POL 459

Vancouver's Property Assessed Clean Energy (PACE) Bond Financing Program

Advantages, Limitations, & the Potential for a More Effective Policy

Final Draft

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Executive Summary

The methods in which industrial societies produce and consume energy and the parallel dependence on fossil fuels, is an unsustainable system that is imposes stress the earth's environment. Following the failure of the UNFCCC/Kyoto model, better methods and attainable solutions will be found in practices that are politically attractive and relentlessly pragmatic.[1] One approach that may hold such promise is a Property Assessed Clean Energy (PACE) Bond Financing Program, which facilitates the financing of energy efficiency improvements to new and existing buildings. The purpose of this document is to investigate if a PACE Bond Financing Program is an effective policy option for the City of Vancouver to pursue. Although the implementation of a PACE program is viable and beneficial for Vancouver, the current structure of Vancouver's PACE program is limited in its capacity, which leaves the effectiveness of the policy uncertain. Based on information about energy use in buildings, efficiency, and the structure of a PACE program, three categories are established to assess the effectiveness of Vancouver's program: *scale of the program, financial issues and costs of efficiency improvements, and participation in the program*. Invoking the principles of Design Thinking,[2] Vancouver's PACE program demonstrates clear advantages that can be realized through its implementation, while modifying the program will address its inherent limitations. Some of the necessary changes to this policy that pertain to financial and participation issues are attainable at the municipal governance level. Other recommended changes are achieved by scaling the program up to the Provincial level. This requires cooperation and a commitment between the City of Vancouver and Provincial Government departments, including the BC Climate Action Secretariat and the BC Ministries of the Environment, Energy, and Finance. A PACE Program has significant potential to increase the energy efficiency of buildings in Vancouver. However the policy requires modification to ensure its effectiveness and address its limitations of scale, costs, and participation.

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[1] Gwyn Prins, "The Hartwell Paper: A new direction for climate policy after the crash of 2009," *Institute for Science, Innovation and Society, University of Oxford & The London School of Economics* (2009), http://www.lse.ac.uk/collections/mackinderProgramme/theHartwellPaper/

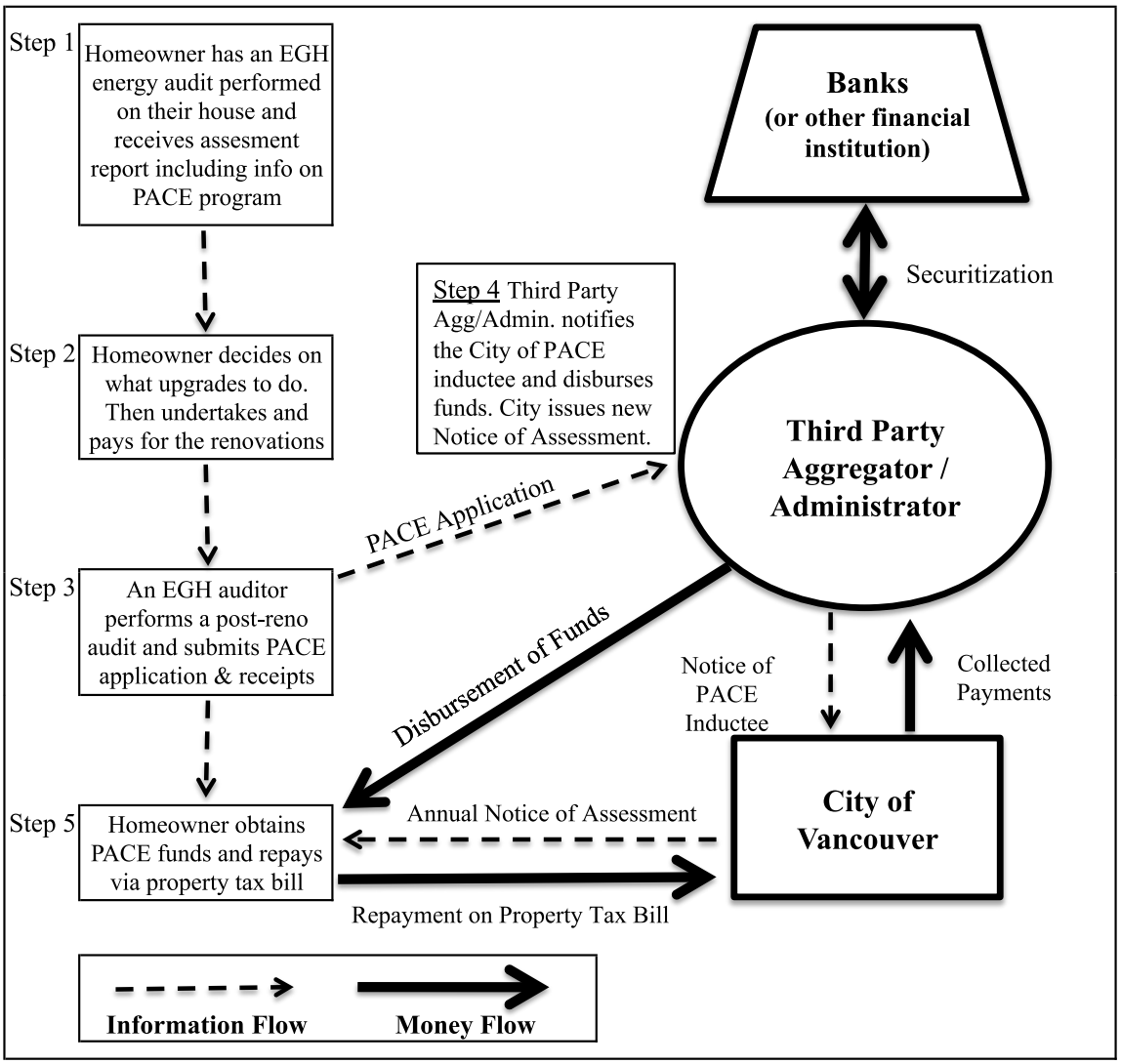
[2] Design Thinking is an approach to problem solving espoused by Tim Brown, which seeks a balance of desirability (humans needs), technical feasibility, and economic viability. The approach aims to find solutions by starting with human needs and involving end-users, using prototyping to test and refine the proposed solutions, and focusing on participatory systems that shift the passive relationship between producer and consumer to a participatory one.

Background

a) How does it work?

- A municipality implementing a PACE Bond Financing program establishes a financing mechanism, which sells PACE bonds to generate revenue to pay for the cost of energy efficiency upgrades installed by property owners. The financing is secured with a lien on the property that essentially functions as a loan, which is repaid by the property owner through a special tax or assessment on their property tax bill amortized over a period up to twenty years. Figure 1 provides an overview of the PACE program structure currently proposed by the City of Vancouver.

