

National Housing Strategy Affordable Housing Innovation Fund

Case Study Solara Flats Residential Development 308 Colony St. Winnipeg, MB

CONSULTANT



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400-136 Market Avenue
Winnipeg MB R3B 0P4

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I. Overview

A. Affordable Housing Innovation Fund - Knowledge Transfer

The CMHC Affordable Housing Innovation Fund supports the exploration of new innovations a path forward for UWCRC 2.0 Inc., which is a not-for-profit housing provider. The fund will support innovation in the energy sector, reduced operating costs for affordable housing, and achieving net-zero carbon targets. These innovations include the central cold climate air-source heat pumps, solar-thermal solar collectors and high temperature water-water heat pumps, BIPV incorporated into the exterior envelope, and innovation and replicability in the design and project management of the project. The integration of these innovative technologies and approaches are key to the Solara Flats project achieving net zero carbon (with Canada Green Building Council Designation) and an EUI of 80 kWhr/m² per year or less in an extreme cold climate.

B. Solara Flats Project Description

The 308 Colony St. development is a 21-storey building with 214 residential dwelling units, and two commercial rental units on the main floor. The building area is 15,265 m². The proposed building incorporates numerous measures to reduce the annual energy consumption from an NECB 2015 baseline building. Design-phase energy modeling showed that the proposed all-electric energy-efficient building exceeded NECB 2015 by 63% using a combination of measures including an enhanced envelope, efficient cooling system, high-efficiency central energy recovery ventilator, and an electric boiler.

Because the project has an aggressive target to reach 80 EUI or less as well as a net zero-carbon target, an innovative heating system was required to further reduce the annual energy & carbon consumption. Incorporating further measure such as heat pump heating of domestic water and onsite energy generation via solar thermal and BIPV panels, the updated energy model (at 66% design) reached EUI levels of 78 EUI.

C. Contributing Authors

1. Epp Siepman Engineering (prime authors)
2. UWCRC 2.0
3. Cibinel Architects
4. Crosier Kilgour Structural Engineering & Building Performance
5. Bockstael Construction
6. UWCRC 2.0

D. Acknowledgements

Solara Flats was partially funded by Canada Mortgage and Housing Corporation's Affordable Housing Innovation Fund which supports new ideas that drive change and disrupt the industry, including ideas and approaches that will evolve the affordable housing sector and create the next generation of housing in Canada.

E. Definitions and Abbreviations

1. NECB: National Energy Code for Buildings.
2. MECB: Manitoba Energy Code for Buildings.
3. EUI: Energy Use Intensity: The total annual energy usage by the building, including heating, cooling, domestic water heating, and all user-based electrical loads such as lighting and power. Units of kWhr/m² per year.
4. NZC: Net Zero Carbon.

5. ASHP: Air-Source Heat Pump.
6. CAGBC; Canada Green Building Council
7. EIFS: Exterior Insulation and Finish Systems
8. BIPV: Building Integrated Photovoltaics

II. Energy Systems

A. Building Envelope

The building envelope materials and construction methods are described in more detail in Section VI. In brief, the exterior cladding is a combination of EIFS panels as well as BIPV. For the building's energy systems, the key consideration in the envelope selection was thermal efficiency (R-value). Through modeling and costing exercises, an R-27^{effective} wall was determined to be the optimal design to meet the energy requirements while also achieving constructability and overall budget considerations.

B. Central Cold-Climate Air-Source Heat Pumps

Rooftop air-source heat pumps (ASHP) combined with a 4-pipe heat recovery heat/cool heat pump produce heating for the central building heating loop (serving fan coils in suites) down to an outdoor ambient temperature of -20°C. The units provide heating for the majority of the building's heating hours at part-load conditions. The efficiency of the ASHP ranges from a COP of 1.53 at -20°C to 3.13 at 8°C. This means that the system provides heating at 1.53 to 3.13 times less input energy than an electric boiler. At temperatures lower than -20°C, the electric boiler supplements the heating by maintaining the temperature setpoint in the central thermal storage tanks. During summer months the heat recovery heat pump provides heating from the heat pump heat of rejection to the thermal pre-heat storage tanks for domestic hot water heating to supplement the solar-thermal generation.

