Achieving a Sustainable Building Stock

How buildings can become part of the solution.

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About Stantec

Stantec provides professional consulting services in planning, engineering, architecture, interior design, landscape architecture, surveying, environmental sciences, project management, and project economics for infrastructure and facilities projects. We support public and private sector clients in a diverse range of markets, at every stage, from initial concept and financial feasibility to project completion and beyond. Our services are offered through approximately 9,300 employees operating out of more than 150 locations in North America.

Stantec is recognized as a world-class leader and innovator in the delivery of sustainable solutions. Our Sustainable Development practice area is responsible for coordinating performance improvement projects which reduce the environmental and social impacts of our organization as well as growing Stantec's sustainability consulting business. We help organizations enhance their performance by identifying, planning for, and realizing social, environmental and economic improvements. Within the broad framework of our integrated sustainability practice, we provide a single source for comprehensive planning, policies, and program development for clients as small as a single office, to multi-national corporations and to community and government organizations.

Biography

As the sustainable design coordinator at Stantec Klaas has more than 30-years of building design industry experience and is an active member of Stantec's Sustainable Solutions team. He has been a LEED® Accredited Professional since 2003 and is the Immediate Past Chair of the Alberta Chapter of the Canada Green Building Council and Past Chair of the CaGBC Leaders Forum, a committee comprised of the senior executives from all eight Canadian Chapters. For the last 3 years he has been the Chair of the Sustainable Building Symposium held annually in Edmonton and Calgary. He leads workshops and charrettes on LEED® and presents on the topic of sustainable buildings to a broad audience.

Abstract

Buildings are directly responsible for more than a third of all energy used and more than 50% of natural resources consumed in Canada. As a significant part of the problem, buildings also present part of the solution. Although buildings look permanent, they are actually replaced or renewed on a perpetual basis. Municipalities can take advantage of this continual renewal cycle to significantly grow their stock of sustainable buildings by expecting higher standards for new buildings and encouraging existing building owners to engage in green renovations. Building codes are slow to change and focus on life safety, health and accessibility and not environmental performance. Therefore the most effective way to accelerate the transformation from market driven, code minimum buildings to sustainable high-performance buildings is through voluntary rating systems such as LEED® (Leadership in Energy and Environmental Design). These voluntary rating systems provide building owners independent third party verification of their building's sustainable achievements. To grow their stock of sustainable buildings cities can deploy a number of strategies that encourage building owners and developers to go beyond the minimum requirements of the building codes and require them to achieve increasingly higher performance levels with the ultimate goal being NetZero impact. Edmonton has a unique opportunity with the EXPO 2017 bid and the redevelopment of the Municipal Airport Lands to lead the world in exploring sustainable development.

Introduction

In Canada, buildings are responsible for: 33% of all energy used, 50% of natural resources consumed, 12% of non-industrial water consumed, 25% of landfill waste generated, 10% of airborne particulates produced, and 35% of greenhouse gases emitted.[1] With that large an impact on a city's ecological footprint it is important for a city to incorporate buildings into their greening strategies and to ensure that they are growing their sustainable building stock quickly. To achieve this, cities will have to play an active role in encouraging building owners to develop facilities that significantly surpass the minimum codes in place today. Building codes are generally created to ensure life safety, health and accessibility of the occupants, not environmental performance. Today it is no longer sufficient to just meet minimum codes, which serve only to reinforce the business as usual scenario. To be accepted as sustainable in today's marketplace and to stay relevant in the future, buildings must exceed existing codes and standards by a significant measure.

To accelerate the transformation of buildings from the minimal performance norm dictated by building codes into high-performance sustainable facilities, a number of voluntary rating systems have been developed around the world. These rating systems reward owners with independent confirmation of their building's level of sustainability. Also known as high-performance buildings, green buildings are intended to be environmentally responsible, economically profitable and healthy places to live and work[2]. Although they have no legal standing, these rating systems allow designers, owners, and the public to compare their buildings to the best in class. This comparison encourages competition and fosters innovation. By leading the way on their own facilities and encouraging building owners and operators to use these voluntary rating systems when developing their next project, cities can accelerate the growth of their sustainable building stock.

