



To: Public Works and Transportation Committee **Date:** January 24, 2014
From: John Irving, P.Eng, MPA **File:** 10-6000-01/2013-Vol
Director, Engineering and Public Works 01
Re: **Sustainable High Performance Building Policy Update**

Staff Recommendation

1. That the City’s Sustainable “High Performance” Building Policy – City Owned Facilities Policy #2306 be rescinded.
2. That the City adopt the revised Sustainable “High Performance” Building Policy – City Owned Facilities as per the attached report from the Director of Engineering dated January 24, 2014.

John Irving, P.Eng, MPA
Director, Engineering
(604-276-4140)

Att. 3

REPORT CONCURRENCE		
ROUTED TO:	CONCURRENCE	CONCURRENCE OF GENERAL MANAGER
Arts, Culture & Heritage	<input checked="" type="checkbox"/>	
Community Social Development	<input checked="" type="checkbox"/>	
Parks Services	<input checked="" type="checkbox"/>	
Recreation Services	<input checked="" type="checkbox"/>	
Fire Rescue	<input checked="" type="checkbox"/>	
RCMP	<input checked="" type="checkbox"/>	
REVIEWED BY STAFF REPORT / AGENDA REVIEW SUBCOMMITTEE	INITIALS: 	
REVIEWED BY POLICY AND PROCEDURES SUBCOMMITTEE	INITIALS: 	APPROVED BY CAO

Staff Report

Origin

In support of Council Term Goal #8.1 ("*Continued implementation and significant progress towards achieving the City's Sustainability Framework, and associated targets*") and in the context of ongoing corporate energy planning and Council's adoption of the Community Energy and Emissions Plan, a Resource Management Study for Corporate Buildings Energy Use was completed to estimate the projected energy demand from corporate buildings over the next twenty years.

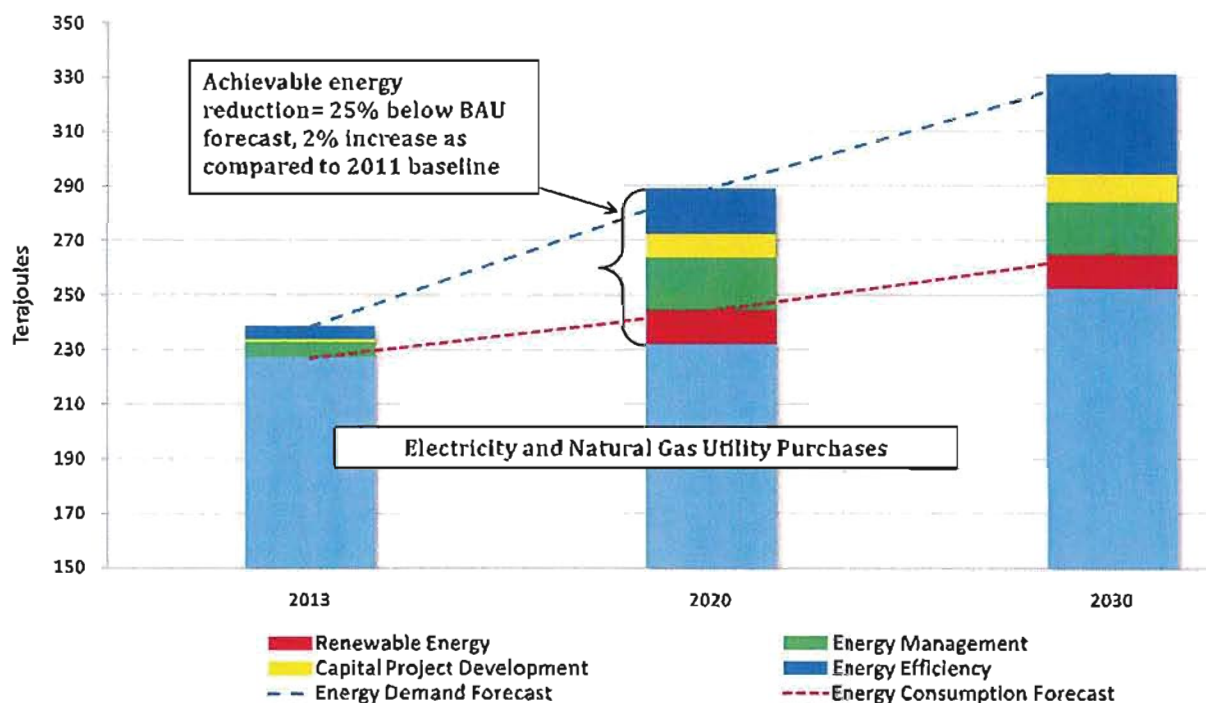
The study examined the impacts to corporate building energy use that may result from increased service levels to serve a growing population. Evaluating costs and benefits for implementing energy efficiency strategies were central to the study. Based on key findings, a report was brought forward to Council to seek support for revising the Sustainable High Performance Building Policy. On June 24, 2013, Council endorsed the following recommendations:

1. That the High Performance Building Policy No. 2306 be updated to include specific emphasis on corporate energy and GHG emissions targets and conservation priorities that reduce long term energy consumption and operational costs.
2. That staff report back to Council with the updated High Performance Building Policy No. 2306.

The existing policy is presented as **Attachment 1**. This report summarizes key findings of the policy review and the proposed revised policy (**Attachment 2**).

Background

In 2012, 72% of the City's corporate energy use and 67% of the City's GHG emissions were from corporate buildings. With anticipated population growth over the next 20 years, a resulting increased demand for corporate infrastructure and services are expected, creating the potential for increased energy use and GHG emissions. With no additional mitigating measures in place beyond Building Code regulated efficiency gains, it is estimated that corporate building energy use could increase by up to 25% and GHG emissions could increase by 22% by 2020, as compared to 2007 to 2009 average energy usage.



Energy Consumption Forecast and City Energy Resources to 2031

Over the last 15 years, significant resources have been put towards increasing energy efficiency and reducing GHG emissions at the City’s corporate buildings, with greater than expected results. Staff efforts included the setting of specific management objectives and evaluation criteria for the development of City buildings culminating in the adoption of the Sustainable “High Performance” Building Policy (HPBP) for City Owned Facilities (#2306) in 2005. The policy established the Leadership in Energy and Environmental Design (LEED®) rating system as the measurement tool for new buildings and major renovations. The policy sets clear direction for the sustainable construction of City buildings, targeting better than code construction. The results of the HPBP have been evident with the following exceptionally well-designed civic buildings: Community Safety building (renovation), Steveston Fire Hall No.2, Hamilton Community Centre, Richmond Olympic Oval, Sea Island Fire Hall No.4, and Hamilton Fire Hall No.5.

Analysis

As the City plans to replace infrastructure over the coming years, an updated high performance building policy is well timed to have a positive impact on building planning, design, construction and maintenance processes. Standards, construction methods, technology, and building codes have improved since 2005, when the current policy was adopted. In addition, in December 2013, the BC Building Code was updated with new energy performance requirements and now references more stringent energy standards. This policy update aims to help ensure that the sustainable development of the City of Richmond’s corporate buildings moves forward with these changes and allows the City to continue to strive for better than code facilities.

During the review of the City’s current policy and of industry best practices, the following opportunities were identified that, if implemented, would strengthen corporate building practices:

1. Acknowledge that the most important operating asset in any new building are its people.

2. Establish direction for collecting specific energy reduction, efficiency, or renewable energy LEED® credits
3. Formalize direction for efficient building operations once buildings are constructed and for existing buildings
4. Utilize an integrated design process (IDP) for new buildings, major renovations, and developer delivered spaces. An IDP is a collaborative approach to building planning and design can help achieve higher performing buildings that meet occupant needs, increases energy and water efficiency, and reduces long term operational and maintenance costs.
5. Embed energy use and GHG emissions targets to help drive building design and system decision making processes