Figure 1: City of Vancouver PACE Program: Draft Program Framework



Source: City of Vancouver Sustainability Department

- The design of a PACE program is highly flexible, allowing each jurisdiction to create a program according to its needs and demands.[3] Municipalities define eligible projects, marketing strategies, and outreach programs during the design phase, although these components can be reviewed and amended as required after the program is established. Administrative responsibilities may be delegated to in-house municipal staff or contracted out. The financing mechanism can be constructed in various forms according to the needs and capacity of each municipality. Typically the financing mechanism is a single company or several companies outside of government, which fulfill the following responsibilities: managing the municipal bond purchase program, coordinating financial partnerships, providing financial advising and bond counsel. Often the municipality will also enlist a partner within the financing mechanism to handle the administrative responsibilities of the program. The City of Vancouver has designed its financing structure so that the full complement of financial and administrative responsibilities will be handled by an outside consultant, which they have labeled a *Third Party Aggregator/Administrator*.[4]

By assigning financial management and administrative duties to external consultants, the program is designed to limit the financial exposure to the municipality and have little to no impact on its capital or operating budgets.

b) Reference Cases

Several jurisdictions in the US have implemented successful PACE programs including Berkeley, CA, Palm Desert, CA, Boulder County, CO, Babylon, NY, and San Francisco, CA.[5] These examples demonstrate the successful establishment of bond purchasing programs as sources of capital, the financing of renewable energy systems and electric vehicle charging systems, and the inclusion of both residential and commercial efficiency upgrade projects. Specifics of the San Francisco model are listed below.

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[3] For a comprehensive overview of different financing options and program design, see Merrian C. Fuller, Cathy Kunkel and Daniel M. Kammen, "Guide to Energy Efficiency & Renewable Energy Financing Districts for Local Governments," *Renewable and Appropriate Energy Laboratory, University of California, Berkley*, (2009), http://vancouver.ca/greenestcity/.

[4] The exact structure of the Third Party Aggregator/Administrator has not yet been determined by the City of Vancouver. An RFP for this contract was issued in autumn 2010.

[5] See Appendix 1 for a comparison chart of some of the specific characteristics of each program.

The San Francisco Model:[6]

In the first 3 weeks of operating,* the San Francisco PACE program received 13 applications with a requested financing amount of $303,605. The City of San Francisco also witnessed a significant increase in the number of required energy audits being scheduled and conducted during this period, signaling significant interest in the program. Specifics below:

Projects Financed	Residential and Commercial
Eligible Upgrades	-Energy Efficiency -Renewable Energy -Water Conservation -Electric Vehicle Chargers
Eligibility	-Must be current on property taxes and mortgage payments -Financing not to exceed 10% of property value -Residential minimum financing: $5000. Maximum: $50,000 -Commercial minimum financing: $5000. Maximum: None
Requirements	-$300 application fee. -Mandatory energy audit or Water Wise evaluation
Financing Source	-Privately funded bond sale program – no impact on SF general fund -Federal Stimulus Grants

Note: PACE programs in the US are currently suspended. This has nothing to do with the operation or efficacy of PACE programs, but is a symptom of the current housing crisis and economic recession in the US. The Federal Housing Finance Agency, Fannie Mae, and Freddie Mac will not provide mortgages to properties participating in a PACE program. This is because PACE financing is technically a tax assessment and has 'first position' (senior status) over a mortgage in the case of foreclosure, and therefore will be paid back before a mortgage on any housing default.

c) Viability for Vancouver

Within the jurisdiction of Vancouver, there are four fundamental reasons why pursing a PACE program is a viable and beneficial option.

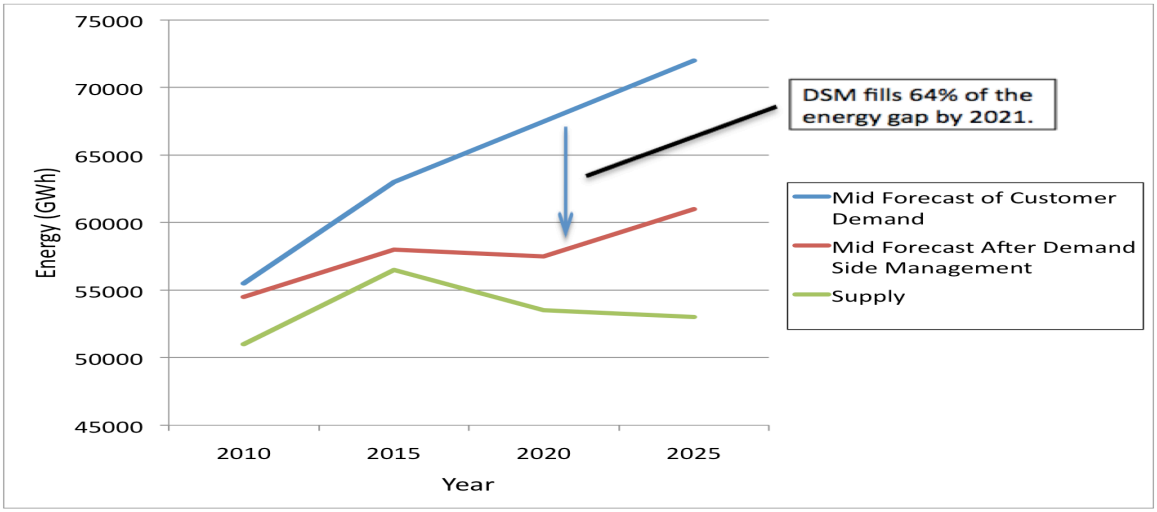
i) Energy Efficiency is Essential to the Business Strategies of Utility Companies

- Improving the efficiency of the buildings where we live and work is a requisite component of BC Hydro's strategy to incorporate Demand Side Management (DSM) in order to reduce electricity consumption. Figure 2 shows BC Hydro's outlook where demand will clearly continue to outstrip supply over the next 15 years. The company forecasts that by 2021, DSM strategies will close the gap

[6] Johanna Partin, "San Francisco's PACE Program: GreenFinanceSF," *City and County of San Francisco*, (2010), http://www.bcsea.org/get-involved/events/2010/07/07/pace-bonds-innovative-approach-to-energy-efficiency-financing

between supply and demand by 64%.[7] In addition, Special Direction 10 (SD 10) puts increased pressure on BC Hydro to close the gap between future supply and demand.[8]

Figure 2: BC Hydro Supply & Demand Forecast



Source: BC Hydro Service Plan: 2010/11-2012/13

- Terasen Gas has incorporated increased energy efficiency into its business model and its supply and demand forecasting.[9] Although supply is not a concern in the short-term with an abundance of gas supply for 70+ years,[10] Terasen Gas is developing alternative energy projects with the view to supplement its conventional gas services with alternative energy. Therefore, a PACE program would augment the business strategy of Terasen Gas.

ii) Greenhouse Gas (GHG) Emissions Targets

- The City of Vancouver and the BC Government have set ambitious targets to reduce GHG emissions by 33% below 2007 levels by 2020, and 80% reduction below 1990 levels by 2050. Vancouver has to reduce the GHG emissions of

[7] BC Hydro, "BC Hydro Service Plan: 2010/11-2012/13" (2010) http://www.bchydro.com/etc/medialib/internet/documents/info/pdf/service_plan_2010_11_2012_13.Par.0001.File

