Industry: Led Market Transformation

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ABSTRACT

Usually one thinks of energy efficiency market transformation as a utility or government driven and funded activity. In Canada, the marketplace is advancing faster than traditional government or utility energy efficiency programs.

As the leading national authority on green buildings, the five year old, industry led organization, Canada Green Building Council (CaGBC) is enhancing the Leadership in Energy and Environmental Design (LEED®) Canada rating system and delivery model to facilitate a massive scaling up of transformation of Canada's new and existing buildings. By 2015, the CaGBC aims to recognize 100,000 buildings and 1 million homes (new and existing) using 50% less energy and water than the 2005 baseline for their building type. Realization of these goals will reduce greenhouse gas emissions by 50 MT/year.

This paper will highlight the work of the CaGBC and its members in developing and piloting a mass approach to rating buildings, not just at the design stage but throughout the entire lifecycle, supported by data driven performance management and benchmarking. The paper will also showcase Canadian solutions for achieving high performance green buildings. Information on scalable and sector-specific programs will demonstrate the role of buildings in meeting the objectives of a national climate change strategy.

This new system will be introduced at what will be the preeminent green building event of 2008 in Canada. "*Shifting into the Mainstream*" will be held in Toronto June 11-12th, 2008. (The presentation at ACEEE will incorporate the results of this event.

LEED Canada

The LEED Green Building Rating System is a voluntary, consensus-based rating system for high-performance, sustainable buildings developed by the US Green Building Council (USGBC) which was founded in 1993. LEED addresses all building types, and provides a structured framework for assessment and improvement in five areas: sustainable sites, water efficiency, energy efficiency and atmosphere, materials and resources, and indoor environmental quality[1].

In December 2002, the Canada Green Building Council (CaGBC) was established as a non-profit organization by a coalition of leading Canadian public- and private-sector individuals and organizations. The CaGBC is affiliated with the USGBC and is the license holder of LEED in Canada[2]. The drivers for founding CaGBC were two-fold:

- the growing recognition of the environmental consequences of business as usual in the buildings sector

[1] US Green Building Council, *Home Page*, www.usgbc.org
[2] Canada Green Building Council, *Strategic Plan* 2003

- the pent-up demand from all sectors of the industry to do things better

With buildings (residential and commercial) consuming 38 per cent of Canada's secondary (end use) energy and accounting directly for 30% of Canada's greenhouse gas emissions, the potential for environmental and economic improvement is immense[3]. Recognizing the strength and brand-power of LEED, the CaGBC introduced the Canadian adaptation – LEED Canada – in the fall of 2003.

Green Buildings Growth in Canada

By any measure, the CaGBC and the introduction of LEED in Canada have been remarkably successful:

Table 1. LEED-related Statistics in Canada

Category	2005	2006	2007
Registered New Construction Projects (cumulative)	204	363	583
Certified New Construction Projects (cumulative)	27	46	106
Total Members	1509	2061	2632
Total LEED Accredited Professionals	1930	2471	3000
Workshops Conducted	1232	1672	3041

In contrast, after 15 years, the USGBC has 72 Chapters, 14,000 members and 49,000 LEED accredited professionals with a building sector about 10 times that in Canada.

Establishing official chapters to build support and deliver CaGBC services at the local and regional level has been a central growth strategy. Eight active chapters now exist across the country. During its first five years the CaGBC has adapted the LEED rating system and developed the supporting products. These include reference documents, registration and certification services, the organization's website (www.cagbc.org), and education and examinations for LEED Accredited Professionals in Canada. Other capacity-building education resources have included integrated design process, LEED for contractors, and a Municipal Toolkit.

History of Energy Conservation in Canadian Buildings

Codes and Standards

In Canada, building regulation is the responsibility of provincial and territorial[4] governments. The *National Building Code* is in the form of a model code to permit adoption by the appropriate authority. Most provinces and territories adopt or adapt the NBC and enforce its requirements. However, the NBC does not include any references to energy efficiency.

