

strategic recommendations for an optimal "PAPER" program



David
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SOLUTIONS ARE IN OUR NATURE

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Executive Summary

An energy retrofits financing program would help Ontario reduce high home energy use and greenhouse gas emissions, protect homeowners from rising and volatile energy prices, safeguard property values and the municipal property tax base, and provide an economic stimulus that would benefit all levels of government.

A property-assessed payments for energy retrofits (PAPER) program would provide an opportunity for capital markets to engage in energy retrofit financing at an optimal scale, with underwriting criteria directed toward minimizing risk for all stakeholders.

A PAPER program would address many concerns that homeowners have about conducting retrofits: high up-front energy retrofit costs, limited availability of low-interest financing, concerns about moving before recouping the energy efficiency investment, achieving energy and cost savings, and having access to a highly skilled, professional workforce to assess a reliable energy-savings potential and do the retrofits.

To address these concerns, an effective PAPER program would require specific features for success, including regulatory changes to allow the Local Improvement Charges mechanism to be used for energy retrofits on private property.

An energy retrofit program should be simple and secure for both municipalities and homeowners at all income levels, and it should be affordable. Facilitated by municipalities, the program should pay for itself. Total program expenses should be reduced by collaboration among stakeholders, including higher government levels whose budgets would benefit from the programs.

Stakeholder collaboration in developing the programs would produce additional economies of scale, which would offset administrative costs. Higher-level governments would support collaborative and cost-effective development of these programs because of support in achieving their targets for reductions in energy use and greenhouse gas emissions, and significant benefits to their budgets. These benefits include avoided expenses for power generation plants and other energy infrastructure costs, cost savings on unemploy-

ment insurance and health care arising from illness costs of air pollution, and income tax revenues. Savings that retrofit suppliers could obtain from bulk buying may also be passed on to the municipality and participating homeowners.¹ Plans for measurement, evaluation and verification of the retrofits and the program would also be developed as part of this collaboration, prior to program onset, and aligned with stakeholder protocols.

Reduced energy use means fewer power plants would have to be built, which would save money for taxpayers and ratepayers. Utilities should be able to help offset program costs by a) leveraging their conservation budgets (electric local distribution companies' custom programs and natural gas distributors' demand side management programs); and b) through the assigning to utilities of the recognition gas savings volume in cubic meters (m³) arising from homeowners' participation in the PAPER program. Utilities could assist with marketing, financing energy evaluations and supporting homeowner energy savings workshops to reduce program and homeowner costs.

The remainder of program expenses would be borne by participant homeowners. These would include costs for outreach to homeowners and for marketing the program, the balance of energy evaluation expenses, property appraisal costs, eligibility processes, and program administration start-up and operations costs.

The security provided by a Local Improvement Charge mechanism modified to allow energy retrofits would enable lower interest rates charged by a financing investor to the municipality, which would be passed on to the homeowners.

A possible process for Ontario could include marketing to homeowners, application and eligibility processing, homeowner participation in workshops to reduce their energy use, the first energy evaluation identifying recommended retrofits including specifications for the products that the contractors would purchase, the first value appraisal, signing the retrofits contract, conducting the retrofits by contractors, inspections and quality assurance processes, second evaluation and appraisal, signing off on the work by the evaluator and homeowner, the municipality's payment to the contractor for work done, and post-retrofit monitoring and evaluation.

An energy retrofit program would enable savings on homeowners' energy bills. Achieving net savings would depend on variables including the home's existing energy efficiency, energy costs, energy use in the home (i.e., occupancy factors), and the selection of cost-effective measures recommended from an energy evaluation.

Homeowners, municipalities and investors would also be safeguarded via risk-mitigation strategies including stringent eligibility criteria that select for fiscally responsible owners at all income levels. As well, the retrofits would be conducted in a turnkey process to access highly skilled energy evaluators and contractors who are knowledgeable about building science, and whose work would result in confidence that energy savings estimates reliably predict actual energy bill savings. Using a neighbourhood approach would also be expected to result in contractor economies of scale. These savings should be shared with homeowners; retaining a portion would help the program pay for itself, or possibly enable a net municipal income from the initiative.

Expected outcomes ideally would be defined at the outset to facilitate measurement, evaluation and verification of both the retrofit projects and the overall program and dovetail

with stakeholders' approaches. Additional impacts apart from the government, taxpayer and homeowner benefits described above include:

- Future generations would have reduced risks arising from climate change.
- Development of skilled jobs and multiple sectors in the energy-efficiency and renewable-energy industry.
- An economic stimulus and local economic multiplier effects as local workers tend to buy locally.
- Individual and government savings on health care (from avoiding health care costs that arise from fossil fuels).
- Enhanced indoor air quality and comfort in more energy-efficient homes.

A PAPER program would benefit local governments, homeowners and taxpayers, and ultimately the environment, the economy, current society and next generations.



1. Goals of the PAPER Program

There are five fundamental PAPER program goals:

1. It must be easy for homeowners at all income levels to use the program.
2. PAPER should be a simple and secure way for municipalities to encourage energy-saving retrofits.
3. The program should be delivered at zero cost to municipalities (or be slightly revenue-positive), so administrative costs should be kept as low as possible.
4. The program should be delivered with a focus on net savings to homeowners.
5. Other program goals would be triple bottom line achievements to support the economy, the environment and society. These include reduced greenhouse gas emissions, an economic stimulus and support for ongoing development of energy efficiency and renewable energy industries, skilled jobs, and spillover economic impacts.

These goals are discussed further below:

1. **It must be easy for homeowners at all income levels to do energy-saving retrofits.** The program achieves this goal by making funds available to all interested homeowners at attractive interest rates, and providing a turnkey program at a neighbourhood scale to lower costs.
2. **PAPER must be a simple and secure way for municipalities to encourage energy saving retrofits.** By using a modified Local Improvement Charge (LIC) mechanism, the repayment of energy improvement costs remains tied to the property and is transferred to the buyer if the owner sells before the investment is repaid. An LIC also provides security to the municipality: if payments are delinquent they are subject to a priority lien. This security is attractive to investors who may be

considering issuing debt financing to the municipality. Regulatory change is required to make the LIC process simpler. The PAPER program is designed to be voluntary, whereas current LIC legislation requires whole neighbourhoods to participate under certain circumstances.

Also, currently, costs are allocated to properties based on the frontage, and this would not be appropriate since the total costs of retrofits installed on each property should be included in that property's LIC (e.g., labour, materials, energy evaluation, other permits required, and the pro-rated administration costs).

3. **The program should be delivered at no cost to the municipality (or potentially be slightly revenue-positive).** Canadian municipalities are run on tight budgets and municipal programs are already subject to competition for scarce resources. There are multiple set-up and overhead program costs. Unexpected expenses or risks may increase one or both of these costs.

A major aspect of delivering a program that would appeal to municipal staff and councillors is that it should be delivered at no cost to the municipality. Staff in Halifax Regional Municipality are also considering having a net positive cash flow from their solar thermal LIC program.² There are several program features that would contribute to a net zero cost scenario:

- a) **Other levels of government collaborate on and assist in setting up these programs because on balance their budgets would benefit from energy retrofits.** These collaborative approaches would generate economies of scale in program development. For example, municipalities have noted that higher-level government assistance with financing (i.e., a role as an investor) and with marketing (i.e., developing marketing materials) would be important. As well, assistance in developing higher-level skill sets among energy evaluators and in fine-tuning evaluations (for confidence in actual vis-à-vis estimated energy savings), and a system to pre-qualify contractors would be needed.

Natural Resources Canada (NRCan) staff have noted:³

“The next generation EnerGuide Rating System (ERS) will be increasing the rigour of the training process for people delivering the ERS. Under the new system, there will be two levels of certification: a certified energy rater (CER) who will be trained to do the base rating of a house, including the blower door test; and a certified energy advisor (CEA) who will receive an additional level of training on developing the upgrade recommendations for both new and existing houses. The CEA will have a higher skill set than the current ERS energy advisor. For the new system, both levels will require building science knowledge in order to be eligible for ERS training.”

As noted in the author's paper on Finance,⁴ by delivering this green jobs stimulus, federal budgets would benefit via savings on employment insurance

costs and increases in income taxes. Provincial budgets would benefit through health-care savings, avoided energy infrastructure costs and a local economic multiplier arising from the green job growth. Additionally, providing collaboration support for PAPER would enable a much less costly financing alternative to energy efficiency grant incentives, and would leverage energy efficiency to a much larger proportion of the existing housing stock.

- b) **Municipalities, industry and key NGOs also would collaborate;** e.g., to conduct research that would supply needed data to multiple municipalities – and so they would not have to replicate studies. For instance, a collaboration to help determine optimal measures for regional climates and given differing regional financing levels may benefit if research teams in several municipalities explore some aspects in common and other aspects independently.
- c) **Municipalities would design their programs so as to minimize other costs.** Some specific features and how they would minimize costs are presented in the section on program.
- d) **The balance of costs would be borne by the program participants.** These are discussed below.
- e) **Municipalities would include a contingency line item as a component of their program in case of unplanned costs.**
- f) **Municipalities need to have effective monitoring programs that track their ongoing costs.** This topic is addressed in the measurement, evaluation and verification section.

Administration costs for the Long Island Green Homes initiative in the Town of Babylon were roughly estimated at 12 per cent in 2009 and 10 per cent in 2010, and the program is believed to be revenue neutral; the Town's budget scenario has limited staff availability to engage in full monitoring and evaluation necessary for a more precise analysis.⁵ They are seeking a computer program to assist in project and program evaluation.

4. **The program should be delivered with a focus on net savings to homeowners.**

Homeowners' participation in the PAPER program should result in annual savings on their utility bills that exceed the annual financing payments. Note that an alternative goal may also be set of having net energy savings over the useful life of the measures and matching the financing term, as this would allow for variables such as weather, changes in plug loads, homeownership and occupancy changes, energy prices changes, etc.⁶ Achieving net savings or targeting break-even will depend on the existing energy efficiency of the home as well as the energy use patterns of the homeowner.⁷

Having annual savings exceed annual payments reduces risk to multiple stakeholders: investors, the municipalities themselves and homeowners. The Long Island Green Homes initiative and the U.K. Green Deal program require net annualized savings. In both, additional non-energy retrofit costs are/would be borne by the homeowners.⁸

5. Program outcomes should be defined at the outset, and plans developed for measurement and evaluation. These outcomes include:

- a) **The program will protect future generations** via mitigated climate change by lowering greenhouse gas emissions arising from reduced non-renewable energy use. Quantifications should also identify governments' targets and impacts. Private sector programs have not necessarily been focused on achieving these goals.⁹
- b) **A large percentage of existing homes should be retrofit.** In Ontario 177,099 ecoENERGY post retrofit-audits were conducted in the 3.75 years between July 2006 and March 2010. This represents five per cent of the approximately 3.5 million single detached and single attached dwellings in Ontario as of 2007.^{10 11} The remainder is an enormous number of homes that may be of limited energy efficiency and whose owners are subject to rising and at times volatile energy prices.
- c) **Provincial and federal governments will also benefit,** via:
 - i. Assistance in achieving targets for reductions in energy use and greenhouse gas emissions.
 - ii. Budgetary benefits through avoided expenses for power generation plants, cost savings on health care and unemployment; and income tax revenues.¹²
- d) **PAPER will provide benefits to society in a new industrial strategy.** It would be important to develop indicators to track these benefits. Some potential outcomes of a PAPER program follow.

A study by the Centre for Spatial Economics published in 2011 for the Ontario Clean Air Alliance found that energy efficiency improvements that would lower natural gas consumption by 15 per cent by 2026 would result in the following economic impacts in 2026: increase GDP by \$5.1 billion; increase consumer spending by \$2.6 billion; reduce money flowing out of the Ontario economy by \$486 million; increase personal income by \$2.6 billion; increase corporate profits by \$451 million; reduce the provincial deficit by \$443 million and the federal deficit by \$148 million; and lower Ontario greenhouse emissions by 5.5 per cent.¹³

Program benefits would also include protection for homeowners from rising and volatile energy prices. Electricity prices are expected to rise by 30 per cent between 2010 and 2014, even with the 10 per cent electricity price rebate to ratepayers.

Some specific indicators would include employment¹⁴ arising from the initiative (direct and indirect jobs in construction, manufacturing, wholesale and retail, in addition to businesses supporting these sectors and benefiting from the increased economic activity); individual savings on health-care costs arising from illness costs of air pollution;¹⁵ and enhanced indoor air quality and comfort in more energy efficient homes.¹⁶

Additionally, appraisals are expected to be modified soon so that energy-efficient homes will have differential value over conventional ones. This

would be assisted by MLS listings including home energy ratings¹⁷ and energy efficiency measures. Tax relief for homeowners needs to be provided through either:

- i. property tax abatement on the incremental value arising from the energy efficiency measures conducted (which would require Ontario Finance Minister prescription and an articulation of specific energy-efficiency measures that would be property-tax exempt), or
- ii. equivalent income tax credits for homes that have an enhanced energy rating, as recommended by the Chief Appraiser of Canada, André Morin.¹⁸

Municipal program facilitators should define additional outcomes representing local needs at the outset, and develop plans for their measurement and evaluation prior to onset.

