Improving BC's Building Code Development Process

By

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Abstract/Abstrait

The province of British Columbia has developed an increasingly broad range of policies and programs related to climate change and GHG emissions. The *Energy Efficiency Buildings Strategy (EEBS)* developed by the Energy Efficiency Branch was first adopted in 2005 and updated in 2008. It was the built component of these strategies and included a range of programs designed to improve built environment energy performance, including two regulatory goals: all new residential buildings would meet the EnerGuide 80 performance standard by 2010, and a reduction in per-home energy demand of 20% by 2020. These EEBS targets instigated an energy performance update of Part 9 of the British Columbia Building Code. The update, originally scheduled for 2010, was adopted in December 2012 and is scheduled to take effect in December 2014. This research analyzes the province's energy performance code development and consultation process to determine how these regulations developed, the factors that influenced the final performance standards and how stakeholders were engaged during the process. The conclusion presents issues and conflicts raised by stakeholders and makes a series of recommendations around the energy performance code development process.

La province de la Colombie-Britannique a élaboré un plus large éventail de politiques et de programmes relatifs aux changements climatiques et les émissions de GES. La Stratégie des bâtiments de l'efficacité énergétique (EEBS) développé par la Direction de l'efficacité énergétique a été adopté en 2005 et actualisé en 2008. Il était le composant intégré de ces stratégies et comprenait une série de programmes visant à améliorer construit performance énergétique de l'environnement, y compris les deux objectifs de la réglementation: tous les nouveaux bâtiments résidentiels répondrait à la norme de rendement ÉnerGuide 80 d'ici 2010 et une réduction de la demande d'énergie par maison de 20% en 2020. Ces objectifs EEBS incité une mise à jour de la performance énergétique de la partie 9 du Code du bâtiment de la Colombie-Britannique. La mise à jour, initialement prévue pour 2010, a été adoptée en Décembre 2012 et devrait entrer en vigueur en Décembre 2014. Cette recherche analyse processus de performance énergétique du code de développement et de consultation de la province pour déterminer comment ces règlements développés, les facteurs qui ont influencé les normes de performance finale et comment les acteurs ont été engagés au cours du processus. La conclusion présente les enjeux et les conflits soulevés par les intervenants et fait une série de recommandations dans le processus d'élaboration des codes de performance énergétique

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Table of Contents

List of Tables

List of Charts:

Chapter 1 – Introduction

As scientific knowledge and understanding of climate issues, including global climate change, continues to increase, it is becoming more difficult for policy-makers to ignore the environmental implications of the built environment, particularly related to energy use and green house gas emissions (GHGs) (IPCC, 2007). It is estimated that buildings consume 20-40% of the world's commercial energy (Pérez-Lombard, Oritz and Out, 2008), while producing roughly 33% of total GHGs (UNEP-CEU, 2007). The implications of both aggregate and sectoral energy use and GHG emissions have prompted a range of policy programs at the international, national, provincial and municipal levels as governments begin to recognize the policy challenges associated with climate change. Policy programs specifically targeting the energy use components of the built environment have been incorporated into broad energy, development, and economic strategies at all levels of government (Province of British Columbia, 2007, and Aldy, Krupnick, Newell, Parry, & Pizer, 2010). In Canada, the use of national energy modeling programs (like the Residential End Use Model) and specific energy data aggregations and energy accounting models can make energy use comparisons with other countries difficult, however it is clear that the built environment is a significant contributor to national energy use. The "Report on Energy Supply and Demand in Canada" produced by National Resources Canada (NRCan), estimates the residential sector alone is responsible for 17% of national energy use and approximately 15% of national GHG emissions (NRCan, 2009).

Within Canada's regulatory framework, authority over the built environment lies with provincial, and in cases like the City of Vancouver, with charter municipal governments, who enact, maintain and enforce building legislation and standards, including building, plumbing and fire codes. The federal government plays a coordinating and research role in the development of building regulations, including the National Model Building, Plumbing and Fire Codes, and oversees three key national agencies working on energy efficiency: NRCan, National Research Commission (NRC) and the Office of Energy Efficiency (OEE). Nationally these agency's have developed a range of energy efficiency programs targeted at the built environment including: increased regulations, rebate and incentive programs, demand side management, utility pricing adjustments, research and training

programs. Some national programs, including the EnerGuide retrofit program, were developed through collaborations between national, provincial and local agencies. However provincial and municipal governments also developed a range of energy efficiency programs in support of specific environmental policy goals without collaboration with national agencies. These primarily consisted of rebates and incentive programs (some targeted specific products, others specific third-party building certifications), as most local governments do not have the legislative authority to increase building regulations and provinces are often unwilling to develop full building code updates without federal support.

In Canada building energy efficiency programs first emerged at the federal level in the late 1970s with the release of the "National Model Energy Code for Buildings" and the R-2000 performance standard (NRC, 2009). No province or territory implemented either initiative and in the absence of any enforcement or compliance requirements the construction industry ignored both standards.

In the absence of a comprehensive federal strategy on energy use and climate change, provincial governments began to take a leadership role on energy policy in the late 1990s, as British Columbia and Ontario began the development of multi-pronged energy policy programs (David Suzuki Foundation, 2008). These were motivated by the dual objectives of reducing the environmental impacts of energy (specifically those related to climate change and GHG emissions), while continuing to provide economic benefits to a range of stakeholders including the construction industry, municipal governments, energy producers and home owners (Province of BC, 2002).

In 2002, British Columbia launched a multi-faceted program, "*Energy for Our Future: A Plan for BC" (BC Energy Plan)*, aimed at reforming provincial energy policy. The documents laid the foundation for a set of additional programs related to energy production, energy use, energy pricing, carbon banking and carbon offsets, transportation, water use and water management and the built environment. Some of these programs involved coordination and collaboration with municipal governments however there has been little involvement with federal agencies or programs. These policies are currently in various stages of implementation, but they can still provide important insights into the province's approach to energy policy from early 2000s to the present, how their climate change mitigation strategies have been implemented and the different regulatory mechanisms used.

Following the introduction of the *BC Energy Plan*, the province followed with two separate policy programs aimed at the Plan's goals of increased efficiency across a range of sectors including the built environment (Ministry of Energy, Mines and Petroleum Resources, 2002). This paper focuses on the residential regulatory component of each program and the process used by the province when developing the increased energy efficiency regulations, which for both programs included a set of changes to the British Columbia Building Code (BCBC). This research focus is significant for two reasons: research into residential building efficiency strategies is limited and the residential sector is responsible for a significant portion of the province's total energy use (13%) and GHG emissions.

The first of these programs, the Energy Efficient Building Strategy (EEBS), was introduced in 2005 and updated at the beginning of 2008. It is a comprehensive policy program that targets three sectors of the built environment: residential, commercial, and institutional. The EEBS acknowledges that each sector contains a mix of stakeholders including owners, architects, designers, material suppliers and all sectors of the construction agency. Additionally, each stakeholder may have distinct needs, depending on their sector. For example, architects working on commercial spaces may have very different requirements than those working on residential high-rises (Ministry of Energy, Mines and Petroleum Resources, 2005). Additionally the EEBS acknowledged the range of policy instruments required to improve building performance, and each program (residential, commercial and institutional) included a mix of legislative, regulatory and incentive strategies.

The two specific regulatory goals of the EEBS are: the BCBC will have the highest efficiency standards in Canada and all new homes would be constructed to meet an EnerGuide 80 rating by 2010[1]. An additional building performance target that connects regulatory improvements to demand side management strategies is the commitment to reducing residential energy demand by 20% per home by 2010. The EEBS promised a tiered strategy for achieving these energy performance goals with gradually strengthening building codes introduced on a schedule designed to limit or offset their potential market or economic impacts on both the construction industry and residential consumers (Ministry of Energy, Mines and Petroleum

[1] NRCan developed the EnerGuide building rating system in the late 1970s as a response to the oil crisis of the early 1970s. A range of policy programs was developed during this period as government programs pushed for increased energy efficiency as a way to reduce consumer costs.

Resources, 2009). This residential regulatory program led to a major BCBC code update project coordinated by the Building and Safety Standards Branch. Residential buildings are covered by Part 9 of the BCBC and this code development program focused on a set of updates specific to this section of the code. This update was scheduled for incorporation into the BCBC in 2010; however it faced numerous delays and is currently scheduled for BCBC inclusion in December 2014.

The second provincial regulatory program is much narrower in scope and covers a set of changes to the BCBC for both Part 9 (residential) and Part 3 (commercial, high-rise residential) buildings adopted in 2008. The "Greening of the Building Code (GBC) program was also coordinated by the Building and Safety Standards Branch. Its main purpose was to add an environmentally focused objective to the BCBC to allow the building code to regulate building energy performance. This update also included the first energy-related performance-path for residential construction and formally incorporated an energy performance rating system (EnerGuide) within the BCBC.

There is limited public information available regarding the how the Energy Efficiency Branch or the Building and Safety Standards Branch developed the EEBS or the GBC. Details around research and modeling programs, stakeholder or inter-government agency consultations, cost-benefit analysis and the public review process are not available for either program. Though the EEBS includes commitment to stakeholder involvement during all phases of code development and implementation, there is no public evidence that suggests stakeholders were consulted during the development of the EEBS and its residential regulatory goals. The one exception to this is the public archive of comments received during the GBC's public review (conducted in the fall of 2007) as organizations not traditionally involved in the development of building standards, including environmental organizations kept public records of their submissions during this process.

The building code development process and the scope of building codes have changed substantially since their introduction to Canada in the early 1940s and has become a much more collaborative process, involving government, industry and stakeholders (including environmentalists and home owners) (Hawkesworth & Imrie, 2009 and Weitkamp & Longhurst, 2011). Despite the increase in stakeholder involvement, changes to the code development process and changes to code scope, limited research has been done around the code development process. In British

Columbia the two residential regulatory programs (the EEBS and the GBC) led to two energy-efficiency related BCBC changes between 2008 and 2014. The first change as part of the GBC did meet program goals by introducing an energy efficiency objective into the BCBC, however the code update associated with the EEBS did not achieve either the program's building performance goals or timeline. Given that the BCBC's energy performance standards will still be below EEBS goals when the second set of Part 9 updates are incorporated in 2014, another update process will be necessary.

Research Objectives

The main objective of this research is to review the two previous energy-efficiency code update processes to identify points at which it could be improved and compile a list of recommendations to the province around the code development process. Secondary objectives are to develop an understanding of how building codes have been incorporated into climate change mitigation policies and determine whether building codes are an appropriate form of regulation for increasing energy efficiency within the built environment. The GBC and EEBS were attempts by the province to use building regulations to increase the energy performance of the built environment. The resulting updates to the BCBC fall well below policy goals and objectives, particularly the EEBS's mandate that all new residential construction would achieve an EnerGuide 80 performance rating by 2010. In order to determine which factors contributed to the update delays and reduced performance standards this research analyzes the BCBC policy development process from the perspectives of both government agencies and key stakeholders.

While numerous research programs have focused on the technical aspects of building regulations designed to increase the energy performance of the built environment, little investigation has been conducted into how these regulations have been developed, what factors have influenced the final performance standards and which stakeholders have been involved in the process and the types of consultation methods used. This research attempts to fill in some of these information gaps around the code development process through an analysis of the process used in British Columbia during the development of the province's first energy efficiency performance code compliance path[2]. In addition to the lack of

[2] This means that the BCBC current contains two different code compliance options for residential energy performance: one that involves following a set of prescriptive requirements, and one that involves the building meeting a specified energy performance rating (EnerGuide 77).

academic research on code development, another challenge has been the limited public information released by the province of British Columbia or stakeholders around either policy program.

In order to satisfy the main research objective of gaining a comprehensive understanding of the residential energy efficiency improvements to the BCBC the following questions will be investigated: How have energy related building regulations evolved and where do British Columbia's policy programs fall along this continuum? What are the potential issues associated with energy performance codes and how did British Columbia's code development and implementation process address these issues? Did provincial government agencies collaborate on the development of either update? How were stakeholders involved in policy and code development and how was their input considered during the code development process? What were stakeholder perspectives on the code development process and how did they feel affected by the final BCBC energy performance standards? How did the province publicize the BCBC changes and how were the two BCBC updates implemented? How did the province monitor and evaluate either the GBC or the EEBS and has this information been made publicly available?

Methodology

This paper incorporates a three-stage methodology in order to understand how two residential regulatory programs (the "Green Building Code" and Part 9 Update of the British Columbia Building Code launched following the EEBS) were developed, implemented and evaluated, how stakeholder concerns influenced the policy development process and the subsequent impact of these changes on specific stakeholders, including homeowners, local governments and the construction industry.

The first section contains a comprehensive literature review that examines the evolution and evaluation of performance-based building codes and their use in regulating energy use and GHG emissions and how different forms of stakeholder engagement have been used during the development and evaluation of performance based building codes. There is limited information available that specifically analyzes either the process of British Columbia Building Code development or the code's performance standards, forcing the literature review to analyze code development process from other jurisdictions including California and Florida. The

literature review is broken down into two main topics: the evolution and typology of building codes, and an evaluation of energy performance codes. The results of the literature review informed the local policy analysis, the interview questions and the final recommendations.

The paper's second section provides a discussion of the local policy context related to the province's energy policy and climate change mitigation and adaptation strategies. It focuses on the EEBS, its residential regulatory goals and the two energy efficiency BCBC updates (2008 and 2014). It constructs a policy timeline using publically available policy documents and legislation (including the *BC Energy Plan* (2002 and 2007), the *Climate Action Plan,* the *Climate Action Charter,* the EEBS, *Ministerial Order M-100,* the *Clean Energy Act,* and the BCBC – see Appendix 1). It also uses these policy documents and newspaper articles to examine the various political factors that have influenced the evolution of the BCBC. This section also uses information from the interviews to provide an overview of the process used by the province to develop the GBC and the Part 9 update.

The third section presents a set of stakeholder interviews with individuals and organizations involved in the development of the EEBS, the GBC and the Part 9 updates. It presents stakeholder perspectives on the process used to develop, implement and evaluate the residential regulatory component of the EEBS and the GBC. Ten interviews were conducted: two with representatives from the provincial government, three from municipal and regional governments, four from the construction industry and one representing an environmental organization. The interviewee recruitment process was similar for each sector and included a standardized interview request letter outlining the purpose of the research, the relevant provincial policy programs (including the EEBS), and three confidentiality options for each interviewee.

The two provincial government branches suggested interviewees based on their experience with the EEBS and the BCBC. Local government and industry interviewees were solicited through direct contact with municipalities, regional districts, construction firms, construction associations and the Building Officials Association of British Columbia. 20 interview requests were sent to local governments with three positive responses, a response rate of 15%. The three interviewees represented municipal and regional governments that each run specific incentive programs geared towards supporting energy efficient

construction and each had over 15 years experience in the construction industry. The construction industry had the lowest response rate of all sectors (3.8%) as 4 of 104 associations and individuals contacted agreed to participate. It is important to note however, that many construction industry firms provided limited public contact details (website contact forms, or general email addresses like info@firmname.com) and 10 industry representatives expressed their interest in the project, but believed they were inappropriate research contacts as they had no awareness of the EEBS project or the Part 9 updates. The four interviewees represent a broad spectrum of the construction industry, including a representative with direct experience in the Part 9 update process. The environmental sector had a response rate of 6.6% as only one organization out of 15 contacted agreed to participate. Environmental groups were contacted based on previous involvement with a BCBC code update process (either through an official submission during the public review period, or attendance at a provincial code meeting or seminar), however many of the groups contacted mentioned that they lacked the technical capacity to discuss programs or policy related to the BCBC. A list of interview participants is available in Appendix 2.

The interviews were all conducted over the phone and ranged from forty-five minutes to almost two hours. The interviews were conducted over a three-week period from May 29th to June 19th. The interviews started with a set of general questions around the interviewee's background and experience with the EEBS and the BCBC to determine their involvement with both processes (see Appendix 2). The next phase of the interview was dependent on the background knowledge and experience of the interviewee. Due to the lack of published information regarding the BCBC development process, significant attention was given to the process used by the provincial government to develop the Part 9 update, from both the government and industry perspective. The interviews also included questions on how stakeholder input and perspectives shaped the code development process and how the government responded to stakeholder concerns raised during code development. The interviews also discussed how the code changes or the lack thereof might have affected different stakeholders and sectors including both the construction industry and local governments.

The final section presents a set of conclusions related to the paper's overall research objectives, including a set of recommendations to the province (specifically branches involved in energy programs) around future BCBC energy efficiency

updates. The recommendations are broken down into three categories that address the major policy process phases: development, monitoring and evaluation and implementation. Some of these recommendations could be incorporated into the current process around the Part 9 changes, while others could guide the next set of BCBC energy efficiency upgrades. The recommendations are based on research conducted during the literature review, analysis of the interview results and code update processes from elsewhere in North America, including the Province of Ontario. The recommendations were not discussed with interview participants, however many of the interviews included discussion on potential policy development improvements and suggestions around code implementation. The section closes with a set of suggestions for additional research around energy performance codes and the process of code development.

Chapter 2 - Literature Review

Building Codes: Their Purpose and Evolution

Regulation of the performance and characteristics of the built environment has been present in a variety of forms within human settlements dating back to the "Code of Hammurabi" of 1772 BC and have been in a process of continuous evolution ever since (Ben-Joseph, 2005). Historically, building regulations have responded to a range of social conditions and pressures including economic, public health and, increasingly, environmental (Moore & Wilson 2009). Moore and Wilson (2009) state that the evolution of building codes has been a very complex process, which represents a record of the continually evolving ideologies and values that have shaped cultures at large.

Payne, Bettman and Schkade (1999) propose that code development is less of an archeological exercise into previously coded societal values; rather it is a study of how special interest groups and the general public respond to questions about their underlying values. When looking at how building codes evolved they believe it is important to consider how various agents, stakeholders or regulators have been able to shape the process used to determine social values during code development (Payne, et al., 1999, and Foucault, 1975/77). The influence of those involved in the process of creating or improving regulations is important and is seen in other areas including health and food policy (Payne et al., 1999). Given the expansion of actors involved in the process of building code development, it is important to also

acknowledge that the motivation and underlying value systems shaping those engaging in code development discussions has changed (Payne et al., 1999).

Payne et al. also posit that building codes have two purposes: the first is to provide a set of guidelines that can shape future policy decisions, and the second is an attempt to predict future consumer responses. During building code development regulators typically focus on future policy decisions, while industry is more concerned with market and consumer responses (Payne et al., 1999). Payne et al. (1999) discuss how industry has focused on consumer behaviour in an attempt to ensure regulations match expected consumer preferences and will not contribute to reduced or stagnant economic growth. There has been considerable overlap between these two purposes as the actors and issues addressed within building codes have undergone significant shifts since the mid-1970s (IPCC, 2007).

Building Code Typologies

Moore and Wilson (2009) also analyzed the process of building code development over time and established four code typologies: tacit, representational, economic and civil. Tacit codes are embedded in cultural or day-to-day practices, reflecting implicit assumptions regarding the process of development without being codified in the modern regulatory sense (Hersey, 1988). These implicit ways of building shaped early BC settlements and still influence common construction practice. Representational codes are form-based strategies, like those used within the New Urbanist Transect (Emerson, 2007). Though these are primarily found in zoning regulations and are becoming increasingly popular as municipalities move towards a form-based code approach focused on elements of building massing (Bohdanow, 2007).

The second two code types (economic and civil) cover modern building codes around the world. The use of each type has shifted and expanded to accommodate changes in the overall approach to building regulations since formalized codes emerged in North America in the early 1940s. Civil codes occur in instances where regulations are considered socially justified, but are not cost effective and abandon the economic efficiency embedded within the economic code system (Feenberg, 2002). Civil code initiatives are often instigated by equity concerns, and include a significant public consultation or "public talk" component (Feenberg, 2002). In North America, the *American Disabilities Act* is one of the most important pieces of

legislation related to civil codes as it enabled the creation of a range of civil codes around accessibility. Civil code components can be appended to other types of codes; an example of this was the addition of accessibility standards to the 2006 BCBC. Civil codes likely have a prominent role to play in the next set of energy efficiency codes, however this process was not the approach taken by the British Columbia in the development of the GBC or the EEBS.

Economic codes emerged in the early part of the 20th century, structuring the first modern building codes, including Canada's Model National Building Code introduced in 1941. These codes continued to evolve throughout the 21st century as regulators used them to respond to changes in social values, increased knowledge of the built environment and specific events with far reaching economic and social consequences (Moore & Wilson, 2009). There are three types of economic codes (prescriptive, incentive and performance) and the majority of current building regulations are found somewhere along this continuum.

Prescriptive Economic Codes

Prescriptive economic codes specify a method for achieving an objective within the built environment, often by stipulating a set of exact specifications for each building component or system. In terms of the building envelope a prescriptive code will stipulate each material found in the wall assembly and the performance criteria that each must meet. These codes are legitimized by a set of actors: governments, regulating agencies, the industry and the general public and enforced by centralized governments (Johnson, 1988). In addition to the main overarching economic concerns of these prescriptive codes, they can be influenced by societal values (Angel & Rock, 2005). Economic interests are mainly represented by the construction industry, while the public health lobby motivated by concerns around the threats to public health caused by poor construction, was the main social driver of the first set of these codes (Moore & Wilson, 2009, and Angel & Rock, 2005).

The construction industry was heavily influenced by the rise of modernist ideals and the desire for increased production and exchange efficiency. Prescriptive economic codes were seen as a way to integrate the Fordist production model of the manufacturing sector into the construction process (Johnson, 1988 and Moore & Wilson, 2009). This enabled increased standardized within the construction industry, creating the first tract builders and a streamlined municipal building permitting processes. Prescriptive codes also modernized economic transactions

within the construction industry and provided access to increasing economies of scale (Moore & Wilson, 2009). In Canada the introduction of the first National Model Building Code in 1941 played a large role in enabling the construction industry to quickly expand to meet the increased demand for development, especially single-family homes, following WWII (CCBFC/PTCBS, 1997 and Payne et al., 1999).

Prescriptive economic codes, by the virtue of their structure and specificity, are deemed to stifle innovation and the use of alternative products that may not meet the prescriptive requirements, despite their actual performance in the field (Shapiro, 2011). The process of determining or evaluating alternative solutions for prescriptive code compliance can be cost prohibitive and act as a barrier to new products entering the marketplace. Additionally these costs may deter established companies from developing new product lines.

Incentive-based Economic Codes

Incentive-based economic codes (often called "stretch codes" in the United States) are optional standards or requirements added to basic prescriptive or performance codes that governments can require developers to meet in exchange for a range of incentives. They were first introduced as a strategy to address aspects of prescriptive codes that were problematic or out of step with existing societal values (Moore & Wilson, 2009). The first of these codes were based on economic incentives and targeted at both the construction industry and general consumers, but recent programs have incorporated environmental interests and the growing awareness of the built environment's impact on the natural world (Moore & Wilson, 2009). Shapiro (2011) illustrates that authorities often use these code components to mandate specific energy performance requirements in exchange for potential development incentives, like tax rebates or additional municipal infrastructure. This encourages the development and use of more efficient products and systems as the various bonuses (density, offset public infrastructure costs etc.) can offset developer costs, lowering the consumer prices of energy efficient buildings (Pape-Salmon, Muncaster & Kaye, 2011). These incentive codes are often used as an interim measure prior to the transition to a full energy performance code in order to ease the market and consumer transition to new products (Pape-Salmon, et al., 2011 and CD Howe Institute, 2007).

