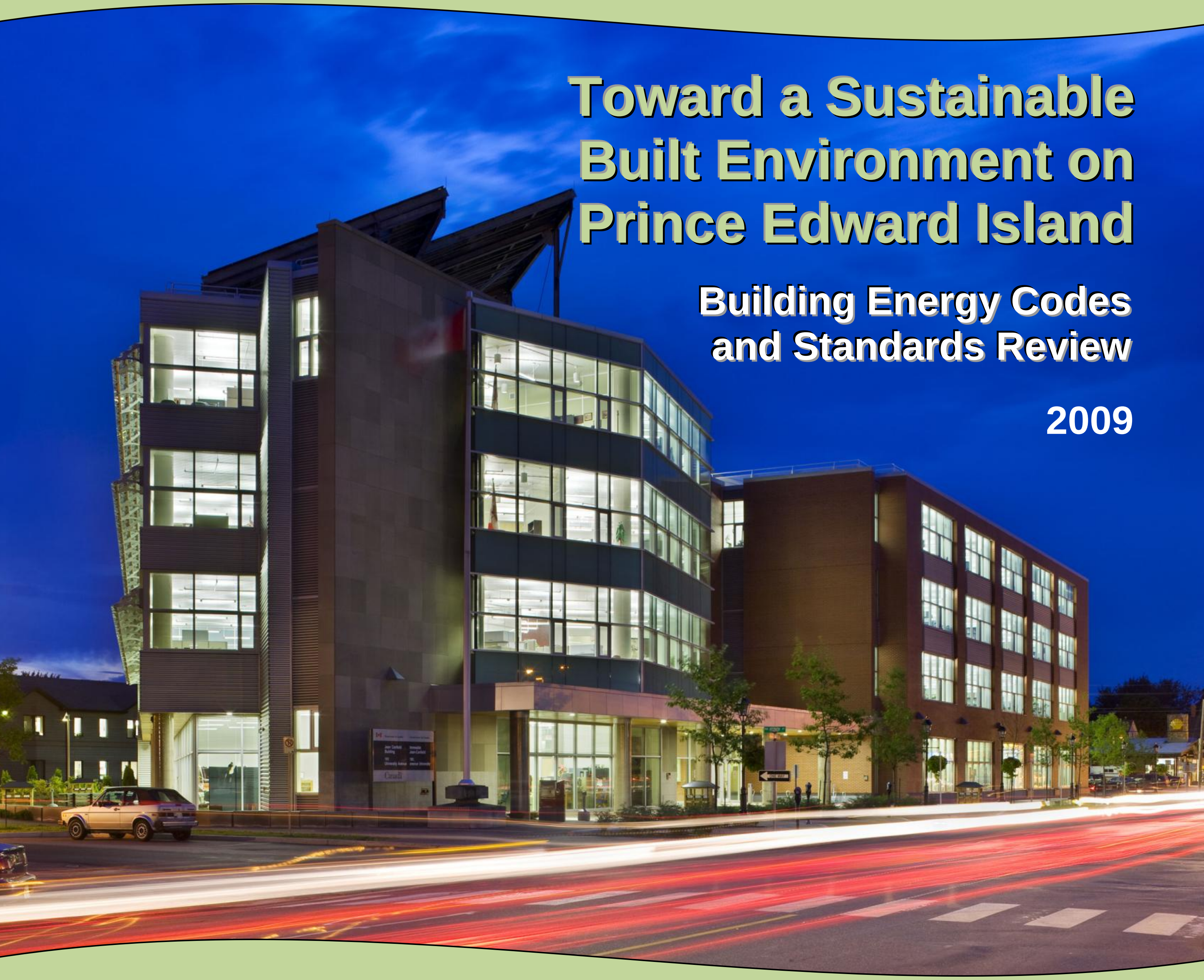
Toward a Sustainable Built Environment on Prince Edward Island

Building Energy Codes and Standards Review

2009



About Us

The Atlantic Canada Sustainable Energy Coalition (ACSEC) is an alliance of four community-based environmental organizations that offer expertise in policy research and analysis, project implementation, and public education. Coalition members include: The Environmental Coalition of Prince Edward Island, The Ecology Action Center in Nova Scotia, The Conservation Council of New Brunswick, and The Sierra Club of Canada – Atlantic Canada Chapter. ACSEC takes action on climate change by promoting a strategy for the adoption of renewable, green energy and improved energy efficiency that is rooted in sound community economic development.

The Environmental Coalition of Prince Edward Island (ECO-P.E.I.) is a community-based action group formed in 1988. ECO-P.E.I.'s goal is to work in partnership with others and the land itself in order to understand and improve the Island environment. Our work centers on education, advocacy and action. On-going projects include The Macphail Woods Ecological Forestry Project and the ECO-P.E.I. Energy Project.

