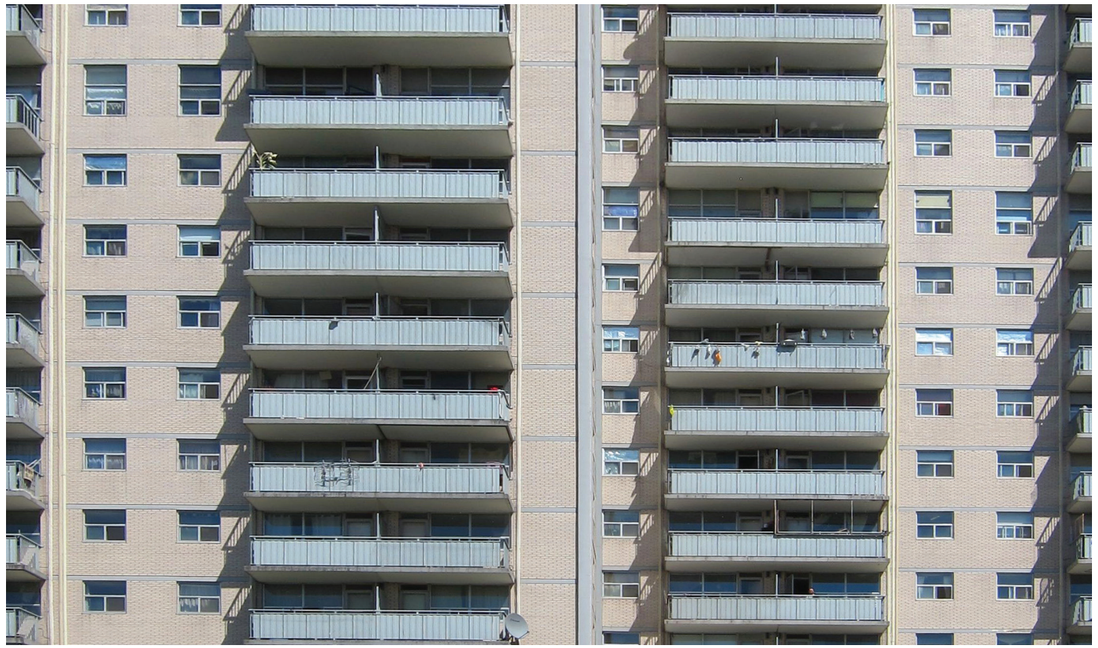
TOWER RENEWAL FINANCIAL INSTRUMENT

TOWER RENEWAL PARTNERSHIP

04

POLICIY BRIEF



WHO WE ARE

The Tower Renewal Partnership (TRP) is an initiative working to transform Canada's stock of post-war apartment towers into more complete communities and resilient housing, fully integrated into our growing cities. TRP is a collaboration between the Centre for Urban Growth and Renewal, Maytree and DKGI. Working with a dynamic network of secondary partners, the TRP engages in research, stakeholder engagement and implementation of innovative urban revitalization – bringing together best-in-class practices in energy retrofit, planning policy, green financing and social inclusion to build more complete communities in apartment tower neighbourhoods.

Based in Ontario, the TRP has conducted research related to this housing stock for municipalities in Ontario and provincial ministries, with a focus on the Greater Golden Horseshoe region. Figures cited here primarily relate to this geography.

Partners and Supporters

CENTRE FOR URBAN GROWTH AND RENEWAL www.cugr.ca CUG+R

dkgi

EVERGREEN CITYWORKS

United Way Toronto & York Region

nblc

Transsolar KlimaEngineering

THIS REPORT

This policy brief presents the scale of the opportunity and identifies current barriers to investment. This research has informed a set of policy directions, identified below, for a financial instrument designed to catalyze deep retrofits across the apartment tower building stock. This instrument could be a key tool for private, public and non-profit owners to improve the quality and energy performance of their buildings, while maintaining the long-term affordability of this housing supply.

OVERVIEW

INTRODUCTION

Canada is home to thousands of post-war apartment towers. The retrofit of this housing stock provides a significant opportunity to meet federal goals related to GHG emission reductions, as well as housing quality and affordability, across the country. As these buildings continue to age, it is increasingly urgent to rehabilitate this housing inventory to ensure its viability for future residents and Canada's shifting demographics.

Improvements to the performance and resilience of this housing stock can be achieved through a package of deep building retrofits,[1] including comprehensive upgrades to building envelopes and systems. These retrofits can significantly reduce energy consumption, improve tenant comfort, and reduce GHG emissions by substantial amounts — exceeding 50 percent.

