



## Addressing the Barriers to Energy Efficiency in Vancouver

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## 1.0 Executive Summary

As part of Vancouver's goal to become the world's greenest city, it plans to lower its GHG emissions by 33% from its 2007 levels by 2020. Since buildings are the largest source of these emissions and affordable technologies exist to greatly reduce a home's energy usage, Energy Efficiency (EE) retrofitting homes is one of the most cost-effective ways for a community to achieve a large-scale decrease of GHG emissions. To date, uptake of these EE measures, although growing, is not sufficiently high to achieve Vancouver's reduction targets. .

Among the barriers to an economically efficient level of energy-saving retrofits are the split incentives in implementing EE measures - those contractors and landlords who pay for the improvements often do not directly or indirectly benefit from the savings they generate. Other barriers include the relatively high upfront cost to the improvements, risk aversion, and short residence ownership time, which limits owners' ability to recover their investment before their property is sold.

The City of Vancouver can address these barriers and encourage a higher uptake of EE measures through various means:

- Regulations require builders to achieve a certain standard in energy efficiency and are the most direct tool. Regulations, however, can raise cost and thus deter new construction and renovation activity.
- Incentives provide short-term rebates for consumers to purchase energy efficient products, increasing customer demand and increasing scale until market-driven demand has made the incentive superfluous.
- Education and Awareness programs can increase customer valuation of green homes and energy efficiency programs. On their own, however, education and awareness programs have a limited impact on the level of energy efficient renovations and construction.
- Financing programs can help overcome the barriers of high upfront-costs and some types of split incentives. Financing models include:
  - On tax-bill financing
  - On utility bill financing
  - Green Funds

There are different segments of the residential energy efficiency market:

- **New single-family dwellings:** Purchasers of new single-family dwellings currently have no shortage of financing available to purchase energy efficient homes. Mortgage loans are typically available at lower interest rates than those offered by self-sustaining energy efficiency loan programs, and the additional cost of energy efficient home, when spread over a typical mortgage amortization period of 15-25 years, is in most cases lower than the monthly amount of savings generated by energy efficiency. The most effective way to increase the building and purchase

of energy efficient new single-family dwellings is through regulations and education programs.

- **Existing single-family dwellings:** Although there are opportunities for financing energy improvement renovations for existing single-family dwellings, the city already has regulations requiring energy efficiency improvements with regular renovations. Even with price-elasticity of demand in the renovation market, regulation appears to be the more effective means. There may be a future opportunity for financing for more intensive energy efficiency measures.
- **New multi-unit residential buildings (MURBs):** Like new single-family dwellings, there does not appear to be a significant shortage of financing for MURB contractors. As a result, the goal of increasing the energy efficiency of new MURBs can best be achieved through regulations.
- **Existing multi-unit residential buildings (MURBs):** There are opportunities to increase the uptake of energy efficiency retrofits in MURBs by providing them with financing tools. Many banks are reluctant to loan to strata corporations, so EE retrofits' high upfront costs are a barrier. Such a financing tool would best be structured as a city-based Green Fund funded by both utility companies. A Green Fund would be a "one-stop shop" for MURBs seeking financing for electricity and gas usage efficiency measures.
- **Renter-Occupied Buildings:** 56.2% of all residential units in Vancouver are renter-occupied. Because often the landlords do not pay the utility bills, split incentives are a significant barrier to energy efficiency improvements. Since a landlord's authorization's approval is needed for any financing program, there are still limited abilities to address the barriers.

The guiding principles used in determining recommendations were to create a self-sustaining program that addresses energy efficiency barriers in a cost effective manner. Although a financing program can also achieve social and economic goals, these will not be criteria for determining recommendations.

Our recommendation is to implement a Green Fund financing program for existing MURBs. This Green Fund would be a "one-stop shop" to avoid having MURB strata's apply for three different financing programs and would be collected through the City's property tax mechanism.

The risk of borrower default to this type of program would be low but there may still be advantages to having a reserve fund to make temporary payments for a borrower to avoid foreclosure. It is also recognized that MURB loans are relatively new and so there may be "growing pains" with the new program as unpredicted administrative, marketing and legal circumstances arise. This challenge can be addressed by scheduling reviews of the program to address problems as they arise.

For an effective financing program, it is critical to "get all of the little things right". Some important considerations are:

- The city should leverage non-profits, contractors and other groups to provide marketing for the financing program
- Audits arranged through the EnerGuide program can help quantify program success and address risk aversion concerns
- The city should retain ownership of any carbon credits that emerge from the program as a possible future revenue source
- The program should be of sufficient scale to reduce average administrative costs.
- The program should be well coordinated with existing programs, rebates and educational programs to avoid inefficiencies.

## 2.0 Scope

This report will explore several questions:

- What are the barriers to investing in cost-effective energy efficiency (EE) improvements for the different segments of the residential market including new and existing single family dwellings and MURBs (multi-family residential buildings) and owner and renter-occupied units?
- Where are the “voids” where market forces are not effectively addressing these barriers?
- What role can the City of Vancouver take in filling these gaps to encourage more owners to improve their buildings’ energy efficiency in a self-sustaining and cost-effective way until government intervention is no longer required?
- Which of the tools at the City’s disposal (regulations, incentives, financing and education) are most effective at addressing the barriers?

## 3.0 Context

The City of Vancouver has set for itself the ambitious goal of becoming the world’s greenest city by 2020. This target will be incorporated into all aspects of the city’s operations. One of the primary objectives in achieving this goal is to lower the citywide absolute GHG emissions, by 33% from 2007 levels. This is particularly challenging for two reasons: 1) Vancouver already has the lowest per-capita GHG emissions in North America<sup>1</sup>, and 2) The City is projected to have population growth of more than 13% during that time<sup>2</sup>.

