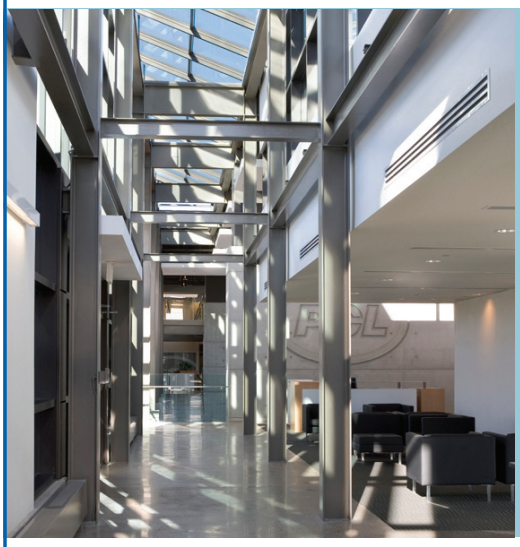

An RBC® White Paper

Moving into the Mainstream

Green Buildings and LEED

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RBC

RBC Environmental Blueprint™

The new normal

The growing awareness of the impact of buildings on the environment is resulting in significant changes to the real estate industry, specifically in the area of green building activity.

While overall construction activity in the United States has declined in recent years, it's worth noting that, in 2010, more than 20% of new construction starts were registered for Leadership in Energy and Environmental Design (LEED) certification,[1] signalling that even in uncertain times, the market is increasingly choosing to build green. Overall trends are similar in the Canadian market.

The speed of this market transformation is due in part to the growing popularity of green building rating systems such as LEED, which help clarify the measurement and understanding of green building attributes. By helping to drive market acceptance, green building rating systems continue to improve awareness of the business case for building green.

The business case for green buildings

Green buildings help to ...	By ...
Lower operating costs	■ Reducing energy use ■ Reducing office churn cost ■ Qualifying for tax incentives (in certain jurisdictions)
Increase employee performance	■ Boosting employee productivity ■ Helping to attract and retain talent
Provide differentiation opportunities	■ Demonstrating leadership ■ Demonstrating a commitment to sustainability ■ Being associated with innovation and technology
Increase access to capital	■ Providing higher cash flows as a result of rental premiums and lower operating costs ■ Insulating assets against future obsolescence ■ Increasing long-term asset value
Meet sustainability goals	■ Reducing emissions ■ Reducing water consumption ■ Reducing amount of waste

"The business necessity for green buildings is simply this: if your next project is not a green building, one that's certified by an established third party rating system, it will be functionally outdated the day it's completed ....Within two to three years, the business case for green buildings is going to be part of 'business as usual'; a developer ignores this emerging market force at his own peril."

— Jerry Yudelson, Principal, Yudelson Associates

Cover: PCL – Ross Grieve Centennial Learning Centre, Edmonton, AB

Drivers and trends

What is a "green building"? A green building is one that is designed to reduce the impact of its construction, operation and renovation on the environment by:

- Efficiently using energy, water and other resources
- Protecting occupant health and improving employee productivity
- Reducing waste, pollution and minimizing environmental degradation

Current building practices are a significant contributor to global warming and ecological degradation. Buildings are responsible for almost 40% of U.S. primary energy use, more than either transportation or industry[2] — they consume more than 70% of American electricity and are responsible for 38% of all CO_2 emissions, making them a significant contributor to global warming. They also impact the natural environment, using 13.6% of all potable water and 40% of raw materials globally. In fact, building-related construction and demolition debris was estimated to be equal to 80% of all U.S. municipal solid waste generated in a single year.[3]

And the demand for buildings continues to grow. In the U.S. alone, 131 billion square feet of new buildings will be required to accommodate projected growth, and another 82 billion square feet of existing buildings will be replaced over the next 20 years.[4] Given this growth rate and considering the negative impact conventional buildings can have on the environment, changing the manner in which we design, build, operate, renovate and reuse buildings is essential to any strategy addressing energy use, climate change and ecological degradation.

