

# **ENERGY EFFICIENCY RETROFITS IN SOCIAL HOUSING: A REVIEW OF POLICY AND PRACTICE IN TORONTO, ONTARIO**

**Cities, Policy & Planning**  
research series



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# ENERGY EFFICIENCY RETROFITS IN SOCIAL HOUSING: A REVIEW OF POLICY AND PRACTICE IN TORONTO, ONTARIO

## 1. INTRODUCTION, OBJECTIVES AND METHODOLOGY

“Energy conservation is the most efficient and effective way for municipalities to reduce energy cost and protect the environment” (Association of Municipalities of Ontario, 2012). As a part of the 2009 *Canada’s Economic Action Plan*, the federal government allocated \$352.16 million to the Province of Ontario (ON) to renovate and retrofit the existing social housing stock in the province. The province matched federal funding and distributed the money between the 47 Consolidated Municipal Service Managers, who then selected eligible social housing providers from across their respective portfolios. The aim of the *Social Housing Renovation and Retrofit Program* (SHRRP) was to improve the quality of the housing stock, while helping low-income Canadians and creating opportunities for jobs in construction and related industries.

This chapter investigates the implementation of energy efficiency measures through SHRRP, as well as the CMHC administered renovation and retrofit programs aimed at improving the social housing stock in Toronto. The paper builds on a literature review of energy efficiency programs for the social housing sector in Canada and the reviews of energy efficiency retrofit policy and practices in British Columbia and Alberta (Tsenkova and Youssef, 2012; Tsenkova and Clieff, 2012). Given the size of the social housing sector in Ontario and the diversity of institutional arrangements, this chapter will focus on the City of Toronto, and the administration of SHRRP and the Renewable Energy Initiative. Toronto has the largest social housing portfolio in the province with over 90,000 social housing units eligible for funding under SHRRP and the Renewable Energy Initiative. The analysis will review the main programs implemented with a focus on funding mechanisms, implementation criteria, types of retrofits completed and outcomes.

Three case studies from Toronto's social housing portfolio were identified to analyze program implementation and outcomes. These three case studies were selected to represent the renovation strategies of the three major types of social/affordable housing providers in Toronto: (i) the local housing corporation—Toronto Community Housing Corporation (TCHC); (ii) non-profit housing corporations; and (iii) co-operative housing corporations. The selection was also guided by recommendations from the Managers and the project leads from the City of Toronto’s Social Housing Unit. Each housing provider which is highlighted agreed to participate in the study.

In addition to the literature review, a content analysis of major policy documents and the case study analyses, 12 key informant interviews and site visits were undertaken in September and December 2012 to develop an understanding of

program implementation measure outcomes and on-site challenges/issues related to program management, as well as to obtain feedback from housing managers that may be useful for future policy recommendations. Specific emphasis was placed on a systematic comparison of the types of energy efficiency retrofits and renovation measures to highlight different investment strategies, as well as to document simple return on investment. Retrofit measures were grouped in three major categories: (1) major mechanical; (2) non-mechanical/building envelope; and (3) renewable energy.

## 2. SOCIAL HOUSING IN TORONTO

The City of Toronto's social housing portfolio represents approximately one-third of all the social housing in the Province of Ontario (City of Toronto, 2001). As of 2011, there were 93,198 units under management and administration by the City's Social Housing Unit of the Shelter, Support and Housing Administration Division, including 3,877 units that are a part of the private rent supplement and housing allowance programs (City of Toronto, 2011). Social housing is a significant feature within Toronto's landscape. It provides 29% of all rental units in the City, houses approximately 220,000 people, and plays a critical role in the provision of affordable housing services for low-income households since over 70,000 housing units provide rent geared-to-income (RGI) assistance. The waiting lists for social housing (RGI) have grown significantly over time, signalling a high level of need for affordable housing.<sup>1</sup>

The types of social housing organizations managing the social housing stock are: (i) the local housing corporation, Toronto Community Housing Corporation (TCHC), a non-profit corporation owned by the City of Toronto and governed by a board of directors appointed by City Council,<sup>2</sup> (ii) private non-profit housing owned and operated by community based non-profit organizations, (iii) and cooperative housing owned and operated by community-based non-profit cooperative corporations, whose members are residents of the cooperative (City of Toronto, 2012). Of the total social housing stock, 63% is owned and operated by the TCHC (City of Toronto, 2011). The remainder of the social housing in the City is provided by 250 non-profit and cooperative housing organizations (City of Toronto, 2011).<sup>3</sup>

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<sup>1</sup> The City of Toronto manages a centralized list, which at the end of 2006 had 67,083 households waiting to access a RGI unit in social housing – about the same number of households already living in subsidized units. Waiting times range from 2 to 12 years, depending on the unit size that a household is eligible for, the rate at which units become available and the length of the waiting list for buildings selected by the household.

<sup>2</sup> Toronto Community Housing Corporation is the country's largest landlord.

<sup>3</sup> In January 2001 and May 2002, the City of Toronto, along with the other municipalities in Ontario, assumed the administration and funding responsibilities of the social housing programs previously funded and administered by the federal and provincial governments. The *Social Housing Agreement* (SHA), which was signed in November 1999, initiated the transfer of administrative responsibilities. The SHA was an agreement between the Ministry of Municipal Affairs and Housing (MMAH) and the CMHC. The agreement required the transfer all federal responsibilities for social housing programs to the Province of Ontario, with the exception of the federal cooperative housing program which continues to be funded and administered by

<b>Table 1 Profile of Social Housing in Toronto, 2007*</b>			
<b>Program</b>	<b>Total Units</b>	<b>RGI Units</b>	<b>Housing Providers/Owners</b>
<b>Social/Affordable Housing</b>			
Non-Profit Housing Corporations	20,740	10,401	159
Coop Housing Corporations	7,448	4,789	68
Toronto Community Housing Corporation	58,194	52,429	1
City Developed Non-Profit Projects	832	660	13
<b>Sub-Total</b>	<b>87,214</b>	<b>68,279</b>	<b>241</b>
Market Housing**	3,665	2,690	9
<b>Total</b>	<b>90,879</b>	<b>70,969</b>	<b>250</b>

