DILLON CONSULTING

Ganatchio Gardens Inc.

Official Plan and Zoning By-Law Amendments

Energy Strategy

Southwest Corner of Florence Avenue & Wyandotte Street East

Windsor, Ontario

June 2022, Revised March 2023 - 21-1691

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1.0 Executive Summary

Dillon Consulting Limited was engaged by Ganatchio Gardens Inc. to develop an Energy Strategy for the proposed townhomes and multi-story residential building at Wyandotte Street East & Florence Avenue in Windsor, Ontario. The objective of the strategy is to identify and evaluate energy-efficient, low-carbon, and resilient opportunities for the development.

To achieve this, the Natural Resources Canada (NRCan.gc.ca) software tool, RETScreen Expert, was utilized to create energy models for the new buildings. This modeling software allows for the assessment of potential energy efficiency and renewable energy options and provides estimates of the proposed development's energy performance.

The development comprises 28 townhomes and a 16-story residential building with 275 units to be constructed on 33,000 m2 of land. The townhomes consist of row houses split into 7 blocks, each block containing 4 units, with additional amenities such as a terrace, parkland, and parking.

The energy strategy report evaluates various energy options, including improving power efficiency, electrifying mechanical systems, and incorporating on-site renewable energy systems to offset consumption. The report outlines three proposed scenarios (Baseline, Higher Performance, and Near Zero Emissions) analyzed and assessed with recommended efficiency measures.

The strategy recommends minimizing fuel-fired heating systems and associated consumption and GHG emissions, with the scenario of Near Zero Emissions offering the greatest savings in terms of GHG reduction, followed by the scenario of Higher Performance. Both scenarios present significant energy savings and are recommended for consideration in this project.

2.0 Inputs and Assumptions

2.1 Climate Data

The site is located in Windsor, Ontario. The standard Typical Meteorological Year (TMY) weather file for Windsor was used to model the climate for a typical year of operation as per Code modeling guidelines. The City of Windsor is located in Climatic Zone 5 [HDD (18°C)<4,000°C].

2.2 Basis of Inputs

Building details were collected and based on the conceptual development plans, including the site area, the proposed number of units, and the row-houses split. No available detailed design drawings were available due to the project nature being in the pre-design stage.

Baseline Case

The baseline 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 OBC SB-10 & SB-12. Inputs such as ventilation rates, hot water usage, and electrical equipment were based off typical "Row-House" and "Apartment - High-rise" building archetypes on RETScreen, obtained from NRCan's database through RETScreen Virtual Energy Analyzer.

Proposed Case

The mechanical systems & building envelope were modelled as "higher-performance" and "near zero emissions" categories as per the Energy Strategy towards Zero Emissions Development; other inputs that had no modifications such as ventilation rates, lighting, and electrical equipment were equivalent to the baseline case.

2.3 Assumptions

1) Total Modeled Area:
   The total modeled area for an average townhome is 196m^2 (2,112 ft^2).
   The total modeled area for the multi-story building is 18,364m^2 (191,705 ft^2).

2) Number of Units: 275 Multi-Unit Residential, and 28 Townhomes.

3.0 Energy Calculations

A print out of the RETScreen simulation results are included in the report Appendices.

3.1 Energy Performance

The team evaluated several design options to assess the feasibility and constructability of Energy Conservation Measures (ECM's) that puts the facility on a path towards Zero Emissions operation. Several priorities and objectives were balanced in the decision making process, including:

- GHG emissions measured in CO2e
- Occupant amenities and facilities
- Energy consumption & efficiency
- Energy resilience suitable for residential use
- Feasibility and constructability
- Greenway space contributing to well-being
- Electrification of heating systems

Three scenarios were considered in the modeling process, they include:

Table 1: Performance Scenarios

Scenario		Notes
1	Baseline – Ontario Building Code	Ontario Building Code SB-10, SB-12
2	Higher Performance	Energy Use Intensity (EUI) 20% < Building Code
3	Near Zero Emissions	Energy Use Intensity (EUI) 50% < Building Code

3.1.1 Energy Conservation & Demand Reduction

The energy conservation strategy considered several technologies to suit the various applications of the building type, as well as minimizing the usage energy and fuel-fired equipment. The focus of this study includes the following options for the two (2) building types:

<u>Multi-Story Residential Building:</u>

1. Higher Performance
    a. Higher thermal efficiency of fuel-fired furnace system serving the rooftop units (90 AFUE to 96 AFUE).
    b. Domestic Hot Water -
        i. Fuel Fired DHW [Baseline] to Electric DHW tanks [Proposed] (90% to 100% Seasonal Efficiency);
        ii. Low flow aerators and showerheads (20% Reduced Water Usage); and

iii. Higher efficiency drain water heat recovery (42% to 60% Efficiency).

c. Installation of high efficiency Heat Recovery System for ventilation (75% to 85% efficiency).

d. Improved lighting efficiency & controls

i. LPD – Building Area Method for MURB: 7.3 W/m^2 (T-SB 9.5.1 -2017, OBC SB-10) to 4.8 W/m^2 (T-4.2.1.5, NECB 2020).

e. High Efficiency Windows - Triple glazing with low E coating (U-0.45 to U-0.21).

2. Near Zero

All of the above measures with addition to:

a. Ground Source Heat Pump for space heating and cooling (350% Seasonal Efficiency for Heating).

b. Building envelope - increased wall insulation and air tightness [R-22 to R-25 Walls].

c. 250 kW Photovoltaic System installed on the building roof, surrounding area and/or offsite.

d. High efficiency HVAC fan and motor units [60 to 85% Efficiency].

<u>Townhomes:</u>

1. Higher Performance

a. Thermal efficiency of fuel-fired furnace with DX Cooling:

i. Higher Efficiency Multi- Stage Furnaces;

ii. Higher efficiency DX Air Conditioning unit.

b. Domestic Hot Water -

i. Electric DHW tanks;

ii. Low flow aerators and showerheads.

2. Near Zero

All of the above measures with addition to:

a. Air Source Heat Pump for space heating and cooling.

b. Heat Pump DHW tanks.

c. 3 kW Photovoltaic System installed per unit.

d. Building envelope - increased wall insulation (+R-5) and air tightness.

3.1.2 Low-Carbon Solutions

Two (2) low-carbon solutions were considered for this development, including photovoltaic system and high performance HVAC systems (air source heat pump for the townhomes and a ground source heat pump for the multi-unit building).

A solar photovoltaic (PV) system was considered to offload some of the electricity requirement, and to provide & maintain basic necessities such as interior and exterior lighting. The PV system was considered for both the townhomes and the multi-story residential building, provided the available roof space or ground mounted in the surrounding areas / off-site. The strategy considered a 3kW system for each individual townhome and a 250kW system for the multi-story residential building to approach net zero targets. The system would allow the buildings to generate renewable energy, and improve energy resilience. In addition, it would help accommodate increased electricity loads due to the electrification of the heating systems.

Air and ground source heat pumps were also considered and could potentially eliminate natural gas as a heating fuel source for the development. The typical ground source heat pump efficiency rating is between 2.5-4x output per kW of electricity consumed for heating and cooling, and 1.3-2x for an air source heat pump. For the sake of this analysis, the highest efficiency units were assumed.

3.1.3 Energy Resilience

Energy resilience was considered in the energy strategy considering the use of the building type as multi-unit residential. With increasing global temperatures, extreme weather events require designs to carefully evaluate threats such as extended heat waves, severe rainfall events, and power outages.

An emergency power generator should be considered in the multi-story building to provide emergency power to critical life safety systems as well as improve energy resilience of the building. The generator would be sized and connected to the electrical panels in the building that are necessary to maintain the following:

1. Fire Protection system, including the Fire Pump and alarm system
2. Emergency and outdoor lighting
3. Building heating systems to avoid freeze over during extended outages
4. Building domestic water and sump pumps

Other design considerations for designing with resiliency in mind could include:

- Locating critical equipment above the flood plain.
- Passive design measures such as a relatively low window-wall ratio, high thermal mass elements within the building, and high R-values for the building insulation would assist in maintaining building temperature in the event of heating/cooling system failure.
- Passive ventilation strategies.
- Tenant and occupant emergency preparedness guides.
- Ceiling fans.
- Shade trees/shrubs.
- External pools.
- Reduced hardscape.

The development should also consider the installation of EV charging stations for the underground parking level. The Ontario Building Code currently requires EV chargers and infrastructure for charge stations to be installed in all new buildings. As society turns to electric vehicles with production and demand on the rise, the infrastructure is needed to be equipped and ready to handle the current and future loads. This can come in the form of a declaration of EV charging in the application process when tenants are interested in purchasing the homes or units, and/or installation of a dedicated number of stations with the infrastructure in place for future additional stations.

3.2 Analysis and Preferred Scenarios

Three scenarios were considered in the analysis for the Multi Story residential building and the townhomes:

I. Scenario 1: Baseline – Ontario Building Code
II. Scenario 2: Higher Performance
III. Scenario 3: Near Zero Emissions

Both scenarios 2 and 3, present feasible and high efficiency options in reducing building energy use intensities. The RETScreen simulation results are shown in the report Appendices, which illustrates results for building energy use, energy/fuel consumption, and carbon emissions. The recommended energy conservation measures along with the savings & percent reductions are outlined below:

3.2.1 Multi-Story Residential Building

The estimated annual energy use for the multi-story residential building is outlined for the three scenarios in the table below. Percent savings over baseline are also shown.

Table 2: Estimated Annual Energy Use

	Heating (kWh)	Cooling (kWh)	Other Electricity (kWh)	Total (kWh)
1: Baseline	1,793,404	379,204	1,831,240	4,003,849
2: Higher Performance	1,080,145 (39.8%)	337,496 (11%)	1,630,255 (11%)	3,047,896 (23.9%)
3: Near Zero Emissions	475,141 (73.5%)	314,915 (17%)	1,213,146 (33.8%)	2,003,202 (50%)

The GHG emissions savings for Scenario 2 account is (187) tCO2e in reductions, and for Scenario 3 is (328) tCO2e in reductions. The annual GHG Emissions savings for the multi story building can be approximated as:

Table 3: GHG Savings – Multi-Story Residential

	GHG Savings (tCO2e)
1: Baseline	-
2: Higher Performance	187
3: Near Zero Emissions	328

The approximate contributions of each identified HVAC and plumbing Energy Conservation Measures in load reductions are as follows:

Scenario 2: Higher Performance

Table 4: ECM Savings – Higher Performance, MURB

Energy Conservation Measure (ECM)	Annual Energy Savings (kWhe/yr)
1: High Efficiency Furnace	72,832
2: Electric Domestic Hot Water Heater	62,809
3: Low flow fixtures & high efficiency drain water heat recovery	214,415
4: High efficiency Ventilation Heat Recovery System	126,514
5: Improved lighting efficiency & controls	201,086
6: High Efficiency Windows	278,397

Scenario 3: Near Zero Emissions

Table 5: ECM Savings – Near Zero Emissions, Multi-Story Residential

Energy Conservation Measure (ECM)	Annual Energy Savings (kWhe/yr)
1: Ground source heat pump for heating and cooling	865,666
2: Improved wall insulation, windows, and air tightness	185,704
3: Installation of a 250 kW photovoltaic system	297,402
4: High efficiency HVAC fans, motor, and pump units	119,399
High Performance Measures	
6: High efficiency Ventilation Heat Recovery System (Higher Performance)	53,959
7: Electric Domestic Hot Water Heater	62,809
8: Low flow fixtures & high efficiency drain water heat recovery	214,415
9: Improved lighting efficiency & controls	201,086

3.2.3 Residential Townhomes

The estimated annual energy use for each townhome is outlined for the three scenarios in the table below. Percent savings over baseline are also shown.

Table 6: Estimated Annual Energy Use – Per Townhome

	Heating (kWh)	Cooling (kWh)	Other Electricity (kWh)	Total (kWh)
1: Baseline	14,290	3,072	7,261	24,623
2: Higher Performance	9,324 (34.8%)	2,543 (17.2%)	7,261 (0%)	19,128 (22.3%)
3: Near Zero Emissions	4,987 (65.1%)	2,764 (10%)	3,783 (47.9%)	11,534 (53.2%)

The annual GHG Emissions savings for the townhomes can be approximated as:

Table 7: GHG Savings - Townhomes

	GHG Savings – Individual Row Home (tCO2e)	GHG Savings – 28 Townhomes (tCO2e)
1: Baseline	-	-
2: Higher Performance	1.5	42
3: Near Zero	2.5	70

The approximate contributions of each identified HVAC and plumbing Energy Conservation Measures in load reductions are as follows:

Scenario 2: Higher Performance

Table 8: ECM Savings – Higher Performance, Townhomes

Energy Conservation Measure (ECM)	Annual Energy Savings per Townhome (kWhe/yr)
1: Higher Efficiency Furnace & DX AC units	2,252
2: Electric Domestic Hot Water Heater	1,514
3: Low flow shower heads and aerators	1,730

Scenario 3: Near Zero Emissions

Table 9: ECM Savings – Near Zero Emissions, Townhomes

Energy Conservation Measure (ECM)	Annual Energy Savings per Townhome (kWhe/yr)
1: Air source heat pump for heating and cooling	4,481
2: Heat Pump DHW	3,532

Energy Conservation Measure (ECM)	Annual Energy Savings per Townhome (kWhe/yr)
3: Improved wall insulation and air tightness	446
4: Installation of a 3 kW photovoltaic system	3,478
5: Low flow shower heads and aerators	1,153

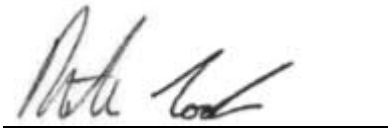
4.0 Conclusions and Recommendations

The project has many opportunities for energy, carbon and energy cost reductions. The current baseline meets the minimum requirements of the Ontario Building Code SB-10 however, implementing a number of identified strategies will aid the project in achieving advanced sustainable design goals.

The total estimated Scenario 3 energy savings for the neighborhood (for 1 Multi-Story Building and 28 townhomes) is 2,368 MWhe and 398 tCO2e. This represents approximately 50% reductions in energy consumption and 85% in GHG emissions over the baseline and is equivalent to taking off the road about 73 cars and light truck vehicles driven for one year.

