

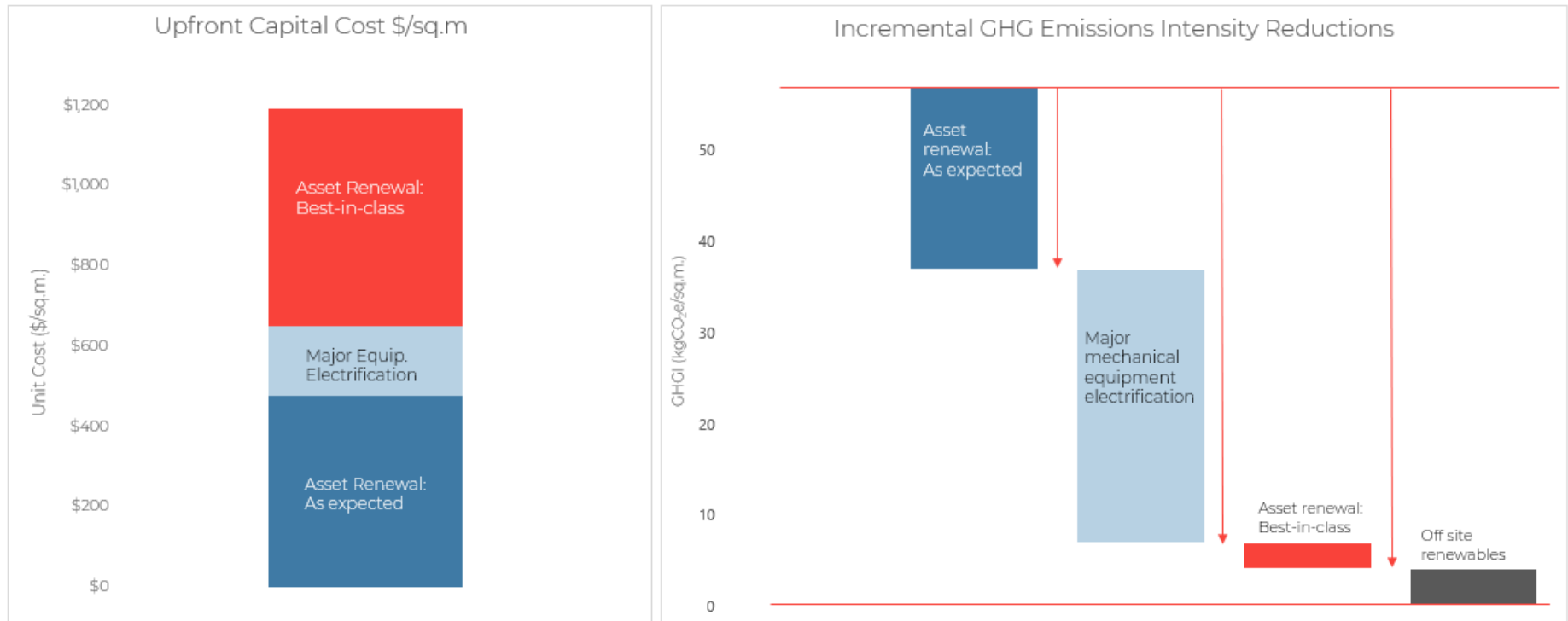
OLDER MULTI-UNIT RESIDENTIAL BUILDINGS

CITY OF OTTAWA ZERO CARBON READY RETROFIT PATHWAY

Older Multi-Unit Residential Buildings (MURBs) built in the 1950's-1970's. The example building has an average of 80 suites in this archetype with a gross floor area (GFA) of approximately 7,600 sq.m.

Typically, older MURBs are in the prime real-estate areas and are ready for more significant upgrades to HVAC delivery and building enclosure systems. Some may also be considering installing better cooling and ventilation systems to improve property value.

The charts below depict the upfront capital and greenhouse gas (GHG) intensity reduction of three progressive retrofit pathways, as defined below.



