

Examining the case for adopting the National Energy Code for Buildings:

Consultation Discussion Document

July 2015



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Introduction

The Government of Newfoundland and Labrador recognizes that improving the province's energy efficiency is fundamental to enhancing long-term economic growth and environmental sustainability. In *Moving Forward: Energy Efficiency Action Plan 2011*, the Provincial Government committed to supporting a major shift in the uptake of energy efficiency. Given houses and buildings consume 22 per cent of all energy used in this province, improving energy efficiency within the construction sector represents a significant opportunity to achieve progress in this area. As such, government outlined several commitments for action in this area, including a commitment to:

"Examine the case for adopting new national energy codes for buildings in Newfoundland and Labrador, in collaboration with key stakeholders including Municipalities Newfoundland and Labrador, the construction industry, and the design consulting and business communities."

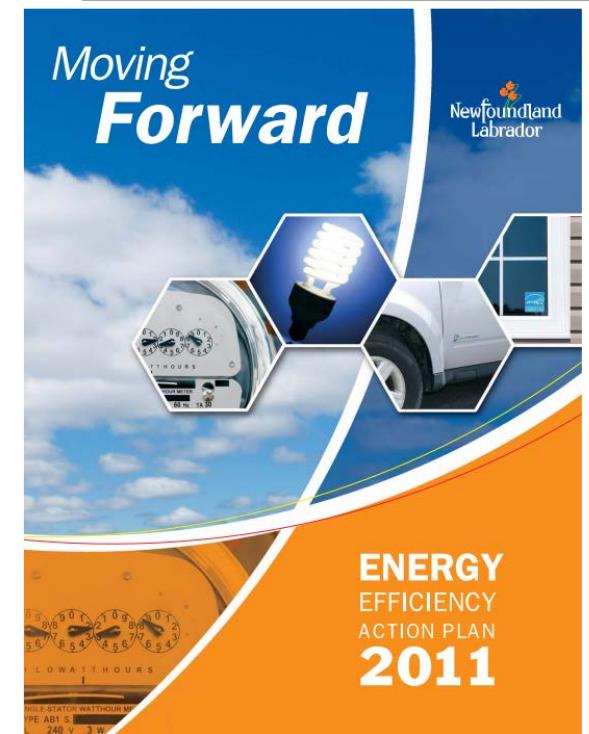
Significant technical work has been completed to date to understand the costs and benefits of adopting the National Energy Code for Buildings (NECB) in Newfoundland and Labrador and the Provincial Government is now moving forward with consultations to solicit stakeholders' views on code adoption. This consultation process is taking a two-pronged approach that comprises: (i) targeted consultation sessions with key stakeholder groups, and (ii) an opportunity for members of the public and stakeholders to submit written feedback via mail, email or fax.

Individuals attending consultation sessions or submitting written feedback are encouraged to review this discussion document and submit responses to the questions provided throughout. The Provincial Government is soliciting views on the three issues set out below, but welcomes any broader input stakeholders may wish to provide:

- The costs and benefits of adopting the NECB;
- Options for code administration; and
- Approaches to enhance skills and training.

The deadline for submitting written responses is September 30, 2015. Responses can be submitted to the Office of Climate Change and Energy Efficiency via the contact information outlined on page nine of this document.

For more information on the consultation process, please visit the [Office of Climate Change and Energy Efficiency's website](#).



Current Context in Newfoundland and Labrador

The Canadian Constitution assigns responsibility for regulating the construction of houses and buildings to provinces and territories. The Federal Government publishes national codes to promote the harmonization of construction standards across the country, but these codes have no legal status until they are adopted by a provincial or territorial government. Provinces and territories may adopt any national code as a whole, in part or with amendments.

In Newfoundland and Labrador, *The Municipalities Act, 1999*¹ and complementary legislation for the province's three cities currently requires all municipalities throughout the province to adopt the National Building Code of Canada, along with any supplements or amendments.

