

UBC Sustainability Scholar Project Report

Energy Benchmarking
City of New Westminster: Corporate Facilities

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Executive Summary

Introduction

This report is a brief summary of the results obtained after benchmarking 22 of City of New Westminster's corporate buildings using Energy Star Portfolio Manager. The list of buildings includes Community Centres, Swimming Pools, Firehall, Public Library, Convention Centre, and Offices among others. The building performance data includes energy consumption from December 2010 to Dec 2014.

Energy benchmarking is the process of quantifying and recording energy consumption from building operations. Energy benchmarking allows for performance comparisons between buildings. Municipalities can track progress towards energy efficiency targets and energy use reductions. Energy benchmarking can also influence building managers to work towards increasing the building's energy efficiency.

According to the City of New Westminster's corporate energy and greenhouse gas emissions management plan, the city aims to reduce its 2007 corporate greenhouse gas emissions quantity by 1311 tonnes CO₂e, or 15% percent, by 2017 (Fig. 1). Building benchmarking is one of the tools that is now being used by the city to track the progress in achieving the planned target.

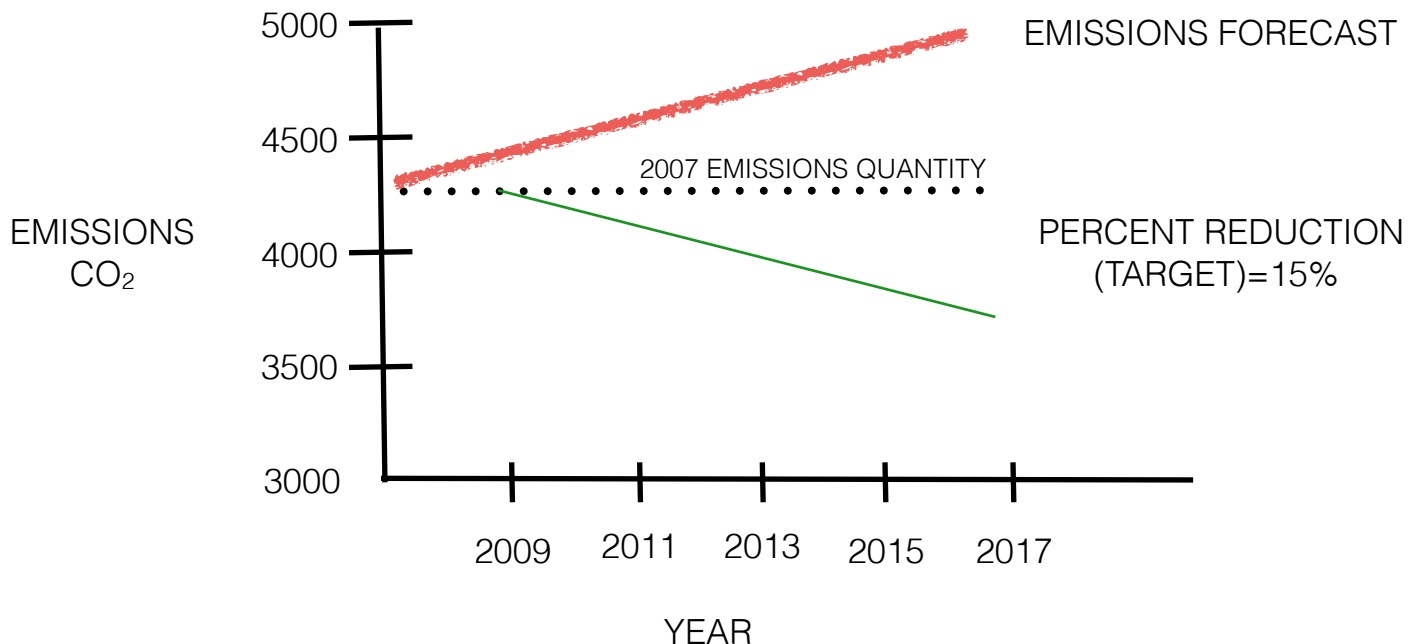


Figure 1: Greenhouse Gas Emissions Forecast, Base Year Quantity, and Reduction Target¹

¹ Source: <http://www.newwestcity.ca/database/rte/Greenhouse%20Gas%20Executive%20Summary%20Dec%202008.pdf>

Energy Star Score

In Canada, the current version of Portfolio Manager is limited to providing Energy Star Scores for Offices, K-12 Schools, Hospitals and Food Retail only. Only offices (from the building types) apply to the City of New Westminster's portfolio which limits the Energy Star Score² availability to 1 building. The remaining buildings have been compared based on energy use intensity (EUI)³. The energy star score reflects a normalized comparison of the building performance with other buildings of similar type in Canada. The score normalizes with respect to varying climate and accounts for the Property Use Details that the EPA has identified as being important to building operation.