Another type of incentive code are the voluntary third-party building certification programs that have emerged across North America to address various gaps or delays in government regulatory programs (Heberle & Christensen, 2010). The best known of these programs is the United States Green Building Council's "Leadership in Energy and Environmental Design" (LEED) a voluntary performance-based code that offers builders four different certification levels (Cidell, 2009). Cidell (2008) outlines how developers have used the LEED program to capitalize on the slow growth of a new category of environmentally conscious citizen-consumers and how they can use certification levels as an incentive to charge higher prices depending on the building's certification level (Wicker & Becken, 2013).

Municipal regulators have begun to use these third party programs as proxy incentive codes, especially in the development of commercial or institutional projects (Shapiro, 2011). In British Columbia, municipal and regional governments have legislative tools that can allow them to require certain amenities (including high performance buildings) during the rezoning process. The LEED program is often included, as the standard buildings must meet as a condition of their rezoning (Kientzel & Kok, 2011). Unfortunately since these third party programs use performance elements beyond what is currently included in the building code, including elements around construction industry practices, and material sourcing, they cannot be directly incorporated into the BCBC.

Performance-Based Economic Codes

Performance-based economic codes can be defined as "the objectively identifiable… characteristics of the building, which help determine its aptitude to fulfill the different functions for which it was designed" (CIB, 1988). These codes move beyond the single compliance option of prescriptive codes, providing multiple design and compliance options, allowing builders additional choice around how they achieve code compliance (Moore & Wilson, 2009 and Gross, 1996). The use of these codes has increased exponentially since the early 1990s as prescriptive economic codes were modified to include performance components (Meacham, 2010, and CIB, 2004). Modern performance codes may include sections about specific building attributes including: fire safety, air tightness, water efficiency and energy efficiency (Foliente, 2000, and CIB, 2004).

The Inter-Jurisdictional Regulatory Collaboration Committee (IRCC, 2008) identifies two types of performance codes: technology-based performance codes and risk-based performance codes. The BCBC updates that resulted from the EEBS are technology-based as they were developed through the modeling of specific performance characteristics under well-defined conditions. The tests and design speculations are intended to measure and evaluate the performance characteristics of the entire building (Meacham, 2010). Risk-based criteria are primarily concerned with the behavior of a product in use and performance is measured in terms of the reliability of the product to perform as expected. This code type primarily applies to structural or load bearing elements with public safety implications.

Performance code goals are often based on the prescriptive code sections they are designed to replace (Shapiro, 2011 and Hui, 2002). For example the EEBS presents energy efficiency goals (including a 20% reduction in energy demand per residence) as the result of modeling calculations that compare the energy use characteristics of the existing building stock (constructed to meet current prescriptive or performance code requirements), with buildings designed to meet the new performance requirements (Ministry of Energy, Mines and Petroleum Resources, 2005 and 2009). Yik and Lee (2002) illustrate that the rising use of energy modeling systems in performance code development has enabled governments, like BC, to set specific energy performance targets and standards. These codes can then be implemented in an incremental fashion, with a schedule designed to minimize impacts on industry and consumers (Lee & Yik, 2002, Payne et al., 1999 and Chau, Tse, & Chung, 2010). However, the failure to include performance-monitoring programs as part of these code update programs may compromise their effectiveness (Jacobsen & Kotchen, 2013 and Parsons, 2006). Regulators have not focused on determining the actual effectiveness of these performance-based standards, which is an issue discussed further in the following chapters (Newsham, Mancini, & Birt, 2009).

The History of Energy Efficient Performance Codes in North America

British Columbia's shift towards a performance-based building code to increase building energy efficiency is not novel. The first energy-related performance codes were introduced in North America following the 1973 oil crisis. This was the first major peacetime oil shortage for industrialized countries and it highlighted the vulnerability of global oil reserves and energy prices (Akins, 1973). The oil

embargos and price increases imposed by the Organization of Arab Petroleum Exporting Countries resulted in limited oil supplies and immediate energy price increases that had large economic consequences (Hubbard, 1956, Akins, 1973, and Duane, 2002). Industrialized nations began to promote energy efficiency as a way to minimize costs and introduced new product standards and regulations (Akins, 1973). In terms of the built environment, countries incorporated a range of policy instruments that mixed incentives and regulations. In Canada during the late 1970s the NRC developed the country's first energy-based performance code "Measures for Energy Conservation in New Buildings" and the R-2000 building rating system, however as already noted no province or territory adopted either initiative and few residential builders have incorporated the R-2000 standard (Taraschuck, et al., 2011).

California's Energy Efficiency Standards for Residential and non-Residential buildings

The energy cost issue of the early 1970s was not enough to induce regulators in British Columbia to adopt more stringent building regulations. However in California additional social factors contributed to the state passing North America's first performance-based building code in 1978. In addition to the economic effects of the oil crisis the "Energy Efficiency Standards for Residential and Non-Residential Buildings" emerged from the state's rapid population growth and an increasingly politicized environmental movement (Akins, 1973 and Duane, 2002). Federal energy allotments were insufficient to compensate for California's rapid population growth and created further pressure on energy prices and a greater need for new energy generation facilities (Akins, 1973 and Duane, 2002). California's growing environmental movement was able to capitalize on the local environmental issues related to energy generation by focusing public attention on health and air quality, the location of power plants and the impacts of runoff and various pollutants (Akins 1973). Environmental interests won a series of early political victories, which led to their involvement in policy consultations including those related to the "Energy Efficiency Standards for Residential and Non-Residential Buildings". This was the first time environmental interests had been involved in building code development in North America, a trend that would be increasingly formalized and is now integral to many building efficiency programs (Shapiro, 2011).

California's "Energy Efficiency Standards for Residential and Non-Residential Buildings" used an early building energy model to determine what changes to the

heating and cooling systems and wall assemblies would lead to a 30% reduction in energy consumption for new residences, and thus 30% cost savings for homeowners (Shapiro, 2011 and Heberle & Christensen, 2010). Unfortunately a performance-monitoring program was not used to corroborate cost and energy savings, making it difficult to determine its actual impacts on California's energy use totals following implementation (Wenz, 2008, and Heberle & Christensen, 2010).

Performance-based codes through the 1980s

Though social movements were the primary drivers of the first performance based building codes, the construction industry still had considerable influence over code development processes (Moore & Wilson, 2009 and Prum, 2012). The statewide approach to performance codes still supported industrial standardization and efficiency enabling high levels of coordination and continued growth, while the marketing approach to efficiency standards assured consumers that they would eventually save money by investing in new energy efficient consumer products (Vine, 2012, Heberle & Christensen, 2010, and Angel & Rock, 2005). Additionally, by raising the bar of building performance across entire states, regulators kept a level playing field within the industry, and enabled all residents to access these building performance improvements (Vine, 2012).

The construction industry continued to influence building code development through the 1980s, however without the energy pricing pressures of the Oil Crisis, industry began to favour increased deregulation and the abandonment of energy performance regulation (McCarthy & Prudham, 2003, and Angel & Rock, 2005). This caused the development of energy performance codes across North America to slow and even industries that developed system or product specific energy performance guidelines (like the American Society of Heating, Refrigerating and Air-Conditioning Engineers) did not make them mandatory across the industry.

The Second Wave of Energy-Based Performance Codes

The first wave of energy-based performance codes of the late 1970s emphasized energy use and its associated environmental effects at the local level, allowing regulators and environmental groups to appeal to citizens in a direct way: through reduced utilities bills and improved local environmental quality (Duane, 2002). In the ensuing twenty-year period prior to the GBC in BC, energy use issues have been grounded in much different environmental and economic contexts: climate change

and globalization (Meehl et al., 2007, and Foliente 2000). The broad scope of the environmental effects of climate change spurred a second wave of increased regulation by government and third party actors for numerous sectors including the built environment and led to a resurgence of research and development around performance based codes for energy efficiency (Lutsey & Sperling, 2008, and Heberle & Christensen, 2010).

The construction industry also influenced the move towards performance codes, though not necessarily those focused on energy efficiency, as globalization shifted the industry's desire for efficiency and coordination from local to global markets (Meacham, 2010, and Foliente, 2000). Prescriptive building code requirements gradually came to be considered as restrictive to international trade. Trade discussions centered on attempts to circumvent the specific material requirements of most prescriptive codes (Foliente, 2000, and Hui, 2002). The inclusion of a clause favouring performance codes in the 1995 Agreement to Technical Barriers to Trade (Clause 2.8) by the World Trade Organization formalized these shifting preferences[3]. This ensured future building codes, especially those like BC's EEBS promoting energy efficiency, would be grounded in a performance-based approach, presumably amenable to global trade agreements and the new global construction market (Foliente, 2000, and Hui, 2002).

Building Regulation Post-Kyoto and the IPCC

Climate change was first brought to the policy forefront following the United Nations Conference on Environment and Development in 1992 (UNCED, 1992). The initial approach focused on climate change mitigation[4] and policy coordination at the international scale. Preliminary policy programs targeted sectors with the highest concentrations of GHG emissions including energy generation, transportation and industry (Aldy, et al., 2010).

The Kyoto Protocol was the first of these global programs. First signed by Canada in 1997 and ratified in 2002, Kyoto was meant to stimulate broad climate change policies and ensure measureable GHG emission reductions. Prior to Canada's withdrawal from the protocol in 2011, the federal government's policy response

[4] Climate change mitigation includes strategies designed to potentially limit or slow the magnitude or rate of long-term climate change. These strategies focus on reductions in anthropogenic GHG emissions.

was limited and primarily focused on voluntary initiatives and incentive programs; options that would not have achieved required national emissions targets in the specified timeframes (David Suzuki Foundation, 2008, Pembina Institute, 2006 and Heberle & Christensen, 2010).

Federal climate change programs included a set of initiatives targeted at building efficiency: EnerGuide program, the ecoEnergy Efficiency for Housing (David Suzuki Foundation, 2008). These programs have faced a range of difficulties (cancellation, uneven funding, poor coordination) and while they did include cooperation and co-funding with provincial agencies, there were no commitments to regulatory improvements, or a large-scale strategy to transition the market towards efficient products in a more timely fashion (David Suzuki Foundation, 2008 and CD Howe Institute, 2007). In the absence of effective national policy programs, provincial and local governments were forced to assume an increased share of the climate change policy burden, (including the creation of provincial incentive programs like BC's LiveSmart program, the rebate and incentive component of the EEBS) often without the resources to pursue full scope of the climate change policy agenda (Lutsey, & Sperling, 2008, and Robinson & Gore, 2005).

Climate change programs developed by local governments, including British Columbia, have been much more comprehensive than those at the federal level, employing a range of policy instruments (increased regulation, incentives and rebate programs, taxation strategies and pricing reforms, the deregulation of specific sectors (including energy production), and changes to provincial and state regulatory frameworks) in strategies that address: energy policy, transportation policy, resource management, water management, industrial regulations, development and product efficiency standards (David Suzuki Foundation, 2008 and Aldy et al., 2010). Provinces have used a variety of implementation strategies for these programs, either through an overarching program that acts as guides for specific sectors, ministries and departments, or a series of disparate policies (David Suzuki Foundation, 2008).

British Columbia has pursued a hybrid approach. The first major climate change focused policy was the *BC Energy Plan*, released in 2002 (David Suzuki Foundation, 2008). It launched with broad emissions reduction targets focused on energy production, transmission and conservation (David Suzuki Foundation, 2008 and Ministry of Energy, Mines and Petroleum Resources, 2002). The plan was used to

provide the initial overarching framework for a range of energy-focused programs and its 2006 update, *BC Energy Plan: A Vision for Clean Energy Leadership*, expanded the program even farther with clear commitments to green energy generation, energy efficiency, municipal corporation energy use and increased funding for research and development of new technologies (Ministry of Energy, Mines and Petroleum Resources, 2006). A range of policies were released under this policy framework, including the updated EEBS, which just predated the release of the province's larger climate change strategy at the end of 2008 (Province of British Columbia, 2008). The *Climate Action Plan* required a longer development process, but by releasing a set of energy policies first, the province took action against one of the core issues of climate change (energy use and GHG emissions) and built awareness of the larger policy changes to come (Archer Dolan et al., 2010).

The EEBS's building code improvement strategy is based on making the previously voluntary EnerGuide performance rating system part of the BCBC. EnerGuide is a Canadian building rating system that uses a combination of energy modeling (via the HOT 2XP modeling program) and performance testing (via a blower door test to check for air leakage) to rate a building's prospective energy use (Parker, Rowlands, & Scott, 2003). It is a central component in the federal government's EcoEnergy initiative and was initially used to encourage building retrofits (Parker et al, 2003). EnerGuide uses a weighted 100-point scale to rank building performance (including the building envelope and heating/cooling systems) and the EEBS recommends the building code include a performance path component to ensure new construction is rated EnerGuide 80 (Ministry of Energy, Mines and Petroleum Resources, 2009 and Gamtessa, 2012). The EnerGuide 80 rating is important as it means that the building is performing to an earlier version of the countries R-2000 standard (Parekh, 2005). R-2000 is another national standard, initially developed by NRCan in the late 1970s that focuses on energy efficiency, air tightness and environmental responsibility. NRCan has continued to upgrade the standard, despite its continued voluntary status and the EnerGuide 80 comparison is between an early 2000s version of the standard (Parekh, 2005). The R-2000 standard has not gained traction within the construction industry and it is estimated that less than 1% of new homes are voluntarily built to this standard (Parker et al., 2003).

Though the Hot2000 modeling program at the heart of the EnerGuide and R-2000 programs has become increasingly sophisticated, it is still driven by economic and industry interests and concerns (Lee & Yik, 2002, CD Howe Institute, 2007).

Modeling programs and related technologies and systems have the capability to determine performance levels much higher than the 25-30% improvements specified by EnerGuide 80, however concerns over consumer costs have lowered upper limits of performance regulations (CD Howe Institute, 2007, and Pape-Salmon, et al., 2011). This incrementalist approach illustrates the balance regulators have attempted to strike between energy performance and consumer costs. The nature of these conflicting factors lead to code standards that are not a reflection of current technological possibilities and there is still considerable potential for increased performance regulations as technologies improve (CD Howe Institute, 2007 and Pape-Salmon et al., 2011). Given the current longevity of the built environment (roughly 40-50 years), the implementation delays associated with the BCBC updates may lead to the further entrenchment of inefficient residences that will require additional energy (particularly embodied energy associated with new products) and further retrofit to increase performance (Pape-Salmon, et al., and Lee & Yik, 2002).

Evaluating Energy Performance Codes

The threat of climate change has been a powerful driver for the second wave of performance based building codes: the vast majority of US States, and British Columbia and Ontario have adopted some form of building efficiency regulations since the late 1990s and the performance requirements of these codes continue to be tightened (Jacobsen & Kotchen, 2013, and David Suzuki Foundation, 2008). Despite this increased focus on using building regulations to limit energy use and GHG emissions, the literature identifies a set of barriers and issues associated with these regulations including: Lack of information and education, construction industry resistance, organizational practices or customs, performance uncertainties, product compliance, higher up-front costs, misplaced or split incentives, long payback periods and increased administrative/managerial costs (Wieditz, 2005).

Jacobsen and Kotchen (2013) identified four additional problems with energy efficiency performance codes: the absence of systems to verify building performance, new standards with minimal changes or upgrades (Jaffe & Stavins, 1995), insufficient understanding of the impacts of occupant behaviour (Greening et al., 2000, and Chau et al., 2010) and inaccurate modeling assumptions that may not reflect real-world conditions and preferences (Metcalf & Hasset, 1999, and Torecellini, et al., 2004). The use of performance testing to determine actual

performance and energy savings could mitigate some of these issues. Testing results could provide a better understanding of how occupants use residences built to newer energy efficiency standards (Greening, et al., 2000). Builder education could also be improved through performance testing as they will be able to judge how well their construction complies with the new performance targets and make adjustments accordingly.

Do Energy Performance Codes Work?

Since building energy performance data is based on the results of a set of sophisticated building stock modeling programs, the incorporation of new building stock profiles as the result of the introduction of a performance code can show immediate efficiency improvements. The reliance on modeling programs means it is particularly important to ensure new residential building stock profiles are effectively integrated into national modeling programs (including Canada's REUM) as these programs are used to determine national residential energy use and GHG emissions (NRCan, 2011). Canada has placed significant resources into the development of these national energy models and their associated building rating systems, and most performance code programs include a significant modeling component during their development. Unfortunately, though the modeling components of performance codes can often demonstrate significant energy efficiency gains, the lack of performance testing elements to verify the modeling assumptions may create questions regarding model accuracy and its ability to accurately predict energy use and efficiency gains (StatsCan 2011, Meier, Olofsson & Lamberts, 2002 and Vine, 2000).

The issue of determining building performance is exacerbated by a lack of connection between code standards and actual building performance (Jacobsen & Kotchen, 2013, Parsons, 2006, and Newsham, et al., 2009). There is a lack of independent scientific evaluation into residential building energy use and few energy code updates include a performance-monitoring component (Jacobsen & Kotchen, 2013). This means performance codes are grounded in energy modeling programs that only present theoretical energy gains and GHG emission reductions (Lee & Yik, 2002). The EEBS includes EnerGuide performance ratings, which enabled specific predictions regarding potential energy savings (a 20% per-home energy demand reduction), but the strategy does not include any discussion of a monitoring program or post occupancy evaluation (POE) program to verify, monitor

or track predicted energy savings and GHG emission reductions (Ministry of Energy, Mines and Petroleum Resources, 2009, Vine, 2012, and Jacobsen & Kotchen, 2013).

Additional Performance Code Issues

Jacobsen and Kotchen (2013) also consider why POE's have proven to be so challenging to develop and implement: traditionally building codes have not extended beyond occupancy, data gathering programs may involve privacy concerns (Canadian Press, 2011) and research programs may pose additional costs on governments and regulators. Their 2002 study of residential energy use in Florida was one of the first to use utility billing data to verify the energy efficiency claims of an energy performance code (Jacobsen & Kotchen, 2013). The study used publicly available residential energy consumption data published by a state non-profit agency, which limited both cost and privacy concerns. Florida's incrementalist approach has introduced a set of increasing performance requirements for residential construction, however since these code programs did not include a performance-monitoring program, this study's use of residential energy consumption data provides the first program evaluation using actual residential energy use data (Jacobsen & Kotchen, 2013). The study confirmed that while the building code changes did lead to increased energy efficiency and energy savings (4% electricity and 6% natural gas), they were below the model predictions of between 10% and 15%. It also identified that performance improvements were not uniform across all residences, as larger homes typically did not show the same percentages of energy savings.

The connection between building size and energy consumption has emerged as a key issue in other studies using POE information in commercial buildings (Newsham et al., 2009, Clune, Morrissey, & Moore, 2012, and Scofield, 2009). Scofield (2009) conducted a series of analyses comparing the performance of LEED certified commercial buildings[5] with conventional buildings. In addition to confirming that LEED certification levels were not indicative of energy performance in commercial buildings, the study illustrated the disproportionate impact of large buildings on the total energy use of the entire sector. The EEBS does not incorporate different standards based on building size however; given the results of these POE studies perhaps it should include a performance monitoring component to evaluate

[5] The LEED program does not include POE testing and does not verify modeling claims.

what kind of additional considerations could be given to parameters beyond local climate and building components. The decision to place additional requirements on specific subsectors within the building may be problematic and could create equity concerns with specific groups believing they are being unduly targeted by increased regulations and the subsequent cost increases.

Cost Equity Issues and Energy Performance Codes

Another frequently referenced barrier to increased building regulations are the upfront costs and extended consumer payback periods of high efficiency products (Wieditz, 2005). Since these codes include additional or higher performance building materials there are often increased costs required at the time of construction, though there are often attempts to mitigate these concerns by pairing building code changes with rebate and incentive programs designed to support consumer and market transitions (Pape-Salmon, et al., 2011, and Wieditz, 2005). Economic interests have always been considered in code development and are influential when setting minimum code standards (CD Howe Institute, 2007 and Parker, et al., 2003).

Since building code update programs have incorporated a range of types, scopes, implementation schedules and companion programs it is impossible to present a comprehensive overview of the cost implications of performance-based building codes. In BC, in an attempt to limit the financial burden associated with these upgrades, the code update programs of the EEBS targeted building systems with the highest energy end uses and thus the higher homeowner costs. Targeting high energy end-uses reduces the potential payback period for homeowners. The EEBS also targeted homeowners living in colder climates by placing the most stringent requirements on the province's coldest region (Ministry of Energy, Mines and Petroleum Resources, 2009).

Though the province released projected cost benefit analysis information during the public comment period of the 2008 BCBC upgrade, this information is no longer available. Public submissions indicate that these cost figures were not prohibitive, with the changes resulting in cost savings for most energy systems and in most areas of the province (this will be further discussed in Chapter 3) (Proskiw, 2012).

These reports illustrate that increased regulations do not inherently include an increase in consumer costs and they provide further evidence in support of the arguments that increased efficiency translates into both energy and cost savings, though additional research into life-cycle costing should have been a component of the updated regulations as a way of monitoring the accuracy of predicted results (Morrissey & Horne, 2010). In British Columbia, an additional cost issue to consider is the continually low energy prices caused by heavy regulations on both public (electricity) and private (natural gas) utilities. These reduced costs can often have considerable impacts on payback periods for energy-related equipment or materials.

Despite this evidence in support of the cost-effectiveness of energy-efficiency regulations, there exists considerable concern regarding the potential impacts of energy efficiency building codes on the construction industry (Shapiro, 2011). Significant research has focused on the cost increases associated with third-party building certification programs including LEED, Built Green and Green Globes (Newsham, et al., 2009, Scofield, 2009, and Shapiro, 2011). These third-party certification programs have become increasingly prominent and prolific, potentially influencing what the construction industry and the general public consider a "Green Building" (Muse & Plaut, 2006). This perception is especially important when considering the differences in scope and thus costs between government building codes and third-party certification programs.

When comparing the cost implications of government regulatory programs and third-party systems (like LEED and Built Green) it is important to maintain and understand the program's differences. Third-party programs are broad in scope, covering everything from construction firm operations, to material sources, and material composition. This scope is estimated to cause cost increases of up to 30% per building (Newsham, et al., 2009, and Scofield, 2009). While there is theoretical evidence that these programs can drastically improve energy performance (especially as it pertains to embodied energy), given the issues that have emerged regarding the actual performance of these buildings (Jacobsen & Kotchen, 2013) it is appropriate that mandatory building regulations have not been extended in an attempt to compete with these programs. Consumers that demonstrate a willingness to pay for third-party programs are capable of using their purchasing power to support these standards, and the relevant sectors within the construction industry (Chau, et al., 2010). As these programs become increasingly popular and

the cost differential reduced there could be increased overlap between the parameters of government regulations and third-party programs, though any changes to the scope of building codes would need to go through extensive consultation between government, industry and other stakeholders.

Chapter 3 - Energy Efficient Building Strategy in Context

Building Energy Use in British Columbia

British Columbia's policy programs around energy, GHG emissions and efficiency are rooted in a growing understanding of the negative environmental externalities of global climate change. The global risk factors of continued GHG emissions are well documented and include raising temperatures, melting of polar ice caps, ocean acidification, and increasing prevalence of drought, floods and other extreme weather events (IPCC, 2007). The broad environmental risks have led to multifaceted policy programs, of which the built environment components have become increasingly prominent (IEA, 2007).