6. The program's evolution should be supported by successive councils and higher level governments.

It would be expected that, over time there would be various tranches of different amounts, financed measures and durations, depending on the housing energy profile and market demand in the facilitating municipality by people at all income levels. One additional key factor is that the program framework and its evolution should endure over successive councils and higher-level governments.



2. Strategic Recommendations for an Optimal “PAPER” Program

Program design

Key features of a Property-Assessed Payments for Energy Retrofits program include ensuring the following:

- a) **The program is based on pre- and post-energy evaluations that identify measures that would contribute to savings on energy bills.**
- b) **Program success is defined based on actual energy savings, not estimated savings from the energy evaluation simulations.**

Energy-savings models should be refined so the energy evaluation produces as close an estimate to actual usage on energy bills as possible (pre- and post-retrofit bills would be obtained with homeowner permission), as this will help increase the reliability of energy savings estimates as a financing assurance of the ability to repay (see the section on evaluators, contractors and products for more details). The evaluation should also include the capacity to identify which combination of measures would be the most cost effective while producing the greatest energy savings.

Natural Resources Canada (NRCan) staff add that *“the EnerGuide Rating System has a set of standard operating conditions (SOCs) that are used for each house being rated in order to eliminate the variable of occupant behaviour from the rating and to allow comparisons between houses. For the next generation ERS, there is an exercise in place to review these SOCs to ensure they are as close to the norm as possible. The current ERS assumes a family of two adults and two children at home 50 per cent of the time, a hot water load of 225 litres per day and a hot water temperature of 55°C, a 21°C winter heating set point (with other seasonal assumptions), and an electrical load for lighting, major appliances and other of 24 kWh/day. Standard assumptions are important to ensure that the savings can still be realized with a change of occupants.”*¹⁹

With this fine-tuning of the modelled energy savings, a collaboration study would be useful to estimate administrative costs of calculating actual energy savings (instead of modelled energy savings), along with a cost-benefit analysis of the increased accuracy. This would help keep administrative costs low in the event that significant financial support from senior levels of government is not forthcoming.

- c) **The program will include energy retrofit performance improvement targets.** Most property-assessed and utility on-bill financing programs have not set performance targets as an outcome of the retrofits, although plans are underway to do so in future.^{20 21}
- d) **Utilities must be willing to provide the necessary data to satisfy the program measurement and evaluation needs.** A partnership with utilities for this data would need to be established early on in program development. Early collaboration in developing the indicators and processes for data transfer is recommended. As well, homeowners need to sign a release allowing their billing information to be shared with the program.

To the extent that carbon emissions reductions are assignable to the City from homeowners, this could amount to a tradeable asset or provide ongoing revenue to the programs. One example of a municipal-utility partnership is the City of Toronto, whose agreement with Enbridge Gas includes that Enbridge claims the m³ in gas savings from the city's low-income program, while the city claims the greenhouse gas emission reductions.²²

- e) **Municipalities have the capacity to track costs, homeowners' energy savings and avoided greenhouse gas emissions, and other project and program evaluation data.** This capacity is discussed further in the section on measurement and evaluation.

ADMINISTRATION PROCESS

Process planning requirements include defining who would be involved and at what stages. It requires developing a critical path for optimizing service, for internal communications and tasks as well as for connections with partners, homeowners and external stakeholders.

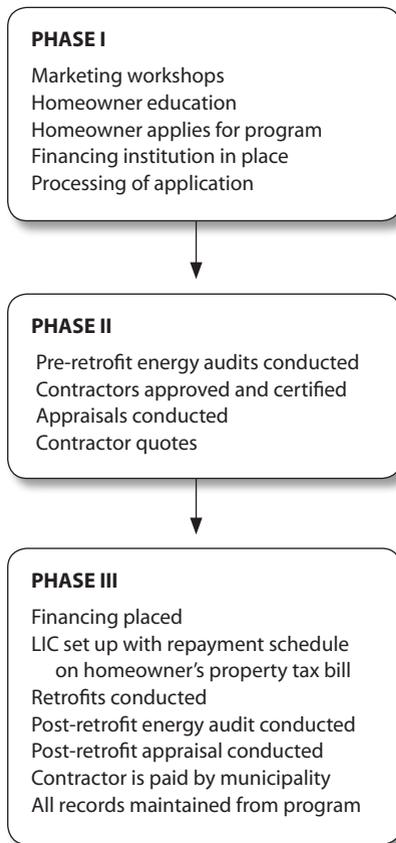
The **selection process** for identifying key targets for preliminary marketing will need to be established. Considerations for municipalities include:

- How will programs address more energy-efficient homes whose owners have already installed "low-hanging fruit" i.e., the least expensive, most cost-effective measures? Typically, such measures would offset those with higher-cost and longer-payback in a comprehensive retrofit.
- How will programs address relatively energy-inefficient homes whose owners are frugal, and who would not qualify for a low-income retrofit program?

An example of a PAPER program energy retrofit process follows. The rationale for these steps is discussed throughout this chapter:

- The program is marketed to homeowners and interest is assessed.
- Financing is obtained based on expected uptake and apparent interest.
- Homeowners fill out an application for the program.
- Homeowners are screened for eligibility. To maintain momentum and homeowner interest in the program, it is critical that this stage is kept as short as possible.
- As part of the eligibility process, the home is screened for deferred maintenance challenges that would need to be addressed prior to undergoing energy retrofits. This could be done via a home inspection, with potential for economies of scale given that neighbourhoods would have similarly constructed homes.²³ Homeowners may decide to have any identified repairs done before engaging in the PAPER program; if so, these would be self-financed and would become an opportunity for private lenders. Another alternative is for the energy-retrofits program to support a small amount of deferred maintenance, such as the Long Island Green Homes initiative, which included a few hundred dollars for this purpose within its financing.
- If eligible (i.e., little or no deferred maintenance depending on the program allowances for this, or such issues having been addressed), the homeowner undergoes a series of educational workshops (which could be supported by utility sponsorship via their DSM programs²⁴). These would show how to save energy through actions that could be taken in the home, as well as lower the chance of the homeowner increasing energy use post-retrofits because the home is more energy efficient.
- After the homeowner has had time to act on the workshop information as well as share his or her activities with the program, a pre-approved, certified energy evaluator who is highly skilled and knowledgeable about building science conducts an energy assessment. This provides a more accurate baseline energy use that is net of homeowner behavioural challenges; i.e., the homeowner changes behaviour to reduce energy use before the evaluation is done.²⁵ This also mitigates rebound, or increased energy consumption by a homeowner arising from having a more energy-efficient home.
- An analysis is done, comparing the energy evaluation with actual energy use from bill history, and the home is screened for potential energy savings based on the homeowner's energy use; i.e., occupancy factors and the efficiency of the home. The energy evaluator provides the homeowner with a list of improvements and potential energy and cost savings. If eligible, based on this information and the expected life of the measures, the energy evaluator recommends an optimal financing term to the homeowner that would enable a goal of estimated annual energy savings exceeding estimated payments.
- A home value appraisal is conducted (this will help establish the impact of the energy retrofits on property value).
- The homeowner is pre-approved.
- The homeowner decides on the certified, highly skilled contractor from among a pre-qualified list. The contractor has associations with pre-qualified installers.

Figure 1.
Energy Retrofit Process Example



- The contractor submits the permits to appropriate regulatory bodies (e.g., building permit, electrical safety authority inspection). Key challenges at this stage would include processing delays incurred or obtaining building or electrical permits. As suggested in a recent study,²⁶ a fast-track system for building permits could be developed subject to anticipated energy performance increments.
- The energy improvements are completed.
- Inspections are conducted as required and inspectors sign off.
- A post-retrofit energy evaluation is conducted, and the revised home energy rating is obtained. As part of this process the energy assessor records the retrofit measures completed and conducts a blower door test. These records are conveyed to the municipality. A number of ratings have been suggested by various energy assessors and retrofit experts as well as government. These include the EnerGuide for Houses rating (which in the next generation will portray high energy efficiency with a low value)²⁷ and the E-Scale Rating developed by CRESNET based on the U.S. RESNET system modified to Canadian conditions.²⁸
- A post-retrofit appraisal is conducted to determine the revised home value based on the completed measures and the post-retrofit home energy rating. (This will likely be different in future, as new appraisal guidelines will be developed.)
- The homeowner signs off on the work to the municipality.
- The contractor submits a final invoice and lien waiver to the municipality.
- Upon receipt of the above records from the energy evaluator, the homeowner and the contractor, the municipality then issues the cheque.
- The municipality conducts follow-up and the rest of the measurement, evaluation and verification processes. Ideally, part of this work would require monitoring energy use in the home for a period of at least one year²⁹ to compare with pre-retrofit energy use to determine the real difference in energy consumption arising from the retrofits – not just the estimated savings.

PROGRAM COSTS

Program costs for the Long Island Green Homes initiative have been estimated as being 12 per cent at start-up (in 2009) and 10 per cent in 2010.³⁰ Those for the Boulder County program were also 12 per cent,³¹ and Halifax Regional Municipality's initial figure is 11 per cent.³²

Overall program costs would be reduced by a collaborative approach with higher-level governments and other stakeholders who would be contributing due to their budgetary savings. The resulting costs would be allocated among program participants in order for the program to be delivered at no cost to the municipality (or to non-participating taxpayers).

Collaboration would avoid duplication of effort and save on program design and development as well as on operating costs for application processing through to the end of the retrofits, and for measurement, evaluation and verification. These

collaborations would be among municipalities and higher levels of government, as well as with educational institutions, industry and NGOs.

Costs for start-up should be identified separately from operations expenses. **Start-up costs**³³ involve developing each approach by means of identifying best practices, collaborating to optimize common approaches and tailoring these methods for each municipality's needs and local scenario; and include:

1. Identifying the "process tree" including which city departments and external entities would be involved, such as (potentially) an ombudsperson intermediary between the program and homeowners.
2. Developing program protocols materials such as the application, homeowner educational details and workshop information. While this should involve multiple city departments within a single municipality, it also would benefit from multiple municipalities' participation.
3. Defining legal matters and developing documents.
4. Facilitating the financing investment; e.g., via a debenture issue.
5. Developing eligibility criteria and protocols (see the finance section on risk mitigation for criteria).
6. Modifying existing LIC processing (for those municipalities that currently use them, and assisting those that don't).
7. Incorporating PAPER payments into existing property tax payments systems (since the LIC is repaid as a temporary fee on the tax bill).
8. Quantifying potential enforcement and foreclosure expenses. Note that the residential mortgage default rate for Canada has been 0.44 per cent,^{34 35} and staff in two Canadian municipalities have noted their property tax default rates have been 0.03 per cent and 0.04 per cent.³⁶
9. Developing measurement and evaluation indicators and protocols for performance evaluation of both the retrofit projects and the program. This should be done in collaboration among municipalities, utilities and other stakeholder providers of data.
10. Ensuring energy assessment, contractor and installer expertise. Recommendations regarding energy evaluators for a financing program are that they should be highly skilled and very knowledgeable about building science. This high skill level and knowledge would allow deeper energy retrofits producing higher energy savings, and reduce risks associated with uncertainty of savings.³⁷
11. Fine-tuning accuracy in energy savings estimations via research in conjunction with expert energy evaluators. There have been queries about the degree to which modelled energy savings data reflect actual savings. There is very little publicly available information on this, although the assumptions for the standard operating conditions were derived from actual data obtained over a broad spectrum of homes. The only published study comparing actuals with estimated savings that CMHC and NRCan are aware of was one of 20 houses retrofitted under the former EnerGuide retrofits program. This study indicated that estimates were on average 37 per cent higher than actuals, and in some cases they were 80 per cent higher. Of course, behaviour was a factor. Metering data would also be useful in the analysis.

12. Developing protocols for energy evaluators to recommend appropriate measures. As noted by some homeowners' subjective experiences in Ontario and B.C., ecoENERGY evaluations did not necessarily include identification of the measures that could be conducted. A study recently conducted for the City of Toronto (December 2010) recommends that energy evaluators should also be specifiers³⁸ for the contracting work – also a highly specialized level of knowledge. In the next generation ERS, energy evaluators would not be trained as specifiers, but NRCan staff note that “once the advisor provides advice on what measure to take, NRCan, CMHC and CHBA provide guidance on the measures themselves.”³⁹

The evaluations would be the basis for the municipalities' financing of the retrofits, and so actual energy and cost savings need to be reliably predicted. The resulting annualized savings on energy bills would reduce the risks to the homeowner, the municipality and the investor if they were equal to or greater than the annualized payments.

There appears to be some flexibility in the methods of achieving net energy savings. A key difference among program developers is that while some are adamant that annual savings should exceed annual payments (including the Long Island Green Homes initiative, which at last report⁴⁰ was expected to have a savings-to-investment ratio of two), others note that all efforts should be taken to aspire to achieve a net energy savings, but that this should not be a program eligibility requirement.⁴¹ Another difference is the way in which net energy savings are measured; *i.e.*, *annualized*, or *over the useful life of the measures and matching the financing term*.