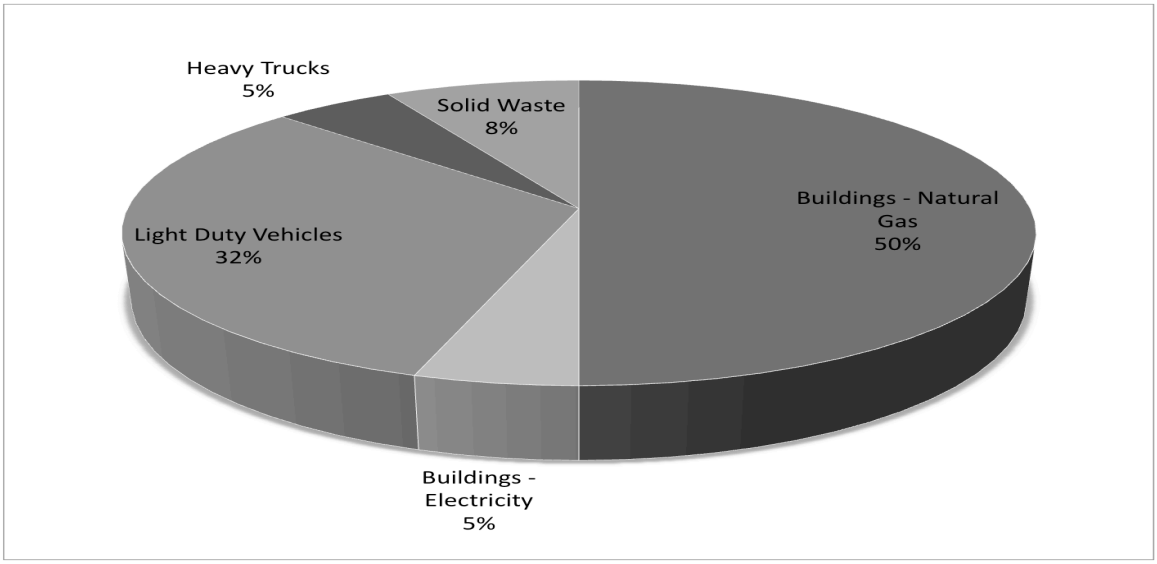
[8] SD 10 to BCUC requires BC Hydro to achieve electricity self-sufficiency by 2016 and each year thereafter solely from electricity generating facilities within B.C.

[9] Terasen Gas, "Terasen Gas 2010 Long Term Resource Plan," (2010), http://www.terasengas.com/_AboutUs/PlanningForFuture/default.htm

[10] ibid.

existing buildings by an average of 20% by 2020 in order to meet their target.[11] Figure 3 provides a breakdown of Vancouver's GHG emissions and demonstrates that a policy that improves the energy efficiency of buildings can impact 55% of the city's total GHG emissions.[12] Therefore any attempt to reduce Vancouver's GHG emissions should include a focus on reducing the fossil fuel use of buildings.

Figure 3: Vancouver's GHG Emissions Breakdown



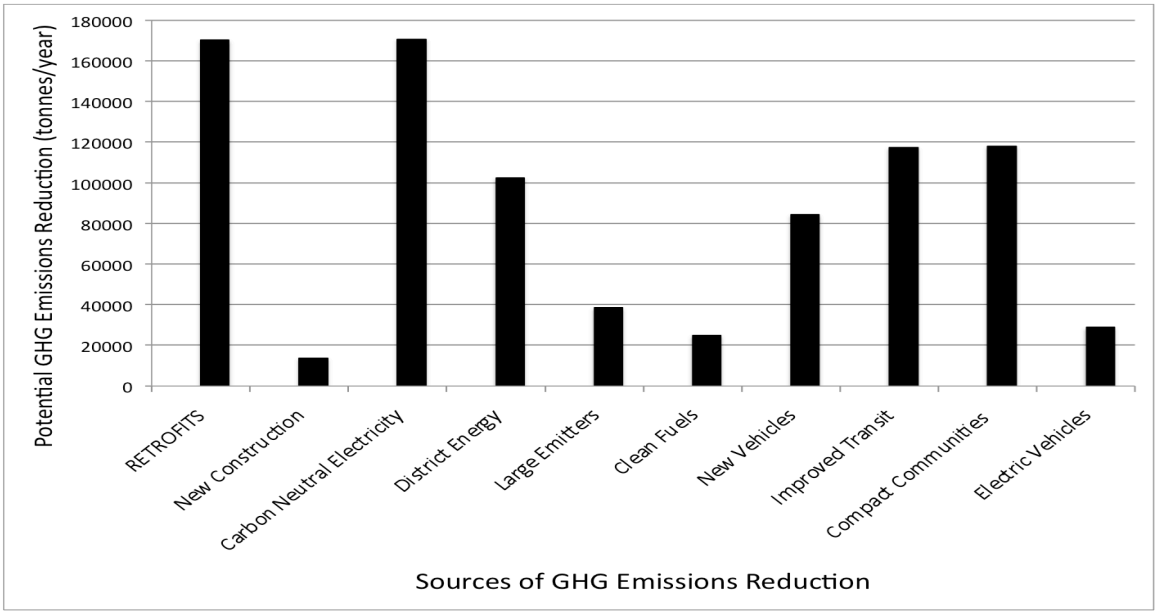
Source: City of Vancouver - 2008 GHG emissions inventory summary and methodologies.

- The City of Vancouver's Sustainability Department issued an assessment based on its studies, identifying several potential sources for reducing GHG emissions; including retrofits of buildings, which alone amount to about 20% of all the potential GHG emission reductions, see Figure 4. Figure 5 illustrates that 79% of residential energy use in BC goes to space heating and water heating, while Figure 6 shows that Vancouver buildings receive 56% of their energy from fossil fuels. This demonstrates once again the potential reduction in GHG emissions that can be achieved by reducing the energy use of buildings and wherever possible, changing the energy source to renewable sources.

[11] City of Vancouver, "Vancouver 2020: A Bright Green Future," (2010), http://vancouver.ca/greenestcity/

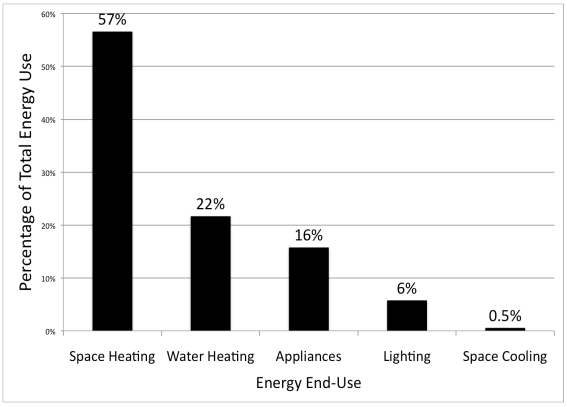
[12] Noteworthy is the fact that the implementation of electric vehicle (EV) infrastructure in buildings would have the potential to further impact the 32% of GHG emissions that are attributed to light duty vehicles.

