MORRISON HERSHFIELD

Comparative Analysis Study to Compare LEED v4 and Green Globes in Newfoundland and Labrador

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EXECUTIVE SUMMARY

The following study was commissioned by the Department of Municipal Affairs and Environment, Government of Newfoundland and Labrador, and was undertaken by Morrison Hershfield Limited. The objective of this study was to conduct a comparative analysis of the Leadership in Energy and Environment Design Version 4 (LEED v4) and Green Globes Version 2 (v2) green building rating systems for new or major renovation building construction projects in Newfoundland and Labrador in order to understand these rating systems and their overall applicability in the province. The review of each rating system focused on the applicability of each rating system in consideration of unique Newfoundland and Labrador circumstances, including the geographic context, climate, typical building types and building sizes, and industry's familiarity with each rating system in the design and construction industry. To extend the comparison beyond Newfoundland and Labrador, we discussed federal, provincial, and municipal trends across Canada for selecting and implementing sustainable building rating systems and approaches to energy efficiency. Finally, the study evaluated the application of both rating systems in Newfoundland and Labrador project using a case study approach of a facility that is currently in the final stages of LEED 2009 certification.

The findings from this study will assist in establishing the evidence base for the Government of Newfoundland and Labrador as it considers updates to its Build Better Buildings (BBB) Policy.

Findings

The following highlights the key findings of this study in regards to the applicability for each rating system.

- Both LEED and Green Globes are being utilized across Canada, including in federal, provincial and municipal green building policies to demonstrate government leadership by example in their own operations.

- LEED v4 is more stringent that LEED v2009 for most project types, which likely results in the drop of one level of certification when compared to projects and strategies used for LEED v2009.

- Green Globes v2 has some significant changes in the calculation of energy credits when compared to Green Globes v1.

- LEED Building Design and Construction (BD+C) v4 Level Certified would be comparable to Green Globes v2 Level high 2- low 3 (pending interpretation of energy credits).

- Green Globes' credits are a mix of intent-based approaches, similar to LEED, (e.g., implement a fundamental commissioning plan), as well as instructive or prescriptive based approaches (e.g., install a roof per manufacturer's guidelines).

- Government of Newfoundland and Labrador officials, as well as local design firms and the local construction industry is generally more familiar with the LEED rating system than Green Globes. Familiarity with either LEED or Green Globes rating systems is limited for smaller design firms and contractors, as well as in smaller communities. This is based on our discussion with architects and contractors, and work with Government departments such as the Department of Transportation and Works on primarily "large" projects in urban cities.

- The implementation of Green Globes would likely require a more detailed and thorough education program to build capacity in the marketplace, plus the addition or increase of Green Globes accredited professionals in Newfoundland and Labrador. **Note**: Green Globes accredited professionals currently located outside the Province can help to fill this void until local capacity can be developed.

- There are no minimum project requirement restrictions for either rating systems that would inhibit the use of either system based on the current parameters of the BBB policy (e.g., building size, building type, occupancy, etc.).

- Green Globes allows for a wider spectrum of certification levels, from entry to high performance (One Globe to Five Globes) and is more flexible with the use of "not applicable" options. Conversely, LEED is intended as a market transformation tool and hence is intended to push and service the top end of the building market.

- LEED's prerequisites allow for a minimum level of environmental performance across all categories, while Green Globes does not have minimum levels of performance; however, Green Globes does have a minimum threshold before points are awarded. The prerequisites present one limitation to certification when compared to Green Globes; however, we do not believe that there are any hurdles for typical projects to meet any of the LEED v4 prerequisites.

- Rural projects with limited alternative transportation systems and waste diversion infrastructure present some limitations in both rating systems. These credit types represent 11.8 per cent of credits in LEED and 3.5 per cent in Green Globes.

- Soft costs, such as architectural, engineering and other consulting fees, are comparable between the two rating systems, with slightly less soft costs typically experienced for Green Globes projects.

- Capital costs are comparable for either rating system at the same levels (i.e. Silver or 3 Globes). Additional capital costs would be anticipated for higher certification levels, but this will depend on a range of factors such as building location, building type and strategies chosen. Green Globes lower certification levels (1 or 2 Globes), would likely see a reduction in capital costs, depending on strategies chosen, but also a corresponding reduction in environmental impact.

- In our opinion, by meeting the requirements of the 2015 National Building Code (NBC), including the National Energy Code for Buildings (NECB) 2011 and/or the previous BBB Policy requirements, projects should incur no additional capital costs, as they relate to energy, to meet the new LEED v4 Certified or Green Globes Level 2 requirements. This is due to the fact that the National Building Code (2015) and Energy Code (NECB 2011) require that buildings become increasingly more energy efficient, and the requirements of the previous BBB Policy, which stipulates that buildings must exceed the Model National Energy Code for Buildings (MNECB) 1997 by 25 per cent - which is approximately equivalent to exceeding the NECB 2011 by 5-10 per cent.

  Note: Newfoundland and Labrador has not adopted the NECB at this time.

- Energy efficiency is awarded slightly higher in Green Globes (39.5 per cent) than LEED (33 per cent); however, Green Globes method of awarding points is limited in building type, available reference data and uses US emissions factors (0.758 kg/kWh) that are an order of magnitude higher than the current Newfoundland and Labrador emission factor (average factor, excluding exports, of 0.144 kg/kwh). Collectively, this approach may cause some complications for projects in Newfoundland and Labrador and would require experienced energy modellers and a close working relationship with Green Globes verifiers.

- Both rating systems are similar with respect to their approach to weighting non-energy environmental credits (e.g., water, health, wellness, waste, etc.).

1. INTRODUCTION

The following study was commissioned by the Department of Municipal Affairs and Environment, Government of Newfoundland and Labrador, and was undertaken by Morrison Hershfield Limited. The objective of this study was to compare LEED v4 and Green Globes v2, with respect to their applicability for new construction or major renovation projects in Newfoundland and Labrador. More specifically, the tools reviewed included LEED v4.0 for Building Design and Construction and Green Globes v2 for New Construction / Major Renovations. For the purposes of this report, these rating systems will be abbreviated as: “LEED v4” and “Green Globes v2”.

This report assesses the two rating systems by examining their histories, general program features and tools used, limitations and challenges for use in Newfoundland and Labrador given the province’s unique circumstances, as well as a focused comparison between the precise requirements of both systems. To illustrate the applicability and use of each system, we have also provided a case study of an existing project pursuing LEED version 2009 in Conception Bay, Newfoundland and Labrador. The case study will illustrate how the project could perform if it was to pursue LEED v4 or Green Globes v2, as well as a discussion on the use, issues and potential paths to achieve higher levels of certification.

The intent of this report is to assist the Government of Newfoundland and Labrador in evaluating the major changes from LEED version 2009 to LEED v4, to provide a comprehensive overview of the Green Globes v2 rating system, and provide expert comparative analysis of the two rating systems in order to inform a review of the Province’s BBB Policy.

1.1 Limitations

This study was based upon our research (e.g., website and industry contacts), familiarity with green building rating systems and Morrison Hershfield’s experience using LEED v2009 for projects funded by the Government of Newfoundland and Labrador. As there have been no Green Globes projects certified in Newfoundland and Labrador to date, there are some limitations to our findings. The content, findings and recommendations outlined within this report are solely intended for the Government of Newfoundland and Labrador. This report is not intended, nor written, to be used as a guide to inform the choice of green building rating systems in other provinces or municipalities.

1.2 The Approach to this Study

We approached this study by asking the following question:

1. What are the building sustainability focuses and goals for the Government of Newfoundland and Labrador?

2. What are the specific challenges and opportunities associated with applying LEED v4 and Green Globes v2 in Newfoundland and Labrador?
3. What are the similarities and differences of LEED v4 and Green Globes v2?
4. What are the capital cost implications associated with pursuing and achieving for LEED v4 and Green Globes v2 certification?
5. To what degree are non-energy related factors assigned importance in each rating system?
6. How do the soft costs and level of administrative burden typically experienced by practitioners compare for each rating system?
7. What is the rest of Canada doing with respect to building sustainability? Which rating systems are most prevalent?

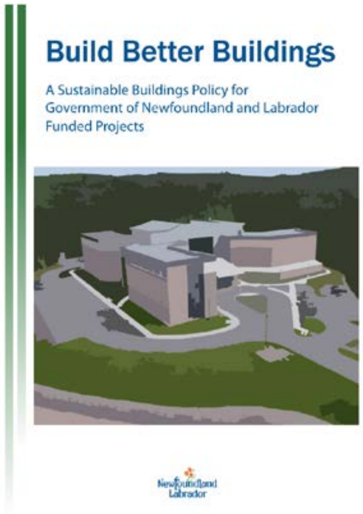
The following sections of this comparative analysis report focus on addressing the above questions.

2. NEWFOUNDLAND AND LABRADOR SUSTAINABLE BUILDING POLICY

The following three Government documents have been specifically highlighted to illustrate the focus for the Government of Newfoundland and Labrador with respect to its historical approach to buildings sustainability.

This comparative analysis that follows this section will form part of the evidence based being assembled to assist the Government of Newfoundland and Labrador in increasing the effectiveness of the BBB Policy.

2.1 Background on BBB Policy



Build Better Buildings

A Sustainable Buildings Policy for Government of Newfoundland and Labrador Funded Projects

Newfoundland Labrador

The Build Better Buildings (BBB) policy is the Government of Newfoundland and Labrador's sustainability policy for government funded projects and establishes the parameters under which certain provincially funded projects are built. The BBB Policy emerged from a commitment in the 2007 Energy Plan*, Focusing our Energy*, and came into effect in September 2010.

The focus of the Policy is to:

- Improve the indoor environment for the benefit of occupants;
- Reduce harmful emissions;
- Conserve valuable energy resources by consuming less energy;
- Reduce operating and maintenance costs over the life-cycle of the building, and;
- Emphasize environmentally-friendly building practices.

The BBB Policy applies to all new buildings and major renovations and/or extensions to existing buildings receiving any level of capital construction funding from the Provincial Government or built by Provincial Government corporations or agencies where:

- The area of a new building or extension to an existing building is 600 square meters (6,458 square feet) or more; or

- The cost of renovations and/or extensions to an existing building (600 square meters or more) exceeds 50 per cent of the cost of a new building of equivalent size and function.

Applicable projects must comply with the three key concepts of the Policy:

1. Exceed the 1997 Model National Energy Code in Canada for Buildings (MNECB) by 25 per cent;

2. Where practical, register with the Canadian Green Building Council (CaGBC) and strive to achieve a minimum of Silver certification under the appropriate LEED rating system; and

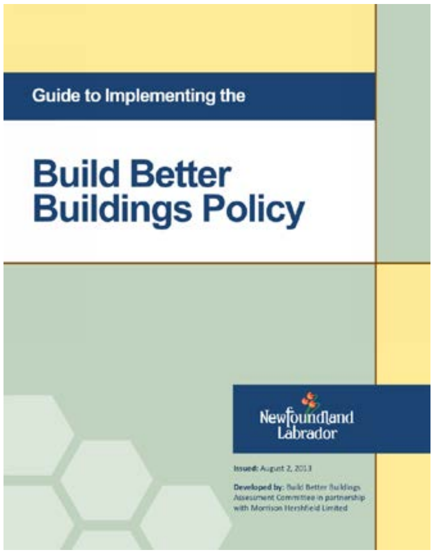
3. Perform a life cycle project cost analysis.

Two specific notes were identified at the time the Policy was drafted:

- The MNECB was scheduled to be updated over time (i.e. beyond the 1997 version), would be reviewed for the impact on projects, and the Policy may be amended accordingly; and

- The LEED rating system would likely be updated over time by the CaGBC and may be reviewed by Government to reflect its goals and overall objectives at that time.

When the BBB Policy was created, the CaGBC had released LEED Canada version 1.0, with the addendum, which was referred to as LEED Canada version 1.1. The LEED Silver certification level was based upon LEED Canada version 1.1. Since that time, LEED was updated to LEED version 2009 in 2010, and subsequently to LEED v4 in 2016; however, there were no parallel updates to the BBB Policy document. Relatedly, there were also no updates to BBB Policy requirements when the NECB was updated in 2011 and 2015.



Guide to Implementing the

Build Better Buildings Policy

Newfoundland Labrador

Issued: August 2, 2013

Developed by: Build Better Buildings Assessment Committee in partnership with Morrison Hershfield Limited

A Guide to Implementing the Build Better Building Policy was released in August 2013 to assist key technical staff, project managers and senior decision-makers in understanding the benefits and requirements of the policy. Three of the key notes from this guideline were;

1. The concept of choosing “smart” credits for their benefits to building occupants and the people of Newfoundland and Labrador;

2. The concept of “striving” for LEED Silver. The “striving” concept was a result of the release of the new LEED version 2009 (considered to be a more difficult target than LEED version 1.1), and a

stretch target for projects that were either not-applicable to the BBB Policy or had other limitations (e.g., location, building type, etc.);

3. A list of green building practices, LEED strategies for Newfoudland and Labrador and an Urban / Rural comparison score card.

Since the Energy Plan commitment in 2007, 61 provincially-funded buildings, including those maintained by agencies, boards, commissions and municipalities, have been LEED registered (six projects were subsequently de-registered).

2.2 Market Transformation Framework

The Market Tranformation Framework (MTF) was issued in October 2015 building upon commitments in the Government of Newfoundland and Labrador's 2011 Climate Change and Energy Efficiency action plans. The framework focused on three key areas, including: buildings, transportation and products and services.

In the MTF, the Government of Newfoundland and Labrador committed to review the BBB Policy with a view to increase its effectiveness. This commitment was made recognizing:

1. That several years of policy implementation had occurred at that time and a number of builings were certified under the Policy;

2. Significant learnings with respect to sustainable buildings had been experienced by government, industry and stakeholders alike since the Policy's inception;

3. A new version of LEED (v4) was scheduled to come online; and

4. Alternative sustainable building rating systems, such as Green Globes, had begun to emerge.

3. NEWFOUNDLAND AND LABRADOR CONTEXT

Green building rating systems have been developed to address a wide range of building-related social and environmental issues, for a range of building and project types and geographic locations. Although generic in nature, rating systems will inherently be more amendable to some project types and location than others. In order to select and apply any green building rating system as part of a mandatory policy, it is important for the policymaker to understand the local context circumstances pertinent to their location. The following is a list of considerations specific to Newfoundland and Labrador that will require reflection during the selection and successful use of a green building rating system moving forward.

- The province's land mass includes an island and an isolated coast, which requires marine or flight access for people and building materials. The primary method of transporting materials is by ship and then by truck. There is one rail line in Newfoundland or Labrador, which is largely used for industrial operations such as mining. The transportation of materials therefore presents an issue of material cost and availability, as well as the carbon footprint associated with the transmission of building materials.

- Newfoundland and Labrador is a relatively large province in which approximately 40 per cent of the population live on the Avalon Peninsula, 55 per cent live in over 350 coastal communities on the island portion of the province, and five per cent live in coastal and central Labrador communities. Outside of the St. John's Census Metropolitan Area, there are only three towns with a population in excess of 10,000. This may present an issue with densification, walk scores and other urban core related accessibility and transportation issues.

- The province covers a wide range of climate zones (ASHRAE Climate Zones (6 – cold, 7 – very cold, and 8 – subarctic)), representing some of the colder climate zones in Canada. Both LEED and Green Globes can be applied in these climates; however, they are inherently designed for more temperate climates.

- The Province includes many coastal communities that may be affected by climate change and related impacts, including rising ocean levels, and increased storm activities. As such, resiliency considerations may be of importance in future updates to the BBB Policy. Both LEED v4 and Green Globes v2 include sustainability measures tied to resiliency, (e.g., site selection credits for projects located above flood plain elevations).

- There are limited recycling and waste diversion facilities in the province capable of handling all construction-related waste products (primarily around St. John's), which may impact waste-related scoring criteria.

- The province has limited alternative transportation means (e.g., bus routes limited to major cities; no passenger train or light rail service; limited bike/walking trail infrastructure, etc.), which are generally concentrated in the most densely populated areas of the province and may limit the amount of credits that can be pursued under green rating systems for projects in rural areas.

- Almost-one half of the province's population lives in municipalities, local service districts or unincorporated areas with a population of less than 2,500 people and it is reasonable to expect that, generally, most public buildings have a smaller floor space than many public buildings in urban areas in other provinces.

- The electricity grid has a low GHG emissions factor (average factor, excluding exports, of 0.144 kg/kwh) and will be 98 per cent renewable after the Muskrat Falls Hydroelectric facility is fully on-line in 2021. However, there are still isolated communities powered from diesel generators, which produce greenhouse gas emissions to generate electricity. There is no natural gas infrastructure in the province at this time.

