Lakefront Heights Inc.

Official Plan and Zoning By-Law Amendments

Energy Strategy
Lakefront Heights Development
Windsor, Ontario

June 2024 – 21-2104

Table of Contents

Tables

Appendices

1.0 Executive Summary

Dillon Consulting Limited was engaged by Lakefront Heights Inc. to develop an Energy Strategy for the proposed townhomes and multi-unit residential buildings at Wyandotte Street East east of Clover Street in Windsor, Ontario. The goal for this report 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 18 attached townhomes and two (2) 13 story residential buildings with 220 units in total to be constructed on 16,333 m^2 of land. The attached townhome-style units consist of row houses split into 2 areas, with one area containing 8 units and the other with 10 units attached to the main structure.

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 two multi-unit buildings is 48,954m^2 *(526,936 ft^2).*

2) Number of Units: 220 Multi-unit Residential, and 18 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
- Energy consumption & efficiency
- Energy resilience suitable for residential use
- Feasibility and constructability
- 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 explored a range of technologies tailored to the applications within the building type, with an emphasis on minimizing the use of energy and fuel-fired equipment. The study's primary focus encompasses the following alternatives for the two (2) types of buildings:

<u>Multi-Unit Residential Buildings:</u>

1. Higher Performance
    a. Higher thermal efficiency of fuel-fired furnace system serving the rooftop units
    b. Domestic Hot Water:
        i. Fuel Fired DHW [Baseline] to Electric DHW tanks
        ii. Low flow aerators and showerheads
        iii. High efficiency drain water heat recovery
    c. Installation of high efficiency Heat Recovery System for ventilation
    d. LED lighting & controls through occupancy and daylight sensors in common areas, exterior spaces, and parking garages

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

2. Near Zero

   All of the above measures with addition to:

   a. Ground Source Heat Pump for space heating and cooling
   b. Building envelope - increased wall insulation +2" XPS (+R-10), roof insulation (R-60), and air tightness
   c. 200 kW Photovoltaic System installed on the building roof, surrounding area and/or offsite
   d. High efficiency HVAC fan and motor units

Townhomes:

1. Higher Performance
   a. Thermal efficiency of fuel-fired furnace with DX Cooling:
      i. High Efficiency Multi Stage Furnaces
      ii. High efficiency DX Air Conditioning unit
   b. Domestic Hot Water:
      i. Fuel Fired [Baseline] to 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 +.5" XPS (+R-5) and air tightness

3.1.2 Low-Carbon Solutions

This strategy explored two (2) low carbon solutions, comprising a photovoltaic system and high-performance HVAC systems (utilizing an air source heat pump for the townhomes and a ground source heat pump for the multi-unit buildings).

Consideration was given to implementing a solar photovoltaic (PV) system with the aim of alleviating a portion of the electricity demand and ensuring the provision of essential amenities such as interior and exterior lighting. The potential application of the PV system extended to both the townhomes and the multi-unit residential building, contingent upon the availability of roof space or suitable ground-mounted installations in the surrounding areas or off-site locations. The devised strategy involved a 3kW system for each individual townhome and a 200kW system for each multi-unit residential building, striving to approach net-zero targets. This system would empower the structures to generate renewable energy,

enhance energy resilience, and facilitate the accommodation of heightened electricity loads resulting from 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 standard efficiency rating for ground source heat pumps ranges between 2.5-4 times the output per kW of electricity consumed for heating and cooling, while for air source heat pumps, it falls between 1.3-2 times. In the context of this analysis, the assumption was made based on the consideration of the highest efficiency units.

3.1.3 Energy Resilience

The energy strategy considered energy resilience, especially given the building type as a multi-unit residential structure. In light of rising global temperatures and the occurrence of extreme weather events, it is crucial for designs to thoroughly assess potential threats, including prolonged heatwaves, intense rainfall events, and power outages.

For the multi-unit building, the consideration of an emergency power generator becomes essential. This generator would serve the purpose of supplying emergency power to critical life safety systems and enhancing the overall energy resilience of the building. Proper sizing and connection of the generator to the necessary electrical panels within the building are imperative to sustain 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 incorporation of electric vehicle (EV) charging stations within the underground parking facility. As per the current regulations outlined in the Ontario Building Code, the installation of EV chargers and the associated infrastructure is mandatory for all new buildings. With the

increasing production and demand for electric vehicles in society, it is imperative that the infrastructure be well-prepared to handle both present and future loads.

3.2 Analysis and Preferred Scenarios

Three scenarios were considered in the analysis for the multi-unit 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-Unit Residential Building

The estimated annual energy use for one multi-unit 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	742,749	209,806	1,300,253	2,252,808
2: Higher Performance	449,532 (39.5%)	180,179 (14.1%)	1,099,167 (15.5%)	1,728,878 (23.3%)
3: Near Zero Emissions	213,195 (71.3%)	169,805 (19.1%)	744,465 (42.7%)	1,127,466 (50%)

The GHG emissions savings for Scenario 2 account is (83) tCO2e in reductions, and for Scenario 3 is (146) tCO2e in reductions. The annual GHG Emissions savings for the two multi-unit residential buildings can be approximated as:

Table 3: GHG Savings – Multi-Unit Residential

	GHG Savings – 1 MURB (tCO2e)	GHG Savings – 2 MURB (tCO2e)
1: Baseline	-	-
2: Higher Performance	83	166
3: Near Zero Emissions	146	292

3.2.2 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 4: 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 estimated as:

Table 5: GHG Savings - Townhomes

	GHG Savings – Individual Row Home (tCO2e)	GHG Savings – 19 Townhomes (tCO2e)
1: Baseline	-	-
2: Higher Performance	1.5	28.5
3: Near Zero	2.5	47.5

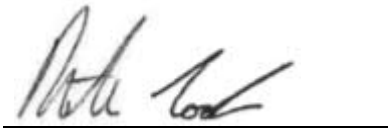
4.0 Conclusions and Recommendations

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 2 multi-unit buildings and 18 townhomes) is 2,354 MWhe and 340 tCO2e. This represents approximately 50% reductions in energy consumption and 81% in GHG emissions over the baseline and is equivalent to taking off the road about 62 cars and light truck vehicles driven for one year.

It is suggested 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-unit buildings, the total annual Carbon cost reduced by 2030 would be $28,220 for Scenario 2; and $49,640 for Scenario 3. With regards to the townhomes, the carbon reductions are $4,875 for scenario 2; and $8,075 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.

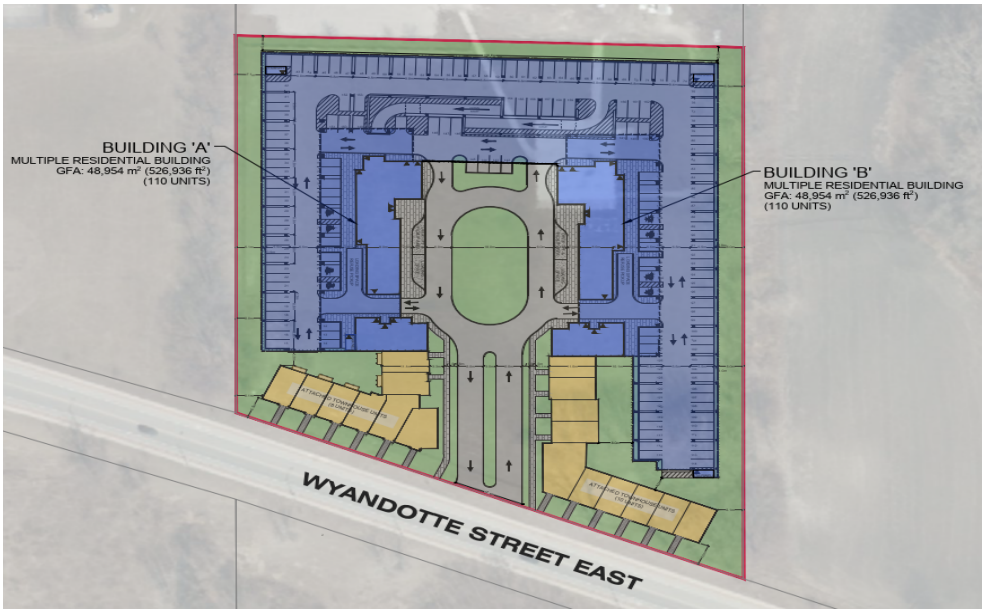
Appendix A

High Performance (MURB)

Carbon Mitigation Strategy

Appendix A - Higher Performance

Lakefront Heights Development



Residential - Multi-unit housing

Prepared for:

Lakefront Heights Inc.

Prepared by:

Dillon Consulting Limited

DILLON CONSULTING

Executive summary

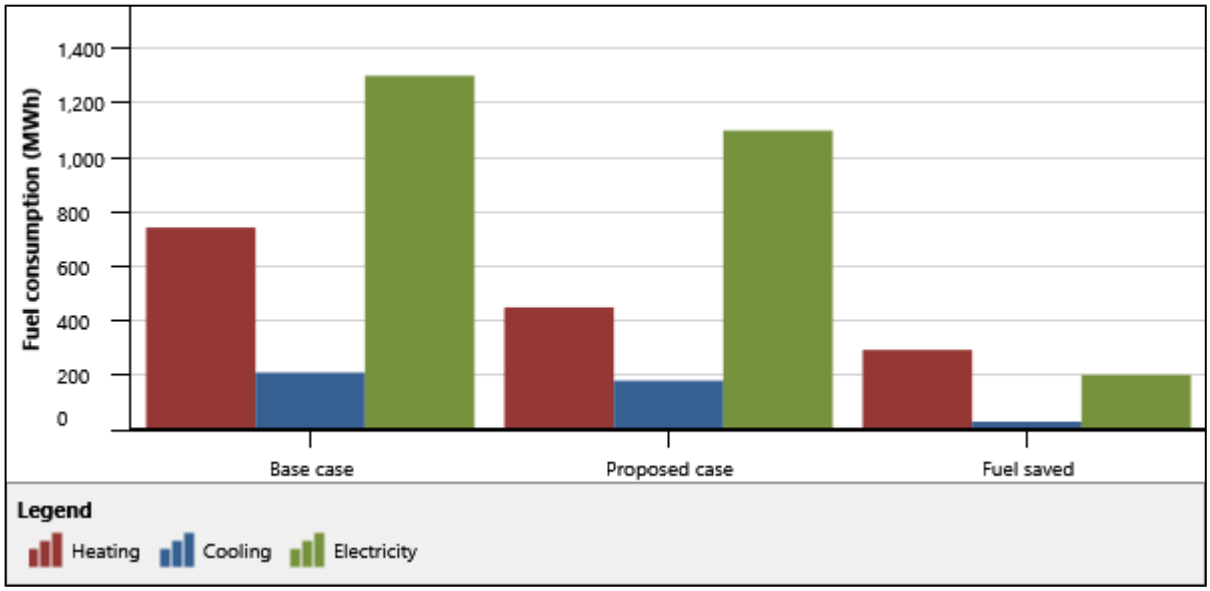
This report was prepared using the RETScreen Clean Energy Management Software. The key findings and recommendations of Higher Performance analysis for Multi unit residential building iis presented below:

Target

	Fuel consumption MWh	Fuel cost $	GHG emission tCO_2
Base case	2,253	273,059	182
Proposed case	1,729	242,077	99
Savings	524	30,982	83
%	23.3%	11.3%	45.6%

The main results are as follows:

Energy savings



Location | Climate data

Location

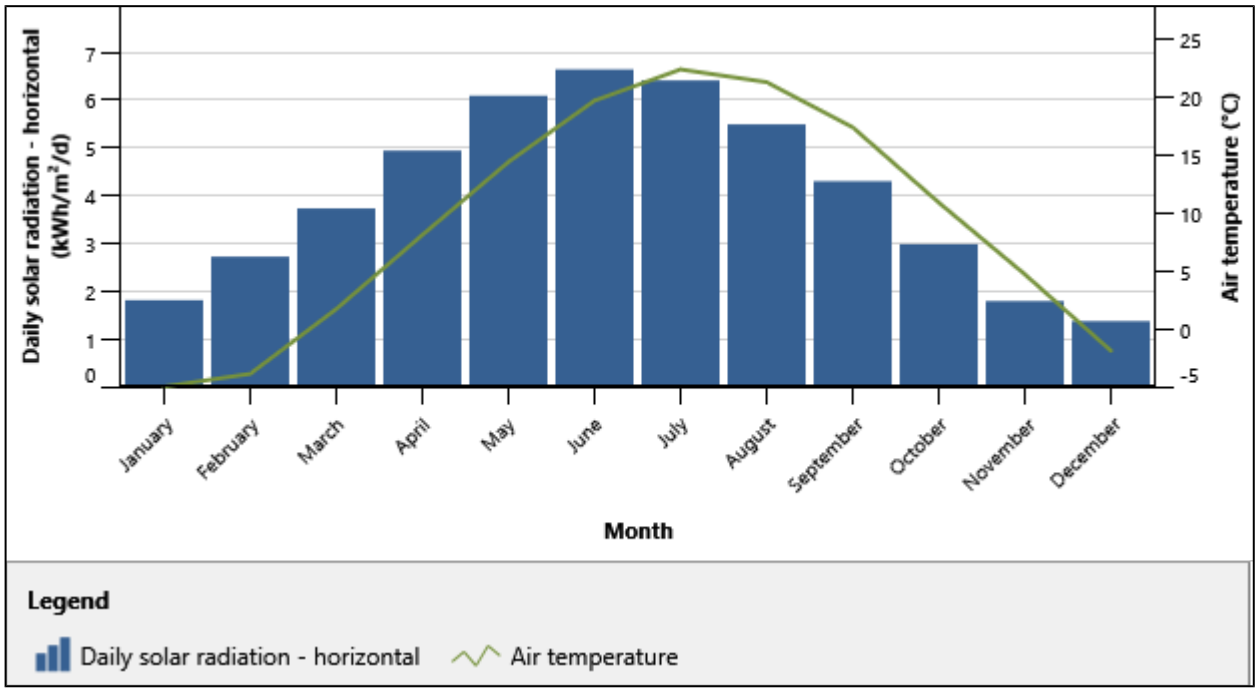
Legend

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

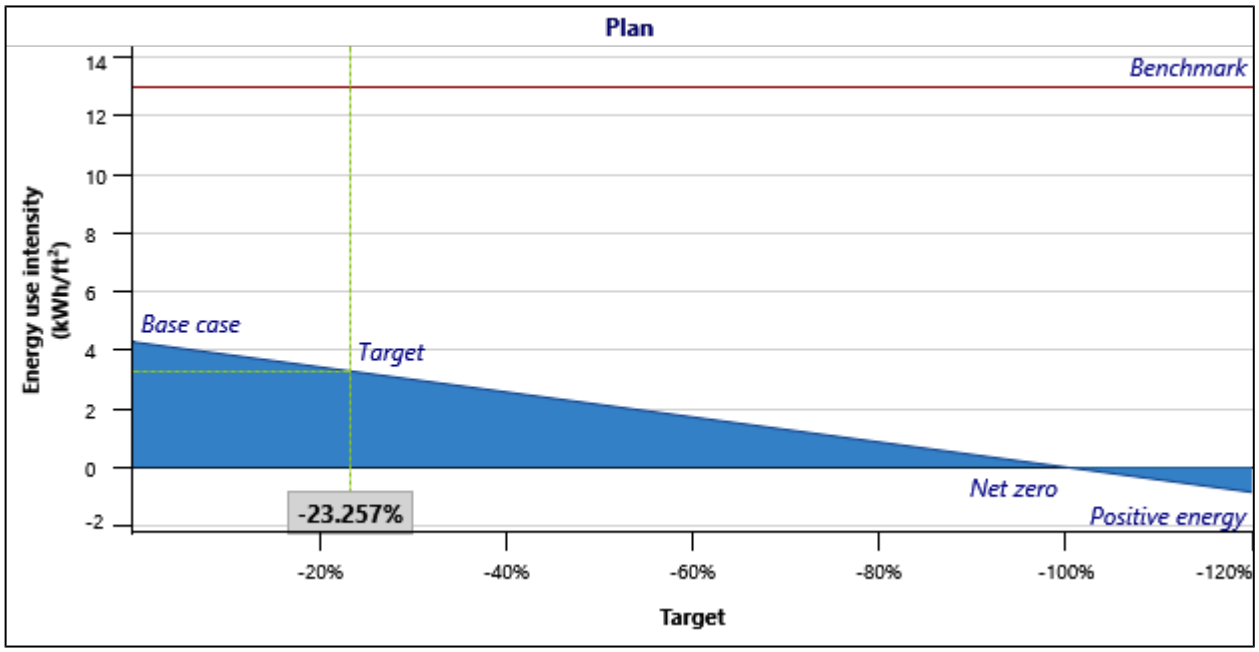


Heating design temperature	-13.7
Cooling design temperature	30.3
Earth temperature amplitude	21.4

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



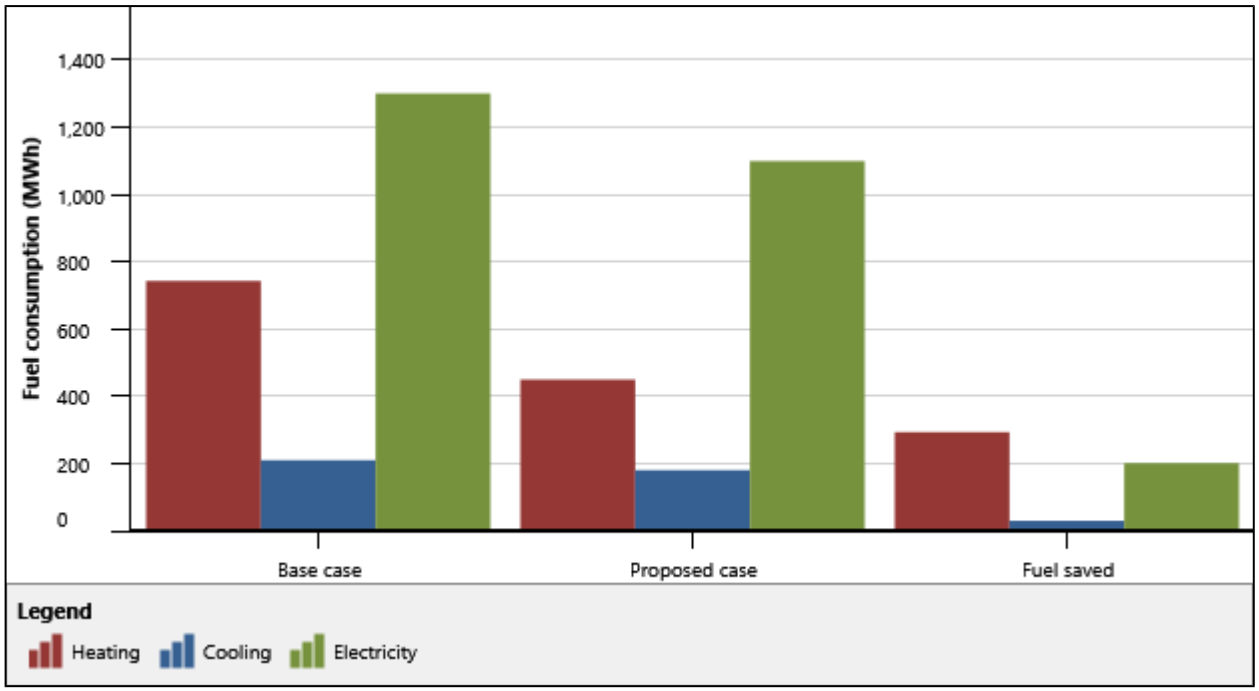
Facility size	526,936	ft²
Benchmark	13	kWh/ft²
Minimum - average	10.2	kWh/ft²
Maximum - average	16.4	kWh/ft²
Base case	4.3	kWh/ft²
Reference year		
Set target	Target	
Year		
Target	-23.3%	
Proposed case	3.3	kWh/ft²

Facility - Plan

Fuel consumption	Annual	
Base case	2,252,808	kWh
Proposed case	1,728,878	kWh
Fuel saved	523,931	kWh

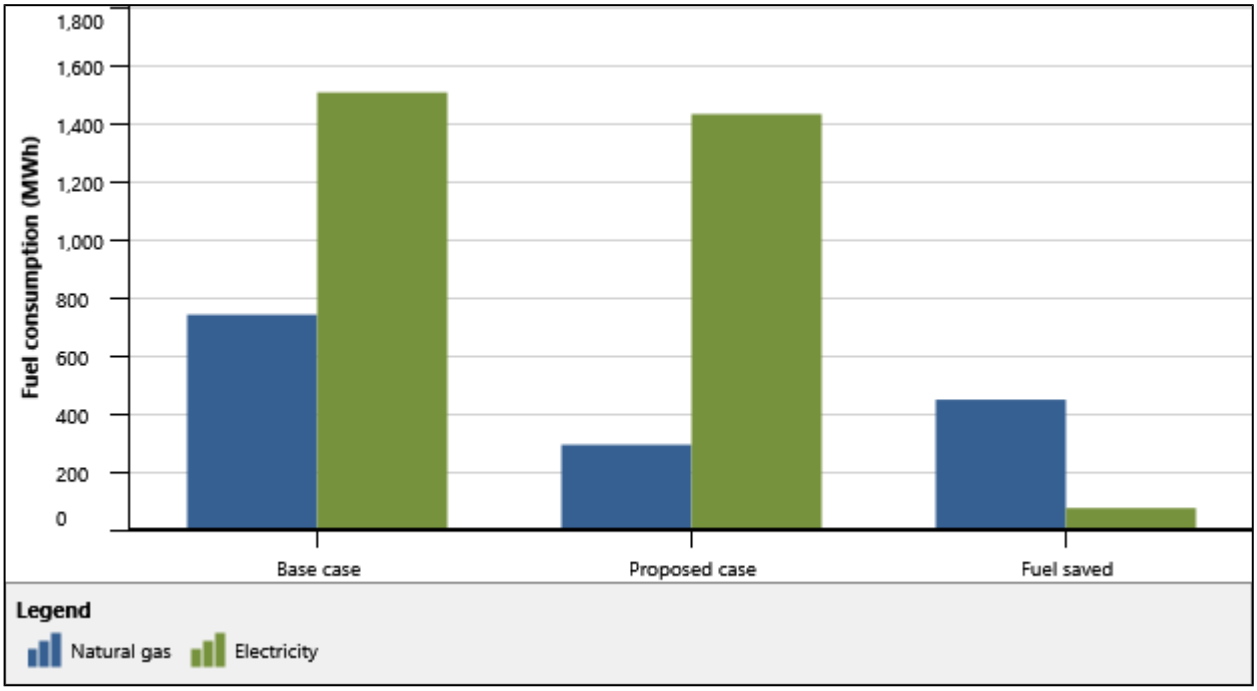
Energy savings | Fuel summary

Energy savings



Fuel consumption	Heating kWh	Cooling kWh	Electricity kWh	Total kWh
Base case	742,749	209,806	1,300,253	2,252,808
Proposed case	449,531	180,179	1,099,167	1,728,878
Fuel saved	293,218	29,627	201,086	523,931
Fuel saved - percent	39.5%	14.1%	15.5%	23.3%