To achieve the significant impacts of deep retrofits, a financial instrument is needed to incent private, public and non-profit building owners to make this investment in their buildings. A mechanism that combines federal incentive loans with performance-based grants could stimulate substantial investment in deep retrofits — with significant economic, social and environmental returns.

This policy brief presents the scale of the opportunity and identifies current barriers to investment. This research has informed a set of policy directions, identified below, for a financial instrument designed to catalyze deep retrofits across the apartment tower building stock. This instrument could be a key tool for private, public and non-profit owners to improve the quality and energy performance of their buildings, while maintaining the long-term affordability of this housing supply.

1. Deep retrofits improve energy performance through comprehensive building envelope and systems upgrades.

POST-WAR APARTMENT TOWERS AND GHG EMISSIONS TODAY

The Apartment Landscape

A large number of Ontarians live in apartment towers constructed as part of a post-war national program to boost rental and affordable housing supply. Between 1945 and 1984, favourable financing, grant programs and tax incentives assisted in the production of multi-unit residential towers. This supply-side stimulation was a response to the need for rental housing to meet new patterns of urbanization and shifting economic activity, alongside pressure to accommodate large numbers of low-income households in affordable housing.

Today, the Greater Golden Horseshoe (GGH) region of Ontario contains one of the largest concentrations of this housing type in Canada (see Fig. 1). More than 3,000 apartments (5 storeys and higher) are located in this region alone, housing over one million people.[2] This building stock provides a significant volume of the region's affordable rental housing – over 50% in the case of Toronto. The majority of the GGH apartment tower stock is owned privately; only 20% is publicly-owned social housing.[3] Other concentrations of this housing type can be found in most major urban centres throughout the country, including Montreal, Vancouver, Ottawa and Edmonton.

Figure 1: Towers by the numbers

3,080 **Apartment buildings 5+ storeys in the Greater Golden Horseshoe of Ontario**

80% **Of GGH towers are privately-owned**

2.2 **Megatonnes (Mt) of GHG emissions produced by towers each year**

1 **Mt of potential GHG emission reductions by retrofitting towers to meet Ontario Building Code**

Source: Tower Renewal Partnership, 2016

2. Tower Neighbourhood Renewal in the Greater Golden Horseshoe: An Analysis of High-Rise Apartment Tower Neighbourhoods Developed in the Post-War Boom (1945-1984), prepared by ERA Architects, planningAlliance, and the Cities Centre at the University of Toronto for the Ontario Growth Secretariat, Ministry of Infrastructure, 2010.
3. Toronto Community Housing Corporation

TOWER RENEWAL PARTNERSHIP

Poor Building Performance and Aging Buildings

Post-war apartment towers are among the most energy intensive housing types in Canada. Constructed prior to the implementation of conservation measures in the National and Provincial Building Codes, these apartment towers do not meet today's energy performance standards. On average, they are 25% more wasteful per square metre than a single family home.[4] Only a small percentage of this inventory has undergone retrofits for increased energy-efficiency.

The average energy intensity of the apartment tower building stock is significantly higher than any existing standard: while the average 2015 apartment tower energy intensity is 318 kWh/m²a, [5] the National Building Code requires new buildings to perform at approximately 200 kWh/m²a. In comparison, the German Federal Building Code sets performance standards at less than 120 kWh/m²a. In the GGH, the poorest performing buildings—those which have retained their original windows and heating plant systems—often have energy intensities of 450 kWh/m²a or higher.

In multi-unit residential buildings, GHG emissions are largely a result of natural gas consumption for space and water heating. Post-war apartment towers are responsible for significant GHG emission production, averaging 4-5 tonnes per unit annually, or 2.2 megatonnes across the GGH region. Not only does this poor building performance result in significant GHG emission production, but it also results in poor tenant comfort, limited control of indoor environments, and reduced indoor air quality.

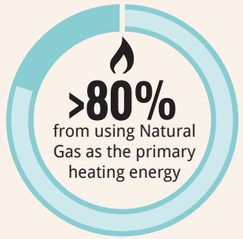
The apartment tower building stock is now late in its life cycle. Much of the post-war apartment tower stock is in a poor state of repair, particularly in the lower end of the private market and in the public housing sector – those buildings which are most affordable to lower income households. Following the end of federal supply-side subsidies and tax incentives in the 1980s, and establishment of rent control in Ontario in the 1990s, owner investment in these buildings began to decline rapidly. In buildings where rent may be increased on a turnover basis, cosmetic renovations are more likely to occur. However, on the whole, large segments of this housing stock continue to face deterioration. As there is a limited supply of rental housing in much of the GGH and across Canada, there is little economic incentive for owners to make significant capital investments in many of these buildings.