Tom Chapman, Pay As You Save project manager with the U.K. Energy Saving Trust, noted that “*for the Pay As You Save pilot, householders were offered a range of finance and measure options. However it was not mandatory that the customer had to choose a package where the repayments were less than the savings. As such, the savings were an important consideration but not criteria for [program] eligibility.*”⁴² However, *in relation to the Green Deal, he states, “householders will not be eligible for the scheme unless their expected savings are more than repayments. As such savings will be criteria for eligibility. However there will be scope for householders to make their own upfront personal contribution (so the package does become pay as you save) or potentially adding subsidy (e.g. from supplier obligation) to ensure repayments are less than savings.”*

13. Training energy evaluators and contractors on the process and protocols, and identifying appropriate products. See the energy evaluators, contractors and products section for details.
14. Establishing a protocol to address deferred maintenance, including identifying which expertise would be engaged and costing the process. (See the section in retrofit measures.)
15. Establishing protocols for appraisal methods to include operating savings from energy improvements, and for real estate multiple listing services to include energy efficiency and other green building features. Although appraisals do not currently

enable recognition of enhanced value that arises, for instance, from reduced operating costs of an energy-efficient home, this is anticipated to change given upcoming discussions.

16. Enabling energy labels for the retrofitted homes and certification. Third-party certification of energy retrofits had an effect on buyers' interest and market value in a U.S. study. Third-party certification requires energy evaluation.⁴³ A study⁴⁴ of sustainable homes in Seattle and Portland found that:
 - a) 56 per cent of third-party-certified home residents reported that their utility bills had been lowered by moving into a certified home (compared to 46 per cent of non-certified home residents who reported lower new home utility bills).
 - b) "Sustainable third-party certified homes sell faster than non-certified homes.
 - c) "Certified homes sell for more than non-certified homes. In the Seattle metro area, third-party certified sustainable homes were found to sell for 9.6 per cent more than non-certified homes. In the Portland metro area, certified homes sold for 4.2 per cent more than non-certified homes.
 - d) "Home builders believe that third-party verification adds value."
 17. Developing protocols for reporting energy assessment findings to the PAPER program, documenting data and retrieval of such data in future.⁴⁵
 18. Developing outreach, marketing and communications protocols.
 19. Establishing follow-up processes, including assessing the need for an ombudsperson.
 20. Developing collaborative, common municipal systems for reporting indicators to mitigate staff costs.
 21. Documenting these methodologies to enable start-up and operating savings in other regions.
- Broad-based operating** costs would be incurred for the following activities:
- a) Marketing and communications
 - b) Application processing and assessing eligibility
 - c) Financial analysis, legal and tranche financing
 - d) Monitoring, measurement and evaluation

METHODS OF COST RECOVERY FROM HOMEOWNER PARTICIPANTS

After a multi-sector collaboration reduces overall expenses, the balance of municipalities' costs would be recovered from homeowner participants on a prorated basis, from a variety of methods:

1. An application fee. Boulder County participants paid a \$75 fee, aggregating to a significant contribution of \$280,000 to the \$300,000 budget.⁴⁶
2. An interest rate increment of (for example) one per cent added to the investor's debenture rate paid by the municipality. (See also the section on finance.)

In addition, homeowners would be responsible for paying the costs for:

- Energy evaluations (pre- and post-retrofit). It is recommended that audits not be free. Free audits result in the incurring of program facilitator costs without enhanced uptake, as noted by the Town of Babylon's Dorian Dale. (The Long Island Green Homes program did not provide free audits but this observation arose from their research of other initiatives.) The provincial Home Energy Savings Program in which \$150 financing is provided to offset assessment costs has been announced as continuing past March 31, 2011.⁴⁷
- Appraisals
- Permit fees (building permits, electrical safety authority permits, etc.) and other required costs.

The municipality may also consider passing on fees for title and lien searches they conduct during the eligibility phase, which would help them establish clear ownership of the property.

All of the above fees could be rolled into the financing. Please also see the section on Financing under Risk Mitigation.

Retrofit measures

THE MEASURES APPROVED DEPEND ON THE FINANCING MECHANISM

Because project financing is associated with the property, measures approved cannot be moveable (also known as "fittings") and so cannot include appliances or (most) lighting measures.

THE MEASURES APPROVED WILL DEPEND ON PROGRAM GOALS AND PARAMETERS

Measures will vary with the project goals; for instance, if a goal is for project net energy savings (or break-even), the recommended measures would focus on cost savings.⁴⁸

If a home is already fairly energy efficient or if major equipment is near the end of its useful life, then more expensive retrofits may be needed to increase the energy efficiency further. Program parameters such as maximum term and amount will make a difference to whether the payments for the recommended measures exceed the savings obtained.

If the homeowner uses very little energy because of frugality or the ability to pay (and not because the home is energy efficient), energy bill savings may be limited and may be less than annualized payments even over fairly long terms. While a low-income home energy retrofit program exists, not all homeowners may meet the income requirements for participation.

Municipalities may want to consider how to address the two above examples within their programs.

The potential suite of energy improvements should depend on a collaborative, multi-municipality study.

There should be a collaborative study conducted by several municipalities to assess appropriate measures for the PAPER energy retrofits program. Measures included from the ecoENERGY/Ontario Home Energy Savings Program may be considered as a starting point, however it should be noted that some of those programs' funded improvements are very high cost – e.g., a ground-source heat pump is about \$30,000 – which is a higher financing amount than many PAPER programs may want to start at. As well, the PAPER program should be geared toward improving a home's energy efficiency first to make sure that any equipment needed is appropriately sized: an inefficient home may require much larger equipment than an efficient one.⁴⁹ There may also be a loading order, such as envelope retrofits being addressed before heating, ventilation and air conditioning.

Energy improvements covered by different programs included:

- In the ecoENERGY/Ontario Home Energy Savings Program: air sealing; ceiling, exterior wall, floor, foundation, basement and crawl space insulation; Energy Star furnaces; space or domestic hot-water heating integrated mechanical system; Energy Star domestic hot-water heater; drain-water heat recovery system; heat- or energy-recovery ventilator; Energy Star air conditioning; solar thermal domestic hot water system; air-, water- or ground-source heat pumps; and doors, windows and skylights, as well as some water-conservation measures.
- In the Long Island Green Homes program in New York State (including the average amounts spent per home): heating, ventilation and air-conditioning (HVAC) \$3,356; attic insulation and air-sealing \$2,633; basement insulation \$1,083; domestic hot water heater \$917; wall insulation \$767; miscellaneous \$263; windows \$140; and comfort and safety \$22.⁵⁰ The upper-end investment for this program was \$12,000; \$15,000 could be obtained with special permission and the average expense was \$9,015.

What non-energy retrofit costs would be included?

In the Long Island Green Homes program (LIGH), most “non-energy” costs were not included in the financing (although some deferred maintenance costs were financed; please see the section below). As an example of non-energy costs, if the homeowner was replacing the siding on the house, and the insulation ISO board that might go under would customarily be 1/2”, the LIGH program would finance the difference between the cost of that and 2” ISO. However, the LIGH program's savings-to-investment ratio is at 1.88-2.00; i.e., the annual payments are about one-half the annual savings – so there is room to include some non-energy costs.

By contrast, a home energy retrofit company that provides an energy savings guarantee includes all retrofit costs in its calculations.⁵¹

Developing details on non-energy measures that could be funded as part of a retrofit should be part of a multi-municipality study.

USEFUL LIFE

The useful life of the measures should be longer than or equal to the term of the retrofits' financing.

KNOWLEDGE GAPS NEED TO BE ADDRESSED ABOUT THE IMPACTS OF MEASURES ON HOME ENERGY EFFICIENCY

There is a lack of knowledge about the kinds of measures that produce significant energy savings (i.e., are cost effective) among both consumers and financing entities. One major Canadian bank that markets an energy-retrofit financing program highlights windows' energy-savings potential without mentioning the (long) payback period before there would be a net savings. Another of the big banks had window manufacturers as referral points to their loan. This challenge is not confined to the private sector; as noted previously, in two PACE programs in Colorado and California a large proportion of funds financed window improvements as well. This is not to say that windows would not be funded, but simply that installation of the suite of funded measures should result in significant cost-effective energy savings.

Municipal staff, council and property owners will need to be informed about these issues related to the measures for the program, or the program could become co-opted to serve product suppliers or manufacturers.

MEASURES MUST BE COST-EFFECTIVE

Measures should be selected so there is a direct relationship between investment in the retrofits package and savings on utility bills. This approach would avoid a high proportion of cost-ineffective measures being installed with long paybacks.

THE SELECTION OF MEASURES NEEDS TO BE DIRECTED BY ENERGY EVALUATIONS

For municipalities that have a program goal of obtaining a net energy savings after the retrofits (the recommended approach), the selection of the measures package should be directed by a home energy assessment by highly skilled energy evaluators who are very knowledgeable about building science. This will help the estimated energy savings to more closely approximate actual savings.

INCLUDING DEFERRED MAINTENANCE IN THE FINANCING WILL REDUCE THE COST EFFECTIVENESS OF THE PROJECT

An aspect to address in the energy retrofit process is whether any deferred maintenance on the home should be funded by the energy savings program, and if so, to what extent. The Long Island Green Homes program financed a small amount of deferred maintenance (a few hundred dollars out of the potential \$12,000 in financing), but was able to obtain an average savings-to-investment ratio of 1.88 as of August 2010.⁵²

In Boulder County's initiative, some homes that were already approved for energy retrofit financing were discovered afterward by the contractors to have deferred maintenance needs that were not covered by the program. Some of these homeowners withdrew

from the program at that point – after the county and homeowner went through all the eligibility and evaluation procedures.⁵³ This suggests the need for screening for deferred maintenance at an early stage.

PACKAGES OF MEASURES

Municipalities will need to consider the size of the retrofit financing in conjunction with the target markets.

Linda Wigington, founder of Affordable Comfort Inc. and director of Deep Energy Reduction Initiatives, notes⁵⁴ that “it is very hard to sell [just] energy efficiency.” Instead, appealing to needs by providing packages addressing issues such as security and health will drive homeowners’ emotional responses and subsequent program uptake.

For instance, she suggests that packages could be developed for about five different basement remodels with different price tags that would vary with complexity, depth and impacts of the retrofits package and “add to the resilience of basements.” Issues such as avoiding frozen pipes and backups during heavy rainfall could be addressed in this approach, as well as the reduction of asthma triggers and indoor air quality challenges.

She notes that a basement package alone could be around \$25,000. As well, she suggests that if a homeowner is considering re-skinning and residing in the home for a few years, it would be important that the financing program not aim low, as it could preclude obtaining longer-term benefits; rather, this package could include windows and it may be appropriate to finance the cost differential for higher energy efficiency models.

Bill Johnston, president of the Toronto Real Estate Board, notes “the key issue for most homeowners is net savings, followed by health, property value enhancement, and comfort.”⁵⁵

Given the possibilities, local governments may want to have multiple levels of financing: one up to about \$15,000, one up to about \$20,000 and one with a higher upper limit. Clearly, deep energy retrofits are vital to engage in. However, there may be much debate on the issues underlying what limits local governments would fund. It may be that a combination of local government financing under a PAPER program with private sector financing beyond the program’s upper limit would be beneficial; however, this hybrid financing would make outcome evaluation more difficult.

Evaluators, contractors and products

The success of a financed energy retrofit program is measured by its capacity to reduce energy bills and greenhouse gas emissions, in order to generate the increased homeowner cash flow and the associated risk-reduction impacts to various stakeholders (these are discussed in the following section on finance). As a result, it is important to have a high degree of accuracy in the program.

Concerns have been expressed about the degree to which estimated energy savings from energy evaluations reliably match actual savings.^{56 57} Maureen Cureton, Green Business Manager, Community Investment at Vancouver City Savings Credit Union (Vancity), observes that “*it is challenging to accept forecasted energy-savings because energy-forecasts and energy-modeling are unreliable. Rated equipment energy performance seldom matches*

*actual performance, and seasonal temperatures as well as occupant behavior all influence actual energy-savings post upgrade.*⁵⁸

Respected U.S. energy researcher Michael Blasnik notes that actual usage data is required since “measured savings are often just fifty percent to seventy percent of projected savings” because of “flaws in assumptions, inputs, and the engineering models themselves tend to over-predict savings for virtually every measure.” Measuring energy savings year to year is challenged by “program treatments, weather, behavior and other changes in the home.”⁵⁹

A proponent of a U.S. home-energy retrofit company that provides an energy-savings guarantee was interviewed in confidence for this report. While proprietary protocols cannot be shared in this publication, it should be noted that such confidence in energy-savings estimates could likely be replicated in Canada.

With regard to the concerns about actual versus estimated energy savings, Ross Elliott, national award-winning energy auditor and retrofitter/homebuilder, and president of HomeSol Building Solutions, notes “*accurate energy modeling is possible with HOT2000 when done by someone who has extensive knowledge about building science and years of energy evaluator experience. If actual energy savings do not match estimates, the ‘certified energy evaluators’ doing ecoENERGY may not have had this necessary knowledge base.*”⁶⁰

Concerns about evaluators are also noted by Michael Blasnik, who states, “Many evaluators have little building science knowledge, so be wary of strange results that could be precisely wrong ... Technical mistakes go unnoticed or unchallenged, hidden behind complex statistics.”⁶¹

Emanuel Machado, Manager of Sustainability and Special Projects in the District of Sechelt, British Columbia, also advises that energy evaluators should be highly knowledgeable and experienced in building science: “Doing an energy evaluation is complex; it depends on siting, size, materials (for instance). It does not simply involve adding insulation.”⁶² He supports the concept of having energy evaluators who are knowledgeable about building science also be the specifiers, since making recommendations about suitable measures and retrofit costs requires (for instance) understanding structural issues (such as addressing weight dispersal when adding heavy equipment), the product characteristics and the performance levels required. He recommends also that safeguards be in place to ensure professional practices.