Figure 4: Potential Sources of Vancouver's GHG Emissions Reduction



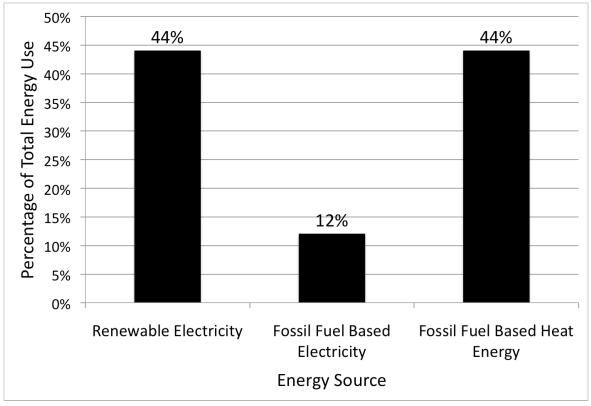
Source: City of Vancouver Sustainability Department

Figure 5: BC Energy Use - Residential



Source: NRCan Comprehensive Energy Use Database 2008, Residential Sector, BC, Table 2.

Figure 6: Van. Energy Use - Buildings



Source: City of Vancouver, Climate Leadership.

iii) Four Common Barriers to Implementing Energy Efficiency Upgrades

- A PACE program attempts to address four common barriers the property owners face when deciding whether to install efficiency upgrades.

1) *Split Incentives*

Split incentives describe the situation where the person making the investment does not benefit from the installation of efficiency upgrades. Renters do not want to

pay for upgrades on property they do not own and landlords often do not invest in upgrades because their tenants benefit from lower utility bills, not themselves.[13] And homeowners are reluctant to make a substantial investment if they think they might move before they realize a return on their investment.

PACE Solution: Costs and repayments are assigned to the property, not property owner, thus eliminating split incentives.

2) *Up-Front Capital Costs and Lack of Access to Capital*

Energy efficiency upgrades often require a significant amount of capital to install.[14] The federal ecoEnergy program (begun in 2007) and provincial LiveSmart BC program (begun in 2008) offer some incentive/rebates to homeowners, but with limited funding and expiry dates. Homeowners will generally save about 5%-15% through available rebates, however ecoEnergy was terminated a year early in March 2010 and LiveSmart BC, which will end in December 31 2010, cancelled its rebate for solar hot water systems. These are capricious programs that homeowners cannot definitively count on as a source of cost reduction.[15] Financial institutions do offer retrofit loan financing,[16] but this loan structure attaches the loan to the homeowner and not the property. Therefore this is an unattractive option for anyone who may sell their property before they have realized the return on their investment. (Split incentives problem.)

PACE Solution: Design the financing structure and repayment schedule so that monthly energy savings gained by the homeowner through efficiency upgrades are greater than the incremental PACE repayment amount. In practice, homeowners should save more on their monthly energy bill than the amount of their monthly repayment to the PACE program.

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13 Lucie Maruejols and Denise Young, "Energy Use in Canadian Multi-Family Dwellings," *Canadian Building Energy End-Use Data and Analysis Centre*, (2010), http://www.cbeedac.com/publications/index.html.

14 See Table 1. This table shows the price range of some typical upgrades, both conventional and renewable. All conventional upgrades fall within the price range of 'Insulation/Windows,' with a maximum of $15,000.

15 Hans Edstrand, Energy Advisor/Auditor, Seed Consulting. Personal communication November 2010.

16 Vancity Credit Union and RBC Royal Bank offer retrofit loan financing at a rate of prime +1%.

3) *Perceived Uncertainty About Potential Energy Savings*

The general public often does not fully understand the systems in their house and therefore have a natural trepidation about how much money they can realistically save with upgrades. There is a wide range of costs, payback periods, and efficiency benefits that vary significantly based on the specific characteristics of each property and homeowner.[17]

PACE Solution: The program requires that an energy audit be performed on the building, providing the homeowner with a detailed assessment of their building's efficiency, recommended upgrades, associated costs, and expected efficiency gains.

4) *Low Energy Prices Result in Long Payback Period*

Underlying the aforementioned barriers is the fact that Vancouver enjoys relatively low energy prices, including some of the lowest electricity prices in North America. This extends the payback period for an investment in upgrades, thereby offering less incentive for anyone who does not have a long-term vested interest in their property and contributing to the perceived uncertainty about potential savings.[18]

PACE Solution: Attaching the costs to the property means the property owner does not incur a loss on the investment should they sell the property before the end of the payback period.

Table 1: General Breakdown of Upgrades, Costs, Payback Period and Efficiency Gains

Efficiency Upgrade	**Net Price Range**	**Average Payback Period**	**Efficiency Gains**
Insulation/Windows	$1000 - $15,000	3-15 years	10% - 40%
Water Heaters / Furnaces / Heat Pumps	$3000 - $6000	7-8 years	20% - 40%
Solar Hot Water Heating	$7000 - $9000	5-6 years	10% - 25%
Geothermal Space Heating	$40,000 - $50,000	28 years	40% - 60%

[17] See Table 1. This outlines the range of each variable. City Green Solutions, a consulting company that performs energy audits suggests that a typical BC home achieve increased efficiency between 30%-70% depending on what upgrades are performed.

[18] See Table 1.

Sources: Seed Consulting, City Green Solutions, Sustainable Energy Technology and Resource Assessment for Greater Vancouver, Solar BC.

iv) Technical Capacity, Governance and Health Benefits

- Vancouver has numerous companies and consulting firms with sufficient technical expertise to install any upgrade that may fall within the scope of a PACE program.

- Underpinning the viability of a PACE program is the issue of governance and political will. A municipality is responsible for initiating, promoting, and implementing this type of program. The current Mayor, Council, and the Sustainability Department at Vancouver City Hall has demonstrated the necessary political will to establish a PACE program for Vancouver.[19] However, should the political will change, the program is susceptible to any change in direction that the government of the day decides.
- There is growing literature that supports the health benefits of implementing efficiency upgrades in terms of better indoor air quality, improving asthma, and personal comfort.[20]

[19] In addition to supporting the development of a PACE program, the City of Vancouver has moved forward with other 'green' projects such as building bike lanes, establishing GHG reduction targets, a green building code, the Greenest City 2020 Action Plan, a dedicated sustainability department, and the "Talk Green to Us" public consultation process.

[20] See J.P. Clinch, and J. D. Healy, Cost-benefit analysis of domestic energy efficiency. *Energy Policy, 29*, (2001), http://www.cbeedac.com/search/literatureresultdetails.php?id=952 and Canada Mortgage and Housing Corporation "The Effect of Improving the Home Environment on Asthma: A Pilot Study," (1998), https://www03.cmhc-schl.gc.ca/catalog/productDetail.cfm?lang=en&cat=123&itm=46&fr=1291671699634

Limitations of the Current Policies

a) Current Policies Provide Limited Support for Improving Efficiency Upgrades

- The City of Vancouver has passed the greenest building code in North America.[21] However these codes only apply to new detached houses, representing about 5% of all detached homes in Vancouver on an annual basis.[22] In addition, the number of single detached houses in Vancouver has declined from 65,415 in 1996 to 48,365 in 2006,[23] so these building codes capture a declining portion of Vancouver dwellings.

- The City of Vancouver has stated that all existing buildings must reach an average of 20% increased efficiency by 2020 in order to meet the GHG reduction target. With limited support to actually implement these standards, the burden of cost for these regulations falls on the property owner.

