Yonge and Birch Development

Energy Strategy Study Report – TGS v4

Prepared for: WOODCLIFFE LANDMARK PROPERTIES

Issued: November 9, 2021

HEALTHY · LOW CARBON · CIRCULAR

1 | Introduction

1. Introduction | .1 Purpose

- This Energy Strategy Study has been prepared at the request of Woodcliffe Landmark Properties, in support of a Zoning By-Law Amendment application for the development of Yonge and Birch Development, 1198 Yonge Street.
- The purpose of this Energy Strategy Study is to satisfy the energy requirements of the City of Toronto Rezoning Application Submission by identifying early opportunities to integrate local energy solutions that are efficient, low-carbon and resilient. This Study is based on the upcoming Version 4 of the Toronto Green Standard
- The intent behind the requirements is for new development to contribute to the City's objectives to reduce energy consumption and GHG emissions and become more resilient.
- Undertaking this Study 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.

1. Introduction | .2 Site Context and Key Development Features

- The Yonge and Birch is a 0.26-hectare parcel of land bordered by Birch Ave and Yonge St. in Toronto, ON.
- 15 above-grade floors, 3 below-grade floors for parking
- Total new above grade GFA: approximately 11,341 m^2
- Total new below grade parking: approximately 3,078 m^2

Space Type	Statistics
Residential	8,504 m^2 (67 units)
Retail	229 m^2
Common Space	2,609 m^2

1. Introduction | .3 Methodology

- The Study is required to consider 3 performance scenarios (see note below):
  1. TGS Version 4 Tier 1 (Mandatory for all new development projects in the City of Toronto)
  2. TGS Version 4 Tier 2 (Voluntary High performance)
  3. TGS Version 4 Tier 3 (Voluntary Near Zero Emissions)
- We have identified a compliance pathway for achieving the mandatory Tier 1 performance scenario.
- We have identified early opportunities for achieving higher levels of performance (Tier 2 and beyond).
- Additional requirements for other sustainability metrics like air quality, water, ecology and solid waste must also be met for TGS compliance (not discussed in this Study).

Note: TGS Version 4 Tier 1 will be mandatory for SPA submitted after May 2022 – the SPA for this development is anticipated to be submitted after this date. The City has not yet issued a new Energy Strategy Terms of Reference that aligns with TGS Version 4. The new scenarios analyzed in this study are based on verbal feedback from the City. TGS Version 4 Tier 1 is equivalent to the current Version 3 Tier 2. Version 4 Tier 2 is equivalent to v3 Tier 3 and v4 Tier 3 is equivalent to v3 Tier 4. This only applies to the energy, carbon and thermal demand targets shown on the next page. Other requirements of TGS v4 are not discussed in this study.

1. Introduction | .4 Toronto Green Standard v4 Performance Targets

The targets the development needs to achieve for TGS v4 Tier 1, Tier 2 and Tier 3 levels of performance are described in the table below. These targets inform the Design Approach.

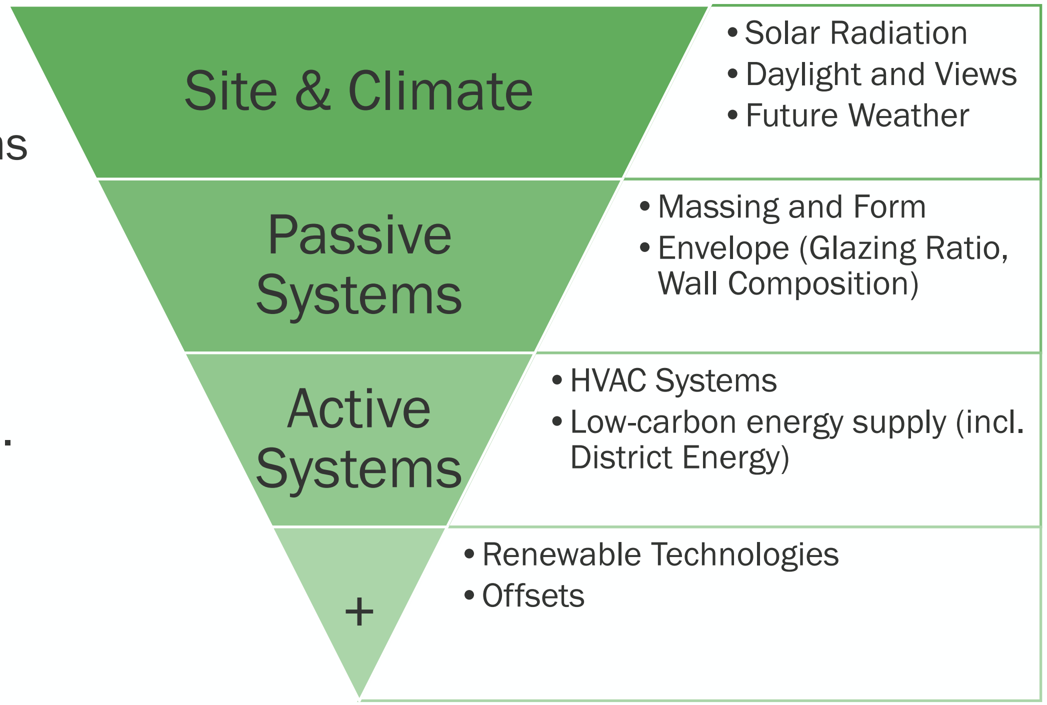
Scenario	Energy Use Intensity kWh/m^2	Thermal Demand Intensity kWh/m^2	Carbon Emissions Intensity $kgCO_2/m^2$
Tier 1	135	50	15
Tier 2	100	30	10
Tier 3	75	15	5

- **Energy Use Intensity (EUI):** total annual building energy use per gross floor area
- **Thermal Energy Demand Intensity (TEDI):** total annual heating demand for envelope and ventilation loads per gross floor area
- **Carbon Emissions Intensity (GHGI):** carbon emissions of total energy used for each fuel type per gross floor area

2 | Design Approach

2. Design Approach | .1 Design Paradigm for Higher Performance

- The energy (EUI) and carbon performance (GHGI) metrics represent the total impact of all building systems, while the thermal energy demand intensity (TEDI) accounts for design features that impact envelope and ventilation loads.
- Because these design features and the building systems interact with each other, there are many different **pathways** to achieving the performance targets of each scenario.
- It is possible to achieve Tier 1 by focussing on active systems (HVAC) rather than passive systems (envelope). This approach has been common in typical Toronto condo projects under TGS V3, but it will become more difficult for TGS V4.
- The focus for higher levels of performance (Tier 2 and beyond) must be on load reductions from passive systems first (i.e. higher performing envelopes).



2. Design Approach | .2 Focus Areas for Higher Performance

The general design approach for higher levels of performance should focus on the following:

1. **Higher glazing performance** (i.e. lower window U-value). Triple glazing may be required for Tier 1 and beyond, unless much higher savings are achieved in other design elements.
2. Higher levels of opaque wall insulation (**higher R-value**).
3. **Reduced thermal bridging** of transition elements like slab edges, parapets and window-to-wall interfaces.
4. **Improved air-tightness** and reduced energy use for ventilation and building pressurization (i.e. better heat recovery effectiveness and lower corridor ventilation for residential buildings).
5. Capitalize on **passive elements** such as solar to maximize building **resilience**
6. Partial or full replacement of conventional natural gas heating with electric systems like **heat pumps**, variable refrigerant flow (VRF) technologies or **district energy systems**
7. Introduction of low-carbon energy generation technologies like **solar PV** panels.

3 | Key Take-aways

3. Key Take-aways | .1 Business Case for Higher Performance

Pursuing higher levels of performance (TGS v4 Tier 2 and beyond) has the potential to deliver the following benefits for the development.

The Development Charge Rebates are based on the rates published on November 1st, 2021

397 MWh
Potential energy saved per year

57 Tonnes
Potential avoided carbon emissions per year

$ 227,000
Potential Development Charge Rebate

Improved occupant thermal comfort, resilience and passive survivability

Potential for reduced operating and maintenance costs

More meaningful community engagement and support of regulatory approvals

Achieving TGS v4 Tier 2 enables the project to pursue CaGBC Zero Carbon Design Certification with minimal additional effort

3. Key Take-aways | .2 Performance Outcomes

The table below estimates how much energy the building would use, how much carbon it would emit and what the thermal demand would be under Tier 1, Tier 2 and Tier 3 scenarios.

	TGS V4 Tier 1	TGS V4 Tier 2	TGS V4 Tier 3
Energy			
Total Energy Use Intensity (ekWh/m^2/yr)	135	100	75
Total Energy (eMWh/yr)	1531	1134	851
% Savings over Tier 1	-	**26%**	**44%**
Carbon			
Greenhouse Gas Emissions Intensity (kgCO_2eq/m^2/yr)	15	10	5
Total Greenhouse Gas Emissions (tonnes CO_2eq/yr)	170	113	57
% Savings over Tier 1	-	**33%**	**67%**
Thermal Energy Demand Intensity			
Thermal Energy Demand Intensity (ekWh/m^2/yr)	50	30	15
Thermal Energy Demand (eMWh/yr)	567	340	170
% Savings over Tier 1	-	**40%**	**70%**

3. Key Take-aways | .3 Recommended Design Strategies

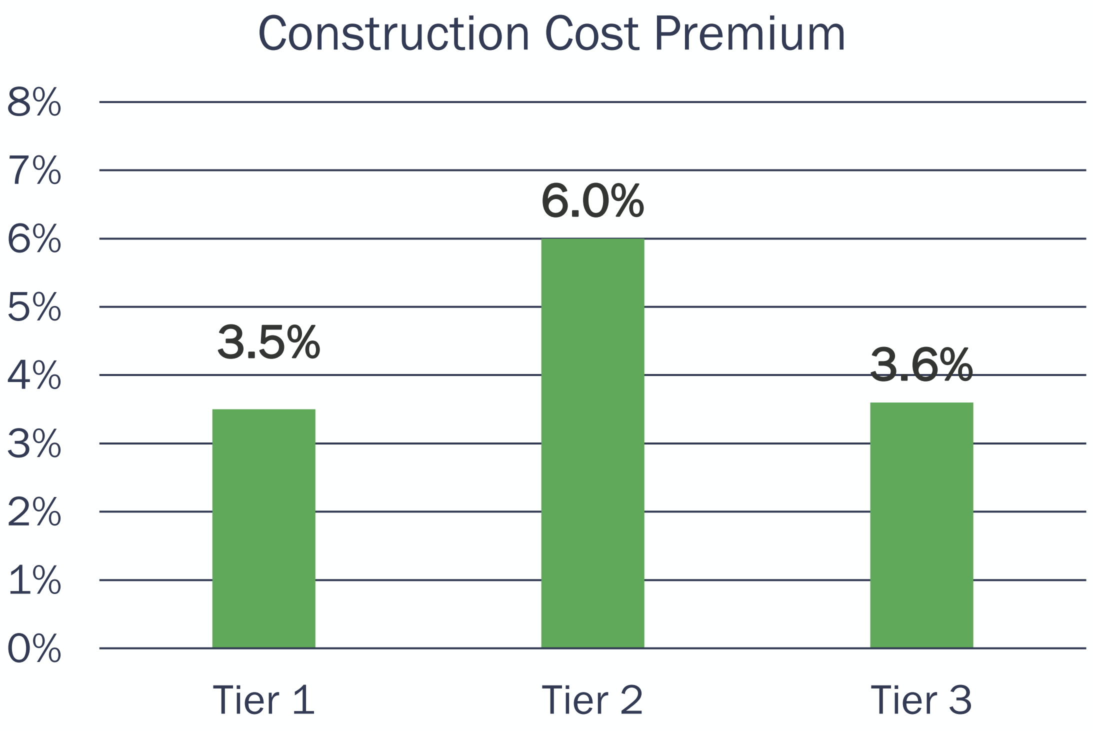
One possible pathway to achieve Tier 1, Tier 2 and Tier 3 performance targets are detailed below. Other approaches are possible.