In fully transitioning to Zero Carbon Ready, the analysis shows the following incremental costs vs asset renewal as expected:

UPFRONT CAPITAL COST		ENERGY COST SAVINGS		GHG EMISSIONS REDUCTION		LIFE-CYCLE COST PER TONNE CO ₂ e SAVED (OVER 25-YEARS)	
\$750/m ²	+150%	\$3/m ² /year	+15%	33 kgCO ₂ e/m ² /yr	+89%	\$850/tonne	+80%

Building System Upgrade Matrix:

		BUILDING SUB-SYSTEM	EXISTING/TYPICAL	DEEP RETROFIT UPGRADE
Older Multi-Unit Residential Buildings	Enclosure	Roofs and walls with minimal or no insulation. Windows are double-glazed and have often been replaced at least once but may soon be ready for renewal again.	Overclad or re-clad existing brick façade with additional insulation up to R-25 continuous. Install roof insulation including re-insulating & expanding parapets. Install triple-glazed windows with best-in-class, thermally-broken frames.	
	HVAC Delivery Systems	Space heating is delivered by hot water baseboards or fan-coil systems. Typically, no central cooling. Pressurized corridor ventilation system. Building automation systems are simple, if present.	Install full building-wide cooling and in-suite, code-compliant ventilation system. Upgrade controls at central plant and suite-level.	
	Fuel switching	Heating systems are gas-fired hot water boilers, typical efficiency (80%).	Install in-suite, cold climate air-source heat pumps (typical of variable-refrigerant flow (VRF) systems)	
	Domestic Hot Water Heating & Appliances	Domestic hot water boilers are similar to (or the same as) main heating ones. Appliances and faucets are tenant-selected, so a mix of quality/efficiency.	Install high-quality low-flow shower & faucets. Install washers and heat pump dryers that achieve an EnergyStar rating in the top 10%. Install an air-source heat pump water heater.	
	Solar Photovoltaic (PV)	No renewable energy systems.	Install a solar array covering 50% of roof area.	

Important Life-cycle Cost & Carbon Analysis Assumptions:

Electricity Rate 11-15 ¢/kWh; Electricity Escalation 2.0%

Natural Gas Rate 19-24 ¢/m³; Natural Gas Escalation 2.0%

The cost of carbon timeline aligns with the November 2020 announcement by the federal government to escalate the carbon tax to \$170/tonne to 2030 and was projected to stay flat until 2050.

Discount rate 2.5%; Inflation 1.9%

What are the holistic benefits of the Deep Retrofit package?

Climate Resilience & Occupant Comfort. Enclosure upgrades prepare a facility for future extreme weather and energy-related risks (e.g. power outages) as well as improving indoor air quality and thermal comfort.

Added Property Value. Through a comprehensive analysis of 2020-2022 property values and high-level costing of implementing deep energy retrofits to meet the City of Ottawa's Energy Evolution objectives we can conclude with regards to rental properties, the incremental life-cycle cost to reach Energy Evolution is estimated at 5-10% of rental value over 25 years. The projected incremental value in the form of increased lease rates as shown in the KPMG analysis is 25%. Rent increase in Ottawa is approximately 14% which is higher than jurisdictional guideline of 2.5%. A similar increase of 12% in the City of Toronto has led to struggles, even for market renters. Given that the value add from the increase in lease rates is as high as 25%, Landlords would need to implement staggered increases to realize the gains from capital cost investment to avoid beyond market rent increases associated with a landlord's mandate to renovate their space.

Through a comprehensive paired sales analysis of 2020-2022 property values for condos and high-level costing of implementing deep energy retrofits to meet the City of Ottawa's Energy Evolution objectives, we can see that, where a value increase proposition is available, the relative cost of capital (including shared costs) seems to be about half the value increase. Unfortunately, the market study by KPMG does not show a broad value increase across all condo sizes.

For Condos, the study cannot offer conclusions on the relative life-cycle cost vs. total cost of ownership for a condo, since analysis of condo fees, etc. was not included in the analysis.