Vancouver’s emissions come from a range of sources, including heavy trucks, solid waste and light duty vehicles. The greatest sources are Vancouver’s buildings, which generate 55% of the city’s emissions<sup>3</sup>. As a result, a key element in reducing emissions is to improve the energy efficiency of the city’s buildings. As the vast majority of the buildings extant in 2020 will be those that

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1 UNEP, Climate Neutral Network

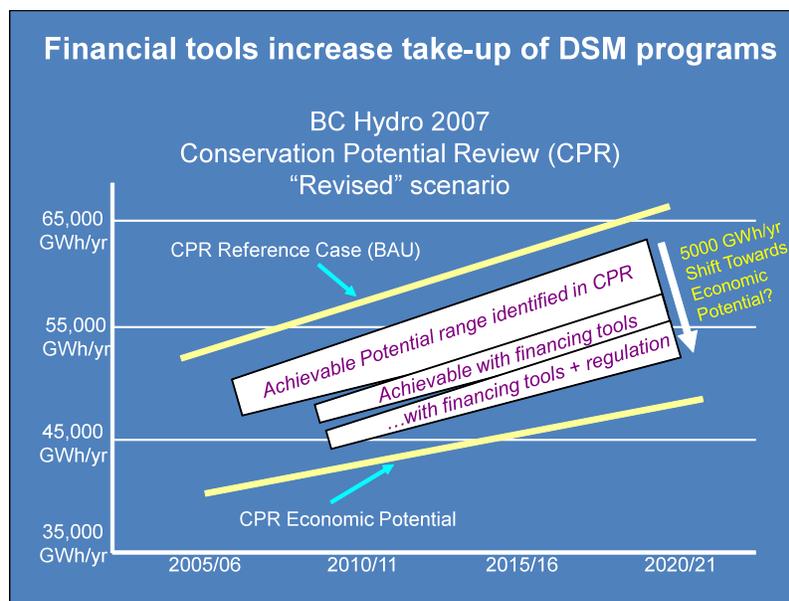
2 <http://vancouver.ca/commsvcs/PLANNING/stats/futurepopgrowth/index.htm>

3 Vancouver 2008 Greenhouse Gas Emissions Inventory

have already been built, it is critical that the city addresses not only the energy efficiency of newly built homes but also of existing buildings.

Energy efficient technologies, like HVAC systems, Energy Star® windows and insulation, can make an enormous impact on a building's GHG emissions, reducing them by as much as 30%<sup>4</sup>. On a macro-economic level, pursuing these energy efficiency measures is the most economically efficient means for a community to achieve lower energy usage and GHG emissions<sup>5</sup>. At the homeowner level, these measures are a good investment. Through lower energy bills, homeowners recover renovation costs for many improvements within 5-7 years<sup>6</sup>, thereafter creating a positive cash flow for the homeowner. Despite the existence of these win/win technologies, the uptake of energy efficiency is lower than what would be economically rational.

This paper will explore the barriers that exist to greater implementation of energy efficiency measures and recommend ways that the city can use available tools to overcome these barriers. The aim is to use a variety of tools to lower Vancouver's energy usage from the upper range of its "business as usual" scenario (see diagram) down closer to its economic potential (the energy use frontier that home owners can achieve while still pursuing their own financial self-interest).



4 US Department of Energy, [www.energysavers.gov/your\\_home/designing\\_remodeling/index.cfm/mytopic=10230](http://www.energysavers.gov/your_home/designing_remodeling/index.cfm/mytopic=10230)

5 McKinsey & Co., "Curbing Global Energy Demand Growth: The Energy Productivity Opportunity," May 2007.

6 U.S. DOE Insulation Fact Sheet

## 4.0 Barriers to Energy Efficiency

Despite the economic, environmental and comfort benefits of having an energy efficient home, the majority of existing homes have sub-optimal levels of energy efficiency. There are a number of reasons for this:

### 4.1 Split Incentives:

Split incentives occur when different stakeholders do not have the same incentives and costs for installing energy efficient measures in homes. In both new and existing homes, these split incentives lead to less energy efficient homes than would occur if all parties shared the same incentives.

With new homes, (which were 34% of 2008 Vancouver home sales<sup>7</sup>) contractors must decide whether to use traditional building materials or more energy efficient materials, usually without the input of the future occupant. Because energy efficient materials are usually more expensive, there is a disincentive for the contractors to use them. This disincentive is magnified by the fact that they will not share in the resulting lower energy savings. Furthermore, although there is growing awareness of the value of energy efficient houses, there is only mixed evidence that owners can charge a premium for energy efficient homes. One survey performed by UniverCity showed that purchasers were willing to pay a premium of 2.5-6.5% for energy efficient homes<sup>8</sup>. However, other studies have shown these consumer intentions do not always translate into actual higher prices for energy efficient homes<sup>9</sup>.

For existing renter-occupied homes, the split incentive barrier deters landlords from making energy efficiency renovations for tenants who pay their own utility bills. In this case, it is the landlords that bear the cost of the renovations, but do not reap the benefit of the lower energy bills. The tenants who would be the beneficiaries do not have the authority to complete the renovations, even if they had the resources to pay for them. This is a significant issue in Vancouver due to the fact that 56.2% of people rent their homes<sup>10</sup>. Even though many landlords, especially those in West-End high rises, pay their tenants' utility bills, the number of renter-occupied, utility-paying households makes this type of split incentive a real factor in preventing an optimal level of energy efficiency improvements.