\* Data refers to housing under City administration as of December 31, 2006

\*\*Market housing includes private housing under rent supplement, housing allowance pilot and limited dividend housing

Source: Adapted from City of Toronto, 2007

A profile of Toronto's social housing portfolio is presented in Table 1. With the exception of the TCHC, social housing in the City is owned by relatively small housing providers. Only three of the housing providers operate more than 500 units, while most operate a single building with fewer than 200 units. Several studies assessing the physical condition of the City's social housing stock found that the buildings were generally in good condition, but that most housing providers (including the TCHC) will not have sufficient funds to meet their future capital repair needs such as roof repairs, and mechanical and electrical systems upgrades (City of Toronto, 2001; 2011). The TCHC reported immediate capital repair needs of \$751 million (2012 dollars), stating that failure to make these investments will result in the withdrawal of housing units due to the failure to meet an appropriate standard for occupancy (City of Toronto, 2007). As the capital repair backlog increases each year, the TCHC expects that the capital needs will exceed \$ 1 billion by 2012 in the absence of new sources of funding (Bailão, et al, 2012) The report on the non-profit and cooperative social housing portfolio indicated that to meet future capital repair needs, funding of housing provider capital reserves should be increased by \$34 million annually. Reports to Council pointed out a significant financial exposure and risk to the City for unfunded future capital repair needs (see City of Toronto, 2007 for additional discussion of these issues). The physical condition of the social housing portfolio and the lack of adequate reserves to address capital needs, as well as the limited

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the CMHC. Following the SHA was the *Social Housing Reform Act* (SHRA) in 2000, which required municipalities to assume responsibility for the funding and administration of social housing programs from the Province and/or the CMHC. The SHRA was completed in two stages. In stage one of the transfer, ownership, funding and administrative responsibilities of the public housing stock (then known as the Metro Toronto Housing Authority, now known as the Toronto Community Housing Corporation) was transferred to the City of Toronto, which administers its Service Manager role through the Shelter, Support & Housing Administration Division. In stage two of the transfer, responsibility for the remaining social housing programs was transferred to the City. As a result, 95,350 units, including community non-profit, non-profit cooperative, and the City's municipal non-profit housing corporation units, are now under the administrative and management of the City of Toronto (City of Toronto, 2001).

institutional capacity of some small community based non-profit organisations to undertake complex retrofit programs, affects the implementation of the SHRRP.

### **3. FUNDING PROGRAMS AND MECHANISMS**

In 2009, the federal and the provincial government of Ontario launched a number of policy initiatives and capital grant programs to support energy efficiency retrofits in social housing. In addition to improving the condition of existing social housing and tenant quality of life, these efforts were aimed at stimulating job creation and reducing energy consumption and impacts on the environment (Tsenkova & Youssef, 2011). The policy tools and initiatives directly relevant to this research are discussed below.

#### ***Social Housing Renovations and Retrofit Program***

The SHRRP is a capital grant program formed under the *Canada-Ontario Housing Initiative*. The federal and provincial governments jointly fund the SHRRP with Ottawa contributing \$352.16 million through the *Renovation and Retrofit of Existing Social Housing Initiative* (part of the CEAP), with Ontario contributing the remaining funds to support its *Poverty Reduction Plan*. A total of \$704 million was available in the 2009 to 2011 fiscal years (City of Toronto, 2009a). Eligible social housing programs included public housing projects developed by the Ontario Mortgage and Housing Corporation (formerly the Ontario Housing Corporation) and transferred to service managers under the *Social Housing Reform Act* (SHRA);<sup>2</sup> projects under the SHRA and formerly funded under federal/provincial non-profit housing programs (non-profit and cooperative housing) and unilateral provincial non-profit housing programs (non-profit and co-operative housing); projects developed under the federal Section 95 housing program including the Urban Native Housing Program; projects developed under the Section 26 housing program (including the Limited Dividend Program) and the Section 27 housing program directly funded by the CMHC; and off-reserve projects funded under the Rural and Native Housing Rental Program (Ministry of Municipal Affairs and Housing, 2009). The Ministry of Municipal Affairs and Housing used notional allocation to distribute the funds to the 47 consolidated municipal service managers in Ontario, which received a share of the \$704 million corresponding to the relative share of social housing in their service area compared to the total units in the province. If the service manager administers 30% of the total social housing units in the province, they received 30% of the funding available. Service managers had authority within the parameters of the published Provincial Guidelines, to distribute funds to social housing providers (Interview data, Provincial Program manager, August 2012). This simple rule ensured some fairness in the distribution of funds across the province and left the service managers sufficient autonomy to address priority needs.



The City of Toronto is one of the 47 service managers in Ontario. Over a two year period, the SHRRP provided approximately \$220 million to the City for construction ready capital repair projects in the social housing sector (City of Toronto, 2009). The SHRRP funding was an indispensable investment to improve the state of social housing in the city, and was consistent with the direction of *Housing Opportunities Toronto* and the City's *Ten Year Affordable Housing Action Plan*. The SHRRP funding also reduced the impact of the withdrawal of federal and provincial funding resulting from the social housing transfer in 2002,<sup>2</sup> and therefore was a necessary investment to fund capital repairs required for exiting social housing across the province. The three key priorities of the SHRRP were to: (1) improve the health and safety of tenants; (2) increase the energy efficiency of buildings; and (3) increase building accessibility for seniors and persons with disabilities (Ministry of Municipal Affairs and Housing, 2009). The two categories of capital projects permitted under the program were renovation and retrofit projects and regeneration projects.