Design Element	Recommended Performance of Each Design Element		
	To achieve Tier 1	To achieve Tier 2	To achieve Tier 3
Glazing Ratio	40-60%	40-50%	30-40%
Glazing Performance	Double or Triple glazing U-value 0.25	Triple glazing U-value 0.20	Triple glazing U-value 0.14
Wall Performance	R-8 to R-10	R-10 to R-15	R-15 to R-25
Airtightness	2.0 – 1.5 $L/s/m^2$	1.5 – 1.0 $L/s/m^2$	0.5 $L/s/m^2$
Corridor Pressurization	20-30 CFM/suite	15-25 CFM/suite	5-10 CFM/suite
HVAC Plant	Small Air-Source Heat Pump + Condensing Boilers	Large Air-Source or Geo-Source Heat Pump + Condensing Boilers	100% Air Source or Geo-Source Heat Pump
HVAC Systems	Fan-coil or heat pump or VRF	Fan-coil or heat pump or VRF	Fan-coil or heat pump or VRF
Heat Recovery	70-75%	75-80%	80-85%
Domestic Hot Water	Low-flow fixtures	Low-flow fixtures	Ultra Low-flow fixtures

3. Key Take-aways | .4 Estimated Cost Premiums

The City of Toronto's Zero Emissions Buildings Framework Report estimated the potential cost of achieving different levels of performance.

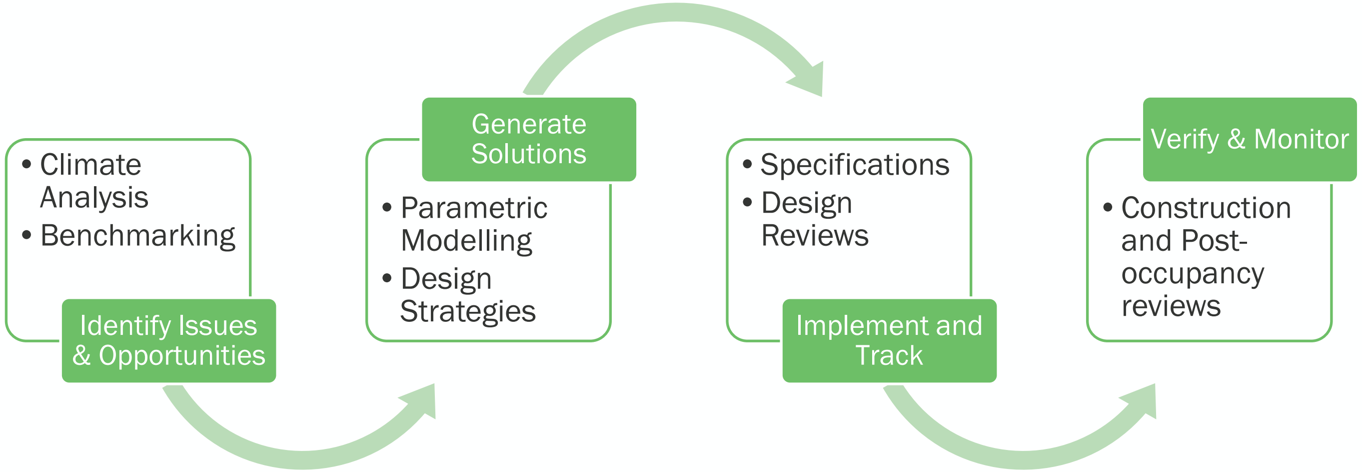
The findings suggest that the highest level of performance may be less expensive than incremental improvements (i.e. high investment in passive systems results in greater savings in active systems).



Source: City of Toronto Zero Emissions Buildings Framework

3. Key Take-aways | .5 Next Steps

- Assess the current development proforma to understand the baseline investment assumptions and the associated design strategies to determine the likely level of attainable performance (i.e. does the current design and proforma meet the desired level of sustainability performance?)
- Estimate the costs of specific design considerations and technologies outlined in **Appendix A**.
- Consider potential sources of funding including new procurement models.
- Evaluate the business case for higher levels of performance, pursuing TGS Tier 2 and beyond. See Appendix D for Development Charge Rebate Estimate.
- Analyze and optimize cost-effective pathways to higher performance, utilizing tools like parametric analysis.
- Implement, track, verify & monitor the agreed-upon strategies during future design phases.

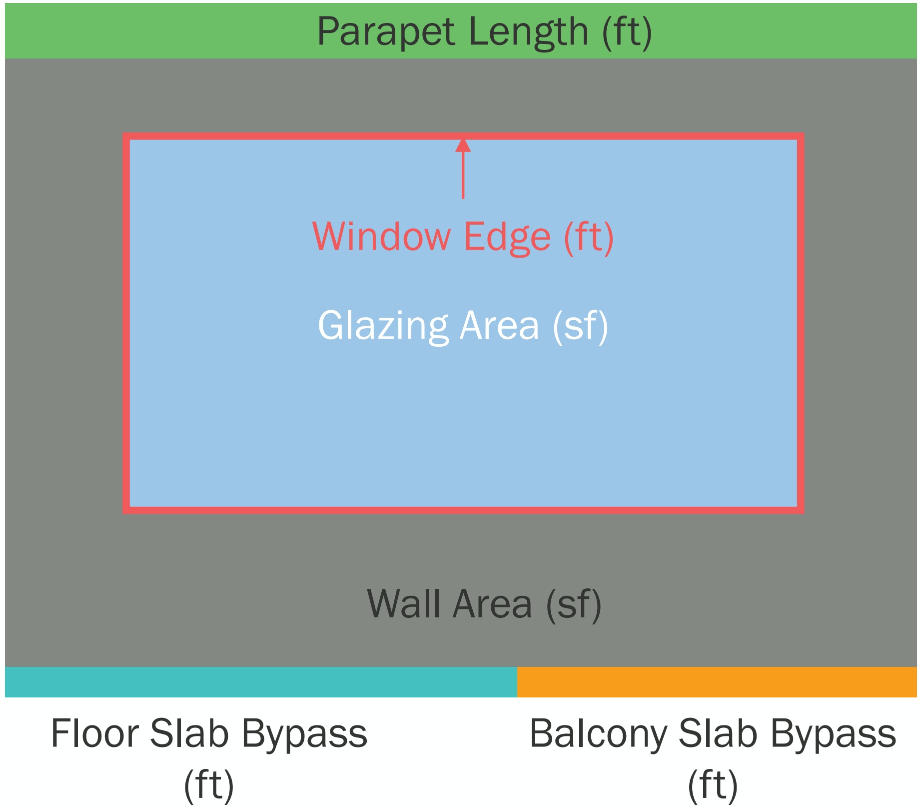


Appendices

A | Design Considerations

A. Design Considerations | .1 Thermal Bridging

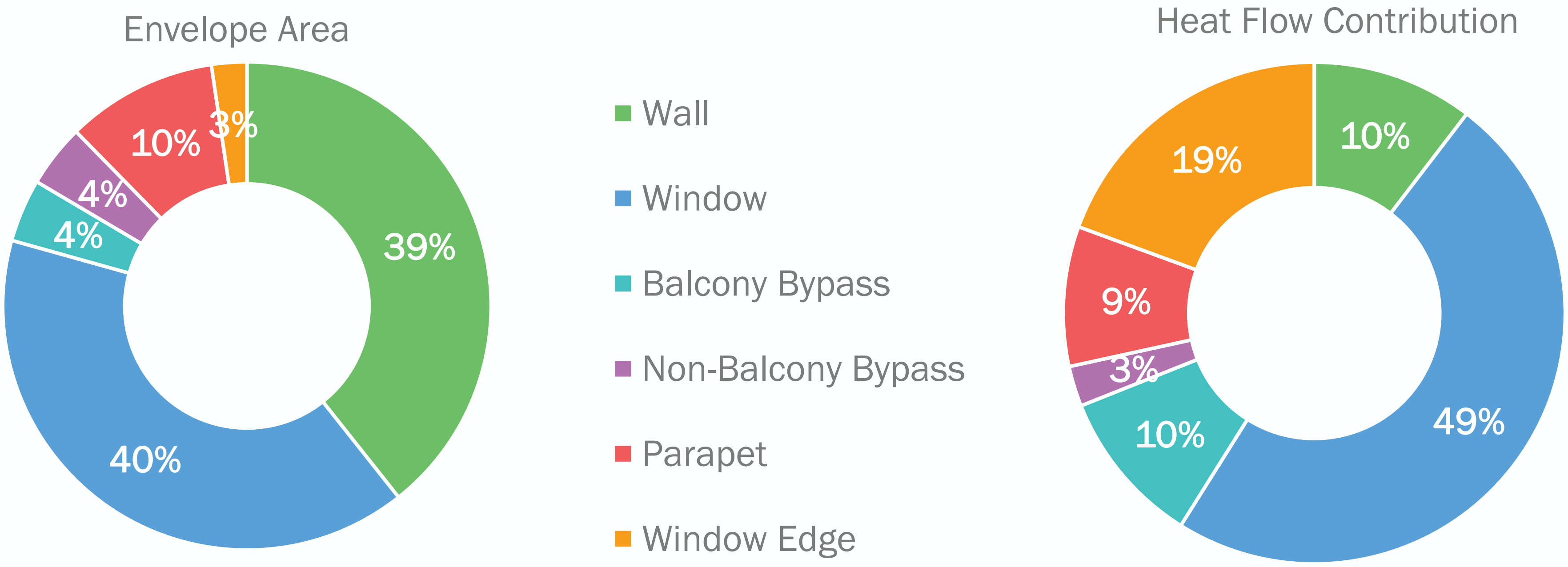
- The TGS requires more rigorous accounting of the thermal performance of individual envelope components which places emphasis earlier in the design process on defining how window and wall systems will perform and which products can be used.
- This may require early discussions with preferred suppliers, trades and cost estimators.
- This project has a highly articulated massing, which makes the building's vertical surface area to floor area ratio (VFAR) high. A VFAR usually leads to higher thermal demand because of the increased heat loss through interface details.
- The impact of individual components on overall performance can be assessed using weighted heat-flow calculations based on catalogues of design detail thermal performance (see Building Envelope Thermal Bridging Guidelines).
- This analysis can be useful in assessing the relative performance of different envelope components vs. their cost.



