Sustainable Prosperity

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SUSTAINABLE COMMUNITIES

Financing Residential Energy Savings:

Assessing Key Features of Residential Energy Retrofit Financing Programs

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Sustainable Prosperity is a national research and policy network, based at the University of Ottawa. SP focuses on market-based approaches to build a stronger, greener, more competitive economy. It brings together business, policy and academic leaders to help innovative ideas inform policy development.

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Key Messages

- Residential energy efficiency measures offer cost savings, substantial low-cost greenhouse gas (GHG) emissions reductions and important local economic development opportunities.
- From the perspective of homeowners and tenants, energy retrofit improvements can be challenging. To achieve energy cost savings, a substantial up-front investment is often required and financing may be difficult to obtain.
- From the perspective of program operators and policy makers, designing programs that reach the available opportunities while also being financially sustainable has been challenging. In order to reach further into the market, previous programs have been built on rebate and subsidy platforms, and consequently have been vulnerable to ongoing funding commitments and continuing political will.
- Residential energy retrofit financing programs that seek to address both the financial sustainability concerns of the programs' operators and the investment concerns of residents have been implemented in limited jurisdictions. These financing programs generally take two forms: **on-utility bill financing**, in which residents repay the cost of energy efficiency retrofits on their utility bill, and **property-tax financing**, in which residents repay the cost of the investment on their property tax bill.
- Until recently, few of these programs have had enough longevity from which to derive best practices, but a growing body of experience now offers an opportunity to evaluate the efficacy and importance of financing programs' key design features.

- One particular question for the design of new financing programs relates to the transferability of the financial liability from resident to resident when there is a change in occupancy or ownership. The absence of such a mechanism could be seen as a reason financing programs might not have been implemented more widely. However, case study analysis shows that while transferability is important, it is perhaps less important than it has been perceived to be. Well-designed programs can have substantial success without mandatory transferability mechanisms.
- The amount of economic, environmental, and social opportunity available in residential retrofits provides justification for communities and utilities to move forward by implementing the best program within their context and jurisdictional authority now.
- New programs in British Columbia, Manitoba, Ontario and Nova Scotia may set the stage for much wider adoption of energy efficiency financing mechanisms in Canada.

The Issue

Residential energy retrofits offer substantial opportunities in Canada for greenhouse gas (GHG) emissions reductions, job creation and residential energy savings. Many residential energy efficiency measures are cost-effective with favourable payback periods and investment returns, yet up-take of these measures has been lower than expected due to persistent market barriers.[1]

Residential energy efficiency measures present a significant greenhouse gas (GHG) abatement opportunity. Residential space heating, cooling, and hot water heating accounted for more than 12% of GHG emissions from energy use in Canada, and over 8% of the national emissions total in 2011.*

* Duffy, R., & Fussell, H. (2011). *This Green House: Building Fast Action for Climate Change and Green Jobs.* Columbia Institute. http://www.civicgovernance.ca/sites/default/files/publications/This%20Green%20House_Report.pdf

Numerous energy efficiency support policies, such as educational programs and voluntary labeling programs, have begun to overcome the informational barriers to proper valuation of energy efficiency in homes. Home energy retrofit rebate programs and appliance rebate programs have sought to address the high capital costs of energy saving projects. But these programs have not fostered the market-wide transition that would be possible through wide-scale adoption of energy efficiency retrofits.[2] In addition, because these simple payout programs require ongoing funding, many have suffered from financial sustainability gaps and consequently have been vulnerable to changes in political support.

Because of these challenges, governments are looking to innovative financing solutions to further the market for energy retrofits and to bring a self-sustaining model to residential energy saving programs. A 2013 report prepared for the Energy and Mines Ministers' meetings notes that through new energy efficiency financing approaches, Canadians could realize energy savings of an estimated 20% in their homes.[3] This Brief draws on the experience of past and present programs to provide guidance on what design elements such financing programs should have for greatest success. It also provides a view on the emergence of new financing programs across Canada

1 Intergovernmental Panel on Climate Change. (2007). *Climate Change 2007: Mitigation of Climate Change. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.* http://www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_wg3_report_mitigation_of_climate_change.htm

2 Zirnhelt, H., & Horne., M. (2010). *Energy Labelling and Efficiency Requirements for Existing Buildings*. Pembina Institute. http://www.pembina.org/docs/gbl/labellingee-existingbuildings-withcover.pdf

3 Energy and Mines Ministers' Conference (2013.) *Energy Efficiency Update 2013: Energy Efficiency: Taking a Balanced Approach* https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/pdf/publications/emmc/EE_update2013_e.pdf

– which may be the beginning of a larger trend in energy retrofit financing.

The Knowledge Base

This Brief explores the case for using financing programs to promote energy efficiency actions in residential applications, and experience with these programs to date.