The data collected to populate the **Property Use Details** in Portfolio Manager can be used to provide custom normalization⁴ metrics which can be used to calculate the Energy Star Score. There are a number of reporting and planning features within Portfolio Manager that can assist with managing building energy use beyond the provision of energy use comparisons. Examples of these features include:

- Setting energy efficient targets and tracking progress.
- Reporting energy use trends through standard and custom reporting templates available on Portfolio Manager.

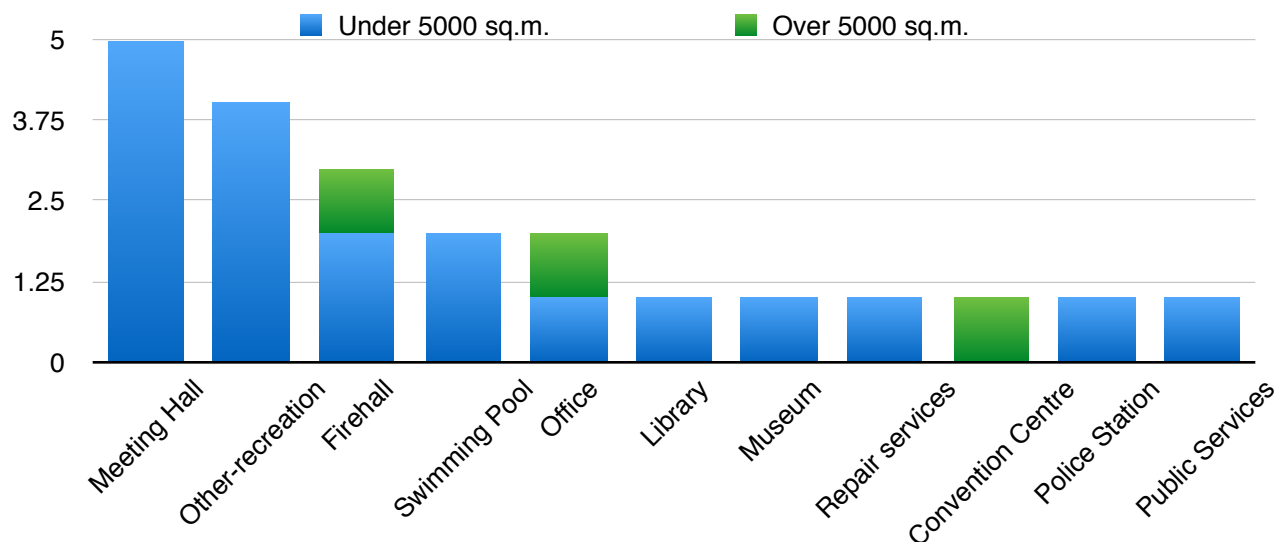


Figure 2: City of New Westminster Energy Benchmarking Portfolio Building Types

² The **Energy Star score** is a measure of how well the property is performing relative to similar properties, when normalized for climate and operational characteristics.

³ **EUI**-calculated by dividing the total energy consumed by the building in one year (measured in kBtu or GJ) by the total gross floor area of the building. Generally a low EUI signifies good energy performance.

⁴ **Weather Normalized Source Energy** –The source energy use the property would have consumed during 30-year average weather conditions. *Weather Normalized Source EUI* is *Weather Normalized Source Energy* divided by property size or by flow through a water/wastewater treatment plant).