A. Design Considerations | .2 Envelope Area vs. Heat Flow

- Windows typically contribute the most to heat loss (and gain) even at glazing ratios of 40-50%.
- However, linear details such as slab edges, balconies and window to wall transitions can contribute significantly to the overall heat loss and require careful consideration early in the design process.

Building envelope area compared to heat flow for 40% double-glazed typical precast wall (Effective R-3.5)



A. Design Considerations | .3 Air Tightness

- While the Ontario Building Code prescribes a minimum level of air-tightness (2.0 $L/s/m^2$ of exterior envelope area at 75 Pa), the requirement is not verified or enforced, and studies suggest that typical building are 50-100% leakier.
- Focusing on airtightness is a key element of achieving higher levels of performance and has downstream benefits of improved occupant comfort, reduced corridor pressurisation to migrate stack effect and smaller mechanical systems.
- Achieving TGS v4 Tier 2 requires whole-building air-tightness testing (see TGS Air-tightness Testing Requirements, carried over from version 3 for more details) – achieving savings over Code maximum (≤ 2.0 $L/s/m^2$ at 75 Pa) is not required for v4 Tier 1, but is recommended to help achieve a lower TEDI for Tier 2.
- Targeting better-than-Code air-tightness is a significant departure from typical practice and will require enhanced design collaboration and better construction practices (see Illustrated Guide for Achieving Airtight Building for more details).

A. Design Considerations | .4 Resilience

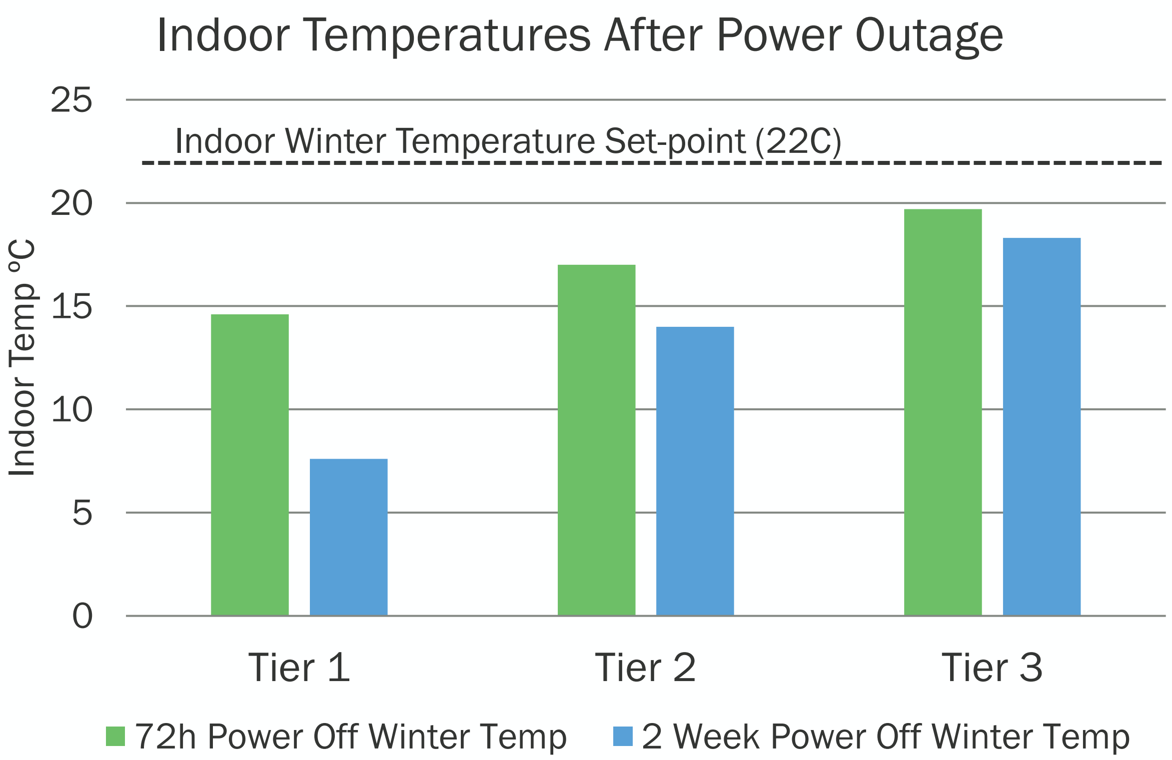
- Toronto's recent weather is warmer and more extreme compared to historical patterns.
- This trend is expected to continue and intensify.
- Resilience is the ability to withstand and recover from sudden shocks (i.e. floods) and chronic stresses (i.e. increasing temperatures). It means designing for changing weather patterns.
- Resilience can be achieve through active measures (back-up power) or passive measures (massing/envelope)

	MAXIMUM TEMPERATURE	EXTENDED HEAT WAVES	HOT DAYS ABOVE 30	MAX DAILY RAINFALL	DAYS WITH HUMIDEX > 40
Toronto's Current Weather (2000-2014)	37°	0	20	66	9
Toronto's Future Weather (2050)	44° Celsius	2.5 Per Year	66	166 Millimeters	39 Days

Adapted from: Toronto Future Weather & Climate Driver Study

A. Design Considerations | .4 Resilience

- The City of Toronto's Zero Emissions Buildings Framework Report estimates what happens to indoor space temperatures following a power outage in the winter.
- The findings suggest that typical practice (i.e. Tier 1 high glazing ratios and poor envelope performance) results in rapid decrease in indoor temperatures.
- Investing in high performing envelope (i.e. Tier 3) residents can shelter-in-place for a longer period of time when there is a loss of mechanical conditioning due to power outages and emergencies.



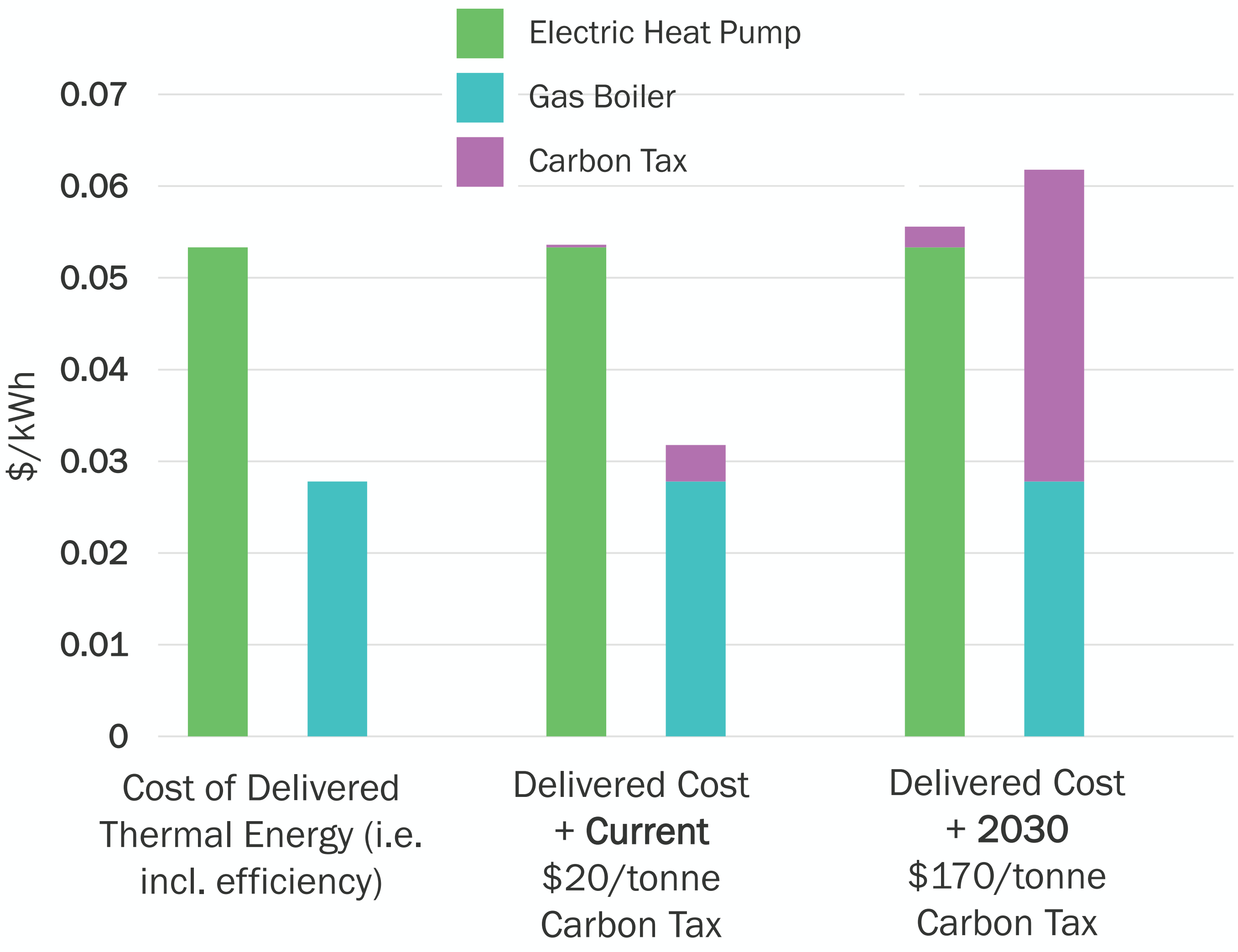
Source: City of Toronto Zero Emissions Buildings Framework

A. Design Considerations | .5 Low Carbon Energy Supply

- Achieving Tier 1 as part of Version 4 of TGS and beyond will likely require partial or full replacement of gas heating systems with electric heat pump systems.
- Beyond TGS, market and investor perceptions and values may shift rapidly away from high-carbon, fossil-fuel assets making futured decarbonization a more expensive and complex process.
- Since electric heating systems typically cannot generate high water temperatures (or at best do so with significant loss of efficiency), they must be paired with better-performance envelope systems.
- One potential strategy is to over-invest in a better envelope (which is less likely to be replaced in a building's lifetime) and design for low-temperature gas-based heating systems which can be retrofitted to low-carbon technologies like heat pumps later.
- Designing a high-temperature heating system is a major barrier to future de-carbonization and HVAC system improvements.