Fuel summary

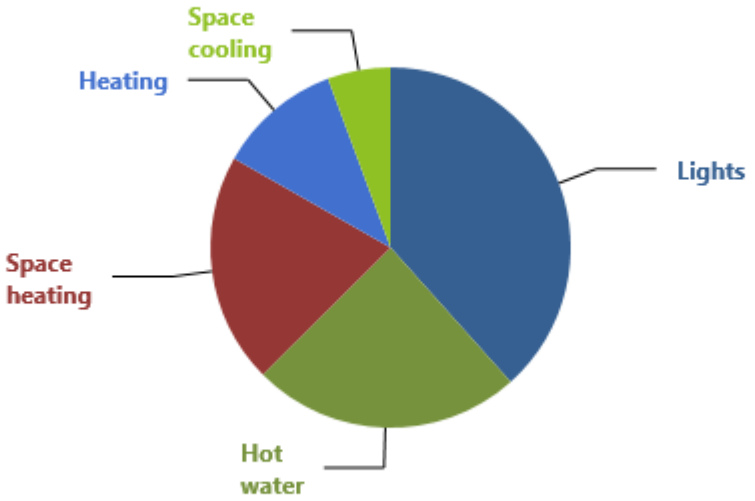


Fuel type	Fuel Unit	Base case Fuel consumption	Proposed case Fuel consumption	Savings Fuel saved
Natural gas	m³	69,888	27,625	42,262
Electricity	kWh	1,510,059	1,435,285	74,775

Fuel type	Fuel Fuel rate	Base case Fuel cost	Proposed case Fuel cost	Savings Savings
Natural gas	0.45 $/m³	$ 31,449	$ 12,431	$ 19,018
Electricity	0.16 $/kWh	$ 241,609	$ 229,646	$ 11,964
Total		$ 273,059	$ 242,077	$ 30,982

End-use

Fuel saved



Section	Fuel saved kWh	Fuel saved %
Lights	201,086	38.4%
Hot water	126,700	24.2%
Space heating	108,319	20.7%
Heating	58,198	11.1%
Space cooling	29,627	5.7%

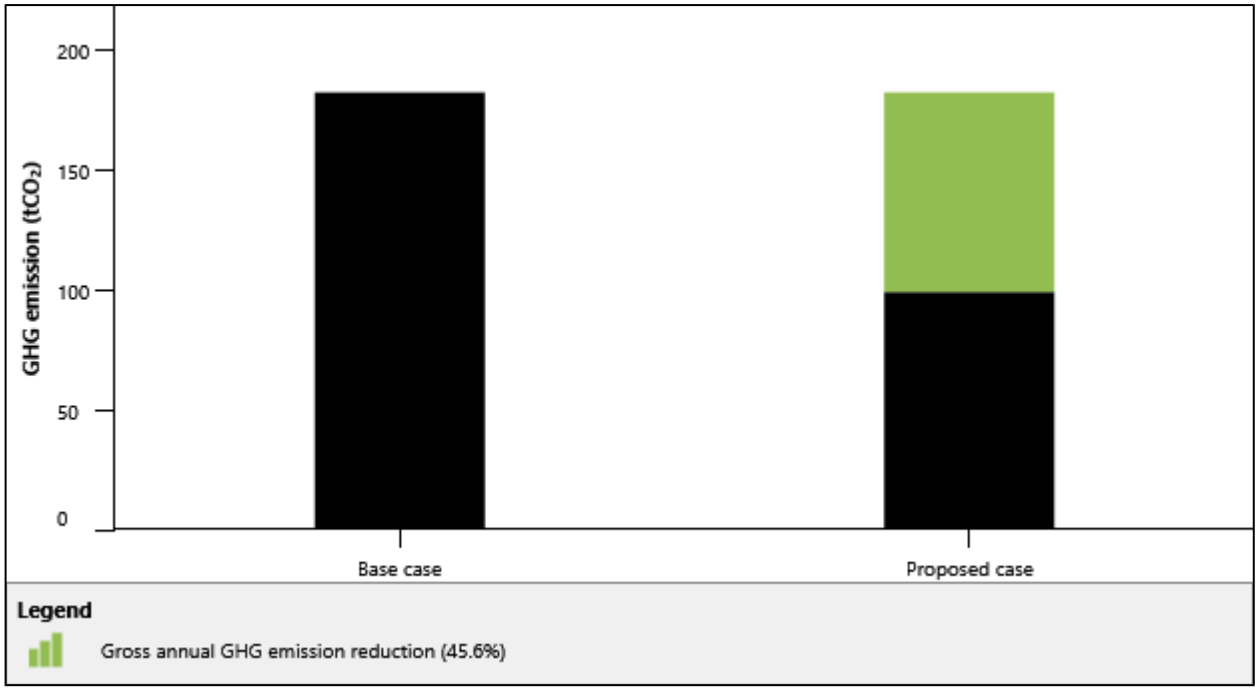
Target

Summary

	Fuel consumption MWh	Fuel cost $	GHG emission tCO_2
Base case	2,253	273,059	182
Proposed case	1,729	242,077	99
Savings	524	30,982	83
%	23.3%	11.3%	45.6%

GHG emission

GHG emission



GHG equivalence

83 tCO_2 is equivalent to 15.2

Cars & light trucks not used

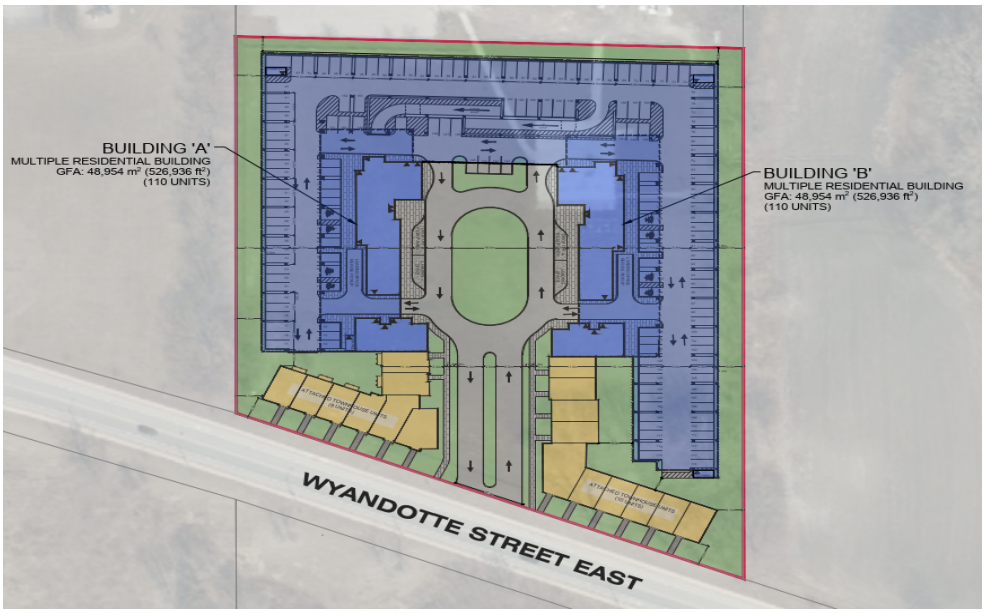
GHG emission		
Base case	182	tCO_2
Proposed case	99	tCO_2
Gross annual GHG emission reduction	83	tCO_2

Appendix B

Near Zero Emissions (MURB)

Appendix B - Near Zero Emissions

Lakefront Heights Development



Residential - Multi-unit housing

Prepared for:

Lakefront Heights Inc.

Prepared by:

Dillon Consulting Limited

DILLON CONSULTING

Executive summary

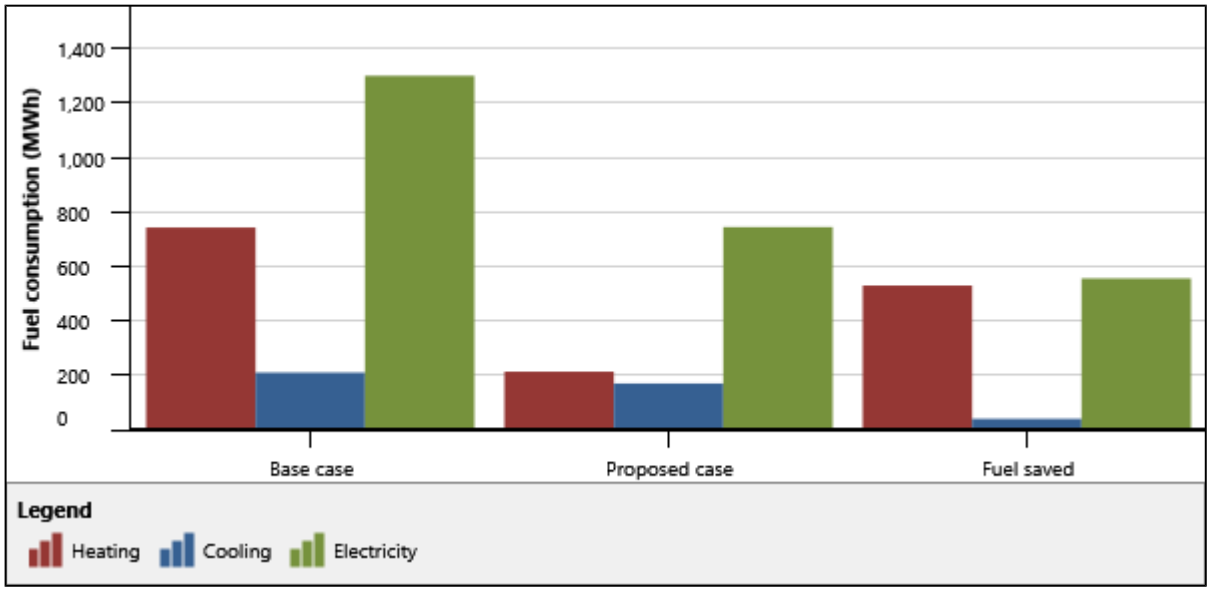
This report was prepared using the RETScreen Clean Energy Management Software. The key findings and recommendations of Higher Performance analysis for the Multi unit residential building iis presented below:

Target

	Fuel consumption MWh	Fuel cost $	GHG emission tCO_2
Base case	2,253	273,059	182
Proposed case	1,127	180,394	36.4
Savings	1,125	92,664	146
%	50%	33.9%	80%

The main results are as follows:

Energy savings



Location | Climate data

Location

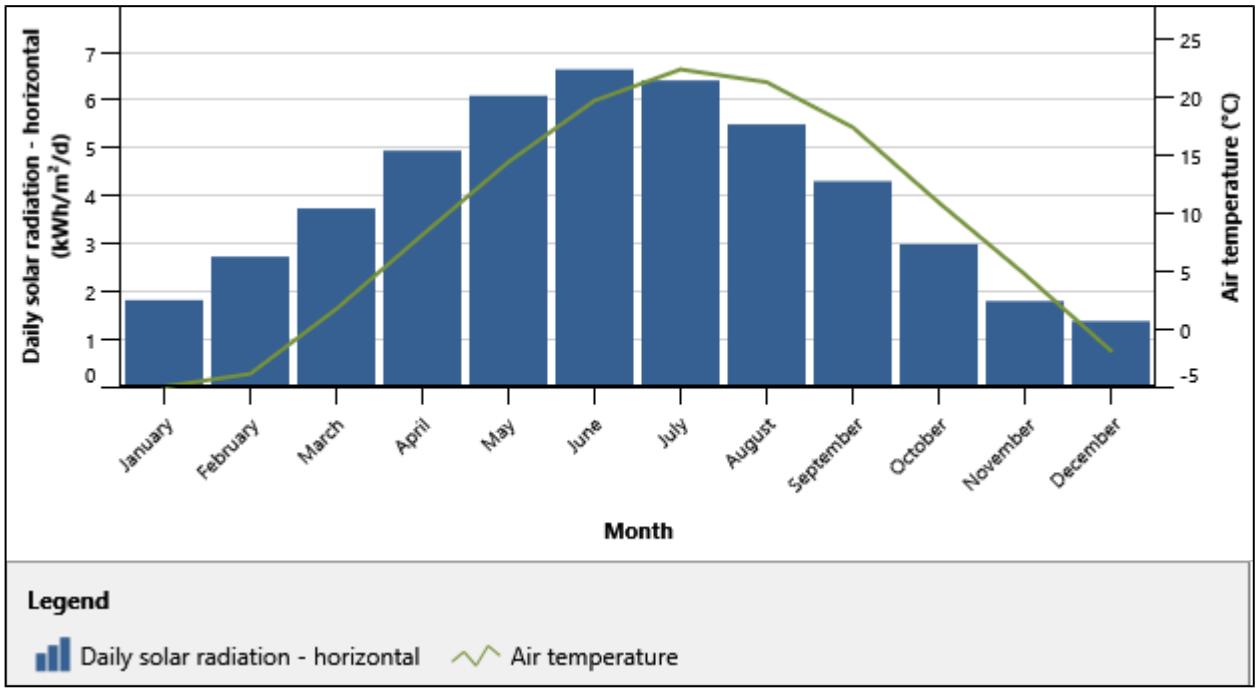
Legend

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

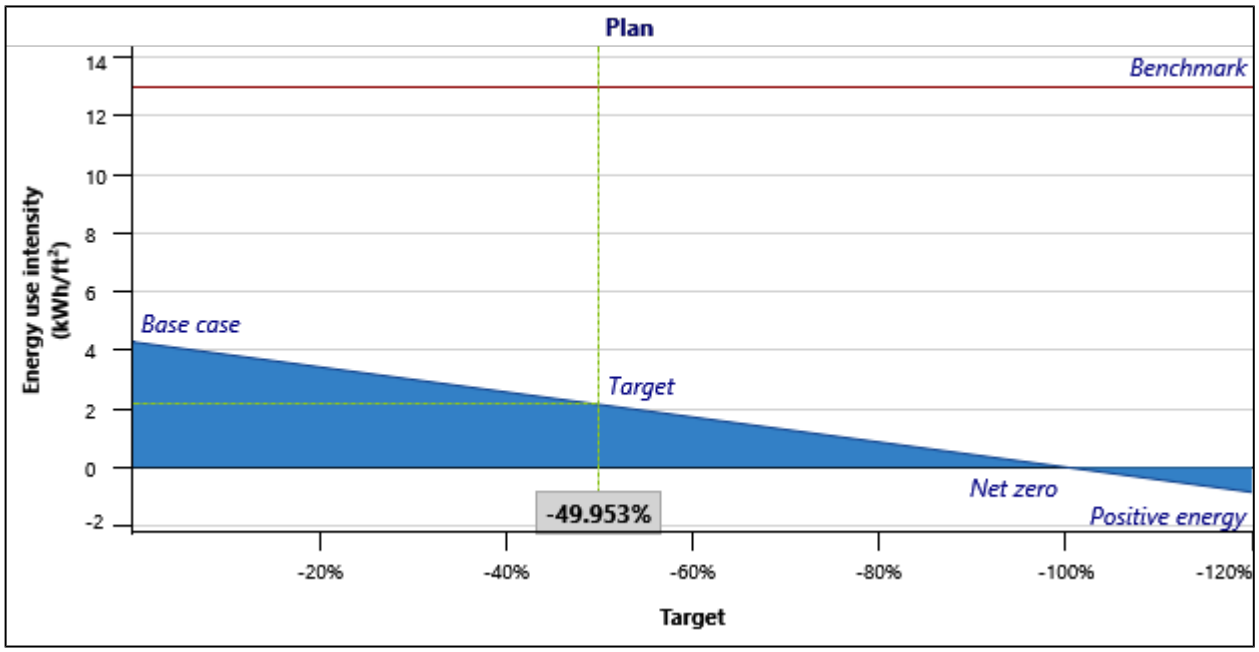


Heating design temperature	-13.7
Cooling design temperature	30.3
Earth temperature amplitude	21.4

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



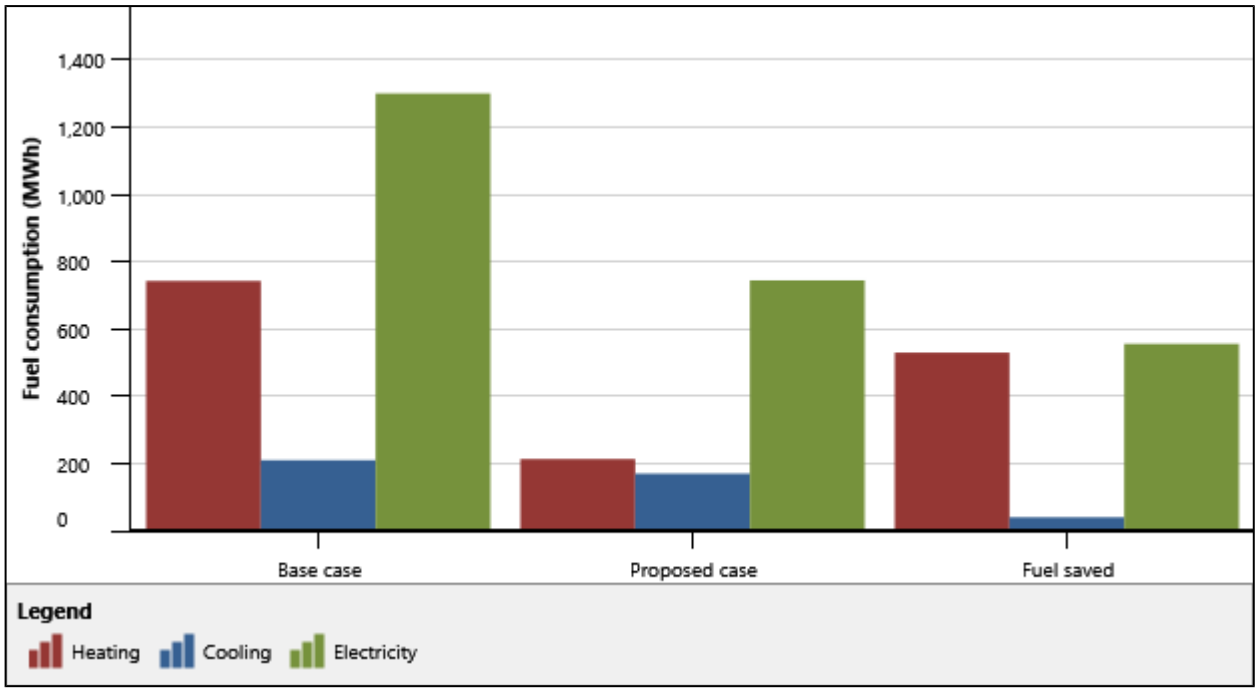
Facility size	526,936	ft²
Benchmark	13	kWh/ft²
Minimum - average	10.2	kWh/ft²
Maximum - average	16.4	kWh/ft²
Base case	4.3	kWh/ft²
Reference year		
Set target	Target	
Year		
Target	-50%	
Proposed case	2.1	kWh/ft²

Facility - Plan

Fuel consumption	Annual	
Base case	2,252,808	kWh
Proposed case	1,127,466	kWh
Fuel saved	1,125,343	kWh

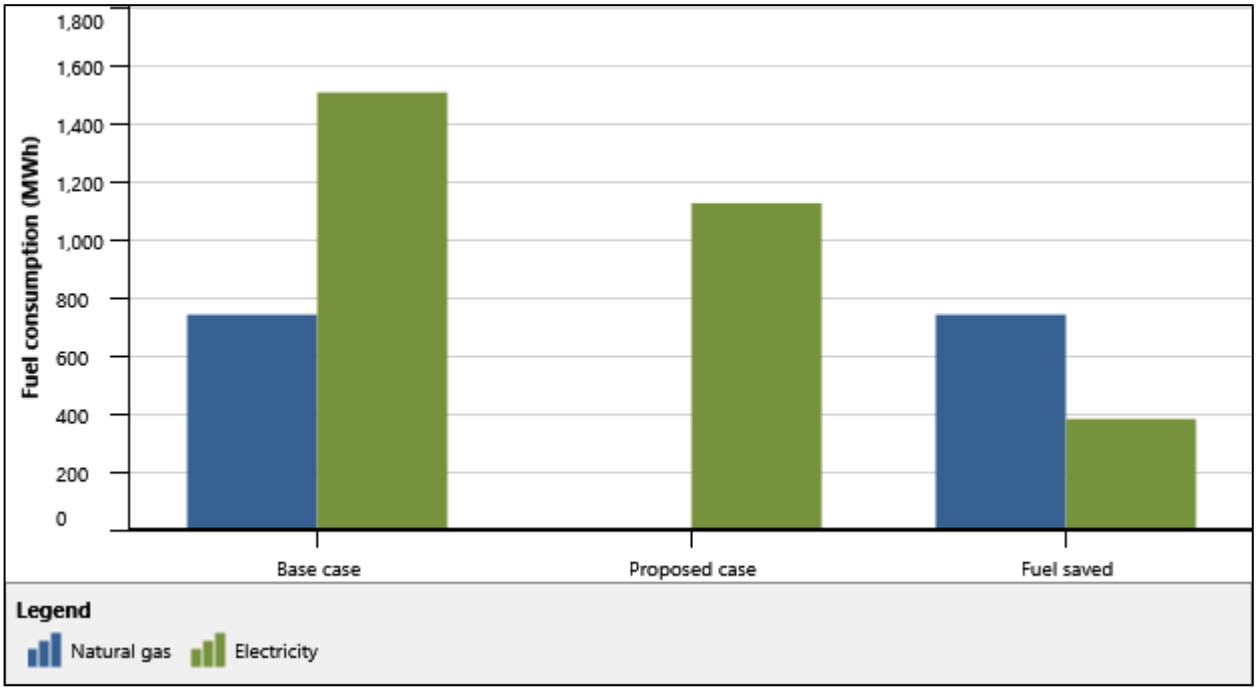
Energy savings | Fuel summary

Energy savings



Fuel consumption	Heating kWh	Cooling kWh	Electricity kWh	Total kWh
Base case	742,749	209,806	1,300,253	2,252,808
Proposed case	213,195	169,805	744,465	1,127,466
Fuel saved	529,554	40,001	555,788	1,125,343
Fuel saved - percent	71.3%	19.1%	42.7%	50%