It is recommended that the measures identified under both Scenario 2 and Scenario 3 be considered as the project moves through design factoring with the strategies described in this report. The ECM's identified under Scenario 3 for both building types would provide an energy load that is 100% electrified. Given this remaining load is 100% electrified, GHG emissions associated with this load would be reduced as the overall percentage of renewable power supplied by the grid increases.

For the multi-story building, the total annual Carbon cost reduced by 2030 would be $31,790 for Scenario 2; and $55,760 for Scenario 3. With regards to the townhomes, the carbon reductions are $7,140 for scenario 2; and $11,900 for Scenario 3. This is based on the City of Windsor ENERGY STRATEGY TERMS OF REFERENCE rate of a $170/tonne of CO2e and current grid-side emissions.



Nathan Cook, P.Eng.

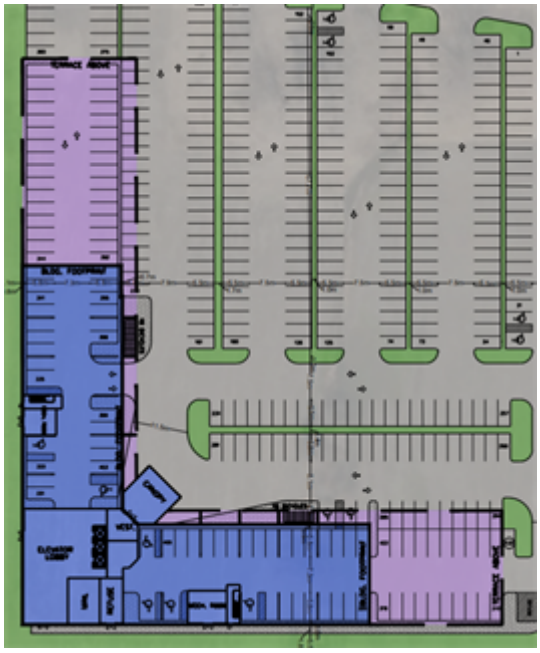
Appendix A

High Performance (MURB)

Carbon Mitigation Strategy

Appendix A - Higher Performance

Ganatachio Gardens



Residential - Multi-unit housing

Prepared for:

Ganatchio Gardens Inc.

Prepared by:

Dillon Consulting Limited

Executive summary

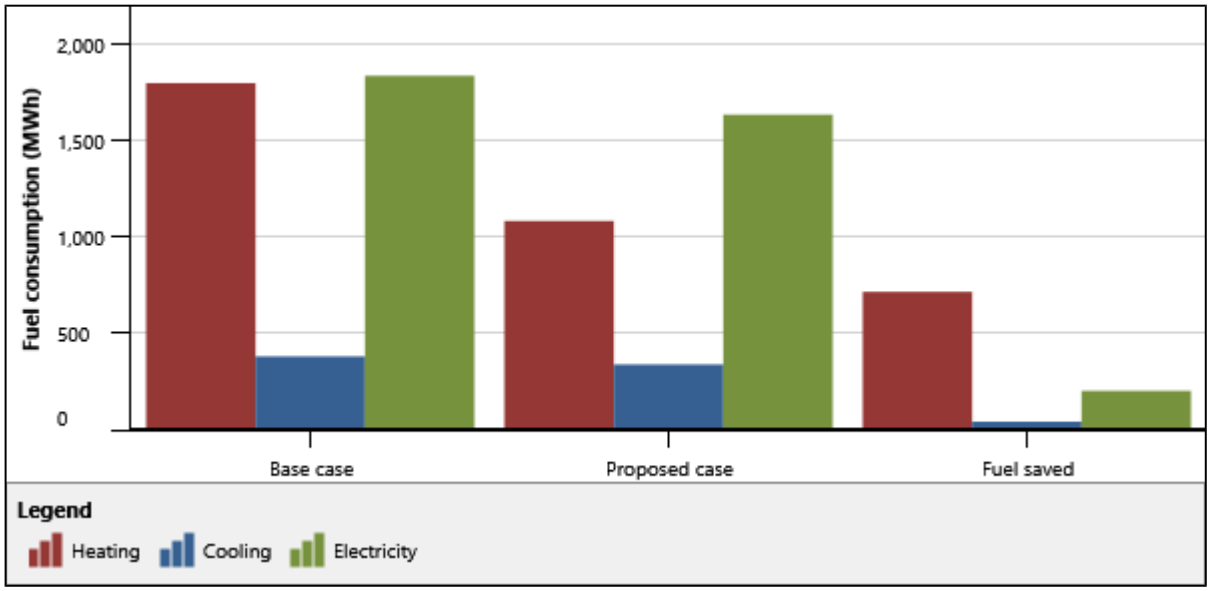
This report was prepared using the RETScreen Clean Energy Management Software. The key findings and recommendations of Higher Performance analysis for Multi unit residential building iis presented below:

Target

	Fuel consumption MWh	Fuel cost $	GHG emission tCO_2
Base case	4,004	429,623	393
Proposed case	3,048	401,857	206
Savings	956	27,766	187
%	23.9%	6.5%	47.7%

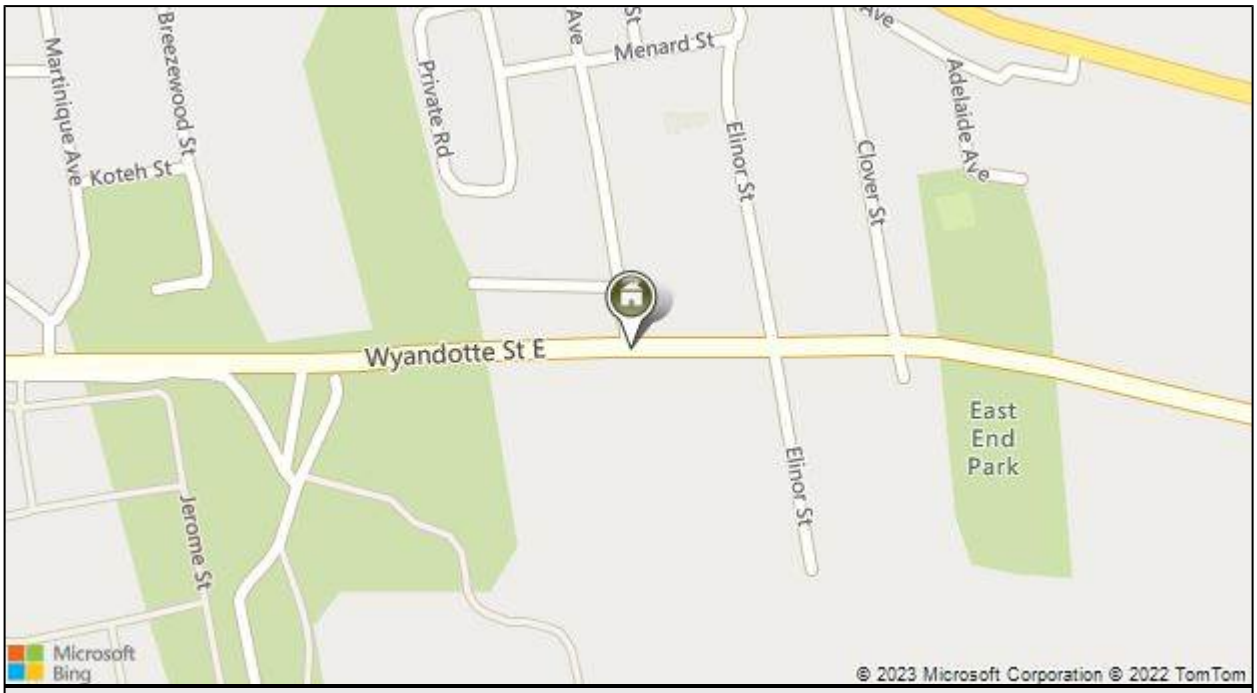
The main results are as follows:

Energy savings



Location | Climate data

Location



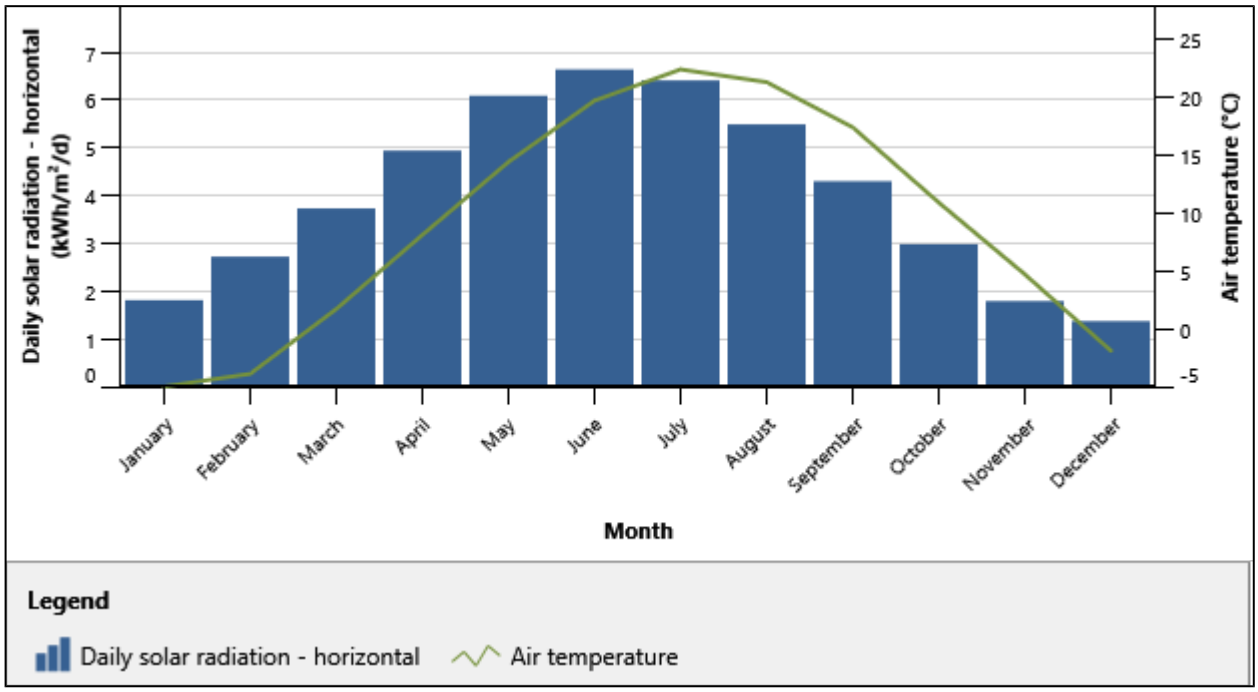
Legend

Facility location

Climate data location

	Unit	Climate data location	Facility location
Name		Canada - Ontario - Windsor Airport	Canada - ON - Windsor
Latitude	˚N	42.3	42.3
Longitude	˚E	-83.0	-82.9
Climate zone		5A - Cool - Humid	5A - Cool - Humid
Elevation	m	190	177

Climate data

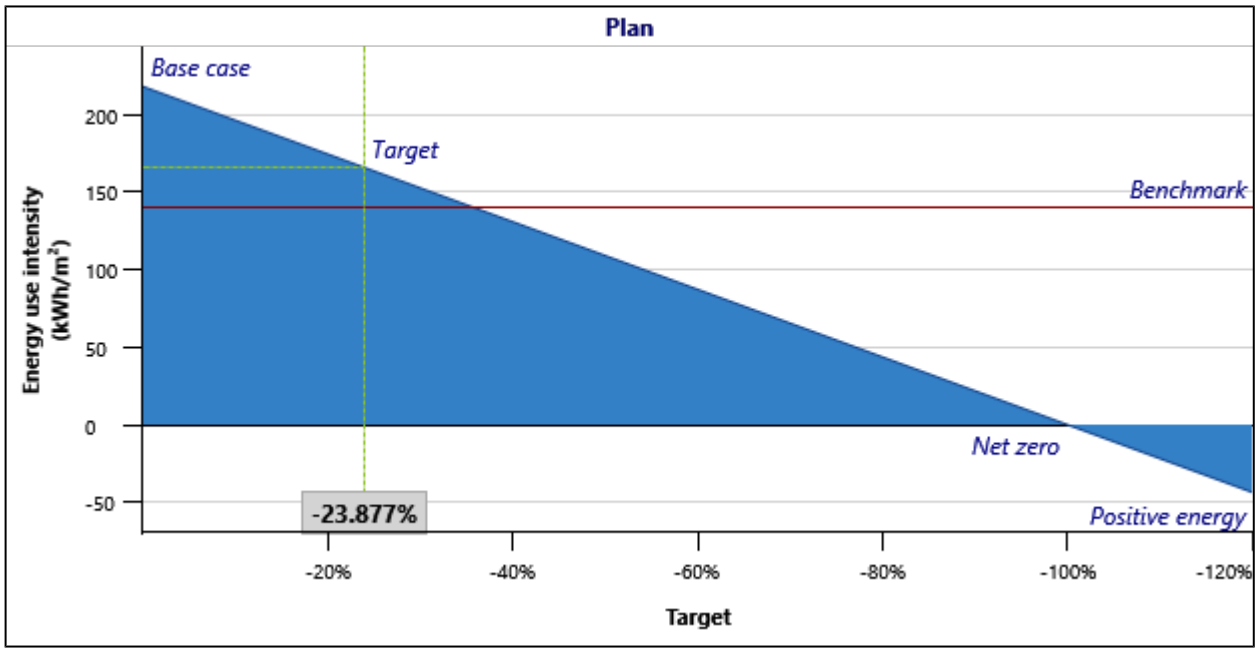


Heating design temperature	-13.7
Cooling design temperature	30.3
Earth temperature amplitude	21.4

Month	Air temperature	Relative humidity	Precipitation	Daily solar radiation - horizontal	Atmospheric pressure	Wind speed	Earth temperature	Heating degree-days	Cooling degree-days
	°C	%	mm	kWh/m²/d	kPa	m/s	°C	°C-d	°C-d
January	-5.0	74.5%	46.81	1.81	99.4	5.6	-3.6	713	0
February	-3.9	71.5%	44.52	2.72	99.4	5.3	-2.9	613	0
March	1.7	68.2%	54.25	3.73	99.3	5.6	1.2	505	0
April	8.1	64.7%	71.70	4.94	99.2	5.3	6.9	297	0
May	14.4	65.0%	80.29	6.09	99.2	4.7	12.8	112	136
June	19.7	66.2%	80.70	6.64	99.2	4.2	18.3	0	291
July	22.4	67.9%	81.84	6.41	99.3	3.6	21.5	0	384
August	21.3	72.3%	79.67	5.49	99.4	3.3	21.0	0	350
September	17.4	72.1%	78.30	4.30	99.5	3.6	17.3	18	222
October	10.9	70.7%	65.10	2.98	99.5	4.5	11.0	220	28
November	4.7	73.4%	64.50	1.79	99.3	4.7	5.0	399	0
December	-1.9	75.7%	56.11	1.37	99.4	5.0	-0.6	617	0
Annual	9.2	70.2%	803.79	4.03	99.3	4.6	9.1	3,494	1,412

