



# BUILDING ON INNOVATION

NEW PRODUCTS,  
SERVICES AND  
FINANCIAL  
TOOLS ARE

HELPING TO ACCELERATE THE MAINSTREAMING  
OF SUSTAINABLE COMMERCIAL BUILDING

BY TYLER HAMILTON



More buildings than ever carry the label green, intelligent, sustainable or smart. Whatever adjective one uses to describe these shelters of the 21st century, it is the pursuit of efficiency – both during construction and over the course of operation – that is common to them all.

The U.S. Environmental Protection Agency defines the act of sustainable building as “the practice of creating and using healthier and more resource-efficient models of construction, renovation, operation, maintenance and demolition.”

From an environmental perspective, the opportunities have long been understood. The EPA estimates that buildings represent 39 per cent of total energy use, 12 per cent of total water consumption, 68 per cent of total electricity consumption and 38 per cent of carbon dioxide emissions in the United States.

Increasingly, however, the decision to build green is being driven by economics. More tenants are demanding “green” work spaces to boost employee productivity and bolster their brands, while property owners are lured to the lower operating costs and the market premium attached to such assets.

It’s why 94 per cent of architects, engineers, contractors and other building consultants are now involved in some level of green building, according to McGraw-Hill Construction’s 2013 World Green Building Trends report. Of this group, more than half are expected to get the majority of their business from certifiably green projects by 2015. The largest growth in activity is expected to come from new commercial building construction, followed by retrofits.

Impressively, in 2012 green building represented an estimated 38 per cent of all project activity worldwide. “This research suggests that green has become a business imperative,” Harvey Bernstein, a vice-president at McGraw-

Hill Construction, wrote in the opening of the report.

The bar on efficiency, of course, will continue to rise alongside the demand for smaller environmental footprints. Innovation will play a key role, both around the technologies embraced and the creative ways to finance greener building construction. Beyond slapping solar panels on a rooftop or installing a high-efficiency boiler in the basement, below are some areas that CK is closely watching:

## GREEN CONCRETE

The 3.6 billion metric tons of Ordinary Portland Cement (OPC) produced each year is responsible for about 6 per cent of human-caused CO<sub>2</sub> emissions worldwide. Half of that cement is used as a main ingredient in concrete blocks, foundations and other products that are key materials in building construction.

Many companies have emerged with processes and products that lower the environmental footprint of the concrete used in buildings. This includes concrete formulas and manufacturing processes that reduce water and energy use and overall emissions.

CeraTech USA, for example, has an OPC-free concrete product made from 95 per cent fly ash and a renewable liquid additive that it refers to as its secret sauce. Since no Portland cement is used in its process, a major source of CO<sub>2</sub> emissions is completely eliminated. The Virginia-based company says its process also uses 50 per cent less water.



Cyber Rain's irrigation tool (above) uses weather predictions retrieved through the Internet to automatically manage watering schedules for landscaped properties. The result is huge water savings.

Some other innovators in the space include U.K.-based Green Concrete Products, which makes concrete from a variety of renewable materials and waste ingredients, from fly ash to household waste to old vehicle tires; and CarbonCure Technologies, based in Halifax, Nova Scotia, which uses waste CO<sub>2</sub> as an ingredient that is injected (i.e., sequestered) into concrete as it's being cured.

The market for green concrete – whatever the flavour – is expected to increase at a compounded annual growth rate of 21.3 per cent between 2010 and 2018, according to a recent report from research firm Global Industry Analysts.

## BORN AGAIN WOOD

Why chop down trees when previously used lumber or rediscovered wood can do the job just fine? For building developers aiming to achieve the LEED green building certification for their projects, using so-called reclaimed wood during construction is one way to earn extra credits.

This is now big business, and Triton Logging of Saanichton, British Columbia, is among several companies supplying growing demand for previously used or “lost” wood. Triton estimates there are 300 million trees worldwide that have been submerged in areas flooded by hydro dams. It has developed machines that harvest these water-trapped trees, which are then sold and processed into lumber products.

Some companies, such as Barnwood Industries of Bend, Oregon, reclaim wood from abandoned barns and other old wooden structures. The products made from this wood are in such high demand that building materials giant Weyerhaeuser agreed in 2012 to become exclusive distributor of Barnwood's products, which include reclaimed beams, timbers and wood flooring.

Viridian Wood Products of Portland, Oregon, looks beyond the barn. It began in 2004 by reclaiming and upcycling wood from shipping pallets and crates discarded at local shipyards. It will now take in all sorts of scrap lumber and turn it into high-value flooring, decking and panelling products.

*A Triton Logging machine (right) retrieves submerged tree trunks from a lake bed; Reclaimed wood (below) from Viridian Wood Products is used for floors, railings and ceiling beams.*



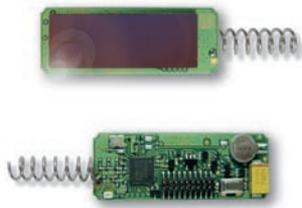
“TRITON ESTIMATES THERE ARE 300 MILLION TREES WORLDWIDE THAT HAVE BEEN SUBMERGED IN AREAS FLOODED BY HYDRO DAMS. IT HAS DEVELOPED MACHINES THAT HARVEST THESE WATER-TRAPPED TREES. WHICH ARE THEN SOLD AND PROCESSED INTO LUMBER PRODUCTS.

## ADVANCED AUTOMATION

You may have heard of the coming “Internet of things,” but what you probably haven't heard is that most of those “things” are going to be sensors and other devices scattered throughout buildings and connected to building automation systems. Those systems are there to control lighting, heating, cooling and ventilation, with the objective of assuring comfort and safety while also reducing energy costs.

Sensors designed to sniff out CO<sub>2</sub> from breathing or to detect motion in a room can instruct a building automation system to turn off lights and ceiling fans or adjust cooling and heating to lower energy consumption. Likewise, cleverly placed photo sensors can control inside lighting to achieve balance throughout the day with natural sunlight.

An individual building could potentially house thousands of sensors and controls. If all those things needed to be hard-wired to communicate and receive power, the costs of installing them would be prohibitive. The economics significantly improved, how-



*Wireless solar sensors (far left) from EnOcean are lowering the cost of building automation, while this Big Ass Fan (immediate left) can help reduce heating and cooling costs in buildings that have areas with high ceilings.*

“MORE OPTIONS HAVE EMERGED FOR HESITANT BUILDING OWNERS THAT EASE THE PAIN OF UPFRONT INVESTMENTS.”

ever, with the proliferation of energy-harvesting wireless sensors from companies such as EnOcean of Germany. These wireless sensors are powered by motion, heat or sunlight, meaning they don't require a battery.

The number of wireless sensors or “nodes” for use with building controls is growing dramatically. Annual worldwide shipments are expected to exceed 36 million units by 2020, according to Navigant Research. But as Navigant points out, “The majority of sensors currently used in buildings are considered dumb – that is, they are incapable of making intelligent decisions in real time.”

In other words, as the data tsunami grows larger there is a need to put more intelligence into building automation systems, particularly energy management systems. Johnson Controls, Schneider Electric, Siemens and United Technologies are among the leaders in a growing field of technology suppliers focused on making buildings smarter.

Others are carving out a niche. Encino, California-based Cyber Rain, for example, has developed a smart controller for irrigation of landscaped commercial property. The controller, which can be operated remotely, automatically checks weather predictions over the Internet and adjusts watering schedules accordingly. This can result in up to a 40 per cent reduction in water use, the company says.

## EFFICIENT PRODUCTS

Controlling devices and appliances efficiently is one thing, but just as important is the efficiency of the item itself – from air conditioners and air blowers to boilers and lighting.

Take the underappreciated ceiling fan. Used strategically in open spaces with higher clearance, ceiling fans can significantly reduce heating and cooling costs in a building. Like any fan, they don't actually create cold or heat. What they do is improve circulation and, in the case of cooling, create a wind-chill effect on the skin so that air conditioners don't have to work as hard.

When that fan is also built to operate with high efficiency, the cost savings over time can be compelling. Big Ass Fans from Lexington, Kentucky, for example, has built its reputation on the efficiency of its ceiling fans. Its bamboo-made Haiku fan is rated one of the most efficient ceiling fans in the world by Energy Star standards. When a fleet of such fans is controlled by a building energy management system – turning on and off only when people are around – energy savings can be substantial.