A. Design Considerations | .5 Low Carbon Energy Supply

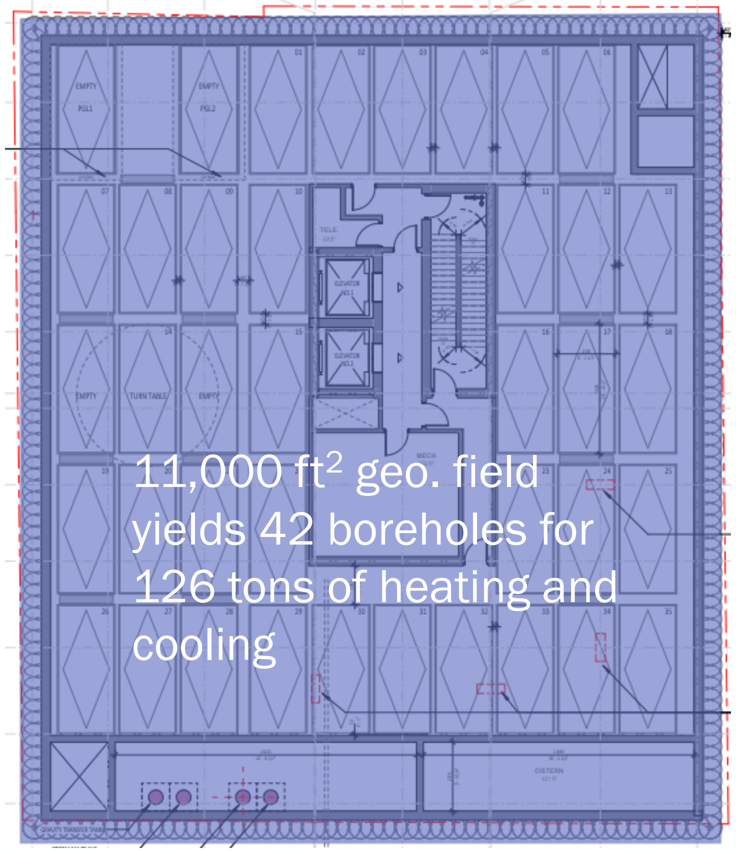
- Current high electricity prices make introducing heat pumps and reducing energy costs challenging.
- Higher carbon taxes in the future will make heat pumps less expensive to operate than by 2030. The IPCC recommends a carbon tax of $390/ton in 2030 making heat pumps more cost effective per unit of thermal energy delivered at that time.
- The key decision for new development is *when* to fuel-switch.



A. Design Considerations | .5 Low Carbon Energy Supply

Criteria	Water-loop	Air-source	Geothermal	VRF
Description	Conventional distributed in-suite heat pumps served by common boiler(s) and cooling tower(s)	Centralized units that can serve in-suite fan-coils or distributed heat pumps	Centralized units and ground loops that can serve in-suite fan-coils or distributed heat pumps.	A more efficient version of all-electric heat pumps that can be air-source or ground-coupled. Distributes refrigerant throughout the buildings.
Efficiency	Lowest	High	Very High	High – Very High
Spatial Needs	Typical	Significant roof area	Below-grade borefield but very little roof area	Roof or borefield
Capital Costs	Typical	Higher	Higher	Higher
Energy Costs	Typical	Lower	Lower	Lower
Carbon Emissions	High (but better than hot water fan-coils)	Low (2-4x lower than gas)	Low – Very Low (3-6x lower than gas)	Low – Very Low (4-6x lower than gas)
				Recommended

A. Design Considerations | .5 Low Carbon Energy Supply



	Tier 1	Tier 2	Tier 3
% of Peak Heating	62%	74%	99%
% of Peak Cooling	62%	62%	67%

The site can accommodate a ground field:

- approximately 11,000 ft2 in area (rough outline of parking garage)
- 42 geothermal boreholes
- 126 tons of heating/cooling capacity

While the COP of an air-source VRF system decreases in winter because the air temperature is lower, compared to the more stable temperature of the ground, a ground-couped VRF is expected to add marginal performance benefits compared to significant additional capital costs and implementation complexity. An air-source VRF system is recommended

Higher Tiers of TGS require increased envelope performance, allowing the ground field to cover more of the total loads of the building.

A. Design Considerations | .7 District Energy

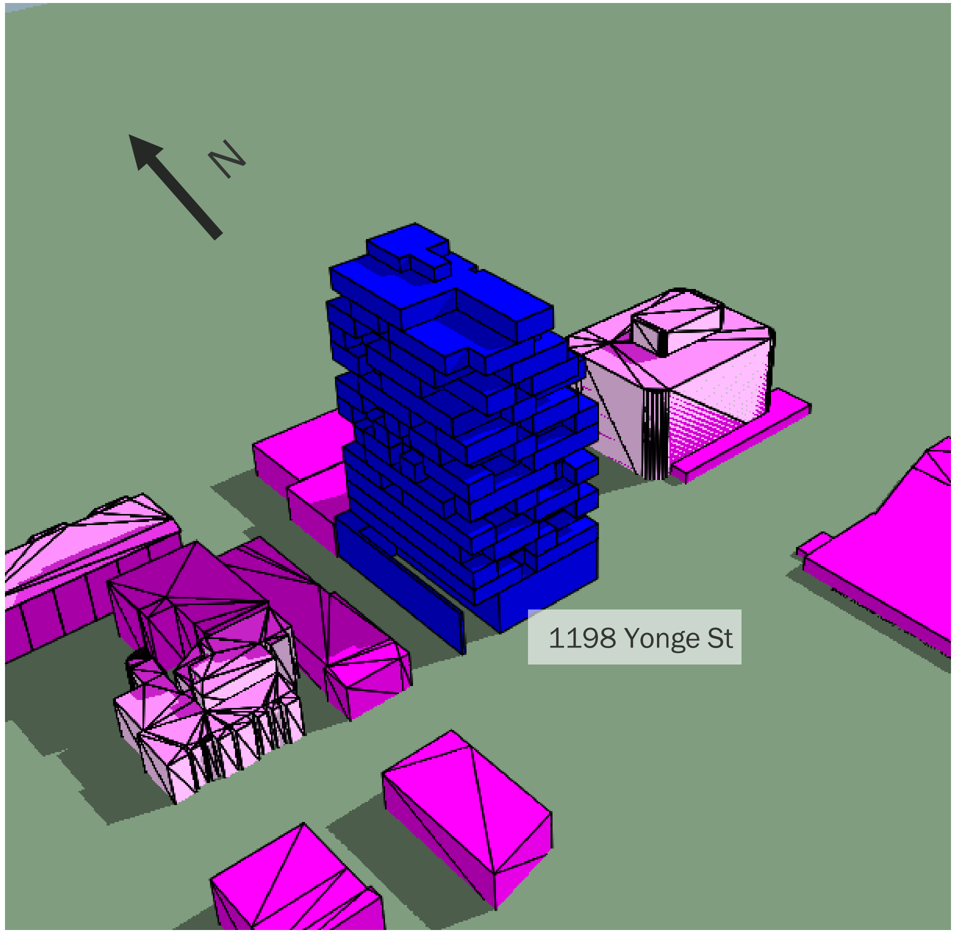
District Energy Systems (DES) connect multiple buildings to a common source of energy, which can be generated within one building or a remote stand-alone location.

There are several benefits of DES:

1. Avoided capital costs. When peak loads are combined, it may be possible to reduce the amount of equipment used to peak loads.
2. Coincident heating/cooling loads create an opportunity to utilize waste heat from cooling for heating other spaces (see next slide), reducing energy use for the whole development.
3. Increased redundancy and improved resilience.
4. Avoided capital and operational costs of plant equipment if connecting to an off-site DES

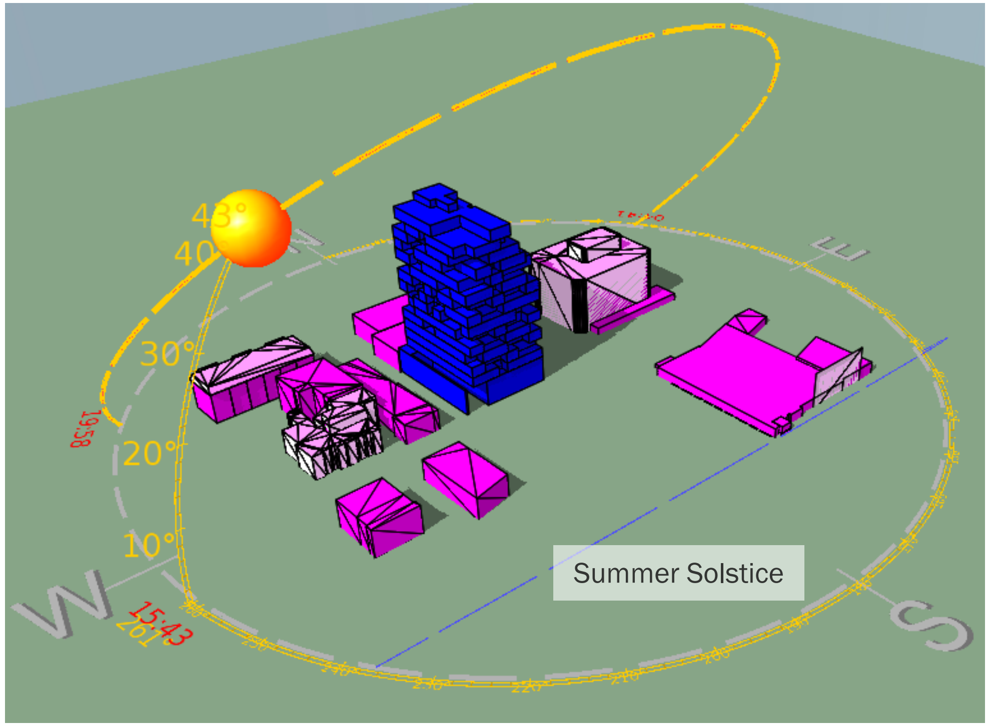
This project is not located near an existing or planned DES and the energy density of the surrounding area is low. A DES is not recommended for this site.