Table 2. Capital Program Investments in the Social Housing Sector: Ontario & Toronto			
Program	Funding Source	Amount Invested	Projects
CEAP Renovation and Retrofit of Existing Social Housing Initiative	Economic Action Plan/Housing Renovation Partnership	\$704million  (\$220 million in Toronto)	5,817 housing developments (includes city owned, non-profit housing and coops) (~2,500 projects in Toronto)
CEAP Renovation and Retrofit of Existing Social Housing Cooperatives	Economic Action Plan/CMHC	\$40.5 million  (\$6.0 million in Toronto)	299 coops  (48 projects in Toronto)
<i>Renewable Energy Initiative</i>	MMAH	\$70 million  (\$30.6 million in Toronto)	NAV  (92 projects in Toronto)

Source: CMHC, 2012; Interview Data, Program Director, September 2012

### ***Federally Administered Retrofit Program***

Retrofits in cooperatives and non-profits under federal contracts with the CMHC were funded separately. Project submissions were reviewed by a special CMHC committee and went through a complex and vigorous application process that was centrally managed in Ottawa. The CMHC granted \$40.5 million to eligible projects in Ontario based on predetermined criteria (CMHC, 2010). About a third of the applicants received funding. Cooperatives used an intermediary, such as the Provincial Federation of Housing Coops, to prepare project submissions and in many cases to manage the construction process once the project was approved. Once funded, some cooperatives hired project managers to complete contracting and supervision as the deadlines were tight—all work had to be completed by April 2011. Large cooperative housing providers had in-house project management expertise, while others received support from the Cooperative Housing Federation of Canada (Interview data, Policy Expert, April 2012). Nearly 300 projects received grants for renovation and energy efficiency retrofit work in Ontario, and about 16% of these projects were located in Toronto

(see Table 2). Grants were relatively small and covered specific measures such as the replacement of heating systems and windows, and improvements to the units.

### ***Renewable Energy Initiative***

In 2010 the Ministry of Municipal Affairs and Housing (MMAH) provided \$70 million in federal and provincial funding to further facilitate social housing renovation and retrofit initiatives (City of Toronto, 2010b). As a one-time funding opportunity, the *Renewable Energy Initiative (REI)* was aimed at further reducing operating costs for housing providers by installing renewable energy technologies for heating, cooling and/or generating electricity. Specifically, the program supported investment in: (i) solar photovoltaic (roof top systems); (ii) solar water heating; (iii) solar air heating; (iv) geothermal; and (v) mid-sized wind technologies (City of Toronto, 2010b). The Province required that contractors for REI supply and installation be from an approved vendor of record list. The list was administered by the Ontario Power Authority.

Council approved applications were submitted for potential renewable energy projects by the Shelter, Support and Housing Administration. The Province awarded \$30,672,243 as a conditional allocation under the REI for 59 projects from the TCHC portfolio (\$21,396,674) and 33 projects from the non-profit and cooperative housing provider portfolios (\$9,275,569) (City of Toronto, 2010b). Funding allocation was based on compliance with program requirements, regional fairness across the province, and a balanced distribution of technology implementation.

### ***Toronto Community Housing Corporation Retrofit Initiatives***

The TCHC has faced many challenges in managing the largest share of social housing in Toronto, most of it in delivering RGI housing assistance, but has also initiated a number of programs to enhance tenant quality of life. SSHRP and REI funding allowed these efforts to be scaled up and implemented in a more efficient manner. The TCHC has the ability to raise funds directly due its AA class debt rating from Standard & Poor, which has allowed borrowing from capital markets to fund redevelopment projects such as Regent Park and Don Mount Court, as well as to address backlogs in capital repairs.<sup>4</sup> Some of the TCHC initiatives prior to the launch of SHRRP include:

- Building Renewal Plan: \$100 million, four-year investment in 19 communities
- Neighbourhood revitalization: \$7 million to open and renew community spaces, playgrounds, community gardens and sports facilities to enhance community safety

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<sup>4</sup> In 2007 the TCHC placed a \$250 million bond to address capital repairs and redevelopment needs. Interviews suggest that the TCHC may have exhausted its current debt servicing capacity.

- Energy Efficiency: a partnership with Brahms Energy Saving Team to reduce energy consumption in their community through energy-saving light bulbs, by saving \$17,000 in energy costs and winning *the 2006 Green Toronto Award for Community Initiative*
- Appliance Replacement: replacement of fridges, stoves, showerheads, toilets and furnaces with energy efficient models, saving over \$1.2 million, reducing energy consumption by 3% across the portfolio and winning *2006 NRCAN Energy Star of the Year Award*
- Unit Refurbishment Program: \$75 million invested to upgrade about 9,000 bathrooms and kitchens (and related unit mechanical systems) to improve unit interiors

Because of the size of its social housing portfolio, the TCHC has the ability and the capacity to benefit from different programs and has emphasised the importance of energy and water savings by installing energy and water efficient systems and devices. The TCHC has a large asset management team, manages its own Building Renewal Energy program to fund such measures from its capital reserve fund and has set up a project management clearing house—Housing Solutions Inc.—to oversee a more holistic approach to renovation and energy efficiency retrofits. The entity is a subsidiary of TCHC and manages many retrofit projects (Interview Data, Asset Management Team, September 2012). While the greening of social housing has many benefits, the installation of “green” technologies is a strain on capital reserves, some with a lengthy payback.<sup>5</sup>