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1.0 Introduction

There is a vital need for sustainable living in our culture. However, in 2003 it was estimated that Prince Edward Island's ecological footprint was 2.2 times larger than its geographical area.[1] If everyone consumed at these levels, we'd need over 4.7 *planets Earth* to provide the necessary resources and waste assimilation capacity.[2]

Fortunately, changes to buildings can significantly reduce our footprint and save life-cycle costs. Thus, a common objective in buildings should be to lower our footprint while serving the ecology and economy. This review focuses on adaptive frameworks to manage new building starts, including building energy efficiency standards, to support these shared objectives.

The Island has led all provincial waste systems in Canada with its Waste Watch program, diverting over 60% of total waste from landfills, thus helping to protect the environment for future generations.[3] Similarly, by establishing a strong approach to reduce waste energy from buildings, we can:

- *work to achieve carbon neutral or net-zero energy in all new buildings by 2030;*
- *cost-effectively reduce building energy use up to 25% over a ten year period;*
- *protect the environment;*
- *create more jobs per dollar invested than wind energy;*
- *protect consumer confidence;*
- *improve air quality, health, quality of life and;*
- *address climate change and other environmental concerns.*

With so many benefits to building energy efficiency, how come there is no province-wide building energy code on P.E.I.? How come there are so few approaches taken to enable the full capture energy efficiency potential? Well, many jurisdictions were slow to recognize the importance of building energy codes as their benefits were less understood. Since the oil embargo of the 1970's however, and especially in recent years, there have many successful examples of how building energy codes and technologies have made it much easier to apply building energy standards. Thus, jurisdictions everywhere are advancing energy efficiency in building codes and P.E.I. has committed to the adoption of building energy codes and standards.

The goal of this paper is to review North American trends in implementing minimum new building energy codes, identify strategies that encourage new buildings to be constructed beyond minimum energy codes and offer recommendations that are both progressive and achievable, in order to proactively address energy use in new buildings on P.E.I.

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1 http://www.gpiatlantic.org/ppt/environmental/P.E.I.-footprint.ppt
2 http://www.gpiatlantic.org/ppt/environmental/P.E.I.-footprint.ppt
3 http://www.iwmc.pe.ca/2007%20combined%20report.pdf

2.0 Challenges to Energy Efficiency in Buildings

Prince Edward Island has multiple challenges to becoming more energy efficient within the built environment. Figure 1 lists some of the fundamental attributes and opportunity-specific barriers associated with pursuing energy efficiency. These barriers are categorized by structural, behavioural or availability issues. Opportunity-specific solution strategies and the components of an overall strategy to address and overcome barriers to efficiency are both illustrated.

Figure 1: Multiple Challenges Associated With Pursuing Building Energy Efficiency on P.E.I.

FUNDAMENTAL ATTRIBUTES OF ENERGY EFFICIENCY

- **Requires outlay:** Full capture of even modest potential (9% savings over baseline projections over a ten year period in residential, commercial and institutional buildings) would require an initial outlay of roughly $85.6 million.[4] Full capture of all cost-effective savings in these sectors (25%) over a ten year implementation period would cost even more.
- **Fragmented:** Potential is spread across thousands of locations and millions of devices
- **Low mind-share:** Improving efficiency is rarely the primary focus of any in the economy
- **Difficult to measure:** Evaluating, measuring and verifying savings, is more difficult than measuring consumption, impairing investor confidence

OPPORTUNITY-SPECIFIC BARRIERS

Structural

- **Agency:** Incentives split between parties, impeding capture of potential
- **Ownership transfer issue:** Owner expects to leave before payback time
- **Transaction barriers:** Unquantifiable incidental costs of deployment
- **Pricing distortions:** Regulatory, tax, or other distortions

Behavioural

- **Risk and uncertainty:** Regarding ability to capture benefit of the investment
- **Lack of awareness/information:** About product efficiency and own consumption behaviour
- **Custom and habit:** Practices that prevent capture of potential
- **Elevated hurdle rate:** Similar options treated differently

Availability

- **Adverse bundling:** Combining efficiency savings with costly options
- **Capital constraints:** Inability to finance initial outlay
- **Product availability:** Insufficient supply or channels to market
- **Installation and use:** Improperly installed and/or operated

OPPORTUNITY-SPECIFIC SOLUTION STRATEGIES

- **Information and education**
- **Incentives and financing**
- **Codes and standards**
- **Third-party involvement**

COMPONENTS OF AN OVERARCHING STRATEGY

- **Recognize energy efficiency as an important energy resource** while the province concurrently develops new energy sources
- **Launch an integrated portfolio** of proven, piloted and emerging approaches
- Identify methods to **provide up front funding**
- **Forge greater alignment** among stakeholders
- **Foster development** of next generation energy efficient technologies

Note: This figure was adapted from its original source: *Unlocking Energy Efficiency in the U.S. Economy*.[5]