Best Practices Review

Currently the leading edge of sustainable building design involves looking at LEED® and beyond for new buildings criteria, with more time and effort put towards the building planning and design stages. Some trends include the following:

- LEED® Gold “plus” – with targeted or mandatory points from specific LEED® categories to achieve increased energy and operational efficiency.
- Net Zero Energy and Net Positive buildings – buildings that on an annual basis produce as much or more energy as they use.
- Living Building Challenge – includes stringent requirements for only sustainable products and materials to be used during construction, and energy efficiency is measured after the building has been operating with a net zero requirement.
- Formal Integrated Design Process (IDP) for new buildings – through a collaborative team approach during building planning and design, the vision, goals, and objectives for a building and its performance are defined and maintained throughout the entire construction process to reduce costly backtracking and redesign.
- Increased focus on passive design approach for building construction – passive design looks to maximize energy efficiency and occupant comfort through minor building architecture alterations to allow for optimized interactions between the building and its environment, and reduce the need for active mechanical systems (such as maximizing the use of daylight and natural ventilation). As compared to energy efficiency retrofits at operating buildings, passive design alterations during building construction can have a dramatic effect on operational costs and efficiencies for significantly less cost.
- Building Energy Performance monitoring and certification – LEED® for new construction encompasses sustainable design guidelines for new facilities, but increasingly there is interest in energy performance monitoring and benchmarking for operating buildings such as Canadian Energy Star®¹ certification.

¹ Energy Star® certified buildings, refers to buildings that meet strict North American energy performance standards. Typically these buildings use 20–30% less energy and cause fewer greenhouse gas emissions than comparable buildings.

- Energy reduction targets – There are a few municipalities in the region that have adopted corporate GHG reduction targets. No jurisdiction in the region (except the City of Seattle) was identified to have adopted a corporate building energy reduction target. Richmond has committed to becoming carbon neutral through Council’s endorsement of the Working Towards Carbon Neutrality: Implementation Strategy, and has an opportunity to take a leadership position through the adoption of a building energy target.

Attachment 3 contains for more detailed best practice information.

Options

Based on the above findings and staff analysis, the following options are proposed for consideration.

Option 1 – Maintain the existing policy (Not Recommended)

If the option to not proceed with this update was chosen, City staff would continue to strive and work on increased energy efficiency and reduced GHG emissions at civic facilities through collaboration with consultants for new buildings and through system improvements to existing buildings.

This option is not recommended. Through the review of current building standards, best practices and internal processes, it was determined that an updated policy and additional guidance would be useful to the corporation.

Option 2 – Adopt the revised Sustainable High Performance Building Policy (Recommended)

Updating the High Performance Building Policy as per Attachment 2 is recommended. Highlights of the revised policy improvements include:

1. Acknowledgement that a “sustainable” building needs to ensure that occupant comfort and functionality allow for high levels of productivity and overall happiness.
2. Clear targets for new buildings in regards to energy performance with targets of 10 points in the LEED® Optimize Energy Performance criteria – 10 pts currently is equal to 24% better than code (ASHRAE 90.1 – Energy Standards for Buildings).
3. Guidance on following an integrated design process for building planning and design, to help ensure that new civic facilities and spaces meet occupant needs, maximize energy efficiency, maximize water efficiency, and reduce long term operational and maintenance costs in the most cost effective way.
4. Reference to sustainable operation and maintenance guidelines for new and existing buildings, including requirements for the re-commissioning of the City’s civic facilities. This guideline will help enable new buildings to be maintained at a high performing level, as would be expected, and is also applicable to existing buildings by setting a high performance operational guideline to target and strive for.
5. Embedded overall building energy use and GHG emissions targets for no net increase in building energy use and GHG emissions as compared to the 2012 baseline, while incorporating all new energy demands from any increase in infrastructure and service demand.

6. Include a long term stretch goal for the City to strive to build net zero energy and carbon neutral buildings by 2030.