Voluntary Rating Systems for Sustainable Buildings

The following is a high level overview of the most common voluntary rating systems for sustainable buildings currently in use around the world: [3]

BREEAM *(Building Research Establishment Environmental Assessment Method)*[4], United Kingdom
Initiated in 1988, this is the oldest and the first widely adopted rating system in the world. It covers offices, homes and industrial units. BREEAM assesses building performance in the following areas: management, energy use, health and well being, pollution, transport, land-use, ecology, materials and water. Buildings are rated on a scale of Pass, Good, Very Good, or Excellent.

CASBEE *(Comprehensive Assessment System for Building Environmental Efficiency)*[5], Japan
CASBEE offers a suite of tools for the various phases of a building's lifecycle: planning, design, completion, operation, and renovation. Buildings are rated on their eco-efficiency and environmental loading in categories such as: indoor environment, quality of service, outdoor environment, energy, resources and materials, and off-site environment. Buildings are rated on a scale of 0.5 to 3.

LEED *(Leadership in Energy and Environmental Design)*[6], North America
Based on BREEAM, LEED NC 1.0 was issued in the United States in 1998 as a pilot and version 2.0 was issued as a full rating system in 2000. LEED Canada-NC 1.0 was launched in 2004. Since then, there has been exponential growth in the number of LEED-registered and -certified buildings, as well as the number of LEED Accredited Professionals. LEED has become almost a de-facto standard for new sustainable buildings and according to some, it has become the most successful voluntary rating system in the world. New rating systems have been launched to cover: new buildings and major renovations, commercial interiors, existing buildings, neighborhoods, and homes. Projects are assessed in the following areas: sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality and innovation and design processes. Buildings are rated on a scale of certified, silver, gold, or platinum.

Green Star[7], Australia
This is a new assessment system based on BREEAM and LEED which is customized for the Australian market. Green Star assesses buildings in the following areas: management, indoor environmental quality, energy, transportation, water, materials land use and ecology, emissions, and innovation. Buildings are rated on a scale of 6 stars, with six stars representing international leadership.

BOMABest *(Building Owners and Managers Association Building Environmental Standards)*[8], Canada
This system offers a checklist for existing commercial buildings in six sections: energy, water, waste reduction and site, emissions and effluents, indoor environment, and environmental management systems. Buildings are rated on a scale of 1 to 4.

Built Green Canada[9]
Built Green is a check list developed specifically for homes in Alberta and British Columbia. It assesses a home in the following categories: operational systems, building materials, exterior & interior finishes, indoor air quality, ventilation, waste management, water conservation, and business practices. Homes are rated on a scale of bronze, silver, gold, and platinum.

The 2030 Challenge[10]
A challenge developed by Ed Mazria, this program asks the global architecture and building community to adopt a series of targets that would result in the design of all buildings to be carbon neutral by the year 2030.

Living Building Challenge[11]
Developed by the International Living Building Institute and first published in November 2006, the Living Building Challenge is the newest ratings system which moves beyond LEED. It uses the flower as a metaphor and is comprised of seven petals and 20 imperatives. The petals represent: site, water, energy, health, materials, equity, and beauty. The Living Building Standard sets higher performance standards across a more comprehensive set of criteria than required by regulation or any other voluntary rating systems currently in use. "It challenges us to ask the question: What if every single act of design and construction made the world a better place?" To date, there are no buildings that have achieved this certification, however more than sixty are currently underway.