In Canada, national energy use and GHG emissions tracking falls to several federal agencies including NRCan, the OEE and Statistics Canada (StatsCan). The main source of Canadian energy production and use data is the StatsCan "Report on Energy Supply and Demand in Canada", which breaks down energy use by energy production and end use categories (StatsCan, 2009). The report presents data at the national and provincial level for both energy production and consumption (see Table 1). Unfortunately, StatsCan does not break down the residential sector into different end use totals, making it impossible to use this data to determine exactly

Table 1: Report on Energy Supply and Demand in Canada

Total Energy Use by Sector						
BC Totals (in TJ)	2005	2006	2007	2008	2009	5-Year Total
Total Industrial	473	436	490	462	451	2,312
Transportation	335	327	343	341	335	1,681
Agriculture	13.4	11.5	13.4	11.4	9.5	59.2
Residential	145	147	143	154	154	743
Comm/Inst/Public Admin	154	152	147	159	153	765
Electric Power Generation	29	30	28	35	30	152
Total:	1,149.4	1,103.5	1,164.4	1,162.4	1,132.5	5,712.2

how occupants use energy within the residence. Additionally these figures do not include or account for embodied energy, an important factor that should be

considered when analyzing or determining total energy use for the built environment (Morrissey & Horne, 2010).

Another set of national energy statistics is compiled by NRCan and published yearly in the "Energy Use Data Handbook". This provides national energy use breakdowns and GHG emissions by end-use and energy type (NRCan, 2011). NRCan uses the "Residential End-Use Model" (REUM) for the report's energy modeling. REUM is a stock counting model developed by the OEE that aggregates energy end use data by combining annual stock characteristics, sales data, usage profiles and unit energy consumption for equipment stock. The report breaks down energy use into five sectors and provides end use breakdowns for each strategy. This provides a better understanding of how energy is used within Canadian homes, allowing performance codes to address the most intensive end use categories. Table 2 shows the REUM breakdown of national energy end-uses for the residential sector.

Table 2: Energy Use Data Handbook

Energy Use by End-Use						
(Percentage of Total)	2005	2006	2007	2008	2009	5-Year Total
Space Heating	61.2	60.3	62.8	63	62.8	62.1
Water Heating	18.1	18.8	17.9	17.5	17.3	17.9
Major Appliances	9.4	9.7	8.8	9	9.1	9.2
Other Appliances[1]	4.3	4.7	4.5	5	5.3	4.7
Lighting	4.6	4.5	4.1	4.1	4.3	4.3
Space Cooling	2.4	2	1.9	1.4	1.2	1.8
Total:	100	100	100	100	100	100

These energy use breakdowns illustrate that heating and hot water systems (including their related components of insulation, windows, piping, ductwork etc.) are the most energy intensive aspects of residential buildings. Given the Canadian climate and the number of heating degree-days, this result is not surprising (Environment Canada, 2008). These systems also represent the largest source of GHG emissions within the residential sector (see Table 3) (NRCan, 2011).

Table 3: Energy Use Data Handbook

Total National GHG Emissions Including Electricity						
Mt of CO_2e	2005	2006	2007	2008	2009	5-Year Total
Space Heating	45.7	40.2	45.7	45.3	42.2	219.1
Water Heating	13.0	13.0	13.4	13.0	12.2	64.6
Major Appliances	7.2	7.2	7.3	7.0	6.2	34.9
Other Appliances	3.3	3.5	3.8	3.9	3.6	18.1
Lighting	3.3	3.3	3.4	3.3	2.9	16.2
Space Cooling	1.9	1.5	1.6	1.2	0.8	7

When looking at the energy consumption figures for British Columbia, the totals differ slightly from Canadian averages. This may be caused by the data availability and the modeling approach used, however given that few provincial policy documents include energy end use totals, this is difficult to verify (Nyboer, Tu, & Joseph, 2006). The EEBS is one of the few large-scale provincial policies to include end use breakdowns, though no data source or year is provided within the report (Ministry of Energy, Mines and Petroleum Resources, 2009). See Chart 1 for energy end use totals for British Columbia.

Chart 1: Energy Use Data Handbook

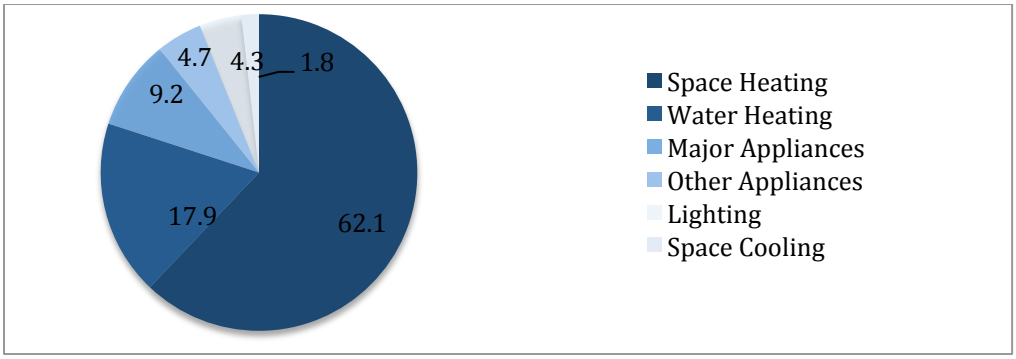

Chart 1 illustrates energy use within residential buildings and the building components and systems that fall under the scope of the BCBC. The most intensive energy end uses, including heating, water heating and cooling systems and their various components are all regulated via the BCBC (a total of approximately 81.8% of residential energy use), while the performance of appliances and lighting fall under the scope of the *Energy Efficiency Act* at the provincial level or the OEE at the federal level.

The EEBS does not include specific GHG emission totals for the residential sector, however the Greenhouse Gas Division of Environment Canada, BC Ministry of Forests, and the Canadian Forest Service have monitored GHG emissions across the province since 1990. In 2005, the first year of the EEBS, the residential GHG emissions totaled 4,421 kilotons of CO_2, while in 2009 the year of the EEBS update GHG emissions had risen slightly to 4,551 kilotons of CO_2 (Ministry of Environment, 2005). The emissions accounting measures used make it difficult to determine the total GHG emissions of the built environment and subsequently to chart how emissions have changed since the introduction of the EEBS, as both the total GHG

emissions and the percentage of the residential sector have fluctuated since its introduction (see Table 4).

Table 4 – British Columbia Greenhouse Gas Inventory Report

BC Greenhouse Gas Emissions						
	2005	2006	2007	2008	2009	2010
Residential	4,421	4,513	4,475	4,470	4,551	3,803
Total	65,554	63,694	64,897	65,417	61,522	61,993
% of Total:	6.74	7.08	6.89	6.83	7.39	6.14

British Columbia's Climate Change Policy Program

As mentioned above, British Columbia released the EEBS in two phases (the initial strategy of 2005 and an update/expansion in 2008) that formed the built environment portion of the province's broad energy efficiency and climate change mitigation and adaptation strategy. The province released a range of policy programs starting in 2002 with the *BC Energy Plan* (which received a significant update in 2007 and continues to guide policy decisions) and they continue to work on policy programs with significant climate change adaptation components (including the much-delayed *Water Sustainability Act* currently scheduled for adoption sometime in 2013). Despite current work on climate change policy and programs, the period between 2002 and 2010 was an especially significant time politically for energy related issues as British Columbia introduced Canada's first carbon tax, shifted energy procurement policies to increase the development of renewable energy projects and introduced the first energy-related building regulations. These policy initiatives were the result of a relatively stable political climate that featured a Premier's Office strongly committed to climate change mitigation and increased energy efficiency. See Appendix 1 for an energy policy timeline for this time period.

The provincial Liberal party under the leadership of Gordon Campbell won three consecutive elections from 2001-2009 and Mr. Campbell was Premier until he resigned in March of 2011. He was initially elected with the largest majority government in British Columbia's history (77 of 79 MLAs) and campaigned with a platform that emphasized the need to reexamine British Columbia's energy policy. This focus on climate change and energy related policy continued through his second term with the introduction of a major update to the *BC Energy Plan (*the *BC Energy Plan: A Vision for Clean Energy Leadership)* which significantly expanded the

plan's scope focusing on clean energy generation, increased efficiency and promised significant investment in the development of new technologies (Ministry of Energy, Mines and Petroleum, 2006). Mr. Campbell's second term also saw the introduction of the *Climate Action Plan* and the second phase of the EEBS. Both programs also had significant support from the Premiere's Office at the time of their adoption, however other policy and political issues eclipsed these programs prior to Mr. Campbell's resignation in March 2011.

These shifts in government priorities illustrate how quickly provincial focus can change, regardless of the amount of funding or person-power previously invested. Despite the impact and importance of shifting political priorities, it is still important to examine the process of policy development, implementation and evaluation. It is also important to note that despite the change in large political priorities throughout the province the work on changing and updating the building code has continued, though at a much slower rate and with much less public attention.

EEBS and GBC: Development and Implementation

The EEBS is a high level, goal oriented policy document that was implemented over two phases that each included programs for every major sector of the built environment: residential, commercial/institutional and industrial. The residential component of the first EEBS included a range of incentive and voluntary strategies designed to encourage the purchase and development of higher efficiency products, a commitment to utility pricing reforms and a set of project specific funding commitments. It alluded to a program of building regulations, but did not provide any details regarding the scope of regulatory upgrades, building performance targets or an upgrade timeline (Ministry of Energy, Mines and Petroleum Resources, 2005). The updated EEBS, "*Energy Efficient Buildings Strategy: More Action, Less Energy*" (2008), reinforced the commitment to market-based solutions (specifically through the introduction of the LiveSmart Rebate program, originally designed to supplement the federal ecoEnergy incentive and rebate program), but also included additional details and commitments regarding regulatory reform, and performance targets. The EEBS included two residential regulatory goals: that BC would have "Canada's Greenest Building Code" and all new Part 9 buildings[6] would meet the EnerGuide 80 standard by 2010. The EEBS also combined the regulatory changes

[6] Part 9 buildings include single-family homes, duplexes, triplexes, townhomes, row houses and low-rise apartments (four stories and less).

with the demand side management programs with a goal of a 20% reduction in energy demand per home by 2020.

Despite its high-level strategic orientation, the EEBS makes clear timeline commitments around regulatory targets, giving the Building and Safety Standards Branch (the department in charge of developing and implementing changes to the BCBC) two years to implement EnerGuide 80 rating goal. The ongoing GBC project creates the impression the Building and Safety Standards Branch had been involved with the EEBS goal development process, however the interviews in Chapter 4 illustrate that this was not a well-coordinated incrementalist strategy.

The two-year timeframe for a major code update is extremely ambitious and there was significant political pressure to develop a robust standard that could continue to place the province at the forefront of national climate change and energy policy. The development of the EEBS did not include consultations with other government agencies or stakeholders around the feasibility of the proposed timeline or to solicit input on potential scheduling changes that could have made the update program more palatable for the construction industry, local government and the Building and Safety Standards Branch.

The Greening of the Building Code and the Addition of an Energy Efficiency Objective

Following the introduction of the initial EEBS in 2005 and prior to the release of the 2008 update, the Building and Safety Standards Branch had begun work on a separate regulatory initiative (influenced by a range of larger policies including the *BC Energy Plan: A Vision for Clean Energy Leadership)* designed to "green" the BCBC. The first "Green Building Code" (GBC) update was released for public review in September of 2007 and incorporated into the BCBC in September of 2008. Though the programs were not connected there were references that the GBC was an important first step towards the larger goals of the EEBS, and a realization of the original *BC Energy Plan* and the promises of its 2007 update, which committed to increased building efficiency (Ministry of Energy, Mines and Petroleum Resources, 2008). The Building and Safety Standards Branch developed the GBC in insolation without consulting the Energy Efficiency Branch.

The main goal of the GBC update was to add an environmental objective to the BCBC, which had been adopted as an objective-based code in 2006, following a

change at the national level and a shift in the Model National Building Code (John Nicol, personal communication, June 19, 2013). The transition towards an objective building code at the federal level actually started in the early 1990s as the NRC began an extensive national code update (NRC, 2006). This shift allowed the NRC to enforce building performance in a hybrid code that contains both prescriptive and performance criteria (NRC, 2006). The first objective-based National Model Codes were released in 2005 and included the following objectives: safety, health, accessibility, fire and structural protection of buildings, protection of buildings and facilities from water and sewage damage (National Plumbing Code) and fire protection of buildings and facilities (National Fire Code). Each objective was further divided into sub-objectives, which provided additional details on performance requirements (NRC, 2006). Additionally each objective also included a set of functional statements that outlined the tasks or requirements for each building system or building component. Functional statements were further supported by a set of acceptable solutions and intent statements. Acceptable solutions are technical specifications (either prescriptive or performance-based) that have been determined to meet the objective-based code requirements and can be used to ensure or demonstrate code compliance (NRC, 2006). Intent statements are not an integral component of the building code, but provide simple descriptions of technical specifications and can be used to evaluate potential alternative solutions, materials or products (NRC, 2006).

The Objective-Based National Model Building Code

The NRC's pursuit of an objective based format was a response to changes at the internal level as international trade agreements began to reference and favour performance-based regulations. Objectives enable better evaluations of alternative solutions and products and the code's tiered structure provides clear evaluation criteria at a range of scales. The issue with determining code compliance of alternative products has been well documented and has been indicated as a barrier to promoting new technologies that often have higher performance ratings (Wieditz, 2005). The NRC believed the introduction of an objective-based code could encourage greater uptake of novel products and encourage companies to invest more resources in research and development (NRC 2006 and Wieditz, 2005). The potential of the objective code is somewhat muted when applied to energy or environmental performance however, as the first objective National Model Building Code did not include an environmentally or energy focused objective.

National programs (like the Model National Energy Code for Buildings) had previously considered energy performance and a growing number of Canadian governments (including British Columbia and Ontario) were considering programs to support higher efficiency buildings and environmentally focused development (David Suzuki Foundation, 2008). This led to a number of agencies working at cross purposes with slightly different motivating factors, which likely contributed to the difficulty in setting a national energy objective or efficiency standards. Had an environmental object been included in the national code it could have built upon previous national programs that had not been adopted at the provincial level or it could have taken a broad approach to building performance and environmental effects. The inclusion of an environmental or energy focused objective could have been an important symbolic gesture and a clear signal of government priorities to the construction industry, regardless of how stringent the initial performance requirements were (Weiditz, 2005).

Instead of pursuing an environmentally focused objective or the integration of previous building energy codes and programs into the National Model Building Code, the Canadian Commission on Building and Fire Codes (CCBFC) and the NRC decided to pursue a new update of the Model National Energy Code for Buildings and created a new national level organization, the Building Energy Codes Collaborative (BECC) to develop it. The work of the BECC lead to the creation of a national Standing Committee on Energy Efficiency of Buildings (SC-EEB) in 2009, three years after the introduction of the first objective code. Though this program delayed the inclusion of an environmental objective into the Model National Building Code, the SC-EEB made significant progress towards energy efficiency regulation for Part 9 buildings, eventually catching up with the process started by BC in pursuit of EEBS goals.

BC Energy Efficiency Objective

The initial delays at the national level (primarily caused by the delay in creating the SC-EEB) created an opportunity for British Columbia to use the new objective structure of the National Model Building Code to develop its own objectives in support of the energy performance goals of the *BC Energy Plan* and the 2008 *BC Climate Action Plan*. The inclusion of the environmental performance objective now enabled the code to regulate buildings and systems for water and energy efficiency. The Part 10 objective is at the heart of the GBC and is structured as follows:

> "OE Energy and Water Efficiency: An objective of this Code is to limit the probability that, as a result of design, construction or renovation of a

> *building,* the use of energy or water will be unacceptably inefficient or the production of greenhouse gases will be unacceptably excessive." (Province of British Columbia, 2008)

The objective is further split into two sets of sub-objectives: energy and water. This split acknowledges the importance of both energy and water use and to allow for each sub-objective to be updated independently of the other and to respond to a range of building issues, systems and components.

BCBC upgrades usually involve the creation of a Technical Advisory Group, or other type of committee to engage experts in the field, but no such external group was formed during the development of the GBC. No public information is available regarding the GBC development process, or the background research conducted during code development. The GBC's main focus was introducing the environmental objective to the BCBC to allow the code to regulate energy efficiency and performance. Its secondary focus was the introduction of an energy performance code compliance path, though a limited amount of research and modeling work was completed during this phase of the development process.

The Building and Safety Standards Branch used broad language in the Part 10 objective to enable it to support a range of changes to energy-related functional statements, acceptable solutions and intent statements to allow for future updates to the standards without altering main Part 10 objective language. The GBC language references prescribed parameters subsequently embedded within the code's acceptable solutions and technical requirements. By referring to a constantly changing set of parameters, the objective can support an incrementalist code update strategy. The province can alter what is considered an "acceptable solution" as building technologies continue to improve subsequently improving the building code without altering the text of the energy efficiency objective (Pape-Salmon, et al., 2011). This also does not explicitly tie energy efficiency improvements to a specific rating system or modeling program (like the EnerGuide system) allowing the general thrust of the objective to remain focused on energy use and GHG emissions reduction. This reduces potential administrative or management costs by allowing for a slightly more streamlined BCBC update process.

Part 10 Code Compliance Paths

The acceptable solutions sections of the energy and water efficiency objectives are included in a new part of the BCBC: Part 10 – Energy and Water Efficiency. Additional changes to the BCBC include: a reference to the applicability of Part 10 in "Part 5 – Environmental Separation", "Section 6.2. Design and Installation" and "Section 7.2. Materials and Equipment", and changes to "Section 9 – Part 9.25.2.1.(1)" to mandate thermal insulation between heated and unheated spaces. Part 10 addresses the new design standards for the Energy and Water Efficiency objective for all buildings and structures covered under the BCBC. For all non Part 9 buildings the ASHRAE 90.1-2004 standard for Non-Residential Buildings is referenced throughout[7]. For Part 9 buildings, the object introduces two compliance paths: prescriptive and performance.

The prescriptive path is structured similar to previous energy performance codes as it takes existing references to energy related systems (like requirements for wall assemblies) and places them under the new energy efficiency objectives. Additionally, the GBC expanded the scope of Part 9 to include four storey residential buildings (previously categorized as high rises under Part 3). In terms of building performance the GBC changes some insulation requirements, increasing the focus on thermal performance and heat loss.

The main prescriptive changes are illustrated in Table 10. This table also illustrates the province's continued use of climate zones, higher requirements for colder regions and focus on heating system and building envelope components (like insulation, windows, and air tightness). The climate zone regions are listed in the Climatic Data appendix of the building code and the GBC does not alter any climate classifications. Each zone has slightly different changes depending on the existing code requirements and climate needs. These changes to the prescriptive path requirements are minimal, and were not the GBC's primary focus.

The other change in the GBC was the inclusion of an energy performance code compliance path. This is the first time an energy performance option had been available to the construction industry, developers or homeowners. Unlike the first performance codes, this performance path could be applied to retrofit or renovation projects. The performance path requirements include:

[7] It should be noted that this was not the most recent version of the ASHRAE 90.1 standard as the 2007 version of the standard was released the previous year.

"3) Alternatives to the requirements of Table 10.2.1.1.A may be determined through
a) the use of energy computer modeling resulting in an equivalent performance to the prescribed requirements in Table 10.2.1.1.A, (See Appendix A), or
b) achieving an EnerGuide Rating System rating of 77, verified by an EnerGuide Rating System energy advisor licensed by Natural Resources Canada to evaluate the energy efficiency of new houses."
(Province of British Columbia, 2008)

Though the GBC introduced a performance compliance option, this was not mandatory, allowing developers and builders to continue building to the prescriptive standards, which saw minimal improvements and still did not include a performance-testing component. It is estimated that the prescriptive path led to an average EnerGuide rating of between 72 and 74 (Construction Industry Representative Two, personal communication, June 12, 2013). Unfortunately this created a considerable gap between the two compliance paths included in the BCBC and did little to encourage the development of residences that used the performance sections as those pursuing the EnerGuide component were mainly firms already involved in green building. The material released regarding the GBC did not highlight this discrepancy however, perhaps leading to misconceptions within the general public, and different government agencies regarding the actual performance of the majority of new residences in British Columbia.

Public Review of the Green Building Code

The GBC went out for public review from September to November 2008 and the provincial government requested input from the general public and specific sectors involved in the residential construction industry. The original public review materials produced by the Building and Safety Standards Branch included a cost-benefit analysis report, which is no longer publicly available. The Building and Safety Standards Branch conducted a range of outreach activities focused on soliciting comments and input from key stakeholders (private homeowners, strata corporations, individual construction firms, material suppliers and environmental organizations). Unlike other government agencies the Building and Safety Standards Branch does not publicize comments received during public legislative reviews. Building code comments and submissions are not made public at any stage of the comment period (public comments regarding other environmental policy legislation

are often listed in a public archive during the comment period) and no report summarizing public questions or concerns was released.

Table 5 – Table 10.2.1.1.A. – British Columbia Building Code

Table 10.2.1.1. A.

Minimum Thermal Resistance of Insulation RSI, m2°C/W for *Buildings* of *Residential Occupancy* less than 5 Storeys in *Building Height*

Forming Part of Sentence 10.2.1.1.(2)

***Building* Assembly**	**Value Required**	**Value Required**	**Value Required**
	Less than 3500 Degree Days	**3500 Degree to 4500 Degree Days**	**More than 4500 Degree Days**
Attic Space(1)	7.0	7.7	9.0
Roof Joist Assemblies (Cathedral Ceilings/Flat Roofs)	4.9	4.9	4.9
Frame Walls(2) (including frame crawl space walls)	3.5	3.5	3.85
Suspended Floors (framed)	4.9	4.9	4.9
Suspended Floors (concrete slab)	2.1	2.1	2.1
Foundation Walls (insulation to 600 mm below grade)	2.1	2.1	2.1
Unheated Concrete Slabs on Ground at or above grade (insulation around edge of slab(3) and 500mm vertical or horizontal from bottom edge of slab)	1.8	2.1	2.1
Radiant Heating Slabs on Ground (insulation under all slab area and around edge of slab)	2.1	2.1	2.1
Radiant Heating Suspended Floor Assembly Over Heated Area (insulation between heated floor and heated area below) (4)	2.1	2.1	2.1

(1) The thermal resistance rating of attic space insulation may be reduced for a distance of

(a) 1.0 m from the exterior wall in *buildings* where the thermal resistance rating of the wall below is not required to exceed 3.5 or

(b) 1.5 m from the exterior wall in *buildings* where the thermal resistance rating of the wall below is not required to exceed 3.85.

(2) Stud/Frame type wall construction. This is not intended to apply to masonry, log or construction without a cavity.

(3) The top edge of insulation between the slab edge and foundation wall may be protected with a pressure treated preserved wood filler strip not more than 50 mm thick.

(4) Not applicable when heating elements or piping are located within a concrete topping on a suspended floor assembly or within an internally heated suspended slab.

Issues Raised During the GBC Public Review

A few of the GBC submissions remain publicly availably, distributed via their contributing organizations. One sector that has a range of archived public submissions available is the environmental sector. The Pembina Institute, a non-profit organization working on a range of energy issues at the provincial and national scale, led one of these submissions. It was co-signed by ten organizations that ranged from municipal governments (the Resort Community of Whistler, the District of Saanich and Dawson Creek), environmental organizations (David Suzuki Foundation, Pembina Institute and the BC Sustainable Energy Association), construction industry associations (Cascadia Green Building Centre, NAIMA Canada and the Lighthouse Sustainable Building Centre) and commercial retailers (Mountain Equipment Co-Op). The submission addressed all changes proposed by the GBC (including those to Part 3 and Part 9) and includes additional general observations (Pembina Institute, 2008).

The Pembina-coordinated submission illustrates one of the main issues related to EEBS development: It views the EEBS (specifically the residential EnerGuide 80 performance goal) and the GBC as part of an interconnected strategy[8] or policy program. However there was no collaboration between the two government agencies involved in developing each document (the Energy Efficiency Branch and the Building and Safety Standards) and the EEBS update had not yet been released. Additionally the document does not reference the gaps between performance and prescriptive paths, taking the approach that EnerGuide 77 performance path applies to all new residential buildings and will significantly increase residential building performance. This approach created the perception that the move to EnerGuide 80 is fairly simple and that the two-year timeline was reasonable and coordinated between the two agencies (Pembina Institute, 2008).

