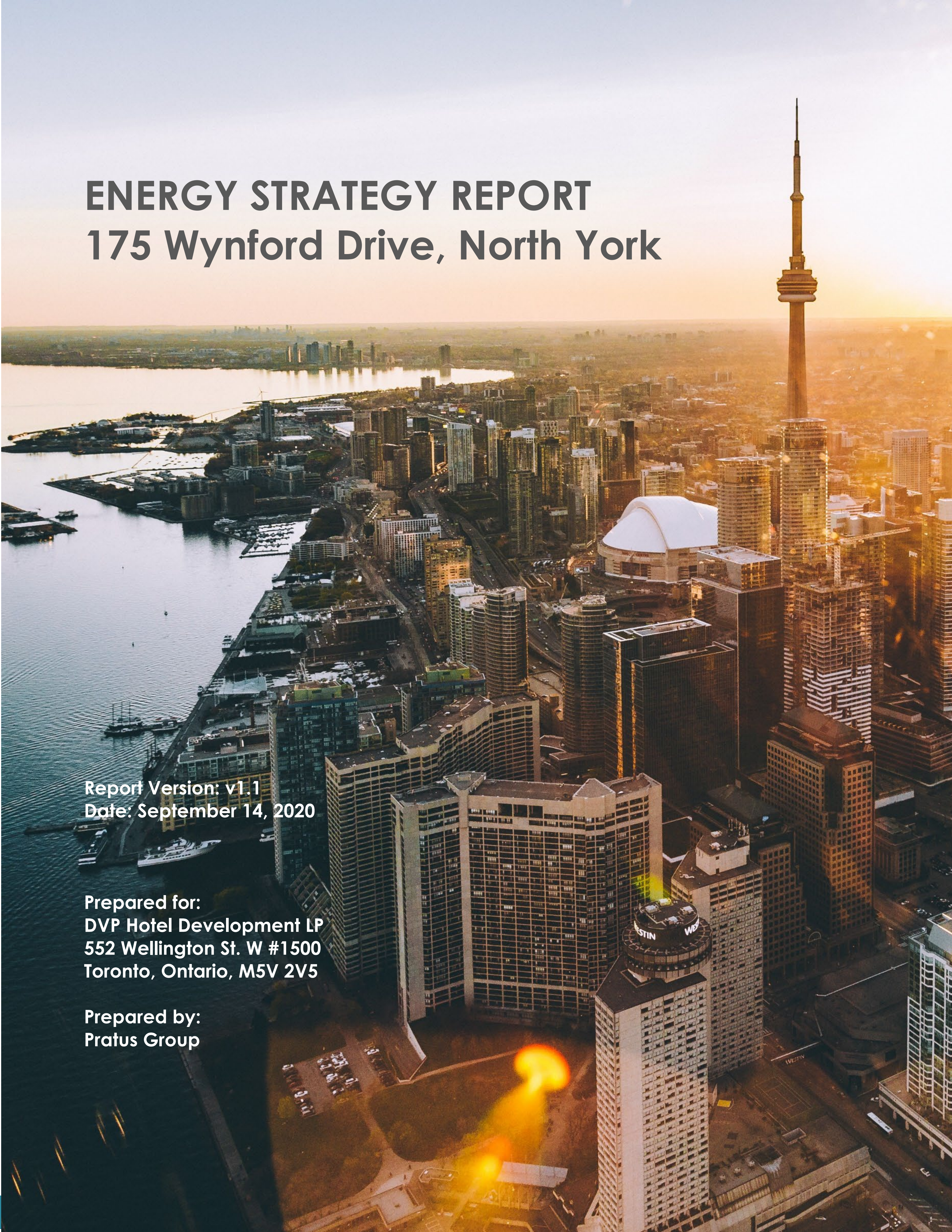

ENERGY STRATEGY REPORT
175 Wynford Drive, North York

Report Version: v1.1
Date: September 14, 2020

Prepared for:
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Table of Contents

1 EXECUTIVE SUMMARY

The following Energy Strategy Report summarizes the analysis and results of the energy conservation measures considered for the Don Valley Hotel project. The proposed mixed-use project is comprised of four towers sitting on two podiums. It will house residential units, hotel accommodation, a commercial/retail component and a community space program to be determined later. Tower 1 is 54 storeys with an 8-storey podium connected with Tower 2, which is 45 storeys. Tower 3 is 47 storeys with an 8-storey podium connected to Tower 4, which is 49 storeys.

Pratus Group has been retained by DVP Hotel Development LP to identify opportunities for integrating local energy solutions that are efficient, low carbon and resilient into the proposed project's design. The results of which have been summarized in the following Energy Strategy report for the Don Valley Hotel. The energy conservation strategies analyzed have been done so in accordance with the City of Toronto's Energy Strategy Terms of Reference. The analysis completed as a part of this report is the first step and will serve to inform subsequent design decisions that will be reflected in the Toronto Green Standard Design Development Stage Energy Report.

2 LIMITATIONS

This report has been prepared for DVP Hotel Development LP to inform and investigate energy strategy for the Don Valley Hotel project. The analysis and the results present modelled performance metrics (TEUI, TEDI and GHGI) for the proposed building design in comparison to performance limits of TGS and OBC SB-10. The calculations are applicable only for determining a strategy for compliance with OBC SB-10, Toronto Green Standard v3 requirements and for option comparison. They are not predictions of actual energy use or costs of the proposed design after construction.

Actual experience will differ from these calculations due to the variations such as occupancy, building operation and maintenance, weather, energy use not covered by energy standard, changes in energy rates between design of the building and occupancy, and precision of the calculation tool.

3 INTRODUCTION

The purpose of this Energy Strategy Report is to explore and identify opportunities to integrate efficient, low carbon, resilient, and local energy solutions for the proposed development. The analysis completed as a part of this report is the first step in this process; it will inform subsequent design decisions that will be reflected in the Toronto Green Standard Design Development Stage Energy Report.

This Energy Strategy Report fulfills the City of Toronto's requirement that apply to all new developments including residential, non-residential and mixed use with:

- A total gross floor area of 20,000 m^2 or more; or
- Are located within a Community Energy Plan area approved by Council

In association with the following application types:

- Official Plan Amendment;
- Zoning By-Law Amendment; or
- Plan of Submission

As per the City of Toronto's Energy Strategy Terms of Reference, the Energy Strategy is intended to contribute to achieving the City's objectives to reduce energy consumption and GHG emissions and become more resilient.

The Official Plan policy 3.4.18 states that "innovative energy producing options, sustainable design and construction practices ... will be supported and encouraged in new development … through: d) advanced energy conservation and efficiency technologies and processes that contribute towards an energy neutral built environment".

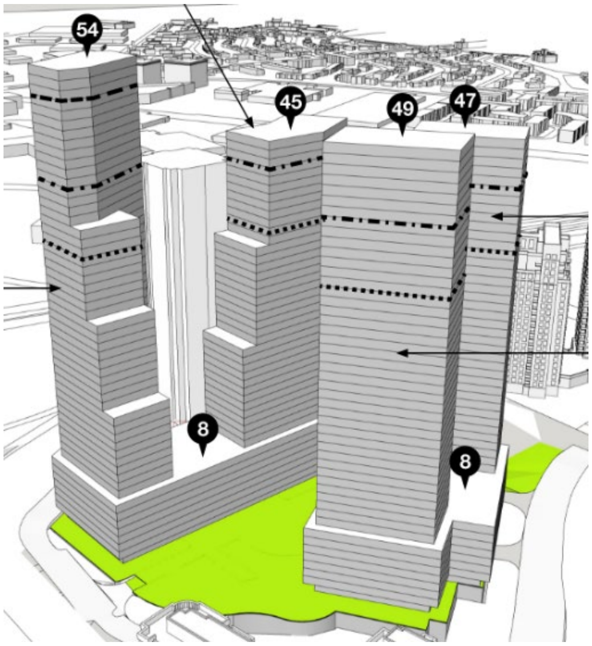
Undertaking an Energy Strategy at the application stage for a Plan of Subdivision, Official Plan or Zoning Bylaw Amendment facilitates the following key outcomes:

- Opportunity to site buildings to take advantage of existing or proposed energy infrastructure, energy capture and/or solar orientation at the conceptual design stage.
- Consideration of potential energy sharing for multi-building development and/or neighboring existing/proposed developments.
- Consideration of opportunities to increase resiliency such as strategic back-up power capacity (for multi-unit residential buildings).
- Identification of innovative solutions to reduce energy consumption in new construction and retrofit of existing buildings (if part of new development).
- Exploration of potential to attract private investment in energy sharing systems.

Pratus Group has been retained to provide the analysis required for the Energy Strategy report for the Don Valley Hotel development.

4 BACKGROUND

4.1 PROPOSED DEVELOPMENT



DVP Hotel Development LP is proposing to develop the lands on the north-east corner of Don Valley Parkway and Eglinton Avenue East in Toronto. The site, 21,897 m² in size, is bound by Eglington avenue East to the South, Don Valley Parkway ramp to the West and the Wynford drive to the East. Currently, the site has an existing 7-storey hotel complex.

The proposed development is looking to demolish the existing building and develop four residential towers with two towers sharing one podium with a total of 2,750 residential units and 125 hotel suites, indoor and outdoor amenity spaces, retail space as well as two levels of underground parking. Tower 1 is 54 storeys with an 8-storey podium connected with Tower 2, which is 45 storeys. Tower 3 is 47 storeys with an 8-storey podium connected to Tower 4, which is 49 storeys. The total gross floor area of the development is 200,117 m².

Figure 1: Site Location

4.2 NEIGHBORHOOD

The site is located on Wynford Drive just west of the Don Valley Parkway, which is a major north-south route in the Greater Toronto Area (GTA). The area is predominately residential, consisting of multi-unit residential buildings, public parks and a waterfront boardwalk. The Eglinton Ave E just south of the site features many shops, grocery stores and restaurants that reflect the multicultural background of the residents who live in this neighborhood. The site is near several bus stops within walking distance.

Figure 2: View of Site from the South-West

4.3 ENERGY ENVIRONMENT

The site is serviced by Toronto Hydro for electricity, Enbridge for natural gas, and by the City of Toronto for domestic potable water. For the purposes of this report the IESO average price of $13.64/kWh for February 2020 is used combined with the Toronto Hydro demand rate of $13.25/kW.

