

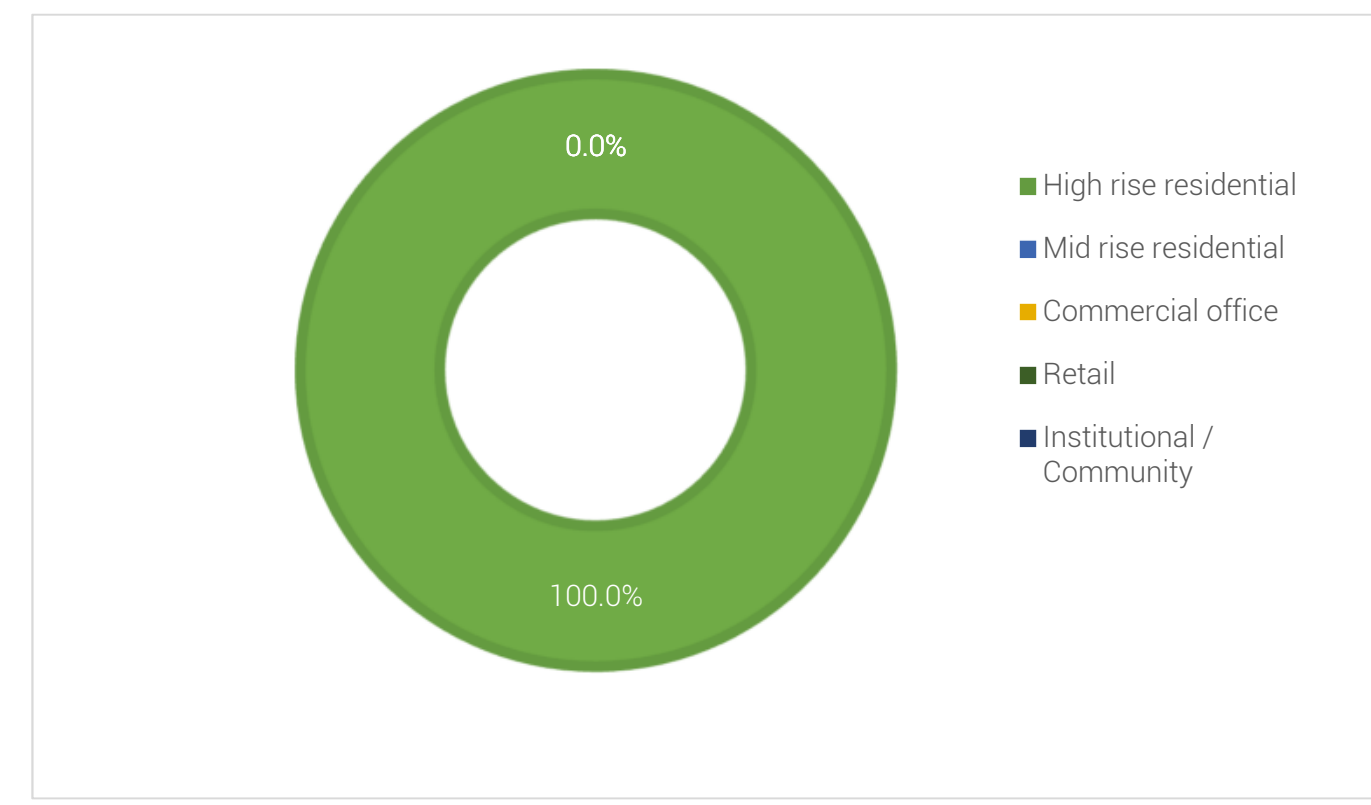
145 St George ESR Take-Off Calculations

145 St George						
	Ph1	Ph2	Ph3	Ph4	Ph5	Total
High rise residential	HRMURB	23,076				23,076
Mid rise residential	MRMURB					-
Commercial office	OFF					-
Retail	RET					-
Institutional / Community	IRMURB					-
Other	OTH					-
<b>Total m<sup>2</sup></b>		<b>23,076</b>	-	-	-	<b>23,076</b>
Low Rise Units						-
High Rise Units		<b>341</b>				<b>341</b>
<b>Total m<sup>2</sup></b>		<b>341</b>	-	-	-	<b>341</b>

Scenarios		v3T1	Scenario 1
1		v3T2	Scenario 2
2		v3T3	Scenario 3
3		v3T4	Scenario 4
4			