Governments are implementing policies and incentives that encourage the transition to green buildings. Governments continue to be instrumental in mainstreaming green building practices by incorporating green building certification into policies for new and retrofitted government buildings[5]; by offering incentives or rebates to the private sector for green buildings; and by integrating green building requirements into provincial/state and municipal laws.[6]

Consumers and corporations are playing their part too. Increased environmental awareness has led to consumer demands for more socially and environmentally responsible corporate behaviour. In response, green buildings have become an important component of an organization's corporate responsibility strategy. Combined with certification, these green buildings can help provide important public relations advantages for both public- and private-sector organizations.[7]

Making the business case for green buildings clear. The widespread adoption of certification systems like LEED has helped to mainstream green building design. Today, a well-designed and constructed "entry-level" LEED building no longer has to cost more than its conventional equivalent.[8] In addition to the environmental benefits of green buildings, data shows that green buildings also have higher market rents and lower operating costs, which translate into a higher asset value over the long term.[9]

The result is a rapidly growing market. In the U.S., green buildings made up approximately 10% to 12% of non-residential construction starts in 2008, totalling $12 billion, up from $792 million in 2000[10] — a 15-fold increase. By midway through 2011, there were over 22,000 projects certified under the LEED building rating system, totalling almost 1.5 billion square feet of space. Another 90,000 projects are registered for LEED certification, representing another 6 billion square feet of space.[11] Experts estimate that an additional 30% of green buildings are being built to LEED standard, but are not registered or certified.[12]

Trends in Canada are similar: the number of green buildings continues to rise. A 2008 study of 350 non-residential LEED projects in Canada concluded that the reported dollar value of the LEED projects was 13% of non-residential permit values reported by Statistics Canada for the same period.[13]

Green building rating systems

No two green buildings are alike. Green building rating systems provide transparency and a measurement standard that helps the market better understand and value differences between buildings.

Green building rating systems certify a building's environmental performance and provide clarity with respect to a building's green features. These rating systems help to set standards, guidelines and/or codes that must be met in order to achieve certification. Generally, the systems deemed to be most credible are those that feature independent, third-party verification that standards or guidelines have been met.

Green buildings do not need to be certified under a rating system to be considered green. However, forgoing certification can make the valuing of green features difficult, particularly in markets with limited green building stock. Green building rating systems can be particularly useful in enabling the market to make comparisons between buildings and their respective features.

Rating systems have different goals and objectives.

- Some take a whole-building approach, while others emphasize performance in certain areas, such as energy or indoor air quality.
- Some require independent verification of meeting standards, while others are self-audited by project proponents.
- Rating systems can be for different building types or for buildings in various stages of their life cycles (construction versus ongoing operations).
- And these systems can be performance-based, systems-based or a combination of the two approaches.

It's important to remember that not all green features will affect a building's financial performance. And those features that do impact a building's financial performance will not always deliver financial benefits to all stakeholders (developers, landlords, tenants and society).

Performance-based ratings certify the performance of a building or construction process based on a measurable result.

Systems-based ratings certify that a building has been constructed or operates according to a specified management process, but they do not necessarily consider the level of performance of the building or the building process. Systems-based ratings are often referred to as "standards" or "guidelines."

Queen's University – Beamish-Munro Hall, Kingston, ON (photo: interiorimages.ca)

Summary of major green building rating systems

Program	Building types	Area of emphasis	Performance- or systems-based	Countries in use
LEED	Commercial Institutional Residential	Whole building	Performance/ Systems*	International
BOMA BESt	Commercial	Whole building	Systems	Canada
BREEAM	Commercial Institutional Residential	Whole building	Performance	Europe, Middle East
Green Globes	Commercial	Whole building	Systems	U.S.
Green Star	Commercial	Whole building	Performance/ Systems*	Australia, New Zealand
ENERGY STAR	Commercial Institutional Residential	Energy	Performance	U.S.
EnerGuide	Residential	Energy	Performance	Canada
NAHB Green Building Standards	Residential	Whole building	Systems	U.S.

* Program contains performance- and systems-based elements.

According to renowned author and environmentalist Paul Hawken, "No organization has had a bigger impact on the environment than [the U.S. Green Building Council] in terms of energy and materials saved, toxins eliminated, greenhouse gases avoided and human health enhanced."[14] The USGBC has achieved this largely through the market acceptance of its LEED building rating system.

LEED

The Leadership in Energy and Environmental Design building rating system is perhaps the best-known green building certification program in North America. The program was developed by the U.S. Green Building Council (USGBC) with support from the U.S. Department of Energy (DoE) and the U.S. Environmental Protection Agency (EPA) and was first launched as a pilot in 1998. Updated versions of LEED have since been released, the latest being LEED 2009 (or version 3). In Canada, LEED has been adapted by the Canadian Green Building Council (CaGBC) to take into account the Canadian climate, construction practices and regulations.