The gas rates are summarized in Table 1.

Table 1: Enbridge Gas Rates

Enbridge Rates

Tier	Rate (cents/m^3)
First 5,00 m3	28.2069
Next 1,050 m3	26.0951
Next 4,500 m3	24.6163

Next 7,000 m3	23.6661
Next 15,250m3	23.2437
All Over 28,300 m3	23.1379

The site is located near a potential District Energy Node as identified by the City of Toronto.

4.4 CARBON

Reducing carbon emissions is a priority for the City of Toronto and the mandate for Energy Strategy Reporting is a part of the process in meeting this objective. Reducing carbon emissions at the municipal level aligns with the broader provincial and federal carbon reduction targets and commitments. Canada has committed to reducing Green House Gas (GHG) emissions to 30% below 2005 levels by 2030 in an effort to limit global climate warming below the 1.5°C degree threshold established by the Paris Agreement in 2015.

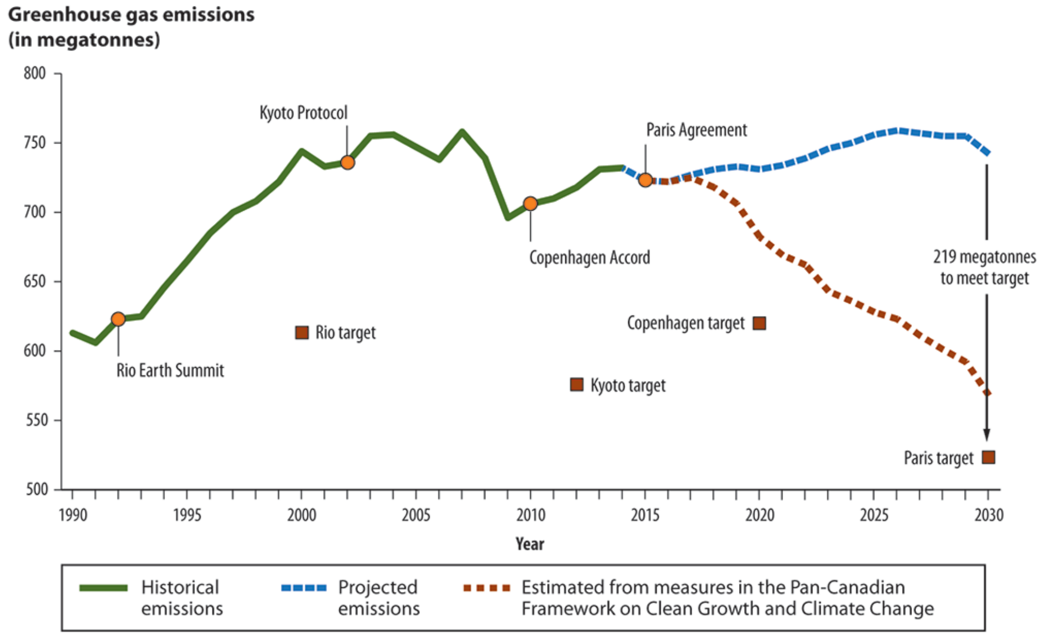


Figure 3: Canada's GHG Reduction Commitment and Progress (Office of the Auditor General of Canada)

Carbon reduction is very closely tied to energy use reduction; higher annual energy use results in a higher annual carbon emission factor associated with the project. Energy source mix, not just overall energy use, contributes to the carbon emission profile of the project. Electricity, natural gas, oil, etc. have difference emissions factors associated with them.

In November 2018, the province of Ontario released their new climate plan with a framework to meet the Paris Agreement commitments. The new plan involves regulation of large emitters, invectives for green innovation and investment.

The Federal Government of Canada's goals exceed those of the Paris Agreement and target a net 80% reduction in emissions by 2050 from 2005 levels. The planned actions to reach these goals have been outlined in the Canada's Pan-Canadian Framework on Clean Growth and Climate Change released in 2016. A federal carbon pricing system is a large part of this outlined plan but has faced opposition from several provinces including Ontario. As a result, the federal government announced in 2018 that it will impose the federal carbon pricing backstopping plan on five of the country's 13 provinces and territories in 2019, including Ontario. Federal and provincial developments in carbon and emission limitations should be kept in mind when thinking about future large-scale developments in the province.

5 ENERGY PERFORMANCE

Pratus Group has used IES VE 2019, an hourly energy simulation tool, to prepare the analysis for this report.

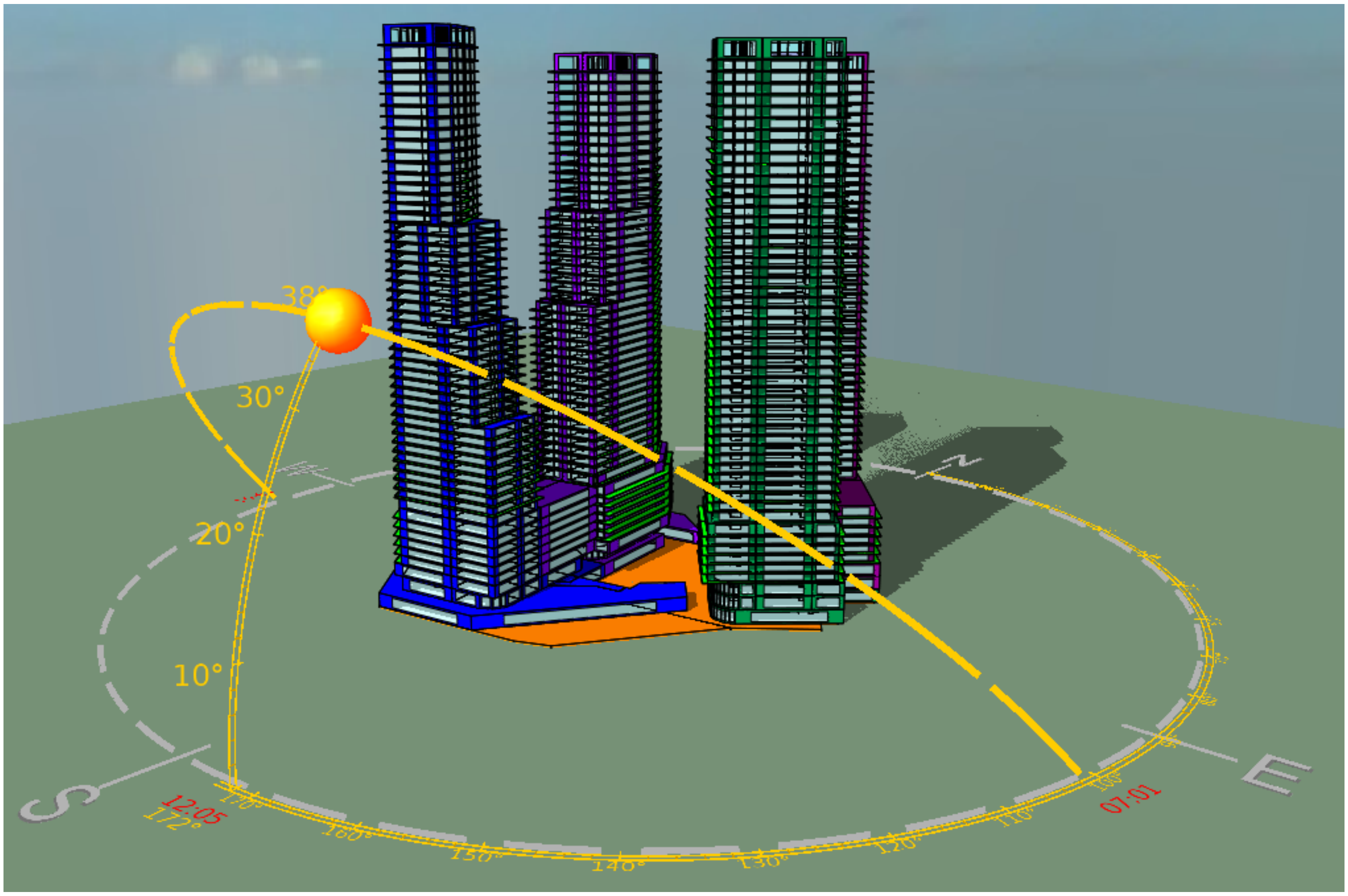


Figure 4: Representation of the proposed development in IES VE 2019

Various metrics are used to evaluate energy performance for a project. The ones that will be discussed in this report are summarized below:

TEUI: Total Energy Use Intensity is the sum of all energy used on site (i.e. electricity, natural gas, and district heating and cooling), minus all Site Renewable Energy Generation, and divided by the Modelled Floor Area. TEUI is reported in kWh/m2/year.

TEDI: Thermal Energy Demand Intensity is the annual heating delivered to the building for space conditioning and conditioning of ventilation air. Measured with modelling software, this is the amount of heating energy delivered to the project that is outputted from any and all types of heating equipment, per unit of modelled floor area. TEDI is reported in kWh/m2/year.

GHGI: Green House Gas Intensity is the total greenhouse gas emissions associated with the use of all energy utilities on site on a per area basis, using the emissions factors in Section 3.3 of this guideline. GHGI shall be reported in kg $eCO2/m^2/year$.

In Toronto, these metrics are analyzed in relation to the targets outlined in the Toronto Green Standard. Targets are unique to each building archetype. The proposed development is most closely aligned with the Multi-Unit Residential Building Archetype. This archetype's TEUI, TEDI and GHGI targets are highlighted in Figure 5. TGS Tier 1 requirements are mandatory for all buildings and Tiers 2-4 are voluntary targets which, should they be achieved, have development charge rebates associated with them.