- The cost of electricity in Newfoundland and Labrador is comparable to other Canadian jurisdictions at this time. However, when Muskrat Falls comes fully on-line in 2021, public information indicates these rates could as much as double in the absence of any government action to mitigate this increase, which would have implications for building design and construction practices and lifecycle costing.

- The design and construction community has familiarity with the BBB Policy (began implementation in 2010) including LEED; however, there are some capacity constraints at this time. For example, there is a limited number of LEED accredited professionals, and fewer Green Globe professionals, in the Province. There are few, if any, energy modelers on both the LEED and Green Globes approved list in Newfoundland and Labrador. As well, there are few local Commissioning Authorities familiar with either LEED or Green Globes' requirements.

- The design community, especially mechanical engineers, is familiar with the use and implementation of high performance mechanical systems, such as Geo-exchange, on large projects. This familiarity will assist the province in pursuing high levels of energy efficiency.

4. GREEN BUILDING RATING SYSTEM OVERVIEW

There are numerous rating systems on the market, but two of the most popular rating systems for new construction and major renovation are LEED and Green Globes. Both LEED and Green Globes evaluate a wide range of buildings and have numerous similarities in their evaluation of building sustainability. This section contains a general overview of both rating systems, their respective histories, and statistics regarding building registration and certification in Newfoundland and Labrador.

However, before discussing the specifics of two rating systems, it is worth highlighting a snapshot of the current green building market in Canada, and trending rating systems.

4.1 Canadian Policy Trends

The following highlights examples of Canadian trends in the use of green building rating systems, energy codes and low carbon initiatives to achieve climate change goals at the federal, provincial and two major city levels. These policies or initiatives were gathered from website research and outreach to professionals in the marketplace.

The two city examples (Vancouver and Toronto) illustrated below have been highlighted for their progressive “step programs” and elements that could be considered in futureproofing the BBB Policy. From a jurisdictional perspective, select provinces with sustainable building policies for government funded buildings, such as Manitoba, Saskatchewan, New Brunswick and Nova Scotia, were also examined.

Note: There is a movement within the green building industry in Canada towards net zero energy or carbon, especially with Federal Government properties and major universities, who are both leading by example.

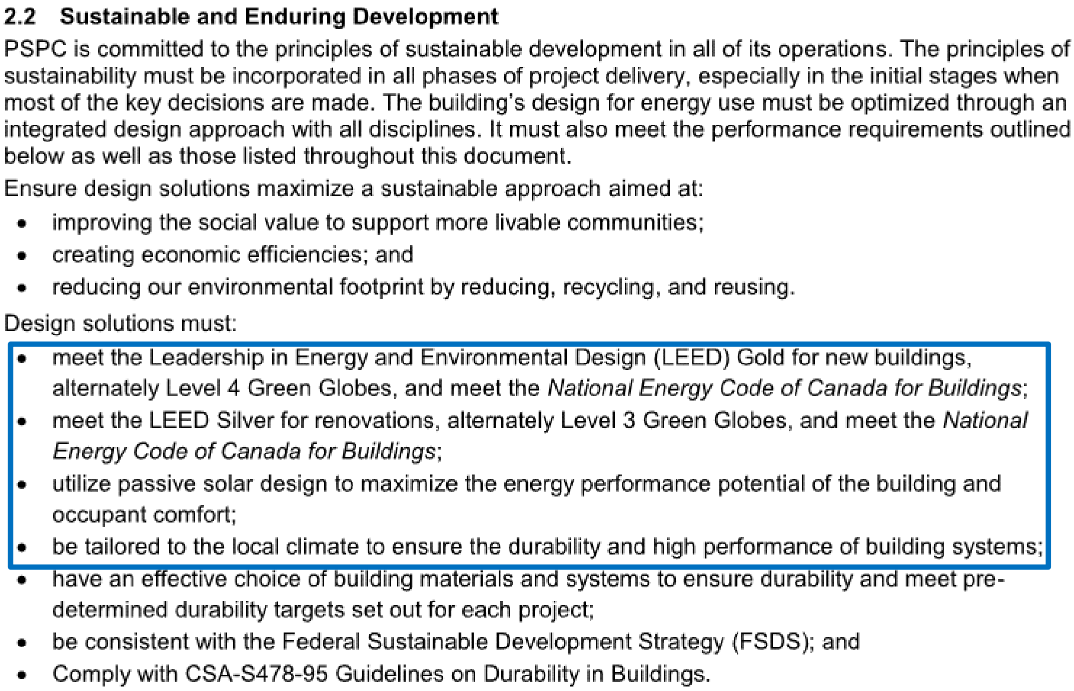
4.1.1 National Building Code of Canada

The following is outlined on the Government of Canada, Natural Resources Canada website (http://www.nrcan.gc.ca/energy/efficiency/housing/new-homes/19845).

In December 2016, First Ministers released the Pan-Canadian Framework on Clean Growth and Climate Change. Among other measures, the Pan-Canadian Framework calls for improving the energy efficiency of new construction through the development and adoption of ***increasingly stringent model building codes****, starting in* ***2020****, with the goal that provinces and territories adopt a ‘****net zero energy ready****’ building code by* ***2030.*** *Similarly, federal, provincial and territorial governments will work to develop a model code for existing buildings by 2022, for its subsequent adoption by authorities having jurisdiction.*

4.1.2 PSPC – Federal Initiatives

The Public Works (Pubic Services and Procurement Canada) technical reference for Office Building Design document (issued Mary 27, 2016, updated April 3, 2017) outlines a general approach, as well as prescriptive discipline related requirements. The general approach, relevant for this report, requires the following (excerpt from document):



2.2 Sustainable and Enduring Development

PSPC is committed to the principles of sustainable development in all of its operations. The principles of sustainability must be incorporated in all phases of project delivery, especially in the initial stages when most of the key decisions are made. The building's design for energy use must be optimized through an integrated design approach with all disciplines. It must also meet the performance requirements outlined below as well as those listed throughout this document.

Ensure design solutions maximize a sustainable approach aimed at:

- improving the social value to support more livable communities;
- creating economic efficiencies; and
- reducing our environmental footprint by reducing, recycling, and reusing.

Design solutions must:

- meet the Leadership in Energy and Environmental Design (LEED) Gold for new buildings, alternately Level 4 Green Globes, and meet the *National Energy Code of Canada for Buildings*;
- meet the LEED Silver for renovations, alternately Level 3 Green Globes, and meet the *National Energy Code of Canada for Buildings*;
- utilize passive solar design to maximize the energy performance potential of the building and occupant comfort;
- be tailored to the local climate to ensure the durability and high performance of building systems;
- have an effective choice of building materials and systems to ensure durability and meet pre-determined durability targets set out for each project;
- be consistent with the Federal Sustainable Development Strategy (FSDS); and
- Comply with CSA-S478-95 Guidelines on Durability in Buildings.

As outlined above, the requirement for LEED Gold or the alternative Green Globes Level 4 (4 Globes) was required for all new buildings and renovations to meet one level of certification lower (Silver or 3 Globes). It is worth noting that the version of either LEED or Green Globes was not identified, implying the “current” version and allowing the document to be futureproofed, which gives the document the ability to be more stringent over time. This was similar to the 2010 BBB Policy, as LEED went through at least two version changes.

4.1.3 Canada Green Building Council

Although not a policy associated with any particular jurisdiction, the following is important for the trending direction of green rating systems in Canada. The Canada Green Building Council, who also administers the LEED v4 green building rating system, introduced the new Zero Carbon Building initiative in 2018. The program requires zero carbon balance in building operations – meaning that projects must annually generate or procure enough zero-emissions, renewable energy to offset 100 per cent of the GHG emissions associated with the building's total annual site energy consumption. Existing buildings are evaluated using actual performance, while new construction and major renovation projects are evaluated based on final design.

4.1.4 British Columbia

In April 2017, the Province of British Columbia introduced the BC Energy Step Code to help both government and industry chart a course towards net-zero energy ready by 2032. The code establishes a series of measureable, performance-based energy efficiency requirements for construction that communities may choose to adopt when ready.

Vancouver, BC

Vancouver has progressively been greening their building by-laws and requirements since 2004's Green Building Strategy for civic and special development projects that required LEED Gold and 30 per cent lower energy consumption than current Vancouver Building By-Laws (VBBL). The current (2016) Zero Emissions Building Plan requires a reduction of emissions from new buildings by 90 per cent as compared to 2007 by 2025 and to achieve zero emissions for all new buildings by 2030, including intermediary time-stepped GHG emission and thermal energy demand targets.

Note:

1. Two new terms have recently been introduced; TEDI and EUI. TEDI, or Thermal Energy Demand Intensity, is the amount of heat that is required to keep a building comfortably warm regardless of how efficiently or inefficiently that heat is produced. This metric reflects building envelope performance and ventilation heat recovery. EUI, or Energy Use Intensity, is the total amount of externally provided energy to a building, including not only for heating, ventilation and hot water, but also for air conditioning, fans, pumps, lighting, appliances and plug loads.

2. The electrical grid in Vancouver is 93 per cent renewable electricity, very similar to Newfoundland and Labrador.

4.1.5 Ontario

As part of the 2016 Climate Change Action Plan, the Government of Ontario introduced actions to improve efficiency in multi-residential buildings and public institutions; to widen low-carbon energy choices for homeowners and help consumers manage their energy use; to establish long-term greenhouse gas reduction targets in the provincial building code and introduce low-carbon content requirements for natural gas; and to support workforce training. There are no specific green building rating systems requirements referenced in the Province’s Climate Change Action Plan.

Toronto Green (Building) Standard

Toronto is leading the green building movement in the Province of Ontario. The Toronto Green Standard (TGS) has just released version 3.0, which has different standards for residential buildings and city buildings. The TGS does not use LEED, Green Globes or other rating systems for compliance. The TGS was created as a custom rating system for the local Toronto market; however the requirement of the standard reference and follow many of the LEED requirements. There are a series of tiers and requirements, which we have listed the requirements for the first two tiers below:

TIER 1: GHG 1.1: Buildings Energy Performance (new construction and major renovations ≥2000m^2) Design the buildings to meet or exceed one of the following:

a. 15 per cent energy efficiency improvement above the Ontario Building Code, SB-10, Division 3 (2017); or

b. Tier 1 TEUI, TEDI and GHGI targets by building type, as provided in the Table 1.

TIER 2: GHG 1.2 Buildings Energy Performance (Core): Design the buildings to meet or exceed Tier 2 TEUI, TEDI and GHGI targets by building type, as provided in the below Table.

Note: Tier 3 or 4 high performance buildings targets (near zero emissions), may also be applied and substituted for Tier 2 levels of performance. Alternative compliance options will be accepted for Tier 3 or Tier 4 TGS including the CaGBC Zero Carbon Building Standard or Passive House standards certification.

Table: Building Energy Performance Requirements Tier 1 & 2

Building Type	*Total Energy Use Intensity (kWh/m²)*		*Thermal Energy Demand Intensity (kWh/m²)*		*Greenhouse Gas Intensity (kg/m²)*	
	Tier 1	*Tier 2*	*Tier 1*	*Tier 2*	*Tier 1*	*Tier 2*
Multi-unit Residential Buildings (≥4 Storeys)	*170*	*135*	*70*	*50*	*20*	*15*
Low Rise Multi-unit residential Buildings (≤ 6 storey woodframe construction)	*165*	*130*	*65*	*40*	*20*	*15*
Commercial Office Buildings	*175*	*130*	*70*	*30*	*20*	*15*
Commercial Retail Buildings	*170*	*120*	*60*	*40*	*20*	*10*
Mixed Use Buildings (90% residential, 5% retail, 5% commercial office)	*170*	*134*	*70*	*49*	*20*	*15*
All Other Building Types	*Tier 1: ≥15% improvement above SB-10, 2017* *Tier 2: ≥25% improvement above SB-10, 2017*					

Note: above highlighted cells refer to those buildings typically captured by the BBB Policy.

4.1.6 Nova Scotia

In the Nova Scotia Climate Change Action Plan, the following Action items were established for Provincial Government buildings;

- Action 37: …achieve a LEED Silver certification after 2008, LEED Gold certification or equivalent after 2010; and be carbon-neutral after 2020.

- Action 38: Organizations seeking Government funds... Adopt LEED Silver.., or an acceptable equivalent, for energy efficiency and water consumption.

- Action 39: By 2015, construct a building that demonstrates a leading standard for energy efficiency and sustainability.

- Action 40: Achieve an overall 30 per cent reduction by 2020 in energy consumption for all government-owned buildings constructed before 2001.

It is our assumption that Green Globes (3 Globes) would be an equivalent alternative to LEED with respect to Action 37 above.

4.1.7 Manitoba

The Manitoba Green Building Program "GBP" v2 (2013) establishes the minimum green building criteria for building projects funded by Manitoba government organizations, with an area of 600 square meters or greater. One compliance path with the GBP Manual is the pursuit and achievement of a minimum LEED Silver certification (version of LEED is not specified, but was not likely updated for LEED v4). If LEED Silver is not practical, an exemption request, including the reasons why, is required, and the owner may propose one of the following as an alternate:

- LEED certification at a lower level;
- Green Globes Certification (3 globes rating);
- Manitoba Hydro Power Smart for Business New Buildings Program; or
- Other certification system, processes or standards.

4.1.7 Saskatchewan

Prairie Resilience: A made-in-Saskatchewan Climate Change Strategy, outlines the following actions pertaining to buildings;

- Adopt 2015 NBC and 2015 NECB;
- Require new and renovated Government buildings to exceed the energy performance requirements of the 2015 National Energy Code for Buildings by 10 per cent;
- Explore options for labelling buildings for energy performance (e.g., benchmarking);
- Encourage industry to further develop innovative solutions to meet energy performance requirements;
- Increase use of wood in building construction in order to extend carbon storage;
- Increase the number of Government building with a sustainability certification (currently BOMA Best – Saskatchewan has now certified 47 Buildings by the end of 2017); and

- Work with other provincial and territorial governments in collaboration with the National Research Council to improve standards for climate resilience in building design.

4.1.8 New Brunswick

The 2010 *Province of New Brunswick Green Building Policy for New Construction and Major Renovation Projects* outlines the following requirements for buildings, based upon their size;

- Type 1 Buildings (>2,000 m^2) shall achieve a minimum LEED for new construction Silver certification or a 3 Green Globes level. **Note**: this was likely based upon the LEED version 2009 and Green Globes version 1.0.

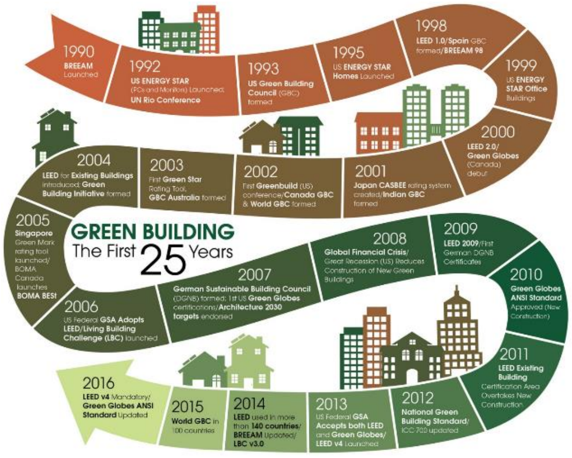
- Type 2 Buildings (1,000 to 2,000m^2) shall meet the *Efficiency New Brunswick edition of the Advanced Buildings Core Performance Guide*^{TM} requirements outlined in the policy, and meet the intent of the LEED for new construction requirements for specific credits outlined in the policy. The Guide is a prescriptive program designed to achieve significant, predictable energy savings (approximately 20-30 per cent below the 1997 MNECB).

- Type 3 Buildings (500 to 999 m^2) shall meet the *Efficiency New Brunswick edition of the Advanced Buildings Core Performance Guide*^{TM} requirements outlined in the policy, plus additional green building practices concerning; water efficiency, lighting, waste recycling and VOC limits.

- Type 4 Buildings, defined as provincially funded social housing, 3 storeys or less in height and less than 600 m^2 (i.e., Part 9 buildings, as defined by the National Building Code), or those of wood framed construction shall meet the mandatory energy and environmental requirements outlined in the policy. These include building envelope thermal performance, heat recovery ventilation systems, fluorescent lighting, maximum water fixture flow rates, and Energy Star heating, ventilation and air conditioning equipment.