A *Model National Energy Code - Buildings (*MNECB), first published in 1997, provides maximum thermal transmittance levels for building envelope components per type of energy (oil,

[3] Roundtable on the Environment and the Economy, *Energy –Related GHG Emissions in Canada 2050* Report.
[4] In addition to 10 provinces, Canada has three northern territories.

natural gas, electricity, wood, propane) for different regions of Canada. These levels were determined using regional construction practices and heating energy costs in a life cycle cost analysis. As well, the MNECB gives regional U-values for windows, references energy-efficient equipment standards, and identifies when heat recovery from ventilation exhaust is required for dwelling units. This code was required to reflect the regional differences in Canada.

To date, the Province of Ontario and the City of Vancouver have referenced the MNECB in their building regulations and enforce its requirements. Prior to 1997, the *Ontario Building Code* referenced ASHRAE 90.1. No other provinces or territories include energy efficiency in their building codes.

Utility Company Programs

Like the US, Canada has used provincial and local utility company Demand Side Management (DSM) programs to deliver energy efficiency to energy users in all sectors. For example, from 1989 to 1993, Ontario Hydro was offering a set of incentive programs to the market which reduced demand by 1200 MW system from 1989 to 1993[5], and the successor Ontario Power Authority is now rolling out new conservation programming in response to provincial directives. British Columbia and Manitoba have continued their Power Smart programs since their inception in 1991. Quebec has a long history of electricity conservation programs from its gas and electric utilities as well as a government agency. Other provinces have also seen utility company DSM programs and government initiatives come and go over the past 20 years.

Government Programs

The federal Office of Energy Efficiency has been actively engaged since the late 1990's in programming for buildings, houses, industry and transportation. The provinces of British Columbia and Ontario have adopted aggressive energy conservation targets, and several major Canadian cities have policies and plans for energy and greenhouse gas emissions reductions.

It is unclear what energy consumption might have been without these initiatives, but with Canadian greenhouse gas emissions having increased by 30% since 1990[6], it is clear that regulations, incentives and the introduction of new technologies are not enough to deliver the full energy conservation potential in buildings.

Industry Led Efforts

Unlike these recent efforts of the CaGBC, most other initiatives involving industry have been government led or financed. For example, the Canadian Industrial Program for Energy Conservation, a voluntary partnership between the Government of Canada and industry brings together industry associations and companies representing more than 98 percent of all industrial energy use in Canada. Since 1975, CIPEC has been helping companies cut costs and increase profits by providing information and tools to improve energy efficiency[7].

[5] Ontario Hydro, *The Net Impact of Demand Side Management Programs from 1989 – 1993,* 1994
[6] Roundtable on the Environment & Economy, *Energy-Related GHG Emissions in Canada 2050 Report*
[7] Natural Resources Canada, CIPEC

Learning from Experience

Energy efficiency, and the associated mitigation of greenhouse gas emissions due to buildings, are primary objectives of the CaGBC. Current thinking about effectiveness of energy conservation programs has been informed by research conducted in 2003-5 into the actual energy performance of more than 60 new schools (built since 2000)[8].

The unexpected result of this work was the range of energy and water intensity in the schools, all of which were built to essentially the same standards. Electricity consumption per sq ft of the higher users was 3 times that of lower end of the range. Gas use (all but one of the schools were heated by gas boilers) had a ratio of 4:1, while water consumption by higher users was 5 times greater than the better performing schools.

Subsequent work with the participating school boards has normalized for material differences between the schools, such as number of portable classrooms, school types, and presence of air conditioning, without significantly altering the original findings. Importantly, sharing the benchmark results with operators and principals led to immediate and significant energy savings. A conclusion drawn from this work is that substantial energy and water savings can be achieved through consistent application of existing good practices for system design and operations, and for system use by staff and students.