Building Type	Total Energy Use Intensity (KWh/m^2)		Thermal Energy Demand Intensity (KWh/m^2)		Greenhouse Gas Intensity (kg/m^2)	
	Tier 1	Tier 2	Tier 1	Tier 2	Tier 1	Tier 2
Multi-unit Residential Buildings (≥4 Storeys)	170	135	70	50	20	15
Multi-unit Residential Buildings (≤ 6 Storeys)	165	130	65	40	20	15
Commercial Office Buildings	175	130	70	30	20	15
Commercial Retail Buildings	170	120	60	40	20	10
Mixed Use Buildings (90% residential, 5% retail, 5% commercial)	170	134	70	49	20	15

Figure 5: TGS v3.0 performance targets

5.1 REFERENCE CASE

During the analysis required for the Energy Strategy Report, it is important to establish a reference scenario for the proposed development. The Reference case selected for the purpose of this analysis is a building architecturally identical to the proposed development and meets the minimum requirements of the current Ontario building code energy regulations as outlined in SB-10 2017 and typical systems. Window to wall ratio is limited to 40% for code compliance. All space uses, set points and schedules are identical between the Reference building and the proposed building. The design characteristics of this Reference building and the subsequent improved scenarios are summarized in Appendix A.

The proposed development's OBC SB-10 Reference Case energy performance is summarized in Appendix A. The Total Energy Use Intensity (TEUI) for this scenario is **185 ekWh/m²**. The associated Thermal Energy Demand Intensity (TEDI) is **67 kWh/m²** and the Green House Gas Intensity (GHGI) is **25.9 eKg/m²**.

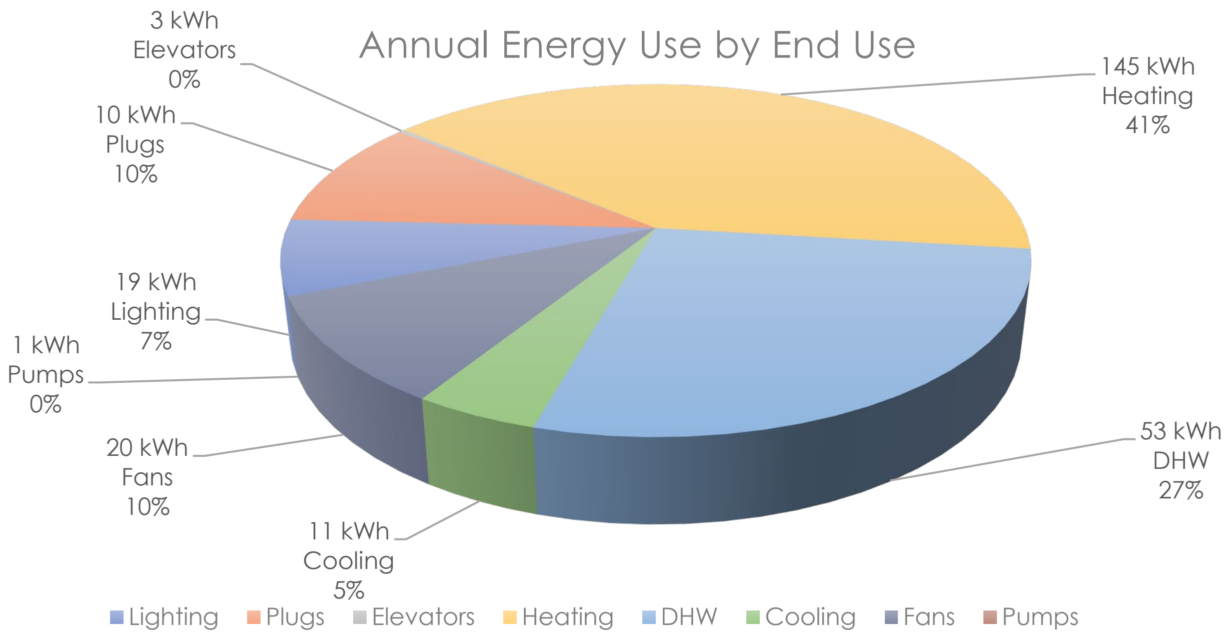


Figure 6: OBC SB-10 Annual Energy Use by End Use

5.2 BASELINE/TGS TIER 1

The baseline for the proposed design is established as a building design which meets the requirements of the Toronto Green Standard Tier 1 for the building archetype. At this very early design stage, only preliminary architectural drawings and renderings are available to describe the development. Currently mechanical and electrical design documents have not been prepared. The mechanical and electrical characteristics for the development were modelled based on typical requirements to meet Tier 1 for a mixed-use building. Realistic envelope values are assumed based on typical construction. The improvements over code consist of building envelope, energy recovery and DHW system improvements.

The design characteristics of this **TGS v3.0 Tier 1** building are summarized in Appendix A. The Total Energy Use Intensity (TEUI) for this scenario is **148 ekWh/m²**. The associated Thermal Energy Demand Intensity (TEDI) is **60 kWh/m²** and the Green House Gas Intensity (GHGI) is **19.4 eKg/m²**. The performance would meet the absolute performance pathway under TGS for Tier 1.

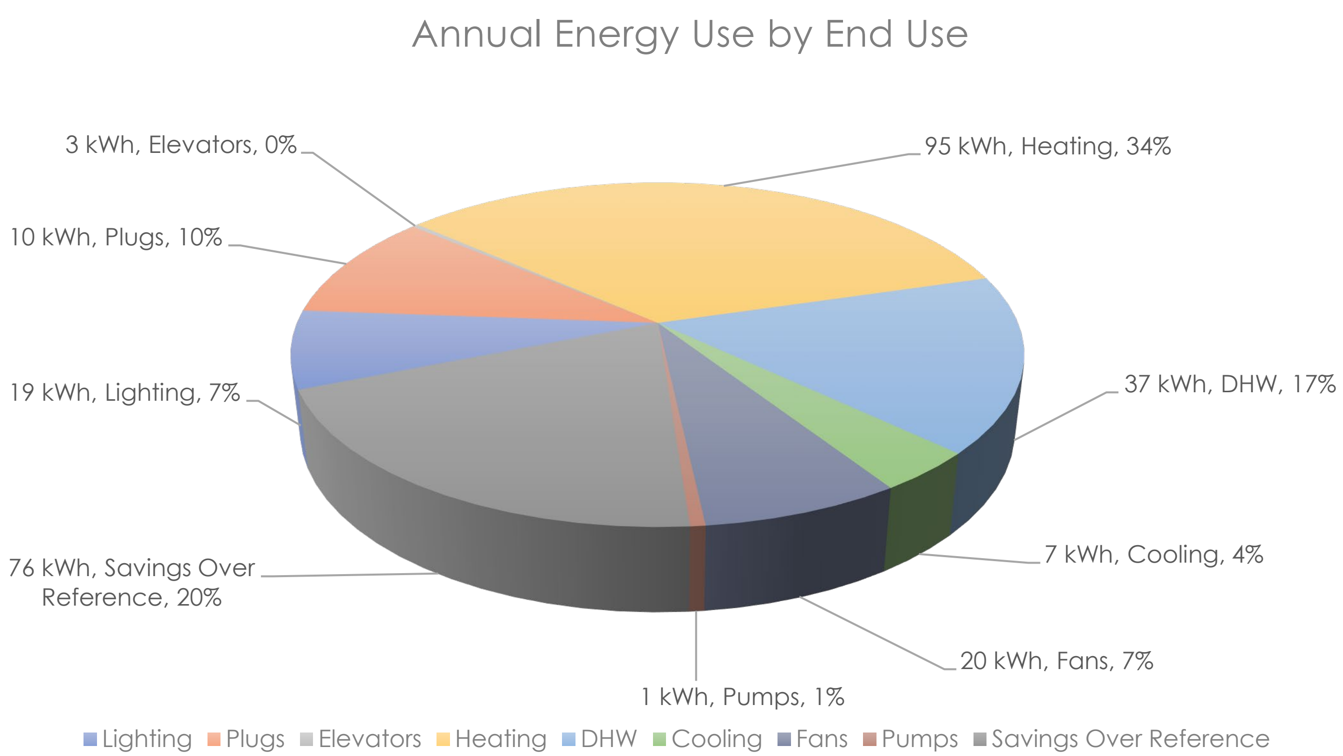


Figure 7: Baseline Annual Energy Use by End Use

5.3 ENERGY CONSERVATION OPPORTUNITIES/TIER 2

TGS Tier 2 targets are absolute targets for TEUI, TEDI and GHGI. The achievement of these requires further HVAC, DHW and envelope improvement along with electrical and lighting enhancements. The Total Energy Use Intensity (TEUI) for this scenario is **127 ekWh/m²**. The associated Thermal Energy Demand Intensity (TEDI) is **40 kWh/m²** and the Green House Gas Intensity (GHGI) is **15 eKg/m²**.

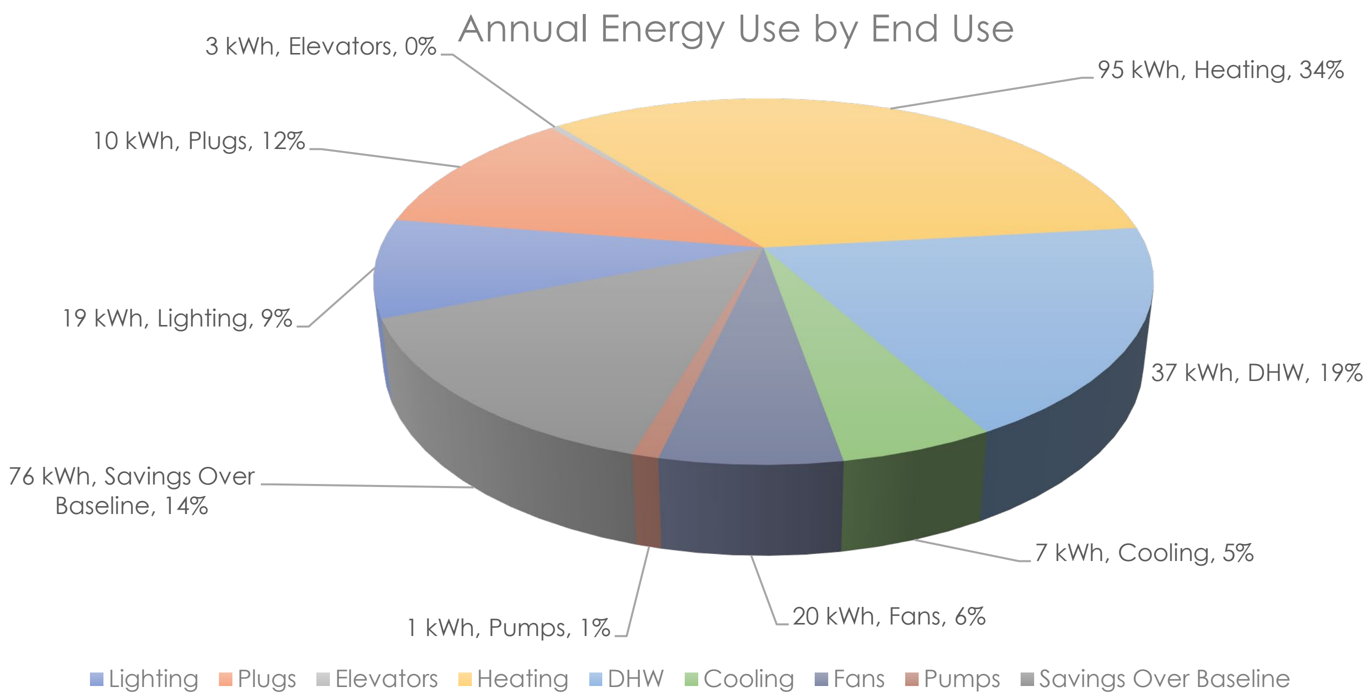


Figure 8: TGS Tier 2 Scenario Annual Energy Use by End Use

5.4 TOWARDS NET-ZERO

The pathway to achieving Net-Zero, whether Net-Zero Carbon or Net-Zero Energy, looks very similar.