Although these voluntary rating and assessment systems were developed in different parts of the world, their common intent is to transform the industry from business as usual to high-performance low impact developments. Performance criteria are often framed as a percentage improvement over a particular code or accepted standard. For example, LEED Canada-NC 1.0 awards 1 point if the building exceeds the Model National Energy Code for Buildings (MNECB) by 24% and a maximum of 10 points if it exceeds the MNECB by 64%. All of these voluntary rating systems have a checklist that is used as a framework by the design team, and all of them award a level of achievement that can be used by building owners to market their facility. We are now seeing premium rents being offered for LEED-certified buildings as well as penalties for not achieving specified levels of certification.

Sustainable Building Strategies

The following is a high level overview of common strategies employed by the most popular voluntary rating systems for sustainable buildings. Individual green buildings will not necessarily incorporate all of these measures; instead integrated design teams will select those that are most appropriate for a particular project's goals and objectives.

Sustainable sites
Finding a suitable site for a building has a significant impact on its environmental performance. Channeling development to urban areas with existing infrastructure protects green fields and preserves habitat and natural resources. Often there are opportunities to rehabilitate damaged or contaminated sites, thus reducing pressure on undeveloped land.

At the same time, greater access to transportation infrastructure which is present in higher density areas offers better opportunities for building occupants to make use of alternative modes of transportation such as walking, biking, and public transit. This is important, as for an American office building built to modern energy codes, more than twice as much energy is expended by office workers commuting to and from the building than is consumed by the building itself for heating, cooling, lighting, and other energy uses.[12] Special attention should be paid to eliminating stormwater runoff from the site and into the city's storm drainage system and treatment plants. This is especially important in Edmonton where all of this stormwater needs to be treated before returning it to the North Saskatchewan River. The use of rain gardens and bioswales can be used to increase on-site infiltration.

Urban centres often experience a heat island effect. This refers to the thermal gradient differences between developed and undeveloped area due to dark surfaces that absorb the sun's radiation creating an artificial microclimate. Providing light color or reflective surfaces on a building's roof and site will reduce this heating effect. Providing green roofs or walls on the building itself will achieve the same thing by providing shade as well as stormwater absorption and views of nature for the occupants.

Water Resources

Water is rapidly becoming a scarce resource and as such we need to ensure that buildings employ good water management strategies. This starts with taking advantage of water that is free – rainfall – then using the rest as efficiently as possible. For buildings and homes this means installing water efficient flush and flow fixtures, employing efficient irrigation systems, and constructing water efficient landscaping such as xeriscaping or nativescaping which uses native trees and grasses adapted to the local climate. For homes, one of the best things you can do to save water is to get rid of your lawn, which uses large quantities of water, fertilizer, weed killer, and gasoline for lawn mowers. Reducing or replacing sections of your lawn with native grasses, trees and shrubs will significantly reduce the environmental impact and greenhouse gas (GHG) emissions of a neighborhood. In Edmonton, nativescaping is a viable option and harvested rainwater can be used to flush toilets.

Energy Efficiency

The energy used by a building for heating, cooling and lighting represents a significant portion of its environmental impact. Canadian commercial and institutional buildings are responsible for approximately 37% of Canada's primary energy consumption[13] and close to 70% of the electricity produced annually. The GHG emissions of a building will depend upon its consumption as well as the source of the energy. A 100 megawatt electrical (MWe) power plant produces daily: 30,000 tons of carbon dioxide (CO_2), 600 tons of sulfur dioxide (SO_2), 40 tons of mono nitrogen oxide (NO_x), and 600 tons of fly ash. Replacing energy

derived from fossil fuels with renewable sources results in significant reductions in emissions as well as reduction of other harmful effects.

According to the Rocky Mountain Institute, 20% of the energy used in the life of a building is embodied energy consumed in the harvesting, processing and transportation of the materials used to construct it and 80% is used to operate the building. So a modest investment in time and capital at the design and construction phase will pay off multiple times over the life span of a building.