Benchmark

Fuel consumption



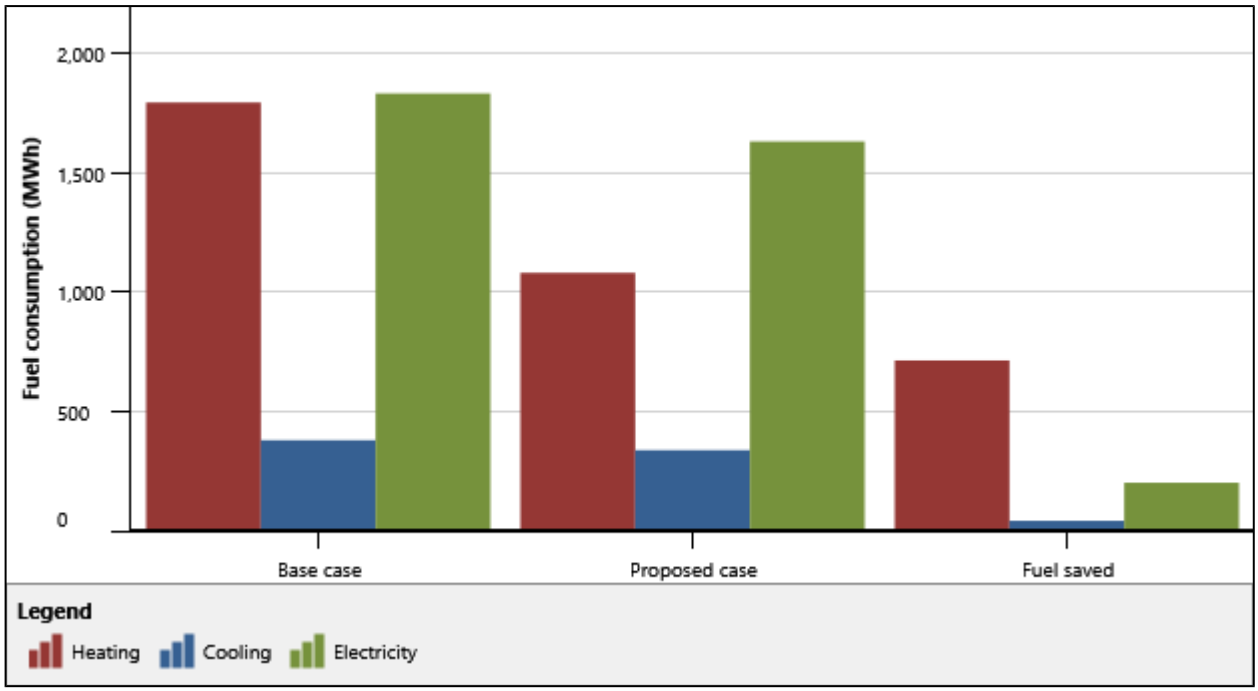
Facility size	18,364	m²
Benchmark	140	kWh/m²
Minimum - average	110	kWh/m²
Maximum - average	176	kWh/m²
Base case	218	kWh/m²
Reference year		
Set target	Target	
Year		
Target	-23.9%	
Proposed case	166	kWh/m²

Facility - Plan

Fuel consumption	Annual	
Base case	4,003,927	kWh
Proposed case	3,047,896	kWh
Fuel saved	956,031	kWh

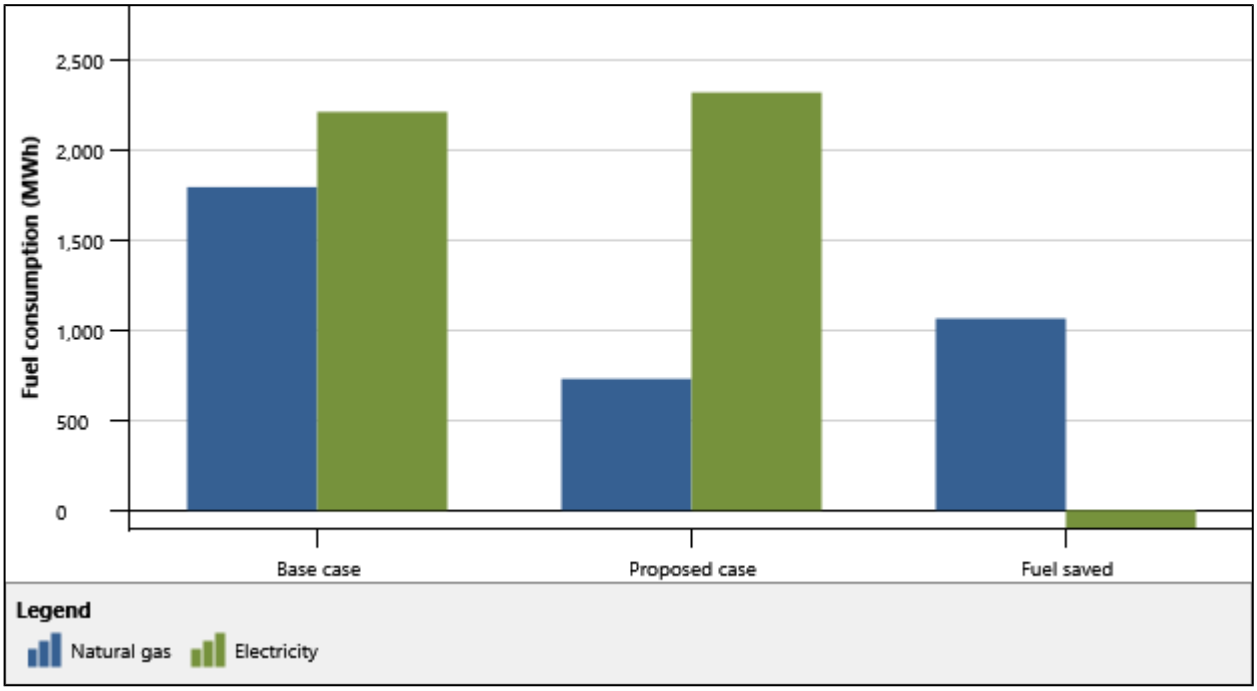
Energy savings | Fuel summary

Energy savings



Fuel consumption	Heating kWh	Cooling kWh	Electricity kWh	Total kWh
Base case	1,793,377	379,209	1,831,341	4,003,927
Proposed case	1,080,145	337,496	1,630,255	3,047,896
Fuel saved	713,233	41,713	201,086	956,031
Fuel saved - percent	39.8%	11%	11%	23.9%

Fuel summary

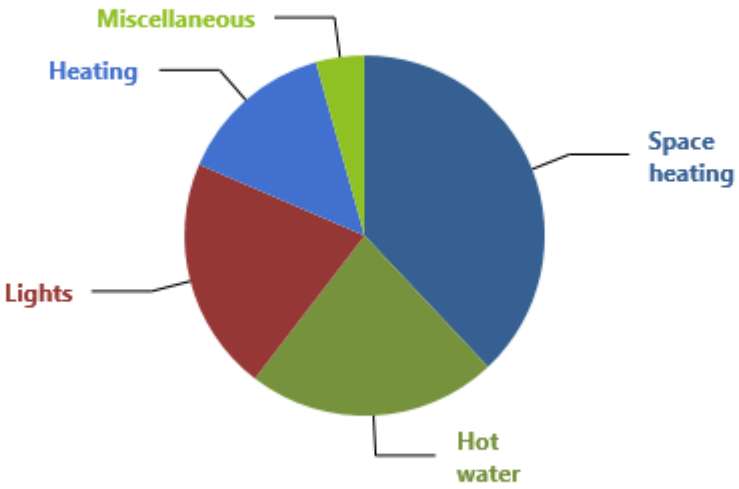


Fuel type	Fuel Unit	Base case Fuel consumption	Proposed case Fuel consumption	Savings Fuel saved
Natural gas	m³	168,744	68,620	100,124
Electricity	kWh	2,210,550	2,318,613	-108,063

Fuel type	Fuel Fuel rate	Base case Fuel cost	Proposed case Fuel cost	Savings Savings
Natural gas	0.45 $/m³	$ 75,935	$ 30,879	$ 45,056
Electricity	0.16 $/kWh	$ 353,688	$ 370,978	$ -17,290
Total		$ 429,623	$ 401,857	$ 27,766

End-use

Fuel saved



Section	Fuel saved kWh	%
Space heating	363,178	38%
Hot water	214,415	22.4%
Lights	201,086	21%
Heating	135,639	14.2%
Miscellaneous	41,713	4.4%
Space cooling	41,713	4.4%

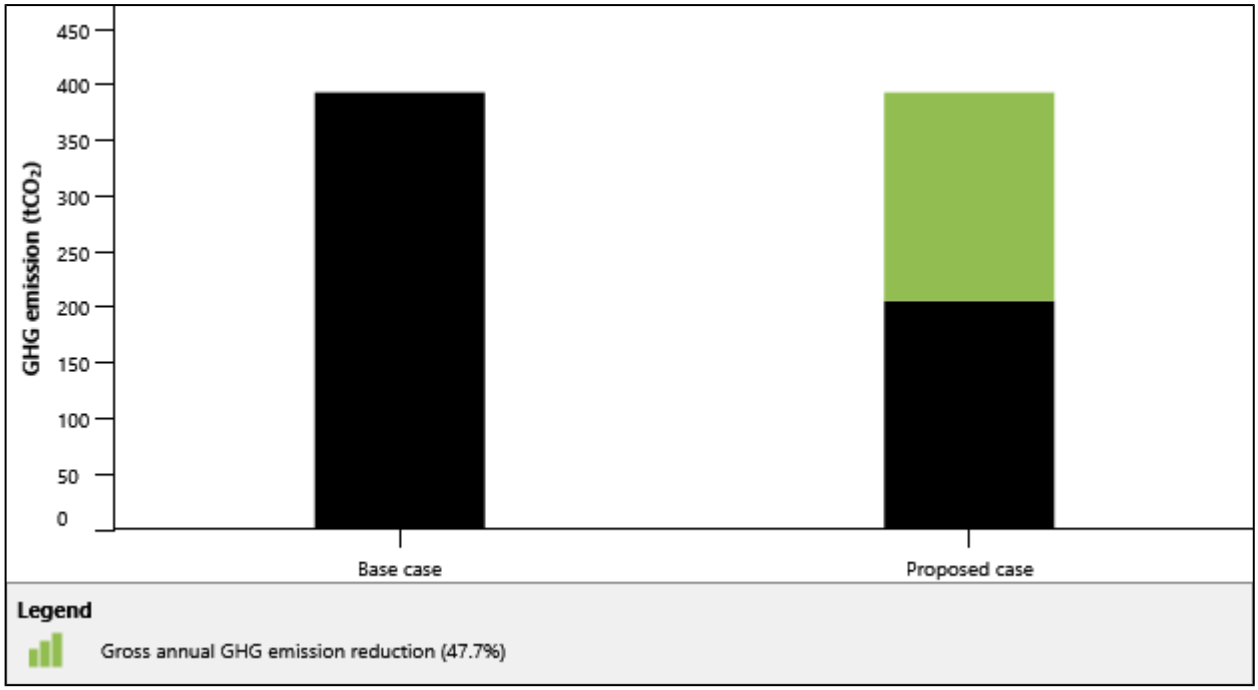
Target

Summary

	Fuel consumption MWh	Fuel cost $	GHG emission tCO_2
Base case	4,004	429,623	393
Proposed case	3,048	401,857	206
Savings	956	27,766	187
%	23.9%	6.5%	47.7%

GHG emission

GHG emission



GHG equivalence

187.4 tCO_2 is equivalent to 34.3

Cars & light trucks not used

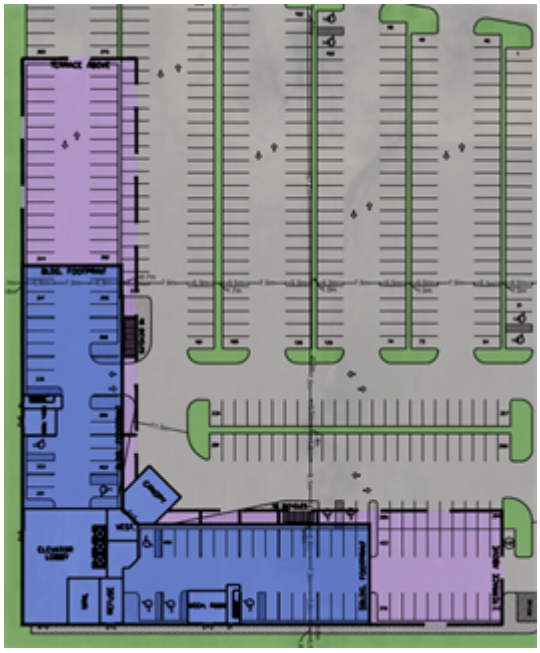
GHG emission		
Base case	393	tCO_2
Proposed case	205.6	tCO_2
Gross annual GHG emission reduction	187.4	tCO_2

Appendix B

Near Zero Emissions (MURB)