Net-Zero Carbon centers around achieving a zero-carbon balance through on-site and off-site renewable, carbon free energy sources while eliminating on-site combustion of fossil fuels. The energy mix of natural gas and electricity has a large impact on this target.

Net-Zero Energy focuses on meeting a net-zero energy balance and is independent of fuel source.

The first step is to reduce project energy loads; this includes improving the building envelope to minimize the heating and cooling requirements, reducing lighting loads through smart design and daylighting or occupancy sensors, reducing ventilation to only provide what is required, optimizing orientation and massing, etc.

Once the loads are reduced, the next step is to meet those loads in an efficient manner. This includes having an efficient HVAC system, efficient lighting technologies, energy recovery, etc.

Once the loads have been reduced and met in the most efficient way, it is time to consider meeting the rest of the energy requirements through on-site or off-site renewable resources such as solar or wind generation.

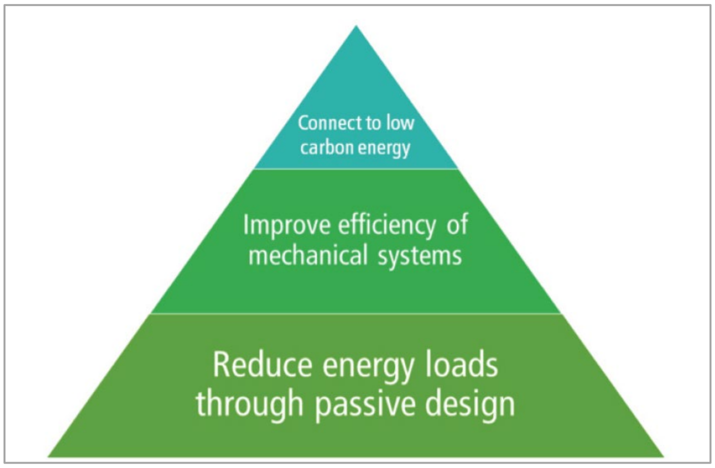


Figure 9: Net-Zero Design Pyramid

A scenario which sets the project on the path to Net-Zero was explored for 1978-2002 Lakeshore Blvd W. This involves significant improvements in the building envelope and HVAC systems. Keeping carbon emissions in mind, an HVAC and DHW system which uses electricity was preferred over a gas combustion one.

The Total Energy Use Intensity (TEUI) for this scenario is **69 ekWh/m²**. The associated Thermal Energy Demand Intensity (TEDI) is **27 kWh/m²** and the Green House Gas Intensity (GHGI) is **3 eKg/m².**

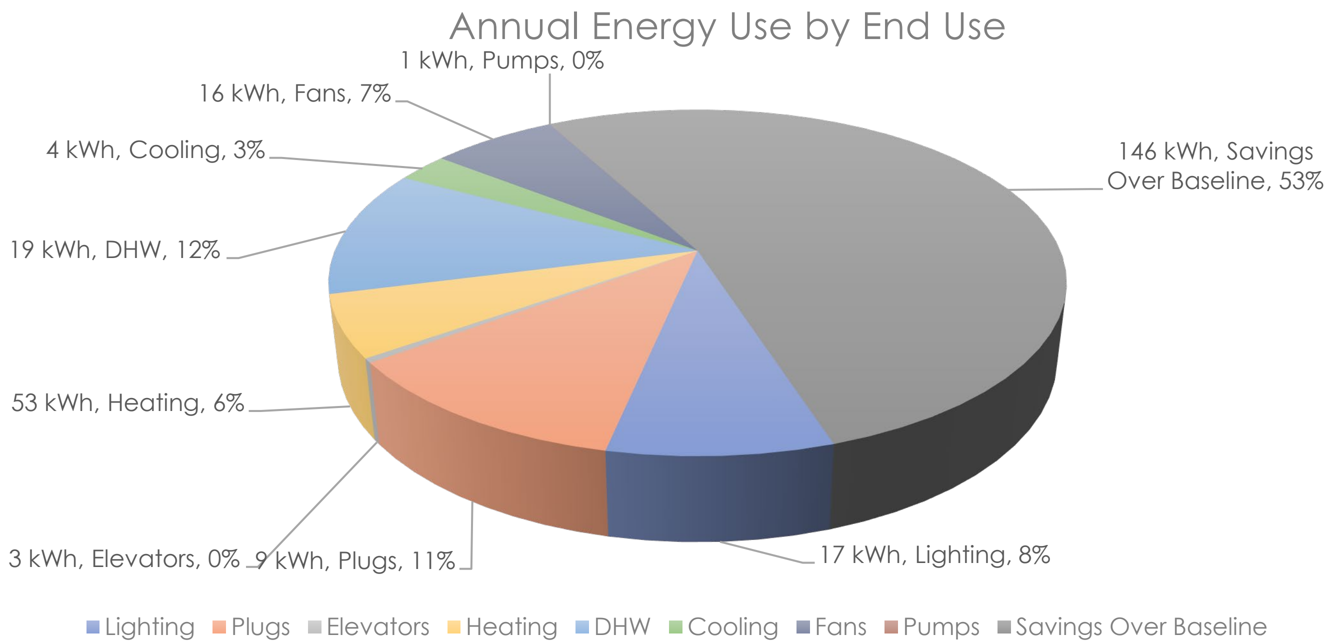


Figure 10: Approaching Net Zero Scenario Annual Energy Use by End Use

The summary of the energy for the four scenarios is presented in Table 2 metrics.

Table 2: Summary of Scenarios

Scenario	TEUI	TEDI	GHGI	Total Utility Cost	Electricity Cost	Natural Gas Cost
OBC Reference	185	67	26	$2,967,641	$2,320,343	$647,297
TGS Tier 1	148	60	19	$2,674,751	$2,203,887	$470,864
TGS Tier 2	127	40	15	$2,630,489	$2,280,847	$349,642
Approaching Net Zero	69	27	3	$2,716,160	$2,716,160	$0

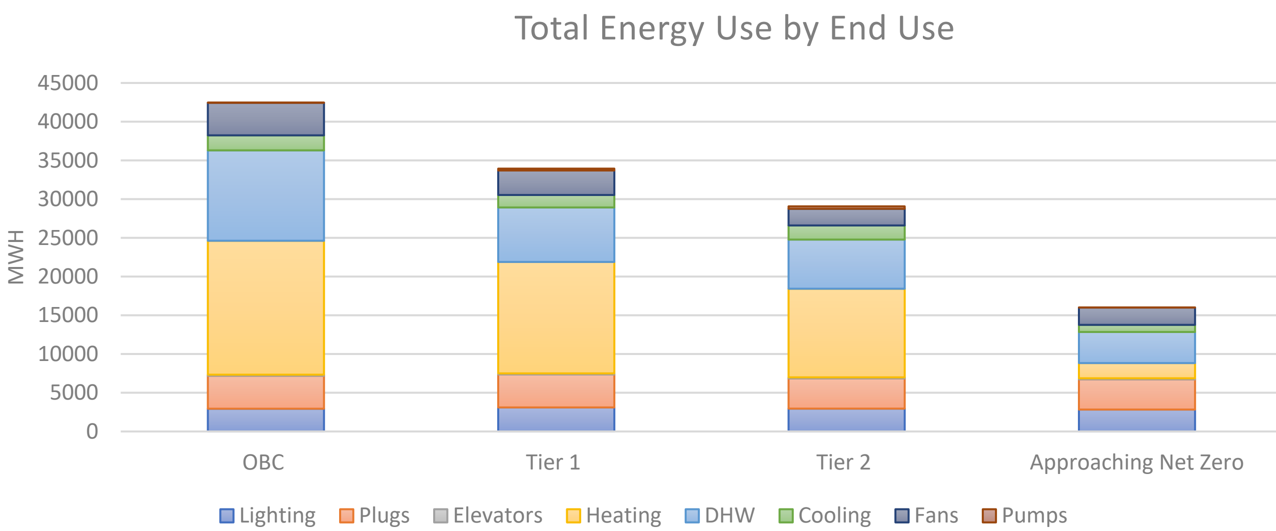


Figure 11: Total Energy Use by End Use by Scenario

5.5 RENEWABLES AND LOW-CARBON OPTIONS

5.5.1 On-Site Solutions

5.5.1.1 Solar PV

An annual analysis of the total available solar energy for the building was performed. The findings are visually summarized in Figure 12 and Figure 13. From this, the penthouse roofs appear to be the optimal locations for on-site solar generation. These locations are not shaded by adjacent buildings or structures and therefore shading will not hinder the generation capacity.