The submission also recommends enshrining the update schedule within the BCBC: it assumes a second major update in 2010, followed by additional changes on a three-year schedule (2013, 2016, etc.). The co-signers believed the formal code update schedule was especially important for the construction industry, and that it would allow firms the time to plan for the proposed regulatory changes. They also

[8] Note: the second phase of the EEBS had not been announced publicly at this time, but the Pembina Foundation had been involved in the research and modeling work around the EnerGuide 80 target and likely knew of its inclusion.

believed that this could enable market transformation, as firms are encouraged to adopt energy-efficiency measures earlier in an attempt to gain a competitive advantage and include the potential for new regulations to be delayed by up to six months to accommodate the needs of the construction industry (Pembina Institute, 2008).

As mentioned above, it has been difficult to find construction industry related public submissions, however a range of industry publications and fact sheets (from organizations including BC Building Info and the BC Construction Agency) were produced illustrating the code changes in a generally positive tone (Pape-Salmon, et al., 2011 and BCCA, 2008). Though these info bulletins generally do not refer to potential economic impacts of these increased regulations on the construction industry, they also do not reference the cost figures provided in the cost benefit analysis produced by the Building and Safety Standards Branch. The construction bulletins also gloss over the performance differences between the prescriptive (EnerGuide 72 – 74) and performance (EnerGuide 77) requirements and appear to be more concerned with transmitting the prescriptive path changes than outlining the new performance component (BC Building Info, 2008).

Cost Issues and the Green Building Code

Though the cost benefit analysis report was not provided, the Pembina coalition public submission includes cost figures taken directly from the province's report (Pembina Institute, 2008). The general theme of this report is that the GBC is cost-effective across almost the whole province and the financial impacts should not be a deterrent to increased regulations. Unfortunately the submission includes only aggregate costs and it is impossible to determine whether this included the additional components required to meet the performance path (EnerGuide 77), which could lead to considerable changes in terms of the GBC's cost effectiveness. According to the provincial cost benefit analysis the new regulations will increase capital costs from $3,257 to $5,388 per residence depending on climate zone. The only areas with negative life cycle costs are the electrically heated single-family detached homes in the south coastal and southern interior regions. All other areas and residences in the south coastal and southern interior regions show positive energy cost savings. While on the surface these figures seem to illustrate the cost effectiveness of the GBC, the prominence of electricity use in heating systems and the high percentage of the province's residential housing concentrated in the south

coast region means the majority of BC residencies are effected by negative payback periods. Additionally the long payback periods are influenced by the continued reality of British Columbia's relatively low electricity costs (Canadian Press, 2013).

EEBS and the Green Building Code

GBC adoption and the announcement of the updated EEBS occurred less than six months apart in 2008, creating the impression that these strategies were connected, especially considering the EEBS's residential regulatory targets and the GBC's introduction of Part 10 (energy efficiency objective) to the BCBC. Unfortunately the timing seems to be simply a coincidence and the regulatory goals of the EEBS were not developed in conjunction with the Building and Safety Standards Branch.

Additionally the lack of consultation meant the EEBS regulatory goals did not consider the work plan or staffing levels of the Building and Safety Standards Branch. Building staff already had a fully committed work plan and could not start work on the next set of BCBC energy efficiency updates until those commitments were satisfied. This delayed an already ambitious timeline before actual work on the program even started, though considering the research, development and consultation required for this kind of major BCBC update it is difficult to consider that the original timeline could have been met in a reasonable manner not involving extreme impacts on housing affordability, the residential construction industry and local level code enforcement.

British Columbia Building Code Part 9 Updates

The Building and Safety Standards Branch began work on the EEBS mandated set of energy efficiency standards for Part 9 buildings (subsequently referred to as the Part 9 updates) at the beginning of 2009 and began the process by launching a Technical Advisory Group dedicated to developing the updates. Technical Advisory Group participants were selected by the Building and Safety Standards Branch and included members of the construction industry that had experience and expertise with residential green building (including representatives from the Canadian Home Builders Association of British Columba (CHBA-BC), Registered Building Officials (recruited through the Building Officials Association of British Columbia (BOABC)), engineers, designers and Certified Energy Advisors (CEA). The Technical Advisory Group did not include other government agencies or third party organizations (like environmental groups) as its focus was on technical aspects of the BCBC, and

current construction practice. Additionally the representatives for each organization were expected to have decision-making authority for their organizations. The Building and Safety Standards Branch did accept a range of input from non-advisory group members via a series of presentations and outreach events conducted between 2010 and 2011.

The Technical Advisory Group met throughout 2009 and in addition to these discussions the Building and Safety Standards Branch also conducted a range of research and modeling initiatives related to the EnerGuide 80 standard and current construction practice. This research program was separate from research conducted by the Energy Efficiency Branch during the development of the EEBS and focused on investigating potential EnerGuide 80 compliance paths. There were issues with the EnerGuide 80 performance level from the beginning of the Technical Advisory Group as there were concerns about the average BC builder's ability to meet that performance rating by 2010.

Another issue emerged around the province's focus on using building envelope improvements to reach the required EnerGuide 80 performance rating and British Columbia's local design preferences. Homeowners in British Columbia frequently desire high percentages of glazing, particularly on south facing walls to maximize views. This type of design configuration is one of the most inefficient wall assemblies and is a key contributor to a high percentage of heat loss and thermal instability.

BC's Technical Advisory Group was unable to finalize a BC based Part 9 update as the provincial process was discontinued early in 2010 in favour of a harmonization strategy with the national Part 9 updates. The national code agency, via the SC-EEB had made significant progress towards developing a national update to Part 9 of the Model National Building Code, leading the province to believe that both groups were likely to finalize their updates in time for inclusion in the provincial BCBC update scheduled for 2012 (major code updates occur on a six year cycle in British Columbia). British Columbia has a policy that mandates harmonization between the National Model Building Code and the BCBC. This policy led to the discontinuation of the BC process, though some members of the Technical Advisory Group, including a representative of the Building and Safety Standards Branch became involved at the national level. This harmonization strategy allowed the province to save financial resources on code development, enabled standardization across Canada and

provided access to an even larger pool of residential construction and development experts.

Unfortunately almost immediately after the decision to harmonize with the national process the SC-EEB's progress slowed and the process faced further significant delays. The Building and Safety Standards Branch did not have the code update ready for inclusion into the 2012 Building Code, leading to a fair amount of confusion within the construction industry as the efficiency changes were initially discussed during a series of presentations held in 2010 and 2011 and then were not implemented in the 2012 BCBC update. The environmental sector in particular was disappointed to see the continued delay of EEBS targets, particularly since they had participated in these sessions and were under the impression that the updated Part 9 would be ready for inclusion (Pembina Institute, 2011).

The national committee first released the Part 9 update in spring of 2012 so it could go through the public review process at the national level. Once the SC-EEB reviewed and responded to the public comments the update was released to the provinces. British Columbia was the first province to go through the Part 9 update public review from September to November of 2012. The Office of Housing and Construction Standards subsequently approved it in December of 2012. The official Part 9 BCBC incorporation date is December 20, 2014 (four years after the target date of the EEBS). The final Part 9 update remains a hybrid code with both prescriptive and performance paths, meaning mandatory performance tests are not required for each new residence.

The new Part 9 standards are also below EnerGuide 80 and the performance path has moved away from specifying the EnerGuide system in favour of a more specified modeling approach involving the development and use of a specific reference building that allows users to look at performance tradeoffs between different building systems and components. Despite the nearly six-year process, the final Part 9 updates will result in few changes to construction practices in the south coast region. However in the northern zone, the standards may change daily construction practices due to the prescriptive changes to mandate effective, not nominal, RSI values for wall assemblies (CHBA, 2013). There are still questions regarding whether the performance gap between the prescriptive and performance standards will be similar to what occurred with the GBC.

Another issue with the content of the Part 9 update is the lack of a mandatory performance-monitoring component. This is created by the abandonment of mandatory EnerGuide certification (which stipulates that each building must receive at least one performance test) and the decision to not include a mandatory performance test for residential buildings pursuing the prescriptive path. Without a monitoring program it will be impossible to reliably track the impact of the Part 9 update on building performance. The Technical Advisory Group discussed the performance testing issue, however it was dropped from the provincial Part 9 update. The national process coordinated by the SC-EEB also discussed the inclusion of mandatory performance testing, but a range of stakeholder concerns led this provision to be abandoned at the national code level as well.

Additionally, despite the early focus on climate change mitigation that formed the heart of the EEBS, built environment regulatory programs continue to lack any means to reliably check whether or not they have had lead to large-scale GHG emissions reductions. There was no collaboration between the Energy Efficiency Branch and the Building and Safety Standards Branch to develop any type of evaluation criteria or performance measurement program to address progress towards the EEBS regulatory performance goals. While it is important to consider emissions from the built environment as part of large-scale climate change strategies the continued development of policy programs with explicit goals, but no monitoring or evaluation programs does not allow regulators to evaluate the success or failure of programs like the Part 9 update or the GBC.

The EEBS goals and implementation process evolved substantially from the original strategy, particularly once the Building and Safety Standards Branch became the lead agency. Through all the changes and delays, one constant was the lack of information regarding the BCBC development process released to the general public. There was also nothing done to increase the literacy of the general public towards performance-based building codes and their importance to increased residential building performance. There was limited information conveyed to the public especially around the challenges that forced the government to abandon previous policy goals. While admitting defeat is not necessarily an easy move for governments politically, presenting factual information that illustrates why certain changes were made to policy programs may help the public understand why it is important to support market transition initiatives, and it may also help home owners to understand both the environmental and financial implications of

inefficient home performance. The next chapter presents the results of stakeholder interviews in an attempt to provide first person accounts and additional details of GBC and EEBS development process and additional information on stakeholder involvement and the energy efficiency update implementation process.

Chapter 4 – Perspectives on the Energy Efficient Building Strategy and BC Building Code Updates

In order to gain a better perspective and understanding of the process surrounding the EEBS and the BCBC updates a series of interviews were conducted with representatives from provincial agencies (Energy Efficiency Branch and the Building and Safety Standards Branch), local government (including building department managers and RBOs), the construction industry (owners of development firms and a CEA), and an environmental group with a history of working on provincial energy issues. Interview requests were sent to industry associations (including the Canadian Home Builders Association, the BC Construction Association, the Greater Vancouver Home Builders Association and the Cascadia Green Building Council), professional associations (the BOABC and the Canadian Association of Home and Property Inspectors), environmental organizations (including Pembina Institute, the BC Sustainable Energy Association, the Fraser Basin Council, and the David Suzuki Foundation), local governments, independent contractors, and material suppliers, including those involved in the manufacturing of windows, heating systems, doors and insulation.

The interview requests consisted of a form letter requesting an interview relating to their participation in, or knowledge of the EEBS and the subsequent BCBC upgrades. It is important to note that many respondents (approximately twenty) indicated their support of the research, but did not believe they had enough involvement or knowledge of the EEBS or the building code update to participate. The interview questions varied depending on the participant's sector, their involvement with the programs and their knowledge of knowledge of the process, goals or regulatory changes of each programs. The interviewees included those that had direct experience with both programs to others that were not aware of key components of either. A list of interviewees and interview questions can be found in Appendix 2.

Government Agencies

Province of British Columbia

The interviews with provincial representatives of the Building and Safety Standards Branch and the Energy Efficiency Branch below are meant to provide some clarification and further insights into the process and priorities of government agencies during the phases of policy development, implementation and evaluation. Various other government agencies (including the Ministry of Environment, and the Climate Action Secretariat) were contacted in an attempt to determine how broad internal consultation was between provincial agencies, however these contacts either did not reply or referred the request onto either the Building and Safety Standard Branch or the Energy Efficiency Branch.

Provincial Government Representative One

Provincial Government Representative 1 (PGR1) works for the Building Safety and Standards Branch and has been involved in the development of energy related BCBC updates since they started in around 2007. He headed the Technical Advisory Group on energy efficiency standards for Part 9 buildings and was heavily involved in the update's outreach strategy. The interview focused on how the Building and Safety Standards Branch was involved in the development of the GBC and the EEBS, and how the EEBS goals influenced the Part 9 update.

PGR1 opened the interview by discussing how the Building and Safety Standards Branch was not involved in the development of the EEBS. He stated that the entire program was coordinated and managed by the Energy Efficiency Branch, who engaged an advisory group and consultants to conduct background research and energy modeling work. The final strategic goals and performance targets (including the residential regulatory component) were developed without discussion or input by anyone with the Building and Safety Standards Branch:

> "Back in 2007 our branch (Building and Safety Standards Branch) were not involved in developing the EEBS. The Energy Efficiency Branch developed that…independently from us. We were consulted on it after it was done and it was a bit of a jolt to some of our people because we hadn't heard a word of what was happening. Then it went to cabinet and it was blessed as a…fairly high-level strategic document to guide policy moving forward." (John Nicol, personal communication, June 19, 2013)

PGR1 discussed how the lack of involvement of the Building and Safety Standards Branch in the development of the EEBS impacted its timeline and implementation. There were issues with staffing levels within the Building and Safety Standards Branch as the project had not been incorporated into approved work plans for 2008. PGR1 also confirmed that work on the EEBS program was not started immediately following adoption, instead the branch had to wait until early 2009 for staffing resources to become available.

Another issue repeatedly referenced by PGR1 related to EEBS development and confusion over the structure of the GBC and it's actual impact on the residential construction industry:

> "First let me say that the 2008 code change was a pretty bare-bones change. The primary thing it accomplished was adding energy efficiency, water conservation and GHG reduction as BCBC objectives. You can't write new code elements unless there's an objective for them in the code. It is quite an elaborate process, you have to write objectives, functional statements and intent statements so that everyone understands exactly what it is they are trying to accomplish. We didn't exactly set the bar very high, for housing we put in some minimum insulation tables for our three climate zones and for complex buildings we referenced the AHRAE 90.1 (2004). And that was about it. (When questioned further regarding the performance path addition of EnerGuide 77) Yeah, so conceptually we added the concept of the performance path, but it would take a massive amount of code writing to prescriptively provide for every kind of contingency, so that (EnerGuide 77) was a shortcut that people could use to demonstrate performance." (John Nicol, personal communication, June 19, 2013)

PGR1 presents a very different understanding of the purpose and structure of the GBC than the representative of the Energy Efficiency Branch (See Provincial Government Representative Two's interview below). These misunderstandings led to the assumption that the GBC had a significant impact on building performance and the perception that residential construction was performing at higher levels than mandated by the code.

PGR1 confirmed the initial performance path embedded in the GBC was a voluntary measure, that did not force builders to switch to a performance standard, rather allowed the performance standard to be pursued by builders that wanted to use the compliance option. The problem with this was the GBC updates to the prescriptive

path led to buildings that would rate around an EnerGuide 74 (Note: industry representatives contrasted this by mentioning that following the prescriptive path leads to a performance rating of EnerGuide 72). This created a discrepancy in the GBC between the performance and the prescriptive path. PGR1 mentioned that the higher standards of the performance path may have created a false perception that the minimum GBC standard was EnerGuide 77. PGR1 felt that the goals of the EEBS might have been based on false modeling projections and believed they were unrealistic based on current construction practice. PGR1 also believed more engagement or consultation between government branches could have clarified some of these performance assumptions and led to more realistic initial targets and timelines (John Nicol, personal communication, 2013).

PGR1 led the Technical Advisory Group focused on implementing the BCBC residential energy efficiency changes mandated by the EEBS. He was given autonomy in choosing the group's participants and sent out invitations to individuals considered experts in residential green building, energy efficiency, building design and engineering and BCBC enforcement:

> "The (Technical Advisory Group) participants were primarily industry, but there were people who had a track record, or interest or pretty extensive knowledge of the topics, so there were engineering firms involved including RDH Engineering, the president of CHBA-BC (and their Technical Advisory Committee), a low-rise/townhouse builder, consultants experienced in energy issues, a couple of CEAs, who spend a lot of time out in the field, and also a couple of guys involved in the assessment side…needed to have people out at the front of this, who were working to push the needle forward and people that were trying to do a good thing, but were having trouble doing it." (John Nicol, personal communication, June 19, 2013)

PGR1 clearly believed in the importance of engaging experts in the field with significant knowledge of current construction practice and on-the-ground building performance realities. He referenced this issue at numerous points during the interview and clearly valued the credibility of the Technical Advisory Group's members, and the range of professional connections they brought to the table.

PGR1 mentioned that since there was no national process around residential energy efficiency active at the time the EEBS was announced, the Building and Safety Standards Branch was forced to start work on their own in-house code development

process around Part 9 buildings. This meant increased research and code development costs for the province, but PGR1 was prepared to absorb the increased costs to develop the Part 9 update (John Nicol, personal communication, June 19, 2013). In late 2009, however, the national process (led by the SC-EEB) emerged quickly, making significant process towards changes to Part 9 of the National Model Code. The province's code harmonization policy led to the Building and Safety Standards Branch abandoning their Part 9 process in favour of work on the national process (John Nicol, personal communication, June 19, 2013):

> "We have a policy in BC that we harmonize with the national codes to the greatest extent possible…many reasons for this, but one that is purely pragmatic is that to do a code change by yourself is a very expensive and time consuming endeavor. We did a lot of consultant and research reports, and a lot of modeling investigations to determine what things made the biggest difference and how to achieve the targets we wanted…from purely a cost perspective, national harmonization just made sense…I would sit in on the task group meetings and they were taking a somewhat different approach…nationally they had included space heating and water heating equipment and window performance…those were already regulated in BC's *Energy Efficiency Act*. So the national folks were taking a somewhat different approach, but…they were doing well enough and were going to hit the targets around the same time as we were so the decision was made to segue over to them if they produced something credible at the end of the day." (John Nicol, personal communication, June 19, 2013)

PGR1 acknowledged that the Part 9 updates were not going to adhere to the EEBS timeline for a range of reasons: the two year update schedule, the gaps between the prescriptive and performance code standards and the stringent performance requirements of the EnerGuide 80 standard (John Nicol, personal communication, June 19, 2013). Additionally the province had limited experience in the development of energy related performance codes, something he felt was not considered by the Energy Efficiency Branch during EEBS development:

> "The energy stuff was brand new to us and when you are starting from scratch to write codes, it can be a pretty challenging thing to do…so doing it in 2013 looks like a couple of years late, but these things require an amount of rigor to be credible and one of the reasons for that quite frankly is it needs to work for industry too, they have to be able to build whatever you specify in the code, you could have sort of poisoned the well for energy efficiency requirements if you did it wrong and completely messed

> up industry, so there was a lot at stake and that's why we ended up taking the approach that we did." (John Nicol, personal communication, June 19, 2013)

PGR1 felt the real work on energy efficiency and the BCBC began in 2009, not with the development of the GBC, viewing this as the first major residential building energy standard and as such needed to be sensitive to the potential impacts on the construction industry (John Nicol, personal communication, June 19, 2013). In addition to making sure the standards were appropriate, PGR1 acknowledged that the process also had to ensure stakeholders were adequately informed:

> "We do (have an outreach protocol), but it depends on the project. I had been out speaking to dozens and dozens of meetings of building officials and various builder organizations talking about what we were developing, what it looked like, what some of the compliance paths were, etc. So I had spoken to probably several thousand people by the time Part 9 was ready for public review. So we put a fair bit of effort into getting the word out. We also participated in the HPO (Homeowner Protection Office) Building Smart seminar series that goes to roughly twenty communities and draws a couple thousand people. I hit most of those as we did one on the energy proposals. So I'm sure you will be able to find in BC someone who says "I never heard of this", but I think you really had to work to avoid it. The buzz was out, certainly in the industry that the province was moving in this direction and I think everybody had a pretty good chance to get their two cents in if they wanted to…and we certainly listened to people and tried to bear in mind the realities that they face when they are out trying to do their jobs." (John Nicol, personal communication, June 19, 2013)

PGR1 also discussed the approach taken to public outreach during the Part 9 update public review, undertaken from October to December of 2012. Similar to communications during the development of the Part 9 update, there was no formalized communications protocol or coordinated outreach strategy that involved external agencies, like local building officials (John Nicol, personal communication, June 19, 2013). Publicizing the Part 9 update public review relied on a trickle-down approach involving professional and industry associations, including the BOABC, the CHBA-BC, architect organizations and CEAs. PGR1 believed the online format of the public review made it easily accessible and a more nuanced strategy that engaged industry associations in outreach strategies was not necessary.

Provincial Government Representative Two

Provincial Government Representative Two (PGR2) has been with the Energy Efficiency Branch of the Ministry of Energy, Mines and Natural Gas since 2008, arriving just after the launch of EEBS Phase 2. PGR2 was not directly involved in the research and development of either EEBS, but is aware of how the strategy was developed and is currently responsible for tracking the progress of two specific EEBS targets: 20% reduction in energy demand per home by 2020 and a 9% reduction of energy demand per square meter in commercial buildings.

PGR2 saw the 2008 EEBS update as less of a strategy or strategic document than the original, as it consisted mainly of funding commitments and promotional pieces. PGR2 did acknowledge one major change of the 2008 EEBS was the inclusion of hard energy efficiency targets for the commercial and residential sectors. Unfortunately PGR2 felt the hybrid nature of the Part 9 updates (and the continued prescriptive code option for energy performance) made these targets more difficult to monitor (Energy Efficiency Branch Representative, personal communication, June 17, 2013). PGR2 confirmed the Energy Efficiency Branch led the development of the EEBS's residential regulatory targets, and that formal consultations were not conducted during EEBS development, but there was some collaboration with other government branches and utility companies including BC Hydro and Fortis BC:

> "With the targets to reduce demand by 20% by 2020 my understanding is that the consultation was primarily it was within government and with BC Hydro and Fortis. There was a lot of back and forth between the agencies because they have a lot of information and analysis already done about what is possible. They conduct periodic "Conservation Potential Reviews" that focus on the relevant sector (electricity or Natural Gas), and illustrate where there is the potential for increased efficiency. So there was no "public" consultation, but targets were based on what we thought was achievable based on the expert advice we got." (Energy Efficiency Branch Representative, personal communication, June 17, 2013)

When questioned specifically regarding the EnerGuide 80 target PGR2 confirmed that this was developed in a similar manner, with research conducted by expert consultants and consultation with energy utilities and agencies led by the Energy Efficiency Branch:

> "The EnerGuide 80 did not have a public consultation on that…and in terms of analysis the Building and Safety Standards Branch had done a whole bunch of modeling during the "Greening of the Building Code", which we then used to figure out what the next step would be…well EnerGuide 77 is what it was supposed to be, there has been some analysis done since then…and I think the prescriptive path most people take actually doesn't meet EnerGuide 77, but based on what it was intended to achieve it was EnerGuide 77[9]." (Energy Efficiency Branch Representative, personal communication, June 17, 2013)

This information contradicts the account of PGR1 regarding the level of consultation and information sharing during the development of the EEBS and the impacts of the GBC. PGR2 also discussed the timeline attached to the introduction of the EnerGuide 80 rating system, stating the province should have pursued a more aggressive implementation strategy that could have achieved the performance targets within the desired timeframe. PGR2 noted the influence of external factors, like the national code process, that could not be anticipated, but contributed to the major update delays. PGR2 also believed the mandatory EnerGuide 80 goal was to be included in the BC-driven Part 9 update, though this component was abandoned at both the provincial and national level:

> "Energy Efficiency Branch has always tried push the limits of what seems reasonable and certainly with a lot of our codes and standards it's pushing the boundaries of energy efficiency for both performance levels and timing…If it had been acted on very quickly - get the code out, then have some substantive training elements - I think it would have been doable, but…the political will has gone up and down over the years and so I think it didn't materialize really quickly, and then the direction changed… they did a lot of modeling work to figure out how to achieve that EnerGuide 80 and what different components should be and whether to go prescriptive or performance…they were heading for the EnerGuide 80, but then that target was kind of pushed aside in favour of a national harmonization process…that required a whole other set of work and discussions." (Energy Efficiency Branch Representative, Personal Communication, June 17, 2013)

Beyond the original EEBS goals and timelines, PGR2 acknowledged that education and information distribution were also major issues and discussed the difficulty governments face in balancing regulatory goals with the needs and concerns of

[9] The comments above illustrate the confusion over the two standards (prescriptive and performance) included in the GBC. Though the performance standards mandate an EnerGuide 77 rating, the prescriptive path leads to the performance equivalent of between EnerGuide 72-74.

industry. Education programs are time and resource intensive and PGR2 felt it was not practical to think government can be responsible for ensuring everyone in the construction has the skills to achieve new regulatory targets (Energy Efficiency Branch Representative, Personal Communication, June 17, 2013). Additionally PGR2 believed that the residential construction industry needed to be the one to figure out how new standards could be achieved, provided government ensured they had reliable access to detailed information about what the standard actually mandates or requires:

> "From a government perspective every time you put out a new code or standard it's industry's responsibility to meet the standard or ensure they have the skills to meet it…ideally we have good information out about what the standard is...I mean we do roadshow kind of things whenever there is a code change and some people turn out, but compared to the whole industry it's pretty small the people who are interested enough to come to an event like that and the rest we kind of rely on the network of builders to trickle down what the standards are and they can obviously access them through websites and building officials have them and that kind of thing. But how to actually meet the standards? It's one of those things where they need to have some training and understanding of the building envelope and energy efficiency and ideally some testing on their side…" (Energy Efficiency Branch Representative, personal communication, June 17, 2013)

Despite some of the difficulties faced by the province during the EEBS implementation, PGR2 still firmly believes that building standards are a very important component of increasing energy efficiency. PGR2 indicated that the types of programs often favoured by industry (voluntary, subsidized or rebate based) have not been proven effective over the long term and despite the lack of widespread popularity for increased standards they must be stringent and should increase as technology progresses (Energy Efficiency Branch Representative, personal communication, June 17, 2013). Governments should also consider a range of supporting programs; however these programs will be less effective if they are used as the main driver of efficiency improvements instead of increased regulation and standards.