Grid Electricity      Natural gas  
 average GHG factors (kg CO<sub>2</sub>e/kWh)      0.050      0.1808  
 marginal GHG factors (kg CO<sub>2</sub>e/kWh)      0.146      0.1808  
**0.276571924**

Grid Electricity      Natural gas  
 Unit costs / ekWh      \$ 0.14      \$ 0.027  
**5.25210084**

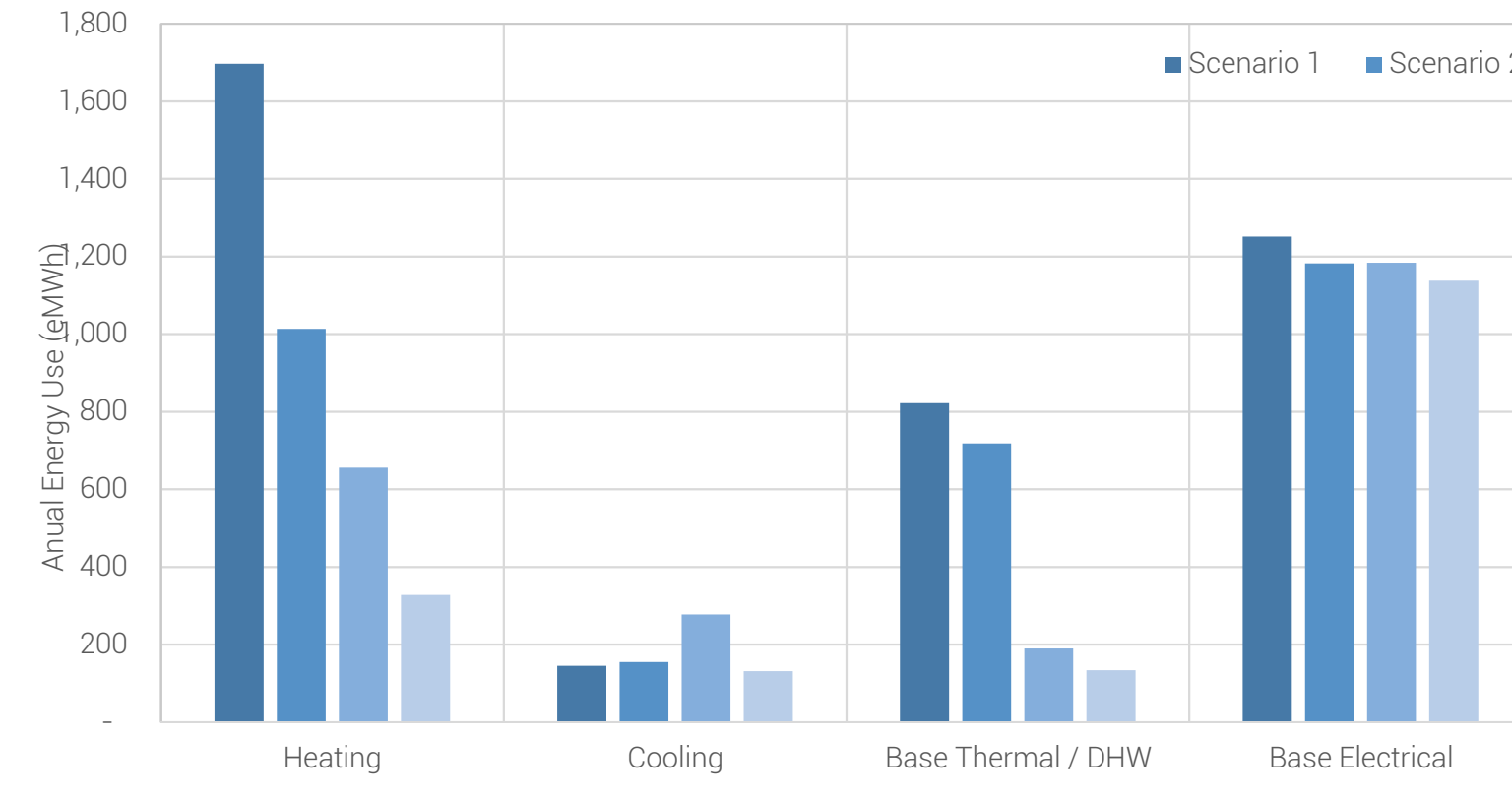
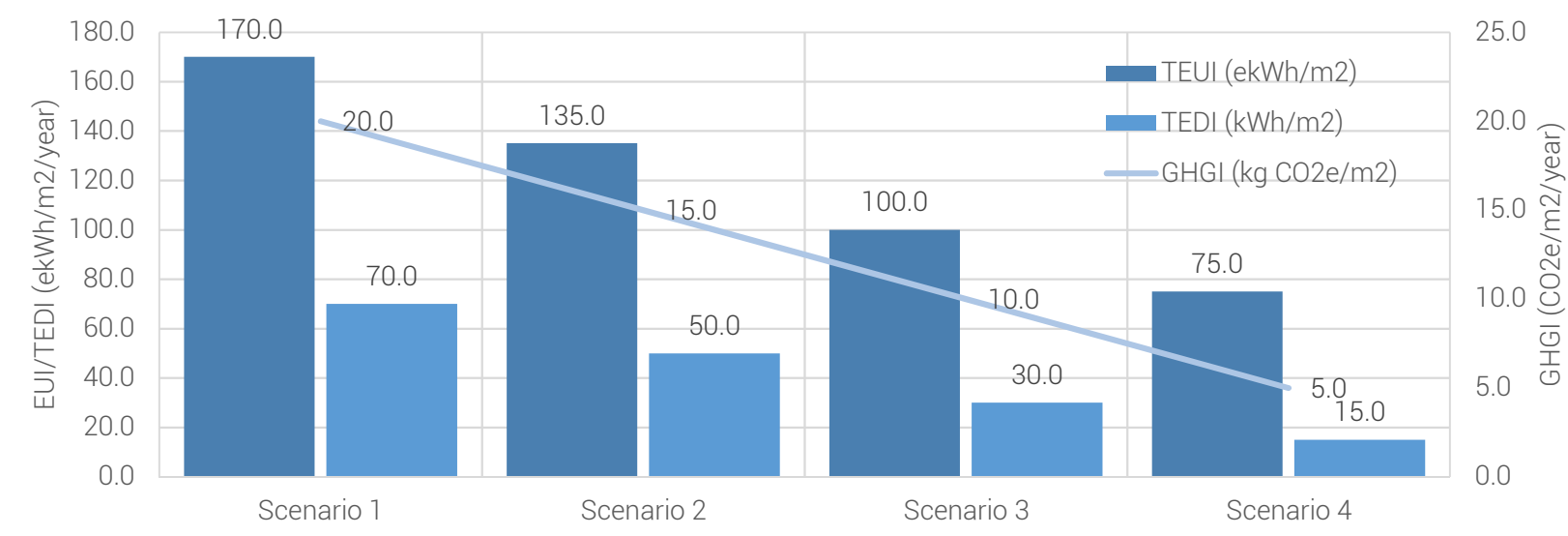
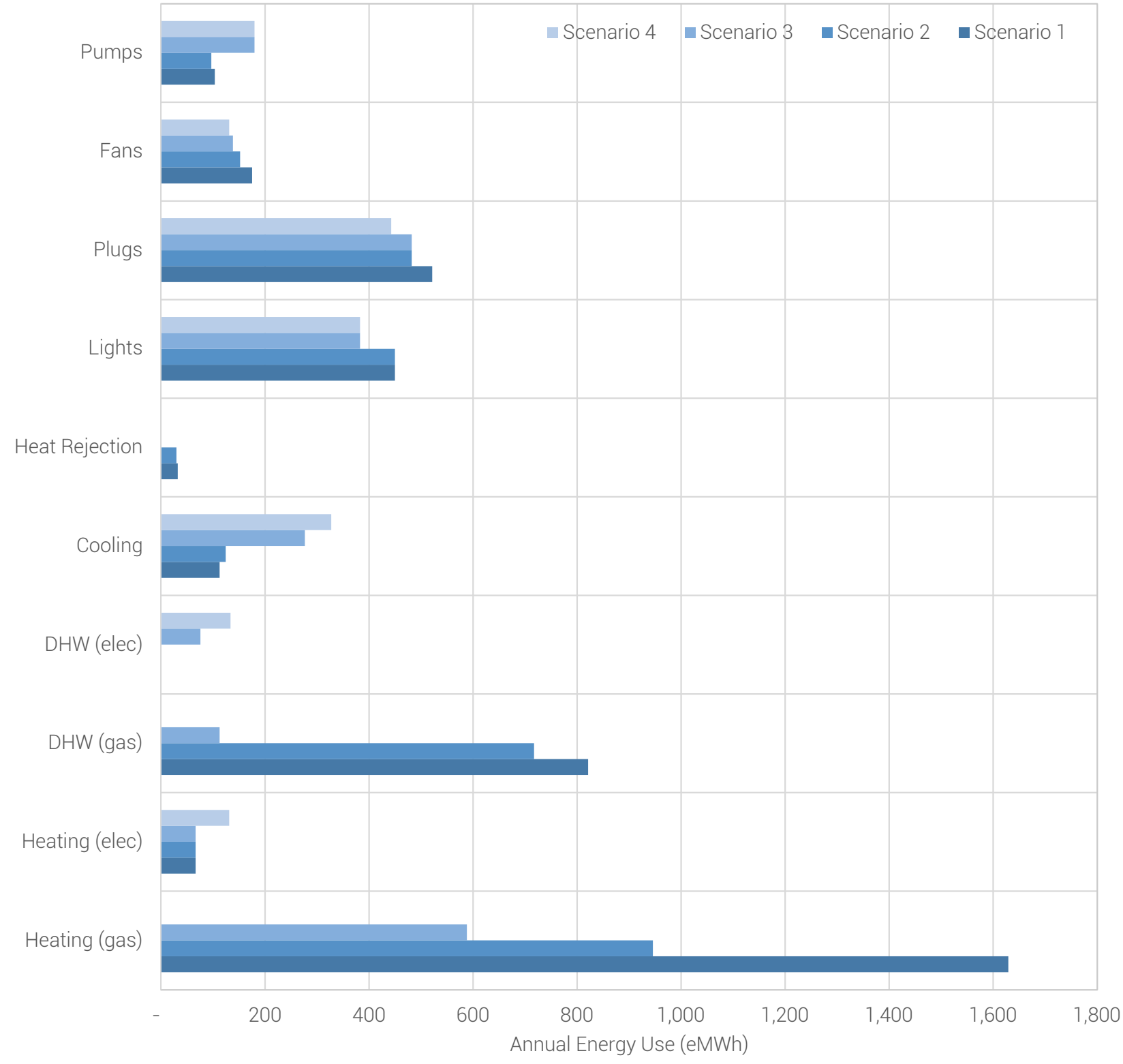