Efficient lighting is also a key consideration, and here the trend clearly favours light-emitting diode (LED) systems. As Navigant reports, “The market for commercial lighting is on the verge of a major transformation.” It cites falling LED prices and improved

quality as driving widespread adoption. “The speed of this transformation promises to be faster than previous transformations to new lamp types, as this one technology appears likely to surpass all others in nearly every metric of quality and efficiency.”

General Electric, Philips, Osram and newcomers such as Cree are leading the charge, and commercial building owners are beginning to follow. They like the fact that LED lighting systems consume far less energy, are easy to control and dim, contain no mercury, and emit considerably less heat than traditional lighting.

One of the biggest benefits is reduced labour costs. Because the lights are durable and last for a long time, building maintenance crews spend considerably less time on ladders switching out bulbs that no longer work.

## CREATIVE FINANCING

Innovation around green buildings isn't just about product. Difficulty financing energy-efficiency retrofits has also been a huge barrier. Over the past few years, however, more options have emerged for hesitant building owners that ease the pain of upfront investments. In all cases, the goal is for retrofit costs to be more than covered by the long-term energy savings achieved.

The concept isn't new. So-called energy service companies, or ESCOs, have existed for the past three decades to help commercial, municipal and other public-sector building owners, such as universities, schools and hospitals, pay for retrofits that result in permanent savings. Through instruments such as energy performance contracts, ESCOs pay for retrofits and then receive monthly payments based on the energy savings. If designed properly, the ESCO makes a healthy profit.

Johnson Controls, Honeywell, Siemens and Lockheed Martin are among the bigger companies with ESCO units. Some smaller firms, such as Ecosystem, go beyond the low-hanging fruit and push for “deep” energy retrofits that result in what Ecosystem calls “high-performance buildings that are worth more, cost less and have appealing, healthy spaces.”

Ecosystem takes what it considers a holistic approach that includes detailed analysis of heating, cooling, ventilation, lighting and other key building systems. The company notes that average energy reductions achieved from its retrofit projects amount to about 30 per cent. Others focus on specific systems. Lighting giant Philips, for example, recently launched a lighting-as-a-service model anchored by the deployment of its own LED lighting products. Along with making this option available to commercial building owners, the company is pursuing deals with municipalities looking to retrofit streetlight assets with LED fixtures (see page 59 for details).

In addition to the ESCO model, other financing options include Property Assessed Clean Energy, through which municipalities provide low-interest loans to property owners interested in energy-efficient retrofits. Those loans are paid back through a charge on property tax bills that, if a project is properly designed, will be lower than monthly energy savings achieved. Likewise, many utilities are offering on-billing financing to assist building owners seeking capital but reluctant to tie up their own balance sheets. 🌱

# THE LEED QUESTION



THE U.S. GREEN BUILDING COUNCIL'S POPULAR LEED STANDARDS MAY HAVE HIT A 20,000 CERTIFIED COMMERCIAL BUILDING MILESTONE LAST DECEMBER, BUT CAN IT SURVIVE A COORDINATED BACKLASH FROM HOSTILE BUSINESS INTERESTS?

BY JEREMY RUNNALLS



To the casual observer, Ohio's sustainable building policy for public buildings has been a notable success. Requiring that new schools and retrofits be certified under the Leadership in Energy and Environmental Design (LEED) standard, the "Buckeye State" leads the nation with over 100 green schools.

"Ohio's LEED schools have outperformed baseline energy performance by 34 per cent, almost 200,000 tons of construction waste has been diverted from landfills and occupants report improved educational outcomes," says Tyler Steele from the Ohio chapter of the U.S. Green Building Council (USGBC).

So why is the state set to pass a non-binding resolution demanding that LEED no longer be used by government agencies?

The first iteration of LEED was unveiled in 1998, but it took several years for it to pick up steam. The standard has since grown so popular that it is often viewed by the general public as synonymous with the concept of green buildings. Hundreds of jurisdictions across North America provide tax and other incentives to encourage LEED construction, while over 30 states and provinces encourage or require it for all new public buildings. The standard has proved popular overseas as well, including a recent burst of certification in the Middle East. Yet despite these successes, the USGBC has managed to antagonize a number of powerful interests: the timber, chemical and plastics industries.

One of the criteria considered by the LEED standard concerns

the sourcing of wood. It has only ever recognized Forest Stewardship Council (FSC) wood as qualifying for its "environmentally responsible forest management" credit, despite a four-year campaign by the Sustainable Forestry Initiative (SFI) to be considered as well. The American Forest and Paper Association launched SFI in 1994 as an industry-friendly antidote to FSC, arguing that failing to include SFI would hurt U.S. forestry jobs.

Seventy-nine members of Congress, along with 12 governors, threw their support behind the SFI's lobbying effort, which was defeated by USGBC members in 2010. Upon defeat, SFI chief executive Kathy Abusow called for companies to ignore the point deducted for using SFI-certified products in LEED buildings to "demonstrate their pride and support for North American forests, communities, and jobs."

As the timber industry began to encounter resistance from the USGBC, it cast around for an alternative ratings system. Based on a British green buildings rating system called BREEAM, the Green Globes was launched in Canada and licensed for use in the United States in 2004. Founded by former Louisiana Pacific lumber executive Ward Hubbell, the Green Building Initiative (GBI) – the licensed operator of Green Globes in the U.S. – quickly drew substantial support from the chemical and forestry industries.

For the past several years the anti-LEED coalition has assembled a series of significant victories, starting in 2011 with an executive order from the Tea Party-friendly governor of Maine, Paul LePage. While not explicitly banning LEED, it only allowed for

green building standards that recognized SFI, the American Tree Farm System and FSC equally. The “wood wars” quickly spread to Georgia, Alabama, North Carolina and several other states.

Discounting the fact that LEED does award points for locally sourced materials, which can include non-FSC wood, the anti-American messaging proved very successful at the state level. During the debate in North Carolina, Weyerhaeuser spokesperson Nancy Thompson condemned the LEED program as “an inherent discrimination of North Carolina lumber.”

State and federal lobbying efforts expanded to include the plastics and chemical industries as well. The big catalyst for this was the long debate – and eventual adoption – of a material transparency credit in LEED version 4. “Before that there were already people saying GBI was going to close down,” says Scot Horst, senior vice-president of the LEED program. But the prospect of mandatory disclosure of material components was viewed as unacceptable by organizations such as the Vinyl Institute, which engendered new interest in promoting Green Globes.

Testifying before the Ohio state house in January, Allen Blakey, vice-president of industry and government affairs at the Vinyl Institute, belittled the transparency credit as a prime example of “discriminatory and disparaging treatment of vinyl in LEED credits.”

The American High-Performance Buildings Coalition (AHPBC), led by the American Chemistry Council and backed by the U.S. Chamber of Commerce, was created to push for federal anti-LEED legislation. “Our mission is to support and promote green building codes, standards, rating systems, and credits and we believe the best systems will be developed in conformance with ANSI or ISO-type processes,” Steve Russell, vice-president of plastics for the American Chemistry Council, stated in a conference call announcing the coalition in 2012. It worked hard to weaken the proposed transparency credit in the draft LEED v4 standards, an effort that failed last fall. At the same time it was lobbying hard for legislative change to accept Green Globes alongside LEED at the federal and state levels.

ANSI, the American National Standards Institute, has proven key to their strategy. Green Globes is certified by ANSI, while LEED is not. The AHPBC and others have used this to denounce LEED as not being sufficiently consensus-driven, despite the long consultation process and open vote by its 13,000 members in the adoption of each LEED standard. The legislation pending in Ohio, for example, specifically bans any green building certification programs that have not been ANSI-approved. *Corporate Knights* contributor and architect Lloyd Alter pointed out last year that numerous other well-regarded rankings are not ANSI-approved either, like the popular Energy Star ratings.

With green federal government buildings serving as a key pillar in President Obama’s executive-driven push on sustainability, the AHPBC turned its attention to influencing the U.S. General Services Administration’s review of its building policies that favour LEED use. In a significant victory for AHPBC, the Green Globes certification was approved as equivalent to LEED in October 2013. Several months later, the U.S. Department of Defense also opened its doors to Green Globes.