A building's energy consumption during its operation phase can be significantly reduced through best practices that are economical and readily achievable. Optimizing a building's performance starts with an efficient envelope, the skin of the building. The more effective the envelope, the smaller the systems, the less energy will be required to heat and cool the building, and the more comfortable its occupants will be. An effective building envelope can be achieved by improving the overall R-value with strategies such as using thicker insulation, triple glazing, and double façade walls. For existing buildings, the concept of "re-skinning" will become increasingly popular as existing curtain walls reach the end of their useful life after 30 to 50 years. In Europe, very energy efficient buildings have been constructed at higher latitudes and winter climates, demonstrating that the same is possible in Edmonton.

The majority of electricity is consumed by lighting and plug loads. Strategies for reducing these loads include daylight harvesting and turning things off when not in use. By using a combination of sensors and social marketing campaigns, buildings can significantly reduce their electricity consumption. As most electricity in Alberta is produced by coal-fired generators, buildings here have higher emissions than in other regions. Therefore, electricity is an important area of opportunity for reducing the environmental impact of our buildings.

Achieving NetZero energy and CO_2 emissions starts with making a building as efficient as possible and then using renewable energy sources such as solar (photovoltaics, thermal), geo-exchange, wind, or biomass. This can be done on a macro scale by purchasing green power certificates or on site by installing a combination of geo-exchange systems for heating and cooling and solar photovoltaic panels or small wind turbines for electricity. It is easy to imagine a building that produces more energy than it consumes on an annual basis by selling its surplus back to the grid.

Materials

Buildings use large quantities of materials that have to be extracted, processed and transported to the site. Most of these materials are only used once before being disposed of in a landfill. Green buildings need to divert as many materials as possible from landfill by reducing waste during construction, reusing materials wherever possible, and using materials with high recycled content in order to reduce demand for virgin materials along with the environmental impacts

associated with their extraction and processing. Further benefits can be gained by using regional and rapidly renewable materials, such as regionally harvested and processed materials, rapidly renewable materials with a harvest cycle of less than 10-years, or certified wood from the Forest Stewardship Council (FSC), which ensure that the wood was harvested and processed in an environmentally responsible manner.

Further reductions in materials use can be achieved by reusing existing buildings wherever possible. The greenest building of all is the one we never have to build.

Indoor Environment

By far the largest cost of operating any commercial or institutional building is the salaries of the people working in them. Therefore, achieving only a 1% or 2% improvement in productivity through reduced absenteeism by providing a healthy indoor environment will pay for itself many times over. This can be achieved by providing occupants with better access to daylight, views of nature, more operable windows, and individual climate controls. Air quality can be improved by ensuring the use of materials which emit low amounts of volatile organic compounds (VOCs), such as adhesives, sealants, paints, carpets, composite woods, and furniture.

Sustainable Building Operations and Lifestyle Considerations

The impacts of a building upon the environment are felt throughout its lifecycle. Findings from the CaGBC GREEN UP building performance program indicate that how a building is operated and maintained has a significant impact on its performance. We can design the most energy efficient building possible, but if it is not operated or maintained properly, its benefits will be significantly reduced. Unfortunately, low cost energy saving measures are often ignored at the expense of more costly and sexy building improvements such as integration of rooftop solar panels. This propagates the mistaken belief that energy efficiency is expensive and has a long-term payoff. Until recently, LEED offered only a one time intervention at the design and construction phase, as this standard did not include any requirements to operate the building efficiently. Fortunately, LEED has recently released a standard for existing buildings which will hopefully greatly improve sustainable building operations over time.

Lifestyle choices of a building's inhabitants can also have a significant impact on its environmental performance over time. For example, seven years after the first residents moved into the Beddington Zero Energy Development (BedZED), a 100 home community located south of London, England, a study found that lifestyles accounted for about half of the eco-savings.[14] Accounting for sustainable lifestyle considerations when the community is being built is key, as is ensuring that occupants are continuously informed and engaged. In commercial buildings, one of the most effective ways of achieving this is through the formation of Green

Teams that meet regularly in order to recommend, initiate, and implement efforts to reduce the environmental impact of the building's operations.