#### **4. PROGRAM IMPLEMENTATION RESULTS**

##### ***Institutional Framework***

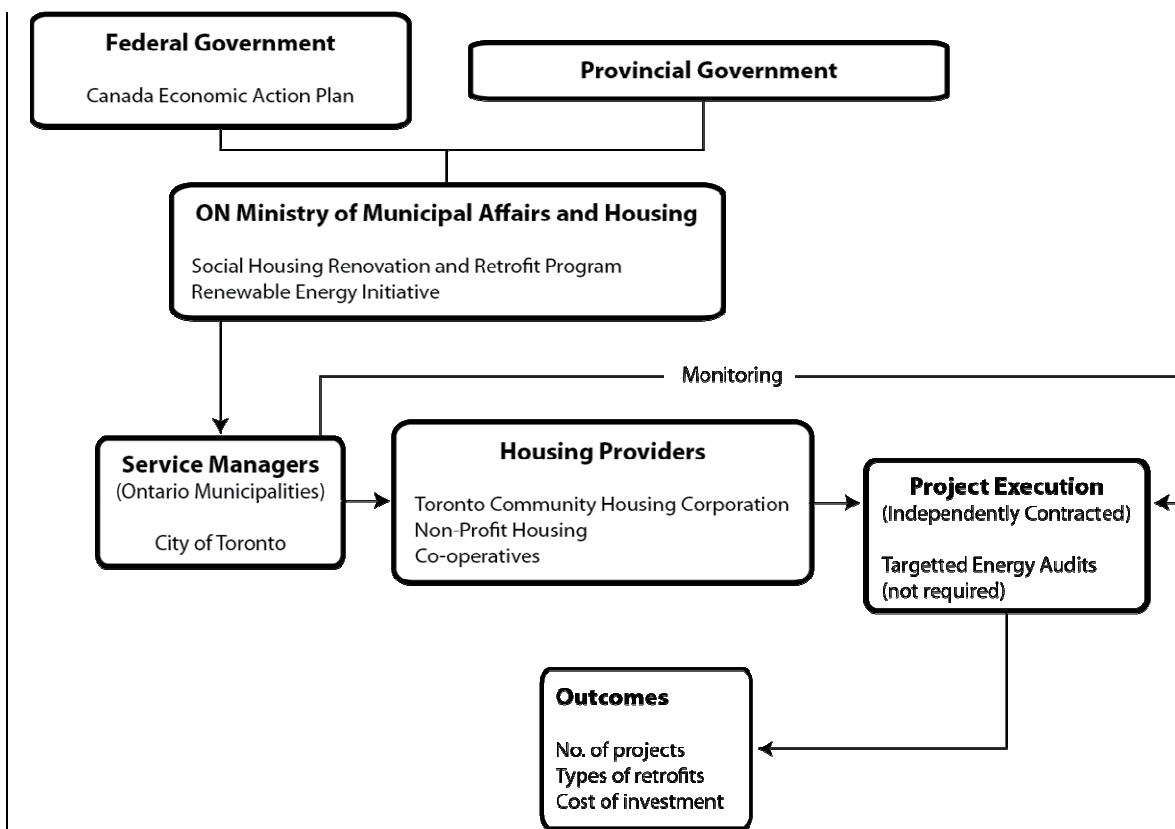
Administration of SHRRP funding was structured around an Administration Agreement between the City and the Province. This agreement served to outline the partnership between the Province and the City by specifying the principles, requirements and procedures guiding reporting, payments and the creation of funding agreements for projects. City staff was also responsible for ensuring that the SHRRP guidelines and reporting requirements were met through the verification of invoices and financial statements submitted by housing providers, and by undertaking site visits. Since the monitoring of the program required staff resources, the Province committed additional funding to offset administrative costs over the two years the program was run (City of Toronto, 2010a).

Figure 1 shows the institutional framework for social housing investment initiatives by federal, provincial, and municipal government in the City of Toronto. The City of Toronto is the Service Manager, through the Shelter, Support and

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<sup>5</sup> The Housing Services Corporation has been working for several years to deliver its Energy Management Program, which assists smaller social housing providers with green retrofits. Funds come from the Ontario Power Authority, Toronto Hydro and other utilities.

Housing Administration Division (SSHA) With City Council approval, this department is responsible for administering the SHRRP program, including the distribution of funds and monitoring of projects. In the two-year period the staff working on SHRRP has ranged between 4-9 people with asset management experts involved at the start of project submission, review and approval. The present staff is extensively involved in monitoring, site inspections, advice and capacity building on capital planning, particularly for some of the small housing providers. City staff was also instrumental in initiating audits for small housing organizations and promoting holistic thinking about the building and retrofit cycle (Interview data, Program Manager, September 2012). Some of the funded projects specifically targeted energy efficiency measures as City staff placed them in the category of ‘big utility spenders’ to ensure that unsustainable high utility bills are addressed through retrofit measures. Once funding was approved, all projects were self-managed by the individual housing providers and contractors were chosen on the basis of a tendering process. The SSHA reports to City Council and MMHA on program results, disbursement of funds and general metrics of performance.



**Figure 1** Institutional Framework of Social Housing Renovation and Retrofit Programs Implemented in the City of Toronto. *Source: Author, 2012*

### **Metrics of Performance**

For both the SHRRP and the REI, the City of Toronto Council authorized the Shelter, Support and Housing Administration to submit projects on behalf of the City to the MMAH, and to subsequently allocate funding to the TCHC, non-profit and cooperative housing providers. For each project approved by the Province for funding, the City and Province entered into a *Provincial Funding Agreement*. Upon execution of the agreement, the Province transferred 20% of the project funds to the City (City of Toronto, 2009b). Upon the commencement of construction, 50% of the funding was forwarded, and the remaining funds were transferred when the project reached 90% completion (City of Toronto, 2009b). As program administrator, the City disbursed the funds to housing providers through a *Provider Funding Agreement* upon completion of specified project milestones.

<b>Table 3. SHRRP &amp; REI Funding Allocations &amp; Impact:</b>				
<b>Proportion of SHRRP &amp; REI Funding Allocated</b>				
	<b>SHRRP</b>		<b>REI</b>	
TCHC	\$150,688,073	58%	\$21,396,674	70%
Non-Profits (other than TCHC)	\$79,841,232	31%	\$5,797,272	19%
Cooperatives	\$28,505,246	11%	\$3,478,297	11%
<b>Total</b>	<b>\$259,034,551</b>	<b>100%</b>	<b>\$30,672,243</b>	<b>100%</b>
<b>Proportion of Units Impacted by SHRRP &amp; REI</b>				
	<b>SHRRP</b>		<b>REI</b>	
TCHC	32,419	55%	7645	70%
Non-Profits (other than TCHC)	19,924	34%	2200	20%
Cooperatives	6,610	11%	1152	10%
<b>Total</b>	<b>58,953</b>	<b>100%</b>	<b>10,997</b>	<b>100%</b>

Source: Interview Data, Program Manager, City of Toronto, September 2012

The total SHRRP allocation of \$259 million had a significant impact on the social housing portfolio in Toronto. The TCHC received the largest share (58%), followed by the non-profit housing providers (31%). In terms of the impact measured by the number of units affected, the TCHC improved over half of its portfolio with SHRRP funds, while units impacted in the non-profit and coop sector accounted for 34% and 11% of the total. However, a comparison of these statistics against the number of units managed by non-profits and coops in the City (see Table 3.1) reveals that every non-profit and coop housing provider received funding and support to upgrade over 90% of the units in their portfolios. It does not seem that notional allocation of funds was a management objective, rather City staff worked hard to ensure that smaller organizations were successfully included. The allocation model used to distribute the REI funding was based on submissions from each social housing provider (refer to Table 3). The data indicates that REI funding supported more TCHC projects, perhaps due to its institutional capacity to absorb grants and the existing management structure that had promoted energy efficiency retrofits and the use of renewal energy features since 2006.