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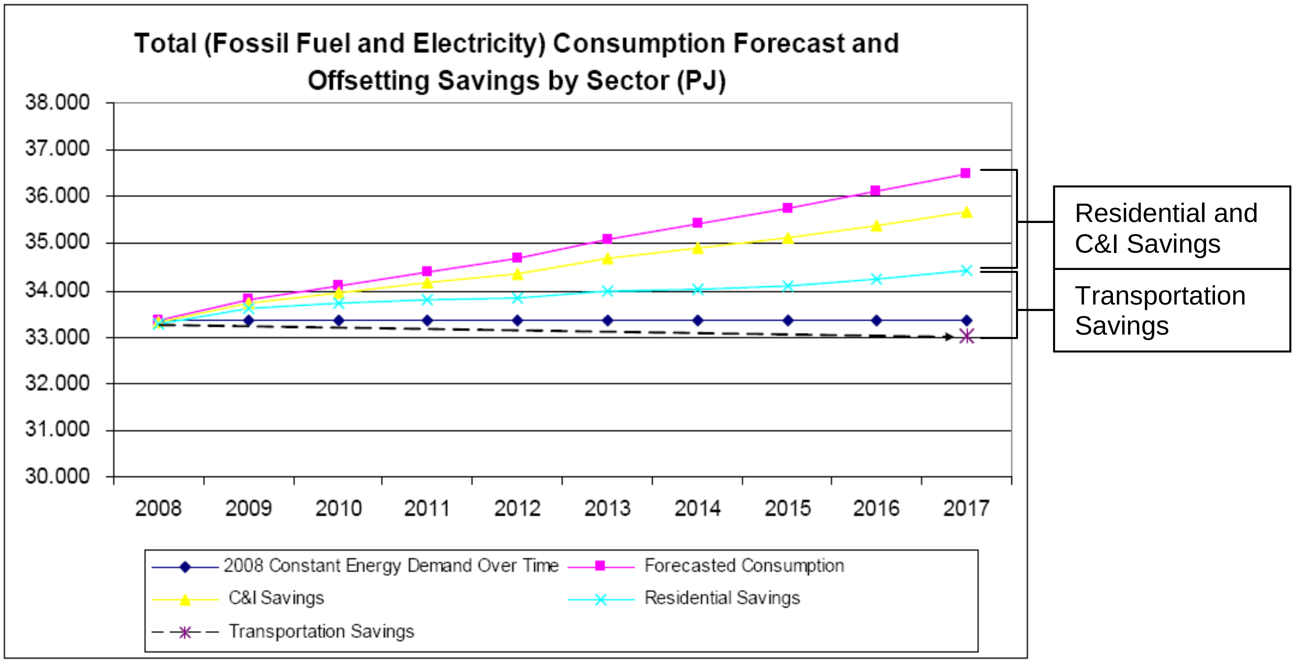
[4] Vermont Energy Investment Corporation, *Energy Efficiency Initiative Designs and Achievable Potential for Prince Edward Island*, April 2008, pg 44: http://www.gov.pe.ca/photos/original/eestudy08.pdf

[5] McKinsey Global Energy and Materials, *Unlocking Energy Efficiency in the U.S. Economy,* July 2009, pg 24: http://www.mckinsey.com/clientservice/electricpowernaturalgas/downloads/US_energy_efficiency_full_report.pdf

3.0 P.E.I. Energy Efficiency Potential

A 2008 report, *Energy Efficiency Initiative Designs and Achievable Potential for Prince Edward Island,* identified a portion of total cost-effective, all-fuels energy efficiency initiatives that if pursued on P.E.I. would substantially reduce energy use and lower greenhouse gas (GHG) emissions by 2017. The study examined energy and GHG savings potential in the residential, commercial and institutional (C&I) and transportation sectors, illustrating how a set of proposed initiatives could easily offset all of the projected energy growth on P.E.I. forecasted by 2017 (see Figure 2).[6]

Figure 2: Annual Energy Savings by Sector versus Forecasted Consumption & 2008 baseline consumption, All energy types (PJ/year)



Note: This figure was adapted from its original source: *Energy Efficiency Initiative Designs and Acheivable Potential*.

In the above scenario, it is highly cost-effective to reduce energy use in residential and C&I buildings by 9% over a ten year period. Using the Societal Cost Test, investing $85.3 million into residential and C&I building energy efficiency would yield $236.6 million in returns over a ten year period. Within this scenario, a modest new building initiative was recommended. It was also recommended that the new buildings concept be further evaluated.

In total, the report identified that **it is cost-effective to reduce energy use in the residential and C&I sectors by 25% over a ten year implementation period**. Note - the total investment needed to fully capture cost-effective energy efficiency in buildings is not provided in the report. ECO-PEI estimates that fully capturing all cost-effective energy efficiency in buildings on PEI, over a ten year period, would require a capital outlay in excess of $200 million. This is a sizable market opportunity for both consumers and Island entrepreneurs – and a low risk investment for P.E.I.'s lending institutions.

[6] *Energy Efficiency Initiative Designs and Achievable Potential for Prince Edward Island*, see Figure 1, pg. 2: http://www.gov.pe.ca/photos/original/eestudy08.pdf

4.0 Canada – Province-wide Building Energy Codes

This section looks at four provinces in Canada that are leading the advancement of minimum energy efficiency standards in provincial building codes: B.C., Manitoba, Ontario[7] and Nova Scotia[8].

