
**Promoting Energy Efficiency Retrofits for Multiple Unit Residential
Buildings: A review of the effectiveness of alternative approaches**

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EXECUTIVE SUMMARY

INTRODUCTION AND BACKGROUND

This report explores methods and implementation approaches to facilitate energy efficiency retrofit (EER) programs in the multiple unit residential building (MURB) sector in British Columbia (BC). An EER is an alteration or set of alterations to an existing structure to improve building performance, resulting in a reduction in energy consumption. The report summarizes the barriers to implementing EER projects in the MURB sector and provides recommendations aimed at improving market penetration of EER projects.

Climate change is one of the most serious challenges human beings face and the reduction of greenhouse gases (GHGs) plays a critical role in the mitigation of climate change. The energy used to heat, cool, and power buildings in BC communities accounts for 29% of energy consumption and 12% of GHG emissions in the province, over half of which is attributable to residential buildings. Therefore, improving the environmental performance of MURBs should be a significant component of the climate change mitigation agenda.

The specific research objectives were as follows:

- To build an inventory of EER project financing and implementation approaches for MURBs;
- To identify, to the degree possible based on the information available, the strengths and weaknesses of EER project financing and implementation policies and models;
- To determine the appropriate degree and manner of government intervention in maximizing EER uptake in the MURB sector based on an observed need for public sector leadership (if any); and
- To present recommendations and suggest areas for further research regarding smart practices for policies and programs to optimize market penetration of EER projects in the BC MURB sector.

METHODOLOGY AND CONCEPTUAL FRAMEWORK

The methodology consists of two main components: a literature review and a jurisdictional scan of public programs and policies. The literature review identifies the array of EER implementation approaches and synthesizes the academic and grey literature on EE policies, financing approaches, implementation models, and implementation barriers. The jurisdictional scan included a web-based scan of jurisdictions in BC, across Canada, the US and Europe, and includes two case studies of actual EER projects implemented in MURBs.

The conceptual framework for the research considers the interaction among the key constructs that drive decision-making with respect to EER projects in MURBs. These key factors are the various EER implementation approaches and implementation barriers that influence decisions to invest in EER. The research was guided by the need to understand the range of implementation tools

available to facilitate investment in EER project opportunities and the barriers to implementation to develop an understanding of the decision-making environment.

LITERATURE REVIEW

There is a body of academic and grey literature that describes the array of implementation approaches for energy efficiency (EE) projects as well as barriers to project implementation. Private sector mechanisms for implementing EER projects include performance contracting tools, including energy services companies (ESCOs) and energy service performance agreements (ESPAs), which utilize industry expertise and performance guarantees to manage EER investment risk. Other private sector offerings include on-bill financing, usually provided through utility companies, and energy efficiency mortgages. A common theme found in the private sector tools is that the financial payments made by the owner toward the investment are typically equal to or less than the savings realized from the increased energy efficiency.

An important public sector implementation tool is property assessed clean energy (PACE) financing, which is commonly found in the US, but less so in Canada. PACE financing programs enable municipalities to finance the full cost of energy efficiency retrofits on private property under an arrangement where the loan is paid back by the property owner through an annual assessment on the property tax bill. Many of the public sector interventions are incentive based including grants, tax credits, and other types of tax-based incentives.

The literature review revealed important themes with respect to implementing EER projects in MURBs. There are particular challenges associated with implementing EER projects in condominium buildings, which is a significant finding since about 25% of BC's housing market is made up of strata units. Differing motivations and degrees of understanding of EER within condominium ownership groups is a challenging factor in condominium ownership.

Market barriers are well documented in the literature. The principal-agent problem is documented as a barrier to EER investment in the MURB sector. In the context of rental apartment MURBs, neither owners nor tenants are motivated to invest in EER, which stands in contrast to an owner-occupant of a building who would be more inclined to make EE investments. In circumstances where tenants are responsible for paying monthly utility bills, landlords lack incentive to invest in EE. Tenants themselves are reluctant to do so since future residents may actually enjoy the benefits rather than the tenant who made the investment.

Financial barriers were found to be significant factors in suppressing demand for EER projects in the literature, including a lack of appropriate financing approaches. Economic barriers that were included in the literature include overall economic conditions and energy prices relative to EER investment.

JURISDICTIONAL SCAN

A scan of federal government programs reveals a mainly incentive-based approach to encouraging EER in Canada; however, the approach has been uneven and inconsistent over time. There has also been a lack of focus on the MURB sector in programs delivered by the federal government. Programs delivered at provincial and territorial levels vary across Canada, with some jurisdictions

setting up special agencies or offices charged with implementing energy efficiency programming, and others with no EER programming in place at all.

European governments show a more coordinated and structured approach to EER generally, including the use of structural and revolving loan funds in some cases. Much of the EE programming in Europe is managed through the European Union. In the US, the Office of Energy Efficiency and Renewable Energy manages the delivery of funding into locally and state managed EE programming. The five most populated states in the US were searched, revealing that PACE, on-bill financing, and low interest loan programs are popular implementation approaches in these US jurisdictions.

RECOMMENDATIONS

Policy/Programming Recommendations

1. The BC government should institute a long term program aimed at improving the energy efficiency of the three distinct segments of MURB sector.
2. The BC government should create the framework for a regulated EER program for MURBs in the province with a focus on building performance.
3. The BC government should develop a program, and if necessary, enabling legislation, to enable the administration of LIC (PACE) programs at the local government level for EER projects in MURBs.
4. Policy development regarding EER in British Columbia should have a particular focus on the MURB sector and should be staged to achieve substantive results as early on as possible.
5. The federal government should be lobbied to provide tax credits to encourage private investment in MURB EER projects.
6. The BC government should amend the Strata Property Act to require assessment of EER opportunities, and support this requirement with a program to provide independent advice and analysis to condo owners with respect to EER.

Pilot Project Recommendations

7. A pilot program should be established in BC targeting a select number of large multi-family residential buildings using an ESPA framework.
8. Performance measures and program outcomes should be established for the pilot program.

Recommendations for Further Research

9. The TAF's TowerWise program should be closely monitored as implementation proceeds.
10. The BC government should consider building an inventory of MURBs for specific urban communities in BC with which to construct an up to date profile of MURB building stock in the province.
11. Further research should be carried out with respect the influence of price signaling as an impediment to EER investment in MURBs in BC.
12. Consideration should be given to surveying a sample of the MURB owners and/or managers in BC to gain a better understanding of the factors limiting EER investment in the MURB sector and the EER program elements that they would find most valuable.
13. The BC government should take a more proactive role in providing access to a centralized resource to local governments and MURB owners/managers.
14. The BC government should consider leading the establishment of a province-wide support structure similar to the Federation of Rental Housing Providers of Ontario.

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1 INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

This report explores methods and implementation approaches to facilitate energy efficiency retrofit (EER) programs in the multiple unit residential building (MURB) sector in British Columbia (BC). An EER is an alteration or set of alterations to an existing structure to improve building performance, resulting in a reduction in energy consumption. The report summarizes the results of research to identify the barriers to implementing EER projects in the MURB sector, draws conclusions, and makes recommendations aimed at improving market penetration of EER projects.

The research considered the public policy environment in BC and the drivers and impediments to private investment in EER projects. The specific research objectives were as follows:

- To build an inventory of EER project financing and implementation approaches for MURBs;
- To identify, to the degree possible based on the information available, the strengths and weaknesses of EER project financing and implementation policies and models, including determining the circumstances in which some policies and models may be more appropriate than others;
- To determine the appropriate degree and manner of government intervention in maximizing EER uptake in the MURB sector based on an observed need for public sector leadership (if any); and
- To present recommendations and suggest areas for further research regarding smart practices for policies and programs to optimize market penetration of EER projects in the BC MURB sector, given BC's specific circumstances.

For the purposes of the research, MURBs were considered to include apartment buildings containing four units or more, as well as attached row housing, regardless of the type of ownership tenure. It does not include duplexes, semi-detached housing, secondary suites, or garden suites. Three distinct classes of MURBs are identified as it is possible that some barriers to investment in EER are more relevant to some types of MURBs than others. The three classes are condominiums, rental apartments, and co-op housing.

1.2 BACKGROUND

GLOBAL AND NATIONAL CONTEXT

In its 2013 World Outlook, the International Energy Agency reports that two-thirds of the economic potential of energy efficiency remains untapped (International Energy Agency, 2013, p. 3). The global opportunity to both reduce greenhouse gas (GHG) emissions and save money through greater energy efficiency is well documented (Sweatman and Managan, 2010, p. V). From the Canadian perspective, the federal government reports that Canada has improved energy efficiency between 1990 and 2010 by 25%. But there remains a significant amount of untapped potential that could be accessed by unlocking further

energy efficiency improvements. The country has significant heating and cooling requirements and energy costs in Canada are relatively low, which works against efforts to improve energy efficiency (Government of Canada, 2013, p. 2).

It is necessary to find opportunities to reduce carbon emissions to curb the progression of climate change, which is a concern of global proportions. The effects of climate change are felt worldwide, but many of the policies and programs required to abate the advance of climate change are powered by decision-making from local to the international levels. Three of the known forces that contribute to the growing rate of human-caused carbon emissions and resulting climate change are public policy (or lack thereof), individual decision-making, and land use change (Intergovernmental Panel on Climate Change, 2014, p. 113). Global annual GHG emissions have reached an all-time historical high of 49.5 billion tonnes of carbon dioxide equivalent (CO₂e). A projection of current CO₂e emission trends into the future is expected to result in increases in global temperatures well beyond the commonly identified goal of 1.5 to 2 degrees C above pre-industrial temperatures. Current models suggest that limiting the increase to 1.5 is so challenging that the scenario is not commonly modelled anymore (Intergovernmental Panel on Climate Change, 2014, pp. 113 – 4). Significant reductions in observed GHG emissions will require a combination of factors, including government intervention, technological advancements, and changes to individual behaviour in order to reduce reliance on conventional energy sources (Intergovernmental Panel on Climate Change, 2014, p. 114). To provide context, global GHG emissions increased overall by 75% between 1970 and 2014 (Intergovernmental Panel on Climate Change, 2014, p. 125).

The Intergovernmental Panel on Climate Change (IPCC) states that “[c]limate change is definitely one of the most serious challenges human beings face” (Intergovernmental Panel on Climate Change, 2014, p. 137). Reduction of GHGs plays a critical role in the mitigation of climate change and is a matter of societal concern. Given that the energy used to heat, cool, and power buildings in BC communities accounts for 29% of energy consumption and 12% of GHG emissions in the province (Berkhout, 2015, p.4), over half of which is attributable to residential buildings (Government of British Columbia, 2008a, p. 36), improving the environmental performance of MURBs should be a significant component of the climate change mitigation agenda.

The research objectives are relevant to the identified need to curb climate change. Whereas buildings are significant consumers of energy, and therefore producers of GHGs, they are contributing to climate change. By researching the financing and implementation approaches for MURBs and analyzing the strengths and weaknesses of each, opportunities to increase EER investment in BC, and reduce the province’s GHG emissions, can be considered. Consideration of the appropriate degree and manner of government intervention introduces a public policy perspective into the analysis and identifies opportunities for the BC government to institute programs that contribute directly to climate change mitigation.

CLIENT

The client for this research project is the BC Sustainable Energy Association (BCSEA). The BCSEA is engaged in “on-the-ground” projects as part of its programming (BC Sustainable Energy Association, 2012, p. 2). The BCSEA believes there is unrealized potential for the EER market in the MURB sector in

BC and would like to explore the reasons for underperformance, as well as opportunities to improve performance in the BC market.

Launched in 2004, the BCSEA is a non-profit society registered in the province of British Columbia concerned with the sustainable production and use of energy. The mission of the organization is to “[empower] British Columbians to build a clean, sustainable energy future” (BC Sustainable Energy Association, 2013, p. 4). This mission is delivered through the development of policies, building partnerships with various levels of government, and educational programming. These activities are intended to help British Columbia become a world leader in the use of sustainable energy (BC Sustainable Energy Association, 2013, p. 4). The BCSEA takes on an advocacy role through its regional chapters and hundreds of provincial members.

The BCSEA is based out of Vancouver and is governed by a volunteer Board of Directors elected annually by its membership. The organization has a staff of eight, including an Executive Director & CEO, Policy Director, Communication Director (client and key contact for this project), Chief Financial Officer, Program Manager, Project Assistant, Webinar Coordinator, and an Administrator (BC Sustainable Energy Association, 2015[a], BCSEA Profiles Section). The BCSEA runs formal projects, often funded by partner organizations, that help build a sustainable energy future for BC.

EER OPPORTUNITIES AND CHALLENGES FOR MURBS

Technologies related to residential building construction have advanced over the years resulting in greater opportunities for energy efficiency. The National Building Code and provincial codes are updated frequently to require greater energy efficiency in new buildings; however, older buildings were built in accordance with the rules in existence at the time they were constructed. Therefore, many opportunities exist for EER projects in MURBs built in BC under earlier versions of the BC Building Code.

Improved energy efficiency of buildings results in financial benefits and better environmental performance, including reduced pollution and GHG emissions. For example, the New York State Energy Research and Development Authority (NYSERDA) states that the MURB sector could save \$3.4 billion annually if it participated in quality energy efficiency planning (NYSERDA, 2015[a], para. 1). The amount of investment required to reach this target is unspecified.

Buildings are significant consumers of energy. The Toronto Atmospheric Fund (TAF) reports that “the built environment contributes approximately 50% of the City of Toronto’s greenhouse gas emissions” (Toronto Atmospheric Fund, 2015[a], para. 3). The MURB sector in BC presents a significant opportunity to improve building performance and reduce GHG emissions in the province. The MURB sector is growing in BC, now comprising 31% of the BC housing stock. This number is nearly double in the City of Vancouver at 60% (Samimi and Shoaieoskouei, 2013, p. 1). Low performing buildings can consume up to five times more energy per unit of floor area than high performing building in the same class (Toronto Atmospheric Fund, 2015 [a], para. 4). While the large MURB sector in BC presents an opportunity for improved energy performance, ownership models and strata governance often give rise to impediments to investment in EER projects (N. Protter, personal communication, April 11, 2014).

A variety of policies and implementation approaches exist to facilitate investment in EER projects, including performance contracting approaches, incentive-based approaches, and property assessment-based financing. There are also known barriers to implementing EER projects in MURBs. These barriers vary in degree and impact. A review and analysis of implementation approaches will help inform understanding of the observed underperformance of the EER market and the consideration of means to improve market uptake in the MURB sector.

1.3 ORGANIZATION OF REPORT

The remainder of this report consists of the following sections:

- Section 2 discusses the methods used to collect information to support the analysis and conclusions outlined in the report. It also describes the conceptual framework for the research and describes the limitations and delimitations of the research.
- Section 3 includes a literature review consisting of a description of the private sector implementation mechanisms and public sector interventions, followed by an overview of the academic and grey literature that exists with respect to implementing EER projects. The literature review identifies opportunities and challenges related to EER implementation.
- Section 4 provides a detailed jurisdictional scan and overview of the policy environment in BC, Canada, the United States, and internationally, including two case studies outlining the key outcomes from EER projects involving MURBs.
- Section 5 includes a discussion of relevant information gathered in relation to the subject matter, including an identification of possible new initiatives with a view toward growing the EER market for the MURB sector in BC.
- Section 6 provides recommendations for preferred implementation approaches based on the information gathered and analysis, and suggestions for further research and analysis in specific areas.
- Section 7 concludes with a recap of the work carried out and an overview of the recommendations.

2 METHODOLOGY AND CONCEPTUAL FRAMEWORK

2.1 METHODOLOGY

The methodology consists of two main components:

First, a literature review was carried out. The first part of the literature review includes an identification of the array of EER implementation approaches found through the research. These tools have been categorized into private sector mechanisms and public sector interventions. The second part of the literature review is a comprehensive review of the academic and grey literature on energy efficiency (EE) policies, financing approaches, implementation models, and implementation barriers. The literature review helps define the starting point for this research so the study can build on the existing literature. The literature review was approached from the standpoint of reviewing research that has been conducted with respect to EER financing and implementation approaches, degrees of success and documented barriers. This review indicates what is already known about the subject and what avenues require further research. Literature from within and outside of Canada was reviewed in order to take advantage of knowledge accumulated around the world.

The web search parameters for the literature review involved the use of the key phrases “energy efficiency” and “energy efficiency retrofit” using both Google and the University of Victoria online libraries. In addition, keywords were searched through Google for a number of implementation approaches that were identified by the client, including “energy services companies”, energy service performance agreement”, “energy concierge”, “property assessed clean energy”, and “on-bill financing.” The term “principal agent problem” was also searched through Google as this was a specific concern identified by the client. The articles and other publications found through the web search were reviewed for information pertaining to implementation approaches, including their strengths and weaknesses and details related to how they are applied. The information was also reviewed for details related to implementation barriers.

Second, a jurisdictional scan of government programs and policies was carried out. The scan identifies existing policies and models and provides information on the current policy environment in BC, Canada, and beyond with respect to government support for EER projects in the MURB sector. The jurisdictional scan begins with a focus on programs delivered by the federal government in Canada, and then provides an overview of programs and policies in each province and territory, followed by a focus on local government in British Columbia. The scan concludes with an overview of programs and experiences outside of Canada, beginning with Europe, followed by the United States. Information that does not apply directly to MURBs, but may still be relevant to the analysis has been included in Appendix A.

The jurisdictional scan was carried out by conducting a web search of each jurisdiction scanned. A general scan of each website was carried out to locate the programming related to energy policy, energy efficiency and/or climate change mitigation, if any existed. This was done by manually navigating through the pages of the website. The website for each jurisdiction was also searched using the built in search function using the keywords “energy efficiency”. The information found through the jurisdictional

scan was reviewed to determine its applicability to MURBs so it could be summarized in the appropriate section of the paper.

The jurisdictional scan is supplemented by two case studies describing actual experiences related to EER projects implemented in MURBs. The case studies provide background information, financial details related to returns on investment, keys to success and project outcomes. Information from actual MURB EER projects improves overall understanding of the opportunities and challenges associated with implementing EER projects and may help to inform recommendations regarding policies and programs.

2.2 CONCEPTUAL FRAMEWORK

The conceptual framework for this research is adapted from the conceptual framework developed by the Neighbourhood Change Research Partnership at the University of Toronto (U of T). The U of T framework shows the major factors affecting neighbourhood change, depicts how they are related, and shows the connections between them and the research questions pertaining to a project being undertaken by the Partnership (Neighbourhood Change Research Partnership, 2015). The conceptual framework that has been adapted from the U of T's model is shown below in Figure 1.