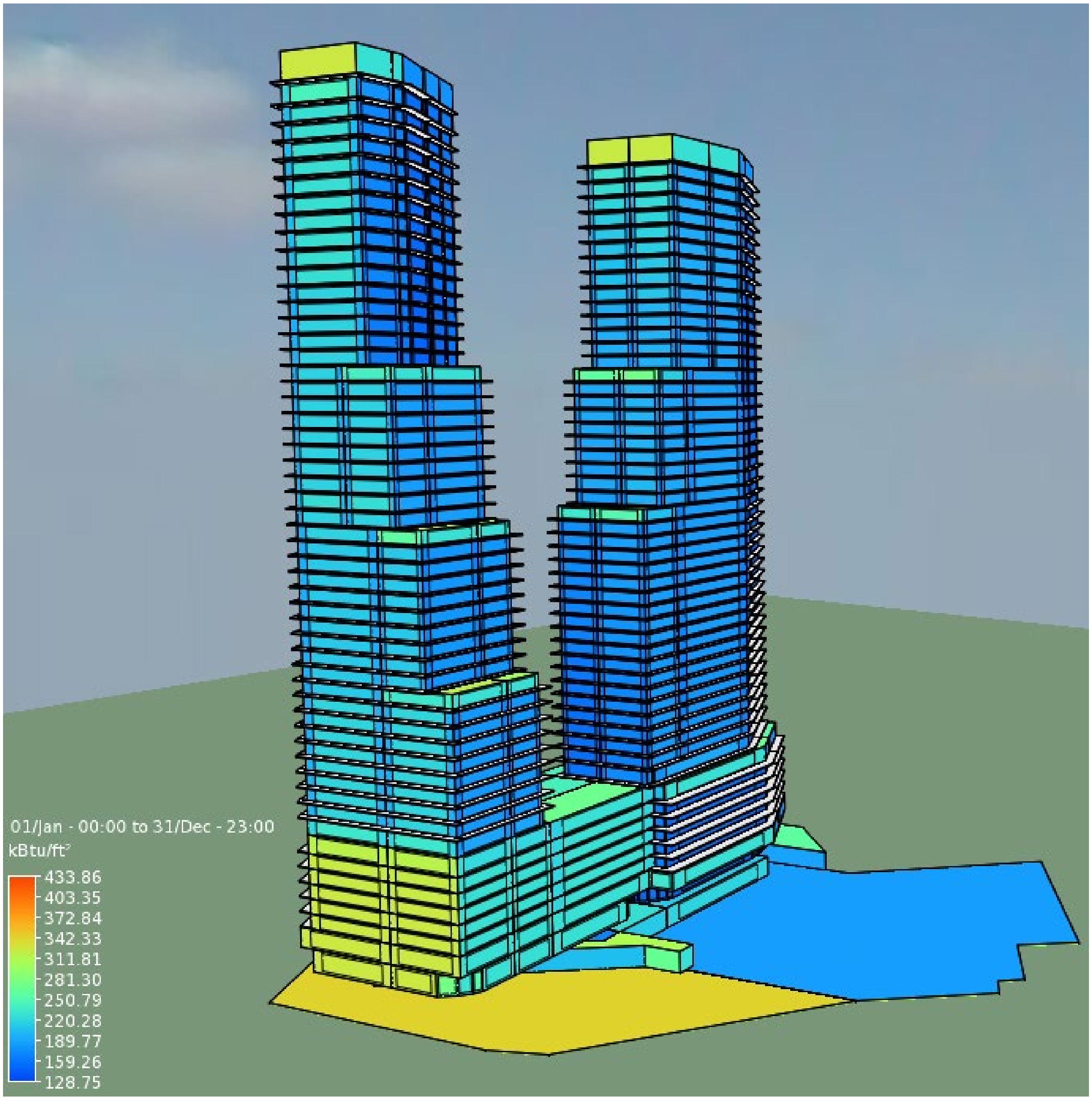


Figure 12: Annual Solar Energy Analysis – Western Towers

The annual solar generation potential for the site was analyzed considering 90% of the penthouse roof area of four towers covered with solar PV panels, about **33,100 ft²**. Based on the IES VE 2019 analysis, this would generate **456,802 kWh** of electricity annual. This represents about **2.9%** of the building's annual energy usage for the 'Approaching Net Zero' scenario. As a reference, to achieve the Canada Green Building Council's Zero-Carbon Building v1 certification the project would have to produce a minimum of 5% of its annual energy use through low-carbon on-site generation. Achieving this target would be challenging for the proposed project as it would require solar panels be placed on terrace levels as well as on the ground floor roof and/or throughout the site.

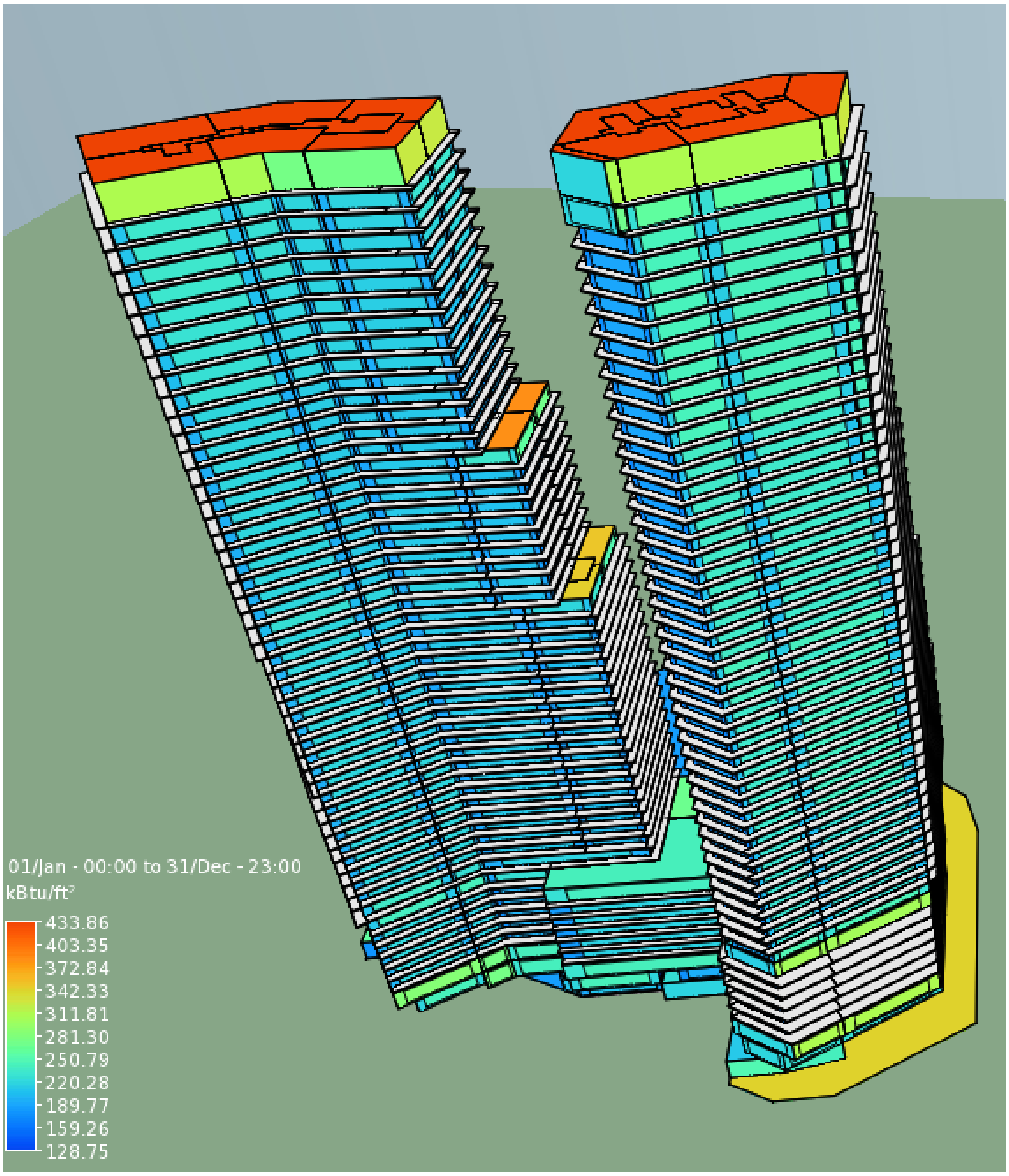


Figure 13: Annual Solar Energy Analysis – Eastern Towers

The on-site solar generation capacity is not sufficient to meet the more ambitious goal of net-zero energy.

5.5.1.2 Ground Source Heat Exchange

Ground Source Heat Exchange does not provide electricity generation on site but rather an opportunity to connect the building's HVAC to a low-carbon renewable system. Using the ground as a heat source in the heating season and a heat sink during the cooling season would allow for an HVAC system that uses far less energy than a conventional heat pump system. Conventional heat pump systems rely on combustion and electricity to meet the heating/cooling needs to the building and therefore have a greater carbon impact

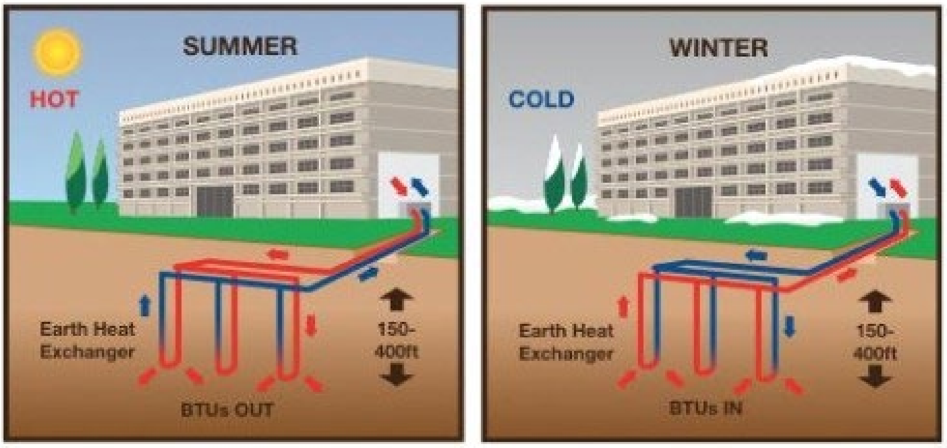


Figure 14: Ground Source Heat Exchanger Illustration (Source: cleantechnica.com)

This system involves drilling deep into the ground (300 ft +) and circulating fluid through the tubes to reject or extract heat from the ground which remains as a relatively constant temperature throughout the year.