Although the administration of the program was complex, the City of Toronto's SSHA efficiently managed the process. As a result, there was an overall increase in the number of projects submitted for funding in the second year. In the first year, 109 social housing providers were approved for funding with TCHC accounting for 70% of all the projects, whereas in the second year this number increased to 178 housing providers (City of Toronto, 2010a). As a result of more staff resources, sufficient time to recruit consultants, and effective collaboration and communication with the social housing providers, program opportunities were maximized. The number of smaller housing providers in the non-profit and cooperative sectors that received funding from 2010 to 2011 increased substantially to 55% of the total (City of Toronto, 2010a).

### **3.5 TORONTO CASE STUDIES**

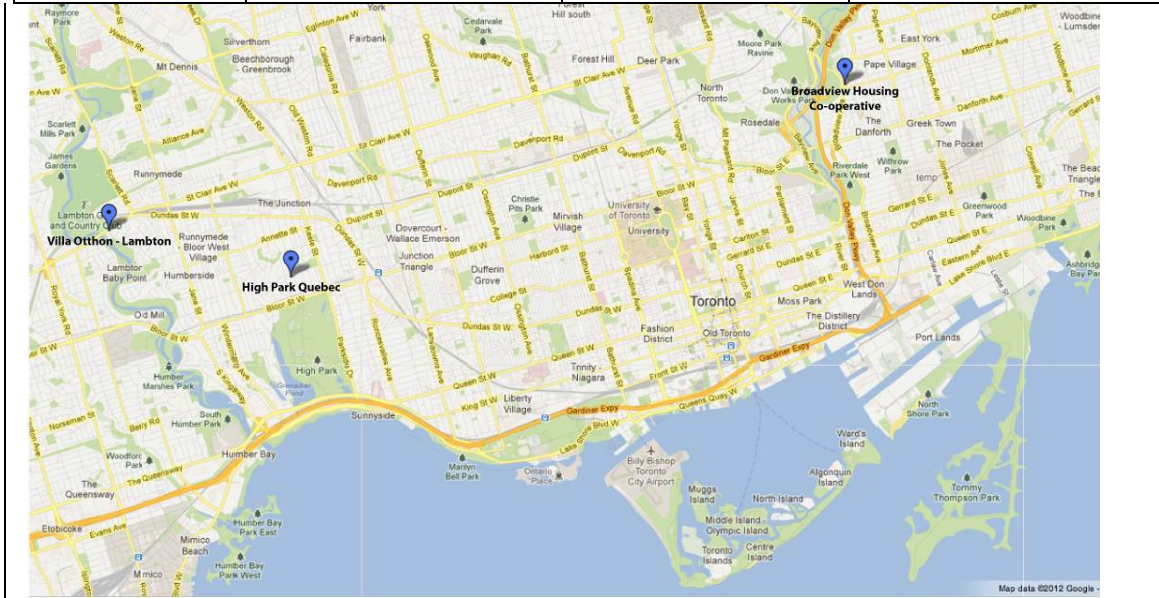
Three case studies were chosen for Toronto to comparatively analyze SHRRP program implementation. The case studies represent retrofit strategies by the three main housing provider types in Toronto: (i) non-profit; (ii) cooperative; and (iii) the local housing corporation. The case studies also highlight best practice in energy efficiency retrofits under the SHRRP program. The first section profiles the projects, followed by an overview of the types of retrofits implemented and estimated energy and cost savings.

Villa Otthon, Broadview Housing Cooperative and High Park Quebec are all residential towers ranging from 11 to 24 storeys in height. The Villa Otthon and High Park developments also include a small town house complex. The buildings were built between 1969 and 1989. All the units operate have controlled market rents, with 60% to 100% of the tenants receiving RGI housing assistance. Monthly market rents typically range from \$800 to \$1,200 depending on the size of the unit. Residents do not pay utility bills and the cost of heating and hot water is included in the rent. Tenant turnover is an issue in Villa Otthon as a result of the comprehensive retrofit measures and the work required in each of the units. The project took 18 months to complete and initially met with a great deal of tenant opposition (Interview data, Building Manager, September 2012).

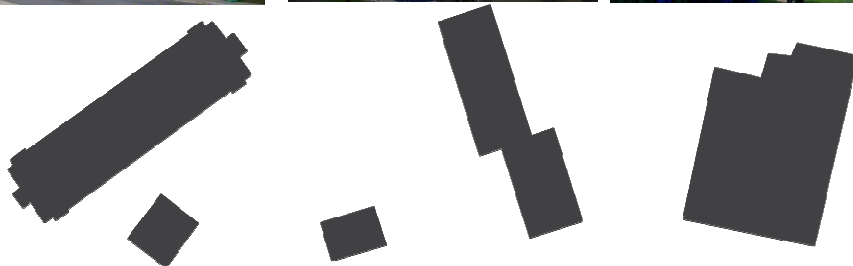


**Table 4. Case Study Profiles**

Study Area	Villa Otthon Lambton	High Park Quebec	Broadview Housing Cooperative
	4062 Old Dundas St. W	100 High Park Avenue High Park Quebec Townhomes	1050 Broadview Ave



Building footprints



Project Type/Characteristics			
Year of Construction	1989	1965, renovation in 1997	1969
Building Type	Residential tower/ Townhouse Complex	Residential Tower	Residential Tower
Bedrooms	1-3 bed	1-3 bed	Bachelor – 3 bed
Storeys	11	15	24
No. of Units	194 apartments (+6 under construction in Year 1)/8 Townhouse	111 apartments	449 apartments

<b>Project Economics</b>			
Total SHRRP Allocation	\$3,937,164	\$700,753	\$2,175,049 <sup>6</sup>
Funding Per Unit	\$18,929	\$6,313	\$4,844
Type of Rent	65% RGI 1b.\$1,000; 2b.\$1,200 Townhouse \$1,400	60%RGI 1b-\$900; 2b.\$1,110	90% RGI 1b.\$850; 2b.\$1,200
Average Rent	NAV	NAV	\$1,651
<b>Tenants</b>			
Tenant Turnover	Medium (21 units vacant)	Very small	Medium
Tenant Pay Utilities	No	No	No

Source: Interview data, 2012b & 2012c

### **Types of Retrofits Completed**

Audits completed for each case study identified key retrofits that responded to the specific needs of each development. These studies were used by City staff to identify potential projects for SHRRP support. Mechanical upgrades, such as the replacement of heating systems, makeup air units and cold-water booster pumps, accounted for the majority of the investment, whereas non-mechanical upgrades such as general repairs to building facilities and replacement of appliances represented the smallest percentage of project investment (Table 5).