The behaviour of the EER investment market in the MURB sector is shaped in part by the level of understanding and knowledge of MURB owners and managers (Box 1) and the economic climate that drives the amount of investment capital available for EER projects (Box 2). These are shown in the model as external factors that act on the key constructs to affect spending decisions and restrict investment in the EER market in the MURB sector. There is risk, both real and perceived, in EER investment. The amount of risk assumed by a MURB owner or manager is partly a function of the implementation approach used and the guarantees and safeguards built into the particular program. The external factors shown in Boxes 1 and 2 are subject to influence and may change over time.

The large centre portion of the model, Box 3, depicts the EER decision-making environment. Boxes 4, 5, and 6 are the key constructs of the model. These are the variables that interrelate and directly influence decision-making about specific EER investment opportunities and were the main focus of this research. Box 4 includes an array of implementation approaches for EER projects, such as energy services companies (ESCO), energy service performance agreements (ESPA), and property assessed clean energy financing (PACE). Box 5 includes the many impediments that restrict investment in EER projects. A key impediment may be the principal-agent problem. The Toronto Atmospheric Fund lists other barriers to EER, including long payback periods to recover investment; lack of understanding of, and confidence in, energy efficiency technologies; and a lack of policy-based sticks and carrots to increase investment in EER (Toronto Atmospheric Fund, 2015[a], para. 7). Box 6 represents the variety of programs and policies, including rebate programs, low-interest and zero-interest loans, and publicly backed loan guarantees. Policies and programs need to grow and evolve in order to support growth in the EER investment market and defining the role of government with this need in mind is an important component of the research.

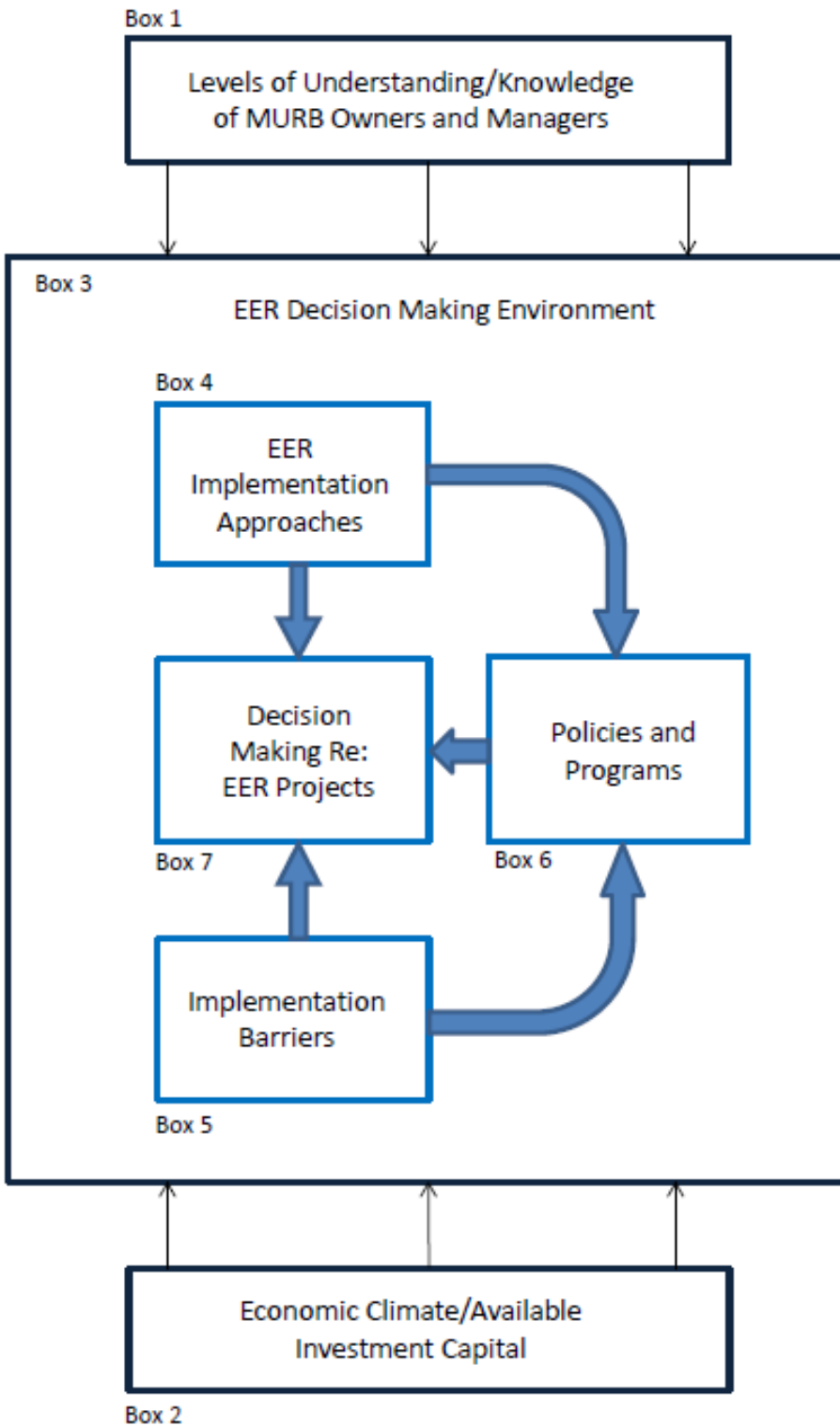


FIGURE 1 – CONCEPTUAL FRAMEWORK

The available EER implementation approaches (Box 4) and the implementation barriers (Box 5) act on decision-makers and impact the amount of investment in energy efficiency projects in MURBs. The options included in the array of implementation approaches provide choices that vary in complexity, risk exposure and financial certainty. They act as portals into the EER market, which would be difficult for MURB owners and managers to access otherwise. The implementation barriers (Box 5) act against the implementation tools and restrict uptake in the EER market. Boxes 4 and 5 also act on programs and policies, both publicly and privately delivered (Box 6), to drive the delivery of programs that are accessible, affordable and provide reasonable levels of assurance respecting returns on investment.

Boxes 4, 5, and 6 directly impact what Box 7 looks like. These factors converge to define the decision-making environment with respect to EER investment. Therefore, the research was guided by the need to understand the range of implementation tools available to facilitate investment in EER projects to improve the energy efficiency of the MURB building stock. The research also focused on defining the barriers to implementation to develop an understanding of the decision-making environment, in particular the factors that impede investment in EER. The research leads to conclusions and recommendations relating to the role of government and the content of public policies and programs with the goal of creating a stable and accessible investment environment for the EER market.

2.3 LIMITATIONS AND DELIMITATIONS

In consideration of the extensive academic and grey literature available on the subject of EER, reliance on expert interviews was considered and was felt to be unnecessary to complete the research. The conclusions and recommendations are informed by the information gathered through the literature review as well as a jurisdictional scan of Canadian, U.S., and European jurisdictions. Expert interviews could provide additional information related to actual EER project experience, further informing analysis related to implementation approaches and market barriers.

There are inherent weaknesses associated with relying on internet content for information pertaining to government programming. The information found through the jurisdictional scan represents a snapshot in time and can become out of date relatively quickly. Also, it is often difficult to determine if the website content is up to date and representative of ongoing public programming.

Due to time constraints, not all relevant jurisdictions could be effectively scanned for EER programming pertaining to MURBs. For example, while the project has a particular focus on the province of British Columbia, it was not practical to scan all municipalities and regional districts in the province for examples of EER programming. Rather, 12 local governments from across the province were chosen and scanned with the aim of representing the most populated areas of the province. Similarly, while it was important to represent the United States in the jurisdictional scan, it was not practical to scan all 50 states. To deal with this problem, the five most populated states in the US, along with the federal government, were scanned and are represented in the paper.

The discussion and recommendations presented in the paper do not deal extensively with matters that require deep regulatory changes by government or that require one level of government to regulate the actions of another. While some discussion of regulation is provided, it is dealt with in a conceptual way

since regulatory reform is considered to be out of scope for the project. The focus of this paper is generally on policies and programs, consistent with the research objective of identifying the appropriate degree and manner of government intervention in implementing EER for MURBs.

The information provided in the jurisdictional scan pertains to programs available to MURB owners and managers. In many instances, it is difficult to determine from the information available in relation to some programs whether they are intended for MURBs or not. Some program descriptions state eligibility requirements and restrictions explicitly while others do not. It is necessary to make assumptions as to the applicability of some programs to MURBs based on the information available; consequently, some programs described in the scan may not be applicable to MURBs. Interviews with program administrators could have helped provide clarity regarding applicability to MURBs; however, this was not practical due to time constraints.

3 LITERATURE REVIEW

This section is an overview of EER implementation approaches provided by both the public and private sectors. The approaches vary in complexity and degree of risk exposure to building and unit owners. Further, there is geographical variation in where some tools are used over others. This variation can be driven by the level of understanding of the different approaches by building owners and managers and by variations in the regulatory support required to enable the use of certain instruments in specific jurisdictions.

Private sector mechanisms are distinguished from public sector interventions to facilitate an analysis of government programs separate from that of private sector offerings. A discussion of strengths and weaknesses is provided when practical to help inform the analysis of which mechanisms would be appropriate for consideration of further development and advancement in the province of BC.

Following the description of the implementation approaches is a synthesis of opportunities and challenges taken from the academic and grey literature on implementation approaches for EER projects for MURBs and implementation barriers. This information satisfies one of the key research objectives identified for this project, which is to build an inventory of EER financing and implementation approaches for MURBs. Table 2 is presented at the end of Section 4 that compares and contrasts the characteristics of each model.

3.1 PRIVATE SECTOR IMPLEMENTATION MECHANISMS

The following is a description of each of the financing and implementation mechanisms generally offered by the private sector¹. The information below is provided in no particular order.

3.1.1 ENERGY SERVICES COMPANIES (ESCOs)

An ESCO is an independent company that performs an analysis of a building to determine the improvements that will maximize energy savings. A common approach is that the ESCO installs, maintains and finances energy efficiency measures, pays the utility bills on behalf of the building owner and keeps some or all of the savings as profit (N. Protter, personal communication, April 11, 2014). Projects are usually financed by the ESCO over a five to ten year period (Vine, 2005, p. 691).

There are variations on how the ESCO model is applied. Another arrangement is that the building owner is put on a monthly payment plan to pay for the retrofitted equipment. The financing is structured so the payments are less than the monthly savings realized from the reduced energy demand, creating a positive cash flow for the owner. Energy savings can be verified using digital meter readings. There is usually no upfront capital or financing required by the owner, who at the end of the contract retains the benefit of the energy efficiency measures (ESCO, 2014). In the event that the guaranteed energy savings are not achieved, the ESCO is obligated to compensate the lessee for any shortfalls (Clinton Climate Initiative, 2009, p. 6).

¹ While many if not all of the programs or mechanisms described in this subsection could in theory be offered by the public sector, they are predominantly found in the private sector.

The ESCO model can be based on a “shared savings contract” in which the ESCO finances the project from its own funds or through debt wherein the ESCO assumes performance as well as credit risk. Alternatively it can be a “guaranteed savings contract” in which the customer finances the project by borrowing funds. Financing may be arranged by the ESCO but the financing contract is between the customer and the lender (i.e., the ESCO only takes the performance risk by guaranteeing the energy savings while the credit risk is assumed by the owner) (Painuly et al, 2003, p. 662).

ESCOs are seen as an important vehicle for promoting energy efficiency in buildings around the world, particularly in countries where privatization of utilities is occurring (Vine, 2005, p. 691).

3.1.2 ENERGY SERVICE PERFORMANCE AGREEMENTS (ESPAS)

An energy service performance agreement is a financing agreement between a financing entity and a building owner that facilitates investment in EER projects. The agreement includes a contractual arrangement with an engineering firm that prepares an energy audit and engineering plan and determines energy savings that are guaranteed through a special insurance policy. The financing entity purchases and owns the equipment for the life of the contract term. Examples of ESPAs are the Retrofit BC program formerly being investigated by the BC Sustainable Energy Association and the TowerWise program being delivered by the Toronto Atmospheric Fund. In the Retrofit BC program the building owner would repay the cost of the equipment to Retrofit BC by transferring some or all of its energy savings for the term of the contract. The ownership arrangement for the equipment would be like an equipment lease wherein the owner enjoys the benefit of enhanced performance during the project and takes ownership of all assets upon conclusion of the project (Protter, 2014, pp. 4-5).

A key benefit of an ESPA is that it enables building owners to substantially reduce, or even eliminate, their risk associated with the performance of the EER project. The risk is assumed by the financing entity, but it is managed through the application of engineering expertise and performance is guaranteed through a special insurance policy. In the case of the Toronto Atmospheric Fund TowerWise program, the funding to support the ESPA model is publicly underwritten.

3.1.3 ON-BILL FINANCING

Under this arrangement a utility company finances energy efficiency investments and recoups its costs through the customer’s utility bill. In order to qualify, the value of anticipated energy savings, as determined through an energy audit, must equal or exceed the on-bill loan payments. The loans are usually administered and financed entirely by the utility company, who also assumes the repayment risk. A variation on this model that has recently been receiving some attention involves an outside lender, such as a financial institution, funding the on-bill loans while the utility provides some administrative functions related to the financing (Natural Resources Defense Council, 2013).

3.1.4 PRIVATELY SECURED DEBT

The capital to finance a retrofit can be obtained through debt by the owner from a financing institution. The debt may be supplemented by private equity supplied by the owner and may be secured through a utility provider. Low-interest or zero-interest loans for energy efficiency retrofits are a common demand-side management (DSM) practice for electric utilities. A downside to private debt is that the owner's debt capacity is reduced and a significant down payment is often required (Rocky Mountain Institute, 2015).

3.1.5 OWNER FINANCING

This option involves self-financing the costs of the retrofit with private equity. Provided the required amount of capital is available, this is a financially beneficial option as it avoids financing costs (interest and administrative costs) but is still subject to the opportunity cost of the investment and associated net present value considerations. A key benefit is that it avoids lost energy cost savings foregone while waiting for external funding to be finalized (Clinton Climate Initiative, 2009, p. 2).

3.1.6 ENERGY IMPROVEMENT MORTGAGES

An energy improvement mortgage is a type of mortgage financing that is applicable specifically to retrofits to an existing home rather than to financing a new home. Homeowners can finance retrofits to their home through their mortgage and keep their monthly payments the same or close to the same, as programs offer extended financing terms. The energy improvement mortgage is appropriate for homeowners who are less able to withstand higher monthly payments, who plan to sell their home before payoff, or who wish to carry out large projects that require more time to pay back (Vermont State Employees Credit Union, 2014[a], paras. 1-2).

3.1.7 USE OF A CONCIERGE

An energy concierge service is used to facilitate participation in energy efficiency projects by helping building owners engage in available programs. Such a service provides a single point of contact to help owners deal with the myriad of rules, requirements, procedures, programs, etc. in order to streamline access to programs (Sightline Institute, 2010). The concierge can also lead engagement and education with building owners and tenants (Abbott, 2009, p. 18).

3.1.8 POOLED PROCUREMENT

Public or private entities can join forces and purchase energy efficiency products or services in new or renovated buildings (Rezessy and Bertoldi, 2010, p. 20). Purchasing equipment in higher quantities can result in price reductions from vendors.

3.1.9 CARBON CREDIT/CARBON OFFSETS

A carbon credit is the generic term for any tradable certificate representing the right to emit a unit of CO₂ equivalent (CO₂e). Carbon credits place a value on a unit of carbon emission and credits can be bought or sold in an open market. Credits can be sold by individuals or organizations that reduce their net carbon emissions and purchased by those who wish to offset their emissions. Carbon offsets are bought and sold

through a number of international brokers, online retailers and trading platforms (David Suzuki Foundation, n.d.).

Building owners and managers wishing to undertake EER projects may engage in the carbon credit market and sell the credits derived from the project in order to offset the capital expenditure requirement for the project. This is sometimes referred to as “carbon finance”. Verified carbon funds will purchase emission reductions similar to a commercial transaction once they have been confirmed by a third party auditor, although revenues realized from such transactions are likely to only have a marginal impact on a EER project bottom line (Rezessy and Bertoldi, 2010, pp. 20-1).

3.1.10 REVOLVING FUNDS

A revolving fund is a self-sustaining financing scheme that requires a one-time initial investment. Revolving funds support specific activities that are clearly defined by the investors and owners of the fund. A fund that supports EER activities would accumulate savings from EER projects to regenerate income for financing of additional projects. If managed properly, the fund accumulates adequate savings over time, thereby sustaining future financing.

The advantage of a revolving fund is that it does not depend fully on external investors or on a government’s credit rating. If operated effectively, a revolving fund can contribute to a permanent financing structure for energy efficiency investments that is separate from political influence. Disadvantages for using revolving funds for EE projects are that they require substantial upfront investment and can be cumbersome and expensive to administer (InoFin, 2008, pp. 41-2).

3.2 PUBLIC SECTOR INTERVENTIONS

A variety of public policy interventions have been introduced by governments. The types of instruments vary by jurisdiction and they are mainly designed to provide direct financial assistance to lessen the cost of investments in EER projects.

3.2.1 PROPERTY ASSESSED CLEAN ENERGY (PACE) FINANCING

PACE programs enable municipalities to finance the full cost of energy efficiency retrofits on private property under an arrangement where the loan is paid back by the property owner through an annual assessment on the property tax bill. PACE can be used to finance a wide range of EE improvements, including lighting, heating & cooling, insulation, water pumps and alternative energy equipment. The local PACE program administrators will generally assist owners in finding appropriate contractors to assess the owners EE needs and undertake the necessary improvements. The repayment schedule can run as long as 20 years and the financing runs with the property such that if the property is sold the repayment obligation transfers to the new owner. The program is intended to have repayment amounts that are equal to or less than the savings realized from reduced energy demand (PACENow, 2014). PACE is attractive to property owners in that it can be financed over a long period of time, making for low payments and creating a positive cash flow.

This financing model is common in the US; however, inconsistent enabling legislation has prevented this approach from being implemented widely in Canada to date (Hamilton, 2013a, para. 1 under “Canada

wakes up”). The use of PACE requires enabling legislation that allows municipalities to administer such a program through a property assessment approach. The province of Ontario has recently revised its regulations related to local improvement charges (LICs) to enable municipalities to administer PACE programs for residents. The City of Toronto is considering a pilot program for up to 1,000 single family homes and 10 multi-unit residential buildings (Hamilton, 2013b, paras. 1, 3 and 4).