Not all companies were pleased with the efforts of the AH-

PBC, including Skanska USA. The American arm of the Swedish construction conglomerate made a high-profile exit from the U.S. Chamber of Commerce over its support of AHPBC in July. Penning an op-ed in the *Washington Post*, Skanska USA CEO Mike McNally denounced the organization’s efforts to influence the LEED v4 process. “What they want is a standard they can manipulate and weaken,” he wrote. “They are putting their bottom lines first and sustainability second.”

For LEED’s Horst, the issue is not with the Green Globes ranking itself. “While not as rigorous as LEED, it’s a good green building tool,” he says. The problem, for Horst, lies with the GBI’s close ties to industry. Its board still consists of representatives from Weyerhaeuser, Plum Creek Timber, the Vinyl Institute and other corporate interests, with a similarly composed list of members and supporters. “They support Green Globes because it doesn’t require them to change their practices,” he adds. He points out that by accepting SFI and avoiding the implementation of any similar material transparency, the GBI can’t claim the same stringency as LEED.

In an attempt to reboot their image, LEED fellow and respected green buildings advocate Jerry Yudelson was hired in January to head up the GBI and its Green Globes certification. All ties to founder Ward Hubbell have been cut, he declared in a telephone interview from his office in Portland, Oregon. “I can’t speak to what the organization has done in the past, but I will say that a year from now the board is going to look a lot different,” he states. Yudelson’s plans for the next year involve spreading the message that Green Globes is faster and cheaper, while assuring people that it remains an effective green building standard.

There are plenty of critiques to level at LEED, from the onerous compliance costs to the points allocated for simple steps taken. A green buildings landscape dominated by LEED is not a realistic scenario, and “in the end, we want as many green buildings built as possible,” says Elizabeth Heider, chief sustainability officer at Skanska USA. “At the same time, insistence by GBI that there is an equivalency between Green Globes and LEED is just not true,” she says.

A look north over the border provides a blueprint for a less acrimonious relationship between green building ratings systems. The BOMA BEST system, run by the Building Owners and Managers Association of Canada, is loosely based on the original Green Globes methodology. The lower costs, compared to LEED, allow for more buy-in from property managers, including those with existing building stock that weren’t built with green standards in mind.

While not as focused on the holistic approach to green buildings as LEED, BOMA Canada president and CEO Benjamin Shinewald views BOMA BEST as somewhat complementary to LEED. “Our ratings systems are both working towards the same goal of greater efficiency in building management, with ours more focused on existing buildings,” he says. Horst disputes the idea that LEED is mainly interested in new buildings – pointing out that LEED has certified more existing buildings than new ones – but he agrees that there is no antipathy between the two organizations.

In the U.S., meanwhile, Green Globes-certified projects currently only constitute about 2 to 4 per cent of green buildings. Yudelson is confident that will expand in the coming year. “The more choices the better,” he says, citing that less than 1 per cent of commercial buildings in the U.S. have been certified green. 🌱

## A LOOK NORTH OF THE BORDER PROVIDES A BLUEPRINT FOR A LESS ACRIMONIOUS RELATIONSHIP BETWEEN GREEN BUILDING RATINGS SYSTEMS.



# CANADA'S BIGGEST AND GREENEST



BOMA BEST is a voluntary, national program created by the Building Owners and Managers Association of Canada. The main goal of the program is to improve the environmental performance and management of the country's existing building stock.

It does this by assessing energy and water use, waste reduction efforts, emissions, effluents, indoor environment, and environmental management systems. About 4,000 buildings have been independently certified with one of four BOMA BEST levels.

Here we highlight the Top 5 highest-scoring large buildings in Canada that have been evaluated and certified under BOMA BEST. *Corporate Knights* defines large buildings as any building with more than 100,000 square feet of floor space.



## TOP 5 BOMA BEST LARGE BUILDINGS

**1.** SCORE: 95 [LEVEL 4]

**189 RED RIVER ROAD**

**City:** Thunder Bay  
**Province:** Ontario  
**Cert. Year:** 2011  
**Square Footage:** 213,259  
**Management:** Infrastructure Ontario  
**Owner:** Infrastructure Ontario

- Smart lighting system, automated daylight harvesting and LEDs keep energy costs down.
- Active on-site waste reduction and recycling program.
- High efficiency boilers and chillers.
- Windows with reflective glazing that keep building cool in summer.

**2.** SCORE: 93 [LEVEL 4]

**4920 51ST STREET**

**City:** Red Deer  
**Province:** Alberta  
**Cert. Year:** 2012  
**Square Footage:** 288,192  
**Management:** Edon Property Management  
**Owner:** Alberta Infrastructure

- Uses outside air for free cooling in the summertime.
- Building uses 100 per cent renewable energy.
- "Green cleaning" contracts in place.

**3.** SCORE: 93 [LEVEL 4]

**80 MAWIDI PLACE (N.S. COMMUNITY COLLEGE WATERFRONT)**

**City:** Dartmouth  
**Province:** Nova Scotia  
**Cert. Year:** 2012  
**Square Footage:** 395,039  
**Management:** Nova Scotia Community College  
**Owner:** Government of Nova Scotia

- Has a "living wall" featuring more than 7,000 plants and an 8,000 square foot green roof.
- A variety of renewable energy systems, including solar, wind and geothermal, double as learning platforms for student.

**4.** SCORE: 92 [LEVEL 4]

**1 CARREFOUR ALEXANDER GRAHAM BELL (BELL CANADA CAMPUS)**

**City:** Verdun  
**Province:** Quebec  
**Cert. Year:** 2011  
**Square Footage:** 1,422,000  
**Management:** SNC-Lavalin Nexacor  
**Owner:** KanAm Grund

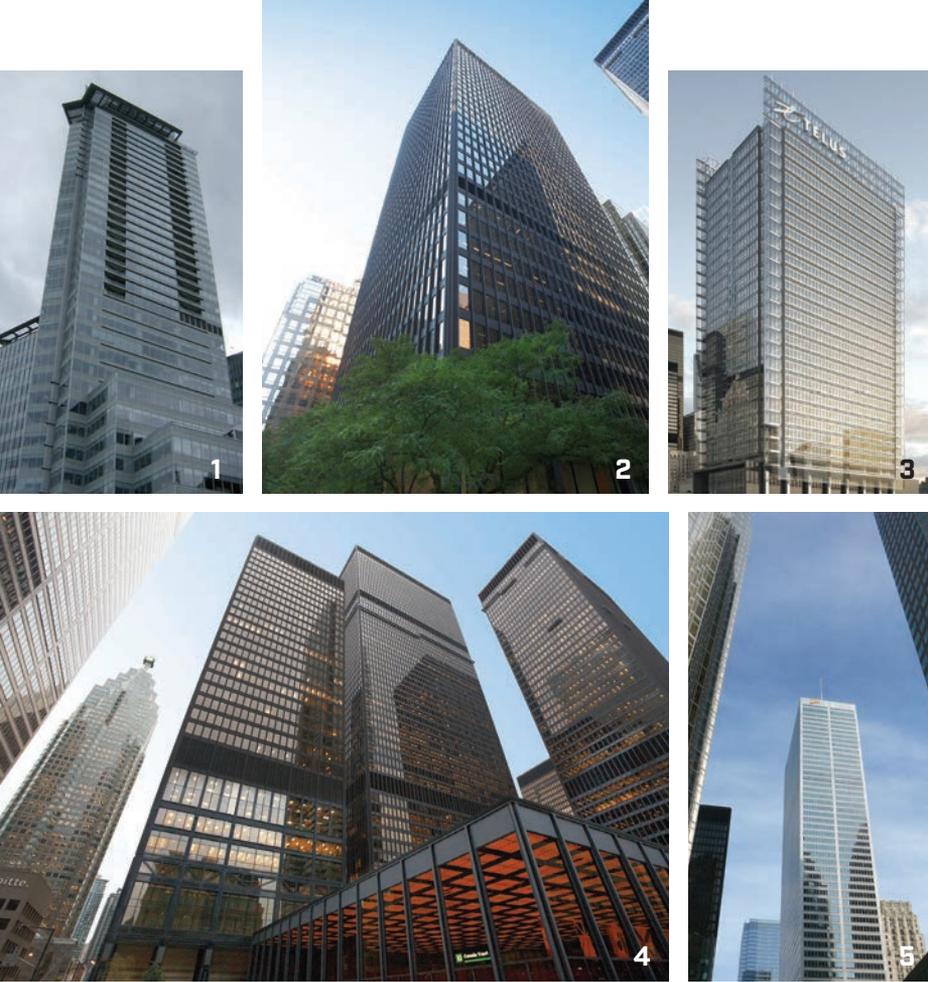
- A light-coloured rooftop increases building albedo - i.e. it reflects sunlight and reduces heat absorption.
- Recycling and compost collection stations on every floor.
- Eco-friendly products used for all maintenance and repairs.