<b>Table 5. Summary of Retrofits Completed</b>			
	<b>Villa Otthon</b>	<b>Broadview</b>	<b>High Park*</b>
<b>Renewable Energy</b>	<b>2%</b>	<b>32%</b>	
Solar Thermal System	\$60,000	\$225,196	
<b>Mechanical</b>	<b>81%</b>	<b>55%</b>	
Makeup Air Units <sup>7</sup>	\$110,000	\$15,617	X
Heating Plant (boilers and conversion)	\$2,944,757	\$215,408	X
Cold Water Booster Pumps	\$40,000	\$85,728	
Building Automation Controls	\$75,000	\$69,144	X
<b>Non-Mechanical</b>	<b>7%</b>	<b>1%</b>	
General Building Upgrades <sup>8</sup>	\$165,793		
Audits <sup>9</sup>	\$8,065	\$4,061	X
Unit Kitchen & Bathroom Upgrades <sup>10</sup>	\$96,879		X
<b>Other Costs</b>	<b>11%</b>	<b>12%</b>	<b>X</b>
<b>Total SHRRP Allocation (100%)</b>	<b>\$3,937,164</b>	<b>\$700,753</b>	<b>\$2,175,049</b>

\*Data on the cost of individual project components are not available for High Park  
Source: Interview data, Program Manager, City of Toronto & Building Managers, September 2012

<sup>6</sup>SHRRP funding was offered on a “use it or lose it” basis. Under the SHRRP rules, if the funding was not used or approved projects are not completed within the fiscal year, funds would be reallocated to other projects by the MMAH. The original amount requested and approved for the High Park development under the SHRRP program was \$3,992,229. As a result of reallocation, the actual funding was \$2,175,049.

<sup>7</sup>The Makeup Air Unit category also includes garage ventilation.

<sup>8</sup>The General Building Upgrades category also includes replacement of balcony panels, elevator room repairs, paint and signage upgrades, lighting upgrades, pipe rehabilitation (corrosion control), and backflow prevention device installation.

<sup>9</sup>The Audits category also includes asbestos audit and abatement (in the case of Villa Otthon), building condition audits and capital reserve fund forecast

<sup>10</sup>Unit Kitchen & Bathroom Upgrades category includes appliance replacement, low flow toilet installation and water conserving showerhead installation.



Retrofits related to renewable energy technology were the solar thermal installations in Villa Otthon and Broadview, accounting for 2% and 32% of project costs. Lighting improvements, as well as the installation of low flow toilets and water conserving showerheads, were implemented in High Park. These different types of projects demonstrate different and unique priorities. For example, the replacement of the electric heating plant with a gas-fired heating plant in Villa Otthon did cost \$2.9 million, but was prompted by a disproportionately high bill for heating and utilities that exceeded \$400,000/per year. The new system uses natural gas, which resulted in a major reduction in utility bills (Interview data, Building manager, September 2012).



**Figure 2** Major Retrofits at Villa Otthon.

Figures 2 and 3 illustrate some of the major retrofits implemented in the case study projects. Initiatives supporting the retrofits included staff training to ensure efficient use and maintenance of new systems, communication strategies to articulate renovation and retrofit plans and the potential benefits to building tenants, and occupant behavioral change programs to encourage energy responsible behavior, especially in buildings where tenants are not responsible for individual utility costs (Interview data, Building Managers, September and December 2012). In Villa Otthon, management constructed two mock up apartments to demonstrate the impact of the retrofit measures. This was particularly helpful in addressing tenant concerns. Building managers worked proactively to minimize the disruption caused by construction work in the building and had ongoing support from City staff. Tenants reported high levels of satisfaction with the improvement measures and appreciated the tangible benefits to common areas in the buildings.

### ***Energy and Cost Saving Metrics***

Energy Audits and feasibility studies conducted prior to the implementation of renovation and retrofit projects projected an overall decrease in energy consumption resulting in cost savings for each case study. The data provided in Table 6 represents these preliminary estimates. Post retrofit studies are required

to confirm the impact on actual energy consumption of projects supported by social housing renovation and retrofit and energy efficiency initiatives.



Figure 3 Major Retrofits at Broadview Housing Coop.

With respect to energy savings, Villa Otthon had an annual projected estimate of 37% in savings, Broadview projected an estimate of 27% in savings, and the High Park development projected an estimate of 16% in savings. The projected energy cost savings exceeded \$100,000 for Vila Otthon and High Park. These estimates included energy retrofit incentives provided by Enbridge Gas and the City of Toronto's Building Better Partnerships, as well as rebates offered by Ecoenergy in Ontario (Finn Projects, 2007a; 2009b). In addition to the economic benefits of reducing energy use, the feasibility studies claim significant environmental gains resulting from reduced consumption of water and GHG emissions. For example, a reduction of 295 tonnes of GHG is equivalent to growing 7,565 tree seedlings for 10 years, or taking 54 passenger cars off the road for a year. Such gains are impressive, given the fact that in two of the projects the GHG reduction is twice and three times the projected amount.