The extension of this thinking is that real progress can be made when every facility manager, caretaker and school principal knows the energy use and emissions they are responsible for, and how they compare with their peers. Effective programming requires engagement through information, enablement through tools and resources, and verification of performance through feedback on actual energy and water use.

The schools' example indicates that a 50 percent reduction in buildings' energy use can be realized through simply applying what we already know how to do in each phase of the life cycle of a building: new construction and retrofit design, commissioning, operations and use. In Canada, a reduction of this magnitude will take us half way to Canada's Kyoto target, leaving industry, transportation and agriculture (which made up 70% of 2004 emissions) to pick up the rest. A national buildings-centric climate change strategy can provide the experience, momentum and confidence to tackle other areas, and complete the transition to a low-carbon society.

A New Model for Conservation

A new generation of large-scale energy conservation programming is evolving from this model inherent in the learning from the schools research, which includes the following:

- Benchmarking to establish energy performance standards for each building type.
- Normalization for material differences to produce energy targets for individual buildings.
- Monitoring and reporting to all stakeholders of progress towards targets.
- Continuous improvement as ever-higher performance is achieved and verified.

This virtuous cycle can work relentlessly towards optimal energy use in all buildings. Its realization integrates:

[8] Ian Jarvis, *Report on Sustainable Schools*, 2006

- Government leadership, setting the standard of target-setting, planning, reporting and continuous improvement for owned facilities and operations, and for all publicly funded organizations.
- Industry-led engagement and enablement of end-use energy consumers through development of information, standards, tools and resources, and verification of performance.
- Public policy support through targeted financial incentives to help fund sustainable infrastructure and programs, codes and regulations, and tax system revisions to reward climate-friendly choices and discourage emissions-intensive options.
- Alignment of utility company programming to support and verify data-driven continuous performance improvement.

Elements of this model are already emerging in Canada. In Ontario, the *Energy Conservation Leadership Act*, proclaimed in 2006, requires energy reporting, action plans and energy targets for all government and publicly funded facilities[9]. The province has strengthened the *Ontario Building Code* to be the most supportive of energy efficiency in Canada. Ontario's Social Housing Services Corporation has adopted the model for its *Green Light Initiative* to serve more than 250,000 social housing units across Ontario[10]. Toronto & Region Conservation's vision of *"The Living City"* has, over the past five years, launched large-scale energy programming for the health care, schools, municipal and residential sectors. With support from the Ontario Power Authority, the Building Owners and Managers Association is engaging Toronto's commercial building owners in comprehensive energy conservation projects. The Association of Colleges of Applied Arts and Technology of Ontario (ACAATO) has created an Energy Secretariat to coordinate a growing number of projects in Ontario's community colleges.

The LEED Canada Initiative (LCI)[11]

This model is also at the heart of the LEED Canada Initiative (LCI), an ambitious, multi-year project of the CaGBC aimed at massive scaling up of green building market penetration and performance outcomes. The LCI was launched in October 2006 at the CaGBC board of directors' strategic planning meeting in Calgary, Alberta[12]. This watershed meeting addressed the high level of awareness and concern about climate change among Canadian governments, corporations and the public-at-large. The success to date in building the CaGBC organization, combined with the brand power of LEED, presented a remarkable opportunity and challenge to create a buildings-centric climate change strategy for Canada which might be replicated in other parts of the world.

By 2015, the CaGBC aims to recognize 100,000 buildings and 1 million homes (new and existing) using 50% less energy and water than the 2005 baseline for their building type. Achievement of this goal will realize 50 MT/year reduction in GHG emissions in 2015, while setting the stage for net-zero buildings and communities by 2030. These targets represent about 20% of all buildings and 10% of all homes in Canada, and require an enhancement of the LEED Canada rating system and an entirely different approach to the delivery.