Using LICs to finance EER projects in Canadian Provinces and Territories has been contemplated in the past and was considered by the Pembina Institute to be worthy of further research, including conducting pilot projects in selected municipalities across the country (Pembina Institute, 2004, pp. 17 – 8).

3.2.2 PUBLICLY SPONSORED DEBT

Many state and local governments in the US offer low-interest, fixed-interest, or sometimes zero-interest loans for a broad range of renewable energy and energy efficiency measures. These programs are commonly available to the residential, commercial, industrial, transportation, public and/or non-profit sectors (DSIRE, 2015[a]). Unsecured home improvement loans, both publicly and privately funded, are available in the US for single family home owners wishing to undertake energy efficiency upgrades. For example, the Pennsylvania sponsored and publicly subsidized “HELP” program is designed to enable homeowners to pay back a loan using the energy cost savings realized from the project (Amram et al, 2010, p. 23).

3.2.3 PUBLIC SECTOR INCENTIVES

3.2.3.1 TAX CREDITS

The US government offers tax credits for the installation of energy efficiency equipment such as solar ready heat pumps and air conditioners; however, programming is mostly geared for single family homes (Lennox, 2014). Similar programs are available in Canada.

In some European nations, tax credit regimes are in place whereby a percentage of the investment made by a corporation in an energy efficiency project can be used to offset the amount of income tax payable (Rezessy and Bertoldi, 2010, p. 23). Similar programs could be put in place to incent homeowner investment in EER through income tax credits.

Tax credit incentives would not apply to all types of MURBs equally, and are therefore not universally applicable as an EER implementation tool. The types of tax credits described here would not be directly applicable to condominium buildings due to the fact that unit owners are responsible for expenses associated with their respective units, but not for the common building elements that are commonly the focus of comprehensive building retrofits.

3.2.3.2 GOVERNMENT GRANTS

There are specific government programs designed to provide grants to building owners for the purpose of incenting investment in energy efficiency projects. An example is the ecoENERGY Retrofit for homes program offered by the Canadian Government from 2007 to 2012, which provided financial assistance to

owners of low-rise buildings to make smart energy retrofit decisions that result in significant energy savings (Natural Resources Canada, 2014[b]).

Investment grants or interest rate subsidies are often offered by governments to help offset the up-front costs of investing in energy efficiency technology. This is intended to improve uptake by supplementing private investment and decreasing long periods of amortization (Rezessy and Bertoldi, 2010, p. 22).

The degree of applicability of government grants to the three types of MURBs is a direct function of program design. Grant programs can be specifically designed to facilitate investment in all types of MURBs, although careful consideration is required to construct program parameters with respect to condominium buildings to account for the voting requirements inherent in condominium corporation decision-making processes. For example, programs can require that condominium buildings are only eligible where all or a majority of unit owners vote in favour of the project.

3.2.3.3 OTHER TAX-BASED INCENTIVE PROGRAMS

Taxation can be an effective instrument to encourage private investment in energy efficiency projects through tax exemptions and programs related to property tax (Rezessy and Bertoldi, 2010, p. 22). Various types of tax-based incentives exist. In some jurisdictions sales tax incentives provide an exemption from, or refund of, the sales tax for the purchase of renewable energy equipment. Some jurisdictions have established an annual "sales tax holiday" for energy efficiency measures by annually allowing a temporary exemption (usually for one or two days) from the sales tax (DSIRE, 2015[b]).

Similar to tax credit programs, these kinds of incentives have limited or no applicability to condominium buildings due to limitations resulting from the ownership structure related to private versus common building elements.

3.3 DOCUMENTED OPPORTUNITIES AND CHALLENGES

There is a body of academic and grey literature that describes the array of implementation approaches for EE projects as well as barriers to project implementation. The various types of barriers are documented as are many proposed solutions to overcome them. Some of the research focuses on opportunities to improve market penetration, including issues related to the public policy environment, financing models, subsidies, price signals (energy prices), and marketing and education (Anderson, 2013; Painuly, Park, Lee and Noh et al., 2003; Peretz, 2009). Other research focuses on experiences associated with specific implementation approaches, such as ESCOs (Painuly et al, 2003; Vine, 2005).

Some of the literature focuses on commercial and institutional applications for EE projects. It is possible that much of the literature content has broadly reaching implications to EE projects generally, including the MURB sector, however it is unclear whether this is universally true. Much of the literature deals with specific types of implementation models (i.e., ESCOs and energy performance contracts) or development sectors (such as institutional or single family homes). Others focus on specific geographic areas (California, the EU).

3.3.1 UNTAPPED MARKET POTENTIAL

Peretz points out that residential buildings account for 25% of the world's energy use and are the "single largest energy consumer worldwide, and also the one where the largest uncaptured energy productivity improvement opportunities lie" (2009, p. 381). Painuly et al. describe an international environment that presents significant opportunity in terms of implementing EE projects, stating that rates of uptake, while improving, have not reached full potential (2003, p. 659). They suggest the potential for increasing uptake in developed nations is in the range of 25 to 30% (p. 659). Vine (2005) corroborates this by conducting an international survey concerning the use of ESCOs. It is not clear, however, whether the conclusions of Vine's study are transferrable to other implementation approaches and EE projects in general.

Vine (2005) goes into some detail concerning untapped EER investment opportunities with respect to the use of ESCOs. He presents the results of a survey of nations known to contain an ESCO community that includes information related to implementation barriers. From the 33 countries that responded, the amount of activity geared toward the residential sector was a very small fraction of that aimed at the commercial and industrial sectors. Canada's reported value for the residential sector was 0% (Vine, 2005, p. 700). This suggests a potential growth opportunity for advancing EE retrofit projects for MURBs in this country through the use of performance contracting approaches.

3.3.2 CHALLENGES WITH CONDOMINIUMS

Consideration of the unique challenges associated with condominium ownership is important since about 25% of BC's housing market is made up of strata units and about half of the new residential units being constructed in the province are condominiums (Hansen, 2014, p. 3). In the case of private a condominium style of ownership, voting rules can impact decision-making by condominium corporations with respect to potential EER projects. In accordance with Section 96 of the Strata Property Act in BC, expenditure of contingency reserve funds to carry out building improvements identified in mandatory depreciation reports must be approved by a simple majority of condominium membership (Strata Property Act of 1998). This was changed from a 75% majority requirement in 2014 (Shaw, 2014, para. 2). Depreciation reports are required to report on the estimated repair and replacement cost of major building elements and the expected life of those elements (Strata Property Act of 1998). While the purpose of the report is to facilitate maintenance of major building components, they could also help identify when opportunities exist to invest in EER projects. However, EER opportunities are outside the scope of what is required to be addressed in the depreciation report.

Yip, Chang and Hung declare that the mix of "individual and collective" forms of ownership inherent in condominium buildings has an inhibiting effect on the participation of residents in the management of the buildings (2007, p. 216). The observation being made here is that building management activities governed by a collective of unit owners, as opposed to a third party professional organization specializing in building maintenance, is subject to the varying degrees of comprehension by the unit owners in relation to building operations.

In a study prepared for the City of Aspen, Alan Richman identifies that a key non-regulatory obstacle to implementing upgrades to aging condominium buildings is the degree of variation in the makeup, background, financial wherewithal, and understanding of the building ownership. He suggests that

differing motivations within the ownership group with respect to investment decisions is a challenging factor in condominium ownership. In a real estate market in which values have grown substantially over time, the financial resources of unit owners can vary significantly within a building from those of modest financial means who purchased their units at a very low price, to those who have purchased more recently at or near current market prices as an investment property. Some unit owners within a building may have access to investment capital while others may be residents of modest financial means who happen to own an asset that has appreciated in value since time of purchase. Richman's research reveals that, for some buildings, the ownership may not have enough support for significant investment in the building until such time as the majority of units are owned by owners who paid present day market prices for their unit. Richman also suggests the varying degrees of awareness of the rules around decision-making within a condominium building can be an obstacle to investment in building improvements (Alan Richman Planning Services, 2012, pp. 14 – 5). Richman suggests there is little that government can do to combat these obstacles as they are inherent in condominium ownership makeup and structure. He suggests that local government can focus on removing as many barriers as possible by encouraging in EER projects as that may be a key motivating factor to help overcome these internal impediments to investment. Richman's research also concluded that government has an important role to play in educating condominium ownership groups on the investment opportunities that exist for them, and that government could partner with non-profits such as real estate boards and chambers of commerce to leverage their educational efforts (Alan Richman Planning Services, 2012, p. 15).

Gaps in understanding exist within condominium ownership with respect to EER opportunities for their buildings. The Alberta Real Estate Foundation (AREF) has produced the Alberta Green Condo Guide, based on work done by the Toronto Atmospheric Fund, to help educate condominium boards on the opportunities available to improve the energy efficiency of their buildings (Pembina Institute, 2015, para. 5). AREF states that the most common reasons given for not investing in EER by condominium owners is the long payback period, lack of control over how individual units are operated and lack of control over utility prices, but goes on to indicate how poorly understood these perceived impediments actually are (Alberta Real Estate Foundation, n.d., p. 1). The guide provides direction on navigating the decision-making process and project planning for a retrofit project, including determining the baseline for the building by comparing its efficiency with other similar structures, conducting an energy audit, setting energy consumption goals for the project, and identifying specific EER opportunities. The guide goes on to describe the options for project implementation, including design-build, design-tender, or do-it-yourself (Alberta Real Estate Foundation, n.d., pp. 3 – 7). AREF is an example of a non-profit organization combining efforts with other like organizations to fill the gaps in knowledge and understanding that exists in the condominium ownership base.

3.3.3 BARRIERS TO IMPLEMENTATION

Market barriers are well documented in the literature. Miller describes low participation rates in EER investment as a market failure caused by an information deficiency. She explains that consumer behaviour and a fragmented approach to conservation measures have produced impediments to quantifying the financial savings associated with energy conservation (2012, pp. 1-2). Rezessy and Bertoldi (2010, pp. 2-4) list at a high level the market and legal barriers that exist in the European context. Among the barriers noted are high transaction costs, asymmetric information (i.e., lack of understanding

by potential customers as well as financial institutions), low collateral asset value of energy efficiency equipment, principal-agent problems, and an asset based culture within financing institutions that is averse to accounting for energy savings as conventional revenue. A report produced by the InoFin project in Europe provides insights into barriers that inhibit investment in EER projects for social housing in several countries. The report concludes that private ownership in condominium MURBs is a complicating factor in organizing retrofit projects when a certain percentage vote is required in order to proceed with a project and the degree of understanding of the costs and benefits varies within the ownership group (Energy Research Centre of the Netherlands, 2007, p. 64).

3.3.3.1 BARRIERS RELATED TO THE PRINCIPAL-AGENT PROBLEM

The principal-agent problem as a barrier to EE project investment is documented, including in the context of some MURB types. Parkin and Bade define the principal-agent problem as “the problem of devising compensation rules that induce an *agent* to act in the best interest of a *principal*” (2010, p. 234). An example of the principal-agent problem in the business sector is that of the managers and employees of a firm (agents) performing and achieving results in the best interest of the shareholders (principals). The employees may have their own objectives related to career aspirations or balancing work responsibilities with personal lives that impede their contributions toward achieving the principals’ objectives, which are mainly related to corporate profit (Parkin and Bade, 2010, p. 234).

In the context of rental apartment MURBs, Peretz states that landlords “make the investment decisions while tenants shoulder financial responsibility. Consequently, both are discouraged from investing in energy efficiency” (2009, p. 386). This is in contrast to an owner-occupant of a building who would be more inclined to make EE investments. Anderson concurs, indicating that where tenants are responsible for paying monthly utility bills, landlords lack incentive to invest in EE (2013, p. 1). Tenants themselves are reluctant to do so since future residents may actually enjoy the benefits. The Energy Savings Trust in the UK makes a similar claim with respect to their Flagship Home case study when it states “it is difficult to engage private landlords on energy efficiency. The immediate benefits of improvements (increased comfort, reduced fuel bills) accrue to the tenant” (Energy Savings Trust, 2006, p. 11). There appears to be substance to the claim that the agency issue is real and may be one of the keys to unlocking the potential in the rental MURB sector.

Carl Blumstein (2010) describes another way in which the principal-agent problem impacts EE project implementation under a system where public utilities are responsible for administering energy reduction programs. Part of the problem lies in the difficulty of the state regulator (the principal) designing an incentive system that will result in the privately owned utilities (agents) maximizing energy reduction outcomes when the utilities are in the business of selling energy. Blumstein states that this problem, at least in the State of California, has been addressed by the separation of utility sales and earnings (p. 1). Blumstein provides an account of how the principal-agent problem affects the task of assessing the success of incentive programs but he does not link agency issues to the degree of EE project market participation.

Anderson conducts a survey of over 6,500 residences to gather data regarding the effect of the principal-agent problem on decisions to invest in weatherization upgrades and energy saving appliances. He

concludes that the principal-agent problem does contribute to decision-making concerning weatherization upgrades, however the survey focused solely on single family households and it is unclear as to whether his conclusions are transferrable to the MURB sector.

3.3.3.4 FINANCIAL BARRIERS

Financial barriers are significant factors in suppressing demand for EE projects. The Clinton Climate Initiative (2009) informs on an extensive range of financing options for energy performance contract based projects and describes the mechanics of each, including pros and cons. The narrative is instructive as it includes an overview of financing options but is narrowly scoped as it is aimed at educational institutions in the United States. Painuly et al state that lack of appropriate financing approaches is an important barrier to implementation (2003, p. 559). Peretz states that the average internal rate of return for investments in EE projects can be 17% (2009, p. 378) and that financing is one key to overcoming implementation barriers. Peretz claims that “the market is most likely to break these barriers if it can turn a profit” (p. 379). Amram, Angkinand and Zeidman assert that the growth of the EE market will depend largely on successfully combining program elements and financial product design (2010, p. 7). They further indicate that “[p]art of the challenge in taking a retrofit program to scale [in the United States] is overcoming consumer reluctance, which arises from high up-front costs and substantial uncertainty about future energy savings benefits” (p. 9).

The financial barriers noted by Rezessy and Bertoldi include high administrative costs, high perceived end user credit risks, a lack of sizeable investment ready projects, low collateral value of EE equipment which lowers creditworthiness of projects, and reluctance of property owners to finance projects on-balance sheet. Specifically with respect to the residential sector, they note long payback periods as a financial barrier (2010, pp. 2-3). Rezessy and Bertoldi make a point of distinguishing between conventional debt and project debt as methods for financing EE projects. They state, “Unlike conventional debt financing that relies on an individual company’s credit-worthiness, project financing relies on a project’s cash flow expectations and spreads the risk between the different actors” (2010, p.16).

The Homeowner Protection Office (HPO), a branch of BC Housing, reports that many MURB retrofits are underway in BC to deal with building envelope problems and moisture intrusion. Lack of focus on the EE benefits of retrofitting existing MURBs is preventing many of those building owners from taking maximum advantage of the retrofit opportunity to achieve greater energy efficiency in the building. The HPO states that deep building retrofits may be too expensive to be worthwhile based solely on the payback period. However, when deep retrofits are considered together with improved operating practices for the buildings, energy and financial savings are cost effective (Homeowner Protection Office, n.d., pp. 6 – 7).

3.3.3.5 ECONOMIC BARRIERS

Overall economic conditions and uncertainty associated with future real estate values can also have an impact on the willingness of condominium corporations to take on the risk of investing in building upgrades. Richman reports that some financial institutions in the US view condominiums as a higher risk than other kinds of housing due to the perception that owners would be more willing to walk away when markets turn downward than they would if they owned detached single family homes. This results in the

institutions requiring greater down payments at time of purchase, leaving the owner with less financial resources to invest in upgrades (Alan Richman Planning Services, 2012, p. 14).

The cost of energy is a factor that contributes to whether EER investment is likely to be a profitable enterprise. The RetrofitBC program formerly being developed by the BCSEA is modeled after Toronto Atmospheric Fund's TowerWise program. The importance of the cost of energy as a price signal needs to be considered as the higher cost of energy in Ontario compared to BC makes energy costs, as a component of a building's operating expense, less of an incentive to invest in EER in BC. Energy costs in BC do not signal the need to improve building efficiency to the same degree as in Ontario (BC Sustainable Energy Association, 2014, pp. 4 – 5).

4 JURISDICTIONAL SCAN

This section first looks at programs and policies administered by the federal government in Canada. This is followed by a scan of programming delivered by the provincial and territorial governments in Canada. The scan then turns to an overview of locally administered policies and programs delivered by several local governments in BC. It then looks at programs in Europe and the United States. Two case studies are summarized in the jurisdictional scan providing details of actual EER retrofit projects for MURBs to further inform the analysis of both opportunities and challenges related to EER implementation.

The jurisdictional scan was entirely an internet-based search of each government jurisdiction. The website for each jurisdiction was manually searched to find content related to energy policy, energy efficiency, or climate change mitigation. Each website was also searched using the keywords “energy efficiency”. Information found through internet resources was taken as being representative of current programming unless information was provided indicating otherwise.

The information included in this scan includes only programs and policies that apply, or appear to apply, to MURBs. Information pertaining non-MURB building types is found in Appendix A.

4.1 FEDERAL GOVERNMENT PROGRAMS

The federal government reports that between 2007 and 2013, federal, provincial and territorial funding resulted in over 640,000 households improving their energy efficiency by an average of 20%, resulting in energy savings valued at more than \$400M (Government of Canada, 2013, p. 4). A scan of federal programs, however, indicates that much of the historical efforts have been directed to improving energy efficiency in commercial and institutional buildings, while programs for the residential sector have mostly targeted single family homes.

Under the ecoENERGY Efficiency for Buildings Program, NRC offers training, technical support, information and other resources to building owners and managers regarding the commissioning of new buildings and the recommissioning of existing buildings. Commissioning is a quality management process that ensures building systems and equipment are installed and operating properly and providing optimal energy efficiency. This is done through systematic verification and testing, staff training, and documentation of all systems. NRC suggests recommissioning of existing buildings prior to considering implementing EER measures. Recommissioning can result in such changes as fixing ventilation dampers, adjusting chiller operations, aligning zone temperature set-points, eliminating simultaneous heating and cooling, and using persistence strategies such as training, monitoring energy bills, energy management information systems and automatic diagnostics (Natural Resources Canada, 2012, pp. 1 – 2).

The federal government reported in 2013 that innovative approaches are being investigated to make energy efficiency more affordable through the use of on-bill financing arrangements (an approach already in use in BC) and the “property assessed clean energy” (PACE) model (Government of Canada, 2013, p. 4).