Natural Gas and GHG Emissions

More than 80% of GHG emissions in apartment towers result from the reliance on natural gas as the primary heating energy (see Fig. 2). Poorly performing building envelopes lack insulation, and low quality windows create significant air leakage — demanding a higher volume of heat energy to maintain indoor comfort. While natural gas is the largest producer of carbon in the operation of these buildings, current pricing has not produced sufficient market pressure to curb consumption (see Fig. 3).

4. Natural Resources Canada

Figure 2: Tower GHG Emissions



Source: City of Toronto: Tower Neighbourhood Renewal Office

Retrofit Measures by Performance Standards

Typical Ontario Tower Retrofit
- Double Glazing

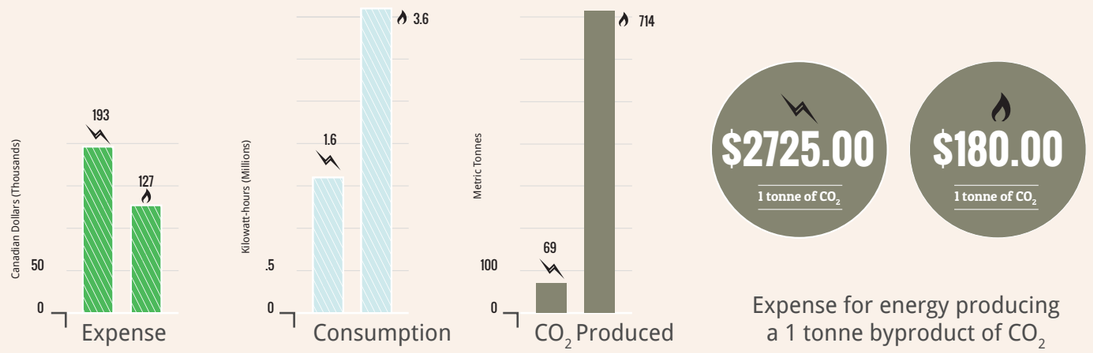
Ontario Building Code
- Double Glazing
- Addition of Insulation

Toronto Green Standard Tier II
- Improved Double Glazing
- Improved Insulation

German Federal Building Code
- Improved Double Glazing
- Improved Insulation
- Mechanical Ventilation
- Improved Airtightness

Passive House Standard
- Triple Glazing
- Improved Insulation
- Mechanical Ventilation
- Improved Airtightness
- Heat Recovery Ventilation
- External Shading

Figure 3: Cost of Carbon — Electricity versus Natural Gas in an Avg. Apartment Tower (2014)



Source: Energy Audits Commissioned by Tower Renewal Partnership

The Retrofit Economy Today

Many towers have undergone selective energy efficiency upgrades, favouring measures with short payback periods. However, these measures are not sufficient to bring the towers up to the minimum standards of the National Building Code.

Energy-saving measures with short-term paybacks are the most common in the apartment tower stock. These are typically undertaken as part of regular maintenance, and are aimed at reducing electricity and water usage. These measures may be described as 'Level 1 Investments,' often including LED fixture replacements and low-flow plumbing fixture upgrades. These measures result in limited GHG emission reductions (5-10%), but relatively high operating cost savings.

Medium-term payback measures are made possible in some towers through modest incentives provided by utilities and low-cost financing from local governments. These measures represent the current market ceiling for energy retrofits, with up to 10 year paybacks. They include the introduction of high-efficiency boilers, centralized heat recovery, or re-sealed doors and windows for improved air tightness. These measures may be described as 'Level 2 Investments' and may result in GHG emission reductions in the order of 10-20%.

Since Level 1 and Level 2 investments do not address building envelope thermal performance, the performance of these improved buildings continues to fall below the National Building Code standards. Further, these improvements do not address issues of tenant comfort resulting from low insulation values, drafty window and moisture infiltration.