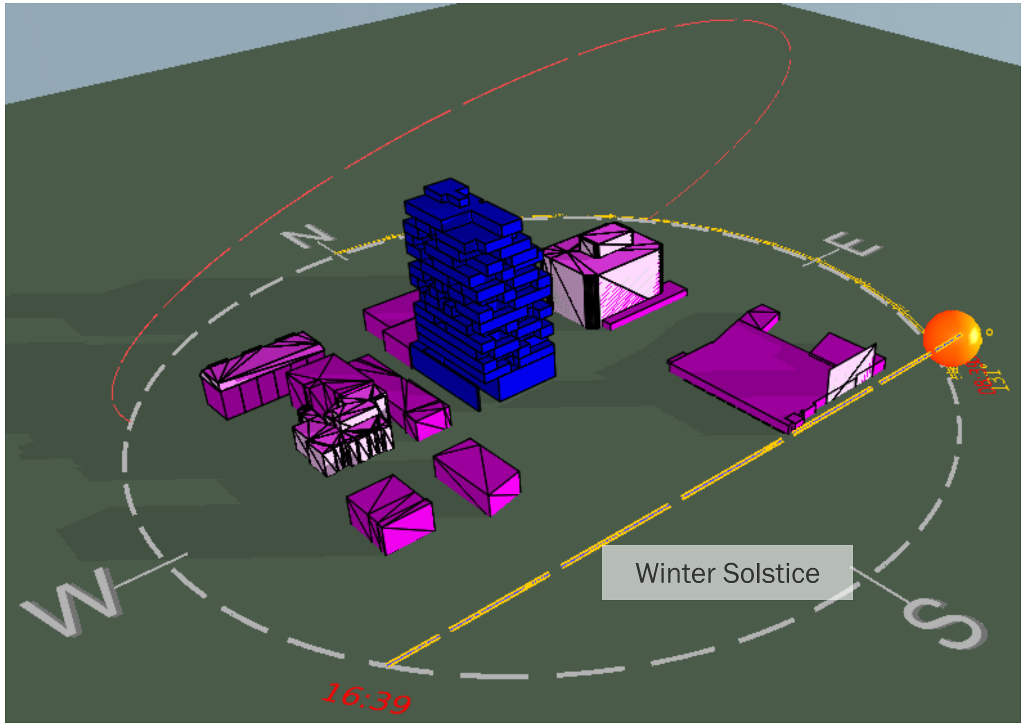
A. Design Considerations | .8 Solar – Site Context



- Incoming solar irradiance can passively act as free heat gains to offset heating energy needed during the winter, or actively provide electricity using photovoltaics (PV)
- Solar PV is a recommended renewable technology for low-carbon solutions due to its proven track record, decreasing costs, spatial requirements and energy generation potential.
- To understand the opportunities for Building Integrated Photovoltaic (BIPV) on site, a solar study has been performed.
- There are no high-rise buildings within proximity of the proposed site. The low-rise neighboring buildings provide opportunities for unobstructed solar irradiance
- The solar study has accounted for these buildings' impact

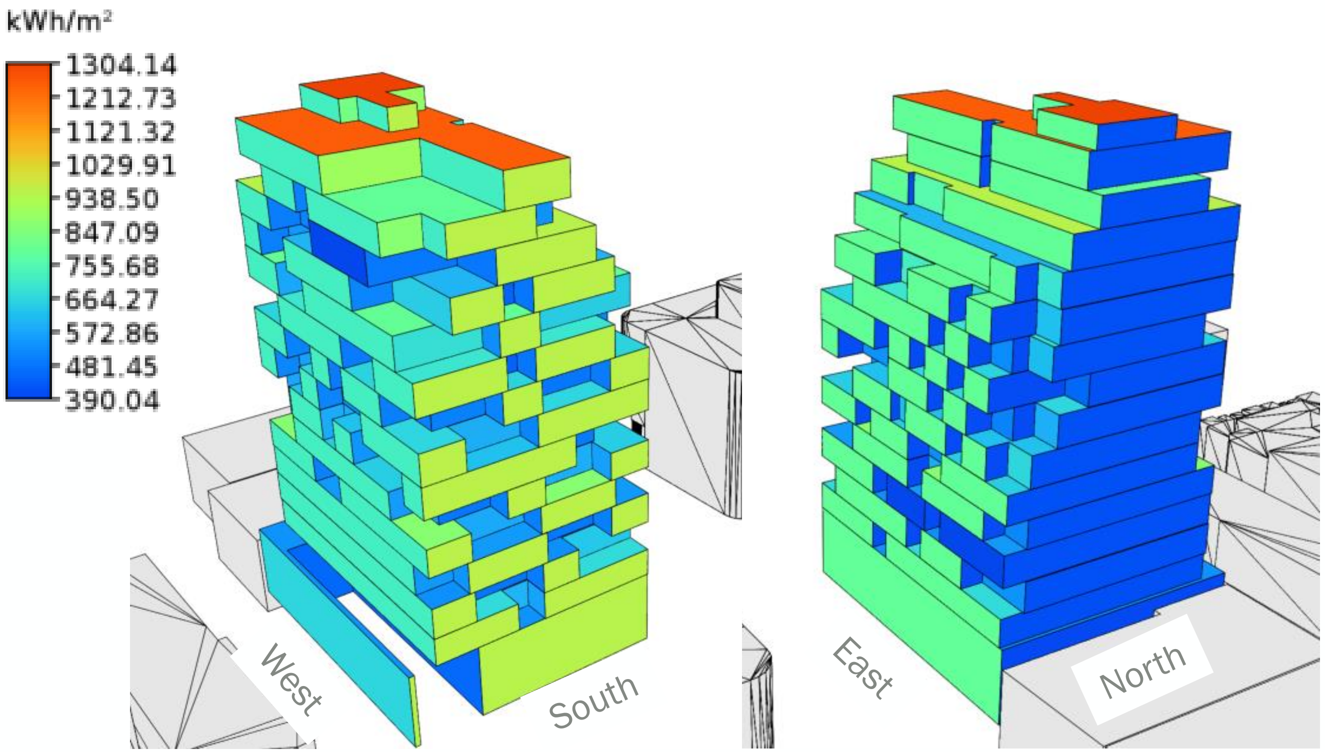
A. Design Considerations | .8 Solar – Sun Path





The image represents the sun altitude at Summer and Winter Solstice. The building is not heavily obstructed by buildings to the south, allowing good solar exposure.

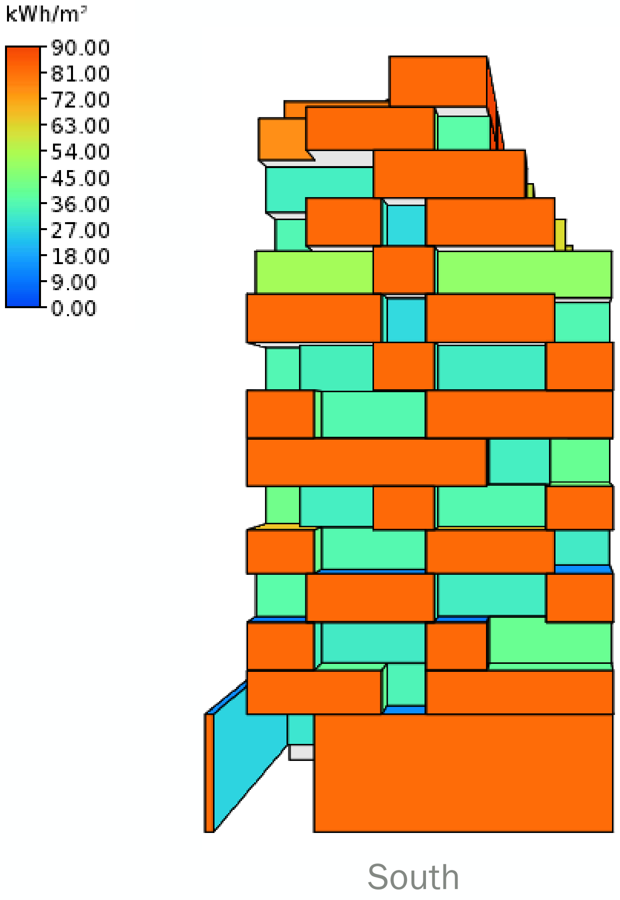
A. Design Considerations | .8 Solar – Annual Solar Radiation



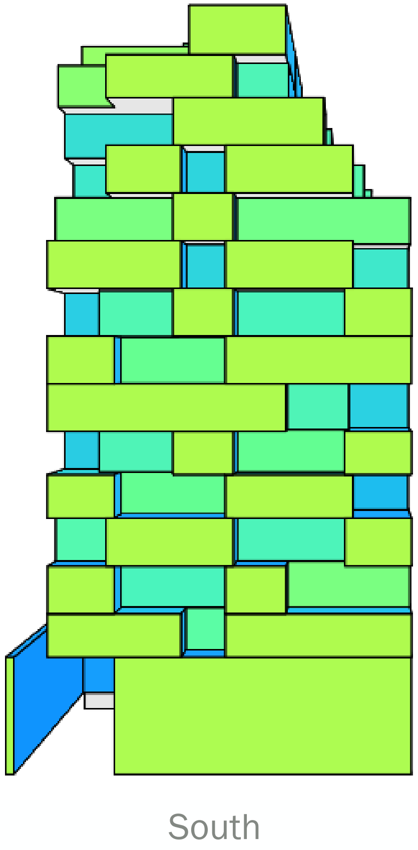
Annual Solar Radiation

- In absences of neighboring high-rise buildings, the site has good solar access.
- The annual solar radiation of the exposed south façade is ~900 kWh/m^2, and ~480 kWh/m^2 of the recessed south façade
- The articulated façade is not an ideal candidate for Building-Integrated PV due to the non-repetitive and unique vertical surfaces. The roof may be able to support a small PV array.