**5.** SCORE: 92 [LEVEL 4]

**1508 WEST BROADWAY**

**City:** Vancouver  
**Province:** B.C.  
**Cert. Year:** 2013  
**Square Footage:** 354,884  
**Management:** CREIT Management (B.C.) Ltd.  
**Owner:** Canadian Property Holdings (Broadway)

- Widespread use of LED and T8 lighting.
- Occupancy sensors to reduce lighting costs.
- Low-flow washroom fixtures and faucets.
- High-efficiency boilers, chillers and water heaters.



EED, or Leadership in Energy and Environmental Design, is a rating system that is recognized as an international mark of excellence for green buildings in over 132 countries. Since 2002, the Canada Green Building Council (CaGBC) and LEED

Canada have certified more than 1,000 buildings in Canada and registered over 4,000, the second highest number in the world.

LEED rates how a building has been constructed, but a related certification called LEED Existing Building Operations & Maintenance (or EB:O&M) evaluates the operational efficiency of buildings and measures in place to minimize environmental, resource and health impacts. This includes whole-building cleaning and maintenance (including chemical use), recycling programs, exterior maintenance programs and system upgrades.

LEED EB:O&M was launched in 2010 and to date includes 349 registered and certified commercial buildings across Canada, representing 18 million square metres. Buildings must file for recertification at least once every five years to maintain their status.

Here we highlight the Top 5 large buildings in Canada that have been certified under LEED EB:O&M. *Corporate Knights* defines large buildings as having more than 100,000 sq. ft. of floor space.

## TOP 5 LEED (EXISTING) LARGE BUILDINGS

**1. SCORE: 85/110  
PLATINUM**

**1067 WEST CORDOVA  
(SHAW TOWER)**

**City:** Vancouver  
**Province:** British Columbia  
**Cert. Year:** 2013  
**Square Footage:** 310,000  
**Management:** Westbank/Shaw Communications  
**Owner:** Westbank/Shaw Communications

- 30 per cent reduction in potable water use through efficiency measures.
- Uses 100 per cent EcoLogo certified power.
- Has instituted Green Cleaning Program to reduce use of toxic chemicals and reduce impact on natural resources.

**2. SCORE: 84/110  
PLATINUM**

**100 WELLINGTON ST. WEST (TD WEST TOWER)**

**City:** Toronto  
**Province:** Ontario  
**Cert. Year:** 2012  
**Square Footage:** 683,000  
**Management:** Cadillac Fairview  
**Owner:** Cadillac Fairview

- High-performance faucets, toilets and urinals reduce water use by up to 30 per cent.
- Has installed automatic lighting controls, state-of-the-art building automation controls, real-time energy monitoring and lighting technologies.
- At least 75 per cent of waste produced is diverted from landfills.

**3. SCORE: 80/110  
PLATINUM**

**25 YORK STREET (TELUS TOWER)**

**City:** Toronto  
**Province:** Ontario  
**Cert. Year:** 2012  
**Square Footage:** 811,000  
**Management:** Menkes Developments  
**Owner:** Menkes Developments

- Deep-water lake cooling cuts cooling costs by more than half.
- Auto dimming, glare-free lighting and sun tracking blinds help boost employee comfort and reduce power costs.
- Giant cistern collects rainwater, reducing water consumption by 10 million litres a year.

**4. SCORE: 70/110  
GOLD**

**79 WELLINGTON ST. WEST (TD SOUTH TOWER)**

**City:** Toronto  
**Province:** Ontario  
**Cert. Year:** 2011  
**Square Footage:** 650,000  
**Management:** Cadillac Fairview  
**Owner:** Cadillac Fairview

- Building automation system performs environmental, energy management, and lighting control functions. It also assures occupants are comfortable.
- Film applied to windows create effect of "closing the blinds," reducing solar load on building and reducing cooling costs.
- Deep-water lake cooling cuts energy bill.

**5. SCORE: 68/110  
GOLD**

**25 KING ST. WEST (COMMERCE COURT)**

**City:** Toronto  
**Province:** Ontario  
**Cert. Year:** 2012  
**Square Footage:** 2,782,600  
**Management:** GWL Realty Advisors  
**Owner:** B.C. Investment Management Corp.

- Comprehensive recycling program diverts 78 per cent of waste from landfill, or equivalent to 257,000 garbage bags.
- Deep-water lake cooling to reduce cooling costs, and contribute to reduction of building GHG emissions by more than 38 per cent since 2007.
- Electricity use monitored through unit submeters.

# TOP 10 NET ZERO ENERGY BUILDINGS

**N**et-zero energy buildings are unique in that they consume no more energy than they generate over a year. For this reason, they are ultra-efficient with how they use energy and they must integrate renewable energy sources (typically solar) into their design.

In just two years, the number of buildings that have achieved net-zero energy status has more than doubled to 160, according to the U.S.-based New Buildings Institute. Net-zero buildings typically use three-quarters less energy than average buildings.

Popular with public-sector building owners, larger net-zero buildings are becoming more common but projects have historically been dominated by buildings less than 25,000 square feet in size.

Net-zero buildings – verified or in development – now exist in 36 U.S. states, up from 26 in 2012. In Canada there are only six known buildings, but that number is expected to rise.

The Smart Net-Zero Energy Buildings Strategic Research Network, a coalition of 29 Canadian researchers from 15 universities, envisions widespread adoption of such building designs by 2030. The challenge, it says, is to optimize design and operation concepts “suited to Canadian climatic conditions and construction practices.”

Here we list the Top 5 net-zero buildings in the United States based on data from the New Buildings Institute. The highest-ranked buildings are those that, after subtracting the energy they consume over a year, have the most energy left over.

Note that ranking this way doesn't necessarily showcase the most efficient buildings. Some industry observers justifiably argue that those buildings that have the lowest energy use intensity – that is, use the least amount of energy per square foot over a year – deserve the greatest recognition.

It's a good problem to have.



*The largest net-zero energy building in the Top 10 is the David and Lucille Packard Foundation head office in Los Altos, California (see image 5).*



**\* ENERGY USE INTENSITY (KBTU/SQ.FT./YR)**

**1.**

**ENVIRONMENTAL NATURE CENTER**

**City:** Newport Beach  
**State:** California  
**Built:** 2008  
**Use:** Educational  
**Size:** 8,535 sq. ft.  
**EUI:** 18\*  
**Renewable EUI:** 28  
**Net EUI:** -10.

**2.**

**BACON STREET OFFICES**

**City:** San Diego  
**State:** California  
**Built:** 2009  
**Use:** Office (renovated)  
**Size:** 4,500 sq. ft.  
**EUI:** 13  
**Renewable EUI:** 22  
**Net EUI:** -9.

**3.**

**OMEGA CENTER FOR SUSTAINABLE LIVING**

**City:** Rhineback  
**State:** New York  
**Built:** 2009  
**Use:** Educational  
**Size:** 6,200 sq. ft.  
**EUI:** 13  
**Renewable EUI:** 21  
**Net EUI:** -8

**4.**

**ANNA MARIA HISTORIC GREEN VILLAGE**

**City:** Anna Maria  
**State:** Florida  
**Built:** 2011  
**Use:** District (renovated)  
**Size:** N/A  
**EUI:** 28  
**Renewable EUI:** 35  
**Net EUI:** -7

**5.**

**DAVID AND LUCILLE PACKARD FOUNDATION**

**City:** Los Altos  
**State:** California  
**Built:** 2012  
**Use:** Office  
**Size:** 49,161 sq. ft.  
**EUI:** 24  
**Renewable EUI:** 28  
**Net EUI:** -4



Bacon Street Offices (image 2) and Omega Center for Sustainable Living (image 3) stand out for using the least energy per square foot.



TD Bank's branch in Fort Lauderdale (image 8) isn't that large, but compared to the other buildings in the Top 10, it produces the most renewable energy per square foot because of the number of solar PV panels integrated into the building's design.