4.2 History of LEED and Green Globes

There are many different sustainable rating systems used across the world, but most of them share the same general intent of evaluating the energy and environmental design of buildings across a number of environmental impact categories. The adjacent image illustrates a simplified history of green building since the 1990's.



http://www.reinventinggreenbuilding.com/news/green-building-timeline

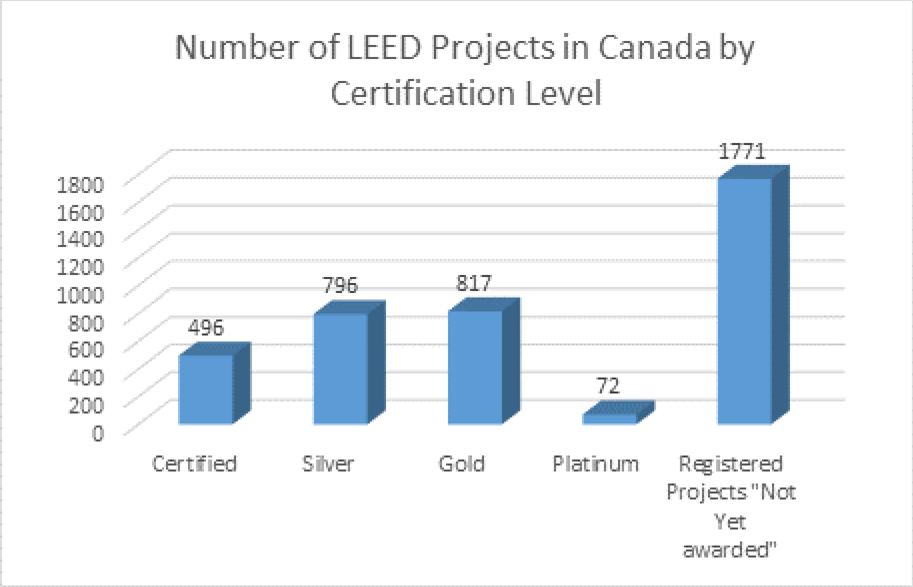
In this Report, LEED v4 and Green Globes v2 are discussed and evaluated for their potential impact on Newfoundland and Labrador projects and the future of the BBB Policy.

Note: Completing a focused, line-by-line or credit-by-credit analysis is particularly challenging to complete, as each has their own approach, weighting/scoring system, focus and target audience. For example, LEED was always intended for the top 25+ per cent of the building market and its mission was to be a market transformation tool. Conversely, Green Globes was intended for a wider market reach, allowing any designers/builders a gateway into green buildings. This is illustrated from the Green Building initiatives description of the first level of Green Globes certification which notes:

"Two Globe 40-54% Demonstrates movement beyond awareness and a commitment to good energy and environmental efficiency practices."

4.2.1 LEED

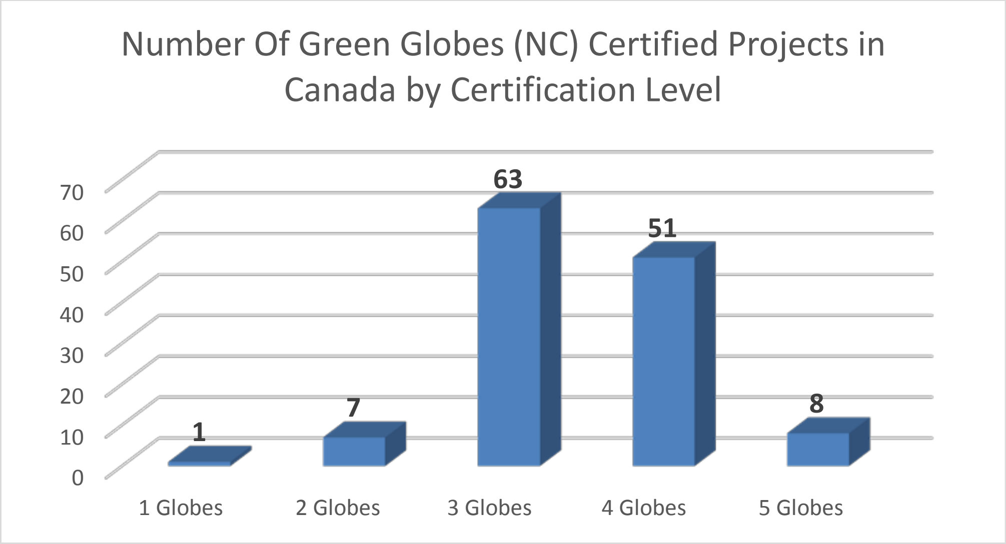
LEED stands for Leadership in Energy and Environmental Design and was first established by the United States Green Building Council (USGBC). The first pilot LEED Rating System for a New Construction "Version 1.0" was launched in 1998 and was an adaptation of the United Kingdom's Building Research Establishment Environmental Assessment Method (BREEAM) rating system for United States market. The Canada Green Building Council (CaGBC) was provided a license to develop and use LEED in Canada in 2002. The first Canadian LEED rating system was LEED Canada NC 1.0, which was released in 2004. Subsequent Canadian rating systems included: LEED Version 1.1 (2007) and LEED Version 2009 (2010). LEED v4 was introduced in the USA and Canada in 2015, but was required for all projects registering after October 31, 2016. The LEED v4 rating system can be used in Canada, through the International path and can use the Alternative Compliance Paths. There is no specific LEED Canada Version 4.



The above graph illustrates the total number of LEED New Construction projects, including Versions 1.0, 2009 and v4, registered or certified by the CaGBC. The majority of certifications are in the Silver and Gold level. The number of registered, but not certified projects is significant and noteworthy. This number includes projects that have abandoned their pursuit of LEED certification as well as those that are still moving through the submission/completion stage.

4.2.2 Green Globes

Green Globes for Existing Buildings was developed as the first Green Globes Rating system in 2000 by ECD Energy and Environmental Canada. Jones Lang LaSalle (JLL), a global commercial property service and investment firm, acquired the global rights to Green Globes in 2008. In January 2018, The Green Building Initiative (GBI) and its subsidiary GB Initiative Canada completed the acquisition of the Global rights to Green Globes from JLL, which will allow GBI to support existing Green Globes Users in Canada. The latest introduced rating system used in Canada is Green Globes Design for New Construction and Major Retrofits v2 (2014).



As illustrated in the above graph, the majority of Green Globes certified projects in Canada are at the 3 or 4 Globes level. Of particular note, the public-facing database for Green Globes projects does not identify the number of projects that are in the processing of receiving certification, but that have not yet been awarded.

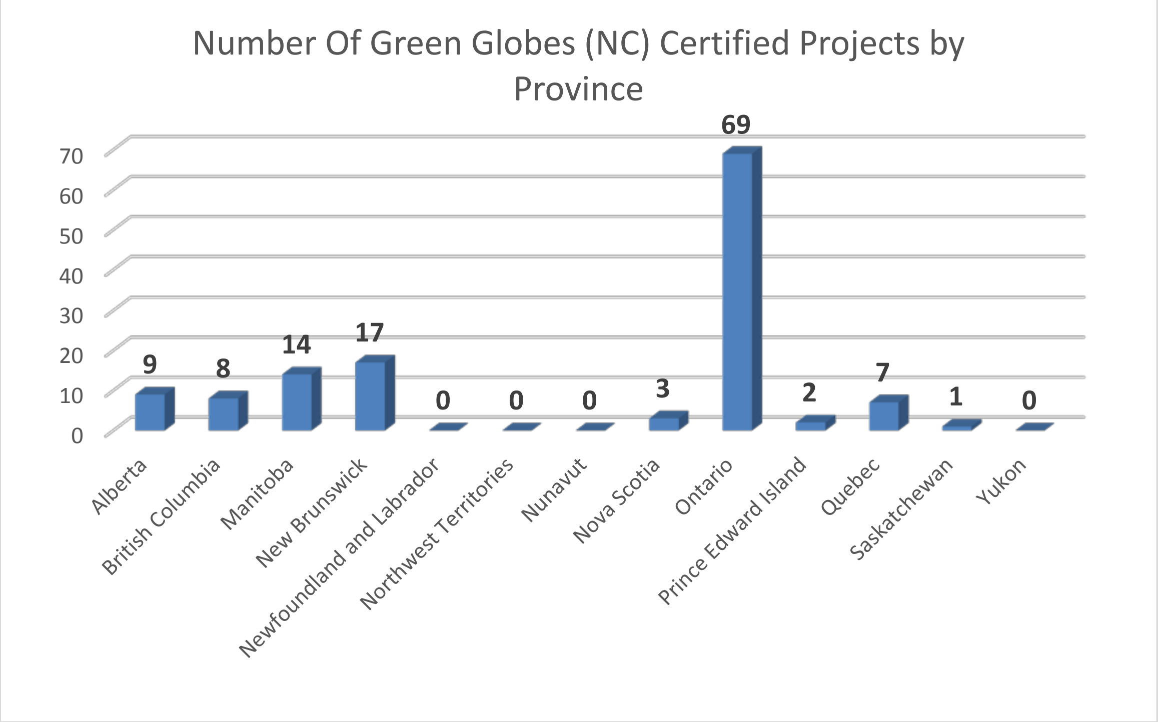
4.3 LEED and Green Globes Project Statistics in Newfoundland and Labrador

In this Section, a series of charts have been provided to illustrate the number of projects registered or certified under both rating systems in Newfoundland and Labrador.

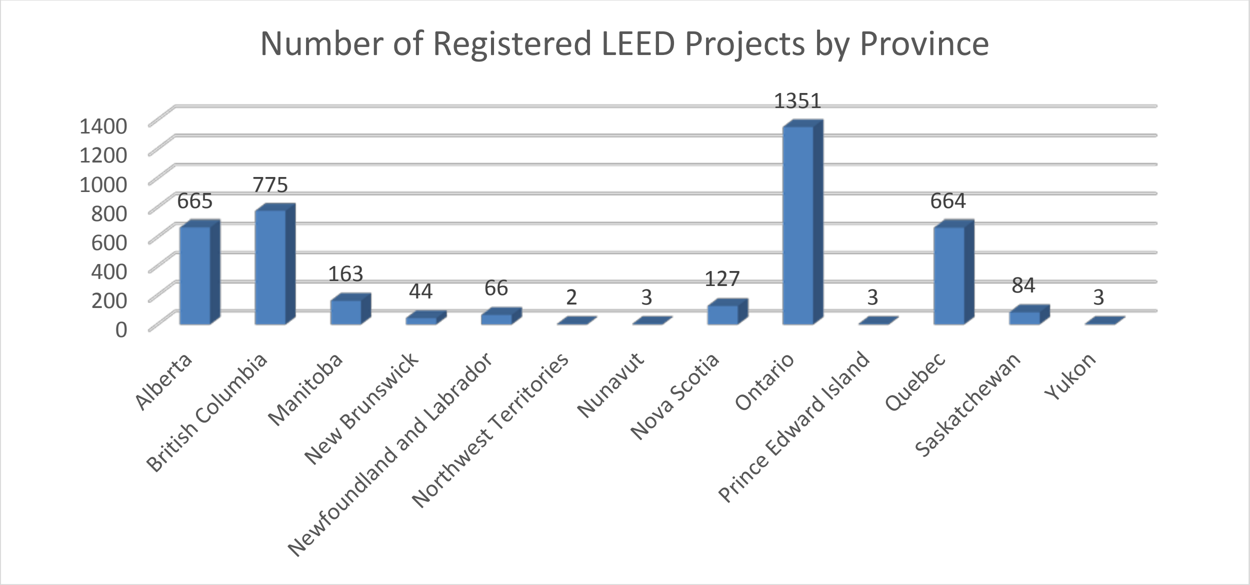
These graphs illustrate the following:

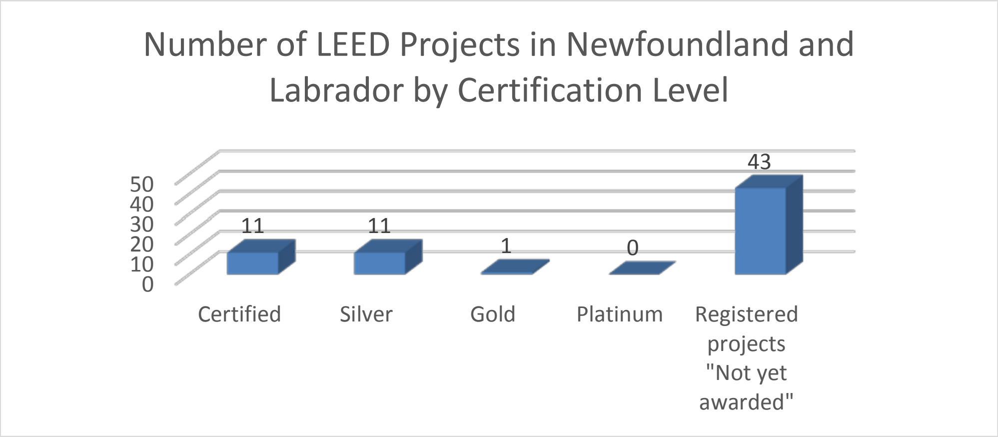
1. There are no Green Globes projects in Newfoundland and Labrador and limited Green Globes projects in Canada relative to the number of LEED projects at this time. That is, there are considerably more LEED projects in Newfoundland and Labrador and the rest of Canada than Green Globes projects; and

2. Most LEED projects in Newfoundland and Labrador (and it is anticipated for Green Globes projects as well) are located in urban locations and have certified at least one level lower than the Canadian average (e.g., Silver or Certified, rather than the average Gold). This is likely due a number of factors, such as the tendency of the rating systems to favour urban centers and in-fill projects, the remote location of the province, and the lack of local construction material availability.



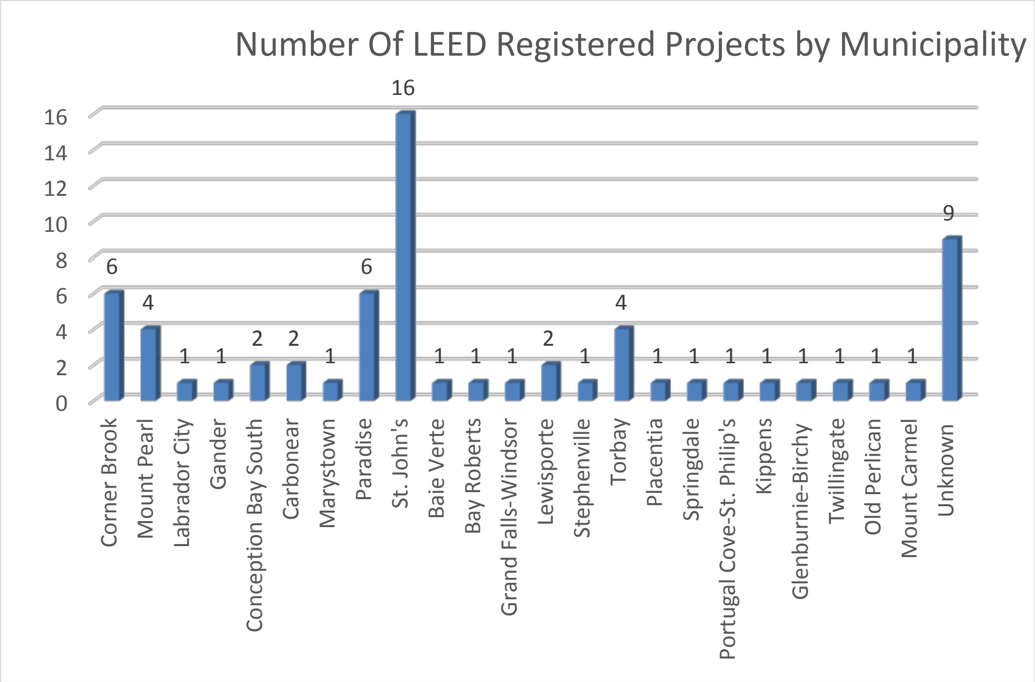
As illustrated in the above graph, there are currently no Green Globes certified projects in Newfoundland and Labrador, while there have been 66 LEED registered projects in Newfoundland and Labrador, as shown in the below graph. It is worth noting that after Ontario, which has the highest number of Green Globe certified buildings with 69, the next two provinces with higher levels of Green Globes market penetration (i.e. New Brunswick and Manitoba), have sustainable building policies for their government funded buildings which permit the use of the Green Globes rating system as an alternative to LEED.





The above graph illustrates LEED outcomes for Newfoundland and Labrador, illustrating a stronger Certified and Silver level of certification, rather than the Canadian average of Silver/Gold. The drop in at least one level of certification is an interesting observation, which we believe is in consideration of the unique Newfoundland and Labrador circumstances that were discussed in Section 3. Another interesting observation is the number of registered, but not awarded projects. This may be due, in part, to unfamiliarity with the application and data management processes associated with LEED in the early days of the BBB Policy, and the typical length of time it has taken for projects to proceed from initial registration to formal certification.

The below graph illustrates the locations for each of the registered projects and demonstrates a stark contrast between urban and rural communities, with at least 50 per cent within the St. John's region and a significant reduction in projects in the next two larger communities (Corner Brook and Grand Falls-Windsor).