- The federal ecoEnergy program and provincial LiveSmart BC program are volatile initiatives with expiration dates and limited funding, which can be canceled by government at anytime. This approach does not provide clear or definitive support for property owners to invest in upgrades and contribute to the efficiency goals set out by BC utility companies and governmental GHG emissions reduction targets.

b) Current Policies Do Not Address Barriers Facing Property Owners

- The current policies do not address the four common barriers that inhibit property owners from investing in efficiency upgrades, documented in Part iii of the previous section.

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[21] The building code requires all new homes to achieve an EnerGuide rating of at least 80, and install infrastructure for solar hot water and electric vehicle charging systems.

[22] Vancouver housing starts totaled 2218 in 2009 and 3984 as of October 2010. Canada Mortgage and Housing Corporation, "Preliminary Housing Start Data," (2010), https://www03.cmhc-schl.gc.ca/catalog/productDetail.cfm?lang=en&cat=58&itm=1&fr=1291659617623

[23] Statistics BC, "Vancouver City Updated 2007 Community Energy and Emissions Inventory," (2008), http://www.bcstats.gov.bc.ca/data/env/env_stat.asp

c) Limitations in the Current Structure of Vancouver's PACE Program

i) Scale of the Program

- The Vancouver PACE program will not provide financing for renewable energy systems such as solar water heating systems, geothermal heating systems, or electric vehicle (EV) charging systems. Eligible upgrades will consist of about five to six conventional upgrade options taken from the federal ecoEnergy list of upgrades.

- Municipal governments have less resources than provincial governments that could use taxation policy, cross-subsidization, and greater economies of scale to improve the effectiveness of the program.

ii) Financial Considerations

- The structure of a PACE program does not attempt to reduce the capital costs associated with efficiency upgrades, but rather it makes these costs more *feasible* to pay.

- The Vancouver PACE program requires homeowners to pay the costs of the upgrades up front and receive reimbursement following a secondary audit to verify the work.

iii) Participation

- The voluntary nature of the program and the lack of any mandatory policies leave participation levels in the program uncertain. To date, participation levels in the existing voluntary federal and provincial efficiency upgrade incentive programs has been low,[24] totaling less than 20% of all BC households.[25] In 2009, 3000

[24] From 1995 to 2005 nearly 2% of Canadian households took part in the federal EnerGuide for Houses program and about 19% of these are known to have retrofitted their homes. For a comprehensive assessment of the participation in the federal program see Lucie Maruejols and David L. Ryan, "Generalizing Home Retrofit Program Results to Non-Participants," *Canadian Building Energy End-Use Data and Analysis Centre*, (2009), http://www.cbeedac.com/publications/index.html.

[25] Glenys Verhulst, "Tools for Improving Residential Energy Efficiency for Existing Homes in BC," City Green Solutions, (2010), http://www.bcsea.org/get-involved/events/2010/10/19/energy-solutions-webinar-energy-efficiency-residential-and-commercial-buildings.

Vancouver households participated in the federal ecoEnergy program,[26] representing 5.75% of all PACE-eligible houses.

- Low voluntary participation rates have a significant impact on the effectiveness of the program in terms of the goal of reducing energy demand. The average house in BC can expect to achieve an improvement in efficiency of about 30%-35%[27] after completing upgrades. Voluntary participation in a PACE program would reduce the total energy use of all houses in Vancouver by about 1% annually if current participation rates are sustained. This percentage would change accordingly should participation rates rise or fall.[28]

- Low participation rates also have a negative impact on the program's capacity to affect a reduction in GHG emissions. Each household that participates in the LiveSmart BC program reduces its GHG emissions by an average of 2.5 tonnes/year.[29] Using the 2009 ecoEnergy participation rate as a basis, 3000 participants in a PACE program will reduce GHG emissions by just 7500 tonnes/yr or 0.3% of Vancouver's annual GHG emissions.

- Vancouver's PACE program currently applies only to houses,[30] which further limits the potential participation as well as its possible effectiveness. Houses constitute 50% of Vancouver's total residential energy use and 22% of the city's total energy use by buildings. (See Fig. 7) The exclusion of commercial buildings

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26 David Ramslie, "Imagine 2020," City of Vancouver Sustainability Department, (2010), http://www.bcsea.org/get-involved/events/2010/07/07/pace-bonds-innovative-approach-to-energy-efficiency-financing

27 This range is a mean average of data collected from City Green Solutions, Natural Resources Canada *Energy Efficiency Trends 1990-2007*, Insulation Guide, Home Performance, CMHC *Case Studies of Major Home Efficiency Retrofits*, CBEEDAC *Explaining Energy Savings under the EnerGuide for Houses Home Retrofit Program 2009*, Seed Consulting.

28 Two forces that may account for low participation in the coming years are: 1) the current economic downturn, and 2) the fact that many people who had the capacity to do renovations on their house did so last year to take advantage of the Federal Home Renovation Tax Credit.

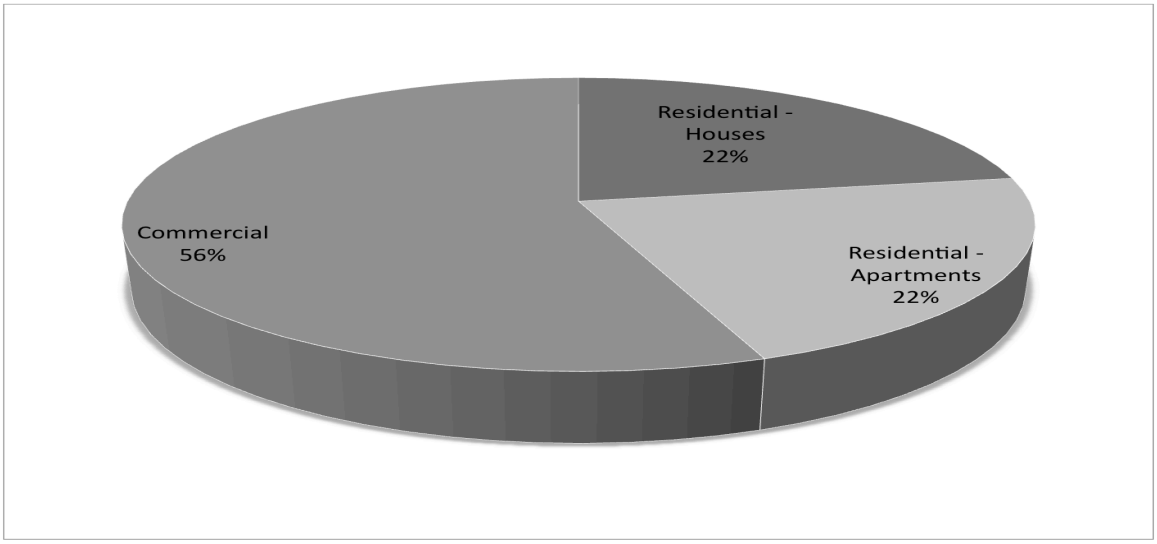
29 Glenys Verhulst, "Tools for Improving Residential Energy Efficiency for Existing Homes in BC," City Green Solutions, (2010), http://www.bcsea.org/get-involved/events/2010/10/19/energy-solutions-webinar-energy-efficiency-residential-and-commercial-buildings

30 Given the multitude of residential building classifications, for clarity of comparison and analysis this report will categorize all PACE-eligible dwellings (single-detached) as 'houses' and all other dwelling will be categorized as 'apartments.'

means that the PACE program will have no impact on the energy use and GHG emissions of this building stock, which account for 56% of the total energy use (See Fig. 7), and 51% of total GHG emissions by buildings in Vancouver.[31]

Note: a PACE program is not well suited for apartments and multi unit residential buildings (MURB). Within these buildings, each unit has its own property tax bill, individual owners cannot change the heating or hot water systems, nor can they make structural changes to the building. A better tool for apartments and MURBs is a similar program called On-Bill Financing, where the utility company finances energy efficiency upgrades and is repaid through a surcharge on the building's utility bill.