## 6.

### OBERLIN COLLEGE LEWIS CENTER

**City:** Oberlin  
**State:** Ohio  
**Built:** 2000  
**Use:** Educational  
**Size:** 13,600 sq. ft.  
**EUI:** 32  
**Renewable EUI:** 36  
**Net EUI:** -4

## 7.

### IDEAS Z2 DESIGN FACILITY

**City:** San Jose  
**State:** California  
**Built:** 2007  
**Use:** Office (renovated)  
**Size:** 6,557 sq. ft.  
**EUI:** 21  
**Renewable EUI:** 25  
**Net EUI:** -4

## 8.

### TD BANK BRANCH -- FT. LAUDERDALE

**City:** Fort Lauderdale  
**State:** Florida  
**Built:** 2011  
**Use:** Bank Branch  
**Size:** 3,970 sq. ft.  
**EUI:** 92  
**Renewable EUI:** 96  
**Net EUI:** -4

## 9.

### DPR CONSTRUCTION PHOENIX REGIONAL OFFICE

**City:** Phoenix  
**State:** Arizona  
**Built:** 2012  
**Use:** Office (renovated)  
**Size:** 16,533 sq. ft.  
**EUI:** 27  
**Renewable EUI:** 30  
**Net EUI:** -3

## 10.

### CHRISNEY LIBRARY

**City:** Chrisney  
**State:** Indiana  
**Built:** 2009  
**Use:** Library  
**Size:** 2,400 sq. ft.  
**EUI:** 15  
**Renewable EUI:** 18  
**Net EUI:** -3

# GREEN BUILDINGS: CRADLE TO CRADLE LIFE CYCLE ASSESSMENT IS THE CORNERSTONE OF SUSTAINABLE PERFORMANCE

The word concrete traces back to the Latin word “concrecere” which means, “to grow together” – an apt descriptor of both the chemistry and use of a material that has helped define the built environment for thousands of years. Some of the earliest examples of concrete are still standing, the almost 2000-year-old Pantheon and the Roman aqueducts being among the most famous. Today, we use twice as much concrete as all other building materials combined – more, in fact, than any material other than water. It’s a striking statistic that speaks volumes about the essential role that concrete plays in the modern world.

That scale of production does not come without environmental impacts, the most significant of which is CO<sub>2</sub> emissions. The lion’s share of concrete’s CO<sub>2</sub> emissions come from the manufacture of cement, the active ingredient – or “glue” – that binds water, sand and gravel together to make concrete. While cement typically constitutes between 7-11% by volume of a concrete mix, cement manufacturing is among the most energy intensive industrial processes in the world and accounts for over 5% of global anthropogenic CO<sub>2</sub> emissions.

Not surprisingly, cement manufacturers have spent hundreds of millions of dollars trying to get these numbers down. In Canada, the industry has achieved an average efficiency improvement of about 1% per year for the past decade from its fleet of already modern plants. A new cement formulation branded Contempra™, introduced to the Canadian market in 2011, reduces these CO<sub>2</sub> emission totals by another 10%. Further reductions are possible as manufacturers push harder to substitute the fossil fuels that typically heat their kilns with low carbon alternatives, like purpose grown biomass, or energy salvaged from non-recyclable waste.

There is no substitute for cement and concrete. With these notable improvements, every tonne of cement produced in Canada generates about 700kg of CO<sub>2</sub>. Significant reductions in this number will require disruptive technologies like carbon capture and storage / re-use on a scalable and commercially viable level.

While some in the green building movement can’t see past these numbers, those who consider the sustainability of green buildings from a life cycle perspective often see concrete as a keystone solution to mitigating the impacts of climate change.

Just as for the cement industry, energy efficiency has been a major preoccupation of the green building movement for good reason – compared to cement’s 5%, buildings are responsible for 33% of global emissions<sup>i</sup> and close to half of all emissions in the U.S. and Canada.<sup>ii</sup> In temperate climates, 88% – 98% of these are associated with a building’s operational energy use,<sup>iii</sup> making energy efficient buildings an essential part of the global strategy to mitigate climate change.

A great way to maximize the energy performance of buildings is through thermal mass – a measure of the capacity of a material to moderate changes in temperature. Alone, concrete’s thermal mass can passively drive efficiency gains of up to 8%.<sup>v</sup> For many structures, that’s more than enough to make up for the CO<sub>2</sub> embodied in the concrete used to make the building. But when concrete’s thermal mass is “activated” as a giant thermal battery for passive solar, geothermal and/or other radiant heating and cooling systems, this value can skyrocket, turning upfront manufacturing emissions into a significant investment in CO<sub>2</sub> mitigation.

And then there is the matter of occupant health. The drive for efficiency has resulted in buildings so air tight that indoor air quality has become a major concern. Concrete itself is inert – it does not off-gas or leach – and so is an inherently healthy material. More importantly, its thermal mass can help drastically improve air quality by facilitating greater introduction of fresh air without compromising efficiency.

Manitoba Hydro Place (MHP), one of Canada’s most innovative green buildings, is an excellent case study on thermal mass in green design. MHP deploys an innovative “solar chimney” design that, in combination with geothermal radiant heating and cooling systems to activate the thermal mass of the building’s 40,000 m<sup>3</sup> of concrete, allows the building to coast through outdoor temperature changes, shift peak energy demand and achieve an overall 66% efficiency improvement over the Model National Energy Code for Buildings.<sup>vi</sup> This strategy is saving MHP \$500K/year<sup>vii</sup> in operating expenses while supporting 100% fresh air circulation, 24 hours per day, 365 days per year – even in the depth of Manitoba’s winter.

None of this is to dismiss the importance of continued investment in reducing manufacturing emissions from cement production, but it does offer an important insight into the pitfalls of compartmentalized rather than integrated thinking about green design. Tools like Life Cycle Assessment and Environmental Product Declarations have given us useful data on the manufacturing impacts of various materials but also risk distracting us from the real prize – improved building performance. The question is not simply which materials have the smallest environmental footprint, it’s which materials, used in what designs, married with what technologies give us the best cradle-to-cradle performance for any given project.

**Adam J. Auer, B.Sc., M.E.S.**

Director of Sustainability, Cement Association of Canada



<sup>i</sup> <http://www.etymonline.com>; <sup>ii</sup> UNEP Sustainable Buildings Initiative, Buildings and Climate Change: Summary for Decision-Makers, 2009; <sup>iii</sup> <http://Architecture2030.org>; <sup>iv</sup> Ochsendorf J., et al. Methods, Impacts, and Opportunities in the Concrete Building Life Cycle. Massachusetts Institute of Technology, 2011; <sup>v</sup> Ochsendorf J., et al. Methods, Impacts, and Opportunities in the Concrete Building Life Cycle. Massachusetts Institute of Technology, 2011; <sup>vi</sup> <http://manitobahydroplace.com>; <sup>vii</sup> <http://www.prnewswire.com/news-releases/manitoba-hydro-place-sets-new-record-with-lead-platinum>

# BENCHMARKING MATTERS

MAKING BUILDINGS TRACK AND DISCLOSE ENERGY USE IS THE ONLY WAY FOR CITIES TO MEET GHG REDUCTION TARGETS.

BY JULIA LANGER



This January the largest coal-fired generating station in North America, located on the north shore of Lake Erie, was shuttered. Along with the prior closure of four other coal plants, greenhouse gas emissions (GHG) from Ontario's electricity sector dropped from 40 to 10 million tons per year – the single biggest GHG reduction action on the continent.

Yes, celebration is in order. However, a sizable gap remains between this decline in emissions and the GHG reduction targets set by many cities, provinces and states. Toronto, for example, aims to lower its emissions to 30 per cent below 1990 levels by 2020. Closing the coal plants got the city about a quarter of the way to that goal.

In addition to decarbonizing their electricity supply, communities across North America also need to dramatically improve levels of energy efficiency and reduce energy demand if they are to meet ambitious reduction targets. In urban centres, roughly half of the GHG emissions are associated with the energy used to heat, cool and run buildings. Making large structures – condominiums, office towers, institutions and apartment buildings – more energy efficient is the fastest and most cost effective means of addressing climate change.