4.1 British Columbia

In 2008, B.C. adopted a Green Building Code, requiring that houses are built to greater insulation levels. Alternatively, builders have the option to build to an EnerGuide 77 rating level through an objective based code. The provincial government also made it possible for local governments to increase local building codes in a number of areas, including energy. B.C. is expected to raise the residential standard to EnerGuide 80 by 2010.

For commercial buildings, B.C. requires ASHRAE 90.1(2004) to be met, which is an industry standard for energy efficient buildings. Vancouver already requires commercial buildings to achieve an ASHRAE 90.1(2007) level, which provides greater energy savings than the provincial standards and the city also requires new residential buildings to include plug-in vehicle charge points.

4.2 Manitoba

The Province of Manitoba has two standards for houses heated by natural gas – one for the northern part of the province, above 53 degrees latitude, and the southern part of the province, below 53 degrees latitude. Both of these standards are similar to comparable regions in British Columbia.

4.3 Ontario

In 2007, Ontario amended their 2006 Building Code with measures to be implemented over the next several years. Energy efficient windows, higher insulation levels, and 90% efficient natural gas and propane furnaces were the first measures to be adopted in 2007. In 2009, the building code will require near full-height basement insulation. By 2012 houses are to achieve an EnerGuide 80 rating.

Ontario requires large buildings in the province to meet the ASHRAE 90.1 standard or the Model National Energy Code for Buildings (1997) plus an Ontario-specific supplementary standard, SB-10. The standards are equivalent to a 16 to 18 per cent increase in energy efficiency for buildings starting in 2007 and a 25 per cent increase in efficiency starting in 2012 (compared to MNECB 1997). The estimated payback period for these changes is less than 5 years for the 2007 change, and between 5 and 7.7 years for the 2012 change, although builder feedback indicates that these payback periods can be reduced further through experience with new construction methods.

4.4 Nova Scotia

By December 31, 2009, the Nova Scotia Building Code will require new residential dwellings, and all commercial buildings under 600 square meters, to meet prescriptive or performance requirements that are equivalent to an EnerGuide rating of 80. The building code will require low-flush toilets and permit the use of water-free technologies and the re-use of grey water. Under an Energy Efficient Appliance Act, N.S. will also require natural gas and propane furnaces to be 90% efficient in 2009.

In 2011 the province will amend the Nova Scotia Building Code Act, to require all new commercial buildings of more than 600 square meters to exceed the 1997 Model National Energy Code for Buildings by at least 25 per cent, or to adopt the updated version of the 1997 Model National Energy Code for Buildings expected in 2011. The province will work with its partners to strengthen standards on a continuing basis as innovative and cost-effective technologies come to the market. The Government has also adopted energy and environmental standards for publicly funded buildings.

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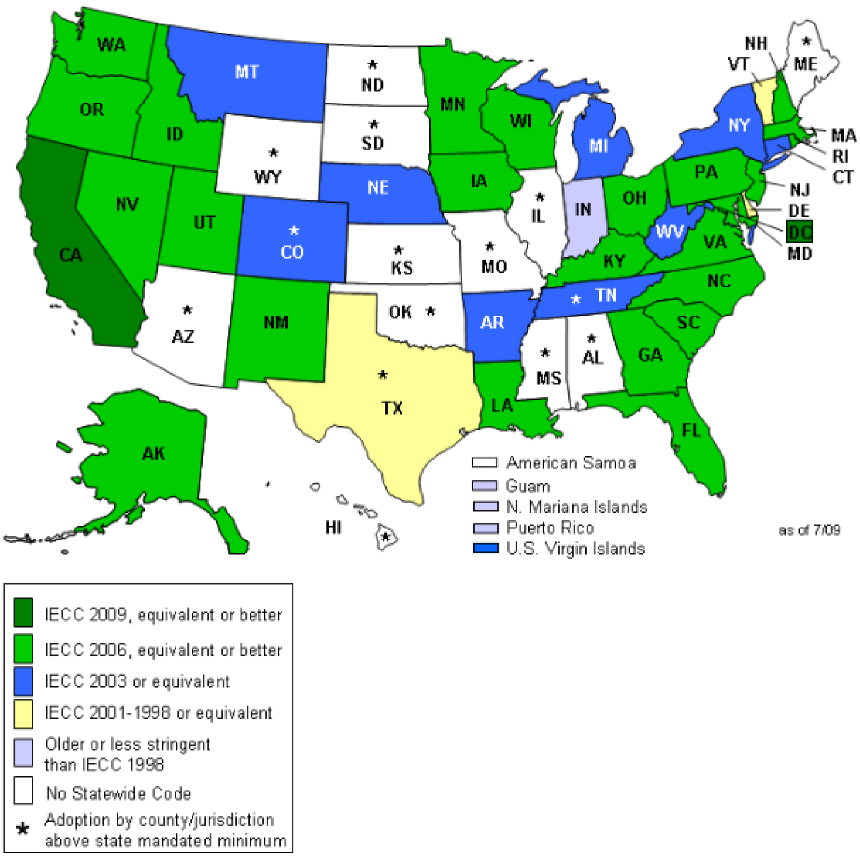
[7] http://pubs.pembina.org/reports/ee-in-prov-building-code-aeea.pdf