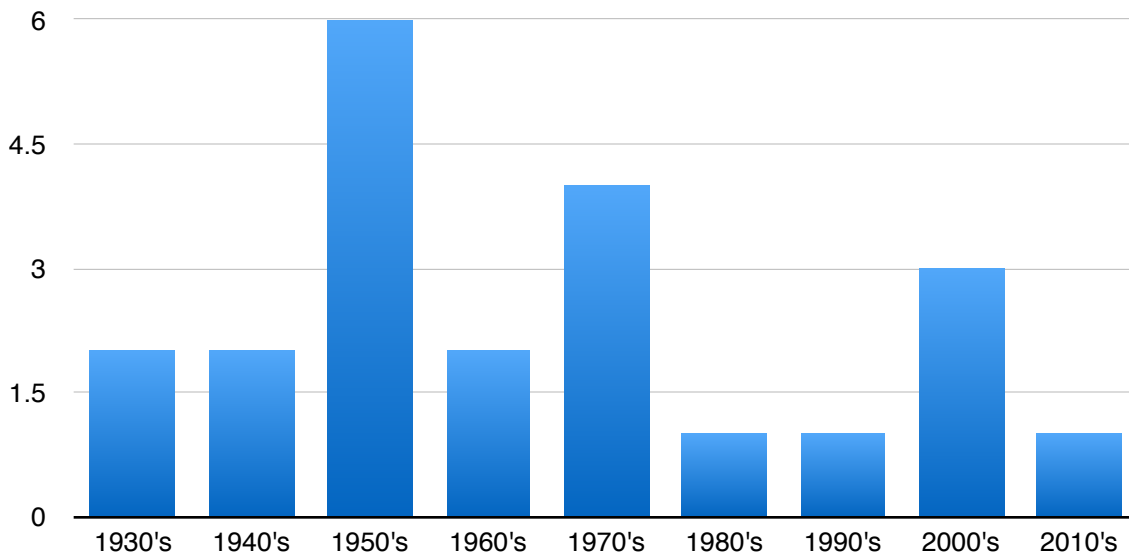


Figure 3- Age of Buildings in the City of New Westminster Energy Benchmarking Portfolio

Method

The building energy use data is derived from the City of New Westminster's SMARTTool⁵ database. The energy data is determined from billing information and is currently only available for buildings for which the city pays for the utilities. Data is provided for each utility meter and is aggregated for properties that contain multiple meters. Energy use data is provided for Electricity and Natural Gas (depending on the building connections).

The City of New Westminster is interested in how the emissions reporting metrics of Portfolio Manager and SMARTTool compare and how these can be used to complement each other for potential data exchange. There is future possibility for integration of the two tools which could help to inform New westminster's Energy benchmarking plan.

The largest time commitment associated with the use of Portfolio Manager is the need to continuously update the energy consumption data. This can be done by manually uploading data to Portfolio manager or through the spreadsheet upload templates provided in the software. A detailed procedure for future updates to the City of New Westminster's Energy Use data has been provided in the form of a guidebook to the City of New Westminster's sustainability team.

⁵SMARTTool is a GHG emissions reporting tool used to help organizations meet GHG reductions targets. The service is provided by BC Hydro to the City of New Westminster.

Challenges

A number of issues were encountered while developing the City of New Westminster's energy benchmarking portfolio. The challenges are as follows:

1. **Data accuracy and comparison of building types-** There are small variations in the values comparing the GHG emissions with the numbers determined by SMARTTool. The Energy Star Score is not currently available for all building types and is not a direct indication of energy consumption. The Energy Star Score allows for a comparison of building energy performance within a category of buildings against the national building stock peer group⁶. However, in Canada the Energy Star Score is currently available for only four building types: Offices, K-12 schools, Hospitals and Food Retail, limiting the pool of buildings available for a comparative analysis.
2. **Property use types-** Property Use Details will need to be added manually to each property type as they are not accounted for in the templates. If property use details are not included Portfolio Manager will use default values based on Property Type and Gross Floor Area when required to perform internal calculations, distorting the EUI values. Also, certain property types are not accounted for in Portfolio Manager, for e.g. Greenhouses.
3. **Buildings with multiple uses-** A number of the City of New Westminster's properties have multiple uses. The Energy Star Score is based on an average of the use types but Portfolio Manager cautions that common configurations will be provided with a more accurate score if the building is classified only with the single dominant use type⁷. The multiple uses have been included in the City of New Westminster's portfolio as this is the preferred approach from the standpoint of building energy management.
4. **Uploading data using templates:** Portfolio manager can sometimes fail to read the data in the uploaded templates. Due to this issue the updating process can become a very time consuming and tedious task.

⁶ ⁷ EPA. "Technical Reference – Energy Star Score". Available online: <<https://portfoliomanager.energystar.gov/pdf/reference/ENERGY%20STAR%20Score.pdf?11ac-97ca>>

Results

Table 1: Benchmarking results for the City of New Westminster’s corporate buildings.