Energy efficiency actions make sense for many reasons:

- From the perspective of the homeowner or renter, energy efficiency investments offer an ongoing stream of cost savings that is generally far greater than the value of the initial investment required;
- For society as a whole, energy conservation has a lower cost than adding energy production capacity;[4]
- Energy efficiency leads directly to pollution abatement, including both local air emissions and GHG emissions reductions.[5] Improving energy efficiency is generally one of the cheapest ways to reduce carbon emissions;[6] and
- Such investments benefit local, regional, and national economies. A number of studies agree that energy efficiency ranks at the top of energy investments in terms of job creation and creates the most local jobs on a per-unit of energy basis.[7] A BC study estimated that 13-17 jobs are created for every $1 million additional output from the building retrofit sector.[8]

Despite the strong environmental and economic rationale for residential energy retrofits, these actions are not taking place as frequently as would make sense from either an environmental or economic perspective.[9] One reason for this is that residents and homeowners face challenges in overcoming market barriers. Another is that program operators face the challenge of designing programs that are financially sustainable. Both factors are considered below.

4 The province of Ontario notes that for every $1 invested in energy conservation, Ontario has avoided about $2 in costs to the electricity system. (See *Conservation First: A Renewed Vision for Energy Conservation in Ontario.* (2013). Government of Ontario. http://www.energy.gov.on.ca/en/conservation-first/#introduction)

The Ontario Clean Air Alliance estimates energy conservation costs 2.3 to 4.6 cents/kWh, compared to costs of new generation ranging from 10 to 80 cents/kWh depending on the technology. (See *An Energy Efficiency Strategy for Ontario's Homes, Buildings and Industries.* (2011). Ontario Clean Air Alliance. http://www.cleanairalliance.org/files/ee.pdf

5 By analogy to a major U.S. study it is possible that residential energy retrofits in Canada could reduce 4% of Canada's GHG emissions from energy use and 2.6% of Canada's overall emissions. See Duffy, R., & Fussell, H. (2011). *This Green House: Building Fast Action for Climate Change and Green Jobs.* Columbia Institute. http://www.civicgovernance.ca/sites/default/files/publications/This%20Green%20House_Report.pdf

6 Intergovernmental Panel on Climate Change. (2007). *Climate Change 2007: Mitigation of Climate Change. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.* http://www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_wg3_report_mitigation_of_climate_change.htm

See alsoMcKinsey & Company analysis of greenhouse gas abatement cost curves at http://www.mckinsey.com/client_service/sustainability/latest_thinking/greenhouse_gas_abatement_cost_curves

7 See, for example: Max Wei, Shana Patadia, Daniel M. Kammen, "Putting Renewables and Efficiency to Work: How many jobs can the clean energy industry generate in the U.S.?" in *Energy Policy* 38 (2010), 922, Table 2.

8 Lee, Marc and Carlaw, K. (2010). *Climate Justice, Green Jobs And Sustainable Production in BC.* Canadian Centre for Policy Alternatives, BC Office. www.policyalternatives.ca/greenjobs

9 Intergovernmental Panel on Climate Change. (2007). *Climate Change 2007: Mitigation of Climate Change. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.* http://www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_wg3_report_mitigation_of_climate_change.htm

Market Barriers Facing Consumers

Despite the strong home renovation market (estimated to be growing at 8% per year[10]), consumers are not investing in energy retrofits. The market barriers preventing consumer investment can be considered as three broad categories.

Access to capital -- Energy retrofit investments, while often economic, require almost entirely upfront capital costs that rely on energy cost savings to pay back the investments. Many residents require debt financing to make the upfront investments necessary, but most energy efficiency retrofits are less than $10,000, a level at which banks typically lend out only as high interest unsecured loans.[11] Moreover, the length of payback and attractiveness to the resident depends to a substantial measure on the financing costs. Even where third-party financing options are available, they may be prohibitively expensive. The difficulty of obtaining affordable financing, or any financing at all, is aggravated for lower-income households and individuals with weaker credit (such as young homeowners or renters) even though energy savings can improve residents' financial situations.

Information barriers -- Information costs, split incentives and principal-agent problems present further market failures in homes and in rented residences. Contractors have few incentives to use materials that are more expensive upfront but will result in reduced energy bills because they do not pay the ongoing energy bills. Prospective homebuyers' lack of information about ongoing energy costs contributes to a lack of incentive in the housing market for current homeowners to make cost-efficient energy saving investments. Renters who pay their own energy bills would benefit from reduced costs but are generally not allowed to make changes to the building without the permission of the landlord or they have lease periods too short to recoup their investment. The landlord, in turn, has little incentive to make the building more energy efficient if the energy costs fall to the tenant or if he/she does not ultimately control the energy use of the rental unit and so may not capture the full savings.