Green teams can help to prioritize environmental issues of primary concern to occupants and can help to devise effective ways of reaching out to occupants and engaging them in environmental programs. For example, occupants can be encouraged to participate in energy-savings initiatives through contests, workshops, or participation in community events. Similar programs can encourage occupants to conserve or reuse water, reduce waste, recycle, and reuse materials, all of which will improve the environmental performance of a building. Edmonton boasts one of the best municipal waste management programs in the world and various options are available for reducing, reusing, and recycling materials responsibly, such as the Edmonton Reuse Directory. Excellent commercial programs are available for recycling paper, cardboard, and beverage containers. Other programs exist for disposing of electronic waste, household hazardous wastes, plastics, and metals. However, these primarily residential programs should be expanded and made more easily accessible to corporations, at a fee if necessary.

Accelerating the Transformation to Sustainability

The concept of sustainability has only been around for a short time. The Brundtland Report that defined the term sustainable development was only published in 1987, less than 25 years ago. For the building industry, where the design and construction process can take years and people will occupy a building for decades, this is a very short timeframe in which to transform. Unlike the computer industry, where new products are introduced monthly and devices become obsolete in less than a couple of years, buildings take a long time before they are renovated or replaced and they do so at different rates.

There are three basic kinds of building types that comprise a city – commercial, domestic, and institutional. Each responds to a changing environment quite differently. Commercial buildings adapt very quickly, often radically, to intense competitive pressure to perform, domestic buildings respond directly to family ideas, growth and prospects, while institutional buildings are designed specifically to prevent change.[15] As a result, the lessons learned, primarily through occupancy evaluations, take a disproportionately longer time to be incorporated into new institutional buildings. This slows the rate of innovation within the industry. When developing sustainable building policies, municipalities need to take this into account.

Slowing innovation even further is the fact that building codes are slow to incorporate the findings of lessons learned. Due to their focus on life safety, health, and accessibility, and due to numerous local amendments and the burden of enforcement, building codes are not well suited to drive the transformation towards more sustainable buildings. As legal entities, they are slow to change

and adapt to innovation and rapidly changing environmentally driven performance targets. For example, the MNECB took 5 years to develop and it has not been updated since 1997, making its data more than 15 years old. The National Building Code (NBC) is updated every 10 years, having last been issued in 2005. Because of their legal standing, building codes establish minimum standards and hence define the baseline or business as usual case for a community's building stock.

In Canada, the federal government produces the NBC, which in turn is adopted by individual provinces or, as is the case in Ontario, British Columbia, and Alberta, is published with local variations. Furthermore, municipalities can make their own amendments from time to time. What the NBC has not traditionally dealt with is environmental performance such as water and consumption, CO_2 emissions, or environmentally preferable materials, which have only recently come to forefront. One example of codes lagging behind the industry is water efficiency. A decade ago, standard toilets used 12 liters per flush. New toilets installed now use only 6 liters and 4.5 liter and 3 liter fixtures will soon be available. Beyond that, waterless urinals and composting toilets are a viable option for some projects. Unfortunately, however, pipe sizing in the current plumbing codes are still based on 12 liter fixtures, thus requiring larger pipes and associated insulation throughout the building. Rainwater harvesting and gray water systems are another example of systems not yet recognized by the plumbing code in most Canadian jurisdictions, although you can get local variances for toilet flushing and underground irrigation. Municipalities can avoid the costs associated with construction and operation of unnecessary water and wastewater infrastructure by supporting updated building codes.

To address the energy side of the equation, the Canadian Government issued the Model National Energy Code for Buildings (MNECB) in 1997 based on the 1989 ASHRAE standards. This model code offers minimum standards for the energy performance of new buildings. It is partially prescriptive and partially performance based, however it is not legally binding and has not yet been adopted in Alberta although it is widely used alongside the ASHRAE 90.1 standard as a best practice within the industry. Similar model codes have been introduced in California (Title 24) and the European Union (EPBD), the latter of which was written in 2002 and is coming into force in 2010 as each nation implements it individually. Edmonton should support the use of MNECB in Alberta.