BOMA BESt

The Building Environmental Standards (BESt) is the Building Owners and Managers Association (BOMA) Canada's building rating system for commercial and institutional buildings. BESt replaces BOMA's Go Green and Go Green Plus programs and is a combination of these separate certifications. The program has four possible levels of certification to measure environmental performance and management.[15]

BREEAM

The Building Research Establishment Environmental Assessment Method (BREEAM) is the U.K. Building Research Establishment's standard for sustainable buildings. There are almost 100,000 buildings certified under BREEAM, making it the world's leading green building rating system. While the framework has also enjoyed success in Europe and the Gulf States, BREEAM's uptake in North America has been significantly less successful. There are five levels of certification and credits are awarded in eight categories depending upon performance.

Green Globes

The Green Globes rating system was originally derived from BREEAM and was published by the Canadian Standards Association in 1996. The system is currently used both in Canada and the U.S. In the U.S., Green Globes is owned and operated by the Green Building Initiative (GBI). In Canada, the version for existing buildings is owned and operated by BOMA Canada under the brand name Go Green (now BOMA BESt).[16]

Green Star

The Green Star rating system evaluates the environmental design and performance of buildings in Australia. Green Star assesses the environmental impact of a project's site selection, design, construction and maintenance.[17]

ENERGY STAR

ENERGY STAR is a comprehensive joint program of the DoE and EPA with a number of energy-related initiatives. The program's two main building-related initiatives promote energy conservation in single-family homes and commercial and institutional buildings:

- ENERGY STAR-qualified homes meet strict energy-efficiency guidelines and are independently verified. Homes must be at least 15% more energy efficient than the 2004 International Residential Code (IRC). They include additional energy-saving features that typically make them 20% to 30% more efficient than standard homes.[18]
- ENERGY STAR's Portfolio Manager is a performance-based benchmarking tool for commercial and institutional buildings. The system compiles energy costs and use of buildings by asset class, which enables the comparison of a building's performance to others within its class. A rating of 50 indicates that the building performs better than 50% of similar buildings (from an energy consumption perspective). Buildings with a rating of 75 or higher qualify for an ENERGY STAR label. ENERGY STAR has also been incorporated into other third-party certification systems, including LEED.

EnerGuide

The EnerGuide rating system was created by the Canadian federal government for use on homes. The rating system is designed to be project-specific and rates a home's energy performance. Upon certification, a home receives a score and a label displaying the estimated amount of energy it is expected to consume each year.[19]

NAHB Green Building Standard

The U.S. National Association of Home Builders (NAHB) Green Building Standard is a standard for single- and multi-family homes, residential remodelling projects and site development projects. There are four levels of certification based on the incorporation of green features into a project's design in the following areas: energy, water and resource efficiency; lot and site development; indoor environmental quality; and homeowner education.[20]

Understanding LEED

Discovery Place, Vancouver, BC (photo: Ema Peter)

LEED is quickly becoming the predominant green building standard. In a survey of real estate executives, 83% of respondents replied they would be "very likely" or "likely" to pursue LEED certification if they were to construct a green building over the next three years.[21]

LEED certification provides third-party verification that a building or community was designed and built using strategies aimed at improving energy savings, water efficiency, greenhouse gas emissions reductions, indoor environmental quality, and stewardship of materials and resources.

There are four possible levels of LEED certification. Points are awarded for meeting a variety of criteria, and the level of certification is based on the number of points a project earns.

Points required for LEED certification under LEED 2009

Level of certification	Points
Certified	40 – 49
Silver	50 – 59
Gold	60 – 79
Platinum	80 – 110

LEED Scorecard

A project must satisfy certain prerequisites and then earn a minimum number of points on its LEED Scorecard in order to be certified. The LEED Scorecard allows for flexibility to meet a wide range of project goals, and promotes a whole-building approach to sustainability by recognizing performance in six categories.