Uncertain payback periods -- The payback periods for these investments depend on the type of energy retrofit measure and the current and expected energy costs. The Clean Air Alliance reports that consumers generally demand a payback on energy efficiency investments in the range of 1-5 years[12] -- which can be explained by the homeowners' uncertainty in the future savings from the investment and difficulty finding funds. Even for shorter-payback retrofits, uncertainty around the time horizon homeowners plan to spend in any given dwelling can dissuade investment if homeowners are uncertain if they will recover their upfront investment at the point of resale. The ownership period for most homes is usually less than 10 years.[13]

10 Scotiabank Group. *Global Economic Research Special Report.* (June 22, 2011). http://www.scotiabank.com/ca/en/files/11/09/Energizing_Household_Energy_Efficiency.pdf

11 Bierth, C., Peyman, H., & Svedova, J. (2010). *Addressing the Barriers to Energy Efficiency in Vancouver.* Vancouver, BC: ISIS, Sauder School of Business. http://www.sauder.ubc.ca/Faculty/Research_Centres/ISIS/Resources/~/media/A6AD2F658A8944CE9165C0622133E564.ashx

12 Ontario Clean Air Alliance. (2011). *An Energy Efficiency Strategy for Ontario's Homes, Buildings and Industries.* http://www.cleanairalliance.org/files/ee.pdf)

13 Bierth, C., Peyman, H., & Svedova, J. (2010). *Addressing the Barriers to Energy Efficiency in Vancouver.* Vancouver, BC: ISIS, Sauder School of Business. http://www.sauder.ubc.ca/Faculty/Research_Centres/ISIS/Resources/~/media/A6AD2F658A8944CE9165C0622133E564.ashx

Program Sustainability Challenges of Policy Makers

Policy makers have sought to address the barriers to consumer action by designing programs that reduce consumer costs, fill information gaps and increase consumers' financial return. Programs to date have been successful in increasing uptake of energy efficiency measures, however the most successful programs have generally offered substantial rebates or refunds to consumers – and as a result, many have been costly and vulnerable to changing fiscal circumstances and political priorities. From the perspective of both policy-makers and taxpayers, program options that are sustainably self-funding (and thus not requiring ongoing public funds) would be ideal. Programs designed with incentives generous enough to encourage homeowner and resident participation while also replenishing their own funds would have great potential and would likely be shielded from changes in the fiscal and political landscape.

Energy Retrofit Financing as a Policy Solution

Energy retrofit financing programs have been proposed as a means of targeting these barriers while also addressing the issues of program sustainability. These financing programs promote energy efficiency and renewable energy actions by homeowners and renters by offering a financing option that may not otherwise be available to them.

To appeal to homeowners and renters, financing programs generally have the following elements:

- they offer reasonable financing at rates that make energy retrofits – at least, the key cost-effective measures – economically attractive;
- they offer loan repayment periods set long enough (corresponding to the useful lives of the retrofits) to allow property owners to benefit immediately from the energy cost savings, often over-and-above the regular repayments; and
- in many cases, they address residents' concern that they will not be able to recover the cost of their investment should they move or sell the property (e.g., by tying the loan obligation to the property instead of the resident who is making the investment – see the section on transferability on page 13).

These programs fall into two basic categories according to how the loan is repaid: on-utility bill financing (often utility-administered) and property tax financing (often municipality-administered). While this categorization explains two common types of programs and facilitates discussion, many other program types and hybrids exist. The source of the financing (utility, municipality or other) and administration of the program (utility, municipality or other) is not essential to understanding the advantages and disadvantages of different programs.[14] These two programs categories are explained further in Table 1.

14 Although most programs fall into one of these two categories, variations are possible. For example, under the Long Island Green Homes program, the town of Babylon, NY pays energy efficiency contractors directly for their work and recoups costs through a surcharge on homeowners' municipal services bill, at a level lower than the homeowner's savings. The town has an existing authority to use their solid waste cleanup fund to clean up solid waste on private property and to recover the cost from the property owner. By reclassifying carbon dioxide as solid waste, they can now finance energy efficiency retrofits under the same authority (Home Performance Resource Center. (2010). *Best Practices for Energy Retrofit Program Design: Case Study: Long Island Green Homes* http://www.hprcenter.org/sites/default/files/ec_pro/hprcenter/best_practices_case_study_long_island.pdf).