Table 6 Projected Annual Costs and Energy Savings				
Energy and Consumption Costs Pre-retrofit	Villa Otthon Lambton	Broadview Housing Co-operative	High Park	
			100 High Park Ave	High Park Quebec
Electric kWh	3,062,123	962,425	2,862,827	127,911
Gas cu.m.	235,135	284,021	801,240	1
Water cu.m.	N/A	N/A	81,803	1
Cost of use (\$)	\$455,373	\$210,636	\$724,608	\$17,734
Energy and Cost Savings Post-retrofit*				
Electric kWh	1,675,176	184,484	221,062	24,117
Gas cu.m.	-57,124	91,451	217,076	0
Water cu.m.	N/A	N/A	3,449	0
GHG Reduction	296	772	455	5
Energy Savings	37%	27%	16%	19%
Cost Savings	\$168,244	\$56,949	\$118,594	\$3,344

\*projected

Source: Source: Finn Projects (2009a); Finn Projects (2009b); Ameresco Canada Inc. (2009)

As with the research completed in British Columbia and Alberta (Tsenkova and Clieff, 2012; Tsenkova and Youseff, 2011), the return on investment was dependent on the amount of capital, energy cost savings, and types of retrofits implemented. For example, Broadview had an original investment of \$611,093 for mechanical retrofits with a projected annual energy savings of \$26,815. Table 7 presents the simple payback period of these measures, ranging from 19 to 68 years (in the case of solar thermal systems). In comparison, Villa Otthon invested \$3,229,975 for mechanical retrofits, contributing to energy savings with a simple payback period of 7 to 77 years (in the case of the heating plant). Collectively these measures projected annual energy savings of \$63,300. The data remain limited, as the non-mechanical upgrades also affect building envelope insulation and may reduce energy and water consumption.

<b>Table 7 Costs and Payback of SHRRP Funded Energy Retrofits</b>			
<b>Broadview Housing Co-operative Mechanical - Energy Retrofit Description</b>	<b>Cost</b>	<b>Projected Annual Energy Savings *</b>	<b>Anticipated Simple Payback</b>
Make-Up Air Units	\$15,617	\$7,059	2.2
Heating Plant	\$215,408	\$10,993	19.6
Solar Thermal System	\$225,196	\$3,298	68.3
Cold Water Booster Pumps	\$85,728	\$3,265	26.3
Building Automation Controls	\$69,144	\$2,200	31.4
<b>All SHRRP Retrofits</b>	<b>\$700,753</b>		
<b>Villa Otthon Mechanical - Energy Retrofit Description</b>	<b>Cost</b>	<b>Projected Annual Energy Savings*</b>	<b>Anticipated Simple Payback</b>
Make-Up Air Units	\$75,000	\$11,700	6.4
Heating Plant (boilers and conversion)	\$2,944,757	\$38,000	77.5
Solar Thermal System	\$60,000	\$3,900	15.4
Cold Water Booster Pumps	\$40,000	\$2,600	15.4
Garage Ventilation	\$35,000	\$2,600	13.5
Building Automation Controls	\$75,000	\$4,500	13.6
<b>All SHRRP Retrofits</b>	<b>\$3,937,164</b>		

\*Gas savings only (does not include electricity savings) are used in the simple payback calculations.  
 Source: Finn Projects (2009a); Finn Projects (2009b); Ameresco Canada Inc. (2009); Interview data, Program Manager, September 2012

## 6 REGENERATION PROJECTS AND DESIGN INNOVATION

### *42 Hubbard Boulevard – TCHC Regeneration Project*

Under the SHRRP, service managers were permitted to use up to 10% of the total two-year funding allocation to fund regeneration projects. In the second year of the SHRRP, the TCHC requested \$4,050,000 for regeneration of the Hubbard Boulevard development. The building was 80 years old and in need of significant repairs and retrofits to improve the performance, functionality and accessibility of the units. In 2008, during kitchen and bathroom repairs, TCHC determined that the building could not be maintained due to major renovation requirements to remediate mold, asbestos, and other safety issues. The social housing development is adjacent to the boardwalk in the Beaches, one of the most attractive historic neighbourhoods in downtown Toronto, and is itself a historic resource. The building contributes to the character of the neighbourhood and has ensured the integration of social housing tenants in the area. During the reconstruction, only the original façade of the 3-story, 27-unit property was preserved. In addition to the installation of an elevator and other accessibility features, the primary goal of the regeneration was to meet a 40% efficiency improvement and create a new amenity area for tenants.

<b>Table 8 Project Costs for 42 Hubbard Boulevard</b>	
<b>Description of Works</b>	<b>Cost</b>
General Site Costs	\$388,750.00
Construction Management	\$120,000.00
Architecture & Engineering	\$400,000.00
Landscaping	\$30,000.00
Earthwork / Shoring / Demolition	\$837,680.00
Concrete / Masonry / Structural Steel	\$876,350.00
Rough Carpentry / Framing / Gypsum	\$865,650.00
Roof / Green Roof / Roof Anchors	\$266,600.00
Windows / Exterior Doors / Curtain Wall	\$227,910.00
Plumbing / HVAC / Controls / Sprinklers	\$831,700.00
Electrical Service / Communication / Security	\$538,200.00
Elevator	\$98,500.00
Solar PV	\$50,000.00
Building Automation System	\$113,000.00
Contingency	\$250,000.00
<b>Total Expenses</b>	<b>\$5,894,340.00</b>

Source: Interview data, Project manager, September 2012

The interior was completely rebuilt with original stained glass windows and other historic elements incorporated in the new design. The emphasis on sustainability and simplicity in design is remarkable and certainly defines the unique attributes of this development (Interview Data, project Architect, September 2012). The regeneration was completed in January 2012 and the building is fully occupied.



The total cost of the regeneration was \$5,894,340, and it provided 27 apartments. SHRRP funding and other energy efficiency and regeneration resources were used to cover project costs. Summary of the costs is presented in Table 3.8. This one-of-a-kind regeneration project had a significant price tag with costs of \$210/sq ft, close to the \$230/sq ft cost of newly built housing. Half of the original tenants were able to come back to Hubbard Boulevard and live in RGI housing units. The other 18 apartments have market-based rents, ranging from \$1,200 to \$1,500 per month. These rent levels are reportedly half of what true market rents will be in the Beaches (Interview Data, Project manager, September 2012).

### **Box 1: 42 Hubbard Boulevard – Energy Efficiency by Design**

SHRRP funding and other energy incentive programs offsetting the cost of energy efficiency and renewable energy measures allowed for new design features, including:

- Insulation and new windows to make units more comfortable and to reduce heating costs
- Energy efficient heating, air conditioning, and lighting
- Rooftop solar panels to generate electricity
- A green roof to improve aesthetics, building cooling, and rain water management
- A building automation system to fine tune energy use.