4.2 PROVINCIAL AND TERRITORIAL GOVERNMENTS

4.2.1 BRITISH COLUMBIA

Provincial energy efficiency programming in British Columbia is led by the Ministry of Energy and Mines. The provincial government adopted a Climate Action Plan in 2008. The plan creates a foundation for a policy framework intended to respond to the challenges of climate change, including mitigation measures. The plan identifies an intent to foster a low-carbon economy and reaffirms the government's goal of reducing carbon emissions by one-third by 2020 (Government of British Columbia, 2008[a], p. 1). The province has also adopted a strategy for promoting energy efficiency in buildings entitled the "Energy Efficient Buildings Strategy: More Action, Less Energy." The strategy supports the carbon emission reduction target noted above as well as the government's objective to be electricity self-sufficient by 2016 (Government of British Columbia, 2008[b], p. 2).

Until 2014, one of the key resources through which the BC government had delivered EE programming was LiveSmart BC. LiveSmart BC had been delivering an efficiency incentive program providing homeowners a certified energy advisor who conducted an in-home assessment of the energy efficiency of the home and provided a report detailing the EnerGuide rating of the home along with prioritized upgrade options. The homeowner could then decide which, if any, upgrades to make to the home and receive rebates from the province. The amounts of rebates were based on quantifiable energy improvements verified by the certified energy advisor who conducted a follow up energy assessment (LiveSmart BC, n.d.[a]). The BC government indicates that since its launch in 2008, the program resulted in participants saving an average of 15 to 28% on their energy bills after completing the program (LiveSmart BC, n.d.[b], Program Highlights Section). Eligible housing types included single family homes, row housing, and mobile homes on permanent foundations (LiveSmart BC, n.d.[c], p. 4).

In April 2014 the provincial government announced that LiveSmart BC would be discontinued and programming would be transitioning to BC Hydro and FortisBC who would be developing utility-funded energy efficiency programs. BC Hydro is reportedly providing \$1.6B in funding over the next ten years to provide energy efficiency kits and deliver the Energy Conservation Assistance Program. These programs target low-income households (BC Government Website). On-bill financing options from the utilities are available to finance upgrades through a pilot project in specific regions of the province (LiveSmart BC, n.d.[d]).

BC Hydro is operating a pilot project called the "Multi-Unit Residential Pilot Program" (MURPP) in the cities of Vancouver, North Vancouver, Surrey and New Westminster. The program is available to building managers and owners of market rental buildings containing 15 or more units. The program is geared for retrofits to existing structures; however, strata properties are not eligible. The project is being funded jointly by FortisBC, LandlordBC and the four municipal partners. The program provides free access to an energy advisor who will:

- Identify energy savings opportunities;
- Provide walk-through assessments of the building;
- Assist with business case development;

- Provide access to knowledgeable contractors and suppliers; and
- Assist with the completion of program application forms.

The program offers incentives for energy upgrades to apartment units and common areas as well as free low flow devices. Incentives are provided on a per unit basis for the replacement of products with more efficient ones (required efficiency ratings are specified by the program) including refrigerators, clothes washers, bathroom fans, and light fixtures (BC Hydro, 2014[b]).

Other programming offered through BC Hydro Power Smart for residential property owners include (BC Hydro, 2014[c]):

- A fridge buy-back program through which BC Hydro will offer \$30 for old refrigerators;
- An appliance rebate program during Power Smart month (October);
- Energy savings kits for low-income households including products and tips to help save energy and money;
- Energy conservation assistance program for low-income households which includes a free home energy assessment, personalized energy coaching and contractor-installed upgrades to help save electricity and money; and
- Various informational and educational services designed to encourage energy conservation in the home.

As an added incentive, the provincial government exempts certain energy efficiency and demand side management investments from provincial sales tax. These include materials and equipment that prevent heat loss, Energy Star products and appliances, and energy efficient gas-fired water heaters (Government of British Columbia, 2008[b], p. 5).

4.2.2 ALBERTA

The Alberta government has been without any kind of energy efficiency incentive program since 2012, which marked the end of a three year program through which \$52 million in rebates were provided to homeowners. New energy efficiency related programming was scheduled to be launched in the fall of 2014 but was put on hold in order to coincide with the provincial government's release of a new climate change strategy. The former program was rebate-based and offered incentives for upgraded appliances and heating systems. It has been reported that Alberta is the only jurisdiction in Canada and the United States without programming aimed at improving the energy efficiency of residential and commercial buildings. The program that was due to be announced in 2014 was to be a \$50 million program offering rebates for consumers as incentives for energy efficiency upgrades (Derworiz, 2014).

A search of the Alberta Ministry of Environment and Sustainable Resource Development website, the ministry responsible for climate change initiatives, including energy efficiency programming, provides little detail in relation to future energy efficiency programs. Future actions identified in the energy efficiency section of the website include the development of an energy efficiency act, establishing an incentive program to promote the use of energy efficient appliances and home improvements, and new

energy efficiency standards in building codes for homes and commercial buildings (Alberta Environment and Sustainable Resource Development, 2015, Strategic Actions section).

No information is provided through the Province of Alberta's website indicating support for financing EER projects for MURBs.

Notably, the election platform published by the newly elected NDP party states that, if elected, the government would create a "green retrofitting loan program" to help better manage energy consumption and GHG emissions (Alberta NDP Party, 2015, p. 18).

4.2.3 SASKATCHEWAN

There is no information available through provincial web resources for the government of Saskatchewan geared specifically for residential EE applications of any type.

4.2.4 MANITOBA

While Manitoba provides multiple options for owners of low density housing forms (see Appendix A), the programming offered through Manitoba Hydro is generic and there is no content specifically intended for MURBs. Also of note, Manitoba Hydro's programming is restricted by a self-imposed limitation on promoting electric energy over natural gas, or vice-versa. The utility's website states, "[a]s a provider of both electric and natural gas services, we cannot promote one fuel over the other" (Manitoba Hydro, n.d.[h], para. 3). This potentially diminishes opportunities to realize maximum benefits in relation to reducing GHG emissions in the province based on the relative advantages offered by one energy source over another.

4.2.5 ONTARIO

Much of the Province of Ontario's programming concerning energy is related to the supply side, specifically, renewable energy. Energy efficiency programming delivered by government ministries is primarily focused on agricultural applications.

Ontario's residential energy efficiency programming is delivered through Hydro One's saveONenergy program. The program does not provide for deep or extensive retrofit projects. Components of the program available to homeowners include (Hydro One, 2009):

- An offering of annual discount coupons that can be used to access reduced prices on energy efficient lighting, fixtures, weather stripping and other energy efficiency products;
- Rebates of up to \$650 for the replacement of heating and cooling systems with high efficiency models;
- A dehumidifier exchange program offering \$50 for old models when owners upgrade to an Energy Star qualified model;
- Free programmable thermostat offer;

- Free pick-up and disposal of dated appliances, including refrigerators, freezers and window air conditioners; and
- Free energy efficiency upgrades for the home for qualified Hydro One customers, including energy efficient appliances and fixtures, programmable thermostats, power bars, and improved insulation and draft proofing. Participants must meet specified low-income requirements and may include owners and tenants living in most forms of housing, including MURB units.

CASE STUDY #1

Two case studies are presented to provide examples of EER projects implemented for MURBs. This first example, a typical aging co-operative building in need of upgrade, was chosen in order to unpack and identify the particular challenges, opportunities, and keys to success related to implementing a retrofit in this style of building. This specific case was chosen as the retrofit project was comprehensive and information is available with respect to both the costs and benefits related to project outcomes.

Project:	Non-Profit Co-operative Housing, Toronto, ON
Background:	<p>The building is a 15 storey, 112 unit structure owned by a non-profit housing co-operative, built in the mid-1960s. The impetus for undertaking upgrades was to bring the building into conformance with the Ontario Ministry of Housing requirements and the provincial Fire Marshal’s Act. The requirement to improve the building to meet mandatory provincial standards was also seen as an opportunity to improve the building envelope and achieve savings through increased energy efficiency. Therefore, the upgrades included improvements related to EE as well as unrelated improvements that were necessary for other reasons. The project occurred over a two year period beginning in 1995.</p> <p>The effectiveness of the retrofit was assessed through the creation of a pre and post retrofit model using a software-based energy simulation program. The model enabled an incremental assessment of the impact of each component of the retrofit with respect to energy efficiency.</p> <p>The degree of financial assistance provided to the project by the government, or through what program(s) it may have been provided, is not known.</p>
Scope of Work:	Energy efficiency aspects only: installation of exterior insulation and finish system (EIFS) over existing masonry wall; replacement of single-glazed aluminum windows with double-glazed units; replacement of wood balcony doors with insulated metal doors; replacement of roof, including increased insulation; replacement of showerheads with low-flow fixtures; replacement of original boilers with more efficient units, including the installation of a control system; and installation of thermostats in the suites.

Total Project Cost: The total project cost was \$6 million, however, breakdowns are not provided for those elements that were related to EE improvements versus those that were not.

Key Outcomes: An overall payback period for the total retrofit project cannot be calculated with the information provided as some aspects of the project were unrelated to EE, such as expensive alterations to the parking garage, addition of air conditioning, and the addition of two rooftop makeup fresh air units. Incremental results for individual elements of the project are as follows:

- The cladding upgrade produced a 3.2% reduction in gas consumption, however at a cost of \$322,000, this element did not produce a reasonable payback period by itself (147 years);
- Door and window improvements produced a 0.89% reduction in gas consumption, resulting in a 21.8 year payback;
- The boiler replacement produced an 18.8% reduction in gas consumption. The payback on this component was considered to be immediate as the upgrade was required and the new units were of standard efficiency;
- Showerhead replacements produced an estimated 23.6% reduction in hot water related gas consumption for an estimated payback period of about 0.7 years.

Overall, the energy efficiency improvements resulted annual operational savings of \$18,719 in reduced electricity and natural gas expenses.

Keys to Success: The Co-op's decision to take advantage of an opportunity to achieve energy and financial savings while undertaking mandated building upgrades was a key aspect of this project's success. The financial savings realized from the EER aspects of the project lessened the overall financial impact of the project.

The use of technology by modeling the effects of EE upgrades using software tools appeared to be a critical factor in the co-op deciding to extend the scope of building upgrades beyond just those elements required by the province. The reduced operating costs of the building helped to significantly offset the cost of the upgrades.

Source: Canadian Mortgage and Housing Corporation, 2004

4.2.5.1 TORONTO ATMOSPHERIC FUND

Of special note in the Province of Ontario is the Toronto Atmospheric Fund (TAF) established by the City of Toronto in 1991 to help the City meet its Climate Plan objectives. The TAF delivers energy efficiency programming that has helped achieve \$55 million in savings for the city to date. The TAF is working to advance energy efficiency retrofits in buildings. The organization operates at arm's length from the City and manages a \$23M endowment fund to support a number of energy reduction initiatives, including building retrofits (Toronto Atmospheric Fund, 2015[b], para. 2). The TAF deploys a business model

based on the idea that a financial return will attract investment and scale is important in order to attract the attention of investors. This translates into packaging up EER projects and pooling investment opportunities so they can be sold into secondary capital markets. Due diligence and standardized protocols for verifying energy savings builds investor confidence and reduces the investment friction caused by a key barrier: financial risk due to unrealized energy performance expectations (Toronto Atmospheric Fund, 2015[c], paras. 3 – 8).

Among the TAF's portfolio is a program called TowerWise, established in 2007 to focus on reducing energy consumption and GHG emissions in Toronto's residential high-rises. By removing barriers, such as lack of financing and low awareness, TowerWise enables substantial reductions in greenhouse gas emissions and energy use in these buildings by 30%. This is achieved through a combination of innovative financial products, technical research, and policy development (Toronto Atmospheric Fund, n.d.[a], para. 2).

The TowerWise program is informative as it is specifically geared for the MURB sector and its step by step guide provides assistance to MURB owners and managers to help them navigate the implementation challenges typically encountered in the MURB sector. This includes the need to communicate with tenants, build a business case to support the project, and advice on the management options available to manage the EER project. The resource material available on the TAF website outlines the high level retrofit options for MURBs: "tuning up" the building with measures such as re-caulking windows and cleaning boilers, resulting in a 5-10% energy savings; a major energy efficiency retrofit, such as installing new equipment or lighting systems, resulting in a 15-30% energy savings; or a deep energy efficiency retrofit involving efficient building cladding, geothermal heating and cooling and solar energy panels, resulting in a 30-60% energy savings (Toronto Atmospheric Fund, n.d.[b]).

The TowerWise program employs an ESPA to facilitate EER projects for MURBs. Under this model, the ESPA is a service agreement between the TAF and the building owner, through which the TAF acts as the financing entity. EER projects begin with a qualified engineering firm undertaking an energy audit on the building and recommending specific energy efficiency upgrades. The TAF pays for the implementation of a suite of energy efficiency measures and retains ownership of any new equipment throughout the term of the ESPA. The cost savings realized from reduced energy consumption, which is guaranteed through the terms of the agreement, are shared between the building owner and the TAF. If the retrofit does not achieve any savings, the building owner pays nothing. At the end of the term of the agreement, the owner retains 100% of the cost savings. Contract terms can be up to 10 years, energy savings are monitored and payments back to the TAF are guaranteed not to exceed energy savings (Toronto Atmospheric Fund, n.d.[c], pp. 1 – 2).

TAF staff indicate that the TowerWise program was set up to establish a brand in the City of Toronto for the EER market in the MURB sector. The program has been successful in generating greater awareness, demonstrating the potential for returns on investment in EER projects in MURBs, and building confidence in the EER market. TAF states that smaller MURB owners and managers are less aware of EER opportunities than larger commercial owners and operators. At the time of communication with TAF, the TowerWise Program had been used for approximately eight buildings and there were approximately 10 more that were set to access the program. TAF staff felt that, for the buildings that had been retrofitted

through the program, there was success in achieving the energy and financial savings planned (B. Purcell, personal communication, March 30, 2015).

The Director of Policy and Programs with TAF believes that ESPA has been effective as applied through the TowerWise program but that it is not a “magic bullet.” It offers particular advantages in situations where access to up front capital investment for retrofit projects is scarce, such as in the social housing sector. It is also felt that price signaling is a factor that contributes to whether building owners will choose to invest in EER (B. Purcell, personal communication, March 30, 2015). If energy prices are relatively low, there is less incentive for an owner to invest in EER because energy makes up a smaller percentage of the operating costs of the building and absolute financial savings available are less.

TAF confirms that the transaction costs associated with the ESPA framework were initially high, but have been falling as the program matures and participants become more familiar with the details and business arrangements that make up the program. Due to the relatively high administrative costs involved, TAF suggests the ESPA tool is mostly suitable for use on large scale EER projects where a large MURB is undergoing a holistic systems upgrade (B. Purcell, personal communication, March 30, 2015).

The City of Toronto is also launching a three year pilot project for MURBs using the PACE financing model called the High-rise Retrofit Improvement Support Program (Hi-RIS). The pilot has a \$10 million funding envelope with a participation target of 10 buildings. In Ontario, PACE funding is referred to as Local Improvement Charges but it has the same basic characteristics as PACE programs found commonly in the United States. A property owner can apply to the program and enter into an agreement with the City to undertake certain energy and water improvements. Once the work is completed, the City places a special charge on the property equal to the cost of the improvements, plus administrative costs incurred by the City. The property owner then pays the special charge on the property tax bill over an agreed term which reflects the useful life of the improvements for a minimum of 5 years to a maximum of 20 years. Through the program, the payment obligation attaches to the property, not the owner, and is secured by the City’s priority lien status. If a property changes ownership, the new owner would assume the obligation and continue to make payments until the special charge is fully paid. Participating properties must be a residential building of at least five stories. Buildings under condominium ownership are eligible for the program, but only with commitment from all property owners (City of Toronto, 2015).

CASE STUDY #2

This case study is an example of a privately owned rental unit building of moderate scale with aging and poorly performing building components. Such conditions present EER opportunities that can provide educational value and help contribute to a broader understanding of EE benefits that may otherwise go unrecognized at critical decision points over the life cycle of the existing building stock.

Project:	849 Broadview Avenue, Toronto, ON
Background:	The MURB at 849 Broadview Avenue in Toronto is a four storey building constructed in the 1930s containing 32 rental apartment units that had not received any upgrades since the building’s original construction. Systems in the building

were all functioning, but not efficiently. The mechanical systems, building envelope, and fixtures throughout the building were outdated and/or in poor condition, resulting in high maintenance and operating costs and regular breakdowns. High operating costs were an important price signal that contributed to the owners' decision to carry out this project.

New owners took over the property in 2003 and immediately identified opportunities to reduce operating costs, increase rental income and reduce energy consumption. The owners also identified that the building had been poorly operated in the past as a result of the condition of the building envelope. For example, as a result of the building having no attic insulation, the temperature in the building was set much higher than would otherwise be required. The result was that while the tenants on the top floor of the building were comfortable, other parts of the building were held at a temperature of approximately 27 degrees C. The tenants in the warmer parts of the building would open their doors and windows to cool off, further exacerbating the inefficiency.

Scope of Work:

The owners undertook comprehensive upgrades to the building to reduce the consumption of both natural gas and water. Upgrades included the following: the original metal-framed single-glazed windows were all replaced with vinyl-framed double-glazed units; boiler controls and steam traps were replaced; attic insulation was installed; all original toilets, which consumed about 25 litres per flush, were replaced; all faucets were replaced with low flow fixtures and aerators; and all common area lighting was replaced with compact fluorescent bulbs.

Total Project Cost:

\$74,200

Key Outcomes:

As of 2007, the upgrades reduced the natural gas consumption by approximately 40%. Estimated contributions to gas savings were 62.5% from boiler controls and window replacement; 25% from ongoing adjustments to boiler operation; and 12.5% to the attic insulation.

The new windows were reported to have improved the appearance of the suites, as well as contributed to a quieter, more comfortable living environment.

The new plumbing fixtures resulted in a 50% reduction in water usage for the year following their installation.

The use of new compact fluorescent bulbs in the common areas of the building resulted in an estimated 86% reduction in electricity consumption associated with lighting those areas.

Overall, the upgrades resulted in an annual operational savings for the whole building of approximately \$14,000, resulting in a 5.7 year payback period, and an annual GHG emission reduction of 48 tonnes of CO₂e.

Keys to Success: The owners intentionally focused on improvements that would produce the greatest impact on energy consumption, and therefore the most favourable return on investment. The owners also took a comprehensive approach to the project and viewed their investment in the property as a long term prospect and they viewed the upgrades as an opportunity to add value to their asset.

The owners relied on their prior building management experience, as well as expertise provided by the Federation of Rental Housing Providers of Ontario. In addition, advice from other building owners who had undertaken energy retrofits helped guide the way for these owners.