5. GENERAL COMPARISON BETWEEN LEED V4 AND GREEN GLOBES V2

The below table presents a high level comparison of the differences between LEED v4 and Green Globes v2 rating systems. A detailed comparison is provided in the following subsections covering the minimum project requirements for registration, applicable building types, geographic impact, rating system process, credit categories and weighting, as well as a discussion on granularity and an energy credit comparison. The next section provides a project credit by credit evaluation approach in the form of a case study.

	LEED v4	Green Globes Canada v2
Rating System Options	Five Main rating systems: 1. Building Design and Construction. 2. Interior Design and Construction. 3. Building Operation and Maintenance. 4. Neighborhood Development 5. Homes	Three Main rating systems: 1. New Construction/Significant Renovations. 2. Commercial Interiors. 3. Existing Buildings.
System Platform Approach	Online submission templates with independent off-site assessment.	The system is based on an online questionnaire with a final, independent onsite assessment.
Total Number Of Points	110 Points	1,000 Points (reduced by “not applicable” strategies)
Levels Of Certification	Four Different Levels: 1. Certified (40-49 Points) 2. Silver (50-59 Points) 3. Gold (60-79 Points) 4. Platinum (80+ Points)	Five Different Levels: 1. One Green Globes (25-39 per cent) 2. Two Green Globes (40-54 per cent) 3. Three Green Globes (55-69 per cent) 4. Four Green Globes (70-84 per cent) 5. Five Green Globes (more than 85 per cent)
Credit Prerequisite	Required prerequisite credits within each category	Not required; achievement threshold is determined by credit category.
Number Of Categories	Nine categories in the New Construction Rating Systems; Integrative Process, Location and Transportation, Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and Resources, Indoor Environmental Quality, Innovation, and Regional Priority.	Seven categories in the New Construction Rating Systems; Project Management, Site, Energy, Water, Materials and Resources, Emissions and Other Impacts, and Indoor Environment.
Certification Valid timeframe	No timeline – recertification under Existing Buildings: Operations & Maintenance (EBOM) is available, which has a 5 year timeframe.	18 months – requires recertification through BOMA BEST for existing buildings
Energy Performance	Benchmarks against hypothetical building model. Baseline model is for a similar building in the same location.	Benchmarks against climate zone performance data (based upon US emission factors; not Canadian emission factors).

5.1 Minimum Requirements for Project Registration

Both rating systems have minimum eligibility requirements; these requirements are referred to as Minimum Project Requirement (MPR's), which represent the following:

LEED v4	Green Globes v2
The project must be a permanent location on existing land	The project should be designed for occupancy and have a conditioned space (e.g., heated and ventilated)
The project must have a reasonable site boundary and include all contiguous land associated with the project and supports its typical operations	The project is a new building and has been occupied no longer than 18 months at the time assessment is ordered
The new construction project must comply with the minimum project size requirements which is 1000 square feet (93 square meters) of gross floor area	The new construction project should be at least 400 gross square feet in size

The above MPRs for either rating system do not appear to present a limitation or challenge for projects in Newfoundland and Labrador based on the types of facilities that are typically captured by the BBB Policy, and thus would not create unnecessary restrictions if the Policy were to be updated to mandate the use of either rating system.

5.2 Prerequisites or Mandatory Credits

Prerequisite credits are only found in the LEED rating system. Projects seeking LEED certification must achieve these prerequisite credits.

Conversely, Green Globes has a minimum threshold to receive points for specific credits (e.g., energy or water), and there are no specific prerequisites in Green Globes that limit a project's ability to pursue and attain certification through the use of prerequisite credits.

The LEED v4 prerequisites may present some challenges for projects required to comply with the BBB Policy. For example, some projects may not be able meet the technical requirements or there may be significant practical reasons (e.g., project cost, benefit or performance) why it may not be feasible to carry out one or more of following:

- Meet the minimum energy target,
- Achieve the outdoor or indoor water savings targets,

- Provide the minimum ventilation rates,
- Establish a waste diversion plan for at least 5 materials,
- Install energy and water meters,
- Prepare an erosion and sedimentation control plan.

In some cases, especially for smaller projects, the need to engage additional specialty consultants may be a financial barrier to the project. That is, consulting fees and soft costs would represent a higher portion of overall project costs.

The LEED v4 prerequisites have been increased from the LEED version 1.0 and 2009 rating systems; there are now 11 general prerequisites and 4 additional prerequisites for health care or schools. A full list of the prerequisites has been provided in Appendix A - LEED v4 prerequisites.

It should be noted that the concept of prerequisites is to ensure that all projects pursuing LEED have a minimum level of environmental benefit across the various categories. The lack of prerequisites in Green Globes could present an advantage for projects typically required to comply with the BBB Policy but that cannot achieve LEED certification, particularly when specific project challenges (e.g., building type or location factors) hinder the ability of the project to meet LEED minimum requirements. If a decision is made to adopt Green Globes as part of the BBB Policy, the lack of prerequisite credits with respect to Green Globes could be addressed by mandating specific minimum levels of performance for projects that are tailored to Newfoundland and Labrador environmental objectives (e.g., to achieve an energy efficiency performance greater than required by Green Globes). The same minimum Newfoundland and Labrador environmental objectives could also be applied to projects pursuing LEED v4, beyond the prerequisite requirements, if desired.

5.3 Applicability to Building Type

Both rating systems can be used for a wide range of building types. For both rating systems, the project teams must select the appropriate rating system (new construction, exiting building, interiors, etc.) based on the building type during the project registration stage.

Green Globes New Construction assessment tool can be used for a range of buildings including: commercial, institutional and multi-residential building types such as offices, schools, hospitals, hotels, academic and industrial facilities, warehouses, laboratories and sports facilities. Within Green Globes, the user is able to mark a specific credit as “not-applicable”, which changes the overall point score and hence the percentage of total achieved credits and level of certification. This presents a customizable rating system, and an advantage over LEED v4, but is open to interpretation by the project team and potentially “gaming” of the system, from an environmental objective perspective, if less rigorous or beneficial credits are chosen and implemented. However, it should be noted that “not–applicable” designations are often only applied when a specific technical barrier is identified, and a Green Globes assessor is required to validate all “not-applicable” responses during the third-party assessment.

The LEED v4 for Building Design and Construction is less flexible and highlights which credits/prerequisites are applicable to which building types. LEED v4 includes the following building sectors: schools, retail, data centers, warehouse and distribution centers, hospitality (including buildings dedicated to hotels, motels and inns), healthcare, and residential. LEED also includes a core and shell approach, which can be applied to any building type, in which the certified building is not fit up at the time of certification, but the building core and envelope and major mechanical and electrical systems are complete. Upon project registration under LEED v4, a scorecard covering the credits applicable to the building type will be automatically generated in the LEED online platform.

The building types available and included within both LEED v4 and Green Globes v2 appear to cover the majority of project types that are typically captured by the requirements of the current BBB Policy, and hence do not appear to present a limitation or challenge if the BBB Policy was updated to include either of the rating systems.

5.4 Geographic Location

Currently, 40 per cent of the LEED registered projects in the province are located in communities with a population of less than 10,000 where there is limited public transit and biking

Both rating systems in general are applicable to the urban and rural locations within the province, but project location will affect the credits that the projects are able to achieve. Buildings located in urban areas have more sustainability credit options to pursue compared to the rural communities. For example, both systems award and encourage urban infill projects to minimize urban sprawl, brownfield redevelopment and “walkscores” or access to amenities. This was discussed in detail in the Guide to Implementing the Build Better Building, Annex D, for LEED 2009 (which is still relevant for LEED v4), which can be found using the following link:

http://www.exec.gov.nl.ca/exec/occ/publicatioyns/bbb_implementation.pdf.

In general, there are approximately 11.8 per cent (13/110) of the total available credits in LEED v4 associated with site location (access to bus, walkability, density, waste recycling and diversion etc.), compared to 3.5 per cent (35/1000) in Green Globes v2. In our opinion, the total number of available points (1000 vs. 110) does slightly skew this percentage; however there is still an advantage to the Green Globes rating system for rural projects, as there are more non-site specific measures available to still allow rural projects to obtain higher certification levels (e.g., 3 Globes).

Notes:

1. From a larger sustainability perspective, encouraging intensification, even in smaller community centers, is often promoted for health, wellness, transportation emissions, and resiliency goals.

2. The site location credits in Green Globes do not offer a “not applicable” option, which will limit the available measures for projects on rural sites. However, as stated above, there are still many additional non-site specific measures available to achieve the desired certification level.

3. LEED v4’s materials credits have significantly changed to reflect material transparency (e.g., Environmental Product Declarations (EPDs)), rather than the previous focus on rationality and recycled content. This is a positive change for projects in Newfoundland and Labrador that previously were not able to achieve the “materials” credits for either regional or recycle content. Note: there is a limited number of products with EPD’s in the marketplace (Newfoundland and Labrador or otherwise), but this number tends to be increasing with each new LEED v4 project.

4. Both Green Globes and LEED promote Building Lifecycle Assessment (LCA) to determine the environmental impact of material choices. Due to the Province’s isolated or island location, and increasingly low-carbon electrical grid, the building’s material carbon footprint increases in relevance and importance (e.g., carbon associated with transportation or carbon intense materials (steel or concrete) becomes more significant once carbon associated with operational energy is reduced).

5. LEED v4 includes four additional “Regional Priority Credits”, which are based upon specific credits that have increased importance for specific regional locations. The regional priority credits increase the overall LEED point score by adding one additional point for each credit pursued. The below table illustrate these bonus Regional Priority Credits for Newfoundland and Labrador associated with each Eco Zone in the province.

Eco Zone in NFLD	LEED v4 Regional Priority Credits
Canada Northern - Urban	The main focus is in the Energy Credits “Enhanced Commissioning, Building Energy Performance, Demand Response, and Light Pollution Reduction”. Also, Indoor Water use reduction credit is considered.
Canada Northern - Rural & Boreal Shield - Rural	The focus is divided between Energy Credits “Enhanced Commissioning and Building Energy Performance” AND Land Protection Credits AND Building Life Cycle impact reduction credit.

Boreal Shield - Urban	The main focus here is Public Transportation and Site Credits such as Access to Quality Transit, Reduced Parking Footprint, Rainwater Management, and Heat Island Reduction. Also, Building Energy Performance is considered as a Bonus Regional Priority Credit as well.

6. On a specific note, the climate zones play an important role on energy efficiency. ASHRAE defines climate zones for regions based on the type and severity of climate conditions. Newfoundland and Labrador spans three of the ASHRAE climate zones (6 – cold, 7 – very cold, and 8 – subarctic). Under LEED, the climate zone will mainly affect the insulation levels of the building envelope (reference building insulation requirements increase with colder climate zones), as well as some mandatory provisions. Conversely, under Green Globes, the climate zone impacts the emission benchmarking. Somewhat counter intuitively, buildings located in colder climate zones generally need to demonstrate lower annual emissions than buildings in less cold zones to achieve the same number of points under the Green Globes rating system. The climate zone also impacts the insulation requirements for the building envelope and fenestration credits.

5.5 Process

This section will highlight the certification process for both Green Globes New Construction v2 and LEED v4 to assess their applicability or any restrictions for projects in Newfoundland and Labrador. Both rating systems can typically receive certification within six to eight months after the final submissions have been issued. For most projects, the final submission should align with the date of occupancy, if possible. In our experience, the delay in certification has more to do with the quality of the submission and the response time of the design and construction team than the delay at either the CaGBC or Green Globes program administrators.

5.5.1 Green Globes Process

The tool used for Green Globes assessment is a “questionnaire based tool” that consists of approximately 400 questions of “Yes/No/Not Applicable” set into different project stages (predesign to commissioning). Once a project is registered, a Green Globes verifier is assigned to the project team. The team will then use the questionnaire to choose applicable strategies and complete the questionnaire. The required submission documents, to verify compliance with the chosen strategies, include the following: project drawings, specifications, and some specific additional maps, drawings, energy models, etc. Two review periods are conducted by the verifier, one at the end of design, and the other at the end of construction. The team is contacted directly by the verifier to review the final submission and make any necessary changes before the final assessment is completed and the project is awarded one of the five certification levels.

5.5.2 LEED Process

The LEED v4 process uses the LEED online tool, which is similar to the questionnaire, but is more performance or intent based, as opposed to Green Globes' prescriptive requirements. When the project is registered, the project team is provided a CaGBC LEED coach. The online tool includes a series of tabs to highlight the project team, building details (location, size, etc.), timeline, etc. The most important tab for the design team is the credits tab, where all the applicable credits are automatically generated on the screen upon registering the project. The credits each illustrate the required submission documents and signatures by the assigned/applicable party. Once the credits are completed, they are marked "ready for review". The required submission documents to verify compliance with the chosen strategies include project drawings, specifications, and some specific additional documents, drawings, energy models, etc. Once the LEED submission has been issued, the team is assigned an anonymous LEED review team, which may be an internal CaGBC team or a third-part consulting team engaged by the CaGBC. The LEED coach is not part of the review team or the process at this stage. There are two main submissions, including an initial and final submission; although a team may opt for an earlier design submission as well (for an increased fee). The review team will review and request clarification on the submissions and issue a final assessment and award one of the four levels of LEED certification. An appeal period is available, if required.

5.6 Administration Tracking and Submission Requirements

There is the perception in the marketplace that green rating systems, particularly LEED, presents an administrative burden on project teams and government departments that are engaged in sustainable building design and construction. In our experience, during the early days of LEED in Newfoundland and Labrador (2008-2012), some project teams experienced significant additional effort in gathering and submitting documentation for LEED certification. Project teams typically ran into one of the following issues;

- Too few credits were pursued (e.g., one/two credits over target certification level), leading to late, costly, credit additions to make up for lost credits;
- Inappropriate credits selected (e.g., waste diversion for rural projects), again leading to lost credits and late additions;
- Credits lost due to experience in utilizing and administering the LEED rating system (design, construction and manufacturers),
- Too much documentation was gathered, which lead to increased project costs, or documentation was not gathered correctly; or

- Documentation was not received and reviewed in a timely manner.

In some cases, the above issues resulted in teams abandoning the LEED pursuit after the completion of the project. However, this process has generally became more streamlined as project teams became more familiar with the LEED process.

In our opinion, the administrative burden has been reduced by the use of on-line tools, specialized sustainability consultants and the collective experience and knowledge of using the LEED or similar rating systems across Canada. We also believe that by final certification, the submission requirements (i.e., the types of documentation submitted) for both LEED and Green Globes will be very similar.

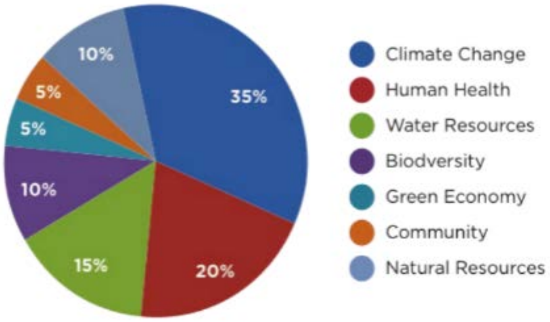
We believe that LEED appears more transparent with respect to what information is required and what will be reviewed by the assessor at each stage, likely improving documentation tracking and reducing administrative burden. Green Globes appears to have a simplified submission process, relying on the questionnaire, project drawings and specification. However, we believe that beyond the questionnaire, supplemental evidence of credit compliance should be expected and could be requested for any chosen strategy by the verifier. For example, the below table illustrates the final document required for similar credits in LEED v4 and Green Globes v2.

	LEED v4	**Green Globes v2**
Integrated Design Process Credit	Integrative process worksheet	Reference to the minutes or reports of the predesign planning workshop or charrette that list participants
Heat Island Effect	Site plans demonstrating compliance & manufacturer's documentation of Solar Reflectance Index (SRI) Values	Roof plan demonstrating compliance & project specification for the roofing system
Energy Performance Credit	Documentation of the energy modelling	Documentation of the energy modelling
Water Consumption Credit	Indoor water use calculator & product cut sheets	Green Globes water consumption calculator
Construction Waste Credit	Indication of waste diversion target & construction waste management plan	Indication of waste diversion target & reference to the specification

5.7 Credit and Category Weighting

Understanding the point allocation system will assist policymakers in Newfoundland and Labrador in better understanding the basis of sustainability category weighting in each rating systems.