Local Government

While the province is the main authority on BCBC development and interpretation, code enforcement and inspection services are provided at the local level via

Registered Building Officials (RBO) employed by municipalities and regional districts. As the BCBC becomes increasingly complex local officials have taken on a larger role in enforcing new standards, and participating in builder education and outreach, as they are often the only government agency in direct contact with the construction industry and owner-builders. This set of interviews attempted to ascertain how local officials were involved in the EEBS and development of the Part 9 update, and how these code changes were communicated to industry associations.

Three local building officials were interviewed: a general manager of a Regional District building department in the province's south coast region, a manager of building inspection services in a small municipality on Vancouver Island and a building inspector at a regional district also in the south coast. A list of interview participants and questions are listed in Appendix 2. Generally comments focused on issues related to communication and consultation as local representatives avoided large-scale declarations regarding the construction industry, and focused on their relationship with other government agencies, particularly the Building and Safety Standards Branch. This may relate to the interview structure, where initial questions focused on intergovernmental relationships, but local officials may have wanted to protect their relationship with a sector they frequently collaborate with

Local Government Representative One

Local Government Representative One (LGR1) has a background in residential construction, but has worked with local government for over fifteen years. He began as a building inspector prior to moving into management at a south coast regional district. He has previously served on Technical Advisory Groups, though he was not invited to participate in the Part 9 process.

He had concerns regarding the EEBS's EnerGuide 80 rating goal and doubted any consultations occurred with stakeholders outside of the provincial government during the development of the EEBS. He believed the larger environmental and climate change policy agenda of the provincial government was the underlying reason for these goals. LGR1 also believed that the Building and Safety Standards Branch did not have adequate resources to meet the EEBS timelines, especially considering the amount of research necessary for this type of program:

> "In addition to the push regarding the carbon tax and climate change, the Premier seemed really focused on increased efficiency…with the sudden

> growth in green buildings, building performance may have seemed like an easy place to look at…but the staff resources clearly weren't there…any program would have required significant consultant work." (Local Government Representative One, personal communication, June 5, 2013)

LGR1 highlighted that the province has been reluctant to increase Building and Safety Standards Branch staffing levels, despite the policy commitments and hinted this may be a reflection of larger government priorities regarding reduced spending:

> "It's crazy what they were expected to do with the new energy code, especially given no additional staff and…the 2012 code happening at the same time and while trying to keep up with code interpretation…the branch needed more staff." (Local Government Representative One, personal communication, June 5, 2013)

LGR1 mentioned that his district has no direct contact with the province regarding general code issues beyond code interpretation questions. He believed the Building and Safety Standards Branch's location and their use of the HPO for outreach activities limited the number of local officials with direct contact with branch staffers. He mentioned that his regional district did not receive notice or warning of the public review period from either the province or their industry association (BOABC). Given the relationship between local building officials and developers and builders, he believed building officials were in an excellent position to distribute consultation details to local builders and developers (Local Government Representative One, personal communication, June 5, 2013).

Local Government Representative 2

Local Government Representative Two (LGR2) has been involved in a range of building and construction activities for over thirty years, starting as a private developer and then moving into municipal work as an RBO. He currently manages the building department of a Vancouver Island municipality and is involved with the BOABC, participating in conferences and panels on their behalf.

At the start of the interview LGR2 mentioned seeing a larger trend with provincial programs focused on simply raising awareness that lack the policies to actually move issues forward:

> "We just keep focusing on awareness and awareness and we just seem to be going in circles…or crying wolf…and it's like that with everything…just

> look at the new strategy for Natural Gas…at some point you know we actually have to start doing something." (Local Government Representative Two, personal communication, June 13, 2013)

In terms of the Part 9 updates, LGR2 was aware of the Building and Safety Standards Branch Technical Advisory Group, though he was not invited to participate. Despite this, he was involved with Part 9 update outreach activities including a multi-stakeholder panel sponsored by the province and the HPO in 2010 (Local Government Representative Two, personal communication, June 13, 2013). The presentation discussed the potential impacts of phasing out the prescriptive energy requirements in favour of a performance-only program. He received numerous negative responses from industry and local officials who felt the standards and the proposed timeline (which by this time had already been changed to 2012) were too extreme and could potentially negatively impact the construction industry (Local Government Representative Two, personal communication, June 13, 2013).

LGR2 firmly believed the BOABC should be a strong presence in code development with a process that acknowledges the role of RBOs in code implementation and builder education:

> "We (RBOs) are at the frontline with the code and the direct face-to-face interaction with builders and homeowners is a huge part of the job. There is a certain educational component, especially with the owner builder…we're acting as plan checker, designer and general overseer of their projects and thus it is really essential that we know…or are aware of the potential or upcoming changes and the impacts they may have…we also get asked countless questions about potential changes that people maybe heard a rumour about and it's hard not really knowing what to tell them." (Local Government Representative Two, personal communication, June 13, 2013)

LGR2 believes a significant information gap exists between the formation of the Technical Advisory Group and the release of the proposed code updates. He also felt there were issues between the timing of HPO seminars and the public review period. He does not believe RBOs need to comment on proposed regulations or standards at each stage of development, however official communication on scheduling and implementation could assist in day-to-day interactions with the development community. He felt RBOs could take advantage of their direct engagement with the development community and publicize the public review period, if they were provided advanced notice.

When asked his opinion on whether the BCBC was an appropriate way to ensure increases in building energy performance, his response was that increased standards will create more complicated buildings and force a subset of current builders out of the single family home market, reducing the supply of single family homes to those built by higher-skilled craftsmen. Furthermore he believed this would negatively impact housing affordability, forcing lower income individuals into other housing types[10] (Local Government Representative Two, personal communication, June 13, 2013).

He felt they "bit off more than they could chew" by implementing the energy and water sections of Part 10 at the same time (Local Government Representative Two, personal communication, June 13, 2013). He felt the technology for water efficiency was more commercially accepted and far easier to implement than energy efficiency standards and should have been the first Part 10 change. He believed the ambitious goals were the reason Part 10 had been stuck for over five years, causing significant confusion within the construction industry (Local Government Representative Two, personal communication, June 13, 2013). LGR2 felt the update schedule of the EEBS (2 year increments) was actually reasonable and could have kept energy efficiency at the forefront of code updates, while gradually increasing building performance, however the government seemed intent on pursuing larger changes (Local Government Representative Two, personal communication, June 13, 2013).

LGR2 believed the scenario of continued delays and slow changing standards was caused by poor builder education and training and exacerbated by the builder registration program implemented by the province via the HPO:

> "When they first started the HPO, they really blew the chance to bring in a more rigorous way of certifying builders/developers. They could have set some sort of qualifications that all general contractors would need prior to becoming a registered builder and ensured that everyone had met, you know, some kind of minimum that would be industry wide." (Local Government Representative Two, personal communication, June 13, 2013)

[10] It is important to note that housing affordability is a related issue to performance code development, however cost-benefit information released by the province indicates minimum cost increases connected to the Part 9 update, however this is clearly an issue that requires further research and consideration.

He went on to discuss that the province and the HPO did not develop a builder registration program involving meaningful qualifications, and that program led to confusion within the industry as certain groups (including the CHBA) attempted to set up a separate developer training program. He feels that if better industry-wide training were developed, code changes would not necessarily matter as certain metrics (particularly air tightness) that relate directly to energy could be improved fairly quickly.

LGR2 mentioned the impact the OAPEC energy crisis had on him as a builder working in the late 1970s and early 1980s as the sudden spike in energy prices had individual consumers asking specifically for a more energy efficient home. These consumer demands had him building a home in 1979 with better R-values than current code standards: "I was building out in the prairies and we were doing R-60 – R-80 in the walls and attic…I think it will take BC another 10 years to get to R-20" (Local Government Representative Two, personal communication, June 13, 2013). This was an interesting observation and a reminder that the personal circumstances and needs of homeowners can be influenced by international events and move building performance beyond minimum standards.

Local Government Representative Three

Local Government Representative Three (LGR3) has worked as an RBO in the south coast region of British Columbia for almost twenty-years. He has not served on any technical code committees with the Building and Safety Standards Branch (mainly due to scheduling conflicts and travel requirements) but is aware of the range of postings via the BOABC.

He was not fully aware of the original EEBS, but did know about the related energy efficiency incentive programs (at both the federal and provincial level) and often provided program information to homeowners during the building permitting process. LRG3 mentioned homeowners were not focused on larger issues of energy use and GHG emissions; instead they were more interested in discussing savings and payback periods on consumer products including window and furnace upgrades (Local Government Representative Three, personal communication, June 7, 2013). LGR3 was also unaware that the initial target of the Part 9 Technical Advisory Group was an EnerGuide 80 rating. LGR3 believes this standard is currently beyond what is possible for the construction industry and will place additional pressure on building

departments and inspectors, especially if it included the mandatory performance-testing requirement:

> "We're already under the gun just to make regular inspections, if there are many more things to check or inspections to do…we just may not be able to make it up…the province isn't upping funding for building inspection that's for sure." (Local Government Representative Three, personal communication, June 7, 2013)

LGR3 focused on the effect of regulations on the day-to-day operation of municipal building departments and the builder-developer relationships formed during front counter interactions and building inspections in the field. LGR2 also felt that if new inspection schedules led to construction delays it could put increased strain on the RBO-builder relationships and cause significant economic impacts to the construction industry, especially if projects were delayed while waiting for inspections. Additionally LGR3 felt there were limited opportunities to present these concerns to the Building and Safety Standards Branch, especially since some of these operational issues fell outside the scope of the BCBC and were not discussed as part of any formalized process (Local Government Representative Three, personal communication, June 7, 2013).

Construction Industry

Four members of the construction industry participated in telephone interviews. The interviewees included presidents of development companies specializing in residential home construction, and a Certified Energy Advisory (CEA) who also has experience as a residential builder. Each has been involved in the industry for at least twenty years and is experienced with a range of third-party certification programs including LEED, Built Green, R-2000, the Passive House Standard and Net Zero. Additionally they are members of industry associations including the Canadian Home Builder Association of British Columbia (CHBABC) and Built Green British Columbia. Given the similarities in their backgrounds it was interesting to note that one of the developers had no awareness of the details regarding the GBC or the Part 9 Technical Advisory Group and two other developers were unclear of how their associations distribute BCBC information to their members.

Construction Industry Representative One

Construction Industry Representative One (CIR1) was not aware of the EEBS program and the Part 9 Technical Advisory Group, but considers himself an active member of the construction and development community in the Okanagan. CIR1 participated on a series of technical research committees with the CHBA-BC through the late 1990s, though has not held a formal position with the organization since 1999. He mentioned that he could not remember the CHBA issuing a call for participants with the Part 9 Technical Advisory Group or any recent information regarding the next set of energy efficiency updates. He also did not receive any communication from the province or the CHBA regarding the public review period for either the GBC (in 2007) or the Part 9 update (in 2012).

CIR1 was particularly concerned about the lack of communication regarding the upcoming Part 9 changes, as there had been numerous hints around what they were to include[11]:

> "There were all these hints and rumors flying around regarding what might be in there (2012 BCBC), but no one seemed to have a copy (of the proposed changes) or seemed to be able to speak with authority about what was going on. It was frustrating not to get any kind of official response, though I was checking all of the regular channels and talking with other builders" (Construction Industry Representative One, personal communication, May 29, 2013).

When asked to elaborate on this he mentioned the HPO came to the Okanagan region during fall 2012 to discuss the 2012 BCBC. During the presentation references were made to the upcoming Part 9 update, however no substantial details were given and the upcoming public review was not mentioned:

> "I think it would have been a great place to have announced the comment period, or at least have given a date when the new Part 9 was going to be released, even if it was just an estimate…a good portion of the building community comes out to these meetings, they could even just have had a handout or something…Then they could have avoided…having to make a full presentation, or answering a bunch of questions if they really didn't have all the details yet." (Construction Industry Representative One, personal communication, May 29, 2013)

[11] Provided CIR1 with details regarding where to find the Part 9 update online. The final version was released December of 2012.

CIR1 stated he welcomed the opportunity for more direct connection to the Building and Safety Standards Branch. His main source of BCBC information and interpretation is local Okanagan building inspectors. He finds these interactions are a good source of information, however he feels local departments are fairly removed from provincial decision makers and not given adequate warnings or information prior to BCBC changes (Construction Industry Representative One, personal communication, May 29, 2013). He mentioned that building inspectors have been unable to provide additional information regarding the Part 9 update. He questioned building officials about Part 9 updates following the HPO presentation, but no additional information about the update or the public review period. He felt the lack of communication around the public review was detrimental to ensuring industry could adequately comment on new or increased regulations:

> "I'm not looking necessarily to change what is being proposed, but a bit more discussion about what's going on would be good for everyone involved…it would also help to build trust between the two groups and could also help with outreach activities and raising greater awareness with the public." (Construction Industry Representative One, personal communication, May 29, 2013)

After being provided with an overview of the EEBS and its broad initial goals (including the EnerGuide 80 provision), CIR1 stated it was obvious initial goals had not been developed in conjunction with the construction industry. His firm builds to an average EnerGuide 78 rating and offers an upgrade package for homes to achieve Built Green certification (a minimum EnerGuide 80), however in order to get to this standard they have undergone an intensive internal process of testing, modeling and skills training to ensure adequate performance:

> "We've been working on honing our building envelopes for at least six years and we're constantly evolving…this isn't something that you can just flick a switch and suddenly know how to do efficiently or cost effectively." (Construction Industry Representative One, personal communication, May 29, 2013)

CIR1 does not think that construction technology and materials are currently at the level where EnerGuide 80 could be achieved in ways that would not drastically increase home prices or construction schedules. He gave a rough estimate of potential cost increases for EnerGuide 80 of $7,000 to $10,000 per home depending on home size and systems used (Construction Industry Representative One,

personal communication, May 29, 2013). He emphasized less skilled builders would likely rely on mechanical systems, instead of cheaper building envelop upgrades, potentially leading to even greater cost increases.

CIR1 was unsure which agency should coordinate these training programs, but he believed it would be impossible to get the whole industry to EnerGuide 80 without a serious commitment to builder training. He noted that despite the increase in firms investigating green building it can be difficult to find additional specialized training that does require returning to trade school full time. He mentioned most LEED courses are targeted at those wanting to enter the industry and work on particular certification programs and that it can be difficult for firms not current working on green projects to retain or hire individuals with these skills (Construction Industry Representative One, personal communication, May 29, 2013).

Construction Industry Representative Two

Construction Industry Representative Two (CIR2) was much more informed about the EEBS and the Part 9 Technical Advisory Group, despite not being a participant. He is active in the Fraser Valley Region of British Columbia and has been very involved with the CHBA at the chapter and provincial level over the past fifteen years. He owns a residential development company that builds mainly to the R-2000 standard, though he is also a Built Green builder and has built Net Zero homes. He first gained awareness of the province's Part 9 Technical Advisory Group through his involvement with the CHBA, as he knew many of the other members and used these personal contacts to monitor the group's evolution and progress:

> "The Technical Advisory Group did ask me to participate, via the CHBA, but I had some previous experience with the province, and I'm not really cut out for that kind of environment…I am through and through a builder, but because I am interested in this stuff and how it could affect our members, I made sure to keep up with what was going on…not through formal communication with the province, no. Just through asking or talking with guys I knew that were participating." (Construction Industry Representative Two, personal communication, June 12, 2013)

His main interest in the Technical Advisory Group and the potential BCBC changes related to his role in the executive of the CHBA as his firm is currently building well above the minimum standard and would not have been affected even if the

EnerGuide 80 standard had been implemented in 2010 (Construction Industry Representative Two, personal communication, June 12, 2013). His work with the CHBA makes him more conscious of the needs and perspective of the rest of the industry and when asked if the changes introduced in 2008 with the GBC had any impact on the quality of construction being built by the average developer, he called into question the appropriateness of addressing these issues through the BCBC:

> "In terms of whether or not the BCBC with energy changes has increased the quality of construction I would say probably not and I'll tell you why, it's that the code is always the minimum level that the average builder shoots for and unfortunately with a lot of things in the code that appeal towards a green bent…they need to be monitored from a performance-base rather than a prescriptive base…So you can implement all of these things in the code from a prescriptive basis, but if they're not properly installed or properly integrated into the project they are not really going to give you the benefit that they were intended to give…I do not think the BCBC was ever meant to try and raise the bar. I think it's there to set a minimum…if a builder comes along and wants to build a higher standard, that's up to that builder I think that's a good thing, don't get me wrong, but I don't think we should be mandating that through a building code. When you start mandating that through a building code is that you get more and more government involvement and more and more red tape and it just becomes more complicated and so when you talk to me you find out that I really advocate the industry being self policing." (Construction Industry Representative Two, personal communication, June 12, 2013)

CIR2 believed the BCBC should be structured like early building codes with a prescriptive economic code structure primarily focused on health and safety. He believed the current BCBC program is under too much political influence and has been altered to serve a specific political agenda:

> "The code is always going to be that minimum standard and it's up to Buildings and Safety Standards Branch to really be ensuring that the public is kept safe and that the codes that are implemented make sense for that sort of minimal structure…I think the code is where it should be. The greening of the code so to speak is really more of that trend that I'm not even convinced that the code should be getting into, but I believe it is a political bent and I believe there is some political push to you know green the BCBC so it looks like we're doing good on the environment…I'm not saying that we shouldn't be doing these things, I've been doing them for 15 years, but it's not about being a green builder, it's just about good building practice…I really think PBI really should pick up the ball and be

> starting to push the green initiative and I think that these things should really be coming from industry." (Construction Industry Representative Two, personal communication, June 12, 2013)

CIR2 was quick to clarify that narrowing the scope of the BCBC did not mean ignoring issues of building energy efficiency, rather he acknowledged the need to shift this responsibility from government regulators back onto the construction industry through a series of certification systems and improved builder education (Construction Industry Representative Two, personal communication, June 12, 2013). He believes the current HPO builder registration program of the HPO is inadequate and should require mandatory training around a range of building issues, including energy performance. A better industry-driven registration and regulatory program could deny builders registration status if they did not have energy efficiency training:

> "I think first of all we need to have better (mandatory) builder education. This is supposed to be happening with the PBI…They've been working for quite a while and it is literally at the doorstep of being implemented by the province…They are supposed to take over the builder registration, so that every legit builder is going to need to be licensed by the PBI and along with that there will be mandatory training for builders. So my personal opinion is that I would rather rely on something like that to bring the standard up rather than a document like the BCBC. (Construction Industry Representative Two, personal communication, June 12, 2013)

In terms of the EEBS goals, CIR2 believed they were developed without any kind of industry input and were solely meant to respond to larger political goals and did not consider how it would impact industry, or how it would be implemented:

> "I don't think they had any idea the scope of what they were trying to implement and how it would affect the industry and again I emphasize though there are guys that embraced it, the industry as a whole really struggled with it (the GBC) and to you know make all of those things happen at once was not really a reality…it's like me in a little power boat and I'm on the water and I'm going down the narrows and in terms of turning that's easy, and now you've got the largest cruise ship behind me and trying to turn and it's like night and day. You are trying to take this industry and realistically you're trying to make it take a huge turn. You want it to do a 90 degree turn basically right on a dime." (Construction Industry Representative Two, personal communication, June 12, 2013)

CIR2 saw the shift towards mandatory performance testing and the use of a performance code standard for all new construction (whether it was the EnerGuide program or another standard) as the biggest hurdle for industry. While he is an advocate of mandatory performance testing, he has a good understanding of the part of the industry that "have never even heard of a fan-door test or HRV or continuous insulation" and have been building to fairly consistent standards for over twenty years (Construction Industry Representative Two, personal communication, June 12, 2013). He believed implementing the performance testing changes would cause the industry to "grind to a halt". He understood that portions of the industry raised significant opposition regarding these program goals during the public presentations held during the Part 9 update process.

CIR2 also felt the Part 9 update and it's Technical Advisory Group did not adequately consider the input of industry representatives, who had a high degree of understanding regarding both the technical issues of construction, and the operational issues around code implementation and enforcement:

> "For any sort of code process you need to engage the experts, both technical experts and those with expert knowledge of the industry, and beyond simply engaging you need to listen to them…you need to hear the industry professionals, so whether it is a Technical Advisory Group or whatever…then you need to listen to that Technical Advisory Group. So I can give you an example because I know people that went through this process through this last round, and I asked them you know what happened here I thought this was your passion and you wanted to see this implemented and they said well "Oh well you know we tried to explain it to them, but they didn't hear what they said." And they've sort of put this, you know this was really their agenda, they wanted to put on a presentation that they were working with maybe the industry and the stakeholders but…there is an agenda and they want to push that agenda." (Construction Industry Representative Two, personal communication, June 12, 2013)

CIR2 identified a range of communication issues between government and industry, however he was able to use his personal connections to circumvent these issues and remain aware of Technical Advisory Group discussions and the code change program. CIR2 was unable to confirm how the CHBA communicated with members or the organization's communications protocol around ongoing projects and processes like the Part 9 update, or how he was informed of the 2012 Part 9 public review.

CIR2 thinks the current code update process is inefficient and could likely be redesigned, but he does not want a system that alters or removes the public review process and the opportunity for the industry and general public to comment on code changes. He did not have any specific suggestions for improvements to the code update process but felt more attention must be given to the development of large policy strategies, like the EEBS. He also felt other industry initiatives, like builder certification changes promised by the PBI need to be considered in conjunction with potential code updates, as perhaps BCBC updates alone are not the most effective vehicle for each EEBS regulatory goal (Construction Industry Representative Two, personal communication, June 12, 2013).