Typical Measures Based on Payback Period

Level 1: 1-5 year paybacks

- Low-flow plumbing fixtures
- Constant speed booster pump replacement with variable frequency device
- Common area lighting retrofit to LED fixtures

Level 2: 5-20 year paybacks

- Weatherstripping and worn door seals on exterior doors
- Make-up air units
- High efficiency boiler
- Centralized heat recovery
- Unit lighting retrofit to LED fixtures
- CO sensors to control exhaust fans

Level 3: > 20 year paybacks

- Controls and programmable thermostats in units
- Insulated overcladding on existing building envelope
- Window replacement with operable double or triple glazed units
- Mechanical ventilation with heat recovery
- Renewables
- Building automation systems

TOWER RENEWAL PARTNERSHIP

THE TOWER RENEWAL OPPORTUNITY

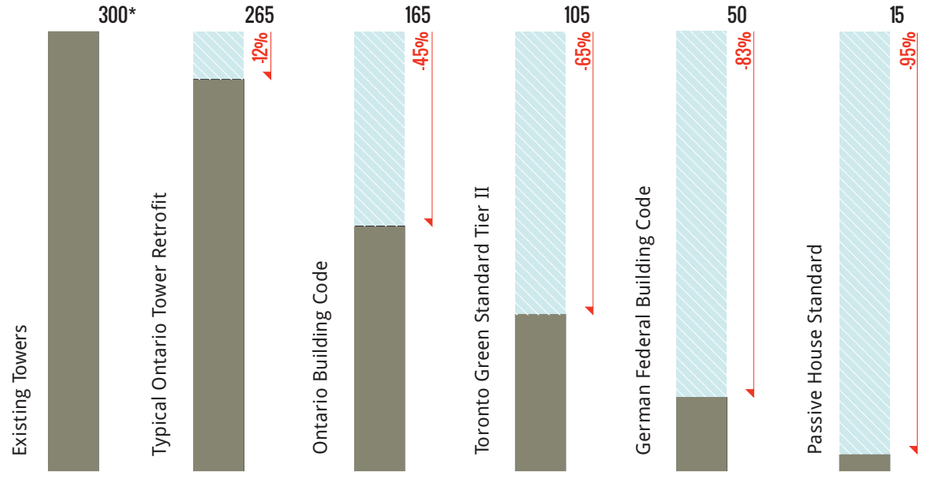
Retrofit Measures

To achieve significant GHG emissions reductions and improvements to tenant comfort, improvements to the building envelope and building systems are required. These measures may be described as 'Level 3 Investments,' and may include heat load demand reduction through envelope upgrades, heating system recalibration to reduce loads, in-unit heat recovery ventilation, the integration of renewable energy systems, and the introduction of building automation systems. In addition to GHG emission reduction, these upgrades improve tenant comfort through increased air tightness, reduced moisture infiltration, increased access to fresh air, and increased tenant temperature control.

GHG Emission Reduction Potential

A recent study undertaken by TRP in partnership with Stuttgart-based TransSolar Climate Engineering demonstrated the significant potential energy savings that can be realized by addressing the retrofit needs of this apartment tower stock (see Fig. 4).

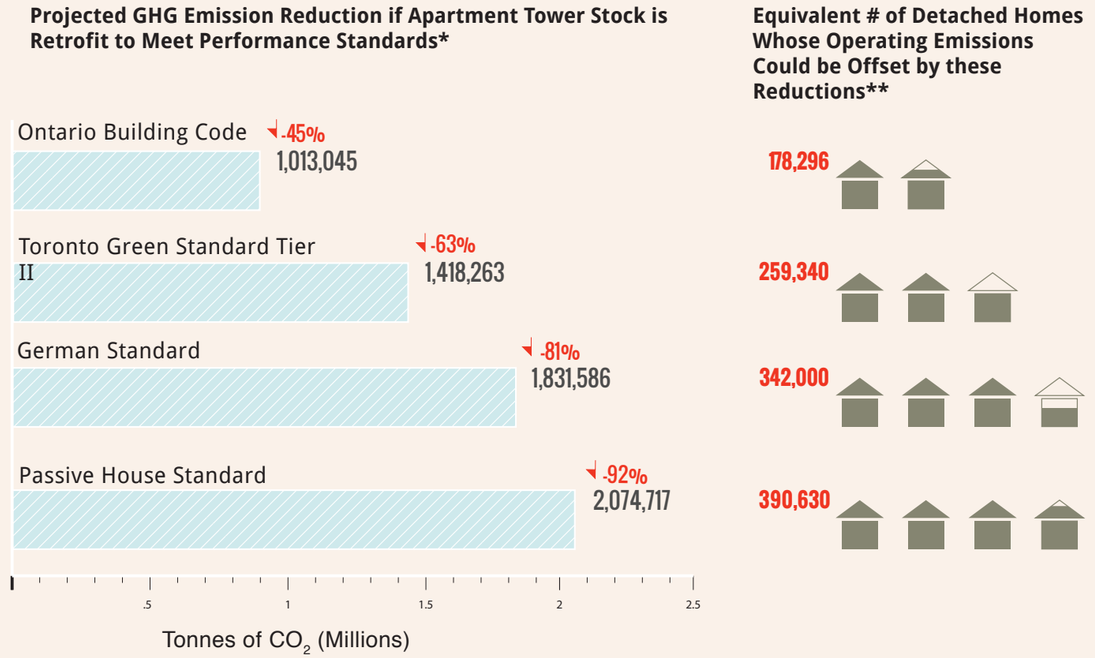
Figure 4: Energy Intensity Reduction Based on Performance Standards (kWh/m²a)