In the case of this building, due to its age and condition, the high costs associated with operating and maintaining the building were important signals that supported the decision to invest in an EER project. As a result, investment risk was relatively low, even though no performance contracting or other similar mechanism was used.

Source: Toronto Atmospheric Fund, n.d.[d]

4.2.6 QUEBEC

The Quebec government has offered the Rénoclimat Program to homeowners since 2006 to encourage investment in energy efficiency upgrades. The program is aimed at encouraging investment in insulation improvements, draft proofing and installing or replacing mechanical systems. The program offers two energy assessments on the home, one before the upgrade(s) and one after. The initial evaluation provides an EnerGuide rating for the home along with a set of recommendations for upgrades to improve the rating. After the upgrades are completed, the second evaluation is carried out to determine the new EnerGuide rating of the home. If the new rating is satisfactory the owner could be eligible for financial assistance from the province. The program requires that the EnerGuide rating be increased by at least one point for the owner to qualify for financial assistance. Owners participating to the Rénoclimat program could also be eligible for the Heating with Green Power program and benefit from financial assistance for the replacement of fossil fuel-based heating systems or water heater. Participants who use qualified contractors to implement the upgrades could also be eligible for a provincial tax credit (Government of Quebec, 2015).

Eligible program participants are owners of single family homes, duplexes, triplexes and MURBs containing up to 20 units, including condominiums. At least 50% of the total floor area must be used for residential purposes. An owner of a condominium unit cannot participate in the program alone. Rather, all the owners in a condominium building must participate in the program at the same time (Government of Quebec, 2015).

Two types of financial assistance are offered. First, more than 50% of the cost of the first evaluation is covered by the program. The cost of the post-upgrade evaluation is covered 100% by the program for first-time participants in the program. Second, financial assistance is offered to help offset the costs of the

upgrades. The amount of assistance provided is dependent upon the types of upgrades carried out (Government of Quebec, 2015).

4.2.7 NEW BRUNSWICK

The New Brunswick government delivers its energy efficiency programming through a crown corporation called Efficiency NB. The mission of Efficiency NB is to provide “sound advice and practical solutions to help New Brunswickers use energy more efficiently, make better energy choices, manage energy expenses and lessen the impact of energy use on the environment.” Efficiency NB acts as a central resource for the promotion of energy efficiency in New Brunswick (Efficiency NB, 2013[a], para. 2). Efficiency NB delivers programming targeting the reduction of energy consumption in existing homes. Program participants who upgraded their homes in the 2012/13 year decreased their annual energy consumption, on average, by 28.2% (Efficiency NB, 2013[b], p. iii).

Efficiency NB previously ran a program called the Residential Energy Efficiency Program (REEP) for existing buildings that provided direct financial incentives for EER projects. There was a component for single family homes as well as for MURBs. In the 2012/13 fiscal year, 122 MURBs participated in the program, resulting in over \$482K in grants being distributed and an average reduction in energy costs for the participating buildings of 21% (Efficiency NB, 2013[b], p. 6). The agency’s website reports that, due to budget restrictions, Efficiency NB is not currently offering financial incentives for EE upgrades (Efficiency NB, 2013[c], para. 1). Rebate programs have also been offered previously through Efficiency NB for EE products, such as thermostats, lighting, showerheads and appliances, however no rebates are currently available (Save Twice, 2015, para. 1). Current programming offered by Efficiency NB in relation to EER projects is limited to outreach and education.

4.2.8 NOVA SCOTIA

Similar to New Brunswick, the Province of Nova Scotia channels its energy efficiency programming through an independent organization called Efficiency Nova Scotia (ENS). ENS operates at arm’s length from both government and Nova Scotia Power and is regulated by the Nova Scotia Utility and Review Board (Efficiency Nova Scotia, 2015[a], para. 4).

The ENS programming appears to be available to owners of single detached and semi-detached homes, only. ENS does not offer programming specifically tailored for the MURB sector.

4.2.9 PRINCE EDWARD ISLAND

The province of PEI’s Office of Energy Efficiency operates the PEI Energy Efficiency Multi Unit Residential Building Grant Program. The program provides a direct subsidy to MURB owners who want to make their building more energy efficient. Owners must make application and must implement eligible energy efficiency upgrades within six months of the date of the application. The program is available for buildings containing two or more residential units provided they are not more than three storeys high (Government of Prince Edward Island, n.d.). The grant amounts are based on a percentage of the investment (either 10 or 15%) or a fixed amount depending upon the improvements carried out. Percentage based grants are provided as follows: (Government of Prince Edward Island, 2014)

- 15% of the costs of improving wall and attic insulation based on a minimum R-value increase;
- 10% of the costs of upgrading to an energy efficient heating system;
- 10% of the costs of hot water system upgrades, (15% of the costs for upgrades to solar domestic hot water systems);
- 15% of the costs of air infiltration improvements;
- 10% of the costs of upgrading to energy efficiency temperature control systems; and
- 10% of the costs of switching to biomass based heating systems.

Fixed grant amounts are set out as follows: (Government of Prince Edward Island, n.d.)

- \$50 per qualified low flow toilet;
- \$5 per qualified low flow shower head;
- \$25 per Energy Star window, door, or skylight to a maximum of \$800 per MURB;
- \$425 per residential unit for qualified air source heat pumps.

Maximum grants available are \$750 per residential unit up to a maximum of \$12,000 per building. Owners of multiple MURBs are capped at two buildings or a combined grant of \$20,000 per year. All grants are subject to application approval before the project begins and inspection before and after the work is undertaken. The program is specifically designed to accommodate retrofit projects, therefore new MURB projects are not eligible (Government of Prince Edward Island, n.d.). A similar program is available for owners of detached homes, called the Residential Energy Efficiency Program (Government of Prince Edward Island, 2015). PEI is one of the few jurisdictions in Canada with a publicly funded program specifically designed to facilitate EER projects in MURBs.

4.2.10 NEWFOUNDLAND AND LABRADOR

The scan turned up no government programming supporting implementation of EER projects for MURBs in Newfoundland and Labrador.

4.2.11 YUKON

The scan turned up no EER related programs applicable to the MURB sector. The programming that is available is noted in Appendix A.

The Yukon government is running the Good Energy Appliance Rebate Program that offers rebates for home appliances (refrigerators, freezers, clothes washers, and dishwashers), heating appliances, hot water systems, and water efficient toilets. The amount of rebates available varies depending upon the type of product, with the highest being up to \$1,200 for the installation of a solar hot water system (Yukon Government, n.d.).

4.2.12 NORTHWEST TERRITORIES

The territorial government is operating the Alternative Energy Technology program that has both a residential and commercial component. The Residential Renewable Energy Fund (RREF) managed under this program is available to assist NWT residents in integrating commercially available, clean energy technologies on their property, building or other assets for the purpose of reducing fuel usage. The RREF

provides funding of up to one-third of the cost of qualified renewable energy systems. The maximum amount available to any recipient is \$5,000 per year (Government of Northwest Territories, n.d., para. 1 – 3).

4.2.13 NUNAVUT

A scan of the government of Nunavut website found no resources relating to programs, either past or present, in support of EER initiatives.

4.3 LOCAL GOVERNMENT APPROACHES IN BRITISH COLUMBIA

A scan of a dozen local government organizations in BC was carried out, including both municipalities and regional districts. Many municipalities have management plans related to energy conservation in the community and they commonly refer to incentive programs available through utility providers. Others, such as the City of Richmond, have educational and promotional programs designed to raise public awareness around energy conservation in the home. Richmond is currently promoting the “Richmond Energy Challenge” which is a competition to reduce energy use in commercial, institutional and multi-family buildings. Participants are recognized at the City of Richmond “Good Energy Awards”. Prizes are awarded to buildings with the greatest energy savings (City of Richmond, 2014).

A similar program was delivered in participating municipalities called the Energy Diet, funded principally by FortisBC. Certain municipalities agreed to provide incentives to households that participated in the program, which provided a subsidized energy assessment, access to rebates and opportunities for financing through FortisBC (City of Kelowna, 2014, para. 3).

The City of Vancouver was running a MURB Retrofit Pilot that stalled in March 2011 due to problems with gaining the required 75% vote on strata debt financing, among other problems. In November 2011 the project was merged with the BCSEA’s Green Landlord Project to form the Green MURB Pilot Project (GMPP) with partners the City of Vancouver, Vancity, and FortisBC. The project was concluded at the end of 2013 with none of the six target MURBs having taken up the program (BC Sustainable Energy Association, 2014, p. 2).

The Capital Regional District offers a program called “Solar CRD” through which it provides incentives to owners of single family homes, multi-unit residential dwellings and businesses in the Capital Region to install solar hot water systems. Incentives cover up to 33% of the total cost of the system before taxes up to a maximum amount based on the size of the system (Capital Regional District, 2014).

4.4 EUROPE

Much of the energy demand management in Europe is achieved through the adoption of new regulation. The European Union has enacted many regulations and directives regarding the use of electricity, energy efficiency, and energy labeling of domestic appliances (European Union, 2014, pp. 3-7).

The use of structural funds is noteworthy with respect the member states of the European Union and how they manage energy efficiency programs. Structural funds play a key role in creating financing instruments that can leverage significant additional private and public funds. Programs such as JESSICA

and JASPERS, both described below, facilitate the delivery of loan programs to support EER projects. Italy, Czech Republic and Poland had the highest amounts of funding from the structural funds and cohesion fund going into energy efficiency, co-generation and energy between 2007 and 2013 (Rezessy and Bertoldi, 2010, pp. 25-6).

In Italy, the main instruments for supporting EER projects in the residential sector have been low-interest loans and tax incentives. Critics argue that the programs require improvement as available tax deductions are capped too low and energy performance contracting should be more extensively used in order to facilitate deeper retrofits (Energy Efficiency Watch, 2013). In the Czech Republic, grant and subsidy programs are used to pay for up to half of the costs of improving insulation in buildings. The improvements must result in specific annual energy savings to qualify (International Energy Agency, 2012, p. 55). In Poland, the national government introduced the Thermal Modernization Law and Fund to support EER projects in MURBs. The projects must meet certain technical and financial criteria, which need to be verified by an energy audit and a financial analysis. The energy savings achieved by the project must be at least 25% in order to take part in the program, which will provide a loan to finance up to 80% of the cost of the project through the state owned National Economy Bank. The maximum payback period is 10 years (Baltic Energy Efficiency Network, n.d., para. 1-3).

The European Union has taken a leadership role in developing an integrated approach to sustainable development in Europe. This includes the creation of the JESSICA Initiative (Joint European Support for Sustainable Investment in City Areas). Through JESSICA, a joint initiative of the EU Commission, the European Investment Bank and the Council of Europe Development Bank, member states are provided access to financial resources to make repayable investments in projects that contribute to sustainable urban development (European Investment Bank, 2010, p. 10). Through JESSICA a combination of investment sources may include private banks and investors. No state guarantee is attached to the loans so there is no impact on public finances (InoFin, 2008, p. 45). In one example of a member state taking advantage of the program, Lithuania provided long term low interest loans in support of EER projects for MURBs. Energy improvements included heating and hot water system upgrades, window and door upgrades, insulation and glazing improvements, and implementation of alternative energy sources (Serbenta, n.d., p. 8). Loans are offered at interest rates not exceeding 3% to owners of residential units in MURBs with tenant associations that act as a coordinating body managing the process of implementing EER projects (Rezessy and Bertoldi, 2010, p. 27).

Funds from the European Regional Development Fund (ERDF) have been used to leverage additional funding for loans from European banks to create a central revolving loan fund in Estonia to provide long term low-interest loans through local commercial banks to upgrade MURBs built before 1993. The loans are offered at 4.5% over 20 year terms to finance EER projects that have been defined as priority measures in an energy audit. The program aims to achieve 20 to 30% reduction in energy consumption in the buildings in which projects are implemented (Rezessy and Bertoldi, 2010, p. 27).

Another similar program in Europe is JASPERS (Joint Assistance in Supporting Projects in European Regions). JASPERS aims to take advantage of the unique expertise of financial institutions to improve the ability of government authorities to assemble and act on sound projects, minimize financial risk and maximize positive outcomes (InoFin, 2008, p. 44).

In Europe, increasing awareness and technological advancement are attracting attention from government. For example in Sweden, Skanska is developing new MURB projects and retrofitting existing MURBs using “passive house” standards. Passive house standards result in significantly less energy use than conventional construction technology. The standard requires very little space heating and relies on heat generated from human occupants, domestic lighting and domestic appliances as well as passive solar energy (Skanska, 2008, p.1). However, a scan of the English language sections of the Swedish government website provides no information about direct senior government support for EER projects of any kind. The Swedish government does require that each municipality employ an energy advisor to whom homeowners can turn for advice concerning energy conservation (Government of Sweden, 2014).

The government of Latvia has initiated state-sponsored programming to facilitate the renovation of MURBs. The key policy objectives of the program were to stimulate the retrofit of privately owned apartment buildings and to promote energy efficiency. The program was set up in 2007 to finance approximately 10 million Euros worth of retrofit work between 2007 and 2010. This involved conducting approximately 1120 energy audits and completing 310 renovation projects. Implementation involved the use of a revolving loan fund and the provision of low-interest loans (Government of Latvia, 2007, pp. 3 – 8).

In Finland, Motiva is a state-owned company that provides energy efficiency related services and programming to government, business, and communities. Services include marketing of energy efficiency agreements, support and monitoring of implementation, development of energy audit and analysis activity, increasing the use of renewable energy, promotion of energy efficiency objectives, and public education (Motiva, 2013). Through Motiva, a voluntary energy conservation program for the MURB sector was delivered from 2002 to 2012. The program involved the institution of an energy conservation agreement, the preparation of an energy efficiency plan, the completion of energy audits, and the implementation of energy efficiency upgrades. The company led the education of energy auditors and, through the program, a 50% subsidy of the cost of audits was provided. Further, energy renovation subsidies were provided for buildings containing three or more apartment units to help offset the costs of improving or replacing windows, additional insulation of external walls and roofs, connecting to district heating systems, upgrading boilers, and other energy efficiency upgrades. The subsidy provided was equal to 10 to 15% of total retrofit costs (Aho, 2005).

4.5 UNITED STATES

In the United States, the federal government plays a facilitator role in energy efficiency by providing information and financial resources in support of local energy efficiency programming. Generally speaking, the energy efficiency programming in the United States is delivered at the state level, sometimes in partnership with other levels of government. The US Department of Energy partners with state and local governments, utilities and non-profit organizations to encourage homeowners to improve the energy efficiency of their homes by implementing upgrades (U.S. Department of Energy, n.d.[a], para. 1). The Office of Energy Efficiency and Renewable Energy (OEERE), part of the Department of Energy, operates the programs that provide funding and assistance to partner agencies in support of their energy efficiency programs, many of which are geared for low-income households.

For example the Department of Energy's Weatherization Assistance Program provides funding to states, territories and some Indian tribes to improve the energy efficiency of the homes of low-income families. Those governments in turn partner with local governments and non-profit agencies to provide weatherization services to those in need using the latest available technologies. The program has been operating since 1976 (U.S. Department of Energy, n.d.[b], para. 1).

The OEERE plays an important role in developing local capacity in the US regarding energy efficiency retrofit approaches. The agency has developed model documents for energy savings performance contract projects. The documents are intended as a central resource to be used by any party wishing to engage an ESCO to facilitate an EER project for its building. The information outlines the steps to solicit the services of an ESCO, prepare and consider retrofit options based on an energy assessment, and provides a model document that can be used to build an energy performance contract. Information is also provided regarding the procurement of financing to support the EER project (U.S. Department of Energy, n.d.[c]).

The State and Local Energy Efficiency Action Network (SEE Action) in the United States is a state and local led effort facilitated by the US Department of Energy and the Environmental Protection Agency. The network acts as a resource for state and local decision-makers and their partner organizations by equipping them with tools and information to assist with local program implementation. SEE Action assists with program design and development of policy options (SEE Action, n.d., para. 1).

In addition to the US federal government acting as a resource for state and local authorities in support of locally delivered programs, tax credits are available to encourage homeowners to invest in energy efficiency upgrades. The Tax Increase Prevention Act of 2014 provides tax incentives for residential energy efficiency improvements including window and insulation upgrades, air sealing of homes and ducts, and upgrades to air conditioning and heating systems. The credit is capped at between \$200 and \$500 for insulation, window and door improvements, and between \$50 and \$500 for heating and cooling equipment, depending on the improvements made and the type of equipment installed (Tax Incentives Assistance Project, 2014, para. 2). The federal government also offers a tax credit equal to 30% of the cost of certain renewable energy technologies with no upper dollar limit. These technologies include geothermal heat pumps, photovoltaic systems, solar hot water systems, and small wind energy systems (U.S. Department of Energy, n.d.[d], para. 4).

Whereas many energy efficiency programs are administered at the state and local level in the US, the five most populous states were selected for a jurisdictional scan. The results are noted below.

4.5.1 CALIFORNIA

The state's energy efficiency programs related to existing buildings is led by the California Energy Commission (CEC) and Energy Upgrade California (EUC). The Commission developed the Home Energy Rating System (HERS) to provide homeowners with qualified home energy auditors (California Energy Commission, n.d., p. 2). The EUC manages the Energy Savings Assistance Program, which provides direct assistance to homeowners and renters that meet low-income criteria. Assistance includes no cost weatherization services (including installation) and energy efficient appliances, equipment and fixtures to qualifying households (Energy Upgrade California, n.d., pp. 1-2).

The EUC also provides funding for EE projects through the Statewide Clean Energy Upgrade Finance Program. The program offers fixed-rate loans over five to fifteen years for energy efficiency upgrades, including solar based projects. Energy assessments must demonstrate that the upgrade produced at least a 10% reduction in energy consumption (Energy Upgrade California, 2015).

The Home Upgrade program provides rebates of up to \$6,500 for EER projects and is designed to encourage holistic home upgrades to achieve maximum energy reduction outcomes. Eligible upgrades include heating and cooling systems, high efficiency windows, air sealing, and insulation improvements. Through the program, a qualified home upgrade professional will conduct an assessment to identify an effective energy savings plan. Eligible residences include single family homes, two to four unit townhouses and condominiums (Pacific Gas and Electricity, n.d.[a], para. 1 – 2).

The Multifamily Energy Efficiency Rebates program encourages owners of existing tenant-occupied properties to upgrade to qualifying energy efficient products. To be eligible, properties must contain two or more dwelling units. The program provides rebates for energy appliances, heating and cooling systems, hot water heaters, and energy efficient lighting fixtures (Pacific Gas and Electricity, n.d.[b], para. 1).