Innovative Aspects

- The system is designed around central thermal storage tanks to take advantage of several different heating sources, and to recapture heat given off by cooling systems.
- The system must function as the sum of various equipment and control items, and a central digital controls system is critical to optimize the energy and carbon savings.
- Winnipeg has one of the most extreme climates (summer and winter) of Canada's major cities, so achieving NZC and 80 EUI in this climate required a high level of innovation in the systems design and the inclusion of site-generated energy.
- The approach is highly replicable for other multi-unit residential buildings and is not restricted by site conditions or regional limitations.

C. Solar-thermal Solar Collectors

The system consists of 60 solar-thermal collectors located on the tower rooftop and the penthouse rooftop. Both the air-source heat pump and the solar thermal systems connect to common thermal storage tanks for central plant heat pumps and low-temperature (120°F – 140°F) heating sources (air-source heat pump & solar thermal panels). The annual domestic hot water heating load is therefore met primarily by solar thermal heat generation with no carbon and minimal energy input, and backed up by a highly efficient and carbon-free heating through the ASHP system to meet demand loads.

Innovative Aspects:

- Utilization of heat recovery from the central heating system.
- Non-carbon heating of domestic water, which is non-typical for a MURB.
- Multiple heating sources provide efficiency optimization as well as backup redundancy.

D. High Temperature Water-Water Heat Pumps

Two water-water heat pumps draw from the solar-thermal storage tanks and heat the domestic hot water to the final storage tank temperature of > 140°F. These heat pumps are capable of heating to greater than 140°F from a source temperature of 100°F.

Innovative Aspects:

- Achieving the high temperatures required for domestic hot water requires specialized heat pumps and a staged hydronic heating system.
- High-temperature water-water heat pumps are new to the market and not typically used in this application.
- The heat pumps allow all electric heating at significantly lower utility consumption than electric boilers.

E. Building-Integrated Photovoltaics

Building Integrated Photovoltaics (BIPV) were installed on 1300 m² of the building facade. The BIPV system was an important aspect of the overall energy efficiency and NZC approach which contributed to meeting the 80 EUI target by offsetting carbon and energy consumption.

F. Discussion & Lessons Learned – Energy Systems**1. Energy Sources for Central Energy Plant**

- o Depending on the region and the utility market, the energy source is a key consideration with high impacts on the operating cost and the NZC impact. In Manitoba, the electrical grid is around 96% hydroelectric power so any form of electrical energy input is effectively NZC. This is not true of other jurisdictions where a significant portion of grid energy is produced by fossil fuels.
- o The project had to strike a balance between competing funding criteria. For example, the best performing NECB comparison model utilized a natural gas energy source. However, with a NZC mandate in addition to NECB targets, the system was based on all-electric heating energy with less of an energy difference compared with the NECB baseline

2. Site-Produced Energy - Solar

- o In terms of annual energy per panel, solar thermal panels can produce more energy annually than PV panels. However, much of this energy is at a low-grade of heat. Capturing this energy and utilizing it for building heating systems is possible but results in a fairly complicated hydronic system.
- o PV panels (either traditional rooftop array or BIPV) have a higher up-front cost, but the operation is very simple. As well, the energy produced by PV is highly utilizable for any electrical energy requirement in the building, and can also be fed back to the grid when not required by the building demand.

3. Mechanical Systems

- o Cold-climate air source heat pumps are a relatively recent equipment option on the market, and at the time of design had only been on the

market for a year. This meant that there was a limited number of equipment manufacturers to select from.

- Even ASHP are challenged in Winnipeg's climate, since -20C is the lower practical limit for their operation (for larger commercial units). This requires a backup system of a traditional boiler (could be gas or electric).
- This system used an electric boiler for backup to run in cold temperatures to achieve the NZC requirements. This large demand load had implications on the electrical service size, as well as the demand charges that are included in the electrical utility costs.
- Due to the limitations of the refrigeration cycle, heat pumps have a limit to how much they can raise the heat of a given system. This can require multiple heat pumps in cases to provide staged heating and achieve desired operating temperatures for space heat and domestic water heating. This results in a fairly complex hydronic system with a greater amount of pumps, tanks, and other components than a typical heating system.
- The above complication in equipment and systems also means that a larger mechanical room is required in addition to significant rooftop areas. This in turn increased the structural loading on the building.