TABLE 1: Types of Financing

	On-Utility Bill Financing	Property Tax Financing
Also Called	PAYS – Pay As You Save	PACE – Property Assessed Clean Energy LIC – Local Improvement Charge PAPER – Property-Assessed Payment for Energy Retrofits
Who is involved	A property owner or resident and a utility	A property owner and a municipality
How it works	The homeowner or resident repays the cost of the retrofit through **a surcharge on his/her utility bill.** In some programs, the loan is made to the individual. In other programs the loan is linked directly to the meter, meaning repayment falls on the account holder and can change with a change of the resident.	A property owner takes out a loan to finance a retrofit and repays the loan through **an additional line item on the owner's property tax.** Loans are generally attached to the property rather than the property owner, and are transferred when the property is sold.
Advantages	Loans are typically repaid over a long period of time so that occupants can see immediate benefits from energy bill savings relative to loan payment.	By tying the loan to the property, owners can finance measures with payback periods longer than their expected ownership.
Risk Management	Risk can sometimes be managed because the repayment is collected the same way other utility fees are. In some cases, the utility can choose to terminate service if fees are not paid.	The payment obligations are generally secured by a municipal lien on the property, which is commonly senior to other creditors for the property, mitigating the lender's risk.
Useful or Necessary Powers	Generally, for regulated utilities that are compensated for providing service at lowest cost, energy retrofit financing for customers must be authorized under regulatory rate reviews. Depending on the program design, utilities may need expanded powers to implement the program, including: • the ability to fund projects relating to both electricity and heating fuel • the ability to transfer repayment to a new occupant of the residence • the ability to cut service for defaulting on a loan, even for non-payment of non-energy charges	Municipalities can implement these programs with authority from a variety of legislative or regulatory provisions. Usually, the programs function under a particular application of the authority to undertake neighbourhood projects (such as road and sewer improvements) and recover the cost of these projects through an extra line on the beneficiary residents' property taxes. With these programs, the projects and recovered costs are applied not at the neighbourhood level but to just one residence. In Canada, many such programs fall under Local Improvement Charges (LIC).

Case Studies

A growing body of practical experience with financing programs, both in the United States and Canada, offers insights on successful program design and implementation and can inform the policy changes needed for implementation. Five programs, concluded or ongoing, are outlined here with commentary relevant to future program design.

Berkeley FIRST (Financing Initiative for Renewable and Solar Technology)

Financing Type	Property Tax
Technology	Residential solar photovoltaic systems
Years of Operation	2008-2009
Number of Projects	13 of 40 program spaces
Mechanism	One of the very first property tax assessed financing programs. The loan was secured with a senior lien on the property. The 13 projects completed had a total loan value of $33,550 funding total installed capacity of 39 kW and an estimated 996 tons of CO2e reduced.
Transferability	If the property sold, the new owners would be responsible for the remaining tax obligation.

Applications were received for all 40 program spaces, but only 13 projects were completed. An evaluation conducted by the City of Berkeley indicated that:

- participants withdrew because the program's interest rates were higher than expected;
- the low application fee ($25) may have encouraged applicants not well suited for the program; better education prior to application would help remedy this;
- contractors were concerned about being paid on time; more consultation with installation contractors would have helped to decrease those concerns; and
- the payback period for solar PV is long; including energy and water efficiency could help reduce the payback period.[15]

Clean Energy Works Oregon

Financing Type	On-Utility Bill
Technology	Energy Efficiency Retrofits
Years of Operation	2009-present
Number of Projects	More than 3000 households
Mechanism	Initially, loans of up to 20 years were repaid through the participant's utility bill. The loans did not automatically transfer to new owners upon sale, though homeowners could apply to transfer the loan for a fee. The program has since transitioned to a rebate-financing hybrid, offering instant rebates and loans with interest rates as low as 4%. Homeowners are only permitted to hire from a selected list of contractors who have undergone special training. There is a strong focus on social equity as the training program targets historically disadvantaged and underrepresented people.
Transferability	Due to the scale of the program, multiple lenders are involved, some of whom place a lien on the property, while others require full repayment at the time of transfer of ownership of the property.

15 City of Berkeley. (2010, November). *Berkeley FIRST Final Evaluation*. http://www.ci.berkeley.ca.us/uploadedFiles/Planning_and_Development/Level_3_-_Energy_and_Sustainable_Development/Berkeley%20FIRST%20Final%20Evaluation%20current.pdf

Despite the program's success at engaging the local community, its policy of encouraging the use of local resources has its downsides. All workers must be hired from a pool of people who have undergone an approved training program – this limits contractors from being able to hire the most qualified workers. In addition, the effort to be more inclusive of the local community also adds to the complexity of the program – this can lead to higher administrative costs. Clean Energy Works Oregon reports that 300 jobs had been created as of June 2012. Pre-screening applications was found to be a successful approach to encouraging applications while minimizing overhead. [16]

Midwest Energy How$mart On-Bill Tariffed Installation Program (Kansas)

Financing Type	On Bill Utility, with coverage of audit costs
Technology	Energy Efficiency Retrofits
Years of Operation	2007- present
Number of Projects	more than 858
Mechanism	Available to all residential customers served by Midwest Energy, including those living in multifamily units and renters. (There is also a commercial portion of the program.) Midwest Energy oversees the retrofit process from start to finish, and contractors must be selected from an approved list. Only retrofits where payments would be less than 90% of estimated savings are eligible for the program.
Transferability	The obligation is tied to the meter so can be transferred to a new resident/owner, or can be paid off at time of change of residency/ownership.