Appendix B - Near Zero Emissions

Ganatachio Gardens



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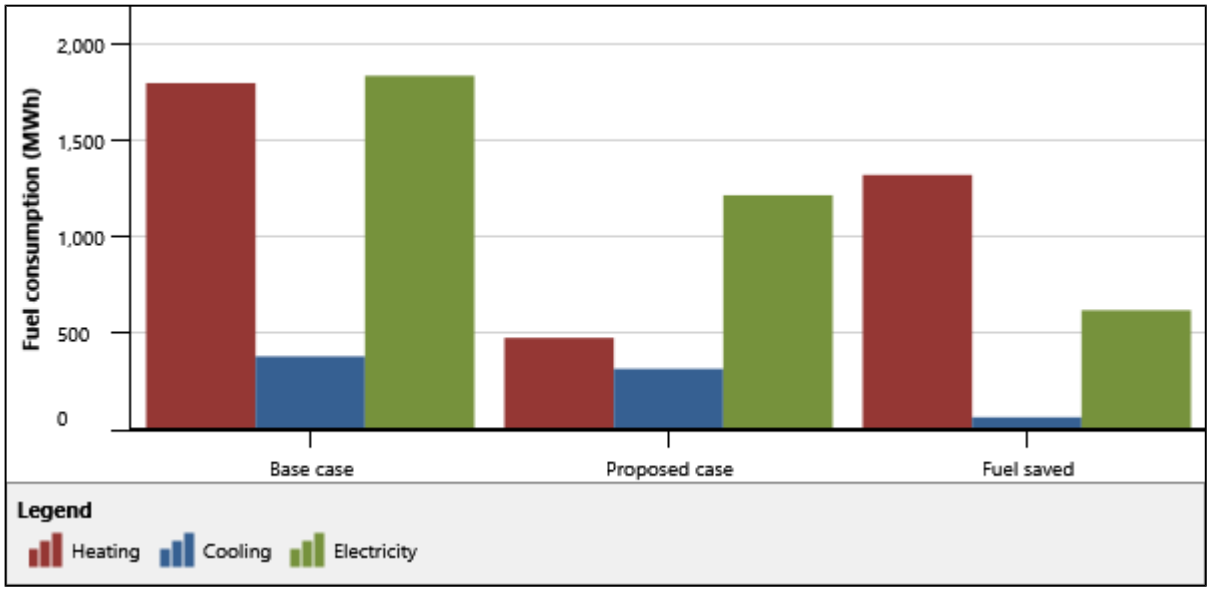
Target

	Fuel consumption MWh	Fuel cost $	GHG emission tCO_2
Base case	4,004	429,607	393
Proposed case	2,003	320,512	64.6
Savings	2,001	109,095	328
%	50%	25.4%	83.6%

The main results are as follows:

Energy savings



Location | Climate data

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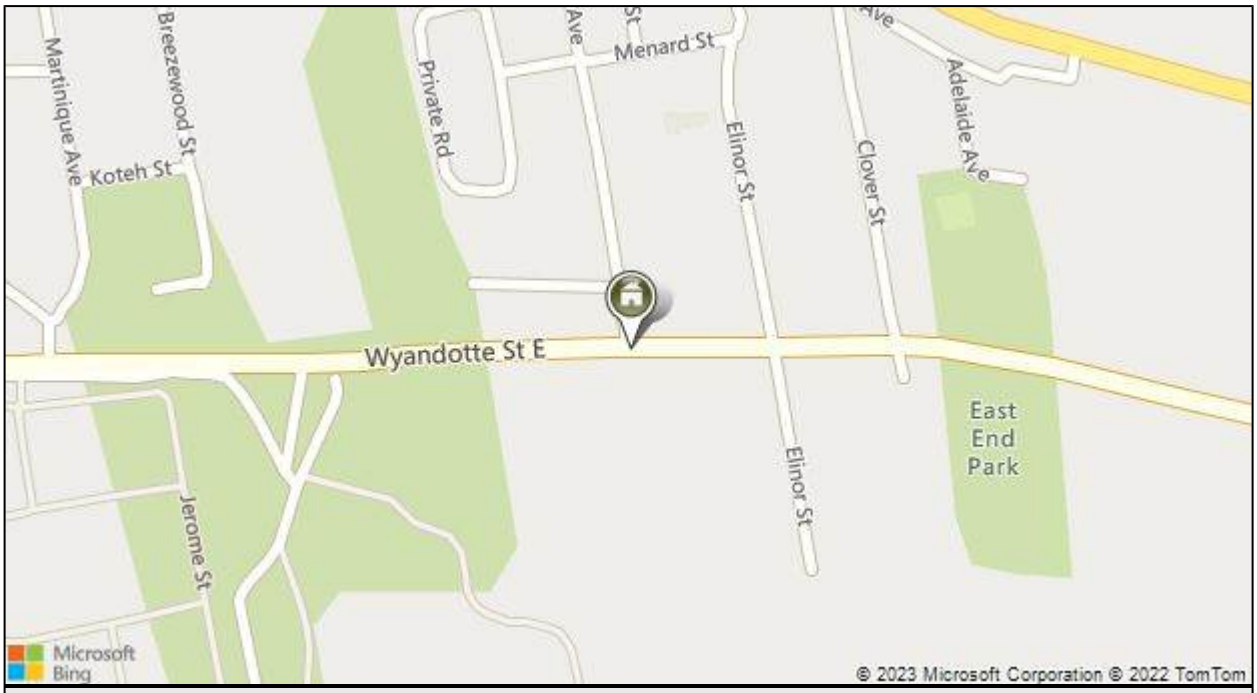

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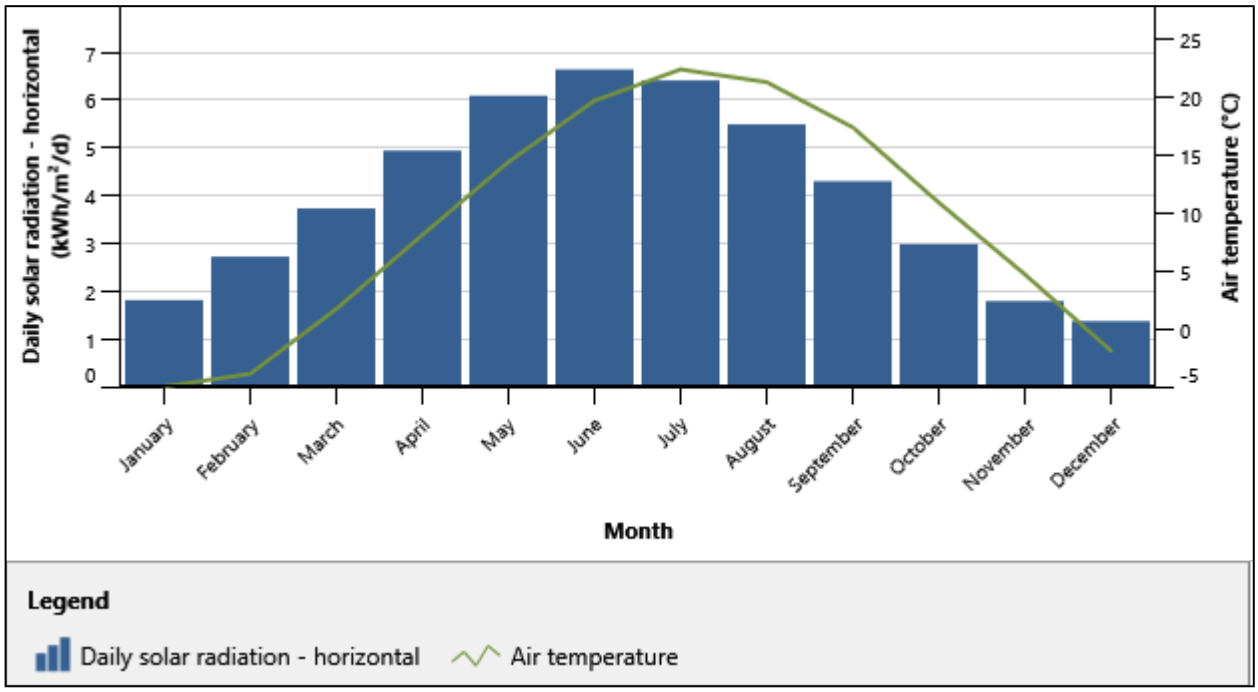

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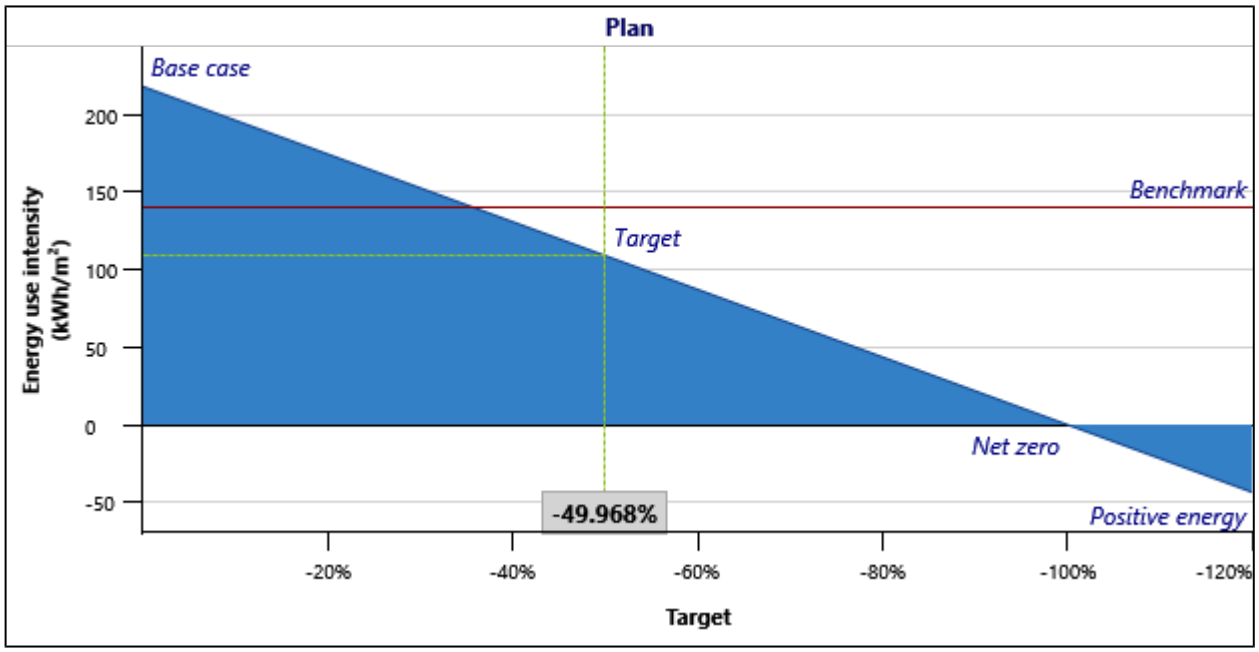
April	8.1	64.7%	71.70	4.94	99.2	5.3	6.9	297	0
May	14.4	65.0%	80.29	6.09	99.2	4.7	12.8	112	136
June	19.7	66.2%	80.70	6.64	99.2	4.2	18.3	0	291
July	22.4	67.9%	81.84	6.41	99.3	3.6	21.5	0	384
August	21.3	72.3%	79.67	5.49	99.4	3.3	21.0	0	350
September	17.4	72.1%	78.30	4.30	99.5	3.6	17.3	18	222
October	10.9	70.7%	65.10	2.98	99.5	4.5	11.0	220	28
November	4.7	73.4%	64.50	1.79	99.3	4.7	5.0	399	0
December	-1.9	75.7%	56.11	1.37	99.4	5.0	-0.6	617	0
Annual	9.2	70.2%	803.79	4.03	99.3	4.6	9.1	3,494	1,412

Benchmark

Fuel consumption



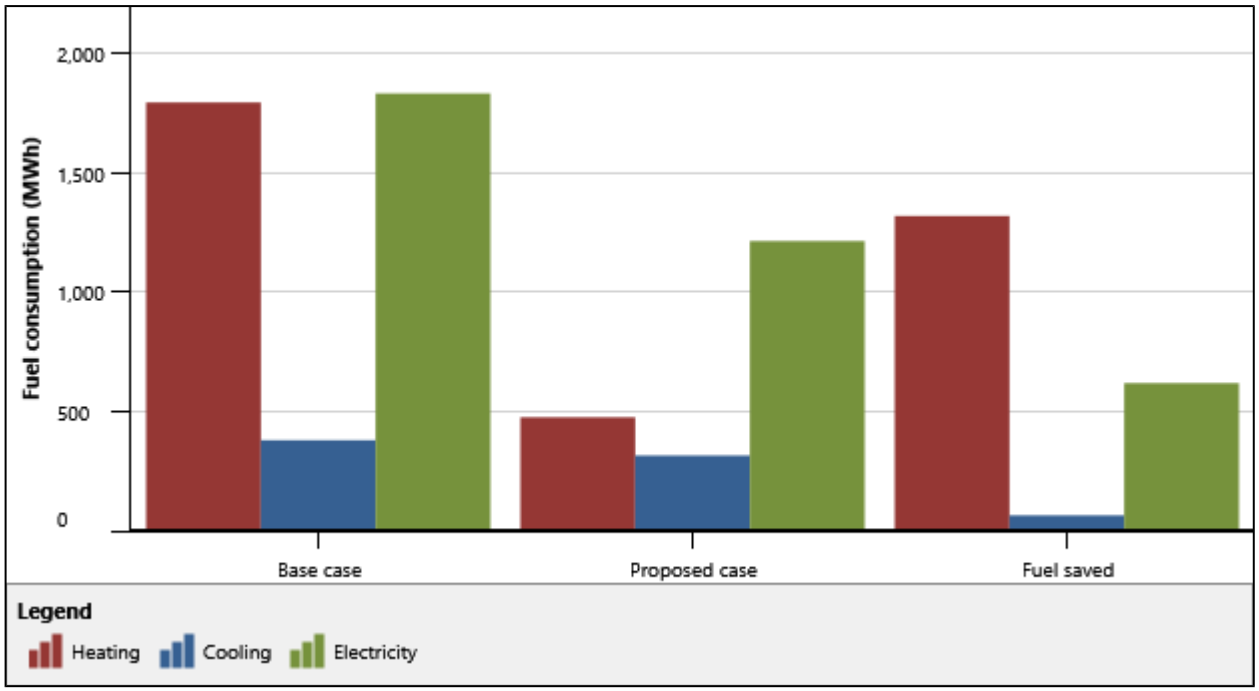
Facility size	18,364	m²
Benchmark	140	kWh/m²
Minimum - average	110	kWh/m²
Maximum - average	176	kWh/m²
Base case	218	kWh/m²
Reference year		
Set target	Target	
Year		
Target	-50%	
Proposed case	109	kWh/m²

Facility - Plan

Fuel consumption	Annual	
Base case	4,003,849	kWh
Proposed case	2,003,202	kWh
Fuel saved	2,000,647	kWh