III. Building Energy Modeling

A. Overview – Modeling Process

Energy modeling simulations of the building were done to meet multiple objectives, including early energy models to inform the selection of HVAC and envelope systems, as well as multiple modeling iterations as validation of energy and GHG targets to meet several different incentive programs. The incentive programs were from a variety of government programs (provincial and federal) as well as third-party validation programs (for example, CAGBC's NZC program). The various programs and jurisdictions and their objectives resulted in different modeling rules or guidelines as well as target energy and GHG thresholds. Most significant was that the version of the Energy Code for Buildings (NECB, or MECB) was not consistent across the various programs and required deliverables. This necessitated specific energy modeling runs to meet each program, and at the various stages of design. The table below provides a list of the main programs that required energy and GHG modeling.

Table 1: Funding Programs and Modeling Requirements

Funding Program	Key Requirements	Energy Code	Risk Areas - Energy/Carbon
CMHC - MLI	40% < energy & GHG than NECB 2017	NECB 2017	Energy aspect will be met if FCM-SAH targets achieved
CMHC-NHS Co-investment fund	35% < energy & 87% less GHG than NECB 2015	NECB 2015	Energy aspect will be met if FCM-SAH targets achieved
FCM - SAH Study Grant & Planning Grant	Report including Energy Modeling Analysis		
FCM SAH New Building Program	55% < energy & GHG than NECB 2015, EUI < 80, NZER	NECB 2015	Deleting or reducing BIPV or solar thermal could risk the 55% and 80 EUI targets; confirm rooftop layout accommodates the required solar thermal array;
Efficiency MB Energy Modeling Incentive	Meet minimum energy code	MECB 2013 (NECB 2011)	Minimal risk if other targets are achieved
Efficiency MB New Buildings Program	20% < energy than MECB to get \$2/sf	MECB 2013 (NECB 2011)	Energy aspect will be met if FCM-SAH targets achieved.
Efficiency MB Innovation Program	Solar Thermal Collector; Cold Climate Heat Pumps; Integrated Controls	NECB 2015	Confirm rooftop layout accommodates the required solar thermal array, integrated controls may exceed budget.
MB Conservation and Climate Fund	Soft targets: Onsite renewables, GHG reductions		GHG aspect will be met if FCM-SAH targets achieved; maintain BIPV or solar thermal aspects
CAGBC Net Zero Carbon	Energy systems to be zero carbon.	Meet CAGBC NZC program requirements	Embodied Carbon, materials selections, concrete. Can't use gas boiler for supplemental heating.
MECB - Code Compliance	Meet minimum energy code	MECB 2013 (NECB 2011)	Minimal risk if other targets are achieved

Through the process of energy modeling and in coordination with the design, it was clear that the most difficult targets to achieve were:

- Energy performance 55% better than NECB 2015, while maintaining a NZC energy system (i.e. all-electric base building).
- Achieving the EUI target of 80 kWh/m² per year

B. Early Models for System Selection

The early energy systems analyzed included:

- Water loop heat pumps in each suite or zone with high efficiency gas boiler and fluid cooler. Two pipe hydronic distribution system. Central ERV for exhaust and ventilation.
- Four pipe fan coil (4PFC) in each suite or zone with high efficiency gas boiler and water-cooled heat-recovery chiller. Four pipe hydronic distribution system. Central ERV for exhaust and ventilation.
- Ground loop heat pump (geothermal) with heat pumps in each suite. This was a hypothetical energy model for comparative purposes only, since it was already understood that the site only fit a fraction of the total geothermal loops required, and it was not a realistic option.

System Selections:

- The 4PFC was the best constructible option to exceed NECB by 55% (the most stringent energy efficiency target).
- Achieving NZC and 80 EUI requirements would mean an electric boiler instead of condensing gas boiler, and an air-source heat pump for base level heating.

- Even with the best performing systems for heating and cooling energy, a higher-performing (and more costly) system would be required for domestic hot water heating, and to meet the 80 EUI target.
- Further modeling iterations were done to include the DHW and to add solar heating in the form of a solar-thermal system as well as BIPV cladding on portions of the exterior façade.