This program is large in scale but narrow in project scope and size of individual project, which could be due to the fact that only the most cost-effective retrofits are covered. The average surcharge on each participant's electric bill was $41.68, and the average savings were $49.45.

It was found that owners tended not to inform the next owner about the loan when they sold their property. Midwest Energy now counters this problem by filing Uniform Commercial Codes so that when a title search is done on the home, the prospective buyer will be able to see that the property has a repayment obligation tied to the meter. However, the loan can be discharged at any time at no penalty and the repayment obligation released.[17]

16 The data in this table comes from the following sources: Duffy, R., & Fussell, H. (2011). *This Green House: Building Fast Action for Climate Change and Green Jobs.* Columbia Institute. http://www.civicgovernance.ca/sites/default/files/publications/This%20Green%20House_Report.pdf

Clean Energy Works Oregon. http://www.cleanenergyworksoregon.org/

Home Performance Resource Centre. (2010). *Best Practices for Energy Retrofit Program Design: Case Study: Clean Energy Works Portland.* http://www.hprcenter.org/sites/default/files/ec_pro/hprcenter/best_practices_case_study_portland.pdf

American Council for an Energy Efficiency Economy. (date unknown). *Case Study: Clean Energy Works Oregon.* http://aceee.org/files/pdf/case-studies/Portland_Clean_Energy_Works.pdf

17 The data in this table is from the following sources: Fuller, Merrian. (2009). Fuller Energy & Resources Group UC Berkeley. *Enabling investments in energy efficiency: A study of energy-efficiency programs that reduce first-cost barriers in the residential sector.* http://erg.berkeley.edu/info/thesis/Fuller_2009_ResiFinancing%20ERG%20Final%20Paper.pdf

Energy Efficiency Institute, Inc .(2013). *Status Report for Programs based on the Pay-As-You-Save (PAYS) system* http://eeivt.com/wordpress/wp-content/uploads/2013/02/PAYSstatus2_21_13.pdf

Duffy, R., & Fussell, H. (2011). *This Green House: Building Fast Action for Climate Change and Green Jobs.* Columbia Institute. http://www.civicgovernance.ca/sites/default/files/publications/This%20Green%20House_Report.pdf

Manitoba Hydro Power Smart Residential Loan program

Financing Type	On Bill Utility
Technology	Energy Efficiency Retrofits
Years of Operation	2001- present
Number of Projects	more than 89,000 households
Mechanism	Financing of up to $7,500, Manitoba Hydro has the authority to cut power service for non-payment of the loan obligation on the utility bill.
Transferability	The loan is tied to the homeowner, not the renter, and becomes due when the home is sold (i.e., it is not transferable).

Even though Manitoba Hydro's on-bill program loans are made to individuals rather than tying them to the property, and are non-transferable, the program has seen significant success. (See also information on a new Manitoba Hydro program in the text box "A New Generation of Residential Energy Efficiency Financing Programs in Canada".)

Program managers highlight the importance of convenience for the consumer – in the case of furnace financing, one contract is used for both furnace purchase and financing. Building strong relationships with contractors has also been important.

BC Hydro Home Improvements Program

Financing Type	On Bill Utility
Technology	Energy Efficiency Retrofits
Years of Operation	1990- 2002
Number of Projects	26,076 households
Mechanism	In addition to the financing, the program included a free energy audit and $1000 rebate.
Transferability	There was no mechanism for transferring the loan with change in ownership.

While this program had successful uptake, almost $10 million of the total $26 million cost to the utility went towards research, administration, and overhead. This works out to 29.34 cents/kWh saved, much pricier than the cost of producing electricity. Ultimately, the program was closed because it was not financially self-sustainable.[18]

A New Generation of Residential Energy Efficiency Programs in Canada

In November 2012, under an amendment to the Municipal Act, the province of Ontario authorized municipalities to use LICs to promote energy efficiency, renewable energy and water conservation projects.[19] In July 2013, the **City of Toronto** became the first municipality to announce a program under the new authority when city council unanimously approved an energy and water efficiency retrofit pilot program that uses LICs. This pilot program is set to launch in late 2013 with the aim of retrofitting 1,000 single family homes and 10 apartment buildings. Participating property owners

18 Data in this table is from: Fuller, Merrian. (2009). Fuller Energy & Resources Group UC Berkeley. *Enabling investments in energy efficiency: A study of energy-efficiency programs that reduce first-cost barriers in the residential sector.* http://erg.berkeley.edu/info/thesis/Fuller_2009_ResiFinancing%20ERG%20Final%20Paper.pdf