In contrast to the slow evolution of building codes, voluntary rating systems for sustainable buildings encourage and accelerate innovation in the traditionally conservative building industry. Awards associated with such rating systems provide extra value to buildings and are proof of their owner's social and environmental commitment. This motivates building owners to spend a little more time, effort and investment during the design and construction phase in order to harness the return on their investment through the lifecycle of their building. At

the same time, it speeds up the creation of a knowledge base that can be accessed by building professionals as evidence that that their green designs will work as intended. This evidence-based design is becoming the norm rather than the exception as sustainable buildings move into the mainstream, drawing upon the knowledge gained from the pioneering efforts of the early adopters.

North American designers are currently looking towards northern Europe for knowledge and inspiration. European buildings tend to outperform North American buildings in energy and water consumption per square meter. This is especially relevant to the Canadian industry given that some of the best examples are at latitudes higher than Edmonton. Europeans have lived with higher energy costs than North Americans and as a result innovation, especially when it comes to energy, is largely driven by necessity. European culture also takes a long-term performance-oriented approach to buildings as compared to North American culture, which has a much shorter-term focus. In North America, initial capital costs tend to be considered much more important than long-term operational costs, which are typically passed on to the tenants.[16]

European design principles have been applied to the 690,000 square foot 22 storey Manitoba Hydro building in Winnipeg, Manitoba. Winnipeg's climate presents design challenge, as temperatures range from minus 35^0 C to plus 35^0 C, humidity is bone dry in the winter and humid in the summer and it is one of the windiest places in North America. The design solution for this building was a 22 storey thermal chimney that promotes natural ventilation in combination with a six storey chain of Mylar strips with water running down them which humidifies the building in the winter and cools it in the summer.

Model sustainable buildings in the residential sector include Hammarby Sjöstad in Stockholm, Sweden[17], which is a community of 35,000 people built on a converted old industrial and harbor area. The community uses a unique eco-cycle that has become known as the Hammarby Model which integrates energy, water and waste within the site. This includes an energy centre fueled by the community's solid waste, collected through underground chutes, that generates electricity as well as district heating and cooling for buildings. Sewage sludge is converted into biogas for vehicles and fertilizer and stormwater is treated on site. Solar panels on the roof provide electricity as well as domestic hot water. Dockside Green in Victoria, British Columbia[18] uses a lot of the same principles for its LEED Platinum 12 acre mixed-use development on a brownfield site. The development features low domestic water consumption through efficient fixtures and the use of reclaimed water for flushing toilets, as well as reduced energy usage through superior building envelope, high efficiency boilers, low energy lighting and a biomass cogeneration plant and district heating system. Closer to home is the Emerald Hills Urban Village in Strathcona County, Alberta, [19] a sustainable neighbourhood designed with the goal of a single planet footprint.

The above examples are just a few of the leading edge developments currently underway. The common thread is that they all greatly exceed the minimum business-as-usual requirements set out by local building codes. For the most part, environmental performance improvements are achieved through voluntary measures and the effective use of technologies readily available within the industry. The lessons learned from these innovative projects will build a knowledge base that can be replicated by building professionals throughout the world as they seek to transform the industry with the ultimate goal of Net Zero. In a Net Zero world, a building, community or city will produce as many resources as it consumes on an annualized basis and communities will facilitate people living a sustainable lifestyle

As we move into the future, new technologies and new ways of applying them will change the urban landscape and will bring us closer to a Net Zero built environment. Some of the concepts being explored right now include buildings that generate more energy than they consume. In Ontario, for example, building owners are putting a price on leasing their roof space so that power generating companies can fill them with solar panels. These rooftops of photovoltaics will feed power into the grid at flow in tariff (FIT) rates of just over 80 cents per kilowatt hour (kWh). As we electrify our transportation, starting with plug-in hybrid vehicles, these smartgrids would use plugged in electric vehicles for electrical storage and back-up use during peak periods. Advancements in digital technologies will result in buildings that respond to their environment and internal loads by, among other things, opening windows for ventilation, deploying solar shading, harvesting daylight, and turning systems off when areas are unoccupied. There are even plans to build vertical farms in the middle of the city. A 30 storey building covering a square block could produce the same amount of food as 2,400 acres of farmland that could thus be decommissioned and returned to nature. There is no doubt that advanced technologies will radically improve the environmental performance capabilities of sustainable buildings over time.