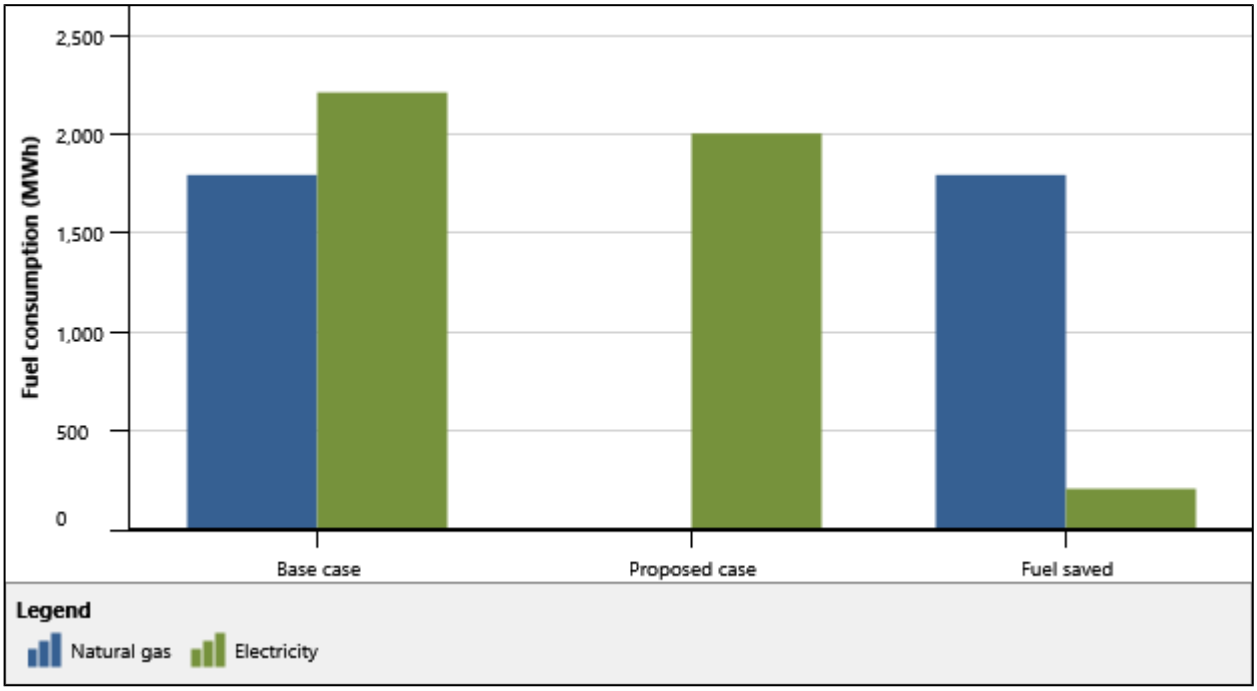
Energy savings | Fuel summary

Energy savings



Fuel consumption	Heating MWh	Cooling MWh	Electricity MWh	Total MWh
Base case	1,793	379	1,831	4,004
Proposed case	475	315	1,213	2,003
Fuel saved	1,318	64.3	618	2,001
Fuel saved - percent	73.5%	17%	33.8%	50%

Fuel summary

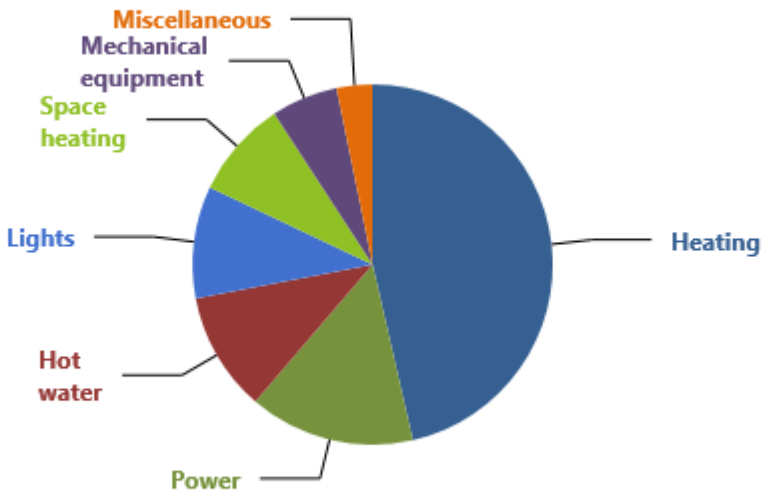


Fuel type	Fuel Unit	Base case Fuel consumption	Proposed case Fuel consumption	Savings Fuel saved
Natural gas	m³	168,747	0	168,747
Electricity	kWh	2,210,444	2,003,202	207,242

Fuel type	Fuel Fuel rate	Base case Fuel cost	Proposed case Fuel cost	Savings Savings
Natural gas	0.45 $/m³	$ 75,936	$ 0	$ 75,936
Electricity	0.16 $/kWh	$ 353,671	$ 320,512	$ 33,159
Total		$ 429,607	$ 320,512	$ 109,095

End-use

Fuel saved



Section	Fuel saved kWh	%
Heating	928,474	46.4%
Power	297,402	14.9%
Hot water	214,415	10.7%
Lights	201,086	10.1%
Space heating	175,374	8.8%
Mechanical equipment	119,607	6%
Miscellaneous	64,289	3.2%
Space cooling	64,289	3.2%

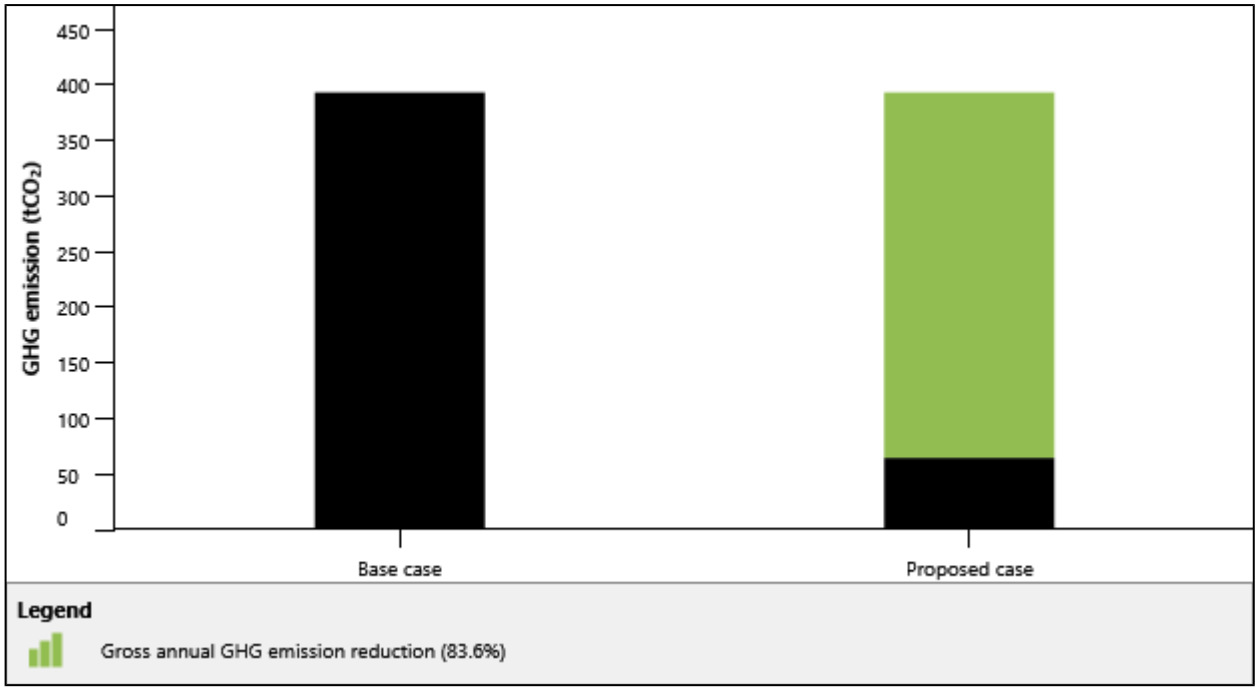
Target

Summary

	Fuel consumption MWh	Fuel cost $	GHG emission tCO_2
Base case	4,004	429,607	393
Proposed case	2,003	320,512	64.6
Savings	2,001	109,095	328
%	50%	25.4%	83.6%

GHG emission

GHG emission



GHG equivalence

328.4 tCO_2 is equivalent to 60.1

Cars & light trucks not used

GHG emission		
Base case	393	tCO_2
Proposed case	64.6	tCO_2
Gross annual GHG emission reduction	328.4	tCO_2

Appendix C

Higher Performance (Townhomes)

Appendix C - Higher Performance

Ganatachio Gardens

Residential - Attached dwellings

Prepared for:

Ganatchio Gardens Inc.

Prepared by:

Dillon Consulting Limited

Executive summary

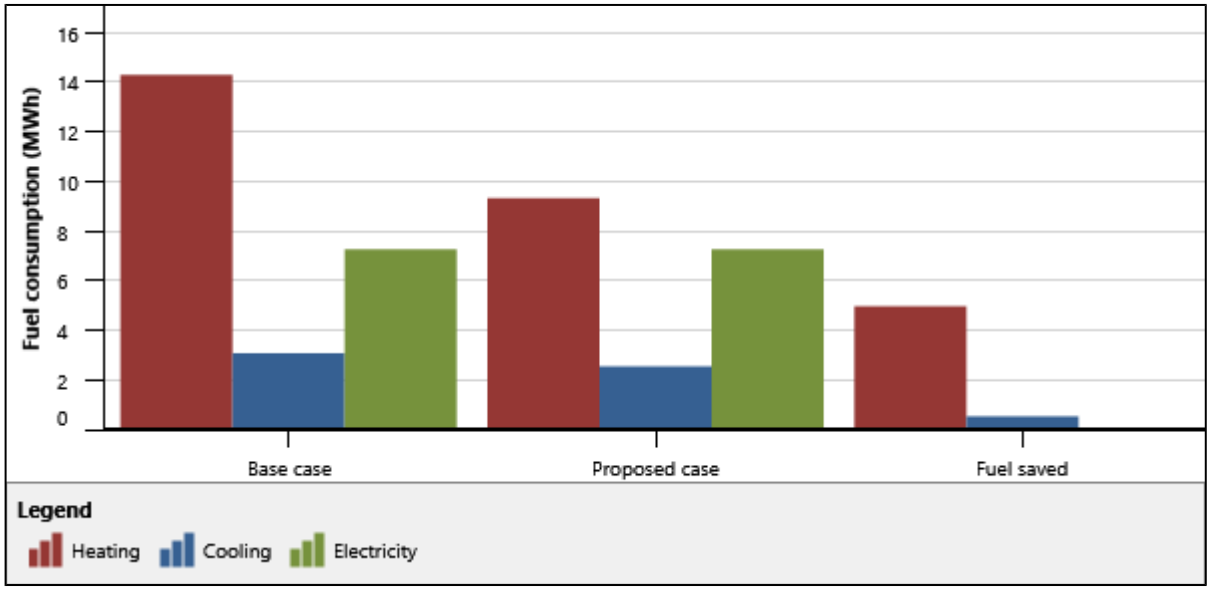
This report was prepared using the RETScreen Clean Energy Management Software. The key findings and recommendations of Higher Performance analysis for Townhomes are presented below:

Target

	Fuel consumption MWh	Fuel cost $	GHG emission tCO_2
Base case	24.6	2,258	2.9
Proposed case	19.1	2,472	1.4
Savings	5.5	-214	1.5
%	22.3%	-9.5%	53.3%

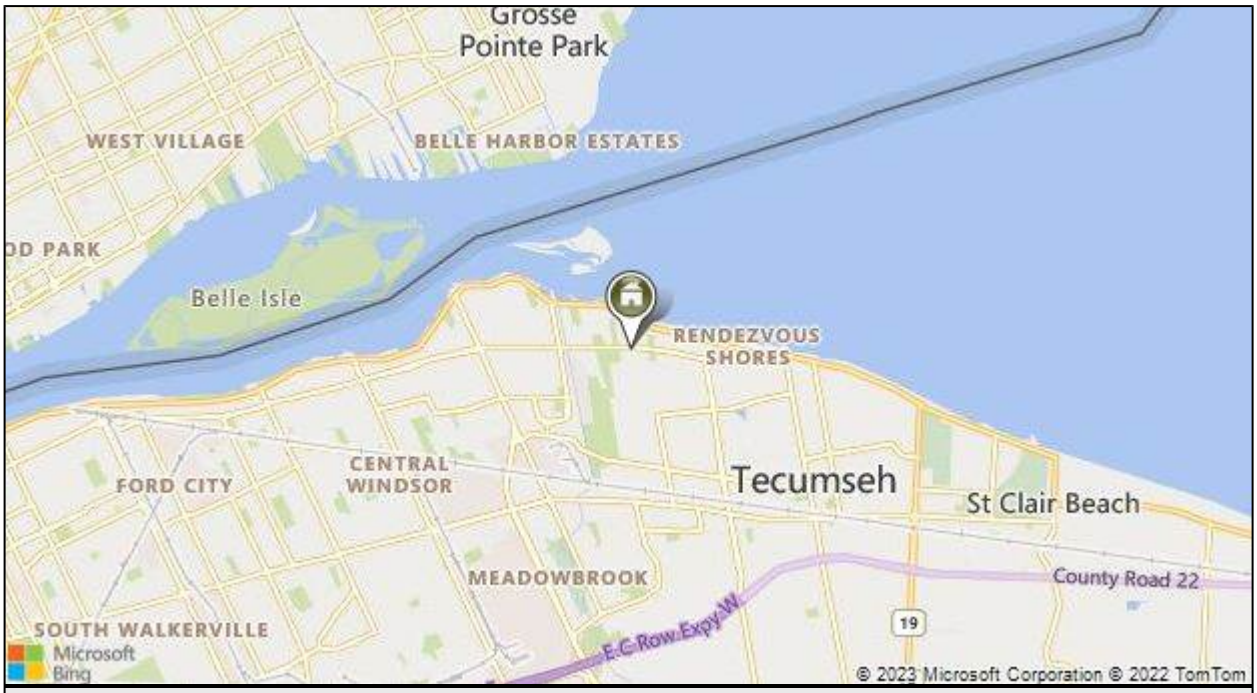
The main results are as follows:

Energy savings



Location | Climate data

Location



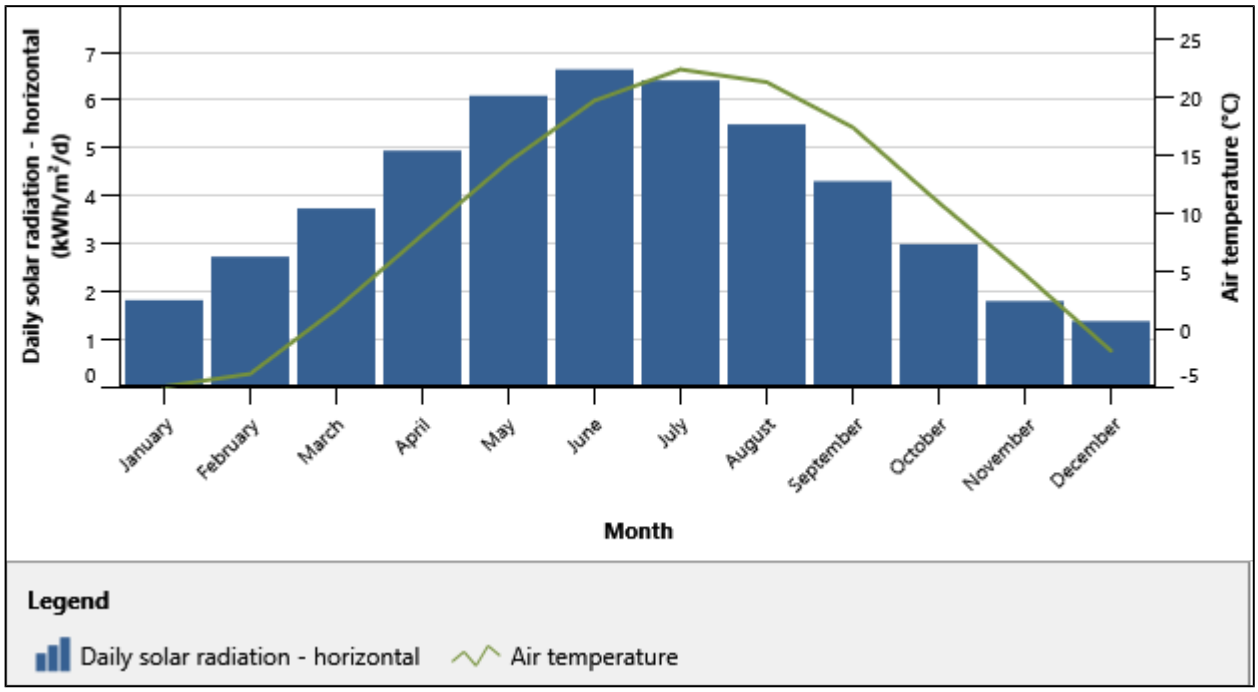
Legend

Facility location

Climate data location

	Unit	Climate data location	Facility location
Name		Canada - Ontario - Windsor Airport	Canada - ON - Windsor
Latitude	˚N	42.3	42.3
Longitude	˚E	-83.0	-82.9
Climate zone		5A - Cool - Humid	5A - Cool - Humid
Elevation	m	190	177

Climate data



Heating design temperature	-13.7
Cooling design temperature	30.3
Earth temperature amplitude	21.4

Month	Air temperature	Relative humidity	Precipitation	Daily solar radiation - horizontal	Atmospheric pressure	Wind speed	Earth temperature	Heating degree-days	Cooling degree-days
	°C	%	mm	kWh/m²/d	kPa	m/s	°C	°C-d	°C-d
January	-5.0	74.5%	46.81	1.81	99.4	5.6	-3.6	713	0
February	-3.9	71.5%	44.52	2.72	99.4	5.3	-2.9	613	0
March	1.7	68.2%	54.25	3.73	99.3	5.6	1.2	505	0
April	8.1	64.7%	71.70	4.94	99.2	5.3	6.9	297	0
May	14.4	65.0%	80.29	6.09	99.2	4.7	12.8	112	136
June	19.7	66.2%	80.70	6.64	99.2	4.2	18.3	0	291
July	22.4	67.9%	81.84	6.41	99.3	3.6	21.5	0	384
August	21.3	72.3%	79.67	5.49	99.4	3.3	21.0	0	350
September	17.4	72.1%	78.30	4.30	99.5	3.6	17.3	18	222
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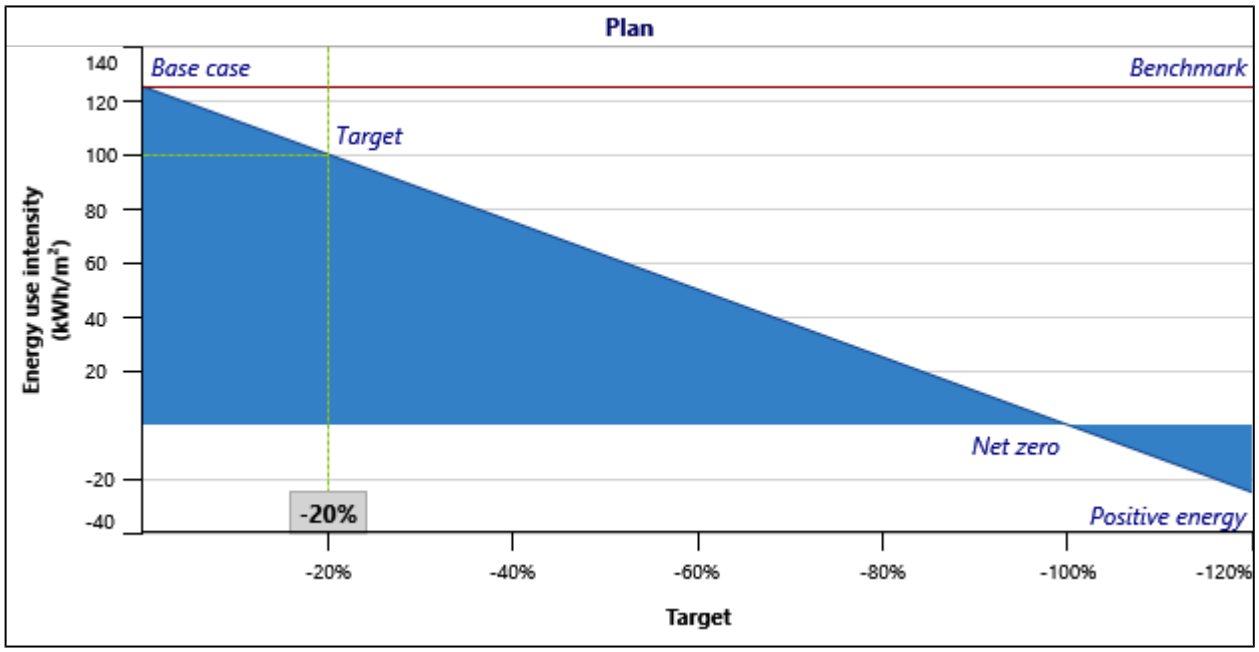
November	4.7	73.4%	64.50	1.79	99.3	4.7	5.0	399	0
December	-1.9	75.7%	56.11	1.37	99.4	5.0	-0.6	617	0
Annual	9.2	70.2%	803.79	4.03	99.3	4.6	9.1	3,494	1,412

Benchmark

Fuel consumption



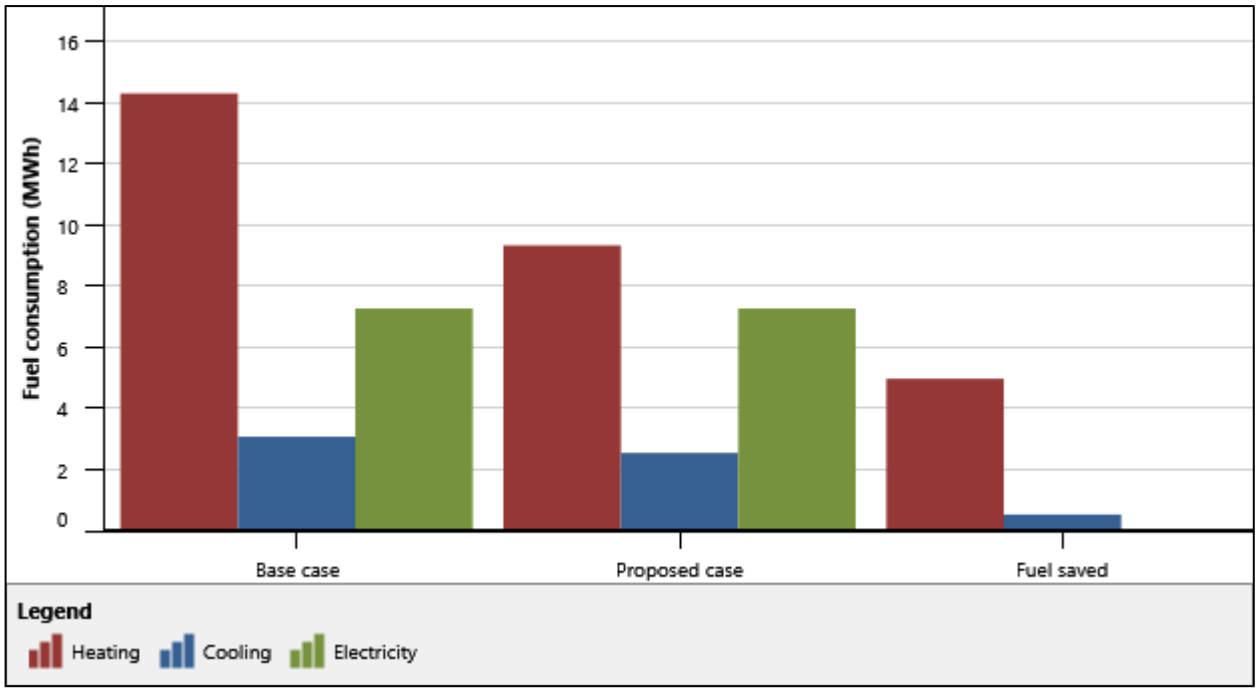
Facility size	196	m²
Benchmark	125	kWh/m²
Minimum - average	104	kWh/m²
Maximum - average	208	kWh/m²
Base case	125	kWh/m²
Reference year		
Set target	Target	
Year		
Target	-20%	
Proposed case	100	kWh/m²

Facility - Plan

Fuel consumption	Annual	
Base case	24,500	kWh
Proposed case	19,600	kWh
Fuel saved	4,900	kWh

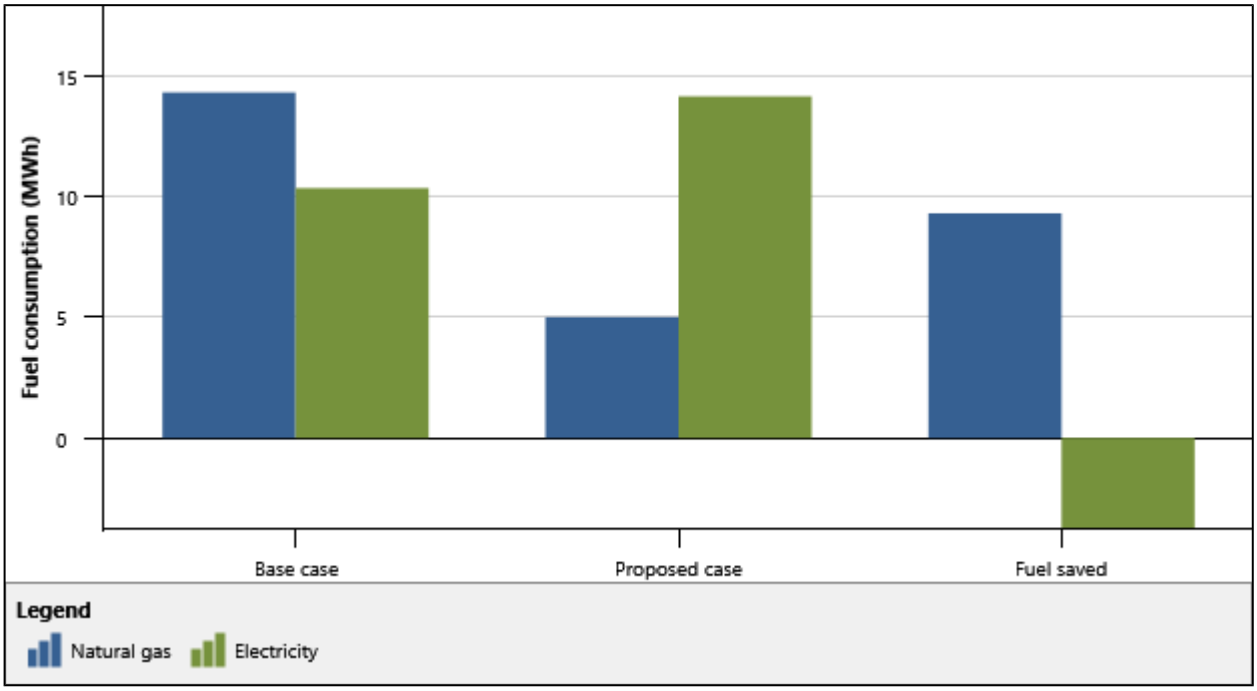
Energy savings | Fuel summary

Energy savings



Fuel consumption	Heating MWh	Cooling MWh	Electricity MWh	Total MWh
Base case	14.3	3.1	7.3	24.6
Proposed case	9.3	2.5	7.3	19.1
Fuel saved	5	0.53	0	5.5
Fuel saved - percent	34.8%	17.2%	0%	22.3%

Fuel summary

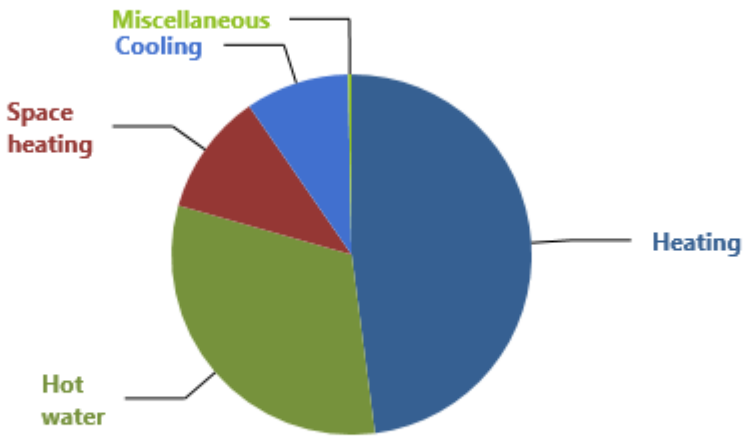


Fuel type	Fuel Unit	Base case Fuel consumption	Proposed case Fuel consumption	Savings Fuel saved
Natural gas	m³	1,345	470	874
Electricity	kWh	10,333	14,128	-3,795