These changes were considered in the context of the planned construction of Fire Hall No.1 and No.3 and the Aquatic and Older Adults Centre. Specific performance requirements for *Optimize Energy Performance* criteria would have a significant effect on reducing energy operational costs and GHG emissions liability. Table 1 provides a summary of the analysis and shows that despite the 100% increase in floor space for these four replacement facilities, energy use would grow by only 55% and GHG emissions by 40% if specific points in *Optimize Energy Performance* criteria are achieved.

Table 1: Energy Use and GHG Emission Comparison for Fire Halls No.1 and No. 3 and the Minoru Aquatic Centre (including the Older Adults Centre): Existing, Construction with the current High Performance Building Policy, and revised High Performance Building Policy

Construction Scenarios	Energy Consumption (GJ)	Energy Cost (current rates)	GHG emissions (tCO2e)	GHG emissions liability/year	Bldg Area (ft ²)
Actual Energy Consumed in Existing Operations (2012)	24,657	\$276,875	1,040	\$26,005	77,256
Estimated Energy Performance with EXISTING HPBP (LEED Gold)	43,484	\$487,138	1,839	\$45,982	147,500
Estimated Energy Performance with UPDATED HPBP (LEED Gold w/ 10 Energy & Atmosphere Points)	32,613	\$365,353	1,379	\$34,487	147,500
LEED Gold vs LEED Gold with 10 Energy & Atmosphere Points	10,871	\$121,784	460	\$11,496	0

Adopting this revised policy update will not prevent staff from pursuing greater energy and operational efficiency gains where strong economic business cases exist. As the City is exploring the increased use of district energy and has experience maintaining renewable energy technologies, analysis will be undertaken to determine the most efficient and cost effective options for the new Minoru Park precinct of buildings (Aquatic Centre and Older Adults Centre) and Fire Hall No.1). Part of this analysis will include an assessment of the feasibility of connecting these facilities to the City’s district energy system and/or installing technologies that facilitates heat sharing between buildings. With these initiatives, the City has the potential to build a “showcase” net zero energy certified building at one of the new facilities in Minoru Park.

Financial Analysis

Recently approved Phase 1 projects in the Major Capital Facilities program and Fire Hall No.3, have been budgeted to meet the LEED® Gold standard, as per the current High Performance Building Policy. Through design optimization and available incentives, staff are reviewing the feasibility of achieving specific points from LEED’s Optimize Energy Performance criteria within the current budget projections Phase 1. Similarly, achieving net zero energy and/or carbon neutral operations for one or more of the Phase 1 facilities will require further analysis to determine feasibility.

With respect to financial implications of the policy on future capital programs, it is anticipated that achieving energy-specific LEED points has potential for impacting future corporate building planning, design, implementation, and operation budgets, either increasing or decreasing total investments required. Where capital costs are increased due to energy efficiency measures, lower operating costs would be anticipated, as compared to a building that does not implement Optimize Energy Performance criteria, thus creating payback opportunities for additional investments. The main intent of the policy is to ensure greater emphasis on planning, design and construction practices that lead to innovative outcomes. For instance, high performance buildings are increasingly including passive heating and cooling technologies that can be used to replace costly mechanical systems.

Financial Impact

Staff anticipate that the new policy will have no additional financial impact on future capital projects, as compared to how they are currently budgeted. As per the current approach, each building project will be evaluated on its own merits and circumstances, recognizing that the suite of energy management measures will be tailored to the project, its user groups and the allocated budget. Staff already use acceptable payback periods and life cycle costing during the planning and design process as matter of regular business in an effort to optimize capital and operating expenditures.

Conclusion

The City of Richmond has shown leadership with regards to energy efficient corporate building operations. The City has been consistently recognized by BC Hydro as being a Power Smart Leader for its commitment to reduce energy use and corresponding GHG emissions. An updated Sustainable High Performance Building Policy with strong, better than code targets for energy efficient new buildings and spaces, and improved internal process and requirements will allow the City of Richmond to continue to be proactive when it comes to energy efficiency at its new and existing corporate buildings. In the context of the Council’s recently adopted Community Energy and Emissions Plan, the proposed new policy has the potential to stand out as a model for pragmatic, but innovative, private development in the City.