### 4.2 High upfront costs:

The high upfront cost of energy efficient retrofits, which can range from \$2,500 to \$20,000, is also a barrier for many homeowners. 75% of all Vancouver renovations are at least partially funded through personal savings<sup>11</sup>, thus a lack of resources is a significant barrier for many would-be renovators. Of those who

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7 CMHC, Renovations and Home Purchase Detailed Tables, 2008

8 UniverCity: Assessing Consumer Demand for Sustainable Development in Greater Vancouver

9 Green value: green buildings, growing assets. Royal Institution of Chartered Surveyors, 2006

10 CMHC, Rental Market Report, Vancouver, 2003

11 CMHC, Renovations and Home Purchase Detailed Tables, 2008

use credit, 25% partially fund the costs through a credit card<sup>12</sup>, which, because of its high interest rate, makes it difficult for the energy efficient improvements to recover the cost of the investment.

### **4.3 Risk Aversion**

Despite the quick payback period for many technologies, many homeowners still do not invest in them, leading some to estimate that many consumers have very high discount rates for future income from energy investment improvements. One estimate by a World Bank Chief Economist is that homeowners have a 30% discount rate<sup>13</sup> on energy efficiency improvements. Although some see this high discount rate as irrational, other studies have argued that this high discount rate is caused by the uncertainty and variability of the future savings from energy efficiency improvements<sup>14</sup>. When a homeowner or contractor is arranging to install energy efficiency improvements they are uncertain about the savings that will result from the investment and the lifespan of the energy efficiency improvement investment. As a result, they apply a discount rate sufficiently high to compensate themselves for the level of risk. Unless homeowners are confident about the savings that will result from an energy efficiency improvement, they will be less likely to invest in it

### **4.4 Short ownership time**

The two factors of high upfront costs and large risk-averse discount rates are exacerbated by many homeowners' short duration of home ownership. An owner is less likely to invest in an energy improvement measure if they do not believe that they will be in the house long enough to recoup the expenditure in energy savings. Although statistics about average home ownership are sparse, surveys have shown that the average intended duration of ownership is only ten years<sup>15</sup>. For condominiums this ownership period is even shorter--in Seattle it is between 6-7.1 years<sup>16</sup>. Many energy efficiency improvements require more time than this to pay off their original investment.

### **4.5 Relatively small size of loans**

While many energy efficiency measures can be achieved for only \$10,000, this amount requires many homeowners to secure financing. Financed as an independent small loan, as compared to being incorporated as an additional amount in a new mortgage, a small amount such as \$10,000 would, in most cases, have a higher monthly payment. This is due to the fact that a loan of this size is typically lent by banks on an unsecured basis, and is amortized over a shorter period. Furthermore, an unsecured loan would carry a higher rate of interest than a secured mortgage. Often these high-interest payments are greater than the energy savings from the improvement. Financing EE

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12 ibid

13 Economist. Com, Opinion Section, The Elusive Negawatt, The Economist (May 8, 2008)

14 Science Direct, Kooreman, Individual discounting and the purchase of durables with random lifetimes

15 [http://www.realtor.org/press\\_room/news\\_releases/2009/11/survey\\_record](http://www.realtor.org/press_room/news_releases/2009/11/survey_record)

16 <http://localism.com/neighbor/crconsulting?page=2>

improvements in this way does not make them cost effective or even cost-neutral to the homeowner.

## 5.0 Overview of Tools

A range of tools exists for the City of Vancouver to help homeowners and developers overcome these barriers to investing in energy efficiency, including incentives, regulations, education and awareness programs, and financing. None of these traditional methods, on its own, has the ability to address all of the barriers and market failures discussed above. In order for energy efficiency improvements to achieve further penetration, a variety of regulatory, financial, and educational approaches need to be combined.

### 5.1. Incentives

Incentives include short-term grants, rebates, reimbursements and tax credits offered by federal, provincial and federal governments and utilities to fully or partially offset the costs of energy efficiency measures. They are meant to stimulate demand that will help businesses increase scale, thereby lowering the price. These lowered prices, along with the awareness gained through the incentive program, create a demand that no longer requires government incentives. One example of this is Solar Homes Strategy's offer of \$3,500 towards the cost of a solar hot water system in Vancouver – which covers about 50 per cent of the cost of a system.

#### Advantages:

- Incentives have an important role in encouraging energy efficiency measures because they reduce the cost of improvements and increase awareness of the product.
- Incentives are a common way of enhancing classic energy efficiency loan programs to offset some of the project cost, e.g. through free or partially subsidized audits.

#### Disadvantages:

- Most incentives only cover a part of the upfront costs.
- Incentives often come with extensive administrative requirements that may scare off consumers. Many developers don't take up incentives due to the efforts necessary to qualify, which are often disproportionate to the actual amount of the incentive<sup>17</sup>.
- Although incentives are a useful tool to help energy efficient products establish a more mature market presence, they can be costly and not financially self-sustaining.
- Incentives must be very carefully planned in order to ensure there is a positive cost/benefit to the incentive. One example of an ineffective

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<sup>17</sup> reSource Rethinking Building, "Financing Options for Vancity Capital: Putting the Greenbacks behind Green Building", May 2007

energy efficiency incentive was the recent rebate for hybrid vehicles<sup>18</sup>. The subsidy experiment is generally seen as having encouraged sales but only at a very high price for each ton of GHG emissions saved.

## 5.2. Regulations

Policies and regulations impose energy-efficiency standards on new buildings and renovation projects. Vancouver currently has one of the most stringent building code regulations in North America. This includes the mandate for all new buildings to be carbon neutral by 2020; a renovation by-law that will require 2-10% of any renovation's cost to be devoted to improving the energy efficiency of the home; and the Green Homes Program, which regulates low rise residential development and requires minimum energy efficiency standards. The easing of regulations can also be used as an incentive for green building projects. Some examples of this are expediting the permit process and increasing density allowances.