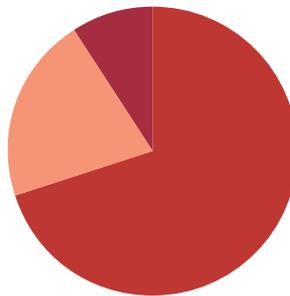
As they say in the accounting profession, you can't manage what you don't measure. That's why energy reporting is critical to driving down energy (and water) consumption and realizing sustainable, energy efficient cities. Benchmarking, data collection and monitoring – all captured in an energy reporting policy – is emerging as one of the most effective tools to reduce energy consumption on a massive scale. Indeed, throughout Europe and across the U.S., policies have been rolled out mandating that building owners and managers monitor and report their energy consumption levels.

In the U.S., New York City, Chicago, Boston, Philadelphia and San Francisco are among the cities that have implemented such programs. Similar policies, often referred to as an energy reporting requirement (ERR), are being explored in Canada by cities such as Vancouver and Toronto.

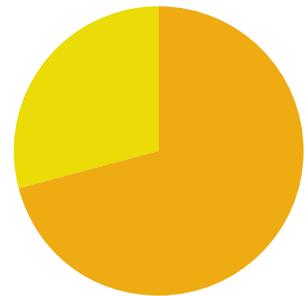
Through an ERR, owners and managers of commercial and multi-unit buildings are required to report the annual amount of energy used by their building to an independent third party, usually a government body. In this way, baseline energy consumption for individual buildings is established, as is a baseline for the overall energy consumption of a city's building stock. Local government agencies can then aggregate emissions information and send back useful data to owners and managers about how their building is performing relative to similar buildings. The data also helps identify local trends in energy consumption and informs the design of effective conservation programs.

By itself, an ERR is not the silver bullet to the problem of climate change. But it is a highly effective approach when used in combination with supporting instruments. Analysis of both voluntary and mandatory energy reporting programs shows that tracking energy consumption and comparing performance among similar buildings leads to an average 2 to 3 per cent improvement in annual energy efficiency rates. Through an ERR, this potential could be applied citywide to generate a significant reduction in energy use. Reductions could possibly be greater still if the reporting requirement is implemented simultaneously with other programs such as conservation demand management initiatives and financial incentives that support energy efficiency retrofits and equipment purchases.

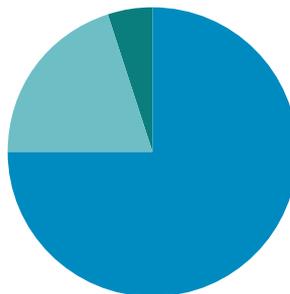
## GREENHOUSE GAS EMISSIONS IN MAJOR CITIES



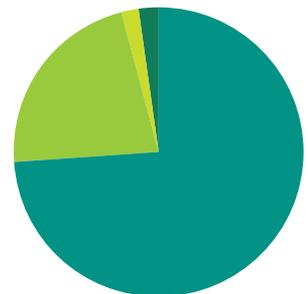
**CHICAGO**  
70% Buildings  
21% Transportation  
9% Other



**BOSTON**  
71% Buildings  
29% Transportation



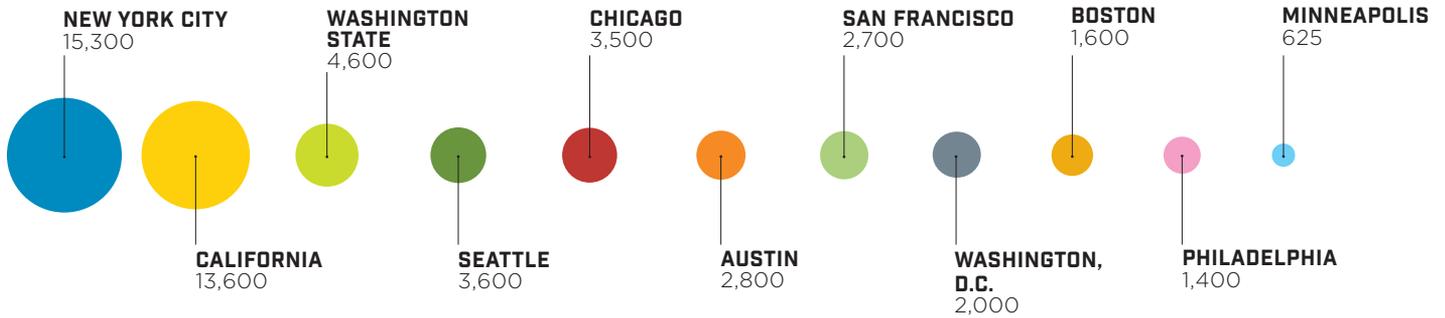
**NEW YORK CITY**  
75% Buildings  
20% Transportation  
5% Waste



**DISTRICT OF COLUMBIA**  
74% Buildings  
22% Transportation  
2% Metro Transit  
2% Waste

# 51,000 U.S. BUILDINGS MUST NOW REPORT ENERGY USE

BUILDINGS PER CITY/STATE. BASED ON EXISTING ERR POLICIES:



The value proposition of an ERR is multisided, with benefits for consumers, building owners, utilities and the planet. Owners can use superior energy performance ratings to promote their buildings as more desirable and better managed. Operating costs are lowered since less money is spent on energy use. U.S. studies have shown that buildings with green status benefit from higher sale prices, rental rates and occupancy rates compared to non-green labelled buildings. On the other side of the equation, tenants, lessees and buyers can use publicly available information about a building's energy efficiency to inform real estate decisions in much the same way consumers can compare fuel efficiency rates when buying a car, understanding that the energy performance will affect long-term operating costs.

Over time, the data generated from an ERR will provide a wealth of analytical opportunities for city planners, utilities and academics – and even private app inventors. Collectively, these analyses will inform the programs, policies and infrastructure needed at neighbourhood and district levels to achieve a truly sustainable energy system and meet an ambitious 2050 target of 80 per cent emissions reductions.

As we strive to create energy efficient cities, municipalities should look to energy reporting requirements as one of the first steps to lowering energy consumption on a substantial scale and addressing the dangerous consequences of climate change. Ontario has said good-bye to King Coal. Now it's time to say good-bye to energy waste in buildings and power up efficiencies instead. 🌱

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# STREET SMARTS

*LumiSolair LED streetlights, installed at the Brooklyn Navy Yard, are powered by a combination of wind and solar. They have survived two hurricanes.*

MORE  
MUNICIPALITIES  
WANT TO  
SWITCH  
OVER TO LED  
STREETLIGHTS  
BUT MANY  
REMAIN IN THE  
DARK ON HOW  
TO PAY FOR IT.

BY TOBY HEAPS



After several hours of driving on a dark rural highway, the first distant glimpse of a roadside streetlight can be a sight for sore eyes. It's also a reminder to urban and suburban dwellers that we too often take these beacons of safety for granted.

Looking out the window of an airplane, streetlights automatically reveal the design and character of a city. They are a kind of municipal fingerprint, and no two are alike.

What they do have in common is that they all run on electricity – and municipalities that pay the bills every year certainly don't take that for granted. There are an estimated 35 million streetlights across Canada and the United States and together they consume enough electricity to power four million homes.

Los Angeles, for example, had been paying more than \$20 million for its fleet of 220,000 streetlights. As part of a massive cost-cutting effort, it decided in 2009 to launch what was then the largest LED streetlight project in North America.

So far, the City of Angels has converted about 140,000 of those streetlights to LED units. The move has paid off. Energy use dropped 63 per cent and the municipality was able to cut its bill by \$7 million a year. That excludes the \$2.5 million annually it now avoids in maintenance costs, reflecting the fact that LED lamps rarely fail and last three to four times longer than sodium lamps typically used today.

“The product is now mature, it works, it lasts, people are happy with it, and prices have come down,” said Philip Jessup, director of LightSavers Canada, an initiative of the Canadian Urban Institute in Toronto.

Despite this win-win story, Jessup explained, the vast majority of municipalities still haven't committed to the switch. In the U.S., an estimated 10 to 13 per cent of streetlights are now using LED lamps. Canada, by comparison, is lagging at just under 5 per cent.

This poses a challenge for LightSavers, which wants to see one million or 37 per cent of all streetlights in Canada switched over to LED by 2016. It has found that municipalities, while they generally “get” the benefits of LED streetlights, remain reluctant to commit the upfront capital required to do the retrofits – particularly when most city budgets these days are strained.