Figure 7: Vancouver – Energy Use by Buildings



Source: BC Stats, Vancouver City Updated 2007 Community Energy and Emissions Inventory

Policy Options

a) Abandon the PACE Program

- Abandoning the PACE program is not advisable for several reasons. Referring to a Design Thinking approach, the PACE program demonstrates clear advantages by assessing the needs of property owners, specifically assistance in overcoming the major barriers to implementing upgrades in houses. The program has

[31] Statistics BC, "Vancouver City Updated 2007 Community Energy and Emissions Inventory," (2008), http://www.bcstats.gov.bc.ca/data/env/env_stat.asp

undergone prototyping through a recognized track record in the US[32], and Toronto is also developing a PACE program. The program invokes a participatory model, where government works with property owners to help them achieve greater efficiency in their houses. Specific advantages of the program include the capacity to address the four barriers that inhibit property owner from making efficiency upgrades, most notably eliminating split incentives. In addition, the program can work to stimulate 'green' jobs, and finally a PACE program is a flexible tool that can be designed, amended, and implemented to suit the specific needs of a region.[33]

b) Proceed With Policy Unchanged

- Proceeding with the Vancouver PACE program without any changes, amendments, or caveats is inadvisable because of the limitations on scale, financial considerations, and participation, as outlined in the previous section. Implementing the program in its current form will simply leave the program's effectiveness uncertain.

c) Policy Recommendation: 'PACE Plus'

- Although limited in its current form, the PACE program being developed by the City of Vancouver provides several positive options to homeowners. With a track record from other jurisdictions and the capacity to address existing barriers and problems, a PACE model is a solid foundation upon which to build a stronger policy. Therefore the policy option recommended is a 'PACE Plus' program. This policy recommendation maintains the structure, elements, and benefits of the existing program, and incorporates modifications aimed at reducing some of the limitations inherent in Vancouver's current program.

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[32] PACE Bond programs have been successfully implemented in San Francisco, Berkley, and Palm Desert, and 23 states have passed legislation for state-wide PACE programs that municipalities can opt into.

[33] For a comprehensive look at the advantages of a PACE program and the different financing mechanisms available, see "Guide to Energy Efficiency & Renewable Energy Financing Districts for Local Governments."

Policy Recommendations

Summary Table: Policy Recommendations

Status Quo	Policy Recommendations	Examples / Benefits
Limited Scale	Scale up to Provincial Level	Larger population of households could increase participation
		Economies of scale would make program more attractive to investors
Financial Considerations	Reduce costs of upgrades	Use revenue from the BC Carbon Tax to cross-subsidize the costs of energy efficiency upgrades.
	Business model to show savings will be greater than costs	
	Business model to include up front disbursement of funds	Disburse funds to energy advisors/auditors who could then pay contractors directly.
Participation	Mandatory Regulations	Point-of-Sale Upgrades
		Energy Audits
	Commercial Building Stock	See San Francisco model
	Include Renewable Upgrades	Include solar, geothermal, and electric vehicle infrastructure.
	Marketing Campaign	

Cost Implications

- All recommendations can be implemented in the design and development phase of the PACE program. Therefore implementing these changes represents little additional cost or resources other than the time spent by City staff, its consultants, and Provincial Government personnel (where applicable), in order to incorporate the recommendations into the development and design of the program.
- The Vancouver PACE program is designed to use a consultant (or consultants) outside of government to handle the financial and administrative management of the program. Therefore the implementation and maintenance of the program will not impact the municipal operating or capital budgets.

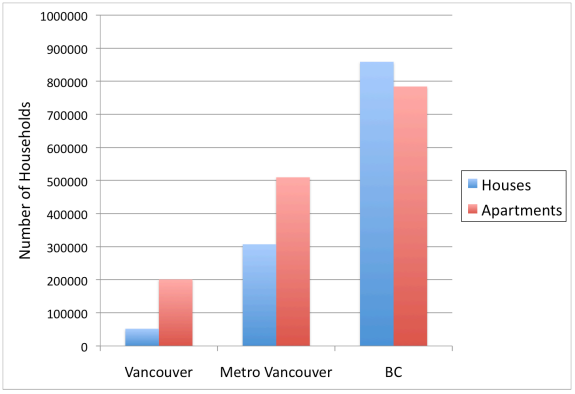
Summary Table: Stakeholders			
City of Vancouver	Financial Mechanism	Province of BC	Beneficiaries
• Sustainability Dept. • Mayor & Council • Financial Services • Business Planning • Legal Services	• Third Party Aggregator / Administrator (TBA) • Bondholders	• Climate Action Secretariat • Ministries of: Environment, Energy, Finance	• Property Owners • Contractors

a) Scale Up to Provincial Level

i) Larger Population

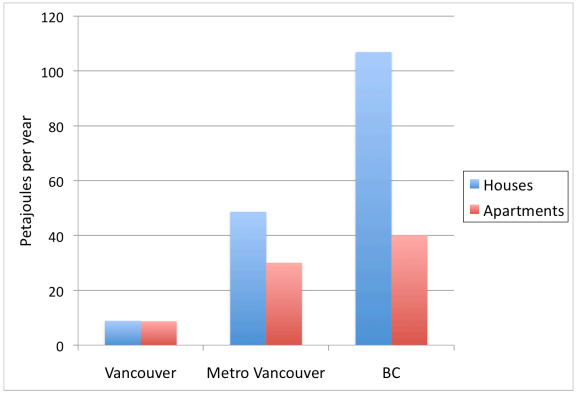
- Implementing a PACE program at the provincial level not only has the opportunity to reach more households, but also more PACE-eligible houses as Figure 8 shows that BC has a significantly greater ratio of houses to apartments than Vancouver. By capturing more houses, which use more energy than apartments, a provincial-wide PACE program has the capacity to impact a far greater amount of energy use and associated GHG emissions, than a municipal program, as illustrated in Figure 9.

Figure 8: Households by Dwelling Type



Source: Statistics Canada Census 2006 & BC Stats 2007 Vancouver and Metro Vancouver Inventory

Figure 9: Energy Use by Dwelling Type



Source: NRCan Comprehensive Energy Use Database 2008, Residential Sector, BC, Table: 34 & BC Stats 2007 Vancouver and Metro Vancouver Inventory

ii) Provincial Program More Attractive to Investors

- A provincial level program would have a greater pool of participants to draw upon. This makes the program more attractive to investors, thereby supporting the continued growth and financial capacity of the program.