Summary of the LEED building rating systems

Category	Possible points	Earn points by
Sustainable sites	26	Avoiding development on previously undeveloped land; minimizing a building's impact on ecosystems and waterways; encouraging regionally appropriate landscaping; rewarding smart transportation choices by occupants; controlling stormwater runoff; and reducing erosion, light pollution, heat island effect and construction-related pollution.
Water efficiency	10	Using water in smarter ways, inside and out. Water reduction is typically achieved through more efficient appliances, fixtures and fittings inside, and water-wise landscaping outside.
Energy and atmosphere	35	Adopting a wide variety of energy strategies, such as commissioning; energy-use monitoring; efficient design and construction; efficient appliances, systems and lighting; the use of renewable and clean sources of energy, generated on-site or off-site; and other innovative strategies.
Materials and resources	14	Selecting sustainably grown, harvested, produced and transported products and materials. This category promotes the reduction of waste as well as reuse and recycling, and takes into account the reduction of waste at a product's source.
Indoor environmental quality	15	Promoting strategies that improve indoor air quality; providing access to natural daylight and views; and improving acoustics.
Innovation and design/ regional priority points	10	Employing new and innovative technologies and strategies to improve a building's performance; including a LEED Accredited Professional on the team.
Total possible points	**110**	

Okanagan College Learning Centre, Kelowna, BC (photo: B+H BuntingCoady)

LEED building rating systems

There are nine LEED building rating systems, each tailored to different building types or for different stages in a building's life cycle.

Summary of the LEED building rating systems

Rating system name	Availability		Applies to
	Canada	U.S.	
New Construction and Major Renovations (NC)	Y	Y	Construction or major renovation of commercial, multi-residential and institutional projects.
Existing Buildings: Operations & Maintenance (EBOM)	Y	Y	Measurement of operations, maintenance and building improvements by building owners and operators.
Commercial Interiors (CI)	Y	Y	Construction of new tenant premises or tenant improvements in new or existing projects.
Core & Shell (CS)	Y	Y	Construction of primary structural components, the exterior skin and common interior spaces of new or renovated buildings (i.e. all the common elements of a building exclusive of tenant space).
Schools	N	Y	Construction of core and ancillary learning spaces for K-12 schools.
Retail	N	Y	Construction of retail buildings or retail interiors
Healthcare	N	Y	Construction of inpatient care facilities, licensed outpatient care facilities, licensed long-term care facilities, medical offices, assisted living facilities, and medical education and research centres.
Homes	Y	Y	Construction or gut rehab of single-family homes or low-rise multi-residential (under four storeys).
Neighbourhood Development (ND)	Y	Y	Design of residential or mixed-used developments.

Kwantlen Polytechnic University Cloverdale Campus, Cloverdale, BC (photo: Howard Waisman)

The business case

The cost of constructing a green building matches or only slightly exceeds that of a comparable conventional building.[22] When market performance and operating performance are taken into account, increased costs are more clearly associated with *not* building green.

The business case for a green building will differ from that of a conventional building in three areas: construction costs, risk profile and stakeholder benefits.[23]

Construction costs

The higher initial costs of green buildings are often attributed to factors such as increased architectural and engineering design times, higher modelling costs, the extra time needed to integrate sustainable business practices into the project[24] (referred to as the "integrated design process") and costs associated with commissioning building systems. As projects aim for higher levels of environmental performance, engineering and materials costs associated with the application of advanced technologies increase exponentially.

The initial costs of green buildings also vary by market, based upon the number of vendors and the level of experience in the local market, as well as by the scale of the project. However, as green building expertise becomes more widespread, regional cost differences are narrowing.[25]

Cost premium of LEED certification[26]

Market	Platinum	Gold	Silver	Certified
U.S. average	7.80%	2.70%	1.00%	**No cost premium for a well-designed entry-level LEED-certified building**

The common assumption is that green buildings are more expensive to build than conventional buildings. Yet, in practice, builders who get on-board early are finding that, through experience, they are building green for little or no additional cost premium, giving them a competitive advantage in the marketplace.

Bell Canada Creekbank – Phase 3, Mississauga, ON (photo: Tom Arban)

Integrated design process (IDP). The integrated nature of building systems means that combining them in the proper manner can help contribute to greater efficiencies and synergies. Leveraging such synergies is difficult in the conventional design process, as owners, architects, engineers and tradespeople often work independently and each have their own goals with respect to a given project. IDP brings parties together from the outset to decide upon building performance targets, strategies and design elements. Budget restrictions are applied at the whole-building level, with no strict separation of budgets for individual building systems, such as HVAC or the building structure. This approach reflects the fact that additional expenditures for one system may reduce costs in other systems (e.g. sun-shading devices will reduce the capital and operating costs of a cooling system). Additional members of the project design team can include a specialist in the field of energy engineering, who would have responsibility for testing design assumptions through energy simulations. Subject specialists (e.g. for day lighting, thermal storage, comfort and materials selection) may also be included for short consultations with the design team. Where knowledge of sustainability is lacking, a design facilitator may be added to raise performance issues and ensure specialists are engaged as required.