In search of strategies to break through this barrier, LightSavers and *Corporate Knights* convened a small group of municipal, financial, energy and technology experts to explore alternative financing options that might accelerate the deployment of LED street lighting without weighing down municipal balance sheets.

Kerry Wilson, director of commercial strategies for RealTerm Energy, an energy services company, or ESCO, said acceptance of and interest in LED streetlights has shifted considerably over the past three years as municipalities become more educated about the technology and its potential benefits.

As an ESCO, RealTerm offers to pay for and install LED street lighting as part of an energy performance contract. The municipality doesn't have to worry about providing capital for the project upfront, such as through debt financing. Instead, it makes regular payments to RealTerm based on its energy savings.

Wilson said RealTerm already has 17 performance contracts in place and more than 60 proposals under consideration. “Once you start getting the ball rolling, it catches on quickly.”

The ESCO model, while not new as it applies to energy-efficiency retrofits in buildings, is a fairly recent development for streetlight deployment. The size of the opportunity, however, is attracting interest from non-traditional ESCOs such as lighting giant Philips and from traditional ESCOs such as

**CONTINUED ON P62**

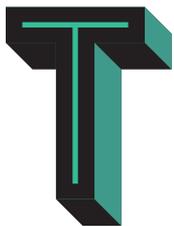


# WHY BIG DATA IS GOING GREEN

DATA CENTRES ARE NOTORIOUS ENERGY HOGS, BUT MORE ARE

REALIZING THAT ENERGY EFFICIENCY AND PROFITS GO HAND IN HAND.

BY  
STEPHEN  
LACEY



he “digital universe” is very similar to the physical universe in its construction. There’s the matter we can easily see: computers, mobile phones, television screens and software. But behind every text message, embedded video, streaming song or recorded television show lays a vast network of data unseen by the physical eye. It’s like the “dark matter” that scientists believe makes up most of space. The digital universe, coined by the consulting firm IDC, is expanding at an astonishing rate. The firm’s latest estimates show a 300 per cent increase in data creation

*Power and data cables connect servers (above) while a worker (right) inspects equipment at EMC’s Durham Cloud Data Center, North Carolina.*

by the end of the decade – growing from 1.3 trillion gigabytes to 40 trillion gigabytes.

“The digital universe astronauts among us – the chief information officers, data scientists, digital entrepreneurs – already know the value that can be found in this ever-expanding collection of digital bits,” IDC optimistically concludes in its analysis of the sector.

But back on terra firma, the expansion of the digital universe also means concurrent growth in the energy-intensive hardware needed to support it. Between now and 2020, IDC projects that global IT infrastructure will grow by 40 per cent. The result is growing demand for energy services that are still largely supplied by finite, polluting fossil fuels.

This creates new challenges for data centre operators and IT service providers seeking to reduce the environmental impact of their operations. Consequently, it also means there’s a lot of economic value to capture as the worldwide market for data centre infrastructure management services balloons from just over US\$660 million today to \$4.5 billion in 2020, according to Navigant Research.

The big question is whether the entire industry – not just the biggest and most public IT firms – will realize that environmental value.

Over the last decade, the data centre industry has begun a steady transition toward reducing energy use in buildings through smarter design and improvements to equipment performance. Driven by pressure



## HIGHLIGHTS OF THE EMC DURHAM CLOUD DATA CENTER

from environmental groups, corporate sustainability goals and steady advances in hardware, the biggest tech firms are now embedding sustainability into their practices. The transition accelerated after the Environmental Protection Agency reported a doubling of energy consumption among U.S. data centres between 2000 and 2006, creating more public awareness about the industry's growing impact.

The most prominent shift has come from corporations like Apple, Facebook, Google and Microsoft, which have all built ultra-efficient data centres powered with renewable energy to green their images. The public might reasonably assume that this is where the entire data centre industry is headed. But these firms are outliers in the industry, not the norm.

"For the companies building highly visible data centres, you see a lot of movement," said Jonathan Koomey, a Stanford University professor who analyses the IT sector's energy use. "But smaller data centres are not getting on board in the same way."

The problem, said Koomey, is not technical – it's structural. The vast majority of data centres are owned by smaller companies with little budget for improving energy performance. They also have no public pressure to improve their facilities as well as conflicting management roles. As a result, they waste a lot of energy.

"Most companies can't even tell you how many computer servers they have," said Koomey. "The IT department buys the hardware, finance pays for the energy bills and no one talks to each other. These are institutional problems that need to be fixed."

Relative to other sectors of the economy, data centres don't use an overwhelming amount of electricity. The industry accounts for around 2 per cent of electricity consumption in the U.S. and about 1.5 per cent globally. In comparison, the U.S. manufacturing sector uses 30 per cent of total energy. However, the amount of waste in the IT sector is staggering. According to a McKinsey & Company analysis compiled for the New York Times, only 6

to 12 per cent of electricity consumed by data centres is actually used for computing. The rest goes to cooling equipment and keeping servers running in case of an unexpected spike in demand.

To reverse that abysmal statistic, the most effective solution for the vast majority of the industry isn't to build out fancy new data centres; it's to better use the infrastructure already in place. In many cases, however, that can be just as difficult.

"In this business, no one gets fired for wasting energy. But you do get fired for making a change that causes a server outage," said Mark Housley, chief executive of Vigilant, a California-based energy management company focused on controlling "mission critical cooling" in data centres.

Founded a decade ago as an intelligent HVAC (heating, ventilation and air conditioning) company for commercial buildings, Vigilant has narrowed its focus mostly to data centres, where cooling systems are often run at full blast to protect servers from overheating, even when they're not needed.

By installing a network of sensors that measure temperature, humidity and pressure, Vigilant can dynamically adjust cooling using its software dashboard. Housley said the company is shutting down 40 per cent of air conditioners on average across its portfolio of 200 facilities by adding intelligence to "Neanderthal" controls systems.

"Operators don't even know which systems to turn off. We figure out which air conditioners are needed for a given IT load, and always find that balance," said Housley. In one data centre, Vigilant was

able to reduce cooling loads by 70 per cent by shutting down excessive cooling.

Canada's second biggest telecom company, Telus, saw similarly striking improvements to its energy use after installing Vigilant's system at its data centres. Telus's first integration brought 1 gigawatt-hour of savings at a data centre in the first year, reaping \$100,000 in savings and enabling a payback on investment of 18 months. After that, Telus was hooked. The company has continued retrofitting its Canadian data centres with the system, and in June of last year, it made an undisclosed venture investment in Vigilant.

Vigilant's success has taken a long time to materialize. Educating and winning new customers is very difficult work, said Housley, who calls himself an "old Silicon Valley guy" accustomed to quick turnaround for products. In the data centre world, change to critical systems comes incrementally. Fears about equipment fail-

- 20,000 square feet within 450,000 square foot building
- LEED Gold
- \$27.2 million in operating cost reduction due to data centre power and cooling efficiencies
- 100 million pounds of CO<sub>2</sub> reduced compared to pre-retrofit building
- Outside air-intake providing free cooling 77 per cent of the year
- Toxic-free flywheel energy storage for back-up power
- 97 per cent recycled material used during construction
- 40 per cent reduction in city-sourced water consumption

## SUSTAINABLE BUILDINGS

ures are the main reason, but finite capital and skepticism about the “crappy ROI of sustainability investments” are also big factors, he said. However, momentum is accelerating as more products get into the market and data centre operators gain experience.

“The market is very slow to change, it’s still a pretty conservative industry. Data centre managers don’t want to take any risk,” said Housley. “But the conversations are getting much shorter than they used to be. Now we have customers that can tell the story.”

For some data centre operators, telling that sustainability story is vital to educating the rest of the industry on what’s possible. EMC, a Massachusetts-based storage and cloud services company, has made sustainability the central focus in its data centre design. Unlike most of the industry, EMC has created an integrated decision-making process that ties together energy budgeting, IT purchases, facilities management and sustainability goals so that all areas of the business are working toward the same goals.

“A lot of companies have no aligned interests between the IT side and the facilities management side,” said Kathrin Winkler, EMC’s chief sustainability officer. “You need to build in 21st century collaboration to actually measure your impact.”