A number of PACE programs are available in the State of California. Fig Tree Energy Financing administers a PACE financing program in a number of California cities in partnership with the Pacific Housing and Finance Agency and the California Enterprise Development Authority (DSIRE, 2013). The program works like a conventional PACE model in that owners are able to finance energy efficiency improvements to their properties and pay back the debt through their property taxes. Up to 20% of the property's value can be financed to facilitate energy and water improvements. The program is available for commercial, industrial and multifamily residential properties and for a wide array of improvements, including renewable energy generation, heating and cooling systems, building envelope improvements, lighting upgrades, and water heating and efficiency improvements (Figtree, 2015).

4.5.2 TEXAS

The City of Austin's electrical utility, Austin Energy, operates the Powersaver Program, a component of which provides rebates for energy efficiency upgrades to multiple family buildings. Incentives are available for upgrades to hot water heaters, heat pumps, building insulation, duct diagnostics and improvements, lighting, HVAC upgrades, and solar energy systems. All incentives for MURBs are provided in the form of rebates and amounts vary depending on the upgrade (Austin Energy, 2015).

American Electric Power (AEP) in Texas targets energy efficiency contractors, rather than residents directly, with the Residential Standard Offer Program (RSOP). AEP contracts with project sponsors to deliver peak energy demand savings by installing qualifying energy efficiency measures in existing homes. AEP pays a fixed price per unit of energy savings resulting from the EER upgrades in the form of incentives to the project sponsors. Approved project sponsors are responsible for marketing their services to AEP customers, entering into contracts with homeowners, installing the upgrades, and reporting on the results. Project sponsors can be ESCOs, contractors, retail electric providers, companies that provide energy related products. Multifamily properties, defined as those containing three or more units, are eligible for the program (American Electric Power, 2014, pp. 3-5).

A myriad of other rebate programs are available through utility providers in various parts of the state (DSIRE, 2015[c], Utility Rebate Program section).

4.5.3 NEW YORK

The New York State Energy Research and Development Authority (NYSERDA) provides a comprehensive suite of resources, including the Multifamily Performance Program for existing buildings. The program information suggests that up to 22% return on investment is available if a whole-building energy efficiency strategy is used. The program is available for buildings containing between five and 49 residential units on four or more floors. MURB owners are partnered with an energy efficiency expert, called a “multifamily performance partner” who will prepare an energy reduction plan for the building designed to hit an energy savings target of 15%. Base incentives are provided by the program ranging from \$300 to \$950 per unit and performance payments are provided ranging from \$200 to \$350 per unit based on the actual percentage increase in efficiency realized (NYSERDA, 2015[b]).

Two different options are available through NYSEERDA to obtain low-interest loans to assist with the implementation of EER projects. First, the on-bill recovery loan option allows for monthly payments through the homeowner’s utility bill. The amount of the payment does not exceed the value of monthly energy savings realized from the project. The current interest rate for such loans is 3.49%, but is subject to change. Loan amounts range from \$1,500 to \$25,000 with payback terms of five, 10 or 15 years and loan balances are transferrable when homes are sold. The option is available provided the homeowner is served by a participating utility. Second, the smart energy loan option provides a more traditional financing arrangement in which loan payments are made by the homeowner to NYSEERDA’s loan servicer. Loan amounts, the interest rate, and payback terms are the same as for the on-bill option (NYSERDA, 2015[d]).

NYSERDA also operates the Home Performance with ENERGY STAR program, designed to provide a financial incentive to owners of single family homes or buildings containing up to four units to implement energy efficiency upgrades. The homeowner is provided the services of a home performance contractor who will provide a home energy assessment identifying the opportunities to improve the energy efficiency of the home. Based on the results of the assessment, the homeowner decides which energy efficiency upgrades make the most sense for them. Examples of upgrades include switching to a high efficiency furnace, energy efficiency lighting, and insulation improvements. The homeowner then signs a contract with a contractor and receives a 10% discount (up to a maximum of \$3,000) on eligible energy improvements. The method of delivering the discount is flexible as it may be paid directly to the homeowner upon completion of the project or it may be assigned to the contractor to reduce the cost to the homeowner. The homeowner also has the option of applying to NYSEERDA for a low-interest loan to further assist with project financing. Once the work is complete, the homeowner signs off indicating the work has been satisfactorily completed, and the applicable financial incentives are provided (NYSERDA, 2015[c]).

The New York State Department of Finance and Taxation rules provide for property tax exemptions to further encourage energy efficiency improvements to certain residential properties. Owners who implement energy efficiency improvements in residential buildings containing one to four residential units

are exempt from paying additional property taxes on the incremental increase in property value, if any, resulting from the improvements. Eligible upgrades include improvements to weather proofing (including doors and windows), furnace and boiler retrofits, heat pumps, improved insulation, and solar and wind energy systems (State of New York, 2012).

4.5.4 FLORIDA

The City of Lauderhill, Florida offers interest free loans for EnergyStar appliances through a municipal revolving loan program. Loans from \$400 to \$2,500 are available to homeowners purchasing new Energy Star certified appliances from eligible retailers. Tankless water heaters, solar photovoltaic systems and solar water heating systems are also eligible for the loan program. Loan funds must be repaid within a two year period (City of Lauderhill, 2015).

St. Lucie County manages a revolving fund program called the Solar Energy Loan Fund (SELF) to provide low cost financing to property owners so they can invest in energy saving property improvements. The fund was created using seed money from federal and state grants and is managed at arm's length from the county government. The loan program is structured in a way that provides positive cash flow to property owners by ensuring that loan repayments are less the value of energy savings realized. SELF offers financing for more than two dozen types of energy efficiency and renewable energy upgrades, including weatherization improvements, air conditioning upgrades, window tinting, cool roof construction, lighting upgrades, and installation of solar energy systems. Interest rates are as low as six percent and terms as long as 15 years and loan amounts can vary from \$1,000 to \$50,000. The program educates property owners about the best ways to save energy and demonstrates the benefits of specific alternatives. It features professional grade energy assessments that explain in simple terms what improvements a home or business needs to make in order to cut its energy consumption (St. Lucie County, 2012, para. 1 – 3).

The Orlando Utilities Commission (OUC) delivers programming that provides direct financial payment to property owners who install solar energy systems. The Photovoltaic Credit Program provides monthly credits on the utility bills of customers who have installed photovoltaic systems. The credit is equal to 5 cents per kWh of energy produced regardless of whether the energy was used on site by the owner or was sent back to the OUC power grid. The Solar Thermal Incentive Program offers residential customers financing and rebate opportunities for the installation of solar hot water systems. Customers can receive a point of sale rebate of \$1,000 and can also have their system financed at zero interest over a 36 month term. Eligible residential property types include single family homes and townhouses (Orlando Utilities Commission, 2014).

Miami-Dade County delivers the Voluntary Energy Efficiency and Renewable Energy Program, using the PACE model, to finance the implementation of energy reducing technologies for residential properties. Applicants are required to submit cost estimates for the proposed work prepared by a certified contractor. Loan amounts are limited to 10% of the value of the property and can be repaid over 20 years (DSIRE, 2012[c]).

Gainesville Regional Utilities (GRU) offers a low-interest loan for pre-approved items including the ENERGY STAR refrigerators, high efficiency central air conditioning systems, and solar photovoltaic systems. Through the program, financing is available from a credit union to fund the energy efficiency improvements. Loans are provided at a six percent interest rate with repayment terms of up to five years and financing amounts of up to \$10,000. Eligible properties include owner occupied single family homes, mobile homes, and multifamily buildings containing up to four units (DSIRE, 2012[d]).

4.5.5 ILLINOIS

The Illinois Solar Energy Association (ISEA), in partnership with the City of Naperville, offers the Renewable Energy Certificate Aggregation Program (RECAP) to solar photovoltaic (PV) system owners, providing them with an opportunity to receive payment for their Solar Renewable Energy Certificates (SRECs). The aggregated SRECs from RECAP supply the solar portion of the City of Naperville's Renewable Energy Program. This partnership is the first market example of SREC transactions in Illinois. To qualify, solar energy systems must be 10 kilowatts or smaller in size. The amount of the incentive is \$105 per megawatt hour (ISEA, 2013).

The Energy Efficiency Loan Program administered through AFC First Financial and funded by participating utilities in Illinois provides loans to customers through an on-bill financing model. These on-bill financing loans are designed to be repaid through utility bill payments and typically target residential customers (including multiple family), although certain utilities will allow commercial participation. The program can be used to finance upgraded appliances, lighting, heating and cooling systems, duct and air sealing, and insulation upgrades. The basic parameters of the program provide for loans of up to \$20,000 to be repaid over three, five, or ten years. The interest rate is currently set at 4.99% although certain loan specifications may vary from utility to utility. Loans of up to \$150,000 are available to retail customers that own multi-family residential or mixed-use buildings with no more than 50 residential units. The interest rate available for these loans is 5.99% or less (DSIRE, 2014).

4.6 SUMMARY MATRIX OF JURISDICTIONAL SCAN

Table 1 is a summary of the key pieces of information found through the jurisdictional scan. It summarizes the detailed information described in Subsections 4.1 to 4.5 and the information provided in Appendix A. The table indicates whether there is any programming accessible by MURB owners and managers. An indication of yes under this column indicates there is programming that can potentially be applied to MURBs but does not indicate there are programs designed to specifically apply to MURBs. In some instances, it is difficult to determine whether some programs are available for MURBs, and in such cases the answer had to be inferred from the information available. The Comments column provides a brief statement about any themes or unique approaches that were encountered through the scan.

TABLE 1 – SUMMARY MATRIX OF JURISDICTIONAL SCAN

Jurisdiction	Programs Applicable to MURBs	Types of Implementation Approaches Found	Comments
Canadian Government	No	Gov't grants (for single family homes only); informational role	No centralized, coordinated entity exists within gov't for EER
British Columbia	Yes	Gov't grants (rebates); financial incentives; tax exemptions; on-bill financing	programming is delivered through a partnership with BCHydro and FortisBC
Alberta	No	None currently in place	Rebate based programming was formerly in place
Saskatchewan	No	None currently in place	Low-interest loans formerly offered
Manitoba	No	Utility bill credits; low-interest loans; on-bill financing; rebates	All programming is delivered through Manitoba Hydro
Ontario	Yes	Gov't rebates; ESPA	ESPA program is through Toronto Atmospheric Fund administered by City of Toronto
Quebec	Yes	Gov't grants	
New Brunswick	Yes	Gov't grants	EE programming delivered through separate crown corp.; rebates formerly provided
Nova Scotia	No	Zero-interest loans; gov't rebates; PACE (Richmond County only)	EE programming delivered through separate crown corp.
Prince Edward Island	Yes	Gov't grants	Programming delivered through the Office of Energy Efficiency
Newfoundland and Labrador	No	Utility bill credits	Province delivers programming through Newfoundland Power
Yukon	No	Gov't rebates; gov't grants	
Northwest Territories	No	Gov't grants	Some programming delivered in partnership with the Arctic Energy Alliance
Nunavut	No	None currently in place	

BC Local Governments	Yes	Rebates; financial incentives	Majority of local governments scanned have no EE programming
Europe	Yes	Revolving loan funds; low-interest loans, tax incentives; gov't grants/subsidies	Low-interest loans are common, private sector revolving loan systems are utilized (distinct from North America); regulatory support for EE is robust.
US Federal Government	No	Tax credits; informational role	Federal gov't role is supportive in nature; programming generally delivered at state & local level; federal government has office set up specifically for EE (OEERE)
California	Yes	Direct provision of weatherization services; fixed-rate loans; gov't rebates; PACE	EE programming is assigned to two separate state agencies
Texas	Yes	Gov't rebates; ESCO; loan programs; PACE	Power utility takes an active role in marketing EE opportunities; loan program offered through partnership with Credit Union of Texas
New York	Yes	Direct financial incentives; low-interest loans; on-bill financing; PACE; property tax exemptions	Specific State Agency set to deal with EE (NYSERDA)
Florida	Yes	Interest-free loans; low-interest loans; direct financial payment (for solar energy generation); PACE	No specific programming for MURBs but some small MURBs could be eligible
Illinois	Yes	Direct financial payment (for solar energy generation), on-bill financing; utility funded rebates	Utility companies are active in EE programming

4.7 SUMMARY MATRIX OF IMPLEMENTATION APPROACHES

Table 2 is a matrix summarizing the key aspects of all implementation approaches described in Section 3. The information provided is based on conclusions drawn from the results of the research. Suitability for use with MURBs depends not only on the EER implementation approach chosen, but also on the ownership and decision-making arrangements within the MURB itself. Governance structures dictating decision-making around investment in MURBs vary greatly depending on the type of ownership tenure in place. Accessibility refers to the likelihood the implementation model will be understood by the MURB decision-makers, providing an appropriate degree of comfort in considering its use. The possible impediments listed in the far right column are not necessarily exhaustive, and are based on the information and analysis presented in the literature review.

TABLE 2 – SUMMARY MATRIX OF IMPLEMENTATION APPROACHES

Implementation Model	Financial Risk Level	Suitable for MURBS?(*)	Admin Costs	Accessibility (**)	Possible Impediments
Private Sector Implementation Mechanisms					
ESCO	Low – Med; depends on experience of practitioners	Yes	Med – High	Med	Principal-agent problem; perceived financial risk; lack of understanding of program by MURB owners; long payback periods
ESPA	Low	Yes	Med – High	Med	Principal-agent problem; perceived financial risk; lack of understanding of contract arrangements by MURB owners; long payback periods
On-bill Financing	Low	Yes, depends upon flexibility of utility co.	Med – High	High	Long payback periods; possibly counter to utilities business interests; administrative demands on utility
Privately	High	Yes	Low	High	Energy savings

Secured Debt					guarantee separate from debt obligations; competing demands for borrowed funds; lack of understanding of EE benefits by financial institutions
Owner Financing	High	Yes, condo buildings are subject to voting rules	Low	High	All risk assumed by owner; competing demands for capital
Energy Improvement Mortgages	Low	possibly – for interior EE upgrades to MURB units	Med	High	Long payback periods; lack of understanding of EE benefits by financial institutions
Concierge	Low	Yes	Med – High	High	May be seen as an extra/unnecessary costs adding to project risk
Pooled Procurement	Low	Questionable	Med	Med	Would require collaboration among MURB owners
Carbon Credits/Offsets	Low	Yes	High	High	Validation costs can be significant
Revolving Fund	Low	Questionable	Med – High	Low – Med	Requires initial infusion of capital
Public Sector Interventions					
PACE	Low	Yes, but limited applicability for condo buildings	Med – High	High	Long payback periods; lack of enabling legislation, municipal capacity and experience in Canada

Publicly Sponsored Debt	High	Yes	Low	High	Energy savings guarantee may be separate from debt obligations; competing demands for borrowed funds
Tax Credits	Low	Yes but not condo buildings	Med – High	High	Changing government priorities and “start and stop” nature of programs
Government Grants	Low	Yes	Med – High	High	Changing government priorities and “start and stop” nature of programs
Incentives	Low	Yes	Med – High	High	Incentives are often offered on a short-term basis or through a pilot; only useful as a component in a larger menu of programs

5 DISCUSSION

A key research objective of this project was to identify the strength and weaknesses of the various EER implementation approaches. The research indicates that there are many more offerings from the private sector than there are public sector interventions. It appears that the private sector has responded to the demand for implementing energy efficiency projects while public policy development has lagged behind.

It is important to consider the three distinct classifications of MURBs in the context of the array of implementation approaches identified in the research. Whereas co-op housing is generally publicly owned and/or funded, decisions to improve property in this classification is likely to be dependent upon government budgets and funding decisions rather than a business case approach. This is demonstrated in Case Study #1, which describes a retrofit project resulting in a payback period far exceeding what is likely considered acceptable by private investors. In this example, EE components were added to the project to lessen the financial impact of the overall project investment, which was necessary to comply with provincial standards.

The following subsections provide discussion on the major themes that have been encountered through the research. Government intervention is discussed in the context of the need for consistent policies, programs, leadership and guidance. The principal-agent problem is discussed as a restricting force that requires recognition. Proactive steps are required to overcome agency issues since individual decision-making has societal implications. Discussion is provided on the lack of focus on the MURB sector generally, and on the particular challenges of EER for condominium buildings specifically, in the current array of public programs. A commentary is provided on what appear to be the most important implementation tools available and a separate subsection is dedicated to performance contracting, which is a particularly attractive option, especially for comprehensive and complex retrofit projects. Finally, a discussion on lessons learned from other jurisdictions is provided.

5.1 GOVERNMENT INTERVENTION

A key research objective for this project is to determine the appropriate degree and manner of government intervention in maximizing participation in EER projects in the MURB sector. There has been minimal government intervention to encourage investment in EER projects in Canada, and much of what does exist are short term programs in the form of rebates and tax incentives. The jurisdictional scan revealed instances of public programs that were formerly delivered, but had since been discontinued. Government could choose take on the role to educate and foster a greater understanding of those making private investment decisions. The public sector could be proactive in facilitating that investment. Such a lead role could involve backstopping investment risk through publicly funded financial guarantees. A lesser role for government, but still a financial one, is to continue an already common trend of provincial governments in Canada: deliver publicly funded incentive programs through various tax credits, rebate initiatives and other types of programming. In comparison to the examples set by the EU and the United States, Canadian public policy in this area falls short.

Regardless of the degree of government intervention, two key issues should be addressed: a lack of focus on the MURB sector in public energy efficiency programming and the short term and unpredictable nature of specific programs.

The government could have a role to play in partnering with performance contracting organizations from the private sector to lend credibility to the concept and reduce the perceived risk to investors. Government does not necessarily need to help with financing since sound business cases can be built demonstrating that energy and financial savings can be realized through investment in EER. If the EER industry were publicly endorsed and promoted by the government it would become part of the public consciousness and awareness of the opportunities would grow. Governments could set targets and adjust programming in accordance with annual performance objectives.

It is generally accepted that there are significant energy savings available that are not being realized by homeowners. An example is provided by the study conducted by the Alberta Energy Alliance which revealed that there are energy efficiency upgrade opportunities currently available to home and business owners that are economically viable. Government has a role to play to lead MURB owners and managers toward available opportunities. This can be accomplished through the strategic combination of directed and proactive education programs and financial incentives. Medium to long term financial returns are not always enough to spur private investment in energy efficiency, even when the paybacks are significant. Education and incentive programs can help lessen the financial impact of private capital investment, while producing energy savings for the consumer and GHG emission reductions for societal benefit. The public interest that underlies the gains enjoyed by society is the impetus for public policy intervention. The unique challenges associated with the decision-making rules under condominium ownership, a popular form of ownership tenure in MURBs in BC, should be taken into consideration.