A. Design Considerations | .8 Solar – Passive Heating



June Solar Radiation



December Solar Radiation

- The seasonal solar radiation analysis shows that the recessed balconies on the south facade help significantly reduce unwanted solar gain in summer, while only moderately reduce the passive solar gain in winter. Hence, the south balcony design has an overall positive impact on the loads

- However, the recessed balconies limit the building's daylight harvesting potential

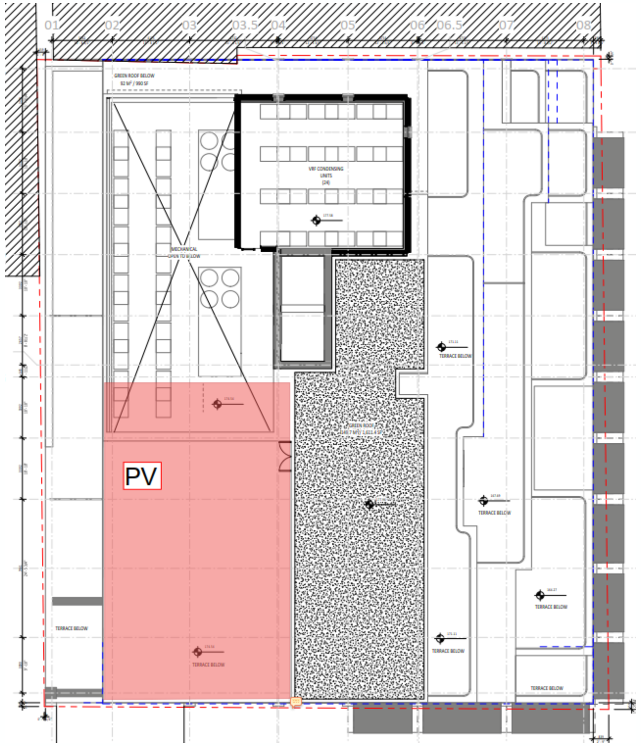
A. Design Considerations | .8 Solar – PV Potential

Given the project massing, and current placement of outdoor VRF condensers and other equipment, only a small portion of the roof may be available for a PV array.

Shown on the right is a 34 kW array, covering approx. 170 m2 of area and capable of annually generating approx. 30,623 kWh of electricity.

This is sufficient to provide approx.:

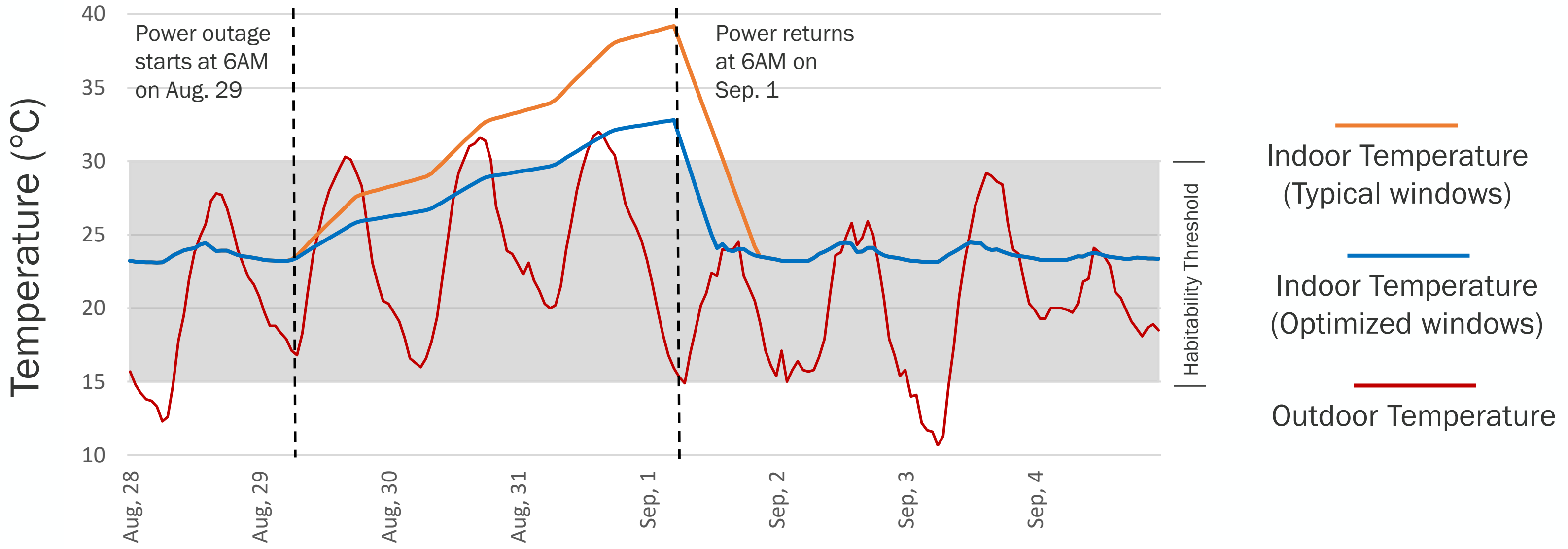
- 2 % of total energy of a Tier 1 building
- 3 % of total energy of a Tier 2 building
- 4 % of total energy of a Tier 3 building



34 kW (170 m^2) PV on roof

A. Design Considerations | .8 Solar – Over Heating

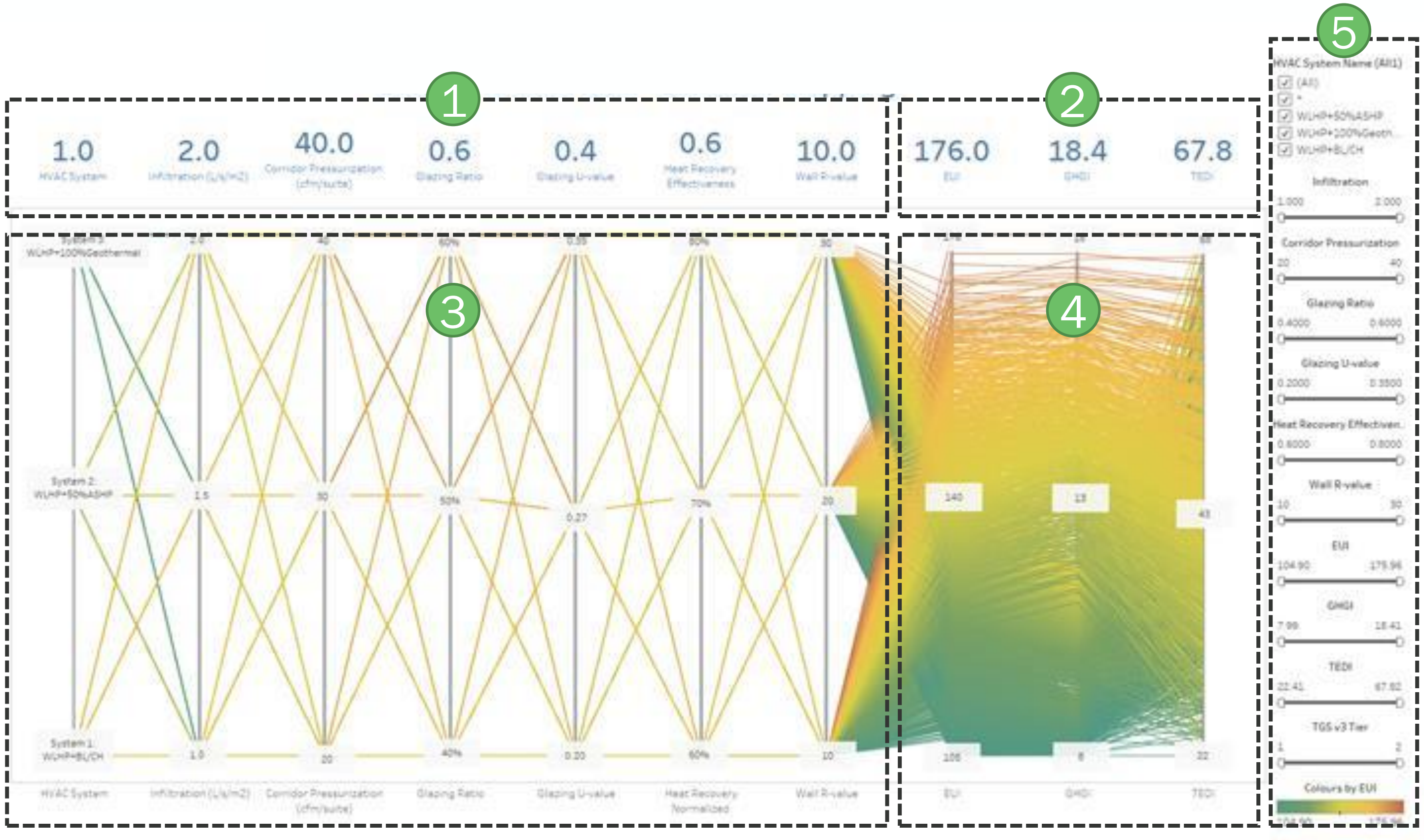
- Reducing solar heat gain is important when considering power outages during a heat wave which pose significant risks to building occupants.
- Passive survivability is an indication of how long a space (or building) can remain occupied safely without active heating or cooling.
- Optimizing the building's windows to minimize solar heat gain in areas of high solar exposure reduces the risk of over heating during a power outage and allows the cooling system to catch back up quicker once power returns.