Required Action

1) A first step or phase-in approach to demonstrate the feasibility of the program at the provincial level would be to scale the program up to the Metro Vancouver level. The governance structure already exists for this region, and other municipalities could use the Third Party Aggregator/Administrator that Vancouver establishes.

2) The City of Vancouver needs to establish a dialogue with Province and procure an agreement with the province to scale the program up if it is successful. This coordination of stakeholders will require the work of a dedicated member of Vancouver's Sustainability Department (who are developing the PACE program) or an outside consultant.

- Vancouver representatives in this dialogue could be David Ramslie, Head of the Sustainability Department, members of the Greenest City Action Team (GCAT), Councilor Andrea Reimer, and Mayor Gregor Robertson who have both had active involvement in the GCAT.
- Provincial representatives would be BC Climate Action Secretariat, which would be a good first point of contact to facilitate the subsequent involvement of the Ministries of Environment, Energy, and Finance.

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b) Financial Considerations

i) Reduce Costs Through Cross-Subsidization

- The provincial government could use revenue from the BC Carbon Tax to cross-subsidize the actual costs of energy efficiency upgrades, reducing the overall expense to consumers. Lower costs would generate more interest in the program and alleviate concerns that a PACE program does not make investments in efficiency more affordable.

ii) Business Models to Demonstrate Savings

- Business models need to be developed, which demonstrate that the savings accrued from efficiency upgrades will be greater than the repayment costs beginning from year one.

iii) Build in Capacity to Disburse Payments Up Front

- The business models should also include the administrative capacity to disburse payment for upgrades directly to contractors. Asking homeowners to pay for the upgrades up front and be reimbursed later, just gives another reason for people to hesitate about participating or decline the program altogether.
- One option for this would be to disburse funds to energy advisors/auditors, who could then pay the individual contractors directly.[34] Energy advisors/auditors are professionals who work for building consulting companies, are certified under the federal EnerGuide for Housing (EGH) Program, and currently provide energy efficiency audits and assessments for new and existing homes as part of the EGH, ecoEnergy, and LiveSmart BC programs.

Required Action

1) The City of Vancouver will need to work directly with its outside financial and administrative consultant (Third Party Aggregator/Administrator) to develop the business models that satisfy the aforementioned criteria.

2) The Third Party Aggregator/Administrator will need to explain the financing structure to the Provincial Ministry of Finance to demonstrate the low financial exposure to the Province and alleviate any concerns this ministry may have.

3) Municipal governments and the BC Climate Action Secretariat could champion the allocation of Carbon Tax revenue to subsidize energy efficiency upgrades, but ultimately this decision rests with the Ministry of Finance.

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[34] Energy Advisors/Auditors are already vetted and accredited by the Federal Office of Energy Efficiency, they have an established relationship with several of the contractors doing the work, they already handle the federal and provincial grant/rebate program applications for homeowners, and under the current structure they would be the ones submitting receipts to the PACE program on behalf of homeowners anyways.

c) Participation

i) Mandatory Policies

- Including mandatory policies would help ensure participation in the program.

  Mandatory Point-of-Sale Energy Upgrades – This policy could more than double the current expected participation rates,[35] by requiring that houses attain a minimum level EnerGuide rating and perform necessary upgrades before the house is sold. Once upgrades are performed and the EnerGuide rating is achieved, the house will receive an 'energy rating label' and any future sale of the house will not require a mandatory upgrade. This policy has been successfully implemented in San Francisco.

  Mandatory Energy Audits – This policy would serve to promote the program, educate property owners, and alleviate the uncertainty of savings vs costs.

ii) Develop Phase-In Strategy to Include Commercial Building Stock in the Program[36]

- Including commercial buildings in the program would allow the program to impact a significantly greater amount of energy use and GHG emissions.[37] However large amounts of capital (anywhere from $50K to $2 million) is required to fund efficiency upgrades of a commercial building. Therefore this component of the program will need to be phased-in once the program is established with a successful bond purchase program. The San Francisco PACE program is one model that successfully includes commercial buildings.

iii) Include Renewable Energy Upgrades in the Program

- Including renewable energy upgrades would also allow the program to impact a significantly greater amount of energy use and GHG emissions. Referring to

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[35] According to the Real Estate Board of Greater Vancouver, 4000 single detached homes were sold in Vancouver between Oct. 2009-Oct. 2010. While the number of households who participated in the federal ecoEnergy program in 2009 was 3000, according to the City of Vancouver Sustainability Department.

[36] For a comprehensive analysis of energy efficiency in commercial buildings see James Lin and Denise Young, "Energy Efficiency in Canadian Commercial Buildings: Evidence from 2000 and 2005," *Canadian Building Energy End-Use Data and Analysis Centre*, (2009), http://www.cbeedac.com/publications/index.html.

[37] Refer to Figure 7 and statistics on page 15. Commercial buildings account for 56% of the energy use by buildings in Vancouver and 51% of the city's GHG emissions.

Figure 5 (p. 8), space heating and water heating account for 79% of all energy use by the residential sector. And referring to Figure 6 (p. 8), 56% of all energy use by buildings in Vancouver is derived from fossil fuels. Therefore including renewable energy systems such as solar water heating and geothermal space heating systems,[38] as well as EV charging infrastructure,[39] would support the goals of reducing energy use and GHG emissions. The cost of including renewable energy systems in the PACE program is low insofar as this change should happen in the development and design phase of the program.

iv) Include a Marketing Campaign in the Business Model

- Educating and informing the public about the goals and potential benefits of a PACE program will be an essential component to a successful program. Appropriate funds need to be allocated for a marketing campaign.

Required Action

1) Implementing mandatory policies and including renewable energy systems is a bureaucratic and political decision within the City of Vancouver and their Sustainability Department, which is designing the program. The Greenest City Action Team should also be consulted to advise on these changes. Decision-makers would be advised to consider the successful policies operating in San Francisco as a reference and also consider the support for solar water heating systems and EV charging systems in the Vancouver building code.

2) The inclusion of commercial buildings in the program is a longer-term strategy. Large amounts of capital is required to fund the upgrade of a commercial building. Therefore the City of Vancouver or Provincial Government will need to work with the Third Party Aggregator/Administrator to develop a long-term plan to generate enough capital to fund a commercial project. Once again, San Francisco is a good model to study as they have included commercial buildings in their PACE program.

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[38] A report titled *Sustainable Energy Technology and Resource Assessment for Greater Vancouver* commissioned by the GVRD (now Metro Vancouver) in 2005, concluded that both solar and geothermal are viable energy systems for the Vancouver region.

[39] Given that the City of Vancouver's building code includes the mandatory installation of solar water heating and EV charging systems infrastructure in all new houses, then it would logically follow to support these upgrades in a retrofit of existing houses.

3) There are several local advertising agencies that work on social, political, and environmental campaigns. Cowie & Fox is one such company that has extensive experience in these areas and would be well suited to handle a PACE marketing campaign. As well, any PACE marketing strategy could dovetail with the existing Vancouver Greenest City 2020 campaign.