The short term and inconsistent nature of publicly delivered EER programming is a concern that should be addressed in BC by the provincial government. Provincial governments are left to establish their own agendas with respect to EER. Some provinces have robust programming in place to spur investment in energy efficiency, which may help to build confidence in the EER market through a critical mass of positive experiences. The BC government should consider implementing a long-term program to improve the energy efficiency of the MURB sector through a combination of sticks and carrots. The government could institute a minimum energy efficiency standard using a standardized system such as the EnerGuide system used by the Canadian government and phase in compliance requirement over a period of time. The phase-in period could be combined with the use of incentive programs to encourage MURB owners toward compliance prior to the mandatory requirement coming into effect.

Most of the government websites researched did not feature energy efficiency programming prominently in the online information presented. Most of the information obtained through online government resources was found through the website search function rather than through a logical flow of links for departmental programming or services for residents. The visibility of web content related to energy efficiency should be improved.

There is an artificial market for energy prices. Given the link between energy consumption and climate change, inefficient buildings result in an externality that imposes a greater burden on society than is

necessary. Energy prices are not sufficiently signaling consumers to alter their practices, lifestyles and buying habits in ways that maximize energy efficiency. While such programs are typically unpopular, governments could consider placing a greater tax on units of energy used to heat and energize buildings. Revenues could be used to fund energy efficiency initiatives and subsidize energy costs for low-income households.

5.2 THE PRINCIPAL-AGENT PROBLEM

Understanding the motivational factors that result in MURB owners and managers taking decisions to invest in EER projects is critical in order to determine best practices for overcoming implementation barriers. This paper documents that due to the principal-agent problem inherent in the rental form of MURB it is necessary to devise incentive programs that induce an agent to act in the best interests of a principal. There is often a problem of asymmetric information associated with EER projects, which is a problem that arises when the participants in an exchange are not equally well informed about the product or service being offered or when factors de-motivate players to invest in EE when they believe they will not recover their investment.

An important part of the way forward lies in the recognition that the societal benefits to be realized from EER projects require that something must trigger the decision of an owner to invest in a project. Therefore, one of the principal keys to unlocking the potential in the EER market in the MURB sector is overcoming the agency concern. While the broader societal benefits of EER projects collectively stem from the reduction in GHG emissions and the resulting climate change mitigation, a chief motivating force that will likely improve market uptake in the MURB sector is the energy and financial savings derived from investment in EER projects. It is perhaps true that building owners and managers do not always have a complete understanding of the business case supporting EER investment. It is also likely that long payback periods is a de-motivating factor in implementing EERs in MURBs as it increases the possibility that benefits will accrue to future owners. The link between energy efficiency and long term financial return is an important factor in attracting greater attention to the benefits of EER investment. There is a place for government in educating decision-makers on the financial opportunities that exist in EER projects.

The way forward for the EER market must include specific opportunities to harness existing expertise in the private and non-profit sectors. Partnerships between government and these sectors could bring greater awareness of EER opportunities and the resulting financial gains, as well as increased credibility. Such partnerships could include a government regulated EER program in which service providers are required to register and meet minimum standards to ensure investors that an appropriate level of expertise is being presented to the market.

5.3 LACK OF FOCUS ON THE MURB SECTOR

The vast majority of publicly sponsored EER incentive programs are geared primarily for single detached dwelling units. While single family homes are an important segment of the housing stock in Canada, a significant opportunity to reduce energy consumption in the residential sector is being overlooked as most jurisdictions do not have programming specifically designed for MURBs. The federal government has

documented that it has substantially improved energy efficiency in Canada; however, such gains may not be as large as they could have been.

The policy environment in British Columbia generally reflects that seen in the rest of Canada with respect to its lack of focus on MURBs. Provincial government support and programming in BC provides some opportunities for EER projects, but does not deliver programming specifically intended for the MURB sector. The LiveSmart BC model heavily favoured the single family detached housing market in its delivery of energy efficiency programming and education. Most of the programs noted in Section 4.2.1 are geared for single family detached homes rather than MURBs and the jurisdictional scan for provincially administered programs in British Columbia turned up very little support EER projects for MURBs.

EER investment decisions in relation to privately owned rental apartments are likely to be made based on the basis of a positive business case and a reasonable payback period realized from reduced energy consumption. Decisions will depend upon the general economic climate and the owner's financial wherewithal; however, such decisions are the owner's to make. The decision-making process in rental apartment buildings is relatively simple compared to a condominium building with many owners. EER investment decision-making in a condominium building is subject to varying degrees of understanding and financial resources held within the condo membership. Membership voting rules in BC require a majority vote by unit owners in order to invest financial resources from the condo organization's contingency reserve fund on an item identified in the mandatory depreciation report. The reduction in the voting requirement from 75% down to a simple majority may increase opportunities for EER in strata properties due to the greater potential for getting ownership support for such investments when major building components come due for replacement or renewal. However, a legislated requirement that depreciation reports include EER opportunities within their scope would enhance the likelihood of EER projects being considered since they would be subject to the 50% voting requirement.

Due to the fragmented nature of condominium ownership it is likely that guidance will be required to improve the understanding of the options and risks associated with EER. Government could provide a leadership role by developing a support system that provides information and other kinds of resources to condominium owners and raise awareness of EER opportunities. Further, regardless of the classification of MURB in question, whenever upgrades are undertaken out of necessity (i.e., required structural upgrades, maintenance and replacement of building components, upgrades required to comply with regulatory requirements), such a centrally operated and funded framework could increase the likelihood that EER components would be added to projects that are necessary for other reasons.

5.4 IMPLEMENTATION TOOLS

Information discovered through the literature review and jurisdictional scan suggest that EER programming, in order to leverage for maximum results, must contain a suite of tools. Financing approaches are an important component of the public sector offering, but must be supported by educational and informational products as well as predictable, consistent programming. Programs offered by the provinces of Manitoba and British Columbia are examples of multi-pronged approaches designed to attract the attention of homeowners through education in addition to financial incentives. While

significant gaps exist in much of the public programming researched with respect to MURBs, valuable lessons can be carried forward by considering the strengths in the programming that does exist. Due consideration should be given to how various components of a program can work together to educate energy consumers on the opportunities available to them.

The experience of TAF is important in the context of this research. Assurance of expected outcomes through performance contracts could be important in order to achieve the scale of investment necessary to make a substantial impact on the significant volume of MURB stock in BC. TAF is also an excellent example of a non-profit (although government sponsored) entity taking a proactive approach to facilitating EER projects by creating a comprehensive resource, developing its own implementation model (TowerWise), and educating potential participants on the benefits of EER projects and how to manage pitfalls.

On-bill financing is an attractive option for MURB owners and operators (at least for rental buildings), depending on the types of upgrades being considered. A limitation of the on-bill financing approach is that the scope of EER projects to which it can be applied is generally limited by the financing entity, which is usually a utility service provider. It can, however, be a useful tool that could form part of a larger suite of options.

Energy efficient mortgages and energy improvement mortgages can be found in many parts of the United States. The research has found no instances of these tools being offered in Canada. Lack of understanding and education within financing institutions could be an issue limiting the ability to use these tools in Canada; however, proactive educational programming and partnership arrangements with government could help with this problem.

PACE is a particularly attractive model for financing EER that could be widely applied in Canada as it is in the United States. Enabling legislation is lacking in many jurisdictions but that could be changed through provincial legislatures as it has been in Ontario. Its use on MURBs could be challenging, depending on the ownership and governance structures in place, due to difficulties with decision-making relative to EER investment.

5.5 PERFORMANCE CONTRACTING

Implementation approaches that include built-in guarantees through well defined contractual provisions and the application of engineering expertise offer positive investment opportunities for building owners and managers. Such tools could play a foundational role in any newly developed program for BC. The examples provided in relation to Aspen, Colorado and Condo owners in Alberta demonstrate a lack of awareness of investment opportunities available to MURB owners. It is plausible that lack of understanding and education in the MURB sector is a contributing factor limiting market participation and investment in EER opportunities.

As the overview of implementation approaches indicates, performance contracting offers strong potential as a tool to foster a more active EER investment market. There has been experience with performance contracting in various jurisdictions that has created learning experiences and a greater level of understanding of the application and administration of contracts. The business arrangements surrounding

performance contracting are accessible and useful for managing risk. The administrative effort required to manage a performance contracting program for EER can be substantial, particularly the start-up costs. However, administrative costs may diminish over the course of time and the structural aspects of the contract provide stable and predictable outcomes for program participants.

In addition to risk management advantages, program elements can be put in place to deal with inherent issues regarding principal-agent problems. Proactive programming could include solicitation for EER projects based on the age and condition of buildings within target areas.

5.6 LESSONS LEARNED FROM OTHER JURISDICTIONS

In the United States an important information resource is provided through the Database of State Incentives for Renewables and Efficiency (DSIRE). DSIRE is an initiative of the US Department of Energy and the North Carolina Clean Energy Technology Center. The database is publicly available and provides a centralized overview of programs and policies in place within state and local governments across the US. The website provides an overview of available programs as well as links to program websites where more information can be found, including eligibility and other program details. Such a resource would be valuable in Canada or British Columbia, provided a means could be found to sustain the resource and keep the information in the database up to date.

Many programs in other jurisdictions are centred around the idea of the public entity playing a facilitator role by providing access to the resources necessary to implement comprehensive EER upgrades. These resources are not always directly financial in nature as they can also include access to professional and technical expertise in relation to financing models and EER techniques. The NYSERDA programming is an excellent example of this kind of role being provided by the public sector.

The Keeping PACE in Texas program is an example of a proven financing technique employed outside of Canada that could be widely adapted for use in this country. Government leadership is required to carry out the research and due diligence necessary to develop the array of program options in Canada, including PACE. PACE financing is used at a micro level in Canada, generally referred to as a local improvement charge (LIC), but it is an implementation model that could be attractive for many homeowners. Further research and analysis may be required to work through the mechanics of how it can be applied to a MURB, however the principles of the model appear to be transferrable to the MURB sector. An apparent limitation, however, is that owners of condominium units are responsible for paying the property taxes for their units.

The case study from 849 Broadview Avenue in Toronto demonstrated that providing MURB owners with access to a MURB owners' network can have value. Such a network could facilitate a greater collective understanding of EER project challenges and opportunities and enable building owners and managers to learn from the experiences of others. A network in British Columbia similar to the Federation of Rental Housing Providers of Ontario could facilitate an accumulation of understanding around EER projects, and could also provide the MURB sector with a common voice with which to communicate to government about the policies and programs needed to support EER efforts in the MURB sector. Such a network, in

order to be useful for building comprehensive knowledge regarding EER would have to be open to all types of MURB owners and managers, not just rental apartments as LandlordBC is.

6 RECOMMENDATIONS

An objective of the research was to present recommendations and suggest areas for further research regarding the promotion of EER projects in the MURB sector in BC. Recommendations arising from the research are presented below. They are grouped into three categories: first, recommendations related to policies and programming to support the growth of the EER market in BC; second, recommendations pertaining to a pilot project; and finally, recommendations for further research in the area of implementing EER in MURBs.

Policy/Programming Recommendations

- 1. The BC government should institute a long term program aimed at improving the energy efficiency of the three distinct segments of MURB sector.** Public sector leadership is a critical part of the way forward for the EER market in British Columbia. Government policy should recognize the public interest in EER and create a program to ensure minimum goals are being met throughout the province, including the existing MURB building stock. The government should consider instituting a uniform energy efficiency standard for the MURB sector (such as the EnerGuide system) and phase in the requirement for compliance over a number of years. The phase-in period should be supplemented by a comprehensive incentive program to maximize voluntary compliance. Such a program would require further research and consideration as to the types of incentives that would be most effective (financial and otherwise), the costs of such a program, enforcement approaches required to ensure compliance, and the administrative resources required to make such a program work.
- 2. The BC government should create the framework for a regulated EER program for MURBs in the province with a focus on building performance.** The centrepiece for such a program would be a performance contracting approach, possibly using the ESPA model. The key direction for the Province of British Columbia to establish impactful EER programming should be centred on building performance. The program would include two main components: first, a requirement for building owners to carry out energy efficiency assessments, including the production of a report detailing EE upgrade opportunities and associated paybacks to be realized from the investment. Secondly, the province should establish a public private partnership through which the provincial government would lead stakeholder engagement, education and marketing while the private partner, defined through an RFP procurement process, would provide the industry expertise and contract administration. Government involvement is necessary to enhance the credibility of performance contracting as an EER tool and to promote the opportunity to achieve energy and financial savings through investment in EER. This arrangement also gives the government the opportunity to link program outcomes to important policy objectives related to GHG reductions and climate change.
- 3. The BC government should develop a program, and if necessary, enabling legislation, to enable the administration of LIC (PACE) programs at the local government level for EER projects in MURBs.** Specific work should be undertaken through the provincial government to

design a model PACE program for local governments in the province and several pilot programs should be launched in different regions of the province, including multiple MURB developments. The results of the pilot should be used to develop a permanent PACE program in the province. This program could also include the development of a model PACE by-law in partnership with the Local Government Management Association, Union of BC Municipalities, or selected municipal partners.

4. **Policy development regarding EER in British Columbia should have a particular focus on the MURB sector and should be staged to achieve substantive results as early on as possible.** Further work is required to determine the specific building types and ages that would yield the greatest return on investment. Programming should be focused on that segment of the building stock first.
5. **The federal government should be lobbied to provide tax credits to encourage private investment in MURB EER projects.** This could include GST rebates for taxes paid on materials and labour required to install EER equipment, as well as a reduction in income tax payable based on the amount of capital invested in EER projects.
6. **The BC government should amend the Strata Property Act to require assessment of EER opportunities, and support this requirement with a program to provide independent advice and analysis to condo owners with respect to EER.** The research reveals there is often little consistency in understanding within condominium ownership with respect to building operations and maintenance matters and this impacts the ability of condominium organizations to make cost-effective decisions at critical points in their buildings' lifecycle. There should be a requirement built into the Strata Property Act mandating the inclusion of an EER assessment in the depreciation report. As building maintenance projects come due, condominium owners would need to consider opportunities to couple EER objectives with scheduled maintenance. Further, the decision of the owners would be subject to the simple majority voting rules for EER projects identified in the depreciation reports. The recommended provincial resource would provide assistance and advice with respect to EER opportunities, including energy efficiency options, return on investment analysis, and general information regarding building operations and maximizing efficiencies.

Pilot Project Recommendations

7. **A pilot program should be established in BC targeting a select number of large multi-family residential buildings using an ESPA framework.** The Retrofit BC program formerly being investigated by BCSEA could form the basis for such a program as it proposes to use an ESPA financing model and could take advantage of lessons learned from the TowerWise program in Toronto. A pilot program would help build understanding in the MURB industry in the province and could contribute to the critical mass of understanding required to gain momentum from a positive outcome.

8. Performance measures and program outcomes should be established for the pilot program.

The program should have specific measurable objectives identified prior to its launch so that success can be measured at the conclusion of the pilot and adjustments can be implemented in permanent programming and learning opportunities can be fully exploited.

Recommendations for Further Research

9. The TAF's TowerWise program should be closely monitored as implementation proceeds.

Whereas TowerWise has only been active for a relatively short period of time, program outcomes should continue to be monitored to maximize learning opportunities taken from the TAF model. This will increase the likelihood of success for a parallel or similar program in BC as it will facilitate program changes based on lessons learned from the TowerWise program.

10. The BC government should consider building an inventory of MURBs for specific urban communities in BC with which to construct an up to date profile of MURB building stock in the province.

The inventory would enable the construction of an up to date energy profile of the MURB building stock in the most heavily populated communities of the province, and would include data regarding age, size, form of ownership, and extent of EERs previously implemented (if any). The inventory could be used to determine the energy and financial savings opportunities available in the MURB building stock and could help to direct future programming so as to achieve optimum outcomes.

11. Further research should be carried out with respect the influence of price signaling as an impediment to EER investment in MURBs in BC. Key research questions would be focused on the degree to which current energy prices are an impediment to EER investment in BC and whether policy intervention by the government with respect to energy prices would improve EER market uptake in the MURB sector.

12. Consideration should be given to surveying a sample of the MURB owners and/or managers in BC to gain a better understanding of the factors limiting EER investment in the MURB sector and the EER program elements that they would find most valuable.

Empirical evidence would help to supplement this and other research in order to build a solid understanding of the British Columbia context and the particular challenges and opportunities that exist there.

13. The BC government should take a more proactive role in providing access to a centralized resource to local governments and MURB owners/managers. British Columbia could benefit from a centrally maintained database similar to the Database of State Incentives for Renewables and Efficiency (DSIRE) in the United States. The resource could act as a central repository of information and weblinks to programs, funding opportunities, and

support material such as template agreements and guidelines to aid in the use of such complex instruments as ESCOs and ESPAs. The DSIRE example in the US is the result of a partnership between government and an academic institution. Perhaps the government could provide a modest amount of funding to set up and maintain the resource while the work is carried out by a non-profit organization or an institutional partner.

14. The BC government should consider leading the establishment of a province-wide support structure similar to the Federation of Rental Housing Providers of Ontario.

One difference from the Ontario example is that it should not be limited to rental housing and should explicitly include condominium ownership. Such a body may need initial government support to get started but should ultimately be self-sustaining. The mandate of the group could be to coordinate the sharing of information among MURB owners and managers and to present a unified voice in communicating with government on behalf of the MURB sector in the province. Such an arrangement would be mutually beneficial as it could help streamline policy development and implementation for the government as it provides a portal into the MURB sector, as well as enable the MURB sector to pursue a coordinated agenda with the province.

7 CONCLUSION

Climate change is documented as one of the most significant challenges facing humanity today. A significant portion of the greenhouse gases contributing to climate change comes from the energy consumed to heat and energize buildings. Opportunities exist to improve to energy efficiency of the existing building stock in British Columbia.

This paper provides an overview of the academic and grey literature related to implementing EER projects in MURBs. It provides information regarding the various implementation mechanisms offered by the private sector as well as public sector interventions. Information is also provided summarizing the known barriers to implementing EER projects in the MURB sector. The jurisdictional scan revealed common approaches in British Columbia, across Canada, in the United States and Europe. In addition to a lack of consistency in EER programming, there is a fundamental lack of focus on the MURB sector in Canada in relation to EER programming. This is true for the province of BC as well.

Government commitment and leadership are necessary in order to foster an inviting environment in which to invest in EER in the province. Lessons should be taken from other jurisdictions to inform the development of a suite of implementation tools in BC to help foster greater investment in EER.