A. Design Considerations | .9 Parametric Analysis

Features	Traditional Energy Modelling	Parametric Analysis
How it works?	Single model is developed to report the performance of a baseline design	Algorithms automatically run the model 100s of times to proactively generate design options
When it is performed?	Once major design decisions are made	Before major design decisions are made
Number of options assessed?	5-10	1,000+
Able to identify optimal design pathways	Maybe	Yes
Typical time to generate results?	3-4 weeks	3-4 weeks
Ability to ask “what-if?” design questions?	Very limited	Extensive

A. Design Considerations | .9 Parametric Analysis



1. Design Parameters (inputs)
2. Performance Metrics (outputs)
3. Possible values of each parameter (each line is one design pathway)
4. Results for each design pathway
5. Design choice filters

A. Design Considerations | .9 Parametric Analysis

Target Tier Tier 2
Zero Carbon No Requirement

Select parameters to Include - must select at least one from each category

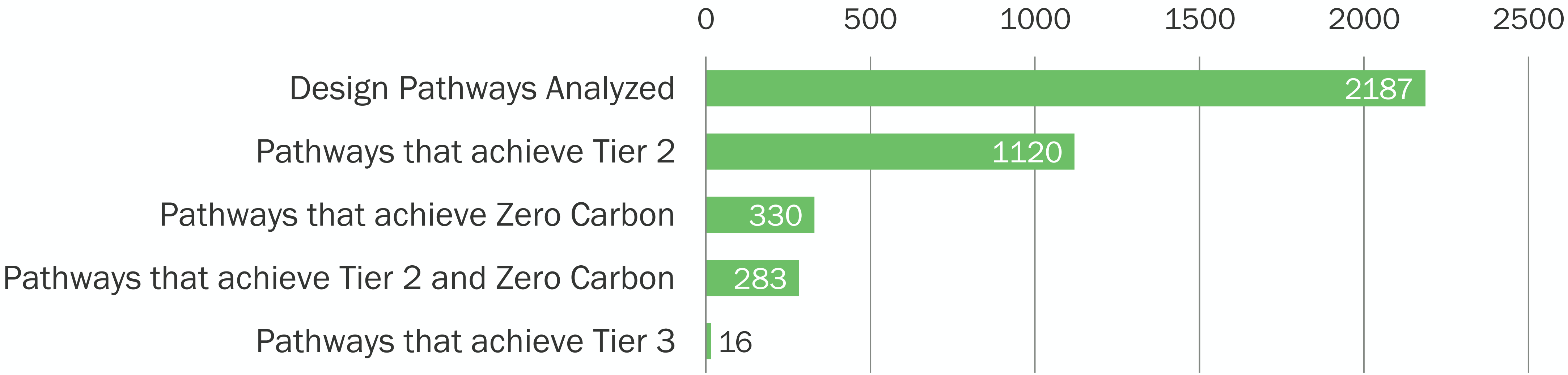
Glazing Ratio	Glazing U-Value	Wall R-Value	Infiltration	Corridor Pressurization	Heat Recovery Effectiveness	HVAC
☑ 40%	☑ 0.35	☑ 10	☐ 1	☑ 20	☑ 60%	☑ WLHP+BL/CH
☐ 50%	☐ 0.2	☑ 20	☐ 1.5	☑ 30	☑ 70%	☑ WLHP+50%ASHP
☐ 60%	☑ 0.27	☑ 30	☑ 2	☑ 40	☑ 80%	☑ WLHP+100%Geothermal

Possible Pathways	81

Based on the selected parameters and overall performance targets, below are the average values for each parameter from the individual results of each of the possible pathways. Selecting this average value is therefore expected to achieve the desired performance targets.

Glazing Ratio	**Glazing U-Value**	**Wall R-Value**	**Infiltration ($L/s/m^2$)**	**Corridors (CFM/suite)**	**Heat Recovery Effectiveness**
40.0%	0.30	21.7	2.0	26.8	73.1%

A. Design Considerations | .9 Parametric Analysis



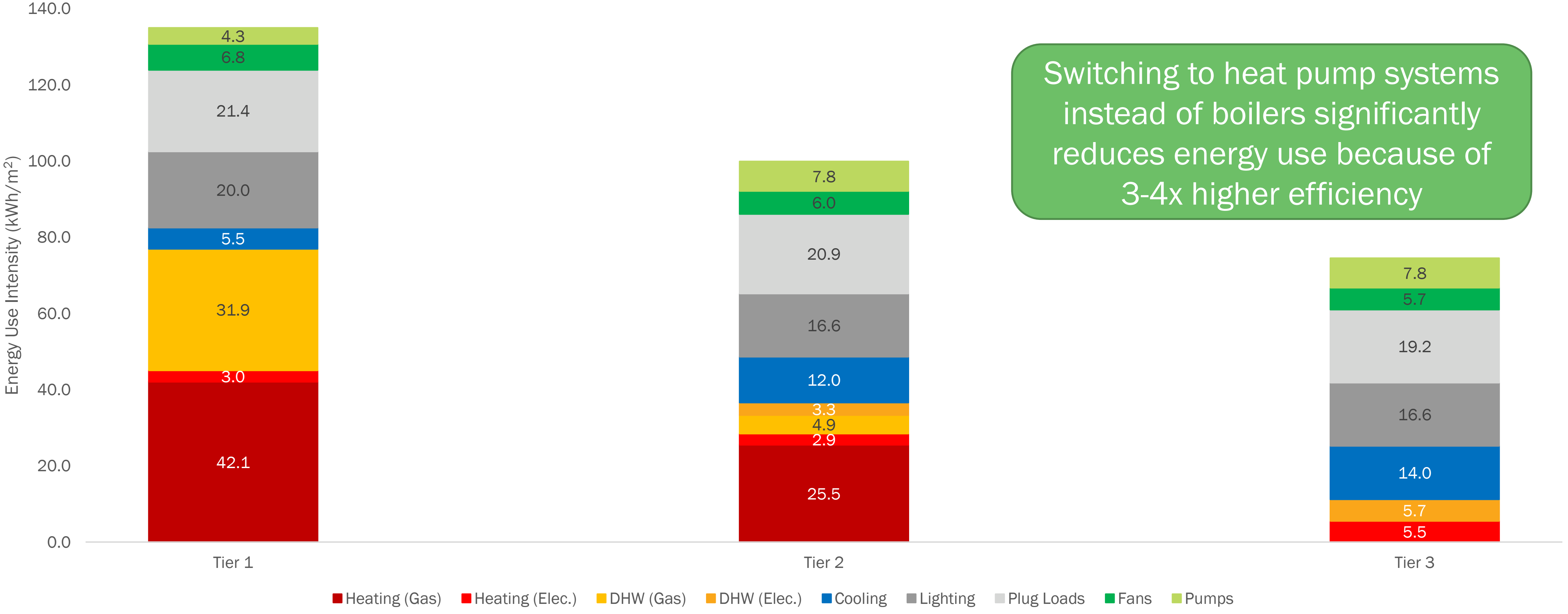
Possible questions we can answer with parametric analysis:

- Assuming we want a high glazing ratio and are concerned about improving airtightness, how can we achieved Tier 2?
- What is more effective, reducing glazing ratio or improving the performance of thermal breaks?
- Is geothermal necessary to achieve TGS Tier 2?

B | Performance Potential Details

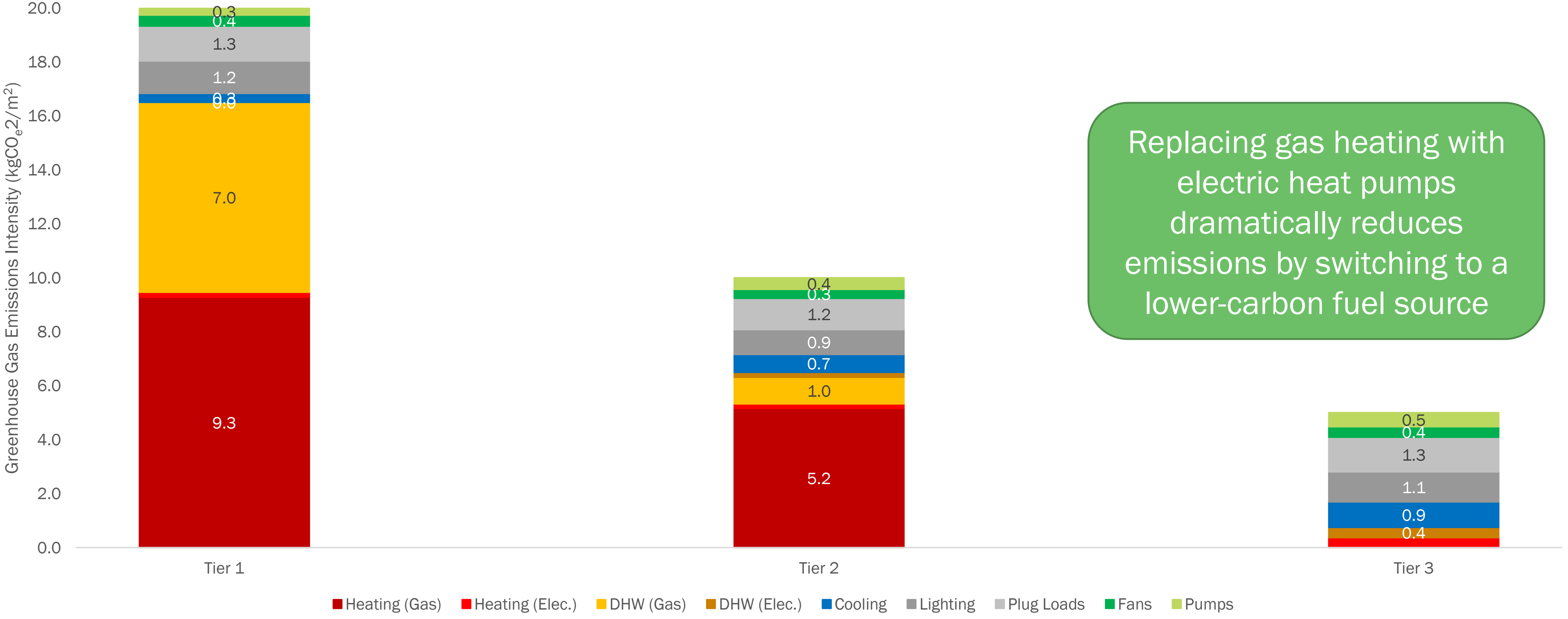
B. Performance Potential Details | .1 Energy Use Intensity Breakdown

Energy Use Intensity Breakdowns show below are representative of typical buildings following the pathways outlined in Section 3.3 Recommended Design Strategies.