Further investigation on this system would be required to get approximate the available on-site capacity and the benefit for the project. This may be impractical due to the site being located in an urban environment and its proximity to the subway network.

5.5.2 Off-Site Solutions

Although on-site solar and energy generation capacity may be limited for the proposed project, off-site solutions can also be considered to achieve net-zero energy and net-zero carbon goals.

If the project were interested in meeting 100% of the annual energy use through solar generation, the total area of solar panels would have to be approximately 1,100,000 ft^2. For illustrative purposes, the area compared to the building size is shown in 5.

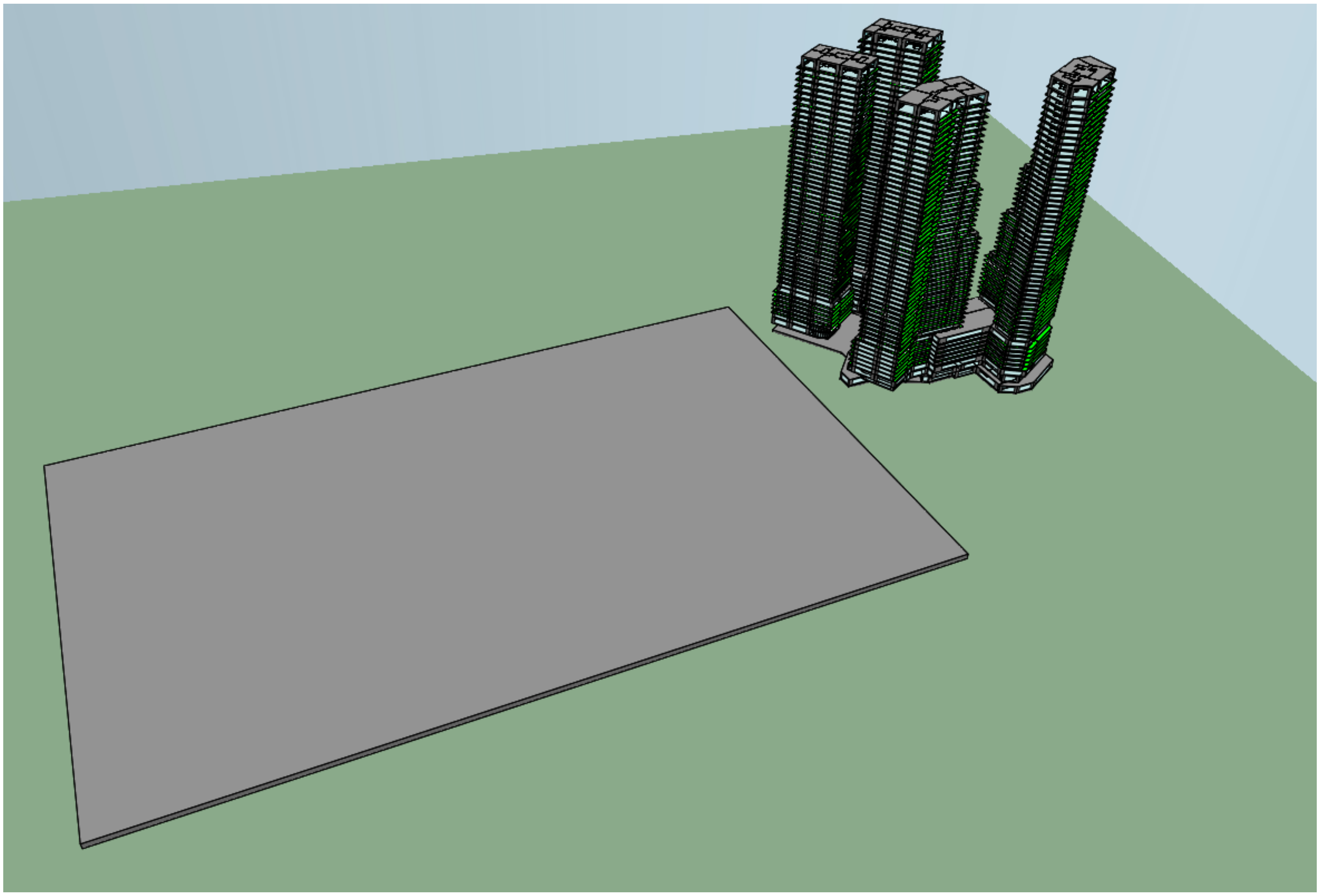


Figure 15: PV for 100% of the Annual Energy Use

6 DISTRICT ENERGY

The City of Toronto has identified district energy systems (DES) as an important opportunity to reduce GHG emissions from new and existing buildings while also reducing the demands on the energy infrastructure. The City seeks to:

- Connect new buildings to DES where it is already established or in the process of development
- Design new buildings to be district energy ready where future DES opportunities exist
- Provide opportunities for existing buildings to connect to future DES

DES is a thermal energy distribution strategy for multiple buildings at a development or neighborhood scale. A DES consists of a heating and/or cooling center, and a thermal network of pipes connecting groups of buildings. The central equipment can include low-carbon technologies such as lake water cooling, ground source heat exchangers (GSHX) and combined heat and power (CHP).

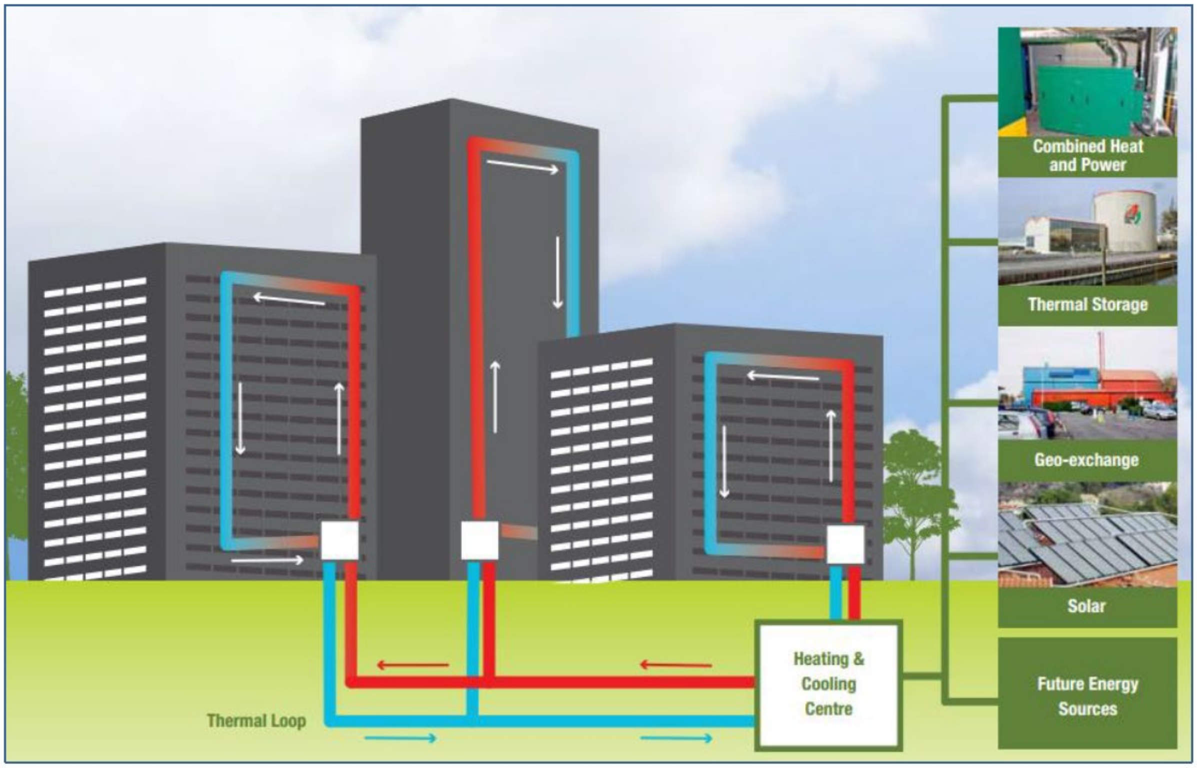


Figure 16: Illustration of DES (DE Ready Guideline, City of Toronto)

District energy systems create the economies of scale and energy sharing opportunities necessary to integrate local, low-carbon sources required to achieve large-scale, cost-effective GHG reductions.

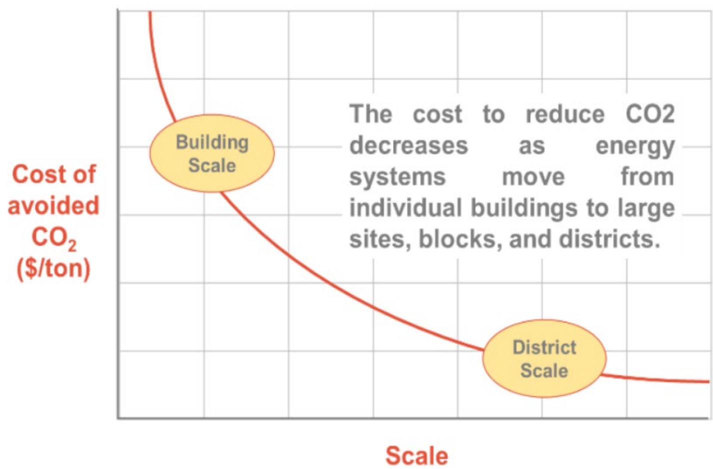


Figure 17: CO2 avoidance cost at building vs. district scale (DE Ready Guide, City of Toronto)

For the purpose of discussion, the following is explored:

To be district energy ready, the following guidelines are presented:

- Provide adequate space required for future equipment and thermal piping
- Design building mechanical systems to be compatible with a future district energy service, including the following features:
    - Hydronic system with large temperature differentials
    - Variable volume flow with variable speed pumps
    - Two-way controls valves on terminal equipment
    - Return water temperature kept to a minimum
- For multi-building developments, design a single, slightly larger mechanical room in one building and connect other buildings through a thermal energy distribution network.

