ANALYSIS OF HIGH PERFORMANCE ENERGY-EFFICIENT BUILDINGS IN THE CITY OF NORTH VANCOUVER

A Sustainability Scholars Program Project

EXECUTIVE SUMMARY

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Acknowledgements

Introduction

The City of North Vancouver's vision is to be a vibrant, diverse and highly livable community that strives to balance the social, economic and environmental needs of the community (CNV, 2018). A city that is brimming with potential, the City of North Vancouver has helped lead the way in energy efficiency in homes in Vancouver for the last decade.

Since 2011, the City of North Vancouver has had energy targets and guidelines in place to ensure that all new developments in the city meet progressive energy targets. This trove of data, created through the Energy Efficient Buildings Initiative, has enabled the city to partner with UBC through the UBC Sustainability Scholars program to analyze the data to identify the tradeoffs being identified by builders in the area who are looking to meet and exceed the energy targets.

Currently in the City of North Vancouver building energy use accounts for nearly half of the city's greenhouse gas emissions and 70% of the city's total energy consumption (CNV, 2018). While there are retrofit programs available for existing homes, the City of North Vancouver is looking to ensure all new homes meet progressive energy targets (CNV, 2018).

Through the city's Living City Initiative, the City of North Vancouver recognizes that they must not only lead by example on sustainability, but provide opportunities for residents and businesses as well. The analysis of the building data will provide an opportunity for local builders to meet and exceed the future energy standards that are required through the BC Step Code.

Background

The City of North Vancouver continues to lead the way in progressive initiatives to reduce energy use and carbon emissions from homes. Building on the legacy of the Energy Efficient Buildings Initiative, on December 15, 2017, the City became the first municipality in British Columbia to require the use of the BC Energy Step Code for all new buildings. The BC Energy Step Code provides an incremental approach to obtaining energy efficient buildings that go above the base requirements of the BC Building Code and a pathway to ensuring all buildings province-wide are Net-Zero Energy Ready by 2032(CNV, 2018). For the purposes of this project, the focus was on Part 9, new construction buildings in the City of North Vancouver between 2011 and 2018.

Research Approach

To meet the requirements of the project, the following methodology was utilized:

1) Project Scope: Utilizing the Sustainability Scholars scope as a reference point, representatives from the City of North Vancouver, BC Hydro, BC Housing and the Province

of British Columbia, reviewed the opportunity and identified the main focus of the project and how to best utilize the available data. The limitations of the data were identified by the group as well as identifying the most useful outcomes of the project. It was decided that the project would focus on; Building Envelope, Mechanical Systems and Air Tightness.

2) Data selection: With a project focused on Building Envelope, Mechanical Systems and Air Tightness, it was determined that the best location to find this data was in HOT2000 reports. Reviewing the reports, 25 data points were selected to provide a complete overview of the homes and their building characteristics.

3) Data Collection: With a clear scope in mind, the project focused on the HOT2000 energy report required with each new development. As every home built in the City of North Vancouver required a HOT2000 report to be completed for approval since 2011, this was the starting point for the data. Through the changing of systems, the reports were found in three main areas; Digitally in ENE or BLD files in the City of North Vancouver Tidemark Advantage database, physically in the filing system for the City of North Vancouver, or when not available locally, through the NRCan database. Each of these data locations were utilized to collect data on each Part 9 building completed between 2011 and 2018. Approximately 70% of the data was found within the Tidemark Advantage database, 20% was received from NRCan and the final 10% was from hard copy reports. As each of the data sets contained the same information, there is no distinction between the locations from which they were compiled.

4) Data Consolidation: Once all of the data was collected from each of the sources, it was consolidated to ensure that the data matched and did not contain duplicates. To complete this, NRCan data was utilized as the base data for homes built between 2011 and 2015. The data collected through the Tidemark Advantage data base was the second layer of data which accounted for the majority of homes and spread from 2011- 2017. Finally the hard copy data was consolidated with most of the data being from 2017 and 2018. House volume was utilized as the main identifier to remove any duplicate data.