By Building Type (From City of Toronto ZEBF)

	High rise residential								Mid Rise Residential					Commercial Office					Retail			
	HRMURB-v2T1	HRMURB-v3T1	HRMURB-v3T2	HRMURB-v3T3	HRMURB-v3T4	MRMURB-v2T1	MRMURB-v3T1	MRMURB-v3T2	MRMURB-v3T3	MRMURB-v3T4	OFF-v2T1	OFF-v3T1	OFF-v3T2	OFF-v3T3	OFF-v3T4	RET-v2T1	RET-v3T1	RET-v3T2	RET-v3T3	RET-v3T4		
	v2T1	v3T1	v3T2	v3T3	v3T4	v2T1	v3T1	v3T2	v3T3	v3T4	v2T1	v3T1	v3T2	v3T3	v3T4	v2T1	v3T1	v3T2	v3T3	v3T4		
Total Energy Intensity (ekWh/m <sup>2</sup> )	190	170	135	100	75	198	165	130	100	70	200	175	130	100	65	190	170	120	90	70		
Heating Gas (ekWh/m <sup>2</sup> )	7.7	70.6	4.1	25.5	0	101.6	64.7	32.7	34.6	0.0	83	67.6	26.5	15.3	1.7	106.2	83.9	37.8	0	0		
Heating Elec (ekWh/m <sup>2</sup> )	2.9	2.9	2.9	2.9	5.7	0.0	2.7	2.7	0.4	11.2	0	0	2.4	2.4	2	2.8	2.8	2.8	7.2	5.7		
DHW Gas (ekWh/m <sup>2</sup> )	44.5	35.6	31.1	4.9	0	32.8	32.8	28.7	4.5	0.0	11.8	11.8	11.8	11.8	2.1	3.3	3.3	3.2	0.6	0		
DHW Elec (ekWh/m <sup>2</sup> )	0	0	0	3.3	5.8	0.0	0.0	0.0	2.9	0.0	0	0	0	0.2	0	0	0	0	0.7	0		
Cooling (ekWh/m <sup>2</sup> )	5.2	4.9	5.4	12	14.2	3.8	4.7	5.6	8.0	11.0	5.9	3.3	4.5	4.8	13	5.7	6.5	4.2	7.8	7.4		
Heat Rejection (ekWh/m <sup>2</sup> )	1.5	1.4	1.3	0	0	1.0	1.2	1.2	0.0	0.0	3.2	2.9	3.3	3.2	0	0	0	0.8	0	0		
Lights (ekWh/m <sup>2</sup> )	24	19.5	19.5	16.6	16.6	21.5	21.5	21.5	17.8	17.8	39.8	31	31	20.6	12.4	39.6	39.6	34.3	26.4	26.4		
Plugs (ekWh/m <sup>2</sup> )	22.6	22.6	20.9	19.2	19.2	20.8	20.8	19.1	19.1	17.5	26.5	26.5	26.5	22.4	22.4	9.8	9.8	9.8	9.8	9.8		
Fans (ekWh/m <sup>2</sup> )	7.8	7.6	6.6	6	5.7	13.8	13.0	12.6	5.4	5.4	13.4	14.8	7.5	7.2	5.8	22.5	22.5	12.4	10.4	10.1		
Pumps (ekWh/m <sup>2</sup> )	4.8	4.5	4.2	7.8	7.8	2.8	3.0	3.2	3.7	3.7	16	13.2	13.1	12	5	0	0	2.4	2.6	2.4		
Thermal Energy Demand Intensity (ekWh/m <sup>2</sup> )	7.7	70	50	30	15	97.0	65.0	40.0	25.0	15.0	82	70	30	22	15	75	60	40	25	15		
GHG intensity (kg CO <sub>2</sub> e/m <sup>2</sup> )	26	20	15	10	5	28.0	20.0	15.0	10.0	5.0	23	20	15	8	4	24	20	10	5	3		