Property Name	Property Type	Area (m ²)	Year Built	Baseline Source EUI (2014)	Current Source EUI (2015) and % change	Baseline Site EUI (2014)	Current Site EUI (2015) and % Change	GHG Emissions Change
Canada Games Pool	Swimming Pool	3877	1973	7.70	7.86 (2.1%)	5.93	6.19 (4.4%)	7.6%
City Hall	Office	5490	1953	0.46	0.54 (17.4%)	0.22	0.26 (18.2%)	17.8%
Centennial Community Centre	Meeting Hall	1926	1985	0.98	0.86 (12.2%)	0.71	0.64 (9.9%)	5.5%
Engineering Operations Admin	Office & Industrial	557	1952	8.95	8.88 (0.8%)	5.40	5.42 (0.4%)	3.3%
Glenbrook Firehall	Firehall	7803	2002	0.43	0.41 (4.7%)	0.29	0.28 (3.4%)	9.8%
West End Firehall	Firehall	287	1947	2.43	2.62 (7.8%)	1.92	2.12 (10.4%)	13.4%
Queensborough Firehall	Firehall	557	1999	2.47	4.04 (63.6%)	1.87	3.13 (67.4%)	72.2%
Hume Park Washroom	Other-Recreation	139	1958	7.08	4.34 (38.7%)	6.51	4.02 (38.2%)	37.8%
Moody Park Arena	Other-Recreation	2845	1974	2.82	2.60 (7.8%)	1.73	1.54 (11.0%)	16.9%
Moody Park Outdoor Pool	Swimming Pool	464	2009	5.56	6.20 (11.5%)	3.97	4.66 (17.4%)	27%
Public Library	Library	4180	1958	1.10	1.15 (4.5%)	0.67	0.70 (4.5%)	4.1%
Century House	Social/ Meeting Hall	2322	1958	0.69	0.69	0.61	0.63 (3.3%)	6.1%
Police Services Building	Police Station	4923	2001	1.95	1.63 (16.4%)	1.17	0.95 (18.8%)	27.4%
Queen’s Park Arenex	Other-Recreation	1254	1938	1.29	0.76 (41.4%)	0.87	0.57 (34.5%)	22.9%
Queen’s Park Arena	Other-Recreation	4459	1930	1.99	1.86 (6.5%)	1.23	1.16 (5.7%)	3.6%
Queen’s Park Centennial Lodge	Social/ Meeting Hall	737	1960	0.88	0.8 (9.1%)	0.61	0.57 (6.6%)	0%
Queen’s Park Maintenance Yard	Repair Services	297	1945	4.27	3.66 (14.3%)	2.72	2.36 (13.2%)	10.9%
Queen’s Park Greenhouses	Other-Public services	696	1970	3.81	3.77 (1.0%)	3.48	3.38 (2.9%)	4.2%

Property Name	Property Type	Area (m ²)	Year Built	Baseline Source EUI (2014)	Current Source EUI (2015) and % change	Baseline Site EUI (2014)	Current Site EUI (2015) and % Change	GHG Emissions Change
Queen's Park Gardeners Building	Meeting Hall	185	1956	1.35	0.99 (26.7%)	1.11	0.81 (27.0%)	26.4%
Irving House Museum	Museum	545	1964	2.05	1.38 (32.7%)	1.17	0.85 (27.4%)	7.5%
Queensborough Community Centre	Social/ Meeting Hall	2415	1978	1.14	1.15 (0.9%)	0.88	0.72 (18.2%)	42.5%
Anvil Centre	Convention Center	7804	2014	Awaiting Results	Awaiting Results	Awaiting Results	Awaiting Results	Awaiting Results

Glossary

Source EUI (GJ/m²) – The Source Energy Use divided by the property per square meters.

Source Energy Use – Source energy represents the total amount of raw fuel that is required to operate the building. It incorporates all transmission, delivery, and production losses. EPA has determined that *source energy* is the most equitable unit of evaluation for determining the Energy Star Score.

Site EUI (GJ/m²) – The Site Energy Use divided by the property per square meters.

Site Energy Use – The annual amount of all the energy consumed on-site by the property, as reported on the utility bills.

GHG Emissions – Greenhouse Gas (GHG) Emissions are the carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O) gases released into the atmosphere as a result of energy consumption at the property. GHG emissions are expressed in carbon dioxide equivalent (CO₂e), a universal unit of measure that combines the quantity and global warming potential of each greenhouse gas.

References

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