Conclusion

In the years ahead, our society will need to develop initiatives that maintain and indeed improve our quality of life, while simultaneously reducing humans' dependence on fossil fuels to generate energy. Increasing the energy efficiency of buildings where we work and live is a fundamental component to restructuring how we use energy, reducing our consumption of energy, and reducing GHG emissions. However, making these necessary upgrades is expensive, and the costs and benefits of implementing upgrades are often not fully understood by property owners. A PACE program is one tool that governments can use help facilitate energy efficiency upgrades in buildings. This policy has tremendous potential to gain traction in Vancouver, however its existing scope is limited and therefore it needs to be modified in order to increase its scale, better address financial issues by reducing costs, and increase participation to ensure its effectiveness. The recommendations made to modify Vancouver's PACE program represent little additional costs and are achievable through a concerted effort by stakeholders to design and develop the program with a view to a more comprehensive and effective policy. In assessing the PACE program through the lens of a Design Thinking approach, the program has the potential to be highly successful by giving property owners the tools to make positive changes, as well as the opportunity to actively participate in reducing energy consumption and GHG emissions in the activities of their daily lives.

Appendix 1: PACE Program Reference Case Comparison Chart

Location	Program Launched	Eligible Measures	Rate / Term / Max Amount	Local Government Staff	Who Processes Application	Results as of Aug. 2009 / May 2010-SF
Berkeley, California	November 2008	Solar PV (Pilot)	7.75% / 20 yrs / $37,500	1.25 FTE	Third party	38 Projects. Ave / $28K per $1M committed
Palm Desert, California	October 2008	Energy Efficiency, Solar Thermal, Solar PV	7 % / Up to 20 yrs / No Maximum	1.5 FTE	City staff	206 Projects. Ave / $36K per $7.5M committed
Boulder County, Colorado	April 2009	Energy Efficiency, Variety of Renewables	6.68 % / 15 yrs / $50,000	1-2 FTE	County staff with third party support	393 Projects. Ave / $19K per $7.5M committed
Babylon, New York	August 2008	Energy Efficiency, Solar Thermal, Solar PV	3% / Term Varies / $12,000	3 FTE	City staff	169 Projects. Ave / $7100 per $1.2M committed
San Francisco, California	April 2010	Energy Efficiency, Renewable Energy, Water Conservation, Electric Vehicle Chargers	7% / Up to 20 yrs / Residential Max $50,000. Commercial Max: None.	Unknown	Third party	37 Projects. Financing requested totaling $303,605

Sources: Merrian C. Fuller, Cathy Kunkel and Daniel M. Kammen, "Guide to Energy Efficiency & Renewable Energy Financing Districts for Local Governments" (2009) and Johanna Partin, "San Francisco's PACE Program: GreenFinanceSF" (2010).

Bibliography

Executive Summary

Prins, Gwyn. "The Hartwell Paper: A new direction for climate policy after the crash of 2009," *Institute for Science, Innovation and Society, University of Oxford & The London School of Economics* (2009). http://www.lse.ac.uk/collections/mackinderProgramme/theHartwellPaper/.

Brown, Tim. "Design Thinking." *Harvard business review*, (2008). http://www.hbr.org.

Background

BC Hydro. "BC Hydro Service Plan: 2010/11-2012/13." (2010). http://www.bchydro.com/etc/medialib/internet/documents/info/pdf/service_plan_2010_11_2012_13.Par.0001.File.

City of Vancouver. "2008 GHG emissions inventory summary and methodologies." (2009). http://vancouver.ca/sustainability/climate_protection.htm.

City of Vancouver. "Vancouver 2020: A Bright Green Future." (2010). http://vancouver.ca/greenestcity/.

Canada Mortgage and Housing Corporation. "The Effect of Improving the Home Environment on Asthma: A Pilot Study." (1998). https://www03.cmhc-schl.gc.ca/catalog/productDetail.cfm?lang=en&cat=123&itm=46&fr=1291671699634.

Clinch, J.P., and J.D. Healy. "Cost-benefit analysis of domestic energy efficiency." *Energy Policy, 29*, (2001): 113-124. http://www.cbeedac.com/search/literatureresultdetails.php?id=952

Partin, Johanna. "San Francisco's PACE Program: GreenFinanceSF." *City and County of San Francisco*, (2010). http://www.bcsea.org/get-involved/events/2010/07/07/pace-bonds-innovative-approach-to-energy-efficiency-financing.

Maruejols, Lucie and Denise Young. "Energy Use in Canadian Multi-Family Dwellings." *Canadian Building Energy End-Use Data and Analysis Centre*, (2010). http://www.cbeedac.com/publications/index.html.

Solar BC. "Solar in BC's Climate." (2010). http://www.solarbc.ca/learn/solar-in-bcs-climate.

Terasen Gas. "Terasen Gas 2010 Long Term Resource Plan." (2010). http://www.terasengas.com/_AboutUs/PlanningForFuture/default.htm.

Limitations of the Current Policies

Canada Mortgage and Housing Corporation. "Preliminary Housing Start Data," (2010). https://www03.cmhc-schl.gc.ca/catalog/productDetail.cfm?lang=en&cat=58&itm=1&fr=1291659617623

Maruejols, Lucie and David L. Ryan. "Generalizing Home Retrofit Program Results to Non-Participants." *Canadian Building Energy End-Use Data and Analysis Centre*, (2009). http://www.cbeedac.com/publications/index.html.

Ramslie, David. "Imagine 2020." *City of Vancouver Sustainability Department*. (2010). http://www.bcsea.org/get-involved/events/2010/07/07/pace-bonds-innovative-approach-to-energy-efficiency-financing

Statistics BC. "Vancouver City Updated 2007 Community Energy and Emissions Inventory." (2008). http://www.bcstats.gov.bc.ca/data/env/env_stat.asp

Verhulst, Glenys. "Tools for Improving Residential Energy Efficiency for Existing Homes in BC." *City Green Solutions*. http://www.bcsea.org/get-involved/events/2010/10/19/energy-solutions-webinar-energy-efficiency-residential-and-commercial-buildings.

Policy Options

Fuller, Merrian, Cathy Kunkel, and Daniel M. Kammen. "Guide to Energy Efficiency & Renewable Energy Financing Districts for Local Governments." *Renewable and Appropriate Energy Laboratory, University of California, Berkley*. (2009). http://vancouver.ca/greenestcity/

Policy Recommendations

City of Vancouver. "Climate Leadership." (2009). http://vancouver.ca/sustainability/climate_protection.htm

Compass Resource Management and MK Jaccard and Associates. "Sustainable Energy Technology and Resource Assessment for Greater Vancouver." (2005). http://www.metrovancouver.org/about/publications/Publications/regionalassessmentofsustainablespaceheating1.pdf

Lin, James, and Denise Young. "Energy Efficiency in Canadian Commercial Buildings: Evidence from 2000 and 2005." *Canadian Building Energy End-Use Data and Analysis Centre*, (2009). http://www.cbeedac.com/publications/index.html.

Natural Resources Canada. "Comprehensive Energy Use Database 2008, Residential Sector, BC." (2008). http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/trends_res_bc.cfm

Statistics Canada. "Census Data." (2006). http://vancouver.ca/commsvcs/planning/census/2006/index.htm