[9] Ontario Ministry of Energy, Energy Conservation Leadership Act 2006
[10] Social Housing Services Corporation, *Energy Management Program, Report to the Board*, August 2004
[11] Canada Green Building Council, *LEED Canada Initiative*, 2008
[12] Canada Green Building Council*, Strategic Plan*, 2007

The LCI is integrating LEED tools for new and existing buildings, harmonizing prerequisites and credits, and supporting best practices at all stages of a building's life cycle. It is also streamlining the process to lower costs and shorten the time required for certification. The next generation of LEED Canada will be web-based and incorporate actual performance-based energy and water efficiency credits on an ongoing basis. The updated rating system will ensure new and existing buildings are designed, operated and used for optimum efficiency, realizing the greatest possible environmental benefits and asset value. Distributed, online and market-based LEED delivery will allow rapid scaling up of certified buildings, while verifying actual performance and emissions reductions. Key elements include:

- **Custom credit sets** – flexibility to select project-specific prerequisites and credit sets based upon building type and life cycle parameters. These will consider actual energy and water use performance, and emphasize carbon emission reductions.
- **Web-based delivery** – lower cost and less time for project teams, while providing a value-added building performance management system for owners and managers to support continuous performance improvement.
- **Performance-based certification** – design and performance standards for all building types established through actual energy and water billing data, to support performance feedback to building owners, operators and designers.
- **Technical rigour** – best current scientific, risk and life cycle assessment knowledge developed in collaboration with leading standards organizations.
- **Certification at all key life cycle milestones** – performance-based certification at distinct stages of a building's life cycle to foster a long-term relationship with LEED, and develop an energy and environmental history for the building. LEED will shift from a "one-time intervention" tool into an on-going management system for buildings and land development.
- **Scalability** – distributed, online delivery, engaging building owners and managers as well as program and service providers.

Transition to the Next Generation of LEED Canada

The first phase of development is underway. Large-scale national pilot projects are being conducted to establish energy and water performance standards, beta test certification processes and tools, determine educational requirements, and develop best practices for building owners and managers, programs, certifiers and assessors. The first pilots are addressing several hundred K-12 schools, 60 commercial office buildings covering over 30 million sq ft, and more than 100 federal, provincial and municipal administration buildings. The pilots include benchmarking of energy and water use, estimation of conservation potential, and building performance audits of the most efficient buildings. Workshops with participants begin in May 2008, and will assess the energy and environmental performance of their buildings and the development of action plans to move building portfolios towards LEED certification.

The LCI is providing a forum for Canadian practitioners and industry leaders to join the CaGBC in the development and delivery of effective solutions that accelerate the greening of buildings across the country, and achieve significant and measurable benefits particularly in greenhouse gas emission reductions.

Shifting into the Mainstream. The CaGBC's national summit, to be held from June 11-12, 2008 in Toronto, will present the overall concept and details of the LEED Canada Initiative, the findings of the pilot projects, and the plans for the ongoing LCI development. The most efficient buildings will be profiled and those facilities whose performance fall short will be encouraged to upgrade their equipment and performance in a continuous improvement cycle, and the summit will showcase Canadian solutions for achieving and sustaining high performance buildings.

Conclusion

Changing direction, from our current upward energy use and greenhouse gas emissions trajectory, to a decline to below 1990 levels, can be visualized, is attainable, and is absolutely essential. Its realization requires a corresponding change of direction in public policy, energy efficiency programming and allocation of responsibilities and resources. A long-term effort is required which can adapt to new learning and ever-changing circumstances. Governments have a crucial role to play, but industry-led organizations like CaGBC can move faster in response to the needs of its members. New, integrated and collaborative models are needed for the buildings' industry, owners, governments, educators, associations and utility companies to work together to effect real, accountable change. Above all, changing direction demands individual, community and corporate acceptance of responsibility for their greenhouse gas emissions, and the accountability framework to support and verify action.

The LEED Canada Initiative can enable large-scale and immediate results, while guiding a national, buildings-centric climate change strategy. Since May 2007, Canada has been home to the new secretariat of the World Green Building Council, which serves as a global hub of climate change response in the buildings' sector and will allow the LCI methodology to be shared with other regions of the world.