By Phase / Block

	145 St George			
	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Heating Gas (ekWh/m <sup>2</sup> )	70.6	41.0	25.5	0.0
Heating Elec (ekWh/m <sup>2</sup> )	2.9	2.9	2.9	5.7
DHW Gas (ekWh/m <sup>2</sup> )	35.6	31.1	4.9	0.0
DHW Elec (ekWh/m <sup>2</sup> )	0.0	0.0	3.3	5.8
Cooling (ekWh/m <sup>2</sup> )	4.9	5.4	12.0	14.2
Heat Rejection (ekWh/m <sup>2</sup> )	1.4	1.3	0.0	0.0
Lights (ekWh/m <sup>2</sup> )	19.5	19.5	16.6	16.6
Plugs (ekWh/m <sup>2</sup> )	22.6	20.9	20.9	19.2
Fans (ekWh/m <sup>2</sup> )	7.6	6.6	6.0	5.7
Pumps (ekWh/m <sup>2</sup> )	4.5	4.2	7.8	7.8
Electricity - Space Cooling (ekWh/m <sup>2</sup> )	6.3	6.7	12.0	14.2
Electricity - Space Heating (ekWh/m <sup>2</sup> )	2.9	2.9	2.9	5.7
Electricity - DHW Heating (ekWh/m <sup>2</sup> )	0.0	0.0	3.3	5.8
Electricity - Base loads (ekWh/m <sup>2</sup> )	54.2	51.2	51.3	49.3
Gas - Space Heating (ekWh/m <sup>2</sup> )	70.6	41.0	25.5	0.0
Gas - DHW / Base Loads (ekWh/m <sup>2</sup> )	35.6	31.1	4.9	0.0
Gas Use (eMWh)	2,451	1,664	702	0
Gas Intensity (ekWh/m <sup>2</sup> )	106.2	72.1	30.4	0.0
Electricity Use (MWh)	1,463	1,403	1,604	1,731
Electricity Intensity (ekWh/m <sup>2</sup> )	63.4	60.8	69.5	75.0
<b>Total Energy Intensity (ekWh/m<sup>2</sup>)</b>	<b>170.0</b>	<b>135.0</b>	<b>100.0</b>	<b>75.0</b>
Total Energy (eMWh)	3,923	3,115	2,308	1,731
% Savings vs Tier 1	-	21%	41%	56%
<b>GHG intensity (kg CO<sub>2</sub>e/m<sup>2</sup>)</b>	<b>20.0</b>	<b>15.0</b>	<b>10.0</b>	<b>5.0</b>
Total GHGs (tonnes CO <sub>2</sub> e)	462	346	231	115
% Savings vs Tier 1	-	25%	50%	75%
<b>Thermal Energy Demand Intensity (ekWh/m<sup>2</sup>)</b>	<b>70.0</b>	<b>50.0</b>	<b>30.0</b>	<b>15.0</b>
Total Thermal Demand (eMWh)	1,615	1,154	692	346
% Savings vs Tier 1	-	29%	57%	79%