Training and precise recording are also needed to preclude clerical and data entry errors by home raters. As well, challenges about equipment sizing that are currently found in the commercial sector are also in the residential realm. Emanuel Machado observes that “right now when someone wants to replace a furnace, the contractor will try to sell what is on hand and replace the existing model with one that is the same size – even though the home has just undergone an energy saving retrofit.”

He added that as a result, appropriate and sufficient energy evaluator training is important: “You wouldn’t certify a plumber in a few days ... The curriculum to do energy evaluations considering all the variables [which would be required for a municipal energy retrofit financing program] has not been written yet.”

Linda Wigington notes⁶³ examples of the special knowledge required to spot and address problems before they occur: structural engineers who identify structural problems don’t

necessarily have the knowledge that energy evaluators and inspectors do. For example, tightening a building causes so many impacts on air flow that prevention measures need to be taken to avoid pressure effects that could arise that and that could lead to back-drafting. Expert energy evaluators and inspectors will also have the knowledge base to anticipate if a roof could be likely to leak.

Another critical aspect of a successful program would be to make the paperwork process easy for all parties – homeowners, evaluators, contractors and the facilitating municipality. Otherwise, an enormous paper load would slow down the process and add to the overhead of these skilled professionals. These costs would be passed on to the homeowners or (if this could not happen), the professionals may not participate in the program, resulting in a loss of expertise and professionalism.

Recommended approaches:

1. A collaborative system should be developed for certifying energy evaluators and ensuring they have a high knowledge and skill level about building science.⁶⁴

This is suggested as an approach for multiple government levels to take on, including several municipalities, since it would be expensive for a single local government. Ross Elliott has observed that “300 full-time professional energy auditors can do over 100,000 residential evaluations a year” and that an association to which he belongs has sufficient expert contractors in Ontario who could hire and train enough staff to meet Ontario’s demand.⁶⁵ NRCan has noted that the next generation EnerGuide Rating System (ERS), which will be launched in 2012, will enhance training and establish a required, standardized knowledge base for both levels of evaluator (certified energy advisor and certified energy rater). As well, the “*house as a system approach to the development of upgrade recommendations looks at the interactions of measures to optimize value,*” default values are being re-assessed, and the homeowner will be given information on design heating and cooling loads for their own comparison with contractor recommendations. However, in the ERS system, the evaluators would not be specifiers.⁶⁶

Two approaches to screen for properties where deferred maintenance would be needed were suggested by architect Martin Liefhebber.⁶⁷ The first approach could use a home inspection, with lower expected costs for each inspection given the neighbourhood approach.⁶⁸ For very large retrofit packages, it might be appropriate to have energy evaluators operating under the auspices of testing companies which often are owned by engineers who are subject to bonding. For example, a soil test would be done to determine load-bearing capacity; the testing company designs the size of the footing, and the project engineer relies on this data. The estimated cost is \$1,000/house for this procedure. (This magnitude of expense could make a smaller investment impractical, but may be very suitable for a larger retrofit.)

The advantage this pre-screening would be to:

- avoid homes that have some deferred maintenance that if not addressed would prevent any energy retrofits from being conducted, or
- allow homeowners (where possible) to finance the outstanding maintenance on the home so that the energy retrofits can proceed

2. The pre-approved contractor list should be posted on the program website.
3. Over a longer term (as noted above) it may be appropriate for non-program participants to also select professionals from this list – an additional motivation for contractors to retain their listing.

Referral points for the retrofits could include:

- Renovations
- Contractors
- Potentially, retailers: for instance, the U.K. PAYS program uses retailers as one pilot project's referral point. However it would be important to ensure that this program would not be directed at maximum purchase but at optimal energy savings. For instance, one Canadian major bank had window suppliers do referrals for energy retrofit financing. And as noted previously, installing many windows would be a challenge when the goal is increased energy efficiency because of the long payback for this measure.

Finance

INVESTORS

Investors would be in a position to provide lower-interest funds for the municipalities' energy retrofit LIC financing because of the priority lien that can be applied to overdue payments. Potential investors could be the private sector, Infrastructure Ontario, other provincial government ministries, utilities, the federal government or the Federation of Canadian Municipalities.

TIMING OF BOND ISSUE/FINANCING

Boulder County pre-qualified homeowners before their bond issue for the aggregated amount. However, that period of waiting for the financing represented a risk to the municipality that people would drop out of the program after eligibility costs had been incurred, and while program overhead costs continued. It indicates that the investment should be obtained before homeowner retrofit financing is approved.

EXAMPLES OF RETROFIT FINANCING

Long Island Green Homes

The capital investment range for participants should be higher than that for on-bill financing; that is, higher than about \$7,500.⁶⁹ The Long Island Green Homes initiative provided financing of energy retrofits (not non-energy expenses) for a range of \$12,000 to \$15,000 (the latter with special permission). The average financing issued was approximately \$9,015.⁷⁰ As discussed previously, ranges of from \$12,000 to \$20,000 or \$25,000 to \$30,000 may be suitable.⁷¹ Linda Wigington notes that these would be appropriate for a mid-range improvement.⁷²

Toronto home⁷³

A sensitivity analysis was conducted on Toronto data from an incremental energy retrofit of a major home renovation. About \$30,000 invested in cost-effective sustainable technologies

addressing natural gas, hydro and water on a \$700,000 home resulted in \$3,300 annual savings. At 12 per cent administration costs paid over the duration of the term (not up-front loaded), financing the \$30,000 over 15 years would cover the administrative costs via an interest rate spread of 1.3 per cent; that is, the municipality would receive funding from the investor at 4.2 per cent and finance the homeowner at 5.5 per cent. If the term was 20 years the spread is one per cent; i.e., the municipality obtains the investor funds at 4.5 per cent and issues financing at 5.5 per cent.

AMOUNTS

Financing amounts should be determined from a collaborative study among several municipalities to determine appropriate measure packages and cost ranges.

Financing terms in U.S. program pilots were as follows⁷⁴:

Table 1: Financing Terms for Property-Assessed and Benefit-Assessed Clean Energy Programs (PACE/BACE)

PROGRAM FACILITATOR	INVESTMENT (USD)	FINANCING RANGE
Boulder County (PACE)	\$9.8 million	\$3,000 to 20 per cent of property value or \$50,000 (whichever is lesser)
Long Island Green Homes (Town of Babylon: BACE)	\$2.56 million	Maximum \$12,000; \$15,000 with special permission
Palm Desert (PACE)	\$7.5 million	\$5,000 to \$100,000
Sonoma County (PACE)	\$8.9 million	Minimum \$2,500; no maximum; Board of Supervisors approves

Financing interest rates provided by local government should either be the same for everybody or with a slightly lower rate for people living on lower incomes. The Long Island Green Homes initiative financed savings on “carbon waste” from their waste management fund at three per cent, which represented the investment rate the fund would otherwise have obtained on the money market. In Boulder County’s first tranche, income-qualified homeowners paid 5.2 per cent interest and other homeowners paid the open rate of 6.68 per cent.

An analysis of best practices resulted in the following recommendations:

- Both revenue-neutral and revenue-positive models should be considered.
- Economies of scale from bulk buying would be passed to the city – which could hold back a proportion of the savings as a slight revenue-generating approach, while passing the majority to the homeowner.⁷⁵
- One feature that could result in a revenue-positive scenario is the assumption of carbon credits. To the extent that carbon-emissions reductions are assigned to the City from homeowners, this could amount to a tradeable asset or provide ongoing revenue to the programs.

- (As noted previously, one example of a municipal-utility partnership mentioned by municipal staff in the call is the City of Toronto's agreement with Enbridge Gas, which includes a stipulation that Enbridge claims the m³ in gas savings from the city's low-income program, while the city claims the greenhouse gas emission reductions.)
- Municipalities should obtain their program financing before approving the financing to homeowners. This reduces municipal overhead costs during the wait, and also mitigates risks of people dropping out and therefore adding new application costs to the municipalities.

RISK MITIGATION METHODS

Financing property assessed payments for energy retrofits (PAPER) programs can provide capital markets with a significant investment opportunity, with the program designed to mitigate risk to all stakeholders.

There are a number of means by which risk would be mitigated in the program:

1. Having annual savings exceed annual payments would be a risk-mitigating factor to investors, local governments and homeowners.
2. The reliably higher cash flow resulting from the retrofits where savings exceeded payments would also increase homeowners' ability to make their mortgage payments.
3. The priority lien applicable to defaulted payments (not the whole obligation) represents a significant security feature that is attractive to investors.⁷⁶ This would result in lower interest rates and therefore be more affordable to homeowners, making the financing easier to repay and therefore even less risky.
4. This greater affordability would also reduce resistance to the program by existing mortgage holders, especially given that overdue energy retrofit financing via the LIC/PAPER mechanism would be subject to a priority lien that would be paid out before the mortgage, as mortgage lenders would otherwise be concerned that the burden of making the financing payments could risk mortgage payments.

Maureen Cureton, Vancity Green Business Manager, Community Investment at Vancouver City Savings Credit Union, comments on impacts of energy efficiency retrofits on owners' capacity to service their mortgages:

"Energy-efficient upgrades to buildings should provide several benefits to owners. Benefits include a well maintained building that is comfortable for occupants. Depending on the type of energy-upgrade, owners may see modest to significant energy-savings and reduced utility bills. When we assess the risk associated with lending (or mortgages) ... we consider the owners' ability to debt service. If energy efficiency upgrades result in lower utility bills, this frees up dollars to repay mortgages, so this benefits the owners' ability to debt service..."

"Another challenge is that there is no guarantee that building or home owners will use their saved energy dollars to service their loan. For example, a homeowner might borrow money to install an energy-efficient furnace, insulation and high performance

windows, thereby realizing significant energy-savings. Then, instead of applying their savings to their loan or mortgage payments they might use their “energy savings” to buy a hot tub, which increases their home’s energy load. To date, for our homeowner energy-efficiency loans (aka Bright Ideas loans) we have not factored in energy auditor’s projected energy savings when considering homeowners’ ability to debt service.”⁷⁷

5. Underwriting criteria can be established to reduce risk. Robert L. Williams, Jr., managing director of RBC Capital Markets in San Francisco, California, comments on the U.S. PACE program, property assessed clean energy (PACE), which is similar to PAPER (see also the section on the U.S. vis-à-vis the Canadian scenarios at the end of this chapter):

“I think that PACE offers an opportunity to homeowners and commercial property owners of [a] viable way to finance solar [pv] and energy- as well as water-efficiency retrofits. And, I think that underwriting criteria can be created to protect all the parties, including investors, other lenders and ultimately the property owners as well as issuers that collect the property taxes used to pay debt service.”⁷⁸

A good example of those criteria is the CaliforniaFIRST Program⁷⁹ for which RBC Capital Markets is the underwriter and Bob Williams is the banker. Some of the criteria include:

- Mortgage lender must be notified (at least).
- Owner must be up-to-date on property taxes for the previous three years.
- Owner must not have any involuntary liens over \$500.
- Owner must not have defaulted on mortgage⁸⁰ and there must not be any foreclosure filings during the previous five years.
- The assessment value and special tax liens on the property cannot be more than 10 per cent of the assessment value or the market value. (Note that the U.S. Department of Energy also recommends 10 per cent as the upper limit.)
- The sum of the mortgage and the special assessment cannot be more than 80 per cent of either the assessed value or the market value.

Other, stringent eligibility criteria⁸¹ that reduce the risk of defaults in the short term are:

- Property valuation as part of application eligibility process.
- No delinquencies in other LIC payments.
- Other criteria specify that there be no tax liens or “other involuntary liens on property.”⁸²
- Pre-retrofit and post-retrofit utility bills required for a specific period (to be determined by risk management team as this may vary with location).
- No history of homeowner bankruptcy for the previous seven years.
- Current property energy efficiency.
- Property requires little or no deferred maintenance.

As well, applications would note that “the participant is warned in the application that providing false, misleading, or inaccurate information is punishable by law.”⁸³

Participation in the program would increase the likelihood of owners having more disposable income due to savings on their energy bills, which could be applied to mortgage

payments. Utility rate increases would result in greater savings and enhance the business case for homeowners.

6. It would not be expected that an existing mortgage would be impacted materially with defaults on PAPER financing given:

- a) the homeowner would be required to produce a letter from the existing mortgage lender (mortgagee);
- b) the above stringent eligibility criteria;
- c) the priority lien would be on defaulted payments only;
- d) the expected enhanced property value from the energy retrofits (see the section at the end of this chapter);
- e) PAPER default risk to the mortgagee is assumed to be similar to:
 - i. the mortgage default risk: i.e., about 0.44 per cent for a portfolio of mortgages on properties with PAPER energy retrofits,⁸⁴ or
 - ii. the default rate for property taxes (e.g., .03 per cent and .04 per cent in two Canadian cities).

Based on \$20,000 financing over 20 years at five per cent, risk could amount to 0.44 per cent of around \$1,585 or about \$7 annually. Even if PAPER financing is in default over several years this is not a large amount. But, by contrast, the U.S. scenario is rather different.