In 2012, the National Building Code was updated to include energy efficiency requirements for houses and small buildings, which are defined in the box on the right. As such, new houses and small buildings in Newfoundland and Labrador must be built to meet certain minimum energy efficiency requirements. However, there are currently no minimum energy efficiency requirements for the construction of large buildings, which are also defined in the box on the right. Over the last three years, records indicate there were about 200 large buildings constructed in the province. To introduce energy efficiency requirements for these buildings going forward, Newfoundland and Labrador would have to adopt a new energy code specifically for large buildings, such as the NECB.

Evidence already shows that constructing energy-efficient buildings in Newfoundland and Labrador is achievable. For example, the Government of Newfoundland and Labrador, through its *Build Better Buildings Policy*, requires government-funded buildings to meet rigorous energy efficiency requirements. In addition, a number of building owners in the province are seeking certification for their buildings under Leadership in Energy and Environmental Design – an independent rating system for sustainable buildings. Buildings that achieve this certification are on the cutting edge of energy-efficient construction practices and exceed the requirements of the NECB.

While the adoption of a new energy code for large buildings would present an opportunity to improve the province's energy efficiency and reduce greenhouse gas emissions, several key factors must be carefully considered in determining whether the province should adopt an energy code for large buildings, including the impact such a code would have on the construction industry, the business community and municipalities.

Useful Definitions – Building Types

Small Buildings – Any building smaller than three storeys and 600m² in building areas. Small buildings and houses are often referred to as "Part 9" buildings, as requirements relating to the construction of these structures are outlined in Part 9 of the National Building Code of Canada.

Large Buildings – Any building greater than three storeys or 600m² in building area, including commercial properties and multi-unit residential buildings. Large buildings are often referred to as "Part 3" buildings, as requirements relating to the construction of these buildings are outlined in Part 3 of the National Building Code of Canada.

¹ *The Municipalities Act does not apply to Inuit communities (Nain, Hopedale, Makkovik, Postville and Rigolet) and First Nation reserves (Shetshatshiu, Natuashish and Conne River).*

Overview of the NECB

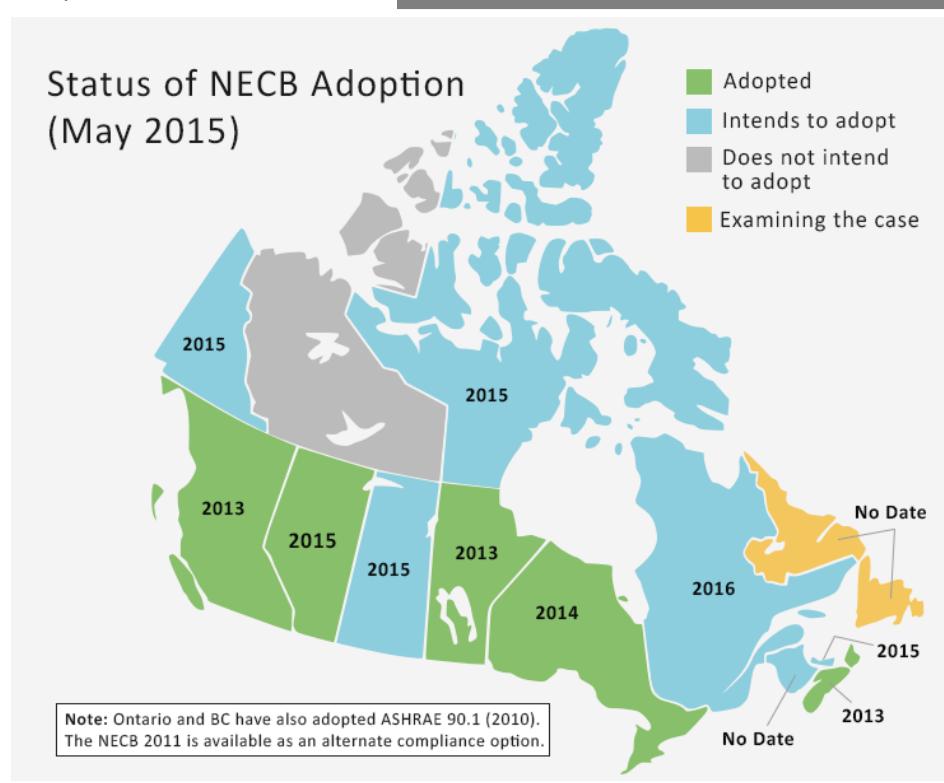
The NECB is one of five national construction codes published by the National Research Council, which is an entity of the Government of Canada. The code provides minimum energy efficiency requirements for the design and construction of large buildings, as defined on the previous page. The code applies to new buildings and additions, but does not apply to farm buildings or renovations. It was first published in 1997, with the most recent version being released in 2011. The next update to the NECB is expected to be published in late 2015.