Levi Higgs
 Corporate Energy Manager
 (604-244-1239)

Attachment 1	Existing – Sustainable High Performance Building Policy – City-Owned Facilities	REDMS# 1409383
Attachment 2	Proposed – Sustainable High Performance Building Policy – City-Owned Facilities	REDMS# 3988334
Attachment 3	Detailed Best Practice Review	REDMS# 4065692

**POLICY 2306:**

It is Council policy to:

1. **Undertake Comprehensive Financial Consideration**

Projects for new buildings and major renovations will be evaluated based on considerations of life-cycle costing and initial financial investment requirements.

2. **Incorporate High Performance Attributes into Building Design and Construction to the Maximum Extent Possible**

- LEED® BC will be used as the standard by which to assess building performance.
- That LEED Gold accreditation be set as the desired standard of building performance for new City buildings greater than 2000 sq.m (approximately 20,000 sq.ft).
- The City will seek to meet the performance standards of LEED Silver certification as a minimum requirement for major renovations to existing facilities and new City Buildings smaller than 2000 sq.m (20,000 sq.ft), but may not necessarily seek formal accreditation.

3. **Pursue Continual Improvement Through Building Retrofit and Efficient Building Maintenance**

Existing facilities and equipment will be upgraded to higher efficiencies as budgets and circumstances allow, and where the change offers a simple payback of no more than five years.

Equipment will be maintained to energy-efficient standards.

4. **Foster Awareness and Innovation**

A continuous education program in resource efficiency procedures and practices will be maintained.

All employees will be encouraged to suggest and initiate projects that will save energy and optimize efficiencies in other resource areas (natural and financial).



5. Undertake Regular Monitoring and Reporting

Corporate energy consumption and extent to which the City has met its LEED building objectives will be monitored and reported on a regular basis using existing City reporting tools.



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Adopted by Council: TBD

Policy TBD

File Ref: 06-2045-00
Vol 1**SUSTAINABLE "HIGH PERFORMANCE" BUILDING POLICY – CITY OWNED FACILITIES****POLICY TBD:**

It is Council policy to:

1. Ensure that newly constructed civic buildings or spaces are built with consideration of occupant safety, comfort and indoor environmental quality, in the context of approved budgets.
2. Ensure effective internal stakeholder engagement is carried out through an integrated design process during the planning, design, implementation, and completion of new facilities or spaces and associated outdoor areas. An integrated design process utilizes a collaborative design approach, involving consultants, staff and user group representatives, to set a well defined vision and performance objectives for new building or spaces, and to identify strategies for achieving the desired outcomes.
3. Incorporate high performance attributes into new civic facility or space design and construction to the maximum extent that relate to:
 - The most current Leadership in Energy and Environmental Design (LEED®) New Construction (NC) classification will be used as the standard by which to assess new facility construction. LEED® Gold certification be set as the desired target of building performance for new City buildings.
 - That at a minimum score of 10 points be targeted from LEED® Optimize Energy Performance criteria where a lifecycle assessment demonstrates reductions in operational costs and/or payback periods are within acceptable levels.
 - For other criteria of LEED® for NC, consideration will be given to measures that reduce energy and water use, reduce maintenance and operational costs, reduce greenhouse gas emissions, and optimize indoor environmental quality.
4. Follow sustainable operation and maintenance best practices guidelines for new and existing buildings, which emphasize conservation, optimized building performance, and continued improvement in energy use, water efficiency, and indoor environmental quality.
5. Maximize energy and operational efficiency through the selective re-commissioning of civic facilities on an on-going basis. Re-commissioning is a form of quality assurance testing that is carried out to ensure that building physical plant systems operate as effectively as possible given occupancy patterns and building function.
6. Target no net increase in corporate building energy use and related greenhouse gas emissions, as compared to 2012 levels by:
 - Aiming to not increase energy demand or GHG emissions when constructing replacement infrastructure; and/or
 - Striving to offset increased energy demand and GHG emissions through reductions at other civic facilities.
7. Aim to construct net zero energy and carbon neutral corporate buildings by 2030.