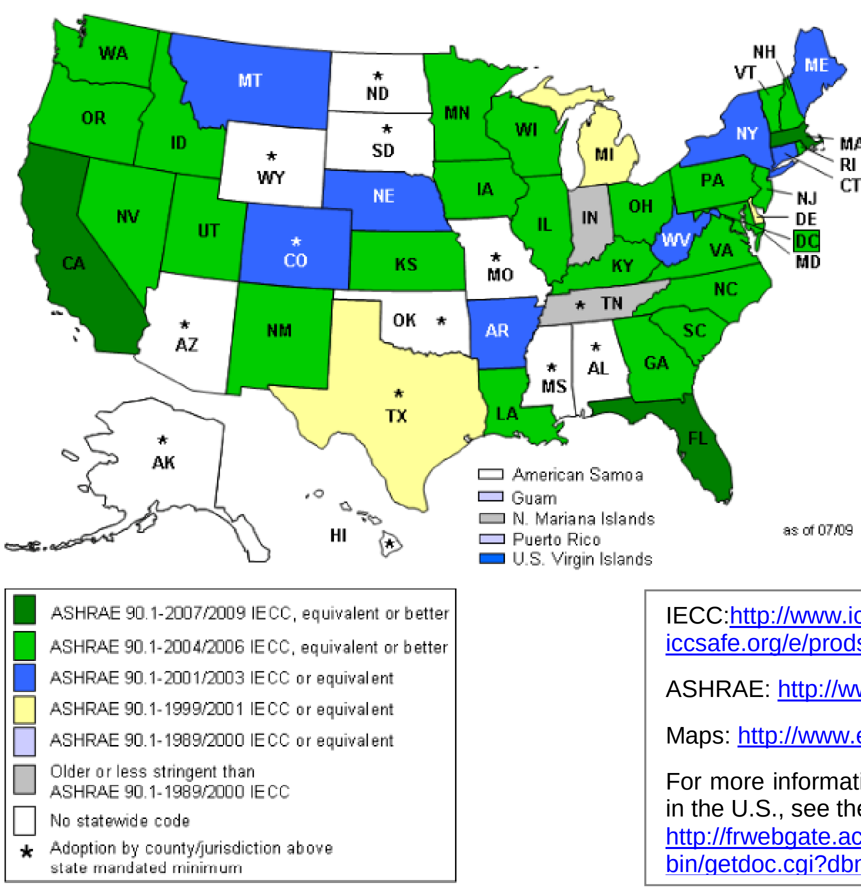
[8] http://secondnature.gov.ns.ca/gov/energy

5.0 United States - Statewide Building Energy Codes

Status of Residential Energy Codes



Status of Commercial Energy Codes



Energy codes are already being applied statewide in the majority of states.

California is leading the way, having adopted the most currently available building energy codes.

The International Energy Conservation Code (IECC) and American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) are commonly applied statewide.

Section 201 of the American Clean Energy and Security Act of 2009 may lead to far Greater Energy Efficiency in Building Codes nationwide.

IECC:http://www.iccsafe.org/e/prodsearch.html?words=3800S09http://www.iccsafe.org/e/prodsearch.html?words=3800S09

ASHRAE: http://www.ashrae.org/

Maps: http://www.energycodes.gov/

For more information on the proposed building energy efficiency measures in the U.S., see the *American Clean Energy and Security Act of 2009*: http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=111_cong_bills&docid=f:h2454pcs.txt.pdf

6.0 Code Improvements – Architecture 2030 Challenge

The Architecture 2030 Challenge (architecture2030.org) has become a powerful movement across the U.S., Canada and internationally. The Challenge provides performance targets and associated timelines for achieving the targets in order to respond effectively to scientific concerns over GHG emissions and climate change. ***Recommendation: ECO-P.E.I. suggests that the province aligns its policy mechanisms with the Architecture 2030 Challenge to keep pace with other North American jurisdictions, to ensure GHG targets are met, and to establish clear signals stimulating the marketplace.***

Architecture 2030 Challenge

"Credible scientists give us 10 years to be well on our way toward *global* greenhouse gas (GHG) emissions reductions in order to avoid catastrophic climate change. Yet there are hundreds of coal-fired power plants currently on the drawing boards in the US. Seventy-six percent (76%) of the energy produced by these plants will go to operate buildings.

Buildings are the major source of demand for energy and materials that produce by-product greenhouse gases (GHG). Slowing the growth rate of GHG emissions and then reversing it over the next ten years is the key to keeping global warming under one degree centigrade (°C) above today's level. It will require immediate action and a concerted global effort.

To accomplish this, Architecture 2030 has issued **The 2030 Challenge** asking the global architecture and building community to adopt the following targets:

- All new buildings, developments and major renovations shall be designed to meet a fossil fuel, GHG-emitting, energy consumption performance standard of 50% of the regional (or country) average for that building type.