Fuel type	Fuel Fuel rate	Base case Fuel cost	Proposed case Fuel cost	Savings Savings
Natural gas	0.45 $/m³	$ 605	$ 212	$ 393
Electricity	0.16 $/kWh	$ 1,653	$ 2,261	$ -607
Total		$ 2,258	$ 2,472	$ -214

End-use

Fuel saved



Section	Fuel saved kWh	Fuel saved %
Heating	2,634	47.9%
Hot water	1,730	31.5%
Space heating	603	11%
Cooling	512	9.3%
Miscellaneous	17	0.31%
Space cooling	17	0.31%

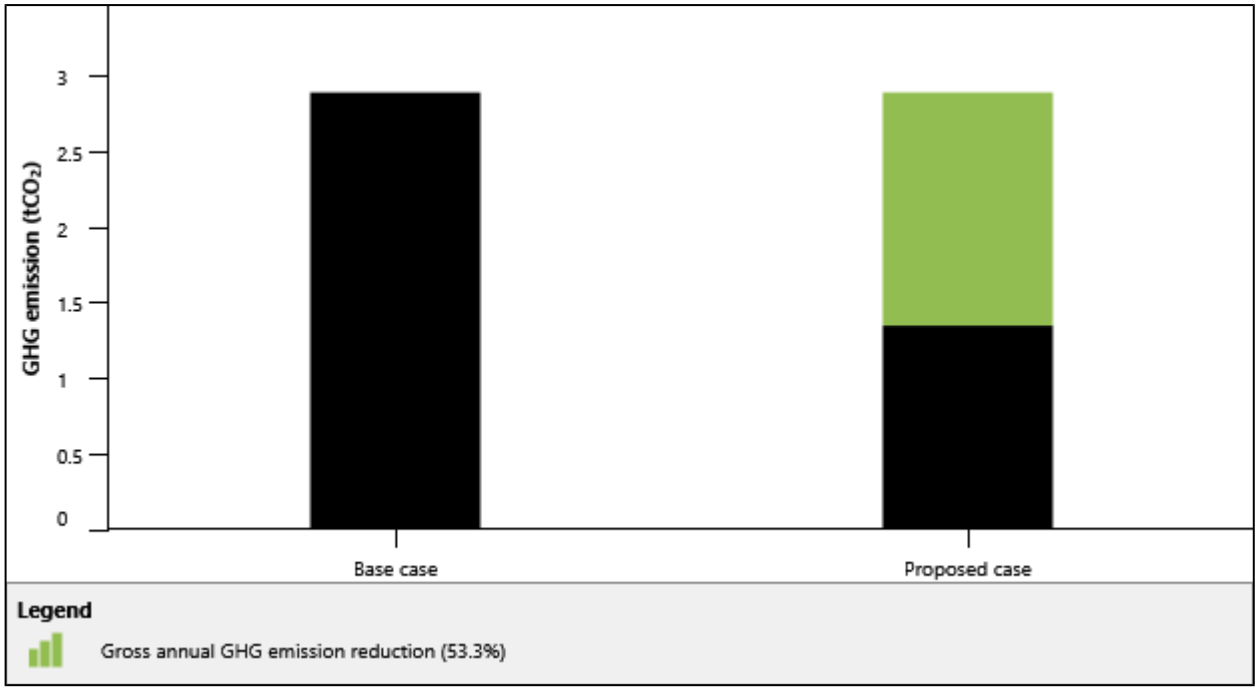
Target

Summary

	Fuel consumption MWh	Fuel cost $	GHG emission tCO_2
Base case	24.6	2,258	2.9
Proposed case	19.1	2,472	1.4
Savings	5.5	-214	1.5
%	22.3%	-9.5%	53.3%

GHG emission

GHG emission



GHG equivalence

1.5 tCO_2 is equivalent to 0.3

Cars & light trucks not used

GHG emission		
Base case	2.9	tCO_2
Proposed case	1.4	tCO_2
Gross annual GHG emission reduction	1.5	tCO_2

Appendix D

Near Zero Emissions (Townhomes)

Appendix D - Near Zero Emissions

Ganatachio Gardens

Residential - Attached dwellings

Prepared for:

Ganatchio Gardens Inc.

Prepared by:

Dillon Consulting Limited

Executive summary

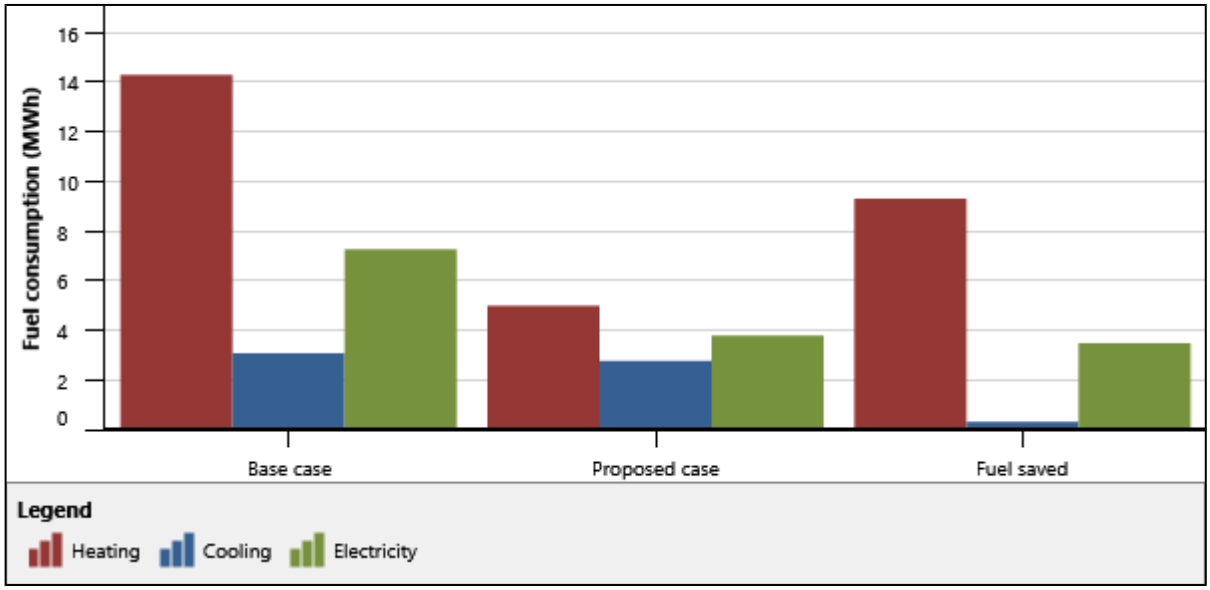
This report was prepared using the RETScreen Clean Energy Management Software. The key findings and recommendations of Near Zero Emissions analysis for Townhomes are presented below:

Target

	Fuel consumption MWh	Fuel cost $	GHG emission tCO_2
Base case	24.6	2,258	2.9
Proposed case	11.5	1,845	0.37
Savings	13.1	413	2.5
%	53.2%	18.3%	87.2%

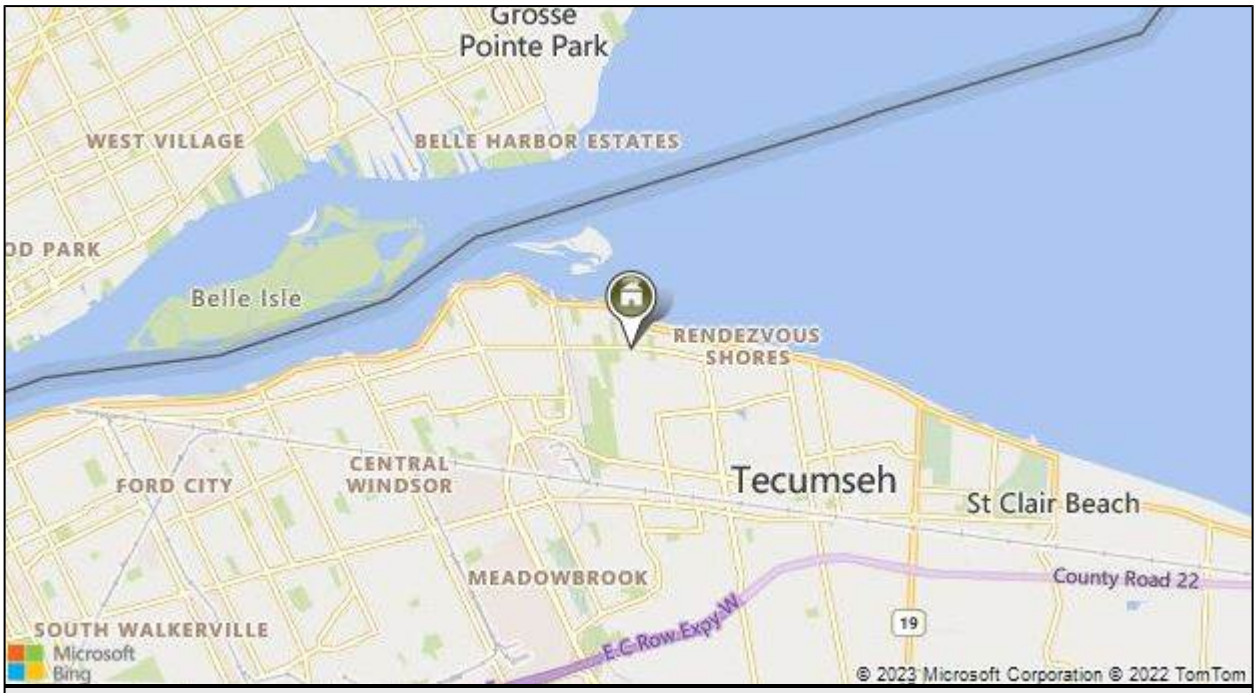
The main results are as follows:

Energy savings



Location | Climate data

Location



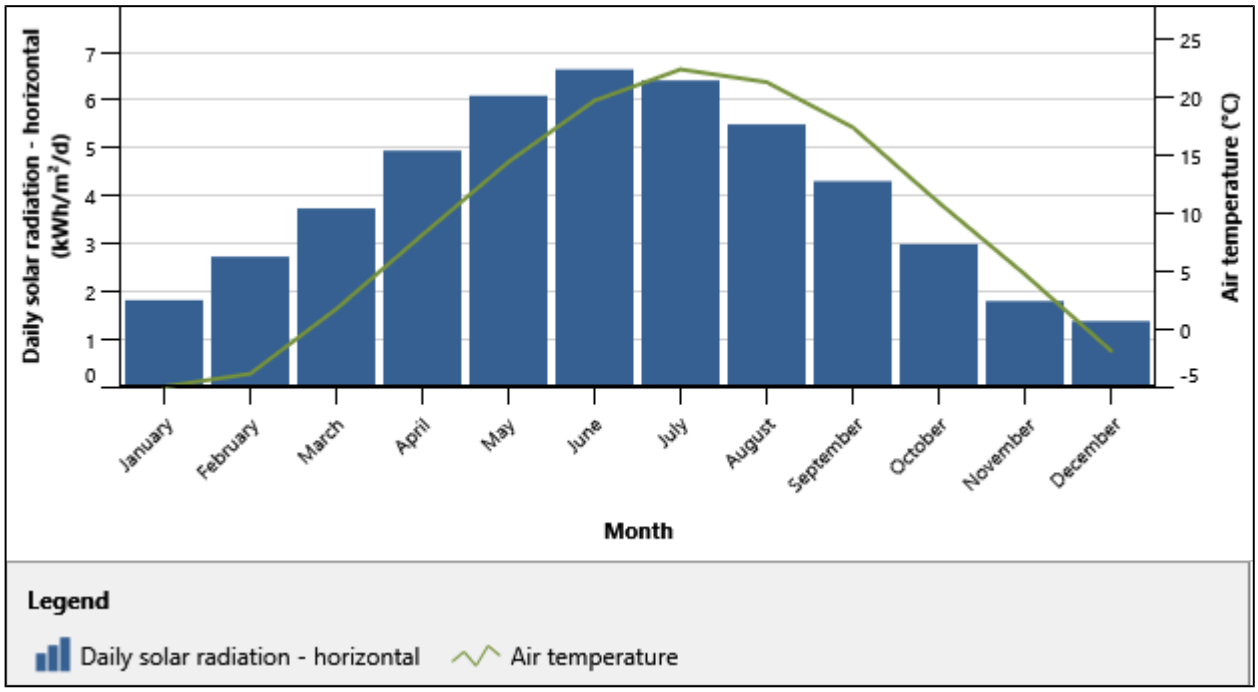
Legend

Facility location

Climate data location

	Unit	Climate data location	Facility location
Name		Canada - Ontario - Windsor Airport	Canada - ON - Windsor
Latitude	˚N	42.3	42.3
Longitude	˚E	-83.0	-82.9
Climate zone		5A - Cool - Humid	5A - Cool - Humid
Elevation	m	190	177

Climate data



Heating design temperature	-13.7
Cooling design temperature	30.3
Earth temperature amplitude	21.4