The requirements of the NECB relate to five key areas of a building's construction:

1. Building envelope
2. Lighting
3. Heating, ventilating and air-conditioning (HVAC) systems
4. Service water heating systems
5. Electrical power systems and motors

The code's specific requirements vary by climate zone, with the stringency of the requirements increasing in colder zones. Newfoundland and Labrador has four climate zones (6, 7a, 7b and 8), with Zone 6 being the warmest and Zone 8 being the coldest. Regardless of a building's climate zone, designers have the option of choosing one of three compliance paths to meet the code's requirements:

- **Prescriptive Path** – The building's design must comply with the specific construction requirements contained within each part of the code (e.g. continuity of insulation, use of energy-efficient lighting).
- **Trade-Off Path** – The building's design can use select substitutions that are available within a particular part of the code (e.g. allowing for a greater window-to-wall ratio if more efficient windows are used).
The only part for which trade-offs are not available is within the section relating to electrical power systems and motors.
- **Performance Path** – The building's design can achieve compliance by using energy modeling software to demonstrate the building will achieve a target energy performance that is equal to or better than what would have been achieved following the prescriptive path.



Costs and Benefits of the NECB

As part of examining the case for adopting the NECB in Newfoundland and Labrador, an energy performance and cost-benefit analysis was commissioned by the Provincial Government to understand how the adoption of the code would affect incremental construction costs and energy consumption within large buildings. This study was completed by Caneta Research and involved technical analysis, as well as consultation with 14 local engineers, architects and building developers to ensure local market conditions were accurately reflected in the work.

To complete this study, a building archetype approach was used. This approach was necessary as the relevant design and energy consumption data were not readily available for existing buildings within the local market. In total, five archetypes were developed, as outlined in Table 1. While these archetypes are not exhaustive of every building type found in the province, consultations with local professionals informed the development of these archetypes, which include a mix of wall assemblies, internal wall construction, functions and sizes to ensure they are representative of the local market. It is important to note that, while this study is a valuable tool for assessing the costs and benefits of the NECB, actual results will vary on a building-by-building basis.

Additionally, given Newfoundland and Labrador does not have any existing requirements for the energy-efficient construction of large buildings, it was necessary to develop a baseline of current construction practices in relation to energy efficiency. Through consultation with local professionals, it was determined the majority of new buildings constructed in Newfoundland and Labrador would meet or exceed the 2007 version of ASHRAE 90.1, which is an American standard for the energy-efficient construction of buildings that has existed for several decades, with the most recent versions published in 2010 and 2013. Given it is a fairly well known standard within the industry, a decision was taken to also look at the costs and benefits of ASHRAE 90.1-2010, as this will provide industry professionals with a comparative tool against which to assess the costs and benefits of the NECB.

To complete this study, a model was developed for each archetype based upon the determined baseline (ASHRAE 90.1-2007). Models of each archetype were then developed for both the 2010 version of ASHRAE 90.1 and the NECB, after which the incremental construction costs and energy savings were compared. It is important to note the analysis assumed all buildings were located in Climate Zone 6, as approximately 63 per cent of the province's population currently resides in this climate zone.

The results of this analysis are outlined on the next page, which shows there are significant differences in the energy performance, costs and benefits of each standard. This is largely due to the fact that the NECB has more rigorous building envelope requirements.

Table 1: Building Archetypes

Building	Wall Construction	Size (m ²)
Warehouse	Metal	2,000
Multi-Unit Residential Building (MURB)	Wood	2,000
Office Building	Concrete	1,500
Box Retail Store	Concrete	1,000
Restaurant	Wood	620

How much energy will be saved?