* Represents Average Tower in the GGH

Source: TransSolar GmbH, Tower Neighbourhood Renewal, Thermal Studies

Figure 5: GHG Emission Reduction Potential within the Greater Golden Horseshoe per Year

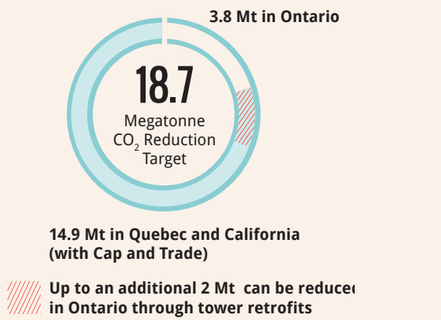


* Assumed existing tower unit emission levels: 4.29 tonnes / unit / year, based on heat load.

** Assumed existing detached home emission levels: 5 tonnes / house / year, based on heat load.

Source: Tower Renewal Partnership, 2016

Figure 6: Ontario 2020 CO_2 Targets



Source: Ontario Climate Change Action Plan, 2016

This study analyzed the energy intensity of a typical apartment building, testing the efficacy of a series of retrofit scenarios to align the building's energy performance to a series of local and international performance standards. The performance standards modelled included:

. Typical apartment tower (based on the 2015 median energy intensity of GGH apartment towers)

. Typical Ontario tower retrofit (based on private-sector retrofit measures typically implemented in today's market)

. Tower retrofit to meet the standards of the Ontario Building Code

. Tower retrofit to meet the standards of the Toronto Green Standard Tier II

. Tower retrofit to meet the standards of the German Federal Building Code

. Tower retrofit to meet the standards of the Passive House Standard

The study results show the potential impacts of achieving code compliance: meeting the performance standards of the Ontario Building Code can reduce GHG emissions by 45%, while meeting German Federal Building Code can reduce GHG emissions by 81%. To meet any recognized performance standard, the study found it necessary to improve the building envelope.

Extrapolated across the GGH apartment tower stock, meeting the performance standards of the Ontario Building Code could reduce annual GHG emissions by more than one megatonne, while meeting the German Federal Building Code standard could result in a reduction of 1.8 megatonnes (see Fig. 5). Even more dramatic is the reduction associated with the Passive House Standard, resulting in a reduction of more than 2 megatonnes.

These projected reductions represent the potential within the GGH alone; with large concentrations of post-war apartment towers in other urban centres throughout the country, the national emission reduction potential is considerable. In Ontario alone, retrofits of apartment towers could form a significant contribution to the provincial 2020 GHG emission reduction targets (see Fig. 6).

Retrofit or Replace

The cost of investing in a deep retrofit on a typical apartment tower represents a fraction of the cost of demolishing and rebuilding (a comprehensive retrofit could represent ¼ to the cost of building replacement). The carbon footprint of rebuilding, and the resulting disruption to the community, suggests that a retrofit program is preferable to replacement from environmental, economic and social perspectives.

TOWER RENEWAL PARTNERSHIP

CHALLENGES TO ACHIEVING DEEP RETROFITS

The Financing Gap

While the efficacy of Level 3 Investments has been demonstrated by the TRP-Transsolar study, the challenges involved in financing these measures must be addressed. Long-term payback capital investments are typically outside the financing capacity of both public and private building owners. Level 3 Investments usually have payback periods longer than 20 years, based on assumed escalations of utility costs. In the current market, there is considerable risk to the owner in projecting these costs over an extended term. In jurisdictions where Level 3 Investments have been made, the investment capital and a portion of the risk is typically borne by government, who are seeking to achieve public policy objectives related to GHG emission reductions.