Fuel summary

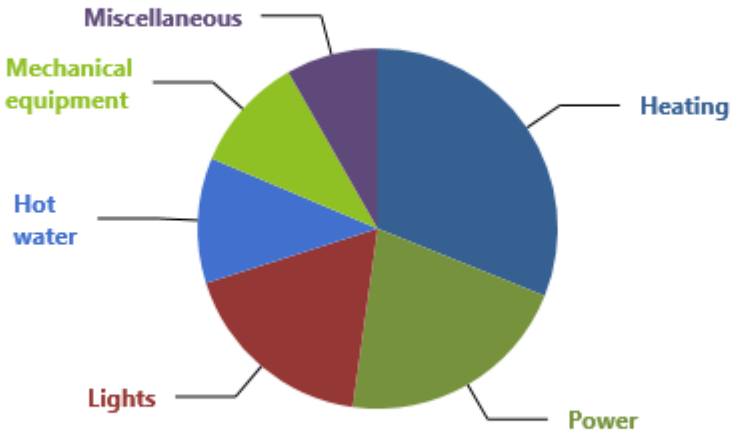


Fuel type	Fuel Unit	Base case Fuel consumption	Proposed case Fuel consumption	Savings Fuel saved
Natural gas	m³	69,888	0	69,888
Electricity	kWh	1,510,059	1,127,466	382,594

Fuel type	Fuel Fuel rate	Base case Fuel cost	Proposed case Fuel cost	Savings Savings
Natural gas	0.45 $/m³	$ 31,449	$ 0	$ 31,449
Electricity	0.16 $/kWh	$ 241,609	$ 180,394	$ 61,215
Total		$ 273,059	$ 180,394	$ 92,664

End-use

Fuel saved



Section	Fuel saved kWh	Fuel saved %
Heating	349,872	31.1%
Power	237,922	21.1%
Lights	201,086	17.9%
Hot water	126,700	11.3%
Mechanical equipment	116,780	10.4%
Miscellaneous	92,983	8.3%
Space heating	52,982	4.7%
Space cooling	40,001	3.6%

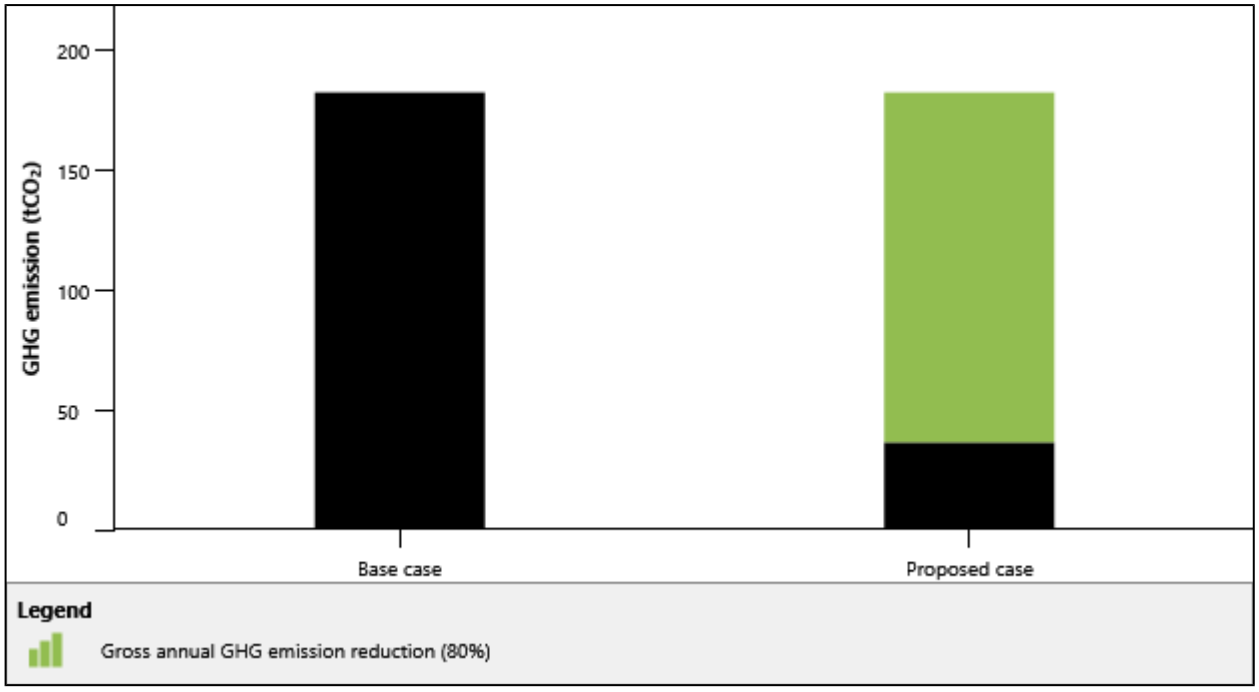
Target

Summary

	Fuel consumption MWh	Fuel cost $	GHG emission tCO_2
Base case	2,253	273,059	182
Proposed case	1,127	180,394	36.4
Savings	1,125	92,664	146
%	50%	33.9%	80%

GHG emission

GHG emission



GHG equivalence

145.6 tCO_2 is equivalent to 26.7

Cars & light trucks not used

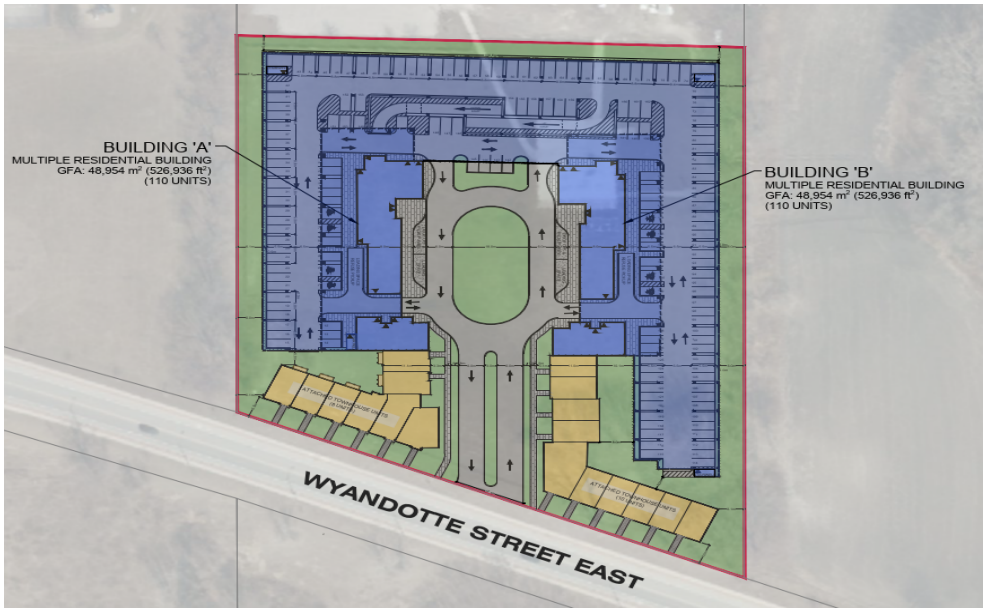
GHG emission		
Base case	182	tCO_2
Proposed case	36.4	tCO_2
Gross annual GHG emission reduction	145.6	tCO_2

Appendix C

Higher Performance (Townhomes)

Appendix C - Higher Performance

Lakefront Heights Development



Residential - Townhomes

Prepared for:

Lakefront Heights Inc.

Prepared by:

Dillon Consulting Limited

DILLON CONSULTING

Executive summary

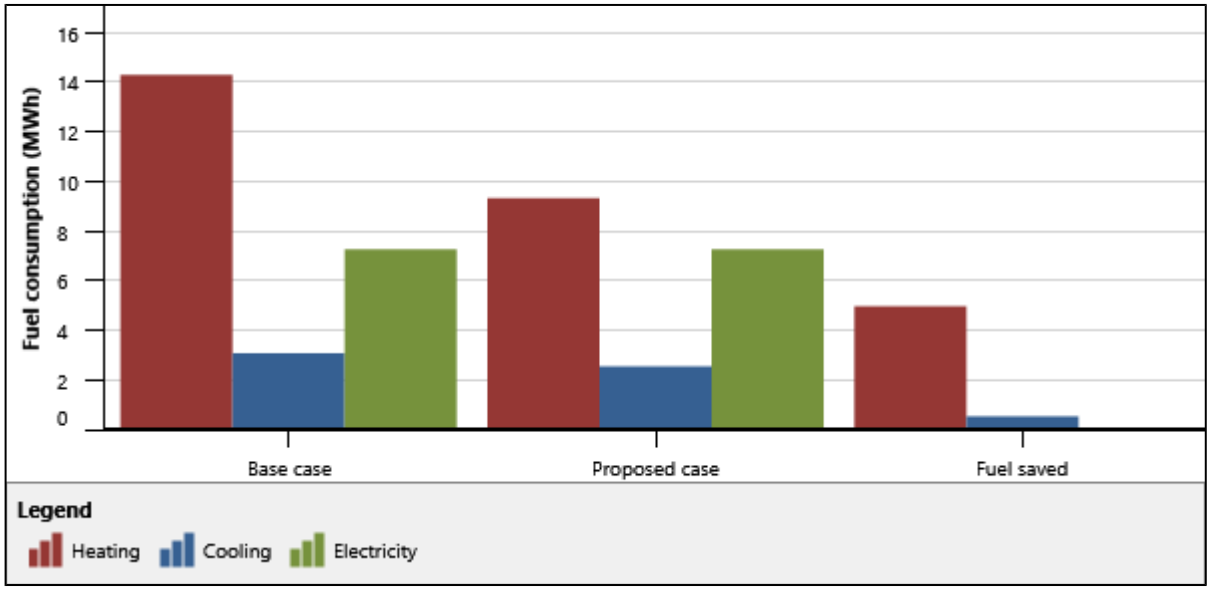
This report was prepared using the RETScreen Clean Energy Management Software. The key findings and recommendations of Higher Performance analysis for Townhomes are presented below:

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%

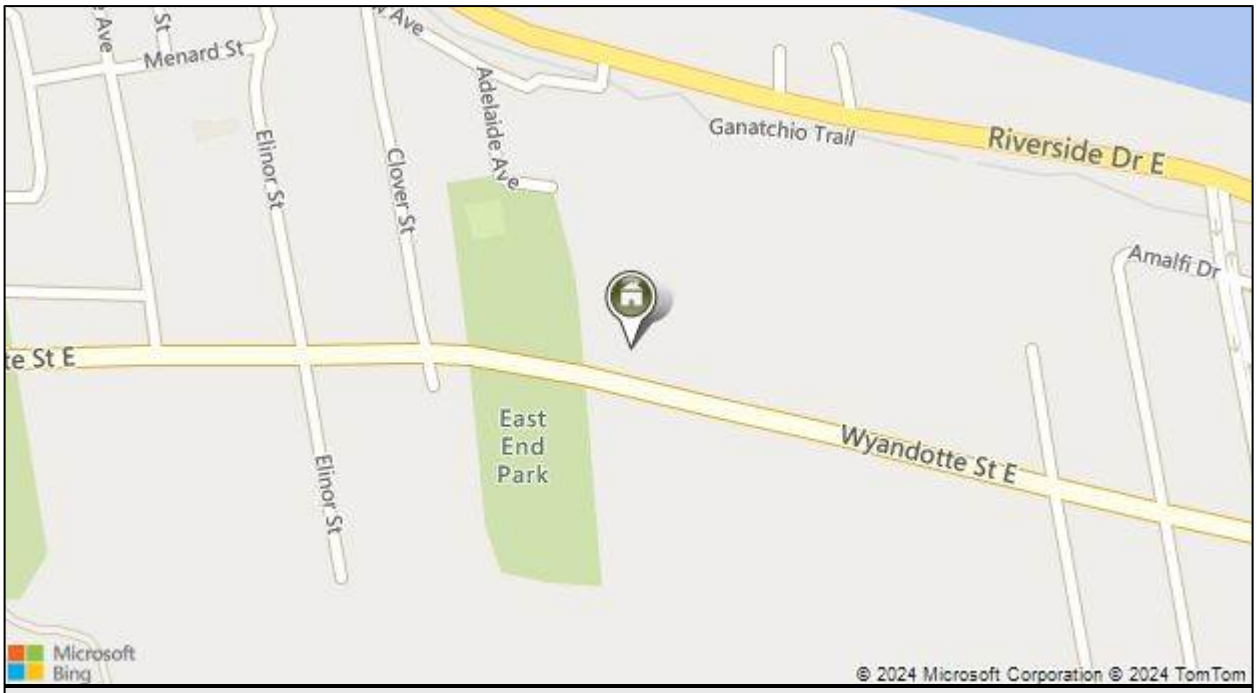
The main results are as follows:

Energy savings



Location | Climate data

Location



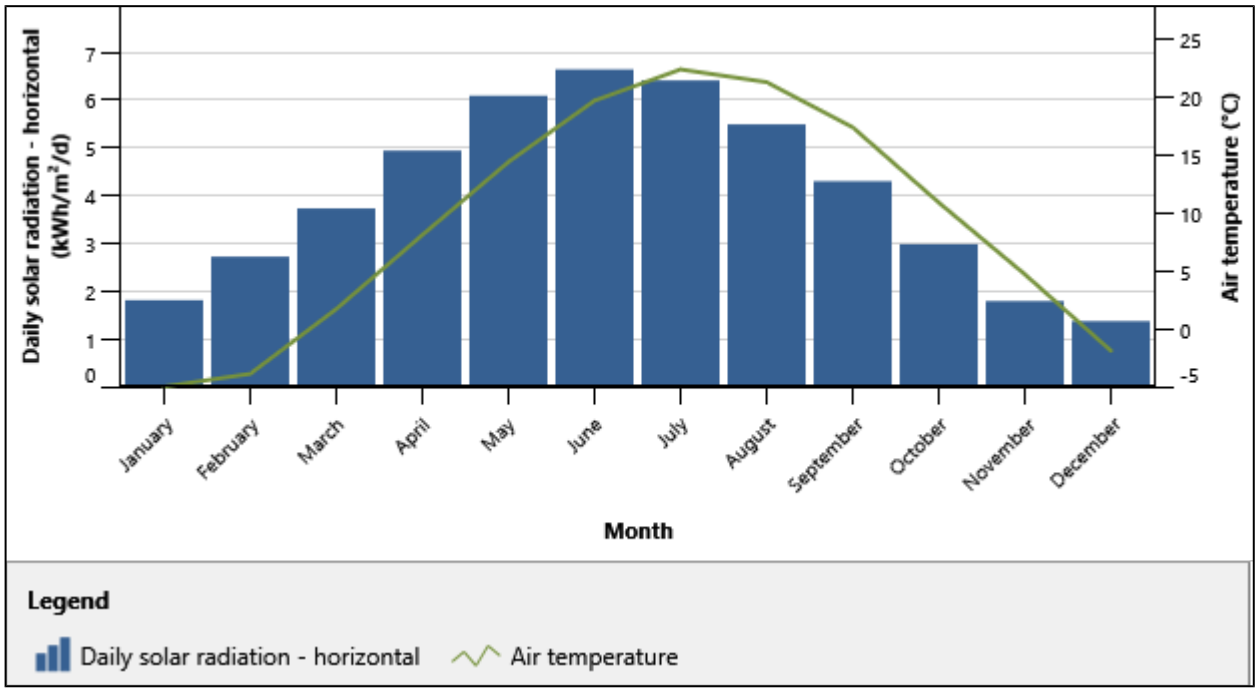
Legend

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

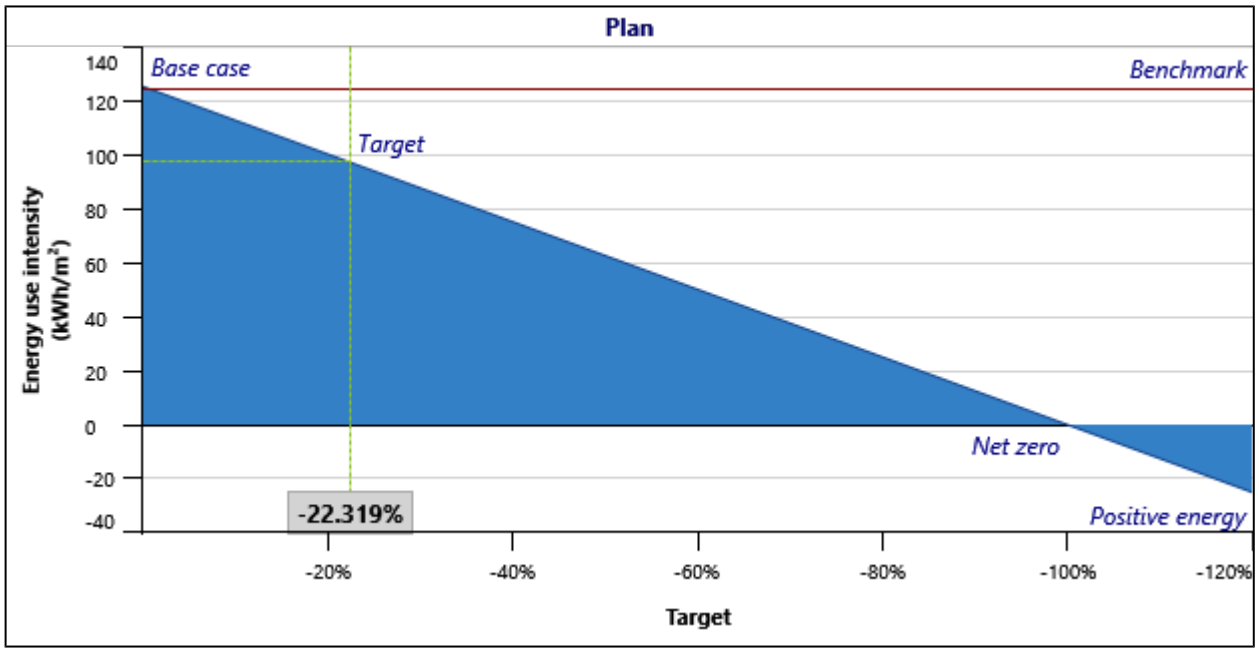


Heating design temperature	-13.7
Cooling design temperature	30.3
Earth temperature amplitude	21.4

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
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



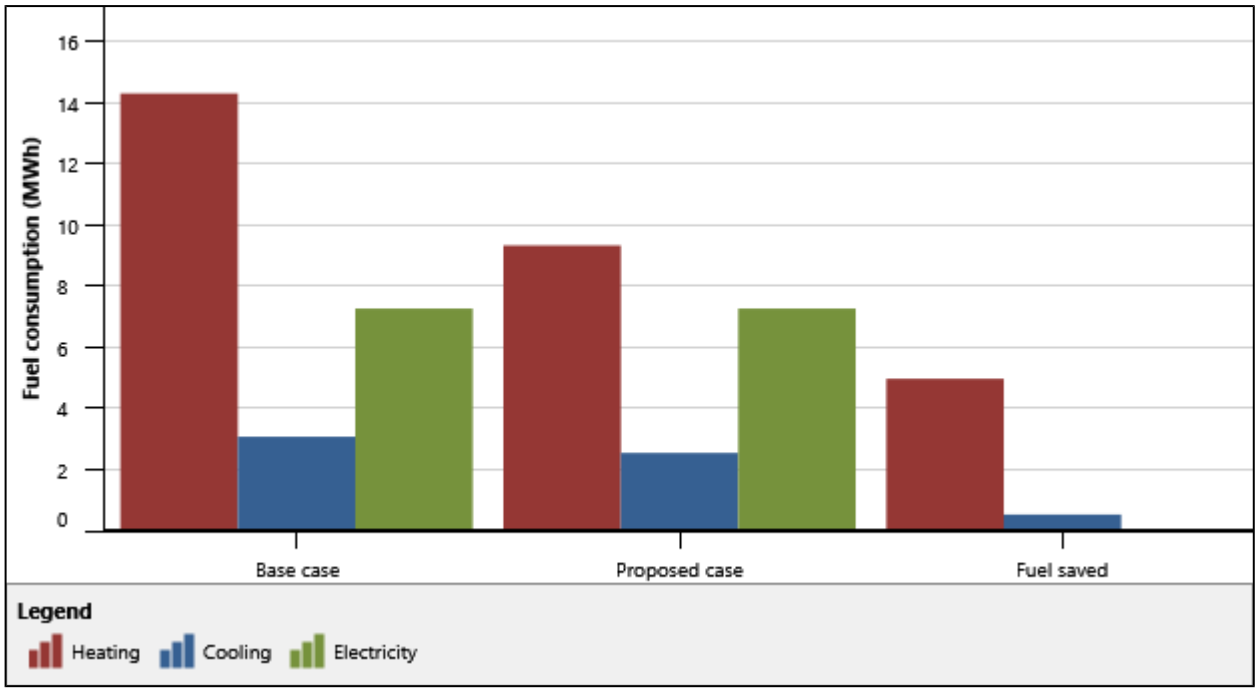
Facility size	196	m²
Benchmark	125	kWh/m²
Minimum - average	104	kWh/m²
Maximum - average	208	kWh/m²
Base case	126	kWh/m²
Reference year		
Set target	Target	
Year		
Target	-22.3%	
Proposed case	97.6	kWh/m²

Facility - Plan

Fuel consumption	Annual	
Base case	24,623	kWh
Proposed case	19,128	kWh
Fuel saved	5,496	kWh