Relative to the baseline, energy savings are achieved for every building archetype under the requirements of the NECB 2011 and ASHRAE 90.1-2010. However, the achieved energy savings are much greater for the NECB, ranging from 2.7 per cent for a restaurant, to 16.7 per cent for the office building. These energy savings are largely due to the NECB's building envelope. By comparison, when built to ASHRAE 90.1-2010, no building achieved a level of energy savings that was more than 1.8 per cent better than the baseline.

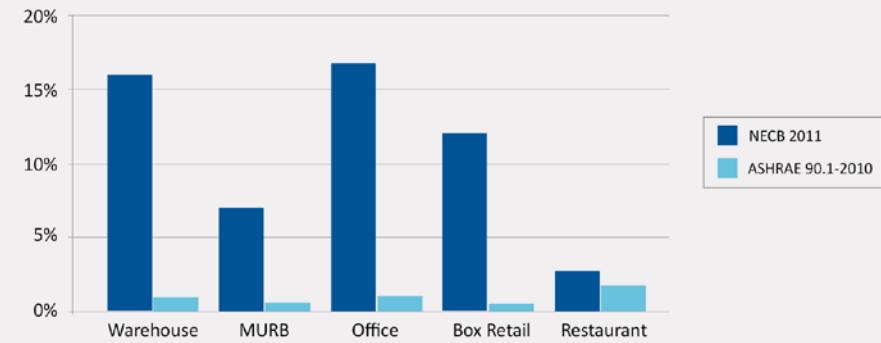
How much extra will it cost?

While the NECB results in higher energy savings, it also presents higher incremental construction costs. This is again due to the more rigorous requirements for the building envelope. For the NECB these costs ranged from 1.6 to 3.1 per cent for every building archetype, except the warehouse (7.5 per cent). This is a result of the fact that the warehouse consisted of a metal frame, meaning it required a more complex wall assembly to meet the NECB requirements. By comparison, the incremental construction costs for ASHRAE 90.1-2010 are dominated by increased interior lighting requirements and, relative to the baseline, do not exceed 0.5 per cent for any archetype.

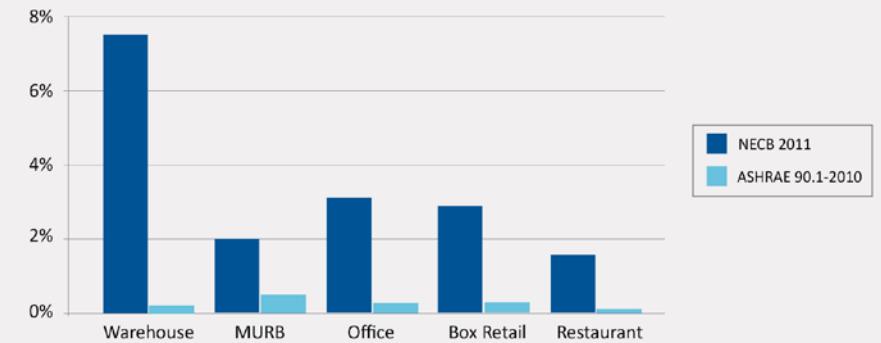
What is the payback period?

The payback period refers to the period of time required to recover an up-front investment. While large buildings typically have a fairly long lifespan, business owners and financial institutions tend to prefer shorter payback periods to reduce risk and maximize long-term profitability. The analysis shows there is no clear relationship between the energy savings for an archetype, incremental construction costs and the overall payback period for both the NECB and ASHRAE 90.1-2010. For example, while the office building under the NECB achieves energy savings of 16.7 per cent with incremental costs of approximately 3.1 per cent (relative to the baseline), it has a payback period of 16 years as energy savings are discounted over time.