### Advantages:

- Regulations ensure a set standard for new buildings and renovations, establishing a more sophisticated market with knowledgeable players.
- Renovation regulations increase the quality of the existing housing stock.
- Building codes help reduce the information barriers of many consumers regarding energy efficiency improvements.
- They also can help mitigate the effect of the agency issue in the construction industry: Developers have few other incentives to concentrate on energy efficiency as potential buyers are mostly not willing to pay more for a property that creates energy savings in the future<sup>19</sup>.
- Regulations have an important function in developing finance opportunities at scale in energy efficiency, as scale is necessary to attract capital from the banking sector<sup>20</sup>.
- Because 27% of all homes are renovated each year in Vancouver<sup>21</sup>, regulations will help a large number of homes receive at least basic energy efficiency improvements within a short time period.

### Disadvantages:

- The construction industry is often resistant to new regulations if there is no assistance to help overcome the higher costs.
- If the demand for renovations and construction is, (as almost all products are), elastic, it will dampen the demand for building construction and renovations.
- The proposed regulations by-law requires no EE improvements for renovations under \$5,000 and only limited ones for renovations between

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18 Chandra, Ambarish, Sumeet Gulati and Milind Kandlikar (March 2009), "Green Drivers or Free Riders: An Analysis of Tax Rebates for Hybrid Vehicles,"

19 Diana Farrell, Scott S. Nyquist, and Matthew C. Rogers , "Making the most of the world's energy resources", FEBRUARY 2007

20 Kirsty Hamilton, "Energy Efficiency and the Finance Sector", January 2009

21 CMHC, Renovations and Home Purchase Detailed Tables, 2008

- \$5-25,000. Since the average cost of Vancouver renovations is only \$13,000, it will only provide relatively low-level EE improvements.
- Regulations also require investment to be made in policy implementation and enforcement. Often, it is challenging for enforcement departments to monitor and enforce regulations that are already in effect due to constrained resources.

### 5.3 Education and awareness programs

Education and awareness programs on energy efficiency inform consumers, builders, and contractors about the financial and environmental benefits of EE measures, strategies for EE, as well as resources available for those who wish to pursue them. Also included under education are audit programs which provide homeowners with analysis of the energy efficiency of their homes and reliable predictions of savings from EE improvements. The City of Vancouver currently provides energy efficiency information through its Green Building website. This information is supplemented by other businesses and non-profit organizations such as BC Hydro, Terasen Gas and Lighthouse Sustainable Building Centre. The BC government also subsidizes ecoENERGY assessments for homeowners.

#### Advantages:

- Education can play a strong role in promoting energy efficiency measures. Greater awareness about energy efficiency benefits can motivate homeowners to make the investment.
- When there is willingness to invest, comprehensive synthesized information on financing options and efficiency measures increase the uptake rate.<sup>22</sup>
- Information about the non-financial benefits of energy efficiency retrofits, such as a more comfortable and healthy house and smaller impact on the environment, often has a significant influence on those considering energy efficiency upgrades. The manager of the Berkeley FIRST financing program stated that the program's largest impact was not on those who took out a loan but on those who were inspired by the program to seek alternate funding for energy efficiency measures.
- Audit programs can help overcome the risk aversion barrier by providing reliable data about potential energy savings.
- On the developers' and contractors' side, education programs can contribute to more awareness and uptake of energy efficiency practices and technologies and thus reduce overall design and implementation costs<sup>23</sup>.
- There already exist significant programs at Lighthouse, BC Hydro and Terasen promoting energy efficient homes, which can be leveraged by the city.

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<sup>22</sup> Philippine de T'Serclaes, "Financing energy efficient homes - Existing policy responses to financial barriers", IEA, February 2007

<sup>23</sup> reSource Rethinking Building, "Financing Options for Vancity Capital: Putting the Greenbacks behind Green Building", May 2007

**Disadvantages:**

- Education is not a stand-alone tool, as it does not help overcome the barriers of high upfront costs or split incentives.
- There are limited ways to provide education to a wide audience at an affordable cost.
- When audits are funded as part of a financing program, there is a significant risk of “free-riding”—people who receive a free audit and then opting out of the loan.

**5.4 Financing**

Many communities, utility companies and financial institutions have provided financing tools for energy efficiency retrofits. These can take many forms—on-tax bill financing, on utility-bill financing, green funds and “Energy Efficient Mortgages”. This financing can be at or below market interest rates and is often funded by a source of capital that is not usually accessible to borrowers. Often, green loans have lower minimums than regular loans to meet the needs of those seeking retrofits. Some examples of EE loans for new buildings are Vancity’s Green Loan or the Green Loan Program of the Toronto Atmospheric Fund<sup>24</sup>.

If the energy efficiency measures are well-chosen and installed, the resulting savings can be greater than the interest and principal repayments, thereby making the improvements a cost effective venture for homeowners. The availability of cost-effective or cost-neutral financing also helps overcome the barriers of high up-front costs for potential renovators. In this way it can accelerate the efficacy of regulations and education, by providing the financial resources to make immediate renovations or buy an energy efficient home.

Financing can be made self-sustaining through charging an administrative fee or a premium on the interest rate. For a sample income statement of a self-sustaining loan program, see the Berkeley Guide of Financing programs in Appendix B of the Interview Summary report.

**5.4.1 On-property-tax-bill financing**

On-property-tax-bill financing is administered by the city and uses special property taxes as a mechanism for repayment of the loan. The interest and principal are repaid in installments as part of a voluntary property tax assessment and the loan balance can be transferred from owner to owner upon sale of the property. If the property is sold before the repayment period ends, the new owner takes over the remaining payments.