B. Performance Potential Details | .2 GHG Intensity Breakdown

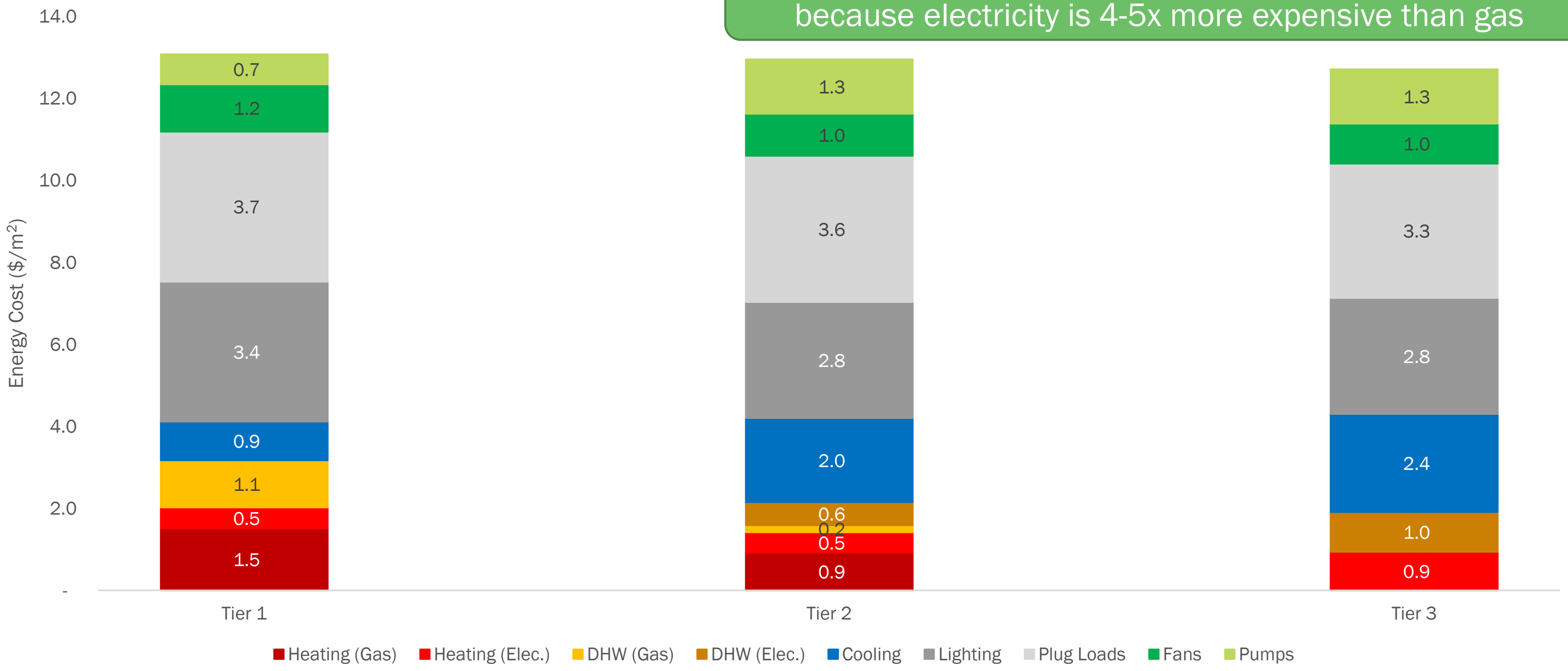
Greenhouse Gas Emissions Intensity Breakdowns show below are representative of typical buildings following the pathways outlined in Section 3.3 Recommended Design Strategies.



Replacing gas heating with electric heat pumps dramatically reduces emissions by switching to a lower-carbon fuel source

Energy Cost at current utility rates (incl. $50/tonne Carbon Tax in 2022)

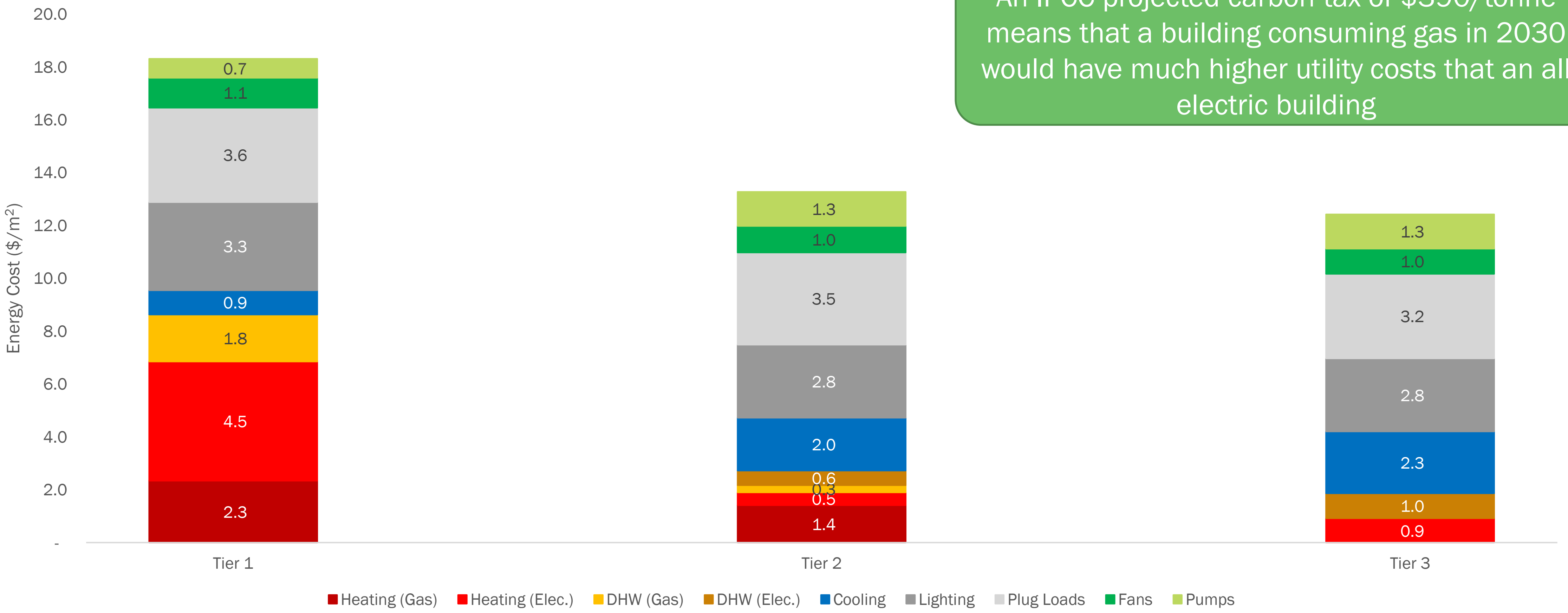
Fuel-switching does not appreciably reduce energy costs because electricity is 4-5x more expensive than gas



Breakdown representative of typical buildings following the pathways outlined in Section 3.3 Recommended Design Strategies.

Energy Cost Scenarios with 2030 Carbon Tax ($170/tonne)

An IPCC projected carbon tax of $390/tonne means that a building consuming gas in 2030 would have much higher utility costs that an all electric building



Breakdown representative of typical buildings following the pathways outlined in Section 3.3 Recommended Design Strategies.

C | TGS Background

C. TGS Background

- TGS includes requirements for energy & carbon emissions, air quality, water, ecology and waste.
- TGS Tier 1 is mandatory for all new developments while TGS Tiers 2 and 3 are voluntary and include development charge rebates.
- TGS performance requirements are updated every 4 years with the current Tier 2 becoming the mandatory Tier 1. The current version in effect is TGS v3. Version 4 is expected to become mandatory in May 2022.
- Compliance must be demonstrated against the TGS version in effect at the time of SPA, with additional submissions for Tier 2 at 50% CD and Occupancy.
- A prequalified evaluator must conduct a two-stage review to verify Tier 2 compliance.

D | Tier 2 Development Charge Rebate Estimate

D. Tier 2 Development Charge Rebate Estimate

TGS v4 Tier 2-4 Development Charge Rebate Calculator

Residential Unit	Rebate ($/unit)	Units	Rebate ($)
Single or semi-detached	$ 5,520.81		$ -
Apartment - 2 BR or larger	$ 3,522.40	51	$ 179,642
Apartment - 1 BR or bachelor	$ 2,402.54	16	$ 38,441
Multiple	$ 4,477.09		$ -
Dwelling Room	$ 1,491.19		$ -
		Total residential rebate	**$ 218,083**

	Rebate ($/m2)	Area (m2)	Rebate ($)
Non-residential use	$ 40.73	229	**$ 9,327.17**

Total residential and non-residential rebate $ 227,410.21

NOTE: Rebate values are per Schedule C of Toronto Bylaw 415, development charges effective Nov 1, 2021. These rates typically change annually. All rates can be found at the City of Toronto website: https://www.toronto.ca/city-government/budget-finances/city-finance/development-charges/development-charges-bylaws-rates/

E | Conditions of Use

E. Conditions of Use

The scope of work and related responsibilities for this report are defined in Purpose Building's proposal and Terms and Conditions. Unless specifically recorded in the report, this scope and these responsibilities do not include:

- physical or destructive testing to evaluate conditions that cannot be quantified by visual observation;
- calculations or evaluations to check compliance with past or current building codes and design standards;
- responsibility to identify errors or insufficiencies in the information obtained from the various sources;
- responsibility for decisions made or actions taken as a result of this report unless Purpose Building are specifically advised and participate in such action, in which case the responsibility will be as agreed to at that time.
- investigating or providing advice, about pollutants, contaminants or hazardous materials including but not limited to asbestos, mould, or other fungus.

Any user explicitly denies any right to any claim, including personal injury claims, which may arise out of pollutants, contaminants or hazardous materials.

No party other than the Client shall rely on anything in this report without Purpose Building's express written consent. Any third party user of this report specifically denies any right to any claims, whether in contract, tort and/or any other cause of action in law, against Purpose Building (including Sub-Consultants, their officers, agents and employees).

Any reliance on this report requires accepting all of the following:

- The work does not express or imply warranty as to the fitness of the property for a particular purpose or compliance with past or present regulations unless otherwise agreed in writing by Purpose Building. The work reflects Purpose Building's best judgement in light of the information reviewed at the time of preparation.
- This work does not wholly eliminate uncertainty regarding the potential for existing or future costs, hazards or losses in connection with a property.
- No portion of this report may be used as a separate entity. The report is written to be read in its entirety.
- Only the specific information identified has been reviewed.
- Conditions existing, but not recorded, were not apparent given the level of study undertaken. Only conditions actually seen during examination of representative samples have been appraised and comments on the balance of the conditions are assumptions based upon extrapolation. Purpose Building can perform further investigation(s) on items of concern, if so requested.
- Applicable codes and design standards may have undergone revision since the subject property was designed and constructed and visual evaluation is not sufficient to determine if those changes affect past or current compliance.
- Budget figures provided represent Purpose Building's opinion of a probable current dollar value of the work and are provided for approximate budget purposes only. If an actual construction budget is required for some or all of the work, Purpose Building can provide an additional service to establish a scope of work and receive quotes from suitable contractors.

PURPOSE

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