Repair Backlogs and Tying Rehabilitation to Energy Retrofit

As the post-war housing supply continues to age, significant rehabilitation is required to bring these buildings up to today's living standards. These capital requirements are in addition to the financing required to achieve energy efficiency. Repairs such as electrical systems upgrades, elevator replacements, amenity space upgrades, and in-unit kitchen and bathroom refurbishment will not result in energy or operating savings, but are required to update this housing stock.[6] Constrained revenues related to the relative affordability of these buildings results in owners' limited capacity to complete building upgrades and keep pace with aging buildings.

Comprehensive data on building repair backlogs is not currently available, but data from the public housing sector shows that the numbers are significant: Toronto Community Housing reported a $2.6 billion backlog in 2015.[7] Tying energy retrofit programs to building rehabilitation should be considered as financial instruments are developed.

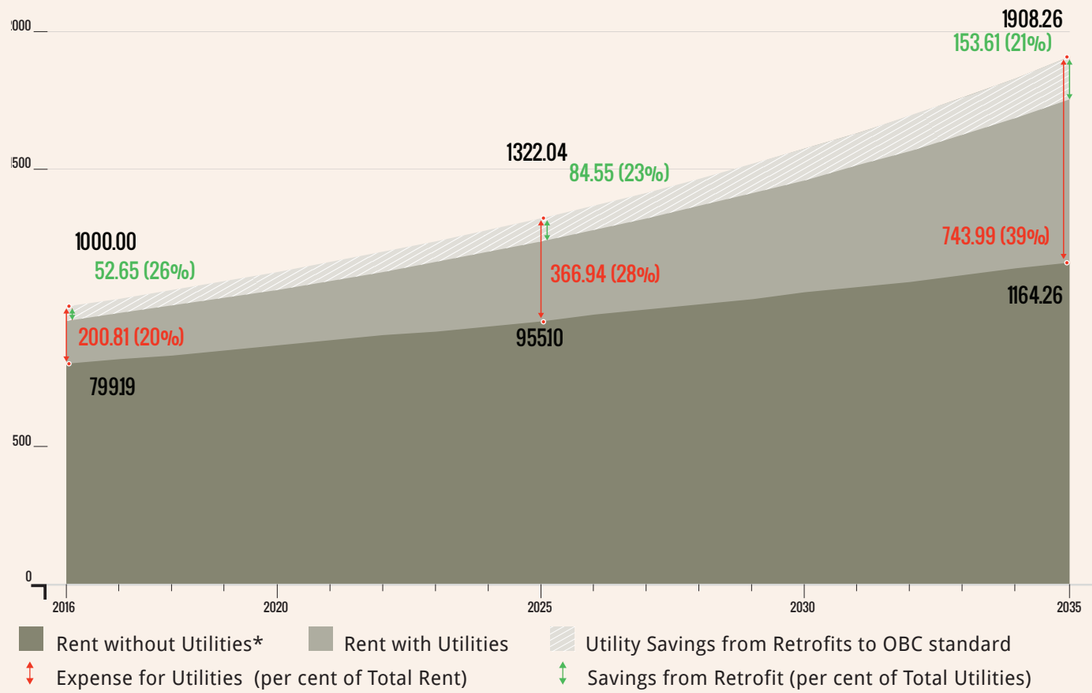
Cost Escalation and Fuel Poverty

Projecting modest utility price inflation, the cost of water, electricity and gas is expected to increase 340% over the next 20 years. Assuming this escalation, a typical 200-unit apartment building in Ontario is projected to spend over $20 million in utilities over this time period.[8] As utility inflation is set to surpass baseline inflation, tenants will directly bear the cost — either through rent increases, or directly, if utilities are not included in rent (see Fig. 7). This "do nothing" scenario will result in a significant loss of rental housing affordability, both through rent increases and the transfer of utility costs onto tenants — many of whom are low income households.

In the UK, fuel poverty is defined as a condition in which the utility costs of a household leave that household with a residual income below the national poverty line.[9] A national strategy to address this condition has resulted in a dual program of targeted utility subsidies for vulnerable populations and retrofit incentives. In a Canadian context, a targeted program of retrofit finance could help to mitigate this impending risk, preserving the affordability of this critical rental housing supply while meeting GHG emission reduction goals.