**Advantages:**

- Because it takes the form of a property tax, the program has first access to resources in the case of bankruptcy, thereby limiting the exposure to borrower default.

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24 ibid

- The transferability of the payments and long repayment period enable property owners to invest in more substantial energy efficiency measures that have a longer payback time than could cost-effectively be done with conventional financing tools. It also encourages short-term homeowners to invest in energy efficiency improvements.
- Because it is considered a tax rather than a loan, opting for on-tax-bill financing will not affect a borrower's credit rating.

**Disadvantages:**

- Although the city's legal department is of the opinion that this form of financing is supported by the Vancouver Charter, there is a small but present chance that this type of financing could be successfully challenged in court which could lead to a large number of loan defaults and high exposure for the city.
- Because it is on the tax bill, misconceptions can arise where the public believes that all taxpayers are subsidizing the renovations.

**5.4.2 On-utility-bill financing**

On-utility-bill financing is administered by a utility company and uses the monthly utility bill as a means to collect loan repayments. This allows the utility customer to pay for improvements over time while benefiting from them. In many jurisdictions, responsibility for the loan can be passed from owner to owner upon sale of the property. Funding for the improvements can come from the utility itself, public funds, utilities or other private sources of capital. Administered by a utility company, the program is generally available to all customers of the utility; therefore a BC Hydro or Terasen program would be available to customers outside of Vancouver as well.

**Advantages:**

- Financing can be made available to strata organizations enabling larger scale EE upgrade projects.
- The program is attractive to customers because it is simple and results in immediate savings.
- In case of a payment default, utility disconnection could be the consequence, which is a powerful payment incentive for occupants.
- Financing eligibility is commonly based on the customer's bill payment history, which expands the customer base beyond the traditional financing one<sup>25</sup>.

**Disadvantages:**

- There is not currently legislation which would permit on-utility bill financing that is transferrable upon change of ownership.

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<sup>25</sup> Matthew Brown, "State Energy Efficiency Policies - Options and Lessons Learned, Brief #3: Paying for Energy Upgrades Through Utility Bills", Alliance to Save Energy

- On-bill financing is not a tool that can be implemented by a municipality alone, it requires partnerships with utility companies and their buy-in and commitment
- For some utilities in North America adding on-bill financing to their billing systems has represented a challenge, as their systems were not set up for non-energy billing.
- If a third party lender is the source of financing, repayment allocation can be a challenge if only part of the utility bill is paid.
- It can be difficult for customers to recognize the energy improvement savings among the natural and seasonal utility bill fluctuations.
- BC Hydro and Terasen are only able to fund measures that lessen electricity and gas use respectively. Other energy efficiency improvements would not be eligible under their programs.

### 5.4.3 Green Funds

Green Funds provide loans and, in some cases, grants to organizations and individuals in order to reduce GHG emissions and increase energy efficiency through green building. Sources of funding include the private sector, philanthropic funds, public funds and climate charities. These funds can take on other integrating functions like engaging local leaders in progressive energy efficiency programs, funding utility company programs and creating high-profile demonstration projects.

The Toronto Atmospheric Fund is one of the most longstanding funds upon which others are modeled. It has pioneered a series of innovative loans to finance energy-efficiency investments in new and existing residential buildings, especially in Toronto's high-rise communities.

#### Advantages:

- Green Funds can be funded by a variety of sources (municipality, utility companies, and financial institutions) and do not have the funding restrictions that on-utility bill financing has.
- Green Funds can take on the role of a "one stop shop" to fund both gas and electricity-saving energy efficiency measures for a MURB or single-family dwelling. Having this reduces overall administrative costs for the lenders.

#### Disadvantages

- The loan is not transferrable from owner to owner as other financing systems are.

## 6.0 Analysis of segments of Residential property types

In order to determine the most effective means to achieve energy efficiency, it is necessary to segment the residential housing market into new and existing single-family dwellings and multi-unit residential buildings (MURBs). We will also

examine the added challenges that renter-occupied MURBs and single-family dwellings face.

Following is a breakdown of the units by type as an indicator of the relative size of the housing market sub-segments. The data provide a breakdown of multi-unit residential (row and apartment units) versus single-family homes.

**Table 1-Segmentation of Vancouver's Residential Units**

Residential Unit type	2001	2006	Change (%)
Total Residential units	236,095	253,385	7.32%
Owner-occupied	43.8%	48.1%	4.3%
Renter-occupied	56.2%	51.9%	-4.3%
Single-family dwelling*	44.4%	41.0%	-3.4%
MURBs**	55.6%	59.0%	3.4%

(Data Source: City of Vancouver 2006 Census)

\* Single Family Dwellings Include detached and semi-detached homes including duplexes and row houses

\*\* MURBs include low and high-rise apartments

This graph shows a number of key elements of the Vancouver residential housing market:

- MURBs make up the largest and still growing segment of residential units.
- A significant number of residential units are occupied by renters who do not have the authority to make their own energy efficient improvements.

**Table 2-Matrix of Barriers and Solutions**

Residential Unit Type	Barriers	Means to Address
<b>New MURBs</b>	Split Incentives	Regulations Education
<b>Existing MURBs</b>	Lack of financing Difficulty in achieving strata consensus for EE improvements Risk aversion	Financing Education
<b>New Single Family Dwellings</b>	Split incentives for contractor-built homes	Regulations Education
<b>Existing Single Family Dwellings</b>	Up-front costs Risk aversion	Incentives Financing Education
<b>Renter-occupied units</b>	Split Incentives Up-front costs	Limited effectiveness of incentives and regulations

## 6.1 MURBs

In Vancouver, MURBs now comprise 59% of the housing stock. Although high-density residential units tend to have lower GHG emissions than low-density units<sup>26</sup>, the sheer number of the units creates a large potential for energy savings.