Construction Industry Representative Three

Construction Industry Representative Three (CIR3) is a past president the CHBA BC and sat on the Part 9 Technical Advisory Group as their representative. He has also served on various CHBA BC technical committees and has been active with green building associations like Built Green BC. He has over thirty years of residential development experience and his company has built homes to a range of third party performance standards including Built Green, LEED, Passive House Standard, Net Zero and R-2000.

CIR3 provided background into the workings of the Technical Advisory Group including how it was assembled, why it was disbanded and its decision-making protocol. The Technical Advisory Group attempted to use consensus decision-making throughout its proceedings, though some contentious issues emerged during industry outreach and presentations (including mandatory EnerGuide certification, mandatory performance testing and some issues with mechanical systems) that made reaching a workable consensus between group members impossible.

CIR3 believed the EEBS was heavily influenced by other government agencies and that the Building and Safety Standards Branch was under tremendous pressure from the Premier's Office to implement the goals of the EEBS (Construction Industry Representative Three, personal communication, June 16, 2013). He felt the Premier's Office was disconnected from the actual reality of the construction industry and the difficulty posed by the upgraded standards. CIR3 stressed the

importance of involving industry during the development of large-scale policy initiatives to ensure appropriate goals:

> "The Technical Advisory Group may have been more effective if it had started with a more general mandate, it was hard to start with a predetermined and unrealistic goal…These green systems are still relatively complex and the whole industry has not yet been given the incentives to be able to build consistently to these standards." (Construction Industry Representative Three, personal communication, June 16, 2013)

CIR3 echoed previous concerns around implementing the EnerGuide 80 rating without an education program, stating his firm took six years of research to develop methods to consistently reach EnerGuide 80 primarily through building envelope upgrades. He also had problems the EEBS goal of reducing energy demand by 20% per home by 2020. This goal was not explicitly raised in Technical Advisory Group discussions, however CIR3 emphasized that this goal should always be presented in conjunction with demand side management initiatives as any goals regarding building energy use must consider the impact of occupant behavior:

> "We can build something to be Net Zero, you know throw enough solar panels on a roof and throw in a bunch of really sophisticated mechanical systems and you can get the building there, but you have no control over what someone does in their home and how they want to use it…so as soon as they (home owner) take a 20 minute shower, or leave the lights on, or do an extra load of laundry the house isn't Net Zero anymore. I think that these occupant issues need to be acknowledged a bit more, I don't know how you do that, but it seems like building quality and occupant use are spoken like they are two different things, but really they are much more connected than we make it seem" (Construction Industry Representative Three, personal communication, June 16, 2013)

CIR3 believed that by focusing so much attention on adding performance standards to the BCBC there were fewer acknowledgements, particularly during the code development process, of the importance of educating the public around occupant behavior and residential energy use. He also thought the Smart Meter program currently being rolled out by the province would have a greater benefit on reducing residential energy consumption since it allows for constant feedback between homeowners and their residences, enabling them to adjust the lifestyle patterns

related to their most energy intensive end-uses (Construction Industry Representative Three, personal communication, June 16, 2013).

CIR3 highlighted the Technical Advisory Group discussions at the provincial and national level around the inclusion of mandatory performance testing (blower door test) in the BCBC. A portion of Technical Advisory Group members were strongly in support of mandatory blower door testing and believed it an easy way to improve construction quality and provide important learning opportunities for industry. CIR3 believed the blower door test to be a cost effective performance measurement tool that could also act as a learning opportunity for the construction industry (Construction Industry Representative Three, personal communication, June 16, 2013). CIR3 still believes this test should be included as part of any future code upgrades and regrets that they were unable to successfully convince provincial government representatives to include this provision in the Part 9 update.

Construction Industry Representative Four

Construction Industry Representative Four (CIR4) has a background in residential development and spent over thirty years working as a developer in Ireland and the United Kingdom prior to moving to Canada in the fall of 2007. He intended to retire in BC's Okanagan region, however after six months of retirement he decided to return to work and completed Certified Energy Advisor (CEA) training. In 2008 he began conducting home energy assessments and advising owners regarding potential energy upgrades. His work as a CEA has allowed him to learn about the theory and technical side of buildings and he is able to devote more time to research, while remaining connected to the practical aspects of building.

Since he immigrated to Canada in 2007 and was just entering the industry when the Part 9 update process started he was not involved in the Technical Advisory Group. CIR4 did hear rumors about ongoing negotiations regarding Part 9 updates during his work with the EcoEnergy program. While he did know about the discussions and subsequent abandonment of the EnerGuide 80 goal, he did not know anything more regarding the update until he saw the December release of the Part 9 update. CIR4 was not informed of the Part 9 update by any industry association; rather he found it online while looking for something else.

CIR4's perspective has been influenced by his time working in Europe and their more stringent energy requirements, providing an important perspective on differences between regulatory approaches in Canada and Europe. He was surprised by the Canadian standards, given some of the climate similarities between Canada and Northern Europe:

> "I mean the general code for wall insulation throughout where I am (the interior of BC) is the same as in the southern UK…the average temperature differences between the two in winter is at least -15 ^{o}C. That's just crazy…these regulations are lightweight". (CEA, personal communication, June 12, 2013)

CIR4 related his experiences with the construction industry in Europe and it's ability to innovate and adapt to a range of changes. He believed that when given a push by increased regulations innovation would happen quickly and new products would be efficiently integrated into construction practices:

> "None of the going back and forth on standards like here…they've been talking about the new Part 9 for five years now and nothing's changed." (CEA, personal communication, June 12, 2013)

CIR4 was clearly frustrated with the lack of progress around the BCBC changes, especially the lack of coordination between the new standards and the phasing out of the national and provincial EcoEnergy grant programs. CIR4 was under the assumption that the incentive programs were meant to complement and prepare the industry for the new standards, but he felt the two programs were poorly coordinated and did not tie into code update programs at either the national or provincial level (CEA, personal communication, June 12, 2013). CIR4 believed that by not using incentive programs to further spread awareness regarding energy efficiency they missed out on important outreach opportunities that could have supported increased standards.

CIR4 also discussed some of the other impacts of the BCBC changes that could impact both energy performance, the construction industry and the next set of energy code updates:

> "The new window standards (these were introduced in December of 2012 as part of the 2012 BCBC) they include some pretty significant testing requirements for compliance, testing that needs to be done in

> Canada…the code now will not just accept products from other country's without Canadian performance testing you know…the market for many of these windows is so small in Canada that it doesn't make sense for these products to complete the testing just for what is a really small market…it's a totally protectionist move…now people here that want to build to certain standards like Passive House will have much less choice and may not be able to get their windows at all since currently there isn't a Canadian manufacturer." (CEA, personal communication, June 12, 2013)

CIR4 talked about the potential problems with new performance standards, particularly BC's new window standards (incorporated into the BCBC at the end of 2012) that mandate specific tests to determine product compliance with Canadian standards. CIR4 thought that though performance codes are meant to streamline international trade and the process of determining code compliance, Canada's decision to require in-country testing to prove code compliance, means increased costs for both international and national material suppliers, potentially limiting the number of high performance products available (CEA, personal communication, June 12, 2013).

CIR4 found it particularly difficult to accept that triple-glazed windows from Sweden that had been in their code since 1976 required a series of prohibitively expensive Canadian tests to prove code compliance (CEA, personal communication, June 12, 2013). He has extensive contacts in the Passive House community and did not understand why their input was not considered more seriously during the code development process (CEA, personal communication, June 12, 2013). He also wondered what other operational problems could be uncovered in the Part 9 update that may not have been uncovered during the development or consultation process. CIR4 did believe that a more stringent building code could bring about substantial changes to the built environment, but it must also incorporate programs to increase the education of both industry and the general public:

> "The literacy of everyone involved with the built environment needs to be raised. Joe Public needs to know what questions to ask regarding home performance and Joe Builder needs to be able to answer them." (CEA, personal communication, June 12, 2013)

CIR4 encountered numerous homeowners during his work as a CEA that had no understanding of how their home actually performed and the different operating requirements of different systems. CIR4 believed BCBC programs needed to

consider improved education around construction principles and energy efficiency at all levels, not just industry.

Environmental Organizations

With the shift in attitudes and priorities of built environment regulations following the shift towards energy performance codes (both in the late 1970s and the early 2000s), non-government and non-industry organizations have an increasingly important role in code analysis, research and development. In British Columbia the Pembina Institute has been very active in energy efficiency research and policy development and worked directly with the province on the EEBS. Despite the province's apparent willingness to engage with ENGOs around energy efficiency and the built environment, environmental organizations have shifted program work away from the built environment (Pembina Institute, personal communication, June 18, 2013). This reflects a combination of shifting ENGO funding realities and the emergence of other energy-related issues in British Columbia, including the Enbridge Pipeline and the province's new liquid natural gas program (Pembina Institute, personal communication, June 18, 2013). 14 ENGOs declined to participate in this research, citing reluctance to comment on the technical aspects of the BCBC, however these shifting organizational priorities may have been another underlying reason for the interview refusals.

Environmental Organizations Representative One

The Pembina Representative provided an overview of the organization's involvement in the development of EEBS and the specific GHG targets related to the strategy's residential and community programs. Since Pembina operates on a slightly different funding model than other Canadian ENGOs, they have more flexibility and scope in terms of the projects they take on. They were involved in direct work with the province on the EEBS via their fee-for-service consulting arm and they were also involved in some advocacy and outreach activities with local governments via their advocacy arm. The Pembina Representative also discussed work that emerged from the EEBS institutional sector program and how that related to issues around the residential component of the BCBC:

> "The first part (of our involvement) was fee-for-service work with the province, back in 2007, doing the calculations related to the energy efficiency improvements in buildings: we were looking at what happens if you change an individual building by a certain percent, what is that

> going to look like over time and how does that relate to targets for community wide or province wide energy efficiency improvements. So we worked directly with the province on a consulting relationship and then we had another contract after that around estimating what the GHG emission savings and targets could be for residential and commercial buildings (this formed a portion of the large goals for the EEBS). So this involved fairly high-level modeling research and then subsequent to that the province put in their energy efficiency targets for communities and provided funding opportunities for communities into the EEBS." (Pembina Institute, personal communication, June 18, 2013)

The Pembina Representative mentioned that the organization's research during the development of the EEBS was incorporated into the background work and modeling during the development of the Part 9 update at the provincial level.

Pembina was one of a few groups to publicize their GBC public review submission, which was coordinated with other ENGOs, local government and construction representatives. This submission came out of consulting work with municipalities enrolled in two EEBS community programs: "Community Action on Energy and Emissions" and the "Remote Community Clean Energy Program". This work involved "helping them (the municipalities) to develop plans or policies for actions to meet the energy efficiency targets of their respective programs" (Pembina Institute, personal communication, June 18, 2013). Working on energy efficiency and the built environment at two levels (provincial and municipal) Pembina started to recognize that in order for the municipalities to reach their energy efficiency and GHG emissions reduction targets significant changes to the built environment were necessary:

> "Communities realized that to meet the targets significant change had to happen and they were realizing that part of the problem was…they had limited opportunities to require buildings to be more efficient. This came up a few times and with a few of the communities we worked with on a fee-for-service basis, and we realized there was a strong desire for that and for a building code that could help support communities in meeting these energy efficiency targets. That was an important component in the submission for the GBC that we coordinated in 2008.
>
> So for our submission it wasn't just us involved, there were municipalities and industry and we reached out to some other ENGOs. A lot of independent organizations saw this as an issue and we had the

> opportunity to come together for the actual submission." (Pembina Institute, personal communication, June 18, 2013)

The Pembina Representative mentioned the issue of local government restrictions and the barriers to energy efficiency caused by the BCBC. As their formal consulting work around the built environment primarily focused on communities following the release of the EEBS they were more directly engaged in the policy issues around energy efficiency. Through this work they continued to realize that the GBC did little to reduce municipal issues with the BCBC and so they launched a new policy program, "Green Building Leaders", focused on regulatory reform to enable increased municipal control of the built environment:

> "We continued to have discussions with municipalities to determine if there was any interest in combining some financial resources for research and modeling to find solutions for achieving increased energy efficiency. (As a result of this research) it turned out that there was still this barrier with the building code, so we did a legal analysis of what is within municipal jurisdiction in terms of requiring increased energy efficiency or renewable energy. Then we did some research on what are the best practices out there and what would regulatory policies bring about in terms of GHG reductions.
>
> With that we found that there were these barriers that would require the provincial government to either provide greater ability for local governments to put this in, or the provincial government itself putting in a stronger building code. So with "Green Building Leaders" we put together a municipal working group and came up with a letter to the minister asking for support of three policy changes that could help municipalities improve energy efficiency and increase use of renewable energy: higher energy efficiency standards for new buildings, requirement for existing homes (the bulk of housing stock) to meet minimum energy performance standards and an provision for the use of renewable energy produced onsite." (Pembina Institute, personal communication, June 18, 2013)

Pembina was invited to participate in a number of code consultations as part of their involvement with the "Green Leaders Program". Pembina Representative mentioned these consultations were broad in scope and included the 2012 BCBC update, the Part 9 update, the addition of the Solar-Ready provision in 2010 and other minor changes. In some cases, Pembina received direct communication from the Building and Safety Standards Branch; in others they received notice via an email list-serv run by consultants interested in building and regulatory issues. One of the Part 9 update

consultations included face-to-face meetings that led Pembina to believe that energy-efficiency was to form a key component of the 2012 BCBC:

> "There were a series of in-person consultations and meetings in 2010 prior to the release of the code change scheduled for 2012 and its public review. These consultations led to the perception that energy efficiency changes were going included and then they obviously weren't in what went out to the public. This was fairly disappointing and we again made a submission (on our own) regarding what we saw as failures of both the code and the update process." (Pembina Institute, personal communication, June 18, 2013)

The Pembina Representative identified issues in the provincial government code development process that they believed contributed to the continued delays in the incorporation of increased energy efficiency measures into the BCBC:

> "When looking at process from the start of this back before 2008…I saw challenges at the staff level. The building code prior to 2008 did not have energy efficiency as part of it so there were the staff in that section of the ministry that were now tasked with doing upgrades…in terms of the changes to the building code the starting point was pretty good, we felt it could have been stronger, but subsequent energy efficiency changes kept getting pushed back and we felt there was a lack of leadership or motivation for the staff to really get into how energy efficiency could be incorporated in. There was a fair bit of consultation, but then felt that …well it was a big change for how people at the building code level considered things. You know prior to that safety was most paramount and now adding energy efficiency; I think it caused challenges in how to prioritize aspects of the code and possibly challenges to staff resources. That group then got pulled into the Ministry of Energy and some internal bureaucracy definitely added to the challenges." (Pembina Institute, personal communication, June 18, 2013)

These staffing concerns echo the issues raised by other sectors, but it is important to note that the Pembina Representative is the only interviewee who does not cite communication and information sharing as a major issue. The Pembina Representative also did not view the large-scale goals of the EEBS as an issue; rather they felt the focus should be on the continuous delays. It seems like Pembina Institute was involved in a much different code development process than representatives from other sectors, though they did highlight some issues around communication in their 2011 submission regarding the 2012 BCBC (Pembina Institute, 2011).

Chapter 5 – Analysis of Interview Results

The interviews outlined above were conducted to gain an understanding of two separate BCBC updates, one that occurred in 2008 and one scheduled for adoption in 2014. The BCBC updates were the result of two policy programs: the EEBS and the GBC. The interviews were structured to look at each BCBC update over three phases: development, monitoring and implementation. In the case of the Part 9 update (associated with the EEBS) there is limited information on monitoring and implementation, as the update has not yet taken effect. The range of stakeholders interviewed and their different levels of involvement in each policy program and code update means that the amount of information available for analysis differs between the two updates. Additionally due to the different perspective and levels of understanding of each program between the interviewees interview responses were not coded according to a predetermined classification system; instead the responses were analyzed collectively following the conclusion of the interviews to look for patterns and similarities between sectors and stakeholders.

Before discussing the interview results in detail it is important to note that a clear consensus emerged between interviewees regarding the belief that additional regulations (whether through the BCBC standards, or through construction industry regulations) are necessary to address issues of residential building energy efficiency. There was general agreement that recent standards have been insufficient, and should have included additional performance measurement components but each sector believes that a regulatory program can be successful in increasing residential energy efficiency. The interviews also highlight the importance of ensuring regulatory programs and increases are supported by other initiatives including outreach and education (for both industry and consumers) programs. Though some of these ancillary programs may fall outside the scope of the BCBC's regulatory framework, issues of builder education can be considered an important component of BCBC implementation and should be considered by regulators throughout the code development process. It is therefore included in the analysis below under implementation.

Policy and Code Development

Each interview included a set of questions designed to determine how the province developed each policy program and update (see Appendix 2). As indicated in the

interview descriptions and overviews above (Chapter 4) there was a considerable range of policy development experience between the interviewees and numerous contradictions regarding how both the large-scale policy programs (the EEBS and the GBC) and BCBC updates were developed.

The two key issues that emerged around the development phase are related to the process's clarity of goals and objectives and the coordination of government agencies. For both of these issues the responses broke down in similar ways: the representative from the Building and Safety Standards Branch, local government representatives and construction industry representatives had a fairly similar understanding of the policy process as it related to goals and government consultation, while the representatives from the Energy Efficiency Branch and the Pembina Institute had a much different recollection and understanding of both issues.

The root of some of these contradictions regarding policy development appear to stem from the significant opportunities given to the Pembina Institute around research and development of the EEBS policy program and their subsequent involvement in consultations around the BCBC updates (both the GBC and the Part 9 update) despite not being involved in the Part 9 Technical Advisory Group. The consulting and research work of Pembina's fee for service arm gave them a much different perspective on the EEBS than the other stakeholders interviewed, as they directly engaged with the Energy Efficiency Branch. This may have led to the similarities of opinion between Pembina and the Energy Efficiency Branch regarding the GBC process and it's impact on residential construction standards. The interviews reflect the fact that the Energy Efficiency Branch and the Pembina Institute had a particular understanding of current residential construction practices in British Columbia that was not verified by engaging construction industry experts during EEBS development. These misunderstandings appear to be the cause of their perception that the increase to EnerGuide 80 over two years is an achievable target.

Industry and the Building and Safety Standard Branch representatives reiterated that the GBC introduced a performance compliance element to the BCBC, but still included a traditional prescriptive path that led to buildings performing at between EnerGuide 72 and 74. The prescriptive path was the most popular code option, as it required a less complex building envelope and did not require verification through performance testing. The Energy Efficiency Branch (or the Pembina Institute) did not attempt to

contact the Building and Safety Standards Branch to discuss the goals, research program and modeling assumptions of the EEBS, making them unaware of the current on the ground realities of the residential construction industry.

Since the EEBS development process relied extensively on energy modeling (some conducted by the Pembina Institute working as a consultant) during the goal setting process. The representative from the Energy Efficiency Branch did not mention verifying these modeling assumptions (particularly in regards to the existing construction standards) with the Building and Safety Standards Branch or any attempt to consider issues of occupant behaviour impact on residential energy use. Again the lack of consultation allowed the EEBS goals and targets to be developed in a relative vacuum by government agencies and stakeholders that did not have the technical expertise to be involved in the subsequent BCBC update (the Part 9 update).

There was general agreement between local government representatives and construction industry representatives that the EEBS had been developed without any consultation that included representatives from their sectors (the provincial government representative from the Building and Safety Standards Branch confirmed this). While the large-scale strategic focus of the EEBS may not have been appropriate for consultation with all facets of the construction industry affected, the EEBS's specific goals and timelines for the BCBC meant that it would have a clear impact on the construction industry and local governments. The decision to implement a policy with such strong performance metrics within a short timeline created some frustration among industry and local government stakeholders. The general impression between these stakeholders is the delays of the Part 9 update (the BCBC upgrade associated with the EEBS) were the result of poor coordination during the goal development process that could have been easily mitigated had industry or the Building and Safety Standards Branch been consulted at any point during the policy development process.

Another important issue that emerged around the issue of consultation is an ideological split between the Energy Efficiency Branch and the Pembina Institute and local government representatives, construction industry representatives and the Building and Safety Standards Branch representatives around the importance of engaging industry experts during the development of policy goals and targets. The Building and Safety Standards Branch representative outlined the need to ensure

that code development engaged a balanced group of experts with a range of construction industry experience. He clearly valued the insights and industry perspectives they brought to the code development discussions and ensured that the BCBC development process involved extensive consultation both through the Technical Advisory Group and the subsequent public review and public outreach events. Local government representatives also considered themselves to have numerous important insights into both the construction industry and how decisions made during code development can impact their role as code enforcers. These sectors clearly valued on the ground experience and believed an important component in the policy development process is an understanding of current industry practice.

The Energy Efficiency Branch representative and the Pembina Institute Representative did not appear to share the same opinion regarding the importance of engaging experts in the construction industry. Though both interviewees referenced the importance of modeling and research programs during goal setting and standard development, neither made any mention of industry engagement or the importance considering the perspectives of industry and local government representatives. The Energy Efficiency Branch representative believed that industry responded to government regulations and that the responsibility to meet increased standards was on the construction industry. This approach is quite different to the one taken by the two other sectors, and this attitude may have been the root cause of why no consultation was conducted by the Energy Efficiency Branch with outside stakeholders and other government agencies.

The lack of consultation during the EEBS development also caused issues with the BCBC update schedule as the Building and Safety Standards Branch was not informed of the scope of the update program or given the opportunity to designate resources to this program within their 2008 work plans. This meant that work could not begin on the Part 9 update until 2009, which placed the project behind schedule before it started and ensured the code update would not meet the EEBS timeline. The Energy Efficiency Branch took an “aggressive approach” to setting targets and timelines, however since a completely different branch of government that may have had other pressing projects was responsible for BCBC updates, this approach does not seem appropriate. If the Building and Safety Standards Branch had been consulted there could have been the opportunity to shift staff resources, however it again appears

that the Energy Efficiency Branch did not prioritize consultation with those most affected by the policy programs they were developing.

The interviews discussed issues of construction industry performance and whether or not the industry was capable of producing the kind of buildings targeted by the EEBS (those that are performance tested to meet EnerGuide 80). During the course of these discussions another source of conflict between government representatives and the construction industry during the policy development process was discovered. This conflict relates to discrepancies between the cost estimates of BCBC updates and the differences between government and construction industry cost estimates[12]. The GBC cost figures from the province (which are difficult to verify as the original cost-benefit analysis report is not publicly available) are significantly lower than the estimates provided by the construction industry.

In addition to the discrepancies between costs, there was also confusion regarding what built environment systems the provinces cost estimates included. The province focused on increased energy efficiency through upgrades to the building envelope, technology that is more cost effective than upgrades to a building's mechanical systems. The construction industry mentioned that meeting performance standards through built environment updates alone is difficult, requiring increased construction skill. Due to the issues with available information on these cost estimates additional research is necessary to understand the cost discrepancies between government and industry and to determine whether they are based on further misunderstandings or miscommunications regarding current industry practice, available technology and code compliance options. The province was using these cost estimates to illustrate the cost-effectiveness of the BCBC changes to homeowners and consumers, however again it appears that no attempts were made to verify these estimates with the construction industry to ensure the public was being provide with accurate information on the potential financial impacts of BCBC changes.