- At a minimum, an equal amount of existing building area shall be renovated annually to meet a fossil fuel, GHG-emitting, energy consumption performance standard of 50% of the regional (or country) average for that building type.

- The fossil fuel reduction standard for all new buildings and major renovations shall be increased to:

  60% in 2010

  70% in 2015

  80% in 2020

  90% in 2025

  Carbon-neutral in 2030 (using no fossil fuel GHG emitting energy to operate).

  These targets may be accomplished by implementing innovative sustainable design strategies, generating on-site renewable power and/or purchasing (20% maximum) renewable energy and/or certified renewable energy credits."

The Architecture 2030 Targets for Canadian Residential and Commercial Regional Averages are available below:

Residential: http://architecture2030.org/downloads/2030_Challenge_Targets_Res_Canada.pdf
Commercial: http://architecture2030.org/downloads/2030_Challenge_Targets_Com_Canada.pdf

7.0 Developing P.E.I. Building Energy Codes

7.1 Current Situation

Prince Edward Island is one of only two jurisdictions in Canada without a province-wide building code. The municipalities of Charlottetown and Summerside do require new buildings to comply with the National Building Code, but they do not attach an energy standard to it. Stratford is examining tax incentives to encourage green building through LEED, Green Globes and other standards.

The Prince Edward Island Energy Strategy in 2008 highlighted the importance of new buildings in addressing energy costs and climate change by committing to implement a province-wide building and energy code to ensure that all new buildings meet minimum standards for energy efficiency.

7.2 Situational Analysis

Minimum building and energy standards alone will only capture a small portion of the broader opportunities associated with creating sustainable communities. Smart growth, sustainable community design, additional market signals, educational opportunities for training and skills development, consumer awareness, value engineering, collaboration and consumer adoption are all generally seen as essential elements to achieve a more sustainable built environment.

Simple property tax incentives could be validated to soften upfront costs for new buildings (or existing building) for those seeking to achieve advanced energy, water and environmental standards. These additional incentives can be designed to offset additional costs for consumers while achieving common objectives such as reduced carbon emissions, total energy and water use – even landfill waste through durability of buildings and reclamations. By establishing clear price signals in the economy, the Island will experience a much deeper investment in sustainable buildings, which creates market demand and job creation. Multi-layered incentive models also have the effect of stimulating innovation across P.E.I's built environment, as businesses seek satisfy the demand in a faster-growing market segment. By stimulating this market proactively, over time the effects are an increased ability to deliver integrated sustainable building approaches at more competitive prices.

7.3 Summary of Government Actions *(Committed)*

- The Provincial Government will be adopting energy codes and standards as part of the process towards the adoption of the National Building Code throughout the province. The code, with some exemptions for small buildings, will provide unified building standards across the province, which will compliment standards for energy efficiency in buildings.[9]

- Building standards and an implementation timeline will be set with escalating targets for energy efficiency over the next 5-10 years.

- Administration, inspection, education and ensuring compliance will be addressed with the roll out of the new Provincial Building Code and Energy Standards.

- The Provincial Government will consider mandating the energy consumption labelling of houses and buildings with special recognition of best practice and best-in-class.

- The Provincial Government, through the OEE, will continue to develop programs for increasing energy efficiency for Islanders that include direct incentives, loan programs, grants and rebates.

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[9] Prince Edward Island Energy Strategy, Energy Efficiency and Conservation, 2008; pg. 17
http://www.peigov.ca/photos/original/env_snergystr.pdf

7.0 Developing P.E.I. Building Energy Codes (Continued)

7.4 Toward a Sustainable Built Environment on Prince Edward Island: A Path Forward

The Environmental Coalition of P.E.I. offers these as Priority Areas:

- *Establish a province-wide building energy code quickly, using open stakeholder processes.*
- *Use this open process to develop incentives for going beyond minimum code requirements.*
- *Use this open process to develop strategies for professional development.*
- *Enhance governance and industry collaboration to encourage smarter incentives and stimulate the green building economy.*
- *Align federal, provincial and sector capacities to coordinate and streamline the implementation of minimum building and energy codes and to develop beyond-code supportive measures.*
- *Ensure building energy codes and supplementary measures will achieve the Architecture 2030 Challenge trajectories for energy and emissions reductions in residential and commercial buildings.*
- *Encourage the use of the Canadian Industry Program for Energy Conservation to enhance the operations of industrial facilities (Cavendish Farms is a great case example).*
- *Support farm energy efficiency, targeting all cost-effective energy savings and improving competitiveness. Embed sustainable approaches into supply chains, using local food initiatives and farming practices which offer environmental benefits, economic viability and value-added consumer benefits.*
- *Reassess and address gaps and achieve an integrated, sustainable new buildings and communities strategy which links transportation and other infrastructure.*

Suggested initial approaches to move toward a sustainable built environment include:

- *Residential: Minimum EnerGuide 80 or equivalent standard (R2000 is an acceptable equivalent)*
- *Commercial: Minimum 30% improvement over the Model National Energy Code 1997*
- *Publicly funded buildings: Must be built to leading energy and environmental standards*
- *Encourage Canada Industry Program for Energy Conservation (CIPEC) for Island industries*
- *Improve water standards, while offering additional incentives to encourage rain water collection in cisterns for use in toilets or for outdoor use*
- *Proactively encourage beyond code sustainability approaches with targeted incentives (ie - Passive House Standard, Net-Zero Homes and CMHC's EQuilibrium™ Initiative, LEED, etc.)*
- *Stimulate market preparedness (ie – marketable strategies, education, outreach and professional development)*
- *Support sustainable approaches to reduce operating costs for new "affordable housing" starts*

Since the commitments in the P.E.I. energy strategy a year ago, no new building code or energy code implementations were carried out. Although implementing a code and establishing appropriate incentives and preparedness typically takes time, there has been little or no public consultation or outreach activity with P.E.I.'s buildings related industry associations and the general public according to interviews with potential stakeholders on this issue. The National Research Council is working with the provinces, including P.E.I., to develop new set of national building energy codes for Canada and input from our local constituency could be timely. Therefore, we encourage the province to move forward quickly to get this process underway.

8.0 Beyond Code – The Factor 9 Home

Factor9.ca

Residential Case Study: Overview

A home was completed in April 2007 in Regina, Saskatchewan, with the following goals:

- to achieve 90% less energy consumption than a conventional 1970 home of the same size;
- to achieve 50% less water consumption than a conventional home of the same size and;
- to achieve other environmental approaches.

The additional costs to implement these measures were estimated to be 12 to 15%.

Performance – For one year, the measured consumption was 33.1 kWh/m2. For comparison, a group of 1970 to 1973 homes in Regina had a measured annual consumption of 331 kWh/m^2 or 10 times as much energy per unit of floor area. For a family of four persons, the average water consumption in Canada is 501 m^3 per year. For the one year monitoring period, the measured water consumption of the home was 171 m^3, a reduction in purchased water use of 66%. Notable is that the precipitation in Regina over the year was less than half of the long-term average, which reduced the amount of water able to be gathered by the roof collection system.

Design – The name "Factor 9" for the home was developed for the following reasons. World population is expected to increase from current levels by about a factor of 1.5 before stabilizing. Material consumption per average person in the world is expected to increase by a factor of about 3 from current levels before stabilizing. Climate scientists have called for a reduction of current greenhouse gas emission by a factor of at least 2 from current levels. By multiplying the three factors the number 9 results. Hence the Factor 9 energy target for this house was developed.

A lot was chosen to have the rear of the house face south for passive and active solar gain. The subdivision chosen is a new area in the city that has access to public transport. The topography is very level. To reduce water runoff from the roof, rainwater and melted snow water from the roof are stored in two 9500 litre storage tanks in the crawl space beneath the basement floor. This non-potable water is used for toilets and exterior water usage. Landscaping was designed to reduce the need for water.

The house features a very energy conserving envelope, with attic insulation levels of RSI 14.1 (R80), above grade walls of RSI 7.2 (R41), and basement wall insulation levels of RSI 7.7 (R44). At the rim joist area, the insulation level is RSI 4.7 (R26.9). The building was well sealed, with a measured air tightness level of 1.2 air changes per hour at 50 pascals, which is tighter than the R-2000 standard of 1.5 ac/h at 50 Pa.

Passive solar heating was used to provide part of the space heating (passive is projected to provide 41% of the total annual space heating requirement). Active solar heating is used with 20.4 square metres of double glazed vertical solar panels mounted on the south wall of the house. The south wall faces 26 degrees east of due south. A 2350 litre water storage tank in the basement is used to store the heat from the solar panels. To distribute the space heating for the house, a fan coil with brushless direct current motors is used.

The active solar panels are used to provide part of the domestic water heating. A passive drain water heat exchanger is used to preheat the domestic hot water prior to the solar storage tank. An instantaneous electric heater provides the auxiliary energy needed for domestic water heating.

The Jean Canfield Government of Canada Building, designed by HOK in joint venture with Bergmark Guimond Hammarlund Jones in Prince Edward Island, delivers on the federal government pledge to embrace new technologies, methodologies, partners, and means of delivering service to Canadians. Thoughtful planning means that the new building has revitalized an underused neighbourhood, uses design to reflect the local flavour of the community, encourages employees and residents alike to use the space and sets the standard for environmentally-progressive government buildings.

Named after the first female member of the PEI Legislative Assembly, the four-storey, 188,000-square-foot building was sited in an underused brownfield location as a gateway to downtown Charlottetown and to revive a neglected part of the city.

The building is articulated as two distinct components to reduce its visual impact on the surrounding urban fabric.

"The L-shaped north wing defines the urban street edge. The south wing is pulled back from the street to accommodate a sun-filled urban park," says Richard Williams, VP architecture and sustainable design Integration with HOK.