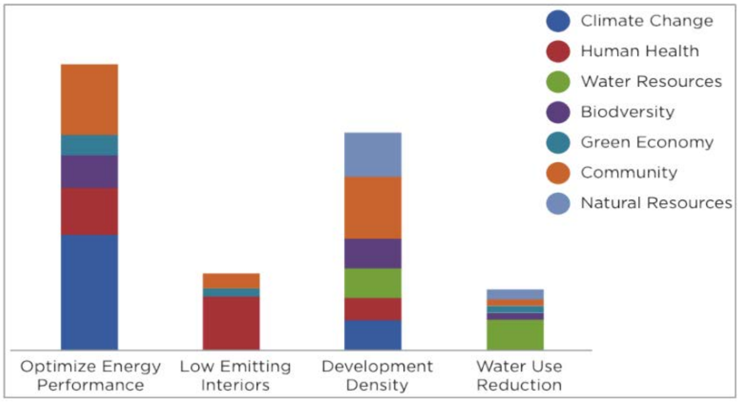
A new point allocation process has been employed for LEED v4 compared to LEED 2009. The LEED Steering Committee approved a set of seven new Impact Categories that focus on particular social, environmental and economic goals, whereas LEED 2009 was assessed on the 13 National Institute of Standards and Technology impact areas. The LEED v4's credit point allocation was then reweighted based on the new seven impact categories. Those Impact Categories are:



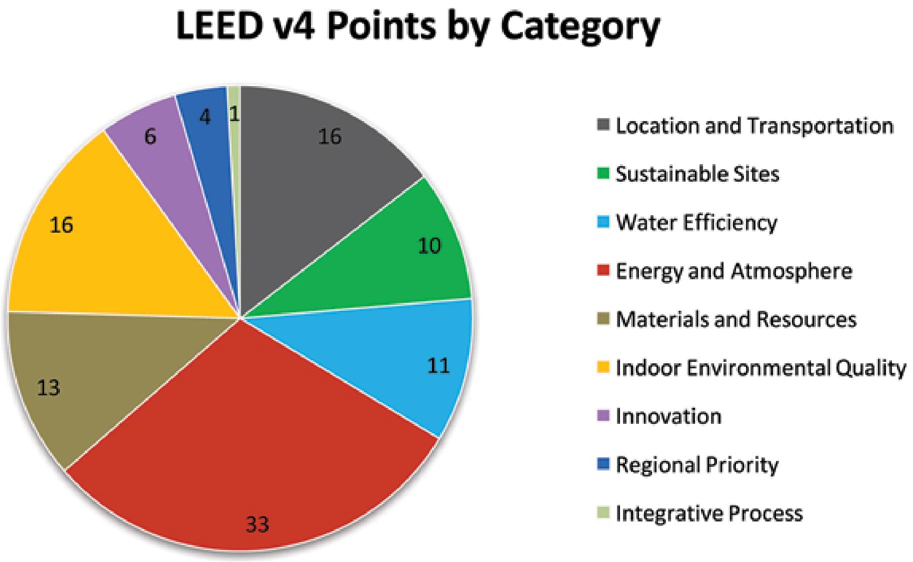
1. Climate Change measured by the GHG Emissions Reduction.
2. Human Health and Well-Being
3. Water Resources.
4. Biodiversity and Ecosystem services.
5. Build a Greener Economy.
6. Social Equity and Community Quality of Life.
7. Natural Resources "Material Resource Cycles".

The points allocated for each credit in LEED v4 depends on the relationship between the credit outcome, goals and the contributions towards each impact category. This relativity can be measured quantitatively such as the Climate Change Impact category or qualitatively such as the social equity and Green Economy impact categories. The weights are then compiled to generate the LEED v4 Scorecard.

The adjacent Figure illustrates an example of how the point allocation system works for some LEED v4 Credits.

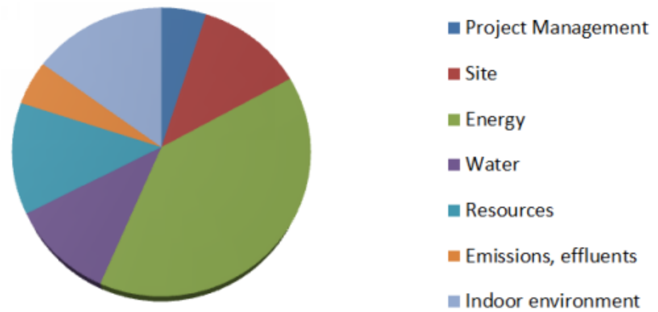


Based upon the above impact areas, LEED v4 Rating System was broken down into nine different credit categories. These categories and associated points available are illustrated in the below graph.



Green Globes v2 has seven categories and the below Chart illustrates the Points allocated for each category.

1. Project Management (50 pts.)
2. Site (120 pts.)
3. Energy (395 pts.)
4. Water (110 pts.)
5. Resources (125 pts.)
6. Emissions, effluents & other impacts (50 pts.)
7. Indoor environment (150 pts.)



Of particular note, the consultant was unable to obtain a document outlining the credit weighting rationale for the Green Globes rating system.

In both rating systems, the building energy use/consumption credits or strategies received the highest weighting relatively to the other categories (39.5 per cent and 33 per cent, respectively for Green Globes and LEED).

Note: Green Globes is more heavily weighted toward energy efficiency and emission reductions than LEED; however, LEED has a prerequisite for all projects to be at least 5 per cent better than ASHRAE 90.1 (2010), while Green Globes does not require a minimum level.

The non-energy related criteria present in both rating systems, typically found in the Sites, Water, Materials and Indoor Environment categories, align very well, both in approaches and weighting on strategies. In our opinion, neither rating system is likely to outperform the other for non-energy related environmental and social objectives; with the exception of “prerequisites/mandatory” or “not applicable” credit options, discussed elsewhere in this report. For example, both systems promote integrated design process, urban in-fill projects, minimizing heat-island effects, reuse of existing buildings, minimum 20-25 per cent water savings, construction waste management, reducing VOC’s, meeting ASHRAE 62 (ventilation) and ASHRAE 55 (thermal comfort), acoustic comfort and daylighting. The main differences are based on the prescriptive or instructive nature of Green Globes, rather than the intent/performance nature of LEED.

Note: Due to the ability to apply the “not applicable” strategy for specific Green Globes credits, the overall score of 1,000 and the credit percentage for each Green Globes level can be adjusted, reweighting credits for their applicability.

5.8 Granularity

One of the main differences between LEED v4 and Green Globes v2 is the level of detail specified for particular credits and the total number of possible points that can be awarded. While LEED packages numerous requirements under one credit, Green Globes breaks the packages into pieces, to allow for what could be called “partial achievement”. This is illustrated in the below table, which provides an overview of the Commissioning Credit in Green Globes.

Number of Points Awarded	Action Performed
1 Point	Commissioning Authority facilitated and documented the “Owner’s Project Requirements” (OPR) for building systems as per ASHRAE Guideline 0-2005.
1 Point	Has the building “Basis of Design” been documented
1 Point	Is an Independent Commissioning Authority report directly to the owner and leading the CX team and the process?

The points are awarded per system commissioned, as - 3.5 Points - 3.0 Points - 2.0 Points - 2.0 Points - 1.0 Point	Is there a requirement to commission the Following systems and their controls as per ASHRAE Guideline 0-2005? - HVAC & R Systems and their controls. - Building Envelope - Structural Systems - Fire Protection System - Lighting System
1.0 Points	Provide Training for building operators
6.0 Points	Develop O&M Manual OR computerized maintenance management system related to each piece of equipment
Total Available: 27.5	

As outlined above, if a team decides to pursue the Commissioning credit in Green Globes v2, the project can achieve a minimum of 1 point or to a maximum of 27.5 points, depending on the items added to the commissioning scope of work. While in LEED v4, all the requirements mentioned in above table, some of which are prerequisites in LEED, would need to be achieved before receiving the 6 total points, plus the prerequisite. In our practice, we often discuss with clients the concept of following the intent of a LEED credit, even if all aspects cannot be achieved. In our opinion, the granularity does present more options for design team members and owners; however, picking apart "packages" has its disadvantages. For example, there is little purpose in establishing an OPR or reviewing a Basis of Design, if the follow-through work or training is not carried out. Some credits are best approached in full packages, and in our opinion, the commissioning credit is one of them.

Another major difference in Green Globes v2 is the awarding of points for what we consider best practices**.** For example a credit can be awarded if *roofing membrane assemblies and systems are installed as per manufacturers' instructions and recommendations*. A similar credit is available in LEED v4 under the Enhanced Commissioning, Option 2: Building Envelope Commissioning; however, this "package" approach to envelope construction practices does not have the granularity of Green Globes. This again highlights the very prescriptive nature of the Green Globes rating system, when compared to the LEED rating system.

LEED Material Credits

One of the biggest changes in LEED v4 was in the Materials section. LEED v4 introduced the Lifecycle Analysis (LCA) and Environmental Product Declaration (EPD) credits. This was a significant movement away from recycled content and regional materials towards a concentration on material transparency (what's in a material) and environmental impact (e.g., foot printing). The adoption of LEED v4 (remember that LEED is also intended as a market transformation tool) has had a slow, but significant impact on the market with the introduction of product EPD's. Early adopters of LEED v4 across Canada have struggled with achieving the EPD credits, due to a lack of available EPD's in the market. LEED practitioners anticipate that more and more EPD's will be added to the roster every year, similar to low VOC paints, FSC and no added urea formaldehyde (NAUF) wood products. This movement away from regional materials may present an advantage for some projects in Newfoundland and Labrador, which have struggled with finding applicable regional material choices. However, this will depend on the evolution of EPDs in Canada and the availability of these products in Newfoundland and Labrador.

Green Globes v2 also uses LCA and EPD's as a means of evaluating the environmental impact of materials.

Note: As the Newfoundland and Labrador electrical grid becomes more clean (low carbon), the carbon associated with building materials (referred to as embodied energy or carbon) becomes more relevant and significant. Government departments could consider and favour, where possible, existing buildings to further reduce the associated embodied carbon footprint in these cases.

5.9 Energy Credits Comparison

Under both rating systems, the energy performance of the proposed building design is simulated using a whole building energy model; however, the overall performance of the building is evaluated in very different ways.

LEED v4 emphasizes the reduction of energy costs, which helps projects justify the investment into energy efficiency by building a business case. However, depending on electrical rates and emission factors of various fuel sources, energy costs may not directly correlate to an environmental benefit (i.e. greenhouse gas emission reductions). This is especially true for jurisdictions such as Newfoundland and Labrador which generate electricity from predominantly non-GHG emitting sources such as hydro. In these cases, the primary motivation for pursuing energy efficiency credits may be for cost reasons (i.e. energy savings) as opposed to environmental objectives (e.g., GHG reductions from electricity generation).

Green Globes places the focus on reducing carbon dioxide emissions as well as the application of specific energy saving systems, efficient equipment and controls (e.g. points are awarded for performance and implementing prescribed technologies). Note that the emission factors used by Green Globes are based on American data (0.758 kg/kWh) and does not represent the actual emissions associated with the province’s electricity grid (average factor, excluding exports, of 0.144 kg/kwh), which is more than an order of magnitude cleaner than the American grid that is overall largely coal based; and hence will affect the overall calculation and “score”. In other words, a project utilizing Green Globes v2 in Newfoundland and Labrador must use the American average GHG emissions factors as the baseline to evaluate the new building. The implication of this is that design decisions would be based on achieving GHG reductions from a baseline that is not reflective of the Province’s circumstances, which could result in equipment and strategies decisions (including costs) that are not required (i.e. there may be too much focus on reducing GHG emissions from an inaccurate baseline to achieve Green Globes points and the required level of certification).

Green Globes also does not offer clear guidance on energy performance for projects beyond four standard occupancy types; office, retail, warehouse, workshop and multi-unit residential. However, the US Green Globes rating system does offer several paths that can be flexibly applied to most building types. A similar approach may need to be adopted by Green Globes Canada to extend its applicability to more building types. Green Globes is currently building their portfolio of projects to allow an improved building type to building type comparison. At this moment, we understand that the Green Globes verifier, in concert with the pre-approved energy modellers, have the ability to assess projects outside the four main building types and allocate appropriate points for equivalent carbon dioxide emissions.

Energy category credits can be of significant interest due to their likelihood of impacting lifecycle cost calculations and payback periods, hence we have provided a comprehensive comparison between both rating systems that covers energy performance, demand, metering, lighting systems, minimum ventilation, refrigerant and renewable energy in Appendix B.

We believe that regardless of the rating system adopted, the Province may wish to consider a minimum energy performance requirement that is more stringent than the current National Building Code. This requirement could take on several forms:

- It could require a minimum number of points be obtained under the energy performance credit, for example: 9/18 LEED points, or 75/150 Green Globes points;
- It could set a standalone performance target based on exceeding the performance of a reference energy standard or code by a percentage (e.g., 5 to 10 per cent better than ASHRAE 90.1 2010 or NECB 2011);
- It could be based around energy consumption, energy costs, peak electric demand, energy use intensities, or equivalent carbon emissions based on actual emission factors for the province; or
- The target could escalate at set time intervals (i.e. step code) so that stringency is gradually increased over time (e.g. carbon neutral by 2030).

When selecting a referenced standard it may be beneficial to coordinate with the selected rating systems. For example, ASHRAE standard 90.1-2010 and the NECB 2011 (through an alternative compliance path) are acceptable for LEED compliance (and 90.1-2010 is accepted by US Green Globes). The reference standard does not need to follow the rating system; however, alignment requires less effort and cost on the part of design teams. Newer energy standards and codes also exist, including ASHRAE standard 90.1-2013 and 2016 (Energy Standard for Buildings except Low-Rise Residential Buildings), ASHRAE Standard 189 (Standard for the Design of High-Performance Green Buildings), NECB 2015 and soon to be 2017 (National Energy Code of Canada for Buildings).

5.10 Cost Comparison

5.10.1 Soft Costs

The soft costs associated with projects include any specialty consulting requirements, which typically include services such as sustainability consulting (LEED or Green Globes), energy modelling, commissioning, etc., as well as program registration and certification costs.

It is becoming increasingly more difficult to separate out soft consulting costs for projects, as almost all projects appear to require some level of sustainability planning, energy modelling and commissioning. However, on smaller projects, architects and engineers providing design services may take on these roles, without additional specialty consultants. By comparison, on larger or more complicated projects, the specialty consultants are typically included on the design/construction teams. The Green Globes rating system prides itself on the simplified questionnaire approach to minimize the requirement for additional sustainability consultants; however, on larger, more complicated projects, sustainability consultants are typically included to manage the Green Globes coordination and submission process. For illustrative purposes, assuming a \$10 to \$100 million dollar project, the following range of costs could be anticipated for each of the following services:

Note: Estimates for smaller projects are included in the brackets.

- LEED/Green Globes Consulting: \$50,000 to \$100,000 (\$30,000 to \$50,000);
- Energy Modelling: \$20,000 to \$50,000 (\$7,500 to \$25,000); and
- Enhanced Commissioning (Mechanical, Electrical and Building Envelope): \$100,000 to \$300,000 (\$30,000 to \$100,000).

Both LEED and Green Globes require experienced energy modellers and provide a list of qualified individuals (rather than consulting firms). The number of experienced modellers in Newfoundland and Labrador is limited at this time.

The above costs range from 2 per cent to less than 1 per cent of a typical project budget, depending on the size and complexity of the project.

The below Table illustrates the difference in project registration and certification fees in Canada between Green Globes Construction and Major Retrofits v2 and LEED v4 Building Design and Construction.

	Registration Fees	**Certification Fees**		
		< 2,500 m^2 Project	**10,000 m^2 Project**	**> 10,000 m^2 Project**
LEED v4 Canada Members	\$1,500	\$4,800	\$11,175	\$ 11,175 + (\$0.85 per additional m^2 till 25,000 m^2)
Green Globes v2 Canada	\$1,500	\$ 5,750 + energy modelling review fees	\$ 7,750 + energy modelling review fees	\$ 10,000 + energy modelling review fees

5.10.2 Capital Costs

To evaluate the cost associated with increasingly stringent sustainable building rating systems (e.g., pursuing LEED v4 or Green Globes v2, which includes a specific percentage better than ASHRAE 90.1 (2010) or NECB 2011), one has to first understand the requirements for the baseline building and then the incremental cost associated with meeting the new requirements. We have assumed that a baseline building would meet the current 2015 National Building Code, plus the intent of the current BBB policy (strive for LEED 2009 Silver and 25 per cent better than MNECB 1997). As the NBC becomes increasingly more stringent for Climate Zones 6-8, the base building mechanical, electrical and envelope systems need to be increasingly more energy efficient to meet the baseline. In our experience, the incremental cost to increase the efficiency of a mechanical, electrical or envelope system beyond the code baseline has become progressively more difficult to justify on a simple payback (5-10 year) or energy savings bases; requiring a consideration for longer-term payback expectations (e.g., NPV neutral of 25+ years). For owner occupied buildings (those that finance, operate and hold buildings for a long timeframe (50+ years), this is easier to accept, while design-build-lease or similar arrangements tend to be more cost conservative.