6. Vertical Poverty, United Way Toronto and York Region, 2011
7. Toronto Community Housing Corporation
8. This figure does not account for forthcoming carbon pricing programs which will further increase future costs.
9. Fuel Poverty Statistics, Department of Energy and Climate Change, UK, 2015

Figure 7: Impact of Inflation on Rent and Utilities (2016-2035)



* Rent – 2% inflation

** Assumed annual cost escalations: Electricity – 8%, Water – 8%, Gas – 2%

Source: Tower Renewal Partnership, 2016

POLICY DIRECTIONS FOR A TOWER RENEWAL FINANCIAL INSTRUMENT

The rehabilitation and deep retrofit of Canada's stock of post-war apartment towers represents an opportunity to significantly advance federal goals related to greenhouse gas emission reduction and housing affordability. Such a solution would: prolong the lifespan of this critical housing supply; improve health outcomes, quality and comfort; make significant reductions to GHG emissions; and develop a homegrown retrofit industry to stimulate research and design, employment, and manufacturing.

TRP research has established key directions for the development of a Tower Renewal Financial Instrument

Design: the instrument is self-sustaining, e.g. structured as a revolving loan fund;

Eligibility: participation is determined by minimum energy performance targets (suggested minimum 50% GHG emission reductions);

Performance Incentives: energy performance exceeding base requirements is incented through a combination of reduced interest rates and grants;

Financing Gap: program financing is designed to address identified market gaps through long-term financing (20 years +) at competitive interest rates;

Affordability: financing is conditional upon an agreement to adhere to guideline rental increases (regulatory or CPI); capital upgrades resulting from program support do not qualify for above-guideline rent increases where these regulations exist;

Debt Servicing: schedules remain flexible and are calibrated to rental owner cash flow models to encourage broad uptake and preservation of housing affordability;

Flexibility: the program supports prototyping (test cases) and phased implementation to manage market demand and pressure on supply pricing;

Rehabilitation: both energy retrofits and base building rehabilitation are eligible for program financing and funds;

Complementarity: the program complements existing retrofit incentive programs which typically support short- to mid-term payback periods; and

Accessibility: the program is designed for ease of use.

TOWER RENEWAL PARTNERSHIP

Additional Policy Considerations

A tower renewal financial instrument can make a significant contribution to achieving the environmental, economic and social benefits associated with tower renewal in a way that is efficient and innovative. However, to reach the full extent of the apartment tower stock in need of renewal and to achieve the full range of benefits, a set of complementary measures needs to be considered. These additional policy considerations are based on best practices identified by TRP in the course of its research (for more detail on this research, see Appendix: International Precedents).

Building Regulation

A robust retrofit finance program will immediately attract a segment of the market, which includes sophisticated owners who are already literate in energy improvement measures. However any program will be limited by its voluntary nature. System-wide uptake may require parallel regulation to identify minimum performance standards. Phased-in performance standards for existing buildings, coupled with a tower renewal financial instrument, could result in stock-wide transformation.

Addressing Repair Backlogs

For the most poorly performing buildings, considerable capital repairs may be required prior to the introduction of energy-saving measures. A complementary apartment tower rehabilitation program may be required — however, further research is required to assess the number of buildings in an advanced state of neglect.

Tax Structures to Encourage Investment

The discontinuation of supply-side incentives in the 1980s, largely through the cancellation of a series of favourable tax programs, has led to a decline in investment in apartment towers. Directing private sector investment to rehabilitation and deep retrofit through tax policy should be explored, as a complement to a tower renewal financial instrument.

Affordability

The apartment tower housing stock represents a large supply of affordable private rental housing. In many centres, such as Toronto, it is the largest inventory of affordable rental housing, and as such, the maintenance and resilience of this affordable housing supply is paramount. There is a risk that rehabilitation of these buildings will raise rents as a result of improved housing quality. As noted above, baseline rents may also increase significantly due to increased utility inflation over the next decades. To address this risk, additional measures to maintain affordability should be considered, such as: a) encouraging an increased supply of affordable housing options, and b) developing alternative tools, such as a flexible housing benefit for low-income households, to counter rising rent levels.

Evaluating the National Apartment Tower Housing Supply

The post-war apartment tower stock in the GGH region of Ontario is well understood as a result of past studies,[10] and the City of Ottawa is currently undertaking a survey of its apartment tower stock in collaboration with the Tower Renewal Partnership. However, the volume of the stock Canada-wide is currently unknown. This poses an opportunity for further research to determine the extent of the national housing supply represented by these towers. With the GGH region housing over one million people in post-war apartment towers, and the potential for more than 2 megatonnes of GHG emissions to be eliminated in this region alone, the scale of the national opportunity could be considerable.