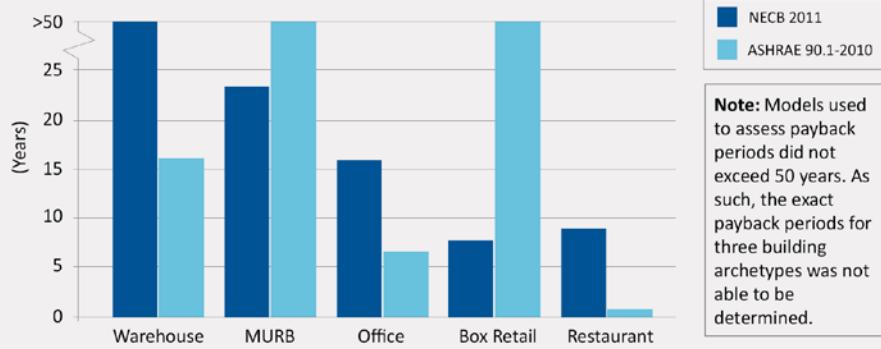
Graph 1: Annual Energy Savings Relative to Baseline Construction



Graph 2: Incremental Capital Costs Relative to Baseline Construction



Graph 3: Payback Period Analysis



What is the internal rate of return?

The internal rate of return (IRR) measures the profitability of an investment. The higher a project's IRR, the more desirable it is to invest in a project. The analysis, based on incremental capital costs incurred, shows that for the NECB, the IRR is positive for all building archetypes, ranging from 2.6 per cent for the warehouse, to 18.4 per cent for the box retail. For ASHRAE 90.1-2010, the IRR was negative for two buildings, but extremely high for the restaurant, due to low incremental construction costs, relative to achieved energy savings.

Overview of Findings

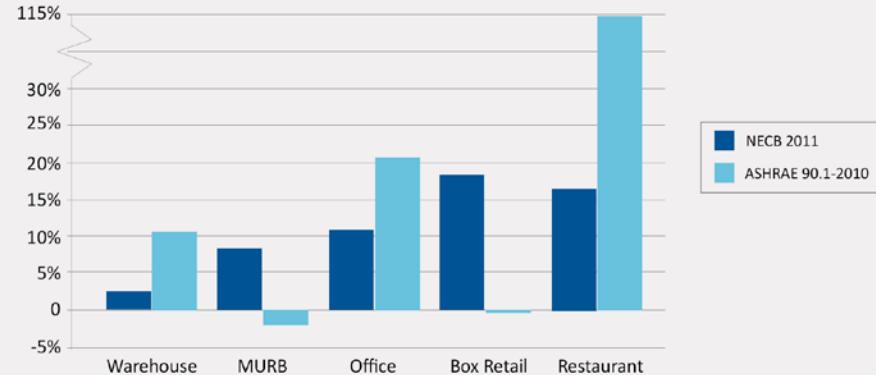
Overall this analysis showed the NECB would represent a more ambitious approach for improving the energy efficiency of large buildings in Newfoundland and Labrador in comparison to ASHRAE 90.1-2010. This is due to the NECB's building envelope requirements. As a result of these requirements, the NECB yields more energy savings, but carries higher incremental costs in each case. While this trend is clear, the extent of the savings and incremental costs vary significantly for the NECB based upon the building type and assembly. For example, a building with a high process load, such as a restaurant, would generate less energy savings than a building with a high share of energy used for heating, such as an office building. However, there is no clear relationship between energy savings and incremental capital costs with either the payback period or the rate of return on capital invested.

While this archetype approach is beneficial in understanding trends in costs and benefits of adopting the NECB in Newfoundland and Labrador, it is important to note actual results will vary on a building-by-building basis. For more information on the cost-benefit analysis, the [full report](#) can be found online.

Questions

1. What are your views on the findings of this cost-benefit analysis?
2. Should Newfoundland and Labrador move forward with adopting the NECB? Why or why not?
3. What opportunities or barriers would you or your organization encounter if the NECB were adopted?

Graph 4: Internal Rate of Return Relative to Baseline Construction



Administration

If Newfoundland and Labrador moves forward with adoption of the NECB, an approach will be required to administer the code that will ensure effective compliance with its requirements.

Across Canada, provinces employ different approaches for the administration of construction codes. Broadly, these models include municipal-level administration, which is used to some extent across Canada, including in all Atlantic provinces, as well as provincial-level administration, which is used in Quebec, to some extent in Alberta, and in rural areas of Manitoba.

Additionally, some provinces, including Ontario and Alberta, allow entities with the responsibility for administration, such as municipalities, to outsource aspects of this function to accredited private companies. As an example, in Ontario these companies are referred to as Registered Code Agencies and municipalities in Ontario can contract these agencies to complete inspections. Employees for agencies are required to undergo the same training and accreditation process as municipal building officials.