Portfolio default risk (U.S./ Canada)

\$350,000 value, \$20,000 at five per cent over 20 years, Payments ~ \$1,585/year

US	CANADA
Using a mortgage default rate as proxy for the energy retrofits financing program's potential default risk	
Mortgage default rate proxy for PACE default risk: 7%	Mortgage default rate proxy for PAPER default risk: 0.44%
Over a mortgage portfolio the default risk is approximately: \$111 per home i.e. 7% x \$1,585	Over a mortgage portfolio the default risk is approximately: \$7 per home i.e., 0.44% x \$1,585
Over 2–3 years (i.e., it might take this long before a municipality decides on foreclosure): the default risk is approx.\$222 to \$333 / home	Over 2–3 years (as at left), the default risk is approx. \$14–\$21/home
Using a property tax default rate as proxy for program default risk	
	Using 1% (the property tax default rate of Halifax Regional Municipality) as the default rate risk for PAPER = \$16 per home; i.e., \$1,585 x 1% Over 2–3 years: \$32–\$48/home
	Large Canadian municipality #1: Using 0.04% property tax default rate: PAPER default rate risk over the portfolio is approx. \$0.64 Over 2–3 years, approx.: \$1.28–\$1.92
	Large Canadian municipality #2: Using 0.03% property tax default rate: PAPER default rate risk over the portfolio is approx. \$0.48. Over 2–3 years, approx.: \$0.96–\$1.44

Maureen Cureton, Green Business Manager, Community Investment, Vancity (and others), have observed that having energy cost savings exceed energy retrofit payments does not assure the investor and existing mortgage lender that these savings would be applied toward servicing the new debt.⁸⁵

In fact, results from the existing PACE programs to date are that the default rate in PACE homes is 1/30 the default rate in non-PACE homes, which seems to support the PACENOW statement that these PACE programs reduce lender risk.⁸⁶ This is particularly interesting since in only one of the four programs (Long Island Green Homes) were savings required to exceed payments.

To assist further in understanding some key differences between the two countries' housing financing situations, the following is a comparison of U.S. and Canadian residential and mortgage environments:⁸⁷

US vis-à-vis Canadian scenario*		
US: MORTGAGES	CANADA: MORTGAGES	IMPLICATIONS
~34% homes no mortgage**	>50% homes no mortgage	Many Canadian homeowners are without a mortgage and could be in a position to benefit from PAPER financing (provided they meet other eligibility criteria).
No promissory note signed with mortgage	Promissory note signed with mortgage	U.S. homeowners do not sign promissory notes when they obtain a mortgage (unlike the Canadian scenario), so if a mortgage is in default it is not a personal liability of the property owner; the mortgage lender has no recourse.
The capacity to maintain a mortgage amount in the U.S. is assessed based on the payments made for principal, interest, taxes & (homeowner) insurance. Costs for heat are not factored in.	Capacity is assessed based on principal, interest, taxes & heat	Since heating bills are not included in calculations of mortgage amounts, U.S. homeowners in colder climates may be less likely than Canadian homeowners to own a house they can afford.
Mortgage default rate: 7% (2009)	Mortgage default rate: 0.44% (2009)	A less risky mortgage lending environment in Canada.
15-30% mortgages insured	50% mortgages insured	
Mortgage insurance in the U.S. is only on the amount that would take the homeowner to their minimum equity amount required for home ownership.	Homeowners with less than 20% equity are required to obtain mortgage insurance in Canada, which is for the whole of the mortgage.	
Securitized: 60% mortgages	Securitized: 29% mortgages	
~24% mortgages underwater**	Not >1% mortgages underwater	About 28% of U.S. mortgages are at risk compared to about 5% in Canada.
4% mortgages with <5% equity**	4% mortgages with <5% equity	

* Mostly sourced from: LaScelles, Eric, *Canadian Mortgage Market Primer*, June 17, 2010

** Smith, Charles Hugh, Real Estate: *The Worrying Numbers Behind Underwater Homeowners*, www.dailyfinance.com, 08/07/10

Update on PACE: A bipartisan Congressional bill initiated by the Republican party was introduced on July 20, 2011, to the U.S. House of Representatives⁸⁸ to reinstate PACE residential financing, which had been frozen in the middle of 2010 via a letter by the U.S. Federal Housing Finance Agency (FHFA, which governs Fannie Mae and Freddie Mac). This FHFA letter and the enormous support from the White House, all levels of government, and multiple stakeholders for PACE were discussed in Appendix II in the author's previous David Suzuki Foundation report published this year: *Property Assessed Payments for Energy Retrofits and Other Financing Options*.

7. **Risks of “adverse selection”** (that riskiest clients would be most likely to apply) **and of “moral hazard”**⁸⁹ (that the program would result in increased default risk) **are screened out** by the eligibility criteria and the net energy bill savings requirement, respectively.
8. It should be noted that **training and certifying energy evaluators to a high skill level is considered a very important risk-mitigation approach and best practice**⁹⁰ for several reasons:
- a.) It results in the selection of the most appropriate and cost-effective energy-efficiency measures.
 - b) A confidence in the accuracy of estimating energy cost savings would reduce default and cash-flow risks of a variety of sectors: homeowners, municipalities engaging in the financing, municipalities’ investors and existing mortgage lenders.
 - c) Knowledge of building science would mitigate risks of installing measures that could impinge on the house structure or existing features.⁹¹
 - d) Only highly knowledgeable evaluators would also have the capacity to specify products and performance.⁹² Having this skill as part of the evaluator’s role:
 - i. reduces the process complexity for the homeowner and the challenges of acquiring vendor and product knowledge;⁹³
 - ii. reduces risks related to product quality and appropriateness;
 - iii. reduces associated default risks of homeowners, local governments, their investors and existing mortgage holders: cost effective, appropriate products would be targeted;
 - iv. increases the potential for bulk buying and economies of scale, which would lower costs for the homeowners and contribute to further reduction of default risk.
9. **There are other risk mitigation considerations. Financing energy efficiency retrofits is also a choice taken by Vancity as a means of reducing community greenhouse gas emissions, and producing other multiple benefits:**

Vancity’s VP of Community Investment, Andy Broderick, has this to say about the credit union’s venture:

“Vancouver City Savings Credit Union (Vancity) is committed to ongoing management and reduction of our carbon footprint, and we recognize that by leveraging financing tools we can help our members and our community to reduce greenhouse gas emissions too. We are developing partnerships and innovative financing tools to advance energy-efficiency upgrades, low carbon building, and community-scale clean energy solutions.

“As buildings account for 55% of GHG emissions in the City of Vancouver our partnership to pilot PACE-style financing is one way we believe we can mobilize action to reduce GHG emissions. If successful, this program will help the City of Vancouver achieve their target of 33% GHG reduction in GHG emissions by 2020.

“We believe that carbon-reducing financing solutions will benefit our members, our community, and our planet, while generating new revenue opportunities for Vancity.”⁹⁴

10. **Methods of cost recovery for a municipality** could include a buffer amount funded by participant homeowners in case of unexpected program expenses.
11. **An alternative model to mitigate risk might be a loan loss reserve.** This could be facilitated by higher-level governments. In Boulder County, Colorado, homeowners paid for setting up the loan loss reserve in the residential tranches, but in the commercial tranche the federal government supported this mechanism.⁹⁵
12. **Another risk-mitigation method that is used in Boulder County, Colorado, is for the homeowners to make an extra amount comprising one year’s payment combined with a debt-service reserve fund.**

For instance, in the first round Boulder County issued financing to income-qualified homeowners. However, they also paid additional costs as risk-mitigation approaches, which amounted to an extra payment that would be aggregated in case of defaults and used to cover any delinquent payments instead of the municipality having to come up with the funds.

Homeowners therefore obtained financing that included the principal amount, the interest (at a rate of 5.2 per cent or the open class rate of 6.68 per cent), plus an additional 12.65 per cent (moderate income) or 15.94 per cent (open class) as “closing costs”, which could either be paid up front or be rolled into the financing. Near the end of the financing term, the obligation would be paid down early using aggregated funds remaining from the closing costs.

Recently a commercial financing round benefited from federal sponsorship of the debt service reserve fund so the closing costs were about seven per cent.

13. **Energy service companies (ESCOs) for commercial-scale energy retrofits could provide an energy savings guarantee** on consumption volume and tie that to the loan level and rate that an applicant can apply for. Some U.S. home-energy retrofit companies provide energy savings guarantees.
14. **The home’s value would be expected to increase due to the retrofits.**⁹⁶ This would be furthered through the inclusion of energy-improvement features and an energy label on realtors’ multiple listing service postings. (Please also see the following section.)

APPRAISALS

Georges Lozano, CEO of the Appraisal Institute of Canada, observes:

“Although it is intuitive that there would be a value increment arising from energy retrofits, it is not certain. This is because these potential contributors to value are not yet tracked.”⁹⁷

Municipal facilitation of energy retrofits will likely receive additional support given a recently announced collaboration between the Appraisal Foundation and the U.S. Department of Energy, which is expected to result in differential value of an energy efficient or green home over a conventional one. By facilitating energy retrofits, municipalities will help to retain their citizens' property values, and municipalities' tax income.

The U.S. collaboration will develop valuation methods in fall 2011 for energy-efficient and green buildings in all sectors.⁹⁸ The Appraisal Foundation's Appraisal Standards Board develops the Standards of Professional Appraisal Practice ("USPAP"), which have been accepted by appraisal organizations in North America, including Canada.⁹⁹ Also in this period the Chief Appraiser of Canada, André Morin will be working with appraisal organizations in Canada to develop guidelines for valuing energy-efficient and green properties.¹⁰⁰

Impacts that can be expected include an alternative appraisal method to comparables that recognizes benefits of lower operating costs in enhancing property value.¹⁰¹

Documentation of the energy-efficiency measures in a home over mass appraisals would result in data collected on the association of these features with higher property prices. (This should also be accompanied by a marketing campaign to recognize enhanced benefits to homeowners of energy efficient homes, as awareness of benefits is related to value.)

Appraisals should be obtained before and after the home retrofits. The combination of enhanced value arising from the retrofits with no property tax increase on balance is a significant reason for homeowners to engage in this energy improvements program. As well, having multiple energy-efficient homes in a neighbourhood would increase the local comparables for appraisers still using this system.

INCREASED VALUE AND TAXES

The business case for homeowners would not be as strong if energy retrofits resulted in increased property taxes. Two possibilities to address this issue are discussed below.

1. Property tax abatements

As discussed in the author's previous report, *Property Assessed Payments for Energy Retrofits and Other Financing Options*, Ontario could take the course of many U.S. jurisdictions that encourage energy-efficient and green buildings through property tax abatements for increments arising from those retrofits.¹⁰² Wording is in place under the Ontario Assessment Act for the finance minister to allow specific energy-efficiency measures to be exempt from property tax.¹⁰³

2. Income tax credit

André Morin, Chief Appraiser of Canada, has noted that Ontario municipalities might be hard-pressed to give up a property tax increment given their cash-strapped budgets, and that a solution may be to repeat the success of the Quebec method of encouraging uptake of new homes built to a higher energy efficiency rating (the Novoclimat standard).¹⁰⁴ The method he suggests would be to provide an income tax credit on homes with an enhanced energy rating, with the application for this support similar to the Home Renovation Tax Credit;¹⁰⁵ i.e., bills for the retrofits are submitted with the income tax return, along with the property

tax bill. Based on the retrofits conducted and an expected change in the mill rate, the homeowner would receive the tax credit from higher-level governments (whose budgets would benefit from the retrofits as previously discussed), without a lot of paperwork and administrative costs.¹⁰⁶

Measurement, evaluation and verification

EVALUATION MEASURES SHOULD BE IDENTIFIED AND PLANNED FOR BEFORE THE PROGRAM AND PROCESS ARE DESIGNED

There are several formal methods for performance evaluation.¹⁰⁷ Program impacts should be compared with planned outcomes and a pre-retrofit baseline. Specific retrofits should also be evaluated: “what works (or when it works) and what doesn’t.” Continuous improvement should be expected, depending on energy savings, technical and field analysis, and stakeholder interviews and surveys. And, measures of program value should be provided to funders, regulators and other stakeholders.

Performance expectations should be developed for the following factors:

- Energy conservation; i.e., performance – namely the EnerGuide for Houses rating. The energy evaluator should be able to manage this rating at the outset, so that the evaluator and the homeowner can arrive at the optimal EnerGuide rating for that property, with a given financing amount.
- Greenhouse gas emission reductions.
- The number of homes targeted and number of homes retrofitted.
- Neighbourhood locations.
- Payback rate.
- Maximum default rates on the financing.
- Energy savings patterns (for example by measure, house type and provider).¹⁰⁸
- The number of people trained (with different kinds of training).
- Total amounts financed for each home and total amount financed for each measure within a home.
- Total numbers of homes installing each type of measure.
- The proportion of a neighbourhood that is retrofitted.
- There should be an expectation of either no change or fewer mortgage defaults (due to the enhanced disposable income arising from the resulting energy savings).

PROGRAM INDICATORS SHOULD ALSO INCLUDE SAVINGS ON SOCIETAL BENEFITS

Indicators ideally would encompass assessing the benefits to society of an energy retrofit program.¹⁰⁹ These would include:

- Non-energy benefits (such as health/safety, and environmental impacts, which should be in accordance with existing emission-trading protocols such as those of the Western Climate Initiative).