### 6.1.1 New MURBs

Despite a slowdown in sales due to the financial crisis, MURBs remain the busiest sector of the development industry. According to the CMHC, there is projected to be a 75% increase in MURB apartment housing starts in 2010<sup>27</sup>.

#### **Assessing the existence of barriers for energy efficiency:**

MURBs are normally built to sell, almost always by a private developer, who has strong incentives to limit construction cost per unit. Because they will not profit from energy savings and it is not obvious to what extent buyers are willing to pay a premium<sup>28</sup>, there is a very clear situation of split incentives.

High up-front costs are less of a barrier for large developers. The incremental costs of energy efficiency measures usually only constitute a small fraction of the overall project financing. Financial resources are available to cover these costs. Although the economic downturn made financing more difficult for developers in early 2009, both the housing market and financing availability has improved greatly since then<sup>29</sup>. As a result, the availability of financing is not an issue.

#### **Measures to address the barriers:**

Due to the fact that the main barrier to energy efficiency in new MURBs comes from split incentives, the best action that the city can take is in regulations which set minimum levels of energy efficiency for new MURBs. Educating consumers about the value of energy efficient new homes is also useful. If an informed consumer is willing to pay a premium for an energy efficient home, then the problem of split incentives will not exist.

### 6.1.2 Existing MURBs

#### **Assessing the existence of barriers to energy efficiency:**

- There are no split incentives for owner-occupied existing MURBs. The person funding the renovations will also reap the energy savings benefits of the work.
- Many banks are reluctant to lend to strata corporations because corporations do not “own” common property and cannot give mortgage security<sup>30</sup>.

26 Journal of Urban Planning and Development, “Comparing High and Low Residential Density: Life-Cycle Analysis of Energy Use and Greenhouse Gas Emissions”, Norman, Maclean and Kennedy, March 2006

27 Housing Market Outlook, Vancouver and Abbotsford CMA, Fall, 2009

28 reSource Rethinking Building, “Financing Options for Vanity Capital: Putting the Greenbacks behind Green Building”, May 2007

29 Housing Market Outlook, Vancouver and Abbotsford CMA, Fall, 2009

30 <http://www.stratacapital.ca/>

- Condo owners, on average, own their units for shorter durations than do single family dwelling owners<sup>31</sup>. This makes it more difficult for them to recoup the investment costs through energy savings before they leave.
- Many strata's regulations require 75% of tenants' approval to make non-essential renovations. This high percentage makes it more difficult for strata's to opt for energy efficiency, especially when not all tenants are aware of the advantages of energy efficiency improvements.

#### **Measures to address the barriers:**

On-utility bill financing that is charged to the strata corporation could be an effective tool for addressing the difficulty of obtaining financing. Both BC Hydro and Terasen would be good candidates for funding this financing. Because it is charged to the corporation, the problem of short condo residency would also be resolved. However, there remain a number of difficulties with this. Vancouver does not have clear legislation facilitating on-utility bill financing. Also BC Hydro and Terasen are only able to fund energy efficiency measures that affect exclusively electricity and gas usage respectively. To achieve full energy efficiency, strata corporations would need to take out multiple loans.

An alternative to this would be a green fund that is administered by the city but is funded by BC Hydro and Terasen Gas. This Green Fund would allow a greater variety of energy efficiency measures to be funded.

A second option is that the City could advocate for legislation changes to facilitate utility-bill financing by BC Hydro and Terasen.

To address the lack of EE awareness and the need for majority approval for renovations, the City could leverage the education programs already available from BC Hydro, Terasen and Lighthouse and create programs focused on MURBs.

## **6.2 Single Family Dwellings**

### **6.2.1 New Single Family Dwellings**

#### **Assessing the existence of barriers to energy efficiency:**

- For contractors who plan to sell the residence upon completion, the primary challenge is the incremental cost of energy efficiency measures when real building costs are already very high. Because it is often difficult for developers to pass these costs on to the consumer, there is a split incentive.
- For those who are building their own home, but have a short projected ownership, there may not be sufficient time to recoup the cost of the energy efficient improvement.
- Mortgages are already available (both green and traditional) to cover the cost of building new homes (and their energy efficient elements). A

<sup>31</sup> <http://localism.com/neighbor/crconsulting?page=2>

separate green loan for the incremental costs of energy efficiency improvements would not increase their accessibility. Green loans traditionally have higher rates of interest than mortgages.

### **Measures to address the barriers**

As shown with the new MURBs, the split incentive barrier can best be addressed through increasing regulations. Education and awareness programs also increase consumers' willingness to pay a premium for energy efficient homes. Incentives like Vancouver's solar hot-water rebates may also facilitate lessened energy usage.

## **6.2.2 Existing Single Family Residences**

### **Assessing the existence of barriers to energy efficiency:**

- There is a lack of homeowners' awareness and understanding of energy efficiency improvement's benefits amongst many homeowners.
- Even with the availability of Green Loans from Vancity, the high cost of renovations and the difficulty of securing financing continues to be a barrier to EE renovations.
- Even with this scarcity of financing, the proposed renovation by-law may still greatly increase the number of homes experiencing EE improvements. Currently only 7% of renovations are focused on EE improvements<sup>32</sup>. Regulations that require some EE improvements for every renovation over \$5,000 will vastly increase the current number of EE improvements.
- Homeowners may be deterred from EE improvements, if they do not plan to stay in the house long enough for their investment to be recouped through energy savings.