Not all green buildings are designed using IDP because of the perceived added cost. However, experience has shown that better integration of structural and mechanical design at the outset of the project can help reduce the number of change orders (and associated costs) during construction and can help eliminate redundancy and the over-sizing of equipment, resulting in better operational performance and reduced capital costs. IDP can also lead to more accurate project monitoring and better-timed draws.

Building commissioning. Commissioning is the process of verifying that a building's systems are installed and calibrated to perform according to the project requirements. Commissioning is conducted by an independent, qualified inspector once the building has been completed and should also include the verification of all systems related to energy performance, including day-lighting features and the building envelope. Benefits of commissioning include reduced energy use, lower operating costs, fewer contractor callbacks, better building documentation and verification that systems perform properly and as specified.

RBC Centre, Toronto, ON

Studies have found that the cost to commission ranges[27]:

- 0.75% – 2% of total construction cost for the commissioning of all building systems
- 1% – 1.5% of the total electrical system cost to commission just the electrical system
- 1.5% – 2.5% of the total mechanical system cost to commission just the HVAC and control systems

Although it represents an additional upfront cost, building commissioning is increasingly being seen as essential to ensuring systems deliver the promised operating cost efficiencies over the long run. Studies have shown that, in addition to ensuring operating costs savings, commissioning can pay for itself by reducing the need to repair or replace wrongly designed or calibrated systems.[28]

Other factors that tend to increase the cost of green buildings are:

- Increased management time related to LEED documentation
- Added tasks, such as construction site recycling programs and air flush procedures
- The use of more expensive materials

Risks

Green buildings have different risk profiles than their conventional equivalents, which the market will value differently.

Selected risks associated with green buildings

Risk driver	Exposure	Impact
Technology	New technologies can be perceived to be riskier because of the greater uncertainties associated with unproven performance. This can result in: financial risk, as payback periods are largely determined by construction costs and savings from operations; and market risk as the market may have a reduced willingness to pay for unproven technologies, translating into a lower value of investment.	Negative
Certification	Buildings that fail to achieve certification or do not perform as expected may be exposed to potential legal and financial risks if a party decides to litigate. This risk increases if there are financial incentives from government or other parties tied to certification or performance. There have been very few cases of this type of litigation to date.	Unsure
Design	Green buildings employ a higher degree of natural ventilation, which, in regions with higher humidity, can lead to mould development if systems are not properly designed. This can expose an owner to legal risk related to indoor health issues as well as financial risks associated with correcting the system design. To mitigate this risk, designers may over-size ventilation systems, which can result in higher energy usage. On the other hand, buildings that are correctly designed will result in healthier indoor air, reducing risk exposure to "sick building" lawsuits. The number of claims related to toxic indoor environments has jumped in recent years, and developers and contractors are increasingly being held responsible for damages.[29]	Neutral
Energy price volatility and carbon emissions regulations	Lower energy use will reduce exposure to the price volatility and long-term supply concerns associated with the use of non-renewable fossil fuel. Energy reduction strategies will also help insulate a building's financial exposure against future carbon emissions regulations, whether they are applied to energy or directly to a building.	Positive

PCL – Ross Grieve Centennial Learning Centre, Edmonton, AB

Stakeholder benefits

Green buildings can offer widespread benefits to a range of stakeholders. Developers, owners, tenants and society will each benefit differently from green buildings. One of the primary challenges lies in properly measuring and valuing these benefits. We still need to overcome barriers caused by split incentives, where owners may not be willing to pay for features that directly benefit tenants, and the difficulty of valuing soft dollar benefits related to reputation, brand and marketing opportunities. However, the growing stock of green buildings continues to provide data confirming that they provide more value, both financial and otherwise.

Lower operating costs. One of the clearest benefits associated with green buildings has to do with lower operating costs. One area of savings — energy — comes in part from reduced electricity purchases and reduced peak energy demand. A study of LEED-certified buildings found they consumed 28% less energy than their code-compliant equivalents.[30] For example, the financial benefit of 30% reduced consumption at an electricity price of $0.08/kWh is approximately $0.30 per square foot annually, or a 20-year net present value of over $5 per square foot, equal to or more than the average additional premium associated with constructing a green building.