The capital costs associated with pursing LEED v4 or Green Globes v2 will depend greatly on the location of the project (urban or rural), the size and occupancy type of the building (e.g., operating energy), design team experience, payback expectations and required level of certification. In addition to the above, capital costs will also be influenced by decisions made on the level of resiliency, on-site alternative energy production and pursuit of net zero energy, likely more for rural locations than urban locations. On this basis, it is challenging to determine the typical capital cost increase that could be experienced by adopting a more stringent rating system. In our opinion, by meeting the requirements of the National Building Code, 2015, and previous BBB Policy requirements (LEED Silver and 25 per cent better than MNECB 1997), most projects should not incur additional capital costs, especially from an energy perspective, to meet the new LEED v4 Certified or Green Globes Level 3 requirements. The pursuit of each additional level of certification will require an increase in capital spending; however, we believe that with the use of lifecycle costing, early in the pre-design phase, the additional capital cost can be optimized with anticipated savings in operation and/or lifecycle cost.

In the consultant’s opinion, although there is a perception that the Green Globes rating system is less expensive, we believe that the savings are only in the soft cost side of documentation, not in the systems, equipment or strategies required for the building to meet the required certification levels.

6. CASE STUDY – CARBONEAR PROJECT

6.1 Intent

This case study analyzes a real project in Newfoundland and Labrador in order to demonstrate the similarities and differences between LEED v4 and Green Globes v2 for new construction. A new LEED v4 Newfoundland and Labrador project example was unavailable for evaluation at the time of writing this report. In lieu of this, a project was selected that is in the final pursuit phase of LEED version 2009. Our firm, Morrison Hershfield, played many roles in the project including LEED consulting, energy modelling, commissioning, M&V consultant and building durability consultant. The range of services provided allowed our team to speak competently on the level of achievement that would be within reach, had the project pursued LEED v4 or Green Globes v2.

6.2 Project Description

The Conception Bay Long Term Care (CBLTC) facility is located in rural Newfoundland in the Town of Carbonear, located on Conception Bay. We believed that it was important to select a project outside of an urban setting for a project case study, as many projects in the province will not be located in an urban center based on available information on projects registered under LEED to date. This project was selected in order to avoid an unrealistic number of points associated with urban construction and access to public transit networks.

The project is located on a hospital campus which includes an existing hospital, parking and district power. The existing hospital did not form part of the LEED boundary, nor have an impact on any of the rating system scores that have been calculated. The actual LEED project and all case study evaluations also excluded previous phases of construction related to existing hospital renovations. The case study new construction building is comprised of two key areas – the main building patient tower, which houses 230 patients in a long term care setting, and a support services area for related office administration work, mechanical equipment and other operational storage needs. The project did not contain any leased tenant spaces, retail space or other specialty areas such as data centers.

6.3 Resulting Scores

As per the scorecards included in Appendix C, our assessment indicates that the project could have achieved the following levels of certification under various rating systems based on the existing design and construction specifications:

- LEED v2009 BD+C rating system: LEED Silver certification level
- LEED v4 BD+C rating system: LEED Certified certification level

- LEED v4 BD+C for Healthcare: LEED Certified certification level
- Green Globes v2.0 rating system: Two* Green Globes certification level

**Due to the high variability in the energy points, we believe that a high Two to low Three Green Globes certification would be achievable.*

6.4 Rationale

The comparison chart provided within Appendix C provides a more in-depth explanation of how the project scorecards were developed under the various rating system. We have provided brief notes for an explanation of how points were earned under each applicable credit for each rating system. While the case study project did not actually pursue LEED v4 or Green Globes v2, the same consulting team (Sustainability, Energy Modeller, Building Science professional and Commissioning Authority) that worked on the LEED v2009 project performed the evaluation. The range of consulting services provided allowed the same team to speak competently on the level of achievement within reach if the project had pursued LEED v4 or Green Globes v2 for new construction.

Recognition was given that the rating systems and their credits differ from the credits pursued for the case study project. The intent of the case study scoring was to represent the projects score while undergoing the same level of effort. The “similar level of effort” methodology was applied throughout the scoring process in recognition that the project could have achieved points if the alternate credit requirements were mandated for the project.

An example of this methodology can be seen within the LEED materials credit sections when comparing the LEED v2009 requirements against the LEED v4 requirements. Based on the consulting teams knowledge of product availability in Newfoundland and Labrador, the level of effort required to incorporate the product requirements into specifications, review associated shop drawing submittals and procure products, the project would have achieved only a few materials credits related to product selection using the same level of effort by all project stakeholders.

As stated earlier in this report, the Green Globes reference guide does not contain clear guidance on energy performance for projects beyond office, retail, warehouse, workshop, and multi-unit residential buildings. Note that the BBB policy will cover projects such as schools, long term care facilities and hospitals. With recognition that Green Globes energy performance credit does not have a benchmark for hospitals, the case study adopted an alternate pathway from the US Green Globes version 1.5 (released March 2018 and not currently in Canada). This alternate pathway used to assess the case study’s energy performance score has resulted in a much higher score for the Green Globes assessment (15 points to 150 points); which resulted in a 3 Globes level, rather than a 2 Globes level final score. The technical barrier discovered as part of this case study presents one of the challenges of using the Green Globes rating system for certain building types that are not directly supported. We believe that a close relationship between the design team, energy modeler and the Green Globes verifier will be required to overcome this issue. We also believe that future versions of Green Globes may address this issue and present less risk to certification.

As detailed in the Appendix C comparison report, Green Globes v2 includes a very limited number of alternate pathways for healthcare projects in the technical manual. This is contrary to the Green Globes claim that hospital projects are fully supported by the rating systems technical manual. In contrast, the LEED v4 reference manual does include clear alternative pathways for healthcare projects. Alternate building types such as healthcare projects are supported to the extent that an alternative scorecard is available with an alternate point scoring structure and credits directly applicable to the alternate building types. The case study comparison includes a typical commercial new construction scorecard evaluation. In addition, a second v4 scorecard to show how the Long Term Care project would fair under the technical manual pathway available for a healthcare project; the results were essentially the same score (48, versus 46, both LEED v4 Certified).

6.5 Case Study Conclusion

It is worthwhile to note that the Carbonear LEED v2009 case study project is on-track to achieve a certification level of LEED Silver. However, the project could have achieved a LEED Gold certification level with additional design considerations, additional detail in specifications, additional capital costs for material premiums and lower indoor plumbing fixture flow rates to achieve additional water savings. LEED Gold would have been technically achievable for the project, but would have required additional effort and costs to achieve.

Similarly, the case study project could have also obtained the next level of both LEED v4 and Green Globes v2. A rating of LEED Silver under LEED v4 and Four Green Globes under Green Globes v2 would be an achievable outcome for the project with modified design decisions and additional costs, representing the next incremental level of performance.

As illustrated with the above two evaluations, lifecycle costing is extremely important to fully understand the impact of strategy choices and certification levels.

In our opinion, for both Green Globes and LEED rating systems, a consultant would be beneficial to successfully navigate and implement the rating system requirements. The overall Green Globes certification process is similar to LEED, requiring at least one individual that is well-versed with the rating system to lead the process. It is commonly perceived that a sustainability consultant is not required when applying the Green Globes rating system; however, this would require that all design and construction requirements are allocated to other project stakeholders who may or may not be unfamiliar with the requirements and process. We believe that this leads to certification risk.

Further, it was found that for Green Globes, a consultant with knowledge of Green Globes would be required in order to ensure actual environmental performance. With Green Globes, oversight is required to ensure a projects score is not made-up entirely of partially awarded points. Green Globes allows projects to earn modest certification levels (One, Two Green Globes) without the full implementation of green strategies. Often, without the full implementation of a green strategy in Green Globes (earning full points under each credit), the strategies tend to fall short of the actual intent of providing an environmental benefit. While earlier versions of LEED were often criticized from a similar perspective that points are awarded too easily (e.g., bike rack or carpet credit), this was much more evident within the Green Globes v2 rating system. The case study project achieved many of the Green Globes requirements without applying the “same level of effort” methodology because the required measures were already in place as required by building code and best building practices.

The case study results indicate that a project that achieves a LEED Certified level under v4 of the rating system would be equivalent to Two to Three Green Globes under v2. The case study also offered a unique comparison against the older LEED version 2009 rating system. Under the older LEED rating system, a level of LEED Silver certification was achieved for the actual project. The case study results support the assertion of continuous improvement incorporated into green rating systems as they develop further.

7. CONCLUSIONS

There are a number of key findings from our comparative analysis of LEED v4 and Green Globes v2. Our review of each rating system focused on the applicability and restrictions to Newfoundland and Labrador, including the geographic context, climate, typical building types and sizes and the expected level of knowledge in the local design and construction industry. To further the comparison, we discussed the federal, provincial, and municipal trends across Canada for selecting and implementing rating systems and approaches to energy efficiency. Finally, the study evaluated the application of both rating systems through a case study of a Newfoundland and Labrador project, currently in the final stages of LEED 2009 certification.

7.1 Report Findings

The following table highlights our findings with respect to each system:

LEED v4 Rating System	Green Globes v2 Rating System
Is proposed and present (more often) across Canada for federal, provincial or municipal green building policies	Is proposed and present across Canada in federal, provincial or municipal green building policies as an alternative to LEED
LEED v4 Certified would be comparable to Green Globes v2 Level 2 (2 Globes)	
Was more stringent than LEED 2009	Was more granular and presented more flexibility to projects, but broke-up “packages” potentially limiting effectiveness of fully implemented strategies.
The LEED rating system and process is known in Newfoundland and Labrador, although there would be education required for practitioners and Government to understand v4 changes	The Green Globes system is relatively new to the Newfoundland and Labrador market (zero registered or certified projects) and hence would likely require significant education and support in the construction community in the early days
Prerequisites present less flexibility, but maintain minimum performance standards	Allowed customization with “not applicable” credits but flexibility could potentially lead to selection of some measures that do not have a material impact
Energy points represent 33 per cent of total	Energy points represent 39.5 per cent of total available points

Site credits (approximately 11.8 per cent) present some limitations to rural projects	Site credits (approximately 3.5 per cent) present less limitations to rural projects
Site, water, materials and Indoor Environment credits and strategies, including weighting, were very similar between the two systems	
Had significant changes to Materials credits, that present some advantages to the Province (transparency over regionality)	Presented points for very specific best practice tasks (e.g., install roofing per manufacturer's requirements)
Presented a more difficult Certified level of certification (roughly equivalent to LEED 2009 Silver certification)	Presented a wider range of certification levels from entry to high performance.
Documentation with on-line forms, with backup documentation (likely slightly more than Green Globes), neither presenting a significant administrative burden	
Certification is approximately 25-35 per cent higher for LEED than Green Globes (approximately $2500 to $5,000)	
Consulting soft costs for LEED and Green Globes are comparable.	
Capital costs are anticipated to be the same for either rating system at the same levels (Silver – 3 Globes). Additional capital cost would be anticipated for higher certification levels, but cost is dependent on location, building type	Lower capital costs could be associated with 1 or 2 Globes, but may not satisfy Government environmental objectives, depending on thresholds established
Energy efficiency is tied to a reference model and applicable to all building types. Energy efficiency is measured by cost	Energy efficiency is tied to US emissions factors and limited to four building types, complicating the energy efficiency analysis

APPENDIX A: LEED v4 – Prerequisites

The prerequisites in LEED v4 New Construction rating system are:

- Applies to health care and school projects: Environmental site assessment should be conducted to determine whether environmental contamination exists at the site.
- Applies to health care projects only: An integrative project planning and design where the owner project requirements, preliminary rating goals should be identified.
- Applies to health care projects: Mercury-containing products disposal methods, mercury contents in lamps.
- Applies to school projects: Meet the minimum acoustic performance by achieving certain reverberation Time and maximum background noise level of 40dBA from HVAC systems in the classroom.
- Applies to all projects:
    - Create and implement an erosion and sedimentation control plan for all construction activities that will lead to reduce pollution from construction activities.
    - Outdoor water use reduction by either showing that the landscape don’t require a permanent irrigation system beyond a maximum two-year establishment period or by reducing the landscape water requirement by at least 30 per cent from the baseline.
    - Reducing the indoor aggregate water consumption of fixtures and fittings by 20 per cent from the baseline. Also, appliances should meet certain labelling requirements.
    - Install permanent water meters that measure the total building potable water use.
    - Fundamental commissioning process that include the following systems: HVAC&R systems, domestic hot water systems, pumps and controls, electrical distribution, lighting and controls and renewable energy systems (if applicable).
    - Simulation model to demonstrate improvement of 5 per cent for New Construction, 3 per cent for Major renovation or 2 per cent for core and shell projects compared to ASHRAE 90.1-2010, Appendix G or any equivalent.

- Install permanent building level energy meters that can represent the total building energy consumption from all energy sources.

- Reducing stratospheric ozone depletion by not using CFC based refrigerants in new HVAC&R systems.

- Allocate dedicated areas accessible to waste haulers and building occupants for the collection and storage of recyclable materials.

- Develop and implement construction and demolition waste management plan that establish diversion goals for at least five materials.

- Comply with ASHRAE 62.1-2010 or equivalent minimum outdoor air intake flow for mechanical ventilation system along with the required monitoring requirements.

APPENDIX B: Energy Credits Comparison

LEED v4	**Green Globes v2**
ENERGY PERFORMANCE	
LEED emphasizes the reduction of energy costs, which helps project buildings to justify investment into energy efficiency. However, depending on utility tariffs and emission factors of various fuel sources, energy costs may not directly correlate to an environmental benefit (i.e. greenhouse gas emission reductions). The energy performance of the proposed design is evaluated using whole-building energy simulation and compared to a reference building that meets the minimum requirements of ASHRAE Standard 90.1-2010. The proposed building's energy costs must show a minimum savings of 5 per cent versus the reference, and may earn up to 18 points (16 for schools, 20 for hospitals) with higher energy cost savings. A prescriptive compliance pathway is also available by following the ASHRAE Advanced Energy Design Guides; however points are capped at 6. Under either pathway, there are mandatory provisions that the design must meet.	Green Globes places the focus on reducing carbon dioxide emissions (as well as the application of specific energy saving systems, efficient equipment and controls discussed later). Note that the emission factors used by Green Globes are based on American data and does not represent the actual emissions associated with the province's electricity grid. The total carbon dioxide emissions (CO_2e) of the proposed design is estimated using whole-building energy simulation. Up to 150 points are available depending on the total CO_2e compared to peer benchmarks (normalized for floor area, building type and climate zone). There is no minimum performance requirement; however, at least one energy model must be developed.
ENERGY DEMAND	
Design the building systems and equipment with the capability to automatically reduce the building's peak demand by 10 per cent or more through load shedding or shifting to lessen the burden of peaks on the electric utility. If offered by the utility, the building must participate in a demand response (DR) program to earn two points; otherwise, if a DR program is not available, the project may earn 1 point for implementing a DR design.	Design the building to minimize the monthly variation in peak electric power demand. Up to eight points are available for a low power demand factor (lowest monthly kW demand divided by the peak month kW demand), estimated using whole-building energy simulation. There is an additional eight points available for equipping the building with an Energy Management and Control System (EMCS) designed to reduce the total electric demand of the building by 15 per cent to 30 per cent or more during peak periods. The EMCS should include an interface to the electric utility, allowing the building to respond as

LEED v4	Green Globes v2
	part of a utility demand response program.
ENERGY METERING, MEASUREMENT & VERIFICATION	
As a prerequisite, the building must be equipped with energy meter(s) that capture the total building energy consumption (e.g. electricity, natural gas, purchased chilled water, purchased steam, fuel oil, propane, biomass, etc.). Consumption data must be recorded and tracked at least monthly, and the project must commit to share the data with the USGBC for at least five years. One point is available for installing an advanced energy metering system for: • All whole building energy services; and • Any individual energy end-uses that represent 10 per cent or more of the total annual consumption. Data collection must be by automated system with permanently installed meters.	Installing meters for the following building level energy sources each earn one point. • Electricity; • Heating fuels; • Purchased steam; and • Other (e.g. purchased chilled water or hot water). Sub-metering (and/or trending) of the following energy end-uses each earn 0.5 points: • Lighting and controls; • Plug loads; • Major electric HVAC; • Chilled water generation; • On-site renewable energy; • Heating water or steam generation; • Specialty or process electrical equipment; and • Critical HVAC controls. An additional 0.5 point per end-use above is available for implementing an Energy Metering Reporting Plan to continually track and report energy use by major end-use via automated metering or building automation system.
LIGHTING	
Points for efficient lighting systems are captured under the Energy Performance section.	Up to eight points are available for a lower power lighting design with lighting power densities at or below prescriptive values. Additional points are available for the following lighting strategies and automatic controls: • Interior automatic light shut-off controls (3 points); • Light reduction controls (4 points); • Daylighting (3 points); and • Controls for day lighted zones (3 points). • Exterior luminaires and controls o Minimum efficacy of luminaires o Exclusive use of LED luminaires o No or low mercury content