19 Government of Ontario. http://www.ontariocanada.com/registry/view.do?postingId=6982

will be able to undertake natural gas, electricity and water efficiency and conservation measures, with the City of Toronto providing funding to qualifying projects and property owners paying via a special charge on their property tax bills (with the savings intended to offset the payments.) Although the project has a $20M budget from the City's Working Capital Reserve, it is designed to be financially self-sustaining. The City's stated aim is to reduce emissions by 30% below 1990 levels by 2020. The residential sector is the largest greenhouse gas emitter in Toronto, accounting for 54% of natural gas use and 30% of electricity use.[20]

Halifax launched the $8.3M Solar City program in March 2013 and in the first 9 months of the program has seen over 200 homes adopt solar hot water systems. Solar City aims to place solar panels on homes for hot water heating, offering a 3.5% interest rate for up to 10 years. Participants will repay the costs as a supplement to their tax bill. The program is intended to be financially self-sustaining and has received an initial low-interest loan through the Federation of Canadian Municipalities Green Municipal Funds. The scale of the program is impressive. In a typical year there are about 800 solar thermal systems installed in all of Canada; the initial phase of Solar City is to finance up to 1,000 solar thermal systems within 18-24 months in Halifax. Initial indicators look positive for the program – with 1600 applicants applying for the 1000 spots.[21] Now that the program has been running for several months, program managers are able to point to factors that have been important in the program's success. These factors include 1) making the process of working with contractors easy for homeowners by having the program oversee the contract management and including rigorous screening, assessment and third party audit of contract work, 2) collecting all available retrofit rebate incentives on behalf of the homeowner, putting the funds towards repayment and 3) considering the program from three economic lenses – budget neutrality from the perspective of the municipality, financial return to the homeowner, and local economic development.

In **British Columbia**, on-bill financing pilot projects in Colwood and the Regional District of Okanagan-Similkameen began in November 2012, allowing homeowners to pay for energy efficiency improvements over time on their utility bill. This pilot program allows eligible homeowners to borrow up to $10,000 at an interest rate as low as 4 per cent. The payment responsibility can be transferred to a new owner if the property is sold and both buyer and seller agree. A new on-bill financing pilot from BC Hydro, Fortis and the BC Government, announced in April 2013 as an extension of the first pilot projects, will target Vancouver Island and Kelowna. It is slated to begin in January 2014 and will apply to single-family homes and row houses that are owned by the utility account holder.[22]

A recent government mandate has led **Manitoba** Hydro to add a meter-tied program called "Power Smart PAYS Financing". For this new program, funding is tied to the property and can be transferred from owner to owner or landlord to tenant. Part of the rationale for this new program is to improve the attractiveness of energy retrofit investments to renters and short-time-horizon homeowners.

20 City of Toronto. http://www.toronto.ca/changeisintheair/about.htm
21 City of Halifax. http://www.halifax.ca/solarcity/
22 Live Smart British Columbia. http://www.livesmartbc.ca/incentives/OBF/

Lessons for Program Design

A review of the literature and the case studies above indicates a set of elements critical to successful program design. These elements are common among successful programs, highlighted for improvement in some programs, or identified as missing among unsuccessful programs.

Cost effectiveness is crucial in motivating participants. Homeowners are more willing to participate in programs where they receive a net financial benefit (meaning repayment charges are less than energy savings.) Program uptake for the Berkeley FIRST program was weak, owing largely to the fact that the technology funded was not cost effective and the program did not offer below-market financing. Programs can pursue cost-effectiveness for participants in a few different ways:

- Careful auditing and good decision-making on which retrofits should be pursued under the financing program. For example, the Midwest Energy How$mart program limited eligibility to investments where, on a month-over-month basis, the savings outweigh the costs.
- Successful programs (such as Midwest Energy and Clean Energy Works Oregon) often provided below-market interest rates to improve the overall cost effectiveness of the investments. It is not essential that interest rates beat private sector loan rates, only that they provide a reasonable option and combine other important parameters, as shown by Manitoba Hydro's Power Smart program.
- If loan repayments are extended over a long enough period (Midwest Energy has a maximum of 15 years; Clean Energy Works Oregon has a maximum of 20 years), then the regular repayments are reduced – however, the overall financing cost is higher for longer periods. Flexibility in the terms can cater to both preferences – lower regular payments or shorter periods for interest accruement.

The size of the up-front capital cost matters. Beyond general cost effectiveness, the size of the capital cost of an investment can increase payback periods and aggravate concerns about residents moving before the investment costs are covered. This can be mitigated by focusing on efficiency measures with shorter payback periods or by combining rebates and financing into a hybrid program -- as seen with the successful Clean Energy Works Oregon program and with Manitoba Hydro's Power Smart program. Related to this, where an energy audit is an important initial step in the program, if homeowners see audit costs as an upfront cost that does not lead directly to energy savings, refunding this cost can lead to homeowners being more willing to participate; however, including refunds and rebates in program design can lead to program sustainability concerns.