	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Heating (gas)	1,629	946	588	-
Heating (elec)	67	67	67	132
DHW (gas)	822	718	113	-
DHW (elec)	-	-	76	134
Cooling	113	125	277	328
Heat Rejection	32	30	-	-
Lights	450	450	383	383
Plugs	522	482	482	443
Fans	175	152	138	132
Pumps	104	97	180	180
Heating	1,696	1,013	655	328
Cooling	145	155	277	132
Base Thermal / DHW	822	718	189	134
Base Electrical	1,251	1,181	1,184	1,138
Total	3,914	3,067	2,305	1,731
GHG	462	346	231	115
TEDI	1,615	1,154	692	346

## Compactness Ratio

perimeter length	120.4
GFA of typical floor	750
floor height	3.1
compactness ratio	50%

## Utility Cost Estimates

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Electricity (kWh/m2)	63.4	60.8	69.5	75
Natural Gas (kWh/m2)	106.2	72.1	30.4	0
Elec \$	\$ 204,823	\$ 196,423	\$ 224,529	\$ 242,298
Natural Gas \$	\$ 65,325	\$ 44,350	\$ 18,699	\$ -
Total \$	\$ 270,100	\$ 240,800	\$ 243,200	\$ 242,300

# SolarPV Analysis

	Roof Area (m2)	Notes
Area 1	400.3	mech roof
Area 2		
Area 3		
Area 4		
Area 5		
Area 6		
Area 7		

		Minimum Outdoor Amenity
	400.3	Sub-Total
	200.15	Total (50%)

Solar PV Summary Table		
System Size (kW)	30	1,730,700
System Size (m <sup>2</sup> )	200	1,505
Annual production (kWh)	34,500	10,033
% of Energy Requirement (Scenario 1)	0.9%	1,730,700
% of Energy Requirement (Scenario 4)	2.0%	44.2%
		100.0%

Total Area needed to offset Tier 4

10,033	total m2
100.2	sqft (for graphic)

# DC Refund Estimates

% of Total (when info not available)	Suites Breakdown				Total # of Units:
	Studio	1 Bedroom	2BR	3BR +	
	21%	57%	15%	7%	341
	72	196	50	23	
Total	268		73		

Non-residential GFA (m2) 0 << only use GROUND FLOOR retail, commercial, institutional

<https://www.toronto.ca/wp-content/uploads/2020/10/8e40-201008-DC-Rates-Green-Standards-Tier-2-3-Nov-1-2020-V0.01.pdf>  
Effective November 1, 2020

	1BR	2+ BR	non-res	single detached and semi-	multiples
Refund/ unit (or sq.m)	\$ 2,232	\$ 3,272	\$ 37.83	\$ 5,128	\$ 4,159
Unit Count	268	73			
Non-residential GFA (m2)			0		
Refund per unit type	<b>\$ 598,176</b>	<b>\$ 238,856</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>
Total Refund	<b>\$ 837,032</b>				

# Premiums

<https://web.toronto.ca/wp-content/uploads/2017/11/9875-Zero-Emissions-Buildings-Framework-Report.pdf>

## HIGH-RISE MURB

	Envelope	M+E	Total	Premium	Envelope premium	M+E Premium
SB-10 2017	6.22	6.71	64.34			
TGSv2 T2	7.08	6.83	65.33	1.5%	13.8%	1.8%
<b>TGS v3 T1</b>	<b>7.08</b>	<b>6.83</b>	<b>65.33</b>	<b>1.5%</b>	<b>13.8%</b>	<b>1.8%</b>
<b>TGS v3 T2</b>	<b>7.58</b>	<b>7.58</b>	<b>66.57</b>	<b>3.5%</b>	<b>21.9%</b>	<b>13.0%</b>
TGS v3 T3	7.75	9.01	68.18	6.0%	24.6%	34.3%
<b>TGS v3 T4</b>	<b>8.01</b>	<b>7.01</b>	<b>66.64</b>	<b>3.6%</b>	<b>28.8%</b>	<b>4.5%</b>