- The number of direct, indirect and induced jobs created per \$1 million invested, and some measure of the import substitution of energy retrofit jobs for gas imports should be taken.
- Energy infrastructure savings (indicators should be in keeping with evaluation, measurement and verification protocols of the Ontario Power Authority and distribution utilities).
- Changes in provincial and federal income taxes and unemployment expenses. These would represent rationales for continued provincial and federal government involvement.

In addition to assessing impacts, the process itself should also be evaluated.¹¹⁰ U.S. researcher Michael Blasnik has noted that measures might include “technical review of procedures, field tools, training and quality control; field visits using diagnostics; administrative/logistical systems of a program; and, surveying clients to get feedback on program implementation, marketing, education, etc.”

STAFF CAPACITY AND COMPUTERIZATION

The capacity to engage in measurement, evaluation and verification will depend on the degree of planning and changes made to accommodate this reporting, as well as staff availability and the computerized incorporation of measures. Post-secondary institutions may be effective partners in this development.

ACCESS TO UTILITY BILLS

A major factor in the capacity to monitor and assess actual savings compared to estimates is access to the homeowners' utility bills. This should be obtained by a release signed by participating homeowners, but the utility also must have some stake in the successful sharing of data. Several regions in the U.S. are still waiting for utility bill data, even after having made arrangements with their utilities to receive the information.

ACTUAL COMPARED TO ESTIMATED PERFORMANCE

Other factors such as occupancy, weather and energy usage changes will affect the quantification of actual compared to simulated energy performance estimates. These will need to be noted and controlled for, over the monitoring duration.

Quality control

There are several methods to address quality control issues.¹¹¹ The first is to ensure that personnel involved in the retrofits have sufficient knowledge base and experience. As well, evaluators and contractors would be bonded and required to meet quality standards. If these standards were not met, the personnel would be held accountable and could be removed from pre-approved list.

Challenges with quality assurance could be assisted by an individual who would mediate between the municipality and stakeholders, and the homeowner participants.

Warranties should be associated with products and equipment installed in the program.

In other regions, a specific number of raters randomly verify a percentage of projects. For example, New York State Energy Research and Development Authority's former Home Performance With Energy Star program tested 10 per cent of energy evaluators' projects. If challenges were found with a specific evaluator, 15 per cent of that individual's projects would be assessed.¹¹²

Marketing and communications

Several messages would need to be conveyed before and during program communications:

A MASS MEDIA CAMPAIGN IS VITAL TO BUILD DEMAND FOR HOME ENERGY EFFICIENCY

It is important to build demand for increasing the energy efficiency of our homes. This is because bogus messages have distracted the public from the risks of climate change and impacts of (non-renewable) energy supply peaks, and have confused people about the reasons for expected energy price increases (i.e., need for energy infrastructure repair, renewal and expansion¹¹³).

Real estate professionals would be helpful in building homeowner awareness, particularly with revised multiple listings that include provision for home energy ratings and energy-efficiency measures. This sector would require appropriate marketing materials that ideally would be developed by real estate boards as part of the broader collaboration.

Utilities may also play a key role in supporting such a campaign by marketing the PAPER program to homeowners on utility bills.

EDUCATIONAL WORKSHOPS SHOULD BE MANDATORY FOR PARTICIPANTS

We recommended that program facilitators require homeowners to take energy-saving workshops to learn how to save on their energy bills. It might be optimal to engage in sessions early, before the energy evaluation, so that when the evaluation is completed the energy use is a baseline after behaviour change. Participant workshops would be directed also to pre-empt rebound (increased energy use because the home is more energy efficient).

The evaluation may be analyzed and adjusted (along with expected savings) if the pre-retrofit audit produces an estimated energy use that is different from the actual pre-retrofit bills by (for instance), more than 10 per cent.¹¹⁴

CONDUCT RETROFITS USING A NEIGHBOURHOOD APPROACH

Conducting retrofits on a neighbourhood scale offers multiple benefits to municipalities. These include economies of scale within a scenario of higher overhead to facilitate uptake, staged installations and bulk buying – which has produced savings of as much as 30 per cent of the individual cost.¹¹⁵ These savings can be completely passed on to the homeowner, or a portion could remain with the municipality to help offset administrative expenses or provide a small net program income.¹¹⁶

The neighbourhood approach would allow municipalities to target specific neighbourhoods depending on the energy profile and income levels. For example, the City of Berkeley directed its focus on eight specific neighbourhoods to address needs of homeowners at all income levels. It found that lower-income neighbourhoods required extra effort to engage homeowners.

Competition, peer-pressure and having a local access point for information and educational sessions have been noted as factors that work well in the neighbourhood scenario.¹¹⁷ These enhance uptake of environmental measures compared to a more spread-out approach.

PACKAGE RETROFITS

In addition to the rationale for energy retrofits arising from needs to reduce energy bills and greenhouse gas emissions, as noted by Linda Wigington previously, having packages of retrofits that could address much-needed issues such as health and safety would enhance the program's appeal to homeowners. Middle income earners may respond more to issues such as basement resilience and air quality for health benefits.

HOMEOWNERS CAN BUILD HOME VALUE (EQUITY) WITHOUT INCREASING PROPERTY TAXES

The marketing campaign described above would result in increased demand for energy-efficient homes: awareness builds demand, which enhances value. (Neighbourhood energy-retrofit approaches would also allow for more local comparables – the current valuation method.)



3. Recommendations: Delivery structure

ROLES FOR MUNICIPALITIES

Collaboration in aspects of program development should be paramount among municipalities, in order to reduce local costs. Municipalities should also request regulatory change and supports from higher-level governments (given their enormous budgetary benefits), as well as other stakeholders.

In addition, data collected from the energy retrofits should be made anonymous and permissions obtained for it to be shareable in aggregate. Energy-retrofit industry professionals need to have access to this information.

ROLES FOR FEDERAL AND PROVINCIAL GOVERNMENTS

There are multiple roles for higher government levels. The province would be needed to make the necessary regulatory changes and to authorize utilities to provide information on energy usage to the program administrator. Also needed are financing and collaboration supports for program development.

Tax incentives should be established for PAPER programs. For instance, the ministry of finance could ensure that energy efficiency retrofits were not subject to property tax increases. (Additionally, retrofits would include not only equipment and machinery but also insulation or measures such as passive solar design and natural ventilation.) Alternatively, higher-level government income tax incentives could credit homeowners with the equivalent of a property tax increment that may arise from the retrofits.

Federal government provision of pilots would be needed, which includes supports for low-interest financing, risk-mitigation mechanisms, and collaborative contractor pre-qualification approaches and program development to reduce individual municipalities' legal and administration costs.

Ideally, higher-level governments would assist with localized research on appropriate measures based on regions' energy profiles and (for example) income levels, to help actual savings exceed payments. Further research should also be conducted on historical actual

energy savings compared to modelled estimates, to fine-tune and ensure the most accurate estimates possible and obtain the highest degree of confidence in the program.

Federation of Canadian Municipalities (FCM)

The FCM would be a critical supporter for studies to look at optimal measures by region, and for collaborations on measurement, evaluation and verification indicators, program development and aspects of marketing.

ROLES FOR PRIVATE, EDUCATIONAL AND NON-PROFIT SECTORS

Financing institutions would be engaged in providing financing to the program, and possibly in a secondary market so that financing is repaid to a revolving fund. If that were the case, a beneficial exchange to both parties would occur if the municipality serviced the financing and provided periodic cheques to the purchasing investor, which in turn would provide enforcement services.

The energy-retrofits industry would be highly engaged and growing.

Educational institutions would be able to participate by providing the administrative framework for expert energy evaluators to conduct training, and by assisting in systems development to reduce program costs.

Non-profits could engage in a variety of roles, including delivery of marketing messaging.

ROLES FOR UTILITIES

Utilities would provide necessary information on energy usage to program administrators, and also collaborate on indicators for project and program performance. Given the benefits they would obtain from an energy retrofits program, they could support energy audits and energy-use reduction workshops. They may also market the program on homeowners' energy bills.



4. Conclusion

Property-Assessed Payments for Energy Retrofits is a product of research collaboration contributed to by many experts in sectors related to and affected by energy retrofits. Development of best practices and confronting challenges to aspects of the program should also be worked out in collaboration, to achieve the optimal and most efficient, low-cost programs that have the lowest risk to all stakeholders. This will benefit local governments, homeowners and taxpayers, and ultimately the environment, the economy, current society and next generations.

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http://www1.eere.energy.gov/wip/pdfs/arra_guidelines_for_pilot_pace_programs.pdf

NOTES

- 1 Yorkshire Energy, presentation to Affordable Energy Canada webinar, February 26, 2011; also staff in one Canadian municipality have been considering this option.
- 2 Halifax Regional Municipality staff, personal communications with Sonja Persram, December, 2010.
- 3 Natural Resources Canada staff, personal communication with Sonja Persram, June 22, 2011. They add: "The proposed skill sets and training requirements for both levels are included in the ERS "Delivery Recommendations" document that is being finalized by the ERS Policy Advisory Committee (PAC) and will be put out for public review later this year."
- 4 Persram, Sonja, Property-Assessed Payments for Energy Retrofits and Other Financing Options, David Suzuki Foundation, 2011.
- 5 Dale, Dorian, Energy Director and Sustainability Officer, Town of Babylon, personal communications with Sonja Persram in March, September and October 6, 2010.
- 6 Natural Resources Canada staff, op. cit.
- 7 Kai Millyard notes that if there are other goals for a municipal energy retrofit program – such as benefits including comfort, safety, a solution to home performance problems, etc, having annual savings exceed annual payments may not necessarily be one of them (related by Clifford Maynes to Sonja Persram, March 3, 2010).
- 8 Regarding the U.K. Green Deal initiative, Chapman adds: "However there will be scope for householders to make their own upfront personal contribution (so the package does become pay as you save) or potentially adding subsidy (e.g., from supplier obligation) to ensure repayments are less than savings." Source: Chapman, Tom, Pay As You Save Project Manager with the Energy Saving Trust in the U.K., personal communication with Sonja Persram, July 27, 2011.
Note that there are some changes to the U.K. Green Deal program from previously available information. While financing is still expected to be long-term, it will not be associated with properties, and will be repaid on homeowners' utility bills. Typical concerns about recourse (utilities have challenges in cutting service when financing payments are overdue if utility bills are current), will be addressed via legislation. "The legislation will seek to allow energy supplier to have the ability to cut off service in the event of default. In practice of course there is pressure on energy suppliers [to] use this as a last resort and they have the ability to move people on to pre-payment meters. How Green Deal will be recovered through pre-payment meters is not clear. Vulnerable [utility] customers are afforded extra protection under the current rules that govern energy suppliers; e.g., they aren't able to cut them off during winter and need to follow extensive process with options around pre-payment meters mentioned above. [It would be expected that] Green Deal legislation [would] make extra provisions for vulnerable customers." Source: Justine Prain, Energy Saving Trust, personal communication with Sonja Persram, July 28, 2011.
- 9 a) This consultant and a municipal staff member participated in a confidential discussion in 2010 with a senior representative of a major Canadian bank who noted that the bank does not focus on reducing energy use or GHG emissions. b) A second Canadian bank's financing program to support energy retrofits was facilitated through window suppliers, which have a very long payback period. Source: Allen, Greg; Persram, Sonja; Kani, Mario; and Lester, Sandra, Assessment of North American Property-Attached and Other Financing Programs For Low-Rise Residential Energy Retrofits, Final Report Prepared for the City of Toronto, Toronto Environment Office, December 17, 2010. By contrast, Alterna Credit Union provides financing for energy retrofits based on energy evaluations. <http://www.alterna.ca/Templates/SavingsPersonalSub.aspx?mid=272&id=3602&langtype=1033>
- 10 Natural Resources Canada, ecoENERGY Retrofit Incentive Payment Report: Canada-wide Totals, Number of D files, Number of E & F files, April 1, 2010.
- 11 As of 2007, the Ontario residential single-family detached and attached housing stock comprised 3.54 million homes. Source: Natural Resources Canada Office of Energy Efficiency, Residential Sector: Ontario: Table 15: Housing Stock by Building Type and Vintage: http://oeenrcan.gc.ca/corporate/statistics/neud/dpa/tablestrends2/res_on_15_e_4.cfm?attr=0 downloaded August 2010
- 12 Thompson, David, Green Jobs: It's time to build Alberta's future, Sierra Club Prairie, Greenpeace Canada, and the Alberta Federation of Labour, April 2009: <http://www.greenpeace.org/canada/en/recent/green-jobs-report/> downloaded January 2011.