C. Regional Climate Challenges to Achieving 80 EUI

The 80 EUI target was defined as a requirement by the FCM-SAH program partly through the schematic design process. Having a measurable goal to define the program's goal of "net zero energy ready" was useful as a benchmark for energy modeling and system selections. As noted above, 80 EUI is a challenging benchmark especially in Winnipeg's climate, and requires significant investment in energy recovery systems and a well-performing envelope. The major energy use for heating and cooling is affected by the regional climate. Regional climate impacts on heating and cooling are measured by the difference in heating and cooling degree days, as well as daily solar radiation (not compared), and are values provided in the National Building Code of Canada climate data. To illustrate Winnipeg's climate challenge in both in heating and cooling, Table 2 shows the EUI of the proposed building (using the design phase model) in Winnipeg compared with several major Canadian cities by using the same building model and only changing the input weather data file. In this table we omitted the EUI contribution of on-site power generation of the BIPV panels and the solar thermal system. Of the cities listed, Winnipeg's climate is the most extreme for heating degree days and is second only to Toronto for cooling degree days. The result is that if the same building were located in Toronto, for example, the resulting EUI would be 71 instead of the 88 EUI when located in Winnipeg. This creates both a technical challenge and increased construction cost to meet the same EUI benchmark with a Winnipeg location.

Table 2: EUI Comparison of the Proposed Model in Other Climates

System Option	Vancouver	Winnipeg	Calgary	Edmonton	Toronto	Quebec City
EUI (kWhr/m ² *)	62	88	76	80	71	77
Heating Degree Days (below 18 C)	2955	5725	5135	5772	3738	5099
Cooling Degree Days (above 10 C)	803	890	513	476	1234	807

** Not including EUI reductions from BIPV or Solar Thermal.*

D. Energy Modeling Results

The early energy modeling studies included a comparison of different envelope performance by inputting wall effective R-values of R-27, R-37, R-45, and R-30 (IP units). The results showed that increasing the effective wall insulation from R-27 to R-45 resulted in an increased overall energy savings of 2%. The difference in cost and complexity of construction to go from a R-27 to an R-45 wall was very significant. Based on the relatively small energy savings with the R-45 walls and the much larger increase to cost and difficulty in construction, R-27 was kept as the baseline assumption for wall insulation. Refer to Table 3 for the energy performance comparison with different envelopes.

Table 3: Wall Insulation Modeling Comparison

Energy Analysis Results (kWh)

Category	R-27 Wall	R-37 Wall	R-45 Wall	R-30 Wall
Interior Lighting	141,226	141,226	141,226	141,226
Space Heating (ELEC)	683,358	663,400	653,833	675,292
Space Heating (NG)	0	0	0	0
Space Cooling	29,064	29,136	29,172	29,091
Pumps	59,597	59,599	59,600	59,598
Fans - Interior	181,339	181,154	181,066	181,264
Receptacle Equipment	192,492	192,492	192,492	192,492
Domestic Water Heating (ELEC)	421,757	421,757	421,757	421,757
Total	1,708,833	1,688,764	1,679,146	1,700,720

Many of the incentive programs required modeling at various stages of the design and some including post-construction energy models for validation. Given the timeline of design and construction, this meant that jurisdictions and agencies had updated the adopted version of the NECB (and/or MECB) to more recent publications by the time the project had finished construction. Successive versions of the NECB typically become more refined and more stringent in terms of energy and GHG targets. The as-built energy model was the energy model done after construction to include the systems and envelope as built, including any relevant changes to the design that may have been incorporated in the construction phase. The following tables and graphs reflect energy modeling results from analysis comparing the NECB 2020 baseline building to the As-Built building.

