crowdfunding for renewable energy: Solar Schools (U.K), Gencommunity (U.K.), Mosaic (U.S.), Abundance Generation (U.K.), Windcentrale (Netherlands).

The more successful crowdfunding models (Mosaic, Windcentrale) provide a return on investment for the contributors, involving somewhat complex administrative and financial structures. There may also be opportunities, however, to obtain donations from the 'crowd' for energy retrofit projects in public buildings such as schools, without providing any return back to contributors.

Photo: Sir John Franklin High School by Alan Sim via Creative Commons

Arctic Green Energy established a successful energy service contract with the GNWT for Sir John Franklin school

Appendix E: References and list of resources and existing research on LIC programs

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Photo: Binnu Jeyakumar, Pembina Institute

Endnotes

1. Since establishing its first Energy Plan in 2004, the City of Yellowknife has already reduced its own corporate GHG emissions by 24%.
2. The City of Yellowknife put forward this resolution. The NWTAC reaffirmed the resolution in 2014.
3. See section 7.10.9: "The GNWT will consider changes to the City, Towns and Villages Act to enable communities to use Local Improvement Charge legislation for the purposes of offering energy financing programs to individual property owners."
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18. The 2006 census indicates there were 9330 private households in Whitehorse. The 2014 CMHC Northern Housing Report indicates that in 2006 there were just over 510 residential transactions in Whitehorse.
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21. Brownlee, 14.
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46. Gabriella Kalapos, pers. comm. Administrative costs for the Halifax Solar City Program are $600,000 for 1000 participants.
47. Julian Boyle, pers. comm.
48. The FCM's Green Municipal Fund may be another possible loan source; this fund was initially created from an endowment.
49. Brownlee, 7.
50. Arctic Energy Alliance has made efforts in the past to establish formal relationships with local realtors, working with them to include home energy ratings in their promotion of houses for sale. While some have been receptive, there has been reluctance to include energy ratings if the scores are low (AEA, pers. comm.).
51. Boyle, presentation.
52. Brownlee, 9. While the program had successful uptake, almost $10 million of the total $26 million cost to BC Hydro went towards research, administration, and overhead, which amounted to 29.34 cents/kWh saved, much higher than the cost of producing electricity.
53. Government of Ontario, *City of Toronto Act,* O.Reg 323/12 amending O. Reg. 596/06, October 2012.
54. Government of Nova Scotia, Bill No. 112: An Act to Amend Chapter 39 of the Acts of 2008, the Halifax Regional Municipality Charter, December 2010. http://nslegislature.ca/legc/bills/61st_2nd/3rd_read/b112.htm
55. In October 2012, the *City of Toronto Act* LIC regulation was amended to:
    1. expand the definition of qualifying capital works to include energy efficiency retrofits, renewable energy installation, water conservation measures
    2. expand the list of qualifying property to which LICs can apply to include individual private property itself, exclusive of City-owned frontage
    3. introduce the use of property agreement between municipality and property owner (in addition to by-law to place charge on tax roll)
    4. enable special charge for these particular works on these particular properties to be placed on property tax roll and receive priority lien status
56. Report for City of Yellowknife on residential heating loads/demands, forthcoming.
57. It is not known how many of these 1074 homes were in Yellowknife, but it can be assumed that a large portion of participating homeowners may have been in Yellowknife, given that Yellowknife contains about half of the population of the territory.
58. NRCan, *ecoENERGY Retrofit – Incentive Payment Report – November 2013.*
59. Canada Mortgage and Housing Corporation, *Housing Market Information Portal,* Profile: Yellowknife,
60. Adapted from S. Persram, *LIC Primer: Using Local Improvement Charges to Finance Residential Energy Upgrades*, Sustainable Alternatives Consulting for CHEERIO.
61. Based on calculations provided by Remi Gervais, email comm.
62. M. Horne, I. Kessel and S. Montgomery, *Yellowknife Community Energy Planning Project: Action Area 1b - Financing Options for Internal Green Energy Projects*, iv.
63. Toronto Atmospheric Fund, TowerWise, http://www.towerwise.ca/.
64. Tim Stoate, pers. comm.
65. Thomas Wunderlin, pers. comm.