Dwellings come in a variety of shapes, sizes and ownership models. **Broader eligibility increases opportunity for uptake, but limited eligibility is good too.** Depending on the community's circumstances, this can mean ensuring that the program is applicable to other forms of housing, such as rental dwellings and condominium-style housing. Midwest Energy has successfully incorporated on-meter financing to help make its program available to renters. However, successful programs can

be operated without mechanisms to make them clearly accessible to all home types, such as in the examples of Manitoba Hydro's PowerSmart Residential Loan Program and Clean Energy Works Oregon's program that are not expressly geared for renter uptake (because the loans are tied to the individual and not the meter.) Programs with more limited eligibility can raise issues of equity and can limit uptake, but they can be a reasonable first step if the objective is to encourage wide program uptake in a market that has yet to see much efficiency retrofit activity; while wide eligibility is in many ways ideal, broadening eligibility can complicate program development and implementation. Particularly in the early phases of a program, a step forward that is shy of 100% eligibility is still important and revisions can be made in later program phases, as was done with Manitoba Hydro's program.

Outreach and education are still needed. Many homeowners are unaware of the long-term savings from energy efficiency retrofits. Education and outreach program components not only increase participation but can also encourage people who are not participating in the program to seek other ways to finance their retrofits. Similarly, **civil society engagement helps support programs.** By building partnerships with environmental organizations, community associations, unions, and business associations, program administrators can obtain support for the program and a wider audience for their outreach programs.[23] Midwest Energy and Clean Energy Works Oregon both provide successful examples of very broad outreach and engagement.

Where possible, **it is important to reduce administrative burden** to facilitate program participation. Streamlining paperwork and processing times will make the application process less intimidating to homeowners. Successful programs (particularly Clean Energy Works Oregon and Manitoba Hydro) have integrated systems to make application of the loan and hiring of the contractor simple, often aided further by the easy one-stop-shop on-bill payments. Similarly, a successful program will provide homeowners with easy access to reliable contractors. Berkeley FIRST identified contractor conflicts as a significant barrier that might have been avoided with more upfront consultation. Manitoba Hydro, in contrast, credits relationships with contractors as a key determinant of the success of the program, as the contractors have been at the front lines in marketing the program.

As noted above, **program sustainability is a key advantage of financing programs but it must be built into program design**. Combining financing with rebates can help to address the problem of upfront capital costs and payback periods but only if the program can be sustained. BC Hydro's program, for instance, was discontinued because of program costs, which included $1000 rebates for retrofits, even though these drove very high uptake. It can be very helpful to take advantage of funding sources for rebates (such as with Manitoba Hydro's program's leveraging of federal rebates and Clean Energy Works Oregon's use of federal stimulus funding), but planning for the long-term should consider the future of the program assuming external rebates end. Ensuring sustainability also entails minimizing administration costs, which can be driven up by financing many small, inexpensive retrofits. A minimum retrofit cost to be eligible for financing can be set to prevent this

23 Duffy, R., & Fussell, H. (2011). *This Green House: Building Fast Action for Climate Change and Green Jobs.* Columbia Institute. http://www.civicgovernance.ca/sites/default/files/publications/This%20Green%20House_Report.pdf

inefficiency. Manitoba Hydro's program charges 4.9% interest, which is very close to the full cost-recovery rate it reports as 5.5%. [24]

As with any loan program, minimizing default risk helps program sustainability. **Addressing and reducing the risk of default is an element of sustainability.** Programs should be designed with eligibility criteria set to decrease risk of default and to ensure that the limited funds or revenue will produce the most benefit for participants. Default rates in efficiency financing programs tend to be low already (1-3%),[25] but setting a maximum loan or financing value can help further minimize risk and ensure long-term program sustainability. Utilities, including Manitoba Hydro and Midwest Energy, have used bill-payment history instead of, or in addition to, credit checks in determining program eligibility and have successfully maintained low default rates. Moreover, utilities can use the threat of discontinuing energy service for nonpayment, as with Manitoba Hydro.

Questioning the Importance of Transferability

Throughout this Brief, the issue of the transferability of the financial obligation has been touched upon. The rationale for including a transfer mechanism is as follows: if the program ties the loan to the property or the meter rather than the individual, the financing program can minimize any homeowner reluctance stemming from uncertainty in future residency or ownership plans.