LEED v4	Green Globes v2
	o Exterior automatic light shut-off controls
LIGHT POLLUTION	
One point may be achieved for reducing light pollution, including light trespass and up lighting, by meeting the IES/IDA Model Lighting Ordinance (MLO) requirements based on the lighting zone of the project. Prescriptive and performance (calculation) options are available for demonstrating credit compliance.	Seven points may be achieved for reducing light pollution by meeting the performance requirements of the IES/IDA Model Lighting Ordinance (MLO) requirements based on the lighting zone of the project.
SYSTEMS, EQUIPMENT & CONTROLS	
Points for efficient system, equipment and controls are captured under the Energy Performance section. Mandatory provisions restrict reheat and re cool, and include requirements to limit duct leakage.	Points for are available under several categories for employing specific systems, efficient equipment and controls beyond credit that may already be taken under the Energy Performance Section. Categories include: • Provision of an integrated building automation system; • Efficiency of cooling equipment, heat pumps, and heating equipment; • Speed control of cooling tower fans; • Condensate recovery on steam systems; • Steam trap design; • Efficiency of domestic hot water heaters; • Provision of variable speed drives on pumps; • Minimizing of re-heat and re-cool • Air economizers for free cooling, and damper design and control; • Design of fans and ductwork; • Demand control ventilation; • Elevators and escalators; and • Other energy efficient equipment and appliances.
RENEWABLE ENERGY	
On-site renewable energy production is recognized with up to three points achievable for providing 10 per cent or more of the total building annual energy cost. On-site renewable energy generation may also contribute towards points under the Energy Performance	On-site renewable energy generation is recognized with up to 15 points achievable for providing 10 per cent or more of the building's thermal or electrical energy consumption. Off-site renewable energy generation is

LEED v4	Green Globes v2
section. Off-site renewable energy generation is recognized through the purchase of green power, carbon offsets or renewable energy certificates (RECs) annually. One or two points are available for the purchase of 50 per cent or 100 per cent or more of the building's total electrical consumption.	recognized through the purchase of renewable energy certificates (RECs) with a minimum of a three-year commitment. Up to 12 points are available for the purchase of 40 per cent or more of the building's total electrical consumption.
COMBUSTION EMISSIONS	
There are no prerequisites or credits for selecting low NOx or low CO emission combustion equipment.	There are two paths with up to 18 points available for low NOx and CO emissions of combustion equipment: (1) connect to a district heating plant, or (2) select low or ultra-low NOx and CO emission boilers and furnaces.
REFRIGERANTS	
As a prerequisite, the building must not use chlorofluorocarbon (CFC)-based refrigerants. (CFCs are no longer permitted for use in new building HVAC equipment in Canada). One point is available for selecting refrigeration equipment with a low refrigerant impact per ton of cooling capacity, based on the life cycle impact of the refrigerant, its ozone depleting potential (ODP) and global warming potential (GWP) in context of its application (refrigerant charge, leakage and equipment life).	There are up to 20 points available for using either no refrigerant, or selecting refrigerants with a low ozone depleting potential (ODP) and/or a low global warming potential (GWP). The life cycle impact of the refrigerant in context of its application is not accounted for, and points are awarded for use of low ODP or low GWP refrigerants alone. Additional points are available for leak detection, including: • Testing of remote commercial systems (e.g. supermarket refrigeration) (3 points); • For projects with a chiller, install refrigerant leak detection system that monitors for leaks (3 points); and • For projects with a chiller, install refrigerant leak detection system with leakage alarm (3 points).
MINIMUM VENTILATION & INDOOR AIR QUALITY	
As a prerequisite, mechanically (and mixed mode) ventilated spaces must be designed to meet the minimum requirements of ASHRAE Standard 62.1-2010, sections 4 through 7, with outdoor air intakes flow for mechanical systems using the ventilation rate procedure, or local equivalent, whichever is more	Seven points are available for providing the quantity of ventilation air required by ASHRAE Standard 62.1-2007, except where local standards require a greater quantity of ventilation air (e.g. healthcare). For mechanical ventilation only, eight points are available for designing ventilation

LEED v4	Green Globes v2
stringent. Naturally (and mixed mode) ventilated spaces must be designed to the natural ventilation requirements and section 4 of ASHRAE Standard 62.1-2010, or local equivalent, whichever is more stringent. Monitoring of outdoor airflow is required for mechanically ventilated systems. For naturally ventilated systems, provide one of the following: direct airflow measurement devices on exhaust systems; automatic indication devices on openings; carbon dioxide (CO_2) monitoring. Section 7 of ASHRAE 62.1-2010 include requirements for the design of ventilation intake and exhausts. One to two points are available for enhanced indoor air quality strategies, including: • Entryway systems; • Interior cross-contamination prevention; and • MERV 13 filtration.	systems with a zone air distribution effectiveness (Ez) value of 0.9 or higher in all regularly occupied, non-transient spaces. For natural ventilation only, up to eight points are available for proximity, size, location and accessibility of openings to the outdoors. For mixed mode ventilation, four points are available for following mechanical ventilation strategies and four points for following natural ventilation strategies. Additional points are achievable for the design of ventilation intake and exhausts (8 points); CO_2 sensing and ventilation control equipment (5 points); MERV 13 filtration (5 points)
POLLUTANT SOURCE CONTROL	
There are no prerequisites or credits for pollutant source control on domestic hot water systems or humidification and dehumidification systems.	Five points are available for designing the domestic hot water system to maintain hot water storage at or above 55°C (131°F) or for provision of instantaneous water heaters, to reduce the risk of Legionellosis associated with building water systems. An additional three points are available for the design of humidification and dehumidification (cooling coils) systems to allow for proper capture and drainage of condensate in air handlers.

APPENDIX C: Case Study

Case Study
Conception Bay Long Term Care Facility (Earles Lane, Carbonear, Newfoundland and Labrador)

Credit Categories	**Rating System**		
	LEED v2009	**LEED v4**	**Green Globes**
Minimum Program Requirements	- Includes minimum site and occupancy requirements. The minimum requirements did not pose any barriers to the project's ability to pursue LEED.	- Includes minimum site and occupancy requirements. The minimum requirements did not pose any barriers to the project's ability to pursue LEED.	- Green Globes does not have any prerequisite program requirements to satisfy.
Project Management	- LEED v2009 does not have a credit category dedicated to project management.	- There is a new prerequisite for integrative project planning and design which healthcare projects must satisfy. However, these requirements would have been satisfied by through a combination of the LEED design charrette that was held for the project and the documentation of owner's project goals which took place as part of the commissioning process.	- An integrated design process (charette) was employed with major disciplines during the design period. This included the discussion and setting of sustainability goals and metrics for energy and water conservation. - Regular design meetings were held and a few meetings were held which involved all stakeholders at certain project stages. The general contractor had some environmental plans put into place with some records for emissions, mould mitigation and IAQ during construction. -The commissioning program included retaining the services of an Independent Commissioning Authority who documented the owner’s project requirements (OPRs), reviewed the basis of design, prepared a commissioning plan, prepared commissioning specifications, oversaw training, and handover to the client.
Sustainable Sites	- Project was considered "previously developed" within the limits of the existing Carbonear Hospital parking lot. The parking lot was removed and the site was re-graded to accommodate the new long term care facility and parking lot. - The site is not located within easy walking distance to public transportation; hence options to reduce transportation issues were limited. However, secure bicycle racks have been designed into the landscape plan to promote alternative means of transportation for local community visitors and staff. - The site and building storm water runoff and removal of	- No points associated with LEED neighborhood development. - One point for a previously developed site or meeting requirements similar to LEED v2009 SSc1 site selection. - Not located on a historic or brownfield site - Surrounding density requirements not met but sufficient access to amenities - No bicycle network access - No carpooling provisions and minimum parking requirements have been exceeded - No electric charging stations or green vehicle parking	- Project does not have a positive walkability index rating but is located close to a commercial zone. The site was previously developed and utility access existed. Sensitive land was not impacted by the project. - An erosion plan was implemented using EPA Best practice measures and landscaping integrated some undergrowth and trees but no tree preservation or protection. A high reflectance roof was installed for the majority of roof area. - A storm water management plan was implemented; the

	suspended solids has been managed by a series of infiltration galleries and roof drain flow restrictors. - A landscape management plan has been put in-place to reduce the amount of Phosphorous used in fertilizing the site vegetation and cleaning products used on-site to further reduce the disturbance to downstream ecosystems. - A significant portion of the site (equaling more than the footprint of the buildings) has been reserved for open space to provide habitat and promote biodiversity. - Respite gardens have been designed to assist in the health and wellbeing of the patients and staff.	- No environmental site assessments conducted and no contamination on site - No site assessment to review environmental factors - Large site areas available to protect site habitat and provide open space to occupants - Ample available site space to treat and manage storm water - No parking under cover, a reflective roof and some reflective landscape areas - No exterior lighting or light pollution considerations for the project - Places of respite available for patients	project is not located near a water body. - An zero irrigation plan was created for the project inclusive of native and adaptive plantings
Water Efficiency	- Project meets prerequisite minimum plumbing fixture requirements - Poor indoor plumbing fixture performance. While this could easily be improved for other projects, project did not fair well above the prerequisite level. - Selection of native and adaptive landscaping that does not require supplementary irrigation.	- Project meets prerequisite minimum plumbing fixture requirements - Entire landscape designed to survive without irrigation systems - Poor indoor plumbing fixture performance. While this could easily be improved for other projects, project did not fair well above the prerequisite level - Project does not have sufficient sub metered water uses.	- Poor indoor plumbing fixture performance. While this could easily be improved for other projects, project did not fair well above the minimum efficiency requirements. - Entire landscape designed to survive without irrigation systems - There is believed to be no once-through water-cooled commercial food equipment.
Energy and Atmosphere	- The building design has included a high-performance building envelope, with air leakage and thermal bridging control, thermally efficient windows for daylighting and passive heating, as well as a number of other energy efficient features; such as: • Heating and cooling provided by ground source heat pumps • Variable speed pumping • Variable air volume systems with variable speed drives • Heat recovery ventilators • Electrically communicated motors on fan coil units • Exhaust and refrigeration heat reclamation • Free well cooling • Service hot water pre-heat using condenser water from distributed heat pumps serving data closets • Low flow plumbing fixtures reducing service hot water demand • Automatic interior lighting controls • Low site lighting power levels - The energy savings were estimated with the use of a	- The simulated energy savings are approximately 39% better than the NECB 2011 reference building, which relates to 15 points (17 for healthcare). Using the Canadian alternative compliance pathway (ACP), the project may pursue compliance using the NECB 2011 and the same point scale as 90.1-2010. Energy performance under NECB 2011 was estimated using the 2011 Adaptation of Guidelines for National Energy Code of Canada for Buildings, CCBFC. - The project did not use any CFC refrigerants and made use of HFC R-410a and R-407c with an average refrigerant atmospheric impact of less than 100. - The project did not make any green power purchases or offset any carbon associated with fossil fuel use. - The commissioning program undertaken meets the requirements of prerequisite 1. - The energy metering installed for the project meets the requirements of prerequisite 3. - The commissioning program meets the requirements of the Enhanced Commissioning Credit Option 1, Path 1, and Option 2. Note, the project had the technical requirements to achieve	The building has a simulated carbon emission of 165 kg CO2e/m2. Note that the energy performance credit does not have a benchmarking for hospitals, so the case study has adopted the pathway from the US Green Globes version 1.5 (March 2018), which offers four paths for assessing energy performance: • Path A: ENERGY STAR® Target Finder – 100 points • Path B: ASHRAE 90.1-2010, Appendix G – 100 points • Path C: ANSI/GBI 01-2010 Energy Performance Building Carbon Dioxide Equivalent (CO2e) Emissions – 100 points, plus 50 bonus points • Path D: ASHRAE Building Energy Quotient (bEQ) – 100 points, plus 25 bonus points Following Path B, the project may be eligible for 100 points based on simulated energy savings of 50% better than the ASHRAE 90.1-2010 reference building. Energy performance under ASHRAE 90.1-2010 was estimated using the 2011 Adaptation of Guidelines for National Energy Code of Canada for Buildings, CCBFC. - Exterior walls and fenestration meet or exceed the

	computer energy simulation tool (DOE2.1 EE4). The simulated energy savings are approximately 55.1% better than the MNECB reference building, which relates to 18 points. - To ensure that the designed energy systems were properly installed, balanced and operated correctly, a whole building commissioning plan was implemented for the project. The commissioning process included a third-party review of the mechanical, electrical and building envelope systems, during the design and construction stages of the project. The commissioning team included the original design team, an external consultant (Morrison Hershfield Ltd.) and the Department of Transportation Work's commissioning agents.	Option 1, Path 2, however it would have required a significant increase in the commissioning consultant's scope of work. - The Measurement and verification program undertaken meets the requirements of the Advanced Energy Metering Credit. - Related to the energy efficient transportation section, the project has sheltered bicycle parking for those who are able to ride bicycles.	thermal performance requirements, with more glazing on N-S orientations versus E-W. - Interior lighting systems are equipped with interior automatic light shut-off controls. Exterior lighting is LED with minimum efficary > 60lumens/W, contains no mercury, and are controlled by photo sensors. - The building is equipped with a building automation system. - Cooling equipment has a COP between 5 and 6, and part load performance exceeds ASHRAE requirements. Cooling system is also equipped with a waterside economizer. - Condensate is returned from the steam system, and steam traps are equipped with isolation valves. - Major pumps are equipped with variable speed control. - The building has air economizers, with controls and low leakage dampers. - Efficient fan motors are used, and VAV systems use static pressure reset. - Ventilation systems are equipped with heat recovery.
Emissions	- LEED does not have a dedicated credit section for emissions.	- LEED does not have a dedicated credit section for emissions.	- Back-up boilers are low NOx and low CO. - The project did not use any CFC refrigerants and made use of HFC R-410a and R-407c, with 0 ozone depleting potential. - The M&V program included elements of sub metering all major end uses and individual pieces of mechanical and electrical equipment. The M&V plan developed specifies the monitoring points, frequencies, and durations. - The individual domestic water end-uses were not metered.

Materials and Resources	- The materials selected for this project were chosen for their recycle content, proximity to the project site and durability. - Waste diversion options were explored but ultimately was not pursued or tracked. - The use of fly ash and other cement replacement materials were chosen to minimize the embodied energy and carbon footprint of the concrete materials. - Interior material (e.g., flooring, wall finishes, etc.) were selected to help with infection control, while providing a durable surface for the operation of the facility. - A building durability plan was established for the project, which highlighted the design and predicted service lives of the primary structural and building envelope components. - The durability plan was used as another bridge between design and construction to ensure the materials were proper installed and tested to minimize air leakage, thermal losses and vapour diffusion.	- The project has the necessary recycling facilities and storage capacity to satisfy the LEED prerequisite. - The project took steps in design to review the potential waste diversion opportunities. Although the credits were not pursued, this type of investigation and planning meets the prerequisite requirements. - The project would need to address the new healthcare construction prerequisite for mercury reduction; however, the requirements could have easily been achieved with little effort and no additional costs. - No reuse of any abandoned or historical buildings as a whole or salvaging of materials, no life cycle assessment studies performed. - The level of effort put into sourcing of environmentally preferred products would result in the achievement of base points for sourcing products with environmental declarations and ingredient reporting. - No consideration into identifying problematic metals or subsequent selection of environmentally preferred metals or their connections. - No consideration for preferred furniture and medical furnishings materials or furniture emissions testing criteria - Building layout is intended to be permanent and no design elements considered for flexible space usage - The project did not implement a waste diversion program for construction related waste.	- The level of effort put into sourcing of environmentally preferred products would result in The achievement of base points for sourcing products with environmental declarations and ingredient reporting. - No existing structure means there is was no opportunity to reuse elements of a pre-existing structure and therefore was marked N/A for Green Globes - No reuse of any abandoned or historical buildings as a whole or salvaging of materials, no life cycle assessment studies performed. - The project did not implement a waste diversion program for construction related waste. - The building design details were reviewed by an independent consultant, mock-ups were completed prior to construction and subsequent construction reviews were performed. Third-party commissioning scope included service life for mechanical and electrical equipment. - Roofing products and flashings were installed in accordance with manufacturer's instructions and reviewed by an independent envelope specialist. - Rainscreen principles employed and subsequent water infiltration testing was performed as part of the third-party building envelope services. - Concrete slabs used vapour retarders, dampproofing, foundation drainage system, incorporated capillary breaks and inspections were performed by a qualified professional. - Exterior cladding and caulking was installed as per industry best practices and inspected. Building envelope included an air barrier and rain screen which was later tested for water infiltration after installation.
Indoor Environmental Quality	- As the occupants of this facility will spend the majority of their time within the building, we pursued all achievable credits within this LEED category to promote a "healthy home". - The primary focus was on minimizing materials that would off-gas harmful chemicals and providing effective and efficient	- Required outdoor airflow rate required in patient rooms is governed by healthcare standards (more stringent than ASHRAE 62.1 ventilation rate procedure). Other areas complied with ASHRAE 62.1-2007 (changes in 62.1-2010 not likely to impact compliance) with minimum ventilation prerequisite.	- Outdoor airflow rates were determined using ASHRAE 62.1, or more stringent requirements for healthcare. - Ventilation intakes and exhausts are designed with good practices - Air handlers are equipped with MERV 13 or better air filtration