10. Tower Neighbourhood Renewal in the Greater Golden Horseshoe: An Analysis of High-Rise Apartment Tower Neighbourhoods Developed in the Post-War Boom (1945-1984) prepared by ERA Architects, planningAlliance, and the Cities Centre at the University of Toronto for the Ontario Growth Secretariat, Ministry of Infrastructure, November 2010.

TOWER RENEWAL PARTNERSHIP

INTERNATIONAL PRECEDENTS

Over recent decades, many European countries have implemented national retrofit programs to target post-war apartment towers. Programs in the UK, Germany, the Netherlands and Sweden, among others, pair financing instruments with research and development, skills training and education to build more robust retrofit economies. These models can help to inform the design of a Canadian tower renewal financial instrument.

The German Model

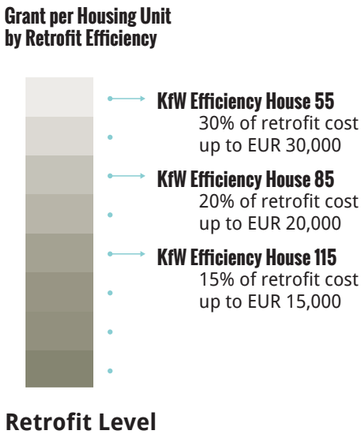
The rental housing supply in Germany has many similarities with that of Canada, making it a valuable case study for financing the retrofit of private-sector housing. Like Canada, Germany has a market-driven private rental housing system – this is in contrast to other European countries, whose systems depend more heavily on social housing. Germany supports affordable and rehabilitated rental housing through supply-side subsidies including favourable tax conditions for capital investment for owners and loans and grants for rehabilitation and energy improvements supported by government, which are tied to affordable rents. The hybrid loan-grant program is provided through the Kreditanstalt fur Wiederaufbau (KfW), a bank created to act as an intermediary between owners and capital markets.

The KfW supports the retrofit economy through a program calibrated to building performance outcomes. The loan program offers below market 10-, 20- and 30-year financing at favourable interest rates, designed to cover retrofit costs up to 100,000 per unit ($145,000 CAD). Up to 30% of this loan may be transferred into a grant if energy performance standards are met, with a range of performance tiers correlated to increasing grant percentages. Grants act as a powerful incentive for owners to improve their buildings beyond legislated base performance requirements.

In Germany, national and regional regulations have driven the uptake of these federal financing mechanisms. Federal legislation imposes limits on primary energy demand and building envelope heat loss on both new and existing buildings.[11] Additionally, while all regions require the use of renewable energy systems in new buildings, some also require their use in existing buildings.

11. EnEV Energy Savings Regulation, 2002

Figure 8: Retrofit Incentives (Germany)



Source: KFW Bank. Accessed 06/08/2016
<www.kfw.de/inlandsfoerderung/Privatpersonen/Bestandsimmobilie>

This combination of regulation and supportive financing in Germany has resulted in impressive energy reductions as well as labour and manufacturing market stimulation, alongside the renewal and rehabilitation of the national housing stock. Refurbishments triggered through KfW investment between 2006 and 2011 resulted in a 5.7 megatonne GHG emission reduction, and more than one billion Euros in heating cost savings.

The UK Model

A study completed by ARUP and the Institute for Sustainability in 2013 assessed the efficacy of a variety of retrofit funding models, in the UK and abroad.[12] Several of their findings may help to guide a Canadian program design. The study found that the uptake of loan programs is better when building rehabilitation can be funded alongside energy savings measures. This allows base improvements to housing quality to be bundled with energy upgrades (as is the case in the KfW model, which allows for a portion of their loans to be used toward rehabilitation). In parallel, it found that comfort and improved value of assets must be viewed as drivers for housing retrofits, in addition to energy savings. In the UK, Energy Act 2011 prohibits the rental of properties that do not meet energy intensity performance standards, effectively legislating tenant comfort. These parameters allow base housing quality and affordability to be tied to energy performance.

Another finding of the study cautioned that financing instruments should be competitive with, and aligned to, mortgage finance. This is relevant in cases where buildings are re-mortgaged to cover retrofit costs – a scenario which may be required for owners without access to large amounts of up-front capital.

12. Delivery and Funding Housing Retrofit: A Review of Community Models, ARUP and Institute for Sustainability, 2013.