The recommendations presented in this paper are focused on the development of programs in the province of BC that are consistent over the long term. Performance contracting tools offer particularly attractive elements with respect to risk management and performance guarantees. The provincial government could develop partnerships to enhance provincial capacity with respect to investment in EER in the MURB sector. The TowerWise Program in Ontario is an example of the use of performance contracting to deliver programming that facilitates deep retrofits in the MURB sector. Further research is required to determine the influence of price signaling (with respect to energy prices in BC) as an impediment to investing in EER in BC. Opportunities for broad implementation of new programming using the PACE model in BC should be pursued. Finally, new programming needs to recognize the particular challenges related to investing in EER projects in for strata properties in the province.

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APPENDIX A: EER PROGRAMS FOR NON-MURB BUILDING TYPES

This appendix describes the programs and policies found through the jurisdictional scan that are not specifically designed for MURBs. This is included as supplemental information as, although it does not pertain to MURBs, it may help inform the analysis of options for best practices for promoting EER projects for the MURB sector. Some programs oriented for single family detached homes, for example, may be able to be altered or combined with other types of tools in order to be adapted for use by MURB building owners and managers.

Federal Government Programs

Natural Resources Canada (NRC), on behalf of the federal government, is running the “ecoENERGY Efficiency Program.” This program has several components, two of which are relevant to EERs for the housing sector: “ecoENERGY Efficiency for Buildings” and “ecoENERGY Efficiency for Housing.” The ecoENERGY Efficiency for Buildings program provides access to a national building energy benchmarking tool that allows building owners and managers to compare the energy performance of their building to that of other buildings. This is intended to help building owners and managers understand the business case for investing in energy efficiency improvements for existing buildings. The benchmarking tool became available in 2013 for commercial and institutional buildings and other building types will be added over time (Natural Resources Canada, 2013, para. 11).

The ecoENERGY Efficiency for Housing program encourages the construction and retrofit of low-rise residential housing by using the EnerGuide Rating System as a basis for offering incentives for EER investments. The ecoENERGY retrofit for homes program ran from 2007 to 2012 but has been discontinued. The program offered grants for up to \$5,000 to assist homeowners in making their homes more energy efficient, however it only applied to detached single family homes (Natural Resources Canada, 2014[a], para. 1 – 2).

British Columbia

An energy efficiency rebate program is offered through the BC Hydro Power Smart brand in partnership with FortisBC called the “Home Energy Rebate Program.” It offers rebates on insulation and space heating upgrades, draft proofing and hot water heating improvements (BC Hydro, 2014[a]). FortisBC is also offering rebates of up to \$1,000 for water heater upgrades (FortisBC, 2014) and low-interest loans through the “Renovating for Efficiency Loan Program.” This is a pilot that offers a low-interest loan amortized over ten years to finance energy efficiency upgrades and it is only available in a specific region of the province (LiveSmart BC, n.d.[e]). BC Hydro is running a similar pilot in the City of Colwood targeted at homes heated primarily with electricity, called the BC Hydro Home Loan Pilot Project (LiveSmart BC, n.d.[f]).

The policy framework in BC includes a suite of incentives to promote energy efficiency for businesses, including income tax and sales incentives offered through the federal and provincial governments. BC Hydro offers programming designed for commercial and industrial customers including access to

resources to improve energy performance, funding and rebates to support high performance design and operations, energy studies and audits, funding for equipment upgrades and energy efficiency projects, funding to assist with sustainable energy management, sustainable power acquisition and transfer assistance, and other resources (BC Hydro, 2014[d]). No equivalent level of comprehensiveness exists in the programming for MURB owners.

From a regulatory perspective, the provincial government is enhancing the requirements for green building practices under the BC Building Code. Recent changes in provincial regulation include solar hot water readiness in new buildings and improvements in the energy performance of both small scale housing and larger, more complex residential, industrial, commercial and institutional buildings. These measures apply only to new builds and the solar hot water readiness regulation only applies to single family dwellings (BC Ministry of Energy & Mines, n.d.). Large supportive housing developments sponsored through BC Housing are required to be built to a LEED gold standard and must be designed to minimize GHG emissions (BC Housing, 2010).

Alberta

The Alberta government has formed a partnership with the Alberta Urban Municipalities Association (AUMA) and the Alberta Association of Municipal Districts and Counties (AAMDC) to establish the municipal climate change action centre (MCCAC). The MCCAC provides technical assistance to improve energy conservation and reduce GHG emissions in communities (MCCAC, 2015[a], About Us section). The MCCAC delivers the “taking action to manage Energy” (TAME) initiative. TAME delivers funding to municipalities to improve the energy performance of municipal operations in the areas of building operation, outdoor lighting, and water and wastewater. Those components concluded in 2013 and additional modules are anticipated for 2015. All the TAME programming is oriented toward municipal operations, and has so far been delivered through a direct funding model to offset the cost to municipalities of EE upgrades (MCCAC, 2015[b]).

Saskatchewan

The jurisdictional scan revealed that there is no currently active provincial programming in place in Saskatchewan for EER. The Saskatchewan government recently managed a fund called the “Go Green Fund” to facilitate the investment of public money in “practical, cost-effective solutions delivered through innovative environmental technologies, processes and improved public understanding” (para. 2). The fund was applied broadly to achieve a wide array of environmental objectives, from GHG emission reductions to biodiversity. It was administered through an application process that was geared mainly for larger scale initiatives that demonstrated significant environmental benefit and had broad applicability in Saskatchewan. The fund is not currently active and applications are no longer being accepted for new initiatives (Government of Saskatchewan, 2013[b]).

A scan of the websites for SaskPower and SaskEnergy revealed that the vast majority of energy efficiency programming is oriented toward commercial and industrial applications. The Saskatchewan government offers some basic programming to assist homeowners in reducing energy consumption. This includes a provincial sales tax exemption on all Energy Star qualified appliances, furnaces, boilers and heat pumps.

The province, through the Energy Star Loan Program, also offers low-interest loans (prime rate plus 2%) to homeowners to aid in the purchase of qualifying energy star equipment. Qualifying ENERGY STAR equipment includes natural gas high-efficiency furnaces with a high-efficiency motor, natural gas boilers and water heaters, and heat recovery ventilation systems. This program ended March 31, 2014 and there is no reference on the government's website as to whether the program will be re-offered in the future or whether another program will replace it (Government of Saskatchewan, 2013[a], Energy Star Loan Program section). This appears to be the sum total of energy efficiency programming offered directly by the provincial government in Saskatchewan.

Manitoba

Manitoba Hydro's Residential Propane and Oil Furnace/Boiler Replacement Program offers a \$245 credit on utility bills to customers who change out their existing propane or oil fired furnace or boiler with a high-efficiency natural gas, electric furnace/boiler, or a geothermal heating system (Manitoba Hydro, n.d.[f]). Manitoba Hydro also offers financing opportunities to homeowners for a variety of energy efficiency upgrades. This includes the installation (for both new builds and retrofits) of geothermal heat pumps facilitated by loans of up to \$20,000 with a payback period of 15 years at 4.9%. Similar terms are available for loans to enable the purchase of solar hot water heaters (Manitoba Hydro, n.d.[g], Earth Power Loan Section).

The utility offers an online "Home Comfort and Energy Assessment Report". Homeowners can complete an online questionnaire that provides details concerning the home's energy usage over the previous 12 months and receive a report that provides recommendations on how to reduce energy consumption.

The Manitoba government offers energy efficiency programming through Manitoba Hydro to encourage homeowners to switch to more energy efficient technologies, including rebates and loan programs. The utility uses on-bill financing to administer their Energy Finance Plan, which supports upgrades to gas and electrical systems for residential, commercial and seasonal customers. The program offers loans of up to \$5,000 with a payback term of up to five years at a current interest rate of 6.75%. The program is available to property owners only (renters are excluded). Eligible EER upgrades include upgrades to electrical systems, central air conditioning systems, electrical and natural gas water heaters, space heating systems, and air source heat pumps. The loan is not transferable, and therefore, is due in full upon the sale of the home (Manitoba Hydro, n.d.[a]). While not explicitly stated, this program appears to be geared for detached or semi-detached housing rather than MURBs.

A second on-bill financing program is available called Power Smart PAYS Financing. The maximum loan available depends on the type of upgrade carried out. Upgrades eligible for the program are limited to space heating equipment, insulation, water heating, and water conservation measures. The loan is tied to the property and is transferable to subsequent homeowners, as well as from a homeowner to a tenant. Apartment style housing is not eligible for this program (Manitoba Hydro, n.d.[b]).

A third on-bill financing program is available called the Power Smart Residential Loan Program. The program is available for upgrades to windows and doors, residential space heating equipment, insulation, air leakage sealing, ventilation systems, and residential water heating equipment. The maximum

allowable loan is \$7,500 to be repaid over a maximum term of five years at an interest of 4.8%. A longer payback period is available if the loan, or part thereof, is for a high-efficiency natural gas furnace. Loans are not transferable from one homeowner to another or from a homeowner to a tenant. This program is also not applicable to MURBs (Manitoba Hydro, n.d.[c]).

The Power Smart Affordable Energy Program offers a series of energy efficiency opportunities to low-income households. These include free insulation improvements, subsidized financing and rebates for heating system upgrades, and free energy saving items including energy efficient lighting. Participating households must demonstrate eligibility based on household income. Eligibility is also dependent upon the results of an energy efficiency review of the home carried out by an energy advisor, which is supplied through the program. Again, eligibility criteria state that this program is only available for detached and semi-detached housing forms (Manitoba Hydro, n.d.[d]).

Manitoba Hydro also offers rebates to qualifying households for insulation upgrades for homes built prior to 1999. The amount of the rebate available is determined by the amount of area in the home that is upgraded and the increase in R-value achieved, but it cannot exceed the value of the insulation required to meet Power Smart standards. This program is explicitly available only to owners of single detached and semi-detached housing (Manitoba Hydro, n.d.[e]).

Nova Scotia

Efficiency Nova Scotia (ENS) provides financial incentives to encourage EER upgrades to existing residences. This begins with an energy assessment on the home and related recommendations, part of the cost of which is paid by ENS (the homeowner is responsible for paying \$200 of the cost of the assessment). If the homeowner chooses to proceed with EER upgrades, ENS offers a choice between zero-interest loans or rebates to assist with the cost of the work (Efficiency Nova Scotia, 2015[b]). Zero-interest loans are available for amounts between \$2,500 and \$15,000 with payback terms of up to five years for heating system upgrades, solar hot water systems or other EER upgrades pursuant to a completed energy assessment (Efficiency Nova Scotia, 2015[c], para. 1). Rebates for components of EER projects are available for homeowners as an alternative to zero-interest loans. For example, to assist with the conversion to a ground source heat pump, a \$2,500 rebate is available or up to 40% of the costs of the product and installation, whichever is lower (Efficiency Nova Scotia, 2015[d], Rebates section).

ENS sponsored product rebates are also available directly from retailers for a variety of energy efficient products such as lights and lighting fixtures, space heating and cooling equipment, programmable thermostats, dimmer switches, power bars, and energy efficient appliances (Efficiency Nova Scotia, 2015[e]).

Homeowners in Richmond County are able to finance the costs of EER upgrades using the PACE model, which enables low-interest financing of up to \$10,000. Eligible homeowners are able to pay back the loan through their property tax bill over a period of up to 10 years (Richmond County, n.d., para. 2 – 3).

Newfoundland and Labrador

The only EER programming indicated on the Newfoundland and Labrador website is the Residential Energy Efficiency Program (REEP), which was last offered in 2012. When it was active, it was delivered for the benefit of low-income households only, providing grant of up to \$4,000 to help fund energy efficiency retrofits (Government of Newfoundland and Labrador, 2013, para. 3 – 5).

The provincial government has partnered with Newfoundland Labrador Hydro and Newfoundland Power to provide the Take Charge program. Take Charge provides rebates for energy efficiency upgrades to residences in the form of a credit on utility bills. Rebates are available for programmable thermostats, Energy Star windows, insulation improvements, installation of heat recovery ventilators, and energy efficient appliances (Take Charge, 2015).

Yukon

The Yukon government is operating the Good Energy Residential Incentives program, which provides incentives to homeowners to improve the air tightness and insulation of their existing homes. Another component of the program offers incentives to reduce the capital costs of installing small scale residential renewable energy systems to generate electricity. Available incentives include: (Yukon Government, 2015)

- \$500 for the installation of a heat recovery ventilator;
- \$50 per item for the installation of EnergyStar doors and windows up to a maximum of \$1,000;
- \$100 per 5% reduction of air leakage from the building envelope achieved;
- 20% of the pre-tax costs of insulating materials installed and labour up to a maximum of \$10,000; and
- 20% of the pre-tax material costs up to \$5,000 for the installation of a renewable energy system.

The program also provides \$100 for before and after energy assessments required in relation to air tightness and insulation improvements. All incentives are provided in the form of post installation rebate cheques directly from the government.

The program details do not specify whether the incentives are intended for any particular type of housing form, however the types of upgrades for which incentives are provided are most applicable to detached homes.

Northwest Territories

The Northwest Territories government, in partnership with the Arctic Energy Alliance, operates the Energy Efficiency Incentive Program. The program provides incentives for household appliances ranging from \$50 to \$400 (washing machines, refrigerators, clothes dryers and freezers), for heating appliances ranging from \$600 to \$1,500 and for air sealing and home insulation improvements ranging from \$250 to \$300. Residents can apply for more than one rebate, to a maximum of two products per category, per household per calendar year, with the exception of the air sealing and insulation upgrades (Government of

Northwest Territories, 2014[a]). All incentives are provided in the form of post installation rebates from the government. Homeowners are required to submit a completed application form along with all required receipts and before and after energy evaluation reports, where applicable (Government of Northwest Territories, 2014[b]).

Local Governments in British Columbia

The City of Vancouver's current programming is focused on the energy consumption and emission performance of newly constructed single and two family homes pursuant to its Greenest City 2020 Action Plan. The city states that its next challenge is to shift its focus to the existing building stock through retrofit and upgrade programs and building operations (City of Vancouver, 2014, para. 3). It is unclear whether the city's policy development concerning EER will be primarily regulatory in nature or incentive-based.

Europe

In the United Kingdom, financing opportunities are available through the Department of Energy and Climate Change who operates "the Green Deal", a program intended to encourage energy efficiency home improvements. Qualifying upgrades include heating systems, insulation, hot water systems, lighting, windows and doors, and micro-energy generation systems. To qualify for the program, owners or renters must have an energy assessment of the home undertaken by a qualified professional. The assessor will review the property and indicate what improvements can be made, estimate potential energy savings, and provide a statement on whether the recommended improvements will pay for themselves through reduced energy costs. If the owner/tenant chooses to proceed with the upgrades, on-bill financing is available through the program with repayment schemes structured such that payments are less than the value of energy savings. Interest rates are not preset and are determined at the time of financing. Since the improvements are part of the property, the loan runs with the property rather than with the owner. Government rebates of up to £1,000 are also available through the program if specific improvements to the property are implemented (Government of the United Kingdom, 2014).

Given the types of improvements supported through this program, it is mostly applicable to single or semi-detached housing forms.

United States

While not a public sector program, the VGreen program in Vermont is worth noting. VGreen is an energy efficiency financing program provided by the Vermont State Employees Credit Union (VSCEU). The program provides financing for any project or purchase that improves energy efficiency in the home or in relation to transportation. Examples of home improvements that may be financed include solar projects, weatherization, heating system upgrades, energy efficient appliances, and a high efficiency heat pump. Home improvement equity loans available through the VGreen program use equity in a home to finance energy efficiency investments and generate energy savings for the benefit of the owner. Energy improvement mortgages are also available to help finance larger projects for long term energy savings (Vermont State Employees Credit Union, 2014[b]). The VGreen program, due to the types of

improvements supported by the program, is presumed to be primarily applicable to single family homes rather than MURBs.

Energy Upgrade California (EUC) delivers the PowerSaver Loan program, backed by the Federal Housing Administration. The program provides access to financing to support implementation of EER projects. Eligible upgrades include air sealing, insulation, window and door upgrades, heating and cooling system upgrades, and water heating improvements. The program also applies to implementation of renewable energy sources, including ground source heat pumps, solar hot water systems, fuel cells and micro turbine systems, and solar panels. Eligible participants are able to borrow up to \$20,000 amortized over 20 years at fixed interest rates. The financing arrangements are administered by a private mortgage company. The program is only available to owners of detached single family homes (Sunwest, 2015, para. 1 - 2).

The Texas state government offers a program using PACE financing called Keeping PACE in Texas (KPT). KPT, which is presently limited in scope to commercial and industrial properties, provides low-cost, long-term loans for water conservation, energy efficiency improvements and renewable retrofits. Through the program, municipalities work with private sector lenders to finance qualified improvements using contractual assessment voluntarily entered into by the owner. PACE loans may be paid back over a 20 year period, resulting in a utility cost savings that exceeds the amount of the added assessment payment. The debt obligation transfers with the property when it is sold (Keeping PACE in Texas, 2015, para. 1).

The City of Plano, Texas offers the Smart Energy Loan Program (SELP) to deliver affordable energy efficiency loans to homeowners. The city partners with the Credit Union of Texas to provide homeowners with financing for energy efficiency upgrades that improve the home's HERS rating. The homeowner is required to sign an agreement committing to having a pre and post-improvement audit carried out to verify the scope of work was completed in accordance with program requirements (City of Plano, n.d.). While not explicitly stated in any of the documentation, the SELP program appears to be designed for single family homes.

New York State legislation provides municipalities the ability to operate PACE programs as a means to offer sustainable energy loan programs. The loans may be used to pay for energy audits, energy efficiency improvements, renewable energy feasibility studies, and the installation of renewable energy systems (DSIRE, 2012[a], Municipal Sustainable Energy Loan Program section, para. 1).

The Town of Babylon, New York uses PACE to finance up to \$12,000 worth of energy efficiency retrofits to privately owned residential properties. As with other PACE programs, the debt is charged against the property and paid back through property taxes (DSIRE, 2012[b]).

In Illinois, an array of utility funded rebate programs are available for specific energy efficiency upgrades. An example is the Ameren Illinois Residential Energy Efficiency Incentives program. While the program is only available for single family residential properties, the types and amounts of rebates vary widely, from \$25 for a programmable thermostat, to \$0.50 per square foot for attic insulation, to \$3.00 per linear foot for crawl space insulation. Maximum ceiling amounts are identified for most rebates. All upgrades must meet program efficiency and installation standards (DSIRE, 2015[d]).