6.1 DES AT 175 WYNFORD DRIVE

The size and use mix of the proposed development at 175 Wynford Drive makes the project a good candidate for creating a common central plant for the development, effectively creating a district energy system.

6.1.1 Energy Impact

Centralizing the mechanical equipment may allow for better energy sharing and part load performance than having four of more individual mechanical plants. This is most notable for systems which use a central loop allowing energy sharing such as Water-Loop Heat Pump (WLHP) systems or Water-Source Variable Refrigerant Flow (WS VRF) systems. Additionally, centralizing the plant may allow opportunities for ground source energy to be incorporated on a centralized scale with one bore-hole field being shared by the entire development. These measures have the opportunity to reduce the energy consumption of the central equipment when compared to having individual mechanical plants.

6.1.2 Design Impact

Locating the mechanical equipment in a central location to serve the entire development may have an impact on the use of space which is typically devoted to mechanical equipment such as the mechanical penthouse. Pending necessary approvals, the mechanical penthouse areas may be reallocated to leasable or saleable space, providing a financial incentive for the owner. Additionally, having a common plant may occupy less total area than four or more building mechanical plants.

A central plant will have an impact on the phasing of the project which will need to be carefully considered.

6.1.3 Resources

The City of Toronto has developed a set of guidelines (DESIGN GUIDELINE FOR DISTRICT ENERGY-READY BUILDINGS, October 2016) for building developers and owners, architects, and engineers support the design of buildings that are ready for connection to a district energy system.

A number of companies provide district energy design, construction and financing. These include:

- Creative Energy
- Enwave Energy Corporation
- FVB Energy

DVP Hotel Development LP can explore the opportunity for a District Energy System for this development by engaging one of these providers for further analysis.

7 RESILIENCY

The City of Toronto has identified improving resiliency as a primary goal and is working to improve its resilience to the physical, social, and economic challenges of the 21st century. The City is working with the global 100 Resilient Cities Network (100RC) and locally the strategy is being led by Toronto's Resiliency Office and Chief Resilience Officer.

100RC defines urban resilience as "the capacity of individuals, communities, institutions, businesses, and systems within a city to survive, adapt, and grow no matter what kinds of chronic stresses and acute shocks they experience."

On a building and development level, response to shocks is a priority for addressing resiliency. Toronto's key shocks are identified as:

Urban flooding

Heat waves

Blizzards/cold snap

Interruption to energy supply

Infrastructure failure

Public health emergencies

Cyber attacks

Toronto's condo and apartment towers, housing a large number of the population, are a key part of the overall resilience of the City. Events such as heat waves, ice storms, rain events and resulting power disruptions means that residence may be relying on the passive and adaptive features of their dwelling for long periods of time.

When considering resilience, it is important to take note of our changing climatic conditions and the impacts that climate change will have on future weather patterns. In 2011 the City of Toronto published Toronto's Future Weather and Climate Study. This study predicts a significant increase in the number of high degree heat days, the frequency of heat waves, and the magnitude of rainfall events.

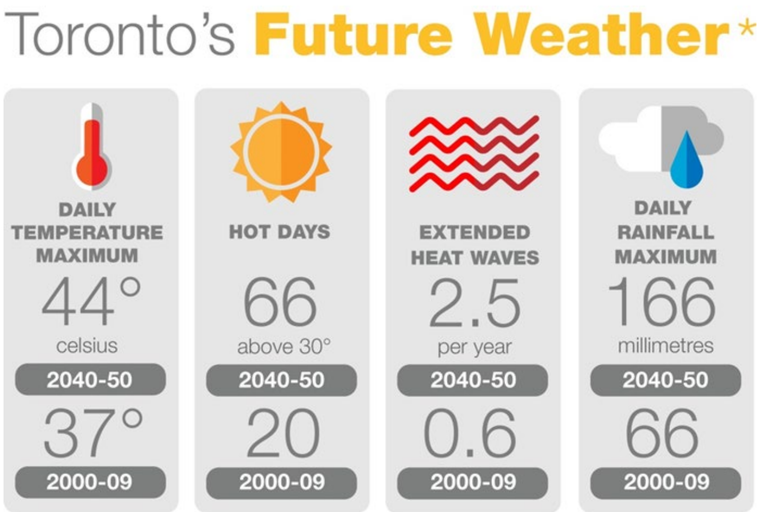


Figure 18: Summary of Toronto's Future Weather and Climate Study

It is not only important to consider resilience measures to meet the energy and stormwater needs of the development under current conditions, but also worthwhile to consider future needs based on forecasted values as a result of climate change. By designing today to meet the predicted needs of the future building owners can safeguard their assets and the individuals who occupy them.

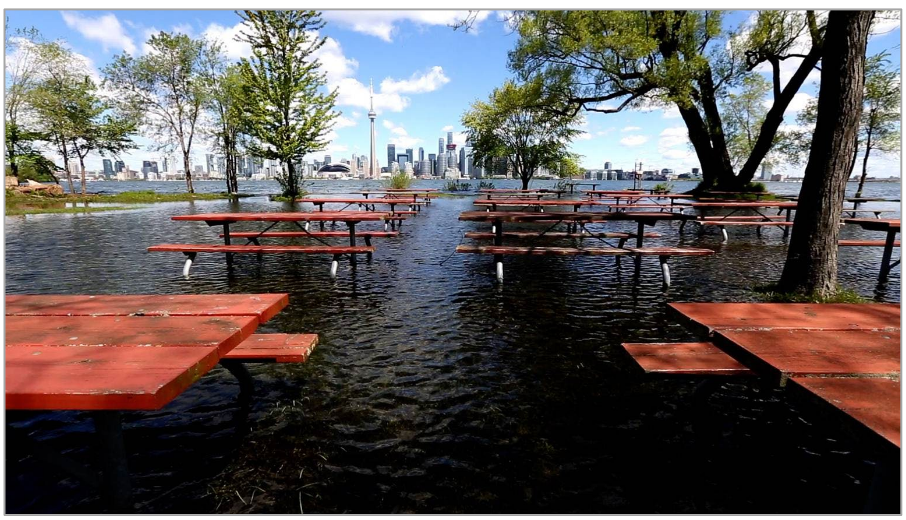


Figure 19: Toronto Island Flooding

A number of design considerations can be taken when designing with resiliency in mind. These include:

- Using future climactic data to inform building design, including weather extremes
- Designing for thermal resiliency by reducing TEDI
- Passive ventilation strategies
- Tenant and occupant emergency preparedness guides
- Indoor refuge areas (heating and/or cooling)
- Ceiling fans
- Shade trees/shrubs

- External pools
- Reduces hardscape
- On-site power including solar PV, solar thermal, battery storage, CHP systems, GSHX, etc.
- Flood proofed electrical, HVAC and back-up generation systems (above 1st floor)

Further design guidelines and considerations can be found in the checklist for Toronto Green Standard v3.0 Resilience Planning New Construction.

8 FUNDING SOURCES

A number of funding options are available for project which are looking to exceed the minimum energy performance standards of the OBC SB-10 and Toronto Green Standard v3.0 Tier 2.

8.1 ENBRIDGE SAVINGS BY DESIGN

Savings by Design is a green building initiative administered by Enbridge Gas Distribution. The program aids builders/developers to design and construct buildings with improved energy performance, with a target of at least a 15% improvement over the current Ontario Building Code. The Savings by Design program provides industry professional design support and financial incentives during design, construction and commissioning stages of a project.

The SBD program is divided into three stages. The first is a visioning session with the project owner to discuss the objectives and goals of the project and establish where additional design consultation may be required. The second stage occurs following the completion of Schematic Design. At this time the SBD program will facilitate a one-day Integrated Design Process (IDP) workshop including design team members, industry design specialist, and energy modelling experts. Outside design specialists will be selected based on the desired outcomes from the visioning session. The costs associated with facilitating the workshop, the attendance of outside design professionals, and the day-of real time energy modelling are all covered by the program. Stage three is the administration of incentive funds directly to the project owner. Funds are approved in two parts, $15,000 for projects who have verified their design meets a 15% improvement over the current Ontario Building Code, and an additional $15,000 for projects who commission their buildings. Phase 1 and Phase 2 may qualify as separate project for the SBD incentive and thus be eligible for a total of $60,000 for Phase 1 and 2.

8.2 TORONTO GREEN STANDARD V3.0 TIER 2 AND ABOVE

The Toronto Green Standard is the City of Toronto's sustainable design requirement for new private and public developments. The Toronto Green Standard (TGS) is a tiered set of performance measures with supporting guidelines that promote sustainable site and building design. Tier 1 of the TGS is mandatory and Tiers 2 to 4 are higher level voluntary standards that offer financial incentives.

Site Plan Applications submitted on or after May 1, 2018 are required to meet Version 3 of the Toronto Green Standard. Tier 1 performance measures must be met, with compliance being confirmed through the planning approval process. Applications pursuing the voluntary Toronto Green Standard Version 3 Development Charge refund program must achieve at minimum the Tier 2 program requirements in addition to Tier 1. Projects pursuing TGS Tier 2 or higher require post-construction verification.

Under the Toronto Green Standard compliance is addressed through five (5) impact categories:

1. Air Quality
2. Energy Efficiency, GHG & Resilience
3. Water Balance, Quality & Efficiency
4. Ecology
5. Solid Waste

Project pursuing Tier 2 must meet all performance measures in the 'Core' development categories and in addition select three 'Optional' performance measures from any of the categories listed below. Projects that meet the Tier 2 requirements are eligible for the Development Charge Refund program. Development charge rebates are issued in accordance with Development Charges By-law 515-2018: https://www.toronto.ca/legdocs/bylaws/2018/law0515.pdf

Tier 1 compliance is verified through Site Plan Approvals. Tier 2, 3 and 4 are third-party verified, including a construction review, and certified by prequalified consultants. The TGS Tier 2 Core performance measures for TGV v3.0 are the following:

- Urban Heat Island Reduction: At-Grade
- Energy Systems
- Commissioning & Reporting
- Stormwater Retention & Reuse
- Water efficiency
- Light Pollution
- Construction Waste Management

8.3 CMHC – RENTAL CONSTRUCTION FINANCING INITIATIVE

Another source of funding to be considered is the Canada Mortgage and Housing Corporation's (CMHC) Rental Construction Financing initiative (RCFi). This initiative is available to projects that are either, purpose built residential rental, or of mixed use between residential rental and non-residential, that offer affordable residential rents, accessible units, greater energy efficiency and reduced greenhouse gas emissions.