	ventilation strategies designed for each room and activity. These approaches were implemented during construction for the contractors and trades, as well as additional measures during the pre-occupancy phase for the staff and patient's health. - Patient's rooms, dining halls, activity spaces and staff offices have included exterior views and daylighting to help improve patients and staff members health and wellbeing. - The design of the ventilation and system control was focused on providing high levels of air quality within all regularly occupied spaces, and the ability to control the temperature. - Operable windows were provided in all occupant rooms to allow more control over ventilation and connection to the exterior.	- The project meets all prerequisite requirements related to tobacco smoke control - Some building materials were evaluated for emissions, however, the scope of materials has greatly increased and for the same level of effort, less points would be achieved than in v2009. - An indoor air quality management plan was developed and implemented during construction along with pre-occupancy air quality testing. - Each patient room is equipped with a thermostat for thermal comfort control and project complied with ASHRAE 55-2004 (changes in 55-2010 not likely to impact compliance). - Individual light controls were not provided in an attempt to reduce overhead lighting levels - Daylight credits are only awarded to projects that perform computer simulations or actual daylight measurement readings post-construction. - The project would achieve the base requirements for the views credit as surrounding areas would be considered quality views. - Project design did not include acoustic performance above and beyond typical construction practices. No consideration for background HVAC noise levels or sound transmission.	- Adhesives, sealants, paints and coatings were specified for lower emissions. - Carpeting was not installed in the building and deemed N/A but other flooring types were specified for lower emissions with third-party indoor air quality testing standards - Materials were chosen for resistance to mould growth such as kitchens and laundry rooms. - Floor drains are located in all areas where equipment failures may cause plumbing leaks or spills and overflows could reasonably be expected. - Measures are in place to facilitate easy access and maintenance of HVAC equipment. - Carbon monoxide monitoring is in-place with alarms in enclosed areas where combustion occurs - The project is awarded points for avoiding the use of wet cooling towers - Hot water is stored above 55C to prevent Legionella growth due to stagnant water. - Drain pans for dehumidifying cooling coils are assumed to be designed to properly capture and drain the condensate in the air handlers (P-trap, sloped, drain opening at lowest point). - Openings were protected with insect and bird screens. - No smoking signage is prevalent inside and outside of the building. - Lighting design meets IESNA lighting level requirement. - The building complies with ASHRAE 55-2004, and is equipped with thermal comfort controls for zones.

Innovation in Design	The LEED® green rating systems recognizes that the design, construction and operation team may go beyond the credits outlined within the rating system. - The project team explored innovation measures such as; implementation of environmental preferred cleaning products (typically certified through a 3rd party, such as GreenSeal), implementation of a composting program for food waste, providing a scent free environment to improve air quality, providing a respite garden, providing a green education program for staff, visitors and patients and extending the commissioning process to include the building envelope. - Ultimately, only two exemplary performance points were awarded for building envelope commissioning and the amount of open space on the project site.	- The projects points awarded under v2009 for innovation in design are now included in credit requirements for which points have already been awarded. No other innovation opportunities were executed for the project. - The project achieves one point for having a LEED AP with specialty appropriate for the project.	- Green Globes does not have a dedicated credit section for innovation.
Regional Priorities	- The project achieved three points under the regional priority section for pursuit and achievement of RPc1 (Durable Building), SSc1 (Site Selection), and MRc5 (Regional Materials). <u>Available options for Carbonear, NL:</u> Development Density and Community Connectivity - Required Point Threshold: 2 Stormwater Quality management - Required Point Threshold: 1 Construction Waste Diversion - Required Point Threshold: 2 Regional Materials - Required Point Threshold: 2 Optimize energy performance - Required Point Threshold: 10 Durable Building - Required Point Threshold: 1	- The project would achieve one point for optimizing energy performance and one point for rainwater management. <u>Available options for Carbonear, NL:</u> Optimize energy performance - Required Point Threshold: 10 Access to quality transit - Required Point Threshold: 3 Reduced parking footprint - Required Point Threshold: 1 Rainwater management - Required Point Threshold: 2 Heat island reduction - Required Point Threshold: 2 Indoor water use reduction - Required Point Threshold: 4	- Green Globes does not have a dedicated credit section for regional priorities or award additional points for particular regions achieving particular credits.

INDEPENDENT ASSESSMENT Green Globes ® Canada v2.0

Project Name: Carbonear - Case Study Example
Date: March 27, 2018
Assessor: Jamie McKay

MORRISON HERSHFIELD

55% = Estimated Achievement *Three Green Globes* **Available Points:** 920

One Globe = 25 - 39% **Two Globes** = 40 - 54% **Three Globes** = 55 - 69% **Four Globes** = 70 - 84% **Five Globes** = 85%+

37	0	**Project Management**	Points	47
7		A.1	Integrated Design Process	10
5		A.2	Environmental Management	9.5
25		A.3	Comissioning	27.5

69	0	**Site**	Points	118
17		B.1	Development Area	30
21		B.2	Ecological Impacts	28
13		B.3	Stormwater Management	18
18		B.4	Landscaping	26
0		B.5	Exterior Light Pollution	7
0		B.6	Site Innovation	9

239	0	**Energy**	Points	372.5
150		C.1	Energy Performance	150
0		C.2	Energy Demand	8
7		C.3	Metering, M & V	9
19		C.4	Building Opaque Envelope	25.5
11		C.5	Lighting	34
49		C.6	HVAC Systems and Controls	78
0		C.7	Other Equipment and Measures	8
0		C.8	Renewable Energy	27
3		C.9	Energy Efficient Transportation	23
0		C.10	Energy Innovation	10

24	0	**Water**	Points	83
9		D.1	Water Consumption	25
0		D.2	Cooling Towers	9
0		D.3	Boilers and Water Heaters	1
1		D.4	Water Intensive Applications	8
0		D.5	Water Treatment	3
0		D.6	Alternate Sources of Water	5
0		D.7	Metering	8
14		D.8	Irrigation	14
0		D.9	Water Innovation	10

37	0	**Materials and Resources**	Points	103
0		E.1	Building Assembly	32
6		E.2	Interior Fit-Outs	10
0		E.3	Re-Use of Existing Structures	4
1		E.4	Waste	8
7		E.5	Building Service Life Plan	7
0		E.6	Resource Conservation	6
10		E.7	BE - Roofing / Openings	10
5		E.8	BE - Foundation / Waterproofing	6
5		E.9	BE - Cladding	5
3		E.10	BE - Barriers	5
0		E.11	Resource Innovation	10

24	0	**Emissions**	Points	50
14		F.1	Heating	18
10		F.2	Cooling	29
0		F.3	Janitorial Equipment	3

78	0	**Indoor Environment**	Points	146
20		G.1	Ventilation	33
34		G.2	Source Control and Pollutants	45
16		G.3	Lighting Design and Systems	30
8		G.4	Thermal Comfort	10
0		G.5	Acoustic Comfort	28

🟩 = **Anticipated Credits**
🟨 = **Risk Credits**

Team Members:

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CY	Chris Yates	Morrison Hershfield Ltd.
KG	Khader Gazal	Morrison Hershfield Ltd.
KF	Kyle Fridgen	Morrison Hershfield Ltd.
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LEED v4 for BD+C: New Construction and Major Renovation

Project Checklist

Conception Bay Long Term Care Facility - v4 Estimate

March 5th, 2018

Y	?	N			
1		0	Credi 1	Integrative Process	1

3	0	29	**Location and Transportation**	Possible Points:	16
		16	Credit 1	LEED for Neighborhood Development Location	16
1			Credit 2	Sensitive Land Protection	1
		2	Credit 3	High Priority Site	2
2		3	Credit 4	Surrounding Density and Diverse Uses	5
		5	Credit 5	Access to Quality Transit	5
		1	Credit 6	Bicycle Facilities	1
		1	Credit 7	Reduced Parking Footprint	1
		1	Credit 8	Green Vehicles	1

6	0	4	**Sustainable Sites**	Possible Points:	10
Y			Prereq 1	Construction Activity Pollution Prevention	Required
		1	Credit 1	Site Assessment	1
2			Credit 2	Site Development--Protect or Restore Habitat	2
1			Credit 3	Open Space	1
2		1	Credit 4	Rainwater Management	3
1		1	Credit 5	Heat Island Reduction	2
		1	Credit 6	Light Pollution Reduction	1

3	0	8	**Water Efficiency**	Possible Points:	11
Y			Prereq 1	Outdoor Water Use Reduction	Required
Y			Prereq 2	Indoor Water Use Reduction	Required
Y			Prereq 3	Building-Level Water Metering	Required
2			Credit 1	Outdoor Water Use Reduction	2
1		5	Credit 2	Indoor Water Use Reduction	6
		2	Credit 3	Cooling Tower Water Use	2
		1	Credit 4	Water Metering	1

22	0	11	**Energy and Atmosphere**	Possible Points:	33
Y			Prereq 1	Fundamental Commissioning and Verification	Required
Y			Prereq 2	Minimum Energy Performance	Required
Y			Prereq 3	Building-Level Energy Metering	Required
Y			Prereq 4	Fundamental Refrigerant Management	Required
5		1	Credit 1	Enhanced Commissioning	6
15		3	Credit 2	Optimize Energy Performance	18
1			Credit 3	Advanced Energy Metering	1
		2	Credit 4	Demand Response	2
		3	Credit 5	Renewable Energy Production	3
1			Credit 6	Enhanced Refrigerant Management	1
		2	Credit 7	Green Power and Carbon Offsets	2

2	0	11	**Materials and Resources**	Possible Points:	13
Y			Prereq 1	Storage and Collection of Recyclables	Required
Y			Prereq 2	Construction and Demolition Waste Management Planning	Required

		5	Credit 1	Building Life-Cycle Impact Reduction		5
1		1	Credit 2	Building Product Disclosure and Optimization - Environmental Product Declarations		2
1		1	Credit 3	Building Product Disclosure and Optimization - Sourcing of Raw Materials		2
		2	Credit 4	Building Product Disclosure and Optimization - Material Ingredients		2
		2	Credit 5	Construction and Demolition Waste Management		2

6	0	10	**Indoor Environmental Quality**		Possible Points:	16
Y			Prereq 1	Minimum Indoor Air Quality Performance		Required
Y			Prereq 2	Environmental Tobacco Smoke Control		Required
		2	Credit 1	Enhanced Indoor Air Quality Strategies		2
2		1	Credit 2	Low-Emitting Materials		3
1			Credit 3	Construction Indoor Air Quality Management Plan		1
2			Credit 4	Indoor Air Quality Assessment		2
1			Credit 5	Thermal Comfort		1
		2	Credit 6	Interior Lighting		2
		3	Credit 7	Daylight		3
		1	Credit 8	Quality Views		1
		1	Credit 9	Acoustic Performance		1

1	0	5	**Innovation**		Possible Points:	6
		5	Credit 1	Innovation		5
1			Credit 2	LEED Accredited Professional		1

2	0	2	**Regional Priority**		Possible Points:	4
1			Credit 1	Regional Priority: Optimize Energy Performance (10 point minimum)		1
1			Credit 2	Regional Priority: Rainwater Managament (2 point minimum)		1
		1	Credit 3	Regional Priority:		1
		1	Credit 4	Regional Priority:		1

46	0	80	**Total**		Possible Points:	110

Certified 40 to 49 points   Silver 50 to 59 points   Gold 60 to 79 points   Platinum 80 to 110

LEED v4 for BD+C: Healthcare

Project Checklist

Conception Bay Long Term Care Facility - v4 Estimate
March 5th, 2018

Y	?	N			
Y			Prereq 1	Integrative Project Planning and Design	Required
1			Credit 1	Integrative Process	1

3	0	19	**Location and Transportation**	Possible Points:	9
		9	Credit 1	LEED for Neighborhood Development Location	9
1			Credit 2	Sensitive Land Protection	1
		2	Credit 3	High Priority Site	2
2		3	Credit 4	Surrounding Density and Diverse Uses	1
		2	Credit 5	Access to Quality Transit	2
		1	Credit 6	Bicycle Facilities	1
		1	Credit 7	Reduced Parking Footprint	1
		1	Credit 8	Green Vehicles	1

6	0	3	**Sustainable Sites**	Possible Points:	9
Y			Prereq 1	Construction Activity Pollution Prevention	Required
Y			Prereq 2	Environmental Site Assessment	Required
		1	Credit 1	Site Assessment	1
1			Credit 2	Site Development--Protect or Restore Habitat	1
1			Credit 3	Open Space	1
1		1	Credit 4	Rainwater Management	2
1			Credit 5	Heat Island Reduction	1
		1	Credit 6	Light Pollution Reduction	1
1			Credit 7	Places of Respite	1
1			Credit 8	Direct Exterior Access	1

2	0	9	**Water Efficiency**	Possible Points:	11
Y			Prereq 1	Outdoor Water Use Reduction	Required
Y			Prereq 2	Indoor Water Use Reduction	Required
Y			Prereq 3	Building-Level Water Metering	Required
1			Credit 1	Outdoor Water Use Reduction	1
1		6	Credit 2	Indoor Water Use Reduction	7
		2	Credit 3	Cooling Tower Water Use	2
		1	Credit 4	Water Metering	1

24	0	11	**Energy and Atmosphere**	Possible Points:	35
Y			Prereq 1	Fundamental Commissioning and Verification	Required
Y			Prereq 2	Minimum Energy Performance	Required
Y			Prereq 3	Building-Level Energy Metering	Required
Y			Prereq 4	Fundamental Refrigerant Management	Required
5		1	Credit 1	Enhanced Commissioning	6
17		3	Credit 2	Optimize Energy Performance	20
1			Credit 3	Advanced Energy Metering	1
		2	Credit 4	Demand Response	2
		3	Credit 5	Renewable Energy Production	3
1			Credit 6	Enhanced Refrigerant Management	1
		2	Credit 7	Green Power and Carbon Offsets	2

2	0	17	**Materials and Resources**	Possible Points:	19
Y			Prereq 1	Storage and Collection of Recyclables	Required
Y			Prereq 2	Construction and Demolition Waste Management Planning	Required
Y			Prereq 3	PBT Source Reduction- Mercury	Required
		5	Credit 1	Building Life-Cycle Impact Reduction	5
1		1	Credit 2	Building Product Disclosure and Optimization - Environmental Product Declarations	2
1		1	Credit 3	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
		2	Credit 4	Building Product Disclosure and Optimization - Material Ingredients	2
		1	Credit 5	PBT Source Reduction- Mercury	1
		2	Credit 6	PBT Source Reduction- Lead, Cadmium, and Copper	2
		2	Credit 7	Furniture and Medical Furnishings	2
		1	Credit 8	Design for Flexibility	1
		2	Credit 9	Construction and Demolition Waste Management	2

7	0	9	**Indoor Environmental Quality**	Possible Points:	16
Y			Prereq 1	Minimum Indoor Air Quality Performance	Required
Y			Prereq 2	Environmental Tobacco Smoke Control	Required
		2	Credit 1	Enhanced Indoor Air Quality Strategies	2
2		1	Credit 2	Low-Emitting Materials	3
1			Credit 3	Construction Indoor Air Quality Management Plan	1
2			Credit 4	Indoor Air Quality Assessment	2
1			Credit 5	Thermal Comfort	1
		1	Credit 6	Interior Lighting	1
		2	Credit 7	Daylight	2
1		1	Credit 8	Quality Views	2
		2	Credit 9	Acoustic Performance	2

1	0	5	**Innovation**	Possible Points:	6
		5	Credit 1	Innovation	5
1			Credit 2	LEED Accredited Professional	1

2	0	2	**Regional Priority**	Possible Points:	4
1			Credit 1	Regional Priority: Optimize Energy Performance (10 point minimum)	1
1			Credit 2	Regional Priority: Rainwater Managament (2 point minimum)	1
		1	Credit 3	Regional Priority:	1
		1	Credit 4	Regional Priority:	1

48	0	75	**Total**	Possible Points:	110

Certified 40 to 49 points   Silver 50 to 59 points   Gold 60 to 79 points   Platinum 80 to 110