- 13 Stokes, Dr. Ernie, *The Economic Impacts of Reducing Natural Gas Use in Ontario*, The Centre for Spatial Economics, prepared for the Ontario Clean Air Alliance, and Ontario Clean Air Alliance Research Inc., April 2011.
- 14 ICLEI Local Governments for Sustainability, *Profiting from Energy Efficiency: 2.0 Why Invest in Energy Efficiency?* <http://www.iclei.org/index.php?id=1672> – 70 direct, indirect and induced jobs arise from energy efficiency retrofits. Induced jobs are more difficult to track.
- 15 Canadian Medical Association, *No Breathing Room: National Illness Costs of Air Pollution*, 2008, which shows economic impacts of ozone and small particulates on Canadians. http://www.cma.ca/index.php/ci_id/86830/la_id/1.htm downloaded February 2011.
- 16 Canadian Home Builders Association British Columbia, *The benefits you can't put a dollar value on, Housing Industry / R2000 / The Real Value of an R-2000 home*, <http://www.chbabc.org/content.php?id=49> downloaded February 2011.
- 17 The Toronto Real Estate Board (TREB) supports including energy ratings on MLS listings. Source: Bill Johnston, Immediate Past President, TREB, personal communication with Sonja Persram, July 2011.
- 18 Source: André Morin, Director, Valuation and Payments in lieu of taxes (PILT) Programs Directorate (Chief Appraiser of Canada), personal communications with Sonja Persram, May 25 and June 21, 2011.
- 19 Natural Resources Canada staff, personal communication with Sonja Persram, June 22, 2011.
- 20 Allen, Greg; Persram, Sonja; Kani, Mario; and Lester, Sandra, *Assessment of North American Property-Attached and Other Financing Programs For Low-Rise Residential Energy Retrofits, Final Report* Prepared for the City of Toronto, Toronto Environment Office, December 17, 2010.
- 21 For instance, other programs have not necessarily facilitated installation of the most cost-effective measures. In some initiatives (including one major bank in Canada and a U.S. PACE program) window manufacturers were encouraged to be referral sources to the financing, and another program (e.g., another major Canadian bank) marketed program financing for window replacements as providing energy savings without also noting the 30-year payback for this measure.
- 22 City of Toronto staff, communications with Sonja Persram and municipalities, January 17, 2011.
- 23 Source: Martin Liefhebber, Architect, Breathe Architects, personal communications with Sonja Persram, July 27, 2011
- 24 This has been considered by staff in one municipality in Canada.
- 25 It has also been suggested that findings from a standard energy evaluation could be adjusted afterward by actual energy consumption and anticipated behavioural impacts on energy saving; however, this approach would require adjustments with new homeowners; e.g., workshop education to help continue the behavioural savings.
- 26 Allen, Greg; Persram, Sonja; Kani, Mario; and Lester, Sandra, *Assessment of North American Property-Attached and Other Financing Programs For Low-Rise Residential Energy Retrofits, Final Report* Prepared for the City of Toronto, Toronto Environment Office, December 17, 2010.
- 27 Natural Resources Canada staff, personal communication with Sonja Persram, June 22, 2011.
- 28 See: http://cresnet.ca/?page_id=13. The following is quoted from the CRESNET website: "RESNET is an American Non-Government organization which has developed a full set of standards of practice and technical specifications for rating the energy performance of residential buildings and HERS – a zero based energy rating system where a U.S. code house rates at 100... CRESNET undertook to adapt the technical specifications of HERS to calibrate the 100 point to better suit Canadian Codes and practices... The Canadianized version is termed the E-Scale."
- 29 In an ideal situation, 3-4 years' energy use would be monitored to control for variations in weather. Source: Natural Resources Canada staff, personal communication with Sonja Persram, June 22, 2011.
- 30 Dale, Dorian, Energy Director and Sustainability Officer, Town of Babylon, personal communications with Sonja Persram in March, September and October 6, 2010.
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- 32 Boyle, Julian, presentation to Ottawa Councillors, city staff, Ecology Ottawa and Sonja Persram, March 2011.

- 33 Some information is sourced from: Allen, Greg; Persram, Sonja; Kani, Mario; and Lester, Sandra, *Assessment of North American Property-Attached and Other Financing Programs For Low-Rise Residential Energy Retrofits, Final Report* Prepared for the City of Toronto, Toronto Environment Office, December 17, 2010.
- 34 Quoted from TD Securities' Chief Canada Macro Strategist Eric LaScelles' recent *Canadian Mortgage Market Primer*: "The current [Canadian residential mortgage default rate] level is just slightly above the 0.42 per cent average from 1990-2009 [at 0.44 per cent]. By contrast, the fraction of prime U.S. mortgages delinquent three or more months was 7.01 per cent as at Q4 2009." Source: LaScelles, Eric, TD Securities' Chief Canada Macro Strategist, *Canadian Mortgage Market Primer*, June 17, 2010 http://www.td.com/economics/special/el0610_cdn_mort_market.pdf downloaded January 18, 2011.
- 35 Another Canadian municipality has been considering exchanging services with a financing institution as a secondary market participant, so that the municipality's financing would be purchased by that institution and the municipality would service the financing to owners in exchange for enforcement services from the institution.
- 36 Source: confidential meeting with staff in two municipalities, April 14, 2011.
- 37 According to NRCan, the program for the next generation EnerGuide Rating System "is addressing the need for [a] highly skilled Certified Energy Advisor" (a more highly skilled level of evaluator who would be making recommendations for home energy upgrades). NRCan also recommends that builders and renovators have access to optional training on this subject, and that this training might be a program requirement. Source: Natural Resources Canada staff, personal communication with Sonja Persram, June 22, 2011.
- To address equivalency so that highly skilled evaluators, builders and renovators do not have to undergo the training, NRCan adds, "Energy Advisors currently certified under the ERS will receive upgrade training only. They do not have to redo all the training. The upgrade training will be in four modules and candidates may choose which modules they think they will require: what's new in the next generation ERS (mandatory for all), training for existing housing EAs on new home procedures, training for new housing EAs on existing housing procedures, and training for those wanting to be CEAs under the new system. Candidates will then write exam(s) to be certified for the new system. If they feel they have sufficient experience and knowledge, they can take the first module and write the appropriate exam. This only applies to training for the launch of the new system. Once it is up and running, new candidates will have to undergo the full training to be a CER or CEA." Source: NRCan staff, personal communications with Sonja Persram, July 27, 2011.
- 38 Allen, Greg; Persram, Sonja; Kani, Mario; and Lester, Sandra, *Assessment of North American Property-Attached and Other Financing Programs For Low-Rise Residential Energy Retrofits, Final Report* Prepared for the City of Toronto, Toronto Environment Office, December 17, 2010
- 39 NRCan staff note: "The advisor is trained to analyze the house and provide advice on what energy efficient measures should be taken. They are not experts on, nor are they trained on, each of the specific products associated with each of the measures. Providing specifications is beyond their qualifications and could make them, and NRCan who has certified them, subject to liability. Additionally, the ERS is aiming for consistency between advisors. Since products are not within their training scope, the recommendations would vary greatly between individuals."
- 40 Dale, Dorian, Energy Director and Sustainability Officer, Town of Babylon, personal communication with Sonja Persram, September 2010.
- 41 Staff in two Canadian municipalities, personal communications with Sonja Persram, 2010-2011.
- 42 Chapman, Tom, Pay As You Save Project Manager with the Energy Saving Trust in the U.K., personal communication with Sonja Persram, July 27, 2011.
- 43 Currently evaluations under the EnerGuide Rating System and that of CRESNET are third-party. As noted by NRCan (op. cit.), in the new version of the ERS, "each home evaluated would receive an ERS label, as well as a homeowner information sheet and access to the suite of on-line services. Homes that undergo the upgrade evaluation will also receive an upgrade recommendations report."
- 44 Griffin, Ann; with Kaufman, Ben; and Hamilton, Sterling: *Certified Home Performance: Assessing the Market Impacts of Third Party Certification on Residential Properties*, Earth Advantage Institute, 2009

- 45 According to NRCan (op.cit.), the "next generation ERS will have an energy assessment protocol developed in collaboration with all of its stakeholders."
- 46 Allen, Greg; Persram, Sonja; Kani, Mario; and Lester, Sandra, *Assessment of North American Property-Attached and Other Financing Programs For Low-Rise Residential Energy Retrofits, Final Report* Prepared for the City of Toronto, Toronto Environment Office, December 17, 2010.
- 47 Greenberg, Lee, Ontario won't reinstate costly incentive program for homeowners looking to green their homes, *Ottawa Citizen*, April 26, 2011; downloaded May 2011.
<http://www.ottawacitizen.com/technology/Ontario+reinstate+costly+program+homeowners+looking+green+their+homes/4678889/story.html>.
- 48 In Boulder County, Colorado, 37 per cent of the \$9.8 million in financing went toward solar photovoltaic panels, and 16 per cent financed window change-outs. (Source: Allen, Greg; Persram, Sonja; Kani, Mario; and Lester, Sandra, *Assessment of North American Property-Attached and Other Financing Programs For Low-Rise Residential Energy Retrofits, Final Report* Prepared for the City of Toronto, Toronto Environment Office, December 17, 2010.) In Sonoma County, California, about 40 per cent of PACE program applications were for solar pv, and almost all the balance were for windows and attic radiant barriers. Source: Home Performance Resource Center, *Best Practices for Energy Retrofit Program Design, Case Study: Sonoma County Energy Independence Program*, March, 2010.
http://www.hprcenter.org/sites/default/files/ec_pro/hprcenter/best_practices_case_study_sonoma.pdf
- 49 NRCan notes (op.cit.) that this is fundamental to the ERS upgrade recommendations and utilizes a "house as a system" methodology.
- 50 Dale, Dorian, *Long Island Green Homes: Summary*, August 2010. Includes Project data.
- 51 Confidential communications with Sonja Persram, January 2011.
- 52 Dale, Dorian, Energy Director and Sustainability Officer, Town of Babylon, personal communications with Sonja Persram in March, September and October 6, 2010.
- 53 Allen, Greg; Persram, Sonja; Kani, Mario; and Lester, Sandra, *Assessment of North American Property-Attached and Other Financing Programs For Low-Rise Residential Energy Retrofits, Final Report* Prepared for the City of Toronto, Toronto Environment Office, December 17, 2010.
- 54 Wigington, Linda, Affordable Comfort Inc. founder and Director, Deep Energy Reduction Initiatives, personal communication with Sonja Persram, Feb 15, 2011.
- 55 Johnston, Bill, President of the Toronto Real Estate Board, personal communication with Sonja Persram, March 7, 2011.
- 56 Don Fugler of CMHC and Claude Lefrancois of NRCan have noted in June-July 2010 that only one study they are aware of has compared either the EnerGuide for Houses or the ecoENERGY Retrofit - Homes national retrofit programs' estimated energy use post-retrofits, with actuals. (This statement was supported by a study conducted for the City of Toronto in late 2010 by Allen, Greg; Persram, Sonja; Kani, Mario; and Lester, Sandra, *Assessment of North American Property-Attached and Other Financing Programs For Low-Rise Residential Energy Retrofits, Final Report* Prepared for the City of Toronto, Toronto Environment Office, December 17, 2010.) The CMHC study of 20 homes under the EnerGuide for Houses program found that average EnerGuide estimations of post-retrofit energy savings were 1.37 x actuals. Source: Thompson, Jane; Goemans, Magda; Goemans, Peter C. and Wisniowski, Andrzej, *The Household Environmental Monitoring Project*, CMHC, 2006, CMHC Project Officer Don Fugler
- 57 62 per cent of surveyed homeowners in Toronto who did not do any energy improvements, and 36 per cent of those who did not implement all post-evaluation energy improvement recommendations were uncertain about the energy savings that would be achieved. Source: Ipsos Reid, op. cit.
- 58 Maureen Cureton, Green Business Manager, Community Investment, via personal communications with Linda Ryan, Communications Consultant, Vancity, June 6-17, 2011. "Vancity will finance loans of between \$4,000-\$10,000 for energy-efficiency retrofits for single family homes in Vancouver. Loan payments will be made through the City's utility billing system and property tax bills and forwarded to Vancity. Expected energy savings from retrofits will be greater than or equal to the incremental loan repayment amount, with savings paying for the upgrades. The City will set aside \$500,000, and Vancity Community Foundation will contribute \$1 million to be held in trust and used