### **Measures to address the barriers:**

The city's current proposed renovation law will help significantly increase the number of EE improvements. Leveraging the education programs currently available and incentive programs may also be effective. A financing program may also increase the number of intensive energy-improvement renovations. This financing would be most effective if it were transferrable like on-tax-bill or on-utility bill financing because it would help overcome the barrier of short home ownership duration. However, because the barriers are being well addressed by regulations, financing for this segment should not be the first priority.

## **6.2.3 Renter-occupied residential units**

### **Assessing the Barriers to Energy Efficiency**

- When a MURB is renter-occupied and the utilities are paid by the renter, split incentives deter landlords from making energy efficiency renovations.
- Where tenants pay utility bills, (as is the case in many high-rises) the split incentive problem does not exist.
- Tenants lack the authority and often the financial resources to authorize energy efficiency improvements.

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<sup>32</sup> CMHC, Renovations and Home Purchase Detailed Tables, 2008

### **Measures to address the barriers**

Although there are a significant number of residential units which are renter-occupied, there are limited measures that can motivate a self-interested landlord to improve the energy efficiency of their buildings. Although there has been some experimentation with Pay As You Save® and other loans that are directly accessible to tenants, they continue to require the involvement and guarantees of the landlord, which would not be in their financial best-interest. Current renovation regulations would also have limited effectiveness, as it does not provide motivation to perform renovations for the landlord if it does not lead to lower costs or increased rental income. Incentives may have the best chance of effectiveness for this segment.

## **7.0 Recommendations**

### **7.1 Key Criteria**

Although there are several means, which can be effective in helping the City of Vancouver increase the uptake of energy efficiency measures and lower GHG emissions from buildings, the City must initially focus its efforts on the most cost effective and economically efficient options available. An important goal in determining the recommended program is to create one that is self-sustaining and addresses energy efficiency barriers faced by the most common type of residential unit. Although many potential measures and financing programs can achieve social and economic goals, their effectiveness in these areas will not be factored into the decision-making process.

The primary objectives in determining the program that will most effectively help to lower GHG emissions from buildings in the City of Vancouver were to:

- Identify the best residential unit-type on which to focus
- Determine the barriers preventing the decision makers from choosing to implement energy efficient measures
- Determine what means (such as education, awareness programs, regulations, incentives, and financing tools) could best help to overcome these barriers
- Design a financing tool that would most effectively enable the decision makers to invest in energy efficiency measures in a cost neutral or cost positive way
- Determine the roles that the City of Vancouver and other stakeholders, such as utilities companies, should play in the implementation of the program
- Determine the most effective size of the program

### **7.2 Residential Unit Type**

This study has shown that in Vancouver MURBs make up the largest (and still growing) segment of residential units. These MURBs contain shared space maintained by strata corporations, which face a significant barrier to being able to implement energy efficiency upgrades in these areas due to the lack of

conventional financing available to them. This presents a significant opportunity for financing to increase the uptake of energy efficiency upgrades.

It has further been determined that of all the categories of residential buildings, the barriers faced by existing MURBs are the most significant. Barriers also exist for new MURBs and new and existing single-family dwellings, but existing measures such as education, awareness, incentive, and regulations are better adapted to overcome their barriers. New MURBs and Single Family Dwellings already have the ability to finance EE measures in a cost neutral or cost positive way.

It is therefore recommended that the primary focus be on existing MURBs. Financing should be a key aspect. MURBs are ideal borrowers as they have a low risk of default, and a financing program would eliminate the most significant barrier preventing these groups from undertaking energy efficiency upgrades in their buildings.

### **7.3 Program and Financing Tool**

The City of Vancouver should implement a Green Fund financing program for existing MURBs. Although research found that on-utility bill financing programs were highly effective in communities throughout North America, they are not the ideal option in this case. Programs administered by utilities companies can only finance a specific set of measures. Therefore a strata wanting to implement a comprehensive set of energy efficiency retrofits would need to apply to both a program administered by BC Hydro and Terasen Gas, and would still face a lack of financing for measures not covered by these programs.

Thus, the most effective financing tool is a Green Fund administered by the City of Vancouver, which would be a “one-stop shop”. The fund would be created through contributions from BC Hydro, Terasen Gas, and the City of Vancouver. It would be administered by the City and collected through the property tax mechanism

### **7.4 Size of Program and Expected Savings**

Vancouver has approximately 500 high-rise residential buildings. Through renovating 10% (50) of these buildings each year at a cost of \$500,000 each, we would be able to reduce each unit’s energy by 30% at a yearly investment of \$25 million. Since 24% of all Vancouver residential units are in buildings over 5-stories, this measure alone would decrease residential buildings’ energy usage by 7.2% (24% x 30%) by 2020. This, along with the new renovation by-law, the stricter building code and the solar thermal incentive, would be an important part of achieving Vancouver’s GHG emission goal of reducing residential buildings’ emissions by 20% by 2020

### **7.5 Green Fund Roles:**

- **Funding:** There are a number of funding sources. Financial institutions, like Vancity, could finance this program through the mechanisms like

- “green” Shared Growth Term Deposits (which have a 3% rate for five-year terms). Utility companies like BC Hydro or Terasen Gas are also candidates. Because the payments are paid through a strata’s property tax, default rates and exposure would be lessened, making it attractive to outside funders.
- **Program Design:** This role can best be taken by the city to ensure that the program addresses its needs. Besides this report, another useful tool for program design is the City of Berkeley’s “Guide to Energy Efficiency and Renewable Energy Districts for Local Governments” (see appendix B of the accompanying report).
  - **Program Administration:** This encompasses handling loan applications and evaluating energy efficiency measures. If the source of payment were a financial institution, it would be best suited to handle loan applications effectively as they have the expertise and infrastructure. However, additional expertise should be needed to evaluate EE measures. For this, the city should leverage resources like the ecoENERGY program or the national audit programs. If City staff administers the program, the city’s role should be limited to payment collection and not include funding or giving loan guarantees. It is estimated based on the experience of other communities that one full-time employee is required for every 100 loans provided.
  - **Collecting Payments:** The City will need to coordinate with both its tax department to facilitate these payments and, if the funding source is external to the city, they will need to arrange a payment mechanism with the other institution.
  - **Program Evaluation:** One system is to have audits to ensure completion of the energy efficiency upgrades. To evaluate the program’s overall success, gaining permission to access participants’ utility bills would provide clear evidence of the program’s efficacy.