1 Ottawa rent increase reference: <https://ottawa.ctvnews.ca/average-rent-in-ottawa-increases-14-per-cent-in-last-year-1.6436001#:~:text=The%20June%202023%20Rent%20Report.cent%20from%20the%20year%20before>

2 Toronto rent increase reference: [Hundreds of High Park tenants call for more rent control after being notified of 12% increases | CBC News](#)

How do I go about implementing such a big project?

Capital Plan Alignment. The most important way to avoid additional capital costs for deep retrofit projects is to align them with existing, planned renewal for overlapping systems. For older MURBs, some of which don't have cooling, the key milestones are:

- Window replacement and roof renewal projects,
- Upgrades of central boiler and heating equipment,
- When installing new cooling and/or improved ventilation to improve occupant comfort, or
- When upgrading/replacing electricity vaults that are outdated.

Timing Envelope & HVAC Improvements. Completing enclosure upgrades (i.e. walls, roof, windows) before fuel switching central heating systems or installing new heat pumps is a best practice to avoid oversizing equipment (and oversizing costs). That said, if existing heating systems can remain in place for a few years to compensate for additional loads during peak times, heat pumps sized for future/lower loads can be installed until capital budgets allow for the enclosure upgrades to be completed.

Alternate Pathways. Some facilities may struggle to implement all of the recommended measures included in the Zero Carbon Ready package due to budget constraints, local electricity grid limitations, heritage concerns, etc. Of course, the package of measures is flexible, despite being holistic. For older MURBs, if alternative pathways are required, it's important to remember:

- Switching away from fossil fuel heating systems will likely be required and some improvement to enclosure will likely be needed to avoid prohibitive increases in electricity service to the site. Analysis of the site power capacity vs. available HVAC heating load reduction is important. Site power management technologies such as battery energy storage may be worthwhile to investigate as well.
- Where enclosure upgrades and controls improvements are not enough to allow for full fuel-switching using air-source heat pump technology, opportunities may exist to install geo-exchange systems or connect to low-carbon district energy systems. These opportunities are site and neighbourhood specific, but are being actively promoted and developed for key areas in the City. Speak to a City of Ottawa or Ottawa Hydro representative for support.

What financial support and programs are available?

[Canada Greener Homes Grant & Financing](#). If your MURB is a low-rise construction built to the Part 9 code requirements (e.g. townhouse complex) your facility may be eligible to access \$600 in audit funding per unit, up to \$10,000 in incentives for system upgrades, and up to a \$40,000 interest-free loan (per owner-occupant) repaid over 10 years.

[Canada Infrastructure Bank - Green Infrastructure](#). For larger MURBs, and especially where significant investment is needed, the CIB will provide low-interest loans (e.g. as low as 1% for a minimum 50% GHG reduction) to support investment, especially where other lenders are involved and projects aggregate to over \$25M in financing.

A list of updated CIB aggregators and their offerings are provided on [Ottawa's Better Buildings webpage](#).

[Enbridge Gas Incentives & Rebates](#). Enbridge offers a variety of equipment-based and custom incentives for retrofit projects and equipment. A recent set of revised incentives have been approved by the Ontario Energy Board and are being rolled out by Enbridge in early 2023. Of unique importance is that those seeking incentives do not need to be Enbridge customers, allowing facilities planning to fuel switch to electric heat pumps, for example, to access relevant incentives as well.

[IESO's Save on Energy Programs](#). The Independent Electricity System Operator (IESO) offers complimentary incentives and rebates for electrical equipment and systems, or for holistic facility-wide improvements as may be required for a deep retrofit project. Incentives for HVAC redesign, variable-speed motors, chiller upgrades and unitary heat pump equipment may be particularly useful to those engaging in deeper retrofits or installing facility-wide cooling for the first time alongside their decarbonization retrofits.

Where should I look for more information?

City of Ottawa - [Energy Evolution](#)

City of Toronto - [Net Zero Existing Buildings](#)

Canada Green Building Council - [Decarbonizing Canada's Large Buildings](#)

Pembina Institute - [Reframed Initiative](#)

Transition Accelerator - [Building Decarbonization Alliance](#)