Overlaid on these two building forms is the front porch, a major public gesture defining the entry. All elevations are designed to reflect and reinforce the surrounding streetscape. For example, a three-storey glazed bay at the building's north corner pays tribute to one of the city's major gateway intersections. Red brick and Wallace Sandstone, both from Atlantic Canada, echo the area's historic architecture. At street level, the emphasis is on accessibility, transparency and availability.

Visitors to the building are lead through the main entrance to the public service areas at the base of the four-storey atrium. The secure, second level of the atrium, is considered a "town centre" for the workplace community of 500 federal government employees, a place for informal interaction and collaboration. Other facilities include a reference library, breakout rooms, fitness centre, training facilities, and drop-in offices/business centre.

The project team closed the gaps between sustainability, architecture and engineering by taking an integrated design approach. That allowed them to incorporate sustainable design principles in all the building's features. Energy consumption has been reduced by 65 per cent compared to the National Energy Code Building standard. The park and other landscaped areas collect rainwater, filter contaminants, support plants and wildlife, and promote infiltration and groundwater recharge. Rainwater is saved in underground cisterns and reused to flush toilets. Overall, the building uses 80 per cent less potable water than comparable buildings.

The south wing, with its large expanses of glazing, is skewed 45 degrees off the city's diagonal grid to optimize solar exposure for the largest building-mounted photovoltaic array in Canada. The higher sun angle to the south means that control devices are less expensive and more effective. Glazing on the north-east and north-west facades has been carefully designed to provide glare-free daylighting for office spaces.

The design team's commitment to sustainability has also translated into a healthy and uplifting workplace. All building materials and products were selected to limit contaminants. Mechanical systems optimize indoor air quality with underfloor air distribution, and an innovative chilled slab cooling system. This eliminates cross circulating of supply and exhaust air flows and draws VOCs and bio-effluents away from people and office equipment. The mixed-mode mechanical system can also function in natural ventilation mode during mild weather, while operable windows in the atrium promote cross ventilation and stack exhaust. Office areas have access to views, fresh air, and, like the atrium, have daylight from two directions.

This flagship project successfully met the federal government's objectives of sustainability, supportive work environments, and connectivity, while providing the city of Charlottetown a striking urban landmark that celebrates its unique gateway location. This is hopefully a model the city will be able to replicate.

Source: http://www.renewcanada.net
Rendering: HOK, http://www.hok.com/

10.0 Toward Net-Zero Energy in New Buildings by 2030

The Architecture 2030 Challenge to achieve carbon neutral or net-zero energy new buildings by 2030 is ambitious. However, the United Kingdom envisages this performance level before 2020. Across Canada, there are already several examples of residential projects which have achieved net-zero energy. Canadian firms are also working internationally to transfer technologies in new markets such as Sapporo, Japan (see below).

Housing | *News* | CanmetENERGY, Natural Resources Canada[10]

Canadian net-zero energy housing technology unveiled in Japan

2009-01-08 - Canada's residential energy technologies industry achieved a new milestone with the opening of the first net-zero energy house in Sapporo, Japan on September 20, 2008.

Natural Resources Canada, the Canada Mortgage and Housing Corporation, and the Department of Foreign Affairs and International Trade have worked for many years with the housing industry to increase international recognition and export of Canadian energy efficient housing innovations through the Super E House Programme. With the introduction of net-zero energy housing exports, Canada has a platform for demonstrating international leadership in the application of leading-edge energy efficient products and clean, renewable technologies.

The Sapporo house will produce as much energy as it consumes, annually. The innovative design and construction techniques applied by K. Ito and Associates Ltd. of Vancouver and Tsuchiya Twoby Home of Japan effectively incorporated superior products to achieve a net zero target. Products supplied by firms based in 5 Canadian provinces included pultruded fibreglass triple pane windows, an energy recovery ventilation system, solar domestic hot water, drain water heat recovery and a geothermal heat pump system. The cornerstone of the design was the application of 21 mm of thin vacuum insulation which produced a 5 fold increase in the insulating value of the walls.

The opening ceremony was attended by Japanese media, local dignitaries, and representatives from the Canadian federal government. A tour of the house provided impressive evidence of the fusion of Japanese and Canadian components and highlighted the benefits of such joint international projects in stretching industry to the next level.

Climate Comparison

Sapporo, Japan	Charlottetown, P.E.I.
Mean annual precipitation ~ 1,100 mm	Mean annual precipitation ~ 1128 mm
Mean annual temperature ~ 8.5°C	Mean annual temperature ~ 5.6°C

The Moncton VISION Home, part of the CMHC's EQuilibrium™ Sustainable Housing Demonstration Initiative, will have combined energy efficiency features to reduce household energy requirements to a predicted 24 % of the energy requirements for a typical Canadian home, and down to 4% when the renewable energy contribution is included.[11]

[10] http://canmetenergy-canmetenergie.nrcan-rncan.gc.ca/eng/buildings_communities/housing/news.html?2009-01-08-1
[11] Moncton Vision Home: http://www03.cmhc-schl.gc.ca/b2c/catalog/z_getpdf.jsp?pdfkey=2748564382727379920137030260601952537543679198475763624/66403.pdf