5) Data Analysis: With all of the data available and tabulated, it was reviewed and summarized to identify trends in builder's choices and tradeoffs. Energy metrics were created to see which areas had the greatest impact on the efficiency of the home as well as which areas builders chose to focus on when they were looking to meet a higher energy target. These trends provided the basis for the summary of results. For the analysis of the report both Energuide data and Step Code data were included, but comparisons between the two systems were not completed.

6) Results: To summarize the findings, visual representations of the data were created and presented to show the findings and tradeoffs that were made. Based on the tradeoffs, recommendations are made on the methods of meeting energy requirements. The results also assist the City in understanding which metrics have the greatest impact on energy efficiency and provide guidance on the best metrics to track to help the City improve its energy efficiency.

Summary

Data was collected on 556 Part 9 homes that were built in the City of North Vancouver between 2011 and May 2018. All of the homes reviewed were built to meet or exceed the Energuide 80 requirements for energy efficiency. Based on the HOT2000 reports that were submitted to the city, the mechanical systems and building envelope characteristics were recorded and analyzed for trends. The data collected focused on the following criteria:

Building Information	House type	Number of Storeys	Year Built	
Building Structure	Thermal Mass Level	Window Type	Ceiling RSI Value	Main Walls RSI Value
Building Envelope	Home Volume	Home Floor Area	Air Leakage	Equivalent Leakage Area
Ventilation	Ventilation System	Heat Recovery Efficiency		
Heating and Cooling	Space Heating Fuel	Space Heating Equipment	Space Heating Efficiency	AC Use and Efficiency
Water System	Hot Water System Fuel	Hot Water Equipment	Hot Water Efficiency	
Energy Rating	Annual Energy Usage (Home)	Energuide/ Step Rating		

Utilizing these categories, data was collected from 556 homes in the City of North Vancouver. This included 8 coach houses, 375 Single Family Homes and 173 Duplexes. As the majority of the homes were made before the Step Code came into effect therefore most of the homes (97%) were rated on the Energuide Scale, with 43% being above Energuide 83, equivalent to Step 3.

Based on the data, the city has done well in having high efficiency mechanical systems installed, but has room to improve on the building envelopes, particularly in increasing insulation levels to meet the Step Code minimum suggestions. Despite this, the buildings have performed well, with 43% being above Energuide 83, which would be the equivalent of Step 3.

Overall the City of North Vancouver has worked at leading the way on energy efficient buildings. The city has the capacity in its designers, builders and city staff to continue to push the energy efficiency further and meet the higher step code requirements. As the city does this it has the opportunity to collect further data on the methods used and continue to analyze the data. To do this the city should concentrate on the main characteristics of the buildings and ensure the data is available to utilize. By collecting and analyzing the data related to the energy efficiency of the

buildings the city can tap into the wealth of knowledge in the city and determine how to move further up the Step Code.

Recommendations

Overall the City of North Vancouver has been collecting useful energy data since 2011. Through the review of the HOT2000 reports from 2011 to 2018, it was clear that there was sufficient data from which to make conclusions. Having data on the mechanical systems, building envelope and building characteristics was a benefit in making recommendations on these areas. Based on this there are four recommendations for the city to help meet their building energy targets:

1) Have a focus on improving building envelope including air tightness and insulation levels.
2) Continue to collect the energy data on new homes.
3) Have a central database to collect the energy data.
4) Share the data with builders, designers and the public.

Further to this for the builders to better meet the Step Code requirements it is recommended that they reduce the number of tradeoffs they make on buildings. The data indicates that there are examples of builders exceeding the requirements in each of the categories reviewed, but by not considering the building as a whole and selecting one efficient system while neglecting another, the building does not function to its full capacity. To aid in this process it is recommended that the designers, builders and city work together earlier in the process to understand expectations and ensure that the energy efficiency is built into the design and does not need to be retrofitted in later.

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