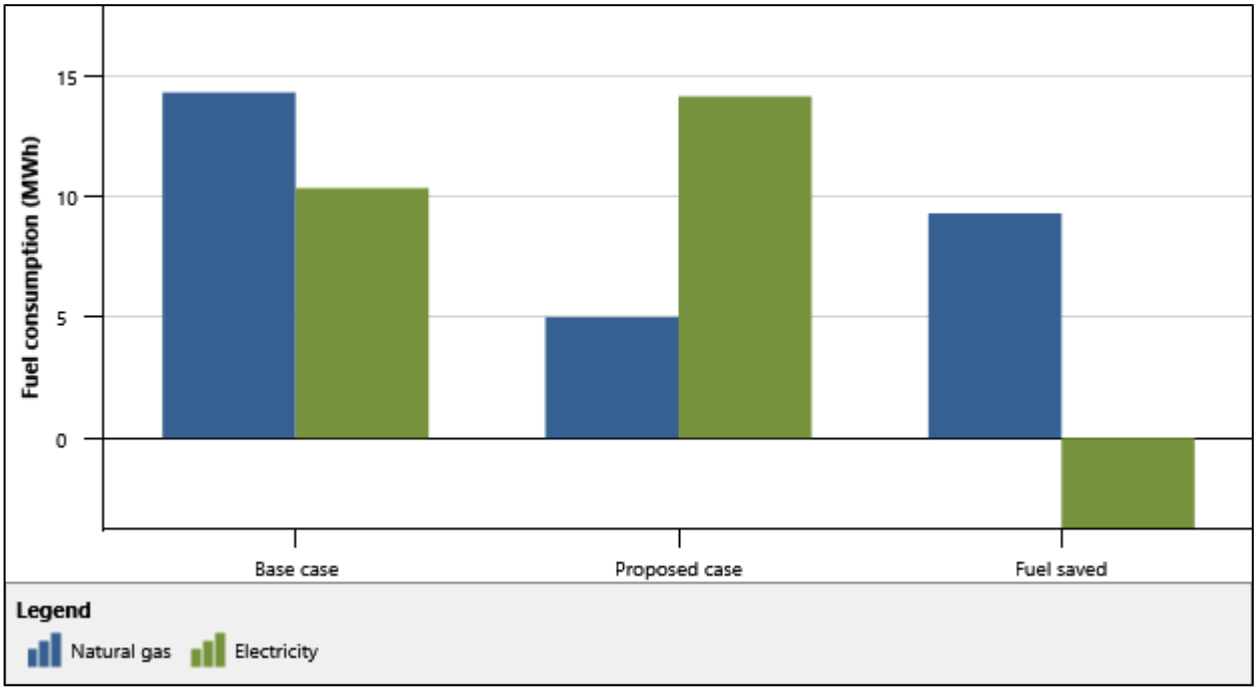
Energy savings | Fuel summary

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

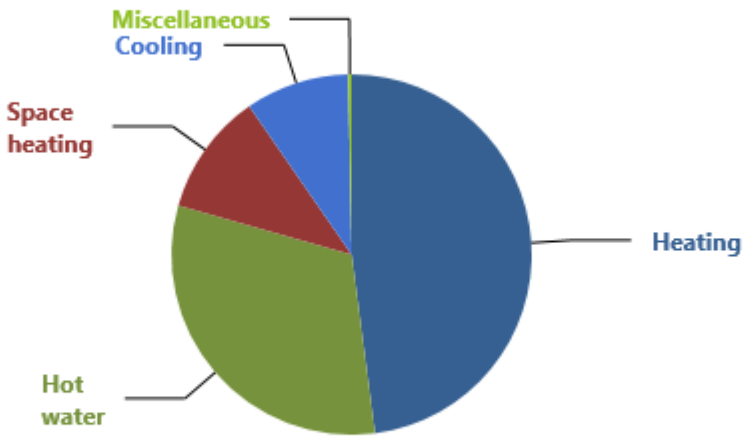


Fuel type	Fuel Unit	Base case Fuel consumption	Proposed case Fuel consumption	Savings Fuel saved
Natural gas	m³	1,345	470	874
Electricity	kWh	10,333	14,128	-3,795

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%

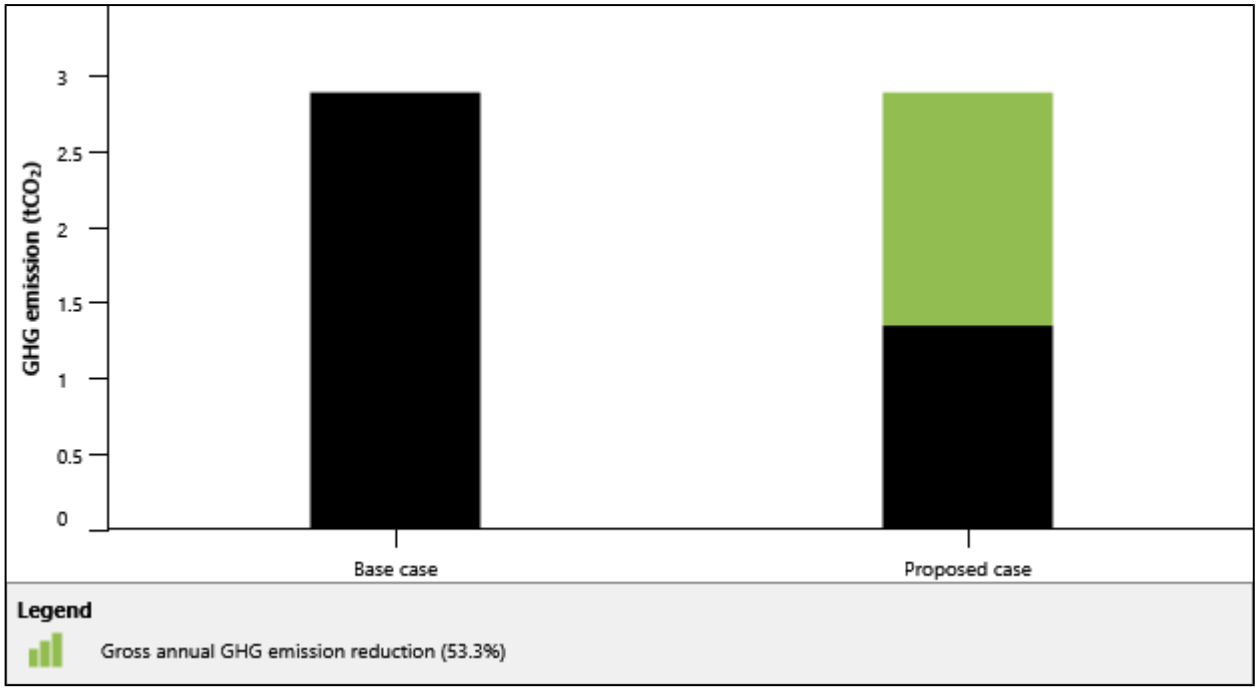
Target

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

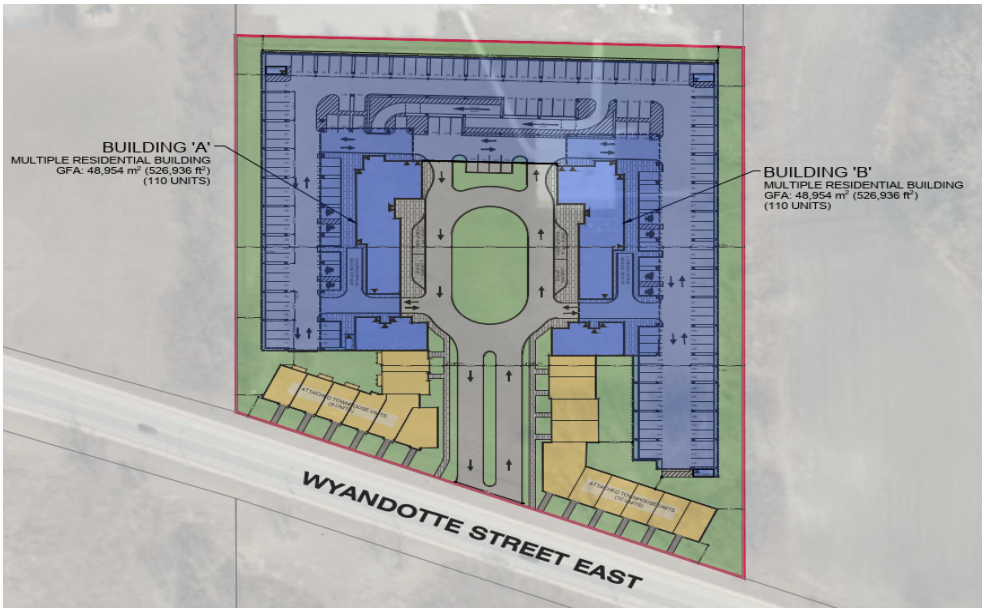
GHG emission		
Base case	2.9	tCO_2
Proposed case	1.4	tCO_2
Gross annual GHG emission reduction	1.5	tCO_2

Appendix D

Near Zero Emissions (Townhomes)

Appendix D - Near Zero Emissions

Lakefront Heights Development



Residential - Townhomes

Prepared for:

Lakefront Heights Inc.

Prepared by:

Dillon Consulting Limited

DILLON CONSULTING

Executive summary

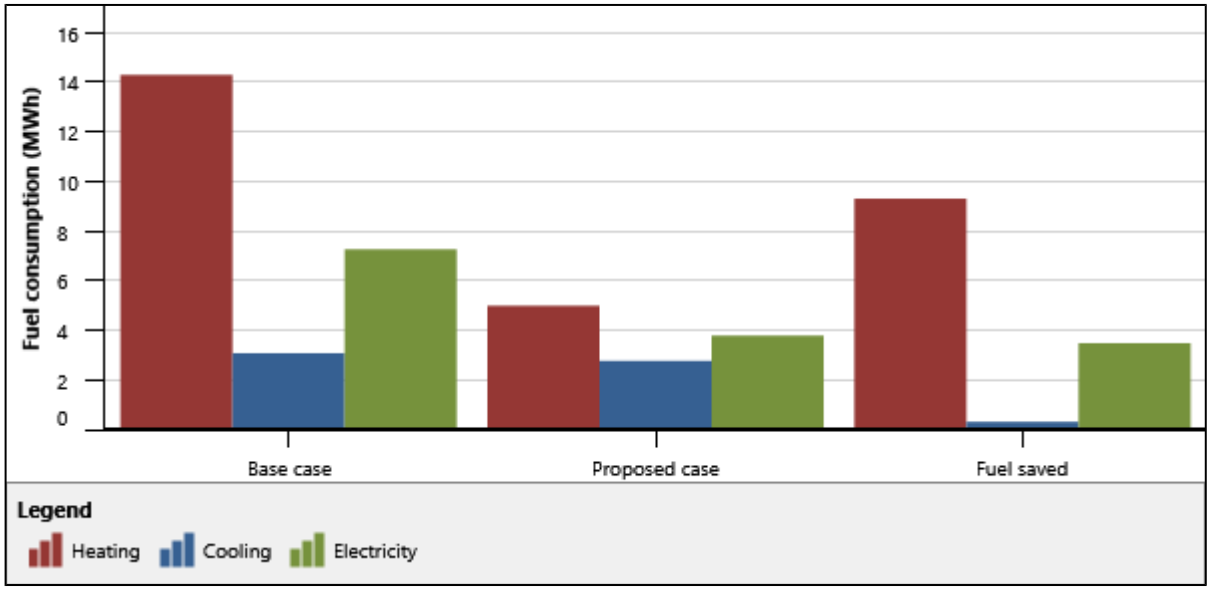
This report was prepared using the RETScreen Clean Energy Management Software. The key findings and recommendations of Near Zero Emissions analysis for Townhomes are presented below:

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

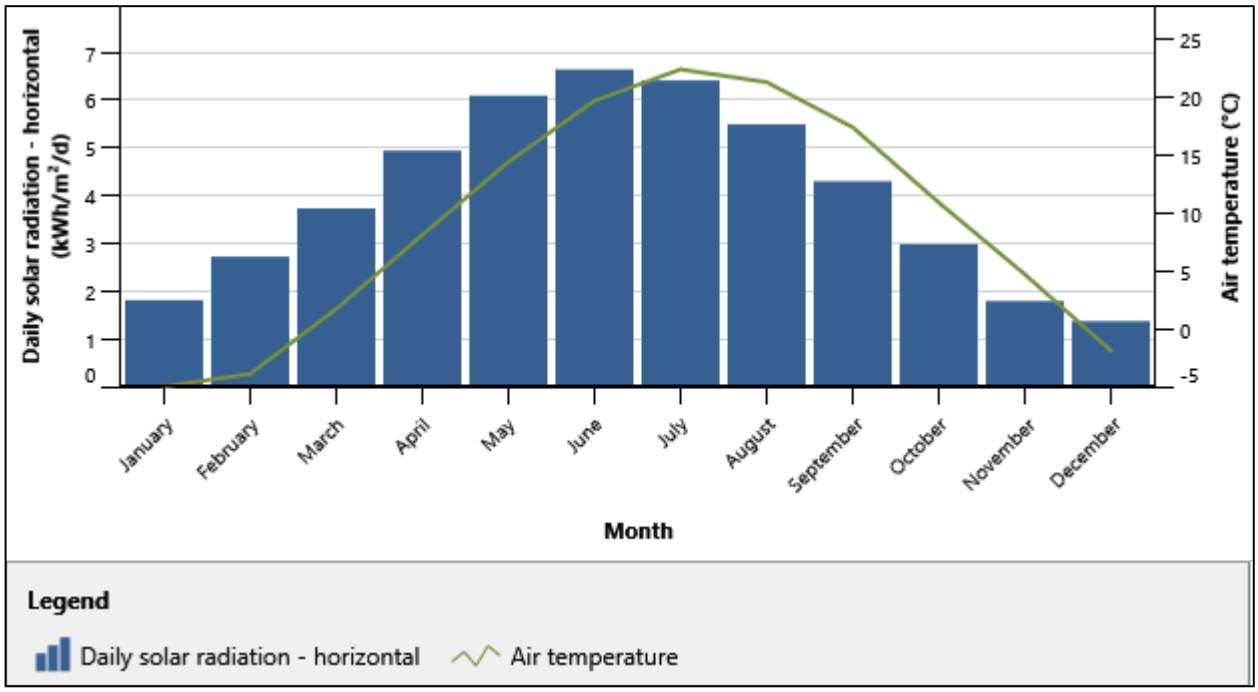
Legend

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
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

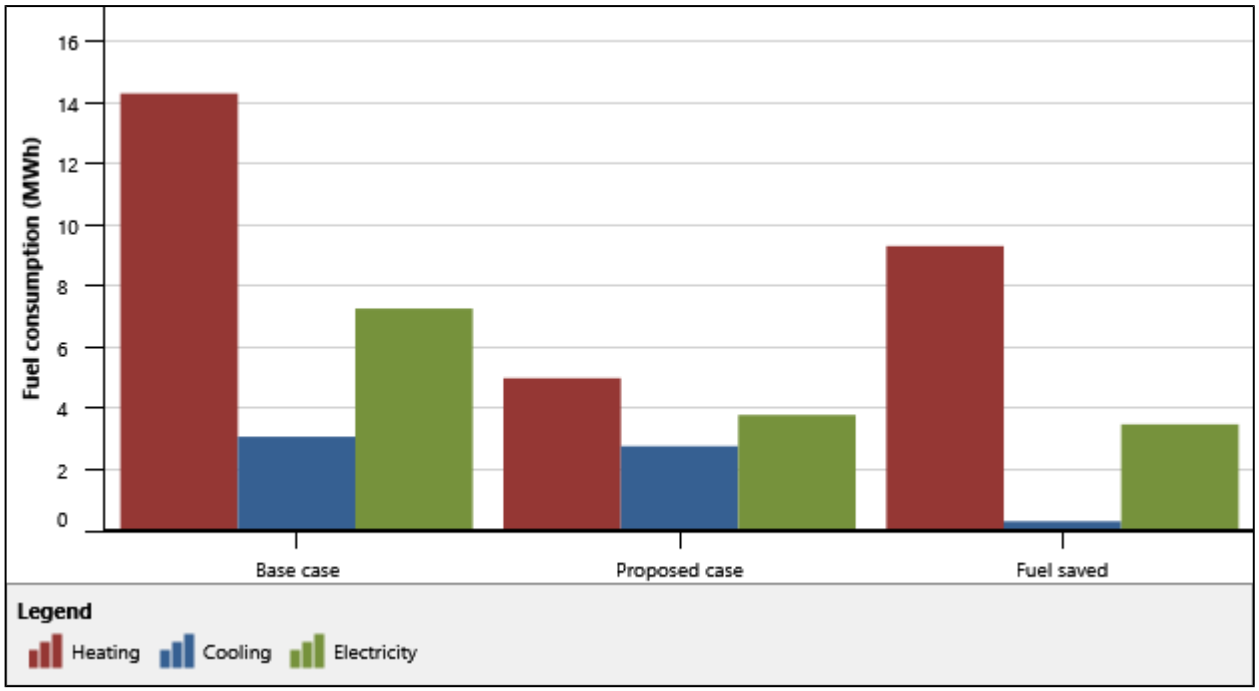
Facility size	196	m²
Benchmark	125	kWh/m²
Minimum - average	104	kWh/m²
Maximum - average	208	kWh/m²
Base case	126	kWh/m²
Reference year		
Set target	Target	
Year		
Target	-53.2%	
Proposed case	58.8	kWh/m²

Facility - Plan

Fuel consumption	Annual	
Base case	24,623	kWh
Proposed case	11,534	kWh
Fuel saved	13,089	kWh

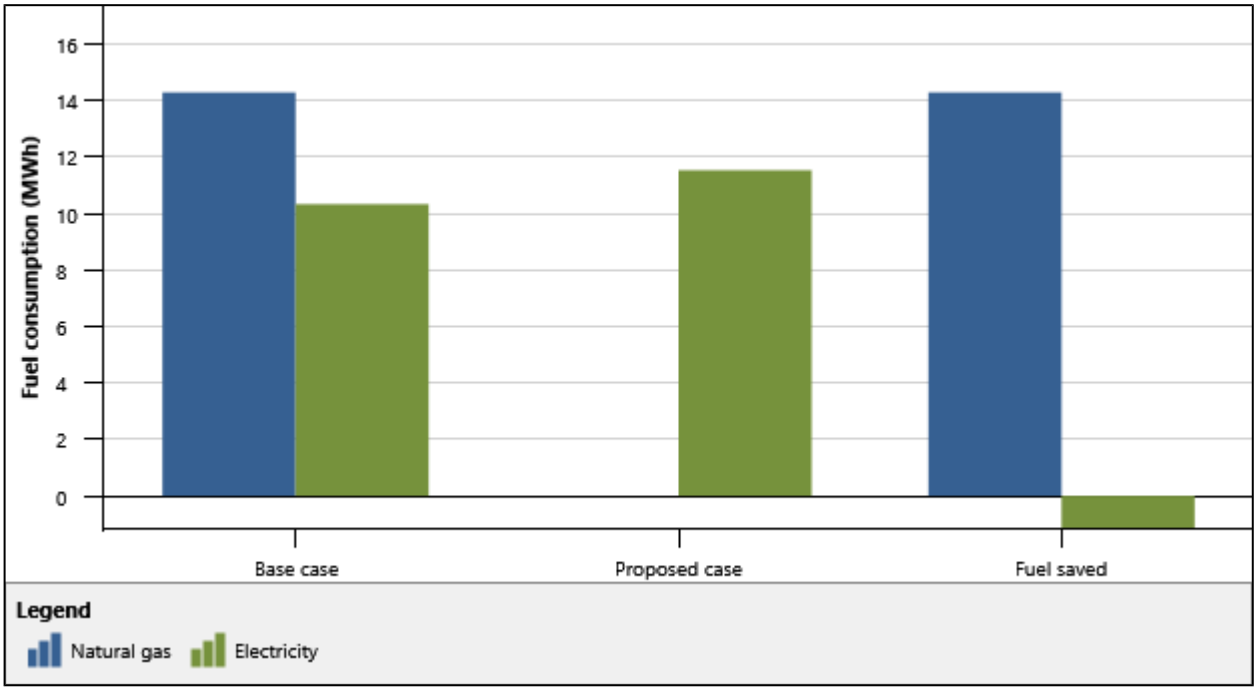
Energy savings | Fuel summary

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

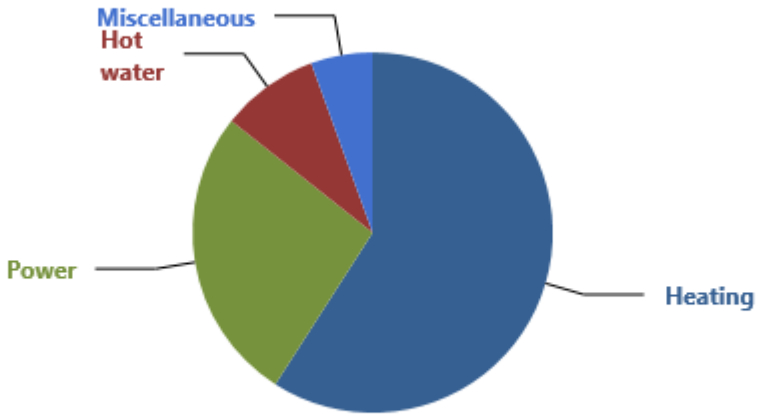


Fuel type	Fuel Unit	Base case Fuel consumption	Proposed case Fuel consumption	Savings Fuel saved
Natural gas	m³	1,345	0	1,345
Electricity	kWh	10,333	11,534	-1,201

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%

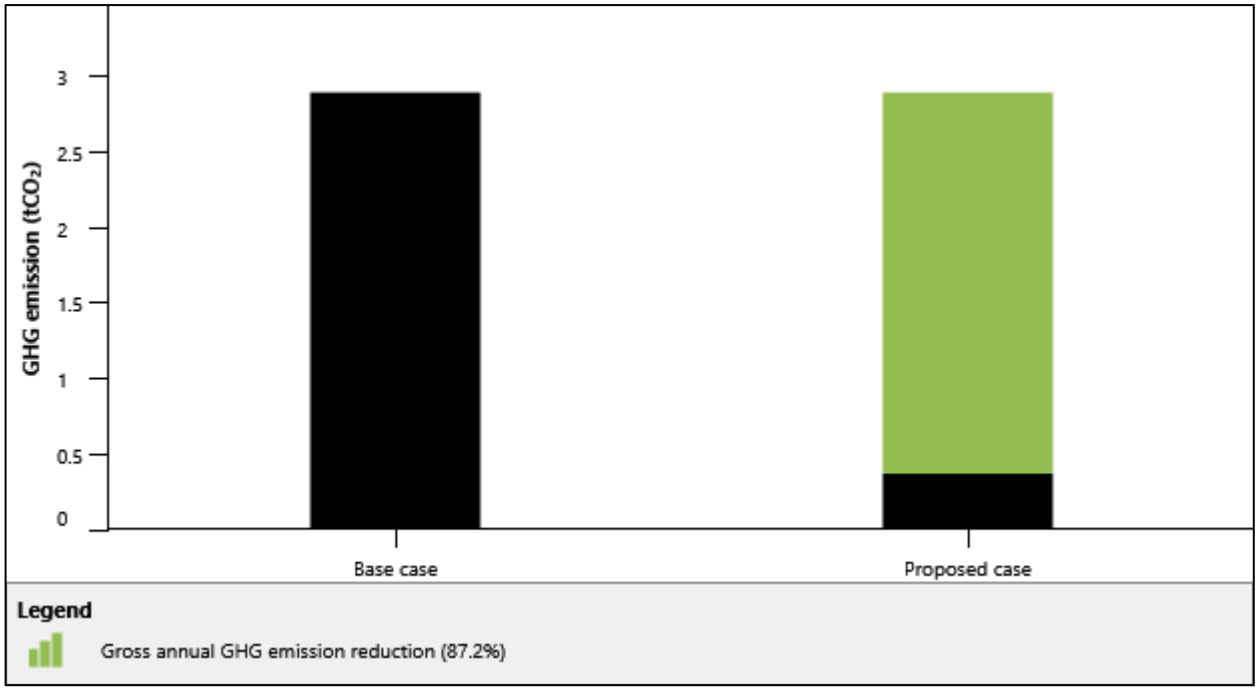
Target

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