In addition to the various approaches used for code administration, the mechanisms used to ensure code compliance vary across Canada as well. While some jurisdictions, such as Nova Scotia, have detailed regulations that help achieve a somewhat uniform approach for administration across the province, in other jurisdictions, including Newfoundland and Labrador, the mechanisms used for administration vary depending on the needs and capacity of the municipality.

Questions

4. If the NECB is adopted in Newfoundland and Labrador, what do you think would be necessary to promote effective compliance with the code's requirements?
5. From your perspective, if the province moves forward with adoption of the NECB, what would be the pros and cons of pursuing the following options for code administration:
 - a) Provincial-level administration
 - b) Municipal-level administration
 - c) Outsourcing aspects of administration to private entities
 - d) Another option (please specify)

Case Study: Newmarket, ON

The Ontario Building Code contains three different options for buildings to achieve compliance with its energy efficiency requirements, including the option of building to the NECB 2011. To achieve compliance with the NECB 2011, a project can follow the prescriptive, trade-off or performance path. Enforcement, which is done at the municipal level, differs depending upon the path selected:

Performance Path – In Newmarket, permit applicants must submit the energy model for their building to the municipal building officials up-front. Newmarket requires a short, one-page certification, but some larger municipalities may ask for the longer version of the document to have it reviewed by a building official.

Prescriptive or Trade-Off Path – Newmarket building officials complete a detailed review of the energy-efficient features contained in the construction plans. Building officials also complete inspections throughout the construction project, which include various spot checks on energy-efficient features, such as the air barrier.

Skills and Training

If Newfoundland and Labrador moves forward with adoption of the NECB, careful consideration must also be given to the skills and knowledge that must be acquired by various groups to ensure effective compliance with the code's requirements. These groups may include:

- **Building designers**, who may require specialized knowledge in how to apply the code during the design of a building, including knowledge of when to pursue each of the three compliance paths and the optimal technology to implement in particular building types;
- **Building contractors**, who may require new skills to incorporate new energy-efficient features into the construction of a building, such as new means of integrating a high-efficiency HVAC system into a building; and
- **Building officials**, who may require specialized knowledge to carry out inspections, complete plan reviews, or review energy model documentation.

Acquiring such knowledge and skills may require new training sessions or programs. If the NECB is adopted in Newfoundland and Labrador, it would be important to ensure an effective transition to meeting the code's requirements. As such, consideration must also be given to the length of time between when the NECB is adopted and when it begins to be enforced.

Questions

6. What knowledge, skills or training would you or your organization's staff need to acquire to build to the NECB?
7. Which entities should be responsible for coordinating the delivery of training on this issue for building designers, building contractors, building officials and any other groups who would need to acquire the necessary knowledge and skills?
8. If Newfoundland and Labrador were to adopt the NECB, how long would your organization need to be ready for any new requirements?

Conclusion

Summary of Questions

Costs and Benefits

1. What are your views on the findings of this cost-benefit analysis?
2. Should Newfoundland and Labrador move forward with adopting the NECB? Why or why not?
3. What opportunities or barriers would you or your organization encounter if the NECB were adopted?

Administration

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5. From your perspective, if the province moves forward with adoption of the NECB, what would be the pros and cons of pursuing the following options for code administration:
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Skills and Training

6. What knowledge, skills or training would you or your organization's staff need to acquire to build to the NECB?
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8. If Newfoundland and Labrador were to adopt the NECB, how long would your organization need to be ready for any new requirements?

Submitting Responses

Responses can be submitted by September 30, 2015 to the Office of Climate Change and Energy Efficiency at:

Office of Climate Change and Energy Efficiency
Government of Newfoundland and Labrador
P.O. Box 8700
St. John's, NL A1B 4J6

Email: climatechange@gov.nl.ca

Fax: 709-729-1119

If you have any questions regarding this consultation process, please contact the Office at 709-729-1210.

Once the consultation process has concluded, the Office of Climate Change and Energy Efficiency will release the results of the feedback collected. Individuals who submit written feedback or attend a consultation session will be notified when the results have been released.