Best Practices Review

Building Design and Construction standards

Currently the leading edge of sustainable building design is looking at LEED® and beyond LEED when it comes to sustainable new buildings criteria, with more time and effort put towards the building planning and design stages. Some of the leading edge sustainable building requirements and actions that jurisdictions in the region have in place include the following;

- LEED® Gold “plus” – with targeted or mandatory points from specific LEED® categories to achieve increased energy and operational efficiency.
 - The City of Vancouver “Green” Rezoning policy requires that suitable new buildings achieve a minimum of 63 LEED® for new construction points (Gold level of certification), with a minimum of six points obtained from the Optimize Energy Performance criteria, one point from the Water Efficiency criteria, and one point the Storm Water criteria.
 - UBC has developed a LEED® implementation guide for new buildings, which has mandatory and optional LEED® point requirements, including a minimum of twelve Optimize Energy Performance points for new facilities.



Figure 1: UBC CIRIS building – certified LEED® Platinum

- Energy Net Zero and Net Positive buildings – buildings that on an annual basis produce as much or more energy as they use.
 - Recent regional examples of this type of sustainable building are the UBC Centre for Interactive Research on Sustainability (CIRIS), the SFU campus UniverCity daycare, and the City of Vancouver VanDusen Garden visitor centre.

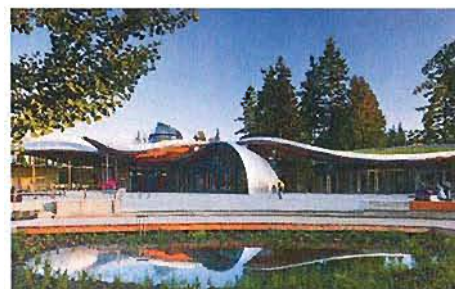


Figure 2: VanDusen Garden visitor centre

- Living Building Challenge – includes stringent requirements for only sustainable products and materials to be used during construction (low or no VOC paint and plastics, locally sourced material), and energy efficiency is measured after the building has been operating with a net zero requirement.
 - The three facilities mentioned above (UBC CIRIS, UniverCity daycare, and VanDusen visitor centre) were constructed to the Living Building Challenge standards.

- The Living Building Challenge is administered through the International Living Future Institute, which has less stringent certification for buildings that can demonstrate Net Zero energy performance.
- Formal Integrated Design Process (IDP) for new buildings – where a collaborative team approach by consultants and engineers during building planning and design is undertaken to ensure that the vision, goals, and objectives for a building and its performance are realized, without undue backtracking and redesign. Part of the purpose of an IDP is to maximize efficiencies and functionality at the outset of the project in order to provide the most cost effective sustainable high performing building.
 - Regional District of Nanaimo and the Province of Manitoba have prescriptive expectations of what their integrated design process for building construction consists of.

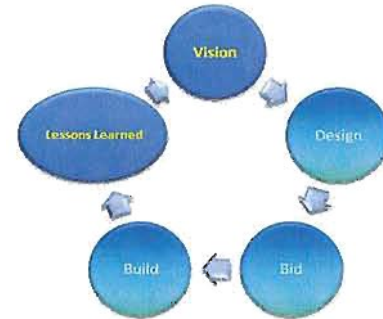


Figure 3: Integrated Design Process diagram

- Increased focus on passive design approach for building construction – a passive design approach for new building looks to maximize energy efficiency and occupant comfort through minor building architecture alterations to allow for optimized interactions between the building and its environment, and reduce the need for active mechanical systems. Typically, as compared to energy efficiency retrofits at operating buildings, energy efficient passive design alterations before the building is constructed can have a dramatic effect on operational costs and efficiencies for significantly less cost.
 - City of Vancouver passive design toolkit.