Other drivers of operational cost savings include:

- Lower space churn costs
- Lower waste disposal costs
- Lower water costs
- Property tax rebates (in certain jurisdictions)

Increased employee productivity. Four of the attributes associated with green building design — increased ventilation control, temperature control, more lighting control and day lighting — have significant positive correlation with increased employee productivity. Increases in tenant control over ventilation, temperature and lighting provide average measured workforce productivity gains of 7.1% as a result of lighting control, 1.8% as a result of ventilation control and 1.2% as a result of thermal control. The debate continues on how much value to attribute to these productivity gains, but current research recommends a 1% productivity and health gain to LEED-Certified and LEED-Silver buildings, and a 1.5% gain to LEED-Gold and LEED-Platinum buildings.[31]

Improved indoor environmental quality is also linked to:

- Higher retail sales
- Higher rates of employee retention

Ritchie Brothers Auction, Vancouver, BC (photo: Ema Peter)

According to the U.S. EPA, indoor air can be more polluted than the outdoor air in even the largest industrialized cities. Given that people spend approximately 90% of their time indoors, the EPA estimates that indoor air pollution costs U.S. corporations up to $60 billion each year in lost productivity.

Opportunity to differentiate. As the public's focus on the environment continues to grow, green buildings can also offer an opportunity for organizations to differentiate themselves. Green buildings can represent a visible commitment to environmental sustainability and can provide communications and branding opportunities with respect to fulfilling sustainability goals. The relative infancy of green buildings allows their proponents to demonstrate leadership in this new and emerging area. Green buildings are also often associated with innovation and new technology, serving to reinforce an image of leadership.

Increased access to capital. Green buildings are able to attract and retain premium tenants and keep them longer while charging more rent. According to the USGBC, green buildings generate 3.5% higher occupancy rates and 3% higher rental rates. All said, lower operating costs, higher occupancy and higher rental rates translate into greater building cash flows and higher asset values. Research[32] has shown that:

- LEED buildings had on average a 9.94% higher sale price than their conventional equivalents
- ENERGY STAR-rated buildings had on average a 5.76% higher sale price than their conventional equivalents

Other financial benefits of green buildings include:

- Reduced marketing costs due to higher absorption rates
- Expedited planning and permit processes (in certain jurisdictions)
- Tax incentives, grants or credits (in certain jurisdictions)

The combined benefits of green buildings help to insulate them against future obsolescence by ensuring they remain attractive assets in the long term.

Green buildings build better balance sheets

"Whether you're a tenant, a developer or an investor, green buildings deliver a host of benefits over their conventional peers. These benefits in turn deliver to the bottom line and ultimately help organizations build better balance sheets by increasing long-term value."

— Brad Lambert, Regional Vice President, RBC Real Estate Markets

RBC Centre, Toronto, ON

RBC Centre

RBC Centre, RBC's new home in downtown Toronto, incorporates many of the latest and most innovative environmental and contemporary office design concepts. The 42-storey, 1.2 million-square-foot building is registered for LEED Gold under the New Construction rating system.

Some of the building's more noteworthy features include lighting sensors and light shelves that monitor and control the amount of daylight entering each floor to provide better quality light, reduce energy use and reduce unwanted solar gain. There is also an innovative deep-water cooling system that circulates naturally chilled water from Lake Ontario to cool the building. RBC Centre was constructed using building materials with a high thermal mass to store heat and contribute to passive solar heating, which further reduces its energy use. The construction products, furniture, fittings and finishes are made from low-environmental-impact materials to ensure fresh and healthy indoor air.

The business case for the RBC Centre is a simple yet compelling one. It demonstrates RBC's commitment to the environment and fulfils a number of objectives within the RBC Environmental Blueprint™, while simultaneously putting employee well-being first and helping to lower overhead costs. All of these factors combined help to provide RBC with exceptional long-term value.

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Environmental
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This report was authored by RBC's Corporate Environmental Affairs Group. The Group is responsible for environmental leadership across the organization and for implementing the RBC Environmental Blueprint, our commitment to environmental sustainability.

To learn more about the RBC Environmental Blueprint or RBC and the environment, please visit www.rbc.com/environment.

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