In the case of property tax financing, the challenge is that while allowing for transfer of repayment to a future owner is appealing to risk-averse homeowners, financing programs that place a financial obligation on the property can be seen to complicate real estate transactions. Current homeowners may be wary of this, and it can pose a barrier to the transfer of the property itself if potential future homebuyers, relators or mortgagers are uninformed about or uncomfortable with the financial obligation. While this is one of the features that minimizes default risk for the program, an obligation tied to the property could pose a hindrance if a lien is placed on the property to ensure the municipality is repaid in case of default; such a lien is often senior to the mortgage and many mortgagers are wary of lending funds if they are not the first to be repaid in case of bankruptcy. [26]

Though somewhat different in nature, on-meter financing can create similar challenge when there is change of ownership or when tenant-landlord relationships change. Payment obligations will fall to the premise owner if utility-paying renters move out, and landlords might have difficulty finding new tenants if the rental market misunderstands or is uncomfortable with the on-meter payment obligation. In either case, landlords might oppose a tenant's decision to participate in an on-meter finance program, again creating friction for the program. They can also face jurisdictional challenges: municipalities and utilities may lack clear authority under provincial law to implement transferability mechanisms, posing a barrier to program implementation.

24 The difference in rates is made up by Manitoba's Affordable Energy Fund. See Manitoba Hydro. (2011). 2011 Power Smart Plan. http://www.hydro.mb.ca/regulatory_affairs/electric/gra_2012_2013/appendix_7_1.pdf.

25 Duffy, R., & Fussell, H. (2011). *This Green House: Building Fast Action for Climate Change and Green Jobs.* Columbia Institute. http://www.civicgovernance.ca/sites/default/files/publications/This%20Green%20House_Report.pdf

26 This challenge has been illustrated in the United States where the Federal Housing Finance Agency indicated it would no longer back or purchase any mortgages on properties participating in any PACE program, putting a halt to many PACE programs. With Canada's less risky mortgage-lending environment, this risk to mortgagors from bankruptcy by program participants is likely reduced; as well, there are both program design and legislative options available to mitigate this risk.

Given these challenges, it is important to consider transferability in program design. However, while transferability of financing by a homeowner to a homebuyer at point of sale or between renters has been thought to be a critical factor of success, the review of the case studies above finds that it is possible to create a successful program without transferability. Manitoba Hydro's Power Smart program and Clean Energy Works Oregon have both seen substantial program uptake, even though the loans are not tied to the property or to the meter, but to the individual resident. The same is true of B.C. Hydro's high-uptake but ultimately discontinued program. It is acknowledged that these programs have less attractiveness to renters and to homeowners with uncertain time horizons. But they have nevertheless provided leading examples of successful program uptake, demonstrating that financing programs can successfully drive efficiency investments without incorporating these formalistic transferability mechanisms.[27] With so much opportunity for residential efficiency improvements in the housing stock, it is not necessary, as a first step, to target attractiveness to all residential situations.

Implications for Policy-Makers

A review of some early financing programs demonstrates strong prospects for success. It also reveals some insights into the most important features for successful programs. In the design of a residential energy retrofit financing program, there are three particular concerns to address:

1. **Availability and cost of capital to property owners or residents**. The lessons learned from the five programs examined highlight the importance of addressing the upfront capital costs for projects in order to ensure cost-effectiveness for homeowners, continuing to fill the ongoing information gaps about the benefits of energy retrofits, and considering all program design elements as a whole.

2. **Transferability**. Much focus has been put on transferability of the payment obligation in financing programs – and whether or not a program should tie the loan obligation to the property or to the utility meter (rather than to an individual), in order to be most appealing and to minimize default risk. This review of programs indicates that well-designed programs can have substantial success without mandatory transferability mechanisms. Where municipalities or utilities lack the existing authority to implement such mechanisms, they can still look to start a program that can have significant uptake

3. **Program Sustainability.** As noted earlier, financing programs have an advantage over rebate or grant programs in that they can be self-sustaining because they can be issued as loans whose repayment replenishes the program funding. However, to ensure this sustainability,

27 Even for programs with transferability, the ability to transfer the obligation has not yet proven to be a critical feature. For instance, Halifax's Solar City program has found that homeowners find transferability to be appealing, but they do not indicate it to be as important as program managers thought it would be.

programs depend on a low default rate as well as low program administration costs where these are not otherwise covered by the government, utility or other external funding, and/or sufficient interest rates to cover these. Setting the loan terms appropriately requires finding the right balance – too generous, and applications will soar but program sustainability will be challenged; too tight, and the program may be sustainable but with a lower level of applicants.

Each jurisdiction will have its own particular context. With the amount of economic, environmental, and social opportunity in residential retrofits available, it makes good sense for communities and utilities to move forward by implementing the best program within their context and jurisdictional authority now -- and plan to reassess the successes and challenges to improve with future programs.

Indeed, as new property-tied and meter-tied financing programs become more common and policy makers and program operators gain experience, there will be an opportunity for further research to review their success in fostering broader eligibility and uptake and to assess the importance of their various design features. With the new programs being introduced in British Columbia, Manitoba, Ontario and Nova Scotia, there will soon be additional opportunities to learn and improve. Should these latest programs prove successful, Canada may soon see more and more such programs introduced.