With the range of stakeholders interviewed it is not surprising that a range of other issues around policy development emerged during the discussions. Most of these

[12] Note: the government placed costs for the GBC from $3,257 - $5,388 (with an estimated cost savings for all areas but electrically heated homes in the south coast region), while the industry representative estimated a cost of $7,000 - $10,000 for similar products (this estimate likely erases any of the cost savings referenced by the province).

were mentioned by a single contact or sector, however they may have greater impacts that were overlooked in the literature reviews or by other interviewees. Further research is required t determine how these issues impacted the overall process of either large-scale policy development or BCBC updates. These include the impact of the BCBC's increasing complexity on the construction industry and owner-builders, the impact of code structure on code enforcement, the cost of proving code compliance of specific products and systems (including doors and windows), the potential of the BCBC to limit or constrain specific types of residential construction (including the Passive Haus standard), and how the structure of the BCBC responds to different climate zones and climate conditions throughout the province.

Monitoring and Evaluation – The shift to a Performance Code

The literature review illustrated the importance of the monitoring and evaluation component of performance codes and the interview questions around this component looked at how British Columbia attempted to shift the residential portion of the BCBC to a full performance code and the types of performance testing used to ensure code compliance. Again discrepancies emerged between the Energy Efficiency Branch and the Pembina Institute and the Building and Safety Standards Branch, local government representatives and construction industry representatives.

Building and Safety Standards Branch, local government representatives and construction industry representatives believed that the shift towards a performance code (with its associated performance testing requirements) could have monitored current industry performance and enabled subsequent analysis of performance changes caused by code updates. The Building and Safety Standards Branch representative believed this type of performance program could mitigate some of the confusion around performance levels that occurred during EEBS development and could lead to changes in the types of energy modeling used during code development.

Construction industry representatives were the strongest supporters of the shift to a performance-based code for energy efficiency, with a mandatory testing component, though they did not support the initial performance code rating of EnerGuide 80. The interviewees favoured a blower, or fan door test, to determine building energy performance, and air tightness. Their rationale for this performance test was based on the structure of the GBC, the focus on building envelope

improvement (mainly through the attention paid to wall assemblies and thermal stability) to increase building performance and the high percentage of residential energy use related to the building envelope. They believed a blower door test was a simple and cost-effective way to verify that buildings were meeting performance code requirements and to monitor building performance changes at an aggregate level across the province. The construction industry also believed that these tests could provide a range of ancillary benefits for builders by allowing them to learn from their developments and buildings and measure and track the performance of their construction over time. The proposal from the construction industry during the Technical Advisory Groups code development consultation included two mandatory blower door tests for each new residence until the builder had proven their homes met or exceeded the minimum performance requirements (Construction Industry Representative Three, personal communication, June 16, 2013).

The construction industry clearly understood the need to ensure that all residential builders, especially those that had not previously incorporated energy efficiency techniques, were provided with an opportunity to learn about how the blower door test can evaluate building envelope performance. Their initial proposal also included a performance standard that ranged from around EnerGuide 76-78 for the first energy performance code iteration of the BCBC, as they felt that the EnerGuide 80 was too stringent a standard for the first mandatory performance BCBC. Industry representatives were unanimous about the potential economic impacts on the industry if the code had suddenly moved to EnerGuide 80, as they felt that numerous projects would likely face considerable delays as builders attempted to meet new performance standards.

Ultimately the Building and Safety Standards Branch was pressured by the larger construction industry (representing interests outside of those expressed by the interviewees) during public outreach events and a subset of Technical Advisory Group members. There were clear concerns that the any form of mandatory performance testing had the potential for negative economic impacts on both the construction industry and consumers and the Building and Safety Standards Branch representative was very aware of the need to balance the requirements of all sectors of industry with government objectives. His attitude and approach again reflect the importance placed on engaging directly with the industry and responding to their concerns.

In addition to the concerns raised by the broader construction industry, the Building and Safety Standards Branch representative also mentioned capacity issues with the EnerGuide program. The current number of Certified Energy Advisors (CEA) capable of conducting performance testing is not sufficient to manage the testing demand that would be created through the shift to a performance based BCBC. The EnerGuide program, in charge of certifying and training all CEAs, is still managed by NRCan. CEAs are responsible for certifying EnerGuide rated homes through a process that involves an initial performance test, a discussion of potential improvements with developers or homeowners and a final test to verify the home's rating. The EnerGuide program includes two sections (retrofits and new construction) and not all CEAs are certified to perform testing on both. The Building and Safety Standards Branch representative mentioned a series of discussions with representatives from NRCan regarding the capacity of the program in British Columbia and it's ability to respond to changes in the BCBC, however it seems these discussions were unsuccessful and there was little formal involvement of NRCan in the code development process.

Given the importance of performance testing to energy performance codes, the removal of this element in the Part 9 update (and the creation of two separate code compliance paths by the GBC) is particularly problematic. The interviews clearly showed support by the construction industry and that a range of different performance code components and performance testing options were available to the Building and Safety Standards Branch. The largest issue appeared to be the capacity of the province's CEAs and a reluctance of NRCan to expand the program. Again this seems to be an instance of poor inter-agency consultation and competing or conflicting objectives between government agencies. There does not appear to be a formal consultative mechanism that the Building and Safety Standards Branch could have used to instigate discussions with NRCan, instead they were forced to rely on more informal communication networks for one of the most important aspects of the Part 9 update.

The focus of the construction industry, the Building and Safety Standards Branch and local governments on the use of the performance component of the Part 9 update as a way to monitor industry performance over time and progress towards the larger goals of the EEBS is not surprising as there are potentially a range of benefits for the industry that could result from demonstrated efficiency

improvements. What is surprising is the lack of interest from the Energy Efficiency Branch in the performance measurement component of the Part 9 updates.

The Energy Efficiency Branch did not develop a monitoring or evaluation program to look at whether or not the performance goals of the EEBS (including the inclusion of the EnerGuide 80 rating) actually had any impact on residential building energy use. The Energy Efficiency Branch Representative mentioned that two performance targets are being tracked, one for commercial and one for residential. By focusing on the target of a 20% reduction in energy demand per home by 2020, the branch ensured that issues of occupant behaviour were considered in analyzing energy use, however this approach also missed the opportunity to use data generated by performance testing and feed it back into additional evaluation programs. The Energy Efficiency Branch representative did not attempt to engage with the Building and Safety Standards Branch during the Part 9 update development to discuss potential evaluation of monitoring programs in conjunction with a larger EEBS evaluation program. This perspective echoed issues raised during the literature review around the monitoring and evaluation of energy performance codes, especially since these codes are primarily developed through energy modeling programs that are not field verified and or developed with a post-occupancy evaluation component.

BCBC Implementation

The implementation phase is an important component of any policy program and though the Part 9 update is not scheduled to take effect until December of 2014 there has still been a range of implementation activities for both it, the GBC, and the EEBS. The implementation section of the interviews focused on determining how information regarding the new standards was communicated to effected stakeholders and the general public to ensure they were ready for the changes, how code enforcement agencies (local governments) were informed regarding the changes and was additional professional training provided and how was the final BCBC update schedule determined? Additionally the two BCBC updates included a public review period around the regulations. This component could be considered under the "Code Development" phase, however since a single public review is done following the major code development discussions, this process appears much more related to attempting to identify any potential implementation issues (including confusion over how the update is worded or questions around enforcement) then an

attempt to engage the public in policy development and thus will be considered here.

Communication was an issue that emerged consistently throughout the interviews; whether it involved inter agency or external communications around any aspect of the policy process. The interviews demonstrated a range of confusion over how information was being transmitted during the development of the GBC, the Part 9 update and the national code update process conducted by the SC-EEB, and again there was discrepancy in both the recollection of the implementation process and the attitudes towards inter-agency communication between the Energy Efficiency Branch and the Building and Safety Standards Branch. The Energy Efficiency Branch representative recalled some discussions with the Building and Safety Standards Branch, however the Building and Safety Standards Branch contradicted this information and stated they were not involved in developing an implementation plan related to the EEBS and were also not provided any advanced notification prior to the strategy's adoption by the legislature. This did not allow the two agencies to develop a joint implementation plan around the EEBS goals and quickly forced the Building and Safety Standards Branch into a new BCBC update process that did not allow time for the development of a nuanced communication strategy or consultation protocol between the two agencies.

Inter-association communication issues also emerged within local governments and the construction industry. Both industry and professional organizations appeared to have difficulty effectively communicating with their members as the interviewees, all members of at least one of either the CHBA-BC or the BOABC had difficulty recalling formal communications from their associations around the BCBC energy efficiency updates. Some relied on professional networks within the associations to remain connected to the Part 9 update process. The awareness of the Part 9 update within the construction industry and among local level building officials suffered from the failure of industry associations to ensure that update information was effectively distributed. The construction industry representative that was not aware of any specifics of the Part 9 update changes despite attending numerous construction industry events, including government-sponsored BCBC presentations is a clear example of this issue. He mentioned that a number of rumors were moving through the construction industry, but he was unable to verify these assumptions through his industry association (CHBA-BC) and gain a greater understanding of the upcoming changes.

The other industry representatives (including one that served on the Technical Advisory Group and another that was involved with the CHBA-BC executive) could not recall how the CHBA-BC distributed information to members during the code update process, if feedback was solicited from members regarding potential code compliance or implementation issues arising from the Part 9 update, or if special information bulletins advertising the changes were sent out outlining the changes and the new code compliance options. Given the scope of the Part 9 updates, their potential impacts on the residential construction industry and the need for the association to represent and inform all members, the lack of coordinated communication regarding the updates could have had extreme consequences had the energy efficiency components been included in the 2012 BCBC[13]

The interviews highlighted that while the Building and Safety Standards Branch prioritized the engagement of experts during the code development process, they did not extend that to consultation with the representative's agencies or associations. The Technical Advisory Group did not include a formal communications protocol and none of the interviewees mentioned any information regarding the distribution of code update details to the construction industry. The Building and Safety Standards Branch representative did not mention anything about publicizing the work of the Technical Advisory Group or any Part 9 update information until the public review. At the provincial level, this review occurred after the update had been ratified at the national level and been slightly changed by branch officials[14]. A similar process (where additional code information was not made publicly available until after the public review) was followed during the GBC update in 2007.

Beyond communication around the work of the Technical Advisory Group and agency associations, the interviews illustrated some discrepancies regarding the public communications around the Part 9 update. The Building and Safety Standards Branch outlined a comprehensive outreach plan that included in person presentations across the province (both via the Homeowners Protection Agency and separately as the Building and Safety Standards Branch) at various stages during the

[13] Note: the original EEBS goal of an 2010 BCBC update was abandoned by the Technical Advisory Group, however the revised schedule was to incorporate the energy efficiency component in the 2012 BCBC, however this schedule was also not met.

[14] No changes were made to the Part 9 updates following the British Columbia public review.

code development process. Unfortunately the construction industry representatives recollections of this outreach program varied widely: some did not remember any presentations, while others were could not recall the presentations in detail and did not use them as their main source of code update information. Additionally since these presentations were targeted at the formal construction industry they may have missed key sectors including material suppliers and owner builders potentially compromising their abilities to prepare for the Part 9 update. This may have limited the opportunity of these sectors to engage in the in-person presentations on code changes that may severely hamper either their ability to complete their home construction projects or their businesses. The province also did not publicize information regarding the Part 9 update over the internet until the standards were released for the public review in the fall of 2012, as the Building and Safety Standards Branch used an outreach program focused on more resource intensive in person activities.

It seems clear that additional research and interviews are necessary to determine the cause of the discrepancy between the Building and Safety Standards Branch and the construction industry, especially between industry representatives who claim to have attended all HPO presentations. The Pembina Institute representative recounted a set of consultations and meetings with government around the Part 9 updates indicated additional sets of discussions occurred. Additionally Construction Industry Representative Three and the Building and Safety Standards Branch representative both cited industry concerns as a key reason the Part 9 updates were modified[15], meaning that feedback was clearly solicited, analyzed and considered prior to the 2012 public review. Perhaps one of the reasons for the confusion of Construction Industry Representatives was the timing of HPO presentations and government outreach activities (throughout 2010) and the subsequent delays around update implementation, though the delay of well publicized standards is a much different issue than industry and local government representatives being unaware of these upcoming changes.

The interviews also highlighted the desire of local government officials for additional communication and consultation opportunities with provincial agencies around code outreach, implementation and enforcement. Local government officials

[15] Note: the Part 9 section that went out for public review already had mandatory performance testing stipulation removed due to previous concerns raised by industry and the capacity issue of the performance testing industry.

saw themselves as playing a direct role in construction industry interactions around code implementation though local builder interactions. The limited information available regarding the Part 9 update limited these activities and created significant uncertainty among local building officials who felt the HPO presentations were not enough to address their concerns and questions around the new energy performance standards. The provincial government representatives did not consider the potential of local officials during code implantation. They did not develop an implementation strategy (regarding either the Part 9 update or the GBC) that specifically included local officials or addressed code compliance. Since the Part 9 update did not develop any builder education programs (despite the acknowledgement by government representatives that education was an important, but difficult component of code change programs), local government officials believed that their omission from the code implementation process led to missed opportunities for increased communication around code updates, and thus the opportunity to create a construction industry that better understood the energy efficiency changes and the BCBC's new Part 9.

Industry and consumer education was a key topic that emerged during the interviews, despite the lack of pre-interview questions designed to address it. It was clear that some sectors believed that though education programs were not contained or mentioned within the BCBC itself, the implementation strategy around such a major code update should contain some kind of education or training program. There were a range of opinions expressed over how this builder education should be funded developed and implemented. The Energy Efficiency Branch believed the responsibility for this training was solely with industry and that government resources should not be spent on this type of code compliance training. Local government representatives highlighted the need for increased builder training, especially around specific issues related to energy efficiency (including building envelope performance) and did not seem concerned about program funding. Industry representatives clearly supported increased education of both the construction industry, and consumers. Some were clearly in support of government sponsored training programs, however Construction Industry Representative 2 believed these programs should be controlled by industry in combination with a stringent residential builder registration program. It appears likely that the issue of training and education in conjunction with the implementation of BCBC updates will continue until some kind of agreement is reached between the province and industry. This will be addressed in further in Chapter 6 below.

Chapter 6 - Recommendations for Future BCBC Energy Efficiency Updates

The analysis of the interview results conducted in Chapter 5 (above) identified a number of series issues with the British Columbia's policy process around energy efficiency and the built environment. These issues influenced all phases of the policy process including development, monitoring and implementation and contributed to the four-year delay of an energy efficiency update to Part 9 of the BCBC. This research and analysis has provided a solid understanding of the provincial policy process, from which a set of recommendations can be made. These are aimed at improving the efficiency of the policy development process, increasing consultation and information sharing between government agencies and increasing transparency around BCBC update programs and their associated Technical Advisory Groups.

The recommendations are broken down into the three sections mentioned in the introduction and the analysis in Chapter 5: development, implementation and monitoring. Each section includes a brief summary of the relevant issues that emerged during the interviews. The recommendations are based on insight gained from the stakeholder interviews, data collected during the literature review and additional research into current energy efficiency building code programs elsewhere. Some of the recommendations are still applicable to the upcoming changes to Part 9 (scheduled for December 2014), while others should be implemented prior to the next round of code changes, whenever these occur.

BCBC Development

Intra agency Consultation During Code Development

The EEBS was developed during a time of extensive political interest in energy and climate change related public policy, though the strategy did not provide additional resources to the Building and Safety Standards Branch to prioritize these BCBC goals. Mandating the need for continued political support of these programs is almost impossible to ensure, however government agencies directly involved in energy and climate must continue to advocate for the inclusion of energy efficiency and climate change adaption related components in all provincial policy programs, regardless of sector. This approach should lead to more interagency consultation as agencies involved in energy and climate, like the Energy Efficiency Branch, can work

directly with other ministries and branches to ensure their programs adequately address efficiency and climate change and that they have the resources and capability to address these goals. This should shift the Energy Efficiency Branch away from developing broad energy efficiency policy without input from affected branches and create a more collaborative structure within the provincial government.

If the province moves forward on additional large-scale climate focused policy programs that include firm performance targets for any sector or agency, the effected branch must be provided with an opportunity to comment on the performance targets and timelines before the policy is approved by the legislature. While high level strategic discussions may involve broad goals and a number of different agencies, making it inappropriate for each agency to be represented at every meeting, once the policy process has started to develop specific goals that could impact branch work plans and other ongoing programs, the branch or agency must be notified and provided with an opportunity to comment.

In terms of the built environment, this research provided clear evidence that the Building and Safety Standards Branch must be involved in future policy decisions that have the potential to impact the BCBC as the lack of consultation between government agencies during the development of the EEBS had the most serious ramifications on the Part 9 updates. If initial discussions had included the Building and Safety Standards Branch, the EEBS could have been modified to include a recommendation for additional staffing resources for the Building and Safety Standards Branch so that the project could have been incorporated into the branch's 2008 work plan. The aggressive strategy of the Energy Efficiency Branch should be modified to encourage a more nuanced understanding of the needs and possibilities of the residential construction industry in British Columbia, not the headline focused standard of having the "Greenest Building Code in Canada". The code development programs used in other provinces, particularly Ontario, emphasized a collaborative code development process that engaged a range of government agencies at various points to ensure building code development considered the perspective of a range of stakeholders and balanced concerns around energy performance, and consumer and industry economic impacts.

Interagency Consultation During Code Development

In addition to effectively engaging a range of government agencies during the code development process, the province must continue to involve external stakeholders with a range of expertise in all relevant aspects and parts of the code. This should apply to all code upgrades whether they are related to energy efficiency or accessibility standards. This will ensure that a range of stakeholder perspectives are represented during the code development process and that potential negative externalities related to the new code can be identified early in the process. In terms of interagency consultation during the large-scale policy development process, this may need to be decided on a policy-by-policy basis, as better intra agency consultation during this phase may limit the need for external stakeholder consultation. In these cases there could still be additional external consultation at the branch level: the Building and Safety Standards Branch engages a group of experts to discuss policy programs similar to the EEBS and then takes these results to the Energy Efficiency Branch.

The issues of public and intra agency communications during the policy development process were raised at numerous points during the interviews and also extend to transparency around larger policy programs, like the EEBS. British Columbia published no information regarding how the EEBS was developed or progress reports regarding specific targets. In Ontario, following the launch of the *Green Energy and Green Economy Act*[16] of 2009, a large-scale policy program with a set of goals related to energy efficiency and the built environment, the province developed the "Building Code Energy Advisory Council" (BCEAC). The Ministry of Municipal Affairs and Housing created the BCEAC to implement relevant portions of the *Green Energy and Economy Act* and chose expert participants from a range of organizations (government agencies at the federal and provincial level, independent consultants and industry representatives) (Province of Ontario, 2010). The work of the BCEAC was well publicized and included meeting minutes, agendas and progress reports and their policy goals and responsibilities were laid out in a publicly available Terms of Reference. This is a much different approach from the Technical Advisory Committees used by the BCBC or the strategy of developing built environment policy via the Energy Efficiency Branch. While a more publicized approach may not be appropriate for each BCBC code update process, each

[16] Policy program focused on economic transition towards a "green economy" including increased energy efficiency across sectors. The plan also includes other climate change mitigation goals around increased production of energy from renewable sources and the pursuit of a feed-in-tariff program. It is similar to a combination of the *BC Energy Plan* and the *Climate Action Plan* in British Columbia.

Technical Advisory Group should be operating under a publicly available terms of reference, to ensure that goals, objectives and update procedures related to the BCBC are well publicized. The creation of this kind of overarching body could also aid in formalizing information sharing between government agencies as the body's goals could reflect both the policy program of the Energy Efficiency Branch (via the development of strategies to increase energy efficiency across sectors) and the Building and Safety Standards Branch (through BCBC improvements). This group could also have stipulations laid out within the Terms of Reference that outline a strategy for dissolution if a process is abandoned in favour of national code harmonization. This could include commitments around maintaining existing information sharing protocols to ensure stakeholders and the general public is kept informed of the national process.

This Terms of Reference should include the stipulation for the advisor group to create a communications protocol. This should describe, in fairly explicit detail, the communication responsibilities of all participants and their parent organizations. The protocol can ensure two-way information sharing between Technical Advisory Group participants, allowing for increased engagement with the construction industry and other stakeholders during the code development process. The protocol should outline how information (including the Terms of Reference, background research and reports) will be made available and provide details regarding the communications responsibilities of Technical Advisory Group members.

This open communication model should mitigate the concerns raised during the interviews regarding access to BCBC information during the code development process. This again echoes the approach taken by the Province of Ontario during the development of their energy efficiency related building code updates that started in 2010 with the introduction of their hybrid energy performance code, *"Supplementary Standard SB-12"* (Province of Ontario, 2013). Ontario made public outreach around the building code development process a priority as numerous reports, information bulletins and historical code information is available on their website. This breadth of information makes it easy for anyone, regardless of his or her knowledge of the construction industry or building to trace the evolution of Ontario's energy efficient building code program and see how energy efficiency updates have progressed since 2006. The information lays out clear timelines for changes, enabling the user to compare code documents to determine why, where and how code changes have occurred and remain current on Ontario Building Code

requirements. British Colombia should consider this approach where code development information can be publicly archived in a way that is cost effective and easily accessible to both stakeholders and the general public.

Energy Modeling and BCBC Development

Modeling assumptions, which is typical for most energy performance codes, heavily influenced the EEBS performance targets. Unfortunately the province did not attempt to verify these assumptions with ground truthing involving the construction industry, a common issue outlined in the literature review. The research and modeling work for further BCBC updates must involve more collaboration with construction industry experts and energy research and modelers. This will hopefully enable more model accuracy and ensure the actual performance of residential buildings match the modeling assumptions. Again, with better coordination between the government agencies this research could be completed early in the policy development process and be used to accomplish multiple objectives, thus avoiding the need for two separate research programs and the inefficient use of resources, similar to what occurred between the EEBS and the Part 9 update. Additionally if the data collection recommendations made around the Monitoring and Evaluation section below are implemented, government agencies may be able to ensure greater model accuracy without the need for intensive construction industry consultation.

Monitoring and Evaluation

The most important aspect of performance codes is that they require external monitoring or testing to determine code compliance. Unfortunately many building codes, including British Columbia's are hybrids of performance and prescriptive economic codes that do not require mandatory performance testing. This has constrained government agencies from implementing comprehensive monitoring and evaluation programs around building code updates and it is impossible to accurately determine whether large-scale goals around energy use or GHG emissions are being achieved. There have also been limited attempts to include post occupancy evaluations (POE) in conjunction with code update programs. Since there was clear interest in incorporating mandatory performance measurement from both government and industry representatives during the Part 9 update development process, British Columbia must include this in the next set of energy performance related BCBC updates.

The final standard for the next set of updates should remove the prescriptive code compliance path and shift the entire industry towards a performance based model. Though the timing of the update, and the performance requirements may lead to similar industry concerns as those raised during the Part 9 update process, the province must attempt to mitigate industry concerns through a range of programs that include: greater information sharing and transparency regarding new energy efficiency standards, education or training options to ensure industry's ability to meet new standards (see Implementation section below) and maintaining adequate staffing levels of CEAs across the province

The province must be able to mitigate industry concerns regarding the potential economic impacts that could result from performance testing delays. Coordination with NRCan at the federal level should be pursued regarding increasing the amount of CEAs within British Columbia. The province may need to contribute some resources to the program, or offer subsidized training for CEAs looking to practice in British Columbia, though the potential gains in terms of the ability to monitor the implementation and effectiveness of the BCBC changes, gather data that can be incorporated into building energy modeling and provide additional builder training (via the information provided by performance testing) could offset those initial costs.