Figure 1: Graphic of As-Built Comparison to NECB 2020 Baseline

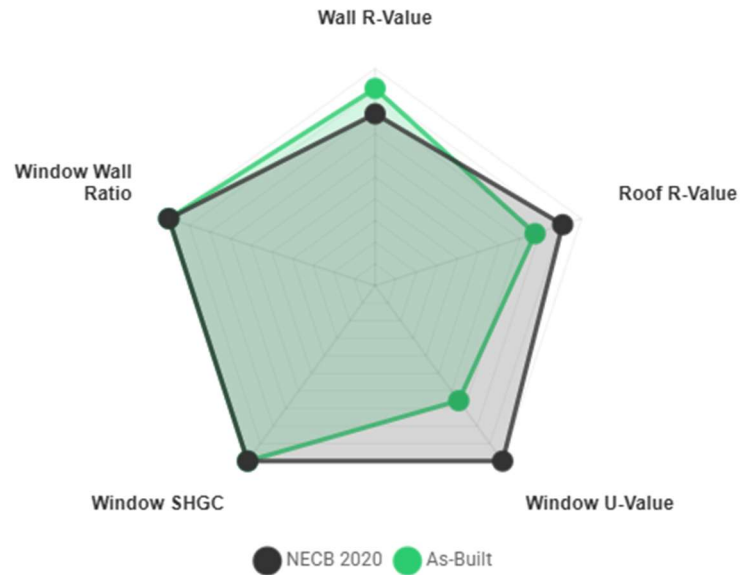


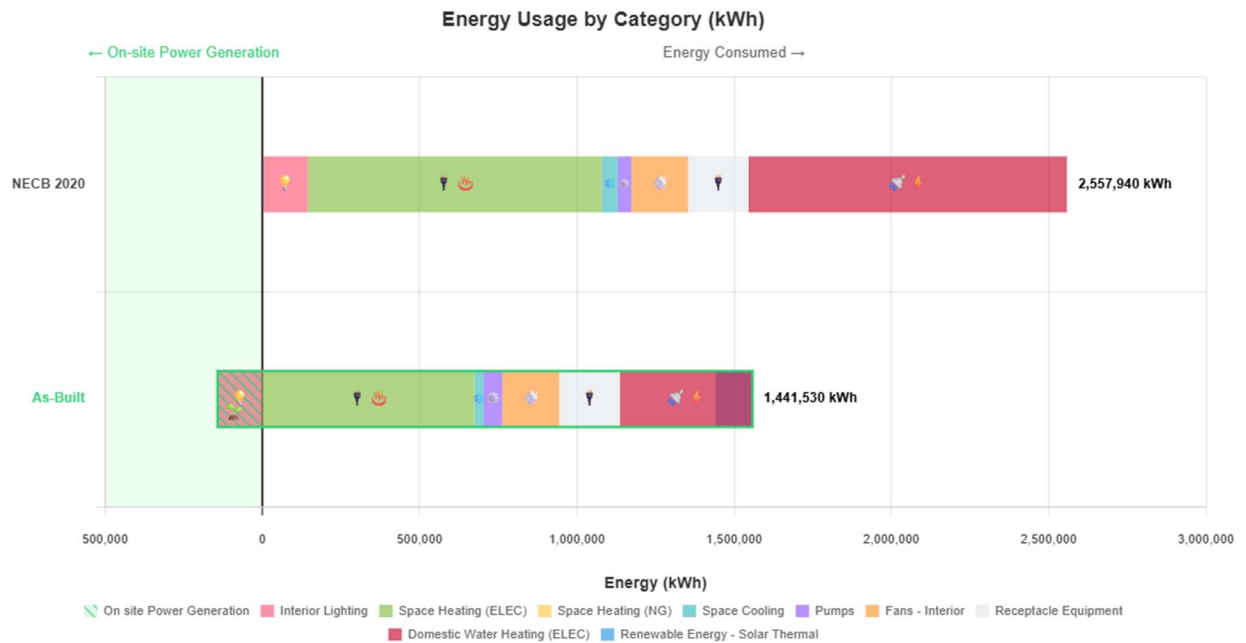
Table 4: Modeling Inputs - Building Envelope & System Specifications

Category	NECB 2020	As-Built
Wall R-Value	26.4	30.3
Roof R-Value	46.9	40
Window U-Value	0.305	0.2
Window SHGC	0.24	0.24
Window Wall Ratio	0.29	0.29
Mechanical System Type	4PFC	fPFC
Ventilation System	HRV, 50%	ERV, 87%
Plant Type	ASHP/E Boiler	ASHP/E Boiler
Domestic Water Heating Type	E Boiler	Heat pump, Solar Thermal
Renewable Energy	None	BIPV, Solar Thermal

Table 5: Energy Modeling – Key Results (kWh)

Category	NECB 2020	As-Built
Interior Lighting	144,160	141,226
Space Heating (ELEC)	934,745	675,292
Space Heating (NG)	0	0
Space Cooling	50,953	29,091
Pumps	43,415	59,598
Fans - Interior	180,234	181,264
Receptacle Equipment	192,492	192,492
Domestic Water Heating (ELEC)	1,011,941	421,757
Renewable Energy - Solar Thermal	0	-116,730
On Site Power Generation - BIPV	0	-142,460
Total	2,557,940	1,441,530

Table 6: Energy Usage By Category



E. Energy Modeling Lessons Learned

The significant lessons learned through the various iterations of energy modeling and analysis include:

- Energy Modeling for a complex project with a relatively long design phase results in moving targets for energy modeling and various codes and program standards evolve or are updated.
- Depending on the program, the base-case building that the proposed design was compared to differs. The result was that in some cases the objectives of incentive programs conflicted. For example, the best performing model to exceed the NECB was based on a gas boiler for primary heating. However this would not meet the NZC goals, so the comparison of an all-electric proposed design to an all-electric base building resulted in smaller savings.
- Achieving the final 5 – 10% of EUI gains comes at a considerable cost and additional complexity of systems and controls. For example, adding solar thermal and BIPV systems, and integrating both solar thermal and water-water heat pumps to the domestic hot water heating system.

IV. Envelope, Structure, Commissioning

A. Efficiency in Design - Cibinel Architects

The building was designed to be repetitive and simple to construct, with the goal of directing funds toward the mechanical systems that have the greatest impact on overall energy efficiency. However, simplicity does not have to mean boring. By using simple forms and clean lines, we were able to create a statuesque building that still feels approachable from the street. The rooftop terrace, located adjacent to the second-floor amenity spaces, provides valuable outdoor space on an extremely tight site.

We selected an EIFS cladding system as a cost-effective solution that uses tried-and-tested details, making it very easy to install. It is also highly energy efficient due to the minimal amount of thermal bridging within the system, making it a clear choice. Because this material is also the primary cladding used on the two adjacent UWCR 2.0 buildings, it creates cohesion among the three structures and helps establish a consistent architectural language along the street.

All of these choices allowed us to focus on the one visible energy-efficiency intervention: the Building-Integrated Photovoltaics (BIPV) system. We worked in close collaboration with the BIPV manufacturer to achieve a balance between energy output efficiency, total BIPV area, the number of panel sizes, and panel placement relative to direct sunlight. By fully understanding these design constraints, we were able to maximize energy output while bringing some panels closer to grade—where there is less direct sunlight—so they remain visible to pedestrians along the street.

Lessons Learned

- Since the panels cannot be changed or cut on site, there is almost no construction tolerance built in. In the future we would like to build more tolerance into the details.
- Long lead times required fabrication of the panels before the building could be site measured
- Tolerances were created at the joints between panels, creating conditions with uneven joints in order to butt panels up to window jambs or the edge of the building

- The design could have incorporated more flexibility at the window jamb in the detail or have had the panels pulled away from any fixed point at one end of the array (or more depending on the design).

B. Structural, Envelope, and Envelope Commissioning – Crosier Kilgour

From a structural perspective, the team at Crosier Kilgour selected an efficient cast-in-place concrete structure that lends itself well to high-rise residential towers. While it can be selected purely on economics, the thermal mass of a concrete structure also contributes to the energy efficiency of the building.

A simple EIFS envelope was selected, based on its economy, constructability aspects and inherent energy efficiency with minimal thermal bridging. However, to maximize the efficiency ultimately achieved in the completed building, a comprehensive Building Envelope Commissioning (BECx) process was implemented.

BECx provides independent verification that the enclosure systems are designed and constructed in accordance with the Owner's Project Requirements. Early design reviews, coordination with the design and construction teams, and targeted field inspection and testing help identify potential issues before they result in costly deficiencies. This process improves building durability, energy performance, occupant comfort, and long-term operational efficiency while reducing the risk of water intrusion, air leakage, and premature component failure.

The BECx contribution on the Solara Flats project contains the following fundamental components:

- Building envelope design assist consulting, working with the architect and builder to confirm constructable, high-quality detailing.
- Development of relevant technical performance specifications.
- Pre-construction meetings to familiarize the construction team with the details and work through any constructability items.
- Submittal reviews for envelope components to confirm that the products supplied are consistent with the design intent.
- Site inspection and testing services. Crosier Kilgour worked with Bockstael Construction to coordinate and witness testing that was carried out in accordance with established functional performance testing standards.

Lessons Learned

Having BECx involvement as early as possible in the project allowed the design and construction process to proceed in a practical way that permits proper attention being paid to critical detailing on the building. This is the last check to confirm that the built systems are constructed and operating as intended to meet the long-term energy efficiency and durability targets of the building.