The CMHC rental construction financing provides low cost funding to eligible borrowers during the riskiest phases of product development such as during construction though to stabilized operations. CHMC mortgage loan insurance is included and provides access to preferred interest rates lowering borrowing costs for the refinancing of multi-unit residential properties and facilitates renewals throughout the life of the mortgage. The program is designed to support sustainable apartment projects in areas where there is a need for additional rental supply. Totaling $13.75 billion in available loans, the initiative is open from 2017 through to the end of 2027.

In order to be eligible, the project must decrease energy use and greenhouse gas emissions 15% below the 2015 National Energy Code for Buildings or the 2015 National Building Code at minimum in addition to fulfilling various affordability and accessibility criteria.

9 CONCLUSIONS AND RECOMMENDATIONS

The project has many opportunities for energy, carbon and energy cost reductions. Although the current baseline is already meeting the minimum requirements of the Toronto Green Standard Tier 1, energy saving opportunities are being explored as the design evolves. Implementing a number of the identified strategies will aid the project in achieving its sustainable design goals.

The Toronto Green Standard Tier 2 targets for this project are achievable with additional consideration surrounding improving the building envelop. Higher energy performance goals such as TGS Tier 3+, Net-Zero Energy and Net-Zero Carbon are achievable with further efficiency improvements such as Air Source VRF systems, triple glazing, improved energy recovery and by incorporating off-site energy generation resources.

Lastly, resiliency continues to have an ever-increasing influence on development, particularly residential developments. Future weather conditions and extreme climate events present a significant potential risk to property owners and occupants. Safeguarding assets today by designing for resiliency helps mitigate climate change risks, fuel security threats, and infrastructure damage predicted because of our changing weather patterns. Designing with resiliency in mind is highly recommended.

APPENDIX A

Energy Modelling Parameters

	General			
Location	Toronto, ON			
Simulation Weather File	Toronto CWEC 2016			
Climate Zone	Table 1.3.1.1 SB-10 Zone 5			
Modeling Software	IESVE 2019			
Building Area	Building total modelled floor area: 228,862 m² (excluding parking areas)			
Hours of Operation	**Residential:**			
	7 days a week, 24 hours a day			
	(As per NECB 2015 Operating Schedule G)			
	Parkade lighting:			
	7 days a week, 24 hours a day			
	(the above and all other schedules as per TGS v3- Energy Efficiency Report Submission & Modelling Guidelines-Revision 2 – February 2019)			
Envelope Performance	**OBC SB-10 Reference**	**TGS v3.0 Tier 1**	**TGS v3.0 Tier 2**	**Approaching Net Zero**
Overall Roof U-value (BTU/h ft² ºF)	U-0.029 (R-34.5)	U-0.029 (R-34.5)	U-0.029 (R-34.5)	U-0.029 (R-34.5)
Overall Vertical Wall U-value (BTU/h ft² ºF)	Overall: U-0.05 (R-20)	U-0.25 (R-4) (Overall effective)	U-0.125 (R-8) (Overall effective)	U-0.05 (R-20) (Overall effective)
Overall Soffit U-value (BTU/h ft² ºF)	U-0.051 (R-19.6) soffit	U-0.051 (R-19.6) soffit	U-0.051 (R-19.6) soffit	U-0.051 (R-19.6) soffit
		U-0.066 (R-15) between garage and first level	U-0.066 (R-15) between garage and first level	U-0.066 (R-15) between garage and first level
Percentage Glazing	40%	60%	50%	40%

Overall Glass U-value including frame (BTU/h ft² °F), and Solar Heat Gain Coefficient (SHGC) Infiltration	Double glazing: U-0.38, SHGC-0.40	Double glazing: U-0.33, SHGC-0.46	Double glazing: U-0.35, SHGC-0.40	Triple glazing: U-0.24, SHGC-0.30
Infiltration	(0.05 cfm/ft2) of total above grade envelope surface area (roofs, exterior walls, and windows)	(0.05 cfm/ft2) of total above grade envelope surface area (roofs, exterior walls, and windows)	(0.05 cfm/ft2) of total above grade envelope surface area (roofs, exterior walls, and windows)	(0.0375 cfm/ft2) of total above grade envelope surface area (roofs, exterior walls, and windows)
Internal Loads	**OBC SB-10 Reference**	**TGS v3.0 Tier 1**	**TGS v3.0 Tier 2**	**Approaching Net Zero**
Occupancy	Residential no. people = no. of bedrooms + 1. Assumed mix of 1-bed/2-bed of 50%/50%			
Lighting Power Density (LPD) (W/m²)	Residential & Common Spaces 5 W/m²	Residential & Common Spaces 5 W/m²	Residential 5 W/m² 20% lighting reduction in common areas	Residential 5 W/m² 20% lighting reduction in common areas
	Garage 1.5 W/m²	Garage 2.1 W/m²	Garage 2.1 W/m²	Garage 2.1 W/m²
	Amenity Spaces 11.5 W/m²	Amenity Spaces 13.3 W/m²	20% lighting reduction in Amenity Spaces	20% lighting reduction in Amenity Spaces
	Retail 13.1 W/m²	Retail 15.5 W/m²	20% lighting reduction in Retail	20% lighting reduction in Retail
	Storage 6.8 W/m²	Storage 6.8 W/m²	20% lighting reduction in Storage	20% lighting reduction in Storage
Plug-Loads (W/m²)	Residential dwellings: 5 W/m (assuming electric stove) ASHRAE default for rest	Residential dwellings: 5 W/m (assuming electric stove) ASHRAE default for rest	Residential dwellings: 4.5 W/m, Energy Star appliances (assuming electric stove) ASHRAE default for rest	Residential dwellings: 4.5 W/m, Energy Star appliances (assuming electric stove) ASHRAE default for rest
Process Loads	Elevator: 18 x 4.55 MWhr per year	Elevator: 18 x 4.55 MWhr per year	Elevator: 18 x 4.55 MWhr per year	Elevator: 18 x 4.55 MWhr per year
	(As per year as per LEED modelling guidelines)	(As per year as per LEED modelling guidelines)	(As per year as per LEED modelling guidelines)	(As per year as per LEED modelling guidelines)

Domestic Hot Water Consumption	500 W/person	500 W/person	500 W/person	500 W/person
	As per NECB 2015/OBC flow rates	Lower flow rates	Low flow rates	Low flow rates
	8.35 LPM kitchen, 8.35 LPM lavs, 7.6 LPM shower	5.7 LPM kitchen, 5.7 LPM lavs, 5.7 LPM shower	5.7 LPM kitchen, 3.8 LPM lavs, 5.7 LPM shower	5.7 LPM kitchen, 3.8 LPM lavs, 1.9 LPM shower
Mechanical Systems	**OBC SB-10 Reference**	**TGS v3.0 Tier 1**	**TGS v3.0 Tier 2**	**Approaching Net Zero**
Indoor Design Temperature for Conditioned Areas	· Occupied: 71.6°F heating, 75°F cooling	· Occupied: 71.6°F heating, 75°F cooling	· Occupied: 71.6°F heating, 75°F cooling	· Occupied: 71.6°F heating, 75°F cooling
	· Unoccupied: 65°F heating, 80°F cooling	· Unoccupied: 65°F heating, 80°F cooling	· Unoccupied: 65°F heating, 80°F cooling	· Unoccupied: 65°F heating, 80°F cooling
	· 55°F heating only for penthouse, storage and mechanical/electrical spaces	· 55°F heating only for penthouse, storage and mechanical/electrical spaces	· 55°F heating only for penthouse, storage and mechanical/electrical spaces	· 55°F heating only for penthouse, storage and mechanical/electrical spaces
Heating/Cooling Supply Air Temperature	Heating: 90°F	Heating: 90°F	Heating: 90°F	Heating: 90°F
	Cooling: 55°F	Cooling: 55°F	Cooling: 55°F	Cooling: 55°F
System Description	System 7: Four-Pipe Fan-Coil	Residential Suites: Four-Pipe Fan-Coil	Residential suites: Water Loop Heat Pump	Residential suites: VRF System
Ventilation Rates	Residential: 50-100 cfm/suite Corridors: 30 cfm/door Retail: 1191 cfm Amenity: 7,607 cfm	Residential: 50-100 cfm/suite Corridors: 30 cfm/door Retail: 1191 cfm Amenity: 7607 cfm	Residential: 50-100 cfm/suite Corridors: 30 cfm/door with 50% turndown at night Retail: 1191 cfm Amenity: 7607 cfm	Residential: 50-100 cfm/suite Corridors: 30 cfm/door with 50% turndown at night Retail: 1191 cfm Amenity: 7607 cfm
	Non-Residential: ASHRAE 62.1	Non-Residential: ASHRAE 62.1	Non-Residential: ASHRAE 62.1	Non-Residential: ASHRAE 62.1
	Garage: 0.75 cfm/ft	Garage: 0.75 cfm/ft	Garage: 0.75 cfm/ft	Garage: 0.75 cfm/ft
Heat Recovery	N/A	70% Sensible/ 50% Latent through in-suite ERV 70% Sensible/ 50% Latent for amenity areas and retail	70% Sensible/ 50% Latent through in-suite ERV 70% Sensible/ 50% Latent for amenity areas and retail	75% Sensible/ 60% Latent through in-suite ERV 75% Sensible/ 60% Latent for amenity areas and retail

Central Plant	OBC SB-10 Reference	TGS v3.0 Tier 1	TGS v3.0 Tier 2	Approaching Net Zero
Domestic Water	Gas at 90% efficiency	Condensing at 96% efficiency	Condensing at 96% efficiency	Electric
Heating Boilers	Natural Draft at 90% efficiency	Condensing at 96% efficiency	Condensing at 96% efficiency	N/A
Chiller	Water Cooled Chiller at COP 6.0	Water cooled chiller, 5.5 COP with 2 compressors 2 Single-cell, forced draft, evaporative cooling towers on VFD fan	Water Cooled Chiller at COP 6.0	N/A