- as security for up to \$5 million of loans from Vancity to qualifying homeowners. 500 homes will participate in the pilot, financed at an interest rate initially offered 4.5 per cent.
- 59 Blasnik, Michael, *How To Evaluate Programs*, PowerPoint presentation to the Energy Retrofits for Houses conference, October 28, 2009.
- 60 Elliott, Ross, personal communications with Sonja Persram, August 2010. He adds: “HOT2000 [a simulation program used in energy evaluations to estimate energy savings from retrofits] is simply a software tool for calculating energy consumption in a residential building, and it does so very accurately, at least as well as any other software out there including the Passive House Planning Package spreadsheet. If predicted results don’t match actual results, there are numerous reasons for this:
- 1) The energy evaluator doesn’t know enough about buildings and using the software to get an accurate model.
 - 2) One upgrade may affect the predicted savings of another: for example, switching to a high efficiency furnace without adding insulation or air sealing will result in higher dollar value savings than after.
 - 3) The air sealing savings can only be accurately determined by a follow-up blower door test — again, the homeowners who meet with an experienced energy evaluator will have better guidance on how best to reduce air leakage than talking to someone who only knows what a blower door machine tells them.
 - 4) Evaluators may not be using accurate fuel cost data.
 - 5) Default values like lighting and appliance loads may be skewing the results (except in “general mode”).
 - 6) Evaluators may not be taking into account special circumstances such as proximity to neighboring buildings or passive solar shading when doing the calculations.”
- 61 Blasnik, Michael, *How To Evaluate Programs*, PowerPoint presentation to the Energy Retrofits for Houses conference, October 28, 2009.
- 62 Machado, Emanuel, Manager of Sustainability and Special Projects in the District of Sechelt, personal communication with Sonja Persram on February 14, 2011. He notes observations reported regarding a recent government program: “The level of understanding of follow-up work was not high. There were not enough actions recommended... Many did the first audit but there was no follow-up (post-retrofit) audit.” He states, for example “some solar installations included a tank — but some installers had no knowledge about the structural integrity that was needed, including adding roof joists or weight dispersal approaches.” And, in B.C., some of the energy evaluators were taking on contracting work themselves; others wanted the homeowner to pay cash.
- 63 Wigington, Linda, founder, Affordable Comfort Inc., personal communication with Sonja Persram, Feb 15, 2011.
- 64 Allen, Greg; Persram, Sonja; Kani, Mario; and Lester, Sandra, *Assessment of North American Property-Attached and Other Financing Programs For Low-Rise Residential Energy Retrofits, Final Report* Prepared for the City of Toronto, Toronto Environment Office, December 17, 2010.
- 65 Elliott, Ross, national award-winning energy evaluator/homebuilder/retrofitter and President, HomeSol Building Solutions, personal communication with Sonja Persram, August 2010.
- 66 Natural Resources Canada staff, op.cit.
- 67 Liefhebber, Martin, MRAIC, Architect, Breathe Architects, personal communication with Sonja Persram, January 27, 2011.
- 68 Liefhebber, Martin, MRAIC, Architect, Breathe Architects, personal communications with Sonja Persram, July 27, 2011.
- 69 As recommended by energy consultant Roger Peters, energy consultant, advisor to Ecology Ottawa (and the first author of the original Pembina reports looking at using Local Improvement Charges for energy improvements across Canada, published in 2004 and 2005), personal communications with Sonja Persram, 2010. This has been an upper limit of financing for energy-efficiency improvements in the Manitoba Hydro program (other energy improvements can also be financed on-bill such as electrical or gas system upgrades at \$5,000; geothermal at \$20,000 and solar thermal at \$7,500 for a total of \$40,000). A key factor is that ideally on-bill financing of energy-efficiency measures would allow annual savings to exceed annual payments in order for the program to be affordable to homeowners. With this goal, an upper limit to financing for energy-efficiency measures is needed since utility financing tends to be for no more than five years.
- 70 Dale, Dorian, Energy Director and Sustainability Officer, Town of Babylon, personal communications with Sonja Persram, September and October 6, 2010.

- 71 Allen, Greg; Persram, Sonja; Kani, Mario; and Lester, Sandra, *Assessment of North American Property-Attached and Other Financing Programs For Low-Rise Residential Energy Retrofits, Final Report* Prepared for the City of Toronto, Toronto Environment Office, December 17, 2010.
- 72 Wigington, Linda, Affordable Comfort Inc. founder, personal communication with Sonja Persram, Feb 15, 2011.
- 73 Information provided by a Toronto homeowner and energy rater/builder John Godden of ClearSphere, May 22, 2011.
- 74 Allen, Greg; Persram, Sonja; Kani, Mario; and Lester, Sandra, *Assessment of North American Property-Attached and Other Financing Programs For Low-Rise Residential Energy Retrofits, Final Report* Prepared for the City of Toronto, Toronto Environment Office, December 17, 2010.
- 75 Yorkshire Energy, presentation to Affordable Energy Canada webinar, February 26, 2011; also staff in one Canadian municipality have been considering this option.
- 76 According to various banks' representatives in confidential discussions with Canadian municipal staff, 2009-2010.
- 77 Maureen Cureton, Green Business Manager, Community Investment, Vancity, via personal communications with Linda Ryan, Communications Consultant, Vancity, June 6-17, 2011. "Vancity will finance loans of between \$4,000-\$10,000 for energy-efficiency retrofits for single family homes in Vancouver. Loan payments will be made through the City's utility billing system and property tax bills and forwarded to Vancity. Expected energy savings from retrofits will be greater than or equal to the incremental loan repayment amount, with savings paying for the upgrades. The City will set aside \$500,000, and Vancity Community Foundation will contribute \$1 million to be held in trust and used as security for up to \$5 million of loans from Vancity to qualifying homeowners. 500 homes will participate in the pilot, financed at an interest rate initially offered 4.5 per cent.
- 78 Robert L. Williams, Jr., Managing Director, RBC Capital Markets, San Francisco, CA, personal communications with Sonja Persram, July 27, 2011.
- 79 Sources: CaliforniaFIRST statewide PACE program and Bob Williams Jr., personal communications with Sonja Persram, July 2011.
- 80 Mortgage statements would be required.
- 81 Many of these criteria are sourced from Natural Resources Defense Council, PACE Now, Renewable Funding, LLC and The Vote Solar Initiative, *Property Assessed Clean Energy (PACE) Programs White Paper: helping achieve environmental sustainability and energy independence, improving homeowner cash flow and credit profile, protecting mortgage lenders, and creating jobs*, May 2010, <http://www.renewfund.com/resources/resources> downloaded February 2011.
- 82 Ibid.
- 83 Ibid.
- 84 LaScelles, Eric, TD Securities' Chief Canada Macro Strategist, *Canadian Mortgage Market Primer*, June 17, 2010. http://www.td.com/economics/special/el0610_cdn_mort_market.pdf downloaded September 20, 2010.
- 85 Maureen Cureton, Green Business Manager, Community Investment, Vancity, via personal communications with Linda Ryan, Communications Consultant, Vancity, June 6-17, 2011.
- 86 According to a recent webinar about the launch of the bill, out of a total of 2,565 homes with PACE financing in the Town of Babylon, Boulder County, Palm Desert and Sonoma County, only one home in Boulder and one in Sonoma experienced mortgage defaults (i.e., a combined mortgage default rate of 0.1 per cent), compared to an average mortgage default rate of 3.2 per cent for non-PACE homes in those counties -- which amounts to 82 non-PACE homes defaulting out of 2,565 non-PACE homes. Source: PACENOW, *PACE: Property Assessed Clean Energy, Update, New Federal Legislation, and a Call to Action*, webinar, July 14, 2011.
- 87 Some of this information was discussed in Appendix II in: Persram, Sonja, *Property Assessed Payments for Energy Retrofits and Other Financing Options*, David Suzuki Foundation, 2011; other material was presented by the author to multiple governments and organizations from February through July 2011, and specifically in that period to staff at Canada Mortgage and Housing Corporation and Natural Resources Canada.
- 88 See <http://pacenow.org/blog/take-action-to-save-pace/> for details.
- 89 Natural Resources Defense Council, PACE Now, Renewable Funding, LLC and The Vote Solar Initiative, *Property Assessed Clean Energy (PACE) Programs White Paper: helping achieve environmental sustainability and energy independence, improving homeowner cash flow and credit profile, protecting mortgage lenders, and creating jobs*, May 2010, <http://www.renewfund.com/resources/resources> downloaded February 2011.

- 90 Many of these were recommended in Natural Resources Defense Council, PACE Now, Renewable Funding, LLC and The Vote Solar Initiative, Property Assessed Clean Energy (PACE) Programs, *White Paper: helping achieve environmental sustainability and energy independence, improving homeowner cash flow and credit profile, protecting mortgage lenders, and creating jobs*, May 2010, <http://www.renewfund.com/resources/resources> downloaded February 2011.
- 91 Machado, Emanuel, Manager of Sustainability and Special Projects in the District of Sechelt, personal communication with Sonja Persram on February 14, 2011.
- 92 Allen, Greg; Persram, Sonja; Kani, Mario; and Lester, Sandra, *Assessment of North American Property-Attached and Other Financing Programs For Low-Rise Residential Energy Retrofits, Final Report* Prepared for the City of Toronto, Toronto Environment Office, December 17, 2010.
- 93 Noted as a major challenge to energy retrofits in Persram, Sonja, *Property-Assessed Payments for Energy Retrofits: Recommendations for Regulatory Change and Optimal Program Features*, David Suzuki Foundation, 2011.
- 94 Broderick, Andy, VP of Community Investment, Vancity, via personal communications with Linda Ryan, Communications Consultant, Vancity, June 6-17, 2011.
- 95 Allen, Greg; Persram, Sonja; Kani, Mario; and Lester, Sandra, *Assessment of North American Property-Attached and Other Financing Programs For Low-Rise Residential Energy Retrofits, Final Report* Prepared for the City of Toronto, Toronto Environment Office, December 17, 2010.
- 96 Canadian appraiser Chris Corps, founder of Asset Strategics and project leader of the *Green Value* study noted (personal communication with Sonja Persram, September 14, 2010): "Any green attribute that is lacking in a home will have an effect on value as dictated by market perception. The value increment after a home retrofit will vary: an energy improvement with a saving of say \$1,000/yr and a ten year life cycle might at best show $10 \times \$1,000 = \$10,000$ better value. This would be the largest discount for a non-green versus green building." Cited in: Persram, Sonja, *PAPER and other financing options*, David Suzuki Foundation, 2011. See also Appendix I in that report.
- 97 Lozano, Georges, Chief Executive Officer, Appraisal Institute of Canada, personal communication with Sonja Persram, April 26, 2011.
- 98 The Appraisal Foundation, *Press Release: The Appraisal Foundation and the US Department of Energy to Collaborate on Issues Relating to Green Building Valuation*, June 13, 2011.
- 99 See: http://www.uspap.org/USPAP/frwrdr/us-pap_foreword.htm
- 100 Source: André Morin, Director, Valuation and Payments in lieu of taxes (PILT) Programs Directorate (Chief Appraiser of Canada), personal communication with Sonja Persram, June 21, 2011 at the International Property Tax Institute Conference, *Implications of Going Green, Current Programs and Developments, Valuation and Taxation, Challenges and Issues*.
- 101 The U.S. Appraisal Institute has previously published a book describing this method: Simmons, Alan, *An Introduction to Green Homes*, Appraisal Institute, 2010: <http://www.appraisalinstitute.org/store/p-216-an-introduction-to-green-homes.aspx> and discussions with staff at the Appraisal Institute of Canada and with the Appraisal Institute (US), November-December 2010.
- 102 See www.dsireusa.org for details.
- 103 Exemption of items would need to go beyond the currently specified machinery and equipment, to include insulation as well as passive solar/natural ventilation measures and assemblies. (See 3. (1) 18 and 18.1 in the Ontario Assessment Act: http://www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_90a31_e.htm#BK2).
- 104 See: Ressources naturelles et Faune du Québec, *Financial assistance for the purchase of a Novoclimat home*: <http://www.aee.gouv.qc.ca/en/my-home/novoclimat/single-family-homes/savings/> downloaded August 2, 2011.
- 105 See: *Canada's Economic Action Plan: Budget 2009, The Home Renovation Tax Credit*, January 27, 2009: <http://www.budget.gc.ca/2009/pdf/pamphlet-depliant3-eng.pdf> downloaded July 28, 2011.
- 106 Source: André Morin, Director, Valuation and Payments in lieu of taxes (PILT) Programs Directorate (Chief Appraiser of Canada), personal communications with Sonja Persram, May 25 and June 21, 2011.
- 107 Many recommendations in this section are sourced from Blasnik, Michael, *How To Evaluate Programs*, PowerPoint presentation to the Energy Retrofits for Houses conference, October 28, 2009. Blasnik notes that program evaluations are not often conducted, and evaluations are not very reliable – often using energy savings from simulations rather than actual bills.

- 108 Ibid.
- 109 Ibid.
- 110 Ibid. The following items are quoted.
- 111 Many of these were recommended in Natural Resources Defense Council, PACE Now, Renewable Funding, LLC and The Vote Solar Initiative, Property Assessed Clean Energy (PACE) Programs, *White Paper: helping achieve environmental sustainability and energy independence, improving homeowner cash flow and credit profile, protecting mortgage lenders, and creating jobs*, May 2010, <http://www.renewfund.com/resources/resources> downloaded February 2011.
- 112 Allen, Greg; Persram, Sonja; Kani, Mario; and Lester, Sandra, *Assessment of North American Property-Attached and Other Financing Programs For Low-Rise Residential Energy Retrofits, Final Report* Prepared for the City of Toronto, Toronto Environment Office, December 17, 2010.
- 113 See *Ontario's Long Term Energy Plan: Building Our Clean Energy Future*: http://www.mei.gov.on.ca/en/pdf/MEI_LTEP_en.pdf
- 114 This was suggested by staff of a U.S. firm engaged in home energy retrofits.
- 115 Yorkshire Energy Services has been taking an "area-based approach" to energy retrofits in the U.K. as part of participation in the Pay As You Save pilots. They have reported bulk buying savings of as much as 30 per cent. Source: William Edrich and Andrew Cooper, Yorkshire Energy Services, presentation to Affordable Energy Canada webinar, February 26, 2011.
- 116 Staff in one Canadian municipality have been considering this approach.
- 117 Yorkshire Energy Services, op.cit.

Local Improvement Charges are fees for municipal financing of infrastructure improvements that benefit homeowners and are repaid on tax bills. This report offers strategic recommendations to create a practical and optimal plan for energy retrofit financing in Ontario, with underwriting criteria directed toward minimizing risk for all stakeholders.

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