- Building Energy Performance monitoring and certification – LEED® for new construction encompasses sustainable design guidelines for new facilities, but increasingly there is interest in energy performance monitoring and benchmarking for operating buildings.

- EnergyStar Portfolio manager is currently being used widely in North America as a performance and benchmarking tool. This online tool can be used to benchmark energy and water use and GHG emissions, and can provide a high energy efficient operating building with ongoing recognition if it achieves 75% or higher rating – Certified EnergyStar Building.



Figure 4: Energy Star Certified building promotion

Corporate Energy and GHG reduction targets in the region

Partly due to the voluntary legislative commitment by municipalities to be carbon neutral and to reduce GHG emissions, most municipalities in the region and BC have adopted community GHG

reduction targets, with some adopting energy reduction targets as well, similar to the City of Richmond commitment to reduce community GHG emissions by 33% and energy use by 10% % by 2020 as compared to 2007 levels.

There are only a few that have adopted GHG reduction targets for their corporate operations, and none that were identified that have adopted corporate energy reduction targets (Seattle is the nearest identified jurisdiction with corporate building energy reduction target).

Table 1: Corporate GHG and energy reduction targets

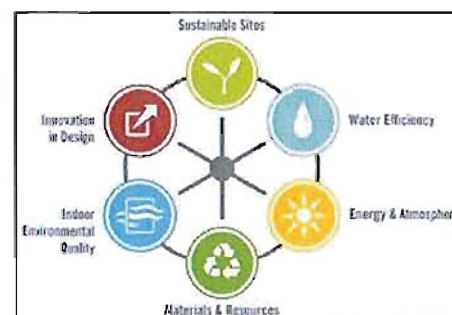
City	Energy Target	GHG Target
City of Vancouver	-	Carbon Neutral by 2020
District of Nanaimo	-	Carbon neutral by 2030
City of North Vancouver	-	25% reduction by 2020 (2007)
City of Surrey	-	20% reduction by 2020 (2007)
City of Coquitlam	-	30% reduction by 2015 (2005)
City of Seattle	20% reduction by 2020 (2008)	-
University of BC	-	66% reduction by 2020 (2007) Carbon Neutral by 2050
Kwantlen University (Richmond)	-	33% reduction by 2020 (2007) 80% reduction by 2050 (2007)

Pros and Cons of LEED® New Construction as a Building Performance Standard

The key advantages and disadvantages with continuing to use LEED® were assessed, and are summarized as follows:

- Advantages

- Industry accepted and well established -
 - LEED® for new construction has been a building design standard in Canada for over 11 years, and it has become well established within various building development stakeholders
- Locally and regionally recognized -
 - LEED® for new construction is a standard and a brand that Council, corporate staff, and the public recognize, which allows for the City of Richmond’s sustainable corporate building efforts to be more easily publicized



- As BC building codes improve, it is anticipated that LEED® standards will improve along with the changes -
 - Using LEED® will allow the organization to continue to target building better than code buildings.
- Includes the requirement for a commissioning agent -
 - Involving a commissioning agent from the onset of a project helps to ensure that the design intent of the building owner is carried through with throughout the different stages of planning, design, and construction.

- Disadvantages

- LEED® for new construction does not specifically consider building operations and maintenance -
 - LEED® for new construction focuses on building design and not operational standards. There is a separate LEED® program, for existing buildings, which can be used for operating buildings, but the program is stringent.
- LEED® for new construction does not specifically consider the building's GHG emission performance -
 - Currently LEED® for new construction does not prioritize measures that look to reduce long-term GHG emissions related to building operation.
- Value engineering for LEED® points -
 - If and when budget constraints occur on a project, typically what will transpire is that LEED® credits will be sought from the most inexpensive categories, which may have no bearing on the operational efficiency of the building and does not take into consideration life cycle costing.