## 8.0 Risk Assessment and Mitigation

### 8.1 Borrower Default:

In all loans, there is a risk of borrower default. Energy Efficiency loans, due to the higher level of credit checks, traditionally have lower than average default rates. The programs that we had surveyed had default rates between 1-3%. The financial risk for the City, if they opted to use the on-tax bill financing would likely be even lower than this. Because the financing payment is on the tax bill, the City would have first access to assets if the home needed to be foreclosed.

Many communities operating energy efficiency loan programs have recognized the negative publicity if the program forced a homeowner into bankruptcy and have created a side fund with which to make payments. The programs, like Berkeley, which have used this side fund were able to be reimbursed by the homeowners for the payments when their financial situations improved.

## 8.2 Novelty of the Program

Unlike with single residency dwellings, there are relatively few energy efficiency retrofit programs for MURBs. There are fewer opportunities for Vancouver to learn from the experiences of other loan programs in how best to develop and implement the program. It should be anticipated that unforeseen administrative, marketing and legal challenges will arise as they did initially for the first energy efficiency programs like Sacramento. To mitigate this circumstance, it is important to schedule a full review and revision of the program every six months so there is a chance to be flexible and address challenges as they emerge.

## 9.0 Key Considerations

In designing a program it is essential to “get the little things right”. Small errors can greatly lessen the uptake or effectiveness of a program. The following are points that should be practiced within the above recommendation.

- **Access to utility bills** - For a program to be effective, there needs to be clear means to measure its success. If BC’s privacy laws will permit it, loan applicants could give permission for the city to access their Terasen Gas and BC Hydro bills. In this way the program will be able to measure the financial, energy and GHG emissions savings from the existence of the program. (It is recognized that there will be other factors like weather and consumer behaviour which will affect their heating bill but, despite these other factors, there should be a clear correlation between the program and the level of savings.
- **Audits** - It is recommended that all loan applicants participate in pre- and post-retrofit audits. This has a number of advantages: It will help them determine which improvements will lead to the largest savings. The audit will also help confirm that the loan has been used for the proper purpose. Finally, participation will also ensure consumers have access to Canadian grants of up to \$5000.
- **Coordination of program with other programs** - Because there are a range of other benefits from other departments and jurisdictions, it is important to ensure that the financing program is appropriately coordinated with them to avoid double subsidization of retrofits. For example, the program should only finance costs for solar water heaters or eco-efficiency that are not already being already subsidized by federal or municipal programs.
- **Marketing and Education** - One of the most successful means to promote financing programs has been through developing relationships with contractors and having them promote the new program. In communities like Sacramento, they have been very effective promoters of the financing program as it has helped to bring them business. Effective marketing and education can also help promote energy efficiency among those who opt not to use the program’s financing to retrofit their homes and instead use other

resources or lines of credit to finance the renovations. In Berkeley, 50% of those who pulled out of the financing program still decided to improve the energy efficiency of their homes through other means. The education program is also necessary to avoid misunderstandings of the nature of the project by the general public. This is particularly important with the on-tax bill program or on-utility bill financing so that the public understands that only those who have opted to have retrofits will be required to pay the extra fee.

- **Ongoing programs** - The most successful program have been those which have been ongoing, allowing consumers and contractors to grow aware and take advantage of the program. The highly successful Sacramento program attributed its program's success to its longevity. Although it is challenging for municipal organizations to make long-term commitment of resources, it may be effective to set a review date with clear criteria that need to be achieved in order for the program to be extended.
- **Carbon credit access** - It would be wise for the City to claim any carbon credits that may emerge from the implementation of these energy efficiency measures. Potentially with the greater emergence of carbon trading, these could be a source of revenue for the community. For most homeowners, these carbon credits would have little utility for them.
- **"One stop shop"** - There are a range of programs that can help homeowners save money from installing energy efficiency. In order to maximize effectiveness the program should facilitate homeowners accessing the full range of subsidies and tax credits available, both provincially and federally. In order to streamline operations, an online-portal for customers to get information, process and track applications should be developed.
- **Fixed Rates** – If it is possible to finance the loan through longer-term debentures or, through a financial institution, through green bonds, it is optimal to offer long-term fixed rates to borrowers as this will provide assurance that their energy savings will not be eroded or erased through higher interest rates.
- **Economies of Scale** - Although most pilot programs initially have a small-scale to start, the program will be more financially sustainable the larger the program because start-up costs can be amortized over a larger number of loans.
- **Administrative Fees** - A loan's administrative fee must be chosen very carefully. Having a high fee negates the financing's advantage of having low up-front costs. However, if the fee is too low or non-existent, it encourages frivolous applications which take up administrative time. A non-existent fee also makes it difficult for the program to be financially sustainable. It is recommended, that an administrative fee of at least \$100 be required. This money is refunded if the loan is rejected. This administrative fee can also be included in the financing.