C. Building Envelope, Energy Efficiency & Replicability – Bockstael Construction

Building Envelope, Innovations, and Contributions to Energy Efficiency

Incorporating Canadian-sourced Building-Integrated Photovoltaics (BIPV) into the exterior cladding system transformed the envelope from a passive barrier into an energy-producing surface. By embedding renewable energy generation directly into the façade, the project not only reduces strain on local grids but feeds surplus energy back into it, while avoiding the spatial and aesthetic limitations of traditional rooftop solar systems.

The envelope strategy is supported by fully electrified, high-efficiency building systems, including central air-source heat pumps for heating and cooling and solar thermal panels for domestic hot water pre-heating. Structural and systems decisions were evaluated

holistically during preconstruction to ensure that massing, envelope detailing, and mechanical integration worked together to optimize thermal performance, constructability, and life-cycle cost.

Replicability of the Design Approach

Solara Flats prioritizes commercially available, scalable systems integrated through disciplined early decision-making. The successful sourcing of a Canadian BIPV manufacturer reduced procurement risk while lowering emissions associated with transportation.

Equally important is the project delivery methodology. Lean Construction principles, including the Last Planner System and Takt Planning, enabled precise coordination on a constrained downtown site and allowed the team to recover early schedule delays, ultimately achieving occupancy ahead of schedule. These methods are not project-specific and can be readily applied to other high-rise developments seeking to balance complex logistics, energy performance, and financial discipline.

Lessons Learned

Solara Flats underscores the importance of early, integrated collaboration in achieving meaningful energy efficiency outcomes. Treating cost, carbon and constructability as interdependent variables, rather than competing priorities, the team made informed decisions that supported both zero-carbon performance and long-term affordability. The project also highlights the value of supply-chain innovation and proactive risk management, particularly when incorporating emerging technologies such as BIPV into high-rise construction.

V. Development & Operations of a Net Zero Carbon Building – UWCRC 2.0

Solara Flats illustrates how developers and operators of not-for-profit housing can benefit from investing in sustainability as a key pillar of building design and function. As the first residential high-rise building in Canada to receive CAGBC Zero Carbon Building – Design Standard certification, Solara Flats demonstrates that sustainability and affordability can work hand in hand to deliver efficiencies and savings that benefit both building operators and residents long after construction is complete.

Developed in partnership with Lotus Holdings Winnipeg and located along the growing residential corridor of Colony Street, the 21-storey building includes 214 residential units—38 premium market units, 90 market units, and 86 affordable units. Of the affordable units, 25 are rented at 59% of Median Market Rent and 61 at 69%, as defined by Canada Mortgage and Housing Corporation. As of March 2026, 93% of the affordable units have been successfully leased. Through its efficient design and innovative building systems, Solara Flats significantly reduces energy use, helping to lower utility costs for building operators. With thoughtful oversight, these savings can be reinvested into building maintenance, resident services, or community improvements, meaning that initial investments and collaborations in designing and implementing innovative, energy-saving systems yields long-term benefits.

Choosing to build a net-zero carbon building like Solara Flats can also contribute to broader financial and social benefits. Buildings that meet high sustainability standards are increasingly attractive to environmentally conscious residents and can enhance long-term property value and market competitiveness.

For residents, the benefits are equally significant: lower utility costs reduce the financial burden on households, particularly for lower-income families who often spend a larger share of their income on energy. Combined with fully accessible shared amenities—including a resident lounge, outdoor greenspace terrace, and laundry facilities—Solara

Flats demonstrates how sustainable, net-zero-carbon housing can support affordability, resilience, and quality of life within a vibrant mixed-income community.

By reducing reliance on external energy sources, developments like Solara Flats are also less vulnerable to energy price fluctuations or supply disruptions, providing greater operational stability for housing providers. We are thankful to project funders, including the Affordable Housing Innovation Fund, whose contributions supported the research, design, and construction of the first net-zero carbon residential high rise in the country.

VI. Summary

The high targets for energy efficiency, net zero carbon, and affordability presented a challenging project that required a high level of innovation at all levels. Throughout the design of the Solara Flats, innovative measures were considered in the overall context of repeatability and application to other affordable multi-unit residential building projects, providing an opportunity to share lessons learned. Achieving the key energy efficiency goals and receiving the CAGBC Zero Carbon Building – Design Standard certification demonstrates the success of the innovations in Solara Flats, and validates it as a fully constructed and commissioned building that is leading edge for sustainability and net zero carbon in the affordable housing market.