In its latest sustainability report, the company said it had reduced its greenhouse gas emissions by 40 per cent since 2005, largely through better use of IT equipment and retrofitting facilities with efficient energy systems. EMC’s newest data centre, completed last year in Durham, North Carolina, recently achieved a LEED gold certification for its integration of free air-cooling, rooftop water collection and a flywheel battery for uninterrupted power supply.

The cumulative impact has been a 34 per cent reduction in energy use and 78 per cent reduction in potable water consumption

compared to the average data centre. The company has achieved a gold rating at four other data centres around the world implementing similar technologies.

EMC has branded itself very heavily around its approach to sustainable data centre design, releasing detailed data on its energy consumption and putting Winkler – its leading voice on the environment – front and centre publicly. But Winkler admits there is a disparity between what a bigger company like EMC can do and what the majority of the industry is capable of. To address this challenge, the company has focused increasingly on “infrastructure-as-a-service,” which allows enterprises to use EMC’s existing resources in the cloud. This approach is becoming standard in the industry, and allows bigger firms with more resources for energy efficient design to pass the benefits along to customers.

“The problem is that there’s a large number of much smaller data centres, and the ROI in those facilities can be relatively small,” said Winkler. “As we incorporate infrastructure-as-a-service, that can help achieve economies of scale.”

Most data centre operators still have a lot of inefficiencies to tackle. But there’s no doubt that the industry has started transforming itself. Since 2008, due to the combination of an economic slowdown, better data centre design and better utilization of IT equipment, growth of electricity consumption in the sector has been far below earlier projections from the Environmental Protection Agency. Koomey said the trend was promising, and that meaningful changes are taking place.

“This is not an overwhelming thing,” said Koomey. “But it comes back to management issues. If you’re not tying the sustainability metric to the rest of your business, you’re not going to end up with sustainable changes.”

### CONTINUED FROM P59

Johnson Controls, which has some performance contracts in the U.S. and is slowly trying to break into the Canadian market. Many cities remain cautious and talks are slower than anticipated, but Brian Del Vecchio, senior account executive at Johnson Controls, said a positive sign is that negotiations are getting more “rigorous” and “detailed.”

Why the municipal skittishness?

“The perception is that it’s still a cowboy market out there,” said Cynthia Robertson, a principal at Parkridge Consulting. In other words, the relative newness of LED street lamps raises questions about quality control, speed of technology advancement and a lack of market standards.

Will LED lamps for streetlights perform much better five years from now, or be replaced by new technology, or drop considerably in price? Which LED lamp suppliers can be trusted? For some city managers, it may be safer to play wait-and-see.

“If you’re a streetlight manager and your city street lighting already works, why change anything?” said Jessup, playing devil’s advocate during the discussion.

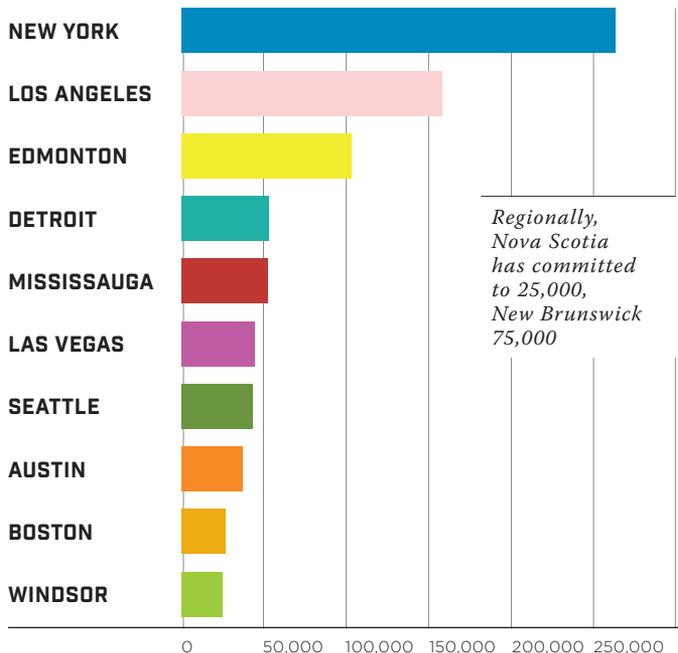
And what about other municipal stakeholders – city treasurers, chief operating officers, the local utility and city councillors? Each represents a different interest or need in the community. The challenge is getting them all on the same page. The good news is that it’s on the radar. In January, the U.S. Conference of Mayors released a survey of 300 mayors, 82 per cent of whom said switching city lighting to LED technology was a high priority.

Not surprisingly, 84 per cent cited budget constraints as the biggest barrier.

It doesn’t have to be.

## 10 TOP LED STREETLIGHT PROJECTS IN NORTH AMERICA

NUMBER OF UNITS INSTALLED AND/OR COMMITTED



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# SUSTAINABLE BUILDINGS BOOST VALUE OF INSTITUTIONAL PORTFOLIOS



BY FRANCISCA QUINN

Canadian pension plans hold more than \$100 billion of real estate assets. In 2012, pension plans allocated on average 10 per cent of total assets to this investment type, the highest number on record.

With this clout, institutional investors play an important role in promoting sustainable building practices in new construction and existing building retrofits.

“Pension plan-owned real estate companies have done more to drive green buildings in Canada than market demand or government regulation,” says Lisa Lafave, senior portfolio manager of real estate at Healthcare of Ontario Pension Plan (HOOPP). “Our fiduciary mandate to maximize financial returns and minimize the risk of asset depreciation fits very well with green buildings,” she says.

The role big investors can play is varied. They can throw capital behind green developments and retrofits of existing buildings. They can take the step of certifying their assets through green labelling systems such as LEED (Leadership in Environment and Energy Design). They can build sustainability criteria into investment decisions by establishing sustainability objectives for asset and property managers in advance. Asset owners can also choose to openly share their buildings’ energy and water usage data through industry benchmarking programs (when mandatory programs are not in place). Altogether, their actions send the important message that sustainability matters throughout the entire value chain, from material suppliers engaged during construction to tenants who end up occupying the building space.

Such actions tend to lead to stronger returns. Sustainability leaders such as HOOPP and Cadillac Fairview (owned by the Ontario Teachers’ Pension Plan), which are current or previous clients of mine, have consistently outperformed the industry index over the past three years with average real estate returns of more than 17 per cent (compared to an index average 13.6 per cent).

The data shows that green-certified buildings with superior comfort and good air quality have, on average, higher occupancy and less lease turnover. These are probably the most important drivers of cash flow in a building portfolio. As an example, Toronto-Dominion Centre, one of the crown jewels in Cadillac

PENSION FUNDS, LIFE INSURANCE COMPANIES AND OTHER BIG INVESTORS ARE GRADUALLY GREENING THEIR REAL ESTATE PORTFOLIOS, AND ENJOYING ABOVE-MARKET RETURNS.

Fairview’s office portfolio, has a 97 per cent occupancy rate, significantly higher than other comparable downtown properties. During the past five years, TD Centre has structured its entire business plan around sustainability excellence and it appears to be paying off.

Sustainability programs also improve operational efficiency, which leads to operational savings. “Investments in equipment and operational procedures can reduce or cap our operating costs,” said TD Centre general manager David Hoffman. “It is a smart decision for our tenants, for our business and for the environment.”

There’s also the long-term perspective to consider. This is the notion that a sustainable building is a way to manage financial risk. Buildings are, per se, more resilient to regulatory changes and market demand when investment criteria such as energy efficiency, climate resiliency, transit-friendly location and healthy indoor environment are incorporated into the investment decision.

This is why in the Canadian commercial real estate sector, LEED certification is a market expectation in core markets such as downtown Calgary and Toronto. Also, many public sector tenants now require green certification. It has become the price to play. However, these tenants will stay longer and contribute to high occupancy rates, which ultimately achieves portfolio return objectives.

Indeed, very inefficient buildings can sometimes become stranded assets. The European Union launched the Energy Performance of Buildings Directive in 2005, where each office building is given an energy performance rating. Now, the U.K. is making it unlawful to lease or sell any building with the least desirable F and G energy performance labels as of 2019.

If the institutional real estate investors’ most important role to date has been to secure meaningful pensions or insurance payouts for its members, their legacy will be at the macro level. Through their current strategies, institutional investors are changing the real estate industry by integrating sustainability into day-to-day management and building industry competencies along the way. At the local level, their contributions reduce the toll on sewers, energy and roads and contribute to improved air quality and human health. 