During the interviews Provincial Government Representative 1 mentioned that Ontario, which originally proposed mandatory performance testing in their energy efficiency building code update in late 2010, abandoned this portion of the update before it was introduced over CEA capacity concerns. This is especially interesting given the continued push at all levels of government around the "green economy" and the need to further promote "green industry" and "green jobs". This appears to be in clear contradiction to government sentiments and actions plans at both the provincial and federal levels, making it difficult to determine exactly how committed various agencies are to the idea of a "green economy". The province should attempt to launch a formalized process with NRCan to analyze the current capacity of CEAs in the province, particularly in rural outlying areas and then attempt to determine how industry capacity could be expanded in a responsible way. NRCan may also be facing staffing and capacity issues and may welcome the opportunity to work collaboratively with the province, instead of simply responding to a set of inquiries or demands. If NRCan is not amenable to any capacity increases, the province should investigate alternative methods to carrying out blower door tests independent of

the NRCan model as this is too important an aspect of performance-based codes to continue to ignore, especially given its cost effectiveness and the implications for both program evaluation and construction industry education.

BCBC Monitoring

As mentioned in the previous section on Code Development, the inclusion of performance testing can support and provide additional data to modeling programs and assumptions. Mandatory performance testing may allow the province to develop a detailed code monitoring and evaluation program that could be implemented through a partnership with selected municipalities that want to take a more proactive role in promoting higher-performance buildings. The program could be targeted at analyzing how building performance improvements translate into energy or GHG emission savings. It could start at the level of select municipalities and then expand across the province, allowing government agencies time to test and refine the monitoring and evaluation program prior to it being introduced province wide. The more localized initial evaluation program could also potentially provide a set of preliminary results faster than a province wide program, allowing governments to provide solid evidence of success, or quickly determine where the performance standards are not leading to the predicted energy savings and potentially adjust the standards to make them more effective.

In addition to the initial building performance tests to determine code effectiveness, the program could have an additional component targeted at tracking and monitoring building performance over time. This component could involve research by institutions (like the British Columbia Institute of Technology) and homeowners or builders designed to monitor changes in residential building performance as the building and systems age. This portion of the program could involve a combination of performance tests and energy data monitoring over the first three years of home use or for the three years immediately following a major renovation to determine if performance ratings are an effective indicator of home energy use over time.

The data from this direct research could be combined with the data from the province wide performance-testing program during building permit issuance and then incorporated into the discussion around the next set of BCBC updates. This kind of pilot project could also increase the knowledge of various construction

industry sectors and participating homeowners[17]. The smaller energy use over time project could be expanded and perhaps combined with the programs mentioned below that use the new data collection possibilities of the Smart Meter program, or expanded to include communities that have decided to prioritize building energy issues.

Monitoring Occupant Behaviour

Another building performance issue highlighted by the interviews, and raised during the literature review, is the impact and influence of occupant behaviour on residential building energy use. Occupant behavior can have considerable impacts on building performance but is often poorly understood by homeowners and occupiers. Though some performance codes have incorporated mandatory performance testing components, POEs to determine actual building energy use over time have not been developed. Though POE evaluations may fall outside the scope of the BCBC, there is the potential to develop additional programs (including something that could be incorporated with the building performance over time research listed above) that could be integrated into the code development process.

This program could be aided through collaboration with BC Hydro's new Smart Meter program. This program is currently rolling out across the province, and despite an organized and well publicized public opposition it will begin collecting detailed energy use information from BC Hydro customers by the fall of 2013. This data could be used to provide additional information to government agencies, homeowners and potentially developers and construction firms to compare energy end use data with predicted building performance. The utility is currently scheduled to provide monitoring data on a monthly basis, which in addition to allowing homeowners to track their consumption habits could also enable government agencies to monitor a range of energy use targets and allow builders greater detail about how consumers are using their product, perhaps enabling them to suggest alternative products or systems to future customers.

This data collected through the Smart Meter program will be used to modernize the utility's billing and rate program, allowing a range of rate structures and incentives designed to encourage further demand side management. This program has

[17] Initial performance testing, at the building permit stage, would provide a certain level of increased information regarding building performance (via the blower door test), though the three-year program would offer significantly more information.

potential large-scale implications related to monitoring and analyzing the nuances of residential energy use. As part of this program and with the additional data available, new pricing strategies could be developed connecting energy prices to consumption, charging the largest energy users a premium price. This pricing scheme is often used in conjunction with water metering programs to encourage conservation. This strategy could be a way of handling the excessive energy use of large buildings (identified as a significant issue in the literature review) without developing a separate strategy to regulate residential buildings according to size.

The data collected by the Smart Meter Program could also lead to significant research into residential energy use in British Columbia. Given the initial controversy of the Smart Meter program, there may be a wide range of privacy issues raised in relation to this data set. However if a fairly simply opt-in protocol or procedure was developed, provincial agencies could potentially gain access to an impressive and unprecedented residential energy consumption data set. This could allow for a comprehensive evaluation strategy, perhaps enabling further engagement of the public in energy use issues through the use of interactive tools. Even if privacy concerns cannot be mitigated on a mass scale, the project could begin as a pilot with willing homeowners who want to increase their understanding of the performance of their home and their personal energy consumption habits. Depending on the scope and the research partners involved this could supplement other energy modeling work, providing both government and industry with a much better picture of how homeowners in British Columbia are using energy and whether the code updates are actually having measurable impacts on energy consumption.

BCBC Implementation

As mentioned in the analysis section in Chapter 5 above there is a significant amount of policy implementation work still to be completed related to the Part 9 update, as it is not scheduled to take effect until December 2014. However, there are a series of recommendations around the implementation process that could still be incorporated in conjunction with this update. Additionally these recommendations consider education and training programs based around BCBC updates to be an integral component of the implementation process and thus include some suggestions regarding these programs.

Communication and Outreach

There were numerous issues identified with how the BCBC updates were communicated to the construction industry, local government and the general public. The lack of communication around code updates and the uneven knowledge of the final performance standards across local governments and industry could be mitigated by a more robust communication plan. As the main keeper of the BCBC, the Building and Safety Standards Branch is likely the first choice to coordinate this type of communication plan in advance of the upcoming changes to Part 9. However given the staffing and capacity issues identified previously it may be unrealistic to assume they can take on additional coordination and communication responsibilities without an increase in funding or an internal branch restructuring. These recommendations should be developed in concert with programs identified during the previous phases of development and evaluation and monitoring.

Considering the range of programs developed and run by the Building and Safety Standards Branch (including code interpretation) the branch should consider reevaluating its communication program across the entire branch. Other BCBC programs may be experiencing similar issues and the changes to branch communications should be designed to consider the needs of all programs. One potential solution could be the development of a clear communications plan for the branch that could be administered by a new communications staffer. This is only one of a range of reorganization and communications options available to the Building and Safety Standards Branch and additional research into communications protocols used by other governments around code updates should be conducted to determine the best option. Though this work may not be completed in time for the Part 9 update of 2014, a new communications plan (that can deal with industry, local governments and the general public) should be in place prior to next comprehensive BCBC update in 2018.

The communications plan should be structured to address issues raised by local officials and its development should devote time to researching the current communication process to determine exactly how the Building and Safety Standards Branch currently communicates with local governments. This should also include the consideration of developing a separate BCBC consultation process or education programs for local government that could be administered through online

presentations thus eliminating the need for representatives from the province to engage in resource intensive outreach activities (meetings and presentations).

Local building officials have the most direct contact of any government agency with those involved in home construction and renovation, both the professional development community and amateur owner-builders[18], and ensuring they are adequately informed regarding future code changes could have multiple benefits: the potential changes can be distributed to industry through a second or third channel (not simply through professional industry associations or the Building and Safety Standards Branch), builders can have code update and implementation questions answered in person, misinformation or rumours about potential changes can be quickly countered, and code compliance solutions can be given out on a case-by-case basis. Additionally local building officials can assist in outreach activities around public reviews, either through direct builder interaction, simple outreach material on the municipalities website, or via building counter brochures.

There is limited public information currently available regarding the upcoming code changes and given that the changes are scheduled to take effect in just over a year, the province should move quickly to develop additional material devoted to code implementation. The Province of Ontario produced a significant amount of outreach material aimed at the implementation of their energy performance code, highlighting specific components and making the material clearly visible on their website. British Columbia should adopt this type of open information-sharing model around code communication as having a well publicized central location where the development community, local officials and the general public can find information could ease frustrations around the updates and provide greater understanding of the proposed changes. Since staffing and budget issues have been identified as a potential contributing factor in code delays, having a single place to send inquiries (i.e., a centralized website with all BCBC updates and process listed) may actually cut down on staff time spent fielding calls and questions regarding these kinds of documents. Additionally, by publicizing background or progress reports, the outreach work of Building and Safety Standards Branch officials could also become more efficient. Less time would be required to provide the background information during presentations (either over the internet or in person), since web references

[18] Owner builders are amateurs engaged in their own development projects, either full home construction or renovations that require building permits and engagement with the BCBC.

could be given for those seeking additional information. If update information is available prior to code presentations, participants from all sectors would have the opportunity to prepare more substantive questions about the upcoming updates than they may be able to with limited preparation time. This could also ensure the comments provided during these meetings are based on a thorough understanding of what is being proposed, and not simply an initial reaction to a set of regulations the commenter may not yet fully understand.

This centralized code information hub could also increase efficiencies at the local level through improved builder-RBO interactions. The centralized website could give RBOs a place to direct questions from builders regarding upcoming code changes, provide them with resources around current code processes and also allow municipalities committed to sustainable development initiatives to develop additional outreach material to publicize the upcoming changes or processes. This approach would also allow the province to take advantage of the outreach activities already being conducted at the local level and it would also potentially make them more efficient as RBOs will be able to more easily stay on top of BCBC developments.

Builder Education and Training

The issue of increased education and training in conjunction with BCBC updates could be implemented in a range of ways and will depend on whether or not the province looks to implement additional regulations on the residential construction industry through the Professional Builder Institute (PBI). This program is current awaiting approval from the province and there should be extensive consultation between the Building and Safety Standards Branch representatives to ensure the builder training and certification program is adequate and includes an adequate energy efficiency component. Additionally this consultation should address how standards will be updated to match future BCBC changes. The province should also take steps to ensure the finalized PBI makes allowances or requirements for continuous builder education, ensuring that in order to remain registered or certified qualifications must be maintained. If the PBI program is not approved the province should begin work on developing its own training program, perhaps one that could be implemented by local officials in the form of a short seminar, or weekend course addressing the most energy intensive components of residential buildings including the building envelope and air tightness.

In the field of builder education and training, Ontario is again at the forefront and has developed a range of courses on construction and development that relate to the Building Code and are administered by provincial authorities (Province of Ontario, 2013). Among the offerings is a course that covers energy efficient construction, including thermal insulation compliance options, thermal performance and air leakage and an overview of the EnerGuide performance program. Though this kind of education program requires considerable resources and political will that may be beyond the scope of the Building and Safety Standards Branch, it is worth noting that government regulators have been effective in installing their own programs without ceding further regulatory control or oversight to industry associations.

Chapter 7 – Conclusion

The Energy Efficient Buildings Strategy launched by the province of British Columbia in 2005 and updated in 2008 contained a range of policy programs aimed at improving the energy efficiency of the built environment. The strategy was connected to other large-scale climate change and GHG emissions reduction policies launched by the province, including the *BC Energy Plan* and the *BC Climate Action Plan*. Two specific regulatory goals were announced as part of the second phase of the EEBS in 2008: that British Columbia would have the "greenest" building code in Canada and that all new residential construction would meet an EnerGuide 80 performance rating by 2010.

This updated EEBS was officially released just prior to the implementation of a separate residential regulatory initiative managed by the Building and Safety Standards Branch: the "Greening of the Building Code" (GBC) that introduced the first BCBC objective for energy and water efficiency and also introduced the first energy efficiency related code compliance path. This created a hybrid building code in terms of energy efficiency, fusing the more traditional prescriptive economic code (the base of all modern building regulatory system) with a performance-based code option.

This followed broad trends in building regulation that emerged in the mid-late seventies in response to issues of energy supply and pricing caused by the OPEC oil crisis and a rising environmental movement, that drew attention to local-level environmental impacts caused by energy production and use, including air and

water pollution. The policy response to these issues saw increased product regulation and standardization and expanded the range of issues considered within building legislation to include social concerns such as environmental performance and energy efficiency. These performance-based codes demanded a specific level of energy performance, often determined by modeling the characteristics of the existing housing stock and comparing it with the potential performance gains from improvements like increased insulation, air-tightness of the building envelope and higher performing mechanical systems.

These performance code programs that became an acceptable and widespread response to energy and environmental challenges of the late 1970s and early 1980s were abandoned as energy supplies and prices were secured through a series of trade agreements. Additionally, the environmental movement began targeting large-scale industrial polluters and shifted focus from residential building environmental impacts. This was also a period of increased deregulation across most industries and sectors, a trend that would continue in the construction industry until the emergence of climate change as a global issue and policy issue in the late 1990s.

With the emergence of climate change concerns, environmental issues became orientated away from local environmental quality and placed in the context of changing global environment processes and events. The scope of climate change and the range of environmental issues associated with it, has been challenging for policy makers to address in a comprehensive manner.

In Canada, there has been limited action at the federal level towards climate change goals, as much of the work on climate change mitigation and adaptation strategies has occurred at the provincial level. British Columbia took a hybrid approach to climate policy launching a plan that targeted energy production, generation and efficient use (the *BC Energy Plan*) in 2002, followed by an update (the *BC Energy Plan: A Vision for Clean Energy Leadership)* in 2007 prior to their major climate change legislation, *BC Climate Action Plan* in 2008, which addressed issues of economic growth, and transportation, while creating the country's first carbon emissions tax (Province of British Columbia, 2008).

Given that the built environment plays a significant role in energy use in British Columbia (approximately 13% of all energy used in the province can be attributed to residential buildings), the province included references to improved built

environment performance in a range of energy policies introduced between 2002 and 2007. This was a time of high political support around energy and climate change policy within the province. Appendix 1 outlines this timeline, illustrating the range of policies developed by the province during this time. The Energy Efficiency Branch developed the most extensive built environment policy, which included specific regulatory goals for the residential sector and instigated a significant update to Part 9 of the BCBC, led by the Building and Safety Standards Branch.

Unfortunately, there was a range of issues during the development of the Part 9 update that led to significant code update delays. One of the most important was the limited discussion or collaboration between government agencies during the large-scale goal development phase of the EEBS. This led to modeling assumptions that did not accurately reflect existing construction practice and the widespread belief within the Energy Efficiency Branch that the two-year timeline for EnerGuide 80 certification implementation was a feasible goal. Interview comments from various stakeholders indicated the EEBS's suggested timeline was impossible, especially with no resources invested to increase the capacity of the Building and Safety Standards Branch or into the development of builder training and education programs.

The Building and Safety Standards Branch was tasked with developing the code update program and they convened a Technical Advisory Group of industry experts that began meeting at the start of 2009. Following a year's worth of meetings between the provincial group, a national Part 9 code process emerged and made significant progress towards a set of energy efficiency improvements. Since the province had a formal policy of code harmonization with the National Building Code, their technical process was abandoned in favour of the national process.

The Part 9 update was released for public review in the fall of 2012 and is currently scheduled for inclusion in the BCBC in December of 2014. The final update standards remain a hybrid code, with a prescriptive and performance compliance paths, and it does not include a mandatory performance-testing component, something that is considered essential for evaluating energy efficiency performance goals and GHG emissions reductions.

A set of interviews conducted with stakeholders involved in either the Part 9 update process or the construction industry in British Columbia highlighted a set of issues

concerning policy development, monitoring and evaluation and implementation. Some of these issues were related directly to the development of the EEBS, while others reflected on the general operations of the Building and Safety Standard Branch and the lack of consultative opportunities during the BCBC updates. There were several contradictions between interview participants (particularly differences between certain government agencies, and the construction industry and local governments); however all believed in the use of some form of regulation to increase building energy efficiency and building performance. There was also large consensus on the importance of performance testing and the need for federal agencies to ensure the testing industry has adequate capacity to handle the incorporation of these provisions into the BCBC.

Though this research does identify a number of policy process issues and a set of recommendations to address them, there is clearly the need for additional research into the development of the EEBS as it relates to issues of coordination between government agencies during the development of large-scale policy programs with climate change and GHG emission implications. The need for additional research is exacerbated by the lack of public information or previous research available around the GBC, EEBS or Part 9 update process and the limited number of people with relevant experience of the policy programs analyzed available to be interviewed. Further research should focus on the relationship between government agencies (including the Energy Efficiency Branch and the Building and Safety Standards Branch), local officials and the construction industry to gain a more nuanced understanding of the consultations that occurred. It should also look at potential options for performance testing and additional information for why these measures were omitted from the final Part 9 update and what issues stakeholders raised during the 2012 public review. Finally, this research should be incorporated into a comparative analysis between this process and portions of other large-scale climate action plans to determine if what happened in British Columbia fits with larger built environment policy trends.

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Appendix 1

Timeline of Climate and Energy Related Policy Programs in British Columbia

2001
Gordon Campbell becomes Premier of BC Liberal Party wins provincial election with environmentally focused mandate

2002 - *BC Energy Plan*
Developed by the Ministry of Energy, Mines and Natural Resources - Focused on energy production, increased efficiency across multiple sectors.

2005 – *Energy Efficient Building Strategy*
Developed by the Energy Efficiency Branch of the Ministry of Energy, Mines and Natural Resources

Focused on increased energy efficiency across 3 sectors of the built environment.

2007 - *BC Energy Plan: A Vision for Clean Energy Leadership* –
Developed by the Ministry of Energy Mines and Natural Resources.

Focused on development of new green energy sources, provincial energy self-sufficiency, demand side management, and increased efficiency.

2008
Green Building Code Update – Ministerial Order M-100
Developed by the Building and Safety Standards Branch of the Ministry of Energy, Mines and Petroleum Resources – Added the Part 10 Objective and an energy performance code compliance path (Note: Released for Public Review in Fall of 2007, added to the BCBC in April of 2008).

Energy Efficient Building Strategy: More Action, Less Energy
Developed by the Energy Efficiency Branch of the Ministry of Energy, Mines and Natural Resources - Update of 2005 Strategy – Included energy performance targets for residential and commercial buildings: EnerGuide 80 by 2010, 20% reduction in energy demand per home by 2020.

Climate Action Plan
Developed by the Ministry of Environment – Includes a commitment to reduce BC's GHG emissions by 33% by2020, mandates the implementation of a carbon tax, supports programs to increase awareness and instigate a range of incentive programs.

2009
"Airtightness in Residential Construction" Building Smart #11, Spring 2009
Presentation sponsored by the Homeowner Protection Office and led by Murray Frank of Custom Homes Solutions. Presentation aimed at Part 9 builders (residential construction) to illustrate the impact of building airtightness on residential performance.

The Building and Safety Standards Branch formed the Technical Advisory Group working on energy efficiency updates to Part 9 of the BCBC in response to the residential building performance goals of the EEBS.

2010
Clean Energy Act (Bill 17) – Developed by the Ministry of Energy, Mines and Petroleum Resources – Legislated specific goals and programs of the *BC Energy Plan* and the *Clean Energy Act* – Included commitments to Smart Metering and Smart Grid technology, a feed-in-tariff program and a standing offer power call.

"2012 Code Changes – Safety, Efficiency and Sustainability" Building Smart #16, Spring 2012
Presentation sponsored by the Homeowner Protection Office and led by Murray Frank of Custom Homes Solutions. Presentation discussed upcoming changes to the 2012 BCBC, though did not include a specific discussion around the proposed Part 9 changes.

Target year for the BCBC to incorporate the EEBS performance goal of the EnerGuide 80 performance standard into the BCBC, however it was incorporated. Additionally the Technical Advisory Group was abandoned this year in support of a national process led by the SC-EEB.

2012
British Columbia Building Code, 2012 –
Developed by the Building and Safety Standards Branch of the Ministry of Energy, Mines and Petroleum Resources.
Major update to the BCBC: included changes to window standards, fire separation requirements and structural changes. Did not include the Part 9 update.

"Making Progress on BC's Climate Action Plan" – Ministry of the Environment.
Update on progress of the 2008 *Climate Action Plan* – Reports an over-all decline in GHG emissions, however building efficiency metrics are measured in terms of soft targets: % of BC homes that have used incentive programs, % of total LEED projects registered in BC, etc.

Building and Safety Standards Branch sends the Part 9 Update is out for public review in the fall. The update is adopted by BC legislature in December – Changes take effect in 2014

Appendix 2

List of Interviewees:

Government Representatives:

Provincial:

John Nicol, Energy Projects Team Leader, Building and Safety Standards Branch

Policy Advisor, Energy Efficiency Branch

Local:

Manager, Building Department, Regional District (South Coast)

RBO, Building Department, Municipality (Vancouver Island)

RBO, Building Department, Regional District (South Coast)

Construction Industry:

CEO, Residential Development Company (Okanagan)

Owner, Residential Development Company (Fraser Valley)

CEO, Residential Development Company (South Coast)

Owner, Certified Energy Advisor Firm, (Okanagan)

Environment:

Policy Advisor, Pembina Institute

List of Interview Questions:

General questions for all participants:

- What was your role (or your agency/organization's role) in the development of the EEBS (either the first phase released in 2005 or the second released in 2008)?

- What was your role (or your agency/organization's role) in the development of the Green Building Code update introduced to the British Columbia Building Code in 2008?
- What was your role (or your agency/organization's role) in the development of the Part 9 update to the British Columbia Building Code currently scheduled for adoption in 2014?
- Were you involved in any type of policy evaluation of the either the EEBS, the Green Building Code or the Part 9 update between 2008-2012?
    - If yes, how did you participate in the evaluation?

Questions for government representatives:

- Are you aware of any intra agency consultation that occurred during the development of the EEBS?
    - What provincial agencies were involved in the consultation?
    - Where the residential performance goals of the EEBS explicitly discussed?
- What kind of research was involved in developing the EEBS's residential performance goals and what agencies were involved in this research?
- Were you involved in the any policy evaluation conducted for either phase of the EEBS?
    - What did this policy evaluation involve?
        - Did it include monitoring of performance targets?
        - Were any other groups or agencies involved in this evaluation?
- Were you involved in any inter agency discussions around the Part 9 update to the British Columbia Building Code?
    - Did these discussions include whether to abandon EnerGuide 80 performance standard?
    - Was the inclusion of a mandatory performance requirement discussed?
    - Did these discussions consider issues of code implementation and enforcement?
    - Were local building officials consulted?
- What factors were the greatest contributors to the delay of the Part 9 update?
- Should the British Columbia Building Code abandon its current hybrid structure and shift to a full energy performance code?

Questions for industry representatives:

- Did the Green Building Code of 2008 have any immediate or long-term effects on your business (either on profitability, construction practice, suppliers or subcontractors)?
    - Were these effects anticipated?

    - Were you able to communicate with the provincial government regarding any of these effects?
        - If yes, what was the process involved?
        - If no, did you attempt to communicate with the provincial government?
- Were you involved in consultations or discussions during the development of the EEBS?
    - Do you believe the residential performance goal of a mandatory EnerGuide Rating by 2010 was appropriate or achievable?
- Are you aware of the energy efficiency changes to Part 9 of the British Columbia Building Code scheduled to take effect in December 2014?
    - If yes, were you involved in the development of these updates?
    - Did you receive information on these updates from an industry association?
- If you are aware of upcoming changes to Part 9, do you believe they will have any effect on your business?

  If yes, have you been able to share these concerns with the provincial government?
- Do you support the inclusion of a mandatory performance-testing requirement within the British Columbia Building Code?
- What changes would you make to the British Columbia Building Code Update Process

Questions for environmental representatives:

- Do you feel the province adequately considered the concerns of organizations outside of the construction industry when developing built environment policies?
- Does your organization still work on energy efficiency related policy programs with the provincial government?
- Have you been provided with any kind of policy evaluation documents that demonstrate improved energy and environmental performance by the residential building sector since the 2008 Building Code update?
- Are there any specific changes you would make to the public consultation process around the Building Code?
- Are there any BC specific energy efficiency elements you feel are missing from the current residential Building Code?