### **Solar Walls**

Through SHRRP funding, four Toronto housing providers have installed solar air heating systems. SolarWall© air heating is a renewable energy technology developed in Toronto. SolarWall© systems are typically wall-mounted (although modular rooftop systems—SolarDuct©—are also available) and can be designed to cover an entire wall or to blend into windows and other architectural details on a wall. SolarWall© resembles a traditional metal wall cladding system. The exterior is comprised of a specially perforated collector installed 6 to 12 inches from the exterior wall, creating an air cavity. It acts as the ventilation air-intake for the building. Fresh air is heated as it passes through the perforations in the system and the heated air is collected in the air cavity behind the wall, where it is

directed into the building's HVAC system. The solar heating reduces the energy load on the conventional heater (City of Toronto, 2011).

Three TCHC projects in Moss Park used REI funding to install SolarWalls© (275, 285 and 295 Shuter Street). Two towers installed two wall-mount systems totaling 3,388 sq ft, which should offset over 85 tonnes of CO<sub>2</sub> each year (see Figure 3.5). A rooftop system was installed on the third tower. The choice was prompted by the fact that SolarWalls© provide a renewable energy technology blending both solar pre-heated air and heat recovery from suite ventilation, while reducing energy consumption. The SolarWall© heating system is most affordable and the payback is best when installed as part of a cladding replacement project. In the Harry Sherman Crowe Housing Cooperative at York University Campus, the systems were installed on a wall covering 6,400 sq ft. (see Figure 4). These systems are heating 18,000 cfm of air for the building, and provide energy savings of over \$15,000 each year. The systems are expected to offset over 130 tonnes of CO<sub>2</sub> each year.



**Figure 4** Solar Walls in two SHRRP Projects in Toronto. Source: City of Toronto, SHRRP Newsletter, 2011

## **7 CONCLUDING COMMENTS**

The renovation and retrofit programs were successful in achieving the goals of improving the quality of social housing in Ontario, reducing energy costs, and improving the overall condition of the housing stock. Nearly 300 projects received grants for renovation and energy efficiency retrofit work in Ontario, and about 16% of those are located in Toronto through the CMHC administered program. In the SHRRP program, the Ministry of Municipal Affairs and Housing used notional allocation to distribute funds to the 47 consolidated municipal service managers in Ontario that received a share of the \$704 million corresponding to the relative share of social housing in their service area. This simple rule ensured some fairness in the distribution of funds across the province and left the service managers sufficient autonomy to address priority needs. In the City of Toronto the investment was critical in addressing the lack of resources needed to fund capital repairs and system upgrades in the aging social housing stock. The

capital shortfall for social housing in Ontario is estimated at \$2 billion, and is not particularly well quantified. The City of Toronto reports to Council illuminated significant financial exposure and risk to the City for unfunded future capital repair needs. The physical condition of the social housing portfolio and the lack of adequate reserves to address capital needs, as well as the limited institutional capacity of small community based non-profit organisations to undertake complex retrofit programs, affected the implementation of the SHRRP.

Interviews consistently pointed out that without the combined funding from SHRRP and REI, most of these retrofits would not have materialized. The issues are particularly critical for small social housing providers in the non-profit and co-op sector that do not have the capacity to raise funds for critical upgrades, nor necessarily the institutional expertise to deal with complex retrofit programming and budgeting operations. In terms of overall impact, SHRRP provided grant funds for a variety of mechanical, structural and building envelope improvements affecting two thirds of the social housing portfolio in Toronto. The impact, in terms of units upgraded, was particularly significant for the non-profit and co-operative housing providers, which saw over 90% of their portfolio affected by program measures. The capital investment enabled the renovation and retrofit of nearly half of TCHC social housing, including comprehensive energy efficiency projects through SHRRP and REI funding as well as innovative demonstration projects. As the largest social housing provider in the City of Toronto, and indeed in Canada, the TCHC received over 55% of the funding (over 70% of REI).

Part of the City of Toronto's success is attributed to the institutional framework established to manage funds in an effective and efficient manner. City staff worked hard to overcome the constraints of a decentralized model of social housing providers to ensure that program benefits were available to all. Efforts included capacity building, assistance with project submissions, project co-ordination and in some cases commissioning audits to ensure greater response rates in year two of the SHRRP and REI program cycle. Constant monitoring, site inspections, advice and training ensured consistency between planned and actual program measures. Some of the most popular retrofits, in addition to lighting—'the low hanging fruit'—were mechanical system upgrades (boilers), roofing, window replacement and cladding/insulation (Interview data, Manager and project lead, September, 2012).

Some of the challengers were associated with the tight deadlines and the need to quickly identify shovel ready projects, when a systematic approach based on building and energy audits would have been more beneficial. City staff continues to oversee disbursement of SHRRP funds, reallocated for other measures or reassigned across the portfolio (Interview data, Program management team, September 2012). Some of these issues are related to the diverse institutional landscape of social housing providers in Toronto—some social housing providers with the institutional capacity to undertake major projects, and others in need of significant assistance in managing these projects. Program management was

stressful and program administration absorbed significant City staff time. Despite these constraints, the approach was strategic and integrated energy efficiency considerations with capital need improvements.

The specific retrofit measures in the case studies are diverse and illustrate the significant challenges of such programs in economic terms. If the simple payback of energy efficiency measures is used as an overall consideration for return on investment, it will be difficult to make the case for green retrofits in the social housing sector. Feasibility studies, however, point to significant environmental benefits resulting from reduced energy and water consumption, and reduced GHG emissions. Some of these metrics of performance, as well as the social impact measured in tenant satisfaction and improved health and well being, are difficult to measure. Because of the size of its social housing portfolio, the TCHC has emphasised the importance of energy and water savings by installing energy and water efficient systems and devices. While the greening of social housing has many benefits, the installation of green technologies is a strain on its capital reserves. REI has provided an important financial boost to experimentation with sustainable design and green technologies such as solar walls/roofs and green roofs which could become mainstream in the future.

Regardless of the overall success of the programs, the funding only temporarily addresses the lack of resources available to maintain the social housing stock. A longer term and consistent funding model needs to be developed to ensure the sustainability of results achieved.



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