Month	Air temperature	Relative humidity	Precipitation	Daily solar radiation - horizontal	Atmospheric pressure	Wind speed	Earth temperature	Heating degree-days	Cooling degree-days
	°C	%	mm	kWh/m²/d	kPa	m/s	°C	°C-d	°C-d
January	-5.0	74.5%	46.81	1.81	99.4	5.6	-3.6	713	0
February	-3.9	71.5%	44.52	2.72	99.4	5.3	-2.9	613	0
March	1.7	68.2%	54.25	3.73	99.3	5.6	1.2	505	0
April	8.1	64.7%	71.70	4.94	99.2	5.3	6.9	297	0
May	14.4	65.0%	80.29	6.09	99.2	4.7	12.8	112	136
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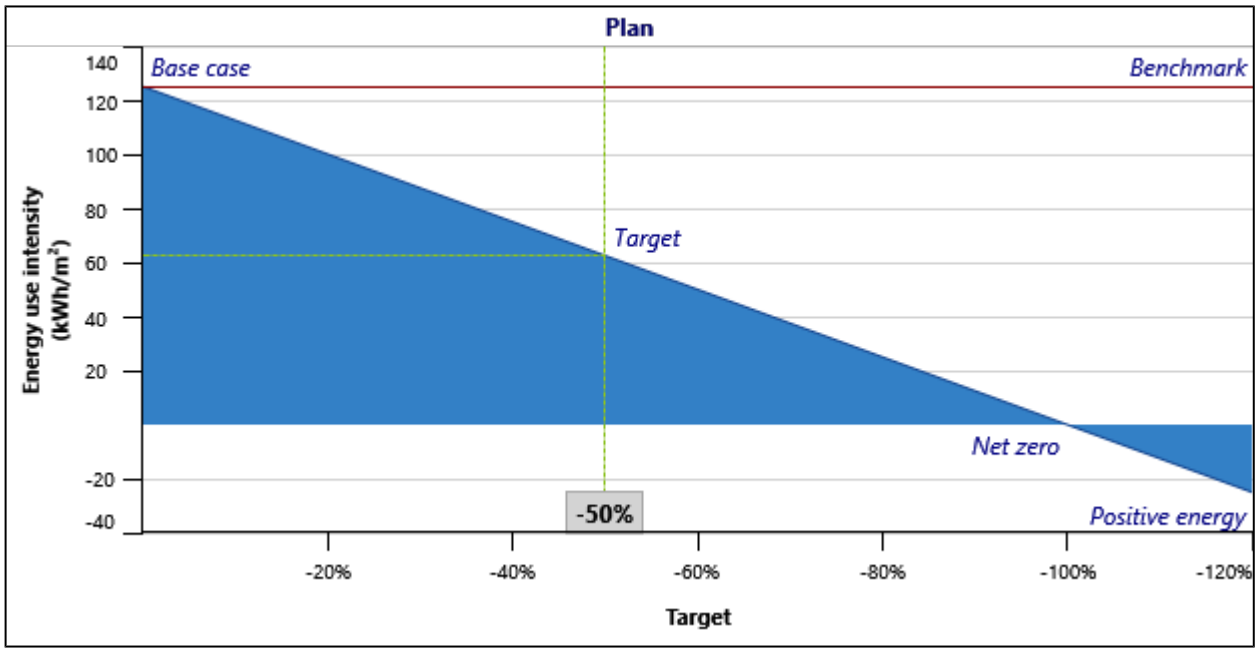
November	4.7	73.4%	64.50	1.79	99.3	4.7	5.0	399	0
December	-1.9	75.7%	56.11	1.37	99.4	5.0	-0.6	617	0
Annual	9.2	70.2%	803.79	4.03	99.3	4.6	9.1	3,494	1,412

Benchmark

Fuel consumption



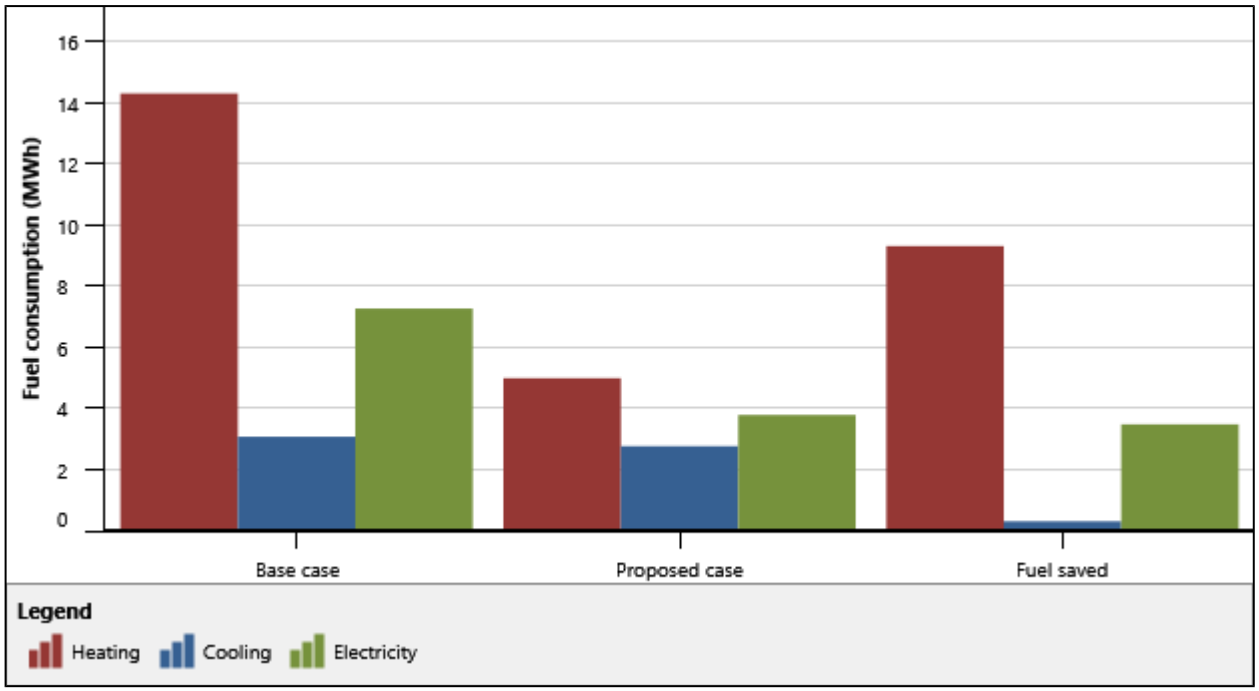
Facility size	196	m²
Benchmark	125	kWh/m²
Minimum - average	104	kWh/m²
Maximum - average	208	kWh/m²
Base case	125	kWh/m²
Reference year		
Set target	Target	
Year		
Target	-50%	
Proposed case	62.5	kWh/m²

Facility - Plan

Fuel consumption	Annual	
Base case	24,500	kWh
Proposed case	12,250	kWh
Fuel saved	12,250	kWh

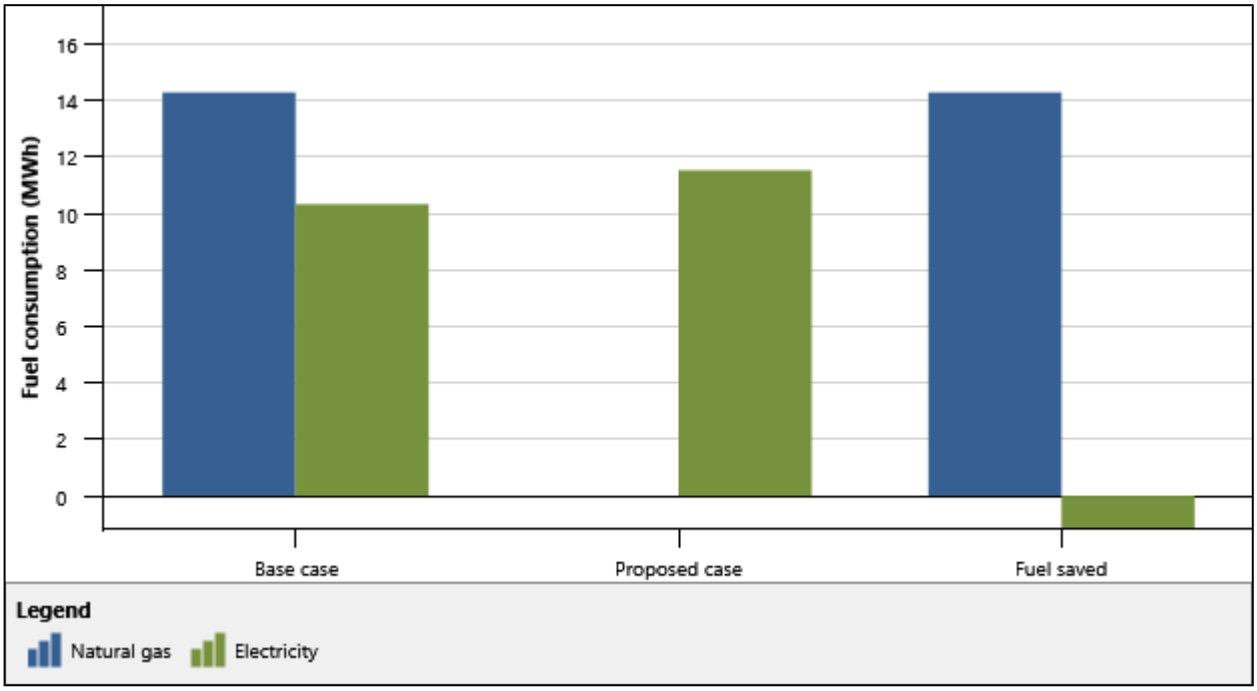
Energy savings | Fuel summary

Energy savings



Fuel consumption	Heating MWh	Cooling MWh	Electricity MWh	Total MWh
Base case	14.3	3.1	7.3	24.6
Proposed case	5	2.8	3.8	11.5
Fuel saved	9.3	0.31	3.5	13.1
Fuel saved - percent	65.1%	10%	47.9%	53.2%

Fuel summary

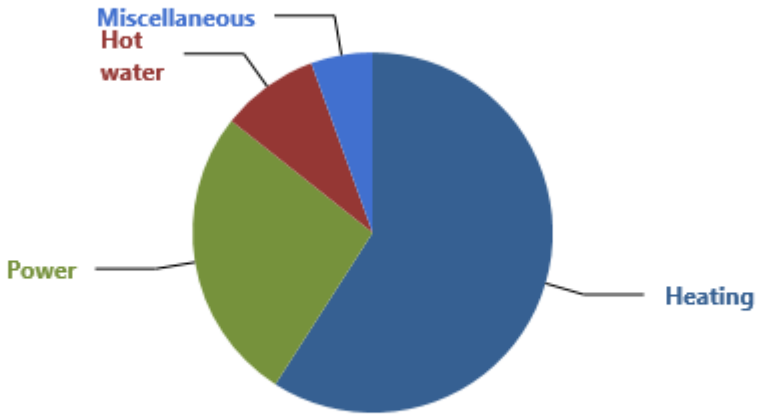


Fuel type	Fuel Unit	Base case Fuel consumption	Proposed case Fuel consumption	Savings Fuel saved
Natural gas	m³	1,345	0	1,345
Electricity	kWh	10,333	11,534	-1,201

Fuel type	Fuel Fuel rate	Base case Fuel cost	Proposed case Fuel cost	Savings Savings
Natural gas	0.45 $/m³	$ 605	$ 0	$ 605
Electricity	0.16 $/kWh	$ 1,653	$ 1,845	$ -192
Total		$ 2,258	$ 1,845	$ 413

End-use

Fuel saved



Section	Fuel saved kWh	Fuel saved %
Heating	7,733	59.1%
Power	3,478	26.6%
Hot water	1,153	8.8%
Miscellaneous	725	5.5%
Space heating	417	3.2%
Cooling	279	2.1%
Space cooling	29	0.22%

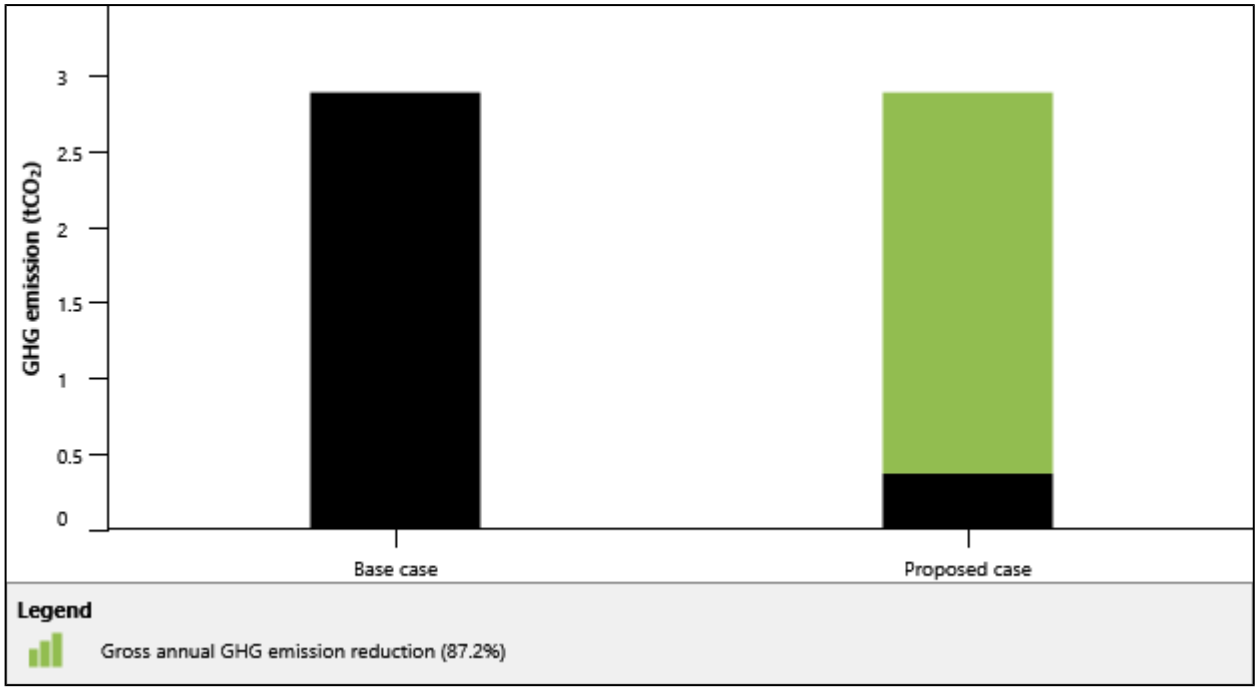
Target

Summary

	Fuel consumption MWh	Fuel cost $	GHG emission tCO_2
Base case	24.6	2,258	2.9
Proposed case	11.5	1,845	0.37
Savings	13.1	413	2.5
%	53.2%	18.3%	87.2%

GHG emission

GHG emission



GHG equivalence

2.5 tCO_2 is equivalent to 0.5

Cars & light trucks not used

GHG emission		
Base case	2.9	tCO_2
Proposed case	0.4	tCO_2
Gross annual GHG emission reduction	2.5	tCO_2

References

[1] - “Electricity Rates.” ENWIN Utilities, https://enwin.com/electric-rates-residential/.

[2] - “Natural Gas Rates.” Enbridge Gas., Natural Gas Rates | Ontario Energy Board, https://www.oeb.ca/consumer-information-and-protection/natural-gas-rates.