Growing a Sustainable Building Stock in Edmonton

Significantly growing its stock of sustainable buildings will help Edmonton to reduce its carbon emissions and will also help Edmontonians to lead more sustainable lifestyles. In order to achieve this, the City will need to transform its existing minimally performing building stock into high-performance buildings over the next 30 to 50-years. To accelerate this process, the City can make use of existing and future voluntary rating tools and encourage the marketplace to go beyond the minimum requirements of various business-as-usual building codes. The City of Edmonton can also influence what buildings are constructed through building permits, zoning laws, and how it handles services such as water and waste management, provision of utilities, , and construction of infrastructure. In Toronto, for example, all new buildings over a certain size must have a green roof, while in Chicago buildings with green roofs are given preferential permit approvals. In Alberta, Calgary has a policy that all new facilities they fund be

constructed to a LEED Gold standard, while Alberta Infrastructure and the City of Edmonton requires only LEED Silver.

Edmonton can further accelerate the construction of sustainable building stock through the development of green financial tools that provide incentives for building and home owners to upgrade to a more sustainable building. Owners can make significant improvements to their building by strategies such as adding water saving fixtures and rainwater harvesting systems, improving the performance of their building envelope, installing energy management systems that quantify savings, providing shading to reduce cooling loads, and add solar panels. All of these strategies require capital funding. Even with relatively short paybacks, owners have significant barriers to overcome including high discount rates, cash-poor small businesses, lack of understanding or time to research options, and uninterested banks. To facilitate rapid uptake requires a one stop program, assurance of actual energy savings, and a critical mass of projects to reduce costs. By bringing financial tools to the community, we can stimulate the green economy by stimulating green investments which will lead to green businesses and green jobs. One strategy is to attach green loans to the property bill, similar to a Local Improvement Charge (LIC) in the US which is referred to as PACE (Property Assessed Clean Energy). In Canada, this would require a charter change, which Toronto and Vancouver are actively seeking. Once a new charter is in place, the City could then create green funds or green bonds that aggregate the loans and secure them through property assessment collection.[20] Examples of this approach include the City of Berkeley's Renewable Energy Financing Districts[21] or the City of San Francisco's GreenFinanceSF program, [22] both include green funds tied to the property tax bill payment service offered by the city.

Conclusion

As a northern city in an extreme climate, Edmonton already has a higher performing building stock than most of its southern counterparts, however, it can learn a lot from Northern European cities whose buildings outperform their North American counterparts by a significant margin. Although building codes set a minimum standard for building performance, they change too slowly to respond to the urgent nature of global climate change. If Edmonton wants to grow its sustainable building stock as part of its "The Way we Green" strategy, it will have to rely on voluntary assessment programs such as LEED, BOMABESt or the Living Building Challenge. These voluntary rating programs continually raise the performance bar towards a NetZero end game, at which time there will be no more green building, as all buildings will be sustainable in nature.

Edmonton has a unique opportunity to lead the world in sustainable buildings by inviting the world to explore a sustainable future at EXPO 2017 and by developing a site that is a model of community sustainability. Another terrific opportunity for Edmonton to take a leadership role in this area is by developing

the City Centre Airport Lands into one of the most sustainable communities in the world, building upon the knowledge gained by some of the best global examples. The knowledge and talent gained through these catalyst projects will generate green jobs within Edmonton and Alberta and will enable Edmonton to begin exporting its technological and strategic expertise as a recognized leader in the sustainable building industry.

Notes and Resources

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